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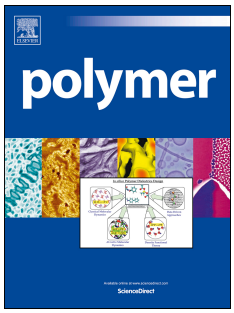

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Glass transition of poly (methyl methacrylate) filled with nanosilica and core-shell structured silica

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ABSTRACT: Core-shell (CS) nanocomposite particles with 53.4 wt% cross-linked poly (methyl methacrylate) (PMMA) shell of 11.6 nm in thickness were fabricated *via* miniemulsion polymerization of methyl methacrylate in the presence of modified nanosilica. The influence of nanosilica and CS nanoparticles on glass transition and segmental dynamics of PMMA in the nanocomposites prepared *via* solution casting was compared. The remarkable depression (≥ 10 ^{o}C) of glass transition temperature (T_g) induced by the incorporation of SiO_2 and CS was both observed at low loadings. Here, different mechanisms were responsible for the effect of SiO_2 and CS on the segmental acceleration of PMMA matrix. The formation of rigid amorphous fraction (RAF) layer around SiO_2 with the thickness of 16.4 nm led to the adjacent molecular packing frustration, while the "lubrication" effect of nonwetting interface between the grafted crosslinked chains and matrix chains resulted in the segmental acceleration and the reduction of dynamic fragility.

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