Electro-oxidation of Methanol, Ethanol and Ethylene Glycol over Pt/TiO₂-C and PtSn/TiO₂-C Anodic Catalysts

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This study focused on the use of a modified Pt/C anodic catalyst with doping tin (Sn) and titania (TiO₂) to improve the efficiency and effective of direct alcohols (methanol, ethanol and ethylene glycol) fuel cells. Decorated the TiO₂ dopant on active carbon support (xTiO₂-C, x = 10, 20, 30, 40 weight percent) was completed by the impregnation method. Then, the series Pt/TiO₂-C and PtSn/TiO₂-C anodic catalysts were prepared by the formic acid reduction method using PtCl₄ and SnCl₂·2H₂O as platinum (Pt, 10 wt%) and tin (Sn, 10 wt%) precursors. The fabricated series anodic catalysts were painted on carbon paper as working electrodes. Evaluation of the catalytic activity for the electro-oxidation of alcohols on working electrodes was performed by cyclic voltammetry (CV) in 0.5 M H₂SO₄ and 1 M alcohol electrolytes at room temperature. The results showed that all the doped TiO₂ and Sn anodic catalysts present well-dispersed platinum with a diameter around 3 - 5 nm. In addition, the activity for electro-oxidation of alcohols was affected remarkably by the content of TiO₂ and Sn in the anodic catalysts. Among the prepared Pt/TiO₂-C and PtSn/TiO₂-C anodic catalysts, the 30 wt% TiO₂ catalyst exhibited the best catalytic performance. In comparison with the various alcohols, the the tendency of activity for the ethanol electro-oxidation was : ethanol > methanol > ethylene glycol.

Keywords: Pt/TiO₂-C; PtSn/TiO₂-C; Electro-oxidation of alcohol; Cyclic voltammetry.

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