



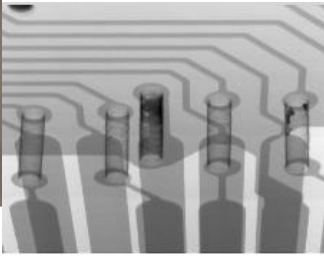
Standardized Outgassing Characterization capability: TML & CVCM determination via ASTM E595

Jayeshkumar Das Ph.D.
Director, Technology & Business Development

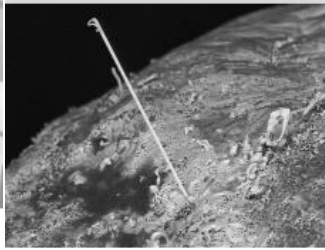
May 2, 2024



Environmental Testing



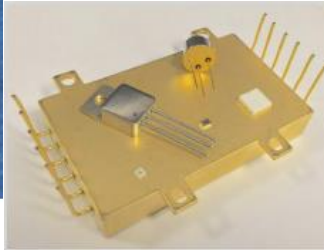
X-Ray Inspection



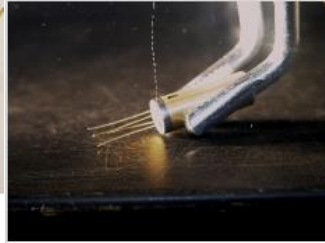
Materials Analysis



Component Analysis



Package Gas Analysis



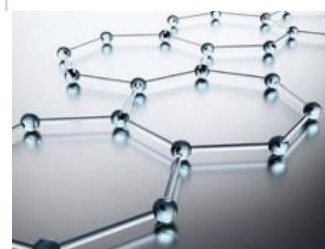
Hermeticity Testing



Mechanical Testing



Getter Sorption Testing



Organic Mass Spectrometry

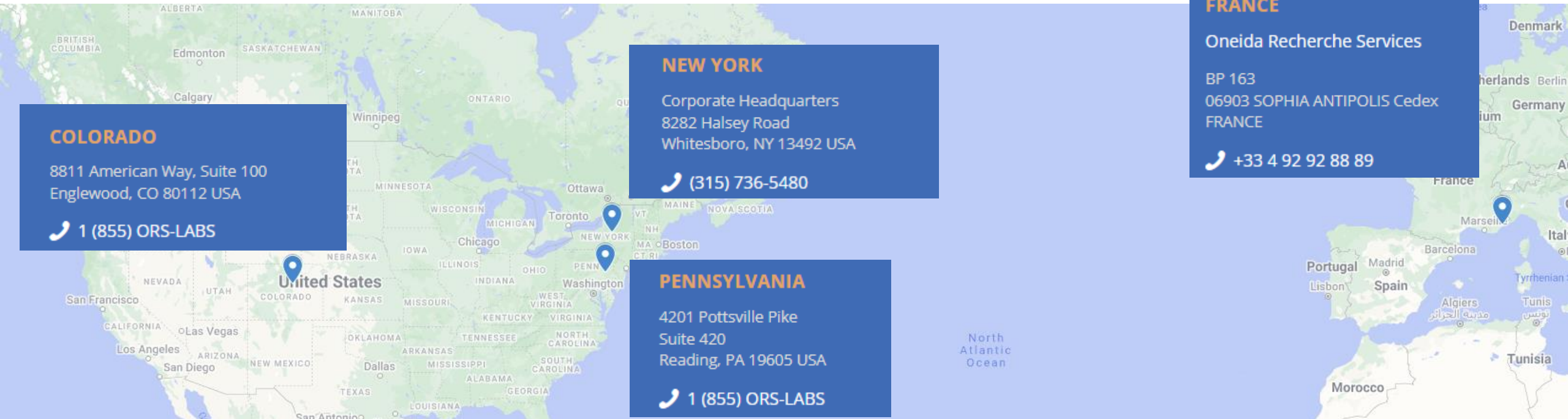
Presentation plan

- Brief introduction
 - Oneida Research Services, Inc
 - ASTM E595
- The OTS-E595 outgassing system
- OTS-E595 and other outgassing capabilities at ORS.



IVA & HSHLD Equipment

<https://orlabs.com/>



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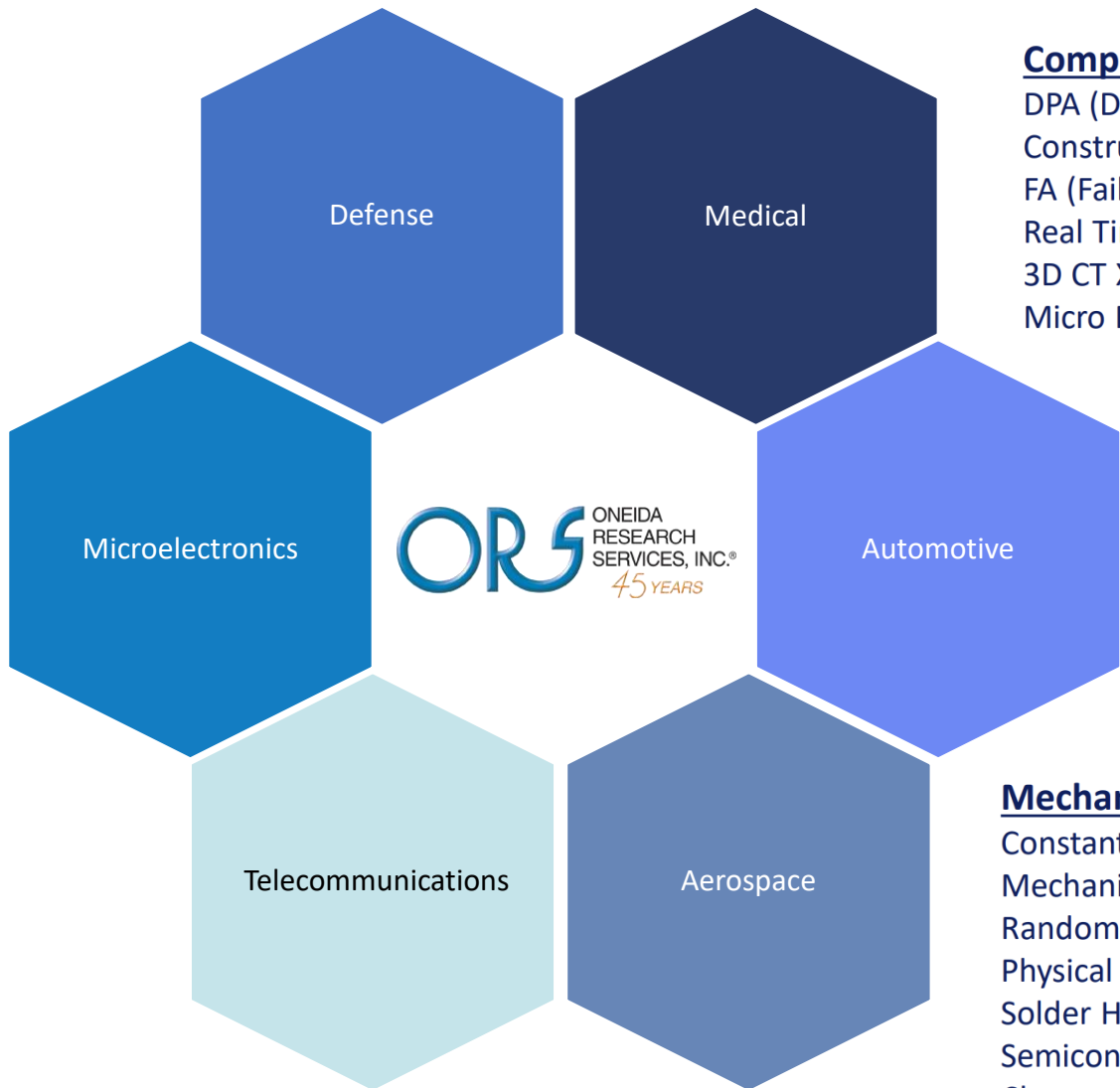
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Component Analysis

- DPA (Destructive Physical Analysis)
- Construction Analysis
- FA (Failure Analysis)
- Real Time X-Ray
- 3D CT X-ray
- Micro FT-IR Spectroscopy

Hermeticity Testing

- HSHLD® (High Sensitivity Helium Leak Detection)
- Krypton-85 Fine and Gross Leak Testing
- Helium Fine Leak Testing
- Gross Leak Testing
- Leak Site Identification

Mechanical Testing

- Constant Acceleration Testing
- Mechanical Shock Testing
- Random Vibration Testing
- Physical Dimension Testing
- Solder Heat Resistance Test (SHRT)
- Semiconductor Parametric Testing and Characterization
- Solderability Testing

Environmental Testing

- Accelerated Bias Aging
- HAST (Highly Accelerated Stress Test)
- MSL (Moisture Sensitivity Level Testing)
- Thermal Shock Testing
- Preconditioning Test
- Salt Atmosphere Testing
- Steam Aging
- Temperature Cycling Testing
- Temperature Humidity Testing
- Temperature Storage Testing
- Autoclave Testing

Package Gas Analysis (RGA/IVA Testing)

- IVA® (Internal Vapor Analysis)
- HR-IVA® (High Resolution IVA Testing)
- Gas Sampling Cylinder Analysis
- Material Outgassing Studies
- GC/MS – Organic Mass Spectrometry
- Delta-P Getter Sorption Qualification Testing

ASTM E595 TML, CVCM Outgassing (June 2024)

ORS equipment manufacturing at our NY location



IVA® (Quad-MS) & HR-IVA® (TOF-MS) model 210s internal vapor analyzer



HSHLD® model 310 High sensitivity Helium leak detector



Delta-P model 410 Getter Sorption Analyzer



Your Partner For Quality Certification

ISO 9001:2015 & AS9100D



ISO/IEC 17025:2017



DLA suitability

MIL-STD 883

MIL-STD 750

Controlled Unclassified Information (CUI)

NIST
National Institute of
Standards and Technology

SP 800-171

Please visit T10, ORS-LABS



www.orslabs.com

ANALYTICAL TESTING SERVICES

- Internal Vapor Analysis (IVA™)
- Kr85 Leak Testing
- DLA Suitable DPA Testing
- IPC-A-600 Inspection
- IPC-TM-650 Coupon Testing
- Biased Aging
- HAST
- Vibration/Shock
- Getter Sorption Testing
- ASTM E595 TML/CVCM Testing



ISO 9001 • AS9100 • ISO/IEC 17025 Certified



ASTM E595: A screening technique to determine volatile content of materials when exposed to vacuum environment



Designation: E595 – 15 (Reapproved 2021)

**Standard Test Method for
Total Mass Loss and Collected Volatile Condensable
Materials from Outgassing in a Vacuum Environment¹**

Test conditions: 125°C at less than 5×10^{-5} (Torr) for 24 h

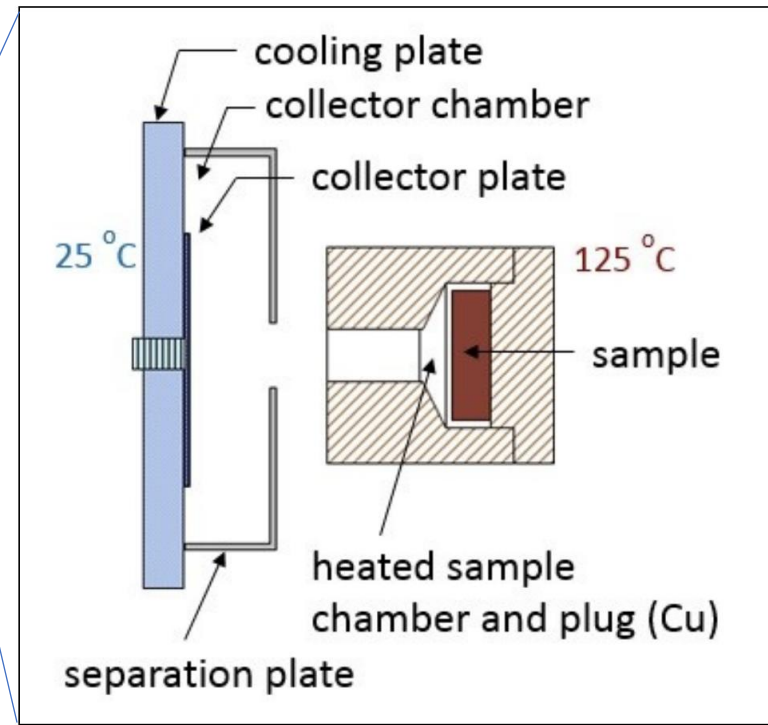
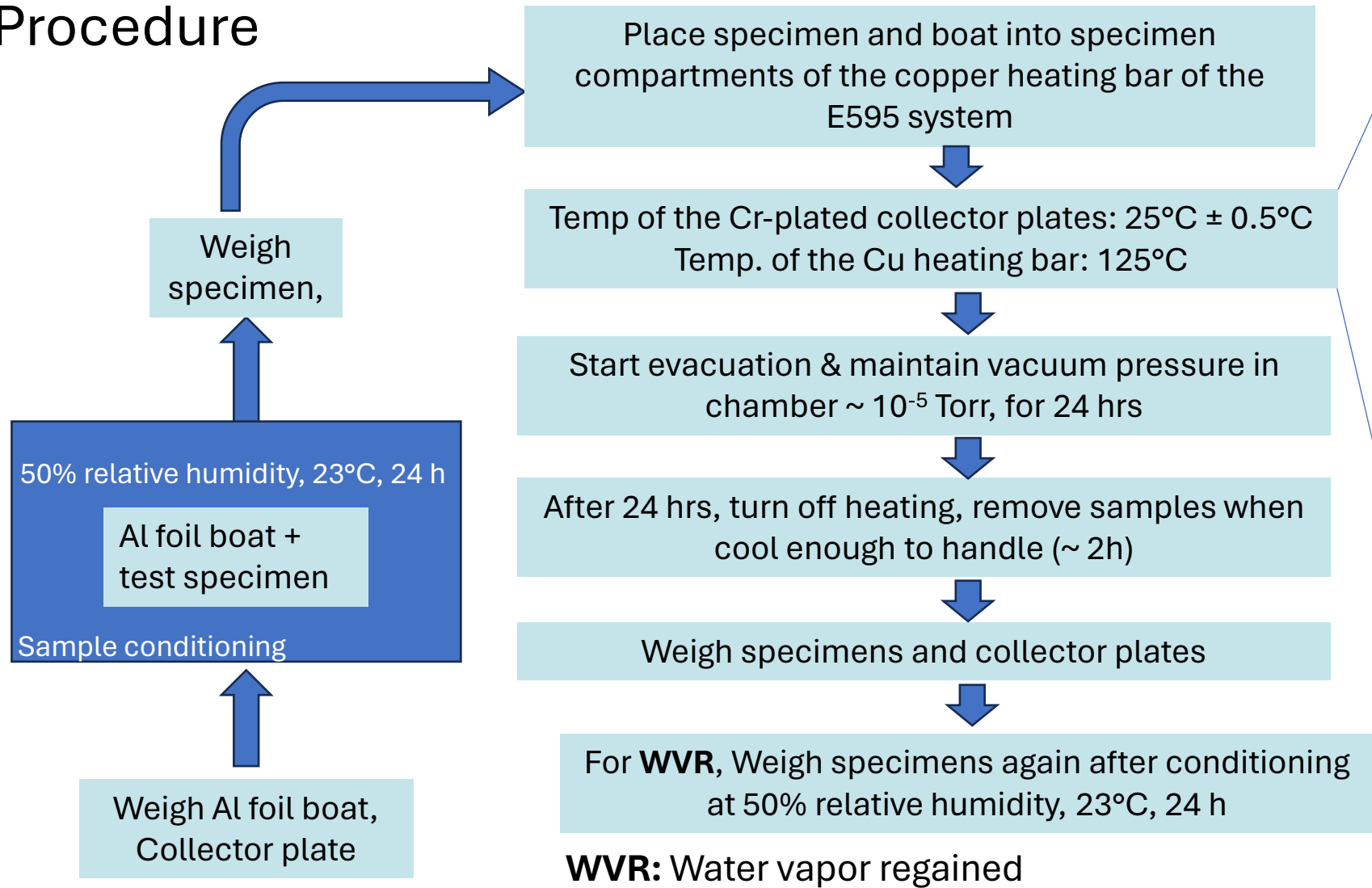
Sample: Organic, polymeric and inorganic materials

(e.g., Polymer potting compounds, foams, elastomers, films, tapes, insulations, Shrink tubing, adhesives, coatings, fabrics, tie cords and lubricants)

Determination: Total Mass Loss (TML) and Collected Volatile Condensable Materials (CVCM)

(e.g., TML of 1.00% and CVCM of 0.10% as screening levels for rejection of spacecraft materials.)

Procedure



Usually set of 3 samples
Total analysis time: ~50 h
For WVR: ~ 3 days

Sample size: 10x12x6 mm Al boat, usually 300 mg target sample

Calculation

S_I = initial specimen mass, g

S_F = final specimen mass, g

S'_F = Reconditioned mass of specimen after 24h, at 50% relative humidity & 23°C, g

C_I = initial mass of collector plate, g

C_F = Final mass of collector plate with condensables, g

Total mass loss

$$\%TML = \frac{S_I - S_F}{S_I} \times 100$$

Collected volatile condensable materials

$$\%CVCM = \frac{C_F - C_I}{S_I} \times 100$$

Water vapor regained

$$\%WVR = \frac{S'_F - S_F}{S_I} \times 100$$

Three samples should be tested, and average should be used to calculate final values

Status update

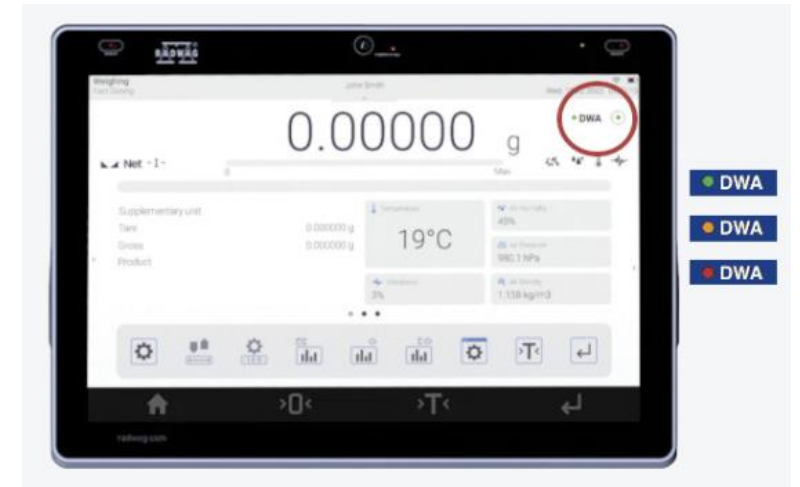
Lab Location: Whitesboro, NY

Lab space readiness: ~50%

ETA for the equipment: June 2024

Microbalance ✓

- Load range: 0.1mg -31g
- Readability: 1 μ g
- Standard repeatability [5% max]: 1.2 μ g
- Standard repeatability [Max]: 4.5 μ g
- Linearity: \pm 8 μ g



Reporting

X1. TEST REPORTING FORM

X1.1 The following format is suggested for reporting raw data and test results:

OUTGASSING DATA SHEET			
Material: (name, part number, lot, and so forth)			
Description: (material type, sample form, color, and so forth)			
Condition: (mix and cure, pre or post condition, as received, on substrate, and so forth)			
Manufacturer:			
Requestor:	Location:		Telephone:
Date:	Charge No.:		
Blanks:			
Heater Position No.	()	()	()
Initial holder mass, g	_____	_____	_____
Final holder mass, g	_____	_____	_____
Initial collector mass, g	_____	_____	_____
Final collector mass, g	_____	_____	_____
Sample:			
Heater Position No.	()	()	()
Initial holder mass, g	_____	_____	_____
Initial holder plus sample	_____	_____	_____
Final holder plus sample	_____	_____	_____
Reweighed sample plus holder, 24 h 50 % RH, g ^A	_____	_____	_____
Initial collector mass, g	_____	_____	_____
Final collector mass, g	_____	_____	_____
Total mass loss (TML) %	_____	_____	_____
			_____ Ave.% TML
Total mass gain (CVCM) %	_____	_____	_____
			_____ Ave.% CVCM
Total water regained ^A	_____	_____	_____
			_____ Ave.% WVR
(Sample WVR)			
^A WVR measurement is optional			
Remarks: (Sample appearance, collector appearance after test, any test anomalies, nonstandard conditions, problems, and so forth)			

Limitations

- Outgassing at only 125°C
- High vacuum range: 10⁻⁶ Torr
- Sample dimensions

Evolved Gas Analyzer

New technology developing a versatile system to perform outgassing testing

A versatile gas analyzer for outgassing characterization for variety of samples:

- UHV heating chamber to heat samples as high as 1200°C
- Outgassing at the vacuum as low as 10⁻⁹ Torr
- Mass range: 1-300 amu
- Mass release profiles with respect to temperature
- Identification of gas species released at a given temperature
- To test variety of solid samples (e.g., wafers, dye, epoxy, metals, ceramics, battery components etc)
- All metal system with easy sample loading/unloading
- Dedicated software for system control and data processing



Thank you.

Questions?