NOTICE

**CERTAIN DATA
CONTAINED IN THIS
DOCUMENT MAY BE
DIFFICULT TO READ
IN MICROFICHE
PRODUCTS.**

HW--19499

DE92 019156

C-100-01

DECLASSIFIED

FILE _____

Route List

1. HM Parker
- 2.
- 3.
- 4.
- 5.

DATE November 15, 1990

SUBJECT Activity of Pile Gas

AUG 24 1992

To HM Parker

FROM WC Roebch

HM Parker

BEFORE READING THIS DOCUMENT, SIGN AND DATE BELOW

SERIAL RE-REVIEW

BY JP Gordon DATE 5/7/81
BY JP Gordon DATE 5/7/81

By Authority of JP Gordon DATE 5/7/81

JP Gordon DATE 5/7/81
JP Gordon DATE 5/7/81

Due to film deterioration,
portions of this document
may be illegible.

4th National

INVENTORIED

FFR TO 1953

DOCUMENT AUTH AND
INVENTORY UNIT

INVENTORIED

DOCUMENT AUTH AND
INVENTORY UNIT

DECLASSIFIED

MASTER

DISTRIBUTION RESTRICTED TO U.S. ONLY

DECLASSIFIED

HW-19499

(ROUGH DRAFT)

MEMORANDUM

November 15, 1950

TO: H. M. Parker
FROM: Wm. C. Roesch
SUBJECT: ACTIVITY OF PILE GAS

This is to confirm our phone conversation of this morning concerning the relative activities of A-41 and N-16 in pile gas composed of 95% carbon dioxide and 5% air.

The saturation activities will be given by:

$$A = N \int \sigma f dE$$

where A is the saturation activity, N the number of target atoms, σ their cross section for activation, and f the energy distribution of pile neutrons. The ratio desired is:

$$\frac{A(N-16)}{A(A-41)} = \frac{N(O-16)}{N(A-40)} \frac{[\int \sigma f dE]_{O-16}}{[\int \sigma f dE]_{A-40}}$$

Now

$$\frac{N(O-16)}{N(A-40)} = \frac{2 \times .95 + 2 \times .05 \times .2}{.05 \times .01} = 3.8 \times 10^3$$

allowing 1% argon in air.

Also, for water samples, we have¹⁾ experimentally

$$[\int \sigma f dE]_{O-16} = 0.8 \times 10^{-29} \text{ cm}^2$$

The flux distribution is here normalized to unity. This may not be the same for pile gas as for water due to different flux distributions.

The activation cross section of A-40 as a function of energy is not known nor is the flux distribution in the pile. We shall therefore assume that is concentrated around the energy corresponding to the temperature of the pile; this is taken to be 500°C. Then

$$\begin{aligned} [\int \sigma f dE]_{A-40} &= \sigma(1042 \text{ ev}) \\ &= 0.25 \times 10^{-24} \text{ cm}^2 \end{aligned}$$

This is determined by assuming an inverse velocity dependence in the thermal region and using experimental data for normal temperatures²⁾.

This document contains information affecting the National Defense of the United States.

H. M. Parker

- 2 -

November 18, 1950

Finally,

$$\frac{A(N-16)}{A(A-41)} = 3.8 \times 10^3 \frac{0.8 \times 10^{-29}}{0.25 \times 10^{-24}} = 0.13$$

This implies that at saturation 10% of the activity is due to N-16 and 90% due to A-41. The half life of N-16 is 7.35 seconds and that of A-41 is 110 minutes. Activities at times less than about six hours after commencement of irradiation should allow for the slower buildup of A-41.

Wm. C. Rouse

References:

- 1) The Fission Spectrum, G. Plasse, CF-1261, Secret.
- 2) Neutron Beam Spectrometer Studies of Argon, E. Melkonian, W.W. Havens, L. J. Rainwater, M-2555, Restricted; Thermal Neutron Absorption Cross Section of the Argon Isotope A-40, B. D. Kern, CP-772, Secret.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DECLASSIFIED

END

**DATE
FILMED**

9 / 17 / 92