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An Intermediate Temperature Creep Model for Ni-based Superalloys

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Abstract

A mathematical model to predict creep properties of Ni-based superalloys at intermediate temperature ranges based on microstructure, process and creep condition, and material properties has been developed by modifying and combining previous models. Modifications are made so that as many necessary model parameters as possible, whose values have been obtained from experimental measurement of creep properties, are determined from CALPHAD (CALculation of PHAse Diagrams) thermodynamic calculations. The model can reproduce minimum creep rate, creep rupture time, and time to specific strain for a wide range of Ni-based superalloys, correlating well with experimental data without any further creep experiments. The applicability and limitation of the model as an alloy design tool for new Ni-based superalloys with improved creep properties are discussed in this paper.

Keywords: Creep, Metallic Material, Analytic functions, Ni-based superalloys, Thermodynamic calculation

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