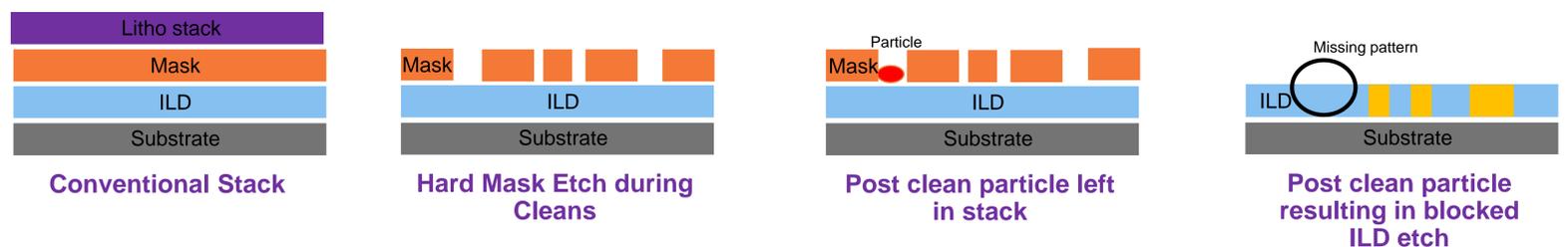


# Improved Post Etch Wet Clean Method for Defectivity Reduction in 14nm BEOL Process

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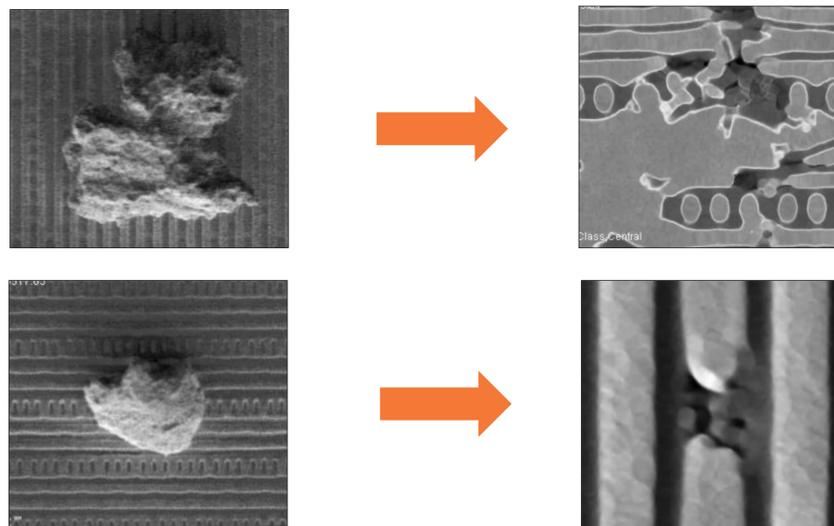
## Abstract

Wet cleaning, rinse and dry steps are important parts of the Back End of Line (BEOL) process integration in advanced semiconductor technology nodes. This ensures the removal of post etch residues from vias and trenches. The processing time, concentration, temperature, and flowrate of the chemical are critical factors influencing particle removal efficiency. In this study, process time for DHF clean was optimized to evaluate the effects to reduce the defect density ( $D_0$ ). By tuning the parameter,  $D_0$  reduction was achieved by 23% when compared to POR improving single and multiple line open defects resulting in significant device yield improvement.



Particle free stack is necessary for high quality patterning, therefore particle removal efficiency is important. Particles left in the stack can cause blocked etch which lead to missing metal pattern

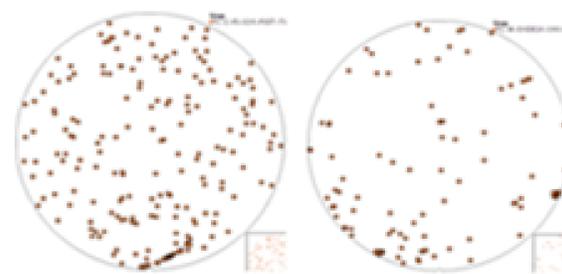
Post clean residue particles can result in various patterning issues depending on their shape, size, location and properties



Post etch residue not cleaned

Post CMP Final Pattern

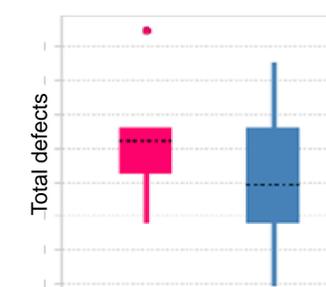
## Particle Removal Comparison



POR

Rcp 1

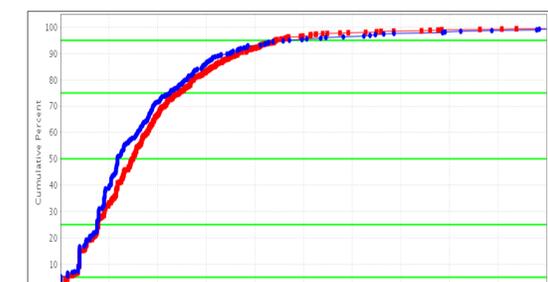
## Total Defects



POR

Rcp 1

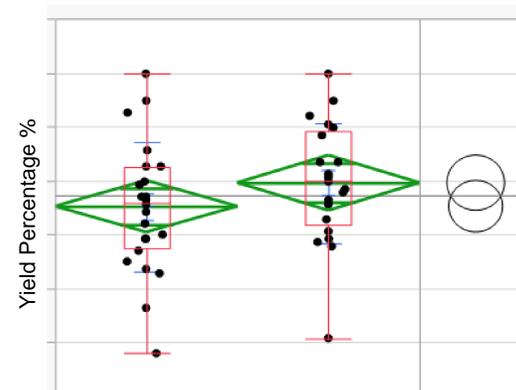
## D0 Cumulative Percentage



POR

Rcp 1

## Yield Percentage



POR

Rcp 1

## Summary

- BEOL cleaning process helps to improve metal patterning and enhance device properties.
- Particle removal efficiency was improved by tuning the process time for DHF clean.
- ~23%  $D_0$  reduction observed with the new CIP recipe resulting in yield improvement.

## Acknowledgements

14 nm BEOL Process Integration team and, 14 nm BEOL CFM team