

Slowing DNA Translocation through Zinc Oxide Nanopores in Transfer-Free Quartz Platform

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Low-noise platform based on glass substrate has demonstrated extremely low dielectric noise, but this platform includes additional membrane transfer process.^[1] We have presented the transfer-free quartz substrate platform for low noise detection. In addition, we integrated zinc oxide (ZnO) nanopores for DNA sensing applications. ZnO is a promising material as an alternative nanopore sensor due to its chemical, mechanical stability in various nanostructures and high isoelectric point (~9.5). Polycrystalline ZnO layer with wurtzite structure is deposited by ALD process and nanopore in such membrane is perforated by a conventional e-beam drilling method. From a study of dsDNA translocation, we reveal that the translocation speed of ZnO pore has more than one order of magnitude slower compared to that of common SiN_x nanopore device. For further investigation of such slowing effect, we propose the additional friction force model by electrostatic interaction between positively charged ZnO pore wall and negatively charged phosphate backbone.

References

- [1] M.-H. Lee *et al.* A Low-Noise Solid-State Nanopore Platform Based on a Highly Insulating Substrate. *Scientific reports* **4**, 7448 (2014).