Electrocatalytic Activity of Graphene Oxide/Metal Organic Framework Hybrid Composite on Hydrogen Evolution Reaction Properties

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In this work, the electrocatalytic activity of graphene oxide (GO) and its composite with metal organic framework (MOF) towards electrochemical hydrogen evolution reaction (HER) was studied. GO/MOF composite was synthesized by impregnation route and characterized using X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), simultaneous thermal analysis (STA), scanning electron microscopy/energy dispersive spectroscopy (SEM/EDS) and high-resolution transmission electron microscopy/energy dispersive X-ray spectroscopy (HR-TEM/EDX). STA analysis showed an enhancement of the thermal stability of the GO/MOF composite compared to the pristine GO and MOF. SEM/EDS and HR-TEM/EDX confirmed the presence of octahedral structure of MOF in the GO sheet-like structure and elemental composition of the synthesized compounds. The performance of the proposed electrolytic system for electrochemical HER by Tafel parameters and turn over frequencies (TOFs) showed a huge increment of H₂ production in the composite through the Volmer reaction together with either of the two mechanisms in HER. This indicated that the addition of GO/MOF in the electrolytic system possessed better catalytic characteristics with enhanced TOFs, which may open a new way for hydrogen technology via HER enhancement.

Keywords: electrocatalyst; graphene oxide; hydrogen evolution reaction; metal organic frameworks; Tafel analysis

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