

Application of a model of plastic porous materials including void shape effects to the prediction of ductile failure under shear-dominated loadings - DTU Orbit (09/11/2017)

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An extension of Gurson's famous model (Gurson, 1977) of porous plastic solids, incorporating void shape effects, has recently been proposed by Madou and Leblond (Madou and Leblond, 2012a, 2012b, 2013; Madou et al., 2013). In this extension the voids are no longer modelled as spherical but ellipsoidal with three different axes, and changes of the magnitude and orientation of these axes are accounted for. The aim of this paper is to show that the new model is able to predict softening due essentially to such changes, in the absence of significant void growth. This is done in two steps. First, a numerical implementation of the model is proposed and incorporated into the SYSTUS® and ABAQUS® finite element programmes (through some freely available UMAT (Leblond, 2015) in the second case). Second, the implementation in SYSTUS® is used to simulate previous "numerical experiments" of Tvergaard and coworkers (Tvergaard, 2008, 2009, 2012, 2015a; Dahl et al., 2012; Nielsen et al., 2012) involving the shear loading of elementary porous cells, where softening due to changes of the void shape and orientation was very apparent. It is found that with a simple, heuristic modelling of the phenomenon of mesoscopic strain localization, the model is indeed able to reproduce the results of these numerical experiments, in contrast to Gurson's model disregarding void shape effects.

General information

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Authors: Morin, L. (Ekstern), Leblond, J. B. (Ekstern), Tvergaard, V. (Intern)

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