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OFFICE MEMORANDUM

TO : Tom Keenan, Group Leader, H-7 DATE: July 2, 1975

THRU : R. D. Baker, CMB-Division Leader

FROM : G. R. Waterbury & Al Zerwekh

SUBJECT: TRANSURANIC WASTE RESEARCH & DEVELOPMENT PROGRAM(A412) SEMIANNUAL REPORT FOR THE PERIOD FROM JANUARY 1 TO JUNE 30, 1975

SYMBOL : CMB-1

Analytical Chemistry

1503 Report

1. Studies of Corrosion

Corrosion testing of coupons from mild steel drums, coated with several materials expected to prevent corrosion, were continued in air containing 50 and 100% relative humidity at ambient temperature. Coatings being studied include Rustoleum Industrial Coatings, white and black enamels, hot-dipped zinc galvanize, and two bituminous coatings, coal-tar and petroleum based. Although some of these may prove to be satisfactory anti-corrosive agents, the high dollar cost and increasingly difficult procurement of mild steel containers and 2.29-mm polyethylene liners make it mandatory to look for substitutes. To this end we have been performing containment and durability tests on fibre drums. Hydrogenous waste inside these drums was exposed to a nichrome heating element at 800°C for 70 min. The waste in contact with the element charred, but did not burn until removed from the drum and exposed to air. Gas samples withdrawn from the drum before burning showed that the O_2 content decreased, and the CO_2 content rapidly increased, indicating that fire inside is unlikely unless the drum is breached. The vendor-supplied fire-retardant coating on the drums proved unsatisfactory. We are investigating various resins, reported to be chemical, corrosion, and fire resistant, for coating metallic or non-metallic waste containers, inside and/or outside, with or

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sample from a drum containing ^{238}Pu-contaminated hydrogenous waste in retrievable storage at LASL. When last sampled, the gas mixture in this drum contained 13% H_2 and 5.3% O_2.

Monitoring of four ^{238}Pu-contaminated waste drums in interim storage has continued, and it is planned to instrument two additional drums in a group which will be placed in storage soon. Table II is a compilation of the data collected from the instrumented waste drums to date. There has been no gas pressure buildup, although there is a significant concentration of combustible gases. Fortunately, there is a decrease in percentage of oxygen. It is hoped that the above described arcing experiment will be the first step in determining whether there is a potential explosion hazard in the storage drums. It has been ascertained that H_2 diffuses rapidly through some packaging materials and through Los Alamos disposal area soil. This diffusion and the fact that these drums are not sealed gas-tight makes it unlikely that there will be any pressurization of waste drums.

Matrices typical of Mound Laboratory wastes were contaminated individually with plutonium at levels shown in Table III, mixed together, and placed in experimental cylinders. After 60 days at ambient temperature (20°C) they have not begun to pressurize.

Another cylinder containing strongly contaminated mixed cellulosics matrix (62 μg $^{238}PuO_2$ on 52.5 g waste), plus water equal in weight to the matrix, showed erratic gas pressure behavior. Although a leak was not detected, all hardware was retightened. There was an immediate and significant gas pressure rate increase, and the average daily

Table II

Data from ^{238}Pu-contaminated Waste in Covered-Trench Storage

er	^{238}Pu Content, g	Waste Content, kg	Days in Storage	Temperature, °C: Inside Drum	Outside Drum	Ambient	Soil Under Cask	Sample Withdrawn From	Gas Composition (Mol %): H_2	CH_4	O_2	CO_2	CO	N_2
	14.9	17.5	41	12.5	11.5	2.0	7.0	DRUM	0.8	0.1	16.0	6.3	2.0	74.0
			94	12.0	12.0	5.0	7.0	DRUM	0.9	0.1	15.0	5.4	0.9	77.0
								CASK	<0.1	0.1	20.0	0.1	0.3	79.0
			176	14.5	14.5	24.5	6.0	DRUM	1.0	0.1	15.0	5.6	1.3	76.0
								CASK	0.1	<0.1	20.0	<0.1	0.4	79.0
	22.1	14.5	41	18.0	12.5	2.0	7.0	DRUM	0.2	<0.1	19.0	1.4	0.7	77.0
			94	16.5	12.0	5.0	7.0	DRUM	0.2	<0.1	19.0	1.2	0.3	78.0
								CASK	0.1	<0.1	20.0	<0.1	0.1	79.0
			176	19.0	13.5	24.5	6.0	DRUM	0.2	<0.1	20.0	1.2	0.4	78
								CASK	<0.1	<0.1	20.0	<0.1	0.2	79.
	29.4	10.2	41	20.5	13.0	2.0	7.0	DRUM	6.7	0.4	11.0	12.0	3.0	66.0
			94	20.0	12.5	5.0	7.0	DRUM	10.0	0.4	7.7	14.0	4.8	62.0
								CASK	0.5	<0.1	20.0	0.1	0.5	78.0
			176	23.5	20.0	24.5	6.0	DRUM	13.0	0.6	5.3	18.0	7.0	56.0
								CASK	0.6	<0.1	20.0	<0.1	0.6	78.0
	17.0	14.5	41	19.0	12.5	2.0	7.0	DRUM	<0.1	<0.1	20.0	0.6	0.7	78.0
			94	17.5	11.0	5.0	7.0	DRUM	0.1	<0.1	20.0	0.6	<0.1	79.0
								CASK	<0.1	<0.1	20.0	0.1	<0.1	79.0
			176	20.0	13.5	24.5	6.0	DRUM	<0.1	<0.1	20.0	0.6	<0.1	78.0
								CASK	0.1	0.1	20.0	0.1	[illegible]	[illegible]