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High Yield Fabrication of Single-Walled Carbon Nanotube Devices via Self-Assembly GEORGE S. TULEVSKI, JAMES B. HANNON, ALI AFZALI, IBM T.J. Watson Research Center, SELECTIVE PLACEMENT AT IBM T.J. WATSON RESEARCH CENTER TEAM — Single-walled carbon nanotubes (SWCNTs) are attractive materials for many technological applications. Success in the large-scale integration of SWCNTs will depend upon progress in processing to address challenges such as separation, chemical doping and selective placement. This work will highlight recent progress in the selective placement of SWCNTs into predefined positions on gate oxide surfaces, allowing for the fabrication of large arrays of SWCNT devices. SWCNTs are first functionalized with organic compounds that selectively bind to metal oxide surfaces. Electron beam lithography is then employed to pattern hafnium oxide trenches into which the functionalized SWCNTs selectively bind. The surface functionalization is shown to be fully reversible. Once the nanotubes are assembled into the trenches, the molecules are then removed leaving the unfunctionalized SWCNTs behind. This technique allows for hundreds of working devices to be fabricated with high yield. The electrical properties of the subsequent devices are excellent, showing no performance deterioration as a result of the placement process.

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