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Supramolecular Nanocomposites Under Confinement: Chiral Optically Active Nanoparticle Assemblies and Beyond PETER BAI, SUI YANG, WEI BAO, MIQUEL SALMERON, XIANG ZHANG, TING XU, Univ of California - Berkeley — Block copolymer-based supramolecules provide a versatile platform to direct the self-assembly of nanoparticles (NPs) into precisely controlled nanostructures in bulk and thin film geometries. A supramolecule, PS-b-P4VP(PDP), composed of the small molecule 3-pentadecylphenol (PDP) hydrogen bonded to a diblock copolymer, polystyrene-block-poly(4-vinylpyridine) (PS-b-P4VP), was subjected to 2-D volume confinement in cylindrical anodic aluminum oxide (AAO) membrane pores. TEM and 3-D TEM tomography reveal that the morphologies accessible by the supramolecule and supramolecule/NP composites, such as NP clusters, arrays, stacked rings, and single and double helical ribbons, are significantly different from those in the bulk or thin film. Furthermore, single molecule dark field scattering measurements demonstrate strong chiral optical response of single helical Au NP ribbon nanostructures in the near infrared wavelength regime. These studies demonstrate 2-D confinement to be an effective means to tailor self-assembled NP structure within supramolecule nanocomposites and pave the way for this assembly approach to be applied towards next generation chiral metamaterials and optoelectronic devices.

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