Facile Synthesis of Fe-MOF/rGO nanocomposite as an Efficient Electrocatalyst for Nonenzymatic H₂O₂ Sensing

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An Fe-MOF (metal–organic framework)/reduce graphene oxide (rGO) nanocomposite was formed by using an efficient synthetic method. The morphology and structure of the Fe-MOF/rGO nanocomposite were characterized by scanning electron spectroscopy (SEM) and X-ray diffraction (XRD). The Fe-MOF/rGO nanocomposites were immobilized on a carbon paste electrode (CPE) to construct a high-performance nonenzymatic electrochemical H₂O₂ sensor. A cyclic voltammetry (CV) study showed that the Fe-MOF/rGO nanocomposites displayed better electrocatalytic activity toward H₂O₂ reduction compared to that of Fe-MOF. An amperometric study indicated that the H₂O₂ sensor displayed high performance, which offered a low detection limit (0.5 μM), a high sensitivity (5.17 μA mM⁻¹ cm⁻²), and a wide linear range (from 5.0 to 945 μM). An electrochemical reaction mechanism was proposed for H₂O₂ reduction on the Fe-MOF/rGO/CPE. Importantly, the as-fabricated H₂O₂ sensor exhibited good reproducibility and excellent selectivity. Furthermore, the constructed high-performance sensor was utilized to monitor the H₂O₂ levels in real samples, and satisfactory results were obtained. These results demonstrated that the Fe-MOF/rGO nanocomposite can be used as a good electrochemical sensor material in practical applications.

Keywords: Metal organic framework, Fe-MOF/rGO nanocomposite, electrocatalytic activity, H₂O₂.

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