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## Phase stability and corrosion resistance of SiC and Yttrium-Silicate EBCs on SiC in moist atmosphere

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For next generation power plants and gas turbines, Si-based Ceramic Matrix Composites (CMCs) are promising structural materials for the hot sections. However, the presence of water vapor in e.g. combustion gases may lead to the formation of gaseous hydroxides which cause the volatilization of protective  $\text{SiO}_2$  scale. The resulting severe material recession necessitates the application of environmental barrier coatings (EBC). In this regard, combinations of yttrium silicates and yttrium oxide or silicon dioxide are most promising EBC materials, and it is necessary to understand their behavior at high-temperature and in  $\text{O}_2/\text{H}_2\text{O}$  containing combustion atmospheres. In this work, the CALPHAD (CALculation of PHase Diagrams) method in combination with key experiments was used to develop a thermodynamic dataset for the multi-component Y-Si-C-O-H system. By this, the equilibrium heterogeneous reactions between EBC and various gas atmospheres can be assessed. An existing thermodynamic description of the Y-Si-C-O system was refined by updating the description of the  $\text{Y}_2\text{O}_3$ - $\text{SiO}_2$  pseudo-binary system and new descriptions of the Gibbs free energies of the silicon- and yttrium-hydroxides were developed based on experimental data from the literature. The updated thermodynamic description of the Y-Si-C-O-H system was used to calculate the thermochemical reactions between the yttrium silicate based coatings and the SiC base material as well as with the  $\text{O}_2/\text{H}_2\text{O}$  containing combustion atmosphere. The stabilities of yttrium silicate based coatings against erosion through formation of volatile silicon- and yttrium hydroxides was thereby evaluated.

### Biography

Hans J Seifert is the Head of the Institute for Applied Materials (IAM-AWP) at the Karlsruhe Institute of Technology (KIT) and Professor of Material Science and Engineering since 2011. He received his PhD in Material Science from University of Stuttgart, Germany, in 1993. He then served as a Research Group Leader at MPI for Metals Research, Stuttgart. From 2001 to 2003, he worked as a Senior Coating Expert for Alstom and from 2003 to 2006 as an Associate Professor at the MSE Department of the University of Florida. In July 2006, he was appointed as Professor by TU Freiberg, Germany.

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