

Nanomaterials Enhanced Mixed Matrix Membranes for Efficient Separation of Aqueous Mixtures

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Abstract:

Mixed matrix membranes (MMMs) have gained increasingly importance due to their ability to combine the features of the aforementioned membrane materials, offering better solutions in terms of performance, fouling, permeate quality and longevity. Enhanced membrane performance could be achieved by tuning their physicochemical properties and introducing unique functionalities via addition of novel nanomaterials and intelligent design of advanced nanocomposite membranes to meet specific separation applications. In our recent work, we have explored a range of different dimensional nanomaterials including metal-organic frameworks (MOFs), graphene oxide, Mxene, CNT and silica and their influence on some emerging membrane technologies (e.g. membrane distillation, forward osmosis, pervaporation). We report here how the incorporation of these nanomaterials with various properties modifies the membrane micro/nano-structure, surface property and separation performance of nanocomposite membranes to achieve the enhanced separation efficiency for desalination and water treatment. Strategy for making dual layer membranes and interlayered membranes using 2D materials are also discussed.

Keywords: mixed matrix membrane, nanomaterials, desalination, water treatment