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CMR-DIVISION PROGRESS REPORT

20 June 1947-20 July 1947 (U)

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MONTHLY PROGRESS REPORT OF THE CHEMISTRY-METALLURGY DIVISION

JUNE 20-JULY 20, 1947

I. Special Materials.

Reported separately.

II. Other Production Work.

1. A total of 1820 pounds of tuballoy was cast, the bulk of the castings being in the form of cubes, the balance in miscellaneous shapes. Eighteen cadmium castings were made for RaLa.

A large heat exchange casting, in which copper was cast around three concentric steel coils, was not satisfactory. The design has been changed, and the first cylinder, weighing 570 pounds, has been successfully cast. These heat exchangers are for use in the fast reactor.

2. Approximately 225 MgO casting plates, crucibles, and pouring rods were made, as well as a number of other special refractory shapes.

3. A U-235 sphere of half the normal density was made for the Weapons Division. An 11" hemisphere of aluminum of half the normal density was also prepared.

III. Research and Development.

1. The Analytical Group again carried a heavy schedule of service analyses, totalling 522 for the month. These heavy loads arise principally from development and control work in the plutonium and U-235 production schedules. Little research was done, but some further progress was made on analytical methods for determining Ni, Co, and Cu in Pu alloys, and the study of alpha absorption in different concentrations of inorganic salts.

2. Research on the co-deposition of La in the form of alloys with other metallic elements is still in the preliminary stage. So far, most of the deposits seem to be in the form of hydroxides or other compounds rather than in the metallic form.

3. The radiochemical training group has begun work on the method for determining Mo99 among fission products. They have also begun work on determination of sub-microgram quantities of U-235 and Pu-249 in mixtures.

4. For some months in the past, the RaLa shipments have given considerable trouble in obtaining precipitates of the proper character for sources in RaLa shots. As a result of a visit from the Clinton staff, changes in the Clinton process were made, and the last shipment received at the end of June was exceptionally good.

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5. The redesign and re-engineering of the RaLa process has continued actively. A considerable number of design problems have been discussed with the firm of Black & Veatch, and four of the major problems have been accepted by them. They have also supplied considerable drafting help on other work.

A new type of stirring mechanism has been designed which consists of a slender, flat strip of stainless steel vibrating at or near its natural frequency while immersed in the solution. This type of agitation does not produce a central whirlpool, and with small amplitudes there is no splashing such as accompanies rotary stirring at high speed.

6. The control laboratory for work on americium and curium is nearing completion, but the remainder of the laboratory has not yet gone beyond the planning stage.

7. The machine for producing a large number of foils of active material mentioned in last month's report was completed and tried. The results were good, but some minor modifications need to be made.

8. Three alloys containing respectively 5 atomic % of C, Fe, and Mg were cast and examined metallographically to serve as guides in the identification of inclusions suspected of occurring in plutonium because of impurities believed to be commonly present. Results to date indicate that a plate-like carbide is frequently encountered.

9. X-ray diffraction studies were extended to 25 and 50 atomic % Ga compositions in the as-cast state. The 25% alloy was found to consist almost entirely of a face-centered cubic phase with a_o = 4.496 A. This phase is tentatively designated as "eta", and it has previously been reported as co-existing with stabilized delta in heat-treated 10 and 15 atomic % Ga alloys. The 50 atomic % alloy showed only one phase, a hexagonal structure with a_o = 6.29 A and c_o = 9.00 A.

10. An apparatus for producing and reading Brinell hardness impressions at elevated temperatures was completed and calibrated. Twenty-five determinations have been made in the range 20-200°C. Near room temperature, a rather surprising combination of brittleness and apparent susceptibility to work hardening was noticed. With increasing temperature, a linear softening of the alpha phase from BHN 159 at 20° to BHN 99 at 110° was observed with a ball loading of 500 kg. A marked decrease in hardness accompanies the alpha to beta transformation. The beta phase at 175°C had BHN 31.

11. Through the use of specially designed containers, it has become possible to sinter uranium compacts successfully with a minimum amount of oxidation. The edges were sharp and firm after sintering. The powder used in this work was produced electrolytically by Group CMR-6. Further experiments have been made on the first batch of uranium powder made by Group CMR-8 by controlled reduction of the tetrafluoride. This particular material was not found suitable, but other samples have been prepared and are awaiting test. The latter method can be made to yield spherical particles ranging in size from +10 to -200 mesh.

12. The development of methods for forming large diameter thin shells is progressing along two lines, namely centrifugal casting to shape, and hot forming

of hemispheres from blanks. No results are as yet available. Considerable work is being carried out on hot and cold rolling methods for uranium.

13. A satisfactory method of forming lucite lens covers for HE lenses has been developed. This consists of pressing layers of pre-heated lucite sheet into a die of the proper radius.

14. Last month's report mentioned the possibility of using the large amount of HI in the supernatant solutions to dissolve PuO_2. This work has continued with promising results.

15. The recovery of Pu from waste solutions by the use of zeolite-Na is still being held up by the lack of a satisfactory method for determining Pu concentrations of the order of 10^{-7} grams per liter.

16. Progress has been made on the electrolytic purification and reduction of Pu solutions by using formic acid to reduce nitrate ion and subsequently electrolyzing over a mercury cathode. About 72 hours were required to remove all of the chromium from the test solutions. This is the most difficult element to remove. Further work to shorten the electrolysis time is in progress.

IV. Health.

1. 96 persons were sent on health passes during the month, all tests being negative. Al Po urine radioassay tests conducted on exposed personnel were below the tolerance excretion level.

2. Airborne alpha contamination in all areas remained at approximately the same level as the preceding month. Temporary high air counts were observed in 16 laboratories and found to be due to: (a) changing of drybox gloves and repairing dryboxes; (b) heavy construction work in D Building and DP East site; (c) a fire in a drybox at DP West site, (cf. 6c below). In all cases the personnel involved wore full protective equipment, but in spite of this the operator in case (c) had a high nose count and was sent on health pass.

3. Radioactive surface contamination remained at about the same level as last month.

4. Routine tests with film badges, dosimeters, pocket meters, cobalt slugs, gamma and neutron survey meters indicate that gamma and neutron radiation levels were very low. One case of over-exposure to gamma radiation was referred to the Health Division.

5. Eastman experimental fission film and proton recoil film are being studied and calibrated for use as fast neutron personnel monitors.

6. Three contaminated accidents occurred during the month, all at DP West Site:

a. An operator ran a steel sliver into his finger. The sliver and surrounding tissue were excised.

b. The material in a "skull" transfer can ignited when the cover was removed, but the operation was in a drybox.

c. Material stored in a recovery vault developed gas pressure and blew the lid from the outside container.

The spread of material in all cases was quickly brought under control, decontamination was complete, and all persons exposed were immediately sent on health passes.

V. Miscellaneous.

1. Dr. R. J. Cottens, who was associated with this laboratory during the war, has returned for three months to act as a consultant in chemical microscopy. He is working with the Analytical Group.

2. The situation regarding the security clearance of personnel for working at this Site, which was mentioned in these reports two months ago, has become still worse. As of July 29, this Division had 18 offers of employment outstanding awaiting clearance. As of that date, from 53 to 98 days had elapsed without receiving clearance, and there is no knowledge of how much longer these individuals and ourselves must wait. The average time was 70 days. When I first discussed this matter, the average was about 60 days. As far as I can determine, the FBI field examination still takes only 15 days, which means that on the average 55 days and more is consumed by the Washington offices of the AEC and the FBI on sheer red tape. I raise the question whether there is anyone who reads this report who has sufficient influence to change this situation. It seems to be very difficult to impress on the officials that people simply will not wait three or four months for employment. If the Commission wishes to see a staff of scientific and other personnel diminished to ineffectiveness by merely normal turnover, they are certainly following the right policy.

3. The Division Maintenance and Safety Sections are actively cooperating with the Plant Security Section of Intelligence in improving the security protection of the Division buildings. New fencing and guard arrangements to create exclusion areas, and the use of badge exchange systems for entrance into the various buildings are being planned.

Eric R. Jette

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GROUP CMR-1 MONTHLY REPORT -- C. F. Metz, Group Leader -- July 20, 1947

GENERAL

The demand for analyses remained heavy although somewhat less than for the previous month. Personnel remained insufficient to permit much research. Room D-302 was finally brought near enough to completion to be used for radioassay work. Conversion of Room 303 to a microscopy laboratory was started. R. J. Gettens reported for work July 3. He will remain for three months and will act as a consultant in chemical microscopy. Breakdowns in the vacuum fusion apparatus were so frequent that the advisability of continuing this method of analysis for routine work is seriously questioned. Several additional research projects were written up and presented for approval. Because of the urgency of some of the problems, work has been started. It is not reported here because final approval has not been received.

The breakdown of analytical services is as follows:

Source	Analyses Reported
CMR-1	9
CMR-4	20
CMR-5	4
CMR-6	39
CMR-8	214
CMR-11	234
Miscellaneous	2
Total	522

PROJECT & PERSONNEL	PROGRESS
CMR-1-7 Analytical Methods for Plutonium Alloys (Ni, Co, and Cu) Bergstresser	Electrodeposition of these metals into a mercury cathode after previous separation of most of the plutonium seems to be satisfactory. Colorimetric determination instead of weighing was started. The problem is to determine if small amounts of plutonium will interfere.
CMR-1-14 Radiochemical Assay Methods for Plutonium Bergstresser, Bradford, Kingsley, LaCombe, Reynolds	The study of the alpha absorption caused by different concentrations of various inorganic salts has been extended. The same general type of curve seems to hold true in all cases.

GROUP CMR-2 MONTHLY REPORT -- J. F. Lemons, Acting Group Leader -- July 20, 1947

PROJECT & PERSONNEL	PROGRESS
CMR-2-2 Absorption of Low Concentrations of Plutonium Ion in Exchange Resins Huber	This problem has been moved to ML Building to avoid the annoying contamination in D Building. The analytical technique is not yet perfected.
CMR-2-5 Preparation of Volatile Plutonium Fluorides Florin	Inactive.
CMR-2-6 Preparation of Plutonium Carbides Stillson, Lemons	Apparatus is being tested.
CMR-2-7 Electrodeposition of a Lanthanum Alloy Florin	Five experiments in which Au-La solutions were electrolyzed resulted in the deposition of about 25% of the La, but the character of the precipitate suggests that the hydroxide rather than the metal is being deposited. One experiment in which a Sn-La solution was electrolyzed at a current density of 2 amps./cm^2 resulted in 43% of the La being deposited in a black, gelatinous, non-adherent precipitate which floated at the bottom of the cell. Electrolysis of a La solution in 0.02 N HCl using as cathode a Hg-Pb amalgam resulted in about 30% of the La being deposited in a gelatinous, non-adherent precipitate. Electrolysis of a La solution using a Hg cathode and Cd anode resulted in no La being deposited in the Hg, but most all of it was contained in a purple, non-adherent precipitate. Four experiments in which La solutions at various acid concentrations were electrolyzed using a Hg cathode and in the presence of solid TlCl has resulted in the recovery of about 20% of the La in the Hg. In one case the final solution remained acidic. The Hg is not bright at the conclusion of the electrolysis.

[illegible] MONTHLY REPORT -- [illegible] and [illegible], Group Leaders --
July 20, 1947

PROJECT & PERSONNEL	PROGRESS
A. Initiator Production and Incidental Production Research	
Project No. 1 -- Urchin Initiator Production.	The efforts of the group were directed almost exclusively to urchin production and related problems.
Group	
1. Counting Assays Abel, Giorgi, L. Moulton, Thomas	The gauzes of five shipments totaling 860 curies were checked with the neutron and gamma counters.
2. Calorimeter Studies Foster, Folts	Seven recovery shipments were assayed in the bridge calorimeter.
3. Recovery Gutierres	Seven recovery shipments, numbers 24 through 30, totalling 89.8 curies were prepared for shipment.

DELETED

Project No. 2 -- Gun Initiator Production Krikorian	Additional neutron counts have been made on the test gun initiator GTI-1 described in last month's report. Although no increase in neutron count occurred during the assembly operation (in contrast to past experience), an increase of roughly a factor of two occurred during the first month after assembly. A slight drop in neutron count occurred during the next week. Additional neutron counts of this initiator will be made at regular intervals.

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PROJECT & PERSONNEL	PROGRESS
CHR-4-1 Training Program for Radiochemists Balagna, Elkin, Hower, Lang, McClendon, Melnick, Minkkinen, Moor, Sattizahn	The fission counters have been put in operating condition at Omega. Final tests will be completed shortly. Four horizontal shields with Eck & Krebs tubes installed are now being used. However, most of the Geiger tubes are not satisfactory, and new ones have been ordered. The first experiments designed to improve the Mc^{99} procedure have not been very successful. Study has begun on the determination of submicrogram quantities of U-235 and Pu-249 in mixtures.
CHR-4-2 Determination of the Half-Life of Tritium Goldblatt, Robinson, Spence	The laboratory was temporarily air-conditioned and the temperature of the tritium ion chamber thermostated to $\pm$ 0.1°C. Small amounts of He^4 were added to the chamber and the effect on the ion current noted. The increase in current was somewhat larger than anticipated, and was not proportional to the pressure increase. When a large quantity of He^4 was added, the current readings did not settle down and were still decreasing at the end of a week. The cause of this behavior is not known. This phenomena will be investigated further when the new air-conditioned laboratory is completed.
CHR-4-3 Analysis of Hydrogen-Tritium Mixtures with the Mass Spectrometer Jones, Novelites	Two more DI samples were prepared, one large and the other small, and bled into the spectrometer. The large sample gave the highest DI/HI ratio yet obtained of 67.1. The ratio decreased steadily with time until at the end of 2 1/2 hours it was only 42.8; however, it then began to increase, reaching a maximum value (65 hours after the sample was admitted) of 62.3. The small DI sample gave a DI/HI ratio of 23.2 which remained fairly constant. It was observed while bleeding D_2 into the spectrometer that the mass 4 to mass 3 ratio depended upon the magnetic field current. Mass 4 to mass 3 ratio varied from 42 to 67, depending on the field current used. Some D_2O was electrolyzed and the D_2 collected; a large and a small sample of DI were prepared from this D_2 and run into the spectrometer. The small sample gave a low DI/HI ratio (6-7), while

PROJECT & PERSONNEL	PROGRESS
CMR-4-3 (contd.)	the large sample gave a DI/HI ratio that started at 32. Nineteen hours later the ratio had increased to 47; the experiment had to be discontinued when a Kovar seal developed a leak.
CMR-4-4 Preparation of Tritium and Deuterium Foils Rodrigues	Three attempts were made to use nickel for deuterium-containing foils, but with no success. Three foils of deuterium absorbed in tantalum were prepared. The last of these had a gold backing evaporated on it without any apparent loss of absorbed deuterium.
CMR-4-8 Preparation of Foils of Active Material Gilmore, Potter	Three 28 foils, five 25 foils, and three 49 foils were prepared by the Zapon technique.
CMR-4-9 Routine Preparation of RaLa Sources Barker, Bone, Fitzgibbon, Halligan, Leary, Marjon, E.Newbury, F.Newbury, Shaffer, Tafoya, Wilhelm	Shipment No. 26 was received and dissolved on June 26. It measured 2400 curies and was processed as follows:

Date	Yield	Disposition
6/24 & 6/25	1390	Shot No. 81
7/2	1450	Shot No. 82
7/10	923	Shot No. 83

The first milking was done in two days; the chemical separation was done on 6/24, while the packaging was done on 6/25. This arrangement reduced the exposure received by the men to a satisfactory amount. The chemical yield on 6/24 was 1820 curies.

In addition, a 4 mc. point source of RaBa and RaLa was made for Group M-5.

Shipment No. 26 was exceptionally good, and no trouble was experienced in the milkings. This shipment had been given an additional purification at the Clinton Labs.

CMR-4-10 RaLa Process Research Zeltmann	Necessary experiments to finish up the SrF_2 and CaF_2 processes weredone. The final report on these processes will be completed shortly.

PROJECT & PERSONNEL	PROGRESS
CMR-4-11 Re-Engineering of Rala Packaging Operations Crits	The friction drive device was drawn up and submitted to the shop. It should be completed in a week. The "two position unit" which will give another operating position in Bayo Canyon was finished by the shop but cannot be tested until an air cylinder ordered from outside is delivered. Further work has been done on gold-plating cadmium tips. The gold-plated threads are easily damaged. It is hoped that the friction drive mechanism can be tested in Bayo after the next shipment has been processed.
CMR-4-12 Redesign and Re-Engineering of Rala Process Coe, Leary, Lilienthal, Zeltmann	Arrangements have been made with Black & Veatch to assist in the design work and preparation of drawings for the mock-up of new process. Certain design problems were discussed with them. Specifically, they agreed to work on the following: (a) Design a remotely controlled mono-rail crane for carrying a maximum load of 10,000 pounds in the form of a lead pot. (b) In conjunction with mono-rail to design an air-tight door to seal the passageway in which the mono-rail operates. (c) Design a method of lighting the interior of the chambers, preferably in the form of a replaceable plug that can be removed through the ceiling. (d) Design a gimballed mirror mount for use inside the chamber whose motions are remotely controlled. For all the above designs, the basic ideas to be considered were given to them. Since it appears that much of this work will be done in Kansas City, close cooperation between their office and ours will have to be maintained. It has been agreed that before any work is done on detail drawings, the preliminary design layouts and assemblies will be submitted for study. Two Black & Veatch men are stationed on the Project available for design work. Work is being done here on the design and detailing of a remotely controlled system for adding measured quantities of reagents to vessels inside the chamber. In

PROJECT & PERSONNEL

CHR-4-12
(contd.)

PROGRESS

addition, these men designed and detailed form boxes for use in the concrete and lead experiments that have been carried out.

The general problem of final building requirements has been discussed with Black & Veatch. In this regard, a preliminary floor plan has been prepared. The floor plan is now being revised to include facilities required by M Division. When completed and approved, the revised floor plan will be given to Black & Veatch to be used as a basis for final design.

The experiments with lead ore as an aggregate in concrete have just about been completed. The lead ore was crushed and graded to give an aggregate similar to a standard concrete mix using sand and gravel. Three blocks of a lead concrete were made exactly similar to three blocks of standard concrete; that is, same size and quantity of aggregates, same water-cement ratio, etc. The results of this experiment preclude the use of a lead concrete solely on a structural basis. The lead concrete crumbles to such an extent that radiation absorption tests could not be made. Various tests have been made to determine the reason for failure. The only explanation that appears reasonable is that the presence of sulphur as lead sulfide prevents the hydration of the cement.

Filtering tests have been made using stainless steel pads. The porosity of the pads is too great to hold the precipitate as prepared by using a solution similar to that used in the present Bayo operations. This experiment is to be repeated under more exact conditions. The finest porosity of the pad is 5 microns. When compared to a sponge platinum pad and running plain water through it, the filtering time of the stainless pad is very short.

A new design for a stirring mechanism has been tried. A slender flat strip of stainless steel projects into the solution to be agitated. When the strip is vibrated at or near its natural frequency, the particles in the solution are thoroughly mixed. The agitation, instead of rotary

PROJECT & PERSONNEL	PROGRESS
CMR-4-12 (contd.)	stirring, has the advantage that it does not cause the liquid to rise on the sides of the container due to the formation of a center whirlpool. The amplitude is small, and there is no splashing that accompanies rotary stirring at high speed. A series of reports on various telescopes and periscopes have been reviewed. Certain of these existing devices appear applicable to our viewing problems, and assembly drawings have been ordered. The design and detail drawings for the spindle assembly have been completed. The number of these drawings totals 61. About half have been released for manufacture. The remainder cannot be released until the receipt of purchased material from which the parts are to be made. Purchase orders were released July 1. The detailing of the jib crane is under way. The design layout for a packaging device is just about completed. The packaging is based on the use of a removable tip which contains the active material.
CMR-4-13 Americium Production Design Briesmeister, Dalton, Ludwig, Sattizahn	The cold laboratory is nearing completion. Machines have been installed, and work benches set up. When the laboratory is finished, drybox experiments will begin. The construction of the rest of the laboratory has not yet gone beyond the planning stage.
CMR-4-14 Plutonium Chemistry Involved in Trans-plutonics Production Lane, Nigon	The progress of this project has been curtailed due to the illness of Mr. Lane. The solution of plutonium oxide is still a major problem; no satisfactory procedure has been found as yet.
CMR-4-16 Research on Foils Gilmore, Potter	Several preliminary foils were made on the machine to produce very large foils. The results were good, but some modifications in the brush are being made to improve the uniformity of the foil.

GROUP C1R-5 MONTHLY REPORT -- A. S. Coffinberry, Group Leader -- July 20, 1947

PROJECT & PERSONNEL

C1R-5-1
Alloy Survey

Struebing, Whyte,
Gerds, Wensch

PROGRESS

1200 grams of plutonium were remelted to provide purified melting stock for projects C1R-5-1, C1R-5-2, and C1R-5-4.

Three alloys containing five atomic percent respectively of carbon, iron, and magnesium were cast and examined metallographically to serve as guides in the identification of inclusions suspected to occur in plutonium and its alloys because of impurities believed to be commonly present. Results to date indicate that a frequently encountered phase is a plate-like carbide. The density of the 5% iron sample was found to be 16.24 gm/cc, indicating the possibility of delta phase stabilization by iron.

Tests were made on a method and apparatus for determining phase changes in alloys as a function of temperature by means of continuously measuring the electrical resistivity of a specimen while heating from room temperature to the molten state and while cooling back to room temperature. The specimen used in these tests was a 50 weight percent lead-antimony alloy. Preliminary results have indicated that the method is feasible, but that changes in the automatic recording system may be required to improve its sensitivity, if this equipment is to have the utility desired for phase diagram studies.

C1R-5-2
Phase Diagram of
Plutonium-Gallium

Struebing, Whyte,
Gerds, Ellinger

The melting and casting of plutonium-gallium alloys having the following gallium contents was undertaken: 0.5, 0.75, 1.0, 10, 25, 30, and 50 at mic percent. Difficulties were encountered with the 1.0, 30, and 50% alloys; and satisfactory ingots of the 1.0 and 30% alloys have still to be cast. The 50% ingot, while porous and somewhat oxidized, was utilized for x-ray diffraction study.

The 0.5, 1.0, 10, and 25% gallium alloys have been heat treated for homogenization at 450°C for 91 hours preparatory to metallographic examination. The 15% alloy, after homogenization treatments at 400°C and 450°C, was held at 500°C for 76 hours. The only change which resulted was a slight spheroidization of its dendrite-and-eutectic type of cast structure.

X-ray diffraction studies were extended to the 25 and 50 atomic% Ga compositions as cast. The 25%

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

PROJECT & PERSONNEL	PROGRESS
CMR-5-2 (contd.)	alloy was found to consist almost entirely of the face-centered cubic phase having $a_0 = 4.495$ A, tentatively designated eta, and previously reported as coexisting with stabilized delta in the heat treated 10 and 15% Ga alloys. The 50% Ga alloy showed the presence of only one phase, a hexagonal structure having $a_0 = 6.29$ A, $c_0 = 9.00$ A, $c/a = 1.44$. A density measurement to determine the number of Pu and Ga atoms per unit cell has not yet been made. Weak lines in the 25% Ga pattern which are extraneous to the eta phase do not conform to the pattern of the hexagonal structure, and can only in part be accounted for as delta lines. Hence it is suggested that another phase exists between 25 and 50 atomic percent gallium. An attempt was made to determine minimum temperature and time for adequate stress relief of Pu-Ga alloy filings used in diffraction studies. Filings from a well homogenized 5% Ga ingot were held at 200°C for 70 hours and then used as a diffraction sample. Resolved K-alpha doublets were obtained, but line sharpness was not as good as could be desired. PuO, which has commonly been found on filings annealed at 300°C and higher, appeared not to have formed during the 200° treatment.
CMR-5-[illegible] Services [illegible]	For C[illegible], an ingot of plutonium was cast into transparent vitreosil in order to obtain information regarding the possible reaction of plutonium with this form of silicon dioxide. CMR-[illegible] concluded that, while some slight amount of reaction may have occurred, its extent was [illegible] from the standpoint of their interest in using a fused silica container for the density determination of liquid plutonium. For the purpose of phase identification, an x-ray diffraction pattern was made for M-6 using a sample supplied by them. For CMR-11, a button containing approximately [illegible]

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PROJECT & PERSONNEL	PROGRESS
CMR-5-3 (contd.)	inclusions attributable to impurities. This same material will be examined after purification by remelting. Seven concrete cylinders were compression tested for Engineering Operations Inspection, and one concrete cylinder was tested for Group A-5.
CMR-5-5 Crystal Structures of Plutonium Krill, Ellinger	Further x-ray patterns obtained by use of 0.010" wire as specimen have yielded no additional information. Improvements in high temperature camera technique are needed to obtain a more satisfactory pattern of the beta phase.
CMR-5-6 Mechanical Properties of Plutonium Schonfeld, Winburn, Southard, Struebing, Whyte	Nine 70-gram remelts of plutonium were cast and pressed to provide specimens for hardness testing. Apparatus for producing and reading Brinell hardness impressions was completed and calibrated. Twenty-five determinations in the temperature range 20° to 200°C have been made. At and near room temperature, a rather surprising combination of brittleness and apparent susceptibility to rapid work hardening was noted. The brittleness caused cracking when more than one determination per specimen was attempted; and the susceptibility to work hardening resulted in discrepancies between hardness measurements at 20°C of the order of BHN 227 versus BHN 159, depending on whether a 3000 kg load or a 500 kg load was used. With increasing temperature, a linear softening of the alpha phase to BHN 99 at 110°C was observed using the 500 kg load. A marked decrease in hardness accompanies the alpha-to-beta transformation, as indicated by a value of BHN 31 (500 kg load) obtained for the beta phase at 135°C. Because of the very low resistance to deformation of plutonium at higher temperatures, further calibration of the apparatus to employ lighter loads will be necessary. Also, because some difficulties due to oxidation have been encountered, improvement of the vacuum system is being considered.

GROUP CMR-6 MONTHLY REPORT -- J. M. Taub, Group Leader -- July 20, 1947

PROJECT & PERSONNEL	PROGRESS
CMR-6-1 Refractories E.Slatin, Cordero	The production of refractory products has continued at a relatively high level. During the month approximately 225 MgO casting plates, crucibles, and pouring rods were delivered to Groups CMR-5, CMR-6, and CMR-11. Several V-2 crucibles of BeO have been requested by Group CMR-6 for the casting of beryllium alloys. Twelve MgO boats and covers were ordered by Group CMR-5. These will be completed and delivered within the next week. The modified Y-3 MgO crucible for DP Site did not test as well as expected. Tests will be undertaken by Group CMR-6 in an attempt to design a crucible which will withstand the casting conditions at DP Site. Twenty ring molds and accompanying pouring crucibles have been requested by Group CMR-11. Two large MgO crucibles and five oversize pouring rods were tamped for the CMR-6 tuballoy foundry.
CMR-6-2 General Foundry Work Arnold, Castro, Wicklin, Palmer, R.Martinez, Donahoe	A total of 1820 pounds of tuballoy was cast this month. The bulk of this weight was in the form of cubes, of which 250 were cast; the balance of the metal was cast in the form of hollow hemispheres, hollow cylinders, and large flat discs. There are on hand a large number of orders for tuballoy castings, chiefly for M Division experimental work. Eighteen cadmium castings were made for Rala. The large heat exchange casting, in which copper was cast around three concentric steel coils, was not satisfactory. Inadequate cooling of the steel coils and a large mass of molten metal resulted in alloying of the two metals and complete solution of parts of the coils. This casting is now being radiographed, after which the copper will be stripped from the remaining coils. The design of the heat exchanger has been changed to hollow cylinders which act as cores on which

GROUP CMR-6 MONTHLY REPORT -- J. R. Taub, Group Leader -- July 20, 1947 (contd.)

PROJECT & PERSONNEL	PROGRESS
CMR-6-2 (contd.)	steel tubing is wound. One cylinder weighing 570 pounds has been successfully cast, and another cylinder will be cast at a later date. Some work has been done towards fabricating dummy HE assemblies for Sandia training operations. Lack of personnel because of vacations has retarded the investigation. Another shipment of tuballoy oxide, totalling 4037 pounds, has been prepared.
CMR-6-3 General Powder Metallurgy Dorfman	Through the use of specially designed containers, it has become possible to sinter uranium compacts successfully, that is, with the minimum amount of oxidation. The appearance of the compact was good, and the edges were sharp and firm after sintering. The powder used in this work was produced electrolytically by Group CMR-6. Further experiments have been made on the first batch of powder obtained from Group CMR-8. The material cannot be used for powder metallurgy work. A new batch of powder is being prepared by Group CMR-8 and will be tested during the coming month. The vacuum system for sintering powder compacts is under construction and will be completed shortly.
CMR-6-4 General Fabrication	
(a) U-235 Andrews, Barnard, Raol, Steinberg, Salazar	The half density sphere of U-235 requested by Group X-2 was completed and delivered this month.
(b) Development Keyser, Broverman Edelmann, Osborn	The development of methods for forming large diameter thin shells is progressing along two lines, namely, centrifugally casting to shape and hot forming of hemispheres from blanks. The centrifugal casting method is awaiting the preparation of large melting crucibles. Dies and molds for the hot forming experiments are being prepared in the graphite shop. Rolling billets of U-235 were cast in investment molds and the rolling to final thickness is now under way. The rolling will be completed before the blanking die is received from V Shop. This work is being carried on for Columbia University.

PROJECT & PERSONNEL	PROGRESS
CMR-6-4 (b) (contd.)	Several U-Be alloy castings were prepared, but delivery is being held up until all of the chemical analyses have been completed. Results thus far indicate a loss of uranium on melting, which is contrary to the results obtained previously.
	Methods for hot rolling uranium are being investigated. The first approach to this problem consists of cladding the billets with copper, silver, or gold by casting the metal around the billet. The first attempt was unsuccessful because of difficulty in heating the mold; although the cladding did not run well, the method appears to be promising and will be investigated fully.
	Considerable difficulty in fabricating the new vacuum furnace out of brass resulted in minor redesigns and the subsequent rebuilding of the furnace of stainless steel. The furnace parts are now in C Shop undergoing final machining and should be available for assembly within another week.
CMR-6-5 Plastic Services	Four large bore, reinforced rubber tubes were made and delivered to S Site for use in HE work.
Church, West, M. Arnold, Griffin	A total of nine silicone rubber gaskets were produced for Group CMR-11. Test runs with this type of gasket indicate that the limit of vacuum lies in the pump rather than in the gasket.
	A satisfactory method of forming lucite lens covers for HE lenses has been developed. The technique consists of pressing layers of preheated lucite sheet into a die having a spherical radius identical with that of the desired lens. A minimum of six lens covers has been requested for the 1216OD lens, and a die is being designed for large scale (1000 or more) production of lens covers for the 3218O lens. This work has been requested by Group X-8.
	Group M-4 has requested that an insulating material be cast in such a manner and shape as to hold in predetermined positions sets of .020 inch diameter pins for "pin shots". Two sets of pins, each containing thirteen pins, have been delivered for testing.

PROJECT & PERSONNEL	PROGRESS
CMR-6-5 (contd.)	Plastic hemispheres having 3.5, 4.5, 5.5, and 6.5 inches radius, respectively, were blow molded for Group H-4. The plastic could contain only the elements C, H, and O. The hemispheres are to be used for holding mice at predetermined distances from a source of radiation. Groups M-4 and X-8 have requested that tourmaline crystals be precision mounted in an insulating medium for use as a Piezo gauge in measuring shock velocity. "Kriston" will be used for this job. This may result in another large production order. Ten foils .005 inches thick and 2.5 inches diameter have been requested by Group P-3. The foils must contain a known amount of nitrogen and in addition must contain no elements other than C, H, or O. An investigation on urea is now in progress. The above-mentioned group has also requested foils .010 inches thick and 2 to 4 inches in diameter. The foils must contain various metallic fillers in a variety of known concentrations, be flexible, and contain only C, H, and O in addition to the metal. Preliminary investigation has been started on a mixture of tungsten and polythene. Group CMR-5 has requested work be done on hollow spheres of plastics of various diameters and wall thicknesses.
CMR-6-6 Electroplating	Two pieces of U-235 material were silver plated prior to rolling operations.
H.Slatin, Gore	Approximately 45 different items were electroplated this month. Metals plated were silver, gold, cadmium, nickel, and hard chrome. A quantity of manganese fluoride, reported to be anhydrous and very pure, was received from an outside supplier. Four separate, unsuccessful attempts were made to supply a single crystal; temperatures as high as 1300°C were reached without melting, although the melting point is reported at 856°C. The only crystal produced satisfactorily was from material produced on the project. Group M-8 has requested that tourmaline crystals be silver plated on the two parallel faces. This problem is now under way.

GROUP CMR-6 MONTHLY REPORT --- J. M. Taub, Group Leader -- July 20, 1947 (contd.)

PROJECT & PERSONNEL

CMR-6-7
Miscellaneous Hot Pressing

Wellborn, Smith, Johnson, Kain, L. Martinez

PROGRESS

Six lead-boron filters were pressed for Group M-5.

A total of 12 tungsten carbide mortars were pressed for Groups CMR-6 and CMR-3.

Six compacts of high density, pure sulphur were pressed for Group P-5.

Four heat resistant electrical insulators were completed for Group M-5. Two thermocouples are being prepared in the same manner.

Special shapes of boron 10 were completed for Group P-2.

An 18 inch diameter MgO crucible was fired in the large induction coil. The crucible was for the CMR-6 tuballoy foundry.

An 11 inch half-density aluminum hemisphere was pressed for Group M-5. Three more hemispheres are on order.

Work is continuing on the fabrication of Alnico 5 hemispheres for Group M-3. A method is being developed which appears to be very promising.

Group M-5 has requested crystal mounts for tourmaline crystals. The mounts, to be of an insulating material, should have approximately the same density and sound velocity as the tourmaline crystal.

52 pieces of Kovar were bright annealed this month.

Work is continuing on the production of tungsten carbide, titanium carbide, and zirconium carbide crucibles for Group CMR-2.

Note: Production of special materials is outlined in a separate report.

GROUP CMR-8 MONTHLY REPORT — R. D. Baker, Group Leader — July 20, 1947

PROJECT & PERSONNEL	PROGRESS
CMR-8-1 Reduction of Normal Uranium Hayward, Schiavone	Five shipments of calcium were tested. Four shipments (~30 pounds each) were found to be satisfactory and were used in production. One shipment (400 pounds) was found to be unsatisfactory because of its high Al content. Thirty-three kilograms of high purity normal uranium were produced during the period. Ore special fluoride from Oak Ridge was tested.
CMR-8-4 Development of Recovery Processes for U-235	Most of the time was spent on production which is covered in a special report under Project No. CMR-8-3. Work continued on a new method for the analysis of strip solutions. It has been found that the use of penta ether with the $Mg(NO_3)_2$ solutions is not feasible because the salt content of the ether layer becomes too high for subsequent fluorimetric analysis. Preliminary work on the precipitation of the Mg as the carbonate, leaving the T in the filtrate, shows promise as a method for the analysis of the strip solutions. A new type hood for the production work was designed and ordered. It is hoped that this hood will eliminate the above-normal air counts which have been encountered during the past month.
(2) Hydrofluorination Goldsmith, Fry	All of the time was spent on production which is covered in a special report under Project No. CMR-8-3.
(3) Concentration Process Bradshaw, Mareman, Wilkinson, Shepherd	Plant production remained the same as last month. The experimental-production program for the study of column operation was continued. Some difficulty in the operation of the column was encountered due to the build-up of H_2SiO_4 in the packing. It was found that the column can be washed free of the H_2SiO_4 rather easily. The complete design and mock-up of the new charge system was completed and final installation started. This new system should eliminate air-locks and also give much better control on the charge and water rates. The design of the new filtrate evaporator was completed and installation started.

GROUP CMR-8 MONTHLY REPORT -- R. D. Baker, Group Leader -- July 20, 1947 (contd.)

PROJECT & PERSONNEL	PROGRESS
CMR-8-4 (%) (contd.)	Design work and the installation of the 100 gallon reactor was started. One hundred samples were prepared by the control lab for analysis.
CMR-8-5 Determination of Temperatures in the Reduction Bomb Hayward	No further work done during the period.
CMR-8-6 Determination of Pressures in the Reduction Bomb Hayward	No further work done during the period.
CMR-8-9 Research on the Hydrofluorination Process Goldsmith, Fry	The laboratory in D-110 was completed and the installation of equipment started. The literature survey was completed. Measurements of the HF flow through a 40 mil orifice with a 20 mil wire insert at various pressures were completed. It was found that previous calibrations of this type of orifice were in error, and that the amount of HF being used is probably far in excess of that actually needed. This problem will be studied. Several peroxide precipitations were made on normal material under carefully controlled conditions so as to obtain as uniform an oxide as possible for future reduction and hydrofluorination studies.
CMR-8-11 Chemical Service on the Water Boiler Gurney	One sample of "soup" was analyzed during the period. A special foil was prepared using T_3O_8 from the water boiler "soup". The acid-water dispensing apparatus was completed and installed. Some revisions will be necessary. At the request of L. D. P. King, a study of the rate at which dilute nitric acid evaporates from an uranyl nitrate solution at 3 liters per minute air flow is being made.

GROUP CMR-8 MONTHLY REPORT -- R. D. Baker, Group Leader -- July 20, 1947 (contd.)

PROJECT & PERSONNEL	PROGRESS
CMR-8-12 Analysis of the Gases from the Water Boiler Gurney	Work continued on the gas collection apparatus which fits inside the boiler.
CMR-8-13 Preparation of Uranium Metal Powder Hayward	Reductions of UF_4 with Ca using UO_2, NaCl, or CaF_2 as inhibitors have been made and the resulting metal recovered. In all cases the uranium metal is obtained in spherical particles ranging in size from +10 to -200 mesh. The reductions using CaF_2 as the inhibitor are the most satisfactory, the yields of usable metal being ~60 percent. The CaF_2 charge will be tested on both the 500 and 1000 gram scale. After these reductions are completed, no further work will be done on this project until the metal obtained is evaluated by Group CMR-5.

GROUP CMR-9 MONTHLY REPORT -- E. F. Hammel, Group Leader -- July 20, 1947

PROJECT & PERSONNEL	PROGRESS
CMR-9-2 Plutonium Coefficient of Expansion Studies Benesi, Hammel	Blank runs with densitometer were carried out July 16. This test pointed up several necessary changes in the electrical and mechanical apparatus which are now being carried out.
CMR-9-3 Low Temperature Studies of Plutonium Properties Hammel	Apparatus is under construction.
CMR-9-4 Density of Liquid Plutonium Hammel	Apparatus being designed and outside orders placed.
CMR-9-6 High Temperature Electrical Resistance of Plutonium Hammel	Apparatus being designed and outside orders placed.
CMR-9-7 Determination of the Elastic Constants of Plutonium Hammel	Apparatus being designed and outside orders placed.
Training Course Benesi	This course is continuing under the leadership of Benesi with an average attendance of about 35.

GROUP CMR-11 MONTHLY REPORT -- F. K. Pittman, Group Leader -- July 20, 1947

PROJECT & PERSONNEL	PROGRESS
General Plant Operation Pittman	During the period June 21 through July 20, production schedules were maintained in all operations. Mr. Kenneth L. Clark resigned as Production Manager on June 30 and was replaced by Mr. I. Budd Venable on July 11. The activities of the Process Development Group are progressing in a normal manner with thirteen problems being actively investigated.
Personnel Magness	During the period, four persons terminated and two new employees were placed on the rolls. The Procurement Section, consisting of six persons, was transferred to CMR-A where all Division property and procurement will be handled. The group personnel strength is now 66, and there are three outstanding job offers. Twenty-six persons used 98 1/2 vacation days, twenty-five persons used 18 1/2 sick leave days, and two persons used 4 1/2 days of leave without pay. Forty-six persons were scheduled for health tests.
Material Control Champion	The metal box, which is to be used to transport classified material, has been completed and will be put in use this week. On July 17, Gilmore discovered a spill in the solutions storage room of the main vault. The room is being emptied, and an effort will be made to decontaminate it without tearing out the walls and taking up the linoleum.
Production Venable, Nordeen, McNeese, Dumrose, Ballard	Solutions Room: 1) Prepared and checked all solutions for Purification and Recovery. 2) Provided solvents and cleaning solution for all operations and the HI Group. 3) Construction and rearrangement of equipment to provide space for CMR-4 has been completed. 4) Carried out all maintenance for proper operation of equipment. Bomb Decontamination: The 1000 count tolerance on plugs is now being followed. Due to a misunderstanding, this had previously been set at 250 counts. After one processing, the average percentage of rejects has been reduced from 80% to less than 20%. Nearly all of the plugs accepted are in the range of 250-500 counts. Recovery: Work is progressing satisfactorily on concentrating supernatants from the purification operation.

PROJECT & PERSONNEL

Production (contd.)

PROGRESS

Purification: Transfer cans used for the air transfer of material from purification to dry chemistry are now being decontaminated after each run.

The supernatant filtering apparatus is not completely enclosed, and therefore certain contamination dangers from accident are present. As soon as possible, the filter apparatus enclosure will be vented and the open side provided with a sliding lucite door.

Dry Chemistry: The brass aspirators used to exhaust HF in the hydrofluorination step are being replaced with a stainless steel type which has proven more satisfactory.

Reduction: The accumulation of metal turnings from Metal Fabrication has been processed. There is some evidence that X-button reductions result in a higher plutonium yield from the fluorids than the A-button reduction. This will be investigated more fully as soon as possible.

Alloying and Casting: All castings were made using the new three-day run procedure. A new type of heavier-walled crucible was used for two hemispherical castings. Both showed deep cracks in the wall, but other shapes are being fabricated and will be tried as soon as available. Two optical pyrometers and one Westinghouse mass spectrograph leak detector were declared surplus and sent to D Building for the use of other groups. Outgassing furnace No. 2 is down for major overhaul.

Machining and Pressing: Work in this operation has progressed satisfactorily. During the past month extensive alterations of the drybox arrangements were made to facilitate the consolidation of all metal fabrication operations in Room 513 (Oper. 7, 8, 9).

Cleaning and Coating: An adaptor has been attached to Unit #8 to permit the use of 5 pound $Ni(CO)_4$ containers instead of the one pound laboratory-size container.

Inspection: Work has progressed uneventfully. An attempt is now being made to rotate the men in the Metal Fabrication operations so as to provide a completely flexible group.

PROJECT & PERSONNEL

Process Development, Engineering Section

Ryland

PROGRESS

The problems that are now under investigation have shown the following progress:

CMR-11-6 Combination of Operations 4A and 4B: This problem is at a standstill due to the limitations set by CMR-1 in that no special samples can be submitted for analysis.

CMR-11-8 Combination of Operations 5 and 6: The MF flowmeters have been received, and testing of the equipment is to be started.

CMR-11-9 Combination of Operation 4 with the unit in Room 408: A new filter box has been fabricated and tested. It will be installed in the unit this week. Windows of the dryboxes are being installed, and the room is to be closed this month. Hot testing will start upon closing the room.

CMR-11-12 Design a drybox for the new Hardinge lathe: Work on the design of the drybox is now being held up due to the lack of draftsmen in the group. A secondary part of this problem, the shock wave testing of glass, lucite, and other glass substitutes is still being carried on. A second test has been made, and the results are inconclusive. If possible, a test will be run for this alone rather than at the same time as a test for M Division.

CMR-11-17 Redesign of the present pressing can: Orders have been placed for the new type heating jackets, as well as for a new type pressing can. Work is about completed on the design of the drybox for loading and unloading of the pressing can.

CMR-11-30 Indicator Jig for determining the Alpha-Beta Transition of Fabricated Pieces: Work is now under way to design a constant temperature bath to be used with the jig.

CMR-11-20 Removal of the Sludge from the Precipitrons: Results of the particle size samples have not yet been received. Settling rate tests indicate that a settling time of 48 hours is sufficient, such that clear oil above the sludge can be reused. The possibility of filtration will be considered at such time as the particle size has been determined.

GROUP CMR-11 MONTHLY REPORT -- F. K. Pittman, Group Leader -- July 20, 1947 (contd.)

PROJECT & PERSONNEL	PROGRESS
Process Development, Engineering Section (contd.)	CMR-11-31 Design a Hot Incinerator to be used for the Destruction of Contaminated Waste and Contaminated Documents: The design work is still going on. No word has been received yet to the inquiry sent out on the "Bond Destructor". Inquiries have been sent out to six companies for information on paper macerators. CMR-11-38 Sampling and Transfer of Material from Recovery Evaporator: Preliminary sketches have been made and approved. Investigation of the possibility of fabricating plastic valves to be used in this equipment has been started. CMR-11-17 Coating of the Incoming "W" Containers: Designs of a plug and bag to enclose the bomb have been completed. The present idea is to design a new type plug to be used by Hanford that would allow an adaptation of a vinylite bag to be placed around the container to eliminate contamination.
Process Development, Chemical Section	CMR-11-3 Gallium: Receipts and deliveries June 22 to July 22 From General Electric 5018.40 grams From E & A 2207.09 7225.49 grams Delivered to Operations None Delivered to CMR-1 55.36 grams Delivered to Elizabeth Graves 25.27 80.63 grams
Lowe, W.S. Magness	CMR-11-32 Dissolving Experiments: It was verified that pure PuO_2 will readily dissolve in a solution high in I^- and H^+ concentration. The lower feasible limit of such a solution in its proposed use for dissolving skulls is approximately 4N in I^- and 4N in H^+. Such a solution has been obtained by evaporating a simulated Operation 4 supernatant solution prepared with HCl rather than HNO_3. Behavior of PuO_2 during evaporation was found to be metathesis to a green precipitate tentatively identified as $Pu_2(C_2O_4)_3$. Treatment of skull samples in this same manner yielded identical results. The possibility of immediate separation of the green precipitate (pending its positive identifica-

PROJECT & PERSONNEL

PROGRESS

Process Development, Chemical Section (contd.)

tion as $Pu_2(C_2O_4)_3$ and sending it directly to the hydrofluorination process is being considered. If prior treatment proves to be necessary, it has been found to be soluble in its own supernatant solution upon the addition of HNO_3 and H_2O_2 and heating, as well as being soluble upon separation and treatment with either HCl or H_2SO_4.

Preparations are being made to dissolve three 160 gram batches of skulls and to send them through Operations 4, 5, and 6. Samples will be taken at each operation and of the product to determine purity and losses.

Mullins

CMR-11-25 Ion Exchange: Two analytical schemes have been tried in an effort to obtain reliable data on low concentration Pu solutions.

A. The first method paralleled the procedure used by the Los Alamos B-14 group in determining the Pu concentration of sea water after the Bikini test (LA-613).

1. Cupferron precipitation at pH 7-8.
2. Chloroform extraction.
3. Evaporation and ignition of extract to the oxide.
4. Conversion of oxide to chloride.
5. Fluoride precipitation, La carrier.
6. Evaporation on plate and counting.

This method has proved to give erratic and undependable results.

			Effluent Sol'n & Spike	
	No.	Blank Sol'n	1	2
Series I	1	--	200 c/m	
	2		328 c/m	
	3	5 c/m	346 c/m	329 c/m spike = 170 c/m

~~SECRET~~

PROJECT & PERSONNEL

Process Development, Chemical Section (contd.)

PROGRESS

Series II	5	12 c/m	53 c/m	340 c/m spike=700 c/m	
	7	16 c/m	42 c/m	195 c/m	410 c/m
	7'	(Backstrike of 7 LaF_3 SN)		170 c/m 365 c/m	
	8	30 c/m	43 c/m	285 c/m	230 c/m
	8'	9 c/m (Backstrike of 8 LaF_3 SN)	24 c/m	180 c/m	130 c/m

Several things are indicated to be wrong with the procedure.

Strong ignition is necessary to completely remove carbon from step 3. The resulting oxide is not completely soluble in HCl. The insoluble portion is mounted on the plate along with the LaF_3 precipitate and results in unevenness and flaking.

Backstrike runs 7' and 8' show that the LaF_3 precipitate does not completely carry the plutonium.

B. The second method is essentially simpler and appears more promising.

1. Lanthanum hydroxide carrier precipitation at approximately pH 10.
2. Lanthanum fluoride carrier precipitation of dissolved hydroxide at approximately pH 0.1.
3. Evaporation on plate and counting.

Data:

	Effluent		Sol'n & Spike	
No.	Blank	Sol'n	1	2
1	5 c/m	17 c/m	425 c/m spike=700 c/m	570 c/m
2	4 c/m	10 c/m	433 c/m spike=700 c/m	

This method shows incomplete recovery of the plutonium but seems to afford better precision.

PROJECT & PERSONNEL

Process Development, Chemical Section, (contd.)

Gibson, Henrickson

PROGRESS

CMR-11-36 Electrolytic Purification and Reduction of Plutonium Solutions: One qualitative run was made to determine operational soundness of the apparatus and to test feasibility of removing nitrate by use of formic acid.

A synthetic solution was prepared to contain:

10 g.	$CuSO_4$
10 g.	$Ni(NO_3)_2$
400 g.	$Fe(NO_3)_3$
200 g.	$Cr(NO_3)_3$
10 g.	$MgSO_4$

Dissolved in four liters of a solution 4N in H_2SO_4 and 2.5N in HNO_3.

This was heated to 60°C and treated with formic acid to remove nitrate and electrolyzed over a mercury cathode at approximately 10 volts and 15 amperes.

The reaction between formic and nitric acids was found to be readily controllable by governing the rate of formic acid addition.

The electrolysis required approximately 72 hours to remove all of the chromium. Chromium, being the most difficult to remove, was used as the test element. It is believed that the electrolysis time can be greatly reduced by operating at a lower sulphuric acid concentration.

GROUP CHR-12 MONTHLY REPORT -- J. F. Tribby, Group Leader -- July 20, 1947

The detailed report of the work of this Group is given in LAMS-598

HEALTH WORK, GENERAL

1. 96 persons were sent on health passes during the month. All tests were negative. All personnel exposed to polonium were given urine radioassay tests, and all tests were well below the tolerance excretion level.

2. Airborne alpha air contamination in all areas remained at approximately the same level as the preceding month. Additional air testing units were put into service in CHR Division laboratories, bringing the total number of air testing units in use to 65. Temporary high air counts were observed in 16 laboratories. These high counts were found to be due to: (a) changing of drybox gloves and repairing dryboxes; (b) heavy construction work in D Building and DP East Site (all personnel involved in reconstruction work were full protective equipment); (c) a fire in a drybox at DP West Site (all personnel were full protective equipment).

3. Radioactive surface contamination remained at about the same level. Some laboratories were effectively decontaminated by complete remodeling and installation of new equipment.

4. Routine tests with film badges, dosimeters, pocket meters, cobalt slugs, gamma and neutron survey meters indicate gamma and neutron radiation levels are very low. One excessive exposure to gamma rays was recorded. This case has been referred to the Industrial Health Division.

5. A three-day run of air sampling units on the roof of D Building showed negligible airborne contamination in the area where construction work is going on. Spot checks inside the exhaust stacks showed slight air contamination but below tolerance levels.

6. Eastman experimental fission film and proton recoil film are being studied and calibrated for use as fast neutron personnel monitors.

7. Three contaminated accidents occurred during the month, all at DP West Site. An operator ran a contaminated steel sliver into his finger. The sliver and surrounding tissue were excised. The material in a "skull" transfer can ignited when the cover was removed. The operation was in a drybox. Material stored in the recovery vault developed gas pressure and blew the lid from the outside container.

In all three accidents, the spread of material was quickly brought under control. Decontamination was complete. All persons exposed were sent on health passes immediately.

RESEARCH & DEVELOPMENT

Little work was done in this section during the month. This work will continue, however, when the electronics personnel we have on order report for work. A new type vibrating reed electrometer was procured which is capable of measuring ion currents in the order of 10^{-17} amperes. Drawings of three types of ion chambers were made up and sent out for fabrication.

Calibration of neutron and gamma ray survey counters and meters continued.