Conclusions

In conclusion, the operating conditions for electrochemical struvite precipitation play a major role in overall success. Application of high potentials increase the quantity of struvite formed per second and reduces the thickness of the double layer at the anode. Of course, operating at high voltages come at higher costs, so balancing the budget for the process with the time necessary for the desired production rate is necessary. This model has many shortcomings that need to be addressed to form a more robust model. It was assumed that the concentrations of ammonium and phosphate only change with struvite precipitation. In reality, phosphate and ammonium both react in water to form $HPO_4^{2-}, H_2PO_4^-, H_3PO_4, and NH_3$. In addition, taking the cathode reaction into account produces hydroxides which will change pH and corresponding speciation of these species. Furthermore, it was assumed that no oxide layer forms on the solid magnesium anode, but in reality a thin layer of magnesium oxide is present. This layer easily dissolves in water but will alter the surface area available. It has also been reported that magnesium metal form local cathodes and anodes when immersed in water, which once again alters the ability for Mg ion release. In summary, there are a number of complicating phenomena which work to reduce the total moles of struvite formed as predicted in this study, but as a first principles, "ideal" situation, this model runs.

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