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# Twin induced compressive strain hardening behaviour, microstructure and texture evolution in Titanium

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This work is a state-of-the-art experimental and polycrystal plasticity modelling investigation to decipher the effect of dislocation slip, $\{10\bar{1}2\}\langle\bar{1}011\rangle$ extension twins (ET), and $\{11\bar{2}2\}\langle11\bar{2}\bar{3}\rangle$ contraction twins (CT) on the sigmoidal strain-hardening behaviour, microstructure and texture evolution [1, 2]. It was observed that at low strains, geometrically hard ET originate in texturally soft grains. ET- ET interaction occurs forming ~56.8°-$\langle10\bar{1}0\rangle$ angle-axis pair boundaries [1]. With increasing strain, the ET lamellar structures broaden to consume the entire parent grains. CT develop on texturally hard domains at intermediate strains and were geometrically softer. CT-CT, ET-CT type interaction and CT-ET double twins with ~77°-$\langle10\bar{1}0\rangle$, ~87°-$\langle4\bar{2}\bar{2}1\rangle$ and ~44.5°-$\langle5\bar{1}\bar{4}0\rangle$ angle-axes pair boundaries evolve [1]. The strain hardening behaviour of the material corroborates with the microstructural evidence and the slip-twin activities obtained from simulation [2]. The deformation texture substantiates that along with the twins, dislocation slips were active. The slip based deformation finally deviates the twin boundaries from its special character at medium to high strains [1,2].

*Keywords: Titanium; extension twins (ET); contraction twins (CT); texture; polycrystal plasticity;*

**References:**

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