APPLICATION**NOTE**

Aereated Concrete – Laser Flash Analysis (LFA)

Improving Efficiency Through Thermal Insulation: Thermal Conductivity Measurement on Aereated Concrete by Means of LFA for Energy-Efficient Buildings

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Introduction

Aereated concrete is a versatile building material, widely used in the construction industry due to its light weight and good insulating properties. Its structure consists of fine air pores, generated by chemical processes during production. Aereated concrete is often used in the form of blocks, plates or elements. Thanks to its thermal insulation, Aereated concrete is particularly well suited for energy-efficient buildings. It is also easy to process, making it a popular material in the building industry.

Knowledge of the thermal conductivity of aereated concrete is crucial to evaluating its insulation properties for energy-efficient buildings and achieving minimized heating and cooling . This enables building designers to select suitable materials for meeting legal requirements for energy efficiency and improving living comfort.

Laser or Light Flash Analysis (LFA) is a recognized method for determining thermal diffusivity; in turn this, along with density and specific heat capacity, allows for calculation of the thermal conductivity. Actually, ideal samples for an LFA measurement consist of solid, non-porous materials. By selecting the appropriate analysis model (here, the *Penetration* model), partially porous materials such as aereated concrete can also be characterized.

The advantage of LFA over the frequently used plate-type devices (heat flow meter and guarded hot plate) is the small sample size. Even small quantities, which are often used in research and development, can be examined without any difficulty.

Experimental

An LFA sample (ø 12.7 mm; thickness: 4 mm) was tested at 25°C, 50°C and 75°C in the LFA 717 *HyperFlash*®. The density was determined via mass and volume at room temperature and the specific heat capacity (c_p) by means of the DSC method.

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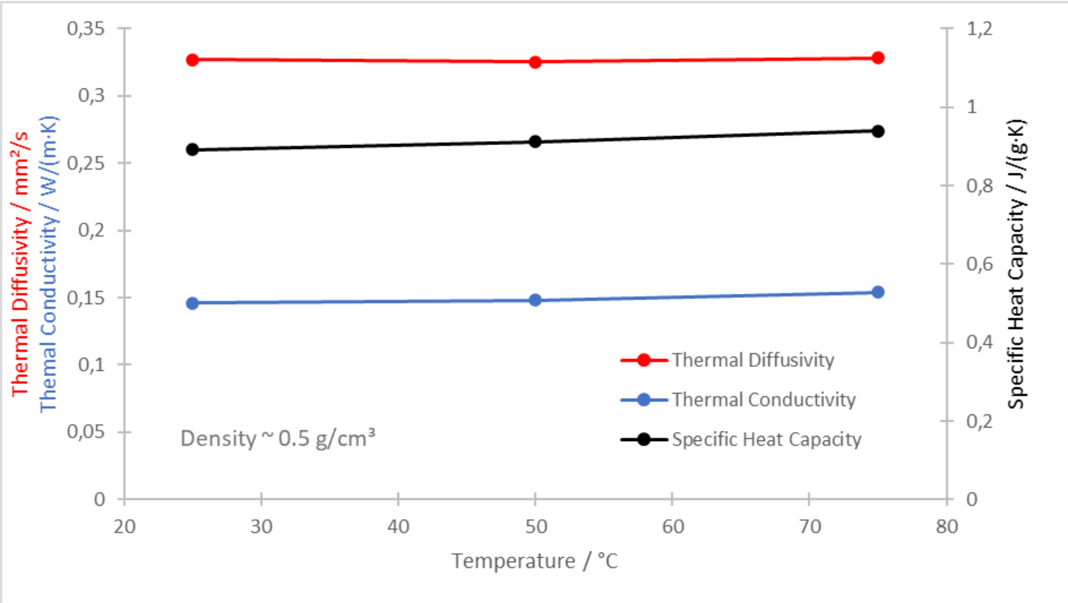
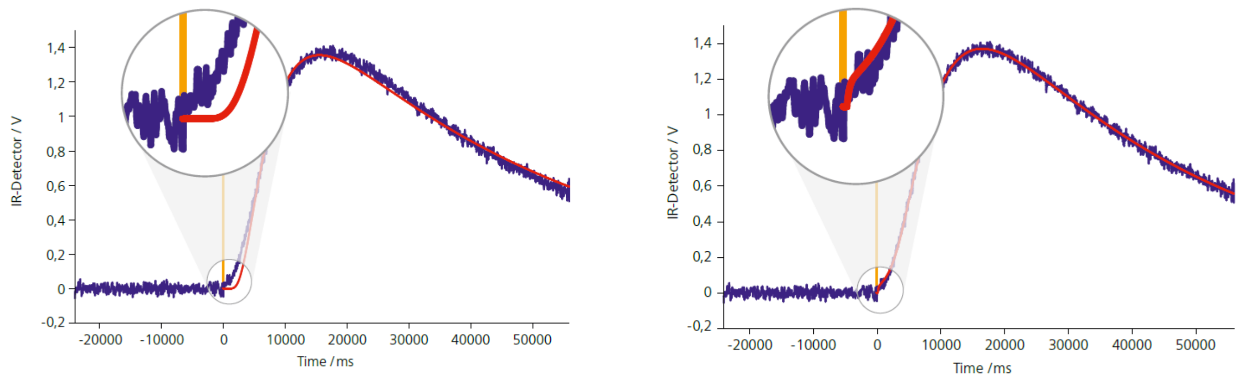


1 Thermophysical properties of aereated concrete.



2 Detector signal of aereated concrete. Evaluation by means of the *Standard* model (left) and the *Penetration* model (right).

Results and Discussion

Figure 1 shows the thermophysical properties of aereated concrete between 25°C and 75°C. The thermal conductivity shows a slight increase with temperature. This is typical behavior for porous materials, as radiative heat transfer increases at higher temperatures.

The LFA signals were evaluated in the *Proteus®* software using the *Penetration* model.This model assumes that energy penetrates the sample through the pores. This is particularly evident at the beginning of the signal; see figure 2. The *Penetration* model is a better fit to this increase than the *Standard* model, which assumes that energy is only absorbed at the surface of the sample.

Summary

The measurements with the LFA 717 *HyperFlash®* demonstrate that it is also possible to characterize the thermophysical properties of samples with a porous surface when applying the appropriate model. This is beneficial for the development of new thermal insulating materials such as aereated concrete and helps increase the efficiency of thermal insulations.

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