Release and recovery of phosphorus from wastewater treatment sludge via struvite precipitation

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ABSTRACT

The release and the recovery of phosphorus (P) from aerobically digested wastewater, sludge during thermal treatment and the solid–liquid separation by struvite precipitation were investigated. The effects of pH, temperature, and heating time on the liberated phosphate from solid phase to liquid phase were determined. After the wastewater treatment, sludge was thermally treated at a temperature over 100°C, no microbial activities were observed over a period of 24 h. The maximum total phosphorus release of 48.9 mg/L (93.6%) was observed at pH 2 ± 3, 170°C in 80 min. The results showed that the optimum pH values that released phosphate ions from the solid phase to the solution were noted at the range of 2–4. The scanning electron microscopy and energy dispersive X-ray analysis (SEM-EDX) indicated that struvite precipitation is unshaped and nonuniform crystal formed. The surface composition of the precipitates contains high amount of O, P, Mg, and trace of C, Cl. The Fourier transform infrared spectroscopy and X-ray diffraction analysis further indicated that the struvite is evidently the main composition of the precipitates.

Keywords: Wastewater; Phosphorus; Release; Recovery; Struvite

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