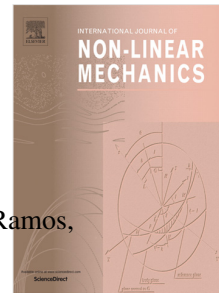


Accepted Manuscript

An asymptotic homogenization approach to the microstructural evolution of heterogeneous media

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PII: S0020-7462(18)30104-5
DOI: <https://doi.org/10.1016/j.ijnonlinmec.2018.06.012>
Reference: NLM 3047

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

Received date: 16 February 2018
Revised date: 20 June 2018
Accepted date: 28 June 2018

Please cite this article as: A. Ramírez-Torres, S. Di Stefano, A. Grillo, R. Rodríguez-Ramos, J. Merodio, R. Penta, An asymptotic homogenization approach to the microstructural evolution of heterogeneous media, *International Journal of Non-Linear Mechanics* (2018), <https://doi.org/10.1016/j.ijnonlinmec.2018.06.012>

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1 An Asymptotic Homogenization Approach to the
 2 Microstructural Evolution of Heterogeneous Media

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14 **Abstract**

In the present work, we apply the asymptotic homogenization technique to the equations describing the dynamics of a heterogeneous material with evolving micro-structure, thereby obtaining a set of upscaled, effective equations. We consider the case in which the heterogeneous body comprises two hyperelastic materials and we assume that the evolution of their micro-structure occurs through the development of plastic-like distortions, the latter ones being accounted for by means of the Bilby-Kröner-Lee (BKL) decomposition. The asymptotic homogenization approach is applied simultaneously to the linear momentum balance law of the body and to the evolution law for the plastic-like distortions. Such evolution law models a stress-driven production of inelastic distortions, and stems from phenomenological observations done on cellular aggregates. The whole study is also framed within the limit of small elastic distortions, and provide a robust framework that can be readily generalized to growth and remodeling of nonlinear composites. **Finally, we complete our theoretical model by performing numerical simulations.**

15 *Keywords:* Asymptotic homogenization, heterogeneous media, remodeling,
 16 BKL decomposition, two-scale plasticity, nonlinear composites

^{*}Manuscript submitted to the Special Issue “Multi-scale nonlinear continuum mechanical coupled field modelling and applications”

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Preprint submitted to International Journal of Nonlinear Mechanics

June 29, 2018

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