Desalination properties of a novel composite membrane with a lamination method

Young-Jea Kim, Myung-Hwan Jeong, Jae-Suk Lee*

Department of Material Science and Engineering and Department of Nano Bio Materials & Electronics,
Gwangju Institute of Science and Technology (GIST), 261 Cheomdan-gwagiro, Buk-gu, Gwangju 500-712, Korea
Tel. +82 (62) 970-2306; Fax +82 (62) 970-2304; email: jslee@gist.ac.kr

Received 12 November 2009; Accepted in revised form 24 December 2009

ABSTRACT

Side chain crosslinked (C-SFPEx-CMy) sulfonated poly(arylene ether) (SPAE) membranes containing fluorine moiety with varying degree of sulfonation (DS) were prepared and evaluated for use as a thin-film composite membrane for seawater desalination. C-SFPEx-CMy membranes were obtained by covalent crosslinking among ethynyl groups at the polymer side chain through thermal curing. The crosslinked network structure suppressed the water uptake and swelling ratio. A novel type of composite membranes (TC-SFPEx-CMy) were prepared side chain crosslinked SPAE layer containing fluorine moiety on top of PET non-woven with epoxy resin as bonding agent. TC-SFPEx-CMy show the increase in NaCl rejection as DS decreases from 30% to 70%. NaCl rejection of the membranes increased with increasing crosslinking moiety (CM) while water permeability decreases due to the crosslinked network structure. Particularly, crosslinked membrane of 30 mol % of CM could enhance the salt (NaCl) rejection property up to 85.3 % as compared to of crosslinked membrane (69.5%) containing 10 mol % of CM under same DS. However crosslinked membrane showed the decrease in water permeability from 6.89 L/m²-h (TC-SFPE30-CM10) to 2.06 L/m²-h (TC-SFPE30-CM30). For TC-SFPE30-CM30 membrane, the order of salt rejection was observed Na₂SO₄ > NaCl > MgSO₄ > MgCl₂.

Keywords: Composite membrane; Seawater; Lamination method

* Corresponding author.