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Kolloquium für Mechanik

Referees:	**Prof. Evgeny Glushkov** Institute for Mathematics, Mechanics and Informatics, Kuban State University, Krasnodar, Russia
Date:	Thursday, November 14, 2019
Time:	15:45 h
Location:	Building 10.81, Emil Mosonyi-Hörsaal (HS 62, R 153)
Title:	**Identificiation of effective material parameters of composite materials and hidden defects using ultrasonic surface acoustic waves**

Abstract

Non-destructive evaluation of the effective material parameters of composite materials and hidden defects is motivated by various practical needs such as the need for reliable input data for numerical simulation and design, the operational control of material degradation to predict a catastrophic failure of constructions, etc. In the present contribution, we would like to discuss the recent results in the use of ultrasonic surface acoustic waves (SAWs) for the determination of effective material parameters of two kinds of composite materials of quite different spatial scales: mesoscale carbon fiber-reinforced plastic (CFRP) composites [1] used in aerospace industry, and polymer (e.g., hydrogen silsesquioxane – HSQ) micro-composites with embedded nitride nano-wires (NWs) designed and fabricated for micro-piezoelectric generators, energy harvesting, micro-sensors, and similar micro-devices [2].

These rather different areas of applications are united by a common mathematical approach, which is based on the use of the Green matrix of the multilayered anisotropic structure under study in the Fourier transform domain. This approach has been experimentally tested with unidirectional and cross-ply CFRP plates and validated by destructive tensile tests. With the HSQ-NW samples, the experimental data are obtained on the basis of transient grating spectroscopy [2]. The use of the developed model for the identification of hidden defects is illustrated by the examples of the determination of the length and depth of delaminations on the basis of information about the scattering resonance frequencies extracted from the laser-acquired SAW characteristics [3].

References
[1] A.A. Eremin, E.V. Glushkov, N.V. Glushkova, R. Lammering, Evaluation of effective elastic properties of layered composite fiber-reinforced plastic plates by piezoelectrically induced guided waves and laser Doppler vibrometry // Composite Structures, 125, 2015, 449–458.
[2] E. Glushkov, N. Glushkova, B. Bonello, L. Lu, E. Charron, N. Gogneau, F. Julien, M. Tchernycheva, O. Boyko, Evaluation of Effective Elastic Properties of Nitride NWs/Polymer Composite Materials Using Laser-Generated Surface Acoustic Waves // Appl. Sci., 8, 2018, 2319, 16p.
[3] A. Eremin, M. Golub, E. Glushkov, N. Glushkova, Identification of delamination based on the Lamb wave scattering resonance frequencies // NDT & E International, 103, 2019, 145-153.

Alle Interessenten sind herzlich eingeladen.
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