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Comb Polymer Architectures for Versatile Nanoparticle Assembly ALEXANDER MASTROIANNI, KARI THORKELSSON, YUE ZHAO, JOSEPH LUTHER, JILL MILLSTONE, PAUL ALIVISATOS, JEAN FRECHET, TING XU, UC Berkeley — Nanoparticles are a material of interest in photovoltaic research due to their optical absorption properties. However, there have been many challenges for device fabrication. It has been difficult to produce continuous, homogenous films, and successes in this area have been highly dependent on the actual nanoparticles used, and have thus been hard to apply generally to different materials of interest. We show how this challenge can be overcome using a comb polymer architecture. Here, pentadecyl phenol small molecules are hydrogen bonded to polyvinyl pyridine. This alkyl moiety produced is compatible with the ligand shells of many nanomaterials. We incorporated these small molecules and nanoparticles into polystrene-polyvinyl pyridine block copolymers. This strategy was successful for assembling nanoparticles made out of a variety of materials, without special considerations for the actual core material or morphology. Following these successes in bulk samples we extended our studies to thin films of these composites. Here, the morphology is controlled by the interfacial interactions. These materials have the potential to be used for photovoltaic devices, as they are easily solution-processible. This strategy is generally applicable with the choice of small molecule mediating interactions with any desired nanomaterial.

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