550e Synthesis and Characterization of Novel Star Polymers

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The key to forming novel microstructures using self assembly of nanoparticles is to code the instructions for assembly by chemically modifying the particle surface. The resulting patchy nanoparticles can then be assembled into a variety of microstructures.

In this work, we report on synthesis and characterization of novel four arm star polymers in which each arm is a block copolymer. The inner segment in each arm is made of N-isopropylacrylamide (NIPAM) and the outer segment is made of dimethylacrylamide. (DMA). The polymers are synthesized by the reversible addition fragmentation chain transfer mechanism (RAFT) and are of a low polydispersity (Mw/Mn ~ 1.2). The functional group at the end of each arm in the star polymer can be changed by using a different chain transfer agent.

When suspended in aqueous solutions at room temperature, the stars are in a good solvent. When the temperature is increased to a value higher than 32oC, the NIPAM segment collapses thus giving rise to a patchy nanoparticle. Initial results show that the collapsed nanoparticle aggregates into a monodisperse structure – the size of which can be tuned by changing the block lengths of NIPAM and DMA.