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Obtaining structural information of small proteins using solid-state nanopores and high-bandwidth measurements

DAVID NIEDZWIECKI, CHRISTOPHER LANCI, JEFFERY SAVEN, MARIJA DRNDIC, University of Pennsylvania — The use of biological nanopores sensors to characterize proteins has proved a fruitful field of study. Solid-state nanopores hold several advantages over their biological counterparts, including the ability to tune pore diameter and their robustness to external conditions. Despite these advantages, the use of solid-state nanopores for protein analysis has proved difficult due to rapid translocation times of proteins and poor signal-to-noise of small peptides. Recently, improvements in high-bandwidth acquisition and in signal-to-noise have made the study of small peptides using solid-state nanopores feasible. Here we report on the detection and characterization of peptides as small as 33 amino-acids in length using sub-10 nm thin silicon nitride nanopores, giving high signal levels, combined with high-bandwidth electronics. In addition we show differentiation between monomers and dimer forms of the GCN-4 p1 leucine zipper, a coil-coil structure, and compare this with the unstructured 33-mer. The differentiation between these two forms demonstrates the possibility of extracting useful structural information from short peptide structures using modern solid-state nanopore systems.

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