

Development and Characterization of Pd-CeO₂ Electrocatalysts for the Formic Acid and Glycerol Oxidation Reactions in Acid Medium

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ABSTRACT

In this work, Pd-CeO₂ and Pd-CeO₂/C electrocatalysts were synthesized by pyrolysis at 300 and 600 °C during 5 hours, in a reducing atmosphere of H₂/N₂ (50:50), in order to study their catalytic activity for the formic acid oxidation reaction (FAOR) and the glycerol oxidation reaction (GOR). The reactions were carried out in acid medium. The electrocatalysts were characterized by XRD, HRTEM, EDS, and electrochemical techniques such as CV. The XRD results indicated the formation of polycrystalline materials with particles sizes ranging from 10 to 48 nm. The unsupported materials showed no catalytic activity as anodes for the FAOR or the GOR. Also, supported Pd-CeO₂/C synthesized at 300 and 600 °C showed no activity for the GOR. However, the Pd-CeO₂/C electrocatalysts showed a high catalytic activity for the electro-oxidation of formic acid. The results suggested that the chemical surface composition of Pd-CeO₂/C differs from that of Pd-CeO₂ due to an effect of the carbon support during the synthesis. Such modification gave the supported material a high catalytic activity towards the FAOR. Therefore, the Pd-CeO₂/C electrocatalysts could be considered as candidate anodes for direct formic acid fuel cells (DFAFCs).

Keywords: Pd-CeO₂/C electrocatalysts, nanomaterials, formic acid oxidation reaction, DFAFCs.

