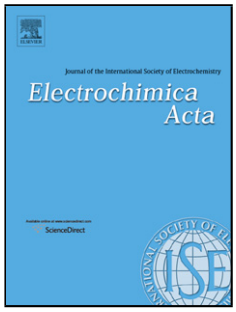

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Thermoplastic interpenetrating polymer networks based on polybenzimidazole and poly (1, 2-dimethy-3-allylimidazolium) for anion exchange membranes

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Highlights:

- Thermoplastic interpenetrating polymer network AEM based on PBI has been developed.
- Physically crosslinking makes better compatibility and chain flexibility than sIPN.
- Good balance achieves between conductivity and swelling (96.7mS cm^{-1}, 4.4%, 80°C).

Abstract

A new series of thermoplastic interpenetrating polymer network (TIPN) anion exchange membranes (AEMs) based on poly [2, 2'- (p-oxydiphenylene) -5, 5'-bibenzimidazole] (OPBI) and poly(1, 2-dimethy-3-allylimidazolium) (PDAIm) (PBI/DAIm TIPN) has been developed. With 1, 2-dimethy-3-allylimidazolium (DAIm) polymerization in presence of OPBI polymer chains, two kinds of uncrosslinked polymer chains, i.e. PDAIm and OPBI interpenetrate with each other to form a physically crosslinking network. Small steric hindrance effect of the DAIm monomer and non-covalent crosslinking interpenetrating polymer chains contribute to better compatibility and chains flexibility in the TIPN compared with the blend and semi-interpenetrating networks, which are evidenced by SEM and SAXS, promote the aggregation of hydrophilic groups and induce connective ionic conductive channels. PBI/DAIm TIPN membranes achieve well-balanced performance between high hydroxide conductivity and dimensional stability because of the dynamically forced compatibility feature of TIPN. Especially, the PBI/DAIm TIPN-65/0.5