The Department of Mechanical Engineering/College of Engineering and Applied Sciences
Stony Brook University

Mechanical Engineering Seminar

Dr. Martin I. Idiart
Center for Micromechanics
Department of Engineering
University of Cambridge
Cambridge, UK

Lecture Title: Infinite-rank laminates and the quest for a constitutive model for viscoplastic porous media

Friday, May 9, 2008, 2:00 PM, Room 301 Engineering Building

Abstract

Predicting the ductile failure of metals in terms of void nucleation, growth and coalescence requires a constitutive model for viscoplastic porous media. In this presentation, we describe a new model which is based on certain theoretical constructions known as "infinite-rank laminates". A distinctive feature of this model is that it is realizable; the resulting dissipation potential for the porous medium is therefore guaranteed to satisfy all pertinent bounds and convexity requirements. The model allows for fairly general viscoplastic matrix behaviors, distributions of porosity, and loading conditions. Sample results are presented for two-dimensional porous materials comprising a power-law matrix containing an anisotropic distribution of porosity. In the limiting case of ideal plasticity, the new predictions lie within those of the standard Gurson model, and exhibit corners. The corners lie on the hydrostatic axis when the porosity is isotropic, but move away from the hydrostatic axis with increasing anisotropy. Corners are known to influence strongly the predictions for plastic flow localization. In view of the preliminary results given in this work, it is conjectured that the new model provides more reliable predictions for viscoplastic porous media than Gurson-type models.

Biography

Martín I. Idiart received a degree in Aeronautical Engineering from the National University of La Plata, Argentina, in 2001, and a Ph.D. in Mechanical Engineering from the University of Pennsylvania, U.S.A., and École Polytechnique, France, in 2006. He currently works as Research Associate at the Centre for Micromechanics, University of Cambridge, U.K., and he has recently been appointed as Adjunct Professor of Rational Mechanics at the National University of La Plata.

Directions: Please refer to website: **http://www.sunysb.edu** or call Melissa Castelbuono at 631-632-8300 for more information. Check **http://me.eng.sunysb.edu** for any changes to location or time.

STONY BROOK
STATE UNIVERSITY OF NEW YORK