

Synthesis of imidazolium grafted poly(arylene ether ketone) anion exchange membrane for vanadium redox flow battery

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Vanadium redox flow battery is recently an attractive energy storage system of renewable energy sources. For the operation of VRFB, ion exchange membrane provides ion transfer channel for charge carriers and prevents electrolyte of each electrode from cross-mixing. In this study, the anion exchange membrane is synthesized from poly(arylene ether ketone) with imidazolium group as pendant groups for vanadium redox flow battery application. Imidazolium group is one kind of positively charged functional groups, which can reduce vanadium ion permeability by Donnan exclusion phenomena. And due to the N-heterocyclic structure in functional groups, excellent chemical stability in electrolyte solution can be expected. As the content of imidazolium group increases, the ion exchange capacity of membrane increases, showing higher value than Nafion 117 membranes. All of the synthesized membranes show significantly low vanadium ion permeability compared to Nafion 117 membranes. In addition, During the 100 cycling test, PAEK-API 2.0 membrane shows higher efficiencies than Nafion 117 membrane without any degradation.