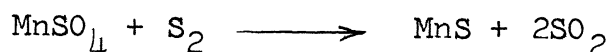


THE MnO-MnS PHASE DIAGRAM

H. C. Chao, Y. E. Smith, and L. H. Van Vlack

The phase relationships for the MnO-MnS system have only been investigated in the eutectic region. Wentrup⁽¹⁾ reported a eutectic at 1280°C (2345°F) with approximately 50 weight percent of each component. More recently, Silverman⁽²⁾ corrected these figures to 2275±10°F (1246°C) with 63 weight percent MnS and 37 percent MnO. Neither Wentrup nor Silverman investigated the solid solution limits in this system. However, Wentrup did suggest with his phase diagram sketch that the maximum solubility of MnS in MnO is 10 weight percent, and the solubility of MnO in MnS is nearer 20 weight percent. These figures have been utilized in subsequent manuscripts without further verification.⁽³⁾

There had been evidence found in this laboratory that the above solid solution figures were high. An investigation was therefore started using the following procedure. The samples were heated just above the eutectic temperature in a purified nitrogen atmosphere and contained in platinum foil before quenching into distilled water. The MnO had been prepared by calcining reagent grade MnCO₃ at 1400°C. Only MnO was detected in subsequent x-ray diffraction analyses. The MnS had been prepared by sulfur deoxidation of reagent grade MnSO₄ according to the reaction:



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The details of the procedure which utilized atmospheric sulfur pressures at 950°C are discussed elsewhere.⁽⁴⁾ The sulfur content was determined to be 36.8 ± 0.2 percent which matches the stoichiometric value of 36.9 percent. No evidence of either MnO or MnSO_4 was detected microscopically or by x-ray diffraction.

The revised diagram is presented in Fig. 1. The melting temperature for MnO is that provided by Glasser.⁽⁵⁾ The eutectic temperature of $1232 \pm 5^\circ\text{C}$ and eutectic composition of 64 weight percent MnS is in close agreement with Silverman's correction of Wentrup's work. The maximum solubility of MnO in MnS was determined to be 1.7 ± 0.2 weight percent. The maximum solubility of MnS in MnO was determined to be 1.8 ± 0.2 weight percent. These figures represent the lower limit for the presence of liquid at 1260°C and are significantly lower than the earlier estimated solid solution figures.

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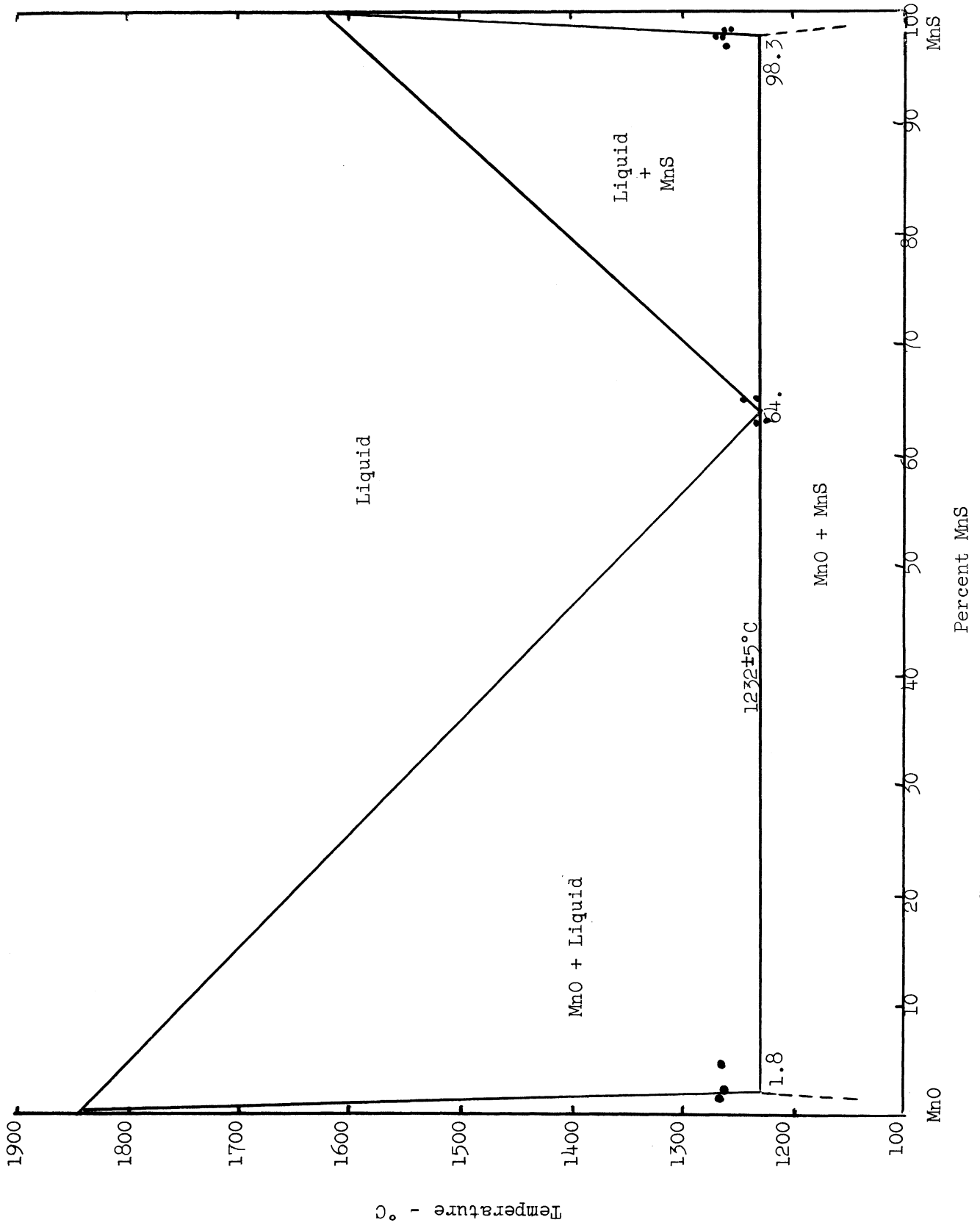


Fig. 1. The MnO-MnS phase diagram.

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