**Pacific Northwest Laboratory
Monthly Report
to Space Nuclear Systems
Division
for May 1975**

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by
H. T. Fullam

June 1975

**Prepared for the U.S. Energy
Research and Development Administration
under Contract AT(45-1):1830**

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PACIFIC NORTHWEST LABORATORY

operated by

BATTELLE

for the

U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

Under Contract AT(45-1)-1830

Printed in the United States of America

Available from

National Technical Information Service

U.S. Department of Commerce

5285 Port Royal Road

Springfield, Virginia 22151

Price: Printed Copy \$4.00; Microfiche \$2.25

3 3679 00062 1930

BNWL-1845-11
UC-23
Special Distribution

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TO SPACE NUCLEAR SYSTEMS DIVISION FOR MAY 1975

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Battelle
Pacific Northwest Laboratories
Richland, Washington 99352

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STRONTIUM HEAT SOURCE DEVELOPMENT PROGRAM

At Hanford, strontium will be separated from the high-level waste, then converted to the fluoride, and doubly encapsulated in small, high-integrity containers for subsequent long-term storage. The fluoride conversion, encapsulation and storage will take place in the Waste Encapsulation and Storage Facilities (WESF). This encapsulated strontium fluoride represents an economical source of ^{90}Sr if the WESF capsule can be licensed for heat source applications under anticipated use conditions. The objectives of this program are to obtain the data needed to license $^{90}\text{SrF}_2$ heat sources and specifically the WESF $^{90}\text{SrF}_2$ capsules. The information needed for licensing can be divided into three general areas:

- 1. Long-term SrF_2 compatibility data.*
- 2. Chemical and physical property data on $^{90}\text{SrF}_2$.*
- 3. Capsule property data such as external corrosion resistance, crush strength, etc.*

The current program is designed to provide the required information.

DISSOLUTION RATE STUDIES

The study to determine the effect of temperature on the dissolution rate of nonradioactive SrF_2 in seawater was stopped due to failure of the metering pump. The pump has been returned to the manufacturer for repair. As soon as the repairs are effected, the dissolution studies will be resumed.

LONG-TERM COMPATIBILITY TESTS

All the hardware required for the long-term compatibility tests have been fabricated except for a small number of Charpy impact test specimens which will be fabricated in July.

Current planning calls for three materials to be evaluated in the long-term compatibility tests: Haynes 25, Hastelloy C-276, and TZM. Because of problems involving the long-term aging of Haynes 25 and Hastelloy C-276, it has been decided to evaluate Hastelloy C-4 as a potential containment material. Initial tests will be designed to evaluate the effect of long-term aging on the high temperature properties of the alloy. Charpy impact test specimens will be held at temperatures of 600 to 1000°C for long time periods and then tested to determine the effect of aging on the toughness of the alloy. If the results are promising, the compatibility tests will be modified to include the Hastelloy C-4.

THERMODYNAMIC ANALYSIS

The preliminary thermodynamic analysis of WESF $^{90}\text{SrF}_2$ -alloy systems was completed and the results presented in earlier reports. A more detailed thermodynamic analysis of the three systems to be tested in the long-term compatibility tests is now under way. The three systems under consideration are:

1. WESF $^{90}\text{SrF}_2$ - Haynes 25
2. WESF $^{90}\text{SrF}_2$ - Hastelloy C-276
3. WESF $^{90}\text{SrF}_2$ - TZM

The study is being carried out by Dr. Carl Alexander and his associates at Battelle's Columbus Laboratories.

TECHNOLOGY REVIEW MEETING

K. M. Harmon, H. H. Van Tuyl, J. H. Jarrett, and H. T. Fullam attended a technology review meeting on May 14-15 at Germantown, Maryland sponsored by the Isotope Technology Branch of SNS. J. H. Jarrett presented a paper on the Strontium Heat Source Development Program at the meeting.

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