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The Role of Point Defects and Functionalizations in the Cyclic Voltammetry of Single-Walled Carbon Nanotubes VAIKUNTH KHALAP, Department of Physics and Astronomy, Univ. of California Irvine, Irvine, CA 92697-4576, TATYANA SHEPS, ALEXANDER KANE, PHILIP G. COLLINS, Department of Physics and Astron — The use of carbon electrodes in electrochemistry is usually preceded by extensive surface functionalization or oxidative pretreatments to "activate" the carbon surface. Precise and quantitative determination of the role of this functionalization is exceedingly difficult. To understand the exact role of different surface groups, we utilize individual, single-walled carbon nanotubes (SWCNTs) as unique, nanoscale working electrodes. Cyclic voltammetry on pristine single SWCNTs quantitatively determines electron transfer rates for a perfect, defect-free graphitic surface of known area. Furthermore, the incorporation of single point defects in the SWCNT sidewall allows kinetic rates to be probed as a function of disorder. Cyclic voltammetry of the same SWCNT before and after the production of a point defect shows a pronounced enhancement of electrochemical activity that can be unambiguously ascribed to the presence of the functionalization. This research is partly supported by NSF (CBET-0729630) and a GAANN fellowship (VRK).

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