

Application of metal oxide nanocomposite enzyme based biosensor for the detection of heavy metal ions Hg (II) and Pb (II) in water

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Abstract

Two metal oxide nanocomposites enzyme based biosensors using stainless steel transducer abbreviated as PANI/ZnO/Urease and PANI/MnO₂/Urease were studied for the detection of heavy metal ions Hg (II) and Pb (II). Amperometric response of biosensors was recorded by adding fixed concentration of respective heavy metal ions i.e 5 mg/l to the phosphate buffer solution of pH 8.5 and 6 respectively, containing known concentration of Urea 10 mM. The inhibition time is taken to be 20 min. and 22 min corresponding to the biosensor used. Constant voltage of 0.6 V against Ag/AgCl reference electrode is applied to the working electrode (biosensor). Chronoamperometry was performed at quiet time 100 sec. The resultant current response with respect to time is obtained as chronoamperometric curve. From the study of relative response of the constructed biosensors it was observed that the response of PANI/ZnO/Urease biosensor to Hg (II) ions is 2 times more than that for Pb (II) ions. Similarly, PANI/MnO₂/Urease biosensor shows 11.4 times more response to the Pb (II) ions compared to that for Hg (II) ions. The relative response of constructed biosensors for the detection of same ion shows that PANI/ZnO/Urease biosensor to Hg (II) ions detection is 5 times more compared to that of PANI/MnO₂/Urease biosensor. Also the response of PANI/MnO₂/Urease biosensor to Pb (II) ion detection is 4.7 times more than that PANI/ZnO/Urease biosensor. Hence the PANI/ZnO/Urease biosensor is being suggested for investigating Hg (II) ions and PANI/MnO₂/Urease biosensor for Pb (II) ion detection. These results are in good agreement with that obtained in values of Sensitivity and Selectivity of the biosensors

Keywords: Biosensor, Urease, Heavy Metal ion Detection, Hg (II), Pb (II).