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Research Department - Mound Laboratory

December, 1964

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TR-071 - Hanford Laboratory Meeting of Isotopes Advisory Board December 7 & 8, 1964 - J. A. Powers

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Dr. G. Richard Grove

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Dr. G. R. Grove and Dr. J. A. Powers of Mound Laboratory attended the Hanford Laboratory meeting of the Isotopes Advisory Board on December 7 & 8, 1964. Others in attendance were W. K. Kister, AEC/DID, T. Butler and K. McHenry, ORNL, D. Davis, AEC/ORO, W. Ruehle, Martin Company and C. A. Rohrmann, R. Moore and others from Hanford. The first day of the two day session was devoted to the various site status reviews, the second day to a tour of a number of Hanford facilities.

December 7, 1964

Site Reviews

Mound Laboratory (G. R. Grove)

The status of the SNAP and POODLE programs was reviewed. The thermal sizes of heat sources and the number of capsules supplied for the SNAP 13 series, the Heat Pipe, the SNAP 19 and the POODLE was discussed. Other topics reviewed in some detail were the heat source fabricating procedures and quality assurance program now being used by Mound Laboratory. There was a great deal of interest shown in the POODLE capsule fabrication procedure as well as our quality control program in general. Before the next meeting, J. A. Powers is to send a letter to the other sites describing our capsule fabrication procedures.

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TA-071 - Hanford Laboratory Meeting of Isotopes Advisory Board, December 7 & 8, 1964 - J. A. Powers

Hanford Laboratory (R. Moore)

The Hanford program has centered primarily around efforts to separate promethium-147 from high energy gamma active promethium-146 and promethium-148. This is done by either aging the promethium or by "burnout" of the promethium-146 in a reactor of high neutron flux. As a final purification step, the isotope is scavenged with neodymium and samarium through an ion exchange column. The degree of seperation is determined by anti-coincidence counting methods.

A dyna-pak machine has been installed at Hanford and various tests are in progress to determine the capabilities of the machine. The fission products are pressed in a container which is sealed and becomes the primary container for an encapsulated source. It was reported that spherically shaped heat sources can be fabricated by this technique.

Hanford has studies underway to screen the entire spectrum of fission products to determine their applicability as heat source materials.

Martin Company (R. Rumble)

The Martin Company has received license approval to handle up to six megacuries of strontium-90 at the Quehanna Plant as either the fluoride or the titanates. The facility is presently under cold checkout using SrF_2, $SrTiO_3$ and Sr_2TiO_4, with varying amounts of zirconium to simulate aged strontium-90. After checkout of the facility with non-radioactive isotopes, the schedule is to use strontium-89, then go into strontium-90 production.

Oak Ridge (R. McHenry)

ORNL reported on the curium, strontium and cerium programs. The $Cm\text{-}244O_2$ fuel has been mixed with ThO_2 to improve the melting point of the fuel. Studies indicate that although the addition of 10-15% ThO_2 does raise the melting point of

the oxide, the melting point is not well defined. The sesquioxide of curium is reportedly more stable than the oxide and is to be investigated in future efforts at ORNL.

Hot pressing of SrO (non-radioactive) has been successful in that theoretical density pellets have been fabricated by pressing at 1800 psi and 1200°C. Hot pressing also reduces the hygroscopic nature of the compound. SrF_2 and $SrTiO_3$ preparations and solubility are under study.

CeO_2 and Ce_2O_3 are candidate cerium fuel forms. Ce_2O_3 heated in air oxidizes to CeO_2 above 200°C but in an inert atmosphere has a melting point of 2150°C. It has been reported that Ce_2O_3 is compatible with the refractory metals to the melting point of the oxide.

December 8, 1964

The status of promethium availability and recovery was presented in detail by Mr. Sam Beard, Hanford. The current promethium inventory is eight megacuries. This material ranges in age from 200 to 720 days, with two 2.2 megacurie batches 200 and 270 days old respectively. After 720 days, promethium-148 cannot be detected, according to Mr. Beard. Present plans include continuation of the promethium-147 aging and monitoring processes.

The isotopes currently being separated from the fission product materials are the rare earths and strontium. The separation of the rare earth and strontium is carried out in a two step process utilizing the Purex and 'B' plants. The fission products are separated from the fuel rods in the Purex building. The 'B' plant facilities separate the strontium from the product mixture. Except for one batch of rare earth crude, the entire eight megacuries of promethium (and other rare earths) is in storage. This one batch was removed from storage to demonstrate the feasibility and efficiency of the purification process. This batch was

run through the present purification process which terminates with the ion exchange procedure. The promethium fraction was contaminated with small amounts of neodymium. The Hanford personnel were quite pleased with the run, however. Future plans include further process development and demonstration runs.

The N-reactor at Hanford was toured the afternoon of December 8, 1964. The unit is in the checkout stage at this time and is near full operating capacity. It was postulated by a Mr. Leverett of Hanford that in two to three years time a polonium-210 production capacity of 500 to 700 grams per year could be reached, using only the 68 spare reactor channels. Costs would range from $400/gm to $1000/gm. A research program of sizable proportions would be a necessary prerequisite, however. The costs and production rates are predicated on the method by which the polonium-210 is separated from the bismuth.

Original Signed by
JAMES A. POWERS

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