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Chemoresistance of carbon nanotube circuits incorporating electrochemically-decorated defects VAIKUNTH KHALAP, ALEXANDER KANE, PHILLIP COLLINS, University of California, Irvine — The chemical functionalization of single-walled carbon nanotubes (SWNTs) is of broad interest, since it allows SWNT properties to be widely tailored. We specifically investigate SWNT devices with single point functionalizations. Standard fabrication techniques are supplemented by an electrochemical point-oxidation process that creates insulating defects into otherwise pristine SWNTs. Selective electrochemistry subsequently deposits metal onto the insulating site(s) and restores the device conductivity. Furthermore, the resulting circuits inherit the chemical sensitivity of the metal deposits. For example, nickel deposits produce an air-sensitive reconnection which readiy oxidizes in air back to an open circuit. Palladium deposits are air stable but highly sensitive to hydrogen gas. The interaction of Pd with point defects appears to entirely reproduce the reported characteristics of SWNT-based hydrogen sensors.

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