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VABILO NA PREGLOV KOLOKVIJ / INVITATION TO THE PREGL COLLOQUIUM

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Macromolecular Nanotechnology with Atomic Force Microscopy

Četrtek / Thursday, 22. 09. 2011, ob / at 13:00

Velika predavalnica Kemijskega inštituta / Lecture Hall at the National Institute of Chemistry; Hajdrihova 19, Ljubljana

Nanotechnology aims at the fabrication, characterization and use of structures, devices and systems that have novel properties and functions because of their miniature size. For bottom up nanotechnologies it is essential to have a direct control of matter either between two nanoobjects, or between a micro (or macro) object and a nanoobject. Novel scanning probe techniques (SPT), such as Atomic Force Microscopy (AFM allow one to visualize single molecules, study their single molecule properties, monitor their motion, and manipulate them. Hence, SPTs have become a truly enabling platform in macromolecular nanotechnology. For example, the strength of molecular bonds can be assessed by AFM-based single-molecule force spectroscopy (AFM-SMFS). After showing some examples for single molecule imaging, the rupture force of supramolecular bonds, as well as the unbinding dynamics of associating polymers will be discussed. AFM is also an enabling platform for nanofabrication using various lithography approaches to manipulate and deliver molecules with nanometer precision. We shall review results of placing initiator molecules for “grafting-from” polymerizations to obtain covalently attach polymers to various surfaces. Red-ox stimulus responsive chains (of organometallic polyferrocenylsilanes) bound to electrodes undergo reversible stiffness and segment length variations at the single chain level, which can be assessed by AFM-SFMS. These chains behave like molecular motors, as it will be demonstrated during the presentation. Stimulus responsive polymer brushes are very efficient to change surface chemistry and provide control of surface properties by variation of external (environmental) parameters. Applications of AFM to monitor and study the responsive behavior of designer surfaces featuring stimulus responsive macromolecular grafts will be shown. Finally, mechanical performance of dendrimers and vesicles to deliver molecular payloads will be briefly elucidated.

General reference: H. Schönherr, G.J. Vancso, Scanning Force Microscopy of Polymers, Springer, Heidelberg, 2010.

Vljudno vabljeni! / Kindly invited!

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