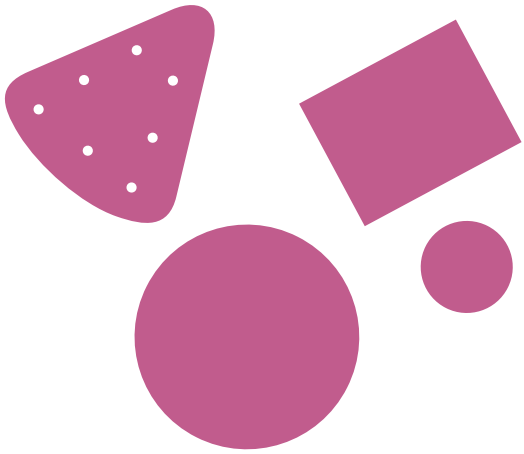


D

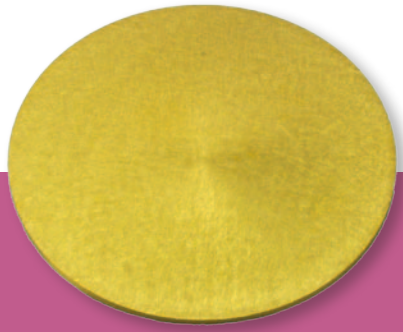
MATERIALS
SPUTTERING TARGETS

- Manufacturing Processes ..... D 03
- Sputtering Targets ..... D 04
- Sputter Yield Guide ..... D 17
- Backing Plates ..... D 20
- Bonding of Sputtering Targets ..... D 21

Most sputtering target can be fabricated into a wide range of shapes and sizes. There are some technical limitations to the maximum size for a given single piece construction.
In such cases, a multi-segmented target can be produced with the individual segments joined together by butt or beveled joints.

OUR SPUTTERING TARGETS AT A GLANCE

- Pure metal and alloy targets (99% to 99.9999%), industrial application targets: Al, Ni/Cr, Mo, Ta, Ti, Ti/Al, W...
- Precious metal targets: Ag, Au, Ir, Pd, Pt, Rh... and alloys on request.
- Hot pressed oxides and intermetallic targets without binder: Al_2O_3, AZO, ITO, PZT, SiO_2, ZnO...
- Circular, rectangular, Delta, ring, tube and any shape on request.
- All targets are delivered with a certificate of analysis.

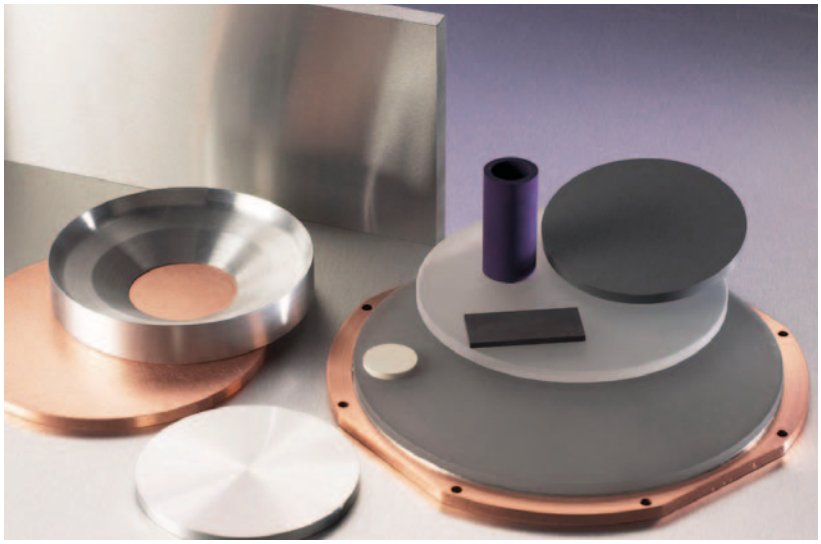


Manufacturing Processes

Neyco manufactures sputtering targets from a wide variety of compositions in various purity levels, allowing customers to match targets to their specific requirements. We employ a number of different target manufacturing techniques to yield optimum grain size, density, hardness and composition. The specific manufacturing process depends on the properties of the target material and the end use of the target.

Manufacturing techniques used include:

- Casting
- Ceramic Sintering
- Cold and Hot Isostatic Pressing
- Extrusion
- Hot and Cold Rolling
- Inert Gas Hot-Pressing
- Plasma Spray
- Precision Machining
- Vacuum Hot-Pressing
- Vacuum Melting



Sputtering Targets

Al 13 ALUMINUM Base

CHEMICAL	FORMULA	PURITY*
Aluminum	Al	99.99 / 99.999
Aluminum Antimonide	AlSb	99.99
Aluminum Chromium (95:5)	AlCr	99.95
Aluminum Copper (99.5:0.5)	AlCu	99.995
Aluminum Copper (90:10) / (92:8) / (95:5) / (98:2) / (99:1)	AlCu	99.99 / 99.995 / 99.999
Aluminum Copper Silicon (98:1:1)	AlCuSi	99.999
Aluminum Magnesium	AlMg	99.995
Aluminum Magnesium Silicon	AlMgSi	99.99
Aluminum Neodymium	AlNd	99.95
Aluminum Nickel Boron (95.5:4:0.5at%)	AlNiB	99.99
Aluminum Nickelide	Al_3Ni	99.9
Aluminum Nitride	AlN	99 / 99.5 / 99.8 / 99.9
Aluminum Nitride Titanium Nitride (50:50at%)	AlN-TiN	99.5
Aluminum Oxide	Al_2O_3	99.99 / 99.995 / 99.999
Aluminum Oxide Tungsten Oxide (95:5at%)	Al_2O_3-WO_3	99.99
Aluminum Oxide Yttrium Oxide (95:5at%)	Al_2O_3-Y_2O_3	99.99
Aluminum Silicon Copper	AlSiCu	99.95
Aluminum Silicon (98:2) / (99:1)	AlSi	99.99 / 99.999
Aluminum Silicon	AlSi	99.999

Sb 51 ANTIMONY Base

CHEMICAL	FORMULA	PURITY*
Antimony	Sb	99.5 / 99.999
Antimony Sulfide	Sb_2S_3	99.99
Antimony Telluride	Sb_2Te_3	99.999

Ba 56 BARIUM Base

CHEMICAL	FORMULA	PURITY*
Barium	Ba	99.9
Barium Ferrite	$BaFe_{12}O_{19}$	99.9
Barium Fluoride	BaF_2	99.9 / 99.995
Barium Lead Oxide	$BaPbO_3$	99.5
Barium Manganese Oxide	$BaMnO_3$	99.9
Barium Oxide	BaO	99.95
Barium Strontium Titanate, BST	$BaSrTiO_3$	99.95
Barium Titanate	$BaTiO_3$	99.9 / 99.95
Barium Zirconate	$BaZrO_3$	99.99
Barium Zirconium Titanate	$BaZrTiO_3$	99.9

*All purities indicated in the tables are based on metallic impurities.

Bi 83 BISMUTH Base

CHEMICAL	FORMULA	PURITY*
Bismuth	Bi	99.9 / 99.99 / 99.999
Bismuth Aluminum Oxide	$BiAlO_3$	99.99
Bismuth Antimonide	BiSb	99.99
Bismuth Antimony Telluride	BiSbTe	99.999
Bismuth Cobalt Oxide	$BiCoO_3$	99.95
Bismuth Ferrite	$BiFeO_3$	99.99
Bismuth Gallate	$BiGa_2O_3$	99.99
Bismuth Indium Oxide	$BiInO_3$	99.9
Bismuth Iron Titanium Oxide	$Bi_{1.02}Fe_{0.98}Ti_{0.02}O_3$	99.9
Bismuth Manganese Oxide	$BiMnO_3$	99.95
Bismuth Neodymium Titanium Oxide, BNdT	$(Bi_{3.15}Nd_{0.85})Ti_3O_{12}$	99.9
Bismuth Oxide	Bi_2O_3	99.9 / 99.999 / 99.99
Bismuth Samarium Ferrite	$BiSmFeO_3$	99.9
Bismuth Selenide	Bi_2Se_3	99.999
Bismuth Silicon Oxide	Bi_2SiO_5	99.99
Bismuth Strontium Calcium Copper Oxide, BSCCO (2212)	$Bi_2Sr_2Ca_1Cu_2O_8$	99.9
Bismuth Strontium Calcium Copper Oxide, BSCCO (2223)	$Bi_2Sr_2Ca_2Cu_3O_{10}$	99.9
Bismuth Telluride	Bi_2Te_3	99.999
Bismuth Telluride Selenide	$BiTe_{1-x}Se_x$	99.999
Bismuth Titanate	$Bi_2Ti_4O_{11}$	99.9
Bismuth Vanadate	$BiVO_4$	99.99

B 5 BORON Base

CHEMICAL	FORMULA	PURITY*
Boron	B	99.9 / 99.97 / 99.999
Boron Carbide	B_4C	99.5 / 99.9
Boron Nitride	BN	97.5 / 99.5 / 99.9

Cd 48 CADMIUM Base

CHEMICAL	FORMULA	PURITY*
Cadmium	Cd	99.9 / 99.99 / 99.999
Cadmium Oxide	CdO	99.99
Cadmium Selenide	CdSe	99.99 / 99.995
Cadmium Stannate	Cd_2SnO_4	99.99
Cadmium Sulfide	CdS	99.99 / 99.999
Cadmium Telluride	CdTe	99.999
Cadmium Tin	CdSn	99.99

Ca 20 CALCIUM Base

CHEMICAL	FORMULA	PURITY*
Calcium Fluoride	CaF_2	99.99 / 99.995
Calcium Manganate	$CaMnO_3$	99.95
Calcium Oxide	CaO	99.99
Calcium Titanate	$CaTiO_3$	99.99

Ce 58 CERIUM Base

CHEMICAL	FORMULA	PURITY*
Cerium	Ce	99.9 / 99.95
Cerium Fluoride	CeF_3	99.9
Cerium Gadolinium	CeGd	99.95
Cerium Oxide	CeO_2	99.9

*All purities indicated in the tables are based on metallic impurities.

Cs 55 CESIUM Base

CHEMICAL	FORMULA	PURITY*
Cesium Iodide	CsI	99.99/99.999

Cr 24 CHROMIUM Base

CHEMICAL	FORMULA	PURITY*
Chromium	Cr	99.8/99.9/99.95/99.99
Chromium Aluminide	CrAl	99.99
Chromium Boride	CrB_2	99.5
Chromium Carbide	Cr_3C_2	99.5/99.95
Chromium Diboride	CrB_2	99.5
Chromium Nitride	Cr_2N	99.5
Chromium Oxide	Cr_2O_3	99.8/99.9/99.95
Chromium Silicide	$CrSi_2$	99.5/99.9
Chromium Silicide	Cr_3Si	99.5
Chromium Titanium (80:20)/(95:5)	CrTi	99.9
Chromium Nickel (60:40)	CrNi	99.9
Chromium Nickel Aluminum	CrNiAl	99.9
Chromium Silicon Monoxide (60:40)/(70:30)	CrSiO	99.5/99.9
Chromium Ruthenium	CrRu	99.95

Co 27 COBALT Base

CHEMICAL	FORMULA	PURITY*
Cobalt	Co	99.8/99.95/99.99
Cobalt Boride	Co_2B	99.9
Cobalt Chromium Aluminum	CoCrAl	99.95
Cobalt Chromium Iron Aluminum	CoCrFeAl	99.9
Cobalt Chromium Oxide	$CoCr_2O_4$	99.9
Cobalt Gadolinium	CoGd	99.95
Cobalt Iron (50:50at%)	CoFe	99.95
Cobalt Iron (50:50)/(60:40)/(70:30)/(84:16)/(90:10)	CoFe	99.9/99.95
Cobalt Iron Boron	CoFeB	99.95
Cobalt Oxide	Co_3O_4	99.95
Cobalt Oxide	CoO	99.95
Cobalt Silicide	$CoSi_2$	99.5
Cobalt Silicon	CoSi	99.95

*All purities indicated in the tables are based on metallic impurities.

Cu 29 COPPER Base

CHEMICAL	FORMULA	PURITY*
Copper	Cu	99.99/ 99.995/ 99.997/99.999
Copper Aluminum Oxide	$CuAl_2O_3$	99.9
Copper Aluminum Oxide	$CuAlO_2$	99.99
Copper Boron (95:5at%)	CuB	99.9
Copper Gallium	CuGa	99.99/99.995
Copper Germanide	CuGe	99.99
Copper Indium	CuIn	99.99
Copper Indium Gallium	CuInGa	99.99
Copper Indium Gallium Selenide	$CuInGaSe_2$	99.99
Copper Iron (99:1)	CuFe	99.95
Copper Magnesium	CuMg	99.99
Copper Nickel	CuNi	99.99
Copper Oxide	CuO	99.7/99.9
Copper Oxide	Cu_2O	99.9
Copper Selenide	CuSe	99.99
Copper Selenide	Cu_2Se	99.5
Copper Sulfide	Cu_2S	99.95
Copper Sulfide	CuS	99.999
Copper Telluride	Cu_2Te	99.99
Copper Tin (90:10)	CuSn	99.99
Copper Titanium Oxide	$CuTiO_3$	99.99

Dy 66 DYSPROSIUM Base

CHEMICAL	FORMULA	PURITY*
Dysprosium	Dy	99.95

Er 68 ERBIUM Base

CHEMICAL	FORMULA	PURITY*
Erbium	Er	99.95
Erbium Fluoride	ErF_3	99.99
Erbium Oxide	Er_2O_3	99.95/99.99

Eu 63 EUROPIUM Base

CHEMICAL	FORMULA	PURITY*
Europium	Eu	99.9
Europium Oxide	Eu_2O_3	99.95

Gd 64 GADOLINIUM Base

CHEMICAL	FORMULA	PURITY*
Gadolinium	Gd	99.9/99.95
Gadolinium Oxide	Gd_2O_3	99.9

Ga 31 GALLIUM Base

CHEMICAL	FORMULA	PURITY*
Gallium Antimonide	GaSb	99.999
Gallium Arsenide	GaAs	99.999
Gallium Indium Zinc Oxide	Ga_2O_3-In_2O_3-ZnO	99.99
Gallium Iron Magnesium Oxide	$GaFeMgO_3$	99.9
Gallium Oxide	Ga_2O_3	99.995/ 99.999
Gallium Phosphide	GaP	99.999
Gallium Selenide	Ga_2Se_3	99.99

Ge 32 GERMANIUM Base

CHEMICAL	FORMULA	PURITY*
Germanium	Ge	99.999
Germanium Antimonide	GeSb	99.999
Germanium Antimony Telluride, GST	$Ge_2Sb_3Te_5$	99.999
Germanium Oxide	GeO_2	99.99
Germanium Selenide	GeSe	99.999
Germanium Telluride	GeTe	99.999

*All purities indicated in the tables are based on metallic impurities.

Au 79 GOLD Base

CHEMICAL	FORMULA	PURITY*
Gold	Au	99.95:99.99 / 99.999
Gold Boride	AuB	99.99
Gold Germanium (88:12)	AuGe	99.999
Gold Palladium (60:40)	AuPd	99.99
Gold Tin (70:30)	AuSn	99.99
Gold Zinc (92:8)	AuZn	99.99

See Section E - Precious Metals in this catalogue about Presentation and Precious Metal Recycling.

C 6 GRAPHITE Base

CHEMICAL	FORMULA	PURITY*
Graphite	C	99.5 / 99.999
Carbon Nickel (95:5)	CNi	99.95

Hf 72 HAFNIUM Base

CHEMICAL	FORMULA	PURITY*
Hafnium	Hf	99.9 / 99.95 / 99.98 / 99.99
Hafnium Boride	HfB_2	99.5
Hafnium Carbide	HfC	99.5 / 99.95
Hafnium Indium Zinc Oxide (0.3:1:1mol%) / (1:1:1mol%)	HfO_2-In_2O_3-ZnO	99.99
Hafnium Nitride	HfN	99.5
Hafnium Oxide	HfO_2	99.95
Hafnium Oxide Yttrium Oxide (90:10) / (85:15)	HfO_2-Y_2O_3	99
Hafnium Oxide Yttrium Oxide (92:8mol%)	HfO_2-Y_2O_3	99.95
Hafnium Silicide	$HfSi_2$	99.5 / 99.8

Ho 67 HOLMIUM Base

CHEMICAL	FORMULA	PURITY*
Holmium	Ho	99.95
Holmium Manganese Oxide	$HoMnO_3$	99.95

In 49 INDIUM Base

CHEMICAL	FORMULA	PURITY*
Indium	In	99.99 / 99.999
Indium Antimonide	InSb	99.99 / 99.999 / 99.9999
Indium Arsenide	InAs	99.999
Indium Gallium Zinc Oxide	InGaZnO	99.99
Indium Oxide	In_2O_3	99.99 / 99.995 / 99.999
Indium Oxide Gallium Oxide, IGO (90:10)	In_2O_3-Ga_2O_3	99.99
Indium Oxide Zinc Oxide, IZO (90:10)	In_2O_3-ZnO	99.99
Indium Selenide	In_2Se_3	99.9 / 99.99
Indium Sulfide	In_2S_3	99.99 / 99.999
Indium Telluride	InTe	99.999
Indium Tin (90:10)	InSn	99.995
Indium Tin Oxide Iron	In_2O_3-SnO_2-Fe	99.99
Indium Tin Oxide, ITO (90:10) / (85:15) / (80:20)	In_2O_3-SnO_2	99.99 / 99.999
Indium Tin Oxide (91:9mol%)	In_2O_3-SnO_2	99.99 / 99.999
Indium Tin Zinc Oxide, ITZO (90:3:7)	In_2O_3-SnO_2-ZnO	99.99
Indium Zinc (90:10)	InZn	99.99

*All purities indicated in the tables are based on metallic impurities.

Ir 77 IRIDIUM Base

CHEMICAL	FORMULA	PURITY*
Iridium	Ir	99.8/99.95
Iridium Manganese (20:80)/(75:25)/(80:20)	IrMn	99.95

See Section E - Precious Metals in this catalogue about Presentation and Precious Metal Recycling.

Fe 26 IRON Base

CHEMICAL	FORMULA	PURITY*
Iron	Fe	99.6/99.95/99.99
Iron Boride	FeB	99.5
Iron Carbide	Fe_3C	99.9
Iron Copper (98:2at%)	FeCu	99.995
Iron Copper Niobium Silicon Boron	FeCuNbSiB	99.9
Iron Germanium (50/50at%)	FeGe	99.95
Iron Magnesium (50/50at%)	FeMg	99.95
Iron Manganese (50:50)	FeMn	99.95
Iron Oxide	Fe_2O_3	99.9
Iron Oxide	Fe_3O_4	99/99.95
Iron Oxide	FeO	99.9
Iron Oxide Cobalt Oxide (50:50)	Fe_2O_3-Co_3O_4	99.9
Iron Silicide	FeSi	99.95
Iron Silicide	$FeSi_2$	99.9/99.99
Iron Silicon Boron	FeSiB	99.95
Iron Terbium (67:33at%)	FeTb	99.9
Iron Terbium Cobalt	FeTbCo	99.9

La 57 LANTHANUM Base

CHEMICAL	FORMULA	PURITY*
Lanthanum	La	99.95
Lanthanum Aluminum Oxide	$LaAlO_3$	99.9
Lanthanum Boride	LaB_6	99.5
Lanthanum Calcium Manganate, LCM	$La_{1-x}Ca_x MnO_3$	99.9
Lanthanum Fluoride	LaF_3	99.9/99.995/99.998
Lanthanum Nickel Oxide	$LaNiO_3$	99.9
Lanthanum Strontium	LaSr	99.95
Lanthanum Strontium Manganate, LSM	$La_{1-x}Sr_xMnO_3$	99.9
Lanthanum Strontium Cobaltite	$La_{0.9}Sr_{0.1}CoO_3$	99.9
Lanthanum Yttrium	LaY	99.95

Pb 82 LEAD Base

CHEMICAL	FORMULA	PURITY*
Lead	Pb	99.99
Lead Fluoride	PbF_2	99.9
Lead Lanthanum ZirconateTitanate, PLZT	$PbLa(ZrTi)O_3$	99.9
Lead Oxide	PbO	99.9
Lead Selenide	PbSe	99.999
Lead Telluride	PbTe	99.99
Lead Titanate	$PbTiO_3$	99.9
Lead Titanate Lead	$PbTiO_3$-Pb	99.9
Lead Zirconate Titanate, PZT	$Pb(ZrTi)O_3$	99.95

*All purities indicated in the tables are based on metallic impurities.

Li 3 LITHIUM Base

CHEMICAL	FORMULA	PURITY*
Lithium Cobalt Oxide	$LiCoO_2$	99.9
Lithium Fluoride	LiF	99.9 / 99.99
Lithium Iron Phosphate	$LiFePO_4$	99.9
Lithium Manganate	$LiMn_2O_4$	99.5
Lithium Niobate	$LiNbO_3$	99.9
Lithium Phosphate	Li_3PO_4	99.99

Mg 12 MAGNESIUM Base

CHEMICAL	FORMULA	PURITY*
Magnesium	Mg	99.9 / 99.95 / 99.99 / 99.999
Magnesium Aluminum Oxide	$MgAl_2O_4$	99.99
Magnesium Fluoride	MgF_2	99.5 / 99.99
Magnesium Germanide	Mg_2Ge	99.99
Magnesium Oxide	MgO	99.95
Magnesium Silicide	Mg_2Si	99.9
Magnesium Titanate	$MgTiO_3$	99.99

Mn 25 MANGANESE Base

CHEMICAL	FORMULA	PURITY*
Manganese	Mn	99.95 / 99.99
Manganese Oxide	MnO	99.9 / 99.95
Manganese Oxide	MnO_2	99.95
Manganese Titanium (50:50)	MnTi	99.95

Mo 42 MOLYBDENUM Base

CHEMICAL	FORMULA	PURITY*
Molybdenum	Mo	99.95
Molybdenum Carbide	Mo_2C	99.5 / 99.95
Molybdenum Oxide	MoO_3	99.95 / 99.99
Molybdenum Oxide Copper	MoO_3-Cu	99.9
Molybdenum Selenide	$MoSe_2$	99.99
Molybdenum Silicide	$MoSi_2$	99.5 / 99.95 / 99.995
Molybdenum Sulfide	MoS_2	99 / 99.9
Molybdenum Telluride	$MoTe_2$	99.99

Nd 60 NEODYMIUM Base

CHEMICAL	FORMULA	PURITY*
Neodymium	Nd	99.95
Neodymium Ferrite	$NdFeO_3$	99.99
Neodymium Magnet, NIB	$Nd_2Fe_{14}B$	99.95
Neodymium Oxide	Nd_2O_3	99.95

*All purities indicated in the tables are based on metallic impurities.

Ni 28 NICKEL Base

CHEMICAL	FORMULA	PURITY*
Nickel	Ni	99.6 / 99.95 / 99.97 / 99.99 / 99.995
Nickel Aluminum (50:50at%) / (50 :50)	NiAl	99.95 / 99.99
Nickel Aluminum Manganese Silicon, Alumel (95:2:2:1)	NiAlMnSi	99.95
Nickel Boride	Ni_2B	99.5
Nickel Chromium	NiCr	99.95
Nickel Chromium (90:10) / (80:20) / (40:60)	NiCr	99.9 / 99.95
Nickel Chromium Iron, Inconel 690	NiCrFe	99.95
Nickel Chromium Silicon (47.5:47.5:5)	NiCrSi	99.95
Nickel Iron (81:19) / (80:20) / (80:20at%)	NiFe	99.95
Nickel Nitride	NiN	99.5
Nickel Oxide	NiO	99 / 99.9 / 99.99 / 99.995
Nickel Platinum (95:5)	NiPt	99.95
Nickel Silicide	$NiSi_2$	99.5
Nickel Titanium (50:50)	NiTi	99.95
Nickel Tungsten (50:50at%) / (95:5at%)	NiW	99.9 / 99.95
Nickel Vanadium (93:7)	NiV	99.95

Nb 41 NIOBIUM Base

CHEMICAL	FORMULA	PURITY*
Niobium	Nb	99.9+ / 99.95
Niobium Aluminide	Nb_3Al	99.95
Niobium Carbide	NbC	99.5
Niobium Germanide	Nb_3Ge	99.95
Niobium Nitride	NbN	99.5
Niobium Oxide	Nb_2O_5	99.5 / 99.95 / 99.995
Niobium Silicide	$NbSi_2$	99.5

Pd 46 PALLADIUM Base

CHEMICAL	FORMULA	PURITY*
Palladium	Pd	99.95 / 99.99
Palladium Nickel (90:10)	PdNi	99.95

***See Section E - Precious Metals** in this catalogue about **Presentation** and **Precious Metal Recycling**.*

Pt 78 PLATINUM Base

CHEMICAL	FORMULA	PURITY*
Platinum	Pt	99.95 / 99.99
Platinum Palladium (50:50)	PtPd	99.99

***See Section E - Precious Metals** in this catalogue about **Presentation** and **Precious Metal Recycling**.*

*All purities indicated in the tables are based on metallic impurities.

Pr 59 PRASEODYMIUM Base

CHEMICAL	FORMULA	PURITY*
Praseodymium	Pr	99.95
Praseodymium Calcium Manganese Oxide, PCMO	$Pr_{0.7}Ca_{0.3}MnO_3$	99.9
Praseodymium Oxide	Pr_6O_{11}	99.9

Re 75 RHENIUM Base

CHEMICAL	FORMULA	PURITY*
Rhenium	Re	99.95 / 99.99

Rh 45 RHODIUM Base

CHEMICAL	FORMULA	PURITY*
Rhodium	Rh	99.8 / 99.95

See Section E - Precious Metals *in this catalogue about* ***Presentation*** *and* ***Precious Metal Recycling****.*

Ru 44 RUTHENIUM Base

CHEMICAL	FORMULA	PURITY*
Ruthenium	Ru	99.95

See Section E - Precious Metals *in this catalogue about* ***Presentation*** *and* ***Precious Metal Recycling****.*

Sm 62 SAMARIUM Base

CHEMICAL	FORMULA	PURITY*
Samarium	Sm	99.9 / 99.95
Samarium Aluminide	$SmAl_2$	99.99
Samarium Cobalt	$SmCo_5$	99.9
Samarium Oxide	Sm_2O_3	99.95 / 99.99
Samarium Zirconium (50:50) / (40:60)	SmZr	99.9

Sc 21 SCANDIUM Base

CHEMICAL	FORMULA	PURITY*
Scandium	Sc	99.99 / 99.995
Scandium Oxide	Sc_2O_3	99.995

Se 34 SELENIUM Base

CHEMICAL	FORMULA	PURITY*
Selenium	Se	99.999
Selenium Germanium (70:30at%)	SeGe	99.999

*All purities indicated in the tables are based on metallic impurities.

Si 14 SILICON Base

CHEMICAL	FORMULA	PURITY*
Silicon	Si	99.999
Silicon Aluminum (92:8) / (94:6) / (95:5) / (96:4) / (98:2)	SiAl	99.99 / 99.995 / 99.999
Silicon Carbide	SiC	99.5
Silicon Chromium	SiCr	99.99
Silicon Dioxide	SiO_2	99.99 / 99.995 / 99.999
Silicon Germanium	SiGe	99.999
Silicon Germanium (50 / 50at%)	SiGe	99.999
Silicon Monoxide	SiO	99.9 / 99.95 / 99.97 / 99.99
Silicon Nitride	Si_3N_4	99.5 / 99.9

Ag 47 SILVER Base

CHEMICAL	FORMULA	PURITY*
Silver	Ag	99.99 / 99.999
Silver Germanium (96:4)	AgGe	99.995
Silver Germanium Tin	AgGeSn	99.995

See Section E - Precious Metals in this catalogue about Presentation and Precious Metal Recycling.

Na 11 SODIUM Base

CHEMICAL	FORMULA	PURITY*
Sodium Fluoride	NaF	99.9 / 99.95 / 99.99

Sr 38 STRONTIUM Base

CHEMICAL	FORMULA	PURITY*
Strontium Copper Oxide, SCO	$SrCu_2O_2$	99.9
Strontium Fluoride	SrF_2	99.9
Strontium Ruthenate	$SrRuO_3$	99.95
Strontium Titanate	$SrTiO_3$	99.9
Strontium Titanium Niobium Oxide	$SrTiNbO_3$	99.95
Strontium Zirconate	$SrZrO_3$	99

Ta 73 TANTALUM Base

CHEMICAL	FORMULA	PURITY*
Tantalum	Ta	99.95
Tantalum Aluminum	TaAl	99.9
Tantalum Carbide	TaC	99.5
Tantalum Nitride	TaN	99.5
Tantalum Oxide	Ta_2O_5	99.99 / 99.995 / 99.997
Tantalum Selenide	$TaSe_2$	99.5 / 99.8
Tantalum Silicide	$TaSi_2$	99.5 / 99.99
Tantalum Silicide	Ta_5Si_3	99.5
Tantalum Sulfide	TaS_2	99.999
Tantalum Telluride	$TaTe_2$	99.99

*All purities indicated in the tables are based on metallic impurities.

Te 52 TELLURIUM Base

CHEMICAL	FORMULA	PURITY*
Tellurium	Te	99.5 / 99.95 / 99.995 / 99.999
Tellurium Oxide	TeO_2	99.99

Tb 65 TERBIUM Base

CHEMICAL	FORMULA	PURITY*
Terbium	Tb	99.95
Terbium Manganate	$TbMnO_3$	99.95

Sn 50 TIN Base

CHEMICAL	FORMULA	PURITY*
Tin	Sn	99.997 / 99.999
Tin Antimonide	SnSb	99.99
Tin Copper (63:35at%)	SnCu	99.99
Tin Monoxide	SnO	99.99
Tin Oxide	SnO_2	99.9 / 99.99
Tin Oxide Zinc	SnO_2-Zn	99.99
Tin Oxide Antimony Oxide	SnO_2-Sb_2O_3	99.99
Tin Selenide	SnSe	99.99
Tin Sulfide	SnS	99.999
Tin Sulfide	SnS_2	99.999
Tin Zinc	SnZn	99.99

Ti 22 TITANIUM Base

CHEMICAL	FORMULA	PURITY*
Titanium	Ti	99.8 / 99.9 / 99.95 / 99.99 / 99.995
Titanium Aluminum (30:70) / (50:50at%) / (65:35at%)	TiAl	99.9 / 99.95 / 99.99
Titanium Aluminide	Ti_3Al	99.9
Titanium Boride	TiB_2	99.5 / 99.8
Titanium Carbide	TiC	99.5
Titanium Cobalt (97:3)	TiCo	99.95
Titanium Monoxide	TiO	99.9 / 99.99
Titanium Neodymium (97:3)	TiNd	99.95
Titanium Nickel (50:50)	TiNi	99.95
Titanium Nitride	TiN	99.5 / 99.9
Titanium Nitride Titanium (90:10)	TiN-Ti	99.5
Titanium Oxide	Ti_2O_3	99.9 / 99.95
Titanium Oxide	TiO_2	99.9 / 99.95 / 99.99 / 99.995 / 99.998
Titanium Silicide	$TiSi_2$	99.5 / 99.95
Titanium Silicide	Ti_5Si_3	99.5

*All purities indicated in the tables are based on metallic impurities.

W 74 TUNGSTEN Base

CHEMICAL	FORMULA	PURITY*
Tungsten	W	99.95
Tungsten Boride	W_2B	99.5
Tungsten Carbide	WC	99.5
Tungsten Disulfide	WS_2	99.9
Tungsten Molybdenum (90:10)	WMo	99.95
Tungsten Nickel (90:10)	WNi	99.95
Tungsten Oxide	WO_3	99.99
Tungsten Selenide	WSe_2	99.8
Tungsten Silicide	WSi_2	99.5/99.95
Tungsten Sulfide	WS_2	99.8
Tungsten Telluride	WTe_2	99.9/99.995
Tungsten Titanium (90:10)/(80:20)	WTi	99.9/99.95/ 99.99/99.995
Tungsten Rhenium	WRe	99.95

V 23 VANADIUM Base

CHEMICAL	FORMULA	PURITY*
Vanadium	V	99.7/99.9
Vanadium Boride	VB_2	99.5
Vanadium Carbide	VC	99.5
Vanadium Nitride	VN	99.5/99.9
Vanadium Oxide	V_2O_5	99.5/99.9
Vanadium Silicide	VSi_2	99.5

Yb 70 YTTERBIUM Base

CHEMICAL	FORMULA	PURITY*
Ytterbium	Yb	99.95
Ytterbium Fluoride	YbF_3	99.995
Ytterbium Oxide	Yb_2O_3	99.99

Y 39 YTTRIUM Base

CHEMICAL	FORMULA	PURITY*
Yttrium	Y	99.9/99.95/ 99.99
Yttrium Barium Cuprate, YBCO	$YBa_2Cu_3O_7$	99.9
Yttrium Fluoride	YF_3	99.9
Yttrium Iron	Y_3Fe_5	99.9
Yttrium Iron	Y_2Fe_{17}	99.99
Yttrium Iron Garnet, YIG	YFe_2O_4	99.9
Yttrium Manganate	$YMnO_3$	99.9
Yttrium Oxide	Y_2O_3	99.95/99.99
Yttrium Silicide	YSi_2	99.9

*All purities indicated in the tables are based on metallic impurities.

Zn 30 ZINC Base

CHEMICAL	FORMULA	PURITY*
Zinc	Zn	99 / 99.99 / 99.995 / 99.999
Zinc Aluminum (98:2) / (99:1)	ZnAl	99.999
Zinc Antimony	Zn_4Sb_3	99.99
Zinc Copper (65:35at%)	ZnCu	99.99
Zinc Oxide	ZnO	99.99 / 99.999
Zinc Oxide Aluminum, AZO (97:3) / (98:2) / (99:1)	ZnO-Al	99.99 / 99.999
Zinc Oxide Aluminum Oxide, AZO (98:2)	$ZnO-Al_2O_3$	99.99 / 99.999
Zinc Oxide Aluminum Oxide, AZO	$ZnO-Al_2O_3$	99.995
Zinc Oxide Gallium	ZnO-Ga	99.99
Zinc Oxide Gallium Oxide (97:3)	$ZnO-Ga_2O_3$	99.99
Zinc Oxide Manganese Oxide	ZnO-MnO	99.99
Zinc Oxide Molybdenum Oxide (97:3mol%)	$ZnO-MoO_3$	99.99
Zinc Oxide Phosphorus Oxide	$ZnO-P_2O_5$	99.99
Zinc Oxide Tin	ZnO-Sn	99.99
Zinc Selenide	ZnSe	99.99 / 99.995
Zinc Sulfide	ZnS	99.99
Zinc Sulfide Silicon Dioxide (80:20)	$ZnS-SiO_2$	99.99
Zinc Telluride	ZnTe	99.99
Zinc Tin (50:50)	ZnSn	99.99
Zinc Tin Oxide	$ZnSnO_3$	99.95 / 99.99
Zinc Tin Oxide, ZTO	Zn_2SnO_4	99.95

Zr 40 ZIRCONIUM Base

CHEMICAL	FORMULA	PURITY*
Zirconium	Zr	99.5 / 99.9 / 99.95
Zirconium Boride	ZrB_2	99.5
Zirconium Carbide	ZrC	99.5
Zirconium Nitride	ZrN	99.5 / 99.8
Zirconium Oxide	ZrO_2	99.95 / 99.99 / 99.995
Zirconium Oxide Calcium Oxide (95:5mol%)	ZrO_2-CaO	99
Zirconium Oxide Yttrium Oxide, YSZ (92:8mol%) / (95:5mol%) / (85-90:10-15mol%)	$ZrO_2-Y_2O_3$	99.95
Zirconium Oxide Yttrium Oxide, YSZ (84:16)	$ZrO_2-Y_2O_3$	99.99
Zirconium Silicide	$ZrSi_2$	99.5
Zirconium Vanadium Titanium	ZrVTi	99.9
Zirconium Yttrium	ZrY	99.95

*All purities indicated in the tables are based on metallic impurities.

Sputter Yield Guide

The following table of common target materials is useful in making comparisons between deposition processes. The first column lists the material.

The second column represents the etch rate data of a standard film deposition.

The sputter rate data in the third column are representative of the film deposition rate at maximum power density (i.e. about 39W/cm^2, with direct cooling), a DC source and a 100 mm source-to-substrate distance. Rate will decrease linearly with power levels and depend upon the source-to-substrate distance.

A useful of thumb is that the film deposition rate:

1. Decrease by ~10%/cm beyond the 100 mm substrate distance.
2. Increase by ~14%/cm closer than the 100 mm substrate distance.

The fourth column represents the number of target atoms sputtered per argon ion striking the target with a kinetic energy of 500 eV (this energy is typical of an argon plasma) and at 0° incidence angle.

Magnetron design factors such as magnetic field strength — and process parameters such as gas composition and pressure — will affect these data. However, these typical data remain useful for comparison purposes.

TARGET MATERIAL	ETCH RATE (Å/min)	SPUTTER RATE (Å/sec)	YIELD 500 eV
Ag	1800	380	2.8
Al	610	170	1
AlCu (98:2)	-	170	-
Al_2O_3	83	40	0.05
AlSi (99:1)	-	160	-
As	-	-	4.40
Au	1080	320	1.70
Ba	-	-	1.25
Be	130	100	0.58
B_4C	-	20	-
BN	-	20	-
Bi	8800	-	2.67
C	110	20	0.20
Ca	-	-	0.89
Cd	-	-	6.39

TARGET MATERIAL	ETCH RATE (Å/min)	SPUTTER RATE (Å/sec)	YIELD 500 eV
CdS	2200	-	1.2
Ce	-	-	0.83
Co	450	190	1.25
Cr	530	180	1.13
Cs	-	-	1.82
Cu	880	320	1.75
Dy	1100	-	1.49
Er	1000	-	1.36
Eu	-	-	1.77
Fe	350	180	1.16
Ga	-	-	1.57
GaAs (100)	650	-	0.38
GaAs (110)	1600	-	0.95
GaP	1590	-	1.04
GaSb	1870	-	0.88
Gd	1100	-	0.92
Ge	920	160	0.97
Hf	660	110	0.75
Hg	-	-	11.61
Ho	-	-	1.42
In	-	800	2.14
In_2O_3	-	20	-
InSb	1520	-	0.6
Ir	590	135	1.06
ITO	-	20	-
K	-	-	1.17
La	-	-	0.73
Li	-	-	0.46
$LiNbO_2$	390	-	0.2
Lu	-	-	0.95
Mg	225	200	2.03
MgO	-	20	-
Mn	870	180	1.82
Mo	410	120	0.86
Mo_2C	280	-	0.2
MoS_2	-	40	-
$MoSi_2$	-	110	-
Na	-	-	1.70
Nb	470	80	0.63
Nd	-	-	1.16
Ni	530	190	1.28
NiFe (80:20)	500	-	1.2
Os	500	120	0.84
P	-	-	2.83
Pb	2600	-	2.48
PbTe	3770	-	1.48
Pd	1100	270	2.09
Pm	-	-	1.60

TARGET MATERIAL	ETCH RATE (Å/min)	SPUTTER RATE (Å/sec)	YIELD 500 eV
Pr	-	-	1.03
Pt	620	205	1.27
Rb	4000	-	1.80
Re	520	120	0.83
Rh	720	190	1.30
Ru	610	180	1.04
S	-	-	3.71
Sc	-	-	0.56
Sb	3238	-	2.83
Se	-	-	5.16
Si	370	80	0.54
SiC	350	50	0.45
SiO_2	330	70	0.23
Si_3N_4	-	800	-
Sm	1100	-	2.13
Sn	1200	800	1.57
SnO	-	20	-
Sr	-	-	1.37
Ta	420	85	0.66
TaN	-	40	-
Ta_2O_5	600	40	0.18
TaC	150	-	0.17
Tb	-	-	1.00
Tc	-	-	1.01
Te	-	-	4.67
Th	810	85	0.66
Ti	330	80	0.58
TiN	-	40	-
TiO_2	-	40	-
Tl	-	-	2.88
U	730	155	0.94
V	310	85	0.66
W	340	80	0.66
WTi (90:10)	-	80	-
WC	-	50	-
Y	950	85	0.70
Yb	-	-	2.45
YBCO	-	10	-
Zn	-	340	4.61
ZnO	-	40	-
ZnS	-	10	-
Zr	570	-	0.63

This document is being made available to assist users. Every effort has been made to ensure accuracy, completeness and clarity. Unfortunately, in a work of this scope, errors are inevitable. Use this information as a general guide.

Do not hesitate to contact us if you see errors or if you have supplementary information.

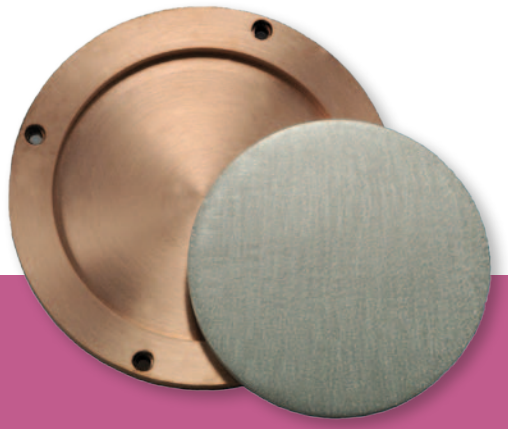
Backing Plates

Backing plate is one of the important components of the PVD sputtering process. Oxygen free, high conductivity (OFHC) copper is the commonly used material. It exhibits the best electrical and thermal characteristics.

Aluminum, Molybdenum and Stainless Steel can also be used for backing plate fabrication when copper is not appropriate. As an example, the desired sputtering target material may have a non-compatible coefficient of expansion compared to that of copper which can cause the bonded target assembly to fail irrecoverably. In such case, the use of an alternative backing plate metal is essential.

Our backing plates at a glance:

- **Used material: OFHC, Stainless Steel, Al, Mo...**
- **Manufactured to customer specifications.**
- **Cleaning and packaging according UHV standards.**



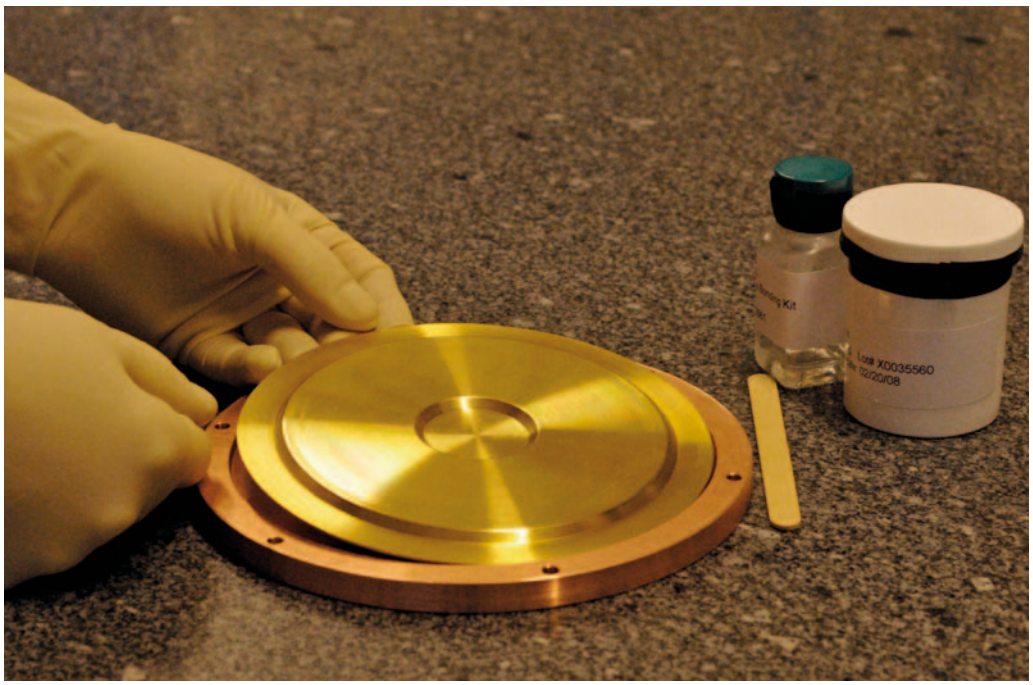
Copper backing plate with target

Bonding of Sputtering Targets

TARGET MOUNTING IN NEYCO LABORATORY

Neyco offers a complete target bonding service on new or existing backing plates:

- Debonding or debrazing of your target.
- Backing plate cleaning.
- New target bonding: Cu/elastomeric bonding (200°C) or silver based mounting (150° C).
- Cleaning and packaging of the assembly with UHV quality.



BONDING WITH Cu/ELASTOMER: A NEW PATENTED PROCESS

The mounting of your new target is made in our laboratory, using a specific elastomeric compound together with copper metal. Ultimate temperature is up to 200°C with a vacuum compatibility in the range of 10^{-7} mbar.

Advantages:

- **Low price.**
- **Very good thermal and electrical conductivities.**
- **Excellent adhesion between many metals.**
- **Suitable for low melting point target materials.**
- **Suitable for especially fragile targets.**

COPPER PADS FOR SPUTTERING

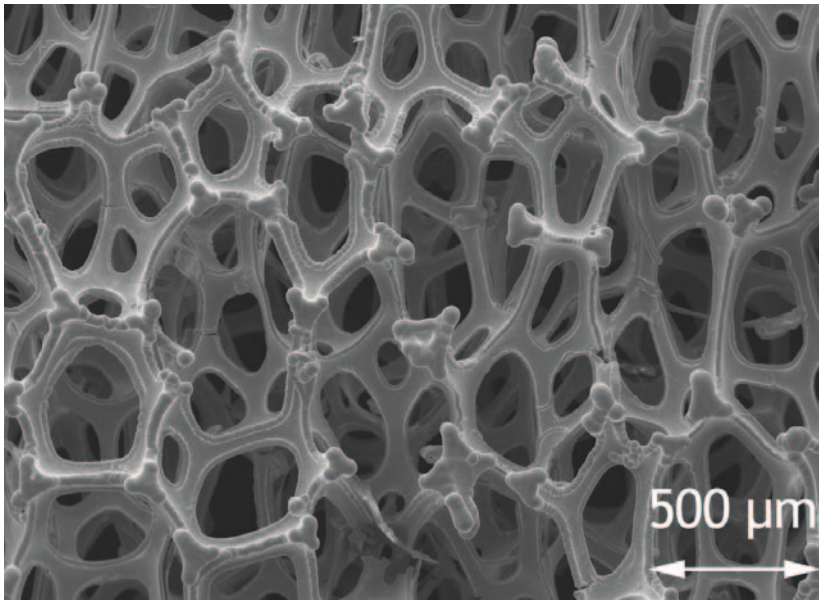
NEYCO has developed sputtering pads, as a replacement of indium or graphite foils or other bondings, for clamped targets.

TECHNICAL ADVANTAGES

- Cu metal properties for thermal transfer (from backing plate to target).
- Compensate the mechanical stress of targets.
- Electrical conductivity of Copper metal.
- Thickness of the pad after clamping 0.2 to 0.5 mm.

CHARACTERISTICS

- 100% metallic.
- Initial thickness 1.4 - 1.6 mm.
- Purity 99.95+%.
- Vacuum packed for a direct mounting in secondary vacuum.
- ~150 mm wide x length on request (up to 1000 mm).



Copper foam pad

SILVER-FILLED EPOXY BONDING CEMENT

CERAC silver-filled epoxy cement is a silver-colored thick paste containing the optimum ratio of silver powder to epoxy resin for maximum thermal and electrical conductivity and mechanical strength. The catalyst is a clear to yellow liquid. Both the epoxy cement and the catalyst should be stored in a refrigerator. This will give a shelf life of 6 months. Shelf life can be further extended to one year or more by freezing.

TYPICAL PROPERTIES OF EPOXY

Volume Resistivity	Less than 0.001 Ω.cm
Thermal Conductivity	0.02 cal.cm / sec.cm^2.°C
Pot Life (after catalyst addition)	30 min at 25°C (77°F)
Shelf Life (sealed container)	6 Months at 25°C (77°F) **> 1 Year at 5°C**
Use Temperature*	-50°C (-58°F) to 150°C (302°F)
Packaging	114 g

* Epoxy retains physical properties to 150°C (302°F), but some outgassing may occur above 115°C (239°F).

INSTRUCTIONS FOR USE

1. Degrease the backing plate, and roughen the bonding surface by lightly sandblasting or sanding with #400 sandpaper. The bonding surface of the target should also be slightly abraded with #400 sandpaper or similar materials.
2. Mask the edges of both the target and the backing plate with cellophane or some other easily removable tape. Also mask the surfaces of the target and backing plate not being bonded to prevent contamination from the epoxy cement.
3. Epoxy cement and catalyst should be at room temperature (approx. 21°C or 70°F) for best results.
4. Add the required quantity of catalyst to the epoxy cement and thoroughly mix. Use a 2.7 weight % ratio (2.7 parts catalyst per 100 parts epoxy).
5. Spread the epoxy cement evenly and smoothly across the surface of the backing plate. Then, mound the epoxy cement towards the middle of the backing plate.
6. Position the target very carefully on the epoxied backing plate, and gently move the target back and forth slightly, while applying light pressure downward, until epoxy cement extrudes from ALL edges, and no gaps are noticed.
7. Remove excess epoxy cement with a small spatula, and be sure the target is parallel to the backing plate. Use a level table for curing. **Bond will form overnight at room temperature or for best results, heat to 65°C (150°F) for one hour.**
8. Remove all masking tape only when the bond is carefully cured.

HOW MUCH TO USE

For round targets, use the chart below. For other-shaped targets, calculate the surface area, and use amounts of epoxy and catalyst closest to a corresponding round target area.

The following are the maximum quantities of epoxy and catalyst you must use:

DIAMETER (Inches)	SURFACE AREA (Square Inches)	WT. OF EPOXY (g)	WT. OF CATALYST (g)
2	3.14	20	0.54
2.5	4.91	30	0.81
3	7.07	40	1.08
3.5	9.62	47.5	1.28
4	12.6	55	1.49
4.5	15.9	67.5	1.82
5	19.6	80	2.16
5.5	23.7	90	2.43
6	28.3	100	2.70
6.5	33.2	110	2.97
7	38.5	120	3.24
7.5	44.2	130	3.51
8	50.2	140	3.78
8.5	56.7	160	4.32
9	63.6	180	4.86
9.5	70.8	200	5.40
10	78.5	220	5.94
10.5	86.5	240	6.48
11	95	260	7.02
11.5	104	280	7.56
12	113	300	8.10