

DuPont™ PlasmaSolv® EKC265™

Post-Etch Residue Remover

Product Description

DuPont™ PlasmaSolv® EKC265™ post-etch residue remover is the flagship product of the DuPont EKC Technology PlasmaSolv® series. It is a highly selective post metal and via etch residue remover based on EKC's proprietary HDA® high performance hydroxylamine-based cleaning technology for aluminum Semiconductor integration and is a proven industry solution.

Applications

EKC265™ post-etch residue remover is widely used within the semiconductor industry to meet critical cleaning needs at all stages of aluminum integration from high aspect ratio Micro Electricro Mechanical Systems (MEMS) devices in the 100 μm+ range to advanced DRAM at sub 70 nm.

A list of common applications is given below:

- Contact clean
- Metal line clean
- Via clean (landed and punched through)
- W buried bit line cleaning
- Polyimide rework
- Pad clean
- MEMS cleaning

Features

- Single solution to all post etch aluminum cleaning processes—contact, metal, via and pad
- Highly selective residue removal
- Removes heavy organic residues
- Wide process window
- Enables high yields
- Reduced via contact resistance
- Industry benchmark for aluminum cleaning
- Low evaporation rate at operating temperature

Chemical Mechanism

HDA® products contain a powerful nucleophile, reducing agent and chelator. Its unique properties enable it to break down and dissolve the many different types of residues that are formed during the etch process without critical dimension (CD) loss or metal corrosion. The powerful chemical activity of HDA® products is complemented by other active components that increase the removal of organometallic and heavy organic residues.

Table 1.

Property	EKC265™
Specific Gravity	1.104
pH	11.5
Viscosity at 25 °C (cps)	25.22
Viscosity at 75 °C (cps)	10.18
Boiling Point (°C)	100
Freezing Point (°C)	<0
Flash Point (°C)	>110
Solubility in Water (%)	100

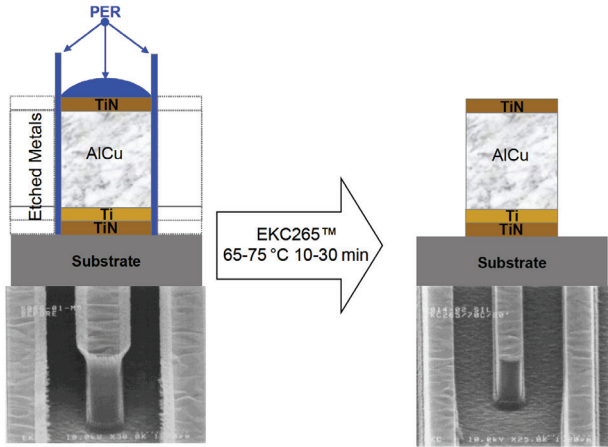
Table 2.

Material	EKC265™ Etch Rate (Å/min)
Al	1.0
Ti	0.3
TEOS	0.1
W	1.0
TiN	1.6

Cleaning Examples

Post Metal Etch Residue Removal

Chloride-based plasma etching of TiN/Ti/Al(Cu)/TiN metal stacks will result in the deposition of unwanted by-products as residues on the metal sidewall and top. Large veils can form along the photoresist and if these are not properly removed cause line shorts and increased particle defectivity. DuPont™ PlasmaSolv® EKC265™ post-etch residue remover is able to remove all the residues that form including any partially or unashed photoresist that might remain.

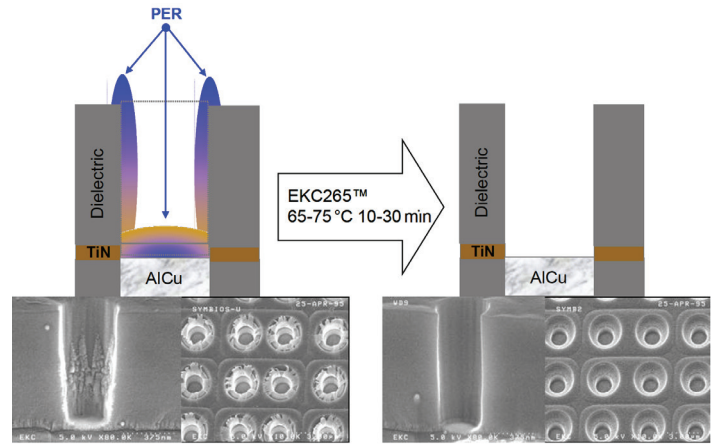


Post Etch Residue Removal using PlasmaSolv® EKC265™

- Suitable for contact, metal, via and pad cleaning
- Can be used in baths or spray tools
- Very effective at removing inorganic and organic residues
- One chemical for all cleaning processes
- Able to remove Ti rich residues in “punched-through” vias

Post Metal Via Residue Removal

In via etching fluoride plasmas such as CF_4 deposit an amorphous fluorocarbon layer on the via sidewall to maintain an anisotropic etch. This residue is chemically inert and can adhere very strongly to the dielectric sidewall. HDA® Technology products such as EKC265™ are powerful enough to clean the sidewall, removing the residue without having to underetch it, as is the case in some alternative cleaning approaches. Importantly, EKC265™ is also able to remove the dense $Ti_{(x)}F_{(y)}$ containing residues formed on etching through TiN cap layers at the base of vias.

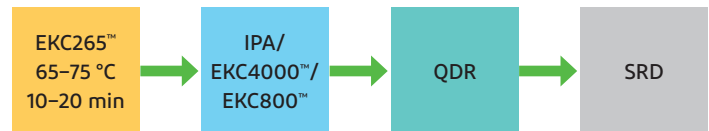


Complete Cleaning with Posistrip® and PlasmaSolv®

- DuPont™ EKC265™ is designed to work in combination with Posistrip® photoresist removers
- DuPont™ Posistrip® EKC830™ or EKC800™ are highly effective positive tone photoresist removers
- High loading capacity to prevent particle redeposition
- Full wet solution to resist and residue removal

Process Conditions

A typical EKC265™ process flow is shown in the diagram below. EKC265™ can be used in bath or spray tools and your DuPont EKC Technology representative can provide guidance and advice on setting up new or optimizing existing processes.



Process Control using PlasmaSolv® EKC265™

- DuPont™ EKC4000™ post clean treatment is an active chemical rinse that neutralizes any anions that form
- EKC265™ efficiency is closely linked to the water and HDA® levels
- If these fall off over time, cleaning efficiency also drops
- EKC can assay chemical samples over time to establish the limits and optimal process conditions for a given clean

EKC265™ is covered by one or more of the following patents:

- U.S. Patent Numbers: 5,279,771; 5,334,332; 5,381,807; 5,482,566; 5,672,577; 5,902,780; 5,911,835; 6,000,411
- Japanese Patent: 2,691,952; 3,048,207
- European Patent: 485,161
- Korean Patent: 150,411
- Other U.S. and Foreign Patents Pending

Table 3. Example Batch Spray Recipe

Step	Process	RPM	Time	Description
1	Check RPM	1500	0:20	C1
2	Speed	35	0:20	C1
3	Dump	35	0:10	T2-M1-C1
4	Drain	35	0:05	C1
5	EKC265™ Clean	35	20:00	T2-M1-T2
6	Top up	35	0:10	T1-M1-T2
7	Purge M1	35	0:10	N2-M1-T2
8	Reclaim	35	0:10	T2
9	Purge	35	0:05	N2-M1/M2/M3-C1
10	Casrinse	35	0:10	T5-M1-C2
11	Drain	600	0:10	C2
12	Chrinse	1600	0:10	T5-M1-C2
13	Drain	35	0:10	C2
14	EKC854™ Rinse	35	1:00	T5-M1-T5
15	Speed	600	0:05	T5
16	Chrinse	1600	2:00	T5-M1-T5
17	Casrinse	300	0:30	T5-M1-T5
18	Top up	300	0:20	T4-M1-T5
19	Purge	300	0:05	N2-M1-C2
20	Reclaim	300	0:05	T5
21	Prerinse	300	1:00	CDI-M2-WD
22	Sling off	600	1:00	WD
23	Rinse	500	5:00	CD1-M1-WD
24	Purge	1500	0:10	N2-M1-WD
25	Dry 1	1500	1:00	N2-M3-WD
26	Dry 2	300	9:00	N2-M3-WD

Process temperature: 75 °C Total process time 43:25

Bathlife

In an open bath under extract the typical bathlife of DuPont™ PlasmaSolv® EKC265™ post-etch residue remover is 24 hours. This can be extended in a number of easily implemented ways. Within closed systems such as spray tools the recipe can readily be optimized to considerably extend bathlife. Further details on bathlife optimization are available from your DuPont EKC Technology representative.

Quality

EKC265™ is manufactured to the highest standards in accordance with ISO9001:2008. High purity raw materials and state of the art process controls ensure low ppb metal levels and particulate specifications.

Material Compatibility

EKC265™ is compatible with the following materials at up to 75°C: 304 and 316 stainless steel, PTFE, Encapsulated Viton, FEP, PTFE, PFA, Quartz.

EKC265™ is compatible with the following materials at ambient temperatures: HDPE, PVDF, PP, LDPE.

Safety, Handling And Disposal

Please contact DuPont EKC Technology to request a material safety data sheet for comprehensive information on the safe use and handling of EKC265™. This product should be disposed of in accordance with federal, state and local regulations.

DuPont EKC Technology

DuPont EKC Technology is the leading manufacturer of patented, specialty chemicals used in the manufacturing of wafers for the semiconductor and related industries. EKC supplies a complete line of chemistries used in the Back End of Line (BEOL) for advanced interconnect applications.



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For more information on DuPont™ PlasmaSolv® EKC265™ or other DuPont products, please visit our website.

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CAUTION: Do not use in medical applications involving permanent implantation in the human body. For other medical applications, see "DuPont Medical Caution Statement," H-50102-5 and "DuPont Policy Regarding Medical Applications" H-50103-5.

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