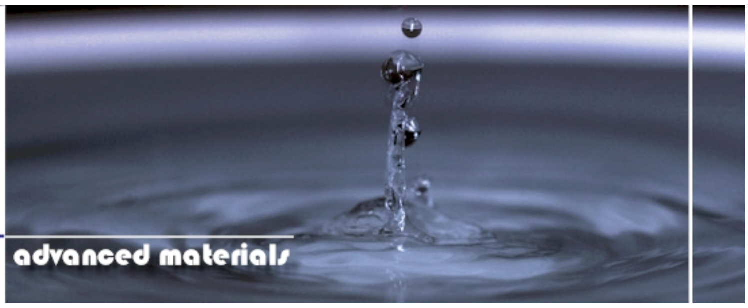

OSNABRUEGGE is recognized for its unique capabilities in the fabrication and supply of sputter targets & evaporation materials (Metal, Oxide, Alloy, Boride, Carbide, Nitride, Fluoride, Silicide, Sulfide), high purity Rare Earth and Lanthanum Hexaboride (LaB6) to customers in industries, university and research institutes on high-quality and cost-effective basis.

Sputtering & Evaporation products short-overview

Sputter Target:

Serve as the raw materials for the sputter deposition of a variety of thin films and coatings used in the semiconductor, photovoltaic, flat panel display, optics, wear and decorative coatings, and other industries, the core process technologies used in coating material and target manufacturing include:
casting (vacuum induction melting, cold crucible levitation melting, electron beam melting, plasma arc melting and vacuum refining), rolling, forging (hot / cold), pressing (cold, hot, uniaxial or isotropic), sintering, spraying (plasma, wire). We run all these process technologies, including cutting, milling, sawing, grinding, etc.

1.) Oxide Sputter Targets:

La2O3, CeO2, Nd2O3, Sm2O3, Eu2O3, Gd2O3, Tb4O7, Dy2O3, Ho2O3, Er2O3, Tm2O3, Yb2O3, Lu2O3, Sc2O3, Y2O3, Ta2O5, Nb2O5, Ga2O3, V2O5, ZrO2 doped with Ti, WO3, WO2.9, HfO2, MgO, Al2O3, Indium Tin Oxide, ITO (In2O3-SnO2), ZnO, Al2O3 doped ZnO (AZO), IZO (Indium Zinc Oxide, 90 wt% In2O3 / 10 wt% ZnO), Ga2O3 doped ZnO (GZO), IGZO, La0.67Sr0.33MnO3 (LSMO), ZrO2-Y2O3 stabilized (YSZ), YBCO, ZrO2+Ti, ZrO2+Zr, ZrO2+SiO2, Bi2O3, Cr2O3, MoO, MoO3, NiO, SiO, Cr-SiO, SiO2, TiO, TiO2, TiO2-Nb2O5, Ti2O3, Ti3O5, CuO/Al2O3, Sb2O3, BaO, BaTiO3, CaO, Fe2O3, Fe3O4, PbO, PbTiO3, PbZrO3, LiNbO3, SrO, SrTiO3, SrZrO3, SrBaTiO3, PZT (Plumbum Zirconate Titanate), SrRuO3, LaNiO3, InGaZnO, CuInO2, LaAl2O3.

2.) (Boride, Carbide, Nitride, Fluoride, Silicide, Sulfide) Sputter Targets

LaB6, ZrB2, CrB2, TiB2, HfB2, Mo2B5, TaB2, NbB2, W2B, WB, VB2
TiC, SiC, WC, WC-Co, WC-Ni, B4C, TaC, ZrC, Cr3C2, HfC, Mo2C, VC
Si3N4, AlN, BN, BN/SiC mixture, HfN, TaN, NbN, ZrN, TiN, VN
LaF3, CeF3, NdF3, YF3, NaF, KF, BaF2, AlF3, LiF, CaF2, SrF3, SrF2, MgF2
CoSi2, Mo5Si3, MoSi2, Ta5Si3, TaSi2, Nb5Si3, NbSi2, CrSi2, Cr3Si, HfSi2, TiSi2, Ti5Si3, ZrSi2, WSi2, VSi2, V3Si, NiSi,
CdS, ZnS, ZnS:Mn, In2S3, Sb2S3, PbS, MoS2, TaS2, WS2

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advanced materials

3.) Metal Sputter Targets:

Gold, Au, Silver, Ag, Osmium, Os, Platinum, Pt, Palladium, Pd, Iridium, Ir, Ruthenium, Ru, Rhenium, Re, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Sc, Y, Silicon, Si, Tellurium, Te, Bismuth, Bi, Tin, Sn, Zinc, Zn, Sulphur, S, Graphite, C, Boron, B, Lead, Pb, Antimony, Sb, Selenium, Se, Chromium, Cr, Cobalt, Co, Aluminum, Al, Nickel, Ni, Titanium, Ti, Tungsten, W, Molybdenum, Mo, Tantalum, Ta, Niobium, Nb, Zirconium, Zr, Hafnium, Hf, Vanadium, V, Germanium, Ge, Indium In, Copper, Cu, Iron, Fe, Manganese, Mn, , Magnesium, Mg, Barium, Ba, Cadmium, Cd, Calcium, Ca, Strontium, Sr.

4.) Alloy Sputter Targets:

Cr-Al, Co-Mn-Ge, Mg-Sm, Al-Sm, Mg-Nd, Mg-Nd-Zr-Y, Mg-Sc, Mg-Zr, Al-Nd, Mg-Gd, Al-Gd, Mg-Dy, Al-Dy, Al-Sc, Mg-Ca, Al-Ca, Mg-Y, Al-Y, NiYb, Ni2Yb, Ni3Yb, Ni-Yb, LaNi, La-Ni, Co-Ni, V-Ni, Cr-Ni, Ti-Ni, Fe-Ni, Co-Ni-Cr, Co-Cr-Ta, Ho-Cu, Ce-Cu,Ce-Ag, Nd-Ag, Fe50Mn50, Ni81Fe19, Ce-Gd, Sm-Fe, Sm-Co, Sm-Zr, Gd-Fe, Gd-Tb, Fe-Hf, HfFe, Tb-Fe, Dy-Fe, Dy-Co, Gd-Fe, Gd-Fe-Co, Dy-Fe-Co, Tb-Fe-Co, Nd-Fe-Co, Nb-Zr, Zr-Al, Al-Ta, Al-V, Al-Mo, Al-Si, Al-Cu, Al-Si-Cu, Al-Ti, Al-Ag, Al-Mg, Al-Mg-Si, Al-Si-Cu, Zn-Al, Ce-Gd, Ce-Sm, CoZr, CoCr, CoNi, Co-Fe, FeCoB, CoTaZr, CoNbZr, CoCrMo, CrV, CrB, CrSi, Cr-Cu, In-Sb, InAs, InP, InSn, MnFe, MnNi, NdDyFeCo, Ni-Cr, Ni-Mn, Ni-Cr-Si, Ni-Cr-Fe, Ni-Fe, Ni-Ti, Ni-V, NiV, Ni-Al, TbGdFeCo, TiAl, Ti-Si, Ti-Al, Ti-Al-Y, Ti-Al-V, Ti-Ni, Ti-Zr, TiSi2, W-Ti, W-Si, V-Al, Zr-Ti, Zr-Ni, Zr-Nb, Zr-Al, Zr-Cu, Zr-Y, Y-Zr-Mg, Gd-Ti, Gd-Ti-Zr.

Rare Earth:

Lanthanum, Cerium, Praseodymium, Neodymium, Samarium, Europium, Gadolinium, Terbium, Dysprosium, Holmium, Erbium,Thulium, Ytterbium, Lutetium, Scandium, Yttrium, Cerium Mischmetal and Cerium Ammonium Nitrate.
Material: metal, alloy, oxide, chloride, hydrate, sulphate, sulfide, acetate, oxalate, carbonate, fluoride, nitrate, nitride.
Purity: 98%, 99%, 99.5%, 99.9%, 99.95%, 99.99%, 99.999% and 99.9999%.
Shape: target, tablet, granule, foil, sheet, piece, wire, filament, rod, pipe, tube, powder, pellet, shot, wafer, plate, ingot, boat, crucible, ring, chunk, lump, dentritic, crystal, etc.

LANTHANUM HEXABORIDE (LaB6):

Used as a high brightness thermionic emission materials because of its low work function, high melting point and high metallic conductivity. LaB6 cathode for Leybold 1104 coating machines for precision optical coating is our advantage.
We produce LaB6 powder, LaB6 disc, LaB6 tablet, LaB6 target, LaB6 rod, LaB6 crucible, LaB6 sector ring, LaB6 tube (hollow cathode), YB6 rod, CeB6, PrB6, NdB6, SmB6, EuB6, GdB6, TbB6, DyB6, HoB6, ErB6, TmB6, YbB6, LuB6, ScB6, (LaBa)B6, (LaEu)B6, CaB6, etc.

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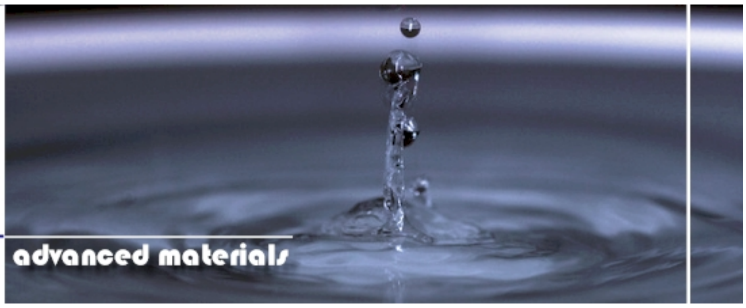

Useful info

Why Bond Sputtering Targets ?

To keep the sputtering targets from falling off the backing plate, to provide electrical conductivity between the target and the backing plate and to provide heat transfer between the target and the backing plate.

1.) To keep it from falling off the backing plate
Vibration will cause sputtering targets to move about in vacuum system.

2.) To provide electrical conductivity
Real conducted current must flow. This current may be high enough to cause contact problems between the backing plate and the target material. If the current varies rapidly, and there are significant inductance and stored energy considerations, electrically noisy arcs may result. These arcs may result in interference, particulate problems or even severe damage to some expensive items.

For dielectric materials, RF sputtering is used, so the coupling can be capacitive and the current is called the "displacement current." For RF sputtering, electrical contact may be less of an issue. Even in that case, however, arcs can still occur due to detailed local current balance requirements.

3.) To provide thermal conductivity
If there is not some deformable material between a target and its backing plate, then the only way for heat energy to make the journey from the target (receiving the heat input) and the backing plate (the cooled element) is via radiation. Radiation is most efficient at rather high temperatures.

Listed below are some very important issues to be considered during the bonding of sputtering targets:

With few exceptions, materials expand when heated. Not all materials expand at the same rate, so as a "couple" is heated, stress that may result in deformation or bending will occur due to differential thermal expansion. in some bad cases, something may fail in brittle fracture or be permanently deformed.

Sputtering targets face two very different situations. The first of these is nominally isothermal heating when the bonding is performed and the other is non-uniform heating from one side and approximately uniform cooling on the other. Each of these has the potential to damage the target, but in different ways and for different reasons.

During the bonding, both the backing plate and the target expand, as does the bonding material. Here are some things to think about:

As mentioned, the expansion coefficient of all the materials involved will, in general, be different. If this difference is large enough, then the target will either be in compression plus shear or tension plus shear after the bond forms and has some strength.

Before the bond forms, everything is free to move, and the only issue may be the relief of internal stress in the target itself.

Most ceramic and glassy materials are fairly strong in compression but weak in tension and shear. Some glassy materials undergo stress crack propagation and may fail in a spectacular manner as seen in the photo. Metals, on the other hand, may undergo buckle-wave failure in compression. This is usually only an issue for very thin or foil targets.

There is another issue that relates more directly to the design of the sputter source itself; namely deflection of the backing plate or support structure by pressure differences. Obviously, any material will deflect when a pressure is applied.

The inherently non-uniform heating associated with magnetron sputter sources may also be a limiting factor. Rotating magnetron sources are expected to be less susceptible to this problem.

Bonding with Adhesives
Plain Epoxy is simply not viable, to no great surprise.

Silver Loaded Epoxy is commonly used and seems to be marginally OK, but is it? Suppose that your target bonder only achieves 50% coverage. In such a case, the temperature drop is doubled and the bond may fail. The only easy way to tell if this is an issue for any particular target is to inspect it using X-ray techniques or possibly ultrasonics. From that inspection, the fractional coverage can be estimated and the maximum permissible power can be determined.

Considerations should include:
Gross bond failure
Outgassing of the bonding agent
Target material issues, such as stress cracking
Release of volumes of gas trapped within the adhesive layer during the bonding process may also be an issue.

Bonding with Metals

Target bonding with metals is essentially a low temperature braze joining technique that is in some ways similar to "sweat soldering."
Most backing plate materials, though not all, can be joined with relative ease. That is definitely not the case with the sputter targets. As a general rule, a coating or series of coatings must be applied to the target. Important characteristics of such layers include:

The coating must adhere well to the target material both during the bonding operation and in normal operation
The coating must form a good bond with the braze metal
The coating must not diffuse significantly into the target
This may limit bond strength at the interface with the target material
Differential thermal expansion may restrict the choice of braze alloys
The coating must act as a barrier to prevent diffusion of the braze metal into the target
The coating must not outgas excessively

As a general rule, one material will not satisfy all of these criteria, so a stack is devised. Such a stack will include an adhesion layer, possibly one or more barrier layers and a top surface to which the braze joint is actually made. The top layer will often be relatively thick, since a substantial portion may alloy with the braze material. Transition layers may also be required for a variety of reasons.

Cleaning Sputtering System and Sputtering Target

Any residual build up of grease, dust, and old coatings will trap water and other contaminants and both impede your ability to achieve a good vacuum and increase the possibility of making bad films. Target arcing, surface roughness in deposited films, and trace chemical impurities are often times linked to dirty sputter chambers, guns and targets.

The cleaning requirement extends to the backing plate, dark space shield, chamber walls, and other neighboring surfaces as well as the target itself.

To clean the vacuum chamber, bead blast the dirty components by using glass beads is recommended, then lightly brighten the surface using alumina impregnated sand paper. Following the sanding, the surfaces should be chemically washed through a series of bathes including trichlor, acetone, alcohol, and deionized water. Ultrasonic bath for these rinses, with cycles of 5 minutes per fluid is recommended.

It is important that you never touch the target with bare hands - likewise you should wear protective gloves whenever working inside your sputter chamber. In the event that the target does need cleaning:

Metal Targets can be cleaned using a four step process. First the target should be wiped using a lint-free lab towel soaked in acetone, followed by a similar wipe with alcohol, followed by a final wipe with deionized water. After the final wipe, the target should be baked out in air for 30 minutes at 100ºC.

Oxide and Ceramic Targets can be cleaned using a non-impregnated "scotch bright" pad. After removing the soiled area, flush the target with high pressure, low moisture, Argon gas - to remove any dust particles that may cause arcing in the sputter system.

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