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Electrical Measurement of Single Molecule Catalysis using Carbon Nanotubes BRETT R. GOLDSMITH, ALEXANDER A. KANE, VAIKUNTH KHALAP, Department of Physics and Astronomy, University of California Irvine, Irvine, CA 92697, JOHN CORONEUS, Department of Molecular Biology and Biochemistry, University of California Irvine, Irvine, CA 92697, GREGORY A. WEISS, Departments of Chemistry, Molecular Biology and Biochemistry, University of California Irvine, Irvine, CA 92697, PHILIP G. COLLINS, Department of Physics and Astronomy, University of California Irvine, Irvine, CA 92697 — We demonstrate single molecule chemical sensors based on single-walled carbon nanotubes (SWNT). The architecture uses a SWNT conductor having a single, reactive species covalently bonded to the sidewall [1]. Dynamics of the molecule are electrically transduced as it interacts with its surrounding environment. As a test case, we investigate the catalytic modification of EDC by a carboxylate. After creating a carboxylate terminus on the SWNT, the circuit is monitored for several hours and through hundreds of individual EDC reactions. Statistical analysis determines the lifetime of the carboxyl-EDC complex, as well as the catalytic turnover rate, from discrete events. Because the carboxylate site can be readily derivatized with proteins, peptides, or other functional molecules, the technique shows promise as a tool for single molecule research independent of optics and scanning probe microscopy.
1. B.R. Goldsmith, et al. *Science* **315**, 77 (2007).

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