Atom Transfer Radical Copolymerization of Gradient Copolymers of HEMA/DMAEMA with Arbitrary Composition Profiles KEITH GALLOW, YUEH-LIN LOO, Princeton University — Gradient copolymers represent a new class of statistical copolymers where a non-uniform composition profile is controllably introduced along the length of the polymer chain. Gradient copolymers have thermal and mechanical properties that are different from random or block copolymers having the same average composition. Due to synthetic limitations, however, the introduction of arbitrary composition profiles remains challenging. Here, we demonstrate the ability to controllably introduce arbitrary composition profiles along copolymers of 2-hydroxyethyl methacrylate (HEMA) and 2-(dimethylamino)ethyl methacrylate (DMAEMA) by atom transfer radical copolymerization in a semi-batch reactor. Using gas chromatography to monitor monomer consumption, we have constructed a kinetic model which we use as a basis to synthesize copolymers with linear and parabolic composition profiles. The overall DMAEMA content and molecular weight of these gradient copolymers were determined using nuclear magnetic resonance spectroscopy and size exclusion chromatography, respectively, and both show good agreement with our model's predictions.

Keith Gallow
Princeton University

Date submitted: 18 Nov 2008   Electronic form version 1.4