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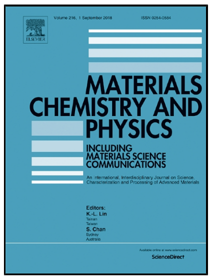

Texture evolution and plastic anisotropy of commercial purity titanium/SiC composite processed by accumulative roll bonding and subsequent annealing

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Texture evolution and plastic anisotropy of commercial purity titanium/SiC composite processed by accumulative roll bonding and subsequent annealing

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Abstract

In this study, commercial purity titanium (CP–Ti) with SiC particle reinforcements produced using accumulative roll bonding (ARB) process and subsequent annealing. Texture evolution and plastic anisotropy in different steps of the process were studied. ARBed material exhibited a significant magnitude of anisotropy of mechanical properties. Moreover, a strong TD split basal texture with basal poles tilted 25° away from the normal direction toward the transverse direction was developed in the ARBed samples. Higher normal anisotropy obtained for ARB–annealed sheet, compared to that of the starting titanium sheet, indicated lower susceptibility to thinning. However, ARB–annealed sheet exhibited higher planar anisotropy ($<\Delta r>=0.048$ for ARB–annealed sheet and $<\Delta r>=-0.434$ for starting titanium). Higher resistance to thinning of the ARB–annealed sheets compared to the starting titanium was ascribed to the higher uniform elongation shown by annealed sheets. Furthermore, it was concluded that finer grain size of ARB–annealed sheet resulted in higher work hardening of the sheet, which in turn, increased the uniform elongation of ARB–annealed sample.

Keywords: Accumulative roll bonding; Titanium; Texture; Mechanical anisotropy; Sheet metal.

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