Hot deformation characteristics and kinetics analysis for Nickel-based corrosion resistant alloy

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Abstract

The hot deformation characteristics of Nickel-based corrosion resistant alloy was studied in the temperature range of 1050~1200oC and the strain rate range of 0.001~0.1s-1 by employing hot compression tests. The results show that the peak stress increases with decreasing temperature and increasing strain rate, and the activation energy is about 409kJ/mol. Basing on the Avrami equation through using the critical strain (εc) and the strain for 50% DRX (ε0.5), a kinetic model for dynamic recrystallization (DRX) was established, where the model parameters could be obtained using the modified Zener-Hollomon parameter (Z*). Applying the model, the predicted value of the steady state strain (εss) and the strain for maximum softening rate (εm) agree well with the experimental results. Accordingly, the relationship between ε m and ε 0.5 is established, which is mainly dependent on the Avrami exponent (n). When n <3.25, εm becomes less than ε0.5 and the difference in between decreases with increasing the strain rate or decreasing the deformation temperature. Finally, through observing DRX microstructure under different deformation conditions, a power law relation between DRX grain size (Ddrx) and Z*, with an exponent of -0.36, was found.

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