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Integration of High-Purity Carbon Nanotube Solution into Electronic Devices GEORGE TULEVSKI, IBM TJ Watson Research Center, IBM TJ WATSON RESERACH CENTER TEAM — Due to their exceptional electronic properties, carbon nanotubes (cnt) are leading candidates to be employed as channel materials in future nanoelectronic devices. A key bottleneck to realizing device integration is the sorting of carbon nanotubes, namely the isolation of high-purity, semiconducting cnt solutions. This talk will describe our efforts in using polymer-based sorting methods to isolate high-density and high-purity semiconducting cnt solutions. We explore the dependence of starting material and polymer to cnt ratio on the effectiveness of the separation. We confirm optically and electrically that the semiconducting purity is >99.99% through several thousand individual device measurements. In addition to single-cnt devices, thin-film transistors were also fabricated and tested. Due to the high purity of the solutions, device switching (˜10^5 I_{ON}/I_{OFF}) was observed at channel lengths below the percolation threshold (<500 nm). Operating below the percolation threshold allows for devices with much higher current densities and effective mobilities as transport is now the result of direct transport as opposed to hopping between cnts.

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