Reactive transport in Hanford sediments under hyperalkaline conditions. (S02-qafoku120555-Oral)

Authors:

- N.P.Qafoku - *Battelle-Pacific Northwest National Laboratory*
- C.C.Ainsworth - *Battelle-Pacific Northwest National Laboratory*
- J.E.Szecsody - *Battelle-Pacific Northwest National Laboratory*
- O.S.Qafoku - *Battelle-Pacific Northwest National Laboratory*

Abstract:

More than 3 million liters of high temperature, Al-rich, hyperalkaline (pH~14) and saline (high ionic strength) waste fluids were deposited at the Hanford vadose zone from leaking waste tanks. Our objective was to investigate coupled dissolution, precipitation and redox reactions during transport that determine the fate of redox-sensitive contaminants in the Hanford sediments. Metal- and glass-free systems were used to conduct column experiments at 50 degree C under CO2 and O2 free conditions, using waste simulants. Results showed that 3 processes occurred during transport: base-induced mineral dissolution, precipitation of newly formed phases (maily cancrinite and sodalite), and reduction of redox-sensitive contaminants (Cr(VI) as a result of Fe(II) release upon dissolution. The Si dissolution rates during experiments varied between 10^-11 and 10^-13 mol m^-2 s^-1, and were similar to the rates in batch systems. While Al clearly inhibited dissolution, the base and the residence time effects on dissolution rates were well pronounced only in the first 20 pore volumes and at the end of the runs, respectively. The Al precipitation rates (~10^-7 mol s^-1)

were faster in column than in batch experiments.

Corresponding Author Information:

Nikolla P. Qafoku
Battelle-Pacific Northwest National Laboratory
Interfacial Geochemisty Group, MSIN: K3-61
Richland , WA 99352

phone: 509 375-4364
e-mail: nik.qafoku@pnl.gov

Presentation Information:

Presentation Date: Tuesday, November 12, 2002
Presentation Time: 9:30 am

Keywords:

reactive transport, dissolution, precipitation, Cr(VI) and U(VI) removal