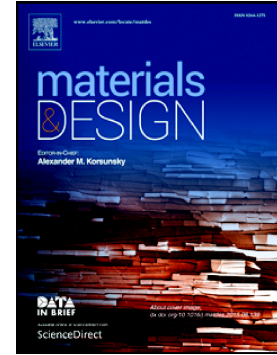


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## Numerical and physical simulation of rapid microstructural evolution of gas atomised Ni superalloy powders

Liang Zheng<sup>a,b</sup>, T.L. Lee<sup>c,d</sup>, Na Liu<sup>a,b</sup>, Zhou Li<sup>a,b</sup>, Guoqing Zhang<sup>a</sup>, J. Mi<sup>d\*</sup>, P.S. Grant<sup>e</sup>

<sup>a</sup>Advanced High Temperature Structural Materials Laboratory, Beijing Institute of Aeronautical Materials, P.O. Box 81-1, Beijing 100095, China

<sup>b</sup>3D Printing Research and Technology Centre, Beijing Institute of Aeronautical Materials, P.O. Box 81-20, Beijing 100095, China

<sup>c</sup>ISIS Neutron Source, Rutherford Appleton Laboratory, Harwell Oxford, Didcot, OX11 0QX, UK

<sup>d</sup>School of Engineering & Computer Science, University of Hull, Cottingham Road, Hull, HU6 7RX, UK

<sup>e</sup>Department of Materials, University of Oxford, Parks Road, Oxford, OX1 3PH, UK

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### Abstract

The rapid microstructural evolution of gas atomised Ni superalloy powder compacts over timescales of a few seconds was studied using a Gleeble 3500 thermomechanical simulator, finite element based numerical model and electron microscopies. The study found that the microstructural changes are governed by the characteristic temperatures of the alloy. At a temperature below the  $\gamma'$  solvus, the powders maintained the dendritic structures. Above the  $\gamma'$  solvus temperature but in the solid-state, rapid grain spheroidisation and coarsening occurred, although the fine-scale microstructures were largely retained. Once the incipient melting temperature of the alloy was exceeded, microstructural change was rapid, and when the temperature was increased into the solid+liquid state, the powder compact partially melted and then re-solidified with no trace of the original structure, despite the fast timescales. The study reveals the relationship between short, severe thermal excursions and microstructural evolution in powder processed components, and gives guidance on the upper limit of temperature

\* Corresponding author. Tel.: +44 (0) 1482 465670  
E-mail address: j.mi@hull.ac.uk (J. Mi)

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