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Synthesis of highly stable graphene oxide membranes on polydopamine functionalized supports for seawater desalination

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Abstract

It is well known that graphene oxide (GO) is highly stable in air or water. However, the stability of asymmetric graphene oxide (GO) membrane depends on the chemistry of the support and also the thickness of the targeted coated GO layer. It is found that the GO membranes prepared on porous Al_2O_3 supports are unstable, and easy to crinkle and finally peel off from the support surface in a short time due to poor interaction with the support surface. In the present work, we have successfully prepared highly stable, permselective and reproducible GO membranes for seawater desalination by using polydopamine (PDA) as a novel covalent linker. Attributing to the high adhesive ability of PDA, GO nanosheets are attracted and bound onto the support surface, thus remarkably enhancing the stability of the GO membranes. It is found that the developed GO membranes are very promising for seawater desalination. For desalination of 3.5 wt% seawater at 90 °C, high water fluxes of 48.4 $kg \cdot m^{-2} \cdot h^{-1}$ and high ion rejections of over 99.7% can be obtained for the GO membrane, which much higher than those obtained from conventional porous inorganic membranes.

Keywords: Graphene Oxide Membranes; Polydopamine Modification; Bioadhesion; Seawater Desalination; Pervaporation

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