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Title:

Ion transport phenomenon across nanoporous mono layer graphene transferred hydrogel membrane

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Abstract: (Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 300 words. The box will 'expand' over 2 pages as you add text/diagrams into it.)

Preparation of Your Abstract

1. The title should be as brief as possible but long enough to indicate clearly the nature of the study. Capitalise the first letter of the first word **ONLY** (place names excluded). No full stop at the end.

2. Abstracts should state briefly and clearly the purpose, methods, results and conclusions of the work.

Introduction: Clearly state the purpose of the abstract

Methods: Describe your selection of observations or experimental subjects clearly

Results: Present your results in a logical sequence in text, tables and illustrations

Discussion: Emphasize new and important aspects of the study and conclusions that are drawn from them

Graphene composes unique characteristics in terms of atomic level thickness, large carrier mobility with its semi metallic nature, high thermal conductivity and excellent chemical properties, demonstrating its potential suitable for wide range of applications. Particularly, a high quality mono layer graphene from chemical vapor deposition (CVD) method has broadened application. Specifically, mono- and multilayer graphene in membrane separation processes such as gas separation and ion separation are widely investigated.

In this study, CVD graphene-supported poly(ethylene glycol) diacrylate (PEGDA) hydrogel membranes were prepared to investigate ion selective transport phenomenon. Single crystalline graphene (SCG) and defect controlled polycrystalline graphene (PCG) were transferred to PEGDA hydrogel membrane (thickness of $300 \pm 50 \mu\text{m}$) to investigate ion selective transport phenomenon.

Intrinsic defect sites in mono layer graphene can be used as ion transport channels. Single crystalline graphene (SCG)-supported poly(ethylene glycol) diacrylate (PEGDA) hydrogel membranes exhibited lower ion permeability than polycrystalline graphene (PCG)- supported poly(ethylene glycol) diacrylate (PEGDA) hydrogel membranes, yet showed size selective transport behavior. By controlling defect density and defect size within polycrystalline graphene (PCG), transport of ions and increasing permeability of ions across these channels were observed. The size of intrinsic defect sites in polycrystalline graphene was controlled through oxygen plasma etching process.

Results and characterizations of designed membranes indicate that CVD graphene-supported hydrogel membranes could be used as an effective ion separation membraned and further could be a promising material for water purification processes.