

Application of NMR Spectroscopy to the Characterisation of Emulsion Polymers

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High-resolution ^{13}C NMR spectroscopy has been applied to the characterisation of molecular structure in two systems, poly(acrylamide-*stat*-sodium acrylate) prepared in inverse microemulsions, and poly(butyl acrylate) prepared by emulsion polymerisation. These applications illustrate the use of NMR in studying various aspects of polymer molecular structure.

In the poly(acrylamide-*stat*-sodium acrylate) system, the monomer sequence structure was determined at the triad level from the carbonyl signals. The sequence statistics were found to follow the Bernoullian model closely, with reactivity ratios of 0.89 ± 0.15 (sodium acrylate) and 0.92 ± 0.15 (acrylamide). These values are somewhat different from those for solution polymerisation (≈ 0.3 and ≈ 0.95 respectively). The results were interpreted in terms of polymerisation by nucleation and interparticular collisions rather than by monomer diffusion through the continuous medium.

In the poly(butyl acrylate) system, the structural feature of interest was chain transfer to polymer. With the aid of DEPT spectra, it was shown that the reaction proceeds by abstraction of tertiary hydrogen atoms at a level of 10–20 branches per 1000 backbone carbon atoms. Changes in molar mass distribution were correlated with measurements of the extent of chain transfer to polymer.