

MATERIALS AND STRUCTURES SYMPOSIUM (C2)  
Advanced Materials and Structures for High Temperature Applications (4)

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EXPERIMENTAL INVESTIGATION OF THE EMISSIVITY OF UHTC COATINGS ON CMC  
MATERIALS IN GHIBLI PLASMA WIND TUNNEL TESTS

**Abstract**

A test campaign was performed in the arc jet facility Ghibli in the framework of a collaboration between CIRA and the Air Force Research Laboratory (AFRL), devoted to research and development of UHTC (Ultra High Temperature Ceramics) coatings on CMC (Ceramic Matrix Composite) materials. In particular 10 samples, developed and manufactured by AFRL with three different geometries, were exposed to an hypersonic jet of plasma composed of air and argon, at increasing heat fluxes and time durations, achieving a maximum surface temperature of about 2200°C. A set-up of optical instruments for non-intrusive measurement of the surface temperature was used, consisting of a system of one IR camera and three pyrometers (two dual/single-color and one dual-color). In particular, the surface temperature at the stagnation point of the samples was measured by the pyrometers, whereas the lateral distribution of the surface temperature was measured by the IR camera. During the tests, one pyrometer was repeatedly switched from dual-color to single-color mode in order to evaluate the experimental emissivity of the sample surface at different temperatures. The temperature measured by the pyrometer in single-color mode depends on the emissivity value set on the instrument. Hence, assuming the temperature measured by the pyrometer in dual-color mode as the true value of temperature, we can obtain the experimental emissivity value of the target. The experimental value obtained in this way is indeed the spectral emissivity value at the pyrometer single-color mode wavelength and angle of view. The results of such investigation show a variation of the emissivity from 0.8 to 0.4 in the range of temperature between 1200 and 2100°C.