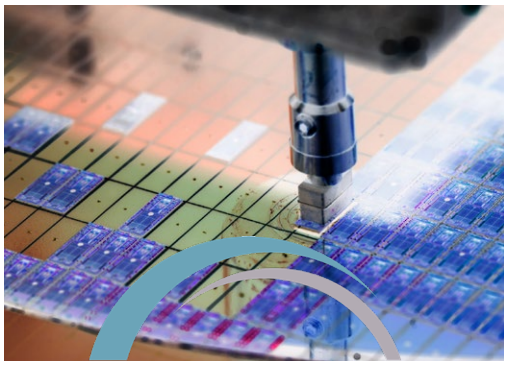
E-GRADE® THEMAH

HUNTSMAN
Enriching lives through innovation

Huntsman has developed a family of quaternary ammonium hydroxides, such as **E-GRADE® THEMAH**, that offer comparable performance and safer handling than TMAH, while providing customers alternatives for their formulations. **Huntsman** offers a broad portfolio of amine chemistries expanding the options for each application including formulated cleaning, stripping and developing, and wet etch.



E-GRADE® AMINES

PRODUCT OVERVIEW

E-GRADE® THEMAH is a clear aqueous solution of tris(hydroxyethyl) methylammonium hydroxide with a high pH and a mild odor. The product is primarily used in cleaning formulations in the semiconductor, display, and PCB industries. **E-GRADE® THEMAH** is an effective cleaning agent in post CMP cleans and can be used to add alkalinity to CMP slurries.

The product is an effective replacement for TMAH and is available in higher concentrations than TMAH in both water and organic solvents (R&D). The combination of low corrosion rates, surfactancy, and lower toxicity make **E-GRADE® THEMAH** an effective, safer to handle alternative to TMAH in next generation semiconductor cleans.

BENEFITS

- **Organic base**
- **High purity, low trace metal**
- **TMAH replacement**
- **Available at 45 wt%**
- **Water or solvent based**
- **Low metal corrosion**
- **CMP slurries and pCMP cleans**
- **PERR**

PRODUCT GRADES

Grades	SEMI Standard	Typical PPB
E-GRADE®	VLSI	<20
E-GRADE® ULM	Grade 2	<10
E-GRADE® SLM	Grade 3	<2

TYPICAL PROPERTIES

	TMAH	THEMAH	XHE-137
Molecular Weight	91	181	181
Active (~wt%)	25	49	45
Water (~wt%)	75	36	<5
Solvent	n/a	n/a	PG
Contact Angles on Cu (10 wt%)	n/a	82	R&D
pK_b	0**	2.53	R&D
VOC (ppm)	9.4***	840	R&D
Corrosion Rates* 1.0 wt% QAH @ 30°C (nm/min)			
Al	22.97	14.32	R&D
Cu	0.73	0.62	R&D
W	0.67	0.18	R&D
TiN	<0.01	<0.01	R&D
SiO_2	<0.01	<0.01	R&D

* *Thickness measured with Napson Cresbox 4 point-probe tester and Filmetrics.*

** *Literature data*

*** *Measured at 2.38% of TMAH*

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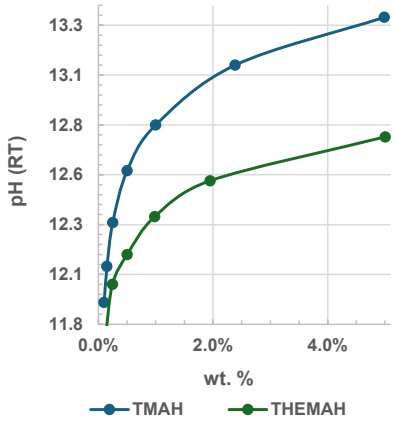
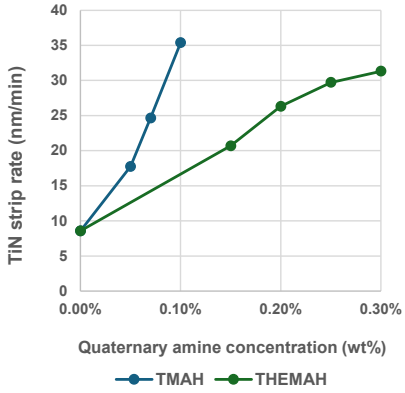
pH—Concentration Dependence

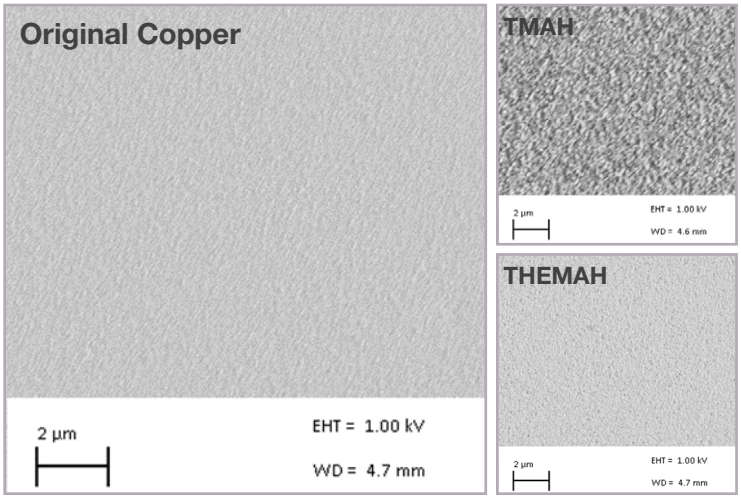


Alkalinity: TMAH > Choline > THEMAH

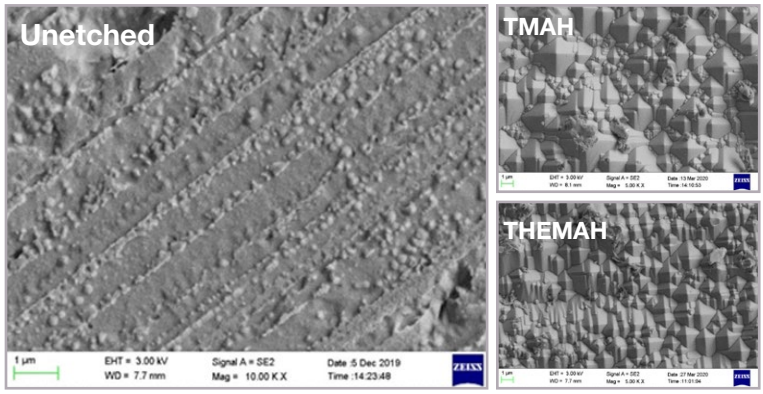
TiN Etch with Hydrogen Peroxide



At appropriate pH and concentration, **E-GRADE® THEMAH** with H_2O_2 can be used for titanium nitride (TiN) strip (etch rate >20 nm/min), which offers wider and more controllable strip rate window comparing to TMAH.



Cu wafer treated with **E-GRADE® THEMAH** demonstrated smoother surface compared to Cu treated with TMAH. (pH 12.8, 30°C for 30 min)



Silicon wafers, treated with **E-GRADE® THEMAH**, demonstrate significant reductions in reflectivity and improvement in uniformity when compared to wafers treated with TMAH. This texturization reduces light reflection and improves absorption for photovoltaic devices.

For more information, contact your local Huntsman representative. www.huntsman.com / AdTech@huntsman.com

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