Accepted Manuscript

Revised date : 7 July 2018 Accepted date : 23 August 2018

Correlation of elastic wave attenuation and scattering with three-dimensional grain size distribution for polycrystals of statistically equiaxed grains

Gaofeng Sha



PII: DOI: Reference:	S0165-2125(18)30064-7 https://doi.org/10.1016/j.wavemoti.2018.08.012 WAMOT 2274
To appear in:	Wave Motion
Received date :	23 February 2018

Please cite this article as: G. Sha, Correlation of elastic wave attenuation and scattering with three-dimensional grain size distribution for polycrystals of statistically equiaxed grains, *Wave Motion* (2018), https://doi.org/10.1016/j.wavemoti.2018.08.012

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.

Correlation of elastic wave attenuation and scattering with three-dimensional grain size distribution for polycrystals of statistically equiaxed grains

Gaofeng Sha*

Department of Mechanical and Aerospace Engineering

201 W 19th Ave, Columbus, Ohio 43210

sha.34@osu.edu

Abstract: This study establishes an explicit relation between spatial two-point correlation function (TPCF) and 3D grain size distribution for aggregates of statistically equiaxed grains. This relation is further validated by applying it to available TPCF and 3D grain size distribution in the literature. Based on this relation, analytical attenuation coefficients for longitudinal and transverse waves, accounting for grain size distribution, are derived from Born approximation for macroscopically isotropic polycrystals of equiaxed triclinic grains. These attenuation models are applicable for whole frequency range except geometric region. Moreover, scattering coefficients for a polycrystal of equiaxed triclinic grains with a 3D grain size distribution are obtained. Finally, the analytical attenuation model for the longitudinal wave is verified by comparison with existing 3D finite element simulation results in the literature. This theoretic study has practical applications to the inverse determination of 3D grain size distribution from ultrasonic measurements.

Keywords: Grain size distribution, two-point correlation function, scattering, equiaxed grains **1.Introduction**

Modeling of elastic wave attenuation and scattering in polycrystalline materials has practical applications in nondestructive evaluation and seismology, thus extensive studies have been reported for wave attenuation and scattering in various polycrystalline media[1]–[20]. A series of

Download English Version:

https://daneshyari.com/en/article/9953988

Download Persian Version:

https://daneshyari.com/article/9953988

Daneshyari.com