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Calcium phosphates recovery from digester supernatant by fast precipitation and recrystallization

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Abstract

Conditional solubility of dicalcium phosphate dihydrate (DCPD) and hydroxyapatite (HAp) in digester supernatant was determined as a function of pH and was compared to its conditional solubility in distilled water. Conditional solubility of both substances in digester supernatant at pH >5-6 was higher than their conditional solubility in pure water due to the presence of impurities, and this influence is more significant for HAp. Amorphous CaP was precipitated through a fast precipitation process from digester supernatant with initial total phosphate concentration 0.008 mol/L and 0.015 mol/L and Ca/P ratios 2 and 5 respectively. The amorphous CaP can be subsequently recrystallized into crystalline CaP. Obtained amorphous products have Ca/P ratio > 1, which allow performing the recrystallization process without further Ca dosing into the system. Batch recrystallization of the amorphous products resulted in crystallization of HAp, DCPD or their mixture depending on the conditions of the process. Maximum achieved P-recovery was 69.5 %. The increase of phosphate concentration and the addition of seeding decreased the yield of the process but promoted crystallization of DCPD. The increase of Ca/P ratio had a positive effect on the total P-recovery. Compared with the direct batch crystallization of CaP from digester supernatant, the two-step process with fast precipitation and recrystallization significantly improved the color of the obtained products.

Keywords A1. Phosphorous recovery; A1. Precipitation; A1. Recrystallization; B1. Digester supernatant; B1. Dicalcium phosphate dihydrate; B1. Hydroxyapatite.

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