Biomolecular Detection with Nanofluidic Diodes based on Nanopores

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Recently, much attention has been paid to fabricate synthetic nanopores with the ability to mimic the function of biological counterparts to miniaturize nanofluidic biosensing devices. The sensing principle is critically depend on the nature of chemical groups (ligands) decorated onto the inner pore walls which interact with ions/molecules passing through the nanopore. In this context, we have fabricated single asymmetric nanopores in swift heavy ion irradiated polymer membranes.[1,2] These asymmetric nanopores display ionic transport properties such as ion current rectification, current gating and ion selectivity much similar to biological pores because of their resemblance in structure (size and shape) and chemistry (fixed charges).[2] The nanopore surface contains carboxylic acid groups which can be covalently coupled with a variety of amine-terminated molecules (ligands) via carbodiimide coupling chemistry.[3-6] Immobilized ligand molecule onto the pore surface enabled us to miniaturize biosensors targeted at a specific (bio)chemical analyte. The ligand-receptor interactions inside the confined geometries lead to measurable changes in the electronic readout resulting from the modulation of ion current passing through the nanopore.[3-6]

References

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