FBMT-2018

BOOK OF ABSTRACTS

V International Conference
"Fundamental Bases of Mechanochemical Technologies"

June 25-28, 2018
Novosibirsk
Russia

OBTAINING OF NANOFILMS BASED ON Ag-CHITOSAN/Na-CARBOXYMETHYL CELLULOSE ON THE SURFACE OF TITANIUM IMPLANTS

B.E. Savdenbekova[1], N.F. Uvarov[2,3], A.K. Ospanova[1]

[1]*Al-Farabi Kazakh National University, 71 al-Farabi Ave., Almaty, 050040, Kazakhstan, e-mail: balzhan.savdenbekova@gmail.com*

[2]*Novosibirsk State Technical University, Prospekt Marksa, 20, Novosibirsk, 630073, Russia*

[3]*Institute of Solid State Chemistry and Mechanochemistry, Kutateladze, 18, Novosibirsk, 630128, Russia, e-mail: uvarov@soilid.nsc.ru*

Titanium (Ti) and its alloys are widely used in orthopedic implants due to their excellent biocompatibility and mechanical properties. However, titanium-based implant materials have specific complications associated with poor cell adhesion and susceptibility of implants to bacterial infections. In this regard, an actual problem in practical medicine is the application of antibacterial and anti-inflammatory agents to the surface of implanting medical and biological products. Various physicochemical methods are used for this. The most promising method from the point of view of ecology, simplicity and cheapness is the multilayer assembly method, based on the acid-base electrostatic interaction of polyelectrolytes.

The results of this study are aimed at establishing optimal conditions for obtaining antibacterial coatings on the surface of titanium with improved biocompatible properties. As an antibacterial agent, silver particles were used. Chitosan and Na-carboxymethyl cellulose were used as biocompatible polyelectrolytes for multilayers. Chitosan, which has natural antibacterial activity, can also serve as a stabilizing ligand for silver ions, since the amino groups of chitosan can chelate silver ions and nanosized particles through coordination interaction. Preliminary, optimal conditions for activating the surface of implants with solutions of sulfuric acid in the presence of hydrogen peroxide (piranha) were established. The thickness of the multilayers increases linearly with increasing bilayers on the surface of the plates. The roughness depends on the nature of the polyelectrolytes and the pH of the medium. The results of scanning microscopy unambiguously showed the presence of silver particles on the surface of nanofilms, and elemental analysis confirmed these data. The obtained experimental data allowed to develop the conditions for obtaining of multilayers with silver particles with good antibacterial properties. Preliminary tests showed good antibacterial activity of the multilayers in relation to the museum strain E. coli ATCC25922 and the wild P.Aeruginosa strain.