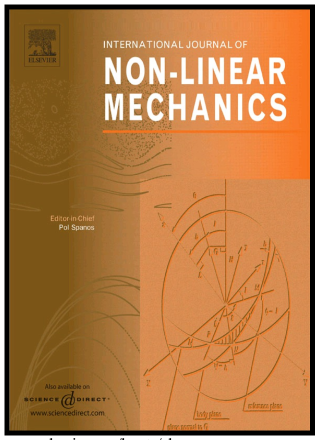
# Author's Accepted Manuscript




www.elsevier.com/locate/nlm

Spherical void expansion in rubber-like materials: the stabilizing effects of viscosity and inertia

Anshul Faye, J.A. Rodríguez-Martínez, K.Y. Volokh

PII: S0020-7462(16)30327-4
DOI: http://dx.doi.org/10.1016/j.ijnonlinmec.2017.04.005
Reference: NLM2825

To appear in: *International Journal of Non-Linear Mechanics*

Received date: 22 November 2016
Revised date: 27 March 2017
Accepted date: 3 April 2017

Cite this article as: Anshul Faye, J.A. Rodríguez-Martínez and K.Y. Volokh, Spherical void expansion in rubber-like materials: the stabilizing effects o viscosity and inertia, *International Journal of Non-Linear Mechanics* http://dx.doi.org/10.1016/j.ijnonlinmec.2017.04.005

# Spherical void expansion in rubber-like materials: the stabilizing effects of viscosity and inertia

Anshul Faye[a,*], J. A. Rodríguez-Martínez[b], K. Y. Volokh[a]

[a] *Faculty of Civil and Environmental Engineering, Technion, Israel*
[b] *Department of Continuum Mechanics and Structural Analysis, University of Carlos III of Madrid, Spain*

**Abstract**

Dynamic cavitation is known to be a typical failure mechanism in rubber-like solids. While the mechanical behaviour of these materials is generally rate-dependent, the number of theoretical and numerical works addressing the problem of cavitation using nonlinear viscoelastic constitutive models is scarce. It has been only in recent years when some authors have suggested that cavitation in rubber-like materials is a dynamic fracture process strongly affected by the rate-dependent behaviour of the material because of the large strains and strain rates that develop near the cavity. In the present work we further investigate previous idea and perform finite element simulations to model the dynamic expansion of a spherical cavity embedded into a rubber-like ball and subjected to internal pressure. To describe the mechanical behaviour of the rubber-like material we have used an experimentally calibrated constitutive model which includes rate-dependent effects and material failure. The numerical results demonstrate that inertia and viscosity play a fundamental role in the cavitation process since they stabilize the material behaviour and thus delay failure.

*Keywords:* Dynamic cavitation; Dynamic failure; Rubber-like materials; Viscosity; Inertia



*Corresponding author. Tel.: +972 586602577; Fax: +972 48295697.
*Email address:* dr.anshul.faye@gmail.com (Anshul Faye)