

ACOUSTICS2008/2719 Laser-Ultrasonic Measurement of Stress in Metal

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Stress in metal was investigated by acousto-elastic effect. The dependence of longitudinal ultrasonic wave velocity on transverse stress was considered. A laser-ultrasonic defectoscope was used for precise ultrasonic velocity measurement. Optoacoustic transducer provides laser excitation and piezoelectric wide-band detection of ultrasonic pulse. The accuracy of the measurement exceeded 0.1% for 2 mm thick metal sample. Samples in the form of plates with the thickness of 2 to 4 mm made of aluminum and titanium alloys and stainless steel were tested. The samples were loaded quasistatically, the load was changing from zero to yield point stress. Load, deformation and velocity of ultrasound were measured. It is shown that the velocity changes significantly with the load. Some features of the velocity change under tensile stress are presented. The possibility of the local residual stress measurement with the laser-ultrasonic technology is discussed.