

The application of solid-state nanopore structures to biomolecule sensing and sequencing

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Nanopore structures have been suggested as a tool to monitor the transport of biomolecules and to sequence the bases of DNA at a single molecule level. For instance, promising results have been reported by using α -hemolysin (protein nanopore molecule) or MspA protein to sequence DNA. Other researchers would like to use solid-state nanopore structures to perform the same function as a protein nanopore.

However, the application of solid-state nanopores, which are assumed to be more stable, still faces many difficulties. One of them is the noise issue. Unlike the devices made from protein nanopores, solid-state devices typically show much higher noise levels, which is detrimental in resolving each base of DNA. Another issue is how to design the structure to resolve each base, when the bases are separated by only about 3.4–5 Å, depending on how the DNA is stretched. In order to resolve the signal from each base, the thickness of sensing region should be less than 5 Å. Still another issue to be resolved is how to control the translocation speed of the biomolecule through the membrane.

In this presentation, all of these issues will be presented with the goal of stimulating an open discussion of whether it can be really feasible for solid-state nanopores to be utilized for the DNA sequencing.