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Resolving Single Molecule Lysozyme Dynamics with a Carbon Nanotube Electronic Circuit YONGKI CHOI, ISSA S. MOODY, ISRAEL PEREZ, TATYANA SHEPS, GREGORY A. WEISS, PHILIP G. COLLINS, Depts. of Physics and Astronomy, Chemistry, and Molecular Biology, Univ. of California at Irvine, Irvine, CA 92697 — High resolution, real-time monitoring of a single lysozyme molecule is demonstrated by fabricating nanoscale electronic devices based on single-walled carbon nanotubes (SWCNT). In this sensor platform, a biomolecule of interest is attached to a single SWCNT device. The electrical conductance transduces chemical events with single molecule sensitivity and 10 microsecond resolution. In this work, enzymatic turnover by lysozyme is investigated, because the mechanistic details for its processivity and dynamics remain incompletely understood. Stochastically distributed binding events between a lysozyme and its binding substrate, peptidoglycan, are monitored via the sensor conductance. Furthermore, the magnitude and repetition rate of these events varies with pH and the presence of inhibitors or denaturation agents. Changes in the conductance signal are analyzed in terms of lysozyme's internal hinge motion, binding events, and enzymatic processing.

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