Solid-state nanopores for DNA and protein sequencing

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Nanopores have emerged as versatile systems for biosensing. In a typical measurement, electric field is applied to drive a charged biomolecular through a tiny pore in a very thin insulating membrane; the current blockades produced by the presence of the biomolecule in the nanopore report on its chemical structure. It is well known that the direction of a biomolecule's transport is determined by the tug of war between the electric field driving the biomolecule through the nanopore and the drag force of the electro-osmotic flow that opposes it. Here, I will describe two systems where the direction of the nanopore transport is determined by the dielectrophoretic effects. Next, I will describe our efforts to assess utility of graphene nanopores for protein sequencing and the ability of the nanopore ionic current to report on the folding state of a protein. At the end of the talk, I will introduce a prototype of an on-line tool that permits fast and accurate evaluation of the nanopore ionic current blockades for moderately charged biomolecules.