DEVELOPMENT OF THERMALLY SPRAYED ENVIRONMENTAL BARRIER COATINGS

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Key Words: ceramic matrix composite (CMC) environmental barrier coating (EBC), thermal spray, surface modification

Ceramic matrix composites (CMCs) are candidate materials for high-temperature applications such as gas turbines. As corrosion by water vapor and deposits is a limiting issue, the application of suitable environmental barrier coatings (EBCs) is inevitable. Gas tightness, chemical stability and a good adhesion of the EBC are crucial aspects for providing an effective barrier against the combustion atmosphere. Thermal spray technologies offer a variety of promising process routes to the manufacturing of ceramic coating systems complying with these demands. This contribution covers coatings for both silicon and oxide based CMCs. Different EBC materials (e.g. silicates, aluminates, rare-earth oxides) were examined and optimized for use as EBC by air plasma spraying (APS). Different thermal spray techniques including high-velocity oxygen-fuel spraying (HVOF), suspension plasma spraying (SPS) and plasma-spray physical vapor deposition (PS-PVD) techniques were assessed for the manufacture of coatings with low amorphous phase content. The application of bond coat as well as alternative surface modification technologies was tested to increase the adhesion of the EBCs. Microstructures and chemical stability of the coatings were analyzed and the performance was tested in terms of adhesion strength or degradation under high-temperature exposure including cyclic oxidation.