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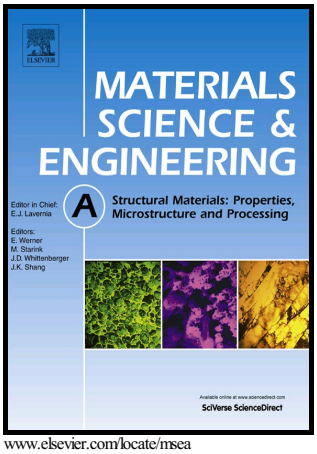

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Mechanical properties and microstructure of a Ti-6Al-4V alloy subjected to cold rolling, asymmetric rolling and asymmetric cryorolling

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Abstract: The mechanical properties of the Ti-6Al-4V alloy are significantly determined by the process used for manufacture. In this study, the mechanical properties of the Ti-6Al-4V alloy manufactured using cold rolling, asymmetric rolling and asymmetric cryorolling were characterized by subjecting it to the tensile test and the microhardness test. The evolution in the microstructure was studied using scanning electron microscopy, transmission electron microscopy as well as energy dispersive X-ray spectrometry. Results show that the Ti-6Al-4V alloy sheets subjected to asymmetrical cryorolling with low rolling speed ratio between the upper and lower rolls have the highest tensile strength and microhardness. The tensile stress of the alloy samples after cold rolling was found to be 1008 MPa, 1046 MPa after asymmetric rolling, and 1113 MPa after asymmetric cryorolling. The highest Vickers hardness (HV395) is achieved by asymmetric cryorolling. We discuss the mechanical behavior using the criteria of grain size, size of second phase as well as dislocation density.

Keywords: Ti-6Al-4V alloy; asymmetric rolling; cryorolling; mechanical property; microstructure

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