Growth of nanostructured patterns by plasmas for biomedical applications

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Abstract

Plasma as a discharge state of the gas is considered nowadays as a cutting-edge tool which can manipulate objects at the atomic or molecular scale. Furthermore, plasma can also tailor the surfaces beyond morphology by creating targeted chemical bonds or modifying underlaying material. These kinds of surfaces possess certain properties which can control the interactions with components of living systems, inducing favourable response from the biological entities, and as such can direct the course of a therapy or diagnostic procedure. In this respect, plasmas can be used to initiate even more favourable surface morphologies or selective responses, enabling the biomaterials even more favourable or selective interaction.

In this talk, I will report the developments on the field of cold plasma nanotexturing of organic or inorganic materials for targeted response of cells, recognition of bacteria or single organic molecules relevant to biomedicine. The special attention will be given to cases like plasma texturing and nanostructuring of polymers for targeted attraction of different cells or its differentiation, or inorganic materials like metal oxides, metal alloys, etc. for targeted trapping, adhesion and recognition of bacteria or other single molecules of interest. The aim of all these is either to improve biocompatibility of plasma nanostructured material, e.g. before body implantation, or use the surface for biomedical diagnostic purposes and detection, e.g. reusable SERS substrates for detection and recognition of bacteria.

Biography

Professor Cvelbar's research focusses on advancing nanoscience, nanotechnology, biomaterials, biotechnology and biomedicine in the cross-roads with plasma science. Prof Cvelbar has authored +175 international peer-reviewed journal publications, several books and +18 patents. Prof Cvelbar's research has been continuously supported by different National Research Councils (e.g. ARRS, MIZŠ), European Union, NATO, and also attracts significant interest from industrial partners. He is executive board member of DST at Electrochemical Society, the chair of Plasma Nanoscience, fellow of WAAS and associated editor of several journals. Prof Cvelbar has successfully supervised to completion 7 PhD students and 10 MSc students. He is currently involved in the supervision of 5 PhD students. Additionally, he has managed and mentored of 9 postdoctoral (PD) research fellows, all of whom have remained in engineering/science and have secured employment in industry or academia. Currently, advising 3 PD research fellows.