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NORMAL SPECTRAL EMISSIVITY OF THE INDUSTRIALLY USED ALLOY HS2-9-1-8 AT 684.5 nm

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The Subsecond Thermophysics Workgroup at TUG uses a fast pulse-heating system, which allows the determination of normal spectral emissivity under pulse heating conditions. Although mainly intended for the investigation of thermophysical properties such as electrical resistivity, specific heat capacity and density of solid and liquid metals and alloys as a function of temperature, the apparatus can also be used for measuring normal spectral emissivity at melting and in the liquid phase. For this purpose, a laser polarimeter, proposed and later in the 1980's developed by R. M. A. Azzam for the determination of optical constants without any moving parts, was adapted for this µs-pulse heating experiment.
By recording the change in polarization of a laser beam reflected off the surface of the wire-shaped sample material during a pulse heating experiment, and evaluating data using the Stokes formalism, measurements of temperature-dependent normal spectral emissivity at the used laser wavelength are possible. As knowledge of emissivity and its behaviour throughout the liquid phase does improve the temperature determination, industry and especially the industrial cooperation partner Böhler Edelstahl GmbH & Co KG is interested in emissivity data for numerical simulations of plastic deformation and remelting processes as well as for process optimisation.

There are three different liquid state behaviours of normal spectral emissivity at 684.5 nm that occurred in numerous experiments with various sample materials, namely increasing, decreasing and constant emissivity with increasing temperature. It's obvious that the behaviour of normal spectral emissivity in conjunction with the radiometric temperature measurement is needed to achieve reliable thermophysical properties of liquid metals, and that's the main target of the present investigations.

Within this paper normal spectral emissivity data at 684.5 nm for HS2-9-1-8 steel at melting and in the liquid state is presented.

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