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July 20, 2000
Contract No. NRC-02-97-009
Account No. 20-1402-871

U.S. Nuclear Regulatory Commission
ATTN: Mrs. Deborah A. DeMarco
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Subject: Programmatic Review of Abstract

Dear Mrs. DeMarco:

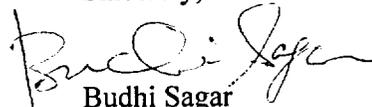
The enclosed abstract is being submitted for programmatic review. This abstract will be submitted for presentation at the Water Rock Interactions Conference, to be held in June 10–15, 2001. The title of this abstract is:

“Local Structure of Uranium(VI) Sorbed on Clinoptilolite and Montmorillonite” by Richard J. Reeder,
Melissa Nugent, and Roberto Pabalan

This abstract is a product of the CNWRA and does not necessarily reflect the view(s) or regulatory position of the NRC.

Please advise me of the results of your programmatic review. Your cooperation in this matter is appreciated.

Sincerely,


Budhi Sagar
Technical Director

BS: ar

Enclosure

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Local Structure of Uranium(VI) Sorbed on Clinoptilolite and Montmorillonite

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EXAFS spectroscopy was used to elucidate the structure of uranium(VI) sorbed onto the zeolite clinoptilolite and the clay montmorillonite. The solids were reacted with uranyl nitrate solutions at pH~3.3, which favors sorption at fixed ion-exchange sites, or at pH~6.3, which favors sorption onto amphoteric surface hydroxyl sites. For all samples, preliminary analyses show the structure of the uranyl cation is preserved, with two axial oxygens at 1.77–1.79 Å. For uranyl-loaded montmorillonite prepared at pH~3.3, a single equatorial oxygen shell is observed at 2.41 Å with a coordination number (N) of ~5.5, whereas montmorillonite prepared at pH~6.3 shows two separate equatorial shells with bond lengths of 2.28 and 2.44 Å and N~3.5 for each shell. Clinoptilolite prepared at pH~6.3 shows similar splitting of the equatorial oxygen shell. Uranyl-loaded clinoptilolite prepared at pH~3.3 also exhibits splitting of the equatorial oxygen shell, but with different coordination numbers (~1.4 and ~4.4 for the first and second shells, respectively).

The results suggest uranyl forms inner-sphere complexes with montmorillonite and clinoptilolite at near-neutral pH. At low pH, uranyl sorbs onto montmorillonite via an outer-sphere complex. Uranyl likely forms an outer-sphere complex when sorbed onto clinoptilolite at low pH, but steric limitations imposed by the zeolite structure probably cause the observed distortion of the equatorial shell.

This work was funded by the National Science Foundation grant EAR9706012 (R. Reeder) and by the U.S. Nuclear Regulatory Commission (M. Nugent and R. Pabalan) under Contract Number NRC-02-97-009. This abstract does not necessarily reflect the views or regulatory position of the U.S. Nuclear Regulatory Commission.