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CATALOG OF HIGHLY PURIFIED URANIUM ISOTOPES

BY

B. Harmatz
R. S. Livingston



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CATALOG OF HIGHLY PURIFIED URANIUM ISOTOPES

B. Harmatz
R. S. Livingston

February 11, 1952

ELECTROMAGNETIC RESEARCH DIVISION
Dr. Robert S. Livingston, Director

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OAK RIDGE NATIONAL LABORATORY
Operated by
CARBIDE AND CARBON CHEMICALS COMPANY
A Division of Union Carbide and Carbon Corporation
Oak Ridge, Tennessee

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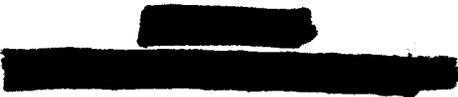
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ABSTRACT

Enriched uranium isotopes of mass 234, 235, 236, and 238 have been separated electromagnetically and are now available. Separations of Th 230 and plutonium isotopes are scheduled.




INTRODUCTION

Uranium isotopes of unusually high isotopic purity have been prepared for use on Atomic Energy Commission projects. To date the three naturally occurring isotopes and U 236 have been separated. These materials were produced at the Oak Ridge National Laboratory with improved electromagnetic separation equipment in multiple-stage processes. The isotopic composition of each of the samples is tabulated in the following sections along with the quantity available for distribution. Most of the materials now on hand are in the form of the black oxide (U_3O_8) or the nitrate solution; it is possible, however, to supply other chemical forms if desired.

Mass analyses of enriched uranium isotopes were furnished by the Y-12 Mass Spectrometer Laboratory. High level U 238 material was analyzed for U 235 at the K-25 Laboratory by the photoneutron fission method. The separation of Th 230 (ionium) is scheduled prior to the concentration of plutonium isotopes. It is also planned to increase the inventories of highly enriched U 234 and U 238.

Persons in need of these materials should communicate with the Office of Research and Medicine, Oak Ridge Directed Operations, Oak Ridge, Tennessee, giving the proposed use of the desired isotopes. The quantity of uranium, the batch number, and the required chemical form should be specified.

This catalog supercedes the previous issues dated May 1, 1951, Report Y-751; January 18, 1950, Report Y-554; and June 1, 1950, Report Y-614.



ENRICHED URANIUM 235

<u>Enriched Batch No.</u>	<u>Isotopic Composition (weight percent)</u>				<u>Quantity on Hand (Grams Uranium)</u>
	<u>U 235</u>	<u>U 238</u>	<u>U 234</u>	<u>U 236</u>	
WR-1	99.994*	0.001*	0.001*	0.004*	3.00
WR-2	99.994*	0.001*	0.001*	0.004*	4.50
R-1	99.94	0.038	0.022		6.32
R-2	99.93	0.044	0.026		9.16
R-4	99.93	0.046	0.024		1.50
R-5	99.92	0.049	0.031		1.70
R-11	99.91	0.070	0.020		9.83
R-3	99.90	0.064	0.036		1.62
R-8, 12	99.90	0.07	0.03		13.42
R-20**	99.88	0.09	0.03		21.27
R-21**	99.78	0.15	0.07		11.54
VR-1	99.80	0.09	0.04	0.07	19.64
VR-2	99.78	0.13	0.02	0.07	12.41
VR-3	99.76	0.12	0.06	0.06	12.23
VR-4**	99.73	0.13	0.06	0.08	49.83
VR-5*	99.72	0.12	0.06	0.10	30.54
VR-6**	99.71	0.12	0.08	0.09	13.67
VR-7	99.70	0.15	0.07	0.08	31.15
VR-8**	99.69	0.16	0.07	0.08	52.07
VR-9**	99.68	0.17	0.08	0.07	41.04
VR-10**	99.67	0.16	0.07	0.10	78.77
VR-11**	99.66	0.19	0.06	0.09	60.58
VR-12**	99.65	0.15	0.06	0.14	33.33
VR-13**	99.62	0.19	0.08	0.11	80.67
VR-14	99.61	0.25	0.05	0.09	17.03

* Estimated values

** Numerical composite of several physically distinct batches.

ENRICHED URANIUM 236

<u>Enriched Batch No.</u>	<u>Isotopic Composition (weight percent)</u>				<u>Quantity on Hand (Grams Uranium)</u>
	<u>U 236</u>	<u>U 235</u>	<u>U 238</u>	<u>U 234</u>	
2V-1***	96.65	3.09	0.21	0.05	0.301
2V-5	95.51	4.00	0.43	0.06	0.210
2V-2	95.31	4.18	0.36	0.15	0.230
2V-6	95.23	4.08	0.60	0.09	0.270
2V-3	94.90	4.63	0.40	0.07	0.119
2V-4	94.77	4.62	0.54	0.07	0.270
1V-0	42.38	53.80	3.16	0.66	0.294
1V-1	28.92	57.43	12.47	1.18	14.918
1V-2	18.49	58.06	22.36	1.09	1.217
1V-3	17.18	50.26	31.53	1.03	2.002
1V-4	14.16	44.52	40.44	0.88	1.963
1V-5	9.28	30.43	59.60	0.69	0.361

*** Previously irradiated in Oak Ridge graphite reactor.

ENRICHED URANIUM 234

<u>Enriched Batch No.</u>	<u>Isotopic Composition (weight percent)</u>			<u>Quantity on Hand (Grams Uranium)</u>
	<u>U 234</u>	<u>U 235</u>	<u>U 238</u>	
W-1	95.99	3.02	0.98	0.029
W-11	94.00	4.45	1.53	0.028
W-4	89.34	7.72	2.89	0.091
W-5	51.7	35.6	12.7	0.196
W-6	46.0	40.1	13.9	0.624
VW-1*	33.23	62.1	4.21	0.328
W-7**	17.30	61.0	21.6	5.402
W-8	13.5	21.9	64.6	39.320

* Contains 0.46% U 236

** Numerical composite of several physically distinct batches.

ENRICHED URANIUM 238

<u>Enriched Batch No.</u>	<u>Isotopic Composition (weight percent)</u>			<u>Quantity on Hand (Grams Uranium)</u>
	<u>U 238</u>	<u>U 235</u>	<u>U 234</u>	
Q-505	99.9995	0.00053	0.000005*	0.87
Q-19	99.9993	0.00065	0.000007*	10.0
Q-17	99.9993	0.00071	0.000008*	13.0
Q-13	99.9991	0.00089	0.000010*	2.0
QS-3	99.9956	0.00440	0.000044*	6.2
QS-4	99.9938	0.00610	0.000061*	23.7
BQ-1	99.996	0.004	0.00005*	11.3
BQ-2	99.995	0.005	0.00006*	2.6
BQ-3	99.994	0.006	0.00007*	80.7
BQ-4	99.993	0.007	0.00008*	43.7
BQ-5	99.992	0.008	0.00009*	7.0
BQ-6	99.990	0.010	0.00011*	28.1
BQ-7	99.989	0.011	0.00013*	24.5
BQ-8	99.988	0.012	0.00014*	638.5
BQ-9**	99.975	0.025	0.00029*	180.0
BQ-10**	99.945	0.054	0.00063*	1058.2

* Estimated values

** Numerical composite of several physically distinct batches.


ACKNOWLEDGEMENT

The separation of these isotopes represents the cooperative efforts of the Y-12 Chemical Division and the ORNL Electromagnetic Research Division. Detailed reports on enrichment of U 238* and U 234** have been published and other reports are in preparation.

* Calloway, F. F., and Googin, J. M., Production of High Purity Q, Y-130, August 1947.

** Harmatz, B., and Livingston, R. S., Enrichment of Uranium 234, Y-660, September 1950.

