Topic Area	E Energy and related Applications	E22-P-1-10
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Symposium	E22 - Materials for energy storage and conversion (fuel cells, hydrogen production, batteries etc.)	
Session		

Preparation of Pt-based electrocatalysts by spontaneous deposition of Pt on Sn, Ni and SnNi nanoparticles supported on carbon for ethanol electro-oxidation

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Abstract

Pt-based nanoparticles supported on carbon have been used as anode elecrocatalysts for Direct Ethanol Fuel Cell (DEFC). Due to the high cost of platinum it is interesting to have all the Pt atoms at the surface of the nanoparticles in order that they can be actively involved in the anodic oxidation of ethanol. In this work, we described the preparation of Pt-based electrocatalysts by spontaneous deposition of Pt on Sn, Ni and SnNi nanoparticles supported on carbon. Sn/C, Ni/C and SnNi/C (Sn:Ni atomic ratio of 50:50) were prepared with 20wt% of metal content. Ni/C was prepared by wet impregnation NiCl2.6H2O on the carbon support (Vulcan XC72) and reduction at 400oC under H2 atmosphere. Sn/C and SnNi/C were prepared by borohydride reduction of SnCl2.2H2O and NiCl2.6H2O. The spontaneous deposition of Pt was performed by stirring an aqueous solution of H2PtCl6.6H2O in the presence of Ni/C, Sn/C and NiSn/C for 1 h at room temperature. After this, the solid was filtrated and washed with excess of water. The obtained materials were characterized by EDX and XRD and they were tested for ethanol electro-oxidation using electrochemical techniques (cyclic voltametry and chronoamperometry). XRD diffractograms of Ni/C and Sn/C showed that a Ni(fcc) phase and metallic Sn were formed, respectively. For NiSn/C the presence of NiSn phases were observed. After the spontaneous deposition of Pt on the Ni/C and SnNi/C, Ni(II) ions were detected in the filtrates using dimethylglyoxime suggesting that Pt(IV) ions were reduced while Ni(0) was oxidized. XRD diffractograms of the obtained materials after spontaneous deposition of Pt did not show the presence of the Pt(fcc) phase probably due to the low Pt loadings. On the other hand, EDX analysis showed the presence of Pt, which could suggest that Pt atoms were spontaneous deposited on the pre-supported nanoparticles. Also, the materials obtained after spontaneous deposition of Pt showed a superior activity for ethanol electro-oxidation, being the material Pt-Sn/C the most active (Fig 1).

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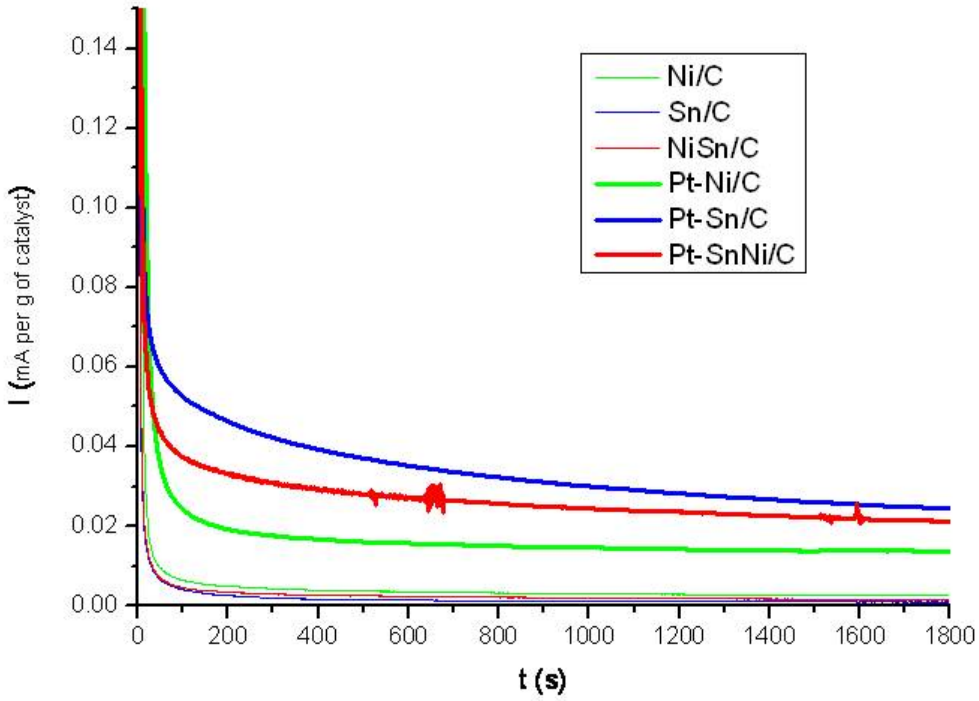

Figure 1: Current-time curves at 0.5 V in 1 mol L-1 ethanol solution in 0.5 mol L-1 H2SO4 for different electrocatalysts.