STUDY ON THE BIOCOMPATIBILITY OF A-C:H:SIO$_X$ COATINGS ON TI-6AL-4V ALLOY*

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Diamond-like carbon coatings (DLC) are well known for their high hardness, good tribological, optical and biomedical properties [1–6]. The inclusion of the Si or SiO_x in a diamond-like carbon matrix leads to improved biomedical properties while maintaining high mechanical and tribological characteristics [7, 8]. These coatings are called a-C:H:SiO_x, diamond-like nanocomposite (DLN), DLC:SiO_x.

The a-C:H:SiO_x coatings are important in the medical applications for increasing the protection, biocompatibility and wear resistance of medical devices that are implanted in the human body. Most medical devices and implants are made of stainless steel (AISI 304, AISI 316L, AISI 321, et al.) or titanium alloys (Ti-6Al-4V, Ti-6Al-7Nb).

In this work, the properties of a-C:H:SiO_x coatings deposited on the Ti-6Al-4V titanium alloy by plasma chemical deposition in a mixture of argon and polyphenylmethylsiloxane vapors were investigated. Before the coating deposition, samples were treated by a low-energy high-current electron beam to reduce surface roughness. It was shown that after electron beam treatment, the mean-square surface roughness of R_q decreases from 22 to ~ 8 nm. Subsequent deposition of a-C:H:SiO_x films results in an increase in hardness, a decrease in the friction coefficient, and a decrease in the wear rate of the surface.

It has been shown that deposition of a-C:H:SiO_x coatings on the surface of Ti-6Al-4V samples reduces platelet adhesion, which is important from the point of view of thrombosis reducing. *In vitro* investigation of variants of cell death (apoptosis, necrosis) of blood leukocytes at direct 24-hour contact with tested samples by means of flow cytofluorometry was conducted. The fraction of viable cells in the tested samples was more than 75%. According to the international standard ISO 10993-5-2009 it indicates the absence of cytotoxicity of Ti-6Al-4V samples with a-C:H:SiO_x coating with respect to human blood leukocytes.

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* The work was supported by the Russian Science Foundation under grant No. 19-19-00186 and is a continuation of the work on RFBR grant № 14-08-31164.