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PREPARATION AND CHARACTERIZATION OF BIOCHAR-IRON OXIDE-PALYGORSKITE COMPOSITES FOR URANIUM(VI) REMOVAL FROM AQUEOUS SOLUTIONS

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Abstract. This paper details the synthesis of palygorskite/biochar/iron oxide composites and their utilization for the remediation of water solutions contaminated with uranium(VI). The synthesis procedure involved the combination of iron chloride, starch, and palygorskite with subsequent pH adjustment, drying of the formed precipitate, and pyrolysis at 600°C. The synthesis of mesoporous materials, primarily composed of iron oxides, including magnetite and hematite, was confirmed using various characterization techniques, including FTIR, SEM, and XRD. It was shown that the adsorption of uranium(VI) reached a maximum of 100.2 μmol/g, exhibiting the highest affinity, which is associated with significant magnetite involvement, which facilitates the reduction processes of uranium(VI) to uranium(IV). The findings demonstrated that the uranium removal process was enhanced by a rise in pH, with significant adsorption and possible precipitation occurring under neutral conditions, so using these composite materials is suitable for in situ remediation of water solutions contaminated by uranium(VI).

Keywords: biochar composite, palygorskite, pyrolysis, adsorption, uranium(VI).

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