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Preparation of hydrophilic and cationic poly (etherimide) membranes with controlled pore size

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The surface activity of poly (ether imide) (PEI) membrane was tuned by using wet-chemical treatment in order to obtain membranes of different Molecular Weight Cut Off (MWCO). Jeffamine M-2070, an amino terminated poly (propylene oxide)/poly (ethylene oxide) copolymer (PEG-amine) and poly (ethyleneimine) (Pei) with molecular weight of 1.3 kDa were used as surface modifying agents.

In a previous report, we confirmed by ATR-FTIR and XPS the attachment of PEG chains to the PEI membrane support. Accordingly, an increasing of the PEG-amine concentration and reaction time resulted in enlarged pores, enhancement of the water permeability and resistance to protein fouling [1].

In this study, the reaction time (PEG-amine 10wt % or Pei 2wt %) was varied from 0.5 h to 24 h to prepare PEGylated or aminated PEI membrane with pore size varying from ultrafiltration to microfiltration or nanofiltration gradually.

The membrane properties including morphology, pore size, pore size distribution and wettability were investigated using Scanning Electron Microscopy (SEM), porometry and water contact angle. On the other hand, water permeability and molecular weight cut off were determined using filtration experiments.

The results suggested that the prolongation of PEG-amine treatment time could gradually enlarge the pore size of PEI membranes, resulting in higher water permeability. After a treatment time of 5h, the pure water permeability increased from 176 to 352 L/h.m².bar and the mean pore size radius (r_p) of membranes from 5.71 to 11.15 nm. In contrast, a Pei treatment for 5h caused a decrease in water permeability to 14 L/h.m².bar and pore size to 0.29 nm.

