

High temperature transverse deformation behavior of directionally solidified Ni-based superalloy

Richa Gupta, Vibha Sharma, M.J.N.V. Prasad and Prita Pant

Department of Metallurgical Engineering and Materials Science, IIT Bombay, 400076, India

Email: g.richa@iitb.ac.in

Directionally solidified (DS) GTD444 is a grade of General Electric (GE), which has applications in gas turbine engines mainly for later stage turbine blades. Uniaxial compression tests with loading perpendicular to the DS boundaries were conducted at elevated temperatures. Despite similar testing conditions, variations in hardening behaviours were observed specifically at 700 °C. To investigate this additional tests in both compression and tensile were performed at 700 °C. Digital image correlation (DIC) was used to measure the strain localization in bi-crystal as a function of grain boundary misorientation. All samples were characterized in detail by electron microscopy. Orientation imaging microscopy and the DIC strain maps of the bi-crystal samples show that there is extensive flow localization in one of the grains thereby leading to failure. Lattice rotation with the deformation was also evident from the EBSD analysis. Microstructural analysis revealed the mechanisms corresponding to the observed differences in deformation behavior of the superalloy samples.

Keywords: *Directionally solidified superalloy, Compression, Tension, Electron backscattered diffraction, Transmission electron microscopy.*

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