

Development of (Heterocycle)_x-PWA / PVdF composite membranes for medium temperature fuel cells

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Medium temperature fuel cells come into the spotlight due to their high reaction kinetics and low CO poisoning of catalyst during cell operation over 100 °C. However, Nafion membrane as proton exchange membrane has several disadvantages including poor performance due to desulfonation over 130 °C, high price, thermal degradation and high methanol cross-over in DMFC. To overcome the drawbacks of Nafion membrane, composite membranes consist of polymer (SPEEK, PBI, SPES, PVdF, etc) and inorganic proton conductor (heteropoly acid, ZrP, etc) have been widely studied. However, inorganic proton conductor can be dissolved by H₂O during cell operation indicating reason for degradation of cell performance. In this study, we prepared several (Heterocycle)_x-phosphotungstic acid (PWA) composite particles to give hydrophobic properties in PWA. Then new composite membranes with (Heterocycle)_x-PWA and PVdF were produced from solvent-casting method. We characterized thermal and electrochemical properties and cell performance with (Heterocycle)_x-PWA/PVdF composite membranes.