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Compatibilization of polystyrene and poly(dimethyl siloxane) with a star polymer having a γ cyclodextrin core and polystyrene arms
C.M. BALIK, A.E. TONELLI, NC State Univ., BRAD BUSCHE, Pacific NW National Labs — Cyclodextrins (CDs) are cyclic starch molecules having a hollow central cavity which can be threaded by a polymer to form an inclusion compound. This characteristic is exploited in a new type of compatibilizer: a star polymer with a γ CD core and polystyrene (PS) arms. Atom transfer radical polymerization is used to grow and control the size of the PS arms from brominated initiator sites on γ CD. Solutions and thin films of PS and poly(dimethyl siloxane) (PDMS) are compatibilized by this CD-star. The mechanism of compatibilization involves threading of the CD core by PDMS and solubilization of the resulting “slip-ring graft copolymer” *via* the PS star arms. Compatibilization of PS/PDMS in chloroform is visually observed when the initially turbid suspensions become clear solutions after addition of CD-star. Thin films spin-cast from these solutions exhibit a high degree of homogeneity and a nanoscale level of mixing. The solutions are characterized with NMR, dynamic light scattering and intrinsic viscosity measurements, and the thin films are characterized with optical and atomic force microscopy. Many different polymers are capable of threading the CD core, thus the same CD-star molecule could be used to compatibilize several different threading polymers with the same matrix polymer.

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