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E. I. du Pont de Nemours and Co.
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CONTENTS

SECTION I

PHYSICS EXPERIMENTS WITH FUEL ASSEMBLIES SIMULATING BURNED-UP FUEL

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INTRODUCTION

Experiments have been performed in the Process Development Pile (PDP) and the Subcritical Experiment (SE) at the Savannah River Laboratory (SRL) to investigate the physics behavior of burned-up fuel in the CANDU and similar heavy-water power reactors. These experiments used specially fabricated fuel assemblies containing plutonium and uranium in approximately the isotopic compositions expected for fuel irradiated to 5000 MWD/ton. Separate sets of fuel assemblies also varied the total plutonium content and the isotopic fraction of ^{240}Pu. The SRL experimental results are being analyzed while the fuel is being shipped to Canada for further experiments.

SUMMARY

Two shipments of SRL fuel were made to Canada in September. A third and final shipment is scheduled in October. The activation experiments are still being analyzed. SRL chemical and isotopic analyses of the fuel were completed.

DISCUSSION

Two shipments have been made to the Chalk River Laboratories of the mockup burned-up fuel elements described in DPST-66-83-8. A third and final shipment is scheduled to leave SRL October 14, 1966. The fuel will remain on loan until March 1967.

The analyses of the SE activation data are nearly completed.

The final SRL analyses for the composition of the fuel elements are given in Table I-1.

Table I-1

Isotopic Analyses and Densities

Type of Material	Pu, Wt %[a]				U, Wt %[a]			
	239	240	241	242	234	235	236	238
Type A 0.00295 Pu/U[b] ρ = 10.421 g/cc	77.91	19.35	2.43	0.31	0.0012	0.302	0.0029	99.69
Type B 0.00259 Pu/U[b] ρ = 10.356 g/cc	93.00	6.17	0.79	0.04	0.0013	0.298	0.0032	99.69
Type C 0.00340 Pu/U[b] ρ = 10.380 g/cc	93.19	6.09	0.69	0.03	0.0012	0.301	0.0030	99.69
Type D Depleted U ρ = 10.403 g/cc					0.0026[c]	0.4979	0.0033	99.4962
GE Rods - Natural U ρ = 10.390 g/cc					0.0057	0.71	-	99.28

(a) SRL Isotopic Analyses. Average of 2 samples.
(b) SRL Pu/U Ratio by Weight.
(c) ORNL Analysis.

Impurity Analyses - ppm[d]

	Al	B	Ca	Cd	Cr	Cu	Fe	Mg	Mn	Mo	Na	Ni	Pb	Si	Sn	V
Type A	40	0.4	<10	<5	175	5	700	5	15	<10	50	20	<5	50	<10	<25
Type B	10	0.7	<10	<5	12	4	75	4	5	<10	100	15	<5	75	<10	<25
Type C	15	8	<10	<5	15	3	130	2	5	<10	75	20	<5	60	<10	<25

(d) SRL Analysis

SECTION II

AECL IN-CORE FLUX MONITORS

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An irradiation test of in-core flux monitors is being made in one of the Savannah River Plant reactors to determine the life characteristics of a selection of flux detectors and of the mineral insulation used in their construction. Self-powered flux detectors are relatively new; therefore, confidence in their use hinges to a great extent on proven performance at large integrated exposures. The chief points of interest are 1) integrity of the conductors and sheath during life, 2) life of insulation, and 3) sensitivity. The higher flux density available at SRP (vis-à-vis Chalk River) will shorten the irradiation time for a given exposure and should also show whether or not any new high intensity effects appear.

Fabrication and installation of the detector rod in the reactor has been completed and testing is in progress. There were no special tests in September. The data being collected will be reported in a separate topical report at the conclusion of the tests.

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