OPTIMIZATION OF THE TAI STRATEGY FOR THE SYNTHESIS OF WATER-SOLUBLE POLYMERS FOR BIOMEDICAL APPLICATIONS

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Recently, a new synthetic strategy utilizing the copper-catalyzed reversible-deactivation radical polymerization (Cu-RDRP) initiated by the adducts of trichloroacetyl isocyanate (TAI) was introducted.1 This strategy enables the synthesis of unique complex polymeric architectures (e.g. graft copolymers, stars) with unprecedently high chain density. So far, however, the strategy has been applied only to non-polar monomers. Within our current efforts aimed at the preparation of hydrophilic biocompatible polymer-based carriers for biomedical applications, we investigated the applicability of the TAI strategy to the polymerization of water-soluble monomers. In this contribution, the optimization of Cu-RDRP conditions to achieve well-defined polymers will be demonstrated for N-(2-hydroxypropyl) methacrylamide (HPMA) and poly(ethylene glycol) methyl ether methacrylate (PEGMA). Different polymerization parameters, such as temperature, solvent, catalyst and ligand type, or catalytic system stoichiometry, have been varied to attain branched low-dispersity polymers at high monomer conversions. The developed conditions were then applied to synthesize different complex polymeric architectures, e.g., multi-arm polymeric stars based on a β-cyclodextrin core, that will be used for subsequent end-group modification. The synthesized branched polymers were characterized by 1H NMR spectroscopy and size-exclusion chromatography with a triple-detection system.

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References

[1] Gupta S., Janata M., Čadová E., Raus V; Straightforward synthesis of complex polymeric architectures with ultra-high chain density. *Chem. Sci*. **2024**, *15*, 12739-12753.