

Electrical Resistivity of Inconel 625 Measured by Millisecond Pulse-Heating in Comparison to Thermal Conductivity at Elevated Temperature

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Electrical resistivity of Inconel 625 was measured by millisecond pulse-heating in the temperature range from room temperature to the melting point at approximately 1300 °C. The measurement results of electrical resistivity as a function of specific enthalpy were combined with results of specific heat capacity measurements by differential-scanning calorimetry to obtain the relation between resistivity and temperature. Additionally, to electrical resistivity and specific heat capacity, thermal diffusivity, density at room temperature, and thermal expansion were measured. From these results, thermal conductivity was calculated. Using the results of thermal conductivity and electrical resistivity, a Smith-Palmer-plot can be drawn. It shows a significant deviation from the Wiedemann-Franz law with the Sommerfeld value mainly due to the lattice component and electron scattering by solute atoms, as well as other smaller contributions.