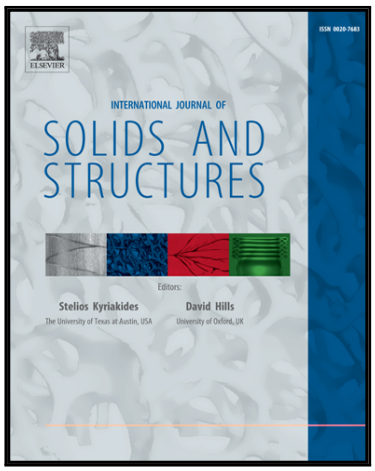

Static Limit Analysis and strength of porous solids with Hill orthotropic matrix

M.I. El Ghezal, I. Doghri, D. Kondo

PII: S0020-7683(17)30005-7
DOI: 10.1016/j.ijsolstr.2017.01.007
Reference: SAS 9421

To appear in: *International Journal of Solids and Structures*

Received date: 28 July 2016
Revised date: 23 December 2016
Accepted date: 3 January 2017

Please cite this article as: M.I. El Ghezal, I. Doghri, D. Kondo, Static Limit Analysis and strength of porous solids with Hill orthotropic matrix, *International Journal of Solids and Structures* (2017), doi: 10.1016/j.ijsolstr.2017.01.007

Static Limit Analysis and strength of porous solids with Hill orthotropic matrix

M. I. El Ghezal[a,*], I. Doghri[a], D. Kondo[b]

[a]*Université catholique de Louvain (UCL), iMMC, Bâtiment Euler, 4 Avenue G.Lemaître B-1348 Louvain-La-Neuve, Belgium*
[b]*Université Pierre et Marie-Curie, Institut Jean Le Rond d'Alembert, 4 place de Jussieu F75005 Paris, France*

Abstract

The present study deals with a strength criterion for ductile porous materials consisting in a Hill type orthotropic matrix containing spherical voids. The originality of the study lies into an attempt to develop an approximate static Limit Analysis for this class of materials, based on the recent work of Cheng et al. (2014) initially proposed for isotropic von Mises matrix. To this end, we considered, in the framework of a statical limit analysis framework, a trial stress field complying with the boundary conditions of the homogenization problem. Interestingly, the proposed procedure delivers an anisotropic macroscopic criterion which is not only pressure dependent, but exhibits an original sensitivity to the sign of the third invariant of the stress deviator. The obtained results are discussed and compared to existing theoretical models, to numerical bounds and to recently available Finite Element results. Finally, we provide the plastic strain rate equations and the void evolution law which are crucial for formulating the failure of anisotropic ductile metals. The influence of the plastic anisotropy on these constitutive equations is illustrated.

Keywords: Ductile porous materials; Hill orthotropic matrix; Statical limit

*Corresponding author.Tel: +32-10-472362/472350; fax: +32-10-472180.
Email address: marieme.elghezal@uclouvain.be (M. I. El Ghezal)