Desalination and Water Treatment
www.deswater.com
10 (2009) 181–191
October
1944-3994 / 1944-3986
doi: 10.5004/dwt.2009.868

The role of reaction time in organic phase on the preparation of thin-film composite nanofiltration (TFC-NF) membrane for dye removal

A. Nora'aini*, A. Norhidayah, A. Jusoh

Department of Science Engineering, Faculty of Science and Technology, Universiti Malaysia Terengganu, 21030, Terengganu, Malaysia Tel. +60 96683254; Fax +60 96694660; email: noraaini@umt.edu.my

Received 1 September 2008; Accepted in revised form 15 September 2009

ABSTRACT

Dyes are widely used in textile-based industries and inefficiencies in the dying process may result in large amounts of dyestuff being discharged into the wastewater. Membrane separation technology provides relatively high removal for dye wastewater. In this study, local thin-film composite nanofiltration (TFC-NF) membranes for dye removal were fabricated. These membranes were synthesised using an interfacial polymerization technique by reacting *m*-phenylene diamine (MPD) (2.0% w/w) in an aqueous solution and trimesoyl chloride (TMC) (0.2% w/w) in an organic solution. The role of reaction time (5 s, 10 s, 15 s, 20 s, 30 s, 45 s and 60 s) in organic phase on the morphologies, structural details and performances were examined. Membranes were characterized in terms of permeability coefficient, separation of charged solute, membrane structural details and membrane morphology. All fabricated membrane characteristics were in the range of nanofiltration (NF) membranes. The membrane that was prepared with the reaction time 30 s in organic phase (TFC-NF-R30) revealed the highest perm-selective performance due to the trade-off between rejection (87%) and flux (8.65×10^{-6} m^3/m^2s) of charged solute. The membrane was further analysed for the application of dye removals with three representative dyes (Reactive Black 5, Reactive Orange 16 and Acid Yellow 17). The perm-selective TFC-NF-R30 membrane showed a good quality of permeate with dye removal was up to 97%. Moreover, the fluxes ($1.9–11.4\times10^{-6}$ m^3/m^2s) were comparable to those observed with commercial membranes. These findings provide an encouraging platform for applying membrane technology in treating dye wastewater.

Keywords: Dye removal; Nanofiltration; Reaction time; Thin-film composite

* Corresponding author.

Presented at EuroMed 2008, Desalination for Clean Water and Energy Cooperation among Mediterranean Countries of Europe and the MENA Region, 9–13 November 2008, King Hussein Bin Talal Convention Center, Dead Sea, Jordan.