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Bottom-up preparation of nanopore array with self-aligned nanogap electrodes for single biomolecule characterization[1] JOSHUA SADAR, QUAN QING, Arizona State University, Department of Physics —
Nanopore sensors, an emerging third-generation DNA sequencing technique, exemplify a new strategy in the characterization of biomolecules at single molecule level. 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 measurable time-dependent electrical read-out signals containing significant local structural information. However, existing fabrication processes face great challenges such as the scalability and reproducibility of fabrication, lack of control of translocation, and low specificity in read-out signals. Here we propose a new framework of preparing nanopore device arrays with the additional integration of a pair of embedded nanogap electrodes in a self-aligned manner. Specifically, 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. The precise control of the critical dimensions of the gap and its mechanism will be demonstrated and discussed. Our design can provide a promising platform for the scalable preparation of single-molecule characterization devices with active translocation control and recognition tunneling readout signals.

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