Commercial polysulfone membranes pretreated with ethanol and NaOH: Effects on permeability, selectivity and antifouling properties

This study explores the effect of three simple pretreatment methods – hot water, ethanol (EtOH) and sodium hydroxide (NaOH) – on the performance of commercial polysulfone (PSf) membranes. 100% EtOH and 1M NaOH pretreated membranes exhibited increases of, respectively, 600% and 50% of water permeability compared to the hot water pretreated membrane (control). Such increases were partially ascribed to the removal of preservatives i.e. glycerol and polyvinylpyrrolidone (PVP) in the chemically pretreated membranes, as confirmed by FTIR spectra. The dramatic increase of water permeability in the ethanol pretreated membranes was also explained by pore enlargement, which was confirmed by decreased retention of dextran of selected molecular weights. Protein (BSA and pepsin) filtration experiments confirmed the occurrence of higher flux during filtration when using ethanol and NaOH pretreated membranes, though fouling caused during filtration was more severe and more difficult to remove in ethanol pretreated membranes compared to the control. Static protein adsorption measurements confirmed that ethanol pretreated membranes had an enhanced propensity to adsorb more protein. Water permeability tests performed after maintaining the pretreated membranes in water for several days confirmed that the changes induced by the selected pretreatments persist after at least 7 days. In general these results show that the studied pretreatment methods can be used to tailor the properties of commercial polysulfone membranes in terms of permeability and retention to a certain extent and in a simple, inexpensive manner.

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