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Thermo-Responsive Viscosity of Polyacrylamide Block Copolymers Synthesized via Aqueous Cu-RDRP

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Aqueous Cu-RDRP was utilized for the rapid synthesis of poly(N-isopropyl acrylamide)-block-poly(2-hydroxyethyl acrylamide) (PNiPAMx-b-PHEAAmy) copolymers with thermo-responsive viscosity. The pre-disproportionation of Cu(I)Br in the presence of an aliphatic tertiary amine (Me_6Tren) in water generated nascent Cu(0) and [Cu(II)] complexes and facilitated the rapid synthesis of a series of (block) copolymers with low dispersity values ($1.08 < \text{Đ} < 1.22$) and control over the molecular weight ($M_n, \text{SEC} \sim 30,000$). The control over the polymerization enabled the design of a series of block copolymers with precision over the segment ratio, which exhibit different thermo-responsive aggregation. Thermal analysis, viscometry and fluorescence measurements gave insights on the effect of composition and temperature alterations rendering the synthesized polymers potential candidates for temperature-dependent applications.

Keywords: Thermoresponsive: Polyacrylamide block copolymers: Cu-RDRP