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Synthesis of Polystyrene-Silica Composite Particles via One-Step Nanoparticle-Stabilized Emulsion Polymerization[1] LENORE DAI, HUAN MA, Department of Chemical Engineering, Arizona State University — Polystyrene-silica core-shell composite particles are prepared by one-step emulsion polymerization with a nonionic initiator VA-086, solely stabilized by silica nanoparticles. The silica nanoparticles are successfully incorporated into as the shell, likely due to the fact that the nanoparticles are thermodynamically favorable to self-assemble and remain at the liquid-liquid interfaces during the emulsion polymerization. The silica content, determined by thermogravimetric analysis, is approximately 20 wtaddition, we further explore the polymerization mechanism by studying the particle growth as a function of initiator concentration and reaction time: when the silica/monomer ratio is increased from 0.83 wthour reaction time decreases for a fixed monomer amount, probably due to a larger number of nuclei at the initial stage of polymerization. Further increasing the initiator/monomer ratio to 4.2 wtsize, which may be limited by the stabilization provided by a fixed concentration of silica nanoparticles. The surface coverage also changes with initiator concentration and reaction time although the underlying mechanism is not fully understood.

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