Sputtering Targets for Thin Film Deposition

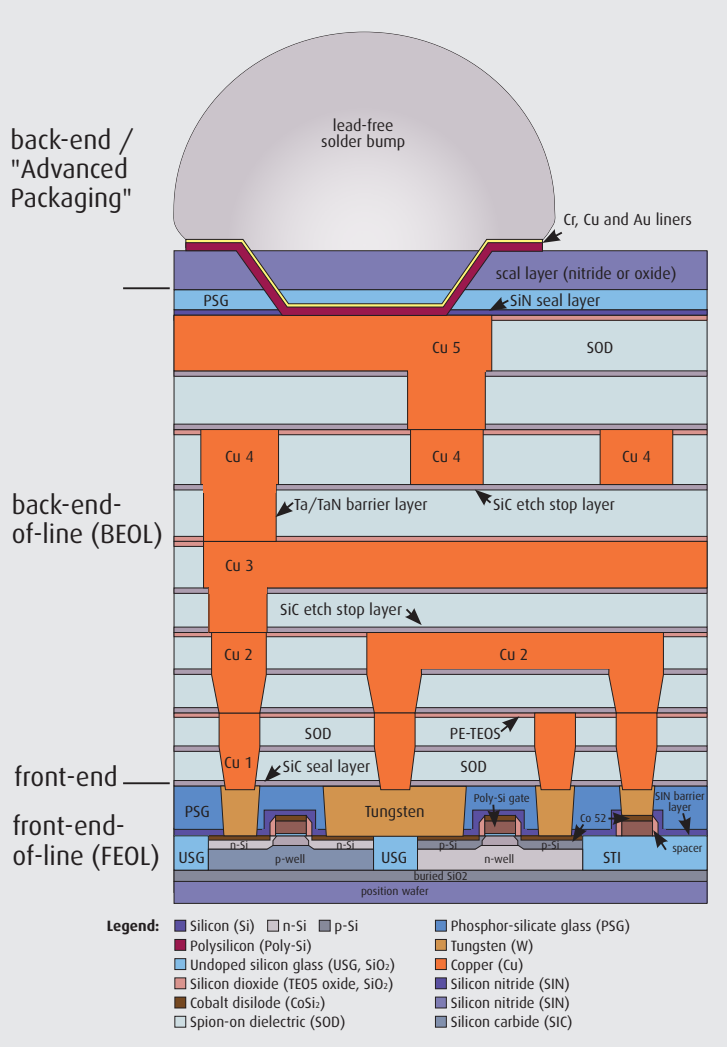
Cu for Microelectronic Applications

umicore
Metal Deposition Solutions

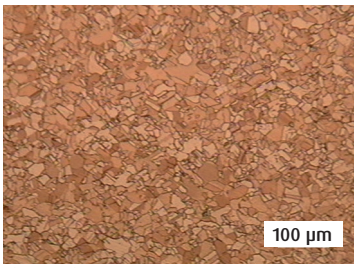
Umicore Thin Film Products

UMICORE THIN FILM PRODUCTS (TFP), A GLOBALLY ACTIVE BUSINESS LINE WITHIN THE UMICORE GROUP, IS ONE OF THE LEADING PRODUCERS OF COATING MATERIALS FOR PHYSICAL VAPOR DEPOSITION (PVD) WITH MORE THAN 60 YEARS OF EXPERIENCE IN THIS FIELD. OUR MICROELECTRONICS PORTFOLIO COVERS A WIDE RANGE OF HIGHLY EFFECTIVE SPUTTERING TARGETS AND EVAPORATION MATERIALS.

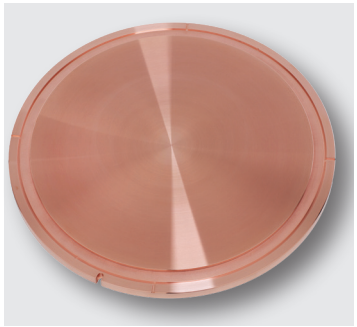
Copper for Integrated Circuits technology is mainly used as a conductor in Front-End applications (e.g. seed layer for interconnects) as well as for Advanced Packaging (e.g. Flip-Chip technology, Under Bump Metallization, Redistribution Layer). Umicore Copper targets are available in several purity grades to match customers' needs for a variety of sputtering tools.



Scheme of a typical layer structure



Fine grain structure



SPTS-Target: Aviza Sigma fxP200

Evatec-Target: ARQ300

Cu for Microelectronic Applications

PRODUCTION PROCESS

Our Copper sputtering targets for microelectronic applications are vacuum melted and cast. Special thermomechanical treatment processes guarantee an uniform microstructure optimized for different target geometries.

ANALYSIS

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

- Glow Discharge Mass Spectrometry (GDMS)
- Carrier Gas Hot Extraction (CGHE)
- Metallographic Investigation

MICROSTRUCTURE

Thanks to the optimized thermomechanical treatment steps our copper has an uniform, isotropic grain structure. A typical micrograph exhibiting a fine grain structure is shown on page 2.

PURITY

Three standard purity grades are available: 4N5, 5N and 6N. These purity grades are tailored to reach the best cost/performance ratio. Other purities are available upon request.

DIMENSIONS

Our manufacturing capabilities allow for the production of different geometries (planar and tubular) and dimensions (ø up to 650 mm, length up to 1000 mm) adapted to the major OEM sputtering tools within a short period of time. Targets are available in monoblock or bonded versions.

BONDING

Umicore TFP uses its own proprietary bonding method, based on a versatile flux-free solder technique. The bonding is compliant to accommodate mechanical and thermal stress.

TRACE IMPURITIES

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

Metallic Element	Standard 4N5	Fine grain 4N5+	Extra fine grain 6N
Ag	12.5	0.13	0.06
Al	0.05	0.05	<0.005
As	1.4	<0.005	<0.005
Bi	0.42	<0.005	<0.005
Cd	<0.01	<0.01	<0.01
Cr	0.21	0.05	0.02
Fe	0.8	0.80	0.10
K	<0.01	<0.01	<0.01
Li	<0.01	<0.001	<0.001
Mg	2.1	<0.005	<0.005
Mn	0.02	0.02	<0.005
Mo	0.012	<0.005	<0.005
Na	<0.005	<0.005	<0.005
Ni	1.7	0.08	0.01
Pb	0.44	0.35	0.01
Sb	0.72	<0.005	<0.005
Se	0.48	<0.01	<0.01
Si	0.17	0.14	0.01
Sn	0.11	0.01	<0.005
Te	0.11	<0.05	<0.05
Ti	<0.005	<0.005	<0.005
Th	<0.0001	<0.0001	<0.0001
U	<0.0001	<0.0001	<0.0001
Zn	0.03	0.01	0.01
Zr	<0.005	<0.005	<0.005
TMI	max.50	max. 10	max. 1
Non-metallic Element			
O	1.8	1.6	<0.3
P	0.12	0.01	<0.005
S	8.48	0.83	0.72

All values are listed in ppm (µg/g). "<" indicates "below detection limits".

PACKAGING

Final cleaning and packaging is performed under clean room conditions. All targets are vacuum sealed in polyethylene bags, guaranteeing consistent target performance over the shelf life.

CERTIFICATIONS

Umicore Thin Film Products is ISO 9001:2015 certified to guarantee consistent product reliability and reproducibility. Documentation, traceability, statistical process control, as well as sophisticated analytical methods and continuously trained employees are important elements of our quality assurance process. We go great lengths to protect the environment as well as our employees and are certified to ISO 14001:2015 and OHSA 18001:2007.

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

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