

Intel Interests for ESH Work in Universities

SRC/SEMATECH Workshop on
Emerging Research Topics

February 9, 2011

Overarching Elements

- Industry and Academia continuing to work ahead of the issues to demonstrate effective stewardship
 - Building on long history of success in this regard
- Focus on minimizing ESH impact of IC manufacturing technology and products
 - More energy efficient
 - More environmentally friendly
 - More efficient consumption of materials
 - Less waste

Good Examples

- Past work on new materials/processes and/or fundamental understanding and characterization
 - CMP, Low k, ALD processes
 - Surface treatment, wafer cleaning
 - Water reduction, waste handling
 - Nanomaterials
- Renewed focus on PFC alternatives
- Some opportunities:
 - Single wafer cleans and associated water consumption
 - Segregation of unlike chemistries that are in the same drain or tool (specifically, single wafer wet etch/cleans)
 - Energy reduction for high vacuum tools – i.e. thin films, etch, implant

Proposal for New Research in the CEBSM

Investigation of PFC Replacement Gases for Plasma Etch Processing of Semiconductor Materials

As part of the semiconductor industry's voluntary efforts to reduce high global warming potential (GWP) greenhouse gas emissions, investigation into potential alternatives to high GWP gases, such as CF₄, SF₆, CHF₃, is needed.

Perfluorocarbon (PFC) gases are commonly used in plasma etch processing of a wide range of materials in the FEOL and BEOL: oxides, nitrides, silicon and inter-level dielectric (ILD) materials.

With the number of layers requiring plasma processing continuing to increase with each new technology generation, replacement of a high GWP gas with one lower on the GWP scale can quickly lead to improvements in emissions and reduce the need for expensive PFC abatement systems.

PFC replacement gases would have to meet all of the current patterning requirements of plasma etch processing (etch rate, profile, selectivity, post-etch polymer production) in the area of insertion as well as provide a significantly lower GWP footprint.

Proposed Milestones (timing TBD):

- Identify high impact gases and plasma etch applications
- Work with industrial liaison to develop, analyze and electrically test performance of alternative gas processes.
- Develop and utilize modeling tools to predict additional PFC replacement strategies