

## **Polyimide Supported Membrane Made of 2D-Coordination-Crosslinked Polyimide for Rapid Molecular Separation in Multi-Solvent Environments**

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**Abstract :** Substrate modification of thin film composite (TFC) membranes with various crosslinkers is typically necessary for organic solvent nanofiltration (OSN) applications. This modification is aimed at enhancing membrane stability and solvent resistance, but it often results in a decline in permeance. This study introduces a distinct approach by developing a coordination-crosslinked polyimide substrate, which differs from the covalently-crosslinked substrates traditionally used. This developed substrate achieves enhanced solvent resistance, improved hydrophilicity, and optimized porous microstructure simultaneously. The study investigates the effects of an alkaline coagulation bath, subsequent ion exchange, and further solvent activation. The resulting TFC membrane successfully overcomes the typical permeability-selectivity trade-off of OSN membranes. It demonstrates significantly improved solvent permeance (1.5-2 times higher than previously reported data) with values of 65.2 LMH/bar for methanol, 33.1 LMH/bar for ethanol, and 59.1 LMH/bar for acetone while maintaining competitive solute rejection (>98% for Rose Bengal). This research is expected to provide a new direction for developing high-performance OSN composite membranes and other separation applications.

**Keywords :** metal coordination, thin film composite membrane, organic solvent nanofiltration, solvent activation

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