

Thermoassociating water-soluble polymers based on tacticity control

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ABSTRACT

An important group of water soluble polymers are associative ones in which hydrophobic parts of the polymer molecules interact, self-assemble and enhance the viscosity of aqueous solutions even at low polymer concentrations. For many applications it would be beneficial to be able to combine the associative behaviour with stimuli-responsiveness. Among water-soluble stimuli-responsive polymers, poly(N-isopropylacrylamide), (PNIPAM), has attracted attention due to its sharp and reversible transition behavior and well-defined demixing temperature in aqueous medium.

Atactic PNIPAM is water-soluble at room temperature, while stereoregular PNIPAMs have rather different solubility, isotactic PNIPAM being insoluble in water and syndiotactic PNIPAM being only barely soluble.¹ As recent advances in controlled radical polymerization methods have made the tailoring of stereoregularity possible, so called stereoblock copolymers based on the same monomer may be realised.

By utilising reversible addition-fragmentation transfer polymerization (RAFT) ABA stereoblock copolymers of PNIPAM having stereoregular blocks have been synthesized.² The properties of aqueous solutions of these stereoblock copolymers were studied with respect to the molecular characteristics, *e.g.* order of the

blocks, block lengths and molecular weight.³

REFERENCES

1. a) Ito, M.; Ishizone, T. *J. Polym. Sci. Part A: Polym. Chem.* 2006, 16, 4832-4845., b) Isobe, Y.; Fujioka, D.; Habaue, S.; Okamoto, Y. *J. Am. Chem. Soc.* 2001, 29, 7180-7181. c) Hirano, T.; Miki H.; Seno, M.; Sato, T. *Polymer* 2005, 46, 5501-5505.
2. Nuopponen M.; Kalliomäki K.; Laukkanen A.; Hietala S.; Tenhu H. *J. Polym. Sci. Polym. Chem.* 2008, 46, 38-46.
3. Hietala S.; Nuopponen M.; Kalliomäki K.; Tenhu H. *Macromolecules*, 41 (2008) 2627 - 2631.