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The simulation of texture evolution with finite elements over orientation space. I: Development. II: Application to planar crystals. (English) Zbl 0861.73073

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Summary: A new class of finite element schemes is presented for the modeling of arbitrary polycrystalline microstructure. A framework is constructed by viewing texture as arising out of maps that associate crystals with orientations drawn from a fundamental region of orientation space. The state of the microstructure is characterized by an orientation distribution function and a hardness field over a fundamental region. Differential equations are derived to describe the evolution of the two fields. Finite element schemes, cast over discretized fundamental regions, are considered for the solution of the differential set. Properties of the schemes considered are illustrated by application to the texturing of a planar polycrystalline microstructure.

MSC:

74S05 Finite element methods applied to problems in solid mechanics
74A60 Micromechanical theories
74M25 Micromechanics of solids
74E10 Anisotropy in solid mechanics

Keywords:

polycrystalline microstructure; orientation distribution function; hardness field

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