ALTAMIRA INSTRUMENTS

BET Surface Area and Pore Size Analyzer

AMI MESO Series

Outline

The AMI MESO Series can accurately measure surface area and pore size of powder materials. There are three types of instruments in the AMI MESO series: Meso 112, Meso 222, and Meso 400. They are configured with a 1000torr pressure sensor at each station, which can be used for BET specific surface analysis and mesopore pore size distribution.
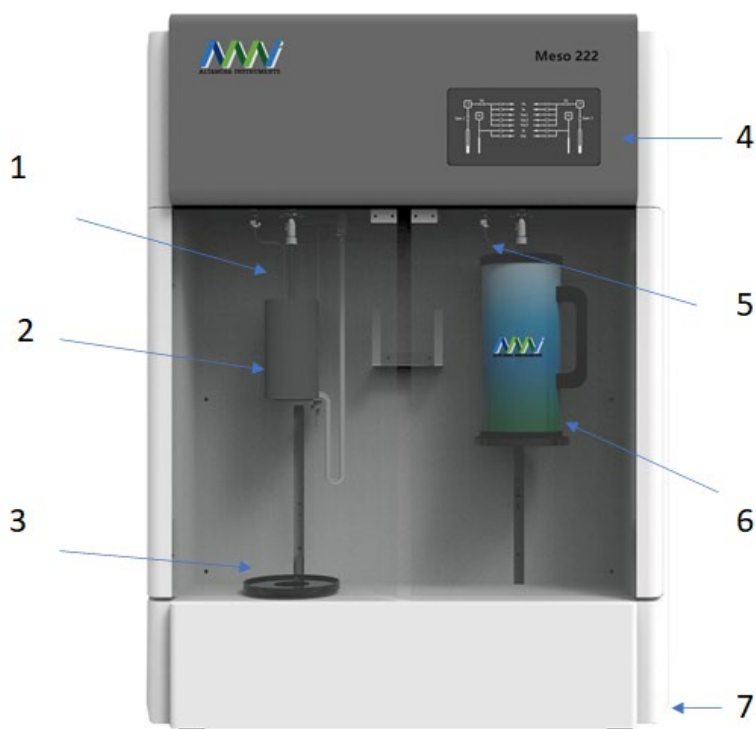
1	Sample tube	5	P0
2	Heating mantle	6	Dewar flask
3	Tray for Dewar	7	Power
4	Indicator		

Features

Test Module

Internal temperature can be controlled through Real-time monitoring, ensuring the highest accuracy.

Saturated Vapor Pressure P_0

Using an independent P_0 pressure sensor guarantees the reliability of the experimental data. The atmospheric pressure input method to determine P_0 also be used.

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

Vacuum System

The MESO systems have a multi-channel, adjustable, and parallel vacuum system that can be controlled in segments.

This design prevents the sample from being pumped into analyzer.

Sample Preparation System

For the MESO 222, there are two dedicated pretreatment stations. In addition, the two analysis stations can be used in preparing samples. There is no interference between pretreatment stations and analysis stations.

Degas temperature can be individually set and controlled from ambient to 400 °C.

Pressure Sensor

Configured with 1000 torr pressure sensors, as shown in the picture below.

Cold Free Space

Cold free space can be corrected by Helium automatically, ensuring accuracy of test results.

This calibration method is suitable for testing of any powder or particle material.

Control of Liquid Nitrogen level

Using 1L Dewars with supplied cover, there is a constant thermal profile along the length of sample and P_0 tubes during testing process.

PAS Control and Analysis Software

The PAS Software is for operation control, data acquisition, calculation and analysis and report generation on the Windows platform. This software can communicate with the host through the Ethernet communications and also control several instruments at the same time.

Clear tabular reports include:

- Adsorption and desorption isotherms
- Single-/Multipoint BET surface area
- Langmuir surface area
- STSA-surface area
- pore size distribution according to BJH
- t-plot

PAS Software adopts a unique doing control method, the pressure in adsorption and desorption process is optimally set in six-stages.
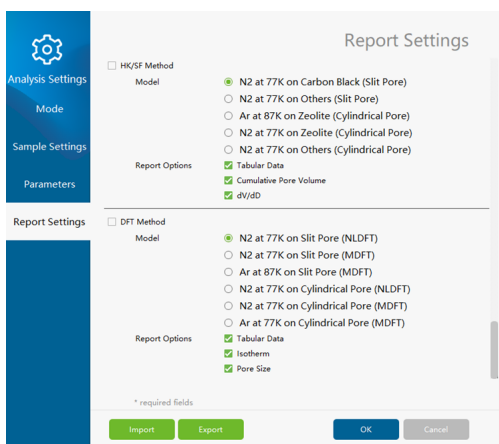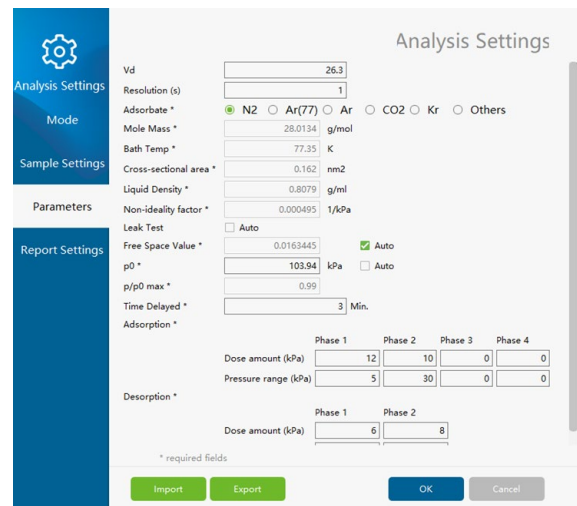
Changes of the pressure and temperature inside the manifold can be observed directly in the test interface.

Current state of analyzer can be observed with the indicator on the front panel and the event status-bar.
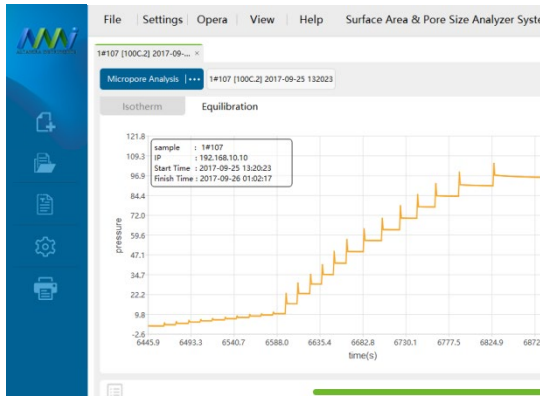
Each adsorption equilibrium process is dynamically displayed on the software interface. Adsorption characteristics of the sample can be easily understood.

Typical analysis examples

BET repeatability is only 0.0015 m² / g in the test of very low surface area powder

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:

Isothermal curve --- Fitting curve

Pore size distribution curve of micropore
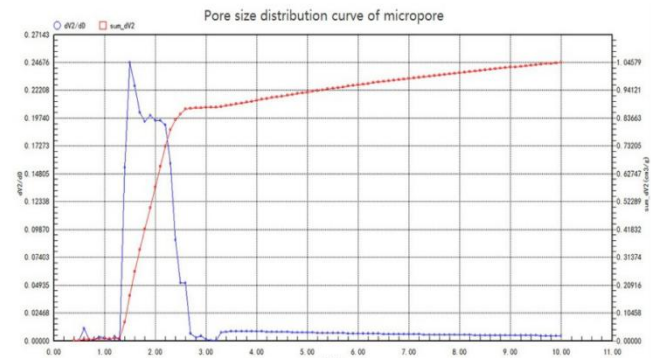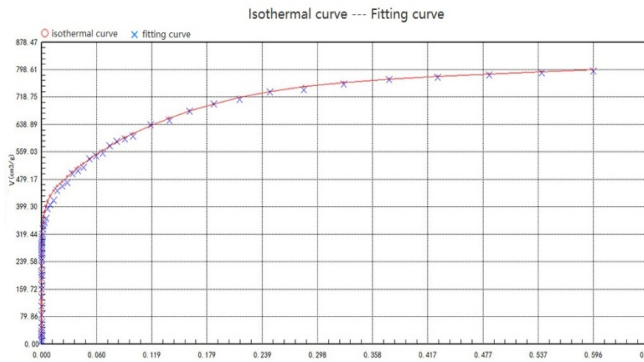
Specifications

Type	Meso 112	Meso 222	Meso 400
Adsorbed Gas	Non corrosive gases, such as N_2, Ar, Kr, H_2, O_2, CO_2, CO, NH_3, CH_4, etc.		
Pressure Sensor at Analysis Station	1000 torr, 1	1000 torr, 2	1000 torr, 4
	Accuracy: ±0.15% (F.S.)		
Degas System	Samples at 2 stations can be pretreated simultaneously under vacuum with heating.		Samples at 4 stations can be pretreated simultaneously under vacuum with heating.
Degas Temperature	Ambient to 400 °C. Free to pick set-point		
Vacuum Pump	Two-stage mechanical vacuum pump, the ultimate vacuum is $6.7*10^{-2}$ Pa		
Analysis Port	Samples on the 2 analysis bits can be tested alternately.	2 sample tube analysis ports, Parallel test at the same time.	2 sample tube analysis ports, Parallel test at the same time.
Test Principle	Gas adsorption by static-volumetric analysis		
Measurement Range of Specific Surface Area	0.0005 m^2/g to the infinity; Standard sample repetition is less than ± 1.0%.		
Test Range of Pore Diameter	0.35 nm-500 nm; pore repeated deviation is less than 0.2 nm in the accurate analysis of porous materials with pore greater than 2 nm		
Minimum Pore Volume	0.0001 cm^3/g		
Range of Relative Pressure P/P_0	10^{-4}-0.998		
Overall Dimension	30'' x 20'' x 37'' (L x D x H); weight:165lbs		
Ambient Temperature	15-40 °C		
Related Humidity	30%-60%		
Electrical Supply	110-220 VAC ± 20 V, 50/60 HZ, maximum power 300W;		

Applications

Field	Typical Materials
Material Research	ceramic powder, metal powder, nanotube
Chemical Engineering	carbon black, amorphous silica, zinc oxide, titanium dioxide
Energy	lithium cobalt, lithium manganate
Catalytic Technologies	active alumina oxide, molecular sieve, zeolite

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