DREXEL UNIVERSITY
Materials Science and Engineering
College of Engineering

Department of Materials Science and Engineering,

Thesis Proposal

December 10th, 1-3 PM
Bossone 302

Self-Assembled Nanoparticles and Hierarchical Materials from Post-Polymerization Modification of Block Copolymers

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Abstract: In this work, post-polymerization modification (PPM) of polymer pendant groups is explored as a synthetic tool for the directed self-assembly of polymer nano-objects and hierarchical materials. The first of three aims supporting this objective focuses on the demonstration and study of the Pd-catalyzed Suzuki-Miyaura cross-coupling (Pd-SMC) reaction as a method for diverse PPMs of RAFT-polymerization-derived polymers. The second aim introduces the utilization of PPM as a method to stimulate *in situ* formation of self-assembled polymer nano-objects and the elucidation of key processing-structure relationships for this approach. The third aim focuses on the self-assembly driven formation of hierarchical materials formed by combining nano-object populations containing complementary charged functional groups (cationic and anionic, respectively). Through these three aims, a multiscale perspective is employed with the first aim concerned with manipulating the linear structure and chemistry of polymers, the second aim focused on multiple polymer chains assembling into higher order structures, and the third aim examining the further assembly of nanoparticles into hierarchical materials.