Supporting Information

Ionic current modulation from DNA translocation through nanopores under high ionic strength and concentration gradients

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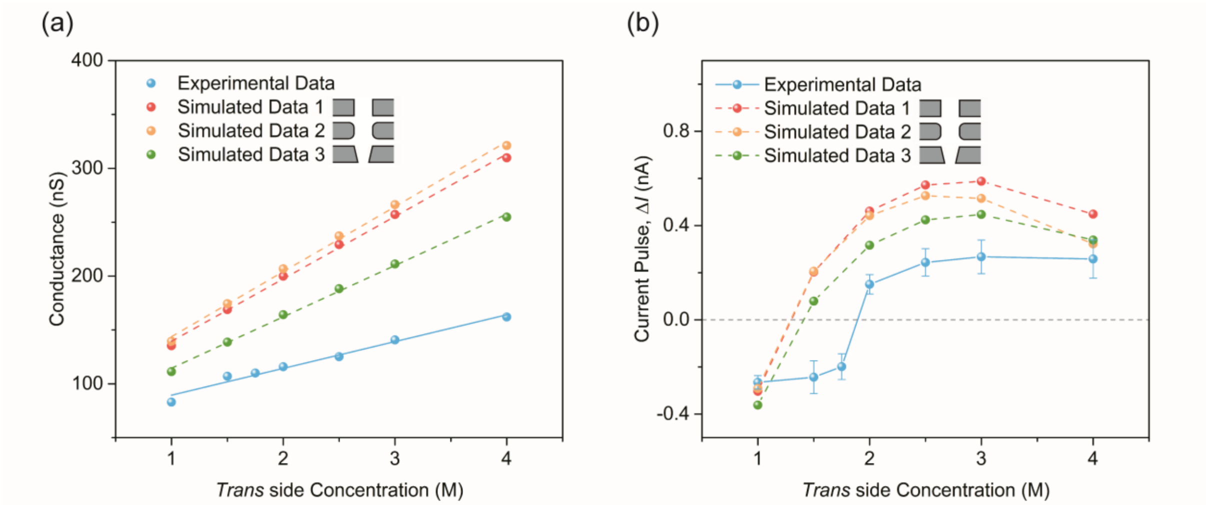

Figure S1. The ion conductance (a) and current pulse (b) for different shape nanopores as functions of the electrolyte concentration in the *trans* side chamber. All simulation results for different pore shapes show larger ion conductance and steeper slope than the experimental data. Ion conductance of cylindrical nanopore with rounded edges is very close to that of the perfectly cylindrical nanopore. The conical nanopore has lower ion conductance because the smaller entrance on one side of the pore limits ions translocation. Both simulation results with conical nanopore and cylindrical nanopores correctly reproduced the observed experimental trend with the ionic current modulation changed from blockade to enhancement as the *trans* side concentration increases. This implies that our model is able to investigate the mechanisms of ionic current modulation. However, the simulation results cannot exactly match the magnitude of the experimental data, thus there should be some other factors play an important role on the pore conductance, which is identified as the different ion conductivities in the modeling and experiment.

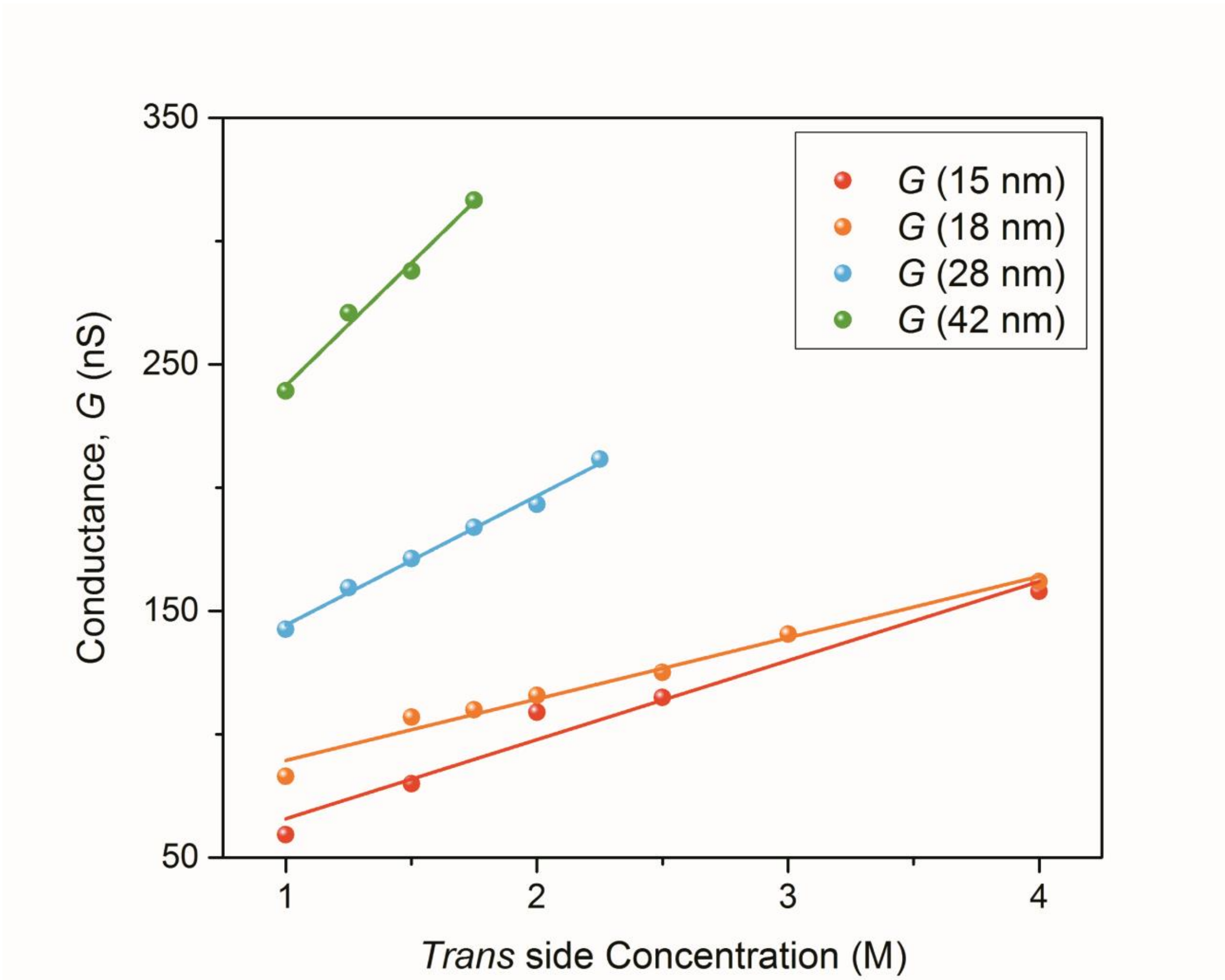

Figure S2. Ionic conductance of four nanopores under different electrolyte concentration gradients. The *cis* side electrolyte concentration was kept at 1 M.

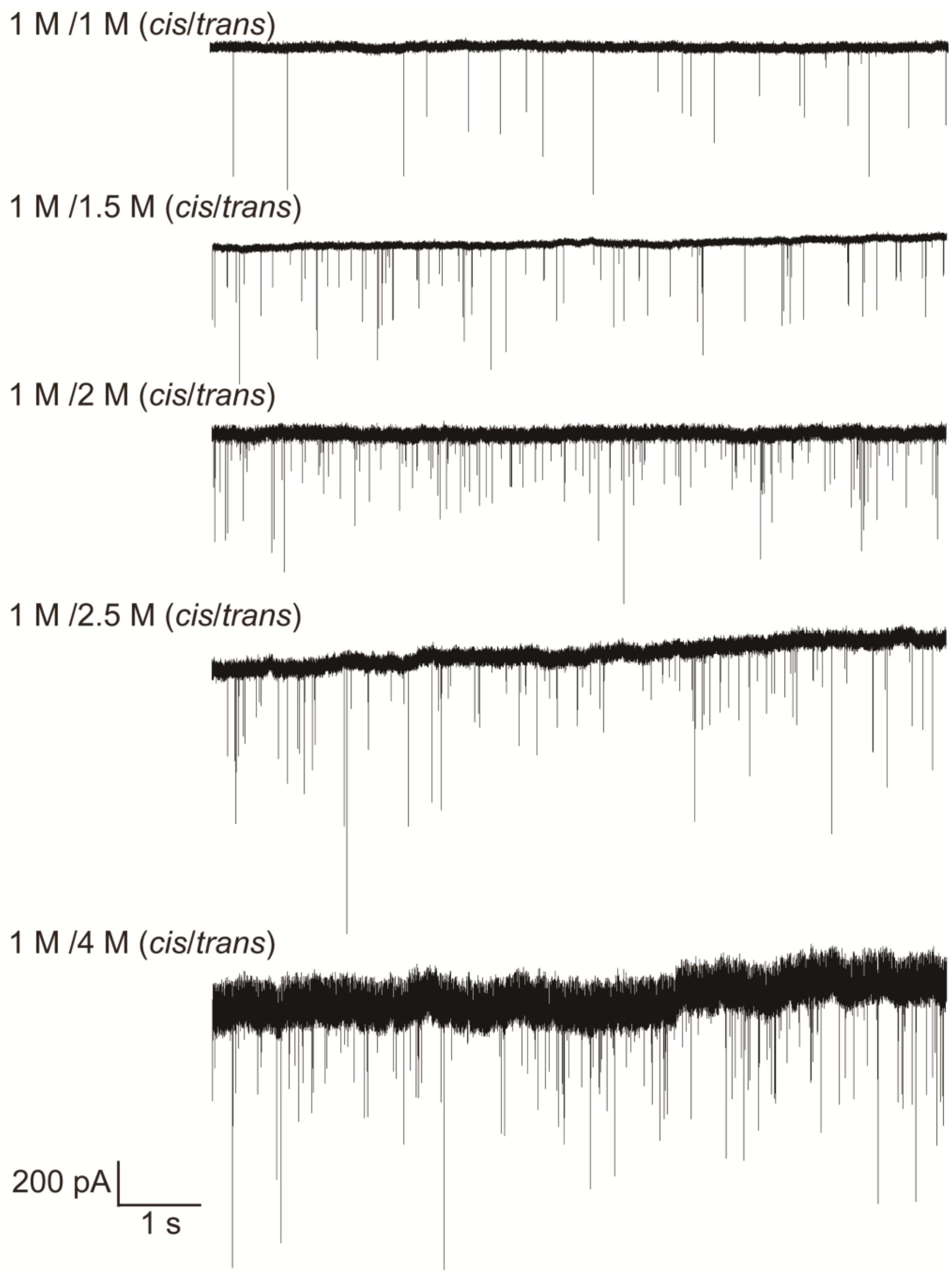

Figure S3. Ionic current traces with translocation of dsDNA molecules through a 15 nm nanopore with a range of concentration gradients. No positive pulse signals can be detected even when the concentration setting is 1 M/4 M (*cis*/*trans*).

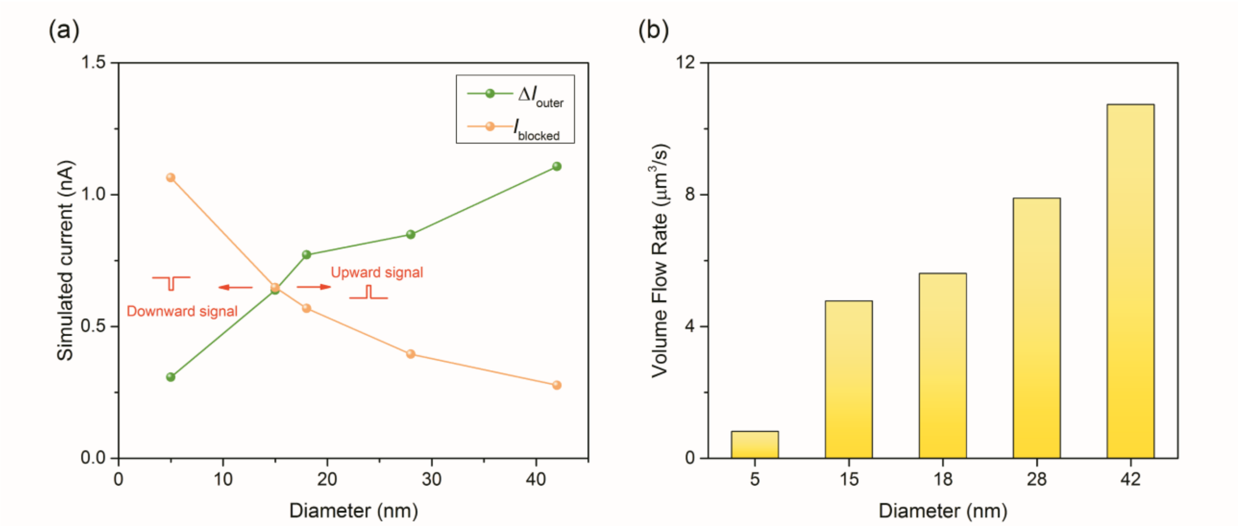

Figure S4. (a) Simulation results of the outer section ionic current change and blocked ionic current for different diameter nanopores with a 1 M/1.5 M (*cis*/*trans*) concentration setting. The blocked current decreases as the pore diameter gets larger, while the outer part ionic current enhancement increases with the pore size. Once the pore is large enough, outer part ionic current increase exceeds the blocked current and converts the current pulse from downward to upward; (b) Simulation results of the volume flow rate for dsDNA in different diameter nanopores with a 1 M/1.5 M (*cis*/*trans*) concentration setting. The volume flow rate increases with the pore size, indicating that larger size pores allow the dsDNA to pump more electrolyte into the pore. As such, more charge carriers will come into pore along with the EOF. This is the reason why the outer part ionic current change increases with the pore size.