

Cost-effective facilitated olefin transport membranes consisting of PVP/AgCF₃SO₃/Al(NO₃)₃
with long-term separation performance

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Polymer electrolyte membranes consisting of a polyvinylpyrrolidone (PVP)/AgCF₃SO₃/Al(NO₃)₃ complex were prepared for the separation of a propylene/propane mixture. Recently, Al(NO₃)₃ was used to suppress reduction of silver ions generated from AgBF₄. In this study, the effect of Al(NO₃)₃ on inhibiting the reduction of silver ions generated from AgCF₃SO₃ was investigated, where AgCF₃SO₃ was used as a cost-effective alternative to AgBF₄ in the facilitated olefin transport membranes. When Al(NO₃)₃ was incorporated into a PVP/AgCF₃SO₃ complex membrane, the selectivity of propylene/propane and mixed gas permeance showed 5 and 0.5GPU, respectively. Moreover, the PVP/AgCF₃SO₃/Al(NO₃)₃ complex membranes showed long-term stability although AgCF₃SO₃ is easily reduced to silver nanoparticles. It was thus proved that Al(NO₃)₃ played the role of a retardant for the reduction of silver ions generated from AgCF₃SO₃ as well as from AgBF₄. The coordinative interaction of the PVP/AgCF₃SO₃/Al(NO₃)₃ complex membranes were investigated by Fourier transform (FT) infrared, X-ray photoelectron, and FT-Raman spectroscopy.