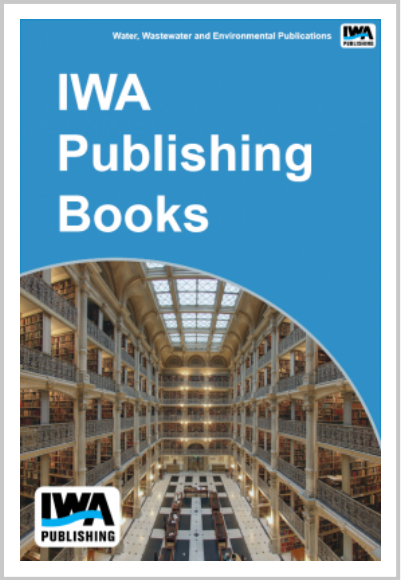
Phosphorus Removal Potential Using Biogenic Iron Oxides



Biogenic iron oxides produced by circumneutral iron-oxidizing bacteria were evaluated for phosphate removal. Traditional batch equilibrium experiments were coupled with bench-scale flow through filters to accomplish this task. Results from batch equilibrium experiments show that biogenic iron oxides can bind between 6.5 and 25.4 mg P/g solids, values that met or exceeded the sorption capacity of other iron rich substrates. Desorption of phosphate ranged from 10 to 40% for saline and potassium chloride solutions. When basic conditions were used to remove bound phosphate, 100 to 250% of applied phosphate was recovered, due to phosphate previously bound to iron oxides and that which was released from intact microbial cells. Flow through filter experiments with biogenic iron oxides highlighted technology potential and limitations. Several filter runs achieved effluent concentrations less than 0.2 mg P/L for more than 4 days, but most trials yielded moderate removal (70%). Paradoxically, the biologic origin of the iron oxides proved to be inhibitory during filtration, while this aspect of the technology would likely be the reason it could be an attractive alternative (matrix potentially re-grown in-place). Detergents and physical separation by a sand support both effectively improved filter performance by dispersing interconnected biogenic iron oxides. Collectively, results suggest biogenic iron oxides could be a reasonable phosphate filter material if a better understanding of growth conditions and requirements is obtained.

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