Physical Characterization of Hierarchically Structured Nanocomposites
ROSS BEHLING, ERIC COCHRAN, Iowa State University — In this contribution we present various aspects of the thermodynamics of self assembly in block copolymer / layered silicate nanocomposites (BCPLSs). Hierarchically structured BCPLSs were prepared using an in situ atom transfer radical polymerization (ATRP) approach. The three part synthesis of the materials included an ion exchange functionalization of the clays, sonication during styrene (St) polymerization, and a block copolymer tert-butyl acrylate (tBA) synthesis. Highly organized lamellar structures were formed with a periodicity of $\sim 200$ nm, much larger than the $\sim 35$ nm periods of bulk block copolymers of comparable molecular weights. The final material had two distinct glass transitions (Tg) $69$ °C for the tBA and $103$ °C for the St. This is a significant Tg enhancement for atactic tBA (Tg = $42$ °C) and is attributed to the chain extension which occurs in the confined geometry of the silicate sheets.