PLATHINIUM
PLASMA THIN FILM INTERNATIONAL UNION MEETING
13-17 September 2021
WWW.PLATHINIUM.COM
VIRTUAL MEETING

#PLATH00155

DEPO / Plasma - deposited coatings for optical, electronical and other functionalities

Fabrication and characterization of magnetron co-sputtered $TiO_2/SiO_2/Ag$ coatings inhibiting bacterial adhesion and biofilm formation

T. Vladkova[1], I. Ivanova[2], F. Mergulhaoe[3]
[1] *UCTM, Sofia (BG)*
[2] *Sofia Univ. "St. Kl. Ohridski", Sofia (BG)*
[3] *Univ. Porto (PT*

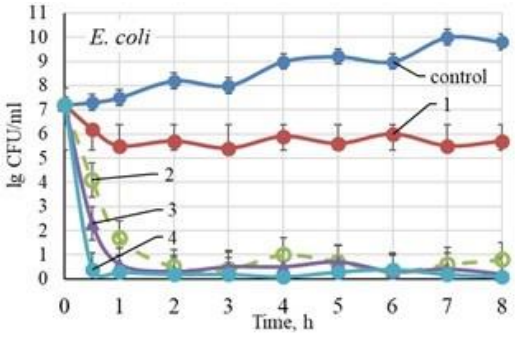
Abstract content

Aim of this study was the development of antimicrobial coatings for medical devices, employing the advantages of magnetron co-sputtering as a dry technique to deposit $TiO_2/SiO_2/Ag$ nanocomposite thin films. Their biological activity was correlated to surface characteristics influencing the bio-adhesion and biofilm formation: elemental composition, morphology, surface energy and its polar and disperse parts. Dispersing effect of SiO_2 was observed lidding to a formation of a submicron grain structure of the coatings. Strong inhibitory effect toward Escherichia coli growth was found: viable bacterial cells number, approaching to zero at the first 30 min - 1 h, depending on the Ag content (Fig. 1). Biofilm formation in urine flow at 48 h was reduced down to 92 % compared to a control glass surface (Fig. 2). Direct contact and eluted silver mediated killing were experimentally demonstrated as a mechanism of antibacterial action. The $TiO_2/SiO_2/Ag$ coatings are promising candidate for antimicrobial protection of urinary tract devices for at least 48h, suggesting benefits over longer time.

Thanks/Acknowledgement

Authors are gratefully acknowledged for the financial support of the Bulgarian National Science Fund (grants DCOST 01/4/2018 ENIUS, KP-06-COST/20/2019); Portuguese national funds through FCT/MCTES (PIDDAC) (project UID/EQU/00511/2019 – LEPABE). The support from COST actions ENIUS (CA16217) and ENBA (CA15216) is acknowledged.

E. coli growth inhibition by studied coatings



E. coli biofilm formation in urine flow