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Performance assessment of prepared polyamide thin film composite membrane for desalination of saline groundwater at Mersa Alam-Ras Banas, Red Sea Coast, Egypt

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ABSTRACT

This study aims to enhance the performance of the flat sheet thin-film composite (TFC) polyamide–polysulfone reverse osmosis (RO) membranes. Composite RO membranes with high salt rejection were fabricated by treating a porous polysulfone (PS) support sequentially with a di-amine and then with a polyfunctional acid chloride, thereby forming a thin film of polyamide (PA) on the PS support. In order to establish conditions for the development of suitable thin-film composite (PS/TFC) membranes, various parametric studies were carried out which included varying the concentration of reactants, reaction time, curing temperature, and curing time for thin-film formation by the interfacial polymerization technique. By suitable combination of these factors, 2.0 wt.% MPD, 0.5 wt.% TMC, 60-s reaction time, 80˚C curing temperature, and curing time 10 min., a desired thin film of PA with improved performance for groundwater desalination could be obtained. Further, a combination of scanning electron microscopy (SEM), attenuated total reflectance infrared (ATR-IR), X-ray diffraction (XRD) was utilized to confirm the existence and to examine the morphology of the PS/TFC membrane. Pilot-scale RO filtration unit was used to study the performance of the fabricated membranes for desalinating brackish, saline groundwater of Red Sea coastal area. Salt rejections percent for various feeds were found to be in the range of 90.6–98.5.

Keywords: Performance assessment; Brackish groundwater; Desalination reverse osmosis; Interfacial polymerization; Thin-film composite

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