

Abstract Submitted
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Transparent Organic Field-Effect Transistors with Carbon Nanotube Electrodes¹ ADRIAN SOUTHARD, VINOD K. SANGUAN, TRACY L. MOORE, ELLEN D. WILLIAMS, MICHAEL S. FUHRER, Dept. of Physics, University of Maryland, College Park, MD 20742-4111 USA, DANIEL HINES, VINCE BALLARATTO, Laboratory of Physical Sciences at the University of Maryland — Carbon nanotube (CNT) films are promising as electrode material for organic field-effect transistors (OFETs). We have fabricated CNT films over large areas by airbrushing and patterned them either using shadow masks, or via photolithography and reactive ion etching. Pentacene thin film transistors bottom-contacted by CNT source/drain electrodes on Si/SiO₂ substrates show moderate mobility (up to 0.1 cm²/Vs) and contact resistance as low as 20 kΩ*cm. The contact resistance varies linearly with the gate voltage, eventually saturating at high negative gate voltage. OFETs were measured at temperatures from 228 to 353.5 K. After accounting for contact resistance, the intrinsic mobility of the transistors is found to be activated in temperature with activation energy between 0.137 and 0.151 eV in reasonable agreement with values in the literature. An all-carbon transparent OFET with CNT source, drain and gate electrodes and polymethylmethacrylate (PMMA) gate dielectric has been assembled on a polyethylene terephthalate substrate by transfer printing, with a field-effect mobility up to 0.06 cm²/(Vs).

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