

mi M I C R O M E R I T I C S

ASAP 2460

Accelerated Surface Area and
Porosimetry System



www.micromeritics.com

Analytical Versatility with Superior Throughput

ASAP 2460 Accelerated Surface Area and Porosimetry System

High Performance/High Sample Throughput

The 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. The instrument also includes intuitive MicroActive™ software that combines user-defined reports with the ability to interactively evaluate isotherm data.

Analysis System

- All analysis ports can be operated independently and concurrently, 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 that take much longer to complete because the system must equilibrate at each data point.
- 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 control for dosing and evacuation provides a higher degree of gas management and speeds collection of data points.
- Up to five different nonreactive adsorptives, plus an additional gas for free space, can be attached to the analyzer simultaneously. Each analysis port can accept a range of sample tube sizes.
- Long-duration dewars and patented isothermal jackets assure a stable thermal profile along the length of both the sample and saturation pressure (P_0) tubes throughout lengthy analyses. The P_0 value can be entered, or measured either continuously or at selected intervals.
- Intuitive MicroActive software combines user-defined reports with the ability to interactively evaluate isotherm data, reducing the time required to obtain surface area and porosity results. 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.

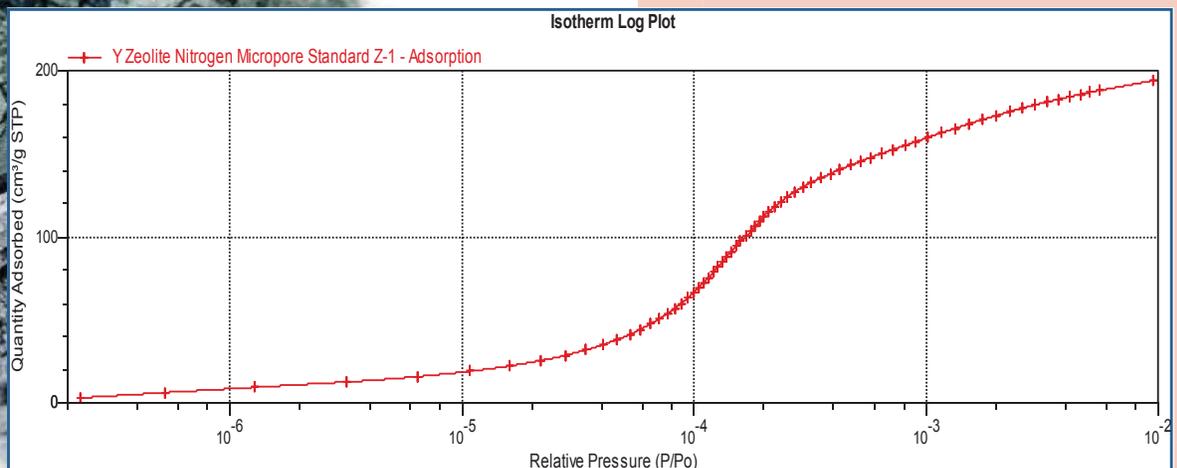
Low surface area (krypton) model includes the addition of a 10-mmHg transducer and permits accurate measurement of very low surface area on materials such as API (active pharmaceutical ingredient), powdered metals, etc.

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 using nitrogen, argon, carbon dioxide, hydrogen, and other fixed gases. 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, calculated, or measured
- ✓ 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 NLDFIT 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.



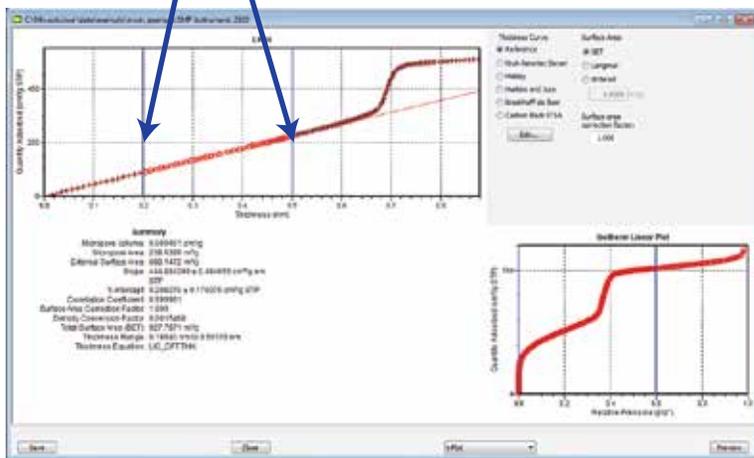
Analysis results: Y Zeolite Isotherm

Superior Data Presentation Capability

Innovative MicroActive Software

Micromeritics' innovative MicroActive software allows users to interactively evaluate isotherm data from Micromeritics' ASAP, 3Flex, TriStar, and Gemini gas adsorption instruments. 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, available to the user under each calculation model. No need to generate reports to review results.

Data used to fit parameters and estimate properties

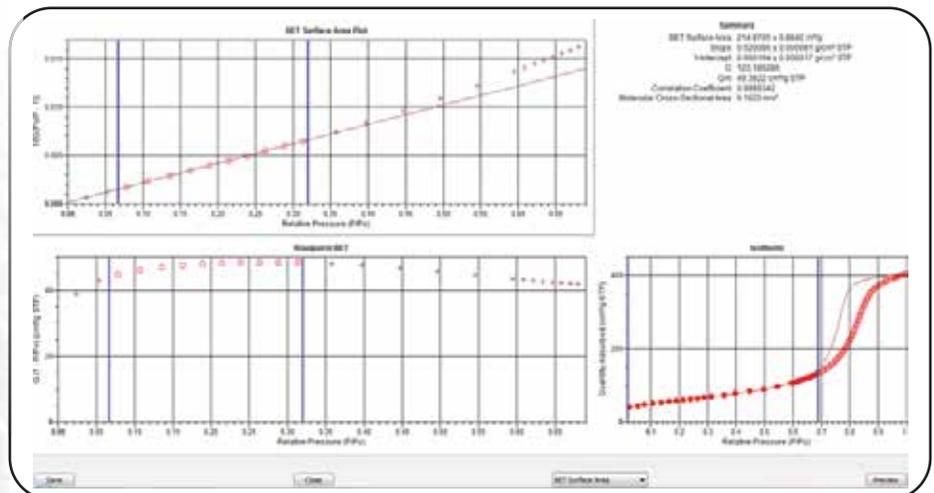


MicroActive interactive features reduce the often difficult trial-and-error procedure for fitting the t-Plot by providing direct feedback to the user.

Data Reduction Benefits

Interaction with adsorption data is direct. By simply moving the calculation bars, the user is immediately updated with new textual properties. One-click access to important parameters allows the user to focus on the result rather than the parameters.

- Interactive data manipulation minimizes the use of dialog boxes and tunneling of dialogs to specify calculation parameters. This allows the user to accurately and efficiently determine surface area and porosity of their materials.
- Improved 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. Each report has the ability to possess one summary, tabular, and graphical information pane.



Calculations, such as the BET surface area transform plot, can be easily generated and adjusted. The selection bars allow for a range of data points to be quickly and easily selected. As a result, the summary of values derived from the calculations is instantly updated. Within the calculation window(s), the range of data used can be further refined.

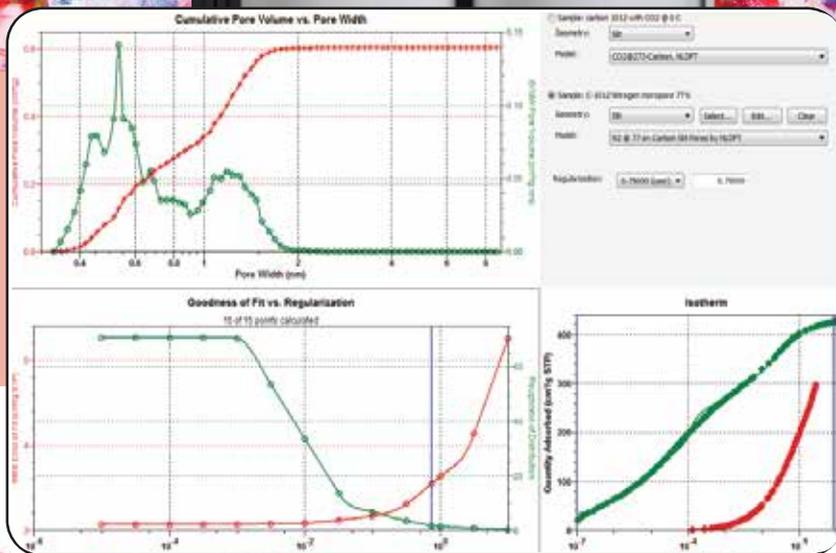
ASAP 2460 Interactive Reports include:

- 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
- Summary
- User-Defined Reports

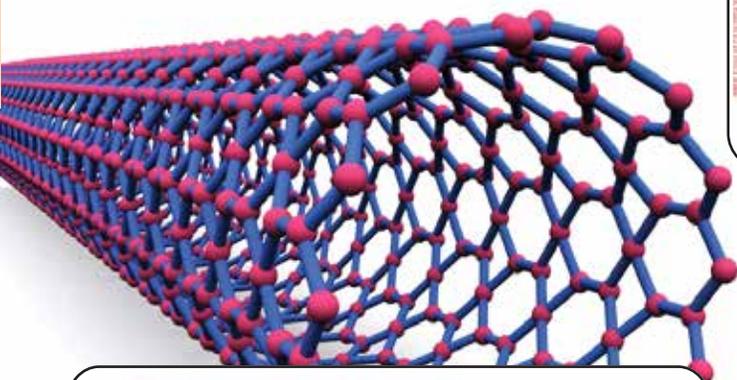


NLDFT Modeling

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 CO₂ can access some very small micropores that are not accessible to N₂ at cryogenic temperatures because of size restrictions.

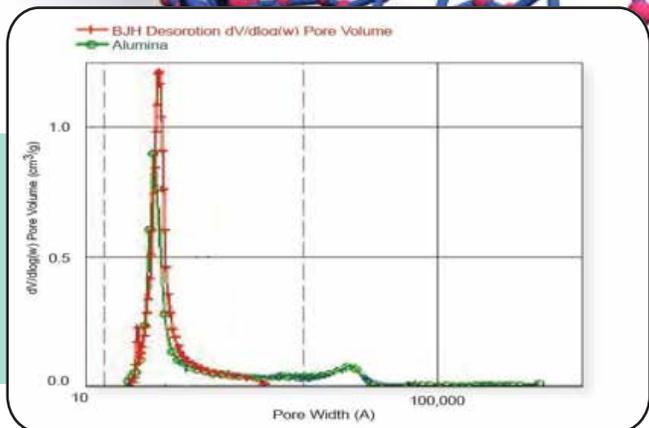


This advanced NLDFT method allows users to determine the pore size distribution of their sample using two isotherms. In this example CO₂ adsorption (red) at 273 K and nitrogen adsorption (green) at 77 K are used to calculate a single pore size distribution. Users do not have to cut and paste distributions from CO₂ and nitrogen – a single distribution is determined using both isotherms.



Mercury Porosimetry/Gas Adsorption Overlay

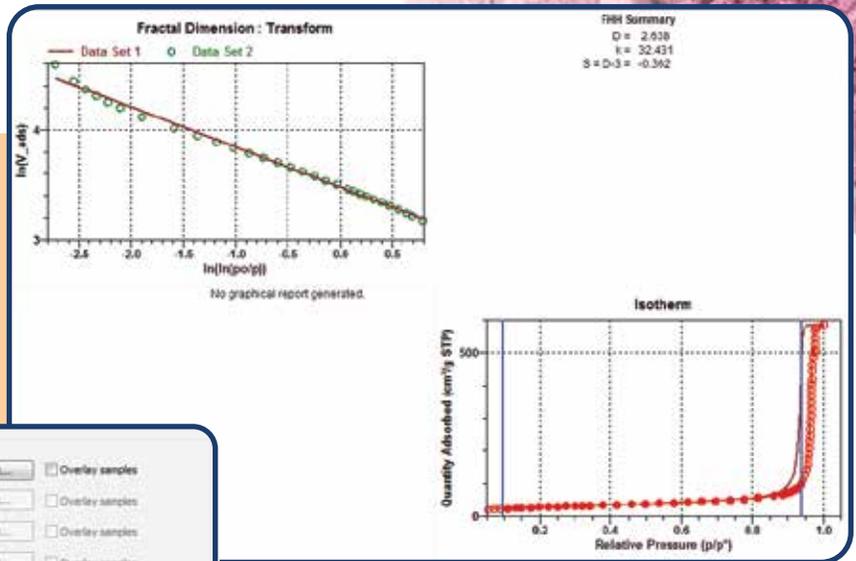
MicroActive for the ASAP 2460 software also includes a powerful utility that allows the user to overlay a mercury porosimetry pore size distribution with a pore size distribution calculated from gas adsorption isotherms. This new import function allows users to rapidly view micropore, mesopore, and macropore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



Overlay of BJH desorption and mercury intrusion log differential pore size distributions for alumina pellets.

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. Micromeritics is regularly adding new scripts and can custom create scripts for users within MicroActive



Fit Summary
 $D = 2.638$
 $k = 32.431$
 $S = D-3 = -0.362$

The "Select Reports" dialog box shows a list of "User Report" entries (User Report 1 through 5) with dropdown menus and "Edit..." buttons. Below this is a section for "Available Reports" with a list box containing "PFR2" and buttons for "Add...", "Replace...", "Edit...", and "Remove".

New isotherm models or calculations are easily added to the report system. The Python interface to MicroActive allows users to customize their reports and extend the utility of MicroActive.

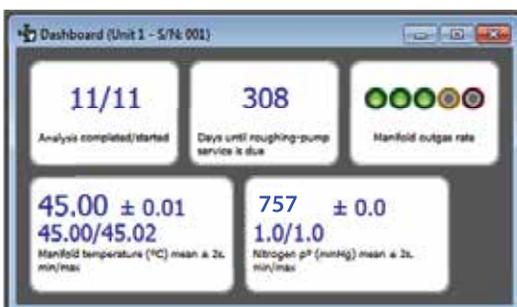
	Up to	Add a Point Every	Using	
	Relative Pressure (P/P ₀)	Relative Pressure (P/P ₀)	Dose Amount (cm ³ /g STP)	Equilibration Interval (s)
1	0.001000000		0.5000	20
2	0.010000000	0.002000000		10
3	0.100000000	0.020000000		10
4	0.900000000	0.050000000	15.0000	10
5	0.950000000	0.010000000		20
6	0.995000000	0.010000000		20
7	0.998000000			20
8	0.995000000			20

Buttons: Insert Range..., Insert, Delete, Clear, Append, Absolute pressure dosing (checkbox).

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. This permits a higher level of accurate dosing of very low partial pressures resulting in improved resolution in the isotherm data.

The pressure table allows data points to be taken in small increments of pressure, quantity dosed, 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.

Innovative Instrument Diagnostics Dashboard

External 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 quality of the data produced by surface area and pore volume analyses depends greatly on the cleanliness of the sample surface. All Micromeritics' sample preparation devices accept helium, nitrogen, argon, and other non-corrosive gases.

The 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 the temperature, gas, and flow rate best suited for your sample material and application. Needle valves allow the user to introduce the flowing gas slowly to prevent fluidization of samples.

The VacPrep™ 061 - Offers two methods for removing adsorbed contaminants. In addition to flowing gas, this sample preparation unit 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. Needle valves allow the user to introduce the flowing gas or vacuum slowly to prevent fluidization of samples.

The 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. This sample preparation unit contains two serial ports, one for connecting to the computer and the other for connection to an additional SmartPrep. Up to five ramps and soaks are allowed. All degas information is integrated into the sample data file for future reference.



Model 021 LN₂ Transfer System -

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 021 LN₂ Transfer System operates at ambient pressure and replaces typical cryogen storage vessels which are pressurized to force the cryogen through the discharge line. With Micromeritics' system, cryogen is transferred by a centrifugal pump. Flow starts and stops immediately when the pump is turned on or off. 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 which easily rolls from location to location.



Additional accessories are available for special applications.

To request a quote or additional product information, visit Micromeritics web site at www.micromeritics.com, contact your local Micromeritics sales representative or our Customer Service Department at (770) 662-3636

Typical ASAP 2460 Applications

- Pharmaceuticals – Surface area and porosity play major roles in the purification, processing, blending, tableting, and packaging of pharmaceutical products as well as the drug's useful shelf life, its dissolution rate, and bioavailability.
- Ceramics – Surface area and porosity affect the curing and bonding of greenware and influence strength, texture, appearance, and density of finished goods. The surface area of glazes and glass frits affects shrinkage, crazing, and crawling.
- Adsorbents – Knowledge of surface area, total pore volume, and pore size distribution is important for quality control of industrial adsorbents and in the development of separation processes. Surface area and porosity characteristics affect the selectivity of an adsorbent.
- Activated Carbons – Surface area and porosity must be optimized within narrow ranges to accomplish gasoline vapor recovery in automobiles, solvent recovery in painting operations, or pollution controls in wastewater management.
- Carbon Black – The wear lifetimes, traction, and performance of tires are related to the surface area of carbon blacks used in their production.
- Catalyst – The active surface area and pore structure of catalysts influence production rates. Limiting the pore size allows only molecules of desired sizes to enter and exit; creating a selective catalyst that will produce primarily the desired product.
- Paints and Coatings – The surface area of a pigment or filler influences the gloss, texture, color, color saturation, brightness, solids content, and film adhesion properties. The porosity of a print media coating is important in offset printing where it affects blistering, ink receptivity, and ink holdout.
- Projectile Propellant – The burn rate of propellants is a function of surface area. Too high a rate can be dangerous; too low a rate can cause malfunctions and inaccuracy.
- Electronics – By selecting high surface area material with carefully designed pore networks, manufacturers of super-capacitors can minimize the use of costly raw materials while providing more exposed surface area for storage of charge.
- Aerospace – Surface area and porosity of heat shields and insulating materials affect weight and function.
- Fuel Cells – Fuel cell electrodes require high surface area with controlled porosity to produce adequate power density.
- Geoscience – Porosity is important in groundwater hydrology and petroleum exploration because it relates to the quantity of fluid that a structure can contain as well as how much effort will be required to extract it.
- Nanotubes – Nanotube surface area and microporosity are used to predict the capacity of a material to store hydrogen.

Size:	Height: 92.7 cm (36.5") Width: 36.6 cm (14.4") Depth: Master: 58.4 cm (23") Depth: Aux: 35.6 cm (14")
Weight:	Master: 68kg (150 lbs) Aux: 34.9kg (77 lbs)
Electrical:	100-240V, 50/60Hz
Power:	150VA, max



HEADQUARTERS

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