Andrés González-Hernández et al., J Material Sci Eng 2018, Volume 7
DOI: 10.4172/2169-0022-C8-114

19th World Congress on

Materials Science and Engineering

June 11-13, 2018 | Barcelona, Spain

Hot corrosion behavior of 4.5 wt. % YSZ coatings elaborated by suspension plasma spraying

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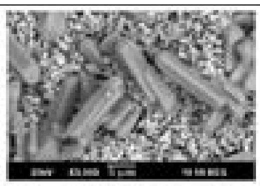
A high percentage of energy generation is made using gas turbines. These turbines have increased in efficiency due to protection systems such as thermal barrier coatings (TBCs). TBCs systems are widely used to provide thermal and corrosion protections for the metallic hot-section components to achieve extended the durability of a gas turbine. A typical TBC system is composed by MCrAlY (M=Ni and/or Co) metallic bond-coat as an oxidation resistant layer and the yttria stabilized zirconia (YSZ) topcoat as a thermal insulation layer. These coatings BCs are usually applied either by an atmospheric plasma spray (APS) or electron beam physical vapour deposition (EB-PVD). Suspension plasma spraying (SPS), as a newly emerged technique of thermal spraying processes, has been intensity investigated to elaborated ceramic coatings with bimodal structures (include nanostructures) obtained from its raw material. The hot corrosion behavior of 4.5 wt. % Yttria Stabilized Zirconia coatings was investigated in the presence of Na_2SO_4 and V_2O_5 and as corrosive molten salt for 40h at 1050ºC. The microstructure of the 4.5 YSZ coating showed that it was composed by a bimodal structure made of un-molten nanosized particles imbedded in a matrix of molten splats, which is a typical characteristic of this kind of coatings. The results of hot corrosion test showed that the molten salts at high temperature had a strong chemical reaction with the yttria (Y_2O_3) of the 4.5 YSZ coating generating its delamination. It was occurred in the ceramic layer due to the creation of stress resulting of these delamination. According to EDS- SEM analysis, the evaluation of surface of 4.5 YSZ coating showed mainly the formation of crystals composed by Y, V, O by interaction between of V_2O_5 of the salts and Y_2O_3 of the coating (Fig. 1).



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2. Tesar T, Musalek R, Medricky J, Kotlan J, et. al. (2017) Development of suspension plasma sprayed alumina coatings with high enthalpy plasma torch. Surface and Coatings Technology. 325: 277-288.
3. Loghman-Estarki M R, Nejati M, Edris H, et. al. (2015). Evaluation of hot corrosion behavior of plasma sprayed scandia and yttria co-stabilized nanostructured thermal barrier coatings in the presence of molten sulfate and vanadate salt. J. Euro. Cer. Soc. 35: 693-702.
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Biography

Andres Gonzalez-Hernandez has his expertise in material science. Ph.D, full time professor at the Metallurgical and Material Science at the Department at Universidad Industrial de Santander, Bucaramanga, Colombia. He received his B.Sc. in Metallurgical Engineering in the Universidad Pedagógica y Tecnológica de Colombia, Tunja, Colombia in 2004, his M.Sc. Engineering degree in 2008 and his Ph.D in Engineering at Universidad de Antioquia, in 2014 together with the degree Ph.D. in Ceramic Materials in Université de Limoges, France. His research interests include: thermal spraying coatings, thermal barrier coatings, plasma spraying coatings, microstructure, wear and flame spraying.

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