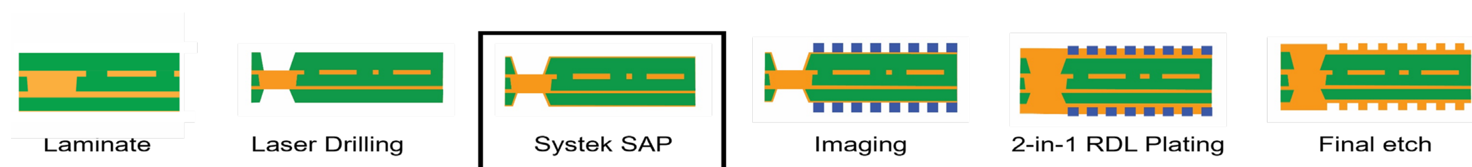
Systek™ SAP

High Performance Build-Up Processes for IC Substrates

Semi-Additive Metallization Process

The Systek™ SAP copper metallization process is a high performance semi-additive primary metallization for IC substrates with multiple process improvements. The system is specifically designed as a metallization seed layer for unclad build up substrates and is composed of a complete line of process chemistry including desmear, conditioning, activation, and metallization processes. For completion of the build-up process, Systek SAP is compatible with Systek advanced 2-in-1 plating technology, allowing the filling of copper micro vias and plating of traces simultaneously. The combined process improvements of Systek SAP enable very high density circuitry with minimal substrate roughening for enhanced layer performance and reliability.



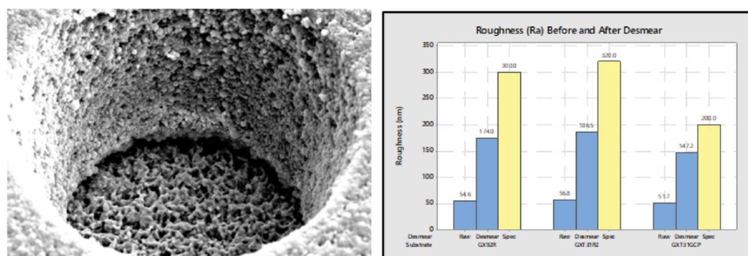
Systek SAP Desmear Process

Systek SAP starts with a four-step desmear process that can be calibrated to optimally prepare multiple substrate materials, imparting minimal roughness while ensuring clean via side walls and copper target pads. The first step is the **Systek Sweller 120**, a solvent-based sweller that modifies the surface of the build-up material to be more wettable. This is then followed by the **Systek Oxidizer 200** and **Systek Neutralizer 300**, a permanganate etch / neutralizer system that removes laser debris and increases topography.

The desmear process is completed with the **Systek GE 360** glass etch, which promotes uniform palladium adsorption on glass surfaces of the build-up material. The Systek SAP desmear steps provide minimum roughness on the build-up film substrate while consistently ensuring a clean via sidewall and copper target pad for superior copper-to-copper adhesion at all copper interfaces.

SYSTEK GE 360

Systek GE 360 is an innovative glass etch process that uniformly frosts glass substrates while removing loose glass spheres with minimal attack. The unique glass etch solution is free of sulfuric acid which allows for improved adhesion and increased peel strength on glass build-up substrate materials.



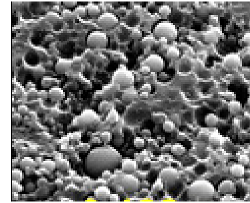
Process improvements in multiple areas allow the Systek SAP desmear to provide a below-spec roughness on many widely used build-up materials

Systek SAP Conditioner Process

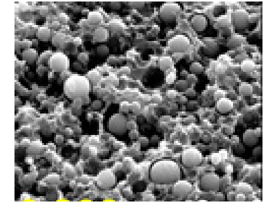
The Systek SAP conditioner process ensures adsorption of the palladium catalyst into the substrate. The process starts with the **Systek Conditioner 400**, a chemical bond enhancing pre-conditioner bath, followed by the **Systek Condition 460**, a cationic resin and glass conditioner bath. **Systek Oxidizer 500** is a microetch that cleans and activates target pads. Working together, these three processes allow unparalleled activation capability for electroless copper initiation in hard-to-reach and hard-to-clean areas of the build-up layer.

Systek Conditioner 400

Systek Conditioner 400 is an alkaline solution with functional organics used to increase peel strength capability. The bath removes loose glass spheres and attaches functional groups to the surface to increase surface energy resulting in superior wetting on difficult-to-reach areas such as the target pad wedge. **Systek Condition 460** is a custom designed cationic conditioner that works on a wide range of materials.



Substrate surface: Desmear, Neutralizer, Glass Etch, 8000x



Substrate surface: Desmear, Neutralizer, Glass Etch, 8000x

Systek Oxidizer 500

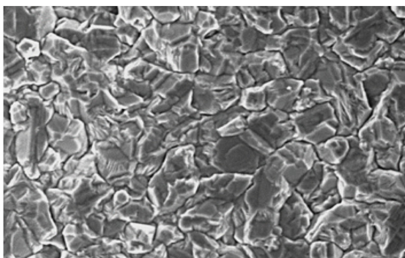
To ensure proper micro via structure reliability, and optimized micro etchant process that gently lifts any remaining debris and residues from the micro via target pads is required. **Systek Oxidizer 500** is a highly controlled micro etch bath that works specifically with the wedge geometry to create superior copper to copper bonding during the subsequent activation and electroless copper metallization step. The process is particularly useful for restoring the copper topography of recast copper that appears on the target pads during UV laser drilling.

Systek SAP Copper Metallization Process

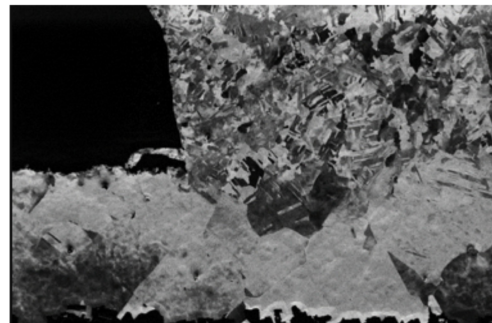
The Systek SAP copper metallization process includes a palladium activation system, an electroless copper metallization process, and an optional anti-tarnish. The **Systek Activate 620 / Systek Reducer 700** is an ionic palladium activator system that works specifically with the conditioner technology to provide a highly active surface for metallization. **Systek Copper 850** is a zero-stress electroless copper plating bath. Following activation of the substrate, the micro via structures enter the final electroless copper plating stage.

Systek Copper 850

Systek Copper 850 is an electroless copper plating process with stellar physical properties. The bath ensures complete and uniform coverage of the surface with just 0.25 to 1 micron thick, stress-free copper. The deposit allows for reduced roughness on the substrate surface, resulting in improved signal properties without sacrificing adhesion. The bath operates at a low temperature of 25 to 38°C and is suitable for SAP build-up for IC substrates.



Sytek Copper 850 produces the angular grain structure that is indicative of improved physical properties



A solid electroless copper depost at the corner interface of the epoxy and target pad with Systek Copper 850's superior grain structure

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