

Preparation and Characterization of PVA/Mesoporous Benzene-Silica Hybrid Membranes for DMFC Application

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Crosslinked poly(vinyl alcohol) (PVA)/mesoporous benzene-silica hybrid membranes were prepared to evaluate the possibility of use as a proton electrolyte membrane for direct methanol fuel cell (DMFC). Sulfosuccinic acid (SSA) as a chemical crosslinking agent having sulfonic acid group ($-\text{SO}_3\text{H}$) were used to achieve lower methanol permeability and higher proton conductivity, simultaneously. Sulfonated periodic mesoporous benzene-silica (SPMB) powders were added and dispersed into PVA matrix to act as a structural barrier of methanol transport and a promoter of proton transport. Periodic mesoporous benzene-silicas were synthesized with a 1, 4-bis(triethoxysilyl)- benzene (BTEB) silsesquioxane precursor and surfactant such as ODTMA and SPMB were prepared by post treatment of $\text{SO}_3/\text{H}_2\text{SO}_4$ solution. Proton conductivity and methanol permeability of PVA/SPMB/SSA hybrid electrolyte membranes were investigated by varying the amount of SPMB, and the results exhibit a SPMB powder acts as an efficient methanol barrier.