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Nanoparticle Tethered Perylene Tetracarboxylic Diimides as Novel Photo Harvesting Antennae WENBIN ZHANG, BIN SUN, HUI LI, MATTHEW PANZNER, WILEY YOUNGS, RODERIC QUIRK, STEPHEN CHENG, Maurice Morton Institute and Department of Polymer Science, Department of Chemistry, The University of Akron — Shape-persistent, well-defined, incompressible nano objects, such as polyhedral oligomeric silsequioxane (POSS) and C60, have been connected covalently to perylene tetracarboxylic diimide (PDI) to give a series of nanoparticle tethered PDI molecules, which could self-assemble into various ordered structures. For example, POSS end-capped PDI, namely POSS-PDI- POSS, grows single crystal lamellae of dimensions up to the centimeter scale in length. The crystal structure has been determined to be triclinic with a = 1.14 nm, b = 2.09 nm, c = 2.31 nm and α = 89.9°, β= 81.9°, γ= 82.3°. It shows that POSS forms bilayers in the crystal separated by PDI dimer molecular planes along the c axis. The self-assembly of the asymmetric POSS-PDI-C60 is even more intriguing. It gives single crystals with alternating POSS and C60 layers separated by PDI planes, which holds promising applications as photo harvesting antennae in photovoltaics. Our results show that nanoparticles could interplay with the strong p-p interaction and assist the self- assembly to ordered structures.

Wenbin Zhang
Maurice Morton Institute and Department of Polymer Science,
Department of Chemistry, The University of Akron

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