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EVOLUTION OF DIFFERENT GENERATIONS OF GAMMA PRIME PRECIPITATES IN A COMMERCIAL NICKEL BASE SUPERALLOY

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Abstract

During continuous cooling of nickel base superalloys from the single gamma phase field, the cooling rate plays a critical role in determining the precipitation of the ordered gamma prime phase. Depending on the cooling rate, either a single or multiple bursts of gamma prime nucleation can occur, changing their size distribution, morphology, and, composition. This study focuses on the compositional and microstructural evolution of different generations of γ' precipitates during the continuous cooling, followed by isothermal aging, of a commercial nickel base superalloy, Rene 88DT, characterized by three dimensional atom probe tomography (3DAP) coupled with energy-filtered transmission electron microscopy (EFTEM) and high-resolution scanning electron microscopy (SEM) studies. Composition and morphology of different generations of gamma prime precipitates as a function of cooling rate will be addressed and compared with previously reported phase-field simulation results. The experimental findings would be compared with simulation results obtained via phase-field and solution thermodynamic modeling.

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