Abstract Submitted
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The translocation time of DNA and protein molecules in solid-state nanopores[1] BRADLEY LEDDEN, RYAN ROLLINGS, DAVID TALAGA, Department of Chemistry and Biochemistry, Montclair State University, Montclair, NJ 07043, JIALI LI, Department of Physics, University of Arkansas. Fayetteville, AR 72701 — The time that a biopolymer takes to translocate through a nanopore contains the properties of the polymer including its size, conformation, electrical charge and charge distribution. We measured the dependence of the translocation times on the size, charge and charge distribution, voltage, and conformation states of DNA and protein molecules. To quantitatively fit the time distributions measured, 1-D Langevin and 1-D Fokker-Planck equations were used for DNA and native state proteins. Kramers reaction rate theory was used to fit the time distribution of unfolded proteins. It was observed that native-state protein and DNA translocation approximately follows simple one-dimensional biased diffusion of charged particles. Due to the heterogeneous charge sequence of polypeptides, unfolded proteins obey a coupled electrophoretic and thermally activated process that is sequence specific. Deviations between models and experimental results as well as future challenges for single molecule DNA and protein characterization using solid-state nanopores will be discussed.

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