

Accepted Manuscript

Measurements of ultrasound velocity and attenuation in numerical anisotropic porous media compared to Biot's and multiple scattering models

Fabien Mézière, Marie Muller, Emmanuel Bossy, Arnaud Derode

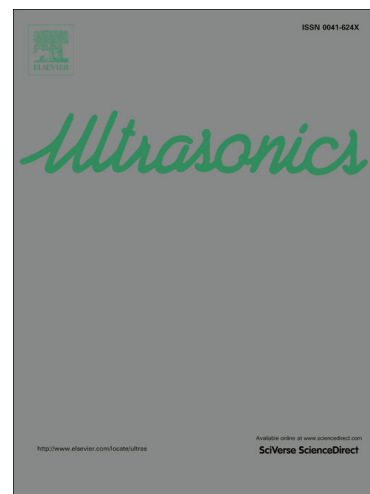
PII: S0041-624X(13)00273-4
DOI: <http://dx.doi.org/10.1016/j.ultras.2013.09.013>
Reference: ULTRAS 4679

To appear in: *Ultrasonics*

Received Date: 27 April 2013
Revised Date: 31 July 2013
Accepted Date: 10 September 2013

Please cite this article as: F. Mézière, M. Muller, E. Bossy, A. Derode, Measurements of ultrasound velocity and attenuation in numerical anisotropic porous media compared to Biot's and multiple scattering models, *Ultrasonics* (2013), doi: <http://dx.doi.org/10.1016/j.ultras.2013.09.013>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Measurements of ultrasound velocity and attenuation in numerical anisotropic porous media compared to Biot's and multiple scattering models

Fabien Mézière, Marie Muller, Emmanuel Bossy, Arnaud Derode

Institut Langevin, ESPCI ParisTech, CNRS UMR7587, INSERM U979, Université Paris Diderot - Paris 7, 1 rue Jussieu, 75005 Paris, France

Abstract

This article quantitatively investigates ultrasound propagation in numerical anisotropic porous media with finite-difference simulations in 3D. The propagation media consist of clusters of ellipsoidal scatterers randomly distributed in water, mimicking the anisotropic structure of cancellous bone. Velocities and attenuation coefficients of the ensemble-averaged transmitted wave (also known as the coherent wave) are measured in various configurations. As in real cancellous bone, one or two longitudinal modes emerge, depending on the micro-structure. The results are confronted with two standard theoretical approaches: Biot's theory, usually invoked in porous media, and the Independent Scattering Approximation (ISA), a classical first-order approach of multiple scattering theory. On the one hand, when only one longitudinal wave is observed, it is found that at porosities higher than 90% the ISA successfully predicts the attenuation coefficient (unlike Biot's theory), as well as the existence of negative dispersion. On the other hand, the ISA is not well suited to study two-wave propagation, unlike Biot's model, at least as far as wave speeds are concerned. No free fitting parameters were used for

Download English Version:

<https://daneshyari.com/en/article/10690519>

Download Persian Version:

<https://daneshyari.com/article/10690519>

[Daneshyari.com](https://daneshyari.com)