Photothermal Characterization of the Thermophysical Properties of Liquids and Solids

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Photothermal techniques determine the thermal properties of materials by probing temperature variations induced by time-varying optical excitation and offer specific advantages. The dimensions of the probing region can be controlled by the frequency or time scale of the measurement and are typically of the order of millimeters, so only small quantities of sample are needed and spatially varying material features can be probed with high resolution. In this work a series of photopyroelectric configurations are presented for the determination of specific thermal parameters of liquids and solids (thermal conductivity, thermal diffusivity, thermal diffusivity and specific heat capacity). Some configurations are used to determine the frequency dependent thermal properties of glassy liquids. An interferometric method is presented which allows the imaging of the time evolution of the thermal expansion and the temperature of a sample surface after laser excitation.