APPLICATION**NOTE**

Thermal Diffusivity of Extremely Thin Polymer Films

Fabia Beckstein

1 LFA 467 *HyperFlash*®

Introduction

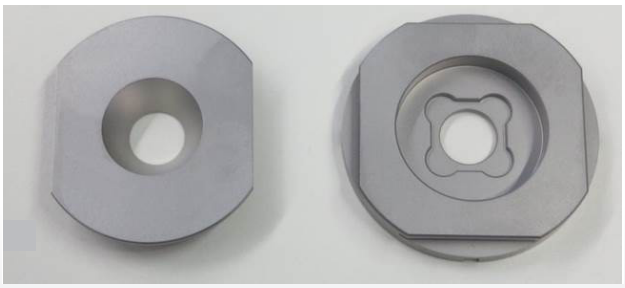
Determination of the thermal conductivity of thin polymer films by means of the laser flash method is mainly limited by two factors:

- Sample thickness: Related to this are very short measurement times
- Scattered light of the flash lamp: Due to the small mass, the sample is not ideally located in the sample holder

A solution to this offers the LFA 467 *HyperFlash*® (see figure 1). Due to its high data acquisiton rate of 2 MHz, a short pulse time (up to 20 µs) and a special sample holder for thin samples (see figure 2), measurements on samples with a small thickness can simply and quickly be realized.

Measurement Conditions

An approximately 20 µm-thick polymer film was measured by means of the LFA 467 *HyperFlash*® between -40°C and 140 °C. In order to obtain an opaque sample, gold was sputtered onto the film prior to the measurement. Using graphite as a coating material is not recommended for such thin samples since it might influcence the measurement results. More information on the optimal coating of samples can be found under [1].



Special sample hoder for thin films:
on the left: lid - on the right: sample holder

NGB · Application Note 097 · E · 01/16 · Technical specifications are subject to change.

NETZSCH-Gerätebau GmbH
Wittelsbacherstraße 42 · 95100 Selb · Germany
Phone: +49 9287/881-0 · Fax: +49 9287/881505
at@netzsch.com · www.netzsch.com

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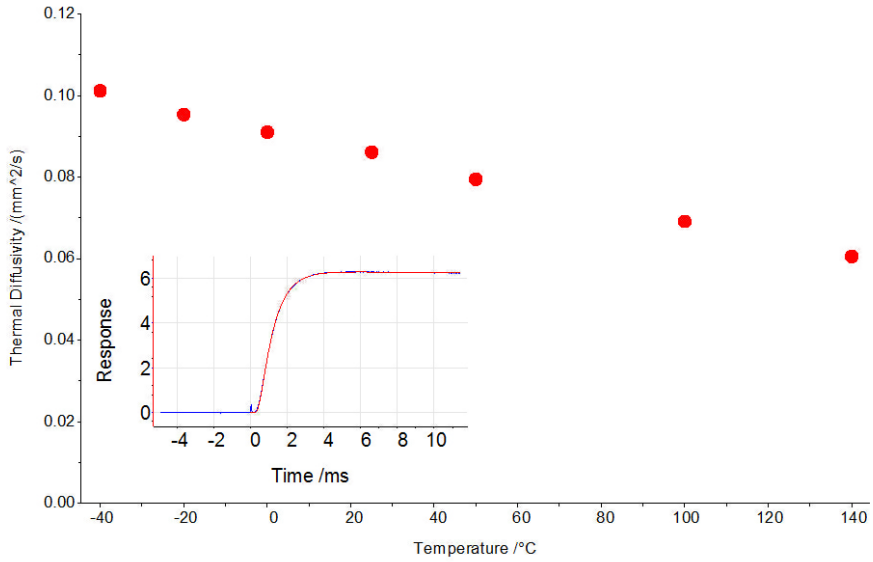

3 Thermal diffusivity of the PP film from -40°C to 140°C

Measurement Results and Discussion

Figure 3 shows the thermal diffusitiy of the polymer film dependent upon temperature and the detector signal of a measurement. The detector signal (blue curve) can be well depicted by the mathematical model (red line). The high data acquisition of 2 MHz und a short pulse time of approx. 20 µs guarantee that very short half times (< 1 ms) can also be accurately resolved. The sample holder additionally reduces the scattered light to a minimum so that evaluation of the signal with such short half times becomes possible.

For determination of the specific heat capacity of very thin samples, a DSC measurement is recommended. Along with the density data, the thermal conductivity can then also be determined.

Literature

[1] Application Note 066: When and How Must Samples Be coated During LFA Measurements?

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Wittelsbacherstraße 42 · 95100 Selb · Germany
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