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**Isotherms, kinetics and mechanism analysis of phosphorus recovery from aqueous solution
by calcium-rich biochar produced from biosolids via microwave pyrolysis**

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Highlights

- Initial pH of phosphorus stock solution played a key role on phosphorus recovery.
- Phosphorus removal capacity was proportional to the calcium content in biochar.
- Brushite precipitation was the main mechanism for phosphorus removal by biochar.
- Phosphorus recovery from wastewater was greater than from P-stock solution.
- Heavy metal leaching from Ca-doped biochar was much lower than undoped biochar.

ABSTRACT

Phosphorus (P) scarcity and eutrophication have triggered the development of new approaches for phosphorus recovery. This study investigated the impact of calcium-doped biochar, produced from biosolids via microwave pyrolysis at 700°C for 20 minutes, on phosphorus recovery. The phosphorus removal isotherms, removal kinetics and the impact of initial pH of phosphorus solution on phosphorus recovery were studied. The phosphorus recovery was proportional to the calcium content in biochar, leading predominantly to the production of brushite. Precipitation was the main mechanism of phosphorus removal by calcium-doped biochar. Phosphorus removal capacity of biochar reached equilibrium after 8

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