Polymer Testing, vol.30(8), 2011, pages 841–847

Preparation of poly(methyl methacrylate) and polystyrene composite-filled porous epoxy microparticles via in-situ suspension polymerization

Abstract

Both poly(methyl methacrylate) (PMMA) and polystyrene (PS) were synthesized through suspension polymerization, and porous epoxy microparticles (PEMP) were incorporated *in-situ* during polymerization. It was discovered that the hollow structure available in the PEMP was able to successfully establish an interlocking mechanism with the PMMA and PS matrices, as revealed by SEM micrographs. Due to the epoxy structures, the PEMP could trigger MMA polymerization of two species of PMMA (different in molecular weight), which resided in two different locations, i.e., the outer and inner portions of the PEMP. In contrast, only one species of PS was obtained after polymerization. The glass transition temperature (T_g) for PMMA and PS decreased to approximately 14 and 8 °C, respectively. The thermal stabilities of the resultant composite beads were improved by approximately 56 °C for PMMA-PEMP and by 30 °C for PS-PEMP. It was hypothesized that the unique microstructure of the newly discovered and novel particles was responsible for enhancing the thermal properties of the composites.

Keywords — Porous epoxy microparticles, suspension polymerization, interlocking mechanism, methyl methacrylate, styrene.