MAGNETICALLY MODIFIED SUGARCANE BAGASSE DISORDERED CARBON AS A CADMIUM REMOVAL AGENT IN WATER

By: Baharudin, IS (Baharudin, Izzaty Syahirah) [1]; Noor, NM (Noor, Noraini Mohamed) [2]; Abdullah, EC (Abdullah, Ezzat Chan) [1]; Othman, R (Othman, Raihan) [2]; Mujawar, MN (Mujawar, Mubarak Nasibab) [3]

IIUM ENGINEERING JOURNAL

Volume: 23 **Issue:** 1 **Page:** 294-309

DOI: 10.31436/iiumej.v23i1.1816

Published: JAN 2022

Indexed: 2022-02-06

Document Type: Article

Abstract

Heavy metals are hazardous to health at certain levels. Currently, heavy metals are removed by physicochemical treatments, such as adsorption, flotation, and electrochemical deposition, and also biological treatments, such as algal biofilm reactor and anaerobic ammonium oxidation. In this study, magnetic biochar was produced to enhance the effectiveness and performance of the adsorbent for heavy metal removal. This study aimed to synthesise high-performance magnetic biochar, to determine the optimum parameters and conditions for high yield of magnetic biochar and high removal of cadmium (Cd2+) from aqueous solution, and to determine the adsorption kinetics and isotherms for Cd2+ removal. Nickel oxide (NiO)-impregnated sugarcane bagasse was subjected to slow pyrolysis to produce magnetic biochar. The impregnated metal, pyrolysis temperature, and pyrolysis time were varied to determine the optimum parameters and conditions to produce high-performance magnetic biochar. The removal of Cd2+ from aqueous solution and batch adsorption study were conducted. The synthesised magnetic biochar was characterised using field-emission scanning electron microscopy (FESEM), energy dispersive X-ray (EDX), X-ray diffraction (XRD), Brunauer-Emmett-Teller (BET) surface area, Fourier transform infrared (FTIR), and vibrating sample magnetometer (VSM). The adsorption data agreed well with the pseudo-second-order model and followed the Langmuir isotherm model. This study achieved 88.47% removal efficiency of Cd2+ from aqueous solution. Thus, the removal of this heavy metal as a human carcinogen reduces the hazardous effects on human health and reduces the toxicity in the environment.

Keywords

Author Keywords: biomass; heavy metal removal; magnetic biochar

Keywords Plus: WASTE-WATER; ACTIVATED CARBON; BIOCHAR; IRON;

Keywords Plus: WASTE-WATER; ACTIVATED CARBON; BIOCHAR; IRON; PERFORMANCE; SAWDUST; METALS; NICKEL

Author Information

Corresponding Address: Noor, Noraini Mohamed (corresponding author)

Int Islamic Univ Malaysia, Sci Engn Dept, Kulliyyah Engn, Jalan Gombak, Kuala Lumpur 53100, Malaysia

Addresses:

1 Univ Teknol Malaysia, Malaysia Japan Int Inst Technol, Jalan Semarak, Kuala Lumpur 54100, Malaysia

2 Int Islamic Univ Malaysia, Sci Engn Dept, Kulliyyah Engn, Jalan Gombak, Kuala Lumpur 53100, Malaysia

3 Curtin Univ, Dept Chem Engn, Sarawak Campus CDT 250, Sarawak 98009, Malaysia

E-mail Addresses: norainimnoor@iium.edu.my

Categories/Classification

Research Areas: Engineering

Funding

Funding agency	Grant number
International Islamic University Malaysia	
IIUM Research Acculturation Grant Scheme (IRAGS)	IRAGS18-0210022

Funding Table

View funding text

Document Information

Language: English

Accession Number: WOS:000744151300018

ISSN: 1511-788X

eISSN: 2289-7860

Other Information

IDS Number: YI9HF

See fewer data fields

Journal information

IIUM ENGINEERING JOURNAL

ISSN: 1511-788X

eISSN: 2289-7860

Current Publisher: KULLIYYAH ENGINEERING, INT ISLAMIC UNIV MALAYSIA, JALAN GOMBAK, 53100, MALAYSIA

Research Areas: Engineering

Web of Science Categories: Engineering, Multidisciplinary

Oxide Nanocomposite for Emulsified Oil Removal
CHINA PETROLEUM PROCESSING & PETROCHEMICAL TECHNOLOGY

See all

Use in Web of Science

Web of Science Usage Count

0	0
Last 180 Days	Since 2013

Learn more

This record is from:

Web of Science Core Collection

- Emerging Sources Citation Index (ESCI)

Suggest a correction

If you would like to improve the quality of the data in this record, please Suggest a correction

37

27 Cited References

Showing 27 of 27 View as set of results

(from Web of Science Core Collection)