

Post Etch/Ash Cleaning of Dual Damascene Structures: Single Wafer Megasonics with STG Dry

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Objectives

In Cu dual damascene process integration, a wet clean after ashing has been commonly used to remove the etch/ash residue remaining in vias and trenches. Both particle and sputtered Cu contamination have significant yield impact on advanced devices.

Single wafer cleaners have process uniformity and cross contamination advantages, but have the challenge of matching the throughput of batch systems. The combination of megasonics and a surface tension gradient dry improve the process efficiency by: (1) enhanced particle removal from recessed areas, (2) decreased boundary layer and therefore better mass transport and (3) removal of rinse solution without drying residue.

Approaches

Wafers with vias and trenches were cleaned on the single wafer megasonic cleaner (Goldfinger) with different recipes and chemistries. The wafer is rotated while cleaning solution is dispensed onto the wafer surface. Megasonic energy is transferred from a transducer assembly to an attached quartz rod and through a liquid meniscus between the rod and wafer surface. Then, a rinse with megasonics is followed by an STG dry to remove the chemical residue and particles from the vias and trenches.

Results and Discussions

Dual damascene wafers with sub 0.2um vias were cleaned. Cross section SEM of the vias before and after cleaning shows residue removal from the via bottom (fig 1). Good electrical measurement results confirmed the efficient cleaning results seen by SEM.

Something about potential damage to structures and low k materials

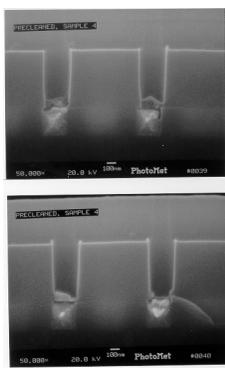


Figure 1a: pre-clean SEMs

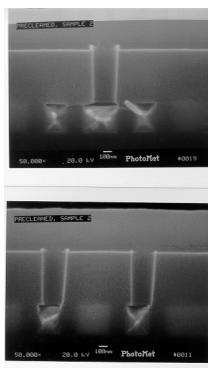


Figure 1b: post-clean SEMs