

Durability enhancement of polymer electrolyte membranes for fuel cell application김덕준[†]

성균관대학교

(djkim@skku.edu[†])

In operation of PEMFC, OH radicals are the major cause for the degradation of polymer electrolyte membrane. In order to enhance its anti-oxidation stability, a few strategies to quench OH radicals are presented. When cerium ion (Ce^{3+} , CE) was introduced to membrane, it led to a significant improvement of anti- degradation effect as it converted the OH radicals into inactive chemicals. In order to prolong the anti-oxidation stability, aminoethyl-15-crown-5 (CRE) was grafted on the polymer to prevent the migration of CE ions from the membrane. CE was also fixed inside the polymer molecules when OSPN was employed. When the cerium oxide nanoparticles were imbedded in membrane, the voltage loss rate of the SPAES140-4CeO₂ membrane, (0.21 mV h⁻¹, was five times lower than that of the Nafion membrane, 1.035 mV h⁻¹ in OCV test. The degradation test demonstrated that the maximum power density of the particle including membrane dropped from 363.67 to 295.43 mW cm⁻² during 100 h, while that of the pristine membrane significantly decreased from 378.59 to 230.48 mW cm⁻². To alleviate the migration effect of OH radical scavenger, organic quenchers are also studied for long term basis.