Selectively Retaining Nutrients in Biochar by Magnesium Added Two-Zone Staged Copyrolysis of Blue Algae and Corn Gluten

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Abstract

Disposal of blue algae (BA) and corn gluten (CG) wastes and simultaneous recovery of the abundant phosphorus (P) and nitrogen (N) by pyrolysis to obtain biochars with high fertility is a promising strategy. However, pyrolysis of BA or CG alone by a conventional reactor cannot reach the target. Herein, we propose a novel MgO-enhanced N and P recovery method by designing a two-zone staged pyrolysis reactor to highly efficiently recover N and P with easily available plant forms in BA and CG. The results show that a 94.58% TP retention rate was achieved by means of the special two-zone staged pyrolysis method, in which the effective P (Mg2PO4(OH) and R-NH-P) accounted for 52.9% of TP, while the total nitrogen (TN) reached 4.1 wt%. In this process, stable P was formed first at 400 to avoid rapid volatilization and then to form hydroxyl P at 800.

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