

Protective coatings for high temperature systems

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Abstract

Advanced applications of ceramics are usually associated to harsh conditions, such as high temperatures, aggressive environments, jointly with friction, wear and mechanical loads, which cannot be withstood by other materials. In some applications, high temperature mechanical performance should be matched to a low thermal conductivity and a high corrosion resistance at the component surface. That is the case of the structural components for the hottest-sections in upcoming generation of gas turbines, and the thermal shields used in aerospace and automotive systems. In these applications, the development of coatings with various layers, each with a specific role to perform, is essential.

In this talk, our research activities related with protective coatings for high temperature systems, such as thermal barrier (TBC) and environmental barrier coatings (EBC), and self-healing thermal shields, will be presented. Besides the main protective function, these coatings should be able to sustain mechanical and thermal loads without failing. Our activities in this field comprise: design of the proper ceramic-based composition, powder engineering technology for achieving sprayable granules with the adequate size and morphology, coating deposition by thermal spraying methods, analysis of the mechanical and thermal properties and ageing tests. Compositions are selected considering key parameters like stability in water vapor atmospheres at high temperature, thermal expansion coefficient close to that of the substrate and a low thermal conductivity. The future perspectives are also envisaged.