

List of High Purity Metals  
Available from American Producers

Compiled by

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for the

United States Atomic Energy Commission

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Ames Laboratory

at

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## Preface

All prices given in this report are quoted from the producer and are subject to change. The stated purities and analyses are also those of the producer. We have made no attempt to check these analyses and assume no responsibility as to their reliability. Where more detailed information is needed concerning the latest prices, purity and other shapes of a particular metal, we suggest direct correspondence with the listed producers. It is our intention that only those who produce and supply pure metals be included in this compilation. Some listings include grades of metal of not exceptional purity, especially for some of the less common metals, and are included because they could be of interest in research on alloys where that metal is a minor constituent.

A producer of a high purity metal not listed here is invited to submit details on his product to the authors for possible inclusion in a subsequent edition. We also invite readers who know of producers of high purity metals not listed, or of a listed company which is not a producer, to pass the pertinent information along to us. Although the immediate objective has been to include in the list only metals and other closely allied elements, future editions might be expected to include practically all high purity elements available from American producers.

Forms are provided at the end of the list for insertion of additional data by the user and for supplying data to the authors. All correspondence to the authors should be addressed in care of

Ames Laboratory of the USAEC  
Iowa State College  
Ames, Iowa

## TOXICITY OF METALS

As a guide to the toxicity of metals, a code has been formulated based on information given in "Dangerous Properties of Industrial Materials", by N. Irving Sax, Reinhold Publishing Corporation New York, 1957.

Code:

- VT - Very Toxic
- T - Toxic
- ST - Slightly Toxic
- NT - Non-Toxic
- U - Unknown
- RH - Radiation Hazard

This code is applied regardless of whether the toxicity is known to be acute or chronic. In some cases the terms also apply where skin and eye irritation, and other external effects are known to arise. For complete information the user should refer to the source from which this information was obtained.

Many of the metals listed in this report may be pyrophoric, particularly when they are encountered in a finely divided state, and as such constitute definite fire hazards. Some metals even in massive form are fire hazards owing to their normal chemical reactivity. Since an attempt has not been made to indicate these hazards, the user should consult a reliable reference when uncertain about the proper handling or storage of any given metal.

LIST OF PRODUCERS

AISI	Pure iron prepared for the American Iron and Steel Institute by Battelle Memorial Institute. Regarding distribution of pure iron write: James W. Halley, Ass't. Mgr. Research & Development Department Inland Steel Company East Chicago, Indiana	CMA	Cooper Metallurgical Associates P. O. Box 3991 Cleveland 20, Ohio
ALCOA	Sales Division Aluminum Company of America New Kensington, Pennsylvania	CMC	Carborundum Metals Corporation Division of Carborundum Company P. O. Box 32 Akron, New York
AS & R	American Smelting and Refining Company Central Research Laboratories South Plainfield, New Jersey	CMSC	Consolidated Mining and Smelting Company of Canada Ltd. P. O. Box 1030, Place D'Armes Montreal, Canada
BEC	The Brush Beryllium Company 4301 Perkins Avenue Cleveland 3, Ohio	CNC	Columbia National Corporation 70 Memorial Drive Cambridge 42, Massachusetts
BEC	The Beryllium Corporation Tuckerton Road Reading, Pennsylvania	DML	Dominion Magnesium Ltd. Suite 1505, 320 Bay Street Toronto, Canada
BHC	The Bunker Hill Company Box 29 Kellogg, Idaho	DOW	Dow Chemical Company 1000 Main Street Midland, Michigan
BS & R	Belmont Smelting & Refining Work, Inc. 330 Belmont Avenue Brooklyn 7, New York	EI-A	Engelhard Industries Inc. American Platinum & Silver Division 231 New Jersey Railroad Avenue Newark 2, New Jersey
CAC	Mr. Richard P. Seelig, Exec. V. Pres. Chromalloy Corporation 450 Tarrytown Road White Plains, New York	EI-B	Engelhard Industries Inc. Baker Platinum Division 113 Astor Street Newark 2, New Jersey
CBC	Chase Brass and Copper Company Waterbury 20, Connecticut	EIDP	Specialty Products Section E. I. duPont de Nemours & Company, Inc. Wilmington 98, Delaware
		EMET	Electro Metallurgical Company Product and Process Development Department 4625 Royal Avenue P. O. Box 580 Niagara Falls, New York

E-P	The Eagle-Pitcher Company Chemical Division American Building Cincinnati 1, Ohio	KLI	King Laboratories, Incorporated 127 Solar Street Syracuse 3, New York
FMC	Fansteel Metallurgical Corporation North Chicago, Illinois	KMI	Kennametal Incorporated Latrobe, Pennsylvania
FTMC	Foote Mineral Company 18 West Chelton Avenue Philadelphia 44, Pennsylvania	LCA	Lithium Corporation of America 2400 Dakota Avenue Minneapolis 16, Minnesota
GCC	General Cerium Corporation 1038 River Road Edgewater, New Jersey	LNK	Lunex Company Pleasant Valley, Iowa
GE	Marketing Section General Electric Company Lamp Wire & Phosphorus Department 1331 Chardon Road Cleveland 17, Ohio	MCA	Molybdenum Corporation of America 3005 Grant Building Pittsburg, Pennsylvania
H & H	Handy and Harmon 82 Fulton Street New York 38, New York	MCC	Michigan Chemical Corporation Saint Louis, Michigan
HZI	Horizons Incorporated 2905 East 79th Cleveland, Ohio	MCW	Mallinckrodt Chemical Works Second & Mallinckrodt Streets St. Louis 7, Missouri
ICA	Indium Corporation of America 1676 Lincoln Avenue P. O. Box 269 Utica 4, New York	MHI	Metal Hydrides, Incorporated 12-24 Congress Street Beverly, Massachusetts
JBC	J. Bishop & Company Platinum Works Malvern, Pennsylvania	MSA	MSA Research Corporation Callery, Pennsylvania
KCC	Kawecki Chemical Company 220 East 42nd Street New York 17, New York	MSM	Mallory-Sharon Metals Corporation Niles, Ohio
		NJZ	The New Jersey Zinc Sales Company, Incorporated 160 Front Street New York 38, New York

NLC	National Lead Company 111 Broadway New York 6, New York	UT	A. D. Melaven Department of Chemistry University of Tennessee Knoxville, Tennessee
NRC	National Research Corporation 70 Memorial Drive Cambridge 42, Massachusetts	VCA	Vanadium Corporation of America Sales Department 420 Lexington Avenue New York 17, New York
PLM	Plastic Metals Division National - U. S. Radiator Corporation Johnstown, Pennsylvania	VDG	The Vulcan Detinning Company Sewarden, New Jersey
RCI	Research Chemicals Inc., Division Nuclear Corporation of America, Inc. P. O. Box 431 170 West Providencia Burbank, California	WRG	W. R. Grace & Company Davison Chemical Division Erwin, Tennessee
RMC	Reynolds Metals Company Reynolds Metals Building Richmond, Virginia		
SCC	Sigmond Cohn Corporation 121 So. Columbus Avenue Mt. Vernon, New York		
SEC	St. Eloi Corporation Box 507 Newton Station Cincinnati 44, Ohio		
SEP	Sylvania Electric Products Towanda, Pennsylvania		
TII	Texas Instruments Incorporated 6000 Lemmon Avenue Dallas 9, Texas		

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Actinium Ac At. No. 89							RH		
		Longest lived isotope is Ac <sup>227</sup> , halflife - 21.8 years. Decays by electron emission to Th <sup>227</sup> . Metal has been prepared in microgram quantities only; for description see: J. G. Stiles, Jr., M. L. Salutsky and B. D. Stone, USAEC Report MLM-881 (1953).							
Aluminum Al At. No. 13	99.99	Detectable amounts of Cu, Fe, Si, and other elements		50 & 700 lb. Pig  6 lb. Ingot	\$0.49 per lb.  \$0.64 per lb.	Other forms available by arrangement	NT	ALCOA	7-25-58 (Letter)
	99.99	Very small amounts of Cu, Ba, Fe, Mg, Si, and others.		50 lb. Pig	\$0.49 per lb.		NT	RMC	6-12-58 (Letter)
	99.9	Detectable Impurities		50 & 700 lb. Pig  6 lb. Ingot	\$0.31 per lb.  \$0.30 per lb.	Other forms available by arrangement	NT	ALCOA	7-25-58 (Letter)
	99.9	Very small amounts of Cu, Ba, Fe, Mg, Si, and others.		50 lb. Pig	\$0.31 Per lb.		NT	RMC	6-12-58 (Letter)
Americium Am At. No. 95							RH		
		Longest lived isotope is Am <sup>243</sup> , halflife - $8 \times 10^3$ years. Decays by alpha particle emission to Np <sup>239</sup> . Metal has been prepared in microgram quantities only; for description see: E. F. Westrum and L. Eyring, J. Am. Chem. Soc. <u>73</u> , 3396 (1951).							

Actinium  
Aluminum  
Americium

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Antimony Sb At. No. 51	99.9999		Zone- refining	Bars	\$6.50 per troy oz.	Special research grade	VT	CMSC	8-22-58 (Letter)
	99.9996	Pb-0.5 Cu-0.8 Fe-0.6 As-1.9 The following are nil: Li, Na, K, Sr, Ba, Be, Al, Ga, B, Co, Ni, Au, Hg, Ag, In, Zn, Tl, Bi, P, Ge, Ti, Zr, Ce, V, Nb, Cr, Mo, W.	Electro- lytic	1 lb. Bars 5 lb. Bars 6.34 lb. long Bars	\$15.00 per lb.		VT	BHC	7-5-58 (Letter)
	99.998	Pb-3.2 Cu-6.0 Fe-2.9 The following are nil: Li, Na, K, Sr, Ba, Be, Al, Ga, Hg, Ag, In, Zn, Tl, Bi, P, Ge, Ti, Zr, Ce, V, Nb, Cr, Mo, W.	Electro- lytic	1 lb. Bars 5 lb. Bars 6.34 lb. long Bars	\$10.00 per lb.		VT	BHC	7-5-58 (Letter)
	99.88	Fe-300 S -400 As-300 Pb-trace Ca-100		Slab			VT	NLC	6-20-58 (Letter)

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Arsenic As At. No. 33	99.999+			Crystals	\$17.00 per Troy oz. (1 oz. tube) \$16.00 per Troy oz. (2 oz. tube) \$15.00 per Troy oz. (3-4 oz. tube)	Min. order \$10.00	VT	AS&R	6-18-58 (Letter)
Barium Ba At. No. 56	99.+  98.+	Sr-1000 to 4000 F-200 Cl-60 Fe-50 Na-50  Sr-5000 to 10,000 Mg-4000 Ca-4000	      BaO + Al	Lump (small pieces 3/8 x 5/8 in.)    Crystals, granules and rods	\$29.75 per lb.   \$6.00 per lb.	Other forms available by arrangement	T	CLI  DML	7-18-58 (Letter)  6-11-58 (Letter)

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Beryllium Be At. No. 4	99.0+	Fe-500 to 2000 Al-500 to 2000 Si-500 to 1000	BeF <sub>2</sub> + Mg	Vacuum cast Ingot (9" x 15") Crushed Lump Chips Turnings	\$6.00 per oz. \$85.00 per lb. Min. order \$10.00	Specified as "Premium Grade"	VT	BBC	6-6-58 (Letter)
	98.5+	Fe-1000 to 2000 Al- 500 to 2000 Si- 500 to 1200 Mg- 200 to 800 BeO-8000 to 15000		Powder Std. 200 mesh	\$8.00 per oz. \$95.00 per lb. Min. order \$10.00	Specified as "Premium Grade"	VT	BBC	6-6-58 (Letter)
	98.0	Fe-1000 to 2000 Al- 500 to 2000 Si- 500 to 1200 Mg- 200 to 800 BeO-8000 to 15000		Fabricated Metal (Rod, foil, sheet, discs, machined shapes, etc.)	Price varies: 0.005" thick foil costs \$30.00 per sq. in. Min. order 1 sq. in. 1" diam. rod costs \$16.00 per lin. in. plus facing charge of \$4.65 per rod. Min. order \$25.00. Min length 1".	Specified as "QMV Beryllium Metal"	VT	BBC	6-6-58 (Letter)
	Unspecified	Consult mill		Beads, vacuum cast ingot, chips, powder, rods, hot pressed slabs, rough machined parts	Consult mill	Specified as high purity "Berylco" beryllium metal	VT	BEC	10-1-58 (Letter)

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Bismuth Bi At. No. 83	99.9999			3.5 lb. Cast bar	\$20.00 per lb. for less than 5 lb. \$15.00 per lb. for 5 lb. or more		ST	CMSC	7-23-58 (Letter)
	99.999+			Cast cake shot	\$5.00 per lb. Min order \$10.00		ST	AS&R	6-18-58 (Letter)
Boron B At. No. 5	99.5+		Electro- lysis U.S. Patents 2,572,248 and 2,572,249	325 mesh also coarse and crystalline aggregates	\$1.30 per gram for 10-50 grams down to \$1 per gram for over 500 grams	Specified as Grade AA powder	ST	CMA	7-1-58 (Letter)
	99.5+			arc-melted available on arrangements	\$5 per gram for 10-50 grams down to \$4.25 per gram for over 500 grams		ST	CMA	7-1-58 (Letter)

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Cadmium Cd At. No. 48	99.9999			3.15 lb. Cast bar	\$20.00 per lb. for less than 5 lb. \$15.00 per lb. for more than 5 lb.		VT	CMSC	7-23-58 (Letter)
	Not Specified	Spectro- graphically Mg and Cu extra faint. Other metals not detected.	Low Vacuum Distillation of Metallic Cadmium	Small lump	\$40.00 per lb. 1 lb. min.	Specified as S.P. Cadmium Metal-45 "Super Purity"	VT	NJZ	11-14-56 (Letter)
	99.994+	Pb-20 Fe- 3 Cu- 9 Ni-11 Zn- 3 Ag- 7 As+Sb- 0.5	Electro- lytic	Balls and sticks			VT	BHC	7-5-58 (Letter)
	99.99+			Cast stick	\$3.50 per lb. Min. order \$10.00		VT	AS&R	6-18-58 (Letter)
	99.9+	Zn- 50 Ni-2 Pb-200 Cu-2 Fe- 3 As-2		Balls	\$3.00 per lb.	Other forms available by arrangement	VT	E-P	6-12-58 (Letter)
	99.9+	Pb=200 Fe=100 Zn=100 Cu= 20		1 lb. sticks, 1 1/4 lb. balls, sheets, mossy, 100 mesh powder, shot and 1/8" dia. wire	1 lb. stick \$7 per lb. In lot of 100 lbs. \$1.70 per lb.		VT	BS&R	6-23-58 (Letter)

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Calcium Ca At. No. 20	99.5			Lump Approx. 1"x3" Crushed 3/8"x20 mesh	By inquiry	Distilled grade	NT	EMET	7-1-58 (Letter)
	99.+	N -150 Mg-500 Al- 10 Fe- 20 Mn- 20 B - 0.2 Cd- 0.2	Distilled	Granules -40+80 mesh	\$3.50 per lb. + duty	Lower grades available	NT	DML	6-11-58 (Letter)
	99+	Li- 1 Na- 10 Fe- 10 Mg-200 Mn- 10 Si- 5 Cu- 5 Cr- 5 Co- 5 Ni- 5 Al- 5 B - 5 N 350	Double distilled	Crystals			NT	MHI	7-3-58 (Letter)

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Cerium Ce At. No. 58	99.9 (min.)	Spectro- analysis furnished on request	Reduction of anhydrous fluoride with appropriate reductant in tantalum	Lump and ingot	\$225.00 per lb.	Other forms available by arrangement	NT	SEC	8-4-58 (Letter)
	99.+			Ingot	By Inquiry		NT	RCI	6-18-58 (Letter)
	98.5+	Fe-7000 Rare Earths-7000 Combined Carbon- 300 Si- 200 Th, Al, O, N, -Trace					NT	GCC	10-24-57 (Letter)
	95.5	Balance- principly other like rare earths La, Nd, Pr, Fe-1500	Electro- lytic reduction	1 lb. piglets	\$15.00 per lb.	Available in developmental quantities	NT	MCW	7-23-58 (Letter)

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Cesium Cs At. No. 55		Note: Producers send needed data for revised edition.						U	
Chromium Cr At. No. 24	99.99+	C-20, range: 10-40 O- 9, range: 2-16 Si-20 (detection limit) Others- Less than 10 or not detected	Van Arkel- deBoer iodide process	Coarse crystal- line aggregate	\$125.00 per lb.	High purity prices should decrease as demand increases	NT	CAC	6-26-58 (Letter)
	99.9+	O-<250 N- <10 Ca-<250		Flake and Powder	\$80.00 per lb.		NT	LNK	6-25-58 (Letter)
	99.9+	C- 100 O- 100 H- 3 N- 180 Fe- 140 S- 50 Si- 300 Pb- 20		1/16" thick x 1/4 to 3/4" irregular shaped flakes	\$28.00 per lb. Introductory basis. f.o.b. Niagra Falls, N.Y.	High purity Grade "A"	NT	EMET	7-1-58 (Letter)
	99.9+ (by difference)	O-<500 N- 20 to 30 C- 100 to 200 S- 70 to 120 H- 40	Fused salt electrolysis	Powder	By Inquiry		NT	HZI	6-24-58 (Letter)
Cobalt Co At. No. 27	99.9+	Ni- <300 Cu- <50 Fe- <50 S - <200 C - <200 H - <200		Powder available in amounts up to one pound			ST	NLC	1-2-57 (Letter)

Cesium  
Chromium  
Cobalt

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference																			
Columbium Nb At. No. 41	99.8+	Research grade		Rod, sheet, powder	By Inquiry		U	FMC	10-17-57 (Letter)																			
	99.8	C- < 100 N- < 200 O- < 500 Ta- < 1000 Si- < 200 Fe- < 100		Powder, sheet, rod, wire	\$75.00 per lb.		U	KMI	7-21-58 (Letter)																			
	Not specified	<table border="1"> <thead> <tr> <th>Powder</th> <th>Ingot</th> </tr> </thead> <tbody> <tr> <td>0-1500</td> <td>300</td> </tr> <tr> <td>N- 800</td> <td>50</td> </tr> <tr> <td>C- 80</td> <td>20</td> </tr> <tr> <td>H- 20</td> <td>5</td> </tr> <tr> <td>Ta- 700</td> <td>700</td> </tr> <tr> <td>Fe- 200</td> <td>80</td> </tr> <tr> <td>Ti- 50</td> <td>10</td> </tr> <tr> <td>Si- 100</td> <td>70</td> </tr> <tr> <td>B- 1</td> <td>1</td> </tr> </tbody> </table>	Powder	Ingot	0-1500	300	N- 800	50	C- 80	20	H- 20	5	Ta- 700	700	Fe- 200	80	Ti- 50	10	Si- 100	70	B- 1	1		Powder, sheet ingot, rod, foil	By Inquiry		U	KCC
Powder	Ingot																											
0-1500	300																											
N- 800	50																											
C- 80	20																											
H- 20	5																											
Ta- 700	700																											
Fe- 200	80																											
Ti- 50	10																											
Si- 100	70																											
B- 1	1																											
	99.6 (min)	<table border="1"> <tbody> <tr> <td>C- 500</td> <td>max</td> </tr> <tr> <td>O-1000</td> <td>"</td> </tr> <tr> <td>N- 400</td> <td>"</td> </tr> <tr> <td>Ta-1500</td> <td>"</td> </tr> <tr> <td>Ti- 100</td> <td>"</td> </tr> <tr> <td>Fe- 100</td> <td>"</td> </tr> <tr> <td>Si- 100</td> <td>"</td> </tr> <tr> <td>B- 100</td> <td>"</td> </tr> </tbody> </table>	C- 500	max	O-1000	"	N- 400	"	Ta-1500	"	Ti- 100	"	Fe- 100	"	Si- 100	"	B- 100	"		Roundels Cold pressed electrodes Ingots - as cast and machined Powder, bar, sheet, wire on request	By Inquiry		U	EMET	7-1-58 (Letter)			
C- 500	max																											
O-1000	"																											
N- 400	"																											
Ta-1500	"																											
Ti- 100	"																											
Fe- 100	"																											
Si- 100	"																											
B- 100	"																											

(Continued on next page)

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Toxicity	Producer	Reference
Columbium (cont.)	99.5+			Rod, sheet, small tubing	By Inquiry	Prepared on special order.	U	JBC	6-24-58 (Letter)
	99.5 (min.)	Ta-1600 Zr-1000 Ni- 200 Ti- 500 Fe- 200 C - 200 N <sub>2</sub> - 600 O <sub>2</sub> -1000 max.		Bars, sheet, rod, wire, powder	By Inquiry		U	FMC	10-17-57 (Letter)
	99.5	C - <300 N <sub>2</sub> - <500 O <sub>2</sub> -2500 Ta-1000 Si- <200 Fe- <100		Powder	\$45.00 per lb.		U	KMI	7-21-58 (Letter)
	99.4+	C - <500 Ta-5000 Ti- <400 Si- <200 Fe- <100		Bars, etc.	\$96 per lb.		U	FMC	A8-4458
	99.3 (min.)	Ta- 1500 C- 500 O- 1000 N- 500 Fe- 500 Cr- 200 Ni- 200 Zr- 400 B- 5		Rod, sheet, strip, wire	By Inquiry		U	EIDP	6-17-58 (Letter)
Not specified	O- 500 N- 30 C- 250	Fused salt electrolysis	Powder	By Inquiry		U	HZI	6-24-58 (Letter)	

Columbium (cont.)  
(Niobium)

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox-icity	Pro-ducer	Reference
Copper Cu At. No. 29	99.999+		Electrolytic Ref.: (Metal Technology, Feb. 1941, Smart, Smith & Phillips)	Continuous cast rod 3/8" diam.	\$20.00 per lb. Min. order \$10.00		NT	AS&R	6-18-58 (Letter)
Curium Cm At. No. 96						Longest lived isotope is Cm <sup>247</sup> , half-life greater than 10 <sup>6</sup> years Metal has been prepared in microgram quantities only; for description see: J. C. Wallman, W. W. T. Crane and B. B. Cunningham, J. Am. Chem. Soc. <u>73</u> , 493 (1951)	RH		
Dysprosium Dy At. No. 66	99.5 (min.)	Spectro- analysis furnished on request	Reduction of anhydrous fluoride with appropriate reductant in tantalum. Then vacuum distilled.	Lump, ingot	\$400.00 per lb.	Other forms available by arrangement	U	SEC	8-1-58 (Letter)
	99.+ N <sub>2</sub> +	Ta ~ 2000 O <sub>2</sub> ~ 2000 Ca - Traces		1" - 3 1/2" Ingot	By Inquiry		U	MCC	6-25-58 (Letter)
	99.+			Ingot	By Inquiry		U	RCI	6-18-58 (Letter)
	99.			1" Rods 2 1/2" Ingots	\$250.00 per lb.		U	LNK	6-25-58 (Letter)
	98. to 99.			Ingot, lump	\$500.00 per lb \$1.75 per gm. for 10-49 gm. \$1.25 per gm. for 50-450 gm.		U	GCC	10-24-57 (Letter)

Copper  
Curium  
Dysprosium

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Erbium Er At. No. 68	99.5 (min.)	Spectro- analysis furnished on request	Reduction of anhydrous fluoride with appropriate reductant in tantalum	Lump, ingot	\$400.00 per lb.	Other forms available by arrangement.	U	SEC	8-1-58 (Letter)
	99.+	Ta-2000 O-2000 N-2000 Ca-Trace		1" to 3 1/2" Ingot	By Inquiry		U	MCC	6-25-58 (Letter)
	99.+			Ingot	By Inquiry		U	RCI	6-18-58 (Letter)
	99.			1" Rods 2 1/2" Ingots	\$600.00 per lb.		U	LNK	6-25-58 (Letter)
	98. to 99.			Ingot, lump	\$500.00 per lb. \$1.75 per gm. for 10-49 gm. \$1.25 per gm. for 50-450 gm.		U	GCC	10-24-57 (Letter)
Europium Eu At. No. 63	99.5 (min.)	Spectro- analysis furnished on request	Vacuum distilled	Lump, ingot	\$4,650 per lb.	Other forms available by arrangement.	U	SEC	8-1-58 (Letter)
	99.+	Ta-2000 O-2000 N-2000 Ca-Trace		1" to 3 1/2" Ingot	By Inquiry	Available on special order only.	U	MCC	6-25-58 (Letter)
	99.+			Ingot	By Inquiry		U	RCI	6-18-58 (Letter)

Erbium  
Europium

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Toxicity	Producer	Reference
Francium Fr At. No. 87							RH		
				Longest lived known isotope is Fr <sup>223</sup> , half life - 21 minutes Decays by electron emission to Ra <sup>223</sup> The short half life of this element renders the preparation of the metal in any but trace quantities very difficult.					
Gadolinium Gd At. No. 64	99.5			1" Rod, 2 1/2" ingot			U	LNK	6-25-58 (Letter)
	99.5 (min.)	Spectro- analysis furnished on request	Reduction of anhydrous fluoride with appropriate reductant in tantalum.	Lump	\$400.00 per lb.	Other forms available by arrangement	U	SEC	8-1-58 (Letter)
	99.+	Ta- 2000 O- 2000 N- 2000 Ca- Trace		1" to 3 1/2" ingot	By Inquiry		U	MCC	6-25-58 (Letter)
	99.+			Ingot	By Inquiry		U	RCI	6-18-58 (Letter)
	Not specified	Ca- 3000 O- 3000 N- 350		Massive	By Inquiry		U	EMET	6-18-58 (Letter)
	98. to 99.			Lump, ingot	\$400.00 per lb. \$1.50 per gm. for 10-49 gm. \$1.00 per gm. for 50-450 gm.		U	GCC	10-24-57 (Letter)

Francium  
Gadolinium

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Toxicity	Producer	Reference
Gallium Ga At. No. 31	99.9999	Pb- 0.3 Cu- 0.1 Mg- 0.07 Ca- 0.1		Crystals	\$3.50 per gm.	Electronic Grade	U	E-P	6-12-58 (Letter)
	99.999				\$3.75 per gm. \$2.75 per gm.	1 - 24 gm. ▶500 gm.	U	ALCOA	7-25-58 (Letter)
	99.99				\$2.75 per gm. \$1.75 per gm.	1 - 24 gm. ▶500 gm.	U	ALCOA	7-25-58 (Letter)
	99.5						U	BS&R	6-23-58 (Letter)
Germanium Ge At. No. 32	Spec. pure	Spectrographically pure Less than .01 total metal impurity.		Ingot, Cut pieces	\$3.70 per gm.	Semiconductor Grade	U	SEP	6-25-58 (Letter)
	Spec. pure	" " "		Rods to 1" diam. Cast discs to 8" diam.	Price depends on size.	Infra-red and misc. applications	U	SEP	6-25-58 (Letter)
	99.999	Si- 1.0 Mg- 0.4 Cu- 1.0		Ingot, Single Crystals	\$0.37 per gm. (varies with resistivity tolerance)	Electronic Grade	U	E-P	6-12-58 (Letter)
	99.9+	Si- 1.5 Mg- 0.4 Fe- below detection Cu- 0.1 Ca- 1.5 As- below detection Pb- 3.0		100/200 mesh, powder	25 gm. (min.) at \$1.40 per gm. 100 gm. at \$0.90 per gm.	Impurities by spectrographic analysis Other forms available	U	BS&R	6-23-58 (Letter)

Gallium  
Germanium

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Gold Au At. No. 79	99.999	Ag and Cu		Wire, sheet		Standard material	NT	SCC	7-21-58 (Letter)
	99.99+	Spectro- graphic analysis on request.		Sponge, sheet rod, tubing, etc.	By Inquiry	Prepared on special order	NT	JBC	6-24-58 (Letter)
	99.99+		Chem. Ppt.	Powder			NT	H&H	7-18-58 (Letter)
	99.99	Spectro- analysis on a particular lot furnished on request.		Ingot, sponge, sheet, wire, etc.		Premium mint gold	NT	EI-A	6-27-58 (Letter)
	99.99		Electro- lytic	Bar, sheet, wire		Premium mint gold	NT	H&H	7-18-58 (Letter)
	99.99	Spectro- analysis on a particular lot furnished on request.		Ingot, sponge, sheet, wire, etc.		Mint gold	NT	EI-B	6-27-58 (Letter)
	99.98	Spectro- analysis on request.		Sponge, sheet, rod, tubing, etc.	By Inquiry		NT	JBC	6-24-58 (Letter)

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Hafnium Hf At. No. 72	97 (3.0% Zr)	Other impurities less than 100 ppm each; O <sub>2</sub> =200 ppm	Van Arkel- deBoer iodide process	1/2" x length			U	FTMC	6-17-58 (Letter)
	Not specified	N- 20 O- 200 H- 10 Zr- unspecified Others- unknown			By Inquiry		U	NLC	6-20-58 (Letter)
Holmium Ho At. No. 67	99.5 (min.)	Spectro- analysis furnished on request.	Reduction of anhydrous fluoride with appropriate reductant in tantalum.	Lump, ingot	\$1,025.00 per lb.	Other forms available by arrangement.	U	SEC	8-1-58 (Letter)
	99.+	Ta- 2000 O- 2000 N- 2000 Ca- Trace		1" to 3 1/2" ingot	By Inquiry		U	MCC	6-25-58 (Letter)
	99.+			Ingot	By Inquiry		U	RCI	6-18-58 (Letter)
	99.			1" rods, 2 1/2" ingot	\$600.00 per lb.		U	LNK	6-25-58 (Letter)
	98. to 99.			Ingot, lumps	By Inquiry		U	GCC	10-24-57 (Letter)

Hafnium  
Holmium

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Indium In At. No. 49	99.9999			5 or 10 troy oz. ingot	\$22.00 per troy oz.	Special research grade. Cast and sealed in vacuum ampoules.	VT	CMSC	7-23-58 (Letter)
	99.999+			Extruded stick (1/4" x 5 1/2" long)	\$5.00 per troy oz. Min. order \$10.00.		VT	AS&R	6-18-58 (Letter)
	99.999			Shot, ingot, rod, wire, sheet	\$4.10 per troy oz. for 1-5 tr. oz. \$3.35 per troy oz. for >6 tr. oz.		VT	ICA	6-9-58 (Letter)
	99.999			10 troy oz. ingot	\$3.65 per troy oz.	High purity	VT	CMSC	7-23-58 (Letter)
	99.97+			Rod, shot, powder, ingot, extruded sticks	\$2.25 per troy oz. for >6 tr. oz.		VT	ICA	6-9-58 (Letter)
Iridium Ir At. No. 77	99.99	Spectro- analysis furnished on request.		Sponge	By Inquiry	Prepared on special order	NT	JBC	6-24-58
	99.98	Spectro- analysis furnished on request.		Sponge, ingot, arc-cast buttons, sheet, wire	By Inquiry	Prepared on special order.	NT	EI-A	6-27-58
	99.9			"	"	"	NT	EI-B	6-27-58 (Letter)

Indium  
Iridium

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Iron Fe At. No. 26	High purity	C- <10 O- 10 to 30 N- < 3 H- < 0.3 Other elements as in A-104 "Plast-Iron".	Zone refining of "Plast-Iron" melting Grade A-104	1 lb. specimens as cast by zone melting	By Inquiry			AISI	6-12-58 (Letter)
	99.9 (by difference)	Al < 30 Be < 5 Ca < 10 C - 40 Cr < 30 Co- 20 Cu < 10 H-100 Pb < 10 Mg < 5 Mn < 10 Mo < 40 Ni < 10 N- 40 O-500 P- 30 Si- 10 S- 40 Sn < 50 Ti < 10 W < 100 Zn-100 Zr- < 10 V < 50	Electro- lytic	Chips (Powders available by arrangement)	100 lb.-1 ton cost \$1.60 per pound	Specified as "Super-Purity Plast-Iron Melting Stock" Grade A-104	Dust ST	PIM	1-28-57 (Letter)
	99.90	Meets ACS Specs.		wire-3" lengths	\$1.80 per 1/4 lb.			MCW	7-23-58 (Letter)

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Lanthanum La At. No. 57	99.5 (min.)	Spectro- analysis furnished on request.	Reduction of anhydrous fluoride with appropriate reductant in tantalum.	Lump, ingot	\$225.00 per lb.	Other forms available by arrangement.	U	SEC	8-1-58 (Letter)
	99.+			Ingot	By Inquiry		U	RCI	6-18-58 (Letter)
	98. to 99.			Ingot, lump	\$300.00 per lb. \$1.25 per gm. for 10-49 gm. \$0.75 per gm. for 50-450 gm.		U	GCC	10-24-57 (Letter)
Lead Pb At. No. 82	99.9999			4 lb. cast bar	\$20.00 per lb. for less than 5 lb. \$15.00 per lb. for more than 5 lb.		VT	CMSC	7-23-58 (Letter)
	99.999+			Cast stick	\$5.00 per lb. Min. order \$10.00		VT	AS&R	6-18-58 (Letter)
	99.99+			Cast stick	\$2.50 per lb. Min. order \$10.00		VT	AS&R	6-18-58 (Letter)

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Toxicity	Producer	Reference
Lithium Li At. No. 3	99.9	Na- 50 K- 100 Ca- 100 N- 50 Fe- 10		Ingot ----- 50 lb.- Rod ----- <25 lb.- Wire ----- <25 lb.-	\$13.00 per lb. \$20.00 per lb. \$25.00 per lb.	Low Na grade	T	LCA	6-27-58 (Letter)
	99.9	Na- 200 K- 700 Cl- 400 N- 120 Si- 10 Al- 5 Fe- 5	Electro-lytic	Cast ingot	\$13.00 per lb. for less than 100 lb.		T	FTMC	6-17-58 (Letter)
Lutetium Lu At. No. 71	99.5 (min.)	Spectro-analysis furnished on request.	Reduction of anhydrous fluoride with appropriate reductant in tantalum.	Lump, ingot	\$5,325.00 per lb.	Other forms available by arrangement.	U	SEC	8-1-58 (Letter)
	99.+	Ta- 2000 N+ O- 2000 Ca- Trace		1" to 3 1/2" ingot	By Inquiry	Available on special order only.	U	MCC	6-25-58 (Letter)
	98.+			Ingot	By Inquiry		U	RCI	6-18-58 (Letter)
	98.+			1" rod, 2 1/2" ingot	\$4,000.00 per lb.		U	LNK	6-25-58 (Letter)

Lithium  
Lutetium

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Magnesium Mg At. No. 12	99.97	Al- 70 Zn- 80 Mn- 40 Fe- 20 Ni- 5 Cu- 5 Si- 50 Pb- 10 Cd- 1 Cr- 1 B- 0.1	MgO + Si	Ingot, rod, granules	\$0.36 + duty 50% ad. val. per lb. small lots ingot		ST	DML	6-11-58 (Letter)
	99.95	Mn- <20 Fe- <7	Distillation	Chunks	\$2.00 per lb.		ST	DOW	6-18-58 (Letter)
	99.95	Mn- <40 Fe- <30 Si- <50 Cu- <30	Electro- lytic	20 lb. Ingot	\$0.51 per lb. In 50 lb. lots	DOW Grade 5	ST	DOW	6-18-58 (Letter)
	99.95		MgO + Si	Ingot, rod, granules	\$0.34 + duty 50% ad. val. per lb. small lots ingot		ST	DML	6-11-58 (Letter)
	99.93	Mn- <40 Fe- <300 Al- <20	Electro- lytic	20 lb. Ingot	\$0.49 per lb. In 50 lb. lots	DOW Grade 4	ST	DOW	6-18-58 (Letter)
	99.8			Rods	50 lb. lot \$0.45 per lb. 1 lb. lot \$4.06 per lb.		ST	BS&R	6-23-58 (Letter)

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Toxicity	Producer	Reference
Manganese Mn At. No. 25	99.9	S- 130 Fe- <10 H- 6	Electro-lytic	Plates	\$0.35 per lb.		T	FTMC	6-17-58 (Letter)
	99.9			1/8" thick piece	\$0.35 per lb.		T	EMET	7-1-58 (Letter)
Mercury Hg At. No. 80		Note: producers of special purity mercury send needed data for revised edition.						VT	
Molybdenum Mo At. No. 42	99.9 (min.)		H <sub>2</sub> Reduction	Powder, pellet, wire, rod, sheet, ribbon, fabricated and cut parts, sintered forms, electrodes for vacuum arc melting	By Inquiry		U	GE	5-16-58 (Letter)
	99.9 (min.)	Fe - 50 max. C - 30 mx. O <sub>2</sub> - 500	H <sub>2</sub> Reduction (of MoO <sub>3</sub> )	Powder, rod, sheet, wire	Depends on demensional specifications. Powder \$3.56 - 4.14/lb.		U	FMC	10-4-57 (Letter)
	99.5 to 99.9+		H <sub>2</sub> Reduction	Powder, rod, wire, pellets, electrodes	Powder- \$3.35 to \$4.10 depending on spec.		U	SEP	6-25-58 (Letter)
	99.0 (min.)			Powder, wire	<200 lb., \$3.95 per lb. >1000 lb., \$3.60 per lb.		U	MCA	7-2-58 (Letter)

Manganese  
Mercury  
Molybdenum

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Neodymium Nd At. No. 60	99.5 (min.)	Spectro- analysis furnished on request.	Reduction of anhydrous fluoride with appropriate reductant in tantalum.	Lump, ingot	\$260.00 per lb.	Other form available on request.	U	SEC	8-1-58 (Letter)
	99.+	Ta- 2000 O- 2000 N- 2000 Ca- Trace		1" to 3 1/2" ingot	By Inquiry	Available on special order only	U	MCC	6-25-58 (Letter)
	99.+			Ingot	By Inquiry		U	RCI	6-18-58 (Letter)
	98. to 99.			Lump, ingot	\$400.00 per lb. \$1.50 per gm. for 10-49 gm. \$1.00 per gm. for 50-450 gm.		U	GCC	10-24-57 (Letter)
Neptunium Np At. No. 93	Longest lived isotope is Np <sup>237</sup> , halflife 2.20 x 10 <sup>6</sup> years. Decays by alpha particle emission to Pa <sup>233</sup> . Metal has been prepared in microgram quantities only; for description see: S. Fried and N. R. Davidson, J. Am. Chem. Soc. <u>70</u> , 3539 (1948).							RH	
Nickel Ni At. No. 28	99.9+	Co < 300 Cu < 50 Fe < 50 S < 200 C < 200 H < 200		Powder available in lots to 1 lb.			ST	NLC	1-2-57 (Letter)
	99.6			Shot	\$2.00 per lb. in 5 lb. lots		ST	BS&R	6-23-58 (Letter)

Neodymium  
Neptunium  
Nickel

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Niobium (See Columbium)									
Osmium Os At. No. 76	99.9+	Spectro- analysis furnished on request.		20 mesh sponge	By Inquiry	Prepared on special order	T	JBC	6-24-58 (Letter)
	99.9+	Spectro- analysis furnished on request.		Sponge, ingot, arc-cast buttons, powder	By Inquiry	Prepared on special order	T	EI-A EI-B	6-17-58 (Letter)
	99.5+	Major impurities Si and Pt		20 mesh sponge	By Inquiry		T	JBC	6-24-58 (Letter)
Palladium Pd At. No. 46	99.99	Spectro- analysis furnished on request.		Foil, sheet, sponge, ingot, arc-cast buttons, wire, powder	By Inquiry	Prepared on special order	NT	EI-A	6-17-58 (Letter)
	99.99(?)	Spectro- analysis furnished on request.		Sponge and any fabricated form	By Inquiry	Prepared on special order	NT	JBC	6-24-58 (Letter)
	99.9	Spectro- analysis furnished on request.		Foil, sheet, sponge, ingot, arc-cast buttons, wire, powder	By Inquiry	Prepared on special order	NT	EI-B	6-17-58 (Letter)
	99.7 - 99.9+		Vacuum melted	Bar, sheet, wire			NT	H&H	7-18-58 (Letter)
	99.8+			Sponge and any fabricated form	By Inquiry			JBC	6-24-58 (Letter)

Niobium  
Osmium  
Palladium

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Platinum Pt At. No. 78	99.999			Wire, sheet	By Inquiry	Standard material	NT	SCC	7-21-58 (Letter)
	99.99+	Spectro- analysis furnished on request.		Sheet, wire sponge, ingot, arc-cast buttons	By Inquiry	Prepared on special order.	NT	EI-A	6-27-58 (Letter)
	99.99+, 99.98+ & 99.9+	Spectro- analysis furnished on request.		Sponge, any fabricated form	By Inquiry	99.99+ prepared on special order	NT	JBC	6-24-58 (Letter)
	99.9	Spectro- analysis furnished on request.		Sheet, wire sponge, ingot, arc-cast buttons	By Inquiry	Prepared on special order.	NT	EI-B	6-27-58 (Letter)
Plutonium Pu At. No. 94	Special nuclear material issued by the USAEC only to properly qualified laboratories. Metal can be prepared by calcium reduction of plutonium fluoride. See Anselon, Faugeras and Grison, Compt. rend. 242, 1996 (1956).					Hazards and properties reported in "Nuclear Metallurgy" IMD Special Report Series No. 1 AIME Oct. 17, 1955	VT		
	For information concerning the procurement of plutonium metal correspondence should be directed to the Division of Licensing and Regulation, U. S. Atomic Energy Commission Washington 25, D. C.								
Polonium Po At. No. 84	Longest lived isotope is Po <sup>209</sup> , half-life - ca. 100 years Decays by alpha particle emission to Bi <sup>205</sup> , Metal has been prepared in minute quantities. See USAEC Report No. MDDC-88, by W. H. Beamer and C. R. Maxwell.						RH		
Potassium K At. No. 19	99.9+		Distillation	Cast in drum		Prepared on special order	T	MSA	7-18-58 (Letter)
	99.+		Distillation	Cast in drum	\$4.75 per lb. for 1-5 lb.		T	MSA	7-18-58 (Letter)

Platinum  
Plutonium  
Polonium  
Potassium

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Praseodymium Pr At. No. 59	99.5 (min.)	Spectro- analysis furnished on request.	Reduction of anhydrous fluoride with appropriate reductant in tantalum.	Lump, ingot	\$275.00 per lb.	Other forms available by arrangement	U	SEC	8-1-58 (Letter)
	99.+	Ta- 2000 O- 2000 N- 2000 Ca- Trace		1" to 3 1/2" ingot	By Inquiry	Special order only	U	MCC	6-25-58 (Letter)
	99.+			Ingot	By Inquiry		U	RCI	6-18-58 (Letter)
	99.			1" rod, 2 1/2" ingot	\$200.00 per lb.		U	LNK	6-25-58 (Letter)
	98. to 99.			Lump, ingot	\$400.00 per lb. \$1.50 per gm. for 10-49 gm. \$1.00 per gm. for 50-450 gm.		U	GCC	7-24-57 (Letter)
Promethium Pm At. No. 61	Does not occur naturally, synthetic isotopes are by-products of nuclear fission. Longest lived isotope is Pm <sup>145</sup> , half-life <u>ca.</u> 30 years.							RH	
Protactinium Pa At. No. 91	Longest lived isotope is Pa <sup>231</sup> , half-life $3.43 \times 10^4$ years Decays by alpha particle emission to Ac <sup>227</sup> . Metal has been prepared in small amounts. See R. E. Elson, S. Fried and P. A. Sellers, USAEC Report ANL-4593(1951).							RH	

Praseodymium  
 Promethium  
 Protactinium

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Radium Ra At. No. 88		Longest lived isotope is Ra <sup>226</sup> , half-life 1622 years Decays by alpha particle emission to Rn <sup>222</sup> . Metal can be prepared by electrolysis. See P. Curie and A. Debierne, Compt. rend. <u>151</u> , 523 (1910).					RH		
Rhenium Re At. No. 75	Not specified	Max. total Metallic Impurities- 200 ppm	H <sub>2</sub> Reduction	Powder Strip Wire	\$680.00 per lb. \$800.00 to \$1300.00 per lb. base \$1000.00 up per lb. base		U	CBC	7-1-58 (letter)
	99.9+	Spec. pure	Hydrogen reduction of NH <sub>4</sub> ReO <sub>4</sub>	Powder	1st 10 g.-\$6/g. (Oxidizes in Next 90 g.-\$4.90/g. moist air) Over 100 g.-\$3.80/g.		U	UT	9-6-57 (Letter)
Rhodium Rh At. No. 45	99.99+	Spectro- analysis furnished on request.		Sponge, ingot, arc-cast button, sheet, wire, powder	By Inquiry	Prepared on special order	U	EI-A	6-17-58 (Letter)
	99.99(?)	Spectro- analysis furnished on request.		Sponge, sheet, wire, rod	By Inquiry	Prepared on special order	U	JBC	6-24-58 (Letter)
	99.9	Spectro- analysis furnished on request.		Sponge, ingot, arc- cast button, sheet, wire, powder	By Inquiry	Prepared on special order	U	EI-B	6-17-58 (Letter)
	99.8+	Spectro- analysis furnished on request.		Sponge, sheet, wire, rod	By Inquiry	Prepared on special order	U	JBC	6-24-58 (Letter)

Radium  
Rhenium  
Rhodium

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
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Rubidium Rb At. No. 37		Note: Producers send needed data for revised edition.						U	
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Ruthenium Ru At. No. 44	99.99	Spectro- analysis furnished on request.		Sponge, ingot, arc-cast buttons, powder	By Inquiry	Prepared on special order	T	EI-A	6-17-58 (Letter)
	99.99(?)	Spectro- analysis furnished on request.		20 mesh sponge	By Inquiry	Prepared on special order	T	JBC	6-12-58 (Letter)
	99.9	Spectro- analysis furnished on request.		Sponge, ingot, arc-cast buttons, powder	By Inquiry	Prepared on special order	T	EI-B	6-17-58 (Letter)
	99.8+	Spectro- analysis furnished on request.		20 mesh sponge	By Inquiry	Prepared on special	T	JBC	6-12-58 (Letter)

Rubidium  
Ruthenium

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Samarium Sm At. No. 62	99.5 (min.)	Spectro- analysis furnished on request.		Lump, ingot	\$310.00 per lb.	Other forms available by arrangement.	U	SEC	8-1-58 (Letter)
	99.+	Ta- 2000 N- 2000 O- 2000 Ca- Trace		1" to 3 1/2" ingot	By Inquiry	Available on special order	U	MCC	6-25-58 (Letter)
	99.+			Ingot	By Inquiry		U	RCI	6-18-58 (Letter)
	99.			1" rod, 2 1/2" ingot	\$300.00 per lb.		U	LNK	6-25-58 (Letter)
	98. to 99.			Lump, ingot	\$600.00 per lb. \$2.00 per gm. for 10-49 gm. \$1.50 per gm. for 50-450 gm.		U	GCC	10-24-57 (Letter)
Scandium Sc At.No. 21	99.5 (min.)	Spectro- analysis furnished on request.	Reduction of anhydrous fluoride with appropriate reductant in tantalum.	Lump, ingot	By Inquiry	Other forms available by arrangement	U	SEC	8-1-58 (Letter)
	98.+			Ingot	By Inquiry		U	RCI	6-18-58 (Letter)
Selenium Se At. No. 34	99.999+			Pellets	\$20.00 per lb. Min. order \$10.00		VT	AS&R	6-18-58 (Letter)
	99.9985 (min.)			Pellets	\$18.50 per lb. in lot of 1 lb. down to \$9.50 per lb. in lot of 150 lbs.		VT	KCC	9-16-58 (Letter)

Samarium  
Scandium  
Selenium

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Silicon Si At. No. 14	Transistor Grade	Less than 3 atoms per billion of electrically active impurities.		Segments	\$730.00 per kg.		U	MCW	7-23-58 (Letter)
	Ultra Pure	Less than 0.1 ppm total metallic impurities.	H <sub>2</sub> reduction of a silicon halide	Chunks, rods	\$340.00 per lb.	Semiconductor Grade	U	TII	6-27-58 (Letter)
	Hyper Pure	Less than 1 ppm total metallic impurity.		Needles, dense lumps, cut rods	\$130.00 to \$355.00 per lb. for semiconductor grades. \$90.00 per lb. for solar cell grade.		U	EIDP	6-17-58 (Letter)
	Spectro- graphically Pure	Less than 1 ppm total metallic impurities.		Granules	By Inquiry	Rectifier and transistor grades	U	FTMC	6-17-58 (Letter)
	Very High Purity	Purity specified by resistivity from single crystal.		Ingot	\$7.90 per gm. \$2.20 per gm.	Semiconductor grade Solar cell grade	U	SEP	6-25-58 (Letter)

(Continued on next page)

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Silicon (cont.)	Very High Purity	Purity specified by resistivity from single crystal.		Rods to 1" diam. Cast sticks to 8" diam.	Depends on size.	Infrared & misc. applications	U	SEP	6-25-58 (Letter)
	99.999	Mg- 1 Cu- 1 Al- 1		Dense pieces, rod	\$0.73 per gm. \$0.78 per gm.	Premium Electronic Grade	U	E-P	6-12-58 (Letter)
Silver Ag At. No. 47	99.9999			Cast bar, shot	\$6.00 per troy oz. for less than 20 oz. \$4.50 for 20 oz. or more.		NT	CMSC	7-23-58 (Letter)
	99.999		Chemical pptn	Powder			NT	H&H	6-18-58 (Letter)
	99.99+			Shot	\$2.50 per troy oz. Min. order \$10.00		NT	AS&R	6-18-58 (Letter)
	99.99+	Spectro- analysis furnished on request.		Needles	By Inquiry	Readily available	NT	EI-A	6-17-58 (Letter)
	99.99+		Electro- lytic	Bar, sheet, wire			NT	H&H	6-18-58 (Letter)

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Sodium Na At. No. 11							T		
Note: Producers of special purity sodium send needed data for revised edition.									
Strontium Sr At. No. 38	99.+	Ba- 1000 to 4000 Ca- 60 Al- 40 Pb- 30		Lump, small pieces (3/8" x 5/8")	\$50.00 per lb.	Other forms available by arrangement.	T	KLI	7-18-58 (Letter)
	98.5	Ca- 8000 Mg- 5000 Ba- 1000 N- 500	SrO + Al	Rod, granules	\$8.00 per lb.		T	DML	6-11-58 (Letter)

Sodium  
Strontium

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Tantalum Ta At. No. 73	99.95+	Detailed analysis available on request.		Ingot, rod, wire, sheet, foil	Depends on size and form.	Control of specific impurities available on special order.	U	NRC	6-13-58 (Letter)
	99.9+	O- 50 C- 20 N- 30 Fe- 40max. Cr- 25 " Ni- 20 " Nb- 150 " Si- 250 "	Al- 250max. Mg- 50 " Ti- 50 " Zr- 50 " Cu- 10 " Mo- 25 " Sn- 10 "	Ingot, rod, sheet, wire, foil	Depends on size and form.	Readily available. Powder also available	U	NRC	6-13-58 (Letter)
	99.9+	C- 100 N- 100 Nb- 300	Fe- 200 W- 50 O- 200	Rod, sheet, foil, wire	By Inquiry		U	KMI	7-21-58 (Letter)
	99.9+	Fe- 300 max. C- 300 max.		Rod, sheet	By Inquiry		U	FMC	10-4-57 (Letter)
	99.9+			Rod, sheet, small tubing	By Inquiry	Prepared on special order.	U	JBC	6-24-58 (Letter)
	99.8	Fe- 200 C- 100 W- 400 Nb- 500		Powder	By Inquiry		U	FMC	10-4-57 (Letter)

(Continued on next page)

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Tantalum (cont)	99.8	Powder	Ingot	Powder, ingot, sheet, wire, rod, foil			U	KCC	9-16-58 (Letter)
		O- 1700	- 500						
		C- 300	- 40						
		N- 200	- 100						
		Nb- 500	- 500						
		Fe- 500	- 200						
		Ti- 100	- 30						
		Si- 500	- 200						
		Al- 100	- 30						
	99.8	C- 100		Powder	\$47.50 per lb.		U	KMI	7-21-58 (Letter)
		N- 100							
		Nb- 300							
		Fe- 200							
		W- 50							
		O- 1000							
	Not specified	O- 150 to 200		Powder	By Inquiry		U	HZI	6-24-58 (Letter)
		N- 30							
		Nb- 10							
	99.7	<u>Roundels</u>	<u>Dendrites</u>	Dendrites, roundels, cold-pressed electrodes, ingots as-cast and machined, shapes on request	By Inquiry		U	EMET	7-1-58 (Letter)
		C- 400	- 400						
		O- 1000	- 800						
		H- 30	- 100						
		N- 80	- 100						
		Fe- 100	- 500						
		Si- 100	- 600						
		Nb- 1000	- 1000						
		Ni- 100	- 100						
		W- 100	- 100						

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Technetium Tc At. No. 43							RH		
	Does not occur naturally; synthetic isotopes are by-products of nuclear fission. Longest lived isotope is Tc <sup>99</sup> , half-life 2.12 x 10 <sup>5</sup> years. Decays by electron emission to Ru <sup>99</sup> . Metal has been prepared in milligram quantities; for description see: S. Fried, USAEC Report MDDC-1513 (1947).								
Tellurium Te At. No. 52	99.999+			Crystals	\$30.00 per lb.	Min. order \$10.00	T	AS&R	6-18-58 (Letter)
	99.99+			Crystals	\$15.00 per lb.	Min. order \$10.00	T	AS&R	6-18-58 (Letter)
Terbium Tb At. No. 65	99.5 (min.)	Spectro- analysis furnished on request.	Reduction of anhydrous fluoride with appropriate reductant in tantalum.	Lump, ingot	\$2,850.00 per lb.	Other forms available by arrangement.	U	SEC	8-1-58 (Letter)
	99.+	Ta- 2000 O- 2000 N- 2000 Ca- Trace		1" to 3 1/2" ingot	By Inquiry	Available on special order only.	U	MCC	6-25-58 (Letter)
	99.+			Ingot	By Inquiry		U	RCL	6-18-58 (Letter)
	98. to 99.			Lump, ingot	\$10.00 per gm. for 10-49 gm. \$9.00 per gm. for 50-450 gm.		U	GCC	10-24-57 (Letter)

Technetium  
 Tellurium  
 Terbium

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Thallium Tl At. No. 81	99.95+			Cast Stick	\$15.00 per lb. Min. order \$10.00		VT	AS&R	6-18-58 (Letter)
Thorium Th At. No. 90	High purity	O<50 N<20 C<40 H<10 Al<20 Fe<30 Cu<20 Other metals less than 2 ppm each	Van Arkel- deBoer Iodide Process	Crystal bar			U	MHI	7-3-58 (Letter)
	99.0	O- 2000 Al- 220 Ca- 300 Fe- 500	ThO <sub>2</sub> + Ca	Powder 80% -200 mesh	\$15.00 per lb.		U	DML	6-11-58
	99.	Spectro- analysis furnished on request.		Lump, powder	By Inquiry		U	SEC	8-1-58 (Letter)

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference			
Thulium Tm At. No. 69	99.5% (min.)	Spectro- analysis furnished on request.	Reduction of anhydrous fluoride with appropriate reductant in tantalum. Then vacuum distilled.	Lump, ingot	\$5,320.00 per lb.	Other forms available by arrangement.	U	SEC	8-1-58 (Letter)			
	99.+			Ingot	By Inquiry		U	RCI	6-18-58 (Letter)			
Tin Sn At. No. 50	99.999	≤1 ppm total detectable foreign metals		Bar 1.2 x 0.7 x 7.5 cm. weighs 50 grams, also rods	\$6.00 per 100 grams	Specified as "Spectrographic Tin"	NT	VDC	6-11-58 (Letter)			
	99.998+			Pb ≤ 10 Fe ≤ 5	Electro- lytic refining		Bar 2.2 x 1.5 x 18.5 cm. weighs 1 lb.	\$5.00 per lb.	Specified as "Extra Pure Tin"	NT	VDC	6-11-58 (Letter)
	99.9+						Bar	\$4.18 per lb. \$8.40 for 5 lbs.		NT	BS&R	6-23-58 (Letter)

Thulium  
Tin

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Titanium Ti At. No. 22	Not specified	Si- 100 Al- 40 Mn- 200 Mg- 100 Ca- 500 Cu- 5 O- 200 N- 50 Fe- 20	Van Arkel- deBoer Iodide Process	1/2" x length	By Inquiry		NT	FTMC	4-8-57 (Letter)
	99.5	Fe- 100 N <sub>2</sub> - 200 O <sub>2</sub> - 1000 C- 200 H- 100	Sodium reduction	Sponge, ingot, mill products	\$2.05 per lb.	Purer material in small quantities upon request.	NT	MSM	6-27-58 (Letter)
	Not specified		Sodium reduction	Sponge 3 mesh by down size			NT	EMET	7-1-58 (Letter)
	Not specified	O- 300 to 600 N- 20 to 50 C- 50 to 120 Cl- 0.00		Powder	By Inquiry		NT	HZI	6-24-58 (Letter)
	99.3 (by difference)	N- 200 C- 250 Mg- 800 Cl- 1200 H- 50 H <sub>2</sub> O- 200 Mn- 500 Si- 400 Fe- 1500	Magnesium reduction	Sponge	Sponge \$2.05 per lb. Min. order 100 lbs.	Specified as "A-1 Sponge" Other less pure grades available.	NT	EIDP	6-17-58 (Letter)
	99.3 (min.)	Fe- 1500 Cl- 1500	Magnesium reduction				NT	DOW	6-18-58 (Letter)

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Tungsten W At. No. 74	99.9 (min.)			Powder, rod, sheet	Depends on dimensions. Powder - \$4.07 per lb.		NT	FMC	10-4-57 (Letter)
	99.9 (min.)		H <sub>2</sub> Reduction	Powder, rod, wire, sheet, ribbon, fabricated and cut parts, wires and coils for vacuum metallizing	Depends on type and form. Metal powder \$3.65 per lb.		NT	GE	5-16-58 (Letter)
	Highest Purity		H <sub>2</sub> Reduction	Powder	By Inquiry		NT	SEP	6-25-58 (Letter)
	99.75 to 99.95		H <sub>2</sub> Reduction	Powder, rod, wire, pellets	\$3.15 to \$3.80 depending on specs.		NT	SEP	6-25-58 (Letter)
	98.5- 99.5		H <sub>2</sub> Reduction of pure WO <sub>3</sub>	Powder, wire	\$3.15 per lb.		NT	MCA	7-2-58 (Letter)
Uranium U At. No. 92	Not specified	Fe- 200 Ni- 50 Cr- 100 Mg- 100 Ca- 5 Si- 100 N- 75 O- 50 H- 5 B- 0.1	UF <sub>4</sub> + Ca	6 lb. "Derbies" 4 1/2" diam.	\$45.00 per lb.	Also available in enrichments.	VT	MCW	7-23-58 (Letter)
	Not specified			Ingot or fabricated forms			VT	WRG	Atom Industry Sept. 1958

Tungsten  
Uranium

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Vanadium V At. No. 23	99.6	-1/4" + 20 mesh C- 1000 max. N- 1000 " H- 1000 " O- 1000 "  - 20 mesh C - 1000 max. N - 2500 " H - 1000 " O - 1000 "		Chips (-1/4" + 20 mesh) Powder (-20 mesh) and mill products on custom basis.	By Inquiry		T	EMET	7-1-58 (Letter)
	99.5	C 250 - 600 O 500 - 2000 H 20 - 60 N 400 - 1000 Fe 250 - 750 Cr < 50 Si < 100 Mn < 50 Al < 100 Cr < 50	V <sub>2</sub> O <sub>5</sub> + Ca + thermal booster in bomb	Irregular shapes from -8 mesh up to 25 pounds each piece.  Ingots 2" in diam. up to 5" length. (up to 3 lbs. each)  Wire, sheet, tubes, etc. under development	Typical 1 oz. - \$8.25 1/4 lb. \$21.75 1 to 9 lbs. @ \$65.00 per lb. 250 lbs. and up @ \$40 per lb.	Available for prompt shipment  Larger sizes of ingots on special request	T	VCA	6-24-58 (Letter)

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference	
Ytterbium Yb At. No. 70	99.5 (min.)	Spectro- analysis furnished on request.		Lump, ingot	\$715.00 per lb.	Other forms available by arrangement.	U	SEC	8-1-58 (Letter)	
	99.+			Ta- 2000 O- 2000 N- 2000 Ca- Trace	1" to 3 1/2" ingot	By Inquiry	Available on special order only.	U	MCC	6-25-58 (Letter)
	99.+				Ingot	By Inquiry		U	RCI	6-18-58 (Letter)
	99.				1" rod, 2 1/2" ingot	\$600.00 per lb.		U	LNK	6-25-58 (Letter)
	98. to 99.				Lump, ingot	\$2.00 per gm. for 10-49 gm. \$1.50 per gm. for 50-450 gm.		U	GCC	10-24-57 (Letter)
Yttrium Y At. No. 39	99.5 (min.)	Spectro- analysis furnished on request.	Reduction of anhydrous fluoride with appropriate reductant in tantalum.	Lump, ingot	\$400.00 per lb.	Other forms available by arrangement.	U	SEC	8-1-58	
	99.+			Ta- 2000 O- 2000 N- 2000 Ca- Trace	1" to 3 1/2" ingot	By Inquiry		U	MCC	6-25-58 (Letter)
	99.+				Ingot	By Inquiry		U	RCI	6-18-58 (Letter)
	99.				1" rod, 2 1/2" ingot	\$350.00 per lb.		U	LNK	6-25-58 (Letter)
	98. to 99.				Lump, ingot	\$1.50 per gm. for 10-49 gm. \$1.00 per gm. for 50-450 gm.		U	GCC	10-24-57 (Letter)

Ytterbium  
Yttrium

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Toxicity	Producer	Reference
Zinc Zn At. No. 30	99.9997			2.6 lb. cast bar	\$20.00 per lb. for less than 5 lb. \$15.00 for 5 lb. or more.		ST	CMSC	7-23-58 (Letter)
	99.999+			Cast cake	\$25.00 per lb. Min. order \$10.00		ST	AS&R	6-18-58 (Letter)
	Not specified	Pb- 2 Cd- 0.5 Cu- Trace Mg- " Si- "	Low temperature vacuum distillation of C.P. Zinc metal	Small lumps	\$20.00 per lb. 1 lb. min. commercial quantity	Specified as S.P. Zinc Metal-11 "Super Purity"	ST	NJZ	7-22-57 (Letter)
	99.9975	Pb-10 Cu- 7 Ag- 1 Sb- 0.3	Fe- 3 Cd- 1 As- 0.1	Electro-lytic	Slab Special shapes available on tonnage basis.	All Zn produced is Special High Grade.	ST	BHC	7-5-58 (Letter)
	The following are nil:								
	Ba, Ca, Mg, Sr, Sn, Bi, Hg, Na, B, Al, Si, Be, K, Li, Au, Pt, In, Ga, Tl, Ni, Pd, Ti, Zr, Mn, Cr, V, W, Ta, Co Mo, Te, Se, Ge,								
	Not specified	Pb- 2 Cd- .5 Cu- .5 Fe- 3 As- .06 Sn- .5		Sticks 5/8" diameter by 10" long	\$1.50 per lb. in lots of 25 to 100 lbs. 10 lbs. min. commercial quantity	Specified as C.P. Zinc Metal-9	ST	NJZ	7-22-57 (Letter)
	99.99+			Cast cake	\$2.50 per lb. Min. order \$10.00		ST	AS&R	6-18-58 (Letter)
	99.99			Slab		"Special High Grade Zinc"	ST	NLC	1-2-57 (Letter)

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Zirconium Zr At. No. 40	Not specified	Low Hf	Van Arkel- deBoer Iodide Process		By Inquiry	Reactor Grade	ST	FTMC	4-8-57 (Letter)
	Not specified	Hf- 100 C- 25 Ti- 10 V- 10 Pb- 10 Ni- 50 Cr- 20 Al- 30	Fe- 250 Mg- 10 Mn- 15 N- 20 B- 0.5 O- 200 H- 10	Ingot	By Inquiry	Reactor Grade	ST	NLC	6-20-58 (Letter)
	99.6 (?) (min.)	Al- 75 max. B- 0.5 " Cl- 1300 " Cr- 200 " Co- 20 " Hf- 100 " Fe- 1500 " Pb- 100 "	Mn- 50 max. Ni- 70 " N- 50 " O- 1400 " Si- 100 " Ti- 50 " V- 50 " plus others	Sponge -3/8" + 20 mesh	\$7.50 per lb.		ST	CNC	6-18-58 (Letter)
	99.5 (min.)	Al- 75 max. B- 0.5 " Cl- 1300 " Cr- 200 " Co- 20 " Fe- 1500 " Hf- 100 " Mg- 600 " Mn- 50 " N- 50 " Ni- 70 " Pb- 100 " Si- 100 " Ti- 50 " V- 50 "	Modified Kroll	Sponge -3/8" + 20 mesh	\$7.50 per lb.	Reactor Grade	ST	CMC	6-30-58 (Letter)

(Continued on next page)

Element Symbol Atomic Number	Purity Weight %	Impurities Nominal P.P.M.	Method of Preparation	Forms Available	Price Approx.	Remarks	Tox- icity	Pro- ducer	Reference
Zirconium (cont)	99.5		Na Reduction	Sponge, ingot, mill products	\$7.50 per lb.	Reactor Grade (Purer material in small quantities on request.)	ST	MSM	6-27-58 (Letter)
	Not specified	Hf- 20,000 Si- 50 Al- 20 Mn- 10 Mg- 20 Ca- 40 Fe- 20 Cr- 10 Sn- -- Cu- 5 Ni- -- O <sub>2</sub> - 200 N <sub>2</sub> - 50 Ti- 50	Van Arkel- deBoer Iodide Process	1/2" x length sheet, wire, bar	By Inquiry	Low Hf (Reactor) Grade available on special order	ST	FTMC	4-8-57 (Letter)
	Not specified	On Request		Ingot	10.50 per lb.	Reactor Grade, Machine conditioned	ST	CMC	6-30-58 (Letter)
	Not specified	O- 600 to 900 N- 50 to 500 C- 300 to 500		Powder	By Inquiry	Commercial or Reactor Grade,	ST	HZI	6-24-58 (Letter)





