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Route List

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DATE 5-31-66

SUBJECT Scavenging Agents

To Section C 111

FROM J. A. Swartout

BEFORE READING THIS DOCUMENT, SIGN AND DATE BELOW:

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1st REVIEW DATE 5-18-76
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(7 supplements)

5/31/44

SCAVENGING AGENTS: Chronologically Arranged Reports

Report No.	Pg.	Date	Subject
CN-556	17	3/31/43	Barium, strontium, ceric, and zirconium sulfates as scavengers plus cerous and lanthanum "holdbacks".
CN-601	10	4/15/43	Barium, ceric, and zirconium sulfates as scavengers plus cerous and lanthanum "holdbacks".
CN-933	9	9/11/43	Zirconium phosphate, columbium oxide, and lanthanum fluoride independently as scavengers.
"	10	"	RuO ₄ as a scavenger for Ru ^{IV} .
CN-958	19	9/25/43	Barium sulfate*.
"	"	"	Zirconium, ceric, barium, and bismuth phosphates in various combinations. Preformed columbium oxide.
"	22	"	Effect of oxidizing agent*.
CN-979	21	9/30/43	Columbium at "W" levels*.
CN-989	12	10/11/43	Effect of ferric ion on decontamination with BiPO ₄ .
Weekly Rep. WCJ to RLD		10/30/43	Bismuth phosphate carrying of Ba and Sr. Lanthanum fluoride carrying of Ba and Sr.
CN-1023	17&19	10/30/43	Ceric phosphate in presence of "W" F.P. Columbium oxide and zirconium phosphate. Ferric ferrocyanide.
Weekly Rep.		11/5/43	Carrying of Cb by MnO ₂ *.
CN-1051	14	11/8/43	Effect of HF on scavenging with lanthanum fluoride.
"	16	"	Comparison of simultaneous and separate precipitation of bismuth phosphate and lanthanum fluoride.
"	17	"	Carrying of Ba, Sr, and R.E. by bismuth phosphate and lanthanum fluoride.
"	19	"	Use of bismuth phosphate and manganese dioxide.
"	"	"	Carrying of Cb and Te by manganese dioxide.
CN-1044	18	11/10/43	Zirconium phosphate as a scavenger for Zr after removal of excess phosphate.
Weekly Rep. WCJ to RLD		12/3/43	Carrying of Zr and Cb by bismuth phosphate.
CN-1113	28	12/11/43	Carrying of Cb and Te by externally and internally formed manganese dioxide.
"	32	"	Carrying of Zr and Cb by bismuth phosphate.
"	34	"	Manganese dioxide, zirconium and bismuth phosphates and lanthanum fluoride plus Zr and Cb holdbacks.
"	38	"	Carrying of Ba, Sr, R.E. by ceric phosphate. Optimum method for addition of ceric ion.

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Report No.	Pg.	Date	Subject
CN-1153	17	12/11/43	Columbium oxide, zirconium hydroxide, and ceric phosphate plus Ba, Sr, La, Y, and Ru as "holdbacks"
MUC-NS-107		12/16/43	Exchange between cerous and ceric.*
CN-1141	16	12/18/43	Carrying of Zr and Cb by lanthanum fluoride.
"	19	"	Zirconium phosphate.
"	21	"	Columbium oxide dissolved in sulfuric acid.
CN-1206	6	1/8/44	Ceric phosphate, columbium oxide, and lanthanum fluoride. Centrifugation experiments with numerous scavengers.
CN-1214	11	1/8/44	Solubility of lanthanum fluoride in nitric acid.
Weekly Rep. WCJ to RD		1/28/44	Effect of ferric ion on carrying of Y and Sr by bismuth phosphate.
M-CN-1403	9	3/15/44	Ceric and zirconium phosphates.
M-CN-1404	4	3/15/44	Cerous fluoride, lanthanum fluoride and barium sulfate.
M-GM-1409	10	3/31/44	Ceric phosphate and columbium oxide. Titania gel.
M-CN-1414	4	3/31/44	Cerous fluoride, lanthanum fluoride and barium sulfate.
"	9	"	Zirconium phosphate.
"	13	"	Adsorption isotherm for ZrO^{++} on manganese dioxide.
"	"	"	Solubility of Cerous fluoride in nitric acid.*
"	"	"	Carrying of ferric ion by bismuth phosphate.*
CN-1422	All	4/10/44	A comprehensive report on scavenging.
M-CN-1424	3	4/15/44	Ceric and zirconium phosphate.*
"	13	"	Solubility of zirconium phosphate in nitric acid.*
M-CN-1434	4	4/30/44	Ceric and zirconium phosphates (f.p. at "X" and "W" levels).
"	"	"	Barium sulfate, lanthanum fluoride and barium fluozirconate.
"	18	"	Adsorption of cerous ion by manganese dioxide.
M-CN-1437	7	4/30/44	Ceric and zirconium phosphates (S-W runs). Titania gel, bismuth arsenate, lanthanum fluoride, manganese dioxide, columbium oxide, and barium sulfate in various combinations.

* See abstract in our scavenging file.

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Supplement No. 1 - Scavenging Agents

<u>Report No.</u>	<u>Pg.</u>	<u>Date</u>	<u>Subject</u>
CN-1278	All	2/15/44	Summary of Lab., S.-W., and Plant Experiments with Scavengers or Strike.
M-CN-1285	4	2/15/44	Decontamination in the Cross-Over Cycle. LaF_3 & BaSO_4 .
"	20	"	Specificity of Various Scavengers.
"	23	"	Factors Affecting Carrying with BiPO_4 .
"	26	"	MnO_2 Scavenging.

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6/14/44

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To: Section C-III

From: J.A. Swartout

Supplement No. 2 - Scavenging Agents

<u>Report No.</u>	<u>Pg.</u>	<u>Date</u>	<u>Subject</u>
M-CN-1612	227	5/15/44	Results of S-W runs with Ce-Zr phosphates.
"	8	"	Titanium gel and Cb_2O_5 .*
M-CN-1614	5	5/15/44	1) Scavenging with lanthanum fluoride-barium sulfate in first decontamination cycle at "X" product and "W" fission product levels.
"	24	"	2) Effect of barium sulfate and HF on decontamination.
"	"	"	Absorption of Zr by lanthanum fluoride.
M-CN-1623	328	5/31/44	Results of S-W runs with Ce-Zr phosphates.
"	10	"	Evaluation of talc, dicalite, antimony hydroxide, stannic oxide and phosphomolybdate.
M-CN-1624	3	5/31/44	Use of barium sulfate in first decontamination cycle.
"	4	"	Effect of HF on decontamination by bismuth phosphate product precipitate.

*See abstract in our scavenging card file

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July 4, 1944

Doc. Ser. No. 10-111

File: 10-111-1000

Supplement No. 3: Scavenging Agents

Report No.	Date	Subject
10-1638	5/17/44	LaPO ₄ as a scavenger
10-1716	5/17/44	Review of results with Ca-Zr scavenger in S.M. and lab.
10-1816	5/17/44	LaSO ₄ , Ca-Zr phosphates
10-1816	5/17/44	Results of S.W. runs with Ca-Zr phosphates. Ca-Mg-PO ₄ in extraction. LaF ₃ by-product precipitation. ZrSiF ₆ . Lanthanum oxalate by-product. Decarboxylation prior to extraction.
10-1816	5/17/44	Results of dummy runs in the plant with Ca-Zr and Ca-Zr as. Results of Ca-Zr and Ca-Zr as. runs in S.M. Scavenging with F ₂ SiF ₆ , Lanthanum and TiO ₂ . Decarboxylation improvement prior to extraction. with a by-product SiF ₄ and TiO ₂ .
10-1816	5/17/44	Results of runs under "A" and "B" with Ca-Zr and LaSO ₄ -LaF ₃ by-product cross-over. Ca, Ba, and Sr oxalates as scavenger. Zr-oxide as a scavenger for Sr and Ba.

See our section 10-111-1000

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July 14, 1944

To: Section C-III

From: J.A. Swartout

Supplement #4 - Scavenging Agents

Report No.	Page	Date	Subject
CN-1700	4	5/1/44	PbSO ₄ and BaSO ₄ as scavengers. LaPO ₄ as a rare-earth scavenger at reduced acidities.
CS-1725	5	5/12/44	Research on PbSO ₄ , LaPO ₄ , Ce-Zr phosphates at Chicago during May.
	6	"	Decontamination of R.E. by by-product BiPO ₄ at 0.2N HNO ₃ .
CN-1609	All	5/23/44	Progress report on decontamination improvement in the BiPO ₄ process (Hanford). Review of work on straight BiPO ₄ , Ce-Zr phosphates, TiO ₂ , LaF ₃ , various "holdback" agents. La salts of organic acids.
CN-1543	All	6/22/44	Hanford orientation runs - LaF ₃ by-products.
CN-1541	All	7/7/44	Surface Reactions of Zr, Ba and Te ions with LaF ₃ and MnO ₂ .

This document contains information affecting the national defense of the United States within the meaning of the Espionage Laws, Title 18, U.S.C., Sec. 793 and 794, and the transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

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7/22/44

To: Section C-III

From: J. A. Swartout

Scavenging Agents: Supplement #5

Report No.	P.	Date	Subject
CS-1520	7	3/21/44	LaF ₃ and BaSO ₄ -LaF ₃ by-product precipitates.
"	10	"	Summary of possible cycles for W. Ce-Zr phosphates.
CS-1836	1	7/4/44	Improvement in decontamination without scavengers.
"	9	"	Overall D.F. for 21. Hanford Runs.
"	12	"	Summary of our work for June.
"	14	"	Status of decontamination in S.W.S. and plant.
"	15	"	Ce-Zr, Ba-Ce-Zr, and H ₂ SiF ₆ .
"	16	"	Pre-extraction by-product BiPO ₄ .
CS-1816	5	7/7/44	Results of two series of runs at "W" conc. product and f.p. with Ce-Zr in two BiPO ₄ cycles, PbSO ₄ and LaF ₃ scavengers in the cross-over.
"	6	"	Use of HF, H ₂ BO ₃ , and H ₂ SiF ₆ in product precipitations.
"	"	"	New decontamination methods with Ba(NO ₃) ₂ , "Trilon A" and "Trilon B". (All ineffective).
CN-1762	7	7/13/44	Ce-Zr scavengers. (Results are summarized in CS-1816).
"	11	"	Use of HF or H ₂ SiF ₆ to complex Cb and Zr in product precipitations.
"	"	"	Complexing of fluoride with H ₂ BO ₃ . (See CS-1816). Influence of the state of dispersion of Cb and Zr on decontamination.
M-CN-1844	16	7/15/44	(Our semi-monthly report) Hydrolysis and complexes of Zr. Colloidal nature of Cb and Zr.
"	17	"	Carrying of La by BiPO ₄ .
"	4	"	Bi-Ce-Zr by-product in a run with "W" product and f.p.
"	9	"	No results are given.
"	"	"	Results of Runs 27-32 with Hanford flowsheet, "W" f.p., and "W" f.p. and product (Ce-Zr scavengers.)

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Report No.

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M-CN-1845

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7/15/44

Results of Plant Runs 170-175
with Pb , PbO , and Ce scavengers.
Semi works runs with Ba-Ce followed
by Ce alone. Effect of temperature
on decontamination of Cb by BiPO_4 .
Decontamination prior to extraction.
Fluosilicate and fluozirconate ions in
extraction cyclate complexes.
Effect of washing BiPO_4 extraction
cont. with fluoride wash. H_2SiF_6 and
 PbSO_4 .

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August 8, 1944.

To: Section C-III

From: J.A. Swartout

Scavenging Agents: Supplement #6

Report No.	Pg.	Date	Subject
CS-1165	2	12/44	Carrying of Cb. and Te by MnO_2 .
"	3	"	Carrying of Ba and Sr by Ce-phosphate.
"	"	"	Carrying of R.E., Ba, Sr, and Zr by LaF_3 .
Erratum On pg. 2 of the bibliography issued on 5/31/44, CN-1206 should be CN-1208.			
CS-1263	12	1/31/44	Review of scavenger investigations by Sep. Process Dev. - $CePO_4$, MnO_2 , Cb_2O_5 , LaF_3 by-product, Zr-phosphate and $Zr(OH)_4$.
CN-1205	61	2/9/44	Adsorption of Cb on MnO_2 .
"	62	"	Scavenging power of $BiPO_4$ for Ru. Carrying of oxidized Ru on $BiPO_4$.
"	63	"	Carrying of reduced Ru on $BiPO_4$.
M-CN-1282	8	2/15/44	Lab. and semi-works runs with Ce-phosphate and LaF_3 by-product.
CS-1363	8	2/23/44	Summary of results of CN-1278 on improvements in decontamination.
M-CN-1294	8	2/29/44	Effect of Al, Ni, and Hg on decontamination, la-chromate and ferrocyanide.
M-CN-1425	8	4/15/44	Conditions for use of Ce-Zr.
CS-1557	7	4/18/44	$LaPO_4$ as a scavenger.
CS-1657	9	5/3/44	Adsorption of Zr on MgO_2 .
"	12	"	Use of Ce-Zr scavenger in lab. runs with "w" flaskon products. Dummy runs in semi-works.
CS-1736	12	5/31/44	Summary of results with Zr-Ce, TiO_2 , $BiAsO_4$ - LaF_3 , MnO_2 , Cb-Ca, $BaSO_4$. (See CN-1609 for details) Results of semi-works runs.
CN-1848	ALL	7/15/44	Improvement in decontamination under Clinton conditions using $BaSO_4$ - LaF_3 , CeF_3 , $BaSO_4$ - CeF_3 , $BaSO_4$ and $BaZrF_6$. Complexing with H ₂ - LaF_3 by-product.
CN-1849	ALL	7/22/44	Use of $BaSO_4$, Ce-Zr phosphates, and TiO_2 along with by-product $BiPO_4$.

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Report No.	Pg.	Date	Subject
M-CN-1854	11	7/31/44	Discussion of H. & B. runs PS-35 and 36 using 1) simultaneous centrifugation of BiPO_4 and Ce-Zr scavengers, 2) lowering of Zr concentra- tion to 10 mg./l.
"	19	"	Our semi-monthly report. Centrifugation of Cb activity. Carrying of La by BiPO_4 . Dif- ferences between Cb tracer preparations.
M-CN-1855	3	7/31/44	Summary of Plant Runs 186-193 (2 cycle with Ce-Zr).
"	4	"	Work in semi-works on 2nd decontamination cycle. Bi and La oxalate by-product scaveng- ing. H_2SiF_6 in the 1st cycle product precipitation.
"	11	"	Waste loss in Ce-Zr Scavenger by-product.

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September 6, 1963

To: Section C-III

From: J.A. Swartout

Scavenging Agents: Supplement #1

Report	Pg	Date	Subject
CS-1955	11	7/14	Decontamination of Pu f.p. in Hanford cycle using Ce-Zr in 1st & 2nd cycles, $\text{LaF}_3\text{-BaSO}_4$ in 3rd.
"	14	"	Review of work of Section C-III. State of La, Ce & Zr. Removal of colloidal substances. Survey of scavenging agents.
"	15	"	Pre-extraction treatment. Evaluation of scavengers in plant.
"	17	"	Thorium oxalate extraction and decontamination process.
CN-S-1843	All	8/15/44	Scavenger survey - Ce IV, Zr, Th and Bi in La, Ce and Ba oxalates, BaSO_4 . Specificities of BaSO_4 , Zr-phosphate, and Ce_2O_5 . Bibliography of scavenger reports.
CN-S-1878	All	8/14/44	Hydrolysis and complex ion formation in solutions of Zr, Ce and U.
M-CN-1884	3	8/13/44	Pre-extraction scavenging with PbSO_4 , infusorial earth, bone black, TiO_2 and activated charcoal.
"	8	"	Continuous vs. batch centrifuging of Ce-Zr phosphates.
"	8	"	Elimination of 2nd decontamination cycle by use of Ce-Zr by-product prior to $\text{LaF}_3\text{-BaSO}_4$ by-product.
"	8	"	Pre-extraction scavenging with Al-Si bonding material, bone black, and PbSO_4 .
"	15	"	Carrying of Zr, Ce and Ce by BiPO_4 .
M-CN-1885	2	8/15/44	Results of final S.W. runs on Hanford process at 100 concentration of product and 100.
"	4	"	Results of plant runs with Ce-Zr, Ce, and Ce-Zr (see above) and lab. control runs for the S.W. process.
CN-1946 (S)	4339	8/15/44	Scavenging with BiPO_4 at low acidity. Dito with Ce as a complexing agent in the product precipitation. Scavenging with BiPO_4 and Ce-Zr phosphate at low acidity.
CS-1960 (I)		8/14/44	Summary of data in CN-1946.

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Report	Pz.	Date	Subject
M-CN-2016	3	8/31/44	Pre-extraction scavenging with SiO_2 . Failure of BiPO_4 as a product carrier and scavenger.
"	4	"	Carrying of Pu(VI) by Ce-Zr scavengers.
"	8	"	Summary of Results with 10 mg/l. of Zr instead of 100 mg/l. Re-precipitation studies in presence of 0.05M H_2SiF_6 .
"	14	"	Colloidal chemical factors - dialysis and diffusion.
"	15	"	Carrying of La by SiPO_4 & effect of Fe^{3+} , H_3PO_4 & HNO_3 .
"	16	"	Carrying of Zr on BiPO_4 by surface adsorption. Surface areas of BiPO_4 (effect of variables) Areas of plant ppts.
M-CN-2017	2	8/31/44	Results of S.W.'s runs with "W" product and "W" flowsheet.
"	3	"	Summary of Plant runs at "W" f.p. level using "W" flowsheet and 1) two cycles with two shot Ce-Zr; Ce-Zr; 2) two shot Ce-Zr; Ce and 3) one cycle two shot Ce-Zr; Ce, with no scavenger in 2nd cycle; 0.05M $(\text{NH}_4)_2\text{SiF}_6$ prior to product precipitation step.
"	4	"	Laboratory runs at "W" product and fission product levels.
"	5	"	Effect of SO_4^{2-} on Ba decontamination. Comparative decontamination with La, Ce and Y fluorides. Pu-Bi-oxalate procedure for decontamination and concentration.

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