

# AIRBORNE MOLECULAR CONTAMINATION (AMC) AND CLEANROOM MATERIALS ANALYSIS

High precision manufacturing of semiconductors, photovoltaics and OLEDs require an ultraclean environment. Microcontaminants in cleanroom air such as process spills, operators, cleanroom consumables and construction materials are often identified as root cause of elevated AMC and when left undetected, they could adversely affect critical surfaces which lead to poor device and semiconductor tool performance.

AMC is classified based on SEMI standard F21-1016, distinguishing molecular acids, bases, condensable organics, dopants and metals, that can modify the electrical properties of semiconductor materials. Contamination level requirements for the industry are suggested by the ITRS and IRDS roadmaps, however, as technology node varies from Fab to Fab, it is crucial for individual Fab to establish process tolerance or control limits and monitor AMC.

A comprehensive AMC testing portfolio is available to support qualification and monitoring of cleanroom construction materials, cleanroom consumables, cleanroom environments, environment inside inspection tools, gas distribution system, requalification of cleanroom environment after disaster recovery cleanup.

**TABLE 1: DIRECT AND INDIRECT AMC ANALYSIS OFFERED BY CHEMTRACE®**

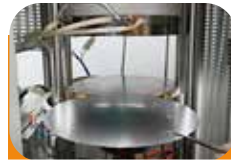
	<i>Collection Methods</i>	<i>Analysis Techniques</i>	<i>Contaminants</i>	<i>Sample Types</i>
<i>Direct AMC Testing</i>	· Direct sample collection using impinger method	· Collected impurities from air sampling are analyzed by Ion Chromatography	· Anions/cations · Organic acids	· Cleanroom air, tool chamber and compressed gases
	· Direct sample collection using impinger method	· Collected impurities from air sampling are analyzed by ICP-MS	· Trace metals · Dopants (B, P, As)	· Cleanroom air, tool chamber and compressed gases
	· Direct sample collection using Tenax tubes	· VOCs captured into Tenax tube are analyzed by ATD GC-MS	· Volatile organics	· Cleanroom air, tool chamber and compressed gases
<i>Indirect AMC Testing</i>	· Witness wafers/ substrates	· Wafer/substrate desorption followed by ATD GC-MS	· Volatile organics (VOC)	· Cleanroom air and tool environment · Witness wafers/coupons
	· Witness wafers/ substrates	· VPD ICP-MS or Controlled Liquid Phase Extraction™ ICP-MS	· Trace metals	· Witness wafers/ substrates



**CHEMTRACE  
MR3000 AIR  
AND  
COMPRESSED  
INERT GAS  
SAMPLER**



**VOLATILE  
ORGANICS  
AIR AND  
COMPRESSED  
INERT GAS  
SAMPLER**



**WAFER/  
COUPON  
DESORBER**



**AUTOMATIC  
THERMAL  
DESORBER**

**TABLE 2: CHEMTRACE® ANALYTICAL SERVICES AND SUPPORT GUIDELINE FOR AMC**

<i>AMC &amp; Cleanroom Testing Guideline</i>	<i>ChemTrace® Analytical Services and Support</i>
Cleanroom Pre-construction	<ul style="list-style-type: none"> <li>· Construction Material Screening and Selection               <ul style="list-style-type: none"> <li>· Paints, walls, floor tiles, HEPA/ULPA filters, curtains, gel sealants, potting compounds, air handling systems, etc.</li> </ul> </li> <li>· Supplier Qualification               <ul style="list-style-type: none"> <li>· Vendor comparison and selection</li> </ul> </li> </ul>
Cleanroom Post-construction	<ul style="list-style-type: none"> <li>· Cleanroom Certification, Qualification and Monitoring               <ul style="list-style-type: none"> <li>· Cleanroom environment</li> </ul> </li> <li>· Cleanroom Consumables and Supplier Qualifications and Monitoring               <ul style="list-style-type: none"> <li>· Packaging materials, bags, wipes, gloves, etc.</li> </ul> </li> <li>· Tool Environment Baseline and Qualification               <ul style="list-style-type: none"> <li>· Litho and inspection tools</li> </ul> </li> <li>· Gas Distribution System Qualification and Monitoring               <ul style="list-style-type: none"> <li>· Compressed dry air (CDA), compressed inert gas lines</li> </ul> </li> </ul>
Disaster Recovery	<ul style="list-style-type: none"> <li>· Re-qualification of cleanroom environments</li> </ul>