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Title of the doctoral thesis:

Assessment of the physicochemical state of metal surfaces by the method of adsorption at the meta /liquid interface using the SERS technique

Abstract

Correlating with the growing world's population, the amount of endoprostheses and implants are also increasing. In 2017, the global orthopedic market has implants and endoprostheses valued at around $ 80 billion and is expected to reach $ 120 billion by 2023. With the development of new devices and technologies, there is also a continuing need to understand and describe how the metal surfaces of the implants interact with the surrounding physiological environment; for example, how the condition of implants is affected by highly oxidative antibodies that accumulate near the implant or adsorb onto its surface and/or cause implant corrosion.

In the doctoral thesis ~~of~~ the evaluation of the adsorption process at the metal/liquid interface using surface-enhanced Raman techniques (SERS) on the surface of: gold (Au), platinum (Pt), iron (Fe) and titanium (Ti) was presented. In addition, two metal oxides in the form of nanoparticles were selected: iron (III) oxide (Fe_2O_3) and titanium (IV) oxide (TiO_2). These surfaces are characterized by: X-ray diffraction (XRD), scanning electron microscope (SEM) along with X-ray energy dispersion spectroscopy (EDS) and visible spectroscopy - ultraviolet (UV-Vis), infrared (FT-IR-ATR) and Raman. Bombensine and its six fragments were adsorbed on selected surfaces.

It has been shown that the SERS technique, based on unique bands, can distinguish whether the peptide is adsorbed on the surface of α-Ti, α-Fe, TiO_2(anatase), γ-Fe_2O_3, Au/ SiO_2 and Pt, and whether bombesin is fragmented. Thus, there is a potential medical application of SERS, in conjunction with an optical probe, to determine whether there is a TiO_2, Fe_2O_3, Fe, Ti, Au or Pt layer near the implant. The obtained results allow a deeper look at the processes that occur in the nano- and microworld between the metal surface and organic compounds.