

Chronicle

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Abstracts

Similarities and Differences of Physicochemical Properties of the di- and triacylglycerols under High Pressure Calculated from the Results of Ultrasonic Measurements

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Two samples of triacylglycerols i.e., olive oil and triolein, and one sample of diacylglycerol were investigated. In the course of compression, the density of the samples was determined by measurements of the change of piston position in pressure chamber and volume correction due to chamber expansion under pressure. The speed of sound was calculated from the time of flight of ultrasonic impulse between emitting and receiving transducers placed in the high pressure chamber. The adiabatic compressibility, intermolecular free length, molar volume, van der Waals' constant b and surface tension were calculated from the density, speed of sound and average molecular mass. All tested liquids undergo the high-pressure phase transition. Discontinuities of the measured isotherms of the physicochemical parameters of the investigated oils indicate the presence of the high-pressure phase transitions. Moreover the change of pressure during the phase transition was measured. The fundamental difference in molecular structure of these acylglycerols influences significantly on their behavior under high pressure.

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The Simplified Method for Measuring the Improvement of Impact Sound Insulation of Floor CoveringsBARUCH Katarzyna, kbaruch@agh.edu.pl
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Laboratory measurements of reduction of impact sound pressure level according to PN-EN ISO 10140-3 standard

are difficult in realization. In order to fulfil basic methodology requirements they are performed using two chambers coupled vertically, which the upper is called source room and the lower – receiving room. These chambers are separated by a 140 mm thick reference floor made of concrete, on which the resilient surfaces are laid. In Poland only one research facility may carry out such measurements. This paper describes preliminary studies which are the basis for design an impact sound reduction test stand based on the devised simplified method. Author using the Statistical Energy Analysis shows that the improvement of impact sound insulation by floor coverings depends primarily on the parameters of the sample. Moreover, during the measurements the type of a chamber plays a secondary role. This thesis was also confirmed by in-situ measurements carried out in two different rooms.

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Model Studies of Sound Absorption Coefficient of Periodic StructuresBARUCH Katarzyna, kbaruch@agh.edu.pl
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Basic theoretical considerations concerning the determination of sound absorption coefficient values assume that for the plane wave incident at an angle θ the reflected wave is also a plane wave reflected specularly. This assumption is true for isotropic, homogeneous and infinitely large planar surfaces. However, for spatial elements or flat surfaces possessing superficial impedance that periodically fluctuates, the reflected wave is a sum of n plane waves reflected at angles θ_n . In this case, the formula for a sound absorption coefficient $\alpha = 1 - |R|^2$, where $|R|$ is the magnitude of reflection coefficient is simplistic. In the paper the authors present a distribution of the sound field in front of different periodical surfaces for a plane wave oblique incidence. It was based on an analytical solution and numerical simulations using finite element method. Furthermore, taking into account the type of reflected waves the values of a sound absorption coefficient for the analysed structures were determined. Presented studies are the basis for mod-

several transducers of such array, some of others transducers adjacent to the activated ones are excited to undesirable vibrations as a result of a crosstalk. This effect is caused by a penetration of electrical voltages between the set of mass and electrode leads of elementary transducers (electrical crosstalk) as well as by the superposition and the propagation of different modes of vibrations (longitudinal, transversal, surface and Lamba waves) in the array construction and in the medium adjacent to the array surface (mechanical crosstalk). The crosstalk is one of the main causes of distortions impairing the quality of ultrasonic images obtained, particularly in medical applications, because the crosstalk distorts the directivity pattern of the array and can also produce its impulse response disturbance.

In the paper, the impact of the crosstalk effect in a number of especially designed linear ultrasonic transducer arrays on the distribution of the generated acoustic field was examined and analyzed. It was demonstrated on the basis of measurement that the crosstalk introduces characteristic distortions of acoustic field distributions narrowing the directivity pattern and forming unwanted local maxima of the acoustic pressure in side parts of the pattern. Measurement results were confirmed using an designed innovative calculation method allows for the simulation of the acoustic field generated by multielement ultrasonic arrays. Results of the study also showed that the acoustic field distortions due to the crosstalk can be reduced by means of a proper selection of the material of the array front matching and protection layer, its thickness and method of application.

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Comparison of Different Methods of Assessing a Reliable Level of External Noise

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Polish standard PN-B-02151-3 defines a reliable level of external noise which is then used for selection of required sound insulation of façade. Recently updated version of the standard published in October 2015 redefined this document.

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The Risk of Hearing Loss among Music Students

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The amount of sound exposure and the risk of hearing loss resulting from everyday musical activity were assessed for music students at the Fryderyk Chopin Music University in Warsaw. The measurements of sound exposure and the assessments of NIPTS (Noise Induced Permanent

Threshold Shift) risk were made according to the ISO 1999 standard. As expected, the results showed that, in many cases, especially for wind and percussion instruments, the exposure to sound exceeded the permissible limit of 85 dB (A). Assuming 45 years of similar exposure in terms of level and weekly duration it was predicted that 16.6% of men and 9.9% of women will acquire a hearing loss exceeding 25 dB. The highest risk of hearing loss occurs for flutists and French horn players (23% men and 15% women).

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Influence of Scattering Conditions of the Medium on the Value of the Effective Number of Scatterers

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Quantitative assessment of the ultrasonic echoes may to be a complementation of the traditional ultrasonic diagnosis based on us b-mode. One of such technique is the analysis of the RF signals by modeling statistics of the signal envelope by using probability density function and determination of the shape parameters of it. The presented studies concern the evaluation the influence of the scattering properties of the medium on the value of the shape parameter of the k distribution, which is called the effective number of scatterers (ENS).

Experiments were performed on phantoms with various scatterers concentrations: 5, 8, 15 and 20 scatterers/resolution cell. The ultrasonic backscattered signals from the mimicking phantoms were acquired using a single-element 6Mhz transducer. Registered echoes were analyzed statistically in a goal of exploration of the relationships between the effective number of scatterers and the structure of scattering medium.

For the scattering medium with the lowest scatterers concentration (5 scatterers/resolution cell), the effective number of scatterers was equal 1.82 and increased to 14.18 for the phantom with the highest concentration (20scatterers/ resolution cell). Presented results demonstrate that the values of the effective number of scatterers depend on the properties of scattering medium and may provide additional information about it.

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The Influence of Signal Spectrum on Sound Source Distance Perception

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The aim of this study is to investigate the possibility of distance perception of the sound source by the human on the basis of the sound source limited to a certain range of frequencies. To minimize the influence of the environment, research has been done in anechoic environment. Due to the