HW 4.159

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DUH-5603

Route List

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FILE

DATE 5-31-44

SUBJECT Scavenging Agents

To Section C 111

FROM J. A. Swartout

[redacted]

BEFORE READING THIS DOCUMENT, SIGN AND DATE BELOW:

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DECLASSIFIED
1st REVIEW DATE: 5-18-06
AUTHORITY AOC ADC ADD
NAME: HF Carroll
ORG: D Bore
2nd REVIEW DATE:
NAME:
ORG:
PNL ltr 7.20.03

7-23-02

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DA Brown PNNL ADD
4-9-2002 Date

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[redacted] (Supplement) [redacted] 5603

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.		11/6/43	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-MS-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-CN-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

Report No.	Pg.	Date	Subject
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

To: Section C-III

From: J.A. Swartout

Supplement No. 2 - Scavenging Agents

Report No.	Pg.	Date	Subject
M-CN-1612	7	5/15/44	Results of S-W runs with Ce-Zr phosphates.
"	8	"	Titania 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.
			2) Effect of barium sulfate and HF on decontamination.
"	24	"	Adsorption of Zr by lanthanum fluoride.
M-CN-1623	8	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

July 4, 194[illegible]

To: Sec'y, Ce-Zr

From: [illegible]

Supplement No. 3: Scavenging Agents

Report No.	Pg.	Date	Subject
CS-1638		5/13/44	$LaPO_4$ as a scavenger
CS-1776		5/24/44	Review of results with Ce-Zr scavengers in S.W. and lab.
CS-CN-16		5/[illegible]/44	$LaSO_4$, Ce-Zr phosphate
CS-CN-16		5/[illegible]/44	Results of S.W. runs with Ce-Zr phosphates. $Ce_3(PO_4)_4$ in extraction. LaF_3 by-product precipitation. H_2SiF_6. Lanthanum oxalate by-product. Decontamination prior to extraction.
CS-CN-[illegible]		5/[illegible]/44	Results of dummy runs in the plant with Ce-Zr and Ce-Zr-Ca. Results of Ce-Zr and Ce-Zr-Ca runs in S.W. Scavenging with H_2SiF_6, $Mn(NO_3)_2$ and TiO_2. Decontamination improvement prior to extraction with a by-product $BiPO_4$ and TiO_2.
CS-CN-[illegible]		5/[illegible]/44	Results of runs under plant conditions with Ce-Zr and $LaSO_4$-LaF_3 by-product co-scavengers.
		5/[illegible]/44	Ca, Ba, and Sr-oxalates as scavengers. Zr-iodate as a scavenger for Th and U.

Re: our scavenging files.

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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	6/1/44	$PbSO_4$ and $BaSO_4$ as scavengers.
"	"	"	$LaPO_4$ as a rare-earth scavenger at reduced acidities.
CS-1725	5	6/12/44	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	6/23/44	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-1643	All	6/22/44	Hanford orientation runs - LaF_3 by-product.
CN-1641	All	7/7/44	Surface Reactions of Zr, Ba and Te ions with LaF_3 and MnO_2.

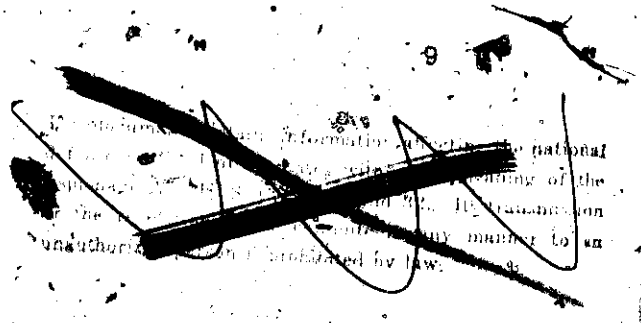
7/20/44

To: Section C-III

From: J. A. Swartout

Scavenging Agents: Supplement #5

Report No.	Pg.	Date	Subject
CS-1520	7	3/21/44	LaF_3 and $BaSO_4$-LaF_3 by-product precipitates.
"	10	"	Summary of possible cycles for U. 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_2SiF_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_3BO_3 and H_2SiF_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_2SiF_6 to complex Cb and Zr in product precipitations. Complexing of fluoride with H_3BO_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.)



Report No.	Pg.	Date	Subject
M-CN-1845	4	7/15/44	Results of Plant Runs 170-175 with Zr-f.p. and Ce-Zr scavengers. Semi-works runs with Ba-Ce-Zr followed by Ce alone. Effect of temperature on decontamination of Cb by $BiPO_4$. Decontamination prior to extraction. Fluosilicate and fluozirconate ions in extraction complex compounds.
"	5	"	
"	6	"	Effect of washing $BiPO_4$ extraction cpt. with fluoride wash. H_2SiF_6 and $PbSO_4$.

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 MnO_2.
"	12	"	Use of Ce-Zr scavenger in lab. runs with "U" fission 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-Ce, $BaSO_4$. (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 HF_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 $BiPO_4$.

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 concentration to 10 mg./l.
"	19	"	Our semi-monthly report. Centrifugation of Cb activity. Carrying of La by $BiPO_4$. Differences 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 scavenging. H_2SiF_6 in the 1st cycle product precipitation.
"	11	"	Waste loss in Ce-Zr Scavenger by-product.

September 6, 1944. 8603

To: Section C-III

From: J.A. Swartout

Scavenging Agents. Supplement #7

Report	Pg.	Date	Subject
CS-1955	11	7/44	Decontamination of Pu-f.p. in Hanford cycle using Ce-Zr in 1st & 2nd cycles, LaF_3-$BaSO_4$ in 3rd.
"	14	"	Review of work of Section C-III. State of La, Cb & 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	8/11/44	Scavenger survey - Ce^{IV}, Zr, Th and Bi oxides, Ce and Ba oxalates, $BaSO_4$. Specificities of $BaSO_4$, Zr-phosphate, and Cb_2O_5. Bibliography of scavenger reports.
CN-S-1878	All	8/14/44	Hydrolysis and complex ion formation in solutions of Zr, Cb 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 LaF_3-$BaSO_4$ by-product.
"	8	"	Pre-extraction scavenging with Al-Si bonding material, bone black, and $PbSO_4$.
"	15	"	Carrying of La, Zr and Cb by $BiPO_4$.
M-CN-1885	2	8/15/44	Results of final S.W.'s runs on Hanford process at 50% concentration of product and F.
"	4	"	Results of plant runs with Ce-Zr, Ce, and work (see above) and lab. control runs for the S.W.'s.
CN-1946 (S)	4&5	8/[illegible]/44	Scavenging with $BiPO_4$ at low acidity. Ditto with [illegible] 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	Pg.	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 $(NH_4)_2SiF_6$ prior to product precipitation step.
"	4	"	Laboratory runs at "W" product and fission product levels.
"	5	"	Effect of $SO_4^{=}$ on Ba decontamination. Comparative decontamination with La, Ce and Y fluorides. Pu-Bi-oxalate procedure for decontamination and concentration.