Clean Techn Environ Policy
DOI 10.1007/s10098-013-0633-3

ORIGINAL PAPER

Voltammetric speciation of arsenic species in plant biomaterial: bioremediation

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Received: 21 September 2012 / Accepted: 9 May 2013
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Abstract Environmental pollution, as a consequence of the industrialization process, is one of the major problems that have to be solved and controlled. The heightened awareness regarding the high toxicity and biochemical behavior of the different arsenic species required to develop cost effective technologies for the speciation of arsenic species. Electrochemical techniques are found to be comparatively better tools for arsenic speciation. As (III) is electrochemically stable in the presence of ascorbic acid as supporting electrolyte, while As (V) is electrochemically inactive at the electrode surface. The present piece of work is an attempt to measure the two arsenic species in the elution of arsenic sorbed *Leucaena leucocephala* seed powder (LLSP), using square wave anodic stripping voltammetry. The strategy employed in this work is based on the determination of As (III) directly, while determining As (V) after reduction with sodium thiosulfate into As (III). The removal percentage of As (III) and As (V) using LLSP biomaterial was 83.18 and 95 %, respectively.

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Keywords Chemical speciation · Arsenic · Square wave anodic stripping voltammetry · *Leucaena leucocephala*

Introduction

Arsenic poisoning has become the biggest environmental disaster of this millennium. Arsenic contamination in ground water has been found above the permissible limit in many parts of India and Bangladesh (Mahmood and Halder 2011). Contamination through arsenic in water generally comes from natural (erosion of rocks, minerals, and soils) and anthropogenic (smelting, petroleum-refining, and pesticide, herbicide, glass, and ceramic manufacturing industries) sources (Vahidnia et al. 2007). Because of its highly toxic nature, World Health Organization (WHO) has revised the guidelines for arsenic in drinking water from 50 to 10 µg/L (WHO 2006). Long-term exposures to arsenic levels can result in permanent and severe damage to human health. Arsenic toxicity causes skin lesions, damages mucous membranes and nervous system, and causes gastrointestinal, cardiovascular, genotoxic, mutagenic, and carcinogenic effects (Rivas and Aguirre 2010). Removal of arsenic from contaminated water to satisfy drinking water standards has been a challenge for water authorities. The methods used for arsenic removal are chemical precipitation, lime coagulation, ion-exchange, reverse osmosis, and flocculation (Nemade et al. 2007; Shao et al. 2008; Ranjan et al. 2009). However, all these methods are associated with several drawbacks like unpredictable arsenic ion removal, high material costs, and the generation of the large quantity of toxic sludge, which is often a problem regarding their disposal. The search for new technologies involving the removal of arsenic from water bodies has directed attention to biosorption, based on arsenic binding

Published online: 19 May 2013