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CERIA DECORATED BIOCHAR DERIVED FROM RICE STRAW FOR CADMIUM REMOVAL

Name : NURUL FAHIMAH BINTI SAMSUDIN
Student ID : 2022835296
Program : AS245
Course code : FSG671
Mobile Phone :
E-mail : 2022835296@student.uitm.edu.my

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**CERIA DECORATED BIOCHAR DERIVED FROM RICE STRAW FOR
CADMIUM REMOVAL**

NURUL FAHIMAH BINTI SAMSUDIN

**BACHELOR OF SCIENCE (HONS.) APPLIED CHEMISTRY
IN THE FACULTY OF APPLIED SCIENCES
UNIVERSITI TEKNOLOGI MARA**

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NURUL FAHIMAH SAMSUDIN

AS245 FSG

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ABSTRACT

CERIA DECORATED BIOCHAR DERIVED FROM RICE STRAW FOR CADMIUM REMOVAL

This study examines the modification of ceria decorated biochar (ce-bc) using pyrolyzed rice straw. After initial pyrolysis, the biochar was impregnated with $\text{Ce}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ before being thermally activated again. Several characterization methods like proximate analysis, Fourier Transform Infrared Spectroscopy (FTIR), X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM), and Energy Dispersive X-ray Spectroscopy (EDX) were applied to evaluate the structural and surface changes induced by cerium loading. Proximate analysis that the Ce inclusion raised ash content to 28.42% and fixed carbon to 17.93%, while moisture was reduced to 2.78%, indicating better thermal stability and hydrophobicity. FTIR spectra revealed abundant hydroxyl and amino groups on both rice-straw biochar and Ce-BC, and distinct Ce-O peaks confirmed cerium oxide formation. XRD patterns showed new diffraction peaks corresponding to cubic CeO_2 , and SEM micrographs displayed increased surface roughness and porosity after impregnation. EDX analysis detected additional cerium with 3.18wt% and an elevated oxygen ratio, corroborating the successful deposition of cerium oxide. Ce-BC was tested in Cd removal in 50mL of 50ppm, with pH 5.5 and soaking time 6h, reaching a maximum uptake of 7.77 mg/g compared to 6.24 mg/g for the unmodified biochar. Overall, the results suggest that decorating biochar with ceria

creates more reactive surface sites and enhances its suitability for heavy-metal remediation.

TABLE OF CONTENT

ACKNOWLEDGEMENTS	vii
TABLE OF CONTENT	viii
LIST OF TABLES	x
LIST OF FIGURES	xi
LIST OF SYMBOLS	xii
LIST OF ABBREVIATIONS	xiii
ABSTRACT	iii
ABSTRAK	v
CHAPTER 1 INTRODUCTION	1
1.1 Background Study	1
1.2 Problem Statement	3
1.3 Research Statement	4
1.4 Objectives	5
1.5 Significance of Study	5
CHAPTER 2 LITERATURE REVIEW	6
2.1 Cadmium	6
2.2 Cadmium Characteristics and Applications	7
2.1.1 Environmental and Health Impacts	8
2.3 Biochar	9
2.3.1 Biochar from Various Precursors	9
2.4 Rice Straw (RS)	11
2.4.1 Cellulose	12
2.4.2 Pyrolysis of Rice Straw (RS).	14
2.5 Biochar Modification	16
2.6 Metal Oxide	17
2.6.1 Cerium Oxide (CeO ₂)	18
2.7 Biochar-Metal Oxide	19
2.8 Cerium Oxide Biochar	20
2.8.1 Cerium Oxide Incorporation Methods	21
2.8.2 Ceria Decorated Biochar Application	22
CHAPTER 3 METHODOLOGY	24
3.1 Raw Materials	24
3.2 Analytical Equipment	24
3.3 Preparation of Rice Straw Biochar (RS-BC)	25
3.4 Synthesis of Ceria Decorated Biochar (Ce-BC)	25
3.5 Determination of Functional Groups.	26
3.6 Proximate Ultimate analysis.	26
3.6.1 Moisture Content.	27
3.7 SEM-EDX analysis	28
3.8 Crystallinity	29
3.9 Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES)	29
3.10 Preparation of Solutions and Adsorbent	29