



Reuse of alum sludge for phosphorus removal from municipal wastewater

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ABSTRACT

In this study, the efficiency of alum sludge for removing phosphorus from synthetic and municipal wastewater (MWW) was investigated. Orthophosphorus (OP) and condensed phosphorus (CP) were used as model pollutants. Alum sludge (A and B) from two local treatment plants was collected, dewatered, dried, and processed before use. Batch experiments were performed to determine OP and CP removal under equilibrium conditions. Sludge dose, contact time, and pH were optimized for both sludges. Adsorption efficiencies of OP and CP were determined by using Langmuir and Freundlich adsorption isotherm models. The maximum adsorption capacity (Q_o) for sludge A was found to be 4.86 mg/g for OP, and 4.21 mg/g for CP at 12 g/L of sludge dose, 90 min of contact time, and pH 4. For sludge B, Q_o was 1.58 mg/g for OP and 4.71 mg/g for CP at 30 g/L of sludge dose, 80 min of contact time, and pH of 5.5. Results showed that pH of wastewater significantly affected adsorption capacity and better removal was achieved within pH range of 4.0–5.5. Optimized conditions for sludge A and B were applied on MWW which provided over 90% of OP and 70–80% of CP removal. Sludge B performed better than sludge A in case of domestic wastewater. This study concluded that alum sludge as being a great resource for phosphorus removal from wastewater, and could be applied to streams feeding water supply reservoirs for prolonged oligotrophic conditions.

Keywords: Alum sludge; Wastewater; Orthophosphorous; Condensed phosphorus; Adsorption

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