Determinations of trace lead in various natural samples by a novel active microband-electrode probe

Wen Zhang, Yiwei Xu, Haroon E. Tahir, Xiaobo Zou

PII: S1385-8947(16)31490-5
DOI: http://dx.doi.org/10.1016/j.cej.2016.10.081
Reference: CEJ 15937

To appear in: *Chemical Engineering Journal*

Received Date: 1 August 2016
Revised Date: 17 October 2016
Accepted Date: 18 October 2016

Please cite this article as: W. Zhang, Y. Xu, H.E. Tahir, X. Zou, Determinations of trace lead in various natural samples by a novel active microband-electrode probe, *Chemical Engineering Journal* (2016), doi: http://dx.doi.org/10.1016/j.cej.2016.10.081

Determinations of trace lead in various natural samples by a novel active microband-electrode probe

Wen Zhang*, Yiwei Xu, Haroon E. Tahir, Xiaobo Zou*

Department of Food & Biological Engineering, Jiangsu University, Jiangsu, China

* These authors (Wen Zhang, dr.wen.zhang@gmail.com; Xiaobo Zou, zou_xiaobo@mail.ujs.edu.cn) are equal corresponding authors.

Abstract

A novel active microband-electrode probe is introduced for determinations of trace lead in various natural samples. It integrates a micro electrode array (MEA) on a silicon substrate and a compact homemade potentiostat. On-chip microband gold electrodes, microband platinum electrodes and silver electrode compose a tri-electrode system. Homemade potentiostat performs cyclic voltammetry (CV) and differential pulse stripping voltammetry (DPSV) measurements, not requiring external commercial potentiostat analyzer. Performances of the as-fabricated sensor are validated in CVs and DPSVs. The sensor shows lower noise than traditional setups. Linearity is outstandingly established from 0.2 μg L^{-1} to 150 μg L^{-1}, and detection limit reaches as low as 0.06 μg L^{-1}. Other analytical properties as accuracy, precision and selectivity are also well obtained. This sensor is extensively adopted to detect trace lead in natural water, soil and fish. Results meet certified method (graphite-furnace atomic absorption spectrometer, GF-AAS) well, and validate promising applicability of the proposed method in many environmental areas.

Keywords

Microband electrode; Active probe; Trace lead; Natural sample