

Abstract Submitted
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Graphene-based novel formulations as large-area nanofiltration membranes and mesoporous capacitive deionization electrodes for water desalination¹ A. HENSON, B. EVANS, S. GUPTA, Western kentucky University, Bowling Green, KY 42101 — In this work, we developed large-area nanofiltration membranes using 1) shear aligned discotic nematic phase of graphene oxide and 2) holey graphenes with narrow hole size distribution via controlled catalytic oxidation. We also prepared interconnected network of mesoporous graphene-based electrodes to achieve optimal desalination during capacitive deionization (CDI) of brackish water, attributed to higher specific surface area, electrical conductivity, good wettability of water, environmentally safe, efficient pathways for ion and electron transportation, as potential successor of current filtration membranes. The pressure driven transport data on highly ordered, continuous, thin films of multi-layered graphene oxide and holey graphene is expected to demonstrate faster transport for salt water, higher retention for charged and uncharged organic probe molecules with hydrated radii above 5Å as well as modest retention of mono- and di-valent salts for ~150 nm thick membranes. The highly ordered graphene nanosheets and nanoscaled porous graphene in the plane of the membrane make organized, molecule-hugging cylindrical and spherical channels, respectively, thus enhance the permeability and hydrodynamic conductivity. The results illustrate that both the macro and nanoscale pores are favorable for enhancing CDI performance by buffering ions to reduce the diffusion distance from external electrolyte to the interior surfaces and enlarging surface area.

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