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CHR_DIVISION PROGRESS REPORT

JULY 20 - AUGUST 20, 1947 (V)

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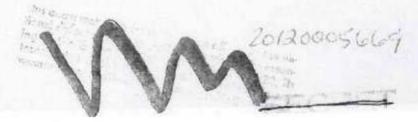
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MONTHLY PROGRESS ARRORS OF THE CHEMISTRY-WETALLURGY DIVISION

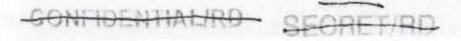
July 20-August 20, 1947

I. Research and Development.

l. The continued heavy demand for analytical services made it mandatory to devote nearly all the efforts of the Analytical Group to routine analyses. In addition to current emples, they disposed of nearly all of the backles. A total of 787 analyses were made during the month.

The construction of a chemical microscopy laboratory is nearly complete, and the expension of the spectrographic laboratory was finished. The new Baird spectrograph has not yet arrived. In spite of the heavy load of routine work, some progress was made in the development of analytical methods for plutonium alloys, the study of the absorption of alpha particles by dissolved salts; and the determination of uranium in umanium tetrafluoride, of carbon in uranium tetrafluoride, and of uranium in concentrated magnesium nitrate solutions.

- 2. The electrodeposition of lanthanum from aqueous solutions was continued with emphasis on the use of a marcury cathode. The results were not conclusive.
- 3. The training program for redicchemists in connection with the determination of bomb efficiencies in the Pacific tests has been essentially completed. The members of this section have been assigned to specific problems, such as the method of determining molybdenum and the reparation of U-236 and Fu-239. Work is also being done on special fission counters in connection with these problems.
- 4. Sources for three Rela shots were made, but much more trouble was encountered with the last shipment (No. 27) than with the previous one, although the Clinton Laboratory reported that their chamical processing was identical.
- 5. All parts of the new package equipment for sources for Raia shots have been received. The mechanism was assembled and worked well, but has not yet been tried in direct chapical operations. The redesign of the Raia processing equipment has made appropriately progress. A study of the various types of parisocopes which have been used in other installations has been started.
- 6. Proliminary work on the separation of americium and curium from plustonium has continued. A concrete counting room has been designed and submitted for construction.
- 7. The machine for producing very large foils has been tried. Ten-foot. folls with a uniformity of about 20% were made, and the uniformity compares favorably with small, hand-painted foils.
- 8. Early in 1945, abbumpts were made to secure thermal arrest points as a cample of platoning and heated. The results could not be inverpreted at the



Introduction

time, and an understanding was acquired only after dilatemetric work had been done. There was, however, some discrepancy between the temperatures of the transformations as determined by these two different methods. A special apparatus was constructed in which both the expansion and the heat effects could be observed simultaneously on the same sample. The agreement between the two sets of results was excellent.

- 9. An apparatus which depends upon electrical resistance measurements has been designed for the determination of the solidus temperature of plutenium alloys. This device has been checked on the melting point of bismuth and several alloys, and appears to be quite satisfactory.
- 10. Investigation of the melting points of the Fu-Ga system by metallographic techniques has continued. The only result available, however, is that an alloy containing .5 atomic % Ga melts between 575 and 600°C. Alloys from 2 to 5 atomic % Go not melt at 620°C. This probably means that the first outsetic in this system lies close to the plutonium end of the system.
- 11. K-ray diffraction work on the Fu-Ga system has continued. The structure of the compound Fu-Ga does not appear to be similar to that of HiAs, the latter being one of the typical structures frequently found for compounds of this type of formula.
- 12. The work on Brinell hardness of plutonium at elevated temperatures has continued, and the marked susceptibility to work hardening mentioned last month was confirmed. At 20°C the Brinell hardness number was 165 with 500 kg loads, and 255 with 3000 kg loads. The difference diminishes as the temperature increases. The apparatus is now leing redesigned to extend the temperature range up to approximately 500°C.
- 13. Defective molds and furnace failures have considerably delayed the work on centrifugal casting of thin-malled tuballoy hemispheres. However, the polar cap, which contains one-half the weight of the hemisphere, may be successfully formed by hot pressing techniques.
- 14. Progress has been made on rolling U-255 for making the discs requested by Columbia University. The work has been delayed by continual difficulty with the vacuum annualing formace. The die for blanking out the discs has not yet been completed.
- 15. A method is being daysloped for hat rolling uranium. Gladding with copper appears to be quite promising.
- 18. The plactice rection has been very active during the month. Among their activities may be montioned the preparation of eight lens covers for HE lenses, the preparation of 30 pin cets for the Wespons Division, and the preparation of 20 special slugs for piece gauge backing.
- 17. U-295 handapheres and other manpon parts oxidize slightly in eir. In handling these objects, some of the oxide rube off and high head counts result. While a suitable protective conting can be put on such specimens by the nickel carbonyl nothed, a search is now being ands for an electroplating nathed to protect the surface.

SECRET/RD CONFIDENTIAL/RD

- 18. Four Almico-V homispheres were made for the Weapons Division.
- 19. An experimental incinerator has been built for burning towels and rags and other organic materials which are contaminated with U-255.
- 20. In Item III-14 of last month's report, it was mentioned that work was being done on the use of HI solutions for dissolving PuO2. During the month, six casting skulls weighing 160 grams each were thus dissolved and sent through purification, dry chamistry, and reduction operations. Analyses on the final metal have not been received.

II. Health.

- l. 135 persons were sent on health passes during August. All tests were negative. All personnel exposed to polonium were given urine radioassay tests. Five persons indicated they were excreting 50-100 c/m of polonium per 24 hour sample of urine, and one person showed on one test that he was excreting 498 c/m of polonium per 34 hour urine sample. This person was removed from exposure to polonium until the counts found in his urine were less than 50 c/m of Po per 24 hour sample. All other polonium urine radioassay tests given during the month were negative.
- 2. Airborne alpha air contamination tests were run in all Pu, Fo, and U processing areas. 70 air testing units were in operation, and approximately 1600 individual tests (air samples collected varied from 800 liters to 120,000 liters) were made in these areas. Average airborne alpha activity in the air throughout GMR laboratories dropped 80% under that of the previous month. However, temporary high air counts were observed in 20 laboratories due to (a) faulty operations, (b) leakage of water through the roof of D Building, (c) heavy construction work in D Building, and (d) weighing of an uncovered sample of plutonium on an open analytical balance.
 - 3. Redicactive surface contemination remained at about the same level.
- 6. Routine and special tests with film badges, desimeters, cobalt eluge, gamma and neutron survey counters and meters indicate beta, gamma, and neutron radiation levels were very low. No excessive exposure of any person to gamma rays or neutrons was recorded.
- 5. All wells and reservoirs supplying water to the Project were analyged for the presence of Pa, Fo, U. Rala, and RaBa contaminants. No contamination in the water was found.
- 5. One contaminated accident occurred at DP West Site during the month. This was an excessive air count caused by a technician weighing an uncovered sample of plutonium on an open analytical balance.

III. Macellaneous.

1. In the July 20 report, I mentioned that I had sent out job offers to 18 persons, and at that time security clearence was on the average 70 days old



CONFIDENTIALIZED -

Introduction

Adgust 20, 1947

without result. As of August 26, 1947, eight of these persons had been cleared. Of the remaining ten, the number of days since submission varies from 80 to 126 with an average of 100 days without clearance. In addition, we now have from this Division 12 other persons who were submitted for clearance from 56 to 126 days ago. The average of this group is 90 days.

The situation has deteriorated more than 20 days in the last month. If this continues, we may expect that in January it will require an average of six months for clearance. How does the AEC expect us to maintain programs on this basis?

Eric R. Jotte

Control of the last of the las

GROUF CAR-1 MONTHLY REPORT -- C. F. Netz, Group Londor -- August 20, 1947

GENERAL

The continued heavy demand for analytical services made it mandatory to devote nearly all our efforts to routine analysis. In addition to current samples, nearly all the backlog was disposed of. We are still unable to handle samples such as plutonium oxide because of lack of proper equipment. A head for such work has been an order for over a year. Curbon analysis of plutonium by the vacuum fusion method has been discontinued due to lack of personnel and inadeptibility of the procedure for routine analysis. Equipment for a combustion method is being planned. Conversion of Room D-503 into a chemical microscopy laboratory is nearly complete. Construction work on increasing the size of the spectrographic laboratory was finished. The Baird Spectrograph has not arrived.

The breakdown of analytical services is as follows:

Source	Analyses Reported
CNR-1	5
CER-4	35
CMR-5	75
C2S1-6	68
CMR-8	312
C12-11	351
Miscellansous	_15
Total	787

PROJECT & PERSONNEL

ChR-1=7 Analytical Methods for Plutonium Alloys (Ni, Co, Cu)

Borgetresser

ChR-1-14 Radioohomical Assay Notheds

Bergstresser, Bradford, Kingsley, laCombe, Reynolds

PROGRESS

Synthetic solutions containing Pu-Ni, Pu-Co, and Pu-Cu were subjected to electrolysis. The alloying elements, Ni, Co, and Cu, were quantitatively deposited in a mercury cathods. In seeking shorter, more rapid methods, colorimetric procedures were tried without preliminary separation of the plutonium. Results indicated that cobalt can be determined in the presence of plutonium with nitrose-R salt as a color reagent. One mg of plutonium gave no interference when present with 1 to 100 micrograms of cobalt.

The study of errors due to absorption of alpha particles by dissolved salts was extended to solutions containing smalle acid and potassium oralists. Sarlier work of a similar nature was respected, using an amount of plutonium that gave approximately 100 counts per minute on a foil, instead of approximately 1200 counts per minute.

SECRET/RECONFIDENTIAL/RD



GROUP CLR-1 MONTHLY REPORT -- C. P. Mate, Group Leader -- August 20, 1947 (contd.)

PROJECT & FERSONNEL

CHR-1-16 Chemical Microscopy of Plutonium Metals

Gettens

CtR+1-20 Determination of Uranium in Uranium Tetrafluoride

Ashley, Henicksman

CMR-1-21 Determination of Carbon in Uranium Tetrafluoride

Van Kooten

CMR-1-27

Determination of Uranium in Concentrated Magnesium Fitrate Solutions

Honickausn

PROGRESS

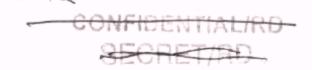
The laboratory for this work was completed. Considerable time was spent in assembling and calibrating equipment. A search of the literature was made and a table prepared containing information that might be of value in this work.

Assay was attempted using colorimetric, volumetric, and gravimetric methods. Results to date have been erratic and inconsistent. A method in which the sample was ignited to U₃O₃, dissolved in nitric acid, funed first with perchloric and then with sulfuric, then run through a Jones reductor and thrated with NMnO₄, gave consistent results. However, the method has not been checked by another procedure.

Present results indicate that the fluorine can be quantitatively absorbed by predered, unfired magnesium exide and CO₂ not absorbed, when the temperature of the magnesium exide is held at 900°C.
Fairly consistent results for carbon in a commercial tetrafluoride were obtained. However, as
yet there is no way of proving the value obtained
is the correct one. Considerable trouble has been
encountered in weight variation of the absorption
tubes, due to humidity or some other form of interference.

The solutions of particular interest contain iron, calcium, and chromium, in addition to large smounts (SN) of magnesium. An ammonium hydroxide precipitation to separate iron, chromium, and uranium from most of the magnesium and calcium seemed to be satisfactory for colorimstric de precipitation of

the uranium. Recovery from synthetic solutions approximating the composition of M Building charge solutions was within 0.8% of the true value over the range S to 50 mg per 100 ml. The same separation was applied to M Building concentrates, containing from 200 to 300 mg of uranium per 100 ml. Numerous attempts were made to check the colorimatric results by standard volumetric and gravimetric procedures, but without success.



GROUP CHE-2 MORTHLY REPORT -- J. F. Leasers, Acting Group Leader -- August 20, 1947 .

PROJECT & PERSONNEL

CAR-Z-2 Absorption of Low Concentrations of Plutonium Ica by Exchange Resins

Huber

CMR-2-5 Preparation of Volatile Plutonium Fluorides

Florin

CMR+2-6 Preparation of Plutonium Carbides

Stillson, Lemons

CM-2-7 Electrodeposition of a Lanthanum Alloy

Florin

PROGRESS

This problem was inactive during a portion of the month, due to a lost-time injury to personnel. An acceptable analytical procedure is not yet available. The procedure at present involves the concentration of the hot solution and precipitation of Fu hydroxide using lenthanum carrier followed by precipitation of the Fu and La se the fluoride which is then plated and counted. At present, the hydroxide precipitation is ineffective in stripping the solution of plutonium. It may be necessary to attempt an entirely different procedure.

Inactive.

The apparatus for this preparation was ready for operation during the month. A breakdown in the induction heating apparatus is delaying operations at present.

Continued attempts were made to electrolyse lenthanum from aqueous solution. A mercury cathode,
graphite ances, and graphite third electrode for
measuring independent cathode potentials were
employed in a small pyrex cell equipped with a
stopcook at the bottom to permit removal of the
marcary cathode without interrupting the current,
Stirring was provided by an electric motor, and
cooling was effected by a stream of cold water
directed on the cell. The independent cathode
potential was measured by a vacuum tube voltmeter.
10 ml. of solution were used in the cell. Yields
were determined by measurement of radiolenthanum
tracer activity.

Ostensibly, no La yield resulted on electrolysis of the solutions:

- 1) 5 M NH CI 0.27 M Lacl
- 2) 10 M LiG1 0.27 M LaG1, 3) 10 M LiG1 - 1.4 x 10-5 M LaG1,

Independent outhods potentials, measured with respect to the whird electrode, vs. current dia-

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GROUP CHE-2 HOWHILM REFORT -- J. F. Lomons, Acting Group Leader -- August 20, 1947 (comtd.)

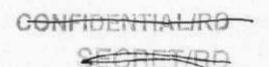
PROJECT & PERSONNEL

CNR-2-7 (contd.)

PROGRESS

for the MH_Cl solution. The LiCl solutions gave curves with a break that depended upon the acidity; the basic solutions showing a break at about 2.5 volts, and the acid solutions showing a break at about 1 volt.

SECTION!



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PROJECT A DECEMBER.

A. Anitiator Production and Incidental Production Research

> OiR-S-1 Vachin Infilition Profession

1. Counting Assays

Abel, Georgi, 1.Moulton, Thomas Loughlin

ARCOUNTS &

The rajor parties of the work of the group was agent in the production of wroking and in problems directly related.

The foils and gauss of five shipments totalling 850 curies were counted in the AFs and Goiger-Haller counter assemblies.

DELETED

Three assumpted took gow initiators were prepared and reviewed teckgrounds followed after assumbly. The nautron backgrounds of those assumblies are slowly increasing.



A program has been initiated to identify and wider timeto the cross of the increase in approximation beckmanner often hastille of gar but, initiations GROUP CAR-4 MONTHLY REPORT - R. W. Spanes, Group Leader -- August 20, 1947

PROJECT & PERSONNEL

CMR-4-1 Training Program for Radiochamists

Balagna, Elkin, Gilmore, Leng, Hower, McClendon, Kelnick, Minkkinen, Moor, Sattisahn, Spence

CMR-4-Z Determination of the Half-IAfe of Tritium

Goldblatt, Robinson

CAR-4-3 Analysis of Hydrogon-Tritium Mixtures with the Mass Spectrometer

Jones, Povelites

FROGRESS

The training program has been essentially completed, and the personnel assigned to specific problems in connection with efficiency measurements.

This work will to held up until the new laboratories in U Building are completed.

The D_m gas used in preparing the DI whose behavior was reported last month was analyzed and gave a D/H ratio of about 35:1, which agrees well with the DI/HI ratio obtained from the large sample of DI. It does not agree with the DI/HI ratio of about 7:1 obtained with the small DI sample. This checks earlier evidence that large DI camples give more trustworthy results than small DI samples.

A sample of DCl was prepared by the photochemical combination of D₂ (over 99% pure) and Cl₂ prepared from AuCl₃. The DCl³7/HCl³7 ratio was only about 5:1; it was expected that a much higher ratio would be found since exchange processes involving DCl should be loss likely than if DI were used. The atomic chlorine peaks were anomalously high.

We have found the results depend upon the gas pressure tehind the capillary loak. Correspondence with Dr. A. O. Nier revealed that such behavior has been met with elsewhere. A loak which insures molecular flow is necessary, and we believe such a leak can be procured from a commercial source.

In view of the lack of success so far achieved in using the mass spectrometer for analyzing hydrogentritium mixtures, very little more work will be done on this problem.

One 4 mil tentalum foil containing dautorium was propured and given to Group P-3. Three attempts to reduce the brittleness of tentalum foils by coating one side of the tentalum with copper failed; the copper wet the tentalum, but the fails were

CMR-4-4 Preparation of Tritium and Dautorium Falls

Pod:1:we

references.

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GROWP CAR-4 MONTHLY REPORT -- R. W. Spence, Group Leader -- August 20, 1947 (contd.)

PROJECT & FERSONNEL

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CAR-4-4 (contd.)

CMR-4-8 Preparation of Foils of Active Material

Gilmore, Potter

OLR-4-9 Routine Preparation of Rala Sources

Barker, Bone, Fitzgibbon, Halligan, Leary, Marjon, B. Newbury, F. Newbury, Shaffer, Tafoya, Wilhelm

CAR-4-11 Re-Engineering of Rala Fackaging

Crits

CLR-4-12 Redesign and Re-Engineering of the Rain Process

Cos, Loary, Lilienthal

PROGRESS

still brittle. In one case the copper seemed to allow with the tentalum, and no deuterium could be absorbed.

JIV. ILLEVIDALINE

An induction furnace has been set up to heat the translature by induction in such a way that the brittleness is greatly reduced.

One 28 feil and sixteen 25 feils ware prepared by the sapen technique.

Shipment No. 27 was received and dissolved on July 25. It measured 20%5 curies. This shipment was processed as follows:

Date	Yield	D:	isposition
July Aug.			hot #84 hot #85
Aug.			hot #86

Much more trouble was encountered with this shipment than with the previous one, although the Clinton Laboratory reported that their chamical processing was identical with each shipment.

All parts of the new packaging equipment have been received. The mechanism was assembled and worked well. It has been installed in Bayo Canyon and will be tested in a cold run as soon as the Rale schedule permits.

All the drawings have been released for manufacture of the spindle assembly. The total number of drawings for this assembly is sixty-one.

A total of 19 drawings has been released for the manufacture of a tip removing packaging unit. The final assembly cannot be completed until receipt of the purchased parts.

The drawings for the jib orans assembly upon which the spindle rides is nearing completion. The purchased parts required for this assembly were ordered on July 25.

SECRETARD CONFIDENTIAL/RU

GROUP GAR-4 MONTHLY REPORT -- R. W. Spence, Group Leader -- August 20, 1947 (contd.)

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PROJECT & PERSONNEL

CAR-4-12 (contd.)

PROGRESS

A tentative building layout for the operations necessary to the Bayo Chemistry has been made.

Some further work has been done with lead ore concrete using mixtures of cement, sand, and lead cre. Better bonding of the cement is apparent but not at all satisfactory. If the block will hold structurally, radiation absorption tests will be made. It is felt that the percentage of lead present will not allow a material reduction in wall thickness.

Sample blocks have been tried using a mix of water glass, litharge, and lead ore. A sample was also made using just litharge and water glass. In both cases the blocks crumble easily and cannot be handled.

The drafteran in V Shop, who has been working on design and detail work since March 18, has left the project. The work he has been on has been picked up by Mrs. Coe.

Eight drawings have been submitted by Black & Veatch, but before they can be checked extensive revisions will be necessary.

On August 18, assembly drawings for five types of periscopes were received from the Argenne Mational Laboratory. A complete study has not yet been made, but tentatively two types appear to be satisfactory for our use. The D-A type periscope is designed for insertion through a five foot wall and provides scanning of 150°. The D-B type is designed for a thick wall and is used for close inspection of objects behind the wall. Inquiries will be made concerning the possibility of obtaining complete units or obtaining the lenses and mounts with the assembly being done here.

Work has begun on the construction of the new laboratories.

A new drybox for small scale separation experiments, a large hood for emericium work, and a hood to house the reservoir and centrifuge used in conmection with supernatants from the perceide precipitation are now being designed.

The hood which will house the apparatus for the dissolution of plutenium and the precipitation of plutonium perceids has been designed and constructed.

GMR-4-13 Americium Freduction Design

Briesmeister, Dalton, Ludwig

CEODET/DD

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FROJECT & FERSONNEL

OMR-4-14 Plutonium Chemistry Involved in Transplutonics Production

Lane, Nigon

GAR-4-16 Research on Foils

Gilmore, Potter

CMR-4-19 Development of Methods for Determination of Ne⁹⁹, Zr⁹⁷, and Np²³⁹

Hower, Lang, Melnick, Minkkinen, Moor

CHR-4-20 Fission and Alpha Counting Development

Balagna, Elkin, McClondon Sattisahn

FROGRESS

A ten gram trial run of the dissolution of plutonium metal and the precipitation of plutonium peroxide was made. Results were better then with smaller emounts of plutonium. It has been decided that the small amount of oxide formed in the dissolution of plutonium metal is too small to cause serious trouble, and no attempt will be made to dissolve it.

The optimum temperature for the precipitation of plutonium percuide has been found to be in the range 40-50°C. It is desirable to cool to 0°C after precipitation to facilitate rapid settling of the percuide.

The preliminary work on the machine to produce very large foils has been completed. The 10 foot foils show a uniformity of about 20%. This uniformity compares favorably with small hand-painted foils.

Work has been done on the preparation of photographic emulsions impregnated with U-235. The emulsions were scaked in alcoholic solutions of uranyl nitrate for varying lengths of time. Densities of 1 mg of U per om² have been obtained. These foils will be used by Rosen of Group P-12 in an attempt to find triple fission.

Work is continuing on the Mo procedure; a somewhat shorter method of Stanley and Katcoff is now being tried. The spread in results is still somewhat too great (10% for 10 determinations run by five analysts), although the experimental half-lives obtained indicate satisfactory decontamination.

Several runs have been made at Gasga using the present stainless steel double fission counter. While absolute results have not yet been obtained, the problems are being systematically studied. A lucite double fission counter drawn to our specifications is now being constructed.

The chamical separation of U-235 and Pu-259 prior to the electrodeposition of these elements for alpha counting is being investigated using U-233 as a tracer for uranium. Apparatus needed for the electrodeposition work is now being sade.

Con

PROJECT & HERSONNEL

CMR-5-1 Alloy Survey

Struebing, Whyte, Wensch

PROGRESS

The only alloy compositions prepared (other than Pu-Ga alloys for CMR-5-2) were in the plutonium-gold system and contained the following atomic percentages of gold: 1, 2, 3, 97, 98, and 99. After original melting and solidification, each of these alloys was recent according to established practice into two ingots of approximately equal size. Two good castings were obtained in each case except 2 and % gold, of which only one sound casting each was obtained. Further alloy preparation has been suspended pending receipt of casting crucibles of a new size, large enough to enable each alloy to be recent and annealed as a single ingot.

Graphite crucibles, to be used in studying the system plutonium-carbon, are also on order. Using these, it is hoped to be able to obtain a carbon gradient in plutonium by a method reported to have been successfully used in determining the variation of microstructure with carbon content in uranium. Analytical results from CMR-1 on a specimen of what had been supposed to be pure plutonium showed 1905 ppm, or 3.67 atomic percent, of carbon. This specimen contained numerous inch sions of the "plats-like carbide" type found in the 5 atomic percent carbon alloy discussed in last month's progress report. When the origin of this specimen was traced, it was found to be a third remelt of plutonium obtained from CM-8 on September 6, 1945.

An ingot of pure plutonium was cast and hot pressed for dilatometry. This specimen was run by Mr. Walters, who, using a newly constructed device for automatically controlling heating and cooling rates, obtained both dilatometric and inverse rate of temperature change data for three successive heatings of the specimen, and for cooling following the second heating.

Two proviously prepared dilatometer specimens, containing 5 atomic percent respectively of indium and tin, have been given a new homogenization heat treatment for 100 hours at 5500C preparatory to re-running them in the dilatometer. Two new furnaces with temperature controllers for homogenization heat treatments are being installed in order

GROUP CHE-5 MONTHLY REFORT -- A. S. Golfinberry, Group leader -- August 20, 1947 (contd.)

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PROJECT & PERSONNEL

CAR-5-1 (contd.)

PROGRESS

to increase from one to three the number of such units available for simultaneous use at different temperatures.

Further work with the electrical resistivity
method of determining phase changes indicated a
need for improvement of the apparatus with regard
to such features as relay contacts, cold junction
control, and electrical connections generally.
Palladium contact relays have been ordered; considerable improvement in cold junction control
has been effected, with further changes contamplated; and soldering of all electrical connections has eliminated the most unsatisfactory charactoristics originally observed in this equipment.

The 50 weight percent lead-antimony alloy first used to test this method gave a well defined indication of resistivity change at the sutectic temperature, but, probably because of the almost 2500 difference between sutectic and liquidus at this composition, no discernable change in slope of the resistance versus temperature curve could be detected at the liquidus temperature. For this reason, it was decided to investigate instead the bismuth-antimony alloys, which manifest complete liquid and solid solubility. Six runs were made with chamically pure bismuth, and this metal's umique increase in conductivity on melting was clearly and consistently indicated to occur at 270°C, in good agreement with 269-271°C reported in available literature. Attempts to work with antimony were abandoned, however, for the reason that this metal apparently alloys with the thermocouple elements (in metallic contact with the specimen in order to serve also as conductors in the resistivity circuit) in such a way as to introduce extraneous potentials or resistances which obscure other electrical effects. An investigation of the bismuth-lead system has therefore been initiated, and while results are as yet incomplete, enough data have been obtained to give promise of good success throughout most of this system involving a outsotic, a peritectic, and extensive solid solution.

In obtaining this date, readings recorded on the Micromax strip chart have to be replotted to an enlarged scale in order to emphasise changes in

GROUP GLR-5 MONTHLY REPORT -- A. S. Coffinberry, Group Leader -- August 20, 1947

PROJECT & PERSONNEL

CER-5-1 (contd.)

CLR-5-2 Phase Diagram of Plutonium-Gallium

Gerds, Schonfeld, Whyte, Ellinger, Struebing

PROGRESS

slope. In order that critical points may be obtained directly from readings automatically recorded in magnified form, an electronic amplifier is being procured to multiply currents supplied to the Micromax.

The principal work on the plutonium-gallium system has consisted of an as yet uncompleted attempt to determine the liquidus line for the composition range 0.5 to 5.0 atomic percent gallium. Use is being made of seven ingets of Pu-Ga alloys already made up to have the compositions: 0.5, 1.0, 2.0, 3.0, 3.5, 4.0, and 5.0 atomic percent gallium. All had been homogenised at 450°C for 100 hours, and the 4.0 and 5.0 percent alloys had, in addition, been subsequently annealed at 400°C for 24 hours.

The procedure being followed is to subject the seven specimens, each scaled into an evacuated glass or vitroosil capsule, to overnight heating (16 hours) at successively higher temperatures according to a predstermined schedule. The specimens are mater-quenched from the furnace and examined schedule stallographically after each treatment.

The temperatures investigated so far are 525, 550, 575, 600, 610, and 620°C. The only specimen in which definite evidence of melting has yet been observed is the 0.5% Ga composition, which had melted sufficiently to assume the shape of the capsule after the 600° treatment. At 610°C the 1.0% alloy had softened somewhat, as shown by slight deformation on the surface of the specimen; but after heating both to this temperature and to 620° (with somewhat further deformation but no marked change in shape) no metallographic evidence of melting could be found. The remaining specimens have shown no evidence of either melting or softening after the 620° treatment.

Consideration has been given to the possibility that an oxide coating of high mechanical strength may be preventing molten metal from changing its shape; so that the microstructures now being observed, which reveal some type of decomposition of the original structure in every case, may be de-

GROUP CHE-S MORNHAY REPORT -- A. S. Gordinberry, Group Leader -- August 20, 1847 (contd.)

PROJECT & PERSONNEL

01R-5-2 (contd.)

PROGRESS

rived from the quenching of a liquid metal. This seems unlikely, however, because all specimens have appeared to be bright and free from oxide after every heating.

Photomicrographs of every specimen are hains to be prefartured when the transformations in the composition and temperature range covered seems to be evolving as a by-product of the solidus determination. Density measurements have also been made on every specimen after each heat treatment. These results indicate changes of density as large as 0.60 g/co for the 0.5 and 1.0% Ca compositions, but not more than 0.50 g/co for any one of the other specimens.

A dilatometer specimen containing 0.75 atomic percent gallium has been given a preparatory homogenization heat treatment at 550°C for 100 hours.

A second attempt was made to prepare a SO atomic percent gallium-plutonium alloy, but some of the added callium was observed to have remained unalloyed on the side of the crucible. Allowance for the weight of this gave 29.3% as the callium content of the alloy. However, its x-ray diffraction pattern was found to be almost identical with that of the 20% gallium alloy, except that weak lines extraneous to the eta phase (Pu,Ga?), suspected of indicating the existence of another phase between 25% and 50% gallium, were very slightly stronger.

Second and third attempts were made to obtain an entirely satisfactory 50 atomic percent gallium-plutonium alloy. The second attempt, carried out at 180°C, resulted in complete melting but yielded an ingot containing a large central cavity. The density of this material was determined to be 10.86; but its diffraction pattern showed only a few weak diffuse lines and a dones background. These lines bere no resemblance to the excellent pattern obtained with the first 50% composition attempted.

In the third obtempt, molting seemed to hive just been accomplished at 1100°C. Densities determined on two portions of the original ingot averaged 11.816 (11.814 and 11.810), which for 50% Cm lies

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GROUP CIR-5 MORTELY ROPORT -- A. S. Schlinborry, Group Leader -- August 20, 1947 (contd.)

PROJECT & PERSONNEL

GAR-5.2 (contd.)

FROGRESS

closely on a straight line for density vs. atomic percent gallium extrapolated from the 3% to 25% Ga range. After recasting the two portions of this ingot, densities of only 10,930 and 11,110 were obtained; and both x-ray diffraction and metallographic examinations of the recast specimens indicated a gallium content appreciably different from SCA. According to Kelley's log-P equation for pure gallium, both the original melting and the recasting of these specimens was carried out under a sufficient pressure of atmosphere to prevent loss of gallium by boiling. However, Harteck's scattered experimental data on gallium, from which Rellay's equation is derived, indicate the possibillity of vapor pressures almost ten times greater than were allowed for. In view of this discrepancy, experiments are being undertaken to determine more exactly the vapor pressure of pure gallium at the temporatures involved in alloying.

The density value, 11,516, for the 50 atomic percent gallium alloy requires that the hexagonal. close packed unit cell reported for FuGa, with $a_0 = 6.29 \, A$, $c_0 = 9.00 \, A$, c/a = 1.44, contain 6.82 molecules of FuGa. Since the nickel arsenide structure (ap = 3.34-4.30 A, cp = 5.03-6.12 A, for known examples) contains two molecules of MiAs per unit cell, it seems unlikely that PuGa can be regarded as derived from any multiplication of the NiAs arrangement. Resemblance to NiAs is further rendered doubtful by the fact that, while not all 50 lines of the PuGa pattern have as yet been indexed according to either cell, on alternative unit cell that seems to be equally satisfactory is a simple hexagonal with a = 6.29 A, co = 4.50 A, c/A = 0.72

Other x-ray diffraction work on the plutoniumgallium system has involved phase identification
and lattice parameter determinations on the 3 and
16 atomic percent gallium alloys. The results of
these determinations will be reported in a later
summary of similar results for all diffraction work
done on plutonium-gallium compositions.

Regarding optimum temperature and time for stress relief of Pu-Ga filings, it was decided that, since the Ga filings annualed at 200°C for 70 hours gave no PuO lines but did not profince sharp K-alpha doublets, a smitable treatment for the 3% Ca alloy might be 18 hours at 250°C. This gave sharp K-alpha



SECRET/RD

Survivore NO

CROUP CLA-5 MONTALY REPORT -- A. S. Coffinborry, Group Leader -- August 20, 1947 (contd.)

PROJECT & REESONNEL

CMR-5-2 (contd.)

CBR-5-3 Services

Gerds, Schonfold, Winburn, Southard

CMR-5-5 Crystal Structures of Plutonium

Krill, Bllinger

CAR-5-6 Mechanical Properties of Phytonium

Winburn, Southard

FROCRESS

doublets and only extremely faint, low order lines of PuO.

Three members of Group CMR-5 visited on A-2 laboratory at S Site for consultation on the preparation of explosives for microscopic examination. Several Pu specimens were sawed into smaller samples for CMR-1. Five concrets cylinders were compression tested for the Engineering Operations Inspection Department.

Attempts were made to improve line sharpness and reduce background in photograms of beta-plutonium obtained with the high temperature diffraction camera. Stress-relief ennealing of the extraded wire used as apecimen accomplished no improvement in line sharpness.

Neither nickel nor aluminum foils, used as filters both in contact with the film and several millimeters in front of it, accomplished any perceptible decrease of background blackening. Exposures were then tried using empty silica glass and Lindemann glass capillaries, and finally without either specimen or capillary in the camera. Since the background remained practically unchanged in all cases, it was concluded that the comera, and not the specimen nor its container, constitutes the source of background scattering. Because the diamotors of the collimating pinholes were once increased without any corresponding enlargement of the ray trap at the back of the camera, attention will be given to making sure that all of the undeviated beam is caught in this trap.

Further hardness determinations on pure plutonium in the temperature range 20° to 200°C have been made, about half with a 500 kg load and half using a 3000 kg load. At room temperature (20°C), average hardnesses of the alpha phase were found to be BHN 165 with a 500 kg load and BHN 235 with a 3000 kg load. This difference in hardness due to difference in load was found to decrease with increasing temperature. At 70°C average Brinell hardness numbers of 140 and 165 were obtained using, respectively, 500 and 3000 kg loads. These results substantiate the previously reported

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GROUP CMR-5 MONTHLY REPORT -- A. S. Goffinberry, Group Leader -- August 20, 1947 (contd.)

PROJECT & PERSONNEL

CMR-5-6 (contd.)

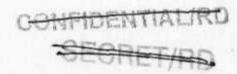
PROGRESS

observation that alpha-plutonium is highly susceptible to work hardening during hardness testing.

Because of the previously noted properties of extreme softness and tendency toward exidation of plutonium at higher temperatures, the present method of hardness testing, using the Richle hydraulic machine, will not be suitable for use at temperatures above the beta range. For this reason, two different types of apparatus have been designed to enable the obtaining of satisfactory hardness values, either Brinell or Vickers, at high temperatures, possibly into the epsilon range. One of these designs is now being constructed, and depending upon its performance, the other may also be built for comparison.

A simple device has been constructed and put into use in order to measure, and thereby enable correction for, linear contraction of the hardness impression on cooling from the temperature of its formation to room temperature. Also, some improvement in avoidance of oxidation has been attained by adding a diffusion pump to the mechanical pump used to evacuate the can in which hardness impressions are taken.

SSORRE



GROUP CHR-S MONTHLY REPORT - J. M. Toub, Group Leader -- August 20, 1947

PROJECT & HERSONNEL

PROGRESS

ChR-6-1 Refractories

E.Sletin, Cordero, Johnson

CHR-6-2 General Foundry Work

Arnold, Castro, Wicklin, Donahos, R. Martinez, Palmer Note: Production of special materials is outlined in a separate report.

260 MgO casting plates, crucibles, and pouring rods were delivered to Groups CMR-5, 6, and 11.

The large gas kiln was down for repairs again, and it was necessary to fire some of the products in the induction coils.

DP West received several Y-3 crucibles which had been high fired in the induction coils. Although these crucibles showed little or no penetration of metal into the walls of the crucible, the mold crucible continued to crack. It is new believed that the combination of casting technique plus the coefficients of expansion of the MgO and the plutonium are the cause of cracking, rather than the crucible design.

Eventy-four support rims of BeO have been requested by M Division. The techniques are being developed for the production of these rings.

A total of \$827 pounds of tuballoy was cast this month. Included in this total are 147 cubes and two large plates for Group M-2, nine hemispheres for hala shots, and six large pieces for Group M-4.

Bight cadmium hemispheres, 4.5 inches in diameter, were cast for Rala shots.

Pour vacuum promeits, each weighing 300 pounds, were cast of copper scrap to refine the metal and to produce multing charges for cylinders to be used in the fast reactor.

Two silver eastings were made for Group CAR-8.

A sagnesium plate 2 x 10 x 12 inches was cast for radiographic test purposes. Proper flux materials were not available, and the substitute material proved inadequate, resulting in a defective casting. The necessary flux has been on order, and the casting will be repeated upon receipt of the flux.

Further work on easting stand-in pieces for emplosive leases has indicated that it may be possible to east Wood's motal into the standard Cerro-tru

GROUP CHR-6 MONTHLY MINORY -- J. M. Taub, Group Loader -- August 20, 1947 (contd.)

PROJECT & PERSONNEL

CMR-6-2 (contd.)

CMR-6-3 . General Fowder Metallurgy

Dorfman

CMR-6-4 General Fabrication

(1) U-255

Andrews, Barnard, Raol, Sheinberg, Salasar

(2) Development

Meyeer, Broverman, Edelmann, Osborn

PROGRESS

limed molds. The eastings would be cored so that the resulting less would have a mass approximately equal to that of the HE less.

During the past few weeks many orders, several of them quite large, have been received for tuballoy, eadmium, and copper castings. This work alone will carry over for the next few months, and unless early elegrance is obtained for men with job offers, who will replace personnel returning to school, the work of the foundry section will be seriously curtailed.

Most of the time this month has been spent in the construction of the high vacuum sintering equipment. This is now practically completed.

The drybex used in the handling of uranium powders was everhauled and new gaskets installed. The box had been leaking air, resulting in the exidation of the uranium powder.

Additional uranium powder was received from Group CIR-8 but has not been tested.

Progress indicated in special report.

Defective molds and furnace failures have delayed considerably the work on the centrifugal casting of thin-wall tutalley hemispheres. However, it was found that the polar cap, which contains one-half the weight of the hemisphere, may be successfully formed by hot pressing techniques. Graphite dies are now being made for forming the central rings of the thin walled aphere.

The rolling for the Columbia University disc job has been partially completed. The delay in this work has been caused by continual difficulty with the recount annualing furnace. A new and feater method for annualing practice is now being worked upon. The his for blanking out the Columbia discs has not been received from the shop but is expected within the race for days.

GROUP CHA-6 ROFIFLY REPORT -- J. M. Caub, Group Leader -- August 20, 1947 (contd.)

PROJECT & PERSONNEL

CMR-6-4 (2) (contd.)

> tlR-6-6 Plastic Services

Church, West, M-Arnold, Griffin

PROGRESS

Work has begun on a program of rolling .020 inch stock for the fabrication of 1.960 inch diameter discs for the General Electric Company. Master patterns have been prepared for investment molding of the rolling stock.

Work is continuing on a method for hot rolling uranium. Cladding with copper appears to be quite promising. The major problem to be overcome at this time is the cutting of the uranium by the impinging stream of molten copper.

Analytical results on the U-Be alloys still reveal a loss of uranium during the melting and casting operation. The relatively long period of time required for the completion of this job is partially due to the delay in receiving the analytical reports. The method of analysis is necessarily long and has required several weeks for the analysis of a sample.

The vacuum molting furnace has been assembled and tested for leaks. The heating system will be tested as soon as the electrical connections have been completed.

Group GMR-5 requested 1000 ml of methacrylate casting resin for mounting Pu. 600 ml was delivered from stock, but it will be necessary to set up vacuum distillation apparatus to complete the order.

The five inch diameter die for the pressing of thin \$\text{UO}_{g}\$-polystyrene discs for Group M-4 has been received and several discs have been precsed.

Eight lens covers for the 121800 HE lens were delivered to Group X-8. The die for the 32190 lens is not expected before November.

A total of 30 pin sets has been mounted and delivered to Group M-4. These have proved catisfactory in test shots, and production is continuing on this job. Molds for other types of pin sets are being designed for production use.

Two sets of hemispheres were blow-molded for Group H-G. This completes the current order.

Ementy slugs I inch in diameter and I inch long of the following compositions were delivered to Group M-A to be used as piezo gauge backing:

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GROUP CAM-6 MONTHLY BEPORT -- J. M. Taub, Group Leader -- August 20, 1947 (contd.)

PROJECT & PRESONNEL

GMR-6-5 (contd.)

FROGRESS

- (a) 23.4% (vol.) of UO₂ in polystyrene; density 3.0-3.2 gms/cc; compressive strength 11,400 pci.
- (b) 21.7% (vol.) of UOg in Durez 287; density 3.0-3.2 gms/co; compressive strength 25,600 pci-

One steel mold for casting piece gauge backings was used and delivered for testing. The molds are not removed from the casting since they become an integral part of the testing apparatus. Fifty brass molds were received from the shop but cannot be used because the casting resin reacts with brass. These will be plated and tested for reaction. This work is for Groups N-4 and X-8.

Twelve platinum foils were coated with a urea-for aldehyde A stage resin and the coating polymerized in place. Coating thicknesses were .005 inches to .006 inches thick and had a nitrogen content approximately 2.65 mg/cm². The foils were requested by Group P-3.

Twenty foils containing 0.29 mg/cm2 of Ug 03 were delivered to Group P-3. Still to be delivered are ten foils, each containing 50 volume percent of Bi, NaI, Sb, As, and P, respectively, in a binder of polythene.

Corresion resistant tubing of lucite and Saran were bent to specified shapes for Group CLR-11.

A special laminated shape was built up of rubber and Recnite T-85C. This was for Group X-3.

An adhesive for holding steel pins in insulator bushings was developed for Group M-4. A chloroform solution of methyl methacrylate polymer was satisfactory for use on lucite bushings. A large scale order for bushings may be forthcoming soon.

Proliminary work has been started on the fabrication of plastic target bases for Group M-4. The bases are 7 inches in diameter and 0.75 inches thick, and contain a depression 2.5 inches in diameter by 0.187 inches doep in the capter of the plate. The faces of the plate must be parallel sithin + .0005 inches.

A sing of polytham 1 inch in dismeter by 1 inch long was molded for Group P-S.



OFOUR CHR-6 MONTHLY REFORT -- J. H. Toub, Group Leader -- August 20, 1947 (contd.)

PROJECT & PERSONNEL

CLR-6-5 (contd.)

CMR-6-6 Electroplating

Slatin, Gore

PROGRESS

Foils containing the exides of Mo. Fe. Gr. and Hi isotopes bonded in polythone are being prepared for Group P-3.

Group CMR-8 has requested that manometers be mounted in a plastic. Lucits molds will be made and a Kriston casting rests will be used. Manometers are now being made in the glass shop.

Three dummy toron-plastic assemblies have been requested by Group M-4 for delivery in September. Mixing with unenriched boron is now under way.

1:0 pieces of U-235 were stripped and replated with silver.

The copper from the large, defective heat exchanger casting is being stripped from the coils so that it may be remalted. The steel coils will be exposed and the cause of the failure may then be determined.

The service work this month consisted of plating a number of miscellaneous items with silver, cadmium, chromium, and gold.

Considerable work has been carried on to develop a thin nickel plate on uranium metal. Some of the experimental data obtained thus far are as follows:

- (a) Tuballoy with .0005 inches mickel placed in dry atmosphere at 100°C is still in original form, and the weight has increased .000 grass over a period of 165 hours.
- (b) Tuballoy with .0005 inch nickel plate was held in a steam bath for 36 hours. The plate peoled off because of oxidation of the tuballoy. This test is probably too rugged, and further tests will be conducted at 60°C over water.
- (a) Nickel plated pieces held at room temperaters have been checked by a monitor at various time intervals after plating and no counts have been observed.

The following jobs were completed this month:

(a) Hounted four thermocouples in an insulating usdies for Group M-5.

CLR-6-7 Miscellansons Not Fressing

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GROUP CHR-6 NOWHLY REFORT - J. W. Temb, Group Londor - August 20, 1947 (contd.)

FROJECT & HERSONWIL

CMR-6-7 (contd.)

Wellborn, Smith, Johnson, Kain, L.Martinez

FROGRESS

- (b) Fabricated four Almico V hemispheres for Group M-3.
 - (c) Annealed 80 pieces of Kovar for Group P-3.
 - (d) Annealed 40 steel cups for Group P-5.
- (e) Fabricated three tangeten carbide postles for Group CMM-1.

One more half density aluminum casting was made for Group M-5.

Preliminary work began on a metal-filled paraffin hemisphere for Group N-5.

Dies for the production of tungsten carbide outters for Group A-3 were designed and submitted to the graphite shop.

Some work was carried on for the production of ceramic crystal mounts for Group M-5.

Titanium carbide powder was prepared to be used in the fabrication of crucibles for Group CAR-2.

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GROUP CIR-S MONTHLY REPORT -- R. D. Beiner, Group Leader -- August 20, 1947

PROJECT & PERSONNEL

OR-S-1 Reduction of Hormal Urenium

Hayward, Schievono

CMR-8-4 Devalopment of Recovery Processes for U-235

(1) Final Recovery & Purification

Kolchner, Kircher

PROGRESS

Three samples of calcium from Electro-Mot were useted. Two of the samples were found to be satisfactory, and one was too high in No and Ale

Three special fluorides from Oak Ridge were tested.

Seventy-four kilograms of high purity normal uranium were produced during the period.

Most of the time was spent on production which is covered in a special report under Project No. CLR-8-3.

The installation of the enclosed heed for the proosssing of U-235 was completed and put into operation. This new heed has reduced the air count in the room to normal.

The experimental incinerator was received from the shop, and work started on its development for use in the recovery process. An electric heater was installed above the grate in the burning-box. Runs were made to develop a method for burning towels and rags. The weight of charge was varied as well as the air-exygen mixture. It was found that toweling can be burned and ashed in the incinerator, and that all volatile products are retained in the condensing system. The resulting ash can be washed out of the burning-box without opening the incinerator. Additional tests using actual residues will be made when the installation of incinerator in the furnace room is complete.

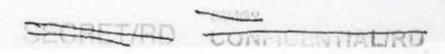
A new type of filtration trap which uses CaO was put into use.

Work was started on recovery methods for wrichloroacetic acid solutions and for solutions containing large excumts of sutting oil.

All of the time was spent on production which is covered in a special report under Project No. CAR-S-S.

(2) Bydrolluorinoblen

Coldmaith, Fry



SHOUP CHR-S MORRELY REPORT -- R. D. Baker, Group Leader -- August 20, 1967 (contd.)

PROJECT & PERSONNEL

CIR-8-6 (contd.)
(3) Concentration Process

Maraman, Bradshaw, Wilkinson, Haytor

PROGRESS

The installation of the filtrate still was completed, and distillation tests run using mitric soid solutions.

-

The extraction column was cleaned of the entrapped silica and experimental extractions run. It is now believed that the presence of entrapped silica in the column decreases the extraction efficiency. A method of back-washing the column periodically was developed.

The installation of the new charge system was completed and tests run. The new system is much more satisfactory than the previous design.

A steam-jet vacuum system for the plant was designed and installed. Design work on the other recovery systems was completed.

Repair parts for the glass-lined lattle were recoived, and a study of their installation started.

A study of the acid properties of synthetic charge solutions was made. The use of methyl red as an acid titrating indicator gives less than one percent error for the general types of liner-charge solutions encountered in the process. PH measurements are not reliable.

Thirty comples were prepared by the control lab for analysis. Experiments were started on the other extraction of solutions containing less than 0.1 ppm of uranium.

Four runs were made, but physical difficulties were encountered each time. Changes in the apparatus are being made in an attempt to avoid these difficulties.

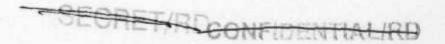
No further work done during the period.

GR-8-5 Beterminstion of Temperatures in the Reduction Bomb

Hayward

CMR-8-6 Determination of Pressures in the Reduction Bomb

Hayward



GROUP CHR-S WONTELY REPORT -- R. D. Baker, Group Leader -- August 20, 1947 (conti.)

PROJECT & PERSONIBL

CHR-8-9 Research on the Hydrofluorination Processes Goldsmith, Fry

CMR-8-11 Chemical Service on the Water Boiler

Gurney

CMR-8-12 Analysis of the Guses from the Water Boiler

Gurney

CMR-8-14 Preparation of Samarium Metal

Goldsmith, Hnyward

IR CORRESS

Mork continued on the study of the temperatures inside the reaction tube during the complete hydro-fluorination cycle. Large variations in the temperatures along the tube were found. A set-up for measuring the temperatures of the exide and fluoride in the reaction bests was completed, and determinations are being made at various points. Literature work continued.

Ten peroxide precipitations were made for the purpose of obtaining a supply of "standard" exide.

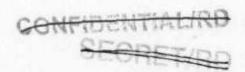
Thrse samples of "soup" were enalyzed during the period.

No further work done during the period

The literature survey on this problem was completed. Very little useful data were found. One run was made to prepare SmF, from Sm₂O₃. At 300°C for 3 hours, a conversion of 96% was obtained on a 5 gram sample. The resulting product was hygroscopic.

Reduction apparatus was ordered for the metal preparation work.

520 000t



PROJECT & PERSCHIEL

CMR-9-2 Plutonium Gosfficient of Expansion Studios

Benesi, Harmel

CMR-9-3 Low Temperature Studios of Plutonium Properties

Hamaso 1

CIR-9-4 Doneity of liquid Plutonius

Hammo 1

CMR-9-6 High Temperature Electrical Resistance of Plutonium

House 1

CMR-9-7 Determination of the Elastic Constants of Plutonium

LennsH

Training Course

Benesi

EROGRESS

Densitonster now complete. Blank runs and calibration being run at end of month.

Apparatus under construction,

No work on this during month.

No work on this during month,

No work on this during month.

Part I. Basic Thermodynamics, completed.

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CROUP CHR-11 MONTHLY REPORT -- P. E. Pittman, Group Lander -- August 20, 1947

PROJECT & FERSONNEL

1. General Flant Operation Pittern

S. Material Control Champion

4. Production

Venable, Nordsen, McNeese, Dumrose, Ballard

201000

PROGRESS

During the period July 21 through August 20, production schedules were maintained in all operations. Certain changes in production procedures have been instituted, based on recommendation of Group CMR-5. These changes are fully outlined under "Production". Mr. Wayne C. Hasen arrived on August 4 to assume his duties as head of the Process Development Group.

The solution storage room of the main vault, in which a spillage occurred July 17, 1947, has been decontaminated end painted. The room is now essentially uncontaminated with the exception of the door casing, which will need further decontamination before material is returned to the room.

Solutions Room:

(a) Prepared and checked all solutions and chemicals for purification, recovery and metal fabrications operations.

(b) Provided solvents and cleaning solutions for all

operations and the HI Group.

(c) Prepared calcium for use at D Building and DP Site.

Bomb Decontamination: The average percentage rejection on plugs for the month has been 14%. On bomb bodies the rejection rate has been of the order of 55%.

Recovery: Work is progressing very well on concentrating supernatants from the purification operation. In addition, several other miscellaneous solutions have been concentrated and stored or returned to Operation 4.

Furification: The sampling equipment in Room 308 will be transferred to a drybox equipped with a balance in Room 313 as soon as possible. This will release Room 308 for other functions and eliminate a possible source of air contamination. Some difficulty has been experienced in the past month in obtaining solid-free samples from Hanford lets for assay. The cause is not yet known.

Dry Chemistry: Considerable difficulty has been encountered in obtaining a satisfactory fluoride conversion during the past month. The cause is not known, but more complete records are now being made

CROUP CHR-11 MONTHLY REPORT -- F. K. Pittman, Group Londor -- August 20, 1947 (contd.)

PROJECT & PERSONNEL

4. (contd.)

FROGRESS

of each run so that any abnormal operating conditions can be detected immediately. Pressure masks are now being used for any work involved inside the dry chemistry hoods.

Reduction: There have been some low reduction yields in the past month. This is probably due to the presence of moisture in the bombs. Steps have been taken to correct this condition. In the near future it is hoped that other factors affecting reduction yields will be fully controlled.

Alloying and Casting: Two castings were run with a 10-hour annealing cycle instead of the normal 5-hour period. Two other castings were made annealing at 500°C instead of 450°C. The latter change in the annealing conditions will be made on each casting now fabricated until analytical results are received for evaluation.

Seginging next month all casting will be done in high-fired refractory. Experiments have indicated that the use of this type crucible will practically eliminate cracking and minimize metal penetration.

Machining and Pressing: Several unusable dies were placed in double-sealed wooden toxes and turned over to the property section for disposal. The new drybox arrangement in Room 513 is working very well. The only contaminated areas present at this time are the lide of the pressing cans. It is hoped that in the next menth a new procedure for leading and unleading the dies will be in effect which will completely eliminate charges of contaminating external portions of equipment.

Cleaning and Coating: The howisphere coating units were completely overhauled and cleaned. A vast improvement in performance has been noted since the overhaul. Room 505 has been decontaminated several times and is now relatively "cold". In the coming wonth it is intended to adapt the equipment in Room 515 to the cleaning operation. This will eliminate the use of Room 506 by Production and promote the program of operational consolidation now under way.

Final Inepaction: Some clight changes in final inspection procedure have resulted in the delivery of gaegots which pass all specifications and are well within maximum allowable telerances.

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GROUP CMR-11 HOMERLY REPORT -- F. H. Pittenn, Group Leader -- August 20, 1947 (contd.)

PROJECT & PERSONNEL

5. Process Development -Chemical Section

Henrickson, Hasen

PROGRESS

On hand July 21, 1947

Receipts - E & A

15,794.46 gas. 601.71

3,508.24 19,904.41 gms.

Disbursoments

None

On hand August 20, 1947

19,904.41 gras.

Mullins

CHR-11-25. Ion exchange columns for separation or concentration of plutonium: The analytical method for determining to in very low concentrations was investigated further. The method consists of carrier precipitation first with lanthanum hydroxide, then with lanthanum fluoride, followed by evaporation on a plate and counting. The work was done with 10 ml aliquot instead of the C. 6 ml aliquot normally used. Samples spiked with 8, 89, and 689 c/m were used. Although the results of duplicates were relatively consistent among themselves, they indicated that only from 40% to 80% of the added "spike" was recovered, depending upon the concentration and other factors at present undetermined. There is a possibility that an empirical factor might be developed to make the method useful, though this would not be desirable. Further work on pH control and technique is indicated. At present the work is suspended because of the necessity of using Mr. Mullins on the problems associated with recovery in Operation 2.

Lowe, W. Magness

CHR-11-32. Dissolving of solid Fu wastes from movellurgical operations: Six lots of skulls weighing 160 grams each were dissolved in 800 ml of 5.5 WHI and sent through purification, dry chemistry, and reduction operations. Two buttons have been made from these lots, and samples have been turned in for analysis. A drybox for dissolving the backelog of skulls has been designed, and installation is scheduled for completion in the early part of September.

Experimental work on the dissolving of crucibles showed that it is possible to dissolve the fired magnesia in hot 6 H HMO3 although the reaction is not swift. This work was suspended while the treatment of old solutions from hydroxide presipitation of recovery solutions is investigated.

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GROUP CHE-11 MONTELY REPORT -- F. H. Pittman, Group Leader -- August 20, 1947 (contd.)

PROJECT & FERSONNEL

5. Process Development - (contd.)

Gibson

Henrickson

Engineering S lotion

Ryland, Hagon

Scholl

Thomas

Hermann

Hartshorme

of plutonium solutions: The quantitative data taken from batch runs of synthetic "cold" solutions showed that after 72 hours chromium was substantially removed. The mercury cathode in which all these experiments were run was considered inedequate for "hot" runs. Accordingly, a continuous flow cell, complete with a mercury cleansing unit has been designed and is under construction. This new cell will provide quantitative information for design of production units if the idea is proven on "hot" runs using evaporated supernatant solutions.

CMR-11-40. Installation of "cold" laboratory in Room 206: It is enticipated that this new laboratory will be ready for use in the first half of September.

CMR-ll-6. Installation of suitable cutting apparatus in purification hoods (combination of Operations 4A and 4B): An arrangement has been made with CMR-l so that two samples from every other Hanford batch may be sent in for analysis. These alternate batches will be sampled by both the routine pipatts method and the automatic sampler installed in the purification hood. During the next six weeks this will give 48 comparisons of the routine sampling method with the new samples.

CMR-11-8. Combination of Operations 5 and 6: The Tucite AF flowmeters received last month were found to be completely worthless. The tube deteriorated after a few minutes of AF flow. They have been returned to the manufacturer. It is intended to use the equipment without these meters, since everything class is ready in Room 406.

ChR-11-9. Combination of purification with the combined Operation 5 and 6 Unit in Room 406: During the month the installation of equipment was completed. A new bubbler was installed and various minor changes made in piping. The room was closed and is now ready for hot testing.

GUR-11-12. Design of drybox for Hardinge lathe in Operation at the drawings have been completed, but installation of the Inthe will be postponed until its med is more definitely proven.



OROUP CHR-11 MONTHLY REPORT -- F. K. Pittman, Group Leader -- August 20, 1947 (contd.)

PROJECT & PERSONNEL

5. (centd.)

Thomas, Sheinberg, Schell

Roth, Zukas, Jenkins

Thomas, Ryland

Scholl, Sheinberg, Eartshorne

PROGRESS

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CAR-11-22. Removal of the precipitron sludge:
Work on this problem has been suspended temporarily because of its low priority in relation to other problems. Tentative plans have been laid for setting up equipment in Room 213 to test the feasibility of recovering a large percentage of the oil in the sludge by setting.

No work was done on the phase of the problem dealing with the method of removal of the sludge from the precipitrons.

CLR-11-37. Redssign of pressing can: The new pressing can was received this month. It was found that the clamps for holding down the lid were structurally weak. Heavier clamps are being made.

Final drawings of the drybox for loading and unloading the new can are proceeding very slowly because of the shortage of draftemen.

The new instrument panel to carry the increased load occasioned by the high capacity heating elements is nearly completed. The new elements have not yet been received.

CMR-11-17. Coating incoming "W" containers to eliminate necessity for decontamination: Three types of plastic strip coats have been tried. They are: Spray Peel Nos. 721, 723 and 726. Of these, the No. 725 seemed the most satisfactory.

A new design has been made of the disposable plastic plug. This new design consists of three parts and eliminates all threads to avoid what might have been an expensive molding problem in the previous design. Three sets of the new plug will be machined of lucite for demonstration and testing.

CMR-11-38. Sampling and transfer of raterial from recovery evagorator: The type of sampler being tested in Uperation 4 was adapted for use under slight pressure instead of vacuum.

Construction was started on the reservoir to draw solution from the evaporator. This reservoir will be on top of the drybox so that the solution can flow by gravity to a bettle set inside the drybox.

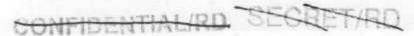


CROUP CHR-12 EURINIA REPORT -- J. F. Tribby, Group Loader -- August 20, 1947

The debailed report of the work of this group is given in LAMS-615.

Health Work, General

- 1. 133 persons were sent on health passes during August. All tests were negative. All personnel exposed to polonium were given urine radioassay tests. Five persons indicated they were excreting 50-100 c/m of polonium per 24 hour sample of urine, and one person showed on one test that he was excreting 498 c/m of polonium per 24 hour urine sample. This person was removed from exposure to polonium until the counts found in his urine were less than 50 c/m of Po per 24 hour sample. All other polonium urine radioassay tests given during the month were negative.
- 2. Airborns alpha air contamination tests were run in all Fu, Po, and U processing areas. 70 air testing units were in continued operation, and approximately 1600 individual tests (air samples collected varied from 800 liters to 120,000 liters) were made in these areas. Average airborns alpha activity in the air throughout GAR laboratories dropped 80% under that of the previous months. However, temporary high air counts were observed in 20 laboratories due to (a) faulty operations, (b) leakage of water through the roof of D Building, (c) heavy construction work in D Building, (d) weighing an uncovered sample of plutonium on an open analytical balance.
 - 3. Radioactive surface contamination remained at about the same level.
- 4. Routine and special tests with film badges, desimeters, cobalt slugs, gamma and neutron survey counters and meters indicate beta, gamma, and neutron radiation levels were very low. No excessive exposure of any person to gamma rays or neutrons was recorded.
- 5. An improved system of monitoring the pick-up and disposal of conteminated trash from the Tech Area, DP Site, Eayo, Chega, and Pajarito Canyons and additional protective measures to avoid excessive radiation hazards in these areas were instituted.
- 6. All wells and reservoirs supplying water to the project were analyzed for the presence of Po, Pu, U, Rala, and RaBa contaminants. No contamination in the water was found.
- 7. Plans for an improved and revised health program for D Building upon the completion of the new construction have been outlined. In general, a tighter control of personnel entering the area will be effected, and it will be possible to prevent unnecessary persons from entering the contaminated portion of the building. The new construction also will provide improved looker and washroom facilities and provide an adequate clothing dispensary.
- 8. One combanisated socident occurred at DP West Sits during the month. This was an excessive air count caused by a toolmicien weighing an uncovered sample of photonium on an open analytical balance. This could be considered a



CROUP CHR-12 MARRIY REPORT -- J. F. Tribby, Group Loader -- August 20, 1947 (comed.)

voluntary breach of health-eafety rules rather than an accident.

Research and Davelopment

Most of the work planned for this section is being held up pending the strival of additional electronic personnel. The majority of the work done during the month consisted of routine maintenance of the instruments row in use. Some work was done on a portable audio type alpha survey proportional counter modified for use in various CMR laboratories.

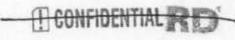
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