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Tannin-based thin-film composite membranes for solvent nanofiltration

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The natural oligomer tannic acid was used as a reactant for an interfacial polymerisation on top of a crosslinked polyacrylonitrile (PAN) membrane. The PAN membrane was soaked with the aqueous tannic acid solution and contacted with a dilute solution of teraphthaloylchloride in hexane. Since both layers, the PAN support and the thin tannin-based layer, are highly crosslinked, the resulting thin film composite membrane is stable in harsh solvent environments such as N-Methyl-2-pyrrolidone (NMP). NMP permeances of up to 0.09 L/m² h bar with a molecular weight cut-off of approximately 800 g/mol were obtained. The exceptional stability in NMP and the incorporation of natural compounds like tannic acid for the manufacture of organic solvent nanofiltration membranes provides a cost-effective alternative for industrial separations due to the simplicity of the interfacial reaction and the replacement of the commonly applied toxic aromatic amines. The scale up of the manufacturing process is not difficult; the low price of the natural tannic acid is another advantage.

Graphical Abstract

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