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Molecular Modifications of the Electronic Characteristics of Carbon Nanotube Field-Effect Transistors KAN-SHENG CHEN, P. XIONG, Florida State University, S.A. MCGILL, National High Magnetic Field Laboratory — We report a systematic examination of the effects of an organic self-assembled monolayer at the electrode/nanotube interface on the key electrical properties, including on/off ratio, subtheshold swing, and threshold voltage, of single-walled carbon nanotube field-effect transistors (SWNT-FETs). For the study, we utilize a unique device structure made of three adjacent Au electrodes, defined by electron-beam lithography, on doped-Si/SiO_2 substrates. A SAM of thiol molecules was formed selectively on one of side electrodes by dip-pen nanolithography. A single SWNT was then directed to assemble across the three electrodes, forming two FETs of essentially identical structure with the difference of the presence of the SAM at one of the electrodes of one FET. The device enables a direct unambiguous comparison of the electrical characteristics of the two SWNT-FETs with and without molecular modification of a Au electrode. We will present results of modification by molecules of different end-groups. Specifically, when one electrode was covered with 16-Mercaptohexandecanoic acid (MHA), a polar molecule, we observed a significant increase of the on/off ratio, decrease of the subthreshold swing, and shift of the threshold voltage for the SWNT-FET.

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