MEASUREMENTS OF ABSORPTIVITY OF MELTS AND CRYSTALS AT HIGH TEMPERATURE

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Experience on measurement of absorption with a method, termed as reflection from a mirror in a melt [1,2] (RMM method) is analyzed. The principle of the method is placing a sample on the mirror heated together with the sample up to high temperature. Infrared radiation (IR) is directed to the sample. IR-radiation goes through the sample, reflects from the mirror, again passes through the sample, and gets into the IR-detector.

The absorptivity (k) is determined from comparison of radiation intensity passing through samples with different thicknesses. For small value of sample reflectivity the next expression was used to find k:

$$k = \frac{\ln I_1 / I_2}{2 (d_2 - d_1)}$$

where $I_{1,2}$ are IR-radiation intensities passed through sample of thickness d_1 and d_2 correspondingly. In general case to find k a more complicated expression was used [1,2].

The measurement features of spectral absorptivity of semitransparent media for the temperature range 300 – 2500K are discussed. Particular attention is given to a technique of absorption measurements for high-temperature melts in the near infrared spectrum (1 - 15 μm). The data accuracy equals to 12 - 15%. The data on spectral absorptivity of melts and single crystals of oxides, fluorides and other materials are analyzed.

From these data the conclusion is drawn that the experimental conditions strong influence on the absorptivity value of the melt. The data, obtained by the author, are compared with the well-known data. It is pointed to the fact that, in specific cases, for computations of heat transfer, it is possible to use data obtained for crystals at room temperature; however, such approach is not universal and can result in a serious error in computations of the heat flux by radiation.

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