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**Fabrication of Few-Electron Carbon Nanotube Single and Double Quantum Dots** HUGH CHURCHILL, PATRICK HERRING, RUBY LAI, CHARLES MARCUS, Harvard University — We discuss fabrication methods for carbon nanotube quantum dot devices designed to satisfy the requirements of spin qubit applications. These requirements include low disorder for reliable access to the few-electron regime, detection of charge states, and rapid manipulation with multiple gates. Nanotube growth occurs at or near the end of the fabrication process, a scheme that has been shown previously to produce clean devices for transport studies. In our devices the nanotubes are grown over pre-patterned gates or the nanotubes are located and gates are placed on top. A new atomic layer deposition process was developed to coat the nanotubes in a high-k dielectric for effective gating and suppression of electron interactions. We find in these devices that disorder on the length scale of the quantum dot is made small enough for routine occupancy with few charges, but disorder with sufficiently short range to couple valleys remains an uncontrolled parameter that is important for qubit applications of nanotubes. We acknowledge support from NSF-MWN, IBM, and Harvard University.

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