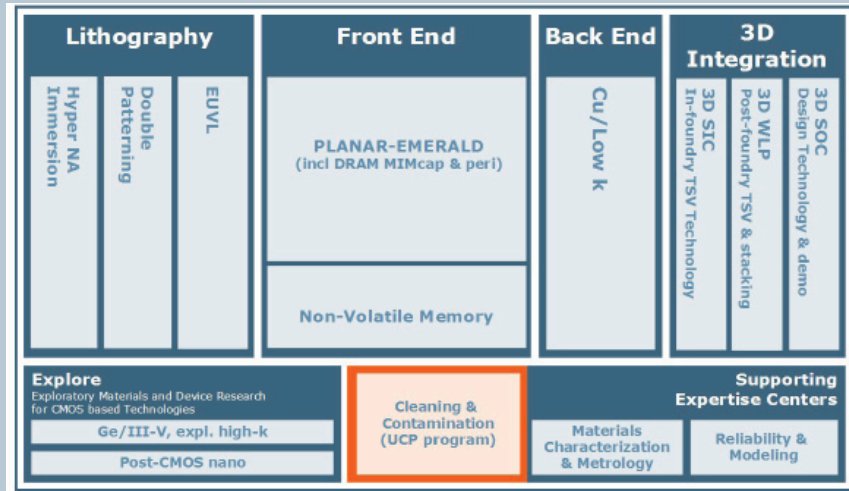


# Cleaning & Contamination (UCP)

## Positioning

This IIAP is part of IMEC's R&D platform towards sub-32nm CMOS:



## Scope

When looking at research in cleaning for semiconductor manufacturing, two important trends can be observed:

- Selectivity towards substrate materials has become very important for several applications. Due to scaling, the amount of (chemical or physical) modification of the substrate material that can be allowed has become very small. Examples are roughening of the surface, loss of dopants in ultra-shallow junctions, low-k degradation. Also, selectivity has become a bigger challenge as more different materials are exposed during the clean. In order to meet the selectivity requirements, there is an increased interest in the use of non-aqueous solvents, and in the use of mixed dry/wet cleans.
- The removal of contamination has become more challenging due to the scaling and the consequent reduction of the critical size of the contaminants. In combination with the high selectivity requirements mentioned above, the use of physical forces in cleaning is becoming more attractive for selective removal of contaminants. The major limitation to the use of physical forces in cleaning is the occurrence of damage to device structures. This might be termed selectivity towards sensitive device structures.



For many of the aspects mentioned above, significant background knowledge and experience exists within IMEC. This knowledge is used to support the activities of the UCP program. At the same time, trends and future needs in cleaning should be identified to keep ahead of challenges. A number of relevant target applications has been chosen in order to guide this long-term research. The main objectives of the UCP program have been defined as follows:

- development of knowledge for removal of ion-implanted photoresist from semiconductor substrates (FEOL cleans);
- development of knowledge for post-etch cleans of low-k material (BEOL cleans);
- development of knowledge for enhancing cleaning performance by physical forces (physical cleans);
- support of other programs by implementation of new cleaning processes based on existing knowledge (transfer & support).

## Structure & Activities

The following topics are currently investigated within the UCP program:

### BEOL cleans:

- wet (aqueous/non-aqueous) and dry (plasma) treatments for photoresist modification or dissolution;
- post-etch polymer removal;
- low-k compatibility.

### FEOL cleans:

- characterization of crusted photoresist;
- substrate loss (Si, SiGe, Ge);
- wet (aqueous/non-aqueous) and dry (plasma) treatments for photoresist modification or dissolution.

### Physical cleans:

- megasonic agitation;
- high-velocity aerosol;
- cryogenic aerosol;
- damage generation;
- particle-substrate interactions;
- drying phenomena.

### Transfer & support:

- activities driven by other programs.

## Partners

1. IC manufacturers;
2. equipment suppliers (cleaning tools, metrology);
3. material suppliers (chemicals).



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