Electrocatalytic Oxidation of Glycerol in Alkaline Media on Pd-Au/MWCNT Nanocatalysts Prepared by the Polyol Method

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ABSTRACT

Several alcohol molecules have been studied with the purpose of replacing hydrogen in fuel cell for portable applications. Among them, glycerol represents a very promising alternative. Glycerol is a by-product of biodiesel production, has high energy content, low flammability, low volatility, and high boiling point. Moreover, glycerol is less toxic than methanol and has a relatively high theoretical energy density (5.0 kWh kg^{-1}, close to that of methanol of 6.1 kWh kg^{-1}). However the glycerol oxidation reaction (GOR) is slow and its utilization as a fuel therefore requires the development of efficient catalysts. Au and Pd catalysts have shown a high catalytic activity for the GOR, outperforming Pt in alkaline solution. Even more, it is generally accepted that the interaction of metal nanoparticles with the carbon support is beneficial to the improvement of catalytic activity and durability of the electrocatalysts. In this work, the synergetic effect between Pd and Au supported on multiwalled carbon nanotubes in the catalytic activity for the GOR in KOH electrolyte has been investigated. Pd-Au/MWCNT catalysts with several chemical compositions have been synthesized by the polyol reduction method. The catalysts exhibited a more negative anodic potential for the oxidation of glycerol compared to monometallic Au and Pd catalyst. Beside, the oxidation mechanism observed clearly depends on the composition and structure of the Pd-Au/MWCNT catalyst. Such electrocatalyts offer potential possibilities for application in Alkaline Glycerol Fuel Cells.

Keywords: Glycerol Oxidation Reaction, Direct Alcohol Fuel Cells, Au and Pd nanoparticles.

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