Abstract Submitted
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Perforated-Graphene Enabled Organic Vertical Field Effect Transistors[1] NICHOLAS S. CUNNINGHAM, MAXIME G. LEMAITRE, BO LIU, MITCHELL A. MCCARTHY, ANDREW G. RINZLER, Dept. of Physics, University of Florida — Following on the heels of the carbon nanotube enabled vertical field effect transistor (CN-VFET, B. Liu et al. Adv. Mater. 2008, 20, 3605–3609) graphene enabled vertical field effect transistors (G-VFETs, M. Lemaitre et al. ACS Nano 2012, 6, 9095-9102) provided an opportunity to distinguish between the mechanisms contributing to the excellent performance of these Schottky barrier controlled devices: barrier height lowering due to the gate field induced modulation of the Fermi level on the carbon side of the junction or tunneling through the barrier due to its gate field induced thinning. Devices fabricated with a continuous layer of graphene probed principally the barrier height lowering mechanism (responsible for 2 1/2 order of magnitude current modulation) while devices fabricated with graphene into which random, micron scale holes had been created probed tunneling as well (resulting in 6 orders of magnitude current modulation). The random hole density in the latter case was limited to 20% of the graphene surface area. Here we describe the performance of devices in which ordered hole arrays permit the exploration of higher hole density G-VFETs.

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