Guided Self-Assembly of Microgels: From Particle Array to Anisotropic Nanostructures

M.-Ph. Schürings¹, S. Hilt¹, A. Pich²*, A. Böker¹*

¹Lehrstuhl für Makromolekulare Materialien und Oberflächen, RWTH Aachen University,
²Funktional and Interactive Polymers, DWI an der RWTH Aachen e.V., Germany

* E-mail: pich@dwi.rwth-aachen.de; boeker@dwi.rwth-aachen.de

The assembly of soft matter colloids on nanostructured substrates represents an easy and accessible way to fabricate microgel chains and nanostructured surfaces.

Assembly of VCL/AAEM- microgels on wrinkled substrates via spin coating.

Core shell microgels, which consist of an N-vinyl-caprolactam (VCL) shell and an acetoacetoxyethyl methacrylate (AAEM) core, can be arranged onto nanostructured surfaces via spin coating. The quality of the assembly is tuneable via various parameters and depends on the interactions between particles and surface. To obtain a high yield of highly aligned self-assembled particles, a system of periodic wrinkles can be used as a substrate.

AFM image of anisotropic nanostructured Si-Surface   TEM image of microgel strings

The prealigned microgels can be transferred onto flat surfaces to create periodic nanostructures, which cover large surface areas. UV irradiation of the assembled particles yields microgel chains with variable widths (500-2000 nm) and lengths (up to 27 μm). These are tuneable by the wavelength of the wrinkles. Due to the thermo responsiveness of VCL/AAEM colloids, anisotropic contraction can be induced. This leads to possible applications as sensors or actuators.