Template-Guided Self-Assembly: Controlling Nanoscale Pattern Formation by Molecular Interaction

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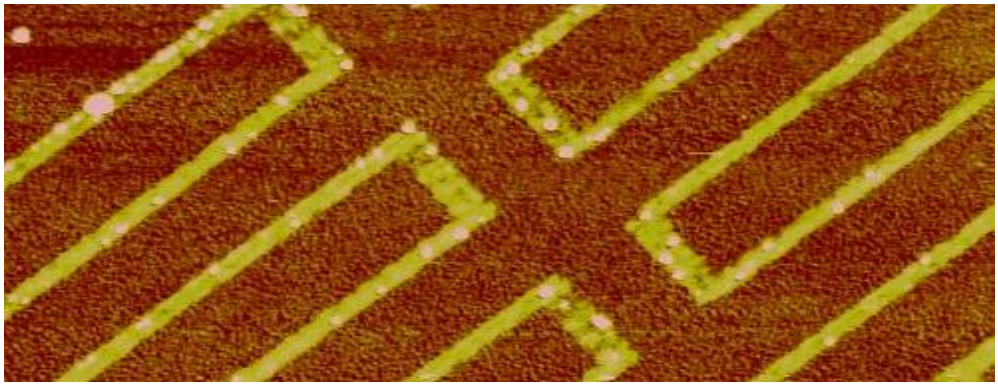
Nanotechnolgy provides the potential to generate and to replicate complex nanoscale patterns by means of intermolecular interaction and by surface-adsorbate interaction. The approach of *Template-Guided Self-Assembly* uses the intermolecular interaction between a chemically patterned surface and molecules in solution to generate well-defined surface energy patterns for the adsorbed layer. Molecules from solution follow this pattern, e.g. of a laterally structured Self-Assembled Monolayer (SAM), and replicate it.

For this purpose, polymer brushes and other molecular functional systems are prepared e.g. on silicon oxide surfaces or on metallic surfaces. Their topography and their adhesion properties are investigated by Atomic Force Microscopy (AFM). These ultra-thin polymer films, in turn, can be mechano-chemically removed by the tip of an AFM at predefined locations and subsequently replaced by a different polymer species. In this way it is possible to generate polymeric surfaces with pre-defined chemical patterns. These surface energy patterns, in turn, can be used to control the phase-mophology of polymer blend thin films subsequently prepared on top of these substrates. Perspectives or this approach of soft lithography include the generation of specifically functionalized nano-scale patterns, e.g. for nano-biology, or for the guided self-assembly of nano-objects.



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