PL0006

Application of plasma processes in NanoBiotechnology

François Rossi[1], Pascal Colpo[2], Maria Perez Roldan[3], Ana Maria Ruiz Moreno[4]

[1]European Commission, Ispra (VA), Italy [2]European Commission Joint Research Centre, Ispra, Italy [3]European Commission, Joint Research Centre, Ispra, Italy [4]University of Milan, Department of Pharmacology, Chemotherapy and Medical Toxicology, Milan, Italy

francois.rossi@jrc.ec.europa.eu

One of the major challenges for the development of bio non bio interfaces relies on the ability to design advanced surfaces with controlled interaction with the biological entities[1]. Surface functionalization techniques provide those bio-interfaces: appropriate surface physico-chemical properties are able to control the conformation and activity of the immobilized biomolecules. The subsequent technological step is the combination of different bio-functions in micro- and nano-patterns on the surfaces. For instance, structuring the surface in adhesive and non adhesive zone in order to preferentially guide the cell growth is one of the most promising tools for the development of cell chips and for tissue engineering[2,3].The requirement of further integration scales and the study of the special behaviour of the biomolecules interacting with nanostructured materials have been the two main motivations for the development of submicron patterning techniques[4]. For instance a strong increase of magnitude of sensitivity in biosensing devices together with lower detection limits have been demonstrated[5].We show some examples of micro- and nano-functional surfaces provided by plasma processes and self assembled monolayers in combination with Electron Beam Lithography and Colloidal lithography, and their application as platforms for molecular detection and stem cell cultures. Different protein micropatterns were used for stem cell culturing, showing that stem cell maintenance and differentiation can be controlled by the nature and topography of the protein spots.

[1] B. G. Keselowsky, D. M. Collard, and J. Garcia, PNAS 2005, 102, 5953-5957.
[2] F. Bretagnol, F. Rossi et al., Plasma Processes and Polymers 2006, 3, 30-38.
[3] F. Bretagnol, F. Rossi et al.Plasma Processes and Polymers 2006, 3, 443-455.
[4] A. Valsesia, F. Rossi et al.Nano Letters 2004, 4, 1047-1050.
[5] A. Valsesia, P. Colpo, P. F. Rossi et alLangmuir 2006, 22, 1763-1767.

Keywords
nanobiotechnology