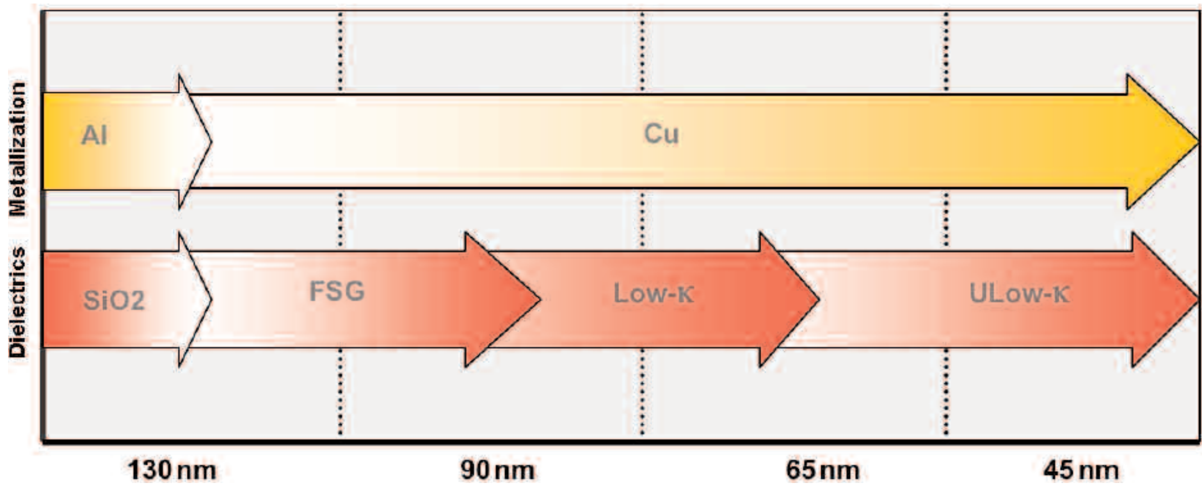
Cu/Low-κ Applications

Faced with increasing market demand for faster, smaller and more efficient integrated circuit devices, semiconductor manufacturers have turned to copper and low-κ based interconnects to replace traditional aluminum/silicon dioxide systems. To assist in this transition, Mallinckrodt Baker, Inc. has developed a complete line of advanced chemistries specifically designed to overcome today's cleaning challenges and provide solutions to the cleaning challenges of the future.

TRENDS

Copper metallization schemes were introduced at the 130 nm technology node and will continue to be the metal of choice for the foreseeable future. The growing portfolio of low-κ dielectric materials available to the industry adds another level of complexity to process integration challenges. A collaborative effort between equipment and chemical/material suppliers is critical for successful implementation of new processes.



An oxidizing ash has been the predominant resist removing process at the 130 nm node where stable dielectric materials are present. This process flow requires a wet clean step to remove residues that remain after the ashing process. O_2 plasma processes can damage most low-κ dielectrics implemented at the 90 nm node and beyond. Bulk photoresist removers are evolving as the cleaning chemistry of choice when sensitive interconnect materials are used.

Generation	130 nm	90 nm	65 nm	45 nm
Resist Removal Technology	• Oxidizing Ash	• Bulk Resist Strip • Reducing Ash • Oxidizing Ash	• Bulk Resist Strip • Reducing Ash	• Bulk Resist Strip • Supercritical CO_2
Technical Issues	• Corrosion • Metal Contamination	• Corrosion • Metal Contamination • Dielectric Damage	• Corrosion • Metal Contamination • Dielectric Damage • Stripper/Moisture Absorption • SARC Removal	• Corrosion • Metal Contamination • Dielectric Damage • Stripper/Moisture Absorption • SARC Removal

MALLINCKRODT BAKER, INC. TECHNOLOGY ROADMAP—Cu

Materials characterization and integration requirements have been a part of the International Technology Roadmap for Semiconductors (ITRS) since its inception. Mallinckrodt Baker, Inc. is committed to developing the cleaning chemistries required to move the technology into the next decade. Our copper and low-κ product line provides solutions to the cleaning challenges encountered at the 130, 90, 65 and 45 nm nodes.

Generation	130 nm	90 nm	65 nm	45 nm
J.T.Baker® Cleaning Chemistry Solutions	■ Ash Residue Removers • REZI™-38 • CLκ™-870	■ Bulk Resist Strippers • CLκ-888 • CLκ-820 • CLκ-288 ■ Ash Residue Removers • REZI-38 • CLκ-870	■ Bulk Resist Strippers and SARC Removers • CLκ-888 • CLκ-288 ■ Ash Residue Removers • REZI-38	■ Bulk Resist Strippers and SARC Removers • CLκ-888 • CLκ-288

PRODUCT HIGHLIGHTS

Bulk Photoresist Stripping and Residue Removal

	Description
BAKER CLκ-820	• Powerful solvent-based photoresist stripper for 90 nm technology
	• Excellent for the removal of post-etch resist from Cu dual or single damascene structures utilizing robust dielectrics such as FSG and SiO_2
	• Effective photoresist stripper for rework of Cu/Low-κ substrates
	• Effective in the removal of post-Ta or post-TaN etched bulk resist
BAKER CLκ-888	• Powerful solvent-based photoresist stripper for processes at or below the 90 nm technology node
	• Capable of removing bulk resist, etch polymer, and bulk resist "skin" without the use of a plasma strip
	• Has the ability to remove sacrificial anti-reflective coatings and photoresist in a single step
	• Can provide an all-wet wafer cleaning solution, allowing manufacturers to meet the ITRS roadmap challenges for processes at or below the 90 nm node
BAKER CLκ-288	• Powerful aqueous-based cleaning chemistry for processes at or below the 90 nm technology node
	• Capable of removing bulk photoresist "skin" and etch polymers without the use of a plasma strip
	• Has the ability to remove sacrificial anti-reflective coatings and bulk photoresist or ash residues in a single step

Ash/Etch Residue Removal

	Description
BAKER CLκ-870	• Fluoride-based residue remover for post-oxygen plasma processing of advanced Cu devices at the 130 and 90 nm nodes
	• Compatible with most dielectrics currently designed for the 130 nm – 90 nm technology nodes
BAKER REZI-38	• Aqueous residue remover for post-oxygen plasma or post-reducing ash processing at or below the 130 nm technology nodes
	• Highly aqueous chemistry allows for environmentally friendly wafer processing and reduced total cost of ownership
	• Optimized for single-wafer processing but can also be utilized in bath processes
	• Compatible with Al/$Si0_2$ and Cu/low-κ substrates

PRODUCT HIGHLIGHTS PERFORMANCE CHARACTERISTICS

Typical etch rates on dielectric films Å/min.

Product	CDO	CORAL[1]	FSG	SiLK[2]	SiN	TEOS	Black Diamond[3]
CLκ-888 @ 55°C	<0.5	0.5	<0.5	2.4	<0.5	<0.5	1
CLκ-870 @ 75°C	<1	<1	5	<1	1	3	<1
CLκ-820 @ 75°C	4	8	4	<1	1	3	Not compatible
CLκ-288 @ 45°C	0.4	1	<0.1	Not compatible	0.1	0.2	0.9
REZI-38 @ 45°C	<1	Not compatible	<1	<1	<1	<1	1

MATERIAL OF CONSTRUCTION COMPATIBILITY

Product	PFA	Kalrez[4]	PTFE	PP	Teflon[5]	PE	304 SS	316 SS
CLκ-888 @ 55°C	Yes	Yes	Yes	Yes	Yes	Yes	No	No
CLκ-870 @ 75°C	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CLκ-820 @ 75°C	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CLκ-288 @ 45°C	Yes	Yes	Yes	Yes	Yes	Yes	No	No
REZI-38 @ 45°C	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

APPLICATION SUPPORT

Mallinckrodt Baker, Inc. has a staff of Applications Engineers available to work with you to implement a process that provides a total solution encompassing the use of J.T.Baker® chemistries in your existing tools or a new facility. Evaluations can be conducted at your manufacturing site or at the Mallinckrodt Baker, Inc. Applications Laboratory. **For additional information about the J.T.Baker products for Cu/low-κ applications, contact us at 1-800-JTBAKER (800-582-2537) or at 1-908-859-9346.**

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