

semblies) is most readily done in dilute thermal reactors such as graphite-uranium systems, where  $\Sigma_f$  is small. One proposal made along these lines was the "Briseis" concept.<sup>2</sup> However, the total power in such cases tends to be large, and it may be advantageous to consider designs not requiring a flux converter filter, i.e., a fast test reactor.

Charles N. Kelber

Argonne National Laboratory  
Argonne, Illinois 60439

October 11, 1968

#### REFERENCES

1. R. E. WOOD, J. F. KUNZE, F. L. SIMS, and C. S. ROBERTSON, Jr., "A Filter for Fast Flux Testing in a Thermal Test Reactor," *Nuclear Applications*, 5, 105 (1968).
2. A. DESCAMPS, E. FOSSOUL, N. MEYVAERT, M. STIEVENART, G. TAVERNIER, and J. VANDIEVAT, "Briseis: Transient Reactor for Fast Reactor Fuel Testing," *Proc. Conf. on Breeding, Economics and Safety in Large Fast Power Reactors, Oct. 7-10, 1963*, ANL-6792, pp. 113-122, Argonne National Laboratory (1963).

#### ACKNOWLEDGMENT

This work was performed under the auspices of the U.S. Atomic Energy Commission.

#### HANDLING PuO<sub>2</sub> OUTSIDE GLOVEBOXES

Dear Sir:

We had the problem of loading a (Pu,U)O<sub>2</sub> specimen into a capsule for an in-pile experiment.<sup>1</sup> The assembly techniques for the 20-ft-long insert used in the experiment were developed over a period of years and involve delicate hand operations on a bench assembly located in a noncontamination area. We did not wish to attempt to assemble a 20-ft-long rig in a glovebox or to change our successful assembly techniques.

An alternative method was to apply a temporary coating on the (Pu,U)O<sub>2</sub> specimen so that it could be handled without spreading plutonium contamination. Naphthalene was selected for the coating material because it has a low melting point (80°C), forms a hard coating, is relatively non-toxic, yet can be vaporized without leaving a residue.

The (Pu,U)O<sub>2</sub> specimen consisted of two pellets, each 0.54-cm o.d., 0.58-cm long, with a 0.127-cm-diam axial hole. The pellets were placed in a glovebox and slid into a tungsten holder that had been machined into a hollow cylinder, 0.60-cm i.d. and ~2.2-cm long, with one end open and the other closed. A drill rod was placed into the axial hole of the pellets so as to leave a hollow space for subsequently receiving a thermocouple. Molten naphthalene was poured into the tungsten holder,

covering the specimen and filling the holder, which was then removed from the glovebox by the usual plastic-bagging method.

The contaminated glovebox had contributed some activity to the naphthalene coating, so the specimen was removed from the bags in a relatively clean hood (used for handling toxic materials) and re-dipped in a series of four clean naphthalene baths. This resulted in a very slightly contaminated outer coating with the contamination firmly fixed. The dipped specimen was stored in a closed bottle containing naphthalene crystals to prevent the coating from evaporating before installation in the capsule.

The specimen was loaded into the capsule using the usual techniques. A portable hood and constant monitoring were employed, but only surgical gloves and lab coats were used for personnel protection. The central rod was extracted from the capsule by twisting until the naphthalene bond broke. Surprisingly, this operation released no contamination.

After the capsule was assembled, a weld was made within one inch of the coated specimen. The naphthalene was prevented from melting by cooling the capsule between short weld periods. The welding required a continuous purge of argon over the interior of the assembly, and there was some concern that this might cause loose contamination to be carried out into the room. However, no release was detected.

After the welding was completed, the assembly was evacuated and the capsule warmed to ~80°C. The warming and pumping was continued overnight; bench tests had shown this to be more than sufficient time to ensure evaporation of the naphthalene. A filter was placed in the pump line to detect any plutonium released during the evaporation of the naphthalene.

Through the entire operation, no detectable contamination was found on any of the equipment, the handling gloves, or the tools. Air monitors detected no activity, although they were placed very close to all operations. All smears and filter readings had zero count level.

The ease of applying and removing naphthalene suggests that it might serve as a protective coating for many types of specimens, especially those of a friable nature, during handling and storing.

R. M. Carroll  
H. E. Robertson

Reactor Chemistry Division  
Oak Ridge National Laboratory  
Oak Ridge, Tennessee

October 9, 1968

#### REFERENCE

1. R. M. CARROLL and P. E. REAGAN, "Techniques for In-Pile Measurement of Fission-Gas Release," *Nucl. Sci. Eng.*, 21, 141 (1965).

#### ACKNOWLEDGMENT

This research was sponsored by the USAEC under contract with the Union Carbide Corporation.