

Poster 4

Hybrid Polymer Nanoparticles by Transitional Phase Inversion

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A new technique was developed for producing polymerisable hybrid nanoemulsions/mini-emulsions when one of the polymer components cannot be produced by free-radical polymerisation. Polyisobutene (PIB), which is produced by cationic polymerisation, was dissolved in a vinyl monomer (styrene or methyl methacrylate) and a transitional phase inversion technique was then used to produce an aqueous emulsion using a mixture of hydrophilic and hydrophobic polyoxyethylene nonylphenylether (NPE) surfactants. Sub-micron drops with average diameter as small as 500 nm were produced. Increasing the monomer fraction in the initial PIB-monomer solution, increased the HLB at phase inversion (HLB_{op}) and decreased the drop size of the inverted oil-in-water emulsion. Any decrease in temperature decreased HLB_{op} but did not affect the drop size significantly. The important result was that the minimum size of drops was obtained in the vicinity of locus of transitional inversion, but prior to inversion. Crossing the inversion locus and re-inversion to the initial emulsion, always enlarged the size of drops to some extent. Free radical polymerisation of the monomer (styrene or methyl methacrylate), inside the polymer/monomer drops after phase inversion, were carried out using an oil soluble initiator (lauroyl peroxide), to form nanocomposite polymer particles. The size of droplets/particles did not change significantly during the polymerisation.