

A biosensor for trace metal ions based on horseradish peroxidase (HRP) immobilized on maize tassel- multiwalled carbon nanotube (MT-MWCNT) through electrostatic interactions is described herein. The biosensor was characterized using Fourier transform infrared (FTIR), UV-vis spectrometry, voltammetric and amperometric methods. The FTIR and UV-vis results inferred that HRP was not denatured during its immobilization on MT-MWCNT composite. The biosensing principle was based on the determination of the cathodic responses of the immobilized HRP to H₂O₂, before and after incubation in trace metal standard solutions. Under optimum conditions, the inhibition rates of trace metals were proportional to their concentrations in the range of 0.092-0.55 mg L⁻¹, 0.068-2 mg L⁻¹ for Pb²⁺ and Cu²⁺ respectively. The limits of detection were 2.5 µg L⁻¹ for Pb²⁺ and 4.2 µg L⁻¹ for Cu²⁺. Representative Dixon and Cornish-Bowden plots were used to deduce the mode of inhibition induced by the trace metal ions. The inhibition was reversible and mixed for both metal ions. Furthermore, the biosensor showed good stability, selectivity, repeatability and reproducibility.