Individual Single Wall Nanotubes for High Sensitiv-
ity Gas Detection BHASKAR NAGABHIRAVA¹, SHARVIL DESAI², GAMINI
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YU WU², BRUCE ALPHENAAR¹, ¹Dept. of Electrical and Computer Engineering
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on the influence of O₂ adsorption on individual SWNTs, and show that the observed
sensitivity is dramatically improved as compared with SWNT thin films or ropes.
SWNTs were grown on a SiO₂ / Si substrate using chemical vapor deposition, and
individual nanotubes were located and contacted with Au/Ti electrodes. The resis-
tance of the SWNT devices was then monitored in a sealed chamber under a number
of different gas environments. We observe a two order of magnitude decrease in the
resistance of a SWNT device following exposure to oxygen. This is much larger than
the 10-15% decrease in the resistance that has been observed for SWNT ropes or
mats. Theoretical analysis suggests that the O₂ molecules provide acceptor impu-
rity states to the nanotubes, which shift the Fermi energy towards the valence band.
The resulting increase in positive charge carriers leads to the observed conductance
increase. We also observe that the resistance of the SWNT decreases substantially
when exposed to inorganic vapors, leading to the possibility of using the nanotube
device for gas sensing applications. Supported by the NSF (DMR-0112824 and ECS-
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