

Characteristics of polyethersulfone/chitosan composite membranes

P. Wanichapichart¹ and W. Puthai¹

1. Biophysics Unit, Membrane Science and Technology Research Center, Faculty of Science, Prince of Songkla University, Had Yai, Songkhla, Thailand 90112.

Supporting polyethersulfone membrane of 0.22 mm pore size was coated with 2% chitosan in 1% acetic acid (w/v). Two methods for the coating were made; one by pressure extrusion and the other by slip casting. The membranes were designated as PES/CH2P and PES/CH25PEG, respectively. Only chitosan solution used in the latter was added with 5% (v/v) PEG (polyethylene glycol). Hydraulic permeability and % rejection of BSA and PEG was studied. It was found that chitosan coating reduced water absorption of the supporting membranes. The hydraulic permeability of PES/CH2P membrane was much greater than that of PES/CH25PEG one but similar to that of the PES supporting membrane. The result was confirmed by pore size and porosity estimation, based on SEM micrographs.

When PEG of molecular weight 10 and 35 kDa was used made up as a feed solution in a dead end filtration unit, it appeared that only 35 kDa PEG was rejected from PES/CH25PEG membrane. The rejection was from 33-64%, depending on filtration time during 5-30 min. This implied that MWCO of the prepared membrane was greater than 35 kDa. A trial for protein filtration was made by using a 0.1% BSA solution as a feed. It appeared that PES/CH25PEG membrane totally rejected BSA, whereas PES/CH2P membrane rejected BSA by 34-80% during the filtration period. BSA fouling was assumed to occur within the membrane pores, and on its selective layer due to concentration polarization. To verify this, an experiment testing for hydraulic resistance of the fouled membranes was carried out. The resistance due to BSA blockage within the pores (R_f) and due to concentration polarization (R_p) on the membrane surface was compared with that of clean membrane (R_m). It revealed that BSA blockage within the pores of PES/CH2P membrane was a primary evident in reduction of permeating volume, whereas concentration polarization was a major effect of the reduction in PES/CH25PEG one.