Special Research Project Title	Effect of carbon pretreatment and preparation method on alcohol electrooxidation of Au/C catalyst
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Abstract

For direct alcohol fuel cells, both anodic and cathodic reactions are equally important especially for high molecular weight alcohols like glycerol and ethylene glycol. In this research, the production of Au/C catalysts for alcohol electrooxidation in alkaline solution was focused by studying the effect of carbon pretreatment and catalyst preparation methods on the electrocatalytic activity of the prepared catalysts. Carbon pretreatment used in this work was heat treatment at 600 °C for 30 minutes, and loading of Au on the carbon support was prepared by polyvinyl alcohol (PVA) and citrate protection methods. The amount of Au on carbon was varied at 20, 30 and 40 wt%. The influence of carbon pretreatment was conducted with 20 wt% Au catalyst. The amount of Au adsorbed on carbon was determined from the amount of the Au left in the filtrate after immobilization step by using Atomic Absorption Spectroscopy (AAS). The average particle size and size distribution of Au on carbon were analyzed by Transmission Electron Microscopy Microscopy (TEM). The catalytic activity and stability of the prepared catalysts were characterized by conducting Cyclic Voltammetry (CV) and Chronoamperometry (CA), respectively. For 20 wt% Au/C, all Au metal was totally deposited on carbon for both PVA and citrate protection methods. However, at higher Au loading, there was some Au precursor left in the solution and the maximum Au loading obtained the PVA and the citrate protection methods was about 27 and 37 wt%, respectively. For the effect of carbon pretreatment, it was found from TEM images that the average Au particle size on treated carbon was smaller than that on untreated carbon. This is due to the enhancement of carbon surface area by heat-treatment. As a consequence, the catalytic activity of Au/treated C was higher for both catalyst preparation methods. When the amount of Au loading increased, the average Au particle size became bigger because of the agglomeration of Au particles. This led to a reduction of catalyst activity. In comparison between two methods of catalyst preparation, the Au/C catalysts prepared by the PVA protection method performed better in terms of activity and stability than that by the citrated one. The results of CA also confirmed that the carbon pretreatment not only enhanced the catalytic activity but

also improved catalyst stability as observed from the lower decaying rate in the CV curves.

Keywords: Au/C Catalyst/ PVA Protection Method/ Citrate Protection Method/ Glycerol Oxidation/ Ethylene Glycol Oxidation