

Crosslinked Sulfonated Polyimide Networks as Polymer Electrolyte Membrane in Fuel Cells

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In this study sulfonated polyimides having tertiary nitrogen in the polymer backbone was synthesized using 1,4,5,8-naphthalenetetracarboxylic dianhydride (NTDA), 4,4'-diaminobiphenyl 2,2'-disulfonic acid (BDSA), 2-bis [4-(4-aminophenoxy)phenyl] hexafluoropropane (HFBAPP) and diaminoacrydine hemisulfate (DAA). They were crosslinked with a series of dibromo alkanes to improve the hydrolytic stability. The crosslinked sulfonated polyimide films were characterized for thermal stability, IEC, water uptake, hydrolytic stability and proton conductivity. All the sulfonated polyimides have good thermal stability and exhibited three step degradation patterns. With the increase in alkyl chain length of the crosslinker, IEC decreased as $1.23 > 1.16 > 1.06 > 1.01$ and water uptake decreased as $7.29 > 6.70 > 6.55 > 5.63$. The proton conductivity of the crosslinked sulfonated polyimides at 90 °C are PI-DBB (0.070) > PI-DBH (0.055) > PI-DBD (0.054). Crosslinked polyimides showed higher hydrolytic stability than the uncrosslinked polyimides.

Acknowledgement

This work was supported by the Ministry of Science and Technology of Korea through the National Research Laboratory Program and Yonsei Center for Clean Technology.