Nanochemistry and biotechnology

Star-like Dextran-graft-PNIPAM copolymers. synthesis AND structural FEATURES

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Poly-N-Isopropylacrylamide (PNIPAM) is important as stimuli-responsive polymer which can be widely used in present-day biomedicine. It forms systems with Lower Critical Solution Temperature (LCST) in the range close to human body temperature (32-35 C). This makes it possible usage it in various drug delivery systems. The main feature of this polymer is its ability to undergo a phase transition (globule-to-coil) in aqueous solution in the temperature range mentioned above. PNIPAM modification enables us to increase the number of factors that will affect the transition temperature.

Purpose of this research was to obtain a water-soluble star-like branched copolymers with low polydispersity and a radical copolymerization process optimization Resulting polymers have a high molecular weight ($4\text{-}5\cdot10^5$ g/mol) and low polydispersity (under 1.4). Also it was planned to study influence of internal structure of branched polymers in dilute solution on ability to control conformational transition in the LCST range.

Branched star-like copolymers dextran-poly-N-isopropylacrylamide were synthesized. PNIPAM was grafted to dextran with molecular weight $M_w = 610^3$ and $M_w = 710^4$ g/mol. Cerium (IV) ammonium nitrate was used as initiator.

The obtained polymers are characterized by size exclusion chromatography equipped with light scattering, refractometry and viscometry detectors. The influence of the polymer internal structure on the temperature of the conformational transition temperature range has been studied by dynamic light scattering. It has been shown that a decrease in the distance between graft leads to more rigid molecular structure, which affects the conformational transition process.