

HIGH THROUGHPUT ANALYSIS  
ASAP 2425 SURFACE AREA AND  
POROSIMETRY SYSTEM



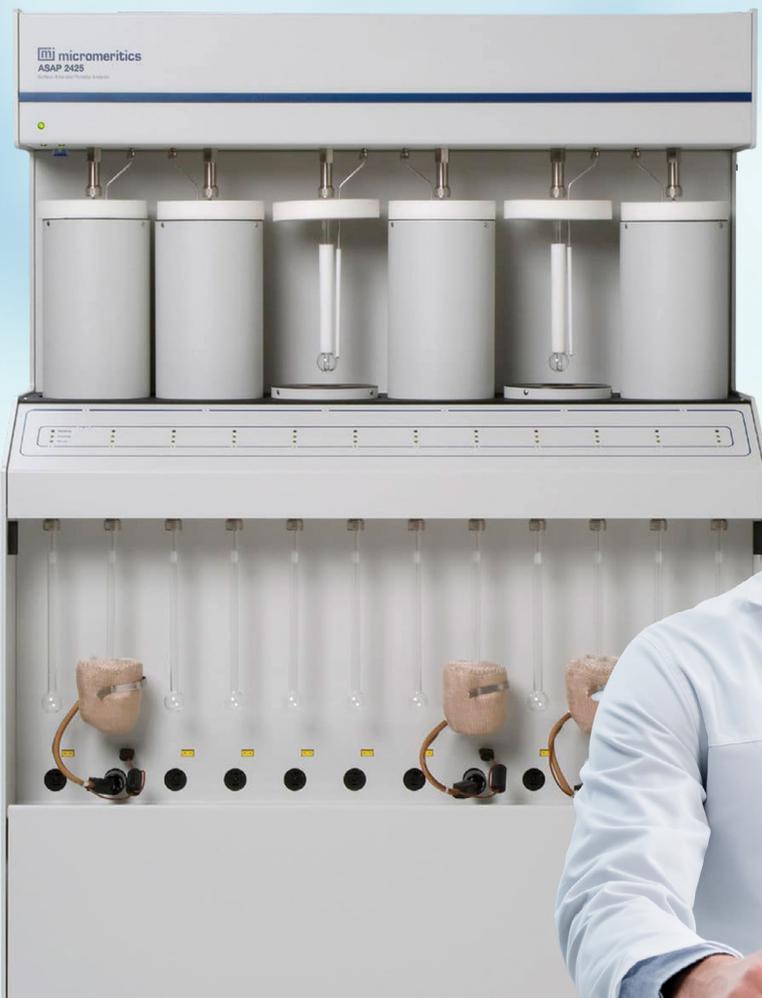
# ASAP 2425

## ANALYTICAL VERSATILITY WITH SUPERIOR THROUGHPUT

Surface area and porosity are important physical properties that influence the quality and utility of many materials and products. Therefore it is critically important that these characteristics be accurately determined and controlled. Likewise, knowledge of surface area and especially porosity often are important properties in understanding the formation, structure, and potential application of many natural materials.

### High Performance and High Sample Throughput

The automated Micromeritics® ASAP® 2425 surface area and porosimetry system is designed to help busy laboratories expand their workflow while providing highly accurate and precise surface area and porosimetry data. High performance, versatile analysis, and sample preparation systems are included in the same instrument.



## Analysis System

- With six independently operated analysis ports, a new analysis can begin as soon as another is finished. This provides an important advantage over many multiport instruments that require all samples to be prepared or analyzed at the same time.
- Long-duration Dewars and Micromeritics Isothermal Jackets<sup>1</sup> assure a constant thermal profile along the length of both the sample and saturation pressure ( $P_0$ ) tubes throughout extended analyses. The  $P_0$  value may be entered, or measured either continuously or at selected intervals.
- The high-capacity Dewar also allows unattended analysis of high-resolution adsorption/desorption isotherms that take much longer to complete because the system must equilibrate at each data point.
- BET surface area analyses utilizing six parallel runs can be achieved in as little as 1 hour.
- A low surface area option that uses krypton as an adsorptive to measure total surface areas of 0.5 m<sup>2</sup> or less is available. This option utilizes five of the six available ports. It also features a turbomolecular drag pump, which provides the high vacuum required for krypton analyses, and a 10 mmHg pressure transducer, which allows accurate, repeatable pressure resolution.
- Intuitive Micromeritics 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.
- Up to five different nonreactive adsorptives, plus an additional gas for free space, can be attached to the analyzer simultaneously.
- The servo pressure control regulates dosing and evacuation during analysis to reduce analysis time.

## Sample Preparation System

- The ASAP 2425 system includes twelve automatically controlled sample preparation ports that operate independently. Samples may be added or removed from degas ports without disturbing the treatment of other samples undergoing preparation.
- The sample preparation system is fully automated with controlled heating time profiles. Temperature and ramp rate can be set and monitored individually and controlled from a few degrees above ambient to 450 °C. The temperature hold period may extend past the point when evacuation is completed.
- A programmable pressure threshold can suspend the temperature ramp if the outgassing pressure exceeds the limit specified, preventing destructive steaming or other undesired reactions with residual gasses and vapors.

## Low Surface Area Measurement (Krypton) and Micropore Options

In addition to the standard ASAP 2425, 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 (< 1 m<sup>2</sup>/g).

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.

<sup>1</sup> Micromeritics invented and patented the Isothermal Jacket in 1986

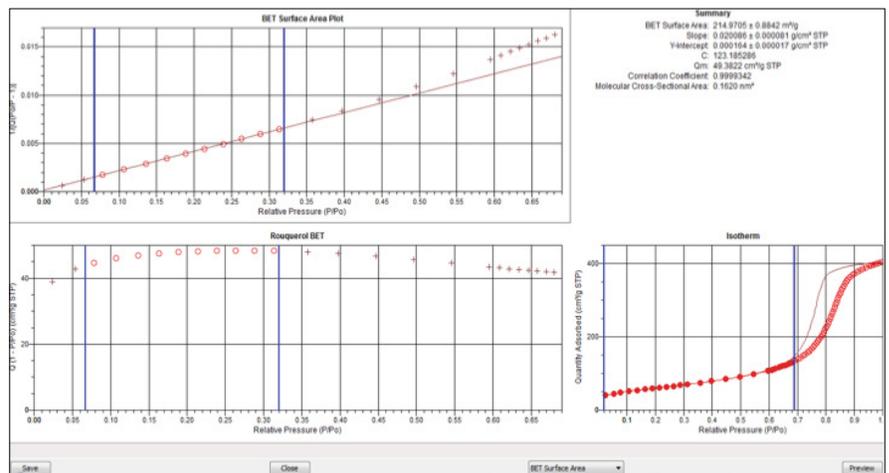
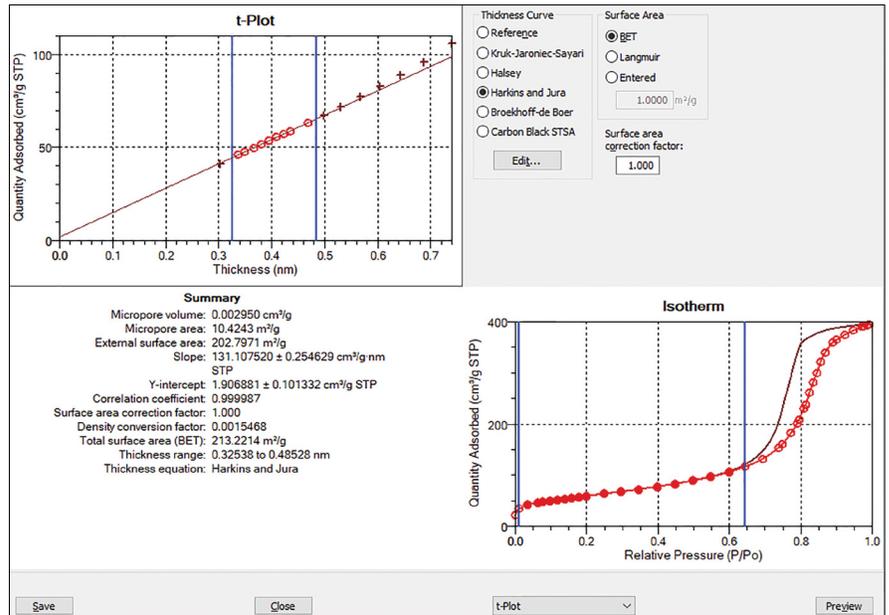
# SUPERIOR DATA PRESENTATION CAPABILITY

## 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.

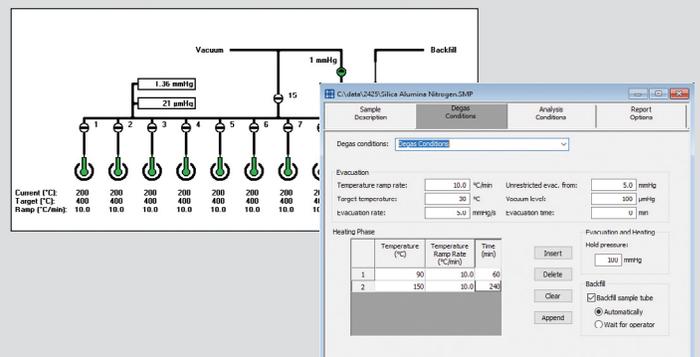
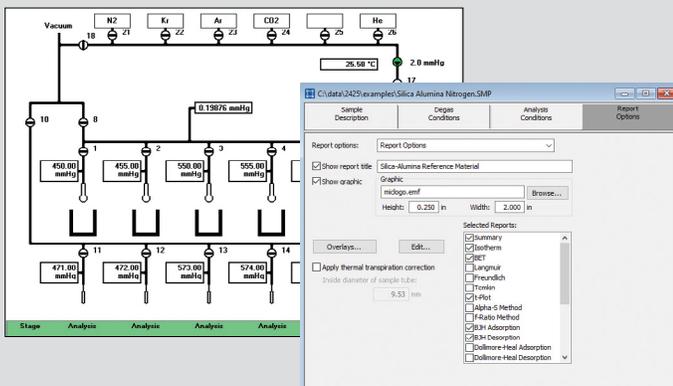


ASAP 2425 Interactive Reports include (when appropriate to the analysis performed):

- Isotherm
- BET Surface Area
- Langmuir Surface Area
- t-Plot
- Alpha-S Method
- BJH Adsorption and Desorption
- Dollimore-Heal Adsorption and Desorption
- Horvath-Kawazoe
- Saito-Foley
- Cheng-Yang
- MP-Method
- DFT Pore Size and Surface Energy
- Dubinin-Radushkevich
- Dubinin-Astakhov
- NLDFT Advanced Reports
- User-Defined Reports

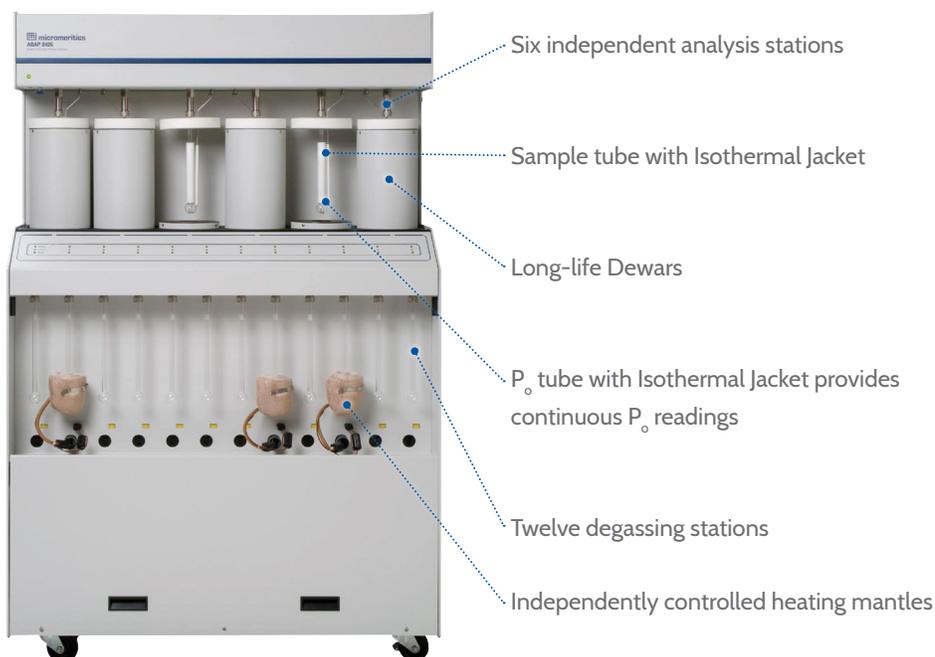
## ASAP 2425 Advantages

- Fully automated analyses
- High throughput with six independent analysis stations
- Each analysis port has a dedicated analysis and  $P_o$  pressure transducer
- Twelve independently controlled degas ports
- Evacuation rate precisely regulated by a servo valve
- BET surface area measurements in as little as 1 hour
- Dosing options of maximum volume increment or dosing over specified pressure ranges
- Entered or calculated analysis temperature
- Equilibration option allows user to specify equilibration times for different parts of the isotherm
- Low surface area option with five independent analysis ports



The ASAP 2425 includes Windows® compatible software. This advanced instrument operation software features a full graphical user interface that displays the instrument operations and a MicroActive reporting system that includes many standard and advanced reports for the characterization of powders and porous materials.

A standard feature of the ASAP 2425 is the integrated twelve-station degas system. Users may prepare up to twelve samples simultaneously. The sample degas procedure is software-controlled and allows easy-to-specify parameters for custom degas and sample preparation. User-defined evacuation rates and temperature ramps are provided to support even the most difficult-to-prepare samples.



# TYPICAL ASAP 2425 APPLICATIONS

## Pharmaceuticals

Surface area and porosity play major roles in the purification, processing, blending, tableting, and packaging of pharmaceutical products as well as their useful shelf life, 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 waste-water management.

## Carbon Black

The wear lifetime, 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 malfunction and inaccuracy.

## Medical Implants

Controlling the porosity of artificial bone allows it to imitate real bone that the body will accept and allow tissue to be grown around it.

## 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.

## Cosmetics

Surface area is often used by cosmetic manufacturers as a predictor of particle size when agglomeration tendencies of the fine powders make analysis with a particle-sizing instrument difficult.

## Aerospace

Surface area and porosity of heat shields and insulating materials affect weight and function.

## 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.

## Fuel Cells

Fuel cell electrodes require high surface area with controlled porosity to produce optimum power density.

# SPECIFICATIONS

## Electrical

Voltage	100/115/230 VAC ( $\pm 10\%$ )
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	6 sample ports, each with a constantly monitored saturation pressure port
Degas System	12 degas ports, each with independently controlled heating mantle

## Analysis System

Manifold Temperature Transducer	Type: Platinum resistance device (RTD) Accuracy: $\pm 0.10$ °C by keyboard entry Stability: $\pm 0.10$ °C per month
Manifold Pressure Transducer	Range: Vacuum to 950 mmHg operating: 1000 mmHg maximum 10 mmHg added for krypton option 1 mmHg for micropore option Resolution: 1000 mmHg Transducer: 0.01 mmHg 10 mmHg Transducer: 0.0001 mm 1 mmHg Transducer: 0.00001 mm Accuracy: 1000 mmHg Transducer: within 0.1% FS 10 mmHg Transducer <sup>1</sup> : within 0.15% of reading 1 mmHg Transducer <sup>2</sup> : within within 0.12% of reading
Sample Port Transducer and Po Port Transducers	Range: 0 to 950 mmHg Resolution: 0.01 mmHg Accuracy: $\pm 0.1\%$ Full Scale
Vacuum Gauge	Type: Thermocouple Range: 0.001 to 1 mmHg

## Physical

Height	159 cm (62.5 in.)
Width	103 cm (40.5 in.)
Depth	51 cm (20.2 in.)
Weight	160 kg (350 lb)

Includes nonlinearity, hysteresis, and non-repeatability.

<sup>1</sup>The 10 mmHg transducer is active only when performing krypton analyses.

<sup>2</sup>The 1 mmHg transducer is present only in the enhanced micropore option.

## Vacuum System

Nitrogen System Pumps	2 oil-based pumps: 1 analysis, 1 degas 4 pumps (optional): 2 oil-free (1 analysis, 1 degas), 1 degas), 2 high vacuum (1 analysis, 1 degas)
Krypton & Micropore Pumps	4 pumps: 2 oil-free (1 analysis, 1 degas), 2 high-vacuum (1 analysis, 1 degas) Oil-based mechanical pump: 5 x 10 <sup>-3</sup> mmHg ultimate vacuum Oil-free and high vacuum pump: 3.8 x 10 <sup>-9</sup> mmHg ultimate vacuum <sup>3</sup>

## Degas System

Capacity	12 degas ports
Vacuum Control	Selectable target pressure controls switchover from restricted to unrestricted evacuation
Evacuation	Selectable evacuation rate from 1.0 to 50.0 mmHg/s
Manifold Pressure Transducer	Range: 0 to 950 mmHg Resolution: 0.01 mmHg Accuracy: $\pm 0.1\%$ Full Scale
Vacuum Transducer	Type: Thermocouple Range: 0.001 to 1 mmHg
Titled Backfill Gas	User-selectable at dedicated port, typically nitrogen or helium
Temperature Control	Temperature Range: Ambient to 450 °C (Programmable) Temperature Control: 1 ramp during evacuation phase, 5 additional selectable ramps during heating phase Selection: Digitally set, 1 °C increments from computer Accuracy: Deviation less than $\pm 10$ °C of set point at the sensing thermocouple embedded in the heating mantle

## Computer Requirements

Windows® 7 Professional or higher operating system recommended (64 bit) <sup>4</sup> USB port <sup>5</sup> Ethernet port (10 base T or 100 base T)
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<sup>3</sup>Ultimate vacuum measured by pump manufacturer according to Pneurop Standard 5608  
<sup>4</sup>Not to be installed on a network drive with shared access. Multiple users cannot operate the application at the same time.

<sup>5</sup>One additional USB port must be available for Instrument.

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

Micromeritics Instrument Corp.  
4356 Communications Drive  
Norcross, GA 30093 • USA  
Tel.: +1 770 662-3636

[info@micromeritics.com](mailto:info@micromeritics.com)  
[micromeritics.com](http://micromeritics.com)

**BELGIUM**  
[micromeritics.benelux@micromeritics.com](mailto:micromeritics.benelux@micromeritics.com)

**CHINA**  
[micromeritics.china@micromeritics.com](mailto:micromeritics.china@micromeritics.com)

**FRANCE**  
[micromeritics.fr@micromeritics.com](mailto:micromeritics.fr@micromeritics.com)

**GERMANY**  
[micromeritics.de@micromeritics.com](mailto:micromeritics.de@micromeritics.com)

**THE NETHERLANDS**  
[micromeritics.benelux@micromeritics.com](mailto:micromeritics.benelux@micromeritics.com)

**UK**  
[micromeritics.uk@micromeritics.com](mailto:micromeritics.uk@micromeritics.com)