

2019 ICU BRUGES

ABSTRACT BOOK

2019 INTERNATIONAL CONGRESS ON ULTRASONICS

BRUGES, BELGIUM
3-6 September 2019

KU LEUVEN

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Thursday, September 5th, 2019 (11:00 am)

MCT+MEI (1/3) - Ultrasonic Characterization of Tissues and Elasticity Imaging

MCT+MEI (1/3): Ultrasonic Characterization of Tissues and Elasticity Imaging	Location: VIVES room A207 Chair: Nico Declercq and Guillermo Rus
11:00-11:30 When bubbles snowplough!	Rodolphe Antoine
11:30-11:45 Calcium sulfate setting monitoring with ultrasonic backscattering analysis	Josep Rodríguez-Sendra, Noé Jiménez, Rubén Picó, Joan Faus, Francisco Camarena
11:45-12:00 Magnetic force induced vibration on a ferromagnetic sphere for viscoelastic media characterization	Alejandro Cebrecos, Miguel Company, Noé Jiménez, José María Benlloch, Francisco Camarena
12:00-12:15 Mechanical biomarkers by torsional wave elastography for gestational diagnosis	Guillermo Rus, Jorge Torres, Rafael Muñoz, Juan Melchor, Ruben Molina, Antonio Callejas, Miguel Riveiro, José Cortes, Inas H Faris, Francisca Molina
12:15 - 12:30 Assessing viscoelasticity of torsional propagation in cervical tissue	Antonio Callejas, Juan Melchor, Inas H. Faris, Jorge Torres, Guillermo Rus

CALCIUM SULFATE SETTING MONITORING WITH ULTRASONIC BACKSCATTERING ANALYSIS

Josep Rodríguez-Sendra[1], Noé Jiménez[1], Rubén Picó[2], Joan Faus[3], Francisco Camarena[1]

[1]*Instituto de Instrumentación para Imagen Molecular (i3M), Universitat Politècnica de València (UPV), Consejo Superior de Investigaciones Científicas (CSIC), Camino de Vera, s/n, 46022, Valencia, (Spain)*

[2]*Insituto para la Gestión Integral de Zonas Costeras (IGIC), Universitat Politècnica de València (UPV), Campus de Gandia. C/Paranimf, 1. Grao Gandía (Spain)*

[3]*Instituto Valenciano de Investigaciones Odontológicas (IVIO). Valencia. C/ Loreto, 6. 46700 Gandia (Spain)*

Ultrasonic backscattering techniques are used to monitor the setting process of calcium sulfate. A 3.5 MHz frequency A-scan pulse-echo system is used to obtain the acoustic properties of a cylindrical sample of calcium sulfate (diameter= 36 mm; thickness= 18 mm). The temperature of the sample and the rf backscattering signal are measured every two seconds during the whole setting process (53 min; 1590 rf-signals). Apparent backscattering integral (AIB) [1], Nakagami parameter [2] and sound speed are calculated from each measured rf signal. A positive correlation is observed between the sound velocity, the AIB and the Nakagami parameter during the setting process, identifying three states of the sample: liquid, transient and solid. Sound velocity changes from 1480 m/s (liquid) to 2700 m/s (solid), meanwhile AIB changes between -15 dB and 0 dB. In the transient phase, the three parameters are sensible to the fast change in the mechanical properties of the medium. The presented results show that, by performing backscattering analysis, the state of a sample in a setting process can be determined, which could have application in monitoring changes in guided bone regeneration processes for dental implant procedures.

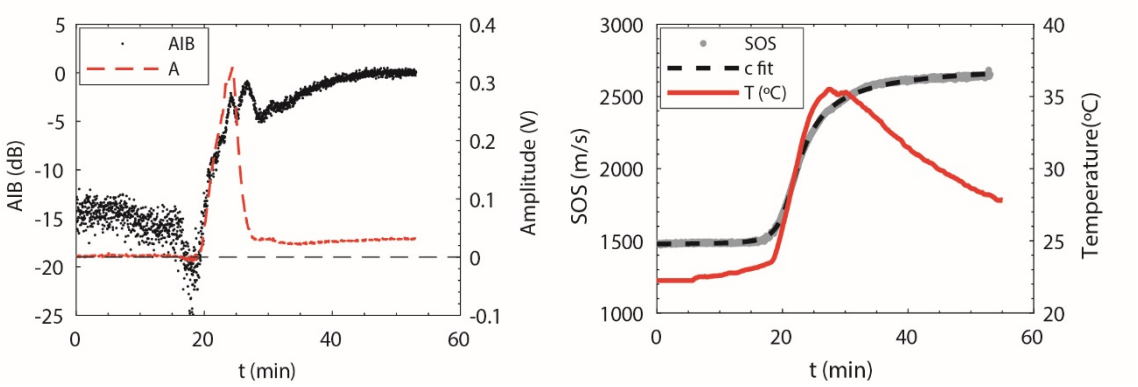


Figure 4: Left: AIB and Amplitude of the echo at the end of the sample during the experiment. Right: Temperature and sound velocity during the experiment.

Keywords
Ultrasound backscattering, AIB, Guided Bone Regeneration.

References

[1] Hoffmeister B. K, Mcpherson J. A, Smathers M. R, Spinolo P. L, Sellers M. E, Ultrasonic backscatter from cancellous bone: the apparent backscatter transfer function, IEEE Trans. Ultrason. Ferroelectr. Freq. Control. Vol. 62(12), **2015**. 2115-25.

[2] Caixinha, M., Jesus, D. A., Velte, E., Santos, M. J. & Santos, J. B. Using ultrasound backscattering signals and Nakagami statistical distribution to assess regional cataract hardness. IEEE Trans Biomed Eng. 61, **2014**. 2921–2929