Three-dimensional Graphene-Carbon Nanotubes Composite-Supported PtSn Catalysts with a Tunable Microstructure to Enhance Electrocatalytic Activity for Ethanol Oxidation

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In this paper, nanostructured platinum-stannum (PtSn) dispersed on a series of composites of graphene oxide (GO) and multi-walled carbon nanotubes (MWNTs), denoted as PtSn/G-CNT have been prepared. Tunable size and distribution of the PtSn nanoparticles was achieved by adjusting the ratio of GO and MWNTs in the composites. The synthesized PtSn/G-CNT, single graphene (PtSn/G) and MWNTs (PtSn/CNT) were applied as anode catalysts for ethanol oxidation. The surface morphology and microstructure of as-prepared catalysts were investigated by scanning electron microscopy, transmission electron microscopy, X-ray photoelectron spectroscopy and X-ray diffraction. The electrocatalytic performance for ethanol oxidation has been estimated by cyclic voltammetry and chronoamperometry in acid media. The PtSn/G-CNT catalysts exhibit higher electrocatalytic activity and stability compared to the PtSn/G and PtSn/CNT. Among all the PtSn/G-CNT catalysts, the optimal PtSn/(2/3G+1/3CNT) catalyst with narrower size, more uniform distribution and higher content of PtSn nanoparticles exhibited higher electrocatalytic activity and stability, which implied the application prospect in the field of ethanol fuel cells.

Keywords: Graphene oxide; Carbon nanotubes; PtSn nanoparticles; Composite support; Electrocatalytic performance

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