

Continuum Framework for Dislocation Structure, Energy and Dynamics of Dislocation Arrays and Low Angle Grain Boundaries

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We present a continuum framework for dislocation structure, energy and dynamics of dislocation arrays and low angle grain boundaries which may be nonplanar and nonequilibrium. We define a dislocation density potential function on the dislocation array surface or grain boundary to describe the orientation dependent continuous distribution of dislocations. The continuum formulations incorporate both the long-range dislocation interaction and the local dislocation line energy, and are derived from the discrete dislocation model.