Jolanta Romanowska et al., Res. Rev. J Mat. Sci. 2017, 5:5
DOI: 10.4172/2321-6212-C1-005

Hafnium and palladium modified aluminide coatings

Jolanta Romanowska and **Maryana Zagula-Yavorska**
Rzeszów University of Technology, Poland

Hafnium or palladium modification of NiAl phase increases the oxidation resistance of aluminide coatings deposited on turbine blades in a hot section of jet engines. Small hafnium or palladium addition to aluminide coatings decreases the oxidation rate of turbine blades made of nickel superalloys. Small content of hafnium (0.1-1.0 % wt) improves high temperature mechanical properties of aluminized nickel based superalloys. Palladium modification increased the outer zone hardness. It is due to the presence of the σ and μ phases. The palladium or hafnium modified aluminide coatings have better oxidation resistance than the non-modified ones. The use of 'co-doping' has recently been emphasized as a strategy for optimizing the oxidation resistance of superalloys, conventional alloys and coatings The comparison of structures of hafnium and palladium modified aluminide coatings deposited on pure nickel and $CMSX_4$ nickel superalloy is presented. Aluminide layers were deposited by the Chemical vapor deposition (CVD) method. Hafnium was deposited simultaneously with aluminum. Aluminum was deposited from the $AlCl_3$ and hafnium from the $HfCl_3$ gas phases. Palladium was deposited by the electrodeposition method. The obtained coatings were examined using an optical microscope, a scanning electron microscope and an XRD phase analyzer. Both coatings consist of two layers; an outer, comprising the ß-NiAl phase and the interdiffusion one. The interdiffusion layer on pure nickel consists of the γ'-Ni_3Al phase, whereas on the $CMSX_4$ – of the ß-NiAl phase. Small inclusions of Pd and Hf rich phases were found at the border of the layers on nickel, whereas inclusion containing Pd, Hf and refractory elements were observed in the interdiffusion zone on the $CMSX_4$ superalloy. The research has been supported by the National Science Centre, Poland Grant No. 2015/19/B/ST8/01645.

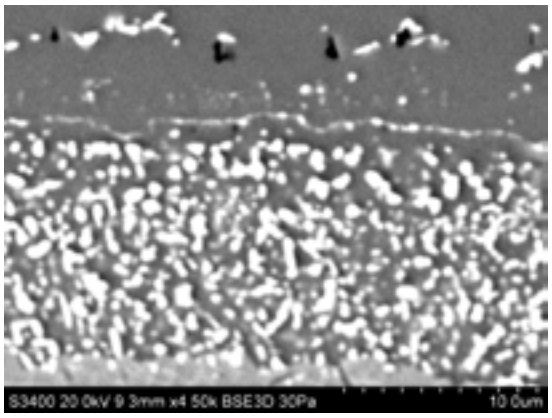

Fig.1: *Cross-section microstructure of aluminide coating obtained by CVD method on pure nickel (a), and CMSX4 nickel superalloy (b)*

Biography

Jolanta Romanowska has completed her PhD from AGH University of Science and Technology, Cracow, Poland and DSC from the Silesian University of Technology, Poland. She is the professor at the Rzeszów University of Technology, Poland. She has published more than 50 papers in reputed journals. She has her expertise in thermodynamics of alloys and protective coatings. She elaborated the model of predicting thermodynamic properties of ternary alloys on the basis of thermodynamic properties of binary alloys.

jroman@prz.edu.pl

Notes: