Opto-acoustic excitation in three-layered system quartz substrate – metal film – liquid

Diploma thesis abstract

The direct problem of optoacoustics for a system, consisted of a metal film coating on a transparent substrate and immersed into a liquid, is solved.

The influence of a film coating thickness on the efficiency of optoacoustic excitation is analyzed. Two detection schemes are considered: the forward mode (the system is irradiated through the substrate, an acoustic signal is detected in a liquid) and the backward (the system is irradiated through the liquid, an acoustic signal is detected at the same side). The transfer functions of optoacoustic excitation for both detection modes were calculated analytically. The energy threshold of neglecting thermal nonlinearity effects during thermooptical excitation of ultrasound was estimated.

Experimental study was performed with three chrome coatings of different thickness on quartz substrate. Acetone and ethanol were used as immersion liquids. Based on the comparison of experimentally obtained and theoretically calculated transfer functions the possibility of submicron metal coating thickness determination is demonstrated.

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