Multicomponent Diffusion in Basaltic Melts

by

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To

my wife, You Wo

my parents, Zhihong Guo and Xiaoli Zhang

献给

我的妻子，沃游

我的父母，郭志宏和张小丽

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ABSTRACT

This dissertation focuses on understanding multicomponent diffusion of major elements in basaltic melts. Diffusion in simpler 7-component FeO-free haplobasaltic melts was first investigated at a single temperature to establish the method and approach that a diffusion matrix can reproduce all features in multicomponent diffusion. After the success in the simpler melts, diffusion in realistic basaltic melts at various temperatures was studied and diffusion matrices were obtained and applied to predict mineral dissolution.

Nine successful diffusion couple experiments were carried out in a 7-component SiO_2–TiO_2–Al_2O_3–MgO–CaO–Na_2O–K_2O system at ~1500 ºC and 1 GPa, to study multicomponent diffusion in haplobasaltic melts, with compositional gradients in only two components in each experiment. At least two concentration traverses were measured for each experiment. Effective binary diffusion coefficients (EBDC) for monotonic profiles were obtained by an error function fit, and the EBDC of a given component is dependent on its counter diffusing component, especially for SiO_2. The EBDC of SiO_2 varies from 15.7 $\mu m^2/s$ when diffusing against Al_2O_3, to 102.9 $\mu m^2/s$ when diffusing against K_2O. Furthermore, the multicomponent diffusion matrix was obtained by simultaneously fitting all diffusion profiles in all experiments. All features in the diffusion profiles, for example uphill diffusion, are captured well by this 6 × 6 diffusion matrix. The slowest diffusing eigenvector is largely due to the exchange between SiO_2 and Al_2O_3, and the fastest diffusing eigenvector is the exchange of Na_2O with all other components. An anorthite

dissolution experiment was also conducted to test whether the diffusion matrix can be applied to mineral dissolution experiments. The calculated diffusion profiles in the melt during anorthite dissolution roughly match the measured profiles, demonstrating the validity and utility of the diffusion matrix in this FeO-free aluminosilicate melt system.

Twenty seven successful diffusion couple experiments were conducted in an 8-component SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO–Na_2O–K_2O system at ~1260 ºC and 0.5 GPa, at ~1350 ºC and 1 GPa and at ~1500 ºC and at 1 GPa, to study multicomponent diffusion in basaltic melts. At least 3 concentration traverses were measured to obtain diffusion profiles for each experiment. Multicomponent diffusion matrices at 1260, 1350 and 1500 ºC were obtained by simultaneously fitting diffusion profiles of diffusion couple experiments. Furthermore, in order to better constrain the diffusion matrix and reconcile mineral dissolution data, mineral dissolution experiments in the literature, in addition to diffusion couple experiments from this study, were also fit to obtain a new diffusion matrix. All features of diffusion profiles in both diffusion couple and mineral dissolution experiments were well reproduced by this new diffusion matrix. Diffusion mechanism at each temperature is inferred from eigenvectors of diffusion matrix, and it shows that both eigenvectors of diffusion matrix and inferred diffusion mechanism in basaltic melts are insensitive to temperature. The diffusive exchange between network-formers SiO_2 and Al_2O_3 is the slowest and the diffusive exchange of Na_2O with all other components is the fastest, which are consistent with those for simpler systems in most literature. Temperature dependence of diffusion matrix is examined by assuming eigenvectors to be independent of temperature and eigenvalues to follow Arrhenius relation. Diffusion matrix at other temperatures can be calculated, and is successfully applied to predict diffusion profiles during olivine and anorthite dissolution in basaltic melts at ~1400 ºC.

CHAPTER I

Introduction

1.1 General introduction

Natural silicate melts consist of numerous major components (e.g. SiO_2, TiO_2, Al_2O_3, FeO, MgO, CaO, Na_2O and K_2O). Diffusion in such melts is always multicomponent diffusion. Therefore, generally speaking, multicomponent diffusion is of fundamental significance in any natural processes involving mass transport, such as magma mixing and contamination (Sato, 1975; Watson, 1982; Koyaguchi, 1985, 1989; Oldenburg et al., 1989), magma double-diffusive convection (Turner, 1985; Liang et al., 1994; Richter et al., 1998), and mineral growth or dissolution in magmas (Watson, 1982; Zhang et al., 1989). More specifically, let's consider two cases where multicomponent diffusion plays a significant role in magma evolution.

In a mid-ocean ridge environment (Fig. 1.1), which accounts for the most abundant (~90%) magmatic activity on Earth, mass transfer takes place in the following processes during magma evolution: magma generation by the decompression partial melting of mantle; and fractional crystallization of magma. The evolution of magma is recorded by the different compositions of mid-ocean ridge basalts.

In a subduction environment (Fig. 1.2), where the most volcanoes on Earth are located, mass transfer takes place in the following processes during magma evolution: magma generation by the hydration partial melting of mantle; magma ascent and emplacement to some reservoir; magmas mixing in the reservoir if there is pre-existing magma; magma contamination in the reservoir by country rocks; fractional crystallization after magma cools down. The evolution history of magma is recorded by diffusion profiles frozen during volcanic eruption. Therefore, there is multicomponent diffusion where there is mass transfer, and multicomponent diffusion treatment should be applied to understand those natural processes more rigorously and accurately.

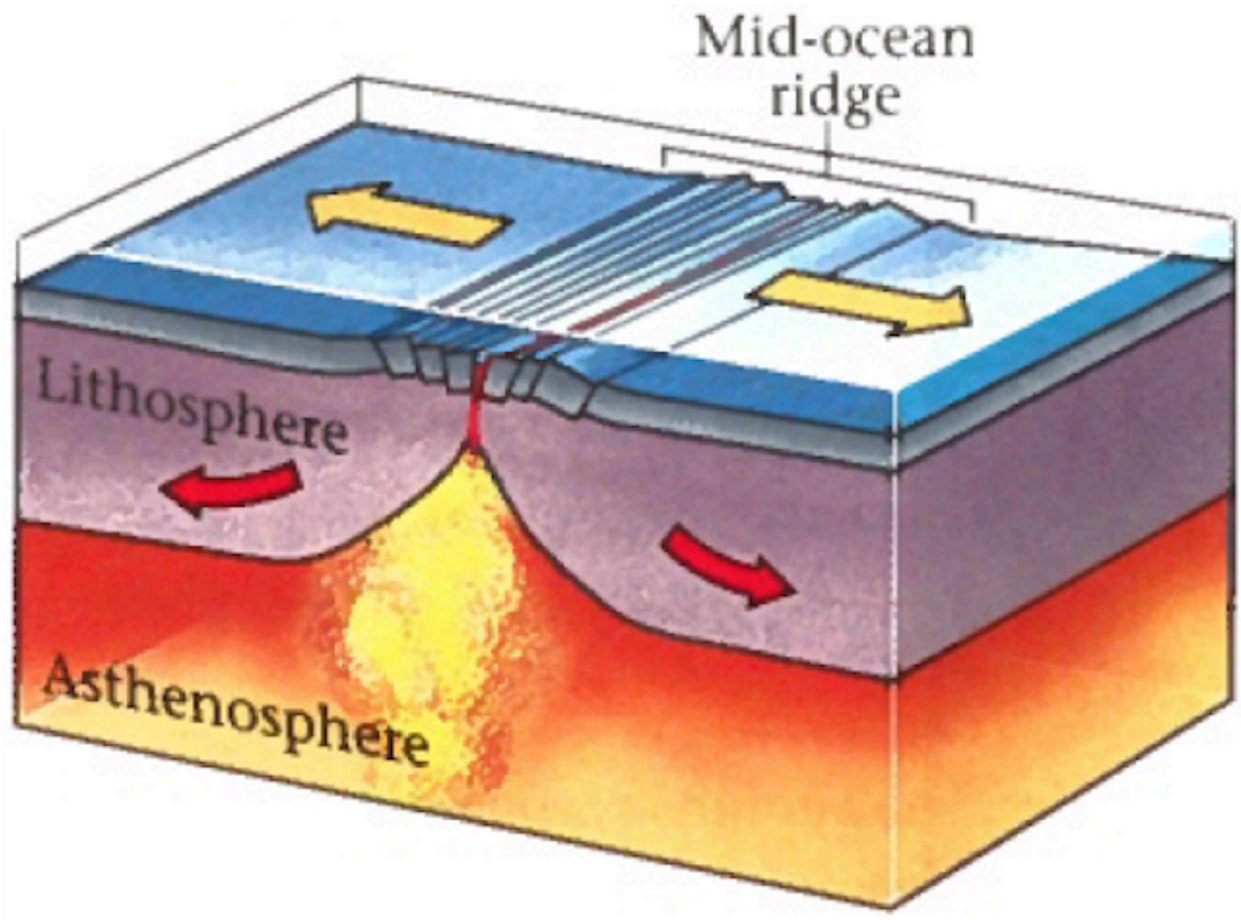

Fig. 1.1 An illustration of magma evolution in the mid-ocean ridges. Magma is generated by the decompression partial melting of mantle. After magma cools down, there will be fractional crystallization. The evolution of magma is recorded by the different compositions of mid-ocean ridge basalts. (figure from Marshak, 2012, p82)

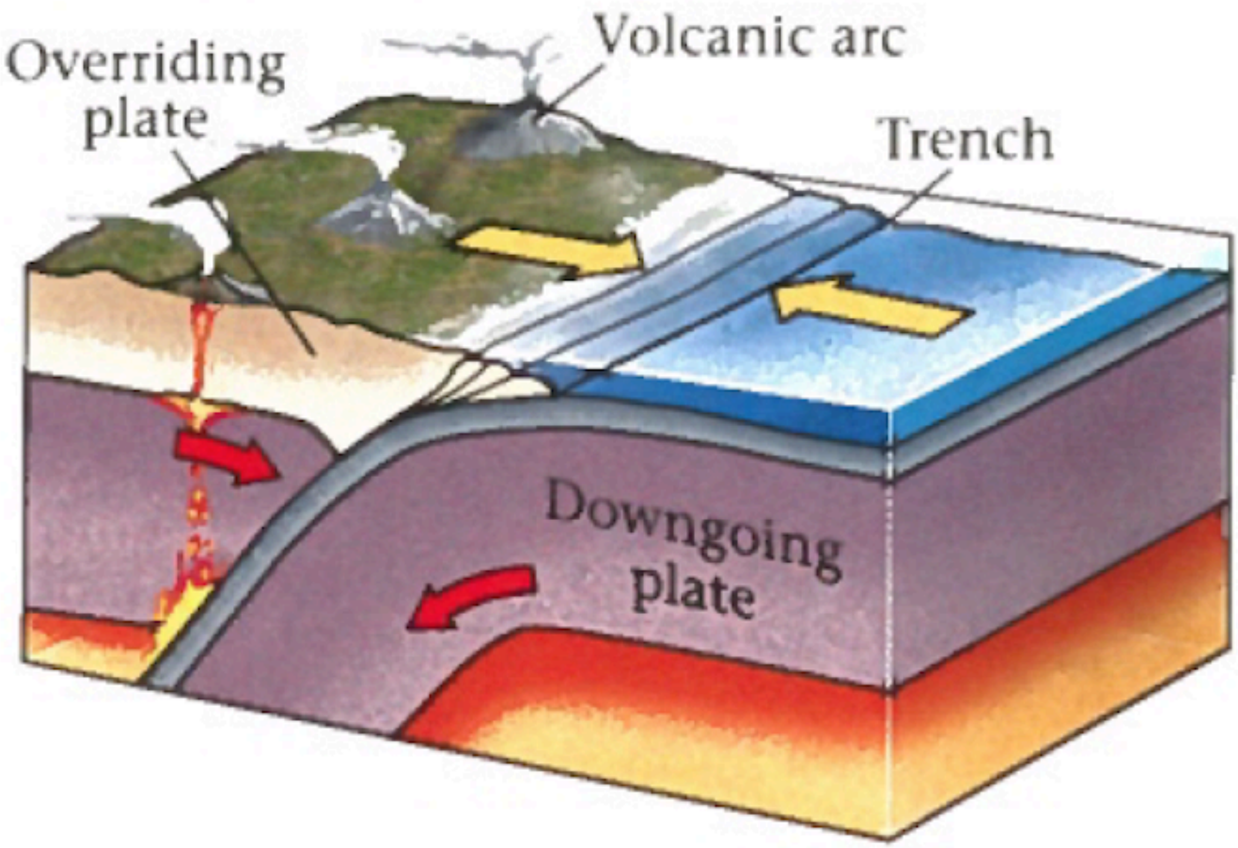

Fig. 1.2 An illustration of magma evolution at subduction zones. Magma is generated by the hydration partial melting of mantle. Magma ascends and emplaces to some reservoir in the lithosphere. If there is pre-existing magma in the reservoir, there will be magma mixing. Moreover, magma gets contaminated by the country rocks. After magma cools down, there will be crystallization near the boundary of the magma. The evolution history of magma is recorded by diffusion profiles frozen during volcanic eruption. (figure from Marshak, 2012, p82)

Instead of multicomponent diffusion treatment, effective binary diffusion treatment (Cooper, 1968) has been widely used as an alternative to treat monotonic diffusion profiles in a multicomponent system, in which case the often-observed uphill diffusion profiles in natural silicate melts (Sato, 1975; Watson, 1982; Zhang et al., 1989) are difficult to be dealt with, although some empirical models have been proposed for quantifying uphill diffusion (Cooper, 1968; Lasaga, 1979; Richter, 1993; Zhang, 1993; Liang et al., 1997). In addition, effective binary diffusion coefficient of a given component depends not only on the composition of silicate melts, but also on the concentration gradients of components in them (Cooper, 1968; Zhang et al., 1989;

Liang et al., 1996; Chen and Zhang, 2008, 2009; Guo and Zhang, 2016), making it more difficult to use the approach.

Tremendous efforts have been made in studying multicomponent diffusion in both synthetic and natural silicate melt systems: SiO_2–Al_2O_3–CaO (Sugawara et al., 1977; Oishi et al., 1982; Liang et al. 1996; Liang and Davis, 2002), SiO_2–CaO–Na_2O (Wakabayashi and Oishi, 1978; Watkins et al., 2014), SiO_2–Al_2O_3–MgO (Kress and Ghiorso, 1993; Richter et al., 1998), SiO_2–Al_2O_3–K_2O (Chakraborty et al., 1995), SiO_2–Al_2O_3–MgO–CaO (Kress and Ghiorso, 1993; Liang, 2010), SiO_2–Al_2O_3–CaO–Na_2O (Claireaux et al., 2016), SiO_2–Al_2O_3–Na_2O–K_2O–H_2O (Mungall et al., 1998), SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO (Kress and Ghiorso, 1995). Earlier studies by Sugawara et al. (1977), Wakabayashi and Oishi (1978) and Oishi et al. (1982) initiated multicomponent diffusion studies by diffusion couple experiments in simple ternary systems. Later studies in Na_2O- and K_2O-free SiO_2–Al_2O_3–MgO–CaO and simpler silicate melt systems by Kress and Ghiorso (1993), Liang et al. (1996), Richter et al. (1998), Liang and Davis (2002) and Liang (2010), found that there are strong diffusive coupling among different components, such as diffusion SiO_2 and Al_2O_3 is strongly coupled with MgO and CaO, and the degree of diffusive coupling depends strongly on the melt composition, moderately on pressure and weakly on temperature. Furthermore, diffusion of Na_2O and H_2O in Na_2O- and K_2O-bearing SiO_2–Al_2O_3–Na_2O–K_2O–H_2O or simpler silicate melt systems by Mungall et al. (1998), Watkins et al. (2014) and Claireaux et al. (2016) was found to be coupled with SiO_2. Diffusion matrices in simple silicate melt systems or partial diffusion matrices in natural silicate melt systems have been obtained (e.g., Kress and Ghiorso, 1995; Mungall et al., 1998; Guo and Zhang, 2016). Temperature dependence of diffusion matrix in simple systems SiO_2–Al_2O_3–CaO, SiO_2–Al_2O_3–K_2O and SiO_2–Al_2O_3–MgO–CaO is summarized by Liang (2010), and it was found that eigenvectors of diffusion matrix is roughly independent of temperature and eigenvalues of diffusion matrix follow good Arrhenius relation. Furthermore, several empirical models have been proposed to calculate multicomponent diffusion matrix based on thermodynamic models (Lasaga, 1979; Richter 1993; Liang et al, 1997). However, only very limited success is achieved in predicting diffusion in natural silicate melts by those experimentally obtained and empirically modeled diffusion matrices. For example, Kress and Ghiorso (1995) reported a partial diffusion matrix in Columbia River Basalts modeled as a 6-component system, but the prediction for olivine dissolution (Zhang et al., 1989) is not successful (Fig. 1.3); Alexander (2011) calculated diffusion matrix from empirical model of Liang et al (1997), by which olivine dissolution (Cheng and Zhang, 2008) is not predicted (Fig. 1.4). Multicomponent diffusion in natural processes usually happens at various temperatures in a more complex system with at least 8 components. Hence, understanding multicomponent diffusion in basaltic melts requires the temperature dependence of diffusion matrix in at least an 8-component system.

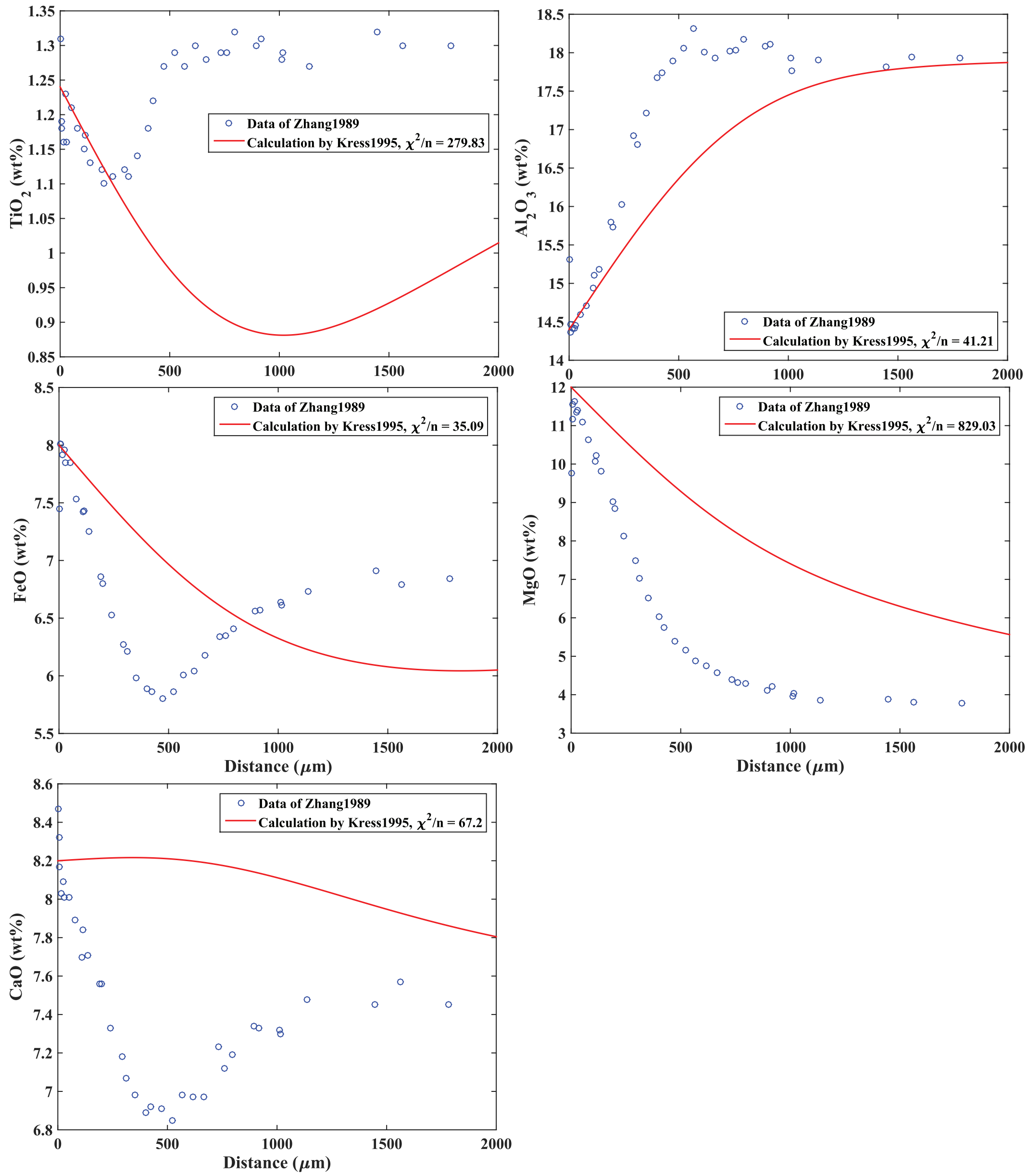

Fig. 1.3 Comparison between the experimental and calculated profiles for exp. 227 in Zhang et al. (1989), where the calculated profiles are by diffusion matrix of Kress and Ghiorso (1995) of multicomponent diffusion during forsterite dissolution in an andesitic melt at 1300°C and 5 kbar. Kress and Ghiorso (1995) ignored Na_2O and K_2O and other minor components, so SiO_2, Na_2O and K_2O are not shown here. The interface and far-field concentrations are determined from experiments. It can be seen that the calculated profiles are much longer than the experimental profiles, and the shape match is not close either. χ^2/n is calculated and shown for those five components.

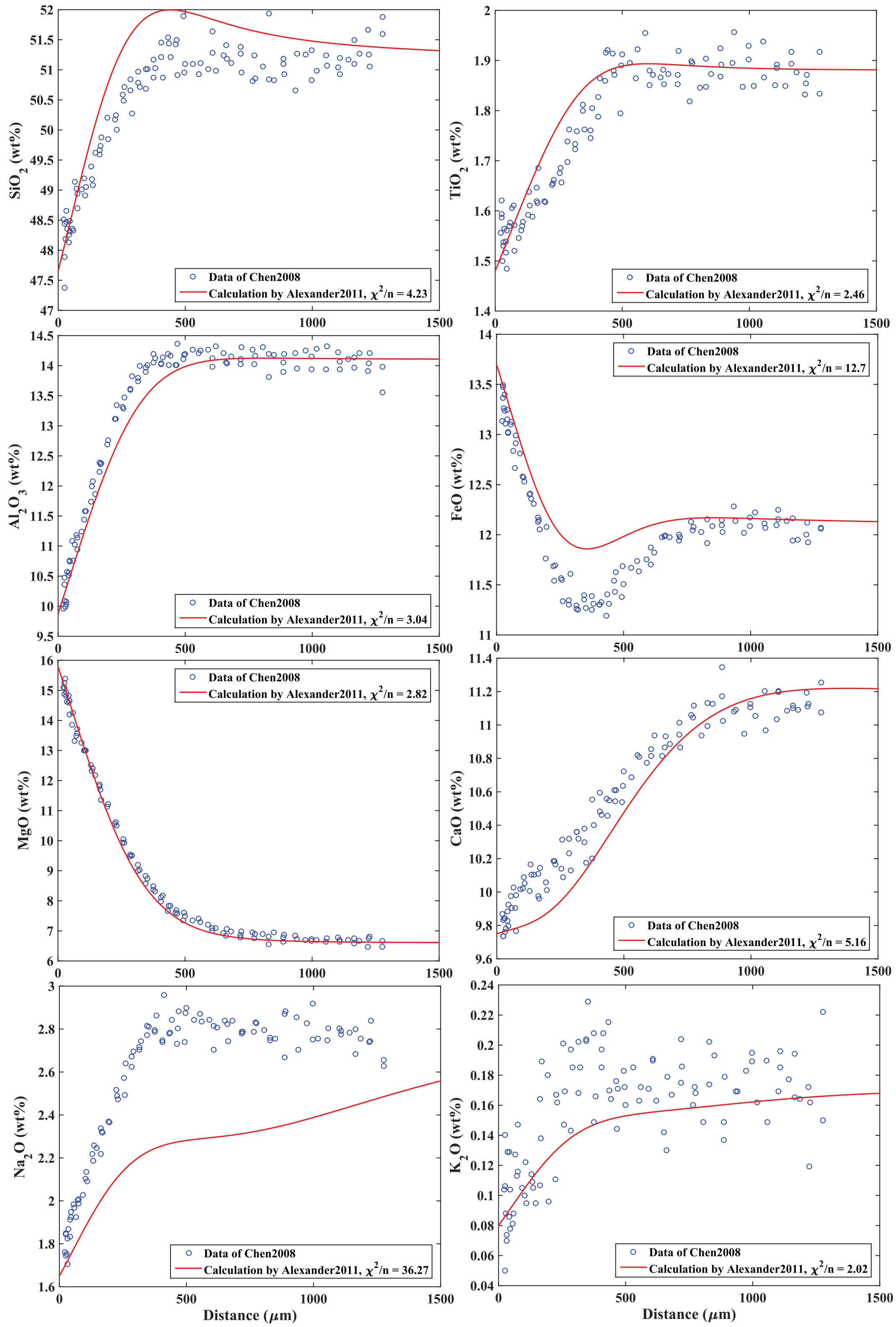

Fig. 1.4 Comparison between the experimental and calculated profiles for exp. 26 in Chen and Zhang (2008), where the calculated profiles are by diffusion matrix of Alexander (2011) for multicomponent diffusion during forsterite dissolution in an basaltic melt at 1372°C and 4.7 kbar. It can be seen that the lengths of the calculated profiles roughly match the data, but the shape match is not so good. χ^2/n is calculated and shown for each component.

1.2 Outline of this dissertation

This dissertation is aimed to better understand major-component diffusion behavior in natural silicate melts, or more specifically in basaltic melts. Diffusion couple experiments with synthetic initial glasses are designed and conducted by ½-inch piston-cylinder apparatus at various temperatures. Diffusion profiles are measured by electron microprobe.

Chapter II gives the general methods for experimental strategy, sample preparation, experimental procedure, analytical methods, preliminary data processing, numerical methods, error propagation and eigenanalysis that are used in later chapters.

Chapter III is the first step, serving as a warm-up preparation for chapters IV and V to obtain diffusion matrix in natural silicate melts. We investigated multicomponent diffusion in a 7-component haplobasaltic melt SiO_2–TiO_2–Al_2O_3–MgO–CaO–Na_2O–K_2O system at 1500 ºC and 1 GPa. This FeO-free system is chosen to avoid complexities associated with FeO in melts, such as ferric/ferrous ratio variation and iron loss during experiments. Diffusion profiles in all experiments were simultaneously fit to obtain the 6×6 diffusion matrix. In addition, we tested the validity of the extracted diffusion matrix by carrying out an anorthite dissolution experiment in the same melt and using the extracted diffusion matrix to predict diffusion behavior during anorthite dissolution.

Chapter IV is a follow-up study of chapter III. We investigated multicomponent diffusion in an 8-component basaltic melt SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO–Na_2O–K_2O system at 1350 ºC and at 1 GPa. This system is chosen to have an average composition close to that of Juan de Fuca mid-ocean ridge basalts (Dixon, 1986, 1988), because mid-ocean ridge magmatism is the most abundant magmatic activity on Earth. Diffusion profiles from all experiments were fit to obtain the 7 × 7 diffusion matrix, from which eigenvectors are used to interpret diffusion mechanisms. This diffusion matrix is successfully used to predict mineral dissolution.

Chapter V is the next step of chapter IV, where the temperature dependence of diffusion matrix in basaltic melts is investigated, in the same 8-component basaltic melt SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO–Na_2O–K_2O system in the same way as in chapter IV, but at two different temperatures at 1260 and 1500 ºC. Diffusion matrices at 1260 and 1500 ºC are obtained, as well as their eigenvalues and eigenvectors. Combining diffusion matrices at 3 different temperatures, the temperature dependence of eigenvalues of diffusion matrix is obtained by assuming that eigenvectors are invariant with temperature and eigenvalues follow Arrhenius relation. The general formula of diffusion matrix is applied to mineral dissolution at other temperatures.

1.3 References

Alexander C. M. (2011) Modeling diffusive dissolution in silicate melts. *Geochim. Cosmochim. Acta* **75**, 588–607.

Chakraborty S., Dingwell D.B. and Rubie D.C. (1995) Multicomponent diffusion in ternary silicate melts in the system K_2O–Al_2O_3–SiO_2: I. Experimental measurements. *Geochim. Cosmochim. Acta* **59**, 255–264.

Chen Y. and Zhang Y. (2008) Olivine dissolution in basaltic melt. *Geochim. Cosmochim. Acta* **72**, 4756–4777.

Chen Y. and Zhang Y. (2009) Clinodiopside dissolution in basaltic melt. *Geochim. Cosmochim. Acta* **73**, 5730–5747.

Claireaux C., Chopinet M., Burov E., Gouillart E., Roskosz M. and Toplis M (2016) Atomic mobility in calcium and sodium aluminosilicate melts at 1200 ºC. *Geochim. Cosmochim. Acta* **192**, 235–247.

Cooper A. R. (1968) The use and limitations of the concept of an effective binary diffusion coefficient for multi-component diffusions. In *Mass Transport In Oxides*, Vol. 296 (ed. J.B. Wachman and A.D. Franklin), pp. 79–84. Nat. Bur. Stand. Spec. Publ.

Dixon J. E., Clague D. A. and Eissen J.P. (1986) Gabbroic xenoliths and host ferrobasalt from the Southern Juan de Fuca Ridge. *J. Geophys. Res.* **91**, 3795–3820.

Dixon J. E., Stolper E. and Delaney J. R. (1988) Infrared spectroscopic measurements of CO_2 and H_2O in Juan de Fuca Ridge basaltic glasses. *Earth Planet. Sci. Lett.* **90**, 87–104.

Guo C. and Zhang Y. (2016) Multicomponent diffusion in silicate melts: SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO–Na_2O–K_2O system. *Geochim. Cosmochim. Acta* **195**, 126–141.

Koyaguchi T. (1985) Magma mixing in a conduit. *J. Volcanol. Geotherm. Res.* **25**, 365–369.

Koyaguchi T. (1989) Chemical gradient at diffusive interfaces in magma chambers. *Contrib. Mineral. Petrol.* **103**, 143–152.

Kress V. C. and Ghiorso M. S. (1993) Multicomponent diffusion in MgO–Al_2O_3–SiO_2 and Cao–MgO–Al_2O_3–SiO_2 melts. *Geochim. Cosmochim. Acta* **57**, 4453–4466.

Kress V. C. and Ghiorso M.S. (1995) Multicomponent diffusion in basaltic melts. *Geochim. Cosmochim. Acta* **59**, 313–324.

Lasaga A. C. (1979) Multicomponent exchange and diffusion in silicates. *Geochim. Cosmochim. Acta* **54**, 2709–2715.

Liang Y. (2010) Multicomponent diffusion in molten silicates: Theory, experiments, and geological application. *Rev. Mineral. Geochem.* **72**, 409–446.

Liang Y. and Davis A. M. (2002) Energetics of multicomponent diffusion in molten CaO–Al_2O_3–SiO_2. *Geochim. Cosmochim. Acta* **66**, 635–646.

Liang Y., Richter F. M. and Chamberlin L. (1997) Diffusion in silicate melts: III. empirical models for multicomponent diffusion. *Geochim. Cosmochim. Acta* **61**, 5295–5312.

Liang Y., Richter F. M. and Watson E. B. (1994) Convection in multicomponent silicate melts driven by coupled diffusion. *Nature* **369**, 390–392.

Liang Y., Richter F. M. and Watson E. B. (1996) Diffusion in silicate melts: II. multicomponent diffusion in CaO–SiO_2–Al_2O_3 at 1500°C and 1GPa. *Geochim. Cosmochim. Acta* **60**, 5021–5035.

Marshak S. (2012) *Earth Portrait of a Planet*. W. W. Norton & Company, Inc., New York, NY.

Mungall J. E., Romano C. and Dingwel D. B. (1998) Multicomponent diffusion in the molten system K_2O–Na_2O–Al_2O_3–SiO_2–H_2O. *Am Mineral.* **83**, 685–699.

Oishi Y., Nanba M. and Pask J. A. (1982) Analysis of liquid–state interdiffusion in the system CaO–Al_2O_3–SiO_2 using multiatomic ion models. *J. Am. Ceram. Soc.* **65**, 247–253.

Oldenburg C. M., Spera F. J., Yuen D. A., and Sewell G. (1989) Dynamic mixing in magma bodies: Theory, simulations and implications. *J. Geophys. Res.* **94**, 9215–9236.

Richter F. M. (1993) A method for determining activity–composition relations using chemical diffusion in silicate melts. *Geochim. Cosmochim. Acta* **57**, 2019–2032.

Richter F. M., Liang Y. and Minarik W.G. (1998) Multicomponent diffusion and convection in molten MgO–Al_2O_3 –SiO_2. *Geochim. Cosmochim. Acta* **62**, 1985–1991.

Sato H. (1975) Diffusion coronas around quartz xenocrysts in andesite and basalt from Tertiary Volcanic Region in northeastern Shikoku, Japan. *Contrib. Mineral. Petrol.* **50**, 49–64.

Sugawara H., Nagata K. and Goto K. S. (1977) Interdiffusivities matrix of CaO–Al_2O_3–SiO_2

melt at 1723 K to 1823 K. *Metall. Trans. B* **8**, 605–612.

Turner J. S. (1985) Multicomponent convection. *Ann. Rev. Fluid Mech*. **17**, 11–44.

Wakabayashi H. and Oishi Y (1978) Liquid-state diffusion of Na2O–CaO–SiO2. *J. Chem. Phys.* **68**, 2046–2052.

Watson E.B. (1982) Basalt contamination by continental crust: Some experiments and models. *Contrib. Mineral. Petrol.* **80**, 73–87.

Watkins J. M., Liang Y., Richter F., Ryerson F. J. and DePaolo D. J. (2014) Diffusion of multi-isotopic chemical species in molten silicates. *Geochim. Cosmochim. Acta* **139**, 313–326.

Zhang Y. (1993) A modified effective binary diffusion model. *J. Geophys. Res.* **98**, 11901–11920.

Zhang Y., Walker D. and Lesher C. E. (1989) Diffusive crystal dissolution. *Contrib. Mineral. Petrol.* **102**, 492–513.

CHAPTER II

Methods

2.1 Experimental strategy

The average composition of silicate melts is referred as "base" hereafter, shown as "Base Comp" in Tables 3.1 and 4.1, for 7- and 8-component systems respectively. The base was chosen to be close to the composition of Juan de Fuca (JDF) mid-ocean ridge basalts (MORB): 50.98% SiO_2, 1.97% TiO_2, 13.81% Al_2O_3, 12.24% FeO, 7.15% MgO, 10.91% CaO, 2.77% Na_2O, 0.17% K_2O (in wt%), shown as "JDF Basalts" in Table 3.1 (Dixon et al., 1986, 1988), except for a significantly higher K_2O concentration (1.5%) for our experimental composition so as to better resolve the role of K_2O in multicomponent diffusion. Note that FeO is substituted by CaO for the 7-component haplobasaltic melts. A MORB composition was chosen because mid-ocean ridge magmatism is the most abundant magmatic activity on Earth. Diffusion couples were designed in such a way that: for each diffusion couple, one half deviates from the base by +1.5 wt% in one oxide component and –1.5 wt% in another oxide component, and the other half deviates by –1.5 wt% and +1.5 wt% in the same two oxide components for complementariness. Therefore, the compositional variation between the two halves is present in only two components. The 3.0-wt% compositional variation for two oxide components in one couple was chosen to optimize the tradeoff between measurable diffusion profiles and negligible compositional dependence of diffusion matrix. 9 diffusion couple experiments were designed for each temperature.

2.2 Sample preparation

The initial glasses for each half of diffusion couple were synthesized in a Deltech furnace at the University of Michigan. SiO_2, TiO_2, Al_2O_3, Fe_2O_3 (only for 8-component basaltic melts), MgO, CaO, Na_2CO_3 and K_2CO_3 powders were weighed in the designed proportions, grinded in a mortar, mixed in ethanol and dried in a desiccator in vacuum. Mixed powders were placed in a glassy carbon crucible, heated up to 1450 ºC at a programmed rate under N_2 flow at 1 atm, kept there at 1450 ºC for 3 hours to homogenize and then quenched in air. For the 8-component basaltic melts, ferric iron is reduced to ferrous iron with 6% ferric iron in the initial glasses measured by XANES. The average compositions of initial glasses are shown in Tables 3.1 and 4.1 for 7- and 8-component systems respectively. Two complimentary compositions, such as BS1 and BS2, are put together to make a diffusion couple BS1&2.

Synthesized glasses were cut and shaped into cylinders with diameter of ~2 mm. Cylinders were sliced into disks with thickness of 1.5–2.0 mm (depending on estimated diffusion distance of the fastest diffusion component). Sample disks were polished on one side. Two sample disks were placed into a graphite capsule. Densities of initial glasses were estimated by Lange and Carmichael (1990), and the less dense sample disk in each diffusion couple was placed on top of the denser one to suppress convection. The graphite capsule was placed into an MgO rod. The MgO rod was placed into a graphite heater. The graphite heater was placed into a $BaCO_3$ pressure medium. This is called a sample assembly. The same design was used for all experiments to maintain consistency of actual temperatures among different experiments.

2.3 Experimental procedure

Chemical diffusion couple experiments were conducted in a ½-inch piston-cylinder apparatus at the University of Michigan. The temperature was chosen to be higher than the estimated liquidus of all initial glasses (Tables 3.1 and 4.1) by the MELTS program (Ghiorso and Sack, 1995; Asimow and Ghiorso, 1998). Temperature was controlled by a type-S thermocouple. The tip of the thermocouple was covered by alumina cement and separated from the graphite capsule by an MgO wafer with thickness of ~0.5 mm. The target controller (thermocouple) temperature was estimated so as to reach target temperature at the center (interface) of the diffusion couple based on the temperature calibration of Hui et al. (2008).

Experimental procedures are as follows. First, the sample assembly is brought to a pressure 10–15% higher than the target pressure, and then relaxed at 200 ºC for over night (>12 hours). After relaxation, the pressure is decreased to the target pressure (piston-out procedure). Then, temperature is increased at a programmed rate to the target temperature within 1 minute. The sample assembly is kept at the target temperature and pressure for a planned duration, until quenched by turning off the power.

Both temperature and pressure were continuously recorded. Temperature fluctuation was less than 1 ºC and pressure was manually controlled with a fluctuation of ~10 MPa. Actual temperature was calculated based on the post-experiment distance between the thermocouple tip and the center of diffusion couple using the calibration by Hui et al. (2008), which is typically slightly different from planned temperature due to a variable distance between the center of the diffusion couple and the thermocouple tip. Pressure was corrected by dividing the nominal pressure by 1.06 (Hui et al., 2008; Ni and Zhang, 2008).

2.4 Analytical methods

After experiments, the sample assembly was embedded in epoxy, grounded, polished and carbon coated. Diffusion profiles were measured at 15 kV using a 10 nA beam by a Cameca SX100 electron microprobe at Electron Microbeam Analysis Laboratory of the University of Michigan, where mass fraction (wt%) instead of mole fraction was used as concentration. Analytical conditions are listed in Table 2.1.

Table 2.1. Analytical conditions of electron microprobe analysis

spectrometer	element	Xtal	position	background+	background–	counting time
Sp1	Na	LTAP	~46381	–1400	820	30s
Sp1	Si	LTAP	~27747	–560	980	30s
Sp2	Mg	TAP	~38505	–1600	1000	30s
Sp2	Al	TAP	~32449	–850	850	30s
Sp3	K	LPET	~42752	–530	1100	30s
Sp3	Ca	LPET	~38381	–700	1300	30s
Sp4	Ti	LLIF	~68278	–620	1380	30s
Sp4	Fe	LLIF	~48084	–1200	1250	30s

Note: Multiple-period-counting sequence of elements in each spectrometer is the same sequence listed in the table. Peak positions change slightly for each analysis. No Na-loss was observed, so time-0 intercept was not used.

2.5 Preliminary data processing

The actual experimental temperatures at the center of the diffusion couple as determined after the experiment and effective experimental durations are listed in Tables 3.3, 4.3 and 5.1. In order to reduce the error in simultaneously fitting diffusion profiles in all experiments at different experimental temperatures, experimental temperatures were “normalized” to 1260, 1350 and 1500 ºC by correcting the effective experimental durations. Experimental durations were corrected by the relation $t_{\mathrm{corr}} = t_{\mathrm{exp}} \cdot \mathrm{e}^{-E/(RT_{\mathrm{exp}})} / \mathrm{e}^{-E/(RT_{\mathrm{corr}})}$, where T_{corr} = 1260, 1350 or 1500 ºC

(Zhang and Behrens, 2000) and E = 145 kJ/mol (from this study). The corrected experimental durations were used in fitting the diffusion profiles.

We defined SiO_2^* = SiO_2 – (total – 100) and used it as replacement of SiO_2 in fitting the diffusion profiles, because (1) SiO_2^* shows smaller variation than SiO_2 at the far-field, (2) SiO_2^* removes the analytical error of the "total", by attributing it to SiO_2, and (3) when using SiO_2 as the dependent component in fitting the diffusion profiles to obtain the diffusion matrix, it implicitly means SiO_2^* is used because concentrations of all components must add up to be 100%.

The boundary conditions in fitting the diffusion profiles were determined by taking average of numerous data points in the far-field. These boundary compositions can be slightly different from those average compositions of initial glasses in Tables 3.1 and 4.1, due to small compositional variation in a large synthesized initial glass and small difference in day-to-day electron microprobe calibration.

The fitting is weighted nonlinear multivariable regression, and the weight is the inverse square of the analytical 1σ error of each oxide component determined by numerous data points in the far-field (which are the same data points used to determine the boundary conditions).

The interface position for each diffusion couple was determined by fitting the best diffusion profile (i.e. the diffusion profile with the largest concentration difference and the smallest 1σ error), by the following equation:

$$w = \frac{w_{-\infty} + w_{+\infty}}{2} + \frac{w_{+\infty} + w_{-\infty}}{2} \cdot \mathrm{erf}\left(\frac{x - x_0}{2\sqrt{Dt}}\right), \tag{2.1}$$

where w is the concentration (in wt%) of the component, $w_{-\infty}$ and $w_{+\infty}$ are the left and right side boundary conditions in the far-field, x is the position, x_0 is the interface position, D is the effective binary diffusion coefficient, and t is the corrected experimental duration. After the interface position was determined, we defined the new position as $x_{\text{new}} = x - x_0$, such that the new interface position was at $x_{\text{new}} = 0$. The new positions were used in fitting the diffusion profiles.

2.6 Numerical methods

Mass fraction (wt%) rather than mole fraction are used for fitting concentration profiles to obtain the diffusion matrix. All diffusion profiles from diffusion couples at the same temperature were fit simultaneously to obtain the diffusion matrix, by minimizing the following χ^2 using Levenberg-Marquardt-Fletcher method (Fletcher, 1971):

$$\chi^2 = \frac{1}{2}\sum_{k=1}^{Ne}\sum_{j=1}^{Np_k}\sum_{i=1}^{Nc}\left(\frac{w_{ijk}^{\text{meas}} - w_{ijk}^{\text{calc}}}{\sigma_{ik}}\right)^2, \tag{2.2}$$

where Ne is the number of experiments fit, Np_k is the number of data points in experiment k, Nc is the number of components, w_{ijk}^{meas} and w_{ijk}^{calc} are the respectively measured and calculated concentrations of component i at position j in experiment k, and σ_{ik} is the 1σ error of w_{ijk}^{meas}. Each w_{ijk}^{calc} was calculated from the analytical solutions to the multicomponent diffusion equations given by eq. (A5) in Appendix A1 for diffusion couples and by eq. (A14) in Appendix A2 for mineral dissolution.

For calculating diffusion profiles during mineral dissolution, the interface melt composition was determined by extrapolation from experimental data in the literature, instead of being calculated from diffusion matrix and chemical potential relation between mineral and melt (Guo and Zhang, 2016). The dissolution rate was determined by eq. (A20) in Appendix A2, where only the interface melt concentration of the best-resolved component was used.

The Levenberg-Marquardt-Fletcher method (LMF method hereafter) is a damped least-squares method using trust region approach to solve nonlinear least squares problems. LMF method is a combination of Gauss-Newton method and descent gradient method through the damping parameter. It is more robust than Gauss-Newton method and faster than descent gradient method. However, this method can only find a local minimum, which requires a Monte Carlo search with different initial values to find the global minimum.

Generally, for a nonlinear least squares problem with a set of data (x_i, y_i), find the model parameters β (where β is a vector of unknowns) in a nonlinear model function $f(x, \beta)$, such that the sum of squares is minimized:

$$\min S(\beta) = \frac{1}{2}\sum_{i=1}^{m}\left(y_i - f(x_i,\beta)\right)^2 = \frac{1}{2}\left(y - f(x,\beta)\right)^T\left(y - f(x,\beta)\right). \tag{2.3}$$

Define the residue between measurement y_i and calculation $f(x_i, \beta)$ as:

$$r_i(\beta) = y_i - f(x_i,\beta), \tag{2.4}$$

and then eq. (2.3) can be written as:

$$\min S(\beta) = \frac{1}{2}\sum_{i=1}^{m} r_i^2(\beta) = \frac{1}{2} r(\beta)^T r(\beta). \tag{2.5}$$

Starting with an initial guess of the model parameters β, in each iteration β is fixed and the step size δ of β is determined as follows. The residue $r(\beta + \delta)$ can be linearized near β as:

$$r(\beta + \delta) \approx r(\beta) + J\delta, \tag{2.6}$$

where J is the Jacobian matrix whose i-th row is the gradient of $r(\beta)$ with respect to β. Therefore, $S(\beta+\delta)$ can be approximated by a quadratic function $Q(\delta)$:

$$S(\beta + \delta) \approx Q(\delta) = \frac{1}{2}\left(r + J\delta\right)^T\left(r + J\delta\right), \tag{2.7}$$

and δ that minimizes $Q(\delta)$ is given by:

$$\delta = -\left(J^T J\right)^{-1} J^T r\,. \tag{2.8}$$

In case of an ill-conditioned J^TJ, a damping parameter v is adopted such that the term to be inverted ($J^TJ + vI$) is always positive definite, and eq. (2.8) is revised as:

$$\delta = -\left(J^T J + vI\right)^{-1} J^T r\,. \tag{2.9}$$

where I is the identity matrix.

The damping parameter v is modified in each iteration using trust region approach, by examining the ratio γ between the actual decrement $\Delta S = S(\beta) - S(\beta+\delta)$ and the calculated decrement from quadratic approximation $\Delta Q = Q(0) - Q(\delta)$:

$$\gamma = \frac{\Delta S}{\Delta Q}\,. \tag{2.10}$$

γ indicates the goodness of approximation during the iteration with $\gamma = 1$ meaning a perfect approximation. If $\gamma > 0.75$, meaning a good approximation, then increase the radius of trust region by decreasing the value of v; if $\gamma < 0.25$, meaning a bad approximation, then decrease the radius of trust region by increasing the value of v; and remain the same γ otherwise.

The general algorithm of Levenberg-Marquardt-Fletcher method is summarized:

Step 1: initialize model parameters β, $v = 1$;

Step 2: terminate iteration if the terminating conditions are satisfied;

Step 3: calculate residue r and Jacobian J;

Step 4: calculate δ by eq. (2.9);

Step 5: calculate γ by eq. (2.10);

Step 6: $v = v / 2$, if $\gamma > 0.75$; $v = 2 \times v$, if $\gamma < 0.75$; $v = v$, otherwise;

Step 7: $\beta = \beta + \delta$, if $\gamma > 0$; $\beta = \beta$ otherwise; then go to step 2.

Specifically for minimizing χ^2 in eq. (2.2), the data are stored in a 3-dimension matrix from Ne experiments with Np_k data points measured in experiment k for Nc components in the system. The model parameters are a 2-dimension diffusion matrix. However, one complexity is that diffusion matrix must have real and positive eigenvalues, which makes it a least squares problem with constraints. Those constraints cannot be easily formulized. Fortunately, a diffusion matrix can be decomposed into the product of two symmetric matrices: a kinetic matrix L and a thermodynamic matrix G, where a symmetric matrix always has real eigenvalues. Therefore, the constraints on diffusion matrix are simplified to those on matrices L and G with positive eigenvalues, and matrices L and G are treated as the model parameters.

The specific algorithm of LMF method for minimizing χ^2 in eq. (2.2) is:

Step 1: initialize the model parameters L and G with identity matrix, $v = 1$, $\gamma = 1$;

Step 2: terminate iteration if termination conditions are satisfied;

Step 3: calculate residue r and Jacobian J, if $\gamma > 0$;

Step 4: calculate step size δ by eq. (2.9); reshape δ to matrix format dL and dG;

Step 5: calculate $LL = L + \mathrm{d}L$ and $GG = G + \mathrm{d}G$;

Step 6: $\mathrm{d}L = \mathrm{d}L / 2$, $\mathrm{d}G = \mathrm{d}G / 2$, and repeat step 5, until both LL and GG are positive definite;

Step 7: calculate γ by eq. (2.10);

Step 8: $v = v / 2$, if $\gamma > 0.75$; $v = 2 \times v$, if $\gamma < 0.75$; $v = v$, otherwise;

Step 9: $L = L + \mathrm{d}L$ and $G = G + \mathrm{d}G$, if $\gamma > 0$; then go to step 2.

The Matlab codes used to obtain diffusion matrix from diffusion couple and mineral dissolution experiments are given in Appendix B with more detailed explanation. The main function is LMF_solver.m, with supporting subroutines initialization.m, get_duration.m, get_distance.m, calc_conc.m, calc_residue.m, calc_jacobian.m.

2.7 Error propagation

The errors of diffusion matrix are estimated by error propagation from data errors (Clifford, 1973). In each experiment, data errors of each component are assumed to the same and uncorrelated with data errors of other components, and they are estimated by taking the standard deviation of numerous points in the far-field. However, the errors of eigenvalues and eigenvectors of diffusion matrix are not given.

In general, let x represents data, y represents model parameters, $\sigma(x_i)$ represent the error of data x_i, and $\sigma(y_i)$ represents the estimated error of model parameter y_i. Denote the derivatives of data with respect to model parameters as A, the covariance matrix of data as M_x and that of model parameters as M_y, where the elements of A and M_x are given by:

$$[A]_{ij} = \frac{\partial x_i}{\partial y_j}, \text{ and} \tag{2.11}$$

$$[M_x]_{ii} = \sigma^2(x_i) \text{ and } [M_x]_{ij} = \rho(x_i, x_j)\sigma(x_i)\sigma(x_j) = 0\,. \tag{2.12}$$

Therefore, M_y is given by error propagation as:

$$[M_y] = ([A^T][M_x^{-1}][A])^{-1}\,. \tag{2.13}$$

And the errors of model parameters are given by:

$$\sigma(y_i) = ([M_y]_{ii})^{1/2}\,. \tag{2.14}$$

The Matlab codes for estimating the errors of diffusion matrix are given in Appendix B by the subroutine calc_error.m.

2.8 Diffusion matrix when another component is used as the dependent component

Diffusion matrix when another component is treated as the dependent component can be derived. Assuming k is the new dependent component and denoting SiO_2 as n ($k \neq n$), the new diffusion matrix is (see Appendix A3 for derivation):

$$D_{ij}^{k} = D_{ij}^{n} - D_{ik}^{n}, \qquad \text{if } i \neq n \text{ and } j \neq n \tag{2.15a}$$

$$D_{in}^{k} = -D_{ik}^{n}, \qquad \text{if } i \neq n \tag{2.15b}$$

$$D_{nj}^{k} = \sum_{i=1}^{n-1} (D_{ik}^{n} - D_{ij}^{n}), \qquad \text{if } j \neq n \tag{2.15c}$$

$$D_{nn}^{k} = \sum_{i=1}^{n-1} D_{ik}^{n}. \tag{2.15d}$$

Eq. (2.15b) is the same as that in Kirkaldy et al. (1963). In ternary systems, the above relations reduce to the relations in Kirkaldy and Young (1987, p.157). Using eqs. (2.15a)–(2.15d), diffusion matrix can be transformed into diffusion matrices using different components as the dependent component.

2.9 Eigenanalysis

Eigenvector of a matrix is a non-zero vector, which changes not in direction, but only in scale, after multiplied by the matrix, and the scale is called eigenvalue. Non-zero value λ and non-zero vector v that satisfy the following equation are called eigenvalue and eigenvector of matrix [D]:

$$[D]v = \lambda v. \tag{2.16}$$

Eigenvalues and eigenvectors of diffusion matrix are calculated from eq. (2.16) to examine the temperature dependence of diffusion matrix. To facilitate the discussion in 7- and 8-component basaltic melts in later chapters, the concepts of eigenvalues, eigenvectors and their temperature dependence are illustrated in a simple well-studied ternary system.

Table 2.2 Diffusion matrices for 3-component SiO_2–Al_2O_3–CaO system, with SiO_2 chosen as the dependent component in temperature range of 1440 to 1650 ºC, together with their eigenvalues and eigenvectors (data from Liang and Davis, 2002).

	T = 1440 ºC		T = 1450 ºC		T = 1500 ºC		T = 1570 ºC		T = 1650 ºC	
D ($\mu m^2/s$)	Al_2O_3	CaO	Al_2O_3	CaO	Al_2O_3	CaO	Al_2O_3	CaO	Al_2O_3	CaO
Al_2O_3	4.2	–40.0	2.3	–53.7	13.8	–73.7	15.6	–117.5	37.8	–187.2
CaO	25.5	99.5	33.9	126.8	32.1	153.1	61.1	274.8	110.8	456.0
λ ($\mu m^2/s$)	λ_1	λ_2	λ_1	λ_2	λ_1	λ_2	λ_1	λ_2	λ_1	λ_2
	16.5		19.2		33.6		47.1		95.3	
		87.2		109.8		133.3		243.3		398.5
2-component v	v_1	v_2	v_1	v_2	v_1	v_2	v_1	v_2	v_1	v_2
Al_2O_3	0.96	–0.43	0.95	–0.45	0.97	–0.52	0.97	–0.46	0.96	–0.46
CaO	–0.29	0.9	–0.3	0.89	–0.26	0.85	–0.26	0.89	–0.29	0.89
3-component v	v_1	v_2	v_1	v_2	v_1	v_2	v_1	v_2	v_1	v_2
SiO_2	–0.56	–0.43	–0.55	–0.40	–0.58	–0.31	–0.58	–0.39	–0.56	–0.39
Al_2O_3	0.80	–0.39	0.80	–0.41	0.79	–0.50	0.79	–0.42	0.80	–0.42
CaO	–0.24	0.82	–0.25	0.82	–0.21	0.81	–0.21	0.82	–0.24	0.82

For example, in the SiO_2–Al_2O_3–CaO silicate melts with an average composition of 45 wt% SiO_2, 20 wt% Al_2O_3 and 35 wt% CaO, diffusion matrices with Al_2O_3 chosen as the dependent component in the temperature range of 1440 to 1650 ºC at 1 GPa are reported by Liang and Davis (2002). Using eqs. (A22)–(A25) in Appendix A3, those diffusion matrices can be transformed with SiO_2 chosen as the dependent component and are shown in Table 2.2, together with their eigenvalues and eigenvectors calculated from eq. (2.16). Eigenvectors in both 2- and 3-component vector space are shown, where the 3-component eigenvectors are calculated by adding the dependent component SiO_2 to the 2-component eigenvectors such that the sum of all 3 components is zero and then renormalized. The eigenvalues of diffusion matrix follow good Arrhenius relation $\lambda = \lambda_0 e^{-E/RT}$ shown in Fig. 2.1a, while the eigenvectors of diffusion matrix are insensitive to temperature with v_1 largely due to the exchange between Al_2O_3 and SiO_2 (with minor CaO) and with v_2 due to the exchange of CaO with SiO_2 and Al_2O_3 (with roughly equal contribution), shown in Fig. 2.1b in a ternary diagram.

The eigenanalysis of diffusion matrix in the 7- and 8-component basaltic melts follow a similar procedure as in the ternary system.

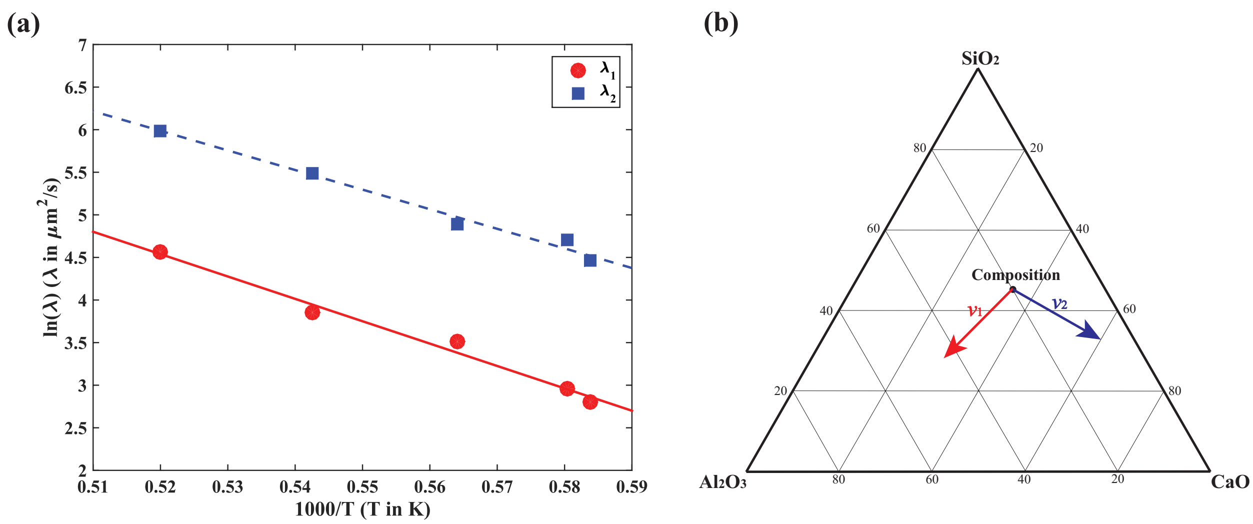

Fig. 2.1 Eigenvalues and eigenvectors of diffusion matrices in 3-component system. (a) Eigenvalues of diffusion matrices at different temperatures with good Arrhenius relation. (b) Eigenvectors of diffusion matrix plot in a ternary diagram. It can be seen that v_1 is largely due to the exchange between Al_2O_3 and SiO_2 with minor CaO and v_2 is due to the exchange of CaO with roughly equal contribution of SiO_2 and Al_2O_3.

2.10 References

Asimow P. D. and Ghiorso M.S. (1998) Algorithmic modifications extending MELTS to calculate subsolidus phase relations. *Am. Mineral*. **83**, 1127–1131.

Clifford A. A. (1973) *Multivariate error analysis: a handbook of error propagation and calculation in many-parameter system*. Wiley, NY.

Dixon J. E., Clague D. A. and Eissen J.P. (1986) Gabbroic xenoliths and host ferrobasalt from the Southern Juan de Fuca Ridge. *J. Geophys. Res.* **91**, 3795–3820.

Dixon J. E., Stolper E. and Delaney J. R. (1988) Infrared spectroscopic measurements of CO_2 and H_2O in Juan de Fuca Ridge basaltic glasses. *Earth Planet. Sci. Lett.* **90**, 87–104.

Fletcher R. (1971) *A modified Marquardt subroutine for nonlinear least squares*. Atomic Energy Research Establishment R6799, Harwell, England.

Ghiorso M. S. and Sack R. O. (1995) Chemical mass transfer in magmatic processes IV. a revised and internally consistent thermodynamic model for the interpolation and extrapolation of liquid–solid equilibria in magmatic systems at elevated temperatures and pressures. *Contrib. Mineral. Petrol*. **119**, 197–212.

Guo C. and Zhang Y. (2016) Multicomponent diffusion in silicate melts: SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO–Na_2O–K_2O system. *Geochim. Cosmochim. Acta* **195**, 126–141.

Hui H., Zhang Y. and Behrens H. (2008) Pressure dependence of the speciation of dissolved water in rhyolitic melts. *Geochim. Cosmochim. Acta* **72**, 3229–3240.

Kirkaldy, J.S. and Young, D.J. (1987) *Diffusion in the Condensed State*. The Institute of Metals, London.

Kirkaldy, J.S., Lane, J.E. and Mason, G.R. (1963) Diffusion in multicomponent metallic systems VII. solutions of the multicomponent diffusion eqs. with variable coefficients. *Can. J. Phys.* **41**, 2174–2186.

Lange R. L. and Carmichael I. S. E. (1990) Thermodynamic properties of silicate liquids with emphasis on density, thermal expansion and compressibility. *Rev. Mineral. Geochem*. **24**, 25–64.

Liang Y. and Davis A. M. (2002) Energetics of multicomponent diffusion in molten CaO–Al_2O_3–SiO_2. *Geochim. Cosmochim. Acta* **66**, 635–646.

Ni H. and Zhang Y. (2008) H_2O diffusion models in rhyolitic melt with new high pressure data. *Chem. Geol.* **250**, 68–78.

Zhang Y. and Behrens H. (2000) H_2O diffusion in rhyolitic melts and glasses. *Chem. Geol.* **169**, 243–262.

CHAPTER III

Multicomponent Diffusion in Silicate Melts:

SiO_2–TiO_2–Al_2O_3–MgO–CaO–Na_2O–K_2O System

3.1 Abstract

Nine successful diffusion couple experiments were carried out in 7-component SiO_2–TiO_2–Al_2O_3–MgO–CaO–Na_2O–K_2O haplobasaltic silicate melts to study multicomponent diffusion at ~1500 ºC and 1 GPa, typically with compositional gradients in only two components in each experiment. At least two concentration traverses were measured for each experiment. Effective binary diffusion coefficients (EBDC) for monotonic profiles were obtained by an error function fit, and the EBDC of a given component is dependent on its counter diffusing component, especially for SiO_2. The EBDC of SiO_2 varies from 15.7 $\mu m^2/s$ when diffusing against Al_2O_3, to 102.9 $\mu m^2/s$ when diffusing against K_2O. Furthermore, the multicomponent diffusion matrix was obtained by simultaneously fitting diffusion profiles of all components in all experiments. Most features in the diffusion profiles, for example uphill diffusion, are captured well by this 6 × 6 diffusion matrix. The slowest diffusing eigenvector is largely due to the exchange between SiO_2 and Al_2O_3, and the fastest diffusing eigenvector is due to the exchange of Na_2O with all other components. An anorthite dissolution experiment was also conducted to test whether the diffusion matrix can be applied to mineral dissolution experiments. The

calculated diffusion profiles in the melt during anorthite dissolution roughly match the measured profiles, demonstrating the validity and utility of the diffusion matrix in this FeO-free aluminosilicate melt system.

3.2 Introduction

Silicate melts consist of numerous components and diffusion in them is always of multicomponent. Hence, multicomponent diffusion in silicate melts is a fundamental part of mass transport in natural processes, such as mixing and contamination of magmas (Sato, 1975; Watson, 1982; Koyaguchi, 1985, 1989; Oldenburg et al., 1989), double-diffusive convection of magmas (Turner, 1985), and growth or dissolution of minerals in magma (Watson, 1982; Zhang, 1989). The often-observed uphill diffusion profiles in natural systems and experiments (Sato, 1975; Watson, 1982; Zhang et al., 1989) require multicomponent diffusion treatment, which has not been fully understood yet. Instead, effective binary diffusion approximation (Cooper, 1968) has been widely used to treat chemical diffusion of components without uphill diffusion, it has difficulty to account for uphill diffusion profiles, as well as the variability of effective binary diffusivity of a given component on other components (Zhang et al., 1989; Chen and Zhang, 2008, 2009). Empirical treatments of uphill diffusion have been developed (Cooper, 1968; Lasaga, 1979; Richter, 1993; Zhang, 1993; Liang et al., 1997).

Great efforts have been made in studying multicomponent diffusion in synthetic and natural silicate melts (including SiO_2–Al_2O_3–CaO, SiO_2–Al_2O_3–MgO, SiO_2–CaO–Na_2O, SiO_2–Al_2O_3–MgO–CaO, SiO_2–Al_2O_3–Na_2O–K_2O–H_2O and SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO) (Sugawara et al., 1977; Oishi et al., 1982; Kress and Ghiorso, 1993, 1995; Chakraborty et al., 1995; Liang et al. 1996; Mungall et al., 1998; Richter et al., 1998; Liang and Davis, 2002;

Lundstrom, 2000, 2003; Liang, 2010; Watkins et al., 2014). Chemical diffusion in silicate melts in SiO_2–Al_2O_3–CaO–MgO and simpler systems shows the degree of diffusive coupling among components depends strongly on compositions (Sugawara et al., 1977; Oishi et al., 1982; Trial and Spera, 1994; Liang et al., 1996; Richter et al., 1998; Liang and Davis, 2002). Furthermore, diffusion of Na_2O and H_2O in Na_2O- and K_2O-bearing silicate melts was found to be strongly coupled to the diffusion of SiO_2 (Chakraborty et al. 1995; Mungall et al., 1998; Lundstrom, 2000 and 2003). Although diffusion matrices for a limited number of components in melts have been obtained (e.g., Kress and Ghiorso, 1995; Mungall et al., 1998; Lundstrom, 2000, 2003; Morgan et al., 2006), full diffusion matrices for major oxide components in natural silicate melts have not been reported yet. Several empirical models to calculate diffusion matrix in a multicomponent system have been proposed (Lasaga, 1979; Richter 1993; Liang, 1997), with which diffusive dissolution profiles were calculated (Alexander, 2011). However, limited success is achieved in natural silicate melts using these empirical models (e.g., comparison in Figs. 1.2–1.3).

To better understand the diffusion behavior in a multicomponent silicate system, and as part of the project to obtain diffusion matrix in natural silicate melts, we investigated multicomponent diffusion in a 7-component SiO_2–TiO_2–Al_2O_3–MgO–CaO–Na_2O–K_2O haplobasaltic melt at 1500 ºC and 1 GPa. This FeO-free system is chosen to avoid complexities associated with FeO in the melt, such as ferric/ferrous ratio variation and iron loss during the experiments. The concentration profiles in all experiments were simultaneously fit to obtain the 6 × 6 diffusion matrix. In addition, we tested the validity of the extracted diffusion matrix by carrying out an anorthite dissolution experiment in the same melt, and using the extracted diffusion matrix to predict the diffusion behavior during anorthite dissolution.

3.3 Experimental strategy and analytical methods

The general experimental strategy, sample preparation, experimental procedure and analytical methods follow sections 2.1–2.4 in chapter II. The compositions and calculated liquidus of the starting glasses are listed in Table 3.1. The experimental temperature of 1500 ºC is chosen because an initial experiment at 1400 ºC resulted in partial crystallization although the calculated liquidus temperature from the MELTS program (Ghiorso and Sack, 1995; Asimow and Ghiorso, 1998) is less than 1380 ºC. The pressure of 1 GPa is chosen for better experimental success rate.

Table 3.1 Average compositions, 1σ errors and liquidus of initial haplobasaltic glasses.

	SiO_2* ave(σ)	TiO_2 ave(σ)	Al_2O_3 ave(σ)	MgO ave(σ)	CaO ave(σ)	Na_2O ave(σ)	K_2O ave(σ)	Total	Liquidus °C
Base Comp.	50	1.5	15	10	19	3	1.5	100	1367
HB2	48.74(12)	1.53(5)	15.92(08)	9.69(07)	18.87(08)	2.69(3)	2.56(2)	100	1358
HB3	52.24(14)	1.27(4)	16.03(07)	10.05(07)	19.02(06)	0.53(1)	0.86(1)	100	1366
HB4	49.46(15)	1.53(4)	16.02(07)	9.85(10)	18.99(11)	2.88(3)	1.28(2)	100	1361
HB5	52.04(23)	1.48(4)	15.95(13)	9.82(12)	17.44(14)	2.00(4)	1.28(2)	100	1364
HB6	49.79(11)	1.45(4)	15.96(07)	9.92(07)	20.34(05)	1.56(2)	0.98(1)	100	1366
HB7	51.96(14)	1.50(4)	15.96(09)	8.27(11)	18.92(09)	2.08(4)	1.33(2)	100	1359
HB8	48.84(16)	1.49(4)	16.12(07)	11.25(10)	18.84(07)	2.12(3)	1.34(2)	100	1365
HB9	54.34(15)	1.53(5)	13.55(10)	9.26(07)	18.04(09)	1.98(3)	1.30(2)	100	1376
HB10	51.04(11)	1.49(3)	16.68(06)	9.30(06)	18.22(07)	2.00(3)	1.27(2)	100	1358
HB11	51.71(16)	0.02(2)	15.88(10)	9.62(07)	18.60(04)	2.66(2)	1.51(2)	100	1351
HB12	49.25(15)	2.91(5)	16.06(08)	9.68(07)	18.07(72)	2.59(2)	1.44(2)	100	1355
HB15	50.82(12)	1.52(4)	15.47(08)	9.55(09)	20.49(07)	0.95(1)	1.16(1)	100	1369
HB16	50.58(15)	1.51(4)	15.64(07)	9.71(08)	17.71(07)	3.45(3)	1.40(2)	100	1363
HB17	50.41(11)	0.02(2)	15.86(09)	11.10(07)	18.76(06)	2.40(2)	1.45(2)	100	1355
HB18	50.44(15)	2.95(7)	15.61(08)	8.21(06)	18.61(08)	2.65(3)	1.53(2)	100	1353

Note: SiO_2* is defined as SiO_2* = SiO_2 − (total − 100), so the "total" here is 100%. The values in parentheses indicate 1s errors on the last digit. Liquidus of glasses are estimated by the MELTS program (Ghiorso and Sack, 1995; Asimow and Ghiorso, 1998).

3.4 Experimental results

Nine successful diffusion couple experiments were carried out. The name of each diffusion couple indicates the two halves of the diffusion couple, e.g., HB7&8B means that one half is HB7, and the other half is HB8, and the last letter "A" means the first experiment for this couple and "B" means the second experiment for this couple (often because the first experiment failed). The interface composition of each diffusion couple is listed in Table 3.2. The 1σ standard deviation of the interface composition of the 9 diffusion couple experiments is 1.1 wt% for SiO_2 and less than 0.5 wt% for all other oxide components.

Table 3.2 Interface compositions of each diffusion couple.

Exp#	SiO2*	TiO2	Al2O3	MgO	CaO	Na2O	K2O	Total
Base composition	50.00	1.50	15.00	10.00	19.00	3.00	1.50	100
HB2&4A	49.07	1.54	15.98	9.74	18.98	2.79	1.92	100
HB3&4A	50.88	1.40	16.01	9.98	18.96	1.71	1.07	100
HB5&6A	51.01	1.47	15.90	9.92	18.83	1.76	1.12	100
HB5&7A	51.93	1.49	15.98	8.96	18.26	2.07	1.32	100
HB7&8B	50.36	1.50	16.07	9.81	18.86	2.08	1.33	100
HB9&10A	52.69	1.51	15.12	9.28	18.13	1.99	1.29	100
HB11&12F	50.48	1.47	15.97	9.65	18.34	2.63	1.48	100
HB15&16A	50.70	1.52	15.56	9.63	19.10	2.20	1.28	100
HB17&18A	50.43	1.49	15.74	9.66	18.69	2.53	1.49	100
Average	50.94	1.46	15.83	9.65	18.71	2.09	1.31	100
1σ deviation	1.01	0.08	0.30	0.32	0.34	0.49	0.29	

Total is 100% because $SiO_2^* = SiO_2 - (\text{total} - 100)$ is used in the fitting.

Fig. 3.1 shows a microscopic image of a polished experimental charge. Quench crystals are not observed, and cracks are present in 6 out of 9 experiments. Interface between the two halves is not visible in the glass, but the physical interface can be seen near the graphite capsule by a small dent or misalignment in Fig. 3.1.

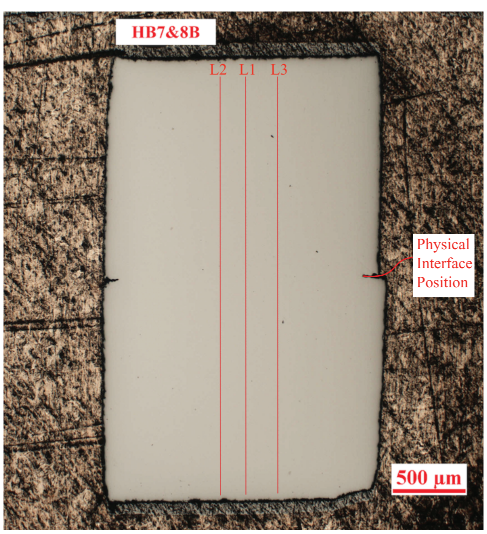

Fig. 3.1 Microscopic image of polished experimental charge HB7&8B. Three traverses (L1, L2 and L3) were measured. Physical interface position is preserved after experiment.

Two or more traverses were measured to obtain concentration profiles for each experiment. Profiles across cracks were re-connected smoothly using different traverses. Uphill diffusion is observed for most components if the initial concentration difference between the two halves is negligible. All microprobe analytical data can be found in the Appendix C.

Table 3.3 Summary of experimental conditions and effective binary diffusion coefficients in haplobasaltic melts at 1500 ºC.

Exp#	T (ºC)	t (s)	Diff Couple	$D(SiO_2)$ ($\mu m^2/s$)	$D(TiO_2)$ ($\mu m^2/s$)	$D(Al_2O_3)$ ($\mu m^2/s$)	D(MgO) ($\mu m^2/s$)	D(CaO) ($\mu m^2/s$)	$D(Na_2O)$ ($\mu m^2/s$)	$D(K_2O)$ ($\mu m^2/s$)
HB11&12F	1505	333	Si–Ti	19.5±2.8	21.5±0.7					
HB9&10A	1499	332	Si–Al	15.7±1.5		12.3±0.8				
HB7&8B	1520	332	Si–Mg	30.0±1.7			49.7±1.5			
HB5&6A	1501	333	Si–Ca	28.7±2.8				60.4±2.0		
HB3&4A	1491	332	Si–Na	44.2±4.0					401.5±8.6	129.7±7.4
HB2&4A	1496	332	Si–K	102.9±19.5						109.1±1.7
HB17&18A	1497	333	Ti–Mg		20.8±0.7		46.9±2.3			
HB5&7A	1495	361	Mg–Ca				61.1±3.8	115.7±7.2		
HB15&16A	1496	333	Ca–Na					70.4±2.6	260.1±3.7	
An&HB4	1484	172	An diss		13.3±0.6	17.9±0.2	36.8±0.5			

Note: all experiments were at 1 GPa. For easy comparison, the effective binary diffusivities are those at 1500 ºC; that is, in the fitting of effective binary diffusivities, the experimental temperatures are "normalized" to 1500 ºC by "normalizing" the experimental duration using the relation $D_{1773K} \cdot t_{1773K} = D_{T_{exp}} \cdot t_{exp}$ (Zhang and Behrens, 2000) with activation energy of 230 kJ/mol (Zhang et al., 1989).

Table 3.3 shows experimental conditions and effective binary diffusion coefficients (EBDC) for monotonic diffusion profiles of all 9 successful experiments. Experimental temperatures are the actual temperatures at the center of the diffusion couple, which vary from 1495 to 1520 ºC. Experimental durations are corrected following Zhang and Behrens (2000) with $t_{exp} = \int D\,dt / D(T_{exp}) = \int e^{-E/(RT)}\,dt / e^{-E/(RT_{exp})}$ where $D(T_{exp})$ is D at the experimental temperature. The first 6 experiments listed in Table 3.3 have initial concentration gradients in SiO_2 and oxide i, where i = TiO_2, Al_2O_3, MgO, CaO, Na_2O and K_2O. These 6 experiments are the minimum for obtaining the 6 × 6 diffusion matrix (Trial and Spera, 1994) unless the analytical accuracy is much higher than regular electron microprobe analyses (Liang, 2010).

Three additional and successful experiments with initial gradients in TiO_2–MgO, MgO–CaO, and CaO–Na_2O were carried out to further constrain diffusion matrix.

In order for fitting effective binary diffusion coefficients and diffusion matrix, the preliminary data processing follows section 2.5 in chapter II.

3.5 Effective binary diffusion coefficients

Effective binary diffusivities or effective binary diffusion coefficients (EBDC) were fit by eq. (2.1) for components with monotonic profiles (Table 3.3). Note that these diffusion couples have a similar bulk (or interface) composition, but the opposing concentration gradients are in different components. Because of our experimental design, most of the effective binary diffusivities may be regarded as inter-diffusivities between two components.

One observation is that EBDC of a given component is strongly dependent on the counter-diffusing component. That is especially significant for SiO_2, partially because more interdiffusion coupling experiments have been run for SiO_2. EBDC of SiO_2 varies from 15.7 $\mu m^2/s$ when the counter-diffusing component is Al_2O_3, to 28.7 $\mu m^2/s$ for SiO_2–CaO, to 44.2 $\mu m^2/s$ for SiO_2–Na_2O, and to 102.9 $\mu m^2/s$ when the counter-diffusing component is K_2O, with total variation by a factor of almost 7. This clearly shows that EBDC depends not only on the bulk composition (all the experiments in this study have a similar bulk composition), but also on the compositional gradients. Notably, EBDC of SiO_2 when diffusing against K_2O (102.9 $\mu m^2/s$) is much larger than that when diffusing against Na_2O (44.2 $\mu m^2/s$), although K_2O diffuses much slower than Na_2O. EBDC's of other components seem to depend less on the counter-diffusing component. EBDC of CaO varies by a factor of about 2, from 60.5 $\mu m^2/s$ for SiO_2–CaO, to 70.4 $\mu m^2/s$ for CaO–Na2O, and to 115.7 $\mu m^2/s$ for MgO–CaO.

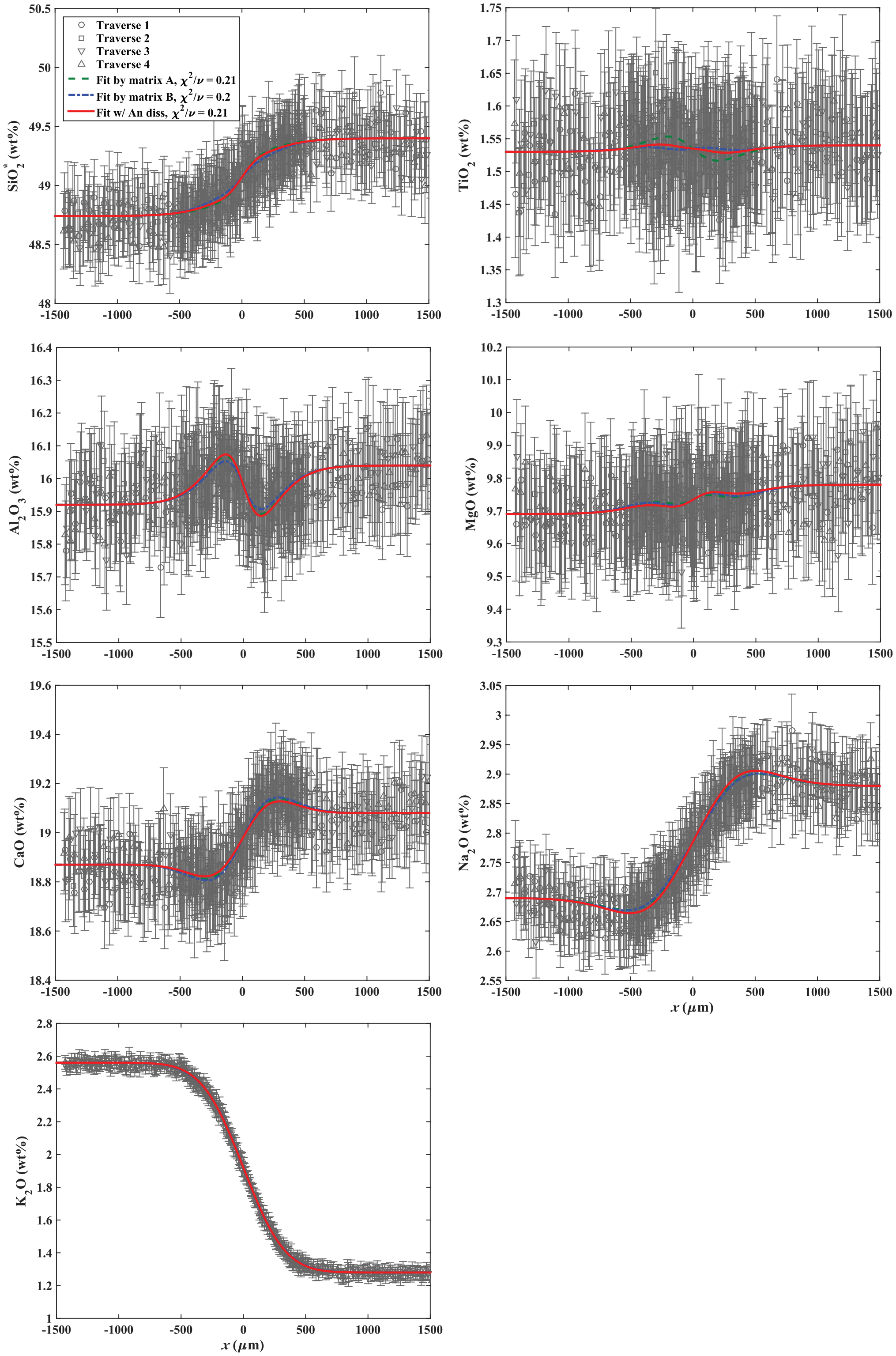

Fig. 3.2 Data of diffusion profiles of HB2&4A with fits. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The dashed curves are fits by matrix A in Table 3.4. The dash-dotted curves are fits by matrix B in Table 3.5. The solid curves are fits by the new matrix in Table 3.7 obtained by fitting diffusion profiles including anorthite dissolution. χ^2/n is calculated and shown for each type of fitting.

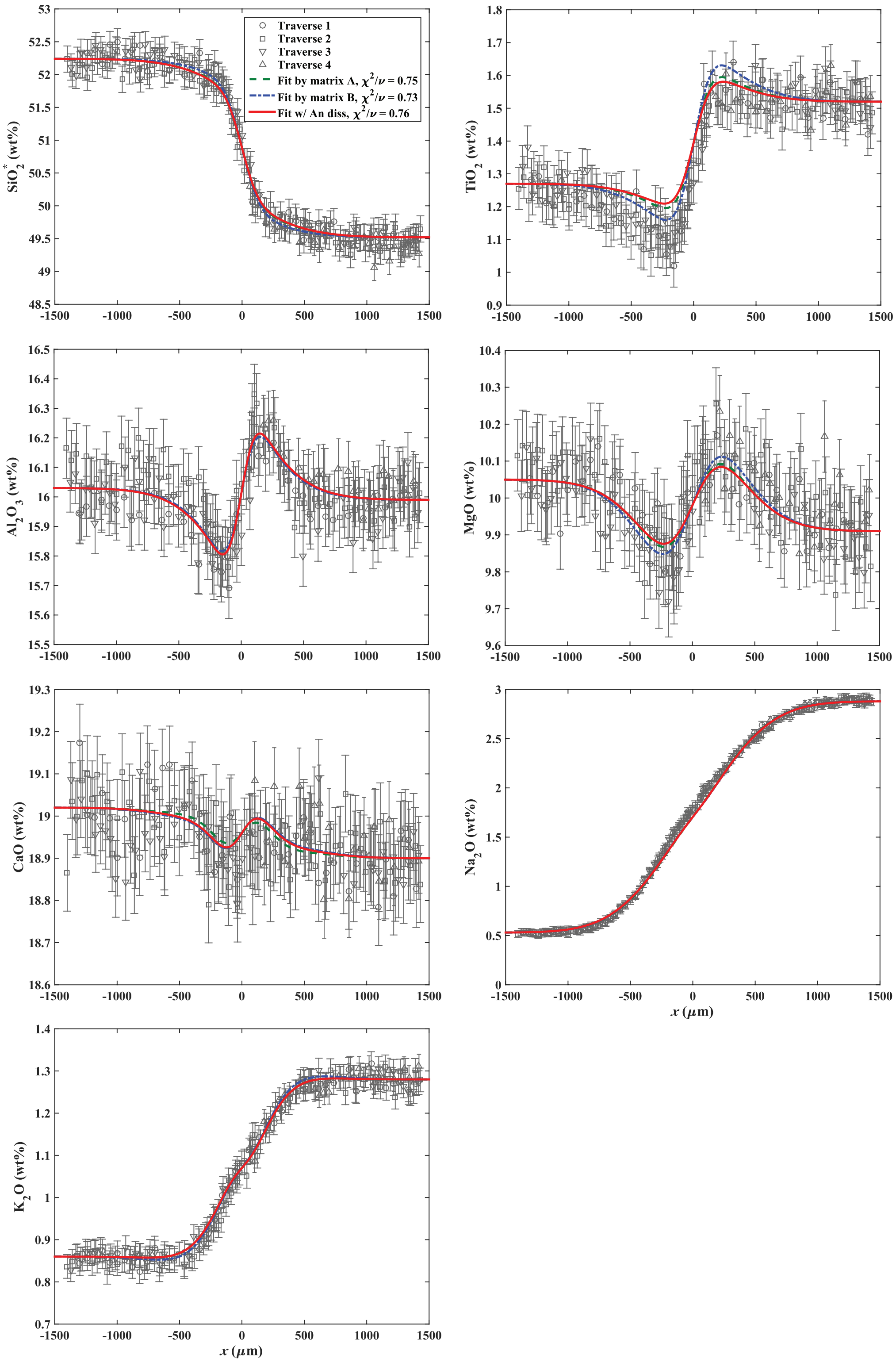

Fig. 3.3 Data of diffusion profiles of HB3&4A with fits. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The dashed curves are fits by matrix A in Table 3.4. The dash-dotted curves are fits by matrix B in Table 3.5. The solid curves are fits by the new matrix in Table 3.7 obtained by fitting diffusion profiles including anorthite dissolution. χ^2/n is calculated and shown for each type of fitting.

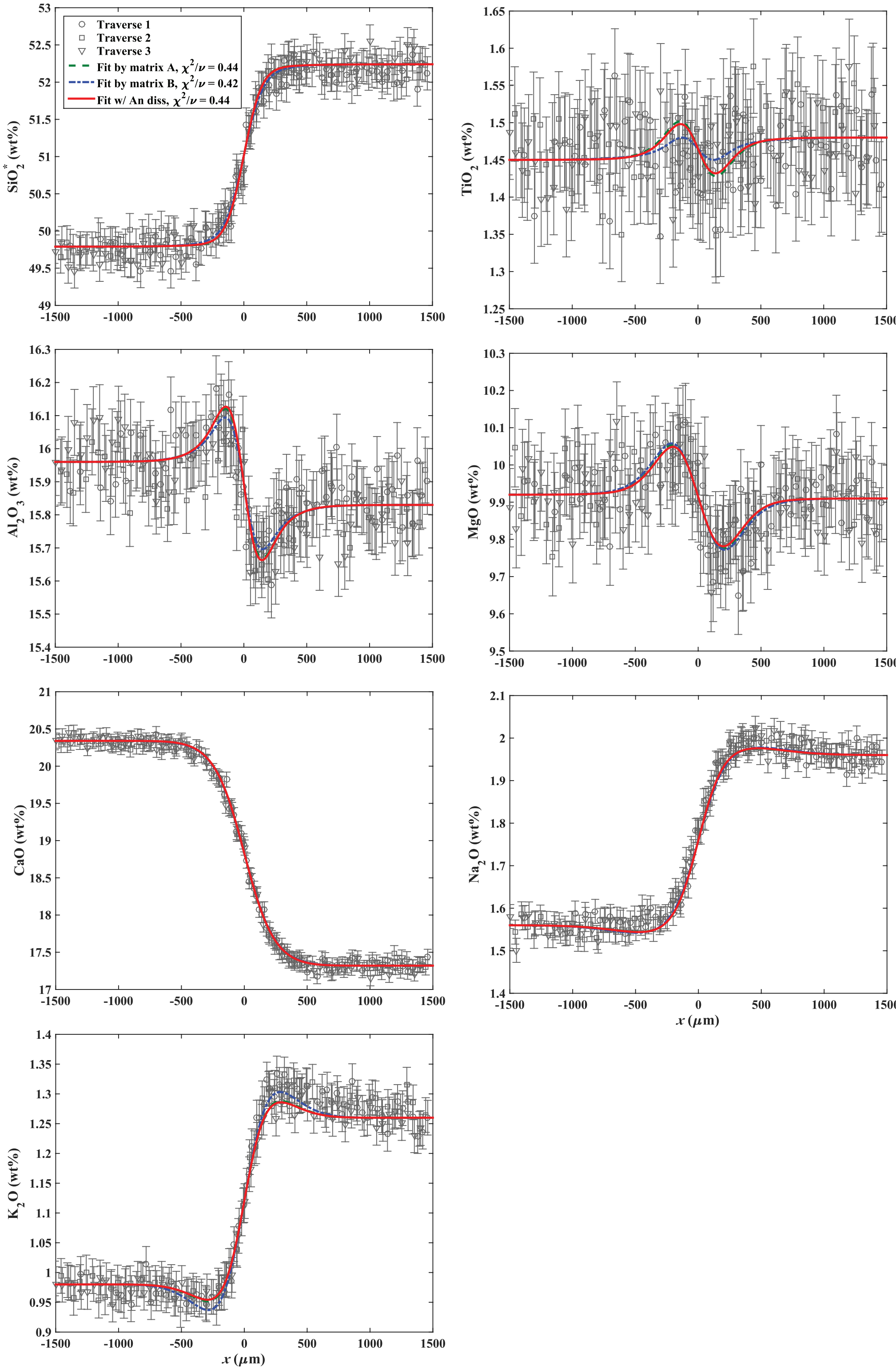

Fig. 3.4 Data of diffusion profiles of HB5&6A with fits. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The dashed curves are fits by matrix A in Table 3.4. The dash-dotted curves are fits by matrix B in Table 3.5. The solid curves are fits by the new matrix in Table 3.7 obtained by fitting diffusion profiles including anorthite dissolution. χ^2/n is calculated and shown for each type of fitting.

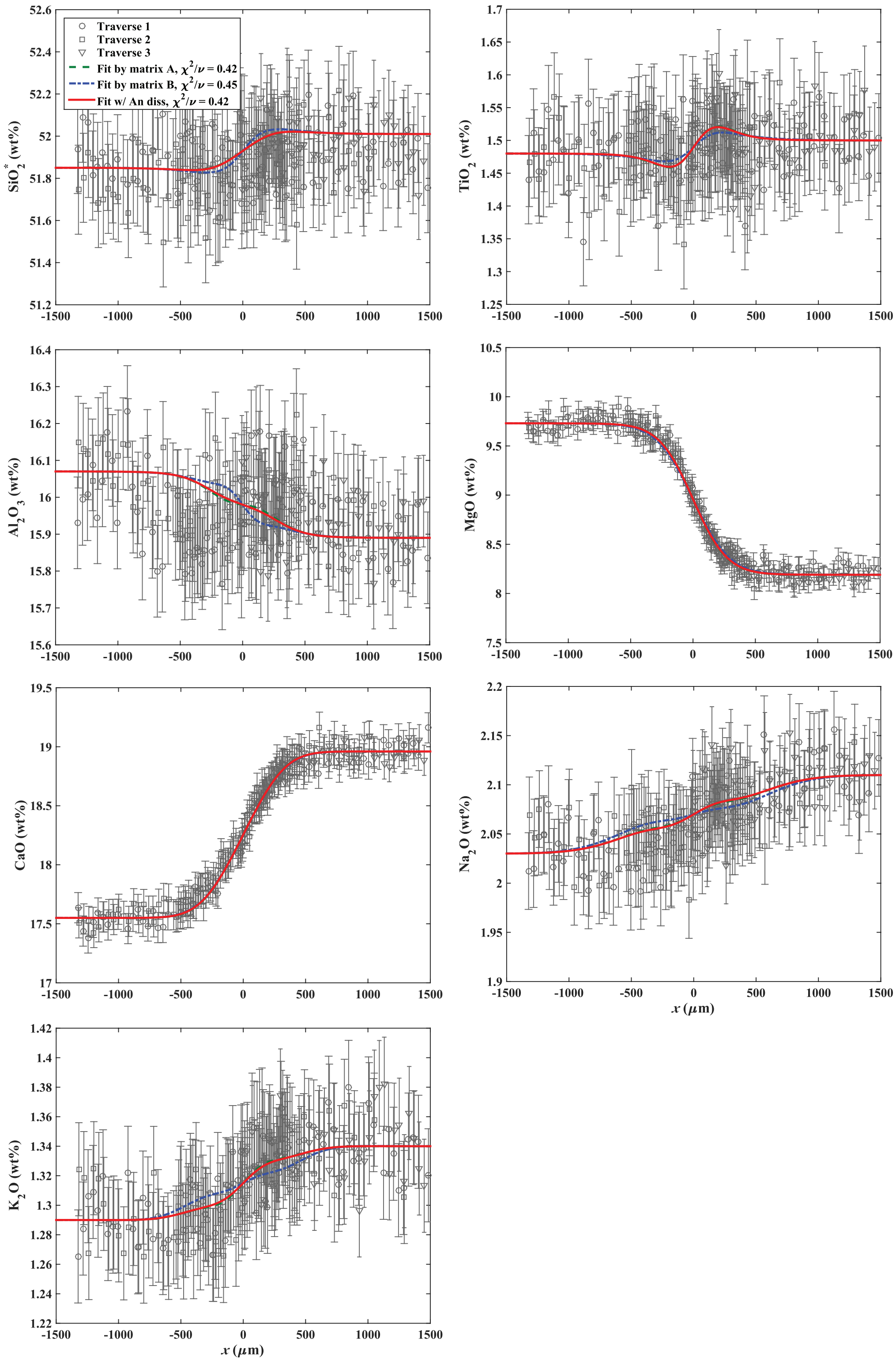

Fig. 3.5 Data of diffusion profiles of HB5&7A with fits. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The dashed curves are fits by matrix A in Table 3.4. The dash-dotted curves are fits by matrix B in Table 3.5. The solid curves are fits by the new matrix in Table 3.7 obtained by fitting diffusion profiles including anorthite dissolution. χ^2/n is calculated and shown for each type of fitting.

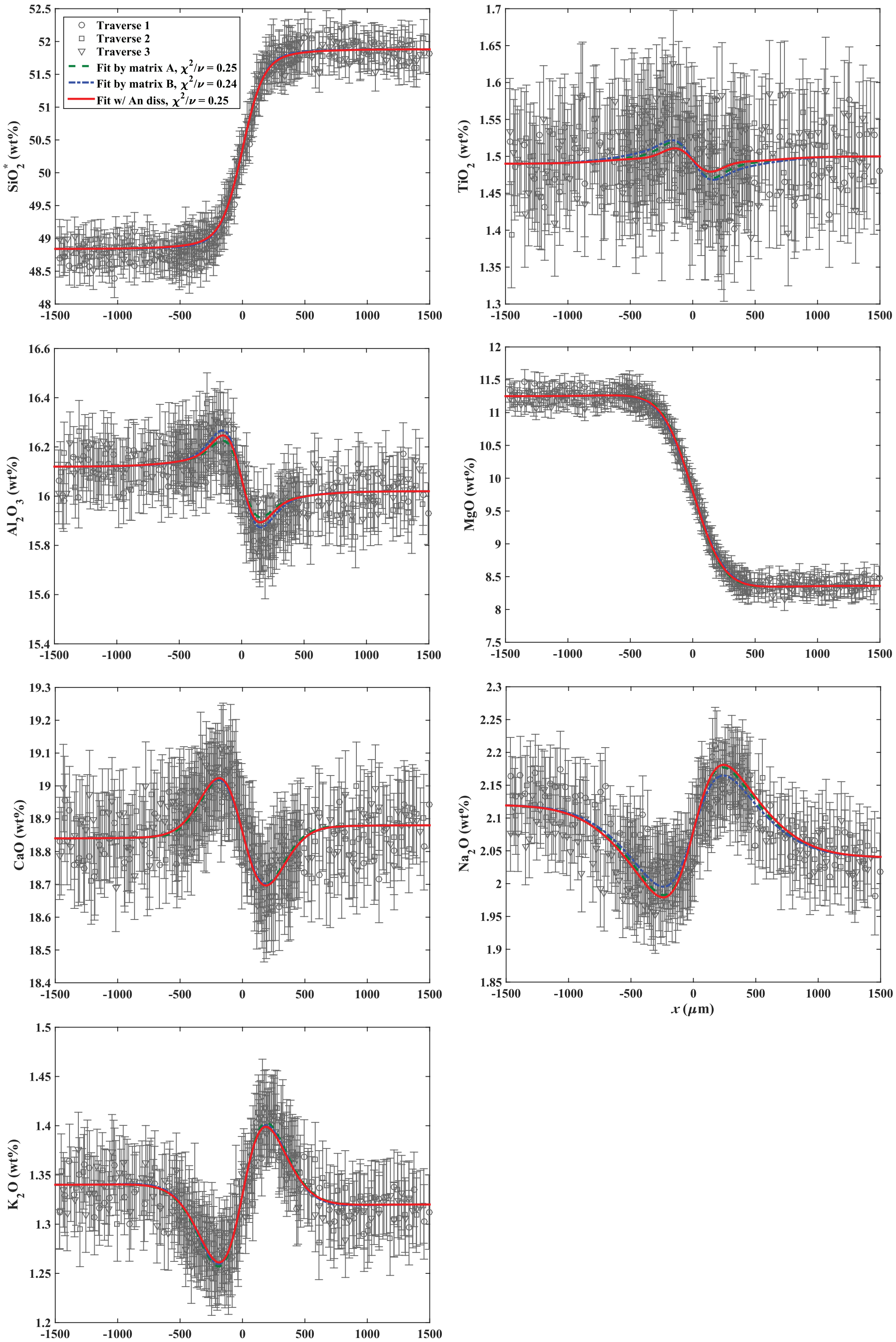

Fig. 3.6 Data of diffusion profiles of HB7&8B with fits. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The dashed curves are fits by matrix A in Table 3.4. The dash-dotted curves are fits by matrix B in Table 3.5. The solid curves are fits by the new matrix in Table 3.7 obtained by fitting diffusion profiles including anorthite dissolution. χ^2/n is calculated and shown for each type of fitting.

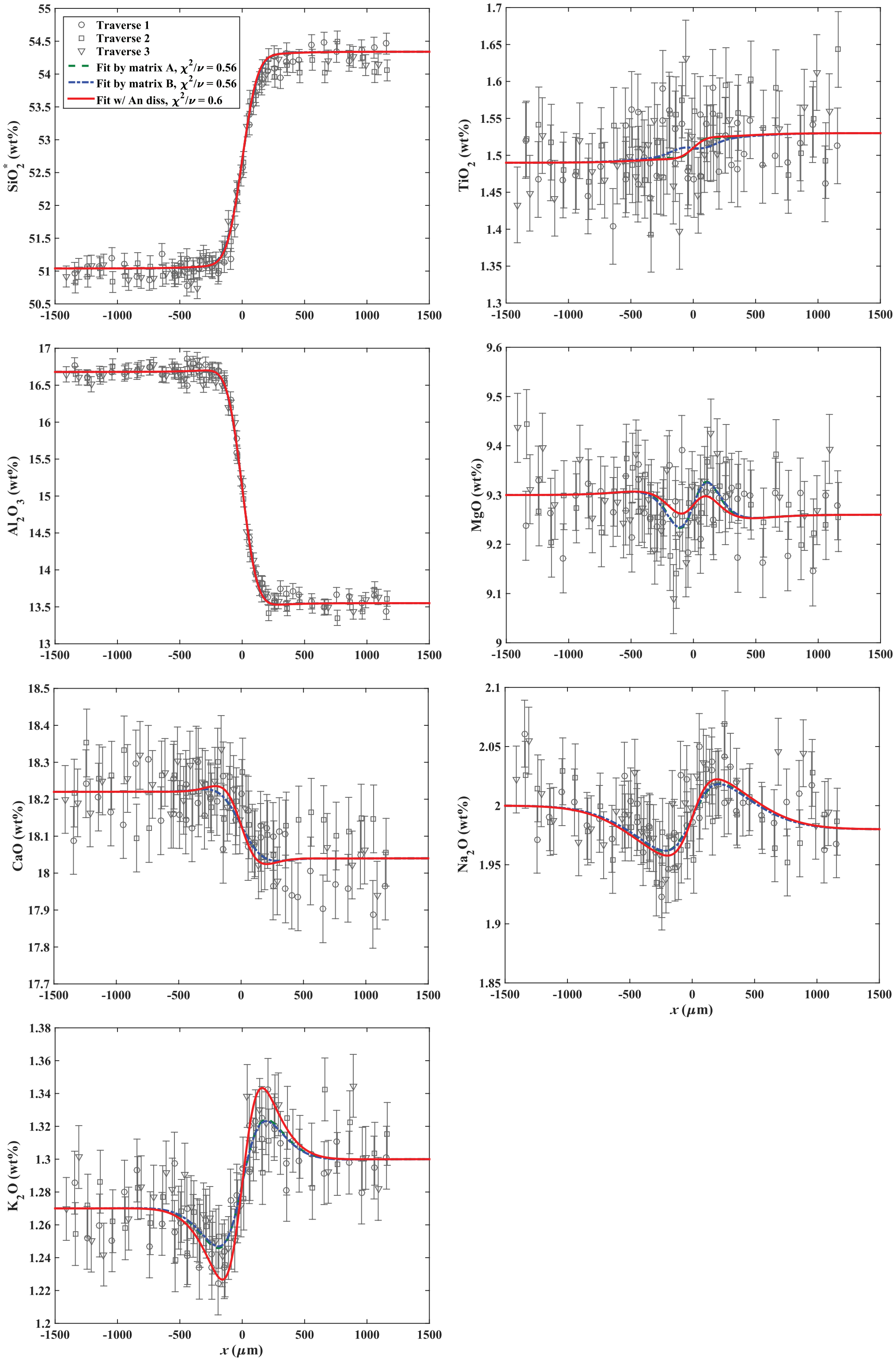

Fig. 3.7 Data of diffusion profiles of HB9&10A with fits. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The dashed curves are fits by matrix A in Table 3.4. The dash-dotted curves are fits by matrix B in Table 3.5. The solid curves are fits by the new matrix in Table 3.7 obtained by fitting diffusion profiles including anorthite dissolution. χ^2/n is calculated and shown for each type of fitting.

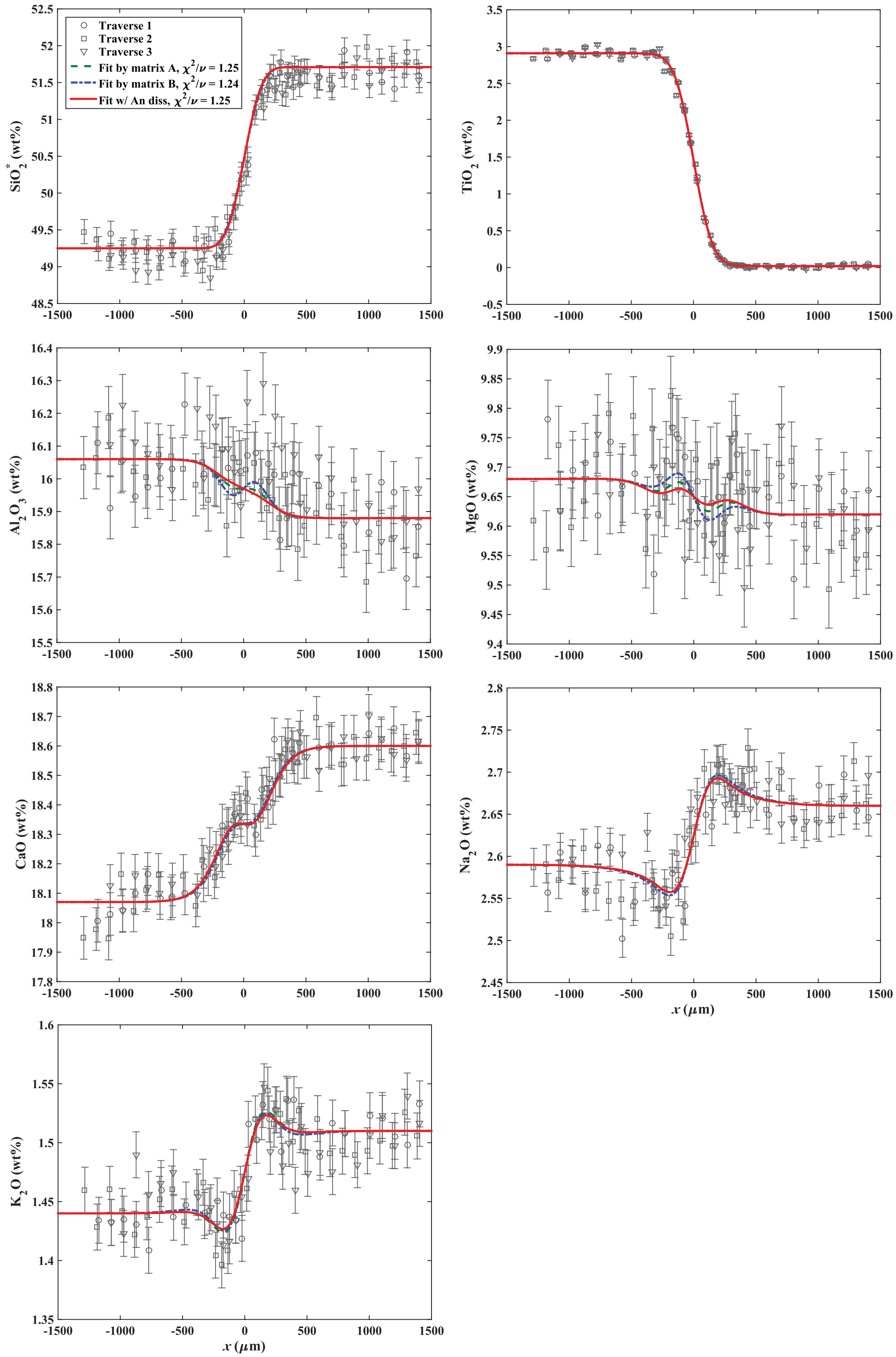

Fig. 3.8 Data of diffusion profiles of HB11&12F with fits. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The dashed curves are fits by matrix A in Table 3.4. The dash-dotted curves are fits by matrix B in Table 3.5. The solid curves are fits by the new matrix in Table 3.7 obtained by fitting diffusion profiles including anorthite dissolution. χ^2/n is calculated and shown for each type of fitting.

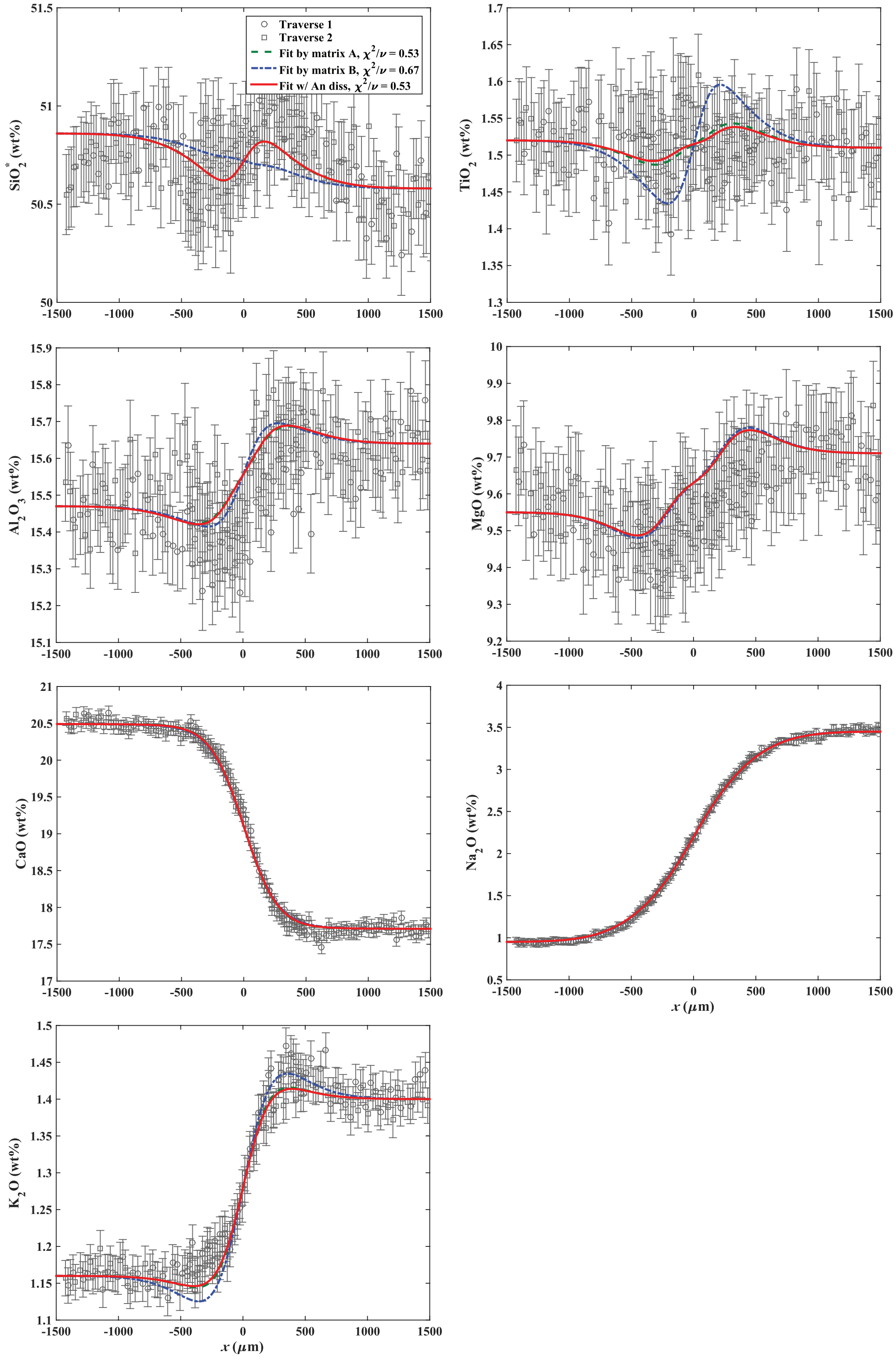

Fig. 3.9 Data of diffusion profiles of HB15&16A with fits. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The dashed curves are fits by matrix A in Table 3.4. The dash-dotted curves are fits by matrix B in Table 3.5. The solid curves are fits by the new matrix in Table 3.7 obtained by fitting diffusion profiles including anorthite dissolution. χ^2/n is calculated and shown for each type of fitting.

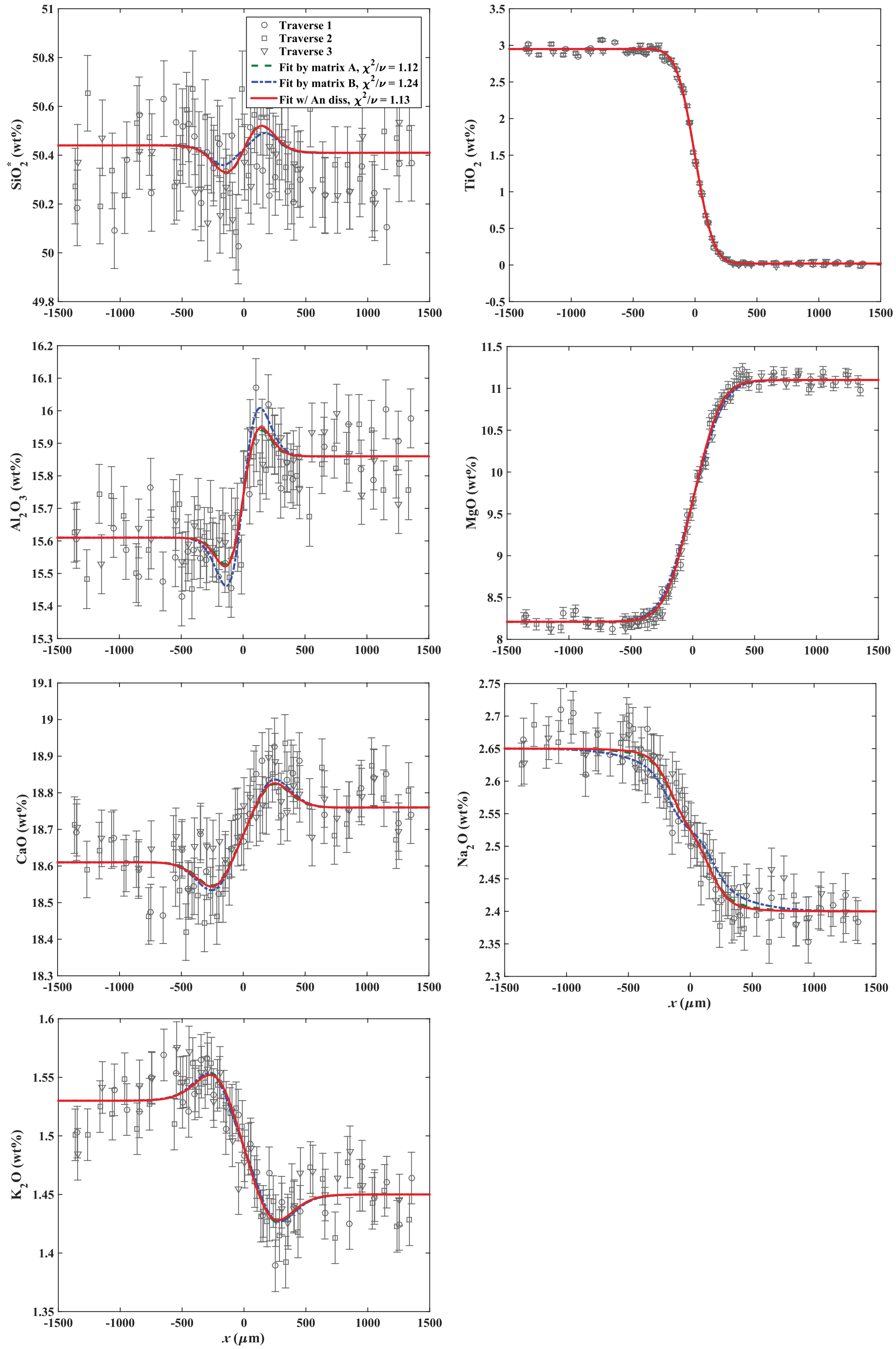

Fig. 3.10 Data of diffusion profiles of HB17&18A with fits. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The dashed curves are fits by matrix A in Table 3.4. The dash-dotted curves are fits by matrix B in Table 3.5. The solid curves are fits by the new matrix in Table 3.7 obtained by fitting diffusion profiles including anorthite dissolution. χ^2/n is calculated and shown for each type of fitting.

3.6 Fitting diffusion profiles of diffusion couples

The diffusion matrix is obtained by simultaneously fitting all diffusion profiles from all experiments using Levenberg-Marquardt-Fletcher methods (Fletcher, 1971), and the numerical methods are given by section 2.6 in chapter II. The error of diffusion matrix was estimated by error propagation (Clifford, 1973), and the numerical method is given by section 2.7 in chapter II.

Table 3.4 Diffusion matrix A obtained by fitting 9 diffusion couples, with 1σ errors for each element, and eigenvalues and eigenvectors.

D (μm^2/s)	TiO_2	Al_2O_3	MgO	CaO	Na_2O	K_2O
TiO_2	18.12±0.19	−0.97±0.28	−5.59±0.33	−12.85±0.67	−30.61±1.58	−21.51±1.92
Al_2O_3	−4.13±0.53	10.23±0.53	−15.78±0.65	−35.57±1.08	−59.08±2.56	−78.00±2.96
MgO	−8.19±0.63	2.25±0.61	35.58±0.89	−41.38±1.31	−83.00±2.96	−51.51±3.90
CaO	−10.05±0.73	−3.29±0.81	−24.75±0.93	66.87±1.43	−26.35±2.98	39.63±4.18
Na_2O	26.67±0.69	10.14±0.77	45.77±0.89	57.84±1.00	335.44±2.11	88.46±3.39
K_2O	5.86±0.28	3.83±0.26	12.63±0.34	15.78±0.52	−0.29±1.04	113.97±1.39
eigenvalues	λ_1	λ_2	λ_3	λ_4	λ_5	λ_6
	14.46					
		19.55				
			33.26			
				78.70		
					123.19	
						311.05
6-component eigenvectors	v_1	v_2	v_3	v_4	v_5	v_6
TiO_2	−0.08	0.87	−0.18	−0.06	−0.08	−0.09
Al_2O_3	0.98	−0.15	−0.33	−0.11	−0.35	−0.15
MgO	−0.18	0.25	0.71	−0.55	−0.33	−0.27
CaO	−0.03	0.35	0.56	0.81	0.66	−0.07
Na_2O	0.01	−0.13	−0.13	−0.02	−0.29	0.94
K_2O	−0.01	−0.14	−0.19	−0.14	0.49	−0.03
7-component eigenvectors	v_1	v_2	v_3	v_4	v_5	v_6
SiO_2	−0.57	−0.73	−0.40	0.07	−0.11	−0.32
TiO_2	−0.07	0.60	−0.16	−0.06	−0.08	−0.08
Al_2O_3	0.81	−0.10	−0.30	−0.10	−0.35	−0.15
MgO	−0.15	0.17	0.65	−0.55	−0.33	−0.25
CaO	−0.02	0.24	0.51	0.81	0.66	−0.07
Na_2O	0.01	−0.09	−0.12	−0.02	−0.28	0.90
K_2O	0.00	−0.10	−0.18	−0.14	0.49	−0.03

Table 3.5 Diffusion matrix B obtained by fitting 6 diffusion couples, with initial gradients on SiO_2 and another component, with 1σ errors for each element, and eigenvalues and eigenvectors.

D ($\mu m^2/s$)	TiO_2	Al_2O_3	MgO	CaO	Na_2O	K_2O
TiO_2	17.21±0.24	−1.88±0.28	−7.25±0.48	−13.00±0.77	−49.24±2.07	−18.71±1.89
Al_2O_3	−2.65±0.65	10.25±0.49	−18.77±0.79	−32.41±1.18	−56.14±3.10	−71.94±2.83
MgO	−11.44±0.79	2.57±0.63	43.08±1.33	−46.70±1.61	−94.21±3.63	−54.79±3.97
CaO	−9.06±0.87	−3.61±0.77	−27.44±1.19	67.66±1.64	−36.40±3.60	41.50±4.05
Na_2O	28.51±0.75	9.89±0.72	41.43±1.16	60.14±1.08	339.42±2.47	89.89±3.22
K_2O	5.37±0.34	3.37±0.25	11.49±0.43	18.85±0.61	−7.49±1.31	115.89±1.35
eigenvalues	λ_1	λ_2	λ_3	λ_4	λ_5	λ_6
	14.64					
		20.78				
			35.26			
				80.48		
					135.87	
						306.48
6-component eigenvectors	v_1	v_2	v_3	v_4	v_5	v_6
TiO_2	0.02	0.88	−0.10	–0.02	0.02	−0.14
Al_2O_3	0.99	0.11	−0.35	0.03	–0.27	−0.13
MgO	−0.14	0.22	0.64	–0.63	–0.29	−0.29
CaO	0.01	0.35	0.63	0.75	0.65	−0.11
Na_2O	−0.01	−0.13	−0.12	0.00	–0.36	0.93
K_2O	−0.02	−0.16	−0.23	–0.19	0.54	−0.07
7-component eigenvectors	v_1	v_2	v_3	v_4	v_5	v_6
SiO_2	–0.65	–0.78	–0.42	0.08	–0.27	–0.18
TiO_2	0.02	0.55	–0.09	–0.02	0.01	–0.14
Al_2O_3	0.75	0.07	–0.32	0.03	–0.26	–0.12
MgO	–0.11	0.14	0.58	–0.63	–0.28	–0.29
CaO	0.01	0.21	0.57	0.75	0.62	–0.11
Na_2O	–0.01	–0.08	–0.11	0.00	–0.35	0.91
K_2O	–0.02	–0.10	–0.21	–0.19	0.52	–0.07

We carried out the fitting for two cases. One fit uses all the 9 diffusion couple experiments, and the obtained diffusion matrix is referred to as matrix A, which is shown in Table 3.4, together with the eigenvalues and eigenvectors. The other fit uses 6 experiments with initial gradients in SiO_2 and i, where i varies from TiO_2, Al_2O_3, MgO, CaO, Na_2O and K_2O (the first 6 experiments in Table 3.3), and the obtained diffusion matrix is referred to as matrix B, which is shown in Table 3.5. The fit curves by matrix A for all experiments are shown by dashed curves in Figs. 3.2–3.10; the fit curves for the first 6 experiments and the calculated curves for the rest three experiments by matrix B are shown by dash-dotted curves in Figs. 3.2–3.10. The purpose of reporting matrix B is to check how different the diffusion matrix B obtained from 6 experiments is from the better constrained matrix A. In other words, the purpose of carrying out more than 6 experiments to determine matrix A is to check whether significant improvement of the diffusion matrix can be obtained by extra experiments.

All features in the profiles of 7 oxide components of all experiments are well reproduced by diffusion matrix A (Figs. 3.2–3.10). Furthermore, matrix B successfully fits the profiles from the first 6 experiments (which are used in fitting) and predicts most features in the rest three experiments, which means 6 independent experiments are sufficient to obtain the diffusion matrix, but 9 experiments are better. Eigenvalues of matrix A and matrix B are close to each other (Tables 3.4–3.5), with relative differences of about 10%. We tested whether matrices A and B are significantly different by calculating $T_{ij} = (A_{ij} - B_{ij}) / \sqrt{\sigma^2_{A,ij} + \sigma^2_{B,ij}}$. If A and B agree with each other within error, then absolute values of T_{ij} should be less than 2 at 95% probability assuming a standard normal distribution. About 40% of the T_{ij} values are outside the range [–2, 2]. That is, A and B are statistically different. Therefore, the improvement by extra experiments is significant even though it is small.

3.7 Eigenvalues and eigenvectors of the diffusion matrix

Eigenvalues and eigenvectors of diffusion matrix A are calculated and shown in Table 3.4. The eigenvalues are in an increasing order, with their eigenvectors in both 6-component TiO_2–Al_2O_3–MgO–CaO–Na_2O–K_2O and 7-component SiO_2–TiO_2–Al_2O_3–MgO–CaO–Na_2O–K_2O vector space, where the 7-component eigenvectors are calculated by adding the dependent component SiO_2 to the 6-component eigenvectors such that the sum of all components is zero and then renormalized. The largest eigenvalue (λ_6) is 21.5 times the smallest eigenvalue (λ_1) in this system.

The eigenvectors are related to the diffusion mechanism, and are often difficult to interpret. The 7-component eigenvectors are examined by first looking for components with large absolute values, which means large contribution during diffusion, and then checking the signs of all components, where components with the same sign diffuse together and components with the opposite signs diffuse against each other. Following the rules, v_1 (the eigenvector associated with the smallest eigenvalue λ_1, meaning the slowest diffusing eigenvector) has components with large values in SiO_2 and Al_2O_3 with the opposite signs, meaning v_2 is largely due the exchange between SiO_2 and Al_2O_3. It is reasonable that the slowest eigenvector is largely due to SiO_2–Al_2O_3 exchange, because both Si and Al are network-formers.

In a similar fashion, v_2 (the eigenvector associated with the second smallest eigenvalue λ_2) is largely due to the exchange between SiO_2 and TiO_2 (with minor MgO and CaO); v_3 (the third smallest eigenvector) is largely due to the exchange between SiO_2+Al_2O_3 and MgO+CaO; v_4 (the third largest eigenvector) is largely due to the exchange between MgO and CaO; v_5 (the second largest eigenvector) is due the exchange of CaO+K_2O with all other components; v_6 (the largest eigenvector) is due to the exchange of Na_2O with all other components. It is also reasonable that the eigenvalue associated with Na_2O exchange with all other components is the largest, because Na self-diffusivity is the largest among the 7 components studied (see diffusivity sequence in Zhang et al., 2010).

In summary, the slowest diffusing eigenvector (v_1) is largely due to the exchange between two network-formers SiO_2 and Al_2O_3; the second slowest (v_2) is largely due to the exchange between SiO_2 and TiO_2; the third slowest (v_3) is due to the exchange between network-formers SiO_2+Al_2O_3 and divalent network-modifiers MgO+CaO; the third fastest (v_4) is largely due to the exchange between divalent network-modifiers CaO and MgO; the second fastest (v_5) is due to the exchange of divalent plus monvalent network modifiers $CaO+K_2O$ with all other components; and the fastest diffusing eigenvector (v_6) is due to the exchange of monovalent Na_2O with all other components. (Table 3.6)

One may also divide multicomponent diffusion eigenvectors into two groups: (1) relatively simple diffusion exchanges v_1 (SiO_2–Al_2O_3 exchange), v_2 (SiO_2–TiO_2 exchange), v_4 (MgO–CaO exchange) and v_6 (Na_2O exchange with all others); (2) more complex exchanges as a combination of two or more simple diffusion exchange along v_3 (MgO+CaO exchange with all others) and v_5 ($CaO+K_2O$ exchange with all others) (Table 3.6). This classification is approximate because no eigenvector is purely due to the exchange of two components.

Table 3.6 Multicomponent diffusion mechanism in haplobasaltic melts at 1500 ºC.

eigenvalue sequence	eigenvalues	eigenvectors	exchanging species
slowest	λ_2	v_2	$SiO_2-Al_2O_3$
2nd slowest	λ_1	v_1	SiO_2-TiO_2
3rd slowest	λ_3	v_3	$(SiO_2+Al_2O_3)-(MgO+CaO)$
3rd fastest	λ_4	v_4	MgO−CaO
2nd fastest	λ_6	v_6	$(CaO+K_2O)$−(all the others)
fastest	λ_5	v_5	Na_2O−(all the others)

3.8 Prediction of diffusion profiles during anorthite dissolution

In order to test the validity and utility of the diffusion matrix that we obtained, we conducted an anorthite dissolution experiment in this haplobasaltic melt (49.63% SiO_2, 1.52% TiO_2, 16.02% Al_2O_3, 9.87% MgO, 18.80% CaO, 2.88% Na_2O, and 1.28% K_2O, in wt%) at 1500 ºC and 1 GPa for ~2.5 min. The composition of the anorthite (Waythomas et al., 2010; Yu et al., 2016) used is 44.77±0.15% SiO_2, 35.07±0.24% Al_2O_3, 0.50±0.03% FeO, 18.96±0.16% CaO, and 0.66±0.02% Na_2O (in wt%). Anorthite is chosen because it is almost FeO-free and its dissolution kinetics is fairly well known (Yu et al., 2016). The experimental procedure follows that of Yu et al. (2016). Fig. 3.11 shows microscopic and back-scattered electron (BSE) images of the polished experimental charge. Cracks are present in the glass and sub-parallel to the interface, but no quench crystal is observed. The part of anorthite in contact with melt is dissolved and indented, while the corner part not in contact with the melt remains intact, allowing an independent estimation of the anorthite dissolution distance.

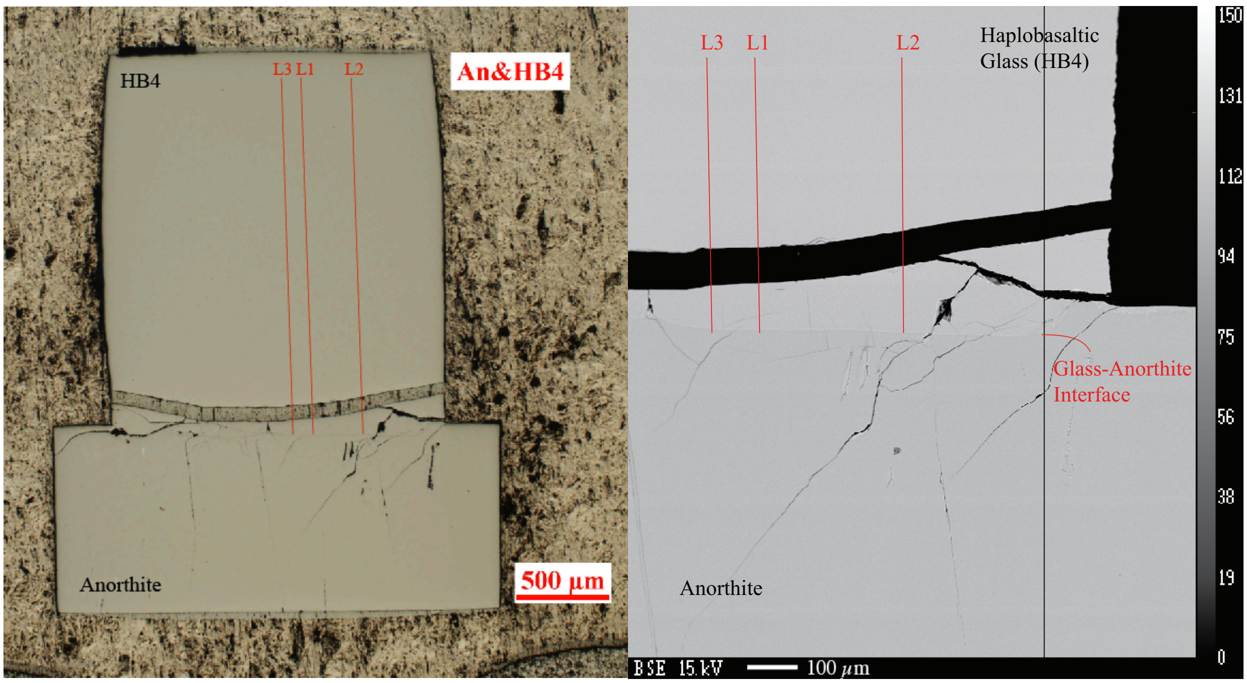

Fig. 3.11 Optical and BSE images of the polished experimental charge An&HB4. Three traverses (L1, L2, and L3) were measured on the right side, because the left side was affected by a piece of graphite in the melt. A flat glass-anorthite interface could be observed in both microscopic and BSE images. Note that the BSE image only shows the right side of the sample.

Three concentration traverses were measured. Profiles across cracks were reconnected smoothly. The three traverses (Fig. 3.12) are highly consistent with each other, and the Al_2O_3 concentration profile could be fit very well by the dissolution-diffusion equation (eqs. 13–14 in Zhang et al., 1989), yielding an effective binary diffusivity for Al_2O_3 of 17.9 μm^2/s. Strong uphill diffusion is observed in CaO, Na_2O and K_2O profiles, which requires a multicomponent diffusion treatment. Dissolution distance was estimated by three different ways: (1) direct measurement under optical microscope (L_1 = 65.5 μm), (2) measurement from mass balance (L_2

= 71.6 μm) and (3) measurement from the profile with largest concentration gradient (

$L_3 = 2\alpha\rho_m\sqrt{D_{Al_2O_3}t} / \rho_c$ = 74.5 μm).

Predictions by diffusion matrix A in Table 3.4 for diffusion profiles during anorthite dissolution using eq. (A14) in Appendix A2 are shown by the dash-dotted curves in Fig. 3.12. Note that the interface melt composition based on extrapolation of actual data points is used. The calculated anorthite dissolution distance is 69.4 μm, close to L_2 = 71.6 μm. It can be seen that all the major features of the concentration profiles are fairly well produced. SiO_2, TiO_2, Al_2O_3, MgO, CaO and Na_2O profiles show good agreement between predictions and experimental data. However, K_2O profile couldn't be predicted well. The disagreement may be partially due to the inaccuracy of the [D] matrix, especially the matrix elements related to K_2O diffusion, or due to the compositional dependence of the diffusion matrix. For the diffusion couple experiments from which the diffusion matrix is extracted, the compositional variation is small (±1.5 wt%). Hence, the compositional dependence of the diffusion matrix is likely negligible. However, during anorthite dissolution, the Al_2O_3 concentration varies from 16 to 31 wt%, SiO_2 from 50 to 43 wt%, and MgO from 10 to 3 wt%. These variations may be large enough to cause significant variation in the values of the elements in the diffusion matrix, and hence cause the mismatch between the predicted K_2O concentration profile and the measured K_2O profile. The overall χ^2/n (n is the number of points multiplied by the number of oxides) for the prediction of oxide concentration profiles for anorthite dissolution in our Fe-free melt is 3.6 (Fig. 3.12), much smaller than the value (8.6) obtained from the calculation of Alexander (2011) for olivine dissolution in andesitic melt (Fig. 1.4), and the value (250.5) from the calculation of Kress and Ghiorso (1995) for olivine dissolution in andesitic melt (Fig. 1.3).

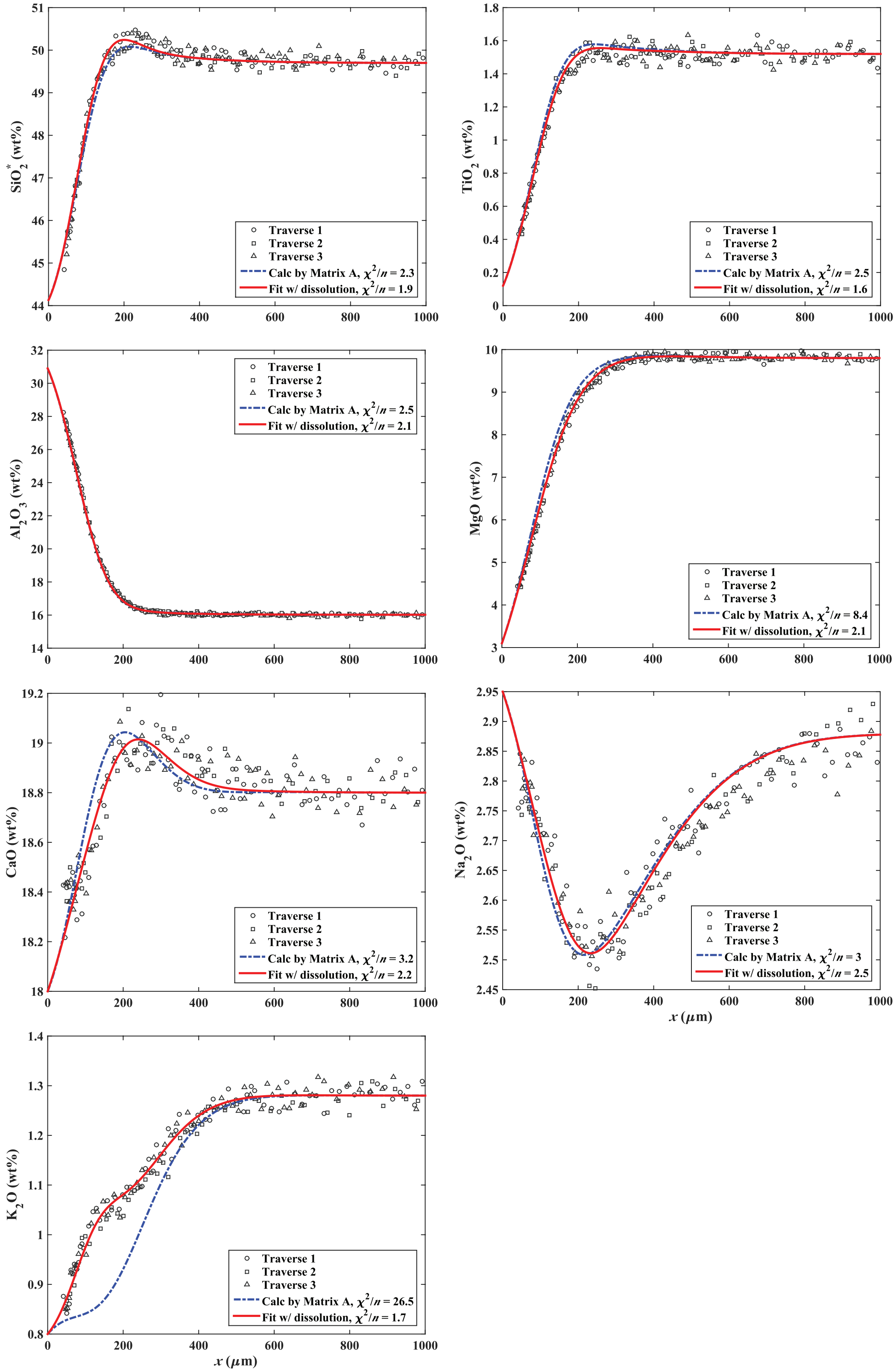

Fig. 3.12 Predicted and fit diffusion profiles of An&HB4, by diffusion matrix A in Table 3.4 and the new diffusion matrix in Table 3.7, with experimentally determined interface composition. Predictions are shown by dash-dotted curves, and fits are shown by solid curves. χ^2/n is calculated and shown for each component.

Furthermore, we could fit both the diffusion couple and anorthite dissolution experiments to obtain a new and more accurate diffusion matrix in this melt (Table 3.7). The fits for the diffusion profiles during anorthite dissolution are excellent (shown by the solid curves in Fig. 3.12) with overall $\chi^2/v = 1.2$. The fits for the diffusion profiles in the diffusion couple experiments are also excellent and shown by solid curves in Figs. 3.2–3.10. Therefore, this new diffusion matrix is preferred and we recommend the use of the new diffusion matrix in Table 3.7 for this 7-component haplobasaltic melt.

Table 3.7 Diffusion matrix obtained by fitting both diffusion couple and anorthite dissolution experiments at ~1500 ºC, with 1σ errors for each element, and eigenvalues and eigenvectors.

D (μm^2/s)	TiO_2	Al_2O_3	MgO	CaO	Na_2O	K_2O
TiO_2	18.78±0.36	–0.81±0.53	–4.20±0.62	–11.10±1.26	–27.13±2.96	–15.54±3.60
Al_2O_3	–4.72±0.99	8.96±1.00	–17.40±1.23	–36.01±2.03	–60.32±4.81	–80.65±5.58
MgO	–6.77±1.18	0.22±1.15	39.02±1.68	–39.62±2.47	–82.61±5.57	–45.38±7.35
CaO	–11.20±1.37	–4.56±1.53	–27.62±1.75	64.89±2.69	–31.03±5.60	30.37±7.88
Na_2O	27.40±1.29	11.66±1.44	48.66±1.67	59.90±1.89	341.56±3.97	98.05±6.37
K_2O	5.39±0.53	5.98±0.49	11.67±0.64	15.20±0.98	–0.37±1.94	114.29±2.61
Eigenvalues	λ_1	λ_2	λ_3	λ_4	λ_5	λ_6
	13.73					
		19.88				
			35.59			
				80.95		
					122.02	
						315.33
6-component Eigenvectors	v_1	v_2	v_3	v_4	v_5	v_6
TiO_2	–0.03	0.90	–0.15	–0.06	–0.05	–0.08
Al_2O_3	0.99	–0.20	–0.35	–0.09	–0.37	–0.15
MgO	–0.07	0.18	0.69	–0.57	–0.27	–0.26
CaO	0.07	0.30	0.58	0.80	0.63	–0.09
Na_2O	–0.02	–0.12	–0.14	–0.01	–0.33	0.95
K_2O	–0.06	–0.11	–0.18	–0.14	0.54	–0.03
7-component Eigenvectors	v_1	v_2	v_3	v_4	v_5	v_6
SiO_2	–0.66	–0.69	–0.41	0.07	–0.15	–0.32
TiO_2	–0.02	0.65	–0.14	–0.06	–0.05	–0.08
Al_2O_3	0.74	–0.15	–0.32	–0.09	–0.36	–0.14
MgO	–0.05	0.13	0.63	–0.57	–0.27	–0.25
CaO	0.05	0.22	0.53	0.80	0.62	–0.08
Na_2O	–0.02	–0.09	–0.13	–0.01	–0.32	0.90
K_2O	–0.05	–0.08	–0.16	–0.14	0.53	–0.03

3.9 Summary and conclusions

Chemical diffusion profiles in silicate melts in a haplobasaltic SiO_2–TiO_2–Al_2O_3–MgO–CaO–Na_2O–K_2O system have been determined at 1500 ºC and 1 GPa. Effective binary diffusion coefficients (EBDC) of monotonic diffusion profiles in each experiment are extracted, and show strong dependence on the compositional gradients, specifically the counter-diffusing component, especially for SiO_2. More importantly, multicomponent diffusion matrix in this system is extracted from 9 diffusion couple experiments, and all features in the diffusion profiles have been captured by this diffusion matrix. The resulting diffusion eigenvectors are intuitively reasonable. The extracted multicomponent diffusion matrix has been applied to calculate diffusion profiles during anorthite dissolution in the haplobasaltic melt at 1500 ºC and 1 GPa, and the diffusion distances and most features in concentration profiles are well reproduced, but with some mismatch for the K_2O profile. It is necessary to experimentally determine the effect of FeO to multicomponent diffusion and to evaluate the compositional effect for reliable applications to natural melts.

We have verified that with the electron microprobe precision, when the number of diffusion couple experiments is the same as the number of independent components and when every experiment is an "interdiffusion" couple between the dependent component and an independent component, the diffusion matrix can be roughly obtained, consistent with Trial and Spera (1994). More experiments of other "interdiffusion" couples will significantly improve the accuracy of the diffusion matrix.

3.10 Acknowledgement

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3.11 References

Alexander C. M. (2011) Modeling diffusive dissolution in silicate melts. *Geochim. Cosmochim. Acta* **75**, 588–607.

Asimow P. D. and Ghiorso M.S. (1998) Algorithmic modifications extending MELTS to calculate subsolidus phase relations. *Am. Mineral*. **83**, 1127–1131.

Chakraborty S., Dingwell D.B. and Rubie D.C. (1995) Multicomponent diffusion in ternary silicate melts in the system K_2O–Al_2O_3–SiO_2: I. Experimental measurements. *Geochim. Cosmochim. Acta* **59**, 255–264.

Chen Y. and Zhang Y. (2008) Olivine dissolution in basaltic melt. *Geochim. Cosmochim. Acta* **72**, 4756–4777.

Chen Y. and Zhang Y. (2009) Clinopyroxene dissolution in basaltic melt. *Geochim. Cosmochim. Acta* **73**, 5730–5747.

Clifford A. A. (1973) *Multivariate error analysis: a handbook of error propagation and calculation in many–parameter system*. Wiley, NY.

Cooper A. R. (1968) The use and limitations of the concept of an effective binary diffusion coefficient for multi–component diffusions. In *Mass Transport In Oxides*, Vol. 296 (ed. J.B. Wachman and A.D. Franklin), pp. 79–84. Nat. Bur. Stand. Spec. Publ.

Fletcher R. (1971) *A modified Marquardt subroutine for nonlinear least squares*. Atomic Energy Research Establishment R6799, Harwell, England.

Ghiorso M. S. and Sack R. O. (1995) Chemical mass transfer in magmatic processes IV. a revised and internally consistent thermodynamic model for the interpolation and extrapolation of liquid–solid equilibria in magmatic systems at elevated temperatures and pressures. *Contrib. Mineral. Petrol*. **119**, 197–212.

Koyaguchi T. (1985)Magma mixing in a conduit. *J. Volcanol. Geotherm. Res.* **25**, 365–369.

Koyaguchi T. (1989) Chemical gradient at diffusive interfaces in magma chambers. *Contrib. Mineral. Petrol.* **103**, 143–152.

Kress V. C. and Ghiorso M. S. (1993) Multicomponent diffusion in MgO–Al_2O_3–SiO_2 and Cao–MgO–Al_2O_3–SiO_2 melts. *Geochim. Cosmochim. Acta* **57**, 4453–4466.

Kress V. C. and Ghiorso M.S. (1995) Multicomponent diffusion in basaltic melts. *Geochim. Cosmochim. Acta* **59**, 313–324.

Lasaga A. C. (1979) Multicomponent exchange and diffusion in silicates. *Geochim. Cosmochim. Acta* **54**, 2709–2715.

Liang Y. (2010) Multicomponent diffusion in molten silicates: Theory, experiments, and geological application. *Rev. Mineral. Geochem.* **72**, 409–446.

Liang Y. and Davis A. M. (2002) Energetics of multicomponent diffusion in molten CaO–Al_2O_3–SiO_2. *Geochim. Cosmochim. Acta* **66**, 635–646.

Liang Y., Richter F. M. and Chamberlin L. (1997) Diffusion in silicate melts: III. empirical models for multicomponent diffusion. *Geochim. Cosmochim. Acta* **61**, 5295–5312.

Liang Y., Richter F. M. and Watson E. B. (1996) Diffusion in silicate melts: II. multicomponent diffusion in $CaO–SiO_2–Al_2O_3$ at 1500°C and 1GPa. *Geochim. Cosmochim. Acta* **60**, 5021–5035.

Lundstrom C. C. (2000) Rapid diffusive infiltration of sodium into partially molten peridotite. *Nature* **403**, 527–530.

Lundstrom C. C. (2003) An experimental investigation of the diffusive infiltration of alkalis into partially molten peridotite: implications for mantle melting processes. *Geochem. Geophys. Geosyst.* **4**, 1–25.

Morgan Z. T., Liang Y. and Hess P. C. (2006) An experimental study of the kinetics of anorthite dissolution in lunar picritic magmas with applications to lunar crustal assimilation processes. *Geochim. Cosmochim. Acta* **70**, 3477–3491.

Mungall J. E., Romano C. and Dingwel D. B. (1998) Multicomponent diffusion in the molten system $K_2O–Na_2O–Al_2O_3–SiO_2–H_2O$. *Am Mineral.* **83**, 685–699.

Oishi Y., Nanba M. and Pask J. A. (1982) Analysis of liquid–state interdiffusion in the system $CaO–Al_2O_3–SiO_2$ using multiatomic ion models. *J. Am. Ceram. Soc.* **65**, 247–253.

Oldenburg C. M., Spera F. J., Yuen D. A., and Sewell G. (1989) Dynamic mixing in magma bodies: Theory, simulations and implications. *J. Geophys. Res.* **94**, 9215–9236.

Richter F. M. (1993) A method for determining activity–composition relations using chemical diffusion in silicate melts. *Geochim. Cosmochim. Acta* **57**, 2019–2032.

Richter F. M., Liang Y. and Minarik W.G. (1998) Multicomponent diffusion and convection in molten $MgO–Al_2O_3$ $–SiO_2$. *Geochim. Cosmochim. Acta* **62**, 1985–1991.

Sato H. (1975) Diffusion coronas around quartz xenocrysts in andesite and basalt from Tertiary

Volcanic Region in northeastern Shikoku, Japan. *Contrib. Mineral. Petrol.* **50**, 49–64.

Sugawara H., Nagata K. and Goto K. S. (1977) Interdiffusivities matrix of CaO–Al_2O_3–SiO_2 melt at 1723 K to 1823 K. *Metall. Trans. B* **8**, 605–612.

Trial A. F. and Spera F. J. (1994) Measuring the multicomponent diffusion matrix: Experimental design and data analysis for silicate melts. *Geochim. Cosmochim. Acta* **58**, 3769–3783.

Turner J. S. (1985) Multicomponent convection. *Ann. Rev. Fluid Mech*. **17**, 11–44.

Watson E.B. (1982) Basalt contamination by continental crust: Some experiments and models. *Contrib. Mineral. Petrol.* **80**, 73–87.

Watkins J. M., Liang Y., Richter F., Ryerson F. J. and DePaolo D. J. (2014) Diffusion of multi–isotopic chemical species in molten silicates. *Geochim. Cosmochim. Acta* **139**, 313–326.

Waythomas C.F., Scott W.E., Prejean S.G., Schneider D.J., Izbekov P. and Nye C.J. (2010) The 7–8 August 2008 eruption of Kasatochi Volcano, central Aleutian Islands, Alaska. *J. Geophys. Res.* **115** B00B06.

Yu Y., Zhang Y., Chen. Y. and Xu Z. (2016) Kinetics of anorthite dissolution in basaltic melt. *Geochim. Cosmochim. Acta* **179**, 257–274.

Zhang Y. (1993) A modified effective binary diffusion model. *J. Geophys. Res.* **98**, 11901–11920.

Zhang Y. and Behrens H. (2000) H_2O diffusion in rhyolitic melts and glasses. *Chem. Geol.* **169**, 243–262.

Zhang Y., Ni H. and Chen Y. (2010) Diffusion data in silicate melts. *Rev. Mineral. Geochem.* **72**, 311–408.

Zhang Y., Walker D. and Lesher C. E. (1989) Diffusive crystal dissolution. *Contrib. Mineral. Petrol.* **102**, 492–513.

CHAPTER IV

Multicomponent Diffusion in Basaltic Melts at 1350 ºC

4.1 Abstract

Nine successful diffusion couple experiments were conducted in an 8-component SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO–Na_2O–K_2O system at ~1350 ºC and at 1 GPa, to study multicomponent diffusion in basaltic melts. At least 3 traverses were measured to obtain diffusion profiles for each experiment. Multicomponent diffusion matrix at 1350 ºC was obtained by simultaneously fitting diffusion profiles of diffusion couple experiments. Furthermore, in order to better constrain the diffusion matrix and reconcile mineral dissolution data, mineral dissolution experiments in the literature, in addition to diffusion couple experiments from this study, were also fit. All features of diffusion profiles in both diffusion couple and mineral dissolution experiments were well reproduced by the diffusion matrix. Diffusion mechanism is inferred from eigenvectors of the diffusion matrix, and it shows that the diffusive exchange between network-formers SiO_2 and Al_2O_3 is the slowest, the exchange of SiO_2 with other oxide components is the second slowest with an eigenvalue that is only ~10% larger, then the exchange between divalent oxide components and all the other oxide components with an eigenvalue that is twice the smallest eigenvalue, then the exchange of FeO+K_2O with all the other oxide components with an eigenvalue that is 5 times the smallest eigenvalue, then the exchange of

MgO with FeO+CaO with an eigenvalue that is 6.3 times the smallest eigenvalue, then the exchange of CaO+K_2O with all the other oxide components with an eigenvalue that is 7.5 times the smallest eigenvalue, and the exchange of Na_2O with all other oxide components is the fastest, with an eigenvalue that is 31 times the smallest eigenvalue. The slowest and fastest eigenvectors are consistent with those for simpler systems in most literature. The obtained diffusion matrix was successfully applied to predict diffusion profiles during olivine dissolution in basaltic melts.

4.2 Introduction

Numerous major components are present in natural silicate melts (e.g. SiO_2, TiO_2, Al_2O_3, FeO, MgO, CaO, Na_2O and K_2O). Therefore, multicomponent diffusion is of fundamental significance in natural processes involving mass transport, such as magma mixing and contamination (Sato, 1975; Watson, 1982; Koyaguchi, 1985, 1989; Oldenburg et al., 1989), magma double-diffusive convection (Turner, 1985; Liang et al., 1994; Richter et al., 1998), and mineral growth or dissolution in magmas (Watson, 1982; Zhang et al., 1989).

Effective binary diffusion treatment (Cooper, 1968) has been widely used as an alternative to treat monotonic concentration profiles for diffusion in a multicomponent system. However, it is difficult to deal with the often-observed uphill diffusion profiles in natural melts (Sato, 1975; Watson, 1982; Zhang et al., 1989), although some empirical models have been proposed for quantifying uphill diffusion (Cooper, 1968; Lasaga, 1979; Richter, 1993; Zhang, 1993; Liang et al., 1997). In addition, effective binary diffusion coefficient of a given component depends strongly on concentration gradients of other components (Cooper, 1968; Zhang et al., 1989; Liang et al., 1996; Chen and Zhang, 2008, 2009; Guo and Zhang, 2016), making it difficult to use the approach. Therefore, multicomponent diffusion treatment is required for a more accurate quantification of diffusion in natural melts.

Tremendous efforts have been made in studying multicomponent diffusion in both synthetic and natural silicate melt systems: SiO_2–Al_2O_3–CaO, SiO_2–Al_2O_3–MgO, SiO_2–CaO–Na_2O, SiO_2–Al_2O_3–MgO–CaO, SiO_2–Al_2O_3–Na_2O–K_2O–H_2O, SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO, and SiO_2–TiO_2–Al_2O_3–MgO–CaO–Na_2O–K_2O (Sugawara et al., 1977; Oishi et al., 1982; Kress and Ghiorso, 1993, 1995; Chakraborty et al., 1995; Liang et al. 1996; Mungall et al., 1998; Richter et al., 1998; Liang and Davis, 2002; Liang, 2010; Watkins et al., 2014; Claireaux et al., 2016; Guo and Zhang, 2016). Diffusion matrices in simple silicate melt systems or partial diffusion matrices in natural silicate melt systems have been obtained (e.g., Kress and Ghiorso, 1995; Mungall et al., 1998; Morgan et al., 2006; Guo and Zhang, 2016). However, they have not been successfully applied to predict diffusion in natural melts, such as during mineral dissolution (e.g. Fig. 1.3). Several empirical models have been proposed to calculate multicomponent diffusion matrix (Lasaga, 1979; Richter 1993; Liang et al, 1997), by which diffusion profiles during mineral dissolutions are calculated (Alexander, 2011). However, only limited success is achieved in predicting diffusion in natural melts by those empirical models (e.g. Fig. 1.4).

To better understand major-component diffusion in natural silicate melts, or more specifically basaltic melts, and as a follow-up study of our previous work on a haplobasaltic melt (Guo and Zhang, 2016), we investigated multicomponent diffusion by diffusion couple experiments in an 8-component SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO–Na_2O–K_2O system at 1350 ºC and at 1 GPa. Experiments were carried out and combined with literature data to determine the 7 × 7 diffusion matrix. From the diffusion matrix, diffusion eigenvectors are used to discuss diffusion mechanisms, and diffusion profiles during mineral dissolution are predicted.

4.3 Experimental strategy and analytical methods

4.3.1 Diffusion couple experiments

The general experimental strategy, sample preparation, experimental procedure and analytical methods for diffusion couple experiments follow sections 2.1–2.4 in chapter II. The 8-component SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO–Na_2O–K_2O basaltic melts have an average composition of 51% SiO_2, 2% TiO_2, 14% Al_2O_3, 11.5% FeO, 6.5% MgO, 10.5% CaO, 3% Na_2O, 1.5% K_2O (in wt%), shown as "Base Comp" in Table 4.1. The average composition of initial glasses is listed in Table 4.1. The temperature of 1350 ºC is chosen to be higher than the liquidus of any basaltic melt at 1 GPa. The pressure of 1 GPa is chosen for better experimental success rate.

Table 4.1 Average compositions, 1σ errors and liquidus of initial basaltic glasses.

	SiO_2^* ave(σ)	TiO_2 ave(σ)	Al_2O_3 ave(σ)	FeO_t ave(σ)	MgO ave(σ)	CaO ave(σ)	Na_2O ave(σ)	K_2O ave(σ)	Total	Liquidus ºC
Base Comp	51.00	2.00	14.00	11.50	6.50	10.50	3.00	1.50	100	1317
JDF Basalts	50.98	1.97	13.81	12.24	7.15	10.91	2.77	0.17	100	1331
Haplobasalts	50.00	1.50	15.00	0.00	10	19.00	3.00	1.50	100	1367
BS1	51.74(23)	0.51(2)	14.17(10)	11.60(10)	6.70(5)	10.78(29)	3.03(6)	1.48(3)	100	1324
BS2	49.46(16)	3.37(6)	14.18(12)	11.20(10)	6.64(6)	10.68(09)	3.01(5)	1.45(2)	100	1309
BS3	51.79(15)	1.95(3)	12.76(05)	11.72(08)	6.64(5)	10.69(12)	2.99(4)	1.46(3)	100	1325
BS4	49.16(14)	1.96(5)	15.73(07)	11.46(07)	6.70(5)	10.56(10)	2.99(3)	1.44(3)	100	1307
BS5	52.16(17)	1.97(5)	14.19(06)	9.90(16)	6.57(7)	10.57(10)	3.10(5)	1.54(4)	100	1322
BS6	49.16(23)	1.96(6)	14.32(06)	12.84(08)	6.68(7)	10.54(06)	3.03(3)	1.51(4)	100	1311
BS7	51.97(15)	1.94(4)	14.30(09)	11.44(07)	5.33(4)	10.62(06)	3.00(3)	1.40(1)	100	1304
BS8	49.15(24)	1.95(6)	14.29(08)	11.40(13)	8.13(8)	10.55(09)	3.01(4)	1.52(3)	100	1330
BS9	51.69(10)	1.95(7)	14.39(09)	11.33(11)	6.60(6)	9.21(08)	3.21(5)	1.61(3)	100	1330
BS10	49.19(16)	2.00(5)	14.17(05)	11.36(08)	6.67(8)	11.99(09)	3.07(3)	1.56(3)	100	1321
BS11	52.19(18)	2.01(5)	14.07(06)	11.30(10)	6.77(4)	10.56(08)	1.55(2)	1.55(2)	100	1339
BS12	49.31(18)	2.00(3)	14.07(09)	11.38(13)	6.70(3)	10.53(07)	4.48(5)	1.53(3)	100	1315
BS13	52.54(23)	1.97(6)	13.94(12)	11.31(07)	6.67(8)	10.52(08)	3.01(6)	0.05(1)	100	1320
BS14	49.18(13)	2.01(5)	13.94(08)	11.62(07)	6.60(5)	10.53(09)	3.06(3)	3.06(7)	100	1317
BS17	51.21(24)	1.97(4)	13.95(17)	11.17(14)	8.00(9)	10.62(05)	3.05(4)	0.04(1)	100	1354
BS18	51.02(19)	1.96(4)	13.83(10)	11.46(14)	5.24(4)	10.52(06)	2.99(4)	2.98(3)	100	1309
BS19	51.11(27)	2.00(5)	15.39(21)	11.33(13)	6.59(7)	9.05(07)	3.04(4)	1.48(2)	100	1328
BS20	51.29(21)	1.98(5)	12.42(14)	11.38(14)	6.61(5)	11.84(07)	2.98(5)	1.50(3)	100	1331

Note:

1. SiO_2^* is define as $SiO_2^* = SiO_2 - (\text{total} - 100)$, so that the new "total" is 100%.
2. The values in parentheses are 1σ errors on the last digit.
3. Liquidus of initial glasses at 1 GPa were estimated by MELTS (Ghiorso and Sack, 1995; Asimow and Ghiorso, 1998).
4. The composition of 7-component haplobasaltic melts for which diffusion matrix at 1500°C and 1 GPa was determined by Guo and Zhang (2016) is also listed for comparison and discussion.

4.3.2 Mineral dissolution experiments

During mineral dissolution in a natural melt, multicomponent diffusion profiles are also generated. These diffusion profiles are critical for understanding mineral dissolution kinetics, but also provide constraints on multicomponent diffusion matrix, and offer data for testing diffusion matrix obtained for a given bulk melt composition. In mineral dissolution experiments, the interface melt composition is dictated by mineral-melt equilibrium, meaning both the total concentration variation for specific components and the direction of concentration gradients cannot be precisely controlled as in diffusion couple experiments. Hence, these experiments may have larger total variations in concentrations of some components, and do not satisfy the ±1.5 wt% total concentration variation as designed in diffusion couple experiments. The larger concentration variation may lead to non-negligible dependence of the diffusion matrix elements on concentrations. Nonetheless, if such data are available, they are useful in testing and constraining the diffusion matrix as long as possible complexities are recognized.

In this study, no new mineral dissolution experiments were carried out. Nonetheless, the choice of our melt composition is close to that of Juan de Fuca mid-ocean ridge basalts that was used in mineral dissolution studies of Chen and Zhang (2008, 2009) and Yu et al. (2016). Hence, we will use the literature data at similar temperatures to test and constrain the diffusion matrix.

4.4 Experimental results

Nine successful diffusion couple experiments were carried out. The name of each diffusion couple experiment ID indicates two halves of initial glasses in the diffusion couple. For example, BS13&14A means that one half is BS13 and the other half is BS14, where "BS" stands for "basalts", and the last letter "A" indicates the experiment is at ~1350 ºC. The interface composition of each diffusion couple is listed in Table 4.2. The average of the interface compositions of the 9 diffusion couple experiments is very close to the compositions of the base and the JDF basalts. The 1σ standard deviation of the interface compositions is less than 0.55 wt% for all components.

Table 4.2 Interface compositions of each diffusion couple.

Exp#	SiO_2^*	TiO_2	Al_2O_3	FeO_t	MgO	CaO	Na_2O	K_2O	Total
Base Comp	51.00	2.00	14.00	11.50	6.50	10.50	3.00	1.50	100
JDF Basalt	50.98	1.97	13.81	12.24	7.15	10.91	2.77	0.17	100
BS1&2A	50.55	1.93	14.20	11.38	6.71	10.81	2.97	1.45	100
BS3&4A	50.37	1.98	14.26	11.74	6.60	10.58	3.00	1.47	100
BS5&6A	50.53	1.96	14.32	11.51	6.56	10.51	3.08	1.53	100
BS7&8A	50.44	1.93	14.27	11.52	6.77	10.60	3.03	1.44	100
BS9&10A	50.54	1.97	14.21	11.34	6.63	10.57	3.15	1.59	100
BS11&12A	50.70	2.00	14.03	11.45	6.72	10.53	3.02	1.55	100
BS13&14A	50.80	1.98	13.95	11.47	6.65	10.51	3.08	1.56	100
BS17&18A	51.73	1.97	13.57	11.20	6.53	10.42	3.06	1.52	100
BS19&20A	51.78	2.00	13.55	11.32	6.52	10.33	3.03	1.47	100
Average	50.83	1.97	14.04	11.44	6.63	10.54	3.05	1.51	100
1σ deviation	0.54	0.03	0.30	0.15	0.09	0.13	0.05	0.05	

Note: SiO_2^* is define as $SiO_2^* = SiO_2 - (total - 100)$, so that the new "total" is 100%.

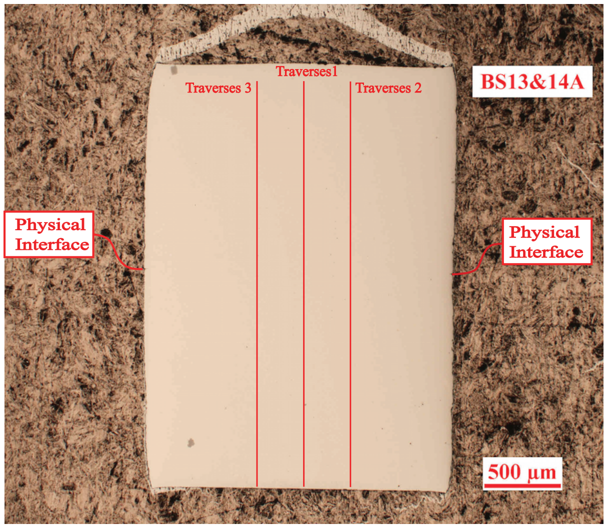

Fig. 4.1 Optical microscopic image of polished experimental charge BS13&14A. Three traverses (Traverse 1, Traverse 2 and Traverse 3) were measured, indicated by solid lines. Physical interface position can be seen in the image.

Fig. 4.1 shows an optical microscopic image of sample charge BS13&14A, with 3 traverses indicated by solid lines. Two halves of initial glasses are molten together, and no crack is observed. Interface between two halves is not visible, but the physical interface could be seen near the graphite crucible as a dent or slight misalignment. In general, quench crystals are not observed, and cracks are present in 5 out of 9 experiments.

At least 3 traverses were measured to obtain diffusion profiles for each diffusion couple experiment. Figs. 4.2–4.10 shows diffusion profiles of all experiments. If cracks are present, profiles across cracks are re-connected smoothly by comparing different traverses. All microprobe analytical data can be found in the Appendix C.

Experimental conditions and effective binary diffusion coefficients (EBDC) for monotonic diffusion profiles of all 9 successful experiments are shown in Table 4.3. The actual experimental temperatures at the center of the diffusion couple are determined after the experiments. The temperature variation is from 1349.2 to 1354.6 ºC, except for one experiment BS1&2A with significant higher temperature 1380.9 ºC. Experimental durations were calculated by $t_{\mathrm{eff}} = \int \mathrm{e}^{-E/(RT)}\,\mathrm{d}t \Big/ \mathrm{e}^{-E/(RT_{\mathrm{exp}})}$ where the integration includes the heating-up and cooling-down segments (Zhang and Behrens, 2000) and E = 145 kJ/mol (from this study). For well-resolved monotonic diffusion profiles, effective binary diffusion coefficients (EBDC) were obtained by fitting the data by an error function. The first 7 experiments have initial concentration differences of 3 wt% in SiO_2 and another component i, where i = TiO_2, Al_2O_3, FeO, MgO, CaO, Na_2O and K_2O. Those 7 experiments are the minimum requirement to obtain the 7×7 diffusion matrix in an 8-component system (Trial and Spera, 1994), unless the analytical precision is much higher than that of a regular electron microprobe (Liang 2010). The additional 2 experiments are for further constraint.

Table 4.3. Summary of experimental conditions and effective binary diffusion coefficients in basaltic melts at 1350 ºC.

Exp#	T	t	couples	$D(SiO_2)$	$D(TiO_2)$	$D(Al_2O_3)$	$D(FeO_t)$	$D(MgO)$	$D(CaO)$	$D(Na_2O)$	$D(K_2O)$
	°C	sec		$\mu m^2/s$	$\mu m^2/s$	$\mu m^2/s$	$\mu m^2/s$	$\mu m^2/s$	$\mu m^2/s$	$\mu m^2/s$	$\mu m^2/s$
BS1&2A	1380.9	1204	Si–Ti	5.1±0.9	8.6±0.2						
BS3&4A	1354.6	1204	Si–Al	4.8±0.6		4.8±0.3					
BS5&6A	1349.2	904	Si–Fe	10.6±1.3			23.7±1.7				
BS7&8A	1352.3	959	Si–Mg	13.1±1.7				28.5±1.2			
BS9&10A	1354.6	546	Si–Ca	10.1±1.6					35.7±1.9		
BS11&12A	1349.2	396	Si–Na	–						249.7±7.6	
BS13&14A	1351.9	515	Si–K	25.6±3.1							42.0±1.2
BS17&18A	1349.9	336	Mg–K					19.8±1.2			28.4±1.7
BS19&20A	1354.6	335	Al–Ca			6.0±0.9			29.3±1.2		

Note:
1. All experiments were at 1 GPa.
2. Reported temperatures are actual experimental temperatures at the center of diffusion couples.
3. Durations are calculated effective experimental durations.
4. For easy comparison, the effective binary diffusion coefficients are not those at the experimental temperatures, but those at 1350 ºC, by correcting effective experimental durations using $t_{corr} = t_{exp} \cdot e^{-E/(RT_{exp})} / e^{-E/(RT_{corr})}$ (Zhang and Behrens, 2000) where T_{corr} = 1350 ºC and E = 145 kJ/mol (from this study).
5. $D(SiO_2)$ for experiment BS11&12A is not listed, because this extracted value is not accurate due to asymmetric SiO_2 profile.

In order for fitting effective binary diffusion coefficients and diffusion matrix, the preliminary data processing follows section 2.5 in chapter II.

4.5 Effective binary diffusion coefficients

Effective binary diffusion coefficients (EBDC) were fit by eq. (2.1) for the two components with 3-wt% concentration difference (i.e. the monotonic profiles) for each diffusion couple (Table 4.3). The fit is typically excellent in reproducing the data with r^2 values ranging from 0.969 to 0.999. EBDC of a given component in a multicomponent system is strongly dependent on its counter-diffusing component in a single bulk composition, which is consistent with theoretical consideration (Cooper, 1968) and observations in Guo and Zhang (2016). Because more diffusion couples have initial concentration gradients in SiO_2, the observation is especially notable for SiO_2. EBDC of SiO_2 varies from 5.1 $\mu m^2/s$ when diffusing against TiO_2, to 25.6 $\mu m^2/s$ when diffusing against K_2O. The total variation of EBDC of SiO_2 is by a factor of 5.0. This observation indicates that application of EBDC's is of limited value and caution should be exercised when applying EBDC's, since EBDC of one component is dependent not only on the bulk melt composition, but also on its counter-diffusing component(s). To apply EBDC's to a diffusion problem, not only the bulk composition, but also the directions of the concentration gradients need to be similar. For example, EBDS's obtained from dissolution experiments of a specific mineral in a specific melt are only applicable to diffusion during the dissolution of the same mineral in the same melt.

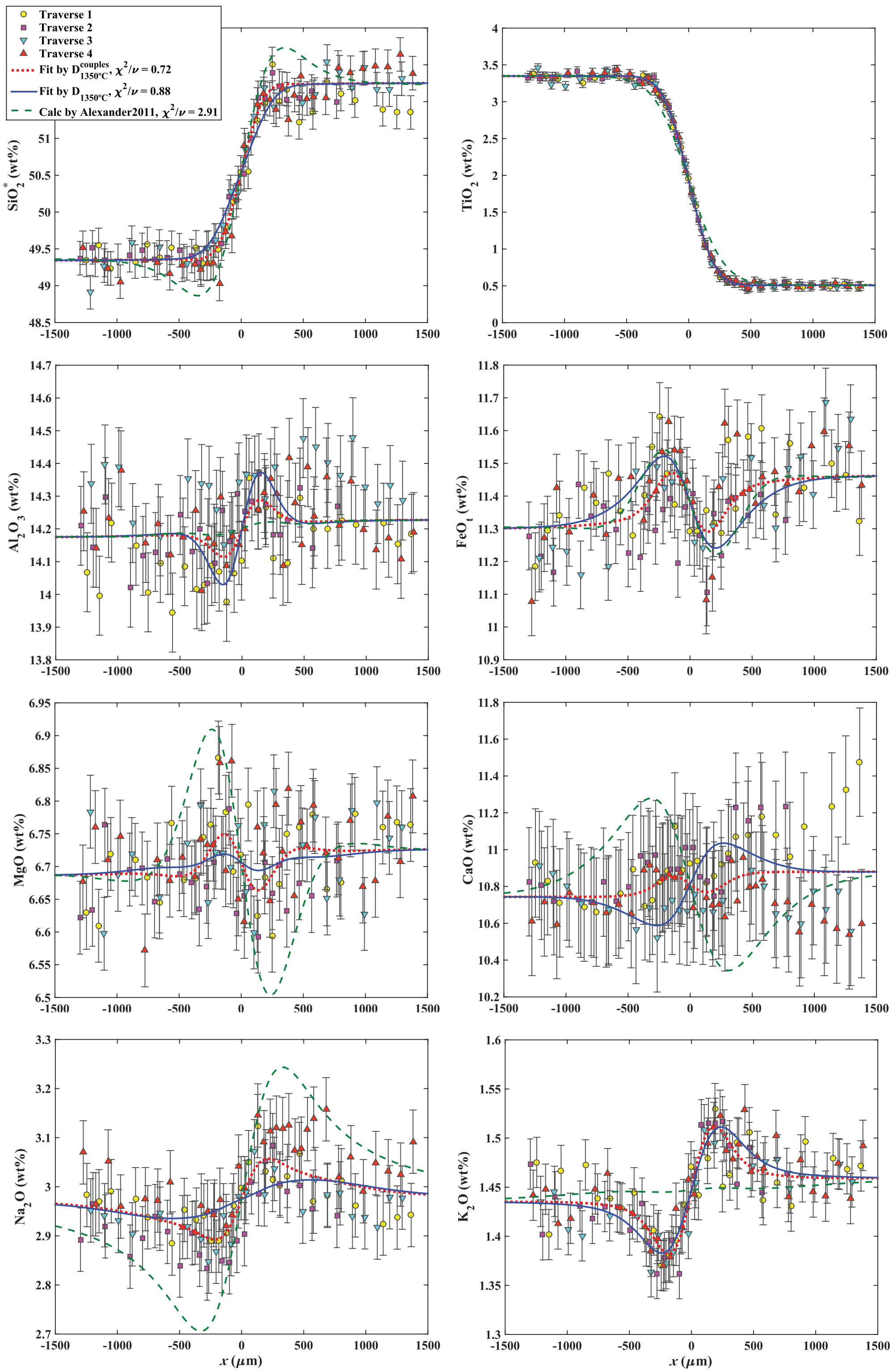

Fig. 4.2 Data of diffusion profiles of BS1&2A with fits. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The long-dashed curves are predicted profiles using the diffusion matrix given by Alexander (2011) (Note this diffusion matrix was corrected to 1350 ºC for comparison). The short-dashed curves are fit profiles for obtaining the diffusion matrix $D_{1350°C}^{couples}$ in Table 4.4. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1350°C}$ in Table 4.5. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1350 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fitting.

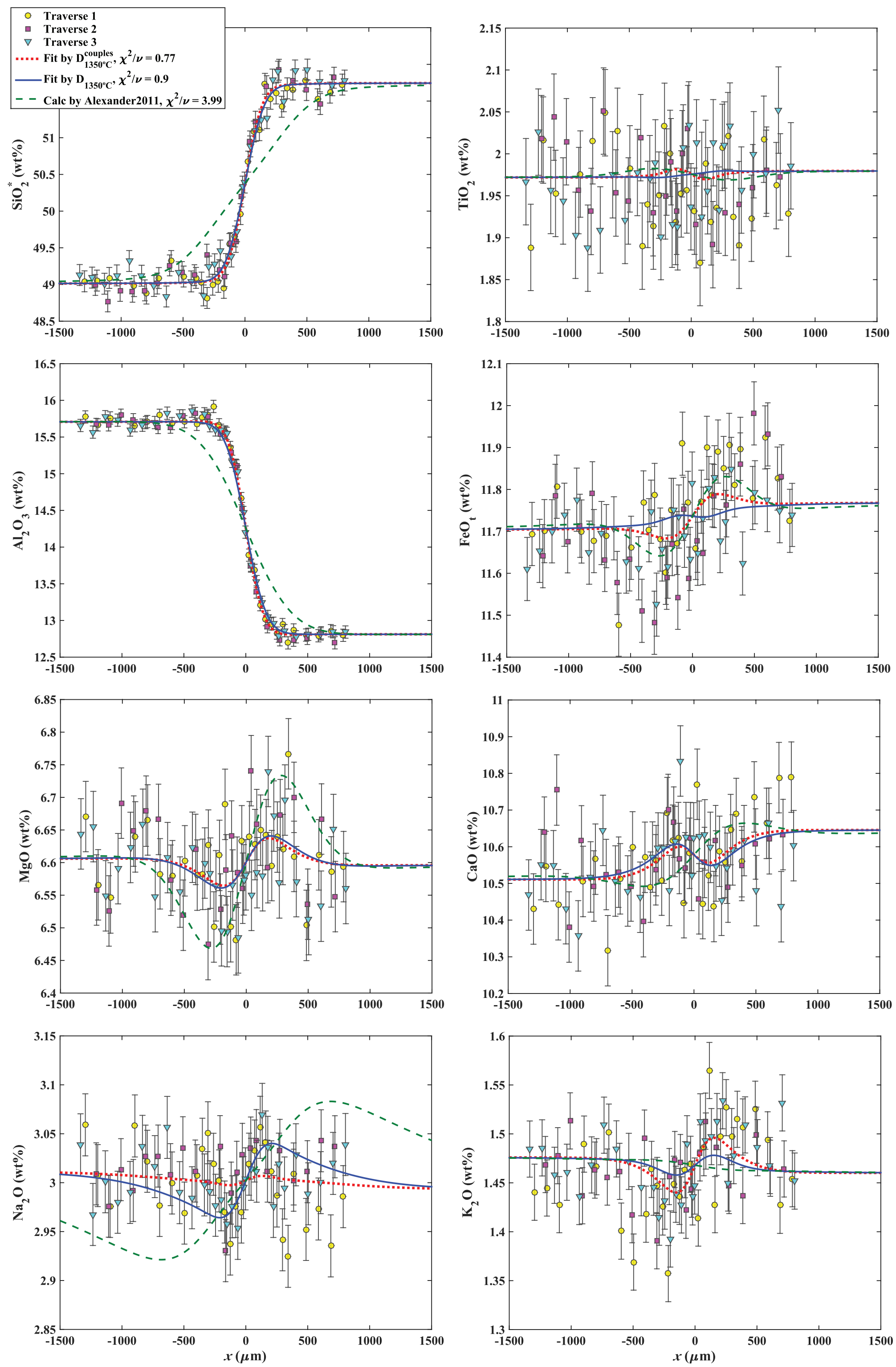

Fig. 4.3 Data of diffusion profiles of BS3&4A with fits. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The long-dashed curves are predicted profiles using the diffusion matrix given by Alexander (2011) (Note this diffusion matrix was corrected to 1350 ºC for comparison). The short-dashed curves are fit profiles for obtaining the diffusion matrix $D_{1350ºC}^{couples}$ in Table 4.4. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1350ºC}$ in Table 4.5. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1350 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fitting.

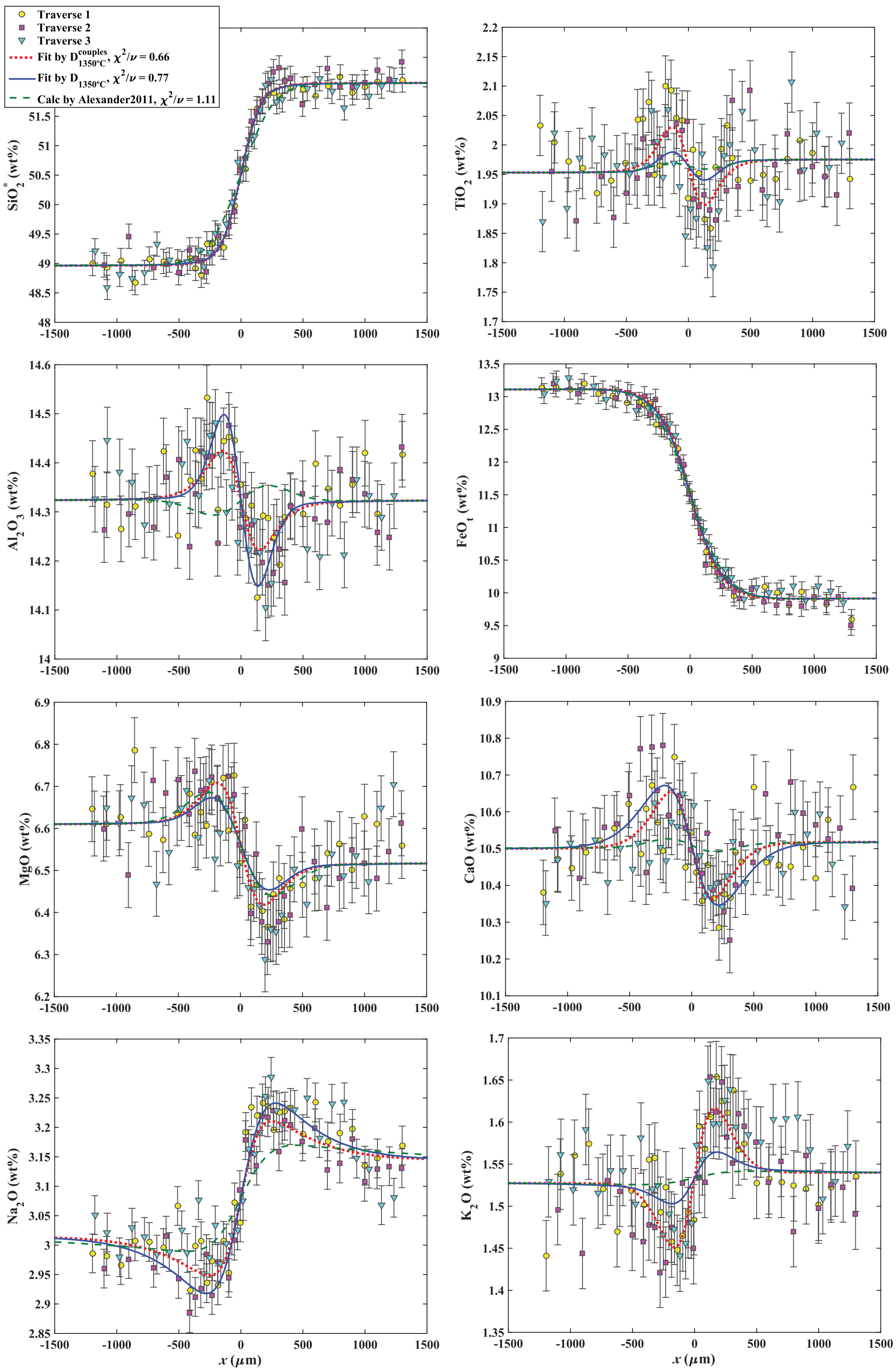

Fig. 4.4 Data of diffusion profiles of BS5&6A with fits. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The long-dashed curves are predicted profiles using the diffusion matrix given by Alexander (2011) (Note this diffusion matrix was corrected to 1350 ºC for comparison). The short-dashed curves are fit profiles for obtaining the diffusion matrix $D^{couples}_{1350ºC}$ in Table 4.4. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1350ºC}$ in Table 4.5. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1350 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fitting.

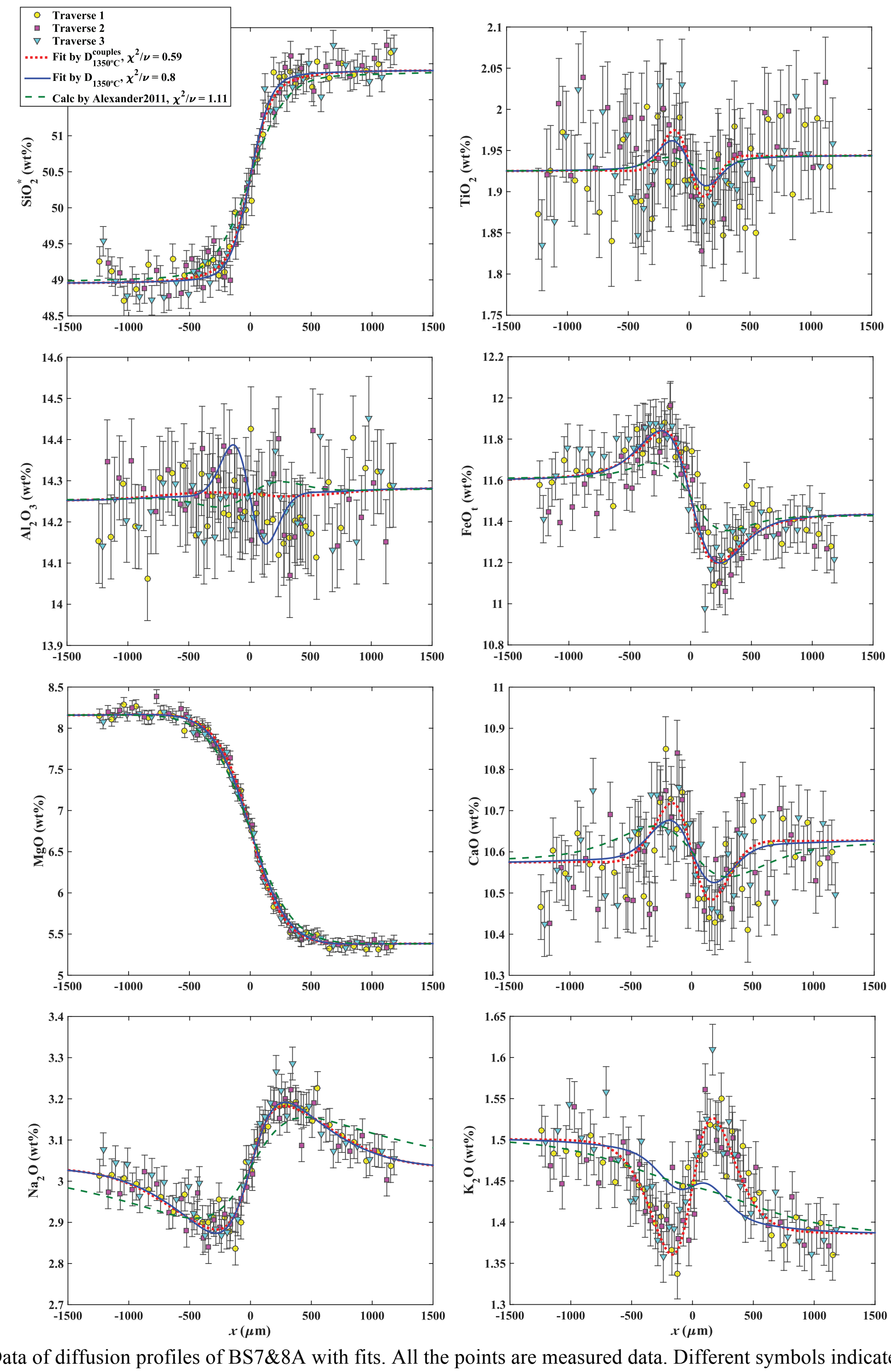

Fig. 4.5 Data of diffusion profiles of BS7&8A with fits. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The long-dashed curves are predicted profiles using the diffusion matrix given by Alexander (2011) (Note this diffusion matrix was corrected to 1350 ºC for comparison). The short-dashed curves are fit profiles for obtaining the diffusion matrix $D^{couples}_{1350°C}$ in Table 4.4. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1350°C}$ in Table 4.5. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1350 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fitting.

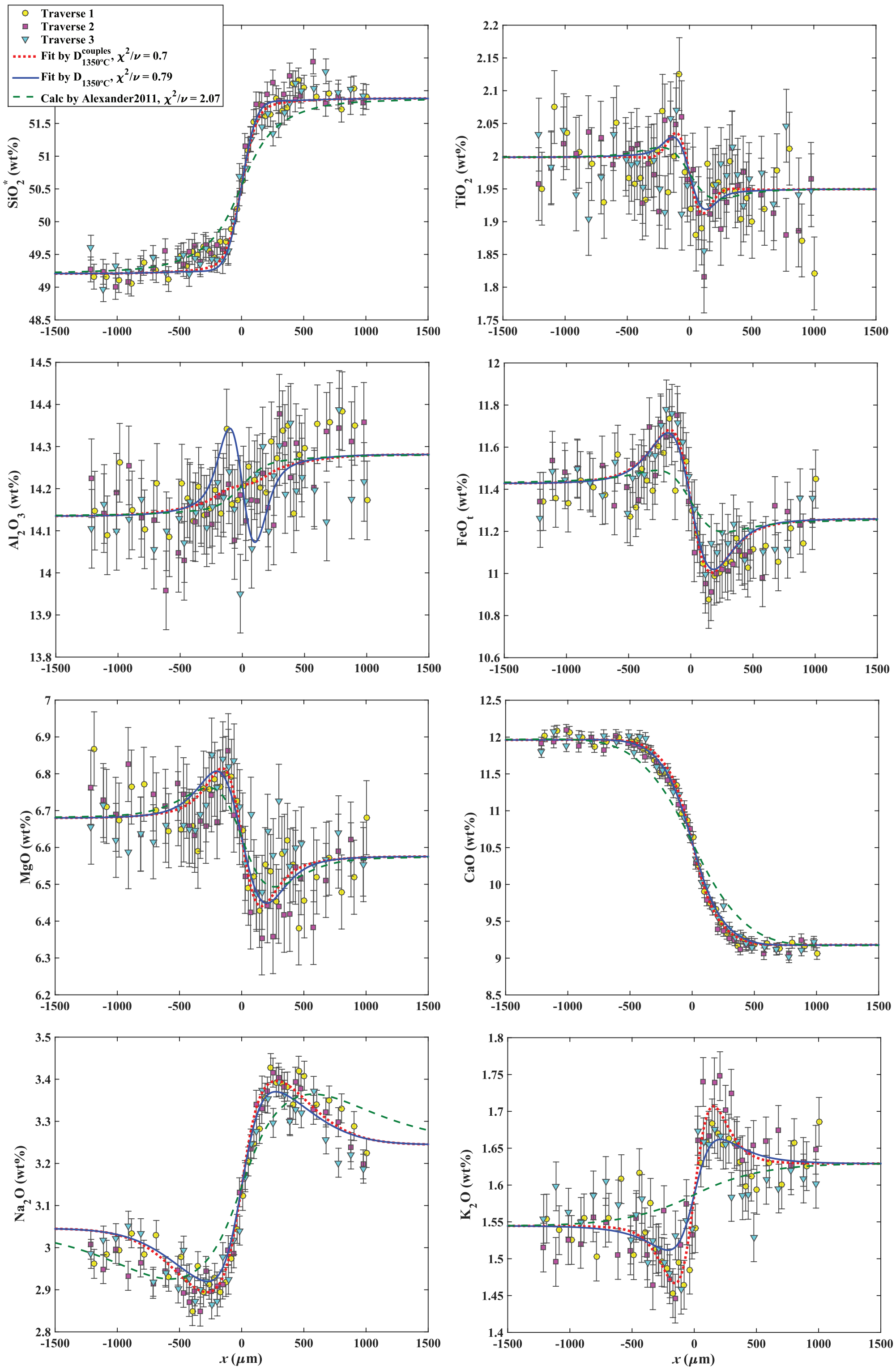

Fig. 4.6 Data of diffusion profiles of BS9&10A with fits. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The long-dashed curves are predicted profiles using the diffusion matrix given by Alexander (2011) (Note this diffusion matrix was corrected to 1350 ºC for comparison). The short-dashed curves are fit profiles for obtaining the diffusion matrix $D^{\mathrm{couples}}_{1350^{\circ}\mathrm{C}}$ in Table 4.4. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1350^{\circ}\mathrm{C}}$ in Table 4.5. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1350 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fitting.

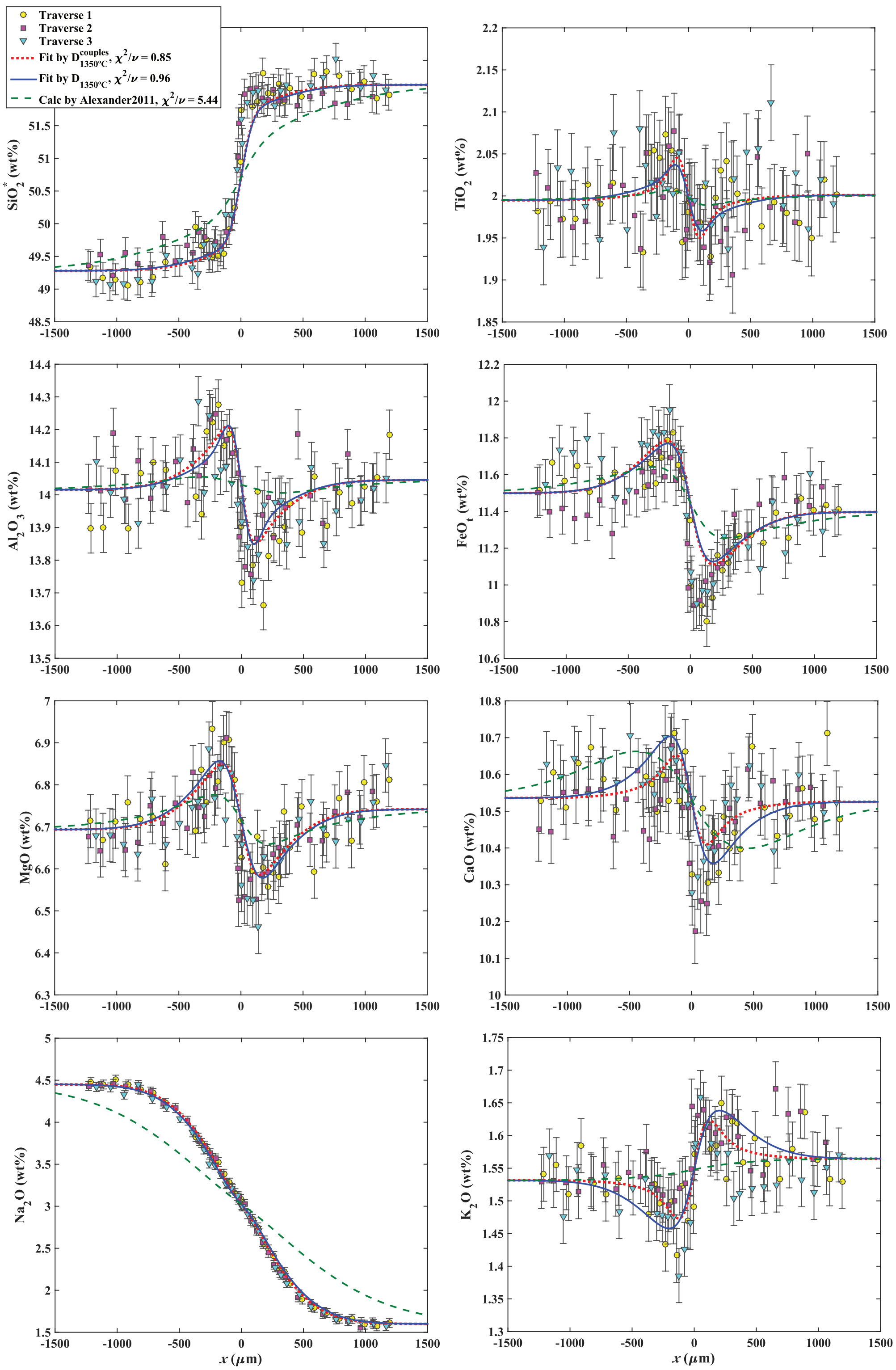

Fig. 4.7 Data of diffusion profiles of BS11&12A with fits. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The long-dashed curves are predicted profiles using the diffusion matrix given by Alexander (2011) (Note this diffusion matrix was corrected to 1350 ºC for comparison). The short-dashed curves are fit profiles for obtaining the diffusion matrix $D^{couples}_{1350°C}$ in Table 4.4. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1350°C}$ in Table 4.5. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1350 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fitting.

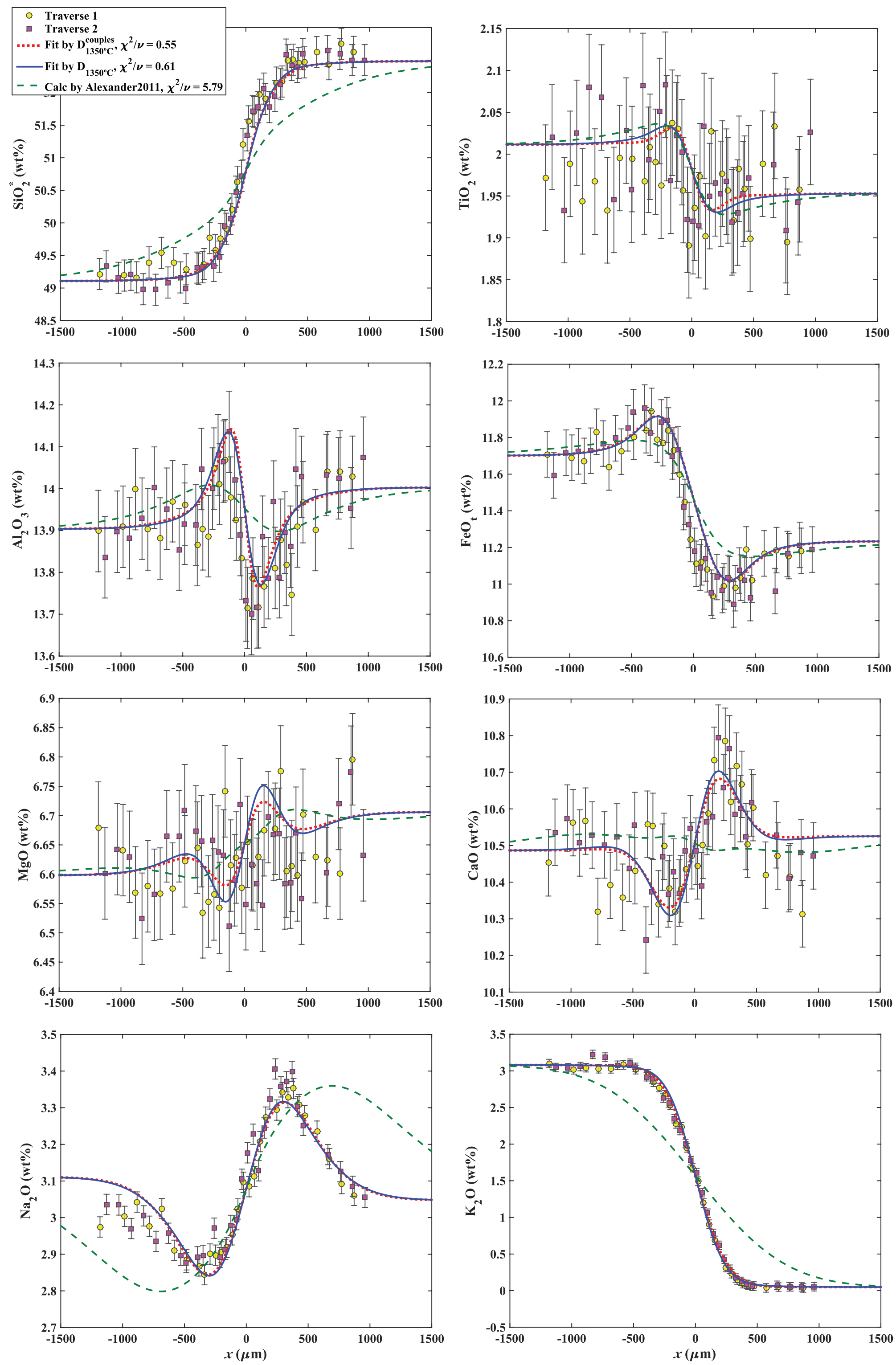

Fig. 4.8 Data of diffusion profiles of BS13&14A with fits. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The long-dashed curves are predicted profiles using the diffusion matrix given by Alexander (2011) (Note this diffusion matrix was corrected to 1350 ºC for comparison). The short-dashed curves are fit profiles for obtaining the diffusion matrix $D_{1350ºC}^{couples}$ in Table 4.4. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1350ºC}$ in Table 4.5. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1350 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fitting.

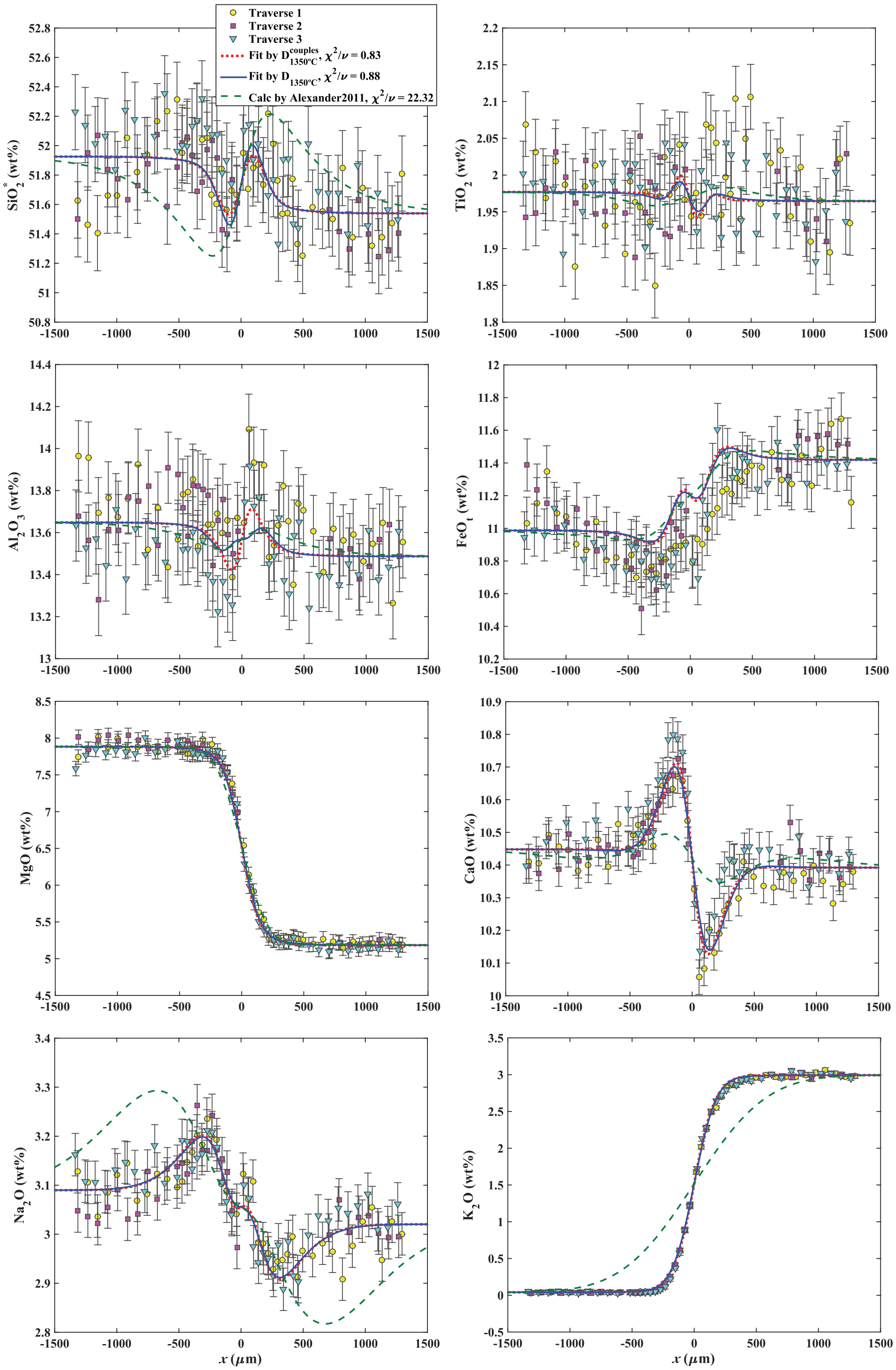

Fig. 4.9 Data of diffusion profiles of BS17&18A with fits. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The long-dashed curves are predicted profiles using the diffusion matrix given by Alexander (2011) (Note this diffusion matrix was corrected to 1350 ºC for comparison). The short-dashed curves are fit profiles for obtaining the diffusion matrix $D_{1350℃}^{couples}$ in Table 4.4. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1350℃}$ in Table 4.5. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1350 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fitting.

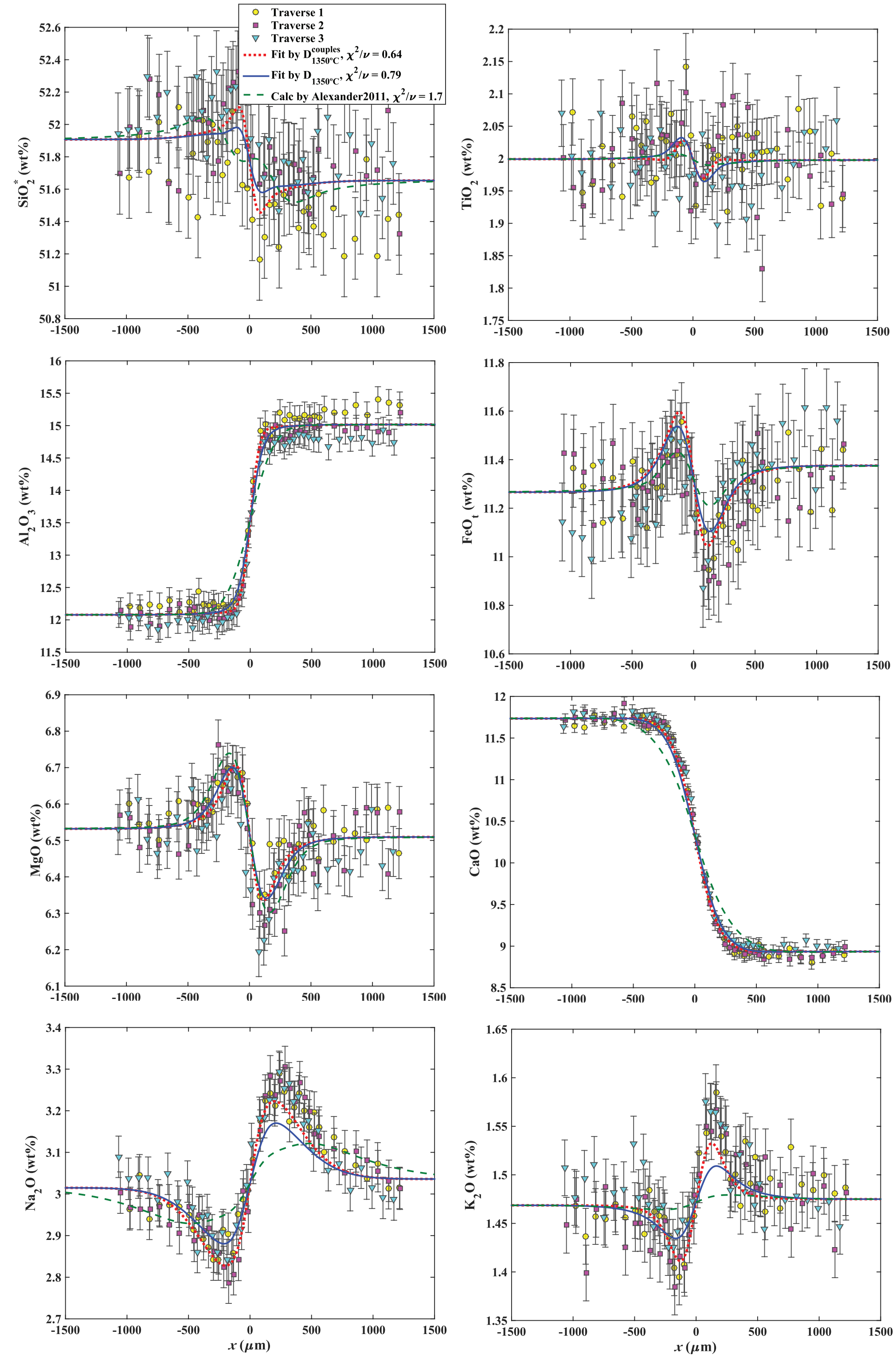

Fig. 4.10 Data of diffusion profiles of BS19&20A with fits. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The long-dashed curves are predicted profiles using the diffusion matrix given by Alexander (2011) (Note this diffusion matrix was corrected to 1350 ºC for comparison). The short-dashed curves are fit profiles for obtaining the diffusion matrix $D^{couples}_{1350°C}$ in Table 4.4. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1350°C}$ in Table 4.5. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1350 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fitting.

4.6 Fitting diffusion profiles of diffusion couples

The diffusion matrix is obtained by simultaneously fitting all diffusion profiles from all experiments using Levenberg-Marquardt-Fletcher methods (Fletcher, 1971), and the numerical methods are given by section 2.6 in chapter II. The error of diffusion matrix was estimated by error propagation (Clifford, 1973), and the numerical method is given by section 2.7 in chapter II.

The fit diffusion matrix is denoted as $D_{1350^{\circ}C}^{couples}$ and is shown in Table 4.4. All the fits by matrix $D_{1350^{\circ}C}^{couples}$ for all 9 diffusion couple experiments are shown by short-dashed curves in Figs. 4.2–4.10. It can be seen that all features in the diffusion profiles are well reproduced by this diffusion matrix. The goodness of fit for each experiment is assessed by reduced chi-square (the same as mean squares weighted deviation, MSWD).

Eigenvalues and eigenvectors of the diffusion matrices $D_{1350^{\circ}C}^{couples}$ are shown in Table 4.4. Eigenvalues are listed in an increasing order (λ_1 always indicates the smallest eigenvalue and λ_7 always indicates the largest eigenvalue). Each column is an eigenvector, associated to the eigenvalue above it (e.g. v_1 is the associated eigenvector of λ_1), in both 7-component TiO_2–Al_2O_3–FeO–MgO–CaO–Na_2O–K_2O and 8-component SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO–Na_2O–K_2O vector space. The 8-component eigenvectors are calculated by adding the dependent component SiO_2 to the 7-component eigenvectors such that the sum of all components is zero and then renormalized (see footnote in Table 4.4). Eigenvalues indicate diffusivities along independent directions. Eigenvectors are often interpreted to indicate independent exchanging "species" during diffusion, i.e. the diffusion mechanism.

Table 4.4 Diffusion matrix $D_{1350°C}^{couples}$ obtained by fitting only diffusion couple experiments at 1350 °C, with 1σ errors for each element, and eigenvalues and eigenvectors.

$D_{1350°C}^{couples}$ (μm²/s)	TiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O
TiO_2	8.47±0.35	–0.36±0.19	–2.83±0.43	–1.31±0.61	–1.52±0.68	–4.42±1.74	–1.53±0.87
Al_2O_3	–1.86±0.65	3.89±0.32	–7.05±0.60	–5.30±0.99	–11.53±1.19	–34.53±2.80	–20.67±1.45
FeO	–11.81±1.46	–0.59±0.74	19.98±1.70	–31.48±1.86	–41.17±2.26	–75.38±5.87	–47.71±2.68
MgO	–3.60±0.72	1.17±0.45	–8.89±0.93	24.09±1.22	–18.56±1.30	–34.43±3.03	–6.90±1.63
CaO	–2.60±1.67	–2.38±0.62	–9.21±1.10	–7.48±1.26	32.36±1.44	–15.88±3.97	15.98±1.74
Na_2O	20.17±2.03	4.07±0.97	20.77±1.34	40.08±1.59	62.64±1.67	223.75±4.77	77.80±1.80
K_2O	3.49±0.34	1.95±0.25	3.88±0.55	9.10±0.59	7.67±0.66	7.60±1.98	41.28±0.91
Eigenvalues	λ_1	λ_2	λ_3	λ_4	λ_5	λ_6	λ_7
	5.07						
		6.32					
			12.22				
				33.26			
					41.01		
						49.37	
							206.58
7-component Eigenvectors	v_1	v_2	v_3	v_4	v_5	v_6	v_7
TiO_2	0.09	–0.55	–0.49	–0.07	0.03	0.04	–0.01
Al_2O_3	0.98	–0.45	–0.14	–0.18	0.02	0.04	–0.14
FeO	0.01	–0.44	0.57	0.85	–0.36	–0.61	–0.34
MgO	–0.01	–0.27	0.43	–0.25	–0.45	0.00	–0.15
CaO	0.12	–0.37	0.41	–0.31	0.81	0.72	–0.06
Na_2O	–0.03	0.17	–0.13	–0.04	–0.11	–0.26	0.92
K_2O	–0.08	0.24	–0.22	0.28	–0.08	0.16	0.02
8-component Eigenvectors	v_1	v_2	v_3	v_4	v_5	v_6	v_7
SiO_2	–0.74	0.86	–0.40	–0.27	0.13	–0.08	–0.23
TiO_2	0.06	–0.28	–0.45	–0.07	0.03	0.04	–0.01
Al_2O_3	0.67	–0.23	–0.13	–0.17	0.02	0.04	–0.14
FeO	0.01	–0.23	0.52	0.82	–0.35	–0.61	–0.33
MgO	–0.01	–0.14	0.39	–0.24	–0.45	0.00	–0.15
CaO	0.08	–0.19	0.38	–0.30	0.80	0.72	–0.05
Na_2O	–0.02	0.09	–0.12	–0.04	–0.11	–0.26	0.89
K_2O	–0.05	0.13	–0.20	0.27	–0.08	0.16	0.02

Note: The SiO_2 component in each eigenvector is calculated from the 7-component eigenvector, by adding the SiO_2 component so that the summation of all elements in the eigenvector is zero. Then the 8-component eigenvector is renormalized. This way, the contribution by all 8 components (including the dependent component SiO_2) to each eigenvector can be directly seen.

By examining eigenvectors of matrix $D_{1350°C}^{couples}$ (Table 4.4), v_1 is largely due to the exchange between SiO_2 and Al_2O_3; v_2 is largely due to the exchange between SiO_2 and all other components; v_3 is due to the exchange of FeO+MgO+CaO with all other components; v_4 is due to the exchange of FeO+K_2O with all other components; v_5 is largely due to the exchange of FeO+MgO and CaO; v_6 is largely due to the exchange of CaO+ K_2O with all other components; and v_7 is due to the exchange of Na_2O (and very minor K_2O) with all other components. The relative values of eigenvalues along the eigenvectors essentially match expectations based on self or tracer diffusivities that high-valence cations and network-formers diffuse slowly, lower-valence cations and network-modifiers diffuse more rapidly, and Na and Li (low valence and small cations) have the highest diffusivity (Zhang et al., 2010).

4.7 Predicting diffusion profiles during mineral dissolution

Predictions by matrix $D_{1350^{\circ}\mathrm{C}}^{\mathrm{couples}}$ for major oxide diffusion profiles during olivine, diopside and anorthite dissolution (Chen and Zhang, 2008, 2009; Yu et al., 2016) using eq. (A14) in Appendix A2 are shown by short-dashed curves in Figs. 4.11–4.13. Theoretically, the interface melt composition in a multicomponent system can also be calculated from the diffusion matrix and the chemical potential relation between mineral and melt (Guo and Zhang, 2016). Nonetheless, in calculating diffusion profiles during mineral dissolution, the interface melt composition was determined by extrapolation of actual experimental data points in the literature, rather than by thermodynamic models such as MELTS (Ghiorso and Sack, 1995; Asimow and Ghiorso, 1998), because chemical potentials of oxides in silicate melts cannot be accurately calculated yet (e.g., Alexander, 2011). The dissolution rate was subsequently determined by solving eq. (A20) in Appendix A2 using the extrapolated interface melt composition. Note that eq. (A20) contains $n - 1$ equations, but only the equation corresponding to the best-resolved component was used to calculate the dissolution rate.

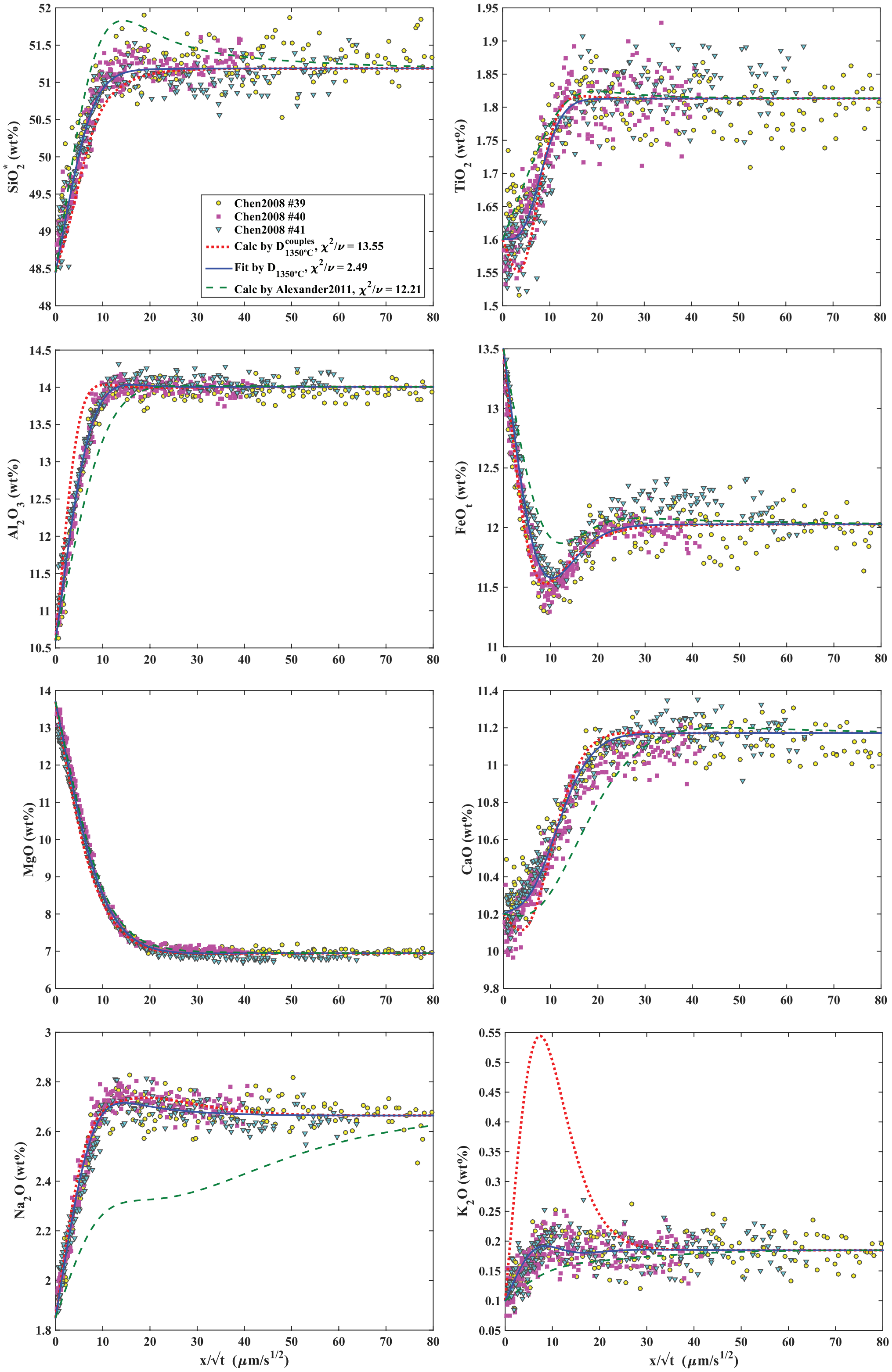

Fig. 4.11 Predicted and fit diffusion profiles for olivine dissolution in basaltic melts at ~1350 ºC (Chen and Zhang, 2008). The long-dashed curves are predicted profiles using the diffusion matrix given by Alexander 2011 (Note this diffusion matrix was corrected to 1350 ºC for comparison). The short-dashed curves are predicted profiles using the diffusion matrix $D^{\text{couples}}_{1350ºC}$ in Table 4.4. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1350ºC}$ in Table 4.5. χ^2/ν is calculated and shown.

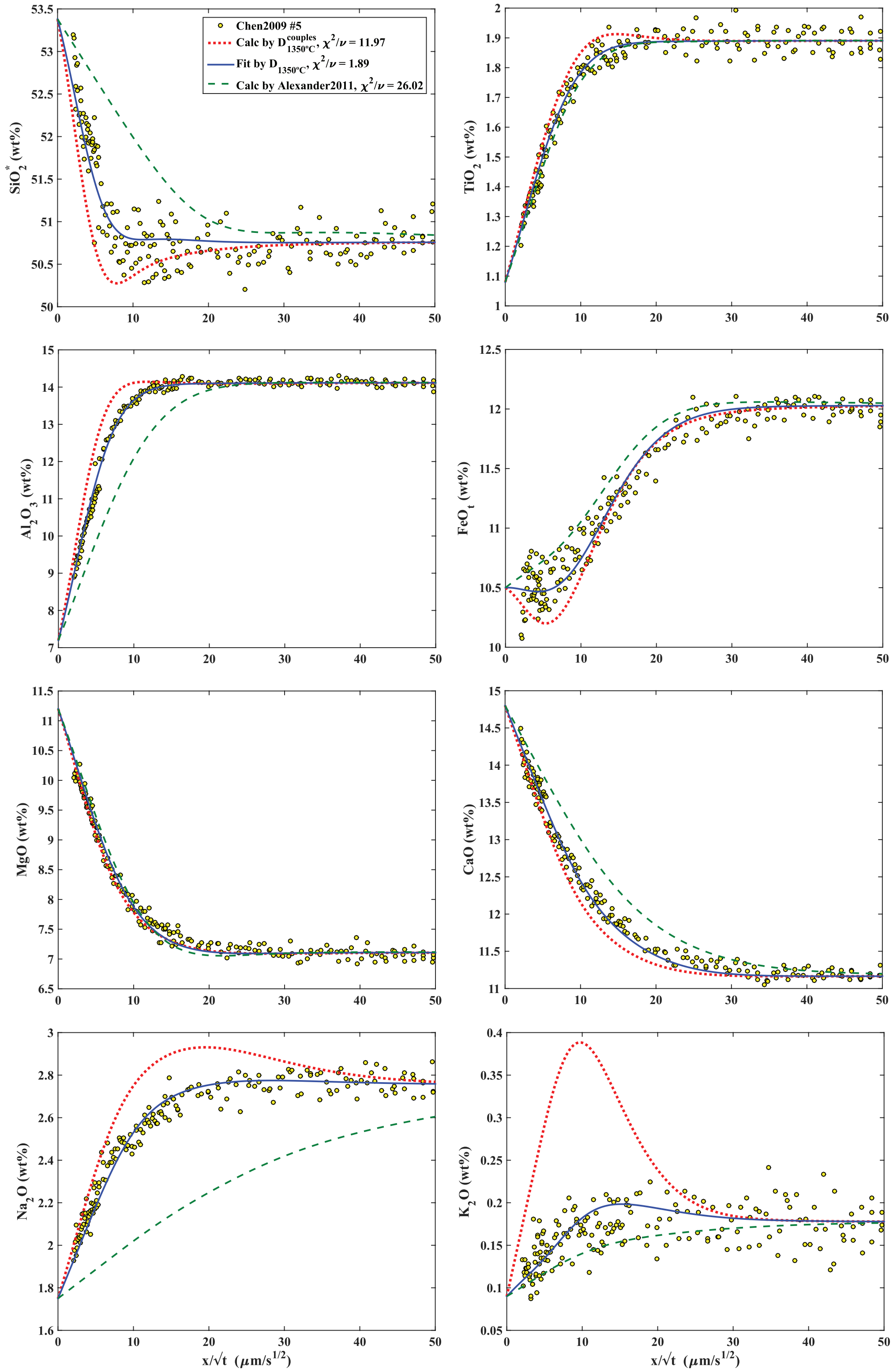

Fig. 4.12 Predicted and fit diffusion profiles for diopside dissolution in basaltic melts at ~1350 ºC (Chen and Zhang, 2009). The long-dashed curves are predicted profiles using the diffusion matrix given by Alexander 2011 (Note this diffusion matrix was corrected to 1350 ºC for comparison). The short-dashed curves are predicted profiles using the diffusion matrix $D^{\text{couples}}_{1350℃}$ in Table 4.4. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1350℃}$ in Table 4.5. χ^2/ν is calculated and shown.

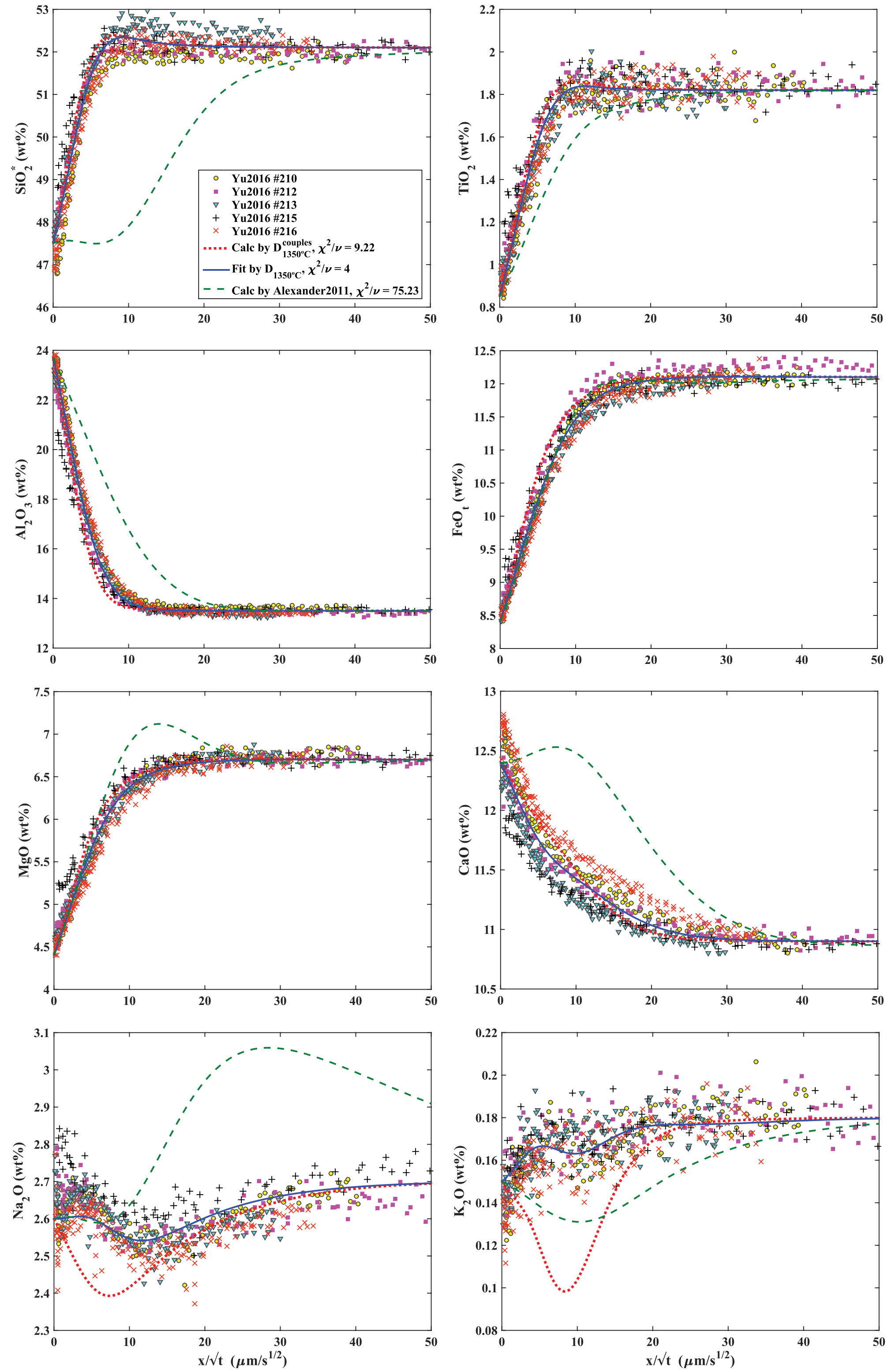

Fig. 4.13 Predicted and fit diffusion profiles for anorthite dissolution in basaltic melts at ~1350 ºC (Yu et al., 2016). The long-dashed curves are predicted profiles using the diffusion matrix given by Alexander 2011 (Note this diffusion matrix was corrected to 1350 ºC for comparison). The short-dashed curves are predicted profiles using the diffusion matrix $D^{couples}_{1350°C}$ in Table 4.4. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1350°C}$ in Table 4.5. χ^2/ν is calculated and shown.

The predicted diffusion profiles and the experimental data match fairly well in both diffusion distances and profile shapes for SiO_2, TiO_2, Al_2O_3, FeO, MgO and CaO. The Na_2O profiles show good agreement for olivine and diopside dissolution (Figs. 4.11–4.12), but disagreement for anorthite dissolution (Fig. 4.13). The K_2O profiles are not predicted in all experiments. The disagreement is not easily explained, but it may be due to the composition dependence of diffusion matrix on K_2O concentration (1.5 wt% in the experiments vs. 0.17 wt% in natural basaltic melts, with almost a factor of 10), or may be related to the observation that K_2O is not a major component in any eigenvector (Table 4.4) and the effect of other components on K_2O diffusion is more difficult to resolve.

4.8 Fitting diffusion profiles of diffusion couples and mineral dissolution

To better constrain the diffusion matrix and reconcile the mineral dissolution data, in addition to the 9 diffusion couple experiments, mineral dissolution experiments (Exp #39, #40, #41 for olivine dissolution at ~1350 ºC in Chen and Zhang, 2008; Exp #5 for diopside dissolution at ~1350 ºC in Chen and Zhang, 2009; Exp #210, #212, #213, #215, #216 for anorthite dissolution at ~1350 ºC in Yu et al., 2016) in basaltic melts were also used for fitting to obtain a new diffusion matrix (referred as $D_{1350ºC}$ hereafter). The mineral dissolution experiments were done at slightly different temperatures from 1350 ºC, and in order for better consistency, the experimental temperatures were "normalized" to 1350 ºC, by correcting the experimental durations by relation $t_{\text{corr}} = t_{\text{eff}} \cdot e^{-E/(RT_{\text{exp}})} \Big/ e^{-E/(RT_{\text{corr}})}$ (Zhang and Behrens, 2000), where T_{corr} = 1350 ºC and E = 145 kJ/mol (from this study). Another complexity is that the basaltic melts for mineral dissolution experiments in the literature contain minor and trace elements, which are ignored in the fitting. That is, $SiO_2^* = SiO_2$ + minor – (total – 100) is used, such that the total is 100%.

Table 4.5 Diffusion matrix $D_{1350°C}$ obtained by fitting both diffusion couple and mineral dissolution experiments at ~1350 ºC, with 1σ errors for each element, and eigenvalues and eigenvectors.

$D_{1350°C}$ (μm^2/s)	TiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O
TiO_2	7.81±0.32	–0.25±0.07	–1.53±0.23	–2.02±0.31	–2.76±0.46	–6.43±1.67	–3.17±0.72
Al_2O_3	–0.81±0.70	5.69±0.14	–7.85±0.43	–6.77±0.55	–14.96±0.82	–29.73±2.90	–20.57±1.43
FeO	–21.66±1.30	–3.70±0.27	23.21±0.91	–31.24±1.08	–38.91±1.57	–72.85±5.73	–46.15±2.48
MgO	–5.52±0.73	1.11±0.16	–7.93±0.55	27.21±0.64	–21.46±0.90	–39.21±3.11	–7.33±1.54
CaO	13.58±1.48	–4.62±0.21	–17.94±0.69	–8.93±0.80	37.88±1.16	–38.15±4.14	15.44±1.66
Na_2O	19.68±1.90	10.28±0.29	28.83±0.90	39.57±0.87	57.21±1.31	243.78±4.65	77.02±1.74
K_2O	5.54±0.33	1.42±0.07	3.24±0.19	4.47±0.28	8.47±0.44	21.37±1.51	39.83±0.73
Eigenvalues	λ_1	λ_2	λ_3	λ_4	λ_5	λ_6	λ_7
	6.43						
		8.18					
			14.95				
				31.43			
					41.68		
						58.24	
							224.52
7-component Eigenvectors	v_1	v_2	v_3	v_4	v_5	v_6	v_7
TiO_2	0.04	–0.57	–0.16	–0.03	–0.01	–0.01	–0.02
Al_2O_3	0.99	–0.75	–0.64	–0.25	–0.13	–0.08	–0.11
FeO	0.07	–0.30	0.55	0.83	0.51	–0.42	–0.30
MgO	–0.04	–0.02	0.37	–0.24	–0.75	–0.30	–0.16
CaO	0.10	0.01	0.31	–0.09	0.39	0.84	–0.14
Na_2O	–0.06	0.08	–0.15	–0.17	–0.06	–0.15	0.92
K_2O	–0.04	0.11	–0.04	0.39	0.08	0.06	0.09
8-component Eigenvectors	v_1	v_2	v_3	v_4	v_5	v_6	v_7
SiO_2	–0.73	0.82	–0.22	–0.41	–0.04	0.05	–0.27
TiO_2	0.03	–0.32	–0.16	–0.02	–0.01	–0.01	–0.02
Al_2O_3	0.68	–0.43	–0.63	–0.23	–0.13	–0.08	–0.10
FeO	0.05	–0.17	0.54	0.76	0.51	–0.42	–0.29
MgO	–0.03	–0.01	0.36	–0.22	–0.75	–0.30	–0.15
CaO	0.07	–0.00	0.30	–0.08	0.39	0.84	–0.14
Na_2O	–0.04	0.05	–0.15	–0.16	–0.06	–0.15	0.89
K_2O	–0.03	0.06	–0.04	0.35	0.08	0.06	0.09

See footnote on Table 4 for the expression of each eigenvector in 8-component space.

Matrix $D_{1350°C}$ is shown in Table 4.5, together with eigenvalues and eigenvectors. The solid curves in Figs. 4.11–4.13 are fit curves for olivine, diopside and anorthite dissolution. All the fits by matrix $D_{1350°C}$ for all 9 diffusion couple experiments are shown by solid curves in Figs. 4.2–4.10. It can be seen from Figs. 4.2–4.13 that all the features of diffusion profiles in diffusion couple and mineral dissolution experiments are well reproduced by matrix $D_{1350°C}$. The goodness of fit is assessed by reduced chi-squares, which shows the quality of the fits by matrix $D_{1350°C}$ for diffusion couples is slightly compromised, but still fairly close to the fits by matrix $D_{1350°C}^{couples}$.

The observation that mineral dissolution experiments with larger concentration variations across profiles (e.g., SiO_2 from 47 to 52 wt% in Fig. 4.13, Al_2O_3 from 14 to 24 wt% in Fig. 4.13, and MgO from 7 to 13 wt% in Fig. 4.11) can be fit well by a constant diffusion matrix means that our choice of total concentration variation of ±1.5 wt% to insure constancy of the diffusion matrix is somewhat conservative. In the future, total concentration variation of ±2.5 wt% may be used so as to better resolve the cross diffusion terms.

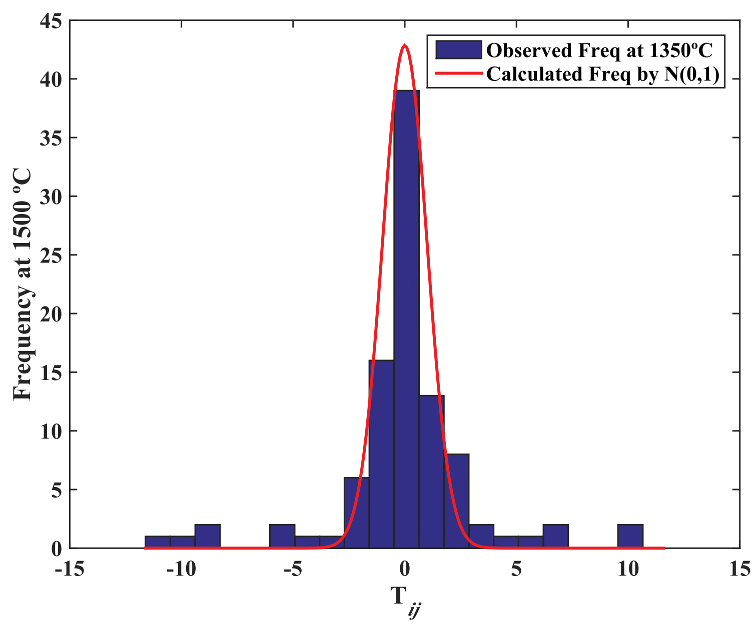

Fig. 4.14 Comparison between observed frequency and calculated frequency from a standard normal distribution.

Whether matrices $D_{1350°C}^{\text{couples}}$ and $D_{1350°C}$ are different can be tested by calculating

$T_{ij}^{\text{couples}} = \dfrac{D_{ij}^{\text{couples}} - \mu_{ij}}{\sigma_{ij}^{\text{couples}}}$ and $T_{ij} = \dfrac{D_{ij} - \mu_{ij}}{\sigma_{ij}}$, where μ_{ij} is the weighted average of D_{ij}^{couples} and D_{ij}.

If matrices $D_{1350°C}^{\text{couples}}$ and $D_{1350°C}$ are statistically the same, then the shape of the histogram of T_{ij}^{couples} and T_{ij} should match standard normal distribution. However, it can be seen from Fig. 4.14, that the shape of the histogram is different from a standard normal distribution, especially with a significant number of data outside ±2σ, which means matrices $D_{1350°C}^{\text{couples}}$ and $D_{1350°C}$ are different. Diffusion matrix $D_{1350°C}$ is preferred because it is constrained by more data, and can fit and predict diffusion profiles in diffusion-couple experiments and mineral dissolution experiments.

Eigenvalues and eigenvectors of the diffusion matrix $D_{1350°C}$ are shown in Table 4.5. By examining eigenvectors of matrix $D_{1350°C}$ (Table 4.5), the eigenvectors are similar as those for $D_{1350°C}^{\text{couples}}$: for example, v_1 is largely due to the exchange between SiO_2 and Al_2O_3; and v_7 is due to the exchange of Na_2O (and very minor K_2O) with all other components.

Therefore, the diffusion mechanism during multicomponent diffusion in basaltic melts is summarized in Table 4.6. One may classify it into 5 categories: (1) the exchange between network-formers, such as SiO_2 – Al_2O_3; (2) the exchange between divalent network-modifiers and all other components, such as (FeO+MgO+CaO) – (all others); (3) the exchange of divalent plus monovalent network-modifier with all other components, such as (FeO+K_2O) – (all others) and (CaO+K_2O) – (all others); (4) the exchange between divalent network-modifiers, such as (FeO+MgO) – CaO; and (5) the exchange of monovalent network-modifier Na_2O with all other components. Curiously, diffusion of K_2O does not dominate any diffusion eigenvector.

Table 4.6. Multicomponent diffusion mechanism in basaltic melts at 1350 ºC.

Sequence	Eigenvalues	Eigenvectors	Exchanging species at 1350 ºC
slowest	λ_1	v_1	SiO_2 – Al_2O_3
2nd slowest	λ_2	v_2	SiO_2 – (all others)
3rd slowest	λ_3	v_3	(FeO + MgO + CaO) – (all others)
4th fastest	λ_4	v_4	(FeO + K_2O) – (all others)
3rd fastest	λ_5	v_5	(FeO + CaO) – MgO
2nd fastest	λ_6	v_6	(CaO + K_2O) – (all others)
fastest	λ_7	v_7	Na_2O – (all others)

4.9 Comparison with previous works

There are no other diffusion matrices for 8-component system in the literature. Hence, no direct comparison between the diffusion matrix (Table 4.5) from this study and that in the literature can be made. There are diffusion matrices in simpler systems, but they are at different temperatures. Therefore, no comparison can be made by crossing out rows and columns of the diffusion matrix (Table 4.5) for our 8-component system. Nonetheless, diffusion mechanisms inferred from eigenvectors can be compared.

In general, diffusion matrices in simpler component systems indicate that the exchange between network-former SiO_2 and Al_2O_3 is the slowest for any SiO_2–Al_2O_3 bearing systems (Sugawara et al. 1977; Oishi et al., 1982; Chakraborty et al., 1995; Kress and Ghiorso, 1995; Liang et al., 1996; Mungall et al., 1998; Richter et al., 1998; Liang and Davis, 2002; Liang, 2010; Guo and Zhang, 2016) and the exchange between Na_2O and other components is the fastest for Na_2O-bearing system (Watkins et al., 2014; Claireaux et al., 2016; Guo and Zhang, 2016). These are consistent with our results.

For Na_2O-absent systems, diffusion matrix in 4-component SiO_2–Al_2O_3–MgO–CaO systems reported by Liang (2010) indicates that the fastest diffusion is due to the exchange of CaO with all other components, and diffusion matrix in SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO reported by Kress and Ghiorso (1995) indicates the fastest diffusion corresponds to the exchange between divalent cations FeO, MgO and CaO, both of which are consistent with our findings if only SiO_2, Al_2O_3, FeO, MgO and CaO components are considered.

Furthermore, Guo and Zhang (2016) reported a diffusion matrix for 7-component SiO_2–TiO_2–Al_2O_3–MgO–CaO–Na_2O–K_2O system. Their inferred diffusion mechanism is that the slowest diffusion is largely due to the exchange between network-former SiO_2 and Al_2O_3, the second slowest diffusion is largely due to the exchange between SiO_2 and TiO_2, the third slowest diffusion is due to the exchange of network-former SiO_2+Al_2O_3 with divalent network-modifier MgO+CaO, the third fastest diffusion is largely due to the exchange between divalent network-modifier MgO and CaO, the second fastest diffusion is due to the exchange of CaO+K_2O with all other components, and the fastest diffusion is largely due to the exchange of monovalent Na_2O with all other components. This is very consistent with the diffusion mechanism found in this study, if FeO component is ignored in Table 4.6.

However, there are also exceptions: In the 4-component SiO_2–Al_2O_3–CaO–Na_2O system, Claireaux et al. (2016) found that the slowest diffusion eigenvector is predominantly due to the exchange between Al_2O_3 and CaO, rather than between SiO_2 and Al_2O_3. In Columbia River basalt modeled as a 6-component SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO system, Kress and Ghiorso (1995) obtained that the slowest diffusion eigenvector is mainly due to SiO_2 exchange with FeO+CaO at 1200 ºC, and due to Al_2O_3 exchange with MgO at 1300 ºC. It is not clear what caused the differences.

In summary, there is an overall agreement among different studies on diffusion mechanism, but inconsistencies are also present. The explanation for the inconsistencies is not readily available, but uncertainty in the diffusion matrix and differences in composition and temperature are possible contributing factors.

4.10 Summary and conclusions

Chemical diffusion profiles of 9 successful diffusion couple experiments at ~1350 ºC and at 1 GPa, in basaltic melts in an 8-component SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO–Na_2O–K_2O system were determined. Effective binary diffusion coefficients of components with monotonic diffusion profiles at ~1350 ºC show a strong dependence on its counter-diffusing component. Multicomponent diffusion matrix in basaltic melts was obtained in two ways: (1) by simultaneously fitting diffusion profiles of 9 diffusion couple experiments in this study, and (2) by simultaneously fitting diffusion profiles of both diffusion couple experiments in this study and mineral dissolution experiments in the literatures. The two diffusion matrices are similar, showing the robustness of the results. Furthermore, 9 diffusion couple experiments are enough for the extraction of diffusion matrix in an 8-component system. Nonetheless, when mineral dissolution data are used in the fitting, the obtained diffusion matrix can predict diffusion profiles during mineral dissolution experiments much better. Diffusion mechanism inferred from eigenvectors of the diffusion matrix is reasonable and consistent with previous studies by Liang (2010) and Guo and Zhang (2016).

4.11 Acknowledgement

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4.12 References

Alexander C. M. (2011) Modeling diffusive dissolution in silicate melts. *Geochim. Cosmochim. Acta* **75**, 588–607.

Asimow P. D. and Ghiorso M.S. (1998) Algorithmic modifications extending MELTS to calculate subsolidus phase relations. *Am. Mineral*. **83**, 1127–1131.

Chakraborty S., Dingwell D.B. and Rubie D.C. (1995) Multicomponent diffusion in ternary silicate melts in the system K_2O–Al_2O_3–SiO_2: I. Experimental measurements. *Geochim. Cosmochim. Acta* **59**, 255–264.

Chen Y. and Zhang Y. (2008) Olivine dissolution in basaltic melt. *Geochim. Cosmochim. Acta* **72**, 4756–4777.

Chen Y. and Zhang Y. (2009) Clinodiopside dissolution in basaltic melt. *Geochim. Cosmochim. Acta* **73**, 5730–5747.

Claireaux C., Chopinet M., Burov E., Gouillart E., Roskosz M. and Toplis M (2016) Atomic mobility in calcium and sodium aluminosilicate melts at 1200 ºC. *Geochim. Cosmochim. Acta* **192**, 235–247.

Clifford A. A. (1973) *Multivariate error analysis: a handbook of error propagation and calculation in many-parameter system*. Wiley, NY.

Cooper A. R. (1968) The use and limitations of the concept of an effective binary diffusion coefficient for multi-component diffusions. In *Mass Transport In Oxides*, Vol. 296 (ed. J.B. Wachman and A.D. Franklin), pp. 79–84. Nat. Bur. Stand. Spec. Publ.

Fletcher R. (1971) *A modified Marquardt subroutine for nonlinear least squares*. Atomic Energy Research Establishment R6799, Harwell, England.

Ghiorso M. S. and Sack R. O. (1995) Chemical mass transfer in magmatic processes IV. a revised and internally consistent thermodynamic model for the interpolation and extrapolation of liquid–solid equilibria in magmatic systems at elevated temperatures and pressures. *Contrib. Mineral. Petrol*. **119**, 197–212.

Guo C. and Zhang Y. (2016) Multicomponent diffusion in silicate melts: SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO–Na_2O–K_2O system. *Geochim. Cosmochim. Acta* **195**, 126–141.

Koyaguchi T. (1985) Magma mixing in a conduit. *J. Volcanol. Geotherm. Res.* **25**, 365–369.

Koyaguchi T. (1989) Chemical gradient at diffusive interfaces in magma chambers. *Contrib. Mineral. Petrol.* **103**, 143–152.

Kress V. C. and Ghiorso M. S. (1993) Multicomponent diffusion in MgO–Al_2O_3–SiO_2 and Cao–MgO–Al_2O_3–SiO_2 melts. *Geochim. Cosmochim. Acta* **57**, 4453–4466.

Kress V. C. and Ghiorso M.S. (1995) Multicomponent diffusion in basaltic melts. *Geochim. Cosmochim. Acta* **59**, 313–324.

Lasaga A. C. (1979) Multicomponent exchange and diffusion in silicates. *Geochim. Cosmochim. Acta* **54**, 2709–2715.

Liang Y. (2010) Multicomponent diffusion in molten silicates: Theory, experiments, and geological application. *Rev. Mineral. Geochem.* **72**, 409–446.

Liang Y. and Davis A. M. (2002) Energetics of multicomponent diffusion in molten CaO–Al_2O_3–SiO_2. *Geochim. Cosmochim. Acta* **66**, 635–646.

Liang Y., Richter F. M. and Chamberlin L. (1997) Diffusion in silicate melts: III. empirical models for multicomponent diffusion. *Geochim. Cosmochim. Acta* **61**, 5295–5312.

Liang Y., Richter F. M. and Watson E. B. (1994) Convection in multicomponent silicate melts driven by coupled diffusion. *Nature* **369**, 390–392.

Liang Y., Richter F. M. and Watson E. B. (1996) Diffusion in silicate melts: II. multicomponent diffusion in $CaO–SiO_2–Al_2O_3$ at 1500°C and 1GPa. *Geochim. Cosmochim. Acta* **60**, 5021–5035.

Morgan Z. T., Liang Y. and Hess P. C. (2006) An experimental study of the kinetics of anorthite dissolution in lunar picritic magmas with applications to lunar crustal assimilation processes. *Geochim. Cosmochim. Acta* **70**, 3477–3491.

Mungall J. E., Romano C. and Dingwel D. B. (1998) Multicomponent diffusion in the molten system $K_2O–Na_2O–Al_2O_3–SiO_2–H_2O$. *Am Mineral.* **83**, 685–699.

Oishi Y., Nanba M. and Pask J. A. (1982) Analysis of liquid–state interdiffusion in the system $CaO–Al_2O_3–SiO_2$ using multiatomic ion models. *J. Am. Ceram. Soc.* **65**, 247–253.

Oldenburg C. M., Spera F. J., Yuen D. A., and Sewell G. (1989) Dynamic mixing in magma bodies: Theory, simulations and implications. *J. Geophys. Res.* **94**, 9215–9236.

Richter F. M. (1993) A method for determining activity–composition relations using chemical diffusion in silicate melts. *Geochim. Cosmochim. Acta* **57**, 2019–2032.

Richter F. M., Liang Y. and Minarik W.G. (1998) Multicomponent diffusion and convection in molten $MgO–Al_2O_3$ $–SiO_2$. *Geochim. Cosmochim. Acta* **62**, 1985–1991.

Sato H. (1975) Diffusion coronas around quartz xenocrysts in andesite and basalt from Tertiary Volcanic Region in northeastern Shikoku, Japan. *Contrib. Mineral. Petrol.* **50**, 49–64.

Sugawara H., Nagata K. and Goto K. S. (1977) Interdiffusivities matrix of $CaO–Al_2O_3–SiO_2$ melt at 1723 K to 1823 K. *Metall. Trans. B* **8**, 605–612.

Trial A. F. and Spera F. J. (1994) Measuring the multicomponent diffusion matrix: Experimental design and data analysis for silicate melts. *Geochim. Cosmochim. Acta* **58**, 3769–3783.

Turner J. S. (1985) Multicomponent convection. *Ann. Rev. Fluid Mech*. **17**, 11–44.

Watson E.B. (1982) Basalt contamination by continental crust: Some experiments and models. *Contrib. Mineral. Petrol.* **80**, 73–87.

Watkins J. M., Liang Y., Richter F., Ryerson F. J. and DePaolo D. J. (2014) Diffusion of multi-isotopic chemical species in molten silicates. *Geochim. Cosmochim. Acta* **139**, 313–326.

Yu Y., Zhang Y., Chen. Y. and Xu Z. (2016) Kinetics of anorthite dissolution in basaltic melt. *Geochim. Cosmochim. Acta* **179**, 257–274.

Zhang Y. (1993) A modified effective binary diffusion model. *J. Geophys. Res.* **98**, 11901–11920.

Zhang Y. and Behrens H. (2000) H_2O diffusion in rhyolitic melts and glasses. *Chem. Geol.* **169**, 243–262.

Zhang Y., Ni H. and Chen Y. (2010) Diffusion data in silicate melts. *Rev. Mineral. Geochem.* **72,** 311-408.

Zhang Y., Walker D. and Lesher C. E. (1989) Diffusive crystal dissolution. *Contrib. Mineral. Petrol.* **102**, 492–513.

CHAPTER V

Multicomponent Diffusion in Basaltic Melts: Temperature Dependence

5.1 Abstract

Eighteen successful diffusion couple experiments in an 8-component SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO–Na_2O–K_2O basaltic melts were conducted at ~1260 ºC and 0.5 GPa and ~1500 ºC and 1 GPa. These experiments are combined with 9 diffusion couple experiments at ~1350 ºC (Guo and Zhang, 2017) to study multicomponent diffusion and their temperature dependence. Diffusion profiles were obtained by measuring 3 traverses for each experiment. Diffusion matrix at each temperature was first obtained by simultaneously fitting all diffusion profiles of all diffusion couple experiments. To better constrain the diffusion matrix and reconcile mineral dissolution data in the literature, diffusion profiles of mineral dissolution experiments were combined with those of diffusion couple experiments, to obtain a new improved diffusion matrix. All features of diffusion profiles in both diffusion couples and mineral dissolution are well reproduced by this new diffusion matrix. Diffusion mechanisms at both 1260 and 1500 ºC are inferred from eigenvectors of diffusion matrices and compared with those at 1350 ºC reported in Guo and Zhang (2017). The diffusion mechanism in basaltic melts is insensitive to temperature. The slowest eigenvector is the exchange of SiO_2 with other oxide components and the fastest eigenvector is the exchange of Na_2O with other oxide components, both of which are

consistent with results in most literature. Temperature dependence of diffusion matrix is obtained by assuming eigenvectors to be independent of temperature and eigenvalues to follow Arrhenius relation. Therefore, diffusion matrix at any temperature can be calculated, and is successfully applied to predict diffusion profiles during olivine and anorthite dissolution in basaltic melts at ~1400 ºC.

5.2 Introduction

Natural basaltic melts consist of numerous major components (e.g. SiO_2, TiO_2, Al_2O_3, FeO, MgO, CaO, Na_2O and K_2O). Therefore, diffusion in such melts is always multicomponent diffusion, which is of significant importance in natural processes involving mass transport, such as magma mixing and contamination (Sato, 1975; Watson, 1982; Koyaguchi, 1985, 1989; Oldenburg et al., 1989), magma double-diffusive convection (Turner, 1985; Liang et al., 1994; Richter et al., 1998), and mineral growth or dissolution in magmas (Watson, 1982; Zhang et al., 1989).

Tremendous efforts have been made in studying multicomponent diffusion in silicate melts in various systems (e.g. Sugawara et al., 1977; Oishi et al., 1982; Kress and Ghiorso, 1993, 1995; Chakraborty et al., 1995; Mungall et al., 1998; Liang, 2010; Watkins et al., 2014; Claireaux et al., 2016; Guo and Zhang, 2016, 2017). Guo and Zhang (2017) first reported a diffusion matrix at 1350 ºC in synthetic 8-component SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO–Na_2O–K_2O basaltic melts, and applied it to predict olivine, diopside and anorthite dissolution in basaltic melts at 1350 ºC. However, it is necessary to quantify multicomponent diffusion in natural melts at various temperatures. Liang (2010) summarized the temperature dependence of diffusion matrix in simple SiO_2–Al_2O_3–CaO, SiO_2–Al_2O_3–K_2O and SiO_2–Al_2O_3–MgO–CaO systems, and found that eigenvalues of diffusion matrix follows good Arrhenius relation and eigenvectors of diffusion matrix are insensitive to temperature. Hence, we have expanded out earlier study to investigate the temperature dependence of diffusion matrix in the same basaltic melts.

To understand the temperature dependence of diffusion matrix in basaltic melts, and following our previous work on multicomponent diffusion in basaltic melts at 1350 ºC (Guo and Zhang, 2017), diffusion couple experiments in the same 8-component SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO–Na_2O–K_2O basaltic melts at two different temperatures 1260 and 1500 ºC were conducted. Diffusion profiles in diffusion couple and literature mineral dissolution experiments were used to obtain diffusion matrix at each temperature. The temperature dependence of diffusion matrix is examined by the temperature dependence of eigenvalues with Arrhenius relation assuming eigenvectors are invariant.

5.3 Experimental strategy and analytical methods

The general experimental strategy, sample preparation, experimental procedure and analytical methods for diffusion couple experiments follow sections 2.1–2.4 in chapter II. The 8-component SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO–Na_2O–K_2O basaltic melts have an average composition of 51% SiO_2, 2% TiO_2, 14% Al_2O_3, 11.5% FeO, 6.5% MgO, 10.5% CaO, 3% Na_2O, 1.5% K_2O (in wt%), shown as "Base Comp" in Table 4.1. The average composition of initial glasses is listed in Table 4.1. The temperatures of 1260 and 1500 ºC are chosen to reach the largest temperature range to obtain the temperature dependence of diffusion matrix. The pressure of 0.5 GPa for experiments at ~1260 ºC is chosen to avoid crystallization at higher pressure than 0.5 GPa. The pressure of 1 GPa for experiments at ~1500 ºC is chosen for better experimental success rate. The experimental results at different pressures can be directly compared and combined because diffusion of major elements in basaltic melts is much less sensitive to pressure than temperature (Liang and Davis, 2002; Chen and Zhang, 2008, 2009).

Literature data from mineral dissolution experiments by Chen and Zhang (2008, 2009) and Yu et al. (2016) will be used to better constrain diffusion matrices.

5.4 Experimental results

Eighteen successful diffusion couple experiments were carried out, of which 9 experiments are at ~1260 ºC and 0.5 GPa and the other 9 experiments are at ~1500 ºC and 1 GPa. The name of each experiment ID indicates both two halves of initial glasses and experimental temperature. For example, BS5&6C indicates that one half is BS5, the other half is BS6, and the experimental temperature is at ~1260 ºC (the last letter "B" means 1500 ºC and "C" means 1260 ºC). The interface composition of each diffusion couple is listed in Table 4.2. The average of the interface compositions of the 9 diffusion couple experiments is very close to the compositions of the base and the JDF basalts.

Two pieces of initial glasses are molten together, and quench cracks are observed in 3 out of 18 experiments. Interface between two halves is not visible, but physical interface could be seen by a small dent or misalignment near the contact with graphite crucible.

At least 3 traverses were measured to obtain diffusion profiles for each diffusion couple experiment. Diffusion profiles for crack-present experiments are re-connected smoothly by comparing different traverses. All microprobe analytical data can be found in the Appendix C.

Experimental conditions and effective binary diffusion coefficients (EBDC) for monotonic diffusion profiles of all 18 successful experiments are shown in Table 5.1. The actual experimental temperatures at the center of the diffusion couple are determined after the experiments. Effective experimental durations were calculated by $t_{\mathrm{eff}} = \int \mathrm{e}^{-E/(RT)}\,\mathrm{d}t \Big/ \mathrm{e}^{-E/(RT_{\mathrm{exp}})}$, where the integration includes the heating-up and cooling-down segments (Zhang and Behrens, 2000) and E = 145 kJ/mol (from this study). For well-resolved monotonic diffusion profiles, effective binary diffusion coefficients (EBDC) were obtained by fitting the data by an error function. For experiments at each temperature, the first 7 experiments have initial 3-wt% concentration differences between SiO_2 and another component i, where i = TiO_2, Al_2O_3, FeO, MgO, CaO, Na_2O and K_2O, which are the minimum requirement to obtain 7×7 diffusion matrix in an 8-component system (Trial and Spera, 1994), unless the analytical data precision is much higher than that of a regular electron microprobe (Liang 2010). The additional 2 experiments are for further constraint.

Table 5.1 Summary of experimental conditions and effective binary diffusion coefficients in basaltic melts at 1260 and 15000 ºC.

Exp#	T °C	t sec	couples	$D(SiO_2)$ μm²/s	$D(TiO_2)$ μm²/s	$D(Al_2O_3)$ μm²/s	$D(FeO_t)$ μm²/s	D(MgO) μm²/s	D(CaO) μm²/s	$D(Na_2O)$ μm²/s	$D(K_2O)$ μm²/s
BS1&2C	1259	1836	Si–Ti	1.4±0.2	2.4±0.1						
BS3&4C	1258	1837	Si–Al	1.7±0.2		1.8±0.1					
BS5&6C	1263	1293	Si–Fe	3.5±0.5			10.3±0.7				
BS7&8C	1258	1294	Si–Mg	–				7.2±0.3			
BS9&10C	1262	934	Si–Ca	1.6±0.4					10.1±0.5		
BS11&12C	1261	576	Si–Na	–						–	
BS13&14C	1263	725	Si–K	13.5±1.8							23.9±0.7
BS17&18C	1274	517	Mg–K					11.7±0.7			20.3±0.5
BS19&20C	1259	605	Al–Ca			2.9±0.2			15.8±0.7		
BS1&2B	1500	276	Si–Ti	6.6±1.6	16.5±0.8						
BS3&4B	1506	216	Si–Al	11.0±2.3		16.9±1.3					
BS5&6B	1501	246	Si–Fe	26.9±3.8			49.7±3.5				
BS7&8B	1499	216	Si–Mg	21.7±2.6				69.3±2.7			
BS9&10B	1502	157	Si–Ca	27.9±5.5					102.0±3.9		
BS11&12B	1501	156	Si–Na	39.8±6.0						515.4±16.4	
BS13&14B	1499	156	Si–K	88.0±10.7							134.8±3.0
BS17&18B	1499	186	Mg–K					69.1±3.5			89.3±1.6
BS19&20B	1505	216	Al–Ca			25.9±1.6			97.5±2.7		

Note:
1. Experiments at ~1260 ºC were at 0.5 GPa; experiments at ~1500 ºC were at 1 GPa.
2. Reported temperatures are actual experimental temperatures at the center of diffusion couples.
3. Durations are calculated effective experimental durations.
4. For easy comparison, the effective binary diffusion coefficients are not those at the experimental temperatures, but those at 1260 or 1500 ºC, by correcting effective experimental durations using $t_{\mathrm{corr}} = t_{\mathrm{exp}} \cdot \mathrm{e}^{-E/(RT_{\mathrm{exp}})} \Big/ \mathrm{e}^{-E/(RT_{\mathrm{corr}})}$ (Zhang and Behrens, 2000) where T_{corr} = 1260 or 1500 ºC and E = 145 kJ/mol (from this study).
5. $D(SiO_2)$ for experiments BS7&8C and BS11&12C are not listed, due to asymmetric SiO_2 profile. $D(Na_2O)$ for experiment BS11&12C are not listed either, due to non-monotonic Na_2O profile.

In order for fitting effective binary diffusion coefficients and diffusion matrix, the preliminary data processing follows section 2.5 in chapter II.

5.5 Effective binary diffusion coefficients

Effective binary diffusion coefficients (EBDC) were fit by eq. (2.1) for the two components with 3-wt% concentration difference. The fits are excellent with r^2 larger than 0.97. EBDC of a given component in this multicomponent system is strongly dependent on its counter-diffusing component even in one single bulk composition, consistent with Cooper (1968) and Guo and Zhang (2016, 2017). The observation is especially significant for SiO_2, partially due to more diffusion couples with concentration differences in SiO_2. At 1260 ºC, EBDC of SiO_2 varies from 1.4 μm_2/s when diffusing against TiO_2 to 13.5 μm_2/s when diffusing against K_2O, by a factor of 9.6; at 1500 ºC, EBDC of SiO_2 varies from 6.6 μm_2/s when diffusing against TiO_2 to 88.0 μm_2/s when diffusing against K_2O, by a factor of 13.3. Notably, EBDC of SiO_2 when diffusing against K_2O is much larger than that when diffusing against Na_2O, although K_2O diffuses much slower than Na_2O. Fig. 5.1 shows temperature dependence of EBDC of each component, where each panel represents one component and different symbols indicate EBDC's obtained from different diffusion couples. It can be seen that there is a large variation in EBDC at a given temperature due to exchange with different components, but EBDC's for each exchange at different temperatures still roughly follow the Arrhenius relation.

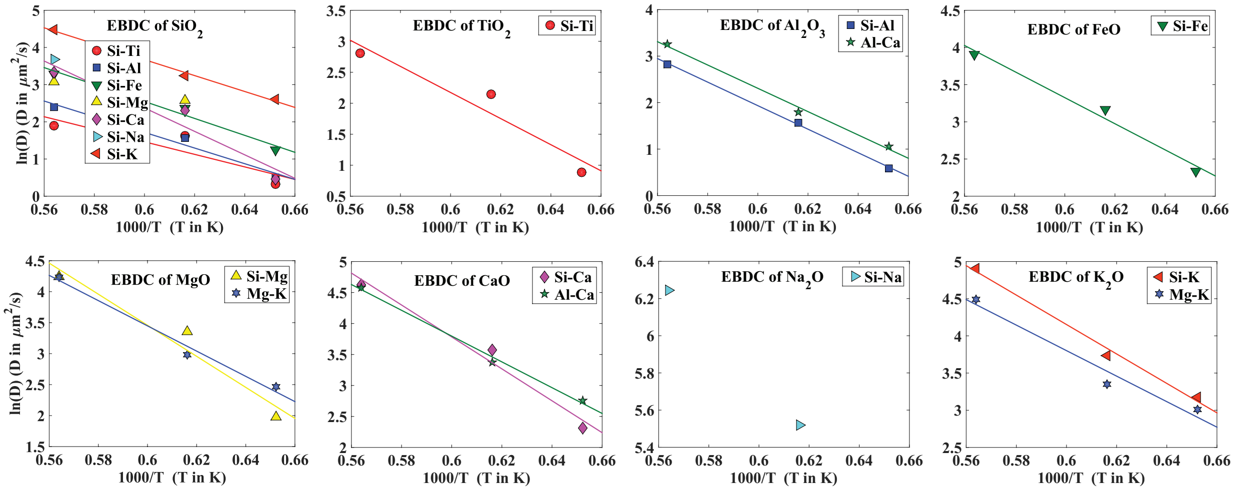

Fig. 5.1 Temperature dependence of EBDC of each component. Each panel in the figure represents one component, and different symbols indicate EBDC obtained from different diffusion couples.

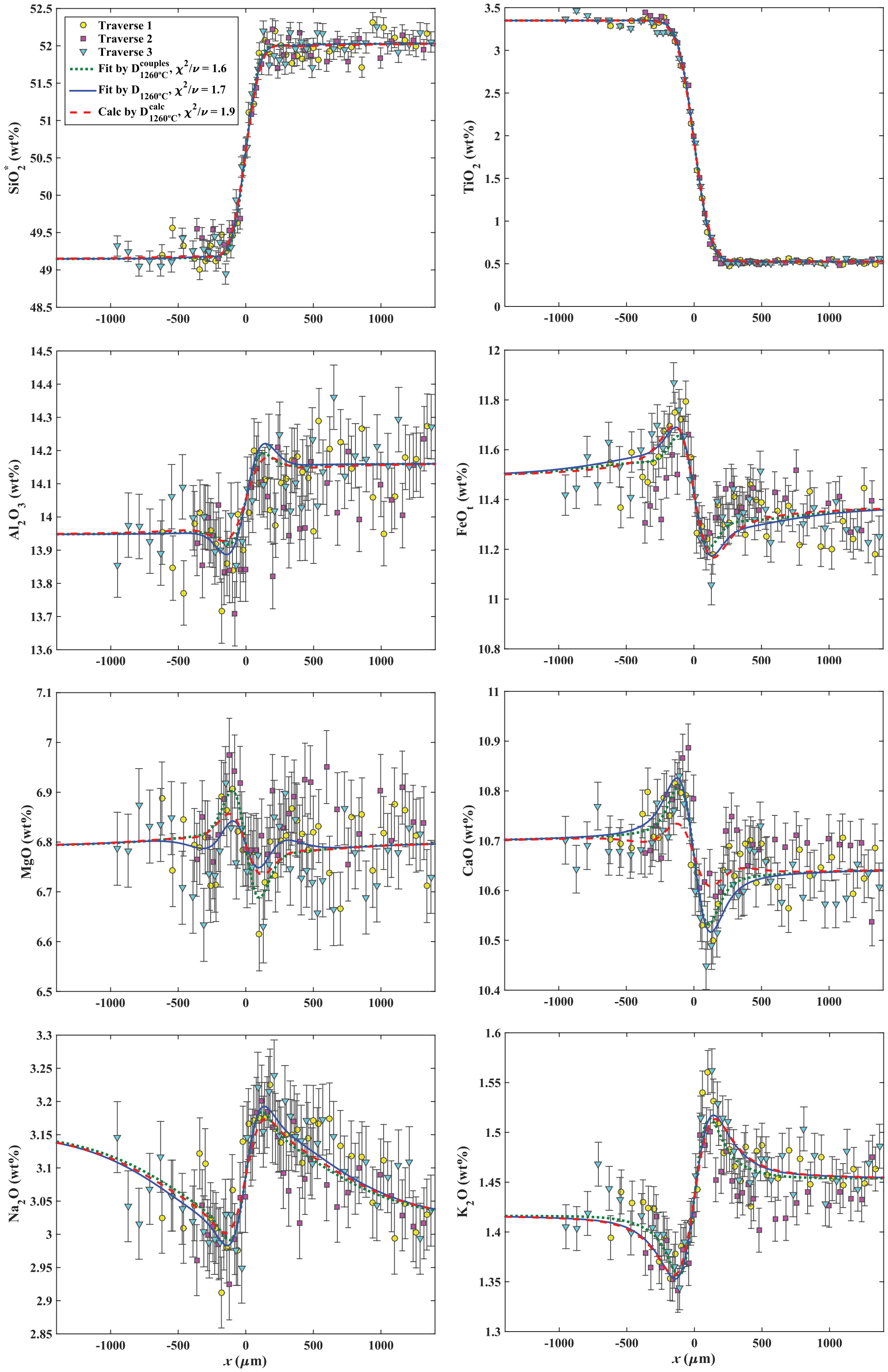

Fig. 5.2 Data of diffusion profiles of BS1&2C with fits and prediction. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The short-dashed curves are fit profiles for obtaining the diffusion matrix $D^{couples}_{1260°C}$ in Table 5.2. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1260°C}$ in Table 5.4. The long-dashed curves are predicted profiles from calculated diffusion matrix by eq. (5.1) at 1260 ºC. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1260 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fits and prediction.

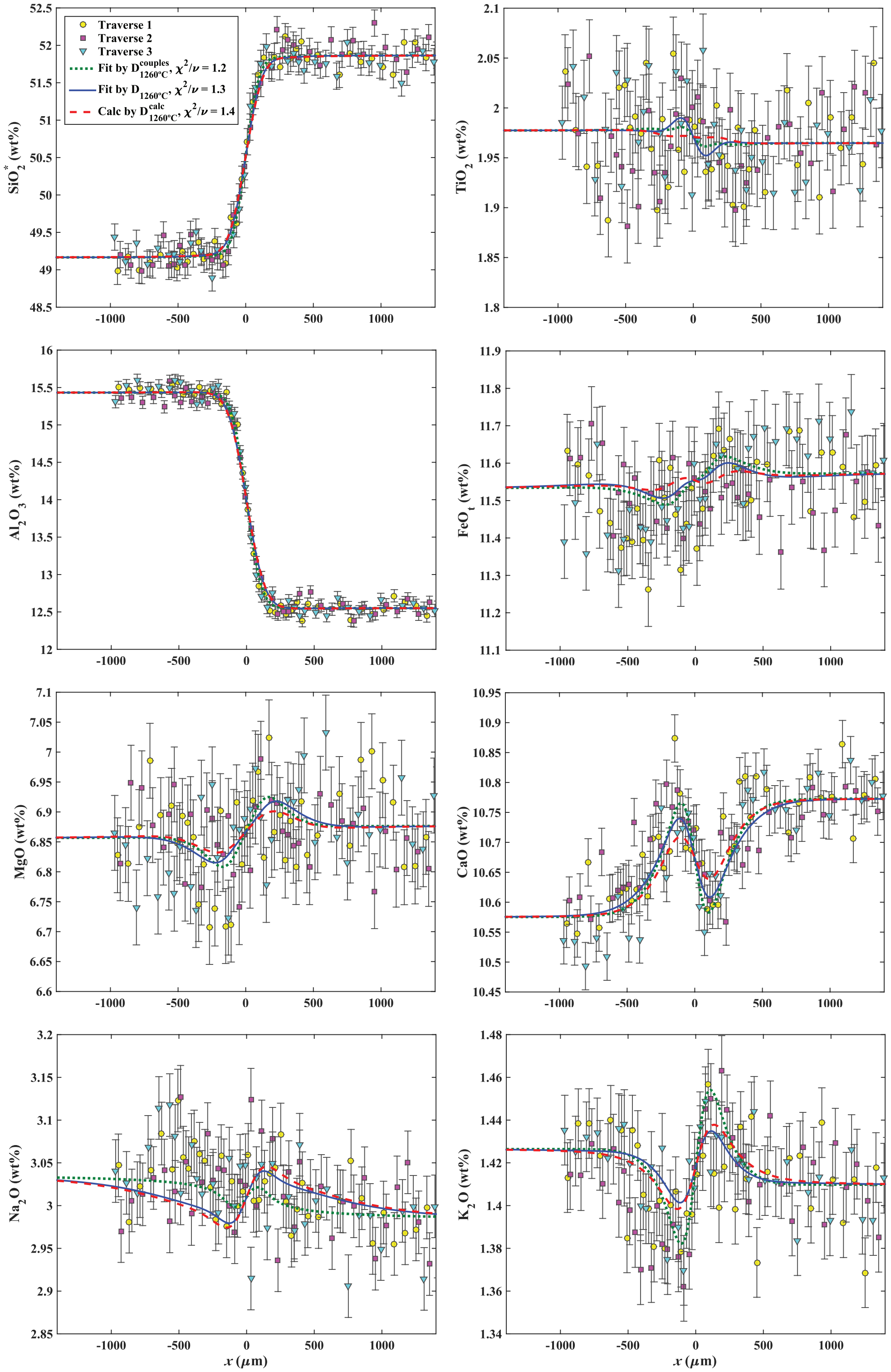

Fig. 5.3 Data of diffusion profiles of BS3&4C with fits and prediction. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The short-dashed curves are fit profiles for obtaining the diffusion matrix $D^{\text{couples}}_{1260°\text{C}}$ in Table 5.2. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1260°\text{C}}$ in Table 5.4. The long-dashed curves are predicted profiles from calculated diffusion matrix by eq. (5.1) at 1260 ºC. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1260 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fits and prediction.

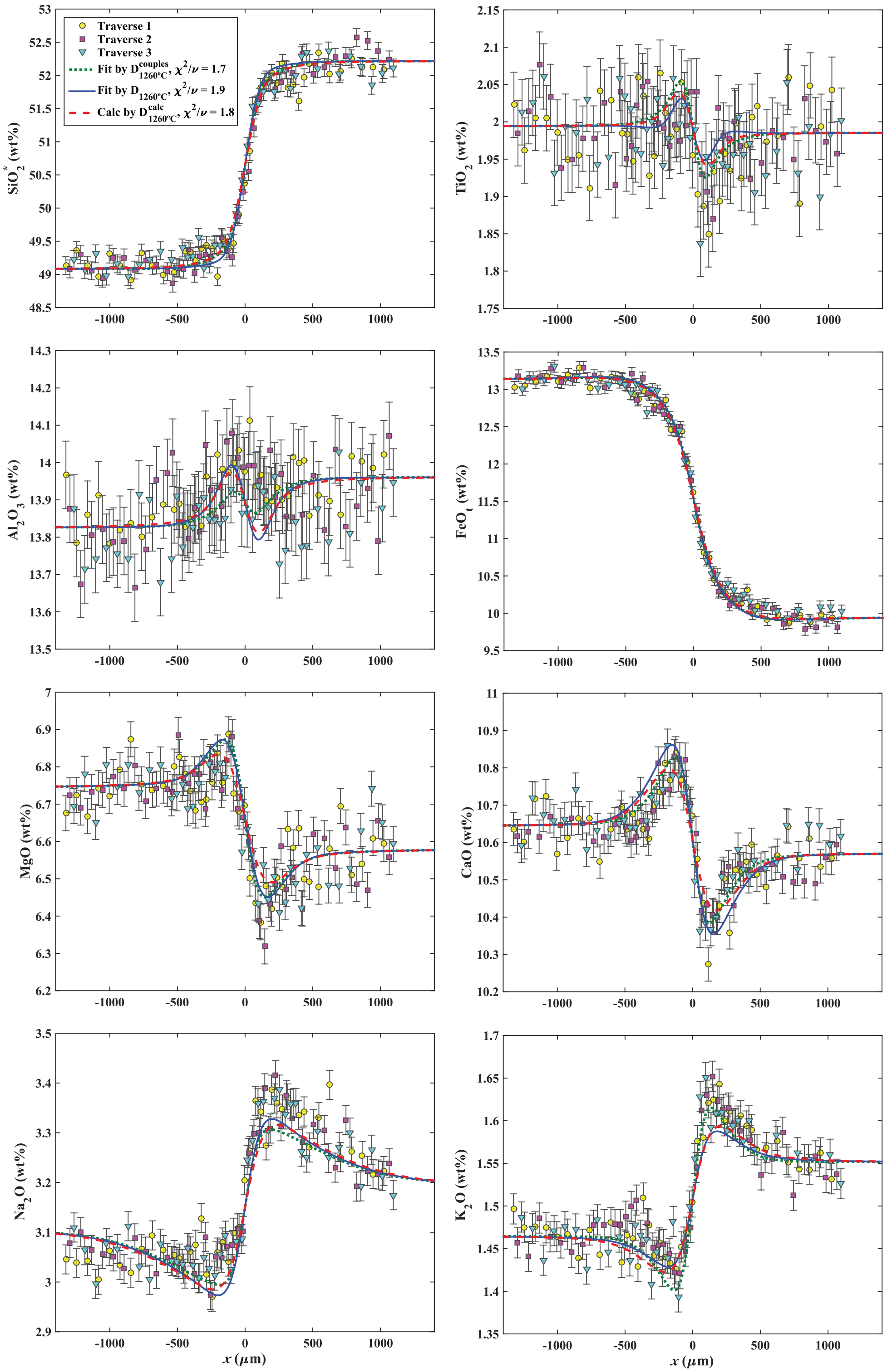

Fig. 5.4 Data of diffusion profiles of BS5&6C with fits and prediction. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The short-dashed curves are fit profiles for obtaining the diffusion matrix $D^{couples}_{1260°C}$ in Table 5.2. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1260°C}$ in Table 5.4. The long-dashed curves are predicted profiles from calculated diffusion matrix by eq. (5.1) at 1260 ºC. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1260 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fits and prediction.

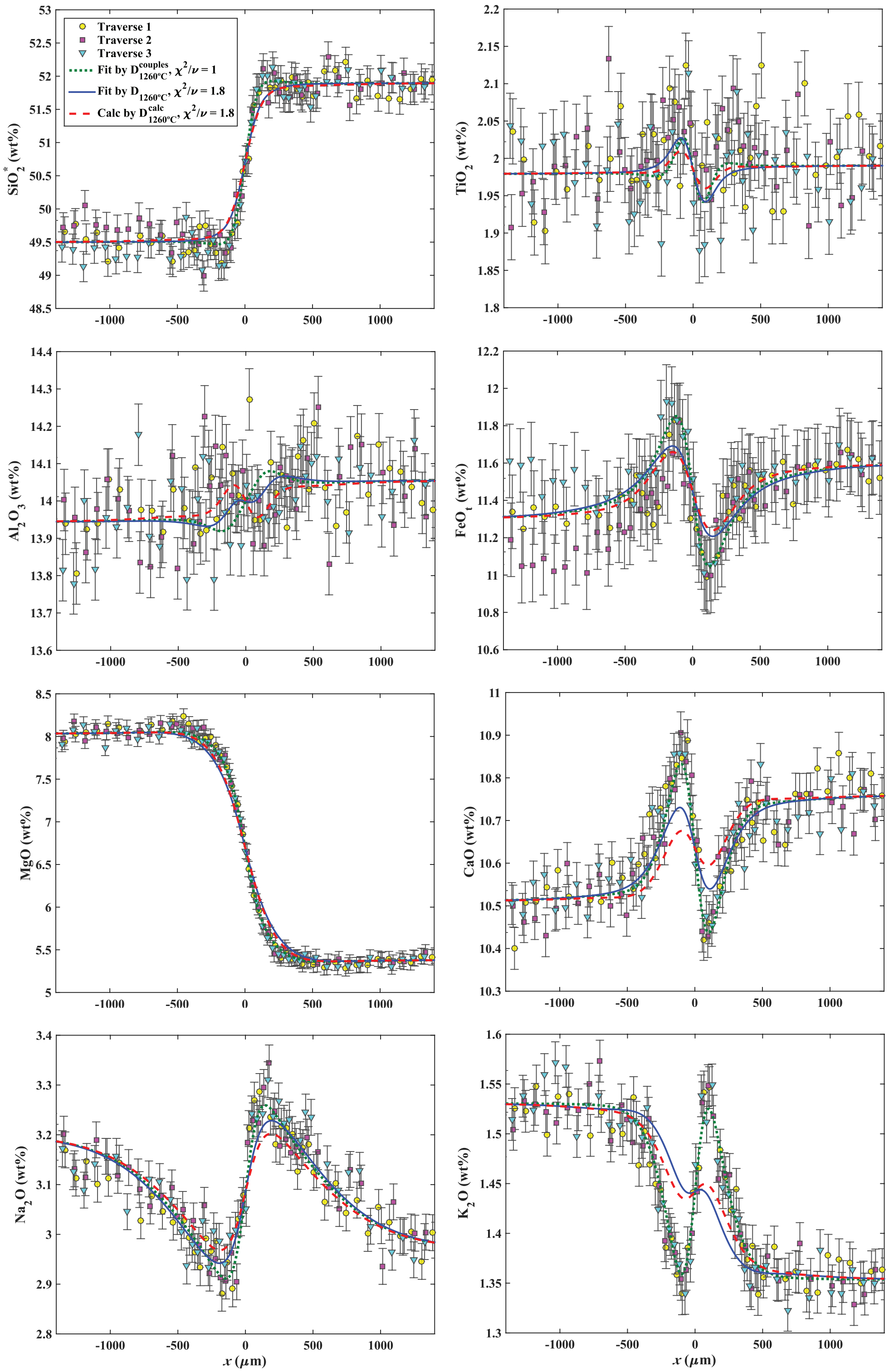

Fig. 5.5 Data of diffusion profiles of BS7&8C with fits and prediction. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The short-dashed curves are fit profiles for obtaining the diffusion matrix $D^{couples}_{1260°C}$ in Table 5.2. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1260°C}$ in Table 5.4. The long-dashed curves are predicted profiles from calculated diffusion matrix by eq. (5.1) at 1260 ºC. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1260 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fits and prediction.

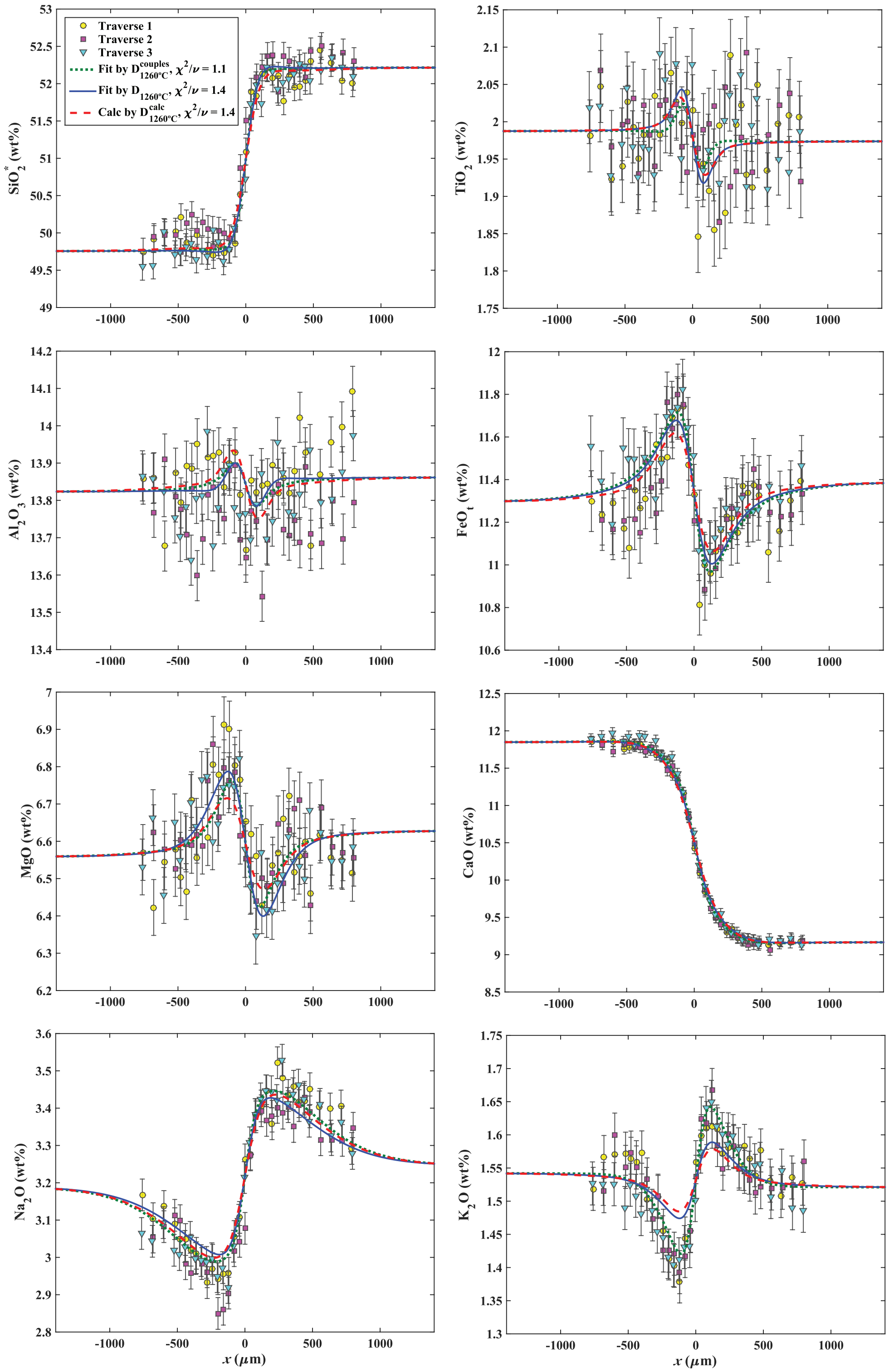

Fig. 5.6 Data of diffusion profiles of BS9&10C with fits and prediction. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The short-dashed curves are fit profiles for obtaining the diffusion matrix $D^{couples}_{1260^\circ C}$ in Table 5.2. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1260^\circ C}$ in Table 5.4. The long-dashed curves are predicted profiles from calculated diffusion matrix by eq. (5.1) at 1260 ºC. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1260 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fits and prediction.

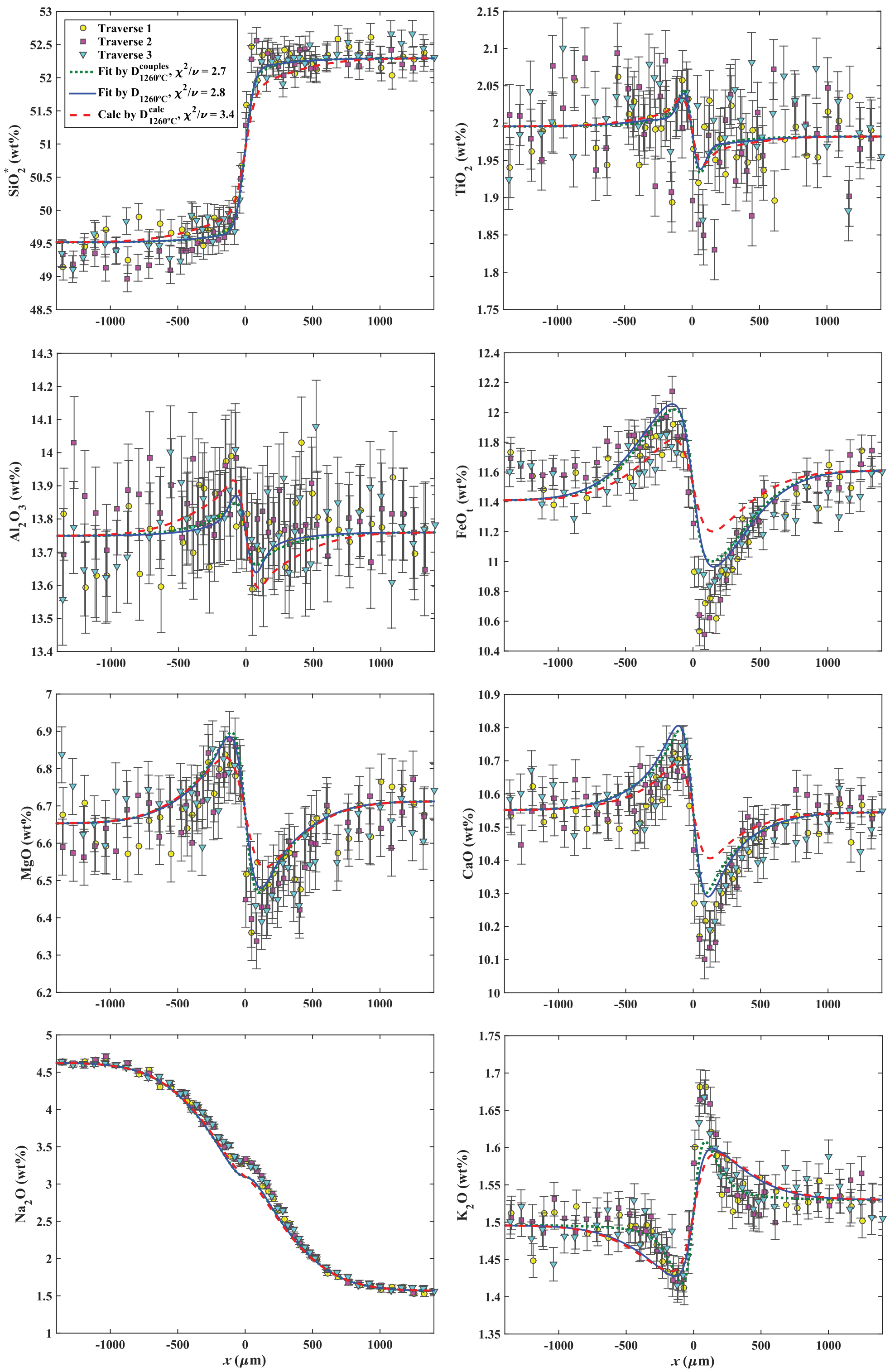

Fig. 5.7 Data of diffusion profiles of BS11&12C with fits and prediction. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The short-dashed curves are fit profiles for obtaining the diffusion matrix $D^{couples}_{1260°C}$ in Table 5.2. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1260°C}$ in Table 5.4. The long-dashed curves are predicted profiles from calculated diffusion matrix by eq. (5.1) at 1260 ºC. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1260 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fits and prediction.

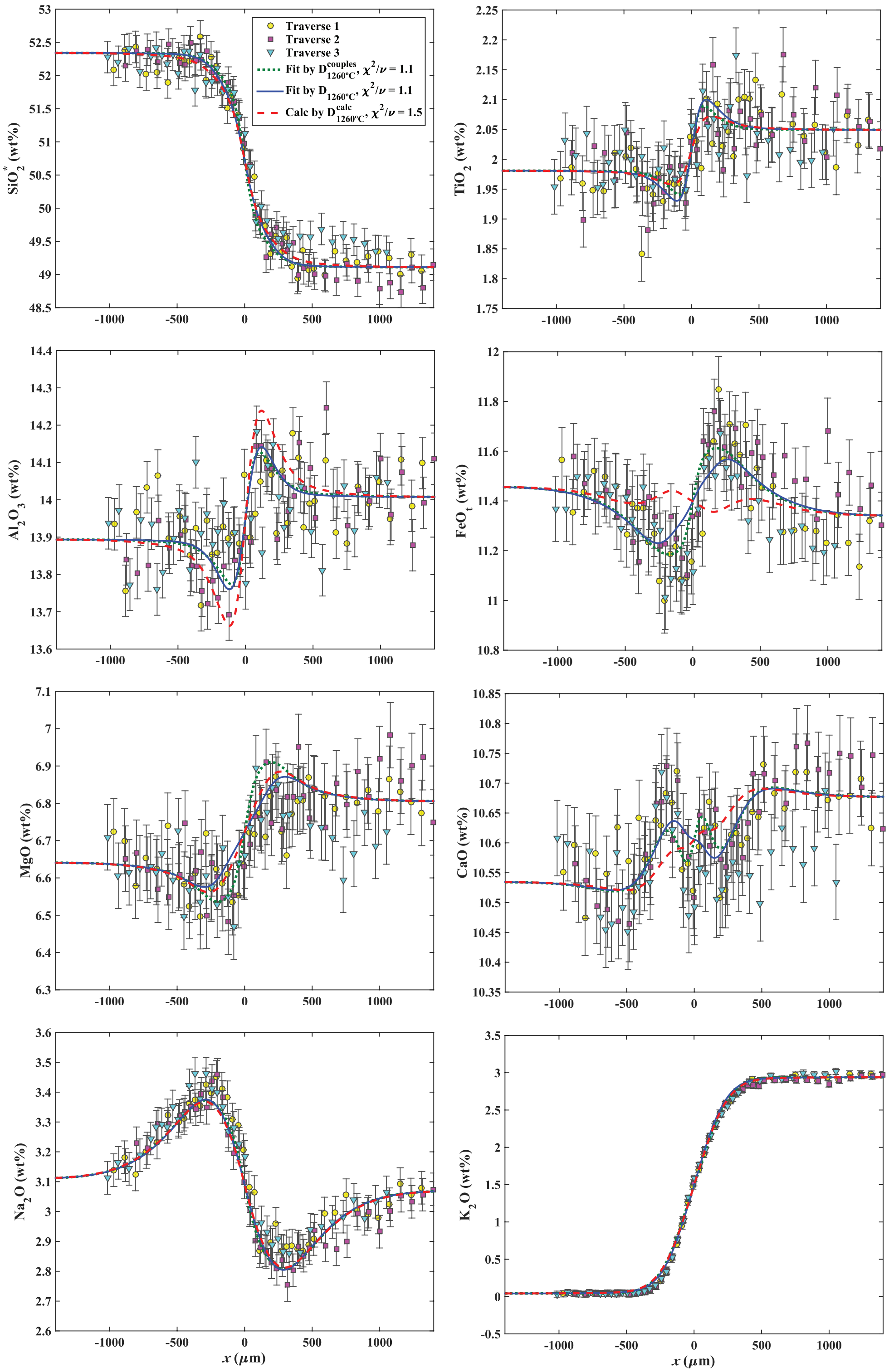

Fig. 5.8 Data of diffusion profiles of BS13&14C with fits and prediction. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The short-dashed curves are fit profiles for obtaining the diffusion matrix $D^{couples}_{1260°C}$ in Table 5.2. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1260°C}$ in Table 5.4. The long-dashed curves are predicted profiles from calculated diffusion matrix by eq. (5.1) at 1260 ºC. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1260 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fits and prediction.

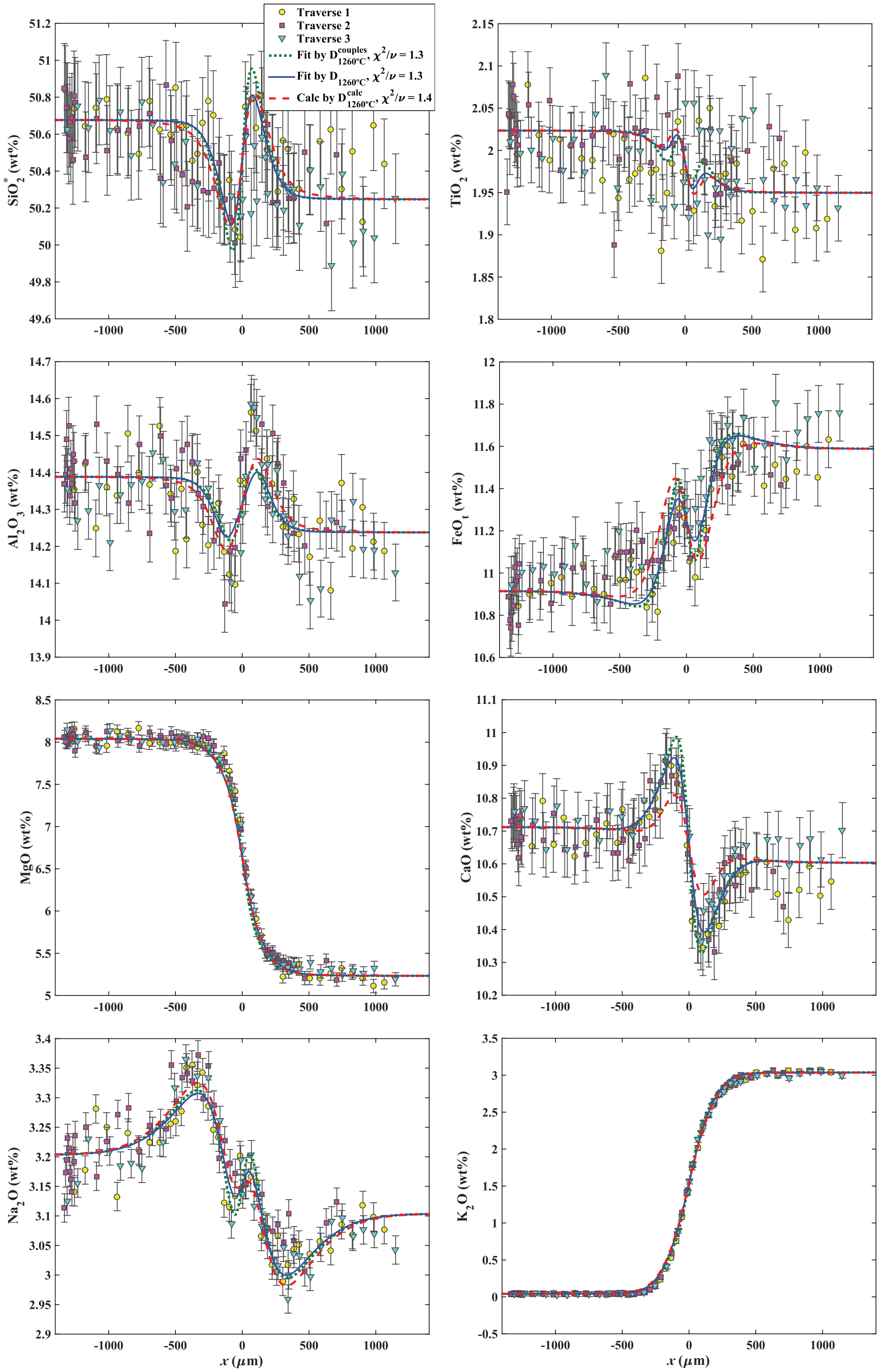

Fig. 5.9 Data of diffusion profiles of BS17&18C with fits and prediction. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The short-dashed curves are fit profiles for obtaining the diffusion matrix $D^{couples}_{1260°C}$ in Table 5.2. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1260°C}$ in Table 5.4. The long-dashed curves are predicted profiles from calculated diffusion matrix by eq. (5.1) at 1260 ºC. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1260 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fits and prediction.

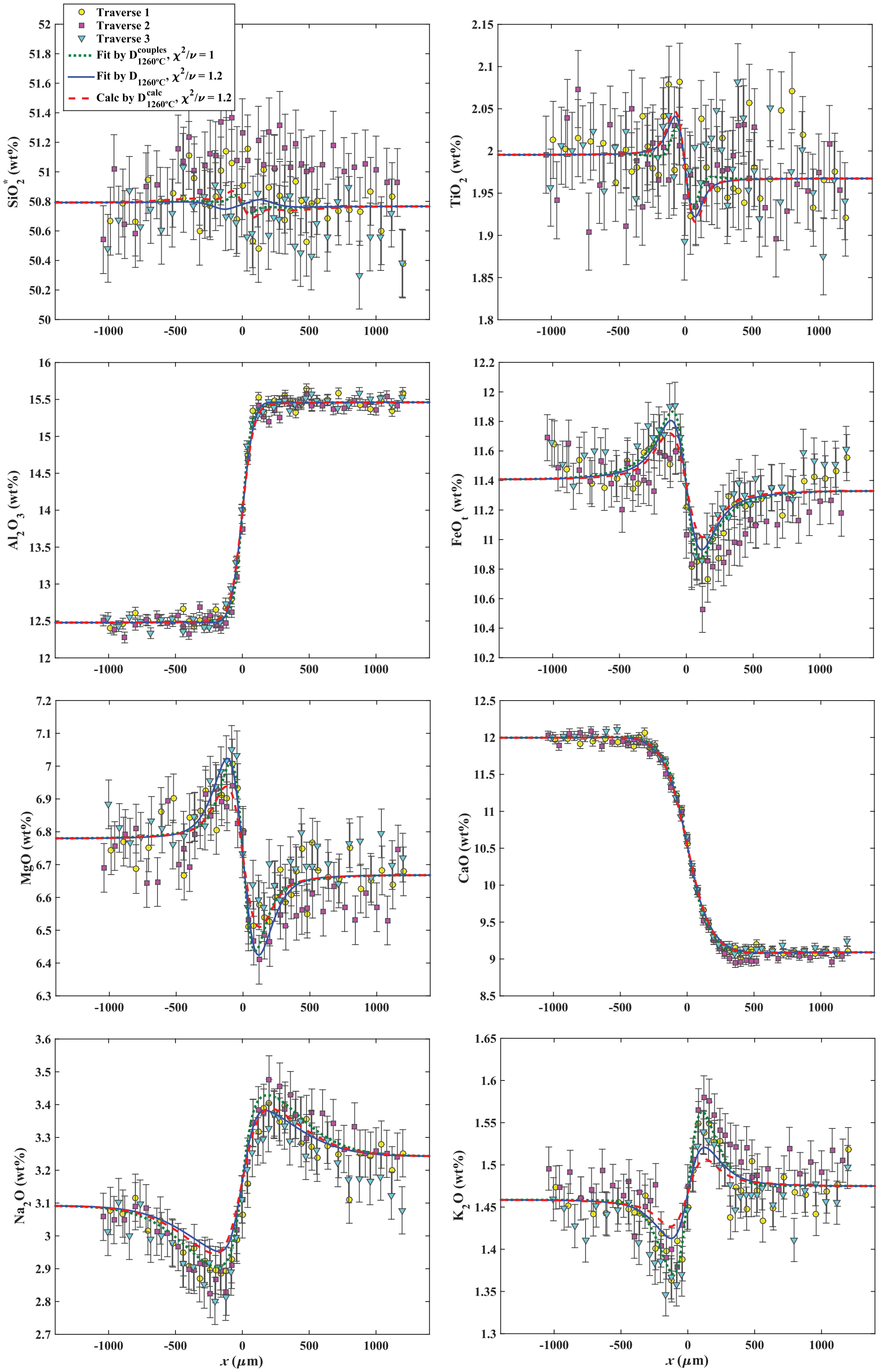

Fig. 5.10 Data of diffusion profiles of BS19&20C with fits and prediction. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The short-dashed curves are fit profiles for obtaining the diffusion matrix $D_{1260°C}^{couples}$ in Table 5.2. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1260°C}$ in Table 5.4. The long-dashed curves are predicted profiles from calculated diffusion matrix by eq. (5.1) at 1260 ºC. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1260 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fits and prediction.

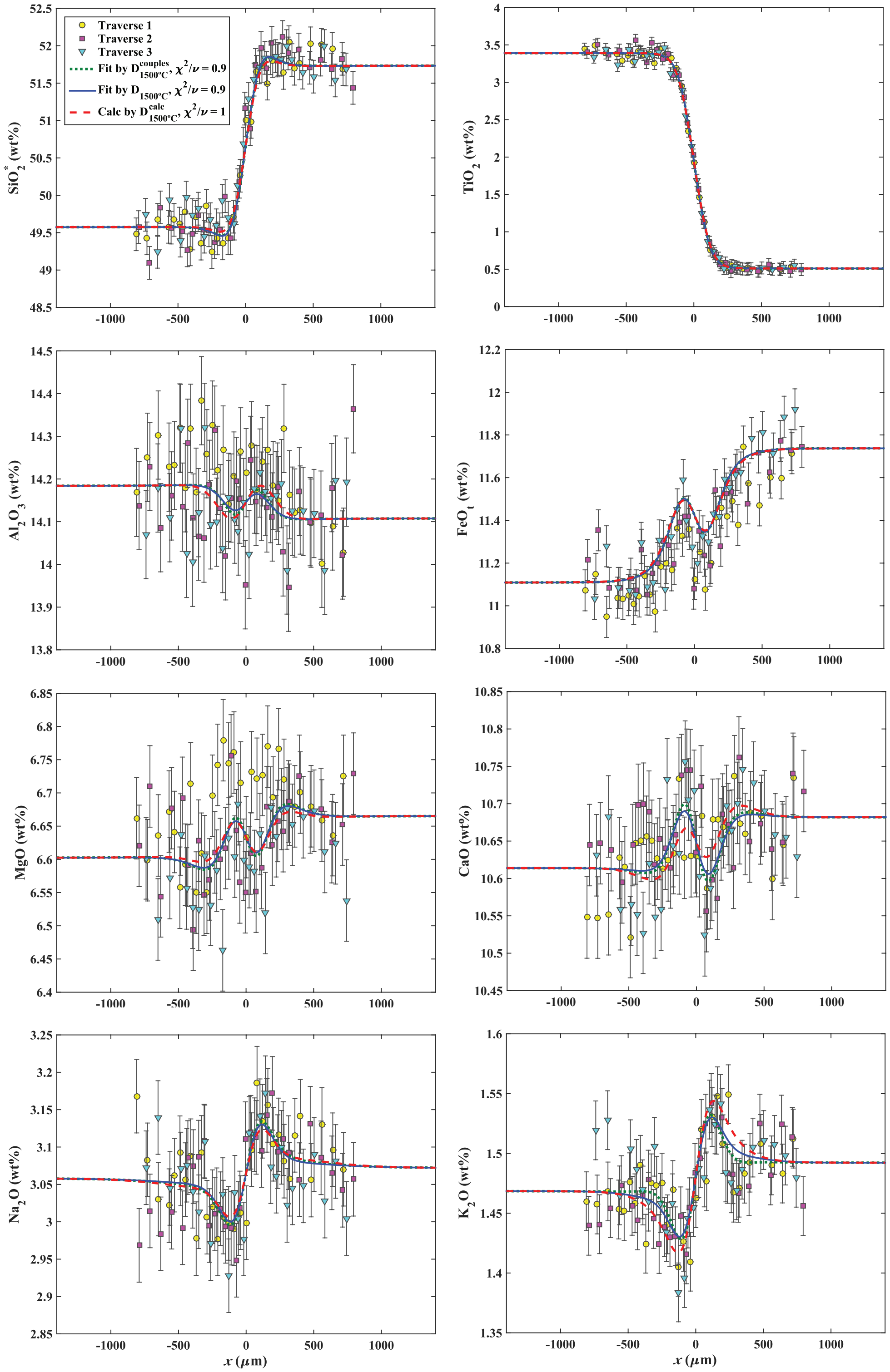

Fig. 5.11 Data of diffusion profiles of BS1&2B with fits and prediction. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The short-dashed curves are fit profiles for obtaining the diffusion matrix $D^{couples}_{1500°C}$ in Table 5.3. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1500°C}$ in Table 5.5. The long-dashed curves are predicted profiles from calculated diffusion matrix by eq. (5.1) at 1500 ºC. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1500 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fits and prediction.

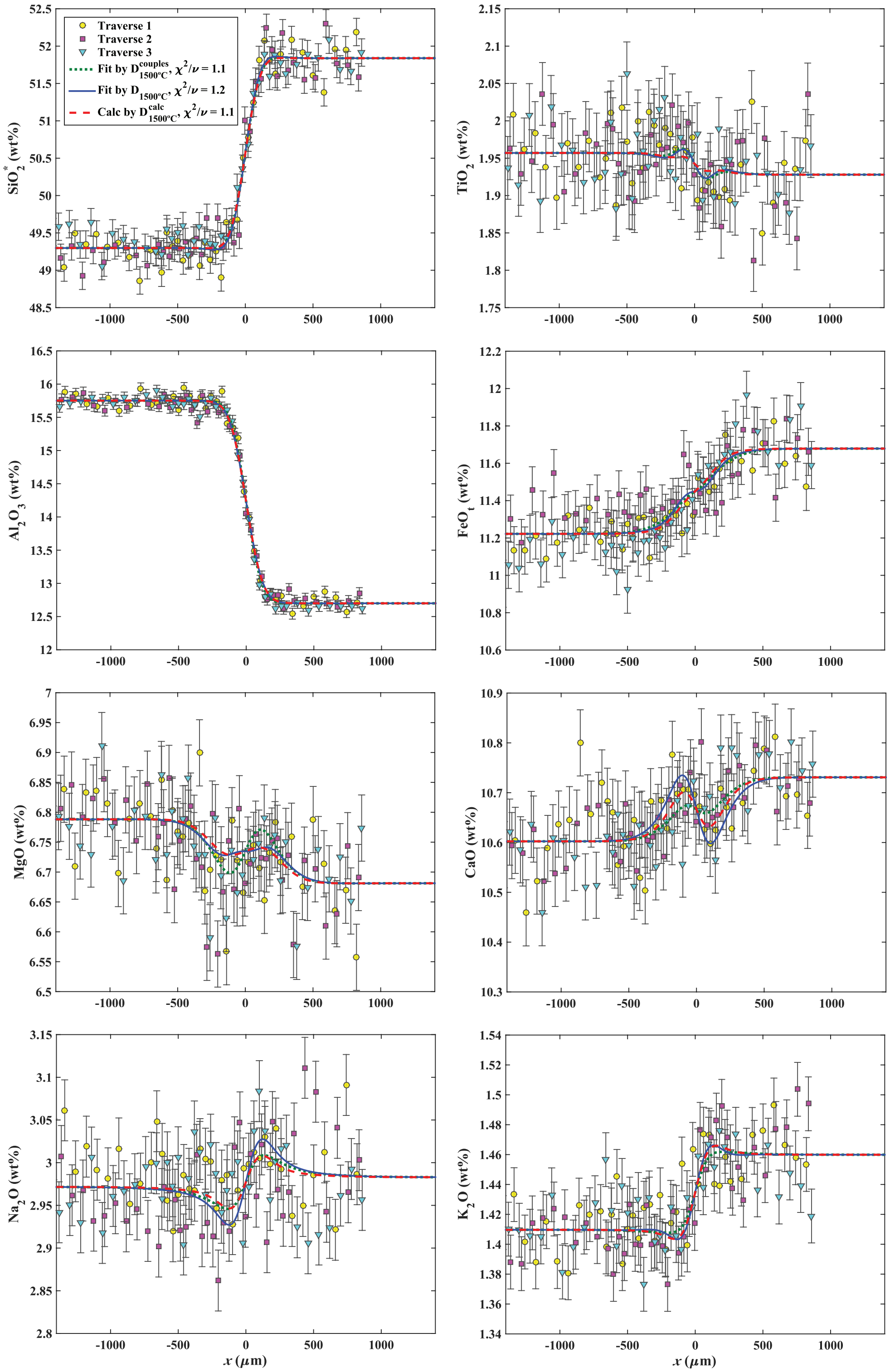

Fig. 5.12 Data of diffusion profiles of BS3&4B with fits and prediction. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The short-dashed curves are fit profiles for obtaining the diffusion matrix $D_{1500°C}^{couples}$ in Table 5.3. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1500°C}$ in Table 5.5. The long-dashed curves are predicted profiles from calculated diffusion matrix by eq. (5.1) at 1500 ºC. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1500 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fits and prediction.

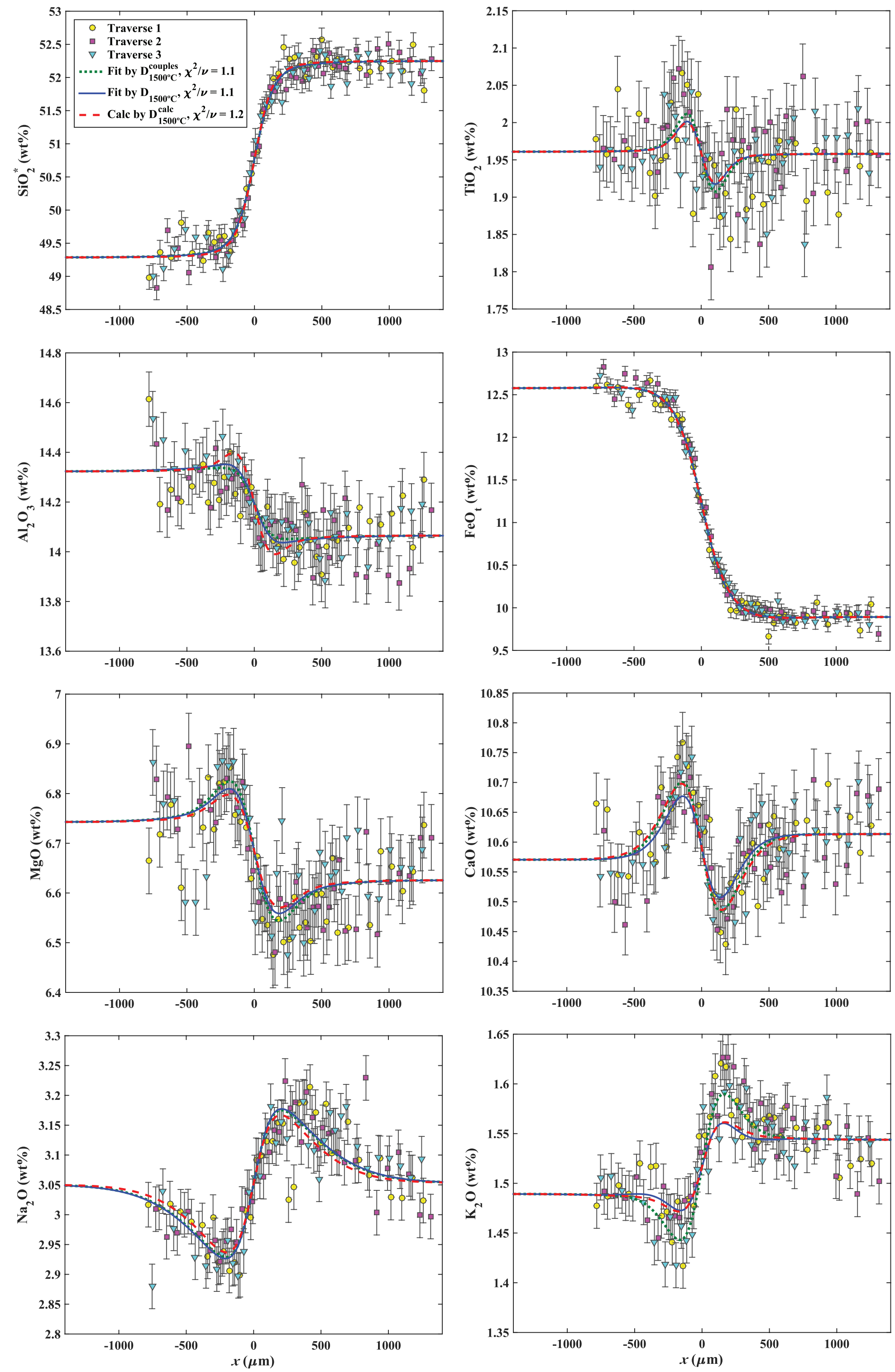

Fig. 5.13 Data of diffusion profiles of BS5&6B with fits and prediction. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The short-dashed curves are fit profiles for obtaining the diffusion matrix $D^{couples}_{1500°C}$ in Table 5.3. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1500°C}$ in Table 5.5. The long-dashed curves are predicted profiles from calculated diffusion matrix by eq. (5.1) at 1500 ºC. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1500 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fits and prediction.

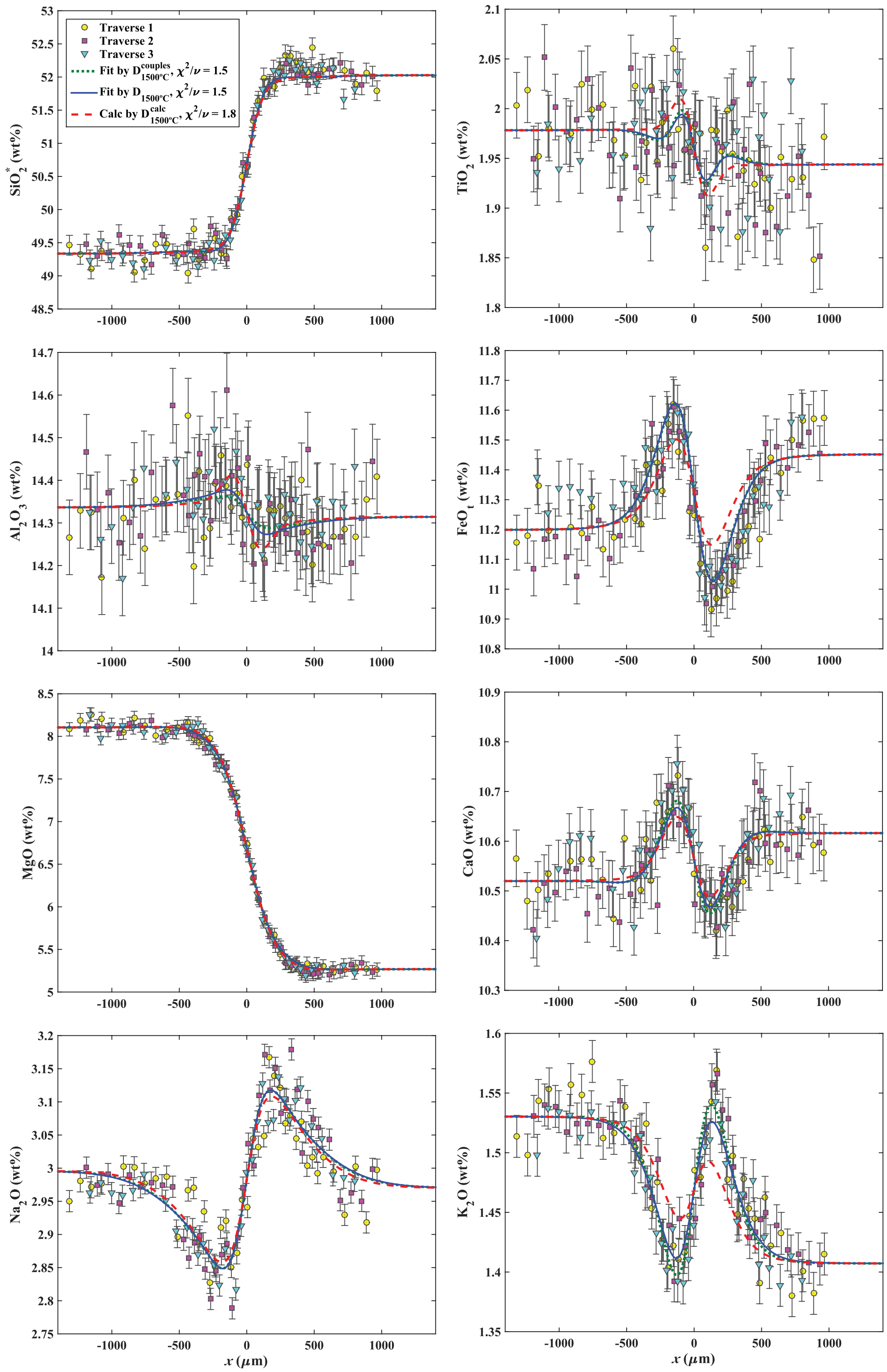

Fig. 5.14 Data of diffusion profiles of BS7&8B with fits and prediction. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The short-dashed curves are fit profiles for obtaining the diffusion matrix $D^{couples}_{1500°C}$ in Table 5.3. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1500°C}$ in Table 5.5. The long-dashed curves are predicted profiles from calculated diffusion matrix by eq. (5.1) at 1500 ºC. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1500 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fits and prediction.

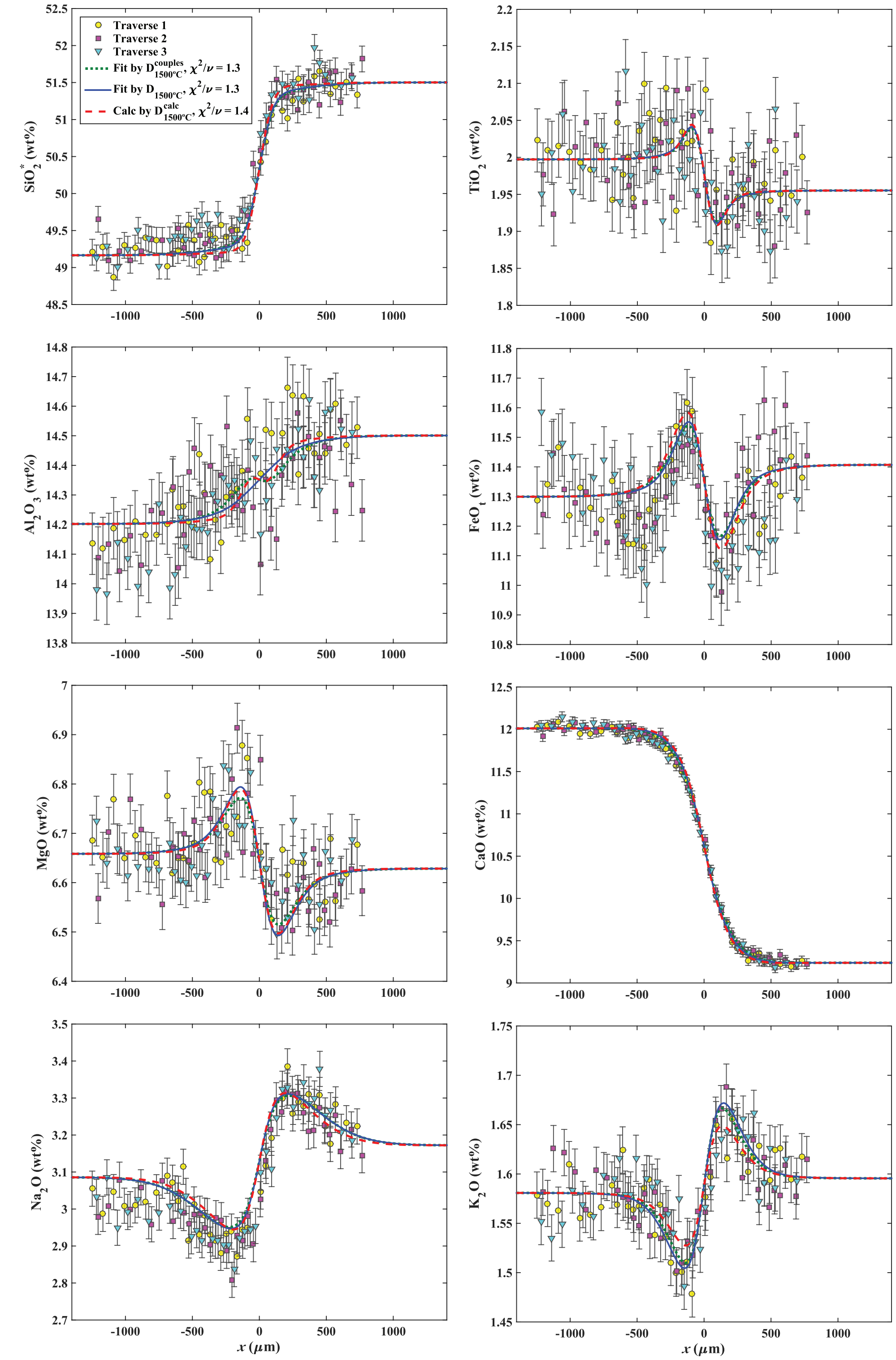

Fig. 5.15 Data of diffusion profiles of BS9&10B with fits and prediction. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The short-dashed curves are fit profiles for obtaining the diffusion matrix $D_{1500℃}^{\text{couples}}$ in Table 5.3. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1500℃}$ in Table 5.5. The long-dashed curves are predicted profiles from calculated diffusion matrix by eq. (5.1) at 1500 ºC. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1500 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fits and prediction.

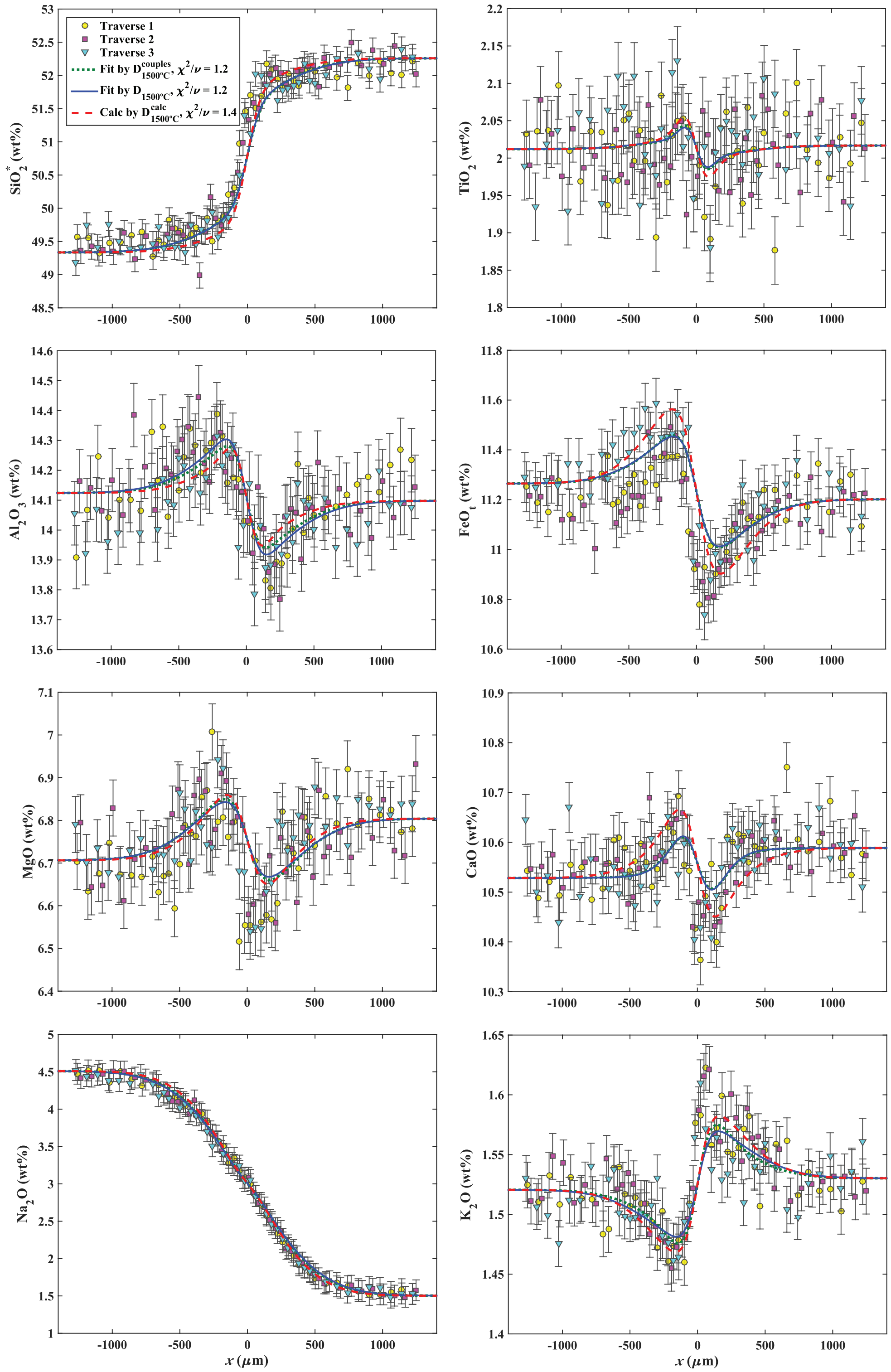

Fig. 5.16 Data of diffusion profiles of BS11&12B with fits and prediction. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The short-dashed curves are fit profiles for obtaining the diffusion matrix $D^{couples}_{1500°C}$ in Table 5.3. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1500°C}$ in Table 5.5. The long-dashed curves are predicted profiles from calculated diffusion matrix by eq. (5.1) at 1500 ºC. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1500 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fits and prediction.

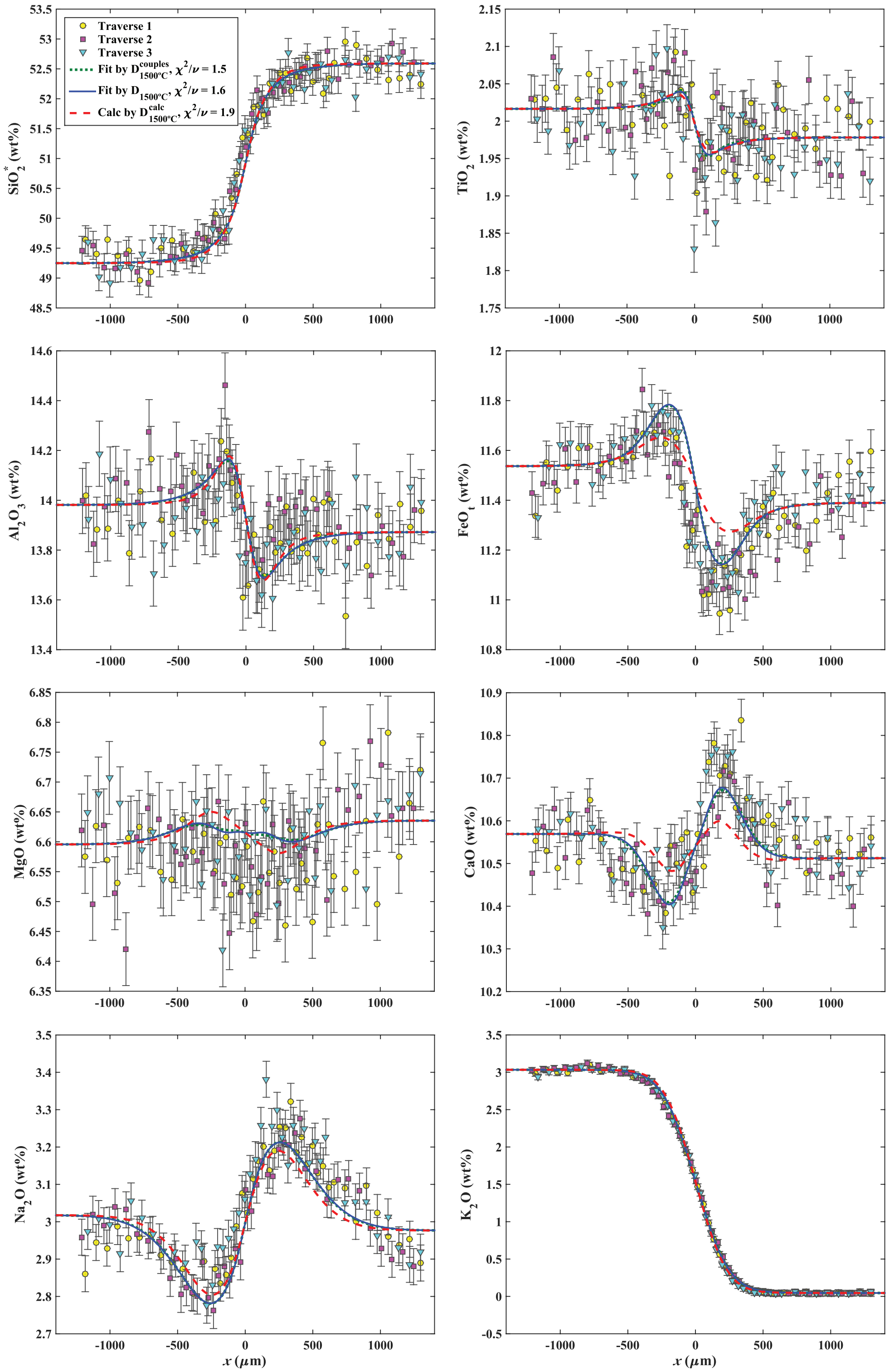

Fig. 5.17 Data of diffusion profiles of BS13&14B with fits and prediction. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The short-dashed curves are fit profiles for obtaining the diffusion matrix $D_{1500°C}^{couples}$ in Table 5.3. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1500°C}$ in Table 5.5. The long-dashed curves are predicted profiles from calculated diffusion matrix by eq. (5.1) at 1500 ºC. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1500 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fits and prediction.

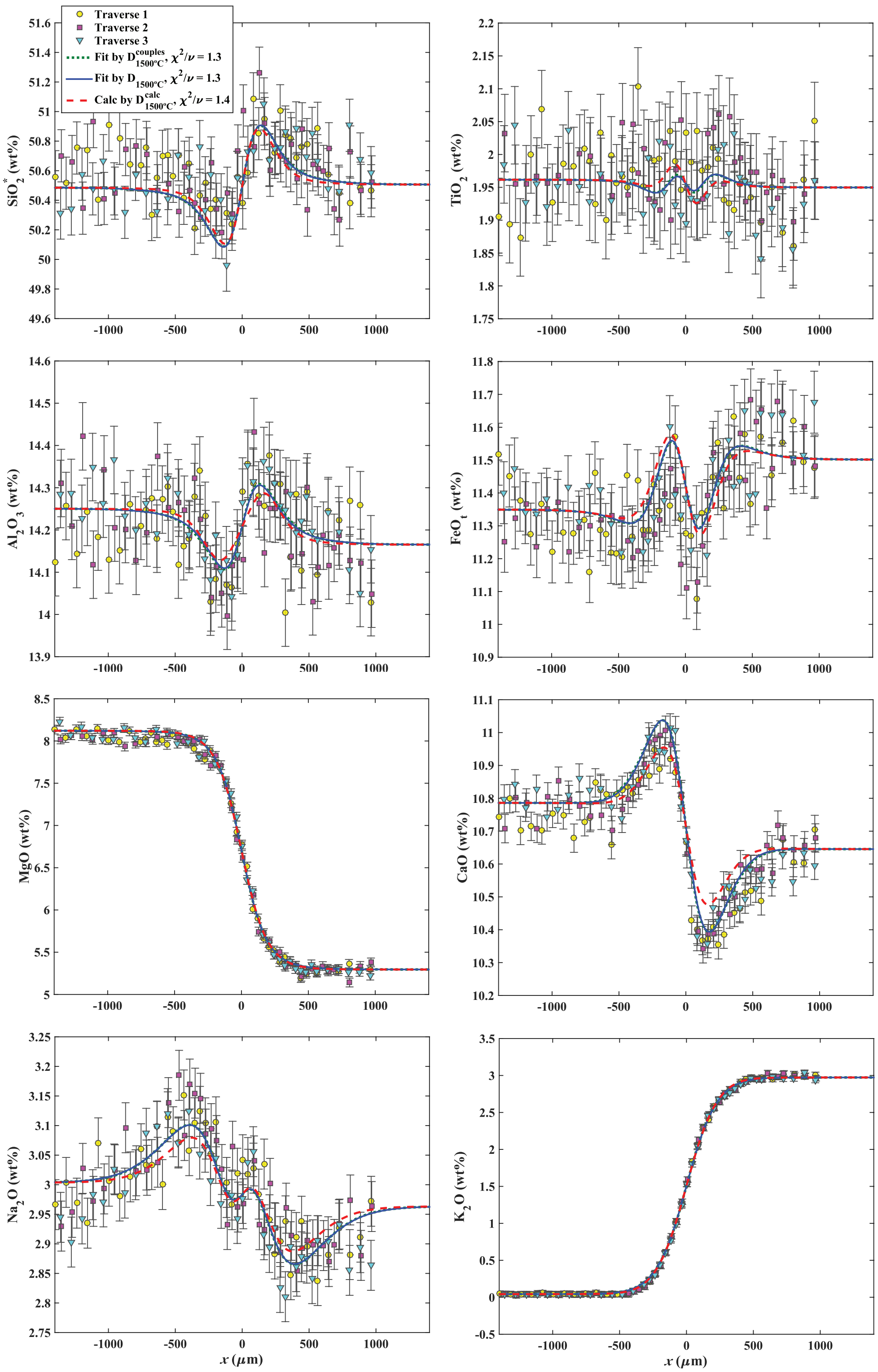

Fig. 5.18 Data of diffusion profiles of BS17&18B with fits and prediction. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The short-dashed curves are fit profiles for obtaining the diffusion matrix $D^{couples}_{1500°C}$ in Table 5.3. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1500°C}$ in Table 5.5. The long-dashed curves are predicted profiles from calculated diffusion matrix by eq. (5.1) at 1500 ºC. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1500 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fits and prediction.

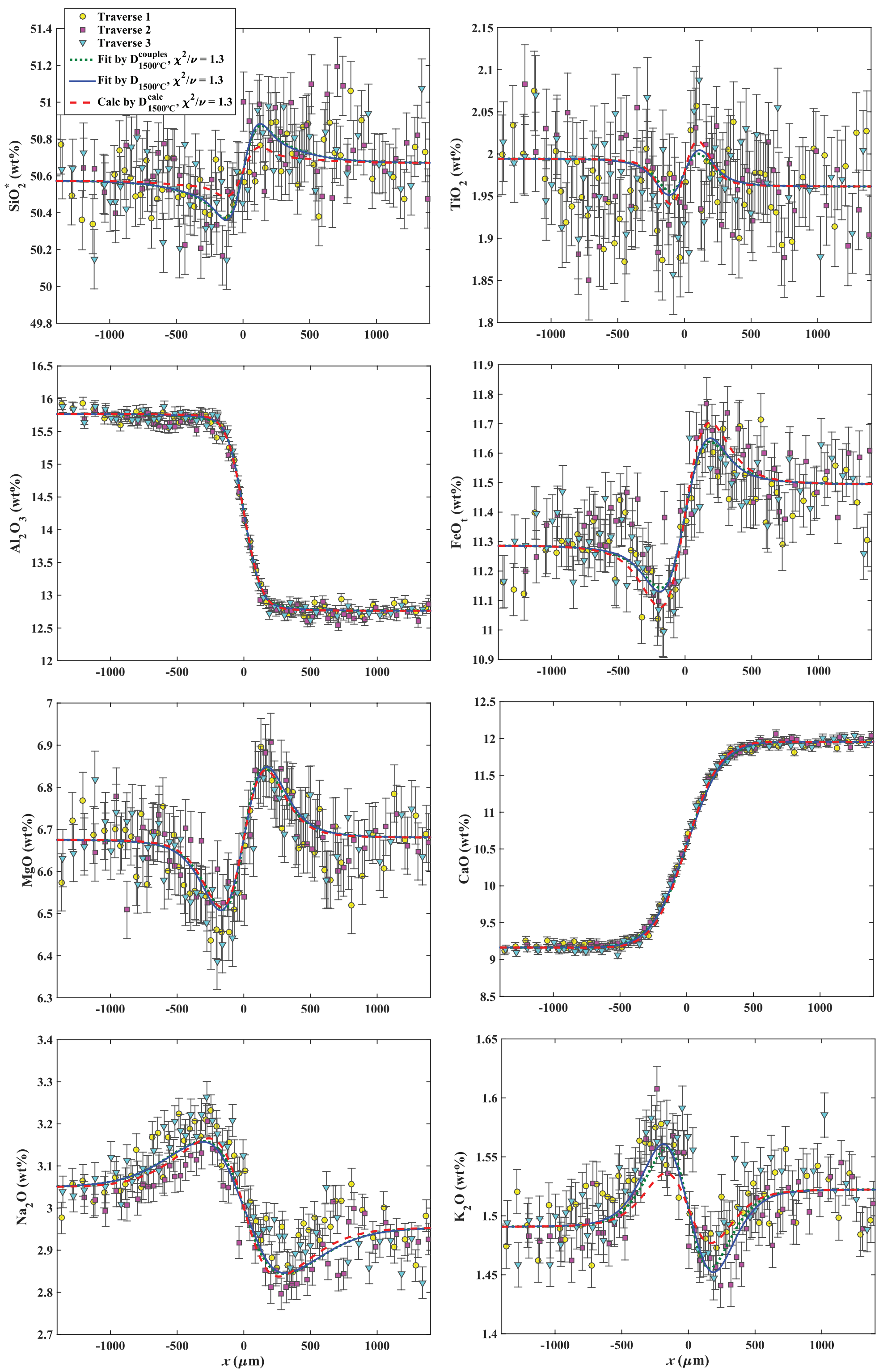

Fig. 5.19 Data of diffusion profiles of BS19&20B with fits and prediction. All the points are measured data. Different symbols indicate different traverses. The error bars are ±1σ errors. The short-dashed curves are fit profiles for obtaining the diffusion matrix $D^{\text{couples}}_{1500°\text{C}}$ in Table 5.3. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1500°\text{C}}$ in Table 5.5. The long-dashed curves are predicted profiles from calculated diffusion matrix by eq. (5.1) at 1500 ºC. Data of Diffusion profiles of other diffusion couple experiments with fits at ~1500 °C are shown in the supplementary file. χ^2/ν is calculated and shown for each type of fits and prediction.

5.6 Fitting diffusion profiles of diffusion couples

The diffusion matrix is obtained by simultaneously fitting all diffusion profiles from all experiments using Levenberg-Marquardt-Fletcher methods (Fletcher, 1971), and the numerical methods are given by section 2.6 in chapter II. The error of diffusion matrix was estimated by error propagation (Clifford, 1973), and the numerical method is given by section 2.7 in chapter II.

5.6.1 Diffusion matrix $D_{1260ºC}^{couples}$

The obtained diffusion matrix for 1260 ºC is denoted as $D_{1260ºC}^{couples}$ and shown in Table 5.2. All the fits by $D_{1260ºC}^{couples}$ for all 9 diffusion couple experiments at 1260 ºC are shown by short-dashed curves in Figs. 5.2–5.10. It can be seen that all features in diffusion profiles are well reproduced by this diffusion matrix $D_{1260ºC}^{couples}$. The goodness of fit is assessed by the reduced chi-squares (also known as mean square weighted deviation, MSWD) shown in each figure.

Eigenvalues and eigenvectors of the diffusion matrix $D_{1260ºC}^{couples}$ are also shown in Table 5.2. Each column is an eigenvector, associated to the eigenvalue above it (e.g. v_1 is the associated eigenvector of λ_1), in both 7-component TiO_2–Al_2O_3–FeO–MgO–CaO–Na_2O–K_2O and 8-component SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO–Na_2O–K_2O vector space. The 8-component eigenvectors are calculated by adding the dependent component SiO_2 to the 7-component eigenvectors such that the sum of all components is zero and then renormalized (see footnote in Table 5.2). Eigenvalues indicate diffusivity along their eigenvector directions; eigenvectors indicate exchanging species in independent directions, i.e. diffusion mechanism.

Table 5.2 Diffusion matrix $D^{\mathrm{couples}}_{1260^\circ\mathrm{C}}$ obtained by fitting only diffusion couple experiments at 1260 ºC, with 1σ errors for each element, and eigenvalues and eigenvectors.

$D^{\mathrm{couples}}_{1260^\circ\mathrm{C}}$ ($\mu m^2/s$)	TiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O
TiO_2	2.47±0.07	–0.11±0.06	–1.12±0.18	–0.30±0.22	–0.50±0.29	–1.79±0.89	–1.43±0.34
Al_2O_3	–0.01±0.21	2.01±0.11	–2.62±0.40	–0.16±0.47	–3.39±0.63	–8.77±2.38	–6.30±0.75
FeO	–7.24±0.70	0.18±0.53	5.02±0.66	–30.39±1.07	–40.07±1.18	–105.17±2.80	–42.03±1.32
MgO	–2.12±0.31	0.66±0.21	–6.83±0.33	5.67±0.53	–12.12±0.60	–30.31±1.80	–13.71±0.74
CaO	–2.46±0.26	–3.07±0.18	–7.20±0.32	–9.44±0.41	9.04±0.55	–26.83±1.54	–0.65±0.64
Na_2O	10.49±1.08	2.03±0.69	20.59±0.67	32.51±0.86	47.61±1.13	186.27±1.94	58.96±1.08
K_2O	1.28±0.13	0.96±0.09	2.38±0.15	3.65±0.20	5.13±0.27	4.22±0.68	25.42±0.36
Eigenvalues	λ_1	λ_2	λ_3	λ_4	λ_5	λ_6	λ_7
	1.76						
		2.02					
			3.55				
				22.74			
					16.39		
						26.71	
							162.73
7-component Eigenvectors	v_1	v_2	v_3	v_4	v_5	v_6	v_7
TiO_2	–0.48	–0.37	–0.42	–0.04	–0.01	0.02	–0.01
Al_2O_3	–0.10	0.79	–0.33	–0.09	–0.09	–0.02	–0.04
FeO	–0.59	–0.37	0.61	0.93	0.29	–0.72	–0.51
MgO	–0.35	–0.27	0.42	–0.19	–0.60	–0.03	–0.13
CaO	–0.46	–0.11	0.35	–0.29	0.71	0.59	–0.11
Na_2O	0.21	0.11	–0.16	–0.02	–0.05	–0.19	0.84
K_2O	0.21	0.07	–0.15	0.08	–0.21	0.31	0.01
8-component Eigenvectors	v_1	v_2	v_3	v_4	v_5	v_6	v_7
SiO_2	0.84	0.15	–0.31	–0.35	–0.05	0.04	–0.05
TiO_2	–0.26	–0.37	–0.39	–0.04	–0.01	0.02	–0.01
Al_2O_3	–0.05	0.78	–0.32	–0.08	–0.09	–0.02	–0.04
FeO	–0.32	–0.37	0.58	0.87	0.29	–0.72	–0.51
MgO	–0.19	–0.26	0.40	–0.18	–0.59	–0.03	–0.13
CaO	–0.25	–0.11	0.33	–0.27	0.71	0.59	–0.11
Na_2O	0.11	0.11	–0.15	–0.02	–0.05	–0.19	0.84
K_2O	0.11	0.07	–0.14	0.08	–0.21	0.31	0.01

Note: The SiO_2 component in each eigenvector is calculated from the 7-component eigenvector, by adding the SiO_2 component so that the summation of all elements in the eigenvector is zero. Then the 8-component eigenvector is renormalized. This way, the contribution by all 8 components (including the dependent component SiO_2) to each eigenvector can be directly seen.

By examining the eigenvectors, v_1 is largely due to the exchange between SiO_2 and all other components; v_2 is largely due to the exchange between Al_2O_3 and all other components; v_3 is due to the exchange of FeO+MgO+CaO with all other components; v_4 is due to the exchange of FeO+K_2O with all other components; v_5 is largely due to the exchange between MgO and CaO; v_6 is due to the exchange of CaO+K_2O with all other components; and v_7 is due to the exchange of Na_2O (and very minor K_2O) with all other components.

5.6.2 Diffusion matrix $D_{1500^{\circ}C}^{\text{couples}}$

The obtained diffusion matrix for 1500 ºC is denoted as $D_{1500^{\circ}C}^{\text{couples}}$ and shown in Table 5.3. All the fits by $D_{1500^{\circ}C}^{\text{couples}}$ for all 9 diffusion couple experiments at 1500 ºC are shown by short-dashed curves in Figs. 5.10–5.18. It can be seen that all features in diffusion profiles are well reproduces by this diffusion matrix $D_{1500^{\circ}C}^{\text{couples}}$. The goodness of fit is assessed by the reduced chi-squares shown in each figure.

Table 5.3 Diffusion matrix $D_{1500^{\circ}C}^{\text{couples}}$ obtained by fitting only diffusion couple experiments at 1500 ºC, with 1σ errors for each element, and eigenvalues and eigenvectors.

$D_{1500^{\circ}C}^{\text{couples}}$ (μm²/s)	TiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O
TiO_2	16.76±0.92	–0.82±0.44	–5.35±0.98	0.34±0.99	–6.51±1.33	–7.87±3.48	–4.97±1.40
Al_2O_3	–2.89±1.44	14.15±0.97	–11.51±2.31	–13.73±2.44	–39.24±2.94	–81.72±8.20	–58.00±3.61
FeO	–28.14±2.40	–13.20±2.10	54.70±3.17	–90.02±3.32	–68.33±4.10	–114.78±9.57	–103.56±4.21
MgO	–5.42±1.61	3.25±1.24	–29.30±2.29	70.73±2.52	–43.68±2.49	–84.86±6.53	–26.62±2.99
CaO	–4.10±1.59	–5.01±1.45	–20.65±2.08	–20.21±2.24	106.77±2.64	–14.10±5.28	54.65±2.64
Na_2O	35.70±3.96	25.73±2.48	76.22±4.06	82.52±2.23	130.51±4.65	550.88±17.35	177.57±4.76
K_2O	7.07±0.80	4.42±0.51	11.20±0.96	23.83±0.91	21.98±1.06	21.71±2.16	130.86±1.70
Eigenvalues	λ_1	λ_2	λ_3	λ_4	λ_5	λ_6	λ_7
	13.76						
		17.68					
			32.05				
				98.60			
					116.85		
						144.99	
							520.92
7-component Eigenvectors	v_1	v_2	v_3	v_4	v_5	v_6	v_7
TiO_2	–0.69	–0.17	–0.24	–0.03	–0.06	–0.01	–0.01
Al_2O_3	0.31	0.97	–0.14	0.01	–0.09	–0.15	–0.15
FeO	–0.52	–0.12	0.70	0.84	0.55	–0.46	–0.20
MgO	–0.24	–0.15	0.43	–0.30	–0.61	–0.09	–0.17
CaO	–0.24	–0.03	0.41	–0.37	0.54	0.79	–0.01
Na_2O	0.15	0.00	–0.18	–0.07	–0.15	–0.25	0.95
K_2O	0.15	0.02	–0.21	0.24	0.03	0.26	0.03
8-component Eigenvectors	v_1	v_2	v_3	v_4	v_5	v_6	v_7
SiO_2	0.74	–0.47	–0.61	–0.30	–0.22	–0.09	–0.41
TiO_2	–0.47	–0.15	–0.19	–0.03	–0.05	–0.01	–0.01
Al_2O_3	0.21	0.85	–0.11	0.01	–0.08	–0.14	–0.13
FeO	–0.35	–0.11	0.55	0.80	0.54	–0.46	–0.19
MgO	–0.16	–0.13	0.34	–0.29	–0.60	–0.09	–0.15
CaO	–0.16	–0.02	0.32	–0.36	0.53	0.79	–0.01
Na_2O	0.10	0.00	–0.14	–0.07	–0.14	–0.25	0.87
K_2O	0.10	0.02	–0.17	0.23	0.03	0.26	0.03

See footnote on Table 5.2 for the expression of each eigenvector in 8-component space.

Eigenvalues and eigenvectors of the diffusion matrix $D_{1500^{\circ}\mathrm{C}}^{\mathrm{couples}}$ are also shown in Table 5.3. By examining the eigenvectors, v_1 is largely due to the exchange between SiO_2 and all other components; v_2 is largely due to the exchange between SiO_2 and Al_2O_3; v_3 is due to the exchange of FeO+MgO+CaO with all other components; v_4 is due to the exchange of FeO+K_2O with all other components; v_5 is largely due to the exchange between FeO+CaO and MgO; v_6 is due to the exchange of CaO+K_2O with all other components; and v_7 is due to the exchange of Na_2O (and very minor K_2O) with all other components. These are consistent with the results at 1260 ºC.

5.7 Predicting diffusion profiles during mineral dissolution

Predictions using diffusion matrices $D_{1260^{\circ}\mathrm{C}}^{\mathrm{couples}}$ and $D_{1500^{\circ}\mathrm{C}}^{\mathrm{couples}}$ for diffusion profiles during olivine, diopside and anorthite dissolution at ~1260 and ~1500 ºC (Chen and Zhang, 2008, 2009; Yu et al., 2016) are shown by short-dashed curves in Figs. 5.20–5.23. Diffusion profiles during mineral dissolution were calculated by eq. (A14) in Appendix A2. The interface melt composition was determined by extrapolation from experimental data in the literature, instead of being calculated from diffusion matrix and chemical potential relation between mineral and melt (Guo and Zhang, 2016). The dissolution rate was determined by eq. (A20) in Appendix A2, where only the interface melt concentration of the best-resolved component was used. Note experimental data for mineral dissolution with similar temperatures and same pressures are plotted together against $x/\sqrt{t}$, and different experiments are indicated by different symbols.

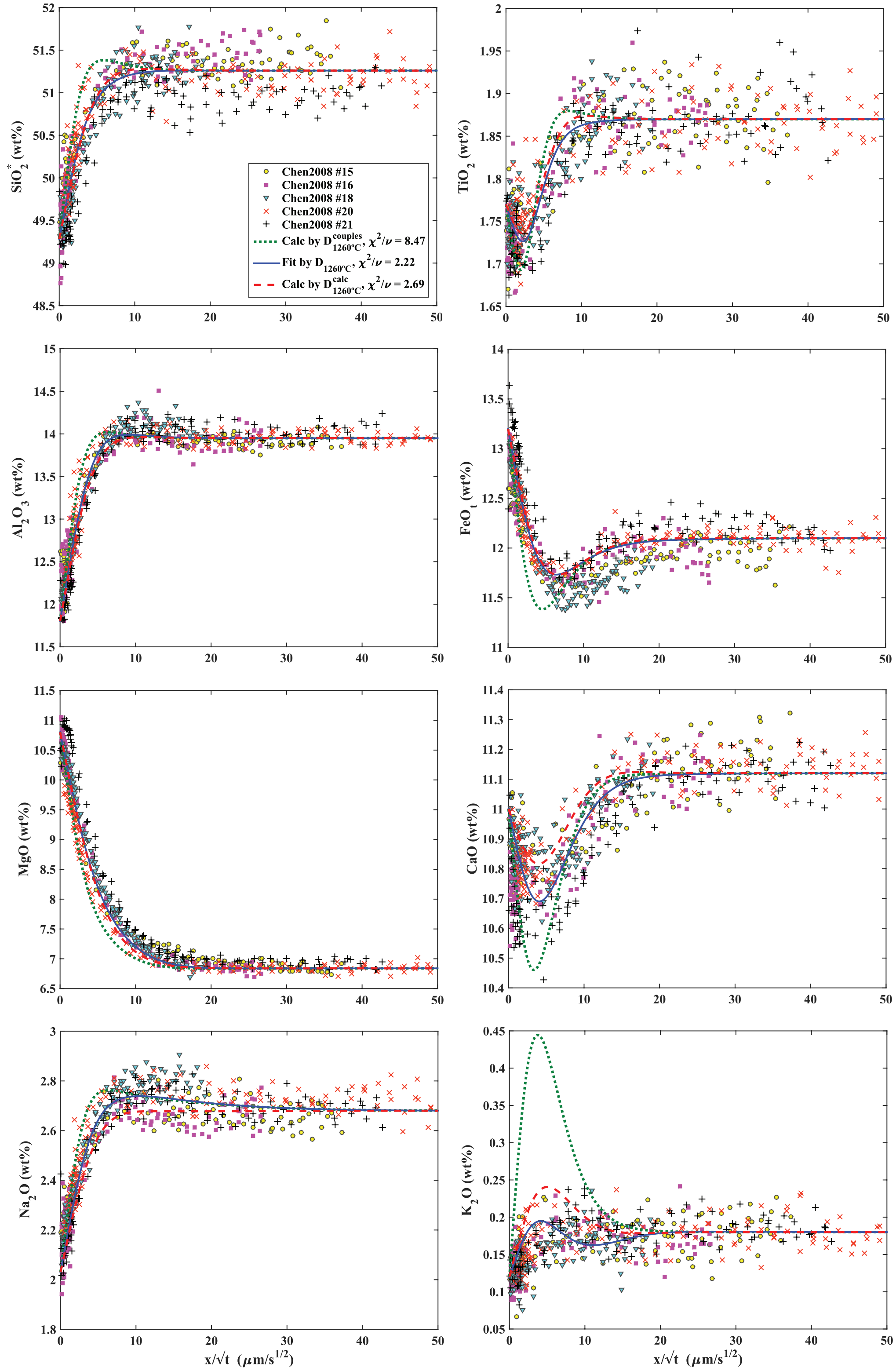

Fig. 5.20 Predicted and fit diffusion profiles for olivine dissolution in basaltic melts at ~1270 ºC (Chen and Zhang, 2008). The short-dashed curves are predicted profiles using the diffusion matrix $D_{1260^{\circ}C}^{couples}$ in Table 5.2. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1260^{\circ}C}$ in Table 5.4. The long-dashed curves are predicted profiles from calculated diffusion matrix by eq. (5.1). χ^2/ν is calculated and shown for each type of predictions and fit.

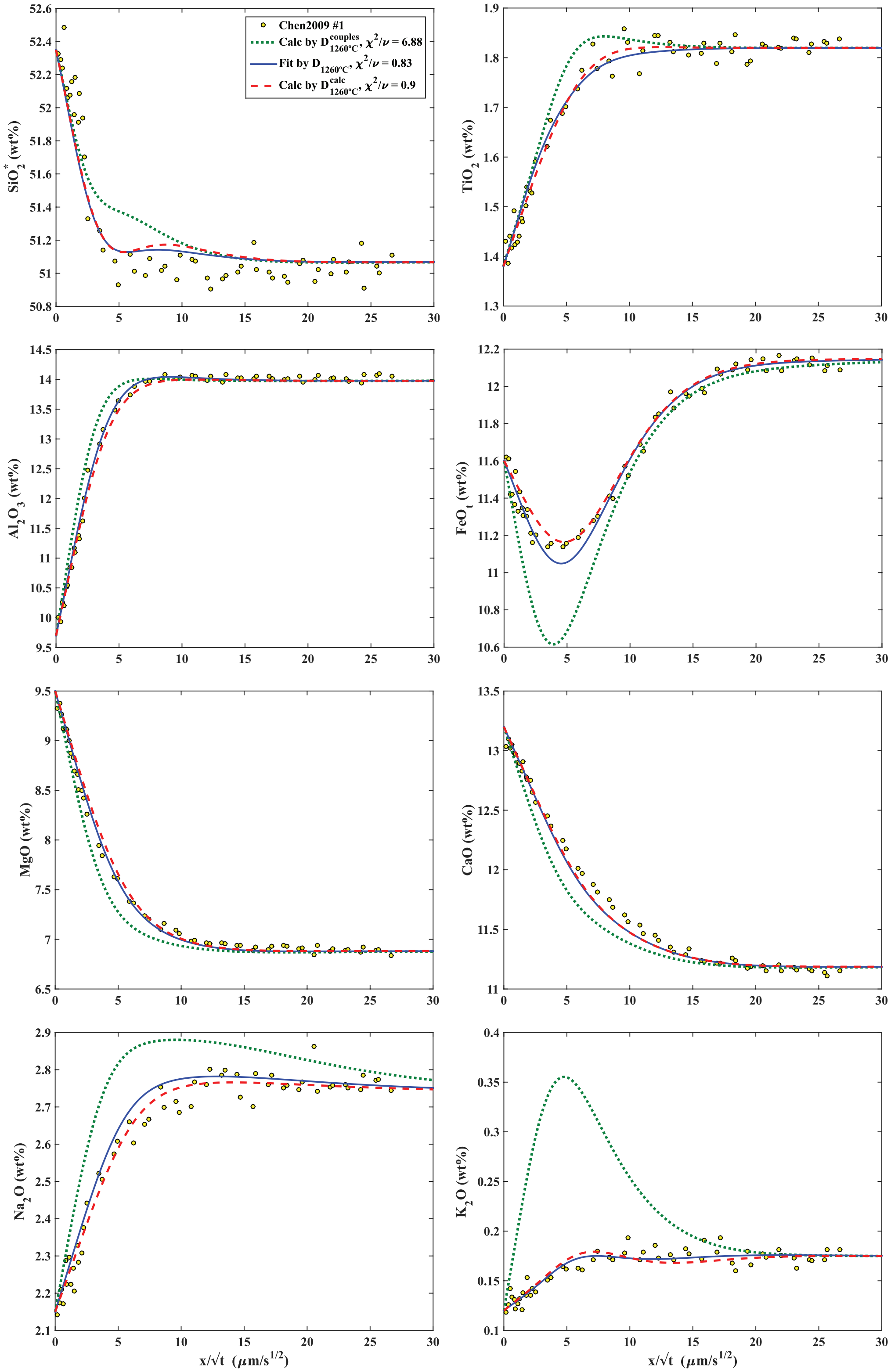

Fig. 5.21 Predicted and fit diffusion profiles for diopside dissolution in basaltic melts at ~1270 ºC (Chen and Zhang, 2009). The short-dashed curves are predicted profiles using the diffusion matrix $D^{couples}_{1260ºC}$ in Table 5.2. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1260ºC}$ in Table 5.4. The long-dashed curves are predicted profiles from calculated diffusion matrix by eq. (5.1). χ^2/ν is calculated and shown for each type of predictions and fit.

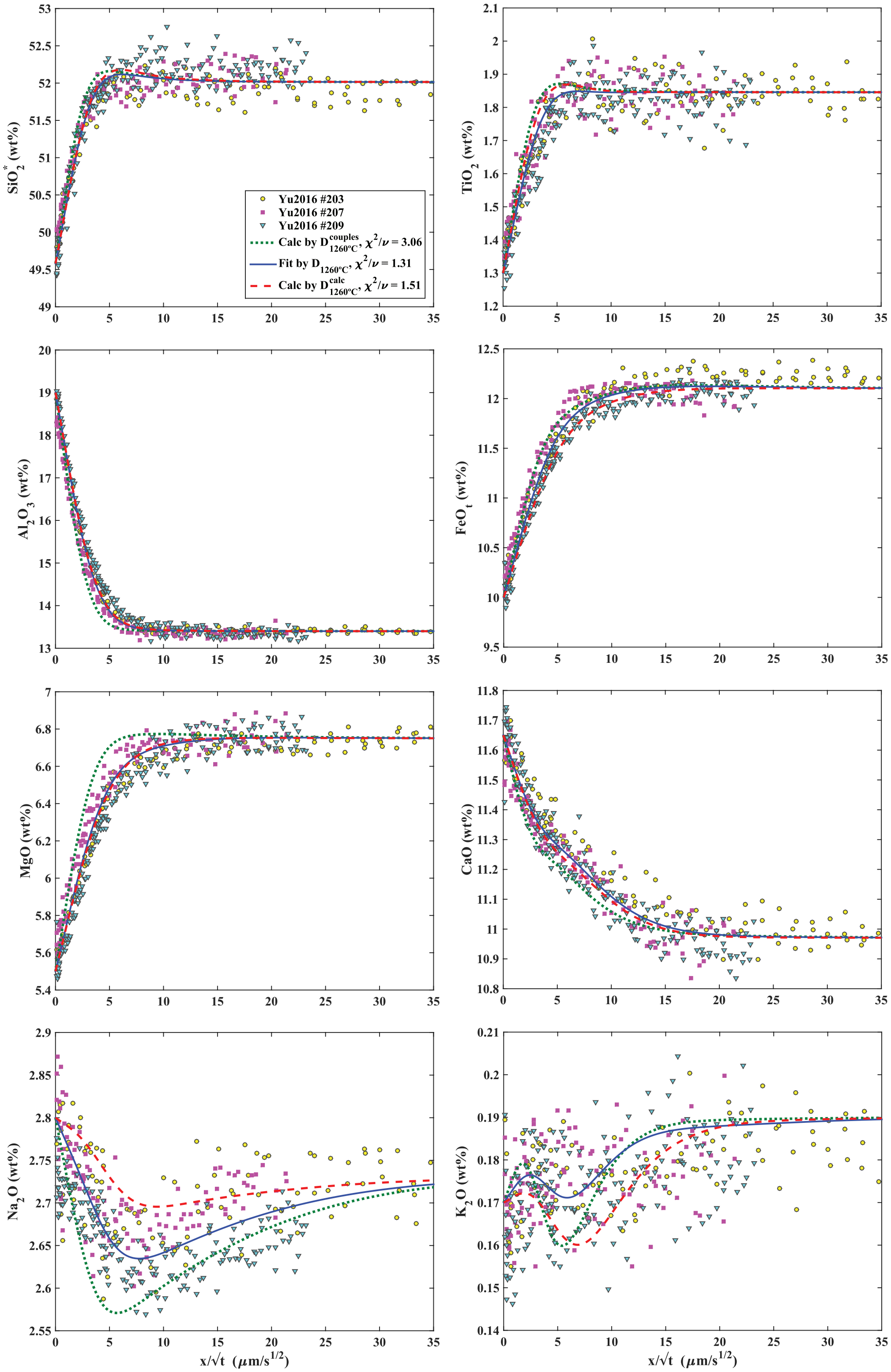

Fig. 5.22 Predicted and fit diffusion profiles for anorthite dissolution in basaltic melts at ~1280 ºC (Yu et al., 2016). The short-dashed curves are predicted profiles using the diffusion matrix $D_{1260ºC}^{couples}$ in Table 5.2. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1260ºC}$ in Table 5.4. The long-dashed curves are predicted profiles from calculated diffusion matrix by eq. (5.1). χ^2/ν is calculated and shown for each type of predictions and fit.

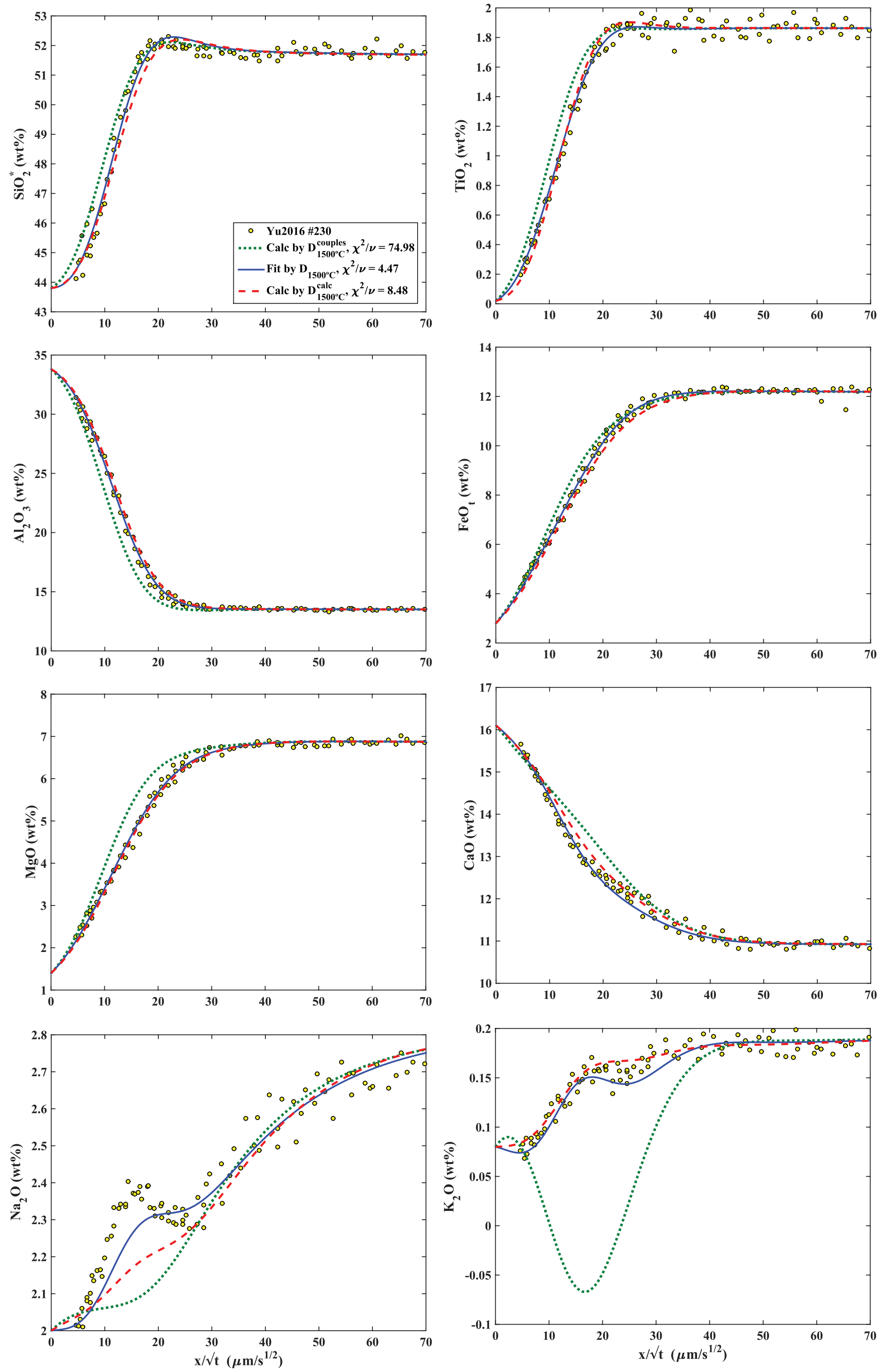

Fig. 5.23 Predicted and fit diffusion profiles for anorthite dissolution in basaltic melts at ~1500 ºC (Yu et al., 2016). The short-dashed curves are predicted profiles using the diffusion matrix $D_{1500℃}^{couples}$ in Table 5.3. The solid curves are fit profiles for obtaining the diffusion matrix $D_{1500℃}$ in Table 5.5. The long-dashed curves are predicted profiles from calculated diffusion matrix by eq. (5.1). χ^2/ν is calculated and shown for each type of predictions and fit.

In general, predicted diffusion profiles for SiO_2, TiO_2, Al_2O_3, FeO, MgO, CaO and Na_2O have slightly shorter diffusion distance than the average experimental data, but are consistent with the experimental data with the shortest diffusion distance. Predicted diffusion profiles and experimental data match well in profile shape. The K_2O diffusion profiles are not predicted in all mineral dissolution experiments. The reason for the disagreement is not clear, but it may be due to the composition dependence of diffusion matrix on K_2O concentration (1.5 wt% in the experiments vs. 0.17 wt% in natural basaltic melts, with almost a factor of 10), or may be related to the observation that K_2O is not a major component in any eigenvector and the unresolved diffusion effects of other components on K_2O.

5.8 Fitting diffusion profiles of diffusion couples and mineral dissolution

In order to better constrain diffusion matrix and reconcile literature data during mineral dissolution, mineral dissolution experiments in basaltic melts (Exp #15, #16, #18, #20, #21 for olivine dissolution at ~1260 ºC in Chen and Zhang, 2008; Exp # 1 for diopside dissolution at ~1260 ºC in Chen and Zhang, 2009; Exp #203, #207, #209 for anorthite dissolution at ~1260 ºC in Yu et al., 2016; Exp #230 for anorthite dissolution at ~1500 ºC in Yu et al., 2016) are also used for fitting besides diffusion couple experiments, to obtain a new diffusion matrix (referred as $D_{1260\,°C}$ for 1260 ºC and $D_{1500\,°C}$ for 1500 ºC). Note only anorthite dissolution is used for fitting at ~1500 ºC because dissolution distances during olivine and diopside dissolution are significantly different from those predicted from diffusion couple experiments. Those mineral dissolution experiments were done at slightly different temperatures from 1260 or 1500 ºC, usually deviating by 10–20 ºC. Therefore, temperatures of those experiments were "corrected" to 1260 or 1500 ºC, by correcting experimental durations using $t_{\mathrm{corr}} = t_{\mathrm{eff}} \cdot \mathrm{e}^{-E/(RT_{\mathrm{exp}})} \Big/ \mathrm{e}^{-E/(RT_{\mathrm{corr}})}$

([Zhang and Behrens, 2000]), where T_{corr} = 1260 or 1500 ºC and E = 145 kJ/mol (from this study). Minor and trace components such as MnO and P_2O_5 contained in basaltic melts were ignored. SiO_2^* = SiO_2 + minor – (total – 100) is used as replacement for SiO_2, such that the total is 100%.

5.8.1 Diffusion matrix $D_{1260°C}$

Table 5.4 Diffusion matrix $D_{1260°C}$ obtained by fitting both diffusion couple and mineral dissolution experiments at ~1260 ºC, with 1σ errors for each element, and eigenvalues and eigenvectors.

$D_{1260°C}$ (μm²/s)	TiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O
TiO_2	2.36±0.07	–0.15±0.03	–0.34±0.12	–1.03±0.17	–1.32±0.20	–2.21±0.84	–2.19±0.32
Al_2O_3	0.71±0.24	2.78±0.09	–3.69±0.33	0.02±0.47	–1.73±0.53	–6.39±2.33	–5.90±0.77
FeO	–11.16±0.72	–2.50±0.19	3.42±0.50	–30.62±0.68	–36.50±0.77	–114.17±2.71	–41.39±1.25
MgO	–0.72±0.36	0.54±0.11	–7.13±0.30	12.48±0.45	–14.23±0.50	–28.97±1.94	–11.30±0.83
CaO	–3.48±0.29	–3.79±0.09	–9.91±0.28	–9.19±0.36	13.16±0.44	–27.68±1.57	–0.13±0.69
Na_2O	13.71±1.02	6.17±0.22	22.43±0.54	33.52±0.54	40.13±0.76	186.16±1.89	58.39±0.95
K_2O	2.26±0.13	0.75±0.03	2.96±0.11	1.68±0.13	4.69±0.17	11.02±0.64	26.02±0.35
Eigenvalues	λ_1	λ_2	λ_3	λ_4	λ_5	λ_6	λ_7
	2.11						
		2.86					
			5.06				
				23.23			
					21.28		
						27.80	
							164.06
7-component Eigenvectors	v_1	v_2	v_3	v_4	v_5	v_6	v_7
TiO_2	–0.71	–0.31	–0.16	–0.01	0.02	–0.02	–0.01
Al_2O_3	0.00	0.94	–0.60	–0.17	0.15	–0.03	–0.02
FeO	–0.51	–0.12	0.58	0.83	–0.65	–0.30	–0.55
MgO	–0.22	–0.05	0.41	–0.06	–0.32	–0.50	–0.12
CaO	–0.37	0.08	0.28	–0.41	0.51	0.77	–0.11
Na_2O	0.20	0.00	–0.16	–0.11	0.16	–0.13	0.82
K_2O	0.13	0.00	–0.05	0.31	–0.41	0.23	0.05
8-component Eigenvectors	v_1	v_2	v_3	v_4	v_5	v_6	v_7
SiO_2	0.83	–0.48	–0.28	–0.36	0.46	–0.01	–0.06
TiO_2	–0.39	–0.27	–0.15	0.00	0.02	–0.02	–0.01
Al_2O_3	0.00	0.83	–0.58	–0.16	0.14	–0.03	–0.02
FeO	–0.28	–0.10	0.55	0.77	–0.57	–0.30	–0.55
MgO	–0.12	–0.05	0.40	–0.06	–0.28	–0.50	–0.12
CaO	–0.21	0.07	0.27	–0.38	0.46	0.77	–0.11
Na_2O	0.11	0.00	–0.15	–0.10	0.15	–0.13	0.82
K_2O	0.07	0.00	–0.05	0.29	–0.36	0.23	0.05

See footnote on Table 5.2 for the expression of each eigenvector in 8-component space.

Diffusion matrix $D_{1260°C}$ obtained by incorporating mineral dissolution experiments at ~1260 ºC is shown in Table 5.4, together with its eigenvalues and eigenvectors. The solid curves in Figs. 5.20–5.22 are the fit curves for olivine, diopside and anorthite dissolution at ~1260 ºC. All the fits by diffusion matrix $D_{1260°C}$ for 9 diffusion couple experiments are shown by solid curves in Figs. 5.2–5.10. It can be seen from those figures that diffusion profiles in both diffusion couple and mineral dissolution experiments are well reproduced by this diffusion matrix $D_{1260°C}$. The goodness of fit for diffusion couple experiments is slightly compromised, but the fits for mineral dissolution are excellent with χ^2 = 2.2, 0.8 and 1.4 respectively. Eigenvectors of $D_{1260°C}$ are very similar to those of $D^{\text{couples}}_{1260°C}$, with the only difference in that v_5 is largely due to the exchange between FeO+MgO and CaO.

Diffusion matrices $D_{1260°C}$ and $D^{\text{couples}}_{1260°C}$ are significantly different by comparing the shape of frequency of $T^{\text{couples}}_{ij} = \frac{D^{\text{couples}}_{ij} - \mu_{ij}}{\sigma^{\text{couples}}_{ij}}$ and $T_{ij} = \frac{D_{ij} - \mu_{ij}}{\sigma_{ij}}$ (where μ_{ij} is the weighted average of D^{couples}_{ij} and D_{ij}) and the shape of frequency calculated by a standard normal distribution shown in Fig. 5.24. Diffusion matrix $D_{1260°C}$ is preferred since it is constrained by more data and can fit diffusion profiles of both diffusion couple and mineral dissolution experiments.

5.8.2 Diffusion matrix $D_{1500°C}$

Diffusion matrix $D_{1500°C}$ obtained by incorporating mineral dissolution experiments at ~1500 ºC is shown in Table 5.5, together with its eigenvalues and eigenvectors. The solid curves in Fig. 5.23 are the fit curves for anorthite dissolution at ~1500 ºC. All the fits by diffusion matrix $D_{1500°C}$ for all 9 diffusion couple experiments are shown by solid curves in Figs. 5.11–5.19. It can be seen from those figures that diffusion profiles in both diffusion couple and anorthite dissolution experiment are well reproduced by this diffusion matrix $D_{1500°C}$.

Eigenvectors of $D_{1500°C}$ are the same as those of $D_{1500°C}^{couples}$.

Table 5.5 Diffusion matrix $D_{1500°C}$, obtained by fitting both diffusion couple and mineral dissolution experiments at ~1500 ºC, with 1σ errors for each element, and eigenvalues and eigenvectors.

$D_{1500°C}$ ($\mu m^2/s$)	TiO_2	Al_2O_3	FeO	MgO	CaO	Na_2O	K_2O
TiO_2	16.22±0.87	–0.40±0.26	–4.47±0.77	0.03±0.98	–6.99±1.08	–8.46±3.50	–5.70±1.38
Al_2O_3	–3.99±1.49	16.66±0.57	–15.91±1.75	–17.42±2.47	–33.68±2.44	–96.67±8.30	–60.43±3.66
FeO	–28.03±2.36	–10.80±1.04	53.44±2.73	–91.28±3.27	–65.83±3.11	–117.14±9.61	–104.18±4.22
MgO	–5.15±1.58	1.97±0.68	–26.37±1.89	71.48±2.48	–47.70±2.06	–83.74±6.51	–27.26±2.99
CaO	–3.35±1.47	–13.13±0.64	–14.86±1.68	–18.27±2.11	94.31±1.87	–13.85±5.17	53.12±2.55
Na_2O	34.98±3.97	28.30±1.44	78.42±3.49	83.94±2.22	132.87±4.03	569.01±16.87	179.85±4.79
K_2O	7.78±0.79	3.53±0.22	4.66±0.69	24.16±0.90	24.85±0.79	24.99±2.09	132.68±1.71
Eigenvalues	λ_1	λ_2	λ_3	λ_4	λ_5	λ_6	λ_7
	13.95						
		20.04					
			32.98				
				83.13			
					118.66		
						144.94	
							540.11
7-component Eigenvectors	v_1	v_2	v_3	v_4	v_5	v_6	v_7
TiO_2	–0.76	–0.28	–0.20	–0.02	–0.05	–0.02	–0.01
Al_2O_3	0.15	0.94	–0.16	–0.05	–0.07	–0.09	–0.17
FeO	–0.53	0.06	0.76	0.85	0.34	–0.47	–0.20
MgO	–0.20	0.00	0.42	–0.13	–0.61	–0.13	–0.16
CaO	–0.20	0.18	0.35	–0.43	0.67	0.71	–0.01
Na_2O	0.16	–0.07	–0.19	–0.08	–0.19	–0.27	0.95
K_2O	0.12	–0.04	–0.16	0.25	0.13	0.41	0.04
8-component Eigenvectors	v_1	v_2	v_3	v_4	v_5	v_6	v_7
SiO_2	0.79	–0.62	–0.64	–0.36	–0.22	–0.12	–0.40
TiO_2	–0.47	–0.22	–0.15	–0.02	–0.05	–0.02	–0.01
Al_2O_3	0.09	0.74	–0.13	–0.05	–0.07	–0.09	–0.15
FeO	–0.33	0.04	0.59	0.80	0.34	–0.47	–0.19
MgO	–0.12	0.00	0.32	–0.12	–0.60	–0.13	–0.15
CaO	–0.12	0.14	0.27	–0.41	0.66	0.71	–0.01
Na_2O	0.10	–0.05	–0.15	–0.08	–0.18	–0.27	0.87
K_2O	0.07	–0.03	–0.12	0.23	0.12	0.40	0.04

See footnote on Table 5.2 for the expression of each eigenvector in 8-component space.

Diffusion matrices $D_{1500°C}$ and $D_{1500°C}^{couples}$ are not significantly different shown in Fig. 5.24. Diffusion matrix $D_{1500°C}$ is preferred since it is constrained by more data and can fit diffusion profiles of both diffusion couple and mineral dissolution experiments.

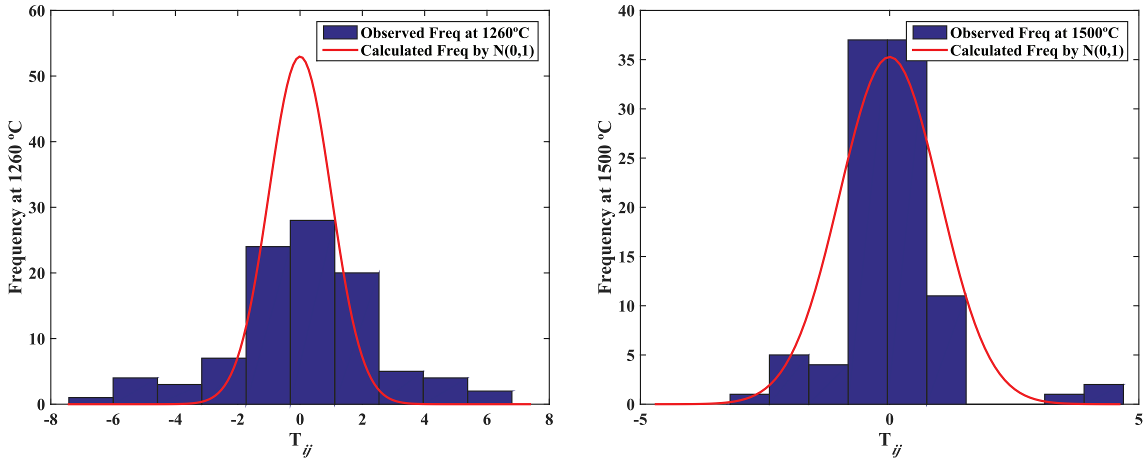

Fig. 5.24. Comparison of observed frequency and calculated frequency by a standard normal distribution.

5.9 Diffusion mechanism in basaltic melts

Diffusion mechanisms in basaltic melts at different temperatures are summarized in Table 5.6, where diffusion mechanism at 1350 ºC is from Guo and Zhang (2017). It can be seen that diffusion mechanism is insensitive to temperature: v_1 is largely due to the exchange between SiO_2 and all other components for all 3 temperatures; v_2 is largely due to the exchange between SiO_2 and Al_2O_3 for all 3 temperatures; v_3 is due to the exchange of FeO+MgO+CaO with all other components for all 3 temperatures; v_4 is due to the exchange of FeO+K_2O with all other components for all 3 temperatures; v_5 is largely due to the exchange between divalent oxides themselves for all 3 temperatures; v_6 is due to the exchange of CaO+K_2O with all other components for all 3 temperatures; and v_7 is due to the exchange of Na_2O (and very minor K_2O) with all other components for all 3 temperatures.

One may classify the diffusion mechanism in basaltic melts into 5 categories: (1) the exchange between network-formers, such as SiO_2 – Al_2O_3; (2) the exchange of divalent oxide components with all other components, such as (FeO+MgO+CaO) – (all others); (3) the exchange of a divalent oxide component plus a monovalent oxide component with all other components, such as (FeO+K_2O) – (all others) and (CaO+K_2O) – (all others); (4) the exchange between divalent oxide components themselves, such as (FeO+MgO) – CaO and (FeO+CaO) – MgO; (5) the exchange of a monovalent oxide component with all other components, such as Na_2O – (all others).

Table 5.6 Multicomponent diffusion mechanism in basaltic melts at 1260, 1350 and 1500 ºC.

λ	v	Exchanging species at 1260 ºC	Exchanging species at 1350 ºC	Exchanging species at 1500 ºC
λ_1	v_1	SiO_2 – (all others)	SiO_2 – (all others)	SiO_2 – (all others)
λ_2	v_2	SiO_2 – Al_2O_3	SiO_2 – Al_2O_3	SiO_2 – Al_2O_3
λ_3	v_3	(FeO + MgO + CaO) – (all others)	(FeO + MgO + CaO) – (all others)	(FeO + MgO + CaO) – (all others)
λ_4	v_4	(FeO + K_2O) – (all others)	(FeO + K_2O) – (all others)	(FeO + K_2O) – (all others)
λ_5	v_5	(FeO + MgO) – CaO	(FeO + CaO) – MgO	(FeO + CaO) – MgO
λ_6	v_6	(CaO + K_2O) – (all others)	(CaO + K_2O) – (all others)	(CaO + K_2O) – (all others)
λ_7	v_7	Na_2O – (all others)	Na_2O – (all others)	Na_2O – (all others)

Note: the sequence of eigenvalues is not in any particular order.

5.10 Temperature dependence of diffusion matrix

The rigorous examination of temperature dependence of diffusion matrix consists of two parts: temperature dependence of eigenvalues and temperature dependence of eigenvectors. However, by examining eigenvectors of diffusion matrices at different temperatures (Table 5.3 for 1260 ºC, Table 4.5 for 1350 ºC, and Table 5.5 for 1500 ºC), it is found that eigenvectors at 3 different temperatures are very similar, which indicates that eigenvectors of diffusion matrix are insensitive to temperature. Therefore, to simplify the treatment, we assume that eigenvectors of diffusion matrix is invariant with temperature at the temperature range from 1260 ºC to 1500 ºC.

The invariant eigenvectors are estimated by taking the weighted average of eigenvectors at 3 different temperatures. The weights for eigenvectors at each temperature are chosen as the inverse exponential of reduced chi-squares in fitting at each temperature (Edwards, 1972). Note that the sequence or signs of eigenvectors are not fixed, and therefore some eigenvectors need to be multiplied by –1 before taking the average. The estimated invariant eigenvectors, denoted as P, are shown in Table 5.7.

Table 5.7 Temperature dependence of eigenvalues [λ(T)] and the invariant eigenvectors [P].

Eigenvalues [λ(T)]	λ_1	λ_2	λ_3	λ_4	λ_5	λ_6	λ_7
	$e^{13.752-19636/T}$						
		$e^{14.737-20912/T}$					
			$e^{14.897-19987/T}$				
				$e^{12.375-13880/T}$			
					$e^{15.063-18569/T}$		
						$e^{15.083-18279/T}$	
							$e^{12.180-10808/T}$
Invariant eigenvectors [P]	v_1	v_2	v_3	v_4	v_5	v_6	v_7
TiO_2	–0.76	–0.20	–0.18	–0.02	–0.02	–0.02	–0.02
Al_2O_3	–0.18	0.97	–0.47	–0.15	–0.01	–0.07	–0.10
FeO	–0.51	0.00	0.66	0.86	0.06	–0.41	–0.36
MgO	–0.17	–0.03	0.41	–0.14	–0.71	–0.32	–0.15
CaO	–0.22	0.12	0.33	–0.33	0.70	0.79	–0.08
Na_2O	0.17	–0.04	–0.18	–0.12	–0.04	–0.19	0.91
K_2O	0.13	–0.02	–0.09	0.32	–0.10	0.25	0.06

Note: temperature is in K, and λ is in $\mu m^2/s$. The invariant eigenvectors [*P*] is represented in 7-component vector space.

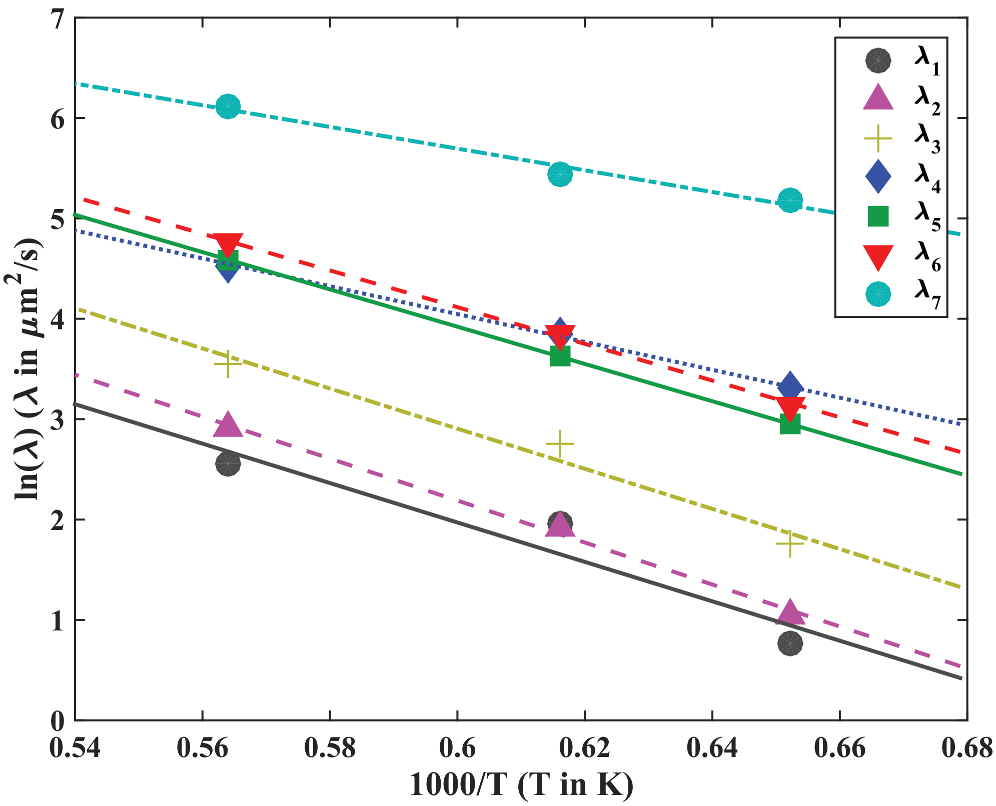

Fig. 5.25 Temperature dependence of eigenvalues, obtained with the fixed invariant eigenvectors [*P*] in Table 5.7, with fits by Arrhenius relation.

Eigenvalues at each temperature were re-calculated by re-fitting diffusion profiles of both diffusion couple and mineral dissolution experiments by fixing eigenvectors as the invariant eigenvectors *P*. The obtained eigenvalues are shown in Fig. 5.25, and can be fit by Arrhenius relation $\lambda = \lambda_0 \cdot e^{-E/RT}$, where λ is in μm^2/s, *E* is activation energy in kJ/mol and *T* is temperature in K. The fit temperature dependence of eigenvalues is shown in Table 5.7, with the largest activation energy of 174 kJ/mol for the exchange between SiO_2 and Al_2O_3 (λ_2) and the smallest activation energy of 90 kJ/mol for the exchange of Na_2O with all other components (λ_7). The activation energies for both λ_1 and λ_2 are similar to that for self diffusion of SiO_2 in a basaltic melt at 1 GPa (e.g., Lesher et al., 1996). The activation energy for λ_7 is similar to that for tracer diffusion of Li_2O, Na_2O and Cu_2O (Zhang et al., 2010; Ni et al., 2016, 2017). The average activation energy is 145 kJ/mol, which was used for correcting experimental temperatures.

Therefore, diffusion matrix at any temperature *T* can be calculated:

$$[D] = [P] \cdot [\lambda(T)] \cdot [P^{-1}], \qquad (5.1)$$

where [*D*] is diffusion matrix in μm^2/s, [*P*] is a matrix of the invariant eigenvectors in Table 5.7 and [λ(*T*)] is a diagonal matrix of eigenvalues with Arrhenius relation in Table 5.7.

5.11 Predicting diffusion profiles during mineral dissolution at different temperatures

Diffusion matrices at 1260 and 1500 ºC are calculated from eq. (5.1), and diffusion profiles in diffusion couple, olivine, diopside and anorthite dissolution experiments in basaltic melts at ~1260 and ~1500 ºC (Chen and Zhang, 2008, 2009; Yu et al., 2016) are predicted using those two diffusion matrices. This is to test the robustness of eq. (5.1). The predicted diffusion profiles are shown by long-dashed curves in Figs. 5.1–5.22, which are very similar to calculated diffusion profiles by the fit diffusion matrices $D_{1260°C}$ and $D_{1500°C}$.

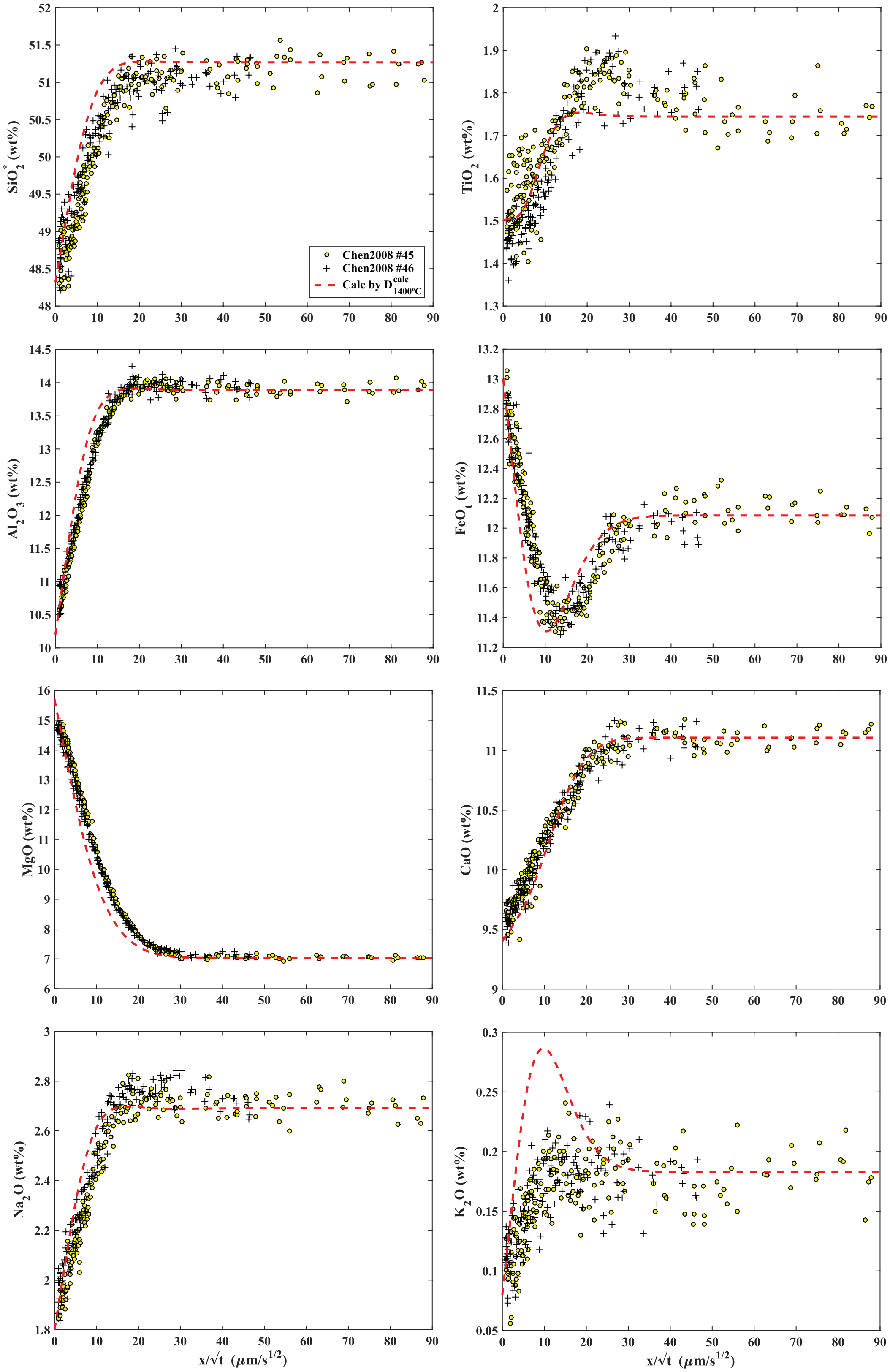

Fig. 5.26 Predicted diffusion profiles for olivine dissolution in basaltic melts at ~1400 ºC (Chen and Zhang, 2008), from calculated diffusion matrix by eq. (5.1).

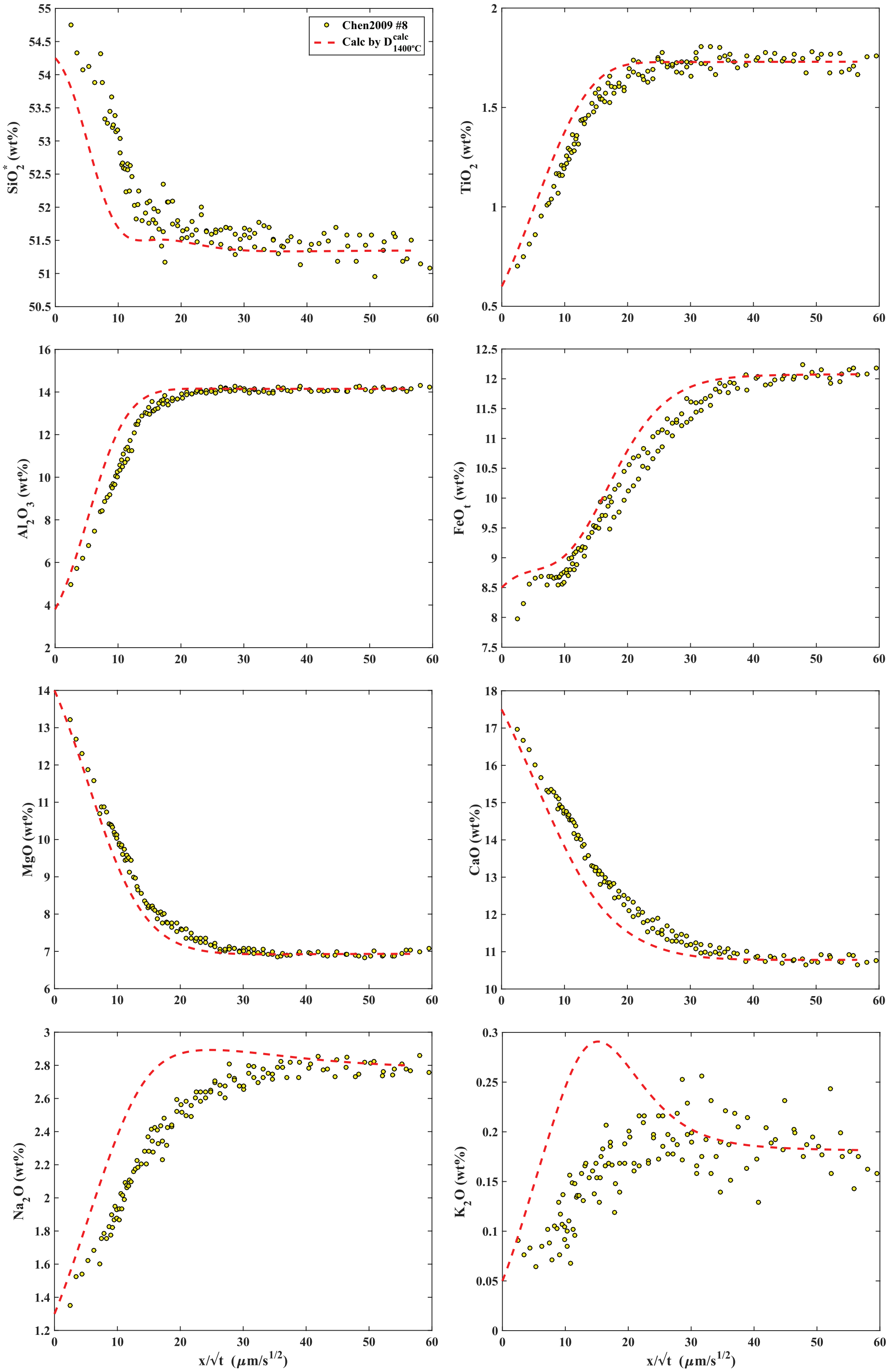

Fig. 5.27 Predicted diffusion profiles for diopside dissolution in basaltic melts at ~1400 ºC (Chen and Zhang, 2008), from calculated diffusion matrix by eq. (5.1).

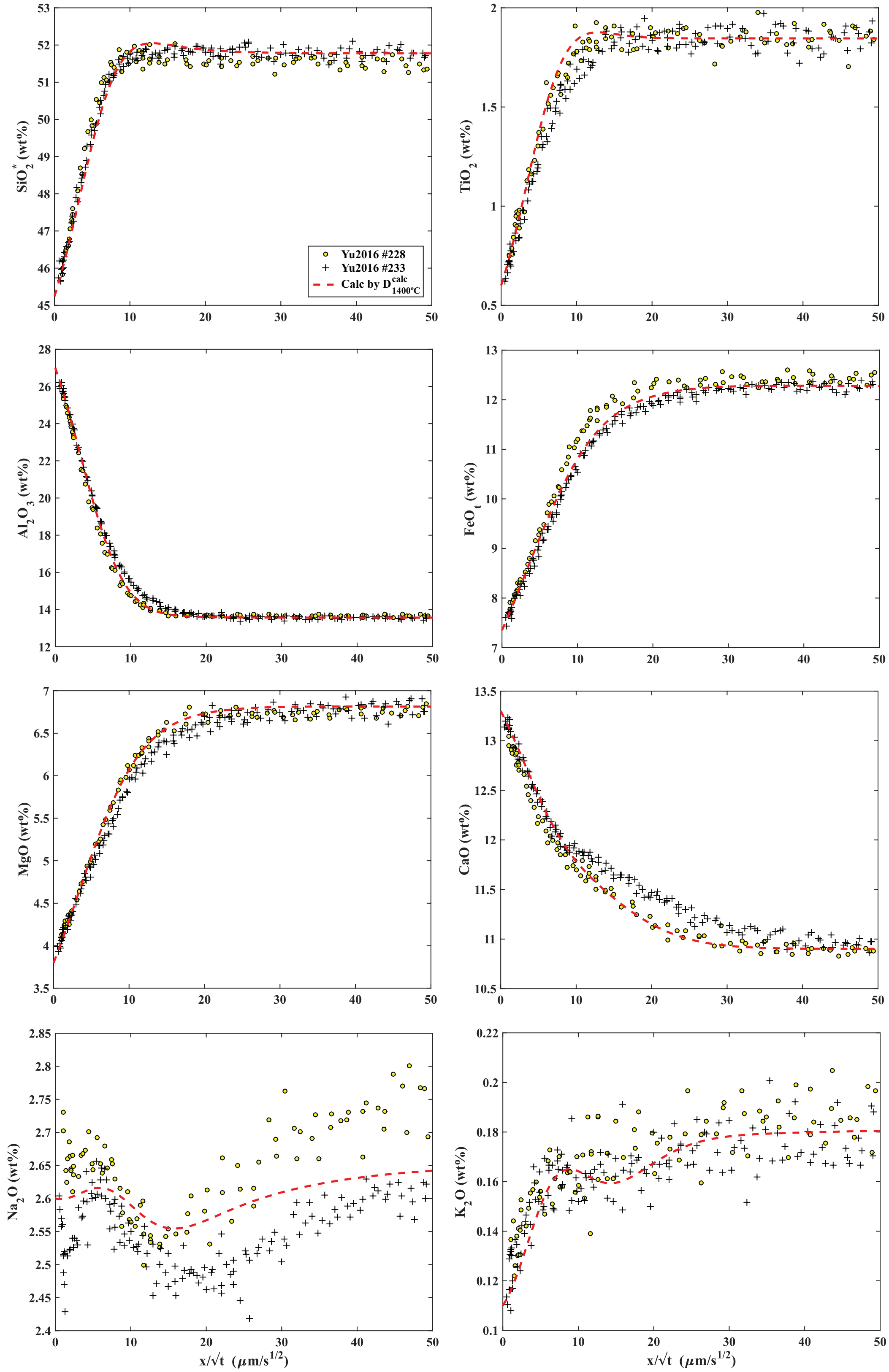

Fig. 5.28 Predicted diffusion profiles for anorthite dissolution in basaltic melts at ~1400 ºC (Yu et al., 2016), from calculated diffusion matrix by eq. (5.1).

Diffusion matrix at 1400 ºC is also calculated from eq. (5.1), and diffusion profiles during olivine and anorthite dissolution at ~1400 ºC (Chen and Zhang, 2009; Yu et al., 2016) are predicted and shown in Figs. 5.26–5.28 by long-dashed curves. The predicted diffusion profiles during olivine and diopside dissolution are slightly shorter than that of experimental data, but the shapes are well predicted. The predicted diffusion profiles during anorthite dissolution and experimental data match well in both diffusion distance and profile shapes.

5.12 Comparisons with previous works

Other diffusion matrices reported in literatures are for simpler systems, and therefore no direct comparison can be made. However, the 7 × 7 diffusion matrices in 8-component system from this study, such as diffusion matrix in Table 5.3 for 1260 ºC, diffusion matrix in Table 5.5 for 1500 ºC and diffusion matrix calculated at any temperature from eq. (5.1), can be compared indirectly with diffusion matrices in literatures for simpler system, by retaining rows and columns of the common components. For example, Guo and Zhang (2016) reported a 6 × 6 diffusion matrix for 7-component SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO–Na_2O–K_2O system. No similarity is found between this matrix and the matrix generated by crossing out row and column of FeO component in diffusion matrix in Table 5.5. One explanation is that absence of FeO versus presence of FeO with 11.5±1.5 wt% has a significant effect on the diffusion matrix, especially on the eigenvalue of Na_2O exchange with other components.

Furthermore, diffusion mechanism inferred by eigenvectors of diffusion matrix can also be compared. It is shown that the slowest eigenvector is due to the exchange between SiO_2 and Al_2O_3 in simple systems (Sugawara et al. 1977; Oishi et al., 1982; Chakraborty et al., 1995;

Kress and Ghiorso, 1995; Liang et al., 1996; Mungall et al., 1998; Richter et al., 1998; Liang and Davis, 2002; Liang, 2010; Guo and Zhang, 2016) and the fastest eigenvector is due to the exchange of Na_2O with other components in Na_2O-bearing systems (Watkins et al., 2014; Claireaux et al., 2016; Guo and Zhang, 2016), which are consistent with our results. More specifically, the diffusion mechanism reported by Guo and Zhang (2016) for 7-component system is very consistent with that in Table 5.6 if FeO component is ignored. In general, agreement on diffusion mechanism is reached among different studies in different systems, but inconsistency also exists. For example, Claireaux et al. (2016) found that the slowest diffusion eigenvector is predominantly due to the exchange between Al_2O_3 and CaO, rather than between SiO_2 and Al_2O_3 in a 4-component SiO_2–Al_2O_3–CaO–Na_2O system; and Kress and Ghiorso (1995) obtained the slowest diffusion eigenvector is mainly due to the exchange of SiO_2 with FeO+CaO at 1200 ºC and the exchange between Al_2O_3 and MgO at 1300 ºC in Columbian River basalts modeled as a 6-component SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO system. The inconsistencies are not readily explained, but uncertainty in diffusion matrix and difference in compositions in different systems may be possible factors.

5.13 Summary and conclusions

Diffusion profiles of 18 successful diffusion couples experiments at 1260 ºC and 0.5 GPa and at 1500 ºC and 1 GPa in an 8-component SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO–Na_2O–K_2O basaltic melts were measured by electron microprobe. Effective binary diffusion coefficients of components with monotonic diffusion profiles were extracted and show a strong dependence on their counter-diffusing component. Diffusion matrix at each temperature was obtained by fitting diffusion profiles of both diffusion couple and mineral dissolution experiments simultaneously.

All features in diffusion profiles are well reproduced by this diffusion matrix. Diffusion mechanisms inferred from eigenvectors in basaltic melts at different temperatures are consistent. Eigenvectors of diffusion matrix are insensitive to temperature, and eigenvalues of diffusion matrices at different temperatures follow good Arrhenius relation. Temperature dependence of diffusion matrix was obtained by temperature dependence of eigenvalues with Arrhenius relation assuming invariant eigenvectors. Diffusion matrix at 1400 ºC was calculated and the predicted diffusion profiles during olivine and anorthite dissolution at 1400 ºC match well with experimental data points.

5.14 Acknowledgement

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5.15 References

Chakraborty S., Dingwell D.B. and Rubie D.C. (1995) Multicomponent diffusion in ternary silicate melts in the system K_2O–Al_2O_3–SiO_2: I. Experimental measurements. *Geochim. Cosmochim. Acta* **59**, 255–264.

Chen Y. and Zhang Y. (2008) Olivine dissolution in basaltic melt. *Geochim. Cosmochim. Acta* **72**, 4756–4777.

Chen Y. and Zhang Y. (2009) Clinodiopside dissolution in basaltic melt. *Geochim. Cosmochim. Acta* **73**, 5730–5747.

Claireaux C., Chopinet M., Burov E., Gouillart E., Roskosz M. and Toplis M (2016) Atomic mobility in calcium and sodium aluminosilicate melts at 1200 ºC. *Geochim. Cosmochim. Acta* **192**, 235–247.

Clifford A. A. (1973) *Multivariate error analysis: a handbook of error propagation and calculation in many-parameter system*. Wiley, NY.

Cooper A. R. (1968) The use and limitations of the concept of an effective binary diffusion coefficient for multi-component diffusions. In *Mass Transport In Oxides*, (ed. J.B. Wachman and A.D. Franklin), Nat. Bur. Stand. Spec. Publ. **296**, 79–84.

Edwards A. W. F. (1972) *Likelihood*. Cambridge University Press.

Fletcher R. (1971) *A modified Marquardt subroutine for nonlinear least squares*. Atomic Energy Research Establishment R6799, Harwell, England.

Guo C. and Zhang Y. (2016) Multicomponent diffusion in silicate melts: SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO–Na_2O–K_2O system. *Geochim. Cosmochim. Acta* **195**, 126–141.

Guo C. and Zhang Y. (2017) Multicomponent diffusion in basaltic melts at 1350 ºC. *Geochim. Cosmochim. Acta* in revision.

Koyaguchi T. (1985) Magma mixing in a conduit. *J. Volcanol. Geotherm. Res.* **25**, 365–369.

Koyaguchi T. (1989) Chemical gradient at diffusive interfaces in magma chambers. *Contrib. Mineral. Petrol.* **103**, 143–152.

Kress V. C. and Ghiorso M. S. (1993) Multicomponent diffusion in MgO–Al_2O_3–SiO_2 and Cao–MgO–Al_2O_3–SiO_2 melts. *Geochim. Cosmochim. Acta* **57**, 4453–4466.

Kress V. C. and Ghiorso M.S. (1995) Multicomponent diffusion in basaltic melts. *Geochim. Cosmochim. Acta* **59**, 313–324.

Lesher C. E., Hervig R. L. and Tinker D. (1996) Self diffusion of network formers (silicon and oxygen) in naturally occurring basaltic liquid. *Geochim. Cosmochim. Acta* **60**, 405–413.

Liang Y., Richter F. M. and Watson E. B. (1994) Convection in multicomponent silicate melts driven by coupled diffusion. *Nature* **369**, 390–392.

Liang Y. (2010) Multicomponent diffusion in molten silicates: Theory, experiments, and geological application. *Rev. Mineral. Geochem.* **72**, 409–446.

Mungall J. E., Romano C. and Dingwel D. B. (1998) Multicomponent diffusion in the molten system K_2O–Na_2O–Al_2O_3–SiO_2–H_2O. *Am. Mineral.* **83**, 685–699.

Ni P. and Zhang Y (2016) Cu diffusion in a basaltic melt. *Am. Mineral.* **101**, 1474–1482.

Ni P., Zhang Y., Simon A. and Gagnon J. (2017) Cu and Fe diffusion in rhyolitic melts during chalcocite "dissolution": Implications for porphyry ore deposits and tektites. *Am. Mineral.* **102**, 1287–1301.

Oishi Y., Nanba M. and Pask J. A. (1982) Analysis of liquid–state interdiffusion in the system CaO–Al_2O_3–SiO_2 using multiatomic ion models. *J. Am. Ceram. Soc.* **65**, 247–253.

Oldenburg C. M., Spera F. J., Yuen D. A., and Sewell G. (1989) Dynamic mixing in magma bodies: Theory, simulations and implications. *J. Geophys. Res.* **94**, 9215–9236.

Richter F. M., Liang Y. and Minarik W.G. (1998) Multicomponent diffusion and convection in molten MgO–Al_2O_3 –SiO_2. *Geochim. Cosmochim. Acta* **62**, 1985–1991.

Sato H. (1975) Diffusion coronas around quartz xenocrysts in andesite and basalt from Tertiary Volcanic Region in northeastern Shikoku, Japan. *Contrib. Mineral. Petrol.* **50**, 49–64.

Sugawara H., Nagata K. and Goto K. S. (1977) Interdiffusivities matrix of CaO–Al_2O_3–SiO_2 melt at 1723 K to 1823 K. *Metall. Trans. B* **8**, 605–612.

Trial A. F. and Spera F. J. (1994) Measuring the multicomponent diffusion matrix: Experimental design and data analysis for silicate melts. *Geochim. Cosmochim. Acta* **58**, 3769–3783.

Turner J. S. (1985) Multicomponent convection. *Ann. Rev. Fluid Mech*. **17**, 11–44.

Watson E.B. (1982) Basalt contamination by continental crust: Some experiments and models. *Contrib. Mineral. Petrol.* **80**, 73–87.

Watkins J. M., Liang Y., Richter F., Ryerson F. J. and DePaolo D. J. (2014) Diffusion of multi-isotopic chemical species in molten silicates. *Geochim. Cosmochim. Acta* **139**, 313–326.

Yu Y., Zhang Y., Chen. Y. and Xu Z. (2016) Kinetics of anorthite dissolution in basaltic melt. *Geochim. Cosmochim. Acta* **179**, 257–274.

Zhang Y. and Behrens H. (2000) H_2O diffusion in rhyolitic melts and glasses. *Chem. Geol.* **169**, 243–262.

Zhang Y., Walker D. and Lesher C. E. (1989) Diffusive crystal dissolution. *Contrib. Mineral. Petrol.* **102**, 492–513.

CHAPTER VI

Conclusions

6.1 General conclusions

Chemical diffusion profiles of diffusion couple experiments, in 7-component SiO_2–TiO_2–Al_2O_3–MgO–CaO–Na_2O–K_2O haplobasaltic melts at ~1500 ºC and 1 GPa and in 8-component SiO_2–TiO_2–Al_2O_3–FeO–MgO–CaO–Na_2O–K_2O basaltic melts at ~1260 ºC and 0.5 GPa, at ~1350 ºC and 1 GPa and at ~1500 ºC and 1 GPa, are determined.

Effective binary diffusion coefficients (EBDC) of components with monotonic diffusion profiles in each experiment are extracted and are strongly dependent on the concentration gradients of their counter-diffusing components, especially for SiO_2. That means extra care should be taken when EBDC's are applied, because they depends on not only the melt composition but also the melt compositional gradients. It may also potentially mean that results reported by previous works in literature based on experimentally determined EBDC's should be re-evaluated to check the conditions under which those EBDC's can be applied.

More importantly, multicomponent diffusion matrix in haplobasaltic and basaltic melts at each temperature is obtained by simultaneously fitting diffusion profiles of both diffusion couple experiments in this study and mineral dissolution experiments in the literature, and all features in the diffusion profiles have been captured by the diffusion matrix. Diffusion mechanisms inferred from eigenvectors of diffusion matrices in haplobasaltic and basaltic melts at different temperatures are reasonable and consistent with each other and previous works (e.g. Liang, 2010). Eigenvectors of diffusion matrix are insensitive to temperature, and eigenvalues of diffusion matrices at different temperatures follow good Arrhenius relation. Temperature dependence of diffusion matrix in basaltic melts is obtained by assuming eigenvectors to be independent of temperature and eigenvalues to follow Arrhenius relation, from which diffusion matrix in basaltic melts at any temperature can be calculated by eq. (5.1). The calculate diffusion matrix at 1400 ºC is successfully applied to predict diffusion profiles during olivine and anorthite dissolution at ~1400 ºC.

Therefore, it is verified that given the electron microprobe precision, when the number of diffusion couple experiments is the same as or more than the number of independent components with each diffusion couple experiment designed as an "interdiffusion" between two components, the diffusion matrix can be obtained and applied to mineral dissolution. Furthermore, it is suggested that the calculated diffusion matrix by eq. (5.1) is potentially applicable to more silicic melts such as andesitic melts, because of the success in predicting diffusion profiles during mineral dissolution in basaltic melts with a large concentration variation with 47–53 wt% SiO_2, 8–34 wt% Al_2O_3, 4–13 wt% FeO and 2–13 wt% MgO.

With the multicomponent diffusion matrix at any temperature, diffusion profiles during multicomponent diffusion in basaltic melts are readily obtained, without using the approximation of effective binary diffusion treatment. Although multicomponent diffusion in basaltic melts has been successfully solved, there are limitations in its applications. The predictions of K_2O diffusion profiles during mineral dissolution are not good, the reason to which is not readily explained, but it may be due to the composition dependence of diffusion matrix on K_2O

concentration (1.5 wt% K_2O in the experiments vs. 0.17 wt% K_2O in natural basaltic melts, with almost a factor of 10), or may be due to the unresolved diffusion effect of other components on K_2O. The temperature range of the diffusion matrix is from 1260 to 1500 ºC, and therefore it remains to be determined whether temperature can be extrapolated to lower temperature such as 1000–1100 ºC for the partial melting of mantle at subduction zones. The experiments were conducted in anhydrous basaltic melts, and therefore the effect of water on multicomponent diffusion is not determined. Iron in those basaltic melts is most ferrous iron and treated as one FeO component instead of two components (FeO and Fe_2O_3), and therefore it may have potential issues when the diffusion matrix is applied to more oxidized basaltic melts, such as arc basaltic melts. Furthermore, the diffusion matrix is obtained specifically for basaltic melts and therefore it may not be applicable to more silicic melts, such as rhyolitic melts, because diffusion matrix is also dependent on the melt composition at least in a simple SiO_2–Al_2O_3–CaO silicate melts (e.g. Liang et al., 1996).

6.2 Geological applications

The obtained diffusion matrix by eq. (5.1) can be applied to predict the diffusion profiles of any natural processes involving mass transfer in basaltic melts at different time scales. Magma evolution in the Earth lithosphere from its generation by partial melting to its solidification by volcanic eruption is one of the many natural processes that can be better understood using the multicomponent diffusion simulation.

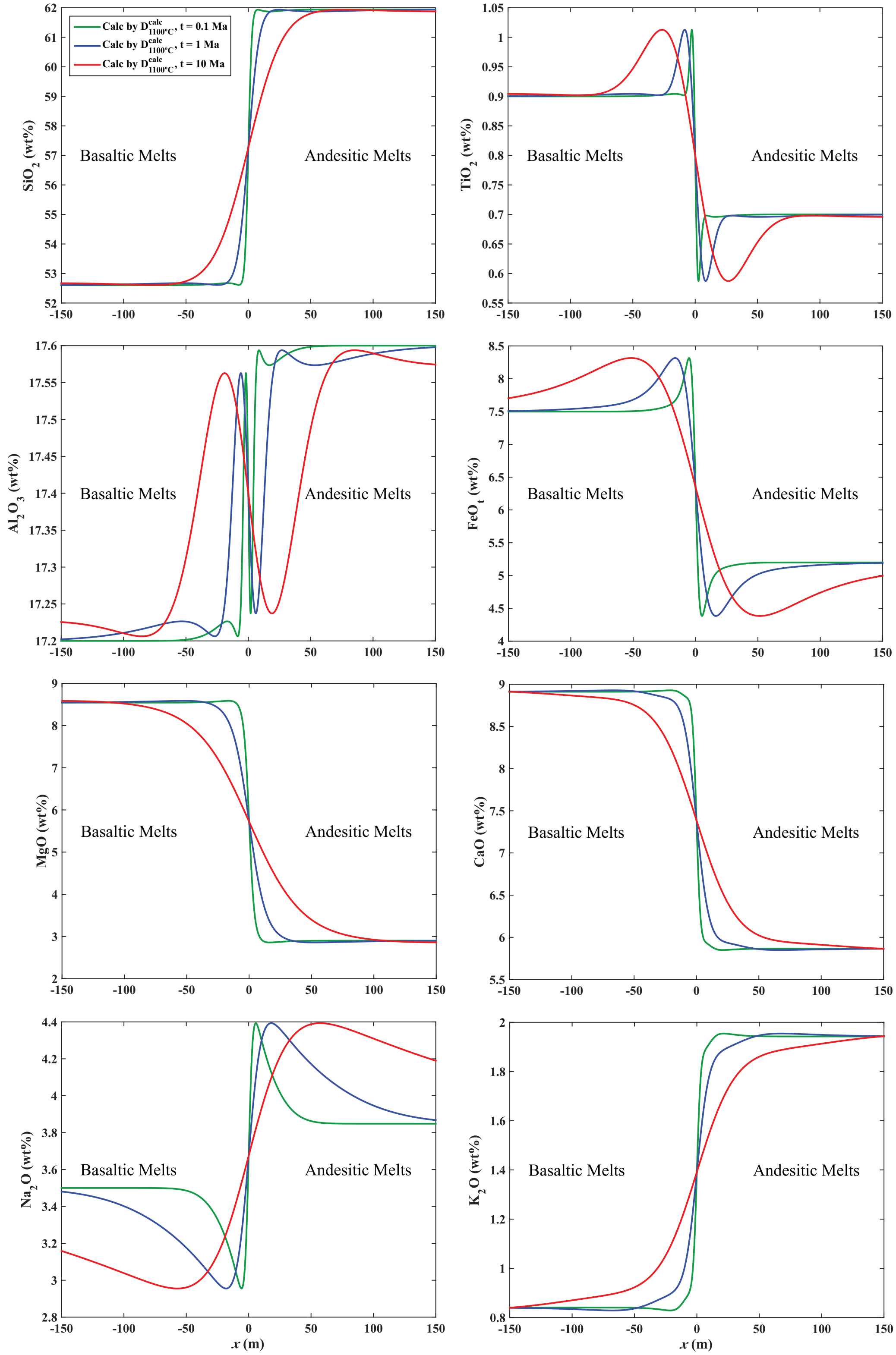

Fig. 6.1 Simulation for magma mixing between basaltic and andesitic melts, using the average compositions of basaltic and andesitic rocks in the Tancítaro-Nueva Italia region of the central Mexican arc at the subduction zone (Ownby et al., 2011) as two end members, is conducted, with the assumption of a constant diffusion matrix at ~1100 ºC, and the calculated diffusion profiles are shown for different time scales from 0.1 to 10 Ma.

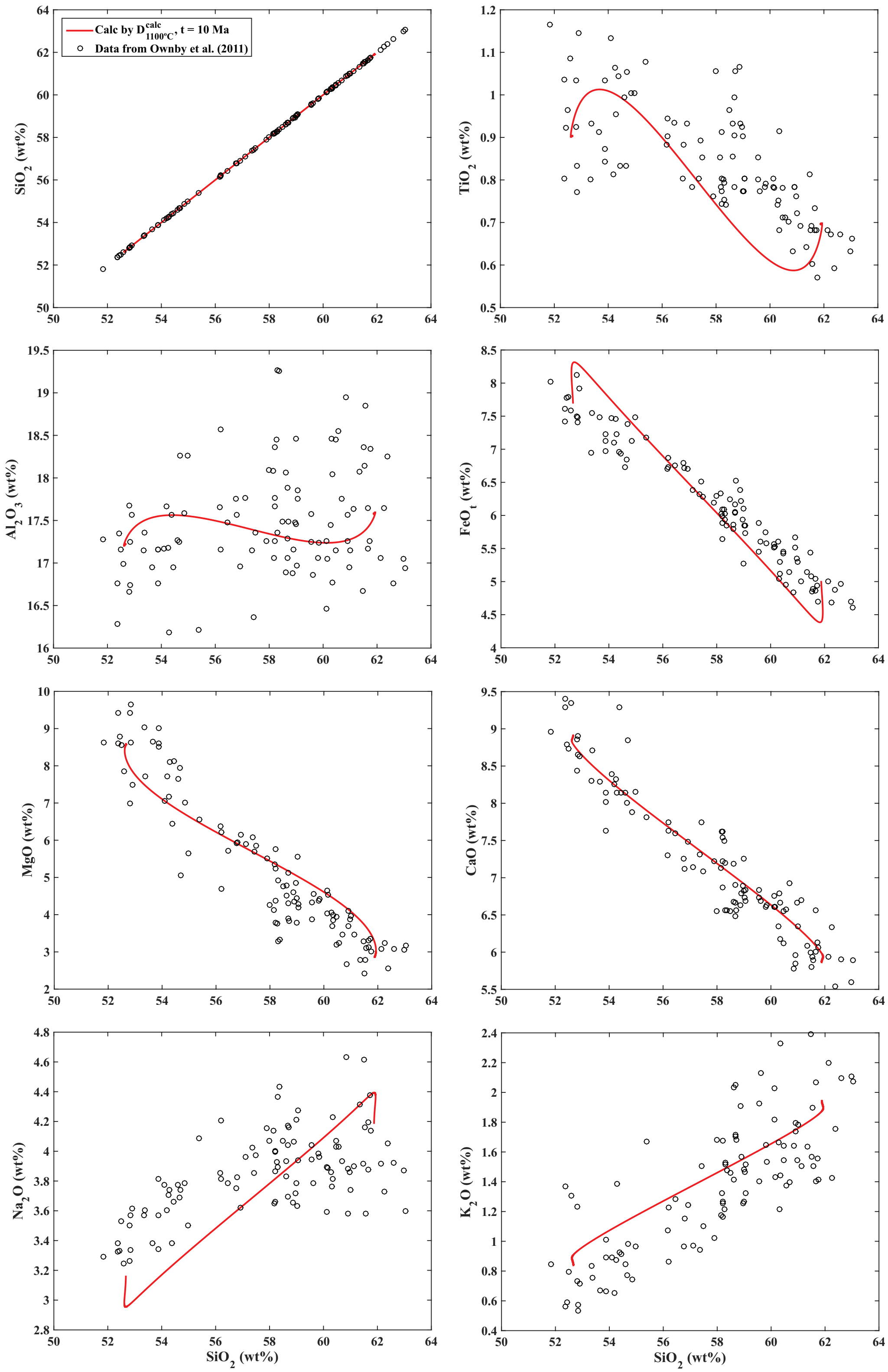

Fig. 6.2 Hacker diagram for the simulation of magma mixing between basaltic and andesitic melts, for the time scale of 10 Ma shown in Fig. 6.1.

For example, the magma evolution in mid-ocean ridges (Fig. 1.1) by fractional crystallization can be modeled by mineral growth in basaltic melts, at a typical temperature of ~1200 ºC at the base of oceanic lithosphere. However, diffusion profiles during mineral growth cannot be readily predicted due to lack of thermodynamic data to calculate the interface melt composition that is in equilibrium with olivine, pyroxene or plagioclase from chemical potentials of oxides in silicate melts. Furthermore, the magma evolution at subduction zones (Fig. 1.2) by magma recharging and mixing can be modeled as diffusion between two melts with different compositions in a temperature range of 1000–1100 ºC. A simulation for magma mixing using the average compositions of basaltic and andesitic melts as two end members in the Tancítaro-Nueva Italia region of the central Mexican arc at the subduction zone (Ownby et al., 2011) is conducted, with the assumption of a constant diffusion matrix at ~1100 ºC, and the calculated diffusion profiles are shown in Fig. 6.1 for different time scales from 0.1 to 10 Ma, with diffusion distance on the order of one to ten meters. However, the time scale for magma mixing in this case cannot be obtained due to a low spatial resolution of collected samples from the field. Hacker diagrams for the simulation at time scale of 10 Ma are shown in Fig. 6.2, and the simulated compositional variation during magma mixing roughly match the data from Ownby et al., (2011). If magma is erupted, the time scales of magma recharging and mixing can be recorded by diffusion profiles (similar to those in Fig. 6.1).

This dissertation provides the first quantitative calculation of diffusion profiles in some natural processes from experimental data, such as magma mixing and mineral dissolution in magma. It could potentially modify or even revise the traditional way of understanding and calculating diffusion in natural processes, especially that in previous works based on experimentally determined effective binary diffusion coefficients, where multicomponent diffusion treatment should be used rather than effective binary diffusion treatment.

6.3 Perspectives and future works

More studies are required to fully understand the multicomponent diffusion in silicate melts. (1) Although diffusion matrix in basaltic melts is obtained, K_2O profiles during mineral dissolution is not predicted, which requires more experiments designed for diffusion effect of other components on K_2O at a lower concentration (0.2 wt%). (2) The temperature range is from 1260 to 1500 ºC, and whether it can be extrapolated to lower temperature needs to be verified by partial melting experiments. (3) The effect of water and ferric iron needs to be determined by diffusion couple experiments in hydrous and oxidized basaltic melts, where water can be measured by FTIR and the ferric/ferrous ratio can be measured by XANES. (4) More importantly, the compositional dependence of diffusion matrix needs to be understood for its further application to magma mixing between basaltic and rhyolitic melts. That requires the understanding of multicomponent diffusion in rhyolitic melts, and mixing between basaltic and rhyolitic melts can be calculated by a compositional-dependent diffusion matrix.

6.4 References

Liang Y. (2010) Multicomponent diffusion in molten silicates: Theory, experiments, and geological application. *Rev. Mineral. Geochem.* **72**, 409–446.

Liang Y., Richter F. M. and Watson E. B. (1996) Diffusion in silicate melts: II. multicomponent diffusion in $CaO–SiO_2–Al_2O_3$ at 1500°C and 1GPa. *Geochim. Cosmochim. Acta* **60**, 5021–5035.

Ownby S., Lange R., Hall C. and Delgado-Granados H. (2011) Origin of andesite in the deep curst and eruption rates in the Tancítaro-Nueva Italia region of the central Mexican arc. *Geol. Soc. Am. Bull.* **123**, 274–294.

APPENDIX A

Analytical Solutions to Multicomponent Diffusion Problems

A1. Analytical Solution to Multicomponent Diffusion for Diffusion Couple

Diffusion in an n-component system can be described by a diffusion matrix [D]. In a mass-fixed frame of reference, when the melt density variation is negligible, without sink or generation, the non-convective multicomponent diffusion equation (e.g. Onsager, 1945; de Groot and Mazer, 1962) is:

$$\frac{\partial w_i}{\partial t} = \sum_{j=1}^{n-1} \nabla (D_{ij} \nabla w_j) \tag{A1}$$

where t is the time, w_i is the concentration (in mass fraction or wt%) of component i, and D_{ij} are elements of a $(n-1) \times (n-1)$ diffusion matrix [D] with component n treated as the dependent component.

With the assumption that the elements of the diffusion matrix do not change within the composition range, for infinite diffusion couple in one dimension, defining the interface as $x = 0$, diffusion equation (A1) can be simplified to:

$$\frac{\partial w}{\partial t} = [D] \frac{\partial^2 w}{\partial x^2} . \tag{A2}$$

with the initial condition of

$$w\big|_{t=0, x<0} = w_{-\infty} \text{ and } w\big|_{t=0, x>0} = w_{+\infty} , \tag{A3}$$

and the boundary conditions of

$$w\big|_{x=-\infty} = w_{-\infty} \text{ and } w\big|_{x=+\infty} = w_{+\infty} \text{ at } t > 0, \tag{A4}$$

where x is the distance from the interface $x = 0$, w is a column vector of concentrations (in mass fraction wt%), $w_{-\infty}$ and $w_{+\infty}$ are column vectors representing far-field concentrations on the left and right sides respectively.

The analytical solution to diffusion equations (eqs. A2–A4) is (Trial and Spera, 1994; Liang, 2010):

$$w = \frac{w_{-\infty} + w_{+\infty}}{2} + [P][\Lambda][P^{-1}] \cdot \frac{w_{+\infty} - w_{-\infty}}{2}, \tag{A5}$$

where $[\Lambda]$ is a diagonal matrix with diagonal elements $\Lambda_{ii} = erf\left(x / \sqrt{4\lambda_i t}\right)$ and $\Lambda_{ij} = 0$ when $i \neq j$, λ_i's are the eigenvalues of $[D]$, and columns of $[P]$ are the eigenvectors of $[D]$. The solution is used to fit experimental concentration profiles.

A2. Analytical Solution for Multicomponent Diffusion during Mineral Dissolution

Denote the crystal dissolution rate as u_c, and the melt growth rate is $u = (\rho_c / \rho_m) \cdot u_c$, where r_c and r_m are crystal and melt density (Zhang, 2008). Diffusion in the melt is a moving boundary problem.

Assume that the melt density and elements of the diffusion matrix do not vary within the compositional range. For one-dimensional crystal dissolution in a semi-infinite melt medium, defining crystal-melt interface as $x = 0$ (i.e., using a crystal-melt interface-fixed frame of reference for this moving boundary diffusion problem), multicomponent diffusion in the melt can be described as (Zhang et al., 1989; Liang, 1999, 2000)

$$\frac{\partial w}{\partial t} = [D]\frac{\partial^2 w}{\partial x^2} - u\frac{\partial w}{\partial x}, \tag{A6}$$

with initial condition of

$$w\big|_{t=0,\, x>0} = w_\infty, \tag{A7}$$

and boundary condition of

$$w\big|_{x=\infty} = w_\infty \text{ at } t > 0, \tag{A8}$$

$$\left([D]\frac{\partial w}{\partial x}\right)\bigg|_{x=0} = u(w_0 - w_c), \tag{A9}$$

where t is time, x is distance from the crystal-melt interface in the melt, w is a column vector of concentrations (in mass fraction wt%) in the melt, w_0 is a column vector of concentrations at the interface in the melt, w_c is a column vector of concentrations at the interface in the crystal, and w_∞ is a column vector of concentrations in the melt at the far-field.

If the interface reaction is rapid, the transition stage can be ignored and the interface melt composition w_0 is practically a constant (Zhang et al., 1989; Chen and Zhang, 2008; Yu et al., 2016). Then the dissolution can be treated as purely diffusion controlled, and the melt growth rate (Crank, 1975; Zhang et al., 1989) is

$$u = \alpha / \sqrt{t} \,. \tag{A10}$$

Equations (A6) to (A10) form the mathematical description of the diffusion problem, in which w_0 and α are unknowns to be solved. Note that u, α, t and x are scalars, w, w_0, w_c and w_∞ are column vectors, and $[D]$ is a square matrix.

Decompose $[D] = [P][\lambda][P^{-1}]$, where $[\lambda]$ is a diagonal matrix of eigenvalues, and $[P]$ is the associated eigenvector matrix. Define $C = [P^{-1}]w$, in which the diffusion of C_i is described by a single diffusion coefficient (eigenvalue) λ_i. Because w_0 (and therefore C_0) is constant, the problem can be solved as:

$$C_i = C_{i,\infty} + (C_{i,0} - C_{i,\infty}) \cdot erfc\left(\frac{x}{\sqrt{4\lambda_i t}} - \frac{\alpha}{\sqrt{\lambda_i}}\right) / \, erfc\left(-\frac{\alpha}{\sqrt{\lambda_i}}\right), \tag{A11}$$

or in matrix form:

$$C = C_\infty + [E](C_0 - C_\infty)\,, \tag{A12}$$

where $[E]$ is a diagonal matrix with:

$$E_{ii} = erfc\left(\frac{x}{\sqrt{4\lambda_i t}} - \frac{\alpha}{\sqrt{\lambda_i}}\right) / \, erfc\left(-\frac{\alpha}{\sqrt{\lambda_i}}\right), \tag{A13}$$

Replacing C in (A12) by $C = [P^{-1}]w$, leads to:

$$w = w_\infty + [P][E][P^{-1}] \cdot (w_0 - w_\infty)\,, \tag{A14}$$

which is the solution once α (appearing in $[E]$) and w_0 are known.

To obtain the full solution, we also need to solve α and w_0. For an n-component system, there are $(n\text{–}1)$ unknowns in w_0 plus one unknown α, with a total of n unknowns. Combining (A9) and (A10) leads to:

$$\left([D]\frac{\partial w}{\partial x}\right)\Bigg|_{x=0} = \frac{\alpha}{\sqrt{t}}\left(w_0 - w_c\right). \tag{A15}$$

Use solution (A14) to obtain $(\partial w/\partial x)_{x=0}$, (A15) can be written as:

$$[P][\lambda][\frac{\partial E}{\partial x}\bigg|_{x=0}][P^{-1}]\left(w_0 - w_\infty\right) = \frac{\alpha}{\sqrt{t}}\left(w_0 - w_c\right). \tag{A16}$$

where $(\partial E/\partial x)_{x=0}$ is a diagonal matrix with:

$$\frac{\partial E_{ii}}{\partial x}\bigg|_{x=0} = -\frac{e^{-\alpha^2/\lambda_i}}{\sqrt{\pi\lambda_i t}\cdot erfc\left(-\alpha/\sqrt{\lambda_i}\right)}. \tag{A17}$$

Define $[F]$ as a diagonal matrix with F_{ii}:

$$F_{ii} = \sqrt{t}\,\frac{\partial E_{ii}}{\partial x}\bigg|_{x=0} = -\frac{e^{-\alpha^2/\lambda_i}}{\sqrt{\pi\lambda_i}\cdot erfc\left(-\alpha/\sqrt{\lambda_i}\right)}. \tag{A18}$$

Therefore, (A16) is simplified as:

$$[P][\lambda][F][P^{-1}]\left(w_0 - w_\infty\right) = \alpha\left(w_0 - w_c\right), \tag{A19}$$

or,

$$w_0 = \left([P][\lambda][F][P^{-1}] - \alpha[I]\right)^{-1}\cdot\left([P][\lambda][F][P^{-1}]w_\infty - \alpha w_c\right), \tag{A20}$$

if $[P][\lambda][F][P^{-1}] - \alpha[I]$ is invertible. Therefore, from (A20), w_0 is an explicit function of α. Equation (A20) provides n–1 equations, with only one unknown α left.

We need one additional equation to solve α. This additional equation is the thermodynamic constraint. For example, for quartz dissolution, the additional equation can be in general written as: $\mu_{\mathrm{SiO_2}}^{\mathrm{melt},0} = \mu_{\mathrm{SiO_2}}^{\mathrm{qtz}}$. For the dissolution of a mineral that is a solid solution with k components, there would be k equations such as,

$$\mu_i^{\mathrm{melt},0} = \mu_i^{\mathrm{mineral},0},\ \text{where } i = 1, \ldots, k. \tag{A21}$$

Note that the composition of a mineral that is a solid solution is not fixed, and hence the interface mineral composition, which contains k–1 unknowns, is not necessarily the initial mineral composition and must also be solved (e.g., Fig. 4–18 in Zhang, 2008). Therefore, the total number of unknowns is $n+k-1$ ($n-1$ for w_0, 1 for α, and $k-1$ for the interface mineral composition), which equals to the total number of equations in (A20) and (A21).

The chemical potential of a component in the melt cannot be easily expressed as a function of composition. Models such as MELTS (Ghiorso and Sack, 1995; Asimow and Ghiorso, 1998) are available, but they do not lead to simple algebraic equations for chemical potentials. Hence, solving the set of equations for the interface melt composition is not straightforward. Furthermore, there are unknown and possibly large uncertainties in the thermodynamic models. Hence, if the interface melt composition w_0 can be obtained from experimental data, it would remove much uncertainty in diffusion treatment.

A rough approach is when the interface melt concentration of one component can be roughly estimated, such as SiO_2 concentration during quartz dissolution in rhyolitic or basaltic melts, Al_2O_3 concentration during anorthite dissolution in basaltic melts (Yu et al., 2016), and MgO concentration during olivine dissolution in basaltic melts (Chen and Zhang, 2008). Once this condition is given, α can be solved by (A20) and therefore w_0.

A3. Derivation of transformation of diffusion matrices when a different component is used as the dependent components

For an *n*-component system, with component *n* chosen as the dependent component, in a mass-fixed frame of reference, diffusion flux equals to:

$$\begin{aligned}
\mathbf{J}_i &= -\rho\left(\sum_{j=1}^{n-1} D_{ij}^n \nabla w_j\right) \\
&= -\rho\left(\sum_{j\neq k}^{n-1} D_{ij}^n \nabla w_j + D_{ik}^n \nabla w_k\right)(\text{use identity } \nabla w_k = -\sum_{j\neq k}^{n} \nabla w_j) \\
&= -\rho\left(\sum_{j\neq k}^{n-1} D_{ij}^n \nabla w_j - D_{ik}^n \sum_{j\neq k}^{n} \nabla w_j\right) \\
&= -\rho\left(\sum_{j\neq k}^{n-1} (D_{ij}^n - D_{ik}^n)\nabla w_j + (-D_{ik}^n)\nabla w_n\right), \text{for all } i\neq n.
\end{aligned}$$

$$\begin{aligned}
\mathbf{J}_n &= -\sum_{i=1}^{n-1} \mathbf{J}_i \\
&= \rho\left(\sum_{i=1}^{n-1}\sum_{j\neq k}^{n-1} (D_{ij}^n - D_{ik}^n)\nabla w_j - \sum_{i=1}^{n-1} D_{ik}^n \nabla w_n\right) \\
&= -\rho\left(\sum_{j\neq k}^{n-1}\sum_{i=1}^{n-1} (D_{ik}^n - D_{ij}^n)\nabla w_j + \sum_{i=1}^{n-1} D_{ik}^n \nabla w_n\right).
\end{aligned}$$

The equations above express all diffusion flux $\mathbf{J}_i$'s with all components but *k*, which is identical to choose component *k* as the dependent component:

$$\mathbf{J}_i = -\rho \sum_{j\neq k}^{n} D_{ij}^k \nabla w_j\ .$$

Therefore,

$$D_{ij}^{k} = D_{ij}^{n} - D_{ik}^{n}, \qquad \text{if } i \neq n \text{ and } j \neq n \tag{A22}$$

$$D_{in}^{k} = -D_{ik}^{n}, \qquad \text{if } i \neq n \tag{A23}$$

$$D_{nj}^{k} = \sum_{i=1}^{n-1} (D_{ik}^{n} - D_{ij}^{n}), \qquad \text{if } j \neq n \tag{A24}$$

$$D_{nn}^{k} = \sum_{i=1}^{n-1} D_{ik}^{n}. \tag{A25}$$

A4. References

Asimow P. D. and Ghiorso M.S. (1998) Algorithmic modifications extending MELTS to calculate subsolidus phase relations. *Am. Mineral*. **83**, 1127-1131.

Chen Y. and Zhang Y. (2008) Olivine dissolution in basaltic melt. *Geochim. Cosmochim. Acta* **72**, 4756-4777.

Crank J. (1975) *The mathematics of diffusion*. Clarendon Press.

de Groot S. R. and Mazur P. (1962) *Non-equilibrium thermodynamics.* Dover, New York.

Ghiorso M. S. and Sack R. O. (1995) Chemical mass transfer in magmatic processes IV. a revised and internally consistent thermodynamic model for the interpolation and extrapolation of liquid-solid equilibria in magmatic systems at elevated temperatures and pressures. *Contrib. Mineral. Petrol*. **119**, 197-212.

Liang Y. (1999) Diffusive dissolution in ternary systems: Analysis with anpplications to quartz and quartzite dissolution in molten silicates. *Geochim. Cosmochim. Acta* **63**, 3983-3995.

Liang Y. (2000) Dissolution in molten silicates: Effects of solid solution. *Geochim. Cosmochim. Acta* **64**, 1617-1627.

Liang Y. (2010) Multicomponent diffusion in molten silicates: Theory, experiments, and geological application. *Rev. Mineral. Geochem.* **72**, 409-446.

Onsager L. (1945) Theories and problems of liquid diffusion. *Ann. New York Acad. Sci.* **46**, 241-265.

Trial A. F. and Spera F. J. (1994) Measuring the multicomponent diffusion matrix: Experimental design and data analysis for silicate melts. *Geochim. Cosmochim. Acta* **58**, 3769-3783.

Yu Y., Zhang Y., Chen. Y. and Xu Z. (2016) Kinetics of anorthite dissolution in basaltic melt. *Geochim. Cosmochim. Acta* **179**, 257-274.

Zhang Y. (2008) *Geochemical Kinetics.* Princeton University Press, Princeton, NJ.

Zhang Y., Walker D. and Lesher C. E. (1989) Diffusive crystal dissolution. *Contrib. Mineral. Petrol.* **102**, 492-513.

APPENDIX B

Matlab Codes for Fitting Diffusion Profiles

B1. The main function "LMF_solver.m"

```
%% Matlab codes to obtain diffusion matrix
% This is a program to obtain the diffusion matrix by fitting all diffusion profiles
from all experiments using Levenberg-Marquardt-Fletcher method, by Chenghuan Guo, most
recently updated on Dec 3, 2017

% The algorithm of LMF method is as follow:
% Step 1: initialize model parameters L and G with identity matrix, v = 1, gamma = 1;
% Step 2: terminate iteration if termination conditions are satisfied;
% Step 3: calculate residue r and Jacobian J, if gamma > 0;
% Step 4: calculate step size d, and reshape d to matrix format dL and dG;
% Step 5: calculate LL = L + dL and GG = G + dG;
% Step 6: dL = dL / 2, dG = dG / 2, and repeat step 5, until both LL and GG are
          positive definite;
% Step 7: calculate gamma;
% Step 8: v = v / 2, if gamma > 0.75; v = 2 * v, if gamma < 0.75; v = v, otherwise;
% Step 9: L = L + dL and G = G + dG, if gamma > 0; then go to step 2.


%% variable and parameter explanation
% C_calc:   a cell of calculated concentration for each experiment
% C_error:  errors of measured concentration
% C_meas:   measured concentration
% chisqr:   chi squares of residues
% Cl:       left-side boundary composition
% Cr:       right-side boundary composition
% Cm:       mineral composition during mineral dissolution
% d:        step size
% Dataset:  index for which data set to be fit
% dchi:     decrement of chi squares in each iteration
% dchisqr:  gradients of chi squares with respect to model parameters L and G
% dG:       increment of model parameter G in matrix format
% Diffusivity:  diffusion matrix
% Distance: numerically determined mineral dissolution distance
% dL:       increment of model parameter L in matrix format
% dq:       decrement of q (the quadratic approximation) in each iteration
% Eigenvalues:  eigenvalues of diffusion matrix
% Eigenvectors: eigenvectors of diffusion matrix
% G:        decomposed thermodynamic matrix from diffusion matrix
% gamma:    the ratio of dchi and dq
% GG:       a temporary variable to store G matrix for next iteration
% I:        identity matrix
% iteration:    index for current interation
```

```
% J:        Jacobian of residues with respect to model parameters L and G
% JJ:       a temporary variable to store J' * J
% L:        decomposed kinetic matrix from diffusion matrix
% lambda:   a temporary variable to store eigenvalues of (J'*J + vI)
% LL:       a temporary variable to store L matrix for next iteration
% max_it:   termination condition for maximum iteration numbers
% min_d:    termination condition for minimum step size
% min_dchisqr:  termination condition for minimum gradients of chi squares
% Nc:       the number of independent components
% Nd:       the number of diffusion couple experiments
% Ne:       the number of experiments used to fit
% Nm:       the number of mineral dissolution experiments
% Np:       the number of data points measured for each experiment
% p:        a temporary variable
% q:        a temporary variable
% r:        residue in current iteration
% r_next:   residue in next iteration
% r_pre:    residue in previous iteration
% Sigma:    1-sigma errors of diffusion matrix
% t:        experimental durations
% v:        damping parameters in LMF method
% X:        the x-axis in diffusion profiles


%%
close all;
clear all;


%% data initialization
% Set1 = diffusion couples at 1260 ºC
% Set2 = diffusion couples and mineral dissolution at 1260 ºC
% Set3 = diffusion couples at 1350 ºC
% Set4 = diffusion couples and mineral dissolution at 1350 ºC
% Set5 = diffusion couples at 1500 ºC
% Set6 = diffusion couples and mineral dissolution at 1500 ºC
Dataset = 'Set4';
[Nc, Np, Nm, Nd, Ne, Cl, Cr, Cm, t, Distance, X, C_meas, C_error] =
    initialization(Dataset);


%% start Levenberg-Marquardt-Fletcher Method
% (1) initial guess of matrices L and G
L = 11 * eye(Nc);
G = 13 * eye(Nc);

% (2) termination conditions
max_it = 50;
min_dchisqr = 1e-5;
min_d = 1e-5;

% (3) initialize some matrices
dL = zeros(Nc);
dG = zeros(Nc);
I = eye(Nc*(Nc+1));
d = ones(Nc*(Nc+1), 1);
dchisqr = ones(Nc*(Nc+1), 1);

% (4) initialize some index
iteration = 1;
v = 1;
gamma = 1;


% (5) start iteration
```

```
while max(abs(dchisqr)) > min_dchisqr && max(abs(d)) > min_d && iteration < max_it

% (5.1) calculate residue r for the first iteration
    if iteration == 1
        C_calc = calc_conc(Nc, Np, Nd, Nm, Ne, Cl, Cr, X, t, Distance, L*G);
        r = calc_residue(Nc, Ne, C_meas, C_calc, C_error);
    end;

% (5.2) calculate Jacobian if gamma > 0
    if gamma > 0
        J = calc_jacobian(Nc, Np, Nd, Nm, Ne, Cl, Cr, X, C_meas, C_error, r, t,
             Distance, L, G);
    end;

% (5.3) calculate chi squares and gradient of chi squares
    chisqr = r' * r / 2;
    dchisqr = J' * r;

% (5.6) adjust d such that (J'*J+v*I) is positive definite
    JJ = J' * J;
    lambda = eig(JJ+v*I);
    while max(real(lambda) < 0)
        v = 4*v;
        lambda = eig(JJ+v*I);
    end;
    d = -(JJ + v * I) \ J' * r;

% (5.7) obtain the increment of model parameters in matrix format: dL and dG, from
those in vector format: d
    for p = 1 : Nc
        for q = 1 : p
            dL(p, q) = d(p*(p-1)/2+q);
            dL(q, p) = dL(p, q);
            dG(p, q) = d(Nc*(Nc+1)/2+p*(p-1)/2+q);
            dG(q, p) = dG(p, q);
        end;
    end;

    while 1
        LL = L + dL;
        GG = G + dG;

        if any(eig(LL) < 0) == 0 && any(eig(GG) < 0) == 0
            break;
        else
            dL = dL / 2;
            dG = dG / 2;
        end;
    end;

% (5.8) calculate new residues
    C_calc = calc_conc(Nc, Np, Nd, Nm, Ne, Cl, Cr, X, t, Distance, LL*GG);
    r_next = calc_residue(Nc, Ne, C_meas, C_calc, C_error);

% (5.9) calculate delta chi squares, delta q, and gamma
    dchi = r' * r / 2 - r_next' * r_next / 2;
    dq = d' * (v * d - J' * r) / 2;
    gamma = dchi / dq;

% (5.10) update model parameters L and G if gamma > 0
    if gamma > 0
        r_pre = r;
        r = r_next;
        L = LL;
        G = GG;
```

```
    end;

% (5.11) update v
    if gamma < 0.25
        v = 2 * v;
    elseif gamma > 0.75
        v = v / 2;
    end;

% (5.12) update iteration index n
    iteration = iteration + 1;
end;
% the model parameters L and G that minimize chi squares are found


%% get diffusion matrix and its eigenvalues and eigenvectors
Diffusivity = L * G;
[Eigenvectors, Eigenvalues] = eig(Diffusivity);


%% calculate 1-sigma errors of diffusion matrix by error propagation
Sigma = calc_error(Nc, Np, Nd, Nm, Ne, Cl, Cr, X, t, Distance, Diffusivity, C_error);


%% end the program
```

B2. Subroutine "initialization.m"

```
%% subroutine function for initialization

function [Nc, Np, Nm, Nd, Ne, Cl, Cr, Cm, t, Distance, X, C, Error] =
    initialization(Dataset)

%% read in boundary conditions, mineral composition, measured data, and data errors
    Boundary = xlsread(strcat(Dataset, '_Boundary', '.xlsx'));
    Mineral  = xlsread(strcat(Dataset, '_Mineral',  '.xlsx'));
    Data     = xlsread(strcat(Dataset, '_Data',     '.xlsx'));
    Error    = xlsread(strcat(Dataset, '_Error',    '.xlsx'));


%% remove the first component: the dependent component SiO2
    Boundary = Boundary(2:end-1, :);
    Mineral = Mineral(2:end-1, :);


%% find Nc = the number of independent components, Nd = the number of diffusion
    couples, Nm = the number of mineral dissolution
    [Nc, Ne] = size(Boundary);   Ne = (Ne+1)/3;
    Nm = size(Mineral, 2);
    Nd = Ne - Nm;


%% get experimental durations and mineral dissolution distance
    t = get_duration(Dataset);
    Distance = get_distance(Dataset, t, Nm);


%% get Cl = left-side boundary condition, Cr = right-side boundary condition, and Cm =
    mineral composition
    Cl = zeros(Nc, Ne);
    Cr = zeros(Nc, Ne);
    Cm = zeros(Nc, Nm);

    for k = 1 : Ne
        Cl(:, k) = Boundary(:, (k-1)*3+1);
        Cr(:, k) = Boundary(:, (k-1)*3+2);
    end;

    for k = 1 : Nm
        Cm(:, k) = Mineral(:, k);
    end;


%% get X = x-axis, and C = measured concentrations for each diffusion couple
    Np = zeros(1, Ne);
    X = {}; C = {};
    for k = 1 : Ne
        X{k} = Data(:, (Nc+5)*(k-1)+1);
        X{k} = X{k}(isfinite(X{k}));
        Np(k) = size(X{k}, 1);
        C{k} = Data(1:Np(k), (Nc+5)*(k-1)+2:(Nc+5)*(k)-3);
    end;
end
```

B3. Subroutine “get_duration.m”

```
%% subroutine function to initialize experimental durations

function t = get_duration(Dataset)

% explanation of experiments used in each dataset:
% Set1 = diffusion couples at 1260 ºC
%      = [BS1&2C, BS3&4C, BS5&6C, BS7&8C, BS9&10C, BS11&12C, BS13&14C, BS17&18C,
         BS19&20C]
% Set2 = diffusion couples and mineral dissolution at 1260 ºC
%      = [BS1&2C, BS3&4C, BS5&6C, BS7&8C, BS9&10C, BS11&12C, BS13&14C, BS17&18C,
         BS19&20C, Exp15, Exp16, Exp18, Exp20, Exp21, Exp1, Exp203, Exp207, Exp209]
% Set3 = diffusion couples at 1350 ºC
%      = [BS1&2A, BS3&4A, BS5&6A, BS7&8A, BS9&10A, BS11&12A, BS13&14A, BS17&18A,
         BS19&20A]
% Set4 = diffusion couples and mineral dissolution at 1350 ºC
%      = [BS1&2A, BS3&4A, BS5&6A, BS7&8A, BS9&10A, BS11&12A, BS13&14A, BS17&18A,
         BS19&20A, Exp39, Exp40, Exp41, Exp5, Exp210, Exp211, Exp212, Exp213, Exp215,
         Exp216]
% Set5 = diffusion couples at 1500 ºC
%      = [BS1&2B, BS3&4B, BS5&6B, BS7&8B, BS9&10B, BS11&12B, BS13&14B, BS17&18B,
         BS19&20B]
% Set6 = diffusion couples and mineral dissolution at 1500 ºC
%      = [BS1&2B, BS3&4B, BS5&6B, BS7&8B, BS9&10B, BS11&12B, BS13&14B, BS17&18B,
         BS19&20B, Exp230]

% Dataset is an index for which data set to be fit
    switch Dataset
        case 'Set1'     % corrected experimental durations for Set1
            t = [1826.0, 1809.6, 1325.5, 1269.2, 950.8, 579.5, 740.0, 577.4, 599.9];
        case 'Set2'     % corrected experimental durations for Set2
            t = [1826.0, 1809.6, 1325.5, 1269.2, 950.8, 579.5, 740.0, 577.4, 599.9,
                796, 1954, 3897, 335, 789, 1971, 395, 1408, 4228];
        case 'Set3'     % corrected experimental durations for Set3
            t = [1492.4, 1243.2, 899.0, 974.4, 563.9, 393.6, 522.0, 335.7, 346.3];
        case 'Set4'     % corrected experimental durations for Set4
            t = [1492.4, 1243.2, 899.0, 974.4, 563.9, 393.6, 522.0, 335.7, 346.3, 298,
                1163, 601, 742, 1611, 395, 3087, 121, 2138];
        case 'Set5'     % corrected experimental durations for Set5
            t = [276.1, 223.6, 247.8, 213.7, 158.5, 157.1, 154.8, 184.9, 221.4];
        case 'Set6'     % corrected experimental durations for Set6
            t = [276.1, 223.6, 247.8, 213.7, 158.5, 157.1, 154.8, 184.9, 221.4,
                138.8];
        otherwise
            disp('error! input the set!');
    end;
end
```

B4. Subroutine "get_distance.m"

```
%% subroutine function to initialize mineral dissolution distance

function Distance = get_distance(Dataset, t, Nm)

% Dataset is an index for which data set to be fit
    switch Dataset
        case 'Set2'
            A = [0.2086, 0.2086, 0.2086, 0.2086, 0.2086, 0.4149, 0.3030, 0.3030,
                 0.3030];
        case 'Set4'
            A = [0.5174, 0.5174, 0.5174, 1.1961, 0.9985, 0.9985, 0.9985, 0.9985,
                 0.9985];
        case 'Set6'
            A = [5.6309];
        otherwise
            A = zeros(1, 0);
    end;

    Distance = 2 * A .* sqrt(t(end-Nm+1:end));
end
```

B5. Subroutine “calc_conc.m”

```
%% subroutine function to calculate concentration

function C = calc_conc(Nc, Np, Nd, Nm, Ne, Cl, Cr, X, t, Distance, Diffusivity)

    C = {};
    [Eigenvectors, Eigenvalues] = eig(Diffusivity);

    for k = 1 : Ne
        C{k} = zeros(Nc, Np(k));
        for j = 1 : Np(k)
            E = zeros(Nc);
            if k <= Nd % analytical solution for diffusion couples
                for m = 1 : Nc
                    E(m, m) = erf(X{k}(j)/sqrt(4*Eigenvalues(m, m)*t(k)));
                end;
                C{k}(:, j) = (Cl(:, k)+Cr(:, k))/2 + Eigenvectors * E / Eigenvectors *
                    (Cr(:, k)-Cl(:, k))/2;
            else      % analytical solution for mineral dissolution
                for m = 1 : Nc
                    E(m, m) = erfc((X{k}(j)-Distance(k-Nd))/sqrt(4*Eigenvalues(m,
                        m)*t(k))) / erfc(-Distance(k-Nd)/sqrt(4*Eigenvalues(m,
                        m)*t(k)));
                end;
                C{k}(:, j) = Cr(:, k) + Eigenvectors * E / Eigenvectors * (Cl(:, k)-
                    Cr(:, k));
            end;
        end;
        C{k} = [100-sum(C{k}); C{k}];
        C{k} = C{k}';
    end;
end
```

B6. Subroutine “calc_residue.m”

```
%% subroutine function to calculate residues between measured and calculated
   concentration

function r = calc_residue(Nc, Ne, C_meas, C_calc, C_error)

    r = [];
    for k = 1 : Ne
        for i = 1 : Nc+1
            r = [r; (C_meas{k}(:, i) - C_calc{k}(:, i)) / C_error(i, k)];
        end;
    end;
end
```

B7. Subroutine "calc_jacobian.m"

```
%% subroutine function to calculate Jacobian of residues with respect to model
parameters

function J = calc_jacobian(Nc, Np, Nd, Nm, Ne, Cl, Cr, X, C_meas, C_error, r, t,
Distance, L, G)

    J = ones((Nc+1)*sum(Np), Nc*(Nc+1));

    dL = 1e-8;
    dG = 1e-8;

    for p = 1 : Nc
        for q = 1 : p
            LL = L;
            LL(p, q) = L(p, q) + dL;
            LL(q, p) = LL(p, q);

            C_calc = calc_conc(Nc, Np, Nd, Nm, Ne, Cl, Cr, X, t, Distance, LL*G);
            r_new = calc_residue(Nc, Ne, C_meas, C_calc, C_error);
            J(:, p*(p-1)/2+q) = (r_new - r) / dL;
        end;
    end;

    for p = 1 : Nc
        for q = 1 : p
            GG = G;
            GG(p, q) = G(p, q) + dG;
            GG(q, p) = GG(p, q);

            C_calc = calc_conc(Nc, Np, Nd, Nm, Ne, Cl, Cr, X, t, Distance, L*GG);
            r_new = calc_residue(Nc, Ne, C_meas, C_calc, C_error);
            J(:, Nc*(Nc+1)/2+p*(p-1)/2+q) = (r_new - r) / dG;
        end;
    end;
end
```

B8. Subroutine "calc_error.m"

```
%% subroutine function to calculate errors of diffusion matrix

function Sigma = calc_error(Nc, Np, Nd, Nm, Ne, Cl, Cr, X, t, Distance, Diffusivity,
    C_error)

    dD = 1e-6;

    derivative = zeros((Nc+1)*(sum(Np)), Nc*Nc);
    weight = zeros((Nc+1)*(sum(Np)), Nc*Nc);
    Sigma = zeros(Nc*Nc, 1);

% calculate the derivative of concentration with respect to diffusion matrix
% calculate the weight
    C = calc_conc(Nc, Np, Nd, Nm, Ne, Cl, Cr, X, t, Distance, Diffusivity);
    for p = 1 : Nc
        for q = 1 : Nc
            D = Diffusivity;
            D(p, q) = D(p, q) + dD;
            CC = calc_conc(Nc, Np, Nd, Nm, Ne, Cl, Cr, X, t, Distance, D);

            t1 = []; t2 = [];
            for k = 1 : Ne
                for i = 1 : Nc+1
                    temp = (CC{k}(:, i) - C{k}(:, i)) / dD;
                    t1 = [t1; temp];
                    t2 = [t2; temp / C_error(i, k)^2];
                end;
            end;
            derivative(:, Nc*(p-1)+q) = t1;
            weight(:, Nc*(p-1)+q) = t2;
        end;
    end;

% get the covariance by taking the inversion of weights
    error = inv(derivative'*weight);

% get the 1-sigma errors from diagonal elements in covariance matrix
    for i=1 : Nc*Nc
        Sigma(i) = sqrt(error(i, i));
    end;

% reshape the 1-sigma errors to a matrix and then transpose it
    Sigma = reshape(Sigma, Nc, Nc)';
end
```

APPENDIX C

All electron microprobe data for all experiments

Table C1. HB2&4A

X (μm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
-1425.4	48.935	48.787	1.466	15.779	0.070	9.658	18.931	2.760	2.549	100.15	HB2&4A_L1_S3
-1385.4	49.110	48.624	1.440	15.955	0.032	9.794	18.892	2.722	2.543	100.49	HB2&4A_L1_S3
-1345.4	49.033	48.873	1.559	15.863	0.050	9.658	18.756	2.699	2.543	100.16	HB2&4A_L1_S3
-1305.4	49.165	48.575	1.540	15.990	0.109	9.677	18.846	2.726	2.538	100.59	HB2&4A_L1_S3
-1265.4	49.159	48.855	1.484	15.938	0.059	9.626	18.768	2.718	2.552	100.30	HB2&4A_L1_S3
-1225.4	49.202	48.794	1.533	15.984	0.040	9.583	18.802	2.706	2.559	100.41	HB2&4A_L1_S3
-1185.4	48.928	48.898	1.489	15.826	-0.003	9.652	18.898	2.686	2.555	100.03	HB2&4A_L1_S3
-1145.4	48.898	48.672	1.546	15.958	0.063	9.662	18.863	2.677	2.559	100.23	HB2&4A_L1_S3
-1105.4	49.038	48.846	1.435	15.941	0.040	9.762	18.694	2.705	2.578	100.19	HB2&4A_L1_S3
-1065.4	48.954	48.970	1.564	15.872	0.105	9.628	18.708	2.634	2.519	99.98	HB2&4A_L1_S3
-1025.4	48.934	48.646	1.598	15.892	0.090	9.655	18.843	2.690	2.586	100.29	HB2&4A_L1_S3
-985.4	48.954	48.845	1.562	15.807	0.000	9.696	18.831	2.713	2.548	100.11	HB2&4A_L1_S3
-945.4	49.160	48.763	1.619	15.925	0.011	9.689	18.799	2.666	2.529	100.40	HB2&4A_L1_S3
-905.4	49.178	48.675	1.506	15.894	0.064	9.671	18.995	2.682	2.514	100.50	HB2&4A_L1_S3
-865.4	49.028	48.882	1.485	15.954	0.069	9.600	18.821	2.648	2.540	100.15	HB2&4A_L1_S3
-825.4	49.279	48.488	1.523	16.047	0.084	9.799	18.794	2.680	2.586	100.79	HB2&4A_L1_S3
-785.4	49.198	48.772	1.507	15.942	0.139	9.710	18.740	2.658	2.532	100.43	HB2&4A_L1_S3
-745.4	49.183	48.613	1.462	15.965	0.143	9.694	18.860	2.685	2.579	100.57	HB2&4A_L1_S3
-705.4	49.076	48.806	1.555	16.007	0.012	9.661	18.806	2.622	2.531	100.27	HB2&4A_L1_S3
-665.4	49.215	48.787	1.500	15.729	0.055	9.809	18.893	2.694	2.534	100.43	HB2&4A_L1_S3
-625.4	49.179	48.927	1.546	15.897	0.067	9.625	18.693	2.681	2.563	100.25	HB2&4A_L1_S3
-585.4	49.043	48.845	1.504	15.913	0.088	9.719	18.771	2.635	2.526	100.20	HB2&4A_L1_S3
-545.4	49.153	48.654	1.525	15.964	0.089	9.684	18.873	2.704	2.509	100.50	HB2&4A_L1_S3
-505.4	49.198	48.748	1.567	15.984	0.029	9.599	18.845	2.680	2.549	100.45	HB2&4A_L1_S3
-485.4	49.066	48.704	1.578	15.940	0.052	9.798	18.724	2.687	2.517	100.36	HB2&4A_L1_S2
-465.4	49.047	48.748	1.545	16.022	0.047	9.707	18.778	2.650	2.503	100.30	HB2&4A_L1_S2
-445.4	49.056	48.913	1.555	15.871	0.067	9.690	18.773	2.672	2.459	100.14	HB2&4A_L1_S2
-425.4	49.197	48.964	1.494	15.946	0.035	9.743	18.717	2.656	2.445	100.23	HB2&4A_L1_S2
-405.4	49.198	48.708	1.549	15.992	0.028	9.764	18.829	2.654	2.477	100.49	HB2&4A_L1_S2
-385.4	49.316	48.770	1.547	16.011	0.059	9.811	18.656	2.713	2.434	100.55	HB2&4A_L1_S2
-365.4	49.235	48.628	1.544	16.142	0.053	9.722	18.820	2.690	2.402	100.61	HB2&4A_L1_S2
-345.4	49.233	48.852	1.582	15.869	0.040	9.727	18.837	2.662	2.431	100.38	HB2&4A_L1_S2
-325.4	49.395	48.987	1.478	15.921	0.006	9.697	18.805	2.691	2.415	100.41	HB2&4A_L1_S2
-305.4	49.119	48.908	1.577	15.851	0.080	9.704	18.823	2.686	2.373	100.21	HB2&4A_L1_S2
-285.4	48.974	49.054	1.528	15.921	0.065	9.639	18.681	2.700	2.413	99.92	HB2&4A_L1_S2
-265.4	49.276	48.919	1.495	15.943	0.044	9.776	18.761	2.697	2.366	100.36	HB2&4A_L1_S2
-245.4	49.370	48.895	1.535	16.034	0.034	9.617	18.886	2.687	2.313	100.48	HB2&4A_L1_S2
-225.4	49.410	49.233	1.462	15.909	0.038	9.650	18.770	2.662	2.276	100.18	HB2&4A_L1_S2
-205.4	49.276	48.939	1.528	15.989	0.096	9.644	18.831	2.708	2.264	100.34	HB2&4A_L1_S2
-185.4	49.204	49.025	1.483	16.003	0.062	9.665	18.767	2.725	2.270	100.18	HB2&4A_L1_S2
-165.4	49.276	48.909	1.513	16.091	0.090	9.661	18.714	2.757	2.265	100.37	HB2&4A_L1_S2
-145.4	49.416	49.070	1.592	16.020	0.023	9.745	18.646	2.716	2.189	100.35	HB2&4A_L1_S2
-125.4	49.353	48.985	1.510	16.017	0.035	9.759	18.825	2.714	2.156	100.37	HB2&4A_L1_S2

-105.4	49.334	48.998	1.523	16.079	0.069	9.738	18.758	2.728	2.108	100.34	HB2&4A_L1_S2
-85.4	49.289	49.078	1.569	16.032	0.017	9.613	18.849	2.784	2.060	100.21	HB2&4A_L1_S2
-65.4	49.445	49.021	1.585	15.967	0.044	9.849	18.745	2.763	2.026	100.42	HB2&4A_L1_S2
-45.4	49.528	48.877	1.497	16.087	0.053	9.759	18.934	2.764	2.029	100.65	HB2&4A_L1_S2
-25.4	49.520	49.167	1.471	15.962	0.038	9.701	18.897	2.788	1.976	100.35	HB2&4A_L1_S2
-5.4	49.406	49.142	1.494	15.984	0.080	9.672	18.947	2.773	1.907	100.26	HB2&4A_L1_S2
14.6	49.419	49.191	1.528	15.933	0.063	9.699	18.875	2.833	1.878	100.23	HB2&4A_L1_S2
34.6	49.559	49.044	1.536	15.874	0.117	9.842	18.945	2.782	1.861	100.51	HB2&4A_L1_S2
54.6	49.483	49.143	1.497	15.978	0.065	9.711	18.982	2.808	1.816	100.34	HB2&4A_L1_S2
74.6	49.571	49.046	1.559	15.900	0.084	9.734	19.056	2.839	1.782	100.53	HB2&4A_L1_S2
94.6	49.573	49.048	1.537	16.004	0.065	9.844	18.947	2.836	1.719	100.52	HB2&4A_L1_S2
114.6	49.485	49.251	1.558	15.906	0.074	9.571	19.074	2.844	1.723	100.23	HB2&4A_L1_S2
134.6	49.565	49.222	1.494	15.921	0.075	9.679	19.143	2.801	1.667	100.34	HB2&4A_L1_S2
154.6	49.521	49.331	1.506	15.849	0.076	9.658	19.151	2.830	1.600	100.19	HB2&4A_L1_S2
174.6	49.725	49.218	1.508	15.804	0.103	9.850	19.067	2.851	1.599	100.51	HB2&4A_L1_S2
194.6	49.601	49.428	1.593	15.790	0.099	9.614	19.094	2.828	1.555	100.17	HB2&4A_L1_S2
214.6	49.743	49.563	1.427	15.876	0.046	9.619	19.033	2.857	1.579	100.18	HB2&4A_L1_S2
234.6	49.481	49.270	1.548	15.841	0.063	9.661	19.172	2.917	1.529	100.21	HB2&4A_L1_S2
254.6	49.657	49.276	1.539	16.010	0.099	9.679	19.050	2.867	1.481	100.38	HB2&4A_L1_S2
274.6	49.563	49.076	1.542	15.952	0.059	9.857	19.150	2.866	1.499	100.49	HB2&4A_L1_S2
294.6	49.654	49.299	1.553	15.941	0.050	9.705	19.132	2.866	1.455	100.36	HB2&4A_L1_S2
314.6	49.612	49.194	1.458	16.013	0.077	9.726	19.226	2.875	1.431	100.42	HB2&4A_L1_S2
334.6	49.655	49.322	1.512	15.910	0.137	9.779	19.061	2.877	1.402	100.33	HB2&4A_L1_S2
354.6	49.695	49.404	1.499	15.932	0.077	9.732	19.107	2.875	1.374	100.29	HB2&4A_L1_S2
374.6	49.710	49.393	1.547	15.926	0.038	9.795	19.074	2.878	1.350	100.32	HB2&4A_L1_S2
394.6	49.726	49.381	1.562	15.842	0.040	9.833	19.072	2.935	1.334	100.35	HB2&4A_L1_S2
414.6	49.681	49.094	1.549	16.013	0.078	9.870	19.145	2.916	1.335	100.59	HB2&4A_L1_S2
434.6	49.683	49.196	1.529	15.909	0.093	9.891	19.124	2.884	1.375	100.49	HB2&4A_L1_S2
454.6	49.660	49.579	1.541	15.861	0.050	9.641	19.102	2.883	1.344	100.08	HB2&4A_L1_S2
474.6	49.751	49.195	1.535	16.024	0.041	9.790	19.150	2.903	1.363	100.56	HB2&4A_L1_S2
494.6	49.749	49.440	1.520	15.954	0.076	9.723	19.059	2.925	1.304	100.31	HB2&4A_L1_S2
514.6	49.873	49.266	1.533	16.072	0.056	9.740	19.098	2.915	1.321	100.61	HB2&4A_L1_S1
554.6	49.881	49.348	1.514	16.101	0.095	9.785	18.993	2.876	1.288	100.53	HB2&4A_L1_S1
594.6	49.852	49.637	1.576	15.946	0.046	9.659	18.941	2.874	1.321	100.21	HB2&4A_L1_S1
634.6	49.601	49.608	1.503	15.960	0.059	9.620	19.030	2.900	1.322	99.99	HB2&4A_L1_S1
674.6	49.696	49.341	1.640	15.942	0.116	9.844	18.924	2.881	1.313	100.35	HB2&4A_L1_S1
714.6	49.830	49.102	1.543	16.126	0.065	9.899	19.049	2.927	1.289	100.73	HB2&4A_L1_S1
754.6	49.611	49.235	1.486	16.033	0.040	9.886	19.105	2.927	1.288	100.38	HB2&4A_L1_S1
794.6	49.751	49.354	1.530	16.004	0.044	9.752	19.094	2.974	1.249	100.40	HB2&4A_L1_S1
834.6	49.736	49.254	1.604	16.006	0.076	9.781	19.055	2.908	1.316	100.48	HB2&4A_L1_S1
874.6	49.750	49.207	1.547	15.970	0.114	9.900	19.113	2.865	1.285	100.54	HB2&4A_L1_S1
914.6	49.656	49.285	1.569	15.957	0.064	9.922	19.035	2.886	1.283	100.37	HB2&4A_L1_S1
954.6	49.699	49.336	1.625	15.957	0.048	9.747	19.078	2.925	1.283	100.36	HB2&4A_L1_S1
994.6	49.743	49.240	1.599	16.039	0.038	9.814	19.052	2.923	1.295	100.50	HB2&4A_L1_S1
1034.6	49.719	49.522	1.534	15.975	0.120	9.658	19.001	2.921	1.269	100.20	HB2&4A_L1_S1
1074.6	49.838	49.540	1.516	15.944	0.042	9.695	19.079	2.874	1.310	100.30	HB2&4A_L1_S1
1114.6	49.711	49.784	1.581	15.905	0.037	9.611	18.924	2.872	1.286	99.93	HB2&4A_L1_S1
1154.6	49.938	49.227	1.549	16.120	0.099	9.887	19.023	2.825	1.270	100.71	HB2&4A_L1_S1
1194.6	49.716	49.451	1.499	15.976	0.067	9.808	19.056	2.859	1.284	100.27	HB2&4A_L1_S1
1234.6	49.749	49.140	1.580	16.119	0.088	9.841	19.059	2.901	1.272	100.61	HB2&4A_L1_S1
1274.6	49.515	49.264	1.559	16.079	0.033	9.729	19.175	2.883	1.278	100.25	HB2&4A_L1_S1
1314.6	49.511	49.614	1.518	15.914	0.012	9.822	19.025	2.824	1.272	99.90	HB2&4A_L1_S1
1354.6	49.492	49.344	1.516	16.030	0.077	9.735	19.155	2.840	1.303	100.15	HB2&4A_L1_S1
1394.6	49.577	49.249	1.489	16.062	0.099	9.796	19.128	2.897	1.282	100.33	HB2&4A_L1_S1
1434.6	49.551	49.459	1.535	16.053	0.030	9.648	19.123	2.883	1.270	100.09	HB2&4A_L1_S1
1474.6	49.620	49.390	1.559	16.059	0.048	9.787	19.002	2.877	1.279	100.23	HB2&4A_L1_S1
1514.6	49.550	49.214	1.553	16.113	0.076	9.689	19.194	2.902	1.260	100.34	HB2&4A_L1_S1
-1396.9	48.849	48.880	1.438	15.901	0.090	9.613	18.811	2.716	2.550	99.97	HB2&4A_L2_S3
-1356.9	48.860	48.850	1.478	15.902	0.042	9.671	18.784	2.697	2.576	100.01	HB2&4A_L2_S3
-1316.9	48.872	48.763	1.495	15.927	0.027	9.698	18.842	2.651	2.598	100.11	HB2&4A_L2_S3
-1276.9	48.855	48.638	1.573	15.929	0.050	9.752	18.823	2.668	2.568	100.22	HB2&4A_L2_S3
-1236.9	49.036	48.672	1.542	16.000	0.037	9.685	18.841	2.684	2.539	100.36	HB2&4A_L2_S3
-1196.9	49.091	48.626	1.554	16.007	0.029	9.704	18.852	2.701	2.528	100.47	HB2&4A_L2_S3

-1156.9	48.949	48.691	1.514	16.001	0.065	9.668	18.830	2.680	2.551	100.26	HB2&4A_L2_S3
-1116.9	48.998	48.575	1.501	16.053	0.002	9.789	18.851	2.672	2.558	100.42	HB2&4A_L2_S3
-1076.9	49.061	48.779	1.481	15.882	0.055	9.622	18.933	2.693	2.555	100.28	HB2&4A_L2_S3
-1036.9	49.076	48.812	1.458	16.021	0.031	9.665	18.755	2.672	2.587	100.26	HB2&4A_L2_S3
-996.9	48.799	48.959	1.506	15.825	0.011	9.728	18.776	2.656	2.540	99.84	HB2&4A_L2_S3
-956.9	49.098	48.717	1.529	15.984	0.015	9.693	18.806	2.699	2.557	100.38	HB2&4A_L2_S3
-916.9	48.984	48.724	1.515	15.954	0.092	9.699	18.745	2.658	2.613	100.26	HB2&4A_L2_S3
-876.9	48.984	48.822	1.508	15.971	0.025	9.650	18.836	2.627	2.561	100.16	HB2&4A_L2_S3
-836.9	48.923	48.771	1.518	15.956	0.077	9.681	18.799	2.636	2.563	100.15	HB2&4A_L2_S3
-796.9	48.976	48.997	1.454	15.929	0.043	9.606	18.723	2.687	2.561	99.98	HB2&4A_L2_S3
-756.9	49.042	48.874	1.502	15.882	0.086	9.704	18.764	2.654	2.535	100.17	HB2&4A_L2_S3
-716.9	48.892	48.668	1.523	15.976	0.046	9.758	18.813	2.701	2.516	100.22	HB2&4A_L2_S3
-676.9	49.152	48.691	1.617	15.932	0.030	9.697	18.791	2.659	2.583	100.46	HB2&4A_L2_S3
-636.9	48.890	48.899	1.538	15.828	0.079	9.630	18.770	2.688	2.568	99.99	HB2&4A_L2_S3
-596.9	49.143	48.705	1.557	16.084	0.004	9.727	18.745	2.663	2.515	100.44	HB2&4A_L2_S3
-556.9	49.083	48.764	1.577	15.861	0.062	9.649	18.905	2.651	2.531	100.32	HB2&4A_L2_S3
-516.9	49.089	48.709	1.574	15.962	0.075	9.695	18.775	2.635	2.575	100.38	HB2&4A_L2_S3
-496.9	48.970	48.544	1.487	16.102	0.042	9.775	18.806	2.690	2.553	100.43	HB2&4A_L2_S2
-476.9	49.065	48.767	1.582	15.929	0.045	9.756	18.753	2.624	2.545	100.30	HB2&4A_L2_S2
-456.9	49.122	48.531	1.524	16.128	0.070	9.617	18.941	2.664	2.526	100.59	HB2&4A_L2_S2
-436.9	49.164	48.691	1.579	15.974	0.080	9.741	18.771	2.680	2.485	100.47	HB2&4A_L2_S2
-416.9	49.095	48.591	1.561	15.985	0.101	9.757	18.883	2.647	2.475	100.50	HB2&4A_L2_S2
-396.9	49.158	48.655	1.556	15.958	0.039	9.897	18.782	2.672	2.441	100.50	HB2&4A_L2_S2
-376.9	49.188	48.853	1.509	15.990	0.038	9.665	18.808	2.689	2.449	100.34	HB2&4A_L2_S2
-356.9	49.129	48.855	1.582	16.019	0.047	9.620	18.775	2.687	2.416	100.27	HB2&4A_L2_S2
-336.9	49.319	48.811	1.570	15.921	0.040	9.708	18.832	2.697	2.422	100.51	HB2&4A_L2_S2
-316.9	49.248	48.786	1.533	15.939	0.050	9.758	18.808	2.676	2.451	100.46	HB2&4A_L2_S2
-296.9	49.276	48.723	1.651	16.014	0.020	9.756	18.735	2.716	2.384	100.55	HB2&4A_L2_S2
-276.9	49.104	48.693	1.461	16.029	0.050	9.806	18.883	2.704	2.375	100.41	HB2&4A_L2_S2
-256.9	49.262	48.839	1.511	16.006	0.114	9.761	18.702	2.714	2.353	100.42	HB2&4A_L2_S2
-236.9	49.347	48.771	1.509	16.076	0.008	9.729	18.835	2.734	2.338	100.58	HB2&4A_L2_S2
-216.9	49.231	48.980	1.531	16.016	0.058	9.616	18.750	2.694	2.354	100.25	HB2&4A_L2_S2
-196.9	49.237	49.061	1.498	16.023	0.071	9.706	18.710	2.711	2.220	100.18	HB2&4A_L2_S2
-176.9	49.298	48.943	1.485	15.964	0.031	9.715	18.874	2.743	2.245	100.35	HB2&4A_L2_S2
-156.9	49.236	48.826	1.513	16.049	0.059	9.805	18.783	2.743	2.223	100.41	HB2&4A_L2_S2
-136.9	49.347	48.807	1.584	16.032	0.074	9.847	18.776	2.744	2.137	100.54	HB2&4A_L2_S2
-116.9	49.293	48.813	1.601	16.093	0.097	9.769	18.796	2.688	2.145	100.48	HB2&4A_L2_S2
-96.9	49.335	48.755	1.514	16.184	0.063	9.840	18.822	2.721	2.102	100.58	HB2&4A_L2_S2
-76.9	49.259	48.875	1.597	16.034	0.036	9.722	18.910	2.746	2.081	100.38	HB2&4A_L2_S2
-56.9	49.366	48.984	1.476	15.994	0.074	9.714	18.952	2.780	2.026	100.38	HB2&4A_L2_S2
-36.9	49.360	48.903	1.577	16.094	0.061	9.747	18.927	2.709	1.982	100.46	HB2&4A_L2_S2
-16.9	49.285	49.268	1.518	16.031	0.036	9.629	18.817	2.739	1.963	100.02	HB2&4A_L2_S2
3.1	49.318	49.356	1.513	15.982	0.042	9.596	18.825	2.806	1.880	99.96	HB2&4A_L2_S2
23.1	49.406	49.046	1.584	16.121	0.092	9.599	18.908	2.789	1.862	100.36	HB2&4A_L2_S2
43.1	49.452	49.207	1.545	15.915	-0.007	9.715	19.017	2.774	1.834	100.25	HB2&4A_L2_S2
63.1	49.429	49.219	1.468	15.982	0.054	9.759	18.940	2.793	1.785	100.21	HB2&4A_L2_S2
83.1	49.398	49.436	1.548	15.835	0.010	9.671	18.923	2.824	1.753	99.96	HB2&4A_L2_S2
103.1	49.488	49.138	1.563	16.000	0.056	9.783	18.922	2.795	1.742	100.35	HB2&4A_L2_S2
123.1	49.505	48.852	1.601	15.907	0.153	9.794	19.170	2.827	1.696	100.65	HB2&4A_L2_S2
143.1	49.524	49.176	1.538	15.954	0.076	9.695	19.071	2.839	1.650	100.35	HB2&4A_L2_S2
163.1	49.466	49.110	1.530	16.048	0.050	9.690	19.054	2.896	1.623	100.36	HB2&4A_L2_S2
183.1	49.569	49.230	1.571	15.934	0.074	9.793	19.021	2.800	1.577	100.34	HB2&4A_L2_S2
203.1	49.595	49.286	1.535	15.956	0.056	9.740	19.042	2.812	1.574	100.31	HB2&4A_L2_S2
223.1	49.741	49.073	1.464	15.945	0.031	9.930	19.128	2.880	1.550	100.67	HB2&4A_L2_S2
243.1	49.664	49.267	1.570	16.025	0.115	9.677	19.000	2.815	1.532	100.40	HB2&4A_L2_S2
263.1	49.448	49.396	1.446	15.953	0.071	9.699	19.101	2.875	1.460	100.05	HB2&4A_L2_S2
283.1	49.696	49.160	1.564	16.013	0.063	9.780	19.113	2.862	1.446	100.54	HB2&4A_L2_S2
303.1	49.660	49.455	1.536	15.779	0.075	9.782	19.090	2.855	1.428	100.21	HB2&4A_L2_S2
323.1	49.579	49.279	1.505	16.091	0.108	9.642	19.117	2.851	1.408	100.30	HB2&4A_L2_S2
343.1	49.481	49.355	1.514	16.014	0.050	9.626	19.151	2.899	1.392	100.13	HB2&4A_L2_S2
363.1	49.605	49.297	1.540	16.000	0.046	9.723	19.114	2.880	1.400	100.31	HB2&4A_L2_S2
383.1	49.707	49.411	1.594	15.898	0.046	9.694	19.059	2.886	1.413	100.30	HB2&4A_L2_S2
403.1	49.713	49.480	1.546	15.959	0.050	9.732	19.013	2.889	1.331	100.23	HB2&4A_L2_S2

423.1	49.749	49.453	1.466	16.024	0.016	9.798	19.037	2.883	1.323	100.30	HB2&4A_L2_S2
443.1	49.545	49.384	1.481	16.051	0.029	9.701	19.103	2.894	1.356	100.16	HB2&4A_L2_S2
463.1	49.737	49.537	1.502	15.913	0.067	9.692	19.100	2.871	1.317	100.20	HB2&4A_L2_S2
483.1	49.592	49.410	1.561	15.938	0.027	9.680	19.181	2.870	1.333	100.18	HB2&4A_L2_S2
503.1	49.651	49.418	1.539	15.967	0.069	9.727	19.078	2.872	1.330	100.23	HB2&4A_L2_S1
543.1	49.765	49.350	1.532	15.869	0.103	9.758	19.147	2.922	1.320	100.41	HB2&4A_L2_S1
583.1	49.711	49.541	1.566	15.914	0.067	9.695	19.053	2.894	1.271	100.17	HB2&4A_L2_S1
623.1	49.739	49.494	1.484	15.919	0.097	9.668	19.138	2.885	1.315	100.24	HB2&4A_L2_S1
663.1	49.736	49.434	1.470	16.085	0.121	9.706	18.998	2.910	1.277	100.30	HB2&4A_L2_S1
703.1	49.788	49.477	1.523	16.025	0.059	9.810	18.964	2.843	1.300	100.31	HB2&4A_L2_S1
783.1	49.805	49.478	1.539	15.976	0.059	9.778	18.981	2.907	1.283	100.33	HB2&4A_L2_S1
823.1	49.762	49.414	1.561	15.990	0.088	9.733	19.095	2.859	1.260	100.35	HB2&4A_L2_S1
863.1	49.845	49.503	1.463	15.933	0.017	9.817	19.069	2.883	1.315	100.34	HB2&4A_L2_S1
903.1	49.784	49.770	1.537	15.923	-0.001	9.670	18.996	2.836	1.270	100.01	HB2&4A_L2_S1
943.1	49.849	49.491	1.506	15.987	0.099	9.711	19.037	2.862	1.308	100.36	HB2&4A_L2_S1
983.1	49.629	49.244	1.561	16.151	0.080	9.731	19.051	2.896	1.287	100.38	HB2&4A_L2_S1
1023.1	49.786	49.263	1.558	16.018	0.097	9.794	19.081	2.922	1.267	100.52	HB2&4A_L2_S1
1063.1	49.621	49.351	1.556	15.980	0.018	9.877	19.073	2.858	1.286	100.27	HB2&4A_L2_S1
1103.1	49.843	49.386	1.533	16.083	0.040	9.751	19.052	2.914	1.242	100.46	HB2&4A_L2_S1
1143.1	49.775	49.297	1.525	16.071	0.099	9.827	19.034	2.892	1.256	100.48	HB2&4A_L2_S1
1183.1	49.700	49.523	1.587	15.949	0.044	9.767	18.979	2.869	1.283	100.18	HB2&4A_L2_S1
1223.1	49.647	49.281	1.576	15.983	0.090	9.880	19.078	2.854	1.258	100.37	HB2&4A_L2_S1
1263.1	49.714	49.313	1.544	15.986	0.061	9.911	19.026	2.875	1.284	100.40	HB2&4A_L2_S1
1303.1	49.825	49.266	1.579	15.979	0.080	9.859	19.083	2.895	1.260	100.56	HB2&4A_L2_S1
1343.1	49.612	49.533	1.559	16.015	0.043	9.765	18.941	2.882	1.263	100.08	HB2&4A_L2_S1
1383.1	49.569	49.392	1.517	16.013	0.098	9.796	19.046	2.860	1.276	100.18	HB2&4A_L2_S1
1423.1	49.624	49.298	1.501	16.115	0.099	9.771	19.093	2.848	1.275	100.33	HB2&4A_L2_S1
1463.1	49.563	49.387	1.600	16.042	0.008	9.800	19.041	2.848	1.276	100.18	HB2&4A_L2_S1
1503.1	49.496	49.259	1.568	16.093	0.119	9.783	19.039	2.851	1.288	100.24	HB2&4A_L2_S1
-1418.3	48.780	48.630	1.610	15.850	0.033	9.868	18.803	2.681	2.525	100.15	HB2&4A_L3_S3
-1378.3	48.876	48.635	1.542	15.906	0.032	9.653	18.975	2.680	2.577	100.24	HB2&4A_L3_S3
-1338.3	48.991	48.596	1.472	15.933	0.106	9.685	18.997	2.681	2.531	100.40	HB2&4A_L3_S3
-1298.3	48.906	48.472	1.556	16.016	0.023	9.671	19.015	2.666	2.581	100.43	HB2&4A_L3_S3
-1258.3	48.727	48.838	1.515	15.902	0.055	9.667	18.845	2.616	2.562	99.89	HB2&4A_L3_S3
-1218.3	49.030	48.593	1.539	15.985	0.036	9.603	19.020	2.679	2.546	100.44	HB2&4A_L3_S3
-1178.3	49.083	48.469	1.624	15.954	0.063	9.703	18.914	2.737	2.537	100.61	HB2&4A_L3_S3
-1138.3	49.015	48.490	1.545	16.100	0.063	9.687	18.869	2.684	2.563	100.53	HB2&4A_L3_S3
-1098.3	48.890	48.755	1.615	15.751	0.041	9.779	18.805	2.691	2.563	100.13	HB2&4A_L3_S3
-1058.3	48.824	48.729	1.498	15.952	-0.007	9.611	18.975	2.653	2.587	100.10	HB2&4A_L3_S3
-1018.3	48.906	48.707	1.517	15.900	0.078	9.771	18.769	2.689	2.570	100.20	HB2&4A_L3_S3
-978.3	49.041	48.855	1.498	15.923	0.079	9.603	18.808	2.685	2.551	100.19	HB2&4A_L3_S3
-938.3	48.882	48.871	1.591	15.768	0.023	9.737	18.808	2.680	2.522	100.01	HB2&4A_L3_S3
-898.3	48.876	48.620	1.556	15.914	0.045	9.712	18.873	2.705	2.576	100.26	HB2&4A_L3_S3
-858.3	49.016	48.735	1.522	15.980	0.073	9.621	18.866	2.661	2.544	100.28	HB2&4A_L3_S3
-818.3	48.996	48.660	1.445	16.079	0.083	9.734	18.796	2.652	2.552	100.34	HB2&4A_L3_S3
-778.3	49.018	48.821	1.510	15.998	-0.013	9.565	18.871	2.697	2.552	100.20	HB2&4A_L3_S3
-738.3	48.982	48.504	1.583	15.991	0.046	9.756	18.871	2.698	2.552	100.48	HB2&4A_L3_S3
-698.3	48.979	48.790	1.504	15.981	0.044	9.759	18.735	2.663	2.525	100.19	HB2&4A_L3_S3
-658.3	48.894	48.567	1.538	15.989	0.061	9.712	18.914	2.649	2.572	100.33	HB2&4A_L3_S3
-618.3	48.976	48.530	1.622	15.943	0.078	9.691	18.911	2.692	2.534	100.45	HB2&4A_L3_S3
-578.3	48.920	48.408	1.588	16.061	0.072	9.698	18.993	2.632	2.548	100.51	HB2&4A_L3_S3
-538.3	48.946	48.772	1.532	16.007	0.061	9.701	18.771	2.665	2.490	100.17	HB2&4A_L3_S3
-498.3	49.024	48.879	1.567	15.799	0.088	9.665	18.810	2.672	2.521	100.15	HB2&4A_L3_S3
-478.3	48.855	48.681	1.539	16.056	0.058	9.739	18.757	2.653	2.517	100.17	HB2&4A_L3_S2
-458.3	49.078	48.799	1.513	15.860	0.058	9.713	18.933	2.637	2.487	100.28	HB2&4A_L3_S2
-438.3	49.064	48.693	1.574	15.855	0.117	9.720	18.883	2.657	2.501	100.37	HB2&4A_L3_S2
-398.3	49.124	48.690	1.564	16.009	0.038	9.765	18.861	2.654	2.422	100.43	HB2&4A_L3_S2
-378.3	49.008	48.578	1.593	16.125	0.081	9.708	18.850	2.638	2.427	100.43	HB2&4A_L3_S2
-358.3	49.076	48.810	1.567	16.033	0.040	9.699	18.770	2.682	2.400	100.27	HB2&4A_L3_S2
-338.3	49.051	48.940	1.516	16.013	0.053	9.643	18.721	2.683	2.430	100.11	HB2&4A_L3_S2
-318.3	49.213	48.626	1.459	16.064	0.008	9.748	18.980	2.718	2.397	100.59	HB2&4A_L3_S2
-298.3	49.108	48.701	1.586	15.973	0.069	9.678	18.846	2.719	2.428	100.41	HB2&4A_L3_S2
-278.3	49.125	48.854	1.602	16.058	0.048	9.694	18.726	2.680	2.339	100.27	HB2&4A_L3_S2

-258.3	49.004	48.867	1.442	16.045	0.050	9.663	18.869	2.742	2.324	100.14	HB2&4A_L3_S2
-238.3	49.162	48.686	1.601	16.138	0.082	9.681	18.762	2.718	2.332	100.48	HB2&4A_L3_S2
-218.3	49.242	48.701	1.516	16.101	0.047	9.875	18.769	2.725	2.267	100.54	HB2&4A_L3_S2
-198.3	49.174	48.837	1.567	16.128	0.120	9.600	18.786	2.688	2.274	100.34	HB2&4A_L3_S2
-178.3	49.101	48.877	1.523	15.970	0.074	9.738	18.862	2.716	2.240	100.22	HB2&4A_L3_S2
-158.3	49.134	48.952	1.572	15.983	0.078	9.685	18.824	2.733	2.174	100.18	HB2&4A_L3_S2
-138.3	49.192	49.003	1.529	16.041	0.078	9.626	18.828	2.710	2.186	100.19	HB2&4A_L3_S2
-118.3	49.188	49.089	1.588	16.032	0.009	9.609	18.792	2.759	2.122	100.10	HB2&4A_L3_S2
-98.3	49.178	48.980	1.503	16.085	0.051	9.515	18.992	2.780	2.095	100.20	HB2&4A_L3_S2
-78.3	49.115	48.874	1.540	15.976	0.086	9.738	19.017	2.737	2.033	100.24	HB2&4A_L3_S2
-58.3	49.285	49.033	1.478	15.985	0.080	9.766	18.878	2.719	2.062	100.25	HB2&4A_L3_S2
-38.3	49.228	49.078	1.543	15.919	0.063	9.766	18.928	2.748	1.956	100.15	HB2&4A_L3_S2
-18.3	49.197	48.870	1.553	16.007	0.048	9.851	18.917	2.780	1.975	100.33	HB2&4A_L3_S2
1.7	49.290	49.349	1.533	15.888	0.063	9.605	18.867	2.756	1.941	99.94	HB2&4A_L3_S2
21.7	49.305	49.276	1.445	15.885	-0.005	9.688	19.018	2.808	1.886	100.03	HB2&4A_L3_S2
41.7	49.295	49.002	1.527	15.882	0.069	9.944	18.974	2.765	1.836	100.29	HB2&4A_L3_S2
61.7	49.603	49.114	1.530	15.821	0.077	9.844	19.019	2.804	1.791	100.49	HB2&4A_L3_S2
81.7	49.334	49.223	1.513	15.897	0.061	9.697	19.050	2.804	1.755	100.11	HB2&4A_L3_S2
101.7	49.264	49.068	1.560	15.847	0.054	9.800	19.114	2.842	1.716	100.20	HB2&4A_L3_S2
121.7	49.595	49.086	1.572	16.040	0.040	9.782	19.024	2.773	1.683	100.51	HB2&4A_L3_S2
141.7	49.540	49.309	1.548	15.894	0.076	9.639	19.074	2.838	1.622	100.23	HB2&4A_L3_S2
161.7	49.401	49.254	1.555	15.837	0.066	9.699	19.127	2.814	1.647	100.15	HB2&4A_L3_S2
181.7	49.435	49.108	1.559	15.974	0.028	9.782	19.110	2.835	1.607	100.33	HB2&4A_L3_S2
201.7	49.572	49.235	1.481	15.937	0.046	9.710	19.139	2.848	1.604	100.34	HB2&4A_L3_S2
221.7	49.425	48.968	1.532	16.035	0.098	9.794	19.166	2.865	1.542	100.46	HB2&4A_L3_S2
241.7	49.521	49.249	1.453	15.992	-0.003	9.786	19.122	2.860	1.542	100.27	HB2&4A_L3_S2
261.7	49.383	49.210	1.577	16.029	0.101	9.635	19.119	2.866	1.465	100.17	HB2&4A_L3_S2
281.7	49.544	49.417	1.581	15.938	0.065	9.676	18.989	2.866	1.469	100.13	HB2&4A_L3_S2
301.7	49.590	49.291	1.492	15.925	0.044	9.737	19.200	2.890	1.421	100.30	HB2&4A_L3_S2
321.7	49.543	49.404	1.490	15.915	0.082	9.693	19.031	2.936	1.450	100.14	HB2&4A_L3_S2
341.7	49.688	49.391	1.540	15.842	0.094	9.775	19.068	2.866	1.424	100.30	HB2&4A_L3_S2
361.7	49.709	49.383	1.545	15.853	0.068	9.769	19.038	2.918	1.425	100.33	HB2&4A_L3_S2
381.7	49.606	49.356	1.548	15.957	0.043	9.784	19.055	2.905	1.353	100.25	HB2&4A_L3_S2
401.7	49.643	49.243	1.556	15.920	0.072	9.737	19.213	2.899	1.361	100.40	HB2&4A_L3_S2
421.7	49.590	49.285	1.515	15.976	0.080	9.697	19.199	2.895	1.352	100.30	HB2&4A_L3_S2
441.7	49.626	49.316	1.542	16.011	0.087	9.799	19.056	2.887	1.303	100.31	HB2&4A_L3_S2
461.7	49.684	49.623	1.502	15.980	-0.043	9.740	19.000	2.905	1.294	100.06	HB2&4A_L3_S2
481.7	49.793	49.164	1.580	15.980	0.059	9.888	19.093	2.910	1.326	100.63	HB2&4A_L3_S2
501.7	49.731	49.595	1.477	15.919	0.032	9.648	19.078	2.906	1.344	100.14	HB2&4A_L3_S2
521.7	49.686	49.294	1.518	15.947	0.042	9.790	19.161	2.923	1.326	100.39	HB2&4A_L3_S1
561.7	49.816	49.320	1.606	15.956	0.073	9.795	19.002	2.931	1.317	100.50	HB2&4A_L3_S1
601.7	49.843	49.181	1.598	16.024	0.057	9.759	19.176	2.932	1.273	100.66	HB2&4A_L3_S1
641.7	49.587	49.621	1.459	15.927	0.059	9.754	19.001	2.870	1.310	99.97	HB2&4A_L3_S1
681.7	49.901	49.239	1.526	16.025	0.123	9.800	19.085	2.919	1.285	100.66	HB2&4A_L3_S1
721.7	49.803	49.435	1.595	15.982	0.077	9.718	19.001	2.887	1.304	100.37	HB2&4A_L3_S1
761.7	49.781	49.463	1.562	15.997	0.086	9.704	19.037	2.894	1.258	100.32	HB2&4A_L3_S1
801.7	49.757	49.654	1.466	15.919	0.084	9.665	19.058	2.891	1.263	100.10	HB2&4A_L3_S1
841.7	49.885	49.461	1.553	16.111	0.029	9.731	18.933	2.882	1.300	100.42	HB2&4A_L3_S1
881.7	49.733	49.415	1.575	15.951	0.076	9.797	19.017	2.895	1.274	100.32	HB2&4A_L3_S1
921.7	49.650	49.399	1.512	16.086	0.072	9.661	19.108	2.889	1.272	100.25	HB2&4A_L3_S1
961.7	49.700	49.190	1.532	16.034	0.090	9.926	19.002	2.943	1.283	100.51	HB2&4A_L3_S1
1001.7	49.722	49.288	1.534	16.157	0.046	9.719	19.129	2.875	1.253	100.43	HB2&4A_L3_S1
1041.7	49.708	49.169	1.592	16.132	0.101	9.843	18.990	2.877	1.296	100.54	HB2&4A_L3_S1
1081.7	49.582	49.314	1.522	16.018	0.031	9.843	19.078	2.916	1.278	100.27	HB2&4A_L3_S1
1121.7	49.660	49.430	1.580	16.079	0.020	9.783	18.965	2.875	1.270	100.23	HB2&4A_L3_S1
1161.7	49.538	49.570	1.492	16.061	0.074	9.565	19.101	2.853	1.284	99.97	HB2&4A_L3_S1
1201.7	49.628	49.274	1.642	16.072	0.066	9.804	18.980	2.902	1.260	100.35	HB2&4A_L3_S1
1241.7	49.522	49.659	1.476	15.979	0.040	9.663	19.028	2.866	1.290	99.86	HB2&4A_L3_S1
1281.7	49.559	49.070	1.552	16.095	0.118	9.773	19.188	2.899	1.306	100.49	HB2&4A_L3_S1
1321.7	49.368	49.398	1.500	15.985	0.053	9.817	19.067	2.897	1.282	99.97	HB2&4A_L3_S1
1361.7	49.629	49.057	1.518	16.098	0.106	9.942	19.101	2.905	1.274	100.57	HB2&4A_L3_S1
1401.7	49.486	49.460	1.525	16.072	-0.011	9.759	19.049	2.849	1.297	100.03	HB2&4A_L3_S1
1441.7	49.509	49.052	1.576	16.128	0.050	9.866	19.229	2.840	1.260	100.46	HB2&4A_L3_S1

1481.7	49.419	49.262	1.526	16.047	0.027	9.801	19.226	2.840	1.272	100.16	HB2&4A_L3_S1
1521.7	49.478	49.487	1.496	16.075	0.031	9.745	19.038	2.861	1.267	99.99	HB2&4A_L3_S1
-1431.2	49.209	48.612	1.573	15.829	0.028	9.766	18.916	2.714	2.561	100.60	HB2&4A_L4_S3
-1391.2	49.006	48.650	1.498	15.810	0.048	9.756	18.982	2.726	2.529	100.36	HB2&4A_L4_S3
-1351.2	48.989	48.532	1.549	15.845	0.038	9.848	18.908	2.706	2.575	100.46	HB2&4A_L4_S3
-1271.2	49.135	48.639	1.516	15.935	0.040	9.680	18.894	2.705	2.592	100.50	HB2&4A_L4_S3
-1231.2	49.163	48.685	1.555	15.930	0.059	9.713	18.849	2.664	2.546	100.48	HB2&4A_L4_S3
-1191.2	49.167	48.758	1.582	15.877	0.019	9.657	18.837	2.685	2.586	100.41	HB2&4A_L4_S3
-1151.2	49.107	48.510	1.530	15.821	0.063	9.804	19.015	2.710	2.548	100.60	HB2&4A_L4_S3
-1111.2	48.966	48.674	1.527	15.801	0.074	9.682	18.942	2.702	2.599	100.29	HB2&4A_L4_S3
-1071.2	49.124	48.557	1.598	16.008	0.068	9.679	18.885	2.661	2.543	100.57	HB2&4A_L4_S3
-1031.2	48.998	48.701	1.588	15.871	0.038	9.636	18.978	2.652	2.535	100.30	HB2&4A_L4_S3
-991.2	48.939	48.638	1.504	15.900	0.065	9.689	18.993	2.652	2.560	100.30	HB2&4A_L4_S3
-951.2	49.024	48.708	1.468	15.941	0.018	9.720	18.939	2.655	2.551	100.32	HB2&4A_L4_S3
-911.2	49.103	48.832	1.525	15.898	0.034	9.722	18.804	2.629	2.556	100.27	HB2&4A_L4_S3
-871.2	49.213	48.506	1.549	15.928	0.044	9.826	18.944	2.683	2.520	100.71	HB2&4A_L4_S3
-831.2	49.051	48.745	1.453	16.042	0.069	9.612	18.934	2.631	2.514	100.31	HB2&4A_L4_S3
-751.2	49.074	48.803	1.446	15.872	0.035	9.749	18.885	2.648	2.563	100.27	HB2&4A_L4_S3
-711.2	49.097	48.594	1.589	15.916	0.080	9.723	18.871	2.698	2.529	100.50	HB2&4A_L4_S3
-671.2	49.085	48.473	1.561	16.109	0.061	9.675	18.921	2.652	2.549	100.61	HB2&4A_L4_S3
-631.2	49.271	48.481	1.499	16.004	0.066	9.662	19.099	2.652	2.537	100.79	HB2&4A_L4_S3
-591.2	49.068	48.731	1.571	15.866	0.109	9.731	18.791	2.630	2.571	100.34	HB2&4A_L4_S3
-551.2	49.032	48.801	1.522	15.904	0.115	9.662	18.826	2.634	2.536	100.23	HB2&4A_L4_S3
-531.2	49.125	48.803	1.511	15.923	0.094	9.611	18.912	2.633	2.513	100.32	HB2&4A_L4_S2
-511.2	49.123	48.757	1.555	15.903	0.016	9.612	18.940	2.650	2.567	100.37	HB2&4A_L4_S2
-491.2	49.105	48.608	1.582	16.036	0.071	9.724	18.797	2.685	2.497	100.50	HB2&4A_L4_S2
-471.2	49.173	48.703	1.540	15.925	0.066	9.724	18.815	2.697	2.530	100.47	HB2&4A_L4_S2
-451.2	49.099	48.760	1.608	15.976	0.053	9.625	18.815	2.671	2.493	100.34	HB2&4A_L4_S2
-431.2	49.250	48.585	1.475	16.125	0.055	9.736	18.892	2.676	2.458	100.67	HB2&4A_L4_S2
-411.2	49.055	48.687	1.534	15.887	0.091	9.712	18.909	2.688	2.492	100.37	HB2&4A_L4_S2
-391.2	49.209	48.751	1.541	15.987	0.052	9.629	18.904	2.655	2.482	100.46	HB2&4A_L4_S2
-371.2	49.197	48.747	1.473	15.959	0.088	9.743	18.872	2.658	2.460	100.45	HB2&4A_L4_S2
-351.2	49.287	48.750	1.488	15.935	0.040	9.724	18.915	2.696	2.453	100.54	HB2&4A_L4_S2
-331.2	49.258	48.825	1.506	15.978	0.099	9.665	18.907	2.628	2.393	100.43	HB2&4A_L4_S2
-311.2	49.168	48.637	1.426	16.030	0.143	9.693	18.940	2.736	2.396	100.53	HB2&4A_L4_S2
-291.2	49.077	48.910	1.478	15.907	0.022	9.780	18.852	2.701	2.350	100.17	HB2&4A_L4_S2
-271.2	49.289	48.798	1.512	15.989	0.096	9.668	18.858	2.702	2.377	100.49	HB2&4A_L4_S2
-251.2	49.263	48.669	1.593	16.063	0.078	9.668	18.873	2.706	2.350	100.59	HB2&4A_L4_S2
-231.2	49.332	48.848	1.545	16.148	0.054	9.641	18.759	2.704	2.300	100.48	HB2&4A_L4_S2
-211.2	49.263	48.836	1.612	15.950	0.052	9.718	18.848	2.695	2.289	100.43	HB2&4A_L4_S2
-191.2	49.320	48.625	1.517	16.132	0.013	9.643	19.005	2.757	2.310	100.70	HB2&4A_L4_S2
-171.2	49.309	48.832	1.569	15.995	0.092	9.766	18.792	2.710	2.243	100.48	HB2&4A_L4_S2
-151.2	49.306	48.897	1.523	16.056	0.010	9.659	18.950	2.691	2.215	100.41	HB2&4A_L4_S2
-131.2	49.262	49.032	1.589	15.967	0.042	9.642	18.876	2.702	2.150	100.23	HB2&4A_L4_S2
-111.2	49.332	48.978	1.413	15.981	0.078	9.810	18.912	2.706	2.122	100.35	HB2&4A_L4_S2
-91.2	49.319	48.715	1.537	16.027	0.112	9.749	18.998	2.745	2.116	100.60	HB2&4A_L4_S2
-71.2	49.474	49.058	1.540	16.012	0.019	9.737	18.833	2.728	2.073	100.42	HB2&4A_L4_S2
-51.2	49.248	48.840	1.533	16.031	0.060	9.731	18.991	2.800	2.015	100.41	HB2&4A_L4_S2
-31.2	49.356	49.111	1.484	15.886	0.037	9.735	19.044	2.758	1.945	100.25	HB2&4A_L4_S2
-11.2	49.392	48.855	1.578	16.090	0.059	9.656	19.000	2.790	1.971	100.54	HB2&4A_L4_S2
8.8	49.417	49.058	1.487	16.048	0.099	9.642	19.026	2.737	1.904	100.36	HB2&4A_L4_S2
28.8	49.386	49.052	1.444	16.088	0.061	9.759	19.002	2.739	1.856	100.33	HB2&4A_L4_S2
48.8	49.347	49.016	1.562	15.911	0.051	9.725	19.137	2.780	1.820	100.33	HB2&4A_L4_S2
68.8	49.417	49.061	1.519	15.949	0.080	9.806	19.027	2.785	1.774	100.36	HB2&4A_L4_S2
88.8	49.503	49.087	1.593	15.943	0.076	9.658	19.161	2.756	1.727	100.42	HB2&4A_L4_S2
108.8	49.429	48.881	1.564	16.066	0.063	9.789	19.160	2.760	1.717	100.55	HB2&4A_L4_S2
128.8	49.469	49.272	1.531	15.979	0.028	9.697	19.069	2.783	1.641	100.20	HB2&4A_L4_S2
148.8	49.560	49.239	1.499	15.911	0.107	9.752	18.998	2.870	1.626	100.32	HB2&4A_L4_S2
168.8	49.410	49.300	1.545	15.744	0.078	9.761	19.175	2.817	1.580	100.11	HB2&4A_L4_S2
188.8	49.411	49.135	1.535	15.976	0.073	9.770	19.108	2.828	1.575	100.28	HB2&4A_L4_S2
208.8	49.542	49.191	1.501	15.949	0.067	9.777	19.171	2.820	1.524	100.35	HB2&4A_L4_S2
228.8	49.432	49.054	1.528	15.973	0.103	9.734	19.243	2.837	1.528	100.38	HB2&4A_L4_S2
248.8	49.455	49.418	1.496	15.880	0.065	9.657	19.118	2.872	1.494	100.04	HB2&4A_L4_S2

268.8	49.676	49.145	1.490	16.011	0.061	9.710	19.280	2.813	1.491	100.53	HB2&4A_L4_S2
288.8	49.650	49.374	1.601	15.954	0.055	9.642	19.090	2.854	1.432	100.28	HB2&4A_L4_S2
308.8	49.676	49.320	1.526	15.912	0.046	9.716	19.179	2.869	1.433	100.36	HB2&4A_L4_S2
328.8	49.552	49.263	1.513	15.976	0.086	9.572	19.252	2.904	1.435	100.29	HB2&4A_L4_S2
348.8	49.538	49.314	1.513	16.022	0.053	9.644	19.206	2.850	1.397	100.22	HB2&4A_L4_S2
368.8	49.629	49.404	1.547	15.925	-0.009	9.769	19.165	2.841	1.358	100.22	HB2&4A_L4_S2
388.8	49.609	49.198	1.466	15.981	0.105	9.803	19.217	2.870	1.362	100.41	HB2&4A_L4_S2
408.8	49.558	49.290	1.568	16.051	0.065	9.803	19.023	2.844	1.355	100.27	HB2&4A_L4_S2
428.8	49.659	49.490	1.473	15.905	0.103	9.636	19.157	2.882	1.355	100.17	HB2&4A_L4_S2
448.8	49.457	49.524	1.505	15.961	0.096	9.638	19.102	2.851	1.323	99.93	HB2&4A_L4_S2
468.8	49.573	49.212	1.615	15.920	0.068	9.747	19.204	2.887	1.347	100.36	HB2&4A_L4_S1
510.5	49.532	49.317	1.514	15.983	0.078	9.757	19.180	2.863	1.308	100.21	HB2&4A_L4_S1
552.1	49.577	49.089	1.539	16.020	0.077	9.870	19.241	2.862	1.303	100.49	HB2&4A_L4_S1
593.8	49.684	49.379	1.501	15.961	0.063	9.682	19.179	2.929	1.306	100.30	HB2&4A_L4_S1
635.5	49.637	49.480	1.504	16.065	0.019	9.727	19.079	2.837	1.289	100.16	HB2&4A_L4_S1
677.1	49.628	49.307	1.536	16.097	0.059	9.696	19.140	2.883	1.284	100.32	HB2&4A_L4_S1
718.8	49.682	49.239	1.541	15.952	0.091	9.876	19.094	2.918	1.290	100.44	HB2&4A_L4_S1
760.5	49.602	49.477	1.596	15.999	0.019	9.634	19.068	2.921	1.288	100.13	HB2&4A_L4_S1
802.1	49.741	49.251	1.536	16.078	0.092	9.775	19.162	2.853	1.253	100.49	HB2&4A_L4_S1
843.8	49.593	49.496	1.501	16.048	0.090	9.765	18.957	2.907	1.236	100.10	HB2&4A_L4_S1
885.5	49.813	49.460	1.554	15.938	0.118	9.659	19.092	2.894	1.286	100.35	HB2&4A_L4_S1
927.1	49.791	49.276	1.581	16.000	0.063	9.919	18.994	2.907	1.261	100.51	HB2&4A_L4_S1
968.8	49.692	49.339	1.510	16.032	0.080	9.743	19.155	2.860	1.282	100.35	HB2&4A_L4_S1
1010.5	49.781	49.490	1.588	15.948	0.079	9.645	19.103	2.845	1.302	100.29	HB2&4A_L4_S1
1052.1	49.579	49.620	1.542	15.962	0.065	9.610	19.056	2.872	1.273	99.96	HB2&4A_L4_S1
1093.8	49.575	49.555	1.547	15.938	0.027	9.636	19.113	2.920	1.264	100.02	HB2&4A_L4_S1
1135.5	49.575	49.316	1.607	15.976	0.035	9.717	19.148	2.908	1.293	100.26	HB2&4A_L4_S1
1177.1	49.638	49.296	1.519	16.019	0.076	9.851	19.103	2.839	1.298	100.34	HB2&4A_L4_S1
1218.8	49.655	49.282	1.556	16.070	0.009	9.741	19.201	2.873	1.268	100.37	HB2&4A_L4_S1
1260.5	49.705	49.284	1.505	15.921	0.040	9.908	19.211	2.888	1.242	100.42	HB2&4A_L4_S1
1302.1	49.617	49.347	1.545	16.079	0.068	9.794	19.019	2.878	1.271	100.27	HB2&4A_L4_S1
1343.8	49.586	49.308	1.558	16.032	0.054	9.741	19.123	2.901	1.282	100.28	HB2&4A_L4_S1
1385.5	49.558	49.199	1.522	16.029	0.086	9.839	19.159	2.893	1.274	100.36	HB2&4A_L4_S1
1427.1	49.741	49.253	1.524	16.051	0.058	9.795	19.150	2.925	1.243	100.49	HB2&4A_L4_S1
1468.8	49.604	48.999	1.553	16.133	0.059	9.954	19.120	2.883	1.301	100.61	HB2&4A_L4_S1

Table C2. HB3&4A

X (µm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
-1298.8	51.989	52.146	1.283	15.946	0.023	10.053	19.174	0.531	0.844	99.84	HB3&4_L0
-1238.8	51.954	52.334	1.292	15.968	0.033	10.006	19.004	0.508	0.855	99.62	HB3&4_L0
-1178.8	51.778	52.383	1.211	16.020	0.003	9.978	18.997	0.537	0.870	99.39	HB3&4_L0
-1118.8	51.851	52.162	1.262	15.989	0.034	10.073	19.054	0.553	0.873	99.69	HB3&4_L0
-1058.8	51.772	52.459	1.277	15.970	-0.007	9.904	18.994	0.558	0.845	99.31	HB3&4_L0
-998.8	51.771	52.499	1.193	15.956	0.001	10.022	18.902	0.560	0.869	99.27	HB3&4_L0
-938.8	51.907	52.245	1.216	15.998	0.042	10.098	18.994	0.555	0.852	99.66	HB3&4_L0
-878.8	51.885	52.385	1.233	15.922	0.003	10.047	19.006	0.569	0.837	99.50	HB3&4_L0
-818.8	51.996	52.439	1.197	15.940	0.022	10.103	18.902	0.572	0.825	99.56	HB3&4_L0
-758.8	51.951	52.047	1.191	16.016	0.029	10.140	19.123	0.607	0.848	99.90	HB3&4_L0
-698.8	51.887	52.212	1.186	16.012	-0.013	9.994	19.065	0.664	0.880	99.67	HB3&4_L0
-638.8	51.814	52.193	1.162	15.922	0.011	10.055	19.115	0.693	0.849	99.62	HB3&4_L0
-578.8	52.065	52.065	1.150	15.942	0.024	10.063	19.122	0.777	0.856	100.00	HB3&4_L0
-458.8	51.785	51.978	1.248	15.917	0.022	10.027	19.025	0.915	0.870	99.81	HB3&4_L0
-398.8	51.781	52.097	1.071	15.870	0.043	9.954	19.085	1.027	0.854	99.68	HB3&4_L0
-338.8	51.782	52.335	1.131	15.773	-0.007	9.823	18.952	1.116	0.878	99.45	HB3&4_L0
-278.8	51.890	51.881	1.110	15.911	0.002	9.985	18.917	1.271	0.924	100.01	HB3&4_L0
-218.8	51.721	52.167	1.054	15.755	0.003	9.802	18.868	1.403	0.948	99.55	HB3&4_L0
-158.8	51.516	51.916	1.019	15.746	0.025	9.846	18.907	1.538	1.005	99.60	HB3&4_L0
-98.8	51.084	51.649	1.125	15.690	0.037	9.841	18.999	1.632	1.026	99.43	HB3&4_L0
-38.8	50.405	51.059	1.255	15.941	0.050	10.016	18.849	1.761	1.069	99.35	HB3&4_L0
81.2	49.746	50.056	1.573	16.183	0.016	10.124	18.963	1.977	1.108	99.69	HB3&4_L0
136.2	49.376	50.171	1.548	16.138	0.036	10.035	18.900	2.029	1.143	99.20	HB3&4_L0
196.2	49.327	49.916	1.514	16.121	0.037	10.168	18.939	2.134	1.172	99.41	HB3&4_L0
256.2	49.110	49.777	1.555	16.183	0.057	10.115	18.914	2.222	1.177	99.33	HB3&4_L0
316.2	49.257	49.707	1.641	16.113	0.049	10.025	18.948	2.314	1.204	99.55	HB3&4_L0
376.2	49.241	49.901	1.518	16.055	0.064	9.982	18.909	2.346	1.225	99.34	HB3&4_L0
436.2	49.046	49.768	1.516	16.021	0.048	10.002	18.954	2.441	1.250	99.28	HB3&4_L0
496.2	49.316	49.482	1.546	16.004	0.064	10.095	18.996	2.557	1.257	99.83	HB3&4_L0
556.2	49.071	49.535	1.588	15.925	0.077	9.999	18.962	2.640	1.276	99.54	HB3&4_L0
616.2	49.109	49.739	1.473	15.969	0.030	10.062	18.841	2.629	1.258	99.37	HB3&4_L0
676.2	48.905	49.620	1.537	15.934	0.054	10.022	18.865	2.700	1.269	99.29	HB3&4_L0
736.2	48.997	49.758	1.501	15.921	0.067	9.855	18.890	2.735	1.272	99.24	HB3&4_L0
856.2	48.888	49.412	1.595	15.937	0.070	10.052	18.823	2.808	1.304	99.48	HB3&4_L0
916.2	48.990	49.627	1.470	16.000	0.082	9.856	18.887	2.828	1.251	99.36	HB3&4_L0
976.2	48.862	49.519	1.554	15.928	0.088	9.899	18.912	2.819	1.281	99.34	HB3&4_L0
1036.2	49.073	49.521	1.468	15.954	0.070	9.956	18.880	2.834	1.318	99.55	HB3&4_L0
1096.2	48.885	49.518	1.580	16.004	0.083	9.866	18.784	2.885	1.279	99.37	HB3&4_L0
1156.2	49.057	49.520	1.527	15.964	0.041	9.917	18.896	2.877	1.259	99.54	HB3&4_L0
1216.2	48.931	49.561	1.467	15.994	0.081	9.939	18.809	2.879	1.270	99.37	HB3&4_L0
1276.2	48.975	49.335	1.521	16.003	0.076	9.926	18.965	2.900	1.275	99.64	HB3&4_L0
1336.2	48.847	49.430	1.527	15.986	0.088	9.909	18.943	2.861	1.255	99.42	HB3&4_L0
1396.2	48.955	49.526	1.420	16.042	0.068	9.953	18.827	2.895	1.270	99.43	HB3&4_L0
-1400.0	52.105	52.236	1.255	16.165	0.011	10.115	18.866	0.516	0.837	99.87	HB3&4_L1_S3b
-1360.0	52.170	52.013	1.290	16.123	0.018	10.141	19.035	0.532	0.849	100.16	HB3&4_L1_S3b
-1320.0	51.998	52.218	1.219	16.147	0.016	10.008	18.999	0.531	0.862	99.78	HB3&4_L1_S3b
-1280.0	51.889	52.151	1.304	15.956	0.031	10.096	19.085	0.523	0.854	99.74	HB3&4_L1_S3b
-1240.0	52.252	51.960	1.263	16.139	0.023	10.130	19.099	0.518	0.867	100.29	HB3&4_L1_S3b
-1200.0	52.084	52.094	1.321	16.033	0.007	10.128	19.040	0.532	0.844	99.99	HB3&4_L1_S3b
-1160.0	52.139	52.205	1.224	16.061	0.052	9.988	19.098	0.523	0.850	99.93	HB3&4_L1_S3b
-1120.0	52.120	52.294	1.200	15.982	0.014	10.111	19.009	0.530	0.860	99.83	HB3&4_L1_S3b
-1080.0	52.034	52.144	1.306	16.119	0.026	10.019	19.035	0.528	0.823	99.89	HB3&4_L1_S3b
-1040.0	52.100	52.294	1.224	16.019	0.033	10.123	18.912	0.543	0.852	99.81	HB3&4_L1_S3b
-1000.0	52.047	52.360	1.205	16.010	0.034	10.033	18.996	0.519	0.843	99.69	HB3&4_L1_S3b
-960.0	52.271	51.929	1.236	16.172	0.032	10.122	19.104	0.554	0.851	100.34	HB3&4_L1_S3b
-902.0	52.150	52.055	1.223	16.158	0.033	10.108	19.032	0.542	0.848	100.10	HB3&4_L1_S3a
-862.0	52.313	52.443	1.203	16.028	0.022	10.023	18.860	0.565	0.856	99.87	HB3&4_L1_S3a
-822.0	52.142	52.080	1.262	16.199	0.005	10.029	18.999	0.565	0.862	100.06	HB3&4_L1_S3a
-782.0	52.271	52.130	1.252	16.090	0.031	10.063	19.009	0.591	0.834	100.14	HB3&4_L1_S3a
-742.0	52.096	51.984	1.206	16.076	0.027	10.160	19.082	0.607	0.857	100.11	HB3&4_L1_S3a
-702.0	52.332	52.166	1.142	16.130	0.010	10.099	18.972	0.627	0.853	100.17	HB3&4_L1_S3a

-662.0	52.195	52.370	1.141	16.009	0.040	9.959	18.978	0.673	0.829	99.83	HB3&4_L1_S3a
-622.0	52.309	52.009	1.238	16.161	0.031	10.074	18.916	0.711	0.859	100.30	HB3&4_L1_S3a
-582.0	52.192	52.075	1.165	16.069	0.025	10.044	19.017	0.756	0.850	100.12	HB3&4_L1_S3a
-542.0	52.093	52.119	1.184	16.008	0.044	9.954	19.036	0.806	0.850	99.97	HB3&4_L1_S3a
-502.0	52.038	52.254	1.104	16.009	0.011	9.953	18.949	0.853	0.867	99.78	HB3&4_L1_S3a
-462.0	51.997	52.013	1.176	16.061	0.022	9.972	19.019	0.902	0.836	99.98	HB3&4_L1_S3a
-422.0	52.162	52.000	1.077	16.046	0.041	9.939	19.059	0.975	0.862	100.16	HB3&4_L1_S3a
-382.0	52.123	52.222	1.128	15.942	-0.008	9.770	19.021	1.063	0.860	99.90	HB3&4_L1_S3a
-342.0	52.159	51.904	1.052	16.068	0.012	9.919	19.004	1.144	0.897	100.26	HB3&4_L1_S3a
-302.0	51.923	51.856	1.139	15.992	0.024	9.969	18.915	1.199	0.908	100.07	HB3&4_L1_S3a
-287.0	52.005	52.020	1.079	15.923	0.064	9.823	18.953	1.228	0.912	99.99	HB3&4_L1_S2d
-267.0	51.888	52.107	1.193	15.822	0.017	9.883	18.790	1.283	0.904	99.78	HB3&4_L1_S2d
-247.0	51.983	51.947	1.077	15.874	0.025	9.881	18.957	1.312	0.927	100.04	HB3&4_L1_S2d
-227.0	51.936	51.779	1.113	15.904	0.004	9.954	18.946	1.376	0.923	100.16	HB3&4_L1_S2d
-207.0	51.939	51.715	1.105	15.907	0.020	9.885	19.031	1.387	0.950	100.22	HB3&4_L1_S2d
-187.0	51.740	51.990	1.078	15.803	0.019	9.848	18.884	1.446	0.933	99.75	HB3&4_L1_S2d
-167.0	51.944	51.763	1.149	15.765	0.024	9.887	18.973	1.494	0.946	100.18	HB3&4_L1_S2d
-147.0	51.791	51.869	1.094	15.797	0.023	9.755	18.943	1.527	0.992	99.92	HB3&4_L1_S2d
-127.0	51.619	51.764	1.154	15.820	0.034	9.796	18.882	1.568	0.984	99.86	HB3&4_L1_S2d
-107.0	51.685	51.596	1.203	15.762	0.052	9.908	18.832	1.606	1.042	100.09	HB3&4_L1_S2d
-87.0	51.576	51.289	1.159	15.887	0.010	9.990	19.007	1.648	1.012	100.29	HB3&4_L1_S2d
-50.0	51.104	51.256	1.197	15.893	0.009	9.978	18.924	1.696	1.048	99.85	HB3&4_L1_S2c
-40.0	51.053	50.893	1.276	16.022	0.041	10.114	18.890	1.725	1.039	100.16	HB3&4_L1_S2b
-20.0	51.072	51.161	1.271	15.928	0.052	9.897	18.870	1.763	1.058	99.91	HB3&4_L1_S2b
0.0	50.563	50.825	1.342	16.044	0.046	10.023	18.859	1.780	1.082	99.74	HB3&4_L1_S2b
20.0	50.588	50.540	1.389	16.094	0.009	10.098	18.952	1.832	1.087	100.05	HB3&4_L1_S2b
40.0	50.414	50.672	1.339	16.060	0.041	10.099	18.925	1.814	1.051	99.74	HB3&4_L1_S2b
60.0	50.392	50.557	1.394	16.096	0.050	9.936	18.961	1.893	1.113	99.83	HB3&4_L1_S2b
87.0	50.198	50.068	1.462	16.282	0.051	10.153	18.834	2.003	1.148	100.13	HB3&4_L1_S2a
105.0	50.244	49.941	1.480	16.347	0.063	10.112	18.957	1.952	1.149	100.30	HB3&4_L1_S2a
123.0	49.958	50.042	1.508	16.316	0.049	10.061	18.917	2.009	1.098	99.92	HB3&4_L1_S2a
149.0	49.560	50.003	1.610	16.175	0.015	10.055	18.970	2.040	1.132	99.56	HB3&4_L1_S1
189.0	49.651	49.728	1.513	16.233	0.034	10.256	18.976	2.102	1.157	99.92	HB3&4_L1_S1
229.0	49.526	50.017	1.506	16.176	0.019	10.095	18.841	2.160	1.187	99.51	HB3&4_L1_S1
269.0	49.600	49.781	1.499	16.234	0.068	10.059	18.933	2.206	1.221	99.82	HB3&4_L1_S1
309.0	49.202	49.860	1.576	16.113	0.051	10.007	18.903	2.280	1.212	99.34	HB3&4_L1_S1
349.0	49.402	49.661	1.517	16.084	0.063	10.109	18.978	2.361	1.230	99.74	HB3&4_L1_S1
389.0	49.142	49.772	1.547	16.057	0.101	10.039	18.850	2.398	1.236	99.37	HB3&4_L1_S1
429.0	49.340	49.826	1.477	15.896	0.044	10.187	18.869	2.451	1.251	99.51	HB3&4_L1_S1
469.0	49.346	49.623	1.563	15.979	0.058	10.025	18.977	2.499	1.275	99.72	HB3&4_L1_S1
509.0	49.260	49.756	1.504	15.979	0.047	10.015	18.951	2.490	1.259	99.50	HB3&4_L1_S1
549.0	49.260	49.481	1.586	15.942	0.069	10.118	18.980	2.547	1.278	99.78	HB3&4_L1_S1
589.0	49.144	49.566	1.492	15.993	0.057	10.143	18.882	2.606	1.261	99.58	HB3&4_L1_S1
629.0	49.406	49.570	1.519	15.996	0.071	9.950	19.005	2.622	1.269	99.84	HB3&4_L1_S1
669.0	48.983	49.543	1.543	16.062	0.045	9.996	18.847	2.699	1.266	99.44	HB3&4_L1_S1
709.0	49.283	49.723	1.437	15.976	0.074	9.879	18.896	2.716	1.301	99.56	HB3&4_L1_S1
749.0	49.380	49.436	1.550	15.986	0.081	9.970	18.929	2.760	1.288	99.94	HB3&4_L1_S1
789.0	49.094	49.505	1.498	15.930	0.070	10.029	18.932	2.754	1.282	99.59	HB3&4_L1_S1
829.0	49.323	49.441	1.489	15.962	0.057	9.970	19.053	2.779	1.248	99.88	HB3&4_L1_S1
869.0	49.236	49.257	1.530	15.964	0.065	10.133	18.961	2.785	1.307	99.98	HB3&4_L1_S1
909.0	49.148	49.569	1.481	15.955	0.059	9.921	18.958	2.804	1.254	99.58	HB3&4_L1_S1
949.0	49.036	49.516	1.500	15.965	0.061	9.942	18.922	2.804	1.291	99.52	HB3&4_L1_S1
989.0	49.278	49.347	1.570	15.991	0.054	10.004	18.868	2.879	1.289	99.93	HB3&4_L1_S1
1029.0	48.954	49.506	1.543	15.983	0.073	9.872	18.888	2.854	1.283	99.45	HB3&4_L1_S1
1069.0	49.262	49.324	1.548	15.920	0.083	10.015	18.972	2.865	1.274	99.94	HB3&4_L1_S1
1109.0	48.998	49.308	1.536	16.074	0.051	9.939	18.988	2.843	1.262	99.69	HB3&4_L1_S1
1149.0	49.239	49.672	1.471	16.033	0.055	9.737	18.847	2.877	1.310	99.57	HB3&4_L1_S1
1189.0	48.980	49.380	1.499	15.970	0.104	9.982	18.867	2.919	1.281	99.60	HB3&4_L1_S1
1229.0	48.984	49.675	1.547	15.919	0.016	9.839	18.842	2.924	1.238	99.31	HB3&4_L1_S1
1269.0	49.056	49.270	1.531	16.053	0.078	9.934	18.944	2.891	1.300	99.79	HB3&4_L1_S1
1309.0	49.126	49.434	1.580	16.027	0.033	9.798	18.972	2.855	1.302	99.69	HB3&4_L1_S1
1349.0	49.205	49.477	1.517	15.898	0.068	9.991	18.884	2.919	1.246	99.73	HB3&4_L1_S1
1389.0	49.032	49.471	1.502	15.928	0.075	9.867	18.929	2.927	1.301	99.56	HB3&4_L1_S1

1429.0	49.195	49.648	1.486	16.014	0.048	9.816	18.839	2.872	1.279	99.55	HB3&4_L1_S1
-1371.0	51.782	52.115	1.322	16.050	0.057	10.006	19.086	0.534	0.829	99.67	HB3&4_L2_S4
-1331.0	51.820	51.989	1.382	16.079	0.026	10.138	18.992	0.535	0.860	99.83	HB3&4_L2_S4
-1291.0	51.768	52.339	1.239	15.943	0.031	10.027	19.040	0.527	0.854	99.43	HB3&4_L2_S4
-1251.0	52.027	52.115	1.273	16.028	0.066	10.108	19.017	0.521	0.873	99.91	HB3&4_L2_S4
-1211.0	51.639	52.337	1.218	16.029	0.040	9.983	19.000	0.521	0.872	99.30	HB3&4_L2_S4
-1171.0	51.997	52.439	1.274	15.910	0.043	9.970	18.958	0.533	0.873	99.56	HB3&4_L2_S4
-1131.0	52.051	52.381	1.209	16.025	0.001	9.999	18.978	0.531	0.877	99.67	HB3&4_L2_S4
-1091.0	52.061	52.260	1.232	16.043	0.013	10.083	18.965	0.545	0.859	99.80	HB3&4_L2_S4
-1051.0	51.904	52.255	1.249	16.013	0.045	10.097	18.946	0.534	0.862	99.65	HB3&4_L2_S4
-1011.0	51.889	52.375	1.302	15.977	0.036	10.053	18.851	0.550	0.857	99.51	HB3&4_L2_S4
-931.0	52.093	52.350	1.246	16.101	0.009	10.020	18.844	0.550	0.881	99.74	HB3&4_L2_S3
-892.0	51.843	52.341	1.313	15.935	0.009	10.044	18.932	0.570	0.856	99.50	HB3&4_L2_S3
-853.0	51.804	52.073	1.310	16.133	0.027	10.081	18.920	0.589	0.868	99.73	HB3&4_L2_S3
-814.0	51.886	51.934	1.263	16.054	0.021	10.161	19.106	0.600	0.863	99.95	HB3&4_L2_S3
-775.0	51.822	52.456	1.235	15.921	0.020	9.952	18.959	0.603	0.855	99.37	HB3&4_L2_S3
-736.0	52.027	52.307	1.202	16.129	0.010	9.904	18.940	0.635	0.872	99.72	HB3&4_L2_S3
-697.0	51.994	52.367	1.238	15.994	0.004	9.897	18.995	0.633	0.871	99.63	HB3&4_L2_S3
-658.0	52.137	52.265	1.231	16.064	0.051	9.921	18.948	0.678	0.842	99.87	HB3&4_L2_S3
-619.0	51.995	52.385	1.207	15.900	0.008	10.009	18.903	0.722	0.867	99.61	HB3&4_L2_S3
-580.0	52.007	52.074	1.243	16.002	0.038	9.980	19.021	0.784	0.859	99.93	HB3&4_L2_S3
-541.0	51.996	52.295	1.141	16.003	0.002	9.906	18.981	0.817	0.857	99.70	HB3&4_L2_S3
-502.0	51.993	52.204	1.173	15.932	0.025	9.912	19.018	0.870	0.866	99.79	HB3&4_L2_S3
-463.0	52.105	52.225	1.148	15.942	0.019	9.895	19.028	0.902	0.841	99.88	HB3&4_L2_S3
-424.0	51.954	52.121	1.150	15.967	0.041	9.870	19.029	0.962	0.861	99.83	HB3&4_L2_S3
-385.0	51.749	51.990	1.159	15.961	-0.001	9.925	18.991	1.068	0.907	99.76	HB3&4_L2_S3
-346.0	51.940	52.195	1.136	15.776	0.016	9.859	18.959	1.156	0.904	99.75	HB3&4_L2_S3
-307.0	51.627	51.828	1.200	15.946	0.005	9.900	19.008	1.220	0.892	99.80	HB3&4_L2_S3
-268.0	51.875	52.033	1.110	15.909	0.014	9.744	18.975	1.302	0.914	99.84	HB3&4_L2_S3
-229.0	51.655	51.983	1.161	15.773	0.023	9.808	18.947	1.350	0.956	99.67	HB3&4_L2_S3
-190.0	51.761	51.969	1.079	15.856	0.043	9.720	18.887	1.478	0.967	99.79	HB3&4_L2_S3
-151.0	51.673	51.778	1.122	15.798	0.035	9.785	18.898	1.563	1.022	99.90	HB3&4_L2_S3
-112.0	51.441	51.727	1.128	15.796	0.046	9.804	18.873	1.609	1.018	99.71	HB3&4_L2_S3
-73.0	51.260	51.379	1.150	15.833	0.014	10.003	18.901	1.679	1.041	99.88	HB3&4_L2_S3
-50.0	51.007	51.276	1.199	15.899	0.047	9.960	18.862	1.696	1.061	99.73	HB3&4_L2_S2
-35.0	50.791	51.438	1.253	15.813	0.034	9.884	18.792	1.733	1.053	99.35	HB3&4_L2_S2
0.0	50.654	51.075	1.275	15.870	0.045	9.964	18.900	1.789	1.082	99.58	HB3&4_L2_S2
70.0	49.958	50.628	1.374	15.991	0.046	10.023	18.926	1.904	1.109	99.33	HB3&4_L2_S2
105.0	49.922	50.186	1.476	16.199	0.062	10.075	18.905	1.988	1.110	99.74	HB3&4_L2_S2
496.0	48.989	49.747	1.630	15.799	0.069	9.971	18.988	2.516	1.280	99.24	HB3&4_L2_S1
536.0	48.832	49.577	1.560	16.041	0.093	9.959	18.939	2.555	1.276	99.25	HB3&4_L2_S1
616.0	48.966	49.532	1.558	15.884	0.086	9.908	19.091	2.639	1.302	99.43	HB3&4_L2_S1
816.0	48.868	49.421	1.576	15.999	0.060	10.010	18.860	2.787	1.288	99.45	HB3&4_L2_S1
896.0	48.940	49.674	1.490	15.846	0.072	9.983	18.841	2.810	1.285	99.27	HB3&4_L2_S1
1056.0	48.912	49.614	1.623	15.858	0.067	9.836	18.872	2.866	1.263	99.30	HB3&4_L2_S1
1096.0	48.915	49.621	1.514	15.881	0.069	9.885	18.865	2.861	1.306	99.29	HB3&4_L2_S1
1136.0	49.099	49.595	1.493	15.927	0.059	9.872	18.915	2.845	1.295	99.50	HB3&4_L2_S1
1216.0	49.070	49.553	1.493	15.929	0.075	9.863	18.904	2.884	1.300	99.52	HB3&4_L2_S1
1256.0	49.043	49.387	1.522	16.064	0.085	9.925	18.850	2.893	1.274	99.66	HB3&4_L2_S1
1296.0	48.860	49.408	1.581	16.067	0.048	9.891	18.837	2.903	1.265	99.45	HB3&4_L2_S1
1336.0	49.126	49.450	1.483	16.117	0.073	9.841	18.892	2.894	1.249	99.68	HB3&4_L2_S1
1376.0	49.020	49.516	1.525	16.034	0.064	9.799	18.963	2.849	1.251	99.50	HB3&4_L2_S1
1416.0	49.061	49.510	1.441	15.946	0.063	9.953	18.908	2.906	1.272	99.55	HB3&4_L2_S1

Table C3. HB5&6A

X (µm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
-1380.9	48.657	49.800	1.456	15.873	0.039	9.955	20.316	1.578	0.982	98.86	HB5&6_L1_S3
-1300.9	48.622	49.767	1.375	15.930	0.027	9.948	20.393	1.563	0.998	98.86	HB5&6_L1_S3
-1140.9	48.767	49.888	1.474	15.881	0.040	9.875	20.307	1.554	0.982	98.88	HB5&6_L1_S3
-1060.9	48.858	49.837	1.472	15.840	0.026	9.972	20.328	1.553	0.973	99.02	HB5&6_L1_S3
-1020.9	48.777	49.834	1.475	15.893	0.035	9.960	20.297	1.541	0.966	98.94	HB5&6_L1_S3
-980.9	48.708	49.691	1.456	16.045	0.008	9.993	20.258	1.589	0.962	99.02	HB5&6_L1_S3
-940.9	48.670	49.803	1.493	15.901	0.035	9.907	20.341	1.538	0.981	98.87	HB5&6_L1_S3
-900.9	48.684	49.595	1.444	16.049	0.054	9.950	20.376	1.586	0.947	99.09	HB5&6_L1_S3
-820.9	48.892	49.462	1.479	16.041	0.067	9.981	20.391	1.593	0.987	99.43	HB5&6_L1_S3
-780.9	48.589	49.745	1.426	15.965	0.054	9.880	20.344	1.571	1.015	98.84	HB5&6_L1_S3
-740.9	48.730	49.723	1.517	15.970	0.051	9.905	20.313	1.571	0.950	99.01	HB5&6_L1_S3
-700.9	48.857	49.931	1.367	15.925	0.019	9.782	20.431	1.581	0.965	98.93	HB5&6_L1_S3
-660.9	48.923	49.673	1.563	15.891	0.036	9.990	20.334	1.548	0.965	99.25	HB5&6_L1_S3
-620.9	49.041	49.819	1.471	15.940	0.043	9.880	20.318	1.567	0.962	99.22	HB5&6_L1_S3
-580.9	49.094	49.458	1.502	16.117	0.042	10.025	20.332	1.540	0.984	99.64	HB5&6_L1_S3
-540.9	48.947	49.650	1.528	16.042	0.059	9.945	20.238	1.565	0.973	99.30	HB5&6_L1_S3
-460.9	49.082	49.669	1.507	16.041	0.047	9.985	20.226	1.576	0.948	99.41	HB5&6_L1_S3
-420.9	48.911	49.906	1.512	15.969	0.017	9.941	20.139	1.556	0.960	99.01	HB5&6_L1_S3
-380.9	49.198	49.556	1.503	16.042	0.025	10.056	20.254	1.601	0.964	99.64	HB5&6_L1_S3
-340.9	49.046	49.762	1.441	16.001	0.029	10.080	20.148	1.580	0.960	99.28	HB5&6_L1_S3
-300.9	49.050	50.038	1.347	16.063	0.030	9.946	20.057	1.573	0.947	99.01	HB5&6_L1_S3
-260.9	49.281	49.891	1.464	16.096	0.043	10.060	19.907	1.580	0.959	99.39	HB5&6_L1_S3
-220.9	49.318	49.861	1.489	16.181	0.044	10.011	19.865	1.608	0.941	99.46	HB5&6_L1_S2
-200.9	49.127	50.034	1.449	16.063	0.039	10.035	19.818	1.588	0.974	99.09	HB5&6_L1_S2
-180.9	49.343	50.140	1.406	16.126	0.016	9.941	19.764	1.642	0.966	99.20	HB5&6_L1_S2
-160.9	49.436	50.022	1.507	16.107	0.052	10.101	19.621	1.623	0.967	99.41	HB5&6_L1_S2
-140.9	49.217	50.074	1.415	16.024	0.050	10.021	19.819	1.607	0.989	99.14	HB5&6_L1_S2
-120.9	49.888	50.100	1.459	16.163	0.060	10.108	19.431	1.667	1.011	99.79	HB5&6_L1_S2
-100.9	49.768	50.066	1.535	16.108	0.043	10.114	19.461	1.687	0.986	99.70	HB5&6_L1_S2
-80.9	49.843	50.430	1.455	16.048	0.017	10.009	19.342	1.652	1.048	99.41	HB5&6_L1_S2
-60.9	49.805	50.729	1.437	15.915	0.056	9.999	19.115	1.709	1.040	99.08	HB5&6_L1_S2
-40.9	49.890	50.665	1.421	16.003	0.036	9.964	19.099	1.733	1.079	99.22	HB5&6_L1_S2
-20.9	50.134	50.701	1.455	15.863	0.030	9.979	19.100	1.783	1.091	99.43	HB5&6_L1_S2
-0.9	50.610	50.818	1.407	15.884	0.043	10.007	18.951	1.779	1.113	99.79	HB5&6_L1_S2
19.1	50.370	51.431	1.405	15.703	0.026	9.779	18.731	1.779	1.146	98.94	HB5&6_L1_S2
39.1	50.463	51.364	1.403	15.817	0.039	9.945	18.454	1.814	1.165	99.10	HB5&6_L1_S2
59.1	51.062	51.395	1.442	15.722	0.033	9.887	18.456	1.854	1.212	99.67	HB5&6_L1_S2
79.1	51.111	51.608	1.473	15.679	0.062	9.759	18.353	1.858	1.209	99.50	HB5&6_L1_S2
99.1	51.298	51.609	1.469	15.704	0.048	9.783	18.258	1.871	1.260	99.69	HB5&6_L1_S2
119.1	51.184	51.924	1.436	15.698	0.045	9.684	18.071	1.882	1.261	99.26	HB5&6_L1_S2
139.1	51.280	51.900	1.356	15.679	0.044	9.823	18.004	1.941	1.253	99.38	HB5&6_L1_S2
159.1	51.278	51.740	1.448	15.690	0.048	9.773	18.077	1.941	1.283	99.54	HB5&6_L1_S2
179.1	51.336	52.041	1.357	15.727	0.065	9.721	17.819	1.946	1.324	99.29	HB5&6_L1_S2
199.1	51.290	51.960	1.461	15.752	0.070	9.813	17.711	1.925	1.309	99.33	HB5&6_L1_S2
219.1	51.421	52.289	1.456	15.588	0.043	9.716	17.689	1.939	1.280	99.13	HB5&6_L1_S2
239.1	51.720	52.083	1.416	15.810	0.030	9.783	17.651	1.933	1.295	99.64	HB5&6_L1_S2
259.1	51.448	51.847	1.536	15.827	0.034	9.789	17.664	1.969	1.334	99.60	HB5&6_L1_S2
279.1	51.600	52.077	1.410	15.840	0.042	9.840	17.501	1.977	1.315	99.52	HB5&6_L1_S2
299.1	51.361	51.973	1.519	15.805	0.020	9.851	17.587	1.960	1.287	99.39	HB5&6_L1_S2
319.1	51.673	52.285	1.509	15.709	0.022	9.650	17.510	1.984	1.333	99.39	HB5&6_L1_S2
339.1	51.536	51.955	1.412	15.883	0.032	9.936	17.467	1.999	1.315	99.58	HB5&6_L1_S2
359.1	51.552	52.328	1.511	15.728	0.036	9.715	17.415	1.988	1.280	99.22	HB5&6_L1_S2
379.1	51.761	52.187	1.502	15.777	0.046	9.820	17.391	1.987	1.289	99.57	HB5&6_L1_S2
399.1	51.797	52.255	1.458	15.783	0.023	9.817	17.361	1.991	1.313	99.54	HB5&6_L1_S2
419.1	51.773	52.122	1.482	15.907	0.050	9.735	17.409	1.988	1.309	99.65	HB5&6_L1_S2
439.1	51.674	52.077	1.444	15.865	0.038	9.851	17.427	2.001	1.296	99.60	HB5&6_L1_S2
459.1	51.813	52.185	1.423	15.882	0.027	9.824	17.356	2.000	1.304	99.63	HB5&6_L1_S1
499.1	51.520	52.170	1.422	15.837	0.039	10.001	17.228	1.990	1.313	99.35	HB5&6_L1_S1
579.1	51.751	52.382	1.465	15.831	0.021	9.836	17.179	1.999	1.287	99.37	HB5&6_L1_S1
619.1	51.568	52.059	1.389	15.932	0.021	9.913	17.414	1.969	1.304	99.51	HB5&6_L1_S1
659.1	51.569	52.173	1.496	15.855	0.022	9.907	17.271	1.970	1.307	99.40	HB5&6_L1_S1

699.1	51.560	52.101	1.441	15.887	0.063	9.938	17.323	1.961	1.286	99.46	HB5&6_L1_S1
739.1	51.781	51.994	1.479	16.005	0.057	9.868	17.321	1.976	1.301	99.79	HB5&6_L1_S1
779.1	51.617	52.171	1.404	15.883	0.018	9.942	17.338	1.978	1.266	99.45	HB5&6_L1_S1
819.1	51.788	52.093	1.524	15.849	0.027	9.907	17.324	1.997	1.280	99.70	HB5&6_L1_S1
859.1	51.581	51.938	1.485	15.915	0.044	9.933	17.429	1.936	1.321	99.64	HB5&6_L1_S1
899.1	51.660	52.171	1.470	15.865	0.007	9.881	17.362	1.967	1.277	99.49	HB5&6_L1_S1
939.1	51.716	52.205	1.475	15.840	0.050	9.947	17.261	1.955	1.268	99.51	HB5&6_L1_S1
979.1	51.508	52.197	1.470	15.814	0.047	9.966	17.287	1.960	1.260	99.31	HB5&6_L1_S1
1019.1	51.613	52.154	1.468	15.782	0.043	9.893	17.397	1.970	1.294	99.46	HB5&6_L1_S1
1059.1	51.356	52.141	1.411	15.937	0.048	9.940	17.290	1.959	1.274	99.22	HB5&6_L1_S1
1099.1	51.624	52.002	1.537	15.785	0.044	10.082	17.330	1.959	1.261	99.62	HB5&6_L1_S1
1139.1	51.472	52.141	1.522	15.870	0.048	9.844	17.387	1.955	1.233	99.33	HB5&6_L1_S1
1179.1	51.716	52.225	1.469	15.877	0.037	9.910	17.306	1.915	1.262	99.49	HB5&6_L1_S1
1219.1	51.413	51.994	1.453	15.979	0.045	9.937	17.359	1.946	1.287	99.42	HB5&6_L1_S1
1259.1	51.687	52.154	1.516	15.761	0.024	9.959	17.310	2.000	1.276	99.53	HB5&6_L1_S1
1299.1	51.707	52.286	1.440	15.860	0.034	9.908	17.239	1.945	1.288	99.42	HB5&6_L1_S1
1339.1	51.468	52.374	1.454	15.775	0.020	9.858	17.295	1.963	1.262	99.09	HB5&6_L1_S1
1379.1	51.757	51.901	1.538	15.964	0.040	10.009	17.341	1.979	1.229	99.86	HB5&6_L1_S1
1419.1	51.441	52.251	1.449	15.860	0.070	9.815	17.340	1.980	1.237	99.19	HB5&6_L1_S1
1459.1	51.650	52.118	1.416	15.901	0.024	9.899	17.438	1.944	1.260	99.53	HB5&6_L1_S1
-1507.3	49.235	49.788	1.493	15.925	0.028	9.919	20.322	1.534	0.990	99.45	HB5&6_L2
-1457.3	49.070	49.658	1.512	15.929	0.032	10.046	20.284	1.544	0.994	99.41	HB5&6_L2
-1407.3	49.379	49.848	1.463	15.922	0.045	9.862	20.286	1.587	0.987	99.53	HB5&6_L2
-1357.3	49.285	49.731	1.432	15.867	0.050	9.958	20.449	1.556	0.958	99.55	HB5&6_L2
-1307.3	49.336	49.712	1.505	15.972	0.066	9.902	20.327	1.534	0.984	99.62	HB5&6_L2
-1257.3	49.090	49.726	1.497	15.907	0.029	9.931	20.331	1.579	1.000	99.36	HB5&6_L2
-1207.3	49.168	49.765	1.444	16.021	0.035	9.840	20.338	1.564	0.994	99.40	HB5&6_L2
-1157.3	49.080	49.952	1.464	15.989	0.050	9.753	20.303	1.535	0.953	99.13	HB5&6_L2
-1107.3	49.306	49.807	1.505	15.975	0.046	9.832	20.315	1.561	0.958	99.50	HB5&6_L2
-1057.3	49.320	49.661	1.477	15.956	0.049	10.045	20.297	1.540	0.976	99.66	HB5&6_L2
-1007.3	49.112	49.703	1.405	16.013	0.071	9.906	20.355	1.564	0.983	99.41	HB5&6_L2
-957.3	49.060	49.733	1.468	15.935	0.022	10.055	20.308	1.527	0.952	99.33	HB5&6_L2
-907.3	49.052	50.012	1.453	15.804	0.075	9.924	20.224	1.527	0.982	99.04	HB5&6_L2
-857.3	49.229	49.806	1.485	15.972	0.050	9.889	20.265	1.561	0.973	99.42	HB5&6_L2
-807.3	49.455	49.929	1.469	15.938	0.044	9.839	20.262	1.531	0.988	99.53	HB5&6_L2
-757.3	49.297	50.003	1.375	15.866	0.043	9.888	20.297	1.549	0.980	99.29	HB5&6_L2
-707.3	49.222	49.755	1.471	15.887	0.045	9.962	20.349	1.549	0.982	99.47	HB5&6_L2
-657.3	49.154	50.043	1.413	15.862	0.035	9.922	20.192	1.544	0.990	99.11	HB5&6_L2
-607.3	49.277	49.878	1.350	15.819	0.056	10.053	20.323	1.550	0.970	99.40	HB5&6_L2
-557.3	49.116	49.979	1.530	15.870	0.030	9.884	20.203	1.548	0.956	99.14	HB5&6_L2
-507.3	49.360	49.713	1.427	15.963	0.030	10.035	20.318	1.577	0.937	99.65	HB5&6_L2
-457.3	49.411	49.844	1.428	15.843	0.056	10.013	20.289	1.565	0.963	99.57	HB5&6_L2
-407.3	49.423	49.855	1.444	15.980	0.046	9.977	20.137	1.593	0.970	99.57	HB5&6_L2
-357.3	49.418	49.776	1.428	15.987	0.037	10.035	20.233	1.550	0.955	99.64	HB5&6_L2
-307.3	49.315	50.046	1.408	15.854	0.048	9.998	20.131	1.566	0.949	99.27	HB5&6_L2
-207.3	49.324	50.144	1.481	15.964	0.023	9.946	19.846	1.618	0.978	99.18	HB5&6_L2
-157.3	49.584	50.181	1.475	16.023	0.050	10.030	19.620	1.633	0.988	99.40	HB5&6_L2
-107.3	49.911	50.354	1.488	16.013	0.064	9.975	19.440	1.655	1.011	99.56	HB5&6_L2
-57.3	49.871	50.810	1.440	15.792	0.018	10.070	19.092	1.741	1.038	99.06	HB5&6_L2
-7.3	50.268	50.590	1.492	16.059	0.048	9.926	18.989	1.784	1.112	99.68	HB5&6_L2
42.7	50.634	51.333	1.460	15.750	0.062	9.814	18.536	1.853	1.194	99.30	HB5&6_L2
92.7	51.166	51.784	1.394	15.631	0.046	9.812	18.277	1.845	1.212	99.38	HB5&6_L2
142.7	51.360	51.922	1.348	15.649	0.040	9.757	18.075	1.916	1.293	99.44	HB5&6_L2
192.7	51.434	52.144	1.448	15.607	0.030	9.785	17.732	1.946	1.308	99.29	HB5&6_L2
242.7	51.487	52.085	1.496	15.705	0.043	9.801	17.575	1.985	1.310	99.40	HB5&6_L2
292.7	51.413	52.141	1.512	15.722	0.007	9.852	17.507	1.960	1.299	99.27	HB5&6_L2
342.7	51.584	52.140	1.424	15.780	0.043	9.816	17.506	1.996	1.296	99.44	HB5&6_L2
392.7	51.452	52.176	1.468	15.722	0.033	9.903	17.404	1.971	1.323	99.28	HB5&6_L2
442.7	51.591	52.083	1.576	15.772	0.053	9.884	17.337	1.997	1.298	99.51	HB5&6_L2
492.7	51.610	52.198	1.491	15.771	0.024	9.901	17.334	1.966	1.315	99.41	HB5&6_L2
542.7	51.460	52.162	1.522	15.805	0.036	9.815	17.345	1.994	1.320	99.30	HB5&6_L2
642.7	51.735	51.995	1.449	15.938	0.036	9.930	17.394	1.985	1.273	99.74	HB5&6_L2
692.7	51.293	52.098	1.537	15.895	0.033	9.997	17.219	1.934	1.289	99.20	HB5&6_L2

742.7	51.429	52.103	1.506	15.839	0.047	9.911	17.297	2.006	1.292	99.33	HB5&6_L2
792.7	51.581	52.224	1.552	15.742	0.023	9.963	17.264	1.949	1.283	99.36	HB5&6_L2
842.7	51.443	52.235	1.479	15.700	0.041	9.881	17.388	1.990	1.286	99.21	HB5&6_L2
892.7	51.505	52.142	1.475	15.846	0.052	9.887	17.345	1.969	1.284	99.36	HB5&6_L2
992.7	51.191	52.114	1.520	15.792	0.046	9.895	17.361	1.985	1.287	99.08	HB5&6_L2
1042.7	51.240	52.259	1.459	15.779	0.021	9.937	17.295	1.957	1.293	98.98	HB5&6_L2
1092.7	51.126	52.234	1.515	15.848	0.025	9.921	17.235	1.959	1.264	98.89	HB5&6_L2
1142.7	51.520	52.063	1.497	15.813	0.035	10.010	17.321	1.984	1.278	99.46	HB5&6_L2
1192.7	51.503	51.971	1.459	15.861	0.034	9.929	17.488	1.989	1.270	99.53	HB5&6_L2
1242.7	51.297	52.380	1.553	15.752	0.016	9.839	17.254	1.936	1.271	98.92	HB5&6_L2
1292.7	51.493	52.037	1.445	15.819	0.038	9.971	17.407	1.968	1.316	99.46	HB5&6_L2
1342.7	51.289	52.250	1.449	15.773	0.053	9.918	17.297	1.974	1.286	99.04	HB5&6_L2
1392.7	51.389	52.166	1.543	15.778	0.034	9.947	17.329	1.961	1.241	99.22	HB5&6_L2
1442.7	51.469	52.230	1.411	15.936	0.063	9.834	17.297	1.966	1.265	99.24	HB5&6_L2
-1497.2	49.203	49.725	1.487	15.958	0.041	9.885	20.343	1.580	0.981	99.48	HB5&6_L3
-1447.2	49.202	49.837	1.460	15.936	0.057	9.829	20.401	1.501	0.980	99.36	HB5&6_L3
-1397.2	49.313	49.522	1.436	15.998	0.049	9.990	20.444	1.577	0.983	99.79	HB5&6_L3
-1347.2	49.212	49.457	1.474	16.079	0.033	10.017	20.372	1.587	0.981	99.75	HB5&6_L3
-1297.2	49.137	49.690	1.449	15.981	0.040	9.909	20.399	1.566	0.968	99.45	HB5&6_L3
-1247.2	49.280	49.764	1.397	16.034	0.048	9.981	20.243	1.566	0.967	99.52	HB5&6_L3
-1197.2	49.132	49.685	1.400	16.088	0.050	9.903	20.359	1.535	0.981	99.45	HB5&6_L3
-1147.2	49.298	49.547	1.413	16.094	0.058	9.926	20.408	1.564	0.992	99.75	HB5&6_L3
-1097.2	49.217	49.701	1.470	15.940	0.041	9.900	20.415	1.546	0.987	99.52	HB5&6_L3
-1047.2	49.101	49.817	1.383	16.020	0.045	9.968	20.280	1.542	0.946	99.28	HB5&6_L3
-997.2	49.186	49.762	1.444	16.089	0.057	9.788	20.332	1.564	0.964	99.42	HB5&6_L3
-947.2	49.196	49.609	1.448	16.065	0.044	9.995	20.306	1.556	0.977	99.59	HB5&6_L3
-897.2	49.012	49.610	1.508	15.957	0.048	9.976	20.363	1.574	0.966	99.40	HB5&6_L3
-847.2	49.257	49.545	1.529	15.981	0.057	9.950	20.399	1.550	0.990	99.71	HB5&6_L3
-797.2	49.117	49.838	1.482	15.956	0.034	9.898	20.303	1.523	0.966	99.28	HB5&6_L3
-747.2	49.114	49.686	1.508	15.985	0.049	9.909	20.315	1.574	0.974	99.43	HB5&6_L3
-697.2	49.366	49.810	1.496	15.842	0.055	10.031	20.220	1.572	0.974	99.56	HB5&6_L3
-647.2	49.235	49.566	1.495	15.952	0.034	10.118	20.280	1.574	0.980	99.67	HB5&6_L3
-597.2	49.146	49.980	1.465	15.868	0.021	9.825	20.288	1.572	0.980	99.17	HB5&6_L3
-547.2	49.110	49.952	1.444	15.905	0.065	9.868	20.266	1.544	0.956	99.16	HB5&6_L3
-497.2	49.142	49.577	1.512	16.059	0.077	9.898	20.342	1.552	0.982	99.56	HB5&6_L3
-447.2	49.107	49.868	1.464	15.977	0.043	9.884	20.202	1.603	0.960	99.24	HB5&6_L3
-397.2	49.398	50.079	1.427	15.982	0.019	9.866	20.104	1.568	0.956	99.32	HB5&6_L3
-297.2	49.387	49.897	1.543	15.989	0.045	9.940	20.043	1.576	0.968	99.49	HB5&6_L3
-247.2	49.446	50.008	1.504	16.015	0.018	9.988	19.934	1.575	0.959	99.44	HB5&6_L3
-197.2	49.575	50.063	1.369	16.091	0.038	10.027	19.826	1.619	0.967	99.51	HB5&6_L3
-147.2	49.673	50.344	1.446	16.045	0.040	10.055	19.468	1.615	0.987	99.33	HB5&6_L3
-97.2	49.727	50.326	1.463	16.026	0.041	10.022	19.412	1.715	0.996	99.40	HB5&6_L3
-47.2	50.158	50.727	1.477	15.930	0.048	9.904	19.155	1.697	1.062	99.43	HB5&6_L3
2.8	50.205	50.849	1.428	15.962	0.054	9.898	18.907	1.783	1.120	99.36	HB5&6_L3
52.8	50.785	51.322	1.471	15.625	0.048	10.023	18.527	1.812	1.173	99.46	HB5&6_L3
102.8	51.315	51.690	1.495	15.727	0.034	9.657	18.278	1.896	1.223	99.63	HB5&6_L3
152.8	51.306	51.905	1.472	15.710	0.055	9.788	17.874	1.938	1.260	99.40	HB5&6_L3
202.8	51.495	51.866	1.523	15.696	0.056	9.824	17.801	1.931	1.305	99.63	HB5&6_L3
252.8	51.851	52.119	1.485	15.630	0.049	9.840	17.629	1.991	1.259	99.73	HB5&6_L3
302.8	51.793	52.128	1.502	15.776	0.061	9.793	17.457	1.975	1.308	99.67	HB5&6_L3
352.8	51.838	52.316	1.446	15.800	0.016	9.712	17.389	2.006	1.315	99.52	HB5&6_L3
402.8	51.828	52.353	1.415	15.700	0.048	9.860	17.384	1.977	1.264	99.48	HB5&6_L3
452.8	51.722	52.259	1.392	15.758	0.051	9.826	17.393	2.023	1.298	99.46	HB5&6_L3
502.8	51.929	52.278	1.488	15.741	0.036	9.811	17.357	2.006	1.284	99.65	HB5&6_L3
552.8	51.723	52.419	1.476	15.831	0.035	9.771	17.260	1.947	1.263	99.30	HB5&6_L3
602.8	51.888	52.305	1.457	15.672	0.046	9.920	17.300	2.018	1.283	99.58	HB5&6_L3
652.8	51.693	52.219	1.456	15.835	0.018	9.871	17.326	2.011	1.265	99.47	HB5&6_L3
702.8	51.837	52.198	1.542	15.874	0.034	9.885	17.229	1.980	1.258	99.64	HB5&6_L3
752.8	51.886	52.221	1.530	15.653	0.063	9.974	17.297	1.980	1.282	99.67	HB5&6_L3
802.8	51.770	52.428	1.436	15.675	0.027	9.906	17.301	1.979	1.249	99.34	HB5&6_L3
852.8	51.855	52.323	1.432	15.772	0.047	9.860	17.293	2.002	1.272	99.53	HB5&6_L3
902.8	51.566	52.044	1.426	15.862	0.014	9.955	17.417	1.989	1.294	99.52	HB5&6_L3
952.8	51.547	52.230	1.527	15.846	0.059	9.820	17.289	1.973	1.258	99.32	HB5&6_L3

1002.8	51.707	52.546	1.436	15.793	0.028	9.809	17.151	1.959	1.277	99.16	HB5&6_L3
1052.8	51.440	52.223	1.458	15.765	0.013	9.989	17.362	1.947	1.243	99.22	HB5&6_L3
1102.8	51.566	52.092	1.458	15.802	0.070	10.035	17.334	1.958	1.250	99.47	HB5&6_L3
1152.8	51.676	52.223	1.491	15.888	0.061	9.918	17.196	1.958	1.265	99.45	HB5&6_L3
1202.8	51.438	52.325	1.576	15.717	0.033	9.824	17.302	1.952	1.272	99.11	HB5&6_L3
1252.8	51.706	51.998	1.406	15.901	0.031	10.022	17.429	1.962	1.251	99.71	HB5&6_L3
1302.8	51.677	52.510	1.480	15.716	0.009	9.790	17.306	1.922	1.267	99.17	HB5&6_L3
1352.8	51.643	52.486	1.453	15.767	0.061	9.853	17.216	1.934	1.231	99.16	HB5&6_L3
1402.8	51.630	52.255	1.496	15.855	0.055	9.823	17.327	1.946	1.243	99.37	HB5&6_L3

Table C4. HB5&7A

X (μm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
-1324	51.782	51.939	1.440	15.931	0.043	9.733	17.637	2.012	1.265	99.84	HB5&7A_L1_S5
-1284	51.876	52.087	1.511	15.994	0.019	9.651	17.439	2.014	1.284	99.79	HB5&7A_L1_S5
-1244	51.880	52.065	1.452	16.007	0.034	9.709	17.380	2.047	1.306	99.81	HB5&7A_L1_S5
-1204	51.759	51.813	1.451	16.088	0.012	9.765	17.512	2.050	1.309	99.95	HB5&7A_L1_S5
-1164	51.785	51.854	1.547	15.944	0.037	9.650	17.591	2.080	1.296	99.93	HB5&7A_L1_S5
-1124	51.722	51.921	1.471	16.045	0.032	9.637	17.558	2.017	1.320	99.80	HB5&7A_L1_S5
-1084	51.484	51.858	1.499	16.176	0.045	9.610	17.490	2.040	1.281	99.63	HB5&7A_L1_S5
-1044	51.551	51.799	1.485	16.100	0.039	9.689	17.580	2.022	1.286	99.75	HB5&7A_L1_S5
-1004	51.528	51.891	1.419	15.930	0.032	9.795	17.581	2.066	1.286	99.64	HB5&7A_L1_S5
-924	51.376	51.772	1.502	16.233	0.015	9.668	17.459	2.029	1.322	99.60	HB5&7A_L1_S5
-884	51.651	51.990	1.346	16.028	0.020	9.763	17.563	2.007	1.284	99.66	HB5&7A_L1_S5
-844	51.570	51.785	1.557	15.960	0.025	9.788	17.622	1.993	1.272	99.79	HB5&7A_L1_S5
-804	51.694	51.927	1.511	15.846	0.077	9.763	17.521	2.051	1.305	99.77	HB5&7A_L1_S5
-764	51.643	51.746	1.462	16.113	0.049	9.784	17.481	2.064	1.301	99.90	HB5&7A_L1_S5
-724	51.877	51.935	1.483	15.905	0.029	9.755	17.608	2.009	1.277	99.94	HB5&7A_L1_S5
-684	51.758	52.148	1.496	15.800	0.039	9.724	17.468	2.034	1.293	99.61	HB5&7A_L1_S5
-644	51.839	52.105	1.501	15.813	0.038	9.806	17.469	1.996	1.271	99.73	HB5&7A_L1_S5
-604	51.786	51.905	1.508	16.034	0.054	9.632	17.576	2.015	1.277	99.88	HB5&7A_L1_S5
-524	52.033	51.728	1.499	16.004	0.033	9.882	17.562	2.016	1.275	100.31	HB5&7A_L1_S5
-504	51.892	52.001	1.436	15.902	0.030	9.742	17.590	1.991	1.309	99.89	HB5&7A_L1_S4
-484	51.760	51.940	1.443	15.886	0.053	9.752	17.583	2.060	1.284	99.82	HB5&7A_L1_S4
-464	51.593	52.068	1.503	15.792	0.046	9.606	17.689	2.014	1.283	99.52	HB5&7A_L1_S4
-444	51.805	52.012	1.530	15.897	0.050	9.605	17.596	2.015	1.294	99.79	HB5&7A_L1_S4
-424	51.638	52.022	1.446	15.852	0.062	9.715	17.594	1.992	1.317	99.62	HB5&7A_L1_S4
-404	51.654	51.981	1.480	15.793	0.053	9.703	17.674	2.002	1.313	99.67	HB5&7A_L1_S4
-384	51.821	51.753	1.532	15.839	0.015	9.681	17.810	2.059	1.313	100.07	HB5&7A_L1_S4
-364	51.692	51.786	1.487	15.863	0.031	9.713	17.761	2.076	1.284	99.91	HB5&7A_L1_S4
-344	51.706	51.834	1.450	15.987	0.056	9.550	17.796	2.052	1.274	99.87	HB5&7A_L1_S4
-324	51.723	51.950	1.513	15.820	0.027	9.545	17.802	2.040	1.302	99.77	HB5&7A_L1_S4
-304	51.758	51.860	1.454	15.855	0.046	9.556	17.903	2.032	1.294	99.90	HB5&7A_L1_S4
-284	51.734	51.840	1.369	15.891	0.034	9.680	17.850	2.047	1.290	99.89	HB5&7A_L1_S4
-264	51.459	51.647	1.500	16.105	0.043	9.580	17.821	1.996	1.309	99.81	HB5&7A_L1_S4
-244	51.737	52.056	1.473	15.853	0.063	9.463	17.794	2.032	1.266	99.68	HB5&7A_L1_S4
-224	51.780	52.041	1.477	15.859	0.042	9.441	17.848	2.012	1.281	99.74	HB5&7A_L1_S4
-204	51.751	51.893	1.465	15.924	0.032	9.551	17.758	2.058	1.318	99.86	HB5&7A_L1_S4
-184	51.659	51.617	1.462	16.004	0.067	9.608	17.930	2.016	1.297	100.04	HB5&7A_L1_S4
-164	51.707	51.945	1.448	15.765	0.057	9.441	18.001	2.041	1.302	99.76	HB5&7A_L1_S4
-144	51.738	51.810	1.532	15.874	0.032	9.422	17.992	2.063	1.276	99.93	HB5&7A_L1_S4
-124	51.668	51.985	1.453	15.901	0.041	9.264	18.012	2.031	1.313	99.68	HB5&7A_L1_S4
-104	51.765	51.719	1.439	15.975	0.070	9.360	18.068	2.056	1.313	100.05	HB5&7A_L1_S4
-84	51.790	51.765	1.563	15.863	0.040	9.263	18.112	2.059	1.336	100.02	HB5&7A_L1_S4
-44	51.637	51.905	1.459	16.000	0.025	9.146	18.098	2.050	1.317	99.73	HB5&7A_L1_S4
-24	51.789	52.113	1.440	15.879	0.067	8.990	18.143	2.056	1.312	99.68	HB5&7A_L1_S4
-17	51.918	52.005	1.476	15.935	0.051	9.025	18.107	2.066	1.336	99.91	HB5&7A_L1_S3
-8	51.600	51.678	1.561	16.045	0.034	9.102	18.158	2.108	1.314	99.92	HB5&7A_L1_S3
-4	51.762	51.913	1.516	15.932	0.040	9.074	18.186	2.022	1.319	99.85	HB5&7A_L1_S4
15	52.090	51.848	1.534	16.018	0.045	8.852	18.310	2.072	1.321	100.24	HB5&7A_L1_S2
33	52.078	51.681	1.491	16.020	0.053	8.924	18.421	2.072	1.338	100.40	HB5&7A_L1_S2
51	52.007	51.925	1.490	15.845	0.040	8.939	18.380	2.067	1.314	100.08	HB5&7A_L1_S2
69	51.972	51.766	1.481	16.167	0.049	8.774	18.417	2.028	1.319	100.21	HB5&7A_L1_S2
87	52.215	51.682	1.512	16.016	0.021	8.861	18.488	2.069	1.353	100.53	HB5&7A_L1_S2
105	51.964	52.022	1.557	15.847	0.043	8.671	18.474	2.092	1.295	99.94	HB5&7A_L1_S2
123	51.947	51.913	1.448	15.979	0.055	8.696	18.531	2.054	1.323	100.03	HB5&7A_L1_S2
141	51.983	51.840	1.457	16.179	0.052	8.532	18.544	2.076	1.320	100.14	HB5&7A_L1_S2
159	52.123	51.853	1.514	15.996	0.002	8.600	18.590	2.098	1.347	100.27	HB5&7A_L1_S2
177	51.955	51.934	1.488	16.007	0.074	8.518	18.616	2.062	1.302	100.02	HB5&7A_L1_S2
195	52.089	52.125	1.463	15.947	0.000	8.543	18.548	2.075	1.299	99.96	HB5&7A_L1_S2
213	52.082	51.788	1.520	16.167	0.069	8.411	18.600	2.100	1.346	100.29	HB5&7A_L1_S2
231	51.922	51.987	1.466	15.926	0.028	8.468	18.741	2.070	1.315	99.93	HB5&7A_L1_S2
249	52.098	51.986	1.515	15.947	0.036	8.394	18.701	2.097	1.324	100.11	HB5&7A_L1_S2
267	52.233	51.723	1.515	16.046	0.058	8.404	18.811	2.109	1.334	100.51	HB5&7A_L1_S2

285	52.146	51.968	1.515	15.845	0.090	8.413	18.722	2.124	1.322	100.18	HB5&7A_L1_S2
303	52.028	51.902	1.488	15.874	0.053	8.452	18.788	2.077	1.366	100.13	HB5&7A_L1_S2
321	52.169	51.766	1.562	15.974	0.043	8.409	18.844	2.072	1.329	100.40	HB5&7A_L1_S2
339	52.067	51.710	1.477	16.137	0.066	8.383	18.790	2.093	1.345	100.36	HB5&7A_L1_S2
357	52.044	51.975	1.482	15.795	0.049	8.447	18.832	2.082	1.339	100.07	HB5&7A_L1_S2
375	52.163	52.149	1.502	15.876	0.010	8.254	18.754	2.104	1.351	100.01	HB5&7A_L1_S2
393	52.203	51.785	1.523	16.040	0.015	8.301	18.937	2.078	1.320	100.42	HB5&7A_L1_S2
411	51.869	51.888	1.370	16.157	0.039	8.277	18.862	2.089	1.318	99.98	HB5&7A_L1_S2
429	52.242	51.964	1.511	15.950	0.052	8.245	18.893	2.062	1.323	100.28	HB5&7A_L1_S2
447	52.177	51.936	1.520	15.930	0.049	8.170	18.982	2.069	1.343	100.24	HB5&7A_L1_S2
465	52.102	51.872	1.453	16.003	0.081	8.219	18.977	2.059	1.335	100.23	HB5&7A_L1_S2
485	52.057	51.758	1.538	16.156	0.044	8.305	18.771	2.084	1.344	100.30	HB5&7A_L1_S1
525	52.173	52.197	1.463	15.887	0.032	8.165	18.828	2.075	1.354	99.98	HB5&7A_L1_S1
565	52.155	51.777	1.424	15.988	0.038	8.387	18.881	2.151	1.353	100.38	HB5&7A_L1_S1
605	52.099	52.015	1.540	15.901	0.044	8.304	18.775	2.074	1.346	100.08	HB5&7A_L1_S1
645	52.141	51.882	1.523	15.976	0.018	8.225	18.954	2.081	1.341	100.26	HB5&7A_L1_S1
685	52.078	52.145	1.489	15.883	0.041	8.134	18.860	2.079	1.370	99.93	HB5&7A_L1_S1
725	52.155	51.933	1.445	15.873	0.037	8.290	18.973	2.098	1.351	100.22	HB5&7A_L1_S1
765	52.326	51.831	1.486	15.995	0.063	8.269	18.970	2.073	1.314	100.50	HB5&7A_L1_S1
805	52.172	52.056	1.558	15.844	0.035	8.124	18.958	2.103	1.323	100.12	HB5&7A_L1_S1
845	52.202	51.752	1.459	15.992	0.039	8.260	18.974	2.144	1.380	100.45	HB5&7A_L1_S1
885	51.987	52.192	1.522	15.835	0.019	8.146	18.861	2.095	1.330	99.80	HB5&7A_L1_S1
925	52.265	52.019	1.506	16.017	0.030	8.115	18.864	2.117	1.332	100.25	HB5&7A_L1_S1
965	52.268	51.784	1.491	15.989	0.043	8.325	18.897	2.134	1.338	100.48	HB5&7A_L1_S1
1005	52.186	51.944	1.567	15.890	0.044	8.198	18.853	2.135	1.369	100.24	HB5&7A_L1_S1
1045	52.194	51.974	1.537	15.835	0.039	8.167	18.958	2.138	1.354	100.22	HB5&7A_L1_S1
1125	52.220	51.763	1.505	15.984	0.020	8.191	19.059	2.156	1.322	100.46	HB5&7A_L1_S1
1165	52.237	51.871	1.427	15.805	0.047	8.353	19.017	2.130	1.351	100.37	HB5&7A_L1_S1
1205	52.062	51.960	1.533	15.768	0.051	8.311	18.944	2.098	1.335	100.10	HB5&7A_L1_S1
1245	52.176	51.780	1.473	15.950	0.031	8.302	19.067	2.087	1.310	100.40	HB5&7A_L1_S1
1285	52.263	51.972	1.502	15.870	0.061	8.161	19.010	2.112	1.312	100.29	HB5&7A_L1_S1
1325	52.097	52.030	1.475	15.826	0.034	8.281	18.940	2.069	1.345	100.07	HB5&7A_L1_S1
1365	51.981	51.843	1.508	15.855	0.039	8.276	19.025	2.108	1.346	100.14	HB5&7A_L1_S1
1405	51.781	51.991	1.447	15.982	0.067	8.152	18.928	2.091	1.343	99.79	HB5&7A_L1_S1
1485	51.972	51.753	1.504	15.836	0.042	8.258	19.160	2.127	1.320	100.22	HB5&7A_L1_S1
-1318	52.132	51.746	1.466	16.149	0.055	9.682	17.508	2.069	1.324	100.39	HB5&7A_L2_S5
-1278	52.182	51.802	1.479	16.130	0.042	9.640	17.541	2.046	1.318	100.38	HB5&7A_L2_S5
-1238	51.759	51.920	1.441	16.118	0.035	9.623	17.520	2.075	1.268	99.84	HB5&7A_L2_S5
-1198	52.209	51.894	1.489	16.044	0.031	9.743	17.426	2.048	1.325	100.31	HB5&7A_L2_S5
-1158	52.081	51.683	1.466	16.146	0.032	9.850	17.474	2.033	1.318	100.40	HB5&7A_L2_S5
-1118	52.047	51.700	1.566	16.159	0.035	9.654	17.559	2.026	1.301	100.35	HB5&7A_L2_S5
-1078	52.007	51.750	1.534	16.117	0.020	9.688	17.579	2.026	1.288	100.26	HB5&7A_L2_S5
-1038	51.952	51.722	1.484	16.031	0.027	9.875	17.536	2.037	1.288	100.23	HB5&7A_L2_S5
-998	51.912	51.710	1.442	16.112	0.049	9.706	17.623	2.077	1.280	100.20	HB5&7A_L2_S5
-958	51.817	51.794	1.491	16.145	0.017	9.726	17.563	1.996	1.267	100.02	HB5&7A_L2_S5
-918	52.179	51.635	1.498	16.143	0.028	9.846	17.521	2.045	1.285	100.54	HB5&7A_L2_S5
-878	51.998	51.799	1.457	15.973	0.039	9.745	17.670	2.026	1.291	100.20	HB5&7A_L2_S5
-838	52.095	51.971	1.386	15.998	0.044	9.772	17.551	2.006	1.272	100.12	HB5&7A_L2_S5
-798	51.864	51.755	1.460	16.037	0.043	9.725	17.664	2.052	1.265	100.11	HB5&7A_L2_S5
-758	52.132	51.701	1.498	16.043	0.025	9.847	17.607	1.998	1.282	100.43	HB5&7A_L2_S5
-718	52.218	51.931	1.414	15.931	0.054	9.829	17.517	2.003	1.322	100.29	HB5&7A_L2_S5
-678	52.132	51.876	1.475	15.958	0.050	9.688	17.666	2.008	1.279	100.26	HB5&7A_L2_S5
-638	51.743	51.496	1.503	16.135	0.041	9.767	17.715	2.069	1.274	100.25	HB5&7A_L2_S5
-598	52.004	51.713	1.391	15.943	0.028	9.897	17.710	2.051	1.268	100.29	HB5&7A_L2_S5
-558	52.209	51.872	1.454	16.023	0.031	9.707	17.578	2.058	1.278	100.34	HB5&7A_L2_S5
-538	52.046	51.962	1.479	15.899	0.039	9.752	17.558	2.031	1.282	100.08	HB5&7A_L2_S4
-518	52.007	51.683	1.507	16.005	0.052	9.717	17.685	2.052	1.299	100.32	HB5&7A_L2_S4
-498	52.211	51.711	1.528	15.928	0.063	9.720	17.641	2.097	1.312	100.50	HB5&7A_L2_S4
-478	52.193	51.787	1.476	15.951	0.041	9.719	17.702	2.057	1.268	100.41	HB5&7A_L2_S4
-458	52.005	51.990	1.477	15.842	0.017	9.657	17.653	2.057	1.306	100.02	HB5&7A_L2_S4
-438	52.043	51.610	1.549	16.007	0.023	9.712	17.741	2.062	1.297	100.43	HB5&7A_L2_S4
-418	51.975	51.685	1.490	15.935	0.048	9.769	17.692	2.072	1.309	100.29	HB5&7A_L2_S4
-398	52.135	52.043	1.479	15.896	0.038	9.535	17.673	2.069	1.268	100.09	HB5&7A_L2_S4

-378	52.029	51.866	1.493	15.963	0.053	9.619	17.653	2.029	1.325	100.16	HB5&7A_L2_S4
-358	51.946	51.694	1.515	15.852	0.080	9.741	17.777	2.039	1.301	100.25	HB5&7A_L2_S4
-338	51.976	51.881	1.545	15.852	0.024	9.563	17.794	2.030	1.312	100.09	HB5&7A_L2_S4
-318	52.052	52.034	1.549	15.846	0.052	9.564	17.653	2.015	1.287	100.02	HB5&7A_L2_S4
-298	52.049	51.515	1.434	16.115	0.025	9.804	17.761	2.053	1.293	100.53	HB5&7A_L2_S4
-278	51.952	51.721	1.470	15.903	0.052	9.696	17.807	2.074	1.278	100.23	HB5&7A_L2_S4
-238	52.006	51.867	1.442	15.920	0.020	9.516	17.892	2.077	1.266	100.14	HB5&7A_L2_S4
-218	51.623	51.597	1.538	16.161	0.036	9.584	17.778	2.032	1.275	100.03	HB5&7A_L2_S4
-198	52.120	51.611	1.468	16.025	0.032	9.541	17.988	2.066	1.269	100.51	HB5&7A_L2_S4
-178	51.763	51.792	1.482	15.883	0.054	9.392	18.093	2.014	1.290	99.97	HB5&7A_L2_S4
-158	51.844	51.775	1.456	15.938	0.024	9.423	18.067	2.051	1.266	100.07	HB5&7A_L2_S4
-138	51.815	51.684	1.410	16.090	0.043	9.424	17.976	2.059	1.314	100.13	HB5&7A_L2_S4
-118	51.876	51.817	1.435	15.836	0.056	9.472	18.013	2.061	1.310	100.06	HB5&7A_L2_S4
-98	51.996	51.770	1.500	15.946	0.021	9.338	18.084	2.036	1.305	100.23	HB5&7A_L2_S4
-78	51.916	51.767	1.341	16.037	0.059	9.201	18.244	2.037	1.315	100.15	HB5&7A_L2_S4
-58	51.956	51.847	1.446	16.050	0.022	9.121	18.181	2.056	1.277	100.11	HB5&7A_L2_S4
-38	51.759	52.182	1.471	15.865	0.042	9.041	18.122	1.983	1.294	99.58	HB5&7A_L2_S4
11	51.846	51.761	1.512	16.078	0.035	8.935	18.305	2.049	1.326	100.08	HB5&7A_L2_S3
-9	52.150	52.083	1.524	15.797	0.049	8.910	18.265	2.074	1.298	100.07	HB5&7A_L2_S2
11	51.961	52.076	1.460	15.926	0.027	8.896	18.260	2.055	1.302	99.89	HB5&7A_L2_S2
31	51.869	51.859	1.527	16.065	0.077	8.824	18.291	2.047	1.310	100.01	HB5&7A_L2_S2
51	51.876	51.969	1.484	16.051	0.050	8.785	18.243	2.096	1.323	99.91	HB5&7A_L2_S2
71	51.890	51.989	1.460	15.852	0.035	8.751	18.488	2.067	1.358	99.90	HB5&7A_L2_S2
91	51.899	52.027	1.444	15.931	0.066	8.615	18.480	2.110	1.326	99.87	HB5&7A_L2_S2
111	51.919	51.927	1.481	15.837	0.030	8.684	18.648	2.041	1.352	99.99	HB5&7A_L2_S2
131	52.016	51.815	1.480	16.109	0.060	8.619	18.482	2.075	1.361	100.20	HB5&7A_L2_S2
151	52.095	51.754	1.548	16.007	0.027	8.552	18.681	2.070	1.362	100.34	HB5&7A_L2_S2
171	51.900	51.741	1.489	15.973	0.068	8.596	18.693	2.094	1.345	100.16	HB5&7A_L2_S2
191	52.141	52.042	1.524	15.937	0.044	8.423	18.613	2.088	1.330	100.10	HB5&7A_L2_S2
211	51.780	51.907	1.490	16.073	0.033	8.374	18.696	2.076	1.350	99.87	HB5&7A_L2_S2
231	52.084	52.108	1.454	15.926	0.053	8.338	18.686	2.119	1.318	99.98	HB5&7A_L2_S2
251	51.927	52.009	1.510	16.039	0.060	8.308	18.705	2.061	1.310	99.92	HB5&7A_L2_S2
271	52.043	51.868	1.422	15.948	0.030	8.457	18.888	2.058	1.329	100.17	HB5&7A_L2_S2
291	51.953	51.867	1.526	15.997	0.060	8.341	18.834	2.039	1.337	100.09	HB5&7A_L2_S2
311	52.067	51.976	1.487	16.054	0.041	8.190	18.860	2.048	1.345	100.09	HB5&7A_L2_S2
331	52.001	51.987	1.505	16.055	0.053	8.153	18.852	2.048	1.347	100.01	HB5&7A_L2_S2
351	51.881	51.718	1.479	16.047	0.031	8.333	18.958	2.078	1.357	100.16	HB5&7A_L2_S2
371	51.906	52.175	1.528	15.843	0.040	8.255	18.734	2.104	1.323	99.73	HB5&7A_L2_S2
391	52.022	51.906	1.478	15.927	0.046	8.351	18.887	2.057	1.349	100.12	HB5&7A_L2_S2
411	52.192	52.018	1.424	16.017	0.048	8.270	18.810	2.087	1.328	100.17	HB5&7A_L2_S2
431	51.918	51.580	1.586	16.224	0.083	8.194	18.894	2.122	1.318	100.34	HB5&7A_L2_S2
451	52.037	52.113	1.519	15.835	0.053	8.242	18.851	2.067	1.321	99.92	HB5&7A_L2_S1
491	51.947	52.149	1.521	15.970	0.061	8.046	18.808	2.084	1.360	99.80	HB5&7A_L2_S1
531	51.990	52.037	1.470	15.879	0.071	8.129	19.009	2.072	1.333	99.95	HB5&7A_L2_S1
571	51.740	51.884	1.533	16.065	0.053	8.182	18.924	2.038	1.321	99.86	HB5&7A_L2_S1
611	51.850	51.763	1.536	15.943	0.023	8.134	19.165	2.106	1.332	100.09	HB5&7A_L2_S1
691	51.729	52.087	1.588	15.812	0.011	8.122	18.916	2.101	1.364	99.64	HB5&7A_L2_S1
731	51.631	51.732	1.477	16.054	0.064	8.166	19.087	2.113	1.307	99.90	HB5&7A_L2_S1
771	51.725	52.215	1.465	15.868	0.052	8.179	18.827	2.076	1.318	99.51	HB5&7A_L2_S1
811	51.699	52.127	1.452	15.807	0.071	8.070	19.002	2.105	1.367	99.57	HB5&7A_L2_S1
851	51.745	51.929	1.514	15.888	0.050	8.267	18.933	2.081	1.339	99.82	HB5&7A_L2_S1
891	51.625	51.871	1.505	15.993	0.070	8.181	18.939	2.096	1.346	99.75	HB5&7A_L2_S1
931	51.859	51.914	1.506	15.850	0.041	8.240	18.978	2.135	1.336	99.95	HB5&7A_L2_S1
1011	51.410	51.845	1.486	15.928	0.057	8.144	19.088	2.087	1.365	99.56	HB5&7A_L2_S1
1051	51.511	51.927	1.461	15.977	0.039	8.156	18.946	2.136	1.358	99.58	HB5&7A_L2_S1
1291	51.515	51.971	1.541	15.939	0.053	8.147	18.902	2.143	1.306	99.54	HB5&7A_L2_S1
-6	52.040	51.748	1.458	16.097	0.043	8.995	18.226	2.096	1.337	100.29	HB5&7A_L3_S2
13	52.146	51.798	1.523	16.056	0.034	8.898	18.306	2.083	1.302	100.35	HB5&7A_L3_S2
32	51.934	51.756	1.489	16.107	0.053	8.895	18.313	2.050	1.337	100.18	HB5&7A_L3_S2
51	51.957	51.801	1.519	15.932	0.063	8.847	18.463	2.050	1.324	100.16	HB5&7A_L3_S2
70	51.968	51.995	1.446	15.865	0.042	8.735	18.450	2.117	1.350	99.97	HB5&7A_L3_S2
89	51.989	51.816	1.481	16.004	0.048	8.667	18.542	2.115	1.326	100.17	HB5&7A_L3_S2
108	51.802	51.767	1.569	16.175	0.035	8.550	18.548	2.035	1.320	100.03	HB5&7A_L3_S2

127	52.128	51.957	1.489	16.001	0.047	8.606	18.493	2.084	1.324	100.17	HB5&7A_L3_S2
146	52.021	52.181	1.564	15.798	0.064	8.449	18.505	2.140	1.300	99.84	HB5&7A_L3_S2
165	51.968	52.013	1.538	15.884	0.041	8.544	18.595	2.081	1.304	99.96	HB5&7A_L3_S2
184	51.809	51.803	1.565	16.009	0.061	8.486	18.644	2.103	1.329	100.01	HB5&7A_L3_S2
203	52.038	51.945	1.602	15.788	0.055	8.462	18.709	2.095	1.344	100.09	HB5&7A_L3_S2
222	51.935	52.127	1.512	15.865	0.031	8.306	18.735	2.082	1.343	99.81	HB5&7A_L3_S2
241	51.953	51.970	1.521	15.935	0.046	8.336	18.751	2.098	1.343	99.98	HB5&7A_L3_S2
260	51.969	51.950	1.504	16.038	0.025	8.367	18.783	2.018	1.315	100.02	HB5&7A_L3_S2
279	52.034	52.084	1.459	15.903	0.059	8.374	18.693	2.093	1.334	99.95	HB5&7A_L3_S2
298	52.008	51.798	1.484	15.995	0.027	8.425	18.759	2.138	1.374	100.21	HB5&7A_L3_S2
317	52.077	51.825	1.397	16.042	0.067	8.393	18.853	2.064	1.360	100.25	HB5&7A_L3_S2
336	51.974	51.792	1.571	16.061	0.052	8.381	18.704	2.104	1.335	100.18	HB5&7A_L3_S2
355	51.915	52.206	1.451	15.825	0.080	8.223	18.802	2.059	1.355	99.71	HB5&7A_L3_S2
374	51.828	52.069	1.444	15.905	0.040	8.272	18.891	2.068	1.311	99.76	HB5&7A_L3_S2
393	51.843	51.917	1.487	15.965	0.106	8.232	18.880	2.089	1.324	99.93	HB5&7A_L3_S2
412	51.921	51.857	1.482	16.012	0.063	8.283	18.895	2.079	1.330	100.06	HB5&7A_L3_S2
431	52.108	52.065	1.396	16.022	0.022	8.313	18.772	2.083	1.326	100.04	HB5&7A_L3_S2
451	51.844	51.944	1.415	15.989	0.069	8.264	18.885	2.100	1.334	99.90	HB5&7A_L3_S1
491	51.761	51.959	1.428	16.018	0.071	8.177	18.950	2.065	1.331	99.80	HB5&7A_L3_S1
531	51.921	52.087	1.499	15.930	0.042	8.139	18.881	2.079	1.343	99.83	HB5&7A_L3_S1
571	51.873	51.912	1.527	15.859	0.053	8.337	18.863	2.135	1.315	99.96	HB5&7A_L3_S1
611	51.623	51.911	1.496	15.902	0.031	8.223	18.983	2.105	1.349	99.71	HB5&7A_L3_S1
651	51.535	51.794	1.460	16.100	0.057	8.183	18.973	2.086	1.348	99.74	HB5&7A_L3_S1
691	51.895	51.893	1.481	15.933	0.029	8.219	19.010	2.111	1.324	100.00	HB5&7A_L3_S1
731	51.967	51.986	1.473	15.908	0.007	8.237	18.943	2.095	1.351	99.98	HB5&7A_L3_S1
771	51.897	51.998	1.448	15.928	0.058	8.191	18.889	2.153	1.336	99.90	HB5&7A_L3_S1
811	51.600	51.849	1.471	16.046	0.051	8.083	19.054	2.128	1.319	99.75	HB5&7A_L3_S1
851	51.949	52.182	1.540	15.800	0.054	8.111	18.879	2.089	1.344	99.77	HB5&7A_L3_S1
891	51.950	51.967	1.483	16.020	0.059	8.151	18.906	2.077	1.338	99.98	HB5&7A_L3_S1
931	51.867	51.998	1.485	15.950	0.039	8.195	18.929	2.108	1.297	99.87	HB5&7A_L3_S1
971	51.859	51.738	1.583	16.001	0.049	8.143	19.078	2.078	1.330	100.12	HB5&7A_L3_S1
1011	51.883	51.895	1.508	15.828	0.066	8.147	19.092	2.118	1.346	99.99	HB5&7A_L3_S1
1051	51.801	52.149	1.491	15.767	0.054	8.179	18.909	2.077	1.374	99.65	HB5&7A_L3_S1
1091	51.818	52.005	1.506	15.916	0.015	8.141	18.936	2.102	1.380	99.81	HB5&7A_L3_S1
1131	51.925	52.063	1.484	15.841	0.039	8.223	18.854	2.112	1.382	99.86	HB5&7A_L3_S1
1171	51.843	52.102	1.485	15.918	0.076	8.151	18.831	2.117	1.322	99.74	HB5&7A_L3_S1
1211	51.651	52.048	1.469	15.882	0.022	8.187	18.913	2.128	1.351	99.60	HB5&7A_L3_S1
1251	51.804	51.870	1.535	15.898	0.037	8.242	18.959	2.104	1.355	99.93	HB5&7A_L3_S1
1291	51.648	52.007	1.516	15.985	0.067	8.075	18.915	2.119	1.316	99.64	HB5&7A_L3_S1
1331	51.678	51.900	1.538	15.865	0.054	8.122	19.076	2.083	1.363	99.78	HB5&7A_L3_S1
1371	51.826	51.928	1.577	15.890	0.053	8.119	18.967	2.121	1.346	99.90	HB5&7A_L3_S1
1411	51.475	51.721	1.484	15.989	0.060	8.233	19.059	2.129	1.325	99.75	HB5&7A_L3_S1
1451	51.912	51.883	1.490	15.990	0.063	8.261	18.885	2.114	1.313	100.03	HB5&7A_L3_S1

Table C5. HB7&8B

X (μm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
-1465.8	49.305	48.702	1.520	16.062	0.068	11.339	18.832	2.164	1.312	100.60	HB7&8B_L0_S3
-1425.8	49.313	48.726	1.486	15.982	0.086	11.301	18.957	2.133	1.330	100.59	HB7&8B_L0_S3
-1385.8	49.139	48.580	1.491	16.125	0.048	11.300	18.926	2.166	1.364	100.56	HB7&8B_L0_S3
-1345.8	49.271	48.546	1.516	16.158	0.078	11.476	18.760	2.137	1.330	100.72	HB7&8B_L0_S3
-1305.8	49.065	48.845	1.488	15.996	0.083	11.301	18.779	2.159	1.350	100.22	HB7&8B_L0_S3
-1265.8	49.230	48.606	1.470	16.160	0.046	11.441	18.748	2.169	1.360	100.62	HB7&8B_L0_S3
-1225.8	49.203	48.569	1.529	16.147	0.066	11.428	18.785	2.120	1.357	100.63	HB7&8B_L0_S3
-1185.8	49.172	48.840	1.431	16.100	0.091	11.373	18.724	2.134	1.307	100.33	HB7&8B_L0_S3
-1145.8	49.171	48.719	1.533	16.108	0.057	11.293	18.822	2.153	1.316	100.45	HB7&8B_L0_S3
-1105.8	49.278	48.840	1.469	16.080	0.026	11.323	18.794	2.148	1.322	100.44	HB7&8B_L0_S3
-1065.8	49.370	48.610	1.451	16.130	0.085	11.386	18.838	2.174	1.327	100.76	HB7&8B_L0_S3
-1025.8	49.180	48.388	1.540	16.168	0.096	11.415	18.887	2.147	1.360	100.79	HB7&8B_L0_S3
-945.8	49.172	48.824	1.511	16.013	0.055	11.369	18.767	2.134	1.327	100.35	HB7&8B_L0_S3
-905.8	49.201	48.628	1.505	16.184	0.052	11.419	18.778	2.134	1.300	100.57	HB7&8B_L0_S3
-865.8	49.319	48.582	1.463	16.187	0.060	11.393	18.853	2.131	1.333	100.74	HB7&8B_L0_S3
-785.8	49.335	48.850	1.535	16.054	0.062	11.283	18.819	2.077	1.320	100.48	HB7&8B_L0_S3
-745.8	49.207	48.631	1.519	16.195	0.073	11.307	18.794	2.140	1.343	100.58	HB7&8B_L0_S3
-705.8	49.260	48.671	1.460	16.132	0.102	11.231	18.915	2.149	1.341	100.59	HB7&8B_L0_S3
-665.8	49.147	48.784	1.527	16.106	0.077	11.338	18.760	2.091	1.318	100.36	HB7&8B_L0_S3
-625.8	49.338	48.807	1.492	16.087	0.091	11.326	18.851	2.055	1.292	100.53	HB7&8B_L0_S3
-585.8	49.393	48.679	1.459	16.039	0.059	11.367	18.982	2.077	1.338	100.71	HB7&8B_L0_S3
-545.8	49.329	48.684	1.491	16.115	0.075	11.411	18.863	2.042	1.319	100.64	HB7&8B_L0_S2
-525.8	49.498	48.716	1.510	16.146	0.074	11.396	18.762	2.063	1.334	100.78	HB7&8B_L0_S2
-505.8	49.281	48.510	1.496	16.134	0.044	11.457	18.953	2.089	1.317	100.77	HB7&8B_L0_S2
-485.8	49.275	48.745	1.464	16.156	0.050	11.394	18.857	2.038	1.297	100.53	HB7&8B_L0_S2
-465.8	49.342	48.959	1.497	16.036	0.076	11.191	18.898	2.040	1.304	100.38	HB7&8B_L0_S2
-445.8	49.277	48.585	1.488	16.266	0.100	11.377	18.895	1.997	1.293	100.69	HB7&8B_L0_S2
-425.8	49.338	48.456	1.529	16.193	0.091	11.404	18.936	2.075	1.318	100.88	HB7&8B_L0_S2
-405.8	49.372	48.612	1.510	16.164	0.063	11.253	18.983	2.106	1.308	100.76	HB7&8B_L0_S2
-385.8	49.238	48.782	1.507	16.068	0.107	11.297	18.941	2.013	1.285	100.46	HB7&8B_L0_S2
-365.8	49.510	48.879	1.481	16.046	0.079	11.259	18.899	2.084	1.273	100.63	HB7&8B_L0_S2
-345.8	49.362	48.805	1.511	16.165	0.065	11.237	18.905	2.024	1.287	100.56	HB7&8B_L0_S2
-325.8	49.379	48.756	1.464	16.158	0.070	11.293	18.952	2.027	1.281	100.62	HB7&8B_L0_S2
-305.8	49.390	48.825	1.492	16.200	0.078	11.107	18.979	2.029	1.290	100.57	HB7&8B_L0_S2
-285.8	49.461	48.965	1.538	16.056	-0.008	11.139	18.997	2.028	1.285	100.50	HB7&8B_L0_S2
-265.8	49.425	48.914	1.441	16.209	0.050	11.089	18.965	2.041	1.292	100.51	HB7&8B_L0_S2
-245.8	49.542	49.095	1.536	16.121	0.072	10.912	18.984	2.017	1.265	100.45	HB7&8B_L0_S2
-225.8	49.550	48.888	1.509	16.218	0.100	10.960	19.031	2.030	1.263	100.66	HB7&8B_L0_S2
-205.8	49.670	49.018	1.512	16.189	0.076	10.926	18.989	2.020	1.269	100.65	HB7&8B_L0_S2
-185.8	49.635	49.039	1.526	16.298	0.054	10.759	19.036	1.999	1.289	100.60	HB7&8B_L0_S2
-165.8	49.833	49.371	1.515	16.097	0.044	10.737	18.951	2.013	1.271	100.46	HB7&8B_L0_S2
-145.8	49.911	49.122	1.458	16.295	0.078	10.721	19.035	2.025	1.266	100.79	HB7&8B_L0_S2
-125.8	49.963	49.335	1.484	16.225	0.046	10.563	19.040	2.051	1.256	100.63	HB7&8B_L0_S2
-105.8	50.089	49.589	1.482	16.164	0.128	10.397	18.964	1.998	1.279	100.50	HB7&8B_L0_S2
-85.8	50.268	49.632	1.477	16.175	0.014	10.424	19.003	2.009	1.266	100.64	HB7&8B_L0_S2
-65.8	50.251	49.514	1.501	16.273	0.065	10.286	19.033	2.022	1.308	100.74	HB7&8B_L0_S2
-45.8	50.394	49.923	1.488	16.156	0.080	10.089	18.969	2.003	1.293	100.47	HB7&8B_L0_S2
-25.8	50.635	50.118	1.487	16.043	0.067	10.047	18.917	2.013	1.308	100.52	HB7&8B_L0_S2
-5.8	50.831	50.397	1.496	15.974	0.050	9.966	18.758	2.033	1.326	100.43	HB7&8B_L0_S2
34.2	51.165	50.487	1.510	15.975	0.080	9.739	18.797	2.089	1.323	100.68	HB7&8B_L0_S2
54.2	51.327	50.436	1.504	15.997	0.080	9.668	18.878	2.091	1.346	100.89	HB7&8B_L0_S2
74.2	51.619	50.768	1.523	15.895	0.059	9.509	18.773	2.119	1.355	100.85	HB7&8B_L0_S2
94.2	51.501	50.970	1.479	15.819	0.048	9.452	18.746	2.125	1.363	100.53	HB7&8B_L0_S2
114.2	51.773	51.170	1.483	15.892	0.050	9.152	18.719	2.130	1.403	100.60	HB7&8B_L0_S2
134.2	51.950	51.152	1.513	15.902	0.093	9.094	18.722	2.117	1.407	100.80	HB7&8B_L0_S2
154.2	52.094	51.398	1.476	15.807	-0.028	9.097	18.689	2.193	1.367	100.70	HB7&8B_L0_S2
174.2	52.182	51.390	1.517	15.820	0.005	8.960	18.692	2.210	1.406	100.79	HB7&8B_L0_S2
194.2	52.122	51.485	1.576	15.878	0.037	8.876	18.626	2.128	1.396	100.64	HB7&8B_L0_S2
214.2	52.300	51.812	1.466	15.790	0.054	8.689	18.662	2.131	1.397	100.49	HB7&8B_L0_S2
234.2	52.287	51.655	1.437	15.835	0.031	8.715	18.771	2.145	1.412	100.63	HB7&8B_L0_S2
254.2	52.410	51.566	1.484	15.868	0.089	8.655	18.749	2.180	1.411	100.84	HB7&8B_L0_S2

294.2	52.601	51.886	1.413	15.966	0.057	8.565	18.632	2.117	1.365	100.71	HB7&8B_L0_S2
314.2	52.355	51.661	1.494	15.946	0.063	8.528	18.774	2.150	1.386	100.69	HB7&8B_L0_S2
334.2	52.328	51.805	1.401	15.905	0.077	8.495	18.791	2.153	1.373	100.52	HB7&8B_L0_S2
354.2	52.527	51.633	1.509	15.984	0.013	8.496	18.802	2.175	1.389	100.89	HB7&8B_L0_S2
374.2	52.566	51.647	1.505	16.084	0.049	8.490	18.704	2.139	1.383	100.92	HB7&8B_L0_S2
394.2	52.637	51.712	1.491	15.968	-0.025	8.528	18.765	2.191	1.370	100.93	HB7&8B_L0_S2
414.2	52.490	51.788	1.508	15.979	0.048	8.432	18.757	2.118	1.370	100.70	HB7&8B_L0_S2
434.2	52.614	51.842	1.472	15.932	0.094	8.417	18.787	2.140	1.316	100.77	HB7&8B_L0_S2
454.2	52.635	51.737	1.510	15.971	0.076	8.409	18.793	2.165	1.341	100.90	HB7&8B_L0_S2
494.2	52.625	52.053	1.465	15.934	0.006	8.382	18.735	2.058	1.368	100.57	HB7&8B_L0_S1
534.2	52.708	51.794	1.506	15.928	0.060	8.419	18.865	2.094	1.336	100.91	HB7&8B_L0_S1
614.2	52.830	51.867	1.448	15.982	0.036	8.483	18.729	2.119	1.337	100.96	HB7&8B_L0_S1
694.2	52.637	51.779	1.527	16.021	-0.008	8.481	18.807	2.079	1.315	100.86	HB7&8B_L0_S1
734.2	52.606	51.783	1.466	16.035	0.068	8.421	18.855	2.069	1.303	100.82	HB7&8B_L0_S1
774.2	52.569	51.717	1.520	16.105	0.024	8.329	18.951	2.042	1.313	100.85	HB7&8B_L0_S1
814.2	52.587	51.962	1.434	15.963	0.035	8.393	18.859	2.048	1.307	100.63	HB7&8B_L0_S1
894.2	52.594	51.957	1.519	15.969	0.060	8.361	18.793	2.035	1.306	100.64	HB7&8B_L0_S1
934.2	52.776	51.826	1.462	16.133	0.054	8.360	18.838	2.012	1.316	100.95	HB7&8B_L0_S1
974.2	52.629	51.833	1.475	16.091	0.008	8.475	18.763	2.065	1.290	100.80	HB7&8B_L0_S1
1014.2	52.702	51.844	1.446	16.075	0.027	8.388	18.896	2.026	1.299	100.86	HB7&8B_L0_S1
1054.2	52.606	51.997	1.547	15.983	0.040	8.319	18.772	2.025	1.317	100.61	HB7&8B_L0_S1
1094.2	52.637	51.964	1.422	16.091	0.072	8.400	18.717	2.011	1.325	100.67	HB7&8B_L0_S1
1134.2	52.606	51.790	1.536	16.052	0.073	8.329	18.864	2.028	1.328	100.82	HB7&8B_L0_S1
1214.2	52.598	51.816	1.464	16.040	0.093	8.369	18.802	2.079	1.338	100.78	HB7&8B_L0_S1
1254.2	52.518	51.629	1.576	16.053	0.060	8.419	18.883	2.074	1.306	100.89	HB7&8B_L0_S1
1294.2	52.561	51.636	1.502	16.173	0.070	8.350	18.944	2.000	1.326	100.92	HB7&8B_L0_S1
1334.2	52.489	51.849	1.529	15.979	0.033	8.355	18.911	2.048	1.296	100.64	HB7&8B_L0_S1
1374.2	52.536	51.602	1.473	16.026	0.076	8.543	18.921	2.023	1.335	100.93	HB7&8B_L0_S1
1454.2	52.674	51.823	1.529	16.006	0.035	8.507	18.816	1.981	1.302	100.85	HB7&8B_L0_S1
1494.2	52.363	51.818	1.480	15.929	0.019	8.480	18.944	2.018	1.312	100.54	HB7&8B_L0_S1
-1452.3	49.037	48.886	1.394	16.096	0.082	11.253	18.801	2.135	1.354	100.15	HB7&8B_L2_S3
-1422.3	49.122	48.774	1.518	16.176	0.074	11.125	18.903	2.103	1.326	100.35	HB7&8B_L2_S3
-1332.3	49.188	48.773	1.525	16.036	0.088	11.191	18.900	2.150	1.337	100.41	HB7&8B_L2_S3
-1302.3	49.109	48.576	1.499	16.264	0.067	11.295	18.886	2.120	1.295	100.53	HB7&8B_L2_S3
-1272.3	49.016	48.915	1.501	16.100	0.114	11.125	18.772	2.121	1.353	100.10	HB7&8B_L2_S3
-1242.3	49.148	48.718	1.450	16.104	0.037	11.270	18.901	2.152	1.368	100.43	HB7&8B_L2_S3
-1212.3	49.026	48.973	1.445	16.073	0.122	11.194	18.712	2.146	1.335	100.05	HB7&8B_L2_S3
-1182.3	48.956	48.990	1.471	16.115	0.143	11.109	18.740	2.102	1.331	99.97	HB7&8B_L2_S3
-1152.3	48.982	48.823	1.466	16.069	0.069	11.269	18.844	2.134	1.327	100.16	HB7&8B_L2_S3
-1122.3	49.091	48.625	1.530	16.069	0.090	11.308	18.919	2.104	1.355	100.47	HB7&8B_L2_S3
-1092.3	48.958	48.768	1.476	16.171	0.081	11.173	18.846	2.148	1.338	100.19	HB7&8B_L2_S3
-1062.3	49.044	48.793	1.534	16.096	0.027	11.269	18.842	2.093	1.346	100.25	HB7&8B_L2_S3
-1032.3	48.932	48.851	1.500	16.066	0.063	11.191	18.853	2.109	1.368	100.08	HB7&8B_L2_S3
-1002.3	49.142	48.876	1.492	16.110	0.073	11.188	18.832	2.129	1.300	100.27	HB7&8B_L2_S3
-972.3	49.024	48.746	1.499	16.110	0.072	11.291	18.854	2.090	1.338	100.28	HB7&8B_L2_S3
-942.3	49.157	48.934	1.522	16.076	0.080	11.164	18.749	2.125	1.351	100.22	HB7&8B_L2_S3
-912.3	48.984	48.873	1.541	16.154	0.019	11.156	18.814	2.100	1.343	100.11	HB7&8B_L2_S3
-882.3	48.955	48.959	1.583	16.027	0.036	11.111	18.840	2.104	1.341	100.00	HB7&8B_L2_S3
-852.3	48.991	48.688	1.509	16.167	0.031	11.222	18.924	2.124	1.335	100.30	HB7&8B_L2_S3
-822.3	48.974	48.785	1.528	16.057	0.042	11.304	18.873	2.069	1.342	100.19	HB7&8B_L2_S3
-792.3	49.049	48.752	1.551	16.149	0.056	11.188	18.873	2.120	1.311	100.30	HB7&8B_L2_S3
-762.3	49.087	49.065	1.493	16.091	0.067	11.141	18.738	2.064	1.342	100.02	HB7&8B_L2_S3
-732.3	49.015	48.760	1.432	16.143	0.033	11.178	18.975	2.129	1.350	100.26	HB7&8B_L2_S3
-702.3	48.932	48.825	1.498	16.141	0.056	11.197	18.856	2.070	1.357	100.11	HB7&8B_L2_S3
-642.3	48.894	48.680	1.533	16.019	0.140	11.274	18.962	2.060	1.333	100.21	HB7&8B_L2_S3
-612.3	48.930	48.929	1.423	16.218	0.047	11.258	18.776	2.017	1.333	100.00	HB7&8B_L2_S3
-582.3	49.153	48.657	1.483	16.255	0.108	11.232	18.875	2.044	1.346	100.50	HB7&8B_L2_S3
-562.3	49.175	48.600	1.511	16.156	0.129	11.398	18.805	2.074	1.327	100.57	HB7&8B_L2_S2
-547.3	49.022	48.853	1.559	16.054	0.040	11.241	18.926	2.029	1.300	100.17	HB7&8B_L2_S2
-532.3	49.143	48.621	1.533	16.252	0.014	11.345	18.842	2.059	1.334	100.52	HB7&8B_L2_S2
-517.3	49.137	48.782	1.518	16.140	0.111	11.319	18.796	2.028	1.305	100.35	HB7&8B_L2_S2
-502.3	49.098	48.653	1.482	16.242	0.058	11.209	18.979	2.050	1.327	100.44	HB7&8B_L2_S2
-487.3	49.197	48.552	1.574	16.183	0.081	11.301	18.946	2.028	1.334	100.65	HB7&8B_L2_S2

-472.3	49.157	48.726	1.508	16.259	0.077	11.178	18.874	2.075	1.304	100.43	HB7&8B_L2_S2
-457.3	49.182	48.798	1.434	16.163	0.107	11.234	18.874	2.056	1.335	100.38	HB7&8B_L2_S2
-442.3	49.080	48.806	1.466	16.182	0.117	11.192	18.892	2.045	1.300	100.27	HB7&8B_L2_S2
-427.3	49.200	48.906	1.449	16.087	0.083	11.120	18.978	2.055	1.322	100.29	HB7&8B_L2_S2
-412.3	49.104	48.874	1.532	16.166	0.088	11.129	18.923	2.009	1.280	100.23	HB7&8B_L2_S2
-397.3	49.005	49.066	1.437	16.105	0.084	11.075	18.901	2.029	1.305	99.94	HB7&8B_L2_S2
-382.3	48.942	48.695	1.545	16.222	0.076	11.187	18.923	2.008	1.344	100.25	HB7&8B_L2_S2
-367.3	49.053	48.836	1.489	16.165	0.067	11.186	18.966	1.998	1.295	100.22	HB7&8B_L2_S2
-352.3	49.009	48.960	1.574	16.146	0.067	11.091	18.899	1.989	1.275	100.05	HB7&8B_L2_S2
-337.3	49.101	49.105	1.473	16.175	0.053	10.990	18.968	1.965	1.272	100.00	HB7&8B_L2_S2
-322.3	48.924	49.100	1.496	16.078	0.092	10.955	19.021	1.978	1.281	99.82	HB7&8B_L2_S2
-307.3	49.135	48.991	1.493	16.178	0.086	11.060	18.874	2.013	1.305	100.14	HB7&8B_L2_S2
-292.3	49.070	49.274	1.471	16.146	0.006	10.944	18.869	2.018	1.272	99.80	HB7&8B_L2_S2
-277.3	49.202	48.846	1.534	16.376	0.055	10.957	18.928	2.022	1.282	100.36	HB7&8B_L2_S2
-262.3	49.175	48.969	1.545	16.278	0.029	10.947	19.001	1.977	1.255	100.21	HB7&8B_L2_S2
-247.3	49.102	49.137	1.403	16.111	0.073	10.991	18.999	2.041	1.245	99.96	HB7&8B_L2_S2
-232.3	49.286	48.725	1.562	16.256	0.098	11.082	18.965	2.033	1.280	100.56	HB7&8B_L2_S2
-217.3	49.111	49.188	1.572	16.218	0.103	10.702	18.997	1.965	1.255	99.92	HB7&8B_L2_S2
-202.3	49.140	49.190	1.565	16.131	0.055	10.797	19.026	1.986	1.250	99.95	HB7&8B_L2_S2
-187.3	49.043	49.216	1.509	16.226	0.067	10.716	19.001	2.009	1.256	99.83	HB7&8B_L2_S2
-172.3	49.330	49.093	1.563	16.340	0.101	10.716	18.901	2.021	1.265	100.24	HB7&8B_L2_S2
-157.3	49.396	49.127	1.580	16.137	0.074	10.676	19.099	2.040	1.269	100.27	HB7&8B_L2_S2
-142.3	49.468	49.565	1.468	16.166	0.044	10.535	18.967	1.969	1.287	99.90	HB7&8B_L2_S2
-127.3	49.485	49.468	1.553	16.156	0.040	10.534	18.985	1.988	1.277	100.02	HB7&8B_L2_S2
-112.3	49.422	49.566	1.584	16.134	0.083	10.406	18.965	2.016	1.246	99.86	HB7&8B_L2_S2
-97.3	49.484	49.698	1.553	16.108	0.033	10.292	19.003	2.049	1.264	99.79	HB7&8B_L2_S2
-82.3	49.585	49.733	1.522	16.213	0.023	10.292	18.968	1.996	1.253	99.85	HB7&8B_L2_S2
-52.3	49.868	49.905	1.480	16.110	0.069	9.976	19.069	2.049	1.342	99.96	HB7&8B_L2_S2
-37.3	49.995	50.050	1.549	16.104	0.021	9.970	18.947	2.078	1.282	99.95	HB7&8B_L2_S2
-22.3	50.241	50.344	1.405	16.054	0.046	9.884	18.895	2.072	1.300	99.90	HB7&8B_L2_S2
-7.3	50.301	50.110	1.555	16.034	0.063	9.890	18.935	2.096	1.318	100.19	HB7&8B_L2_S2
7.7	50.156	50.293	1.483	16.080	0.061	9.772	18.897	2.077	1.337	99.86	HB7&8B_L2_S2
22.7	50.480	50.598	1.528	15.927	0.025	9.630	18.838	2.101	1.354	99.88	HB7&8B_L2_S2
37.7	50.514	50.792	1.497	15.854	0.061	9.549	18.777	2.128	1.344	99.72	HB7&8B_L2_S2
52.7	50.721	50.794	1.459	15.940	0.029	9.498	18.876	2.066	1.340	99.93	HB7&8B_L2_S2
67.7	50.850	50.921	1.438	15.861	0.078	9.379	18.796	2.158	1.370	99.93	HB7&8B_L2_S2
82.7	50.985	50.941	1.475	15.863	0.054	9.327	18.883	2.135	1.321	100.04	HB7&8B_L2_S2
97.7	51.219	51.223	1.405	15.865	0.044	9.303	18.691	2.120	1.349	100.00	HB7&8B_L2_S2
127.7	51.371	51.390	1.449	15.872	0.033	9.045	18.683	2.114	1.414	99.98	HB7&8B_L2_S2
142.7	51.321	51.385	1.449	15.776	0.082	9.058	18.719	2.147	1.385	99.94	HB7&8B_L2_S2
157.7	51.567	51.563	1.510	15.821	0.048	8.866	18.639	2.156	1.397	100.00	HB7&8B_L2_S2
172.7	51.547	51.545	1.507	15.791	0.065	8.938	18.597	2.143	1.414	100.00	HB7&8B_L2_S2
187.7	51.625	51.774	1.506	15.708	0.035	8.655	18.698	2.205	1.419	99.85	HB7&8B_L2_S2
202.7	51.778	51.639	1.409	15.872	0.025	8.757	18.740	2.159	1.399	100.14	HB7&8B_L2_S2
232.7	51.786	51.962	1.392	15.798	0.009	8.654	18.628	2.157	1.401	99.82	HB7&8B_L2_S2
247.7	51.825	52.051	1.445	15.760	0.019	8.536	18.619	2.157	1.413	99.77	HB7&8B_L2_S2
262.7	51.733	51.729	1.470	15.811	0.037	8.712	18.662	2.161	1.419	100.00	HB7&8B_L2_S2
277.7	51.989	51.613	1.466	15.828	0.036	8.609	18.847	2.183	1.418	100.38	HB7&8B_L2_S2
292.7	51.848	51.866	1.487	15.916	0.011	8.451	18.722	2.179	1.369	99.98	HB7&8B_L2_S2
307.7	51.775	51.605	1.530	15.896	0.090	8.478	18.829	2.198	1.375	100.17	HB7&8B_L2_S2
322.7	51.798	51.675	1.516	15.953	0.035	8.500	18.740	2.172	1.409	100.12	HB7&8B_L2_S2
337.7	51.841	52.024	1.542	15.850	0.029	8.393	18.681	2.122	1.359	99.82	HB7&8B_L2_S2
352.7	51.955	51.954	1.478	15.865	0.059	8.327	18.762	2.179	1.376	100.00	HB7&8B_L2_S2
367.7	51.831	51.933	1.493	15.939	0.035	8.410	18.660	2.163	1.366	99.90	HB7&8B_L2_S2
382.7	51.859	51.920	1.541	15.926	0.084	8.390	18.664	2.123	1.351	99.94	HB7&8B_L2_S2
397.7	51.750	51.953	1.489	15.842	0.056	8.290	18.873	2.132	1.367	99.80	HB7&8B_L2_S2
412.7	51.978	51.618	1.540	15.984	0.039	8.461	18.838	2.152	1.367	100.36	HB7&8B_L2_S2
427.7	51.813	51.717	1.512	15.954	0.071	8.397	18.842	2.137	1.369	100.10	HB7&8B_L2_S2
442.7	51.985	51.722	1.498	16.071	0.040	8.258	18.882	2.158	1.371	100.26	HB7&8B_L2_S2
462.7	52.153	51.794	1.436	15.992	0.062	8.379	18.875	2.110	1.353	100.36	HB7&8B_L2_S1
492.7	52.066	51.824	1.545	15.985	0.088	8.292	18.809	2.114	1.344	100.24	HB7&8B_L2_S1
522.7	51.979	51.793	1.457	15.962	0.079	8.377	18.858	2.139	1.336	100.19	HB7&8B_L2_S1
552.7	52.016	52.046	1.523	15.849	0.009	8.351	18.719	2.161	1.343	99.97	HB7&8B_L2_S1

582.7	52.069	51.840	1.513	16.059	0.025	8.282	18.832	2.083	1.366	100.23	HB7&8B_L2_S1
612.7	51.955	51.848	1.533	15.961	0.075	8.306	18.919	2.076	1.282	100.11	HB7&8B_L2_S1
642.7	52.054	51.780	1.498	16.032	0.080	8.324	18.873	2.066	1.347	100.27	HB7&8B_L2_S1
672.7	51.961	52.178	1.447	15.924	0.042	8.288	18.708	2.073	1.339	99.78	HB7&8B_L2_S1
702.7	51.970	52.069	1.582	15.931	0.006	8.369	18.702	2.019	1.322	99.90	HB7&8B_L2_S1
732.7	51.850	51.829	1.478	16.014	0.038	8.409	18.862	2.078	1.293	100.02	HB7&8B_L2_S1
762.7	51.893	51.890	1.516	15.925	0.021	8.366	18.864	2.085	1.334	100.00	HB7&8B_L2_S1
792.7	51.739	51.906	1.459	15.893	0.063	8.390	18.879	2.096	1.316	99.83	HB7&8B_L2_S1
822.7	51.800	51.921	1.457	15.929	0.054	8.376	18.839	2.087	1.337	99.88	HB7&8B_L2_S1
852.7	52.076	51.944	1.518	15.951	0.073	8.376	18.791	2.038	1.309	100.13	HB7&8B_L2_S1
882.7	51.945	51.981	1.560	15.902	0.004	8.315	18.830	2.083	1.326	99.96	HB7&8B_L2_S1
912.7	51.858	51.994	1.445	15.834	0.035	8.310	19.000	2.067	1.315	99.86	HB7&8B_L2_S1
942.7	51.898	51.695	1.528	16.013	0.102	8.395	18.881	2.059	1.328	100.20	HB7&8B_L2_S1
972.7	51.922	51.946	1.489	15.963	0.048	8.353	18.852	2.037	1.312	99.98	HB7&8B_L2_S1
1002.7	52.123	51.803	1.516	15.981	0.077	8.444	18.830	2.056	1.293	100.32	HB7&8B_L2_S1
1032.7	51.955	51.773	1.480	15.924	0.084	8.420	18.910	2.083	1.327	100.18	HB7&8B_L2_S1
1062.7	51.996	51.956	1.513	15.997	0.063	8.259	18.785	2.100	1.327	100.04	HB7&8B_L2_S1
1092.7	51.786	51.859	1.485	15.982	0.065	8.307	18.923	2.065	1.315	99.93	HB7&8B_L2_S1
1152.7	51.814	51.840	1.494	16.014	0.046	8.364	18.839	2.078	1.326	99.97	HB7&8B_L2_S1
1182.7	51.941	51.825	1.507	16.037	0.040	8.380	18.899	2.026	1.286	100.12	HB7&8B_L2_S1
1212.7	51.982	51.919	1.504	15.943	0.015	8.417	18.844	2.054	1.305	100.06	HB7&8B_L2_S1
1242.7	51.882	51.880	1.454	15.961	0.071	8.375	18.887	2.037	1.335	100.00	HB7&8B_L2_S1
1272.7	51.946	52.033	1.496	15.965	0.040	8.285	18.844	2.015	1.323	99.91	HB7&8B_L2_S1
1302.7	51.916	51.885	1.501	15.992	0.051	8.284	18.926	2.052	1.309	100.03	HB7&8B_L2_S1
1332.7	51.811	52.020	1.468	15.934	0.055	8.328	18.808	2.063	1.325	99.79	HB7&8B_L2_S1
1362.7	52.038	51.961	1.497	15.893	0.010	8.356	18.931	2.034	1.318	100.08	HB7&8B_L2_S1
1392.7	51.765	51.598	1.531	16.042	0.094	8.455	18.914	2.058	1.309	100.17	HB7&8B_L2_S1
1452.7	52.138	52.043	1.466	15.969	-0.015	8.265	18.902	2.051	1.319	100.09	HB7&8B_L2_S1
-1465	49.471	48.997	1.534	16.013	0.065	11.215	18.787	2.078	1.313	100.47	HB7&8B_L3_S3
-1435	49.237	48.723	1.505	15.994	0.059	11.274	18.993	2.117	1.335	100.51	HB7&8B_L3_S3
-1405	49.243	48.987	1.496	16.012	0.086	11.198	18.832	2.077	1.311	100.26	HB7&8B_L3_S3
-1375	49.342	48.805	1.521	16.217	0.044	11.122	18.817	2.134	1.341	100.54	HB7&8B_L3_S3
-1345	49.247	49.033	1.422	16.092	0.069	11.153	18.849	2.057	1.325	100.21	HB7&8B_L3_S3
-1315	49.358	48.883	1.451	16.110	0.027	11.318	18.768	2.068	1.376	100.47	HB7&8B_L3_S3
-1285	49.155	48.766	1.473	16.147	0.066	11.180	18.896	2.134	1.339	100.39	HB7&8B_L3_S3
-1255	49.240	48.948	1.483	16.206	0.020	11.072	18.868	2.095	1.309	100.29	HB7&8B_L3_S3
-1225	49.283	48.727	1.446	16.195	0.029	11.185	18.975	2.113	1.331	100.56	HB7&8B_L3_S3
-1195	49.213	48.513	1.551	16.212	0.067	11.286	18.897	2.143	1.331	100.70	HB7&8B_L3_S3
-1165	49.142	48.867	1.480	16.092	0.060	11.222	18.845	2.076	1.359	100.28	HB7&8B_L3_S3
-1135	49.289	48.997	1.492	16.131	0.048	11.092	18.805	2.094	1.342	100.29	HB7&8B_L3_S3
-1105	49.368	48.775	1.410	16.222	0.038	11.293	18.848	2.076	1.339	100.59	HB7&8B_L3_S3
-1075	49.066	48.716	1.510	16.194	0.049	11.205	18.919	2.091	1.316	100.35	HB7&8B_L3_S3
-1045	49.147	48.547	1.521	16.214	0.062	11.255	18.953	2.074	1.374	100.60	HB7&8B_L3_S3
-1015	49.099	49.039	1.474	16.121	0.032	11.227	18.689	2.071	1.347	100.06	HB7&8B_L3_S3
-985	49.092	48.865	1.470	15.997	0.055	11.299	18.914	2.049	1.352	100.23	HB7&8B_L3_S3
-955	49.120	48.686	1.525	16.104	0.044	11.271	18.918	2.090	1.363	100.43	HB7&8B_L3_S3
-925	49.086	49.047	1.443	16.110	0.053	11.122	18.812	2.065	1.348	100.04	HB7&8B_L3_S3
-895	49.115	48.896	1.580	16.028	0.052	11.308	18.808	2.016	1.313	100.22	HB7&8B_L3_S3
-865	49.153	49.103	1.436	16.174	0.062	11.056	18.726	2.099	1.344	100.05	HB7&8B_L3_S3
-805	48.961	48.874	1.493	16.129	0.027	11.266	18.834	2.031	1.347	100.09	HB7&8B_L3_S3
-775	48.666	48.631	1.552	16.184	0.088	11.127	19.001	2.054	1.362	100.03	HB7&8B_L3_S3
-745	49.168	48.961	1.516	16.134	0.037	11.256	18.757	1.993	1.347	100.21	HB7&8B_L3_S3
-715	49.113	48.918	1.458	16.079	0.067	11.289	18.875	1.987	1.328	100.20	HB7&8B_L3_S3
-685	49.253	48.739	1.507	16.143	0.119	11.241	18.906	2.046	1.298	100.51	HB7&8B_L3_S3
-655	49.165	48.698	1.508	16.248	0.052	11.188	18.946	2.044	1.316	100.47	HB7&8B_L3_S3
-625	49.220	48.704	1.574	16.126	0.058	11.282	18.893	2.019	1.345	100.52	HB7&8B_L3_S3
-595	49.159	48.800	1.534	16.080	0.079	11.273	18.937	2.006	1.291	100.36	HB7&8B_L3_S3
-565	49.189	48.833	1.451	16.170	0.060	11.246	18.951	1.977	1.313	100.36	HB7&8B_L3_S3
-545	49.261	48.739	1.465	16.212	0.075	11.185	18.954	2.039	1.332	100.52	HB7&8B_L3_S2
-530	49.177	48.784	1.530	16.135	0.096	11.218	18.892	1.990	1.355	100.39	HB7&8B_L3_S2
-515	49.281	48.905	1.486	16.177	0.092	11.193	18.845	1.993	1.309	100.38	HB7&8B_L3_S2
-500	49.247	48.887	1.460	16.166	0.073	11.138	18.936	2.036	1.303	100.36	HB7&8B_L3_S2
-485	49.152	48.813	1.560	16.167	0.082	11.271	18.788	1.989	1.331	100.34	HB7&8B_L3_S2

-470	49.201	48.802	1.568	16.104	0.048	11.205	18.986	1.980	1.307	100.40	HB7&8B_L3_S2
-455	49.338	49.185	1.413	16.127	0.068	11.050	18.913	1.970	1.274	100.15	HB7&8B_L3_S2
-440	49.393	48.928	1.539	16.131	0.090	11.212	18.811	2.001	1.287	100.47	HB7&8B_L3_S2
-425	49.230	48.969	1.496	16.202	0.084	11.047	18.918	1.991	1.293	100.26	HB7&8B_L3_S2
-410	49.267	49.011	1.554	16.107	0.123	11.136	18.800	2.011	1.257	100.26	HB7&8B_L3_S2
-395	49.128	48.895	1.562	16.096	0.054	11.225	18.908	1.967	1.295	100.23	HB7&8B_L3_S2
-380	49.173	48.814	1.506	16.166	0.076	11.152	18.988	2.015	1.283	100.36	HB7&8B_L3_S2
-365	49.237	48.699	1.562	16.281	0.055	11.145	18.981	1.998	1.279	100.54	HB7&8B_L3_S2
-350	49.180	48.984	1.519	16.177	0.061	10.989	18.970	1.994	1.307	100.20	HB7&8B_L3_S2
-335	49.305	48.548	1.554	16.301	0.084	11.167	19.091	1.974	1.281	100.76	HB7&8B_L3_S2
-320	49.096	48.975	1.521	16.203	0.017	11.086	18.946	1.957	1.295	100.12	HB7&8B_L3_S2
-305	49.216	49.092	1.500	16.223	0.038	10.967	18.957	1.953	1.270	100.12	HB7&8B_L3_S2
-290	49.309	48.640	1.579	16.293	0.104	11.021	19.063	2.036	1.264	100.67	HB7&8B_L3_S2
-275	49.348	49.101	1.480	16.117	0.088	10.970	18.994	1.987	1.263	100.25	HB7&8B_L3_S2
-260	49.269	48.893	1.544	16.267	0.065	10.952	19.043	1.967	1.270	100.38	HB7&8B_L3_S2
-245	49.347	48.924	1.589	16.211	0.088	10.866	19.040	1.978	1.305	100.42	HB7&8B_L3_S2
-230	49.347	49.017	1.482	16.280	0.058	10.855	19.010	2.002	1.297	100.33	HB7&8B_L3_S2
-215	49.412	48.879	1.554	16.312	0.046	10.867	19.057	2.033	1.253	100.53	HB7&8B_L3_S2
-200	49.420	49.033	1.527	16.305	0.032	10.785	19.058	2.004	1.257	100.39	HB7&8B_L3_S2
-170	49.495	49.284	1.500	16.297	-0.010	10.574	19.112	1.970	1.273	100.21	HB7&8B_L3_S2
-155	49.646	49.218	1.626	16.173	0.014	10.567	19.119	2.006	1.278	100.43	HB7&8B_L3_S2
-140	49.584	49.532	1.510	16.217	0.065	10.414	18.979	2.031	1.253	100.05	HB7&8B_L3_S2
-125	49.830	49.609	1.513	16.136	0.050	10.318	19.045	2.038	1.291	100.22	HB7&8B_L3_S2
-110	49.774	49.354	1.505	16.308	0.052	10.428	19.050	2.032	1.270	100.42	HB7&8B_L3_S2
-95	49.780	49.578	1.522	16.093	0.073	10.310	19.115	2.007	1.303	100.20	HB7&8B_L3_S2
-80	49.973	49.767	1.520	16.056	0.094	10.180	19.068	2.021	1.294	100.21	HB7&8B_L3_S2
-65	49.965	49.957	1.489	16.167	0.041	10.089	18.916	2.049	1.292	100.01	HB7&8B_L3_S2
-50	50.275	49.913	1.575	16.082	0.048	10.151	18.937	2.004	1.290	100.36	HB7&8B_L3_S2
-35	50.296	50.139	1.490	16.082	0.057	10.002	18.937	2.019	1.275	100.16	HB7&8B_L3_S2
-20	50.459	50.262	1.527	16.041	0.088	9.841	18.911	2.023	1.308	100.20	HB7&8B_L3_S2
-5	50.569	50.395	1.424	16.017	0.076	9.805	18.892	2.039	1.351	100.17	HB7&8B_L3_S2
10	50.714	50.347	1.550	16.009	0.023	9.790	18.892	2.031	1.359	100.37	HB7&8B_L3_S2
25	50.952	50.398	1.526	16.078	0.015	9.715	18.870	2.090	1.308	100.55	HB7&8B_L3_S2
40	50.940	50.477	1.454	16.132	0.006	9.654	18.798	2.133	1.347	100.46	HB7&8B_L3_S2
55	51.122	50.537	1.471	15.939	0.118	9.580	18.881	2.132	1.344	100.59	HB7&8B_L3_S2
70	51.250	50.826	1.533	15.908	0.054	9.332	18.863	2.115	1.369	100.42	HB7&8B_L3_S2
85	51.312	50.842	1.510	15.872	0.081	9.372	18.817	2.123	1.382	100.47	HB7&8B_L3_S2
100	51.457	51.025	1.404	15.994	0.041	9.249	18.772	2.119	1.395	100.43	HB7&8B_L3_S2
115	51.346	51.514	1.485	15.787	0.028	9.078	18.636	2.078	1.394	99.83	HB7&8B_L3_S2
130	51.709	51.153	1.500	15.974	0.029	9.013	18.788	2.154	1.389	100.56	HB7&8B_L3_S2
145	51.705	51.430	1.534	15.757	-0.016	9.067	18.714	2.106	1.408	100.28	HB7&8B_L3_S2
160	51.915	51.496	1.445	15.818	0.056	8.832	18.763	2.161	1.430	100.42	HB7&8B_L3_S2
175	51.806	51.497	1.483	15.988	0.000	8.830	18.660	2.126	1.418	100.31	HB7&8B_L3_S2
190	51.781	51.700	1.454	15.873	0.027	8.818	18.607	2.128	1.393	100.08	HB7&8B_L3_S2
205	51.899	51.491	1.403	15.921	0.073	8.812	18.736	2.163	1.400	100.41	HB7&8B_L3_S2
220	51.836	51.534	1.412	15.867	0.096	8.775	18.751	2.159	1.406	100.30	HB7&8B_L3_S2
235	52.113	51.510	1.582	16.005	0.063	8.621	18.661	2.144	1.414	100.60	HB7&8B_L3_S2
250	51.774	51.676	1.376	15.883	0.029	8.689	18.805	2.137	1.405	100.10	HB7&8B_L3_S2
265	52.037	51.646	1.519	15.876	0.030	8.605	18.776	2.155	1.394	100.39	HB7&8B_L3_S2
295	52.003	51.667	1.486	15.956	0.044	8.551	18.787	2.139	1.371	100.34	HB7&8B_L3_S2
310	52.006	51.504	1.485	15.973	0.052	8.640	18.768	2.175	1.403	100.50	HB7&8B_L3_S2
325	51.992	51.550	1.554	15.982	0.094	8.463	18.820	2.164	1.374	100.44	HB7&8B_L3_S2
340	52.032	51.486	1.451	16.048	0.103	8.523	18.848	2.180	1.361	100.55	HB7&8B_L3_S2
355	52.000	51.809	1.481	16.011	0.051	8.410	18.791	2.102	1.346	100.19	HB7&8B_L3_S2
370	52.021	52.045	1.429	15.896	0.023	8.347	18.748	2.160	1.351	99.98	HB7&8B_L3_S2
385	52.037	51.668	1.535	15.976	0.075	8.402	18.783	2.173	1.388	100.37	HB7&8B_L3_S2
400	52.117	51.863	1.507	15.947	0.052	8.334	18.785	2.140	1.374	100.25	HB7&8B_L3_S2
415	51.947	51.688	1.468	16.046	0.021	8.448	18.822	2.146	1.362	100.26	HB7&8B_L3_S2
430	51.954	51.819	1.537	15.950	0.037	8.349	18.791	2.171	1.348	100.14	HB7&8B_L3_S2
445	52.218	52.039	1.469	16.008	0.033	8.275	18.761	2.097	1.318	100.18	HB7&8B_L3_S2
465	52.237	51.981	1.390	15.932	0.000	8.383	18.890	2.089	1.335	100.26	HB7&8B_L3_S1
525	52.210	52.156	1.433	15.914	0.002	8.293	18.780	2.084	1.339	100.05	HB7&8B_L3_S1
555	52.184	51.765	1.536	16.055	0.010	8.439	18.783	2.082	1.331	100.42	HB7&8B_L3_S1

585	52.197	51.583	1.540	16.131	0.071	8.373	18.927	2.066	1.310	100.61	HB7&8B_L3_S1
615	52.190	51.518	1.585	16.111	0.031	8.455	18.905	2.076	1.319	100.67	HB7&8B_L3_S1
645	52.261	51.954	1.504	15.965	0.081	8.215	18.878	2.096	1.306	100.31	HB7&8B_L3_S1
705	52.225	51.922	1.451	15.975	0.006	8.343	18.898	2.103	1.301	100.30	HB7&8B_L3_S1
735	52.084	52.011	1.584	15.999	0.054	8.164	18.794	2.074	1.321	100.07	HB7&8B_L3_S1
765	52.234	51.990	1.397	16.057	0.024	8.344	18.801	2.075	1.313	100.24	HB7&8B_L3_S1
795	52.144	52.194	1.514	15.922	0.014	8.293	18.730	2.020	1.313	99.95	HB7&8B_L3_S1
825	51.757	51.742	1.442	15.998	0.072	8.424	18.974	2.064	1.284	100.02	HB7&8B_L3_S1
855	52.418	51.658	1.533	16.064	0.084	8.519	18.788	2.051	1.304	100.76	HB7&8B_L3_S1
885	52.200	52.020	1.512	15.919	0.018	8.380	18.766	2.072	1.313	100.18	HB7&8B_L3_S1
915	52.198	52.002	1.533	16.076	0.013	8.273	18.743	2.046	1.314	100.20	HB7&8B_L3_S1
945	52.060	51.716	1.494	16.097	0.069	8.314	18.928	2.058	1.323	100.34	HB7&8B_L3_S1
975	52.182	51.873	1.516	15.907	0.033	8.423	18.916	2.018	1.314	100.31	HB7&8B_L3_S1
1005	52.128	51.872	1.532	15.994	0.046	8.252	18.904	2.078	1.322	100.26	HB7&8B_L3_S1
1035	52.293	51.985	1.472	15.995	0.006	8.242	18.947	2.048	1.306	100.31	HB7&8B_L3_S1
1065	52.088	51.537	1.590	15.969	0.044	8.510	18.992	2.033	1.326	100.55	HB7&8B_L3_S1
1095	52.120	51.871	1.483	15.928	0.090	8.326	18.937	2.054	1.312	100.25	HB7&8B_L3_S1
1125	51.988	51.938	1.470	16.075	0.058	8.205	18.877	2.054	1.323	100.05	HB7&8B_L3_S1
1155	52.178	51.718	1.528	16.141	0.055	8.318	18.869	2.043	1.328	100.46	HB7&8B_L3_S1
1185	52.244	51.874	1.457	16.035	0.035	8.350	18.824	2.097	1.329	100.37	HB7&8B_L3_S1
1215	52.122	51.765	1.558	15.995	0.048	8.520	18.756	2.053	1.304	100.36	HB7&8B_L3_S1
1245	52.095	51.723	1.555	16.054	0.055	8.351	18.922	2.016	1.324	100.37	HB7&8B_L3_S1
1275	52.042	51.958	1.474	16.074	0.006	8.265	18.879	2.013	1.332	100.08	HB7&8B_L3_S1
1305	52.035	51.937	1.427	16.025	0.074	8.299	18.914	2.018	1.306	100.10	HB7&8B_L3_S1
1335	52.031	51.680	1.493	16.071	0.067	8.447	18.883	2.034	1.326	100.35	HB7&8B_L3_S1
1365	52.001	51.753	1.552	16.032	0.079	8.345	18.895	2.030	1.314	100.25	HB7&8B_L3_S1
1395	52.161	51.714	1.487	16.146	0.046	8.375	18.895	2.022	1.315	100.45	HB7&8B_L3_S1
1425	52.091	51.801	1.534	16.110	0.011	8.326	18.861	2.040	1.317	100.29	HB7&8B_L3_S1

Table C6. HB9&10A

X (µm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
-1343.7	51.316	50.972	1.520	16.769	0.066	9.238	18.089	2.061	1.286	100.34	HB9&10_L0
-1243.7	51.270	51.072	1.467	16.606	0.060	9.329	18.242	1.971	1.252	100.20	HB9&10_L0
-1143.7	51.089	51.068	1.490	16.654	0.069	9.264	18.206	1.990	1.260	100.02	HB9&10_L0
-1043.7	51.197	51.198	1.467	16.674	0.062	9.171	18.166	2.011	1.251	100.00	HB9&10_L0
-943.7	51.274	51.111	1.473	16.659	0.045	9.298	18.132	2.003	1.280	100.16	HB9&10_L0
-843.7	51.220	50.921	1.445	16.682	0.057	9.324	18.296	1.983	1.293	100.30	HB9&10_L0
-743.7	51.286	50.867	1.485	16.740	0.057	9.308	18.308	1.989	1.247	100.42	HB9&10_L0
-643.7	51.192	51.260	1.404	16.640	0.056	9.266	18.142	1.972	1.261	99.93	HB9&10_L0
-543.7	51.155	50.922	1.540	16.689	0.063	9.338	18.159	1.992	1.297	100.23	HB9&10_L0
-543.7	51.203	50.967	1.468	16.709	0.050	9.269	18.257	2.025	1.256	100.24	HB9&10_L1
-493.7	51.254	51.119	1.562	16.636	0.046	9.214	18.159	2.004	1.261	100.14	HB9&10_L1
-443.7	51.020	51.181	1.559	16.500	0.043	9.331	18.144	2.002	1.241	99.84	HB9&10_L0
-443.7	51.341	50.781	1.461	16.854	0.047	9.362	18.240	1.986	1.270	100.56	HB9&10_L1
-393.7	51.436	51.043	1.497	16.788	0.067	9.263	18.123	1.961	1.259	100.39	HB9&10_L1
-343.7	51.090	51.049	1.443	16.764	0.070	9.255	18.190	1.973	1.256	100.04	HB9&10_L0
-343.7	51.214	51.026	1.490	16.679	0.038	9.251	18.301	1.982	1.234	100.19	HB9&10_L1
-293.7	51.162	51.078	1.472	16.778	0.057	9.236	18.157	1.960	1.263	100.08	HB9&10_L1
-243.7	51.085	51.066	1.547	16.694	0.078	9.244	18.206	1.923	1.242	100.02	HB9&10_L0
-243.7	51.174	51.074	1.591	16.636	0.069	9.261	18.202	1.934	1.234	100.10	HB9&10_L1
-193.7	51.375	50.963	1.561	16.704	0.046	9.361	18.194	1.946	1.224	100.41	HB9&10_L1
-143.7	51.304	51.277	1.536	16.592	0.051	9.259	18.064	1.977	1.244	100.03	HB9&10_L0
-143.7	51.537	51.137	1.489	16.563	0.054	9.288	18.263	1.972	1.234	100.40	HB9&10_L1
-93.7	51.684	51.185	1.543	16.307	0.076	9.392	18.197	2.026	1.275	100.50	HB9&10_L1
-43.7	52.087	52.063	1.479	15.778	0.060	9.183	18.143	2.023	1.273	100.02	HB9&10_L0
-43.7	52.150	52.214	1.469	15.588	0.055	9.245	18.169	1.983	1.278	99.94	HB9&10_L1
6.3	53.016	52.583	1.467	15.132	0.042	9.279	18.216	1.986	1.294	100.43	HB9&10_L1
56.3	53.495	53.386	1.472	14.435	0.043	9.211	18.170	1.990	1.292	100.11	HB9&10_L0
56.3	53.595	53.234	1.555	14.382	0.076	9.311	18.072	2.050	1.320	100.36	HB9&10_L1
106.3	53.915	53.726	1.543	13.962	0.053	9.307	18.077	2.009	1.323	100.19	HB9&10_L1
156.3	53.950	53.842	1.557	13.820	0.048	9.249	18.130	2.030	1.325	100.11	HB9&10_L0
156.3	54.236	53.925	1.592	13.670	0.058	9.310	18.097	2.037	1.312	100.31	HB9&10_L1
206.3	54.012	54.042	1.478	13.635	0.068	9.294	18.121	2.020	1.342	99.97	HB9&10_L1
256.3	54.221	54.080	1.527	13.567	0.069	9.295	18.099	2.041	1.321	100.14	HB9&10_L0
256.3	54.356	54.271	1.527	13.583	0.064	9.269	17.965	2.002	1.318	100.08	HB9&10_L1
306.3	54.379	53.939	1.487	13.750	0.054	9.315	18.113	2.033	1.310	100.44	HB9&10_L1
356.3	54.259	54.316	1.482	13.543	0.089	9.173	18.106	1.995	1.297	99.94	HB9&10_L0
356.3	54.473	54.189	1.544	13.674	0.043	9.292	17.957	2.020	1.281	100.28	HB9&10_L1
406.3	54.411	54.184	1.502	13.713	0.043	9.303	17.941	2.003	1.311	100.23	HB9&10_L1
456.3	54.367	54.215	1.547	13.662	0.040	9.299	17.936	2.003	1.299	100.15	HB9&10_L0
556.3	54.333	54.440	1.486	13.574	0.037	9.162	18.006	1.991	1.303	99.89	HB9&10_L0
656.3	54.215	54.478	1.500	13.491	0.047	9.305	17.903	1.985	1.292	99.74	HB9&10_L0
756.3	54.438	54.338	1.491	13.660	0.055	9.176	17.968	2.003	1.311	100.10	HB9&10_L0
856.3	54.542	54.202	1.517	13.641	0.068	9.305	17.959	2.010	1.298	100.34	HB9&10_L0
956.3	54.437	54.361	1.542	13.546	0.060	9.145	18.049	2.017	1.280	100.08	HB9&10_L0
1056.3	54.645	54.401	1.461	13.648	0.044	9.299	17.888	1.963	1.295	100.24	HB9&10_L0
1156.3	54.488	54.463	1.513	13.433	0.079	9.279	17.965	1.967	1.301	100.02	HB9&10_L0
-1337.7	51.082	50.827	1.522	16.650	0.060	9.444	18.217	2.026	1.254	100.26	HB9&10_L2_S3
-1237.7	51.098	50.916	1.541	16.600	0.037	9.267	18.352	2.015	1.272	100.18	HB9&10_L2_S3
-1137.7	50.946	51.043	1.518	16.618	0.090	9.203	18.256	1.986	1.286	99.90	HB9&10_L2_S3
-1037.7	51.203	50.833	1.480	16.754	0.077	9.300	18.265	2.029	1.262	100.37	HB9&10_L2_S3
-937.7	51.203	50.925	1.478	16.681	0.027	9.273	18.334	2.024	1.258	100.28	HB9&10_L2_S3
-837.7	51.058	51.122	1.464	16.705	0.052	9.302	18.095	1.978	1.282	99.94	HB9&10_L2_S3
-737.7	51.230	51.075	1.513	16.742	0.065	9.224	18.121	1.999	1.261	100.16	HB9&10_L2_S3
-637.7	51.358	50.927	1.541	16.654	0.074	9.307	18.266	1.954	1.277	100.43	HB9&10_L2_S3
-537.7	51.397	50.923	1.474	16.688	0.057	9.374	18.265	1.982	1.238	100.47	HB9&10_L2_S2
-487.7	51.236	51.064	1.487	16.564	0.048	9.355	18.231	1.982	1.269	100.17	HB9&10_L2_S2
-437.7	51.141	51.036	1.488	16.726	0.032	9.268	18.217	1.990	1.243	100.11	HB9&10_L2_S2
-387.7	51.330	50.996	1.466	16.653	0.077	9.341	18.219	1.980	1.268	100.33	HB9&10_L2_S2
-337.7	51.180	51.154	1.393	16.631	0.063	9.302	18.222	1.981	1.253	100.03	HB9&10_L2_S2
-287.7	51.246	51.168	1.518	16.576	0.051	9.255	18.240	1.935	1.259	100.08	HB9&10_L2_S2
-237.7	51.336	51.046	1.469	16.710	0.082	9.287	18.179	1.978	1.249	100.29	HB9&10_L2_S2

-187.7	51.350	51.001	1.556	16.688	0.053	9.176	18.301	1.974	1.253	100.35	HB9&10_L2_S2
-137.7	51.467	51.372	1.555	16.527	0.077	9.140	18.147	1.948	1.235	100.09	HB9&10_L2_S2
-87.7	51.749	51.457	1.575	16.193	0.042	9.256	18.261	1.963	1.252	100.29	HB9&10_L2_S2
-37.7	52.267	52.190	1.484	15.543	0.072	9.283	18.193	1.966	1.268	100.08	HB9&10_L2_S2
12.3	52.915	52.661	1.559	14.956	0.065	9.256	18.274	1.954	1.276	100.25	HB9&10_L2_S2
62.3	53.639	53.592	1.471	14.213	0.037	9.263	18.131	2.000	1.294	100.05	HB9&10_L2_S2
112.3	54.102	53.675	1.517	13.942	0.067	9.368	18.082	2.031	1.319	100.43	HB9&10_L2_S2
162.3	54.431	54.059	1.517	13.809	0.057	9.239	18.041	1.987	1.292	100.37	HB9&10_L2_S2
212.3	54.439	54.227	1.554	13.416	0.051	9.319	18.104	2.018	1.311	100.21	HB9&10_L2_S2
262.3	54.458	53.959	1.594	13.546	0.077	9.373	18.050	2.069	1.332	100.50	HB9&10_L2_S2
362.3	54.650	54.138	1.558	13.484	0.057	9.318	18.128	1.993	1.325	100.51	HB9&10_L2_S1
462.3	54.426	54.028	1.603	13.567	0.063	9.281	18.144	2.007	1.308	100.40	HB9&10_L2_S1
562.3	54.401	54.218	1.537	13.518	0.048	9.244	18.165	1.988	1.283	100.18	HB9&10_L2_S1
662.3	54.586	54.028	1.592	13.503	0.043	9.383	18.145	1.964	1.343	100.56	HB9&10_L2_S1
762.3	54.510	54.496	1.473	13.351	0.051	9.280	18.100	1.952	1.297	100.01	HB9&10_L2_S1
862.3	54.523	54.285	1.503	13.559	0.051	9.198	18.114	1.968	1.323	100.24	HB9&10_L2_S1
962.3	54.420	54.254	1.549	13.438	0.061	9.222	18.149	2.028	1.300	100.17	HB9&10_L2_S1
1062.3	54.627	54.031	1.493	13.737	0.058	9.239	18.147	1.992	1.303	100.60	HB9&10_L2_S1
1162.3	54.626	54.056	1.643	13.611	0.076	9.255	18.057	1.986	1.315	100.57	HB9&10_L2_S1
-1410.1	50.936	50.917	1.433	16.647	0.075	9.436	18.199	2.022	1.270	100.02	HB9&10_L3_S3
-1310.1	50.895	51.033	1.449	16.606	0.054	9.312	18.190	2.055	1.301	99.86	HB9&10_L3_S3
-1210.1	50.801	51.082	1.527	16.513	0.058	9.396	18.163	2.011	1.250	99.72	HB9&10_L3_S3
-1110.1	50.849	51.098	1.442	16.646	0.055	9.280	18.250	1.987	1.242	99.75	HB9&10_L3_S3
-910.1	51.059	50.866	1.520	16.698	0.056	9.372	18.256	1.969	1.264	100.19	HB9&10_L3_S3
-810.1	51.095	50.897	1.478	16.729	0.061	9.253	18.319	1.980	1.283	100.20	HB9&10_L3_S3
-710.1	50.817	50.891	1.466	16.773	0.097	9.289	18.240	1.967	1.277	99.93	HB9&10_L3_S3
-610.1	50.891	50.963	1.486	16.635	0.070	9.286	18.273	1.995	1.292	99.93	HB9&10_L3_S2
-560.1	50.773	51.022	1.492	16.752	0.061	9.243	18.159	1.989	1.282	99.75	HB9&10_L3_S2
-510.1	50.774	50.957	1.498	16.681	0.053	9.249	18.304	1.993	1.264	99.82	HB9&10_L3_S2
-460.1	50.939	50.996	1.471	16.590	0.046	9.382	18.197	2.028	1.291	99.94	HB9&10_L3_S2
-410.1	51.010	50.840	1.508	16.748	0.087	9.274	18.292	1.979	1.271	100.17	HB9&10_L3_S2
-360.1	50.983	50.740	1.514	16.841	0.076	9.291	18.306	1.975	1.257	100.24	HB9&10_L3_S2
-310.1	50.932	51.233	1.547	16.507	0.040	9.189	18.246	1.973	1.266	99.70	HB9&10_L3_S2
-260.1	51.043	51.119	1.471	16.676	0.069	9.228	18.215	1.958	1.264	99.92	HB9&10_L3_S2
-210.1	51.173	51.130	1.499	16.538	0.047	9.350	18.249	1.938	1.251	100.04	HB9&10_L3_S2
-160.1	51.261	51.298	1.458	16.495	0.083	9.089	18.335	2.001	1.241	99.96	HB9&10_L3_S2
-110.1	51.485	51.762	1.397	16.200	0.048	9.220	18.179	1.949	1.246	99.72	HB9&10_L3_S2
-60.1	51.924	51.679	1.632	15.991	0.055	9.163	18.227	2.002	1.251	100.24	HB9&10_L3_S2
-10.1	52.528	52.455	1.526	15.239	0.047	9.318	18.144	1.998	1.272	100.07	HB9&10_L3_S2
39.9	53.075	53.204	1.446	14.513	0.051	9.249	18.174	2.025	1.339	99.87	HB9&10_L3_S2
89.9	53.739	53.542	1.501	14.127	0.065	9.329	18.095	2.036	1.306	100.20	HB9&10_L3_S2
139.9	53.947	53.876	1.516	13.756	0.056	9.425	18.022	2.019	1.330	100.07	HB9&10_L3_S2
189.9	54.221	53.993	1.502	13.681	0.054	9.385	18.047	2.018	1.322	100.23	HB9&10_L3_S2
289.9	53.906	54.228	1.548	13.577	0.029	9.302	17.979	2.004	1.333	99.68	HB9&10_L3_S1
689.9	53.928	54.205	1.536	13.495	0.059	9.297	18.070	2.046	1.292	99.72	HB9&10_L3_S1
889.9	53.901	54.261	1.565	13.437	0.068	9.258	18.022	2.044	1.345	99.64	HB9&10_L3_S1
989.9	53.986	54.136	1.612	13.591	0.045	9.269	18.062	1.983	1.301	99.85	HB9&10_L3_S1
1089.9	54.058	54.149	1.559	13.634	0.048	9.394	17.940	1.995	1.282	99.91	HB9&10_L3_S1

Table C7. HB11&12F

X (µm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
-1171.8	48.962	49.244	2.833	16.110	0.034	9.781	18.007	2.557	1.434	99.72	HB11&12_L1_S4
-1071.8	49.031	49.454	2.903	15.911	0.039	9.625	18.030	2.605	1.432	99.58	HB11&12_L1_S4
-971.8	48.767	49.227	2.884	16.057	0.071	9.694	18.042	2.589	1.435	99.54	HB11&12_L1_S4
-871.8	49.080	49.221	2.993	15.947	0.044	9.708	18.100	2.557	1.431	99.86	HB11&12_L1_S4
-771.8	49.007	49.255	2.894	15.974	0.072	9.619	18.165	2.613	1.409	99.75	HB11&12_L1_S4
-671.8	49.261	49.120	2.948	16.002	0.034	9.743	18.084	2.611	1.459	100.14	HB11&12_L1_S4
-571.8	48.938	49.346	2.873	16.030	0.055	9.668	18.090	2.503	1.437	99.59	HB11&12_L1_S4
-471.8	49.223	49.079	2.883	16.228	0.029	9.688	18.099	2.546	1.447	100.14	HB11&12_L1_S4
-321.8	48.805	49.282	2.921	16.014	0.077	9.518	18.190	2.558	1.441	99.52	HB11&12_L1_S3
-221.8	48.945	49.158	2.804	16.010	0.079	9.711	18.237	2.551	1.451	99.79	HB11&12_L1_S3
-171.8	49.296	49.131	2.643	16.089	0.022	9.767	18.330	2.580	1.439	100.16	HB11&12_L1_S3
-121.8	49.261	49.332	2.517	16.033	0.042	9.749	18.319	2.572	1.437	99.93	HB11&12_L1_S3
-71.8	49.800	49.800	2.125	15.962	0.050	9.718	18.371	2.541	1.434	100.00	HB11&12_L1_S3
-21.8	50.051	50.189	1.700	16.022	0.053	9.662	18.342	2.613	1.419	99.86	HB11&12_L1_S3
28.2	50.683	50.383	1.234	16.071	0.044	9.676	18.422	2.654	1.516	100.30	HB11&12_L1_S3
95.2	51.232	51.168	0.623	16.080	0.068	9.613	18.298	2.649	1.502	100.06	HB11&12_L1_S2
145.2	51.560	51.376	0.319	15.965	0.080	9.639	18.453	2.635	1.532	100.18	HB11&12_L1_S2
195.2	51.642	51.461	0.159	16.045	0.064	9.650	18.393	2.708	1.520	100.18	HB11&12_L1_S2
245.2	51.730	51.393	0.092	16.014	0.054	9.605	18.622	2.693	1.528	100.34	HB11&12_L1_S2
295.2	51.611	51.779	0.018	15.813	0.034	9.685	18.498	2.681	1.493	99.83	HB11&12_L1_S2
345.2	51.614	51.585	0.028	15.879	0.055	9.721	18.546	2.651	1.535	100.03	HB11&12_L1_S2
395.2	51.599	51.435	0.032	16.018	0.059	9.658	18.578	2.684	1.537	100.16	HB11&12_L1_S2
445.2	51.405	51.473	0.001	16.016	0.085	9.599	18.611	2.703	1.511	99.93	HB11&12_L1_S2
605.2	51.760	51.569	0.013	15.978	0.060	9.650	18.594	2.649	1.488	100.19	HB11&12_L1_S1
705.2	51.730	51.461	0.021	15.955	0.056	9.684	18.607	2.700	1.517	100.27	HB11&12_L1_S1
805.2	51.744	51.943	0.016	15.796	0.045	9.510	18.538	2.646	1.508	99.80	HB11&12_L1_S1
1005.2	51.769	51.627	-0.007	15.837	0.031	9.663	18.642	2.684	1.523	100.14	HB11&12_L1_S1
1105.2	51.603	51.507	0.028	15.989	0.053	9.621	18.619	2.663	1.521	100.10	HB11&12_L1_S1
1205.2	51.705	51.410	0.049	15.958	0.061	9.659	18.661	2.697	1.505	100.30	HB11&12_L1_S1
1305.2	51.662	51.913	0.004	15.696	0.076	9.592	18.567	2.655	1.498	99.75	HB11&12_L1_S1
1405.2	51.821	51.596	0.047	15.855	0.049	9.661	18.613	2.647	1.533	100.22	HB11&12_L1_S1
-1284.8	48.973	49.476	2.840	16.034	0.045	9.609	17.948	2.587	1.460	99.50	HB11&12_L2_S4
-1184.8	48.876	49.368	2.944	16.064	0.066	9.560	17.978	2.591	1.428	99.51	HB11&12_L2_S4
-1084.8	48.819	49.113	2.940	16.187	0.044	9.737	17.946	2.572	1.460	99.71	HB11&12_L2_S4
-984.8	48.942	49.189	2.916	16.052	0.049	9.598	18.164	2.590	1.442	99.75	HB11&12_L2_S4
-884.8	48.797	49.334	2.878	16.024	0.049	9.642	18.041	2.610	1.422	99.46	HB11&12_L2_S4
-784.8	48.889	49.201	2.902	16.005	0.065	9.722	18.110	2.558	1.437	99.69	HB11&12_L2_S4
-684.8	48.857	48.985	2.944	16.073	0.046	9.792	18.162	2.547	1.452	99.87	HB11&12_L2_S4
-584.8	49.105	49.289	2.828	16.069	0.066	9.656	18.083	2.549	1.461	99.82	HB11&12_L2_S4
-484.8	49.014	49.036	2.948	16.031	0.066	9.787	18.159	2.541	1.433	99.98	HB11&12_L2_S4
-384.8	48.891	49.383	2.914	15.981	0.074	9.562	18.058	2.570	1.458	99.51	HB11&12_L2_S3
-334.8	48.734	48.948	2.929	16.051	0.054	9.766	18.213	2.572	1.466	99.79	HB11&12_L2_S3
-284.8	48.839	49.376	2.873	15.935	0.051	9.621	18.164	2.538	1.442	99.46	HB11&12_L2_S3
-234.8	48.971	49.515	2.663	16.013	0.040	9.649	18.154	2.562	1.405	99.46	HB11&12_L2_S3
-184.8	49.157	49.283	2.679	15.991	0.079	9.822	18.246	2.505	1.396	99.87	HB11&12_L2_S3
-134.8	49.326	49.675	2.339	15.857	0.049	9.755	18.313	2.603	1.409	99.65	HB11&12_L2_S3
-84.8	49.612	49.666	2.201	16.064	0.068	9.675	18.347	2.523	1.457	99.95	HB11&12_L2_S3
-34.8	49.956	49.998	1.800	16.052	0.059	9.610	18.391	2.631	1.460	99.96	HB11&12_L2_S3
15.2	50.357	50.272	1.402	16.027	0.070	9.713	18.440	2.615	1.461	100.08	HB11&12_L2_S3
85.2	51.107	51.089	0.676	16.048	0.050	9.584	18.330	2.704	1.520	100.02	HB11&12_L2_S2
135.2	51.611	51.298	0.435	15.991	0.014	9.702	18.349	2.689	1.522	100.31	HB11&12_L2_S2
185.2	51.730	51.401	0.212	15.910	0.060	9.708	18.455	2.709	1.545	100.33	HB11&12_L2_S2
235.2	51.665	51.711	0.107	15.935	0.028	9.586	18.406	2.710	1.516	99.95	HB11&12_L2_S2
285.2	51.767	51.631	0.046	15.880	0.044	9.686	18.502	2.688	1.524	100.14	HB11&12_L2_S2
335.2	51.702	51.340	0.037	16.012	0.057	9.758	18.589	2.669	1.537	100.36	HB11&12_L2_S2
385.2	51.715	51.594	0.025	15.890	0.051	9.667	18.589	2.682	1.501	100.12	HB11&12_L2_S2
435.2	51.985	51.645	-0.002	15.784	0.083	9.690	18.543	2.729	1.527	100.34	HB11&12_L2_S2
485.2	51.962	51.657	0.005	15.855	0.062	9.663	18.562	2.704	1.493	100.31	HB11&12_L2_S2
585.2	51.545	51.455	0.032	15.895	0.075	9.672	18.695	2.655	1.520	100.09	HB11&12_L2_S1
685.2	51.880	51.539	0.017	15.914	0.051	9.706	18.600	2.683	1.491	100.34	HB11&12_L2_S1
785.2	51.875	51.721	-0.010	15.823	0.057	9.710	18.536	2.670	1.493	100.15	HB11&12_L2_S1

885.2	51.643	51.575	0.007	15.997	0.065	9.602	18.631	2.633	1.490	100.07	HB11&12_L2_S1
985.2	51.676	51.985	-0.007	15.687	0.041	9.603	18.556	2.643	1.493	99.69	HB11&12_L2_S1
1085.2	51.840	51.791	0.028	15.865	0.066	9.494	18.593	2.662	1.501	100.05	HB11&12_L2_S1
1185.2	51.935	51.828	0.001	15.816	0.055	9.571	18.584	2.648	1.498	100.11	HB11&12_L2_S1
1285.2	51.722	51.602	0.046	15.881	0.053	9.582	18.600	2.713	1.526	100.12	HB11&12_L2_S1
1385.2	52.087	51.780	0.019	15.765	0.074	9.551	18.644	2.662	1.506	100.31	HB11&12_L2_S1
-1072.8	48.841	49.153	2.906	16.104	0.060	9.627	18.125	2.594	1.432	99.69	HB11&12_L3_S4
-972.8	48.752	49.130	2.850	16.224	0.057	9.679	18.040	2.597	1.423	99.62	HB11&12_L3_S4
-872.8	48.908	48.954	2.981	16.112	0.064	9.681	18.159	2.560	1.490	99.95	HB11&12_L3_S4
-772.8	48.849	48.926	3.024	16.076	0.056	9.756	18.118	2.588	1.456	99.92	HB11&12_L3_S4
-672.8	48.906	49.203	2.888	16.040	0.045	9.654	18.101	2.605	1.465	99.70	HB11&12_L3_S4
-572.8	48.801	49.164	2.903	15.967	0.086	9.673	18.130	2.603	1.475	99.64	HB11&12_L3_S4
-372.8	49.216	49.076	2.869	16.214	0.049	9.617	18.093	2.629	1.454	100.14	HB11&12_L3_S3
-322.8	48.959	49.227	2.908	16.003	0.017	9.701	18.144	2.562	1.438	99.73	HB11&12_L3_S3
-272.8	49.045	48.849	2.973	16.188	0.077	9.681	18.250	2.538	1.445	100.20	HB11&12_L3_S3
-222.8	49.006	49.126	2.835	16.161	0.046	9.667	18.192	2.541	1.432	99.88	HB11&12_L3_S3
-172.8	49.041	49.236	2.680	16.092	0.064	9.704	18.225	2.585	1.413	99.81	HB11&12_L3_S3
-122.8	49.262	49.435	2.506	16.093	0.054	9.662	18.270	2.564	1.417	99.83	HB11&12_L3_S3
-72.8	49.372	49.825	2.142	16.020	0.052	9.544	18.362	2.621	1.434	99.55	HB11&12_L3_S3
-22.8	49.759	50.254	1.679	15.915	0.052	9.626	18.365	2.656	1.454	99.51	HB11&12_L3_S3
27.2	50.286	50.461	1.164	16.236	0.060	9.605	18.333	2.670	1.470	99.83	HB11&12_L3_S3
155.2	51.313	51.158	0.296	16.290	0.044	9.571	18.428	2.666	1.547	100.16	HB11&12_L3_S2
205.2	51.431	51.586	0.131	15.991	0.064	9.549	18.490	2.696	1.493	99.85	HB11&12_L3_S2
255.2	51.558	51.426	0.058	16.192	0.035	9.616	18.484	2.661	1.528	100.13	HB11&12_L3_S2
305.2	51.567	51.353	0.039	16.094	0.053	9.745	18.560	2.676	1.480	100.21	HB11&12_L3_S2
355.2	51.435	51.612	0.041	15.887	0.062	9.594	18.619	2.685	1.499	99.82	HB11&12_L3_S2
405.2	51.562	51.695	0.017	16.074	0.035	9.495	18.548	2.676	1.460	99.87	HB11&12_L3_S2
455.2	51.542	51.629	0.011	15.926	0.056	9.561	18.648	2.657	1.514	99.91	HB11&12_L3_S2
505.2	51.331	51.649	0.023	15.906	0.058	9.662	18.562	2.665	1.474	99.68	HB11&12_L3_S2
605.2	51.448	51.559	0.004	16.066	0.069	9.603	18.518	2.690	1.492	99.89	HB11&12_L3_S1
705.2	51.598	51.432	0.026	16.002	0.063	9.770	18.594	2.638	1.475	100.17	HB11&12_L3_S1
805.2	51.665	51.605	0.010	15.862	0.074	9.669	18.631	2.642	1.508	100.06	HB11&12_L3_S1
905.2	51.714	51.835	-0.018	15.871	0.070	9.563	18.557	2.642	1.481	99.88	HB11&12_L3_S1
1005.2	51.573	51.459	0.025	15.919	0.067	9.682	18.702	2.640	1.506	100.11	HB11&12_L3_S1
1105.2	51.573	51.665	0.035	15.809	0.071	9.625	18.626	2.646	1.523	99.91	HB11&12_L3_S1
1205.2	51.665	51.734	0.028	15.822	0.050	9.629	18.571	2.669	1.497	99.93	HB11&12_L3_S1
1305.2	51.632	51.776	0.001	15.870	0.056	9.544	18.552	2.661	1.540	99.86	HB11&12_L3_S1
1405.2	51.888	51.526	0.019	15.969	0.062	9.594	18.618	2.696	1.516	100.36	HB11&12_L3_S1

Table C8. HB15&16A

X (μm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
-1404.7	50.303	50.575	1.548	15.636	0.060	9.634	20.470	0.931	1.147	99.73	HB15&16A_L1_S4
-1364.7	50.330	50.690	1.502	15.433	0.088	9.732	20.461	0.930	1.164	99.64	HB15&16A_L1_S4
-1284.7	50.456	50.714	1.515	15.489	0.074	9.489	20.632	0.932	1.155	99.74	HB15&16A_L1_S4
-1244.7	50.325	50.708	1.527	15.450	0.069	9.552	20.603	0.928	1.164	99.62	HB15&16A_L1_S4
-1204.7	50.453	50.748	1.545	15.582	0.004	9.537	20.476	0.948	1.160	99.71	HB15&16A_L1_S4
-1164.7	50.396	50.652	1.560	15.468	0.058	9.566	20.578	0.955	1.163	99.74	HB15&16A_L1_S4
-1124.7	50.332	50.735	1.532	15.532	0.045	9.590	20.453	0.972	1.141	99.60	HB15&16A_L1_S4
-1084.7	50.261	50.591	1.516	15.481	0.042	9.607	20.642	0.956	1.165	99.67	HB15&16A_L1_S4
-1044.7	50.344	50.931	1.480	15.367	0.060	9.586	20.447	0.964	1.164	99.41	HB15&16A_L1_S4
-1004.7	50.360	50.912	1.473	15.351	0.039	9.664	20.443	0.959	1.159	99.45	HB15&16A_L1_S4
-964.7	50.308	50.855	1.544	15.468	0.044	9.502	20.451	0.952	1.185	99.45	HB15&16A_L1_S4
-924.7	50.464	50.746	1.562	15.501	0.034	9.643	20.383	0.985	1.147	99.72	HB15&16A_L1_S4
-884.7	50.326	50.861	1.535	15.542	0.052	9.394	20.475	0.977	1.164	99.46	HB15&16A_L1_S4
-844.7	50.205	50.673	1.572	15.557	0.085	9.472	20.494	0.983	1.163	99.53	HB15&16A_L1_S4
-804.7	50.217	50.990	1.442	15.400	0.051	9.436	20.497	1.037	1.149	99.23	HB15&16A_L1_S4
-764.7	50.292	50.815	1.546	15.489	0.025	9.513	20.459	1.012	1.142	99.48	HB15&16A_L1_S4
-724.7	50.360	50.899	1.487	15.389	0.045	9.500	20.460	1.050	1.171	99.46	HB15&16A_L1_S4
-684.7	50.196	50.993	1.407	15.432	0.078	9.452	20.395	1.089	1.154	99.20	HB15&16A_L1_S4
-644.7	50.219	50.932	1.481	15.395	0.046	9.440	20.448	1.098	1.160	99.29	HB15&16A_L1_S4
-604.7	50.218	50.993	1.524	15.366	0.043	9.367	20.429	1.147	1.130	99.22	HB15&16A_L1_S4
-564.7	50.294	50.813	1.526	15.363	0.056	9.494	20.431	1.140	1.178	99.48	HB15&16A_L1_S4
-524.7	50.247	50.804	1.532	15.346	0.035	9.486	20.451	1.172	1.176	99.44	HB15&16A_L1_S4
-484.7	50.059	50.847	1.523	15.353	0.071	9.460	20.357	1.227	1.164	99.21	HB15&16A_L1_S4
-444.7	50.311	50.567	1.469	15.455	0.099	9.525	20.408	1.311	1.167	99.74	HB15&16A_L1_S4
-424.7	50.213	50.470	1.500	15.472	0.032	9.511	20.525	1.316	1.175	99.74	HB15&16A_L1_S3
-404.7	50.172	50.762	1.528	15.312	0.070	9.450	20.345	1.329	1.205	99.41	HB15&16A_L1_S3
-384.7	50.126	50.618	1.456	15.381	0.054	9.550	20.449	1.353	1.141	99.51	HB15&16A_L1_S3
-364.7	49.980	50.624	1.468	15.416	0.043	9.503	20.365	1.420	1.162	99.36	HB15&16A_L1_S3
-344.7	50.156	50.914	1.511	15.323	0.054	9.368	20.229	1.430	1.171	99.24	HB15&16A_L1_S3
-324.7	50.116	50.809	1.522	15.239	0.041	9.518	20.223	1.458	1.190	99.31	HB15&16A_L1_S3
-304.7	50.072	50.734	1.459	15.398	0.054	9.467	20.187	1.519	1.183	99.34	HB15&16A_L1_S3
-284.7	50.205	50.485	1.530	15.430	0.067	9.511	20.246	1.535	1.196	99.72	HB15&16A_L1_S3
-264.7	49.966	50.671	1.559	15.359	0.076	9.344	20.199	1.592	1.200	99.30	HB15&16A_L1_S3
-244.7	50.126	50.925	1.479	15.255	0.055	9.367	20.123	1.624	1.174	99.20	HB15&16A_L1_S3
-224.7	50.007	50.784	1.450	15.317	0.057	9.386	20.133	1.664	1.208	99.22	HB15&16A_L1_S3
-204.7	50.084	50.940	1.451	15.291	0.085	9.392	19.969	1.688	1.184	99.14	HB15&16A_L1_S3
-184.7	49.997	50.698	1.393	15.374	0.034	9.444	20.116	1.726	1.216	99.30	HB15&16A_L1_S3
-164.7	50.111	50.750	1.471	15.373	0.057	9.467	19.880	1.786	1.217	99.36	HB15&16A_L1_S3
-144.7	50.061	50.634	1.525	15.298	0.045	9.554	19.891	1.837	1.216	99.43	HB15&16A_L1_S3
-124.7	50.130	50.704	1.454	15.405	0.015	9.529	19.762	1.924	1.207	99.43	HB15&16A_L1_S3
-104.7	49.998	50.782	1.550	15.355	0.058	9.491	19.665	1.903	1.196	99.22	HB15&16A_L1_S3
-84.7	50.103	50.911	1.535	15.276	0.056	9.396	19.643	1.968	1.215	99.19	HB15&16A_L1_S3
-64.7	50.005	50.798	1.578	15.316	0.066	9.372	19.601	2.031	1.239	99.21	HB15&16A_L1_S3
-44.7	50.103	50.617	1.578	15.385	0.087	9.492	19.497	2.097	1.248	99.49	HB15&16A_L1_S3
-24.7	50.129	50.856	1.567	15.235	0.062	9.468	19.443	2.116	1.253	99.27	HB15&16A_L1_S3
-4.7	49.983	50.683	1.537	15.379	0.078	9.537	19.334	2.173	1.280	99.30	HB15&16A_L1_S3
15.3	50.129	50.922	1.510	15.331	0.078	9.454	19.198	2.209	1.300	99.21	HB15&16A_L1_S3
55.3	50.177	50.858	1.511	15.319	0.056	9.519	19.036	2.370	1.332	99.32	HB15&16A_L1_S3
85.3	50.282	50.886	1.507	15.599	0.026	9.472	18.778	2.393	1.339	99.40	HB15&16A_L1_S2
105.3	50.411	50.772	1.539	15.481	0.081	9.596	18.715	2.461	1.355	99.64	HB15&16A_L1_S2
125.3	50.351	51.030	1.466	15.516	0.029	9.555	18.500	2.524	1.381	99.32	HB15&16A_L1_S2
145.3	50.351	51.243	1.456	15.465	0.044	9.457	18.412	2.542	1.382	99.11	HB15&16A_L1_S2
165.3	50.267	50.908	1.537	15.550	0.084	9.595	18.285	2.640	1.401	99.36	HB15&16A_L1_S2
185.3	50.282	51.164	1.500	15.453	0.030	9.569	18.231	2.658	1.394	99.12	HB15&16A_L1_S2
205.3	50.417	50.976	1.545	15.550	0.059	9.492	18.237	2.710	1.432	99.44	HB15&16A_L1_S2
225.3	50.371	51.214	1.452	15.400	0.068	9.601	18.097	2.727	1.441	99.16	HB15&16A_L1_S2
245.3	50.473	50.993	1.462	15.538	0.057	9.670	18.091	2.804	1.385	99.48	HB15&16A_L1_S2
285.3	50.445	51.050	1.531	15.596	0.044	9.578	17.951	2.823	1.426	99.40	HB15&16A_L1_S2
305.3	50.545	50.931	1.528	15.612	0.055	9.677	17.879	2.883	1.436	99.61	HB15&16A_L1_S2
325.3	50.578	50.827	1.496	15.571	0.053	9.743	17.977	2.900	1.433	99.75	HB15&16A_L1_S2
345.3	50.455	51.096	1.440	15.570	0.042	9.569	17.839	2.972	1.473	99.36	HB15&16A_L1_S2

385.3	50.511	50.743	1.536	15.623	0.052	9.684	17.869	3.032	1.462	99.77	HB15&16A_L1_S2
405.3	50.469	51.152	1.525	15.450	0.075	9.599	17.756	3.025	1.419	99.32	HB15&16A_L1_S2
425.3	50.417	50.687	1.510	15.638	0.070	9.761	17.825	3.060	1.451	99.73	HB15&16A_L1_S2
445.3	50.455	51.100	1.507	15.463	0.085	9.629	17.653	3.126	1.438	99.36	HB15&16A_L1_S2
465.3	50.397	50.959	1.490	15.559	0.085	9.527	17.801	3.171	1.407	99.44	HB15&16A_L1_S2
485.3	50.513	50.734	1.514	15.726	0.053	9.753	17.683	3.131	1.407	99.78	HB15&16A_L1_S2
505.3	50.268	50.879	1.519	15.698	0.038	9.651	17.629	3.151	1.436	99.39	HB15&16A_L1_S1
545.3	50.436	50.868	1.521	15.395	0.067	9.715	17.733	3.246	1.455	99.57	HB15&16A_L1_S1
585.3	50.377	50.939	1.534	15.611	0.094	9.620	17.578	3.207	1.417	99.44	HB15&16A_L1_S1
625.3	50.320	51.134	1.462	15.587	0.079	9.580	17.464	3.255	1.441	99.19	HB15&16A_L1_S1
665.3	50.353	50.807	1.487	15.650	0.073	9.615	17.615	3.287	1.466	99.55	HB15&16A_L1_S1
705.3	50.301	50.664	1.532	15.666	0.066	9.669	17.672	3.338	1.394	99.64	HB15&16A_L1_S1
745.3	50.278	50.517	1.425	15.705	0.097	9.817	17.689	3.331	1.419	99.76	HB15&16A_L1_S1
785.3	50.172	50.714	1.525	15.601	0.052	9.667	17.711	3.332	1.398	99.46	HB15&16A_L1_S1
825.3	50.221	50.517	1.590	15.598	0.077	9.787	17.718	3.322	1.393	99.70	HB15&16A_L1_S1
865.3	50.008	50.790	1.515	15.536	0.042	9.666	17.688	3.387	1.375	99.22	HB15&16A_L1_S1
905.3	50.123	50.693	1.495	15.491	0.060	9.774	17.653	3.410	1.423	99.43	HB15&16A_L1_S1
945.3	50.061	50.641	1.523	15.519	0.045	9.748	17.696	3.413	1.416	99.42	HB15&16A_L1_S1
985.3	50.096	50.326	1.555	15.647	0.075	9.779	17.782	3.447	1.389	99.77	HB15&16A_L1_S1
1025.3	50.148	50.398	1.519	15.706	0.073	9.750	17.747	3.386	1.422	99.75	HB15&16A_L1_S1
1065.3	50.075	50.567	1.514	15.565	0.056	9.752	17.700	3.434	1.411	99.51	HB15&16A_L1_S1
1105.3	50.079	50.517	1.524	15.561	0.066	9.769	17.750	3.432	1.382	99.56	HB15&16A_L1_S1
1145.3	49.942	50.327	1.577	15.707	0.067	9.767	17.726	3.431	1.397	99.62	HB15&16A_L1_S1
1185.3	50.121	50.441	1.502	15.668	0.066	9.757	17.723	3.432	1.413	99.68	HB15&16A_L1_S1
1225.3	50.078	50.755	1.519	15.599	0.082	9.620	17.566	3.458	1.402	99.32	HB15&16A_L1_S1
1265.3	49.995	50.240	1.505	15.700	0.046	9.813	17.858	3.451	1.388	99.76	HB15&16A_L1_S1
1345.3	50.112	50.361	1.525	15.782	0.045	9.731	17.654	3.512	1.391	99.75	HB15&16A_L1_S1
1385.3	50.021	50.631	1.530	15.649	0.070	9.646	17.613	3.436	1.426	99.39	HB15&16A_L1_S1
1425.3	49.924	50.721	1.460	15.566	0.076	9.637	17.652	3.455	1.433	99.20	HB15&16A_L1_S1
1465.3	50.099	50.453	1.496	15.758	0.033	9.584	17.764	3.472	1.439	99.65	HB15&16A_L1_S1
1505.3	50.135	50.416	1.520	15.693	0.070	9.814	17.683	3.431	1.375	99.72	HB15&16A_L1_S1
-1425.8	50.275	50.549	1.520	15.536	0.047	9.664	20.564	0.964	1.157	99.73	HB15&16A_L2_S4
-1385.8	50.110	50.588	1.543	15.510	0.079	9.717	20.451	0.954	1.158	99.52	HB15&16A_L2_S4
-1345.8	50.329	50.692	1.564	15.412	0.070	9.540	20.622	0.949	1.152	99.64	HB15&16A_L2_S4
-1305.8	50.472	50.740	1.549	15.446	0.069	9.601	20.479	0.950	1.167	99.73	HB15&16A_L2_S4
-1265.8	50.322	50.767	1.478	15.393	0.071	9.659	20.524	0.943	1.165	99.56	HB15&16A_L2_S4
-1225.8	50.464	50.816	1.535	15.354	0.037	9.622	20.499	0.959	1.179	99.65	HB15&16A_L2_S4
-1185.8	50.429	50.798	1.449	15.511	0.031	9.590	20.522	0.934	1.166	99.63	HB15&16A_L2_S4
-1145.8	50.514	50.758	1.488	15.451	0.056	9.499	20.601	0.950	1.198	99.76	HB15&16A_L2_S4
-1105.8	50.561	50.729	1.515	15.520	0.044	9.545	20.514	0.968	1.165	99.83	HB15&16A_L2_S4
-1065.8	50.281	50.911	1.521	15.393	0.054	9.484	20.507	0.955	1.177	99.37	HB15&16A_L2_S4
-1025.8	50.515	50.810	1.509	15.540	0.012	9.489	20.523	0.954	1.162	99.70	HB15&16A_L2_S4
-985.8	50.458	50.757	1.526	15.462	0.044	9.633	20.443	0.953	1.182	99.70	HB15&16A_L2_S4
-945.8	50.383	50.727	1.478	15.477	0.050	9.647	20.484	0.966	1.171	99.66	HB15&16A_L2_S4
-905.8	50.479	50.599	1.563	15.651	0.032	9.596	20.434	0.985	1.140	99.88	HB15&16A_L2_S4
-865.8	50.568	50.870	1.562	15.343	0.054	9.513	20.515	0.995	1.149	99.70	HB15&16A_L2_S4
-785.8	50.509	50.795	1.467	15.499	0.038	9.495	20.467	1.061	1.176	99.71	HB15&16A_L2_S4
-745.8	50.641	50.692	1.553	15.549	0.023	9.547	20.430	1.042	1.166	99.95	HB15&16A_L2_S4
-705.8	50.545	50.680	1.452	15.609	0.029	9.611	20.403	1.061	1.156	99.87	HB15&16A_L2_S4
-665.8	50.606	50.584	1.540	15.520	0.058	9.604	20.490	1.061	1.142	100.02	HB15&16A_L2_S4
-625.8	50.563	50.893	1.590	15.453	0.043	9.399	20.351	1.103	1.169	99.67	HB15&16A_L2_S4
-585.8	50.494	50.606	1.561	15.548	0.063	9.519	20.433	1.123	1.148	99.89	HB15&16A_L2_S4
-545.8	50.688	50.620	1.437	15.615	0.026	9.561	20.425	1.151	1.165	100.07	HB15&16A_L2_S4
-505.8	50.507	50.555	1.575	15.588	0.069	9.572	20.291	1.213	1.137	99.95	HB15&16A_L2_S4
-465.8	50.410	50.514	1.526	15.697	0.055	9.391	20.385	1.260	1.171	99.90	HB15&16A_L2_S4
-445.8	50.369	50.485	1.543	15.605	0.048	9.457	20.414	1.288	1.160	99.88	HB15&16A_L2_S3
-425.8	50.409	50.623	1.534	15.415	0.040	9.459	20.405	1.338	1.186	99.79	HB15&16A_L2_S3
-405.8	50.409	50.547	1.534	15.463	0.070	9.504	20.328	1.393	1.163	99.86	HB15&16A_L2_S3
-385.8	50.481	50.443	1.579	15.631	0.034	9.462	20.336	1.356	1.160	100.04	HB15&16A_L2_S3
-365.8	50.427	50.370	1.526	15.539	0.052	9.567	20.332	1.443	1.171	100.06	HB15&16A_L2_S3
-345.8	50.474	50.464	1.584	15.509	0.054	9.530	20.263	1.446	1.149	100.01	HB15&16A_L2_S3
-325.8	50.316	50.401	1.550	15.425	0.072	9.622	20.314	1.467	1.150	99.92	HB15&16A_L2_S3
-305.8	50.351	50.934	1.424	15.394	0.064	9.350	20.142	1.520	1.173	99.42	HB15&16A_L2_S3

-285.8	50.466	50.850	1.437	15.427	0.034	9.388	20.121	1.543	1.202	99.62	HB15&16A_L2_S3
-265.8	50.384	50.586	1.491	15.479	0.060	9.442	20.161	1.597	1.185	99.80	HB15&16A_L2_S3
-245.8	50.263	50.698	1.552	15.402	0.029	9.437	20.055	1.647	1.181	99.57	HB15&16A_L2_S3
-225.8	50.356	50.381	1.489	15.584	0.037	9.545	20.087	1.689	1.189	99.98	HB15&16A_L2_S3
-205.8	50.341	50.538	1.475	15.556	0.045	9.453	20.046	1.726	1.162	99.80	HB15&16A_L2_S3
-185.8	50.436	50.829	1.497	15.332	0.051	9.436	19.930	1.745	1.179	99.61	HB15&16A_L2_S3
-165.8	50.386	50.465	1.603	15.407	0.038	9.496	20.018	1.783	1.190	99.92	HB15&16A_L2_S3
-145.8	50.505	50.568	1.506	15.534	0.067	9.508	19.747	1.845	1.224	99.94	HB15&16A_L2_S3
-125.8	50.282	50.566	1.580	15.395	0.036	9.538	19.856	1.853	1.177	99.72	HB15&16A_L2_S3
-105.8	50.439	50.353	1.582	15.463	0.052	9.645	19.784	1.912	1.210	100.09	HB15&16A_L2_S3
-85.8	50.371	50.631	1.570	15.390	0.061	9.621	19.522	1.975	1.231	99.74	HB15&16A_L2_S3
-65.8	50.406	50.798	1.494	15.410	0.059	9.634	19.373	2.007	1.226	99.61	HB15&16A_L2_S3
-45.8	50.387	50.747	1.443	15.432	0.052	9.603	19.344	2.145	1.234	99.64	HB15&16A_L2_S3
-25.8	50.265	50.696	1.454	15.422	0.100	9.555	19.373	2.137	1.262	99.57	HB15&16A_L2_S3
-5.8	50.410	50.636	1.516	15.497	0.072	9.577	19.258	2.186	1.257	99.77	HB15&16A_L2_S3
14.2	50.373	50.734	1.508	15.456	0.095	9.599	19.130	2.195	1.284	99.64	HB15&16A_L2_S3
34.2	50.299	50.802	1.608	15.478	0.049	9.505	18.987	2.276	1.296	99.50	HB15&16A_L2_S3
54.2	50.282	50.814	1.542	15.560	0.043	9.507	18.864	2.345	1.326	99.47	HB15&16A_L2_S3
88.2	50.441	50.635	1.536	15.678	0.039	9.657	18.704	2.424	1.327	99.81	HB15&16A_L2_S2
108	50.538	50.693	1.464	15.751	0.041	9.572	18.651	2.493	1.336	99.85	HB15&16A_L2_S2
147.6	50.460	51.001	1.527	15.603	0.056	9.546	18.357	2.527	1.383	99.46	HB15&16A_L2_S2
167.4	50.561	50.917	1.440	15.622	0.067	9.581	18.403	2.606	1.364	99.64	HB15&16A_L2_S2
187.1	50.556	50.749	1.549	15.721	0.062	9.621	18.300	2.637	1.361	99.81	HB15&16A_L2_S2
206.9	50.583	50.684	1.485	15.765	0.041	9.701	18.221	2.687	1.415	99.90	HB15&16A_L2_S2
226.7	50.592	51.233	1.495	15.579	0.034	9.515	17.985	2.781	1.379	99.36	HB15&16A_L2_S2
246.5	50.525	50.800	1.530	15.786	0.061	9.596	18.057	2.784	1.386	99.72	HB15&16A_L2_S2
266.3	50.528	50.906	1.519	15.651	0.048	9.734	17.909	2.842	1.390	99.62	HB15&16A_L2_S2
286.1	50.570	50.878	1.481	15.706	0.065	9.640	17.969	2.835	1.426	99.69	HB15&16A_L2_S2
305.9	50.428	51.032	1.552	15.636	0.052	9.564	17.863	2.867	1.436	99.40	HB15&16A_L2_S2
325.7	50.670	50.833	1.574	15.698	0.092	9.662	17.828	2.922	1.392	99.84	HB15&16A_L2_S2
345.5	50.593	51.036	1.501	15.713	0.050	9.658	17.716	2.930	1.397	99.56	HB15&16A_L2_S2
365.3	50.672	50.969	1.495	15.741	0.072	9.656	17.706	2.923	1.439	99.70	HB15&16A_L2_S2
385	50.752	50.846	1.529	15.697	0.050	9.622	17.825	2.997	1.434	99.91	HB15&16A_L2_S2
404.8	50.689	50.775	1.487	15.700	0.070	9.671	17.791	3.047	1.458	99.91	HB15&16A_L2_S2
424.6	50.605	50.970	1.523	15.650	0.049	9.547	17.803	3.059	1.399	99.64	HB15&16A_L2_S2
444.4	50.578	50.809	1.505	15.611	0.081	9.721	17.750	3.100	1.423	99.77	HB15&16A_L2_S2
464.2	50.604	50.687	1.554	15.735	0.076	9.663	17.716	3.131	1.438	99.92	HB15&16A_L2_S2
484.2	50.501	50.842	1.507	15.682	0.046	9.626	17.732	3.136	1.430	99.66	HB15&16A_L2_S1
524.2	50.580	50.641	1.528	15.679	0.048	9.693	17.846	3.144	1.421	99.94	HB15&16A_L2_S1
564.2	50.388	50.761	1.477	15.726	0.054	9.747	17.636	3.180	1.419	99.63	HB15&16A_L2_S1
604.2	50.723	50.691	1.552	15.677	0.074	9.738	17.613	3.234	1.421	100.03	HB15&16A_L2_S1
644.2	50.481	50.633	1.491	15.783	0.071	9.671	17.644	3.288	1.420	99.85	HB15&16A_L2_S1
684.2	50.439	50.672	1.494	15.554	0.043	9.742	17.763	3.328	1.405	99.77	HB15&16A_L2_S1
724.2	50.364	50.817	1.492	15.605	0.067	9.635	17.646	3.334	1.405	99.55	HB15&16A_L2_S1
764.2	50.418	50.717	1.505	15.692	0.052	9.634	17.652	3.330	1.418	99.70	HB15&16A_L2_S1
804.2	50.311	50.728	1.553	15.508	0.092	9.650	17.675	3.385	1.409	99.58	HB15&16A_L2_S1
844.2	50.258	50.662	1.508	15.588	0.073	9.721	17.654	3.392	1.403	99.60	HB15&16A_L2_S1
884.2	50.343	50.891	1.492	15.571	0.042	9.594	17.670	3.347	1.393	99.45	HB15&16A_L2_S1
924.2	50.212	50.419	1.587	15.672	0.060	9.774	17.728	3.375	1.385	99.79	HB15&16A_L2_S1
964.2	50.312	50.420	1.570	15.622	0.065	9.761	17.765	3.378	1.419	99.89	HB15&16A_L2_S1
1004.2	50.392	50.895	1.407	15.620	0.062	9.607	17.687	3.342	1.380	99.50	HB15&16A_L2_S1
1044.2	50.384	50.631	1.523	15.600	0.060	9.701	17.681	3.394	1.409	99.75	HB15&16A_L2_S1
1084.2	50.127	50.488	1.509	15.601	0.081	9.729	17.769	3.435	1.388	99.64	HB15&16A_L2_S1
1124.2	50.058	50.511	1.441	15.545	0.057	9.727	17.812	3.493	1.414	99.55	HB15&16A_L2_S1
1164.2	50.203	50.463	1.558	15.675	0.046	9.678	17.744	3.448	1.389	99.74	HB15&16A_L2_S1
1204.2	50.070	50.388	1.533	15.621	0.075	9.687	17.831	3.494	1.372	99.68	HB15&16A_L2_S1
1244.2	50.060	50.690	1.440	15.532	0.034	9.780	17.681	3.428	1.416	99.37	HB15&16A_L2_S1
1284.2	50.048	50.469	1.506	15.563	0.070	9.796	17.693	3.502	1.401	99.58	HB15&16A_L2_S1
1324.2	50.121	50.450	1.568	15.682	0.069	9.635	17.706	3.494	1.396	99.67	HB15&16A_L2_S1
1364.2	50.086	50.630	1.483	15.662	0.075	9.555	17.727	3.472	1.397	99.46	HB15&16A_L2_S1
1404.2	50.190	50.495	1.486	15.670	0.064	9.716	17.671	3.492	1.406	99.69	HB15&16A_L2_S1
1444.2	50.209	50.435	1.486	15.597	0.060	9.840	17.734	3.449	1.399	99.77	HB15&16A_L2_S1
1484.2	50.268	50.638	1.524	15.567	0.056	9.628	17.679	3.518	1.391	99.63	HB15&16A_L2_S1

Table C9. HB17&18A

X (µm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
-1346.9	50.056	50.184	3.015	15.606	0.049	8.286	18.692	2.664	1.503	99.87	HB17&18_L1_S3
-1046.9	50.101	50.091	2.947	15.640	0.084	8.315	18.676	2.709	1.539	100.01	HB17&18_L1_S3
-946.9	49.949	50.382	2.852	15.572	0.018	8.342	18.607	2.705	1.523	99.57	HB17&18_L1_S3
-846.9	50.158	50.565	2.957	15.491	0.074	8.195	18.589	2.610	1.521	99.59	HB17&18_L1_S3
-746.9	50.121	50.243	3.074	15.763	0.038	8.188	18.473	2.672	1.550	99.88	HB17&18_L1_S3
-646.9	50.177	50.632	3.041	15.476	0.049	8.127	18.466	2.641	1.569	99.54	HB17&18_L1_S3
-546.9	50.226	50.536	2.892	15.550	0.035	8.237	18.567	2.630	1.553	99.69	HB17&18_L1_S2
-496.9	50.322	50.517	2.940	15.429	0.070	8.185	18.644	2.686	1.529	99.81	HB17&18_L1_S2
-446.9	50.209	50.528	2.939	15.567	0.074	8.206	18.537	2.627	1.521	99.68	HB17&18_L1_S2
-396.9	50.277	50.475	2.884	15.573	0.043	8.295	18.545	2.650	1.536	99.80	HB17&18_L1_S2
-346.9	50.328	50.204	2.957	15.547	0.057	8.304	18.687	2.681	1.565	100.12	HB17&18_L1_S2
-296.9	50.065	50.414	2.948	15.540	0.060	8.247	18.586	2.640	1.566	99.65	HB17&18_L1_S2
-246.9	50.043	50.347	2.791	15.566	0.063	8.563	18.543	2.592	1.535	99.70	HB17&18_L1_S2
-196.9	50.179	50.447	2.758	15.489	0.083	8.553	18.523	2.601	1.546	99.73	HB17&18_L1_S2
-146.9	50.152	50.332	2.662	15.532	0.047	8.792	18.608	2.521	1.506	99.82	HB17&18_L1_S2
-96.9	50.099	50.479	2.413	15.456	0.057	8.888	18.647	2.538	1.522	99.62	HB17&18_L1_S2
-46.9	50.222	50.028	1.938	15.687	0.047	9.490	18.736	2.557	1.518	100.19	HB17&18_L1_S2
3.1	50.433	50.414	1.419	15.784	0.063	9.671	18.666	2.500	1.483	100.02	HB17&18_L1_S2
53.1	50.561	50.516	0.990	15.743	0.067	9.946	18.743	2.502	1.493	100.05	HB17&18_L1_S2
103.1	50.745	50.355	0.585	16.070	0.068	10.099	18.852	2.502	1.469	100.39	HB17&18_L1_S2
153.1	50.751	50.339	0.237	15.945	0.041	10.667	18.887	2.452	1.432	100.41	HB17&18_L1_S2
203.1	50.789	50.233	0.157	16.020	0.045	10.807	18.836	2.434	1.469	100.56	HB17&18_L1_S2
253.1	50.882	50.309	0.072	15.895	0.078	10.914	18.927	2.418	1.389	100.57	HB17&18_L1_S2
303.1	50.682	50.629	0.028	15.761	0.049	10.932	18.737	2.422	1.443	100.05	HB17&18_L1_S2
353.1	50.731	50.251	0.011	15.840	0.068	11.179	18.835	2.389	1.428	100.48	HB17&18_L1_S2
403.1	50.706	50.207	0.029	15.790	0.058	11.230	18.853	2.394	1.439	100.50	HB17&18_L1_S2
453.1	50.690	50.300	0.012	15.858	0.042	11.043	18.887	2.423	1.436	100.39	HB17&18_L1_S2
653.1	50.758	50.236	0.027	15.890	0.063	11.191	18.739	2.421	1.434	100.52	HB17&18_L1_S1
853.1	50.561	50.252	0.008	15.958	0.071	11.153	18.753	2.380	1.425	100.31	HB17&18_L1_S1
953.1	50.522	50.355	0.000	15.819	0.081	11.105	18.812	2.353	1.474	100.17	HB17&18_L1_S1
1053.1	50.718	50.245	0.021	15.788	0.059	11.194	18.843	2.404	1.447	100.47	HB17&18_L1_S1
1153.1	50.334	50.107	0.037	16.004	0.055	11.075	18.851	2.410	1.461	100.23	HB17&18_L1_S1
1253.1	50.624	50.365	0.023	15.908	0.061	11.076	18.718	2.425	1.424	100.26	HB17&18_L1_S1
1353.1	50.642	50.367	0.021	15.977	0.071	10.978	18.739	2.383	1.464	100.28	HB17&18_L1_S1
-1363.5	50.282	50.273	2.953	15.625	0.059	8.252	18.712	2.626	1.501	100.01	HB17&18_L2_S3
-1263.5	50.370	50.654	2.869	15.483	0.037	8.180	18.591	2.686	1.501	99.72	HB17&18_L2_S3
-1163.5	50.102	50.192	3.019	15.745	0.047	8.178	18.642	2.653	1.525	99.91	HB17&18_L2_S3
-1063.5	50.110	50.335	2.870	15.738	0.061	8.146	18.671	2.660	1.519	99.77	HB17&18_L2_S3
-963.5	50.178	50.234	2.890	15.677	0.067	8.297	18.595	2.692	1.549	99.94	HB17&18_L2_S3
-863.5	50.082	50.530	2.943	15.501	0.059	8.199	18.619	2.643	1.506	99.55	HB17&18_L2_S3
-763.5	50.117	50.472	3.075	15.573	0.054	8.186	18.464	2.649	1.527	99.64	HB17&18_L2_S3
-563.5	50.162	50.273	2.923	15.698	0.070	8.208	18.660	2.659	1.510	99.89	HB17&18_L2_S2
-513.5	50.176	50.326	2.937	15.713	0.041	8.209	18.533	2.695	1.545	99.85	HB17&18_L2_S2
-463.5	50.008	50.585	2.911	15.538	0.069	8.252	18.419	2.680	1.546	99.42	HB17&18_L2_S2
-413.5	50.089	50.672	2.899	15.451	0.054	8.210	18.533	2.618	1.562	99.42	HB17&18_L2_S2
-363.5	50.001	50.423	2.992	15.702	0.054	8.173	18.519	2.600	1.538	99.58	HB17&18_L2_S2
-313.5	50.152	50.554	2.944	15.612	0.064	8.197	18.443	2.639	1.546	99.60	HB17&18_L2_S2
-263.5	50.264	50.400	2.849	15.695	0.051	8.315	18.520	2.608	1.562	99.86	HB17&18_L2_S2
-213.5	50.148	50.470	2.807	15.563	0.073	8.489	18.463	2.591	1.543	99.68	HB17&18_L2_S2
-163.5	49.997	50.234	2.726	15.672	0.055	8.692	18.524	2.564	1.534	99.76	HB17&18_L2_S2
-113.5	50.238	50.245	2.451	15.487	0.067	9.064	18.571	2.598	1.519	99.99	HB17&18_L2_S2
-63.5	50.277	50.084	2.171	15.641	0.058	9.210	18.733	2.578	1.524	100.19	HB17&18_L2_S2
-13.5	50.500	50.672	1.537	15.527	0.050	9.490	18.680	2.536	1.508	99.83	HB17&18_L2_S2
36.5	50.514	50.318	1.114	15.854	0.034	9.954	18.724	2.514	1.489	100.20	HB17&18_L2_S2
86.5	50.597	50.565	0.677	15.858	0.046	10.113	18.837	2.443	1.461	100.03	HB17&18_L2_S2
136.5	50.680	50.556	0.370	15.780	0.053	10.580	18.745	2.485	1.432	100.12	HB17&18_L2_S2
186.5	50.718	50.554	0.173	15.819	0.054	10.731	18.764	2.477	1.427	100.16	HB17&18_L2_S2
236.5	50.677	50.417	0.080	15.917	0.034	10.879	18.852	2.378	1.444	100.26	HB17&18_L2_S2
286.5	50.958	50.372	0.044	15.869	0.057	11.015	18.803	2.426	1.415	100.59	HB17&18_L2_S2
336.5	50.695	50.350	0.019	15.794	0.078	11.046	18.936	2.384	1.392	100.35	HB17&18_L2_S2
386.5	50.869	50.273	0.034	15.808	0.054	11.111	18.867	2.399	1.454	100.60	HB17&18_L2_S2

436.5	50.678	50.341	0.017	15.800	0.058	11.157	18.835	2.373	1.418	100.34	HB17&18_L2_S2
536.5	50.542	50.589	0.024	15.674	0.063	11.021	18.762	2.395	1.473	99.95	HB17&18_L2_S1
636.5	50.584	50.300	0.029	15.836	0.049	11.100	18.870	2.353	1.463	100.28	HB17&18_L2_S1
736.5	50.794	50.362	0.021	15.884	0.063	11.183	18.682	2.393	1.413	100.43	HB17&18_L2_S1
836.5	50.720	50.361	0.020	15.843	0.062	11.098	18.714	2.424	1.478	100.36	HB17&18_L2_S1
936.5	50.727	50.303	0.042	15.960	0.062	10.989	18.798	2.389	1.458	100.42	HB17&18_L2_S1
1036.5	50.603	50.219	-0.004	15.941	0.045	11.077	18.873	2.406	1.443	100.38	HB17&18_L2_S1
1136.5	50.608	50.496	0.018	15.755	0.057	11.039	18.785	2.395	1.454	100.11	HB17&18_L2_S1
1236.5	50.748	50.470	0.007	15.822	0.050	11.171	18.671	2.386	1.423	100.28	HB17&18_L2_S1
1336.5	50.635	50.512	-0.017	15.756	0.045	11.083	18.805	2.388	1.428	100.12	HB17&18_L2_S1
-1343.9	49.933	50.371	2.905	15.629	0.063	8.215	18.705	2.628	1.484	99.56	HB17&18_L3_S3
-1143.9	49.879	50.471	2.907	15.528	0.082	8.129	18.676	2.666	1.541	99.41	HB17&18_L3_S3
-843.9	49.920	50.415	2.905	15.638	0.073	8.190	18.595	2.641	1.543	99.50	HB17&18_L3_S3
-743.9	49.890	50.415	2.911	15.605	0.071	8.160	18.646	2.644	1.549	99.48	HB17&18_L3_S3
-543.9	49.965	50.289	2.923	15.661	0.069	8.133	18.681	2.669	1.575	99.68	HB17&18_L3_S2
-493.9	49.904	50.439	2.914	15.536	0.057	8.188	18.650	2.672	1.546	99.47	HB17&18_L3_S2
-443.9	50.008	50.424	3.004	15.590	0.060	8.197	18.532	2.620	1.572	99.58	HB17&18_L3_S2
-393.9	49.884	50.249	2.894	15.646	0.089	8.293	18.654	2.634	1.543	99.64	HB17&18_L3_S2
-343.9	50.145	50.263	2.960	15.575	0.059	8.282	18.694	2.613	1.554	99.88	HB17&18_L3_S2
-293.9	50.032	50.121	3.011	15.562	0.092	8.364	18.654	2.638	1.557	99.91	HB17&18_L3_S2
-243.9	49.911	50.368	2.888	15.580	0.057	8.293	18.648	2.637	1.529	99.54	HB17&18_L3_S2
-193.9	49.875	50.154	2.803	15.603	0.066	8.580	18.666	2.575	1.554	99.72	HB17&18_L3_S2
-143.9	49.981	50.270	2.552	15.595	0.069	8.761	18.617	2.612	1.524	99.71	HB17&18_L3_S2
-93.9	49.952	50.134	2.346	15.671	0.059	9.061	18.647	2.585	1.496	99.82	HB17&18_L3_S2
-43.9	50.121	50.392	1.953	15.597	0.053	9.324	18.677	2.548	1.455	99.73	HB17&18_L3_S2
6.1	50.292	50.370	1.370	15.787	0.061	9.635	18.764	2.534	1.478	99.92	HB17&18_L3_S2
56.1	50.470	50.272	0.953	15.944	0.053	9.996	18.788	2.504	1.490	100.20	HB17&18_L3_S2
106.1	50.513	50.641	0.565	15.904	0.062	10.150	18.733	2.487	1.458	99.87	HB17&18_L3_S2
156.1	50.638	50.714	0.288	15.836	0.042	10.426	18.767	2.491	1.436	99.92	HB17&18_L3_S2
206.1	50.855	50.436	0.135	15.918	0.042	10.722	18.898	2.417	1.432	100.42	HB17&18_L3_S2
256.1	50.790	50.405	0.088	15.897	0.026	10.815	18.885	2.457	1.428	100.38	HB17&18_L3_S2
306.1	50.826	50.454	0.020	15.918	0.079	10.889	18.777	2.427	1.438	100.37	HB17&18_L3_S2
356.1	50.661	50.445	0.009	15.842	0.055	11.043	18.746	2.436	1.425	100.22	HB17&18_L3_S2
406.1	50.786	50.365	0.019	15.848	0.028	11.073	18.820	2.408	1.440	100.42	HB17&18_L3_S2
456.1	50.627	50.345	0.007	15.759	0.062	11.122	18.797	2.440	1.468	100.28	HB17&18_L3_S2
556.1	50.721	50.260	0.024	15.933	0.060	11.143	18.678	2.433	1.470	100.46	HB17&18_L3_S1
656.1	50.612	50.234	-0.012	15.934	0.034	11.113	18.783	2.464	1.450	100.38	HB17&18_L3_S1
756.1	50.528	50.235	0.025	15.991	0.043	11.058	18.732	2.452	1.464	100.29	HB17&18_L3_S1
856.1	50.603	50.252	0.042	15.869	0.047	11.172	18.753	2.380	1.486	100.35	HB17&18_L3_S1
956.1	50.512	50.477	0.047	15.741	0.070	11.027	18.790	2.390	1.458	100.04	HB17&18_L3_S1
1056.1	50.580	50.205	0.049	15.848	0.089	11.093	18.841	2.427	1.449	100.37	HB17&18_L3_S1
1256.1	50.803	50.534	0.024	15.713	0.036	11.155	18.695	2.399	1.445	100.27	HB17&18_L3_S1

Table C10. An&HB4

X (μm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
11.5	43.066	43.661	0.241	30.009	0.300	3.552	18.332	3.148	0.759	99.406	Glass_L1_S1
16.5	43.287	44.143	0.273	29.695	0.285	3.655	18.239	2.996	0.715	99.145	Glass_L1_S1
21.5	43.592	43.951	0.271	29.481	0.274	3.836	18.536	2.912	0.739	99.640	Glass_L1_S1
26.5	43.614	44.343	0.299	29.273	0.253	3.892	18.357	2.823	0.760	99.272	Glass_L1_S1
36.5	44.008	44.432	0.381	28.616	0.233	4.204	18.502	2.811	0.821	99.576	Glass_L1_S1
41.5	44.351	44.627	0.434	28.225	0.216	4.439	18.429	2.754	0.876	99.724	Glass_L1_S1
46.5	44.652	45.171	0.452	27.772	0.230	4.459	18.217	2.845	0.856	99.481	Glass_L1_S1
51.5	44.810	45.500	0.464	27.142	0.232	4.640	18.416	2.765	0.842	99.310	Glass_L1_S1
56.5	45.024	45.503	0.536	26.893	0.234	4.751	18.420	2.804	0.860	99.521	Glass_L1_S1
61.5	45.286	45.788	0.557	26.419	0.231	4.943	18.363	2.771	0.928	99.498	Glass_L1_S1
66.5	45.819	46.042	0.631	25.916	0.216	5.011	18.479	2.784	0.922	99.776	Glass_L1_S1
71.5	45.874	46.603	0.736	25.153	0.212	5.213	18.386	2.756	0.941	99.271	Glass_L1_S1
76.5	46.203	46.660	0.722	24.925	0.219	5.421	18.290	2.832	0.931	99.542	Glass_L1_S1
81.5	46.642	46.656	0.743	24.516	0.211	5.685	18.501	2.745	0.944	99.987	Glass_L1_S1
86.5	46.592	47.308	0.817	23.784	0.207	5.714	18.447	2.747	0.976	99.283	Glass_L1_S1
91.5	47.125	47.581	0.912	23.338	0.218	5.886	18.311	2.772	0.982	99.544	Glass_L1_S1
109.0	47.905	48.568	1.016	21.609	0.236	6.383	18.460	2.712	1.017	99.337	Glass_L1_S2
119.0	48.432	48.838	1.075	20.728	0.237	6.808	18.584	2.684	1.046	99.594	Glass_L1_S2
129.0	48.578	49.144	1.186	20.095	0.168	7.073	18.588	2.694	1.053	99.434	Glass_L1_S2
139.0	48.757	49.303	1.313	19.365	0.157	7.360	18.765	2.708	1.030	99.454	Glass_L1_S2
149.0	48.974	49.668	1.293	18.814	0.201	7.655	18.750	2.578	1.041	99.305	Glass_L1_S2
159.0	49.292	49.813	1.367	18.301	0.162	7.857	18.868	2.564	1.069	99.479	Glass_L1_S2
169.0	49.482	49.504	1.426	17.937	0.173	8.264	19.023	2.623	1.049	99.978	Glass_L1_S2
179.0	49.339	50.206	1.427	17.455	0.119	8.223	18.939	2.555	1.076	99.134	Glass_L1_S2
189.0	49.378	50.042	1.403	17.291	0.148	8.554	19.006	2.505	1.052	99.336	Glass_L1_S2
199.0	49.565	50.223	1.465	16.906	0.143	8.660	18.967	2.557	1.080	99.342	Glass_L1_S2
209.0	49.520	50.243	1.493	16.753	0.154	8.804	18.933	2.524	1.096	99.277	Glass_L1_S2
219.0	49.405	49.951	1.588	16.695	0.138	9.065	18.912	2.556	1.095	99.455	Glass_L1_S2
229.0	49.446	50.336	1.530	16.366	0.129	9.089	18.971	2.491	1.089	99.110	Glass_L1_S2
239.0	49.541	50.245	1.478	16.412	0.141	9.208	18.892	2.530	1.095	99.297	Glass_L1_S2
249.0	49.288	50.154	1.524	16.253	0.146	9.257	19.082	2.485	1.098	99.134	Glass_L1_S2
259.0	49.540	50.249	1.545	16.194	0.125	9.239	18.951	2.565	1.133	99.291	Glass_L1_S2
269.0	49.359	49.990	1.518	16.236	0.109	9.480	18.976	2.539	1.153	99.370	Glass_L1_S2
279.0	49.374	50.091	1.498	16.295	0.116	9.437	18.918	2.515	1.129	99.283	Glass_L1_S2
289.0	49.525	49.776	1.558	16.162	0.104	9.617	19.071	2.531	1.181	99.749	Glass_L1_S2
299.0	49.543	49.717	1.514	16.200	0.121	9.543	19.194	2.549	1.162	99.826	Glass_L1_S2
309.0	49.279	50.010	1.464	16.062	0.093	9.674	19.029	2.504	1.165	99.268	Glass_L1_S2
319.0	49.324	50.101	1.571	15.998	0.075	9.579	18.932	2.531	1.213	99.224	Glass_L1_S2
329.0	49.546	49.749	1.454	16.094	0.110	9.782	19.012	2.646	1.152	99.796	Glass_L1_S2
339.0	49.497	49.897	1.507	16.149	0.091	9.700	18.833	2.613	1.209	99.600	Glass_L1_S2
349.0	49.427	49.793	1.602	16.041	0.100	9.816	18.814	2.592	1.242	99.634	Glass_L1_S2
369.0	49.521	49.712	1.541	16.053	0.069	9.784	19.025	2.605	1.210	99.809	Glass_L1_S2
379.0	49.360	49.787	1.527	16.089	0.084	9.691	18.949	2.655	1.219	99.574	Glass_L1_S2
389.0	49.517	49.955	1.560	16.041	0.068	9.763	18.805	2.589	1.221	99.562	Glass_L1_S2
399.0	49.474	49.551	1.540	16.104	0.117	9.822	18.947	2.678	1.241	99.923	Glass_L1_S2
409.0	49.537	49.769	1.529	15.996	0.072	9.798	18.894	2.697	1.246	99.769	Glass_L1_S2
419.0	49.286	49.923	1.516	16.012	0.074	9.862	18.782	2.601	1.232	99.363	Glass_L1_S2
429.0	49.536	49.560	1.495	16.148	0.067	9.788	18.975	2.736	1.230	99.976	Glass_L1_S2
439.0	49.237	49.989	1.513	15.980	0.070	9.758	18.725	2.692	1.273	99.248	Glass_L1_S2
449.0	49.325	49.755	1.512	16.041	0.084	9.824	18.810	2.722	1.253	99.570	Glass_L1_S2
459.0	49.268	49.923	1.525	15.953	0.072	9.848	18.731	2.691	1.257	99.345	Glass_L1_S2
469.0	49.550	49.882	1.470	16.037	0.073	9.828	18.730	2.724	1.255	99.668	Glass_L1_S2
479.0	49.312	49.734	1.506	16.020	0.087	9.795	18.843	2.720	1.293	99.577	Glass_L1_S2
489.0	49.552	49.613	1.445	16.016	0.100	9.943	18.894	2.723	1.267	99.939	Glass_L1_S2
499.0	49.450	49.463	1.548	16.089	0.071	9.877	18.896	2.785	1.271	99.987	Glass_L1_S2
509.0	49.328	49.873	1.489	16.070	0.073	9.737	18.774	2.716	1.268	99.456	Glass_L1_S2
519.0	49.513	49.896	1.518	15.972	0.061	9.791	18.834	2.680	1.248	99.617	Glass_L1_S2
529.0	49.342	49.669	1.481	16.031	0.082	9.829	18.902	2.725	1.282	99.673	Glass_L1_S2
539.0	49.328	49.526	1.486	16.118	0.089	9.921	18.803	2.758	1.298	99.802	Glass_L1_S2
549.0	49.624	49.625	1.491	16.131	0.092	9.786	18.830	2.756	1.290	99.999	Glass_L1_S2
573.0	49.340	49.626	1.460	16.065	0.070	9.912	18.846	2.761	1.261	99.714	Glass_L1_S3

593.0	49.309	49.646	1.522	16.043	0.051	9.918	18.804	2.762	1.255	99.663	Glass_L1_S3
613.0	49.276	49.690	1.482	15.980	0.061	9.957	18.793	2.789	1.248	99.586	Glass_L1_S3
633.0	49.350	49.654	1.518	15.967	0.075	9.788	18.868	2.823	1.307	99.695	Glass_L1_S3
653.0	49.474	49.572	1.538	15.977	0.065	9.827	18.911	2.827	1.283	99.902	Glass_L1_S3
673.0	49.121	49.657	1.634	16.025	0.058	9.782	18.750	2.833	1.262	99.465	Glass_L1_S3
693.0	49.466	49.815	1.470	16.116	0.063	9.643	18.770	2.844	1.279	99.651	Glass_L1_S3
713.0	49.268	49.630	1.592	16.059	0.082	9.780	18.775	2.802	1.280	99.638	Glass_L1_S3
733.0	49.265	49.630	1.566	15.985	0.058	9.799	18.865	2.853	1.243	99.635	Glass_L1_S3
753.0	49.487	49.502	1.566	16.140	0.042	9.852	18.775	2.833	1.289	99.986	Glass_L1_S3
773.0	49.159	49.579	1.529	16.053	0.077	9.871	18.810	2.793	1.289	99.580	Glass_L1_S3
793.0	49.269	49.668	1.468	15.896	0.078	9.960	18.752	2.878	1.299	99.601	Glass_L1_S3
813.0	49.346	49.594	1.519	16.037	0.085	9.823	18.782	2.879	1.282	99.752	Glass_L1_S3
833.0	49.359	49.792	1.538	16.003	0.047	9.804	18.670	2.862	1.285	99.568	Glass_L1_S3
853.0	49.231	49.507	1.535	16.110	0.074	9.884	18.795	2.808	1.287	99.724	Glass_L1_S3
873.0	49.250	49.589	1.500	16.033	0.067	9.746	18.930	2.832	1.304	99.662	Glass_L1_S3
893.0	49.269	49.385	1.573	16.098	0.074	9.893	18.794	2.887	1.296	99.884	Glass_L1_S3
913.0	49.463	49.535	1.551	16.048	0.085	9.803	18.860	2.844	1.273	99.929	Glass_L1_S3
933.0	49.330	49.539	1.517	16.050	0.061	9.766	18.935	2.845	1.287	99.791	Glass_L1_S3
953.0	49.303	49.676	1.540	15.998	0.079	9.741	18.803	2.864	1.299	99.627	Glass_L1_S3
973.0	49.275	49.660	1.475	15.982	0.073	9.781	18.893	2.874	1.262	99.615	Glass_L1_S3
993.0	49.293	49.755	1.433	16.005	0.072	9.784	18.810	2.832	1.309	99.539	Glass_L1_S3
1033.0	49.237	49.737	1.448	16.103	0.082	9.791	18.667	2.892	1.281	99.500	Glass_L1_S3
1053.0	49.252	49.872	1.448	16.049	0.065	9.682	18.702	2.872	1.310	99.380	Glass_L1_S3
1073.0	49.197	49.382	1.542	16.140	0.072	9.874	18.777	2.918	1.296	99.814	Glass_L1_S3
1093.0	49.370	49.826	1.550	16.029	0.073	9.644	18.713	2.878	1.287	99.545	Glass_L1_S3
1113.0	49.211	49.693	1.571	16.008	0.072	9.657	18.828	2.894	1.278	99.518	Glass_L1_S3
1133.0	49.311	49.651	1.519	16.032	0.064	9.755	18.794	2.901	1.285	99.660	Glass_L1_S3
1153.0	49.084	49.833	1.515	16.020	0.074	9.737	18.641	2.879	1.300	99.251	Glass_L1_S3
1173.0	49.124	49.608	1.508	16.080	0.061	9.831	18.785	2.857	1.270	99.516	Glass_L1_S3
1213.0	49.148	49.696	1.541	15.999	0.072	9.811	18.716	2.873	1.293	99.453	Glass_L1_S4
1253.0	49.243	49.868	1.522	15.868	0.043	9.850	18.687	2.847	1.316	99.375	Glass_L1_S4
1293.0	49.019	49.819	1.521	16.049	0.070	9.750	18.673	2.848	1.271	99.200	Glass_L1_S4
1333.0	49.324	49.559	1.470	16.048	0.049	9.882	18.881	2.871	1.240	99.764	Glass_L1_S4
1373.0	49.114	49.410	1.494	16.027	0.080	9.855	18.901	2.938	1.294	99.704	Glass_L1_S4
1413.0	49.086	49.624	1.490	15.915	0.066	9.908	18.854	2.853	1.291	99.462	Glass_L1_S4
1453.0	49.300	49.745	1.507	15.993	0.071	9.774	18.758	2.867	1.286	99.555	Glass_L1_S4
1493.0	49.065	49.908	1.502	16.030	0.070	9.620	18.723	2.856	1.292	99.157	Glass_L1_S4
1533.0	49.218	49.494	1.514	16.024	0.079	9.804	18.910	2.880	1.297	99.724	Glass_L1_S4
1573.0	49.131	49.799	1.474	16.073	0.089	9.636	18.782	2.873	1.274	99.332	Glass_L1_S4
1613.0	49.027	49.804	1.516	15.939	0.061	9.742	18.805	2.872	1.262	99.223	Glass_L1_S4
1653.0	49.294	49.762	1.562	16.073	0.071	9.660	18.742	2.868	1.262	99.532	Glass_L1_S4
1693.0	49.257	49.433	1.495	16.085	0.055	9.955	18.834	2.863	1.281	99.824	Glass_L1_S4
1733.0	49.071	49.665	1.494	16.027	0.081	9.771	18.853	2.856	1.253	99.406	Glass_L1_S4
1773.0	49.060	49.602	1.519	15.977	0.076	9.875	18.773	2.892	1.287	99.458	Glass_L1_S4
1813.0	49.165	49.620	1.545	15.997	0.072	9.783	18.810	2.883	1.291	99.545	Glass_L1_S4
1853.0	48.943	49.894	1.484	15.917	0.100	9.788	18.713	2.833	1.272	99.049	Glass_L1_S4
1893.0	49.037	49.572	1.553	16.040	0.066	9.761	18.780	2.926	1.302	99.465	Glass_L1_S4
1933.0	48.924	49.673	1.582	15.999	0.100	9.698	18.812	2.841	1.295	99.252	Glass_L1_S4
1973.0	49.010	49.445	1.491	16.055	0.072	10.010	18.801	2.867	1.260	99.565	Glass_L1_S4
20.0	43.157	43.850	0.263	29.761	0.276	3.722	18.426	2.973	0.729	99.307	Glass_L2_S1
25.0	43.113	44.106	0.275	29.446	0.264	3.824	18.505	2.831	0.750	99.007	Glass_L2_S1
30.0	43.312	44.419	0.295	29.093	0.256	3.904	18.511	2.747	0.777	98.893	Glass_L2_S1
35.0	43.490	44.668	0.330	28.757	0.236	4.009	18.411	2.796	0.794	98.822	Glass_L2_S1
40.0	44.072	44.732	0.379	28.406	0.238	4.158	18.503	2.769	0.816	99.340	Glass_L2_S1
45.0	44.143	44.953	0.381	28.023	0.249	4.375	18.450	2.725	0.846	99.190	Glass_L2_S1
50.0	44.278	45.440	0.432	27.456	0.270	4.427	18.364	2.743	0.868	98.838	Glass_L2_S1
60.0	44.785	45.846	0.601	26.419	0.199	4.763	18.500	2.792	0.881	98.939	Glass_L2_S1
70.0	45.268	46.347	0.637	25.570	0.220	5.143	18.433	2.753	0.898	98.921	Glass_L2_S1
75.0	45.594	46.703	0.715	24.962	0.246	5.281	18.415	2.747	0.931	98.891	Glass_L2_S1
90.0	46.379	47.466	0.860	23.621	0.197	5.727	18.413	2.723	0.994	98.912	Glass_L2_S1
95.0	46.702	47.716	0.931	23.058	0.221	5.849	18.516	2.736	0.973	98.986	Glass_L2_S1
100.0	46.943	48.056	0.978	22.475	0.172	6.120	18.477	2.727	0.997	98.887	Glass_L2_S1
110.0	47.391	48.533	1.038	21.591	0.199	6.453	18.570	2.635	0.981	98.858	Glass_L2_S1

140.0	48.878	49.364	1.374	19.285	0.149	7.542	18.617	2.658	1.012	99.514	Glass_L2_S2
155.0	49.172	49.672	1.352	18.551	0.158	7.930	18.704	2.603	1.031	99.501	Glass_L2_S2
170.0	49.200	49.667	1.407	17.826	0.145	8.374	18.996	2.529	1.056	99.533	Glass_L2_S2
185.0	49.434	49.761	1.521	17.438	0.157	8.651	18.887	2.542	1.043	99.674	Glass_L2_S2
200.0	49.698	49.830	1.452	17.041	0.139	8.974	18.991	2.536	1.038	99.869	Glass_L2_S2
215.0	49.643	49.935	1.476	16.795	0.125	8.952	19.137	2.510	1.070	99.709	Glass_L2_S2
230.0	49.516	50.060	1.587	16.536	0.115	9.197	18.960	2.456	1.089	99.456	Glass_L2_S2
245.0	49.299	50.160	1.529	16.439	0.107	9.219	18.997	2.452	1.096	99.139	Glass_L2_S2
260.0	49.441	50.005	1.549	16.349	0.106	9.341	18.996	2.543	1.111	99.436	Glass_L2_S2
275.0	49.273	49.912	1.515	16.296	0.147	9.553	18.919	2.535	1.124	99.362	Glass_L2_S2
290.0	49.313	49.812	1.568	16.275	0.095	9.607	19.002	2.518	1.123	99.501	Glass_L2_S2
305.0	49.291	49.816	1.560	16.236	0.095	9.560	19.054	2.533	1.145	99.476	Glass_L2_S2
320.0	49.456	49.801	1.487	16.212	0.118	9.737	19.020	2.511	1.115	99.655	Glass_L2_S2
335.0	49.219	49.604	1.623	16.085	0.077	9.758	19.059	2.592	1.202	99.615	Glass_L2_S2
350.0	49.248	49.874	1.499	16.146	0.121	9.710	18.845	2.611	1.195	99.374	Glass_L2_S2
365.0	49.440	49.669	1.523	16.131	0.104	9.840	18.949	2.576	1.207	99.771	Glass_L2_S2
380.0	49.161	49.707	1.443	16.125	0.090	9.906	18.945	2.579	1.206	99.454	Glass_L2_S2
395.0	49.214	49.575	1.596	16.211	0.104	9.822	18.867	2.622	1.203	99.639	Glass_L2_S2
410.0	49.080	49.781	1.523	15.989	0.087	9.886	18.867	2.646	1.221	99.299	Glass_L2_S2
425.0	49.292	49.764	1.524	16.028	0.067	9.862	18.890	2.606	1.258	99.528	Glass_L2_S2
440.0	49.090	49.641	1.500	16.103	0.076	9.919	18.867	2.643	1.252	99.449	Glass_L2_S2
470.0	49.296	49.724	1.456	16.081	0.048	9.775	18.978	2.687	1.251	99.572	Glass_L2_S3
500.0	49.280	49.598	1.592	16.031	0.066	9.900	18.852	2.698	1.263	99.682	Glass_L2_S3
530.0	49.290	49.637	1.566	16.069	0.139	9.816	18.803	2.723	1.248	99.653	Glass_L2_S3
560.0	49.410	49.368	1.461	16.179	0.101	9.913	18.898	2.810	1.270	100.042	Glass_L2_S3
590.0	49.234	49.511	1.526	16.084	0.072	9.934	18.847	2.778	1.249	99.724	Glass_L2_S3
620.0	49.290	49.545	1.488	16.111	0.056	9.953	18.754	2.814	1.279	99.745	Glass_L2_S3
650.0	49.388	49.508	1.518	16.135	0.083	9.888	18.836	2.766	1.267	99.880	Glass_L2_S3
680.0	49.139	49.783	1.552	16.001	0.070	9.771	18.766	2.795	1.261	99.356	Glass_L2_S3
710.0	49.170	49.759	1.458	16.055	0.067	9.757	18.806	2.818	1.279	99.411	Glass_L2_S3
740.0	49.071	49.767	1.546	15.928	0.062	9.763	18.847	2.840	1.246	99.305	Glass_L2_S3
770.0	49.279	49.743	1.481	16.059	0.057	9.787	18.789	2.814	1.270	99.536	Glass_L2_S3
800.0	49.257	49.501	1.494	16.072	0.073	9.882	18.858	2.880	1.241	99.756	Glass_L2_S3
830.0	49.033	49.926	1.506	15.789	0.051	9.808	18.736	2.879	1.306	99.108	Glass_L2_S3
860.0	49.121	49.649	1.476	15.968	0.066	9.861	18.779	2.892	1.310	99.472	Glass_L2_S3
890.0	49.183	49.688	1.516	15.951	0.075	9.850	18.764	2.897	1.259	99.495	Glass_L2_S3
920.0	49.298	49.303	1.592	16.061	0.105	9.847	18.880	2.920	1.294	99.995	Glass_L2_S3
950.0	49.244	49.502	1.533	15.949	0.076	9.893	18.872	2.902	1.273	99.742	Glass_L2_S3
980.0	49.228	49.828	1.495	15.879	0.084	9.752	18.763	2.930	1.269	99.400	Glass_L2_S3
1010.0	49.158	49.764	1.548	15.979	0.063	9.744	18.700	2.884	1.318	99.394	Glass_L2_S3
1040.0	49.246	49.501	1.511	16.037	0.056	9.896	18.795	2.872	1.332	99.746	Glass_L2_S3
1070.0	49.185	49.885	1.529	15.870	0.120	9.751	18.703	2.884	1.258	99.299	Glass_L2_S3
1100.0	49.089	49.780	1.471	15.969	0.069	9.772	18.726	2.903	1.310	99.309	Glass_L2_S3
1130.0	49.003	49.872	1.520	15.901	0.063	9.678	18.789	2.902	1.275	99.131	Glass_L2_S3
1160.0	49.332	49.927	1.542	15.825	0.062	9.805	18.704	2.867	1.269	99.406	Glass_L2_S3
1190.0	49.194	49.638	1.545	15.938	0.060	9.773	18.887	2.884	1.275	99.556	Glass_L2_S3
1220.0	49.271	49.600	1.483	15.937	0.059	9.844	18.937	2.866	1.275	99.672	Glass_L2_S3
1250.0	48.985	49.812	1.547	15.909	0.062	9.814	18.719	2.863	1.274	99.173	Glass_L2_S3
1280.0	49.073	49.889	1.528	15.863	0.079	9.814	18.721	2.839	1.268	99.184	Glass_L2_S3
1310.0	48.965	49.951	1.531	15.796	0.087	9.736	18.772	2.844	1.284	99.014	Glass_L2_S3
1340.0	48.911	49.740	1.532	15.931	0.073	9.807	18.730	2.902	1.286	99.171	Glass_L2_S3
1370.0	48.946	49.797	1.612	15.881	0.078	9.753	18.763	2.851	1.265	99.149	Glass_L2_S3
1400.0	48.971	49.810	1.551	15.924	0.071	9.729	18.740	2.887	1.289	99.161	Glass_L2_S3
1430.0	48.983	49.528	1.476	15.915	0.065	9.989	18.831	2.917	1.280	99.456	Glass_L2_S3
1460.0	48.996	49.759	1.620	15.857	0.079	9.787	18.720	2.886	1.292	99.237	Glass_L2_S3
1490.0	48.953	49.995	1.479	15.864	0.073	9.656	18.807	2.844	1.283	98.958	Glass_L2_S3
1520.0	49.080	49.419	1.609	15.997	0.069	9.902	18.793	2.919	1.294	99.661	Glass_L2_S3
1550.0	49.368	49.600	1.518	15.943	0.061	9.829	18.854	2.898	1.296	99.768	Glass_L2_S3
1580.0	48.955	49.996	1.436	15.925	0.056	9.711	18.749	2.861	1.265	98.959	Glass_L2_S3
1610.0	48.947	49.756	1.502	15.972	0.071	9.744	18.812	2.862	1.283	99.191	Glass_L2_S3
1640.0	48.967	49.710	1.596	15.916	0.090	9.786	18.756	2.878	1.269	99.257	Glass_L2_S3
1670.0	49.187	49.719	1.505	15.889	0.076	9.741	18.916	2.875	1.281	99.468	Glass_L2_S3
1700.0	49.087	49.902	1.470	15.918	0.044	9.705	18.826	2.907	1.227	99.185	Glass_L2_S3

1730.0	49.051	49.968	1.482	15.757	0.068	9.818	18.798	2.864	1.246	99.083	Glass_L2_S3
1760.0	48.936	49.709	1.486	15.879	0.080	9.860	18.826	2.895	1.265	99.227	Glass_L2_S3
1790.0	48.753	49.651	1.561	15.864	0.074	9.858	18.863	2.842	1.288	99.102	Glass_L2_S3
1820.0	48.875	49.802	1.541	15.854	0.083	9.712	18.868	2.883	1.257	99.073	Glass_L2_S3
1850.0	48.748	49.920	1.505	15.864	0.071	9.741	18.746	2.884	1.268	98.828	Glass_L2_S3
1880.0	48.745	49.750	1.564	15.824	0.093	9.853	18.714	2.927	1.275	98.995	Glass_L2_S3
1910.0	48.933	49.741	1.562	15.650	0.093	9.916	18.901	2.839	1.299	99.192	Glass_L2_S3
1940.0	48.861	49.959	1.620	15.781	0.064	9.705	18.698	2.900	1.273	98.902	Glass_L2_S3
1970.0	48.858	49.956	1.516	15.801	0.069	9.726	18.837	2.831	1.263	98.902	Glass_L2_S3
12.5	42.862	43.735	0.222	30.063	0.276	3.444	18.401	3.111	0.748	99.127	Glass_L3_S1
17.5	42.902	44.002	0.269	29.788	0.282	3.607	18.327	2.967	0.759	98.900	Glass_L3_S1
22.5	43.563	44.223	0.255	29.476	0.235	3.766	18.372	2.928	0.746	99.340	Glass_L3_S1
27.5	43.571	44.047	0.282	29.413	0.238	3.861	18.543	2.835	0.781	99.523	Glass_L3_S1
32.5	43.743	44.495	0.331	28.898	0.228	3.954	18.464	2.845	0.785	99.247	Glass_L3_S1
37.5	43.786	44.600	0.409	28.542	0.209	4.152	18.470	2.785	0.833	99.187	Glass_L3_S1
42.5	44.019	45.130	0.415	28.000	0.228	4.344	18.279	2.788	0.816	98.889	Glass_L3_S1
47.5	44.350	44.956	0.475	27.728	0.254	4.475	18.433	2.829	0.850	99.394	Glass_L3_S1
52.5	44.692	45.362	0.524	27.203	0.214	4.620	18.438	2.787	0.853	99.330	Glass_L3_S1
57.5	44.777	45.620	0.608	26.669	0.234	4.800	18.361	2.835	0.872	99.156	Glass_L3_S1
62.5	45.134	45.809	0.596	26.260	0.226	4.936	18.447	2.802	0.924	99.325	Glass_L3_S1
67.5	45.365	46.387	0.653	25.677	0.205	5.064	18.328	2.766	0.921	98.978	Glass_L3_S1
72.5	45.843	46.604	0.670	25.182	0.206	5.241	18.363	2.797	0.938	99.239	Glass_L3_S1
77.5	46.007	46.714	0.728	24.780	0.200	5.431	18.419	2.790	0.939	99.293	Glass_L3_S1
82.5	46.342	46.987	0.839	24.186	0.196	5.578	18.546	2.709	0.961	99.355	Glass_L3_S1
101.0	47.186	48.336	0.965	22.259	0.172	6.207	18.392	2.710	0.959	98.850	Glass_L3_S2
116.0	47.893	48.726	1.079	20.926	0.164	6.807	18.567	2.709	1.022	99.167	Glass_L3_S2
131.0	48.180	49.202	1.235	19.859	0.182	7.163	18.660	2.653	1.047	98.977	Glass_L3_S2
146.0	48.796	49.373	1.302	18.921	0.182	7.737	18.824	2.595	1.067	99.423	Glass_L3_S2
161.0	48.916	49.725	1.415	18.094	0.207	8.056	18.854	2.610	1.040	99.192	Glass_L3_S2
176.0	48.868	49.874	1.398	17.563	0.138	8.463	18.924	2.559	1.080	98.993	Glass_L3_S2
191.0	49.122	49.877	1.418	17.160	0.149	8.765	19.085	2.512	1.034	99.245	Glass_L3_S2
206.0	49.131	49.911	1.536	16.815	0.123	8.997	18.961	2.582	1.075	99.220	Glass_L3_S2
221.0	49.159	50.248	1.502	16.556	0.147	9.030	18.912	2.522	1.084	98.911	Glass_L3_S2
236.0	49.225	50.172	1.555	16.403	0.165	9.122	18.971	2.506	1.105	99.053	Glass_L3_S2
251.0	49.223	49.935	1.528	16.345	0.112	9.405	19.026	2.518	1.129	99.288	Glass_L3_S2
266.0	49.073	50.209	1.494	16.159	0.085	9.495	18.896	2.537	1.125	98.864	Glass_L3_S2
281.0	49.292	49.823	1.478	16.161	0.139	9.673	18.957	2.614	1.155	99.469	Glass_L3_S2
296.0	49.178	50.039	1.591	16.013	0.118	9.567	18.946	2.576	1.149	99.139	Glass_L3_S2
311.0	49.109	50.152	1.466	15.971	0.104	9.721	18.891	2.513	1.182	98.957	Glass_L3_S2
326.0	49.207	49.897	1.495	16.125	0.116	9.705	18.906	2.557	1.199	99.309	Glass_L3_S2
341.0	48.995	49.687	1.575	16.118	0.065	9.778	18.969	2.585	1.224	99.308	Glass_L3_S2
356.0	49.221	49.574	1.599	16.097	0.067	9.871	19.006	2.607	1.180	99.648	Glass_L3_S2
371.0	48.945	50.018	1.475	15.993	0.083	9.727	18.859	2.600	1.246	98.928	Glass_L3_S2
386.0	48.975	49.891	1.520	15.924	0.084	9.907	18.834	2.620	1.221	99.083	Glass_L3_S2
401.0	49.140	49.603	1.560	16.040	0.087	9.898	18.931	2.652	1.229	99.538	Glass_L3_S2
416.0	48.984	49.976	1.438	16.019	0.057	9.751	18.884	2.625	1.249	99.008	Glass_L3_S2
431.0	49.223	49.488	1.549	16.142	0.054	9.946	18.927	2.638	1.256	99.735	Glass_L3_S2
446.0	49.141	49.798	1.560	16.033	0.064	9.776	18.806	2.707	1.256	99.342	Glass_L3_S2
461.0	48.950	49.756	1.555	15.993	0.069	9.871	18.787	2.695	1.275	99.194	Glass_L3_S2
476.0	49.325	49.748	1.501	16.033	0.054	9.760	18.951	2.690	1.264	99.577	Glass_L3_S2
491.0	49.182	49.655	1.634	16.016	0.066	9.894	18.781	2.694	1.260	99.527	Glass_L3_S2
506.0	49.063	49.603	1.553	16.091	0.078	9.783	18.936	2.707	1.249	99.460	Glass_L3_S2
521.0	49.097	49.795	1.492	16.065	0.101	9.744	18.775	2.730	1.297	99.302	Glass_L3_S2
536.0	48.946	49.753	1.482	16.030	0.074	9.767	18.889	2.724	1.281	99.193	Glass_L3_S2
551.0	49.129	49.745	1.481	16.070	0.068	9.713	18.893	2.757	1.273	99.384	Glass_L3_S2
566.0	49.195	49.892	1.506	15.966	0.080	9.797	18.751	2.756	1.253	99.303	Glass_L3_S2
581.0	49.303	49.800	1.502	15.964	0.057	9.755	18.878	2.740	1.304	99.503	Glass_L3_S2
596.0	49.157	49.783	1.557	16.024	0.063	9.840	18.705	2.748	1.281	99.374	Glass_L3_S2
611.0	49.139	49.857	1.479	15.955	0.067	9.773	18.790	2.783	1.295	99.282	Glass_L3_S2
626.0	49.218	49.744	1.533	15.994	0.095	9.776	18.813	2.790	1.256	99.474	Glass_L3_S2
641.0	49.038	49.918	1.532	15.812	0.073	9.786	18.851	2.775	1.254	99.120	Glass_L3_S2
656.0	49.211	49.459	1.531	16.014	0.089	9.911	18.942	2.770	1.285	99.753	Glass_L3_S2
671.0	49.145	49.576	1.572	16.009	0.062	9.801	18.875	2.846	1.259	99.569	Glass_L3_S2

686.0	49.196	49.613	1.524	16.042	0.071	9.809	18.810	2.841	1.291	99.583	Glass_L3_S2
701.0	49.105	49.674	1.559	15.954	0.065	9.800	18.854	2.812	1.282	99.431	Glass_L3_S2
716.0	49.292	50.041	1.422	15.867	0.059	9.743	18.738	2.813	1.318	99.251	Glass_L3_S2
731.0	49.360	49.687	1.468	15.996	0.096	9.825	18.785	2.835	1.309	99.673	Glass_L3_S2
766.0	49.268	49.776	1.506	15.969	0.081	9.845	18.720	2.830	1.274	99.492	Glass_L3_S3
796.0	49.103	49.609	1.480	15.991	0.069	9.908	18.807	2.835	1.301	99.494	Glass_L3_S3
826.0	49.277	49.835	1.463	15.984	0.022	9.826	18.719	2.859	1.293	99.443	Glass_L3_S3
856.0	49.236	49.559	1.492	16.087	0.079	9.753	18.891	2.852	1.288	99.677	Glass_L3_S3
886.0	49.084	49.734	1.572	15.879	0.061	9.831	18.854	2.777	1.293	99.350	Glass_L3_S3
916.0	49.212	49.754	1.574	16.074	0.046	9.666	18.743	2.825	1.317	99.458	Glass_L3_S3
946.0	49.302	49.771	1.529	15.973	0.046	9.747	18.813	2.843	1.278	99.531	Glass_L3_S3
976.0	49.338	49.567	1.484	16.109	0.116	9.837	18.750	2.884	1.252	99.770	Glass_L3_S3
1006.0	49.335	49.689	1.542	16.090	0.069	9.713	18.760	2.866	1.271	99.646	Glass_L3_S3
1036.0	49.246	49.648	1.498	16.101	0.089	9.700	18.772	2.911	1.281	99.598	Glass_L3_S3
1066.0	49.184	49.731	1.465	15.960	0.080	9.810	18.751	2.876	1.327	99.453	Glass_L3_S3
1096.0	49.196	49.570	1.535	15.968	0.059	9.881	18.785	2.910	1.293	99.625	Glass_L3_S3
1126.0	49.237	49.850	1.499	15.918	0.053	9.778	18.735	2.859	1.308	99.388	Glass_L3_S3
1156.0	49.372	49.636	1.502	16.030	0.069	9.805	18.798	2.870	1.290	99.736	Glass_L3_S3
1186.0	49.305	49.452	1.589	16.030	0.092	9.888	18.765	2.897	1.289	99.853	Glass_L3_S3
1216.0	49.256	49.461	1.523	16.068	0.066	9.893	18.818	2.859	1.312	99.795	Glass_L3_S3
1246.0	49.105	49.676	1.589	15.969	0.040	9.709	18.849	2.894	1.273	99.429	Glass_L3_S3
1276.0	49.213	49.634	1.479	15.941	0.062	9.852	18.905	2.862	1.266	99.579	Glass_L3_S3
1306.0	49.285	49.635	1.547	16.061	0.101	9.734	18.771	2.864	1.287	99.650	Glass_L3_S3
1336.0	49.147	49.449	1.441	15.988	0.062	9.950	18.877	2.920	1.314	99.698	Glass_L3_S3
1366.0	49.180	49.731	1.531	16.048	0.063	9.757	18.761	2.828	1.283	99.449	Glass_L3_S3
1396.0	49.175	49.557	1.517	16.099	0.044	9.762	18.881	2.856	1.285	99.618	Glass_L3_S3
1426.0	49.299	49.561	1.496	16.124	0.081	9.824	18.749	2.895	1.269	99.738	Glass_L3_S3
1456.0	49.145	49.791	1.533	15.991	0.056	9.743	18.751	2.857	1.277	99.355	Glass_L3_S3
1486.0	49.195	49.862	1.496	15.919	0.070	9.753	18.761	2.859	1.281	99.333	Glass_L3_S3
1516.0	49.096	49.587	1.530	15.999	0.076	9.864	18.809	2.857	1.279	99.509	Glass_L3_S3
1546.0	49.195	49.516	1.590	16.005	0.058	9.876	18.823	2.859	1.274	99.679	Glass_L3_S3
1576.0	48.969	49.548	1.506	15.995	0.071	9.912	18.810	2.880	1.279	99.422	Glass_L3_S3
1606.0	49.299	49.706	1.485	16.015	0.073	9.777	18.786	2.884	1.274	99.594	Glass_L3_S3
1636.0	49.454	49.597	1.509	16.078	0.077	9.748	18.765	2.963	1.263	99.857	Glass_L3_S3
1666.0	49.421	49.597	1.550	16.010	0.056	9.771	18.830	2.900	1.286	99.824	Glass_L3_S3
1696.0	49.178	49.649	1.616	16.033	0.063	9.843	18.702	2.854	1.240	99.529	Glass_L3_S3
1726.0	49.195	49.708	1.533	16.058	0.059	9.817	18.670	2.905	1.250	99.487	Glass_L3_S3
1756.0	49.125	49.718	1.508	16.086	0.071	9.750	18.724	2.882	1.260	99.408	Glass_L3_S3
1786.0	49.189	49.688	1.494	16.093	0.087	9.702	18.790	2.875	1.271	99.501	Glass_L3_S3
1816.0	49.079	49.617	1.521	16.080	0.062	9.870	18.685	2.909	1.257	99.462	Glass_L3_S3
1846.0	49.212	49.808	1.495	15.953	0.076	9.769	18.691	2.910	1.298	99.404	Glass_L3_S3
1876.0	49.299	49.500	1.473	16.129	0.077	9.812	18.873	2.873	1.263	99.799	Glass_L3_S3
1906.0	49.255	49.664	1.526	16.055	0.085	9.780	18.759	2.857	1.273	99.591	Glass_L3_S3
1936.0	49.172	49.457	1.508	16.020	0.095	9.843	18.915	2.889	1.273	99.715	Glass_L3_S3
1966.0	49.167	49.638	1.521	16.023	0.065	9.919	18.662	2.895	1.278	99.529	Glass_L3_S3
1996.0	49.175	49.637	1.499	16.147	0.057	9.825	18.767	2.826	1.243	99.538	Glass_L3_S3

Table C11. BS1&2A

X (μm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
1365.1	50.719	51.353	0.488	14.185	11.322	6.763	11.475	2.942	1.472	99.366	BS1&2A_L1_S1
1252.6	50.502	51.358	0.529	14.153	11.463	6.768	11.324	2.937	1.469	99.144	BS1&2A_L1_S1
1140.1	50.513	51.396	0.490	14.219	11.499	6.760	11.232	2.925	1.479	99.117	BS1&2A_L1_S1
915.1	50.583	51.513	0.486	14.213	11.426	6.781	11.123	2.962	1.496	99.070	BS1&2A_L1_S1
802.6	50.520	51.604	0.529	14.225	11.560	6.676	10.963	3.013	1.431	98.917	BS1&2A_L1_S1
690.1	50.657	51.767	0.511	14.200	11.343	6.665	11.078	2.981	1.455	98.890	BS1&2A_L1_S1
577.6	50.345	51.354	0.475	14.200	11.606	6.779	11.180	2.970	1.437	98.991	BS1&2A_L1_S1
465.1	50.869	51.219	0.494	14.295	11.582	6.760	11.078	3.067	1.506	99.650	BS1&2A_L1_S1
369.1	50.930	51.669	0.538	14.096	11.361	6.750	11.069	3.022	1.495	99.262	BS1&2A_L1_S2
309.1	50.968	51.506	0.566	14.241	11.571	6.674	10.979	3.002	1.462	99.463	BS1&2A_L1_S2
249.1	50.976	52.011	0.616	14.110	11.286	6.594	10.919	3.014	1.450	98.966	BS1&2A_L1_S2
189.1	50.870	51.472	0.845	14.266	11.319	6.683	10.855	3.031	1.530	99.399	BS1&2A_L1_S2
129.1	50.596	51.248	1.085	14.260	11.358	6.625	10.822	3.124	1.479	99.349	BS1&2A_L1_S2
56.1	50.137	50.546	1.580	14.356	11.291	6.795	10.940	3.050	1.442	99.591	BS1&2A_L1_S3
-3.9	49.537	50.539	1.957	14.103	11.292	6.718	10.923	2.997	1.471	98.998	BS1&2A_L1_S3
-63.9	48.931	50.139	2.381	14.066	11.440	6.693	10.888	2.962	1.432	98.792	BS1&2A_L1_S3
-123.9	48.592	49.789	2.650	13.977	11.376	6.784	11.123	2.905	1.396	98.803	BS1&2A_L1_S3
-183.9	48.340	49.496	2.947	14.069	11.468	6.867	10.883	2.890	1.380	98.844	BS1&2A_L1_S3
-243.9	48.248	49.305	3.114	14.087	11.643	6.764	10.827	2.890	1.371	98.943	BS1&2A_L1_S3
-303.9	48.138	49.304	3.298	14.029	11.552	6.745	10.724	2.942	1.406	98.834	BS1&2A_L1_S3
-363.9	47.874	49.522	3.356	14.016	11.402	6.682	10.694	2.933	1.395	98.352	BS1&2A_L1_S4
-461.9	47.932	49.333	3.333	14.086	11.280	6.679	10.892	2.953	1.444	98.599	BS1&2A_L1_S4
-559.9	47.919	49.515	3.348	13.944	11.355	6.767	10.759	2.884	1.428	98.404	BS1&2A_L1_S4
-657.9	48.083	49.385	3.366	14.096	11.468	6.645	10.666	2.935	1.439	98.699	BS1&2A_L1_S4
-755.9	47.883	49.568	3.326	14.006	11.381	6.683	10.660	2.938	1.438	98.316	BS1&2A_L1_S4
-853.9	47.801	49.329	3.252	14.148	11.425	6.710	10.688	2.975	1.473	98.472	BS1&2A_L1_S4
-1049.9	47.867	49.234	3.317	14.219	11.342	6.719	10.711	2.991	1.467	98.633	BS1&2A_L1_S4
-1147.9	48.031	49.554	3.341	13.996	11.296	6.610	10.831	2.970	1.402	98.477	BS1&2A_L1_S4
-1245.9	47.805	49.351	3.382	14.068	11.184	6.629	10.927	2.983	1.475	98.453	BS1&2A_L1_S4
767.3	50.932	51.500	0.556	14.270	11.325	6.709	11.235	2.941	1.464	99.432	BS1&2A_L2_S1
567.3	50.098	51.637	0.533	14.141	11.404	6.655	11.231	2.955	1.445	98.461	BS1&2A_L2_S1
467.3	50.803	51.552	0.456	14.326	11.342	6.674	11.157	3.003	1.490	99.251	BS1&2A_L2_S1
367.3	50.870	51.532	0.540	14.227	11.394	6.633	11.230	2.991	1.453	99.338	BS1&2A_L2_S1
307.3	50.509	51.711	0.572	14.181	11.384	6.703	10.950	3.006	1.492	98.798	BS1&2A_L2_S2
250.3	50.418	51.892	0.674	14.183	11.219	6.659	10.771	3.085	1.517	98.526	BS1&2A_L2_S2
193.3	50.474	51.552	0.807	14.273	11.346	6.707	10.748	3.052	1.515	98.922	BS1&2A_L2_S2
136.3	50.270	51.551	1.051	14.370	11.107	6.593	10.829	2.985	1.515	98.719	BS1&2A_L2_S2
79.3	49.958	51.003	1.390	14.284	11.281	6.668	10.852	3.009	1.514	98.955	BS1&2A_L2_S2
22.3	49.549	50.515	1.793	14.254	11.407	6.655	11.010	2.903	1.462	99.034	BS1&2A_L2_S2
-37.7	48.734	50.161	2.206	14.308	11.366	6.628	11.011	2.890	1.429	98.573	BS1&2A_L2_S3
-97.7	48.546	50.211	2.544	14.161	11.194	6.788	10.893	2.846	1.362	98.335	BS1&2A_L2_S3
-157.7	48.245	49.571	2.921	14.255	11.393	6.721	10.894	2.849	1.396	98.674	BS1&2A_L2_S3
-217.7	47.973	49.612	3.049	14.096	11.358	6.707	10.852	2.949	1.378	98.361	BS1&2A_L2_S3
-277.7	47.768	49.506	3.330	14.033	11.295	6.669	10.972	2.833	1.362	98.262	BS1&2A_L2_S3
-337.7	47.821	49.309	3.311	14.200	11.359	6.635	10.930	2.861	1.395	98.512	BS1&2A_L2_S3
-397.7	47.933	49.403	3.274	14.130	11.212	6.676	10.967	2.905	1.434	98.531	BS1&2A_L2_S4
-497.7	47.723	49.483	3.316	14.242	11.226	6.688	10.798	2.840	1.406	98.240	BS1&2A_L2_S4
-597.7	47.828	49.384	3.430	14.121	11.297	6.712	10.719	2.908	1.430	98.445	BS1&2A_L2_S4
-697.7	47.626	49.352	3.309	14.130	11.368	6.647	10.823	2.940	1.430	98.273	BS1&2A_L2_S4
-797.7	47.900	49.487	3.329	14.118	11.338	6.697	10.718	2.895	1.418	98.413	BS1&2A_L2_S4
-897.7	47.680	49.414	3.415	14.021	11.435	6.695	10.732	2.858	1.431	98.266	BS1&2A_L2_S4
-1097.7	47.817	49.350	3.339	14.297	11.168	6.764	10.723	2.919	1.440	98.467	BS1&2A_L2_S4
-1197.7	48.092	49.522	3.313	14.143	11.217	6.634	10.806	2.964	1.402	98.570	BS1&2A_L2_S4
-1297.7	47.985	49.374	3.326	14.210	11.278	6.622	10.825	2.892	1.474	98.611	BS1&2A_L2_S4
1292.6	50.938	51.811	0.518	14.286	11.636	6.760	10.556	2.978	1.455	99.128	BS1&2A_L3_S1
1192.6	51.041	51.662	0.488	14.334	11.546	6.744	10.774	2.979	1.473	99.379	BS1&2A_L3_S1
1092.6	50.927	51.669	0.518	14.276	11.687	6.797	10.677	2.917	1.459	99.258	BS1&2A_L3_S1
992.6	50.777	51.956	0.509	14.328	11.404	6.628	10.777	2.938	1.460	98.820	BS1&2A_L3_S1
892.6	50.835	51.690	0.527	14.480	11.520	6.786	10.598	2.939	1.461	99.146	BS1&2A_L3_S1
792.6	51.024	51.900	0.505	14.364	11.485	6.680	10.630	2.987	1.449	99.124	BS1&2A_L3_S1
692.6	51.143	52.045	0.486	14.402	11.302	6.651	10.652	2.984	1.478	99.098	BS1&2A_L3_S1

592.6	51.135	51.596	0.514	14.451	11.371	6.776	10.801	3.016	1.476	99.539	BS1&2A_L3_S1
492.6	51.032	51.482	0.479	14.477	11.518	6.734	10.889	2.949	1.472	99.550	BS1&2A_L3_S1
262.6	50.997	51.431	0.647	14.390	11.454	6.815	10.724	3.036	1.503	99.566	BS1&2A_L3_S2
182.6	50.757	51.690	0.806	14.291	11.308	6.764	10.661	2.984	1.495	99.067	BS1&2A_L3_S2
102.6	50.289	51.305	1.241	14.363	11.241	6.599	10.670	3.072	1.509	98.984	BS1&2A_L3_S2
34.6	49.597	50.842	1.670	14.367	11.258	6.662	10.757	2.989	1.455	98.755	BS1&2A_L3_S3
-25.4	49.225	50.273	2.158	14.342	11.416	6.762	10.666	2.980	1.403	98.953	BS1&2A_L3_S3
-85.4	48.617	50.273	2.404	14.190	11.470	6.699	10.673	2.883	1.408	98.343	BS1&2A_L3_S3
-145.4	48.126	49.825	2.810	14.151	11.443	6.721	10.724	2.942	1.384	98.301	BS1&2A_L3_S3
-205.4	48.189	49.615	3.058	14.259	11.425	6.721	10.683	2.868	1.372	98.574	BS1&2A_L3_S3
-265.4	47.936	49.520	3.244	14.332	11.490	6.646	10.521	2.847	1.401	98.416	BS1&2A_L3_S3
-325.4	47.785	49.242	3.286	14.337	11.398	6.794	10.685	2.894	1.364	98.542	BS1&2A_L3_S4
-436.5	47.895	49.304	3.226	14.355	11.476	6.735	10.566	2.918	1.420	98.591	BS1&2A_L3_S4
-658.7	47.799	49.533	3.410	14.177	11.185	6.654	10.674	2.946	1.421	98.266	BS1&2A_L3_S4
-881	47.991	49.584	3.307	14.218	11.159	6.719	10.709	2.903	1.401	98.407	BS1&2A_L3_S4
-992.1	47.906	49.339	3.216	14.389	11.231	6.687	10.802	2.930	1.407	98.567	BS1&2A_L3_S4
-1103.2	48.219	49.272	3.231	14.397	11.244	6.597	10.871	2.942	1.446	98.947	BS1&2A_L3_S4
-1214.3	48.184	48.912	3.456	14.338	11.211	6.784	10.913	2.952	1.436	99.272	BS1&2A_L3_S4
1380.4	50.569	51.886	0.500	14.190	11.434	6.807	10.598	3.092	1.493	98.683	BS1&2A_L4_S1
1280.4	50.356	52.140	0.490	14.109	11.553	6.708	10.537	3.025	1.438	98.216	BS1&2A_L4_S1
1180.4	50.259	51.974	0.545	14.173	11.457	6.777	10.569	3.032	1.474	98.284	BS1&2A_L4_S1
1080.4	50.394	51.987	0.503	14.137	11.597	6.678	10.610	3.048	1.441	98.407	BS1&2A_L4_S1
980.4	50.504	51.952	0.489	14.199	11.554	6.669	10.701	2.991	1.445	98.552	BS1&2A_L4_S1
880.4	50.592	51.893	0.486	14.347	11.413	6.771	10.553	3.060	1.478	98.700	BS1&2A_L4_S1
780.4	50.502	51.964	0.502	14.209	11.438	6.712	10.714	3.020	1.440	98.538	BS1&2A_L4_S1
680.4	50.880	51.551	0.529	14.357	11.475	6.720	10.707	3.158	1.503	99.329	BS1&2A_L4_S1
580.4	51.041	51.565	0.499	14.238	11.459	6.793	10.837	3.139	1.470	99.476	BS1&2A_L4_S1
530.4	51.010	51.543	0.560	14.389	11.376	6.732	10.802	3.117	1.481	99.467	BS1&2A_L4_S2
480.4	50.921	51.846	0.474	14.151	11.422	6.768	10.797	3.078	1.466	99.075	BS1&2A_L4_S2
430.4	50.804	51.589	0.506	14.280	11.407	6.656	10.959	3.074	1.529	99.215	BS1&2A_L4_S2
380.4	50.861	51.261	0.574	14.417	11.590	6.819	10.719	3.125	1.494	99.599	BS1&2A_L4_S2
330.4	50.778	51.678	0.580	14.088	11.396	6.723	10.940	3.118	1.479	99.100	BS1&2A_L4_S2
280.4	50.687	51.389	0.643	14.308	11.623	6.794	10.635	3.120	1.487	99.298	BS1&2A_L4_S2
230.4	50.676	51.533	0.698	14.355	11.429	6.648	10.701	3.114	1.523	99.143	BS1&2A_L4_S2
180.4	50.410	51.604	0.917	14.310	11.152	6.721	10.696	3.091	1.511	98.806	BS1&2A_L4_S2
130.4	50.262	51.461	1.059	14.259	11.083	6.760	10.738	3.145	1.495	98.801	BS1&2A_L4_S2
25.4	49.425	50.909	1.770	14.201	11.382	6.615	10.683	2.997	1.443	98.516	BS1&2A_L4_S3
-24.6	48.964	50.395	2.068	14.151	11.445	6.650	10.792	3.041	1.458	98.569	BS1&2A_L4_S3
-74.6	48.606	49.675	2.520	14.178	11.537	6.862	10.877	2.942	1.409	98.930	BS1&2A_L4_S3
-124.6	48.381	49.733	2.745	14.089	11.541	6.694	10.850	2.920	1.429	98.648	BS1&2A_L4_S3
-174.6	48.133	49.024	2.975	14.298	11.627	6.858	10.866	2.973	1.379	99.109	BS1&2A_L4_S3
-224.6	48.151	49.317	3.101	14.155	11.536	6.733	10.845	2.942	1.370	98.834	BS1&2A_L4_S3
-274.6	48.040	49.297	3.150	14.172	11.415	6.734	10.887	2.949	1.398	98.744	BS1&2A_L4_S3
-324.6	48.066	49.218	3.321	14.010	11.447	6.742	10.916	2.962	1.385	98.848	BS1&2A_L4_S3
-374.6	48.136	49.285	3.241	14.258	11.327	6.685	10.888	2.907	1.410	98.851	BS1&2A_L4_S4
-474.6	47.733	49.283	3.378	14.173	11.459	6.715	10.652	2.918	1.423	98.449	BS1&2A_L4_S4
-574.6	47.520	49.170	3.436	14.121	11.453	6.678	10.704	3.009	1.429	98.351	BS1&2A_L4_S4
-674.6	47.889	49.309	3.392	14.215	11.281	6.711	10.656	2.972	1.464	98.580	BS1&2A_L4_S4
-774.6	47.572	49.342	3.395	14.157	11.402	6.572	10.709	2.975	1.448	98.230	BS1&2A_L4_S4
-974.6	47.770	49.055	3.387	14.379	11.289	6.746	10.766	2.960	1.418	98.715	BS1&2A_L4_S4
-1074.6	47.773	49.236	3.340	14.233	11.424	6.710	10.593	3.052	1.413	98.537	BS1&2A_L4_S4

Table C12. BS3&4A

X (µm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
786.2	50.746	51.724	1.929	12.798	11.725	6.594	10.790	2.986	1.454	99.022	BS3&4A_L1_S1
686.2	50.852	51.615	1.962	12.861	11.826	6.586	10.788	2.935	1.427	99.237	BS3&4A_L1_S1
586.2	50.617	51.524	2.017	12.792	11.924	6.612	10.664	2.973	1.494	99.092	BS3&4A_L1_S1
486.2	50.427	51.779	1.923	12.801	11.780	6.504	10.736	2.952	1.525	98.648	BS3&4A_L1_S1
386.2	50.948	51.657	1.891	12.871	11.897	6.610	10.559	3.009	1.507	99.291	BS3&4A_L1_S2
341.2	50.549	51.674	1.925	12.695	11.810	6.767	10.691	2.925	1.515	98.875	BS3&4A_L1_S2
296.2	50.697	51.423	2.022	12.944	11.906	6.620	10.647	2.942	1.497	99.274	BS3&4A_L1_S2
251.2	50.697	51.603	2.008	12.828	11.851	6.639	10.558	2.986	1.527	99.093	BS3&4A_L1_S2
206.2	50.450	51.531	1.935	12.953	11.890	6.595	10.588	3.011	1.497	98.919	BS3&4A_L1_S2
161.2	50.332	51.735	1.919	13.012	11.786	6.643	10.437	3.042	1.428	98.597	BS3&4A_L1_S2
116.2	50.408	51.103	1.989	13.216	11.899	6.650	10.523	3.057	1.565	99.305	BS3&4A_L1_S2
71.2	50.324	51.085	1.870	13.683	11.771	6.628	10.445	3.032	1.486	99.239	BS3&4A_L1_S2
26.2	49.363	50.675	1.932	13.891	11.660	6.640	10.770	3.019	1.414	98.688	BS3&4A_L1_S2
-35.8	49.054	49.960	1.957	14.661	11.768	6.633	10.582	2.970	1.469	99.094	BS3&4A_L1_S3
-80.8	48.435	49.655	1.952	15.116	11.909	6.482	10.448	2.976	1.463	98.781	BS3&4A_L1_S3
-125.8	48.251	49.552	1.919	15.357	11.672	6.502	10.625	2.937	1.436	98.700	BS3&4A_L1_S3
-170.8	48.200	48.954	2.001	15.569	11.751	6.689	10.618	2.970	1.449	99.246	BS3&4A_L1_S3
-215.8	47.981	49.036	2.033	15.667	11.601	6.611	10.693	3.002	1.357	98.944	BS3&4A_L1_S3
-260.8	48.025	48.997	1.951	15.917	11.680	6.501	10.509	3.019	1.425	99.028	BS3&4A_L1_S3
-305.8	47.888	48.817	1.914	15.796	11.787	6.627	10.562	3.051	1.447	99.072	BS3&4A_L1_S3
-350.8	47.620	49.026	1.940	15.762	11.703	6.582	10.490	3.034	1.464	98.595	BS3&4A_L1_S3
-395.8	47.856	49.091	1.890	15.673	11.769	6.581	10.571	3.007	1.418	98.765	BS3&4A_L1_S3
-495.8	47.878	49.109	1.982	15.708	11.661	6.603	10.600	2.969	1.369	98.769	BS3&4A_L1_S4
-595.8	47.512	49.320	2.027	15.683	11.477	6.580	10.513	3.000	1.401	98.192	BS3&4A_L1_S4
-695.8	47.891	49.088	2.049	15.797	11.689	6.583	10.317	2.977	1.502	98.803	BS3&4A_L1_S4
-795.8	47.620	48.876	2.016	15.711	11.677	6.665	10.566	3.022	1.467	98.744	BS3&4A_L1_S4
-895.8	47.687	48.978	1.976	15.654	11.700	6.639	10.505	3.058	1.490	98.709	BS3&4A_L1_S4
-1095.8	47.799	49.090	1.953	15.760	11.807	6.546	10.442	2.976	1.428	98.710	BS3&4A_L1_S4
-1195.8	47.910	49.054	2.016	15.665	11.701	6.566	10.546	3.007	1.445	98.857	BS3&4A_L1_S4
-1295.8	47.912	49.044	1.888	15.774	11.694	6.671	10.430	3.059	1.440	98.868	BS3&4A_L1_S4
719.2	50.099	51.818	1.973	12.696	11.831	6.548	10.633	3.037	1.464	98.280	BS3&4A_L2_S1
608.1	49.961	51.460	1.981	12.833	11.931	6.667	10.622	3.043	1.465	98.502	BS3&4A_L2_S1
497.0	50.284	51.650	1.960	12.755	11.981	6.536	10.608	3.011	1.499	98.634	BS3&4A_L2_S1
385.9	50.320	51.781	1.939	12.732	11.860	6.700	10.549	3.003	1.437	98.539	BS3&4A_L2_S1
274.8	50.124	51.927	1.930	12.737	11.762	6.674	10.490	3.033	1.447	98.197	BS3&4A_L2_S1
174.8	49.885	51.703	1.892	12.915	11.784	6.592	10.617	3.012	1.486	98.183	BS3&4A_L2_S2
84.8	49.368	51.218	1.974	13.388	11.648	6.658	10.557	3.043	1.513	98.150	BS3&4A_L2_S2
39.8	49.129	50.950	1.916	13.742	11.678	6.741	10.458	3.035	1.481	98.179	BS3&4A_L2_S2
-28.2	48.640	50.200	2.030	14.525	11.587	6.561	10.625	3.029	1.444	98.440	BS3&4A_L2_S3
-73.2	48.254	49.580	2.000	15.106	11.754	6.585	10.543	3.011	1.422	98.674	BS3&4A_L2_S3
-118.2	47.972	49.565	1.932	15.294	11.542	6.641	10.568	2.989	1.471	98.407	BS3&4A_L2_S3
-163.2	47.829	49.113	1.991	15.566	11.670	6.589	10.667	2.931	1.474	98.715	BS3&4A_L2_S3
-208.2	47.681	49.196	1.950	15.542	11.589	6.529	10.702	3.037	1.456	98.486	BS3&4A_L2_S3
-308.2	47.488	49.407	1.930	15.779	11.482	6.474	10.537	3.000	1.391	98.081	BS3&4A_L2_S4
-408.2	47.254	49.127	2.019	15.820	11.511	6.620	10.396	3.012	1.496	98.128	BS3&4A_L2_S4
-508.2	47.366	49.169	1.944	15.788	11.633	6.519	10.493	3.036	1.417	98.196	BS3&4A_L2_S4
-608.2	47.410	49.261	1.953	15.636	11.577	6.573	10.531	3.008	1.462	98.150	BS3&4A_L2_S4
-708.2	47.176	49.013	2.051	15.630	11.632	6.666	10.524	3.027	1.456	98.163	BS3&4A_L2_S4
-808.2	47.249	48.920	1.931	15.696	11.791	6.679	10.493	3.027	1.463	98.330	BS3&4A_L2_S4
-908.2	47.362	48.902	1.956	15.736	11.713	6.648	10.616	2.992	1.437	98.460	BS3&4A_L2_S4
-1008.2	47.508	48.913	2.014	15.797	11.676	6.691	10.381	3.013	1.513	98.595	BS3&4A_L2_S4
-1108.2	47.357	48.771	2.044	15.667	11.785	6.526	10.755	2.976	1.478	98.587	BS3&4A_L2_S4
-1208.2	47.258	48.994	2.018	15.671	11.641	6.558	10.640	3.009	1.469	98.264	BS3&4A_L2_S4
804.4	50.572	51.779	1.986	12.842	11.739	6.560	10.603	3.039	1.452	98.794	BS3&4A_L3_S1
704.4	50.657	51.715	2.052	12.846	11.748	6.651	10.437	3.020	1.532	98.942	BS3&4A_L3_S1
604.4	50.624	51.767	1.977	12.817	11.775	6.533	10.664	3.000	1.468	98.857	BS3&4A_L3_S1
504.4	50.549	51.929	1.999	12.812	11.793	6.513	10.480	2.989	1.486	98.620	BS3&4A_L3_S1
404.4	50.422	51.917	1.957	12.778	11.623	6.571	10.617	3.029	1.509	98.505	BS3&4A_L3_S1
312.4	50.415	51.497	2.033	12.861	11.849	6.696	10.591	2.995	1.478	98.917	BS3&4A_L3_S2
267.4	50.169	51.901	2.011	12.787	11.723	6.569	10.541	3.019	1.450	98.268	BS3&4A_L3_S2
222.4	50.634	51.793	1.933	12.962	11.677	6.671	10.454	2.976	1.534	98.841	BS3&4A_L3_S2

177.4	50.569	51.267	2.013	13.054	11.829	6.740	10.548	3.036	1.513	99.302	BS3&4A_L3_S2
132.4	50.031	51.248	1.956	13.248	11.803	6.580	10.598	3.070	1.497	98.783	BS3&4A_L3_S2
87.4	50.168	51.094	1.925	13.530	11.730	6.585	10.632	3.012	1.493	99.074	BS3&4A_L3_S2
42.4	49.528	50.882	2.013	13.754	11.647	6.550	10.629	3.014	1.512	98.646	BS3&4A_L3_S2
-2.6	49.486	50.389	1.937	14.204	11.814	6.581	10.624	3.004	1.447	99.097	BS3&4A_L3_S2
-19.6	48.858	50.334	2.035	14.472	11.634	6.574	10.522	2.995	1.436	98.524	BS3&4A_L3_S3
-64.6	48.540	49.725	2.007	15.026	11.689	6.485	10.625	2.953	1.490	98.815	BS3&4A_L3_S3
-109.6	48.220	49.382	1.913	15.168	11.735	6.566	10.834	2.975	1.427	98.838	BS3&4A_L3_S3
-154.6	47.909	49.279	1.916	15.550	11.751	6.494	10.614	2.958	1.438	98.630	BS3&4A_L3_S3
-199.6	47.736	49.463	1.978	15.592	11.616	6.495	10.481	2.983	1.393	98.273	BS3&4A_L3_S3
-244.6	47.742	49.276	1.901	15.597	11.657	6.564	10.596	2.977	1.431	98.466	BS3&4A_L3_S3
-289.6	47.660	49.245	1.989	15.655	11.525	6.584	10.597	2.991	1.415	98.415	BS3&4A_L3_S3
-334.6	47.582	48.851	1.970	15.817	11.747	6.599	10.572	2.998	1.446	98.731	BS3&4A_L3_S3
-434.6	47.737	49.042	1.978	15.853	11.612	6.624	10.462	2.985	1.445	98.695	BS3&4A_L3_S4
-534.6	47.871	49.167	1.921	15.789	11.628	6.555	10.479	2.990	1.472	98.704	BS3&4A_L3_S4
-634.6	47.923	48.837	1.975	15.825	11.707	6.608	10.507	3.057	1.485	99.086	BS3&4A_L3_S4
-734.6	47.554	48.980	1.909	15.698	11.696	6.548	10.645	3.016	1.509	98.575	BS3&4A_L3_S4
-834.6	47.764	49.120	1.888	15.662	11.649	6.659	10.518	3.037	1.468	98.644	BS3&4A_L3_S4
-934.6	47.527	49.320	1.903	15.595	11.776	6.623	10.357	2.990	1.436	98.207	BS3&4A_L3_S4
-1034.6	47.842	49.124	1.944	15.730	11.740	6.591	10.431	2.980	1.461	98.718	BS3&4A_L3_S4
-1134.6	47.692	49.011	1.956	15.777	11.700	6.549	10.548	3.001	1.458	98.682	BS3&4A_L3_S4
-1234.6	47.687	49.094	2.026	15.567	11.654	6.655	10.551	2.968	1.486	98.594	BS3&4A_L3_S4
-1334.6	48.152	49.129	1.967	15.658	11.610	6.644	10.468	3.039	1.485	99.023	BS3&4A_L3_S4

Table C13. BS5&6A

X (μm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
1299.9	50.550	52.117	1.943	14.418	9.593	6.558	10.667	3.169	1.536	98.433	BS5&6A_L1_S1
1099.9	50.104	52.079	1.946	14.296	9.820	6.611	10.578	3.147	1.523	98.025	BS5&6A_L1_S1
999.9	50.186	51.998	1.987	14.420	9.912	6.628	10.420	3.135	1.501	98.188	BS5&6A_L1_S1
899.9	50.498	51.899	2.007	14.356	10.017	6.500	10.503	3.198	1.521	98.599	BS5&6A_L1_S1
799.9	50.119	52.168	1.976	14.312	9.817	6.563	10.450	3.190	1.524	97.951	BS5&6A_L1_S1
699.9	50.242	52.012	1.942	14.347	9.998	6.541	10.456	3.176	1.528	98.230	BS5&6A_L1_S1
599.9	50.389	51.837	1.949	14.398	10.098	6.481	10.461	3.242	1.533	98.552	BS5&6A_L1_S1
499.9	50.122	51.959	1.940	14.296	9.957	6.466	10.667	3.189	1.527	98.164	BS5&6A_L1_S1
399.9	50.485	51.979	1.940	14.313	10.037	6.458	10.465	3.233	1.574	98.506	BS5&6A_L1_S2
354.9	50.109	52.112	1.978	14.289	9.953	6.384	10.490	3.227	1.567	97.997	BS5&6A_L1_S2
309.9	50.129	51.838	2.033	14.191	10.225	6.482	10.368	3.226	1.638	98.291	BS5&6A_L1_S2
264.9	49.956	51.893	1.994	14.248	10.239	6.443	10.377	3.196	1.611	98.064	BS5&6A_L1_S2
219.9	50.093	51.861	1.963	14.287	10.378	6.366	10.285	3.235	1.625	98.232	BS5&6A_L1_S2
174.9	50.105	51.746	1.859	14.292	10.441	6.403	10.365	3.241	1.654	98.359	BS5&6A_L1_S2
129.9	49.457	51.629	1.874	14.125	10.626	6.465	10.456	3.220	1.606	97.828	BS5&6A_L1_S2
84.9	49.338	51.190	1.953	14.314	10.970	6.413	10.359	3.234	1.568	98.149	BS5&6A_L1_S2
39.9	49.009	50.601	1.992	14.287	11.277	6.621	10.435	3.192	1.595	98.408	BS5&6A_L1_S2
-5.1	48.349	50.602	1.909	14.355	11.550	6.517	10.544	3.039	1.484	97.747	BS5&6A_L1_S2
-50.1	48.163	49.978	2.041	14.446	11.797	6.725	10.448	3.073	1.492	98.185	BS5&6A_L1_S2
-95.1	47.805	49.690	2.045	14.452	12.200	6.596	10.598	2.954	1.465	98.115	BS5&6A_L1_S2
-140.1	47.693	49.276	2.093	14.445	12.261	6.720	10.750	3.007	1.448	98.417	BS5&6A_L1_S2
-185.1	47.705	49.439	2.100	14.304	12.504	6.673	10.591	2.932	1.457	98.266	BS5&6A_L1_S2
-230.1	47.455	49.335	1.965	14.456	12.543	6.710	10.495	2.973	1.523	98.120	BS5&6A_L1_S2
-275.1	47.181	49.334	1.949	14.532	12.578	6.607	10.572	2.935	1.493	97.848	BS5&6A_L1_S2
-320.1	47.315	48.799	2.073	14.367	12.889	6.638	10.671	3.007	1.557	98.515	BS5&6A_L1_S2
-365.1	47.552	48.916	2.044	14.425	12.868	6.584	10.609	2.999	1.555	98.636	BS5&6A_L1_S2
-410.1	47.230	49.090	2.043	14.364	12.912	6.682	10.485	2.923	1.501	98.140	BS5&6A_L1_S2
-510.1	47.376	49.029	1.969	14.252	12.908	6.637	10.621	3.067	1.518	98.347	BS5&6A_L1_S3
-624.4	47.266	49.034	1.940	14.424	13.008	6.572	10.557	2.995	1.470	98.232	BS5&6A_L1_S3
-738.7	47.179	49.076	1.918	14.325	13.047	6.587	10.522	3.005	1.520	98.103	BS5&6A_L1_S3
-853.0	47.252	48.675	1.960	14.311	13.198	6.786	10.490	3.006	1.574	98.578	BS5&6A_L1_S3
-967.2	47.242	49.050	1.972	14.265	13.113	6.627	10.447	2.966	1.561	98.193	BS5&6A_L1_S3
-1081.5	47.085	48.931	2.005	14.315	13.148	6.610	10.472	2.982	1.538	98.154	BS5&6A_L1_S3
-1195.8	47.274	49.000	2.033	14.378	13.135	6.646	10.381	2.986	1.441	98.273	BS5&6A_L1_S3
1297.2	50.501	52.418	2.020	14.432	9.505	6.612	10.392	3.131	1.491	98.083	BS5&6A_L2_S1
1197.2	50.359	52.133	1.915	14.248	9.945	6.546	10.556	3.134	1.523	98.225	BS5&6A_L2_S1
1097.2	50.524	52.282	1.947	14.258	9.853	6.481	10.525	3.129	1.526	98.242	BS5&6A_L2_S1
997.2	50.363	52.073	1.964	14.336	9.941	6.516	10.565	3.108	1.498	98.289	BS5&6A_L2_S1
897.2	50.450	52.001	1.955	14.365	9.793	6.549	10.596	3.181	1.560	98.449	BS5&6A_L2_S1
797.2	50.427	51.993	2.020	14.386	9.832	6.481	10.681	3.139	1.470	98.434	BS5&6A_L2_S1
697.2	50.231	52.311	1.966	14.279	9.817	6.411	10.535	3.128	1.553	97.920	BS5&6A_L2_S1
597.2	50.202	52.036	1.923	14.286	9.858	6.521	10.649	3.199	1.528	98.165	BS5&6A_L2_S1
497.2	50.347	51.705	2.092	14.337	10.053	6.598	10.463	3.176	1.577	98.642	BS5&6A_L2_S1
397.2	50.455	52.144	1.930	14.311	9.911	6.395	10.511	3.204	1.595	98.311	BS5&6A_L2_S2
352.2	50.242	52.093	2.076	14.157	10.012	6.439	10.401	3.211	1.610	98.149	BS5&6A_L2_S2
307.2	49.970	52.322	1.922	14.223	10.195	6.378	10.250	3.159	1.551	97.649	BS5&6A_L2_S2
262.2	50.200	52.259	1.957	14.175	10.108	6.362	10.329	3.228	1.582	97.940	BS5&6A_L2_S2
217.2	50.081	52.058	1.872	14.151	10.316	6.330	10.409	3.217	1.648	98.023	BS5&6A_L2_S2
172.2	50.208	51.762	1.890	14.197	10.556	6.378	10.387	3.219	1.612	98.446	BS5&6A_L2_S2
127.2	49.788	51.566	1.916	14.218	10.431	6.538	10.543	3.135	1.653	98.223	BS5&6A_L2_S2
82.2	49.608	51.411	1.895	14.274	10.905	6.399	10.433	3.156	1.528	98.197	BS5&6A_L2_S2
37.2	49.008	50.791	1.908	14.333	11.184	6.606	10.467	3.178	1.534	98.217	BS5&6A_L2_S2
-7.8	48.361	50.575	2.040	14.268	11.516	6.561	10.497	3.093	1.450	97.786	BS5&6A_L2_S2
-52.8	48.026	49.886	2.025	14.408	11.957	6.679	10.557	3.008	1.480	98.140	BS5&6A_L2_S2
-97.8	47.578	49.628	2.036	14.476	12.021	6.725	10.643	2.944	1.527	97.950	BS5&6A_L2_S2
-187.8	47.273	49.465	2.017	14.236	12.575	6.670	10.590	2.971	1.475	97.808	BS5&6A_L2_S2
-232.8	47.481	49.181	1.979	14.414	12.577	6.721	10.780	2.915	1.434	98.300	BS5&6A_L2_S2
-277.8	47.367	48.865	2.005	14.412	12.960	6.693	10.659	2.985	1.421	98.502	BS5&6A_L2_S2
-322.8	47.011	49.039	1.949	14.424	12.721	6.691	10.775	2.927	1.475	97.972	BS5&6A_L2_S2
-367.8	47.269	49.088	2.011	14.337	13.002	6.737	10.436	2.912	1.478	98.180	BS5&6A_L2_S2
-412.8	47.322	49.232	1.944	14.230	12.848	6.634	10.771	2.884	1.458	98.091	BS5&6A_L2_S2

-502.8	47.268	48.842	1.918	14.407	13.065	6.716	10.645	2.943	1.465	98.426	BS5&6A_L2_S3
-602.8	47.317	48.984	1.877	14.370	12.983	6.684	10.567	3.016	1.518	98.332	BS5&6A_L2_S3
-702.8	47.283	48.935	1.946	14.269	13.086	6.715	10.557	2.961	1.531	98.348	BS5&6A_L2_S3
-902.8	47.229	49.462	1.871	14.296	13.043	6.489	10.419	2.976	1.444	97.768	BS5&6A_L2_S3
-1102.8	47.272	48.973	1.955	14.264	13.202	6.600	10.550	2.960	1.496	98.299	BS5&6A_L2_S3
1233.3	50.366	52.112	2.003	14.333	9.854	6.705	10.342	3.081	1.572	98.255	BS5&6A_L3_S1
1133.3	50.045	52.012	1.963	14.289	10.034	6.648	10.457	3.068	1.530	98.033	BS5&6A_L3_S1
1033.3	50.409	51.838	2.021	14.333	10.102	6.474	10.594	3.130	1.509	98.572	BS5&6A_L3_S1
933.3	50.179	51.995	1.958	14.365	9.894	6.534	10.539	3.147	1.567	98.184	BS5&6A_L3_S1
833.3	49.930	51.643	2.107	14.212	10.102	6.487	10.600	3.243	1.606	98.286	BS5&6A_L3_S1
733.3	49.935	51.923	1.903	14.318	10.040	6.539	10.433	3.240	1.604	98.012	BS5&6A_L3_S1
633.3	50.095	52.139	1.912	14.208	9.998	6.482	10.475	3.182	1.603	97.956	BS5&6A_L3_S1
533.3	49.766	51.971	1.991	14.224	10.074	6.419	10.495	3.250	1.576	97.795	BS5&6A_L3_S1
433.3	50.060	52.013	2.057	14.300	9.904	6.503	10.408	3.230	1.585	98.047	BS5&6A_L3_S1
333.3	49.627	51.779	2.000	14.277	10.232	6.394	10.519	3.205	1.595	97.848	BS5&6A_L3_S2
288.3	50.012	51.748	1.981	14.259	10.364	6.354	10.426	3.229	1.639	98.264	BS5&6A_L3_S2
243.3	50.112	52.127	1.888	14.154	10.216	6.360	10.343	3.286	1.626	97.986	BS5&6A_L3_S2
198.3	49.787	52.026	1.794	14.104	10.531	6.289	10.405	3.253	1.598	97.761	BS5&6A_L3_S2
153.3	49.727	51.618	1.826	14.217	10.737	6.418	10.394	3.192	1.599	98.108	BS5&6A_L3_S2
108.3	49.374	51.155	1.984	14.282	10.949	6.456	10.371	3.154	1.649	98.220	BS5&6A_L3_S2
63.3	49.136	51.110	1.876	14.222	11.134	6.459	10.481	3.163	1.555	98.026	BS5&6A_L3_S2
18.3	48.545	50.606	1.891	14.294	11.398	6.546	10.617	3.075	1.573	97.940	BS5&6A_L3_S2
-26.7	48.436	50.714	1.845	14.238	11.640	6.512	10.547	3.025	1.480	97.722	BS5&6A_L3_S2
-71.7	47.783	50.043	1.930	14.350	11.887	6.669	10.649	3.016	1.455	97.740	BS5&6A_L3_S2
-116.7	47.855	49.670	1.969	14.299	12.411	6.649	10.559	3.003	1.441	98.185	BS5&6A_L3_S2
-161.7	47.514	49.331	2.060	14.418	12.591	6.588	10.571	2.969	1.473	98.183	BS5&6A_L3_S2
-206.7	47.183	49.518	1.945	14.482	12.535	6.528	10.468	3.034	1.490	97.665	BS5&6A_L3_S2
-251.7	47.480	49.181	2.007	14.457	12.695	6.713	10.504	2.978	1.466	98.300	BS5&6A_L3_S2
-296.7	47.055	48.942	2.059	14.420	12.802	6.677	10.623	2.952	1.525	98.112	BS5&6A_L3_S2
-341.7	47.345	49.232	1.966	14.334	12.829	6.579	10.463	3.077	1.521	98.112	BS5&6A_L3_S2
-431.7	47.296	49.023	1.966	14.444	12.794	6.690	10.516	2.987	1.581	98.273	BS5&6A_L3_S2
-476.7	47.031	48.999	1.951	14.398	13.031	6.649	10.445	3.025	1.503	98.032	BS5&6A_L3_S2
-576.7	47.087	49.057	1.965	14.316	13.087	6.543	10.502	2.988	1.543	98.029	BS5&6A_L3_S3
-676.7	47.303	49.329	1.983	14.328	12.956	6.468	10.409	2.984	1.543	97.974	BS5&6A_L3_S3
-776.7	47.293	48.847	2.012	14.273	13.158	6.657	10.524	3.014	1.516	98.446	BS5&6A_L3_S3
-876.7	47.216	48.749	1.977	14.361	13.113	6.672	10.507	3.030	1.591	98.467	BS5&6A_L3_S3
-976.7	47.249	48.814	1.893	14.381	13.287	6.612	10.514	2.979	1.519	98.435	BS5&6A_L3_S3
-1076.7	46.951	48.594	2.021	14.446	13.238	6.649	10.469	3.021	1.562	98.357	BS5&6A_L3_S3
-1176.7	46.998	49.214	1.870	14.326	13.047	6.612	10.352	3.051	1.529	97.784	BS5&6A_L3_S3

Table C14. BS7&8A

X (µm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
1151.1	50.928	52.150	1.930	14.288	11.279	5.357	10.599	3.037	1.360	98.778	BS7&8A_L1_S1
1051.1	51.126	51.998	1.989	14.322	11.338	5.310	10.571	3.074	1.399	99.129	BS7&8A_L1_S1
951.1	51.010	51.900	1.981	14.331	11.360	5.318	10.672	3.049	1.391	99.110	BS7&8A_L1_S1
851.1	51.007	51.845	1.897	14.404	11.412	5.356	10.587	3.095	1.406	99.162	BS7&8A_L1_S1
751.1	50.987	52.008	1.993	14.186	11.289	5.361	10.681	3.110	1.372	98.979	BS7&8A_L1_S1
651.1	50.741	51.801	1.989	14.297	11.453	5.321	10.619	3.137	1.384	98.940	BS7&8A_L1_S1
551.1	50.638	52.033	1.850	14.114	11.376	5.491	10.474	3.226	1.435	98.604	BS7&8A_L1_S2
506.1	50.702	51.679	1.952	14.171	11.488	5.463	10.674	3.146	1.428	99.024	BS7&8A_L1_S2
461.1	50.698	51.817	1.856	14.189	11.572	5.521	10.411	3.175	1.460	98.881	BS7&8A_L1_S2
416.1	50.822	51.926	1.882	14.211	11.366	5.435	10.510	3.177	1.493	98.895	BS7&8A_L1_S2
371.1	50.583	51.722	1.979	14.203	11.318	5.534	10.569	3.193	1.482	98.861	BS7&8A_L1_S2
326.1	50.857	51.897	1.909	14.161	11.258	5.523	10.554	3.188	1.510	98.960	BS7&8A_L1_S2
281.1	50.668	51.827	1.847	14.148	11.204	5.716	10.618	3.185	1.456	98.842	BS7&8A_L1_S2
236.1	50.923	51.807	1.946	14.120	11.110	5.844	10.441	3.182	1.550	99.115	BS7&8A_L1_S2
191.1	50.480	51.885	1.863	14.205	11.087	5.833	10.429	3.181	1.517	98.594	BS7&8A_L1_S2
146.1	50.441	51.399	1.905	14.199	11.346	6.062	10.439	3.132	1.519	99.041	BS7&8A_L1_S2
101.1	49.936	51.022	1.882	14.267	11.471	6.267	10.486	3.123	1.483	98.914	BS7&8A_L1_S2
56.1	49.784	50.673	1.905	14.220	11.629	6.507	10.487	3.098	1.481	99.111	BS7&8A_L1_S2
11.1	49.483	50.097	1.915	14.426	11.742	6.751	10.596	3.026	1.448	99.386	BS7&8A_L1_S2
-33.9	49.228	49.967	1.914	14.225	11.753	6.961	10.667	3.046	1.467	99.261	BS7&8A_L1_S2
-78.9	48.511	49.734	1.991	14.212	11.736	7.240	10.744	2.899	1.444	98.777	BS7&8A_L1_S2
-123.9	48.401	49.933	1.933	14.301	11.712	7.292	10.655	2.836	1.338	98.467	BS7&8A_L1_S2
-168.9	48.388	49.459	1.912	14.217	11.957	7.482	10.729	2.878	1.367	98.930	BS7&8A_L1_S2
-213.9	48.101	49.109	2.000	14.222	11.881	7.607	10.850	2.913	1.419	98.992	BS7&8A_L1_S2
-258.9	48.129	49.060	1.991	14.309	11.794	7.764	10.720	2.956	1.406	99.069	BS7&8A_L1_S2
-303.9	47.741	49.274	1.867	14.264	11.841	7.840	10.603	2.912	1.399	98.467	BS7&8A_L1_S2
-348.9	47.874	49.229	2.004	14.189	11.800	7.983	10.474	2.900	1.421	98.645	BS7&8A_L1_S2
-393.9	47.958	49.204	1.889	14.317	11.728	8.030	10.492	2.901	1.439	98.755	BS7&8A_L1_S2
-438.9	47.734	49.044	1.888	14.167	11.849	8.053	10.644	2.911	1.445	98.690	BS7&8A_L1_S2
-538.9	47.517	49.058	1.964	14.337	11.744	7.970	10.490	2.968	1.470	98.458	BS7&8A_L1_S3
-638.9	47.700	49.294	1.840	14.318	11.473	8.152	10.549	2.925	1.449	98.406	BS7&8A_L1_S3
-738.9	47.964	48.993	1.875	14.306	11.644	8.185	10.561	2.962	1.473	98.971	BS7&8A_L1_S3
-838.9	47.601	49.206	1.904	14.062	11.646	8.126	10.570	2.980	1.506	98.395	BS7&8A_L1_S3
-938.9	47.707	48.871	1.913	14.189	11.643	8.262	10.645	2.994	1.483	98.836	BS7&8A_L1_S3
-1038.9	47.593	48.706	1.973	14.294	11.697	8.289	10.548	3.007	1.486	98.887	BS7&8A_L1_S3
-1138.9	47.891	49.114	1.925	14.164	11.589	8.108	10.604	3.014	1.483	98.777	BS7&8A_L1_S3
-1238.9	47.747	49.256	1.873	14.153	11.579	8.149	10.466	3.013	1.511	98.492	BS7&8A_L1_S3
1120.2	50.737	52.258	2.033	14.152	11.265	5.331	10.586	3.004	1.371	98.479	BS7&8A_L2_S1
1020.2	50.776	52.073	1.929	14.294	11.277	5.429	10.530	3.076	1.392	98.703	BS7&8A_L2_S1
920.2	50.893	51.973	1.945	14.211	11.415	5.390	10.584	3.111	1.372	98.920	BS7&8A_L2_S1
820.2	50.741	51.824	1.998	14.255	11.390	5.388	10.642	3.073	1.431	98.916	BS7&8A_L2_S1
720.2	50.458	52.007	1.955	14.142	11.337	5.371	10.704	3.086	1.400	98.452	BS7&8A_L2_S1
620.2	50.655	51.958	1.996	14.282	11.329	5.405	10.500	3.135	1.396	98.697	BS7&8A_L2_S1
520.2	50.668	51.621	1.915	14.421	11.359	5.476	10.550	3.190	1.467	99.047	BS7&8A_L2_S1
420.2	50.604	51.932	1.946	14.197	11.218	5.430	10.739	3.087	1.451	98.672	BS7&8A_L2_S2
375.2	50.734	51.774	1.945	14.164	11.255	5.542	10.653	3.187	1.480	98.960	BS7&8A_L2_S2
330.2	50.653	52.106	1.957	14.070	11.139	5.542	10.462	3.222	1.503	98.547	BS7&8A_L2_S2
285.2	50.660	51.945	1.867	14.167	11.062	5.718	10.557	3.201	1.483	98.716	BS7&8A_L2_S2
240.2	50.337	51.593	1.940	14.402	11.099	5.815	10.509	3.152	1.490	98.744	BS7&8A_L2_S2
195.2	50.395	51.328	1.912	14.316	11.220	5.957	10.581	3.188	1.500	99.068	BS7&8A_L2_S2
105.2	50.115	51.291	1.828	14.175	11.366	6.190	10.456	3.133	1.562	98.824	BS7&8A_L2_S2
60.2	49.645	50.800	1.894	14.246	11.381	6.471	10.614	3.092	1.503	98.845	BS7&8A_L2_S2
15.2	49.205	50.500	1.895	14.155	11.601	6.821	10.601	3.017	1.410	98.706	BS7&8A_L2_S2
-29.8	48.890	50.274	1.954	14.303	11.664	6.948	10.493	2.986	1.378	98.616	BS7&8A_L2_S2
-74.8	48.439	49.932	1.952	14.229	11.630	7.172	10.726	2.957	1.402	98.508	BS7&8A_L2_S2
-119.8	48.236	49.491	1.950	14.264	11.804	7.354	10.841	2.916	1.380	98.745	BS7&8A_L2_S2
-164.8	48.019	48.997	1.982	14.370	11.965	7.639	10.686	2.895	1.467	99.022	BS7&8A_L2_S2
-209.8	47.958	49.043	2.001	14.385	11.822	7.678	10.748	2.920	1.403	98.915	BS7&8A_L2_S2
-254.8	48.088	49.364	1.940	14.301	11.738	7.644	10.730	2.889	1.395	98.724	BS7&8A_L2_S2
-299.8	47.835	49.542	1.909	14.326	11.639	7.800	10.462	2.906	1.417	98.293	BS7&8A_L2_S2
-344.8	47.800	49.394	1.895	14.262	11.807	7.953	10.448	2.840	1.402	98.406	BS7&8A_L2_S2

-389.8	47.967	48.893	1.989	14.379	11.859	8.006	10.601	2.862	1.412	99.075	BS7&8A_L2_S2
-434.8	47.581	49.122	1.952	14.263	11.697	7.919	10.606	2.971	1.470	98.459	BS7&8A_L2_S2
-479.8	47.619	49.290	1.990	14.275	11.561	8.044	10.481	2.905	1.453	98.329	BS7&8A_L2_S2
-524.8	48.048	49.202	1.987	14.229	11.569	8.165	10.484	2.880	1.485	98.846	BS7&8A_L2_S2
-569.8	47.982	48.810	1.954	14.242	11.716	8.232	10.591	2.957	1.497	99.172	BS7&8A_L2_S2
-669.8	47.973	48.782	2.002	14.326	11.621	8.178	10.690	2.924	1.477	99.191	BS7&8A_L2_S3
-769.8	47.972	49.127	1.928	14.225	11.437	8.384	10.460	2.993	1.447	98.846	BS7&8A_L2_S3
-869.8	47.813	48.879	2.039	14.281	11.583	8.135	10.584	3.023	1.475	98.934	BS7&8A_L2_S3
-969.8	47.994	48.977	1.919	14.348	11.471	8.250	10.514	2.980	1.540	99.016	BS7&8A_L2_S3
-1069.8	47.723	49.102	2.007	14.307	11.393	8.213	10.561	2.970	1.447	98.621	BS7&8A_L2_S3
-1169.8	48.005	49.228	1.921	14.346	11.445	8.192	10.427	2.973	1.468	98.777	BS7&8A_L2_S3
1180.3	51.064	52.192	1.959	14.289	11.216	5.402	10.495	3.055	1.391	98.872	BS7&8A_L3_S1
1080.3	51.032	51.815	1.931	14.322	11.421	5.391	10.669	3.073	1.378	99.217	BS7&8A_L3_S1
980.3	50.944	51.755	1.947	14.451	11.458	5.370	10.604	3.054	1.361	99.188	BS7&8A_L3_S1
880.3	50.896	51.930	2.016	14.151	11.360	5.398	10.683	3.084	1.377	98.966	BS7&8A_L3_S1
780.3	50.971	51.981	1.950	14.274	11.365	5.330	10.625	3.093	1.383	98.990	BS7&8A_L3_S1
680.3	50.883	52.258	1.929	14.133	11.331	5.364	10.477	3.072	1.437	98.625	BS7&8A_L3_S1
580.3	50.660	51.539	1.944	14.408	11.448	5.454	10.684	3.115	1.408	99.121	BS7&8A_L3_S1
480.3	50.783	52.002	1.922	14.176	11.330	5.457	10.520	3.182	1.411	98.781	BS7&8A_L3_S2
435.3	50.648	51.786	1.934	14.205	11.354	5.506	10.639	3.171	1.406	98.863	BS7&8A_L3_S2
390.3	50.824	51.843	1.902	14.197	11.294	5.496	10.646	3.178	1.444	98.981	BS7&8A_L3_S2
345.3	50.631	51.673	1.908	14.243	11.352	5.564	10.493	3.286	1.482	98.958	BS7&8A_L3_S2
300.3	50.580	51.542	1.914	14.226	11.376	5.666	10.596	3.159	1.522	99.038	BS7&8A_L3_S2
255.3	50.704	51.685	1.920	14.259	11.234	5.686	10.512	3.220	1.484	99.019	BS7&8A_L3_S2
210.3	50.711	51.372	1.885	14.373	11.274	5.862	10.454	3.265	1.515	99.339	BS7&8A_L3_S2
165.3	50.349	51.345	1.895	14.296	11.166	6.036	10.463	3.191	1.610	99.004	BS7&8A_L3_S2
120.3	50.386	51.657	1.865	14.168	10.977	6.140	10.509	3.157	1.526	98.729	BS7&8A_L3_S2
75.3	50.125	50.894	1.890	14.274	11.334	6.356	10.619	3.141	1.492	99.231	BS7&8A_L3_S2
30.3	49.421	50.674	1.914	14.212	11.364	6.727	10.543	3.085	1.482	98.748	BS7&8A_L3_S2
-14.7	49.395	50.342	1.909	14.258	11.457	6.873	10.670	3.047	1.444	99.053	BS7&8A_L3_S2
-59.7	49.034	49.975	2.030	14.211	11.670	7.040	10.661	2.989	1.425	99.060	BS7&8A_L3_S2
-104.7	48.589	49.697	1.964	14.278	11.782	7.199	10.757	2.907	1.416	98.892	BS7&8A_L3_S2
-149.7	48.395	49.747	1.907	14.182	11.866	7.379	10.610	2.919	1.392	98.648	BS7&8A_L3_S2
-194.7	48.330	49.373	1.936	14.260	11.805	7.708	10.648	2.875	1.394	98.957	BS7&8A_L3_S2
-239.7	48.335	49.226	2.029	14.256	11.866	7.732	10.666	2.867	1.358	99.109	BS7&8A_L3_S2
-284.7	48.330	49.189	1.926	14.164	11.878	7.843	10.739	2.884	1.378	99.141	BS7&8A_L3_S2
-329.7	47.978	48.962	1.907	14.313	11.874	7.846	10.739	2.916	1.444	99.016	BS7&8A_L3_S2
-374.7	48.078	49.260	1.880	14.151	11.854	7.929	10.617	2.867	1.442	98.819	BS7&8A_L3_S2
-419.7	48.202	49.089	1.847	14.172	11.765	7.976	10.656	2.996	1.498	99.113	BS7&8A_L3_S2
-464.7	48.112	49.118	1.893	14.289	11.756	7.945	10.648	2.922	1.429	98.994	BS7&8A_L3_S2
-509.7	47.805	48.806	1.970	14.246	11.799	8.137	10.629	2.988	1.426	98.998	BS7&8A_L3_S2
-609.7	48.189	48.961	1.919	14.293	11.803	8.124	10.470	2.955	1.475	99.228	BS7&8A_L3_S3
-709.7	47.928	48.750	1.997	14.294	11.716	8.195	10.493	2.996	1.558	99.178	BS7&8A_L3_S3
-809.7	48.005	48.716	1.944	14.225	11.727	8.136	10.748	3.015	1.488	99.289	BS7&8A_L3_S3
-909.7	48.217	48.767	2.024	14.188	11.753	8.173	10.629	2.964	1.502	99.450	BS7&8A_L3_S3
-1009.7	48.124	48.781	1.967	14.204	11.758	8.170	10.536	3.041	1.544	99.344	BS7&8A_L3_S3
-1109.7	47.838	48.988	1.864	14.255	11.620	8.159	10.557	3.046	1.511	98.850	BS7&8A_L3_S3
-1209.7	47.975	49.536	1.835	14.142	11.411	8.077	10.424	3.077	1.498	98.439	BS7&8A_L3_S3

Table C15. BS9&10A

X(µm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
1003.6	50.578	51.905	1.821	14.172	11.449	6.681	9.063	3.225	1.686	98.673	BS9&10A_L1_S1
903.6	50.659	52.034	1.871	14.349	11.144	6.519	9.167	3.289	1.626	98.625	BS9&10A_L1_S1
803.6	50.684	51.711	2.012	14.384	11.213	6.479	9.214	3.331	1.657	98.973	BS9&10A_L1_S1
703.6	50.777	51.954	1.979	14.358	11.056	6.571	9.132	3.350	1.601	98.823	BS9&10A_L1_S1
603.6	50.669	51.904	1.920	14.353	11.132	6.520	9.203	3.339	1.630	98.765	BS9&10A_L1_S1
503.6	50.724	52.046	1.900	14.296	11.115	6.455	9.186	3.408	1.594	98.677	BS9&10A_L1_S2
458.6	50.490	52.157	1.936	14.280	11.027	6.382	9.188	3.420	1.611	98.333	BS9&10A_L1_S2
413.6	50.547	52.114	1.904	14.141	11.082	6.553	9.269	3.339	1.598	98.433	BS9&10A_L1_S2
368.6	50.486	51.740	1.946	14.350	11.169	6.619	9.162	3.383	1.632	98.746	BS9&10A_L1_S2
323.6	50.532	51.694	1.992	14.339	11.055	6.583	9.291	3.389	1.656	98.837	BS9&10A_L1_S2
278.6	50.505	51.885	1.948	14.273	11.049	6.453	9.336	3.393	1.663	98.620	BS9&10A_L1_S2
233.6	50.341	51.638	1.961	14.312	11.002	6.535	9.471	3.427	1.655	98.703	BS9&10A_L1_S2
188.6	50.458	51.617	1.956	14.190	10.988	6.553	9.670	3.356	1.670	98.841	BS9&10A_L1_S2
143.6	50.236	51.789	1.989	14.202	10.878	6.429	9.748	3.282	1.684	98.447	BS9&10A_L1_S2
98.6	50.070	51.520	1.890	14.220	11.047	6.521	9.898	3.246	1.658	98.550	BS9&10A_L1_S2
53.6	49.436	51.095	1.880	14.252	11.190	6.489	10.258	3.205	1.631	98.341	BS9&10A_L1_S2
8.6	49.227	50.627	1.919	14.207	11.297	6.647	10.638	3.123	1.541	98.601	BS9&10A_L1_S2
-36.4	48.754	50.189	1.976	14.174	11.531	6.727	10.873	3.045	1.485	98.564	BS9&10A_L1_S2
-81.4	48.258	49.889	2.125	14.163	11.626	6.793	10.965	2.975	1.465	98.370	BS9&10A_L1_S2
-126.4	47.969	49.699	2.000	14.343	11.394	6.801	11.350	2.919	1.495	98.270	BS9&10A_L1_S2
-171.4	47.972	49.689	1.944	14.140	11.737	6.764	11.378	2.894	1.453	98.283	BS9&10A_L1_S2
-216.4	48.161	49.448	2.069	14.198	11.573	6.785	11.512	2.928	1.486	98.713	BS9&10A_L1_S2
-261.4	48.165	49.552	2.009	14.153	11.604	6.758	11.516	2.912	1.496	98.613	BS9&10A_L1_S2
-306.4	47.870	49.615	1.993	14.138	11.394	6.761	11.693	2.894	1.513	98.255	BS9&10A_L1_S2
-351.4	47.976	49.487	1.934	14.205	11.441	6.590	11.812	2.956	1.576	98.488	BS9&10A_L1_S2
-396.4	47.998	49.538	1.967	14.122	11.496	6.657	11.834	2.849	1.536	98.460	BS9&10A_L1_S2
-441.4	47.997	49.324	1.958	14.177	11.313	6.726	11.962	2.924	1.616	98.673	BS9&10A_L1_S2
-486.4	47.895	49.476	1.967	14.212	11.271	6.649	11.941	2.979	1.505	98.419	BS9&10A_L1_S2
-586.4	47.839	49.124	2.052	14.085	11.566	6.645	11.990	2.931	1.608	98.715	BS9&10A_L1_S3
-686.4	47.814	49.261	1.930	14.214	11.374	6.702	11.933	3.030	1.556	98.553	BS9&10A_L1_S3
-786.4	47.850	49.372	1.988	14.103	11.409	6.771	11.871	2.983	1.503	98.478	BS9&10A_L1_S3
-886.4	47.798	49.055	2.007	14.148	11.441	6.764	11.997	3.034	1.555	98.743	BS9&10A_L1_S3
-986.4	47.964	49.109	2.035	14.262	11.335	6.674	12.067	2.993	1.526	98.855	BS9&10A_L1_S3
-1086.4	47.991	49.164	2.075	14.089	11.358	6.711	12.081	2.983	1.539	98.827	BS9&10A_L1_S3
-1186.4	47.984	49.160	1.950	14.148	11.342	6.868	12.016	2.962	1.555	98.823	BS9&10A_L1_S3
977.0	50.500	51.821	1.965	14.359	11.252	6.568	9.189	3.198	1.648	98.679	BS9&10A_L2_S1
877.0	50.458	51.828	1.887	14.313	11.230	6.623	9.250	3.239	1.631	98.630	BS9&10A_L2_S1
777.0	50.469	51.912	1.880	14.345	11.295	6.590	9.053	3.298	1.627	98.557	BS9&10A_L2_S1
677.0	50.591	51.800	1.913	14.335	11.322	6.511	9.124	3.321	1.675	98.791	BS9&10A_L2_S1
577.0	50.456	52.446	1.941	14.203	10.981	6.383	9.059	3.328	1.659	98.010	BS9&10A_L2_S1
477.0	50.377	51.925	1.948	14.262	11.102	6.518	9.213	3.377	1.654	98.452	BS9&10A_L2_S2
432.0	50.515	51.868	1.975	14.308	11.089	6.546	9.175	3.394	1.645	98.648	BS9&10A_L2_S2
387.0	50.626	52.233	1.955	14.227	11.107	6.418	9.124	3.303	1.634	98.393	BS9&10A_L2_S2
342.0	50.395	51.940	2.013	14.306	11.042	6.416	9.248	3.382	1.653	98.455	BS9&10A_L2_S2
297.0	50.403	51.842	1.930	14.378	11.013	6.441	9.270	3.404	1.724	98.561	BS9&10A_L2_S2
252.0	50.511	52.127	1.889	14.113	11.021	6.358	9.375	3.416	1.702	98.384	BS9&10A_L2_S2
207.0	50.287	51.942	1.947	14.155	10.998	6.442	9.398	3.371	1.748	98.345	BS9&10A_L2_S2
162.0	50.184	51.776	1.911	14.237	10.914	6.355	9.738	3.329	1.740	98.408	BS9&10A_L2_S2
117.0	50.261	51.791	1.816	14.170	10.950	6.478	9.789	3.339	1.667	98.470	BS9&10A_L2_S2
72.0	50.150	51.263	1.913	14.172	11.124	6.425	10.129	3.234	1.740	98.887	BS9&10A_L2_S2
27.0	49.391	51.157	1.980	14.123	11.099	6.522	10.287	3.173	1.661	98.235	BS9&10A_L2_S2
-18.0	48.930	50.432	1.964	14.185	11.341	6.654	10.759	3.132	1.533	98.497	BS9&10A_L2_S2
-63.0	48.445	50.003	2.060	14.078	11.554	6.688	11.057	2.987	1.574	98.442	BS9&10A_L2_S2
-108.0	48.213	49.526	2.049	14.210	11.751	6.863	11.089	2.994	1.519	98.687	BS9&10A_L2_S2
-153.0	47.860	49.584	2.029	14.190	11.654	6.798	11.387	2.913	1.446	98.277	BS9&10A_L2_S2
-198.0	47.900	49.650	2.055	14.181	11.646	6.670	11.419	2.908	1.472	98.250	BS9&10A_L2_S2
-243.0	47.827	49.514	1.915	14.116	11.714	6.743	11.537	2.896	1.566	98.313	BS9&10A_L2_S2
-288.0	47.543	49.645	1.972	14.138	11.467	6.657	11.665	2.945	1.510	97.898	BS9&10A_L2_S2
-333.0	47.930	49.382	1.989	14.164	11.696	6.671	11.786	2.848	1.464	98.548	BS9&10A_L2_S2
-378.0	47.729	49.633	1.928	14.120	11.547	6.633	11.738	2.896	1.505	98.096	BS9&10A_L2_S2
-423.0	47.780	49.540	2.017	14.164	11.349	6.658	11.872	2.871	1.528	98.240	BS9&10A_L2_S2

-468.0	47.642	49.354	2.011	14.029	11.522	6.743	11.893	2.893	1.556	98.289	BS9&10A_L2_S2
-513.0	47.789	49.395	2.003	14.048	11.409	6.774	11.914	2.945	1.511	98.394	BS9&10A_L2_S2
-613.0	47.689	49.549	1.988	13.958	11.322	6.712	12.022	2.944	1.505	98.140	BS9&10A_L2_S3
-713.0	47.762	49.300	2.028	14.126	11.514	6.745	11.824	2.914	1.549	98.463	BS9&10A_L2_S3
-813.0	47.620	49.247	2.037	14.131	11.439	6.636	11.990	2.965	1.556	98.373	BS9&10A_L2_S3
-913.0	47.878	49.086	2.004	14.255	11.500	6.825	11.876	2.933	1.520	98.791	BS9&10A_L2_S3
-1013.0	47.879	49.004	2.020	14.190	11.482	6.690	12.092	2.997	1.525	98.874	BS9&10A_L2_S3
-1113.0	48.017	49.235	1.981	14.142	11.537	6.727	11.933	2.949	1.496	98.782	BS9&10A_L2_S3
-1213.0	47.894	49.271	1.957	14.225	11.342	6.763	11.920	3.007	1.515	98.622	BS9&10A_L2_S3
979.0	50.337	51.919	1.948	14.216	11.357	6.553	9.217	3.188	1.602	98.418	BS9&10A_L3_S1
879.0	50.492	52.018	1.942	14.174	11.359	6.566	9.111	3.221	1.609	98.474	BS9&10A_L3_S1
779.0	50.423	51.972	2.047	14.387	11.116	6.640	9.017	3.202	1.620	98.451	BS9&10A_L3_S1
679.0	50.342	52.296	1.927	14.122	11.115	6.568	9.121	3.257	1.595	98.046	BS9&10A_L3_S1
579.0	50.174	52.033	1.975	14.198	11.104	6.553	9.157	3.372	1.607	98.140	BS9&10A_L3_S1
479.0	50.280	52.002	1.965	14.226	11.202	6.609	9.147	3.319	1.529	98.278	BS9&10A_L3_S2
434.0	50.284	52.112	1.925	14.194	11.062	6.599	9.194	3.327	1.587	98.172	BS9&10A_L3_S2
389.0	50.167	51.800	1.972	14.356	11.135	6.550	9.300	3.300	1.586	98.367	BS9&10A_L3_S2
344.0	50.122	51.669	2.014	14.187	11.235	6.590	9.283	3.363	1.659	98.453	BS9&10A_L3_S2
299.0	50.270	51.475	1.970	14.301	11.142	6.725	9.408	3.394	1.584	98.795	BS9&10A_L3_S2
254.0	50.107	51.347	1.988	14.230	11.195	6.578	9.711	3.296	1.655	98.761	BS9&10A_L3_S2
209.0	49.958	51.646	1.957	14.099	11.099	6.644	9.534	3.354	1.667	98.312	BS9&10A_L3_S2
164.0	49.938	51.442	1.925	14.300	11.142	6.478	9.664	3.373	1.676	98.496	BS9&10A_L3_S2
119.0	49.912	51.535	1.855	14.234	10.995	6.473	9.976	3.277	1.655	98.377	BS9&10A_L3_S2
74.0	49.667	51.255	1.928	14.057	11.140	6.690	10.023	3.247	1.658	98.411	BS9&10A_L3_S2
29.0	49.354	50.821	1.958	14.170	11.307	6.557	10.346	3.167	1.674	98.533	BS9&10A_L3_S2
-16.0	48.721	50.697	1.955	13.951	11.460	6.711	10.645	3.041	1.540	98.024	BS9&10A_L3_S2
-61.0	48.337	49.999	1.912	14.152	11.624	6.835	10.908	3.018	1.552	98.338	BS9&10A_L3_S2
-106.0	47.904	49.549	2.070	14.240	11.716	6.820	11.224	2.924	1.458	98.355	BS9&10A_L3_S2
-151.0	47.860	49.398	2.058	14.179	11.760	6.841	11.256	2.978	1.532	98.462	BS9&10A_L3_S2
-196.0	47.865	49.416	1.915	14.214	11.781	6.762	11.561	2.872	1.480	98.449	BS9&10A_L3_S2
-241.0	47.901	49.424	1.950	14.157	11.705	6.851	11.554	2.865	1.495	98.477	BS9&10A_L3_S2
-286.0	47.867	49.590	1.994	14.108	11.562	6.715	11.597	2.921	1.514	98.277	BS9&10A_L3_S2
-331.0	47.699	49.349	2.005	14.156	11.568	6.691	11.805	2.901	1.525	98.350	BS9&10A_L3_S2
-376.0	47.712	49.438	1.953	14.144	11.468	6.646	11.983	2.873	1.494	98.274	BS9&10A_L3_S2
-421.0	47.449	49.202	1.989	14.169	11.473	6.648	12.011	2.927	1.581	98.246	BS9&10A_L3_S2
-466.0	47.692	49.489	1.987	14.071	11.453	6.661	11.788	2.993	1.559	98.203	BS9&10A_L3_S2
-511.0	47.670	49.439	1.995	14.129	11.284	6.705	12.019	2.903	1.526	98.231	BS9&10A_L3_S2
-611.0	47.611	49.227	2.034	14.099	11.529	6.660	11.937	2.941	1.574	98.384	BS9&10A_L3_S3
-711.0	47.653	49.446	1.968	14.055	11.371	6.615	12.020	2.919	1.606	98.207	BS9&10A_L3_S3
-811.0	47.788	49.288	1.904	14.174	11.431	6.637	11.946	3.034	1.586	98.500	BS9&10A_L3_S3
-911.0	47.863	49.236	1.942	14.127	11.496	6.589	12.009	3.052	1.550	98.626	BS9&10A_L3_S3
-1011.0	47.602	49.329	2.040	14.100	11.446	6.619	11.882	3.023	1.563	98.274	BS9&10A_L3_S3
-1111.0	47.769	48.969	1.983	14.164	11.485	6.715	12.069	3.017	1.598	98.800	BS9&10A_L3_S3
-1211.0	47.865	49.603	2.033	14.105	11.262	6.655	11.803	2.985	1.554	98.262	BS9&10A_L3_S3

Table C16. BS11&12A

X(µm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
1191.0	50.406	51.974	2.002	14.184	11.409	6.811	10.479	1.611	1.530	98.432	BS11&12A_L1_S1
1091.0	50.617	51.915	2.019	14.053	11.435	6.761	10.711	1.571	1.534	98.702	BS11&12A_L1_S1
991.0	50.550	52.180	1.950	14.025	11.408	6.807	10.477	1.591	1.563	98.370	BS11&12A_L1_S1
891.0	50.301	52.064	1.967	13.975	11.469	6.666	10.563	1.660	1.636	98.237	BS11&12A_L1_S1
791.0	50.348	52.261	1.980	14.007	11.256	6.768	10.488	1.662	1.579	98.087	BS11&12A_L1_S1
691.0	50.398	52.334	1.992	13.905	11.392	6.680	10.432	1.730	1.534	98.064	BS11&12A_L1_S1
591.0	50.537	52.295	1.964	14.056	11.231	6.594	10.511	1.792	1.557	98.242	BS11&12A_L1_S1
491.0	50.256	51.943	1.992	13.884	11.272	6.749	10.676	1.889	1.596	98.314	BS11&12A_L1_S1
391.0	50.240	52.067	2.002	13.974	11.265	6.652	10.398	2.084	1.559	98.173	BS11&12A_L1_S2
348.0	50.408	51.864	2.019	13.904	11.196	6.737	10.441	2.220	1.619	98.544	BS11&12A_L1_S2
305.0	50.175	52.140	2.042	13.859	11.121	6.581	10.398	2.237	1.621	98.035	BS11&12A_L1_S2
262.0	50.375	51.999	2.030	13.873	11.081	6.591	10.486	2.407	1.534	98.377	BS11&12A_L1_S2
219.0	50.373	52.002	1.998	13.813	11.162	6.557	10.333	2.486	1.650	98.371	BS11&12A_L1_S2
176.0	50.386	52.299	1.928	13.662	10.928	6.603	10.443	2.553	1.584	98.087	BS11&12A_L1_S2
133.0	50.337	51.867	2.011	14.011	10.802	6.676	10.306	2.748	1.579	98.471	BS11&12A_L1_S2
90.0	50.426	51.789	1.969	13.785	10.889	6.596	10.508	2.850	1.613	98.637	BS11&12A_L1_S2
4.0	49.865	51.740	1.994	13.731	10.995	6.628	10.328	3.014	1.572	98.126	BS11&12A_L1_S2
-6.0	49.169	50.952	1.981	13.904	11.351	6.715	10.520	3.087	1.491	98.217	BS11&12A_L1_S3
-51.0	48.672	50.242	1.945	14.129	11.585	6.813	10.662	3.155	1.469	98.430	BS11&12A_L1_S3
-96.0	48.384	49.918	2.006	14.185	11.650	6.908	10.528	3.281	1.524	98.466	BS11&12A_L1_S3
-141.0	48.138	49.547	2.055	14.152	11.829	6.902	10.712	3.387	1.417	98.591	BS11&12A_L1_S3
-186.0	48.206	49.501	2.073	14.277	11.790	6.808	10.527	3.525	1.498	98.704	BS11&12A_L1_S3
-231.0	48.218	49.496	2.045	14.223	11.694	6.934	10.600	3.575	1.434	98.722	BS11&12A_L1_S3
-276.0	48.164	49.766	2.054	14.195	11.551	6.759	10.499	3.680	1.496	98.398	BS11&12A_L1_S3
-321.0	47.940	49.659	2.051	13.940	11.661	6.835	10.574	3.754	1.525	98.281	BS11&12A_L1_S3
-366.0	48.016	49.950	1.933	13.994	11.536	6.690	10.593	3.823	1.480	98.066	BS11&12A_L1_S3
-611.0	47.672	49.414	2.016	14.076	11.613	6.611	10.503	4.232	1.535	98.258	BS11&12A_L1_S4
-711.0	47.707	49.180	1.991	14.100	11.561	6.723	10.588	4.348	1.511	98.527	BS11&12A_L1_S4
-811.0	47.896	49.110	2.013	14.065	11.505	6.719	10.674	4.387	1.526	98.786	BS11&12A_L1_S4
-911.0	47.723	49.061	1.973	13.897	11.649	6.758	10.630	4.449	1.585	98.661	BS11&12A_L1_S4
-1011.0	47.791	49.150	1.973	14.073	11.564	6.713	10.511	4.506	1.511	98.641	BS11&12A_L1_S4
-1111.0	47.784	49.165	1.993	13.899	11.664	6.669	10.606	4.449	1.555	98.619	BS11&12A_L1_S4
-1211.0	47.847	49.342	1.982	13.897	11.516	6.714	10.527	4.481	1.541	98.505	BS11&12A_L1_S4
1156.3	50.877	52.492	1.893	13.976	11.291	6.767	10.442	1.580	1.559	98.385	BS11&12A_L2_S1
956.3	50.825	52.127	2.050	13.981	11.431	6.723	10.566	1.558	1.564	98.698	BS11&12A_L2_S1
856.3	50.756	51.834	1.969	14.125	11.459	6.783	10.560	1.634	1.637	98.923	BS11&12A_L2_S1
756.3	50.750	51.838	1.985	14.020	11.583	6.736	10.525	1.679	1.633	98.912	BS11&12A_L2_S1
656.3	50.921	52.003	1.987	13.914	11.457	6.666	10.584	1.718	1.672	98.919	BS11&12A_L2_S1
556.3	50.774	51.948	2.047	13.997	11.440	6.669	10.522	1.838	1.540	98.826	BS11&12A_L2_S1
456.3	50.731	51.802	1.958	14.185	11.272	6.705	10.615	1.916	1.546	98.929	BS11&12A_L2_S1
356.3	50.680	51.889	1.906	13.961	11.384	6.642	10.472	2.148	1.598	98.791	BS11&12A_L2_S2
309.3	50.766	51.883	1.961	13.976	11.186	6.650	10.508	2.207	1.629	98.883	BS11&12A_L2_S2
262.3	50.687	52.053	1.946	13.868	11.117	6.634	10.450	2.304	1.628	98.634	BS11&12A_L2_S2
215.3	50.696	51.892	1.988	13.993	11.095	6.592	10.407	2.446	1.588	98.805	BS11&12A_L2_S2
168.3	50.657	51.924	1.921	13.937	11.056	6.588	10.400	2.571	1.603	98.733	BS11&12A_L2_S2
121.3	50.736	52.073	1.939	13.868	11.021	6.527	10.249	2.710	1.613	98.662	BS11&12A_L2_S2
74.3	50.658	52.057	1.968	13.758	10.917	6.576	10.256	2.827	1.640	98.600	BS11&12A_L2_S2
27.3	50.507	51.977	1.991	13.779	10.891	6.533	10.173	3.026	1.630	98.529	BS11&12A_L2_S2
-19.7	50.234	51.536	1.960	13.872	10.986	6.526	10.358	3.118	1.645	98.698	BS11&12A_L2_S2
-25.7	49.970	51.023	1.948	14.066	11.225	6.601	10.510	3.079	1.549	98.947	BS11&12A_L2_S3
-70.7	49.086	50.129	2.052	14.128	11.619	6.826	10.511	3.208	1.527	98.957	BS11&12A_L2_S3
-115.7	48.658	49.871	2.077	14.170	11.570	6.911	10.607	3.275	1.520	98.788	BS11&12A_L2_S3
-160.7	48.454	49.655	2.060	14.180	11.695	6.852	10.678	3.381	1.500	98.799	BS11&12A_L2_S3
-205.7	48.411	49.723	1.999	14.249	11.588	6.791	10.586	3.569	1.494	98.688	BS11&12A_L2_S3
-250.7	48.636	49.534	2.019	14.231	11.724	6.822	10.531	3.630	1.509	99.103	BS11&12A_L2_S3
-295.7	48.211	49.796	2.016	14.101	11.618	6.725	10.506	3.721	1.517	98.415	BS11&12A_L2_S3
-340.7	48.241	49.874	2.051	14.058	11.545	6.747	10.423	3.776	1.524	98.367	BS11&12A_L2_S3
-385.7	48.364	49.555	1.937	14.140	11.614	6.830	10.446	3.902	1.576	98.808	BS11&12A_L2_S3
-430.7	48.370	49.675	1.977	13.978	11.507	6.697	10.610	4.019	1.537	98.695	BS11&12A_L2_S3
-530.7	48.290	49.432	2.013	14.102	11.452	6.757	10.533	4.167	1.544	98.858	BS11&12A_L2_S4
-630.7	48.306	49.802	2.012	14.028	11.281	6.709	10.430	4.220	1.518	98.504	BS11&12A_L2_S4

-730.7	48.270	49.326	1.998	13.989	11.459	6.751	10.557	4.365	1.555	98.944	BS11&12A_L2_S4
-830.7	48.013	49.393	1.970	14.104	11.378	6.663	10.561	4.399	1.532	98.619	BS11&12A_L2_S4
-930.7	48.099	49.550	1.963	13.987	11.361	6.645	10.553	4.427	1.514	98.549	BS11&12A_L2_S4
-1030.7	48.144	49.209	1.972	14.190	11.414	6.678	10.552	4.457	1.528	98.935	BS11&12A_L2_S4
-1130.7	48.332	49.527	2.010	14.013	11.396	6.644	10.445	4.434	1.531	98.805	BS11&12A_L2_S4
-1230.7	48.331	49.364	2.028	14.018	11.503	6.676	10.451	4.431	1.530	98.968	BS11&12A_L2_S4
1164.6	51.033	52.047	1.990	14.051	11.400	6.846	10.523	1.573	1.570	98.986	BS11&12A_L3_S1
1064.6	50.926	52.264	2.020	14.020	11.292	6.758	10.497	1.600	1.551	98.662	BS11&12A_L3_S1
964.6	50.862	52.083	1.961	13.983	11.608	6.712	10.517	1.624	1.513	98.780	BS11&12A_L3_S1
864.6	50.796	52.099	2.028	14.034	11.357	6.718	10.600	1.632	1.532	98.697	BS11&12A_L3_S1
764.6	50.732	52.525	1.989	13.950	11.173	6.666	10.484	1.652	1.561	98.207	BS11&12A_L3_S1
664.6	50.733	52.234	2.111	13.853	11.450	6.695	10.391	1.742	1.524	98.499	BS11&12A_L3_S1
564.6	50.713	52.117	2.056	14.085	11.087	6.760	10.569	1.803	1.522	98.596	BS11&12A_L3_S1
464.6	50.850	52.012	2.053	13.918	11.206	6.718	10.625	1.951	1.519	98.838	BS11&12A_L3_S1
364.6	50.769	52.131	2.021	13.849	11.221	6.650	10.533	2.084	1.512	98.639	BS11&12A_L3_S2
319.6	50.588	52.041	1.937	13.982	11.158	6.621	10.571	2.186	1.504	98.548	BS11&12A_L3_S2
274.6	50.701	51.802	1.976	13.976	11.265	6.612	10.524	2.273	1.573	98.899	BS11&12A_L3_S2
184.6	50.413	51.873	1.966	13.970	11.005	6.628	10.393	2.592	1.574	98.541	BS11&12A_L3_S2
139.6	50.652	52.041	2.015	13.818	10.967	6.462	10.403	2.707	1.588	98.611	BS11&12A_L3_S2
94.6	50.694	52.015	1.964	13.739	10.970	6.525	10.365	2.807	1.616	98.680	BS11&12A_L3_S2
49.6	50.500	51.852	1.995	13.841	10.900	6.530	10.321	2.904	1.658	98.648	BS11&12A_L3_S2
4.6	50.107	51.594	1.999	13.919	11.069	6.562	10.277	2.998	1.582	98.513	BS11&12A_L3_S2
12.6	49.901	51.225	1.994	13.981	11.020	6.659	10.535	2.997	1.588	98.675	BS11&12A_L3_S3
-32.4	49.002	50.837	2.023	13.972	11.381	6.677	10.519	3.123	1.467	98.165	BS11&12A_L3_S3
-77.4	48.673	50.143	2.051	14.037	11.726	6.828	10.570	3.220	1.426	98.530	BS11&12A_L3_S3
-122.4	48.612	50.146	2.003	14.086	11.762	6.717	10.638	3.263	1.386	98.465	BS11&12A_L3_S3
-167.4	48.437	49.593	2.009	14.077	11.953	6.841	10.669	3.384	1.476	98.844	BS11&12A_L3_S3
-212.4	48.221	49.670	2.015	14.055	11.827	6.768	10.701	3.489	1.475	98.551	BS11&12A_L3_S3
-257.4	48.153	49.492	1.976	14.243	11.814	6.886	10.602	3.508	1.479	98.661	BS11&12A_L3_S3
-302.4	48.356	49.688	2.016	14.008	11.835	6.751	10.546	3.675	1.481	98.668	BS11&12A_L3_S3
-347.4	48.328	49.235	2.037	14.287	11.761	6.761	10.583	3.816	1.520	99.093	BS11&12A_L3_S3
-392.4	48.266	49.319	2.080	14.097	11.772	6.747	10.573	3.879	1.533	98.947	BS11&12A_L3_S3
-492.4	47.927	49.434	1.960	14.108	11.517	6.710	10.706	4.045	1.520	98.493	BS11&12A_L3_S4
-604.9	48.141	49.521	2.075	14.025	11.476	6.659	10.579	4.182	1.484	98.620	BS11&12A_L3_S4
-717.4	48.046	49.118	1.948	14.024	11.689	6.767	10.638	4.277	1.540	98.928	BS11&12A_L3_S4
-829.9	47.991	49.148	1.988	13.912	11.797	6.635	10.547	4.444	1.530	98.843	BS11&12A_L3_S4
-942.4	48.098	49.082	2.029	13.988	11.722	6.659	10.644	4.328	1.548	99.016	BS11&12A_L3_S4
-1054.9	47.809	49.064	2.034	14.006	11.732	6.681	10.593	4.414	1.476	98.745	BS11&12A_L3_S4
-1167.4	48.046	49.117	1.939	14.102	11.546	6.679	10.629	4.419	1.569	98.929	BS11&12A_L3_S4

Table C17. BS13&14A

X(μm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
872.1	50.739	52.626	1.958	14.028	11.181	6.796	10.314	3.061	0.037	98.113	BS13&14A_L1_S1
772.1	50.946	52.750	1.895	14.041	11.153	6.601	10.415	3.093	0.053	98.197	BS13&14A_L1_S1
672.1	50.716	52.436	2.034	14.040	11.185	6.623	10.471	3.161	0.050	98.280	BS13&14A_L1_S1
572.1	50.890	52.622	1.989	13.901	11.167	6.629	10.419	3.236	0.037	98.268	BS13&14A_L1_S1
472.1	50.641	52.465	1.899	13.968	11.022	6.701	10.603	3.278	0.063	98.175	BS13&14A_L1_S2
427.1	50.716	52.459	1.959	13.909	11.189	6.598	10.503	3.308	0.075	98.257	BS13&14A_L1_S2
382.1	50.551	52.507	1.983	13.747	11.035	6.614	10.667	3.352	0.095	98.043	BS13&14A_L1_S2
337.1	50.591	52.497	1.921	13.818	10.977	6.605	10.717	3.328	0.138	98.094	BS13&14A_L1_S2
292.1	50.468	52.171	1.957	13.878	11.026	6.775	10.620	3.341	0.231	98.297	BS13&14A_L1_S2
247.1	50.147	52.155	1.977	13.811	10.987	6.678	10.785	3.294	0.315	97.992	BS13&14A_L1_S2
157.1	50.117	51.905	2.028	13.765	10.934	6.675	10.733	3.274	0.686	98.213	BS13&14A_L1_S2
112.1	50.042	51.969	1.902	13.717	11.081	6.630	10.587	3.208	0.908	98.073	BS13&14A_L1_S3
67.1	50.063	51.700	1.974	13.785	11.119	6.615	10.500	3.112	1.195	98.362	BS13&14A_L1_S3
22.1	49.789	51.560	1.936	13.715	11.111	6.655	10.444	3.084	1.495	98.230	BS13&14A_L1_S3
-22.9	49.365	51.206	1.891	13.833	11.245	6.577	10.472	3.096	1.679	98.158	BS13&14A_L1_S3
-67.9	48.737	50.633	1.957	13.926	11.448	6.629	10.436	3.024	1.948	98.104	BS13&14A_L1_S3
-112.9	48.611	50.208	2.031	13.979	11.599	6.615	10.382	2.953	2.235	98.403	BS13&14A_L1_S3
-157.9	48.190	49.910	2.038	14.068	11.729	6.741	10.319	2.919	2.276	98.279	BS13&14A_L1_S3
-202.9	47.976	49.755	2.031	14.011	11.838	6.542	10.383	2.906	2.534	98.221	BS13&14A_L1_S3
-247.9	47.704	49.586	1.962	14.048	11.769	6.565	10.498	2.898	2.674	98.119	BS13&14A_L1_S3
-292.9	47.648	49.767	1.991	13.886	11.789	6.553	10.341	2.901	2.773	97.881	BS13&14A_L1_S3
-337.9	47.663	49.368	2.009	13.903	11.945	6.535	10.552	2.844	2.844	98.295	BS13&14A_L1_S3
-382.9	47.579	49.295	1.967	13.865	11.840	6.645	10.558	2.868	2.961	98.284	BS13&14A_L1_S3
-482.9	47.585	49.288	1.994	13.961	11.804	6.622	10.431	2.885	3.016	98.297	BS13&14A_L1_S4
-582.9	47.453	49.386	1.995	13.970	11.723	6.575	10.359	2.911	3.081	98.066	BS13&14A_L1_S4
-682.9	47.634	49.539	1.933	13.881	11.637	6.567	10.391	3.025	3.028	98.095	BS13&14A_L1_S4
-782.9	47.358	49.394	1.967	13.902	11.832	6.579	10.320	2.977	3.029	97.964	BS13&14A_L1_S4
-882.9	47.397	49.165	1.944	13.999	11.672	6.569	10.567	3.043	3.043	98.232	BS13&14A_L1_S4
-982.9	47.517	49.192	1.988	13.909	11.690	6.641	10.562	3.003	3.015	98.325	BS13&14A_L1_S4
-1182.9	47.460	49.215	1.972	13.899	11.707	6.680	10.453	2.975	3.100	98.245	BS13&14A_L1_S4
960.3	50.811	52.499	2.027	14.074	11.188	6.632	10.472	3.055	0.054	98.312	BS13&14A_L3_S1
860.3	50.675	52.499	1.943	13.953	11.214	6.775	10.481	3.085	0.051	98.176	BS13&14A_L3_S1
760.3	50.607	52.596	1.909	14.025	11.164	6.720	10.409	3.125	0.052	98.011	BS13&14A_L3_S1
660.3	50.686	52.642	1.987	14.032	10.962	6.602	10.529	3.172	0.073	98.043	BS13&14A_L3_S1
460.3	50.928	52.591	1.971	14.028	10.923	6.558	10.616	3.252	0.060	98.337	BS13&14A_L3_S2
415.3	50.827	52.396	1.952	14.046	11.022	6.671	10.525	3.303	0.086	98.431	BS13&14A_L3_S2
370.3	50.701	52.423	1.930	13.861	11.074	6.586	10.601	3.399	0.126	98.278	BS13&14A_L3_S2
325.3	50.691	52.585	1.919	13.895	10.889	6.584	10.586	3.371	0.172	98.106	BS13&14A_L3_S2
280.3	50.518	52.129	1.967	13.788	11.034	6.669	10.764	3.357	0.293	98.390	BS13&14A_L3_S2
235.3	50.370	51.950	1.953	13.969	10.967	6.668	10.659	3.406	0.429	98.421	BS13&14A_L3_S2
190.3	50.271	51.778	1.965	13.786	11.038	6.697	10.793	3.324	0.619	98.494	BS13&14A_L3_S2
145.3	50.209	52.063	1.950	13.885	10.953	6.546	10.578	3.245	0.781	98.146	BS13&14A_L3_S2
100.3	50.010	51.776	2.034	13.716	11.140	6.584	10.565	3.128	1.057	98.234	BS13&14A_L3_S2
55.3	49.789	51.721	1.915	13.700	11.090	6.617	10.391	3.228	1.338	98.068	BS13&14A_L3_S2
10.3	49.587	51.345	1.920	13.733	11.181	6.549	10.485	3.177	1.611	98.242	BS13&14A_L3_S2
-34.7	49.260	50.722	1.922	13.889	11.323	6.719	10.546	3.105	1.774	98.538	BS13&14A_L3_S2
-79.7	48.575	50.480	2.002	14.020	11.420	6.590	10.485	2.994	2.008	98.095	BS13&14A_L3_S2
-124.7	48.230	50.062	2.022	14.135	11.734	6.512	10.370	2.979	2.185	98.168	BS13&14A_L3_S2
-169.7	47.733	49.951	1.968	14.065	11.697	6.632	10.428	2.913	2.347	97.783	BS13&14A_L3_S2
-214.7	47.528	49.482	2.083	14.080	11.895	6.639	10.368	2.891	2.562	98.046	BS13&14A_L3_S2
-259.7	47.310	49.341	2.052	14.000	11.882	6.658	10.468	2.971	2.629	97.970	BS13&14A_L3_S2
-349.7	47.211	49.319	1.993	14.047	11.825	6.656	10.374	2.897	2.889	97.893	BS13&14A_L3_S2
-394.7	47.231	49.314	2.081	13.913	11.964	6.673	10.242	2.893	2.920	97.917	BS13&14A_L3_S2
-484.7	47.118	48.999	1.958	13.916	11.939	6.709	10.555	2.877	3.048	98.120	BS13&14A_L3_S2
-529.7	47.104	49.163	2.028	13.855	11.850	6.665	10.438	2.897	3.104	97.941	BS13&14A_L3_S2
-629.7	47.189	49.085	1.945	13.952	11.796	6.665	10.524	2.957	3.077	98.104	BS13&14A_L3_S3
-729.7	47.013	48.973	2.068	14.002	11.767	6.565	10.502	2.935	3.188	98.040	BS13&14A_L3_S3
-829.7	47.226	48.981	2.080	13.928	11.728	6.524	10.529	3.005	3.225	98.244	BS13&14A_L3_S3
-929.7	47.084	49.203	2.025	13.882	11.724	6.630	10.507	2.970	3.059	97.881	BS13&14A_L3_S3
-1029.7	47.224	49.157	1.933	13.897	11.717	6.643	10.575	3.035	3.044	98.067	BS13&14A_L3_S3
-1129.7	47.051	49.331	2.021	13.836	11.593	6.601	10.536	3.036	3.046	97.720	BS13&14A_L3_S3

Table C18. BS17&18A

X(µm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
1295.7	49.489	51.811	1.935	13.553	11.159	5.184	10.380	3.001	2.978	97.678	BS17&18A_L1_S1
1215.7	49.681	51.472	2.023	13.263	11.669	5.229	10.342	3.027	2.976	98.209	BS17&18A_L1_S1
1135.7	49.645	51.376	1.895	13.645	11.637	5.198	10.283	2.947	3.019	98.270	BS17&18A_L1_S1
1055.7	49.823	51.323	1.965	13.546	11.484	5.213	10.353	3.055	3.063	98.500	BS17&18A_L1_S1
975.7	49.556	51.710	1.910	13.465	11.261	5.199	10.398	3.027	3.031	97.846	BS17&18A_L1_S1
895.7	49.663	51.376	2.011	13.589	11.447	5.228	10.375	2.976	2.999	98.288	BS17&18A_L1_S1
815.7	49.702	51.847	1.944	13.563	11.273	5.142	10.352	2.908	2.970	97.855	BS17&18A_L1_S1
735.7	49.433	51.504	2.034	13.620	11.297	5.231	10.377	2.965	2.973	97.929	BS17&18A_L1_S1
655.7	49.712	51.555	2.017	13.412	11.463	5.271	10.332	2.982	2.968	98.157	BS17&18A_L1_S1
575.7	49.894	51.579	1.960	13.608	11.372	5.195	10.338	2.957	2.992	98.315	BS17&18A_L1_S1
495.7	49.757	51.250	2.107	13.707	11.386	5.256	10.365	2.967	2.962	98.507	BS17&18A_L1_S2
455.7	49.758	51.331	2.049	13.740	11.346	5.271	10.381	2.914	2.969	98.427	BS17&18A_L1_S2
415.7	50.060	51.774	1.940	13.351	11.292	5.300	10.409	2.996	2.939	98.286	BS17&18A_L1_S2
375.7	49.816	51.544	2.104	13.653	11.309	5.233	10.297	2.959	2.901	98.271	BS17&18A_L1_S2
335.7	49.898	51.535	1.975	13.821	11.211	5.246	10.410	2.948	2.855	98.363	BS17&18A_L1_S2
295.7	49.820	51.763	1.997	13.633	11.240	5.287	10.283	2.943	2.855	98.057	BS17&18A_L1_S2
255.7	49.992	52.013	1.946	13.538	11.228	5.250	10.260	2.929	2.837	97.979	BS17&18A_L1_S2
215.7	50.076	52.219	2.043	13.485	11.122	5.279	10.190	2.960	2.701	97.857	BS17&18A_L1_S2
175.7	50.110	51.732	2.065	13.921	11.087	5.535	10.131	2.981	2.548	98.378	BS17&18A_L1_S2
135.7	50.251	51.871	2.068	13.765	10.993	5.628	10.203	2.983	2.489	98.380	BS17&18A_L1_S2
95.7	50.366	51.846	1.945	13.933	10.904	5.920	10.084	3.108	2.261	98.521	BS17&18A_L1_S2
55.7	50.543	51.706	1.976	14.090	10.934	6.148	10.057	3.071	2.018	98.836	BS17&18A_L1_S2
15.7	50.472	51.953	1.944	13.645	10.792	6.540	10.326	3.123	1.678	98.519	BS17&18A_L1_S2
-35.6	49.928	51.668	1.967	13.670	10.912	6.988	10.536	3.041	1.219	98.260	BS17&18A_L1_S3
-75.6	49.862	51.696	2.042	13.389	10.891	7.383	10.660	3.043	0.897	98.166	BS17&18A_L1_S3
-115.6	49.854	51.564	1.982	13.659	10.893	7.532	10.672	3.089	0.608	98.290	BS17&18A_L1_S3
-155.6	49.924	51.842	1.973	13.598	10.874	7.582	10.632	3.103	0.397	98.083	BS17&18A_L1_S3
-195.6	50.064	51.603	2.024	13.690	10.809	7.765	10.666	3.193	0.249	98.462	BS17&18A_L1_S3
-235.6	50.092	51.664	1.972	13.639	10.815	7.913	10.642	3.201	0.154	98.428	BS17&18A_L1_S3
-275.6	50.200	52.051	1.850	13.638	10.723	7.823	10.588	3.235	0.093	98.149	BS17&18A_L1_S3
-315.6	50.177	52.042	1.937	13.579	10.765	7.983	10.458	3.183	0.054	98.136	BS17&18A_L1_S3
-355.6	50.467	52.165	1.977	13.536	10.734	7.795	10.552	3.201	0.041	98.301	BS17&18A_L1_S3
-395.6	50.038	51.936	1.956	13.852	10.798	7.775	10.469	3.168	0.047	98.102	BS17&18A_L1_S3
-435.6	50.442	52.046	1.963	13.795	10.697	7.785	10.523	3.146	0.046	98.396	BS17&18A_L1_S3
-475.6	50.335	51.948	1.991	13.781	10.834	7.808	10.492	3.107	0.039	98.387	BS17&18A_L1_S3
-515.6	50.468	52.312	1.892	13.568	10.768	7.877	10.451	3.096	0.036	98.155	BS17&18A_L1_S3
-595.6	50.382	52.234	1.957	13.437	10.820	7.873	10.526	3.113	0.041	98.148	BS17&18A_L1_S4
-675.6	50.265	52.167	1.932	13.719	10.808	7.815	10.396	3.123	0.042	98.098	BS17&18A_L1_S4
-755.6	50.235	51.937	2.013	13.521	11.042	7.892	10.477	3.082	0.036	98.298	BS17&18A_L1_S4
-835.6	50.376	51.818	1.985	13.924	10.869	7.884	10.399	3.069	0.052	98.558	BS17&18A_L1_S4
-915.6	50.530	52.050	1.876	13.763	10.906	7.837	10.382	3.145	0.042	98.479	BS17&18A_L1_S4
-995.6	50.428	51.662	1.987	13.676	11.070	7.995	10.447	3.122	0.043	98.767	BS17&18A_L1_S4
-1075.6	50.310	51.660	2.019	13.768	11.092	7.879	10.456	3.086	0.041	98.650	BS17&18A_L1_S4
-1155.6	50.476	51.405	1.969	13.693	11.346	8.018	10.492	3.037	0.040	99.071	BS17&18A_L1_S4
-1235.6	50.404	51.464	2.032	13.958	11.151	7.850	10.405	3.106	0.035	98.939	BS17&18A_L1_S4
-1315.6	49.963	51.626	2.069	13.963	11.031	7.742	10.411	3.127	0.029	98.336	BS17&18A_L1_end
1268.2	49.918	51.403	2.029	13.488	11.516	5.194	10.394	2.996	2.980	98.515	BS17&18A_L2_S1
1188.2	49.486	51.286	2.015	13.638	11.509	5.195	10.362	2.993	3.002	98.200	BS17&18A_L2_S1
1108.2	49.456	51.248	1.909	13.567	11.577	5.258	10.435	3.002	3.004	98.208	BS17&18A_L2_S1
1028.2	49.550	51.401	1.940	13.438	11.564	5.200	10.435	3.038	2.985	98.149	BS17&18A_L2_S1
948.2	49.642	51.635	1.927	13.378	11.549	5.181	10.355	3.035	2.941	98.007	BS17&18A_L2_S1
868.2	49.595	51.295	1.962	13.521	11.567	5.189	10.444	3.003	3.019	98.300	BS17&18A_L2_S1
788.2	49.707	51.417	1.967	13.508	11.318	5.225	10.530	3.070	2.965	98.289	BS17&18A_L2_S1
708.2	49.841	51.566	2.005	13.569	11.360	5.110	10.409	2.998	2.982	98.275	BS17&18A_L2_S1
-33.1	49.751	51.612	2.007	13.608	11.108	6.992	10.464	2.973	1.236	98.139	BS17&18A_L2_S3
-73.1	49.806	51.767	1.928	13.497	10.957	7.235	10.688	3.049	0.880	98.039	BS17&18A_L2_S3
-113.1	49.894	51.398	2.011	13.591	10.996	7.541	10.724	3.127	0.612	98.496	BS17&18A_L2_S3
-153.1	50.022	51.428	1.916	13.756	11.036	7.624	10.674	3.154	0.411	98.594	BS17&18A_L2_S3
-193.1	49.966	51.915	1.920	13.656	10.709	7.743	10.629	3.172	0.257	98.052	BS17&18A_L2_S3
-233.1	50.126	52.034	2.024	13.444	10.790	7.696	10.609	3.243	0.161	98.092	BS17&18A_L2_S3
-273.1	50.179	51.972	1.981	13.779	10.623	7.783	10.584	3.171	0.106	98.207	BS17&18A_L2_S3

-313.1	50.398	51.753	1.990	13.805	10.743	7.899	10.565	3.172	0.074	98.644	BS17&18A_L2_S3
-353.1	50.447	51.690	1.949	13.820	10.863	7.862	10.501	3.262	0.053	98.758	BS17&18A_L2_S3
-393.1	50.308	51.935	2.053	13.826	10.509	7.920	10.527	3.189	0.041	98.373	BS17&18A_L2_S3
-433.1	50.313	52.061	1.888	13.583	10.914	7.965	10.433	3.123	0.033	98.253	BS17&18A_L2_S3
-473.1	50.450	52.021	2.006	13.716	10.756	7.897	10.425	3.146	0.034	98.429	BS17&18A_L2_S3
-513.1	50.301	51.854	1.949	13.877	10.801	7.895	10.449	3.139	0.037	98.448	BS17&18A_L2_S3
-593.1	50.437	51.585	1.977	13.909	10.938	7.976	10.437	3.134	0.044	98.852	BS17&18A_L2_S4
-673.1	50.064	52.076	1.950	13.539	10.971	7.888	10.462	3.072	0.043	97.988	BS17&18A_L2_S4
-753.1	50.246	51.879	1.947	13.823	10.864	7.860	10.450	3.129	0.047	98.367	BS17&18A_L2_S4
-833.1	50.071	51.727	2.020	13.751	11.031	7.976	10.423	3.042	0.031	98.344	BS17&18A_L2_S4
-913.1	50.242	51.631	1.962	13.768	11.120	8.038	10.413	3.030	0.038	98.611	BS17&18A_L2_S4
-993.1	50.244	51.774	1.998	13.612	11.036	7.956	10.494	3.091	0.039	98.471	BS17&18A_L2_S4
-1073.1	49.943	51.839	2.031	13.613	11.008	8.037	10.387	3.056	0.030	98.104	BS17&18A_L2_S4
-1153.1	49.733	52.070	1.982	13.279	11.152	7.967	10.482	3.022	0.046	97.663	BS17&18A_L2_end
-1233.1	49.779	51.952	1.948	13.563	11.234	7.850	10.375	3.037	0.041	97.827	BS17&18A_L2_end
-1313.1	49.953	51.499	1.942	13.680	11.388	8.012	10.397	3.047	0.034	98.454	BS17&18A_L2_end
1260.8	49.227	51.497	1.936	13.607	11.392	5.119	10.433	3.062	2.954	97.730	BS17&18A_L3_S1
1180.8	49.355	51.563	2.004	13.434	11.386	5.241	10.374	3.014	2.985	97.792	BS17&18A_L3_S1
1100.8	49.362	51.678	1.951	13.377	11.401	5.135	10.428	3.009	3.020	97.683	BS17&18A_L3_S1
1020.8	49.275	51.456	1.882	13.612	11.423	5.146	10.387	3.082	3.013	97.819	BS17&18A_L3_S1
940.8	49.306	51.868	1.933	13.400	11.276	5.129	10.333	3.058	3.003	97.438	BS17&18A_L3_S1
860.8	49.355	51.397	1.982	13.453	11.502	5.107	10.486	3.043	3.030	97.958	BS17&18A_L3_S1
780.8	49.494	51.679	1.980	13.353	11.297	5.211	10.372	3.053	3.055	97.814	BS17&18A_L3_S1
700.8	49.248	51.677	1.945	13.393	11.525	5.097	10.380	3.028	2.955	97.571	BS17&18A_L3_S1
620.8	49.497	51.688	2.027	13.394	11.274	5.124	10.450	3.037	3.005	97.809	BS17&18A_L3_S1
540.8	49.307	52.011	1.921	13.241	11.239	5.191	10.447	2.998	2.952	97.296	BS17&18A_L3_S1
460.8	49.280	51.442	2.018	13.652	11.407	5.209	10.458	2.903	2.912	97.838	BS17&18A_L3_S2
420.8	49.452	51.469	1.938	13.586	11.429	5.285	10.445	2.916	2.933	97.984	BS17&18A_L3_S2
380.8	49.277	51.910	1.921	13.307	11.346	5.224	10.380	2.985	2.928	97.367	BS17&18A_L3_S2
340.8	49.365	51.906	2.027	13.372	11.311	5.221	10.412	2.888	2.863	97.460	BS17&18A_L3_S2
300.8	49.391	51.334	2.043	13.670	11.452	5.219	10.419	2.979	2.885	98.058	BS17&18A_L3_S2
260.8	49.412	51.771	1.916	13.489	11.470	5.257	10.388	2.916	2.795	97.641	BS17&18A_L3_S2
220.8	49.676	51.659	1.941	13.451	11.605	5.324	10.351	2.952	2.717	98.017	BS17&18A_L3_S2
180.8	49.825	51.800	1.985	13.613	11.361	5.393	10.245	2.962	2.642	98.026	BS17&18A_L3_S2
140.8	50.080	52.011	1.990	13.768	11.088	5.502	10.196	2.943	2.501	98.069	BS17&18A_L3_S2
100.8	50.038	51.907	2.006	13.728	11.172	5.762	10.168	2.975	2.282	98.130	BS17&18A_L3_S2
60.8	49.842	52.145	1.923	13.919	10.692	5.985	10.138	3.073	2.126	97.698	BS17&18A_L3_S2
20.8	50.185	52.105	1.963	13.744	10.799	6.286	10.284	3.101	1.719	98.081	BS17&18A_L3_S2
-34.5	49.314	51.606	2.042	13.466	10.900	7.103	10.619	3.059	1.207	97.709	BS17&18A_L3_S3
-74.5	49.600	51.740	1.988	13.256	11.149	7.199	10.746	3.040	0.883	97.859	BS17&18A_L3_S3
-114.5	49.408	51.899	2.005	13.295	10.850	7.525	10.786	3.067	0.573	97.510	BS17&18A_L3_S3
-154.5	49.682	51.817	2.033	13.370	10.769	7.735	10.798	3.106	0.372	97.865	BS17&18A_L3_S3
-194.5	49.746	52.077	2.044	13.225	10.648	7.825	10.783	3.177	0.220	97.669	BS17&18A_L3_S3
-234.5	49.811	52.076	1.970	13.367	10.831	7.759	10.675	3.207	0.114	97.735	BS17&18A_L3_S3
-274.5	49.873	52.123	1.986	13.400	10.695	7.848	10.661	3.211	0.076	97.750	BS17&18A_L3_S3
-314.5	50.064	52.322	1.931	13.564	10.690	7.782	10.501	3.165	0.047	97.742	BS17&18A_L3_S3
-354.5	50.037	52.171	1.901	13.514	10.848	7.776	10.593	3.156	0.042	97.866	BS17&18A_L3_S3
-394.5	49.814	52.132	1.984	13.601	10.803	7.805	10.504	3.132	0.039	97.682	BS17&18A_L3_S3
-434.5	49.918	51.999	2.016	13.522	10.884	7.854	10.497	3.190	0.040	97.920	BS17&18A_L3_S3
-474.5	49.938	52.003	1.999	13.520	10.894	7.912	10.443	3.192	0.036	97.935	BS17&18A_L3_S3
-514.5	49.904	51.964	2.017	13.585	10.741	7.959	10.573	3.117	0.045	97.940	BS17&18A_L3_S3
-614.5	49.916	52.357	1.991	13.458	10.765	7.843	10.450	3.104	0.031	97.559	BS17&18A_L3_S4
-694.5	50.222	52.064	2.017	13.566	10.883	7.813	10.440	3.180	0.038	98.158	BS17&18A_L3_S4
-774.5	50.253	51.935	1.991	13.497	10.912	8.000	10.537	3.087	0.040	98.317	BS17&18A_L3_S4
-854.5	50.444	52.177	1.950	13.617	10.809	7.787	10.479	3.128	0.054	98.267	BS17&18A_L3_S4
-934.5	50.209	52.242	1.978	13.381	10.981	7.817	10.422	3.147	0.033	97.967	BS17&18A_L3_S4
-1014.5	50.326	51.839	1.893	13.711	11.020	7.838	10.530	3.131	0.039	98.487	BS17&18A_L3_S4
-1094.5	50.297	52.065	1.982	13.443	11.122	7.803	10.443	3.087	0.055	98.231	BS17&18A_L3_S4
-1174.5	50.199	52.011	1.992	13.572	10.960	7.844	10.472	3.106	0.043	98.188	BS17&18A_L3_S4
-1254.5	50.090	52.140	1.989	13.527	10.989	7.771	10.433	3.108	0.042	97.949	BS17&18A_L3_end
-1334.5	50.133	52.228	2.002	13.634	10.942	7.585	10.397	3.162	0.050	97.905	BS17&18A_L3_end

Table C19. BS19&20A

X(μm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
1215.1	49.588	51.444	1.938	15.319	11.439	6.464	8.895	3.015	1.487	98.144	BS19&20A_L1_S1
1126.2	49.635	51.414	2.008	15.358	11.192	6.590	8.943	3.014	1.481	98.220	BS19&20A_L1_S1
1037.4	49.770	51.188	1.927	15.401	11.445	6.586	8.881	3.074	1.499	98.582	BS19&20A_L1_S1
948.5	49.766	51.783	2.042	15.167	11.185	6.502	8.801	3.037	1.484	97.984	BS19&20A_L1_S1
859.6	49.714	51.296	2.077	15.314	11.361	6.519	8.876	3.068	1.490	98.418	BS19&20A_L1_S1
770.7	49.587	51.188	1.968	15.202	11.513	6.527	8.971	3.103	1.529	98.399	BS19&20A_L1_S1
681.8	49.556	51.485	2.015	15.207	11.313	6.498	8.881	3.136	1.466	98.071	BS19&20A_L1_S1
601.8	49.644	51.321	2.011	15.255	11.362	6.583	8.871	3.101	1.496	98.323	BS19&20A_L1_S2
561.8	49.379	51.571	2.010	15.124	11.285	6.450	8.940	3.160	1.462	97.808	BS19&20A_L1_S2
521.8	49.468	51.372	2.039	15.153	11.190	6.540	9.024	3.196	1.486	98.096	BS19&20A_L1_S2
481.8	49.363	51.486	2.005	15.121	11.210	6.552	8.947	3.161	1.519	97.877	BS19&20A_L1_S2
441.8	49.385	51.461	2.035	15.165	11.313	6.425	8.909	3.201	1.491	97.925	BS19&20A_L1_S2
401.8	49.417	51.358	1.984	15.110	11.397	6.489	8.884	3.242	1.535	98.059	BS19&20A_L1_S2
361.8	49.306	51.755	2.049	15.106	11.028	6.451	8.935	3.209	1.468	97.552	BS19&20A_L1_S2
321.8	49.512	51.761	2.033	15.158	11.058	6.400	8.914	3.175	1.501	97.751	BS19&20A_L1_S2
281.8	49.446	51.564	1.919	15.092	11.202	6.499	8.984	3.245	1.496	97.882	BS19&20A_L1_S2
241.8	49.484	51.241	2.032	15.201	11.125	6.490	9.096	3.290	1.523	98.243	BS19&20A_L1_S2
201.8	49.503	51.510	2.005	14.967	11.170	6.409	9.186	3.213	1.540	97.993	BS19&20A_L1_S2
161.8	49.483	51.502	2.000	14.841	10.995	6.491	9.346	3.241	1.585	97.981	BS19&20A_L1_S2
121.8	49.482	51.301	2.020	15.028	10.945	6.350	9.567	3.223	1.566	98.181	BS19&20A_L1_S2
81.8	49.232	51.166	1.969	14.916	11.104	6.347	9.779	3.177	1.543	98.066	BS19&20A_L1_S2
22.4	49.361	51.411	1.927	14.140	11.177	6.492	10.247	3.083	1.523	97.951	BS19&20A_L1_S3
-17.6	49.646	51.607	2.036	13.371	11.332	6.600	10.587	3.010	1.458	98.039	BS19&20A_L1_S3
-57.6	49.586	51.624	2.142	12.763	11.474	6.686	10.870	2.987	1.454	97.962	BS19&20A_L1_S3
-97.6	49.721	51.837	2.023	12.424	11.557	6.674	11.127	2.951	1.408	97.884	BS19&20A_L1_S3
-137.6	49.583	52.083	2.005	12.289	11.420	6.692	11.258	2.858	1.395	97.500	BS19&20A_L1_S3
-177.6	49.620	51.765	2.069	12.189	11.484	6.698	11.486	2.905	1.404	97.855	BS19&20A_L1_S3
-217.6	49.576	51.689	2.027	12.236	11.419	6.652	11.628	2.913	1.437	97.888	BS19&20A_L1_S3
-257.6	49.660	51.893	2.032	12.211	11.290	6.657	11.619	2.842	1.456	97.767	BS19&20A_L1_S3
-297.6	49.439	52.000	1.969	12.254	11.283	6.578	11.615	2.842	1.458	97.439	BS19&20A_L1_S3
-337.6	49.500	51.894	1.963	12.225	11.305	6.611	11.669	2.872	1.462	97.606	BS19&20A_L1_S3
-377.6	49.557	52.025	2.058	12.240	11.120	6.563	11.619	2.891	1.485	97.533	BS19&20A_L1_S3
-417.6	49.521	51.428	2.020	12.441	11.355	6.599	11.774	2.944	1.439	98.092	BS19&20A_L1_S3
-457.6	49.585	51.820	2.047	12.142	11.286	6.604	11.725	2.914	1.463	97.765	BS19&20A_L1_S3
-497.6	49.491	51.549	2.066	12.272	11.392	6.539	11.770	2.949	1.463	97.942	BS19&20A_L1_S3
-577.6	49.711	52.107	1.941	12.124	11.156	6.608	11.639	2.969	1.456	97.603	BS19&20A_L1_S4
-657.6	49.532	51.647	1.989	12.298	11.324	6.575	11.724	2.973	1.470	97.885	BS19&20A_L1_S4
-737.6	49.734	52.013	2.019	12.215	11.142	6.502	11.683	2.973	1.454	97.721	BS19&20A_L1_S4
-817.6	49.855	51.708	1.960	12.240	11.375	6.546	11.773	2.940	1.457	98.147	BS19&20A_L1_S4
-897.6	49.890	51.926	1.947	12.186	11.290	6.544	11.626	3.045	1.437	97.964	BS19&20A_L1_S4
-977.6	49.647	51.672	2.072	12.214	11.365	6.602	11.645	2.963	1.468	97.975	BS19&20A_L1_S4
1217.8	49.578	51.326	1.945	15.199	11.465	6.579	8.992	3.013	1.482	98.253	BS19&20A_L2_S1
1128.9	49.066	52.085	1.929	14.888	11.325	6.409	8.910	3.032	1.423	96.981	BS19&20A_L2_S1
1040.1	49.153	51.719	2.005	14.908	11.367	6.577	8.881	3.055	1.488	97.434	BS19&20A_L2_S1
951.2	49.241	51.682	1.973	14.973	11.338	6.591	8.863	3.080	1.501	97.559	BS19&20A_L2_S1
862.3	49.335	51.835	1.989	14.960	11.201	6.577	8.864	3.102	1.471	97.500	BS19&20A_L2_S1
773.4	49.344	52.141	2.044	14.916	11.147	6.417	8.839	3.052	1.444	97.203	BS19&20A_L2_S1
684.5	49.693	51.746	1.990	14.990	11.242	6.513	8.922	3.108	1.489	97.947	BS19&20A_L2_S1
564.5	49.567	51.845	1.830	14.998	11.388	6.442	8.841	3.138	1.519	97.721	BS19&20A_L2_S2
524.5	49.439	51.674	1.910	14.973	11.510	6.409	8.894	3.145	1.486	97.765	BS19&20A_L2_S2
484.5	49.380	51.448	2.032	15.090	11.310	6.516	8.920	3.198	1.487	97.932	BS19&20A_L2_S2
444.5	49.402	51.584	2.080	14.889	11.228	6.576	8.932	3.232	1.481	97.818	BS19&20A_L2_S2
404.5	49.379	51.720	2.004	14.916	11.138	6.540	8.903	3.269	1.511	97.659	BS19&20A_L2_S2
364.5	49.296	51.752	2.038	14.904	11.128	6.478	8.958	3.221	1.523	97.544	BS19&20A_L2_S2
324.5	49.371	51.573	2.096	14.848	11.268	6.488	8.953	3.254	1.521	97.798	BS19&20A_L2_S2
284.5	49.304	52.261	1.952	14.795	10.965	6.251	8.979	3.305	1.491	97.043	BS19&20A_L2_S2
244.5	49.233	51.700	2.083	14.779	11.222	6.379	9.023	3.271	1.542	97.533	BS19&20A_L2_S2
204.5	49.232	51.786	2.035	15.016	10.892	6.305	9.179	3.238	1.550	97.446	BS19&20A_L2_S2
164.5	49.071	51.859	2.014	14.780	10.920	6.311	9.267	3.283	1.567	97.212	BS19&20A_L2_S2
124.5	49.252	51.692	1.993	14.855	10.902	6.267	9.510	3.237	1.545	97.560	BS19&20A_L2_S2
84.5	49.215	51.630	1.973	14.640	10.957	6.300	9.798	3.152	1.550	97.586	BS19&20A_L2_S2

26.1	49.260	51.807	1.960	13.997	11.100	6.325	10.236	3.075	1.500	97.453	BS19&20A_L2_S3
-13.9	49.490	51.865	1.920	13.314	11.350	6.533	10.582	2.957	1.479	97.625	BS19&20A_L2_S3
-53.9	49.615	52.154	2.102	12.535	11.259	6.666	10.840	3.007	1.438	97.461	BS19&20A_L2_S3
-93.9	49.402	52.326	2.055	12.343	11.254	6.631	11.147	2.842	1.404	97.077	BS19&20A_L2_S3
-133.9	49.319	52.260	2.023	12.125	11.439	6.692	11.238	2.807	1.416	97.059	BS19&20A_L2_S3
-173.9	49.446	52.227	2.022	12.063	11.417	6.635	11.466	2.787	1.385	97.220	BS19&20A_L2_S3
-213.9	49.279	52.128	2.036	12.018	11.390	6.690	11.503	2.825	1.411	97.151	BS19&20A_L2_S3
-253.9	49.420	51.773	2.037	12.014	11.410	6.762	11.693	2.857	1.452	97.647	BS19&20A_L2_S3
-293.9	49.362	51.695	2.117	12.195	11.335	6.669	11.710	2.861	1.418	97.667	BS19&20A_L2_S3
-333.9	49.289	52.008	2.025	11.989	11.308	6.569	11.738	2.918	1.445	97.281	BS19&20A_L2_S3
-373.9	49.397	52.086	1.994	12.084	11.269	6.589	11.645	2.911	1.422	97.311	BS19&20A_L2_S3
-413.9	49.143	52.032	2.010	12.027	11.284	6.570	11.651	2.949	1.477	97.111	BS19&20A_L2_S3
-453.9	49.501	52.037	1.978	12.194	11.154	6.602	11.697	2.887	1.450	97.464	BS19&20A_L2_S3
-493.9	49.402	51.945	2.030	12.160	11.214	6.485	11.747	2.970	1.450	97.458	BS19&20A_L2_S3
-573.9	49.529	51.591	2.085	12.247	11.367	6.463	11.916	2.906	1.425	97.938	BS19&20A_L2_S4
-653.9	49.298	51.635	2.015	12.154	11.467	6.539	11.798	2.925	1.467	97.663	BS19&20A_L2_S4
-733.9	49.101	52.181	1.951	11.899	11.321	6.488	11.703	2.970	1.488	96.920	BS19&20A_L2_S4
-813.9	49.083	52.282	1.966	11.944	11.132	6.527	11.722	2.964	1.465	96.801	BS19&20A_L2_S4
-893.9	49.333	51.956	1.927	12.108	11.347	6.481	11.820	2.964	1.399	97.378	BS19&20A_L2_S4
-973.9	49.243	51.982	1.956	11.890	11.423	6.562	11.747	2.967	1.475	97.261	BS19&20A_L2_S4
-1053.9	49.245	51.698	2.001	12.141	11.427	6.570	11.712	3.003	1.448	97.548	BS19&20A_L2_S4
1169.7	48.732	51.759	2.059	14.745	11.560	6.470	8.975	2.987	1.447	96.973	BS19&20A_L3_S1
1080.8	49.038	51.547	2.015	14.929	11.613	6.431	9.002	2.991	1.472	97.491	BS19&20A_L3_S1
992.0	48.936	51.884	2.042	14.730	11.277	6.585	9.001	3.015	1.466	97.053	BS19&20A_L3_S1
903.1	49.163	51.451	2.040	14.821	11.614	6.469	9.068	3.063	1.474	97.712	BS19&20A_L3_S1
814.2	48.762	51.938	1.992	14.805	11.401	6.414	8.963	3.009	1.479	96.824	BS19&20A_L3_S1
725.3	49.071	51.683	1.956	14.795	11.550	6.444	9.026	3.072	1.474	97.388	BS19&20A_L3_S1
636.4	48.944	52.043	2.012	14.671	11.383	6.422	8.936	3.057	1.476	96.901	BS19&20A_L3_S1
556.4	48.932	51.959	1.974	14.789	11.371	6.376	8.934	3.152	1.444	96.973	BS19&20A_L3_S2
516.4	49.199	51.660	2.010	14.795	11.423	6.518	9.000	3.104	1.491	97.539	BS19&20A_L3_S2
476.4	49.217	51.577	1.927	14.829	11.459	6.547	9.014	3.177	1.469	97.639	BS19&20A_L3_S2
436.4	49.177	51.787	1.907	14.852	11.268	6.456	9.032	3.168	1.531	97.390	BS19&20A_L3_S2
396.4	49.049	51.646	1.958	14.867	11.382	6.416	9.014	3.235	1.483	97.403	BS19&20A_L3_S2
356.4	49.145	51.621	2.013	14.789	11.391	6.419	9.025	3.222	1.521	97.523	BS19&20A_L3_S2
316.4	48.928	51.762	1.957	14.750	11.314	6.390	9.071	3.266	1.491	97.167	BS19&20A_L3_S2
276.4	48.959	51.776	1.998	14.685	11.244	6.406	9.151	3.255	1.485	97.182	BS19&20A_L3_S2
236.4	48.973	51.469	1.972	14.817	11.303	6.438	9.159	3.294	1.548	97.503	BS19&20A_L3_S2
196.4	49.005	51.665	1.898	14.738	11.235	6.397	9.290	3.226	1.552	97.340	BS19&20A_L3_S2
156.4	48.552	51.908	1.957	14.603	11.110	6.284	9.348	3.226	1.565	96.644	BS19&20A_L3_S2
116.4	48.974	51.673	1.980	14.752	10.985	6.227	9.634	3.185	1.565	97.302	BS19&20A_L3_S2
76.4	48.917	51.875	2.039	14.426	10.870	6.195	9.837	3.183	1.576	97.042	BS19&20A_L3_S2
12.0	49.073	51.913	1.977	13.650	11.158	6.364	10.323	3.120	1.495	97.160	BS19&20A_L3_S3
-28.0	49.131	52.156	1.974	12.861	11.328	6.413	10.775	3.021	1.473	96.975	BS19&20A_L3_S3
-68.0	49.380	52.280	2.024	12.402	11.290	6.544	11.094	2.916	1.449	97.100	BS19&20A_L3_S3
-108.0	49.273	52.233	1.939	12.099	11.473	6.691	11.186	2.926	1.453	97.040	BS19&20A_L3_S3
-148.0	49.385	52.213	2.007	12.045	11.526	6.642	11.286	2.840	1.442	97.172	BS19&20A_L3_S3
-188.0	49.166	52.085	2.002	12.039	11.485	6.660	11.462	2.841	1.425	97.081	BS19&20A_L3_S3
-228.0	49.201	52.052	1.987	11.973	11.438	6.613	11.604	2.907	1.425	97.149	BS19&20A_L3_S3
-268.0	49.290	52.327	2.045	11.907	11.241	6.511	11.640	2.860	1.469	96.964	BS19&20A_L3_S3
-308.0	49.262	52.168	1.915	12.112	11.133	6.592	11.714	2.901	1.466	97.094	BS19&20A_L3_S3
-348.0	49.374	51.795	2.032	12.055	11.397	6.542	11.782	2.949	1.447	97.579	BS19&20A_L3_S3
-388.0	49.507	52.080	2.016	11.980	11.197	6.533	11.780	2.945	1.470	97.427	BS19&20A_L3_S3
-428.0	49.169	52.295	1.987	12.024	11.130	6.471	11.719	2.861	1.513	96.874	BS19&20A_L3_S3
-468.0	49.305	52.041	1.980	11.879	11.250	6.643	11.763	2.967	1.477	97.264	BS19&20A_L3_S3
-508.0	49.136	52.039	1.959	12.002	11.075	6.542	11.823	3.030	1.532	97.097	BS19&20A_L3_S3
-588.0	49.157	51.984	2.044	11.991	11.180	6.565	11.769	2.982	1.485	97.173	BS19&20A_L3_S4
-668.0	49.061	52.200	1.957	11.928	11.154	6.492	11.740	3.049	1.482	96.861	BS19&20A_L3_S4
-748.0	49.057	52.047	2.070	11.854	11.392	6.464	11.732	2.985	1.457	97.010	BS19&20A_L3_S4
-828.0	49.060	52.298	2.009	11.903	10.989	6.503	11.749	3.039	1.511	96.762	BS19&20A_L3_S4
-908.0	49.232	51.967	1.979	12.034	11.079	6.613	11.794	3.039	1.496	97.265	BS19&20A_L3_S4
-988.0	49.130	51.968	2.004	12.025	11.100	6.573	11.816	3.036	1.477	97.162	BS19&20A_L3_S4
-1068.0	49.198	51.943	2.070	12.083	11.143	6.530	11.634	3.089	1.507	97.255	BS19&20A_L3_S4

Table C20. BS1&2C

X(µm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
1419.7	50.741	52.047	0.483	14.239	11.287	6.834	10.666	3.025	1.420	98.694	BS1&2C_L1_S1
1339.7	50.674	52.162	0.496	14.274	11.179	6.712	10.686	3.030	1.463	98.512	BS1&2C_L1_S1
1259.7	50.776	51.991	0.501	14.174	11.446	6.813	10.624	3.003	1.448	98.785	BS1&2C_L1_S1
1179.7	50.516	52.076	0.535	14.179	11.242	6.864	10.594	3.047	1.463	98.440	BS1&2C_L1_S1
1099.7	51.119	52.111	0.493	14.061	11.314	6.876	10.706	2.993	1.447	99.008	BS1&2C_L1_S1
1019.7	50.463	52.242	0.555	13.950	11.202	6.818	10.667	3.112	1.454	98.221	BS1&2C_L1_S1
939.7	50.576	52.310	0.507	14.059	11.212	6.742	10.646	3.048	1.475	98.266	BS1&2C_L1_S1
859.7	50.782	51.714	0.538	14.266	11.434	6.856	10.629	3.116	1.448	99.069	BS1&2C_L1_S1
779.7	50.586	51.988	0.525	14.147	11.217	6.851	10.682	3.117	1.473	98.598	BS1&2C_L1_S1
699.7	50.704	51.990	0.563	14.226	11.375	6.666	10.564	3.133	1.482	98.714	BS1&2C_L1_S1
619.7	50.923	51.929	0.538	14.205	11.354	6.738	10.608	3.175	1.454	98.994	BS1&2C_L1_S1
539.7	50.628	51.818	0.524	14.290	11.252	6.832	10.660	3.166	1.458	98.809	BS1&2C_L1_S2
499.7	50.492	51.966	0.516	13.957	11.390	6.819	10.694	3.171	1.487	98.526	BS1&2C_L1_S2
459.7	50.663	51.961	0.499	14.117	11.398	6.783	10.615	3.145	1.481	98.703	BS1&2C_L1_S2
419.7	50.557	51.823	0.533	14.136	11.459	6.816	10.700	3.108	1.426	98.735	BS1&2C_L1_S2
379.7	50.447	51.870	0.511	14.182	11.258	6.843	10.694	3.158	1.485	98.576	BS1&2C_L1_S2
339.7	50.453	51.771	0.545	14.171	11.372	6.867	10.674	3.150	1.451	98.682	BS1&2C_L1_S2
299.7	50.336	51.881	0.534	14.115	11.413	6.814	10.629	3.149	1.466	98.455	BS1&2C_L1_S2
259.7	50.322	52.009	0.472	14.101	11.305	6.803	10.689	3.138	1.483	98.313	BS1&2C_L1_S2
219.7	50.269	52.201	0.513	13.975	11.300	6.733	10.641	3.159	1.480	98.068	BS1&2C_L1_S2
179.7	50.382	51.890	0.605	14.022	11.376	6.801	10.573	3.226	1.509	98.492	BS1&2C_L1_S2
139.7	50.361	52.076	0.705	14.113	11.182	6.718	10.501	3.175	1.532	98.285	BS1&2C_L1_S2
99.7	50.089	51.906	0.871	14.104	11.240	6.615	10.530	3.175	1.560	98.184	BS1&2C_L1_S2
59.7	49.801	51.220	1.266	14.199	11.294	6.780	10.531	3.171	1.540	98.581	BS1&2C_L1_S2
19.7	49.046	51.108	1.592	14.013	11.266	6.777	10.635	3.166	1.443	97.938	BS1&2C_L1_S2
-20.3	48.337	50.399	2.142	13.902	11.570	6.784	10.652	3.140	1.412	97.938	BS1&2C_L1_S2
-60.3	47.722	49.631	2.592	14.007	11.795	6.821	10.792	2.976	1.387	98.091	BS1&2C_L1_S2
-100.3	47.560	49.462	2.821	13.839	11.723	6.906	10.797	3.067	1.386	98.097	BS1&2C_L1_S2
-140.3	47.214	49.252	3.103	13.860	11.750	6.864	10.815	2.980	1.378	97.962	BS1&2C_L1_S2
-180.3	47.027	49.473	3.211	13.717	11.693	6.891	10.750	2.912	1.353	97.554	BS1&2C_L1_S2
-220.3	47.026	49.120	3.385	13.918	11.674	6.714	10.787	3.010	1.394	97.906	BS1&2C_L1_S2
-260.3	47.021	49.328	3.329	13.958	11.572	6.712	10.706	3.024	1.370	97.693	BS1&2C_L1_S2
-300.3	46.691	49.120	3.284	14.000	11.549	6.810	10.708	3.106	1.424	97.571	BS1&2C_L1_S2
-340.3	46.887	49.006	3.377	14.014	11.471	6.788	10.798	3.122	1.424	97.881	BS1&2C_L1_S2
-380.3	46.645	49.151	3.358	13.980	11.489	6.794	10.754	3.044	1.430	97.494	BS1&2C_L1_S2
-460.3	46.770	49.327	3.343	13.771	11.591	6.845	10.685	3.010	1.429	97.443	BS1&2C_L1_S2
-540.3	46.846	49.563	3.287	13.846	11.368	6.744	10.695	3.058	1.440	97.283	BS1&2C_L1_S3
-620.3	46.971	49.203	3.286	13.954	11.548	6.887	10.702	3.025	1.394	97.768	BS1&2C_L1_S3
1477.7	50.594	52.037	0.518	14.220	11.294	6.799	10.633	3.039	1.462	98.558	BS1&2C_L2_S1
1317.7	50.771	51.950	0.554	14.236	11.394	6.838	10.537	3.017	1.475	98.821	BS1&2C_L2_S1
1237.7	50.567	52.071	0.519	14.155	11.275	6.841	10.695	3.012	1.432	98.496	BS1&2C_L2_S1
1157.7	50.482	52.146	0.518	14.004	11.270	6.909	10.691	3.029	1.433	98.336	BS1&2C_L2_S1
1077.7	50.498	52.065	0.481	14.050	11.412	6.802	10.692	3.057	1.441	98.433	BS1&2C_L2_S1
997.7	50.460	51.837	0.555	14.098	11.386	6.903	10.704	3.090	1.427	98.623	BS1&2C_L2_S1
837.7	50.367	52.095	0.525	13.993	11.335	6.816	10.696	3.100	1.440	98.272	BS1&2C_L2_S1
757.7	50.374	51.787	0.539	14.198	11.518	6.755	10.710	3.063	1.429	98.587	BS1&2C_L2_S1
677.7	50.478	52.059	0.516	14.012	11.405	6.866	10.688	3.041	1.414	98.419	BS1&2C_L2_S1
597.7	50.572	51.794	0.534	14.101	11.430	6.951	10.703	3.074	1.413	98.778	BS1&2C_L2_S1
477.7	50.471	51.867	0.494	14.167	11.356	6.920	10.682	3.112	1.402	98.604	BS1&2C_L2_S2
437.7	50.436	51.934	0.520	13.966	11.445	6.925	10.692	3.083	1.433	98.501	BS1&2C_L2_S2
397.7	50.427	52.175	0.535	13.965	11.409	6.801	10.651	3.017	1.448	98.252	BS1&2C_L2_S2
357.7	50.319	51.860	0.506	14.170	11.367	6.891	10.596	3.170	1.439	98.459	BS1&2C_L2_S2
317.7	50.174	52.106	0.518	13.943	11.352	6.858	10.722	3.066	1.436	98.068	BS1&2C_L2_S2
277.7	50.318	51.877	0.514	14.029	11.461	6.828	10.748	3.092	1.451	98.441	BS1&2C_L2_S2
237.7	50.290	51.704	0.522	14.211	11.443	6.773	10.719	3.147	1.481	98.586	BS1&2C_L2_S2
197.7	50.207	52.225	0.507	13.820	11.325	6.903	10.597	3.161	1.461	97.981	BS1&2C_L2_S2
157.7	50.354	52.050	0.560	14.061	11.328	6.776	10.589	3.184	1.452	98.304	BS1&2C_L2_S2
117.7	50.345	51.751	0.730	14.104	11.266	6.813	10.635	3.201	1.501	98.594	BS1&2C_L2_S2
77.7	49.957	51.442	1.093	14.147	11.247	6.784	10.617	3.183	1.487	98.514	BS1&2C_L2_S2
37.7	49.397	51.086	1.505	14.091	11.307	6.783	10.606	3.126	1.497	98.311	BS1&2C_L2_S2
-2.3	48.656	50.631	1.992	13.843	11.491	6.785	10.784	3.056	1.418	98.025	BS1&2C_L2_S2

-42.3	47.977	49.683	2.585	13.843	11.661	6.919	10.887	3.055	1.368	98.295	BS1&2C_L2_S2
-82.3	47.413	49.630	2.824	13.709	11.654	6.942	10.866	2.993	1.382	97.782	BS1&2C_L2_S2
-122.3	47.255	49.524	3.086	13.839	11.502	6.975	10.809	2.925	1.341	97.731	BS1&2C_L2_S2
-162.3	47.341	49.339	3.230	13.833	11.578	6.886	10.782	3.000	1.353	98.001	BS1&2C_L2_S2
-202.3	47.269	49.156	3.339	14.036	11.487	6.814	10.792	2.985	1.392	98.113	BS1&2C_L2_S2
-242.3	47.288	49.537	3.397	13.945	11.320	6.759	10.666	3.012	1.365	97.752	BS1&2C_L2_S2
-282.3	47.093	49.257	3.352	13.997	11.442	6.809	10.729	2.999	1.415	97.836	BS1&2C_L2_S2
-322.3	46.948	49.431	3.403	13.854	11.373	6.850	10.681	3.044	1.364	97.517	BS1&2C_L2_S2
-362.3	47.569	49.554	3.442	13.920	11.306	6.764	10.675	2.961	1.379	98.015	BS1&2C_L2_S2
1529.7	51.036	52.065	0.535	14.232	11.259	6.831	10.639	2.986	1.455	98.972	BS1&2C_L3_S1
1369.7	50.863	52.052	0.564	14.272	11.253	6.730	10.607	3.036	1.486	98.811	BS1&2C_L3_S1
1289.7	51.086	52.175	0.530	14.156	11.227	6.815	10.634	2.993	1.469	98.911	BS1&2C_L3_S1
1209.7	50.980	52.014	0.522	14.151	11.281	6.828	10.653	3.109	1.443	98.966	BS1&2C_L3_S1
1129.7	50.977	51.913	0.564	14.293	11.280	6.779	10.585	3.104	1.481	99.063	BS1&2C_L3_S1
1049.7	51.022	52.027	0.533	14.155	11.391	6.784	10.573	3.086	1.451	98.995	BS1&2C_L3_S1
969.7	50.712	52.252	0.495	14.211	11.284	6.713	10.573	3.044	1.428	98.460	BS1&2C_L3_S1
889.7	50.976	52.039	0.514	14.173	11.366	6.689	10.633	3.109	1.477	98.937	BS1&2C_L3_S1
809.7	50.876	52.041	0.520	14.184	11.301	6.779	10.587	3.084	1.504	98.835	BS1&2C_L3_S1
729.7	51.005	51.945	0.528	14.122	11.352	6.868	10.654	3.095	1.437	99.059	BS1&2C_L3_S1
649.7	50.847	51.955	0.509	14.361	11.311	6.665	10.576	3.147	1.477	98.892	BS1&2C_L3_S1
569.7	51.033	52.162	0.507	14.135	11.229	6.723	10.619	3.173	1.453	98.872	BS1&2C_L3_S2
529.7	51.152	52.171	0.507	14.033	11.362	6.657	10.659	3.137	1.474	98.980	BS1&2C_L3_S2
489.7	51.101	51.711	0.516	14.232	11.513	6.718	10.730	3.107	1.474	99.391	BS1&2C_L3_S2
449.7	50.918	51.958	0.526	14.147	11.320	6.742	10.679	3.171	1.457	98.960	BS1&2C_L3_S2
409.7	50.780	52.053	0.519	14.029	11.401	6.727	10.682	3.141	1.450	98.727	BS1&2C_L3_S2
369.7	50.962	51.960	0.521	14.102	11.349	6.845	10.598	3.148	1.478	99.003	BS1&2C_L3_S2
329.7	51.034	52.178	0.503	14.018	11.335	6.747	10.591	3.178	1.452	98.856	BS1&2C_L3_S2
289.7	50.938	51.754	0.519	14.093	11.443	6.898	10.612	3.201	1.481	99.184	BS1&2C_L3_S2
249.7	50.759	51.816	0.506	14.249	11.300	6.832	10.639	3.148	1.511	98.943	BS1&2C_L3_S2
209.7	50.886	51.874	0.566	14.017	11.332	6.851	10.607	3.239	1.515	99.012	BS1&2C_L3_S2
169.7	50.537	51.746	0.639	14.213	11.390	6.755	10.514	3.214	1.529	98.791	BS1&2C_L3_S2
129.7	50.813	52.197	0.812	14.097	11.058	6.631	10.490	3.155	1.562	98.616	BS1&2C_L3_S2
89.7	50.591	51.685	0.982	14.188	11.198	6.774	10.449	3.221	1.503	98.906	BS1&2C_L3_S2
49.7	49.982	51.357	1.404	14.050	11.244	6.749	10.546	3.135	1.514	98.624	BS1&2C_L3_S2
9.7	49.433	50.647	1.914	14.084	11.413	6.741	10.598	3.146	1.457	98.786	BS1&2C_L3_S2
-30.3	48.741	50.378	2.287	13.927	11.481	6.828	10.742	2.950	1.409	98.363	BS1&2C_L3_S2
-70.3	48.214	49.939	2.655	13.855	11.653	6.759	10.774	2.977	1.390	98.275	BS1&2C_L3_S2
-110.3	47.896	49.296	2.905	14.006	11.761	6.828	10.831	3.030	1.344	98.600	BS1&2C_L3_S2
-150.3	47.841	48.945	3.191	13.922	11.869	6.918	10.760	3.029	1.366	98.896	BS1&2C_L3_S2
-190.3	47.501	49.367	3.212	13.900	11.663	6.783	10.708	2.987	1.380	98.134	BS1&2C_L3_S2
-230.3	47.628	49.446	3.209	13.895	11.606	6.732	10.721	2.993	1.398	98.182	BS1&2C_L3_S2
-270.3	47.666	49.247	3.210	13.947	11.700	6.736	10.775	2.988	1.397	98.418	BS1&2C_L3_S2
-310.3	47.736	49.273	3.323	14.000	11.665	6.634	10.696	3.004	1.404	98.463	BS1&2C_L3_S2
-390.3	47.608	49.253	3.342	13.998	11.601	6.690	10.681	3.019	1.417	98.355	BS1&2C_L3_S3
-470.3	47.692	49.424	3.260	14.091	11.408	6.708	10.673	3.038	1.399	98.268	BS1&2C_L3_S3
-550.3	47.704	49.107	3.283	14.061	11.532	6.848	10.678	3.058	1.433	98.597	BS1&2C_L3_S3
-630.3	47.384	49.054	3.353	13.891	11.629	6.834	10.679	3.117	1.444	98.330	BS1&2C_L3_S3
-710.3	47.549	49.118	3.358	13.927	11.459	6.831	10.770	3.068	1.468	98.431	BS1&2C_L3_S3
-790.3	47.500	49.053	3.405	13.971	11.573	6.874	10.690	3.016	1.419	98.447	BS1&2C_L3_S3
-870.3	47.670	49.248	3.460	13.975	11.445	6.783	10.643	3.042	1.403	98.422	BS1&2C_L3_S3
-950.3	47.573	49.320	3.368	13.855	11.418	6.787	10.701	3.146	1.405	98.253	BS1&2C_L3_S3

Table C21. BS3&4C

X(μm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
1492.1	50.691	52.180	1.928	12.491	11.448	6.786	10.695	3.043	1.429	98.512	BS3&4C_L1_S1
1412.1	50.349	51.869	1.928	12.563	11.501	6.913	10.859	2.952	1.416	98.480	BS3&4C_L1_S1
1332.1	50.425	51.837	2.045	12.446	11.593	6.858	10.805	2.998	1.418	98.588	BS3&4C_L1_S1
1252.1	50.263	52.042	1.943	12.588	11.498	6.809	10.779	2.972	1.369	98.220	BS3&4C_L1_S1
1172.1	50.091	52.035	1.990	12.626	11.456	6.808	10.706	2.968	1.412	98.056	BS3&4C_L1_S1
1092.1	50.184	51.607	1.960	12.716	11.591	6.916	10.864	2.955	1.392	98.577	BS3&4C_L1_S1
1012.1	50.142	51.716	1.991	12.531	11.629	6.953	10.777	2.992	1.412	98.426	BS3&4C_L1_S1
932.1	50.124	51.820	1.910	12.471	11.629	7.001	10.774	2.956	1.439	98.304	BS3&4C_L1_S1
852.1	50.138	51.777	2.005	12.544	11.471	6.987	10.809	3.009	1.399	98.361	BS3&4C_L1_S1
772.1	50.081	51.896	1.943	12.388	11.687	6.844	10.766	3.053	1.423	98.185	BS3&4C_L1_S1
692.1	50.089	51.612	2.018	12.611	11.686	6.930	10.717	3.005	1.422	98.478	BS3&4C_L1_S1
532.1	50.191	51.866	1.916	12.571	11.596	6.861	10.789	2.987	1.416	98.325	BS3&4C_L1_S1
452.1	50.139	51.817	1.978	12.605	11.603	6.827	10.810	2.987	1.373	98.322	BS3&4C_L1_S2
412.1	50.148	52.052	1.939	12.383	11.500	6.917	10.742	3.026	1.442	98.096	BS3&4C_L1_S2
372.1	49.978	51.954	1.901	12.627	11.493	6.808	10.810	2.995	1.413	98.024	BS3&4C_L1_S2
332.1	50.242	51.823	1.981	12.519	11.589	6.885	10.802	2.965	1.437	98.419	BS3&4C_L1_S2
292.1	50.327	52.116	1.903	12.474	11.593	6.819	10.693	3.005	1.398	98.211	BS3&4C_L1_S2
252.1	50.358	51.714	1.942	12.589	11.666	6.895	10.684	3.083	1.428	98.645	BS3&4C_L1_S2
212.1	50.405	51.849	1.952	12.493	11.635	6.866	10.743	3.044	1.418	98.556	BS3&4C_L1_S2
172.1	50.387	51.732	2.003	12.517	11.692	7.025	10.596	3.038	1.399	98.654	BS3&4C_L1_S2
132.1	50.236	51.838	1.938	12.741	11.620	6.824	10.596	3.028	1.415	98.398	BS3&4C_L1_S2
92.1	50.083	51.613	1.936	12.851	11.581	6.967	10.589	3.007	1.457	98.469	BS3&4C_L1_S2
52.1	49.501	51.248	1.988	13.273	11.478	6.919	10.666	3.006	1.423	98.253	BS3&4C_L1_S2
12.1	49.070	50.711	1.981	13.865	11.372	6.873	10.723	3.059	1.415	98.359	BS3&4C_L1_S2
-27.9	48.443	50.210	1.988	14.357	11.533	6.812	10.688	3.017	1.396	98.233	BS3&4C_L1_S2
-67.9	48.156	49.615	1.936	15.008	11.438	6.916	10.691	3.000	1.396	98.541	BS3&4C_L1_S2
-107.9	47.773	49.702	1.958	15.125	11.316	6.712	10.782	3.028	1.378	98.071	BS3&4C_L1_S2
-147.9	47.594	49.084	2.054	15.433	11.463	6.709	10.874	2.976	1.407	98.510	BS3&4C_L1_S2
-187.9	47.626	49.172	1.921	15.277	11.587	6.901	10.684	3.058	1.400	98.455	BS3&4C_L1_S2
-227.9	47.568	49.377	1.988	15.367	11.508	6.739	10.657	2.984	1.380	98.191	BS3&4C_L1_S2
-267.9	47.616	49.191	1.898	15.462	11.608	6.708	10.709	3.022	1.402	98.425	BS3&4C_L1_S2
-307.9	47.481	49.141	1.959	15.442	11.506	6.812	10.707	3.053	1.381	98.341	BS3&4C_L1_S2
-347.9	47.422	49.371	2.045	15.508	11.262	6.746	10.610	3.061	1.399	98.051	BS3&4C_L1_S2
-387.9	47.572	49.211	1.974	15.405	11.393	6.858	10.679	3.075	1.405	98.361	BS3&4C_L1_S2
-427.9	47.363	49.104	1.992	15.451	11.478	6.883	10.621	3.044	1.428	98.259	BS3&4C_L1_S2
-467.9	47.476	49.242	1.980	15.401	11.390	6.893	10.603	3.056	1.435	98.234	BS3&4C_L1_S2
-507.9	47.383	49.028	2.023	15.573	11.399	6.848	10.622	3.123	1.385	98.355	BS3&4C_L1_S2
-547.9	47.484	49.074	2.020	15.529	11.374	6.910	10.616	3.042	1.435	98.411	BS3&4C_L1_S2
-627.9	47.472	49.198	1.887	15.449	11.441	6.895	10.606	3.084	1.440	98.274	BS3&4C_L1_S3
-707.9	47.340	49.092	1.942	15.488	11.471	6.986	10.558	3.041	1.424	98.248	BS3&4C_L1_S3
-787.9	47.487	48.996	1.941	15.495	11.567	6.875	10.667	3.023	1.438	98.492	BS3&4C_L1_S3
-867.9	47.442	49.174	1.978	15.471	11.597	6.813	10.548	2.981	1.438	98.268	BS3&4C_L1_S3
-947.9	47.443	48.979	2.037	15.501	11.632	6.828	10.564	3.047	1.413	98.464	BS3&4C_L1_S3
1352.1	50.350	52.102	1.963	12.628	11.434	6.805	10.751	2.932	1.385	98.247	BS3&4C_L2_S1
1272.1	50.252	51.950	2.015	12.469	11.576	6.834	10.774	2.980	1.402	98.303	BS3&4C_L2_S1
1192.1	50.356	51.640	2.021	12.675	11.551	6.856	10.786	3.051	1.419	98.716	BS3&4C_L2_S1
1112.1	50.359	51.813	1.979	12.505	11.676	6.804	10.794	3.021	1.409	98.546	BS3&4C_L2_S1
1032.1	50.352	51.970	1.916	12.596	11.474	6.868	10.770	2.977	1.429	98.382	BS3&4C_L2_S1
952.1	50.147	52.298	2.015	12.476	11.368	6.768	10.747	2.938	1.391	97.850	BS3&4C_L2_S1
872.1	50.151	51.878	1.944	12.559	11.468	6.906	10.792	3.032	1.420	98.273	BS3&4C_L2_S1
792.1	50.069	52.065	1.954	12.379	11.552	6.881	10.741	2.999	1.427	98.004	BS3&4C_L2_S1
712.1	50.181	51.880	1.984	12.611	11.535	6.885	10.707	3.005	1.393	98.300	BS3&4C_L2_S1
632.1	49.943	52.073	1.981	12.537	11.362	6.912	10.763	2.962	1.410	97.870	BS3&4C_L2_S1
552.1	50.132	51.737	1.970	12.591	11.556	6.930	10.751	3.023	1.442	98.396	BS3&4C_L2_S1
472.1	50.256	51.918	1.938	12.768	11.455	6.808	10.687	3.017	1.410	98.338	BS3&4C_L2_S1
392.1	50.264	51.820	1.925	12.747	11.517	6.848	10.690	3.052	1.402	98.443	BS3&4C_L2_S2
352.1	50.183	52.003	1.942	12.572	11.580	6.844	10.662	2.974	1.423	98.180	BS3&4C_L2_S2
312.1	49.969	52.073	1.898	12.511	11.507	6.862	10.691	3.039	1.419	97.896	BS3&4C_L2_S2
272.1	50.366	51.936	1.998	12.502	11.546	6.868	10.707	3.011	1.432	98.430	BS3&4C_L2_S2
232.1	50.296	52.210	1.917	12.471	11.539	6.915	10.568	2.936	1.445	98.086	BS3&4C_L2_S2
192.1	50.288	51.697	1.945	12.672	11.508	6.920	10.717	3.078	1.463	98.591	BS3&4C_L2_S2

112.1	50.083	51.490	1.945	12.960	11.478	6.989	10.603	3.087	1.450	98.594	BS3&4C_L2_S2
72.1	49.755	51.329	1.986	13.160	11.525	6.909	10.646	3.000	1.445	98.426	BS3&4C_L2_S2
32.1	49.216	50.907	2.011	13.624	11.438	6.802	10.664	3.124	1.430	98.309	BS3&4C_L2_S2
-7.9	48.524	50.378	2.001	14.038	11.560	6.862	10.721	3.023	1.418	98.146	BS3&4C_L2_S2
-47.9	47.912	49.973	1.989	14.558	11.598	6.741	10.735	3.029	1.377	97.939	BS3&4C_L2_S2
-87.9	47.547	49.737	2.029	14.970	11.399	6.796	10.738	2.969	1.362	97.811	BS3&4C_L2_S2
-127.9	47.251	49.243	1.994	15.188	11.519	6.893	10.788	3.000	1.376	98.008	BS3&4C_L2_S2
-167.9	47.218	49.065	1.962	15.338	11.614	6.830	10.759	3.041	1.391	98.153	BS3&4C_L2_S2
-207.9	47.229	49.175	1.935	15.397	11.426	6.845	10.798	3.044	1.380	98.054	BS3&4C_L2_S2
-247.9	47.215	49.132	1.906	15.435	11.533	6.890	10.693	3.029	1.382	98.084	BS3&4C_L2_S2
-287.9	47.312	49.175	1.935	15.295	11.445	6.903	10.765	3.084	1.400	98.138	BS3&4C_L2_S2
-327.9	47.301	49.232	1.997	15.376	11.518	6.774	10.704	3.028	1.371	98.070	BS3&4C_L2_S2
-407.9	47.441	49.473	1.901	15.316	11.430	6.896	10.624	2.990	1.370	97.968	BS3&4C_L2_S2
-447.9	47.426	49.059	1.937	15.492	11.560	6.780	10.734	3.051	1.387	98.367	BS3&4C_L2_S2
-487.9	47.359	49.320	1.881	15.298	11.492	6.853	10.630	3.127	1.398	98.039	BS3&4C_L2_S2
-527.9	47.471	49.070	1.941	15.389	11.597	6.946	10.625	3.016	1.416	98.400	BS3&4C_L2_S2
-567.9	47.358	49.046	1.953	15.582	11.522	6.896	10.619	2.982	1.402	98.312	BS3&4C_L2_S2
-607.9	47.399	49.466	1.972	15.242	11.405	6.840	10.607	3.041	1.426	97.933	BS3&4C_L2_S2
-687.9	47.387	49.065	1.910	15.367	11.654	6.878	10.684	3.032	1.410	98.322	BS3&4C_L2_S3
-767.9	47.374	48.989	2.052	15.301	11.706	6.940	10.571	3.013	1.429	98.386	BS3&4C_L2_S3
-847.9	47.357	49.063	1.975	15.371	11.615	6.949	10.608	3.006	1.414	98.294	BS3&4C_L2_S3
-927.9	47.397	49.203	2.024	15.360	11.612	6.814	10.603	2.970	1.415	98.193	BS3&4C_L2_S3
1472.1	50.828	51.992	1.942	12.617	11.533	6.817	10.761	2.937	1.403	98.837	BS3&4C_L3_S1
1392.1	50.358	51.779	1.977	12.520	11.608	6.927	10.778	2.999	1.413	98.580	BS3&4C_L3_S1
1312.1	50.418	51.923	2.008	12.550	11.575	6.838	10.800	2.914	1.393	98.495	BS3&4C_L3_S1
1232.1	50.407	51.879	1.918	12.621	11.574	6.846	10.771	2.999	1.394	98.528	BS3&4C_L3_S1
1152.1	50.055	51.498	1.961	12.589	11.739	6.957	10.837	2.994	1.426	98.557	BS3&4C_L3_S1
992.1	50.310	51.736	1.974	12.668	11.664	6.871	10.745	2.949	1.393	98.574	BS3&4C_L3_S1
912.1	50.119	51.773	1.983	12.450	11.713	6.863	10.816	2.989	1.414	98.346	BS3&4C_L3_S1
832.1	50.129	51.872	1.926	12.502	11.620	6.896	10.790	2.989	1.406	98.258	BS3&4C_L3_S1
752.1	50.136	52.036	1.915	12.559	11.664	6.816	10.721	2.906	1.384	98.100	BS3&4C_L3_S1
672.1	50.125	51.589	1.986	12.691	11.692	6.857	10.754	3.011	1.421	98.537	BS3&4C_L3_S1
592.1	50.011	51.758	1.915	12.449	11.659	7.033	10.755	3.020	1.411	98.253	BS3&4C_L3_S1
512.1	50.348	51.777	1.946	12.499	11.695	6.849	10.817	3.005	1.412	98.571	BS3&4C_L3_S1
432.1	50.467	51.669	1.950	12.520	11.671	6.995	10.772	2.979	1.444	98.797	BS3&4C_L3_S2
392.1	50.329	51.781	1.918	12.453	11.640	6.938	10.787	3.071	1.412	98.548	BS3&4C_L3_S2
352.1	50.300	51.895	1.978	12.563	11.491	6.918	10.764	2.971	1.419	98.404	BS3&4C_L3_S2
312.1	50.269	51.789	1.938	12.650	11.584	6.920	10.687	3.010	1.422	98.480	BS3&4C_L3_S2
192.1	50.273	51.726	1.953	12.752	11.622	6.853	10.612	3.050	1.432	98.547	BS3&4C_L3_S2
152.1	50.178	51.979	1.984	12.559	11.651	6.778	10.643	2.973	1.433	98.199	BS3&4C_L3_S2
112.1	50.001	51.759	1.943	12.714	11.581	6.892	10.648	3.048	1.416	98.242	BS3&4C_L3_S2
72.1	49.673	51.443	2.058	12.990	11.506	6.973	10.551	3.032	1.449	98.230	BS3&4C_L3_S2
32.1	49.214	51.187	1.968	13.494	11.504	6.904	10.592	2.915	1.437	98.027	BS3&4C_L3_S2
-7.9	48.840	50.270	1.913	14.167	11.598	6.889	10.708	3.047	1.408	98.570	BS3&4C_L3_S2
-47.9	48.231	49.812	2.027	14.642	11.431	6.871	10.750	3.047	1.421	98.419	BS3&4C_L3_S2
-87.9	48.078	49.470	1.984	15.152	11.426	6.875	10.724	3.000	1.370	98.609	BS3&4C_L3_S2
-127.9	47.693	49.365	2.037	15.236	11.478	6.723	10.716	3.055	1.390	98.329	BS3&4C_L3_S2
-207.9	47.682	49.264	1.931	15.528	11.447	6.823	10.641	2.992	1.375	98.418	BS3&4C_L3_S2
-247.9	47.520	48.891	1.974	15.496	11.482	6.946	10.758	3.026	1.427	98.628	BS3&4C_L3_S2
-327.9	47.384	49.251	2.043	15.317	11.389	6.924	10.645	3.013	1.418	98.134	BS3&4C_L3_S2
-367.9	47.188	49.504	1.996	15.274	11.425	6.736	10.635	3.032	1.399	97.685	BS3&4C_L3_S2
-407.9	47.356	49.358	1.966	15.462	11.429	6.776	10.538	3.071	1.400	97.997	BS3&4C_L3_S2
-487.9	47.349	49.108	2.028	15.574	11.475	6.842	10.540	3.014	1.420	98.241	BS3&4C_L3_S2
-527.9	47.397	49.215	1.922	15.594	11.397	6.763	10.589	3.081	1.438	98.182	BS3&4C_L3_S2
-567.9	47.571	49.200	2.036	15.489	11.313	6.799	10.610	3.118	1.436	98.371	BS3&4C_L3_S2
-647.9	47.654	49.288	1.978	15.522	11.408	6.759	10.509	3.114	1.422	98.366	BS3&4C_L3_S3
-727.9	47.351	49.073	1.928	15.483	11.651	6.823	10.540	3.069	1.434	98.278	BS3&4C_L3_S3
-807.9	46.976	49.354	2.011	15.596	11.359	6.740	10.493	3.015	1.432	97.622	BS3&4C_L3_S3
-887.9	47.263	49.108	2.041	15.525	11.495	6.845	10.534	3.027	1.426	98.154	BS3&4C_L3_S3
-967.9	47.249	49.437	1.985	15.311	11.390	6.865	10.536	3.040	1.435	97.812	BS3&4C_L3_S3

Table C22. BS5&6C

X(μm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
1025.6	51.261	52.089	2.043	14.022	9.940	6.593	10.558	3.223	1.532	99.173	BS5&6C_L1_S1
945.6	51.383	52.119	1.993	13.984	9.979	6.609	10.536	3.217	1.562	99.265	BS5&6C_L1_S1
865.6	51.478	52.121	2.049	14.003	9.882	6.539	10.610	3.253	1.543	99.357	BS5&6C_L1_S1
785.6	51.477	52.249	1.890	14.018	9.968	6.511	10.558	3.262	1.544	99.228	BS5&6C_L1_S1
705.6	51.479	52.064	2.060	13.861	9.875	6.695	10.643	3.251	1.552	99.415	BS5&6C_L1_S1
625.6	51.347	52.023	1.982	13.896	9.982	6.582	10.565	3.396	1.576	99.324	BS5&6C_L1_S1
545.6	51.339	52.339	1.973	13.913	9.917	6.479	10.480	3.331	1.568	99.000	BS5&6C_L1_S1
475.6	51.495	52.179	2.021	13.858	10.100	6.491	10.514	3.270	1.566	99.316	BS5&6C_L1_S2
435.6	51.493	51.965	2.007	14.006	9.997	6.498	10.594	3.343	1.590	99.528	BS5&6C_L1_S2
395.6	51.433	51.610	1.968	13.999	10.310	6.636	10.548	3.335	1.594	99.822	BS5&6C_L1_S2
355.6	51.291	51.861	1.925	14.015	10.125	6.584	10.524	3.360	1.606	99.431	BS5&6C_L1_S2
315.6	51.369	51.818	1.999	13.909	10.150	6.633	10.527	3.369	1.596	99.550	BS5&6C_L1_S2
275.6	51.221	52.181	1.935	13.901	10.188	6.479	10.359	3.347	1.611	99.040	BS5&6C_L1_S2
235.6	51.460	51.880	1.958	13.932	10.263	6.504	10.505	3.359	1.600	99.580	BS5&6C_L1_S2
195.6	51.288	52.030	1.894	13.896	10.301	6.420	10.430	3.387	1.643	99.258	BS5&6C_L1_S2
155.6	51.011	51.931	1.933	13.900	10.453	6.480	10.403	3.275	1.625	99.079	BS5&6C_L1_S2
115.6	51.083	51.820	1.849	13.968	10.744	6.383	10.273	3.342	1.621	99.263	BS5&6C_L1_S2
75.6	50.697	51.543	1.887	13.937	10.816	6.436	10.437	3.364	1.580	99.154	BS5&6C_L1_S2
35.6	50.228	50.852	1.903	14.113	11.237	6.501	10.555	3.264	1.577	99.376	BS5&6C_L1_S2
-4.4	49.487	50.374	1.955	13.976	11.615	6.697	10.673	3.205	1.505	99.112	BS5&6C_L1_S2
-44.4	49.233	49.899	2.038	14.032	12.024	6.680	10.749	3.108	1.469	99.334	BS5&6C_L1_S2
-84.4	48.789	49.461	2.053	14.000	12.441	6.728	10.766	3.099	1.452	99.328	BS5&6C_L1_S2
-124.4	48.741	49.394	1.990	13.974	12.449	6.887	10.839	3.041	1.426	99.347	BS5&6C_L1_S2
-164.4	48.350	49.534	1.980	13.984	12.466	6.757	10.767	3.079	1.433	98.816	BS5&6C_L1_S2
-204.4	48.632	48.964	2.012	14.022	12.854	6.839	10.812	3.059	1.440	99.669	BS5&6C_L1_S2
-244.4	48.454	49.383	2.066	13.869	12.762	6.758	10.735	2.970	1.457	99.071	BS5&6C_L1_S2
-284.4	48.576	49.440	1.954	13.963	12.775	6.713	10.698	3.015	1.442	99.135	BS5&6C_L1_S2
-324.4	48.176	49.389	1.928	13.831	12.929	6.707	10.610	3.128	1.478	98.788	BS5&6C_L1_S2
-364.4	48.459	49.206	2.034	13.873	12.985	6.683	10.634	3.075	1.509	99.253	BS5&6C_L1_S2
-404.4	48.338	49.339	2.060	13.849	12.873	6.735	10.654	3.061	1.429	98.999	BS5&6C_L1_S2
-444.4	48.508	49.351	1.947	13.828	12.938	6.781	10.677	3.017	1.462	99.157	BS5&6C_L1_S2
-484.4	48.293	49.096	1.984	13.891	13.057	6.826	10.635	3.047	1.466	99.197	BS5&6C_L1_S2
-524.4	48.367	49.026	1.985	13.875	13.133	6.801	10.693	3.054	1.434	99.341	BS5&6C_L1_S2
-604.4	48.018	48.991	2.029	13.888	13.164	6.750	10.634	3.064	1.480	99.027	BS5&6C_L1_S3
-684.4	48.212	49.127	2.041	13.853	13.155	6.738	10.549	3.094	1.443	99.085	BS5&6C_L1_S3
-764.4	48.259	49.320	1.911	13.801	13.012	6.753	10.665	3.066	1.472	98.939	BS5&6C_L1_S3
-844.4	48.121	48.918	1.955	13.837	13.292	6.874	10.666	3.019	1.439	99.203	BS5&6C_L1_S3
-924.4	48.277	49.128	1.949	13.820	13.199	6.791	10.612	3.034	1.467	99.149	BS5&6C_L1_S3
-1004.4	48.521	49.306	1.986	13.783	13.108	6.722	10.569	3.063	1.464	99.215	BS5&6C_L1_S3
-1084.4	48.323	48.965	2.005	13.912	13.172	6.743	10.724	3.005	1.474	99.358	BS5&6C_L1_S3
-1164.4	48.482	49.139	2.005	13.860	13.093	6.668	10.718	3.042	1.476	99.343	BS5&6C_L1_S3
-1244.4	48.365	49.362	1.962	13.784	13.055	6.724	10.601	3.038	1.475	99.003	BS5&6C_L1_S3
-1324.4	48.509	49.132	2.023	13.967	13.025	6.676	10.636	3.045	1.497	99.377	BS5&6C_L1_S3
1065.6	51.579	52.233	1.957	14.072	9.809	6.558	10.595	3.239	1.537	99.345	BS5&6C_L2_S1
985.6	51.364	52.364	1.973	13.790	9.908	6.655	10.560	3.216	1.534	98.999	BS5&6C_L2_S1
905.6	51.456	52.523	1.989	13.931	9.815	6.470	10.490	3.224	1.559	98.933	BS5&6C_L2_S1
825.6	51.461	52.573	2.031	13.882	9.786	6.486	10.496	3.192	1.554	98.888	BS5&6C_L2_S1
745.6	51.666	52.285	1.949	13.829	9.968	6.638	10.493	3.326	1.513	99.381	BS5&6C_L2_S1
665.6	51.681	52.272	1.979	14.035	9.861	6.528	10.508	3.230	1.587	99.409	BS5&6C_L2_S1
585.6	51.660	52.118	1.988	13.820	10.062	6.609	10.543	3.306	1.555	99.542	BS5&6C_L2_S1
505.6	51.247	52.018	1.945	13.966	10.072	6.618	10.527	3.317	1.537	99.228	BS5&6C_L2_S1
425.6	51.276	52.329	1.923	13.861	10.084	6.420	10.526	3.281	1.577	98.947	BS5&6C_L2_S2
345.6	51.441	52.035	1.967	13.853	10.185	6.503	10.541	3.328	1.588	99.406	BS5&6C_L2_S2
305.6	51.039	52.080	2.001	13.855	10.190	6.472	10.431	3.375	1.597	98.959	BS5&6C_L2_S2
265.6	51.090	51.890	1.978	13.970	10.112	6.588	10.534	3.313	1.615	99.200	BS5&6C_L2_S2
225.6	51.375	51.792	1.982	13.907	10.290	6.484	10.516	3.416	1.613	99.583	BS5&6C_L2_S2
185.6	51.069	51.902	2.019	14.032	10.284	6.433	10.398	3.309	1.623	99.167	BS5&6C_L2_S2
145.6	51.265	51.897	1.870	13.925	10.542	6.319	10.406	3.389	1.652	99.368	BS5&6C_L2_S2
105.6	50.905	51.663	1.906	13.952	10.731	6.387	10.433	3.299	1.630	99.242	BS5&6C_L2_S2
65.6	50.649	51.208	1.930	13.992	11.009	6.535	10.417	3.298	1.612	99.442	BS5&6C_L2_S2
25.6	49.880	50.551	2.041	13.992	11.389	6.599	10.624	3.259	1.545	99.330	BS5&6C_L2_S2

-14.4	49.474	50.250	2.041	13.988	11.775	6.665	10.704	3.102	1.475	99.225	BS5&6C_L2_S2
-54.4	49.037	49.869	1.995	14.013	12.057	6.688	10.822	3.108	1.447	99.168	BS5&6C_L2_S2
-94.4	48.776	49.261	1.974	14.078	12.489	6.880	10.823	3.074	1.421	99.515	BS5&6C_L2_S2
-134.4	48.551	49.355	1.996	14.055	12.453	6.816	10.831	3.072	1.422	99.197	BS5&6C_L2_S2
-174.4	48.752	49.556	1.968	13.883	12.619	6.738	10.743	3.049	1.444	99.196	BS5&6C_L2_S2
-214.4	48.746	49.451	1.991	13.854	12.667	6.795	10.736	3.052	1.455	99.295	BS5&6C_L2_S2
-254.4	48.694	49.256	1.999	13.926	12.766	6.813	10.812	2.974	1.454	99.438	BS5&6C_L2_S2
-294.4	48.446	49.305	2.003	14.048	12.729	6.688	10.686	3.091	1.451	99.141	BS5&6C_L2_S2
-334.4	48.473	49.272	2.054	13.816	12.952	6.780	10.639	3.009	1.479	99.201	BS5&6C_L2_S2
-374.4	48.598	49.016	2.048	13.877	13.151	6.780	10.658	3.016	1.455	99.582	BS5&6C_L2_S2
-414.4	48.211	49.379	2.022	13.796	12.858	6.756	10.614	3.069	1.507	98.832	BS5&6C_L2_S2
-454.4	48.577	49.077	1.968	13.841	13.212	6.770	10.605	3.027	1.500	99.500	BS5&6C_L2_S2
-494.4	48.448	49.095	1.951	13.843	13.059	6.886	10.643	3.037	1.488	99.353	BS5&6C_L2_S2
-534.4	48.513	48.868	2.041	14.027	13.144	6.732	10.669	3.042	1.478	99.646	BS5&6C_L2_S2
-574.4	48.470	49.040	1.915	13.972	13.157	6.740	10.649	3.048	1.478	99.431	BS5&6C_L2_S2
-654.4	48.396	49.142	2.026	13.953	13.029	6.742	10.615	3.016	1.478	99.254	BS5&6C_L2_S3
-734.4	48.406	49.216	1.978	13.766	13.190	6.708	10.604	3.061	1.477	99.190	BS5&6C_L2_S3
-814.4	48.447	49.065	1.978	13.664	13.294	6.805	10.652	3.088	1.455	99.383	BS5&6C_L2_S3
-894.4	48.540	49.249	1.949	13.790	13.136	6.741	10.664	3.026	1.446	99.291	BS5&6C_L2_S3
-974.4	48.456	49.253	1.939	13.788	13.092	6.773	10.647	3.051	1.457	99.203	BS5&6C_L2_S3
-1054.4	48.497	48.943	2.033	13.821	13.276	6.737	10.670	3.056	1.464	99.554	BS5&6C_L2_S3
-1134.4	48.537	49.054	2.077	13.806	13.165	6.733	10.616	3.064	1.486	99.483	BS5&6C_L2_S3
-1214.4	48.178	49.295	2.014	13.675	13.155	6.691	10.629	3.100	1.441	98.883	BS5&6C_L2_S3
-1294.4	48.196	49.082	1.985	13.876	13.182	6.724	10.617	3.079	1.457	99.114	BS5&6C_L2_S3
1095.6	51.551	52.112	2.002	13.947	10.029	6.594	10.617	3.174	1.526	99.439	BS5&6C_L3_S1
1015.6	51.469	52.030	1.984	13.878	10.091	6.651	10.593	3.213	1.561	99.439	BS5&6C_L3_S1
935.6	51.693	51.851	1.899	13.961	10.084	6.741	10.646	3.266	1.552	99.841	BS5&6C_L3_S1
855.6	51.514	52.134	1.993	13.947	9.903	6.628	10.649	3.192	1.554	99.381	BS5&6C_L3_S1
775.6	51.453	52.289	1.931	13.810	10.048	6.529	10.529	3.300	1.563	99.163	BS5&6C_L3_S1
695.6	51.546	52.028	2.053	14.028	9.937	6.482	10.646	3.271	1.554	99.518	BS5&6C_L3_S1
615.6	51.468	52.368	1.961	13.787	10.025	6.482	10.546	3.250	1.583	99.100	BS5&6C_L3_S1
535.6	51.463	52.104	1.928	13.877	10.118	6.583	10.531	3.303	1.557	99.359	BS5&6C_L3_S1
455.6	51.288	52.340	1.906	13.779	10.043	6.566	10.551	3.250	1.566	98.948	BS5&6C_L3_S2
415.6	51.340	52.296	1.971	13.775	10.166	6.421	10.509	3.262	1.600	99.044	BS5&6C_L3_S2
375.6	51.361	51.997	1.957	13.842	10.252	6.489	10.529	3.360	1.576	99.365	BS5&6C_L3_S2
335.6	51.274	51.809	2.006	13.928	10.188	6.531	10.581	3.357	1.600	99.465	BS5&6C_L3_S2
295.6	51.287	52.086	1.956	13.766	10.316	6.437	10.509	3.337	1.594	99.202	BS5&6C_L3_S2
255.6	51.465	52.073	1.940	13.728	10.401	6.409	10.475	3.387	1.588	99.392	BS5&6C_L3_S2
215.6	51.287	51.753	1.944	13.963	10.347	6.506	10.508	3.369	1.610	99.535	BS5&6C_L3_S2
175.6	51.129	51.889	1.959	13.882	10.515	6.443	10.398	3.304	1.610	99.239	BS5&6C_L3_S2
135.6	51.258	51.753	1.943	13.922	10.524	6.537	10.368	3.363	1.592	99.505	BS5&6C_L3_S2
95.6	50.987	51.569	1.954	13.938	10.713	6.433	10.383	3.359	1.651	99.418	BS5&6C_L3_S2
55.6	50.787	51.533	1.836	13.850	10.937	6.569	10.363	3.285	1.628	99.254	BS5&6C_L3_S2
15.6	50.226	50.932	1.989	13.864	11.286	6.632	10.497	3.245	1.556	99.294	BS5&6C_L3_S2
-24.4	49.483	50.419	1.979	13.865	11.882	6.572	10.697	3.086	1.500	99.064	BS5&6C_L3_S2
-64.4	49.222	49.919	2.022	13.984	12.048	6.756	10.732	3.081	1.458	99.304	BS5&6C_L3_S2
-104.4	48.885	49.577	1.997	13.929	12.449	6.849	10.781	3.026	1.393	99.308	BS5&6C_L3_S2
-144.4	48.573	49.461	2.058	13.850	12.508	6.771	10.778	3.093	1.482	99.112	BS5&6C_L3_S2
-184.4	48.686	49.439	1.978	13.837	12.582	6.810	10.859	3.056	1.439	99.246	BS5&6C_L3_S2
-224.4	48.488	49.441	1.941	13.848	12.805	6.787	10.743	3.013	1.423	99.048	BS5&6C_L3_S2
-264.4	48.281	49.156	2.031	13.849	12.977	6.808	10.706	3.028	1.446	99.125	BS5&6C_L3_S2
-304.4	48.459	49.091	2.000	13.906	12.997	6.826	10.721	3.049	1.409	99.368	BS5&6C_L3_S2
-344.4	48.307	49.555	1.991	13.885	12.687	6.756	10.658	3.007	1.461	98.752	BS5&6C_L3_S2
-384.4	48.414	49.272	1.957	13.826	13.021	6.695	10.730	3.033	1.466	99.142	BS5&6C_L3_S2
-424.4	48.402	49.259	1.963	13.835	13.069	6.689	10.640	3.068	1.478	99.143	BS5&6C_L3_S2
-464.4	48.353	49.398	2.018	13.775	12.943	6.754	10.640	3.036	1.436	98.954	BS5&6C_L3_S2
-504.4	48.416	49.103	2.035	13.911	13.068	6.729	10.660	3.040	1.454	99.313	BS5&6C_L3_S2
-544.4	48.346	49.229	2.059	13.743	13.098	6.715	10.651	3.042	1.464	99.118	BS5&6C_L3_S2
-624.4	48.420	49.356	1.953	13.680	13.067	6.806	10.615	3.077	1.446	99.064	BS5&6C_L3_S3
-704.4	48.546	49.226	1.943	13.902	13.017	6.792	10.633	3.005	1.484	99.321	BS5&6C_L3_S3
-784.4	48.479	49.145	2.031	13.915	13.142	6.730	10.581	3.030	1.426	99.333	BS5&6C_L3_S3
-864.4	48.199	48.964	1.986	13.743	13.175	6.806	10.742	3.112	1.473	99.235	BS5&6C_L3_S3
-944.4	48.501	49.158	1.994	13.755	13.142	6.746	10.663	3.066	1.476	99.343	BS5&6C_L3_S3

-1024.4	48.304	48.974	1.932	13.772	13.311	6.805	10.658	3.078	1.471	99.330	BS5&6C_L3_S3
-1104.4	48.477	49.310	2.061	13.741	13.130	6.652	10.674	2.996	1.437	99.167	BS5&6C_L3_S3
-1184.4	48.482	49.070	2.026	13.714	13.153	6.781	10.719	3.064	1.474	99.412	BS5&6C_L3_S3
-1264.4	48.276	49.227	2.013	13.877	13.001	6.695	10.591	3.110	1.487	99.049	BS5&6C_L3_S3

Table C23. BS7&8C

X(μm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
1385.6	50.832	51.947	2.016	13.976	11.522	5.414	10.759	3.003	1.364	98.885	BS7&8C_L1_S1
1305.6	50.672	51.958	2.002	13.995	11.501	5.428	10.810	2.946	1.362	98.714	BS7&8C_L1_S1
1225.6	50.674	51.801	2.058	14.037	11.622	5.354	10.773	3.005	1.350	98.872	BS7&8C_L1_S1
1145.6	50.360	51.654	2.056	14.079	11.670	5.372	10.800	2.998	1.370	98.706	BS7&8C_L1_S1
1065.6	50.187	51.670	2.002	14.088	11.594	5.390	10.858	3.024	1.374	98.517	BS7&8C_L1_S1
985.6	50.461	51.699	1.990	14.152	11.563	5.396	10.769	3.054	1.378	98.762	BS7&8C_L1_S2
905.6	50.320	51.928	1.978	14.018	11.589	5.323	10.821	3.002	1.341	98.392	BS7&8C_L1_S2
825.6	50.694	51.659	2.101	14.173	11.575	5.320	10.762	3.069	1.342	99.035	BS7&8C_L1_S2
745.6	50.530	52.208	1.992	13.970	11.381	5.283	10.762	3.043	1.362	98.322	BS7&8C_L1_S2
665.6	50.627	52.083	1.929	13.934	11.607	5.349	10.642	3.103	1.354	98.544	BS7&8C_L1_S2
585.6	50.499	52.079	1.929	14.036	11.536	5.295	10.674	3.065	1.386	98.420	BS7&8C_L1_S2
505.6	50.068	51.698	2.125	14.207	11.513	5.324	10.652	3.125	1.356	98.370	BS7&8C_L1_S3
465.6	50.536	51.903	2.069	14.030	11.368	5.369	10.742	3.180	1.339	98.633	BS7&8C_L1_S3
425.6	50.574	51.690	2.000	14.164	11.560	5.332	10.694	3.174	1.387	98.884	BS7&8C_L1_S3
385.6	50.078	51.809	1.934	14.119	11.478	5.411	10.749	3.127	1.373	98.268	BS7&8C_L1_S3
345.6	50.739	51.985	2.010	14.060	11.302	5.397	10.656	3.201	1.389	98.754	BS7&8C_L1_S3
305.6	50.549	51.817	1.980	13.929	11.481	5.492	10.644	3.213	1.444	98.732	BS7&8C_L1_S3
265.6	50.727	51.931	2.037	14.070	11.337	5.402	10.582	3.217	1.423	98.796	BS7&8C_L1_S3
225.6	50.653	51.824	1.957	14.022	11.426	5.553	10.581	3.181	1.456	98.829	BS7&8C_L1_S3
185.6	50.531	51.830	2.027	14.104	11.100	5.674	10.545	3.235	1.484	98.700	BS7&8C_L1_S3
105.6	50.843	51.758	2.048	13.948	10.989	5.962	10.460	3.287	1.546	99.084	BS7&8C_L1_S3
65.6	50.599	51.565	1.990	13.948	11.120	6.143	10.421	3.270	1.542	99.034	BS7&8C_L1_S3
25.6	49.900	50.757	1.969	14.272	11.246	6.446	10.632	3.213	1.465	99.143	BS7&8C_L1_S3
-14.4	48.903	50.567	2.045	14.004	11.304	6.851	10.710	3.078	1.441	98.336	BS7&8C_L1_S3
-54.4	48.839	49.781	2.124	14.014	11.574	7.204	10.887	3.031	1.386	99.058	BS7&8C_L1_S3
-94.4	48.356	49.636	1.963	14.075	11.831	7.418	10.847	2.891	1.339	98.720	BS7&8C_L1_S3
-134.4	48.006	49.349	2.076	13.972	11.829	7.643	10.829	2.944	1.359	98.657	BS7&8C_L1_S3
-174.4	48.166	49.180	2.093	14.144	11.752	7.765	10.789	2.882	1.395	98.987	BS7&8C_L1_S3
-214.4	48.487	49.334	2.024	13.951	11.639	7.901	10.779	2.986	1.386	99.153	BS7&8C_L1_S3
-254.4	48.240	49.462	1.975	14.063	11.365	7.996	10.728	2.967	1.444	98.778	BS7&8C_L1_S3
-294.4	48.362	49.745	2.032	13.921	11.272	7.978	10.611	2.992	1.450	98.617	BS7&8C_L1_S3
-334.4	48.340	49.740	1.965	13.913	11.331	7.935	10.715	2.933	1.469	98.600	BS7&8C_L1_S3
-374.4	48.159	49.381	2.032	14.091	11.439	7.968	10.621	2.965	1.502	98.778	BS7&8C_L1_S3
-414.4	48.597	49.345	1.971	13.948	11.534	8.142	10.598	2.994	1.468	99.252	BS7&8C_L1_S3
-454.4	48.282	49.315	1.969	13.981	11.397	8.234	10.539	3.028	1.536	98.966	BS7&8C_L1_S3
-534.4	48.509	49.207	2.070	14.031	11.429	8.173	10.566	3.025	1.500	99.302	BS7&8C_L1_S4
-614.4	48.578	49.597	1.999	13.917	11.253	8.082	10.601	3.047	1.503	98.981	BS7&8C_L1_S4
-694.4	48.099	49.487	1.971	13.973	11.320	8.137	10.511	3.078	1.522	98.611	BS7&8C_L1_S4
-774.4	48.360	49.589	2.017	13.976	11.309	8.070	10.514	3.027	1.498	98.771	BS7&8C_L1_S4
-934.4	48.710	49.420	1.958	14.031	11.274	8.112	10.522	3.143	1.540	99.290	BS7&8C_L1_S4
-1014.4	48.839	49.211	1.982	14.058	11.366	8.150	10.583	3.113	1.537	99.628	BS7&8C_L1_S4
-1094.4	48.708	49.641	1.902	13.941	11.309	8.063	10.544	3.101	1.499	99.067	BS7&8C_L1_S4
-1174.4	48.785	49.546	1.914	13.924	11.361	8.049	10.510	3.147	1.548	99.239	BS7&8C_L1_S4
-1254.4	48.557	49.778	1.999	13.806	11.247	8.027	10.507	3.113	1.523	98.779	BS7&8C_L1_S4
-1334.4	48.810	49.653	2.036	13.939	11.339	7.938	10.400	3.170	1.525	99.157	BS7&8C_L1_S4
-1414.4	48.607	49.600	1.979	13.929	11.321	7.957	10.487	3.185	1.543	99.007	BS7&8C_L1_S4
1335.6	50.730	51.884	1.989	13.958	11.630	5.470	10.702	3.005	1.363	98.846	BS7&8C_L2_S1
1255.6	50.881	51.800	2.009	14.140	11.537	5.401	10.772	3.002	1.339	99.081	BS7&8C_L2_S1
1175.6	50.704	52.044	1.948	14.012	11.643	5.360	10.668	2.997	1.329	98.659	BS7&8C_L2_S1
1095.6	50.506	51.975	1.937	13.935	11.656	5.349	10.732	3.065	1.352	98.531	BS7&8C_L2_S1
1015.6	50.631	51.895	2.022	14.075	11.598	5.385	10.742	2.936	1.347	98.736	BS7&8C_L2_S1
855.6	50.844	51.799	1.909	14.151	11.591	5.330	10.763	3.103	1.354	99.044	BS7&8C_L2_S2
775.6	50.754	51.559	2.085	14.144	11.581	5.350	10.761	3.130	1.390	99.196	BS7&8C_L2_S2
695.6	50.850	51.978	2.011	14.064	11.449	5.390	10.697	3.052	1.359	98.873	BS7&8C_L2_S2
615.6	50.706	52.290	1.962	13.831	11.468	5.360	10.643	3.093	1.353	98.416	BS7&8C_L2_S2
535.6	50.926	51.746	2.007	14.251	11.369	5.332	10.752	3.166	1.377	99.181	BS7&8C_L2_S2
455.6	50.741	51.809	2.014	14.116	11.403	5.384	10.716	3.195	1.363	98.932	BS7&8C_L2_S3
415.6	50.695	51.717	1.993	14.053	11.553	5.380	10.793	3.167	1.345	98.977	BS7&8C_L2_S3
375.6	50.999	51.966	2.017	13.979	11.342	5.404	10.728	3.177	1.388	99.033	BS7&8C_L2_S3
335.6	51.119	51.694	2.049	14.055	11.518	5.436	10.685	3.165	1.400	99.425	BS7&8C_L2_S3
295.6	50.918	51.687	2.094	14.066	11.390	5.523	10.653	3.191	1.396	99.231	BS7&8C_L2_S3

255.6	50.923	51.752	2.038	14.089	11.424	5.433	10.628	3.177	1.459	99.171	BS7&8C_L2_S3
215.6	50.995	52.049	2.067	13.962	11.134	5.448	10.634	3.248	1.460	98.946	BS7&8C_L2_S3
175.6	51.003	51.598	2.015	13.983	11.291	5.699	10.616	3.344	1.454	99.404	BS7&8C_L2_S3
135.6	50.942	52.111	1.945	13.882	10.996	5.768	10.486	3.295	1.518	98.832	BS7&8C_L2_S3
95.6	51.065	51.811	1.985	14.002	11.004	6.000	10.428	3.223	1.548	99.254	BS7&8C_L2_S3
55.6	50.771	51.482	1.947	13.885	11.225	6.261	10.441	3.228	1.531	99.290	BS7&8C_L2_S3
15.6	49.918	50.716	2.007	14.000	11.351	6.647	10.652	3.184	1.442	99.201	BS7&8C_L2_S3
-24.4	49.637	50.188	2.047	14.081	11.478	6.942	10.807	3.058	1.400	99.449	BS7&8C_L2_S3
-64.4	48.848	50.220	2.036	13.997	11.488	7.154	10.838	2.905	1.364	98.628	BS7&8C_L2_S3
-104.4	48.454	49.420	2.069	14.015	11.820	7.453	10.906	2.964	1.354	99.034	BS7&8C_L2_S3
-144.4	48.509	49.337	2.052	14.123	11.651	7.780	10.772	2.906	1.380	99.172	BS7&8C_L2_S3
-184.4	48.576	49.609	2.027	14.043	11.475	7.734	10.799	2.914	1.399	98.967	BS7&8C_L2_S3
-224.4	48.355	49.467	2.078	14.147	11.517	7.802	10.645	2.951	1.393	98.888	BS7&8C_L2_S3
-264.4	48.446	49.633	1.997	14.039	11.388	7.928	10.646	2.922	1.448	98.813	BS7&8C_L2_S3
-304.4	48.584	48.989	2.042	14.227	11.441	8.105	10.661	3.058	1.477	99.595	BS7&8C_L2_S3
-344.4	48.710	49.460	1.997	13.943	11.416	8.097	10.593	2.978	1.516	99.250	BS7&8C_L2_S3
-384.4	48.472	49.506	1.989	13.886	11.352	8.093	10.660	3.027	1.488	98.965	BS7&8C_L2_S3
-464.4	48.685	49.620	1.960	13.954	11.253	8.097	10.576	3.050	1.491	99.066	BS7&8C_L2_S3
-504.4	48.813	49.793	1.984	13.820	11.231	8.144	10.478	3.036	1.514	99.020	BS7&8C_L2_S3
-544.4	48.577	49.337	2.008	14.122	11.264	8.119	10.527	3.093	1.529	99.240	BS7&8C_L2_S3
-624.4	48.698	49.602	2.133	13.904	11.138	8.155	10.500	3.077	1.493	99.096	BS7&8C_L2_S4
-704.4	48.709	49.776	1.947	13.823	11.227	8.024	10.573	3.057	1.573	98.933	BS7&8C_L2_S4
-784.4	48.854	49.864	2.040	13.835	11.013	8.063	10.546	3.090	1.550	98.990	BS7&8C_L2_S4
-864.4	48.899	49.700	2.029	13.974	11.143	7.990	10.506	3.134	1.524	99.198	BS7&8C_L2_S4
-944.4	48.850	49.679	1.990	14.006	11.043	8.038	10.599	3.119	1.526	99.170	BS7&8C_L2_S4
-1024.4	48.845	49.721	1.989	14.057	11.018	8.054	10.494	3.157	1.511	99.124	BS7&8C_L2_S4
-1104.4	48.945	49.756	1.928	13.978	11.090	8.105	10.430	3.190	1.522	99.189	BS7&8C_L2_S4
-1184.4	48.888	50.051	1.969	13.863	11.054	7.950	10.470	3.114	1.530	98.837	BS7&8C_L2_S4
-1264.4	48.829	49.745	1.953	13.955	11.048	8.172	10.463	3.132	1.533	99.084	BS7&8C_L2_S4
-1344.4	49.218	49.715	1.908	14.002	11.189	7.981	10.499	3.201	1.505	99.504	BS7&8C_L2_S4
-1424.4	48.853	49.769	1.954	14.034	11.253	7.835	10.449	3.207	1.498	99.084	BS7&8C_L2_S4
1405.6	51.117	51.837	1.981	14.011	11.621	5.432	10.775	2.988	1.354	99.280	BS7&8C_L3_S1
1325.6	50.839	51.839	1.999	14.044	11.625	5.422	10.735	2.986	1.350	99.000	BS7&8C_L3_S1
1245.6	50.787	51.838	1.961	14.162	11.563	5.407	10.769	2.949	1.351	98.950	BS7&8C_L3_S1
1165.6	51.139	51.813	1.942	14.051	11.630	5.396	10.811	2.994	1.364	99.326	BS7&8C_L3_S1
1085.6	50.914	51.981	2.010	14.026	11.696	5.305	10.678	2.964	1.340	98.933	BS7&8C_L3_S1
1005.6	50.730	52.086	1.915	13.959	11.508	5.376	10.798	3.018	1.341	98.644	BS7&8C_L3_S2
925.6	51.222	51.884	1.959	14.069	11.611	5.409	10.669	3.016	1.383	99.338	BS7&8C_L3_S2
845.6	50.815	51.875	2.002	14.090	11.530	5.320	10.719	3.129	1.335	98.940	BS7&8C_L3_S2
765.6	50.928	52.097	1.982	13.916	11.496	5.316	10.708	3.125	1.361	98.831	BS7&8C_L3_S2
685.6	50.856	51.918	2.034	14.112	11.548	5.298	10.678	3.090	1.323	98.939	BS7&8C_L3_S2
605.6	50.882	51.924	1.998	14.000	11.586	5.299	10.699	3.142	1.354	98.958	BS7&8C_L3_S2
525.6	50.714	51.696	1.988	14.119	11.543	5.416	10.741	3.130	1.368	99.018	BS7&8C_L3_S3
485.6	50.753	51.535	2.004	14.101	11.540	5.390	10.831	3.235	1.364	99.218	BS7&8C_L3_S3
445.6	50.773	51.855	1.904	14.068	11.432	5.451	10.679	3.246	1.366	98.918	BS7&8C_L3_S3
405.6	50.763	51.793	2.032	14.148	11.454	5.372	10.664	3.190	1.347	98.970	BS7&8C_L3_S3
365.6	50.796	51.904	1.970	14.002	11.589	5.397	10.588	3.187	1.363	98.892	BS7&8C_L3_S3
325.6	51.003	51.681	2.090	14.037	11.413	5.397	10.740	3.230	1.414	99.323	BS7&8C_L3_S3
285.6	51.140	51.689	2.009	14.033	11.513	5.438	10.672	3.223	1.423	99.451	BS7&8C_L3_S3
245.6	51.103	51.932	2.005	13.968	11.276	5.450	10.662	3.268	1.439	99.172	BS7&8C_L3_S3
205.6	51.027	52.139	1.891	13.984	11.253	5.518	10.532	3.238	1.446	98.888	BS7&8C_L3_S3
165.6	51.108	52.007	2.030	13.948	11.065	5.646	10.521	3.311	1.472	99.101	BS7&8C_L3_S3
125.6	50.866	52.007	1.949	13.955	11.058	5.785	10.454	3.242	1.549	98.858	BS7&8C_L3_S3
85.6	50.954	51.805	1.885	14.014	11.012	6.065	10.475	3.232	1.512	99.149	BS7&8C_L3_S3
45.6	50.264	51.308	1.877	14.010	11.158	6.328	10.538	3.242	1.538	98.955	BS7&8C_L3_S3
5.6	49.680	50.724	1.940	14.043	11.515	6.660	10.597	3.052	1.469	98.955	BS7&8C_L3_S4
-34.4	49.094	50.064	2.114	13.881	11.769	7.030	10.737	3.033	1.372	99.030	BS7&8C_L3_S4
-74.4	48.748	49.752	2.023	13.999	11.743	7.279	10.857	3.008	1.340	98.996	BS7&8C_L3_S4
-114.4	48.561	49.450	2.018	13.884	11.829	7.593	10.858	2.998	1.369	99.111	BS7&8C_L3_S4
-154.4	48.692	49.157	2.036	13.968	11.919	7.735	10.855	2.941	1.389	99.534	BS7&8C_L3_S4
-194.4	48.708	49.150	1.968	14.003	11.930	7.817	10.743	2.986	1.404	99.558	BS7&8C_L3_S4
-234.4	48.458	49.528	1.886	13.790	11.846	7.803	10.710	3.007	1.431	98.931	BS7&8C_L3_S4
-274.4	48.301	49.353	1.979	14.107	11.547	7.936	10.722	2.933	1.424	98.948	BS7&8C_L3_S4

-314.4	48.651	49.084	2.043	14.118	11.558	7.947	10.730	3.028	1.492	99.567	BS7&8C_L3_S4
-354.4	48.433	49.314	1.968	14.006	11.532	8.101	10.589	2.965	1.527	99.120	BS7&8C_L3_S4
-394.4	48.360	49.640	1.940	13.944	11.530	7.950	10.520	2.980	1.496	98.720	BS7&8C_L3_S4
-434.4	48.424	49.870	1.926	13.790	11.381	8.037	10.548	2.937	1.512	98.554	BS7&8C_L3_S4
-474.4	48.251	49.289	1.916	14.034	11.558	8.077	10.609	3.005	1.514	98.962	BS7&8C_L3_S4
-554.4	48.540	49.243	2.046	14.055	11.380	8.143	10.556	3.069	1.508	99.296	BS7&8C_L3_S5
-634.4	48.496	49.543	1.985	13.877	11.414	8.003	10.563	3.106	1.509	98.953	BS7&8C_L3_S5
-714.4	48.179	49.491	1.910	13.906	11.334	8.115	10.595	3.111	1.538	98.688	BS7&8C_L3_S5
-794.4	48.453	49.268	1.992	14.177	11.471	7.973	10.474	3.115	1.529	99.185	BS7&8C_L3_S5
-874.4	48.503	49.285	1.968	13.983	11.567	8.101	10.553	3.046	1.497	99.218	BS7&8C_L3_S5
-954.4	48.465	49.250	2.033	13.930	11.498	8.071	10.496	3.157	1.568	99.215	BS7&8C_L3_S5
-1034.4	48.501	49.431	2.022	13.956	11.507	7.866	10.490	3.157	1.571	99.070	BS7&8C_L3_S5
-1114.4	48.512	49.408	2.017	13.817	11.421	8.062	10.574	3.143	1.560	99.104	BS7&8C_L3_S5
-1194.4	48.660	49.131	1.939	14.001	11.621	8.140	10.556	3.089	1.524	99.530	BS7&8C_L3_S5
-1274.4	48.776	49.394	2.023	13.779	11.587	8.073	10.480	3.126	1.538	99.382	BS7&8C_L3_S5
-1354.4	48.794	49.427	2.044	13.814	11.611	7.912	10.505	3.172	1.514	99.367	BS7&8C_L3_S5

Table C24. BS9&10C

X(μm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
790.6	50.879	52.005	2.006	14.092	11.393	6.514	9.172	3.292	1.526	98.874	BS9&10C_L1_S1
710.6	51.063	52.040	2.008	13.997	11.304	6.550	9.161	3.406	1.536	99.024	BS9&10C_L1_S1
630.6	50.819	52.277	1.997	13.957	11.160	6.555	9.149	3.398	1.508	98.542	BS9&10C_L1_S1
550.6	50.885	52.453	1.935	13.870	11.061	6.617	9.131	3.404	1.531	98.431	BS9&10C_L1_S1
480.6	51.010	52.306	2.049	13.680	11.325	6.461	9.151	3.452	1.577	98.705	BS9&10C_L1_S2
440.6	51.130	52.038	1.912	13.928	11.374	6.600	9.192	3.419	1.538	99.092	BS9&10C_L1_S2
400.6	51.261	51.962	1.929	14.023	11.337	6.560	9.208	3.417	1.564	99.298	BS9&10C_L1_S2
360.6	50.900	51.953	2.022	13.877	11.370	6.517	9.219	3.459	1.583	98.947	BS9&10C_L1_S2
320.6	51.145	52.105	1.996	13.820	11.150	6.721	9.221	3.434	1.552	99.040	BS9&10C_L1_S2
280.6	51.105	51.764	2.089	13.860	11.220	6.661	9.345	3.480	1.582	99.342	BS9&10C_L1_S2
240.6	51.311	52.105	1.878	13.819	11.228	6.569	9.300	3.522	1.580	99.206	BS9&10C_L1_S2
200.6	51.002	52.071	1.995	13.895	11.162	6.536	9.411	3.358	1.572	98.931	BS9&10C_L1_S2
160.6	51.114	52.207	1.855	13.845	11.065	6.477	9.497	3.446	1.608	98.907	BS9&10C_L1_S2
120.6	51.053	52.131	1.908	13.841	10.959	6.427	9.716	3.406	1.612	98.922	BS9&10C_L1_S2
80.6	51.141	51.836	1.943	13.821	11.000	6.561	9.845	3.383	1.611	99.305	BS9&10C_L1_S2
40.6	50.671	51.892	1.846	13.854	10.813	6.620	10.100	3.277	1.598	98.779	BS9&10C_L1_S2
0.6	50.279	51.091	2.015	13.668	11.329	6.654	10.424	3.261	1.559	99.188	BS9&10C_L1_S2
-39.4	49.392	50.512	2.039	13.814	11.469	6.765	10.839	3.107	1.455	98.880	BS9&10C_L1_S2
-79.4	49.082	49.858	1.999	13.927	11.743	6.804	11.169	3.056	1.444	99.224	BS9&10C_L1_S2
-119.4	48.655	49.774	2.026	13.898	11.732	6.901	11.332	2.957	1.379	98.881	BS9&10C_L1_S2
-159.4	48.441	49.729	2.065	13.835	11.692	6.912	11.409	2.956	1.403	98.711	BS9&10C_L1_S2
-199.4	48.624	49.835	2.007	13.927	11.504	6.778	11.594	2.943	1.414	98.789	BS9&10C_L1_S2
-239.4	48.868	49.704	1.983	13.920	11.498	6.805	11.666	2.970	1.455	99.164	BS9&10C_L1_S2
-279.4	48.642	49.759	2.035	13.914	11.564	6.610	11.679	2.932	1.506	98.883	BS9&10C_L1_S2
-359.4	48.870	49.968	1.982	13.952	11.312	6.557	11.716	3.011	1.502	98.902	BS9&10C_L1_S2
-399.4	48.776	49.774	1.951	13.886	11.268	6.711	11.819	3.019	1.574	99.002	BS9&10C_L1_S2
-439.4	48.629	49.870	1.993	13.892	11.351	6.465	11.823	3.048	1.559	98.759	BS9&10C_L1_S2
-479.4	48.749	50.211	2.026	13.793	11.080	6.502	11.773	3.050	1.564	98.538	BS9&10C_L1_S2
-519.4	48.865	50.016	1.940	13.873	11.172	6.578	11.760	3.090	1.572	98.849	BS9&10C_L1_S2
-599.4	48.644	50.003	1.923	13.678	11.288	6.545	11.857	3.136	1.570	98.641	BS9&10C_L1_S3
-679.4	48.736	49.918	2.047	13.861	11.236	6.423	11.846	3.104	1.567	98.818	BS9&10C_L1_S3
-759.4	48.585	49.749	1.981	13.857	11.299	6.570	11.858	3.168	1.519	98.836	BS9&10C_L1_S3
800.6	51.025	52.302	1.920	13.795	11.332	6.555	9.191	3.346	1.560	98.723	BS9&10C_L2_S1
720.6	50.920	52.418	2.038	13.696	11.234	6.569	9.206	3.314	1.525	98.502	BS9&10C_L2_S1
640.6	51.199	52.354	2.022	13.800	11.228	6.584	9.176	3.316	1.520	98.845	BS9&10C_L2_S1
560.6	51.089	52.503	1.982	13.684	11.245	6.690	9.062	3.315	1.519	98.586	BS9&10C_L2_S1
480.6	51.030	52.433	1.973	13.710	11.366	6.428	9.180	3.390	1.521	98.598	BS9&10C_L2_S2
440.6	51.252	52.085	1.932	13.889	11.450	6.562	9.139	3.429	1.513	99.166	BS9&10C_L2_S2
400.6	51.253	52.210	2.092	13.687	11.230	6.710	9.131	3.407	1.533	99.043	BS9&10C_L2_S2
360.6	50.958	52.179	1.979	13.747	11.327	6.687	9.186	3.351	1.544	98.778	BS9&10C_L2_S2
320.6	51.259	52.306	1.934	13.707	11.237	6.632	9.232	3.404	1.549	98.954	BS9&10C_L2_S2
280.6	51.357	52.373	1.913	13.721	11.265	6.489	9.270	3.387	1.583	98.984	BS9&10C_L2_S2
240.6	51.146	51.890	2.046	13.843	11.215	6.647	9.358	3.402	1.601	99.256	BS9&10C_L2_S2
200.6	51.286	52.381	1.865	13.822	11.084	6.516	9.405	3.379	1.549	98.905	BS9&10C_L2_S2
160.6	51.241	52.372	2.021	13.693	10.985	6.480	9.497	3.367	1.585	98.869	BS9&10C_L2_S2
120.6	51.200	52.217	1.997	13.543	11.058	6.501	9.624	3.393	1.668	98.983	BS9&10C_L2_S2
80.6	51.038	52.083	1.990	13.745	10.883	6.439	9.866	3.377	1.618	98.956	BS9&10C_L2_S2
40.6	50.648	51.548	1.964	13.772	11.208	6.482	10.126	3.275	1.625	99.100	BS9&10C_L2_S2
0.6	49.939	51.501	1.982	13.648	11.207	6.553	10.495	3.078	1.537	98.438	BS9&10C_L2_S2
-39.4	49.365	50.869	1.933	13.694	11.540	6.614	10.852	3.043	1.455	98.496	BS9&10C_L2_S2
-79.4	48.962	50.042	1.967	13.895	11.753	6.784	11.123	3.018	1.417	98.920	BS9&10C_L2_S2
-119.4	48.696	49.927	2.024	13.881	11.799	6.763	11.310	2.904	1.393	98.769	BS9&10C_L2_S2
-159.4	48.806	49.996	2.006	13.751	11.640	6.797	11.529	2.861	1.421	98.811	BS9&10C_L2_S2
-199.4	48.814	50.029	2.029	13.774	11.762	6.664	11.467	2.850	1.426	98.784	BS9&10C_L2_S2
-239.4	48.564	49.815	2.023	13.836	11.395	6.860	11.653	2.993	1.426	98.749	BS9&10C_L2_S2
-279.4	48.659	50.052	1.941	13.816	11.242	6.764	11.716	2.961	1.508	98.607	BS9&10C_L2_S2
-319.4	48.706	50.141	1.982	13.696	11.364	6.587	11.775	2.984	1.473	98.566	BS9&10C_L2_S2
-359.4	48.739	50.027	2.022	13.598	11.486	6.616	11.719	2.999	1.533	98.713	BS9&10C_L2_S2
-399.4	48.959	50.239	1.930	13.831	11.150	6.589	11.778	2.958	1.525	98.720	BS9&10C_L2_S2
-439.4	48.949	50.127	2.032	13.708	11.214	6.593	11.792	2.983	1.551	98.822	BS9&10C_L2_S2
-479.4	48.992	49.741	2.001	13.777	11.367	6.603	11.840	3.098	1.573	99.251	BS9&10C_L2_S2

-519.4	48.792	49.977	1.996	13.809	11.206	6.527	11.821	3.113	1.552	98.815	BS9&10C_L2_S2
-599.4	48.780	49.969	1.967	13.911	11.167	6.579	11.724	3.082	1.600	98.811	BS9&10C_L2_S3
-679.4	48.937	49.944	2.069	13.768	11.210	6.623	11.816	3.055	1.515	98.993	BS9&10C_L2_S3
795.6	51.140	52.092	1.986	13.973	11.464	6.586	9.134	3.279	1.486	99.049	BS9&10C_L3_S1
715.6	50.845	52.223	1.932	13.877	11.345	6.546	9.224	3.363	1.489	98.622	BS9&10C_L3_S1
635.6	51.110	52.345	1.950	13.804	11.297	6.547	9.186	3.325	1.546	98.765	BS9&10C_L3_S1
555.6	51.153	52.174	1.910	13.793	11.371	6.623	9.212	3.410	1.506	98.979	BS9&10C_L3_S1
475.6	50.922	52.041	2.031	13.936	11.259	6.682	9.130	3.365	1.556	98.880	BS9&10C_L3_S2
435.6	51.271	52.230	1.995	13.849	11.251	6.498	9.199	3.424	1.554	99.040	BS9&10C_L3_S2
395.6	51.064	52.270	1.913	13.817	11.249	6.533	9.213	3.462	1.543	98.793	BS9&10C_L3_S2
355.6	51.126	52.129	2.063	13.761	11.312	6.547	9.201	3.439	1.549	98.997	BS9&10C_L3_S2
315.6	50.831	52.066	2.001	13.770	11.262	6.613	9.298	3.413	1.578	98.765	BS9&10C_L3_S2
275.6	50.956	52.018	2.036	13.873	11.142	6.511	9.295	3.529	1.598	98.938	BS9&10C_L3_S2
235.6	51.026	51.922	2.001	13.955	11.267	6.486	9.363	3.421	1.585	99.104	BS9&10C_L3_S2
195.6	50.981	52.162	1.918	13.744	11.170	6.412	9.549	3.444	1.601	98.819	BS9&10C_L3_S2
155.6	51.075	52.218	1.942	13.697	11.125	6.417	9.542	3.447	1.613	98.857	BS9&10C_L3_S2
115.6	50.978	51.738	1.962	13.872	11.065	6.570	9.719	3.425	1.650	99.240	BS9&10C_L3_S2
75.6	50.932	51.978	1.934	13.791	11.011	6.346	9.918	3.383	1.641	98.954	BS9&10C_L3_S2
35.6	50.595	51.734	1.947	13.693	11.069	6.479	10.196	3.307	1.575	98.862	BS9&10C_L3_S2
-4.4	49.749	50.727	2.077	13.764	11.512	6.578	10.626	3.214	1.502	99.022	BS9&10C_L3_S2
-44.4	49.557	50.344	2.018	13.760	11.643	6.822	10.882	3.100	1.432	99.213	BS9&10C_L3_S2
-84.4	48.940	50.065	1.951	13.780	11.822	6.746	11.176	3.030	1.431	98.876	BS9&10C_L3_S2
-124.4	48.926	49.777	2.078	13.894	11.740	6.752	11.427	2.919	1.412	99.149	BS9&10C_L3_S2
-164.4	48.839	49.620	2.003	13.882	11.719	6.745	11.656	2.973	1.404	99.219	BS9&10C_L3_S2
-204.4	48.943	49.876	2.057	13.782	11.694	6.648	11.580	2.948	1.416	99.067	BS9&10C_L3_S2
-244.4	48.675	50.040	2.091	13.678	11.475	6.599	11.675	2.996	1.446	98.635	BS9&10C_L3_S2
-284.4	48.680	49.692	1.929	13.985	11.309	6.773	11.873	2.987	1.454	98.988	BS9&10C_L3_S2
-324.4	48.796	49.762	1.963	13.812	11.478	6.766	11.742	2.991	1.486	99.035	BS9&10C_L3_S2
-364.4	48.724	49.645	1.966	13.805	11.505	6.640	11.924	2.997	1.519	99.080	BS9&10C_L3_S2
-404.4	48.592	49.856	1.925	13.640	11.409	6.704	11.932	3.054	1.481	98.737	BS9&10C_L3_S2
-444.4	48.710	49.809	1.966	13.782	11.495	6.599	11.811	3.030	1.508	98.901	BS9&10C_L3_S2
-484.4	48.847	49.745	2.045	13.704	11.497	6.549	11.929	3.007	1.525	99.102	BS9&10C_L3_S2
-524.4	48.854	49.713	1.970	13.753	11.547	6.652	11.856	3.019	1.490	99.141	BS9&10C_L3_S2
-604.4	48.779	50.012	1.928	13.824	11.191	6.455	11.973	3.093	1.526	98.767	BS9&10C_L3_S3
-684.4	48.664	49.564	2.021	13.859	11.392	6.663	11.931	3.043	1.526	99.100	BS9&10C_L3_S3
-764.4	48.737	49.547	2.019	13.866	11.557	6.531	11.890	3.064	1.527	99.191	BS9&10C_L3_S3

Table C25. BS11&12C

X(μm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
1410	51.167	52.128	2.062	13.734	11.699	6.737	10.536	1.567	1.537	99.039	BS11&12C_L1_S1
1330	51.333	52.374	1.991	13.773	11.603	6.676	10.532	1.523	1.529	98.959	BS11&12C_L1_S1
1250	51.542	52.272	1.981	13.695	11.747	6.707	10.566	1.532	1.502	99.271	BS11&12C_L1_S1
1170	51.382	52.319	2.036	13.814	11.494	6.745	10.453	1.617	1.522	99.063	BS11&12C_L1_S1
1090	51.471	52.030	2.003	13.926	11.568	6.751	10.573	1.615	1.535	99.441	BS11&12C_L1_S1
1010	51.284	52.154	2.015	13.774	11.646	6.764	10.538	1.583	1.527	99.130	BS11&12C_L1_S1
930	51.591	52.616	1.954	13.785	11.360	6.617	10.479	1.635	1.556	98.975	BS11&12C_L1_S1
850	51.321	52.363	1.956	13.826	11.499	6.704	10.482	1.644	1.527	98.958	BS11&12C_L1_S1
770	51.408	52.472	1.995	13.731	11.451	6.613	10.534	1.685	1.519	98.936	BS11&12C_L1_S1
690	51.349	52.581	1.978	13.767	11.312	6.574	10.509	1.756	1.523	98.768	BS11&12C_L1_S1
610	51.348	52.340	1.896	13.798	11.427	6.684	10.508	1.806	1.541	99.009	BS11&12C_L1_S1
530	51.039	52.124	1.937	13.806	11.443	6.666	10.495	1.989	1.540	98.915	BS11&12C_L1_S2
490	51.264	52.197	1.954	13.878	11.266	6.653	10.464	2.028	1.559	99.067	BS11&12C_L1_S2
450	51.044	52.224	1.990	13.744	11.295	6.623	10.468	2.143	1.514	98.819	BS11&12C_L1_S2
410	51.044	52.291	1.947	14.029	11.132	6.477	10.426	2.178	1.520	98.753	BS11&12C_L1_S2
370	51.127	52.057	1.995	13.849	11.287	6.503	10.458	2.300	1.551	99.070	BS11&12C_L1_S2
330	51.153	52.355	1.954	13.736	11.017	6.575	10.366	2.468	1.529	98.797	BS11&12C_L1_S2
290	51.403	52.425	2.023	13.654	10.946	6.565	10.343	2.531	1.514	98.978	BS11&12C_L1_S2
250	51.188	52.244	1.931	13.756	10.916	6.557	10.364	2.647	1.585	98.943	BS11&12C_L1_S2
210	51.107	52.216	1.979	13.710	10.936	6.520	10.300	2.801	1.537	98.890	BS11&12C_L1_S2
170	51.040	52.394	1.950	13.789	10.621	6.490	10.268	2.899	1.590	98.646	BS11&12C_L1_S2
130	51.293	52.344	2.031	13.614	10.753	6.480	10.187	2.970	1.621	98.948	BS11&12C_L1_S2
90	51.291	51.956	1.995	13.708	10.723	6.550	10.215	3.172	1.681	99.334	BS11&12C_L1_S2
50	51.251	52.470	1.920	13.587	10.536	6.360	10.171	3.273	1.682	98.780	BS11&12C_L1_S2
10	50.540	51.591	1.965	13.815	10.929	6.518	10.269	3.313	1.601	98.949	BS11&12C_L1_S2
-30	49.535	50.673	2.032	13.788	11.465	6.719	10.563	3.268	1.493	98.863	BS11&12C_L1_S2
-70	48.690	50.163	2.057	13.777	11.717	6.781	10.747	3.347	1.412	98.527	BS11&12C_L1_S2
-110	48.941	49.847	2.031	13.989	11.816	6.810	10.703	3.373	1.431	99.094	BS11&12C_L1_S2
-150	48.617	49.685	1.894	13.974	11.919	6.837	10.725	3.533	1.433	98.932	BS11&12C_L1_S2
-190	48.340	49.842	2.017	13.807	11.867	6.798	10.620	3.615	1.434	98.498	BS11&12C_L1_S2
-230	48.692	49.884	1.993	13.877	11.714	6.732	10.581	3.772	1.447	98.808	BS11&12C_L1_S2
-270	48.329	49.705	1.992	13.655	11.838	6.816	10.650	3.874	1.470	98.624	BS11&12C_L1_S2
-310	48.419	49.463	2.007	13.891	11.833	6.786	10.581	3.951	1.488	98.957	BS11&12C_L1_S2
-350	48.483	49.545	1.993	13.903	11.770	6.700	10.563	4.030	1.496	98.938	BS11&12C_L1_S2
-390	48.668	49.906	1.943	13.697	11.711	6.676	10.513	4.083	1.471	98.762	BS11&12C_L1_S2
-430	48.340	49.630	2.029	13.803	11.807	6.641	10.487	4.109	1.494	98.710	BS11&12C_L1_S2
-470	48.600	49.707	2.012	13.728	11.560	6.692	10.594	4.212	1.495	98.893	BS11&12C_L1_S2
-550	48.318	49.662	2.062	13.768	11.631	6.571	10.494	4.302	1.509	98.655	BS11&12C_L1_S3
-630	48.531	49.804	1.943	13.596	11.694	6.670	10.519	4.296	1.479	98.727	BS11&12C_L1_S3
-710	48.523	49.506	1.967	13.770	11.533	6.660	10.542	4.532	1.491	99.017	BS11&12C_L1_S3
-790	48.388	49.903	1.997	13.633	11.424	6.592	10.494	4.473	1.484	98.485	BS11&12C_L1_S3
-870	48.446	49.247	2.057	13.837	11.595	6.571	10.549	4.623	1.521	99.199	BS11&12C_L1_S3
-1030	48.601	49.709	2.000	13.628	11.380	6.592	10.532	4.645	1.513	98.892	BS11&12C_L1_S3
-1110	48.452	49.613	1.990	13.630	11.481	6.600	10.514	4.660	1.512	98.839	BS11&12C_L1_S3
-1190	48.152	49.447	1.962	13.594	11.575	6.707	10.623	4.642	1.449	98.705	BS11&12C_L1_S3
-1350	48.266	49.149	1.940	13.814	11.732	6.675	10.535	4.643	1.512	99.118	BS11&12C_L1_S3
-1430	48.222	49.072	1.996	13.945	11.647	6.765	10.472	4.631	1.473	99.150	BS11&12C_L1_S3
-1510	48.432	49.378	1.952	13.698	11.665	6.702	10.510	4.601	1.494	99.054	BS11&12C_L1_S3
1485	50.931	52.012	2.037	13.827	11.690	6.752	10.621	1.566	1.495	98.919	BS11&12C_L2_S1
1405	50.973	52.324	1.993	13.653	11.622	6.739	10.606	1.551	1.513	98.649	BS11&12C_L2_S1
1325	51.032	52.300	1.979	13.647	11.742	6.671	10.524	1.608	1.530	98.732	BS11&12C_L2_S1
1245	51.025	52.152	1.965	13.760	11.652	6.772	10.590	1.544	1.565	98.872	BS11&12C_L2_S1
1165	51.076	52.198	1.902	13.815	11.714	6.682	10.558	1.575	1.556	98.878	BS11&12C_L2_S1
1085	51.237	52.418	1.994	13.815	11.495	6.587	10.584	1.573	1.535	98.819	BS11&12C_L2_S1
1005	51.294	52.266	2.047	13.830	11.515	6.640	10.543	1.638	1.522	99.028	BS11&12C_L2_S1
925	51.005	52.337	1.986	13.669	11.560	6.727	10.568	1.625	1.529	98.668	BS11&12C_L2_S1
845	51.101	52.177	1.998	13.792	11.592	6.632	10.598	1.677	1.534	98.924	BS11&12C_L2_S1
765	51.129	52.201	2.025	13.802	11.494	6.657	10.612	1.676	1.533	98.928	BS11&12C_L2_S1
605	51.086	52.290	2.072	13.689	11.405	6.701	10.499	1.846	1.499	98.796	BS11&12C_L2_S1
525	51.266	52.148	1.956	13.783	11.473	6.598	10.479	2.023	1.540	99.118	BS11&12C_L2_S2
485	51.061	52.136	2.014	13.908	11.271	6.602	10.507	2.052	1.510	98.925	BS11&12C_L2_S2

445	51.164	52.427	1.876	13.783	11.257	6.534	10.503	2.110	1.511	98.738	BS11&12C_L2_S2
405	51.181	52.417	1.936	13.765	11.190	6.421	10.530	2.221	1.520	98.763	BS11&12C_L2_S2
365	51.110	52.204	1.959	13.779	11.164	6.570	10.489	2.301	1.535	98.906	BS11&12C_L2_S2
325	51.125	52.277	1.923	13.723	11.195	6.605	10.318	2.424	1.536	98.848	BS11&12C_L2_S2
285	51.156	52.041	2.038	13.768	11.055	6.505	10.384	2.652	1.558	99.115	BS11&12C_L2_S2
245	51.462	52.171	2.004	13.887	10.876	6.492	10.324	2.704	1.543	99.291	BS11&12C_L2_S2
205	51.344	52.333	1.947	13.798	10.743	6.473	10.263	2.873	1.571	99.011	BS11&12C_L2_S2
165	51.210	52.365	1.830	13.760	10.879	6.427	10.152	2.968	1.617	98.845	BS11&12C_L2_S2
125	51.468	52.242	1.984	13.823	10.625	6.428	10.136	3.103	1.659	99.226	BS11&12C_L2_S2
85	51.302	52.556	1.850	13.800	10.512	6.338	10.101	3.176	1.668	98.747	BS11&12C_L2_S2
45	51.433	52.280	1.864	13.710	10.644	6.396	10.164	3.278	1.664	99.153	BS11&12C_L2_S2
5	50.428	51.275	1.896	13.781	11.253	6.450	10.431	3.335	1.579	99.153	BS11&12C_L2_S2
-35	49.383	50.477	2.032	13.817	11.467	6.787	10.645	3.284	1.491	98.906	BS11&12C_L2_S2
-75	49.098	49.904	1.994	13.983	11.842	6.861	10.653	3.341	1.423	99.194	BS11&12C_L2_S2
-115	48.866	49.840	2.022	13.813	11.836	6.878	10.669	3.523	1.419	99.026	BS11&12C_L2_S2
-155	48.506	49.589	1.908	13.962	12.140	6.783	10.705	3.491	1.422	98.917	BS11&12C_L2_S2
-195	48.707	49.555	2.084	13.877	11.973	6.781	10.656	3.617	1.457	99.152	BS11&12C_L2_S2
-235	48.418	49.667	2.036	13.751	11.958	6.684	10.673	3.770	1.460	98.751	BS11&12C_L2_S2
-275	48.557	49.532	1.915	13.779	12.011	6.843	10.630	3.829	1.461	99.025	BS11&12C_L2_S2
-315	48.574	49.715	2.003	13.786	11.866	6.714	10.604	3.805	1.508	98.859	BS11&12C_L2_S2
-355	48.625	49.506	1.985	13.784	11.853	6.734	10.627	4.024	1.488	99.119	BS11&12C_L2_S2
-395	48.764	49.406	2.048	13.983	11.767	6.600	10.683	4.026	1.486	99.358	BS11&12C_L2_S2
-435	48.729	49.387	2.004	13.845	11.846	6.702	10.549	4.177	1.491	99.342	BS11&12C_L2_S2
-475	48.377	49.393	2.046	13.745	11.848	6.627	10.594	4.237	1.510	98.984	BS11&12C_L2_S2
-555	48.524	49.096	2.094	13.903	11.771	6.701	10.571	4.345	1.519	99.428	BS11&12C_L2_S3
-635	48.450	49.385	1.967	13.817	11.804	6.618	10.523	4.381	1.506	99.065	BS11&12C_L2_S3
-715	48.508	49.175	1.937	13.984	11.665	6.708	10.538	4.483	1.510	99.333	BS11&12C_L2_S3
-795	48.516	49.133	2.087	13.874	11.563	6.728	10.591	4.520	1.504	99.383	BS11&12C_L2_S3
-875	48.421	48.972	2.061	13.887	11.644	6.690	10.644	4.616	1.487	99.449	BS11&12C_L2_S3
-955	48.417	49.395	2.020	13.830	11.579	6.578	10.498	4.595	1.505	99.022	BS11&12C_L2_S3
-1035	48.508	49.134	2.077	13.705	11.612	6.640	10.587	4.715	1.531	99.375	BS11&12C_L2_S3
-1115	48.319	49.353	1.950	13.818	11.579	6.592	10.560	4.663	1.486	98.967	BS11&12C_L2_S3
-1195	48.517	49.382	1.979	13.868	11.574	6.563	10.548	4.586	1.501	99.135	BS11&12C_L2_S3
-1275	48.424	49.182	2.010	14.030	11.640	6.573	10.447	4.615	1.503	99.242	BS11&12C_L2_S3
-1355	48.291	49.339	2.011	13.692	11.690	6.590	10.543	4.628	1.507	98.952	BS11&12C_L2_S3
-1515	48.364	49.102	2.024	13.987	11.740	6.600	10.488	4.568	1.490	99.261	BS11&12C_L2_S3
1480	51.171	52.233	1.984	13.856	11.532	6.797	10.621	1.498	1.479	98.938	BS11&12C_L3_S1
1400	51.199	52.302	1.955	13.783	11.602	6.742	10.548	1.563	1.505	98.897	BS11&12C_L3_S1
1320	51.260	52.446	1.994	13.769	11.590	6.606	10.493	1.596	1.506	98.814	BS11&12C_L3_S1
1240	51.214	52.663	1.987	13.725	11.436	6.628	10.425	1.608	1.528	98.551	BS11&12C_L3_S1
1160	51.136	52.516	1.882	13.777	11.425	6.720	10.551	1.610	1.517	98.620	BS11&12C_L3_S1
1080	51.090	52.659	2.029	13.610	11.303	6.661	10.617	1.574	1.548	98.431	BS11&12C_L3_S1
1000	51.414	52.275	1.968	13.870	11.467	6.696	10.511	1.625	1.588	99.139	BS11&12C_L3_S1
920	51.298	52.302	2.074	13.895	11.364	6.620	10.539	1.670	1.537	98.996	BS11&12C_L3_S1
840	51.336	52.333	1.996	13.820	11.504	6.680	10.465	1.645	1.559	99.003	BS11&12C_L3_S1
760	51.414	52.536	2.030	13.766	11.276	6.633	10.454	1.759	1.547	98.878	BS11&12C_L3_S1
680	51.147	52.349	2.063	13.848	11.301	6.549	10.506	1.812	1.573	98.798	BS11&12C_L3_S1
600	51.097	52.308	2.014	13.823	11.316	6.674	10.461	1.883	1.521	98.790	BS11&12C_L3_S1
520	51.195	52.268	1.981	14.080	11.181	6.551	10.403	2.007	1.530	98.927	BS11&12C_L3_S2
480	51.049	52.491	1.969	13.665	11.328	6.543	10.392	2.084	1.528	98.558	BS11&12C_L3_S2
440	51.393	52.208	2.081	13.646	11.309	6.619	10.468	2.152	1.517	99.185	BS11&12C_L3_S2
400	50.987	52.299	1.973	13.865	11.191	6.433	10.434	2.266	1.539	98.688	BS11&12C_L3_S2
360	51.301	52.307	2.005	13.763	11.116	6.464	10.409	2.390	1.546	98.994	BS11&12C_L3_S2
320	51.348	52.269	2.045	13.640	11.120	6.535	10.377	2.451	1.564	99.079	BS11&12C_L3_S2
280	51.186	51.911	2.033	13.922	11.027	6.548	10.356	2.647	1.557	99.275	BS11&12C_L3_S2
240	51.054	52.302	1.980	13.750	10.949	6.450	10.325	2.676	1.569	98.752	BS11&12C_L3_S2
200	51.215	52.241	1.969	13.725	10.905	6.459	10.307	2.831	1.562	98.974	BS11&12C_L3_S2
160	51.148	51.996	2.004	13.881	10.868	6.420	10.215	3.018	1.600	99.152	BS11&12C_L3_S2
120	51.081	52.235	1.959	13.707	10.837	6.390	10.190	3.064	1.619	98.845	BS11&12C_L3_S2
80	51.007	51.901	1.870	13.720	10.914	6.433	10.270	3.224	1.668	99.106	BS11&12C_L3_S2
40	50.631	51.545	2.024	13.738	10.935	6.529	10.358	3.238	1.633	99.086	BS11&12C_L3_S2
-40	49.045	50.159	2.042	13.818	11.709	6.803	10.709	3.307	1.454	98.886	BS11&12C_L3_S2
-80	48.903	49.685	2.030	14.009	11.925	6.808	10.745	3.369	1.429	99.218	BS11&12C_L3_S2

-120	48.806	49.951	2.019	13.887	11.731	6.790	10.693	3.514	1.415	98.855	BS11&12C_L3_S2
-160	48.690	49.874	1.962	13.802	11.775	6.826	10.705	3.570	1.488	98.816	BS11&12C_L3_S2
-200	48.417	49.814	2.009	13.796	11.851	6.688	10.746	3.632	1.465	98.603	BS11&12C_L3_S2
-240	48.703	49.535	2.053	13.805	11.849	6.853	10.643	3.799	1.464	99.168	BS11&12C_L3_S2
-280	48.934	49.895	2.061	13.803	11.616	6.717	10.563	3.864	1.482	99.038	BS11&12C_L3_S2
-320	48.770	49.704	2.079	13.861	11.668	6.589	10.657	3.963	1.479	99.066	BS11&12C_L3_S2
-360	48.688	49.854	2.003	13.761	11.601	6.708	10.493	4.064	1.516	98.833	BS11&12C_L3_S2
-400	48.702	49.926	1.996	13.775	11.592	6.735	10.510	3.996	1.470	98.776	BS11&12C_L3_S2
-440	48.673	49.598	2.022	13.799	11.513	6.694	10.624	4.222	1.529	99.075	BS11&12C_L3_S2
-480	48.875	49.238	2.034	13.911	11.777	6.739	10.607	4.207	1.488	99.637	BS11&12C_L3_S2
-560	48.600	49.271	2.036	14.002	11.547	6.708	10.593	4.360	1.483	99.329	BS11&12C_L3_S3
-640	48.963	49.470	2.007	13.789	11.473	6.705	10.599	4.440	1.517	99.492	BS11&12C_L3_S3
-720	48.888	49.472	2.029	13.743	11.530	6.745	10.565	4.421	1.497	99.417	BS11&12C_L3_S3
-880	48.754	49.836	1.955	13.685	11.289	6.720	10.473	4.562	1.480	98.918	BS11&12C_L3_S3
-960	48.491	49.386	2.101	13.657	11.468	6.740	10.575	4.591	1.481	99.105	BS11&12C_L3_S3
-1040	48.427	49.497	2.002	13.624	11.588	6.594	10.629	4.624	1.444	98.930	BS11&12C_L3_S3
-1120	48.304	49.644	1.986	13.641	11.388	6.652	10.593	4.607	1.490	98.660	BS11&12C_L3_S3
-1200	48.683	49.283	2.043	13.646	11.642	6.624	10.672	4.613	1.478	99.400	BS11&12C_L3_S3
-1280	48.387	49.112	1.985	13.774	11.657	6.752	10.601	4.597	1.521	99.274	BS11&12C_L3_S3
-1360	48.667	49.355	1.924	13.558	11.604	6.837	10.583	4.638	1.501	99.313	BS11&12C_L3_S3
-1440	48.552	49.015	2.064	13.863	11.678	6.708	10.556	4.611	1.506	99.538	BS11&12C_L3_S3
-1520	48.548	49.266	2.020	13.717	11.724	6.638	10.479	4.648	1.509	99.282	BS11&12C_L3_S3

Table C26. BS13&14C

X(μm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
1311.5	48.878	49.056	2.066	14.099	11.319	6.774	10.625	3.080	2.982	99.823	BS13&14C_L1_S1
1231.5	48.533	49.304	2.023	13.984	11.136	6.804	10.707	3.057	2.985	99.229	BS13&14C_L1_S1
1151.5	48.392	49.001	2.073	14.109	11.232	6.831	10.679	3.092	2.985	99.391	BS13&14C_L1_S1
1071.5	48.271	49.249	1.986	13.948	11.343	6.866	10.677	3.024	2.907	99.022	BS13&14C_L1_S1
991.5	48.199	49.345	2.012	14.048	11.230	6.778	10.672	2.980	2.935	98.854	BS13&14C_L1_S1
911.5	48.284	49.270	2.058	13.991	11.280	6.835	10.681	2.992	2.894	99.013	BS13&14C_L1_S1
831.5	48.416	49.184	2.039	14.034	11.288	6.802	10.719	3.005	2.929	99.233	BS13&14C_L1_S1
751.5	48.230	49.216	2.059	13.882	11.283	6.817	10.719	3.055	2.969	99.015	BS13&14C_L1_S1
671.5	48.163	49.348	2.109	13.912	11.277	6.786	10.658	2.996	2.914	98.815	BS13&14C_L1_S1
591.5	48.323	48.993	2.041	14.106	11.458	6.819	10.683	2.994	2.907	99.330	BS13&14C_L1_S1
511.5	48.197	49.096	2.079	13.996	11.454	6.840	10.731	2.908	2.895	99.100	BS13&14C_L1_S2
471.5	48.260	49.063	2.132	13.989	11.533	6.870	10.643	2.889	2.880	99.196	BS13&14C_L1_S2
431.5	48.049	49.363	2.102	13.926	11.371	6.807	10.652	2.869	2.911	98.686	BS13&14C_L1_S2
391.5	48.338	48.947	2.105	14.114	11.706	6.805	10.608	2.874	2.843	99.392	BS13&14C_L1_S2
351.5	48.177	49.114	2.100	14.178	11.587	6.771	10.597	2.886	2.768	99.063	BS13&14C_L1_S2
311.5	48.411	49.552	2.005	13.938	11.631	6.660	10.617	2.883	2.715	98.859	BS13&14C_L1_S2
271.5	48.471	49.337	2.046	14.079	11.707	6.725	10.614	2.868	2.623	99.134	BS13&14C_L1_S2
231.5	48.491	49.574	2.023	13.910	11.570	6.872	10.521	2.959	2.573	98.917	BS13&14C_L1_S2
191.5	48.261	49.308	2.093	14.066	11.850	6.819	10.508	2.897	2.460	98.953	BS13&14C_L1_S2
151.5	48.786	49.737	2.026	14.105	11.641	6.711	10.629	2.870	2.282	99.049	BS13&14C_L1_S2
111.5	48.739	49.840	2.101	14.049	11.580	6.773	10.669	2.868	2.120	98.899	BS13&14C_L1_S2
71.5	48.867	50.473	1.985	13.962	11.269	6.717	10.625	3.065	1.904	98.394	BS13&14C_L1_S2
31.5	49.882	50.629	2.031	13.899	11.348	6.721	10.593	3.080	1.699	99.253	BS13&14C_L1_S2
-8.5	50.417	50.899	2.037	14.066	11.157	6.634	10.519	3.205	1.481	99.517	BS13&14C_L1_S2
-48.5	50.646	51.408	1.947	13.882	11.090	6.554	10.566	3.288	1.265	99.238	BS13&14C_L1_S2
-88.5	50.616	51.704	1.960	13.911	11.084	6.535	10.555	3.308	0.944	98.912	BS13&14C_L1_S2
-128.5	50.798	51.513	1.959	13.897	11.218	6.611	10.720	3.383	0.700	99.285	BS13&14C_L1_S2
-168.5	51.082	51.759	1.961	13.929	11.188	6.585	10.667	3.412	0.500	99.323	BS13&14C_L1_S2
-208.5	51.148	52.131	1.930	13.859	11.000	6.624	10.683	3.451	0.323	99.017	BS13&14C_L1_S2
-248.5	51.252	52.279	1.977	13.854	11.079	6.571	10.630	3.397	0.215	98.973	BS13&14C_L1_S2
-288.5	51.355	51.927	1.941	13.945	11.268	6.719	10.637	3.426	0.137	99.429	BS13&14C_L1_S2
-328.5	51.494	52.591	1.950	13.717	11.234	6.497	10.572	3.353	0.086	98.903	BS13&14C_L1_S2
-368.5	51.427	52.243	1.841	13.925	11.372	6.612	10.572	3.373	0.063	99.185	BS13&14C_L1_S2
-408.5	51.415	52.211	1.984	13.852	11.370	6.525	10.642	3.364	0.053	99.204	BS13&14C_L1_S2
-448.5	51.148	52.222	2.020	13.917	11.389	6.582	10.518	3.312	0.041	98.926	BS13&14C_L1_S2
-488.5	51.323	52.262	2.005	13.955	11.265	6.601	10.569	3.301	0.043	99.061	BS13&14C_L1_S2
-568.5	51.369	51.896	2.011	13.896	11.458	6.740	10.627	3.322	0.050	99.473	BS13&14C_L1_S3
-648.5	51.525	52.043	1.947	14.065	11.499	6.625	10.548	3.231	0.042	99.483	BS13&14C_L1_S3
-728.5	51.334	52.016	1.949	14.034	11.521	6.654	10.582	3.200	0.045	99.317	BS13&14C_L1_S3
-808.5	51.304	52.430	1.960	13.966	11.436	6.579	10.474	3.124	0.030	98.874	BS13&14C_L1_S3
-888.5	51.467	52.381	1.986	13.756	11.355	6.699	10.596	3.182	0.045	99.086	BS13&14C_L1_S3
-968.5	51.509	52.083	1.968	13.935	11.564	6.725	10.551	3.139	0.037	99.426	BS13&14C_L1_S3
1398.5	48.695	49.147	2.017	14.110	11.304	6.749	10.623	3.074	2.976	99.548	BS13&14C_L2_S1
1318.5	48.541	48.801	2.063	13.992	11.464	6.924	10.747	3.057	2.953	99.739	BS13&14C_L2_S1
1238.5	48.211	49.113	2.054	13.879	11.368	6.900	10.693	3.033	2.960	99.098	BS13&14C_L2_S1
1158.5	48.425	48.742	2.080	14.074	11.514	6.861	10.746	3.053	2.930	99.684	BS13&14C_L2_S1
1078.5	47.963	48.874	2.108	13.960	11.425	6.983	10.750	3.003	2.898	99.090	BS13&14C_L2_S1
998.5	48.257	48.788	2.003	14.109	11.683	6.919	10.717	2.933	2.849	99.468	BS13&14C_L2_S1
918.5	47.849	49.124	2.120	13.997	11.327	6.817	10.722	3.000	2.893	98.725	BS13&14C_L2_S1
838.5	48.491	48.904	2.031	14.026	11.486	6.885	10.767	2.993	2.907	99.587	BS13&14C_L2_S1
758.5	48.345	49.153	2.074	13.931	11.482	6.797	10.762	2.900	2.901	99.192	BS13&14C_L2_S1
678.5	48.180	48.922	2.175	14.018	11.581	6.854	10.667	2.874	2.910	99.258	BS13&14C_L2_S1
598.5	48.033	48.977	2.041	14.247	11.504	6.735	10.705	2.886	2.907	99.057	BS13&14C_L2_S1
518.5	48.503	49.009	2.074	13.952	11.576	6.838	10.716	2.936	2.901	99.494	BS13&14C_L2_S2
478.5	48.522	49.138	2.023	14.085	11.638	6.761	10.651	2.878	2.826	99.384	BS13&14C_L2_S2
438.5	48.654	49.093	2.067	14.032	11.592	6.818	10.715	2.852	2.830	99.561	BS13&14C_L2_S2
398.5	48.551	48.986	2.053	14.154	11.508	6.951	10.633	2.882	2.833	99.565	BS13&14C_L2_S2
358.5	48.434	49.483	2.080	14.011	11.455	6.817	10.575	2.803	2.776	98.952	BS13&14C_L2_S2
318.5	48.680	49.377	2.018	13.969	11.693	6.818	10.628	2.754	2.745	99.303	BS13&14C_L2_S2
278.5	48.596	49.466	2.082	14.060	11.575	6.732	10.597	2.837	2.651	99.130	BS13&14C_L2_S2
238.5	48.715	49.709	1.983	13.895	11.618	6.836	10.560	2.808	2.592	99.006	BS13&14C_L2_S2

198.5	49.039	49.603	2.043	14.082	11.681	6.747	10.572	2.830	2.442	99.436	BS13&14C_L2_S2
158.5	48.905	49.266	2.159	14.084	11.759	6.911	10.655	2.864	2.301	99.638	BS13&14C_L2_S2
118.5	48.929	49.788	2.059	14.143	11.625	6.761	10.595	2.881	2.149	99.141	BS13&14C_L2_S2
78.5	49.157	49.895	2.083	14.143	11.640	6.765	10.617	2.904	1.952	99.262	BS13&14C_L2_S2
38.5	49.868	50.652	2.017	13.888	11.346	6.690	10.647	3.004	1.757	99.216	BS13&14C_L2_S2
-1.5	50.370	50.974	2.030	13.898	11.336	6.630	10.508	3.099	1.524	99.396	BS13&14C_L2_S2
-41.5	50.739	51.359	1.927	13.864	11.103	6.639	10.576	3.217	1.315	99.380	BS13&14C_L2_S2
-81.5	50.997	51.605	1.989	13.837	11.170	6.552	10.619	3.196	1.032	99.393	BS13&14C_L2_S2
-121.5	51.146	51.892	1.968	13.692	11.248	6.482	10.704	3.257	0.757	99.254	BS13&14C_L2_S2
-161.5	51.238	51.787	1.987	13.823	11.338	6.546	10.605	3.384	0.530	99.450	BS13&14C_L2_S2
-201.5	51.448	51.942	1.946	13.737	11.229	6.604	10.729	3.458	0.356	99.507	BS13&14C_L2_S2
-241.5	51.399	52.045	1.969	13.784	11.220	6.639	10.670	3.438	0.237	99.354	BS13&14C_L2_S2
-281.5	51.358	52.365	1.926	13.722	11.339	6.498	10.666	3.348	0.137	98.993	BS13&14C_L2_S2
-321.5	51.538	52.239	1.881	13.756	11.417	6.669	10.560	3.394	0.084	99.299	BS13&14C_L2_S2
-361.5	51.468	52.229	1.951	13.821	11.390	6.620	10.580	3.342	0.066	99.240	BS13&14C_L2_S2
-401.5	51.625	52.499	1.975	13.824	11.158	6.599	10.543	3.351	0.052	99.126	BS13&14C_L2_S2
-441.5	51.387	52.158	1.999	13.948	11.233	6.746	10.536	3.335	0.046	99.230	BS13&14C_L2_S2
-481.5	51.638	52.189	2.045	13.906	11.435	6.607	10.464	3.320	0.034	99.449	BS13&14C_L2_S2
-561.5	51.728	52.465	1.965	13.872	11.335	6.549	10.469	3.295	0.050	99.263	BS13&14C_L2_S3
-641.5	51.626	52.205	2.011	13.944	11.443	6.568	10.488	3.294	0.048	99.421	BS13&14C_L2_S3
-721.5	51.745	52.389	2.023	13.824	11.398	6.622	10.494	3.211	0.039	99.357	BS13&14C_L2_S3
-801.5	51.667	52.364	1.899	13.804	11.468	6.668	10.536	3.229	0.033	99.303	BS13&14C_L2_S3
-881.5	51.612	52.152	2.011	13.841	11.580	6.652	10.565	3.155	0.044	99.460	BS13&14C_L2_S3
1049.5	48.986	49.342	2.051	14.046	11.221	6.724	10.534	3.064	3.018	99.644	BS13&14C_L3_S1
969.5	48.917	49.354	2.012	14.060	11.195	6.686	10.687	3.033	2.974	99.563	BS13&14C_L3_S1
889.5	48.844	49.459	1.998	14.016	11.212	6.775	10.591	2.976	2.972	99.384	BS13&14C_L3_S1
809.5	48.799	49.524	1.995	13.916	11.300	6.666	10.563	3.039	2.997	99.274	BS13&14C_L3_S1
729.5	48.964	49.562	2.017	14.038	11.281	6.595	10.590	2.983	2.934	99.401	BS13&14C_L3_S1
649.5	49.038	49.490	2.008	14.013	11.275	6.709	10.625	2.965	2.915	99.548	BS13&14C_L3_S1
569.5	48.859	49.687	2.033	13.811	11.244	6.736	10.584	2.950	2.956	99.172	BS13&14C_L3_S1
489.5	48.694	49.567	2.043	13.915	11.403	6.741	10.499	2.939	2.894	99.127	BS13&14C_L3_S1
409.5	48.737	49.577	1.973	14.034	11.319	6.812	10.545	2.864	2.877	99.160	BS13&14C_L3_S1
329.5	48.918	49.442	2.174	13.973	11.501	6.768	10.549	2.860	2.733	99.477	BS13&14C_L3_S2
288.5	48.943	49.630	2.089	13.927	11.495	6.767	10.569	2.866	2.657	99.313	BS13&14C_L3_S2
247.5	48.998	49.546	2.055	14.008	11.534	6.850	10.542	2.909	2.556	99.453	BS13&14C_L3_S2
206.5	49.058	49.471	2.008	14.148	11.673	6.842	10.521	2.888	2.449	99.588	BS13&14C_L3_S2
165.5	49.045	49.809	2.067	14.091	11.499	6.777	10.505	2.931	2.321	99.236	BS13&14C_L3_S2
124.5	49.308	50.023	2.054	13.858	11.572	6.755	10.626	2.964	2.148	99.285	BS13&14C_L3_S2
83.5	49.390	49.801	2.114	14.182	11.535	6.894	10.548	2.955	1.970	99.589	BS13&14C_L3_S2
42.5	50.064	50.626	1.991	13.950	11.369	6.734	10.557	3.010	1.763	99.439	BS13&14C_L3_S2
1.5	50.516	51.132	2.056	13.776	11.115	6.660	10.492	3.183	1.586	99.384	BS13&14C_L3_S2
-39.5	51.133	51.385	1.950	13.808	11.191	6.640	10.479	3.228	1.320	99.748	BS13&14C_L3_S2
-80.5	51.249	51.746	1.976	13.912	11.077	6.469	10.522	3.281	1.018	99.504	BS13&14C_L3_S2
-121.5	51.396	51.790	1.967	13.881	11.128	6.548	10.649	3.268	0.768	99.605	BS13&14C_L3_S2
-162.5	51.241	51.757	1.980	13.990	11.088	6.680	10.623	3.350	0.532	99.484	BS13&14C_L3_S2
-203.5	51.327	52.113	2.019	13.915	11.014	6.528	10.676	3.399	0.338	99.214	BS13&14C_L3_S2
-244.5	51.307	51.908	1.983	13.880	11.281	6.575	10.719	3.411	0.242	99.399	BS13&14C_L3_S2
-285.5	51.339	51.898	1.955	13.962	11.308	6.605	10.661	3.461	0.149	99.441	BS13&14C_L3_S2
-326.5	51.579	52.320	1.974	13.909	11.246	6.535	10.534	3.377	0.104	99.259	BS13&14C_L3_S2
-367.5	51.503	51.779	2.006	14.100	11.457	6.576	10.549	3.463	0.070	99.724	BS13&14C_L3_S2
-408.5	51.761	52.368	1.973	13.812	11.274	6.568	10.528	3.423	0.055	99.393	BS13&14C_L3_S2
-449.5	51.601	52.368	1.999	13.952	11.328	6.497	10.484	3.325	0.048	99.233	BS13&14C_L3_S2
-490.5	51.729	52.034	2.049	13.971	11.416	6.726	10.451	3.307	0.046	99.695	BS13&14C_L3_S2
-531.5	51.793	52.317	2.013	13.896	11.289	6.594	10.491	3.352	0.048	99.476	BS13&14C_L3_S2
-572.5	51.577	52.172	1.964	13.885	11.460	6.615	10.583	3.284	0.036	99.404	BS13&14C_L3_S2
-613.5	51.963	52.306	1.995	13.806	11.427	6.666	10.465	3.292	0.045	99.657	BS13&14C_L3_S2
-654.5	51.680	52.418	1.958	13.760	11.470	6.615	10.455	3.284	0.041	99.262	BS13&14C_L3_S2
-695.5	51.343	52.290	1.953	13.936	11.428	6.632	10.476	3.245	0.042	99.054	BS13&14C_L3_S2
-775.5	51.494	52.058	2.043	13.947	11.496	6.626	10.586	3.189	0.055	99.436	BS13&14C_L3_S3
-855.5	51.544	52.400	2.007	13.773	11.497	6.615	10.530	3.143	0.036	99.144	BS13&14C_L3_S3
-935.5	51.639	52.206	2.032	13.971	11.369	6.606	10.599	3.163	0.054	99.433	BS13&14C_L3_S3
-1015.5	51.843	52.279	1.954	13.937	11.368	6.709	10.608	3.113	0.033	99.564	BS13&14C_L3_S3

Table C27. BS17&18C

X(µm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
1063.7	49.686	50.439	1.919	14.188	11.634	5.156	10.545	3.077	3.043	99.246	BS17&18C_L1_S1
983.7	49.754	50.646	1.908	14.213	11.453	5.111	10.502	3.098	3.069	99.108	BS17&18C_L1_S1
903.7	49.556	50.125	1.997	14.306	11.599	5.200	10.594	3.118	3.062	99.432	BS17&18C_L1_S1
823.7	49.257	50.509	1.906	14.195	11.481	5.269	10.520	3.068	3.052	98.748	BS17&18C_L1_S1
743.7	49.221	50.304	1.984	14.372	11.444	5.319	10.429	3.085	3.063	98.917	BS17&18C_L1_S1
663.7	49.244	50.627	1.978	14.080	11.513	5.260	10.509	3.041	2.991	98.617	BS17&18C_L1_S1
583.7	49.409	50.561	1.871	14.270	11.415	5.200	10.606	3.057	3.021	98.848	BS17&18C_L1_S1
503.7	48.933	50.409	1.928	14.172	11.603	5.207	10.612	3.036	3.035	98.524	BS17&18C_L1_S1
423.7	49.662	50.302	1.916	14.234	11.613	5.368	10.574	3.051	2.942	99.360	BS17&18C_L1_S2
383.7	49.185	50.252	1.985	14.328	11.525	5.363	10.567	3.044	2.938	98.933	BS17&18C_L1_S2
343.7	49.492	50.519	1.992	14.252	11.457	5.331	10.566	3.018	2.866	98.973	BS17&18C_L1_S2
303.7	49.596	50.565	1.972	14.254	11.604	5.226	10.541	2.989	2.848	99.031	BS17&18C_L1_S2
263.7	49.381	50.290	1.970	14.416	11.548	5.425	10.484	3.066	2.802	99.091	BS17&18C_L1_S2
223.7	49.872	50.461	1.934	14.368	11.583	5.492	10.412	3.017	2.734	99.412	BS17&18C_L1_S2
183.7	49.523	50.518	2.050	14.439	11.397	5.484	10.429	3.077	2.606	99.005	BS17&18C_L1_S2
143.7	49.403	50.805	1.987	14.387	11.203	5.709	10.385	3.065	2.458	98.598	BS17&18C_L1_S2
103.7	49.419	50.635	2.035	14.513	11.105	5.905	10.344	3.159	2.304	98.784	BS17&18C_L1_S2
63.7	49.579	50.787	1.928	14.562	10.980	6.181	10.382	3.166	2.014	98.793	BS17&18C_L1_S2
23.7	49.593	50.749	1.969	14.371	11.056	6.525	10.427	3.153	1.751	98.844	BS17&18C_L1_S2
-16.3	49.582	50.045	1.975	14.378	11.262	7.079	10.656	3.202	1.403	99.536	BS17&18C_L1_S2
-56.3	48.668	50.083	2.034	14.097	11.307	7.425	10.840	3.134	1.081	98.585	BS17&18C_L1_S2
-96.3	48.879	50.350	1.985	14.124	11.144	7.659	10.869	3.115	0.754	98.529	BS17&18C_L1_S3
-136.3	49.165	50.243	1.950	14.186	11.193	7.873	10.900	3.122	0.534	98.923	BS17&18C_L1_S3
-176.3	49.160	50.341	1.881	14.317	11.149	7.781	10.914	3.233	0.385	98.820	BS17&18C_L1_S3
-216.3	49.377	50.701	1.978	14.298	10.817	7.961	10.762	3.246	0.238	98.676	BS17&18C_L1_S3
-256.3	49.871	50.780	1.973	14.204	10.902	7.912	10.800	3.286	0.143	99.091	BS17&18C_L1_S3
-296.3	49.156	50.664	2.086	14.258	10.839	7.975	10.742	3.343	0.094	98.492	BS17&18C_L1_S3
-336.3	49.736	50.491	1.979	14.401	11.016	7.935	10.793	3.321	0.064	99.244	BS17&18C_L1_S3
-376.3	49.740	50.458	1.973	14.423	11.004	8.001	10.727	3.356	0.060	99.283	BS17&18C_L1_S3
-416.3	49.592	50.647	1.965	14.219	11.065	7.998	10.710	3.351	0.045	98.944	BS17&18C_L1_S3
-456.3	49.355	50.640	2.014	14.356	10.967	8.020	10.697	3.277	0.028	98.714	BS17&18C_L1_S3
-496.3	49.386	50.854	1.944	14.188	10.968	7.974	10.766	3.260	0.047	98.532	BS17&18C_L1_S3
-536.3	49.277	50.596	2.019	14.343	11.076	8.000	10.663	3.256	0.047	98.681	BS17&18C_L1_S3
-616.3	49.529	50.627	1.965	14.526	10.899	8.002	10.724	3.225	0.033	98.902	BS17&18C_L1_S4
-696.3	49.816	50.778	1.988	14.367	10.923	7.992	10.689	3.224	0.039	99.038	BS17&18C_L1_S4
-776.3	49.934	50.491	1.990	14.399	11.040	8.165	10.664	3.212	0.039	99.443	BS17&18C_L1_S4
-856.3	49.800	50.606	2.005	14.505	10.886	8.085	10.623	3.240	0.050	99.194	BS17&18C_L1_S4
-936.3	49.950	50.630	2.013	14.339	10.982	8.125	10.740	3.133	0.040	99.321	BS17&18C_L1_S4
-1016.3	50.148	50.788	1.989	14.360	10.951	7.957	10.658	3.251	0.047	99.360	BS17&18C_L1_S4
-1096.3	49.919	50.745	2.018	14.249	10.912	7.961	10.791	3.281	0.044	99.174	BS17&18C_L1_S4
-1176.3	49.783	50.642	2.078	14.423	10.901	8.085	10.653	3.178	0.041	99.141	BS17&18C_L1_S4
-1256.3	49.480	50.740	1.996	14.354	10.843	8.161	10.739	3.141	0.028	98.741	BS17&18C_L1_S4
708.7	49.204	50.491	2.014	14.264	11.415	5.189	10.471	3.123	3.032	98.713	BS17&18C_L2_S1
628.7	48.963	50.117	2.028	14.245	11.467	5.412	10.576	3.088	3.067	98.846	BS17&18C_L2_S1
468.7	48.353	50.503	2.000	14.202	11.598	5.205	10.521	3.005	2.966	97.850	BS17&18C_L2_S1
388.7	49.110	50.256	1.954	14.235	11.518	5.358	10.622	3.058	3.001	98.854	BS17&18C_L2_S2
348.7	48.866	50.251	1.989	14.273	11.500	5.380	10.533	3.104	2.970	98.615	BS17&18C_L2_S2
308.7	48.625	50.324	1.956	14.371	11.411	5.400	10.618	3.055	2.866	98.302	BS17&18C_L2_S2
268.7	49.035	50.230	1.948	14.423	11.463	5.413	10.602	3.086	2.836	98.805	BS17&18C_L2_S2
228.7	48.806	50.232	1.948	14.506	11.470	5.511	10.520	3.074	2.741	98.575	BS17&18C_L2_S2
188.7	48.581	50.650	2.026	14.308	11.446	5.538	10.332	3.080	2.620	97.931	BS17&18C_L2_S2
148.7	49.190	50.716	1.986	14.530	11.161	5.636	10.370	3.136	2.465	98.474	BS17&18C_L2_S2
28.7	49.169	50.614	1.932	14.461	11.070	6.506	10.479	3.154	1.786	98.555	BS17&18C_L2_S2
-11.3	48.988	50.150	2.002	14.439	11.227	6.965	10.630	3.145	1.443	98.838	BS17&18C_L2_S2
-51.3	48.557	50.013	2.088	14.197	11.274	7.318	10.799	3.172	1.138	98.544	BS17&18C_L2_S2
-91.3	48.212	50.150	2.008	14.187	11.212	7.561	10.846	3.188	0.848	98.062	BS17&18C_L2_S2
-131.3	48.472	50.247	2.043	14.044	11.220	7.764	10.868	3.227	0.587	98.225	BS17&18C_L2_S3
-171.3	48.859	50.442	2.005	14.245	11.073	7.715	10.914	3.197	0.410	98.417	BS17&18C_L2_S3
-211.3	48.994	50.306	2.063	14.214	11.061	7.954	10.848	3.288	0.267	98.688	BS17&18C_L2_S3
-251.3	49.023	50.284	1.986	14.336	11.060	8.045	10.763	3.354	0.172	98.740	BS17&18C_L2_S3
-291.3	49.248	50.293	2.023	14.309	11.053	8.069	10.852	3.299	0.102	98.955	BS17&18C_L2_S3

-331.3	49.214	50.333	2.023	14.341	11.153	8.028	10.677	3.373	0.073	98.881	BS17&18C_L2_S3
-371.3	49.008	50.344	2.027	14.428	11.204	7.956	10.656	3.329	0.056	98.664	BS17&18C_L2_S3
-411.3	49.080	50.209	2.079	14.476	11.103	8.041	10.715	3.341	0.036	98.871	BS17&18C_L2_S3
-451.3	48.971	50.377	2.019	14.461	11.100	8.055	10.612	3.334	0.043	98.594	BS17&18C_L2_S3
-491.3	49.346	50.416	1.990	14.411	11.097	8.070	10.672	3.294	0.050	98.930	BS17&18C_L2_S3
-531.3	49.128	50.566	1.888	14.331	11.084	8.105	10.634	3.356	0.037	98.562	BS17&18C_L2_S3
-571.3	49.165	50.864	2.022	14.364	10.851	7.980	10.632	3.247	0.040	98.301	BS17&18C_L2_S3
-611.3	49.430	50.359	2.026	14.500	10.978	8.075	10.761	3.257	0.045	99.071	BS17&18C_L2_S3
-691.3	49.175	50.714	2.018	14.234	10.898	8.114	10.732	3.253	0.038	98.461	BS17&18C_L2_S4
-771.3	49.583	50.644	2.006	14.476	11.028	7.961	10.628	3.209	0.047	98.940	BS17&18C_L2_S4
-851.3	49.041	50.619	2.006	14.318	11.023	8.054	10.651	3.283	0.045	98.422	BS17&18C_L2_S4
-931.3	49.573	50.621	1.977	14.395	11.036	8.019	10.644	3.272	0.037	98.951	BS17&18C_L2_S4
-1011.3	48.918	50.512	2.059	14.430	10.856	8.129	10.753	3.226	0.034	98.406	BS17&18C_L2_S4
-1091.3	48.884	50.683	1.996	14.530	10.963	7.945	10.672	3.167	0.045	98.201	BS17&18C_L2_S4
-1171.3	48.738	50.477	2.054	14.429	10.915	8.113	10.717	3.251	0.045	98.261	BS17&18C_L2_S4
-1251.3	48.581	50.772	2.006	14.318	11.045	7.901	10.675	3.236	0.047	97.809	BS17&18C_L2_S5
-1259.3	49.093	50.807	2.018	14.432	10.754	8.070	10.683	3.192	0.044	98.286	BS17&18C_L2_S5
-1267.3	48.491	50.463	2.025	14.450	10.984	8.086	10.746	3.210	0.037	98.028	BS17&18C_L2_S5
-1275.3	49.098	50.686	2.021	14.370	10.960	8.156	10.617	3.141	0.050	98.412	BS17&18C_L2_S5
-1283.3	49.147	50.585	2.064	14.410	11.029	8.055	10.660	3.162	0.036	98.562	BS17&18C_L2_S5
-1291.3	49.239	50.665	2.078	14.336	10.946	8.036	10.724	3.175	0.039	98.574	BS17&18C_L2_S5
-1299.3	48.626	50.574	2.042	14.527	10.845	8.025	10.737	3.215	0.036	98.052	BS17&18C_L2_S5
-1307.3	48.618	50.743	2.041	14.387	10.812	8.005	10.731	3.231	0.051	97.875	BS17&18C_L2_S5
-1315.3	49.246	50.744	2.041	14.491	10.741	8.000	10.750	3.194	0.039	98.502	BS17&18C_L2_S5
-1323.3	48.755	50.837	2.043	14.394	10.777	8.012	10.724	3.173	0.042	97.919	BS17&18C_L2_S5
-1331.3	49.222	50.848	1.951	14.370	10.890	8.062	10.731	3.113	0.035	98.374	BS17&18C_L2_S5
1148.7	48.246	50.250	1.932	14.129	11.760	5.191	10.703	3.042	2.993	97.996	BS17&18C_L3_S1
988.7	48.459	50.039	1.956	14.189	11.754	5.326	10.614	3.070	3.053	98.421	BS17&18C_L3_S1
908.7	48.390	50.074	1.935	14.191	11.730	5.262	10.677	3.076	3.054	98.316	BS17&18C_L3_S1
828.7	48.441	50.010	1.966	14.321	11.668	5.288	10.657	3.065	3.025	98.432	BS17&18C_L3_S1
748.7	48.372	50.384	1.932	14.248	11.536	5.247	10.594	3.096	2.962	97.988	BS17&18C_L3_S1
668.7	48.382	49.887	1.941	14.271	11.807	5.319	10.676	3.092	3.008	98.495	BS17&18C_L3_S1
588.7	48.562	50.316	1.966	14.086	11.603	5.286	10.673	3.047	3.024	98.246	BS17&18C_L3_S1
508.7	48.334	50.406	2.048	14.054	11.498	5.392	10.608	2.998	2.997	97.928	BS17&18C_L3_S1
428.7	48.088	50.105	2.038	14.118	11.736	5.318	10.658	3.032	2.995	97.982	BS17&18C_L3_S2
388.7	48.765	50.304	1.964	14.264	11.559	5.374	10.581	3.036	2.918	98.461	BS17&18C_L3_S2
348.7	48.741	50.287	2.002	14.274	11.637	5.284	10.625	3.000	2.891	98.454	BS17&18C_L3_S2
308.7	48.033	50.188	1.964	14.282	11.699	5.362	10.564	3.047	2.894	97.845	BS17&18C_L3_S2
268.7	48.434	50.392	1.895	14.345	11.612	5.397	10.511	3.016	2.832	98.042	BS17&18C_L3_S2
228.7	48.445	50.464	1.956	14.287	11.575	5.447	10.503	3.026	2.742	97.981	BS17&18C_L3_S2
188.7	48.927	50.279	2.023	14.421	11.621	5.490	10.465	3.052	2.650	98.648	BS17&18C_L3_S2
148.7	48.731	50.582	1.966	14.421	11.361	5.633	10.486	3.083	2.467	98.148	BS17&18C_L3_S2
108.7	48.730	50.238	2.025	14.548	11.447	5.777	10.456	3.149	2.360	98.492	BS17&18C_L3_S2
68.7	48.786	50.172	2.056	14.586	11.305	6.169	10.382	3.204	2.128	98.614	BS17&18C_L3_S2
28.7	49.143	50.588	1.921	14.390	11.215	6.402	10.515	3.175	1.794	98.554	BS17&18C_L3_S2
-11.3	48.909	50.157	1.962	14.183	11.359	7.031	10.694	3.195	1.419	98.752	BS17&18C_L3_S2
343.7	48.613	50.315	1.946	14.229	11.627	5.333	10.645	2.960	2.945	98.298	BS17&18C_L3_S3
258.7	48.203	50.217	2.023	14.406	11.624	5.383	10.565	3.007	2.776	97.985	BS17&18C_L3_S3
173.7	48.276	50.474	1.900	14.329	11.633	5.520	10.478	3.078	2.589	97.802	BS17&18C_L3_S3
88.7	48.648	50.540	1.938	14.575	11.238	6.014	10.361	3.117	2.218	98.108	BS17&18C_L3_S3
3.7	48.966	50.249	2.057	14.285	11.299	6.727	10.684	3.137	1.563	98.717	BS17&18C_L3_S3
-81.3	48.810	50.264	1.934	14.102	11.384	7.438	10.897	3.086	0.895	98.546	BS17&18C_L3_S3
-166.3	48.753	50.253	1.932	14.280	11.137	7.797	10.928	3.262	0.412	98.500	BS17&18C_L3_S3
-251.3	49.387	50.481	1.941	14.358	10.986	7.937	10.817	3.334	0.148	98.906	BS17&18C_L3_S3
-336.3	49.123	50.319	1.999	14.426	11.030	8.034	10.794	3.336	0.061	98.804	BS17&18C_L3_S3
-421.3	49.575	50.564	2.000	14.299	11.018	8.019	10.686	3.366	0.049	99.012	BS17&18C_L3_S3
-506.3	49.305	50.436	1.956	14.294	11.197	8.003	10.743	3.317	0.054	98.869	BS17&18C_L3_S3
-591.3	49.160	50.341	2.089	14.434	11.105	7.998	10.760	3.224	0.049	98.819	BS17&18C_L3_S3
-671.3	49.505	50.650	2.044	14.454	10.864	8.030	10.671	3.243	0.045	98.855	BS17&18C_L3_S4
-751.3	49.345	50.773	1.974	14.376	10.947	8.003	10.709	3.180	0.037	98.572	BS17&18C_L3_S4
-831.3	49.173	50.486	2.013	14.368	11.131	8.041	10.734	3.189	0.038	98.687	BS17&18C_L3_S4
-911.3	48.967	50.719	1.977	14.339	11.031	8.073	10.643	3.184	0.034	98.248	BS17&18C_L3_S4
-991.3	49.475	50.619	2.014	14.211	10.996	8.141	10.776	3.210	0.033	98.856	BS17&18C_L3_S5

-1071.3	49.849	50.785	1.990	14.365	11.032	7.938	10.644	3.209	0.038	99.064	BS17&18C_L3_S5
-1151.3	49.217	50.635	2.001	14.296	11.016	8.045	10.730	3.230	0.047	98.582	BS17&18C_L3_S5
-1231.3	49.458	50.751	1.997	14.269	11.004	8.009	10.770	3.156	0.045	98.707	BS17&18C_L3_S6
-1311.3	49.119	50.626	2.010	14.355	10.943	8.147	10.760	3.125	0.035	98.492	BS17&18C_L3_S6

Table C28. BS19&20C

X(μm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
1160	50.118	50.928	1.954	15.414	11.178	6.746	9.034	3.241	1.505	99.190	BS19&20C_L2_S1
1080	50.274	50.930	2.008	15.544	11.264	6.530	8.957	3.250	1.518	99.344	BS19&20C_L2_S1
1000	50.270	51.012	1.975	15.362	11.258	6.570	9.075	3.258	1.491	99.258	BS19&20C_L2_S2
920	50.429	51.054	1.953	15.423	11.183	6.613	9.020	3.251	1.503	99.375	BS19&20C_L2_S2
840	50.572	51.031	1.960	15.480	11.131	6.530	9.045	3.334	1.489	99.542	BS19&20C_L2_S2
760	50.274	51.002	1.928	15.377	11.275	6.570	9.062	3.265	1.519	99.272	BS19&20C_L2_S2
680	50.472	51.180	1.896	15.366	11.102	6.633	9.010	3.344	1.470	99.291	BS19&20C_L2_S2
600	50.494	51.050	1.933	15.418	11.125	6.557	9.049	3.374	1.495	99.444	BS19&20C_L2_S2
520	50.441	51.012	2.028	15.412	11.096	6.611	8.977	3.376	1.488	99.429	BS19&20C_L2_S3
480	50.538	51.003	1.968	15.578	11.134	6.567	8.967	3.298	1.485	99.535	BS19&20C_L2_S3
440	50.488	51.054	2.032	15.458	11.036	6.562	8.987	3.351	1.520	99.434	BS19&20C_L2_S3
400	50.475	51.188	2.031	15.426	10.977	6.544	8.962	3.369	1.504	99.287	BS19&20C_L2_S3
360	50.574	51.032	1.994	15.447	10.981	6.648	8.947	3.429	1.521	99.542	BS19&20C_L2_S3
320	50.565	51.161	1.978	15.517	10.914	6.514	9.007	3.386	1.524	99.405	BS19&20C_L2_S3
280	50.612	51.315	1.977	15.256	10.843	6.548	9.072	3.455	1.535	99.297	BS19&20C_L2_S3
240	50.486	51.023	1.983	15.361	10.949	6.637	9.136	3.369	1.541	99.463	BS19&20C_L2_S3
200	50.112	51.271	1.959	15.198	10.816	6.464	9.257	3.477	1.559	98.841	BS19&20C_L2_S3
160	50.539	51.049	1.962	15.270	10.858	6.487	9.423	3.376	1.576	99.490	BS19&20C_L2_S3
120	50.465	51.214	1.943	15.420	10.527	6.410	9.523	3.383	1.580	99.251	BS19&20C_L2_S3
80	50.622	50.741	1.935	15.165	10.881	6.469	9.901	3.345	1.565	99.880	BS19&20C_L2_S3
40	50.473	51.077	1.973	14.693	10.832	6.533	10.160	3.226	1.506	99.397	BS19&20C_L2_S3
0	50.599	51.265	1.946	13.747	11.030	6.796	10.631	3.111	1.475	99.334	BS19&20C_L2_S4
-40	50.672	51.077	2.006	13.098	11.549	6.826	10.998	3.018	1.429	99.596	BS19&20C_L2_S4
-80	50.697	51.369	2.030	12.622	11.597	6.940	11.151	2.911	1.379	99.327	BS19&20C_L2_S4
-120	50.629	51.579	1.966	12.477	11.549	6.878	11.323	2.830	1.400	99.051	BS19&20C_L2_S4
-160	50.578	51.337	2.004	12.405	11.568	6.893	11.510	2.893	1.390	99.241	BS19&20C_L2_S4
-200	50.703	51.110	1.966	12.436	11.591	6.930	11.695	2.869	1.404	99.594	BS19&20C_L2_S4
-240	50.610	51.120	2.009	12.575	11.329	6.848	11.821	2.823	1.476	99.490	BS19&20C_L2_S4
-280	50.545	51.040	1.985	12.528	11.386	6.914	11.776	2.914	1.458	99.504	BS19&20C_L2_S4
-320	50.479	50.869	1.934	12.687	11.400	6.823	11.922	2.916	1.450	99.610	BS19&20C_L2_S4
-360	50.660	51.008	1.989	12.463	11.459	6.792	11.925	2.896	1.468	99.653	BS19&20C_L2_S4
-400	50.300	51.233	2.050	12.324	11.420	6.692	11.968	2.898	1.415	99.067	BS19&20C_L2_S4
-440	50.530	51.073	1.911	12.424	11.515	6.750	11.932	2.915	1.481	99.458	BS19&20C_L2_S4
-480	50.430	51.155	1.996	12.573	11.205	6.699	11.943	2.966	1.463	99.275	BS19&20C_L2_S4
-560	50.539	50.800	2.031	12.473	11.376	6.894	11.943	3.009	1.475	99.739	BS19&20C_L2_S5
-640	50.327	50.913	1.960	12.564	11.534	6.647	11.877	3.013	1.493	99.414	BS19&20C_L2_S5
-720	50.310	50.899	1.904	12.516	11.398	6.644	12.084	3.084	1.471	99.411	BS19&20C_L2_S5
-800	50.403	50.583	2.073	12.449	11.468	6.810	12.068	3.091	1.460	99.820	BS19&20C_L2_S5
-880	50.538	50.643	2.039	12.276	11.653	6.793	12.055	3.050	1.492	99.895	BS19&20C_L2_S5
-960	50.284	51.022	1.942	12.384	11.486	6.757	11.888	3.048	1.474	99.262	BS19&20C_L2_S5
-1040	50.006	50.541	1.996	12.507	11.690	6.690	12.024	3.058	1.496	99.465	BS19&20C_L2_S5
1195	49.956	50.382	1.941	15.531	11.611	6.721	9.239	3.078	1.498	99.574	BS19&20C_L3_S1
1115	49.876	50.721	1.966	15.437	11.510	6.699	9.090	3.123	1.455	99.155	BS19&20C_L3_S1
1035	50.011	50.562	1.875	15.522	11.509	6.795	9.099	3.181	1.457	99.449	BS19&20C_L3_S2
955	50.242	50.559	1.951	15.503	11.532	6.660	9.151	3.167	1.477	99.683	BS19&20C_L3_S2
875	49.748	50.301	2.001	15.589	11.591	6.771	9.103	3.175	1.469	99.448	BS19&20C_L3_S2
795	49.941	50.895	1.976	15.424	11.270	6.765	9.087	3.173	1.411	99.047	BS19&20C_L3_S2
715	49.871	50.798	1.940	15.385	11.359	6.643	9.191	3.222	1.464	99.073	BS19&20C_L3_S2
635	50.104	50.557	2.051	15.489	11.353	6.702	9.104	3.293	1.452	99.547	BS19&20C_L3_S2
555	50.298	50.651	1.920	15.483	11.319	6.757	9.137	3.260	1.472	99.647	BS19&20C_L3_S3
515	50.174	50.431	1.976	15.578	11.414	6.694	9.134	3.309	1.465	99.743	BS19&20C_L3_S3
475	50.309	50.818	1.954	15.520	11.240	6.694	9.067	3.244	1.464	99.491	BS19&20C_L3_S3
435	50.217	50.454	2.040	15.457	11.301	6.797	9.136	3.351	1.464	99.763	BS19&20C_L3_S3
395	50.073	50.496	2.082	15.443	11.386	6.687	9.100	3.344	1.463	99.577	BS19&20C_L3_S3
355	50.183	50.841	1.979	15.347	11.312	6.710	9.077	3.288	1.446	99.342	BS19&20C_L3_S3
315	50.304	50.815	1.936	15.481	11.151	6.627	9.177	3.336	1.477	99.489	BS19&20C_L3_S3
275	50.078	50.678	2.001	15.477	11.213	6.594	9.175	3.362	1.501	99.399	BS19&20C_L3_S3
235	50.162	50.688	2.048	15.392	11.170	6.636	9.199	3.370	1.497	99.474	BS19&20C_L3_S3
195	50.325	50.570	2.015	15.469	11.086	6.702	9.306	3.328	1.524	99.755	BS19&20C_L3_S3
155	50.105	50.743	2.009	15.339	11.023	6.571	9.491	3.294	1.530	99.362	BS19&20C_L3_S3
115	50.266	50.856	1.963	15.288	10.857	6.594	9.616	3.288	1.539	99.410	BS19&20C_L3_S4

75	50.313	50.580	2.005	15.180	10.888	6.639	9.933	3.252	1.523	99.733	BS19&20C_L3_S4
35	49.954	50.558	1.977	14.867	11.065	6.570	10.266	3.202	1.495	99.396	BS19&20C_L3_S4
-5	50.139	50.790	1.893	14.003	11.369	6.734	10.653	3.112	1.447	99.349	BS19&20C_L3_S4
-45	50.215	50.658	2.029	13.292	11.693	7.033	10.930	2.995	1.370	99.558	BS19&20C_L3_S4
-85	50.591	50.704	1.970	12.932	11.909	7.050	11.187	2.891	1.358	99.887	BS19&20C_L3_S4
-125	50.250	50.697	2.042	12.737	11.900	7.018	11.425	2.814	1.367	99.553	BS19&20C_L3_S4
-165	50.428	50.865	2.029	12.484	11.708	6.985	11.676	2.907	1.347	99.564	BS19&20C_L3_S4
-205	50.512	50.914	1.992	12.494	11.742	6.937	11.733	2.802	1.386	99.598	BS19&20C_L3_S4
-245	50.389	50.789	2.000	12.419	11.691	6.956	11.842	2.918	1.384	99.600	BS19&20C_L3_S4
-285	50.330	50.831	1.999	12.415	11.774	6.819	11.917	2.852	1.394	99.499	BS19&20C_L3_S4
-365	50.268	50.771	1.944	12.528	11.632	6.845	11.968	2.905	1.408	99.497	BS19&20C_L3_S5
-445	50.438	51.030	2.024	12.359	11.434	6.788	11.994	2.916	1.456	99.408	BS19&20C_L3_S5
-525	50.252	50.721	2.005	12.531	11.447	6.761	12.109	2.980	1.447	99.532	BS19&20C_L3_S5
-605	50.052	50.605	1.952	12.516	11.594	6.810	12.083	2.999	1.441	99.447	BS19&20C_L3_S5
-685	50.198	50.746	2.023	12.335	11.603	6.833	12.017	2.991	1.452	99.453	BS19&20C_L3_S5
-765	49.914	50.627	2.008	12.495	11.571	6.785	12.005	3.098	1.410	99.287	BS19&20C_L3_S5
-845	50.103	50.874	2.000	12.550	11.361	6.767	12.020	3.000	1.428	99.228	BS19&20C_L3_S6
-925	50.138	50.673	2.006	12.430	11.511	6.812	12.017	3.103	1.448	99.465	BS19&20C_L3_S6
-1005	50.250	50.482	1.957	12.541	11.658	6.884	12.008	3.012	1.459	99.768	BS19&20C_L3_S6

Table C29. BS1&2B

X(μm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
720.7	51.295	51.689	0.525	14.029	11.715	6.726	10.735	3.070	1.512	99.606	BS1&2B_L1_S1
640.7	50.913	51.957	0.495	14.090	11.597	6.636	10.645	3.096	1.483	98.956	BS1&2B_L1_S1
560.7	51.083	52.012	0.507	14.003	11.601	6.659	10.599	3.130	1.490	99.071	BS1&2B_L1_S1
480.7	51.017	52.033	0.473	14.097	11.470	6.680	10.684	3.056	1.508	98.984	BS1&2B_L1_S1
400.7	51.205	51.765	0.512	14.127	11.573	6.701	10.689	3.141	1.492	99.440	BS1&2B_L1_S2
360.7	51.167	51.693	0.503	14.120	11.746	6.680	10.659	3.116	1.483	99.474	BS1&2B_L1_S2
320.7	51.125	52.048	0.527	14.163	11.378	6.682	10.674	3.057	1.471	99.077	BS1&2B_L1_S2
280.7	51.189	51.638	0.550	14.318	11.489	6.720	10.737	3.081	1.467	99.552	BS1&2B_L1_S2
240.7	51.082	51.825	0.512	14.150	11.420	6.766	10.663	3.116	1.550	99.257	BS1&2B_L1_S2
200.7	51.254	51.797	0.586	14.185	11.460	6.693	10.669	3.104	1.508	99.457	BS1&2B_L1_S2
160.7	51.384	51.494	0.669	14.269	11.416	6.770	10.679	3.156	1.548	99.890	BS1&2B_L1_S2
120.7	51.196	51.733	0.756	14.240	11.201	6.727	10.679	3.135	1.530	99.464	BS1&2B_L1_S2
80.7	50.775	51.651	1.128	14.175	11.076	6.721	10.587	3.185	1.477	99.124	BS1&2B_L1_S2
40.7	50.570	50.982	1.455	14.278	11.253	6.731	10.683	3.097	1.520	99.588	BS1&2B_L1_S2
0.7	49.840	51.009	1.925	14.215	11.126	6.634	10.630	2.999	1.463	98.831	BS1&2B_L1_S2
-39.3	49.444	50.262	2.347	14.264	11.361	6.716	10.630	3.012	1.410	99.182	BS1&2B_L1_S2
-89.3	48.612	49.714	2.946	14.207	11.328	6.761	10.628	2.991	1.426	98.898	BS1&2B_L1_S3
-129.3	48.499	49.428	3.189	14.140	11.362	6.744	10.734	2.998	1.405	99.072	BS1&2B_L1_S3
-169.3	48.656	49.356	3.321	14.268	11.166	6.779	10.634	3.006	1.469	99.300	BS1&2B_L1_S3
-209.3	48.428	49.423	3.373	14.220	11.200	6.742	10.624	2.977	1.441	99.005	BS1&2B_L1_S3
-249.3	48.419	49.240	3.445	14.326	11.184	6.696	10.613	3.020	1.476	99.179	BS1&2B_L1_S3
-289.3	48.762	49.861	3.252	14.259	10.974	6.550	10.627	3.006	1.473	98.902	BS1&2B_L1_S3
-329.3	48.898	49.354	3.385	14.383	11.052	6.609	10.650	3.093	1.475	99.544	BS1&2B_L1_S3
-369.3	48.561	49.711	3.372	14.169	11.140	6.550	10.656	2.977	1.425	98.850	BS1&2B_L1_S3
-409.3	48.731	49.277	3.418	14.319	11.044	6.714	10.650	3.088	1.491	99.454	BS1&2B_L1_S3
-449.3	48.675	49.781	3.278	14.179	11.008	6.592	10.647	3.056	1.458	98.894	BS1&2B_L1_S3
-489.3	48.738	49.621	3.363	14.320	11.050	6.557	10.522	3.092	1.476	99.118	BS1&2B_L1_S3
-529.3	48.597	49.671	3.295	14.232	11.031	6.641	10.615	3.062	1.452	98.925	BS1&2B_L1_S3
-569.3	48.771	49.578	3.382	14.228	11.038	6.672	10.627	3.022	1.453	99.193	BS1&2B_L1_S3
-649.3	48.204	49.671	3.392	14.303	10.948	6.636	10.552	3.030	1.468	98.534	BS1&2B_L1_S4
-729.3	48.300	49.423	3.490	14.251	11.150	6.599	10.548	3.083	1.457	98.877	BS1&2B_L1_S4
-809.3	48.177	49.478	3.444	14.168	11.072	6.662	10.548	3.168	1.460	98.700	BS1&2B_L1_S4
794.2	51.098	51.438	0.495	14.364	11.744	6.729	10.717	3.057	1.456	99.660	BS1&2B_L2_S1
714.2	50.918	51.826	0.473	14.022	11.730	6.652	10.740	3.042	1.514	99.092	BS1&2B_L2_S1
634.2	51.111	51.683	0.502	14.180	11.772	6.626	10.648	3.066	1.524	99.429	BS1&2B_L2_S1
554.2	50.962	51.815	0.564	14.115	11.624	6.676	10.639	3.086	1.482	99.147	BS1&2B_L2_S1
474.2	50.936	51.707	0.474	14.100	11.718	6.671	10.674	3.132	1.525	99.229	BS1&2B_L2_S1
394.2	51.180	51.948	0.498	14.171	11.480	6.726	10.649	3.056	1.473	99.233	BS1&2B_L2_S1
314.2	51.214	51.898	0.512	13.947	11.635	6.687	10.762	3.093	1.467	99.316	BS1&2B_L2_S2
274.2	51.127	52.118	0.467	14.029	11.536	6.642	10.614	3.111	1.483	99.009	BS1&2B_L2_S2
234.2	51.317	51.803	0.583	14.181	11.526	6.658	10.673	3.094	1.483	99.514	BS1&2B_L2_S2
194.2	51.247	52.040	0.559	14.111	11.281	6.622	10.686	3.172	1.530	99.208	BS1&2B_L2_S2
154.2	51.058	51.702	0.706	14.132	11.542	6.679	10.573	3.142	1.524	99.355	BS1&2B_L2_S2
114.2	51.032	51.970	0.860	14.160	11.188	6.587	10.598	3.095	1.542	99.061	BS1&2B_L2_S2
74.2	50.574	51.744	1.128	14.148	11.235	6.551	10.556	3.113	1.525	98.830	BS1&2B_L2_S2
34.2	50.400	50.886	1.570	14.244	11.352	6.609	10.723	3.120	1.496	99.514	BS1&2B_L2_S2
-5.8	49.355	51.159	2.028	13.952	11.080	6.550	10.635	3.111	1.484	98.196	BS1&2B_L2_S2
-45.8	49.224	50.182	2.464	14.153	11.419	6.565	10.745	3.019	1.455	99.043	BS1&2B_L2_S2
-70.8	48.451	49.830	2.805	14.195	11.417	6.644	10.745	2.949	1.416	98.621	BS1&2B_L2_S3
-110.8	48.582	49.423	3.099	14.155	11.390	6.756	10.738	2.991	1.447	99.158	BS1&2B_L2_S3
-150.8	48.409	49.988	3.097	14.020	11.195	6.617	10.658	2.994	1.431	98.421	BS1&2B_L2_S3
-190.8	48.410	49.545	3.380	14.131	11.283	6.600	10.615	3.018	1.430	98.865	BS1&2B_L2_S3
-230.8	48.218	49.371	3.312	14.314	11.303	6.610	10.640	3.010	1.438	98.847	BS1&2B_L2_S3
-270.8	48.180	49.532	3.439	14.188	11.200	6.570	10.653	2.995	1.424	98.648	BS1&2B_L2_S3
-310.8	48.252	49.545	3.524	14.062	11.151	6.547	10.619	3.108	1.445	98.707	BS1&2B_L2_S3
-350.8	48.351	49.734	3.264	14.066	11.053	6.628	10.689	3.087	1.478	98.617	BS1&2B_L2_S3
-390.8	48.058	49.489	3.408	14.109	11.263	6.494	10.700	3.074	1.465	98.570	BS1&2B_L2_S3
-430.8	48.088	49.264	3.561	14.284	11.072	6.591	10.699	3.086	1.444	98.824	BS1&2B_L2_S3
-470.8	48.109	49.521	3.432	14.134	11.127	6.693	10.645	2.992	1.456	98.588	BS1&2B_L2_S3
-550.8	48.133	49.567	3.430	14.160	11.084	6.677	10.595	3.013	1.474	98.565	BS1&2B_L2_S4
-630.8	48.053	49.838	3.372	14.086	11.084	6.544	10.638	2.984	1.454	98.216	BS1&2B_L2_S4

-710.8	47.962	49.095	3.510	14.229	11.353	6.710	10.647	3.015	1.441	98.867	BS1&2B_L2_S4
-790.8	48.025	49.574	3.401	14.138	11.215	6.620	10.645	2.968	1.440	98.450	BS1&2B_L2_S4
742.6	51.028	51.682	0.554	14.193	11.920	6.538	10.629	3.004	1.480	99.346	BS1&2B_L3_S1
662.6	51.215	51.536	0.523	14.197	11.886	6.624	10.655	3.081	1.498	99.679	BS1&2B_L3_S1
582.6	50.939	51.997	0.499	13.986	11.713	6.611	10.659	3.028	1.507	98.942	BS1&2B_L3_S1
502.6	51.140	51.587	0.516	14.119	11.813	6.673	10.690	3.090	1.511	99.553	BS1&2B_L3_S1
422.6	51.201	51.641	0.505	14.124	11.785	6.663	10.728	3.048	1.505	99.560	BS1&2B_L3_S1
342.6	51.041	51.809	0.512	14.125	11.624	6.652	10.746	3.045	1.486	99.232	BS1&2B_L3_S2
302.6	51.064	51.996	0.534	13.987	11.614	6.677	10.701	3.022	1.469	99.067	BS1&2B_L3_S2
262.6	50.808	51.814	0.529	14.189	11.554	6.676	10.664	3.100	1.475	98.994	BS1&2B_L3_S2
222.6	51.156	51.862	0.507	14.161	11.592	6.635	10.697	3.061	1.484	99.294	BS1&2B_L3_S2
182.6	51.069	51.834	0.648	14.154	11.419	6.678	10.652	3.074	1.541	99.235	BS1&2B_L3_S2
142.6	51.205	51.839	0.736	14.170	11.430	6.519	10.610	3.173	1.524	99.366	BS1&2B_L3_S2
102.6	50.917	51.712	0.870	14.214	11.300	6.638	10.587	3.142	1.537	99.205	BS1&2B_L3_S2
62.6	50.606	51.547	1.249	14.176	11.325	6.583	10.524	3.117	1.480	99.060	BS1&2B_L3_S2
22.6	50.240	51.288	1.690	14.023	11.202	6.588	10.603	3.118	1.488	98.952	BS1&2B_L3_S2
-17.4	49.405	50.691	2.142	14.145	11.273	6.599	10.717	2.977	1.455	98.714	BS1&2B_L3_S2
-57.4	49.028	50.135	2.550	14.078	11.399	6.683	10.706	3.004	1.446	98.893	BS1&2B_L3_S2
-83.4	48.597	49.621	2.888	14.106	11.589	6.604	10.756	3.040	1.396	98.976	BS1&2B_L3_S3
-127.8	48.491	49.699	3.115	14.157	11.452	6.631	10.634	2.928	1.384	98.792	BS1&2B_L3_S3
-172.3	48.474	49.925	3.114	14.037	11.322	6.463	10.643	3.036	1.458	98.549	BS1&2B_L3_S3
-216.7	48.444	49.598	3.455	14.099	11.076	6.583	10.733	3.023	1.434	98.846	BS1&2B_L3_S3
-261.2	48.126	49.680	3.402	14.093	11.306	6.532	10.558	2.971	1.459	98.445	BS1&2B_L3_S3
-305.6	48.361	49.446	3.360	14.321	11.108	6.605	10.548	3.107	1.506	98.915	BS1&2B_L3_S3
-350.1	48.439	49.821	3.352	14.121	11.088	6.524	10.620	3.013	1.460	98.618	BS1&2B_L3_S3
-394.5	48.338	49.735	3.400	14.005	11.295	6.527	10.527	3.041	1.470	98.603	BS1&2B_L3_S3
-439	48.226	49.969	3.283	14.026	11.052	6.556	10.551	3.076	1.487	98.257	BS1&2B_L3_S3
-483.4	48.448	49.394	3.438	14.318	11.073	6.637	10.565	3.071	1.504	99.054	BS1&2B_L3_S3
-563.4	48.652	49.939	3.227	14.109	11.084	6.572	10.559	3.045	1.465	98.712	BS1&2B_L3_S4
-651.4	48.317	49.244	3.438	14.179	11.279	6.510	10.683	3.140	1.528	99.073	BS1&2B_L3_S4
-739.4	48.353	49.739	3.336	14.070	11.031	6.601	10.631	3.072	1.519	98.614	BS1&2B_L3_S4

Table C30. BS3&4B

X(μm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
821.3	50.716	52.189	1.973	12.713	11.473	6.557	10.655	2.987	1.453	98.528	BS3&4B_L1_S1
741.3	50.784	51.946	1.936	12.567	11.638	6.670	10.696	3.091	1.458	98.838	BS3&4B_L1_S1
661.3	50.655	51.957	1.944	12.787	11.597	6.635	10.693	2.921	1.467	98.698	BS3&4B_L1_S1
581.3	50.846	51.381	1.891	12.875	11.823	6.714	10.812	3.012	1.493	99.465	BS3&4B_L1_S1
501.3	50.963	51.605	1.849	12.802	11.708	6.788	10.788	2.985	1.476	99.358	BS3&4B_L1_S1
421.3	50.912	51.911	2.025	12.662	11.561	6.676	10.743	2.949	1.474	99.001	BS3&4B_L1_S1
341.3	50.514	52.082	1.941	12.544	11.613	6.760	10.679	2.938	1.444	98.432	BS3&4B_L1_S1
261.3	50.804	51.895	1.893	12.816	11.618	6.716	10.628	2.993	1.442	98.909	BS3&4B_L1_S2
221.3	50.907	51.627	1.909	12.760	11.752	6.783	10.671	3.040	1.459	99.281	BS3&4B_L1_S2
181.3	51.167	51.808	1.899	12.844	11.571	6.732	10.709	2.999	1.439	99.359	BS3&4B_L1_S2
141.3	50.657	52.076	1.905	12.797	11.475	6.653	10.624	3.030	1.440	98.581	BS3&4B_L1_S2
101.3	50.757	51.815	1.918	13.038	11.446	6.707	10.598	3.005	1.473	98.941	BS3&4B_L1_S2
61.3	50.150	51.239	1.907	13.491	11.505	6.745	10.626	3.013	1.474	98.911	BS3&4B_L1_S2
21.3	49.980	50.775	1.893	13.982	11.522	6.716	10.672	2.999	1.441	99.205	BS3&4B_L1_S2
-18.7	49.291	50.501	1.978	14.382	11.319	6.666	10.697	2.993	1.464	98.790	BS3&4B_L1_S2
-58.7	48.986	49.680	1.960	15.184	11.383	6.720	10.707	2.968	1.400	99.306	BS3&4B_L1_S2
-98.7	48.743	49.650	1.910	15.339	11.226	6.786	10.707	2.928	1.454	99.093	BS3&4B_L1_S2
-138.7	48.113	49.642	1.964	15.405	11.319	6.567	10.698	2.985	1.421	98.472	BS3&4B_L1_S2
-178.7	48.263	48.904	1.982	15.887	11.337	6.721	10.777	2.979	1.414	99.360	BS3&4B_L1_S2
-218.7	47.950	49.261	1.991	15.741	11.308	6.728	10.629	2.946	1.397	98.689	BS3&4B_L1_S2
-258.7	48.165	49.143	1.968	15.817	11.250	6.704	10.684	3.001	1.433	99.023	BS3&4B_L1_S2
-298.7	48.134	49.372	1.993	15.631	11.297	6.669	10.632	3.005	1.402	98.762	BS3&4B_L1_S2
-338.7	48.059	49.059	2.012	15.810	11.095	6.899	10.682	3.016	1.427	99.000	BS3&4B_L1_S2
-378.7	48.374	49.398	1.937	15.688	11.310	6.773	10.503	2.967	1.424	98.975	BS3&4B_L1_S2
-418.7	47.875	49.198	1.999	15.811	11.306	6.782	10.530	2.969	1.404	98.677	BS3&4B_L1_S2
-458.7	47.838	49.130	1.916	15.942	11.203	6.759	10.645	2.986	1.419	98.708	BS3&4B_L1_S2
-498.7	47.794	49.391	1.972	15.610	11.277	6.768	10.609	2.963	1.410	98.404	BS3&4B_L1_S2
-538.7	48.025	49.329	2.018	15.811	11.140	6.804	10.593	2.920	1.387	98.696	BS3&4B_L1_S2
-578.7	48.080	49.503	1.887	15.748	11.219	6.687	10.554	2.956	1.445	98.577	BS3&4B_L1_S2
-618.7	48.029	48.967	2.011	15.787	11.289	6.855	10.661	3.010	1.420	99.062	BS3&4B_L1_S2
-658.7	48.051	49.239	1.949	15.716	11.226	6.739	10.683	3.049	1.398	98.812	BS3&4B_L1_S2
-698.7	48.106	49.273	1.924	15.690	11.179	6.793	10.720	3.000	1.422	98.833	BS3&4B_L1_S2
-778.7	47.984	48.863	1.974	15.937	11.359	6.815	10.657	2.976	1.420	99.120	BS3&4B_L1_S3
-858.7	47.887	49.178	1.939	15.674	11.244	6.789	10.800	2.951	1.426	98.709	BS3&4B_L1_S3
-938.7	48.031	49.371	1.970	15.596	11.322	6.698	10.646	3.017	1.381	98.661	BS3&4B_L1_S3
-1018.7	47.829	49.314	1.897	15.793	11.175	6.815	10.637	2.982	1.388	98.515	BS3&4B_L1_S3
-1098.7	47.946	49.479	1.938	15.661	11.091	6.836	10.588	2.992	1.415	98.468	BS3&4B_L1_S3
-1178.7	48.104	49.344	1.984	15.696	11.214	6.833	10.523	3.019	1.388	98.759	BS3&4B_L1_S3
-1258.7	48.057	49.491	1.962	15.854	11.133	6.710	10.459	2.990	1.402	98.566	BS3&4B_L1_S3
-1338.7	48.362	49.036	2.008	15.884	11.135	6.839	10.604	3.061	1.433	99.326	BS3&4B_L1_S3
-1418.7	48.181	49.512	1.938	15.835	10.955	6.755	10.576	3.016	1.415	98.669	BS3&4B_L1_S3
836.0	50.542	51.583	2.035	12.854	11.661	6.691	10.679	3.003	1.494	98.959	BS3&4B_L2_S1
756.0	50.348	51.746	1.843	12.735	11.734	6.744	10.729	2.965	1.504	98.602	BS3&4B_L2_S1
676.0	50.381	51.762	1.890	12.646	11.839	6.630	10.714	3.041	1.479	98.619	BS3&4B_L2_S1
596.0	50.418	52.305	1.886	12.702	11.416	6.610	10.662	2.943	1.478	98.114	BS3&4B_L2_S1
516.0	50.437	51.570	1.977	12.727	11.708	6.706	10.784	3.083	1.446	98.867	BS3&4B_L2_S1
436.0	50.475	51.551	1.814	12.769	11.775	6.720	10.795	3.111	1.465	98.924	BS3&4B_L2_S1
356.0	50.359	51.778	1.973	12.738	11.779	6.579	10.690	3.034	1.430	98.581	BS3&4B_L2_S2
316.0	50.534	51.671	1.972	12.915	11.543	6.728	10.754	2.966	1.452	98.863	BS3&4B_L2_S2
276.0	50.349	52.172	1.942	12.618	11.534	6.687	10.671	2.938	1.438	98.177	BS3&4B_L2_S2
236.0	50.476	51.595	1.946	12.827	11.692	6.756	10.744	2.969	1.472	98.881	BS3&4B_L2_S2
196.0	50.318	51.944	1.858	12.824	11.390	6.752	10.692	3.048	1.492	98.373	BS3&4B_L2_S2
156.0	50.138	52.245	1.898	12.756	11.335	6.722	10.655	2.907	1.483	97.894	BS3&4B_L2_S2
116.0	50.150	51.563	1.941	13.105	11.526	6.724	10.650	3.021	1.471	98.588	BS3&4B_L2_S2
76.0	49.838	51.525	1.907	13.412	11.348	6.763	10.635	2.960	1.450	98.313	BS3&4B_L2_S2
36.0	49.380	50.863	1.883	13.813	11.438	6.713	10.802	3.010	1.477	98.517	BS3&4B_L2_S2
-4.0	48.762	51.004	1.928	14.056	11.339	6.682	10.641	2.937	1.414	97.759	BS3&4B_L2_S2
-44.0	48.699	49.474	1.997	14.925	11.589	6.806	10.740	3.047	1.423	99.225	BS3&4B_L2_S2
-84.0	48.073	49.374	1.971	15.254	11.649	6.671	10.659	3.018	1.405	98.699	BS3&4B_L2_S2
-124.0	47.785	49.465	1.992	15.367	11.394	6.752	10.715	2.920	1.394	98.319	BS3&4B_L2_S2
-164.0	47.484	49.315	2.021	15.599	11.392	6.666	10.655	2.930	1.422	98.169	BS3&4B_L2_S2

-204.0	47.609	49.704	1.965	15.573	11.275	6.563	10.685	2.862	1.373	97.905	BS3&4B_L2_S2
-244.0	47.691	49.285	1.962	15.715	11.358	6.797	10.571	2.914	1.399	98.406	BS3&4B_L2_S2
-284.0	47.701	49.702	1.942	15.588	11.213	6.574	10.650	2.930	1.401	97.999	BS3&4B_L2_S2
-324.0	47.650	49.211	1.982	15.833	11.341	6.709	10.611	2.914	1.400	98.439	BS3&4B_L2_S2
-364.0	47.569	49.426	1.937	15.414	11.461	6.722	10.605	3.009	1.426	98.143	BS3&4B_L2_S2
-404.0	47.667	49.224	1.931	15.608	11.427	6.810	10.637	2.963	1.399	98.443	BS3&4B_L2_S2
-444.0	47.413	49.379	1.893	15.825	11.247	6.789	10.544	2.925	1.400	98.034	BS3&4B_L2_S2
-484.0	47.362	49.294	1.898	15.776	11.315	6.752	10.618	2.920	1.427	98.068	BS3&4B_L2_S2
-524.0	47.491	49.302	1.930	15.730	11.339	6.671	10.678	2.957	1.394	98.189	BS3&4B_L2_S2
-564.0	47.589	49.190	1.942	15.644	11.433	6.857	10.561	2.968	1.405	98.399	BS3&4B_L2_S2
-604.0	47.495	49.243	1.989	15.837	11.223	6.782	10.575	2.972	1.380	98.252	BS3&4B_L2_S2
-644.0	47.282	49.344	1.997	15.668	11.326	6.759	10.608	2.902	1.397	97.938	BS3&4B_L2_S2
-724.0	47.839	49.067	1.968	15.707	11.411	6.847	10.675	2.920	1.405	98.772	BS3&4B_L2_S3
-804.0	47.510	49.197	1.984	15.746	11.291	6.753	10.670	2.945	1.414	98.313	BS3&4B_L2_S3
-884.0	47.641	49.306	1.929	15.646	11.328	6.821	10.639	2.931	1.401	98.336	BS3&4B_L2_S3
-964.0	47.479	49.333	1.905	15.755	11.306	6.782	10.549	2.953	1.418	98.146	BS3&4B_L2_S3
-1044.0	47.685	49.103	1.995	15.601	11.547	6.856	10.538	2.937	1.424	98.583	BS3&4B_L2_S3
-1124.0	47.931	49.271	2.036	15.672	11.325	6.824	10.523	2.932	1.417	98.660	BS3&4B_L2_S3
-1204.0	47.713	48.926	1.946	15.873	11.455	6.791	10.627	2.967	1.414	98.787	BS3&4B_L2_S3
-1284.0	47.765	49.320	1.929	15.805	11.173	6.846	10.579	2.962	1.387	98.446	BS3&4B_L2_S3
-1364.0	47.824	49.167	1.963	15.771	11.303	6.807	10.594	3.008	1.388	98.658	BS3&4B_L2_S3
859.3	49.942	51.914	1.966	12.623	11.590	6.774	10.757	2.956	1.419	98.027	BS3&4B_L3_S1
779.3	50.212	51.668	1.935	12.664	11.906	6.652	10.744	2.993	1.439	98.544	BS3&4B_L3_S1
699.3	50.121	51.690	1.877	12.662	11.835	6.726	10.802	2.962	1.448	98.432	BS3&4B_L3_S1
619.3	50.213	52.086	1.902	12.668	11.591	6.689	10.710	2.924	1.432	98.127	BS3&4B_L3_S1
539.3	50.394	51.849	1.931	12.659	11.663	6.738	10.779	2.916	1.466	98.545	BS3&4B_L3_S1
459.3	50.382	51.893	1.955	12.588	11.772	6.674	10.776	2.906	1.436	98.489	BS3&4B_L3_S1
379.3	50.169	51.757	1.946	12.706	11.967	6.576	10.664	2.924	1.460	98.412	BS3&4B_L3_S1
299.3	50.235	51.626	1.889	12.653	11.813	6.751	10.774	3.020	1.474	98.609	BS3&4B_L3_S2
259.3	50.150	51.778	1.948	12.659	11.661	6.685	10.790	3.016	1.462	98.372	BS3&4B_L3_S2
219.3	50.078	51.884	1.937	12.621	11.649	6.763	10.681	3.001	1.466	98.195	BS3&4B_L3_S2
179.3	50.290	51.602	1.989	12.837	11.608	6.742	10.790	2.956	1.476	98.688	BS3&4B_L3_S2
139.3	50.258	51.888	1.898	12.801	11.570	6.790	10.565	3.037	1.452	98.371	BS3&4B_L3_S2
99.3	49.874	51.508	1.930	12.983	11.587	6.748	10.693	3.084	1.467	98.366	BS3&4B_L3_S2
59.3	49.765	51.368	1.894	13.365	11.508	6.721	10.670	3.037	1.438	98.396	BS3&4B_L3_S2
19.3	49.109	50.692	1.982	13.958	11.537	6.737	10.663	2.972	1.459	98.418	BS3&4B_L3_S2
-20.7	48.428	50.359	1.956	14.529	11.407	6.695	10.723	2.906	1.425	98.069	BS3&4B_L3_S2
-60.7	47.862	50.105	1.950	14.932	11.241	6.665	10.675	3.002	1.431	97.757	BS3&4B_L3_S2
-100.7	47.679	49.548	1.978	15.447	11.350	6.736	10.557	2.987	1.397	98.132	BS3&4B_L3_S2
-140.7	47.506	49.428	1.922	15.617	11.352	6.622	10.685	2.968	1.406	98.078	BS3&4B_L3_S2
-180.7	47.714	49.455	1.933	15.648	11.283	6.694	10.622	2.941	1.425	98.259	BS3&4B_L3_S2
-220.7	47.515	49.341	2.031	15.662	11.149	6.791	10.642	2.988	1.396	98.174	BS3&4B_L3_S2
-260.7	47.418	49.358	2.015	15.785	11.202	6.590	10.624	3.021	1.406	98.060	BS3&4B_L3_S2
-300.7	47.351	49.396	2.001	15.721	11.238	6.730	10.551	2.962	1.402	97.955	BS3&4B_L3_S2
-340.7	47.342	49.590	1.939	15.516	11.189	6.729	10.594	3.013	1.431	97.752	BS3&4B_L3_S2
-380.7	47.220	49.397	1.960	15.690	11.183	6.744	10.617	3.037	1.373	97.823	BS3&4B_L3_S2
-420.7	47.532	49.214	1.982	15.780	11.121	6.857	10.635	2.981	1.430	98.318	BS3&4B_L3_S2
-460.7	47.233	49.592	1.896	15.700	11.197	6.789	10.512	2.904	1.410	97.641	BS3&4B_L3_S2
-500.7	47.425	49.510	2.064	15.720	10.924	6.762	10.594	3.006	1.421	97.916	BS3&4B_L3_S2
-540.7	47.395	49.424	1.929	15.664	11.155	6.801	10.616	2.972	1.439	97.971	BS3&4B_L3_S2
-580.7	47.500	49.553	1.882	15.757	11.023	6.729	10.657	3.000	1.399	97.947	BS3&4B_L3_S2
-620.7	47.525	49.213	1.998	15.802	11.163	6.863	10.581	2.957	1.423	98.312	BS3&4B_L3_S2
-660.7	47.453	49.250	1.931	15.902	11.127	6.720	10.614	2.999	1.457	98.203	BS3&4B_L3_S2
-740.7	47.414	49.301	1.922	15.838	11.210	6.793	10.514	2.995	1.428	98.113	BS3&4B_L3_S3
-820.7	47.453	49.380	1.918	15.752	11.250	6.804	10.511	2.975	1.412	98.074	BS3&4B_L3_S3
-900.7	47.634	49.418	1.961	15.798	11.203	6.685	10.570	2.967	1.398	98.217	BS3&4B_L3_S3
-980.7	47.301	49.494	1.968	15.701	11.113	6.777	10.605	2.961	1.381	97.807	BS3&4B_L3_S3
-1060.7	47.504	49.056	2.019	15.764	11.289	6.912	10.610	2.918	1.433	98.448	BS3&4B_L3_S3
-1140.7	47.429	49.644	1.893	15.800	11.064	6.730	10.459	3.006	1.405	97.785	BS3&4B_L3_S3
-1220.7	47.537	49.344	2.008	15.738	11.195	6.744	10.636	2.930	1.405	98.193	BS3&4B_L3_S3
-1300.7	47.847	49.617	1.914	15.709	11.038	6.777	10.586	2.950	1.409	98.230	BS3&4B_L3_S3
-1380.7	47.889	49.583	1.937	15.658	11.056	6.793	10.621	2.942	1.410	98.306	BS3&4B_L3_S3
-1460.7	48.136	49.265	2.049	15.792	11.081	6.825	10.604	2.972	1.412	98.871	BS3&4B_L3_S3

Table C31. BS5&6B

X(µm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
1258.9	50.529	51.803	1.960	14.290	10.038	6.737	10.628	3.024	1.520	98.725	BS5&6B_L1_S1
1178.9	50.357	52.495	1.941	14.017	9.736	6.643	10.583	3.062	1.524	97.863	BS5&6B_L1_S1
1098.9	50.225	52.099	1.961	14.225	9.922	6.604	10.643	3.028	1.517	98.125	BS5&6B_L1_S1
1018.9	50.550	52.248	1.876	14.153	9.924	6.653	10.611	3.029	1.506	98.301	BS5&6B_L1_S1
938.9	50.528	52.141	1.907	14.110	9.806	6.683	10.697	3.095	1.561	98.387	BS5&6B_L1_S1
858.9	50.630	52.081	1.963	14.124	10.057	6.535	10.618	3.067	1.555	98.549	BS5&6B_L1_S1
778.9	50.380	52.140	1.895	14.177	9.906	6.622	10.637	3.091	1.533	98.240	BS5&6B_L1_S1
698.9	50.576	52.237	1.973	14.097	9.821	6.530	10.632	3.155	1.556	98.339	BS5&6B_L1_S1
618.9	50.434	52.275	1.956	14.046	9.913	6.520	10.608	3.105	1.576	98.159	BS5&6B_L1_S2
578.9	50.239	52.154	1.975	14.056	9.905	6.670	10.589	3.104	1.548	98.085	BS5&6B_L1_S2
538.9	50.327	52.268	1.953	14.022	9.821	6.542	10.643	3.185	1.566	98.059	BS5&6B_L1_S2
498.9	50.176	52.566	1.947	13.909	9.662	6.599	10.629	3.120	1.568	97.610	BS5&6B_L1_S2
458.9	50.439	52.317	1.891	13.979	9.941	6.598	10.538	3.172	1.564	98.121	BS5&6B_L1_S2
418.9	50.407	52.212	1.950	14.047	10.040	6.502	10.493	3.214	1.542	98.195	BS5&6B_L1_S2
378.9	50.441	52.009	1.901	14.156	10.048	6.541	10.599	3.188	1.559	98.432	BS5&6B_L1_S2
338.9	50.548	52.181	1.884	14.019	10.057	6.530	10.576	3.187	1.567	98.368	BS5&6B_L1_S2
298.9	50.364	52.297	1.962	13.957	10.085	6.591	10.515	3.046	1.547	98.067	BS5&6B_L1_S2
258.9	50.220	52.276	2.017	14.090	9.959	6.507	10.542	3.025	1.583	97.944	BS5&6B_L1_S2
218.9	50.055	52.460	1.844	13.970	9.971	6.502	10.531	3.154	1.569	97.595	BS5&6B_L1_S2
178.9	50.310	52.065	1.905	14.020	10.262	6.547	10.429	3.155	1.617	98.246	BS5&6B_L1_S2
138.9	50.128	51.979	1.874	14.045	10.434	6.476	10.449	3.123	1.620	98.149	BS5&6B_L1_S2
98.9	49.800	51.557	1.942	14.183	10.540	6.535	10.513	3.123	1.608	98.244	BS5&6B_L1_S2
58.9	49.299	51.488	1.952	14.031	10.677	6.547	10.638	3.100	1.567	97.810	BS5&6B_L1_S2
18.9	49.059	50.881	1.930	14.138	11.120	6.674	10.618	3.091	1.548	98.178	BS5&6B_L1_S2
-21.1	48.731	50.554	2.038	14.260	11.315	6.629	10.661	2.996	1.547	98.178	BS5&6B_L1_S2
-61.1	48.400	50.325	1.877	14.241	11.657	6.732	10.683	3.007	1.477	98.075	BS5&6B_L1_S2
-101.1	48.032	49.994	2.051	14.142	11.959	6.743	10.727	2.899	1.484	98.038	BS5&6B_L1_S2
-141.1	47.896	49.630	2.066	14.231	12.212	6.758	10.766	2.920	1.417	98.266	BS5&6B_L1_S2
-181.1	47.641	49.376	1.977	14.400	12.264	6.852	10.743	2.907	1.482	98.265	BS5&6B_L1_S2
-221.1	47.642	49.605	2.027	14.300	12.210	6.824	10.656	2.939	1.441	98.037	BS5&6B_L1_S2
-261.1	47.649	49.596	1.955	14.208	12.437	6.821	10.592	2.920	1.472	98.054	BS5&6B_L1_S2
-301.1	47.692	49.514	1.949	14.277	12.377	6.728	10.692	2.996	1.468	98.178	BS5&6B_L1_S2
-341.1	47.870	49.662	1.902	14.200	12.389	6.832	10.567	2.930	1.518	98.208	BS5&6B_L1_S2
-381.1	47.711	49.239	1.932	14.352	12.668	6.731	10.580	2.982	1.516	98.472	BS5&6B_L1_S2
-461.1	47.615	49.344	2.012	14.264	12.497	6.758	10.616	2.988	1.520	98.271	BS5&6B_L1_S3
-541.1	47.776	49.806	1.965	14.202	12.380	6.611	10.542	3.005	1.490	97.970	BS5&6B_L1_S3
-621.1	47.678	49.280	2.045	14.250	12.586	6.777	10.546	3.019	1.498	98.398	BS5&6B_L1_S3
-701.1	47.584	49.363	1.957	14.190	12.619	6.718	10.654	3.012	1.487	98.221	BS5&6B_L1_S3
-781.1	47.448	48.984	1.977	14.614	12.602	6.665	10.665	3.017	1.477	98.464	BS5&6B_L1_S3
1313.7	49.955	52.283	1.957	14.167	9.695	6.712	10.689	2.997	1.502	97.672	BS5&6B_L2_S1
1233.7	49.920	52.057	2.002	14.064	9.945	6.711	10.678	2.999	1.545	97.863	BS5&6B_L2_S1
1153.7	50.027	52.260	1.998	13.931	9.937	6.635	10.681	3.068	1.489	97.768	BS5&6B_L2_S1
1073.7	49.575	52.381	1.935	13.875	9.946	6.640	10.561	3.105	1.557	97.194	BS5&6B_L2_S1
993.7	49.977	52.505	1.949	13.906	9.903	6.622	10.529	3.078	1.507	97.471	BS5&6B_L2_S1
913.7	50.032	52.430	1.960	14.030	9.929	6.517	10.573	3.003	1.557	97.602	BS5&6B_L2_S1
833.7	50.415	52.030	1.906	13.899	9.966	6.723	10.705	3.229	1.542	98.385	BS5&6B_L2_S1
753.7	49.964	52.412	2.062	13.907	9.922	6.527	10.525	3.090	1.555	97.552	BS5&6B_L2_S1
673.7	50.417	52.143	1.978	14.215	9.886	6.523	10.604	3.087	1.565	98.274	BS5&6B_L2_S2
633.7	50.078	52.164	2.009	14.073	9.860	6.666	10.546	3.103	1.578	97.914	BS5&6B_L2_S2
593.7	50.170	52.189	1.913	14.125	9.956	6.608	10.516	3.141	1.553	97.981	BS5&6B_L2_S2
553.7	50.143	52.369	1.935	13.977	9.873	6.572	10.611	3.137	1.527	97.774	BS5&6B_L2_S2
513.7	49.964	52.060	2.000	14.167	9.980	6.525	10.558	3.146	1.564	97.904	BS5&6B_L2_S2
473.7	50.089	52.173	1.988	14.022	9.996	6.574	10.580	3.110	1.555	97.915	BS5&6B_L2_S2
433.7	50.047	52.409	1.837	13.896	9.917	6.571	10.628	3.163	1.581	97.639	BS5&6B_L2_S2
393.7	50.000	52.118	1.991	14.146	9.919	6.531	10.555	3.205	1.535	97.882	BS5&6B_L2_S2
353.7	50.185	51.949	1.967	14.268	9.954	6.582	10.585	3.122	1.573	98.236	BS5&6B_L2_S2
313.7	50.119	51.999	1.976	14.088	9.943	6.623	10.581	3.189	1.603	98.121	BS5&6B_L2_S2
273.7	50.418	52.028	1.876	14.112	10.054	6.573	10.603	3.179	1.576	98.391	BS5&6B_L2_S2
233.7	50.074	51.816	1.977	14.128	10.171	6.577	10.491	3.224	1.617	98.258	BS5&6B_L2_S2
193.7	50.028	51.946	2.018	14.063	10.147	6.589	10.472	3.139	1.627	98.082	BS5&6B_L2_S2
153.7	50.067	51.793	1.959	14.122	10.369	6.481	10.507	3.142	1.627	98.274	BS5&6B_L2_S2

113.7	49.793	51.859	1.902	14.110	10.433	6.570	10.454	3.105	1.568	97.934	BS5&6B_L2_S2
73.7	49.392	51.524	1.806	14.035	10.836	6.588	10.557	3.064	1.590	97.868	BS5&6B_L2_S2
33.7	49.230	50.965	1.951	14.055	11.178	6.582	10.642	3.090	1.537	98.266	BS5&6B_L2_S2
-6.3	48.934	50.848	1.972	14.130	11.240	6.645	10.612	3.022	1.531	98.087	BS5&6B_L2_S2
-46.3	48.581	50.183	1.990	14.217	11.749	6.689	10.636	3.037	1.499	98.398	BS5&6B_L2_S2
-86.3	48.247	49.775	2.014	14.271	11.912	6.823	10.708	3.010	1.487	98.472	BS5&6B_L2_S2
-126.3	47.721	49.846	2.038	14.314	11.944	6.771	10.650	2.955	1.482	97.875	BS5&6B_L2_S2
-166.3	47.844	49.541	2.072	14.293	12.138	6.805	10.711	2.975	1.465	98.303	BS5&6B_L2_S2
-206.3	47.944	49.332	2.060	14.255	12.436	6.830	10.665	2.955	1.467	98.611	BS5&6B_L2_S2
-246.3	47.564	49.541	1.995	14.241	12.388	6.814	10.633	2.922	1.466	98.023	BS5&6B_L2_S2
-286.3	47.710	49.281	1.993	14.416	12.448	6.743	10.666	2.957	1.497	98.429	BS5&6B_L2_S2
-326.3	47.644	49.432	1.933	14.178	12.628	6.768	10.676	2.941	1.445	98.213	BS5&6B_L2_S2
-406.3	47.562	49.315	2.003	14.329	12.637	6.785	10.501	2.968	1.463	98.246	BS5&6B_L2_S3
-486.3	47.787	49.056	1.956	14.299	12.700	6.895	10.582	3.005	1.507	98.731	BS5&6B_L2_S3
-566.3	47.394	49.421	1.976	14.214	12.745	6.728	10.462	2.970	1.485	97.973	BS5&6B_L2_S3
-646.3	47.484	49.690	1.951	14.167	12.449	6.793	10.500	2.963	1.487	97.794	BS5&6B_L2_S3
-726.3	47.299	48.827	1.966	14.432	12.826	6.829	10.619	3.009	1.492	98.472	BS5&6B_L2_S3
1246.7	49.969	52.096	1.933	14.191	9.800	6.687	10.662	3.094	1.539	97.873	BS5&6B_L3_S1
1166.7	50.303	51.911	2.019	14.165	9.947	6.650	10.701	3.062	1.545	98.392	BS5&6B_L3_S1
1086.7	50.055	52.097	1.984	14.174	9.871	6.651	10.597	3.081	1.545	97.958	BS5&6B_L3_S1
1006.7	50.058	52.032	1.980	14.051	9.954	6.687	10.655	3.094	1.546	98.026	BS5&6B_L3_S1
926.7	50.052	52.237	1.980	14.041	9.871	6.589	10.600	3.096	1.586	97.815	BS5&6B_L3_S1
846.7	49.890	52.368	2.016	13.941	9.835	6.593	10.621	3.078	1.548	97.521	BS5&6B_L3_S1
766.7	50.091	52.319	1.837	14.050	9.846	6.727	10.545	3.114	1.562	97.772	BS5&6B_L3_S1
686.7	50.490	51.912	2.006	14.153	9.850	6.712	10.669	3.181	1.517	98.578	BS5&6B_L3_S2
646.7	50.151	52.280	1.975	13.975	9.895	6.603	10.582	3.166	1.525	97.871	BS5&6B_L3_S2
606.7	50.339	52.257	1.946	14.062	9.832	6.643	10.589	3.141	1.531	98.083	BS5&6B_L3_S2
566.7	50.435	51.866	1.966	14.158	10.086	6.634	10.573	3.172	1.545	98.569	BS5&6B_L3_S2
526.7	50.131	52.344	1.899	13.884	9.915	6.658	10.619	3.124	1.557	97.786	BS5&6B_L3_S2
486.7	50.286	52.409	1.850	13.974	9.913	6.683	10.552	3.059	1.562	97.877	BS5&6B_L3_S2
446.7	50.188	52.170	1.950	14.049	9.973	6.564	10.664	3.107	1.523	98.018	BS5&6B_L3_S2
406.7	50.450	51.978	1.978	14.116	10.006	6.598	10.647	3.116	1.561	98.473	BS5&6B_L3_S2
366.7	50.042	52.114	1.929	14.041	10.051	6.499	10.638	3.189	1.539	97.928	BS5&6B_L3_S2
326.7	50.162	52.341	1.870	13.990	9.938	6.636	10.480	3.152	1.596	97.821	BS5&6B_L3_S2
286.7	50.479	52.077	1.950	14.104	10.004	6.513	10.607	3.169	1.577	98.402	BS5&6B_L3_S2
246.7	50.224	52.140	1.962	14.091	10.195	6.476	10.466	3.128	1.543	98.084	BS5&6B_L3_S2
206.7	50.395	51.624	1.942	14.120	10.293	6.746	10.521	3.155	1.598	98.770	BS5&6B_L3_S2
166.7	50.303	51.850	1.877	14.014	10.418	6.639	10.490	3.120	1.591	98.452	BS5&6B_L3_S2
126.7	50.291	51.634	1.930	14.122	10.564	6.513	10.509	3.182	1.545	98.657	BS5&6B_L3_S2
86.7	49.742	51.606	1.916	14.138	10.570	6.590	10.470	3.133	1.578	98.136	BS5&6B_L3_S2
46.7	49.682	51.421	1.956	14.029	10.884	6.605	10.529	3.064	1.512	98.261	BS5&6B_L3_S2
6.7	49.265	51.051	1.928	14.122	11.093	6.542	10.624	3.062	1.577	98.214	BS5&6B_L3_S2
-33.3	48.584	50.563	1.911	14.200	11.383	6.750	10.641	3.038	1.514	98.021	BS5&6B_L3_S2
-73.3	48.344	49.868	2.041	14.288	11.860	6.813	10.743	2.939	1.448	98.476	BS5&6B_L3_S2
-113.3	48.003	49.989	1.976	14.367	11.834	6.763	10.731	2.898	1.443	98.014	BS5&6B_L3_S2
-153.3	47.853	49.688	1.930	14.324	12.101	6.865	10.717	2.918	1.457	98.165	BS5&6B_L3_S2
-193.3	47.659	49.313	2.009	14.305	12.466	6.856	10.677	2.957	1.418	98.346	BS5&6B_L3_S2
-233.3	47.857	49.102	2.024	14.464	12.470	6.866	10.673	2.934	1.466	98.755	BS5&6B_L3_S2
-273.3	47.614	49.371	2.038	14.338	12.482	6.854	10.590	2.909	1.419	98.244	BS5&6B_L3_S2
-353.3	47.840	49.588	1.954	14.387	12.518	6.634	10.564	2.914	1.441	98.252	BS5&6B_L3_S3
-433.3	47.703	49.589	1.949	14.341	12.568	6.581	10.563	2.929	1.481	98.115	BS5&6B_L3_S3
-513.3	47.793	49.707	1.938	14.407	12.315	6.582	10.566	3.000	1.485	98.087	BS5&6B_L3_S3
-593.3	47.988	49.410	1.941	14.334	12.516	6.785	10.545	2.977	1.493	98.578	BS5&6B_L3_S3
-673.3	47.797	49.115	1.964	14.451	12.597	6.779	10.548	3.040	1.507	98.683	BS5&6B_L3_S3
-753.3	47.876	49.010	1.940	14.536	12.724	6.863	10.543	2.880	1.506	98.866	BS5&6B_L3_S3

Table C32. BS7&8B

X(μm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
965.9	50.471	51.793	1.972	14.409	11.574	5.263	10.577	2.998	1.415	98.679	BS7&8B_L1_S1
885.9	50.077	52.059	1.848	14.354	11.572	5.275	10.592	2.918	1.382	98.017	BS7&8B_L1_S1
805.9	50.166	51.892	1.931	14.268	11.565	5.294	10.648	3.002	1.401	98.275	BS7&8B_L1_S1
725.9	50.163	52.097	1.929	14.285	11.499	5.263	10.617	2.930	1.380	98.066	BS7&8B_L1_S1
645.9	50.501	52.138	1.951	14.268	11.390	5.233	10.594	2.995	1.432	98.363	BS7&8B_L1_S1
565.9	50.578	52.113	1.900	14.248	11.442	5.301	10.558	3.017	1.422	98.465	BS7&8B_L1_S2
525.9	50.355	51.992	1.930	14.354	11.407	5.240	10.623	2.993	1.463	98.363	BS7&8B_L1_S2
485.9	50.345	52.441	1.940	14.202	11.168	5.234	10.609	3.016	1.391	97.904	BS7&8B_L1_S2
445.9	50.438	52.071	1.924	14.280	11.334	5.333	10.610	3.004	1.445	98.367	BS7&8B_L1_S2
405.9	50.423	52.135	1.948	14.400	11.211	5.220	10.563	3.070	1.453	98.288	BS7&8B_L1_S2
365.9	50.490	52.236	1.938	14.297	11.163	5.326	10.518	3.044	1.478	98.254	BS7&8B_L1_S2
325.9	50.523	52.315	1.871	14.322	11.145	5.305	10.514	3.080	1.449	98.207	BS7&8B_L1_S2
285.9	50.229	52.335	1.955	14.312	11.025	5.342	10.467	3.068	1.497	97.894	BS7&8B_L1_S2
245.9	50.249	52.136	1.998	14.338	10.995	5.447	10.487	3.121	1.478	98.113	BS7&8B_L1_S2
205.9	50.378	51.858	1.958	14.330	11.037	5.671	10.490	3.139	1.518	98.520	BS7&8B_L1_S2
165.9	50.301	51.859	1.977	14.331	10.969	5.706	10.421	3.167	1.569	98.442	BS7&8B_L1_S2
125.9	50.301	51.985	1.979	14.214	10.932	5.829	10.469	3.048	1.543	98.316	BS7&8B_L1_S2
85.9	50.235	51.633	1.860	14.338	11.056	6.102	10.462	3.033	1.516	98.602	BS7&8B_L1_S2
45.9	49.835	51.340	1.975	14.246	11.086	6.335	10.494	3.045	1.479	98.495	BS7&8B_L1_S2
5.9	49.265	50.640	1.982	14.437	11.248	6.732	10.535	2.941	1.485	98.625	BS7&8B_L1_S2
-34.1	48.853	50.495	1.961	14.314	11.261	6.901	10.668	2.953	1.447	98.358	BS7&8B_L1_S2
-74.1	48.739	49.923	1.958	14.369	11.518	7.292	10.652	2.872	1.416	98.816	BS7&8B_L1_S2
-114.1	48.103	49.864	1.980	14.337	11.460	7.366	10.732	2.851	1.411	98.239	BS7&8B_L1_S2
-154.1	48.053	49.296	2.060	14.387	11.619	7.632	10.662	2.921	1.422	98.758	BS7&8B_L1_S2
-194.1	48.175	49.337	1.975	14.459	11.554	7.703	10.659	2.910	1.404	98.838	BS7&8B_L1_S2
-234.1	47.988	49.569	1.986	14.392	11.329	7.805	10.640	2.852	1.427	98.419	BS7&8B_L1_S2
-274.1	47.851	49.386	1.947	14.286	11.424	7.977	10.677	2.827	1.475	98.465	BS7&8B_L1_S2
-314.1	48.115	49.349	2.022	14.266	11.470	7.984	10.521	2.935	1.454	98.766	BS7&8B_L1_S2
-354.1	47.904	49.248	1.966	14.420	11.414	7.932	10.604	2.891	1.524	98.656	BS7&8B_L1_S2
-394.1	47.974	49.709	1.928	14.198	11.219	7.982	10.502	2.970	1.492	98.265	BS7&8B_L1_S2
-434.1	47.893	49.041	2.023	14.552	11.236	8.154	10.523	2.966	1.505	98.851	BS7&8B_L1_S2
-514.1	47.995	49.299	1.953	14.367	11.233	8.109	10.606	2.896	1.539	98.697	BS7&8B_L1_S3
-594.1	47.914	49.472	1.968	14.360	11.175	8.077	10.445	2.987	1.516	98.443	BS7&8B_L1_S3
-674.1	47.988	49.477	2.004	14.355	11.133	8.012	10.522	2.985	1.512	98.511	BS7&8B_L1_S3
-754.1	47.777	49.238	1.999	14.241	11.277	8.129	10.563	2.977	1.577	98.539	BS7&8B_L1_S3
-834.1	47.911	49.057	2.025	14.401	11.188	8.217	10.563	3.001	1.548	98.854	BS7&8B_L1_S3
-914.1	47.883	49.343	1.975	14.312	11.207	8.044	10.560	3.003	1.557	98.540	BS7&8B_L1_S3
-1074.1	47.747	49.381	1.981	14.172	11.196	8.205	10.535	2.977	1.554	98.366	BS7&8B_L1_S3
-1154.1	48.000	49.105	1.952	14.324	11.346	8.255	10.502	2.971	1.544	98.895	BS7&8B_L1_S3
-1234.1	47.882	49.324	2.019	14.328	11.179	8.192	10.480	2.980	1.498	98.558	BS7&8B_L1_S3
-1314.1	48.001	49.462	2.003	14.266	11.156	8.083	10.566	2.950	1.514	98.539	BS7&8B_L1_S3
932.3	50.624	52.012	1.851	14.444	11.455	5.234	10.597	2.999	1.407	98.612	BS7&8B_L2_S1
852.3	50.481	51.882	1.913	14.310	11.527	5.348	10.662	2.951	1.408	98.598	BS7&8B_L2_S1
772.3	50.481	52.087	1.952	14.207	11.485	5.319	10.572	2.963	1.415	98.394	BS7&8B_L2_S1
692.3	50.396	52.217	1.912	14.267	11.407	5.243	10.584	2.952	1.419	98.179	BS7&8B_L2_S1
612.3	50.399	52.123	1.882	14.245	11.478	5.199	10.592	3.043	1.439	98.276	BS7&8B_L2_S1
532.3	50.467	52.049	1.875	14.253	11.489	5.228	10.596	3.061	1.450	98.418	BS7&8B_L2_S2
492.3	50.703	52.033	1.935	14.238	11.364	5.212	10.701	3.074	1.444	98.670	BS7&8B_L2_S2
452.3	50.738	51.883	1.883	14.472	11.295	5.213	10.719	3.101	1.434	98.855	BS7&8B_L2_S2
412.3	50.521	52.066	2.025	14.277	11.376	5.245	10.559	3.024	1.429	98.455	BS7&8B_L2_S2
372.3	50.494	52.038	1.959	14.230	11.262	5.341	10.588	3.118	1.464	98.456	BS7&8B_L2_S2
332.3	50.554	52.099	1.932	14.355	11.159	5.313	10.518	3.179	1.444	98.455	BS7&8B_L2_S2
292.3	50.864	52.197	2.007	14.275	11.081	5.348	10.501	3.103	1.488	98.667	BS7&8B_L2_S2
252.3	50.742	52.081	1.895	14.291	11.105	5.522	10.494	3.083	1.529	98.661	BS7&8B_L2_S2
212.3	50.568	51.939	1.962	14.274	11.062	5.543	10.534	3.151	1.536	98.629	BS7&8B_L2_S2
172.3	50.650	51.888	1.965	14.344	11.039	5.653	10.427	3.117	1.567	98.763	BS7&8B_L2_S2
132.3	50.639	51.813	1.879	14.206	11.010	5.873	10.491	3.171	1.557	98.827	BS7&8B_L2_S2
92.3	50.256	51.573	1.924	14.347	10.951	6.078	10.496	3.110	1.521	98.683	BS7&8B_L2_S2
52.3	49.971	51.389	1.912	14.203	11.150	6.348	10.520	3.004	1.474	98.582	BS7&8B_L2_S2
12.3	49.691	50.681	1.985	14.452	11.323	6.605	10.473	3.037	1.445	99.009	BS7&8B_L2_S2
-27.7	49.020	50.708	1.957	14.250	11.272	6.801	10.613	2.971	1.429	98.312	BS7&8B_L2_S2

-67.7	48.396	50.046	1.959	14.428	11.512	7.095	10.644	2.895	1.421	98.351	BS7&8B_L2_S2
-107.7	48.381	49.837	2.024	14.410	11.529	7.334	10.634	2.789	1.445	98.544	BS7&8B_L2_S2
-147.7	48.216	49.261	1.943	14.611	11.611	7.638	10.658	2.887	1.393	98.955	BS7&8B_L2_S2
-187.7	48.133	49.385	1.960	14.392	11.529	7.713	10.712	2.870	1.439	98.747	BS7&8B_L2_S2
-227.7	47.822	49.642	1.993	14.397	11.403	7.670	10.623	2.845	1.427	98.180	BS7&8B_L2_S2
-267.7	48.089	49.743	1.944	14.305	11.379	7.862	10.471	2.803	1.494	98.346	BS7&8B_L2_S2
-307.7	48.073	49.268	2.018	14.408	11.555	7.858	10.582	2.848	1.463	98.805	BS7&8B_L2_S2
-347.7	48.065	49.296	1.957	14.463	11.334	8.001	10.582	2.897	1.471	98.770	BS7&8B_L2_S2
-387.7	47.993	49.361	1.968	14.412	11.301	8.004	10.551	2.887	1.516	98.632	BS7&8B_L2_S2
-427.7	48.100	49.490	1.941	14.317	11.312	8.029	10.534	2.865	1.511	98.610	BS7&8B_L2_S2
-467.7	48.055	49.319	2.041	14.365	11.267	8.112	10.493	2.892	1.509	98.736	BS7&8B_L2_S2
-547.7	48.367	49.332	1.909	14.575	11.180	8.052	10.437	2.972	1.544	99.036	BS7&8B_L2_S3
-627.7	48.158	49.613	1.953	14.345	11.102	7.987	10.505	2.974	1.522	98.545	BS7&8B_L2_S3
-707.7	48.201	49.174	2.001	14.419	11.230	8.187	10.488	2.978	1.523	99.027	BS7&8B_L2_S3
-787.7	48.116	49.454	2.030	14.270	11.170	8.127	10.454	2.971	1.524	98.662	BS7&8B_L2_S3
-867.7	47.818	49.462	1.989	14.302	11.043	8.148	10.544	2.990	1.524	98.356	BS7&8B_L2_S3
-947.7	47.932	49.622	1.977	14.253	11.107	8.038	10.539	2.947	1.517	98.311	BS7&8B_L2_S3
-1027.7	48.418	49.350	2.002	14.372	11.177	8.073	10.496	2.991	1.539	99.068	BS7&8B_L2_S3
-1107.7	48.037	49.298	2.052	14.332	11.168	8.121	10.516	2.974	1.540	98.738	BS7&8B_L2_S3
-1187.7	48.161	49.480	1.949	14.467	11.070	8.081	10.422	3.001	1.531	98.681	BS7&8B_L2_S3
798.5	50.317	51.812	1.957	14.433	11.576	5.228	10.621	2.981	1.393	98.505	BS7&8B_L3_S1
718.5	50.292	51.668	2.028	14.338	11.561	5.313	10.694	2.986	1.413	98.625	BS7&8B_L3_S1
638.5	50.431	52.138	1.877	14.351	11.323	5.278	10.655	2.989	1.389	98.293	BS7&8B_L3_S1
558.5	50.502	52.193	1.929	14.274	11.276	5.252	10.628	3.044	1.404	98.309	BS7&8B_L3_S2
518.5	50.531	51.903	1.994	14.351	11.284	5.327	10.687	3.026	1.429	98.628	BS7&8B_L3_S2
478.5	50.346	52.119	1.972	14.245	11.345	5.264	10.586	3.064	1.406	98.227	BS7&8B_L3_S2
438.5	50.689	52.114	2.030	14.217	11.313	5.192	10.603	3.054	1.477	98.574	BS7&8B_L3_S2
398.5	50.465	52.212	1.890	14.256	11.196	5.271	10.614	3.122	1.440	98.253	BS7&8B_L3_S2
358.5	50.323	52.109	1.877	14.356	11.193	5.313	10.584	3.103	1.465	98.213	BS7&8B_L3_S2
318.5	50.704	52.250	1.978	14.320	11.096	5.344	10.495	3.073	1.443	98.454	BS7&8B_L3_S2
278.5	50.738	52.025	2.002	14.368	11.101	5.418	10.510	3.105	1.472	98.713	BS7&8B_L3_S2
238.5	50.649	52.077	1.964	14.293	11.065	5.545	10.427	3.138	1.491	98.572	BS7&8B_L3_S2
198.5	50.675	52.104	1.879	14.319	11.013	5.624	10.464	3.073	1.525	98.571	BS7&8B_L3_S2
158.5	50.563	51.828	1.970	14.360	11.035	5.730	10.465	3.069	1.543	98.735	BS7&8B_L3_S2
118.5	50.335	51.819	1.901	14.227	11.077	5.853	10.485	3.128	1.511	98.516	BS7&8B_L3_S2
78.5	50.128	51.576	1.917	14.342	10.972	6.152	10.465	3.070	1.505	98.553	BS7&8B_L3_S2
38.5	49.690	51.094	1.976	14.291	11.050	6.488	10.593	3.013	1.495	98.596	BS7&8B_L3_S2
-1.5	49.208	50.636	1.964	14.297	11.353	6.699	10.619	2.993	1.439	98.572	BS7&8B_L3_S2
-41.5	48.642	50.140	1.967	14.405	11.520	6.975	10.669	2.913	1.410	98.502	BS7&8B_L3_S2
-81.5	48.512	49.825	2.017	14.468	11.494	7.284	10.704	2.817	1.391	98.686	BS7&8B_L3_S2
-121.5	48.101	49.543	2.038	14.360	11.592	7.455	10.756	2.864	1.393	98.558	BS7&8B_L3_S2
-161.5	48.078	49.613	1.931	14.400	11.499	7.542	10.701	2.879	1.436	98.466	BS7&8B_L3_S2
-201.5	48.010	49.529	2.021	14.354	11.571	7.658	10.644	2.823	1.401	98.482	BS7&8B_L3_S2
-241.5	48.044	49.238	1.995	14.520	11.467	7.823	10.678	2.854	1.424	98.807	BS7&8B_L3_S2
-281.5	47.945	49.499	1.978	14.421	11.326	7.869	10.600	2.875	1.433	98.446	BS7&8B_L3_S2
-321.5	48.369	49.381	1.880	14.310	11.420	8.068	10.574	2.887	1.480	98.988	BS7&8B_L3_S2
-361.5	48.188	49.140	2.019	14.342	11.475	8.152	10.533	2.869	1.470	99.048	BS7&8B_L3_S2
-401.5	47.986	49.257	2.007	14.318	11.301	8.114	10.582	2.908	1.514	98.729	BS7&8B_L3_S2
-441.5	47.950	49.353	1.985	14.379	11.341	8.121	10.428	2.911	1.483	98.597	BS7&8B_L3_S2
-521.5	48.074	49.232	1.951	14.443	11.355	8.047	10.542	2.906	1.524	98.842	BS7&8B_L3_S3
-601.5	48.081	49.421	1.954	14.366	11.275	8.004	10.504	2.951	1.525	98.660	BS7&8B_L3_S3
-761.5	48.268	49.102	1.991	14.428	11.304	8.043	10.607	2.991	1.534	99.166	BS7&8B_L3_S3
-841.5	48.213	49.192	1.948	14.337	11.328	8.105	10.611	2.967	1.513	99.021	BS7&8B_L3_S3
-921.5	48.062	49.301	1.970	14.170	11.344	8.127	10.598	2.959	1.531	98.761	BS7&8B_L3_S3
-1001.5	48.004	49.254	1.939	14.292	11.337	8.136	10.545	2.962	1.534	98.750	BS7&8B_L3_S3
-1081.5	47.983	49.523	1.984	14.261	11.255	7.978	10.483	2.979	1.537	98.460	BS7&8B_L3_S3
-1161.5	47.908	49.240	1.936	14.325	11.375	8.258	10.406	2.963	1.498	98.668	BS7&8B_L3_S3

Table C33. BS9&10B

X(μm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
729.9	51.011	51.330	2.001	14.527	11.365	6.677	9.259	3.223	1.618	99.681	BS9&10B_L1_S1
649.9	50.753	51.510	1.948	14.468	11.435	6.618	9.195	3.232	1.594	99.244	BS9&10B_L1_S1
569.9	50.914	51.444	1.950	14.608	11.300	6.563	9.225	3.283	1.626	99.470	BS9&10B_L1_S2
529.9	50.830	51.347	2.010	14.588	11.340	6.689	9.226	3.176	1.624	99.483	BS9&10B_L1_S2
489.9	50.596	51.557	1.941	14.441	11.395	6.561	9.288	3.224	1.594	99.039	BS9&10B_L1_S2
449.9	50.897	51.649	1.965	14.507	11.200	6.526	9.255	3.308	1.591	99.248	BS9&10B_L1_S2
409.9	50.678	51.580	1.952	14.441	11.173	6.597	9.353	3.276	1.628	99.098	BS9&10B_L1_S2
369.9	50.743	51.493	1.994	14.457	11.233	6.566	9.332	3.309	1.616	99.250	BS9&10B_L1_S2
329.9	50.724	51.240	1.950	14.635	11.387	6.640	9.268	3.278	1.602	99.484	BS9&10B_L1_S2
289.9	50.788	51.548	1.957	14.371	11.286	6.562	9.367	3.289	1.621	99.240	BS9&10B_L1_S2
249.9	50.914	51.253	1.944	14.636	11.220	6.644	9.409	3.259	1.636	99.660	BS9&10B_L1_S2
209.9	50.483	51.020	1.997	14.662	11.182	6.615	9.483	3.386	1.656	99.463	BS9&10B_L1_S2
169.9	50.612	51.120	1.913	14.509	11.165	6.667	9.713	3.298	1.616	99.492	BS9&10B_L1_S2
89.9	50.405	51.060	1.956	14.509	11.077	6.526	10.030	3.193	1.650	99.345	BS9&10B_L1_S2
49.9	49.909	50.698	1.884	14.520	11.225	6.627	10.333	3.117	1.597	99.211	BS9&10B_L1_S2
9.9	49.563	50.423	2.091	14.373	11.254	6.661	10.574	3.047	1.576	99.141	BS9&10B_L1_S2
-88.1	49.073	49.340	2.022	14.558	11.589	6.852	11.212	2.948	1.478	99.733	BS9&10B_L1_S3
-128.1	49.048	49.253	2.018	14.382	11.616	6.879	11.399	2.944	1.511	99.795	BS9&10B_L1_S3
-168.1	48.665	49.508	2.035	14.322	11.531	6.734	11.497	2.872	1.501	99.157	BS9&10B_L1_S3
-208.1	48.682	49.523	1.928	14.306	11.537	6.698	11.569	2.939	1.500	99.160	BS9&10B_L1_S3
-248.1	48.625	49.417	2.022	14.292	11.423	6.714	11.689	2.932	1.510	99.208	BS9&10B_L1_S3
-288.1	48.523	49.569	2.094	14.139	11.371	6.641	11.769	2.882	1.537	98.954	BS9&10B_L1_S3
-328.1	48.713	49.396	2.050	14.217	11.398	6.646	11.811	2.914	1.569	99.317	BS9&10B_L1_S3
-368.1	48.541	49.445	2.024	14.082	11.288	6.785	11.909	2.930	1.539	99.096	BS9&10B_L1_S3
-408.1	48.571	49.139	2.060	14.307	11.256	6.783	11.877	2.982	1.595	99.432	BS9&10B_L1_S3
-448.1	48.353	49.076	2.099	14.437	11.131	6.803	11.937	2.930	1.586	99.277	BS9&10B_L1_S3
-488.1	48.374	49.365	2.035	14.191	11.230	6.681	11.918	3.012	1.567	99.009	BS9&10B_L1_S3
-528.1	48.528	49.572	1.945	14.212	11.140	6.643	12.009	2.915	1.564	98.956	BS9&10B_L1_S3
-568.1	48.493	49.373	2.000	14.263	11.138	6.650	11.894	3.114	1.568	99.121	BS9&10B_L1_S3
-608.1	48.589	49.230	1.976	14.260	11.234	6.650	12.003	3.023	1.624	99.359	BS9&10B_L1_S3
-648.1	48.551	49.190	2.047	14.318	11.215	6.619	11.972	3.071	1.569	99.361	BS9&10B_L1_S3
-688.1	48.424	49.017	1.943	14.203	11.353	6.776	12.030	3.090	1.589	99.407	BS9&10B_L1_S3
-768.1	48.551	49.369	2.010	14.166	11.223	6.640	11.981	3.045	1.566	99.182	BS9&10B_L1_S4
-848.1	48.447	49.408	1.983	14.164	11.262	6.652	11.952	3.020	1.559	99.039	BS9&10B_L1_S4
-928.1	48.498	49.263	1.992	14.211	11.330	6.696	11.943	3.010	1.555	99.235	BS9&10B_L1_S4
-1008.1	48.539	49.300	2.008	14.148	11.237	6.650	12.039	3.009	1.610	99.239	BS9&10B_L1_S4
-1088.1	48.374	48.865	2.016	14.188	11.466	6.769	12.088	3.046	1.563	99.510	BS9&10B_L1_S4
-1168.1	48.565	49.274	2.009	14.121	11.342	6.652	12.046	2.987	1.570	99.291	BS9&10B_L1_S4
-1248.1	48.462	49.207	2.023	14.135	11.287	6.686	12.028	3.055	1.579	99.255	BS9&10B_L1_S4
766.7	50.801	51.819	1.926	14.248	11.436	6.584	9.228	3.145	1.615	98.982	BS9&10B_L2_S1
686.7	50.772	51.592	2.031	14.335	11.403	6.628	9.219	3.215	1.578	99.180	BS9&10B_L2_S1
606.7	50.680	51.232	1.979	14.551	11.608	6.599	9.266	3.157	1.609	99.448	BS9&10B_L2_S2
566.7	50.768	51.658	1.929	14.246	11.422	6.574	9.337	3.254	1.578	99.110	BS9&10B_L2_S2
526.7	50.488	51.627	1.880	14.456	11.520	6.520	9.212	3.202	1.583	98.861	BS9&10B_L2_S2
486.7	50.804	51.525	2.022	14.465	11.349	6.543	9.303	3.227	1.566	99.279	BS9&10B_L2_S2
446.7	50.811	51.196	1.955	14.427	11.625	6.638	9.271	3.273	1.616	99.616	BS9&10B_L2_S2
406.7	50.613	51.438	1.923	14.361	11.500	6.668	9.312	3.213	1.585	99.175	BS9&10B_L2_S2
366.7	50.576	51.511	1.989	14.496	11.236	6.543	9.382	3.210	1.634	99.065	BS9&10B_L2_S2
326.7	50.522	51.407	1.970	14.427	11.347	6.611	9.366	3.260	1.614	99.114	BS9&10B_L2_S2
286.7	50.683	51.129	1.935	14.577	11.463	6.587	9.400	3.314	1.596	99.554	BS9&10B_L2_S2
246.7	50.704	51.364	1.907	14.424	11.369	6.504	9.473	3.311	1.648	99.340	BS9&10B_L2_S2
206.7	50.588	51.311	1.979	14.434	11.118	6.585	9.591	3.320	1.663	99.277	BS9&10B_L2_S2
166.7	50.600	51.303	1.946	14.366	11.238	6.508	9.690	3.262	1.688	99.297	BS9&10B_L2_S2
126.7	50.750	51.545	1.923	14.151	10.978	6.578	9.864	3.294	1.666	99.205	BS9&10B_L2_S2
86.7	50.508	51.151	1.940	14.184	11.162	6.596	10.098	3.215	1.655	99.357	BS9&10B_L2_S2
46.7	49.927	50.850	2.036	14.354	11.168	6.557	10.304	3.130	1.602	99.077	BS9&10B_L2_S2
6.7	49.617	50.586	1.963	14.066	11.255	6.848	10.694	3.026	1.561	99.031	BS9&10B_L2_S2
-44.3	49.210	50.398	1.949	14.259	11.337	6.658	10.932	2.905	1.562	98.812	BS9&10B_L2_S3
-84.3	48.948	49.695	2.056	14.384	11.452	6.780	11.132	2.982	1.518	99.253	BS9&10B_L2_S3
-124.3	48.654	49.769	2.093	14.248	11.475	6.662	11.308	2.914	1.532	98.885	BS9&10B_L2_S3
-164.3	48.842	49.368	2.013	14.264	11.468	6.913	11.534	2.929	1.510	99.474	BS9&10B_L2_S3

-204.3	48.672	49.492	2.090	14.295	11.390	6.811	11.612	2.809	1.502	99.180	BS9&10B_L2_S3
-244.3	48.494	49.273	1.946	14.530	11.388	6.657	11.778	2.887	1.540	99.220	BS9&10B_L2_S3
-284.3	48.748	49.169	2.046	14.366	11.298	6.727	11.861	2.970	1.564	99.579	BS9&10B_L2_S3
-324.3	48.435	49.128	2.020	14.279	11.408	6.702	11.953	2.975	1.535	99.307	BS9&10B_L2_S3
-364.3	48.461	49.353	1.985	14.398	11.211	6.730	11.839	2.904	1.582	99.109	BS9&10B_L2_S3
-404.3	48.456	49.323	2.009	14.300	11.355	6.611	11.916	2.949	1.538	99.133	BS9&10B_L2_S3
-444.3	48.361	49.435	1.940	14.240	11.198	6.667	11.954	2.987	1.580	98.926	BS9&10B_L2_S3
-484.3	48.474	49.170	2.002	14.457	11.240	6.724	11.874	2.985	1.547	99.304	BS9&10B_L2_S3
-524.3	48.674	49.193	1.934	14.379	11.320	6.645	12.014	2.960	1.555	99.481	BS9&10B_L2_S3
-564.3	48.384	49.270	1.961	14.166	11.300	6.700	12.040	2.989	1.574	99.115	BS9&10B_L2_S3
-604.3	48.209	49.527	1.999	14.054	11.148	6.653	12.001	3.041	1.576	98.682	BS9&10B_L2_S3
-644.3	48.401	49.191	2.073	14.326	11.202	6.671	11.987	2.967	1.583	99.210	BS9&10B_L2_S3
-724.3	48.299	49.368	1.969	14.239	11.145	6.555	12.052	3.076	1.597	98.932	BS9&10B_L2_S4
-804.3	48.512	49.376	2.016	14.248	11.178	6.651	11.969	2.959	1.604	99.137	BS9&10B_L2_S4
-884.3	48.582	49.226	2.047	14.064	11.316	6.707	12.018	3.059	1.564	99.355	BS9&10B_L2_S4
-964.3	48.588	49.098	2.014	14.161	11.279	6.770	12.078	3.000	1.602	99.490	BS9&10B_L2_S4
-1044.3	48.493	49.219	2.061	14.043	11.326	6.666	11.985	3.079	1.622	99.275	BS9&10B_L2_S4
-1124.3	48.457	49.097	1.923	14.135	11.448	6.702	12.061	3.009	1.626	99.360	BS9&10B_L2_S4
-1204.3	48.428	49.652	1.977	14.088	11.238	6.568	11.916	2.979	1.581	98.775	BS9&10B_L2_S4
691.7	51.166	51.565	1.940	14.511	11.290	6.688	9.229	3.185	1.593	99.601	BS9&10B_L3_S1
611.7	50.738	51.464	1.918	14.523	11.425	6.603	9.244	3.209	1.615	99.274	BS9&10B_L3_S1
531.7	50.823	51.510	2.065	14.590	11.154	6.647	9.181	3.267	1.586	99.312	BS9&10B_L3_S2
491.7	50.996	51.603	1.873	14.579	11.150	6.663	9.254	3.253	1.626	99.394	BS9&10B_L3_S2
451.7	50.785	51.762	1.901	14.317	11.224	6.557	9.270	3.379	1.591	99.023	BS9&10B_L3_S2
411.7	50.575	51.975	1.914	14.362	11.112	6.505	9.261	3.299	1.572	98.600	BS9&10B_L3_S2
371.7	50.865	51.268	1.947	14.622	11.360	6.561	9.297	3.284	1.661	99.596	BS9&10B_L3_S2
331.7	50.641	51.430	2.018	14.429	11.127	6.657	9.359	3.343	1.638	99.211	BS9&10B_L3_S2
291.7	50.790	51.285	1.964	14.524	11.217	6.595	9.459	3.302	1.656	99.505	BS9&10B_L3_S2
251.7	50.751	51.479	1.963	14.447	11.057	6.726	9.409	3.276	1.644	99.273	BS9&10B_L3_S2
211.7	50.769	51.439	1.920	14.454	11.134	6.528	9.535	3.328	1.662	99.331	BS9&10B_L3_S2
171.7	50.523	51.480	1.880	14.389	11.029	6.563	9.691	3.325	1.643	99.043	BS9&10B_L3_S2
131.7	50.612	51.353	1.874	14.454	11.053	6.496	9.891	3.246	1.635	99.260	BS9&10B_L3_S2
91.7	50.433	51.340	1.912	14.332	11.073	6.600	10.016	3.108	1.620	99.093	BS9&10B_L3_S2
51.7	50.116	51.050	1.967	14.282	10.998	6.629	10.333	3.156	1.586	99.066	BS9&10B_L3_S2
11.7	49.585	50.812	1.927	14.167	11.176	6.649	10.606	3.098	1.566	98.774	BS9&10B_L3_S2
-28.3	49.005	50.173	2.061	14.426	11.401	6.675	10.787	2.954	1.524	98.832	BS9&10B_L3_S2
-68.3	49.155	49.803	1.955	14.484	11.475	6.824	10.984	2.944	1.531	99.352	BS9&10B_L3_S3
-108.3	48.714	49.776	1.997	14.272	11.491	6.717	11.278	2.940	1.529	98.938	BS9&10B_L3_S3
-148.3	48.729	49.654	1.973	14.297	11.516	6.717	11.438	2.921	1.486	99.075	BS9&10B_L3_S3
-188.3	48.674	49.401	1.984	14.351	11.480	6.734	11.637	2.838	1.575	99.273	BS9&10B_L3_S3
-228.3	48.872	49.254	2.051	14.332	11.347	6.830	11.744	2.903	1.540	99.618	BS9&10B_L3_S3
-268.3	48.652	49.251	2.022	14.359	11.417	6.837	11.650	2.904	1.560	99.400	BS9&10B_L3_S3
-308.3	48.547	49.719	1.914	14.279	11.123	6.699	11.795	2.915	1.557	98.828	BS9&10B_L3_S3
-348.3	48.687	49.372	1.981	14.303	11.230	6.770	11.832	2.920	1.592	99.315	BS9&10B_L3_S3
-388.3	48.648	49.583	2.013	14.172	11.190	6.616	11.859	2.981	1.586	99.065	BS9&10B_L3_S3
-428.3	48.715	49.715	2.007	14.185	11.005	6.675	11.902	2.916	1.595	99.001	BS9&10B_L3_S3
-468.3	48.703	49.626	2.044	14.185	11.056	6.613	11.970	2.943	1.564	99.077	BS9&10B_L3_S3
-508.3	48.716	49.521	2.005	14.195	11.154	6.633	11.951	2.926	1.616	99.194	BS9&10B_L3_S3
-548.3	48.722	49.383	1.976	14.124	11.398	6.600	11.905	3.035	1.579	99.339	BS9&10B_L3_S3
-588.3	48.505	49.425	2.117	14.225	11.169	6.606	11.885	2.995	1.580	99.080	BS9&10B_L3_S3
-628.3	48.451	49.431	1.940	14.031	11.280	6.623	12.037	3.042	1.616	99.021	BS9&10B_L3_S3
-668.3	48.466	49.374	1.984	13.985	11.376	6.681	11.995	3.009	1.595	99.092	BS9&10B_L3_S3
-748.3	48.577	49.021	2.017	14.271	11.423	6.625	12.056	2.990	1.598	99.556	BS9&10B_L3_S4
-826.3	48.159	49.387	1.984	14.040	11.363	6.627	12.075	2.967	1.557	98.773	BS9&10B_L3_S4
-904.3	48.201	49.503	1.987	13.993	11.245	6.633	12.046	3.025	1.569	98.698	BS9&10B_L3_S4
-982.3	48.476	49.248	1.954	14.085	11.436	6.614	12.088	2.992	1.584	99.228	BS9&10B_L3_S4
-1060.3	48.308	49.006	2.058	14.140	11.482	6.669	12.147	2.949	1.549	99.303	BS9&10B_L3_S4
-1138.3	48.276	49.291	2.006	13.967	11.441	6.639	12.035	3.086	1.535	98.984	BS9&10B_L3_S4
-1216.3	48.150	49.130	1.950	13.981	11.586	6.725	12.044	3.033	1.552	99.021	BS9&10B_L3_S4

Table C34. BS11&12B

X(µm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
1221.5	51.085	52.212	2.048	14.234	11.094	6.781	10.578	1.527	1.527	98.874	BS11&12B_L1_S1
1141.5	51.139	52.005	1.992	14.268	11.301	6.774	10.535	1.590	1.535	99.134	BS11&12B_L1_S1
1061.5	51.006	52.034	2.027	14.217	11.272	6.825	10.569	1.553	1.503	98.972	BS11&12B_L1_S1
981.5	51.129	52.210	1.973	14.128	11.151	6.813	10.682	1.521	1.521	98.919	BS11&12B_L1_S1
901.5	51.287	51.997	1.994	14.179	11.344	6.850	10.602	1.514	1.520	99.289	BS11&12B_L1_S1
821.5	51.094	52.191	2.010	14.153	11.171	6.792	10.583	1.565	1.536	98.903	BS11&12B_L1_S1
741.5	51.079	51.811	2.100	14.118	11.298	6.921	10.606	1.630	1.516	99.268	BS11&12B_L1_S1
661.5	51.398	51.969	2.059	14.079	11.116	6.792	10.750	1.673	1.562	99.429	BS11&12B_L1_S1
581.5	50.837	52.155	1.876	14.041	11.239	6.857	10.606	1.667	1.559	98.681	BS11&12B_L1_S1
501.5	51.021	52.061	2.034	14.050	11.238	6.741	10.588	1.735	1.554	98.960	BS11&12B_L1_S2
461.5	51.041	52.098	1.990	14.108	11.132	6.761	10.588	1.818	1.507	98.944	BS11&12B_L1_S2
421.5	51.046	52.070	2.012	13.991	11.107	6.807	10.593	1.880	1.539	98.975	BS11&12B_L1_S2
381.5	50.905	51.848	2.068	14.222	11.123	6.686	10.560	1.910	1.582	99.057	BS11&12B_L1_S2
341.5	50.894	51.919	1.940	14.005	11.187	6.724	10.612	2.042	1.572	98.975	BS11&12B_L1_S2
301.5	50.976	52.023	2.010	13.915	10.967	6.734	10.617	2.178	1.556	98.953	BS11&12B_L1_S2
261.5	50.978	51.844	2.003	13.887	11.076	6.822	10.602	2.216	1.550	99.134	BS11&12B_L1_S2
221.5	51.032	51.945	2.062	13.894	10.991	6.606	10.611	2.338	1.552	99.087	BS11&12B_L1_S2
181.5	50.865	52.081	2.040	13.806	10.949	6.568	10.468	2.488	1.599	98.784	BS11&12B_L1_S2
141.5	50.596	52.181	1.962	13.831	10.900	6.578	10.399	2.577	1.572	98.415	BS11&12B_L1_S2
101.5	50.839	51.696	1.891	14.007	11.015	6.562	10.557	2.714	1.558	99.144	BS11&12B_L1_S2
61.5	50.604	51.517	1.921	13.978	10.928	6.705	10.491	2.838	1.623	99.087	BS11&12B_L1_S2
21.5	50.689	51.709	1.991	14.026	10.780	6.553	10.364	2.995	1.583	98.980	BS11&12B_L1_S2
-18.5	50.469	51.462	1.946	14.031	10.923	6.554	10.427	3.081	1.577	99.007	BS11&12B_L1_S2
-58.5	49.783	50.978	2.041	14.169	11.071	6.516	10.543	3.174	1.509	98.805	BS11&12B_L1_S2
-98.5	49.219	50.307	2.053	14.176	11.305	6.796	10.555	3.349	1.460	98.912	BS11&12B_L1_S2
-138.5	49.133	50.205	2.050	14.158	11.376	6.761	10.694	3.278	1.479	98.929	BS11&12B_L1_S2
-178.5	49.025	49.879	2.030	14.315	11.372	6.807	10.619	3.505	1.474	99.146	BS11&12B_L1_S2
-218.5	48.977	49.816	1.968	14.388	11.372	6.798	10.629	3.569	1.461	99.161	BS11&12B_L1_S2
-258.5	48.846	49.502	2.083	14.292	11.372	7.007	10.582	3.659	1.503	99.345	BS11&12B_L1_S2
-298.5	48.654	49.844	1.893	14.266	11.261	6.870	10.546	3.847	1.472	98.810	BS11&12B_L1_S2
-338.5	48.601	49.659	2.024	14.194	11.327	6.854	10.511	3.938	1.494	98.942	BS11&12B_L1_S2
-378.5	48.816	49.704	1.996	14.283	11.271	6.763	10.560	3.916	1.509	99.113	BS11&12B_L1_S2
-418.5	48.588	49.601	2.037	14.341	11.173	6.771	10.597	3.972	1.509	98.987	BS11&12B_L1_S2
-458.5	48.730	49.556	1.997	14.242	11.302	6.789	10.562	4.039	1.514	99.174	BS11&12B_L1_S2
-498.5	48.440	49.658	2.059	14.133	11.264	6.697	10.543	4.139	1.507	98.782	BS11&12B_L1_S2
-538.5	48.494	49.694	2.051	14.175	11.229	6.593	10.590	4.152	1.517	98.800	BS11&12B_L1_S2
-578.5	48.621	49.817	1.970	14.045	11.191	6.675	10.610	4.154	1.539	98.804	BS11&12B_L1_S2
-618.5	48.518	49.451	2.015	14.346	11.183	6.669	10.604	4.194	1.539	99.067	BS11&12B_L1_S2
-658.5	48.564	49.516	1.937	14.167	11.374	6.633	10.559	4.326	1.487	99.047	BS11&12B_L1_S2
-698.5	48.671	49.273	2.034	14.330	11.303	6.715	10.506	4.355	1.484	99.399	BS11&12B_L1_S2
-778.5	48.564	49.639	2.036	14.065	11.283	6.667	10.485	4.314	1.512	98.924	BS11&12B_L1_S3
-858.5	48.483	49.588	1.969	14.100	11.207	6.671	10.549	4.402	1.513	98.895	BS11&12B_L1_S3
-938.5	48.533	49.488	2.010	14.101	11.141	6.674	10.554	4.502	1.531	99.045	BS11&12B_L1_S3
-1018.5	48.448	49.479	2.097	14.041	11.277	6.746	10.494	4.358	1.509	98.970	BS11&12B_L1_S3
-1098.5	48.398	49.321	2.038	14.245	11.152	6.675	10.520	4.516	1.533	99.077	BS11&12B_L1_S3
-1178.5	48.433	49.559	2.036	14.067	11.188	6.634	10.488	4.518	1.511	98.875	BS11&12B_L1_S3
-1258.5	48.263	49.562	2.033	13.910	11.252	6.703	10.542	4.475	1.525	98.701	BS11&12B_L1_S3
1247.5	51.102	52.018	2.014	14.145	11.224	6.933	10.573	1.575	1.519	99.085	BS11&12B_L2_S1
1167.5	51.133	52.259	2.056	14.091	11.220	6.718	10.654	1.488	1.515	98.874	BS11&12B_L2_S1
1087.5	51.259	52.442	1.942	14.041	11.231	6.730	10.579	1.504	1.531	98.817	BS11&12B_L2_S1
1007.5	51.186	52.172	2.021	14.164	11.150	6.849	10.593	1.520	1.532	99.015	BS11&12B_L2_S1
927.5	50.883	52.374	2.078	13.973	11.072	6.760	10.619	1.596	1.528	98.509	BS11&12B_L2_S1
847.5	51.138	52.152	2.060	14.066	11.291	6.799	10.541	1.566	1.525	98.986	BS11&12B_L2_S1
767.5	51.169	52.498	1.954	13.984	11.102	6.714	10.590	1.637	1.522	98.671	BS11&12B_L2_S1
687.5	51.279	52.171	2.030	14.139	11.214	6.773	10.550	1.611	1.511	99.107	BS11&12B_L2_S1
607.5	51.148	52.126	1.991	14.094	11.195	6.738	10.605	1.696	1.555	99.021	BS11&12B_L2_S2
567.5	51.257	52.267	2.018	14.071	11.096	6.716	10.644	1.668	1.522	98.990	BS11&12B_L2_S2
527.5	51.206	51.836	2.065	14.226	11.157	6.871	10.565	1.736	1.545	99.370	BS11&12B_L2_S2
487.5	51.174	52.145	2.083	14.076	11.076	6.667	10.602	1.797	1.553	99.029	BS11&12B_L2_S2
447.5	51.166	52.132	1.997	14.074	11.004	6.776	10.573	1.880	1.565	99.035	BS11&12B_L2_S2
407.5	51.095	52.083	1.950	13.901	11.135	6.809	10.612	1.946	1.564	99.012	BS11&12B_L2_S2

367.5	50.783	52.065	2.026	14.060	11.086	6.608	10.537	2.030	1.588	98.718	BS11&12B_L2_S2
327.5	50.951	51.837	1.971	14.069	11.151	6.734	10.602	2.092	1.545	99.114	BS11&12B_L2_S2
287.5	50.896	51.880	2.065	14.044	11.102	6.679	10.519	2.130	1.581	99.016	BS11&12B_L2_S2
247.5	50.724	52.038	1.954	13.768	10.958	6.760	10.552	2.370	1.601	98.686	BS11&12B_L2_S2
207.5	50.593	52.116	1.997	13.885	10.956	6.560	10.501	2.405	1.580	98.477	BS11&12B_L2_S2
167.5	50.857	52.027	1.956	13.859	10.921	6.717	10.441	2.518	1.561	98.830	BS11&12B_L2_S2
127.5	50.724	51.865	2.008	14.004	10.813	6.627	10.433	2.684	1.567	98.860	BS11&12B_L2_S2
87.5	50.981	51.503	2.031	14.145	10.806	6.679	10.471	2.744	1.621	99.478	BS11&12B_L2_S2
47.5	50.595	51.589	2.063	13.923	10.870	6.603	10.453	2.883	1.616	99.007	BS11&12B_L2_S2
7.5	50.610	51.326	1.976	14.031	10.940	6.580	10.479	3.081	1.588	99.284	BS11&12B_L2_S2
-32.5	49.653	50.987	2.002	14.128	11.062	6.790	10.431	3.079	1.522	98.666	BS11&12B_L2_S2
-72.5	49.513	50.539	1.925	14.143	11.283	6.809	10.607	3.198	1.496	98.974	BS11&12B_L2_S2
-112.5	49.024	50.218	2.050	14.241	11.274	6.794	10.658	3.283	1.483	98.806	BS11&12B_L2_S2
-152.5	48.952	49.896	2.042	14.196	11.459	6.892	10.647	3.396	1.473	99.056	BS11&12B_L2_S2
-192.5	48.884	49.750	1.989	14.326	11.491	6.910	10.637	3.443	1.455	99.134	BS11&12B_L2_S2
-232.5	48.609	49.845	1.999	14.308	11.385	6.779	10.561	3.646	1.477	98.763	BS11&12B_L2_S2
-272.5	48.665	50.171	1.965	14.162	11.200	6.746	10.573	3.703	1.480	98.494	BS11&12B_L2_S2
-312.5	48.725	49.644	1.991	14.225	11.368	6.867	10.568	3.847	1.490	99.081	BS11&12B_L2_S2
-352.5	49.037	48.988	2.071	14.445	11.471	6.896	10.690	3.956	1.483	100.049	BS11&12B_L2_S2
-392.5	48.740	49.472	1.983	14.260	11.211	6.857	10.592	4.116	1.509	99.268	BS11&12B_L2_S2
-432.5	48.770	49.729	2.030	14.347	11.216	6.698	10.548	3.935	1.499	99.041	BS11&12B_L2_S2
-472.5	48.421	49.597	1.991	14.304	11.215	6.784	10.491	4.094	1.526	98.824	BS11&12B_L2_S2
-512.5	48.733	49.626	1.968	14.264	11.163	6.872	10.476	4.097	1.535	99.108	BS11&12B_L2_S2
-552.5	48.683	49.699	1.978	14.186	11.149	6.815	10.542	4.107	1.524	98.984	BS11&12B_L2_S2
-592.5	48.706	49.612	2.038	14.207	11.107	6.740	10.565	4.211	1.521	99.094	BS11&12B_L2_S2
-672.5	48.431	49.462	1.973	14.066	11.288	6.734	10.556	4.374	1.547	98.969	BS11&12B_L2_S3
-752.5	48.639	49.576	2.002	14.212	11.004	6.735	10.566	4.397	1.509	99.063	BS11&12B_L2_S3
-832.5	48.540	49.235	1.988	14.385	11.177	6.710	10.559	4.423	1.525	99.305	BS11&12B_L2_S3
-912.5	48.427	49.628	2.040	14.049	11.122	6.612	10.535	4.504	1.509	98.799	BS11&12B_L2_S3
-992.5	48.349	49.347	1.975	14.168	11.121	6.829	10.509	4.509	1.543	99.002	BS11&12B_L2_S3
-1072.5	48.642	49.375	2.032	14.066	11.287	6.648	10.576	4.468	1.549	99.267	BS11&12B_L2_S3
-1152.5	48.225	49.424	2.078	14.142	11.212	6.644	10.551	4.436	1.514	98.801	BS11&12B_L2_S3
-1232.5	48.570	49.358	1.991	14.164	11.216	6.794	10.547	4.419	1.511	99.212	BS11&12B_L2_S3
1220.9	51.497	52.279	2.077	14.075	11.132	6.839	10.510	1.527	1.561	99.218	BS11&12B_L3_S1
1140.9	51.153	52.390	1.936	14.090	11.080	6.838	10.597	1.534	1.536	98.764	BS11&12B_L3_S1
1060.9	51.173	52.251	2.012	14.083	11.247	6.812	10.596	1.478	1.522	98.922	BS11&12B_L3_S1
980.9	51.385	51.939	2.006	14.198	11.307	6.827	10.569	1.605	1.549	99.446	BS11&12B_L3_S1
900.9	51.037	52.099	2.027	14.022	11.196	6.834	10.669	1.619	1.534	98.938	BS11&12B_L3_S1
820.9	51.244	52.335	1.999	13.951	11.119	6.849	10.631	1.590	1.526	98.910	BS11&12B_L3_S1
740.9	50.933	52.237	2.032	14.003	11.358	6.741	10.585	1.545	1.498	98.696	BS11&12B_L3_S1
660.9	50.916	52.249	1.984	13.943	11.264	6.853	10.575	1.628	1.504	98.667	BS11&12B_L3_S1
580.9	51.035	52.010	2.086	14.108	11.166	6.785	10.621	1.686	1.539	99.025	BS11&12B_L3_S1
500.9	51.162	51.884	2.106	14.002	11.174	6.879	10.606	1.791	1.559	99.278	BS11&12B_L3_S2
460.9	51.111	51.926	1.978	14.083	11.223	6.790	10.635	1.830	1.536	99.185	BS11&12B_L3_S2
420.9	50.921	52.173	2.056	14.100	10.956	6.748	10.545	1.883	1.540	98.748	BS11&12B_L3_S2
380.9	50.940	51.894	2.035	14.156	10.996	6.813	10.622	1.935	1.549	99.046	BS11&12B_L3_S2
340.9	51.031	51.841	1.991	13.960	11.258	6.759	10.564	2.117	1.510	99.190	BS11&12B_L3_S2
300.9	51.086	51.803	2.030	14.047	11.085	6.729	10.591	2.143	1.572	99.282	BS11&12B_L3_S2
260.9	50.804	51.779	2.036	13.919	11.039	6.789	10.628	2.265	1.545	99.025	BS11&12B_L3_S2
220.9	51.076	51.632	2.050	13.946	11.025	6.799	10.606	2.409	1.534	99.443	BS11&12B_L3_S2
180.9	50.758	51.941	2.040	13.882	10.948	6.653	10.549	2.458	1.529	98.817	BS11&12B_L3_S2
140.9	50.769	51.843	2.007	13.874	10.984	6.634	10.493	2.600	1.565	98.926	BS11&12B_L3_S2
100.9	50.813	51.990	1.880	14.017	10.878	6.546	10.409	2.742	1.538	98.823	BS11&12B_L3_S2
60.9	50.757	52.025	2.015	13.786	10.738	6.549	10.479	2.837	1.571	98.732	BS11&12B_L3_S2
20.9	50.535	51.121	1.997	14.155	11.096	6.540	10.428	3.052	1.610	99.413	BS11&12B_L3_S2
-19.1	50.094	51.401	1.946	14.016	10.952	6.679	10.405	3.038	1.564	98.694	BS11&12B_L3_S2
-59.1	49.996	50.502	2.028	13.942	11.491	6.681	10.603	3.245	1.508	99.494	BS11&12B_L3_S2
-99.1	49.347	50.052	2.015	14.285	11.469	6.833	10.598	3.254	1.494	99.295	BS11&12B_L3_S2
-139.1	48.979	49.867	2.131	14.253	11.543	6.858	10.536	3.349	1.464	99.112	BS11&12B_L3_S2
-179.1	48.725	49.820	2.114	14.215	11.465	6.923	10.600	3.402	1.462	98.905	BS11&12B_L3_S2
-219.1	48.835	49.572	2.026	14.315	11.455	6.942	10.652	3.562	1.476	99.263	BS11&12B_L3_S2
-259.1	48.646	49.943	2.039	14.266	11.449	6.738	10.581	3.502	1.482	98.703	BS11&12B_L3_S2
-299.1	48.640	49.804	1.977	14.176	11.587	6.743	10.480	3.703	1.531	98.836	BS11&12B_L3_S2

-339.1	48.684	49.682	1.991	14.123	11.451	6.785	10.608	3.854	1.508	99.002	BS11&12B_L3_S2
-379.1	48.772	49.459	2.005	14.182	11.567	6.821	10.551	3.918	1.499	99.313	BS11&12B_L3_S2
-419.1	48.380	49.747	1.936	14.137	11.492	6.706	10.512	3.969	1.501	98.633	BS11&12B_L3_S2
-459.1	48.509	49.340	2.109	14.216	11.467	6.828	10.473	4.070	1.498	99.169	BS11&12B_L3_S2
-499.1	48.501	49.408	2.053	14.239	11.389	6.864	10.531	4.019	1.496	99.093	BS11&12B_L3_S2
-539.1	48.523	49.419	2.069	14.084	11.470	6.706	10.536	4.218	1.499	99.104	BS11&12B_L3_S2
-579.1	48.531	49.558	2.110	14.096	11.356	6.738	10.498	4.145	1.501	98.973	BS11&12B_L3_S2
-619.1	48.511	49.406	1.969	14.174	11.420	6.719	10.551	4.224	1.537	99.105	BS11&12B_L3_S2
-659.1	48.286	49.719	2.065	14.002	11.282	6.722	10.508	4.174	1.530	98.567	BS11&12B_L3_S2
-699.1	48.460	49.459	1.939	14.151	11.383	6.685	10.537	4.332	1.514	99.001	BS11&12B_L3_S2
-789.1	48.447	49.419	2.051	13.990	11.215	6.757	10.567	4.461	1.540	99.028	BS11&12B_L3_S3
-869.1	48.397	49.382	2.061	14.131	11.344	6.729	10.491	4.349	1.512	99.015	BS11&12B_L3_S3
-949.1	48.379	49.508	1.929	13.991	11.346	6.668	10.670	4.376	1.512	98.872	BS11&12B_L3_S3
-1029.1	48.349	49.765	2.037	13.962	11.258	6.678	10.438	4.386	1.476	98.584	BS11&12B_L3_S3
-1109.1	48.445	49.411	2.018	14.069	11.277	6.736	10.532	4.458	1.499	99.035	BS11&12B_L3_S3
-1189.1	48.288	49.742	1.935	13.923	11.249	6.701	10.500	4.443	1.507	98.546	BS11&12B_L3_S3
-1269.1	48.567	49.178	1.989	14.056	11.289	6.790	10.646	4.522	1.530	99.389	BS11&12B_L3_S3

Table C35. BS13&14B

X(µm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
1297.0	51.765	52.238	2.000	13.956	11.597	6.720	10.561	2.890	0.039	99.527	BS13&14B_L1_S1
1217.0	51.415	52.405	1.994	13.894	11.506	6.665	10.520	2.953	0.063	99.010	BS13&14B_L1_S1
1137.0	52.012	52.339	2.006	13.984	11.556	6.575	10.560	2.938	0.043	99.674	BS13&14B_L1_S1
1057.0	52.101	52.316	2.017	13.845	11.502	6.783	10.527	2.961	0.050	99.785	BS13&14B_L1_S1
977.0	52.083	52.480	2.030	13.941	11.428	6.496	10.557	3.025	0.042	99.603	BS13&14B_L1_S1
897.0	51.970	52.665	1.963	13.737	11.318	6.635	10.548	3.096	0.037	99.305	BS13&14B_L1_S1
817.0	51.711	52.892	1.990	13.832	11.199	6.550	10.477	3.001	0.059	98.818	BS13&14B_L1_S1
737.0	51.605	52.959	1.983	13.536	11.298	6.522	10.561	3.091	0.051	98.646	BS13&14B_L1_S1
657.0	51.609	52.602	2.015	13.836	11.337	6.543	10.514	3.106	0.047	99.007	BS13&14B_L1_S2
617.0	51.922	52.341	2.049	14.002	11.290	6.629	10.556	3.093	0.041	99.581	BS13&14B_L1_S2
577.0	51.885	52.085	1.952	13.991	11.430	6.765	10.590	3.150	0.038	99.800	BS13&14B_L1_S2
537.0	51.872	52.534	1.921	13.860	11.258	6.630	10.612	3.131	0.054	99.338	BS13&14B_L1_S2
497.0	51.901	52.292	1.991	14.006	11.375	6.466	10.599	3.203	0.067	99.609	BS13&14B_L1_S2
457.0	51.512	52.684	1.925	13.786	11.301	6.535	10.548	3.152	0.069	98.828	BS13&14B_L1_S2
417.0	51.816	52.494	2.024	13.806	11.209	6.564	10.602	3.227	0.075	99.322	BS13&14B_L1_S2
377.0	51.704	52.372	1.999	13.879	11.282	6.521	10.652	3.186	0.110	99.331	BS13&14B_L1_S2
337.0	51.821	52.123	1.973	13.795	11.179	6.620	10.835	3.322	0.153	99.698	BS13&14B_L1_S2
297.0	51.856	52.425	1.927	13.975	11.116	6.460	10.631	3.250	0.216	99.431	BS13&14B_L1_S2
257.0	51.256	52.421	1.987	13.827	10.958	6.531	10.710	3.253	0.313	98.836	BS13&14B_L1_S2
217.0	51.478	52.233	1.933	13.791	11.134	6.583	10.728	3.189	0.410	99.245	BS13&14B_L1_S2
177.0	51.244	52.256	1.950	13.892	10.946	6.549	10.706	3.138	0.562	98.988	BS13&14B_L1_S2
137.0	51.332	51.737	2.033	13.696	11.117	6.667	10.782	3.202	0.766	99.595	BS13&14B_L1_S2
97.0	50.976	51.883	1.972	13.721	11.023	6.516	10.739	3.163	0.984	99.093	BS13&14B_L1_S2
57.0	50.692	51.861	1.951	13.861	11.020	6.467	10.493	3.114	1.233	98.831	BS13&14B_L1_S2
17.0	50.701	51.426	1.904	13.658	11.360	6.593	10.568	3.024	1.467	99.275	BS13&14B_L1_S2
-23.0	50.469	51.346	2.050	13.609	11.278	6.526	10.432	3.076	1.685	99.123	BS13&14B_L1_S2
-63.0	49.970	50.736	2.008	14.017	11.215	6.539	10.573	2.988	1.924	99.234	BS13&14B_L1_S2
-103.0	49.472	50.343	2.041	14.071	11.449	6.511	10.557	2.903	2.126	99.129	BS13&14B_L1_S2
-143.0	49.622	49.791	2.092	14.194	11.649	6.609	10.499	2.858	2.308	99.831	BS13&14B_L1_S2
-183.0	49.359	49.780	1.927	14.238	11.675	6.598	10.542	2.836	2.405	99.580	BS13&14B_L1_S2
-223.0	48.678	50.073	1.994	13.915	11.625	6.551	10.384	2.875	2.583	98.605	BS13&14B_L1_S2
-303.0	48.692	49.676	2.022	13.912	11.672	6.613	10.452	2.894	2.758	99.016	BS13&14B_L1_S3
-383.0	48.482	49.439	2.035	14.109	11.667	6.584	10.436	2.809	2.922	99.042	BS13&14B_L1_S3
-463.0	48.344	49.487	1.995	14.008	11.574	6.638	10.483	2.874	2.941	98.857	BS13&14B_L1_S3
-543.0	48.384	49.628	2.019	13.865	11.565	6.538	10.487	2.891	3.008	98.756	BS13&14B_L1_S3
-623.0	48.570	49.506	2.049	13.919	11.553	6.550	10.473	2.910	3.040	99.064	BS13&14B_L1_S3
-703.0	48.557	49.097	2.040	14.166	11.545	6.619	10.557	2.964	3.012	99.461	BS13&14B_L1_S3
-783.0	48.678	48.956	2.063	14.035	11.618	6.625	10.649	2.958	3.096	99.722	BS13&14B_L1_S3
-863.0	48.434	49.456	2.029	13.788	11.609	6.607	10.503	2.956	3.053	98.978	BS13&14B_L1_S3
-943.0	48.626	49.370	1.988	13.998	11.534	6.531	10.603	2.987	2.990	99.256	BS13&14B_L1_S3
-1023.0	48.209	49.647	2.045	13.887	11.438	6.569	10.490	2.930	2.994	98.562	BS13&14B_L1_S3
-1103.0	48.262	49.406	2.030	13.882	11.552	6.626	10.529	2.944	3.031	98.856	BS13&14B_L1_S3
-1183.0	48.357	49.641	2.029	14.020	11.337	6.575	10.553	2.861	2.985	98.716	BS13&14B_L1_S3
1245.3	51.573	52.618	1.930	13.961	11.382	6.656	10.533	2.880	0.041	98.955	BS13&14B_L2_S1
1165.3	51.410	52.784	2.027	13.772	11.398	6.656	10.401	2.920	0.043	98.626	BS13&14B_L2_S1
1085.3	51.607	52.931	1.927	13.827	11.253	6.643	10.476	2.899	0.043	98.676	BS13&14B_L2_S1
1005.3	51.735	52.653	1.928	13.897	11.359	6.729	10.468	2.929	0.038	99.082	BS13&14B_L2_S1
925.3	51.987	52.560	1.943	13.698	11.497	6.768	10.513	2.983	0.038	99.427	BS13&14B_L2_S1
845.3	51.978	52.595	2.055	13.851	11.223	6.676	10.484	3.082	0.034	99.383	BS13&14B_L2_S1
765.3	51.855	52.576	1.977	13.807	11.294	6.653	10.538	3.116	0.039	99.278	BS13&14B_L2_S1
685.3	51.760	52.322	1.985	13.893	11.315	6.688	10.642	3.112	0.044	99.437	BS13&14B_L2_S1
605.3	51.508	52.794	2.018	14.025	11.159	6.503	10.402	3.060	0.039	98.715	BS13&14B_L2_S1
525.3	51.696	52.507	1.979	13.965	11.337	6.585	10.449	3.135	0.044	99.190	BS13&14B_L2_S1
445.3	51.806	52.542	1.999	13.963	11.097	6.589	10.592	3.142	0.076	99.263	BS13&14B_L2_S2
405.3	51.508	52.373	1.972	14.032	11.113	6.577	10.557	3.277	0.098	99.136	BS13&14B_L2_S2
365.3	51.571	52.438	2.010	13.976	11.005	6.601	10.603	3.237	0.131	99.133	BS13&14B_L2_S2
325.3	51.683	52.278	1.974	13.897	11.186	6.635	10.625	3.205	0.200	99.405	BS13&14B_L2_S2
285.3	51.808	52.126	1.948	13.955	11.196	6.593	10.692	3.213	0.277	99.682	BS13&14B_L2_S2
245.3	51.559	52.208	1.963	14.005	11.052	6.498	10.704	3.195	0.375	99.351	BS13&14B_L2_S2
205.3	51.337	52.096	2.017	13.843	11.045	6.629	10.716	3.123	0.532	99.241	BS13&14B_L2_S2
165.3	51.262	51.767	2.038	13.985	11.224	6.530	10.609	3.125	0.722	99.495	BS13&14B_L2_S2

125.3	51.040	51.998	1.966	13.759	11.071	6.541	10.634	3.163	0.868	99.042	BS13&14B_L2_S2
85.3	51.173	52.147	1.879	13.676	11.043	6.479	10.570	3.098	1.107	99.026	BS13&14B_L2_S2
45.3	50.808	51.747	1.950	13.805	11.035	6.558	10.564	3.030	1.312	99.061	BS13&14B_L2_S2
5.3	50.571	51.194	1.935	13.785	11.342	6.630	10.481	3.086	1.547	99.377	BS13&14B_L2_S2
-34.7	50.295	51.051	2.020	13.974	11.305	6.515	10.459	2.893	1.784	99.244	BS13&14B_L2_S2
-74.7	49.679	50.487	2.091	14.093	11.383	6.594	10.454	2.928	1.970	99.192	BS13&14B_L2_S2
-114.7	49.393	50.447	2.017	14.121	11.550	6.447	10.420	2.844	2.155	98.946	BS13&14B_L2_S2
-154.7	49.201	49.652	2.081	14.461	11.547	6.530	10.541	2.882	2.307	99.549	BS13&14B_L2_S2
-194.7	49.195	49.811	2.065	14.167	11.495	6.668	10.520	2.856	2.418	99.384	BS13&14B_L2_S2
-234.7	48.716	49.922	2.037	14.118	11.675	6.547	10.403	2.762	2.537	98.794	BS13&14B_L2_S2
-274.7	48.744	49.631	2.009	14.137	11.702	6.628	10.412	2.797	2.684	99.113	BS13&14B_L2_S2
-314.7	48.617	49.659	2.071	13.949	11.651	6.582	10.451	2.891	2.746	98.958	BS13&14B_L2_S2
-354.7	48.525	49.743	2.003	14.059	11.583	6.568	10.381	2.801	2.863	98.782	BS13&14B_L2_S2
-394.7	48.497	49.321	2.047	14.018	11.844	6.623	10.445	2.811	2.891	99.176	BS13&14B_L2_S2
-434.7	48.567	49.387	2.067	13.997	11.677	6.576	10.545	2.823	2.928	99.180	BS13&14B_L2_S2
-474.7	48.441	49.572	1.981	14.058	11.603	6.563	10.428	2.806	2.990	98.869	BS13&14B_L2_S2
-514.7	48.530	49.343	1.991	14.183	11.555	6.584	10.454	2.900	2.989	99.187	BS13&14B_L2_S2
-554.7	48.459	49.359	2.021	14.034	11.613	6.625	10.511	2.848	2.988	99.100	BS13&14B_L2_S2
-634.7	48.626	49.254	1.987	14.046	11.577	6.638	10.485	2.946	3.066	99.372	BS13&14B_L2_S3
-716.7	48.599	48.916	2.026	14.273	11.519	6.656	10.574	2.949	3.087	99.684	BS13&14B_L2_S3
-798.7	48.443	49.099	1.978	13.992	11.609	6.608	10.625	2.967	3.124	99.344	BS13&14B_L2_S3
-880.7	48.323	49.397	1.974	14.071	11.474	6.420	10.571	3.032	3.061	98.926	BS13&14B_L2_S3
-962.7	48.450	49.162	2.017	14.085	11.607	6.514	10.512	3.041	3.063	99.288	BS13&14B_L2_S3
-1044.7	48.580	49.170	2.086	13.976	11.470	6.628	10.629	2.989	3.052	99.410	BS13&14B_L2_S3
-1126.7	48.465	49.548	2.017	13.825	11.467	6.496	10.587	3.020	3.041	98.917	BS13&14B_L2_S3
-1208.7	48.581	49.464	2.030	13.997	11.428	6.619	10.477	2.959	3.025	99.117	BS13&14B_L2_S3
1295.9	51.746	52.412	1.920	13.992	11.445	6.715	10.540	2.919	0.058	99.334	BS13&14B_L3_S1
1215.9	51.523	52.362	1.993	14.054	11.503	6.678	10.478	2.886	0.048	99.162	BS13&14B_L3_S1
1135.9	51.501	52.687	2.037	13.787	11.420	6.657	10.444	2.931	0.038	98.815	BS13&14B_L3_S1
1055.9	51.722	52.691	1.943	13.775	11.369	6.669	10.498	3.013	0.044	99.031	BS13&14B_L3_S1
975.9	51.843	52.595	1.948	13.834	11.406	6.645	10.561	2.963	0.048	99.248	BS13&14B_L3_S1
895.9	51.648	52.493	1.976	13.972	11.464	6.521	10.476	3.053	0.044	99.155	BS13&14B_L3_S1
815.9	51.940	52.024	1.966	14.095	11.516	6.695	10.605	3.053	0.048	99.916	BS13&14B_L3_S1
735.9	51.911	52.650	1.929	13.738	11.340	6.628	10.604	3.052	0.059	99.261	BS13&14B_L3_S1
635.9	51.767	52.316	1.938	13.988	11.507	6.518	10.629	3.058	0.045	99.452	BS13&14B_L3_S2
595.9	51.561	52.191	2.023	13.828	11.535	6.614	10.539	3.227	0.044	99.370	BS13&14B_L3_S2
555.9	51.427	52.578	1.946	13.715	11.409	6.660	10.480	3.163	0.049	98.850	BS13&14B_L3_S2
515.9	51.589	52.540	1.950	13.767	11.392	6.540	10.540	3.216	0.056	99.049	BS13&14B_L3_S2
475.9	51.645	52.437	1.962	13.829	11.268	6.652	10.641	3.159	0.053	99.207	BS13&14B_L3_S2
435.9	51.716	52.156	1.995	13.951	11.393	6.612	10.593	3.248	0.051	99.560	BS13&14B_L3_S2
395.9	51.485	52.450	1.965	13.769	11.321	6.589	10.657	3.166	0.084	99.035	BS13&14B_L3_S2
355.9	51.561	52.196	2.008	13.874	11.342	6.624	10.592	3.258	0.107	99.365	BS13&14B_L3_S2
315.9	51.428	52.775	1.922	13.832	11.030	6.536	10.609	3.152	0.146	98.653	BS13&14B_L3_S2
275.9	51.274	52.275	2.008	13.808	11.108	6.604	10.763	3.227	0.208	98.998	BS13&14B_L3_S2
235.9	51.582	52.243	1.988	13.809	11.095	6.494	10.752	3.298	0.320	99.339	BS13&14B_L3_S2
195.9	51.054	52.261	1.993	13.607	11.171	6.608	10.674	3.255	0.432	98.793	BS13&14B_L3_S2
155.9	51.213	51.822	1.864	13.825	11.059	6.654	10.767	3.381	0.628	99.391	BS13&14B_L3_S2
115.9	50.946	51.898	1.972	13.620	11.117	6.536	10.755	3.258	0.845	99.048	BS13&14B_L3_S2
75.9	51.159	51.639	1.925	13.679	11.212	6.601	10.716	3.166	1.063	99.520	BS13&14B_L3_S2
35.9	50.697	51.313	1.954	13.926	11.146	6.511	10.640	3.129	1.381	99.384	BS13&14B_L3_S2
-4.1	50.338	51.483	1.829	13.749	11.214	6.602	10.443	3.060	1.621	98.856	BS13&14B_L3_S2
-44.1	50.077	50.967	2.019	13.777	11.234	6.575	10.526	3.024	1.878	99.111	BS13&14B_L3_S2
-84.1	49.262	50.595	1.977	13.965	11.392	6.543	10.517	2.980	2.030	98.667	BS13&14B_L3_S2
-124.1	49.213	49.802	2.030	14.171	11.676	6.651	10.492	2.956	2.222	99.411	BS13&14B_L3_S2
-164.1	49.116	50.123	2.029	14.065	11.682	6.419	10.404	2.932	2.347	98.993	BS13&14B_L3_S2
-204.1	48.673	49.607	2.098	14.007	11.744	6.568	10.488	2.934	2.556	99.066	BS13&14B_L3_S2
-244.1	48.646	49.812	2.036	13.904	11.756	6.629	10.350	2.831	2.683	98.834	BS13&14B_L3_S2
-284.1	48.496	49.481	2.090	14.051	11.660	6.651	10.533	2.777	2.758	99.015	BS13&14B_L3_S2
-324.1	48.539	49.312	2.014	14.095	11.779	6.530	10.465	2.928	2.878	99.227	BS13&14B_L3_S2
-364.1	48.857	49.424	2.015	13.876	11.668	6.667	10.478	2.948	2.924	99.432	BS13&14B_L3_S2
-444.1	48.459	49.520	1.927	13.967	11.654	6.588	10.490	2.889	2.966	98.939	BS13&14B_L3_S3
-524.1	48.245	49.286	2.051	13.932	11.648	6.593	10.531	2.919	3.042	98.959	BS13&14B_L3_S3
-604.1	48.250	49.646	1.960	13.821	11.620	6.537	10.459	2.922	3.035	98.604	BS13&14B_L3_S3

-684.1	48.353	49.647	1.996	13.706	11.493	6.616	10.547	2.966	3.029	98.707	BS13&14B_L3_S3
-764.1	48.586	49.400	2.014	13.903	11.462	6.586	10.585	3.010	3.040	99.185	BS13&14B_L3_S3
-844.1	48.619	49.176	1.998	13.894	11.621	6.616	10.561	3.056	3.078	99.443	BS13&14B_L3_S3
-924.1	48.532	49.172	1.967	13.986	11.630	6.665	10.617	2.915	3.049	99.360	BS13&14B_L3_S3
-1004.1	48.741	48.916	2.068	14.083	11.624	6.707	10.599	2.991	3.012	99.825	BS13&14B_L3_S3
-1084.1	48.353	49.023	1.987	14.187	11.534	6.681	10.575	3.009	3.005	99.330	BS13&14B_L3_S3
-1164.1	48.373	49.601	2.003	13.924	11.329	6.649	10.580	2.974	2.938	98.771	BS13&14B_L3_S3

Table C36. BS17&18B

X(µm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
963.9	49.428	50.465	2.051	14.029	11.478	5.293	10.705	2.972	3.008	98.964	BS17&18B_L1_S2
883.9	49.329	50.481	1.962	14.259	11.493	5.304	10.604	2.911	2.987	98.848	BS17&18B_L1_S2
803.9	49.475	50.384	1.860	14.269	11.619	5.363	10.605	2.882	3.019	99.091	BS17&18B_L1_S2
723.9	49.613	50.449	1.881	14.223	11.554	5.277	10.674	2.927	3.016	99.164	BS17&18B_L1_S2
643.9	49.764	50.573	1.950	14.245	11.452	5.303	10.643	2.882	2.951	99.191	BS17&18B_L1_S2
563.9	49.635	50.887	1.897	14.094	11.570	5.258	10.488	2.838	2.969	98.748	BS17&18B_L1_S2
483.9	49.991	50.776	1.935	14.291	11.366	5.245	10.518	2.896	2.973	99.215	BS17&18B_L1_S3
443.9	49.621	50.760	1.960	14.103	11.580	5.194	10.514	2.938	2.952	98.862	BS17&18B_L1_S3
403.9	49.720	50.686	1.956	14.285	11.447	5.341	10.464	2.911	2.912	99.035	BS17&18B_L1_S3
363.9	49.602	50.817	1.916	14.135	11.633	5.391	10.453	2.848	2.808	98.785	BS17&18B_L1_S3
323.9	49.815	50.840	1.926	14.004	11.513	5.439	10.526	2.939	2.814	98.975	BS17&18B_L1_S3
283.9	49.597	51.005	1.931	14.309	11.354	5.383	10.387	2.904	2.727	98.592	BS17&18B_L1_S3
243.9	49.769	50.724	1.993	14.311	11.554	5.521	10.354	2.883	2.660	99.045	BS17&18B_L1_S3
203.9	49.828	50.674	2.011	14.375	11.448	5.563	10.408	2.941	2.581	99.153	BS17&18B_L1_S3
163.9	49.727	50.949	1.981	14.256	11.346	5.661	10.373	3.035	2.399	98.778	BS17&18B_L1_S3
123.9	49.688	50.850	1.976	14.282	11.338	5.900	10.367	2.984	2.304	98.838	BS17&18B_L1_S3
83.9	49.908	51.086	2.035	14.311	11.079	6.013	10.401	3.028	2.047	98.822	BS17&18B_L1_S3
43.9	49.801	50.588	1.988	14.357	11.269	6.514	10.429	3.018	1.838	99.213	BS17&18B_L1_S3
3.9	49.559	50.382	2.034	14.291	11.277	6.774	10.667	3.042	1.533	99.178	BS17&18B_L1_S3
-36.1	49.161	50.556	1.946	14.168	11.321	6.926	10.805	3.019	1.260	98.605	BS17&18B_L1_S3
-76.1	49.225	50.237	1.990	14.064	11.571	7.263	10.879	2.966	1.029	98.987	BS17&18B_L1_S3
-116.1	48.890	50.314	2.036	14.071	11.361	7.506	10.920	3.004	0.789	98.577	BS17&18B_L1_S3
-196.1	49.036	50.403	1.993	14.085	11.347	7.753	10.889	3.106	0.423	98.633	BS17&18B_L1_S4
-236.1	49.039	50.343	1.991	14.030	11.426	7.893	10.949	3.052	0.316	98.697	BS17&18B_L1_S4
-276.1	49.003	50.518	1.994	14.233	11.287	7.780	10.870	3.105	0.212	98.484	BS17&18B_L1_S4
-316.1	49.591	50.434	1.951	14.341	11.288	7.821	10.879	3.124	0.162	99.157	BS17&18B_L1_S4
-356.1	49.403	50.210	2.104	14.278	11.437	7.908	10.855	3.105	0.105	99.194	BS17&18B_L1_S4
-396.1	49.571	50.650	1.977	14.179	11.266	7.971	10.815	3.058	0.084	98.921	BS17&18B_L1_S4
-436.1	49.373	50.413	1.950	14.162	11.454	7.998	10.834	3.152	0.038	98.960	BS17&18B_L1_S4
-476.1	49.420	50.707	1.967	14.118	11.205	8.066	10.824	3.072	0.040	98.712	BS17&18B_L1_S4
-516.1	49.393	50.562	1.956	14.243	11.215	8.080	10.813	3.090	0.042	98.831	BS17&18B_L1_S4
-556.1	49.202	50.706	1.999	14.303	11.219	7.954	10.659	3.115	0.047	98.496	BS17&18B_L1_S4
-596.1	49.488	50.697	1.900	14.272	11.274	8.005	10.813	3.000	0.039	98.791	BS17&18B_L1_S4
-636.1	49.464	50.553	2.033	14.179	11.287	7.987	10.826	3.098	0.036	98.910	BS17&18B_L1_S4
-676.1	49.327	50.304	1.925	14.274	11.462	8.096	10.847	3.034	0.059	99.023	BS17&18B_L1_S4
-716.1	49.315	50.757	1.989	14.247	11.161	8.027	10.741	3.033	0.045	98.557	BS17&18B_L1_S4
-756.1	49.473	50.638	2.009	14.210	11.319	7.988	10.729	3.061	0.048	98.835	BS17&18B_L1_S4
-836.1	49.531	50.640	1.983	14.261	11.277	8.114	10.679	3.013	0.034	98.891	BS17&18B_L1_S5
-916.1	49.414	50.819	1.986	14.152	11.281	7.984	10.750	2.981	0.048	98.596	BS17&18B_L1_S5
-996.1	49.351	50.909	1.927	14.130	11.221	8.010	10.754	3.006	0.043	98.442	BS17&18B_L1_S5
-1076.1	49.279	50.407	2.069	14.184	11.366	8.143	10.704	3.071	0.057	98.873	BS17&18B_L1_S5
-1156.1	49.233	50.740	2.000	14.243	11.275	8.055	10.715	2.935	0.038	98.494	BS17&18B_L1_S5
-1236.1	49.272	50.754	1.874	14.143	11.378	8.138	10.702	2.969	0.043	98.518	BS17&18B_L1_S5
-1316.1	49.256	50.515	1.894	14.257	11.452	8.035	10.799	3.004	0.045	98.740	BS17&18B_L1_S5
-1396.1	49.338	50.559	1.905	14.124	11.518	8.135	10.744	2.966	0.049	98.779	BS17&18B_L1_S5
-1476.1	49.204	50.307	1.938	14.188	11.482	8.209	10.858	2.971	0.048	98.898	BS17&18B_L1_S5
-1556.1	49.316	50.409	1.960	14.337	11.308	8.212	10.838	2.902	0.035	98.907	BS17&18B_L1_S5
-1636.1	49.250	50.363	1.958	14.129	11.426	8.203	10.898	2.971	0.051	98.886	BS17&18B_L1_S5
-1716.1	49.762	50.887	1.909	14.111	11.088	8.146	10.834	2.982	0.044	98.875	BS17&18B_L1_S5
968.2	49.030	50.524	1.960	14.049	11.482	5.379	10.679	2.963	2.963	98.506	BS17&18B_L2_S1
888.2	49.146	50.466	1.940	14.122	11.603	5.338	10.656	2.881	2.995	98.679	BS17&18B_L2_S1
808.2	49.234	50.727	1.898	14.127	11.492	5.141	10.643	2.974	2.998	98.507	BS17&18B_L2_S1
728.2	49.056	50.266	1.961	14.187	11.646	5.300	10.679	2.933	3.028	98.790	BS17&18B_L2_S2
688.2	49.145	50.343	1.934	14.158	11.679	5.289	10.719	2.899	2.980	98.801	BS17&18B_L2_S2
648.2	49.150	50.748	1.968	14.116	11.474	5.273	10.572	2.870	2.980	98.402	BS17&18B_L2_S2
608.2	48.915	50.595	1.942	14.187	11.355	5.336	10.656	2.897	3.033	98.319	BS17&18B_L2_S2
568.2	48.967	50.612	1.899	14.111	11.653	5.284	10.585	2.905	2.951	98.355	BS17&18B_L2_S2
528.2	49.111	50.640	1.973	14.031	11.618	5.302	10.584	2.898	2.954	98.471	BS17&18B_L2_S2
488.2	49.006	50.333	1.973	14.301	11.683	5.264	10.584	2.906	2.957	98.673	BS17&18B_L2_S2
448.2	48.860	50.883	1.929	14.143	11.439	5.209	10.585	2.893	2.919	97.977	BS17&18B_L2_S2
408.2	49.146	50.547	1.994	14.198	11.580	5.338	10.598	2.854	2.890	98.599	BS17&18B_L2_S2

368.2	49.157	50.782	1.988	14.138	11.509	5.362	10.501	2.914	2.806	98.375	BS17&18B_L2_S2
328.2	49.216	50.667	2.057	14.291	11.445	5.329	10.447	2.960	2.803	98.550	BS17&18B_L2_S2
288.2	49.241	50.701	1.956	14.256	11.440	5.506	10.496	2.886	2.760	98.540	BS17&18B_L2_S2
248.2	49.101	50.749	2.061	14.250	11.450	5.473	10.450	2.927	2.640	98.352	BS17&18B_L2_S2
208.2	49.145	50.603	2.041	14.252	11.523	5.627	10.388	3.002	2.564	98.542	BS17&18B_L2_S2
168.2	49.262	50.919	2.032	14.145	11.393	5.726	10.387	2.924	2.475	98.343	BS17&18B_L2_S2
128.2	49.303	51.260	1.932	14.263	11.239	5.745	10.342	2.932	2.287	98.044	BS17&18B_L2_S2
88.2	49.519	50.764	1.928	14.432	11.129	6.182	10.395	3.040	2.130	98.755	BS17&18B_L2_S2
8.2	48.736	51.004	1.949	14.129	11.111	6.617	10.631	2.968	1.591	97.732	BS17&18B_L2_S3
-31.8	48.988	50.734	2.052	14.134	11.183	6.832	10.812	2.962	1.292	98.254	BS17&18B_L2_S3
-71.8	48.545	50.307	1.977	14.117	11.411	7.203	10.901	3.065	1.021	98.238	BS17&18B_L2_S3
-111.8	48.635	50.447	1.901	13.997	11.475	7.458	10.964	2.933	0.825	98.188	BS17&18B_L2_S3
-151.8	48.546	50.181	2.018	14.050	11.396	7.713	11.007	3.026	0.609	98.365	BS17&18B_L2_S3
-191.8	48.976	50.339	1.915	14.114	11.318	7.824	10.993	3.075	0.423	98.637	BS17&18B_L2_S3
-231.8	48.889	50.652	1.927	14.040	11.273	7.707	10.979	3.095	0.327	98.237	BS17&18B_L2_S3
-271.8	49.075	50.407	1.932	14.166	11.371	7.840	10.972	3.086	0.226	98.668	BS17&18B_L2_S3
-311.8	49.101	50.287	2.009	14.225	11.273	8.015	10.905	3.146	0.141	98.814	BS17&18B_L2_S3
-351.8	49.127	50.379	1.972	14.323	11.223	7.998	10.841	3.155	0.109	98.747	BS17&18B_L2_S3
-391.8	49.165	50.465	2.046	14.187	11.204	8.015	10.833	3.170	0.079	98.700	BS17&18B_L2_S3
-431.8	49.001	50.623	1.939	14.248	11.254	8.001	10.797	3.083	0.055	98.378	BS17&18B_L2_S3
-471.8	49.239	50.326	2.049	14.265	11.323	8.039	10.765	3.185	0.048	98.912	BS17&18B_L2_S3
-551.8	49.366	50.513	1.938	14.253	11.332	8.081	10.702	3.139	0.043	98.853	BS17&18B_L2_S4
-631.8	49.242	50.465	1.966	14.374	11.318	8.050	10.748	3.038	0.041	98.778	BS17&18B_L2_S4
-711.8	49.263	50.714	1.997	14.194	11.301	7.985	10.746	3.024	0.039	98.550	BS17&18B_L2_S4
-791.8	49.201	50.770	2.002	14.127	11.296	7.969	10.777	3.024	0.037	98.431	BS17&18B_L2_S4
-871.8	49.243	50.743	1.958	14.202	11.221	7.934	10.796	3.096	0.049	98.500	BS17&18B_L2_S4
-951.8	49.398	50.448	1.969	14.206	11.372	8.097	10.852	3.025	0.032	98.950	BS17&18B_L2_S4
-1031.8	49.530	50.412	1.956	14.343	11.352	8.092	10.805	2.993	0.046	99.118	BS17&18B_L2_S5
-1111.8	49.263	50.932	1.966	14.118	11.237	8.014	10.709	2.972	0.054	98.331	BS17&18B_L2_S5
-1191.8	49.426	50.347	1.955	14.422	11.367	8.057	10.786	3.028	0.040	99.079	BS17&18B_L2_S5
-1271.8	49.135	50.662	1.955	14.210	11.324	8.068	10.802	2.953	0.026	98.473	BS17&18B_L2_S5
-1351.8	49.143	50.701	2.033	14.311	11.253	8.018	10.708	2.930	0.047	98.443	BS17&18B_L2_S5
-1431.8	49.164	50.716	1.882	14.218	11.388	8.008	10.814	2.931	0.043	98.449	BS17&18B_L2_S5
-1511.8	49.622	50.335	2.029	14.387	11.316	8.186	10.759	2.943	0.046	99.287	BS17&18B_L2_S5
-1591.8	49.348	50.342	2.020	14.314	11.320	8.145	10.834	2.977	0.049	99.007	BS17&18B_L2_S5
-1671.8	49.380	50.871	1.962	14.081	11.293	8.028	10.807	2.916	0.042	98.510	BS17&18B_L2_S5
962.7	49.415	50.587	1.961	14.154	11.676	5.223	10.596	2.864	2.939	98.828	BS17&18B_L3_S2
882.7	49.396	50.679	1.925	14.051	11.514	5.267	10.635	2.894	3.036	98.717	BS17&18B_L3_S2
802.7	49.357	50.907	1.856	14.106	11.507	5.263	10.546	2.855	2.960	98.450	BS17&18B_L3_S2
722.7	49.624	50.461	1.888	14.196	11.637	5.301	10.628	2.932	2.956	99.163	BS17&18B_L3_S2
642.7	49.300	50.479	1.919	14.241	11.638	5.290	10.546	2.904	2.985	98.821	BS17&18B_L3_S2
562.7	49.223	50.667	1.841	14.175	11.643	5.270	10.554	2.906	2.945	98.556	BS17&18B_L3_S3
522.7	49.220	50.852	1.877	14.198	11.397	5.357	10.526	2.841	2.951	98.368	BS17&18B_L3_S3
482.7	49.267	50.694	1.955	14.279	11.391	5.264	10.583	2.876	2.958	98.573	BS17&18B_L3_S3
442.7	49.298	50.594	1.959	14.221	11.652	5.287	10.493	2.878	2.916	98.705	BS17&18B_L3_S3
402.7	49.330	50.890	1.965	14.193	11.437	5.301	10.468	2.861	2.886	98.441	BS17&18B_L3_S3
362.7	49.559	50.634	2.032	14.285	11.421	5.396	10.510	2.895	2.826	98.925	BS17&18B_L3_S3
322.7	49.557	50.862	1.879	14.247	11.560	5.345	10.532	2.811	2.764	98.695	BS17&18B_L3_S3
282.7	49.458	50.758	2.015	14.258	11.471	5.420	10.534	2.826	2.719	98.701	BS17&18B_L3_S3
242.7	49.458	50.753	2.008	14.311	11.428	5.470	10.428	2.927	2.676	98.705	BS17&18B_L3_S3
202.7	49.676	50.670	1.956	14.345	11.503	5.609	10.468	2.894	2.555	99.006	BS17&18B_L3_S3
162.7	49.682	51.052	1.937	14.363	11.211	5.707	10.358	2.915	2.457	98.630	BS17&18B_L3_S3
82.7	49.754	50.734	1.930	14.315	11.328	6.224	10.379	3.056	2.035	99.020	BS17&18B_L3_S4
42.7	49.453	50.726	1.933	14.352	11.227	6.356	10.569	3.038	1.799	98.727	BS17&18B_L3_S4
2.7	49.385	50.520	1.895	14.265	11.386	6.754	10.671	2.977	1.532	98.865	BS17&18B_L3_S4
-37.3	49.115	50.553	1.908	14.142	11.334	7.104	10.773	2.943	1.243	98.562	BS17&18B_L3_S4
-77.3	49.051	50.282	1.923	14.043	11.396	7.382	11.006	2.983	0.987	98.769	BS17&18B_L3_S4
-117.3	48.709	49.961	2.013	14.129	11.602	7.524	11.014	2.987	0.771	98.748	BS17&18B_L3_S4
-157.3	48.736	50.403	1.943	14.102	11.377	7.667	10.941	2.969	0.597	98.333	BS17&18B_L3_S4
-197.3	49.023	50.184	2.021	14.186	11.447	7.732	10.945	3.045	0.441	98.839	BS17&18B_L3_S4
-237.3	48.805	50.573	1.922	14.083	11.325	7.867	10.917	3.007	0.307	98.232	BS17&18B_L3_S4
-277.3	49.047	50.332	1.994	14.131	11.254	8.002	10.987	3.063	0.237	98.715	BS17&18B_L3_S4
-317.3	48.996	50.763	1.909	14.193	11.221	7.810	10.882	3.052	0.171	98.233	BS17&18B_L3_S4

-397.3	49.256	50.559	1.959	14.190	11.258	7.990	10.836	3.124	0.084	98.698	BS17&18B_L3_S5
-477.3	49.282	50.708	1.970	14.287	11.218	7.968	10.739	3.071	0.040	98.574	BS17&18B_L3_S5
-557.3	49.280	50.410	1.929	14.323	11.307	8.099	10.775	3.120	0.037	98.870	BS17&18B_L3_S5
-637.3	49.218	50.324	1.971	14.191	11.409	8.133	10.831	3.099	0.043	98.893	BS17&18B_L3_S5
-717.3	49.125	50.449	1.928	14.264	11.424	7.986	10.824	3.087	0.039	98.675	BS17&18B_L3_S5
-797.3	49.332	50.575	1.951	14.199	11.312	8.040	10.862	3.017	0.045	98.757	BS17&18B_L3_S5
-877.3	49.022	50.318	2.037	14.233	11.419	8.153	10.809	2.986	0.045	98.704	BS17&18B_L3_S6
-957.3	49.157	50.477	1.952	14.366	11.347	8.021	10.767	3.027	0.043	98.679	BS17&18B_L3_S6
-1037.3	49.092	50.668	1.921	14.262	11.381	8.018	10.743	2.971	0.036	98.424	BS17&18B_L3_S6
-1117.3	49.257	50.477	1.955	14.349	11.337	8.035	10.828	2.983	0.036	98.779	BS17&18B_L3_S6
-1197.3	49.079	50.577	1.927	14.226	11.340	8.172	10.773	2.942	0.043	98.502	BS17&18B_L3_S6
-1277.3	49.001	50.342	2.045	14.288	11.473	8.068	10.844	2.903	0.038	98.659	BS17&18B_L3_S6
-1357.3	49.093	50.314	1.985	14.285	11.401	8.228	10.798	2.945	0.045	98.779	BS17&18B_L3_S6
-1437.3	49.045	50.334	1.996	14.333	11.369	8.150	10.832	2.936	0.052	98.711	BS17&18B_L3_S6
-1517.3	49.061	50.324	1.941	14.330	11.351	8.275	10.746	3.001	0.033	98.738	BS17&18B_L3_S6
-1597.3	49.115	50.412	1.970	14.230	11.369	8.250	10.820	2.906	0.044	98.702	BS17&18B_L3_S6
-1677.3	49.173	50.561	1.959	14.336	11.271	8.188	10.728	2.929	0.029	98.612	BS17&18B_L3_S6

Table C37. BS19&20B

X(μm)	SiO2	SiO2*	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Total	Comment
1368.6	50.154	50.728	2.028	12.811	11.304	6.690	11.962	2.982	1.496	99.426	BS19&20B_L1_S1
1288.6	49.846	50.758	2.026	12.746	11.433	6.733	11.958	2.863	1.484	99.088	BS19&20B_L1_S1
1208.6	50.053	50.473	1.986	12.905	11.543	6.674	11.958	2.926	1.536	99.580	BS19&20B_L1_S1
1128.6	50.067	50.591	1.914	12.876	11.558	6.785	11.871	2.907	1.498	99.475	BS19&20B_L1_S1
1048.6	49.939	50.669	1.999	12.738	11.512	6.607	11.943	3.001	1.531	99.270	BS19&20B_L1_S1
968.6	50.213	50.584	2.007	12.847	11.461	6.687	11.942	2.930	1.543	99.629	BS19&20B_L1_S1
888.6	49.935	50.902	1.972	12.673	11.438	6.589	11.896	2.996	1.534	99.034	BS19&20B_L1_S1
808.6	50.293	51.062	1.896	12.766	11.387	6.520	11.818	3.057	1.494	99.231	BS19&20B_L1_S1
728.6	50.144	50.710	1.892	12.936	11.291	6.621	11.977	3.017	1.557	99.434	BS19&20B_L1_S2
688.6	50.121	50.725	1.931	12.754	11.468	6.708	11.896	3.016	1.503	99.395	BS19&20B_L1_S2
648.6	50.239	50.889	1.937	12.678	11.496	6.579	11.929	2.955	1.537	99.350	BS19&20B_L1_S2
608.6	50.325	50.799	1.976	12.848	11.366	6.603	11.943	2.972	1.494	99.526	BS19&20B_L1_S2
568.6	50.225	50.381	1.977	12.801	11.713	6.749	11.937	2.924	1.519	99.844	BS19&20B_L1_S2
528.6	50.228	50.661	1.977	12.890	11.445	6.645	11.910	2.978	1.494	99.567	BS19&20B_L1_S2
488.6	49.909	50.884	1.956	12.648	11.436	6.782	11.819	2.948	1.527	99.026	BS19&20B_L1_S2
448.6	50.073	50.865	1.940	12.688	11.527	6.664	11.833	2.964	1.519	99.208	BS19&20B_L1_S2
408.6	49.866	50.553	1.900	12.867	11.690	6.656	11.896	2.935	1.503	99.313	BS19&20B_L1_S2
368.6	50.401	50.719	2.038	12.747	11.533	6.789	11.817	2.849	1.508	99.682	BS19&20B_L1_S2
328.6	49.993	50.831	2.006	12.712	11.443	6.792	11.859	2.864	1.494	99.162	BS19&20B_L1_S2
288.6	50.364	50.626	1.978	12.805	11.683	6.704	11.763	2.955	1.486	99.738	BS19&20B_L1_S2
248.6	50.325	50.892	1.943	12.839	11.521	6.773	11.658	2.858	1.516	99.433	BS19&20B_L1_S2
208.6	50.399	50.891	1.977	12.856	11.603	6.816	11.502	2.883	1.473	99.509	BS19&20B_L1_S2
168.6	49.980	50.645	1.991	12.888	11.693	6.847	11.476	2.975	1.485	99.335	BS19&20B_L1_S2
128.6	50.062	50.766	1.933	13.165	11.608	6.896	11.228	2.924	1.481	99.296	BS19&20B_L1_S2
88.6	50.288	50.570	2.057	13.391	11.569	6.841	11.136	2.969	1.467	99.719	BS19&20B_L1_S2
48.6	50.139	50.621	2.028	13.828	11.446	6.745	10.826	3.015	1.490	99.518	BS19&20B_L1_S2
8.6	49.994	50.567	1.967	14.129	11.371	6.661	10.715	3.089	1.502	99.427	BS19&20B_L1_S2
-31.4	49.453	50.619	1.878	14.554	11.350	6.550	10.412	3.084	1.553	98.834	BS19&20B_L1_S2
-71.4	49.889	50.442	1.949	15.067	11.137	6.509	10.257	3.125	1.516	99.447	BS19&20B_L1_S2
-111.4	49.886	50.376	1.977	15.258	11.113	6.457	10.104	3.156	1.560	99.510	BS19&20B_L1_S2
-166.4	49.817	50.636	1.874	15.567	10.999	6.457	9.823	3.100	1.543	99.181	BS19&20B_L1_S3
-206.4	49.596	50.687	1.909	15.405	11.037	6.461	9.729	3.194	1.578	98.909	BS19&20B_L1_S3
-246.4	49.730	50.390	1.980	15.632	11.199	6.436	9.558	3.231	1.575	99.340	BS19&20B_L1_S3
-286.4	49.542	50.403	2.006	15.750	11.201	6.543	9.326	3.211	1.561	99.139	BS19&20B_L1_S3
-326.4	49.811	50.579	1.968	15.775	11.044	6.547	9.354	3.171	1.562	99.232	BS19&20B_L1_S3
-366.4	49.694	50.436	1.936	15.734	11.257	6.553	9.315	3.206	1.564	99.258	BS19&20B_L1_S3
-406.4	49.590	50.542	1.957	15.677	11.270	6.547	9.290	3.188	1.530	99.047	BS19&20B_L1_S3
-446.4	49.692	50.499	1.872	15.695	11.398	6.568	9.279	3.160	1.530	99.193	BS19&20B_L1_S3
-486.4	49.714	50.486	1.923	15.641	11.441	6.610	9.167	3.223	1.509	99.228	BS19&20B_L1_S3
-526.4	49.711	50.696	1.894	15.710	11.171	6.687	9.184	3.125	1.534	99.015	BS19&20B_L1_S3
-566.4	49.750	50.697	1.943	15.565	11.303	6.602	9.209	3.168	1.513	99.053	BS19&20B_L1_S3
-606.4	49.936	50.524	1.887	15.792	11.287	6.754	9.167	3.073	1.516	99.412	BS19&20B_L1_S3
-646.4	49.512	50.475	1.972	15.674	11.329	6.692	9.161	3.179	1.519	99.037	BS19&20B_L1_S3
-686.4	49.720	50.369	1.980	15.704	11.372	6.693	9.187	3.168	1.527	99.352	BS19&20B_L1_S3
-726.4	49.765	50.684	1.927	15.773	11.269	6.570	9.232	3.087	1.458	99.080	BS19&20B_L1_S3
-766.4	49.837	50.496	1.949	15.765	11.273	6.737	9.205	3.050	1.525	99.341	BS19&20B_L1_S3
-806.4	49.643	50.487	1.990	15.805	11.324	6.586	9.177	3.139	1.492	99.156	BS19&20B_L1_S3
-846.4	49.656	50.587	1.938	15.673	11.292	6.683	9.240	3.077	1.509	99.069	BS19&20B_L1_S3
-886.4	49.694	50.632	1.918	15.744	11.294	6.698	9.150	3.058	1.506	99.062	BS19&20B_L1_S3
-926.4	49.835	50.738	1.956	15.597	11.303	6.662	9.224	3.041	1.480	99.097	BS19&20B_L1_S3
-966.4	49.684	50.605	2.003	15.720	11.263	6.700	9.146	3.073	1.489	99.078	BS19&20B_L1_S3
-1046.4	49.679	50.557	1.971	15.704	11.270	6.696	9.255	3.038	1.509	99.121	BS19&20B_L1_S4
-1126.4	49.749	50.338	2.075	15.847	11.398	6.686	9.179	3.015	1.462	99.411	BS19&20B_L1_S4
-1206.4	49.737	50.359	2.000	15.932	11.122	6.768	9.261	3.066	1.492	99.378	BS19&20B_L1_S4
-1286.4	49.761	50.494	2.034	15.858	11.138	6.720	9.179	3.057	1.521	99.267	BS19&20B_L1_S4
-1366.4	49.971	50.770	1.999	15.924	11.163	6.574	9.119	2.977	1.474	99.201	BS19&20B_L1_S4

1386	49.474	50.477	1.904	12.864	11.608	6.669	12.040	2.927	1.510	98.997	BS19&20B_L2_S1
1306	49.515	50.823	1.934	12.603	11.587	6.648	11.997	2.920	1.489	98.692	BS19&20B_L2_S1
1226	49.440	50.781	1.891	12.742	11.599	6.661	11.880	2.912	1.533	98.659	BS19&20B_L2_S1
1146	49.597	50.694	1.981	12.701	11.382	6.737	12.022	2.938	1.545	98.903	BS19&20B_L2_S1
1066	49.708	50.626	1.939	12.757	11.539	6.706	11.934	2.966	1.533	99.082	BS19&20B_L2_S1
986	49.540	50.668	2.003	12.815	11.467	6.696	11.925	2.908	1.518	98.872	BS19&20B_L2_S1
906	49.667	50.766	1.961	12.629	11.571	6.656	11.927	2.988	1.503	98.901	BS19&20B_L2_S1
826	49.559	50.740	1.933	12.648	11.492	6.674	11.983	3.000	1.529	98.818	BS19&20B_L2_S2
787	49.665	50.642	1.989	12.680	11.601	6.625	12.002	2.967	1.495	99.024	BS19&20B_L2_S2
748	49.717	51.089	1.877	12.711	11.377	6.609	11.970	2.844	1.524	98.628	BS19&20B_L2_S2
709	49.522	51.191	1.955	12.549	11.401	6.601	11.958	2.841	1.505	98.330	BS19&20B_L2_S2
670	49.456	50.480	1.981	12.707	11.545	6.707	12.064	3.015	1.501	98.976	BS19&20B_L2_S2
631	49.613	51.041	2.014	12.642	11.452	6.581	11.927	2.867	1.475	98.571	BS19&20B_L2_S2
592	49.614	50.487	1.966	12.900	11.601	6.680	11.928	2.915	1.524	99.127	BS19&20B_L2_S2
553	49.840	50.625	1.969	12.734	11.531	6.715	11.984	2.942	1.500	99.215	BS19&20B_L2_S2
514	49.719	51.097	1.921	12.667	11.434	6.654	11.858	2.855	1.516	98.622	BS19&20B_L2_S2
475	49.710	50.875	1.980	12.607	11.623	6.664	11.920	2.830	1.500	98.835	BS19&20B_L2_S2
436	49.735	50.704	1.970	12.776	11.594	6.725	11.885	2.857	1.489	99.031	BS19&20B_L2_S2
397	49.811	50.720	1.958	12.860	11.682	6.684	11.818	2.820	1.459	99.090	BS19&20B_L2_S2
358	49.691	50.999	1.904	12.762	11.506	6.781	11.762	2.821	1.465	98.692	BS19&20B_L2_S2
319	49.861	50.659	1.990	12.765	11.737	6.816	11.779	2.813	1.442	99.201	BS19&20B_L2_S2
280	49.974	50.837	1.916	12.820	11.618	6.844	11.695	2.796	1.474	99.137	BS19&20B_L2_S2
241	49.754	50.972	2.033	12.772	11.538	6.774	11.618	2.853	1.441	98.782	BS19&20B_L2_S2
202	49.837	50.793	1.998	12.830	11.677	6.908	11.527	2.811	1.456	99.044	BS19&20B_L2_S2
163	49.980	50.517	2.012	13.049	11.768	6.881	11.457	2.853	1.464	99.464	BS19&20B_L2_S2
124	49.608	50.988	1.935	12.932	11.675	6.830	11.215	2.936	1.490	98.619	BS19&20B_L2_S2
85	49.587	50.605	2.031	13.439	11.650	6.841	11.065	2.907	1.462	98.983	BS19&20B_L2_S2
46	50.088	50.897	1.990	13.738	11.394	6.686	10.848	2.960	1.488	99.191	BS19&20B_L2_S2
4	49.629	51.003	1.936	14.152	11.265	6.539	10.627	3.003	1.474	98.626	BS19&20B_L2_S3
-36	49.424	50.567	1.943	14.571	11.404	6.622	10.421	2.918	1.554	98.857	BS19&20B_L2_S3
-76	49.459	50.510	1.972	14.976	11.159	6.549	10.212	3.069	1.554	98.950	BS19&20B_L2_S3
-116	49.345	50.518	1.916	15.140	11.153	6.576	10.080	3.050	1.568	98.827	BS19&20B_L2_S3
-156	49.250	50.168	1.970	15.537	11.381	6.525	9.829	3.054	1.536	99.082	BS19&20B_L2_S3
-196	49.373	50.334	1.884	15.706	11.096	6.605	9.684	3.136	1.556	99.039	BS19&20B_L2_S3
-236	49.290	50.580	1.984	15.493	11.120	6.529	9.548	3.140	1.608	98.711	BS19&20B_L2_S3
-276	49.414	50.336	1.991	15.674	11.208	6.527	9.500	3.207	1.557	99.078	BS19&20B_L2_S3
-316	49.423	50.205	1.981	15.766	11.257	6.673	9.423	3.131	1.565	99.218	BS19&20B_L2_S3
-356	49.430	50.514	2.055	15.521	11.444	6.539	9.277	3.116	1.536	98.916	BS19&20B_L2_S3
-396	49.599	50.489	1.938	15.655	11.358	6.675	9.241	3.125	1.519	99.109	BS19&20B_L2_S3
-436	49.331	50.226	2.022	15.747	11.466	6.703	9.218	3.103	1.516	99.105	BS19&20B_L2_S3
-476	49.367	50.600	2.019	15.647	11.373	6.590	9.212	3.078	1.481	98.767	BS19&20B_L2_S3
-516	49.443	50.692	1.949	15.578	11.370	6.613	9.224	3.074	1.500	98.751	BS19&20B_L2_S3
-556	49.495	50.525	1.991	15.638	11.415	6.625	9.213	3.100	1.493	98.970	BS19&20B_L2_S3
-596	49.388	50.777	1.947	15.575	11.284	6.688	9.185	3.067	1.476	98.611	BS19&20B_L2_S3
-636	49.296	50.727	1.890	15.591	11.287	6.735	9.190	3.095	1.486	98.569	BS19&20B_L2_S3
-676	49.464	50.599	1.950	15.609	11.380	6.696	9.226	3.054	1.486	98.866	BS19&20B_L2_S3
-716	49.288	50.568	1.850	15.773	11.396	6.630	9.204	3.050	1.528	98.719	BS19&20B_L2_S3
-756	49.447	50.531	1.992	15.737	11.352	6.705	9.129	3.058	1.496	98.916	BS19&20B_L2_S3
-796	49.493	50.837	1.881	15.643	11.311	6.677	9.158	3.021	1.473	98.656	BS19&20B_L2_S3
-876	49.372	50.768	2.049	15.712	11.293	6.509	9.200	3.007	1.462	98.604	BS19&20B_L2_S4
-956	49.335	50.397	2.023	15.701	11.391	6.778	9.189	3.041	1.480	98.938	BS19&20B_L2_S4
-1036	49.578	50.510	2.030	15.807	11.357	6.671	9.149	2.994	1.483	99.068	BS19&20B_L2_S4
-1116	49.788	50.637	2.003	15.824	11.249	6.645	9.145	3.019	1.479	99.151	BS19&20B_L2_S4
-1196	49.682	50.645	2.082	15.694	11.199	6.669	9.202	3.025	1.483	99.037	BS19&20B_L2_S4
1340.3	49.551	51.074	2.004	12.787	11.260	6.636	11.928	2.823	1.488	98.476	BS19&20B_L3_S1
1260.3	49.473	50.548	1.906	12.801	11.515	6.748	12.039	2.928	1.514	98.925	BS19&20B_L3_S1
1180.3	49.166	50.529	1.969	12.849	11.525	6.734	12.023	2.843	1.528	98.638	BS19&20B_L3_S1
1100.3	49.350	50.612	1.972	12.724	11.583	6.671	11.994	2.923	1.522	98.738	BS19&20B_L3_S1

1020.3	49.485	50.663	1.878	12.692	11.629	6.623	12.008	2.921	1.586	98.822	BS19&20B_L3_S1
940.3	49.378	50.938	1.957	12.725	11.413	6.694	11.878	2.858	1.538	98.441	BS19&20B_L3_S1
860.3	49.837	50.819	1.961	12.734	11.474	6.653	11.905	2.916	1.539	99.018	BS19&20B_L3_S1
780.3	49.413	50.612	1.948	12.841	11.582	6.729	11.898	2.872	1.519	98.802	BS19&20B_L3_S1
700.3	49.547	50.745	2.055	12.681	11.445	6.635	11.924	2.977	1.538	98.802	BS19&20B_L3_S1
620.3	49.520	50.837	1.966	12.771	11.353	6.579	11.895	3.050	1.550	98.683	BS19&20B_L3_S1
540.3	49.567	50.521	2.023	12.739	11.570	6.702	11.964	2.942	1.539	99.046	BS19&20B_L3_S2
501.3	49.640	50.815	1.930	12.617	11.541	6.783	11.897	2.912	1.505	98.824	BS19&20B_L3_S2
462.3	49.126	50.727	2.030	12.820	11.436	6.732	11.860	2.896	1.499	98.399	BS19&20B_L3_S2
423.3	49.467	50.684	2.014	12.801	11.421	6.731	11.890	2.914	1.544	98.784	BS19&20B_L3_S2
384.3	49.493	50.807	1.946	12.776	11.525	6.678	11.870	2.893	1.506	98.686	BS19&20B_L3_S2
345.3	49.496	50.626	1.999	12.884	11.499	6.776	11.811	2.858	1.549	98.870	BS19&20B_L3_S2
306.3	49.490	50.975	1.959	12.702	11.565	6.689	11.684	2.934	1.493	98.515	BS19&20B_L3_S2
267.3	49.468	50.704	1.969	12.799	11.583	6.775	11.743	2.933	1.495	98.763	BS19&20B_L3_S2
228.3	49.499	50.631	2.008	12.835	11.639	6.794	11.635	2.973	1.485	98.868	BS19&20B_L3_S2
189.3	49.434	50.979	1.971	12.723	11.550	6.843	11.536	2.951	1.447	98.455	BS19&20B_L3_S2
150.3	49.479	50.835	1.920	12.965	11.623	6.823	11.416	2.950	1.469	98.644	BS19&20B_L3_S2
111.3	49.763	50.959	2.088	13.157	11.419	6.817	11.154	2.939	1.467	98.804	BS19&20B_L3_S2
72.3	49.586	50.830	2.051	13.521	11.404	6.656	11.086	2.980	1.472	98.756	BS19&20B_L3_S2
33.3	49.452	50.524	1.883	13.829	11.653	6.725	10.822	3.008	1.556	98.927	BS19&20B_L3_S2
-5.7	49.420	50.451	1.918	14.300	11.407	6.687	10.546	3.125	1.567	98.969	BS19&20B_L3_S2
-44.7	49.374	50.627	1.901	14.731	11.166	6.550	10.350	3.084	1.591	98.748	BS19&20B_L3_S2
-83.7	49.119	50.483	1.857	15.204	11.062	6.442	10.178	3.208	1.566	98.636	BS19&20B_L3_S2
-122.7	49.022	50.143	1.939	15.495	11.131	6.561	10.029	3.147	1.555	98.880	BS19&20B_L3_S2
-161.7	49.298	50.569	2.005	15.398	10.996	6.427	9.874	3.152	1.579	98.729	BS19&20B_L3_S2
-200.7	49.392	50.456	1.939	15.734	11.068	6.387	9.691	3.176	1.549	98.936	BS19&20B_L3_S2
-236.7	49.244	50.325	1.950	15.766	11.128	6.558	9.501	3.209	1.563	98.919	BS19&20B_L3_S3
-276.7	49.564	50.318	2.067	15.588	11.277	6.477	9.427	3.263	1.583	99.246	BS19&20B_L3_S3
-316.7	49.593	50.478	1.955	15.698	11.211	6.544	9.322	3.222	1.571	99.115	BS19&20B_L3_S3
-356.7	49.500	50.667	1.971	15.668	11.227	6.550	9.216	3.170	1.530	98.833	BS19&20B_L3_S3
-396.7	49.509	50.444	1.934	15.730	11.316	6.528	9.288	3.221	1.539	99.065	BS19&20B_L3_S3
-436.7	49.466	50.773	1.905	15.703	11.150	6.539	9.240	3.173	1.518	98.694	BS19&20B_L3_S3
-476.7	49.507	50.207	1.979	15.795	11.376	6.677	9.260	3.184	1.521	99.300	BS19&20B_L3_S3
-516.7	49.591	50.531	2.048	15.784	11.164	6.662	9.065	3.206	1.541	99.060	BS19&20B_L3_S3
-556.7	49.404	50.637	1.976	15.575	11.317	6.671	9.186	3.145	1.495	98.767	BS19&20B_L3_S3
-596.7	49.569	50.237	2.013	15.875	11.446	6.579	9.160	3.194	1.498	99.332	BS19&20B_L3_S3
-636.7	49.642	50.627	1.950	15.695	11.327	6.715	9.120	3.089	1.479	99.015	BS19&20B_L3_S3
-676.7	49.637	50.565	2.010	15.685	11.257	6.685	9.153	3.137	1.509	99.072	BS19&20B_L3_S3
-716.7	49.751	50.735	1.936	15.641	11.300	6.656	9.155	3.088	1.490	99.016	BS19&20B_L3_S3
-756.7	49.556	50.644	1.971	15.825	11.236	6.632	9.113	3.095	1.483	98.912	BS19&20B_L3_S3
-796.7	49.530	50.806	1.899	15.679	11.311	6.569	9.145	3.074	1.518	98.724	BS19&20B_L3_S3
-836.7	49.565	50.759	1.996	15.681	11.162	6.739	9.111	3.063	1.491	98.806	BS19&20B_L3_S3
-876.7	49.681	50.420	1.991	15.792	11.304	6.719	9.149	3.113	1.512	99.261	BS19&20B_L3_S3
-916.7	49.845	50.545	1.913	15.747	11.470	6.671	9.143	3.010	1.502	99.300	BS19&20B_L3_S3
-956.7	49.846	50.463	2.018	15.690	11.399	6.740	9.130	3.085	1.476	99.383	BS19&20B_L3_S3
-996.7	49.667	50.460	1.963	15.703	11.370	6.648	9.235	3.121	1.500	99.208	BS19&20B_L3_S3
-1036.7	49.516	50.552	1.945	15.841	11.280	6.720	9.154	3.050	1.459	98.964	BS19&20B_L3_S3
-1116.7	49.598	50.147	2.070	15.879	11.397	6.818	9.121	3.071	1.498	99.451	BS19&20B_L3_S4
-1196.7	49.467	50.727	1.998	15.633	11.289	6.659	9.157	3.042	1.496	98.741	BS19&20B_L3_S4
-1276.7	49.725	50.639	1.990	15.846	11.302	6.644	9.093	3.029	1.458	99.087	BS19&20B_L3_S4
-1356.7	49.757	50.636	2.015	15.880	11.164	6.631	9.142	3.038	1.494	99.121	BS19&20B_L3_S4
-1436.7	49.906	50.799	1.980	15.790	11.221	6.628	9.019	3.039	1.524	99.107	BS19&20B_L3_S4