Measurement of Thermophysical Properties of Spherical Samples using Photothermal Radiometry

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Motivated by increasing practical applications of photothermal technique in the measurement of thermo-physical properties of materials, we extend the applications of photothermal diagnostics by means of laser infrared photothermal radiometry (PTR) to samples with curved surfaces. Specifically, we present both theoretical and experimental PTR studies on solid spherical samples (surfaces). Based on the Green function method, the thermal-wave field distribution of a spherical surface is obtained. The characteristics of the thermal-wave field with respect to thermal diffusivity of the material, the diameter of the sample, the size of the incident beam, and the measurement angle are discussed. Experimental results show good agreement between the theory and the experiments.