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A numerical model to predict mechanical properties of Ni-base disk superalloys

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Abstract

A numerical model to predict mechanical properties of Ni-base superalloys for turbine disk applications is developed by modifying and combining previous models that consider various microstructural factors. Modifications are made so that as many necessary model parameters as possible, whose values have been obtained from mechanical measurements and microstructural observation, can be determined using a thermodynamic calculation and a precipitation kinetics simulation. The model's predictions of tensile properties, creep resistance and fatigue damage tolerance have good correlation with experimental data. The applicability and limits of the present model as an alloy design tool for new Ni-base disk superalloys are discussed in this paper.

Keywords: Metallic material, Materials design, Thermodynamics, Precipitation kinetics,
Analytic functions

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