

Carbon supported Pd-Sn and Pd-Ru-Sn nanocatalysts for ethanol electro-oxidation in alkaline medium

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ABSTRACT: Carbon supported Pd-Sn and Pd-Ru-Sn nanocatalysts were prepared by the chemical reduction method, using sodium borohydride and ethylene glycol mixture as the reducing agent. The catalytic activity towards ethanol electro-oxidation in alkaline medium was studied by cyclic, carbon monoxide stripping voltammetries and chronoamperometry. The current density obtained for the electro-oxidation was affected by varying ethanol concentration between 0.25 and 4 M. Raising ethanol concentration up to 3 M increased the coverage of the adsorbed ethoxy ($\text{CH}_3\text{CO}_{\text{ads}}$) species on the nanocatalyst surface, thus yielding an increase in current density. Pd-Sn/C displayed better electrocatalytic activity and stability towards poisoning than Pd-Ru-Sn/C and Pt-Ru/C (E-TEK Inc.) nanocatalysts. Transmission electron microscopy results showed that Pd-Sn and Pd-Ru-Sn nanoparticles were uniformly dispersed on carbon support. The average particle size of Pd-Sn was 7 ± 0.5 nm in diameter while for Pd-Ru-Sn was 6 ± 0.7 nm.