

MacDermid Enthone ViaForm® Copper Damascene Chemistries

Advanced copper plating chemistries

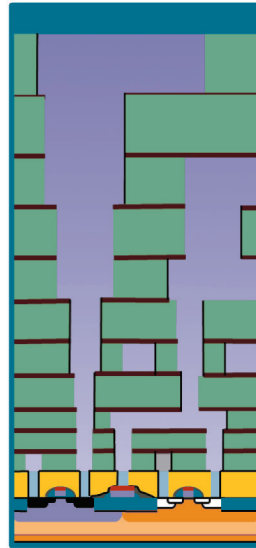
MacDermid Enthone ViaForm® copper damascene chemistries deliver superior filling performance for wafer fabrication. Each chemistry is specially designed for manufacturing advanced copper interconnects and provides a high degree of process control that enables a more robust interconnect fill capability and ensures greater device yield and reliability.

The key characteristics include fast and void-free fills with broad operating window, excellent overburden control and across wafer uniformity, and customized impurities to meet reliability needs for specific applications.

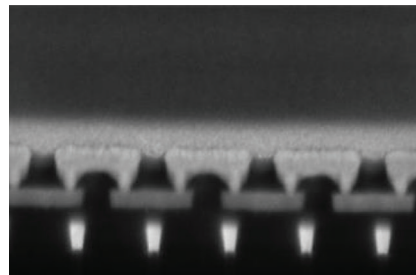
ViaForm chemistry is produced in MacDermid Enthone's high-volume manufacturing (HVM) facility and advanced research facilities based in West Haven, Connecticut, USA. The HVM features computer integrated manufacturing including fully automated, enclosed chemical distribution and dedicated processing streams. The facility ensures stringent batch-to-batch control and consistency, readily meeting the demanding manufacturing requirements worldwide.

As the products are developed and manufactured by MacDermid Enthone, Entegris provides key technical field support during qualification and HVM at customers' sites. ViaForm chemistry is exclusively marketed and distributed worldwide by Entegris, Inc., Billerica, Massachusetts, USA.

ViaForm represents both Entegris and MacDermid Enthone's commitment to continually develop and distribute state-of-the-art electroplating products to meet the developing need



Typical BEOL copper damascene structure



Example of filled via chains

for production of advanced copper interconnects. Used by the world's major semiconductor manufacturers, ViaForm chemistry provides superior filling performance in high-volume facilities, with a reduction in product defects and proven integration into chemical mechanical planarization (CMP) processes.

ViaForm Copper Damascene Products

Entegris is the leading supplier for copper damascene plating chemistries with competitive IP positions. ViaForm offers a clear advantage in that it meets the demands of shrinking device geometries while giving chip manufacturers the flexibility to apply this chemistry to their existing processes and tool systems. This is especially important in the manufacturing of memory and logic devices. New generation process technology provides a high degree of process control, enables a more robust interconnect fill capability and ensures greater device reliability.

Selection of additive suites including accelerator, suppressor and leveler, is the key to achieve the best performance. Impact of electrolyte is also becoming very important for future nodes. Basic functions of each component in the bath are shown in Figure 1. In order to meet the industry needs, MacDermid

Enthone through collaboration with OEM partners has developed several chemistry suites (as shown in roadmap and Table 1 below, not all products included). Entegris/MacDermid Enthone work closely with customers on chemistry selection and process qualifications.

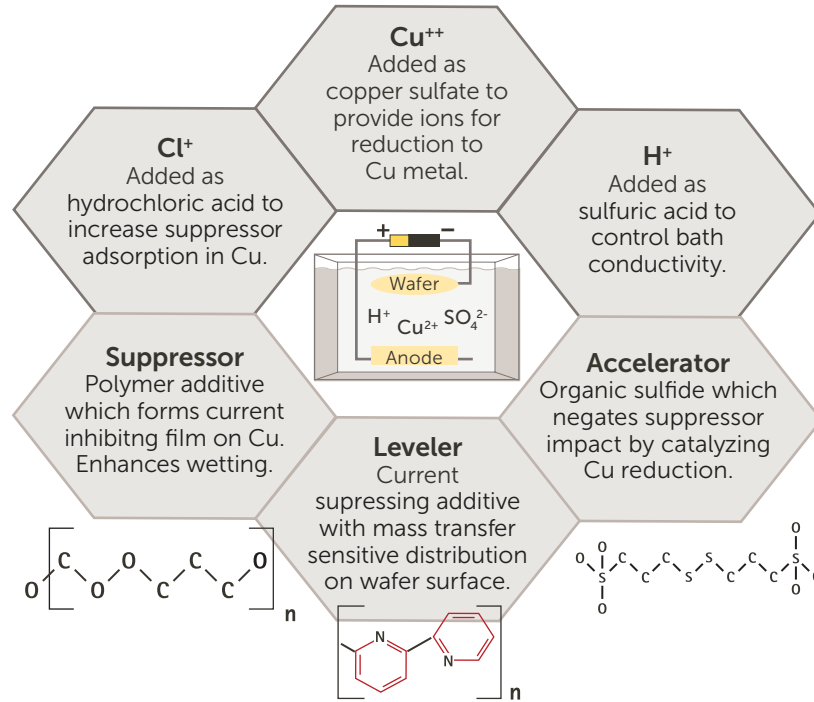


Figure 1.

ViaForm Cu Plating Products

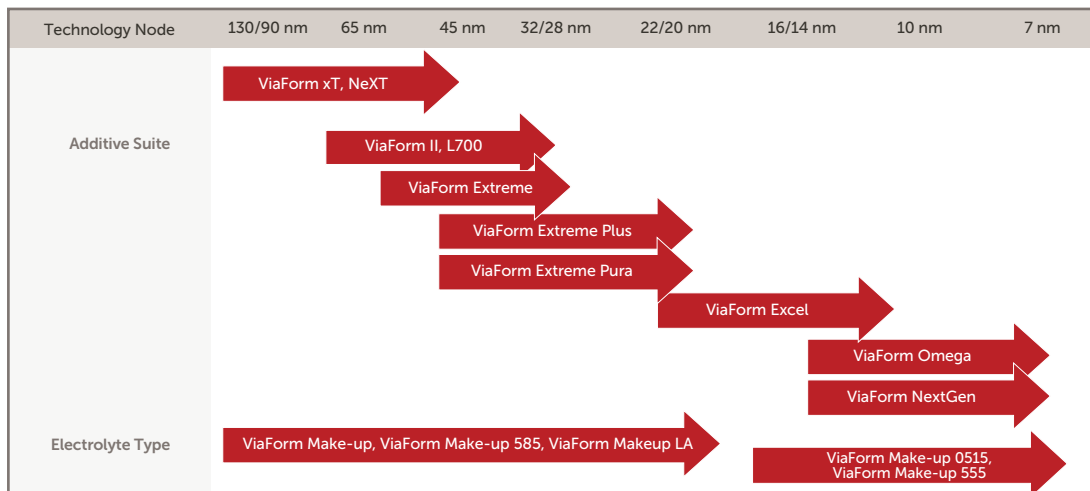


Table 1. Sample of ViaForm Extreme Chemistry Suite

PCN	Product	Type	Function
208894	ViaForm Make-Up LA	Electrolyte (VMS)	Base makeup solution
253129	ViaForm Extreme Accelerator	Additives	Bottom up void free fill and overburden control as well as metallurgy to ensure defect, yield and reliability needs
416486	ViaForm Extreme Plus Suppressor		
253120	ViaForm Extreme Leveler		
412577	ViaForm Extreme Accelerator STD	Standards	Online metrology
416444	ViaForm Extreme Plus Suppressor STD		
416906	ViaForm Extreme Plus 923 Target STD		

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Corporate Headquarters
129 Concord Road
Billerica, MA 01821
USA

Customer Service
Tel +1 952 556 4181
Fax +1 952 556 8022
Toll Free 800 394 4083

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