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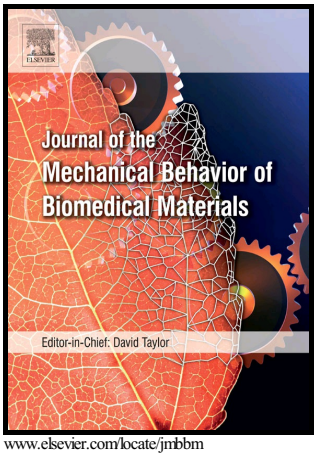

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PII: S1751-6161(17)30210-2
DOI: http://dx.doi.org/10.1016/j.jmbbm.2017.05.021
Reference: JMBBM2339

To appear in: *Journal of the Mechanical Behavior of Biomedical Materials*

Received date: 9 May 2017
Accepted date: 15 May 2017

Cite this article as: F. Cristofari, B. Piotrowski and R. Pesci, Mechanica properties of a nanoporous membrane used in implantable medical devices Correlation between experimental characterization and 2D numerical simulation *Journal of the Mechanical Behavior of Biomedical Materials* http://dx.doi.org/10.1016/j.jmbbm.2017.05.021

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Abstract

Nanoporous membranes are used for the elaboration of implantable medical devices. In order to guaranty their integrity after implantation in a patient body, it is necessary to characterize the microstructure and the mechanical behavior of such membranes. They present randomly distributed pores around 1 µm in diameter at the surface. X-ray nanotomography permits to get the geometry of the pores through the thickness with a reduction of the diameter in the core. A multiscale study is done to characterize the membranes: macroscopic tensile tests permit to get the behavior law of the non porous material and in situ tensile tests are carried on in a Scanning Electron Microscope in order to observe the evolution of pores and cracks during loading. A 2D Finite Element Model is also developed in parallel. The confrontation between experiments and numerical simulations permit to validate the accuracy of the model. The latter is then used to simulate several types of loadings considering various pore distributions and sizes.

Graphical abstract