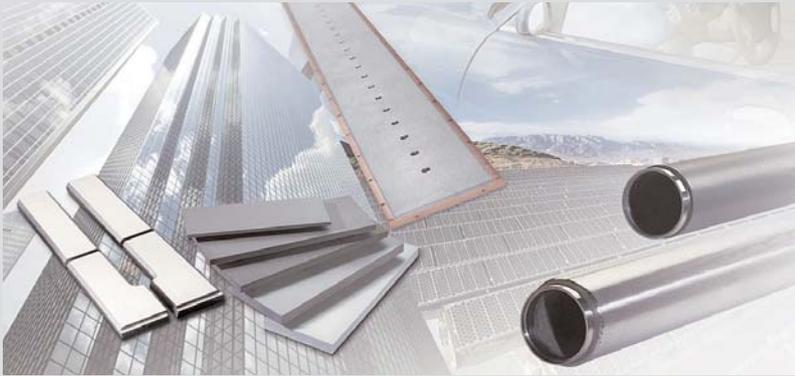


## Rotatable Targets for Large Area Coating Applications



### Applications

The Thin Film Materials Division (TMD) of W. C. Heraeus is the world's leading supplier of sputter targets for the glass coating industry. When the first industrial glass coatings were developed, TMD was there – involved in development and production of coating materials for architectural glass, automotive glass, photovoltaics, mirrors,

CRT's, and other specialty coatings in such applications as ARAS, electrochromics and smart windows.

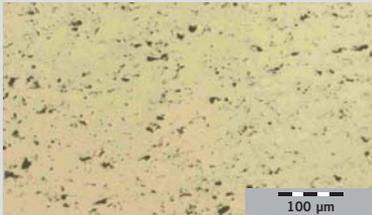
The following table illustrates the diverse material sets, production technique and material properties currently used to manufacture rotatable targets.

Rotatable target materials and manufacturing processes at W. C. Heraeus TMD

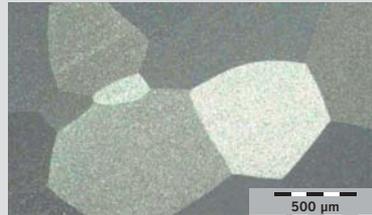
	ZnAl2 Zn	ZnAl2	ZnSn50	Ag	Sn	NiV7	NiCr20	Ti	SiAl10
Thermal spraying	X								X
Monolithic* cast						X	X		
Direct cast		X			X				
Cast and bond			X	X					
Others								X	
Theoretic density TD [g/cm <sup>3</sup> ]	6.9 7.14	6.9	7.2	10.49	7.28	8.6	8.5	4.5	2.36
Actual density	~ 90% TD	100% TD	100% TD	100% TD	100% TD	100% TD	100% TD	100% TD	~ 90% TD
Thermal conductivity [W/m K]	< 110	110	88	420	63	90	15	22	< 90
Specific resistivity [μΩcm]	> 6	~ 6		1.6	10	39.4	112	48	> 140
Coeff of expansion [10 <sup>-6</sup> K <sup>-1</sup> ]	~ 30	~ 30	~ 30	20	23	13	14	9	~ 4
Melting point [°C]	381 – 405 420	381 – 405	199 – 352	960	232	1440 – 1450	1420 – 1440	1670	580 – 1360

\* monolithic = target and backing tube of identic material

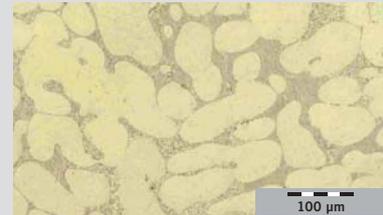
TD = Theoretic Density



Microstructure of a sprayed Zn-rotatable



Microstructure of a cast Sn-rotatable

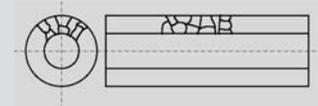
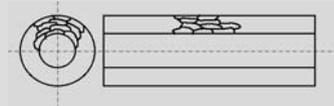


Microstructure of a cast ZnAl<sub>2</sub>-rotatable

## Comparison of Characteristics of Sprayed and Cast Rotatables

	Thermal Sprayed Rotatables	Cast Rotatables
Density	~ 90% TD	100% TD
Porosity	~ 10%	0%
Oxygen content	< 5000 ppm	< 200 ppm
Nitrogen content	< 400 ppm	< 50 ppm
Average grain size	10 – 100 µm	0.1 – 2 mm
Microstructure	flake like	dendritic and globular
Orientation of microstructure / texture	parallel to rotatable axis	perpendicular to rotatable axis

TD = Theoretic Density



## Production Processes

TMD uses unique near-net-shape casting processes with proprietary grain refining technologies. These specialized target production techniques enable TMD to produce sputter targets with evenly distributed homogeneous grains – while maintaining a high purity. Specially designed thermal spray processes are used for those materials where casting is not viable. These production processes yield high quality targets that are qualified by the major sputter equipment manufacturers.

The data given here are correct for May 2006.  
We reserve the right to make technical alterations as necessary.

## Target Geometry

Targets can be manufactured to fit all commonly used cathodes with lengths up to 4000 mm and target thicknesses as required.

## Recycling

To extend the lifetime of costly backing tubes, TMD offers a robust cleaning and recycling program, which will allow tubes to be re-used several times, reducing cost while conserving resources.

## Quality Assurance

TMD uses DIN EN ISO 9001:2000 certified procedures to guarantee the highest and most consistent product reliability. Our teams strive for continuous improvements in our stringent manufacturing processes using statistical process control.

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