

Oxidation Effect on the Spectral Emissivity of Ni-Based Alloys: Iron and Tungsten Carbide/Cobalt

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Knowledge of the emissivity is of great importance in order to determine and optimize the radiative properties of materials. Depending on the application, the aim can be to decrease or increase the emissivity. In other applications, its value is needed to allow an accurate radiometric measurement of the temperature. Moreover, the emissivity shows a strong dependence on oxidation, so it is crucial to characterize the oxidation effect on the emissivity since, in most cases, the materials undergo an oxidation process or were previously oxidized in their conditions of use.

In this work, the spectral directional emissivity was studied in several samples: Ni-based alloys, CW-Co, and pure iron. In some cases, samples with different surface roughnesses were considered. The emissivity measurements were carried out by the direct radiometrical method, using a Fourier Transform Infrared spectrometer (FT-IR). Spectral normal emissivity values between approximately 200 and 700 °C and for wavelengths between 2 and 22 μm were obtained. The difference between the oxidized and non-oxidized states is shown. In addition, in situ isothermal measurements were made during the oxidation. This allowed us to measure the kinetics of the oxidation process.