Performance Optimization of Mesoporous Porphyrinic Carbon based Membrane Electrode Assembly for Polymer Electrolyte Fuel Cells

황선미, 전상연, 천재영, 임은자, 임성대, 박구곤†
한국에너지기술연구원
(gugon@kier.re.kr†)

Exploring the cost effective electrocatalyst with high activity and durability is one of the most important challenges for the commercialization of polymer electrolyte fuel cells (PEFCs). Many researches focus on the development of non-precious metal based catalysts (NPMCs) or low platinum based Pt-M alloy catalysts by taking advantage of morphological and structural modifications with inexpensive transition metals. In the half-cell test, we recently found that the self-supported ordered mesoporous porphyrinic carbon (OMPC) revealed a comparable ORR kinetic activity to conventional Pt/C under a relatively large amount of catalyst (ca.>0.6 mg/cm^2) loading. However, the OMPC showed a poor MEA performance because of its low conductivity, limited access to the active site, and a high mass transfer resistance due to a thick catalyst layer over 100 μm. In this study, we investigated the effect of ionomer content, catalyst loading amount, conductivity, and pore size of the catalysts through a morphological tuning to maximize the MEA performance.