

## BIOACTIVE CARBON-METAL COATINGS FOR MEDICAL APPLICATIONS

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*The mechanical, chemical and biological properties of prostheses can be modified by thin coatings. Presently, carbon based coatings are often applied mainly to improve mechanical properties of the covered parts of the artificial prostheses. Particularly useful mechanical properties (such as good adhesion, high hardness, elasticity, etc.) are obtained when the coatings are formed by ion techniques such as the IBSD – Ion Beam Sputter Deposition and IBAD – Ion Beam Assisted Deposition.*

*The chemical and biological properties of carbon coatings can be modified by metallic additives. In the ion-based techniques the metallic additives can be introduced into the coating in a few ways: by ion implantation of the chosen metal into the carbon substrate, by the IBAD technique working with two beams in the dual beam mode, or by using a complex sputtered target, composed of carbon and the selected metal. The final properties of the complex carbon – metal coating are related to the method used for its formation.*

*In this work carbon–Ti and carbon–Ag coatings were investigated. All the coatings were formed by the IBSD or by DB IBAD techniques on UHMWPE and PU substrates. For each type of coatings the depth composition, chemical bonds and mechanical properties were determined. The morphology and thermal stability of the carbon–metal coatings were investigated mainly by the confocal dispersive Raman microspectrometry.*

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## BIOFILM FORMATION UNDER ANAEROBIC CONDITIONS ON BIOMATERIAL'S SURFACE

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### Abstract

*Investigations of the biofilm formation processes on biomaterials surfaces are focused on typical physiologic conditions - aerobic condition. In experimental works onto model strains, and also in the clinical reports there is a lack of the information related to the mechanisms engaged in biofilm grown under conditions of limited access to oxygen or in entirely anaerobic environment.*

*Presented results show the colonization of medical steel 316L surface and creation of biofilm structures by E. coli bacteria's, under oxygen deficit conditions or its total lack. In studied arrangement the change of the dynamics of bacterium growth was observed, which led to considerable slowdown of the biofilm development. Bacteria were observed with use of the combination of fluorescent dyes - bis-benzimide and propidium iodide – which makes it possible the distinction of live/death bacteria. In oxygen deficiency and in anaerobic conditions multiplication of death bacteria level in comparison to standard conditions was observed (suitably 34% and 41% dead cells, oxygenic conditions - 1%). The limitation of oxygen utilization possibility by the bacteria, which colonized investigated surfaces also resulted in decreased sizes reached by the cells.*

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