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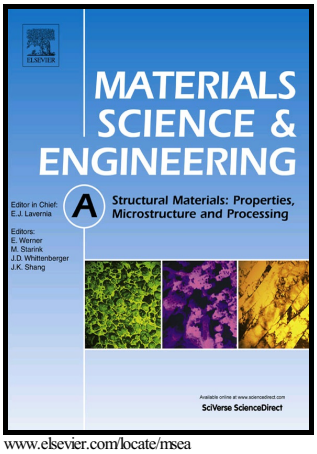

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Microstructural evolution and recrystallization behavior of cold rolled austenitic stainless steel with dual phase microstructure during isothermal annealing

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Abstract

In the present study, the concept of phase reversion developed by Misra's group (references 2，4,14-16,25) was adopted to process a 304 austenitic stainless steel and explore the microstructural evolution, recrystallization behavior, and relate to mechanical properties. Dual phase structure, including strain-induced martensite and hardened austenite, was obtained by two-stage cold rolling at room temperature. Subsequently, the reversion of martensite to austenite during annealing was carried out and studied in terms of microstructural evolution and recrystallization behavior using a combination of X-ray diffraction, optical microscopy, and electron backscatter diffraction techniques. The Vickers hardness and tensile properties of samples annealed at different conditions were also determined. The X-ray diffraction study indicated that reversion of martensite occurred rapidly at temperatures greater than 750℃ because of the change in the reversion mechanism to shear-type reversion. The variation in hardness of annealed samples at 750-850℃ exhibited three distinct stages and corresponded to different process. Depending on the grain size and annealing conditions, different combination of yield strength (466-1758 MPa) and ductility (6.6-57.5%) were obtained.

Keywords: Austenitic stainless steel; thermo-mechanical processing; reversion; recrystallization; texture.

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