Authors: Maria Savelieva, Saratov State University, Postgraduate student
Abstract: Biocompatible polymer matrices modified with inorganic materials including hydroxyapatite, calcium carbonate CaCO3 and calcium phosphate CaP have promising applications for designing of materials for bone tissue regeneration. In this study we fabricated and described the nanostructured composite based on electrospun polycaprolactone (PCL) fibers coated with porous CaCO3. Such modification of fibers allows the functional properties of nanofibrous material to be achieved. In regard to bone tissue formation, the CaCO3 is bioactive material due to its ability to form strong biomaterial-bone interface [1]. The presence of calcium carbonate provides osteoconductive properties of PCL/CaCO3 scaffold which are beneficial for bone reconstruction materials designing. Moreover, the porous structure of vaterite is suitable for loading of various substances (medicaments, growth factors, dyes, nanoparticles). Vaterite coatings on PCL electrospun fibers provide capabilities of functional substance storage and release in scaffold interior and environment. In such way PCL/CaCO3 materials can be promising candidate for designing scaffolds provided with the function of cell growth control by incapsulated agent. In this research we present the simple but efficient technique of polymeric fibrous matrix mineralization by porous CaCO3 and an ability to control the coating homogeneity, CaCO3 mass and polymorph during mineralization process. Cytotoxicity tests showed that PCL/CaCO3 scaffold did not release toxic substances and are suitable for cell cultivation.
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P19) Medical nanofilms of titanium oxynitride deposited by reactive magnetron sputtering

Authors: E. L. Boytsova, L.A. Leonova, National Research Tomsk Polytechnic University
Abstract: Nanofilms are widely used in recent years in different fields of technologies especially in medicine. The methods of thin film coatings depositing are commonly in demand for the obtaining of new materials, including nanostructure. Films for medical purposes, used for many kinds of implants and vascular stents, should improve qualities of the products: biocompatibility, stability of properties and composition, reducing the impact on the surrounding tissue. The complex Ti-O-N-film is one of the most promising coatings for coronary stents [1].

The aim of this work is investigation the sputtering conditions influence, particularly, the bias voltage Ub = 0-100 V on changing the chemical properties of the composition and morphology of Ti-O-N-films under prolonged contact with physiological liquid (solution NaCl 0,9%) [2].

The substrates for depositing bilateral coatings were the crystal plate of NaCl (10 × 10 × 1 mm). Plasma gases were oxygen (O2) and nitrogen (N2). Coating deposition parameters: cathode material was Ti, the operating pressure in the chamber 0.1 Pa, the power 1 kW, current 3A, the working gas leakage rate 5 ml/min, the bias voltage from 0 V to -100 V. The ratio of the partial pressure pure gases N2 and O2: p(O2)/p(N2) = 1/1, deposition time 60 minutes.

Using of X-ray fluorescence analysis (RFlA, Thermo Electron QUANT'X) it was established that Ti-ON coatings are chemically stable, and negative electric bias (Ub = -100 V) leads to the growth of amorphous phase with respect to the nanocrystalline structure for Ub =0 [3].

References

P20) Investigation of interaction between bimodal fluorescent-magnetic nanoparticles based on CQD and living cell using flow cytometry

Authors: Anna Belousova, IIP, junior scientist
Abstract: The interaction between the bimodal fluorescent-magnetic nanoparticles and living cells such as HeLa and different macrophages were investigated using the flow cytometry method. The nanoparticles contained carbon quantum dots and core-shell iron-carbon nanoparticles. The interaction between carboxilated (negatively charged) and aminated (positively charged) nanoparticles has been studied, the uptake mostly of the positively charged nanoparticles into the cells has been established.