

## **SUPERIOR PERFORMANCE OF PLASMA SPRAYED YSZ THERMAL BARRIER COATINGS WITH OXIDE DISPERSION STRENGTHENED BOND COATS**

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Advanced thermal barrier coatings are essential to increase the efficiency of next-generation gas turbine engines. Different materials and process technologies give the possibility to extend the lifetime of TBCs. One limiting factor of the TBC lifetime is the growth of the TGO during thermal exposure resulting in an accelerated crack growth at the top coat- bond coat interface. The oxidation resistance and the temperature of the bond coat are key factors influencing the TGO growth rate. Oxide dispersion strengthened (ODS) bond coats have a slower oxygen scale growth during thermal exposure in comparison to standard bond coats.

In previous studies TBC systems with an additional thin ODS bond coat on top of a standard bond coat showed a higher thermal cycling performance. These studies used Inconel 738 and Amdry 386 as substrate and bond coat material, respectively.

This study investigates the thermal cycling performance of the ODS bond coat TBC systems combined with a different substrate ERBO 1 and bond coat material Amdry 995. TBC systems with the new material combination show high cycling lifetimes and superior performance in comparison to previous samples.

Samples were tested by a cyclic burner rig facility. Surface was heated by a gas burner to 1400°C while the backside is cooled by pressurized air to 1050°C. One cycle consists of 5 min heating followed by 2 min cooling. Cross sections of the samples were analyzed by SEM and laser microscope. The lifetime of the samples was evaluated especially with respect to diffusion processes, material properties, and bond coat temperature.

ODS powders with higher aluminum oxide additions were produced by high energy milling to fit the CTE of the ODS bond coat to the one of the top coat. This will reduce the initial crack formation on the top a wavy top coat - bond coat interface and increase lifetime. The advanced bond coats were applied by low pressure plasma spraying, the standard YSZ top coat by atmospheric plasma spraying. The performance was evaluated by a gas burner rig test.