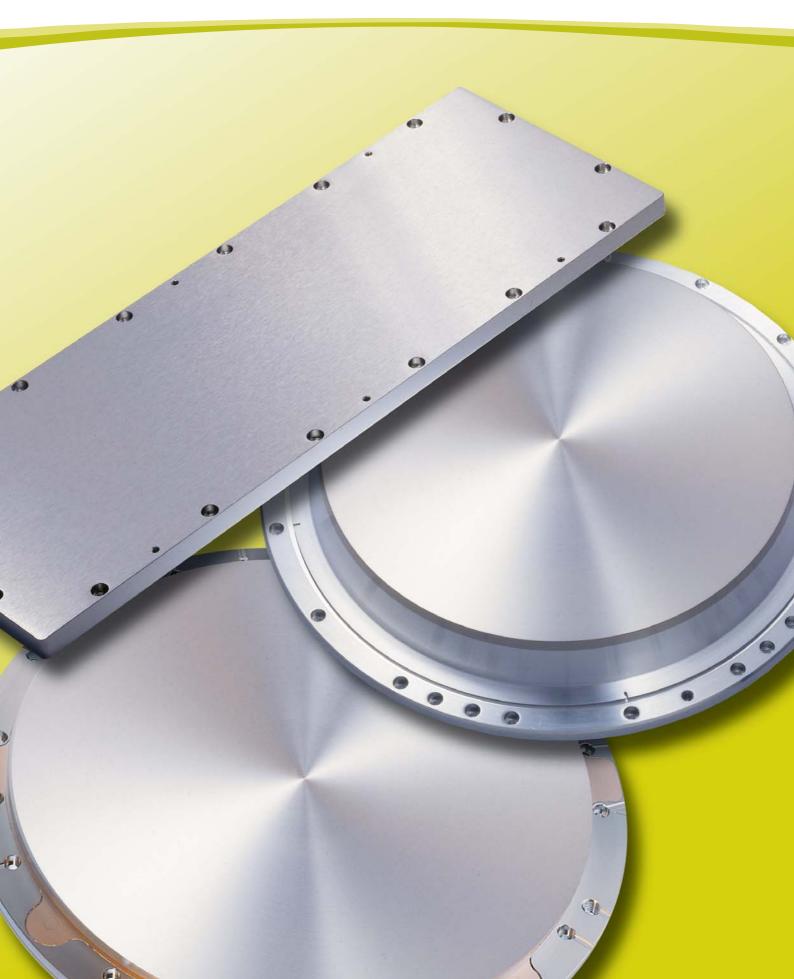
Ti for Semiconductor Applications

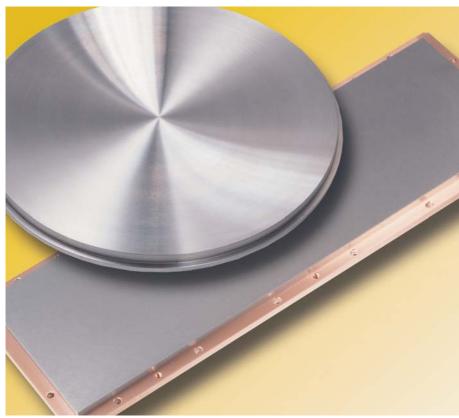


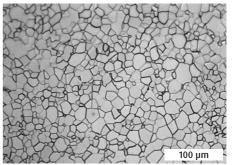


Umicore Thin Film Products

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.

Titanium for Semiconductor technology is used for front end applications as well as for advanced packaging, e.g. Flip-Chip technology, and in a variety of compounds. Umicore Titanium sputtering targets are available in several grades to match customers needs.





Microstructure of Ti 4N5

Selection of Ti Targets

Ti for Semiconductor Applications

Production Process

Our Titanium sputtering targets for Semiconductor applications are E-beam melted. Special thermomechanical heat treatment processes guarantees a uniform structure optimized to the different target geometries.

Analysis

All materials are tested in our leading edge analytical laboratory or in one of our associate laboratories:

- > Hot Gas Extraction (LECO)
- > Glow Discharge Mass Spectrometry (GDMS)
- > Induction coupled plasma spectrometry (ICP)
- Metallographic Investigation

Microstructur

Due to the optimized thermomechanical treatment steps our Titanium has a uniform, isotropic grain structure. A typical micrograph is shown on page 2.

Average grain size 3N grade:	200 µm	
Average grain size 4N5 grade:	50 µm	
Average grain size 5N grade:	50 µm	

Purity

Three different standard purity grades are available: 3N, 4N5 and 5N. This purity grades are tailored to reach the best cost/performance ratio. Other purities upon request.

Trace Impurities

A selection of the maximum impurity values is listed for the three different grades.

3N	4N5	5N
1	1	0.2
100	10	3
1	1	1
20	2	2
5	5	5
400	5	2
50	2	2
400	20	7
1	0.2	0.2
1	0.1	0.1
30	5	1
50	5	0.5
1	0.2	0.1
400	5	2
50	5	2
0.005	0.002	0.002
3N	4N5	5N
200	50	40
100	50	40
700	450	250
	1 100 1 100 50 400 1 1 1 1 1 1 1 1 1 1 1 30 50 1 1 400 50 1 1 400 50 0.005 3N 200 100	1 1 100 10 1 1 20 2 5 5 400 5 50 2 400 20 1 0.2 1 0.1 30 5 50 5 1 0.1 30 5 50 5 1 0.2 1 0.2 1 0.1 30 5 50 5 50 5 0.005 0.002 3N 4N5 200 50 100 50

All values are listed in ppm.

Dimensions

Due to our dynamic management processes, different dimensions (ø up to 400 mm, length up to 800 mm) can be realized within a short period of time. Targets are available in monoblock or bonded versions.

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 vacuumsealed in argon-filled polyethylene bags, guaranteeing consistent target performance, even when stored for a longer period of time.

Quality Assurance

Our quality assurance process is ISO 9001:2000 certified to guarantee the highest and most consistent product reliability. Documentation, traceability, statistical process control, detailed test and process specifications as well as sophisticated analytical methods and continuously trained employees are important elements of our quality assurance process.

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

Manufacturing sites of Umicore Thin Film Products

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Due to our continuing program of product improvements, specifications are subject to change without notice.