Metal-metal oxide nanoparticles decorated polyoxometalate/reduced graphene oxide for highly efficient electrocatalyst for methanol oxidation

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Fuel cells have been attracting more and more attention in recent decades due to high-energy demands, fossil fuel depletions and environmental pollution throughout world [1-2]. In this study, platinum nanoparticles (PtNPs) and iron oxide nanoparticles (Fe_3O_4NPs) decorated polyoxometalate/reduced graphene oxide nanomaterials (POM/rGO) were developed for methanol electro-oxidation. The developed electrocatalysts (PtNPs/POM/rGO, Fe_3O_4NPs/POM/rGO and PtNPs/Fe_3O_4NPs/POM/rGO) were characterized by the energy-dispersive x-ray spectroscopy (EDX), cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS), X-ray photoelectron spectroscopy (XPS) and scaning electron microscopy (SEM). PtNPs/Fe_3O_4NPs/POM/rGO electrocatalyst shows better electrocatalytic activity and stability towards methanol oxidation than PtNPs/POM/rGO, Fe_3O_4NPs/POM/rGO, POM/rGO and rGO. The results could be attributed to the synergetic effects of the bimetallic nanoparticles and the enhanced electron transfer of reduced graphene oxide sheets. Experimental results demonstrated that the prepared nanohybrids enhanced electrochemical efficiency for methanol electro-oxidation with regard to diffusion efficiency, oxidation potential and forward oxidation peak current.

Keywords: Methanol oxidation; Reduced graphene oxide; Pt nanoparticle; Polyoxometalate, Iron nanoparticle, Electrocatalyst

References

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