

Material Directional Spectral Emissivity Measurement at High Temperature

Yanming Guo, Yong Shuai^{C, S} and Heping Tan

*Key Laboratory of Aerospace Thermophysics of MIIT, HIT School of Energy Science and Engineering,
Harbin Institute of Technology, Harbin, China
shuaiyong@hit.edu.cn*

Emissivity is a significant parameter to describe the thermal radiation characteristics of objects. It has important applications in thermal control of spacecraft, highly efficient use of solar energy, building energy insulation and saving, and so on. Besides, more attention is attached to selective control of thermal emission by using micro/nanostructures. In this work, to measure directional spectral emissivity, a measurement facility is developed which includes a sample heating unit with temperature control, a blackbody source, mirror assembly, and a Fourier transform infrared spectrometer with different detectors. A sample heating unit is designed, and by using ceramic electric heaters, samples can be heated up to 1400 K at a high heating speed. And a new kind of water-cooled surface of the sample heating unit is designed to reduce the error by reducing the thermal radiation from the surface of the heating unit so that the measurement accuracy is improved. An electro-controlling rotating stage is adopted and the measuring angle is up to 60 degrees. A SiC wafer is used as the reference to test the directional spectral emissivity measurement facility and the error is evaluated. Different kinds of microstructure paintings directional emissivity spectra are measured as temperature increases and their performances are evaluated.