# Airborne Molecular Contamination (AMC) Control in Wafer Fabrication



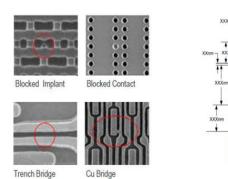
#### **Airborne Molecular Contamination**

Measuring and controlling chemical contaminants to the parts-per-trillion level is essential to state-of-the-art semiconductor manufacturing. Many product defects and reduced product yields are a direct result of chemical contaminants on wafers and processing equipment during the manufacturing process.

These chemicals contaminants must be thoroughly removed from wafers and equipment after each step or they can become airborne contaminants in later steps.

#### AMC causes:

- Corrosion of metal features on the wafer
- Filter degradation, in some cases associated with particle shedding
- Haze on wafers and tool optics
- T-topping on developed resist profiles
- Changes in contact electrical properties



**Figure 1.** Contamination by accumulated PPT levels of inorganic gases can cause significant defects. The figure shows several types of failure modes and an example of a contaminant flocculated within a photoresist layer.

#### Picarro SI Analyzers for Common AMCs

Picarro SI series analyzers are designed for semiconductor industry AMC applications. They provide fast and accurate analysis of common semiconductor AMCs:

- SI2205 for Hydrogen Fluoride (HF)
- SI2103 for Ammonia (NH<sub>3</sub>)
- SI2108 for Hydrogen Chloride (HCI)
- SI2306 for HF and NH<sub>3</sub>

These gases are used extensively in wafer fabrication and are potentially a major cause of AMC.

## SI Series Trace Gas Monitoring Innovations

SI analyzers have been redesigned for speed, accuracy and reliability. Improvements include:

- HF, HCl and NH<sub>3</sub> detection in parts-per-trillion
- A modified flow path with more reliable pumps
- Precise internal temperature stability to milli-Kelvin levels
- Simultaneous measurement of, and compensation for, moisture content

#### High Throughput and Quick Response Time

SI series analyzers are designed for high throughput and quick response time. Improved design increases the speed of response up to 10 times! Design innovations include a:

- 35cc cavity
- SilcoNert coating on cavity, valves and tubing
- Two liter per minute flow rate

#### **Drastically Reduced Maintenance**

Reduced maintenance interval from monthly to annual:

- Particulate air filter management. A two-filter system with easy access makes filter swapping fast and easy
- 4 hours of annual maintenance with no consumables (filters only)
- No field calibration (annual verification only)
- Compliant with SEMI industry standards
- PPT levels of inorganics, amines and select organics
- 24/7/365 expert support & emergency exchange modules

### **Applications**

These are some of the many applications where Picarro SI analyzers can improve manufacturing process and quality.

- OEM FOUP cleaning systems
- CVD chamber contaminant control

- OEM Mask/reticle printing and inspection equipment
- Real-time airborne molecular contamination and event confirmation
- Effluent emissions and telemetry data reporting

# **New Linux Operating System**

Picarro analyzer's new Linux operating system provides:

- A more consistent programming interface
- More accurate and consistent monitoring due to less downtime
- More security from malware and viruses
- Lower costs (no licensing fees)
- Controlled updates.
- Greater product longevity