

Factorial Screening on the Development of Cellulose Nanocrystal/ Carboxylated Multi-walled Carbon Nanotube Polyethersulfone Membrane for Humic Acid Rejection

*Nor Azura C. Mahmud^a, Mazrul Nizam Abu Seman^a, Mohd Sobri Takriff^{b,c} and Wei Lun Angb, Syed M. Saufia**

^aFaculty of Chemical and Process Engineering Technology, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Gambang, Kuantan, Pahang, Malaysia.

^bDepartment of Chemical & Process Engineering, Faculty of Engineering & Built Environment, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia

^cChemical and Water Desalination Engineering Program, College of Engineering, University of Sharjah, United Arab Emirates

*Corresponding author: smsaufi@ump.edu.my

Abstract

A two-level factorial experimental design was used to formulate the dope composition of cellulose nanocrystal (CNC) multi-walled carbon nanotube (MWCNT) polyethersulfone (PES) membrane for humic acid (HA) rejection. Four factors were screened, which are the composition of PES (15-17 wt.%), polyvinylpyrrolidone (PVP, 1-4%), CNC (0.01-0.75%), and carboxylated MWCNT (0-0.025%). The membranes were evaluated based on HA rejection from a 10-ppm aqueous feed solution. The percentage of MWCNT was the most significant factor, accounting for 72.31 % of the contribution. The highest HA rejection of 90% was obtained from the membrane fabricated using 17 % PES, 1% PVP, 0.01 % CNC, and 0.025% MWCNT. The predicted values generated from the model agreed reasonably with the experimental data, demonstrating the model's validity.

Keywords: Humic acid rejection; Cellulose nanocrystal; Multi-walled carbon nanotubes; Polyethersulfone membrane.