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Sonia R. Lakhotia, Mausumi Mukhopadhyay, Premlata Kumari

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Iron oxide (FeO) nanoparticles embedded thin-film nanocomposite nanofiltration (NF) membrane for water treatment

Sonia R. Lakhotia^{ab}, Mausumi Mukhopadhyay^{b*}, Premlata Kumari^a

^aApplied Chemistry Department, Sardar Vallabhbhai National Institute of Technology, Surat-395007, Gujarat, India.

^bDepartment of Chemical Engineering, Sardar Vallabhbhai National Institute of Technology, Surat-395007, Gujarat, India.

* **Corresponding author.** Tel.: 0261-2251645, Fax: +91 261 2227334

E-mail address: mmu@ched.svnit.ac.in; mausumi_mukhopadhyay@yahoo.com (M. Mukhopadhyay)

Abstract

This research work investigated the usage of pre-seeding interfacial polymerization method using iron oxide (FeO) nanoparticles on the polyethersulfone (PES) support membrane for water treatment. The two different concentrations (low (0.05 wt%) and high (2 wt%) of FeO nanoparticles were used as the membrane surface modification parameter. Surface modified membranes were characterized by several characterizations methods. Membrane surface charge was calculated qualitatively by using Grahame equation with the help of contact angle measurements. Synthesized membranes showed 90% rejection with polyethylene glycol (PEG) with M.W. 1500Da, which was fitted in the range of nanofiltration. The membrane performance towards salt rejection, flux (at different pressure) and anti-fouling activity was evaluated using a various salt solution like CaCl₂, MgCl₂, C₆H₅Na₃O₇, Na₂SO₄, NaCl with an initial concentration of 2000 mg/L, saltwater (collected from Suvali beach, Surat, India). With the increase in the concentration of FeO nanoparticles, hydrophilic nature (84.7 to 49.6°), surface charge (-6.27 to -14.21 mC/m²) and flux (27.46 to 36.85 L/m²h) of the nanocomposite membranes were effectively enhanced, and also showed the high salt rejections (>90%). Anti-fouling activity of

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