Structure and mechanical properties of TaN and Ta_2O_5 coatings prepared by sputtering using non-self-maintained gas discharge

A. Taran[1], I. Garkusha[1,2], I. Misiruk[1], O. Tymoshenko[1], Ya. Kravchenko[3], S. Romaniuk[4]

[1] *National Science Center (NSC KIPT), Institute of Plasma Physics, Kharkiv, Ukraine*

[2] *V.N. Karazin Kharkiv National University, Kharkiv, Ukraine*

[3] *Sumy State University, Sumy, Ukraine*

[4] *State Biotechnology University, Kharkiv, Ukraine*

Among the different transition metal nitrides (TiN, CrN, ZrN, etc.), tantalum nitride (TaN) is gaining increasing interest due to its excellent chemical and physical properties [1,2]. Ta_2O_5 coatings are used in medicine research as a new type of biomaterials. Ta_2O_5 coatings have an excellent biocompatibility, good dielectric properties, and high corrosion resistance [3]. It was reported in [4] that Ta_2O_5 coating promotes the biocompatibility, anticorrosion and antibacterial behaviors of NiTi substrate.

In the present research the TaN and Ta_2O_5 coatings have been deposited by sputtering using non-self-maintained gas discharge in Bulat-type facility. Non-self-sustained gas discharge, in which the additional charge carriers are produced by a vacuum-arc evaporator, is characterized by high values of current and degree of ionization [5]. Due to enhanced plasma density and degree of ionization, the processes of surface treatment in such gas discharge are much more intense than they are in a self-sustained glow discharge [5].

The surface topography of the coatings was studied using JEOL JSM-6390LV scanning electron microscope (SEM), chemical composition was examined using energy-dispersive X-ray analysis (EDX). The measurement of nonohardness was carried out with a Nanoindenter G200 nanoindentor from the USA, using Berkovich diamond triangular pyramid.

References

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