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Title: "PVD coatings for protection of aero engine components under challenging environments"

Abstract:
Advanced aero engines operate under extreme conditions. This ultimately calls for materials with increased high temperature capability and lightweight components that are pushed to its limits. Usage of coatings offers the potential to prolong lifetime, to increase operating temperatures, and to protect turbine components. Several PVD coating techniques that are used to protect turbine parts will be presented. Thermal barrier coatings (TBCs) are applied to increase lifetime and efficiency of turbine blades and vanes in aero-engines and land-based gas turbines by reducing the average metal temperature and mitigating the detrimental effects of hot spots. The presentation highlights the behaviour of coatings that are produced by electron beam-physical vapor deposition (EB-PVD) especially under high loadings of dust, commonly described as CMAS deposits, that are ingested in aero-engines during the flight. The presentation provides results on several new TBCs, especially their improved behaviour under the influence of deposits. PVD methods are also capable to protect TiAl against oxidation. Magnetron Sputtering is a suitable method to manufacture the desired complex coatings that are either multi-element coatings such as TiAlCrY, TiSiAl, or complex MAX-phases. Finally, for very challenging conditions in terms of temperature that can be present in engines and hypersonic flight applications, CMC (Ceramic Matrix Composites) and Ultra High Temperature Ceramics (UHTCs) are potential solutions. Both ceramic materials need complex and demanding coatings to provide an adequate service life. The presentation will show results on promising PVD-based metallic and ceramic coatings for these materials.

Biography:
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Uwe Schulz studied materials science at the Technical University Mining Academy Freiberg. He is working at the German Aerospace Center (DLR) on development, manufacture, characterisation, and testing of protective coatings for turbine applications, deposited mainly by PVD methods. He is head of the department "High temperature and functional coatings" at DLR's Institute of Materials Research and in charge of various in–house, national and European projects, funded by industry and government. His major research focus is on oxidation, thermal and environmental protection for TiAl, Ni-based and new silicide-based alloys, CMCs, and for other space and energy applications. He holds several patents and is the author of 50+ papers and co-author of more than 80 further papers and holds an appointment as lecturer professor at Technical University in Dresden, Germany.