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DNA-Functionalized Carbon Nanotubes for Chemical Sensing[1]
M. CHEN, C. STAII, S. KHAMIS, A.T. JOHNSON, J.E. FISCHER, U. of Pennsylvania, A GELPERIN, Monell Senses Center — We demonstrate nanoscale sensors based on single-stranded DNA (ss-DNA) as the chemical recognition site and single-walled carbon nanotube field effect transistors (swCN-FETs) as the electronic readout component. SwCN-FETs functionalized with ss-DNA respond to gaseous analytes that do not cause a detectable current change in bare swCN-FETs. The response differs in sign and magnitude depending on the type of analyte and the DNA base sequence. The sensors maintain a constant response through at least 50 air-analyte cycles, and have response and recovery times on the scale of seconds. Furthermore, ss-DNA is found to chemically gate swCN-FET. The analytes used are found to interact with both the nanotube and the substrate. This sensor is promising for electronic olfaction systems consist of coupled sensor arrays and an odor recognition algorithm. Applications range from homeland security to disease diagnosis.

[1]C. Staii et al. Nano Lett. 5, 1774 (2005). Support by the Laboratory for Research on the Structure of Matter (NSF DMR00-79909), and US Department of Energy, grant No. DE-FG02-98ER45701 (M.C.).

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