SM22L_10692

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

Elastoplastic Microscopic Bifurcation and Post-Bifurcation Behavior of Periodic Cellular Solids

Nobutada Ohno[1], Dai Okumura[1], Hirohisa Noguchi[2]

(1) *Nagoya University, Nagoya, Japan*
(2) *Keio University, Yokohama, Japan*

In this study, a general framework to analyze microscopic bifurcation and post-bifurcation behavior of elasto-plastic, periodic cellular solids is developed on the basis of a two-scale theory of the updated Lagrangian type. We thus derive the eigenmode problem of microscopic bifurcation and the orthogonality to be satisfied by the eigenmodes. By use of the framework, then, bifurcation and post-bifurcation analysis are performed for cell aggregates of an elastoplastic honeycomb subject to in-plane compression. Thus, demonstrating a basic, long-wave eigenmode of microscopic bifurcation under uniaxial compression, it is shown that the eigenmode causes microscopic buckling to localize in a cell row perpendicular to the loading axis. It is also shown that under equi-biaxial compression, the flower-like buckling mode having occurred in a macroscopically stable state changes into an asymmetric, long-wave mode due to the sextuple bifurcation in a macroscopically unstable state, leading to the localization of microscopic buckling in deltaic areas.

View the extended summary