DIFK Deutsches Institut für Feuerfest und Keramik GmbH

Thermal Conductivity

All tests at our Institute are conducted by experts. Our employees include specialists from the fields of physics, chemistry, and mineralogy as well as material testing and technology.

Further testing methods are:

- Rotary Kiln Test
- Gas Permeability of Refractories at Elevated Temperature
- Gas Corrosion Tests for Reducing Media
- Induction Melting Aggregates
- Wedge-Splitting Test
- Quantitative Oxidation Test
- Friction Wear
- Blast Wear
- Computer-Aided Thermochemistry

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DIFK Deutsches Institut für Feuerfest und Keramik GmbH

We are a central institute with more than 50 years of experience in all areas of refractories technology. We are absolutely committed to neutrality and are therefore a partner to all companies working in refractories technology.

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Thermal Conductivity

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The thermal conductivity of ceramic materials is of great importance in many industrial applications like the lining and insulation of furnaces and materials in heat exchangers.

At the DIFK GmbH the thermal conductivity of refractories is measured by the hot wire methods according to **ISO 8894-1 (cross wire and resistance techniques)** and **ISO 8894-2 (parallel wire techniques)** up to 1250°C. The parallel wire technique also makes possible to determine the thermal diffusivity and the heat capacitiy.

By the use of a special equipment the parallel wire technique can also applied to samples with high electric conductivity.

Three testing facilities are available. The boundaries of this technique with regard to the smallest sample geometries have been determined. In the case of small samples, the resistance technique is in advantage.

A different method to determine the thermal conductivity of refractories is the **calorimeter method according to ASTM C201** and its extensions for bricks (ASTM C202)insulation bricks (ASTM C182) and unshaped refractories (ASTM C417). The advantage of this method is the ability to measure the thermal conductivity in distinct directions of anisotropic materials. Two test facilities are available.

In addition the method according to Dr. Klasse ist used. This is a comparative method by which the sample is compared to a reference with known thermal conductivity.

To determine the thermal conductivity at temperatures up to 1600°C, the method of Monotonic Heating is established at DIFK. The result of the test is the thermal diffusivity as continous curve. The thermal conductivity is calculated from the known specific heat, the bulk density and the measured thermal diffusivity.

This method is also capable to detect phase transformations like chemical reactions, the crystallization of phases or the formation of melts very sensitively within the original sample. No processing like powderization is necessary for this.

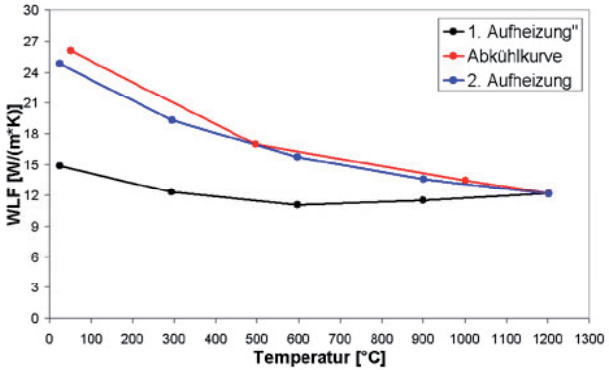

Fig. 1: The thermal conductivity of a castable containing SiC during the first heating, the following cooling and the second heating. Measured by hotwire-parallel-wire.

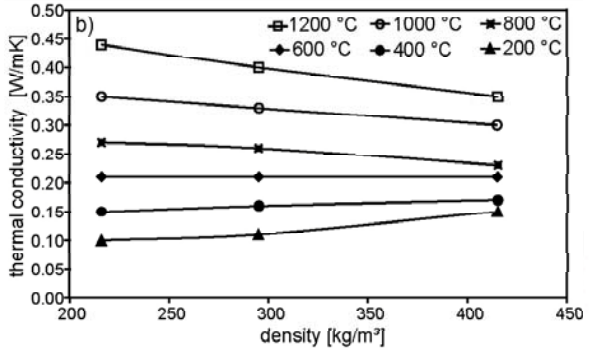

Fig. 2: The thermal conductivities of high temperature insulation wool depending on the bulk density (compression) and the temperature. Measured by the method of Monotonic Heating.