SM18S_10734

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

Advanced Thermo-Visco-Plastic Constitutive Relations for Direct Applications in Numerical Analyses

Alexis Rusinek[(1)], Janusz R. Klepaczko[(1)], Ramon Zaera[(2)]

(1) *Laboratory of Physics and Mechanics of Materials, Université de Metz, Metz, France*
(2) *Department of Continuum Mechanics and Structural Analysis, University Carlos III of Madrid, Madrid, Spain*

Abstract: In this contribution thermo-visco-plastic constitutive relations are proposed. This phenomenological approach is partly based on theory of dislocations and processes of thermal activation. The main advantages of such constitutive relation are reduction of number of material constants in comparison with the complete approach based on materials science (theory of dislocations). In the proposed formulation, the total stress is a sum of two contributions, the internal stress and the effective stress which define respectively the strain rate and temperature-dependant hardening and the direct coupling strain rate-temperature during plastic deformation. This constitutive relation has been used so far many times in finite element codes to simulate dynamic processes of impact loading and an original algorithm using theory has been recently proposed by Zaera et al. (2004).

View the extended summary