Geochimica et Cosmochimica Acta Vol. 55, pp. 1199–1200

0016-7037/91/$3.00 + .00

BOOK REVIEWS

Geochemical Biomarkers edited by T. F. Yen and J. M. Moldowan. Harwood Academic Publishers, 1988, xii + 439p., US $66.00 (ISBN 3-7186-0483-3).

GEOCHEMICAL BIOMARKERS originated from a symposium organized by the co-editors at a national meeting of the American Chemical Society. The term "biomarker" is broadly defined as any compound which retains in its molecular structure information about its biological source. In addition, biomarker compounds often provide inferences about diagenetic pathways and processes by the types of alterations they exhibit from their precursor molecules. The book contains contributions from different authors which have as a unifying theme the application of biomarker geochemistry to coal and petroleum studies.

Twenty-one chapters comprise the book. Rather than describe the contents of each chapter, I will give a summary of their collective coverage. Over half the chapters describe biomarker compositions of crude oils and their separated fractions. Eight consider the biomarker contents of organic matter in potential source rocks as well. Three chapters are devoted to coal biomarker geochemistry. One chapter describes laboratory thermal alteration simulations of chlorins, and another characterizes the biomarker content of black trona waters. Two chapters describe nickel and vanadium complexes. Of particular note is that eight of the contributions are about biomarker contents of Chinese oils. All of the chapters concentrate on the results and the geochemical significance of their respective studies, not on analytical procedures. This is not a book for those who seek information about detailed analytical procedures.

Petroleum geology is typically concerned with Cenozoic and Mesozoic rocks and oils, and most of the chapters of *Geochemical Biomarkers,* including the three on coal geochemistry, describe samples of these ages. Three chapters expand the coverage to older geological time by giving information about Paleozoic oils and bitumens. All of the contributions to this book are concerned with the later stages of diagenesis of organic matter, principally thermal alterations. Early diagenesis is long past in the types of samples studied by the various authors.

Edited volumes are subject to their own brand of problems, and this book has three such flaws that are especially obvious. First and most irksome is that the individual chapters are not consistent in their styles and formats. Some chapters are single-spaced while most are double-spaced. Several seem to have been prepared on manual typewriters and are of poor quality. Most contributions are thoughtfully written research reports, but a few are superficial. The second problem is related to the first; typographical errors abound. The volume appears not to have received adequate copy editing. The third flaw is that nearly all the chapters were written before or shortly after the symposium, which was held in 1985, and consequently contain citations dating from 1986 or earlier. One chapter completely lacks citations, a rarity in modern scientific communications. A final problem, not peculiar to edited books, is that the index is frustratingly inadequate—only two pages long! Despite these shortcomings, much of value is contained in this volume.

The principal attraction of *Geochemical Biomarkers* is that it provides a broad range of examples which illustrate the use of biomarker information in petroleum and coal geochemistry. These examples are a good introduction for those who wish to begin to learn about the applications of biomarker geochemistry, and they are a good source of primary data from often unique samples for experienced hands in the biomarker business. Although most of its chapters are 3 to 5 years old, the book remains generally current. Indeed, one of its chapters describes the results of a GC/MS/MS study of crude oils, a procedure which has yet to become routine. The book should be on every organic geochemist's bookshelf.

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Principles and Applications of Inorganic Geochemistry by Gunter Faure. MacMillan, 1991, xiii + 626p., US $58.00 (ISBN 0-02-336441-6).

GEOCHEMISTRY HAS become so large and complex a subject that viable courses and textbooks designed for them can reasonably be limited to only parts of the field. This book, intended "for geology students in their senior year or their first year of graduate work," is a good example. It covers, as the title implies, only inorganic geochemistry and is restricted further almost entirely to geochemical processes at low temperatures. Within these limits, it is a remarkably clear and complete exposition of the subject—obviously the product, as the author tells us, of many years of teaching.

The first third of the book is a grand survey of the history and chemistry of the universe, the solar system, and our own planet. Included are an introduction to the periodic table, nucleosynthesis, the electronic structure of atoms, chemical bonding, crystal structure, radiometric dating, and the chemical differentiation of the Earth and other objects in the Sun's family. Much of this is doubtlessly intended as a review and synthesis of concepts that students have already encountered in other courses. The text is embellished with spectacular pictures of the planets and with excellent diagrams to illuminate the more difficult ideas. Also notable are the colorful vignettes of the history of some of the investigations on which the scientific conclusions are based.

Then comes an abrupt change to the mundane details of chemical reactions in solution and between solutions and minerals. The sequence of topics follows a fairly standard pattern: acids and bases, solubility and hydrolysis of salts, elementary thermodynamics, chemical weathering, stability diagrams, clay minerals, oxidation-reduction reactions. Noteworthy is the emphasis on details of setting up chemical equations and the mechanics of calculating concentrations and activities on the assumption of equilibrium. To this reviewer the general assumption of equilibrium seems a bit extreme; I worry that students may conclude that the dissolving of silica and the weathering of feldspar to kaolinite commonly proceed as rapidly and cleanly to equilibrium as the dissolving of halite or gypsum. Possible effects of grain size, colloid formation, pressure, and supersaturation are ignored or mentioned very briefly. These criticisms are minor; the details of activity calculations and the setting up of stability diagrams are made wonderfully clear by numerous worked examples, and the limitations of such reasoning are noted later in the book. Especially good is the chapter on fractionation of stable isotopes. The central part of the book concludes with an elementary discussion of geochemical reaction rates.

The many idealized reactions displayed in these intermediate chapters are related to natural occurrences only briefly and perfunctorily, but the last quarter of the book goes far toward compensating for this brevity. Here, in what the author calls "applications of geochemistry to global problems," are five chapters in which some of