

MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Advancements in Materials Applications and Rapid Prototyping (9)

Author: Dr. Mario Tului
Centro Sviluppo Materialispa (CSM), Italy

Dr. Roberto Gardi
CIRA Italian Aerospace Research Centre, Italy
Dr. Antonio Del Vecchio
CIRA Italian Aerospace Research Centre, Italy

PLASMA SPRAYED CERAMIC COATINGS, ON REFRACTORY, METALS FOR SPACE
APPLICATIONS.

Abstract

The CSM, Centro Sviluppo Materiali, has a wide experience in the field of ceramic materials their utilization as coating on different substrates. Ceramic coatings are widely used as thermal barrier or as oxidation barrier, in many industrial applications. CSM is extending this technological know how in the field of aerospace hypersonic vehicles, where the high thermal load are coupled with highly reactive plasma environment. In order to improve the adhesion of the coating, to better match different thermal expansions, and in order to provide an additional oxidation barrier too, some interlayers are used between the ceramic coating and the bulk substrate. CSM in cooperation with CIRA (Centro Italiano Ricerche Aerospaziali) is conducting a wide campaign of characterization and selection of ceramic coatings, substrates, interlayers and spraying techniques. The campaign started with the selection of a set of substrate materials, a set of interlayer materials, and a set of ceramic materials. The chosen substrate materials are refractory metals already used in the aerospace field, and refractory metals that are more innovative in this field. In the first case the aim is to slightly improve the performance of a well performing material. For the second set of materials, the ambitious objective is to be able to use, in oxidizing environments, materials that have been usually discarded because, even if characterized by a very high melting point, they show a poor oxidation resistance. The coating and the interlayer for the selection campaign have been selected with the same main objectives: protect the bulk material and guarantee a good adhesion. The campaign foresees a large number of spraying activities, aimed to tune up the technique. The first coated specimens are flat and are used for the first evaluations and pull tests. Once the coating procedure is well tuned, for each materials stack, the coating is applied to conical specimens, much more representative of the final aerospace applications. In this second phase, the spraying technique shall be tuned in order to have a good coating on the sharp tip of the cones. The paper shall also contain the results of the final test that CSM shall execute on the conical samples, when they are exposed to the plasma torch heating.