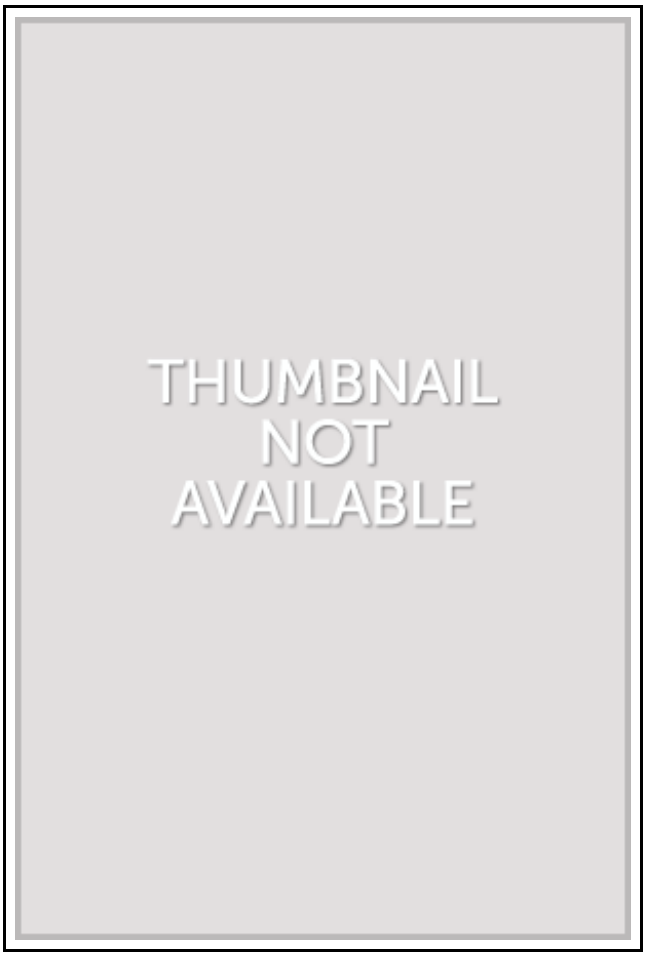
Anisotropic Inelasticity - Modelling, Simulation, Validation



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Reviews

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(Prof. Rick Romaguera)

ANISOTROPIC INELASTICITY - MODELLING, SIMULATION, VALIDATION

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Shaker Verlag Sep 2005, 2005. Taschenbuch. Book Condition: Neu. 210x149x14 mm. Neuware - The main purpose of this work is threefold. First, to consider a phenomenological model for anisotropic elastoplasticity at finite plastic strains within the framework of continuum mechanics with internal variables. The model aims to describe metallic solids, where the source of anisotropy may be either a kind of texture in polycrystals, which allows for an orthotropic modelling in an averaged sense, or the anisotropy of fcc single crystals. The second thrust is to derive and implement within the finiteelement framework stable and efficient time integration algorithms for the evolution equations of elastoplasticity, for both, finite plastic strains and for the infinitesimal strain case. The algorithmic formulation of unilateral contact in this work opens the door to the simulation of metal forming processes such as deep-drawing and extrusion. The third aim is to validate the material model along with its corresponding numerical treatment. Significant anisotropic phenomena of crystalline materials at large, inelastic deformations should be captured within the simulations. It is shown that the earing effect of a deep drawn cup is predicted. Furthermore, the present work is devoted to elucidate a curious phenomenon of a spherical indentation test into a fcc single crystal; upon release of the ball, the indent looks rather like a square than like a circle. The topography of the indentation crater is reconstructed applying scanning electron microscopy along with digital image processing. The anisotropic topography of the sample is predicted by the material model in the simulations. Corroborated on the experimental findings a kinematical explanation of the observed deformation pattern is proposed that operates on the micromechanical scale of plastic deformation in a fcc single crystal. 230 pp. Englisch.

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