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A model for elastic-viscoplastic deformations of crystalline solids based on material symmetry: theory and plane-strain simulations. (English) [Zbl 1423.74168](#)

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Summary: A model for the elastic-viscoplastic response of metallic single crystals is developed on the basis of the modern finite-deformation theory of plasticity combined with considerations of material symmetry. This is proposed as an alternative to conventional crystal plasticity theory, based on a decomposition of the plastic deformation rate into a superposition of slips on active slip systems. A simple special case of the general theory, modeling evolving geometrically necessary dislocations and their effect on hardening, is developed and used as the basis of numerical experiments.

MSC:

- [74C15](#) Large-strain, rate-independent theories of plasticity (including nonlinear plasticity) Cited in 1 Document
- [74A05](#) Kinematics of deformation
- [74C10](#) Small-strain, rate-dependent theories of plasticity (including theories of viscoplasticity)
- [74E15](#) Crystalline structure

Keywords:

[crystal viscoplasticity](#); [material symmetry](#); [dislocation evolution](#)

Software:

[CHIMP](#)

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