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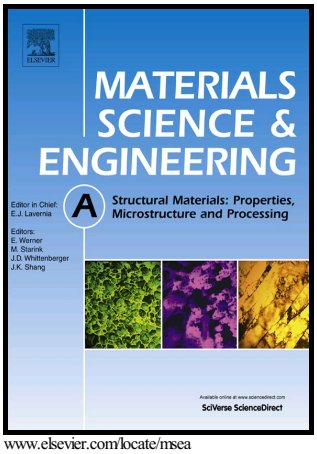

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Processing of ultrafine-grained titanium with high strength and good ductility by a combination of multiple forging and rolling

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Abstract

The microstructure and the mechanical properties of Grade 2 titanium semi-products processed by a combination of multiple-forging and subsequent plane rolling are studied. It is shown that the application of this technology on Grade 2 titanium doubled the strength without considerable deterioration of ductility at room temperature. The high strength is caused by the ultrafine-grained (UFG) microstructure with high dislocation density. The minimum grain size and the maximum dislocation density achieved by the combined method were very low (~560 nm) and high (~18 × 10^{14} m^{-2}), respectively. Mechanical modelling suggests that the effectiveness of multiple forging in grain refinement is mainly caused by the large, homogeneous imposed strain