

Nonlocal Modelling of Dislocation Glide in a Two-Phase Material

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We model the glide of dislocations in a single slip system by formulating continuum transport equations for the total dislocation density as well as the excess density. Short-range interactions between the dislocations are accounted for by gradients of these densities along the slip system. This results in nonstandard, nonlocal governing equations. The equations are solved numerically by the finite element method. Results are discussed for a uniform medium with constrained boundaries, as well as for a heterogeneous, two-phase material. These results demonstrate how the nonlocal transport character influences the material's plastic response.

Keywords: Dislocations, Continuum Modelling, Nonlocal Continua, Finite Element Simulation