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TiNb coating for development of antibacterial nanostructured surface composed from oxide nanotubes and nanosilver particles

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Orthopaedic implants are developed with respect to surface optimization of parts which are in direct mechanical contact (e.g. articulating or bone connections). Small attention is also paid to the surfaces not subjected to mechanical load or those in contact with soft tissue where biomaterial-associated infection may occur. One of the ways to reduce the formation of a bacterial film is to develop a combined antibacterial nanostructured surface composed of oxide nanotubes and nanosilver particles.
This system can be produced directly on the surface of conventional titanium and titanium alloys used in the manufacturing of orthopaedic implants. Other possible way is to deposit suitable coating on the surface of other conventional metallic materials (e.g. CoCrMo alloys, austenitic stainless steel) with very good adhesion to these materials and the possibility of its further nanostructuring.
TiNb coating has a high corrosion resistance and is non-toxic; therefore it is potentially applicable as a support for the system. In the first step, we investigated TiNb coatings deposited by magnetron sputtering on substrates made from CoCrMo alloys, austenitic stainless steel and Ti6Al4V. Optimal conditions for deposition of chemically stable and biocompatible coatings were found. Significant layer properties as crystalline structure, chemical composition, roughness, etc. were characterized. In the second step, we tested possibility to create nanostructure on TiNb coating surface and we analysed mechanical and chemical properties of the system.

Keywords
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