



# InterVia™ Cu 8540

For Advanced Packaging Applications

Regional Product Availability			
N.America	Japan/Korea	Asia	Europe
✓	✓	✓	✓

## DESCRIPTION

The InterVia Cu 8540 Process provides excellent throwing power and deposition with superior elongation. The InterVia Cu 8540 Process was designed as a high-speed, thick-plating electroplated copper bath for pattern plate and copper post/bump formation on both wafer and organic substrates.

The InterVia Cu 8540 deposit has excellent thermal shock resistance thanks to good elongation and low stress. InterVia Cu 8540 is a two-component additive, which is very stable in acidic environments.

## ADVANTAGES

- Capable of thick plating and suitable for Cu post/Cu bump forming
- Ability to plate at high current densities
- Excellent throwing power
- Bright deposit
- Superior thermal shock resistance
- Excellent elongation
- Completely analyzable additive package by CVS

## DEPOSIT DATA

Conductivity:	0.59 MS/cm
Deposit Density:	8.9 g/cm <sup>3</sup>
Tensile Strength:	294–343 N/mm <sup>2</sup>
Ductility:	14–20%
Hardness:	100–120 Hv
Internal Stress:	-5.9–14.7 N/mm <sup>2</sup>

## BATH MAKE-UP

The make-up procedure of InterVia Cu 8540:

1. Add 950 ml/l of InterVia Cu 8500, 8501 or 8502.
2. Add InterVia Cu 8540 Carrier and mix well.
3. Add InterVia Cu 8540 Additive and mix well.
4. Dilute to volume with InterVia Cu 8500, 8501, 8502 and mix well.
5. Dummy plate at 2–3 A/dm<sup>2</sup> for approximately two hours to confirm uniform plating appearance. If the plating appearance is not uniform, adjust each component and dummy plate for an additional 2 hours.
6. Analyze the plating bath and adjust the content of organic additives.

## INTERVIA 8500 SOLUTION (Bath Formulation 1)

Component	Range	Recommended
CuSO <sub>4</sub> •5H <sub>2</sub> O	60–90 g/l (8–12 oz./gal.)	75 g/l (10 oz./gal.)
H <sub>2</sub> SO <sub>4</sub>	160–200 g/l (21–27 oz./gal.)	190 g/l (25 oz./gal.)
Chloride Ion	30–75 mg/l (30–75 ppm)	50 mg/l (50 ppm)
InterVia Cu 8540 Additive	2.5–20 ml/l (0.25–2.0% v/v)	5 ml/l* (0.5% v/v)
InterVia Cu 8540 Carrier	2.5–20 ml/l (0.25–2.0% v/v)	5 ml/l* (0.5% v/v)
Temperature	20–27°C (68–81°F)	23°C (74°F)
Cathode Current Density	2–4 A/dm <sup>2</sup> (20–40 A/ft <sup>2</sup> )	2.5 A/dm <sup>2</sup> (25 A/ft <sup>2</sup> )
Anode Current Density	0.5–3.0 A/dm <sup>2</sup> (5–30 A/ft <sup>2</sup> )	
Agitation	Jet agitation, cathode rocking, air agitation	
Anode	Phosphorus content copper anode (phosphorus content 0.02–0.06%)	
Anode Bag	Polypropylene, terylene, dynel	

\* Dependent upon application

## INTERVIA CU 8540

### INTERVIA 8501 SOLUTION (Bath Formulation 2)

Component	Range	Recommended
$\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$	100–130 g/l (13–17 oz./gal.)	120 g/l (16 oz./gal.)
$\text{H}_2\text{SO}_4$	160–200 g/l (21–27 oz./gal.)	190 g/l (25 oz./gal.)
Chloride Ion	30–75 mg/l (30–75 ppm)	50 mg/l (50 ppm)
InterVia Cu 8540 Additive	2.5–7.0 ml/l (0.25–0.70% v/v)	5.0 ml/l* (0.5% v/v)
InterVia Cu 8540 Carrier	2.5–20 ml/l (0.25–2.00% v/v)	5.0* ml/l (0.50% v/v)
Temperature	20–27°C (68–81°F)	23°C (74°F)
Cathode Current Density	5–15 A/dm <sup>2</sup> (50–150 A/ft <sup>2</sup> )	8 A/dm <sup>2</sup> (80 A/ft <sup>2</sup> )
Anode Current Density	0.5–3.0 A/dm <sup>2</sup> (5–30 A/ft <sup>2</sup> )	
Agitation	Jet agitation, cathode rocking, air agitation	
Anode	Phosphorus content copper anode (phosphorus content 0.02–0.06%)	
Anode Bag	Polypropylene, terylene, dynel	

\* Dependent upon application

### OPERATING PARAMETERS

#### Temperature

20–27°C (68–80°F); When the bath exceeds 35°C (95°F), brightness will deteriorate in low current density areas. Use titanium heater or cooling pipes to maintain the optimum temperature.

#### Cathode Current Density

Cathode current density is typically 2–20 A/dm<sup>2</sup> depending upon the inorganic component composition. Three inorganic component packages are available; InterVia Cu 8500, 8501 and 8502 (see attached table).

#### Agitation

Agitation is a critical factor to obtain excellent filling performance, good throwing power, low stress deposits with good elongation. Jet agitation, cathode rocker or air agitation is recommended. All air must be oil free.

(The range of cathode current density depends on agitation of the plating bath.)

### INTERVIA 8502 SOLUTION (Bath Formulation 3)

Component	Range	Recommended
$\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$	190–210 g/l (25–28 oz./gal.)	200 g/l (27 oz./gal.)
$\text{H}_2\text{SO}_4$	90–110 g/l (12–15 oz./gal.)	100 g/l (13 oz./gal.)
Chloride Ion	30–75 mg/l (30–75 ppm)	50 mg/l (50 ppm)
InterVia Cu 8540 Additive	0.7–3.0 ml/l (0.07–0.30% v/v)	2.0 ml/l (0.2% v/v)
InterVia Cu 8540 Carrier	10–50 ml/l (0.10–0.50% v/v)	20 ml/l (2.0% v/v)
Temperature	20–27°C (68–81°F)	23°C (74°F)
Cathode Current Density	8–20 A/dm <sup>2</sup> (80–200 A/ft <sup>2</sup> )	12 A/dm <sup>2</sup> (120 A/ft <sup>2</sup> )
Anode Current Density	0.5–3.0 A/dm <sup>2</sup> (5–30 A/ft <sup>2</sup> )	
Agitation	Jet agitation, cathode rocking, air agitation	
Anode	Phosphorus content copper anode (phosphorus content 0.02–0.06%)	
Anode Bag	Polypropylene, terylene, dynel	

### BATH MAINTENANCE

#### InterVia Cu 8500 Solution

Bath formulation 1: low copper sulfate content

#### InterVia Cu 8501 Solution

Bath formulation 2: medium copper sulfate content

#### InterVia Cu 8502 Solution

Bath formulation 3: high copper sulfate content

The InterVia Cu Solution used will be dictated by the target process/properties. InterVia Cu Solution contains copper sulfate, sulfuric acid and chloride. These components can be replenished by make-up and feed-and-bleed systems. When high throwing power desired, InterVia Cu 8500 Solution is recommended (Bath formulation 1: low copper sulfate content). When the bath must be run under high current density, use InterVia Cu 8502 Solution (Bath formulation 3: high copper sulfate content).

## INTERVIA CU 8540

### 1. Copper sulfate

The concentration of copper sulfate is measured by titration. When the copper sulfate content becomes low, a burn tends to occur in high current area. When it becomes too high, throwing power will deteriorate and crystallization of  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  will form in the plating cell along the anode sides.

### 2. Sulfuric acid

Sulfuric acid provides a plating solution with conductivity and leveling effect. The concentration of sulfuric acid can be measured by titration. If the sulfuric acid concentration becomes too low, throwing power will degrade.

### 3. Chloride

Chloride is necessary to promote dissolution at the anode and affects the deposition reaction at the cathode. Chloride content can be measured by titration or ultraviolet-visible spectroscopic analysis. Chloride is typically adjusted by the addition of hydrochloric acid. When the chloride content is less than 30 mg/l, add hydrochloric acid to bring into specification.

## INTERVIA CU 8540 ADDITIVE/ INTERVIA CU 8540 CARRIER

InterVia Cu 8540 Additive and InterVia Cu 8540 Carrier are organic additives that control the brightness and plating properties of the film. InterVia Cu 8540 Additive is measured by CVS. InterVia Cu 8540 Additive is consumed by electrolysis, solution circulation and drag out. The consumption by electrolysis is approximately 0.5–0.2 ml per 1 AH.

InterVia Cu 8540 Carrier is also measured by CVS. InterVia Cu 8540 Carrier is consumed by electrolysis, solution circulation and drag out. The consumption by electrolysis is approximately 0.05–0.2 ml per 1 AH.

## CLEANING METHOD OF PLATING EQUIPMENT

When making up InterVia Cu for the first time, proper equipment cleaning is a necessity.

### Cleaning Procedure

1. After disposal of the previous plating solution, fill the equipment with clean DI water and circulate. Discharge the rinsing water and remove any precipitates.
2. Fill the equipment with 50–100 g/l of potassium hydroxide or sodium hydroxide and circulate it for at least one hour.
3. Rinse the tank and all lines with DI water thoroughly.
4. Fill the equipment with 50–100 g/l of sulfuric acid and circulate it for more than one hour.
5. Rinse the tank and all lines with DI water thoroughly.

## PRODUCT DATA

For the specific Product Data values, please refer to the Certificate of Analysis provided with the shipment of the product(s).

## ASSOCIATED PRODUCTS

**InterVia Cu 8500 Starter Solution**  
**InterVia Cu 8501 Starter Solution**  
**InterVia Cu 8502 Starter Solution**  
**InterVia Cu 8540 Additive**  
**InterVia Cu 8540 Carrier**

## INTERVIA CU 8540

### HANDLING PRECAUTIONS

Before using this product, consult the Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) for details on product hazards, recommended handling precautions and product storage.

**CAUTION!** Keep combustible and/or flammable products and their vapors away from heat, sparks, flames and other sources of ignition including static discharge. Processing or operating at temperatures near or above product flashpoint may pose a fire hazard. Use appropriate grounding and bonding techniques to manage static discharge hazards.

**CAUTION!** Failure to maintain proper volume level when using immersion heaters can expose tank and solution to excessive heat resulting in a possible combustion hazard, particularly when plastic tanks are used.

### STORAGE

Store products in tightly closed original containers at temperatures recommended on the product label.

### DISPOSAL CONSIDERATIONS

Dispose in accordance with all local, state (provincial) and federal regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

It is the user's responsibility to verify that treatment and disposal procedures comply with local, state (provincial) and federal regulations. Contact your Rohm and Haas Electronic Materials Technical Representative for more information.

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