Effect of shot peening on the oxidation behavior of thermal barrier coatings

A conventional thermal barrier coating (TBC) system is made up of a multilayered coating system that comprises a metallic bond coat including oxidation-resistant MCrAlY and a thermally insulating ceramic top coat including yttria stabilized zirconia (YSZ). In this study, in order to improve the oxidation behavior in conventionally produced TBC systems, shot peening process is applied for modification of surface layer structure of atmospheric plasma spray (APS) bond coats. The oxidation behavior of TBCs, produced by the APS process and subjected to shot peening, was investigated. Oxidation tests were performed under isothermal conditions at 1000 °C for different time periods. The coatings produced by the APS process include high porosity and oxide content due to atmospheric production conditions as well as exposure to very high temperature. In this study, the coatings, produced by the APS process, subsequently subjected to shot-peening, were compared with the ones which were not shot peened. Following the application of the shot peening process, a dense structure is obtained due to the plastic deformation effect in the metallic bond coating structure at a certain distance from the surface. To this end, the effects of the shot-peening on the high temperature oxidation behavior of the coatings are investigated and evaluated.