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## A comparative study on electrochemical performance of GC/MFe<sub>2</sub>O<sub>4</sub> (M = Cu and Ni) electrodes for oxygen evolution

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The ovalbumin sol-gel method has been used to manufacture the nano-sized spinel oxides Fe<sub>3</sub>O<sub>4</sub>, NiFe<sub>2</sub>O<sub>4</sub>, and CuFe<sub>2</sub>O<sub>4</sub> at 550°C. These materials have then been characterized using the physicochemical Infrared (IR) spectrometry method with the (XRD) and electrochemical methods (CV), and Tafel polarisation. The IR and XRD have been used to establish the production of a stable spinel phase of metal oxides. IR spectra exhibits distinctive absorption bands at ~450 and ~586 cm<sup>-1</sup> respective to the vibrations in octahedral and tetrahedral voids in spinel oxides. The development of nano-sized oxides with crystallite diameters of 28, 11, and 45 nm for pure, Ni, and Cu-ferrites has been verified by XRD powder patterns of decomposed oxide. The electrocatalytic performance for the oxygen evolution process has been investigated using the CV and Tafel polarization techniques in an alkaline medium on a fabricated GC/oxides/IMKOH electrode interface. Tafel slopes for (OER) at the higher-over-potentials region ranges between (b = 118 -140 mV dec<sup>-1</sup>) and follows almost first-order reaction mechanism and thermodynamic parameters such as the electrochemical activation energy ( $\Delta H_{el}^{0\#}$ ) at constant potentials (0.85V) and the electrochemical entropy ( $\Delta S^{0\#}$ ) for OER have also been estimated from the Arrhenius plot, with observed values ranging from 6 to 39 kJ mol<sup>-1</sup> and a highly negative value of entropy ( $\Delta S_{21}^{0\#} = -330$  J deg<sup>-1</sup> mol<sup>-1</sup>), respectively.

**Keywords:** Cyclic voltammetry, Electrocatalysis, Oxygen evolution reaction, Spinel oxide, Tafel Polarization