

## Fabrication of ZnFe<sub>2</sub>O<sub>4</sub>/BMITFB/carbon paste electrode for quantitative determination of propranolol as a nonselective β-adrenergic receptor in pharmaceutical samples

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### Abstract

**Introduction:** Propranolol (PROP) as a nonselective β-adrenergic receptor blocker mainly used for the treatment of various cardiovascular disorders, such as hypertension, angina pectoris, cardiac arrhythmias, and myocardial infarction. PROP is rapidly metabolized after oral administration, and even traces of the drug may be difficult to detect in biological fluids sometime after administration. Hence its detection is of tremendous importance. A novel and sensitive modified carbon paste electrode (MCPE) employing ZnFe<sub>2</sub>O<sub>4</sub> nanoparticles (ZnFe<sub>2</sub>O<sub>4</sub>/NPs) and 1-butyl-3-methylimidazolium tetrafluoroborate (BMITFB) ionic liquid was used for trace level analysis of propranolol (PROP) in aqueous solutions.

**Methods and Results:** Carbon paste electrode (CPE) was modified with ZnFe<sub>2</sub>O<sub>4</sub>/NPs and BMITFB as a binder. A portion of the paste was filled firmly into one glass tube to prepare BMITFB/ZnFe<sub>2</sub>O<sub>4</sub>/NPs/MCPE. The electrochemical investigations were carried out using square wave voltammetry (SWV) and cyclic voltammetry (CV) techniques. Scanning electron microscope (SEM) and X-ray powder diffraction (XRD) studies were applied to characterize the synthesized ZnFe<sub>2</sub>O<sub>4</sub>/NPs. The obtained result shows that, the electro-oxidation signals were increased at the surface of MCPE compared to bare CPE. At pH 7.0 phosphate buffer (0.1 M), the catalytic oxidation signal exhibited a wide linear range with a low detection limit.

**Conclusions:** It can be concluded that, the developed BMITFB/ZnFe<sub>2</sub>O<sub>4</sub>/NPs/MCPE in the current work was a promising approach for successful detection of PROP in biological and pharmaceutical samples.

**Keywords:** Propranolol analysis, ZnFe<sub>2</sub>O<sub>4</sub> nanoparticle, Electrochemical sensor, Ionic liquid, Modified carbon paste electrode.