A New Experimental Device for Spectral Directional Emissivity Measurements

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A new spectral directional emissivity measurement device for opaque samples has been designed and mounted at the University of the Basque Country, in Spain. The experimental set up measures the emissivity of a sample by the direct radiometric method, using the signals from the sample, blackbody, background, and the corresponding temperatures.

The measuring temperature range is between 200 ºC and 800 ºC. The sample is heated up by means of a resistive heater placed in the rear surface of the sample. The temperature is measured using K type thermocouples that are spot welded in the front surface of the sample, out of the measuring area. The sample holder is placed inside a vacuum chamber in order to obtain the emissivity in different environmental conditions. The sample can be turned from outside the chamber using a step motor, between the normal to the surface and till a maximum of about 70 º.
The detection system is a Fourier Transform Infrared Spectrometer (FT-IR) with a KBr beamsplitter and a pyroelectric detector (DTGS), which limits the spectral range between 1.3 and 27 micrometers approximately. We have designed an optical entrance that guides the radiation coming from the sources (sample and blackbody) towards the spectrometer.

In order to validate our experimental set up, measurements carried out in ARMCO iron are compared to other authors' measurements.