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Arrays of Versatile DNA-Carbon Nanotube Hybrid Chemical Sensor for Vapor Analyte Detection NICHOLAS KYBERT, MITCHELL LERNER, ZHENGQING JOHN QI, A.T. CHARLIE JOHNSON, University of Pennsylvania, Department of Physics and Astronomy — Large arrays of nanoscale sensors were fabricated for the detection of small molecules based on single-stranded DNA (ssDNA) for chemical recognition and single-walled carbon nanotube field effect transistors (SWNT FETs) for electronic read-out. These versatile sensors are capable of detecting very low concentrations of molecules ranging from volatile organic compounds, whose detection could provide a method for detection or identification of individuals, to noxious compounds designed to harm them. In this work, we deposited enriched semiconducting SWNTs on Si/SiO2 with an APTES adhesion layer. Photolithographically defined contacts resulted in high yield, high performance arrays of SWNT FETs, which were then individually coated in different ssDNA. The arrays of devices were then simultaneously exposed to analytes down to ppb concentrations. The sensing response of a single device is both analyte and ssDNA sequence dependant. The response and recovery to baseline are both fast (seconds) and repeatable without need for refreshing. By using large arrays of differently functionalized devices, we distinguished similar analytes and established electronic signatures indicative of their presence, paving the way for incorporation of ssDNA/SWNT FET arrays in "electronic nose"-type systems.

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