Use of the Thermoresponsive and Charge Properties of Microgels to Load an Organic Substrate

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Microgels are an appealing reaction media because they offer possibilities for external switching and manipulation [1,2]. Using conventional surfactant-free emulsion polymerization, poly-N-isopropylacrylamide (pNIPAM) and N-isopropylacrylamideco-2-acrylamido-2-methyl-propanosulfonic acid (pNIPAMcoAMPS) microgels were successfully prepared. The size, morphology, thermosensitive behavior and zeta potential were studied for each microgel (see Figure).

We have chosen Crystal Violet as a model organic substrate. The uptake efficiency of the Crystal Violet by both types of microgels was studied quantitatively. The influence of the thermosensitive behavior and the charge toward the uptake process was investigated. The pNIPAM microgels showed different uptake efficiency depending on the swelling ratio. The pNIPAMcoAMPS microgels showed a greater efficiency compared to the pNIPAM microgels due to the ion pair formation between the crystal violet and the sulfonic moieties of the 2-acrylamido-2-methyl-propanesulfonic acid co-monomer.

This preliminary results show that the uptake capabilities of microgels as drug delivery systems can be further improved by designing a specific microgel suitable for each particular molecule.

Figure. (Left) TEM image of the pNIPAMcoAMPS microgel and (Right) Variation with the temperature of the hydrodynamic diameter for pNIPAM microgels (open circles) and pNIPAMcoAMPS microgel (close squares).
