

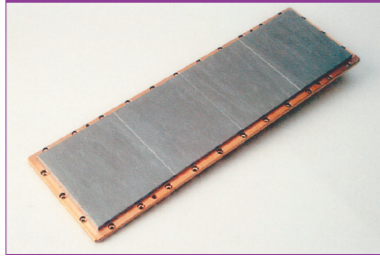
Sputtering Targets

4M Electro-Optics Co.,Ltd

Contents

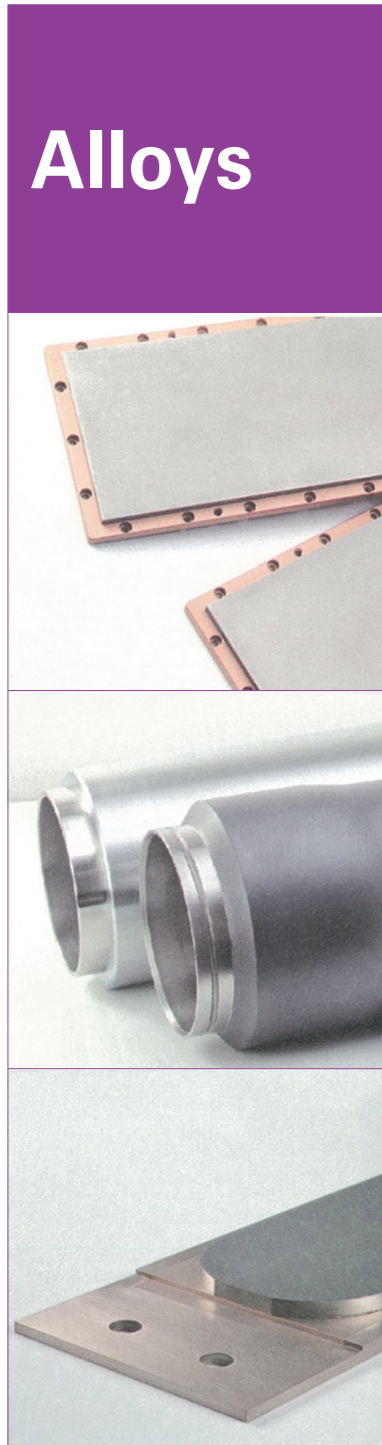
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Pure Metals



Name	Chemical Formula	Purity	Appearance	Density (G/cm ³)	Melting Point °C	Electrical Resistivity (10 ⁻⁹ /cm)	Thermal Resistivity (W/cmK)	Remarks	Risk and Safety Indication
Silver	Ag	99.99%	Silvery	10.5	961	0.63	4.29	Various specifications with circular, rectangular or irregular shape	CAS No.7440-22-4 R48/20/22
Aluminum	Al	99.999% 99.9995%	Silvery White	2.702	660	0.377	2.37	Controllable grain orientation, high uniformity based on fine grain size (avg.<50um)	CAS No.7429-90-5
Gold	Au	99.99% 99.999%	Golden Yellow	19.32	1064	0.452	3.17	Various specifications with circular, rectangular or irregular shape	CAS No.7440-57-5 R48/20/22
Boron	B	99.90%	Yellowish-brown	3.24	2300	1.00E-12	0.274	Various specifications with circular, rectangular or irregular shape	CAS No.7440-42-8
Graphite	C	99.99%	Black	2.26	3500	0.00061	1.29	High purity and high density graphite	CAS No.7782-42-5
Cerium	Ce	99.90%	Gray	6.77	798	0.0115	0.114	Various specifications with circular, rectangular or irregular shape	CAS No.7440-45-1
Cobalt	Co	99.95%	Silvery White	8.9	1495	0.172	1	Various specifications with circular, rectangular or irregular shape	CAS No.7440-48-4
Chromium	Cr	99.8% 99.95%	Gray	7.19	1857	0.0774	0.937	HIP process production to form high density	CAS No.7440-47-3
Copper	Cu	99.97% 99.999% 99.9999%	Reddish orange	8.96	1084.6	0.596	4.01	High uniformity based on fine grain size (avg.<50um)	CAS No.7440-50-8 R48/20/22
Iron	Fe	99.9% 99.99%	Silvery white	7.874	1535	0.0993	0.802	Various specifications with circular, rectangular or irregular shape	CAS No.7439-89-6 R48/20/22
Germanium	Ge	99.999%	Offwhite	5.323	937.4	1.45E-08	0.599	Various specifications with circular, rectangular or irregular shape	CAS No.7440-56-4
Hafnium	Hf	99.90%	Silvery white	13.31	2227	0.0312	0.23	Various specifications with circular, rectangular or irregular shape	CAS No.7440-58-6 S3/14
Indium	In	99.99%	Silvery white	7.31	156.76	0.116	0.816	Various specifications with circular, rectangular or irregular shape	CAS No.7440-74-6
Iridium	Ir	99.95%	White	22.4	2443	0.197	1.47	Density could reach up to 99%	CAS No.7439-88-5
Magnesium	Mg	99.99%	Gray	1.738	649	0.226	1.56	With compact internal organization and smooth surface no cratering on the cross section	CAS No.7439-95-4 S3/14
Molybdenum	Mo	99.95%	Silvery white	10.22	2617	0.187	1.38	High uniformity based on fine grain size (avg. <50um)	CAS No.7439-98-7
Niobium	Nb	99.95%	Silvery gray	8.57	2460	0.0693	0.537	High uniformity based on fine grain size (avg. <50um)	CAS No.7440-3-1
Nickel	Ni	99.995%	White	8.9	1453	0.143	0.907	High uniformity based on fine grain size (avg. <50um)	CAS No.7440-02-0
Osmium	Os	99.90%	Black	22.6	3027	0.109	0.876	Various specifications with circular, rectangular or irregular shape	CAS No.7440-4-2
Palladium	Pd	99.99%	Silvery White	12.02	1552	0.095	0.718	Various specifications with circular, rectangular or irregular shape	CAS No.7440-5-5
Platinum	Pt	99.99%	Silvery White	21.45	1772	0.0966	0.716	Various specifications with circular, rectangular or irregular shape	CAS No.7440-6-4
Rhenium	Re	99.95% 99.99%	Silvery White	21.04	3180	0.0542	0.48	Various specifications with circular, rectangular or irregular shape	CAS No.7440-15-5
Rhodium	Rh	99.99%	Silvery White	12.41	1966	0.211	1.5	Various specifications with circular, rectangular or irregular shape	CAS No.7440-16-6
Ruthenium	Ru	99.95%	Silvery White	12.37	2250	0.137	1.17	Density>95%	CAS No.7440-18-8
Antimony	Sb	99.99% 99.999%	White	6.684	630.9	0.0288	0.243	Various specifications with circular, rectangular or irregular shape	CAS No.7440-36-0
Selenium	Se	99.99%	Dark gray	4.79	221	1.00E-12	0.0204	Various specifications with circular, rectangular or irregular shape	CAS No.7782-49-2
Monocrystalline Silicon	Si	99.99% 99.999%	Dark gray	2.33	1410	<0.05*cm <0.02*cm	1.48	Additional resistivity data available upon request	CAS No.7440-21-3
Polycrystalline Silicon	Si	99.99% 99.999%	Dark gray	2.33	1410	<0.05*cm <0.02*cm	1.48	Additional resistivity data available upon request	CAS No.7440-21-3
Tin	Sn	99.999%	White	7.31	232.06	0.0917	0.666	Fine grain and low gas content	CAS No.7440-31-5
Tantalum	Ta	99.95%	Gray	16.65	2990	0.0761	0.575	High uniformity based on fine grain size (avg. <50um)	CAS No.7440-25-7
Tellurium	Te	99.99%	Silvery white	6.24	449.65	2.00E-06	0.0235	Various specifications with circular, rectangular or irregular shape	CAS No.13494-80-9
Titanium	Ti	99.6% 99.99%	Silvery white	4.5	1660	0.0234	0.219	High uniformity based on fine and equiaxed grain (avg.<10um for 4N5,<20um for 5N)	CAS No.7440-32-6 S3/ 14
Vanadium	V	99.95% 99.99%	Silvery white	6.11	1902	0.0489	0.307	Various specifications with circular, rectangular or irregular shape	CAS No.7440-62-2
Tungsten	W	99.995%	Silvery white	19.35	3407	0.189	1.74	HIP process production to form high density	CAS No.7440-33-7
Zinc	Zn	99.99%	Bluish white	7.13	419.73	0.166	1.16	Various specifications with circular, rectangular or irregular shape	CAS No.7740-66-6 S3/14
Zirconium	Zr	99.90%	Silvery gray	6.51	1852	0.236	0.227	Various specifications with circular, rectangular or irregular shape	CAS No.7440-67-7

Various dimensions and ratios are available upon customers' request



Alloys

Various dimensions and ratios are available upon customers' request

Name	Chemical Formula	Purity	Remarks	Risk and safety Indication
Silver+Copper	Ag+Cu	99.90%	Various specifications with circular, rectangular or irregular shape	CAS No.7440-22-4/7440-S0-8 R48/20/22
Aluminum+Copper	Al+Cu	99.99%	Fine structure with average grain size<50Um	CAS No.7429-90-5/7440-50-8 R48/20/22
Aluminum+Silicon	Al+Si	99.99%	Fine structure with average grain size<50Um	CAS No.7429-90-5/7440-21-3
Gold+Beryllium	Au+Be	99.99%	Various specifications with circular, rectangular or irregular shape	CAS No.7440-57-5/7440-41-7
Gold+Copper	Au+Cu	99.99%	Various specifications with circular, rectangular or irregular shape	CAS No.7440-57-5/7440-50-8 R48/20/22
Gold+Germanium	Au+Ge	99.99%	Various specifications with circular, rectangular or irregular shape	CAS No.7440-57-5/7440-56-4
Gold+Germanium+Nickel	Au+Ge+Ni	99.99%	Fine structure with average grain size<50Um	CAS No.7440-57-5/7440-56-4/7440-02-0
Gold+Germanium+Antimony	Au+Ge+Sb	99.99%	Fine structure with average grain size<50Um	CAS No.7440-57-5/7440-56-4/7440-36-0
Gold+Nickel	Au+Ni	99.90%	Fine structure with average grain size<50Um	CAS No.7440-57-5/7440-02-0
Chromium+Silicon	Cr+Si	99.50%	Various specifications with circular, rectangular or irregular shape	CAS No.7440-47-3/7440-21-3
CIGS	Cu(InGa)Se ₂	99.99%	Various specifications with circular, rectangular or irregular shape	CAS No.7440-S0-8/7440-74-6/7440-55-3/7782-49-2 R48/20/22
Copper+Gallium	Cu+Ga	99.99%	State of the art melting allows for high purity, density and uniformity (avg. grain size <50Um)	CAS No.7440-50-8/7440-55-3 R48/20/22
Copper+Indium	Cu+In	99.99%	State of the art melting allows for high purity, density and uniformity (avg. grain size <50Um)	CAS No.7440-50-8/7440-74-6 R48/ 20/22
Copper+Nickel	Cu+Ni	99.99%	State of the art melting allows for high purity, density and uniformity (avg. grain size <50Um)	CAS No.7440-50-8/7440-02-0 R48/20/22
Copper+Selenium	Cu+Se	99.99%	State of the art melting allows for high purity, density and uniformity (avg. grain size <50Um)	CAS No.7440-50-8/7782-49-2 R48/ 20/22
Copper+Zinc	Cu+Zn	99.99%	State of the art melting allows for high purity, density and uniformity (avg. grain size <50Um)	CAS No.7440-50-8/7440-66-6 R48/ 20/22
Copper+Indium+Selenium	CuInSe ₂	99.99%	State of the art melting allows for high purity, density and uniformity (avg. grain size <50Um)	CAS No.7440-50-8/7440-74-6/7782-49-2 R48/20/22
Iron+Hafnium	Fe+Hf	99.90%	High PTF,fine structure	CAS No.7439-89-6/7440-58-6 R48/ 20/22
Germanium+Antimony	Ge+Sb	99.90%	Various specifications with circular, rectangular or irregular shape	CAS No.7440-56-4/7440-36-0
Germanium+Antimony + Tellurium	Ge+Sb+Te	99.90%	Various specifications with circular, rectangular or irregular shape	CAS No.7440-56-4/7440-36-0/13494-80-9
Germanium+ Tellurium	Ge+Te	99.90%	Various specifications with circular, rectangular or irregular shape	CAS No.7440-56-4/13494-80-9
Indium+ Tin	In+Sn	99.99%	Various specifications with circular, rectangular or irregular shape	CAS No.7440-74-6/7440-31-5 R48/20/22
Indium+Selenium	In ₂ Se ₂	99.99%	Various specifications with circular, rectangular or irregular shape	CAS No.7440-74-6/7782-49-2
Nickel+Chromium	Ni+Cr	99.99%	NiCr targets are available in monoblock and bonded assembly	CAS No.7440-02-0/7440-47-3
Nickel+Platinum	Ni+Pt	99.95%	Mainly used for silicide metallization in Schottky diodes processes	CAS No.7 440-02-0/7 440-6-4
Nicle+Vanadium	Ni+V	99.95%	Mainly used for the formation of resistive films and diffusion barriers	CAS No.7440-02-0/7440-62-2
Osmium+Iridium	Os+Ir	99.90%	Various specifications with circular, rectangular or irregular shape	CAS No.7440-4-2/7439-88-5
Osmium+Iridium+Aluminum	Os+Ir+Al	99.90%	Various specifications with circular, rectangular or irregular shape	CAS No.7440-4-2/7439-88-5/7429-90-5
Osmium+Rhenium	Os+Re	99.90%	Various specifications with circular, rectangular or irregular shape	CAS No.7440-4-2/7440-15-5
Osmium+Ruthenium	OS+Ru	99.90%	Various specifications with circular, rectangular or irregular shape	CAS No.7440-4-2/7440-18-8
Osmium+Tungsten	Os+W	99.90%	Various specifications with circular, rectangular or irregular shape	CAS No.7440-4-2/ 7440-33-7
Palladium+Silver	Pd+Ag	99.90%	Various specifications with circular, rectangular or irregular shape	CAS No.7440-5-5/7440-22-4
Silicon+Antimony+Tellurium	Si+SB+Te	99.99%	Various specifications with circular, rectangular or irregular shape	CAS No.7440-21-3/7440-36-0/13494-80-9
Antimony+Tellurium	Te+SB	99.90%	Various specifications with circular, rectangular or irregular shape	CAS No.13494-80-9/7440-36-0
Titatium+Aluminum	Ti+Al	99.50% 99.99%	Fine structure with average grain size<501Jm	CAS No.7440-32-6/ 7429-90-5
Titanium+Chromium	Ti+Cr	99.50% 99.95%	State of the art melting allows for high purity, density and uniformity (avg. grain size <50urm)	CAS No.7440-32-6/7440-47-3
Titanium+Copper	Ti+Cu	99.90%	State of the art melting allows for high purity, density and uniformity (avg. grain size <50urm)	CAS No.7440-32-6/7440-50-8
Titanium+Nickel	Ti+Ni	99.90%	Fine structure with average grain size<501Jm	CAS No.7440-32-6/7440-02-0
Titanium+Silicon	Ti+Si	99.50%	Various specifications with circular, rectangular or irregular shape	CAS No.7440-32-6/7440-21-3
Titanium+Zirconium	Ti+Zr	99.5% 99.9%	Various specifications with circular, rectangular or irregular shape	CAS No.7440-32-6/7440-67-7
Tungsten+Titanium	W+Ti	99.90%	State of the art melting allows for high purity, density and uniformity (avg. grain size <50urm)	CAS No.7440-33-7/7440-32-6
Zinc+Aluminum	Zn+Al	99.99%	Fine structure with average grain size<501Jm	CAS No.7740-66-6/7429-90-5
Zinc+Selenium	Zn+Se	99.99%	Various specifications with circular, rectangular or irregular shape	CAS No.7740-66-6/7782-49-2
Zinc+Tin	Zn+Sn	99.99%	Various specifications with circular, rectangular or irregular shape	CAS No.7740-66-6/7440-31-5
Zirconium+Aluminum	Zr+Al	99.90%	Fine structure with average grain size<501Jm	CAS No.7440-67-7/7429-90-5
Zirconium+Hafnium	Zr+Hf	99.90% 99.95%	Fine structure with average grain size<501Jm	CAS No.7440-67-7/7440-58-6

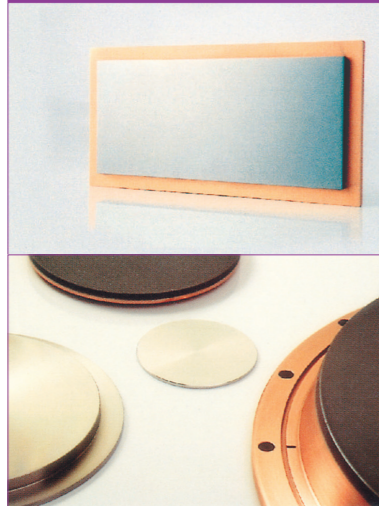
Compounds



Name	Chemical Formula	Purity	Apperance	Density (G/cm ³)	Melting Point °C	Remarks	Risk and Safety Indication
Aluminium oxide	Al ₂ O ₃	99.9% 99.99%	White	3.98	2020	Sintered compact	CAS No.1344-28-1
Aluminum nitride	AlN	99.90%	White	3.26	2400	Optical disc	CAS No.24304-00-5
Antimony doped tin oxide	Sb ₂ O ₃ +SnO ₂ (ATO)	99.99%	Blue			Transparent conductive oxides(TCO)	CAS No.18282-1 0-5/ 13494-80-9
Barium titanate	BaTiO ₃	99.99%	White	6	1500	Tetragonal system	CAS No.12047-27-7
Boron nitride	BN	99%	White	2.25	3000	Hexagonal system	CAS No.1 0043-11-5
Cadmium sulfide	CdS	99.90%	Yellowish-brown	3.91-4.15	1750	Solar energy and thin-film resistor	CAS No.1306-23-6 R21/R22
Cerium dioxide	CeO ₂	99.99%	Straw yellow	7.13	1950		CAS No.1306-38-3 R22
Dichromium trioxide	Cr ₂ O ₃	99.90%	Green	5.21	2275		CAS No.1333-82-0
Chromium silicide	CrSi ₂	99.50%	Gray	5	1570	Hexagonal system	CAS No.12018-09-6
Cupric oxide	CuO	99.90%	Black	6.3-6.49	1326	Monoclinic system	CAS No.1317-38-0 R23/ 24/25
Iron tri oxide	ln ₂ O ₃ +SnO ₂ (ITO)	99.90%	Reddish brown	5.24	1565	Trigonal system	CAS No.1309-37-1
Hafnium oxide	HfO ₂	99.99%	White	9.68	2812	Monoclinic system	CAS No.12055-23-1
Indium oxide	ln ₂ O ₃	99.99%	Straw yellow	7.179	1910	Trigonal system	CAS No.1312-43-2
Indium tin oxide	ITO	99.99%	Yellow-gray			Transparent conductive oxides(TCO)	CAS No.18282-1 0-5/ 1312-43-2 R48/ 20,S22
Lanthanum oxide	La ₂ O ₃	99.99%	White	6.51	2260		CAS No.1312-81-8 R14,S3/ 14
Magnesium oxide	MgO	99.90%	White	3.58	2852	Cubic system	CAS No.1309-48-4
Columbium pentoxide	Nb ₂ O ₅	99.99%	Black	4.47	1530	Sintered compact	CAS No.1313-96-8
Neodymium sesquioxide	Nd ₂ O ₃	99.90%	Lilac colour	7.24	1900	Sintered compact	CAS No.1313-97-9 R22
Nickel oxide	NiO	99.90%	Green	6.7		Sintered compact	CAS No.1313-99-1 R23/ 24,R42/43/45
Silicon nitride	Si ₃ N ₄	99.50%	Gray	3.44	1900	Hexagonal system	CAS No.12033-89-5
Silicon carbide	SiC	99.90%	Atrovirens	3.217	2500	Hexagonal system	CAS No.409-21-2
Silicon monoxide	SiO	99.99%	Yellowish-brown	2.24	1700	Sintered compact	CAS No.10097-28-6
Silicon dioxide	SiO ₂	99.99%	Colourless	2.1	1713	Tetragonal system	CAS No.7631-86-9
Stannic oxide	SnO ₂	99.99%	White	6.95	1630	Tetragonal system	CAS No.18282-1 0-5
Strontium titanate	SrTiO ₃	99.99%	Colourless	4.8	2080	Cubic system	CAS No.12060-59-2
Tantalum pentoxide	Ta ₂ O ₅	99.99%	White	8.74	1800	Sintered compact	CAS No.1314-61-0
Titanium sesquioxide	Ti ₂ O ₃	99.90%	Purple	4.29	1850	Sintered compact	CAS No.1344-54-3
Trititanium pentoxide	Ti ₃ O ₅	99.90%	Purple	4.29	1850	Sintered compact	CAS No.12065-65-5
Titanium nitride	TiN	99.90%	Yellow	5.43	2950	Sintered compact	CAS No.25583-20-4/ 11116-16-8
Titanium monoxide	TiO	99.90%	Orange and black	4.88	1750	Sintered compact	
Titanium dioxide	TiO ₂	99.90%	Black	4.29	1850	Sintered compact	CAS No.13463-67-7
Tungsten oxide	WO ₃	99.90%	Green	12.1	1473	Rhombic system	CAS No.1314-35-8
Yttrium oxide	Y ₂ O ₃	99.99%	White	5	2410	Cubic system	CAS No.1314-36-9
Aluminium zinc oxide	Al ₂ O ₃ +ZnO(ZAO)	99.90%	White			Transparent conductive oxides(TCO)	CAS No.1314-13-2/ 1344-28-
Zinc oxide	ZnO	99.90%	White	5.6	1975	Hexagonal system	CAS No.1314-13-2
Zinc oxide+Silver	ZnO+Ag	99.90%	White			Sintered compact	CAS No.1314-13-2/7440-22-4
Zinc oxide+Aluminium	ZnO+Al	99.90%	White			Sintered compact	CAS No.1314-13-2/7429-90-5
Zinc sulfide	ZnS	99.99%	White	4.102	1700	Hexagonal system	CAS No.1314-98-3
Zirconium nitride	ZrN	99.50%	Yellowish-brown	7.3	2980		CAS No.25658-42-8
Zirconium dioxide	ZrO ₂	99.90%	White	5.49	2715	Sintered compact	CAS No.1314-23-4
Zirconium Yttrium oxide	ZrO ₂ +Y ₂ O ₃ (YSZ)	99.99%	White			Sintered compact	CAS No.1314-23-4/1314-36-9
Zinc tin oxide	ZnO+SnO ₂ (ZTO)	99.90%	White			Transparent conductive oxides(TCO)	CAS No.1314-13-2/18282-10-5

Various dimensions and ratios are available upon customers' request

Application Matrix



Application	Chemical Formula Purity	Remarks
Semi-Conductor	Semi-Conductor	Al, AlSiCu, AlSi, Ti, WTi, Ta, Cu, Au ect.
Optical Disc	ODS	Al, Ag, AgTi, AgPdCu, Au, ZnS-SiO ₂ , AgInAsTe ect.
Magnetic Storage	MDS	CoCrTaZr, Coer, FeCo, CoCrPtTa, CoCrPtB, Ru, IrMn ect.
Large Area Coating	LAC	SUS, Cr, Ti, Ag, NiCr, ZnAl, TiO _x , Sn, SiAl ect.
Flat Panel Display	FPD	Al, Ag, Ni, Au, Cr, Mo, Ta, Ti, Si, SiO ₂ , ITO, AlNd ect.
Photovoltaics	PV	Al, Ag, AZO, ITO, NiV, CuIn, CuInGaSn, Mo ect.
Optoelectronics	OPT	Al, Ag, Si, Ti, Ta, Nb, SiO ₂ , Zr ect.
Gear Cutting Tool Coating	WDC	Cr, Ti, Al, TiAl, Zr ect.
Crystal Oscillator	OSL	Cr, Ag, Au ect.
Thin-film Resistor	RES	NiCr, NiCrSi, CrSi, NiCuCrMn ect.
Decorative Coating	SDC	Ag, Au, CuZn, Ti, TiAl, Sn, NCVm ect.
Electromagnetic Shielding	EMI	SUS, Cu, Sn, Ni, NiCr, Al, Ag, Au ect.

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