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Dimension controlled self-assembly of perylene based molecules

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Recent advances in the self-assembly of highly organized structures of organic semiconducting molecules by controlled non-covalent interactions has opened avenues for creating materials with unique optical and electrical properties. The main focus of this talk lies in the synthesis and self-assembly of n-type perylene based organic semiconducting molecules into highly organized materials. Perylene based molecules used in this study are perylene diimide (PTCDI, two side-chains), perylene mono imide (m-PTCI, one side-chain), perylene tetracarboxylic acid (PTCA, no side-chain) and tetra-alkali metal salts of PTCA (M4-PTCA, no side-chain), which are synthesized from the parent perylene tetracarboxylic dianhydride (PTCDA). The self-assembly of these molecules have been performed using solution processing methods (dispersion, phase-transfer, and phase-transfer at high temperature) by taking advantage of the changes in solubility of the molecules, wherein the molecular interactions are maximized to favorably allow for the formation of highly organized structures. Dimension control (1D, 2D and 3D structures) of self-assembly has been obtained for different perylene based molecules by appropriate design of the molecule followed by controlling the conditions of assembly. Furthermore, it has been demonstrated that these 1D nanostructures can be chemically converted to different chemical species, both of which still retain the 1D morphological characteristic, though with changes in the size. Various functional self-assembled structures discussed in this work open up new avenues to explore structure-property-function relationships and their use in applications such as sensors, electronics and opto-electronic devices.

Biography

Arshad S Sayyad received his PhD in Chemistry in 2010 from Rice University, Houston, TX. His research work at Rice University was focused on synthesis and self-assembly of organic and hybrid inorganic materials into ordered supramolecular structures (1D, 2D and 3D) leading to interesting optical and electronic properties. He then joined College of Optical Science, University of Arizona as a postdoctoral research associate. His research work at UA was based on solution processed colored polarizer's, thin films exhibiting polarized emission and thin flimbiotronic capacitors exhibiting ultra-high dielectric strength. He has published 9 papers in reputed journals, presented in both national and international conference, has 1 approved patent, served as session chair in an international conference and is reviewer for various journals. Presently, he is employed as senior process engineer at Intel Corporation, USA.

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