

Influence of Organic Solvents on the Hydrodynamic Diameter of Hydrophobically-Modified poly(*N*-isopropylacrylamide)-Based Microgels

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The swelling behaviour of poly(*N*-isopropylacrylamide) (NIPAM) microgel particles in short-chain alcohol-water solutions consists of particle collapse at low volume fractions of alcohol and re-entrant swelling at higher volume fractions.^{1,2} The effect of increasing the hydrophobic nature of aqueous poly(NIPAM)-based microgels upon this behaviour has been investigated in the presence of increasingly hydrophobic organic (water-miscible) solvents.

Several poly(NIPAM)-based copolymers incorporating hydrophobic co-monomers such as vinyl laurate (C₁₄) and vinyl stearate (C₂₀) (at 10 % w/w of NIPAM monomer) were prepared by a surfactant-free emulsion polymerisation reaction. The variation in particle size (hydrodynamic diameter) of these microgels was measured by dynamic light scattering in the presence of increasing mass fractions (0–100 %) of co-solvents of varying polarity and dielectric constant, which included methanol ($\epsilon = 32.63$), ethanol ($\epsilon = 24.3$) and formic acid ($\epsilon = 58.5$).³ The hydrodynamic diameters were measured at 25 and 50 °C, i.e. above and below the volume phase transition temperature of each microgel dispersion.

Variations in particle size were observed as the hydrophobic nature of poly(NIPAM)-based copolymer microgels and/or the added co-solvents were increased. Different trends were observed depending on the hydrophobic nature of the microgels/co-solvents. These results suggest that such microgels may have future applications, for example in the removal of hydrophobic materials/solvents from water.

References:

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