

Thermal Conductivity Measurements along Out-of-Plane and In-Plane Directions by Steady-State and Flash Diffusivity Methods

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The paper will discuss several approaches of employing the Steady-State Method and Flash Diffusivity Method for thermal conductivity measurements of plastic materials along the out-of-plane and in-plane directions. The heat flow meter method is easy-to-use due to the direct measurement of thermal conductivity by contrast to the flash method in which most of plastic samples have to be coated with a layer of metal thin film on both end surfaces of the samples to make them opaque. A method of multiple layer analysis with the heat flow meter can be used to measure thermal conductivity of very thin samples. If the materials are not available in a large size, which are required by the heat flow meters, the flash method offers a viable alternative. The flash method measures thermal diffusivity that is related to thermal conductivity by specific heat and density. Specific heat can be determined either by the flash method or DSC. With a laminate holder, the in-plane thermal diffusivity measurement can be carried out with the flash method to obtain in-plane thermal conductivity. The extension of in-plane thermal diffusivity/thermal conductivity measurement by the flash method on a single thin film is discussed as well.