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Index No. Y-681

ELECTROMAGNETICALLY ENRICHED ISOTOPES
Inventory, October 31, 1950

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

October 31, 1950

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

OAK RIDGE NATIONAL LABORATORY
Y-12 AREA
Operated By
CARBIDE AND CARBON CHEMICALS DIVISION
UNION CARBIDE AND CARBON CORPORATION

Oak Ridge, Tennessee

Contract No. W-7405-eng-26

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Plant Records Department, Y-12 Plant

Date Issued: NOV 29 1950

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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.

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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.

Isotopic abundance data not available upon shipment of material will be forwarded to requestor as soon as available.

Isotopic abundance data not in this report, such as concentrations of other isotopes in the sample, will be submitted upon request. On all shipments, however, complete isotopic abundance data will be forwarded together with a spectrographic analysis.

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

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 without the Atomic Energy Commission and may be requested by using A.E.C. Forms 558 and 100, respectively. Copies of these forms may be obtained from the Isotopes Division, U. S. Atomic Energy Commission, P. O. Box "E", Oak Ridge, Tennessee.

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SUMMARY OF PRODUCTION AND SHIPMENTS

June 30, 1950 - October 31, 1950

Atomic No.	Element	No. of Samples Production Completed	No. of Samples Now Available For Shipment	No. of Independent Shipments Made
3	Lithium	17	10	44
4	Beryllium	2	0	2
5	Boron	3	2	1
6	Carbon	2	0	2
8	Oxygen	2	0	0
12	Magnesium	15	11	29
14	Silicon	9	6	13
16	Sulfur	3	1	9
17	Chlorine	4	1	3
19	Potassium	19	10	36
20	Calcium	30	8	23
22	Titanium	5	3	18
24	Chromium	8	5	29
26	Iron	108	38	31
28	Nickel	18	10	41
29	Copper	10	8	14
30	Zinc	15	9	23
31	Gallium	1	1	3
32	Germanium	5	6	13
34	Selenium	25	21	28
35	Bromine	4	2	0
37	Rubidium	2	0	0
38	Strontium	11	6	11
40	Zirconium	19	14	35
42	Molybdenum	15	14	56
47	Silver	6	6	15
48	Cadmium	16	15	47
49	Indium	9	6	12
50	Tin	51	25	74
51	Antimony	4	2	15
52	Tellurium	29	21	54
56	Barium	7	5	20
57	Lanthanum	2	2	2
58	Cerium	9	6	9
60	Neodymium	0	0	0
62	Samarium	7	7	1
72	Hafnium	1	1	0
74	Tungsten	10	7	25
75	Rhenium	2	2	8
80	Mercury	23	39	30
81	Thallium	16	16	16
82	Lead	3	10	43
TOTAL		547	356	835

59354

Natural Isotopic Abundance:

Li 6 - 7.5%

Li 7 - 92.5%

Lithium
Atomic No. 3

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Li 6	H	23(a)	93.91	0	
Li 6	I	25(a)	87.76	0	
Li 6	AR	139(a)	95.5	0	
Li 6	BQ	264(a)	95.4	36	Li ₂ SO ₄
Li 6	CT	376(a)	99.4	0	
Li 6	CU	378(a)	98.8	0	
Li 6	DV	499(a)	98.32	0	
Li 6	ED	537(a)	95.2	186	Li ₂ SO ₄
Li 6	ED	537(b)	95.5	0	
Li 7	H	24(a)	99.89	389	Li ₂ SO ₄
Li 7	I	26(a)	99.91	10	Li ₂ SO ₄
Li 7	AR	140(a)	99.5	711	Li ₂ SO ₄
Li 7	BQ	265(a)	99.8	5,522	Li ₂ SO ₄
Li 7	CT	377(a)	99.6	82	LiF
Li 7	CU	379(a)	98.4	5,564	Li ₂ SO ₄
Li 7	DV	500(a)	99.58	10,000	Li ₂ SO ₄
Li 7	ED	538(a)	99.87	35,979	Li ₂ SO ₄
Li 7	ED	538(b)	Refinement Incomplete		

59357

Natural Isotopic Abundance:

B 10 - 18.83%

B 11 - 81.17%

Boron
Atomic No. 5

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
B 10	DP	481(a)	Analysis Incomplete	68	H_3BO_3
B 11	BM	250(ar)	Analysis Incomplete	32	H_3BO_3
B 11	DP	482(a)	Analysis Incomplete	296	H_3BO_3

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Natural Isotopic Abundance:

Mg 24 - 77.4%

Mg 25 - 11.5%

Mg 26 - 11.1%

Magnesium
Atomic No. 12

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Mg 24	P	47(a)	99.5	600	MgO
Mg 24	Q	50(a)	98.36	192	MgO
Mg 24	BZ	288(a)	99.52	2,441	MgO
Mg 24	BZ	288(b)	99.2	132	MgO
Mg 24	BZ	288(c)	99.50	2,250	MgO
Mg 24	BZ	288(d)	99.4	1,786	MgO
Mg 24	DZ	519(a)	99.59	3,978	MgO
Mg 25	P	48(a)	83.22	0	
Mg 25	Q	52(a)	97.00	0	
Mg 25	BZ	289(a)	86.8	205	MgO
Mg 25	DZ	520(a)	92.33	1,566	MgO
Mg 26	P	49(a)	96.16	0	
Mg 26	Q	52(a)	97.00	0	
Mg 26	BZ	290(a)	95.91	210	MgO
Mg 26	DZ	521(a)	98.12	834	MgO

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Natural Isotopic Abundance:

Si 28 - 89.6%

Si 29 - 6.2%

Si 30 - 4.2%

Silicon
Atomic No. 14

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Si 28	AI-AJ	103-106(a)	99.4	1,796	SiO ₂
Si 28	BW	280(a)	98.1	12,500	SiO ₂
Si 28	EB	524(a)	Analysis Incomplete	9,050	SiO ₂
Si 29	AI-AJ	104-107(a)	68.6	63	SiO ₂
Si 29	BW	281(a)	63.6	0	
Si 29	EB	525(a)	Analysis Incomplete	420	SiO ₂
Si 30	AI-AJ	105-108(a)	63.9	0	
Si 30	BW	282(a)	49.6	0	
Si 30	EB	526(a)	Analysis Incomplete	106	SiO ₂

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Natural Isotopic Abundance:

Sulfur
Atomic No. 16

S 32 - 95.1%

S 33 - 0.7%

S 34 - 4.2%

S 36 - 0.016%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
S 32	CX	391(a)	97.90	200	S
S 32	ES	596(a)	Analysis Incomplete	6,780	CdS
S 33	CX	392(a)	5.54	0	
S 33	ES	597(a)	Refinement Incomplete		
S 34	CX	393(a)	20.65	0	
S 34	ES	598(a)	Refinement Incomplete		
S 36	CX	394(a)	0.319	0	
S 36	ES	599(a)	Refinement Incomplete		

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Natural Isotopic Abundance:

Chlorine
Atomic No. 17

Cl 35 - 75.4%

Cl 37 - 24.6%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT	
				Element Weight (milligrams)	Product Form
Cl 35	DH	436(a)	92.4	0	
Cl 37	DH	438(a)	65.6	549	AgCl

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Natural Isotopic Abundance:

Potassium
Atomic No. 19

K 39 - 93.38%

*K 40 - 0.012%

K 41 - 6.61%

Electromagnetically Concentrated Isotopes

*Radioactive

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
K 39	W	67(a)	99.93	0	
K 39	BJ	237(a)	99.5	1,592	KClO ₄
K 39	CM	346(ar)	99.9	9.920	KCl
K 39	DA	407(a)	99.94	19,418	K ₂ SO ₄
K 39	DB	410(a)	99.74	5,659	KCl
K 39	DT	494(a)	99.89	9,374	KCl
K 40	W	68(a)	0.16	0	
K 40	BJ	238(a)	0.40	0	
K 40	CM	347(ar)	0.17	288	KCl
K 40	DA	408(a)	1.31	0	
K 40	DB	411(a)	0.40	124	KCl
K 40	DB	411(ar)	0.40	182	KCl
K 40	DT	495(a)	7.13	0	
K 40	DT	495(b)	8.1	0	
K 41	W	69(a)	88.36	0	
K 41	BJ	239(a)	92.9	65	KClO ₄
K 41	CM	348(a)	86.8	0	
K 41	DA	409(a)	95.45	0	

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Natural Isotopic Abundance:

K 39 - 93.38%

*K 40 - 0.012%

K 41 - 6.61%

Potassium (cont'd)

Atomic No. 19

Electromagnetically Concentrated Isotopes

*Radioactive

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
K 41	DB	412(a)	91.61	0	
K 41	DT	496(a)	98.94	1,349	KCl

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Natural Isotopic Abundance:

Ca 40 - 96.96% Ca 44 - 2.06%
 Ca 42 - 0.65% Ca 46 - 0.0033%
 Ca 43 - 0.15% Ca 48 - 0.19%

Calcium
 Atomic No. 20

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Ca 40	V	61(a)	99.95	0	
Ca 40	V	61(b)	98.6	114	CaO
Ca 40	X	70(a)	99.97	171	CaO
Ca 40	BN	251(a)	98.9	400	CaO
Ca 40	DI	441(a)	99.78	8,261	CaCO ₃
Ca 40	DI	441(c)	99.83	27,093	CaCO ₃
Ca 40	EV	613(a)	Refinement Incomplete		
Ca 42	V-X	62-71(a)	61.4	0	
Ca 42	BN	252(a)	56.1	0	
Ca 42	DI	442(b)	28.3	600	CaCO ₃
Ca 42	EV	614(a)	Refinement Incomplete		
Ca 43	V-X	63-72(a)	34.4	0	
Ca 43	BN	253(a)	59.9	0	
Ca 43	DI	443(b)	37.56	0	
Ca 43	EV	615(a)	Refinement Incomplete		
Ca 44	V	64(a)	95.8	0	
Ca 44	BN	254(a)	85.4	40	CaCO ₃

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Natural Isotopic Abundance:

Ca 40 - 96.96% Ca 44 - 2.06%
 Ca 42 - 0.65% Ca 46 - 0.0033%
 Ca 43 - 0.15% Ca 48 - 0.19%

Calcium (cont'd)
 Atomic No. 20

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Ca 44	CS	373(a)	96.2	0	
Ca 44	DI	444(a)	91.9	566	CaCO ₃
Ca 44	EV	616(a)	Refinement Incomplete		
Ca 46	X	74(a)	7.3	0	
Ca 46	CS	374(a)	4.8	0	
Ca 46	DI	445(a)	1.45	0	
Ca 46	EV	617(a)	Refinement Incomplete		
Ca 48	V-X	66-75(a)	13.1	0	
Ca 48	BN	256(a)	83.9	0	
Ca 48	CS	375(a)	62.2	0	
Ca 48	DI	446(a)	42.32	0	
Ca 48	EV	618(a)	Refinement Incomplete		

5935-14

Natural Isotopic Abundance:

Ti 46 - 7.95% Ti 49 - 5.51%

Ti 47 - 7.75% Ti 50 - 5.34%

Ti 48 - 73.45%

Titanium

Atomic No. 22

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Ti 46	BF	215(a)	84.26	0	
Ti 46	EN	576(a)	Analysis Incomplete	924	TiO ₂
Ti 47	BF	216(a)	82.05	29	TiO ₂
Ti 47	EN	577(a)	Analysis Incomplete	2,132	TiO ₂
Ti 48	BF	217(a)	99.23	350	TiO ₂
Ti 48	EN	578(a)	Analysis Incomplete	26,614	TiO ₂
Ti 49	BF	218(a)	77.62	37	TiO ₂
Ti 49	EN	579(a)	Analysis Incomplete	43	TiO ₂
Ti 50	BF	219(a)	84.69	0	
Ti 50	EN	580(a)	Analysis Incomplete	111	TiO ₂

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Natural Isotopic Abundance:

Cr 50 - 4.49%

Cr 52 - 82.78%

Cr 53 - 9.43%

Cr 54 - 2.30%

Chromium

Atomic No. 24

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Cr 50	D	10(a)	73.76	0	
Cr 50	CD	309(a)	41.2	117	Cr ₂ O ₃
Cr 50	CD	309(ar)	41.2	97	Cr ₂ O ₃
Cr 50	EU	609(a)	Refinement Incomplete		
Cr 52	D	11(a)	99.14	20	Cr ₂ O ₃
Cr 52	CD	310(a)	99.1	119	Cr ₂ O ₃
Cr 52	EU	610(a)	Refinement Incomplete		
Cr 53	D	12(a)	88.59	0	
Cr 53	CD	311(a)	92.1	18	Cr ₂ O ₃
Cr 53	EU	611(a)	Refinement Incomplete		
Cr 54	D	13(a)	61.0	10	Cr ₂ O ₃
Cr 54	CD	312(a)	83.1	0	
Cr 54	EU	612(a)	Refinement Incomplete		

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Natural Isotopic Abundance:

Fe 54 - 6.04%

Fe 56 - 91.57%

Fe 57 - 2.11%

Fe 58 - 0.34%

Iron

Atomic No. 26

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Fe 54	B	3(a)	55.47	365	Fe ₂ O ₃
Fe 54	B	3(f)	39.0	278	Fe ₂ O ₃
Fe 54	C	6-I	42.85	195	Fe ₂ O ₃
Fe 54	C	6-II(a)	38.99	0	
Fe 54	E	14(a)	81.06	0	
Fe 54	F	18(a)	83.03	0	
Fe 54	AM	122(a)	49.2	354	Fe ₂ O ₃
Fe 54	AZ	183(a)	93.27	16	Fe ₂ O ₃
Fe 54	BA	187(a)	87.9	0	
Fe 54	BA	187(ar)	87.9	488	Fe ₂ O ₃
Fe 54	BB	194(a)	87.4	69	Fe ₂ O ₃
Fe 54	CI	328(a)	84.3	364	Fe ₂ O ₃
Fe 54	DO	477(a)	34.47	69,774	Fe ₂ O ₃
Fe 56	B	4(a)	98.41	3,235	Fe ₂ O ₃
Fe 56	B	4(e)	98.5	901	Fe ₂ O ₃
Fe 56	C	9(a)	98.7	2,683	Fe ₂ O ₃
Fe 56	C	9(c)	96.89	462	Fe ₂ O ₃
Fe 56	E	15(a)	98.62	10,403	Fe ₂ O ₃

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Natural Isotopic Abundance:

Fe 54 - 6.04%

Fe 56 - 91.57%

Fe 57 - 2.11%

Fe 58 - 0.34%

Iron (cont'd)
Atomic No. 26

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Fe 56	F	19(a)	97.42	1,120	Fe ₂ O ₃
Fe 56	AM	123(a)	98.9	2,627	Fe ₂ O ₃
Fe 56	AZ	184(a)	99.0	12,451	Fe ₂ O ₃
Fe 56	BA	188(a)	98.5	35,474	Fe ₂ O ₃
Fe 56	BB	192(a)	98.3	9,818	Fe ₂ O ₃
Fe 56	CI	329(a)	96.5	51,056	Fe ₂ O ₃
Fe 56	CZ	404(f)	99.84	13,892	Fe ₂ O ₃
Fe 56	DO	478(a)	99.70	346,494	Fe ₂ O ₃
Fe 57	B	5(a)	21.10	62	Fe ₂ O ₃
Fe 57	B	5(f)	30.5	81	Fe ₂ O ₃
Fe 57	C	7(b)	56.13	0	
Fe 57	E	16(a)	73.01	0	
Fe 57	F	20(a)	69.63	15	Fe ₂ O ₃
Fe 57	AM	124(a)	33.2	69	Fe ₂ O ₃
Fe 57	AZ	185(a)	67.7	0	
Fe 57	BA	189(a)	75.8	0	
Fe 57	BB	193(a)	77.6	24	Fe ₂ O ₃
Fe 57	CI	330(a)	50.7	0	

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Natural Isotopic Abundance:

Fe 54 - 6.04%

Fe 56 - 91.57%

Fe 57 - 2.11%

Fe 58 - 0.34%

Iron (cont'd)
Atomic No. 26

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Fe 57	CZ	405(f)	51.91	509	Fe ₂ O ₃
Fe 57	DK	449(a)	79.43	232	Fe ₂ O ₃
Fe 57	DL	453(j)	43.45	2,571	Fe ₂ O ₃
Fe 57	DM	459(a)	74.6	190	Fe ₂ O ₃
Fe 57	DL	463(k)	54.23	2,569	Fe ₂ O ₃
Fe 57	DL	463(j)	53.53	2,184	Fe ₂ O ₃
Fe 57	DN	475(a)	87.29	572	Fe ₂ O ₃
Fe 58	B	8(a)	22.0	0	
Fe 58	E	17(b)	40.7	10	Fe ₂ O ₃
Fe 58	AM	125(a)	10.3	44	Fe ₂ O ₃
Fe 58	BA	190(a)	35.1	0	
Fe 58	CI	331(a)	46.0	0	
Fe 58	DO	480(a)	75.7	0	
Fe 58	DO	480(b)	42.0	0	
Fe 58	DO	480(c)	34.8	154	Fe ₂ O ₃

5935-21

Natural Isotopic Abundance:

Ni 58 - 67.4% Ni 62 - 3.8%
 Ni 60 - 26.7% Ni 64 - 0.88%
 Ni 61 - 1.2%

Nickel
 Atomic No. 28

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Ni 58	J	27(a)	98.05	0	
Ni 58	K	33(a)	98.51	0	
Ni 58	AS-AT	141-147(a)	99.3	934	N10
Ni 58	DF	422(a)	92.7	7,409	N10
Ni 60	J	28(a)	94.4	1,124	N10
Ni 60	K	34(a)	87.10	390	N10
Ni 60	AS-AT	142-148(a)	97.7	175	N10
Ni 60	DF	423(a)	95.0	40	N10
Ni 61	J	29(a)	78.83	0	
Ni 61	AS-AT	143-149(a)	80.9	29	N10
Ni 61	DF	424(a)	72.2	40	N10
Ni 62	J	30(a)	94.25	0	
Ni 62	AS-AT	144-150(a)	94.7	20	N10
Ni 62	DF	425(a)	91.2	23	N10
Ni 64	J	32(a)	85.10	0	
Ni 64	K	38(a)	64.2	0	
Ni 64	AS-AT	146-152(a)	97.4	0	
Ni 64	DF	427(a)	80.6	0	

5935-22

Natural Isotopic Abundance:

Cu 63 - 69.09%

Cu 65 - 30.91%

Copper

Atomic No. 29

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Cu 63	A	1(a)	97.0	151	CuO
Cu 63	J-K	31-37(a)	99.35	549	CuO
Cu 63	AS-AT	145-151(a)	99.7	0	
Cu 63	AV	161(cu)	98.2	203	CuO
Cu 63	DF	426(a)	99.11	3,351	CuO
Cu 63	DL	455(a)	96.12	578	CuO
Cu 63	DU	497(a)	99.40	21,357	CuO
Cu 65	A	2(a)	93.81	0	
Cu 65	AV	162(cu)	90.6	14	CuO
Cu 65	DU	498(a)	98.16	15,873	CuO

5935-23

Natural Isotopic Abundance:

Zn 64 - 50.9% Zn 68 - 17.4%

Zn 66 - 27.3% Zn 70 - 0.5%

Zn 67 - 3.9%

Zinc

Atomic No. 30

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Zn 64	AG	97(a)	83.8	394	ZnO
Zn 64	BK	240(a)	93.4	0	
Zn 64	EK	556(a)	93.12	10,312	ZnO
Zn 66	AH	100(a)	78.4	712	ZnO
Zn 66	BK	241(a)	76.1	0	
Zn 66	EK	557(a)	93.79	7,881	ZnO
Zn 67	AG	98(a)	62.6	0	
Zn 67	BK	242(a)	56.0	102	ZnO
Zn 67	EK	558(a)	60.46	2,514	ZnO
Zn 68	AH	101(a)	72.6	0	
Zn 68	BK	243(a)	93.9	18	ZnO
Zn 68	EK	559(a)	95.47	6,635	ZnO
Zn 70	AH	102(a)	32.9	0	
Zn 70	BK	244(ar)	32.0	0	
Zn 70	EK	560(a)	48.40	381	ZnO

51935-24

Natural Isotopic Abundance:

Ga 69 - 60.2%

Ga 71 - 29.8%

Gallium

Atomic No. 31

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Ga 69	EI	554(a)	98.42	13,746	Ga ₂ O ₃
Ga 71	EI	555(a)	98.08	694	Ga ₂ O ₃

5935-25

Natural Isotopic Abundance:

Ge 70 - 21.2% Ge 74 - 37.1%

Ge 72 - 27.37% Ge 76 - 6.5%

Ge 73 - 7.9%

Germanium

Atomic No. 32

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Ge 70	BD-BE	205-210(a)	88.1	460	GeO ₂
Ge 72	BD-BE	206-211(a)	89.2	1,262	GeO ₂
Ge 73	BD-BE	207-212(a)	68.9	100	GeO ₂
Ge 74	BD-BE	208-213(a)	95.2	2,364	GeO ₂
Ge 76	BD-BE	209-214(a)	79.3	19	GeO ₂

5935-24

Natural Isotopic Abundance:

Se 74 - 0.9% Se 78 - 24.0%

Se 76 - 9.5% Se 80 - 48.0%

Se 77 - 8.3% Se 82 - 9.3%

Selenium
Atomic No. 34

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Se 74	AK	109(a)	6.5	10	Se
Se 74	BS	268(a)	14.1	0	
Se 74	CY	397(a)	12.3	0	
Se 74	DY	513(a)	12.08	304	Se
Se 76	AN	126(a)	43.5	10	Se
Se 76	BS	269(a)	41.5	600	Se
Se 76	CY	398(a)	54.8	542	Se
Se 76	DY	514(a)	57.40	2,244	Se
Se 77	AK	110(a)	50.1	100	Se
Se 77	BS	270(a)	53.6	143	Se
Se 77	BS	270(ar)	53.6	42	Se
Se 77	CY	399(a)	49.4	909	Se
Se 77	DY	515(a)	58.40	1,160	Se
Se 78	AN	127(a)	79.3	68	Se
Se 78	BS	271(a)	72.7	1,853	Se
Se 78	CY	400(a)	81.7	700	Se
Se 78	DY	516(a)	82.56	3,307	Se
Se 80	AK	111(a)	86.7	0	

5935-27

Natural Isotopic Abundance:

Se 74 - 0.9% Se 78 - 24.0%

Se 76 - 9.5% Se 80 - 48.0%

Se 77 - 8.3% Se 82 - 9.3%

Selenium (cont'd)
Atomic No. 34

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Se 80	BS	272(a)	94.6	1,120	Se
Se 80	CY	401(a)	91.7	1,136	Se
Se 80	DY	517(a)	93.76	3,042	Se
Se 82	AN	128(a)	49.6	96	Se
Se 82	BS	273(a)	44.4	0	
Se 82	CY	402(a)	51.6	314	Se
Se 82	DY	518(a)	52.36	1,132	Se

5935-28

Natural Isotopic Abundance:

Br 79 - 50.5%

Br 81 - 49.5%

Bromine

Atomic No. 35

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Br 79	EJ	552(a)	86.98	342	AgBr
Br 81	EJ	553(a)	96.81	318	AgBr

5935-29

Natural Isotopic Abundance:

Rb 85 - 72.8%

Rb 87 - 27.2%

Rubidium

Atomic No. 37

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT	
				Element Weight (milligrams)	Product Form
Rb 85	EW	619(a)	Refinement Incomplete		
Rb 87	EW	620(a)	Refinement Incomplete		

5935.30

Natural Isotopic Abundance:

Sr 84 - 0.56%

Sr 86 - 9.86%

Sr 87 - 7.02%

Sr 88 - 82.5%

Strontium
Atomic No. 38

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Sr 84	Z	77(a)	27.2	15	SrO
Sr 84	BL	245(a)	61.6	0	
Sr 84	EH	548(a)	63.68	89	SrSO ₄
Sr 86	Z	78(a)	69.9	0	
Sr 86	BL	246(a)	88.2	0	
Sr 86	EH	549(a)	89.02	1,359	Sr(NO ₃) ₂
Sr 87	BL	247(a)	73.1	0	
Sr 87	EH	550(a)	60.03	2,018	SrCO ₃
Sr 88	Z	79(a)	98.9	1,115	SrO
Sr 88	BL	248(a)	99.5	348	SrSO ₄
Sr 88	EH	551(a)	99.67	4,940	Sr(NO ₃) ₂

5935-81

Natural Isotopic Abundance:

Zr 90 - 48.0% Zr 94 - 17.0%

Zr 91 - 11.5% Zr 96 - 1.5%

Zr 92 - 22.0%

Zirconium
Atomic No. 40

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Zr 90	AA	80(a)	91.7	18	ZrO ₂
Zr 90	CK	334(a)	98.0	7,166	ZrO ₂
Zr 90	CV	381(a)	95.6	3,612	ZrO ₂
Zr 90	EE	539(a)	Analysis Incomplete	12,003	ZrO ₂
Zr 91	AA	81(a)	54.4	0	
Zr 91	CK	335(a)	86.6	123	ZrO ₂
Zr 91	CV	382(a)	75.1	839	ZrO ₂
Zr 91	EE	540(a)	86.89	2,827	ZrO ₂
Zr 92	AA	82(a)	3.8	0	
Zr 92	CK	336(a)	92.7	588	ZrO ₂
Zr 92	CV	383(a)	89.8	1,099	ZrO ₂
Zr 92	EE	541(a)	Analysis Incomplete	5,592	ZrO ₂
Zr 94	AA	83(a)	82.1	94	ZrO ₂
Zr 94	CK	337(a)	92.8	68	ZrO ₂
Zr 94	CV	384(a)	80.9	1,062	ZrO ₂
Zr 94	EE	542(a)	Analysis Incomplete	5,353	ZrO ₂
Zr 96	AA	84(a)	40.6	0	
Zr 96	CK	338(a)	74.6	0	

5935-32

Natural Isotopic Abundance:

Zr 90 - 48.0% Zr 94 - 17.0%

Zr 91 - 11.5% Zr 96 - 1.5%

Zr 92 - 22.0%

Zirconium (cont'd)

Atomic No. 40

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Zr 96	CV	385(a)	43.6	0	
Zr 96	EE	543(a)	89.48	278	ZrO ₂

5935-33

Natural Isotopic Abundance:

Mo 92 - 14.9% Mo 97 - 9.65%

Mo 94 - 9.4% Mo 98 - 24.1%

Mo 95 - 16.1% Mo 100 - 9.25%

Mo 96 - 16.6%

Molybdenum
Atomic No. 42

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Mo 92	R and T	53(a)	92.07	0	
Mo 92	AW	163(a)	95.5	103	MoO ₃
Mo 94	R and T	54(a)	74.68	0	
Mo 94	AW	164(a)	79.1	120	MoO ₃
Mo 95	R and T	55(a)	80.75	1,405	MoO ₃
Mo 95	AW	165(a)	88.0	736	MoO ₃
Mo 96	R and T	56(a)	85.94	3,397	MoO ₃
Mo 96	AW	166(a)	90.6	581	MoO ₃
Mo 97	R and T	57(a)	77.97	968	MoO ₃
Mo 97	AW	167(a)	75.4	1,110	MoO ₃
Mo 98	R and T	58(a)	95.0	738	MoO ₃
Mo 98	T	58(b)	89.9	393	MoO ₃
Mo 98	AW	168(a)	96.3	1,135	MoO ₃
Mo 100	R and T	59(b)	90.20	43	MoO ₃
Mo 100	AW	169(a)	93.0	51	MoO ₃

5935-34

Natural Isotopic Abundance:

Silver
Atomic No. 47

Ag 107 - 51.9%

Ag 109 - 48.1%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Ag 107	N	41(a)	98.96	39	AgCl
Ag 107	S and U	41(b)	90.26	0	
Ag 107	S and U	41(br)	90.26	1,572	Ag
Ag 107	EA	522(a)	Analysis Incomplete	2,147	AgCl
Ag 109	N	42(a)	95.88	0	
Ag 109	S and U	42(b)	92.16	22	AgCl
Ag 109	S and U	42(br)	92.16	1,349	Ag
Ag 109	EA	523(a)	99.54	6,745	AgCl

5935-35

Natural Isotopic Abundance:

Cd 106 - 1.4% Cd 112 - 24.2%

Cd 108 - 1.0% Cd 113 - 12.3%

Cd 110 - 12.8% Cd 114 - 28.0%

Cd 111 - 13.0% Cd 116 - 7.3%

Cadmium
Atomic No. 48

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Cd 106	AC	88(a)	19.94	0	
Cd 106	CD	314(a)	32.9	0	
Cd 108	AX	170(a)	14.2	438	CdO
Cd 108	CD	315(a)	24.8	22	CdO
Cd 110	AX	171(a)	55.8	1,930	CdO
Cd 110	CE	316(a)	70.0	2,606	CdO
Cd 111	AC	89(a)	53.3	0	
Cd 111	CE	317(a)	64.5	3,645	CdO
Cd 112	AX	172(a)	79.3	903	CdO
Cd 112	CE	318(a)	83.5	3,988	CdO
Cd 113	AR	86(a)	25.5	21	CdO
Cd 113	CE	319(a)	54.1	2,418	CdO
Cd 114	AC	90(a)	79.52	96	CdO
Cd 114	CE	320(a)	94.2	3,419	CdO
Cd 114	CE	320(ar)	94.2	818	CdO
Cd 116	AB	87(a)	24.01	401	CdO
Cd 116	CE	321(a)	71.2	31	CdO
Cd 116	CE	321(ar)	71.2	485	CdO

5935-36

Natural Isotopic Abundance:

Indium
Atomic No. 49

In 113 - 4.5%

In 115 - 95.5%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
In 113	BH	225(a)	22.8	403	In ₂ O ₃
In 113	CO	354(a)	16.8	415	In ₂ O ₃
In 113	CQ	358(a)	65.4	0	
In 113	DE	419(a)	14.2	1,735	In ₂ O ₃
In 113	ER	594(a)	Analysis Incomplete	2,333	In ₂ O ₃
In 115	AD	92(a)	99.56	0	
In 115	BH	226(a)	99.6	856	In ₂ O ₃
In 115	CO	355(a)	99.9	14,563	In ₂ O ₃
In 115	CQ	359(a)	99.8	12,379	In ₂ O ₃
In 115	DE	420(a)	99.92	0	
In 115	ER	595(a)	Refinement Incomplete		

5935-37

Natural Isotopic Abundance:

Sn 112 - 1.1% Sn 118 - 22.5%

Sn 114 - 0.8% Sn 119 - 9.8%

Sn 115 - 0.4% Sn 120 - 28.5%

Sn 116 - 15.5% Sn 122 - 5.5%

Sn 117 - 9.1% *Sn 124 - 6.8%

Tin

Atomic No. 50

Electromagnetically Concentrated Isotopes

*Radioactive

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Sn 112	BI	227(a)	30.8	0	
Sn 112	CR	360(a)	45.5	0	
Sn 112	EC	527(a)	Analysis Incomplete	185	SnO ₂
Sn 114	AL	113(a)	32.7	0	
Sn 114	BI	228(a)	19.2	0	
Sn 114	CR	361(a)	24.1	0	
Sn 114	EC	528(a)	Analysis Incomplete	211	SnO ₂
Sn 115	BI	229(b)	4.5	28	SnO ₂
Sn 115	CR	362(a)	12.1	0	
Sn 115	EC	529(a)	Analysis Incomplete	516	SnO ₂
Sn 116	AL	115(a)	76.3	0	
Sn 116	AY	176(a)	74.5	142	SnO ₂
Sn 116	BC	198(a)	58.4	388	SnO ₂
Sn 116	BI	230(a)	43.2	304	SnO ₂
Sn 116	CR	363(a)	89.57	4,149	SnO ₂
Sn 116	EC	530(a)	Analysis Incomplete	7,450	SnO ₂
Sn 117	AL	116(a)	69.8	0	
Sn 117	BI	231(b)	75.3	302	SnO ₂

5935-38

Natural Isotopic Abundance:

Sn 112 - 1.1% Sn 118 - 22.5%

Sn 114 - 0.8% Sn 119 - 9.8%

Sn 115 - 0.4% Sn 120 - 28.5%

Sn 116 - 15.5% Sn 122 - 5.5%

Sn 117 - 9.1% *Sn 124 - 6.8%

Tin (cont'd)

Atomic No. 50

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Sn 117	CR	364(a)	Analysis Incomplete	4,728	SnO ₂
Sn 117	EC	531(a)	Analysis Incomplete	4,476	SnO ₂
Sn 118	AL	117(a)	69.3	918	SnO ₂
Sn 118	AY	178(a)	90.1	1,014	SnO ₂
Sn 118	BC	200(a)	91.8	63	SnO ₂
Sn 118	BI	232	84.6	1,020	SnO ₂
Sn 118	CR	365(a)	Analysis Incomplete	8,510	SnO ₂
Sn 118	EC	532(a)	Analysis Incomplete	13,126	SnO ₂
Sn 119	AL	118(a)	68.3	0	SnO ₂
Sn 119	AY	179(a)	77.1	93	SnO ₂
Sn 119	BC	201(a)	64.4	382	SnO ₂
Sn 119	BI	233(a)	78.5	91	SnO ₂
Sn 119	CR	366(a)	Analysis Incomplete	5,024	SnO ₂
Sn 119	EC	533(a)	Analysis Incomplete	5,037	SnO ₂
Sn 120	AL	119(a)	93.5	325	SnO ₂
Sn 120	AY	180(a)	95.4	1,588	SnO ₂
Sn 120	BC	202(a)	72.6	3,155	SnO ₂
Sn 120	BI	234(a)	53.6	1,760	SnO ₂

5935-39

Natural Isotopic Abundance:

Sn 112 - 1.1% Sn 118 - 22.5%

Tin (cont'd)
Atomic No. 50

Sn 114 - 0.8% Sn 119 - 9.8%

Sn 115 - 0.4% Sn 120 - 28.5%

Sn 116 - 15.5% Sn 122 - 5.5%

Sn 117 - 9.1% *Sn 124 - 6.8%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Sn 120	CR	367(a)	Analysis Incomplete	18,190	SnO ₂
Sn 120	EC	534(a)	Analysis Incomplete	18,066	SnO ₂
Sn 122	AL	120(a)	61.0	0	
Sn 122	AY	181(a)	70.7	0	
Sn 122	BC	203(a)	42.9	0	
Sn 122	BI	235(a)	45.8	13	SnO ₂
Sn 122	CR	368(a)	Analysis Incomplete	2,695	SnO ₂
Sn 122	EC	535(a)	Analysis Incomplete	2,499	SnO ₂
Sn 124	AL	121(a)	64.5	0	
Sn 124	BC	204(a)	52.0	0	
Sn 124	BI	236(a)	71.0	0	
Sn 124	CR	369(au)	83.1	80	Sn
Sn 124	CR	369(ar)	83.1	0	
Sn 124	EC	536(a)	Analysis Incomplete	2,864	SnO ₂

5935-40

Natural Isotopic Abundance:

Antimony
Atomic No. 51

Sb 121 - 56%

Sb 123 - 44%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Sb 121	AE	93(a)	99.4	0	
Sb 121	BT	274(a)	97.7	25	Sb
Sb 123	AE	94(a)	96.7	0	
Sb 123	BT	275(a)	95.6	1,405	Sb

5935.71

Natural Isotopic Abundance:

Te 120 - 0.088% Te 125 - 6.95%

Te 122 - 2.43% Te 126 - 18.71%

Te 123 - 0.85% Te 128 - 31.85%

Te 124 - 4.59% Te 130 - 34.52%

Tellurium

Atomic No. 52

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Te 120	AU	153(a)	18.0	0	
Te 120	CA	292(a)	13.7	0	
Te 120	DX	505(a)	22.3	24	Te
Te 122	AU	154(a)	77.8	19	Te
Te 122	CA	293(a)	79.4	0	
Te 122	DX	506(a)	86.24	558	Te
Te 123	AU	155(a)	34.9	0	
Te 123	CA	294(a)	45.8	0	
Te 123	DX	507(a)	60.91	268	Te
Te 124	AU	156(a)	72.5	56	Te
Te 124	CA	295(a)	83.9	122	Te
Te 124	CA	295(b)	21.8	225	Te
Te 124	DX	508(a)	76.47	300	Te
Te 125	AU	157(a)	81.1	38	Te
Te 125	CA	296(a)	87.9	0	
Te 125	CA	296(b)	40.5	264	Te
Te 125	DX	509(a)	81.65	888	Te
Te 126	AU	158(a)	93.2	1,496	Te

5935.42

Natural Isotopic Abundance:

Te 120 - 0.088% Te 125 - 6.95%

Te 122 - 2.43% Te 126 - 18.71%

Te 123 - 0.85% Te 128 - 31.85%

Te 124 - 4.59% Te 130 - 34.52%

Tellurium (cont'd)
Atomic No. 52

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Te 126	CA	297(a)	95.4	3,485	Te
Te 126	CA	297(b)	79.0	914	Te
Te 126	DX	510(a)	89.68	4,436	Te
Te 128	AU	159(a)	93.5	1,658	Te
Te 128	CA	298(a)	94.4	502	Te
Te 128	CA	298(b)	91.8	1,594	Te
Te 128	CA	298(c)	94.0	111	Te
Te 128	DX	511(a)	82.32	7,763	Te
Te 130	AU	160(a)	93.0	1,183	Te
Te 130	CA	299(a)	97.4	0	
Te 130	CA	299(b)	93.5	0	
Te 130	DX	512(a)	78.23	7,939	Te

5935.43

Natural Isotopic Abundance:

Ba 130 - 0.101% Ba 136 - 7.81%

Ba 132 - 0.097% Ba 137 - 11.32%

Ba 134 - 2.42% Ba 138 - 71.66%

Ba 135 - 6.59%

Barium

Atomic No. 56

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Ba 130	DG	429(a)	16.0	0	
Ba 132	DG	430(a)	7.43	0	
Ba 134	DG	431(a)	51.39	59	BaCO ₃
Ba 135	DG	432(a)	67.32	756	BaCO ₃
Ba 136	DG	433(a)	50.02	588	BaCO ₃
Ba 137	DG	434(a)	38.98	2,423	BaCO ₃
Ba 138	DG	435(a)	98.04	1,432	BaCO ₃

5935-47

Natural Isotopic Abundance:

La 138 - 0.089%

La 139 - 99.911%

Lanthanum

Atomic No. 57

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
La 138	EF	544(a)	0.597	851	La ₂ O ₃
La 139	EF	545(a)	99.96	17,643	La ₂ O ₃

5935-45

Natural Isotopic Abundance:

Ce 136 - 0.193%

Ce 138 - 0.350%

Ce 140 - 88.48%

Ce 142 - 11.07%

Cerium

Atomic No. 58

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Ce 136	DD	415(a)	16.6	0	
Ce 136	DW	501(a)	8.94	27	CeO ₂
Ce 138	DD	416(a)	8.9	38	CeO ₂
Ce 138	DW	502(a)	4.42	620	CeO ₂
Ce 140	CW	389(a)	98.5	3,786	CeO ₂
Ce 140	DD	417(a)	98.7	8,397	CeO ₂
Ce 140	DW	503(a)	99.25	8,558	CeO ₂
Ce 142	DD	418(b)	87.4	29	CeO ₂
Ce 142	DW	504(a)	84.42	1,745	CeO ₂

5935-46

Natural Isotopic Abundance:

Nd 142 - 27.13% Nd 146 - 17.18%

Nd 143 - 12.20% Nd 148 - 5.72%

Nd 144 - 23.87% Nd 150 - 5.60%

Nd 145 - 8.30%

Neodymium

Atomic No. 60

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Nd 142	EQ	587(a)	Analysis Incomplete	3,459	Nd ₂ O ₃
Nd 143	EQ	588(a)	Analysis Incomplete	1,643	Nd ₂ O ₃
Nd 144	EQ	589(a)	Analysis Incomplete	2,309	Nd ₂ O ₃
Nd 145	EQ	590(a)	Analysis Incomplete	1,128	Nd ₂ O ₃
Nd 146	EQ	591(a)	Analysis Incomplete	1,726	Nd ₂ O ₃
Nd 148	EQ	592(a)	Refinement Incomplete		
Nd 150	EQ	593(a)	Refinement Incomplete		

5935-47

Natural Isotopic Abundance:

Sm 144 - 3.16% Sm 150 - 7.47%
 Sm 147 - 15.05% Sm 152 - 26.63%
 Sm 148 - 11.27% Sm 154 - 22.53%
 Sm 149 - 13.84%

Samarium
 Atomic No. 62

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Sm 144	EM	567(a)	72.13	207	Sm ₂ O ₃
Sm 147	EM	569(a)	81.63	100	Sm ₂ O ₃
Sm 148	EM	570(a)	76.01	1,332	Sm ₂ O ₃
Sm 149	EM	571(a)	71.53	1,239	Sm ₂ O ₃
Sm 150	EM	572(a)	74.09	730	Sm ₂ O ₃
Sm 152	EM	573(a)	89.90	5,023	Sm ₂ O ₃
Sm 154	EM	574(a)	92.10	3,664	Sm ₂ O ₃

5935-48

Natural Isotopic Abundance:

Hf 174 - 0.18% Hf 179 - 13.8%

Hf 176 - 5.30% Hf 180 - 35.1%

Hf 177 - 18.4%

Hf 178 - 27.1%

Hafnium

Atomic No. 72

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Hf 174	ET	602(a)	Analysis Incomplete	185	HfO ₂
Hf 176	ET	603(a)	Analysis Incomplete	650	HfO ₂
Hf 177	ET	604(a)	Refinement Incomplete		
Hf 178	ET	605(a)	Refinement Incomplete		
Hf 179	ET	606(a)	Refinement Incomplete		
Hf 180	ET	607(a)	Analysis Incomplete	2,630	HfO ₂

5935-49

Natural Isotopic Abundance:

W 180 - 0.2% W 184 - 30.1%

W 182 - 22.6% W 186 - 29.8%

W 183 - 17.3%

Tungsten
Atomic No. 74

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
W 180	BG	220(a)	9.00	0	
W 180	CL	340(a)	4.95	41	WO ₃
W 180	EL	561(a)	Analysis Incomplete	395	WO ₃
W 182	BG	221(a)	94.25	46	WO ₃
W 182	CL	341(a)	91.58	1,691	WO ₃
W 182	EL	562(a)	Analysis Incomplete	10,097	WO ₃
W 183	BG	222(a)	86.21	217	WO ₃
W 183	CL	342(a)	82.01	545	WO ₃
W 183	EL	563(a)	Analysis Incomplete	6,169	WO ₃
W 184	BG	223(a)	95.72	240	WO ₃
W 184	CL	343(a)	91.14	106	WO ₃
W 184	EL	564(a)	Analysis Incomplete	1,079	WO ₃
W 186	BG	224(a)	97.94	92	WO ₃
W 186	CL	344(a)	97.17	718	WO ₃
W 186	EL	565(a)	Analysis Incomplete	11,749	WO ₃

5935.50

Natural Isotopic Abundance:

Re 185 - 38.2%

Re 187 - 61.8%

Rhenium

Atomic No. 75

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Re 185	CP	356(a)	85.38	2,491	Re
Re 187	CP	357(a)	98.22	1,217	Re

5935-51

Natural Isotopic Abundance:

Mercury
Atomic No. 80

Hg 196 - 0.15% Hg 201 - 13.2%

Hg 198 - 10.1% Hg 202 - 29.6%

Hg 199 - 17.0% Hg 204 - 6.7%

Hg 200 - 23.3%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Hg 196	DR	485(a)	8.44	0	
Hg 196	DR	485(b)	1.90	58	Hg
Hg 196	DR	485(c)	1.46	400	Hg
Hg 198	DR	486(a)	79.11	831	Hg
Hg 198	DR	486(b)	66.11	375	Hg
Hg 198	DR	486(c)	53.37	853	Hg
Hg 198	DR	486(d)	54.35	2,930	Hg
Hg 199	DR	487(a)	73.9	50	Hg
Hg 199	DR	487(b)	72.1	28	Hg
Hg 199	DR	487(c)	68.0	80	Hg
Hg 199	DR	487(d)	65.45	43	Hg
Hg 199	DR	487(e)	62.51	340	Hg
Hg 200	DR	488(a)	91.39	228	Hg
Hg 200	DR	488(b)	86.45	119	Hg
Hg 200	DR	488(c)	80.85	749	Hg
Hg 200	DR	488(d)	74.90	3,478	Hg
Hg 200	DR	488(e)	64.66	1,420	Hg
Hg 200	DR	488(f)	76.28	1,492	Hg

5935.52

Natural Isotopic Abundance:

Hg 196 - 0.15% Hg 201 - 13.2%
 Hg 198 - 10.1% Hg 202 - 29.6%
 Hg 199 - 17.0% Hg 204 - 6.7%
 Hg 200 - 23.3%

Mercury (cont'd)
 Atomic No. 80

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Hg 201	DR	489(a)	71.8	32	Hg
Hg 201	DR	489(b)	62.48	90	Hg
Hg 201	DR	489(c)	57.90	336	Hg
Hg 201	DR	489(d)	57.3	178	Hg
Hg 201	DR	489(e)	51.48	121	Hg
Hg 202	DR	490(a)	98.3	93	Hg
Hg 202	DR	490(b)	98.06	20	Hg
Hg 202	DR	490(c)	97.33	131	Hg
Hg 202	DR	490(d)	96.45	122	Hg
Hg 202	DR	490(e)	95.13	484	Hg
Hg 202	DR	490(f)	91.46	1,710	Hg
Hg 202	DR	490(g)	87.87	354	Hg
Hg 202	DR	490(h)	80.27	4,300	Hg
Hg 202	DR	490(i)	75.75	825	Hg
Hg 204	DR	491(a)	89.17	138	Hg
Hg 204	DR	491(b)	77.61	255	Hg
Hg 204	DR	491(c)	69.80	0	

5935.53

Natural Isotopic Abundance:

Hg 196 - 0.15% Hg 201 - 13.2%
 Hg 198 - 10.1% Hg 202 - 29.6%
 Hg 199 - 17.0% Hg 204 - 6.7%
 Hg 200 - 23.3%

Mercury (cont'd)
 Atomic No. 80

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Hg 204	DR	491(d)	62.78	129	Hg
Hg 204	DR	491(e)	49.66	1,504	Hg
Hg 204	DR	491(f)	42.91	662	Hg
Hg 204	DR	491(g)	30.07	363	Hg
Hg 204	DR	491(h)	72.34	354	Hg

5935.54

Natural Isotopic Abundance:

Thallium
Atomic No. 81

Tl 203 - 29.1%

Tl 205 - 70.9%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Tl 203	BV-3	278(a)	75.6	194	Tl ₂ O ₃
Tl 203	BX	284(a)	61.1	7,906	Tl ₂ O ₃
Tl 203	BY-3	386(a)	47.9	8,881	Tl ₂ O ₃
Tl 203	CC-3	307(a)	58.8	601	Tl ₂ O ₃
Tl 203	CF-3	322(a)	86.0	1,342	Tl ₂ O ₃
Tl 203	CG-3	324(a)	34.1	104	Tl ₂ O ₃
Tl 203	CH-3	326(a)	61.0	1,892	Tl ₂ O ₃
Tl 205	BR-3	267(a)	89.5	1,436	Tl ₂ O ₃
Tl 205	BU-3	277(a)	92.8	4,776	Tl ₂ O ₃
Tl 205	BV-3	279(a)	95.2	1,047	Tl ₂ O ₃
Tl 205	BX	285(a)	98.7	1,041	Tl ₂ O ₃
Tl 205	BY-3	287(a)	92.8	2,715	Tl ₂ O ₃
Tl 205	CC-3	308(a)	66.1	1,078	Tl ₂ O ₃
Tl 205	CF-3	323(a)	95.6	176	Tl ₂ O ₃
Tl 205	CH-3	327(a)	91.8	1,594	Tl ₂ O ₃
Tl 205	CJ-3	333(a)	90.5	3,818	Tl ₂ O ₃

5935.55

Natural Isotopic Abundance:

Pb 204 - 1.5%

Pb 206 - 23.6%

Pb 207 - 22.6%

Pb 208 - 52.3%

Lead

Atomic No. 82

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Pb 204	O	43(a)	7.8	0	
Pb 204	AQ	135(a)	16.69	0	
Pb 204	AQ	135(ar)	16.69	38	PbCrO ₄
Pb 204	BO	257(a)	23.4	13	PbCrO ₄
Pb 204	CN	349(a)	27.0	0	
Pb 204	EO	581(a)	25.70	3,076	PbO
Pb 206	O	44(a)	75.67	14	PbCrO ₄
Pb 206	AQ	136(a)	77.9	18	PbCrO ₄
Pb 206	BO	258(a)	71.3	238	PbCrO ₄
Pb 206	BO	258(ar)	71.3	1,018	PbCrO ₄
Pb 206	CN	350(a)	81.0	0	
Pb 206	EO	582(a)	64.93	4,213	PbO
Pb 207	O	45(a)	61.55	0	
Pb 207	AQ	137(a)	48.2	323	PbCrO ₄
Pb 207	AQ	137(ar)	48.2	512	PbCrO ₄
Pb 207	BO	259(a)	66.8	1,299	PbCrO ₄
Pb 207	BO	259(ar)	66.8	529	PbCrO ₄
Pb 207	CN	351(a)	61.6	0	

5935-56

Natural Isotopic Abundance:

Pb 204 - 1.5%

Pb 206 - 23.6%

Pb 207 - 22.6%

Pb 208 - 52.3%

Lead (cont'd)

Atomic No. 82

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Pb 207	EO	583(a)	61.06	5,660	PbO
Pb 208	O	46(a)	92.1	33	PbCrO ₄
Pb 208	O	46(ar)	92.1	160	PbCrO ₄
Pb 208	AQ	138(a)	82.10	322	PbCrO ₄
Pb 208	BO	260(a)	96.6	0	
Pb 208	CN	352(ar)	95.8	197	PbSO ₄
Pb 208	EO	584(a)	87.97	23,697	PbO

5935-57