Synthesis and characterization of fluorinated polybenzimidazoles for high-temperature 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 characterization of two kinds of fluorinated polybenzimidazole(PBI)s which can be potentially used for phosphoric acid-doped, high-temperature polymer electrolyte membrane fuel cells. For this, two kinds of perfluorocyclobutane (PFCB)-containing monomers were prepared via three synthetic steps. After fluoroalkylation of methyl 3-(hydroxy) benzoate and methyl 4-(hydroxy) benzoate with 1,2-dibromotetrafluoroethane and subsequent Zn-mediated dehalogenation, these compounds were cyclodimerized at 200℃ affording the ester-terminated monomers containing PFCB ether groups. The synthesized intermediates and monomers were characterized using FT-IR, 1H-NMR, 19F-NMR, and Mass spectroscopy. The fluorinated PBIs were then prepared through the solution polycondensation of the monomers and 3,3′-diaminobenzidine in polyphosphoric acid. Compared with traditional PBI, the glass transition temperatures of the fluorinated PBIs were obtained at 262℃ and 269℃ which are lower than that of PBI and their initial degradation temperatures were still high over 400 C under nitrogen. The fluorinated PBIs are confirmed they could be good candidates for the high temperature fuel cell membranes.