Reliability of PMMA Measured by Guarded Hot Plate, Contact Pulse Transient Method, Hot Bridge Method and DSC

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Global heating highlights the importance of effective thermal insulation materials used e.g. in industrial and private building technologies. This challenge can only be met by the development of a range of new materials as well as different reliable testing methods. The variety in macrostructures of thermal insulation materials on the one side and the use of new highly productive testing methods on the other side induces the search for appropriate certified reference materials (CRM) working in the range of thermal conductivities and temperatures that correspond to the technology needs. The CRM's are a prerequisite of the reliability of the testing methods especially when comparative methods are used that are based on various different principles. Therefore, minimization of experimental data uncertainty is a crucial problem that affords looking on physics behind the measuring process and the heat transport in the materials tested.

Polymethylmethacrylate (PMMA) is a promising candidate CRM for thermal conductivity, thermal diffusivity and specific heat measurements. Its tabulated thermal conductivity value is 0.19 W/(m K) at 25 ^{o}C. However, recent experimental data indicate discrepancies that may arise from the following reasons:

- PMMA might show structural relaxation effects.
- Radiative heat transport might influence experimental data on thermal conductivity.
- Finally, the principal question exists how far can be data from different techniques agree among each other.

The present contribution discusses:
- the difference in the measuring regimes of classic and transient methods,
- possible effects of the structural relaxation of the material and radiative heat transfer considering measuring regime of the individual methods.

The objective of our presentation is to demonstrate the limits in the measuring regime, specimen size, temperature range and heat treatment to obtain reliable thermophysical data of the PMMA.