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Assembly of Organic/Nanoparticle Hybrid Systems STEPHEN Z.D. CHENG, University of Akron, YINGFENG TU, CHUN YE, WENBIN ZHANG, XINFEI YU, RYAN M. VAN HORN, CHIEN-LUNG WANG — The structure, dispersion, and chemical functionality of particles in a material are critical to the material's properties. We are working to build the scientific and technological foundations of using particles such as C60 and POSS to develop new, highly functional, self-assembled materials. These efforts have involved developing new synthetic techniques to efficiently and precisely manipulate particles to control their dispersion and structure within the organic material. First, C60-polymer and POSS-polymer molecules have been synthesized. These materials are capable of crystallizing in solution, enabling the formation of highly conducting or insulating sheets on the basal surfaces of the crystals. Additionally, these molecules may form micelles in solution. Next, POSS-C60-porphyrin molecules were synthesized and were found to self-assemble into discotic columnar structures where the intimately arranged porphyrin core harvests photons and the C60 enhances charge transport, making these materials ideal for organic photovoltaic applications. Finally, C60-POSS conjugate molecules have been synthesized that crystallize into a bilayer structure with alternating conducting and insulating layers. From these investigations, we will develop how best to chemically incorporate particles into materials from a fundamental level for significant technological advancements.

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