Optimization of UV-photografting factors in preparation of polyacrylic-polyethersulfone forward osmosis membrane using response surface methodology

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ABSTRACT

Commercial nanofiltration polyethersulfone (NF2) membrane was modified via ultraviolet (UV) photografting to prepare a high-performance forward osmosis (FO) membrane. The optimized condition of grafting parameters was obtained using central composite design (CCD) and response surface methodology (RSM). UV-photografting time and acrylic acid (AA) monomer concentration were the considered variables, while the two RSM responses were water permeate flux and reverse salt diffusion flux (RSD). Quadratic models were established between the responses and the independent parameters using analysis of variance (ANOVA). The membranes were characterized with functional group, morphology and surface roughness. The obtained optimum conditions were 2.81 min grafting time and 27.85 g/L AA monomer concentration. Under these conditions, a maximum water permeate flux of 1.52±0.04 L/m^2·h was achieved with an RSD value of 10.09±0.36 g/m^2·h. The optimized membrane exhibited a higher water flux compared to the unmodified NF2 membrane without any significant change of the RSD value.

KEYWORDS

UV-photografting, Forward Osmosis, Central Composite Design, Water Flux, Reverse Salt Diffusion

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