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Development of poly(ether ether ketone)(PEEK) derived from bisphenol-S for proton exchange membrane (PEM) in direct methanol fuel cells (DMFC) SAIRUNG CHANGKHAMCHOM, ANUVAT SIRIVAT, The Petroleum and Petrochemical College — The currently used Proton Exchange Membrane (PEM) in Direct Methanol Fuel Cell (DMFC) is Nafion[®], an excellent proton conductivity in fully hydrated membrane. However, it has major drawbacks such as very high cost, and lost of conductivity at elevated temperature and low humidity. In our work, the novel PEM was based on sulfonated poly(ether ether ketone) (S-PEEK) which was synthesized by the nucleophilic aromatic substitution polycondensation of bisphenol-S, 4,4'-dichlorobenzophenone (DCBP), and sodium 5,5'-carbonylbis(2-chlorobenzenesulfonate) (SDCBP). Bisphenol-S is expected to improve thermal stability due to its high melting point (245°C). S-PEEK was characterized by FTIR, ¹H-NMR, TGA, DSC, and titration to determine the degree of sulfonation (D.S.). Composite membranes were prepared by using S-PEEK as polymer matrix and heteropolyacid (HPA) as an inorganic filler. The phosphotungstic acid (PTA) was used due to its highly proton conductivity at high temperature and low water uptake. The membranes were characterized by SEM, TGA, DSC, DMTA, and by the measurements of the water uptake (%), the swelling ratio (%), the ion exchange capacities (IEC), the methanol diffusion coefficient, and the proton conductivity.

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