



## **ANNOUNCEMENT OF CONTAMINATION OF BEHAVIOR OF SPENT FUEL IN STORAGE PROJECT FUEL OXIDATION SAMPLES**

The Office of Civilian Radioactive Waste Management (OCRWM) of the U.S. Department of Energy (DOE) has funded testing at Pacific Northwest Laboratory to determine the oxidation of commercial spent nuclear fuel in a number of gaseous environments, including air. The Behavior of Spent Fuel in Storage (BSFS) Project has been conducting spent-fuel oxidation testing to obtain data relevant to dry storage of spent fuel in air. In March 1991 it was discovered that the specimens in the concluding test series had become contaminated with fluorine with a potential impact on the interpretation and usability of the data.

One early realization was a need to inform the technical community of the fluorine contamination incident. An initial announcement was made at the 1991 International High-Level Radioactive Waste Management Conference (IHLRWMC) held April 12–16, 1991, in Las Vegas, Nevada. It was thought that an appropriate followup that would reach more of the technical community would be to submit letters to the editor or technical notes to selected technical journals, particularly those in which the BSFS Project has published data from the contaminated test series. The following is a modification of the announcement made at the 1991 IHLRWMC.

The presence of fluorine was discovered in spent nuclear fuel oxidation test specimens (test series B) being used by the BSFS Project. The presence of fluorine in the test atmosphere could compromise the accumulated test results because the kinetics and quantity of fluorine release into the test environment and the effects of fluorine on the test results are uncertain. The fluorine was detected in March 1991 during the posttest examinations of test series B specimens. The spent-fuel oxidation tests were completed during September 1990. Previous test series conducted by the BSFS Project were not contaminated with fluorine.

The BSFS Project conducted oxidation test series B on irradiated and nonirradiated  $\text{UO}_2$  fuel from 1985 through 1990. The purpose of these tests was to develop a technical basis for spent nuclear fuel dry storage temperature limits in air by characterizing uranium oxide oxidation behavior. Test series B was conducted at temperatures between 135 and 230°C in sealed ovens. The oven atmosphere was bottled air

adjusted to a dewpoint of 0, 20, or 40°C at the beginning of each test run. Cesium-137 gamma sources were used to impose an enhanced radiation field on the test specimens.

The DOE OCRWM Final Report for the BSFS Project will be published in 1993. The final report will provide a comprehensive compilation and analysis of the test series B results, including the effects of the fluorine.

Any previously published test series B data from the BSFS Project should be treated as preliminary. Previous publications are listed below:

1. T. K. CAMPBELL et al., "Interim Results from  $\text{UO}_2$  Fuel Oxidation Tests in Air," PNL-6201, Pacific Northwest Laboratory (Aug. 1987).
2. C. K. THORNHILL, T. K. CAMPBELL, and R. E. THORNHILL, "Storage of LWR Spent Fuel in Air: Vol. 1—Design and Operation of a Spent Fuel Oxidation Test Facility," PNL-6640, Vol. 1, Pacific Northwest Laboratory (Dec. 1988).
3. L. E. THOMAS et al., "Storage of LWR Spent Fuel in Air: Vol. 2—Microstructural Characterization of Low-Temperature Oxidized LWR Spent Fuel," PNL-6640, Vol. 2, Pacific Northwest Laboratory (Dec. 1989).
4. C. A. KNOX, T. K. CAMPBELL, and E. R. GILBERT, "Spent Fuel Oxidation Testing Under Simulated Dry Storage Conditions," presented at 3rd Int. Spent Fuel Storage Technology Symp./Workshop, Seattle, Washington, April 8–10, 1986.
5. E. R. GILBERT et al., "Progress of Air Oxidation Tests on Spent Light Water Reactor Fuel in an Imposed Gamma Field," *Proc. Workshop Chemical Reactivity of Oxide Fuel and Fission Product Release*, Berkeley Nuclear Laboratories, U.K., April 7–9, 1987.
6. E. R. GILBERT et al., "Results of Studies on the Behavior of Spent Fuel in Storage," presented at the Institute of Nuclear Materials Management Seminar V, Washington, D.C., January 20–22, 1988.
7. E. R. GILBERT et al., "Allowable Spent LWR Fuel Storage Temperatures in Inert Gases, Nitrogen, and Air," presented at the Institute of Nuclear Materials Management Seminar VII, Washington, D.C., January 17–19, 1990.

8. M. E. CUNNINGHAM et al., "Interim Results of Spent Fuel Oxidation Testing," presented at 92nd Annual American Ceramics Society Mtg., Dallas, Texas, April 25, 1990.

9. M. E. CUNNINGHAM et al., "Status of Spent UO<sub>2</sub> Oxidation Studies Supporting Air Dry Storage of Spent Fuel," presented at the Institute of Nuclear Materials Management Seminar VIII, Washington, D.C., January 16-18, 1991.

10. E. R. GILBERT et al., "Advances in Technology for Storing Light Water Reactor Spent Fuel," *Nucl. Technol.*, **89**, 141 (1990).

11. T. K. CAMPBELL et al., "Oxidation Behavior of Spent UO<sub>2</sub> Fuel," *Nucl. Technol.*, **84**, 182 (1989).

12. T. K. CAMPBELL and E. R. GILBERT, "Effect of Burnup on Oxidation of LWR Spent Fuel," presented at Waste Management '87, Tucson, Arizona, March 1-5, 1986.

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