Measurements of Selected Thermophysical Properties of the Alloy 53Nb-47Ti in the Range 1500 to 2100 K by a Millisecond-Resolution Pulse-Heating Technique

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Measurements of enthalpy, specific heat capacity, electrical resistivity, hemispherical total emissivity, and normal spectral emissivity of the binary alloy 53Nb-47Ti in the temperature range 1500 to 2100 K are described. The method is based on rapid resistive self-heating of a rod-shaped specimen from room temperature to the maximum temperature of interest by the passage of a subsecond-duration electrical current pulse through the specimen and on simultaneously measuring the pertinent experimental quantities. The experimental quantities yield: current through the specimen, voltage drop across the specimen, and specimen temperature. Current is determined from the measurement of the voltage drop across a standard resistor placed in series with the specimen. Voltage drop across the middle one third of the specimen is measured between spring-loaded knife-edge probes. Temperature is determined from the measured radiance temperature and normal spectral emissivity. Radiance temperature is measured with a high-speed pyrometer and normal spectral emissivity is measured with a high-speed laser polarimeter. The experimental quantities are recorded digitally every 0.5 ms with a full-scale resolution of about one part in 8000. The results are presented and the significant points are discussed.