Abstract

A fundamental study of the kinetic control of the Hyperbranched (HB) polymerization process using triaryl phosphine oxide based monomers: Bis-(4-fluorophenyl)-4-hydroxyphenylphosphine Oxide, 1a, and 1d (derivative of 1a) and core molecules: Tris(3, 4, 5-trifluorophenyl)phosphine Oxide, Tris(2-fluorobenzotrifluoride)phosphine Oxide, Tris(1-fluoro, 2-nitrobenzyl)phosphine Oxide, 2c, 2d and 2e was done. The HB PAEPOs were prepared via AB2 monomers and B3 cores, whose reactivity was systematically altered to give control of the HB polymerization process. Additionally the effects of different polymerization reaction conditions were investigated. Polymers with number-average molecular weights ranging from 2,000 to 8,300 Da, and PDIs as low as 1.36 were prepared. The most highly activated core, 2c, provides the best control over the final MW and lowest PDIs. Molecular weights were determined by Gel Permeation Chromatography (GPC) and the characterization of new compounds was done by NMR spectroscopy, elemental analysis and GC/MS where applicable.