Tailormade Polymer Monolayers and Networks for the Generation of Novel Microsystems and Engineered Biointerfaces

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All interactions of materials with their respective environments are controlled by the topography and chemical composition of their surfaces. Examples are the adhesion between two objects, wetting of surfaces by contacting liquids and the adsorption of molecules from the surrounding medium. Accordingly, it is important to develop chemical tools which allow the attachment of tailor-mode polymer molecules to surfaces of different chemical composition. In the presentation a new strategy based on C,H insertion crosslinking (Chic) will be presented which allows generating novel, micropatterned polymer coatings with tailor-made properties with high spatial resolution on a broad spectrum of different substrates, ranging from inorganic surfaces to polymers and biological materials and even chemically rather inert polymers. We combine this chemical toolbox with the formation of very distinct micro- and nanostructures yielding novel metamaterials.

We show examples how such designed surfaces can be used to control the wetting properties of surfaces, determine adhesion of cells or prevent the formation of biofilms. We give examples how the surface properties of materials can be adapted according to an external stimulus and describe how the obtained materials can be used for the generation of materials with extremely unusual wetting properties or new bioanalytical devices, such as DNA, RNA, protein or polysaccharide chips.

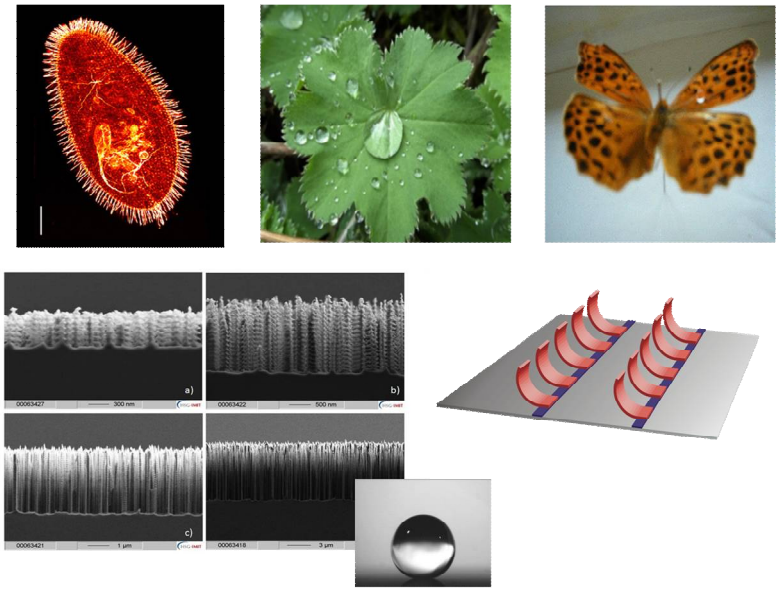

Fig. 1: Wetting and transport realized by natural (top row: Paramecium, Ladies mantel, butterfly) and articificial (bottom row: silicon nanograss, magnetic rubber flaps) metamaterials