

Surface Dislocations and the Growth of Deformation Twins

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Abstract

Phase boundaries in diffusionless phase transformations are defined as surface dislocations. Growth kinetics for deformation twins are discussed in relation to the rate controlling process for the motion of surface dislocations. The elementary process is the nucleation of step rings on surface dislocations. The effect of abnormal elastic properties residing along twinning surface dislocations is taken into account. These abnormalities result from the disturbed atomic arrangement along twinning surface dislocations (twin boundaries).

The theory predicts three important features:

- (1) Twinning deformation is very fast when the applied stress exceeds a critical value.
- (2) Stress-strain curves will show large yield drops at the start of twinning when the displacement rate is constant.
- (3) Twinning is more prominent at lower temperatures compared with the slip mode of deformation.

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