

## **DEVELOPMENT OF ENVIRONMENTAL BARRIER COATINGS FOR $Al_2O_3/Al_2O_3$ CMCS WITH IMPROVED ADHESION BY TEXTURING WITH LASER ABLATION**

Caren Sophia Gatzen, Forschungszentrum Jülich GmbH  
c.gatzen@fz-juelich.de

Daniel Emil Mack, Forschungszentrum Jülich GmbH  
Olivier Guillon, Forschungszentrum Jülich GmbH  
Robert Vaßen, Forschungszentrum Jülich GmbH

**Key Words:** Environmental Barrier Coatings, Ox/Ox CMCs, surface structuring, thermal spray

$Al_2O_3/Al_2O_3$  ceramic matrix composites (CMC) are candidate materials for high-temperature applications such as gas turbines. As water vapor corrosion of oxide/oxide CMC is a major issue, the application of suitable environmental barrier coatings (EBC) is inevitable. Besides the gas tightness a good adhesion of the EBC is a crucial aspect for providing an effective barrier against the combustion atmosphere. Due to the brittleness of the ceramic matrix conventional surface treatments like grinding and sandblasting fail to increase roughness without causing damage to the substrate. Therefore there is a need for new methods of surface preparation of CMCs. This work examines the suitability of surface preparation with laser ablation for use prior to air plasma spraying (APS) on an oxide/oxide-CMC. Laser ablation allows controlling of the surface's structure and roughness. The effects of different laser parameters on the alumina surface were examined and a variety of different structures, for example a honeycomb or a cauliflower like structure, were prepared.

The laser treated surfaces were coated with potential EBC-candidates, such as  $Y_2O_3$  and  $Gd_2Zr_2O_7$  and the impact of laser textures on the coating adhesion was examined. Evaluation of the coated samples was done by pull-off adhesion testing and thermal cycling. Results indicate that laser pretreatment helps to increase the adhesion strength of the EBC-system.