Living Radical Polymerization under Emulsion Conditions

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Living radical polymerization (LRP) is a valuable strategy to design a large range of polymers with well-defined molecular characteristics under mild conditions. LRP techniques such as SFRP (Stable Free Radical Polymerization),[1] RAFT (Radical Addition Fragmentation Chain Transfer),[2] ATRP (Atom Transfer Radical Polymerization)[3] are efficiently carried out in bulk, solution and under aqueous conditions. Although miniemulsion polymerizations have been relatively easy to perform,[4] emulsion polymerizations have proven troublesome. The challenge of this research consists in controlling the molecular weight of the polymeric chains while preserving the stability of the latex. Gilbert et al[5] presented the first solution to this problem under RAFT conditions using a unique amphipathic RAFT agent. We have recently added to this successful approach by developing a nanoprecipitation technique under SFRP conditions.[6] Particles resulting from precipitation of an acetone solution of low molar mass TEMPO-terminated polystyrene were swollen with monomer and subsequently polymerized to provide stable emulsions and narrow polydispersity polymers. The extension of this nanoprecipitation technique to RAFT and ATRP will be presented in this poster. To date we have had good success with the RAFT system but limited success with the ATRP system. A discussion will be provided to explain some of the issues we have encountered while working under ATRP conditions.

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