

Mesoporous Structured Highly Active Metal-free Oxygen Reduction Electrocatalysts in the Membrane Electrode Assemblies for Anion Exchange Membrane Fuel Cell

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Anion exchange membrane fuel cells (AEMFCs) have been developed for next generation-, clean energy conversion devices. ORR more easily occur in alkaline media compared to acidic media. Therefore, it may facilitate the use of inexpensive metal-free electrocatalysts. Doping heteroatom into carbon framework significantly enhances the catalytic activity and it is considered as a promising approach to replace Pt catalysts in AEMFCs. However, previous researches on metal-free electrocatalysts are mainly focused on half-cell measurements. Thus, it is required to study metal-free electrocatalysts in MEA level. Here, we report the mesoporous structured highly active metal-free ORR electrocatalysts in the MEA for AEMFC. The pore size and doping-site position were controlled to find the effect of them to MEA performance. They affect the accessibility of reactants to catalytically active sites. Finally, mesoporous structured N, P co-doped carbon with a large pore size and precisely controlled doping-site position exhibited a remarkable on-set potential and produced 70% of the maximum power density obtained using Pt/C.