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Ion Transport in 2-D Graphene Nanochannels[1] QUAN XIE, ELBERT FOO, CHUANHUA DUAN, Boston Univ — Graphene membranes have recently attracted wide attention due to its great potential in water desalination and selective molecular sieving. Further developments of these membranes, including enhancing their mass transport rate and/or molecular selectivity, rely on the understanding of fundamental transport mechanisms through graphene membranes, which has not been studied experimentally before due to fabrication and measurement difficulties. Herein we report the fabrication of the basic constituent of graphene membranes, i.e. 2-D single graphene nanochannels (GNCs) and the study of ion transport in these channels. A modified bonding technique was developed to form GNCs with well-defined geometry and uniform channel height. Ion transport in such GNCs was studied using DC conductance measurement. Our preliminary results showed that the ion transport in GNCs is still governed by surface charge at low concentrations (10^{-6}M to 10^{-4}M). However, GNCs exhibits much higher ionic conductances than silica nanochannels with the same geometries in the surface-charge-governed regime. This conductance enhancement can be attributed to the pre-accumulation of charges on graphene surfaces.

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