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# Influence of protection layer on photoacoustic response of polymer samples — theory and experiment

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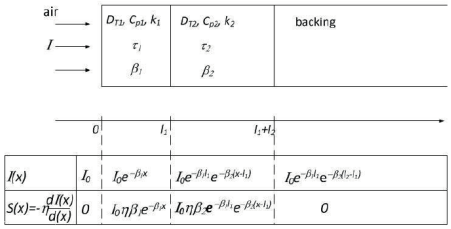
Photoacoustic techniques are useful techniques for determination thermal characteristics of individual layers of multilayered structures. Many papers that observe this problem are based on the assumption that the optically excited layer of a two-layer (or multilayered) structure is surface absorber, so that optical properties of the examined layer do not affect the measured signal.




In this work, theoretical-mathematical model of transmission photoacoustic response for two-layer samples with volumetric absorption of incident radiation is obtained. This model is derived based on the generalized theory of heat conduction and equations for temperature variations given in [1]. The geometry of the problem is presented on the figure 1. The difference from the existing models is discussed.

Fig. 1. Geometry of the problem

It is analyzed case when the examined sample is covered with a thin protection layer. The influence of the investigated sample thickness upon the selection criterion for the theoretical-mathematical model (double-layer vs. surface absorbent [2,3,4]) is analyzed. Experimental results obtained on laser-sintered polyamide samples (PA12) of different thickness, uniformly covered with the layer of ink, are presented.

Theoretical predictions are compared to experimental results. It is demonstrated that, in case of thinnest samples, the influence of protection layer cannot be neglected, which is in accordance with theoretical predictions.

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