BEHAVIOR OF AL-SI-N NANOSTRUCTURED COATINGS UNDER THE IONS (HE^+, AR^+, Xe_2^+) IRRADIATION

VITALI SHYMANSKI[1], *VLADIMIR UGLOV*[1], *NIKOLAI KVASOV*[1], *GENNADY REMNEV*[2] *AND JINDRICH MUSIL*[3]

[1]*Belarusian State University, Belarus*
[2]*National Research Tomsk Polytechnic University, Russia*
3University of West Bohemis, Czech Republic
Shymanskiv@mail.ru

The results presented in this work are devoted to the study of radiation damage in nanostructured coatings based on Al-Si-N system formed by magnetron sputtering. The coatings were synthesized with a different silicon concentration which was varied in the range from 6 to 30 at. %. The nitrogen atoms efficiently interact with aluminum ones resulting in formation of a crystalline phase of aluminum nitride h-AlN. When adding silicon atoms, the h-AlN grains growth is blocked silicon nitride layer providing a nanocomposite structure formation. The thickness of the coating was about 1 μm. The formed Al-Si-N coatings were irradiated with He^+, Ar^+ and Xe_2^+ ions up to dose of $5 \times$ E16 ions/cm^2. The structure as well as phase composition of the as-deposited and irradiated coatings were investigated by means of both atomic-force microscopy and x-ray diffraction.

The obtained results showed the dependence of the Al-Si-N structure on Si content. Indeed, the coating containing 6 at. % of Si are characterized by a nanocomposite structure (h-AlN nanocrystals surrounded by amorphous a-SiNx matrix) whereas the coatings with 30 at. % of Si become fully amorphous. The results of structure analysis showed that addition of Si atoms to the AlN nitride structure enhances its structure under the ions irradiation.

Keywords: *nanostructured coatings, Al-Si-N composite, ion irradiation, radiation stability.*