Stability of Graphene-Supported DMFC Cathode Catalysts

Lixin Lu, Meng Wang, Le Zheng, Xindong Wang*

Department of Physical Chemistry, school of metallurgical and ecological engineering, University of Science and Technology Beijing
30 College Road, Beijing 100083, China

Direct methanol fuel cell (DMFC) show great application potential as power sources for transportation and small electronics applications. For commercial implementation of a DMFC, long-term stability of DMFC is one of the most critical requirements. At present, the technology of DMFC has been greatly hindered by the activity of catalyst. The attenuation of electrochemical active area is a main reason for the decrease of DMFC’s stability. The cause of the decrease of the electrochemical active area can be attributed to the following points. The dropped of nano-particles platinum caused by the corrosion of carbon-support. The dissolve and deposit of platinum and the particle size increase caused by the Ostwald ripening. Agglomerate and dissolve of platinum. In order to reduce the attenuation of the cathode catalyst performance, select the appropriate carbon support is critical. Because of its good electrical conductivity and chemical stability, graphene has a great potential to improve the stability of the cathode catalyst.

The graphene-platinum particle nanocomposites was prepared by oxidation-reduction method.

In this study, we used a three-electrode system to investigate the attenuation of the electrochemical active area. Catalyst was dispersed in the solution composed by water isopropanol and nafion. The solution was sonicated for 2h, then dropped it on the working electrode. Three-electrode were graphite working electrode, platinum counter electrode, saturated K$_2$SO$_4$ reference electrode. Investigate the attenuation condition in the following 600 circle CV scan. Although the corrosion of graphene may lead to the dissolution of platinum, the graphene-supported catalysts has a better anti-attenuation performance.

References