Low Methanol Permeability in Sulfonated Polyimides/PEGDA based semi-IPN Membranes for Direct Methanol Fuel Cell

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This paper presents the synthesis and characterization of sulfonated polyimides/PEGDA (poly ethylene glycol diacrylate) semi-IPN membranes and evaluated the methanol permeability for the use in DMFCs. First two type of sulfonated polyimides were synthesized from 1,4,5,8-naphthalenetetracarboxylic dianhydride (NTDA), 4,4'-diaminobiphenyl 2,2'-disulfonic acid (BDSA), 2-bis [4-(4-aminophenoxy)phenyl] hexa fluoropropane (HFBAPP) and another non sulfonated diamine, 1,10-decamethylenediamine (DMD). These sulfonated polyimides were blended with the PEGDA having ethylene oxide group in the main chain. Various sulfonated polyimides/PEGDA semi-IPN having different molar ratio of sulfonic acid group and ethylene oxide group are synthesized and successfully characterized for ion exchange capacity (IEC), water uptake, hydrolytic stability, proton conductivity and methanol permeability. From these proton conductivity and methanol permeability, the membrane selectivity was obtained. Even though the proton conductivities of the semi-IPN membranes were lower than the series of Nafion, but the values of the membrane selectivity were higher than them due to the low methanol permeability.