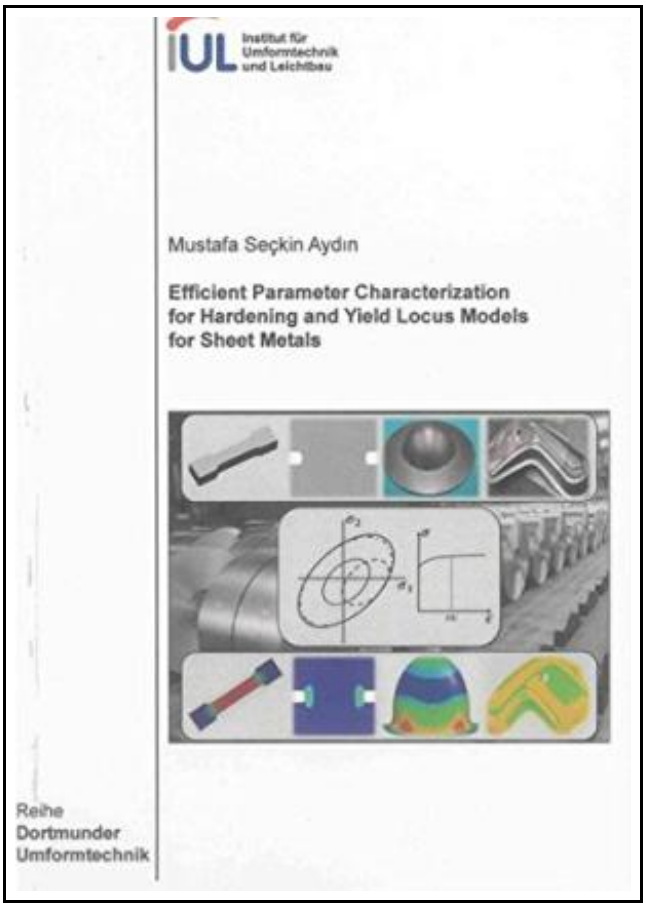
Efficient Parameter Characterization for Hardening and Yield Locus Models for Sheet Metals



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EFFICIENT PARAMETER CHARACTERIZATION FOR HARDENING AND YIELD LOCUS MODELS FOR SHEET METALS

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Shaker Verlag Aug 2013, 2013. Buch. Book Condition: Neu. Neuware - Various mechanical tests performed under different loading conditions such as, biaxial stretching, tensile, shear, plane strain etc. are proposed to calibrate advanced constitutive models. Except for uniaxial tensile tests, these testing techniques are either expensive to be conducted or cumbersome to be evaluated. Furthermore, accuracy of these non-standardized tests is not guaranteed. This thesis presents three inverse identification concepts ensuring material characterization by necessitating simple tests conducted either solely on an ordinary tensile test machine or both on standard tensile and sheet metal testing devices. In this manner, the desired simulation quality is maintained in an economical manner by means of testing devices available in many industrial laboratories. In this dissertation, first of all, material characteristics of several steel grades from mild, high strength and advanced high strength categories were investigated with regard to rate dependency, hardening and yield locus shape by means of monotonic mechanical tests. Conducting uniaxial tensile tests with different machine speeds, a concept to model the impact of strain rates is proposed and implemented in user models incorporating Yld2000-2d (Barlat et al., 2003) and Yld2004-18p (Barlat et al., 2005) yield criteria. Shape evolution of yield locus in equi-biaxial, uniaxial and shear stress states is analyzed via cruciform, hydraulic bulge, uniaxial tensile and shear tests. According to this study, it has been deduced that there is almost no evolution of yield locus shape after roughly an equivalent plastic strain of 0.04, implying the feasibility of isotropic hardening beyond the mentioned amount of deformation. Performing numerical simulations for a cup drawing test of a mild steel grade, it has been shown that a locus shape fitted at a deformation exceeding an equivalent plastic strain of 0.04 can be representative for the whole deformation history without regarding the...

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