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Controlled Fabrication of Single Electron Transistors from Single-Walled Carbon Nanotubes PAUL STOKES, SAIFUL I. KHONDAKER, NANOSCIENCE TECHNOLOGY CENTER AND DEPARTMENT OF PHYSICS, UNIVERSITY OF CENTRAL FLORIDA TEAM — Single-walled carbon nanotubes (SWNTs) are considered to be an ideal material for quantum electronic applications such as single electron transistors (SETs). However, fabrication of SET based devices is still in its infancy. Controlled fabrication of SWNT-SETs has been demonstrated by introducing kinks using AFM. However, AFM manipulation is time consuming and reproducibility can be extremely challenging. Here, we show a novel approach to fabricate controllable and reproducible SETs using SWNT. SWNTs were placed on 100 nm wide local Al/Al_2O_3 bottom gates and then contacted with Pd source and drain electrodes with 1 um spacing on Si/SiO_2 substrates. The Al gate serves two purposes (i) it defines tunnel barriers at the edges of the gate electrodes by introducing buckles, and (ii) it acts as a local gate to tune the number of carriers in the central island. Low temperature electronic transport measurements show coulomb oscillations up to 125 K. The stability diagram shows a charging energy of ~ 13 meV and energy level spacing of ~ 5 meV. These energies are consistent with a quantum dot size of $\sim$100 nm, thus verifying the dot is defined and controlled by the 100 nm wide aluminum oxide gate.

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