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PNNL-32878

Effect of Processing on Precipitation Kinetics in Nano Polycrystalline 7075 Aluminum Alloy

CRADA 564 (79330)

May 2022

Aashish Rohatgi
Shenyang Hu

Fairmount Technologies, LLC

U.S. DEPARTMENT OF ENERGY

Prepared for the U.S. Department of Energy
under Contract DE-AC05-76RL01830

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Abstract

Fairmount Technologies (FT) seeks to optimize the thermomechanical processing of Aluminum Alloy 7075. The target yield strength is 20% higher than commercially available 7075-T6 temper sheet which will enable structural light weighting by a similar magnitude and reduce the carbon footprint of the transportation sector. To reduce processing cost and make this commercially viable, it is important to understand physical mechanisms driving microstructural changes. A mesoscale phase-field model seeded with experimentally measured microstructures and assessed thermodynamic and kinetic properties will be developed and exercised using HPC at PNNL. It will account for the effect of deformation, temperature, and chemistry on precipitation kinetics in nanocrystalline microstructures. Our objective is to understand this “stress-aging” coupling by performing parametric simulations with mesoscale models for a better understanding of GP zone and η' formation in nanocrystalline 7075 Al. This will help FT optimize processing schedules to achieve desired microstructures that increase both strength and ductility.

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