

Accepted Manuscript

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PII: S0020-7683(15)00202-4

DOI: <http://dx.doi.org/10.1016/j.ijsolstr.2015.04.029>

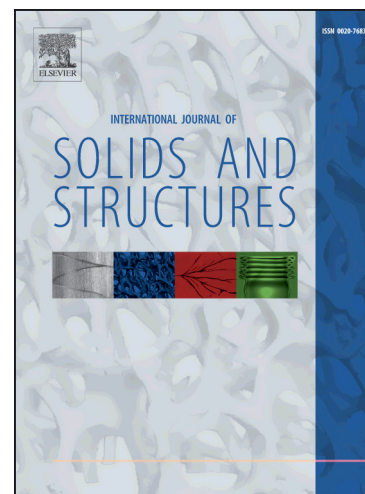
Reference: SAS 8759

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

Received Date: 9 December 2014

Revised Date: 13 April 2015

Accepted Date: 24 April 2015



Please cite this article as: Cohen, T., Molinari, A., Dynamic cavitation and relaxation in incompressible nonlinear viscoelastic solids, *International Journal of Solids and Structures* (2015), doi: <http://dx.doi.org/10.1016/j.ijsolstr.2015.04.029>

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Dynamic cavitation and relaxation in incompressible nonlinear viscoelastic solids

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Abstract

Closed form analytical solutions for the dynamic expansion of a spherical void in a finite, spherically symmetric, nonlinearly viscoelastic medium are presented. We account for finite strains and application of load, both internally, at the cavity wall, and at the external surface. Hence, the present solution may apply to a wide range of known physical phenomena with examples from biomechanics, as in the appearance of cavitation bubbles due to traumatic brain injury or expansion of soft tissue due to an internal growth, to fracture initiation in soft materials and softening of seismic bearings in large scale structures. Specifically it is suggested that the present closed form analytical relations can be facilitated to measure the local viscoelastic properties of the material through controlled relaxation experiments.

Keywords: Dynamic cavity expansion, nonlinear viscoelasticity, cavitation rheology, relaxation, thick-walled spherical shell

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