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Graphene Oxide-assisted Membranes: Fabrication and Potential Applications in Desalination and Water Purification

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Abstract

Globally, the problem of fresh water scarcity has continued to escalate. One of the most powerful techniques to fully secure the availability of fresh water is desalination. Searching for more efficient and low-energy-consumption desalination processes is the highest priority on the research agenda. Recent progress has been achieved using graphene oxide (GO)-assisted membranes in desalination applications. GO's abundant functional groups, including epoxide, carboxyl and hydroxyl, provide functional reactive sites and hydrophilic properties. Its freestanding membrane, with a thickness of a few nanometres, has been applied recently in pressurised filtration, which is an ideal candidate for the application of desalination membranes. The multilayer GO laminates have a unique architecture and superior performance that enable the development of novel desalination membrane technology. With good mechanical properties, they are easily fabricated and have the ability to be industrially scaled up in the future. This review considers the different fabrication and modification strategies for various innovative GO-assisted desalination membranes, including freestanding GO membranes, GO-surface modified membranes and casted GO-incorporated membranes. Their desalination performance and mechanism will be discussed, and their future opportunities and challenges will be highlighted.

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