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Single-nanotube Devices from Purified HiPCO Material DANVERS E. JOHNSTON, M. F. ISLAM, ARJUN G. YODH, A. T. JOHNSON, University of Pennsylvania — We have developed a purification process that retains the remarkable electronic properties of single walled carbon nanotube (SWNT) material. Nanotubes grown by the HiPCO method (High Pressure catalytic decomposition of Carbon monOxide) are purified and suspended as single tubes and small bundles in a surfactant solution. SWNTs are deposited on functionalized substrates and contacted by electrodes. The resulting circuits consist of high quality metallic and semiconducting nanotubes that are apparently unaffected by the purification process. Circuits made from raw HiPCO material have vastly inferior device parameters indicating the crucial role of the purification process. We show how source-drain current measurements as a function of temperature and backgate voltage can be used to determine the energy gap of a semiconducting nanotube in a field effect transistor geometry. This work represents significant progress towards the goal of producing complex integrated circuits from bulk-grown SWNT material. This work has been partially supported by NSF (Grants DMR 00- 79909 (MRSEC); DMR-0203378), by NASA (NAG8-2172), and the Petroleum Research Fund. DJ acknowledges support from an NSF- funded IGERT Fellowship Grant DGE-0221664 administered through Penn's Center for the Science and Engineering of Nanoscale Systems.

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