AMI-Meso 112/222 Series
BET Surface Area and Pore Size Analyzer

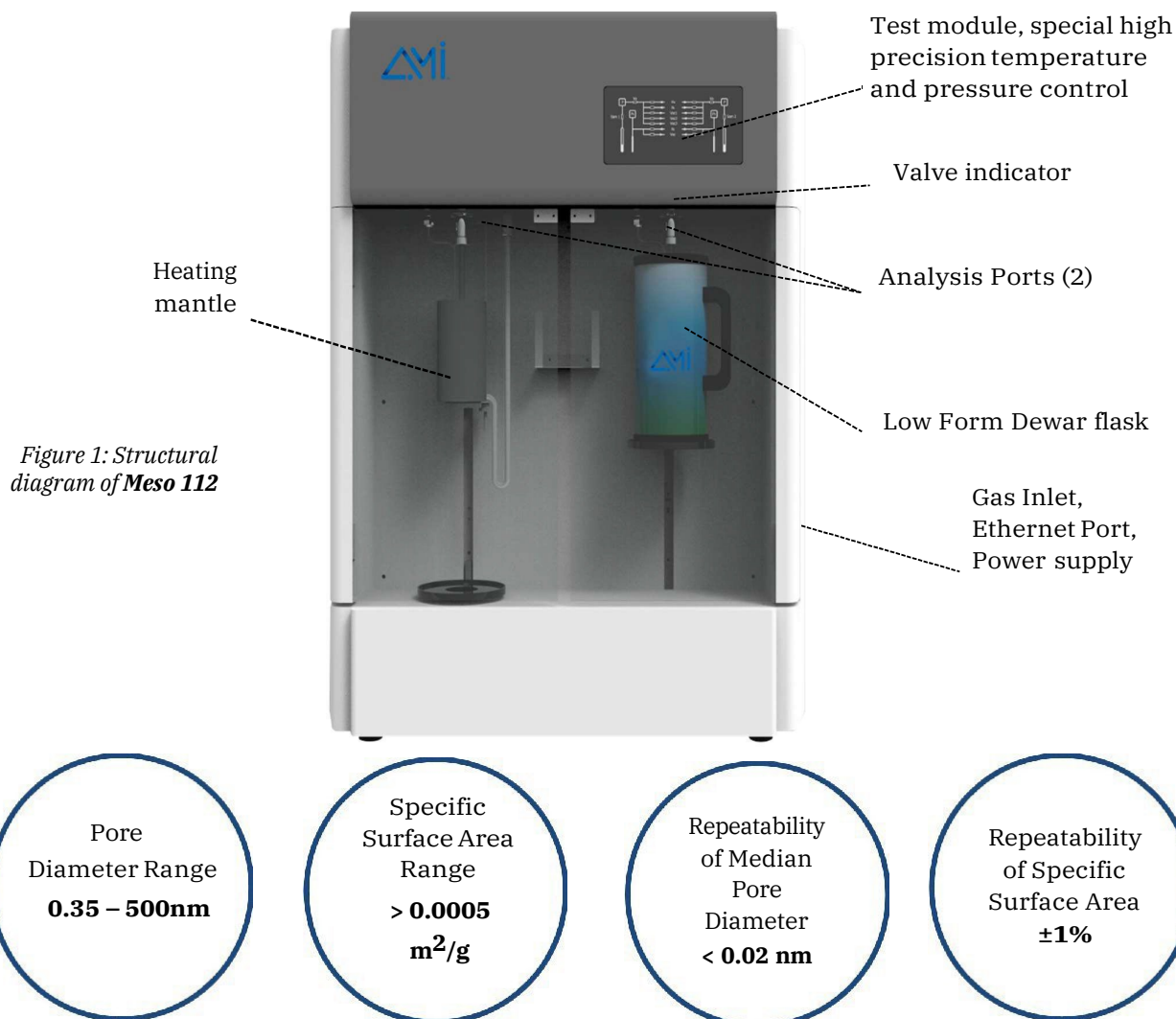*"Accurate, Accessible, Advanced Gas Sorption"*

- Single/ Multipoint BET Surface Area

- BJH Adsorption and Desorption

- Horvath-Kawazoe

- Saito-Foley

- Material Research

- Chemical Engineering

- New Energy

- Catalytic Technologies

INTRODUCTION

The **AMI-Meso112/222** Series is engineered for high-precision surface area and pore size characterization of powdered materials. This series comprises two models, Meso 112 and Meso 222, both integrated with 1000 Torr pressure transducers at each analysis station for accurate BET surface area determination and mesopore size distribution analysis.

Each analysis port is equipped with an in-situ degassing module capable of heating samples up to 400°C, ensuring efficient removal of adsorbed contaminants prior to analysis. This in-situ degassing eliminates the risk of contamination associated with sample transfer. Additionally, when multiple stations are utilized, each operates independently, allowing for simultaneous yet discrete analyses of different samples.

Test module, special high precision temperature and pressure control

Valve indicator

Heating mantle

Analysis Ports (2)

*Figure 1: Structural diagram of **Meso 112***

Low Form Dewar flask

Gas Inlet, Ethernet Port, Power supply

Pore Diameter Range
0.35 – 500nm

Specific Surface Area Range
> 0.0005 m^2/g

Repeatability of Median Pore Diameter
< 0.02 nm

Repeatability of Specific Surface Area
±1%

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KEY FEATURES

Module Design for Minimal Dead Volume
The internal gas path design of the instrument adopts a unique integrated metal module design, which not only reduces the internal dead volume space but also helps mitigate possible leaks.

Saturated Vapor Pressure P_0
An independent P_0 pressure transducer is configured at 133 kPa for P_0 value testing, enabling real-time P/P_0 measurement for more accurate and reliable test data. Alternatively, an atmospheric pressure input method can be used to determine P_0.

p0 *	103.94	kPa	☐ Auto
p/p0 max *	0.99		

Independent analysis ports
With independent analysis ports, the system employs a unique vacuum control logic that allows each station to operate without disruption, even when using a single mechanical pump or pump group. This enables simultaneous, independent experiments, meeting diverse adsorbent testing needs while ensuring high efficiency.

Thermal Stabilization
A core rod in the sample tube reduces dead volume and stabilizes the cold free space coefficient, while an iso-thermal jacket maintains a constant thermal profile along the tube. Additionally, automatic helium correction ensures precise calibration for any powder or particulate material, minimizing temperature- related deviations during analysis.

High Accuracy Pressure Transducers
Equipped with 1000 Torr pressure transducers, the Meso Series enables precise physical adsorption analysis, achieving a partial pressure (P/P_0) as low as 10^{-2} for nitrogen (N_2) at 77 K.

Optimized Manifold Contamination Control
This system features a multi-channel, adjustable, and parallel vacuum design with segmented vacuum control. This setup effectively prevents samples from being drawn up into the analyzer therefore preventing manifold contamination.

Liquid Nitrogen Dewar
The use of 1 L Dewar flasks in conjunction with a sealed cover ensures a stable thermal profile along the entire length of both the sample tubes and P_0 tubes throughout the testing process.

Sample Preparation
Equipped with two in-situ degassing ports, enabling simultaneous degassing and analysis. Each port offers independent temperature control from ambient to 400°C, ensuring precise sample preparation.

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SOFTWARE

PAS Software is an intelligent solution for operation control, data acquisition, calculation, analysis, and report generation on the Windows platform. It communicates with the host via the LAN port and can remotely control multiple instruments simultaneously.
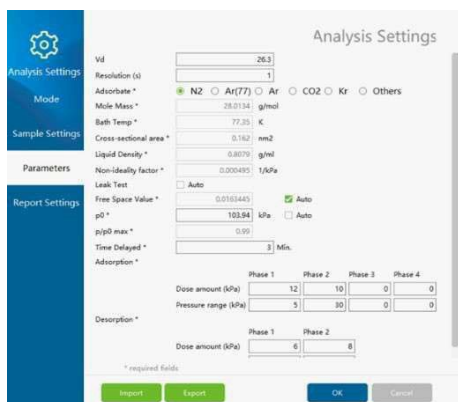

PAS Software adopts a unique intake control method, optimizing pressure in the adsorption and desorption processes through a six-stage setting, which improves testing efficiency

Each adsorption equilibrium process is dynamically displayed on the test interface. Adsorption characteristics of the sample can be easily understood.
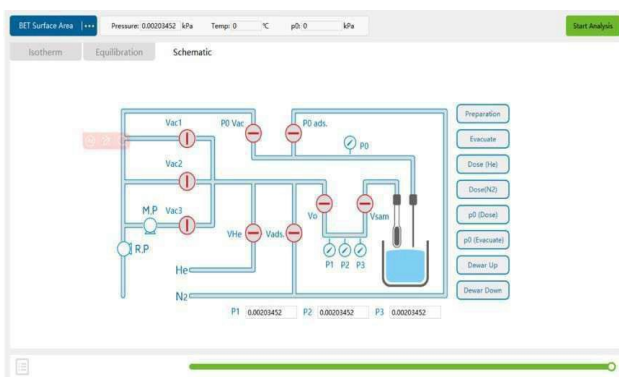
Changes in pressure and temperature inside the manifold can be directly observed in the test interface, providing convenience for sample testing and instrument maintenance. The current state of analyzer can be intuitively understood with the indicator light and event bar.
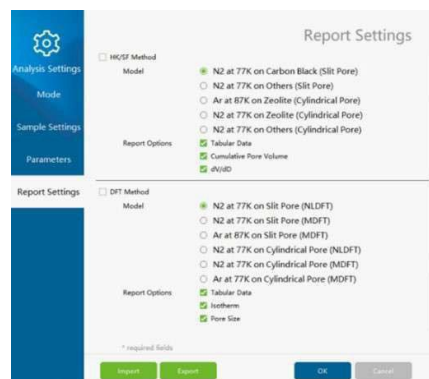
A clear and concise report setting interface, including the following:

- Adsorption and desorption isotherms
- Single-/Multipoint BET surface area
- Langmuir surface area
- STSA-surface area
- pore size distribution according to BJH
- t-plot
- Dubinin-Radushkevich
- Horvath-Kawazoe
- Saito-Foley

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TYPICAL ANALYSIS RESULTS

The specific surface area test results of iron ore powder are presented in the figure below. As a material with very small specific surface area, the repeatability error is only 0.0015 m²/g.

ID	Pd	Pcd	P/Po	V	R	Time
2	10.57665	6.49165	0.06368	0.05149	1.32095	16:39:04
3	14.47043	10.49325	0.10300	0.05714	2.00944	16:40:34
4	20.49214	15.55271	0.15266	0.06328	2.84716	16:42:08
5	26.25142	20.97835	0.20608	0.06958	3.73044	16:43:45
6	31.09524	26.11512	0.25661	0.07540	4.57787	16:45:24
7	36.24625	31.26206	0.30719	0.08122	5.45905	16:47:06

Slope	Intercept	Vm	C	Cc
16.90313	0.25562	0.05828	67.12578	0.99997

Specific surface area (m2/g) : 0.25410

ID	Pd	Pcd	P/Po	V	R	Time
2	11.12797	7.02669	0.06872	0.05193	1.42099	14:21:24
3	15.08480	11.06897	0.10834	0.05767	2.10708	14:22:55
4	21.71276	16.45800	0.16109	0.06420	2.99078	14:24:29
5	27.29098	21.94468	0.21492	0.07083	3.86529	14:26:07
6	32.00053	27.05703	0.26512	0.07653	4.71376	14:27:46
7	37.32853	32.26907	0.31619	0.08262	5.59644	14:29:28

Slope	Intercept	Vm	C	Cc
16.78425	0.27576	0.05862	61.86487	0.99996

Specific surface area (m2/g) : 0.25557

Analysis value of pore size distribution in activated carbon materials as follows:
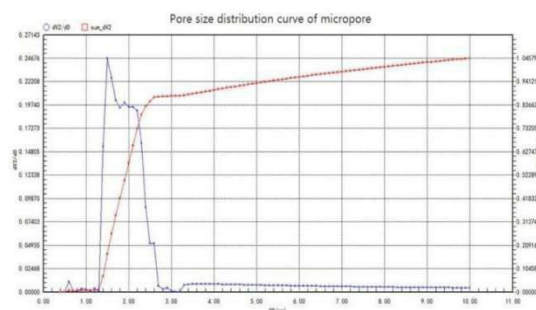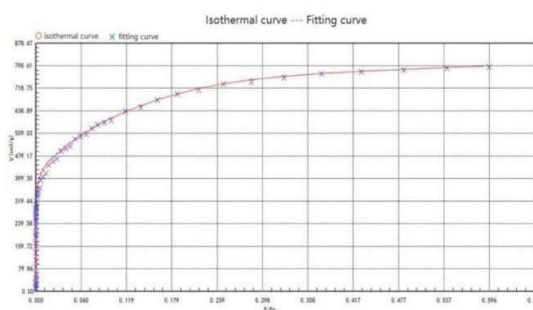
APPLICATIONS

Applied Field	Typical Materials	Details
Material Research	Ceramic powder, metal powder, nanotubes	According to surface area value of the nanotube, hydrogen storage capacity can be predicted.
Chemical Engineering	Carbon black, amorphous silica, zinc oxide, titanium dioxide	Introduction of carbon black in rubber matrix can improve mechanical properties of rubber products. Surface area of carbon black is one of the important factors affecting the reinforcement performance of rubber products.
New Energy	Lithium cobalt, lithium manganate	Increasing surface area of electrode can improve Electrochemical reaction rate and promote iron exchange in negative electrode.
Catalytic Technologies	Active alumina oxide, molecular sieve, zeolite	Active surface area and pore structure influence reaction rate.

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SPECIFICATIONS

Model	AMI-Meso 112	AMI-Meso 222
Analysis Ports	2	2
P_0 Transducer	2	2
Analysis Pressure Transducer	1	2
Accuracy PTs	1000 torr	
Pump	1 Mechanical pump (ultimate vacuum 10^{-2} Pa);	
P/P_0	10^{-4} - 0.998	
Surface Area	≥ 0.0005 m^2/g, test repeatability: RSD $\leq 1.0\%$	
Pore Size	0.35-500 nm, test repeatability: ≤ 0.2 nm	
Pore Volume	≥ 0.0001 cm^3/g	
Degassing Ports	2 in-situ	
Adsorbates	N_2, CO_2, Ar, Kr, H_2, O_2, CO, CH_4, etc.	
Cold Trap	1	
Volume and Weight	L 34.5 in (870 mm) × W 22.5 in (570 mm) × H 35.0 in (890 mm), 188 lbs (85 kg)	
Power Requirements	110 or 200-240 VAC, 50/60 Hz, maximum power 300 W	

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