Spectral Emissivity Measurements on High Temperature Concentrating Solar Power Copper-Alloyed Spinel Black Oxide-Based Coatings

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The cost of the energy produced by Concentrating Solar Power (CSP) plants is a significant barrier for its penetration into the energy grid system. To further reduce the cost of CSP energy, the working temperature of the solar plants and their durability need to be increased, as well as its solar-to-thermal conversion efficiency. In order to achieve that, new copper-alloyed spinel black oxide solar coatings capable of working up to 750 °C have been developed [1]. This type of coating shows an excellent durability in air and a promising efficiency. Besides, they are easy to produce by a simple spray coating process. In order to estimate the thermal radiation losses, knowledge of the emissivity at the working temperature of the coating is needed. In this work, temperature-dependent spectral directional emissivity measurements, as well as total hemispherical emissivity values of these coatings, the Inconel 625 substrate, and the commercial Pyromark coating, are presented. The measurements were performed simulating working conditions (750 °C in air) in the HAIRL radiometer [2].

References:

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[2] L. del Campo, R.B. Pérez-Sáez, X. Esquisabel, I. Fernández, M.J. Tello, *New experimental device for infrared spectral directional emissivity measurements in a controlled environment*, Review of Scientific Instruments **77** (2006) 133111.