

SRM for Calibration of a Laser Flash Instrument at High Temperatures

U.V. Mardolcar^{C,S}

Departamento de Física and Nucleo de Termofísica, Instituto Superior Técnico, Lisboa, Portugal
pcumesh@alfa.ist.utl.pt

C.A. Castro

Departamento de Química e Bioquímica, Faculdade de Ciências da Universidade de Lisboa, Lisboa, Portugal

This paper presents thermal diffusivity measurements of several materials at high temperatures. Some of these samples are accepted or proposed for SRM at high temperatures. The measurements were performed using the laser flash technique [1].

Poco graphite AXM was studied in an extended temperature range, from room temperature up to 2200 °C. Several samples of this material were studied including a recommended NIST sample. This material has the advantage of being stable in a wide temperature range. However graphite has the problem of purity and its high thermal diffusivity makes it not suitable when the instrument is supposed to work with isolating materials. Pyroceram 9606 has a value of thermal diffusivity one order of magnitude lower than graphite. One of the main limitations is the temperature range. It was studied up to 1000 °C.

We have also studied metals such as Stainless Steel and Copper up to 1000 K. Problems of purity and internal structure changes are discussed.

The paper also presents results of thermal diffusivity of fused silica up to 1000 K. The experimental data were adjusted by non linear curve fits. The coefficients as well as the standard deviation of the fits are presented. The results are compared with the available data in the literature. However when we compare data from different laboratories, usually the deviations are beyond the claimed accuracy by the authors.

Most of the data used for the comparisons are measured by laser flash instruments as these apparatus are accepted as the ones that provide more reliable results at high temperatures. Deviations from the ideal model are discussed.

Present work shows the urgent need for calibration procedures and standard recommended materials, especially low thermal diffusivity materials.

[1] W. J. Parker, R. J. Jenkins, C. P. Butler and G. L. Abbott, *J. Appl. Phys.* **32**, 1679-1684 (1961).