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AN ELASTO-VISCOPLASTIC DAMAGE MODEL: FORMULATION AND NUMERICAL IMPLEMENTATION

Fernando Pala Beirão Macedo, fmacedo@fe.up.pt
Department of Mechanical Engineering, Faculty of Engineering, University of Porto, Portugal

Francisco Manuel Andrade Pires, fpires@fe.up.pt
Department of Mechanical Engineering, Faculty of Engineering, University of Porto, Portugal

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In many practical applications, metallic materials are subjected to complex loading conditions at various strain rates in the presence of internal microstructural degradation. Therefore, in order to study the non-linear solid behaviour of these materials, the present contribution proposes a von Mises-type viscoplastic damage model that couples Perić's viscoplastic law [1,2] with Lemaitre's ductile damage evolution law [3]. The formulation of the constitutive model is presented in detail and the description of the integration algorithm, considering an implicit elastic predictor/return-mapping scheme, is made. The solution of the system of equations is obtained with the Newton-Raphson method and the derivation of the consistent tangent matrix is also presented. A representative set of numerical examples is analysed covering a wide range of viscoplastic parameters such as: time span, rate-sensitivity and viscosity. The predictions of the model are appraised against the numerical results obtained by other authors [2,4].

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