Proceedings International
Platinum Open Access Journal (ISSN 2668-6384)

Proceedings, Abstract
Volume 3, Issue 6, 2021, 13
https://doi.org/10.33263/Proceedings36.013

Electrochemical Sensor for Ultrasensitive Detection of Lead(II) ions in Water Using Na_3BiO_4 - Bi_2O_3 Mixed Oxide Nanostructures †

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† Presented at Environmental Toxicology: Impact on Human Health (Environ Tox 2021)

Received: 5.11.2021; Revised: 18.11.2021; Accepted: 20.11.2021; Published: 30.11.2021

Abstract: This study presents a systematic observation of the ability of Na_3BiO_4 - Bi_2O_3 mixed oxide nanostructures to detect trace amounts of lead. Na_3BiO_4 - Bi_2O_3 mixed oxide nanostructures were synthesized using electrochemical deposition with potentiostatic mode on indium tin oxide coated glass electrodes. Nanoplates with an average thickness of 90 nm was observed in scanning electron microscopy (SEM). X-ray diffraction (XRD) pattern indicates the presence of poly-crystalline Na_3BiO_4 and Bi_2O_3 in the ratio 1:4. The chemical structure of the prepared samples was also studied through X-ray photoelectron spectroscopy. The square wave anodic stripping voltammetry (SWASV) technique confirms that these nanostructured electrodes are highly sensitive for Pb^{2+} ions down to concentrations as low as 68 ppt (0.32 nM).

Keywords: heavy metal ion sensor; nanostructured bismuth hexagons; potentiostatic electrodeposition; square wave anodic stripping voltammetry; cyclic voltammetry.

Funding

We thank DST, New Delhi (IFA-13/PH-84), SERB, New Delhi (ECR/2016/1888) and UGC DAE CSR, Indore (CSR-IC/CRS-73/2014-15/581) for providing financial support.

Acknowledgments

We are thankful to MRC, MNIT Jaipur, for providing characterization facilities.

Conflicts of Interest

The authors declare no conflict of interest.