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Assessment of performance recently developed acriflavine thin film composite nanofiltration membrane for seawater treatment and RO brine concentration

B. Garudachari*, M. Ahmed, K. A. Rajesha, J. Thomas

Kuwait Institute for Scientific Research, Water Research Center, P.O. Box: 24885, Safat 13109, Kuwait, emails: bgarudachari@kisr.edu.kw (B. Garudachari), mahmed@kisr.edu.kw (M. Ahmed), ralambi@kisr.edu.kw (K.A. Rajesha), jithomas@kisr.edu.kw (J. Thomas)

ABSTRACT

To enhance the permeation and salt rejection properties of polysulfone membrane, novel TiO_2 nanoparticle incorporated acriflavine thin film composite (TFC) was fabricated. Fabricated TFC membranes were characterized thoroughly using Fourier transform infra red (FT-IR), atomic force microscope, field emission scanning electron microscope and contact angle (CA). The signature peaks in FT-IR spectra were identified to confirm the interfacial polymerization (IP) of acriflavine and TMC. TiO_2 nanoparticle incorporation in the TFC layer was analysed using elemental mapping analysis and EDX. The addition of TiO_2 nanoparticle in acriflavine TFC layer resulted change in morphology of membrane and contact angle. The highest pure water flux was reached up to 67.1 Lm^{-2} h^{-1} with 0.1 weight percentage of TiO_2 nanoparticle dosage (TFC 4). The water flux of 53.0, and 44.5 Lm^{-2} h^{-1} were achieved for TFC 4 membrane using Arabian Gulf Seawater, and reverse osmosis (RO) brine, respectively. Most importantly, TFC 4 membrane showed less fouling with more than 99% of ionic rejection for magnesium, calcium, and sulfate ions. From the studies, it was concluded that, novel TiO_2 nanoparticle incorporated acriflavine TFC membranes are having high capability of rejecting divalent ions and suitable for seawater treatment and RO brine concentration applications.

Keywords: Desalination; TiO_2 nanoparticle; Salt flux; Water flux

* Corresponding author.

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