

3rd Annual Conference and Expo on

BIOMATERIALS

March 05-06, 2018 | Berlin, Germany

Functionalized antimicrobial thin films for stainless steel implants coatings

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We report on the transfer of novel polymer-antibiotic-bioactive glass composites by matrix assisted pulsed laser evaporation to uniform thin layers onto stainless steel implant. Influence of the deposition process on the structure of nanomaterials was studied. The targets were prepared by freezing in liquid nitrogen of mixtures containing polymer and antimicrobial natural extract reinforced with bioglass powders. The cryogenic targets were submitted to multipulse ablation with a UV KrF* ($\lambda=248$ nm, $t\sim 25$ ns) excimer laser source. The main advantages with this coating are multiple: stopping any leakage of metal and metal oxides to the biological fluids and finally to inner organs (by polymer use), speeding up osteointegration (by bioactive glass use), antimicrobial effect (by antibiotics use) and decreasing of the implant price (by cheaper stainless steel use). The behaviour of polymer-natural extract-glass/stainless steel structure in conditions which simulate the physiological environment was evaluated *in vitro* by complementary techniques. The bioactivity and the release of the antibiotics were assessed by immersion into simulated body fluid and monitoring by FTIR, UV-VIS spectrometry and electrochemical measurements involving corrosion and EIS studies, carried out in order to investigate the corrosion resistance. The biological properties were tested including the microbial viability using Gram -ve and Gram +ve bacterial strains, the microbial adherence and the cytotoxicity on eukaryotic cells.



Figure 1: Obtaining of antimicrobial thin films onto stainless steel substrate by advanced laser techniques

Recent Publications

1. Floroian L, Craciun D, Socol G, Dorcioman G, Socol M, et al. (2017) Titanium implants' surface functionalization by pulsed laser deposition of TiN, ZrC and ZrN hard films. *Applied Surface Science* 417:175-183.
2. Floroian L, Ristoscu C, Candiani G, Pastori N, Moscatelli M, et al. (2017) Antimicrobial thin films based on ayurvedic plants extracts embedded in a bioactive glass matrix. *Applied Surface Science* 417:224-234.
3. Badea M, Floroian L, Restani P, Cobzac SC and Moga M (2016) Ochratoxin A detection on antibody- immobilized on BSA-functionalized gold electrodes. *PLoS ONE* 11(7):e0160021.
4. Floroian L, Ristoscu C, Mihailescu N, Negut I, Badea M, et al. (2016) Functionalized antimicrobial composite thin films printing for stainless steel implant coatings. *Molecules* 21:740-758.
5. Ciuca S, Badea M, Pozna E, Pana I, Kiss A, et al. (2016) Evaluation of Ag containing hydroxyapatite coatings to the *Candida albicans* infection. *Journal of Microbiological Methods* 125:12-18.

Biography

Laura Floroian received her BSc Degree in Physics at the University of Bucharest, Romania in 1995 and she is currently Associate Professor at Transilvania University of Brasov, Romania. Her current research interests cover biomaterials fields, optical sensor for cell detection, biosensors for biological compounds and toxic compounds, advanced techniques for thin films deposition and advanced techniques for surface characterization. She is a member of many scientific societies: SRF-Romanian Society of Physics, Romanian Society of Automation and Technical Informatics (SRAIT), National Society for Medical Engineering and Biological Technology (SNMITB) and International Association of Online Engineering (IAOE).

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