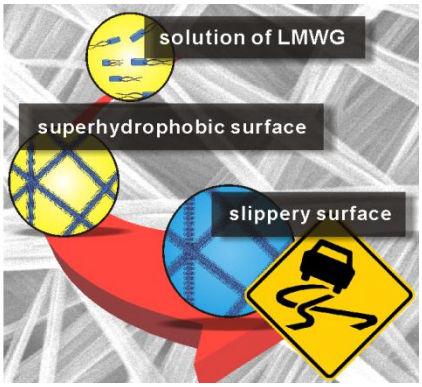
Supramolecular Gels: From Superhydrophobic and Slippery Surfaces to Directional Transport

Christoph A. Schalley, Freie Universität Berlin

In two parts, the talk demonstrates how (stimuli-responsive) supramolecular gels and polymers can be utilized to design functional materials.



In the first part, a very simple production procedure for superhydrophobic and slippery surfaces is demonstrated. The deposition of a gel leads to the surface roughness needed for superhydrophobicity and in a way mimics the Lotus leaf effect. While the superhydrophobic surfaces repel water, but not solutions of detergents such as SDS, infusion of a lubricant into the cavities of a gel provides a slippery surface, which also repels SDS solutions and more complex liquids such as serum or blood. Both surfaces are stable to extended exposure to running water. In addition, the slippery surfaces are self-healing.

The second part discusses how to use a supramolecular polymer self-assembling from easy-to-synthesize monomers as a supramolecular machine for the directional transport of particles as their cargo over millimeter distances. The direction is defined by a salt gradient and the energy dissipated in the process comes from the crystallization of flexible, bent and partially amorphous ribbons into rigid rods. Overall, this supramolecular machine generates external work from chemical energy. The structural details have been unraveled by electron microscopy, small and wide angle X-ray scattering and electron diffraction experiments.