

MECHANICAL PROPERTIES OF AlCrN COATINGS DEPOSITED USING  
CATHODIC ARC EVAPORATION

*A. Gilewicz<sup>1</sup>, P. Myslinski<sup>1</sup>, R. Jedrzejewski<sup>2,3</sup>, B. Warcholinski<sup>1</sup>*

<sup>1</sup> *Koszalin University of Technology, Faculty of Mechanical Engineering,  
Raclawicka 15-17, 75-620 Koszalin, Poland*

<sup>2</sup> *West Pomeranian University of Technology Szczecin, Faculty of Mechanical  
Engineering and Mechatronics, 19 Piastow Ave., 70-313 Szczecin, Poland*

<sup>3</sup> *Lukasiewicz Research Network – PORT Polish Center for Technology  
Development, Stablowicka 147, 54-066 Wroclaw, Poland*

Corresponding author: adam.gilewicz@tu.koszalin.pl

The Al-Cr-N coatings were formed from AlCr (50:50) cathode at various nitrogen pressure, substrate bias voltage and substrate temperature using cathodic arc evaporation. The relationship between technological parameters and properties of the coatings was investigated. The phase and chemical composition of the coatings, roughness, hardness, adhesion and thermal stability were analyzed by xrd, sem, edx, micro-indenter, rockwell and scratch tester and modulated-temperature dilatometer.

For coatings deposited at 350°C and 450°C the deposition rate increases to 3 Pa of nitrogen pressure and then decreases. With substrate bias voltage increase the deposition rate decreases. The deposition rate for coatings formed at 450°C is less from 4% to 25% than for coatings obtained at lower temperatures.

XRD analysis indicate that coatings crystallize in cubic CrN structure and show preferential orientation in (200) plane. With increase nitrogen pressure the preferential orientation changes to (111).

EDX analysis shows that with nitrogen pressure increase, and the Al/(Al+Cr) rate decreases. The microscopic observations indicate that number of macroparticles reduces with nitrogen pressure increase. The results of the studies show that with the increase of the nitrogen pressure and the substrate bias voltage, the surface roughness parameter Ra coatings decreases. The hardness of the coatings depends on the deposition parameters: with the increase of the nitrogen pressure in the chamber and the substrate bias voltage the hardness increase. With an increase in deposition temperature the hardness decrease. AlCrN coatings show very good adhesion to the substrate. The critical force for coatings formed at nitrogen pressure from 1 Pa to 5 Pa and temperature 350°C is nearly constant and is approximately 90 N. The coatings deposited at 450°C characterizes by about 20% lower critical force.

*Investigations partly financed by the National Centre for Research and Development,  
Poland, BIOSTRATEG3/344303/14/NCBR/2018.*