
**Cover Sheet for a Hanford
Historical Document
Released for Public Availability**

Released 1995

**Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830**

**Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute**



DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, make any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

UNCLASSIFIED

DOCUMENT NO.

HW-59743

HANFORD TECHNICAL RECORD GENERAL ELECTRIC

(CLASSIFICATION)

CIRCULATING COPY
RECEIVED 300 AREA

MAR 27 1959

DATE
March 27, 1959

COPY NO. AND SERIES

HANFORD ATOMIC PRODUCTS OPERATION - RICHLAND, WASHINGTON

FILE DESIGNATION:

TECHNICAL INFORMATION FILES

8

THIS DOCUMENT CONTAINS RESTRICTED INFORMATION AS DEFINED IN EXECUTIVE ORDER NO. 11652 OF 1954. ITS TRANSMITTAL OR DISCLOSURE OF ITS CONTENTS IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED.

TITLE

RECUPLEX PROTOTYPE ANION EXCHANGE COLUMN

OTHER OFFICIAL CLASSIFIED INFORMATION
MATERIAL CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE ESPIONAGE LAWS, TITLE 18, U. S. C., SECTIONS 793 AND 794, THE TRANSMISSION OR REVELATION OF WHICH IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.

AUTHOR

R. E. Smith

THIS DOCUMENT MUST NOT BE LEFT UNATTENDED OR WHERE AN UNAUTHORIZED PERSON MAY HAVE ACCESS TO IT. WHEN NOT IN USE, IT MUST BE STORED IN AN APPROVED LOCKED REPOSITORY WITHIN AN APPROVED GUARDED AREA. WHILE IT IS IN YOUR POSSESSION AND UNTIL YOU HAVE OBTAINED A SIGNED RECEIPT FROM CLASSIFIED FILES, IT IS YOUR RESPONSIBILITY TO KEEP IT AND ITS CONTENTS WITHIN THE LIMITS OF THIS PROJECT AND FROM ANY UNAUTHORIZED PERSON. ITS TRANSMITTAL TO, AND STORAGE IN YOUR PLACE OF RESIDENCE IS PROHIBITED. IT IS NOT TO BE DUPLICATED. IF ADDITIONAL COPIES ARE REQUIRED, OBTAIN THEM FROM THE RELATED RECORDING FILE. ALL PERSONS RECEIVING THIS DOCUMENT ARE REQUESTED TO SIGN IN THE SPACE PROVIDED BELOW.

ROUTE TO:	PAYROLL NO.	LOCATION	SIGNATURE	DATE
...	142	202-A	[Signature]	3/31/59
			[Signature]	4/2/59
			[Signature]	4/8/59
			[Signature]	4-15-59
			[Signature]	4/28/59
[Signature]	1353	2055	[Signature]	5/11/59
[Signature]			[Signature]	5/22/59

RECORD

COPY

Indefinite Retention _____ Disposal Date _____

Authority _____ Authority _____

C-3195-D (11-54) REC-GE RICHLAND, WASH.

UNCLASSIFIED

(CLASSIFICATION)

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

UNCLASSIFIED

Distribution:

This document contains restricted data as defined in the Atomic Energy Act of 1954. Its transmission or the disclosure of its contents in any manner to an unauthorized person is prohibited.

1. V. R. Cooper
2. D. E. Braden
3. W. G. Browne
4. L. E. Bruns - M. J. Stedwell
5. J. B. Fecht
6. O. F. Hill
7. H. H. Hopkins
8. E. R. Irish
9. C. E. Linderoth
10. W. N. Mobley
11. R. E. Olson
12. A. M. Platt
13. W. H. Reas
14. R. E. Smith
15. E. O. Swain
16. R. E. Tomlinson
17. M. T. Walling
18. 300 File
19. Record File

CLASSIFICATION CANCELLED

Per DOE May 1973

By B. Roberts 2/13/74

This document consists of 3 pages. No. 8 of 19 copies. Series

RECUPLEX PROTOTYPE ANION EXCHANGE COLUMN

By:

R. E. Smith

FINISHED PRODUCTS TECHNOLOGY
RESEARCH AND ENGINEERING
CHEMICAL PROCESSING DEPARTMENT

**SPECIAL RE-REVIEW
FINAL DETERMINATION
DECLASSIFICATION CONFIRMED**
BY Devin DATE 2-26-82
BY Al Baker DATE 3-4-82

NOT UONI

March 27, 1959

UNCLASSIFIED


UNCLASSIFIED

Mr. V. R. Cooper, Manager
Research and Engineering
Chemical Processing Department
2704-E Building, 200-E Area

RECUPLEX PROTOTYPE ANION EXCHANGE COLUMN

Future Z-Plant needs for reducing the metallic impurities in plutonium nitrate feeds, reducing the amounts of plutonium sent to cribs in wastes, and the development of new technology for plutonium recycle recovery place emphasis on expanding the application of anion exchange systems. It is proposed to install a fixed bed ion exchange prototype in Recuplex to make feasibility studies on feed and waste streams. Depending on the results from these studies, and the status of development at Savannah River, the decision may be made toward the end of CY 1959 to construct a second prototype to develop design data on the fluid bed principle of operation.

The following discussion treats the need and scope of this prototype development study.

DISCUSSION

Anion exchange resins are used in the Purex Plant to purify plutonium nitrate solutions following the final solvent extraction cycle. The plutonium nitrate solution is then concentrated and shipped to Z-Plant for conversion to metal. The purity of Purex plutonium nitrate solutions has been routinely higher than nitrate solutions received from either Redox⁽¹⁾ or Recuplex. With the probable requirement for production of large quantities of alpha plutonium, high purity plutonium nitrate will be routinely required. Recuplex can produce such high purity nitrate solution from the solvent extraction system, but with occasional upsets in the system, lower purity nitrate solution occurs. The need for high purity nitrate solution in the future may require that the Recuplex solvent extraction system be supplemented by or replaced with an anion exchange system.

Also, in Recuplex, a measurable amount of plutonium is contained in the solvent extraction waste. This waste is now routinely discharged to underground cribs. The long range goal for Chemical Processing Department is a reduction in the quantity of plutonium discharged to ground. Laboratory studies⁽²⁾ show that anion exchange will remove the plutonium almost quantitatively, thereby permitting a decrease in the plutonium being cribbed.

To test the principal of removing plutonium from wastes, a prototype column is required. The prototype column would provide data for (1) number of column throughputs required to load the column with Pu, (2) allowable volume velocity




UNCLASSIFIED

in column to permit removal of Pu, (3) required volume of solution to remove plutonium from a loaded column, and (4) number and size of columns to provide sufficient capacity to treat all Recuplex waste. The same prototype column could be used to test Recuplex feed by repiping the equipment, and the data obtained may provide the required information for design of an anion exchange system for a new plutonium recovery facility.

*Plutonium
also.*

The data available at HAPO indicate that the solids present in the Recuplex feeds or wastes would soon plug a fixed bed ion exchange column. At the present time, a prototype fixed bed ion exchange column is being operated at the Purex Plant to remove plutonium from concentrated wastes. This bed plugs frequently but has been freed by a short back-flush to momentarily fluidize the bed, allowing some solids to pass. This system would probably be satisfactory for an exploratory prototype column in the Recuplex facility. Installation of the prototype column in Recuplex rather than in a laboratory facility is recommended because of the presence of the volume of feed solution required and the difficulty of transferring these solutions to a laboratory.

The duPont Company at Savannah River has under development an agitated bed anion exchange column which permits passage through the column of solids of smaller diameter than the resin beads. Such a column would be taller than a fixed bed to accomplish the same amount of plutonium absorption, but the operating feature which allows the solids to pass through the column on out to waste would eliminate the need for extensive feed clarification steps prior to the columns. The agitated bed system may make anion exchange more economical to operate than solvent extraction with the elimination of solvent treatment and solvent reprocessing problems.

Mr. F. Tober of duPont Company indicated during his recent visit to HAPO that they will have a full scale agitated bed anion exchanger in operation in about two months. Data available from this unit might be used as the design basis for such columns in a new recovery facility following prototype studies in Recuplex.

R. E. Smith
Manager, Finished Products Technology
Research and Engineering

REFERENCES

- (1) HW-59460, "Revised Metallic Impurity Specification for Z-Plant Feed from Purex and Redox", R. E. Smith, March 6, 1959.
- (2) HW-58702, "Preliminary Study of the Removal and Recovery of Plutonium from Recuplex Process Waste", H. L. Brandt - A. E. Reisenauer, December 12, 1958.

RE Smith:MJS:cmb

