DESIGN AND SYNTHESIS OF TAILOR-MADE NANOSTRUCTURED POLYMER BIOINTERFACES

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The design and synthesis of polymer brush systems became very attractive for applications in the biomedical field. Control of their architectural features and chemical environment offers possibilities for the creation of particular biointerfaces or applications in nanotechnologies on a variety of substrates [1].

In this study, we were interested in the establishment of such polymer brush biointerfaces by the usage of surface-induced reversible addition fragmentation chain transfer (RAFT) polymerization on various materials. Via covalent coupling of a RAFT-reagent to the surface, polymer brushes can be generated in a “grafting from” attempt, benefitting from the general advantages of RAFT polymerization (gentle polymerization conditions, absence of toxic catalysts, uniform chain lengths and defined molecular weights and a variety of possible end group modifications). Different acrylamides and vinyl esters were applied for the generation of their appropriate RAFT polymers under variable initiation conditions. Their morphology and behavior in aqueous environment was studied via light and X-ray scattering methods to predict their arrangement in a polymer brush system. Further studies were performed on proper end-group modification methods to provide a coupling to specific biomolecules. Investigations on the immobilization of the appropriate RAFT reagent to different substrate surfaces (SiO_2, porous polymer materials) were performed by usage of various coupling methods and characterization methods (contact angle, ellipsometry).

[1] M. Krishnamoorthy, S. Hakobyan, M. Ramstedt and J. E. Gautrot, Chemical Reviews, 2014, 114, 10976-11026.