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Transfer Printed Parallel Carbon Nanotube Devices¹ ANDREW TUNNELL, VINOD SANGWAN, VINCENT BALLAROTTO, DANIEL HINES, MICHAEL FUHRER, ELLEN WILLIAMS, University of Maryland — Carbon nanotube (CNT) device properties can be improved by increasing the density and alignment of tubes and avoiding the problems associated with random networks. We are optimizing this approach by preparing devices composed of parallel arrays of CNTs fabricated on quartz and plastic substrates. CNT growth catalysts, ferric nitrate, ferritin and iron, are a point of control of the density and degree of alignment of the grown tubes. Though ferric nitrate produced a denser network, ferritin allows a high degree of alignment, and iron will also be tested. Plastic devices with a 5 μm channel length and a 22.5 mm width were prepared with approximately 1 channel crossing tube per 4 μm of width. The density is improved by repeatedly printing more CNT's to the same area. The metallic tubes were removed by selective electrical breakdown, marginally increasing the on/off current ratio while decreasing the On current from 800 μA to 450 μA (at $V_{\text{gs}}=-20\text{V}$, $V_{\text{ds}}=-10\text{V}$). Results from optimized devices prepared with patterned iron as the growth catalyst will also be presented.

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