Diploma thesis abstract

Laser ultrasonic evaluation of the mechanical properties of polymer composite parts.

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Non-destructive evaluation methods allow to control structural modifications and defects in materials. Defects, inhomogeneties and damages, which occur during fabrication and exploitation of composite materials can significantly diminish its strength. Therefore the problem of developing non-destructive evaluation methods discussed in this work is very relevant.

In this work influence of porosity and matrix concentration on ultrasound velocity in carbon fiber-reinforced plastic composite samples and constructions was considered. Using laser-ultrasound method sound velocity was measured for fiber, matrix, composite samples with different fiber direction and for composite panel. It was shown that the major influence on the speed of sound in investigated single-axial composite samples was exerted by porosity. Porosity in single-axial composites was counted with using isolated pore model. It was shown that in investigated multi-axial composites sound velocity altered because of different matrix concentration in samples. Matrix concentration in multi-axial composites was counted with using two-phase medium model. It was shown that both porosity and variation of matrix concentration exert an influence on sound velocity in composite panel. The velocity was compared with value, which was counted from three-phase medium model.