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Multi-functional biomimetic surfaces of PLA based biomaterials created by printing of functional PLA-b-PEO colloids

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A specific distribution of cell-adhesion structures, such as RGDS-peptide, over the biomaterial surface and the synergy with other signaling bio-motifs play a crucial role in regulating cell-biomaterial interactions in tissue engineering. In this study, we investigate the creation of surfaces with single peptide nano-clusters with different spatial distribution and multi-functional surfaces with at least two different peptides nano-clusters, which were prepared by deposition of functionalized PLA-b-PEO. The model surfaces were prepared by spin-casting of PLA-b-PEO copolymer colloidal solutions with selected composition of non-functionalized, maleimide-functionalized and alkyne-functionalized copolymers on a PLA film. The surfaces were grafted with RGDS, KRSR and KRTGQYKLGSKTGPGQK peptides via Michael addition and azide-alkyne cycloaddition. The second end of the peptide chains was flanked with biotin which was used for determination of peptide surface distribution by visualization of streptavidin-labelled gold nanospheres (A-Au NS, 40 nm) selectively bound to biotin using AFM. The concentration of peptides was determined by radioactivity measurements of analogous peptides with iodine label. The surfaces were tested in cell tissue cultures with bone, endothelial and stem cells. The selected surfaces cultured with osteosarcoma MG63 cells were tested under dynamic condition. PLA-b-PEO copolymers in selective solvents form self-assemblies, surface deposition of which results in nanoscale-organized surfaces. Using the deposition of various ratios of functionalized and non-functionalized nano-colloids, the surfaces with overall RGDS-peptide concentration in the range of 8.5 to 15.5 pmol/cm^2 and peptide cluster distance from 320 up to 1250 nm were obtained. The effect of RGDS clusters distance, synergic effect of additional peptide sequence as well as the influence of mechanical loading on cell response will be demonstrated.

Biography

Mazl Chanova E has completed her PhD in early 2011 from the Institute of Macromolecular Chemistry AS CR (IMC), Prague under the auspices of the University of Chemistry and Technology, Prague, Czech Republic. She is a Member of the Department of Bioactive Polymers at IMC, a leading polymer institute in the central Europe. She is interested in the biomimetic surface modification, cell-surface interactions and surface analytic techniques of biomaterials. She has published more than 12 papers in reputed journals.

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