Effective Thermal Conductivity in Quasistatic Phototermal Phenomena: The Case of the Bulk Light Absorption

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In this report, we develop our new theoretical approach of obtaining effective thermal parameters of photothermal phenomena of two-layer structures, which was discussed for the first time in [1, 2]. Now we consider bulk light absorption. For simplicity, we limited ourselves to the case of the quasistatic approximation. This approximation means that the thermal waves are so long that the phase shift is absent, so that only the thermal conductivity characterizes the photothermal process. It is shown that unlike surface light absorption, now the effective thermal conductivity has to be obtained together with effective optical parameters, such as effective coefficients of light absorption, refraction, and reflection. As a result, the effective thermal conductivity, in the general case, is dependent on both the thermal and optical parameters of the layers. The role of the thermal properties of the interface between the layers are discussed. It is concluded that, in the general case, the effective parameters are not single-valued. They depend on the manner of measurement and the point at which the measurement is made.

[1] N.M. Aguirre, G.G. de la Cruz, Y.G. Gurevich, G.N. Logvinov, and M.N. Kasjanchuk, *Physica Status Solidi (b)* **220, 7**, 781 (2000).
[2] Y.G. Gurevich, G.N. Logvinov, G.G. de la Cruz, and G.E. López, *International Journal of Thermal Science* **42**, 63 (2003).

One of the authors, Y.G.Gurevich, left his permanent place of work at CINVESTAV-I.P.N., México D.F., this year, for a sabbatical year.