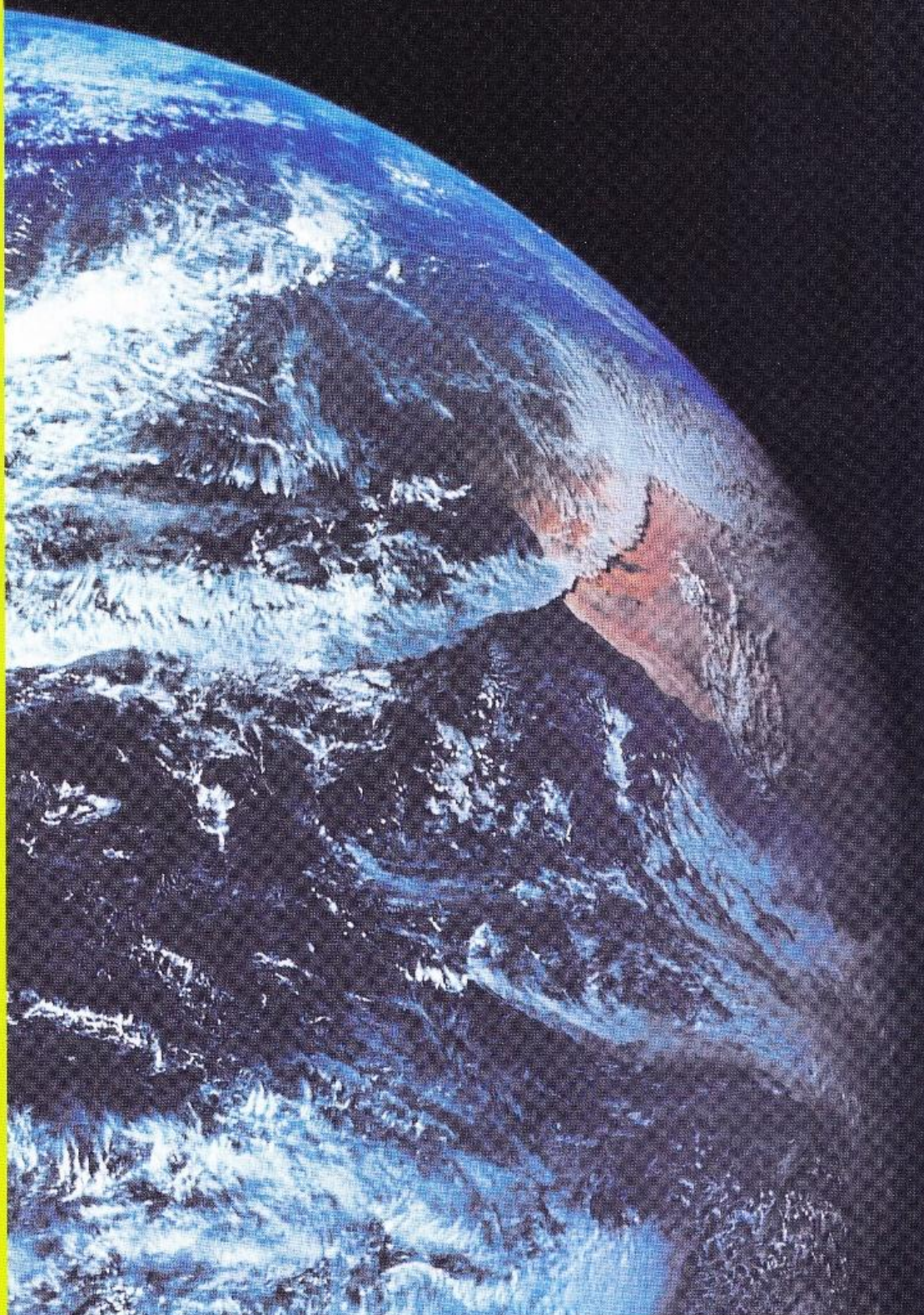




**Materials Science International, Inc.**

**World class manufacturer of  
high quality sputtering targets**

**The mission of  
Materials Science  
International, Inc.** is to  
be the world's preferred  
supplier of quality targets.  
This is being accom-  
plished by following the  
precepts of total quality  
management as detailed  
in ISO-9001, and by  
striving in all aspects of  
our business to exceed  
customer expectations.





## Known world wide for excellence

Materials Science International, Inc. (MSI) commands an international reputation for its experience in the design, manufacture, and servicing of metal and ceramic sputtering targets and coater support equipment. We have served customers in many countries engaged in thin film coating of architectural/industrial glass, electronic, automotive, and aerospace components.

After our founding in 1981, MSI spent several years working with a leading international industrial manufacturer. During this period, we developed innovative manufacturing processes for producing sputtering targets used in

the Physical Vapor Deposition (PVD) process for coating such products as Winchester disks, low-emissivity glass, rapid defrost automotive windshields, aircraft canopies, and photovoltaic solar panels.

Our quality and on-time delivery performance have earned numerous awards from customers for outstanding service and dependability. In 1998, MSI's quality management system was certified as meeting ISO-9001 requirements, and today we are certified to BS EN ISO-9001:2000.



*All production, engineering, shipping and administrative operations are carried out in a modern 30,000 sq. ft. facility located on the southwest side of Columbus, Ohio. The building houses the latest in fabrication and machining equipment to assure the highest levels of product integrity.*





## Targets for a variety of applications

MSI's sputtering and evaporation materials are used in a multitude of industrial thin film coating applications: aerospace, automotive, electronics, architectural, decorative, optical, solar panels and others.

### Metal Targets

Our product offering includes a wide range of high purity precious, semi-precious, and non-precious metals and alloys. Targets are available in segmented planar, monolithic planar, and rotatable styles, and may be cast, plasma sprayed, or bonded. Our specially configured boat targets can provide up to twice the service life of standard targets by maximizing material usage and applied power capability.

MSI's internal process controls achieve superior material utilization and lot-to-lot stability, while enabling competitive pricing through reduced production costs. Each target is carefully designed and manufactured to avoid the introduction of raw material surface contaminants to the thin film coating process. Proper grain size is assured

with minimal alloy gradient, regardless of target size.

MSI offers excellent target repair and reconditioning services, allowing customers to refill and install existing targets, greatly extending their life cycle.

### Ceramic Targets

MSI employs wet and dry chemical processes to produce a full line of ceramic targets. Single crystal substrates include  $\text{Al}_2\text{O}_3$ ,  $\text{LaAlO}_3$ ,  $\text{MgF}_2$ ,  $\text{MgO}$ ,  $\text{SrTiO}_3$ , YAG, YSZ, and others. Extensive machining capabilities permit us to supply target assemblies for a broad range of production applications, including the MRC and Singolis designs, and sizes to accommodate 3.8 meter (148") Leybold and Airco 7200 Series sputtering machines.

Our advanced bonding process allows us to bond ceramic targets to almost any backing plate up to 100" long x 20" wide. A state-of-the-art plasma spraying process enables MSI to meet precise rotatable target specifications.





### Specialty Targets

Many of our customers have unique requirements, and our engineering staff is skilled at designing one-of-a-kind prototypes for research and production trials. Customized targets, in lots of one or hundreds, can be produced to meet a wide range of production parameters.

### Analysis and Certification

Every target product we deliver is accompanied by a detailed analysis which certifies the chemical purity of the material. Upon request, MSI will also supply Material Safety Data Sheets.

### Silver Recovery

MSI has formed a separate company, Metals Recovery Services, LLC, to meet customers needs for high purity silver. MRS can supply 99.95% pure silver bullion through a reclamation process of photographic and X-ray fixer solutions.

## Metals and Metal Alloy Styles

| Materials                             | Forms   | Applications   |
|---------------------------------------|---|--|
| Aluminum & Al Alloys                  | Planar Clamp and Bolt Down, Annular, and Rotatable            | Optical including low-e glass, IC and PV solar cells                     |
| Chromium                              | Planar Clamp and Bolt Down, Annular                           | Optical including low-e glass, printer heads                             |
| Copper                                | Planar Clamp and Bolt Down, Annular                           | Optical including low-e glass, decorative hardware, backing plates       |
| Indium, Tin, and Indium-Tin Alloys    | Rotatable, Boat   | Optical including low-e glass, aircraft canopies, LCD and PV solar cells |
| Molybdenum                            | Planar Clamp and Bolt Down, Annular                           | Optical coating and IC   |
| Niobium/Columbium                     | Planar Clamp and Bolt Down, Annular                           | Optical coating and IC   |
| Nickel and Ni Alloys                  | Planar Clamp and Bolt Down, Annular                           | Optical including low-e glass, back side of chip coat                    |
| Silver                                | Planar Clamp and Bolt Down, Annular                           | Optical including low-e glass  |
| Stainless Steel                       | Planar Clamp and Bolt Down, Cylinder                          | Optical including low-e glass, backing plate                             |
| Tantalum                              | Planar Clamp and Bolt Down, Annular                           | Decorative including flat panel display and IC                           |
| Titanium and Titanium/Aluminum Alloys | Planar Clamp and Bolt Down, Rotatable, Monolithic             | Optical including low-e glass, wear coat                                 |
| Tungsten (Wolfram)                    | Planar Clamp and Bolt Down, Annular                           | Electronic devices, IC   |
| Zinc and Zinc Alloys                  | Planar Clamp and Bolt Down including Monolithic and Rotatable | Optical including low-e glass, PV solar cells                            |
| Zirconium                             | Planar Clamp and Bolt Down, Annular                           | Decorative hardware  |



## Processes and Capabilities

- Metal casting
- Rolling & straightening
- 40" capacity sawing
- CNC machining
- Hot & cold vacuum pressing
- Hot & cold isostatic pressing
- Sintering
- Heat treating
- Bonding
- Ceramic grinding
- Fabrication & assembly
- Custom design services
- Vacuum packaging



Vacuum Hot Pressing (VHP) and Sintering Processes



Hot Isostatic Pressing (HIP)



CNC Machining of small and medium size targets



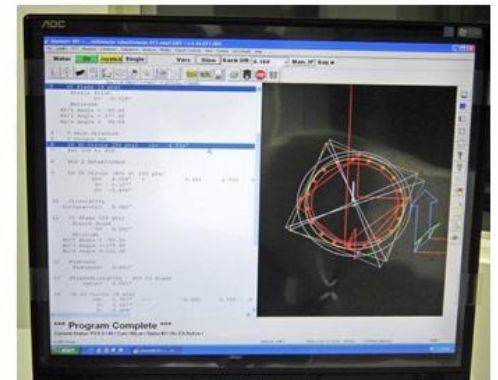
CNC Machining of large targets



CNC Machining of small and medium size targets



CNC Machining of large targets







## Our commitment to quality

- **Customer Satisfaction**  
Responsive to deliver quality
- **Accountability**  
Dependable and reliable
- **Integrity**  
Communicative and honest
- **Teamwork**  
Respectful and supportive to others
- **Result**  
Focused to provide value

MSI maintains an aggressive, ongoing program to ensure that we anticipate and exceed the expectations of our customers. Our quality system has been certified by BSI, an independent third party registration service, to be compliant with BS EN ISO-9001:2000 for the following scope:

*Design, manufacture and service of sputtering targets and specialized*

*components, including customized precision machining and related equipment development.*

MSI follows a Total Quality Management (TQM) approach to constantly improve our products and services.

**Total customer satisfaction** is our goal every day.

**Discover why MSI has earned dozens of customer awards for quality excellence in both products and services. Call 614-870-0400 to discuss your requirements.**



### **Materials Science International, Inc.**

1660 Georgesville Road  
Columbus, Ohio 43228-3620 U.S.A.

Phone: 614-870-0400

Fax: 614-878-6000

E-mail: [sales@msitarget.com](mailto:sales@msitarget.com)

Web Site: [www.msitarget.com](http://www.msitarget.com)