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# Bio-inspired deposition of polydopamine on PVDF followed by interfacial cross-linking with trimesoyl chloride as means of preparing composite membranes for isopropanol dehydration

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## Abstract

Polydopamine (PDA) simulates the adhesive properties of mussels and modifies the surface of hydrophobic materials. In this study, the mussel-inspired deposition of PDA on a polyvinylidene fluoride support was adopted. Afterward, the catecholamine in PDA was cross-linked with trimesoyl chloride (TMC). Attenuated total reflectance-Fourier transform infrared spectroscopy and x-ray photoelectron spectroscopy validated the success of the cross-linking process. Scanning electron microscopy illustrated that the cross-linking induced the reduction of nodules. Water contact angle measurements indicated that the cross-linked membrane exhibited a higher contact angle compared with the pristine membrane. Atomic force microscopy showed that the cross-linked membrane surface was smoother than that of the membrane without cross-linking. Pervaporation tests demonstrated that the cross-linked membrane could separate water from isopropanol. Several parameters were varied: dopamine concentration, buffer solution pH, self-polymerization time, TMC concentration, cross-linking time, and annealing time. At optimum conditions, the permeate flux was 2411 ± 33 $g \cdot m^{-2} \cdot h^{-1}$ and the water concentration in permeate was 95.72 ± 0.44 wt% (feed = 70 wt% isopropanol at 25 °C). At a feed temperature of 70 °C, the permeate flux was 11001 ± 989 $g \cdot m^{-2} \cdot h^{-1}$ and the water concentration in permeate was 93.61 ± 0.45 wt%. This indicates that a composite membrane containing cross-linked PDA is stable at a high feed temperature.