

Analysis of Monomer Composition in Copolymer Microgel Particles

Hani Nur, L.S. Benée and M.J. Snowden

*Medway Sciences, School of Science, University of Greenwich at Medway, Chatham
Maritime, Kent ME4 4TB, UK*

Abstract

A series of colloidal microgels have been prepared by surfactant-free emulsion polymerization (SFEP) based on the N-isopropylacrylamide (NIPAM) monomer. 4-vinylpyridine (4-VP) and butylacrylate (BUA) have been used as co-monomers. Copolymer poly(NIPAM/4-VP) and poly (NIPAM/BUA) have been prepared with various monomer ratios, ranging from pure poly(NIPAM) to pure poly(BUA)/ poly(4-VP). Freeze-dried samples of the microgels have been analysed by Raman and NMR (Nuclear Magnetic Resonance) spectroscopy to investigate the monomer composition in the copolymer microgels. Spectral data have been analysed graphically and also statistically (least-square fitting of each monomer to the co-polymer spectrum). Results has shown that for both the co-polymer microgels, differing in monomer composition, Raman spectroscopy can be employed as a quick and easy method to ensure that copolymerization has occurred and also to determine, semi-quantitatively, the percentage incorporation of the 4-VP / BUA monomer. A good correlation exists between the Raman and NMR results, Raman spectroscopy however much less time consuming (Raman spectral acquisition time is < 10 mins), the measurements are easy to make and very small quantities (less than 1 mg) of the material under investigation are required. This compares with the experimental measurements of ~72 hours and 100-200 mg of sample that are required for the NMR experiments.