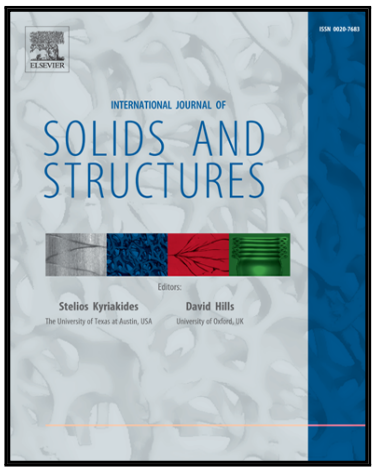

A Gurson-type layer model for ductile porous solids with isotropic and kinematic hardening

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A Gurson-type layer model for ductile porous solids with isotropic and kinematic hardening

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Abstract

The aim of this work is to propose a Gurson-type model for ductile porous solids exhibiting isotropic and kinematic hardening. The derivation is based on a "sequential limit-analysis" of a hollow sphere made of a rigid-hardenable material. The heterogeneity of hardening is accounted for by discretizing the cell into a finite number of spherical layers in each of which the quantities characterizing hardening are considered as homogeneous. A simplified version of the model is also proposed, which permits to extend the previous works of Leblond et al. (1995) and Lacroix et al. (2016) for isotropic hardening to mixed isotropic/kinematic hardening. The model is finally assessed through comparison of its predictions with the results of some micromechanical finite element simulations of the same cell. First, the numerical and theoretical overall yield loci are compared for given distributions of isotropic and kinematic pre-hardening. Then the predictions of the model are investigated in evolution problems in which both isotropic and kinematic hardening parameters vary in time. A very good agreement between model predictions and numerical results is found in both cases.

Keywords: Porous ductile solids; Isotropic hardening; Kinematic hardening; Sequential limit-analysis

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