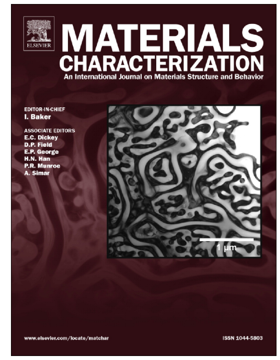

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AUSTENITE STABILITY IN REVERSION-TREATED STRUCTURES OF A 301LN STEEL UNDER TENSILE LOADING

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Abstract. Ultrafine-grained austenitic stainless steels can be produced by the martensitic reversion process, but the factors affecting the stability of refined austenite in subsequent deformation are still unclear. To clarify this, fully and partially austenitic reversed structures with the average grain size between 24 and 0.6 µm were created in a 60% cold-rolled 301LN type (18Cr-7Ni-0.16N) austenitic stainless steel by varying the annealing conditions. The amount of strain-induced α'-martensite (SIM) during tensile loading was determined by magnetic measurements and the microstructure evolution and texture examined by electron backscatter diffraction and X-ray diffraction methods. The extensive experimental data evidenced firmly that in completely austenitic structures the austenite stability increases with decreasing grain size down to about 1 µm, obtained at 900°C, but the stability decreases drastically in the ultrafine-grained and partially reversed structures, with the average grain size of 0.6–0.7 µm obtained at 800–700°C. However, these structures are nonuniform also containing larger micron-size grains transformed from slightly deformed SIM. The low stability of austenite is not a result from the ultrafine grain size, neither due to retained phases nor texture, but the main reason is concluded to be the precipitation of CrN during the reversion at low temperatures of 800–700°C. Due to this precipitation, micron-size grains in the ultrafine and partially reversed structures show most unstable behavior under tensile deformation.

Keywords: austenitic stainless steel, austenite stability, grain size, reversion annealing, strain-induced martensite, tensile straining

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