

Synthesis of surface engineered nanoparticles for energy and biological applications

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We have developed surface engineered nanoparticles(NPs) with small hydrodynamic radius, containing various functional groups that readily compatible for conjugation to bio-molecules. The main advantage of making compact NPs is that we expect to see the enhancement in many properties including increase of diffusion rate and decrease of steric hindrance to bio-molecule conjugation when compared to the larger NPs.

To achieve this goal, we'd like to design new biocompatible lidands, modify the surface of nanomaterials using newly designed polymers by ligand exchange method, and finally test the cell viability and targeting efficiency of those new materials by incubating in the cell.

This surface engineering concept is also essential to overcome the bottleneck of quantum dots based solar cells. We demonstrated the remarkable improvement in device performance by employing ionic liquid molecules for the interface control, resulting in forming a spontaneously oriented dipole at the donor/acceptor interface, acting as a vacuum level tuning layer.