

Self-Assembly of Nanocrystals with Polymeric Materials

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Abstract: Integrating polymeric materials with inorganic nanocrystals offers significant potential for creating functional materials that leverage their distinct physicochemical characteristics. To engineer these composite materials with specific functionalities, it is crucial to meticulously manage their nano-scale architectures. In my presentation, I will initially explore the unique assembly behaviors of gold nanoparticles coated with polystyrene (Au@PS NPs), which change according to their size, ligand chain length, and surface graft density. Additionally, I'll highlight how the assembly patterns of Au@PS NPs are distinctly influenced by the environment of assembly, whether at the liquid-air boundary or within an oil-in-water emulsion system. When these NPs are incorporated into the self-assembly process of block copolymers (BCPs) in an oil-in-water emulsion, they form peculiar nanostructures. Here, the positioning of the Au nanoparticles transitions from the exterior to the interior of the BCP domains, driven by the entropic forces between the NPs and the BCP molecules. Concluding my talk, I will demonstrate how these composite materials are harnessed to design colloidal particles that respond to external stimuli by altering their shape and color, presenting a broad spectrum of possibilities for their use in smart material systems.