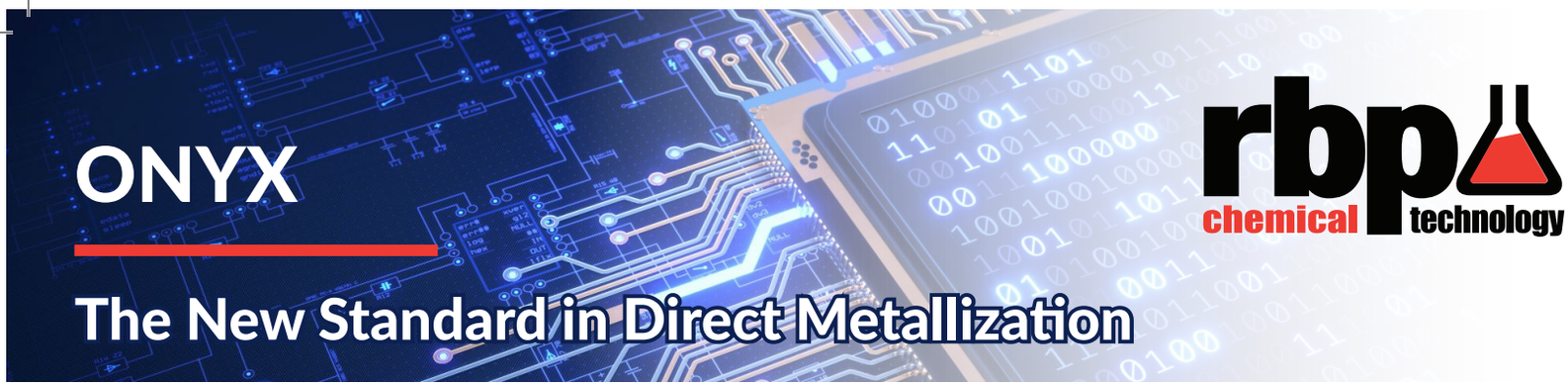

ONYX

The New Standard in Direct Metallization

rbp chemical technology

What is Onyx?

- Onyx is a direct metallization process which uses graphite (electrically conductive) to coat a non-conductive surface and render it conductive. This enables an electrical current to pass across these previously non-conductive surfaces and allow metal to be electroplated onto the surface
- The graphite material in Onyx is coated with a organic material called “binder” which provides solution stability and significantly improves the coating performance compared to a “binderless” graphite. This process is an alternative to electroless copper deposition
- Onyx Process is enabled through extensive technique and know-how
- Horizontal conveyor process-single or double pass

Key Advantages of Onyx

- Less expensive than conventional electroless copper
- Smaller equipment footprint compared to electroless copper
- Able to successfully metalize literally all resin materials used in PWB fabrication

The Onyx DM Process

Specially formulated cleaner/conditioner

- Mild alkaline solution
- High charged polyelectrolyte additive to promote adsorption of the graphite

Fine nano-crystalline graphite dispersion

- Synthetic graphite
- Anisotropic conductivity
- Thin, uniform coating on multiple resin systems and glass types
- Unique/binder technology for cross-linking with cleaner/conditioner active molecules

Leveler

- Acidic process
- Removes excess graphite not bound to the cleaner/conditioner active sites

For more detailed information, please review our electronics chemistry web page

RBPchemical.com/electronics

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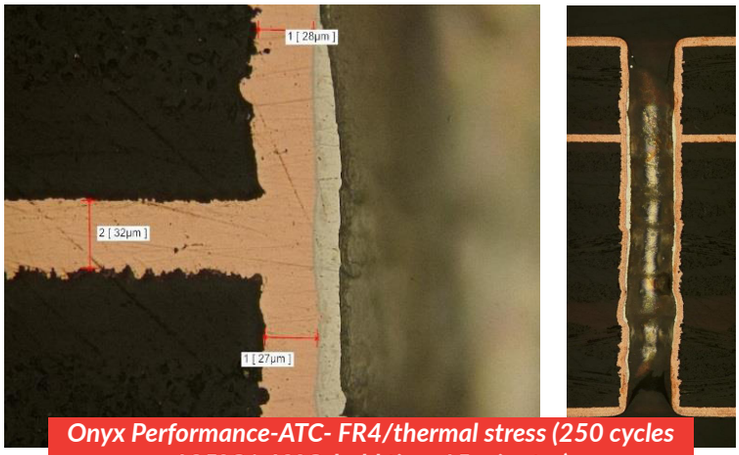
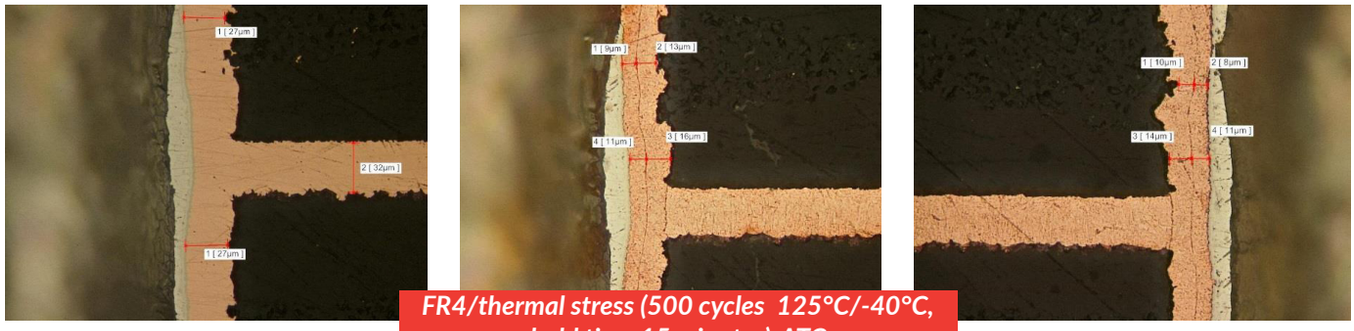
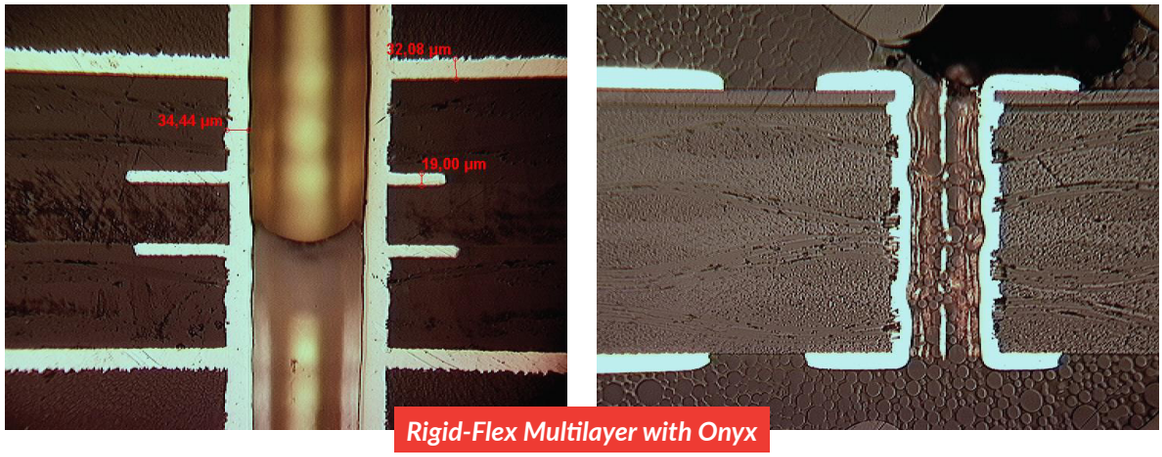


Onyx Performance-ATC- FR4/thermal stress (250 cycles 125°C/-40°C, hold time 15 minutes)



FR4/thermal stress (500 cycles 125°C/-40°C, hold time 15 minutes)-ATC

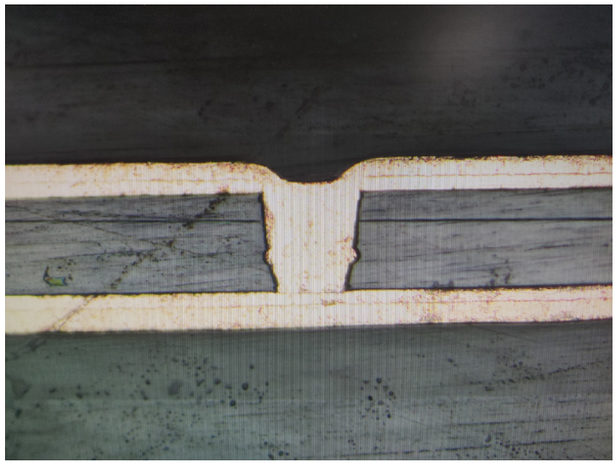


Rigid-Flex Multilayer with Onyx

Parameter	Min	Optimum	Max
Onyx Colloid (wt. % solids)	2.5	3.2	4
pH value	8.6	9.0	9.6
Copper (mg/l)	0	0	1000
Conductivity (mS)	0.5	1.2	2.0
Dwell times-see PDS			

Onyx Properties (key control indicators)

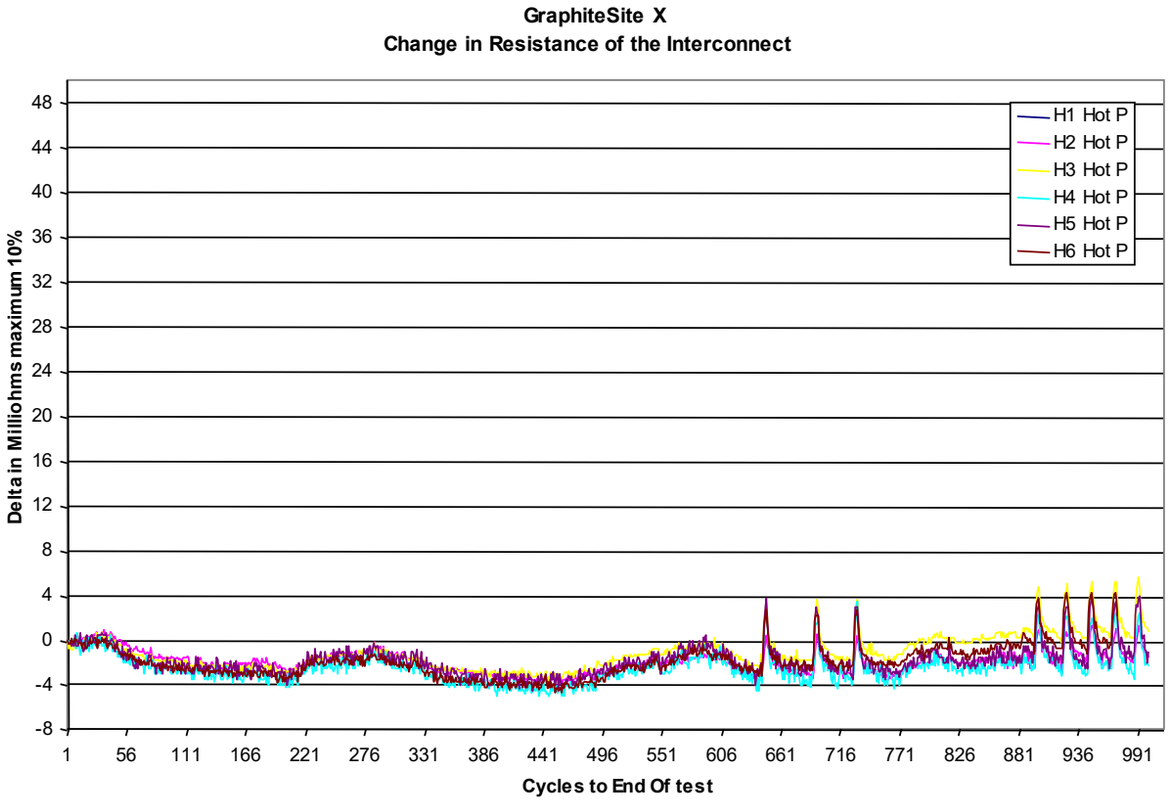
Excellent Coverage in Blind Vias and High-Performance Resin Materials



Polyimide	Cyanate Ester
Flexible materials	PTFE
Ceramic filled	PPO
Low Dk, Low Df materials	PPE
FR-4	Copper-Invar-Copper
FR-5	CEM-1
BT	(ask about list of other materials)

ONYX Site X

Robust interconnects
No failures through 1000 cycles.



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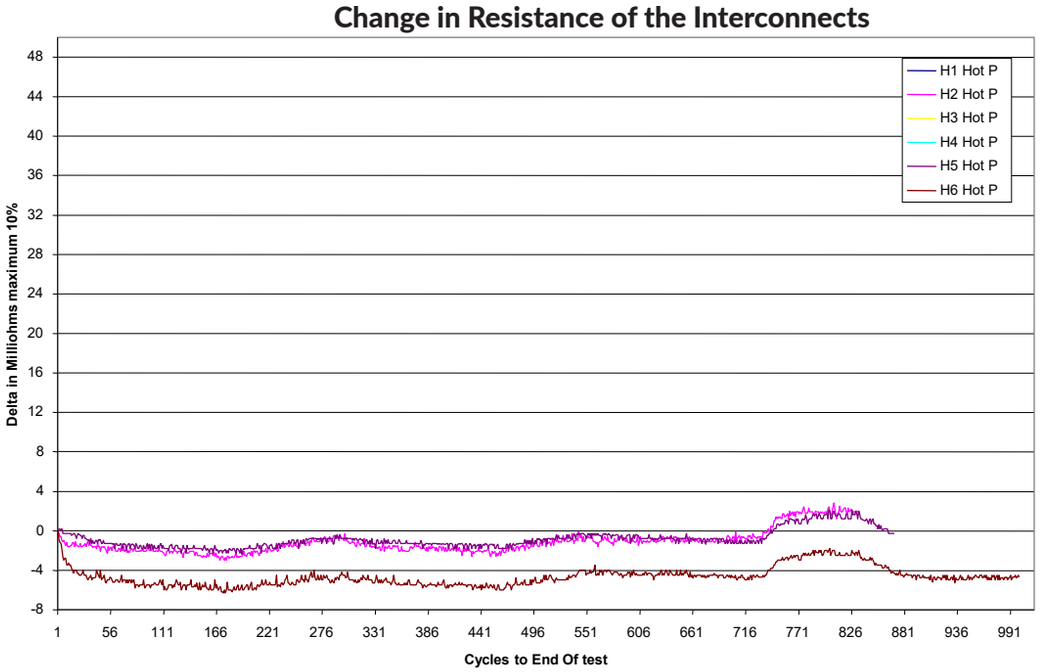
The Intelligent Choice

Outstanding Interconnect Reliability

- **Confirmed via IST and ATC (accelerated thermal cycling)**
- **Copper to copper bond (unlike conventional electroless copper)**
- **Low viscosity graphite dispersion minimizes thick deposit on the interconnect**
- Onyx **formulated with lower particle size graphite for extra conductivity**

ONYX Site II

Robust interconnects
No failures through 1000 cycles.



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