World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:11, No:07, 2017

# Effect of Strains and Temperature on the Twinning Behavior of High Purity Titanium Compressed by Split Hopkinson Pressure Bar

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**Abstract :** Deformation twinning plays an important role in the mechanical properties of Ti which has high specific strength and excellent corrosion resistance ability. To investigate the twinning behavior of Ti under high strain rate compression, the split Hopkinson pressure bar (SHPB) was adopted to deform samples to different strains at room temperature. In addition, twinning behaviors under varied temperatures of 373K, 573K and 873K were also investigated. The cylindrical-shaped samples with purity 99.995% were annealed at 1073K for 1 hour in vacuum before compression. All the deformation twins were identified by electron backscatter diffraction (EBSD) techniques. The mechanical behavior showed three-stage work hardening in stress-strain curves for samples deformed at temperature 573K and 873K, while only two stages were observed for those deformed at room temperature. For samples compressed at room temperature, the predominant twin types are {10-12}<10-11> (E1), {11-21}<11-26> (E2) and {11-21}<11-23> (C1). The secondary and tertiary twinning was observed inside some E1, E2 and C1 twins. Most of the twin boundaries of E2 acted as the nucleate sites of E1. The densities of twins increase remarkably with increment of strains. For samples compressed at relatively higher temperatures, the migration of twin boundaries of E1, E2 and C1 was observed. All the twin lamellas shorten with temperature, and nearly disappeared at 873K except some remaining E1 twins. Polygonizations of grain boundaries were observed above 573K. The microstructure intended to have a texture with c-axes parallel to compression direction with temperature increment. Factors affecting the dynamic recovery and re-crystallization were discussed.

**Keywords :** deformation twins, EBSD, mechanical behavior, high strain rate, titanium
**Conference Title :** ICMET 2017 : International Conference on Materials Engineering and Technology
**Conference Location :** Stockholm, Sweden
**Conference Dates :** July 13-14, 2017