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Thin-Film Nanocomposite Membrane with Single-Walled Carbon Nanotubes Axial Positioning in Support Layer for Desalination of Water

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Abstract : Single-walled carbon nanotubes (SWCNTs) are an outstanding material for applications in thermoelectric power generation, nanoelectronics, electrochemical energy storage, photovoltaics, and light emission. They are ultra-lightweight and possess electrical as well as thermal conductivity, flexibility, and mechanical strength. SWCNT is applicable in water treatment, brine desalination, removal of heavy metal ions associated with pollutants, and oil-water separation. Carbon nanotube (CNT) is believed to tackle the trade-off issue between permeability, selectivity, and fouling issues in membrane filtration applications. Studying these CNT structures, as well as their interconnection in nanotechnology, assists in finding the precise position to be placed for water desalination. Reverse osmosis (RO) has been used globally for desalination, resulting in purified water. Thin film composite (TFC) membranes were utilized in the RO process for desalination. The sheet thickness increases the salt rejection and decreases the water flux when CNT is utilized as a support layer to this membrane. Thus, through a temperature-induced phase separation technique (TIPS), axially aligned SWCNT (AASWCNT) is fabricated, and its use enhances the salt rejection and water flux at short reaction times with a modified procedure. An evaluation was conducted and analogized with prior works in the literature, which exhibited that the prepared TFC membrane showed a better outcome.

Keywords : single-walled carbon nanotubes, thin film composite, axially aligned swcnt, temperature induced phase separation technique, reverse osmosis
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