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Building a Better Barristor – The Case for Carbon Nanotubes over Graphene[1] XIAO CHEN, MAXIME LEMAITRE, ANDREW RINZLER, Univ of Florida - Gainesville — A dilute carbon nanotube (CNT) network is used as a field-transparent, gate-tunable, source electrode in a nanotube/silicon Schottky barrier field effect transistor – a barristor [1]. Analogous to the graphene barristor, the gate-field modulates the Fermi-level of the low density-of-states CNT source electrode, thus controlling the barrier height at the junction. Unique to the CNT device, however, is the ability of the gate field to penetrate through the porous regions of the dilute CNT network to tune the carrier density in the semiconductor, thus also controlling the width of the depletion layer near the interface [2]. This phenomena was first described in 2008 using an organic semiconductor channel layer in the carbon nanotube enabled, vertical, field effect transistor (CN-VFET) [3]. Here we shift our focus to high-mobility, inorganic, semiconductors to demonstrate a silicon-based CN-VFET. Unlike the bottom-gate, organic CN-VFET, our present device features a top-gate structure for which a two-step, low-temperature atomic layer deposition process enabled the growth of a high-k dielectric layer on top of the low surface energy CNT network. Operating the device in reverse bias yields on-current densities exceeding 100A/cm^2 at a drive voltage of 5V with on/off ratio over 10^7, suitable for a wide range of microelectronic power and logic applications. [1] Y. Heejun *et al. Science* 2012. 336, 1140, [2] M. G. Lemaitre *et al. ACS Nano*, 2012, 6, 9095, [3] Liu, B, *et al. Adv. Mat.* 2008. 20,. 3605

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