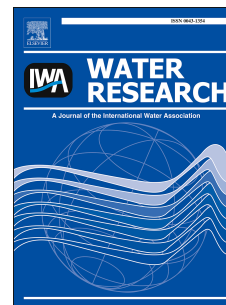


Accepted Manuscript

Treatment of synthetic arsenate wastewater with iron–air fuel cell electrocoagulation to supply drinking water and electricity in remote areas

Jung Hwan Kim, Hubdar Ali Maitlo, Joo Yang Park



PII: S0043-1354(17)30165-3

DOI: [10.1016/j.watres.2017.02.066](https://doi.org/10.1016/j.watres.2017.02.066)

Reference: WR 12735

To appear in: *Water Research*

Received Date: 5 October 2016

Revised Date: 27 February 2017

Accepted Date: 28 February 2017

Please cite this article as: Kim, J.H., Maitlo, H.A., Park, J.Y., Treatment of synthetic arsenate wastewater with iron–air fuel cell electrocoagulation to supply drinking water and electricity in remote areas, *Water Research* (2017), doi: 10.1016/j.watres.2017.02.066.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

1 Treatment of synthetic arsenate wastewater with iron–air fuel cell electrocoagulation to supply drinking water
2 and electricity in remote areas

3

4 Jung Hwan Kim, Hubdar Ali Maitlo, Joo Yang Park*

5 Department of Civil and Environmental Engineering, Hanyang University, 17 Haengdang-dong, Seongdong-gu, Seoul 133-
6 791, Republic of Korea.

7 * Corresponding author: *Email: jooypark@hanyang.ac.kr; Tel: +82 2 2220 0411*

8

9 **Keywords:**

10 Iron-air fuel cell, arsenate removal, electricity production, drinking water, remote areas

11

12 **Abstract**

13 Electrocoagulation with an iron–air fuel cell is an innovative arsenate removal system that can operate without
14 an external electricity supply. Thus, this technology is advantageous for treating wastewater in remote regions
15 where it is difficult to supply electricity. In this study, the possibility of real applications of this system for
16 arsenate treatment with electricity production was verified through electrolyte effect investigations using a
17 small-scale fuel cell and performance testing of a liter-scale fuel cell stack. The electrolyte species studied were
18 NaCl, Na₂SO₄, and NaHCO₃. NaCl was overall the most effective electrolyte for arsenate treatment, although
19 Na₂SO₄ produced the greatest electrical current and power density. In addition, although the current density and
20 power density were proportional to the concentrations of NaCl and Na₂SO₄, the use of concentrations above 20
21 mM of NaCl and Na₂SO₄ inhibited arsenate treatment due to competition effects between anions and arsenate in
22 adsorption onto the iron hydroxide. The dominant iron hydroxide produced at the iron anode was found to be
23 lepidocrocite by means of Raman spectroscopy. A liter-scale four-stack iron–air fuel cell with 10 mM NaCl
24 electrolyte was found to be able to treat about 300 L of 1 ppm arsenate solution to below 10 ppb during 1 day,
25 based on its 60-min treatment capacity, as well as produce the maximum power density of 250 mW/m².

Download English Version:

<https://daneshyari.com/en/article/5759085>

Download Persian Version:

<https://daneshyari.com/article/5759085>

[Daneshyari.com](https://daneshyari.com)