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Structure and Entanglement Factors on Dynamics of Polymer Grafted Magnetic Nanoparticles SIQI LIU, Stevens Institute of Technology, ERKAN SENSES, NCNR NIST, YANG JIAO, Air Force Research Laboratory, SURESH NARAYANAN, Argonne National Laboratory, PINAR AKCORA, Stevens Institute of Technology — Magnetic nanoparticles functionalized with long polymer chains at low graft density are interesting systems to study structure-dynamic relationships in polymer nanocomposites since they are shown to aggregate into strings in both solution and melts, and also into spheres and branched aggregates in the presence of free polymer chains. This work investigates the structure, free volume and entanglement effects in composites of polystyrene grafted iron oxide nanoparticles by measuring particle dynamics with x-ray photon correlation spectroscopy technique. Particles of highly ordered strings and aggregated systems follow heterogeneous dynamics commonly observed in jammed soft glassy systems and other nanocomposites. On the other hand, particle dynamics becomes diffusive in branched structures which could be caused by the less penetration of long matrix chains into the brushes. These results show that particle dynamics is dictated through the strong interactions of low graft density chains with the host polymer.

Pinar Akcora
Stevens Institute of Technology

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