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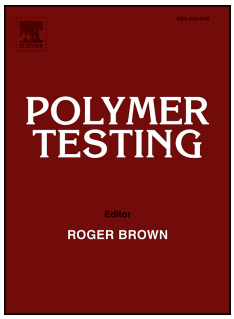

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Effects of POSS Vertex Group on Structure, Thermal and Mechanical Properties of PMMA/POSS Hybrid Materials

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Abstract

This paper explores the preparation of polymethyl methacrylate (PMMA/POSS) hybrid materials in bulk polymerization. The effects of pendant polyhedral oligomeric silsesquioxane type and content were investigated. The materials were characterized by Fourier transform infrared (FTIR) spectroscopy, gel permeation chromatography (GPC), field emission scanning electron microscopy (SEM-FEG), wide-angle X-ray diffraction (WAXD), synchrotron small-angle X-ray scattering (SAXS), thermal, thermo-mechanical, and mechanical properties. All materials showed no particles agglomerated on a micrometric scale, which contributed to the formation of optically transparent materials. Regardless of the POSS type or content, the use of POSS produced no change in the molecular packing of PMMA. A higher relation between the chain size/topological restrictions of movement was not observed for significant changes in the glass transition temperature, softening temperature, or thermal deflection. The interfacial thickness (E) was dependent on the amount and type of POSS used. Lower E values caused a greater increase in elastic modulus.

Keywords: PMMA; POSS; hybrid materials; bulk polymerization