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Two-Dimensional Confinement of Nanorods in Block Copolymer Domains YU LIU, RANJAN DESHMUKH, RUSSELL COMPOSTO, University of Pennsylvania, DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING TEAM — To control their unique electrical and optical properties, one-dimensional metallic/semiconductor nanoparticles need to be aligned and assembled within a host material. In our research, we investigated the assembly of gold nanorods (NRs) in films of a symmetric diblock copolymer, poly(styrene-b-methyl methacrylate), PS-b-PMMA (211kg/mol). The NR length and diameter was 42nm and 13nm, respectively. The NRs were grafted with a short PEG-brush (5kg/mol). During solvent annealing, the NRs become oriented as the PS-b-PMMA chains assemble into a parallel lamellar morphology. The NRs are selectively sequestered and confined in the PMMA domains, which are narrower than the NR length, due to the favorable interaction between the PEG brush and PMMA block. This confinement orients 71% of NRs within $\pm$ 5° of the lamella plane. This route to produce alternating layers containing conducting NRs separated by dielectric domains has the potential for fabricating self-assembled nanodevices. The thermal stability of the NRs in PS-b-PMMA and homo PMMA films will also be discussed.

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