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Controlling the dielectrophoretic assembly of single-walled carbon nanotubes SARBAJIT BANERJEE, BRIAN WHITE, BLAKE REGO, STEPHEN O'BRIEN, NICHOLAS TURRO, IRVING HERMAN, Nanoscale Science and Engineering Center, Columbia University — The AC dielectrophoretic assembly of single-walled carbon nanotubes (SWNTs) represents an attractive approach for the fabrication of SWNT devices. The dielectrophoresis approach relies on the deposition of water-soluble surfactant-wrapped individualized SWNTs in electrode gaps. We have tested a variety of different anionic, non-ionic, and cationic surfactants for their ability to dissolve SWNTs. The zeta potential of the dissolved nanotubes, which is a measure of their surface charge, can be adjusted by varying the surfactant, the pH, and the surfactant concentration. The resulting modulation in surface conductance has implications for the chiral selectivity of the dielectrophoretic process. The surfactant-wrapped SWNTs have been precisely positioned in device geometries by designing appropriate electrode structures based on electric-field simulations. The influence of the surfactant on the transport properties of these devices will also be discussed. This work is primarily supported by the Nanoscale Science and Engineering Center at Columbia University, which is supported under NSF Award Number CHE-0641523. It is also partially supported by the MRSEC program of the NSF under Award Number DMR-0213574 and by NYSTAR.

Sarbajit Banerjee

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