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Elastic Characterization of Beta-Ti15Mo by Transient Grating Spectroscopy

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Elasticity of single crystals of metastable beta-phase of the Ti15Mo alloy with particles of both isothermal and athermal omega phase was studied by the Transient grating spectroscopy. This laser-ultrasonic method utilizes a pulse infrared laser for thermoelastic generation of high-frequency surface acoustic waves (SAWs) in an examined material and a 532nm-continuous laser beam for their contactless heterodyne detection [1]. By attaching a sample to a rotational stage, an angular dispersion of SAWs can be measured. Since the hexagonal isothermal omega-phase forms from the bcc beta-phase as a result of low-temperature aging, the measurement was performed both on a sample in the solution-treated state [2] and on samples that were aged after solution treatment at different ageing temperatures (300°C, 350°C, 400°C) and durations (4h, 6h, 16h, 32h). A 360deg-angular scan of SAWs over examined samples showed that the ageing conditions affect the amount of isothermal omega particles whose presence leads to stiffening and isotropization of shear elasticity of the aged samples. All samples were measured at room temperature, the solution-treated single crystal was afterwards measured in-situ between room temperature and 83K. The effect of athermal omega phase particles on elasticity was comparable to that caused by isothermal omega particles.

Keywords: Elasticity, Laser-ultrasonics, Surface acoustic waves, Titanium alloys, Omega phase

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