Application of anisotropic yield functions with axial symmetry

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Abstract

Semi-products, such as wires, bolts and cylindrical bars are manufactured by axisymmetric processing by e.g. extrusion and drawing, and hence have axial symmetry afterwards. In metals, the plastic deformations introduced by such forming operations and/or subsequent thermal treatment give rise to strong fiber textures resulting in plastic anisotropy with axial symmetry. In the continuum plasticity models, the axial symmetry put constraints on the parameter selection for Barlat-type anisotropic yield functions, hence reducing the number of anisotropy parameters substantially. In this work, crystal plasticity will be used to compute yield surfaces for chosen fiber textures. Several Barlat-type of anisotropic yield functions, e.g. Yld2004, Yld2011 and Yld2013 will be calibrated to crystal plasticity yield surfaces. The ability of the continuum models to capture the plastic anisotropy of fiber textures will be assessed.

Keywords: axial symmetry, yield surface, crystal plasticity

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