# Styrene/Butadiene Gradient Block Copolymers: Molecular and Mesoscopic Structures

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ABSTRACT: Rubbery−glassy block copolymer dispersions are an attractive solution for toughening rigid thermoplastics like polystyrene without affecting optical transparency. An interesting facet of the copolymers used is molecular disorder, artificially introduced during anionic synthesis through composition gradients along the copolymer chain and/or blending and partial coupling of different copolymers. In particular, this level of disorder is apparently a key to achieve the desired PS/copolymer blend morphologies and properties in short processing times. In this work, we investigate the role of these "synthesis imperfections" on self-assembly of styrene-rich asymmetric gradient triblock copolymers, denoted S1−G−S2, where S*i* are pure polystyrene blocks and G is a gradient copolymer of styrene and butadiene. Kinetic modeling of conversion data is used to predict gradient composition profiles for the anionic copolymerization conditions used. Self-assembly, dynamic viscoelastic behavior, and experimentally determined mesoscopic composition profiles across microdomains are discussed in light of the particular copolymer structure.