Nucleation and growth mechanisms of deformation-twin in magnesium

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Twinning is a prevalent deformation mechanism in hexagonal close-packed (hcp) metals. Twin nucleation and growth are responsible for the hardening and texture evolution characteristic of hcp metals subjected to plastic deformation. In this paper, a theoretical model is suggested to describe the nucleation and growth of deformation twins in hcp metals. In the framework of the model, the deformation twins are nucleated and grew through the emission of glissile Shockley partial dislocations which are generated due to the nonplanar dissociation of <a> slip dislocations on the basal plane. The energy and stress conditions of the deformation twin nucleation in hexagonal closed-packed magnesium are calculated and discussed.