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Electrostatic signatures of single protein dynamics for detection with carbon nanotube sensors G. SCHNEIDER, L. PRISBREY, E. MINOT, Oregon State University — Observing single molecule dynamics in real time at atomic resolution is crucial to study enzyme function, which is closely linked to the intrinsic dynamics of the enzyme and molecular interactions between enzyme and substrate. At present, techniques such as nuclear magnetic resonance (NMR) and single molecule fluorescence energy transfer (FRET) are used together with computer simulations to study single molecule dynamics. Recent progress in point-functionalization of single wall carbon nanotubes[1] (CNT) opens up the possibility of electronic detection of single molecule dynamics.[2] CNTs are ideal candidates for electronic sensing of single protein dynamics. Typical CNT diameters are 1-2 nm, comparable to both the size of proteins in solution and the electrostatic screening length in physiological solutions. CNT sensors based on point defects have potential advantages over FRET including better time resolution. We report results for the electrostatic signature of several proteins in solution, both in substrate free and bound forms, and discuss the potential for electronic detection of biologically relevant single protein dynamics using functionalized carbon nanotubes.

[1]B. R. Goldsmith et al, Science 315, 77-81 (2007).
[2]B. R. Goldsmith et al, Nano Lett 8, 189-194 (2008).

Guenter Schneider
Oregon State University

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