Non-precious metal oxygen-reduction catalysts for PEM Fuel Cells based on N-doped ordered porous carbon

옥진희, Altansukh Dorjgotov, 장은진, 설용건*

연세대학교

(shulyg@yonsei.ac.kr*)

N-doped ordered porous carbon (CNx) was synthesized via a nano-casting process using polyaniline (PANI) as the carbon and nitrogen precursor and mesoporous silica as a hard template. Transmission electron microscopy (TEM), X-ray photoelectron spectroscopy (XPS) and electrochemical tests were used to characterize the synthesized CNx and the derived nonprecious metal oxygen-reduction catalysts. The non-precious metal oxygen-reduction catalysts were prepared by pyrolyzing iron chloride-impregnated CNx in nitrogen, followed by post-treatments. Optimizations of the iron loading and the pore size were also explored. The catalytic activities of the CNx products for the oxygen reduction reaction (ORR) were examined by rotating disc electrode (RDE) measurements and single-cell tests. The onset potential for oxygen reduction in 0.5 M H_2SO_4 of the best catalyst was as high as 0.82 V vs. normal hydrogen electrode (NHE). The current density obtained in an H_2/O_2 proton exchange membrane fuel cell (PEMFC) was as high as 0.3 A/cm2 at 0.6 V with a cathode catalyst loading of 4 mg/cm2.