

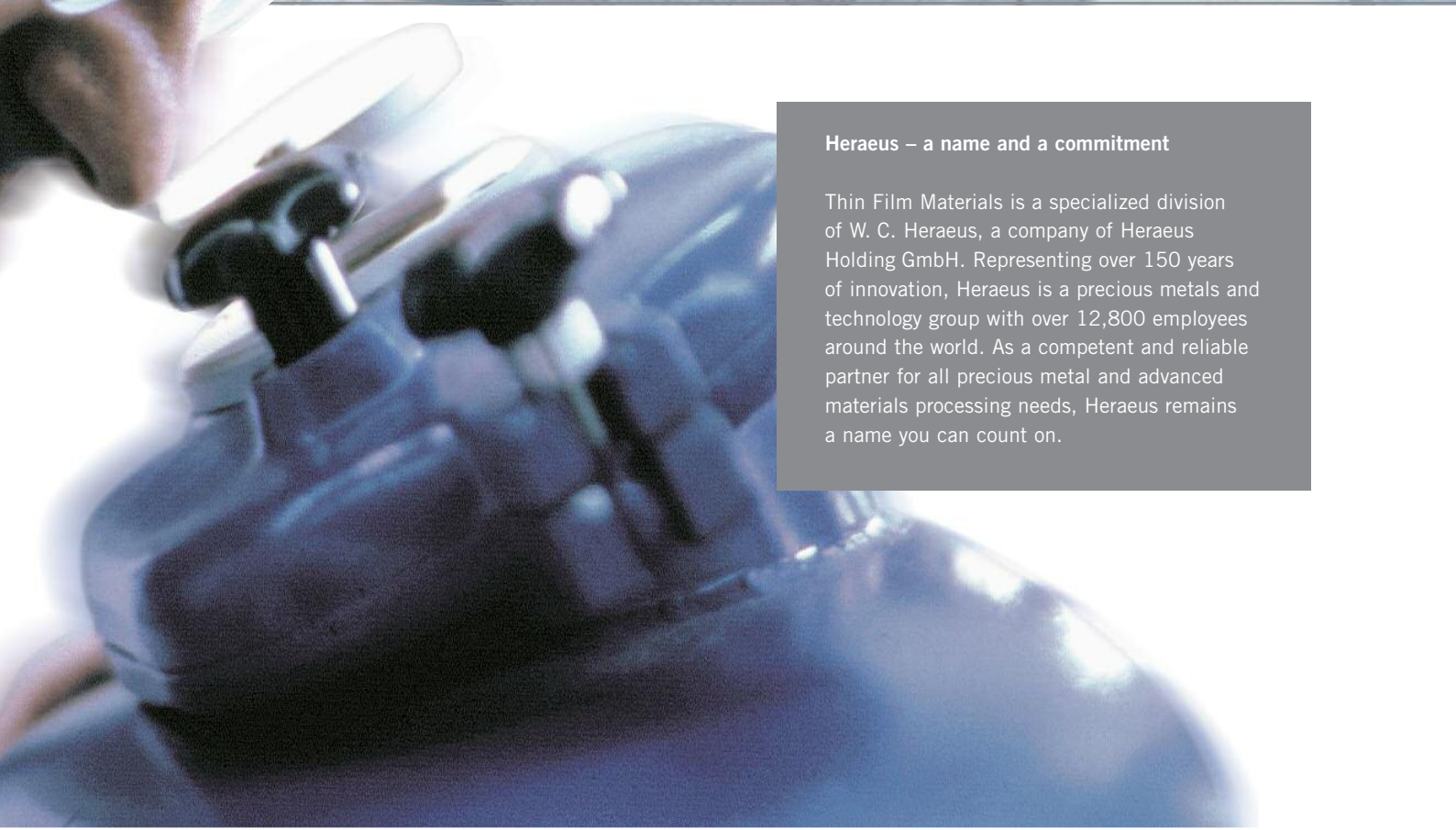
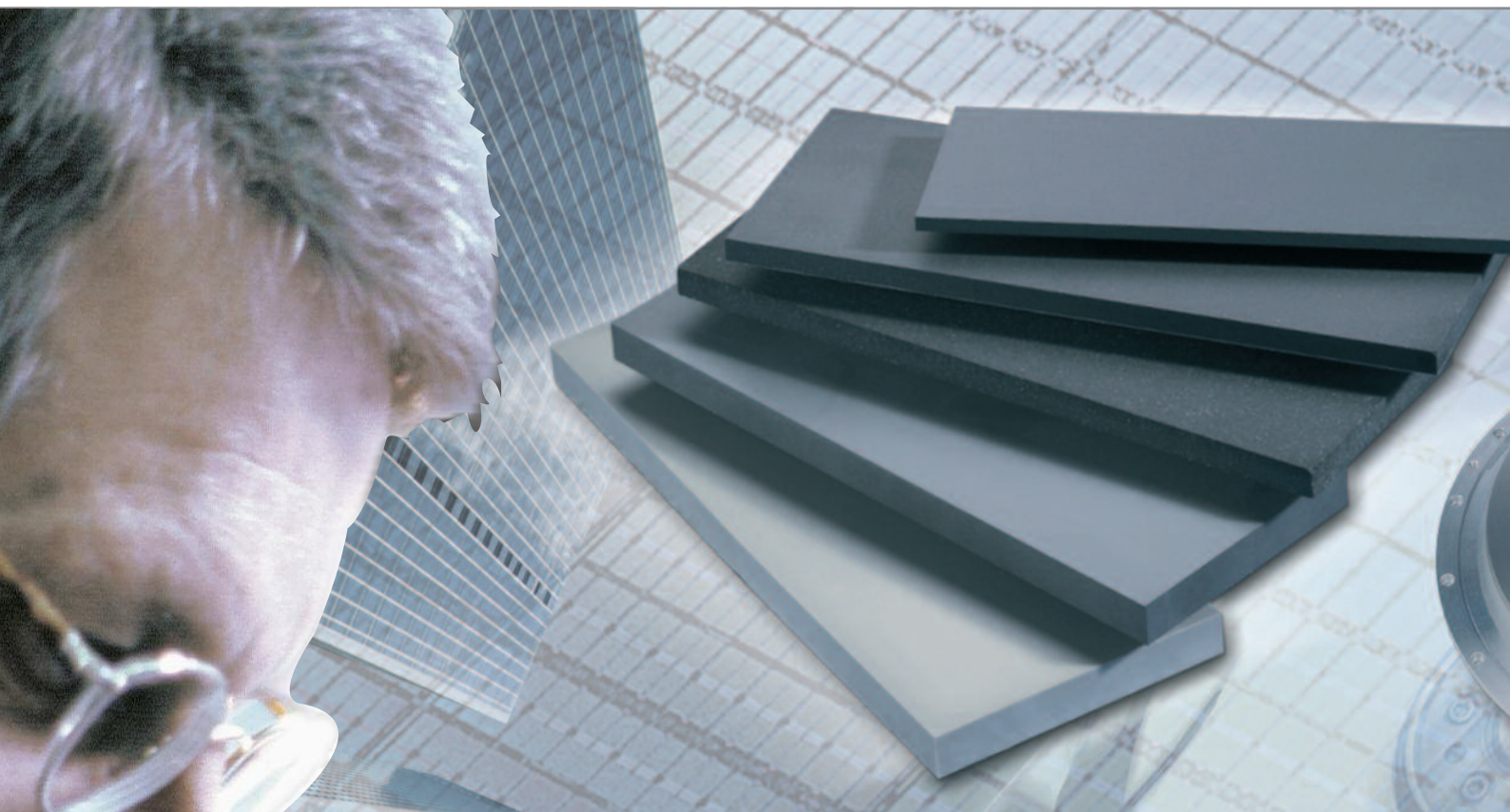
Heraeus



**Your partner for
advanced PVD materials**

Thin Film Materials Division

Draw from our experience and know-how in sputtering targets



Heraeus – a name and a commitment

Thin Film Materials is a specialized division of W. C. Heraeus, a company of Heraeus Holding GmbH. Representing over 150 years of innovation, Heraeus is a precious metals and technology group with over 12,800 employees around the world. As a competent and reliable partner for all precious metal and advanced materials processing needs, Heraeus remains a name you can count on.



The Thin Film Materials Division (TMD) of W. C. Heraeus is one of the world's largest – and most experienced – developers and manufacturers of high purity sputtering targets and evaporation materials. With our global network of sales and service offices, production facilities and bond shops, we provide our customers the technical support and rapid logistical response needed in today's 24-hour manufacturing environments – around the world.

But that's not all. We continue to work closely with you – leading industry manufacturers, production system suppliers, and research institutes – to continually develop new, high performance products.

Heraeus TMD is your ideal partner for advanced materials solutions.

Business Excellence

Based on the European standards for Business Excellence (EFQM), we strive to implement excellent business processes throughout our organization. For us, this means more than excellent results. We have ongoing review processes in place to continuously improve how we manage our employees, develop our strategies, and use our resources. The goal is to consistently improve both employee and customer satisfaction – and to be a good corporate citizen.

Using our experience to help solve your production challenges



The manufacturing process

Casting / Melting

VIM
e-beam
continuous casting

Powder Metallurgy

atomizing / blending
powder milling
axial pressing
CIP
hot pressing
HIP
sintering

Spray Technology

plasma spraying
wire spraying

Thermo Mechanical Treatment

forging / rolling / extrusion
homogenization / recrystallization

Mechanical Tooling

waterjet cutting / EDM
milling / turning / grinding

Bonding

soldering
glueing
reactive foil bonding (RNT)

Quality Control

Clean Room



A complete production chain

We have manufactured our own targets since the beginning of industrial scale sputtering. Our materials development capabilities range from prototyping to mass-production – including advanced manufacturing processes, sophisticated material procurement capabilities and rigorous quality control.

Casting, rolling, pressing, sintering, and spraying – these are all precise processes in the production of sputtering targets and evaporation materials that demand expert knowledge and the right hardware. They are complemented by a full range of industrial material processing and treatment procedures that include cutting, milling, sawing, grinding, and soldering, etc.

The advantage of control

Optimized and reliable target manufacturing is a logical result of our innovative R&D activities – usually done in cooperation with you, our customers. We continually invest in the most advanced manufacturing equipment. Controlling the whole production chain offers you key

advantages – minimizing production time, optimizing quality control efforts, and ensuring an optimized product.

Testing

Our comprehensive testing and analytical capabilities assure that every target is of the highest quality.

- X-ray fluorescence and diffraction analyses (XRF & XRD)
- Induction coupled plasma spectroscopy (ICP)
- Glow discharge mass spectroscopy (GDMS)
- Glow discharge lamp spectroscopy (GDL)
- Fusion and gas extraction analysis (LECO)
- Metallography
- Scanning electron microscopy (SEM)
- Ultrasonic testing

Finally, with our in-line sputter system we can run production tests for PV, glass and display applications using a 500 mm cathode with both Twin Mag and reactive sputtering capabilities. It is primarily used for testing of planar and rotatable targets that are in co-development with our customers, but is also used for internal testing of target/layer characterizations and performance, bonding analysis, and the determination of sputter data.

Specialists for a wide range of thin film applications



What do we do? Our versatile product development specialists work with you to meet even the most demanding production parameters in a wide range of thin film applications.

This wide range of expertise, in both production know-how and precious metals proficiency, is unique in the industry. Our core markets include:

- Glass Coating
- Magnetic Data Storage
- Semiconductor
- Display
- Photovoltaics & Solar Thermal

Flat panel displays is just one of many examples of how we continue to upgrade our manufacturing and development capacity for all our products. Today we provide clean room quality materials used for TFT and OLED manufacturing applications – and constantly develop and test materials for emerging applications in this dynamic market.

Maintaining the technology lead

While we offer products that have remained unchanged and have performed well for over 20 years, almost 50% of our current coating materials are less than 5 years old. And this number is set to increase in the future, as we – together with our customers – continue to develop and optimize improved coating material solutions to meet new market demands.



A global leader in key technologies



We have five core markets: Glass coating, magnetic data storage, semiconductor, display, photovoltaics and solar thermal. In both glass coating and magnetic data storage TMD remains the undisputed market leader for advanced sputtering targets and coating materials. We are also growing rapidly in semiconductor, display, photovoltaics and solar thermal.

Our expertise in materials technology and process optimization support enable you to meet today's stringent production and cost parameters.

High-performance glass coatings

We have been a technology leader in large area coating applications since the beginning of industrial-scale glass coating. Used predominantly by the flat glass and web industries, our sputtering targets enable the smart windows and sophisticated glass surfaces used in modern buildings and automobiles. Our portfolio of sputtering

targets includes all the key pure metals used in large area coating applications, as well as all the popular alloys, and ceramics. These are produced in different shapes (planar and rotatable, sprayed and cast) and sizes – up to 4 meters in length or several 100 kg in weight.

Coatings for photovoltaic and solar thermal applications

With emerging solar technologies and processes, Heraeus sputtering targets production, process know-how and supply capabilities are in great demand by photovoltaic module manufacturers and solar thermal system makers.

Heraeus, in cooperation with its customers, research institutes and coating system manufacturers, has developed a variety of sputtering targets for most layers found in the different types of photovoltaic cells (c-Si, a-Si, μ -Si, CIGS, CdTe, wafer based) as well as reflective, anti-reflective and absorber coatings for solar thermal systems.



Complex layers for high density magnetic data storage

As the world's largest target manufacturer and supplier to the hard disk industry, we understand the complex metallurgy behind this high density storage technology.

Our materials development capabilities range from prototyping to mass-production. Our advanced manufacturing processes, sophisticated material procurement capability and rigorous quality control assures our customers – the leading hard disk manufacturers – compatible and reliable target quality for all stages of the manufacturing process.

Meeting the special requirements of the display industry

Based on decades of hands-on experience with precious and special metals, Heraeus is able to offer tailor-made targets that meet the special requirements of the display industry.

Be it high purity metals, sophisticated alloys, ceramics; be it planar, tubular, extremely homogenous designs or very large form factors up to 2500 x 2800 mm, Heraeus masters the task.

Working in a clean room environment

We work with leading electronic and semiconductor companies, and coating equipment suppliers, to test and optimize a range of targets and evaporation materials for various types of electronic and semiconductor applications:

- IC-Interconnects
- Underbump metallization
- MEMS
- Backside metallization
- High-K
- Optoelectronics
- Thru Si Via (TSV) metallization
- CB-RAM, R-RAM, FeRAM

The precise tolerances needed for mass-production of integrated circuits and discrete electronic components place extremely high demands on the purity and quality of the coating materials. This is why all our targets and evaporation materials are cleaned and packaged in a clean room environment.

We work with you – anywhere in the world



Technical support

The products based on thin film technology range from the highly specific to mass commodities. Their production demands a high level of process and technical support. For us, this means providing you with around-the-clock availability, innovative products and quick delivery, no matter where your production line is located.

Global network

Our global network of sales and service offices comprises locations in over 20 countries. In addition, our network of bond shops – in Asia, Europe and North America – are located close to the customer site for quicker turnaround and lower processing costs.

Our sales and service professionals are there, where and when you need them.

The technology of quality

An essential element of our services are the consistently high-quality processes and official certification. All our manufacturing parameters and processes are certified (ISO 9001:2008, ISO 14001:2009, etc.). These guidelines provide total transparency for our customers – individual quality controls, tracking the production parameter, and even identifying the source of the raw material. This assures absolutely consistent material quality – and reliable production results for our customers.



W. C. Heraeus GmbH
Thin Film Materials Division, Hanau, Germany



Heraeus Materials Technology LLC
Chandler, Arizona, USA



Heraeus Materials Singapore Pte. Ltd.
Singapore



Heraeus Materials Technology Shanghai Ltd.
Shanghai, China



Heraeus Materials Technology Taiwan Ltd.
Taipei, Taiwan

Sales representatives in:

- | | |
|--------------|----------------|
| Brazil | Czech Republic |
| The Emirates | France |
| India | Italy |
| Japan | Korea |
| Spain | Sweden |
| Turkey | United Kingdom |



China

**Heraeus Materials
Technology Shanghai Ltd.**

1 Guang Zhong Road
Zhanquiao Town Minhang District
Shanghai 201108
Phone +86 (21) 33 57 56 88
Fax +86 (21) 33 57 56 99
hmts@heraeus.com

Singapore

**Heraeus Materials
Singapore Pte. Ltd.**

Block 5014
Ang Mo Kio Avenue 5
#07-01/04 TechPlace II
Singapore 569881
Phone +65 65 71 78 88
Fax +65 65 71 75 88
enquiry.hsl@heraeus.com

Taiwan

**Heraeus Materials Technology
Taiwan Ltd.**

4F-5, No. 408, Rui-Guang Road
Nei-Hu District
Taipei City 114, Taiwan, R.O.C.
Phone +886 (2) 26 27 11 11
Fax +886 (2) 26 27 12 48
echo.fang@heraeus.com

USA

**Heraeus Materials
Technology LLC**

280 N. Roosevelt Ave
Chandler, Arizona 85226
Phone +1 (480) 961-9200
Fax +1 (480) 961-9028
targets.us@heraeus.com

Europe

W. C. Heraeus GmbH

Thin Film Materials Division
Wilhelm-Rohn-Str. 25
63450 Hanau, Germany
Phone +49 (61 81) 35 - 22 02
Fax +49 (61 81) 35 - 22 10
targets@heraeus.com

www.heraeus-targets.com

www.heraeus-materials-technology.com