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TUNABLE THERMO-RESPONSIVE COPOLYMERS VIA RAFT POLYMERIZATION: EFFECTS OF COMPOSITION ON PHASE TRANSITION IN AQUEOUS SOLUTIONS

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Stimuli-responsive polymers, particularly amphiphilic macromolecules with distinct affinities for polar and nonpolar solvents, have recently garnered significant scientific interest [1]. The intricate self-organization of hydrophilic and hydrophobic units within these macromolecules, influenced by external stimuli (temperature, ionic strength, and solvent quality) opens up avenues for applications in diverse fields, including medicine, biochemistry, and microelectronics [2].

The advancement of RAFT methods has enabled the synthesis of a wide range of amphiphilic copolymers with unique architectures, including brush polymers. This study focuses on the synthesis and investigation of statistical copolymers, specifically p(DEGMA-co-OEG_xMA) ($x = 5, 9$), synthesized through RAFT polymerization.

Various analytical techniques, including ¹H NMR, FT-IR, molecular sieve chromatography (MSC), and dynamic light scattering (DLS), were employed to characterize the copolymers.

From the NMR data, the structure of the copolymers was determined, and the exact composition, which is very close to the original monomer composition, was calculated. Using DLS method lower critical dissolution temperatures (LCST) of synthesized polymers were measured. It was found that the LCST values of the copolymers increased with increasing number of OEG_xMA ($x = 5, 9$) monomeric units in the copolymer composition.

The copolymers p(DEGMA-co-OEG₅MA) and p(DEGMA-co-OEG₉MA) with relatively high amount of DEGMA monomeric units in composition (80 and 90 mol%, respectively), exhibited LCST values close to human body temperature. This indicates their potential applications in medicine, pharmacy, and biotechnology.

[1] Kavaliauskaite, M. et. al. *Polymers* 2022, 14, 229.

[2] Korde, J. M. et.al. *Ind. Eng. Chem. Res.* 2019 58 (23), 9709-9757.