

Development of Oxidation Protective Coatings for Advanced Aero Engines

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The development of novel aero engines mainly aims on more efficient fuel consumption, decrease of the emission of exhaust gases as well as higher propulsive force. New materials are necessary to realize the increasing demands. Engine designers show continued interest in titanium aluminides as lightweight structural materials. With regard to high efficient combustion the components are exposed to higher temperatures, finally leading to material failure in former times due to rapid oxidation. For long term use of lightweight titanium aluminides at temperatures above 750°C coatings are needed to clearly extend the lifetime. The major challenge of the coating development is long-term stability of a protective, slow growing oxide scale that forms during service. Furthermore, changes of coating chemistries at high temperatures must be controlled to avoid rapid degradation of the coatings due to diffusional losses into the substrate material and vice versa.

In this study 10 µm thick Pt-based, silicide based as well as Ti-Al-Cr-X coatings were deposited on Ti-45Al-8Nb (at.%) by magnetron sputtering. The oxidation resistance of each coating system was tested under cyclic conditions at 950°C up to 1000 1h-cycles and compared to the oxidation behaviour of uncoated material. Investigations of microstructure evolution will be presented observed by means of SEM and EDS analysis after exposure.