SM18L_10393

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

Physically Based Thermomechanical Modeling of Metals over a Wide Range of Strain Rates and Temperatures

George Z. Voyiadjis, Farid H. Abed

Louisiana State University, Baton Rouge, USA

Microstructural physical based constitutive models are developed in this work in order to characterize the thermomechanical response of different types of metals subjected to low and high strain rates and temperatures. The concept of thermal activation energy as well as the dislocations interaction mechanisms is used in the derivation procedure taking into consideration the effect of the mobile dislocation production as well as the dislocation speed on the flow stress of the deformed material. The model is verified using different sets of experimental data for the same material parameters obtained from other independent tests. Good correlation is observed between the model predictions and the experimental observations. The plastic flow is considered in the range of temperatures and strain rates where diffusion and creep are not dominant.

View the extended summary