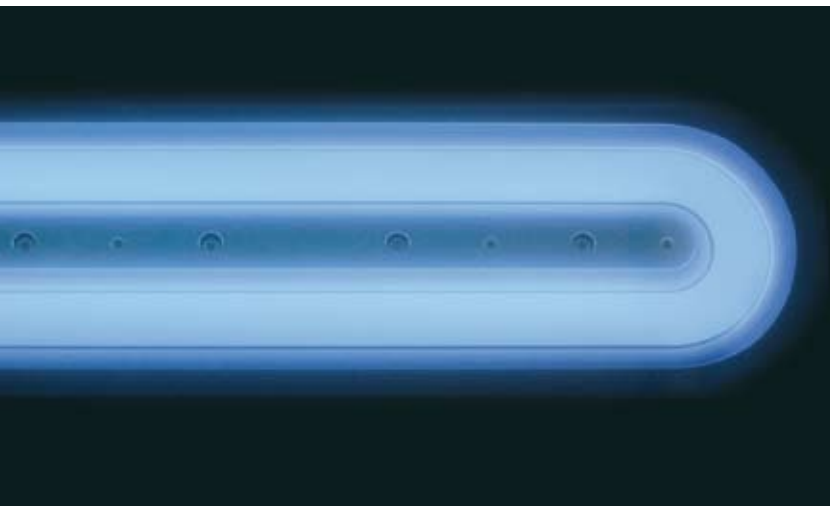
Target Designs for Magnetic Materials

umicore

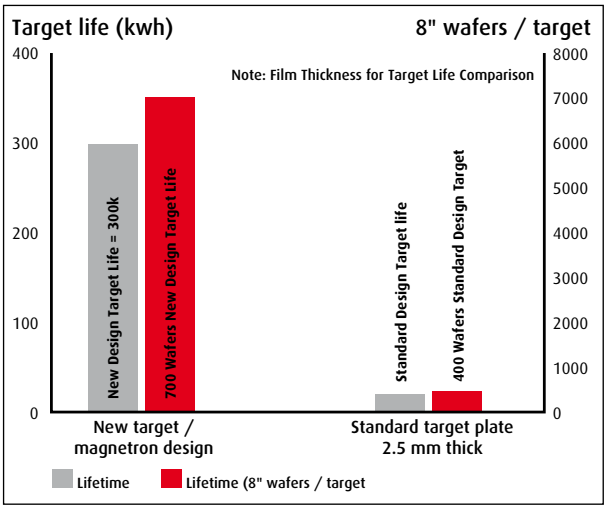
Umicore Thin Film Products

Umicore Thin Film Products, a globally active business unit within the Umicore Group, is one of the leading producers of coating materials for physical vapor deposition with more than 50 years experience in this field. Its Semiconductor portfolio covers a wide range of highly effective sputtering targets and evaporation materials.

Magnetic materials like Ni, Fe and their alloys are difficult to sputter using traditional magnetrons. These materials absorb and disturb the magnetic field of the magnetron resulting in poor sputtering rate and bad film homogeneity. Umicore has developed special target designs to cope with this problem.



Long life target during sputtering (courtesy Oerlikon)



Comparison of target life for standard and long life targets (courtesy Oerlikon)

Conventional design

The conventional approach uses a thin plate of the magnetic materials. Since the disturbance of the magnetic field is proportional to the thickness of the magnetic material, this solution insures sufficient sputter rate and film homogeneity with standard magnet systems, at the cost of a limited target lifetime. Depending on the target and magnetron design, typical target thickness is around 3 to 5 mm.

Patterned hole (Swiss cheese) design *

The aim of this design is to increase the target lifetime. Through the realisation of locally thin parts (holes) it is possible to increase the overall magnetic field strength over the sputter surface and hence to sputter thicker targets (up to 8.5 mm). This design does not require special magnet systems, but the pattern must match the magnetic field and is so specific to the magnetron source.

Long life design for NiFe alloys **

Umicore has developed a new target design to further increase target lifetime. The concept is to enhance and equalize the horizontal component of the magnetic field above the race track, which essentially controls the sputtering rate. The solution is a 3-piece design with defined air gap and magnetic separation between the different pieces. The new target design comes along with a dedicated magnet system. The target thickness can be increased up to 12 mm. The extension of target lifetime is at least by a factor of about 10 compared to the conventional solution.

Bonding

Umicore Thin Film Products uses its own proprietary bonding method, based on a flux-free solder technique. Thin film adhesion and diffusion barrier layers are applied to the back of each target, followed by a temperature controlled metallic solder seal between target and backing plate. The bonding is compliant to accommodate mechanical and thermal stress.

Packaging

Final cleaning and packaging is completed under clean room conditions. All targets are vacuum sealed in argon-filled polyethylene bags, guaranteeing consistent target performance, even when stored for a longer period of time.

Quality Assurance

The Balzers location is certified according to ISO 9001:2000, ISO 14001:2004 and OHSAS 18001:1999 standards. Other production sites are also ISO 9001:2000 certified. Documentation, process specifications, traceability, sophisticated analytical methods, and continuously trained employees guarantee the highest and most consistent product reliability.

* designed for LLS Evo systems
** designed for LLS Evo systems with adapted magnetic system

07.2024

Please find your local sales partner at:
www.tfp.umicore.com

Umicore Thin Film Products AG
Headquarter
Alte Landstrasse 8
9496 Balzers
Principality of Liechtenstein
Tel +423 388 7300
Fax +423 388 7450
sales.materials@umicore.com

Umicore Optical Materials
USA Inc.
2976 S. 614 Road
Quapaw, OK 74363
USA
Tel +1 918 673 1650
Fax +1 918 673 2121
sales.materials.us@umicore.com

Umicore Thin Film Products
Taiwan Co., Ltd.
No. 22, Aly. 4, Ln. 711 Bo'ai St.,
Zhubei City, Hsinchu County 302
Taiwan
Tel +886 3553 2999
Fax +8863553 2525
sales.materals.hc@umicore.com