

Spectrometer System for Characterization of Thermo-reflectance of Metals

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Thermo-reflectance methods based on the measurement of the temperature-dependent reflectivity of the surface have been applied successfully to the thermophysical property measurements and the thermal characterization of solids. The authors have developed recently a surface temperature measurement technique using a confocal microscope with a cw laser beam. In this paper we present a new spectrometer system for studying wavelength and temperature dependence of the reflectance of metals at visible and near infrared wavelength region. The spectrometer consists of a lamp source, a single grating monochromator and a specially designed double-beam optics with a rotational sector mirror for reflectance measurement. The signal beams reflected on the tested and the reference surfaces are detected alternately by a photo-multiplier tube with an integrating sphere and analyzed by a lock-in-amplifier. By changing temperature of the tested sample, temperature dependence of spectral reflectance of the sample can be measured in the temperature range up to 200 °C and in the wavelength range from 400 nm to 850 nm. Provisional measurement results show that $dR/dT = 6.2 \times 10^{-5}$ for an aluminum specimen at the wavelength of 700 nm near room temperature.