

# IEST Working Group and Recommended Practice Support from Balazs Analytical Services



## Introduction to Standards Developing Organizations

Many industries look to external technical societies or standards developing organizations, such as the Institute of Environmental Sciences and Technology (IEST), in order to optimize their operations, drive technological growth, and ensure continued improvement for an entire industry segment. Groups like the IEST manage the technical Working Groups that generate the peer-created and peer-approved standards and solicit input from industry experts on an ongoing basis.

Balazs actively participates in many standards-developing organizations including IEST, SEMI (for semiconductor and photovoltaics), IDEMA (for disk drives), ASTM (Electronics, air, water, chemicals, materials tests) and ITRS (International Technology Roadmap for Semiconductors). As a participating member we contribute by:

- ✓ Providing expertise regarding current analytical capabilities
- ✓ Identifying gaps in current techniques and methods compared to proposed standards and leading edge technology requirements
- ✓ Suggesting new methods and techniques to eliminate roadblocks from advancing standards & technologies

## Specific to the IEST

As stated on the IEST website, <http://www.iest.org>: "The Institute of Environmental Sciences and Technology (IEST), founded in 1953, is a multidisciplinary, international society whose members are internationally recognized for their contributions to the environmental sciences in the areas of contamination control in electronics manufacturing and pharmaceutical processes; design, test, and evaluation of commercial and military equipment; and product reliability issues associated with commercial and military systems.



Balazs currently supports the analytical needs embedded within current recommended practices often exceeding the reporting limits of the standards. The remainder of this document focuses on the individual working groups (WG) and recommended practices (RP) that Balazs supports to ensure clients are complying with the standards, especially within the CC = contamination control section. In many cases, Balazs also offers specialized tests beyond those specified yet in the standards to cover leading edge issues where the consensus process has not yet developed standards or RP's

## IEST Recommended Practices Supported by Balazs

- ✓ **RP-CC-003.3:** Analysis of new and used garments. Balazs also does analysis for the laundry water, packaging, residues, end of life cuff studies, since the cuff of the garment is closest to the products. Balazs reports ionic, organic, NVR contaminants  $\text{ng/cm}^2$ , extractable particles, or per IEST 1246D. Similar tests can be applied to other disposables including hairnets, facemasks, etc.
- ✓ **RP-CC-004.3:** Analysis of new and used wipes. Balazs offers wipe tests for surface contamination for organics, inorganics, particle, contamination assessment, to assess cleaning residues, and to assess cleanup post fires, floods, spills, maintenance etc. Dirty surfaces can be wiped clean, but no wipe is perfect, so clean surfaces can be wiped dirty and this needs to be evaluated carefully; especially for high end optics.
- ✓ **RP-CC-005.3:** Gloves; new and end of use: Balazs tests for ionics, metals, organics, outgassing, and offers smudge tests and contact transfer assessment. Some gloves can have very high levels of Zn, Ca, Cl, nitrate, plasticizers etc, and this needs to be controlled for many applications. **RP-CC-006.3:** Testing cleanrooms. Many companies test for particle counts, and Balazs works with users to ID particles, document cleanliness of surfaces, AMC levels etc.
- ✓ **RP-CC-008.2:** Gas-Phase Adsorber Cell Balazs tests upstream and downstream of AMC filters to assess removal efficiency as a function of time for acids, bases, organics, SOx, metals, dopants, refractories, , and when to replace filters

- ✓ **RP-CC-012.2:** Cleanroom design, materials selection, outgassing & leach tests, AMC & SMC monitoring, materials compatibility tests.
- ✓ **RP-CC-016.2:** Non-volatile residue to sub-monolayers, and semi-volatile organic compounds to 0.001 ML (0.1 ng/cm<sup>2</sup>) using witness wafers and SEMI MF1982-1103 TD-GC-MS methods, that also meet ITRS requirements. FTIR, Raman, SEM/EDS and other methods can be used for residue ID.
- ✓ **RP-CC-025:** Swabs; new, & used to evaluate surfaces for baselining fab surfaces and cleanups, and small parts, areas, o-ring groves, etc
- ✓ **RP-CC026.2:** Cleanroom operations. Any changes in cleanroom air flows, exhausts, tools, processes, workflow can perturb parameters and lead to contamination problems. Cross contamination via people, processes and substrate movement must be assessed. Incoming materials must be cleaned, QC'd to avoid bringing contaminants into the cleanroom.
- ✓ **RP-CC027.2:** Personnel in cleanrooms. Personnel can contaminate cleanrooms with particles, vapors like silicones and ammonia, biologically active organisms. Procedures are needed to avoid cross contamination by personnel via garments, gloves, packaging, boxes, equipment, etc.
- ✓ **RP-CC28.1:** Minienvironments. Balazs uses witness wafers for Surface Molecular Acids (SMA), Surface Molecular Bases (SMB), Surface Molecular Organics/Condensables (SMOrgs), Surface Molecular Dopants (SMD), Surface Molecular Metals (SMM). Additionally, we leach boxes and minienvironments, other surfaces for acids and bases, organics, test outgassing, identify particles added to substrates and tests AMC Parameters for minienvironments, glove boxes, storage areas, stockers, etc
- ✓ **RP-CC031.2:** Balazs measures outgassing performance criteria for cleanroom materials, measured in ppmw. We can also test and report in ng/cm<sup>2</sup>/day, do proximity outgassing onto surfaces/wafers per SEMI MF1982-1103, SEMI E108. For Disk drives, we can test to IDEMA standards, including whole running disk drive. We test whole running devices for outgassing including lasers, motors, actuators, etc.

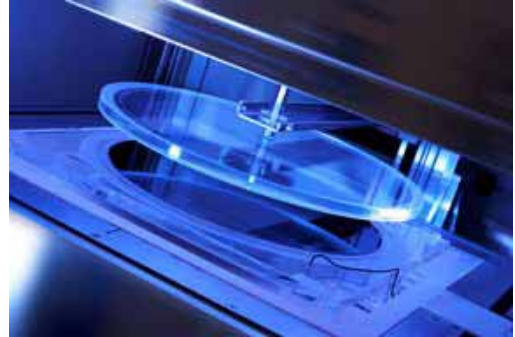


### IEST Working Group Participation

- ✓ **WG-CC032:** Packaging Materials for Cleanrooms. Balazs offers outgassing, extractables, contact transfer, compatibility, trace metals, organics, ionics testing. We can also assess parts contamination due to heat sealing bags, contact with gel based shipped or membrane boxes.
- ✓ **WG-CC035:** Design Considerations for Airborne Molecular Contamination Filtration Systems in Cleanrooms. Methods for baseline AMC analysis testing before and after filters and baseline witness wafers post filters. Comparison with ITRS, other standards. We apply similar test methods for optics, lasers, disk drives and other AMC sensitive industries
- ✓ **WG-CC040:** Cleaning of Equipment Surfaces in the Cleanroom & Controlled Environments. Balazs validates cleaning for residues using IC, GC-MS, NVR, FTIR, wipes, extracts, outgassing, ICP-MS, SEM/EDX, particle counts.
- ✓ **WG-CC041:** Recovery from Disruption to Cleanrooms and Other Controlled Environments (due to fires, floods, spills, leaks, power outage, HVAC failures) using AMC and SMC tests, witness wafers, swabs, and wipes. Reported per IEST 1246D, or ng/cm<sup>2</sup>, using IC, GC-MS, FTIR, EDX, ICP-MS, etc. Contingency planning and baselining prior to failures.



- ✓ **WG-CC042:** Liquid Particle Counters. Many companies count particles, and Balazs identifies particles by SEM/EDX, FTIR, Raman and other methods to help find particle sources for water, solvents, chemicals, extracts, gases.
- ✓ **WG-CC043:** SMC, Surface Molecular Contamination organics, ions, metals, dopants, NVR using IC, ICP-MS, GC-MS, FTIR, Raman on wafers, optics, any surface in critical environments, for SEMI, Disk, FPD, PV, Laser, optoelectronics, aerospace, medical, instrumentation, optics, coating and related industries.
- ✓ **WG-CC201:** Forum on Nanotechnologies. Due to their huge surface areas & small particle sizes, nanotechnologies can in some case be very sensitive to molecular contamination. Balazs can ID both composition, catalysts, additives and impurities in nanomaterials including particles, fibers, nanorods, films.
- ✓ **WG-CC901:** IEST-STD-CC1246D: Product Cleanliness Levels and Contamination Control Program See 1246D below.



### Additional IEST Involvement

- ✓ **STD-CC1246D:** Method for specifying product cleanliness levels & contamination control program requirements. The emphasis is on contaminants that can impact product performance. Balazs tests surface cleanliness levels & can report contamination levels per this standard for particles and molecular contaminants on surfaces in various wt/area units .
- ✓ **WG-CC902 and MIL-HDBK-406:** Contamination Control Technology: Cleaning Materials for Precision Pre-Cleaning and Use In Cleanrooms and Clean Work Stations. Balazs tests environments, cleaning solutions, baths at end of life, residues on parts or coupons, packaging issues.
- ✓ **MIL-HDBK-407:** Contamination Control Technology: Precision Cleaning Methods and Procedures. Balazs bridges contamination control from %, to ppm, to ppb and ppt levels and from bulk composition to a millionth of a monolayer from the mold or machine shop to the end users reactor or systems

In addition to the above standards, many problems encountered by high tech facilities are not covered in any standard and often requires proper design of experiments to relate contamination issues or process problems to your key electrical, optical, pharmacological, mechanical, magnetic, chemical or other important properties, or media like water, gases, vacuum systems, plasmas, interfaces. Balazs will help you ID the contaminants, control the contaminants and set specification limits for your unique processes. We are here to help!