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Investigation into the effect of carboxylic acid monomer on emulsion copolymerization mechanism

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Carboxylic acid monomers are added to latex recipes to improve colloidal stability, mechanical, freeze-thaw properties and pigment-mixing stability of the latex. Mechanistic understanding of the processes governing the kinetics of emulsion polymerization of amphiphilic copolymers is scientifically and technically essential. Despite a large number of investigations, controlling of the relative incorporation of each monomer in the resulting polymer chain, as well as the homogeneity of the final polymers is still a big challenge. Latexes of carboxylated styrene–methacrylic acid were prepared via both batch and semi-batch emulsion copolymerization with different amounts of methacrylic acid. The effect of acid monomer on particle formation and particularly on radical entry was investigated. In addition, to study the influence of PH on polymerization kinetics, copolymerization of styrene with methacrylic acid was cried out under different PH and ionic strength. The water soluble methacrylic acid monomers which are mostly polymerize in water phase may be adsorbed on the particle surface giving particles both steric and electrostatic stabilization. In addition, the surfactant molecules are also present on the surface of particles. So, there is a hairy layer of chains around the particle which profoundly affects on the radical entry rate and as a result on the reaction mechanism. The results show that the rate of entry to the particles strongly depends on the amount of incorporated methacrylic acid and the length of acid chains. Using polymerization rate and assuming zero-one condition, entry rate coefficient was measured which was significantly lower comparing the same recipe without methacrylic acid. In addition, a mathematical model was developed to study different parameters on copolymerization of methacrylic acid and styrene.

Biography

Samira Ghasemi has completed her Master degree from Tehran Polytechnic in 2008. She is doing her Ph.D at University of Sydney (School of Chemical & Bimolecular Engineering). She is working on amphiphilic copolymerization via emulsion polymerization method: synthesis, mechanistic understanding and mathematical modeling of the process.

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