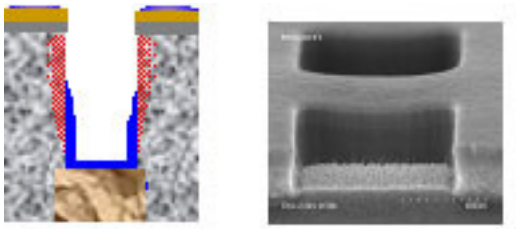
DuPont™ CuSolve™ EKC™575

TECHNICAL APPLICATION NOTE

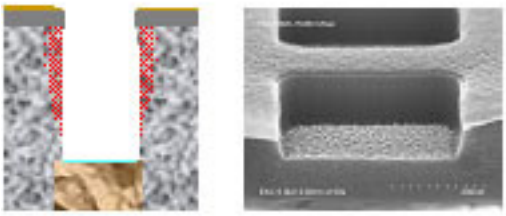
SELECTIVE POST ETCH RESIDUE REMOVER WITH TiN METAL HARD MASK PULLBACK FOR COPPER METAL HARD MASK INTEGRATION SCHEMES

Qualified and Proven Solutions for Cu Cleaning

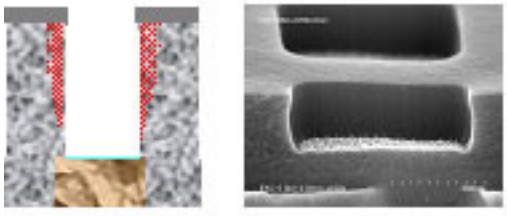
Illustrations of TiN Removal and Cleaning Performance



Pre-Clean



Post Clean EKC™575–TiN Pull Back



Post Clean EKC™575–TiN Removed

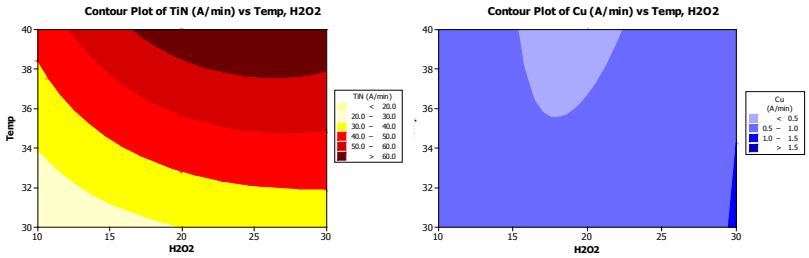
Introduction

DuPont™ EKC™575 post etch residue remover is an aqueous cleaning solution designed specifically to address TiN metal hard mask pull-back *in situ* during cleaning. The product is provided as a concentrate which is activated by the addition of hydrogen peroxide at point of use. Peroxide concentration, process temperature, and process time enable a controlled, selective and tunable removal of TiN metal hard mask *in situ* during the clean process. The product is qualified for 28nm Cu Dual-Damascene application.

Cleaning Performance

- Complete removal of etch polymer residues
- Complete removal of $Ti_{(x)}F_{(y)}$ residues and Cu oxides
- Compatible with low-k (such as SiOC, k=2.5) and Cu

TiN and Cu Etch Rate vs. H_2O_2 and Temperature



- TiN etch rate increases with H_2O_2 concentration and process temperature
- Cu etch rate increases with H_2O_2 concentration
- The TiN etch rate can be tuned by varying H_2O_2 concentration and process temperatures according to customer requirements

Etch Rates for Various Materials

EKC™575 + 20% H_2O_2 (30%) at 30°C			
Cu (Å/min)	TiN (Å/min)	TEOS (Å/min	BD2 (Å/min)
< 2	30 ± 2	0.5 ± 0.3	0.5 ± 0.3

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Single Wafer Process Recommendation

- Mix EKC™575 with 30% hydrogen peroxide (4:1) prior to use (e.g., 7.5L of 30% peroxide added to 30L of EKC™575 for a 40L tank)
- Mix by recirculation through the tool for 20-30min
- Set process temperature to 25 to 45°C (optimum 30°C)
- Process time – 120s (range is 60 to 150s)
- Flow rate – 1-2L/min
- TiN: Cu selectivity is governed by pH, peroxide concentration and temperature
- Process time can be readily adjusted to control the level of TiN removal – partial recess
- 30% hydrogen peroxide semiconductor grade is recommended

Material Compatibility

EKC™575 (activated with peroxide) and EKC™575 have been tested at 30 °C and are compatible with PFA, PP, HDPE, PVC, PTFE, PVDF, Kalrez O-ring, and SS316.

Physical and Chemical Properties

Parameter	EKC™575 No Peroxide		EKC™575 with Peroxide
pH	9.6–10		8.8–9.2
Flash Point (°C)	NA		NA
Surface Tension (dynes/cm, 24°C)	65.1		NA
Freezing Point (°C)	-11.5		NA
Density (g/mL)	1.0014 (20°C)	0.9982 (30°C)	NA
Absolute Viscosity (cp)	1.10 (20°C)	0.87 (30°C)	NA
Kinematic Viscosity (cSt)	1.09 (20°C)	0.88 (30°C)	NA

Bathlife and Shelf life

- Typical bathlife is 12 hrs when peroxide is added
- Shelf life is one year from date of manufacture

Safety

EKC™575 is a clear liquid with no odor and is non corrosive. Exposure to the eyes causes irritation, and exposure to the skin and respiratory tract may cause irritation. For further information please refer to the MSDS.

For more information on DuPont EKC Technology products, please contact your local representative, or visit our website:

Americas
DuPont Electronic Technologies
EKC Technology, Inc.
2520 Barrington Court
Hayward, CA 94545
Tel: 510 784 9105

Japan
EKC Technology, K.K.
KSP R&D D3 42
3-2-1 Sakado, Takatsu-ku, Kawasaki
Kanagawa, 213-0012 Japan
Tel: 81 44 850 8215

Taiwan
EKC Technology
No. 2, LiHsing 4th Road
Science-Based Industrial Park
Hsinchu, Taiwan R.O.C.
Tel: 866 357 90550
Fax: 866 357 98857

European Sales & Support
EU Technical Support: 44 (0) 16 98 26 69 46
EU Sales Support: 44 (0) 15 55 72 80 84
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