High-temperature corrosion and the protection stragies of thermal barrier coatings for aero-engines

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Abstract Thermal barrier coating (TBC) is a high-temperature protective coating applied onto the turbine blade surface of aero-engines. In recent years, with the development of aero-engines towards higher thrust to weight ratios, the operating temperature of engines and the surface temperature of TBCs have been increasing. Many environmental deposits have been found on the surface of TBCs, which are mainly composed of CaO MgO、Al_2O_3、SiO_2, abbreviated as CMAS. CMAS has serious corrosiveness to TBC, which is an important reason for premature spallation of TBCs; Once TBC peels off, the blade metal will face harsh high-temperature environments, posing a serious safety hazard to the engine. Therefore, CMAS corrosion has become a major issue in the development of TBCs, and CMAS protection is a hot and difficult research topic in the field of TBCs. This report summarizes the main causes of TBC CMAS damage, proposes protective methods based on suppressing molten CMAS infiltration, and develops CMAS-resistant TBCs. In addition, a new issue that exacerbates the CMAS corrosion of TBCs was raised: the coupling corrosion of CMAS and sea salt in marine environments, which provides a new direction for future research on high-temperature corrosion of TBCs.

Keywords Thermal barrier coating, High-temperature corrosion, CMAS, Corrosion protection, Coupling Corrosion.

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