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Microstructural and textural evolution during cold unidirectional rolling (UR) and cold cross-rolling (CR) of near alpha titanium alloy Ti-3Al-2.5V

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Ti-3Al-2.5V is a near alpha titanium alloy widely used in aircraft industries due to its excellent cold workability. However, a significant mechanical anisotropy related to a microstructural and textural anisotropy is observed after cold-working process. In this study, the evolution of microstructure and texture of Ti-3Al-2.5V titanium alloy sheet deformed by cold rolling and subsequent annealing was investigated with the aim of achieving planar isotropy. Both unidirectional rolling (UR) and cross rolling (CR) deformation process were studied using Electron Back-Scattered Diffraction (EBSD). Basal poles (0001) initially along the transverse direction (TD) gradually change along the normal direction (ND) during cold CR while basal poles remain tilted to the TD during cold UR. The change in basal texture during cold CR is intensified with the succession of rolling and annealing. During the first step of rolling, the deformation by UR is only accommodated by dislocation slip while {10 12} <10 -1 1> extension twinning (ET) is activated by cross rolling. At the end of rolling and annealing successive steps, fully recrystalized microstructure is obtained for both UR and CR.

Keywords: Ti-3Al-2.5V, anisotropy, cross-rolling, texture, microstructure.