Disposable and Low-Cost Laser Scribed Graphene Metal Phosphate nanohybrid Electrochemical Sensor for Detection of Serotonin and Hydrogen Peroxide

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1.1. Instrumentation

X-ray diffraction (XRD) analysis was carried out using an advance X-ray diffractometer (PANalytica, Netherlands) with the Cu-Kα radiation of wavelength 1.5406 Å. Fourier-transform infrared (FT-IR) spectroscopy was performed using a FT-IR, IRTRACER-100 Frontier FT-IR spectrometer. The Transmission electron microscopy (TEM) images were recorded by a JEOL JEM-2100F system equipped with a high-angle annular dark-field scanning transmission electron microscopy (HAADF-STEM), and The surface morphology of the synthesized materials were examined by high resolution scanning electron microscopy (HR-SEM, Thermoscientific Apero S) elemental mapping function, and energy-dispersive X-ray spectroscopy (EDS).

1.2. Electrochemical measurements

The electrochemical measurements, such as cyclic voltammetry (CV) and difference pulse voltammetry (DPV), were carried out using CHI600E electrochemical workstation with a three-electrode system in 0.1 M PBS solution at ambient temperature. The Laser induced graphene (LIG) electrode and modified FCZP-LIG electrode has the working electrode, Ag/AgCl has the reference electrode and Pt wire has the counter electrode, respectively. The CV response was evaluated between -0.4 to 0.8 V at various scan range (10-250 mV/s) and various concentration of analytes. Likewise, the practicability of serotonin and H_2O_2 detection in serum and milk and urine samples respectively.

1.3. Real Sample Preparation

The real sample was prepared based on a slight modification of a previously reported method. [22] The serum sample obtained from Sigm-Aldrich India, placed in sample tubes and refrigerated at -20 ◦C before use. Prior to use, the serum was first softened and

centrifuged at 4000 rpm for 10 min, and 50 μL of the supernatant was diluted 100-fold for subsequent use.

Antimicrobial study

Staphylococcus aureus and Escherichia coli pathogenic bacteria were used as model microorganisms in this test. The method involving the microdilution technique was applied to evaluate the MIC values of FCZP. Two-fold dilutions of FCZP were transferred to Muller Hinton broth with 1×10^8 CFU/ml. After the tubes were kept at 37 °C (1 day), the MIC value was determined by considering the turbidity in the tubes. Negative and positive control tubes were adjusted without bacteria and only bacteria tubes, respectively.

Table S1. The weight percentages of elements present in the FCZP nanocomposite

Elements	Weight %	Atom %	Atom % error
O	31.96	59.88	0.44
P	16.47	15.93	0.13
Fe	3.30	1.77	0.07
Cu	21.78	10.27	0.17
Zn	26.49	12.14	
	100.00	**100.00**	