ADVANCED PACKAGING

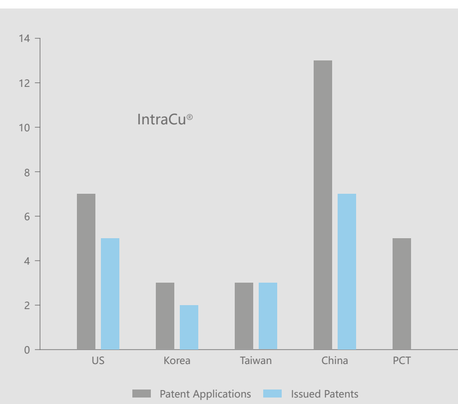
Take Advanced Packaging to a completely new level.

As functionality and reliability of electronic devices progress, requiring changes in systems development and integration, materials, chemicals and auxiliaries are undergoing significant adaptions in performance, cost-efficiency and reliability.

In order to respond to such market needs, Umicore's business unit Electroplating has partnered with Shinhao Materials to provide innovative patented additives for copper electroplating in the advanced packaging industry together with Umicore's Copper(II)oxide and Anode and Cathode solutions for ECD tools.

www.ep.umicore.com
www.shinhaomaterials.com

IntraCu® additives

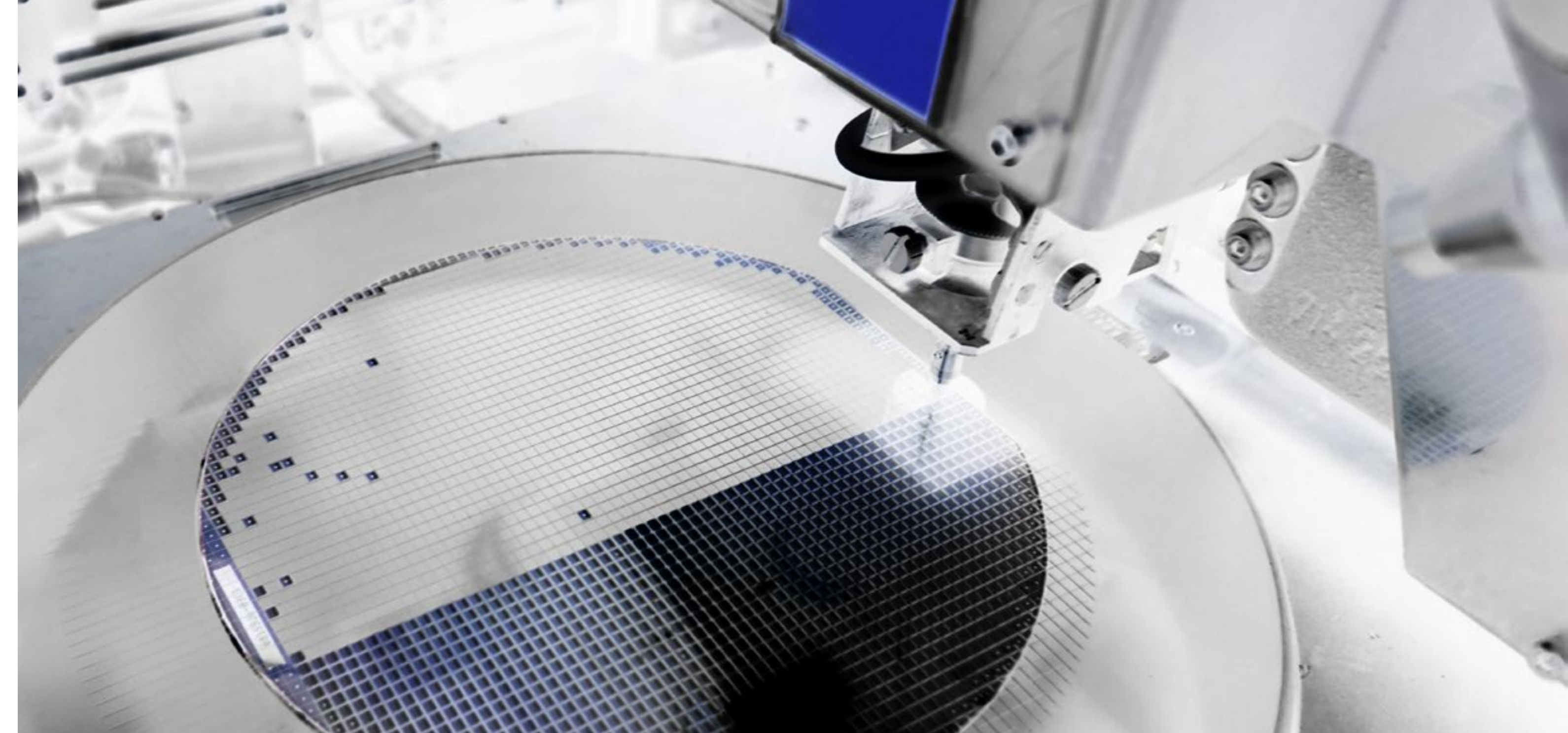


IntraCu® SC-1

IntraCu® SC-1 System provides customers the opportunity to make products that require thermal and mechanical stability in future, so that fine lines/structures will not break during subsequent packaging and assembly operations. In addition, it offers a lower cost alternative for copper to copper direct bonding due to its signature flat topography. Furthermore, its submicron surface roughness and etch-resistant nature is a great advantage in PLP applications in addition to wafer level packaging.

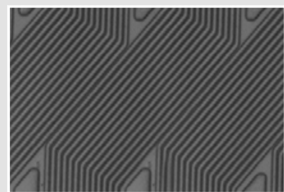
IntraCu® SC-2

IntraCu® SC-2 System provide customers the opportunity to reduce total cost of ownership by extending the process window. In addition, it is a true 2in1 procedure that produces no or only a small number of Kirkendall-voids (KV-less). The system is a drop-in replacement for current POR offerings.



	Application	Cu Appearance	Anode type	VMS; Cu content	Cu-to-Cu Direct Bond	Stable Tensile Strength	High Speed Plating	Comparable WID vs. POR
SC-1	Fine Line RDL	Matt Cu Ra <0.2 µm	Insoluble / Soluble	VMS 28 & VMS 50	✓	✓	✓	✓
SC-2	2inl RDL + Pillar	Bright Cu Ra < 0.03 µm	Insoluble / Soluble	VMS 28 & VMS 50			✓	✓

Our modular additives are designed to meet the highest requirements of the semiconductor industry in advanced packaging and offer the foundation for depositing customized material properties e.g. for Microbumps in IC packages, RDL in wafer level packaging and Pillar in flip-chip packaging



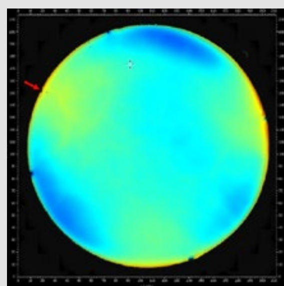
IntraCu® Series

SYSTEM APPLICATIONS

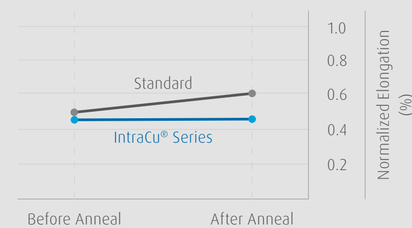
- Fine line RDL (< 2 µm)
- Cu-to-Cu direct bonding

SYSTEM FEATURES

- Bamboo-like structure
- Matte Cu, Ra < 0.2 µm
- Flat topography
- Stable tensile strength
- Resistant to grain growth
- Resistant to etching



Very low stress of IntraCu® SC layers: 8 inch blanket wafer, plated on one side with 20 µm, shows warpage < 10 µm.

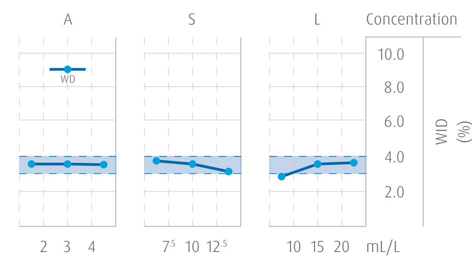


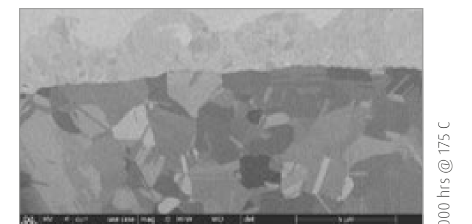
SYSTEM APPLICATIONS

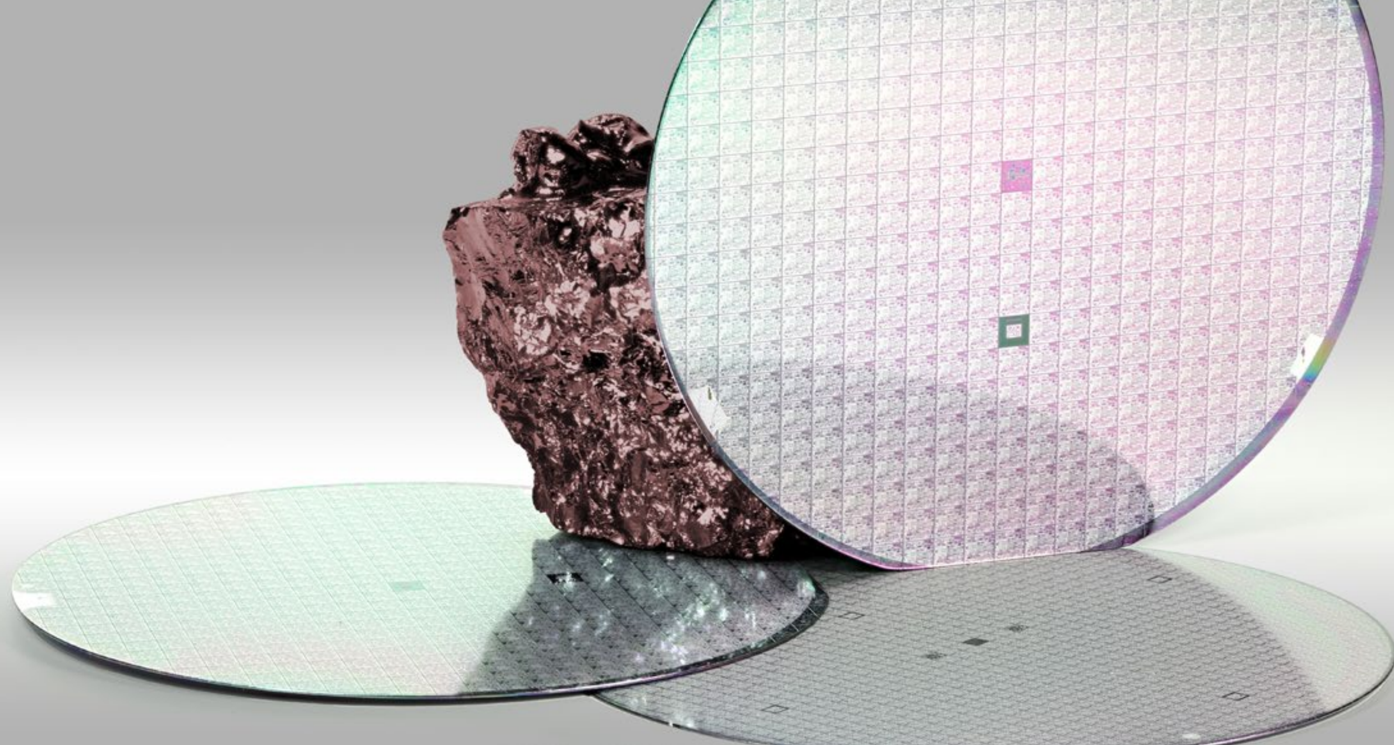
- 2-in-1 bright Cu (Cu pillar and RDL)
- 2-in-1 with KV-less requirement

SYSTEM FEATURES

- Bright Cu, Ra < 0.03 µm
- ±50% process window for Cu pillar and RDL
- Total in-film organics < 11 ppm
- Excellent KV-less performance







Our high-performance and multiple patented additive IntraCu® for the copper process sets new standards in advanced packaging.

ADVANCED PACKAGING

PRODUCTS FOR PERFECT ELECTROCHEMICAL DEPOSITION IN THE SEMICONDUCTOR INDUSTRY

Cu(II)Oxide high purity metal salt

Umicore copper oxide high purity metal oxide powder are developed, manufactured and quality tested in accordance with the demanding requirements of the semiconductor advanced packaging industry. In combination with ancosys DMR® concept (Direct Metal Replenishment) clean room usage is possible enabling lower cost of ownership for Cu replenishment along with a boost in performance of the electrolyte through higher Cu concentrations.

	Umicore CuO PG	Umicore CuO HG	Umicore CuO 4N
Application	RDL and panel level substrates	Panel substrates	Fine line RDL and Pillar
Purity	99,9 %	99,9%	99,99%
auto-dosing compatibility **DMR**	✓	-	✓
Dissolution speed	★	★	★★
High Speed Plating	✓	✓	✓
Clean room packed / compatibility	✓	-	✓

Picture: Courtesy ancosys GmbH

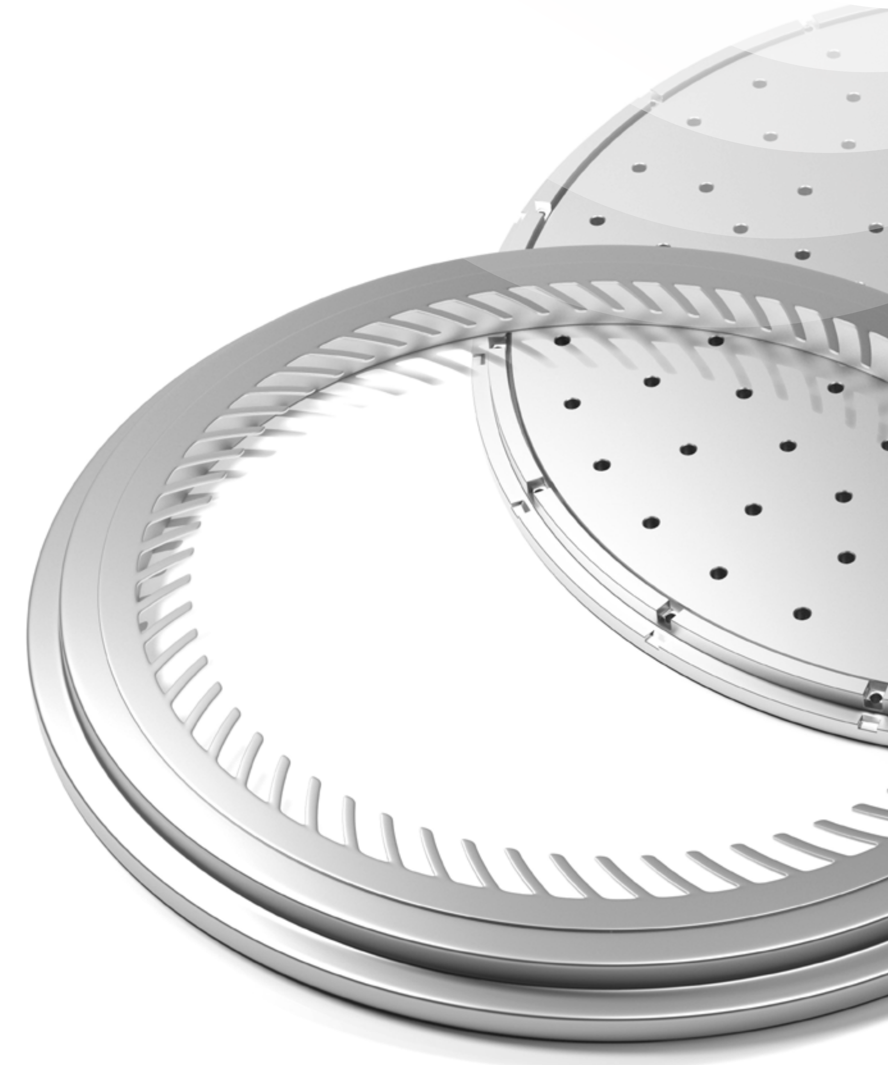
NO VMS NEEDED

- H_2SO_4 concentration remaining consistent. Stable electrolyte volume, feed and bleed not needed.
- Several grades (4N, Packaging)
- Full traceability, only one source for Cu

COST EFFICIENCY

- Reduction tool down time, supporting maintenance-free plating chambers
- 50% lower cost per kg Cu compared with VMS
- 15% higher speed through higher Cu^{2+} (60g/l i/o 50g/l)

PLATINODE® SC electrodes

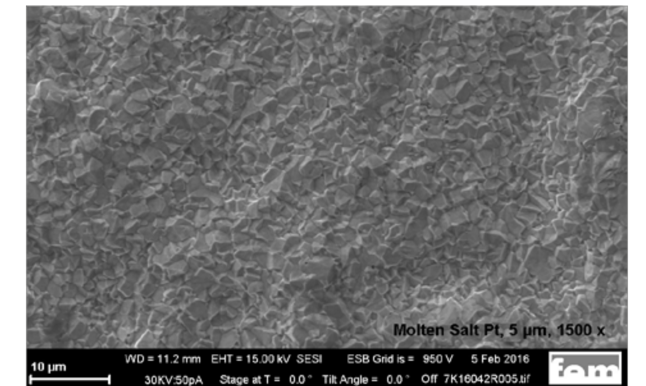


Insoluble anodes are proven to help increase process efficiency, reduce process costs, environmental impact and process control efforts in plating tools for advanced packaging. he key differentation of Umicore´s PLATINODE® is the unique layer performance due to the manufacturing method using a molten salt electrolyte allowing ultra-high purity, low porosity and best ductility even at high Pt layer thicknesses.

- Function: providing best-in-class ductility and chemical resistance due to unique HTE™ coating of electrode
- Customized designs, contact materials and coatings
- Fully integrated production and clean room packaging: Built-to-Order or series
- Insoluble anodes and cathodes in qualification for several WLP/PLP ECD Tools

PLATINODE® SC PtTi	PLATINODE® SC MMO
Molten salt deposited Pt on Ti substrate	Developed for low organic consumption
Developed for high ASD, predictable lifetime and outmost current distribution accuracy	End of lifetime characterized by end of electrocatalytic function and wear rate
Pt thickness can be measured / correlated to lifetime	Thickness cannot be measured / correlated to lifetime

SEM
Surface morphology 5000x



Right Composition.
Perfect Surface.

www.ep.umicore.com
www.shinhaomaterials.com

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中国江苏省苏州市吴江经济技术开发区

Established in 2012 to provide innovative products and processes to semiconductor advanced packaging

multiple patents in the field of Cu plating additives for advanced packaging

R&D, manufacturing and QA/QC located in Suzhou China, ISO 9001 and ISO 14001 certified

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Umicore S.A. has 11.150 employees globally, €3,4 bn Revenues were generated 2019 via 50 Sites

Its Business Unit Electroplating is a segment leader in precious metals electroplating

International Set-Up for manufacturing, quality control, sales, marketing and logistics in the field of semiconductors