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Controlling nanorod self-assembly in polymer thin film composites MIGUEL MODESTINO, University of California, Berkeley, JEFFREY URBAN, Molecular Foundry, Lawrence Berkeley National Laboratory, RACHEL SEGALMAN, University of California, Berkeley — Semiconducting nanorods are of particular interest for use in polymer composites due to their anisotropic physical properties; however such properties can only be harnessed in systems with orientational order. Here, we demonstrate control over nanorod self-assembly in solution which leads to arrays of vertically aligned nanorods in polymer thin films over large areas (>1 cm^2). Transmission electron microscopy and X-ray scattering techniques were used to determine the structure of composites and probe the nanorod self-assembly mechanism. This work demonstrates that strong interactions between alkane-covered colloidal nanorods can enable the formation of hexagonally packed arrays of nanorods in a wide range of polymer matrices. Kinetic effects during the casting process are shown to affect the final morphology of the composites, leading to reduced array sizes for systems with increasing polymer molecular weight and nanorod concentration. The results presented show that thin film confinement as well as surface segregation of the nanorod arrays enhance the orientational order of nanorods in composites.

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