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6-2-S-216

PRELIMINARY OUTLINE OF

PLUTONIUM-238 FUEL AND CONTAINMENT STUDIES

Released through the
MOUND LSDR PROJECT
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MOUND LABORATORY, JULY 27, 1962

MOUND DECLASSIFICATION REVIEW
1ST REVIEW-DATE: 7/3/97
DETERMINATION (CIRCLE NUMBER(S))
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2ND REVIEW-DATE: 4/17/97
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7. OTHER (SPECIFY):

ALMD62082160205

1. Metal containers with tantalum liners for the loading of about one cubic centimeter of plutonium-238 would be prepared and time-temperature studies on the effect of the plutonium on the tantalum would be performed. Samples would be maintained at 1400, 1600, and 1800°F for periods of 1, 2, 4, 8, 16, 32, and 52 weeks, following which they would be examined in detail for reliability of containment.

2. Studies of the suitability of selected alloys of plutonium would be made and the most promising mixtures would be subjected to the time-temperature evaluation described in Item 1 for the 1600°F temperature.

3. The preparation and characterization of plutonium oxide particles in the one-micron or smaller diameter size range and the one to fifteen-mil diameter size range would be made. The oxide appears to be an attractive form of the plutonium-238 if it can be fabricated in a matrix material such as nickel and would exhibit desirable burn characteristics.

4. Compounds of plutonium such as the nitride, arsenide and selenide and some alloys of potential merit should be evaluated.

5. Evaluation of the potential value and fabrication practicability of plutonium-238 carbide for use as an isotopic power source material should be made. Inasmuch as a considerable amount of information exists for plutonium carbide, initial efforts would be limited to literature studies.

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The first phase of this effort would be the evaluation of plutonium fuel forms and containment studies by Mound Laboratory and the performance of impact studies and the evaluation of electrical conversion systems by the Martin-Marietta Corporation. This phase would extend over a twelve-month period. The second phase would include the detailed generator design by the Martin-Marietta Corporation and the fabrication of the sources subject to the specifications determined from the Phase I study. Concurrently with the Phase II effort, additional research and development work would be done on the materials not fully evaluated in the Phase I effort.

G. Richard Grove, Director
Research Department

GRG:la

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EQUIPMENT LIST

Metallographic and Inspection Equipment	$ 12,000
Plasma Torch and Associated Equipment	15,000
Differential Thermal Analysis Equipment	10,000
Special Containers for Time-Temperature Studies	5,000
Four Furnaces with Temperature Indicators and Controls	10,000
Miscellaneous Equipment	8,000
Total	$ 60,000

This equipment is required to accomplish the work outlined in the discussions at Mound Laboratory with representatives from the Martin-Marietta Corporation and the Division of Isotopes Development on July 19, 1962.