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MONTHLY PROGRESS REPORT FOR MAY 1986

PROJECT TITLE: Technical Assistance in Geochemistry
PROJECT MANAGER: G. K. Jacobs
PROJECT STAFF: J. G. Blencoe, R. M. Gove, A. D. Kelmers,
R. E. Meyer, G. D. O'Kelley, and K. L. Von Damm
ACTIVITY NUMBER: ORNL #41 88 54 92 4 (FIN No. B0287)
NRC #50 19 03 01

OBJECTIVE:

The objective of this project is to provide technical assistance to the NRC in the evaluation of geochemical information pertinent to candidate HLW repository sites. The project emphasizes the collection and review of key information in order to provide input to the NRC analysis of technical issues regarding the geochemical aspects of HLW isolation.

TECHNICAL HIGHLIGHTS:

Hanford Site Geochemical Technical Assistance

As discussed on the phone, the topical report on solubility for the Hanford Site will be modified to include only simulated waste forms. After the topical report has been published, two separate letter reports will be prepared on tracer-doped and fully-loaded waste form experiments.

J. G. Blencoe reviewed the report, Progress Report on the Hydrothermal Interaction of Defense Waste Glasses with Basalt and Groundwater at 150°C, SD-BWI-TI-312, 1986, by D. L. Lane, C. C. Allen, and R. R. Adee. The report summarizes data obtained on the hydrothermal stabilities of two radionuclide-doped SRL-165 glasses (ATM-10 and ATM-11) in five experiments that were designed to simulate geochemical conditions around a waste package during the early post-containment period. The experiments provided information on the geochemical behavior of Tc, Pu, Am, U, and Np released from the glasses. Although abundant useful data were obtained from these experiments, several noteworthy deficiencies were identified. The detailed review and evaluation (LR-287-42) will be forwarded under separate cover.

Yucca Mountain Geochemical Technical Assistance

K. L. Von Damm reviewed two reports pertinent to dating carbonate deposits using the uranium-series technique (requested by Task Order No. 34). The reports, Uranium-series dating of secondary carbonate and silica precipitates relating to fault movements in the Nevada Test Site region and of caliche and travertine samples from the Amargosa desert, USGS Open-File Report 85-47, 1985, by B. J. Szabo and P. A. O'Malley, and Uranium, thorium

analyses and uranium-series ages of calcite and opal, and stable isotopic compositions of calcite from drill cores UE25a#1, USW G-2, and USW G-3/GU-3, Yucca Mountain, Nevada, USGS Open-File Report 85-224, 1985, by B. J. Szabo and T. K. Kyser, document attempts to date carbonate materials at the Yucca Mountain site by uranium-series methods as well as attempts to determine the source of the carbonate through stable isotopic measurements. While the analytical procedures are quite straightforward, the interpretation of the data is not, and is based on a series of assumptions. The detailed letter report, which will be forwarded under separate cover, addresses the validity of some of these assumptions.

Salt Site Geochemical Technical Assistance

Nothing significant to report.

Short-Term Technical Assistance

A. D. Kelmers reviewed the paper, "Adsorption of actinides by marine sediments: Effect of the sediment/seawater ratio on measured distribution coefficients," Environ. Sci. Tech. 20, 483-490, 1986, by J. J. W. Higgo and L. V. C. Rees. The report presents both theoretical predictions and experimental results of the effects on distribution coefficients of the presence of two aqueous species and of varying the solid/solution ratio in batch-contact tests. The authors suggest that many cases of apparent sorption/desorption disequilibrium can be explained by the presence of a small amount of a poorly-sorbed solution species. The poorly-sorbed species could be particulates generated during tests as a result of the shaking action. Additional details are included in a letter report (LR-287-46) to be forwarded under separate cover.

G. D. O'Kelley reviewed the paper, "Neptunium and americium speciation in selected basalt, granite, shale, and tuff ground waters," Science 221, 271-273, 1983, by J. M. Cleveland, T. F. Rees, and K. L. Nash. This report, and a subsequent report on plutonium to be reviewed next month, are still being referenced by several of the sites and used to support various conclusions. Our concern about the methods and conclusions contained in these reports prompted us to prepare these letter reports so that the work of Cleveland and coworkers can be kept in proper perspective. The stated objective of the work was to study the chemical speciation of neptunium and americium in various groundwaters associated with rock types proposed as possible hosts for nuclear waste repositories. Results were presented as percentages of the original concentrations remaining in solution at 25° and 90°C after periods of time of up to 30 days. No attempts were made to monitor and control either the atmospheres over the groundwaters or the redox conditions. Because of the qualitative nature of the observations and the poor control of experimental parameters, there is little in this paper which might be applied in any way to the chemistry of nuclear waste repositories. The detailed letter report (LR-287-44) will be forwarded under separate cover.

PROJECT MANAGEMENT:

The workshop on sorption was held during May 13-15 in Silver Spring, Maryland. Approximately 25 persons from the NRC and its subcontractors attended the workshop. Lively discussions pertinent to technical and regulatory issues concerning sorption models and experimentation contributed to a successful workshop. The participants were able to reach a consensus on several topics -- including the types of data needed to be obtained by the DOE site projects to model sorption processes with a reasonable level of confidence. A draft of the letter report on the results of the workshop is in preparation and will be forwarded to the NRC Project Manager for review early in June so that a revised draft may be prepared for use by J. Bradbury in a presentation to the Advisory Committee on Reactor Safety (ACRS) late in June. A draft will also be forwarded to all participants of the workshop so that they may review the letter report for consistency with their perceptions of the conclusions reached during the workshop.

MEETINGS AND TRIPS:

J. G. Blencoe, G. K. Jacobs, A. D. Kelmers, G. D. O'Kelley, and R. E. Meyer attended the workshop on sorption held during May 13-15 in Silver Spring, MD. A letter report summarizing the results of the workshop is being prepared (see Project Management).

REPORTS AND PUBLICATIONS:

LR-287-42, by J. G. Blencoe, "Review and Evaluation of: Progress Report on the Hydrothermal Interaction of Defense Waste Glasses with Basalt and Groundwater at 150°C", SD-BWI-TI-312, 1986, by D. L. Lane, C. C. Allen, and R. R. Adee."

LR-287-43, by K. L. Von Damm, "Review of: Uranium-series dating of secondary carbonate and silica precipitates relating to fault movements in the Nevada Test Site region and of caliche and travertine samples from the Amargosa desert", USGS Open-File Report 85-47, 1985, by B. J. Szabo and P. A. O'Malley, and "Uranium, thorium analyses and uranium-series ages of calcite and opal, and stable isotopic compositions of calcite from drill cores UE25a#1, USW G-2, and USW G-3/GU-3, Yucca Mountain, Nevada", USGS Open-File Report 85-224, 1985, by B. J. Szabo and T. K. Kyser."

LR-287-44, by G. D. O'Kelley, "Review of: "Neptunium and americium speciation in selected basalt, granite, shale, and tuff ground waters," Science 221, 271-273, 1983, by J. M. Cleveland, T. F. Rees, and K. L. Nash."

LR-287-46, by A. D. Kelmers, Review of the paper: "Adsorption of actinides by marine sediments: Effect of the sediment/seawater ratio on measured distribution coefficients," Environ. Sci. Tech. 20, 483-490, 1986, by J. J. W. Higgs and L. V. C. Rees."

PROBLEM AREAS:

None.

COST/BUDGET REPORT:

Expenditures were \$33.6K for May 1986 and \$323.6K for FY 86 to date. A detailed cost/budget report will be sent under separate cover.