Title: Microstructure and mechanical properties of Ni-base superalloys fabricated by selective laser meltings

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Abstract

The effects of unexpected precipitation and recrystallization on the creep properties of Ni-base superalloys fabricated by selective laser melting will be discussed. Tensile and creep properties were examined at 650 °C and 816 °C. In IN718 alloy which is strengthened γ''-γ' precipitation, the creep rupture life and ductility of materials produced by additive manufacturing were lower than those of a conventional material at 650 °C. The horizontal-direction specimen exhibited inferior creep life and worse ductility than the vertical-direction specimen because of the direction of the interdendritic δ-phase precipitates, which were arrayed perpendicular to the stress axis in the former specimen. The morphology and a row of interdendritic δ-phase with incoherent interfaces were found to affect the materials' creep life and ductility in IN718. Whereas, as for IN939 alloy which is strengthened by γ' precipitation, crystals oriented along [001] orientation and high density of dislocations were observed in the as-built specimen. However, the recrystallization during heat treatment and creep deformation were found to affect the materials' creep life and ductility both at 650 °C and 816 °C.

Biography

2017-	Professor in Department of Mechanical Engineering, Tokyo Metropolitan University.
2006-2017	Associate Professor in Department of Mechanical Engineering, Tokyo Metropolitan University.
2002-2006	Associate Professor in Department of Mechanical Engineering, Tokyo Metropolitan Institute of Technology.
2001-2002	Visiting Research Scholar in Department of Materials Science and Metallurgy, Cambridge University
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