

Solid-state nanopore technologies for nanopore-based DNA analysis

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Nanomedicine 2 (2007) 875-897

Nanopore-based DNA analysis is a new single-molecule technique that involves monitoring the flow of ions through a narrow pore, and detecting changes in this flow as DNA molecules also pass through the pore. It has the potential to carry out a range of laboratory and medical DNA analyses, orders of magnitude faster than current methods.

Initial experiments used a protein channel for its pre-defined, precise structure, but since then several approaches for the fabrication of solid-state pores have been developed.

These aim to match the capabilities of biochannels, while also providing increased durability, control over pore geometry and compatibility with semiconductor and microfluidics fabrication techniques. This review summarizes each solid-state nanopore fabrication technique reported to date, and compares their advantages and disadvantages.

Methods and applications for nanopore surface modification are also presented, followed by a discussion of approaches used to measure pore size, geometry and surface properties.

The review concludes with an outlook on the future of solid-state nanopores.