DYNAMIC MEASUREMENT OF SPECIFIC HEAT ABOVE 1000 °C

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Many branches of industry, such as space, aeronautic and nuclear industry, rely on high temperature applications above 1000 °C. New materials are developed to work at even higher temperatures up to 3000 °C to optimize processes or to increase the working temperature range and the product reliability. Accurate data on their thermophysical properties is needed to evaluate these materials and for the optimization and design of new high temperature applications.

At PTB a novel technique for the measurement of the specific heat of solid, opaque materials at temperatures above 1000 °C has recently been developed. This was achieved by a significant improvement of PTBs dynamic emissivity measurement. The modified laser-flash setup uses coated samples, which are inductively heated, and combines radiometric and calorimetric approaches. The spectral emissivity of the applied coating has been investigated and allows for a radiometric measurement of the temperature rise of the backside of the sample after heating the frontside with a short, high energy laser pulse. The incident laser energy is measured absolutely and in situ for each laser pulse via a beamsplitter and a calibrated laser power meter. The specific heat of the sample can then be determined from the mass of the sample, the absorbed laser power, and the adiabatic temperature rise.

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