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Account No. 20-01402-561

U.S. Nuclear Regulatory Commission
ATTN: Mrs. Deborah A. DeMarco
Two White Flint North
11545 Rockville Pike
Mail Stop T8A23
Washington, DC 20555

Subject: Programmatic Review of Abstract

Dear Mrs. DeMarco:

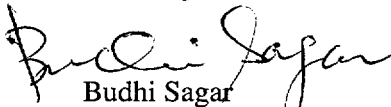
The enclosed abstract is being submitted for programmatic review. This abstract will be submitted for presentation at the 8th International Conference on the Chemistry and Migration Behavior of Actinides and Fission Products in the Geosphere, Migration '01, to be held September 16-21, 2001, in Bregenz, Austria. The title of this abstract is:

“The Solubility of Uranophane at Atmospheric CO₂ Pressure”
by James D. Prikryl and William M. Murphy

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

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Enclosure

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THE SOLUBILITY OF URANOPHANE AT ATMOSPHERIC CO₂ PRESSURE

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Uranophane [Ca(UO₂)₂Si₂O₇ • 6H₂O] is a corrosion product of long-term leaching of spent fuel under oxidizing conditions and is a weathering product of uraninite in uranium ore deposits hosted by siliceous rocks. The solubility of uranophane may, therefore, play an important role in radionuclide release at the proposed nuclear waste repository at Yucca Mountain, Nevada. In this study, the solubility of uranophane under atmospheric PCO₂ (g) conditions was investigated. Batch solubility experiments were designed to approach uranophane equilibrium in both undersaturated and supersaturated solutions that had initial U concentrations of 10⁻⁴ to 10⁻⁷ M in matrices of 10⁻² M CaCl₂ and 10⁻³ M or 10⁻⁴ M SiO₂(aq). Experimental solutions were reacted with synthetic uranophane (confirmed by XRD and chemical analyses) and analyzed at 1 week intervals over 6 to 7 weeks. Uranophane equilibrium was evaluated by comparing theoretical phase relations with those calculated from aqueous speciations of the experimental data. Activity diagrams derived for these comparisons indicate that the experimental data parallel the slope for the stability field of uranophane. The pH of experimental solutions reacted with uranophane ranged from 3.8 to 6.5. The data suggest that at solution pH below about 5.5 uranophane dissolution leads to soddyite [(UO₂)₂SiO₄ • 2H₂O] precipitation. Equilibrium aqueous speciations for experimental solutions with pH > 6.0 were used to extract a provisional equilibrium constant (log K = 9.67 ± 0.25) for the dissolution reaction: Ca(UO₂)₂Si₂O₇ • 6H₂O + 6H⁺ ⇌ Ca²⁺ + 2UO₂²⁺ + 2SiO₂(aq) + 9H₂O.

This work, funded by the NRC under contract NRC-02-97-009, does not necessarily reflect the views or regulatory position of the NRC.