Abstract Submitted
for the 4CF15 Meeting of
The American Physical Society

Sub-10 nm fluidic system with self-aligned nanogap electrodes for biomolecule characterization[1] JOSHUA SADAR, QUAN QING, Department of Physics, Arizona State University — Nanopore sensors, an emerging third-generation DNA sequencing technique with rapid speed, single-base sensitivity and long read lengths, exemplify a new strategy in biomolecule characterization. In such designs, the dimension of the sensor matches precisely with a single target molecule, so that the presence and/or motion of the molecule inside the sensor can generate time-dependent electrical read-out signals containing significant local structural information. The capability of single-molecule level and label-free detection of sequence of DNA and protein molecules promise a new paradigm in both fundamental studies and biomedical applications. However, existing techniques face great challenges such as the scalability and reproducibility of fabrication, translocation control, and read-out signal specificity. Here we propose a new framework of preparing a sub-10 nm fluidic system with the additional integration of a pair of embedded nanogap electrodes in a self-aligned manner. We will introduce our impedance-based feedback control system for the electrochemical deposition of metal on pre-defined nanoscale electrodes within a confined space to construct sub-10 nm nanopores with gate electrodes. Our design can be developed into a promising platform for the scalable preparation of single-molecule characterization devices with active translocation control and additional readout mechanisms, including recognition tunneling signals and surface enhanced Raman spectrum.

[1]Supported by an NSF Graduate Research Fellowship

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Date submitted: 14 Sep 2015 Electronic form version 1.4