SPECIAL PHYSICAL CHEMISTRY SEMINAR

Friday **3:30 pm** **Room 8335**
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Structures and Dynamics of Nanoparticle Tethered Polymers

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Understanding how polymer− nanoparticle interactions influences structure and properties of composites is of fundamental importance for both the science and technology applications of organic− inorganic hybrid materials. Great attention has been given to changes organic polymer species undergo in forming polymer nanoparticle composites. This work focuses on specific type of hybrid systems by densely grafting polymer chains onto inorganic nanoparticles. Termed Nanoscale Organic Hybrid Materials (NOHMs), the self-suspended suspensions of the particles are created in which every polymer chain is both anchored to and confined between the surface of neighboring particles.

This talk presents the hierarchical structures and relaxation dynamics of polymer chains in NOHMs. We have investigated the conformations and thermo-physical properties by tethering polyethylene glycol (PEG) chains to silica nanoparticles. We have found that the structure and crystallization of confined PEG could be very different depending on the length scale on which the structure is observed. Below the size of a hybrid NOHM unit, particle-tethered PEG chains form more stable conformations, whereas tethered PEG is more amorphous than free chains on length scales above one hybrid unit.

We also report the polymer chain relaxation dynamics of NOHMs. In this study, diverse molecular weight of cis 1-4 Polyisoprene (PI), one of type A dielectric polymers, is synthesized in the spectrum from unentangled to entangled regime, and then tethered to the surface of silica nanoparticles with various grafting densities. Global chain relaxation is conveniently explored since the net dipole moment of an entire chain of cis 1-4 PI is parallel to the end-to-end vector of the repeating unit. We have found that tethered PI chains exhibit slower relaxation dynamics compared to free polymers.