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МАТЕРІАЛИ ВСЕУКРАЇНСЬКОЇ НАУКОВОЇ КОНФЕРЕНЦІЇ ВИКЛАДАЧІВ, АСПІРАНТІВ, СПІВРОБІТНИКІВ ТА СТУДЕНТІВ

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STRUCTURE AND PHYSICAL-MECHANICAL PROPERTIES OF NITRIDE AND CARBIDE COATINGS OBTAINED WITH MAGNETRON SPUTTERING

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As industrial interest is directed to enhancing of the wear resistance, fracture toughness and hardness, the physical-mechanical properties of the multilayer nitride and carbide-based systems based on V were under consideration. Various multilayer coatings (VC/VN, VN/VC, VN/VCN/VC) were obtained. The structure and physical-mechanical characteristics of nitride and vanadium carbide monolayers were analyzed comparatively.

The deposition was performed by using the CMSII method, by means of optimized portions of argon atmosphere and jet gas (nitrogen). The coatings with a microhardness value 3700HV 0.05 and as thick as up to 20 microns have been produced. The elemental and phase composition of the coating, and tribological properties (wear and friction coefficient) of the coating were investigated. The chemical and structural investigations were performed by GDOES (Glow Discharge Optical Emission Spectrometry), EDX (Energy Dispersive X-ray analysis), XRD (X-ray Diffraction) and SEM (Scanning Electron Microscopy), while microhardness measurements and wear test were used to assess the characteristics of coatings. The friction coefficient and the wear resistance of the coatings were evaluated by using a pin on disc tests in unlubricated condition.

It has been found that the vanadium compounds have a coefficient of friction lower than the control samples HSS, the lowest values were determined for the vanadium carbide (μ = 0.5-0.56). The wear mechanism changes from a cohesive wear, in the case of vanadium carbide monolayer, to an abrasive wear mechanism in the case of vanadium multilayer structures. Although vanadium carbide has the highest microhardness, its wear resistance is not so good, but when the VN is reinforced with the VC layer, the wear resistance increases significantly.