

Abstract Submitted
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Anisotropic Self-Assembly of Spherical Nanoparticles in Polymer Composites PINAR AKCORA, SANAT K. KUMAR, Columbia University, YU LI, BRIAN BENICEWICZ, LINDA S. SCHADLER, Rensselaer Polytechnic Institute, DEVRIM ACEHAN, New York University, JACK F. DOUGLAS, National Institute of Standard and Technology, COLUMBIA UNIVERSITY COLLABORATION, RPI COLLABORATION, NYU COLLABORATION, NIST COLLABORATION — I will present our recent experimental findings on the organization of isotropic polymer grafted particles forming anisotropic three dimensional structures. Earlier studies have shown that particle shape and anisotropic particle interactions determine the self-assembly process. It has been also shown that isotropic particles can form string like colloidal assemblies within monolayers at two-dimensions but at high particle loadings. Here, I will present the three dimensional sheet structures formed by mixing spherical nanoparticles that are grafted uniformly with long polymers and dispersed in the same homopolymer matrices at relatively low loadings. The molecular origin of this anisotropic organization is the combined short ranged repulsive forces and longer ranged attraction interaction between the particles that is also supported through theory and numerical simulations. The self-assembly of isotropic nanoparticles into anisotropic structures within polymer melts has profound application potentials in improving the electrical and mechanical properties of composite materials.

Pinar Akcora
Columbia University

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