Abstract Submitted
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Viscosity of Polymer Nanocomposites with Athermal Hairy Nanoparticles FEI CHEN, Physics Department, Boston Univerity, DAN ZHAO, SANAT K. KUMAR, Department of Chemical Engineering, Columbia University, OPHELIA K.C. TSUI, Physics Department, Boston Univerity, PROF. OPHELIA K. C. TSUI'S GROUP TEAM, PROF. SANAT K. KUMAR'S GROUP TEAM — We studied the viscosity of polymer nanocomposites (PNC) containing silica nanoparticles (core radii, r_c = 4, 12 and 25 nm) grafted with polystyrene ligands blended with polystyrene homopolymer. Viscosity reduction, contrary to Einstein's prediction, was observed in the PNCs fulfilling the following conditions: (1) The radius of gyration of the matrix polymer (R_g) is bigger than the r_c and (2) the ratio of the molecular weight of the homopolymer, P, to that of the ligands, N , is bigger than 1. Importantly, the phenomenon of viscosity reduction we found is unlike those observed previously. Specifically, previous observations had found the diameters of the particle inclusions to be smaller than the matrix R_g and also the Edwards tube diameter – fulfillment of which means that the particles may act as a plasticizer and allow for constraint release of the Edwards tube, respectively. Our result suggest that either an unaccounted mechanism exists in causing the viscosity reduction we observed or the criteria for the existing mechanisms need to be revised.

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