ELECTRO-OXIDATION OF CARBON MONOXIDE AND METHANOL ON CARBON-SUPPORTED $Ni_{59}Nb_{40}Pt_{(1-X)}Y_X$ (Y =Sn, Ru; X =0, 0.4% AT.) NANOPARTICLES AS ANODIC IN A DMFC.

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ABSTRACT

The electrochemical oxidation of methanol and related small molecules has been of special interest in relation to fuel cell research (1,2). This work will focus on the investigation of the electro-oxidation of carbon monoxide and methanol on carbon-supported $Ni_{59}Nb_{40}Pt_{(1-x)}Y_x$ (Y =Sn, Ru; x =0, 0.4% at.) nanoparticles as anode, that are considered as catalysts, in acid solutions.

The amorphous structure of the nanoparticles, leads to considerable enhancement of the oxidative currents, which is more than the double of that of the platinum polycrystalline electrodes.

Moreover, there is a slight shift to more negative potentials of the "onset" potential as a function of the alloy composition, as well as, the activation time of the alloy. These new alloys show a very interesting behavior, taking into account their high tolerance to CO molecules, which are the main cause of poisoning of the anodes materials in fuel cells.

It was observed that both $Ni_{59}Nb_{40}Pt_{0.6}Ru_{0.4}$ and $Ni_{59}Nb_{40}Pt_{0.6}Sn_{0.4}$ containing MCPEs, shift the onset potential for CO (ca. 0.23 V) to lower potentials compared to $Ni_{59}Nb_{40}Pt_1$ electrodes. While ruthenium promoted the catalytic activity for methanol and CO electrooxidation, tin showed the same enhancing behaviour for a shorter period of time, probably due to the facile dissolution of tin from the surface[1].

Concerning the reactivity of methanol, the current density is drastically decreased with the presence of tin, susceptible to the potential range, followed by the $Ni_{59}Nb_{40}Pt_1$ and $Ni_{59}Nb_{40}Pt_{0.6}Ru_{0.4}$ alloys. However, these new electrodes show a very interesting behaviour, taking into account their high tolerance to CO molecules, and the decrease of the onset potential for methanol electrooxidation, which are the main causes of poisoning of anode materials in fuel cells.

Acknowledgements

The authors gratefully acknowledge the financial support of the Excelentísima Diputación Foral de Guipúzcoa (project. 206/2005, fondos FEDER), Basque Govermment (Saoitek 2006-2007 project. S-PE06UN40) and MEC (CTQ2006-13163/BQU).

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