

517f The Effects of Raft Agent on Braching in a Free-Radical Polymerization

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In a typical free-radical polymerization process, chain transfer to dead polymers causes long chain branching. Branching affects the polymer viscoelastic and mechanical properties, and highly branched polymer may gel. Reversible aggregation-fragmentation transfer (RAFT) free-radical polymerization process has the advantage of easily control of molecular weights. However the effects of RAFT agents on branching are not clear and sometimes contradictive. In this work, we modeled a free-radical polymerization with RAFT agent and studied the effect of the RAFT agent on branching. Chain transfer to live (active and dormant) polymers is included as well as chain transfer to dead polymers because large amount of dormant chains are present in the system. We derived the population balance equations that keep track of numbers of monomer units, uncapped radicals, capped (by RAFT agent) radicals, and branching points; and obtained the moment equations. The resulting moment equations are simple and do not require a closure approximation that chain transfer only to dead polymer mechanism does. We found that the RAFT agent only affects the polymer concentration, and does not affect monomer conversion or branching frequency.