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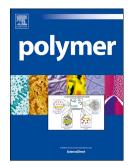
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## Glass transition of poly (methyl methacrylate) filled with nanosilica and core-shell structured silica Yihu Song<sup>1\*</sup>, Jing Bu<sup>1</sup>, Min Zuo<sup>1\*</sup>, Yang Gao<sup>1</sup>, Wenjing Zhang<sup>2</sup>, and Qiang Zheng<sup>1</sup>

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**ABSTRACT**: Core-shell (CS) nanocomposite particles with 53.4 wt% cross-linked poly (methyl 8 9 methacrylate) (PMMA) shell of 11.6 nm in thickness were fabricated via miniemulsion 10 polymerization of methyl methacrylate in the presence of modified nanosilica. The influence of 11 nanosilica and CS nanoparticles on glass transition and segmental dynamics of PMMA in the 12 nanocomposites prepared via solution casting was compared. The remarkable depression ( $\geq 10$ <sup>o</sup>C) of glass transition temperature ( $T_g$ ) induced by the incorporation of SiO<sub>2</sub> and CS was both 13 observed at low loadings. Here, different mechanisms were responsible for the effect of SiO<sub>2</sub> and 14 CS on the segmental acceleration of PMMA matrix. The formation of rigid amorphous fraction 15 16 (RAF) layer around SiO<sub>2</sub> with the thickness of 16.4 nm led to the adjacent molecular packing 17 frustration, while the "lubrication" effect of nonwetting interface between the grafted crosslinked 18 chains and matrix chains resulted in the segmental acceleration and the reduction of dynamic 19 fragility.

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