INTERDISCIPLINARY CENTRE FOR ADVANCED MATERIALS SIMULATION

ICAMS Special Seminar

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Universitätsstr. 90a, 44789 Bochum

Oxide Ceramic Matrix Composites – Manufacturing, properties and numerical assessment of failure in components

Burner tube made out of Whipox

Since about 20 years the DLR develops fiber reinforced ceramics also known as ceramic matrix composites (CMC). The DLR in Cologne is specializing on CMCs based on oxide ceramics (Alumina, Mullite). For the manufacturing of CMC components the DLR relies on a winding technique, which also coined the trade name Whipox (wound highly porous oxide ceramic) for the material. As an oxide ceramic Whipox is thermally stable under adverse operating conditions. Like all CMCs Whipox is damage tolerant and capable of operating at high temperatures. While the manufacturing of components has reached a rather mature state, the understanding of its properties and the numerical assessment of its behavior and especially its failure modes under high temperatures is still in its infancy.

The presentation is giving an introduction into the manufacturing of Whipox. The manufacturing procedure clearly has an impact on the micro- and macrostructure of the material which in turn directly influences the mechanical properties of the material and the topology of its inherent imperfections. Hence, the resulting mechanical and structural properties are outlined. This is followed by some ideas how the DLR tries to model the failure behavior of the material in components under realistic loads.