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Vertical Alignment of Single Wall Carbon Nanotubes (SWNTs) in Thin Polymer Films MEAGAN MAUTER, MENACHEM ELIMELECH, CHINEDUM OSUJI, Yale University — Thin polymer films (1-10 um) incorporating singly dispersed, vertically aligned carbon nanotubes have a diverse set of potential applications. Desalination membranes that use aligned SWNT as pores, for instance, are predicted to exhibit high flux and salt rejection through size exclusion of hydrated ions. Current fabrication techniques, however, are unable to realize the vertical assembly of narrow diameter SWNTs. Here, we direct the vertical alignment of SWNTs in thin films by using magnetic field aligned lyoptropic surfactant mesophases as structure directing templates. The short alkyl tails of the surfactant impart negative diamagnetic anisotropy to worm-like micelles and lead to parallel alignment of the liquid crystalline (LC) director in an applied magnetic field. The nanotubes orient preferentially with their long axis parallel to the director field of the mesophase, thus promoting their vertical alignment in the system. The LC mesophase incorporates monomers that are polymerized by UV exposure after nanotube alignment to form the polymer matrix. X-ray scattering and optical spectroscopy are used to characterize the field-guided assembly process. The present system may have additional applications for polymer reinforcement using carbon nanotubes.

Meagan Mauter
Yale University

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