Interaction and Transport Phenomena of Polyphosphates and Uranium

FIU's Applied Research Center (ARC) is supporting the U.S. Department of Energy's Hanford Site in developing a strategy to improve the efficiency of the uranium stabilization process through polyphosphate injection technology.

Uranium occurs in high concentrations at several contaminated sites in the United States including Hanford Site. By using polyphosphates, uranium in groundwater can be made immobile, thus preventing its release into the surface water system. However, this technology is relatively new, and very little information is available on physical and chemical factors that govern the uranium immobilization process in the groundwater environment. The nature and the rate of phosphate-uranium complexation together with the rate limiting processes require further research in order to successfully immobilize uranium contaminants in the groundwater zone using polyphosphate based technology at the Department of Energy's Hanford Site.

Objectives

- Compilation of relevant site information and data, along with critical review of current trends in polyphosphate research concerning uranium stabilization.
- Study fate, transport, and behavior of polyphosphates in groundwater with special reference to uranium contamination.
- Investigate the interaction of polyphosphate with groundwater sediment and groundwater ions such as calcium and iron, with focus on reaction kinetics.
- Study the formation of phosphate and uranium complexes under Hanford environmental conditions.

Benefits

- The sorption coefficients and the reaction rate constants obtained from this study will be helpful in determining the mass balance of polyphosphate in the aquifer.
- This experimentation can form a basis to improve injection volume and the rates of polyphosphate injection into the aquifer.
- The findings will contribute towards the understanding of fate and transport of polyphosphates in the aquifer, in presence of uranium and other chemical factors.

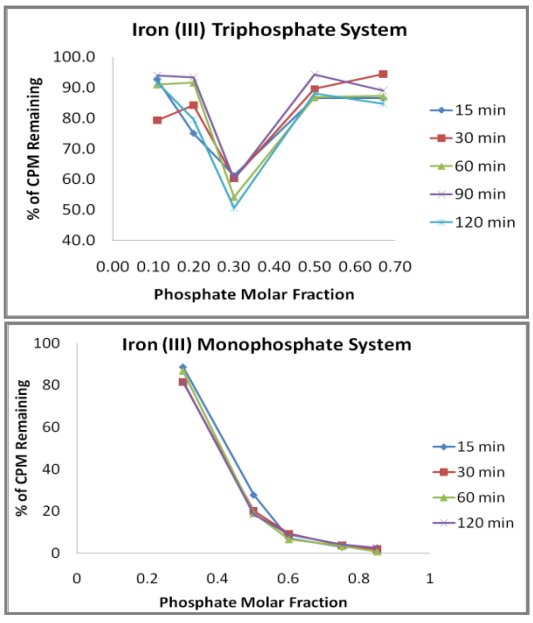

Figure 1. Iron-phosphate precipitation study conducted using ^{68}Ga as a radiochemical tracer, measured using COBRA Gamma Analyzer

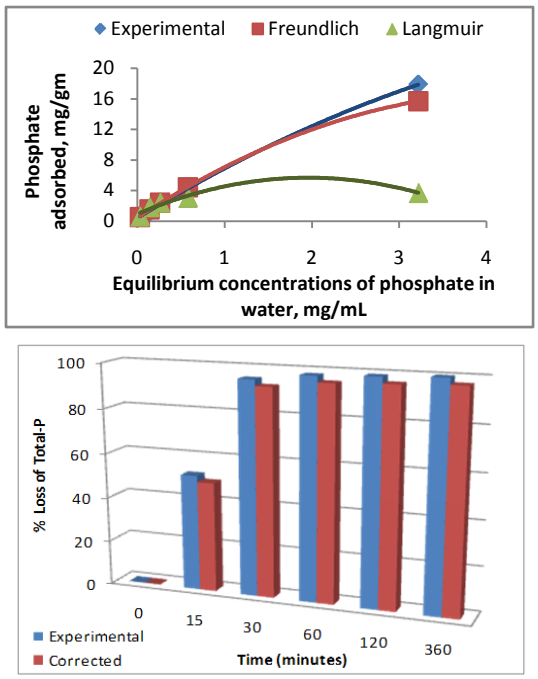

Figure 2. Adsorption isotherms of phosphate for Hanford sediments (above), reduction in the aqueous phosphate concentrations with time during reaction with calcium (below)