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Microgels: Simple Matter where Complexity Matters

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Abstract: Microgels are macromolecular networks swollen by the solvent they are dissolved in. They are unique systems that are distinctly different from common colloids, such as, e.g., rigid nanoparticles, flexible macromolecules, micelles or vesicles. When swollen, they are soft and have a fuzzy surface with dangling chains and the presence of cross-links provides structural integrity. Finally, microgels reveal interface activity without being amphiphilic. Microgel adsorb to fluid and rigid interfaces surfaces and their response to external stimuli allows preparing responsive emulsions and coatings which can be used, e.g., in biocatalysis and as sensors.

At high packing density, microgels can deswell, interpenetrate and deform, thus they can behave like particles or / and macromolecules. Due their properties, microgels can be used to tune the particle-to-polymer transition.

We will discuss properties of microgels of different architectures both in aqueous solution and at interfaces. In particular we will address ultra-low cross-linked microgels, hollow and anisotropic microgels which are sensitive to stimuli as, e.g. temperature and pH.

The structure of microgels is investigated by means of scattering methods, especially exploiting the technique of contrast variation in small angle neutron scattering as well as by super resolved fluorescence microscopy and scanning force microscopy. The experimental results will be compared to computer simulations.

References

Schulte, M. F *et al.* Stiffness Tomography of Ultra-Soft Nanogels by Atomic Force Microscopy. *Angew Chem Int Edit* **2021**, 60, 2280–2287.

Nickel, A. C. *et al.* Anisotropic Microgels Show Their Soft Side. *Langmuir* (2021)
doi:10.1021/acs.langmuir.1c01748.

Scotti, A. *et al.* Exploring the Colloid-to-Polymer Transition for Ultra-Low Crosslinked Microgels From Three to Two Dimensions. *Nat Commun* **2019**, 10, 1418.

Nickel, A. C. *et al.* Anisotropic Hollow Microgels That Can Adapt Their Size, Shape, and Softness. *Nano Lett.* **2019**, 19, 8161–8170.

Keidel, R. *et al.* Time-Resolved Structural Evolution During the Collapse of Responsive Hydrogels: the Microgel-to-Particle Transition. *Science Advances* **2018**, 4, eaao7086