An electric field responsive nanopore with ion selectivity: Design based on controlling transport resistance

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Using external stimuli to control ionic transport behavior confined in the nanopore has many widely potential applications ranging from water desalination to fuel cells and becomes an important focused topic for membrane material designers. Conventionally, the idea that the intensity of electric field could change the ion selectivity with same charge seems impossible. In this work, we proposed a novel strategy that controlling the resistance of ionic transport utilizing the different structural responses of modified pore wall to the electric field intensity to regulate the ionic selectivity.

Molecular simulation has been an integral part in the field of nanofluidics and has an important role in discovering novel view of nanomaterial design[1]. In order to verify the above notion, molecular simulation studies were performed to investigate the transport behaviors of K^+ and Na^+ in the inner wall modified nanopore under electric field. The results showed that the flux and K^+/Na^+ selectivity increased in the modified nanopore. The observation reinforces the notion that both the driving force and the resistance force can be simultaneously affected to external stimuli under nanoconfinement, which is useful for smart nanodevice designing.

References

1. Y.D. Zhu, J. Zhou, X.H. Lu, X.J. Guo, L.H. Lu, *Microfluid Nanofluid*, **15**, 191 (2013).

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