Synthesis and characterization of sulfonated-fluorinated poly(fluorene)ether membranes for fuel cell applications

박재완[1,2], 김동진[1], 장봉준[1], 김정훈[1,*], 이수복[1]
[1]한국화학연구원 환경에너지센터; [2]충남대학교 화학공학과
(jhoonkim@krict.re.kr*)

This paper describes the preparation and electrochemical properties of new proton conducting polymer membranes, sulfonated poly(fluorenyl ether) containing perfluorocyclobutane (PFCB) moieties for fuel cell applications. The sulfonated polymers were prepared via thermal cyclodimerization of 9,9-bis(4-trifluorovinyloxyphenyl) fluorene and subsequent post-sulfonation using chlorosulfonic acid (CSA) as a sulfonating agent. The post-sulfonation reaction was carried out by changing the molar ratio of CSA/repeating unit of the polymer at room temperature for 5 hr and the resulting sulfonated polymers showed different degree of sulfonation (DS) and ion exchange capacities (IEC). With the increment of CSA content, the DS, IEC and water uptake of the sulfonated polymer membranes increased. Their proton conductivity was investigated as a function of temperature. The polymer membrane with an IEC value of 1.86 mmol/g showed a water content of 25% similar to Nafion-115's but showed higher proton conductivity than Nafion-115 over the temperature 25~80°C. The methanol permeability of the polymer membrane possessing an IEC value similar to Nafion-115's was considerably lower than that of Nafion-115 at 25°C.