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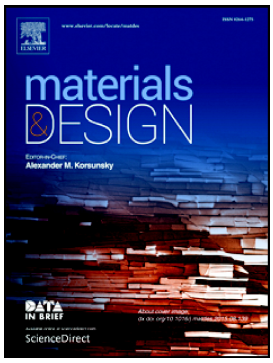

Effects of strain amount and strain rate on grain structure of a novel high Co nickel-based polycrystalline superalloy

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Abstract

The development of nickel-based superalloys with high Co addition has aroused widespread interest recently owing to their potential application in hot sections of gas turbine. However, how hot working parameters impact the grain evolution of these superalloys remains to be studied systematically. In this work, high-throughput double cone (DC) specimen, which yielded gradient strain at different regions in a single sample after hot compression, were designed to investigate the thermo-mechanical behaviors of a novel superalloy. Superslovus treatment was subsequently conducted to investigate the susceptibility to abnormal grain growth (AGG). By means of finite element simulation, transmission electron microscope (TEM), and electron backscatter diffraction (EBSD), it was found that slow strained DC was preferred to obtain a well-distributed grain structure after supersolvus annealing, owing to its adequate dynamical recrystallization (DRX) and dynamical recovery (DRV) during deformation.

Keywords: High Co addition, nickel-based superalloy, dynamical recrystallization, dynamical recovery, abnormal grain growth

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