Unrefined humic substances as a potential low-cost remediation method for acidic groundwater contaminated with uranium

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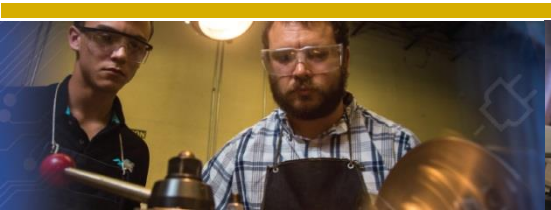
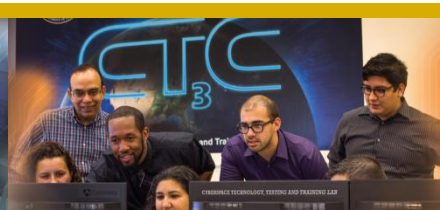
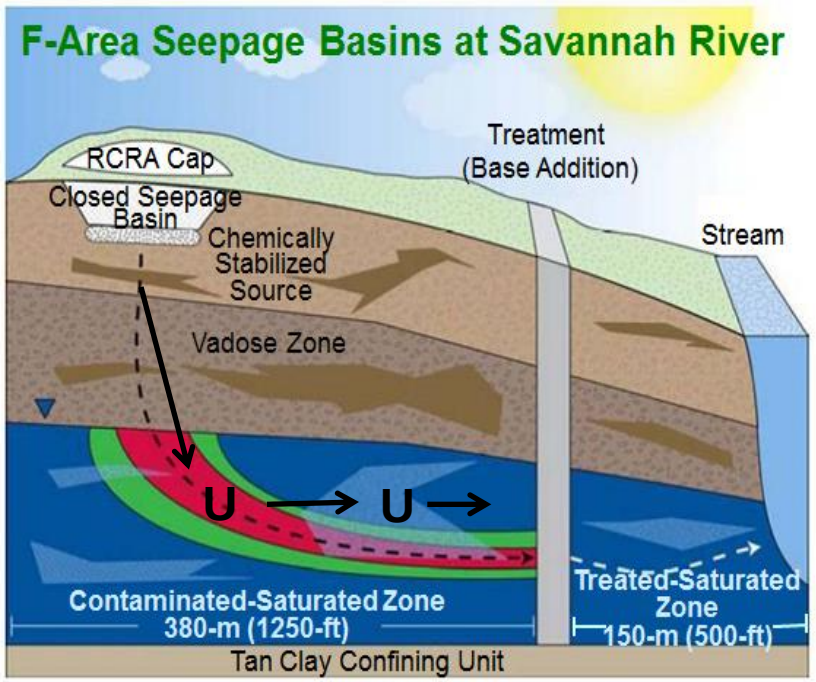




Project Description/Background

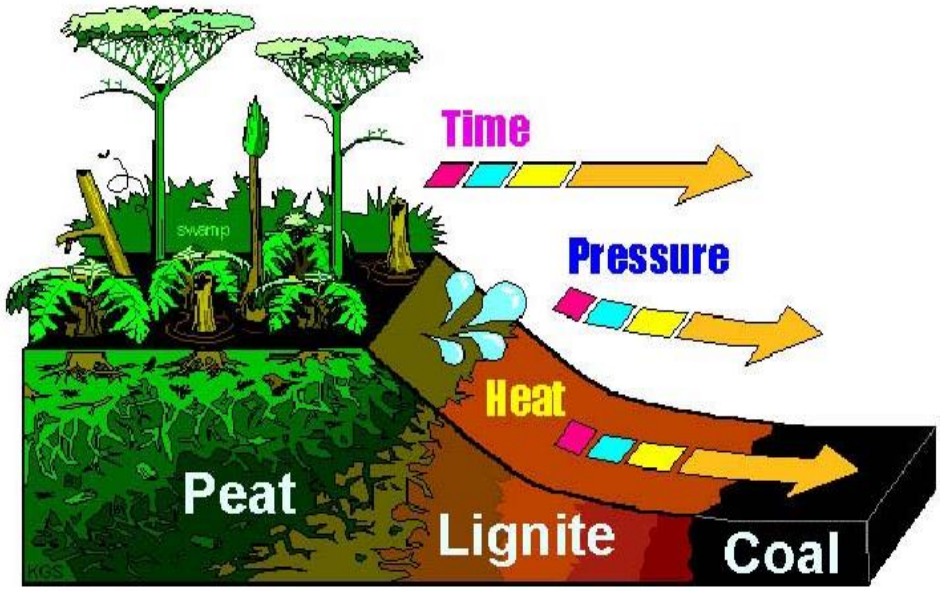
- Approximately 1.8 billion gallons of acidic waste solution containing radionuclides and dissolved metals were discharged to a series of unlined seepage basins at the F/H Area.
- The constituents of concern (COCs) associated with the F-Area groundwater plume are ^{238}U, ^{129}I, ^{90}Sr, and ^{99}Tc.
- Radionuclides such as are migrating into the groundwater creating an acidic plume pH between 3-5.5.



Uranium migration

Project Description/Background

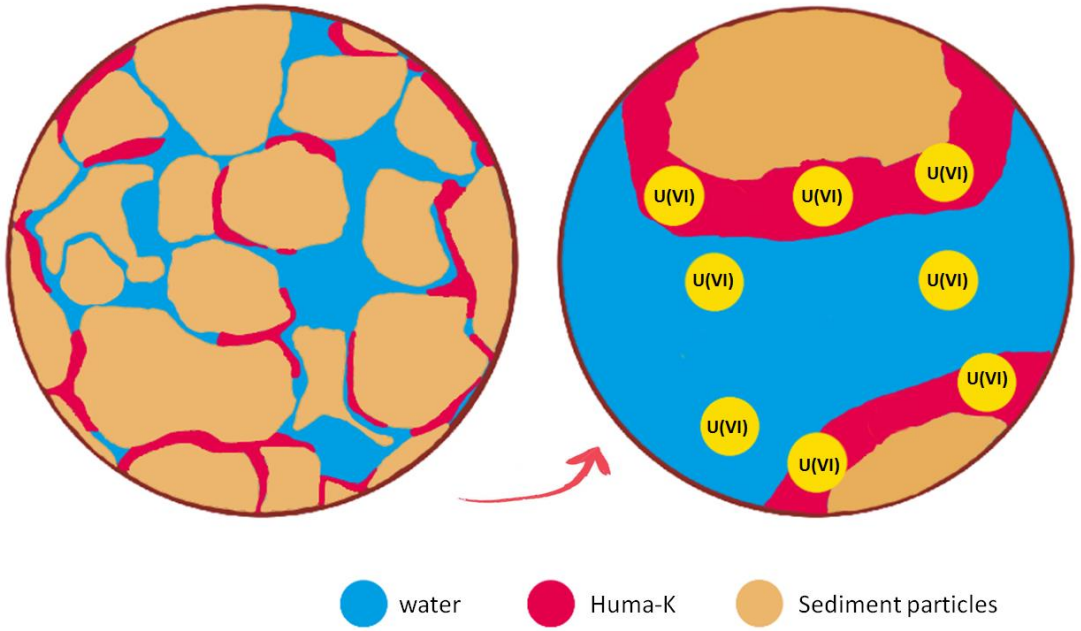
- Humic substances are ubiquitous in the environment, occurring in all soils, waters, and sediments of the ecosphere.
- Humic substances arise from the decomposition of plant and animal tissues.
- Fulvic acid soluble at all pH values.
- Humic acid insoluble at pH < 2.
- Humin insoluble at all pH values.



Formation of Humic Substances

Project Description/Background

- Huma-K is an organic fertilizer that comes from the alkaline extraction of leonardite (a low-rank coal).
- Huma-K has a high content of humic substances.



Scope/Objective

- The principal objective of my project is to determine if the low cost unrefined humate solution known as Huma-K can be used to facilitate uranium adsorption to control the mobility of uranium in acidic groundwater.
- This objective will be fulfilled by completing the following specific aims:
  - Characteristics of Savannah River Site sediments and Huma-K.
  - Sorption behavior of Huma-K on Savannah River Site sediments.
  - Removal of uranium using SRS sediments amended with Huma-K.

Method / Approach

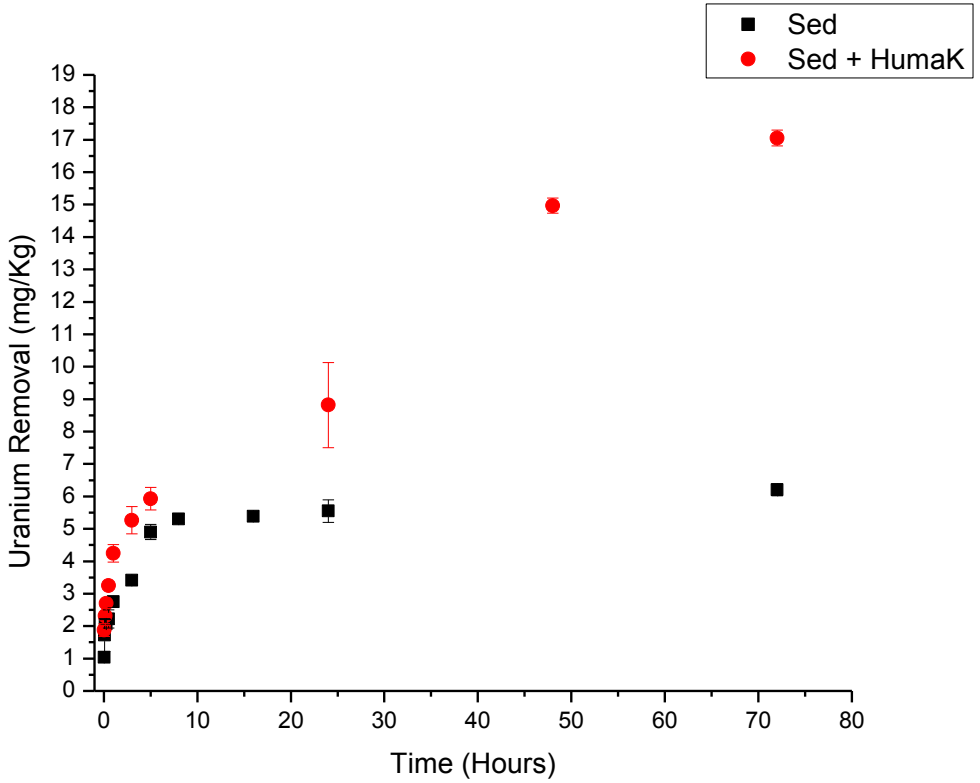
Centrifuge tube with amended sediment and uranium

Samples in shaker table

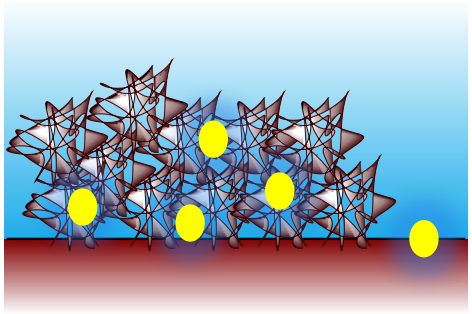
Centrifuge

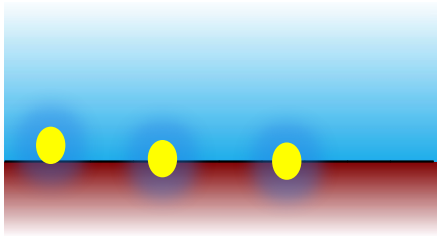
Kinetic Phosphorescence Analyzer

Preliminary Results/Discussion



Kinetics of U(VI) removal





Future Work

- The effect of pH and initial uranium concentrations will be evaluated, as well as an extension of the U(VI) desorption study via the following experimental matrix:
  - Savannah River Site sediments + Uranium
  - Savannah River Site sediments + Uranium + Huma-K
  - Sediments coated with Huma-K + Uranium
  - Huma-K + Uranium

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  - Yelena Katsenovich

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