Using a modified laser flash apparatus to measure spectral emissivity

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The precise knowledge of the spectral emissivity is essential for industrial radiation thermometry and the design of high temperature applications and the modelling of radiative heat transfer. It becomes increasingly important at elevated temperatures above 1000 K where the heat transfer is dominated by radiation.

In recent years, the PTB developed a new measurement technique for the spectral emissivity, the so called dynamic emissivity measurement (AdεM) [1]. The measurement is based on a laser flash set-up – a well-established method for determining the thermal diffusivity [2]. The setup is modified to measure *in situ* the absolute laser energy, used to pulse heat the sample, and the absolute temperature rise of the rear side of the sample.

Recently, the conventional tube furnace was replaced with an inductive heating system, which allows for the sample to be heated in a cold environment. Any interreflections between hot furnace walls and sample are therefore minimized, which allows to reduce the measurement uncertainty especially for samples with a reflecting surface (i.e. smaller emissivity).

In this set-up, a characterised array spectrometer allows for a spectral emissivity measurement in the spectral range between 550 nm to 1100 nm.

[1] Krenek, S., Gilbers, D., Anhalt, K., Taubert, D. R., & Hollandt, J. (2015). A Dynamic Method to Measure Emissivity at High Temperatures.*International Journal of Thermophysics*,***36***(8), 1713-1725.

[2] Parker, W. J., Jenkins, R. J., Butler, C. P., & Abbott, G. L. (1961). Flash method of determining thermal diffusivity, heat capacity, and thermal conductivity.*Journal of applied physics*, ***32***(9), 1679-1684.