



ANTIBACTERIAL ACTIVITY OF Ag-DOPED DIAMOND-LIKE CARBON (DLC) COATINGS

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ABSTRACT

Trauma medicine has experienced a continuous and progressive increase of the number of hip and knee replacements worldwide in the last decade, where infection-related diseases representing a global risk of 2-5%. The continuous growth of antibiotic resistance bacteria (ARB) and antibiotic resistance genes (ARGs) in the environment makes it necessary to reduce even prevent bacterial colonization by means of surface modification of implants with materials that are unfavorable for biofilm attachment [1]. The addition of effective bactericidal agents like silver suggests the potential application of silver-doped DLC coatings in the biomedical sector [2].

In this work, DLC Ag-doped coatings were grown on CoCrMo substrates by pulsed filtered cathodic arc co-deposition using pure graphite and silver targets. Morphology, structure and chemical composition of the coatings were characterized by SEM, XPS and XRD. Roughness, Wettability and surface free energy were also measured. The Daimler-Benz Rockwell-C adhesion test was used to qualitatively assess the coating adhesion. Cytotoxicity and antibacterial activity against *S. aureus* and *P. aeruginosa* were also studied. Hard and well-adhered Ag-DLC nanostructured coatings of up to 1.5 μm thick, with a silver concentration of 2% were obtained on CoCrMo substrates. The doping concentration of silver studied in this work seems to be optimal for the preparation of noncytotoxic coatings with a significant bactericidal activity.

[1] P. Písařík *et al.*, *Mater Sci Eng C*. 77 (2017) 955–962

[2] S. Liao *et al.*, *Int. J. Nanomed.* 14 (2019) 1469–1487.