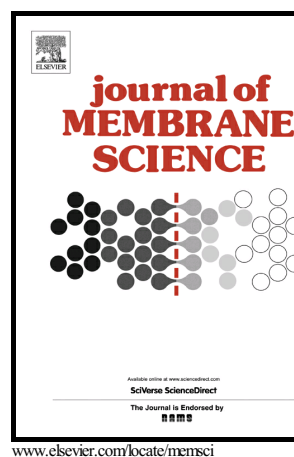


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Effect of citrate-based non-toxic solvents on poly(vinylidene fluoride) membrane preparation *via* thermally induced phase separation

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Abstract

The replacement of commonly-used substances with non-toxic equivalents is attracting a great amount of attention in membrane preparation processes. In order to address this issue, we prepared poly(vinylidene fluoride) (PVDF) flat membranes *via* thermally-induced phase separation using non-toxic citrate-based solvents (Citroflex): acetyl tributyl citrate (ATBC); acetyl triethyl citrate (ATEC); and triethyl citrate (TEC). It was found that the three kinds of Citroflex showed the different solubility with PVDF: the solubility was improved in the following order of ATBC < ATEC < TEC. The prepared porous PVDF membranes were characterized in terms of their morphology observed by scanning electron microscopy, porosity, pore-size, contact angle, and tensile properties. The pore structures of the membranes were affected by the solvent's affinity with PVDF, as well as by the gap between the casting knife and plate. This result was explained by taking into account the polymer / solvent phase separation behavior during the membrane formation. In the microfiltration test of pure water, the water permeability of the membranes widely changed depending on their pore structures. In conclusion, the prepared PVDF flat membranes exhibited the great potential for practical separation processes.

Keywords: Non-toxic solvent; Membrane preparation; Thermally Induced Phase Separation (TIPS); Poly(vinylidene fluoride); Citroflex; Microfiltration

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