Radiance Temperature and Normal Spectral Emittance (in the Wavelength Range of 1.5 to 5 μm) of Nickel at its Melting Point by a Pulse-Heating Technique

K. Boboridis[C,S]
Department of Physics, University of Cyprus, Nicosia, Cyprus
bobo@ucy.ac.cy

A. Seifter and A.W. Obst
Physics Division, Los Alamos National Laboratory, Los Alamos, New Mexico, U.S.A.

D. Basak
Space Systems Group, Orbital Sciences Corp., Dulles, Virginia, U.S.A.

The radiance temperature of nickel at its melting point was measured at four wavelengths (in the range of 1.5 to 5 μm) by a pulse-heating technique using a high-speed fiber-coupled four-channel infrared pyrometer. The method was based on the rapid resistive self-heating of a specimen from room temperature to its melting point in less than 1 s, while simultaneously measuring the radiance emitted by it in four spectral bands as a function of time. A plateau in the recorded radiance-versus-time traces indicated melting of the specimen. The melting-point radiance temperature for a given specimen was determined by averaging the temperature measured along the plateau at each wavelength. The results for several specimen were then, in turn, averaged to yield the melting-point radiance temperature of nickel as follows: 1316 K at 1.77 μm, 1211 K at 2.26 μm, 995 K at 3.48 μm, and 845 K at 4.75 μm. Finally, the melting-point normal spectral emittance of nickel at these wavelengths was derived from the measured radiance in each spectral band and the published value of the thermodynamic (true) melting temperature of nickel.