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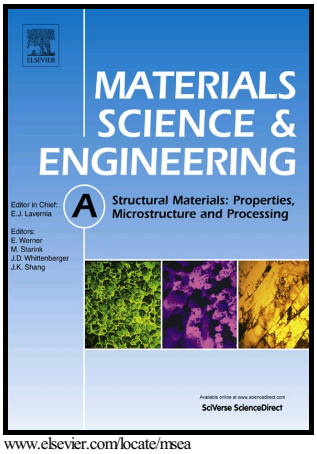


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# On the evolution of microstructure and texture in commercial purity titanium during multiple passes of incremental equal channel angular pressing (I-ECAP)

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## Abstract

This paper presents an investigation on the evolution of microstructure and deformation characteristics of commercial purity Titanium (CP-Ti) during incremental equal channel angular pressing (I-ECAP). CP-Ti grade 2 was subjected to six passes at 300 °C following route $B_C$, using a die with channel angle of 120°. Electron backscatter diffraction (EBSD) technique was used to characterize the microstructure after first, second, fourth and sixth pass, in the flow and transverse plane of the samples. Texture development through subsequent processing was also investigated using pole figures in both planes. Following first pass, the grain boundary maps across both flow and transverse plane showed a high degree of heterogeneity in grain morphology with the presence of elongated and fine grains. Also, misorientation peaks associated with $\{10\bar{1}2\}$ tensile twins and a small fraction of $\{11\bar{2}2\}$ compressive twins were observed in the microstructure. After second pass, microstructure was further refined and the twinning activity was greatly reduced with no noticeable activity after the fourth pass. Remarkable grain refinement was achieved after sixth pass with majority of grains in the ultrafine grain (UFG) range and with a relatively homogenous microstructure. Continuous dynamic recrystallization (CDRX) has been observed during subsequent I-ECAP processing. It was seen that twinning alongside CDRX acted as a dominant grain refinement mechanism during the initial passes of I-ECAP process beyond which slip was dominant deformation behaviour.

## Keywords

*Commercially pure Titanium; Incremental equal channel angular pressing (I-ECAP); Grain refinement; Electron back scatter diffraction (EBSD); Twinning; Continuous dynamic recrystallization (CDRX)*