

This paper describes the fabrication and application of an inhibition-based enzyme biosensor proposed for environmental monitoring and assessment of heavy metal ions in aqueous solution. A maize tassel-multiwalled carbon nanotube (MT-MWCNT) composite material was prepared and used to immobilize horseradish peroxidase (HRP) on a glassy carbon electrode (GCE) to produce a biosensor responsive to H<sub>2</sub>O<sub>2</sub>. The biosensor was incubated in heavy metal solutions and the inhibited cathodic response determined amperometrically. The response was linear ( $R^2 > 0.99$ ) over the concentration ranges 0.092 - 0.55 and 0.068 - 2.0 mg/L for Pb<sup>2+</sup> and Cu<sup>2+</sup> respectively, with limits of detection (LOD) values of 2.3 and 4.1 pg/L. Relative error values of 7.93 and 2.55 % were obtained for Pb<sup>2+</sup> and Cu<sup>2+</sup>, respectively, when the biosensing technique was validated using a standard reference material. Recoveries of 96-104% were obtained when applied to the measurement of Pb<sup>2+</sup> and Cu<sup>2+</sup> in tap water. The fabricated biosensor exhibited good stability, repeatability and reproducibility.