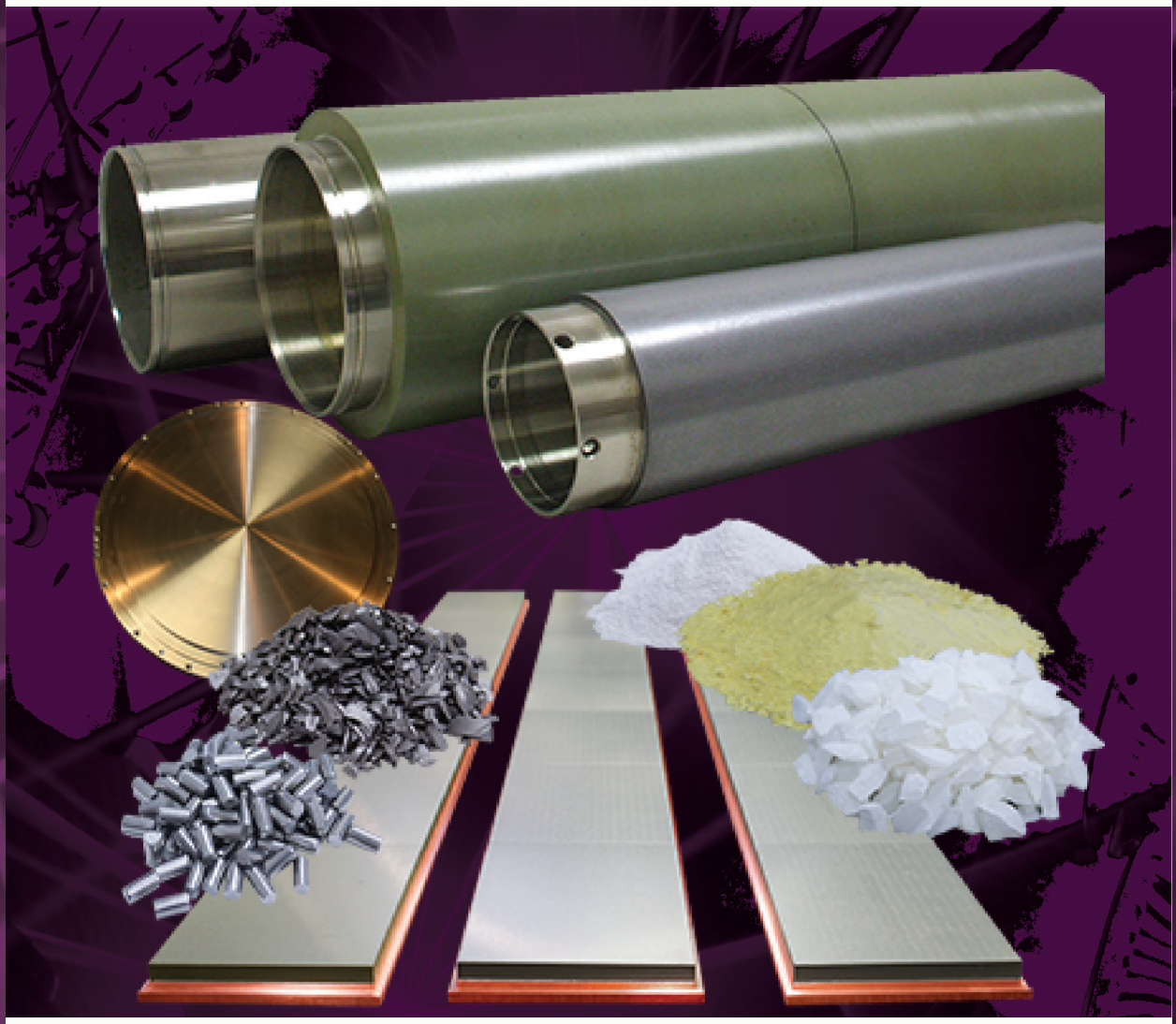
Process Materials, Inc.

ELEMENTS FOR A BETTER WORLD

Planar Targets • Cylindrical Targets • Backing Tubes

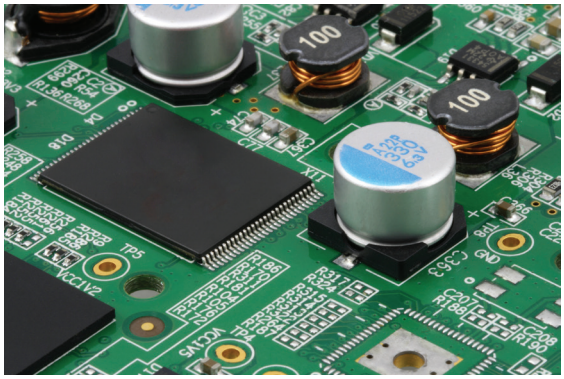


Evaporation Materials • Powders • Bonding Services

Process Materials, Inc.
269 Technology Way Suite B-6
Rocklin, CA. 95765 U.S.A.
www.processmaterials.com

About Us

Founded in 1997, Process Materials has earned a global reputation for its commitment to quality and service, where trust is as important as technical knowledge.



Process Materials assigns every order with proven techniques, flexible capabilities, and the finest fabrication, measuring, and testing equipment.

We believe that our corporation's future rests on its corporate values and company culture. We maintain these values as part of our daily operations.

Advanced Manufacturing

Material Knowledge

Research & Development

PMI

Process Materials, Inc.

Elements for a Better World

Powder & Product Development Solutions

Sales & Service

Process Materials is a worldwide supplier and marketer of sputtering targets, both planar and cylindrical, evaporation materials, powders, backing plates, and bonding services. We are focused on providing and perfecting the highest level of performance.

Analysis of materials includes glow discharge mass spectrometer (GDMS), testing for trace elements, atomic absorption testing for major contaminates within the metal, and c-scan testing for bond integrity.

Process Materials' Total Quality Management (TQM) system guarantees the highest possible product reliability. Documentation, traceability, statistical process control, and detailed test and process specifications are all important elements of our continuous improvement process.

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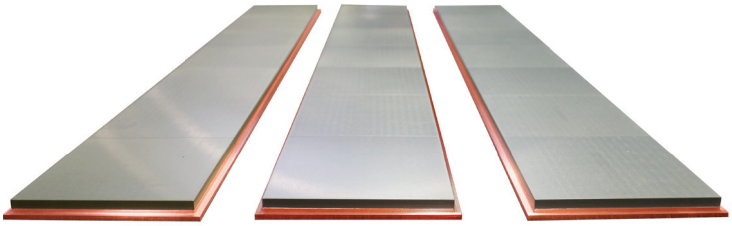
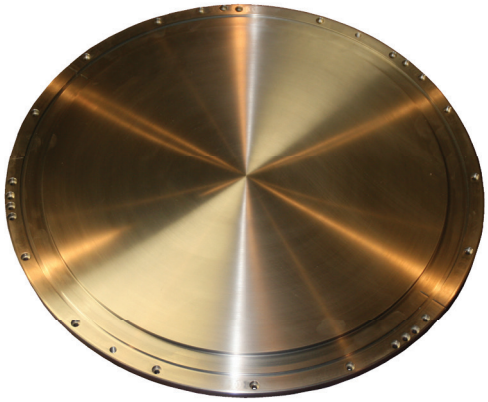
Product List

Our planar materials capabilities range from prototyping to a full product array. Melting/casting, rolling, sintering, pressing and vacuum-induction melting are part of our most advance processes that ensure you are receiving the highest quality products.



Process Materials, Inc. supplies a wide variety of different sized targets for all major sputtering systems.

Our rotatable target lengths are available up to 4000mm. We provide magnetron-specific end block fixation, thermal spray or cast cylindrical targets in dog-bone or straight configuration. The target surfaces can be finished or unfinished.

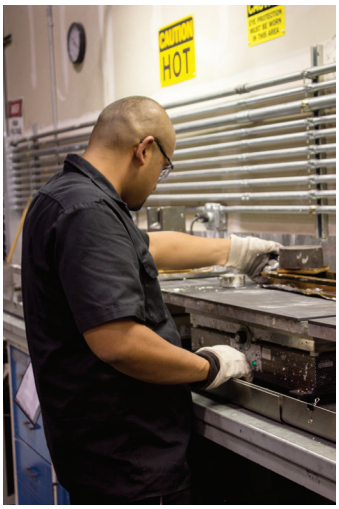


PMI offers standard and custom backing plates to suit your specific sputtering processes. We offer backing plate materials, such as oxygen-free, high conductivity copper (OFHC), molybdenum, titanium, aluminum (alloys) and stainless steel in different sizes, shapes, and geometries.

PMI supplies materials to the optics, medical, architectural glass, electronics, automotive, aerospace, fiber optics, crystal growth and fuel cell industries among others. We now offer atomizing powders with exact stoichiometric results.

In additional to our standard catalogue of high quality products, PMI has been designing, synthesizing, and offering custom material formulations since 1999.

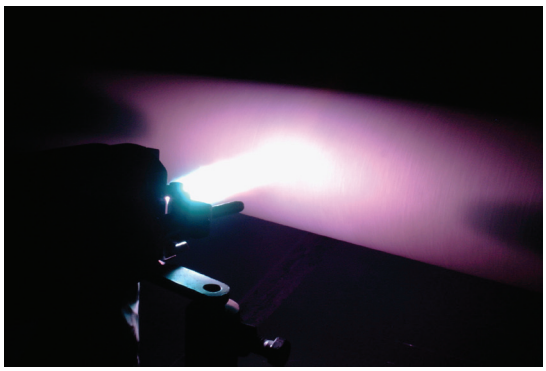
Our manufacturing systems enable us to make adjustments to materials and processing techniques at whatever point necessary. This ensures a perfect match to the exact requirements of our customers' specifications.



Process Materials has developed a sophisticated and reliable bonding method. Thin film adhesion, diffusion barrier, and metallization are sputtered to the back of each target, followed by a temperature controlled metallic solder seal between the target and the backing plate.

We provide several products for thermal spraying applications including plasma, wire flame, powder, and wire arc spraying. This technology is especially advantageous for rotatable sputtering targets.

Plasma sprayed materials can be applied in thicknesses ranging from thin R&D applications to production coating requirements.



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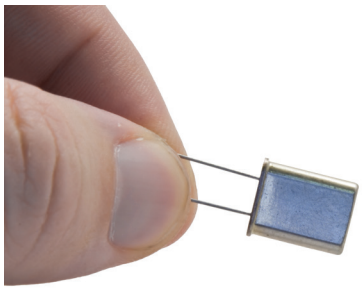
Applications

PHOTOVOLTAICS: The photovoltaics industry is served by Process Materials because of their strict quality control and product guarantee.
Target materials include:

- Al
- AlSi
- Etc.
- AZO
- ITO

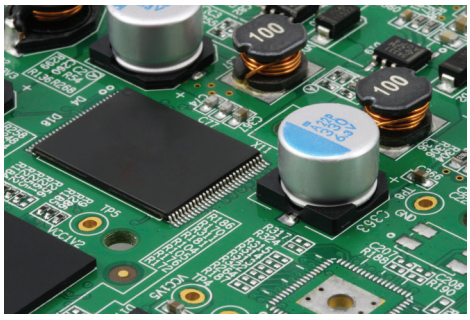


CRYSTAL OSCILLATORS: The crystal oscillator industry utilizes PMI products for their highest quality materials.
Target materials include:

- Ta_2O_5
- SiO_5
- Nb
- Ti
- SiAl
- Au
- Cr
- ZnAl
- TiOx
- Ta

THIN FILM RESISTOR: Process Materials provides the following materials for the thin film resistor industry.
Target materials include:

- NiCr
- NiCrSi
- Etc.
- CrSi
- NiCrCrMn



OPTICAL DISK: For the highest quality reflectivity, see Process Materials' full line of products for this industry.
Target materials include:

- Al
- Ag
- AgTi
- AgPdCu
- Au
- Etc.
- $Zns-SiO_2$
- AgInAsTe

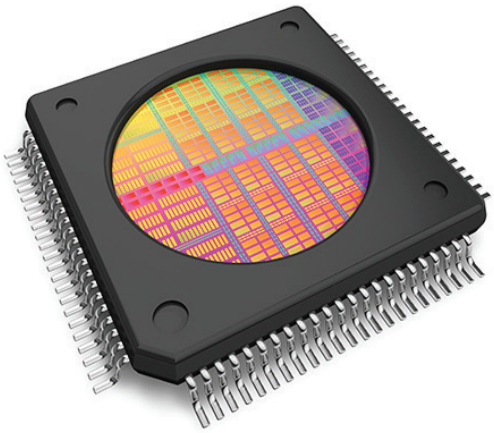
DECORATIVE COATING: PMI has a broad variety of sputter materials for the decorative coating industry. From bathroom faucets to wheel rims, we have the products to help you create your decorative items with superior coating.
Target materials include:

- Ag
- Cr
- Nb
- SST
- Ti
- NiCr
- Si
- Etc.
- SiAl
- ZnAl
- TiOx

WEAR RESISTANT COATING: Industries involved in the wear resistance coating rely upon PMI to provide quality materials.

Target materials include:

- Cr
- Al_2O_3
- Ni
- SiO_2
- W
- TiAl
- Zr
- Etc.



Industries, such as SEMICONDUCTOR, recognize the importance of PMI's quality materials. This industry uses the following materials:

- Al
- AlSiCu
- AlSi
- Ti
- Au
- Cu
- Ta
- Etc.

FLAT PANEL DISPLAY: This ever-emerging industry is consistently on the cutting edge of technology. Partners in this industry recognize the flexibility and quality of our products.

Target materials include:

- Al
- Ag
- Mo
- SiO_2
- ITO
- Si
- Ta
- Etc.

MAGNETIC STORAGE: PMI serves the magnetic storage industry by supplying certified products.

- CoCrTaZr
- CoCr
- CoCrPtTa
- IrMn
- FeCo
- CoCrPtB
- Ru
- Etc.

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Metals

Materials & Composition	Typical Purity	Density	Melting Pt. C	Electrical Resistivity	Thermal Resistivity	Risk & Safety Indication
Ag Silver:	99.9%-99.99%	10.5	961	0.63	4.29	CAS No.. 7440-22-4 R48/20/22
Al Aluminum	99.9%-99.9999%	2.702	660	0.377	2.37	CAS No. 7429-90-5
Au Gold	99.9%-99.999%	19.32	1064	0.452	3.17	CAS No. 7440-57.5 R48/20/22
B Boron	99.9%	3.24	2300	1.00E-12	0.274	CAS No. 7440-42-8
Ba Barium	99.5%	3.51	727	0.332	0.184	CAS No. 7440-39-3
Bi Bismuth	99.5%-99.999%	4.78	271.5	0.129	0.797	CAS No 7440-69-9
C Carbon/Graphite	99.9%-99.999%	2.26	3500	0.00061	1.29	CAS No. 7782-42-5
Cd Cadmium	99.5%-99.999%	8.65	32.1	0.727	0.308	CAS No. 7440-43-4
Ce Cerium	99.9%	6.77	798	0.0115	0.114	CAS No. 7440-45-1
Co Cobalt	99.8%-99.95%	8.9	1495	0.172	1	CAS No. 7440-48-4
Cr Chromium	99.8%-99.99%	7.19	1857	0.0774	0.937	CAS No. 7440-47-3
Cu Copper	99.9%-99.9999%	8.96	1084.6	0.596	4.01	CAS No. 7440-50-8 R48/20/22
Fe Iron	99.9%-99.99%	7.874	1535	0.0993	0.802	CAS No. 7439-89-6 R48/20/22
Ga Gallium	99.999%-99.9999%	5.91	29.7646	0.270	0.406	CAS No. 7440-55-3
Ge Germanium	99.999%	5.323	937.4	1.45E-08	0.599	CAS No. 7440-56-4
Hf Hafnium	99.9% (ex. Zr)	13.31	2227	0.0312	0.23	CAS No. 7440-58-6 S3/14
In Indium	99.99%	7.31	156.76	0.116	0.816	CAS No. 7440-74-6
Ir Iridium	99.8%-99.95%	22.4	2443	0.197	1.47	CAS No. 7439-88-5

Materials & Composition	Typical Purity	Density	Melting Pt. C	Electrical Resistivity	Thermal Resistivity	Risk & Safety Indication
La Lanthanum:	99.9%	0.162	920	0.615	2.134	CAS No. 7439-91-0
Mg Magnesium	99.99%	1.738	649	0.226	1.56	CAS No. 7439-95-4 S3/14
Mn Manganese	99.9%	7.43	1245	0.144	2.781	CAS No. 7439-96-5
Mo Molybdenum	99.95%	10.22	2617	0.187	1.38	CAS No. 7439-98-7
Nb Niobium	99.8%-99.95%	8.57	2460	0.0693	0.537	CAS No. 7440-3-1
Ni Nickel	99.99%-99.995%	8.9	1453	0.143	0.907	CAS No. 7440-02-0
Os Osmium	99.9%	22.6	3027	0.109	0.876	CAS No. 7440-4-2
Pd Palladium	99.95%-99.99%	12.02	1552	0.095	0.718	CAS No. 7440-5-5
Pt Platinum	99.9%-99.99%	21.45	1772	0.0966	0.716	CAS No. 7440-6-4
Re Rhenium	99.95%-99.99%	21.04	3180	0.0542	0.48	CAS No. 7440-15-5
Rh Rhodium	99.8%-99.99%	12.41	1966	0.211	1.5	CAS No. 7440-16-6
Ru Ruthenium	99.5%-99.95%	12.37	2250	0.137	1.17	CAS No. 7440-18-8
Sb Antimony	99.99%-99.999%	6.684	630.9	0.0288	0.243	CAS No. 7440-20-2
Sc Scandium	99.9%	3	1539	0.562	0.158	CAS No. 7782-49-2
Se Selenium	99.99%-99.999%	4.79	221	1.00E-12	0.204	CAS No. 7782-49-2
Si Silicon	99.99%-99.999%	2.33	1410	<0.05Ω●cm - <0.02Ω●cm	1.48	CAS No . 7440.21.3
Sr Strontium	98%	2.6	768	0.132	0.354	CAS No. 7440-26-6
Sn Tin	99.999%	7.31	232.06	0.0917	0.666	CAS No. 7440-31-5

Metals/Alloys

Materials & Composition	Typical Purity	Density	Melting Pt. C	Electrical Resistivity	Thermal Resistivity	Risk & Safety Indication
Ta Tantalum	99.95%	16.65	2990	0.0761	0.575	CAS No. 7440-25-7
Te Tellurium	99.99%-99.999%	6.24	449.65	2.00E-06	0.0235	CAS No. 13494-80-9
Ti Titanium	99.2%-99.995%	4.5	1660	0.0234	0.0204	CAS No. 7440-32-6 S3/14
V Vanadium	99.8%-99.99%	6.11	1902	0.0489	0.307	CAS No. 7440-62-2
W Tungsten	99.95%-99.99%	19.35	3407	0.189	1.74	CAS No. 7440-33-7
Y Yttrium	99.9%	4.47	1509	0.596	1.72	CAS No. 7440-65-5
Zn Zinc	99.9%	7.13	419.73	0.166	1.16	CAS No. 7440-66-6
Zr Zirconium	99.9%	6.51	1852	0.0236	0.227	CAS No. 7440-67-7

Materials & Composition	Typical Purity	Risk & Safety Indication
AG + Cu Silver + Copper	99.9%	CAS No. 7440-22-4/7440-50-8 | R48/20/22
Al+Cu Aluminum + Copper	99.99%	CAS No. 7429-90-5/7440-50-8 | R48/20/22
Al + Cr Aluminum + Chromium	99.9%-99.99%	CAS No. 7429-90-5/7400-50-8
Al + Si Aluminum + Silicon	99.99%	CAS No. 7429-90-5/7440-21-3
Al + Ti Aluminum + Titanium	99.95%	CAS No.7429-90-5/7440-32-6
Au + Be Gold + Beryllium	99.99%	CAS No. 7440-57-5/7440-41-7
Au + Cu Gold + Copper	99.99%	CAS No. 7440-57-5/7440-50-8 | R48/20/22
Au + Ge Gold + Germanium	99.99%	CAS No. 7440-57-5/7440-56-4
Au + Ge + Ni Gold + Germanium + Nickel	99.99%	CAS No. 7440-57-5/7440-56-4/7440-02-0

Alloys

Materials & Composition	Typical Purity	Risk & Safety Indication
Au + Ge + Sb Gold + Germanium + Antimony	99.99%	CAS No. 7440-57-5/7440-56-4/7440-36-0
Co + Ni Cobalt + Nickel	99.95%	CAS No. 7440-48-4/7440-02-0
Au + Ni Gold + Nickel	99.9%	CAS No. 7440-57-5/7440-02-0
Cr + Si Chromium + Silicon	99.5%	CAS No. 7440-47-3/7440-21-3
$Cu(InGa)Se_2$ CIGS	99.99%	CAS No. 7440-50-8/7440-74-6/7440-55-3/7782-49-2 | R48/20/22
Cu + Ga Copper + Gallium	99.99%	CAS No. 7440-50-8/7440-55-3 | R48/20/22
Cu + In Copper + Indium	99.99%	CAS No. 7440-50-8/7440-74-6 | R48/20/22
Cu + Ni Copper + Nickel	99.99%	CAS No. 7440-50-8/7440-02-0 | R48/20/22
Cu + Se Copper + Selenium	99.99%	CAS No. 7440-50-8/7782-49-2 | R48/20/22
Cu + Zn Copper + Zinc	99.99%	CAS No. 7440-50-8/7440-66-6 | R48/20/22
$CuInSe_2$ Copper + Indium + Selenium	99.99%	CAS No. 7440-50-8/7440-74-6/7782-49-2 | R48/20/22
Fe + Hf Iron + Hafnium	99.9%	CAS No. 7439-89-6/7440-58-6 | R48/20/22
Fe + Ni Iron + Nickel	99.9%	CAS No. 7439-89-6/7440-02-0
Ge + Sb Germanium + Antimony	99.9%	CAS No. 7440-56-4/7440-36-0
Ge + Sb + Te Germanium + Antimony + Tellurium	99.9%	CAS No. 7440-56-4/7440-36-0/13494-80-9
Ge + Te Germanium + Tellurium	99.9%	CAS No. 7440-56-4/13494-80-9
In + Sn Indium + Tin	99.99%	CAS No. 7440-74-6/7440-31-5 | R48/20/22
In_2Se_3 Indium + Selenium	99.99%	CAS No. 7440-74-6/7782-49-2

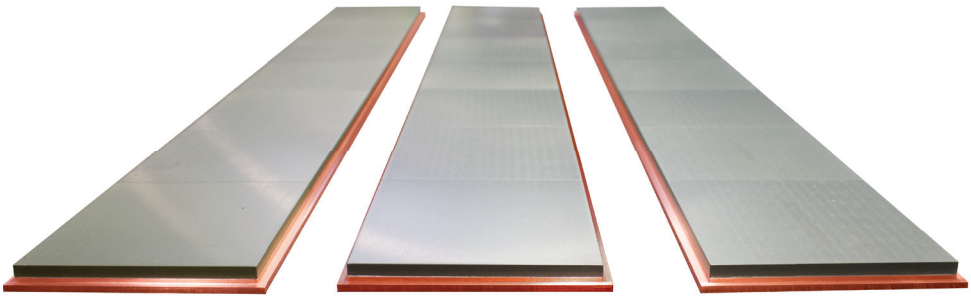
Alloys

Materials & Composition	Typical Purity	Risk & Safety Indication
Ni + Cr Nickel + Chromium	99.99%	CAS No. 7440-02-0/7440-47-3
Ni + Pt Nickel + Platinum	99.95%	CAS No. 7440-02-0/7440-6-4
Ni + V Nickel + Vandium	99.95%	CAS No. 7440-02-0/7440-62-2
Os + Ir Osmium + Iridium	99.9%	CAS No. 7440-4-2/7439-88-5
OS + Ir + Al Osmium + Iridium + Aluminum	99.9%	CAS No. 7440-4-2/7439-88-5/7429-90-5
Os + Re Osmium + Rhenium	99.9%	CAS No. 7440-4-2-/7440-15-5
Os + Ru Osmium + Ruthenium	99.9%	CAS No. 7440-4-2/7440-18-8
Os + W Osmium + Tungsten	99.9%	CAS No. 7440-4-2/7440-33-7
Pd + Ag Palladium + Silver	99.9%	CAS No. 7440-5-5/7440-22-4
Si + Sb + Te Silicon + Antimony + Tellurium	99.99%	CAS No. 7440-21-3/7440-36-0/13494-80-9
Te + Sb Tellerium + Antimony	99.9%	CAS No. 7440-36-0/13494-80-9
Ti + Al Titanium + Aluminum	99.5% | 99.99%	CAS No. 7440-32-6/7429-90-5
Ti + Cr Titanium + Chromium	99.5% | 99.99%	CAS No. 7440-32-6/7440-47-3
Ti + Cu Titanium + Copper	99.9%	CAS No. 7440-32-6/7440-50-8
Ti + Ni Titanium + Nickel	99.9%	CAS No. 7440-32-6/7440-02-0
Ti + Si Titanium + Silicon	99.5%	CAS No. 7440-32-6/7440-21-3
Ti + Zr Titanium + Zirconium	99.5% | 99.9%	CAS No. 7440-32-6/7440-67-7
W + Ti Tungsten + Titanium	99.9%	CAS No. 7440-33-7/7440-32-6

Alloys & Compounds

Materials & Composition	Typical Purity	Risk & Safety Indication
Zn + Al Zinc + Aluminum	99.9%	CAS No. 7740-66-6/7429-90-5
Zn + Se Zinc + Selenium	99.99%	CAS No. 7740-66-6/7782-49-2
Zn + Sn Zinc + Tin	99.99%	CAS No. 7740-66-6/7440-31-5
Zr + Al Zirconium + Aluminum	99.9%	CAS No. 7440-67-7/7429-90-5
Zr + Hf Zirconium + Hafnium	99.9% | 99.95%	CAS No. 7440-67-7/7440-58-6

Materials & Composition	Typical Purity	Density	Melting Pt. °C	Risk & Safety Indication
Al_2O_3 Aluminum Oxide	99.9% | 99.99%	3.98	2020	CAS No. 1344-28-1
Al_2O_2+*ZnO (ZA0)* Aluminum Oxide + Zinc Oxide	99.9%			CAS No. 1314-13-2/1344-28-1
AlN Aluminum Nitride	99.9%	3.26	2400	CAS No. 24304-00-5
Sb_2O_3+SnO_2 *(ATO)* Antimony-doped Tin Oxide	99.9%			CAS No. 18282-10-5/13494-80-9
$BaTiO_3$ Barium Titanate	99.99%	6	1500	CAS No. 12047-27-7
BN Boron Nitride	99%	2.25	3000	CAS No. 10043-11-5
CdS Cadmium Sulfide	99.9%	3.91~4.15	1750	CAS No. 1306-23-6 | R21//22
CeO_2 Cerium Dioxide	99.99%	7.13	1950	CAS No. 1306-38-3 | R22



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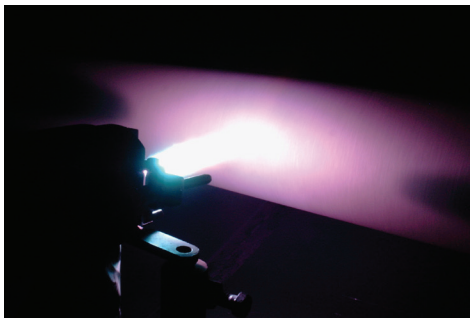
Target Compounds

Materials & Composition	Typical Purity	Density	Melting Pt. °C	Risk & Safety Indication
$CrSi_2$ Chromium Silicide	99.5%	5	1570	CAS No. 12018-09-6
CuO Cupric Oxide	99.9%	6.3˜6.49	1326	CAS No. 1317-38-0 | R23/24/25
HfO_2 Hafnium Oxide	99.99%	9.68	2812	CAS No. 12055-23-1
In_2O_3 Indium Oxide	99.99%	7.179	1910	CAS No. 1312-43-2
ITO Indium Tin Oxide	99.99%		1500	CAS No. 18282-10-5/1312-43-2 | R48/20, S22
La_2O_3 Lanthanum Oxide	99.99%	6.51	2260	CAS No. 1312-81-8 | R14,S3/14
MgO Magnesium Oxide	99.9%	3.58	2852	CAS No. 1309-48-4
Nd_2O_3 Neodymium Sesquioxide	99.9%	7.24	1900	CAS No. 1313-97-9 | R22
NiO Nickel Oxide	99.9%	6.7		CAS No. 1313-99-1 | R23/24, Nickel R42/43/45
Nb_2O_5 Niobium Pentoxide	99.99%	4.47	1530	CAS No. 1313-96-8
Si_3N_4 Silicon Nitride	99.5%	3.44	1900	CAS No. 12033-89-5
SiO Silicon Monoxide	99.99%	2.24	1700	CAS No. 10097-28-6
SiO_2 Silicon Dioxide	99.99%	2.1	1713	CAS No. 7631-86-9
SnO_2 Tin Oxide	99.99%	6.95	1630	CAS No 18282-10-5
$SrTiO_3$ Strontium Titanate	99.99%	4.8	2080	CAS No. 12060-59-2
Ta_2O_5 Tantalum Pentoxide	99.99%	8.74	1800	CAS No. 1314-61-0
Ti_2O_3 Titanium Oxide	99.9%	4.29	1850	CAS No. 1344-54-3
TiN Titanium Nitride	99.9%	5.43	2950	CAS No. 25583-20-4/11116-16-8

Target Compounds

Materials & Composition	Typical Purity	Density	Melting Pt. °C	Risk & Safety Indication
Ti_3O_5 Titanium Pentoxide	99.9%	4.29	1850	CAS No. 1265-65-5
TiN Titanium Nitride	99.9%	5.43	2950	CAS No. 25583-20-4/11116-16-8
TiO Titanium Monoxide	99.9%	4.88	1750	
TiO_2 Titanium Dioxide	99.9%	4.29	1850	CAS No. 13463-67-7
WO_3 Tungsten Oxide	99.9%	12.1	1473	CAS No. 1314-35-8
Y_2O_3 Yttrium Oxide	99.99%	5	2410	CAS No. 1314-36-9
ZnO Zinc Oxide	99.9%	5.6	1975	CAS No. 1314-13-2
ZnO+Ag Zinc Oxide + Silver	99.9%			CAS No. 1314-13-2/7440-22-4
ZnO + Al Zinc Oxide + Aluminum	99.9%			CAS No. 1314-13-2/7429-90-5
ZnS Zinc Sulfide	99.99%	4.102	1700	CAS No. 1314-98-3
ZrN Zirconium Nitride	99.5%	7.3	2980	CAS No. 25658-42-8
ZrO_2 Zirconium Dioxide	99.9%	5.49	2715	CAS No. 1314-23-4
$ZrO_2 + Y_2O_3$ *(YSZ)* Zirconium Yttrium Oxide	99.99%			CAS No. 1314-23-4/1314-36-9
ZnO + SnO_2 *(ZTO)* Zinc Tin Oxide	99.9%			CAS No. 1314-13-2/18282-10-5



269 Technology Way Suite B-6, Rocklin, CA. 95765 U.S.A.

Evaporation Materials

Materials & Composition	Melting Pt. ºC	Typical Purity	Refractive Index*	Shapes: Granules	Shapes: Tablets	Shapes: Crystal Granules	Transparency Range	Risk & Safety Indication
LOW REFRACTIVE INDEX MATERIALS:								
CAF_2 Calcium Fluoride	1360	99.9-99.999%	1.23-1.46		•	•	0.15-12µm	CAS No. 7789-75-5
NaF Sodium Fluoride	992	99.9%	1.29-1.30		•	•	0.2-14µm	CAS No. 7681-49-4
Na_3AiF_6 Cryolite	1000	99.9%	1.32-1.35	•	•		0.2-14µm	CAS No. 1506-52-3 | R48/23/25 R20/22,R51/53,S45,S60,S61
KF Potassium Fluoride	880	99.95%	1.35	•	•			CAS No. 7789-23-3
MgF_2 Magnesium Fluoride	1266	99.99%	1.38			•	0.11-10µm	CAS No.7783-40-6 | R20/21/22 R36/37/38, R64, S22,S26,S28, S36/37
AlF_3 Aluminum Fluoride	900	99.9%	1.38	•			0.2-20µm	CAS No. 7784-18-1
SiO_2 Silicon Dioxide	1700	99.99%	1.45-1.46	•	•	•	0.2˜9µm	CAS No. 7631-86-9
BaF_2 Barium Flouride	1280	99.9%	1.47	•	•		0.25-15µm	CAS No. 7787-32-8 | R20/21/22
$Sio_2 + Ai_2O_3$ Silicon Dioxide + Aluminum Oxide	2000	99.99%	1.48	•	•		0.3-7µm	CAS No. 7631-86-9/1344-28-1
YbF_3 Ytterbium Fluoride	1157	99.99%	1.52	•			0.22-12µm	CAS No. 13760-80-0
MEDIUM REFRACTIVE INDEX MATERIALS:								
Al_2O_3 Aluminum Oxide	2020	99.9%	1.54	•	•	•	0.17˜9µm	CAS No. 1344-28-1
LaF_3 Lanthanum Fluoride	1490	99.9-99.99%	1.55	•	•		0.2-12µm	CAS No. 13709-38-1 | R20/21/ 22, R36/37/38,R64, S22,S26 S28,S36/37
YF_3 Yttrium Fluoride	1387	99.9%	1.59	•			0.22-14µm	CAS No.13709-49-4 | R20/21/22 R36/37/38,S22,S26,S28
SmF_3 Samarium Fluoride	1306	99.99%	1.59	•			0.22-14µm	CAS No. 13765-24-7
NdF_3 Neodymium Fluoride	1410	99.9%	1.61	•	•		0.22-6µm	CAS no.13709-42-7 | R20/21/22 R36/37/38,S22, S26,S28
CeF_3 Cerium Fluoride	1460	99.9%	1.63	•	•		0.22-14µm	R20/21/22,R36/37/38, S22, S26,S28

* Index measured at 550nm

Materials & Composition	Melting Pt. °C	Typical Purity	Refractive Index*	Shapes: Granules	Shapes: Tablets	Shapes: Crystal Granules	Transparency Range	Risk & Safety Indication
MEDIUM REFRACTIVE INDEX MATERIALS (Cont.):								
WO_3 Tungsten Oxide	1473	99.9%	1.65-1.7	•	•		0.36~10µm	CAS No. 1314-35-8
$Ai_2O_3+TiO_2$ Aluminum Oxide + Titanium Dioxide	1127	99.9%	1.7		•	•		CAS No. 1344-28-1/13463-67-7
MgO Magnesium Oxide		99.9%	1.7	•	•		0.23~9µm	CAS No. 1309-48-4
$ZrO_2+A_{l2}O_3$ Zirconium Dioxide+Aluminum Oxide		99.99%	1.7	•	•			CAS No. 1314-23-4/1344-28-1
BiF_3 Bismuth Flouride	722	99.9%	1.74 (1µm)	•	•		0.26~20µm	CAS No. 7787-61-3
$BaTiO_3$ Barium Titanate	1620	99.99%	1.66 (10µm)	•	•			CAS No. 12047-27-7
$SnO+Al_2O_3$ Tin Oxide + Aluminum Oxide		99.9%		•	•			CAS No. 21651-19-4/1344-28-1
$SrTiO_3$ Stronium Titanate		99.9%		•	•			CAS No. 12060-59-2
HIGH REFRACTIVE INDEX MATERIALS:								
$Sc2O_3$ Scandium Oxide: UV coating	2300	99.9%	1.86	•	•		0.35-13µm	CAS No. 12060-08-1
Y_2O_3 Yttrium Oxide: Insulative coating	2410	99.99%	1.87	•	•		0.3~12µm	CAS No. 1314-36-9
SiO Silicon Monoxide	1700	99.9%	1.8-1.9	•	•		0.4-9µm	CAS No. 10097-28-6
Ti_2O_3 Titanium Oxide	1800	99.9%	1.9-2.3	•	•	•	0.4~12µm	CAS No. 1344-54-3
TiO Titanium Monoxide	1750	99.9%	1.9-2.3	•	•		0.4~12µm	CAS No. 12137-20-1
TiO_2 Titanium Dioxide	1850	99.99%	1.9-2.3	•	•		0.36~9µm	CAS No. 13463-67-7
PrO_{11} Praseodymium Oxide	2125	99.9%	1.92-2.05	•			0.4~10µm	CAS No. 12037-29-5
ZrO_2 Zirconium Dioxide	2715	99.9%	1.97-2.05	•	•		0.25~9µm	CAS No. 1314-24-4
$SnO_2+In_2O_3$ Tin Oxide + Indium Oxide	1127	99.9%	0.3-9µm	•	•		0.3-9µm	CAS No. 18282-10-5/1312-43-2 R48/20,S2

Additional Product Information

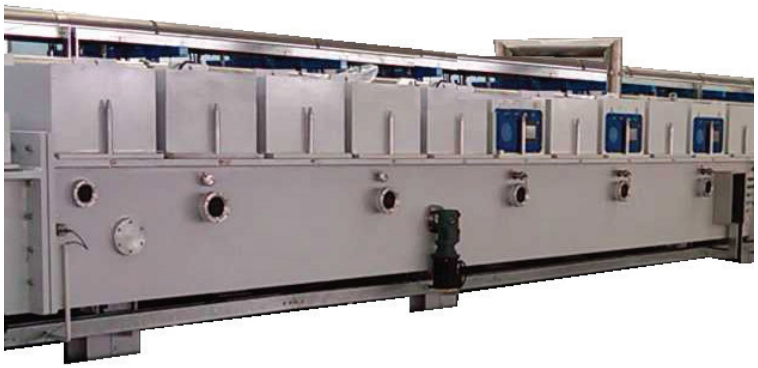
BULK PROPERTIES OF THIN FILM MATERIALS

Metal	Symbol	Atomic Weight	Atomic Radius (A)	Melting Point (°C)	Density g/cc	Density -lbs/In^2	Modulus of Elasticity (10^4 PSI)	Electrical Resistivity LL-ohm-m	Thermal Conductivity cal-cm/cm2 sec°C	Coeff. of Thermal Exp. (cm/cm°C)x10^6
Aluminum	Al	26.98	1.43	660	2.699	.098	10	26.55	.53	23.6
Chromium	Cr	52.10	1.25	1875	7.19	.259	36	130	.16	6.2
Copper	Cu	63.54	1.28	1083	8.96	.323	17	16.73	.94	16.5
Germanium	Ge	72.60	1.22	937	5.32	.192	23	.45 ohm m	.14	5.7
Gold	Au	197.00	1.44	1063	19.32	10.166*	11.6	23.5	.71	14.2
Indium	In	114.82	1.57	156	7.32	.263	1.6	80**	.057	33.0
Molybdenum	Mo	95.95	1.36	2610	10.22	.369	47	52**	.34	4.9
Nickel	Ni	58.71	1.25	1453	8.90	.322	30	68.44	.22	13.3
Palladium	Pd	106.7	1.37	1552	12.02	6.293*	16.3	108	.17	11.7
Platinum	Pt	195.09	1.38	1769	21.45	11.287*	21.3	106	.16	8.9
Silver	Ag	107.88	1.44	961	10.49	5.527*	11	14.7**	1.0	19.6
Tantalum	Ta	180.95	1.43	2996	16.6	.601	27	135	.13	6.5
Tin	Sn	118.70	1.509***	232	7.3	.258	6	155	.15	23.0
Titanium	Ti	47.9	1.47	1668	4.51	.163	16.8	420	.22	8.4
Zinc	Zn	65.38	1.33	419	7.13	.258	13.4	59.16	.27	39.7
Zirconium	Zr	91.22	1.58	1852	6.49	.234	13.7	450	.21	5.8

*toz/cu. in

**@0°C

***Lattice parameters vary with structure



Process Materials, Inc. supports:

- All planar target systems
- All cylindrical target systems
- All evaporative systems

PRODUCT FORMS:

- Raw Material: High purity
- Ingots: 50 Grams to 500 Pounds
- Mill Products: Billet, Plate, Bar, Wire
- Powders

SPUTTER TARGETS:

- Round
- Rectangular
- Ring
- Delta
- Rotatable
- All shapes and sizes

EVAPORATIVE MATERIALS:

- Random size pieces
- Pellets
- Shot / Granules
- Starter Charges
- Crucible Liners
- Wire

PROCESSING CAPABILITIES:

- Vacuum Arc Melting
- Annealing
- Electron Beam Melting
- Rolling
- Hot Pressing
- HIP'ing
- Vacuum Induction Melting
- CNC

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