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Fabrication of Wafer-scale Low Resistance, Single Carbon Nanotube Devices ARITH RAJAPAKSE, California State University, Long Beach, PHILIP COLLINS, University of California, Irvine — The remarkable physical properties of carbon nanotubes (CNTs) have captivated nanoscience researchers since their discovery. In particular, their high current density and thermal conductivity make CNTs ideal conductors and semiconductors for nanoelectronics. In the Collins Research Group at UC Irvine, single CNT devices are utilized as field effect transistors to measure the activity of proteins such as lysozymes or DNA polymerase I on a single molecule scale. Despite the abundance of single CNT research, a primary challenge facing CNT-based electronics remains the fabrication of clean, single CNT devices on a wafer-scale. This project explores new CNT synthesis and device fabrication methods that aim to produce high quality CNT devices with wafer-scale reproducibility in order to enable arrays of single molecule measurements. Specifically, the project combines a number of best practices developed by CNT experts worldwide, novel growth recipes developed at UC Irvine, and a sophisticated synthesis apparatus critical for achieving reproducible results. Acceptable device resistance, CNT noise, gate leakage and hysteresis can each be achieved with appropriate fabrication methods, and in this project these methods are being combined to efficiently produce clean, low-resistance CNT devices across 4" wafers.

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