High desalination performance of reverse osmosis membrane incorporating single-walled carbon nanotubes with tip and inner modification

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Abstract

To enhance the desalination of reverse osmosis membranes, thin film nano composite reverse osmosis membranes were prepared by inter-facial polymerization that trimesoyl chloride (TMC) solution in n-hexane blended in aqueous solutions of m-phenylenediamine (MPD) containing modified single-walled carbon nano tubes (SWCNTs) (0.93 nm diameter). The functionalized SWCNTs were obtained by chemical process and analyzed by TGA, XPS, and HRTEM, etc. The experimental results showed that the expected functional groups were successfully grafted on the tip and inner wall of the single-walled carbon nano tubes. The surface characteristics of membranes were studied in SEM images, salt rejection, water flux tests and surface contact angle analysis. Membrane performance test showed that the water flux and salt rejection were significantly increased for modified SWCNT-polyamide thin film nano composite membranes (especially those containing hydrophilic groups such as carboxyl groups and amino groups) compared with the bare polyamide membrane.

Keywords: Single-walled carbon nano tubes; Inner/surface modification; SWCNTs-polyamide nano composite membranes; Desalination

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