

EXPERIMENTAL INVESTIGATION OF RESISTANCE TO PARTICLES IMPACT OF COATINGS ON THE BASIS OF AL-SI-N SYSTEM

*EVGENIAY V. RYBALKO¹, IRINA A. BOZHKO¹,
ANNA V. IVANOVA², MARK P. KALASHNIKOV¹,
MARINA V. FEDORISCHEVA¹, VIKTOR P. SERGEEV¹
AND YURII F. HRISTENKO³*

¹*Institute of Strength Physics and Materials Science, Russia*

²*National Research Tomsk Polytechnic University, Russia*

³*Scientific research institute of applied mathematics and mechanics
of Tomsk state university, Russia
bozhko_irina@mail.ru*

Active exploration of space and the need to develop of spacecrafts, capable to operate in extreme conditions of outer space, requires the development of new construction materials and technologies of their production. Impact of micrometeoroids with spacecraft is important factors capable to cause an erosion of a surface and local destructions. Various optical spacecraft elements on suffer from micrometeoroids more. One way of solving this problem can be deposition of protective coatings on basis of the Al-Si-N characterized by a high degree of transparency in the visible spectrum and a high level of mechanical properties on the optical parts spacecraft system. The aim of this work is to study the structural-phase state and mechanical properties of magnetron coating on the basis of Al-Si-N system, as well as their impact on the stability of the quartz glass samples to the impact of iron microparticles moving at a speed of 5–8 km/s.

The results of X-ray showed that the nanocrystalline Al-Si-N coating with different thickness having phase AlN (hcp) is formed on the surface of the quartz glass under pulsed magnetron sputtering technique. Coatings of Al-Si-N system are characterized by a high degree of transparency (80 %) in the visible wavelength range. Study crater formation on the surface of the samples as a result of the bombardment them of high speed iron particles have shown that increasing of the Al-Si-N coating thickness from 1 to 10 micrometers can decrease the surface density of craters of quartz glass 4 times.

Keywords: *Magnetron deposition, Protective coating, Structure-phase state, Microhardness, optical properties, Crater density.*