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Abstract

Ultrasonic techniques in the biopolymer research

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Abstract:
The diversity and versatility of biopolymers demand a handfulof methods fortheir characterization. Mechanical and Visco-elastic properties comprise a set of properties that can determine the suitability of a certain biopolymer to an intended application, or modifications to obtain desired co-biopolymers, in case of synthetic biopolymers. These fundamental properties are alsoinvestigated to infer changes that indicate abnormalities in biological biopolymers with different degrees of complexities. 1. Scanning Acoustic Microscopy (SAM) SAM probes the samples with a high frequency reflected and transmitted ultrasonic waves that are collected confocally to generate high resolution images. The analysis of the micrographs and the accompanied signals provides a wealth of quantitative information.. 2. Non-linear ultrasonic analysis The interaction of ultrasound waves with materials is essentially non-linear. As such, linear elasticity can be thought of as an assumed simplification. At sufficiently high amplitudes, the non-linearity is obvious and manifested by progressive distortions of the signal, resulting in an instantaneously amplitude-dependent wave propagation velocity and in the generation of secondary and higher harmonics of the fundamental frequency.

Biography:

Esam Ahmed Mohamed is a researcher and lecturer at Georgia Institute of Technology Lorraine (GTL) since 2017. He is a biophysicist who obtained his Dr. rer.nat. degree at University of Leipzig in Physics with Biophysics where he has been working as a scientific fellow until 2012. He has extended experience in the application of different techniques of physics to biological matter and biomedical materials; like Nuclear Magnetic Resonance, Confocal Microscopy, Raman Spectroscopy, Linear and Non-linear Ultrasoundand Radiation Therapy, among others. He has a special experience in the investigation of biodegradable biopolymers (Chitosan for instance) and biological cells and tissues with scanning acoustic microscopy and non-linear ultrasound.

Recent Publications:

1. Esam T. Ahmed Mohamed et al;Scanning acoustic microscopy investigation of weld lines in injection-molded parts manufactured from industrial thermoplastic polymer, 2020.
2. Esam T. Ahmed Mohamed et al; Giga-Hertz ultrasonic microscopy: Getting over the obscurity: A short review on the biomedical applications, 2020.
3. Esam T. Ahmed Mohamed et al; Utilization of scanning acoustic microscopy (SAM) in quantifying the biomechanical variations in tissues with Fuchs endothelial dystrophy (FECD), 2019.
4. Esam T. Ahmed Mohamed et al; Scanning Acoustic Microscopy Comparison of Descemet's Membrane Normal Tissue and Tissue With Fuchs' Endothelial Dystrophy, 2018
5. Esam T. Ahmed Mohamed et al; Non destructive evaluation of bi-material structures: a case study, 2017.

Webinar on Biopolymers and Bioplastics; October 15, 2020; Paris, France.

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