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The study on kinetics of metadynamic recrystallization of a Nb–V microalloyed non-quenched and tempered steel

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ABSTRACT

The metadynamic recrystallization (MDRX) behavior of a Nb–V microalloyed non-quenched and tempered steel was investigated by isothermal hot compression tests on Gleeble-1500 thermal–mechanical simulator. Compression tests were performed using double hit schedules at temperatures of 1273–1423 K, strain rates of 0.01–5 s⁻¹, initial grain sizes of 92.4–148.9 μm, and inter-pass time of 0.5–10 s. The effects of deformation parameters, including deformation temperature, strain rate, initial grain size, and inter-pass time, on MDRX softening fraction were analyzed. The experimental results show that MDRX softening fraction increases with the increasing of deformation temperature, strain rate, and inter-pass time, while it decreases with the increasing of initial grain size. Based on the experimental results, the kinetic model of MDRX for the tested steel was established. A good agreement between the experimental and predicted MDRX softening fraction was obtained, which indicates that the established kinetic model can precisely predict the MDRX softening fraction for the hot deformed tested steel.

KEYWORDS: metadynamic recrystallization, Nb–V microalloyed steel, non-quenched and tempered steel, hot compression