Estimation of Spallation Life of Thermal Barrier Coating of Gas Turbine Blade by Thermal Gradient Fatigue Test

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Thermal barrier coating (TBC) for a gas turbine blade is composed of a ceramic top and a MCrAlY bond coating layer, and creates the thermally grown oxide (TGO) layer in the interface between the bond and top coating in high temperature services. TGO layer causes the delamination and spallation of a coating layer under thermal fatigue loading. In case of the spallation of coating, since oxidation and corrosion rapidly proceed in a substrate of spalled coating, the life evaluation is very important.

In this study, the influence of the real thermal gradient on the life of thermal barrier coating was evaluated. For this, we performed the thermal fatigue test applied to the real thermal gradient of the gas turbine blade and clarified the coating life and failure mechanism by internal cooling using the section-analysis by the optical microscope and the bond strength test.

Keywords
Thermal Barrier Coating
Thermal Gradient
Internal Cooling
Thermal Fatigue
Spallation Life