Ball-like Pt Nanoparticles on GO-modified Carbon Fiber Cloth with High Electrocatalytic Activity for Methanol Oxidation

Fang Lu^{1,2}, Chunyong Zhang^{1,2,*}, Jiehong Cheng^{2,3,*}, Cheng Zhu^{1,2}, Haojing Zhang^{1,2}, Xian Cheng^{2,3}

¹ Jiangsu Key Laboratory of Precious Metal Chemistry and Technology, Jiangsu University of Technology, Changzhou, 213001, China

² School of Chemistry and Environmental Engineering, Jiangsu University of Technology, Changzhou, 213001, China

³ Jiangsu Province Key Laboratory of E-Waste Recycling, Jiangsu University of Technology, Changzhou, 213001, China

Fang Lu, Chunyong Zhang, Jiehong Cheng contributed equally to this article.

*E-mail: zhangcy@jsut.edu.cn, cjh@jsut.edu.cn

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A direct methanol fuel cell (DMFC) electrode based on the carbon fiber cloth (CFC) modified with wrap-like graphene oxide (GO) decorated with platinum nanoparticles was prepared by multicycle CV method. Also, the Pt/CFC composite and GO/CFC composite were prepared by multicycle CV and potentiostatic method, respectively. The four electrodes (GO-Pt/CFC, Pt/CFC, GO/CFC and CFC) were tested in a fuel cell for electro-oxidation of methanol and were analyzed by scanning electron microscopy (SEM) and X-Ray powder diffraction (XRD). The SEM image indicated that the surface of CFC was covered by a wrap-like graphene oxide (GO) film completely, which increased the contact area with methanol solution and provided more load points. And the Pt nanoparticles supported GO/CFC electrode possessed the ball-like morphology. The electrochemical measurements showed that the electrocatalytic peak current density of methanol oxidation of GO-Pt/CFC electrode (218 mA/cm²) was about 27% higher than Pt/CFC electrode (172 mA/cm²) and the steady-state current density of GO-Pt/CFC electrode was 57.6%, 114.5% and 497.9% higher than that of Pt/CFC, GO/CFC and CFC electrodes, respectively. And this data revealed that the ball-like morphology of Pt nanoparticles and a wrap-like GO film coated on CFC surface were favorable to improve the electrocatalytic oxidation activity of methanol.

Keywords: Direct Methanol Fuel Cell; Graphene Oxide; Pt nanoparticles; Electro-catalytic Activity; Carbon Fiber Cloth

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