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Index No. Y-819

ELECTROMAGNETICALLY ENRICHED ISOTOPES

Inventory, September 30, 1951

WO-7995

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

September 30, 1951

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

OAK RIDGE NATIONAL LABORATORY
Y-12 Area
Operated by
CARBIDE AND CARBON CHEMICALS COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
Oak Ridge, Tennessee

Contract No. W-7405-eng-26

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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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UNCLASSIFIEDINTRODUCTION

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 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 an extension of the loan period should write The Isotopes Division, Atomic Energy Commission, Oak Ridge, Tennessee.

SUMMARY OF PRODUCTION AND SHIPMENTS

Atomic No.	Element	No. of Samples Production Completed	No. of Samples Now Available For Shipment	No. of Individual Shipments Made
3	Lithium	19	9	56
4	Beryllium	2	0	2
5	Boron	3	3	2
6	Carbon	2	2	2
8	Oxygen	2	0	0
12	Magnesium	15	11	30
14	Silicon	9	5	18
16	Sulfur	10	7	12
17	Chlorine	2	2	5
19	Potassium	29	22	41
20	Calcium	36	15	27
22	Titanium	10	12	25
23	Vanadium	2	1	0
24	Chromium	12	9	37
26	Iron	113	55	42
28	Nickel	18	9	46
29	Copper	10	9	19
30	Zinc	15	10	27
31	Gallium	2	2	7
32	Germanium	5	4	13
34	Selenium	38	21	43
35	Bromine	4	2	0
37	Rubidium	2	2	2
38	Strontium	11	5	24
40	Zirconium	19	19	41
42	Molybdenum	15	14	60
47	Silver	6	7	15
48	Cadmium	16	16	58
49	Indium	11	9	17
50	Tin	51	30	96
51	Antimony	4	2	17
52	Tellurium	29	25	74
56	Barium	7	4	25
57	Lanthanum	2	2	3
58	Cerium	9	6	15
60	Neodymium	7	6	27
62	Samarium	7	10	28
72	Hafnium	6	6	23
74	Tungsten	10	17	32
75	Rhenium	2	2	11
80	Mercury	23	36	52
81	Thallium	16	16	18
82	Lead	3	18	50
TOTAL		614	453	1142

Natural Isotopic Abundance:

Lithium
Atomic No. 3

Li 6 - 7.43%

Li 7 - 92.57%

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	0	
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	0	
Li 6	ED	357(b)	95.5	0	
Li 6	FI	667(a)	94.07	815	Li ₂ SO ₄
Li 6	FI	667(b)	94.29	1,065	LiF
Li 6	FI	667(c)	91.75	327	Li ₂ SO ₄
Li 6	FI	667(d)	93.39	880	Li ₂ SO ₄
Li 7	H	24(a)	99.89	0	
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	0	

Natural Isotopic Abundance:

Lithium (cont'd)
Atomic No. 3

Li 6 - 7.43%

Li 7 - 92.57%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Li 7	BQ	265(ar)	99.8	720	Li ₂ SO ₄
Li 7	CT	377(a)	99.6	82	LiF
Li 7	CU	379(a)	98.4	0	Li ₂ SO ₄
Li 7	DV	500(a)	99.58	0	
Li 7	ED	538(a)	99.87	0	
Li 7	EZ	628(c)	99.52	4,518	Li ₂ SO ₄
Li 7	EZ	628(e)	99.86	178	Li ₂ SO ₄

Natural Isotopic Abundance:

Boron
Atomic No. 5

B 10 - 18.83%

B 11 - 81.17%

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	25	H_3BO_3
B 11	BM	250(a)	Analysis Incomplete	10	H_3BO_3
B 11	DP	482(a)	Analysis Incomplete	200	H_3BO_3

Natural Isotopic Abundance:

Carbon
Atomic No. 6

C 12 - 98.91%

C 13 - 1.09%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
C 12	FD	638(ah)	99.963	0	
C 12	FD	638(ai)	Analysis Incomplete	8,400	C
C 12	FD	638(aj)	99.945	9,900	C

Natural Isotopic Abundance:Magnesium
Atomic No. 12

Mg 24 - 78.98%

Mg 25 - 10.03%

Mg 26 - 10.99%

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	1,570	MgO
Mg 24	Q	50(a)	98.36	192	MgO
Mg 24	BZ	288(a)	99.52	2,520	MgO
Mg 24	BZ	288(b)	99.2	132	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	P	48(ar)	83.22	515	MgO
Mg 25	Q	51(a)	62.59	0	
Mg 25	BZ	289(a)	86.8	185	MgO
Mg 25	DZ	520(a)	92.33	1,566	MgO
Mg 26	P	49(a)	96.16	410	MgO
Mg 26	Q	52(a)	97.00	0	
Mg 26	BZ	290(a)	95.91	300	MgO
Mg 26	DZ	521(a)	98.12	834	MgO

Natural Isotopic Abundance:

Silicon
Atomic No. 14

Si 28 - 92.17%

Si 29 - 4.71%

Si 30 - 3.12%

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	7,510	SiO ₂
Si 28	EB	524(a)	99.16	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)	68.62	110	SiO ₂
Si 30	AI-AJ	105-108(a)	63.9	131	SiO ₂
Si 30	BW	282(a)	49.6	550	SiO ₂
Si 30	EB	526(a)	64.04	48	SiO ₂

Natural Isotopic Abundance:

S 32 - 94.89%

S 33 - 0.80%

S 34 - 4.29%

S 36 - 0.02%

Sulfur
Atomic No. 16**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	113	S
S 32	ES	596(a)	Analysis Incomplete	7,453	CdS
S 33	CX	392(a)	5.54	76	S
S 33	CX	392(b)	5.54	30	S
S 33	ES	597(a)	Analysis Incomplete	0	
S 34	CX	393(a)	20.65	0	
S 34	CX	393(b)	5.38	59	S
S 34	ES	598(a)	14.92	1,124	CdS
S 36	CX	394(a)	0.319	0	
S 36	ES	599(a)	Analysis Incomplete	0	

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	AV	161(c1)	79.5	18	AgCl
Cl 35	DH	436(a)	92.4	0	
Cl 37	DH	438(a)	65.6	248	AgCl

Natural Isotopic Abundance:

Potassium
Atomic No. 19

K 39 - 93.25%

*K 40 - 0.011%

K 41 - 6.74%

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(a)	99.9	35	KCl
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 39	EX	621(g)	99.96	18,470	KCl
K 39	EY	624(i)	99.94	24,977	KCl
K 39	FA	629(a)	99.83	10,473	KCl
K 40	W	68(a)	0.16	0	
K 40	BJ	238(a)	0.40	0	
K 40	CM	347(a)	0.14	0	
K 40	CM	347(ar)	0.14	0	
K 40	DA	408(a)	1.31	0	
K 40	DB	411(a)	0.40	124	KCl
K 40	DB	411(ar)	0.40	300	KCl

Natural Isotopic Abundance:

K 39 - 93.25%

*K 40 - 0.011%

K 41 - 6.74%

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 40	DT	495(a)	7.13	0	
K 40	EX	622(u)	3.64	12	KCl
K 40	EY	625(t)	7.75	0	
K 40	FA	630(a)	0.978	33	KCl
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	37	KCl
K 41	DA	409(a)	95.45	0	
K 41	DB	412(a)	91.61	0	
K 41	DT	496(a)	98.94	705	KCl
K 41	DT	496(ar)	98.94	65	KCl
K 41	EX	623(e)	99.20	1,064	KCl
K 41	EY	626(e)	99.21	750	KCl
K 41	FA	631(a)	87.75	634	KCl

Natural Isotopic Abundance:

Calcium
Atomic No. 20

Ca 40 - 96.96%	Ca 46 - 0.0033%
Ca 42 - 0.64%	Ca 48 - 0.185%
Ca 43 - 0.145%	
Ca 44 - 2.06%	

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	1,040	CaO
Ca 40	BN	251(a)	98.9	5,820	CaCO ₃
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)	Analysis Incomplete	28,720	CaCO ₃
Ca 40	FF	648(a)	Analysis Incomplete	44,750	CaCO ₃
Ca 42	BN	252(a)	56.1	0	
Ca 42	DI	442(b)	28.3	600	CaCO ₃
Ca 42	EV	614(a)	Analysis Incomplete	210	CaCO ₃
Ca 42	FF	649(a)	Analysis Incomplete	439	CaCO ₃
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)	Analysis Incomplete	0	
Ca 43	FF	650(a)	Analysis Incomplete	78	CaCO ₃

Natural Isotopic Abundance:

Ca 40 - 96.96%	Ca 46 - 0.0033%
Ca 42 - 0.64%	Ca 48 - 0.185%
Ca 43 - 0.145%	
Ca 44 - 2.06%	

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	V	64(a)	95.8	0	
Ca 44	X	73(a)	21.1	0	
Ca 44	BN	254(a)	85.4	40	CaCO ₃
Ca 44	CS	373(a)	96.2	115	CaCO ₃
Ca 44	DI	444(a)	91.9	466	CaCO ₃
Ca 44	EV	616(a)	Analysis Incomplete	723	CaCO ₃
Ca 44	FF	651(a)	Analysis Incomplete	1,143	CaCO ₃
Ca 46	V-X	65-74(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)	Analysis Incomplete	0	
Ca 46	FF	652(a)	Analysis Incomplete	0	
Ca 48	V-X	66-75(a)	13.1	0	
Ca 48	BW	256(a)	83.9	0	
Ca 48	CS	375(a)	62.2	0	
Ca 48	DI	446(a)	42.32	0	

Natural Isotopic Abundance:

Calcium (cont'd.)
Atomic No. 20

Ca 40 - 96.96%

Ca 46 - 0.0033%

Ca 42 - 0.64%

Ca 48 - 0.185%

Ca 43 - 0.145%

Ca 44 - 2.06%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Ca 48	EV	618(a)	Analysis Incomplete	0	
Ca 48	FF	653(a)	Analysis Incomplete	147	CaCO ₃

Natural Isotopic Abundance:

Titanium
Atomic No. 22

Ti 46 - 7.97%

Ti 47 - 7.41%

Ti 48 - 73.50%

Ti 49 - 5.64%

Ti 50 - 5.48%

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	BF	215(ar)	84.26	183	TiO ₂
Ti 46	EN	576(a)	82.68	610	TiO ₂
Ti 47	BF	216(a)	82.05	8	TiO ₂
Ti 47	BF	216(ar)	82.05	185	TiO ₂
Ti 47	EN	577(a)	63.11	1,945	TiO ₂
Ti 48	BF	217(a)	99.23	50	TiO ₂
Ti 48	EN	578(a)	98.90	24,620	TiO ₂
Ti 49	BF	218(a)	77.62	37	TiO ₂
Ti 49	BF	218(ar)	77.62	55	TiO ₂
Ti 49	EN	579(a)	77.27	523	TiO ₂
Ti 50	BF	219(a)	84.69	0	
Ti 50	BF	219(ar)	84.69	75	TiO ₂
Ti 50	EN	580(a)	81.44	576	TiO ₂

Natural Isotopic Abundance:

Vanadium
Atomic No. 23

V 50 - 0.28%

V 51 - 99.72%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
V 50	FB	632(a)	Analysis Incomplete	0	
V 50	FM	683(a)	Analysis Incomplete	279	V ₂ O ₅
V 51	FB	633(a)	Analysis Incomplete	2,514	V ₂ O ₅
V 51	FM	684(a)	Refinement Incomplete		

Natural Isotopic Abundance:

Chromium
Atomic No. 24

Cr 50 - 4.40%

Cr 52 - 83.73%

Cr 53 - 9.49%

Cr 54 - 2.38%

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	0	
Cr 50	CD	309(ar)	41.2	97	Cr ₂ O ₃
Cr 50	EU	609(a)	88.3	772	Cr ₂ O ₃
Cr 52	D	11(a)	99.14	500	Cr ₂ O ₃
Cr 52	D	11(ar)	99.14	140	Cr ₂ O ₃
Cr 52	CD	310(a)	99.1	3,450	Cr ₂ O ₃
Cr 52	EU	610(a)	97.1	23,140	Cr ₂ O ₃
Cr 53	D	12(a)	88.59	100	Cr ₂ O ₃
Cr 53	CD	311(a)	92.1	110	Cr ₂ O ₃
Cr 53	EU	611(a)	90.06	958	Cr ₂ O ₃
Cr 54	D	13(a)	61.0	0	
Cr 54	CD	312(a)	83.1	0	
Cr 54	EU	612(a)	88.95	220	Cr ₂ O ₃

Natural Isotopic Abundance:

Iron
Atomic No. 26

Fe 54 - 5.90%

Fe 56 - 91.52%

Fe 57 - 2.24%

Fe 58 - 0.34%

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	57	Fe ₂ O ₃
Fe 54	B	3(f)	39.0	268	Fe ₂ O ₃
Fe 54	C	6-I(a)	42.85	195	Fe ₂ O ₃
Fe 54	C	6-II(a)	38.99	0	
Fe 54	E	14(a)	81.06	17	Fe ₂ O ₃
Fe 54	F	18(a)	83.03	30	Fe ₂ O ₃
Fe 54	AM	122(a)	49.2	343	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	75	Fe ₂ O ₃
Fe 54	BB	194(a)	87.4	69	Fe ₂ O ₃
Fe 54	CI	328(a)	84.3	62	Fe ₂ O ₃
Fe 54	DO	477(a)	34.47	69,272	Fe ₂ O ₃
Fe 54	FC	634(a)	Analysis Incomplete	1,550	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

Natural Isotopic Abundance:

Fe 54 - 5.90%

Fe 56 - 91.52%

Fe 57 - 2.24%

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	C	9(c)	96.89	462	Fe ₂ O ₃
Fe 56	E	15(a)	98.62	10,403	Fe ₂ O ₃
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	0	
Fe 56	FC	635(a)	Analysis Incomplete	18,171	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	

Natural Isotopic Abundance:

Iron (cont'd.)
Atomic No. 26

Fe 54 - 5.90%

Fe 56 - 91.52%

Fe 57 - 2.24%

Fe 58 - 0.34%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
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	
Fe 57	CZ	405(r)	51.91	509	Fe ₂ O ₃
Fe 57	DK	449(a)	79.43	232	Fe ₂ O ₃
Fe 57	DL	453(a)	62.38	830	Fe ₂ O ₃
Fe 57	DL	453(d)	59.31	1,381	Fe ₂ O ₃
Fe 57	DL	453(e)	31.9	1,245	Fe ₂ O ₃
Fe 57	DL	453(f)	59.3	1,122	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(a)	40.61	1,687	Fe ₂ O ₃
Fe 57	DL	463(b)	45.43	1,018	Fe ₂ O ₃
Fe 57	DL	463(e)	67.3	2,278	Fe ₂ O ₃
Fe 57	DL	463(j)	53.53	2,184	Fe ₂ O ₃
Fe 57	DL	463(k)	54.23	2,267	Fe ₂ O ₃
Fe 57	DL	467(c)	63.1	165	Fe ₂ O ₃

Natural Isotopic Abundance:

Iron (cont'd.)
Atomic No. 26

Fe 54 - 5.90%

Fe 56 - 91.52%

Fe 57 - 2.24%

Fe 38 - 0.34%

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Fe 57	DN	471(a)	84.78	451	Fe_2O_3
Fe 57	DN	475(a)	87.29	370	Fe_2O_3
Fe 58	B	8(a)	22.0	0	
Fe 58	B	8(b)	22.0	20	Fe_2O_3
Fe 58	E	17(b)	40.7	0	
Fe 58	AM	125(a)	10.3	44	Fe_2O_3
Fe 58	BA	190(a)	35.1	0	
Fe 58	CI	331(a)	46.0	0	
Fe 58	DL	454(f)	23.4	189	Fe_2O_3
Fe 58	DL	454(m)	71.7	92	Fe_2O_3
Fe 58	DL	464(l)	79.8	24	Fe_2O_3
Fe 58	DL	464(p)	71.8	25	Fe_2O_3
Fe 58	DO	480(a)	75.7	115	Fe_2O_3
Fe 58	DO	480(b)	42.0	875	Fe_2O_3
Fe 58	DO	480(c)	34.8	37	Fe_2O_3
Fe 58	FC	637(i)	60.62	0	
Fe 58	FC	637(j)	76.13	0	

Natural Isotopic Abundance:

Nickel
Atomic No. 28

Ni 58 - 67.4%

Ni 60 - 26.7%

Ni 61 - 1.2%

Ni 62 - 3.8%

Ni 64 - 0.88% **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	12	NiO
Ni 58	AS-AT	141-147(a)	99.3	434	NiO
Ni 58	DF	422(a)	92.7	6,386	NiO
Ni 58	FJ	669(a)	Refinement Incomplete		
Ni 60	J	28(a)	94.4	22	NiO
Ni 60	J	28(ar)	94.4	390	NiO
Ni 60	K	34(a)	87.10	650	NiO
Ni 60	AS-AT	142-148(a)	97.7	175	NiO
Ni 60	DF	423(a)	95.0	40	NiO
Ni 60	FJ	670(a)	Refinement Incomplete		
Ni 61	J	29(a)	78.83	0	
Ni 61	K	35(a)	34.42	25	NiO
Ni 61	AS-AT	143-149(a)	80.9	0	
Ni 61	DF	424(a)	72.2	40	NiO
Ni 61	FJ	671(a)	Refinement Incomplete		
Ni 62	AS-AT	144-150(a)	94.7	20	NiO
Ni 62	K	36(a)	67.99	50	NiO

Natural Isotopic Abundance:

Ni 58 - 67.4%

Ni 60 - 26.7%

Ni 61 - 1.2%

Ni 62 - 3.8%

Ni 64 - 0.88% **Electromagnetically Concentrated Isotopes**

Nickel

Atomic No. 28

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Ni 62	DF	425(a)	91.2	23	NiO
Ni 62	FJ	672(a)	Refinement Incomplete	0	
Ni 64	J	32(a)	85.10	10	NiO
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	
Ni 64	FJ	674(a)	Refinement Incomplete	0	

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	650	CuO
Cu 63	A	1(ar)	97.0	960	CuO
Cu 63	J-K	31-37(a)	99.35	730	CuO
Cu 63	AS-AT	145-151(a)	99.77	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	19,754	CuO
Cu 63	FJ	673(a)	Refinement Incomplete		
Cu 65	A	2(a)	93.81	0	
Cu 65	A	2(ar)	93.81	460	CuO
Cu 65	AV	162(cu)	90.6	14	CuO
Cu 65	DU	498(a)	98.16	14,867	CuO

Natural Isotopic Abundance:

Zinc
Atomic No. 30

Zn 64 - 49.18%

Zn 66 - 27.76%

Zn 67 - 4.05%

Zn 68 - 18.40%

Zn 70 - 0.61% **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	9,830	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	1,023	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	6,620	ZnO
Zn 70	AH	102(a)	32.9	20	ZnO
Zn 70	BK	244(a)	32.0	39	ZnO
Zn 70	BK	244(ar)	32.0	0	
Zn 70	EK	560(a)	48.40	381	ZnO

Natural Isotopic Abundance:Gallium
Atomic No. 31

Ga 69 - 60.00%

Ga 71 - 40.00%

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	11,878	Ga_2O_3
Ga 71	EI	555(a)	98.08	187	Ga_2O_3

Natural Isotopic Abundance:

Germanium
Atomic No. 32

Ge 70 - 20.63%

Ge 72 - 27.41%

Ge 73 - 7.84%

Ge 74 - 36.37%

Ge 76 - 7.75% **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	0	
Ge 73	DD-BE	207-212(ar)	68.9	230	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

Natural Isotopic Abundance:

Selenium
Atomic No. 34

Se 74 - 0.84% Se 80 - 49.97%
 Se 76 - 9.15% Se 82 - 8.89%
 Se 77 - 7.53%
 Se 78 - 23.62%

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	CY	397(ar)	12.3	255	Se
Se 74	DY	513(a)	12.08	143	Se
Se 74	FG	654(a)	18.02	90	Se
Se 74	FG	654(b)	33.06	15	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	CY	398(ar)	54.8	390	Se
Se 76	DY	514(a)	57.40	89	Se
Se 76	FG	655(a)	74.20	374	Se
Se 76	FG	655(b)	88.51	159	Se
Se 77	AK	110(a)	50.1	49	Se
Se 77	BS	270(a)	53.6	143	Se
Se 77	BS	270(ar)	53.6	40	Se
Se 77	CY	399(a)	49.4	408	Se

Natural Isotopic Abundance:

Se 74 - 0.84% Se 80 - 49.97%
 Se 76 - 9.15% Se 82 - 8.89%
 Se 77 - 7.53%
 Se 78 - 23.62%

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 77	DY	515(a)	58.40	52	Se
Se 77	FG	656(c)	74.22	203	Se
Se 77	FG	656(d)	83.16	16	Se
Se 77	FG	656(e)	86.58	18	Se
Se 77	FG	656(f)	91.73	25	Se
Se 77	FG	656(g)	86.00	8	Se
Se 78	AN	127(a)	79.3	68	Se
Se 78	AN	127(ar)	79.3	104	Se
Se 78	BS	271(a)	72.7	1,853	Se
Se 78	CY	400(a)	81.7	700	Se
Se 78	CY	400(ar)	81.7	1,026	Se
Se 78	DY	516(a)	82.56	52	Se
Se 78	FG	657(b)	90.24	667	Se
Se 78	FG	657(d)	96.55	174	Se
Se 80	AK	111(a)	86.7	270	Se
Se 80	BS	272(a)	94.6	1,400	Se
Se 80	BS	272(ar)	94.6	250	Se

Natural Isotopic Abundance:

Se 74 - 0.84% Se 80 - 49.97%
 Se 76 - 9.15% Se 82 - 8.89%
 Se 77 - 7.53%
 Se 78 - 23.62%

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	CY	401(a)	91.7	1,136	Se
Se 80	DY	517(a)	93.76	41	Se
Se 80	FG	658(a)	96.94	1,506	Se
Se 80	FG	658(b)	98.39	11,609	Se
Se 82	AN	128(a)	49.6	96	Se
Se 82	BS	273(a)	44.4	0	Se
Se 82	BS	273(ar)	44.4	1,087	Se
Se 82	CY	402(a)	51.6	314	Se
Se 82	CY	402(ar)	51.6	260	Se
Se 82	CY	518(a)	52.36	1,081	Se
Se 82	FG	659(a)	75.74	460	Se
Se 82	FG	659(b)	89.87	140	Se

Natural Isotopic Abundance:

Bromine
Atomic No. 35

Br 79 - 50.57%

Br 81 - 49.43%

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

Natural Isotopic Abundance:

Rb 85 - 72.27%

Rb 87 - 27.73%

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)	95.97	3,109	RbCl
Rb 87	EW	620(a)	89.62	2,056	RbCl

Natural Isotopic Abundance:

Strontium
Atomic No. 38

Sr 84 - 0.56%

Sr 86 - 9.86%

Sr 87 - 7.02%

Sr 88 - 82.6%

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	0	
Sr 84	BL	245(a)	61.6	0	
Sr 84	EH	548(a)	63.68	0	
Sr 86	Z	78(a)	69.9	0	
Sr 86	Z	78(ar)	69.9	490	SrO
Sr 86	BL	246(a)	88.2	0	
Sr 86	EH	549(a)	89.02	34	Sr (NO ₃) ₂
Sr 87	BL	247(a)	73.1	0	
Sr 87	EH	550(a)	60.03	1,939	SrCO ₃
Sr 88	Z	79(a)	98.9	1,049	SrO
Sr 88	BL	248(a)	99.5	322	SrSO ₄
Sr 88	EH	551(a)	99.67	39	Sr(NO ₃) ₂

Natural Isotopic Abundance:

Zirconium
Atomic No. 40

Zr 90 - 50.83%

Zr 91 - 11.21%

Zr 92 - 17.18%

Zr 94 - 17.79%

Zr 96 - 2.99% **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	AA	80(ar)	91.7	460	ZrO ₂
Zr 90	CK	334(a)	98.0	6,564	ZrO ₂
Zr 90	CK	334(ar)	98.0	1,878	ZrO ₂
Zr 90	CV	381(a)	95.6	3,612	ZrO ₂
Zr 90	EE	539(a)	98.66	11,987	ZrO ₂
Zr 91	AA	81(a)	54.4	50	ZrO ₂
Zr 91	AA	81(ar)	54.4	100	ZrO ₂
Zr 91	CK	335(a)	86.6	33	ZrO ₂
Zr 91	CK	335(ar)	86.6	1,956	ZrO ₂
Zr 91	CV	382(a)	75.1	839	ZrO ₂
Zr 91	EE	540(a)	86.89	2,099	ZrO ₂
Zr 92	AA	82(a)	3.8	0	
Zr 92	AA	82(ar)	3.8	65	ZrO ₂
Zr 92	CK	336(a)	92.7	387	ZrO ₂
Zr 92	CK	336(ar)	92.7	1,951	ZrO ₂
Zr 92	CV	383(a)	89.8	1,099	ZrO ₂
Zr 92	EE	541(a)	95.38	5,577	ZrO ₂

Natural Isotopic Abundance:

Zr 90 - 50.83%

Zr 91 - 11.21%

Zr 92 - 17.18%

Zr 94 - 17.79%

Zr 96 - 2.99%

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 94	AA	83(a)	82.1	94	ZrO ₂
Zr 94	AA	83(ar)	82.1	40	ZrO ₂
Zr 94	CK	337(a)	92.8	68	ZrO ₂
Zr 94	CK	337(ar)	92.8	1,794	ZrO ₂
Zr 94	CV	384(a)	80.9	861	ZrO ₂
Zr 94	EE	542(a)	97.92	5,325	ZrO ₂
Zr 96	AA	84(a)	40.6	30	ZrO ₂
Zr 96	CK	338(a)	74.6	0	
Zr 96	CK	338(ar)	74.6	20	ZrO ₂
Zr 96	CV	385(a)	43.6	0	
Zr 96	EE	543(a)	89.48	192	ZrO ₂

Natural Isotopic Abundance:

Mo 92 - 15.04% Mo 98 - 24.00%

Mo 94 - 9.35% Mo 100 - 9.67%

Mo 95 - 15.78%

Mo 96 - 16.56%

Mo 97 - 9.60%

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-T	53(a)	92.07	34	MoO ₃
Mo 92	R-T	53(ar)	92.07	550	MoO ₃
Mo 92	AW	163(a)	95.5	0	
Mo 92	AW	163(ar)	95.5	225	MoO ₃
Mo 94	R-T	54(a)	74.68	0	
Mo 94	AW	164(a)	79.1	120	MoO ₃
Mo 95	R-T	55(a)	80.75	1,405	MoO ₃
Mo 95	AW	165(a)	88.0	121	MoO ₃
Mo 95	AW	165(ar)	88.0	175	MoO ₃
Mo 96	R-T	56(a)	85.94	3,397	MoO ₃
Mo 96	AW	166(a)	90.6	581	MoO ₃
Mo 97	R-T	57(a)	77.97	474	MoO ₃
Mo 97	R-T	57(ar)	77.97	280	MoO ₃
Mo 97	AW	167(a)	75.4	1,110	MoO ₃
Mo 98	R-T	58(a)	95.0	738	MoO ₃
Mo 98	AW	168(a)	96.3	1,109	MoO ₃
Mo 100	R-T	59(a)	90.24	0	

Natural Isotopic Abundance:

Mo 92 - 15.04% Mo 98-- 24.00%
 Mo 94 - 9.35% Mo 100- 9.67%
 Mo 95 - 15.78%
 Mo 96 - 16.56%
 Mo 97 - 9.60%

Molybdenum (cont'd.)
 Atomic No. 42

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Mo 100	R-T	59(ar)	90.24	225	MoO ₃
Mo 100	R-T	59(b)	90.20	240	MoO ₃
Mo 100	AW	169(a)	93.0	25	MoO ₃

Natural Isotopic Abundance:

Silver
Atomic No. 47

Ag 107 - 51.86%

Ag 109 - 48.14%

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-U	41(b)	90.26	115	AgCl
Ag 107	S-U	41(br)	90.26	2,152	Ag
Ag 107	EA	522(a)	96.10	2,131	AgCl
Ag 109	N	42(a)	95.88	0	
Ag 109	S-U	42(b)	92.16	22	AgCl
Ag 109	S-U	42(br)	92.16	1,653	Ag
Ag 109	EA	523(a)	99.54	1,736	AgCl

Natural Isotopic Abundance:

Cadmium
Atomic No. 48

Cd 106 - 1.22%	Cd 112 - 23.79%
Cd 108 - 0.89%	Cd 113 - 12.34%
Cd 110 - 12.43%	Cd 114 - 28.81%
Cd 111 - 12.86%	Cd 116 - 7.66%

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	110	CdO
Cd 106	CD	314(a)	32.9	0	
Cd 108	AX	170(a)	14.2	438	CdO
Cd 108	AX	170(ar)	14.2	60	CdO
Cd 108	CD	315(a)	24.8	22	CdO
Cd 110	AX	171(a)	55.8	2,010	CdO
Cd 110	CE	316(a)	70.0	2,569	CdO
Cd 111	AC	89(a)	53.3	285	CdO
Cd 111	CE	317(a)	64.5	3,645	CdO
Cd 112	AX	172(a)	79.3	1,880	CdO
Cd 112	CE	318(a)	83.5	4,013	CdO
Cd 113	AB	86(a)	25.5	370	CdO
Cd 113	CE	319(a)	54.1	2,418	CdO
Cd 114	AC	90(a)	79.52	760	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

Natural Isotopic Abundance:

Indium
Atomic No. 49

In 113 - 4.22%

In 115 - 95.78%

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	600	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	735	In ₂ O ₃
In 113	ER	594(a)	59.58	1,230	In ₂ O ₃
In 115	AD	92(a)	99.56	950	In ₂ O ₃
In 115	BH	226(a)	99.6	756	In ₂ O ₃
In 115	BH	226(ar)	99.6	470	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)	99.94	42,908	In ₂ O ₃

Natural Isotopic Abundance:

Sn 112 - 1.00% Sn 118 - 24.07%

Sn 114 - 0.68% Sn 119 - 8.63%

Sn 115 - 0.44% Sn 120 - 32.53%

Sn 116 - 14.40% Sn 122 - 4.68%

Sn 117 - 7.68% *Sn 124 - 5.89%

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	EI	227(a)	30.8	0	
Sn 112	CR	360(a)	45.5	0	
Sn 112	EC	527(a)	72.49	12	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)	50.03	210	SnO ₂
Sn 115	BI	229(a)	4.5	28	SnO ₂
Sn 115	CR	362(a)	12.1	0	
Sn 115	EC	529(a)	14.0	535	SnO ₂
Sn 116	AL	115(a)	76.3	0	
Sn 116	AY	176(a)	74.5	116	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	3,840	SnO ₂
Sn 116	EC	530(a)	92.64	7,284	SnO ₂
Sn 117	AL	116(a)	69.8	0	

Natural Isotopic Abundance:

Sn 112 - 1.00% Sn 118 - 24.07%

Sn 114 - 0.68% Sn 119 - 8.63%

Sn 115 - 0.44% Sn 120 - 32.53%

Sn 116 - 14.40% Sn 122 - 4.68%

Sn 117 - 7.68% *Sn 124 - 5.89%

Tin (cont'd.)

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 117	BI	231(b)	75.3	288	SnO ₂
Sn 117	CR	364(a)	73.93	4,728	SnO ₂
Sn 117	EC	531(a)	77.07	4,482	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(a)	84.6	1,020	SnO ₂
Sn 118	CR	365(a)	93.26	8,510	SnO ₂
Sn 118	EC	532(a)	94.91	13,126	SnO ₂
Sn 119	AL	118(a)	68.3	0	
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	166	SnO ₂
Sn 119	CR	366(a)	78.25	5,024	SnO ₂
Sn 119	EC	533(a)	79.82	18,057	SnO ₂
Sn 120	AL	119(a)	93.5	420	SnO ₂
Sn 120	AY	180(a)	95.4	1,588	SnO ₂
Sn 120	BC	202(a)	72.6	3,155	SnO ₂

Natural Isotopic Abundance:

Sn 112 - 1.00%	Sn 118 - 24.07%
Sn 114 - 0.68%	Sn 119 - 8.63%
Sn 115 - 0.44%	Sn 120 - 32.53%
Sn 116 - 14.40%	Sn 122 - 4.68%
Sn 117 - 7.68%	*Sn 124 - 5.89%

Tin (cont'd.)
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 120	BI	234(a)	53.6	1,760	SnO ₂
Sn 120	CR	367(a)	97.01	18,120	SnO ₂
Sn 122	EC	534(a)	98.14	18,047	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)	83.66	2,545	SnO ₂
Sn 122	EC	535(a)	88.92	2,235	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	BI	236(ar)	71.0	125	SnO ₂
Sn 124	CR	369(au)	83.1	0	
Sn 124	CR	369(ar)	83.1	0	
Sn 124	EC	536(a)	95.04	30	SnO ₂
Sn 124	EC	536(as)	95.04	2,295	Sn

Natural Isotopic Abundance:Antimony
Atomic No.51

Sb 121 - 57.25%

Sb 123 - 42.75%

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	80	Sb
Sb 123	AE	94(a)	96.7	0	
Sb 123	BT	275(a)	95.6	1,379	Sb

Natural Isotopic Abundance:

Te 120 - 0.094% Te 126 - 18.69%

Te 122 - 2.46% Te 128 - 31.81%

Te 123 - 0.86% Te 130 - 34.44%

Te 124 - 4.67%

Te 125 - 6.97%

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	0	
Te 120	FE	640(a)	19.90	0	
Te 122	AU	154(a)	77.8	19	Te
Te 122	CA	293(a)	79.4	0	
Te 122	DX	506(a)	86.24	0	
Te 122	FE	641(a)	81.72	240	Te
Te 123	AU	155(a)	34.9	10	Te
Te 123	CA	294(a)	45.8	0	
Te 123	DX	507(a)	60.91	67	Te
Te 123	FE	642(a)	48.58	114	Te
Te 124	AU	156(a)	72.5	56	Te
Te 124	CA	295(a)	83.9	22	Te
Te 124	CA	295(b)	21.8	225	Te
Te 124	DX	508(a)	76.47	550	Te
Te 124	FE	643(a)	81.34	650	Te

Natural Isotopic Abundance:

Te 120 - 0.094%	Te 126 - 18.69%
Te 122 - 2.46%	Te 126 - 31.81%
Te 123 - 0.86%	Te 130 - 34.44%
Te 124 - 4.67%	
Te 125 - 6.97%	

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 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	CA	296(ar)	87.9	2,130	Te
Te 125	DX	509(a)	81.65	0	
Te 125	FE	644(a)	80.53	1,270	Te
Te 126	AU	158(a)	93.2	1,496	Te
Te 126	CA	297(a)	95.4	1,510	Te
Te 126	CA	297(ar)	95.4	943	Te
Te 126	CA	297(b)	79.0	914	Te
Te 126	DX	519(a)	89.68	4,436	Te
Te 126	FE	645(a)	Analysis Incomplete	3,250	Te
Te 128	AU	159(a)	93.5	1,656	Te
Te 128	CA	298(a)	94.4	8,767	Te
Te 128	CA	298(ar)	94.4	714	Te
Te 128	CA	298(b)	91.8	1,594	Te
Te 128	CA	298(c)	94.0	111	Te

Natural Isotopic Abundance:

Tellurium (cont'd.)
Atomic No. 52

Te 120 - 0.094%	Te 126 - 18.69%
Te 122 - 2.46%	Te 128 - 31.81%
Te 123 - 0.86%	Te 130 - 34.44%
Te 124 - 4.67%	
Te 125 - 6.97%	

Electromagnetically Concentrated Isotopes

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Te 128	DX	511(a)	82.32	5,760	Te
Te 130	AU	160(a)	93.0	530	Te
Te 130	CA	299(a)	97.4	7,882	Te
Te 130	CA	299(b)	93.5	506	Te
Te 130	CA	299(br)	93.5	950	Te
Te 130	DX	512(a)	78.23	4,936	Te

Natural Isotopic Abundance:

Ba 130 - 0.103% Ba 137 - 11.25%

Ba 132 - 0.096% Ba 138 - 71.83%

Ba 134 - 2.39%

Ba 135 - 6.55%

Ba 136 - 7.79%

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	0	
Ba 135	DG	432(a)	67.32	451	BaCO ₃
Ba 136	DG	433(a)	50.02	183	BaCO ₃
Ba 137	DG	434(a)	38.98	1,100	BaCO ₃
Ba 138	DG	435(a)	98.04	1,380	BaCO ₃

Natural Isotopic Abundance:

Lanthanum
Atomic No. 57

La 138 - 0.097%

La 139 - 99.903%

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	351	La ₂ O ₃
La 139	EF	545(a)	99.96	17,643	La ₂ O ₃

Natural Isotopic Abundance:

Ce 136 - 0.195%

Ce 138 - 0.265%

Ce 140 - 88.44%

Ce 142 - 11.10%

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	0	
Ce 136	FK	675(a)	Analysis Incomplete	0	
Ce 138	DD	416(a)	8.9	0	
Ce 138	DW	502(a)	4.42	203	CeO ₂
Ce 138	FK	676(a)	Refinement Incomplete	0	
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	8,530	CeO ₂
Ce 140	FK	677(a)	Refinement Incomplete	0	
Ce 142	DD	418(b)	87.4	29	CeO ₂
Ce 142	DW	504(a)	84.42	516	CeO ₂
Ce 142	FK	678(a)	Refinement Incomplete	0	

Natural Isotopic Abundance:

Nd 142 - 26.83% Nd 146 - 17.29%
 Nd 143 - 12.10% Nd 148 - 5.80%
 Nd 144 - 23.95% Nd 150 - 5.67%
 Nd 145 - 8.36%

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)	93.00	1,810	Nd ₂ O ₃
Nd 143	EQ	588(a)	83.93	100	Nd ₂ O ₃
Nd 144	EQ	589(a)	93.45	1,862	Nd ₂ O ₃
Nd 145	EQ	590(a)	78.60	225	Nd ₂ O ₃
Nd 146	EQ	591(a)	95.60	64	Nd ₂ O ₃
Nd 148	EQ	592(a)	89.85	0	
Nd 150	EQ	593(a)	94.76	0	

Natural Isotopic Abundance:

Sm 144 - 3.13% Sm 152 - 26.59%

Sm 147 - 15.12% Sm 154 - 22.62%

Sm 148 - 11.29%

Sm 149 - 13.87%

Sm 150 - 7.38%

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	17	Sm ₂ O ₃
Sm 144	FH	660(a)	58.93	132	Sm ₂ O ₃
Sm 147	EM	569(a)	81.63	0	
Sm 147	FH	661(a)	78.35	830	Sm ₂ O ₃
Sm 148	EM	570(a)	76.01	729	Sm ₂ O ₃
Sm 148	FH	662(a)	62.40	668	Sm ₂ O ₃
Sm 149	EM	571(a)	71.53	0	
Sm 149	FH	663(a)	73.01	647	Sm ₂ O ₃
Sm 150	EM	572(a)	74.09	348	Sm ₂ O ₃
Sm 150	FH	664(a)	68.04	910	Sm ₂ O ₃
Sm 152	EM	573(a)	89.90	4,496	Sm ₂ O ₃
Sm 152	FH	665(a)	93.92	4,798	Sm ₂ O ₃
Sm 154	EM	574(a)	92.10	3,130	Sm ₂ O ₃
Sm 154	FH	666(a)	96.05	2,638	Sm ₂ O ₃

Natural Isotopic Abundance:

Hf 174 - 0.17% Hf 179 - 13.67%

Hf 176 - 5.22%

Hf 177 - 18.53%

Hf 178 - 27.25%

Hf 179 - 13.67%

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)	7.85	83	HfO ₂
Hf 176	ET	603(a)	48.46	98	HfO ₂
Hf 177	ET	604(a)	61.71	788	HfO ₂
Hf 178	ET	605(a)	80.91	1,448	HfO ₂
Hf 179	ET	606(a)	46.57	578	HfO ₂
Hf 180	ET	607(a)	93.96	1,443	HfO ₂

Natural Isotopic Abundance:

W 180 - 0.16%

W 182 - 26.21%

W 183 - 14.33%

W 184 - 30.61%

W 186 - 28.69%

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	CL	340(ar)	4.95	.54	WO ₃
W 180	EL	561(a)	6.95	275	WO ₃
W 182	BG	221(a)	94.25	46	WO ₃
W 182	CL	341(a)	91.58	1,639	WO ₃
W 182	EL	562(a)	92.33	11,003	WO ₃
W 183	BG	222(a)	86.21	217	WO ₃
W 183	CL	342(a)	82.01	745	WO ₃
W 183	EL	563(a)	82.63	6,164	WO ₃
W 184	BG	223(a)	95.72	440	WO ₃
W 184	CL	343(a)	91.14	106	WO ₃
W 184	CL	343(ar)	91.14	2,980	WO ₃
W 184	EL	564(a)	95.06	1,074	WO ₃
W 186	BG	224(a)	97.94	92	WO ₃
W 186	CL	344(a)	97.17	616	WO ₃
W 186	CL	344(ar)	97.17	372	WO ₃
W 186	EL	565(a)	97.54	11,543	WO ₃

Natural Isotopic Abundance:

Re 185 - 37.31%

Re 187 - 62.69%

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	2,540	Re
Re 187	CP	357(a)	98.22	715	Re

Natural Isotopic Abundance:

Mercury
Atomic No. 80

Hg 196 - 0.16% Hg 202 - 29.76%

Hg 198 - 10.02% Hg 204 - 6.86%

Hg 199 - 16.90%

Hg 200 - 23.10%

Hg 201 - 13.20% **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	0	
Hg 196	DR	485(c)	1.46	400	Hg
Hg 198	DR	486(a)	79.11	626	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	45	Hg
Hg 199	DR	487(b)	72.1	28	Hg
Hg 199	DR	487(c)	68.0	0	
Hg 199	DR	487(d)	65.45	43	Hg
Hg 199	DR	487(e)	62.51	177	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

Natural Isotopic Abundance:

Mercury (cont'd.)
Atomic No. 80

Hg 196 - 0.16% Hg 202 - 29.76%

Hg 198 - 10.02% Hg 204 - 6.86%

Hg 199 - 16.90%

Hg 200 - 23.10%

Hg 201 - 13.20% **Electromagnetically Concentrated Isotopes**

Isotope	Series	Sample	Abundance of Enriched Isotope (per cent)	AVAILABLE FOR SHIPMENT Element Weight (milligrams)	Product Form
Hg 200	DR	488(f)	76.28	1,492	Hg
Hg 201	DR	489(a)	71.8	26	Hg
Hg 201	DR	489(b)	62.48	90	Hg
Hg 201	DR	489(c)	57.90	230	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	75	Hg
Hg 202	DR	490(b)	98.06	20	Hg
Hg 202	DR	490(c)	97.33	55	Hg
Hg 202	DR	490(d)	96.45	122	Hg
Hg 202	DR	490(e)	95.13	379	Hg
Hg 202	DR	490(f)	91.46	1,447	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	58	Hg
Hg 204	DR	491(b)	77.61	255	Hg

Natural Isotopic Abundance:

Hg 196 - 0.16% Hg 202 - 29.76%

Hg 198 - 10.02% Hg 204 - 6.86%

Hg 199 - 16.90%

Hg 200 - 23.10%

Hg 201 - 13.20%

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(c)	69.80	0	
Hg 204	DR	491(d)	62.78	129	Hg
Hg 204	DR	491(e)	49.66	1,346	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	93	Hg

Natural Isotopic Abundance:

Tl 203 - 29.51%

Tl 205 - 70.49%

Thallium

Atomic No. 81

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	5,899	Tl ₂ O ₃
Tl 203	BY-3	286(a)	47.9	6,875	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	1,189	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	940	Tl ₂ O ₃
Tl 205	BY-3	287(a)	92.8	2,715	Tl ₂ O ₃
Tl 205	CC-3	308(a)	86.1	568	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

Natural Isotopic Abundance:

Lead
Atomic No. 82

Pb 204 - 1.37%

Pb 206 - 26.26%

Pb 207 - 20.82%

Pb 208 - 51.51%

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	90	PbCrO ₄
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	2,826	PbO
Pb 206	O	44(a)	75.67	270	PbCrO ₄
Pb 206	AQ	136(a)	77.9	250	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	4,207	PbO
Pb 207	O	45(a)	61.55	170	PbCrO ₄
Pb 207	AQ	137(a)	48.2	550	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	

Natural Isotopic Abundance:

Lead (cont'd.)
Atomic No. 82

Pb 204 - 1.37%

Pb 206 - 26.26%

Pb 207 - 20.82%

Pb 208 - 51.51%

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	500	PbCrO ₄
Pb 208	O	46(ar)	92.1	160	PbCrO ₄
Pb 208	AQ	138(a)	82.10	830	PbCrO ₄
Pb 208	BO	260(a)	96.6	330	PbO
Pb 208	CN	352(ar)	95.8	166	PbSO ₄
Pb 208	EO	584(a)	87.97	23,445	PbO