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Development of carbon nanotube membranes for dissolved gases removal as seawater pretreatment

Bhadrachari Garudachari*, Ali Al-Odwani, Rajesha Kumar Alambi, Mohammad Al-Tabtabaei, Y. Al-Foudari

Water Research Center, Kuwait Institute for Scientific Research, P.O. Box: 24885, Safat 13109, Kuwait, Tel. +965 98724398; emails: bgarudachari@kisr.edu.kw/garuda.achar@gmail.com (B. Garudachari), aodwani@kisr.edu.kw (A. Al-Odwani), ralambi@kisr.edu.kw (R.K. Alambi), mtabtaba@kisr.edu.kw (M. Al-Tabtabaei), yfoudari@kisr.edu.kw (Y. Al-Foudari)

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ABSTRACT

The removal of dissolved gases such as oxygen from seawater is one of the primary process applied in desalination industries. The effective degasification of dissolved gases remains a challenge in the desalination industry due to several reasons such as removal efficiency, performance, gas selectivity, and others. This paper describes the fabrication, characterization, and degasification performance study of carbon nanotube/polyvinyl chloride (CNT/PVC) nanocomposite membranes. The CNT/PVC nanocomposite membranes were fabricated by immersion precipitation method at 0.01, 0.25, and 0.5 wt.% CNT concentrations in the casting solution. The physicochemical properties of fabricated membranes were studied by Fourier transform infrared spectroscopy (FTIR), field emission scanning electron microscopy (FESEM), atomic force microscopy (AFM), contact angle (CA), water uptake, and liquid entry pressure (LEP). The FTIR analysis confirmed the proper dispersion of CNT throughout the membrane. The values of CA, water uptake, and LEP decreased with the increase of CNT concentration in the membrane matrix. The FESEM and AFM studies showed an increase in macrovoid structure and a decrease in surface roughness with increased CNT concentration. The newly fabricated membranes showed excellent degasification performance under the prevalent conditions of the desalination process.

Keywords: Carbon nanotube/polyvinyl chloride membrane; Degasification; Flux; Contact angle; Liquid entry pressure

* Corresponding author.