Electrocatalytic Activity of $LnMn_{0.5}Fe_{0.5}O_3$ toward Serotonin and H_2O_2

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Abstract

Double perovskites are functional materials that have attracted considerable attention due to their structural stability and favorable electrocatalytic properties [1-3]. In this study, double perovskite oxides with the formula $LnMn_{0.5}Fe_{0.5}O_3$ (Ln = Pr, Nd, Sm, Gd) were synthesized via the solution combustion method using glycine as the fuel. Structural and microstructural characterization was performed using X-ray Powder Diffraction (XRPD), Scanning Electron Microscopy (SEM), and Energy-Dispersive X-ray (EDX) spectroscopy. The analyses confirmed the formation of crystalline perovskite phases, as well as particle morphology, size, and elemental distribution, verifying an approximate 2:1:1 atomic ratio among the constituent elements. For electrochemical studies, paraffin-impregnated graphite electrodes (PIGE) were modified with perovskite microcrystals. The electrocatalytic performance was evaluated by cyclic and square-wave voltammetry in phosphate buffer solution, focusing on the oxidation of hydrogen peroxide (H_2O_2) and serotonin. All compositions exhibited catalytic activity toward both analytes, with comparable results for H_2O_2. Meanwhile, $SmMn_{0.5}Fe_{0.5}O_3$ and $GdMn_{0.5}Fe_{0.5}O_3$ demonstrated higher efficiency for serotonin oxidation compared with $NdMn_{0.5}Fe_{0.5}O_3$.

References

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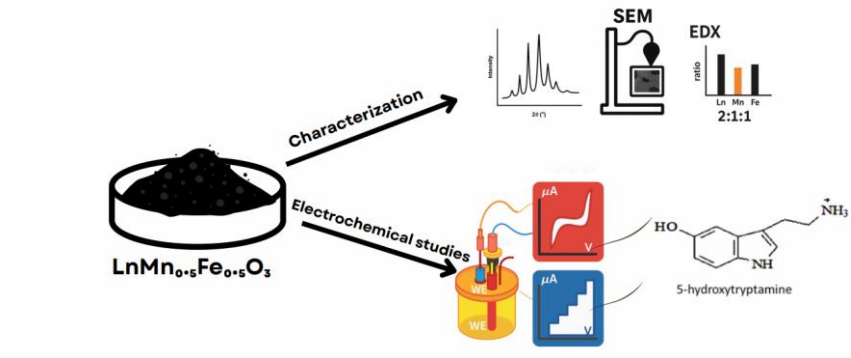

Figure 1: $LnMn_{0.5}Fe_{0.5}O_3$ perovskite with structural characterization (XRPD, SEM, EDX) and electrochemical studies