DEPOSITION OF MULTI-STRUCTURAL THIN FILMS WITH ANTIMICROBIAL EFFECT BY PULSED MAGNETRON SPUTTERING*

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The aim of our work is to produce materials for artificial medical devices such as bone implants, which combine good cellular adhesion of osteoblasts at the surface with distinguished antimicrobial effects. Our actual approach is to insert copper as a metal with known antimicrobial properties into the surface of titanium substrates. Titanium is a material with very good natural surface biocompatibility and excellent mechanical strength. Thus, titanium implants for bone replacement, once successfully implanted, usually perform well up to ten years or beyond. However, a relevant amount of operations results in complications due to infections. The release of Cu species from Ti-Cu surface during the postoperative time could provide antibacterial effects and increase adoption of the implant by living tissue. For such purposes the amount of Cu and the structural bond between particular Ti and Cu components has to be controlled carefully.

High Power Impulse Magnetron Sputtering is employed for preparation of multi-structural Ti-Cu films. Crystallographic phases of deposited thin films are investigated by grazing incidence x-ray diffractometry (XRD), chemical composition is measured by x-ray photoelectron spectroscopy (XPS). Plasma properties are characterized by time-resolved Langmuir probe measurements, time resolved optical emission spectroscopy, ion particle flux and total energy flux measurements. The combination of these diagnostic methods enables an extensive characterization of the films and also agents responsible for formation of thin films with different properties.

The work is supplemented by measurements of the copper release which is an important parameter to characterize the antimicrobial effect of the film. Hence, the microbial and cell adhesion bio-expertises are included to give a survey of properties of thin films.

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