WSRC-TR-2000-00007

Analysis of Floating Organic Samples from Waste Tanks 26F and 33F - Fall 1999

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This document was prepared in conjunction with work accomplished under Contract No. DE-AC09-96SR18500 with the U.S. Department of Energy.

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Summary

Organics analyses of floating material taken from Tanks 26F and 33F indicate that the concentration of organic materials is extremely low.

With the exception of small amounts of some organosilicon compounds, no quantifiable organics were found in the either the Tank 26F or Tank 33F floating organic samples. These organosilicon compounds may actually be present in the tanks (e.g., from organosilicon-based lubricants or antifoaming agents) or may be artifacts of the solid phase extraction (SPE) disks used in sampling. The SPE disks are comprised in large part of organosilicon compounds. Though quantification of the concentrations of the compounds in the tanks is not possible because of the sampling method, the results indicate that the concentrations are low. These results are consistent with other tank organic analyses and continue to confirm very low organic content of High Level Waste supernate.

Introduction

The High Level Waste Tank Farms store and process high-level liquid wastes from a number of sources including F- and H-Canyons, Receiving Basin for Offsite Fuels (RBOF) and the Defense Waste Processing Facility (DWPF). These wastes are made alkaline prior to transfer to the Tank Farm and are subject to acceptance based on their composition. These wastes may contain minor concentrations of organic compounds. The Authorization Basis for the Tank Farms identifies several controls to prevent unwarranted, adverse chemical reactions. However, current analysis of the accident scenarios does not adequately evaluate the impact of the presence of organic compounds. A Potential Inadequacy in the Safety Analysis (PISA) was declared regarding the issue of organic compounds in the waste.[1] Processing vessels of concern include the 5H and 3F pump tanks, waste tanks 26F, 33F and 43H , and evaporators.

The resolution of this PISA includes sampling and analysis of the processing vessels of concern for organic constituents. This report documents the results of the analyses of floating organic samples pulled from Waste Tanks 26F and 33F during the fall of 1999. Sampling at the surface would help evaluate material at the highest risk of release of flammable organics into the vapor space, since volatile organics are generally less dense than SRS waste salt solutions.

Discussion

Sampling Equipment

A floating organic sampler that was previously described in Reference 2 was used to pull the samples from the surface of the liquid phase. The samples were collected on an SPE disk. The SPE disk has a high affinity for adsorbing organic compounds and is routinely used in EPA methods to extract organics from aqueous systems.[3,4]

Analytical Techniques

The analytical techniques used for the samples described in this report were previously described in Reference . These included gas chromatography-mass spectroscopy (GC-MS) for both volatile (purgeable from water with a boiling point < 200°C) and semivolatile (extractable into methylene chloride with a boiling point between 150 and 500°C) organic components. Mass spectroscopy results identify the presence of a spectrum of volatile and semivolatile organic species. Ion chromatography (IC) was also used to analyze for cations such as ammonia and the methylamines.

Analytical Results

Floating organic samples were pulled from Tanks 26F and 33F in October 1999. Figures 1 and 2, respectively, show photographs of the Tank 26F and 33F floating organic samples. The Tank 26F sample SPE disk appeared to have a brownish greasy substance as well as some black material that resembled sludge. The Tank 33F sample SPE disk also appeared to have a brownish greasy looking substance but did not have any sludge material.

Figure 1. Tank 26F Floating Organic Sample – October 1999

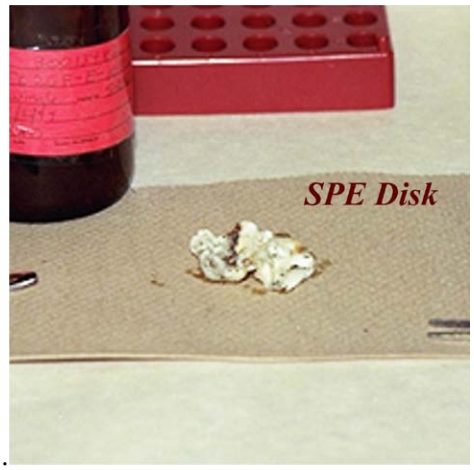

Figure 2. Tank 33F Floating Organic Sample – October 1999

No volatile or semivolatile organic compounds were found in either sample with the exception of several organosilicon compounds: methoxytrimthyl silane, trimethyl silanol and hexamethyl disilanol. Table 1 provides the amounts of these organosilicon compounds and minimum levels of detection for other specifically examined organic materials.

Table 1. Results of Analyses of Tanks 26F and 33F Floating Organic Samples

Species	Tank 26F Sample (m g/disk)	Tank 33F Sample (m g/disk)
n-Butanol	<10	<16
Benzene	<0.5	<0.32
Ammonia	<100	<100
Methylamine	<100	<100
Dimethylamine	<100	<100
Trimethylamine	<250	<250

Methoxytrimethyl silane	110	270
Trimethyl silanol	50	95
Hexamethyl disiloxane	52	44
1,2,4-trimethylbenzene	<0.5	1.9

The origin of the organosilicon compounds is not clear. The SPE disk is composed of DSC-18, a polymeric octadecyl (C-18)-bonded silica in a polytetrafluoroethylene (PTFE) matrix that is used to isolate and purify organic compounds from aqueous media. Experiments indicate that the components found are not a hydrolysis product of the SPE disk. However no radiolysis tests have been performed.[5] The fact that the organosilicon compounds were found in samples for both tanks in different ratios seems to support the notion that organosilicon compounds are either present in the tanks or are possibly an artifact of sampler fabrication and operation in a high radiation field. The site sources of these compounds might be an organosilicon defoamer such as those used in the Tank Farm Evaporators or a silicone grease.

Quality Assurance

Analysis of the samples was performed using routine ADS quality assurance protocols. It should be noted that the ADS laboratory is not certified by the South Carolina Department of Health and Environmental Control (DHEC) for the purposes of generating data that is required to demonstrate compliance with a specific permit. The data is qualified for the purposes of establishing knowledge of the process or facility. Any data from this laboratory that is available or submitted to DHEC must be qualified as originating from a non-certified lab.

Data collected from these analyses is kept in laboratory notebook WSRC-NB-99-00228.

Acknowledgements

The author gratefully acknowledges the assistance of J. E. Young and S. L. Crump.

References

1. M. Layton, "Contribution of Organics to the Tank Farm Deflagrations", NI-HLW-98-007, Rev. 2, April 26,1999.
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3. Environmental Protection Agency, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, SW-846, Procedure 3535, "Solid-Phase Extraction (SPE)".
4. U.S. Environmental Protection Agency Region 9 Laboratory Standard Operating Procedure #222, "Extraction of Organic Compounds from Drinking Water Samples by Solid Phase Extraction", Rev. 0, August 27, 1998.
5. J. E. Young, "GC/MS Analysis Results - Volatile Organics in HLW Tank F-33", SRT-ADS-99-0443, October 27, 1999.