Proton Conducting Nanocomposite Membranes Based On P(VDF-co-CTFE)-g-PSSA Graft Copolymer and TiO_2-PSSA Nanoparticles

박정태[1,2], 지원석[1,2], 노동규[1,2], 변수진[1,2], 김종학[1,2,*]
[1]연세대학교 화공생명공학과; [2]수소연료전지 특성화 대학원
(jonghak@yonsei.ac.kr*)

Bifunctional TiO_2 nanoparticles with hygroscopic and proton-conductive properties were synthesized by grafting proton conducting polymer, i.e. poly(styrene sulfonic acid) (PSSA) from TiO_2 nanoparitlces via surface-initiated atom transfer radical polymerization (ATRP). These bifunctional TiO_2-PSSA nanoparticles were blended with poly(vinylidene fluoride-co-chlorotrifluoroethylene)-graft-poly(styrene sulfonic acid), i.e. P(VDF-co-CTFE)-g-PSSA to give proton conducting membranes for high temperature fuel cells. FT-IR, UV-visible spectroscopy and XRD results revealed bifunctional properties of TiO2-PSSA nanoparticles due to successful grafting of PSSA chains. IEC of P(VDF-co-CTFE)-g-PSSA/TiO_2-PSSA membranes was not significantly changed irrespective of TiO_2-PSSA concentrations, representing almost fixed SO_3^- concentration in the membranes. In contrast, water uptake and proton conductivity of membranes continuously increased with increasing TiO_2-PSSA concentrations, presumably due to hygroscopic, soft conducting property of nanoparticles. The results of thermal gravimetric analysis (TGA) also showed that all the membranes were stable at least up to 280 °C.