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SYNTHESIS OF THE TIN-CU COMPOSITE LAYERS ON ALLOY T15K6 BY METHOD OF VACUUM-ARC EVAPORATION AND MAGNETRON SPUTTERING*

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The processes of TiN synthesis in Cu vapors appear promising for the synthesis of composite nanostructured TiN–Cu coatings [1]. In this paper, we consider the structure, phase and elemental composition, microhardness of composite TiN-Cu layers on the T16K6 alloy obtained at different values of the arc current, magnetron discharge current, and working gas pressure. The deposition of the composite layers was carried out on a modernized installation with a vacuum arc evaporator and a planar magnetron [2].

TiN-Cu coatings were deposited in copper vapor in the mode of titanium evaporation in argon and nitrogen-containing plasma, dissociation of molecular nitrogen N2 - 2N, and chemical reaction of Ti and N. Samples of alloy T15K6, 18x18 mm in size and 5 mm thick, were used as substrates. For a more efficient sputtering of the magnetron target, a gas mixer was used, in which nitrogen and argon were mixed in different proportions. The proportion of argon ranged from 20% to 50% of the total volume of the working gas. X-ray phase analysis (XRD) was performed on a Phaser 2D Bruker diffractometer (Cukα - radiation). The microstructure of the layers was investigated on a METAM PB-22 microscope. By means a JSM-6510LV JEOL electron microscope with a system of microanalysis INCA Energy 350 Oxford Instruments by scanning electron microscopy and X-ray spectral microanalysis were carried out the study of the surface and determination of the elemental composition. The microhardness of the formed layers was determined using a PMT-3 microhardness meter. X-ray phase analysis was performed according to which the samples contained TiN phases with different crystal lattice and volume fraction. In addition, reflections of copper reflections were recorded, the intensity of which was very low intensity. According to the data of X-ray spectral microanalysis, the content of Ti, N and Cu in various concentrations was detected. The concentration of these elements varies and depends on the deposition conditions. In addition to the main elements, in the coating was found a negligible content of aluminum, tungsten and oxygen.

The thickness of the TiN layers and the TiN-Cu composite ranged from 2-3 microns to 5-8 microns depending on the deposition time. Figure 1 shows a microimage of T15K6 alloy sample with the deposited TiN-Cu layer.

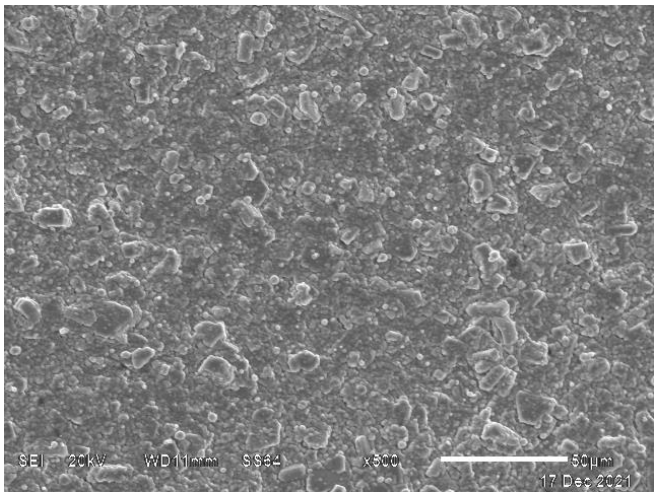

Fig.1. The surface of TiN-Cu layer deposited on the T15K6 alloy.

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