An Extension of the Data-file for the System Co-Re-Cr-C-O: Sourced and Restrictions of the Application

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ABSTRACT

The experimental Co-Re-based alloys are promising for high-temperature applications for service temperatures beyond 1200°C. Thermodynamic analysis of phase equilibria is necessary to gain knowledge of how to control the phases present and, particularly, to provide guidelines for the further development of such kinds of new alloying systems. Phase transformations as well as the formation of corrosion products during oxidation of the Co-Re-based alloys at 1000°C were predicted using CALPHAD based thermodynamic calculations. They were performed by means of a commercial software FactSage that determines the equilibria state in complex systems such as Co-Re-based alloys by minimization of the total Gibbs' free energy of the system. The basic structure of a FactSage data-file as well as thermodynamic models for compounds and solution phases occurring in the system Co-Re-Cr-C-O are presented. Thermodynamic calculations contribute to the identification of oxidation mechanisms of alloys at high-temperature. The use of thermodynamic calculations is documented in more details on the basis of the computational thermodynamics for the Co-Re-(Cr)-(Si)-(O) system. The experimental investigations agree well with the calculated results in which the presence of the most phases were experimentally confirmed after oxidation.