

Comparison of Thermal Diffusivity Apparatus at Very High Temperatures (2500°C) Demonstrated using Isostatic Graphite

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New metrological facilities for high temperature measurements of thermophysical properties have been developed by European National Metrology Institutes (NMIs), during the joint research project "MetroFission"[1]. These instruments were initially developed to provide reliable measurements up to 2000 °C and to improve the traceability of measurements to the International System of Units (SI). The original validation of these reference facilities, carried out by measuring the thermal properties of an homogeneous material (isostatic graphite), showed that the results obtained were in agreement with literature data. The LNE diffusivimeter has recently been further modified to enable the measurement of thermal diffusivity of solid materials up to 2500 °C, by integrating a new inductive furnace in the existing setup. This paper describes an initial study to compare thermal diffusivity measurements from a commercially based apparatus Netzsch LFA427, with measurements up to 2500°C from the improved NMI diffusivimeter at LNE. The isostatic graphite recommended as a reference material for thermal diffusivity determination, has been characterised on an apparatus based in an industrial setting, normally used for quality control purposes. The extended temperature range of the commercial apparatus (2800°C) made it possible to obtain values for the reference material at higher temperatures than explored within the Metrofission project, and the impact of alternative shielding gases on the resultant thermal diffusivity is described.

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References

[1] Hay, B.; Anhalt, K. ; Chapman, L. ; Boboridis, K. ; Hameury, J. ; Krenek, S. ; Vlahovic, L. ; Fleurence, N. ; Benes, O. Traceability Improvement of High Temperature Thermal Property Measurements of Materials for New Fission Reactors IEEE Transactions on Nuclear Science, (Volume:PP , Issue: 99)