UC-34

TID-6250

RADIATION TESTING OF SHIELD SPECIMEN:

TEST LTH_x-5 AND 6

UNCLASSIFIED

M. P. Reagan

GE-ANPD - ORNL

Classification Cancelled

Or Changed To

By Authority Of DOCBy J. J. Morpheu Date 10/19/71

January 16, 1958

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GENERAL ELECTRIC-AIRCRAFT NUCLEAR PROPULSION DEPARTMENT-CINCINNATI 15, OHIO

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DC 58-1-211

IBM #10550

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	HFC	4	12-4-81
Class: 4	TR	4	12-14-81

THE RADIATION TESTING OF LITHIUM
HYDRIDE: TEST LTH_x-5 & 6

(CLASSIFIED TITLE)

January 16, 1958

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Prepared by

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M. P. Reagan

Approved by

E. S. Collins
E. S. Collins

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THE RADIATION TESTING OF LITHIUM
HYDRIDE: TEST LTH_x-5 & 6
(CLASSIFIED TITLE)

ABSTRACT OF REPORT NO. DC 58-1-211

Test LTH_x-5 & 6 containing specimens of lithium hydride in separate capsules were combined into one test and irradiated in Hole C-48 of the LITR at ORNL. It was intended that the specimens should be run at 600°F and 400°F respectively; but when the reactor reached full power (3000 KW), it was found that both the tests could not be held at the specified temperatures. So, specimen "A" was run at 600°F and specimen "B" was run at ~ 160°F for 583.0 hours.

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IRRADIATION REQUEST

GEIT NO. _____

TASK NO. 7703

I. GENERAL

A. Title of Test: THE RADIATION TESTING OF LITHIUM HYDRIDE: Test LTH_x-5 & 6

B. Purpose of Test: To measure damage of material (powder pressed) at temperatures of (a) 400°F, (b) 600°F, and (c) 800°F

C. Reference: GEIT 465

1. Engineer: Frank H. Welch or Paul Bauer

2. Phone: VA 1-7400, Ext. 542

D. Description and composition of material to be irradiated:

Powder pressed lithium hydride material with 1/16" void around outside, O.D. 0.940" - 0.125" = 0.815 ± 0.005" Normal lithium hydride (Virgin) material

E. Dosage Desired

1. Flux: Flux to achieve equilibrium temperature (a) 400°F (b) 600°F, (c) 800°F

a. Thermal neutrons: 10^{17} nvt

b. Fast neutrons: Time 100 hours or more

c. Gamma: Cobalt Flux monitor at interior of and along outside of lithium hydride material.

2. Facility or Reactor position:

LITR

F. Schedule

1. Date submitted: April 17, 1957

2. Desired insertion date: May 15, 1957

If not possible, use earliest available date.

G. Data desired at given test conditions:

Temperature and pressure monitoring over specimen desired. Time and integrated flux.

H. Temperature

1. Continuous monitor or recorder: Yes, Ref. GEIT 465

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2. Operating Limits: a) $400^{\circ} \pm 5^{\circ} \text{F}$
b) $600^{\circ} \pm 5^{\circ} \text{F}$
c) $800^{\circ} \pm 5^{\circ} \text{F}$

II. SUPPLEMENTAL

- A. Drawing or sketch of in-pile assembly, showing dimensions:

Ref. GEIT Sketch. Primary capsule only unless double capsule needed for cooling or other reasons.

- B. Location of all thermocouples attached to the in-pile assembly:

(1) At center

(1) On outer shell

- C. Two copies of bench test data taken before reactor insertion:

Bench test required to outgas specimen

Reference: GEIT 465

- D. Schematic diagram of circuits both internal and external to the test reactor:

See GEIT 465

- E. Schematic diagram of any commercial equipment that may be provided with the test assembly:

None used

- F. Identification for any coded test leads or tubes: All thermocouple leads

III. OPERATING PROCEDURE:

- A. Insertion: Normal insertion

- B. Operation: Adjust LITR position to obtain correct operating temperature.

- C. Removal: Normal removal procedure

- (1) Pull out of flux area for approximately 15 hours.
- (2) Pull into cask for storage.
- (3) Sever capsule in hot cell.
- (4) Remove Cobalt wire for activation.
- (5) Post-irradiation examination same as GEIT 465.

- D. Disposal: Deliver to Hot Cell, Evendale

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IV. EXTERNAL FACILITIES:

- A. Air: None
- B. Water: None
- C. Electrical Power
 - 1. Volts: 110 volts, 60 cycles
- D. Gas: No cooling gas needed.

V. SAFETY

- A. Possible damage to test reactor: Negligible if operated within temperature limitation.
- B. Possible danger to operating personnel: None, if operated according to normal reactor operating precautions.
- C. List any unsafe operating limits: Temperature of test material should not exceed control temperature of GEIT 465.

The Test Specimen

The lithium hydride samples used in LTH_x-5 & 6 were prepared in the Y-12 area at Oak Ridge, Tennessee. The samples were .765" in diameter, 4.000 " long, and had a concentric hole .129" in diameter and 3 1/4" deep drilled in one end to serve as a thermocouple well. A chemical analysis of the sample, also made at Y-12, is shown in Table I.

The samples were encapsulated at Y-12 in separate stainless steel containers and sealed by welding. There was an 1/8" access tube through which the cans were evacuated and sealed off before being transferred to the Radiation Testing Unit where they were incorporated into test capsules.

The Test Capsule

The test specimens as received from Y-12 (referred to hereafter as the primary capsule) were 1" in diameter and 5" long. Around each was placed a helium jacket 1 1/4" in diameter and 6" long with a 1/4" access tube. The primary capsule access tube was brought out through the helium jacket. Thermocouples were placed in the well and on the outside of the primary capsule as shown in Figure 1 and the leads were brought out through the helium access tube. This was then placed in the cooling air jacket which was a can 2 1/4" in diameter and 7" long. The cooling air jacket was perforated at the bottom to allow cooling air to pass into the can from the bottom, up along the outside of the helium jacket, and out through a 3/8" stainless steel exit air line attached to the top of the can. The two cans were then welded together, one on top of the other, making a dual test capsule. Other thermocouples were attached in the cooling air stream on the helium jacket and outside the air jacket as shown in the diagrammatic view Figure 1.

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CHEMICAL ANALYSIS OF THE LITHIUM HYDRIDE

Li (%)	-	85.55	Cu (ppm)	-	75
H ₂ (%)	-	12.12	Fe (ppm)	-	475
OH (%)	-	1.34	K (ppm)	-	< 40
CO ₃ (%)	-	1.70	Mg (ppm)	-	310
C (%)	-	0.291	Mn (ppm)	-	7
Cl (%)	-	< .01	Mo (ppm)	-	< 6
Ag (ppm)	-	5	Na (ppm)	-	1240
Al (ppm)	-	425	Ni (ppm)	-	300
B (ppm)	-	<100	Pb (ppm)	-	150
Ba (ppm)	-	18	Si (ppm)	-	900
Be (ppm)	-	< 2	Sn (ppm)	-	< 20
Ca (ppm)	-	520	Sr (ppm)	-	20
Cd (ppm)	-	< 20	V (ppm)	-	< 10
CO (ppm)	-	< 40	Zn (ppm)	-	< 1000
Cr (ppm)	-	35	Nb (ppm)	-	< 400

TABLE I

FIGURE 1
Diagrammatic View

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The Test System

In order to monitor the vacuum over the specimen, each of the primary capsule access tubes was extended to a separate Microsyn pressure transmitter and a vacuum pump. The output of the Microsyn transmitter was connected to an indicating milliammeter and a Brown recorder.

Helium was supplied to the helium jackets through separate control panels from a common helium supply tank. The control panel consisted of a series of solenoid operated valves and pressuretrol switches which maintained the helium pressure between 20 psig and 35 psig and initiated alarms and setbacks, should these pressures exceed predetermined limits.

The cooling air was taken from the plant air supply through a pressure regulating control panel, through the test and out into the reactor off-gas line through pneumatically controlled valves. The pneumatic valves were controlled by Brown recorder controllers. T.C. #1 (Figure 1) was used to control the air flow over capsule "A" and T.C. #11 (Figure 1) was used to control the air flow over capsule "B".

Weights and location of cobalt monitors used to determine the dosage of the tests are shown in Figure 1.

Operating History

Test LTH_x-5 & 6 was inserted into Mole C-48 of the LITR 11-12-57. All T.C.'s were tested and found to be good. Helium lines and cooling air lines were connected and tested for leaks. The vacuum lines were connected to the vacuum pump; and when the lines were pumped down, it was discovered that one of the Microsyn transmitters was not working properly. The two vacuum systems were then tied together through the valves and "tee" provided so that both systems were under the same vacuum and monitored by the same transmitter and recorder.

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The reactor started up at 2100. A reactor setback was experienced at 2130 due to high temperature. After investigation it was detected that the high temperature was a result of the control valves not opening properly due to jamming. The trouble was corrected and the Reactor started up a second time at 2315. When reactor power reached 1600 KW at 2332, another high temperature setback was experienced with maximum air flow over both capsules. At this time the test was pulled 8" into a lesser flux zone to reduce the temperature.

The reactor started up the third time at 2347, reaching 1600 KW at 0005 11-13-57, when the third setback occurred due to high temperature. At this time it was decided that, due to the fact that the heat generated in the specimen must pass through the vacuum in the primary capsule, then through the helium in the helium jacket, to be carried off by the cooling air, the cooling problem was such that both specimen could not be controlled to the predetermined temperatures. At 0030 the test was pulled up 8 feet out of the flux and tied off until a solution to the problem could be decided upon.

The test was removed from the reactor 11-19-57 to make way for other tests. The test was stored with vacuum pump attached. Provisions were made to fill the primary capsules with helium, should it become necessary to remove the vacuum pump.

On 12-3-57 the primary capsules were allowed to fill with helium after which the vacuum pump was removed. The test was again inserted in C-48 of the LITR to

3 feet above the maximum flux zone. The vacuum pump was reconnected and the helium was pumped from the primary capsules. All air lines, helium lines and T.C.'s used on the previous run were reconnected and tested. The test was set to run capsule "A" (involving T.C.'s #1 through 10) at 600°F and capsule "B" (involving T.C.'s #11 through 20), Figure 1, at 400°F. T.C.'s #21, 22, and 23 were outer shell temperatures.

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The reactor started up at 1825; and upon reaching 2000 KW at 1851, no temperature increase in the test had been experienced. At this time all cooling air was closed off from the test and still there was no noticeable increase in temperature. At 2000 the test was lowered 6 1/2" into a higher flux zone and at 2130 it was lowered an additional 5 1/2", bringing the test to within ~ 2 feet of maximum flux. At 2200 the highest T.C. was indicating only 480°. At 2235 Reactor Operations corrected actual heat power of the reactor from 2450 KW to 3000 KW, causing an increase in test temperatures. At 2350 T.C. #1 set off the high temperature alarm and continued to increase to 700°F. The test was then withdrawn 6 1/2" from the maximum flux zone at 0035 12-4-57 and then lowered 4" in 3 steps, leveling the temperature, indicated by T.C. #1, out at 600°F at about 0300. T.C. #11 was reading about 200°F. Maximum cooling air flow through capsule "A" had little effect on the temperature at T.C. #1, so it was decided that a temperature of 400°F at capsule "B" could not be reached while holding capsule "A" to 600°F.

On 12-12-58 at 1530 capsule "A" at T.C. #1 had drifted down to ~ 500°F. The test was lowered about 1" nearer the maximum flux zone to restore temperature to 600°F. At 1854 the Brown recorder recording temperature at T.C. #3 caused an alarm and temporary setback to the reactor. The recorder was repaired and normal operation was resumed.

Capsule "A" temperature drifted down to ~ 500°F again by 12-26-58; and at 1030 on that date while the reactor was down, the test was lowered 2" towards maximum flux zone. But, when the reactor started up and reached 2000 Kw, it was estimated that the temperature would go too high at full power. The test was withdrawn ~ 2"; and when the reactor power reached 3000 KW, capsule "A" temperature at T.C. #1 leveled out at ~ 600°F and remained at this level for the duration of the test.

The test was removed from the reactor 12-31-57 after 583 hrs. of operation.

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Post-Irradiation Inspection

The test assembly was opened in an ORNL hot cell using a remote controlled lathe with a cut-off tool. Capsule "A" (LTH_x-5) and capsule "B" (LTH_x-6) were separated from each other and the cobalt monitors were removed for counting.

Capsule LTH_x-5 (run at 600°F) was placed in the lathe and the top of the primary capsule was cut off. The thermocouple well which fit snugly in the specimen was removed with the top. After the top had been removed from the capsule, it was found to be filled with a dark gray or black powder. This powder, ~ 1 inch deep, was emptied into a glass container (Figures 2 and 3), leaving the remainder of the specimen black and in solid form, fitting snugly in the can.

The other end of the primary capsule was then cut away and an effort was made to extrude the specimen. When this could not be accomplished, ~ 1 inch more was cut from the upper end of the container, so that it could be clamped in a milling machine to be split open.

When making this 1-inch cut, ~ 1/2 inch of the specimen was inadvertently cut off and ignited by contact with the cutting tool. The fire was immediately extinguished with an Ansul Metal-X extinguisher.

The container was then clamped in the milling machine and split open. The specimen was removed in two solid pieces accompanied by a small amount of powder.

The specimen was then transferred to a dry box, where a sample was taken from the inside of the specimen for X-ray diffraction analysis. The results of this analysis is shown on Page

When extracting the X-ray sample from the specimen, it was noted that the surface of the specimen was porous and flaked off easily to a depth of ~ 1/8 inch. From this depth the specimen became harder toward the center and the color varied from a very dark gray or black on the surface to a light gray in the center.

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When the cobalt monitor from the thermocouple well of the specimen (Fig. 1) was counted, it was found that the flux at this location had been 1.5×10^{11} neutrons/cm²/sec and that the total dose was 3.0×10^{17} nvt. The monitor from outside the specimen showed a flux of 1.5×10^{12} neutrons/cm²/sec and a total dose of 3.1×10^{18} nvt.

Capsule LTH_x-6 (run at $\sim 200^{\circ}\text{F}$) was opened by cutting loose the top end of the container in the lathe. The specimen slipped easily from the can, along with the top and thermocouple well (Figures 4 and 5). There was no powder in the capsule. The specimen was gray with small white specks and was broken in two large pieces with a third small chip missing from the top end.

Specimen LTH_x-6 was transferred to the dry box, and a sample was prepared from the center of this specimen for X-ray diffraction analysis. The results of this analysis is shown on Page 16.

In preparing the X-ray sample, it was found that the surface of this specimen had a very hard crust $\sim 1/16$ inch thick. Under this crust the material became soft but still somewhat harder than that at the center of LTH_x-5. The color varied from gray with small white specks on the surface to black in the center.

The cobalt monitor from the thermocouple well of this specimen showed that it had been run in a flux of 5.4×10^9 N_T/cm²/sec for a total dose of 1.1×10^{16} nvt. The monitor from outside the primary capsule was lost in disassembling.

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Please use separate
card for each sample

Sample No. LTHX-6 Date submitted 1-22-58 X-Ray Sample No. 1048
Submitted by M.P. REAGAN Building No. _____ Date Reported 1-22-58
Telephone No. _____ Account No. 85504-597-37 Film No. used Q1048

Information sought:

Sample description (include treatment, expected comp. etc.):

Reported:

Remarks:

Compound or Element	Status	Percent
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24

5

Notation: "P" present, "T" probably present, "Q" questionable,
"N" none detected

Reported by R J Sherman

Please use separate
card for each sample

ANALYTICAL CHEMISTRY DIVISION
X-RAY SECTION

X-1027

Sample No. LTHX-5 Date submitted 1-22-58 X-Ray Sample No. 1951
Submitted by M.L.P. REAGAN Building No. _____
Telephone No. _____ Account No. 35504-597-37 Date Reported 1-24-58

Information sought:

Sample description (include treatment, expected comp. etc.):

Reported:

mag. 1.

Remarks:

Compound or Element	Percent	Status
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1517

P

LiOH

P

Notation: "P" present, "T" probably present, "Q" questionable,
"N" none detected

Reported by R. E. H.

TASK

7123

FACILITY

Hole C-48

LITR

EXPERIMENT NAME

LT-Hx-4 & 5

PERSON RESPONSIBLE

R. C. Lee

11-12-57

2030 Experiment in reactor; all thermocouples connected, all are good. Helium lines connected and tested. Vacuum lines connected to pump; one Microsyn was out of order and both primary capsules will be connected to the same microsyn. Vacuum pump started. Alarms & setbacks set as follows:

T.C. #1, 2 & 3 Alarm: Setback:

T.C. #11, 12, & 13 Alarm: Setback:

T.C. #22 Alarm: 650° Setback: 675°

High He pressure Alarm: 235 psig

Low He pressure Alarm: < 15 psig 5 B: < 10 psig

Good Microsyn calibrated. Brown with T.C. #1 attached has 8-hour chart speed.

2045 Helium control panel giving trouble; trouble partially corrected so that reactor can go up.

2100 Reactor started up. Pressure on test, but no flow.

2130 Reactor setback; high temperature. Investigating flow through exit air system.

2300 Both control valves were jammed & have been repaired.

2315 Reactor starting up again

2317 200 KW

2330 1600 KW - temperatures still rising, even with full air flow.

2332 Reactor setback; high temperature

2345 Pulled test up about 8" to reduce temperature.

2347 Reactor starting up again; at N₂.

2352 800 KW

0000 1600 KW - to hold here.

0005 Reactor setback. Pulled test up 8 more inches.

0010 Admitted air to capsule to help cool test temporarily.

0030 Decided to end test for time being. Pulled test up 8 feet out of hole. Left vacuum pump connected; all T.C.'s still good.

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TASK 7123FACILITY Hole C-48LITREXPERIMENT NAME LT-Hx-4 & 5PERSON RESPONSIBLE R. C. Lee

11-14-57

- 1100 Pulled test from reactor; capped off vacuum lines and stored test outside LITR
- 12-35-57 Attached vacuum pump to primary capsules and started pumping. Arranged to bleed helium into capsules for transfer back into reactor.
- 12-3-57 Prepared to reinsert test.
- 0900 Put helium into primary capsules. Removed test from storage and pulled the capsule up through the top flange the maximum amount; capsule will now be about 3 feet above maximum flux zone.
- 1000 Inserted test in hole C-48 and made connections. Vacuum pump attached to primary capsules and inadvertently started before a direct calibration of the microsyns was possible.
- 1400 Helium panel checked; all T.C.'s on single-point Browns are intact.
- 1500 Alarms & Setbacks as follows:
T.C. # 1, 2, & 3	Alarm - 650°	Setback - 675°
T.C. # 11, 12 & 13	Alarm - 450°	Setback - 475°
T.C. # 21	Alarm - 650°	Setback - 675°
Primary Capsule Vacuum	A - 0 psig	SB - 5 psig
He low pressure	A - 15 psig	SB - 10 psig
He high pressure	A - 35 psig	
- System set up so that test "A" is to run at 600°F; test "B" is to run at 400°F. Test "A" involves T.C.'s 1 to 10; test "B" involves T.C.'s 10 to 20; T.C.'s 21-23 are attached to the outer metal shell.
- 1530 Both primary capsules, still attached to vacuum pump, reading 5 mm of Hg pressure.
- 1725 Reactor starting up
- 1840 Reactor at 200 KW
- 1845 Reactor at 1000 KW - maximum flow - no increase in temp.
- 1850 1800 KW - reduced air supply pressure to 30 psi
no temp. increase.
- 1900 2000 KW for 9 minutes - air flow 0 - no temp. increase

LITR

PERSON RESPONSIBLE R.C. Lee

12-3-57

140

1120

18

TASK 7123FACILITY Hole C-48

LITR

EXPERIMENT NAME LT-Nx 556PERSON RESPONSIBLE R.C. Lee

12/5
2000 Turned vacuum pump on both primary capsules (reading 0.0 on Browns - meaning 0 pressure) to see if the vacuum was impaired & check effect of better vacuum on T.C. #1.

12-6
0100 Set controller on #1 TC. so that test would have some flow ~ 5%
0130 Vacuum valve closed as Temp. seems to have leveled out. TC #1 Reads 600° after it was 560° Before.
Temp. on T.C. #1 + 11 began dropping.
0150 Vacuum valves were opened to give an immediate rise of about 2 mm of Hg was noted (50%) Then valve to pump was opened.
0200 Sharp dip on TC #2 Brown began oscillating
0230 Temp. back to 600° on #1
1610 Vacuum pump still on. Flow over capsule increased to ~ 8%; little change in most T.C.'s, but T.C. #2 dropped 35° to 335° F immediately.

12-7
~1300 From the charts, T.C. #1 dropped suddenly ~ 15° and all other "A" test couples jumped about 20-30°. The temperatures then drifted back to previous values. Reactor power has been steady. Vacuum pump still on.

12-9
0900 Same phenomenon mentioned above has occurred ~ 4 times during the weekend.
0905 Shut off air flow to see effect on test.
0910 Turned flow on. T.C.'s responded as expected; slow increase in all T.C.'s except #1, which would show no effect for several minutes.
0900 Turned off vacuum pump.
12-10
0930 Reactor down; no reading (0.0) on primary capsule vacuum.

TASK 7123FACILITY Hole C-48LITEREXPERIMENT NAME LT-H₂-586PERSON RESPONSIBLE R.C. Lee

12-10	
1100	Chart speed on circular Brown Controller to which T.C. #1 was attached changed from 8 hrs to 24 hrs.
1545	Primary capsule vacuum still 0.0.
12-11	
1000	Reactor still down
1330	Reactor starting up. Pri. cap. Vac. still 0.0.
2100	Reactor power fluctuating, temp. increased some on T.C.'s but has leveled out somewhat, also it snowed.
2243	Reactor going into manual control, power unsteady in servo
2302	Back in Servo
12-12	
1530	Test "A" running smoothly at 500°F. Decided to adjust position of capsule in flux to bring temperature up. Pushed capsule down about 1".
1854	Alarm & temporary shut back by TC #3. Temp went up to approx. 690° (on chart) and came back to 355°F.
12-21	600 Operation normal
12-26	
0900	Found that Vacuum Recorders and Vacuum indicating meters are not reading together. Adjusted Pot in Brown to read with indicating meters. Previous vacuum readings possibly in error.
1030	Pushed capsule down into flux ~ 2" (Reactor down)
1821	Reactor at N. - starting to 2000 KW in 200 KW steps. will hold at 2000 KW about 1 hr.
1830	Reactor at 2000 KW
1900	TC #1 @ 560°F. Pulled test up ~ 1 1/2".
1925	TC #1 @ 530°F. Pulled test up ~ 1/2".
2011	Reactor at full power (3000 KW)
12-28-57	
1210	Adjusting Reactor Power. Took water samples
1225	Reactor Power Adj. To 3000 KW. Had actually been at 2800 KW

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752 021

TASK 7123FACILITY Hole C-48 LITREXPERIMENT NAME LTHX 586PERSON RESPONSIBLE R.C. Lee

12-30

1230

Primary Vacuum test "B" increasing in straight line since capsule was pushed down in flux 12-26.

1330

Pumped primary capsule "B" to .5 ma.

12-31

0700

Reactor down. Pulled test up out of flux. Total Running time 583.0 hr

Experiment LT-HX-546 Task No. 7123Date In 12-3-57

Operator	DBS	DBS	HHH DBS	NNH	NNH	RCL	RCL	RCL	HCC	HCC	HCC	NNH
Date	12-3	12-3	12-4	12-4	12-4	12-4	12-4	12-4	12-4	12-4	12-4	12-5
Time	2215	2315	0930	0400	0700	0900	1100	1400	1700	2000	2300	0200
Running time	2.0	3.0	5.3	7.7	10.7	12.7	14.7	17.7	20.7	23.7	26.7	29.7
Reactor Power	3000	3000	2000	3000	3000	3000	3000	3000	3000	3000	3000	3000
T.C. #	1	560	790	520	585	600	600	600	608	605	600	600
	2	368	428	385	420	428	428	432	427	412	417	421
	3	320	375	290	325	335	325	325	320	320	325	330
	4	365	550	400	475	485	480	480	470	465	475	480
	5	260	360	340	380	390	380	372	368	360	370	380
	6	320	460	360	435	445	440	435	428	420	430	440
	7	125		230	210	210	200	195	193	175	185	195
	8	125		280	280	285	280	275	285	250	270	280
	9	125		280	275	275	270	270	250	240	250	270
	10	125		280	275	275	270	270	250	240	250	270
	11	165	140	130	140	140	140	195	195	182	185	190
	12	170	183	173	197	195	192	190	190	182	183	185
	13	170	180	169	198	190	188	185	186	180	181	185
	14	125		180	190	190	190	190	190	185	185	185
	15	125		170	190	190	190	188	190	185	185	185
	16	125		170	190	190	185	188	188	185	185	185
	17	125		150	160	160	165	160	160	155	155	160
	18	125		150	160	160	162	160	160	155	155	160
	19	125		145	160	160	162	160	160	155	155	160
	20	125		145	160	160	162	160	160	155	155	160
	21	110		150	140	142	136	136	133	125	130	137
	22	125		130	155	160	160	155	152	145	150	155
	23	125		140	135	135	135	132	132	125	125	130
Main Line Flow %	11	15	0	~3	~3	0	0	0	0	0	0	0
" " Press.	50	55	40	41	41	40	40	40	40	41	41	41
Temp.	67	68	68	67	67	66	66	66	66	64	64	65
SCFM	12	17	0	~2.5	~2.5	0	0	0	0	0	0	0
* Brown fixed at this point.												
										41		22

Experiment LT-NX-546

Task No. 7123

Date In 12-3-57

[illegible]

Experiment LT-NX-546 Task No. 7123

Date In 12-3-57

~~SECRET~~

[illegible]

Experiment LT-H-546 Task No. 7123

Date In 12-3-57

[illegible]

Experiment LT-HS46Task No. 7123Date In 12-3-57

Operator	BOYS	MPR	MPR	MPR	S.D.E.	MPR	MPR	MPR	H.H.H.	MPR	MPR
Date	12-12	12-16	12-16	12-19	12-21	12-23	12-26	12-26	12-29	12-29	12-30
Time	2320	0930	1510	1500	1600	1520	0930	2015	1200	0945	1230
Running time	187.5	269.7	330	353.1	377.8	418.3	475.0	477.3	516.4	538.2	565.0
Reactor Power	3000	3000	3000	3000	3000	3000	0	3000	3000	3000	3000
A { PRIM. CAP. VAC.	0.0	0.2	0.55	0.6	0.6	0.65	1.95	2.15	1.95	2.10	2.10
" " PRESS.											
B { PRIM. CAP. VAC.	0.0	0.0	0.0	0.0	0.0	0.0	1.60	1.70	2.60	3.00	3.70
" " PRESS											

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