

Manipulating Nanochannel of Polymer-Crosslinked Graphene Oxide Membrane via Pressure-Assisted Compaction for Selective Ion Permeation

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Suffering from water shortages becomes serious problems for many countries due to environmental pollution and climate change, so that research on the separation process through membrane is being actively conducted to selectively remove ions or organic molecules from contaminated water or seawater. Graphene oxide (GO) membrane is regarded as an promising candidate for the selective ion rejection membrane owing to electrostatic repulsive properties derived from oxygen functional groups as well as the physically narrow nanochannel between GO layers. In this work, we designed a nanochannel modified polymer-crosslinked GO membrane for effectively regulating the ion penetration. In the GO composite membranes, hyper-branched polyethylenimine (HPEI) and polyacrylic acid (PAA) were used to crosslink GO layers through amide bonds. We found that the size of nanochannel can be successfully tuned by pressing the composite membrane with different pressure during the crosslinking process. Our results show that the composite GO membrane pressed by high pressure effectively suppresses the penetration of ions through the nanochannel, simultaneously enhancing the transport rate of water molecules.