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Magnetic field alignment of supramolecular perylene/block copolymer complexes for electro-optic thin films[1]
MANESH GOPINADHAN, PAWEL MAJEWSKI, Department of Chemical Engineering, Yale University, RYAN SHADE, EMMA DELL, NALINI GUPTA, LUIS CAMPOS, Department of Chemistry, Columbia University, CHINEDUM OSUJI, Department of Chemical Engineering, Yale University — The realization of nanostructured electro-optic materials by self-assembly is complicated by the persistence of structural defects which render the system properties isotropic on macroscopic length scales. Here we demonstrate the use of magnetic fields to facilitate large area alignment of a supramolecular system consisting of a poly(styrene-b-acrylic acid) (PS-b-PAA) diblock copolymer host and a semiconducting perylene ligand. Hydrogen bonding between the carboxylic acid groups of PAA and imidazole head group of the perylene species results in hierarchically ordered materials with smectic perylene layers in a matrix of hexagonally packed PS cylinders at appropriate stoichiometries. The smectic layers and the PS domains are strongly aligned by the application of large (> 2T) magnetic fields in a manner reflective of the positive diamagnetic anisotropy and the planar anchoring of perylene units at the PS interface. We use a combination of SAXS studies in-situ with applied magnetic fields, GISAXS and polarized optical transmission measurements to characterize the system. Magnetic fields thus offer a viable route for directing the self-assembly of functional materials based on rigid chromophores and further, that supramolecular approaches can be complementary to such efforts.

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