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Results of Initial Analyses of the Macrobatch 5 Tank 21H Qualification Samples

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EXECUTIVE SUMMARY

Savannah River National Laboratory (SRNL) analyzed samples from Tank 21H in support of qualification of Salt (Macro)Batch 5 for the Integrated Salt Disposition Project (ISDP). This document reports the initial results of the analyses of samples of Tank 21H. No issues with the projected Salt Batch 5 strategy are identified.

LIST OF ABBREVIATIONS

AD – Analytical Development
ICPES – inductively-coupled plasma emission spectroscopy
RSD – relative standard deviation
SRNL - Savannah River National Laboratory
TIC/TOC – Total Inorganic Carbon/Total Organic Carbon
TTR – task technical request
TTQAP – task technical and quality assurance plan

1.0 Introduction

This report describes the laboratory results of Salt (Macro)Batch 5 preliminary samples from Tank 21H. These results will be used by Tank Farm Engineering for their blend calculations. This work was specified by Technical Task Request (TTR)[1] and by Task Technical and Quality Assurance Plan (TTQAP).[2]

Details for the work are contained in controlled laboratory notebooks.[3]

2.0 Experimental Procedure

Five Tank 21H samples (i.e., dip sample bottles HTF-21-11-114, HTF-21-11-115, HTF-21-11-116, HTF-21-11-117, and HTF-21-11-118) arrived at SRNL on October 13, 2011. The samples were optically clear, with no visible solids present. Researchers measured the density of each of the solutions. With customer concurrence, the samples were combined and mixed. After combining, duplicate filtered samples (using a 0.45 μm syringe filter) were sent to Analytical Development (AD) for analysis. Samples were not diluted before delivery to AD.

3.0 Results and Discussion

The results of the density measurements are listed in Table 1.

Table 1. Sample Density Measurements (25 ºC)

Sample	Measured Density (g/mL)
HTF-21-11-114	1.306
HTF-21-11-115	1.315
HTF-21-11-116	1.292
HTF-21-11-117	1.292
HTF-21-11-118	1.301
Average (%RSD)	1.301 (0.75%)

The analytical uncertainty is typically <1% for density measurements.

The results of the ICPES analysis are listed in Table 2.

Table 2. ICPES Results

Analyte	Result (mg/L)	Analyte	Result (mg/L)
Ag	<1.46	Mo	7.79 (8.45%)
Al	7125 (0.10%)	Na	146000 (0.49%)
B	35.8 (0.40%)	Ni	<1.6
Ba	<0.52	P	168 (0.84%)
Be	<0.08	Pb	<7.16
Ca	<0.56	S	2940 (0.00%)
Cd	0.850 (1.66%)	Sb	<10.7
Ce	<6.03	Si	46.8 (1.66%)
Cr	41.0 (0.34%)	Sn	<5.61
Cu	1.29 (23.7%)	Sr	<0.05
Fe	5.54 (0.64%)	Th	<2.68
Gd	<2.15	Ti	<0.38
K	324 (2.40%)	U	<32.7
La	<0.67	V	<0.47
Li	10.4 (0.68%)	Zn	4.40 (0.64%)
Mg	<0.15	Zr	>0.25
Mn	<0.53		

ICPES analytical uncertainty is 10%. The values in the parentheses are the percentage residual standard deviation (RSD).

Results from the IC Anions, Free Hydroxide, and TIC/TOC are listed in Table 3.

Table 3. IC Anions, Free Hydroxide and TIC/TOC Results

Analyte	Result (mg/L)
IC Anions	
F^-	<10
Cl^-	<500
Br^-	<500
Formate	<10
Nitrite	25750 (5.77%)
Nitrate	175000 (5.27%)
Phosphate	485 (13.7%)
Sulfate	7305 (4.36%)
Oxalate	242 (20.5%)
TIC	2860 (2.97%)
TOC	220 (5.14%)
Free Hydroxide	2.08 M (2.04%)

The analytical uncertainty for the IC results is 10%. The analytical uncertainty for the TIC/TOC results is 10%. The analytical uncertainty for the Free Hydroxide result is 10%. The values in the parentheses are the %residual standard deviation (RSD).

The TIC and TOC results are in terms of mg/L of carbon. If we assume that the entire TIC result is carbonate, this translates to a carbonate concentration of 0.238 M.

Results from the gammascan (^{137}Cs) are listed in Table 4.

Table 4. ^{137}Cs Results

Analyte	Result (pCi/mL)	Result (Ci/gal)
^{137}Cs	5.90E+07 (0.00%)	0.223

The analytical uncertainty of the ^{137}Cs measurement is 5.00%. The values in the parentheses are the percentage relative standard deviation (RSD).

4.0 Conclusions

Analysis of the Tank 21H sample indicates that the material does not display any unusual characteristics. Further sample results will be reported in a future document.

5.0 References

[1] A. R. Shafer, "Qualification of ISDP Salt Batch 5", HLW-DWPF-TTR-2012-0001, October 17, 2011.

[2] T. B. Peters and S. D. Fink, "Task Technical and Quality Assurance Plan for ISDP Salt Batch 5 Sample Qualification", SRNL-RP-2011-01629, Rev.0, November 16, 2011.

[3] T. B. Peters, "ISDP5", SRNL-NB-2012-00017, January 30, 2012.

Distribution:

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