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MONTHLY PROGRESS REPORT ON
WORK ORDER C-38176

by

K. M. HARMON

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MONTHLY PROGRESS REPORT ON
WORK ORDER C-38176

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K. M. HARMON

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C-446

This document consists
of 5 pages. ~~SECRET Series A~~Chemical Separations
Chemical Research
Chemistry Department

July 1, 1965

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July 1, 1965

Mr. T. W. Evans
Senior Engineer
Chemistry and Metallurgy Operation
B-Reactor Department
General Electric Company
Richland, Washington

Dear Mr. Evans:

Attached is a copy of our June, 1965 monthly report concerning work done by the Chemistry Department under authorization of your Work Order No. C-38176.

Very truly yours,

ORIGINAL SIGNED BY
K. M. Harmon, N.
Manager
Chemical Separations
Chemical Research

KM Harmon:ew

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MONTHLY PROGRESS REPORT
JUNE, 1965
W. C. Greenhalgh and W. H. Yunker

Examination of unirradiated lithium aluminates by infrared spectroscopy indicates that this technique will be a useful tool for studying the concentration of OH and OT in target materials. Absorption in the 1400-1600 cm^{-1} range, presumed due to bending (ν_2) of adsorbed H_2O , was found to disappear upon vacuum outgassing of the sample (~ 1 hr at 800° C), but a residual absorption remained near 3400 cm^{-1} , due to OH stretching. The aluminate was observed to be transparent in the region of 2100 cm^{-1} , that anticipated for the OT stretching frequency, so that it should be possible to detect any appreciable amounts of OT present in the lattice. Experiments are under way to determine approximate extinction coefficients. It is hoped that use of these techniques on irradiated material (aluminates and silicates) will provide a means for following hydrogen isotope exchange and concentration changes in the various target materials.

Solubility studies with unirradiated materials are completed, for the present. The results are summarized in Table I. The more successful solvents are being tried on irradiated materials. One sample of irradiated lithium silicate has been dissolved in sodium tetraborate at 900° C (~ 25 w/o lithium silicate). Most of the melt distilled to the cooler sections of the apparatus in the course of the treatment. Though all analyses are not yet in, it was noted that the atom ratio of T/H₂O in the non-condensable gas fraction was 1:1, and that twice as much tritium (probably as T_2O or TOH) was condensed in the liquid N_2 trap as passed through it.

The remains of the sample (including the part of the melt which distilled) are being analysed for tritium. If none is found, further work will be done on the use of this dissolution-distillation technique for measuring the total tritium content of a sample.

Interest has focused on the production of "low temperature" lithium aluminate*, primarily because of the possibility of effecting a separation during the 30% volume increase which occurs during the transformation to "high temperature" aluminate (above 600° C).

* Lehmann, Z. Anorgan. und Allgemein. Chem. 313, 117 (1961).

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SUMMARY OF DISSOLUTION STUDIES

SOLVENTS FOR LITHIUM ALUMINATE AND LITHIUM SILICATE

Sample	Tank	Weight, g.	Solubile	Time (hrs.)	Temp. (° C.)	Melt Properties
L1A1O ₂	Borax glass	25	2-1/2	750		Vitreous glass
L1A2O ₂	Potassium carbonate	20	3	700		Low viscosity yellow melt; no erosion
L1A3O ₃	Potassium carbonate potassium carbonates sodium carbonates	20	2-1/2	750		Low viscosity glass white melt;
L1A4O ₃	Potassium carbonate potassium carbonates sodium carbonates	6	1	600		Yellow melt; corrosion problems may be encountered
L1A5O ₃	Potassium carbonate potassium carbonates sodium carbonates	> 20	2-1/2	750		Low viscosity yellow melt;
L1A6O ₃	Potassium carbonate potassium carbonates sodium carbonates	25	2-1/2	750		White melt; corrosion problems may be encountered

Non-solvents for Lithium Aluminate and Lithium Silicate

Sample	Non-solvent	Notes
L1A1O ₂	Li ₂ SO ₄ , NaCl, KCl mixture	90% LiCl, 10% eutectic LiCl, KCl
L1A2O ₂	CaCl ₂	Li ₂ SO ₄ , with 10% eutectic LiCl, KCl
L1A3O ₃	Na ₂ O ₃	Li ₂ SO ₄ , with 10% eutectic LiCl, KCl
L1A4O ₃	CaCl ₂	Li ₂ SO ₄ , with 10% eutectic LiCl, KCl
L1A5O ₃	Na ₂ O ₃	Li ₂ SO ₄ , with 10% eutectic LiCl, KCl
L1A6O ₃	CaCl ₂	Li ₂ SO ₄ , with 10% eutectic LiCl, KCl

Note: Powdered samples were used in all of the above studies

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