



MATERION



**ADVANCED
MATERIALS GROUP**

PVD Materials
& Services for the
LED Industry

PVD Materials & Services for the LED Industry

The Challenge

LED manufacturers are under relentless pressure to reduce costs and increase performance. Thin film precious metals offer numerous performance advantages on the LED chip and on reflectors, but the high cost of precious metals is a problem.

The Solution

Materion offers the complete solution: precious metal sputtering targets and evaporation slugs, target bonding, shield kit cleaning, reclaim and refining services. The combination of our in-house chamber shield cleaning and precious metal reclaim and refining capabilities enables us to provide higher returns and quicker settlements. Our 20+ years of experience in lifecycle management maximizes the benefits of using precious metals and provides lower total cost of ownership.

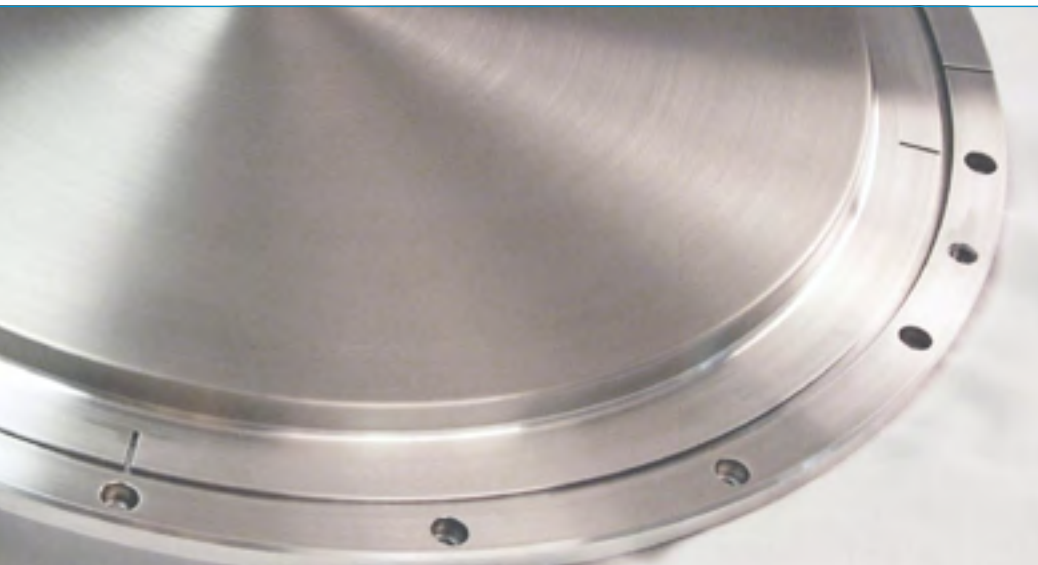
SPUTTERING TARGETS

Materion's sputter materials include:

- Blu-S™ and Blu-X™ tarnish-resistant Silver alloys
- Gold-Tin alloys to deposit 80:20 Au:Sn solder
- Gold-Germanium alloy
- High purity Gold, Silver, Palladium & Platinum
- Titanium & Aluminum
- Ni:V and Ti:W
- Doped or floatzone silicon

Our accreditations include:

- ISO 9001:2008
- ISO 14001:2004
- LeanSigma



Materion ... Materials to Advance the World's Technologies



TARGET BONDING

Materion maintains one of the largest internal networks of target bonding facilities in the world. Our proximity minimizes your turnaround time.

- Over 5000 targets are bonded annually
- Four bonding facilities in USA, three in Asia and one in Europe
- Bonding methods include metallic solders, elastomer, epoxy and diffusion bonding
- Adhesion, diffusion and wetting layers are applied by sputtering or evaporation
- Customized solutions available for specific material combinations or operating requirements
- Production sites can verify bond integrity with nondestructive ultrasonic testing

Backing plates are available to fit nearly all OEM designs. Typical backing plates include copper alloys, stainless steel and molybdenum.

EVAPORATION MATERIALS

Slugs, Starter Sources and Premelts

Materion offers a wide range of evaporation metals for the LED industry.

Metals include:

- Gold-Germanium alloy
- High purity Gold, Silver, Palladium, Platinum, Nickel, Titanium, Aluminum, and Tin
- Proprietary EVAPro™ high purity, low spitting materials to improve yield and tool uptime

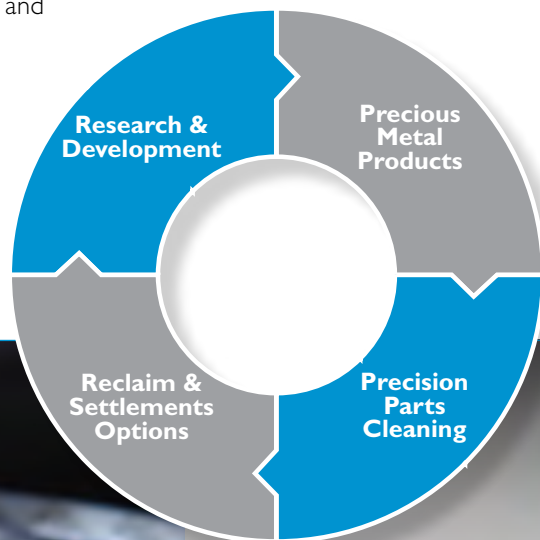
Premelts, starter sources and crucible liners are available for most standard and custom configurations. To create starter sources, the metal is machined into truncated cones to conform to the interior dimensions of your crucible or crucible liner.

PRECIOUS METAL LIFECYCLE MANAGEMENT

Materion can provide all of the services needed to minimize the total cost of using precious metals for your PVD process.

- Vacuum Chamber services: removal of deposited metal, shields cleaned and returned in low particle condition
- Damage-free removal of evaporated gold from copper turrets and V-plates
- Service centers: two in the USA and one in Europe
- Reclaim of spent targets and evaporation material
- Reclaim of precious metals removed from shields
- Metal assay using the most advanced analytical techniques including GDMS, ICP-MS, and LECO

Materion's engineering expertise in metal refining and precision parts cleaning enables customers to focus on their core business. With two of the largest and most efficient chemical and electrolytic refineries in North America and precision parts cleaning sites in the US and Europe, Materion is the partner of choice for manufacturers seeking to gain a competitive advantage.



SILVER FOR LEDs

Silver is the optimal reflective surface for white light, better than aluminum. However, pure silver can tarnish through the formation of sulfides. Tarnishing can be accelerated by exposure to high humidity and high temperature. Therefore, pure silver is not the ideal choice of material for use in LED reflective layers due to its potential loss of reflectivity from tarnishing.

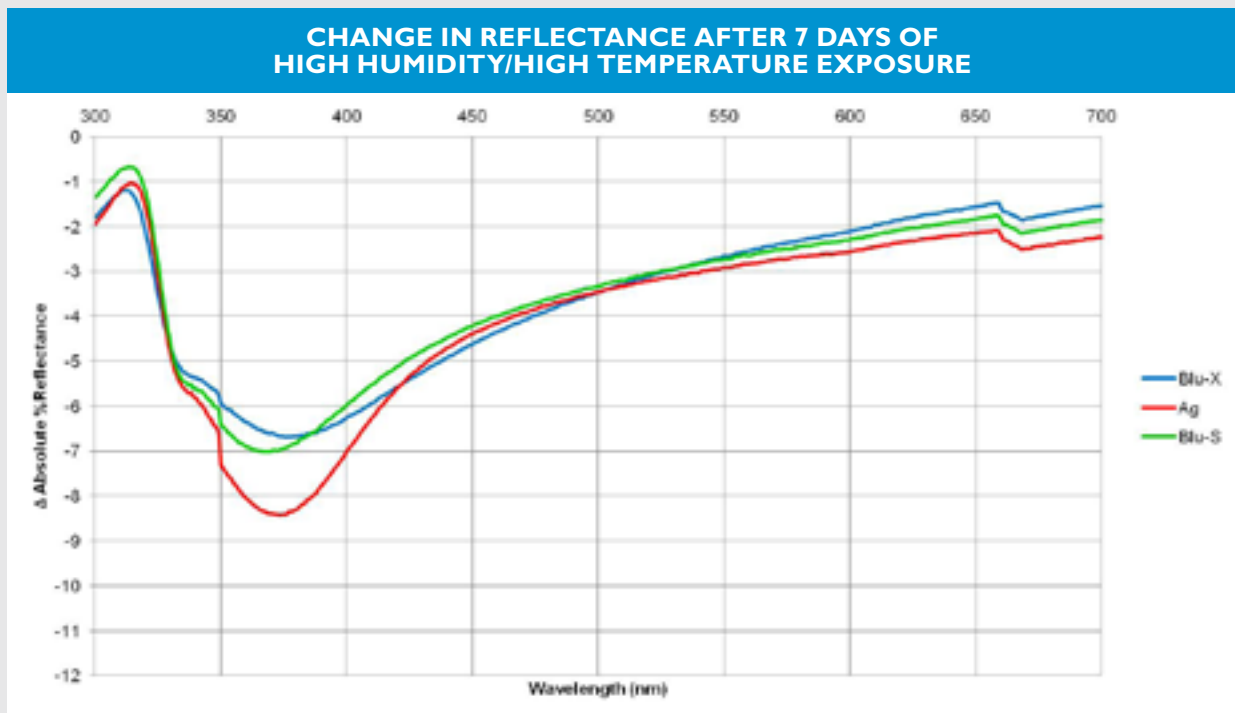
Sputtering of Tarnish-Resistant Silver Alloys

Fortunately, Materion offers tarnish-resistant silver alloys that have demonstrated superior resistance to environmental degradation compared to pure silver. These alloys include our proprietary Blu-X™ and Blu-S™. Sputter targets made of Blu-X™ and Blu-S™ are available in designs compatible with most OEM sputter systems.

APPLICATIONS

One application for silver is in light-emitting diodes (LED) used for general illumination.

- Silver is used as the backside reflective layer on the LED chip. Its purpose is to reflect stray light in the intended forward direction.
- Silver can also be used to coat the surfaces of the sub-mount and reflector surrounding the LED chip.



This environmental testing was co-conducted with TEL-NEXX, a division of Applied Materials.



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ADVANCED MATERIALS GROUP

2978 Main Street
Buffalo, NY 14214 USA
Phone: +1 800.327.1355
advancedmaterials@materion.com
www.materion.com/advancedmaterials

Europe: +441 488.686056
Asia: +65 6559.4450

MATERION CORPORATION
www.materion.com



MATERION ADVANCED MATERIALS GROUP is an industry leader in microelectronic packaging for the semiconductor, MEMS, wireless & LED markets. We manufacture lids, frames, solder & braze alloys, precious metal targets, and evaporation materials to meet the broadest range of customer requirements. In addition to developing innovative packaging products, we offer related services to support your business needs including precision parts cleaning, precious metals refining & recycling, and sputtering target bonding.