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Abstract of an invited lecture

Some recent advances in experimental identification of thermophysical properties.

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A number of materials widely used in modern industrial applications are complex media that may be dispersed ones and/or semitransparent media, and/or undergoing a phase change. The processing or the use of these materials may also involve complex heat transfer phenomena. Although many numerical and analytical methods are currently available to predict these mechanisms, the assessment of the materials thermophysical properties necessary to feed the predictive models remains a challenging research area.

The experimental characterization of conductive and radiative thermophysical properties is a strong activity of the researchers of CETHIL (the Thermal Science Centre of Lyon) a joined laboratory of INSA-Lyon, Université Claude Bernard de Lyon and CNRS.

After a brief presentation of the properties of interest and a survey of experimental methods most commonly in use to determine these properties, the talk will be focused on three examples of thermophysical properties identification which are currently under development at CETHIL and for which some promising results have recently been obtained. One concerns thermal radiative properties of solid dispersed media, the second deals with the retrieval of temperature, gas concentrations and volume fraction of soot particles in a combustion medium. The third example deals with thermal conductivity, heat capacity and phase change enthalpy of a material which is undergoing a liquid to solid phase change. In each case several properties are simultaneously identified from experiments which have been carefully designed by using a parameter sensitivity analysis. Some typical results will be shown to illustrate the capabilities of these methods and remaining problems to be solved.