

High Temperature Emissivity of High Purity Titanium and Zirconium

G. Teodorescu,^{C,S} P.D. Jones, R.A. Overfelt, and B. Guo
Materials Engineering Department, Auburn University, U.S.A.
teodoge@auburn.edu

The normal spectral emissivity of high purity (99.99%) titanium and zirconium at temperatures above 1000 °C was determined in high vacuum conditions ($< 10^{-7}$ Torr) and for a very broad spectral range from 1 to 16 microns. The normal spectral emissivity was determined by comparing the radiative fluxes of the sample and a blackbody radiating cavity under the same conditions. The experimental setup not only avoids sample oxidization, due to the high vacuum level, but also prevents sample contamination easily encountered by samples heated in a crucible. Sample positioning is performed by suspension inside a copper induction coil, where the samples can be electromagnetically heated. The normal spectral emissivities of titanium and zirconium are found to decrease monotonically with increasing wavelength, and to increase slightly with increasing temperature, indicating no departure from metallic behavior. The maximum uncertainty in emissivity was found to be less than 4 %. The broad spectral range of reported emissivities is then used to determine the total hemispherical emissivity. The measured spectral normal emissivities were compared to published values, although very little work has been done in the infrared region.