AIM

Association for Information and Image Management

1100 Wayne Avenue, Suite 1100
Silver Spring, Maryland 20910
301/587-8202

Centimeter

Inches

MANUFACTURED TO AIM STANDARDS
BY APPLIED IMAGE, INC.

1 of 1

HW-84161

(CLASSIFICATION)

COPY NO.

DATE _____

September 21, 1964

GENERAL ELECTRIC

HANFORD ATOMIC PRODUCTS OPERATION - RICHLAND, WASHINGTON

X

THIS DOCUMENT CONTAINS RESTRICTED DATA AS
DEFINED BY THE ENERGY ACT OF 1954
AND ITS AMENDMENTS. THE INFORMATION
CONTAINED HEREIN IS UNCLASSIFIED
PERSON IS PROHIBITED.

TITLE

PROPOSED PROCESS TEST TO EVALUATE
DIRECT INGOTING OF UNPICKLED BUTTONS

7

OTHER OFFICIAL CLASSIFIED INFORMATION

THIS MATERIAL CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE ESPIONAGE LAWS, TITLE 18, U. S. C., SECS. 793 AND 794, THE TRANSMISSION OR REVELATION OF WHICH IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.

AUTHOR

R. H. Bond

ISSUING FILE

XXXXXXXXXXXX

ROUTE 101

PAYROLL NO.

LOCATION

FILES	ROUTE	DATE

SIGNATURE AND DATE

OCT 11 '64

~~NY 9 1966~~

SEP 21 1971

HANFORD CODE W-3

Limited Circulation

Access Limited To Personnel Specifically

Authorized To Receive

Classification Cancelled (Change to

By Authority: Communication Coord-
inator, Bates Northwest

C-3195-MB (7

DECLASSIFIED

(CLASSIFICATION)

DECLASSIFIED

HW-84161

This document classified by
R. H. Bond

This document consists of
7 pages.

HANFORD CODE W-3
Limited Circulation
Access Limited To Personnel Specifically
Authorized To Receive

Classification Cancelled and Changed To
DECLASSIFIED

By Authority of B.M. Den
CG-PR-2, 4-14-94
By DK Hanson, 5-9-94
Verified By J.E. Savely 5-13-94

PROPOSED PROCESS TEST TO EVALUATE
DIRECT INGOTING OF UNPICKLED BUTTONS

By

R. H. Bond

Plutonium Chemistry Laboratory
Research and Engineering Operation
Chemical Processing Department

HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

September 21, 1964

Operated for the Atomic Energy Commission by the
General Electric Company under Contract #AT(45-1)-1350

MASTER

Energy 1951... the di... of...
content in any manner to an authorized person is prohibited.

Excluded from automatic downgrading
and declassification

Classification Cancelled and Changed To

By Authority of [redacted] Classification Coord-
inator, [redacted] Northwest.

Date 10/2/73

DECLASSIFIED

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

DISTRIBUTION

Copy Number

1	R. H. Bond
2	R. E. Felt
3	W. S. Frank
4	H. H. Hopkins, Jr.
5	L. M. Knights
6	G. B. Kuklinski
7	R. J. Sloat
8	A. E. Smith
9	C. M. Walker
10	R. L. Walser
11 - 15	Extra
16	Records Center
17	300 Area Files

DECLASSIFIED

TABLE OF CONTENTS

	<u>Page</u>
I. INTRODUCTION	4
II. PROPOSED PROCESS TEST	
A. Contribution Of Reduction Operation	4
B. Plutonium Chemistry Laboratory Processing	
1. Direct Ingoting	5
2. Second Ingoting Step	5
3. Sampling And Analysis	5
4. Density	5
5. Radiation	6
6. Corrosion During Storage--Evaluation	6
C. Contribution Of Fabrication Operation	6
III. PROBLEMS TO BE RESOLVED	
A. Accountability And Transfer	7
B. Possible Safety Problems	7

DECLASSIFIED

PROPOSED PROCESS TEST TO EVALUATE
DIRECT INGOTTING OF UNPICKLED BUTTONS

I. INTRODUCTION

A proposal has been made for ingotting of buttons, without pickling, immediately after breakout from the reduction vessel (HW-83735). This proposed process change could enable the substitution of an ingot of definable, high purity, and good appearance in place of a button as the final product of the Reduction Operation. The change should also achieve economic advantages and decrease radiation exposure.

The packaging and storage of the resultant high-grade ingot will require a change of storage container from that presently used to eliminate plastic materials. High-grade plutonium metal corrodes rapidly when packaged in plastic (HW-81240). The ingots, to be prepared in the process test described below, provide an opportunity for testing of a revised, organic-free storage container.

The purposes of this process test do not depend on the nature of the buttons processed, hence the tests could be run with unalloyed buttons or with alloyed buttons (RAB), as current FAB needs dictate.

II. PROPOSED PROCESS TEST

A. Contribution Of Reduction Operation

Buttons for the process test will be provided from normal production. Sixteen buttons should adequately define process variables and provide control specimens. The buttons should be consecutively numbered, if possible, or consecutively numbered in lots of four at one time, to allow for charge variations.

Button sampling will be done in the Plutonium Chemistry Laboratory to assure comparability of samples throughout the process test. No samples are to be taken in the Button Line.

Even-numbered buttons will be pickled and checked for density, then loaded out in the normal manner. Odd-numbered buttons will not be pickled or checked for density, nor will any attempt be made to remove the calcium cap. They will be weighed carefully for accountability, then loaded out in the normal manner.

The PCL will ingot the buttons as rapidly as possible, as they become available.

DECLASSIFIED

B. Plutonium Chemistry Laboratory Processing

1. Direct Ingoting

All non-pickled buttons will be routed through the low-temperature ingot pour (see HW-83735). Half of these will be dribble-poured at minimum temperature (650 - 660 C); half will be plug-poured (at 700 C maximum).

Half of the pickled (normal) buttons will be routed through the low-temperature pour; one-quarter by each technique. The remaining half of the normal buttons will be ingoted as near to normal FAB procedure as possible (900 C for 30 minutes); one-quarter will be melted in a silicon nitride crucible, the other quarter in tantalum to evaluate the effect of electro-magnetic stirring on outgassing.

2. Second Ingoting Step

All the non-pickled buttons and the low-temperature - ingoted pickled buttons will be processed through the second step. Half of these will be processed under FAB conditions (900 C for 30 minutes in silicon nitride); the remainder will be propeller-stirred in tantalum at 1100 C until reasonable bell jar vacuum is attained (30 minutes maximum) to assure maximum outgassing.

3. Sampling And Analysis

Samples will be obtained by drilling from the bottom of each non-pickled button, and from top and bottom of each pickled button. A single sample will be taken from the bottom of all final ingots and from all intermediate ingots.

Samples will be analyzed for complete spectrographic, with emphasis on proper silicon evaluation. Iron will be carefully determined by the wet method. (This may be the critical determinant as to whether pickling is required. Iron, if present in an appreciable amount, is thought to be concentrated near the top surface of the button.) Tantalum analyses will be obtained, if possible, for batches stirred at high temperature in tantalum.

If alloy buttons are processed, 70-58 analyses will also be required.

4. Density

Densities will be determined by normal methods in the Button Line or FAB, with cross-checking in the PCL, if schedules permit. Pickled buttons will be so checked, and all final ingots as returned to FAB.

DECLASSIFIED

5. Radiation

The radiation output, both neutron and gamma, will be determined for metal in storage containers. Pickled buttons will be evaluated immediately after canning and again before ingoting, if the elapsed interval is more than a few days.

Final ingots will be evaluated, whether in normal containers (with plastic), or double-canned. Change of metal shape, from button-to-ingot, may increase fission neutron and gamma radiation. However, ingoting should remove sufficient impurities (reduce the α -n contribution) to result in a net decrease of total radiation from that of the original button. The nature of the container (single or double can) should have no effect.

High-grade ingots are expected to produce significantly less radiation during storage than buttons.

6. Corrosion During Storage--Evaluation

Previous experience (HW-81240) has shown that high-grade ingoted metal deteriorates much more rapidly than buttons, when stored in contact with plastic ("normal" packaging consists of sealing the metal in PVC plastic, then sealing in a can). The high-grade ingots prepared in this process test can provide an accelerated-storage container test.

The ingots will be "paired" for the storage test. One of each pair will be sealed in the "normal" package, the other double-canned with no contact between ingot and plastic.

Storage from a few days to a maximum of a month should provide useful data on storage containers and packaging problems.

C. Contribution Of Fabrication Operation

All ingots will be returned to FAB as high-grade metal for casting use. The metal can be returned as a single, casting-charge-size ingot, or as ingot segments for charge blending.

Since the purposes of this process test are not dependent on the nature of the metal, the buttons furnished may be unalloyed or alloyed (RAB), and the resultant ingots returned in the most appropriate shape and size for intended casting use.

Final evaluation will depend on radiographic integrity, and dimensional stability (if alloy).

DECLASSIFIED

III. PROBLEMS TO BE RESOLVED

A. Accountability And Transfer

Pickled buttons will constitute no problem.

Accountability and transfer details for unpickled buttons will constitute a departure from normal procedures. Allowance will have to be made for the calcium cap.

The amount of metallic calcium could probably be determined by vaporization from the button residue, and measurement of weight loss. The numbers so obtained could be useful otherwise.

B. Possible Safety Problems

The potential fire hazard of the massive calcium metal in the residue would require evaluation; also its behavior during burning, if the residue is routed to burning with its contained calcium.

R. H. Bond

R. H. Bond

DECLASSIFIED

**DATE
FILMED**

10 / 21 / 94

END