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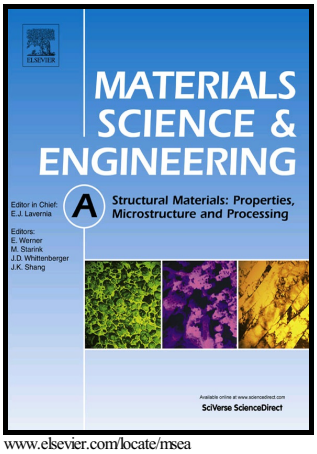

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The effect of annealing on the microstructural evolution and mechanical properties in phase reversed 316LN austenitic stainless steel

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Abstract

The present study aims to investigate the effect of annealing on microstructural evolution and mechanical properties in phase reversion-induced ultrafine/fine-grained 316LN austenitic stainless steel. The commercial 316LN austenitic stainless steel was cold rolled at room temperature to 90% thickness reduction and subsequently annealed in the temperature range of 600-1000 °C for 1-100 minutes. Evolution of phases in selected samples was identified and quantified by X-ray diffraction together with the corresponding microstructural characterization through optical, scanning and transmission electron microscopy, and electron backscattered diffraction. Mechanical properties of selected samples were determined by the tensile test. The results indicated that 46% α′-martensite and 54% deformed untransformed austenite were obtained in 316LN austenitic stainless steel after 90% cold reduction. Ultrafine/fine austenite grains nucleated at α′-martensite and deformed untransformed austenite via nucleation and growth process on annealing. The average grain size increased gradually with increased annealing temperature and time, with consequent decrease in yield strength and increased elongation.

Keywords: Austenitic stainless steel; Phase reversion; Recrystallization; Grain size; Mechanical property.