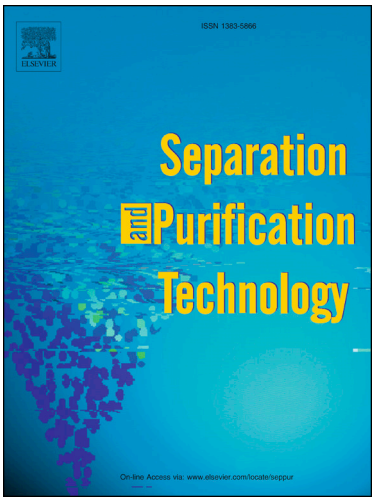

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Performance evaluation of novel nanostructured modified mesoporous silica/polyetherimide composite membranes for the treatment of oil/water emulsion

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Abstract

The discharges from industries particularly petroleum industry at any stage from exploration/drilling to transportation are of major environmental concerns in the present scenario. In this work, mesoporous silica (SBA-15) was modified using a bio-inspired coating and was used as filler in the fabrication of efficient, robust polyetherimide composite ultrafiltration membranes. The membranes prepared by this facile two-step approach were seen to be highly hydrophilic with improved porosity and pore-interconnectivity with a thinner skin layer. The rougher top surfaces of these membranes imparted an oleophobic character under water. The composite membranes exhibited improved emulsion/water flux while maintaining >99.8% rejection of oil from a synthetic motor oil/water/surfactant emulsion. The composite membranes were investigated for its long-term efficiency in the removal of oil from produced water. The flux declination was only < 15% for up to 9 hours with three intermittent backwashes and the oil/grease content of the permeate was lower than 10 ppm, well below the discharge limits. A significant improvement in antimicrobial characteristic was found to be achieved by the composite membranes against the gram-positive (*Bacillus subtilis*) and gram-negative (*Pseudomonas aeruginosa*) bacteria. The results from this study indicate that the polydopamine decorated SBA-15incorporatedpolyetherimide membranes hold a promising potential to be employed for oil-water emulsion separation.

Key Words:

Composite membranes; mesoporous silica; hydrophilicity; oil-water emulsion; bacterial anti-adhesion.

1. Introduction

The environmental destruction and threat to the ecological imbalance caused by the oil spills during the Gulf of Mexico Oil Spill (2010, USA)[1] or the recent one near the coast of