

Responsive microgels: Responsive Microgels: Simple Mater where Complexity Matters

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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 - in contrast to linear and (hyper-) branched polymers. Obviously, the cross-linker content will allow controlling whether microgels behave more "colloidal" or "macromolecular". Finally, microgels reveal interface activity without being amphiphilic.

The combination of being soft and porous while still having a stable structure through the cross-linked network allows for the possibility to introduce chemical functionality at different positions. The architectural diversity and compartmentalization of reactive groups enable thus short-range coexistence of otherwise instable combinations of chemical reactivity. The capability of microgels to adjust both their shape and volume in response to external stimuli provides the opportunity to reversibly tune their physico-chemical properties. From a physics point of view, microgels are particularly intriguing and challenging, since their intra-particle properties are intimately linked to their inter-particle behavior.