Relationship between Metal-Support Interaction and Durability in Platinum Supported on Heteroatom Doped Ordered Mesoporous Carbons for Oxygen Reduction Reaction

김재형, 박정영[1], 주상훈†
울산과학기술원; [1]한국과학기술원
(shjoo@unist.ac.kr†)

Stabilizing Pt catalysts is one of the major issues for long-term operation of polymer electrolyte membrane fuel cell (PEMFC). To improve stability of Pt catalysts, recently, heteroatom-doped carbons have been used as support materials. In this work, we investigate the relationship between metal-support interaction and durability of Pt catalysts for the oxygen reduction reaction (ORR). For this purpose, three different types of heteroatom (N,O,S)-doped ordered mesoporous carbon (OMC) supports were prepared and Pt nanoparticles were supported on these carbon supports. The interaction between Pt and doped OMC supports was investigated by using atomic force microscopy (AFM). It was revealed that the S,O-OMC exhibited the strongest adhesion with Pt whereas the N,O-OMC showed the weakest adhesion. In accelerated degradation tests for the ORR, Pt/S,O-OMC exhibited the highest durability, followed by Pt/O-OMC and Pt/N,O-OMC. These results suggest that sulfur has the strong adhesive strength with Pt, thereby enhancing the durability, but nitrogen exert less adhesive force with Pt, undermining the durability.