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A new visco-plastic self-consistent formulation implicit in dislocation-based hardening within implicit finite elements: Application to high strain rate and impact deformation of tantalum

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A microstructure-based modeling framework for high-strain-rate deformation is presented. Visco-plastic self-consistent model implicit in dislocation-based hardening is developed. Spherical linear interpolation in the space of quaternions is used for interpolation of texture. The multi-level model is used to simulate the Taylor impact test on a cylinder of tantalum. Texture evolution, anisotropic plastic flow, and geometrical changes are predicted.

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