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GROUP CMB-14 MONTHLY PROGRESS REPORT SEPTEMBER 22, 1964 - OCTOBER 20, 1964

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WING 9 HOT CELL FACILITY

A. Operations

1. Rover Program

Ten 20-ton casks containing ~1500 elements of the B-4E-301 reactor were received from NRDS. The elements were weighed and counted by ACFI personnel using the equipment in Cells 5 and 7. Twenty-four elements were inspected for plugged holes and ground. Twenty-seven samples were taken in Cell 3 for J-11. Two 17" lengths were sectioned from each of four elements and ten-10 mil slices were taken from one element for J-11.

In progress are the following: Δl examination, element slicing for N-1 gas passage examination, element sectioning, flexure compression testing of element sections. All the elements which had been selected for special examination have been pulled and located either in the library or in special cask inserts which are stored either in Cell 5 or on the shelf under Cell 7. The "module" cask containing Mo cones, tie rods, filler strips and center elements with thermocouples (plus miscellaneous hardware) was received on November 16.

During the "301" post-mortem operations two incidents occurred which are described in some detail as follows:

a. Contaminated Spill

During the crushed element tumbling operation in Cell 3 a switch was inadvertently thrown which released the can from the

tumbler spilling about 200 g of fine element dust throughout Cells 1 and 3. All dust that could be reached in Cells 1 and 3 with the remote vacuum system was picked up remotely. After removing the elements, one cell at a time was opened and cleaned. The contamination in the basement was confined to a small area under Cell 1 and 3. This area was vacuumed and then mopped. The count was ~15 mr/hr immediately after mopping but climbed up to 650 mr/hr (swipe) about 10 minutes later. All decontamination work was done with full protective clothing and face masks. The area was remopped and vacuumed several times over the next three days. It was concluded that dust continued to sift through the door crack.

The following corrective measure were taken: plastic sheeting was laid on the floor in the basement to catch dust that would fall at a later date; the table in Cell 3 was sealed on all edges to prevent dust from dropping to the floor; a guard was placed over the switch to prevent recurrent accidents of this nature. An improved method for dust containment in Cell 3 is under consideration.

b. Loss of Crushed Material Due to Burning

As was indicated in the preceding report the temperature of the powder following crushing was 300° C, and about 3 hrs. was required to cool the material to room temperature. During the hot runs 5 elements were crushed successively, and the receiving cans were placed adjacent to each other for the cooling period. After about 5 hrs. the temperature was still too high for sampling. Upon inspection of the powder a red glow was observed in the cans indicating that the powder was burning. Since the heat loss is primarily by radiation, the material did not cool down with the 5 cans in close proximity. The cans were therefore dispersed within the cell, and the powder was stirred remotely. The temperature was reduced to about 35° C in 2 hrs. by this procedure, but the surface of the powder had an ashen appearance. Subsequent weighings indicated that between 12 g and 30 g of graphite had been lost as a result of the burning.

The corrective measure taken which obviates this problem is as follows: an Al fixture containing twelve 8" x 1/2" diameter prongs is placed directly in the powder following grinding

to dissipate the heat. The temperature can now be reduced from 300°C to 35°C in about 40 min.

The last half of the six fuel elements for ORNL was shipped on September 21.

A radiation measurement on a B-4E-301 fuel element (03440) on September 25 gave a reading of ~12 r/hr at 1 meter. This reading is higher by a factor of 4 than that obtained on a "202" element with approximately equal cooling time.

2. LAMPRE Program

The remaining eighteen mounted metallography samples were demounted and packaged in an Al block. This completed the metallographic work on the 42 Lampre II core capsules selected by K-2. The remainder of the core is being moved from Ten Site storage to Wing 9 for processing. The capsules are unloaded, counted, removed from the α cans and washed. The stainless steel threaded adapter is sawed off, and the capsule is stored in an Al block. The capsules are being transported individually from Ten Site to Wing 9 in a K-Division cask. Sixty of the 100 capsules have been transferred to date. Two Al insert blocks have been filled, one has been placed in floor storage and the second is awaiting storage. Approval was received from N-2 for increasing the number of Lampre pins from 7 to 14 in the unloading process which utilizes the new 7" lucite transfer container.

Capsule #1536 was sectioned into three pieces with a tubing cutter and the Na dissolved in butyl alcohol. It was necessary to section the area with the fuel into three lengths in order to remove the fuel. All pieces and residue were transferred to Cell 12 for analysis by CMB-1.

3. Plasma Thermocouple Program

One irradiated unit was disassembled during this period, and metallography was completed on one pin sample. Cell 2, where the PTC disassembly is done, was used primarily for work on the UHTREX samples.

4. UHTREX Program

Assistance was provided P. J. Peterson, CMB-11, in disassembling and examining a UHTREX test cell. The assembly was

received from the OWR in an N-5 cask and lowered into Cell 2 through the ceiling plug. Before lowering, it was necessary to remove some tubing which extended over the top of the cask, drill holes and fasten cables to the unit. A 40 r/hr beam was measured at the top of the cask. The assembly was lowered into the Cell 2 lathe, and a reading of 1500 rhm was recorded. A gas sample was taken and sent to GMX-2 for analysis. The capsule was cut open. All parts were removed, examined and photographed using the Kollmorgen periscope. The two fuel elements were measured for length, i.d., o.d., passed through a go-no-go gauge, weighed and sectioned as follows:

6 - 1/8" sections for CMB-1 analysis
3 - 1/4" sections for Cell 8 metallography
3 - 1/4" sections for Cell 4 density tests

The fuel element chamber was washed with 200 cc 6N HNO_3, and this solution will be provided to CMB-1 for analysis. Metallographic work was completed on the three fuel samples. After the examination all fuel element pieces were placed in floor storage and the remaining equipment was sent to the contaminated dump. Cell 6 was set up with equipment for dissolving the six graphite samples. J. Dahlby, CMB-1, has completed the dissolution on 4 of these graphite samples as of October 20.

5. Miscellaneous

Some work was done using the modular periscope and Kentron hardness tester to determine the feasibility of this combination in cell operation.

Three cold samples, using the Syntron machines for the final polish, were prepared for J. Bender, GMX-1. The samples were used in evaluating the techniques for electron microscopy studies.

Cell 3 was entered and decontaminated following the element grinding operation. The 500 cfm wall filter reading 1 r/hr contact, the cyclone separator filter reading 30 r/hr contact and the plastic receiving bottle reading 8 r/hr contact were removed and replaced.

The element grinding motor (Router) which had failed at the completion of the grinding was replaced. Using masking and Al tape the table was taped to the wall and the corridor door, and a piece of felt was fastened on the table at the inter-cell door. This was to effect a dust seal during the element sawing operation and reduce the amount of dust falling past the doors to the basement floor as mentioned earlier. The Cell 3 absolute filter which read 2.5 r/hr at contact was replaced.

Three contaminated acid waste solutions and one bottle of contaminated Syntron polishing oil were given to H-7 for disposal. These materials came from the Pu cells.

Six heavy duty tie down shackles were constructed and welded into the bed of the new 5-ton truck by Zia. The existing shackles proved to be too weak. Two had failed in use before the change was made.

A 3 kg sample of highly purified U^{238} was unloaded from a shield for E. Jurney, P-2. The U^{238}, which measured 3 RHM, will be removed from a Be container and stored for decay. The Be container will be saved for possible re-use by P-2.

The irradiation of the plastic-fiber glass materials for ACFI was completed. Samples of Presray, which has a potential use as material in a high γ environment, was irradiated to 10^9 r with no deleterious effects being observed.

During the dissolution of the UHTREX element samples a few high air counts of nearly pure Ru^{103} were obtained on the basement air samplers. This contaminant was released as a volatile oxide during the $HClO_4$ dissolution of the graphite. A 500 cfm filter (charcoal type) in Cell 6 was observed to be plugged and apparently permitted the fine dust to fall into the basement area through the cracks in the vertical steel doors. The filter was changed, and an air flow indicator has now been installed on this filter.

B. Development Work

1. Rover Program

N-Division has requested visual examination of "301" elements at higher magnifications than presently available with the

Kollmorgen periscopes.

Consequently a mirror, reading glass and flood light have been installed in Cell 7 which when used with the 17 mm (30X) Kollmorgen eyepiece give a true magnification of about 6. The Cell 7 element tray serves as the stage for this operation. In addition the $_{\Delta}$1 equipment is being modified to be used as the stage for viewing selected element sections at a true magnification of about 25.

For future reactors a stereo-microscope and stage will be available with a maximum true magnification capability of 60.

The second potential drop measuring device has been fabricated and will be used by GMX-1. The first device has been tested by GMX-1 and installed in Cell 1 for "301" post-mortem measurements.

A measuring tool (profilometer) has been designed to remotely gage the width and depth of corrosion grooves and holes on selected "301" element faces. Fabrication is complete pending receipt of a special dial indicator. The precision requested by N-Division (capable of measuring grooves 0.030" wide by 0.005" deep to a ± 0.0003" tolerance) suggests that some other measuring technique, such as optical, should be developed for future reactors.

The foam glass filler strip used in the residuals boxes has been redesigned to strengthen the foam glass and increase the capacity of the box from 20 to 22 two-quart cans. By double stacking the residuals boxes and loading two elements into each two-quart can a single cask now has a maximum capacity of 88 crushed or sectioned elements. All changes have been approved by N-2 for criticality safety.

In preparation for mechanical properties tests on the "301" elements the tensile tester was calibrated with a proving ring borrowed from GMX-3. The tensile machine is accurate within ± 1% for loads greater than 300 lbs. (the range of interest).

Two vibratory polishers have been modified for remote operation and will be installed in Cell 6 to polish "301" element samples for electron microscopy. The polished samples will be examined by GMX-1.

2. LAMPRE Development

The mirror system used to relay the arc light in Cell 16 to the emission spectrograph has been modified to accommodate two beam focusing lens systems requested by CMB-1.

Ten additional 7" transfer cans are being equipped with the positive lock lid feature to be used for eventual shipment of LAMPRE Core II capsules to SRL.

3. UHTREX Program

No progress.

4. Miscellaneous Development

The new objective and eyepiece for the modular Kollmorgen periscope have been received. They will permit better photography than was possible with the former lens combination.

The Aminco abrasive cut-off machine was found to be unsatisfactory for cutting bend test strips from the irradiated 3/8" x 5-1/2" boron steel plate furnished by P-2. Modifications to the machine which include doubling the power and speed and using a thicker more rigid blade should eliminate the problems.

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