Desmear and metallization

Leading production solutions for PCB and package substrates

mks | Atotech

Desmear and metallization at a glance

Leading-edge chemistry, equipment, and process solutions for PCB, package substrate and display applications

- Desmear
- Electroless copper
- Direct plating
- Metallization of glass substrates
- Blackening of copper structures

Presence in 40 countries
Serving more than 1,000 customers

Over 120 vertical and 250 horizontal lines running in mass production with our electroless copper processes

Dedicated desmear and metallization TechCenters in Jangan, South Korea and Berlin, Germany

Global market leader for horizontal high end HDI and vertical package substrates manufacturing

Highly trained experts dedicated to desmear and metallization technologies

165 registered patents worldwide

Sustainable approach
Products and processes designed to lower chemistry and water usage

Our Products – Your Choice
We have solutions for all established PTH technologies in our portfolio

Market leading solutions for desmear and metallization

#1

With Ecoganth® PLP MKS' Atotech has introducted the world's first formaline free electroless copper process for panel level packaging (PLP)

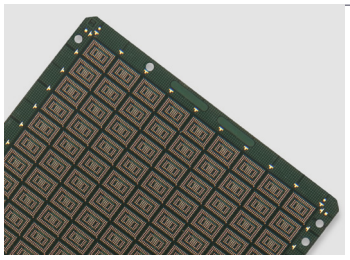
Tailor-made solutions for the electronics industry

As a globally leading brand in the PCB industry, MKS' Atotech is providing specialized process solutions for each market segment, namely MLB, HDI, flex, flex-rigid and package substrates. Our customers benefit from MKS' Atotech's decades of experience and know-how in effective hole-wall / BMV cleaning (desmear), our unique ionic activation system Neoganth® and the stable and highly reliable electroless copper processes Noviganth® and Printoganth®. As a leading supplier of innovative and sustainable metallization solutions, MKS' Atotech added a new electroless copper family named Ecoganth® to its portfolio that eliminates the usage of formaldehyde in the electroless copper process. Moreover, we transfer our leading metallization expertise to different applications like flat panel displays or transparent conductive films required for touchscreens and offer specialized solutions for these market segments.

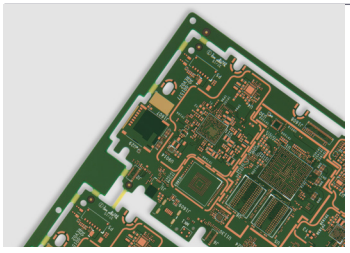
We understand the goals of our customers

With a combination of high quality wet chemistry and state-of-the-art plating equipment, we provide high-end system solutions for desmear and metallization processes. We strive for innovative solutions to sustain our customer's business in the future. Recent examples are high throwing power electroless copper processes and thin material transportation capabilities of our Uniplate® equipment to cope with major industry challenges such as higher wiring densities and reduced form factors.

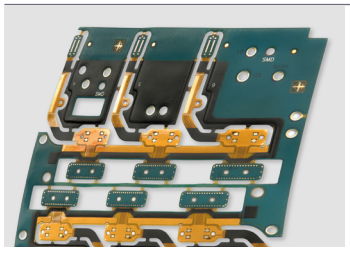
Our broad solutions portfolio



Package substrates



MLB / HDI



Flex / flex-rigid

Display technology

Systems

Uniplate® P/LB

Market leading & fully automated horizontal equipment for desmear (P) and electroless copper (LB) processes with best-in class thin panel transportation

Polygon PLB Line®

Cost-effective & robust horizontal mass production line for desmear (P) and electroless copper (LB) processes with excellent solution exchange

Uniplate® CP/NP

Best in class metallization equipment for direct plating processes

VisioPlate®

Cutting edge horizontal equipment for the metallization of large-size glass substrates, such as for Flat Panel Display applications

Desmear / adhesion promoter	Electroless copper	Direct plating
	Printoganth® P Plus / P2 (H)	
Securiganth® MV (V)	Printoganth® MV TP1 / TP2 (V) Ecoganth® MV G2 (V)	
VitroCoat® GI (V)	Cupratech® GI (V)	
Securiganth® E (H)	Printoganth® U Plus / U NF (H) Printoganth® P Plus / P2 (H) Printoganth® T1 (H)	Neopact® (H) Ecopact® CP (H) ViaKing® (H)
Securiganth® NX (V) Securiganth® BLG (V)	Printoganth® UV / TV (V) Printoganth® PV (V) Noviganth® AF 76 (V) Noviganth® BV / LS Plus (V)	Neopact® (V) Ecopact® CP (V)
Securiganth® E (H)	Printoganth® P Plus / P2 (H)	Neopact® (H) Ecopact® CP (H) ViaKing® (H)
Securiganth® NX (V) Securiganth® BLG (V)	Printoganth® PV (V)	Neopact® (V) Ecopact® CP (V)
	Cupratech® FPD HD1 (H) Cupratech® TS D3 (H) Cupratech® G HT1 (H) Telotech® TS (H) for blackening	

(H) – horizontal processing
(V) – vertical processing

Auxiliary equipment

Oxamat

Regenerates manganate to permanganate, thereby preventing the accumulation of sludge and other chemical dosing

Technology leading Printoganth® U Plus and Printoganth® MV TP2

> 90

lines in mass production with Printoganth® U Plus

> 80%

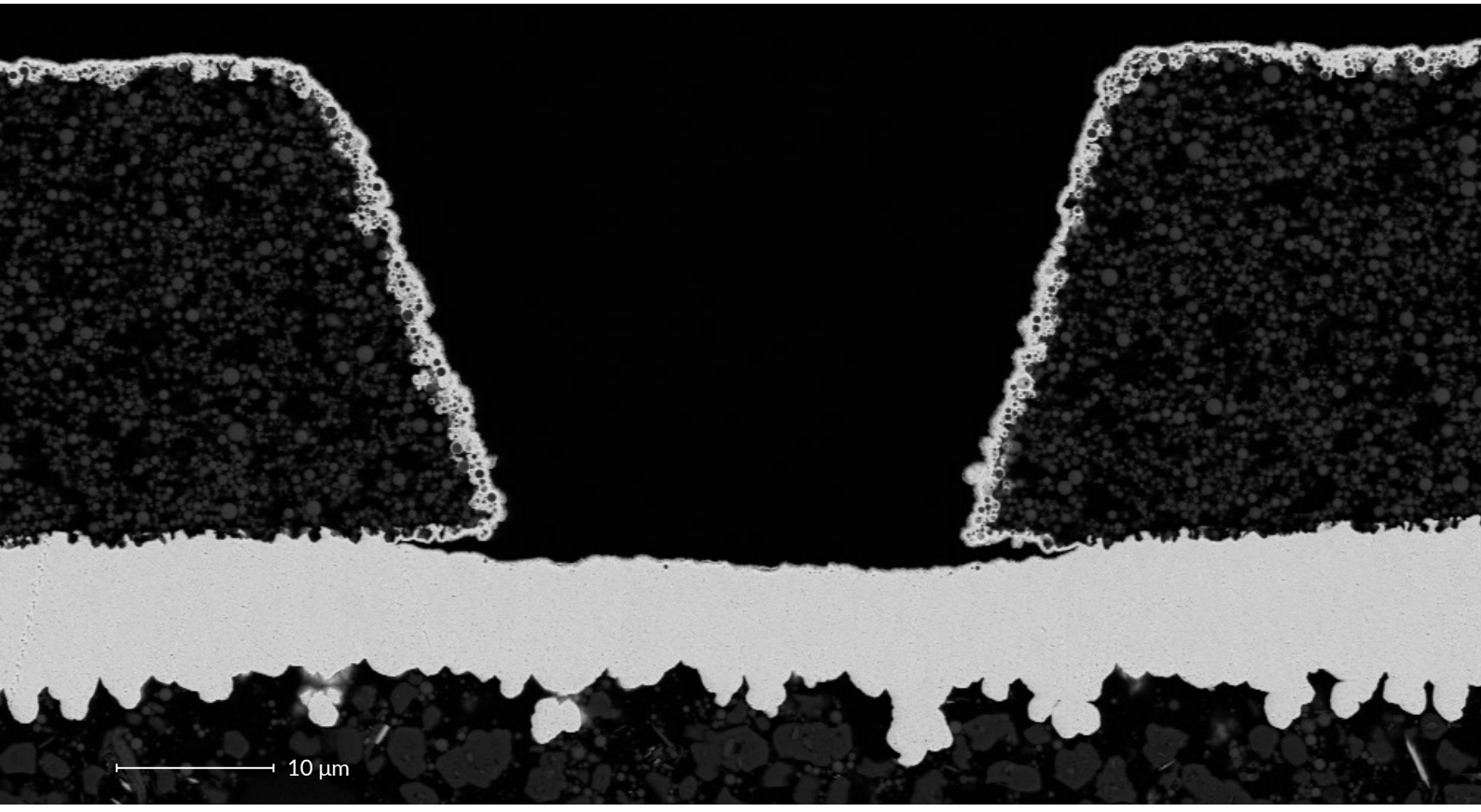
throwing power in BMVs

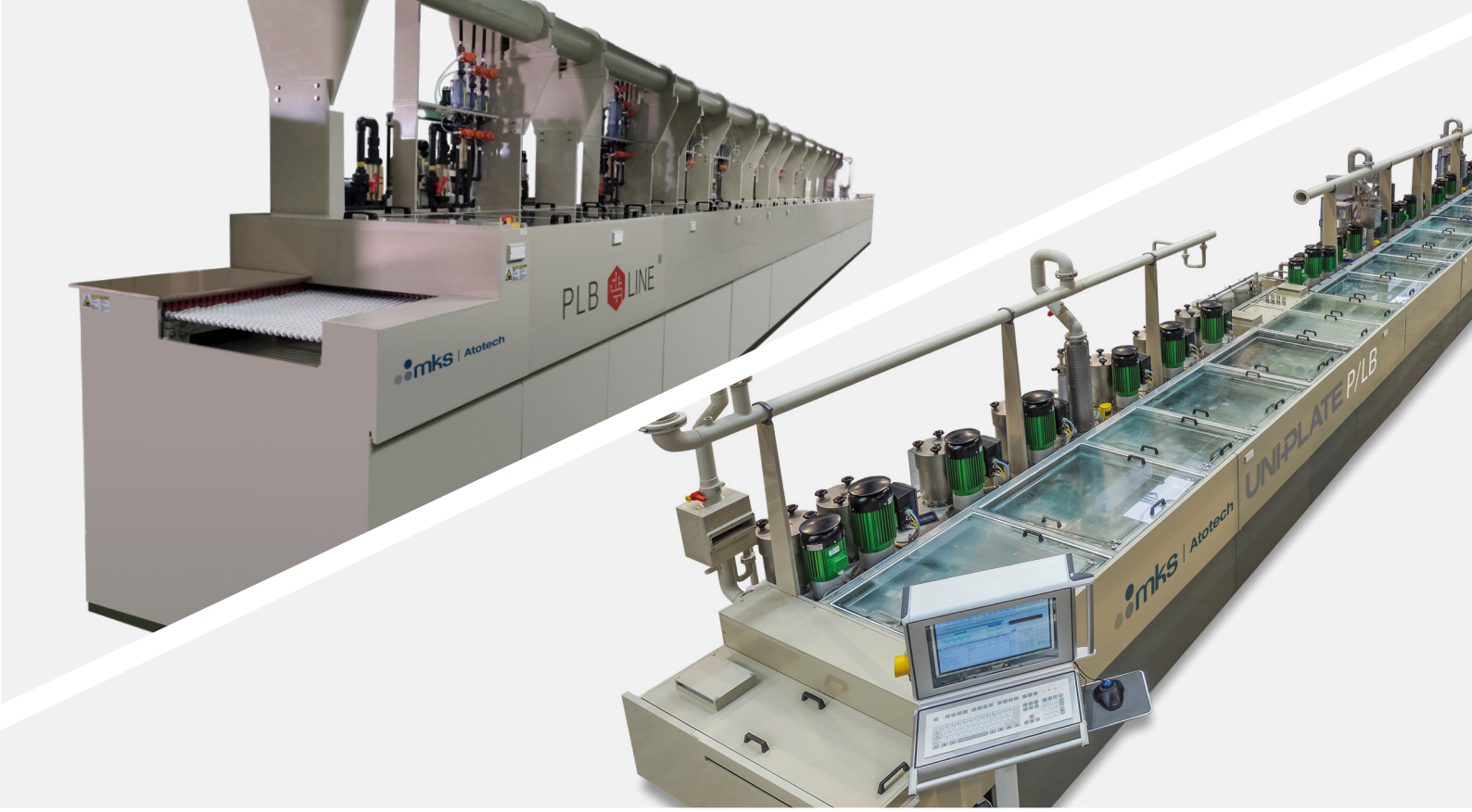
Printoganth® U Plus

MKS' Atotech working horse Printoganth® U Plus is a horizontal electroless copper process that provides excellent copper to copper interconnections resulting in best reliability performance even under severe thermal shock conditions. It is therefore perfectly suited for production of high layer count PCBs with multiple inner layers and advanced HDI any-layer / ELIC technology based on (a)mSAP technology. Printoganth® U Plus has a remarkable reference list with leading HDI manufacturers especially from Taiwan and China. The process is used to produce high-end smartphone PCBs and complies with the latest requirements of (a) mSAP technology.

Printoganth® MV TP2

Printoganth® MV TP2 is our latest generation of vertical electroless copper processes for package substrates. The process has been optimized to provide a maximum of throwing power (TP) into blind micro vias and their wedges. Together with an improved enhanced dry film adhesion, Printoganth® MV TP2 is the ultimate solution for ultra-fine lines and spaces of 8/8 µm and below.





Polygon PLB Line®

Uniplate® P/LB

High yield and efficient equipment solutions for all PCB types, from MLB to package substrates

> 700

Uniplate® P and LB lines delivered worldwide

Uniplate® P/LB – high-end mass production equipment for HDI and package substrates

Market leading mass production lines for best process control, excellent solution exchange into vias and market leading thin panel transportation capability. A high level of automation and MKS' Atotech Fab 4.0 solutions ensure maximum yield and an easy integration into a smart factory for high end PCB fabrication.

3.0

m/min maximum line speed

Polygon PLB Line® – cost-effective mass production equipment for MLB and HDI PCBs

State of the art horizontal PTH lines equipped with the most advanced flooding devices for best solution exchange. The high volume production line offers an operator friendly design and technology to minimize the consumption of water and chemistry.

End markets and industries we serve

Smartphone

Automotive electronics

Computing

Big data infrastructure

Consumer electronics

Communication infrastructure

Printoganth® P2

Universal horizontal electroless Cu

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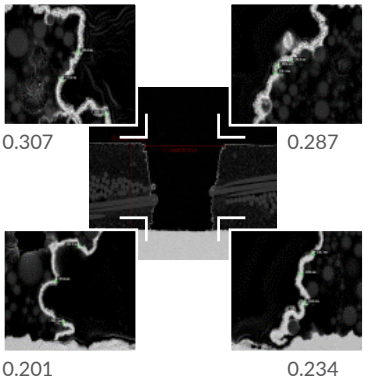
Universal horizontal e'less Cu system for flex, flex-rigid, HDI & MLB base materials



Latest member of the Printoganth® P series

Printoganth® P2 is a new horizontal electroless copper bath which offers outstanding throwing power performance and excellent coverage, even on challenging base materials, such as those used in high speed or 5G applications.

As the successor to Printoganth® P Plus, the new P2 process features a comparable internal stress level which ensures very good adhesion even on PI. In combination with an excellent reliability performance and proven compatibility to various via filling electrolytes.

Printoganth® P2 is truly a universal solution for HDI and flex PCB manufacturers.

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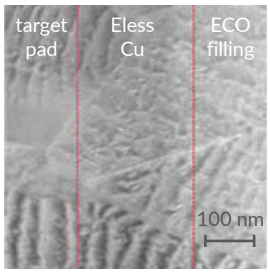
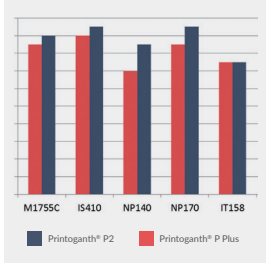
Universal horizontal e'less Cu for flex, flex-rigid and MLB & HDI base materials





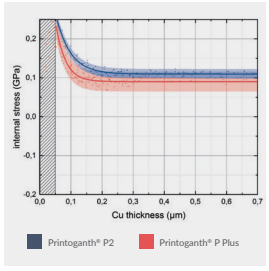


Figure 1: Void free interface
Figure 2: Coverage on relevant base materials
Figure 3: In-situ stress measurement during electroless copper deposition

Enhanced crystal structure, with improved via fill performance

With an industry wide, and increasing concern over stacked BMV reliability, and based on Atotechs market leading investigations into nano voids, Printoganth® P2 targets nano void free interfaces between the target pad and the e'less copper itself.
In combination with unrivalled compatibility with via fill electrolytes, Printoganth® P2 offers a universal electroless copper process that also enables smaller post plate dimples in the via surface.

Excellent coverage

Ideal for high technology applications, Printoganth® P2 exhibits enhanced throwing power over previous Printoganth® P series processes, ensuring good coverage in even the most challenging of via geometries.
Compatible with the Neoganth series of activator processes, Printoganth® P2 maintains the excellent coverage characteristics typical of the P series electroless coppers, and is suitable for use on a wide range of dielectric materials.

Internal Stress

The formulation of Printoganth® P2 has been carefully controlled to ensure that the deposited layers show moderate tensile stress which is comparable to the previous Printoganth® P series.
By further suppressing the formation of blisters in the plated layer, Printoganth® P2 offers excellent adhesion on Upilex and Kapton polyimide foil up to deposit thickness of 0.45 µm absolute or 0.80 µm when measured on FR4 (by XRF / titration).

Features and benefits

- Excellent throwing power into BMVs, outperforming Printoganth® U Plus and P Plus
- Outstanding adhesion and non-blistering performance even on high speed and other challenging substrates such as PI and BT
- Excellent reliability performance, very low to zero defects at the BMV capture pad even at ultra high resolution
- Wide compatibility with industry proven electrolytic via filling processes
- Fully analyzable stabilizer system for best process control

Securiganth® MV Cleaner GFR-S1

Advanced cleaner chemistry in SAP e-less Cu process

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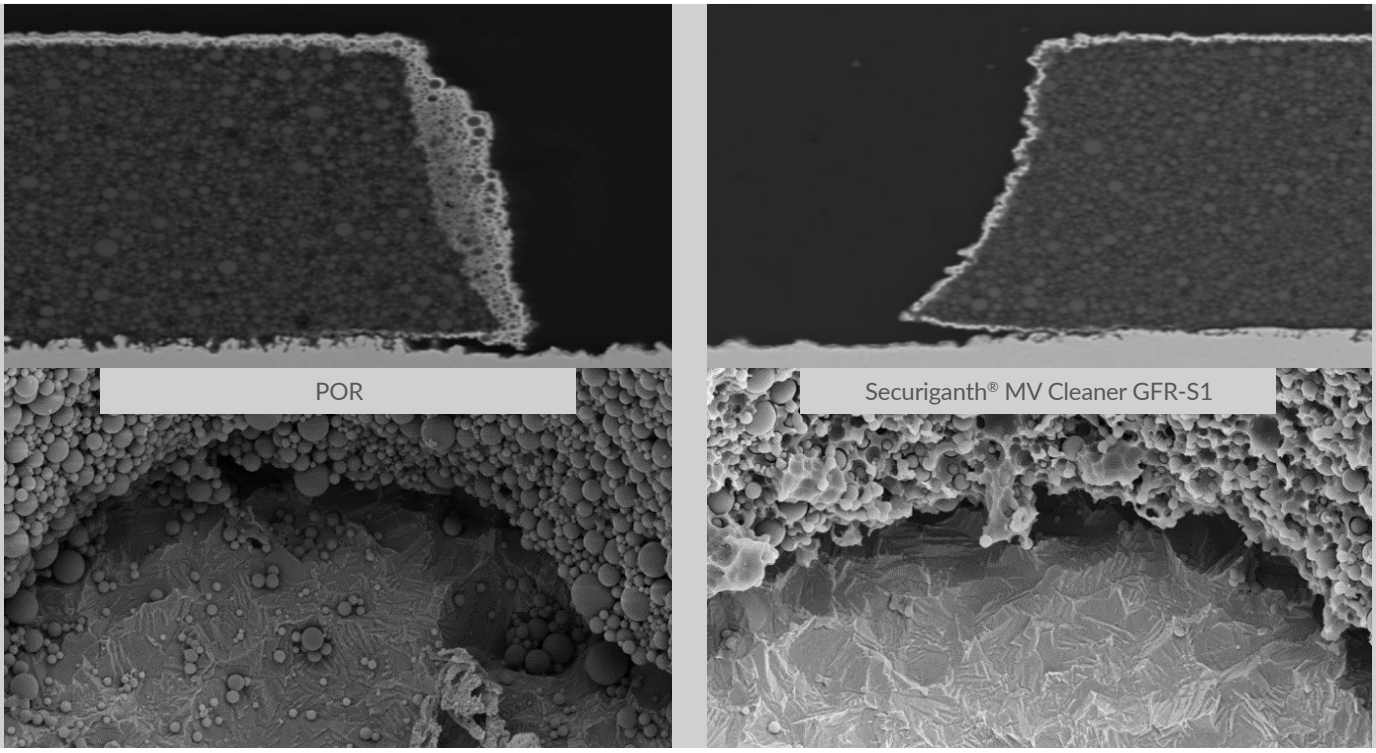

Securiganth® MV Cleaner GFR-S1 enables higher peel strength on bare laminates

Fluoride-free

Specifically developed to remove glass fillers in order to provide enhanced electroless copper adhesion

The latest generations of build up laminates contain increasing amounts of glass fillers which are exposed during desmear. Loose glass fillers on the surface and in the BMV interfere with copper – resin adhesion which can impact the integrity of the copper – copper interconnects.

Securiganth® MV Cleaner GFR-S1 is a fluoride-free chemical solution for simple and efficient glass filler removal on advanced dielectric materials.

Reliable filler removal and surface cleaning can be achieved with Securiganth® MV Cleaner GFR-S1 and offers improved electroless copper adhesion on very smooth surfaces such as solder resist (SR-FA) and LCP material.

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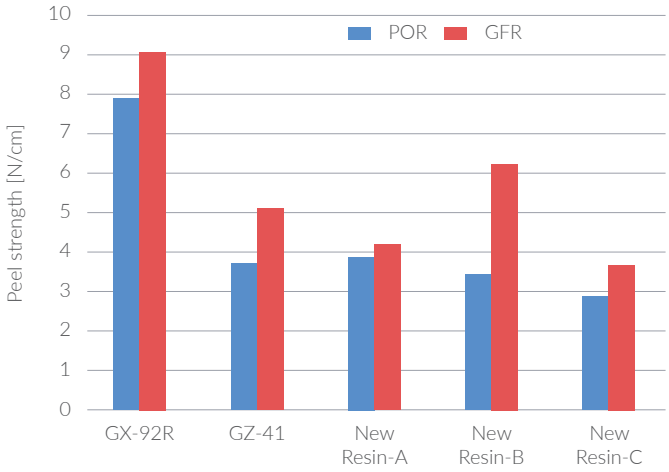
Blister-free deposition on solder resist and LCP material

Features and benefits

- Secure removal of loose glass fillers from SAP build-up laminate surfaces and BMV hole walls
- Enhanced cleaning for challenging base materials
- Blister free deposition on solder resist (SR-FA) after plating and annealing
- Enhanced and more homogeneous peel strength performance
- Blister-free deposition on LCP material
- Can create clean target pads without the use of ultrasonic devices
- Fluoride-free
- Enhanced process safety /yield rates for next generation of ABF laminates

Increased peel strength on advanced material



Electroless Cu thicknesses 0.5 µm – No blisters after annealing

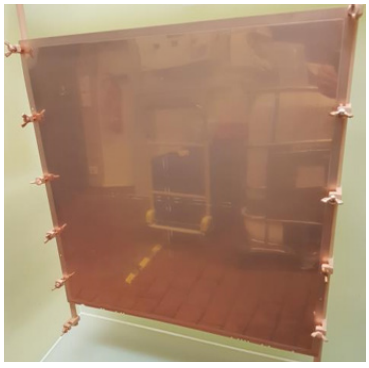


Figure 1: After e-less Cu deposit

Annealing
150 °C, 30 min

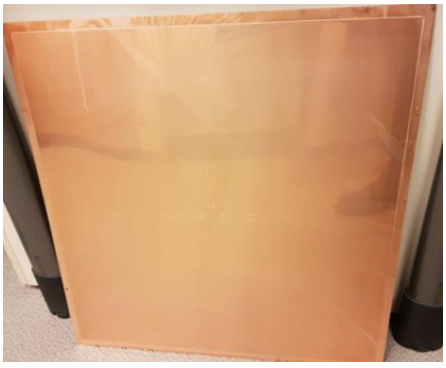


Figure 2: No blisters

ViaKing®

The superior Graphite based PTH process

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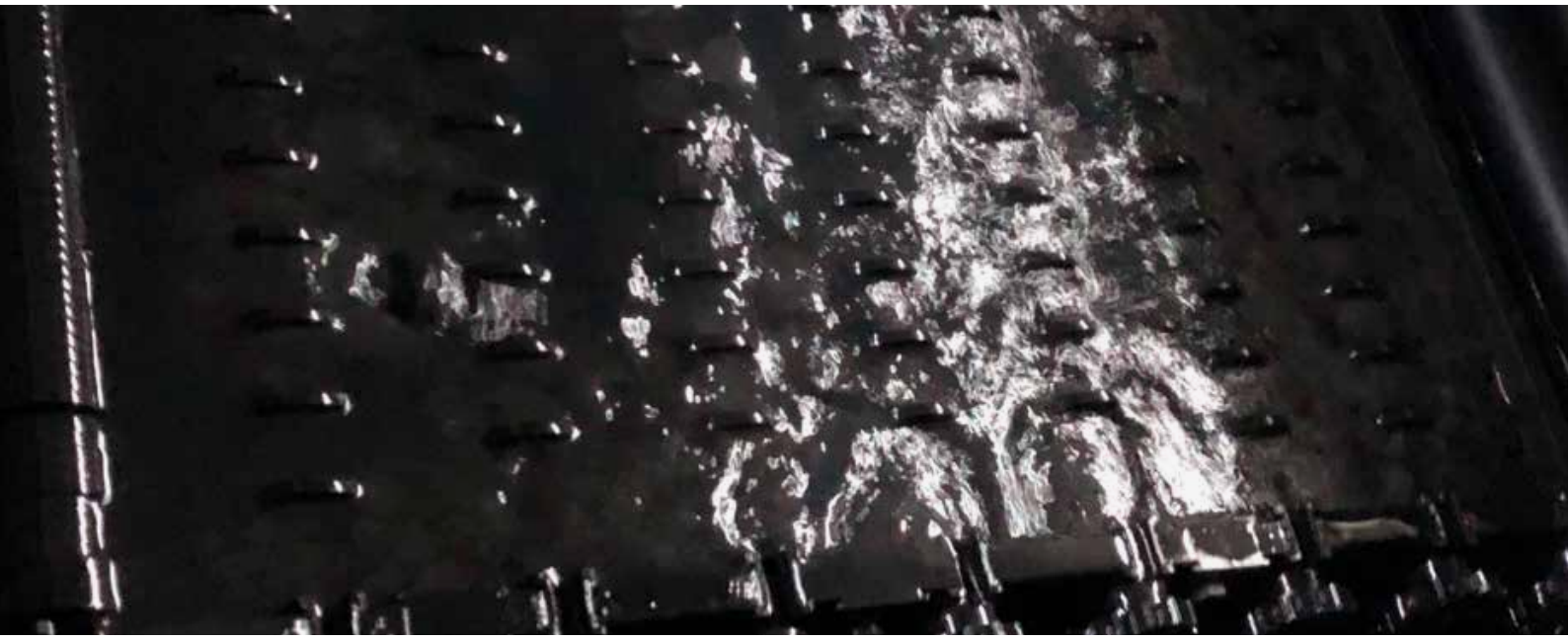

A cost effective metallization process for HDI, flex and exotic dielectric material

Excellent performance and bath life

ViaKing® is MKS' Atotech's enhanced graphite-based direct metallization process. Optimized for both high and low volume production needs, ViaKing® operates with an attractive CoO but offers the highest product reliability and capability.

Designed to operate with low etch conditions, in combination with a stable and long life graphite bath, ViaKing® provides excellent stability, conductivity and electrical integrity for market-leading high yield electrolytic plating.

Key benefits

- Compatible with a very wide range of dielectric materials
- Direct Cu to Cu adhesion for maximum reliability
- Low etch depth for minimal copper removal on inner layers - reduced risk of etch back ICD or voids
- Unique Conductivator formulation is highly resistant to bacterial and copper contamination
- Wide operating window and enhanced bath stability
- Outstanding plating propagation
- Suitable for both panel and pattern plate technologies
- Easy to install into existing equipment
- Ideal for both high volume as well as low volume or stop / start production

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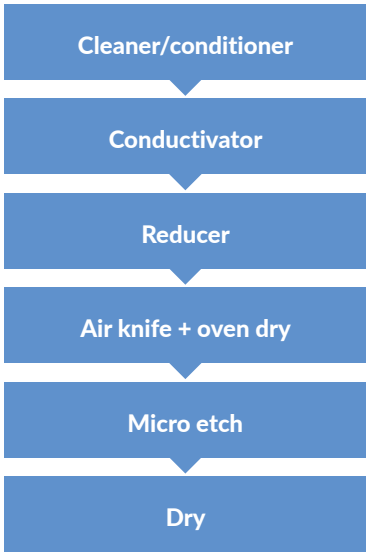
ViaKing® is a functioning and technically superior Graphite based PTH process



50%

of existing customers are using ViaKing® for the production of flex and exotic dielectric materials

Benefits

- Universal, quick, single or double pass process
- Excellent joint reliability
- Enables mixed or hybrid dielectric builds
- No impact from low volume, or stop/start operations
- Very stable graphite bath with a long solution lifetime and wide operation window

Features

- Exceptional adhesion to a wide range of PCB materials
- Suitable for flex, flex-rigid, multilayer and HDI BMV products
- Direct Cu-Cu adhesion
- Improved conductivity over simple carbon black processes
- Small particle size with high pH ensures bath stability
- Short horizontal process with low water consumption
- Chelator free for simple waste treatment

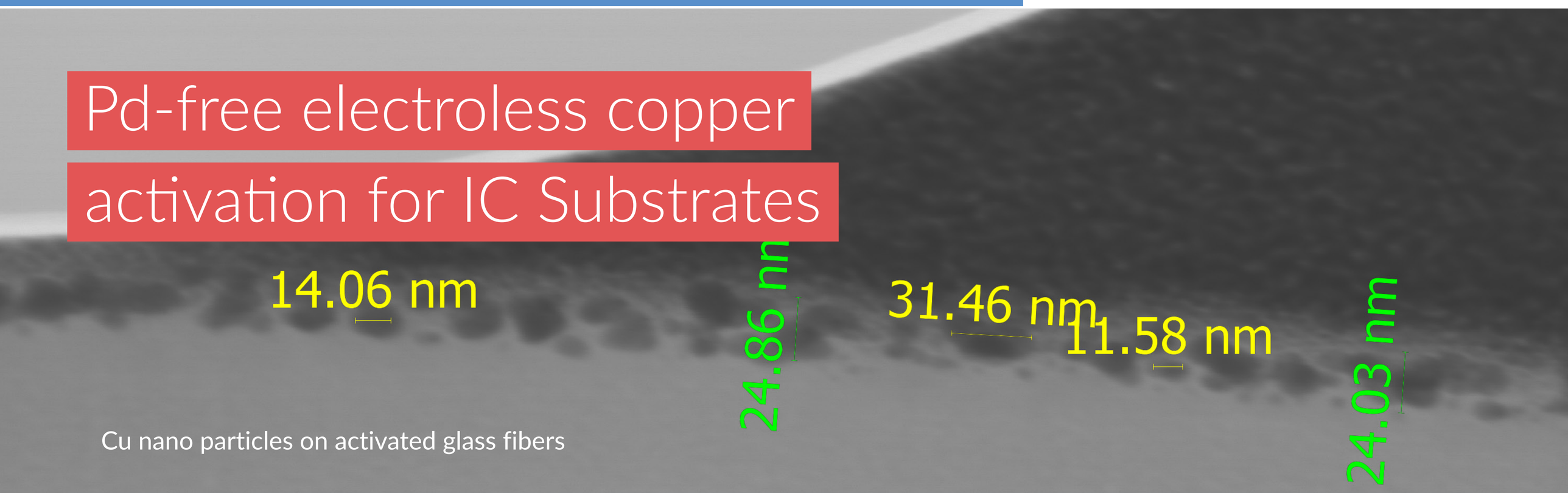
Environmental and HSE implications

- No cyanide
- No formaldehyde
- No chelators

Cupraganth® MV

Atotech

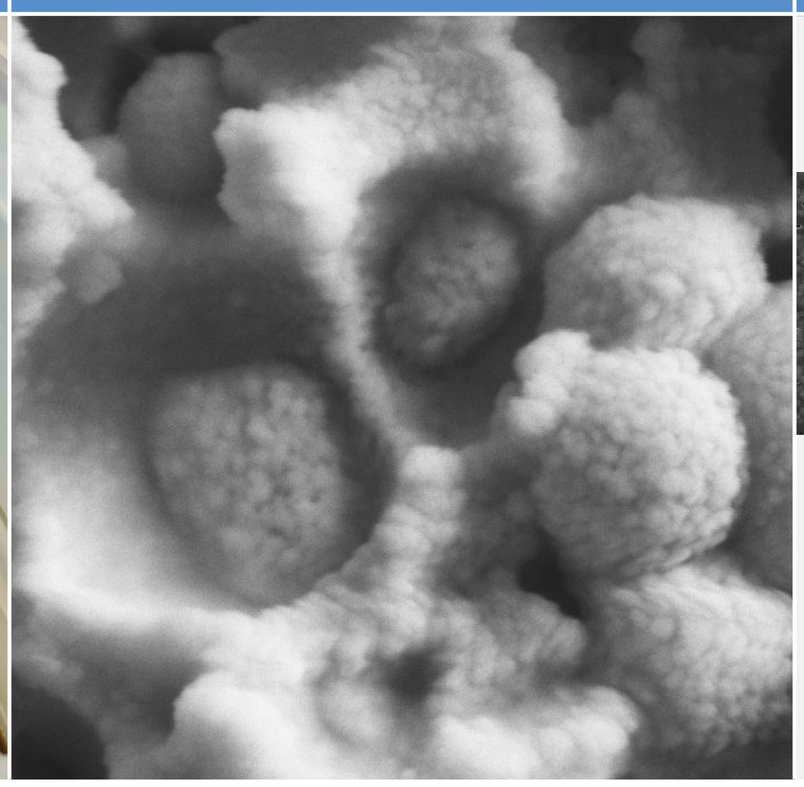
Pd-free electroless copper activation for IC Substrates



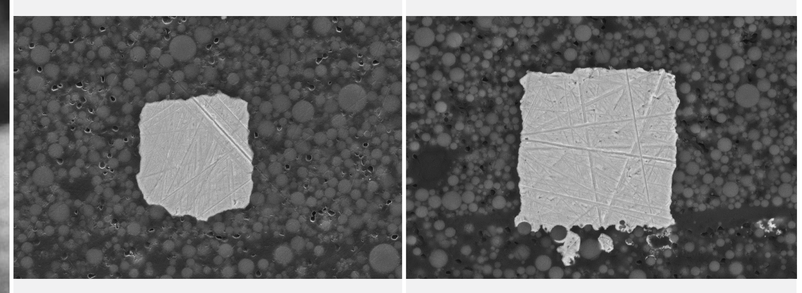
Cu nano particles on activated glass fibers

Stable & robust process, compatible with standard EQ

ABF GX-92 covered with Cu nano particles



Enhanced fine line capability and track shape



Ionic activation with Pd stripping

Cupraganth® MV without Pd stripping

Next generation electroless copper activation

Cupraganth® MV is the next generation of electroless copper activation for advanced packaging applications. Based on a unique colloidal copper technology, Cupraganth® MV replaces traditional Pd-based activation processes and enables both performance and cost benefits. Finer features are achievable as the additional Pd seed layer etch is no longer required, and the Cupraganth® MV layer is removed in the same etch step as the bulk electroless copper layer. Reduced Cost of Ownership (CoO) is possible through the significant differences between the Pd and Cu spot prices, with Cu prices also typically being more stable.

Features

- Revolutionary Pd-free activation based on Cu colloids
- Compatible with established tartrate based electroless Cu baths for IC substrate production
- Robust and stable process
- Comparable coverage and peel strength to POR technology (ionic Pd activation)
- Enables finer L/S due to simplified differential etch and no need for Pd stripping
- 4-step process

Benefits

- Enables higher yields & finer track pitches
- Reduces operational costs compared to Pd activators
- Pd free – No exposure to volatile Pd spot price

Electroless copper process for IC Substrate

Desmear

Securiganth® MV Cleaner PF

Etch Cleaner

Cupraganth® MV Conditioner

Cupraganth® MV Selector

Cupraganth® MV Activator

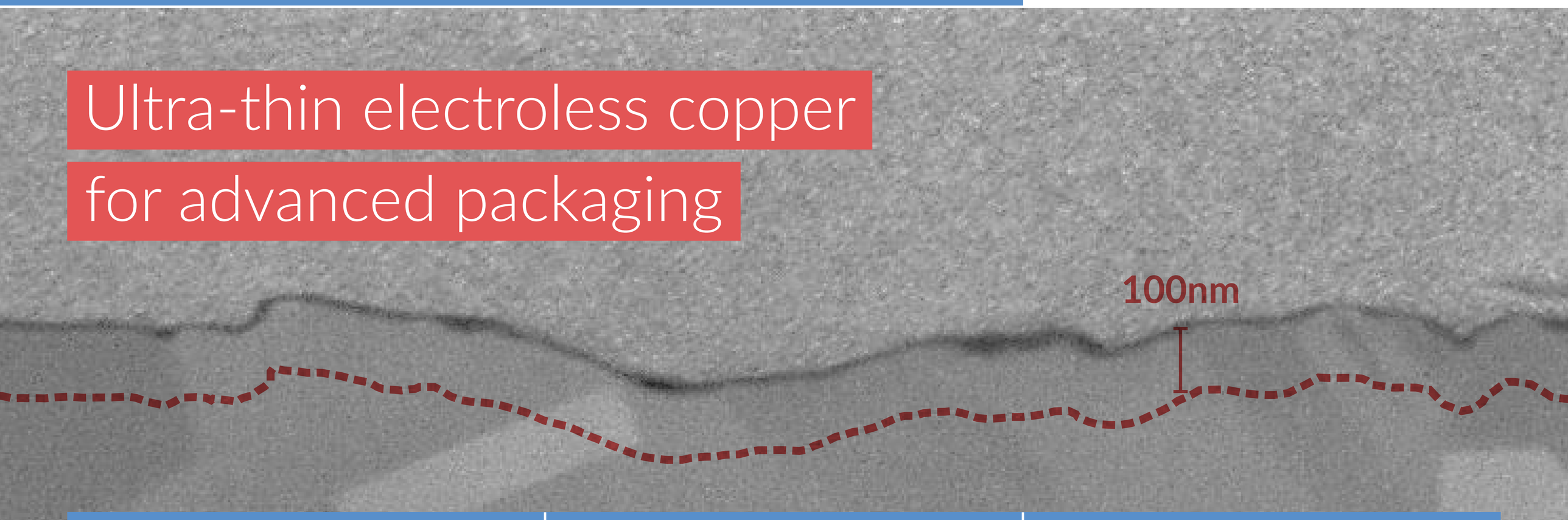
Cupraganth® MV Enhancer

Printoganth® MV series

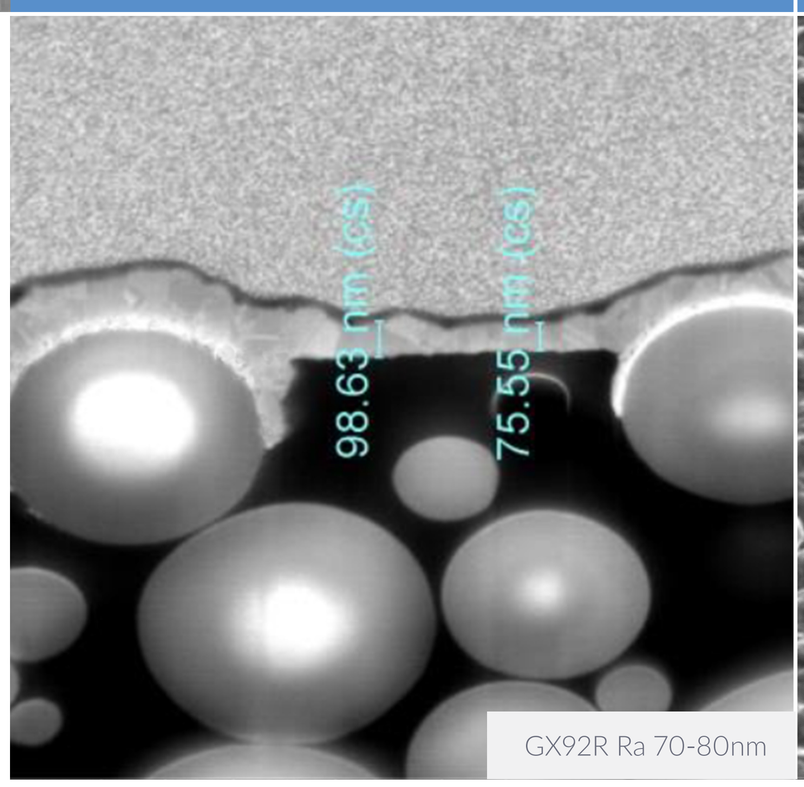
Printoganth® MV TP3

Atotech

Ultra-thin electroless copper for advanced packaging

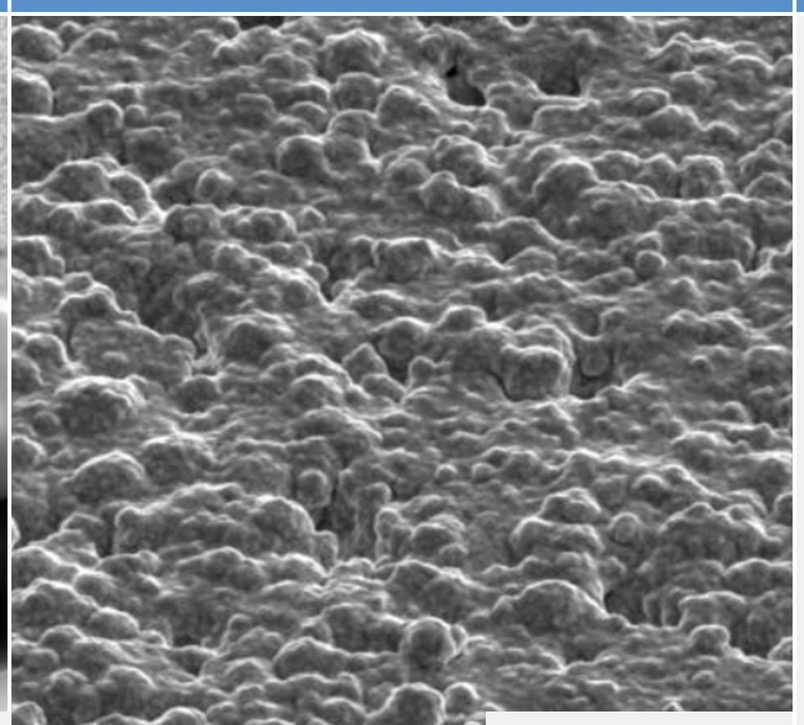


100nm thickness



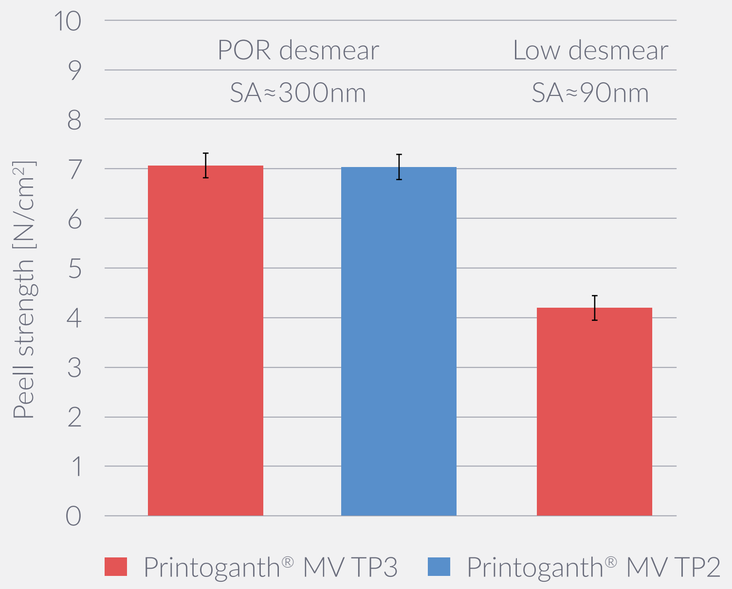
GX92R Ra 70-80nm

Uniform copper deposit



GX92R Ra 70-80nm

Excellent adhesion performance



ABF GX-92

Latest generation of advanced electroless copper

Printoganth® MV TP3 is the latest generation in the high-throw Printoganth® MV TP series of electroless copper baths for advanced packaging applications. One of the challenges facing next-generation IC substrates is the ability to further reduce line and space dimensions, where electroless copper has a significant role to play. Printoganth® MV TP3 has been optimized to create a uniform copper deposit of 100 - 150 nm in thickness. When used in combination with MKS' Atotech's Neoganth® MV activation systems, it will do so on a wide range of challenging and low roughness dielectrics.

Based on our market-leading experience and understanding of electroless copper deposition and recrystallization, the Printoganth® MV TP3 process deposits a fine-grained copper layer that facilitates "bottom-up" or "epitaxial" recrystallization and ensures that your interconnects meet the highest reliability requirements.

Features and benefits

- Enables next-step in fine-line creation by SAP technology targeting L/S < 5/5 µm
- 100 - 150 nm abs. copper deposit
- Excellent adhesion on low roughness dielectrics
- Enables "bottom-up" recrystallization for best-in-class reliability
- Excellent bath initiation, zero dummy plating required
- Outstanding throwing power
- Fully compatible to market leading Neoganth® activation process