APPLICATION **NOTE**

Why Does It Makes Sense to Determine the Thermal Conductivity of Elastomers Using the LFA 467 *HyperFlash®*?

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Introduction

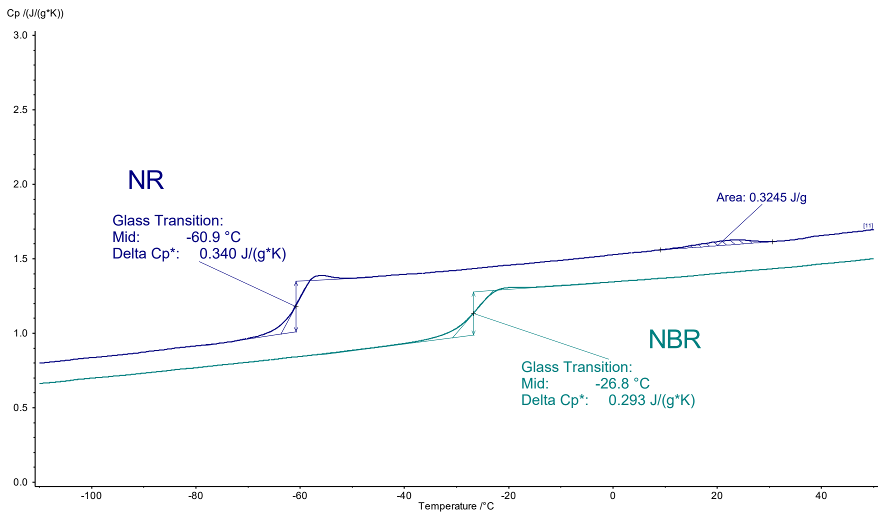
In the case of elastomers, the thermophysical properties below room temperature often need to be known. For example, elastomers are frequently used as seals in components or machine parts, and thus, the lower temperature limit becomes relevant. In most cases, it is of interest to understand in which temperature range an elastomer material can still reliably fulfill its function in the respective application range.

Experimental

The LFA467 *HyperFlash®* can cover a temperature range of -100°C to 500°C with only one furnace. The following measurements show the thermal conductivity of two elastomers (NBR and NR), investigated between -100°C and 60°C. Measurements in the low-temperature range (T<0°C) require the MCT detector (Mercury-Cadmium-Telluride) and a liquid-nitrogen cooling (in this case, the NETZSCH CC300 cooling system) without having to modify the furnace. The specific heat capacity was determined by means of the DSC 204 ***F1** Phoenix®*.

Measurement Results

Figure 1 shows the specific heat capacity of the two samples. As usual for elastomers, the glass transition is below RT (NR = -60.9°C; NBR = -26.8°C) and appears as a step in the c_p curve. The thermophysical properties of the two



1 DSC measurement for determination of the specific heat capacity of two elastomer samples

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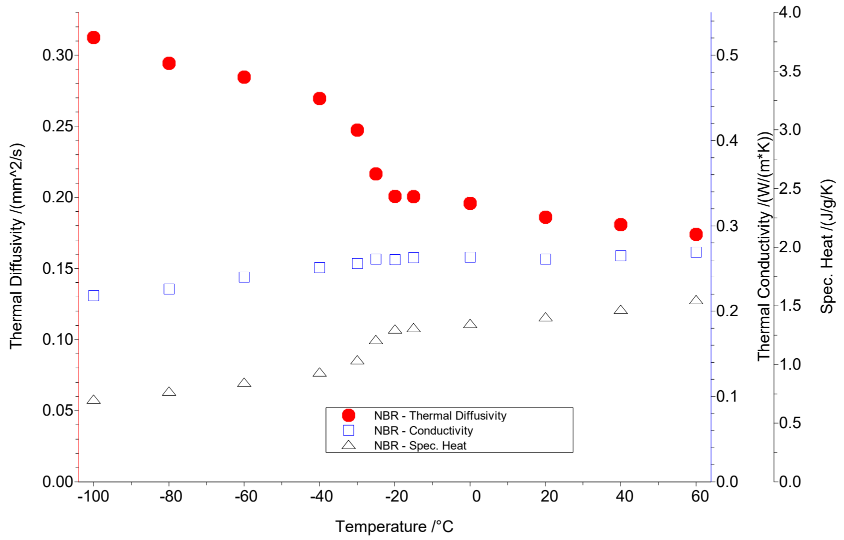
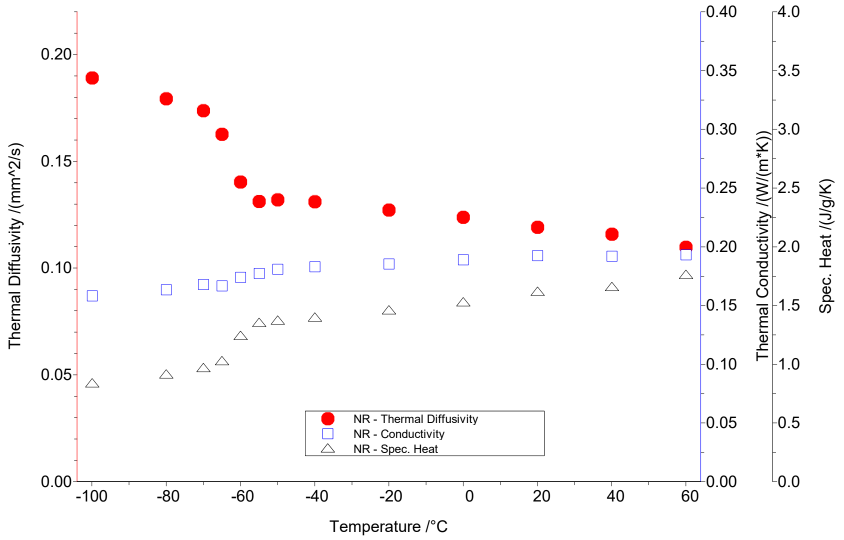
elastomer samples – the thermal diffusivity, thermal conductivity and the specific heat capacity – are compared in figures 2 and 3. In the LFA measurement, the glass transition can be seen through a clear decrease in thermal diffusivity. The thermal conductivity, on the other hand, rises almost linearly with increasing temperature and shows no significant step.

Summary

Elastomers often contain fillers for improvement of the physical properties and aging resistance. With the help of the two methods LFA and DSC, their thermophysical properties can be determined even in the low-temperature range, not only as a function of the material composition, but also with regard to the type and amount of filler.



2 Thermophysical properties of the NBR sample: Direct measurement of the thermal diffusivity by means of LFA and the specific heat capacity by means of DSC along with the thermal conductivity determined therefrom



3 Thermophysical properties of the NR sample: Direct measurement of the thermal diffusivity by means of LFA and the specific heat capacity by means of DSC along with the thermal conductivity determined therefrom

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