DECLASSIFIED

(CLASSIFICATION)

RL-GEN-1309

C.1

SERIES AND COPY NO.

—

GENERAL ELECTRIC

HANFORD ATOMIC PRODUCTS OPERATION - RICHLAND, WASHINGTON

DATE

January 3, 1967

[X] RESTRICTED DATA

THIS DOCUMENT CONTAINS RESTRICTED DATA AS DEFINED IN THE ATOMIC ENERGY ACT OF 1954. ITS TRANSMITTAL OR THE DISCLOSURE OF ITS CONTENTS IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED.

TITLE

CHARACTERISTICS OF LITHIUM ALUMINATE POWDER

[ ] OTHER OFFICIAL CLASSIFIED INFORMATION

THIS MATERIAL CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE ESPIONAGE LAWS, TITLE 18, U.S.C., SECS. 793 AND 794, THE TRANSMISSION OR REVELATION OF WHICH IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.

AUTHOR

R.R. Studer

ISSUING FILE

THIS DOCUMENT MUST NOT BE LEFT UNATTENDED OR WHERE AN UNAUTHORIZED PE[illegible] IT WHEN NOT IN USE, IT MUST BE STORED IN AN APPROVED LOCKED REPOSITORY WITHIN AN APPROVED GUA[illegible] IN YOUR POSSESSION AND PRIOR TO YOU HAVE OBTAINED A SIGNED RECEIPT FROM CLASSIFIED FILES, IT IS YOUR RESPONSIBILITY TO KEEP IT AND[illegible] THIS PROJECT AND FROM ANY UNAUTHORIZED PERSON. ITS TRANSMITTAL TO, AND STORAGE AT [illegible]ACE OF RESIDENCE IS PROHIBITED. IT IS NOT TO BE DUPLICATED. IF ADDITIONAL COPIES ARE REQUIRED, OBTAIN THEM [illegible] CREATED ISSUING FILE. ALL PERSONS READING THIS DOCUMENT ARE REQUESTED TO SIGN [illegible] SPACE PROVIDED BELOW.

ROUTE TO:	PAYROLL NO.	LOCATION	FILES ROUTE DATE	SIGNATURE AND DATE
[illegible]	[illegible]	[illegible]	[illegible]	
K.W. Kiesel	[illegible]	[illegible]	[illegible]	
T.J. Kabele				

4-3000-340 (3-57) AEC-GE RICHLAND, WASH.

DECLASSIFIED

(CLASSIFICATION)

[illegible]

DECLASSIFIED

RL-GEN-1309

[redacted]

Page 1

RESTRICTED DATA

This document cont[illegible] Restricted Data as defined [illegible] Energy Act of 1954. Its tr[illegible]tal or the disclosure of its con[illegible]s in any manner to an unauthorized person is prohibited.

GROUP 1

Excluded [illegible]om Automat[illegible] Downgrading and [illegible]lass[illegible]cation.

CLASSIFIED BY: [signature]

Manager,
Special Pro[illegible]ts Eng'g

CHARACTERISTICS OF LITHIUM ALUMINATE POWDER

January 3, 1967

Author:

R. R. Studer
Senior Engineer

SPECIAL PRODUCTS ENGINEERING OPERATION
N-REACTOR FUELS SECTION

Reviewed and Approved for
Public Release by the NSAT
[signature] PNNL ADD
10/19/01 Date

Distribution:

1. R Cooperstein
2. DL Cornell
3. JE Hansen
4. MC Leverett
5. M Lewis
6. TD Naylor
7. WS Nechodom
8. CH Shaw
9. RR Studer
10. CJ Volmer
11. DH Walker
12. JW Nickolaus
13. 700 Area Files
14. ~~700~~ DUN Area Record Center

Classification cancelled by authority of
[signature]
on 7/10/[illegible]
by RL-CG-4
on JE Savely 10-30-01
JR Ahrens 1-15-02

[redacted]

DECLASSIFIED [redacted]

[redacted] DECLASSIFIED

January 3, 1967

CHARACTERISTICS OF LITHIUM ALUMINATE POWDER

SUMMARY

Analytical results of 113 lots of $LiAlO_2$ powder are tabulated. The principal deviation from specifications is in boron content. The weighted average boron contamination of the 113 lots is 50 ppm.

DISCUSSION

The procurement of lithium aluminate for PT-66 and PT-75 represents approximately a hundredfold increase in the rate of $LiAlO_2$ production. The vendor had little or no experience in controlling chemistry and other characteristics to the degree required by our specification. The plant is constructed to produce a variety of industrial-grade lithium chemicals beginning with the raw ores.

Personnel were not accustomed to operate with the precautions necessary to avoid cross-contamination of the various products. The commercial $LiAlO_2$ produced in the past was usually from 10 percent to 25 percent hypostoichiometric in Li and some experimentation was required to find the feed material ratios and operating conditions which consistently resulted in the specified total lithium contents.

A considerable amount of $LiAlO_2$ was produced with boron contents in excess of the allowable 10 ppm. The extent and degree of contamination was not known until a DUN spectrographic laboratory developed a semi-quantitative analytical procedure. Cooperation between N-Fuels, Special Products Engineering and the vendor, Lithium Corporation of America, finally established the exact operation in the process at which the boron contamination was being introduced. Since that time all lots analyzed have shown very low boron contents.

A method for fluorine analysis has been available only recently. The few samples analyzed show fluorine to be present in amounts less than the specification limit. This limit was imposed arbitrarily, as there is no definite information as to the effects of fluorine on target integrity under irradiation.

The analytical data presented here represents about 50 percent of the material acquired for PT-66 and PT-75. An addendum to this document will present data for the balance after it is received and analyzed.

RR Studer:jan

DECLASSIFIED [redacted]

TABLE 1.

Inventory Lot No.	Total Li Wt. %	Wt. Ratio Li^6/Li	Li^6 In $LiAlO_2$ %	Spectrographic Analysis, PPM B	Cd	Co	Na	Si	Other	Chemical Analysis, PPM Water	Carbon	Fluorine	Vendor's L.O.I., %	Wt. % +100 Mesh	Bulk Density
001	9.58	0.0643	0.635	100	<2	<2		500					0.13		
002	10.10	0.0643	0.626	10	<2	10		500					0.20		
012	10.0	0.0218	0.217	100	<2	<2	500	200					0.58	19.9	
013	9.65	0.0218	0.212	100	<2	<2	500	200					0.13	13.1	
014	9.80	0.0218	0.219	100	<2	<2	500	200					0.45	12.6	
015	9.90	0.0218	0.220	2									1.30		
016	9.90	0.0643	0.652							3659	694		0.29		
017	10.15	0.0643	0.652		<10		2000	200					0.29	11.8	
018	7.42	0.0643	0.480								7274		4.01	9.3	
020	10.00	0.0258	0.256								2610		1.64	28.1	
021	10.03	0.0243	0.246								1919		1.34	7.5	
022	10.03	0.0241	0.246								3229		1.92	10.2	
023	10.03	0.0236	0.237	0.2	<2	<2	1000	100			1641		0.73	8.2	1.13
024	10.50	0.0157	0.158	50	<2	<2	1000	100					0.16	15.5	0.99
025	8.11	0.0643	0.542	100	<2	<2	1000	1000					0.50	16.8	1.08
026	10.25	0.0157	0.157	50	<2	<2	1000	100					0.15	7.5	1.04
027	10.25	0.0643	0.635	10	<2	<2	2000	100					0.44	9.0	1.09
028	9.86	0.0218	0.216	100	<2	<2	500	200			461		0.19	15.0	0.86
029	10.14	0.0218	0.216	10	<2	<2	2000	100					0.18	8.4	1.08
030	10.35	0.0218	0.226	10	<2	<2	1000	100			837		0.16	7.7	1.09
033	9.85	0.0157	0.153	100	<2	<2	500	200					0.32	12.9	0.85
034	9.65	0.0157	0.152	100	<2	<2	500	200			505		0.15	20.9	0.83
035	9.79	0.0157	0.154	100	<2	<2	500	200					0.73	13.7	0.83
037	9.91	0.0157	0.156	100	<2	<2	500	200					0.42	16.2	0.85
038	10.10	0.0157	0.158	20	<2	<2	2000	100					0.16	15.5	1.07
039	10.10	0.0157	0.158	100	<2	<2	500	200					0.10	19.7	0.82
040	10.30	0.0157	0.161	20	<2	<2	2000	100			989		0.15	7.5	1.04
041	9.70	0.0157	0.153	100	<2	<2	500	200			1362		0.73	17.3	0.84
042	9.85	0.0157	0.154	50	<2	<3	2000	100			865		0.23	6.6	1.07
043	9.15	0.0157	0.151	100	<2	<2	500	1000					0.26	11.2	0.86
044	9.79	0.0643	0.629												1.12
045	10.08	0.0643	0.647	5	<2	<2	2000	100							1.11
047	8.35	0.0643	0.538	100	<2	<2	1000	1000					0.32	16.8	1.06
048	9.74	0.0643	0.625	100	<2	<2	1000	500			205		0.13	11.6	0.85
049	10.22	0.0643	0.658	2	<2	<2	2000	100					0.70	11.9	1.06

DECLASSIFIED

DECLASSIFIED

Inventory Lot No.	Total Li Wt. %	Wt. Ratio Li^6/Li	Li^6 In $LiAlO_2$ %	Spectrographic Analysis, PPM B	Cd	Co	Na	Si	Other	Chemical Analysis, PPM Water	Carbon	Fluorine	Vendor's L.O.I., %	Wt. % +100 Mesh	Bulk Density
050	10.00	0.0643	0.643	2	<2	<2	2000	100					0.18	18.9	1.03
051	10.01	0.0643	0.643	5	<2	<2	2000	100					0.24	15.2	1.03
052	9.51	0.0643	0.605	2	<2	<2	2000	100					0.19	16.0	1.01
053	9.86	0.0643	0.614	2	<2	<2	2000	500					0.17	12.8	1.04
054	9.86	0.0221	0.218	1	<2	<2	2000	50			765		0.24	17.1	1.09
055	9.78	0.0221	0.216	0.5	<2	<2	2000	20					0.18	7.9	1.04
056	9.70	0.0221	0.214	1	<2	<2	2000	50			173	0.08	0.12	17.4	1.02
057	10.69	0.0221	0.236	1	<2	<2	2000	50					0.19	8.3	0.98
058	10.20	0.0221	0.226	10	<2	<2	2000	50			365		0.12	8.0	1.00
059	10.13	0.0221	0.224	2	<2	<2	2000	100					0.10	7.4	0.98
060	10.06	0.0221	0.222	1	<2	<2	2000	50			597		0.14	13.3	0.99
061	10.12	0.0221	0.224	1	<2	<2	2000	100					0.10	5.0	0.97
062	9.90	0.0221	0.218	1	<2	<2	2000	50			748		0.14	11.2	1.00
063	10.19	0.0221	0.224	1	<2	<2	2000	50			649		0.12	4.3	0.99
064	9.99	0.0221	0.219	0.5	<2	<2	2000	20			754		0.15	11.4	0.99
065	9.99	0.0221	0.219	0.5	<2	<2	2000	50					0.22	10.8	1.03
066	10.33	0.0221	0.229	1	<2	<2	2000	100			632		0.15	13.1	1.00
067	10.40	0.0221	0.230	0.5	<2	<2	2000	100					0.13	10.3	1.03
068	9.91	0.0221	0.219	1	<2	<2	2000	100			271		0.11	16.3	1.00
069	9.91	0.0221	0.219	1	<2	<2	2000	100					0.16	15.6	1.00
070	10.28	0.0221	0.227	1	<2	<2	2000	100			329		0.11	10.5	1.01
071	10.06	0.0221	0.222	1	<2	<2	2000	50					0.16	11.9	0.99
072	10.06	0.0221	0.222	1	<2	<2	2000	100			403		0.20	14.8	1.01
073	9.70	0.0221	0.214										0.11	14.5	
074	9.98	0.0221	0.220										0.10	14.4	
075	9.98	0.0221	0.220										0.10	11.8	
076	9.79	0.0305	0.298	100	<2	<2	500	500					0.88	11.5	0.82
077	9.50	0.0305	0.289	100	<2	<2	500	200					0.17	12.9	0.77
078	9.71	0.0305	0.296	100	<2	<2	500	500					0.13	9.8	0.79
079	9.58	0.0305	0.292	100	<2	<2	500	1000					0.09	15.3	0.79
080	9.44	0.0305	0.288	100	<2	<2	500	500					0.22	15.0	0.78
081	9.50	0.0305	0.289	100	<2	<2	500	200	500 Fe	2226	2868	21.8	0.36	15.2	0.80
082	9.50	0.0305	0.289	100	<2	<2	500	500					0.09	12.7	0.77
083	9.91	0.0305	0.302	100	<2	<2	500	500		1256	324	9.0	0.26	15.7	0.75
084	9.50	0.0305	0.289	100	<2	<2	500	500					0.90	11.2	0.78
085	9.64	0.0305	0.294	50	<2	<2	500	500				2.19	0.13	12.3	0.78
086	9.39	0.0305	0.286	100	<2	<2	500	500					0.05	11.2	0.78

DECLASSIFIED

DECLASSIFIED

Inventory Lot No.	Total Li Wt. %	Wt. Ratio Li^6/Li	Li^6 In $LiAlO_2$ %	Spectrographic Analysis, PPM						Chemical Analysis, PPM			Vendor's L.O.I., %	Wt. % +100 Mesh	Bulk Density
				B	Cd	Co	Na	Si	Other	Water	Carbon	Fluorine			
087	9.23	0.0305	0.282	100	<2	<2	500	500				2.69	0.05	13.5	0.78
088	9.71	0.0305	0.296	200	<2	<2	500	200	500 Fe			5.62	0.26	8.1	0.80
089	9.71	0.0305	0.296	200	<2	<2	500	200					0.49	11.4	0.80
090	9.64	0.0305	0.294	200	<2	<2	500	500				1.88	0.10	10.6	0.75
091	10.33	0.0305	0.315	200	<2	<2	500	200					0.66	3.4	0.72
092	10.06	0.0305	0.306	200	<2	<2	<500	200					0.10	3.8	0.74
093	9.78	0.0305	0.298	200	<2	<2	<500	200				1.0	0.10	1.4	0.77
094	9.85	0.0305	0.300	200	<2	<2	<500	200				3.0	0.25	2.7	0.75
095	9.64	0.0305	0.294	200	<2	<2	500	200					0.29	7.8	0.75
096	10.12	0.0305	0.309	100	<2	<2	2000	200					0.16	4.7	0.94
097	9.92	0.0305	0.302	100	<2	<2	2000	200					0.20	3.4	1.01
098	10.06	0.0305	0.307	20	<2	<2	2000	100					0.17	3.4	1.05
099	9.92	0.0305	0.302	50	<2	<2	2000	100					0.30	4.7	1.02
100	9.92	0.0305	0.302	100	<2	<2	2000	100					0.56	5.4	0.99
101	9.99	0.0305	0.304	20	<2	<2	2000	100					0.15	3.7	1.03
102	10.27	0.0305	0.312	20	<2	<2	2000	200					0.33	7.3	1.01
103	9.70	0.0305	0.295	10	<2	<2	2000	200					0.26	6.8	1.03
104	9.70	0.0305	0.295	1	<2	<2	2000	100					0.24	6.7	1.07
105	10.04	0.0305	0.306	1	<2	<2	2000	50					0.28	4.7	1.11
106	10.04	0.0305	0.306	5	<2	<2	2000	100					0.24	6.4	1.09
107	9.50	0.0305	0.290	0.5	<2	<2	2000	50					0.19	5.8	1.10
108	9.64	0.0305	0.294	0.2	<2	<2	2000	20					0.35	5.5	1.08
109	9.50	0.0305	0.290	20	<2	<2	1000	100					0.26	6.1	1.01
110	9.57	0.0305	0.292	10	<2	<2	2000	50					0.27	6.0	1.05
111	9.79	0.0305	0.298	5	<2	<2	2000	100					0.25	4.0	1.06
112	9.85	0.0305	0.300	1	<2	<2	2000	100					0.22	2.9	1.04
113	9.57	0.0305	0.292	1	<2	<2	2000	50					0.31	16.1	1.08
114	9.79	0.0305	0.298	0.5	<2	<2	2000	100					0.32	6.6	1.06
115	10.25	0.0305	0.312	1	<2	<2	2000	100							
116	10.25	0.0305	0.312	0.5	<2	<2	2000	100							
117	10.13	0.0305	0.309	0.5	<2	<2	2000	100							
118	10.13	0.0305	0.309	0.2	<2	<2	2000	100							
119	10.33	0.0305	0.315	0.2	<2	<2	2000	100							
120	10.25	0.0305	0.312	0.2	<2	<2	2000	100							
121	10.25	0.0305	0.312	0.2	<2	<2	2000	100							
122	10.33	0.0305	0.315	0.2	<2	<2	2000	200							
123	9.09	0.0305	0.277	0.5	<2	<2	2000	200							
124	10.25	0.0305	0.312	0.2	<2	<2	2000	200							
125	10.20	0.0305	0.311	0.2	<2	<2	2000	100							
126	10.25	0.0305	0.312	0.2	<2	<2	2000	100							

DECLASSIFIED

DECLASSIFIED