SM27L_12450

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

A Model of Cyclic Viscoplasticity with Special Reference to Yield-Point Phenomena

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A constitutive model of viscoplasticity that describes the yield-point phenomena is presented on the premise that the sharp yield point and the subsequent abrupt yield drop result from rapid dislocation multiplication and the stress dependence of dislocation velocity. This model can well simulate rate-dependent stress-strain responses with respect to flow stress and Luders elongation. This paper describes its modeling, some strong features of this model by comparing the numerical simulations and the corresponding experimental data on fundamental cyclic plasticity such as cyclic straining and rate-dependent ratcheting. Furthermore, as an example of industrial application of this model, a result of finite element numerical simulation on skin-pass rolling in a sheet metal producing process is presented.

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