Title
MINUTES OF MEETING OF MTA TARGET COMMITTEE HELD APRIL 9, 1951

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Publication Date
1951-04-09

UNIVERSITY OF CALIFORNIA — BERKELEY

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UCRL-1228
Technology - Materials
Testing Accelerator

UNIVERSITY OF CALIFORNIA
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Contract No. W-7405-eng-48

CALIFORNIA RESEARCH & DEVELOPMENT COMPANY
Contract No. AT(11-1)-74

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HELD APRIL 9, 1951

Russell H. Ball

Berkeley, California

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RESEARCH SERVICE BRANCH
Atomic Energy Commission
Berkeley Area
Berkeley, California

MINUTES OF MEETING OF MTA TARGET COMMITTEE
HELD APRIL 9, 1951

Present: UCRL: Brobeck, Brown, Cooksey, Hansen, Kane, Latimer, Martin, Street, Van Atta

CR&D: Chaffe, Crandall, Frankel, Gaylord

AEC: Ball, Moore

NAA: Hunt, Taylor

Kane reported on a trip that Brobeck, Gaylord, and he had made to various installations to determine the feasibility of using NaK as a target coolant. A detailed report of this trip is being prepared and will be available soon. Numerous systems with pipe sizes up to 8-inch were observed, some of which have been in operation for several years. It was the consensus that this coolant is practical and five to six arrangements of such systems are now being studied.

Crandall discussed the supply of thorium. Recently the representatives of the Ames Area, the New York Operations Office, the AEC Washington office, and the Catalytic Construction Company held a meeting to determine thorium metal supplies and suppliers. Catalytic Construction was authorized to study the engineering and design of plants to produce 40 tons/year and 300 tons/year, respectively. Since production will take 18 months from the date of authorization of construction, Ames, which now produces 1/2 ton/month, will have to scale up its production by a factor of three or four to supply our initial requirement. Van Atta, Brown, and Crandall have re-estimated the minimum initial thorium requirement using thorium only in the primary target and a 0.1 ampere average beam to be 30 tons by October 1952 and the minumum replacement rate to be 30 tons/year beginning in the spring of 1954. At present the Commission has 200 tons of thorium available as the nitrate and with this uniform supply of raw material it is expected that Ames will be able to produce a uniform grade of metal. Since there are as yet no specifications on the required purity of thorium, Dr. Spedding at Ames agreed to publish with each billet a "standard" specification on impurities. The Ca supply should be normal and is not expected to introduce variations in the purity of the thorium metal during the Ames production period. Research on thorium by various Commission installations is progressing with little overlap among the groups.

Thorium has now been developed to give 4,200 psi yield strength at 600° C as compared to the room temperature value of 24,000 psi. Los Alamos is being requested to state the purity of U^{233} needed by them and from this specifications can be developed for thorium. A wet step is being placed in the projected thorium purification plant to take care of any future variation in purity of raw materials.

Information was determined that high density graphite is not available commercially in the quantities needed but that Hanford has a sufficient stockpile of pile grade graphite to supply our needs up to 500 tons. It will be necessary to be more firm about procurement schedules and types of graphite desired if a type other than that available at Hanford is to be procured on schedule.

Kane stated that information from Hanford showed that reactor grade graphite as of 1948 was 20¢ - 35¢ per pound raw and 80¢ per pound in place in the pile. The present price of reactor grade graphite is now 50¢ per pound, so that the cost in place might now be $1.20 per pound. Van Atta said that the target design depends upon the specifications of the graphite to be used and therefore he would also like to obtain information on Great Lakes Carbon Company high density graphite as well as that available from Hanford.

Brobeck stated he has heard that 1% chromium-uranium alloy is an order of magnitude better in resistance to thermal cycling damage than pure uranium.

Frankel discussed a recent meeting he attended at WAPD in Pittsburgh on radiation damage. It was his feeling from the tenor of the meeting that most mechanical properties of materials are improved by irradiation. Table 1 shows data on the changes in some physical properties of 347 stainless steel as produced by pile irradiation and by cold working, as compiled by Murphy at Argonne.

	Rockwell_B	Yield Strength	Ultimate Tensile Strength	Elongation
Annealed (unirradiated)	76	33,000 psi	85,000 psi	58%
Above sample with exposure of 10^{20} nvt	98	77,000 psi	102,000 psi	32%
10% cold worked (unirradiated)	100	78,000 psi	106,000 psi	30%

Table 1.

The conclusion was that irradiation to 10^{20} nvt produced essentially the same changes in mechanical properties as though the sample had been

10% cold worked. In the case of 99.4% nickel plus cobalt ("A" nickel) the exposure to an nvt of 10^{20} was equivalent to a 20% cold working. The only significant difference between irradiated and cold worked samples is that the changes can be annealed out of the irradiated samples more rapidly than from the cold worked samples. Frankel said some information of leakage of gas from irradiated Li-Al alloy was presented at the conference. A 7% Li-Al alloy was canned in Al and irradiated in a Hanford pile. It was found that following a six-month irradiation the cast alloy sample had lost 6.5 volumes of gas while the extruded Al had lost about 1-2 volumes (at NTP). It was also reported that NAA has shown that large changes in electrical resistivity were observed at -150° C for several metals, but only $\sim$4% change was retained at room temperature, indicating room temperature annealing of resistivity effects.

Latimer discussed his recent trip to GE. It appears that the Purex Process using mixer settlers is favored for plutonium extraction. He said also that GE is experiencing high losses in tritium recovery from Li-Al alloy - sometimes as much as 20%. Studies are now underway on the Li-Mg alloy from which it appears the tritium is released at lower temperatures and with greater efficiency. He said that much chemistry will need to be developed if production of U^{233} is decided upon, since little information on its separation is presently available. Also, if Pa is to be separated from U^{233} the chemistry of Pa will need to be studied in detail.