

## Grain Formation and Growth Mechanism in Rapidly Solidified and Hot-Extruded Superalloy A-286

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Transmission electron microscopy (TEM), and scanning transmission electron microscopy (STEM) are used for the determination of grain growth resistance (GGR) that is imparted by rapid solidification processing (RSP) in inert-gas-atomized (IGA) and hot-extruded superalloy A-286. Grain growth inhibition (GGI) models are used to compare the behavior of both individual powder particles and extruded samples of various heat treatments with conventionally processed counterparts (CPC). The results indicate that the GGR in IGA samples is due to the extremely stable, high-number-density, precipitates formed from 1) prior powder surface films, 2) segregation to dendrite boundaries, and 3) supersaturated solute. The precipitates showed extremely high stability against dissolution at high temperature.

The average grain size in the powder just after atomization had a strong relationship with solidification. The grain sizes in heat-treated powder particles were found to have affected by the thermomechanical condition involved in the hot-extrusion.

The study will report the relation of number density and volume fraction of precipitates with the grain growth. Grain growth inhibition models such as Zeners model and Hillerts will be checked to examine the significance of precipitates on grain growth behavior in this alloy.