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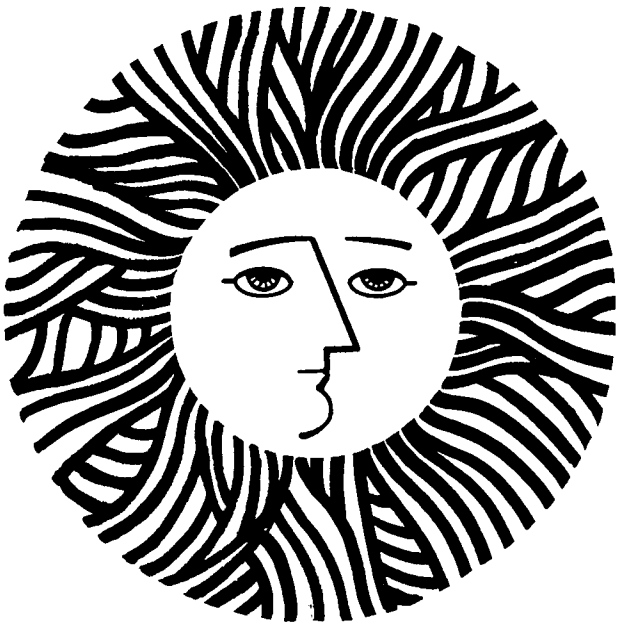

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LAWRENCE BERKELEY LABORATORY
Room: 128 Bldg.: 70 Ext.: 6241

TO: Art Hartstein

FROM: Richard Fish, Bob Giauque, and Phyllis Fox

RE: April Monthly Progress Report
The Partitioning of Major, Minor, and Trace Elements
During Simulated In-Situ Oil Shale Retorting
LBID-205

PRESENTATIONS AND PUBLICATIONS

The papers "Speciation of Organic Ligands, Inorganic and Organometallic Compounds in Oil Shale Process Waters," and "A Study of the Relationships between Minerals, Elements, and Oil Content for Two Oil Shale Core Holes" were presented at the Thirteenth Oil Shale Symposium, Golden, Colorado, April 18, 1980.

NAVY CORE PROJECT

A revised draft of the final report was prepared.

IDENTIFICATION OF POTENTIAL ORGANIC COMPOUNDS AS LIGANDS OF METALS IN OIL SHALE PROCESS WATERS

Our studies to isolate and identify monocarboxylic and dicarboxylic acids are continuing. Forty-two monocarboxylic and dicarboxylic acids have been identified by capillary column gas chromatography-electron impact mass spectrometry, and we have noted important differences among the samples studied. Some of these differences are summarized here.

The Occidental process waters--heater-treater, boiler blowdown, and retort water--contained all of the identified monocarboxylic acids (C_4 - C_{14}) while the Geokinetics retort water contained C_4 - C_{10}, the 150-ton retort water contained C_4 - C_{11}, the Omega-9 retort water contained C_6 - C_{14}, and the L-2 retort water contained only the C_6 monocarboxylic acid.

Significant differences were also noted in the dicarboxylic acids. The Occidental process waters contained no C_2 - C_8 dicarboxylic acids while the C_8 - C_{12} acids were present. The Omega-9 retort water contained all of the identified dicarboxylic acids (C_2 - C_{12}) while the 150-ton

retort water contained C_2 - C_5 and C_9 - C_{10} dicarboxylic acids. The Geokinetics retort water had from C_3 - C_4 and C_8 - C_{11} dicarboxylic acids present while the L-2 sample contained only the C_4 and C_5 acids.

All of the samples studied had several branched monocarboxylic acids as well as several methyl-substituted benzoic acids.

These studies demonstrate that there are substantial variations among the fatty acid profiles of various oil shale process waters. This suggests that fatty acids, and perhaps other organic profiles, can be used to fingerprint oil shale processes for use in future environmental monitoring studies.

SPECIATION OF INORGANIC AND ORGANOMETALLIC COMPOUNDS IN OIL SHALE PROCESS WATERS VIA HIGH PERFORMANCE LIQUID CHROMATOGRAPHY-GRAPHITE FURNACE ATOMIC ABSORPTION DETECTION

We have received and interfaced a graphite furnace atomic absorption spectrophotometer with our high performance liquid chromatograph. This will allow us to continue our speciation studies for arsenic, selenium, and mercury compounds in the oil shale process waters.

We are now completing our arsenic work that was started at the National Bureau of Standards in collaboration with Drs. Brinckman and Jewett. We are further verifying our tentative identifications by adding known compounds to process water samples. This technique, known as spiking, will more clearly define the compounds we believe present in the retort waters.

This report was done with support from the Department of Energy. Any conclusions or opinions expressed in this report represent solely those of the author(s) and not necessarily those of The Regents of the University of California, the Lawrence Berkeley Laboratory or the Department of Energy.

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