

Towards accurate measurements of specific heat of solids by drop calorimetry up to 3000°C

Refat Razouk

French National Metrology Institute (LNE), 29 av Roger Hennequin, 78197 Trappes, France

The French National Metrology Institute has modified a laser-flash high temperature diffusivity meter in order to perform measurement of specific heat of solids by drop calorimetry using the same high-temperature inductive furnace and pyrometers of the diffusivity meter. The sample, held by automated pliers using a thin wire, is heated by the inductive furnace and dropped into a differential heat-flux Calvet calorimeter maintained at near ambient temperature. This calorimeter is equipped with an in-situ electrical calibration system in order to perform accurate and reliable measurements of heat released by the sample directly traceable to the International System of Units (SI). This electrical calibration system has been designed to enable the calibration of the calorimeter by electrical substitution (Joule effect) and to remain in-situ during the drop of the heated sample keeping exactly the same experimental conditions during both steps of calibration and measurement. A calibration & measurement procedure was established in order to measure the enthalpy increments of solids at temperatures higher than 1000 °C. The first results obtained on the specific heat of α -alumina (SRM-720), tungsten, and the enthalpy of fusion of pure copper are in good agreement with literature values.

Keywords: Drop calorimetry, enthalpy increments, calibration, and metrology.