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# ATOMIC OXYGEN EFFECTS EVALUATION ON HIGH THICKNESS CARBON-CARBON NANO-COATED STRUCTURES FOR RE-ENTRY APPLICATIONS

**Abstract**

Since the beginning of the Space Age, the Re-entry environment has been crucial both for manned and unmanned missions. Thus, along high temperatures and plasma, created during the re-entry phase, several issues must be considered in order to use new technologies and materials. Carbon-Carbon composites are widely used for high temperatures applications, included Thermal Protection Systems for Re-entry, and the effect of Space Environment have to be considered in order to design and produce a re-entry structure that can be used also for long duration missions. In this work high thickness Carbon Carbon has been tested in the Atomic Oxygen Facility at the Aerospace Systems Laboratory of Sapienza University of Rome, evaluating the erosion and oxide creation on the TPS surface due to Atox interaction. This interaction can affect the material and degrade the thermal, physical and mechanical properties of the TPS structure, thus an evaluation of these effect is mandatory. The experimental campaign has been carried out setting the Atomic Oxygen generator at a fluence of 1.5E21 atoms/cm2, for a time of exposure of 1000 equivalent sun hours. The material involved in the campaign is a high thickness Carbon Carbon, made with a customized CVI process. Two categories of sample have been considered: first of all, naked CC samples, secondly CC samples coated with an Aluminum Oxide varnish charged with 0.5