Performance studies of phosphorus removal using cross-flow nanofiltration

W.P. Cathie Leea, Shee-Keat Maha, C.P. Leo, Ta Yeong Wua, Siang-Piao Chai, a,*

aChemical Engineering Discipline, School of Engineering, Monash University, Jalan Lagoon Selatan, Bandar Sunway 46150, Selangor Darul Ehsan, Malaysia
Tel. +60 3 5514 6234; email: chai.siang.piao@monash.edu
bSchool of Chemical Engineering, Universiti Sains Malaysia, Engineering Campus, Seri Ampangan, 14300 Nibong Tebal, Pulau Pinang, Malaysia

Received 27 December 2012; Accepted 24 May 2013

ABSTRACT

Over-enrichment of phosphorus in water bodies can have a serious impact on aquatic life. In this study, the removal of phosphorus from aqueous solution was investigated with a cross-flow filtration process system using nanofiltration membranes (NF and NF90). The effect of different operating parameters, such as pressure, temperature and pH of the model solution, was studied. The result obtained from this study showed a near complete removal of phosphorus, from the feed solution, i.e. 99.9% rejection for NF90 membrane and 99.2% for NF membrane. It was found that the rejection of phosphorus decreased as the pressure and temperature increased resulted from the concentration polarisation and diffusivity of phosphorus, respectively. An increase in pH of the feed solution gave a higher phosphorus rejection. The permeate flux increased with pressure, temperature and pH for both membranes tested. Amongst the parameters investigated, pH had the most significant effect on the rejection of phosphorus.

Keywords: Cross-flow filtration; Flux decline; Isoelectric point; Membrane; Phosphate ion

*Corresponding author.

1944-3994/1944-3986 © 2013 Balaban Desalination Publications. All rights reserved.