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Inventory, May 31, 1953

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ELECTROMAGNETICALLY ENRICHED ISOTOPES

Inventory, May 31, 1953

C. P. Keim
C. E. Normand
Boyd Weaver

Date Issued

JUL 20 1953

ISOTOPE RESEARCH AND PRODUCTION DIVISION
C. P. Keim, Director

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ABSTRACT

This inventory lists the isotopes which have been concentrated electromagnetically, along with the completed information on their enriched abundances, and the element weights and product forms available in milligram quantities to users on Atomic Energy Commission projects and in university and industrial laboratories.

TABLE OF CONTENTS

	Page No.
Introduction	7-8
Summary of Production and Shipments	9

Stable Isotopes:

Element	Page No.
Antimony	33
Barium	35-36
Boron	10
Bromine	25
Cadmium	29-30
Calcium	14-15
Carbon	11
Cerium	36-37
Chlorine	13
Chromine	16-17
Copper	21
Gallium	22
Germanium	22-23
Hafnium	39
Indium	30
Iron	17-20
Lanthanum	36
Lead	42-44
Lithium	10
Magnesium	11
Mercury	40-42
Molybdenum	27-28
Neodymium	37-38
Nickel	20-21
Palladium	28
Potassium	13-14
Rhenium	40
Rubidium	25
Samarium	38
Selenium	23-25
Silicon	11-12
Silver	28-29
Strontium	25-26
Sulfur	12
Tellurium	34-35
Thallium	42
Tin	30-33
Titanium	15-16
Tungsten	39-40
Vanadium	16
Zinc	21-22
Zirconium	26-27

INTRODUCTION

This report of electromagnetically enriched isotopes is revised frequently to include all isotopes which are available for use, or are in the process of chemical refinement. The most recent information on the isotopic abundance of each enriched sample and the amount of each isotope in the inventory is also listed. The list also includes those isotopes which have been concentrated but are not available at present.

All weights reported are element weights converted from compound weights by standard gravimetric factors.

On all shipments material will be shipped in the product form shown unless special arrangements are made for further chemical processing.

Isotopic abundance data not in this report, such as concentrations of other isotopes in the sample, will be submitted upon request. Spectrographic analyses and complete isotopic abundance data will be forwarded with all shipments or as soon as available.

Any users of isotopes who need mass analysis services should check with the Isotopes Division of the A. E. C. regarding their specific needs.

Isotopes produced by the electromagnetic process are available in milligram quantities for distribution on loan within and outside of the Atomic Energy Commission and may be requested by using A. E. C. form 100. Copies of this form may be obtained from the Isotopes Division, U. S. Atomic Energy Commission, P. O. Box "E", Oak Ridge, Tennessee.

Users of Stable Isotopes who need extensions of their loan periods should write The Isotopes Division, Atomic Energy Commission, Oak Ridge, Tennessee.

All purchase orders are to be sent to Dr. C. P. Keim, Oak Ridge National Laboratory, Y-12 Area, Oak Ridge, Tennessee.

SUMMARY OF PRODUCTION AND SHIPMENTS

Atomic No.	Element	Production Completed	No. of Samples Now Available For Shipment	No. of Individual Shipments and Transfers Made
51	Antimony	4	4	26
56	Barium	19	15	32
4	Beryllium	2	0	2
5	Boron	5	5	3
35	Bromine	2	2	4
48	Cadmium	19	15	75
20	Calcium	39	17	61
6	Carbon	3	2	3
58	Cerium	14	12	32
17	Chlorine	7	6	7
24	Chromium	14	9	66
29	Copper	13	11	29
31	Gallium	2	2	16
32	Germanium	11	10	36
72	Hafnium	6	2	39
49	Indium	12	9	25
26	Iron	79	60	74
57	Lanthanum	2	2	4
82	Lead	29	25	63
3	Lithium	24	10	103
12	Magnesium	17	14	44
80	Mercury	40	34	87
42	Molybdenum	31	26	88
60	Neodymium	14	15	57
28	Nickel	26	14	65
8	Oxygen	2	0	0
46	Palladium	6	0	0
19	Potassium	31	23	55
75	Rhenium	2	2	16
37	Rubidium	2	2	11
62	Samarium	14	13	68
34	Selenium	47	43	62
14	Silicon	9	7	24
47	Silver	8	8	18
38	Strontium	14	9	33
16	Sulfur	9	6	16
52	Tellurium	42	34	85
81	Thallium	16	12	29
50	Tin	63	55	120
22	Titanium	14	10	61
74	Tungsten	18	17	50
23	Vanadium	3	3	6
30	Zinc	16	10	60
40	Zirconium	27	22	70
	TOTAL	777	597	1825

ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Lithium						
Li 6	7.43	95.2	ED	537 (a)	7	Li_2SO_4
Li 6	7.43	95.5	ED	537 (b)	15	Li_2SO_4
Li 6	7.43	88.22	EZ	627 (e)	12	Li_2SO_4
Li 6	7.43	94.07	FI	667 (a)	25	Li_2SO_4
Li 6	7.45	ca 95	FY	745 (b)	1,000	Li_2SO_4
Li 7	92.57	99.91	I	26 (a)	10	Li_2SO_4
Li 7	92.57	99.5	AR	140 (a)	711	Li_2SO_4
Li 7	92.57	99.8	BQ	265 (ar)	710	Li_2SO_4
Li 7	92.57	98.4	CU	379 (a)	4,546	Li_2SO_4
Li 7	92.57	99.86	EZ	628 (e)	5,064	Li_2SO_4
Li 7	92.57	ca 99.99	GE	767 (j)	1,000	Li_2SO_4
Boron						
B 10	19.57	86.78	DP	481 (a)	40	H_3BO_3
B 10	19.57	*	FV	734 (a)	2,179	H_3BO_3
B 10	19.57	**	GF	768 (a)		
B 11	80.43	*	BM	250 (a)	10	H_3BO_3
B 11	80.43	*	DP	482 (a)	200	H_3BO_3
B 11	80.43	97.77	FV	735 (a)	1,890	H_3BO_3
B 11	80.43	**	GF	769 (a)		

* - Analysis Incomplete
** - Refinement Incomplete

ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Carbon						
C 12	98.91	99.96	FD	638 (ah)	1,140	C
C 12	98.91	99.94	FD	638 (aj)	9,950	C
Magnesium						
Mg 24	78.98	99.5	P	47 (a)	1,570	MgO
Mg 24	78.98	98.36	Q	50 (a)	192	MgO
Mg 24	78.98	99.52	BZ	288 (a)	2,527	MgO
Mg 24	78.98	99.2	BZ	288 (b)	132	MgO
Mg 24	78.98	99.5	BZ	288 (c)	2,251	MgO
Mg 24	78.98	99.4	BZ	288 (d)	1,786	MgO
Mg 24	78.98	99.59	DZ	519 (a)	1,804	MgO
Mg 25	10.03	62.59	Q	51 (a)	20	MgO
Mg 25	10.03	65.67	Q	51 (b)	14	MgO
Mg 25	10.03	86.8	BZ	289 (a)	220	MgO
Mg 25	10.03	92.33	DZ	520 (a)	1,270	MgO
Mg 26	10.99	96.16	P	49 (a)	416	MgO
Mg 26	10.99	95.91	BZ	290 (a)	213	MgO
Mg 26	10.99	98.12	DZ	521 (a)	583	MgO
Silicon						
Si 28	92.17	99.4	AI-AJ	103-106 (a)	1,796	SiO_2
Si 28	92.17	98.1	BW	280 (a)	7,510	SiO_2

* - Analysis Incomplete
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ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Silicon (Cont'd)						
Si 28	92.17	99.16	EB	524 (a)	9,041	SiO_2
Si 28	92.17	**	GC	761 (a)		
Si 29	4.71	68.62	EB	525 (a)	90	SiO_2
Si 29	4.71	**	GC	762 (a)		
Si 30	3.12	63.9	AI-AJ	105-108 (a)	100	SiO_2
Si 30	3.12	49.6	BW	282 (a)	350	SiO_2
Si 30	3.12	64.04	EB	526 (a)	48	SiO_2
Si 30	3.12	**	GC	763 (a)		
Sulfur						
S 32	94.89	97.90	CX	391 (a)	215	S
S 32	94.89	98.45	ES	596 (a)	7,463	CdS
S 32	94.89	**	GB	757 (a)		
S 33	0.80	5.54	CX	392 (a)	25	S
S 33	0.80	9.8	ES	597 (a)	0	
S 33	0.80	**	GB	758 (a)		
S 34	4.29	20.65	CX	393 (a)	0	
S 34	4.29	5.38	CX	393 (b)	59	S
S 34	4.29	14.92	ES	598 (a)	997	CdS
S 34	4.29	**	GB	759 (a)		
S 36	0.02	0.88	ES	599 (a)	24	CdS
S 36	0.02	**	GB	760 (a)		

* - Analysis Incomplete
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ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Chlorine						
Cl 35	75.4	79.5	AV	161 (cl)	18	AgCl
Cl 35	75.4	92.4	DH	436 (a)	0	AgCl
Cl 35	75.4	*	FW	736 (a)	17,603	NaCl
Cl 35	75.4	*	FW	736 (b)	8,824	NaCl
Cl 37	24.6	65.6	DH	438 (a)	97	AgCl
Cl 37	24.6	*	FW	737 (a)	672	NaCl
Cl 37	24.6	*	FW	737 (b)	4,777	NaCl
Potassium						
K 39	93.25	99.5	BJ	237 (a)	1,592	$KClO_4$
K 39	93.25	99.9	CM	346 (a)	35	KCl
K 39	93.25	99.9	CM	346 (ar)	9,920	KCl
K 39	93.25	99.94	DA	407 (a)	19,225	KCl
K 39	93.25	99.74	DB	410 (a)	5,659	KCl
K 39	93.25	99.89	DT	494 (a)	9,384	KCl
K 39	93.25	99.96	EX	621 (g)	18,470	KCl
K 39	93.25	99.94	EY	624 (i)	24,977	KCl
K 39	93.25	99.83	FA	629 (a)	10,473	KCl
K 40	0.011	1.31	DA	408 (a)	10	KCl
K 40	0.011	0.40	DB	411 (a)	150	KCl
K 40	0.011	0.40	DB	411 (ar)	318	KCl
K 40	0.011	7.13	DT	495 (a)	0	

* - Analysis Incomplete
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ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Potassium (Cont'd)						
K 40	0.011	3.64	EX	622 (u)	7	KCl
K 40	0.011	7.75	EY	625 (t)	10	K_2SO_4
K 40	0.011	0.978	FA	630 (a)	33	KCl
K 41	6.74	92.9	BJ	239 (a)	65	$KClO_4$
K 41	6.74	86.8	CM	348 (a)	37	KCl
K 41	6.74	98.94	DT	496 (a)	100	KCl
K 41	6.74	98.94	DT	496 (ar)	65	KCl
K 41	6.74	99.20	EX	623 (e)	69	KCl
K 41	6.74	99.21	EY	626 (e)	650	KCl
K 41	6.74	99.21	EY	626 (er)	988	KCl
K 41	6.74	87.75	FA	631 (a)	540	KCl
Calcium						
Ca 40	96.96	98.6	V	61 (b)	114	CaO
Ca 40	96.96	99.97	X	70 (a)	1,048	CaO
Ca 40	96.96	98.9	BN	251 (a)	5,825	$CaCO_3$
Ca 40	96.96	99.83	DI	441 (d)	35,259	$CaCO_3$
Ca 40	96.96	99.98	EV	613 (a)	28,733	$CaCO_3$
Ca 40	96.96	99.98	FF	648 (a)	44,756	$CaCO_3$
Ca 40	96.96	**	FO	689 (a)		
Ca 42	0.64	28.3	DI	442 (b)	393	$CaCO_3$
Ca 42	0.64	82.52	EV	614 (a)	140	$CaCO_3$

* -Analysis Incomplete
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ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Calcium (Cont'd)						
Ca 42	0.64	64.17	FF	649 (a)	355	$CaCO_3$
Ca 42	0.64	**	FO	690 (a)		
Ca 43	0.145	37.56	DI	443 (b)	43	$CaCO_3$
Ca 43	0.145	72.13	EV	615 (a)	0	
Ca 43	0.145	67.95	FO	691 (a)	295	$CaCO_3$
Ca 44	2.06	85.4	BN	254 (a)	40	$CaCO_3$
Ca 44	2.06	96.2	CS	373 (a)	0	
Ca 44	2.06	97.90	EV	616 (a)	488	$CaCO_3$
Ca 44	2.06	97.99	FF	651 (a)	555	$CaCO_3$
Ca 44	2.06	**	FO	692 (a)		
Ca 46	0.0033	10.16	FF	652 (a)	0	
Ca 48	0.185	84.28	FO	694 (a)	0	
Ca 48	0.185	7.49	FF	653 (a)	10	$CaCO_3$
Titanium						
Ti 46	7.97	84.26	BF	215 (ar)	83	TiO_2
Ti 46	7.97	82.68	EN	576 (a)	309	TiO_2
Ti 46	7.97	**	GA	752 (a)		
Ti 47	7.41	82.05	BF	216 (a)	28	TiO_2
Ti 47	7.41	82.05	BF	216 (ar)	99	TiO_2
Ti 47	7.41	63.11	EN	577 (a)	444	TiO_2
Ti 47	7.41	**	GA	753 (a)		

* - Analysis Incomplete
** - Refinement Incomplete

ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Titanium (Cont'd)						
Ti 48	73.50	99.23	BF	217 (a)	50	TiO_2
Ti 48	73.50	98.90	EN	578 (a)	14,856	TiO_2
Ti 48	73.50	**	GA	754 (a)		
Ti 49	5.64	77.62	BF	218 (a)	37	TiO_2
Ti 49	5.64	77.62	BF	218 (ar)	45	TiO_2
Ti 49	5.64	**	GA	755 (a)		
Ti 50	5.48	84.69	BF	219 (a)	0	
Ti 50	5.48	81.44	EN	580 (a)	139	TiO_2
Ti 50	5.48	**	GA	756 (a)		
Vanadium						
V 50	0.28	22.83	FM	683 (b)	36	V_2O_5
V 51	99.72	>99.95	FB	633 (a)	2,516	V_2O_5
V 51	99.72	>99.98	FM	684 (a)	26,265	V_2O_5
Chromium						
Cr 50	4.40	88.3	EU	609 (a)	393	Cr_2O_3
Cr 52	83.73	99.14	D	11 (a)	510	Cr_2O_3
Cr 52	83.73	99.14	D	11 (ar)	140	Cr_2O_3
Cr 52	83.73	99.1	CD	310 (a)	3,057	Cr_2O_3
Cr 52	83.73	97.1	EU	610 (a)	23,140	Cr_2O_3
Cr 53	9.49	88.59	D	12 (a)	56	Cr_2O_3

* - Analysis Incomplete
** - Refinement Incomplete

ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Chromium (Cont'd)						
Cr 53	9.49	92.1	CD	311 (a)	14	Cr_2O_3
Cr 53	9.49	90.06	EU	611 (a)	6	Cr_2O_3
Cr 54	2.38	88.95	EU	612 (a)	0	
Iron						
Fe 54	5.90	55.47	V	3 (a)	57	Fe_2O_3
Fe 54	5.90	39.0	B	3 (f)	268	Fe_2O_3
Fe 54	5.90	81.06	E	14 (a)	17	Fe_2O_3
Fe 54	5.90	83.03	F	18 (a)	32	Fe_2O_3
Fe 54	5.90	49.2	AM	122 (a)	343	Fe_2O_3
Fe 54	5.90	93.27	AZ	183 (a)	16	Fe_2O_3
Fe 54	5.90	87.9	BA	187 (a)	10	Fe_2O_3
Fe 54	5.90	87.4	BB	194 (a)	69	Fe_2O_3
Fe 54	5.90	84.3	CI	328 (a)	41	Fe_2O_3
Fe 54	5.90	34.47	DO	477 (a)	67,252	Fe_2O_3
Fe 54	5.90	93.06	FC	634 (a)	340	Fe_2O_3
Fe 54	5.90	**	FN	685 (a)		
Fe 54	5.90	**	FN	685 (b)		
Fe 56	91.52	98.41	B	4 (a)	3,235	Fe_2O_3
Fe 56	91.52	98.5	B	4 (e)	901	Fe_2O_3
Fe 56	91.52	98.62	E	15 (a)	10,403	Fe_2O_3
Fe 56	91.52	97.42	F	19 (a)	1,120	Fe_2O_3

* - Analysis Incomplete
** - Refinement Incomplete

ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Iron (Cont'd)						
Fe 56	91.52	98.9	AM	123 (a)	2,627	Fe_2O_3
Fe 56	91.52	99.0	AZ	184 (a)	12,451	Fe_2O_3
Fe 56	91.52	98.5	BA	188 (a)	35,471	Fe_2O_3
Fe 56	91.52	98.3	BB	192 (a)	9,818	Fe_2O_3
Fe 56	91.52	96.5	CI	329 (a)	51,056	Fe_2O_3
Fe 56	91.52	99.84	CZ	404 (f)	10,690	Fe_2O_3
Fe 56	91.52	99.70	DO	478 (a)	242,643	Fe_2O_3
Fe 56	91.52	99.70	DO	478 (ar)	76,218	Fe_2O_3
Fe 56	91.52	99.70	DO	478 (as)	27,594	Fe
Fe 56	91.52	*	FC	635 (a)	18,171	Fe_2O_3
Fe 56	91.52	*	FN	686 (a)	304,226	Fe_2O_3
Fe 56	91.52	**	FN	686 (b)		
Fe 57	2.24	21.10	B	5 (a)	62	Fe_2O_3
Fe 57	2.24	30.5	B	5 (f)	81	Fe_2O_3
Fe 57	2.24	69.63	F	20 (a)	15	Fe_2O_3
Fe 57	2.24	33.2	AM	124 (a)	69	Fe_2O_3
Fe 57	2.24	77.6	BB	193 (a)	24	Fe_2O_3
Fe 57	2.24	51.91	CZ	405 (f)	509	Fe_2O_3
Fe 57	2.24	79.43	DK	449 (a)	232	Fe_2O_3
Fe 57	2.24	62.38	DL	453 (a)	830	Fe_2O_3
Fe 57	2.24	59.31	DL	453 (d)	381	Fe_2O_3
Fe 57	2.24	31.9	DL	453 (e)	1,245	Fe_2O_3

* - Analysis Incomplete
** - Refinement Incomplete

ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Iron (Cont'd)						
Fe 57	2.24	59.3	DL	453 (f)	1,122	Fe_2O_3
Fe 57	2.24	43.45	DL	453 (j)	2,571	Fe_2O_3
Fe 57	2.24	74.6	DM	459 (a)	172	Fe_2O_3
Fe 57	2.24	40.61	DL	463 (a)	1,687	Fe_2O_3
Fe 57	2.24	45.43	DL	463 (b)	1,018	Fe_2O_3
Fe 57	2.24	67.3	DL	463 (e)	278	Fe_2O_3
Fe 57	2.24	53.53	DL	463 (j)	184	Fe_2O_3
Fe 57	2.24	54.23	DL	463 (k)	1,766	Fe_2O_3
Fe 57	2.24	63.1	DL	467 (c)	165	Fe_2O_3
Fe 57	2.24	87.29	DN	475 (a)	0	
Fe 57	2.24	83.44	FC	636 (a)	1,024	Fe_2O_3
Fe 57	2.24	**	FN	687 (a)		
Fe 57	2.24	**	FN	687 (b)		
Fe 58	0.34	22.0	C	8 (b)	15	Fe_2O_3
Fe 58	0.34	10.3	AM	125 (a)	44	Fe_2O_3
Fe 58	0.34	23.4	DL	454 (f)	39	Fe_2O_3
Fe 58	0.34	71.7	DL	454 (m)	92	Fe_2O_3
Fe 58	0.34	79.8	DL	464 (l)	0	
Fe 58	0.34	75.7	DO	480 (a)	117	Fe_2O_3
Fe 58	0.34	42.0	DO	480 (b)	484	Fe_2O_3
Fe 58	0.34	34.8	DO	480 (c)	37	Fe_2O_3
Fe 58	0.34	74.20	FN	688 (b)	37	Fe_2O_3

* - Analysis Incomplete
** - Refinement Incomplete

ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Iron (Cont'd)						
Fe 58	0.34	59.65	FN	688 (c)	104	Fe_2O_3
Fe 58	0.34	55.74	FN	688 (d)	372	Fe_2O_3
Fe 58	0.34	57.31	FN	688 (f)	197	Fe_2O_3
Fe 58	0.34	65.85	FN	688 (g)	82	Fe_2O_3
Fe 58	0.34	78.66	FN	688 (i)	82	Fe_2O_3
Fe 58	0.34	78.02	FN	688 (j)	86	Fe_2O_3
Nickel						
Ni 58	67.4	98.51	K	33 (a)	12	NiO
Ni 58	67.4	99.3	AS-AT	141-147 (a)	34	NiO
Ni 58	67.4	98.36	DF	422 (a)	5,485	NiO
Ni 58	67.4	*	FJ	669 (a)	36,817	NiO
Ni 60	26.7	94.4	J	28 (a)	18	NiO
Ni 60	26.7	94.4	J	28 (ar)	190	NiO
Ni 60	26.7	87.10	K	34 (a)	680	NiO
Ni 60	26.7	97.7	AS-AT	142-148 (a)	0	
Ni 60	26.7	*	FJ	670 (a)	13,430	NiO
Ni 61	1.2	34.42	K	35 (a)	28	NiO
Ni 61	1.2	80.9	AS-AT	143-149 (a)	0	
Ni 61	1.2	*	FJ	671 (a)	570	NiO
Ni 62	3.8	67.99	K	36 (a)	50	NiO
Ni 62	3.8	94.7	AS-AT	144-150 (a)	0	

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ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Nickel (Cont'd)						
Ni 62	3.8	*	DF	425 (br)	30	Ni
Ni 62	3.8	*	FJ	672 (a)	1,462	NiO
Ni 64	0.88	85.10	J	32 (a)	10	NiO
Ni 64	0.88	97.4	AS-AT	146-152 (a)	0	
Ni 64	0.88	*	FJ	674 (a)	0	
Copper						
Cu 63	69.09	97.0	A	1 (a)	650	CuO
Cu 63	69.09	97.0	A	1 (ar)	960	CuO
Cu 63	69.09	99.35	J-K	31-37 (a)	730	CuO
Cu 63	69.09	98.2	AV	161 (cu)	100	CuO
Cu 63	69.09	99.11	DF	426 (a)	3,351	CuO
Cu 63	69.09	96.12	DL	455 (a)	578	CuO
Cu 63	69.09	99.40	DU	497 (a)	5,140	CuO
Cu 63	69.09	*	FJ	673 (a)	9,426	CuO
Cu 65	30.91	93.81	A	2 (ar)	461	CuO
Cu 65	30.91	90.6	AV	162 (cu)	14	CuO
Cu 65	30.91	98.16	DU	498 (a)	3,850	CuO
Zinc						
Zn 64	49.18	83.8	AG	97 (a)	394	ZnO
Zn 64	49.18	93.12	EK	556 (a)	4,470	ZnO

* - Analysis Incomplete
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ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Zinc						
Zn 66	27.76	78.4	AH	100 (a)	712	ZnO
Zn 66	27.76	93.79	EK	557 (a)	5,200	ZnO
Zn 67	4.05	56.0	BK	242 (a)	102	ZnO
Zn 67	4.05	60.46	EK	558 (a)	146	ZnO
Zn 68	18.40	95.47	EK	559 (a)	3,786	ZnO
Zn 70	0.61	32.9	AH	102 (a)	20	ZnO
Zn 70	0.61	32.0	BK	244 (a)	39	ZnO
Zn 70	0.61	48.40	EK	560 (a)	151	ZnO
Gallium						
Ga 69	60.00	98.42	EI	554 (a)	3,900	Ga_2O_3
Ga 71	40.00	98.08	EI	555 (a)	978	Ga_2O_3
Germanium						
Ge 70	20.63	88.1	BD-BE	205-210 (a)	29	GeO_2
Ge 70	20.63	91.38	FZ	747 (a)	10,210	GeO_2
Ge 72	27.41	89.2	BD-BE	206-211 (a)	860	GeO_2
Ge 72	27.41	94.86	FZ	748 (a)	15,537	GeO_2
Ge 73	7.84	68.9	BD-BE	207-212 (a)	86	GeO_2
Ge 73	7.84	78.04	FZ	749 (a)	3,654	GeO_2
Ge 74	36.37	95.2	BD-BE	208-213 (a)	1,360	GeO_2
Ge 74	36.37	95.80	FZ	750 (a)	17,640	GeO_2

* - Analysis Incomplete
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ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Germanium (Cont'd)						
Ge 76	7.75	81.02	FZ	751 (a)	4,897	GeO_2
Ge 76	7.75	79.3	BD-BE	209-214 (a)	122	GeO_2
Selenium						
Se 74	0.84	6.5	AK	109 (a)	10	Se
Se 74	0.84	12.3	CY	397 (ar)	255	Se
Se 74	0.84	12.08	DY	513 (a)	143	Se
Se 74	0.84	18.02	FG	654 (a)	90	Se
Se 74	0.84	33.06	FG	654 (b)	0	
Se 76	9.15	43.5	AN	126 (a)	10	Se
Se 76	9.15	41.5	BS	269 (a)	600	Se
Se 76	9.15	54.8	CY	398 (a)	542	Se
Se 76	9.15	54.8	CY	398 (ar)	390	Se
Se 76	9.15	57.40	DY	514 (a)	89	Se
Se 76	9.15	74.20	FG	655 (a)	374	Se
Se 76	9.15	88.51	FG	655 (b)	148	Se
Se 77	7.53	50.1	AK	110 (a)	99	Se
Se 77	7.53	53.6	BS	270 (a)	143	Se
Se 77	7.53	53.6	BS	270 (ar)	500	Se
Se 77	7.53	49.4	CY	399 (a)	107	Se
Se 77	7.53	58.40	DY	515 (a)	302	Se
Se 77	7.53	74.22	FG	656 (c)	203	Se
Se 77	7.53	83.16	FG	656 (d)	10	Se

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ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Selenium (Cont'd)						
Se 77	7.53	86.58	FG	656 (e)	10	Se
Se 77	7.53	91.73	FG	656 (f)	25	Se
Se 77	7.53	86.00	FG	656 (g)	8	Se
Se 78	23.62	79.3	AN	127 (a)	68	Se
Se 78	23.62	79.3	AN	127 (ar)	104	Se
Se 78	23.62	72.7	BS	271 (a)	1,853	Se
Se 78	23.62	81.7	CY	400 (a)	707	Se
Se 78	23.62	81.7	CY	400 (ar)	1,026	Se
Se 78	23.62	82.56	DY	516 (a)	69	Se
Se 78	23.62	90.24	FG	657 (b)	376	Se
Se 78	23.62	96.55	FG	657 (d)	145	Se
Se 80	49.97	86.7	AK	111 (a)	281	Se
Se 80	49.97	94.6	BS	272 (a)	1,520	Se
Se 80	49.97	94.6	BS	272 (ar)	257	Se
Se 80	49.97	91.7	CY	401 (a)	1,136	Se
Se 80	49.97	93.76	DY	517 (a)	41	Se
Se 80	49.97	96.94	FG	658 (a)	454	Se
Se 80	49.97	98.39	FG	658 (b)	851	Se
Se 82	8.89	49.6	AN	128 (a)	96	Se
Se 82	8.89	44.4	BS	273 (ar)	1,087	Se
Se 82	8.89	51.6	CY	402 (a)	314	Se
Se 82	8.89	51.6	CY	402 (ar)	260	Se

* - Analysis Incomplete
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ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Selenium (Cont'd)						
Se 82	8.89	52.36	DY	518 (a)	1,081	Se
Se 82	8.89	75.74	FG	659 (a)	460	Se
Se 82	8.89	89.87	FG	659 (b)	109	Se
Bromine						
Br 79	50.57	86.96	EJ	552 (a)	240	AgBr
Br 81	49.43	96.81	EJ	553 (a)	268	AgBr
Rubidium						
Rb 85	72.27	95.97	EW	619 (a)	257	RbCl
Rb 87	27.73	89.62	EW	620 (a)	763	RbCl
Strontium						
Sr 84	0.56	63.68	EH	548 (a)	0	
Sr 84	0.56	45.95	FL	679 (a)	80	$SrCO_3$
Sr 86	9.86	69.9	Z	78 (ar)	290	SrO
Sr 86	9.86	89.02	EH	549 (a)	23	$Sr(NO_3)_2$
Sr 86	9.86	83.44	FL	680 (a)	1,380	$SrCO_3$
Sr 87	7.02	60.03	EH	550 (a)	0	
Sr 87	7.02	42.82	FL	681 (a)	1,460	$SrCO_3$
Sr 88	82.6	98.9	Z	79 (a)	1,049	SrO
Sr 88	82.6	99.5	BL	248 (a)	322	$SrSO_4$

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ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Strontium (Cont'd)						
Sr 88	82.6	99.67	EH	551 (a)	39	$Sr(NO_3)_2$
Sr 88	82.6	99.63	FL	682 (a)	13,480	$SrCO_3$
Zirconium						
Zr 90	50.83	91.7	AA	80 (a)	18	ZrO_2
Zr 90	50.83	91.7	AA	80 (ar)	460	ZrO_2
Zr 90	50.83	98.0	CK	334 (a)	7,045	ZrO_2
Zr 90	50.83	98.0	CK	334 (ar)	1,878	ZrO_2
Zr 90	50.83	95.6	CV	381 (a)	3,612	ZrO_2
Zr 90	50.83	98.66	EE	539 (a)	11,815	ZrO_2
Zr 91	11.21	54.4	AA	81 (a)	50	ZrO_2
Zr 91	11.21	54.4	AA	81 (ar)	100	ZrO_2
Zr 91	11.21	86.6	CK	335 (a)	33	ZrO_2
Zr 91	11.21	86.6	CK	335 (ar)	1,837	ZrO_2
Zr 91	11.21	75.1	CV	382 (a)	839	ZrO_2
Zr 92	17.18	92.7	CK	336 (a)	281	ZrO_2
Zr 92	17.18	92.7	CK	336 (ar)	2,149	ZrO_2
Zr 92	17.18	89.8	CV	383 (a)	96	ZrO_2
Zr 92	17.18	95.38	EE	541 (a)	5,461	ZrO_2
Zr 94	17.79	82.1	AA	83 (a)	94	ZrO_2
Zr 94	17.79	82.1	AA	83 (ar)	40	ZrO_2
Zr 94	17.79	92.8	CK	337 (a)	68	ZrO_2

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ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Zirconium (Cont'd)						
Zr 94	17.79	92.8	CK	337 (ar)	1,786	ZrO_2
Zr 94	17.79	80.9	CV	384 (a)	861	ZrO_2
Zr 94	17.79	80.9	CV	384 (ar)	188	ZrO_2
Zr 94	17.79	97.92	EE	542 (a)	5,068	ZrO_2
Zr 96	2.99	74.6	CK	338 (a)	0	
Zr 96	2.99	74.6	CK	388 (ar)	0	
Zr 96	2.99	89.48	EE	543 (a)	0	
Molybdenum						
Mo 92	15.04	92.07	R-T	53 (a)	48	MoO_3
Mo 92	15.04	95.5	AW	163 (ar)	20	MoO_3
Mo 92	15.04	87.57	FP	695 (a)	194	MoO_3
Mo 94	9.35	79.1	AW	164 (a)	111	MoO_3
Mo 94	9.35	84.91	FP	696 (a)	128	MoO_3
Mo 95	15.78	80.75	R-T	55 (a)	804	MoO_3
Mo 95	15.78	88.0	AW	165 (a)	121	MoO_3
Mo 95	15.78	86.70	FP	697 (a)	156	MoO_3
Mo 95	15.78	91.27	FP	697 (b)	105	MoO_3
Mo 96	16.56	85.94	R-T	56 (a)	2,797	MoO_3
Mo 96	16.56	90.6	AW	166 (a)	81	MoO_3
Mo 96	16.56	92.0	FP	698 (a)	210	MoO_3
Mo 97	9.60	77.97	R-T	57 (a)	474	MoO_3

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ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Molybdenum (Cont'd)						
Mo 97	9.60	77.97	R-T	57 (ar)	284	MoO_3
Mo 97	9.60	75.4	AW	167 (a)	510	MoO_3
Mo 97	9.60	73.45	FP	699 (a)	74	MoO_3
Mo 97	9.60	89.63	FP	699 (b)	119	MoO_3
Mo 98	24.00	95.0	R-T	58 (a)	486	MoO_3
Mo 98	24.00	89.9	R-T	58 (b)	393	MoO_3
Mo 98	24.00	96.3	AW	168 (a)	487	MoO_3
Mo 98	24.00	95.15	FP	700 (a)	536	MoO_3
Mo 100	9.67	90.20	R-T	59 (b)	40	MoO_3
Mo 100	9.67	93.0	AW	169 (a)	25	MoO_3
Mo 100	9.67	86.65	FP	701 (a)	25	MoO_3
Palladium						
Pd 102	0.8	**	GG	770 (a)		
Pd 104	9.3	**	GG	771 (a)		
Pd 105	22.6	**	GG	772 (a)		
Pd 106	27.1	**	GG	773 (a)		
Pd 108	26.7	**	GG	774 (a)		
Pd 110	13.5	**	GG	775 (a)		
Silver						
Ag 107	51.86	98.96	N	41 (a)	39	AgCl

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ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Silver						
Ag 107	51.86	90.26	S-U	41 (b)	115	AgCl
Ag 107	51.86	90.26	S-U	41 (br)	2,143	Ag
Ag 107	51.86	96.10	EA	522 (a)	1,030	AgCl
Ag 109	48.14	95.88	N	42 (a)	31	AgCl
Ag 109	48.14	92.16	S-U	42 (b)	22	AgCl
Ag 109	48.14	92.16	S-U	42 (br)	1,644	Ag
Ag 109	48.14	99.54	EA	523 (a)	1,135	AgCl
Cadmium						
Cd 106	1.22	19.94	AC	88 (a)	44	CdO
Cd 106	1.22	32.9	CE	314 (a)	0	
Cd 108	0.89	14.2	AX	170 (a)	98	CdO
Cd 108	0.89	24.8	CE	315 (a)	0	
Cd 110	12.43	55.8	AX	171 (a)	2,027	CdO
Cd 110	12.43	70.0	CE	316 (a)	1,867	CdO
Cd 111	12.86	53.3	AC	89 (a)	295	CdO
Cd 111	12.86	64.5	CE	317 (a)	2,941	CdO
Cd 112	23.79	79.3	AX	172 (a)	1,890	CdO
Cd 112	23.79	83.5	CE	318 (a)	3,414	CdO
Cd 113	12.34	25.5	AB	86 (a)	376	CdO
Cd 113	12.34	54.1	CE	319 (a)	1,818	CdO
Cd 114	28.81	79.52	AC	90 (a)	772	CdO

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ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Cadmium						
Cd 114	28.81	94.2	CE	320 (a)	2,767	CdO
Cd 114	28.81	94.2	CE	320 (ar)	316	CdO
Cd 116	7.66	71.2	CE	321 (a)	31	CdO
Cd 116	7.66	71.2	CE	321 (ar)	10	CdO
Indium						
In 113	4.22	16.8	CO	354 (a)	415	In_2O_3
In 113	4.22	65.4	CQ	358 (a)	0	
In 113	4.22	14.2	DE	419 (a)	1,735	In_2O_3
In 113	4.22	59.58	ER	594 (a)	316	In_2O_3
In 115	95.78	99.56	AD	92 (a)	964	In_2O_3
In 115	95.78	99.6	BH	226 (a)	856	In_2O_3
In 115	95.78	99.6	BH	226 (ar)	470	In_2O_3
In 115	95.78	99.9	CO	355 (a)	14,563	In_2O_3
In 115	95.78	99.94	ER	595 (a)	30,900	In_2O_3
In 115	95.78	99.94	ER	595 (ar)	11,000	In_2O_3
Tin						
Sn 112	1.00	72.49	EC	527 (au)	84	Sn
Sn 112	1.00	58.88	FS	710 (a)	187	SnO_2
Sn 114	0.68	50.03	EC	528 (a)	138	SnO_2
Sn 114	0.68	45.10	FS	711 (a)	82	SnO_2

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** - Refinement Incomplete

ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Tin (Cont'd)						
Sn 115	0.44	4.5	BI	229 (a)	28	SnO_2
Sn 115	0.44	14.0	EC	529 (a)	535	SnO_2
Sn 115	0.44	17.64	FS	712 (a)	63	SnO_2
Sn 115	0.44	*	FS	712 (b)	90	SnO_2
Sn 116	14.40	74.5	AY	176 (a)	116	SnO_2
Sn 116	14.40	74.5	AY	176 (as)	49	Sn
Sn 116	14.40	58.4	BC	198 (a)	388	SnO_2
Sn 116	14.40	43.2	BI	230 (a)	304	SnO_2
Sn 116	14.40	89.57	CR	363 (a)	4,144	SnO_2
Sn 116	14.40	92.64	EC	530 (a)	7,284	SnO_2
Sn 116	14.40	90.89	FS	713 (a)	4,425	SnO_2
Sn 116	14.40	*	FS	713 (b)	2,913	SnO_2
Sn 117	7.68	75.3	BI	231 (b)	288	SnO_2
Sn 117	7.68	75.3	BI	231 (bs)	182	Sn
Sn 117	7.68	73.93	CR	364 (a)	4,748	SnO_2
Sn 117	7.68	77.07	EC	531 (a)	4,482	SnO_2
Sn 117	7.68	61.83	FS	714 (a)	2,607	SnO_2
Sn 117	7.68	*	FS	714 (b)	1,457	SnO_2
Sn 118	24.07	69.3	AL	117 (a)	918	SnO_2
Sn 118	24.07	90.1	AY	178 (a)	1,014	SnO_2
Sn 118	24.07	90.1	AY	178 (as)	346	Sn
Sn 118	24.07	91.8	BC	200 (a)	63	SnO_2

* - Analysis Incomplete
** - Refinement Incomplete

ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Tin (Cont'd)						
Sn 118	24.07	84.6	BI	232 (a)	1,020	SnO_2
Sn 118	24.07	93.26	CR	365 (a)	8,510	SnO_2
Sn 118	24.07	94.91	EC	532 (a)	13,126	SnO_2
Sn 118	24.07	95.86	FS	715 (a)	11,804	SnO_2
Sn 118	24.07	*	FS	715 (b)	4,970	SnO_2
Sn 119	8.63	77.1	AY	179 (a)	93	SnO_2
Sn 119	8.63	77.1	AY	179 (as)	48	Sn
Sn 119	8.63	64.4	BC	201 (a)	382	SnO_2
Sn 119	8.63	78.5	BI	233 (a)	166	SnO_2
Sn 119	8.63	78.25	CR	366 (a)	5,024	SnO_2
Sn 119	8.63	79.82	EC	533 (a)	18,057	SnO_2
Sn 119	8.63	*	FS	716 (a)	4,400	SnO_2
Sn 119	8.63	*	FS	716 (b)	1,730	SnO_2
Sn 120	32.53	93.5	AL	119 (a)	420	SnO_2
Sn 120	32.53	95.4	AY	180 (a)	1,588	SnO_2
Sn 120	32.53	95.4	AY	180 (as)	464	Sn
Sn 120	32.53	72.6	BC	202 (a)	3,155	SnO_2
Sn 120	32.53	53.6	BI	234 (a)	1,760	SnO_2
Sn 120	32.53	97.01	CR	367 (a)	18,120	SnO_2
Sn 120	32.53	98.14	EC	534 (a)	17,976	SnO_2
Sn 120	32.53	98.21	FS	717 (a)	16,592	SnO_2

* - Analysis Incomplete
** - Refinement Incomplete

ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Tin (Cont'd)						
Sn 120	32.53	*	FS	717 (b)	6,177	SnO_2
Sn 122	4.68	45.8	BI	235 (a)	13	SnO_2
Sn 122	4.68	83.66	CR	368 (a)	2,545	SnO_2
Sn 122	4.68	88.92	EC	535 (a)	2,235	SnO_2
Sn 122	4.68	88.92	EC	535 (au)	241	Sn
Sn 122	4.68	84.62	FS	718 (a)	497	SnO_2
Sn 122	4.68	*	FS	718 (b)	955	SnO_2
Sn 124	5.89	71.0	BI	236 (ar)	125	SnO_2
Sn 124	5.89	83.1	CR	369 (au)	49	Sn
Sn 124	5.89	95.04	EC	536 (a)	40	SnO_2
Sn 124	5.89	95.04	EC	536 (as)	958	Sn
Sn 124	5.89	90.26	FS	719 (a)	526	SnO_2
Sn 124	5.89	*	FS	719 (b)	900	SnO_2
Antimony						
Sb 121	57.25	99.4	AE	93 (a)	0	
Sb 121	57.25	99.4	AE	93 (ar)	355	Sb
Sb 121	57.25	97.7	BT	274 (a)	50	Sb
Sb 123	42.75	96.7	AE	94 (a)	0	
Sb 123	42.75	96.7	AE	94 (ar)	372	Sb
Sb 123	42.75	95.6	BT	275 (a)	377	Sb

* - Analysis Incomplete
** - Refinement Incomplete

ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Tellurium						
Te 120	0.094	22.3	DX	505 (a)	0	
Te 120	0.094	19.90	FE	640 (a)	0	
Te 122	2.46	77.8	AU	154 (a)	19	Te
Te 122	2.46	86.24	DX	506 (a)	140	Te
Te 122	2.46	81.72	FE	641 (a)	240	Te
Te 123	0.86	34.9	AU	155 (a)	7	Te
Te 123	0.86	60.91	DX	507 (a)	67	Te
Te 123	0.86	48.58	FE	642 (a)	114	Te
Te 124	4.67	72.5	AU	156 (a)	56	Te
Te 124	4.67	83.9	CA	295 (a)	198	Te
Te 124	4.67	21.8	CA	295 (b)	225	Te
Te 124	4.67	76.47	DX	508 (a)	555	Te
Te 124	4.67	81.34	FE	643 (a)	650	Te
Te 125	6.97	81.1	AU	157 (a)	38	Te
Te 125	6.97	87.9	CA	296 (ar)	2,130	Te
Te 125	6.97	40.5	CA	296 (b)	264	Te
Te 125	6.97	80.53	FE	644 (a)	1,262	Te
Te 126	18.69	93.2	AU	158 (a)	1,496	Te
Te 126	18.69	95.4	CA	297 (a)	1,547	Te
Te 126	18.69	95.4	CA	297 (ar)	943	Te
Te 126	18.69	79.0	CA	297 (b)	914	Te
Te 126	18.69	89.68	DX	510 (b)	4,411	Te
Te 126	18.69	93.46	FE	645 (a)	3,261	Te

* - Analysis Incomplete
** - Refinement Incomplete

ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Tellurium						
Te 128	31.81	93.5	AU	159 (a)	1,156	Te
Te 128	31.81	94.4	CA	298 (a)	8,795	Te
Te 128	31.81	94.4	CA	298 (ar)	714	Te
Te 128	31.81	91.8	CA	298 (b)	1,594	Te
Te 128	31.81	94.0	CA	298 (c)	111	Te
Te 128	31.81	82.32	DX	511 (a)	5,760	Te
Te 128	31.81	96.47	FE	646 (a)	4,881	Te
Te 130	34.44	93.0	AU	160 (a)	630	Te
Te 130	34.44	97.4	CA	299 (a)	7,605	Te
Te 130	34.44	93.5	CA	299 (br)	950	Te
Te 130	34.44	78.23	DX	512 (a)	4,936	Te
Te 130	34.44	97.78	FE	647 (a)	4,412	Te
Barium						
Ba 130	0.103	27.50	FT	720 (a)	0	
Ba 130	0.103	23.31	FU	727 (a)	85	$BaCO_3$
Ba 132	0.096	6.69	FT	721 (a)	792	$BaCO_3$
Ba 132	0.096	12.01	FU	728 (a)	275	$BaCO_3$
Ba 134	2.39	51.39	DG	431 (a)	0	
Ba 134	2.39	15.41	FT	722 (a)	4,995	$BaCO_3$
Ba 134	2.39	50.82	FU	729 (a)	1,969	$BaCO_3$
Ba 135	6.55	67.32	DG	432 (a)	350	$BaCO_3$

* - Analysis Incomplete
** - Refinement Incomplete

ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Barium						
Ba 135	6.55	58.22	FU	730 (a)	5,314	$BaCO_3$
Ba 136	7.79	50.02	DG	433 (a)	0	
Ba 136	7.79	39.22	FT	724 (a)	5,200	$BaCO_3$
Ba 136	7.79	48.72	FU	731 (a)	7,752	$BaCO_3$
Ba 137	11.25	38.98	DG	434 (a)	1,116	$BaCO_3$
Ba 137	11.25	43.56	FU	732 (a)	9,660	$BaCO_3$
Ba 138	71.83	98.04	DG	435 (a)	380	$BaCO_3$
Ba 138	71.83	96.73	FT	726 (a)	37,220	$BaCO_3$
Ba 138	71.83	97.41	FU	733 (a)	34,830	$BaCO_3$
Lanthanum						
La 138	0.087	0.597	EF	544 (a)	850	La_2O_3
La 139	99.913	99.96	EF	545 (a)	16,641	La_2O_3
Cerium						
Ce 136	0.195	29.97	FR	706 (a)	249	CeO_2
Ce 138	0.265	4.42	DW	502 (a)	290	CeO_2
Ce 138	0.265	10.22	FK	676 (a)	195	CeO_2
Ce 138	0.265	13.10	FR	707 (a)	657	CeO_2
Ce 140	88.44	98.5	CW	389 (a)	3,786	CeO_2
Ce 140	88.44	98.7	DD	417 (a)	8,397	CeO_2
Ce 140	88.44	99.55	FK	677 (a)	6,263	CeO_2

* - Analysis Incomplete
** - Refinement Incomplete

ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Cerium (Cont'd)						
Ce 140	88.44	99.65	FR	708 (a)	22,478	CeO_2
Ce 142	11.10	87.4	DD	418 (ab)	29	CeO_2
Ce 142	11.10	84.42	DW	504 (a)	1,330	CeO_2
Ce 142	11.10	88.84	FK	678 (a)	926	CeO_2
Ce 142	11.10	90.08	FR	709 (a)	5,863	CeO_2
Neodymium						
Nd 142	26.83	93.00	EQ	587 (a)	70	Nd_2O_3
Nd 142	26.83	*	FX	738 (a)	498	Nd_2O_3
Nd 142	26.83	*	FX	738 (b)	1,280	Nd_2O_3
Nd 143	12.10	83.93	EQ	588 (a)	102	Nd_2O_3
Nd 143	12.10	*	FX	739 (a)	290	Nd_2O_3
Nd 143	12.10	*	FX	739 (b)	478	Nd_2O_3
Nd 144	23.95	93.45	EQ	589 (a)	91	Nd_2O_3
Nd 144	23.95	*	FX	740 (a)	348	Nd_2O_3
Nd 144	23.95	*	FX	740 (b)	913	Nd_2O_3
Nd 145	8.36	78.60	EQ	590 (a)	187	Nd_2O_3
Nd 145	8.36	78.60	EQ	590 (ar)	87	Nd_2O_3
Nd 145	8.36	*	FX	741 (a)	432	Nd_2O_3
Nd 146	17.29	95.60	EQ	591 (a)	21	Nd_2O_3
Nd 146	17.29	**	FX	742 (a)		
Nd 148	5.80	89.85	EQ	592 (a)	0	

* - Analysis Incomplete
** - Refinement Incomplete

ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Neodymium (Cont'd)						
Nd 148	5.80	89.85	EQ	592 (ar)	69	Nd_2O_3
Nd 148	5.80	**	FX	743 (a)		
Nd 150	5.67	94.76	EQ	593 (a)	0	
Nd 150	5.67	94.76	EQ	593 (ar)	155	Nd_2O_3
Nd 150	5.67	**	FX	744 (a)		
Samarium						
Sm 144	3.13	72.13	EM	567 (a)	0	
Sm 144	3.13	58.93	FH	660 (a)	14	Sm_2O_3
Sm 147	15.12	78.35	FH	661 (a)	496	Sm_2O_3
Sm 147	15.12	81.63	EM	569 (a)	14	Sm_2O_3
Sm 148	11.29	76.01	EM	570 (a)	178	Sm_2O_3
Sm 148	11.29	62.40	FH	662 (a)	649	Sm_2O_3
Sm 149	13.87	71.53	EM	571 (a)	34	Sm_2O_3
Sm 149	13.87	73.01	FH	663 (a)	423	Sm_2O_3
Sm 150	7.38	74.09	EM	572 (a)	48	Sm_2O_3
Sm 150	7.38	68.04	FH	664 (a)	907	Sm_2O_3
Sm 152	26.59	89.90	EM	573 (a)	3,261	Sm_2O_3
Sm 152	26.59	93.92	FH	665 (a)	138	Sm_2O_3
Sm 154	22.62	92.10	EM	574 (a)	2,528	Sm_2O_3
Sm 154	22.62	96.05	FH	666 (a)	430	Sm_2O_3

* - Analysis Incomplete
** - Refinement Incomplete

ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Hafnium						
Hf 174	0.17	7.85	ET	602 (a)	12	HfO_2
Hf 176	5.22	48.46	ET	603 (a)	67	HfO_2
Hf 177	18.53	61.71	ET	604 (a)	0	
Hf 178	27.25	80.91	ET	605 (a)	0	
Hf 179	13.67	46.57	ET	606 (a)	0	
Hf 180	35.16	93.96	ET	607 (a)	0	
Tungsten						
W 180	0.16	9.00	BG	220 (a)	0	
W 180	0.16	4.95	CL	340 (a)	41	WO_3
W 180	0.16	4.95	CL	340 (ar)	54	WO_3
W 180	0.16	6.95	EL	561 (a)	175	WO_3
W 182	26.21	94.25	BG	221 (a)	46	WO_3
W 182	26.21	91.58	CL	341 (a)	1,639	WO_3
W 182	26.21	92.33	EL	562 (a)	10,990	WO_3
W 183	14.33	86.21	BG	222 (a)	217	WO_3
W 183	14.33	82.01	CL	342 (a)	745	WO_3
W 183	14.33	82.63	EL	563 (a)	5,664	WO_3
W 184	30.61	95.72	BG	223 (a)	390	WO_3
W 184	30.61	91.14	CL	343 (a)	106	WO_3
W 184	30.61	91.14	CL	343 (ar)	2,579	WO_3
W 184	30.61	95.06	EL	564 (a)	10,974	WO_3

* - Analysis Incomplete
** - Refinement Incomplete

ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Tungsten (Cont'd)						
W 186	28.69	97.94	BG	224 (a)	92	WO_3
W 186	28.69	97.17	CL	344 (a)	616	WO_3
W 186	28.69	97.17	CL	344 (ar)	372	WO_3
W 186	28.69	97.54	EL	565 (a)	10,367	WO_3
Rhenium						
Re 185	37.31	85.38	CP	356 (a)	2,241	Re
Re 187	62.69	98.22	CP	357 (a)	245	Re
Mercury						
Hg 196	0.16	8.44	DR	485 (a)	0	***
Hg 196	0.16	1.46	DR	485 (c)	347	$Hg(NO_3)_2$
Hg 198	10.02	79.11	DR	486 (a)	78	$Hg(NO_3)_2$
Hg 198	10.02	66.11	DR	486 (b)	375	$Hg(NO_3)_2$
Hg 198	10.02	53.37	DR	486 (c)	853	$Hg(NO_3)_2$
Hg 198	10.02	54.35	DR	486 (d)	2,930	$Hg(NO_3)_2$
Hg 199	16.90	73.09	DR	487 (a)	45	$Hg(NO_3)_2$
Hg 199	16.90	72.1	DR	487 (b)	28	$Hg(NO_3)_2$
Hg 199	16.90	65.45	DR	487 (d)	43	$Hg(NO_3)_2$
Hg 199	16.90	62.51	DR	487 (e)	0	
Hg 200	23.10	91.39	DR	488 (a)	97	$Hg(NO_3)_2$
Hg 200	23.10	86.45	DR	488 (b)	119	$Hg(NO_3)_2$

* - Analysis Incomplete
** - Refinement Incomplete
***- $Hg(NO_3)_2$ is in Aqueous Solution

ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Mercury (Cont'd)						***
Hg 200	23.10	80.85	DR	488 (c)	749	$Hg(NO_3)_2$
Hg 200	23.10	74.90	DR	488 (d)	3,478	$Hg(NO_3)_2$
Hg 200	23.10	64.66	DR	488 (e)	1,420	$Hg(NO_3)_2$
Hg 200	23.10	76.28	DR	488 (f)	489	$Hg(NO_3)_2$
Hg 201	13.20	71.8	DR	489 (a)	26	$Hg(NO_3)_2$
Hg 201	13.20	62.48	DR	489 (b)	90	$Hg(NO_3)_2$
Hg 202	29.76	98.3	DR	490 (a)	36	$Hg(NO_3)_2$
Hg 202	29.76	98.06	DR	490 (b)	20	$Hg(NO_3)_2$
Hg 202	29.76	97.33	DR	490 (c)	55	$Hg(NO_3)_2$
Hg 202	29.76	96.45	DR	490 (d)	122	$Hg(NO_3)_2$
Hg 202	29.76	95.13	DR	490 (e)	329	$Hg(NO_3)_2$
Hg 202	29.76	91.46	DR	490 (f)	25	$Hg(NO_3)_2$
Hg 202	29.76	91.46	DR	490 (fs)	120	Hg
Hg 202	29.76	87.87	DR	490 (g)	354	$Hg(NO_3)_2$
Hg 202	29.76	80.27	DR	490 (h)	4,334	$Hg(NO_3)_2$
Hg 202	29.76	75.75	DR	490 (i)	825	$Hg(NO_3)_2$
Hg 204	6.86	89.17	DR	491 (a)	0	
Hg 204	6.86	77.61	DR	491 (b)	189	$Hg(NO_3)_2$
Hg 204	6.86	62.78	DR	491 (d)	129	$Hg(NO_3)_2$
Hg 204	6.86	49.66	DR	491 (e)	344	$Hg(NO_3)_2$
Hg 204	6.86	49.66	DR	491 (es)	147	Hg
Hg 204	6.86	42.91	DR	491 (f)	662	$Hg(NO_3)_2$

* - Analysis Incomplete
** - Refinement Incomplete
*** - $Hg(NO_3)_2$ is in Aqueous Solution

ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Mercury (Cont'd)						***
Hg 204	6.86	30.07	DR	491 (g)	363	$Hg(NO_3)_2$
Hg 204	6.86	72.34	DR	491 (h)	93	$Hg(NO_3)_2$
Hg 204	6.86	72.34	DR	491 (hs)	143	Hg
Thallium						
Tl 203	29.51	75.6	BV-3	278 (a)	119	Tl_2O_3
Tl 203	29.51	47.9	BY-3	286 (a)	320	Tl_2O_3
Tl 203	29.51	58.8	CC-3	307 (a)	404	Tl_2O_3
Tl 203	29.51	86.0	CF-3	322 (a)	416	Tl_2O_3
Tl 203	29.51	34.1	CG-3	324 (a)	83	Tl_2O_3
Tl 205	70.49	89.5	BR-3	267 (a)	1,261	Tl_2O_3
Tl 205	70.49	95.2	BV-3	279 (a)	919	Tl_2O_3
Tl 205	70.49	98.7	BX	285 (a)	229	Tl_2O_3
Tl 205	70.49	86.1	CC-3	308 (a)	444	Tl_2O_3
Tl 205	70.49	95.6	CF-3	323 (a)	107	Tl_2O_3
Tl 205	70.49	91.8	CH-3	327 (a)	1,615	Tl_2O_3
Tl 205	70.49	90.5	CJ-3	333 (a)	1,715	Tl_2O_3
Lead						
Pb 204	1.37	7.8	O	43 (a)	87	$PbCrO_4$
Pb 204	1.37	16.69	AQ	135 (ar)	38	$PbCrO_4$
Pb 204	1.37	23.4	BO	257 (a)	13	$PbCrO_4$

* - Analysis Incomplete
** - Refinement Incomplete
*** - $Hg(NO_3)_2$ is in Aqueous Solution

ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Lead (Cont'd)						
Pb 204	1.37	27.0	CN	349 (ar)	355	PbO
Pb 204	1.37	25.70	EO	581 (a)	673	PbO
Pb 204	1.37	5.30	FQ	702 (a)	3,170	PbO
Pb 206	26.26	75.67	O	44 (a)	278	$PbCrO_4$
Pb 206	26.26	77.9	AQ	136 (a)	255	$PbCrO_4$
Pb 206	26.26	71.3	BO	258 (a)	238	$PbCrO_4$
Pb 206	26.26	71.3	BO	258 (ar)	1,018	$PbCrO_4$
Pb 206	26.26	81.0	CN	350 (a)	0	
Pb 206	26.26	64.93	EO	582 (a)	3,156	PbO
Pb 206	26.26	35.02	FQ	703 (a)	8,726	PbO
Pb 207	20.82	61.55	O	45 (a)	181	$PbCrO_4$
Pb 207	20.82	48.2	AQ	137 (a)	553	$PbCrO_4$
Pb 207	20.82	48.2	AQ	137 (ar)	512	$PbCrO_4$
Pb 207	20.82	66.8	BO	259 (a)	998	$PbCrO_4$
Pb 207	20.82	66.8	BO	259 (ar)	529	$PbCrO_4$
Pb 207	20.82	61.06	EO	583 (a)	4,609	PbO
Pb 207	20.82	26.81	FQ	704 (a)	8,802	PbO
Pb 208	51.51	92.1	O	46 (a)	33	$PbCrO_4$
Pb 208	51.51	92.1	O	46 (ar)	160	$PbCrO_4$
Pb 208	51.51	82.10	AQ	138 (a)	846	$PbCrO_4$
Pb 208	51.51	96.6	BO	260 (a)	234	PbO
Pb 208	51.51	95.8	CN	352 (ar)	166	$PbSO_4$

* - Analysis Incomplete
** - Refinement Incomplete

ELECTROMAGNETICALLY CONCENTRATED ISOTOPES

Element and Isotope	ISOTOPIC ABUNDANCE (atom percent) Natural	Enriched	Series	Sample	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Lead (Cont'd)						
Pb 208	51.51	87.97	EO	584 (a)	4,345	PbO
Pb 208	51.51	75.41	FQ	705 (a)	9,090	PbO

* - Analysis Incomplete
** - Refinement Incomplete