Accepted Manuscript

Performance of vertically oriented graphene supported platinum-ruthenium bimetallic catalyst for methanol oxidation

Zheng Bo, Dan Hu, Jing Kong, Jianhua Yan, Kefa Cen

PII: S0378-7753(14)01536-5

DOI: 10.1016/j.jpowsour.2014.09.125

Reference: POWER 19858

To appear in: *Journal of Power Sources*

Received Date: 21 July 2014

Revised Date: 15 September 2014

Accepted Date: 19 September 2014

Please cite this article as: Z. Bo, D. Hu, J. Kong, J. Yan, K. Cen, Performance of vertically oriented graphene supported platinum-ruthenium bimetallic catalyst for methanol oxidation, *Journal of Power Sources* (2014), doi: 10.1016/j.jpowsour.2014.09.125.

Performance of vertically oriented graphene supported platinum-ruthenium bimetallic catalyst for methanol oxidation

Zheng Bo *, Dan Hu, Jing Kong, Jianhua Yan, and Kefa Cen

State Key Laboratory of Clean Energy Utilization, Department of Energy Engineering, Zhejiang University, Hangzhou, Zhejiang Province 310027, China

Keywords: direct methanol fuel cells; methanol oxidation; electrocatalysis; vertically oriented graphene; bimetallic catalyst

Abstract

This work reports the electrocatalytic performance of vertically oriented graphene (VG) supported Pt-Ru bimetallic catalysts toward methanol oxidation reaction (MOR). Dense networks of VG are directly synthesized on carbon paper (CP) *via* a microwave plamsa-enhenced chemical vapor deposition (PECVD) method. A repeated pulse potentials approach is applied in a conventional three-electrode electrochemical system for the co-electrodeposition of Pt-Ru bimetallic nanoparticles. It is found that, the decoration of VG can simultaneously lead to a ~3.5 time higher catalyst mass loading and a ~50% smaller nanoparticle size than the pristine CP counterparts. An optimum Pt molar ratio of 83.4% in the deposits, achieved with a $[H_2PtCl_6]$: $[RuCl_3]$ of 1:1 in the

* Corresponding author at: State Key Laboratory of Clean Energy Utilization, Institute for Thermal Power Engineering, Department of Energy Engineering, Zhejiang University, 38 Zheda Road, Zhejiang, 310027 China
Tel.: +86 571 87953290; fax: +86 571 87952438; email: bozh@zju.edu.cn.