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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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NURUL FAHIMAH BINTI SAMSUDIN

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

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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 $Ce(NO_3)_3 \cdot 6H_2O$ 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.

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