Evaluation of Gibbs energies of phases and calculations of vertical sections of Fe-x%Mo-N diagrams by common tangent method.

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ABSTRACT

Hillert's model is developed to study the stability of nitride phases in the case of Fe-Mo-N system. The temperature range was from 200 to 600°C. The purpose of this study is to explain the behavior of nitrogen in nitrided alloys. Studied phases were all the nitrides of Fe-Mo-N system. Variation of Gibbs energy for all phases of this system is calculated versus temperature, nitrogen and molybdenum content. The chemical potential of nitrogen was evaluated and variation of the Gibbs energies of phases was plotted versus temperature and nitrogen content. Vertical sections of Fe-X%Mo-N diagram are plotted in the range of studied temperatures using the common tangent method. The thermodynamic results were compared to our own experimental results. This shows that the molybdenum effect is negative on all nitride phases and specially for the γ' field. Except for Mo_2N nitride, molybdenum amount increases the stability field of this nitride. Hillert's model for the regular solutions gave good results in the calculation of Gibbs energies of mixture and partial Gibbs energies of real nitrides phases. The shapes, the values and the distributions of these energies allowed to plot coherent phase diagrams. The method of common tangents despite its slowness remains a reliable method that can be used to verify the results of a complex calculation.

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