

When nano-ions bind to microgels: from intra- to inter-cross-linking in suspension and at interfaces

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Microgels are colloidal particles made of swollen polymeric network, whose softness imparts many original properties both in suspension and at interfaces. In particular, poly(N-isopropylacrylamide) (pNIPAM) microgels adsorb at fluid interfaces and were found to stabilize Pickering emulsions and foams. ^[1] The stabilization effect is directly linked to their deformability at the interface, which has consequences on the interfacial elasticity of the drop surface. ^[2] Nanometric anions such as boron clusters and polyoxometalates (POMs) having a low charge density, belong to the class of superchaotropic ions, being prone to dehydration and coassembly with non-ionic systems. In particular, POMs were found to interact with pNIPAM polymers. ^[3] In the present work, we are delving into the interactions between POMs and pNIPAM microgels, investigating 1) how microgel structure impacts the association constant between polymers and nanoions, 2) how these interactions impact the microgel softness and thus, their interfacial behavior in emulsions. The concept is summarized in Figure 1. Interestingly, microgels could efficiently capture nanoions in the μM range, 3 orders of magnitude below the linear homologs. These nanoions act as internal physical cross-linkers and alter microgel softness. Moreover, they also create additional and reversible cross-linking effects between the microgels. Depending on the type of microgels and the pathway, the stability of microgel-stabilized emulsions could be enhanced or weakened ^[4].

Keywords:

Microgel, Nano-ion, Superchaotropic, Emulsion, Pickering

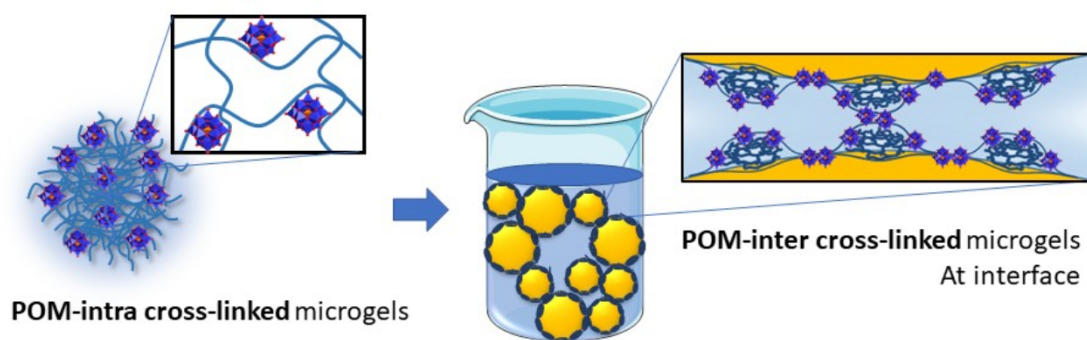


Figure 1. Scheme of a POM-cross-linked PNIPAM microgel (left) and inter-cross-linked microgels adsorbed at the oil-water interface of droplets in an emulsion (right).

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