

Techneium Attenuation in the Vadose Zone: Role of Mineral Interactions

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Tc Contamination at Hanford

Less Tc has been found by groundwater monitoring than predicted by current models of Tc mobility and geochemical conditions in the vadose zone at Hanford

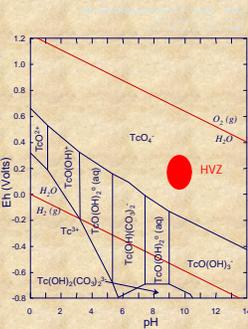
- Where is the Tc?
- By what mechanism is Tc attenuated?
- Can Tc be remobilized by changing environmental conditions?
- Can Tc further stabilized?

Current Model of Tc Geochemistry

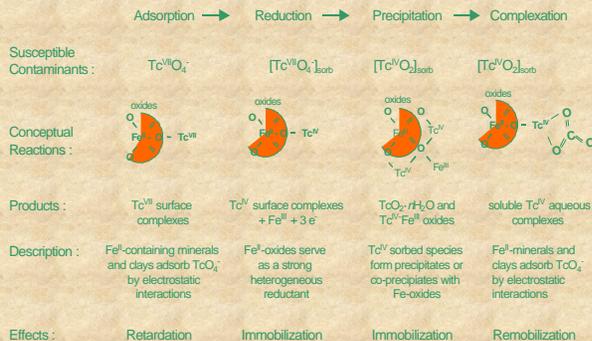
Tc solubility directly related to oxidation state: Tc(VII) is soluble, Tc(IV) is insoluble.

Hanford Vadose Zone (HVZ) relatively oxidizing.

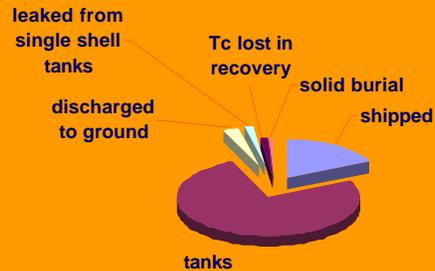
Tc should be soluble and very mobile.



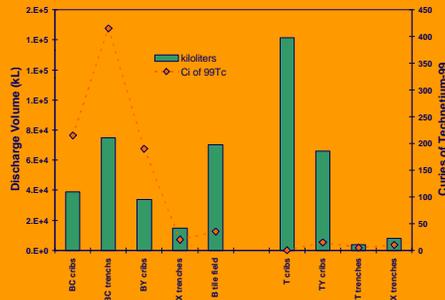
Model of Tc Attenuation



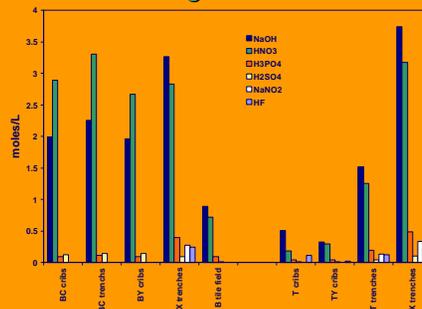
Fate of Tc inventory: 36,000 Ci



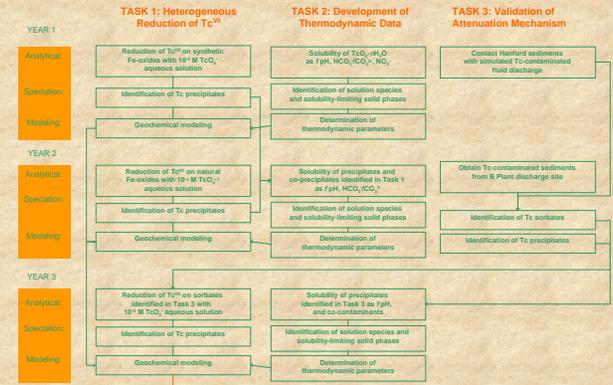
Volume and Activity of Liquids Discharged to Ground



Composition of Liquids Discharged to Ground



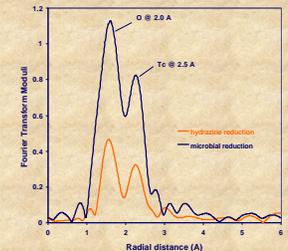
Research Plan



Tc attenuation and mobility in the vadose zone

Research Progress at 6 months

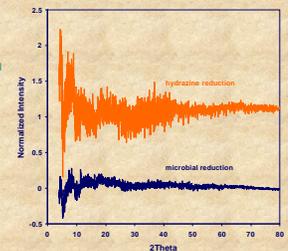
- Reduction products of TcO_4^- using hydrazine and dissimilatory iron-reducing bacteria, *Shewanella putrefaciens*, were characterized using XAFS and diffuse x-ray scattering. Both products are amorphous yet appear to have differing degrees of disorder.



- Initial solubility studies of $TcO_2(am)$ produced by hydrazine reduction were conducted under acidic conditions. Initial results indicate the need for aggressive reducing conditions to maintain Tc(IV) in solution.

- Solvent extraction and scintillation counting techniques, used for oxidation state analysis, are being optimized to increase percentage of recovered Tc.

- Uncontaminated drill core from the Hanford site are being evaluated for spiked Tc exposure.



- Tc-contaminated drill core from the SX-tank farm are being requested for radiography analysis.