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MICROGELS PREPARED BY MOLECULAR ASSEMBLING

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There are two main methods to prepare polymer particles. One is particle-forming polymerization and the other is molecular assembling followed by crosslinking. This paper focuses on microgel preparation via assembling of polymer molecules from their solution.

Anionic polymers in their dilute aqueous solutions were assembled into submicron aggregates by polycation, multivalent cation, or cationic surfactant. Then the aggregates were crosslinked and converted to stable microgels. The anionic polymers include such as poly(acrylic acid) (PAA), carboxymethyl cellulose (CMC), hyaluronic acid (HA) and poly(glutamic acid) (PGA). Resulting microgels were pH-sensitive.

In the case of thermo-sensitive microgels, they were obtained by elevating temperature of aqueous solution of thermosensitive polymer, for example, poly(N-isopropylacrylamide) (PNIPAM). The critical temperature above which polymer molecules are hydrophobically assembled is lower critical solution temperature (LCST).

Polymeric micelles were obtained by assembling one of blocks in amphiphilic multi-block copolymer. Poly(glycerol methacrylate) (PGLM)-block-PNIPAM gave two types of micelles, that is, PNIPAM core / PGLM shell micelle and PGLM core / PNIPAM shell one. The former was prepared by warming up the polymer solution above the LCST of PNIPAM. The latter was formed by solvent exchange. The polymer was dissolved in methanol. To this solution tetrahydrofuran (THF) was added slowly. When the fraction of THF in solvent reaches a certain level, PGLM blocks aggregate to form micelle stabilized by PNIPAM because THF is non-solvent for PGLM but good solvent for PNIPAM. The structures and properties of above-mentioned microgels will be discussed.