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Photoacoustics and Photothermal instrumentation in the study of thermal properties of liquids and semisolids

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The fundamentals of the measurements of the thermal properties of solids and semisolids using photoacoustics and photothermal techniques are presented. It is shown that photoacoustics is a high stability technique which allows the monitoring of complex process in which the physical properties of the liquid can evolve. Additionally, it is shown that the methodology known as thermal wave cavity can be used successfully in high accuracy measurements for a wide variety of materials. In particular the case of magnetic fluids in which the viscosity can be varied, using an external magnetic fluid, is presented. It is also shown that the thermal wave cavity permits the study of magnetic fluids in which high aspect ratio particles are introduced in the fluid matrix. The effect of the orientation of non-magnetic particles inside the magnetic fluid generated by external magnetic field is also investigated. The possible applications and consequences in the development of windows of controlled thermal conductivity are discussed.