Construction of Highly Active Pt/Ni-Fe Layered Double Hydroxide Electrocatalyst towards Methanol Oxidation in Alkaline Medium

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A novel Pt/Ni-Fe layered double hydroxide (Pt/Ni-Fe LDH) electrocatalyst was fabricated by a two-step facile process for oxidation of methanol in alkaline medium. It is found that Pt/Ni-Fe LDH electrocatalyst exhibits higher electrocatalytic activity, better anti-poisoning ability and stability for methanol oxidation comparing to pure Pt black and commercial Pt/C catalyst. Such an enhancement is probably attributed to the synergistic effect of Ni-Fe LDH and the uniform loading of Pt nanoparticles on the LDH layers. When ionic liquid (IL) was introduced to the composites, the prepared Pt/IL/Ni-Fe LDH exhibits even better electrocatalytic behaviors (205.6 mA mg⁻¹_{Pt}, $I_f/I_b=5.67$) than the Pt/Ni-Fe LDH. Moreover, the morphology and structure of composites were characterized using scanning electron microscope equipped with an energy dispersive X-ray spectrometry, transmission electron microscope, X-ray diffraction, and FT-IR spectra. It is found that the Ni-Fe LDH have a flake-like morphology, the mean diameter of Pt nanoparticles in Pt/Ni-Fe LDH and Pt/IL/Ni-Fe LDH electrocatalyst is 4.36 nm and 3.09 nm, smaller than that in pure Pt black and commercial Pt/C electrocatalyst (8.70 nm and 6.48 nm).

Keywords: Electrocatalyst, Methanol oxidation, Ionic liquid, Pt/Ni-Fe layered double hydroxide

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