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

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® 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.

**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 2in1 RDL + Pillar | Bright Cu Ra < 0.03 µm | Insoluble / Soluble | VMS 28 & VMS 50 | ✔ | ✔ | ✔ | ✔

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

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

**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 2in1 RDL + Pillar | Bright Cu Ra < 0.03 µm | Insoluble / Soluble | VMS 28 & VMS 50 | ✔ | ✔ | ✔ | ✔

**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

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

**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.**
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.

**NO VMS NEEDED**
- H₂SO₄ 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 Cu²⁺ (60g/l vs 50g/l)

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**Cu(II)Oxide**
high purity metal salt

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**Advantages**
- 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

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**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. The key differentiation 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.

- 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

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**Additional Information**
- Our high-performance and multiple patented additive IntraCu® for the copper process sets new standards in advanced packaging.
Right Composition.  
Perfect Surface.

SHINHAO MATERIALS LLC  
苏州昕皓新材料科技有限公司  
Wujian Economic and Technological Development Zone,  
Suzhou, Jiangsu, China  
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

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