

A Workbench for Functional Macromolecules and their Complexes

N. Severin, H. Liang, W. Zhuang, J. Barner,
J.P. Rabe

Institut für Physik der Humboldt-Universität zu Berlin
www.polymerphysics.de

Supramolecular structures of single functional macromolecules are a key to understand function in natural molecular systems, as well as to develop novel artificial functional systems. In order to investigate and control the conformations of single macromolecules and their complexes a "Molecular Workbench" [1] has been developed, consisting of the basal plane of highly oriented pyrolytic graphite (HOPG), coated with a layer of flat lying amphiphiles that controls the interaction between the substrate and adsorbed macromolecules. A scanning force microscope operated in tapping or contact modes is used to both image and manipulate the macromolecules, in order to correlate their structure with mechanical properties, and to assemble macromolecular systems that would not form spontaneously. We report on recent progress on structure formation and mechanical properties, particularly on self-sorting of metallo-supramolecular coordination polyelectrolyte complexes on surfaces [2], self-folding and synthesis with of single dendronized polymers [3,4], supramolecular polymers of oligopeptide functionalized polydiacetylenes [5,6], multiblock copolymers of DNA and polyethylene glycol [7], and self-stretching and time dependent rupture of single ds-DNA on the molecular workbench.

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