

Specific Heat Measurements by a Thermal Relaxation Method: Influence of Convection and Conduction¹

H. Valiente,² O. Delgado-Vasallo,³ R. Abdelarrague,⁴ A. Calderón,^{4, 5}
and E. Marin^{4, 6}

This paper involves the well-known thermal relaxation method for measurement of the specific heat (c) of thin solid samples. Although this method was applied successfully in recent years for the characterization of different materials, in this work some aspects that must be taken into account in order to avoid problems based on satisfying the required experimental conditions of heat flux imposed by the physical model used for data analysis and processing will be discussed. For this purpose, for a given experimental geometry, the heat diffusion equation will be solved in order to obtain the sample's requirements for reliable measurements of c , regarding its thickness and thermal conductivity. An experimental device is described that can be used for the study of the influence of heat dissipation by convection on the method. A computer simulation was performed for comparing the simple model with one that takes into account the gradient of temperature inside the sample. The results of measurements are presented.

KEY WORDS: heat conduction; heat convection; specific heat capacity.

¹Paper presented at the Seventeenth European Conference on Thermophysical Properties, September 5–8, 2005, Bratislava, Slovak Republic.

²Centro de Aplicaciones Tecnológicas y Desarrollo Nuclear (CEADEN), Calle 30 #502, Playa, La Habana, Cuba.

³Universidad de La Habana, Instituto de Materiales, San Lázaro y L, Vedado 10400, La Habana, Cuba.

⁴Centro de Investigación en Ciencia Aplicada y Tecnología Avanzada del IPN, Legaria 694 Colonia Irrigación, 11500 México D. F., Mexico.

⁵To whom correspondence should be addressed. E-mail: jcalderona@ipn.mx

⁶Part of this work was performed when the author was at Universidad de La Habana, Facultad de Física, San Lázaro y L, Vedado 10400, La Habana, Cuba.