mi micromeritics®

Effective Solutions for Material Characterization

FULLY AUTOMATED MODULAR SYSTEM

ASAP 2460 SURFACE AREA AND POROSIMETRY ANALYZER

ASAP 2460

ANALYTICAL VERSATILITY WITH SUPERIOR THROUGHPUT

High Performance and High Sample Throughput

The Micromeritics® ASAP® 2460 Surface Area and Porosimetry Analyzer incorporates a unique expandable system designed for high performance and high sample throughput. The base ASAP 2460 is a two-port master control unit. For more throughput, additional two-port auxiliary units can be connected to the master unit expanding the system to either a four-port or six-port analyzer.

Analysis System

- All analysis ports can be operated independently and consecutively, allowing the user to load and unload samples at any time, regardless of the analysis stage. A new analysis can begin as soon as another is finished.

- An analysis of up to 60 hours can be performed without refilling the Dewar. This allows unattended analysis of high-resolution adsorption/desorption isotherms.

- With a master unit and two auxiliary units, BET surface area analyses utilizing six parallel runs can be achieved in as little as 30 minutes.

- Servo pressure control for dosing and evacuation.

- Up to five different nonreactive adsorptives, plus an additional gas for free space, can be attached to the analyzer simultaneously.

- Intuitive MicroActive software combines user-defined reports with the ability to interactively evaluate isotherm data. User-selectable data ranges through the graphic interface allow direct modeling for BET, t-Plot, Langmuir, DFT interpretation, and new advanced NLDFT methods.

- An innovative dashboard monitors and provides convenient access to real-time instrument performance indicators and maintenance scheduling.

Low Surface Area Measurement (Krypton) and Dedicated Micropore Options

In addition to the standard 2460, low surface area krypton and micropore models are available.

Low surface area (krypton) model includes the addition of a 10 mmHg transducer and permits accurate measurement of very low surface area materials.

The micropore model includes the addition of a 1 mmHg transducer which extends the low pressure measurement capabilities and allows enhanced performance for characterizing microporous materials. The transducer also increases pressure resolution in the range necessary for micropore analysis.

ASAP 2460 Advantages

- Fully automated modular system optimized for walk-up sample screening

- High throughput with two, four, or six independent analysis stations

- BET surface area measurements in as little as 30 minutes

- Dosing options of maximum volume increment or dosing over specified pressure ranges

- Analysis temperature can be entered or calculated

- Equilibration option allows user to specify equilibration times for different parts of the isotherm

- Low surface area and micropore options

- Innovative MicroActive software with advanced NLDFT modeling

- State-of-the-art engineering ensures excellent accuracy, repeatability, and reproducibility from all ports, from the master control unit through one or two auxiliary analysis units.
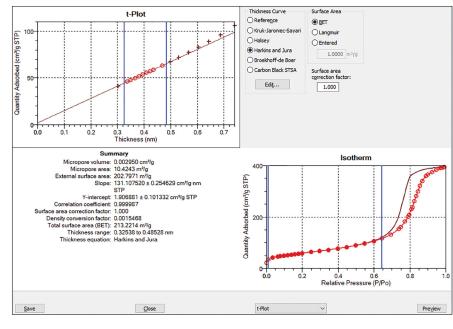
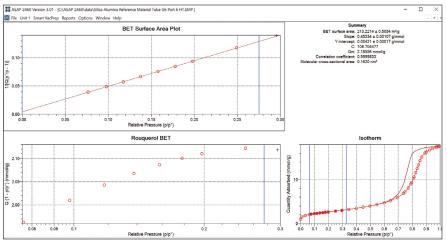# SUPERIOR DATA PRESENTATION CAPABILITY

Innovative MicroActive Software

Micromeritics' innovative MicroActive software allows users to interactively evaluate isotherm data. Users can easily include or exclude data, fitting the desired range of experimentally acquired data points using interactive, movable calculation bars. Isotherms can be viewed on either a linear or logarithmic scale.

Data Reduction Benefits

- Interaction with adsorption data is direct. By simply moving the calculation bars, the user is immediately updated with new textual properties.

- Interactive data manipulation minimizes the use of dialog boxes and tunneling of dialogs to specify calculation parameters.

- Ability to overlay files (up to 25) including mercury intrusion data with a file add-and-subtract feature.

- User-selectable data ranges through the graphic interface allow direct modeling for BET, t-Plot, Langmuir, DFT interpretation, and much more.

- Report Options editor allows the user to define reports with on-screen previews. Information from each report can be included in a concise summary, as well as in a tabular and graphical information pane.

ASAP 2460 Interactive Reports include (when appropriate to the analysis performed):

- Isotherm
- BET Surface Area
- Langmuir Surface Area
- t-Plot
- Alpha-S Method

- BJH Adsorption and Desorption
- Dollimore-Heal Adsorption and Desorption
- Horvath-Kawazoe
- MP-Method

- DFT Pore Size and Surface Energy
- Dubinin-Radushkevich
- Dubinin-Astakhov
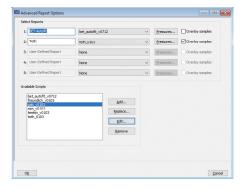- User-Defined Reports

NLDFT Modeling

The NLDFT Advanced PSD, Dual DFT modeling allows the user to combine the information gathered from nitrogen and carbon dioxide isotherms to deliver a full pore size distribution on materials (such as carbon slit pores) where pores of molecular sizes are present. The range of pore size analysis in this method is extended to smaller pore sizes compared to the standard nitrogen analysis. This is due to the fact that CO_2 can access some very small micropores that are not accessible to N_2 at cryogenic temperatures.
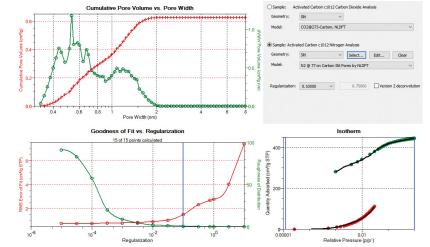
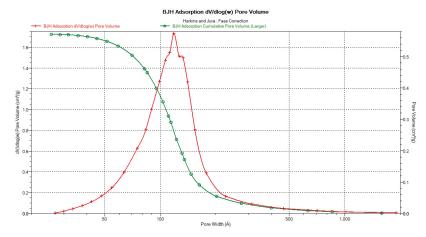## Mercury Porosimetry and Gas Adsorption Overlay

MicroActive for the ASAP 2460 software also includes a powerful utility that allows the user to overlay a mercury porosimetry pore size distribution with a pore size distribution calculated from gas adsorption isotherms. This new import function allows users to rapidly view micropore, mesopore, and macropore distributions in one easy-to-use application.

Python Programming Language Included

The Python programming language has been incorporated into the ASAP 2460 software. This powerful scripting language allows users to develop extensions to the standard report library available within the ASAP 2460 application.
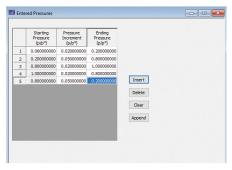
New Dosing Options

Dosing options added to the pressure table give the user the ability to change the pressure increment, volume dose increment, and equilibration interval time between data points. A detailed isotherm can be collected by specifying that a data point be recorded after a certain amount of gas is dosed, increasing the relative pressure by a small amount, or both.

Innovative Dashboard

With a single click, the ASAP 2460 provides a powerful suite of information that allows the user to maintain the instrument in peak operating condition with real-time analysis views.

SAMPLE PREPARATION DEVICES

Micromeritics' sample preparation devices prepare batches of samples for surface area and pore volume analysis. They combine flowing gas and/or vacuum with heat to remove atmospheric contaminants, such as water vapor and adsorbed gas, from the surface and pores of the sample.

The Micromeritics® FlowPrep™ 060: Applies both heat and a stream of inert gas to the sample for removal of adsorbed contaminants from the surface and pores. With six degassing stations, this sample preparation unit lets you choose a temperature, the gas, and the flow rate best suited for your sample material and application.

The Micromeritics® VacPrep™ 061: Offers two methods for removing adsorbed contaminants. In addition to flowing gas, this sample preparation until provides vacuum to prepare samples by heating and evacuation. The VacPrep offers the user a choice of vacuum or gas flow on each of the six degassing stations.

The Micromeritics® SmartPrep™ 065: Applies a stream of flowing gas over the sample at elevated temperatures to remove adsorbed contaminants. Temperature, ramp rates, and soak times of each sample are individually controlled on the six degassing stations by a computer. Up to five ramps and soaks are allowed. All degas information is integrated into the sample data file for future reference.

TRANSFER SYSTEM

The Micromeritics® Model 021 LN2 Transfer System is useful for any number of tasks where frequent needs arise for relatively small volumes of liquid nitrogen or argon. The LN2 Transfer System makes it easy to fill Dewars with liquid cryogen for laboratory or general purposes. The system includes a large storage Dewar with a 47 liter capacity that can hold liquid nitrogen or argon up to 30 days allowing convenient and cost-efficient use of your cryogen. The discharge rate is continuously adjustable to a maximum flow of 3 L/min. The discharge line is insulated to prevent frosting and icing during use, and flexible to allow easy positioning for discharge into almost any type of receiving vessel. The system includes a mobile platform that easily adapts to different Dewar dimensions.

Model 021 LN$_2$ Transfer System

FlowPrep 060

Smart Prep 065

VacPrep 061

SPECIFICATIONS

Electrical

Voltage	100/115/230 VAC (±10%)
Frequency	50 or 60 Hz
Power	800 VA, exclusive of vacuum pumps, which are powered separately

Environment

Temperature	10 to 30 °C, operating -10 to 55 °C, storage or shipping
Humidity	Up to 90% (non-condensing) for instrument

Capacity

Analysis System	2, 4, or 6 sample ports (for krypton analysis, one sample port is used for dosing), each with a constantly monitored saturation pressure port

Analysis System

Manifold Temperature Transducer:	Type: Platinum resistance device (RTD) Accuracy: ±0.10 °C by keyboard entry Stability: ±0.10 °C per month

Manifold Pressure Transducers:	Range: 0 to 950 mmHg operating: 1000 mmHg maximum
	       0 to 10 mmHg added for Krypton option
	Resolution: 1000-mmHg Transducer: 0.001 mmHg
	       10-mmHg Transducer[1]: 0.00001 mmHg
	       1-mmHg Transducer**: 0.000001 mmHg
	Accuracy: 1000-mmHg Transducer: within 0.15% of reading
	       10-mmHg Transducer[1]: within 0.15% of reading
	       1-mmHg Transducer[2]: within 0.12% of reading

Sample Port Transducers and Po Port Transducers	Range: 0 to 950 mmHg Resolution: 0.001 mmHg Accuracy: ±0.1% Full Scale
Vacuum Transducer	Type: Thermocouple Range: 0.001 to 1 mmHg

Vacuum System

Pumps[3]	Nitrogen: Oil-sealed pump Krypton & enhanced micropore option: High-vacuum pump

Physical

Height	94 cm (37 in.)
Width	38 cm (15 in.)
Depth	59 cm (23 in.)
Weight	54 kg (119 lb)

Computer Requirements

Windows® 7 Professional or higher operating system (64 bit)[5,7]
USB port[6]
Ethernet port (10 base T or 100 base T)

Includes nonlinearity, hysteresis, and non-repeatability
[1]The 10-mmHg transducer is active only when performing krypton analyses
[2]The 1-mmHg transducer is presented only in the enhanced micropore option
[3]Oil-free and high vacuum pump: 3.8 × 10-9 mmHg ultimate vacuum[4]
[4]Ultimate vacuum measured by pump manufacturer according to Pneurop Standard 5608

Due to continuous improvements, specifications are subject to change without notice.

[5]For 21 CFR Part 11, Windows 10 Professional or Windows 10 Enterprise or higher is required.
[6]One additional USB port must be available for Instrument.
[7]Not be installed on a network drive with shared access. Multiple users cannot operate the application at the same time.

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