Jürgen Ramm, Oerlikon Surface Solutions AG

Title: “PVD^{+} - Combination of PVD and PECVD deposition processes to synthesize EBC structures for SiC-based CMC materials”

Jürgen Ramm, Oerlikon Surface Solutions AG, Iramali 18, LI-9496 Balzers, Liechtenstein
Daniele Casari, Laboratory for Mechanics of Materials and Nanostructures, Empa, Feuerwerkerstrasse 39, CH-3602 Thun, Switzerland
Dianying Chen, Oerlikon Metco (US) Inc., Westbury, NY 11590, USA
Kerstin Glaentz, Oerlikon Surface Solutions AG, Iramali 18, LI-9496 Balzers, Liechtenstein
Xavier Maeder, Laboratory for Mechanics of Materials and Nanostructures, Empa, Feuerwerkerstrasse 39, CH-3602 Thun, Switzerland
Helmut Schoech, Oerlikon Surface Solutions AG, Iramali 18, LI-9496 Balzers, Liechtenstein
Benno Widrig, Oerlikon Surface Solutions AG, Iramali 18, LI-9496 Balzers, Liechtenstein

Abstract:

SiC-based substrate materials require protective coatings to suppress volatilization in water vapour at high temperatures. In addition, concepts need to be developed which allow thermal barrier coatings to extent the operating temperature beyond the melting temperature of silicon which is utilized as bond coat in current EBC layer stacks. This work describes a hybrid deposition technology developed for EBC relevant class of coating materials which combines PVD and PECVD processes. The presentation will discuss this new PVD^{+} approach and show representative coating materials which have been synthesized. The technology allows for the deposition of EBC layers in a single uninterrupted and economical process. The thermal stability and adhesion of Si-based coatings has been tested on SiC substrates. The TGO formation on a simple SiC/Si/Yb-Si-O EBC layer stack was investigated in isothermal and thermal cycling water vapour tests at 1316°C. Possibilities to reduce the TGO growth at Si bond coat or avoid elemental Si in the bond coat are discussed.

Biography:

Jürgen Ramm received his diploma in Experimental Physics in 1972 from Technical University in Dresden (Germany) and worked there subsequently in the field of Pattern Recognition based on Discrete Walsh Transformations. In 1981 he obtained his Ph.D. in Nuclear Physics from University of Zurich (Switzerland). Since 1984 he has been working at different positions at Oerlikon company in the field of thin film material development and PVD and CVD process development in semiconductor industry as well as for wear resistant coatings. During last years, his work focused on the synthesis of oxides, aluminides and superalloys by reactive cathodic arc evaporation and protective coatings in high-temperature applications. Recently, he is investigating Environmental Barrier Coatings for SiC-based substrate material utilizing a combination of PVD and CVD process. He is author and co-author of about 50 patents and more than 80 publications.