Opimization of chemical precipitation of struvite for nutrient removal

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ABSTRACT

This study evaluated the efficiency of struvite precipitation from synthetic wastewater under the effects of various process parameters. The nutrient removal efficiency was investigated by analysis of struvite precipitation. With a synthetic wastewater, Box-Behnken design with the response surface methodology (RSM) was employed to determine the effects of pH value, temperature, Magnesium to Phosphorus molar ratio (Mg:P), mixing speed (rpm) and organic compounds on phosphorus recovery. Test results showed that PO4-P recovery efficiency ranged from 56.04% to 90.04%. The results of ANOVA indicated that the proposed quadratic model predict the responses adequately. The experimental results for struvite precipitation first-order kinetics for the factors of mixing and organic contents showed that, a) mixing speed enhanced phosphorus removal efficiency, as seen when the mixing speed increased in range of experiment (50 to 100 rpm). The rate constants were found to be 0.813; 3.633 and 3.928 L.mMol-P-1.min-1 when the mixing speed are 50, 80, 100 rpm, respectively; b) organic substance (sugar) had little effect on the amount PO4-P finally removed, but had significant effect the intrinsic rate constants. The rate constants are found to be 1.231; 3.023 and 1.49 L.mMol-P -1.min-1 for sugar concentration of 0.6; 1.02 and 1.05 g/L, respectively. The maximum NH4-N recovery was 10.2% corresponded to the PO4-P recovery of 90.04% and led to the conclusion that struvite precipitation was not the suitable method for Nitrogen recovery.

Keywords : Struvite、RSM、Box-Behnken design、ANOVA、first-order kinetic model.

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