

Dynamic Nitrogen Adsorption BET Surface Area Analyzer

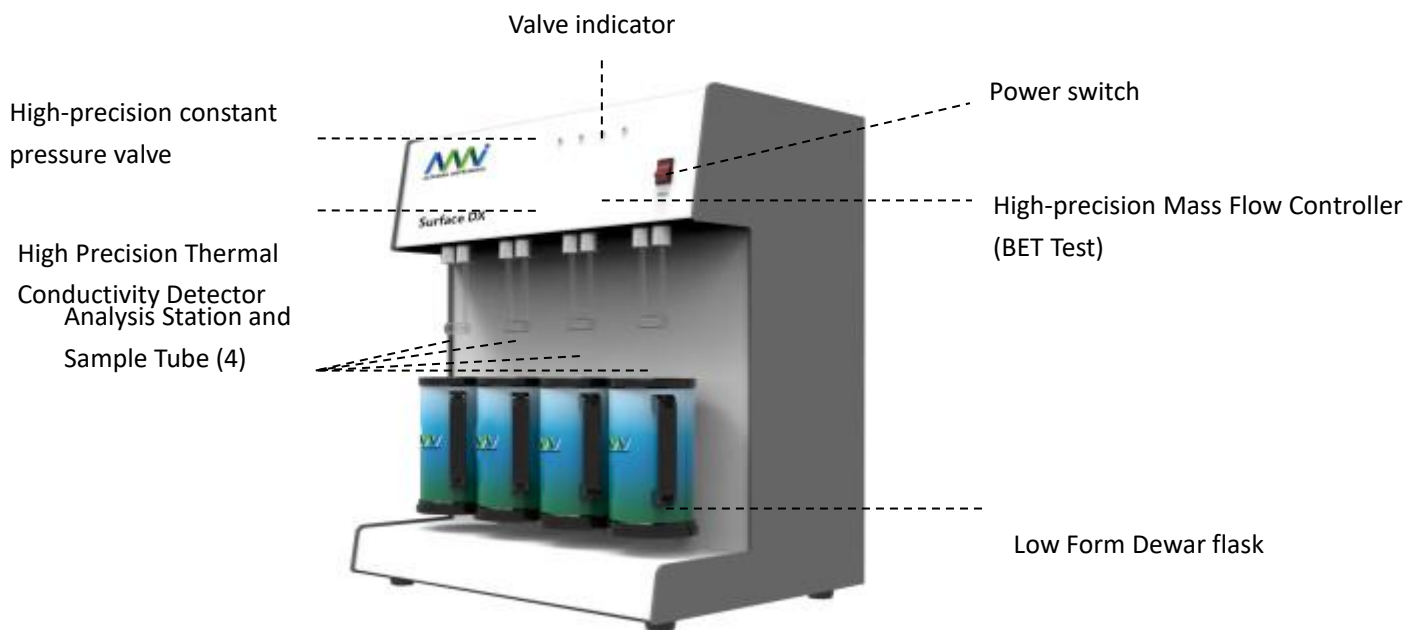
AMI Surface DX



- Single-/Multipoint BET measurements
- Four Parallel Operating Analysis Stations
- Dynamic Adsorption Measurements
- Automatic Determination of Equilibrium
- Material Research
- Chemical Engineering
- New Energy
- Catalytic Technologies

Outline

Surface DX is a fully automated gas sorption analyzer with four parallel operating analysis stations for rapid BET surface area determination. The analyzer operates without a vacuum system but works with the dynamic principle (flow method). Both Single point-BET and Multipoint-BET measurements can be carried out reliably and in very short times suitable for production and quality control. Use of reference comparison methods keeps the detection time of adsorption peaks extremely short.



Structural distribution diagram of Surface DX

Features

Experimental report comes from the detection of adsorption peaks. Using this method could avoid test deviation caused by the incomplete desorption of samples. It's suitable for measurements of low surface area materials, such as ternary materials, positive electrode, and negative electrode

Sample Preparation Device

It's optional. External sample preparation device with four-degas stations can remove adsorbed contaminants from surface and pores of samples with heating in flowing gas/vacuum. Temperature can be set and controlled from ambient to 400 °C.

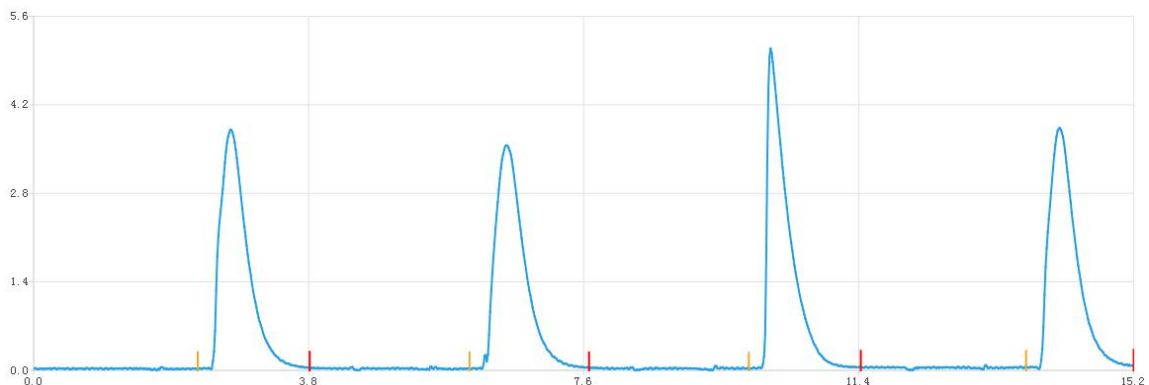
Low Form Dewar flask

Long-life and high volume (1L) Dewar flasks assure a constant thermal profile along the length of sample tubes during experiment.



Adsorption Peak

Adsorption peak looks sharp, no trailing phenomenon, the change of nitrogen concentration caused by each sample adsorption is not diluted at all; the sensitivity of the sample test is greatly improved. The test efficiency is greatly improved under the condition of sufficient adsorption and the comparative test of four samples in one time only needs about 15 minutes.



Anti-pollution Technique

A built-in anti-pollution unit is used to Prevents samples from being blown into the instrument pipeline, ensuring cleanliness of instrument.

Nitrogen Partial Pressure Automatic

Using a 70ml/min and 30ml/min precision mass flow controllers to automatically adjust the partial pressure of nitrogen in BET surface area test.

The stability and accuracy of the flow of gas passing through the sample surface could be ensured.

Calibration System

Using electromagnetic valve to automatically control calibration system which is advanced and broken the traditional six-line valve control limitations.

Analysis Station

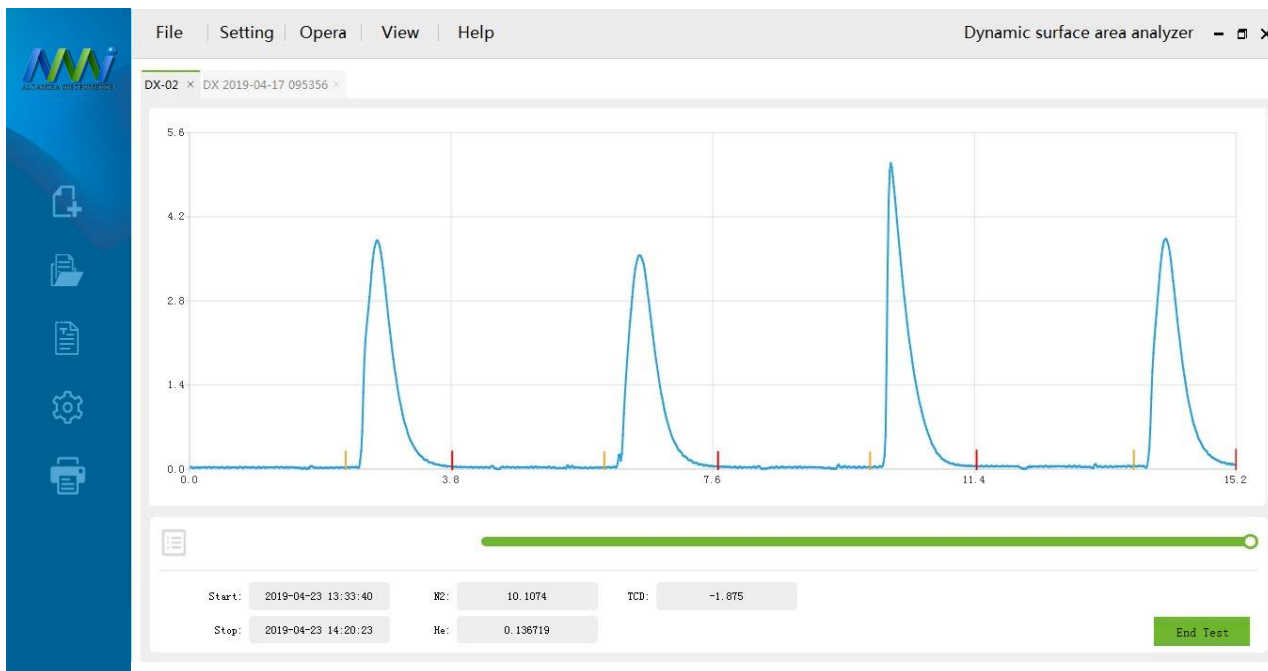
All analysis ports (4) can be controlled individually achieving high efficiency and ensuring the parallelism of test results. The repeatability of test results is better than $\pm 1.0\%$.

Convenient Operation and User-friendly Design

Operation of Surface DX:

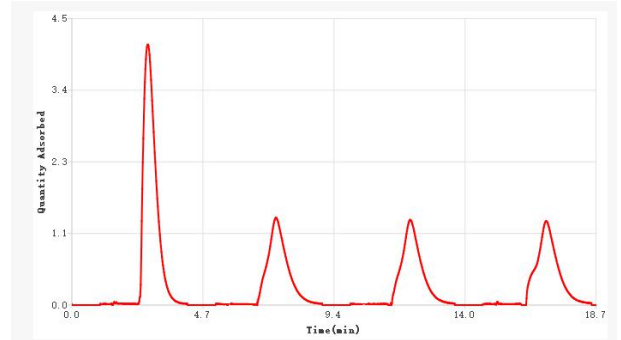
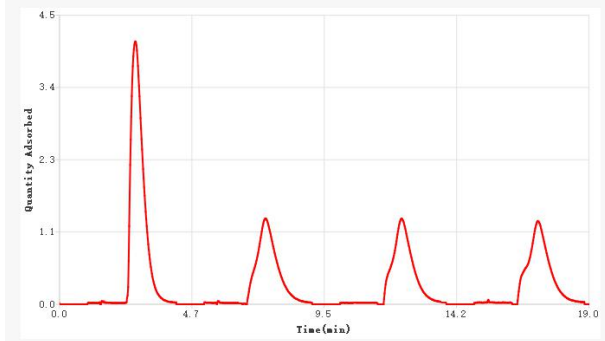
Adsorption process is dynamically displayed on test interface. It's easy to monitor the flow of nitrogen and helium real time which is convenient to learn about whole process.

External sample preparation devices equip miniature vacuum pump and heating furnace; ambient temperature of furnace is in the range of $400 \pm 1^\circ\text{C}$. Transferring sample after degassing from furnace to analyzer, users can start test.



Specific examples

Test of small specific surface area samples



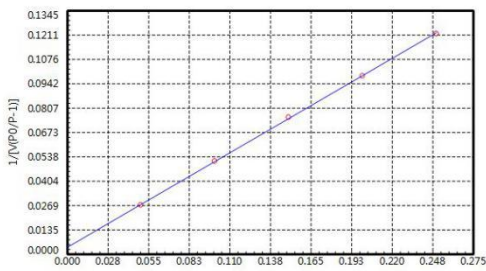
Number	Sample	Mass (g)	Peak Area	Surface Area(m2/g)
1	Reference	1.0442	858692	9.100
2	NC-H3M#031	3.9968	440288	1.219
3	NC-H3M#046	3.8427	422557	1.217
4	NC-H3M#049	4.0343	450965	1.237

Number	Sample	Mass (g)	Peak Area	Surface Area(m2/g)
1	Reference	1.0213	836140	9.100
2	NC-H3M#031	3.9968	437848	1.218
3	NC-H3M#046	3.8427	419070	1.212
4	NC-H3M#049	4.0343	436612	1.203

Multi-Points BET

BET Surface Area: 9.13864 m2/g
 Slope: 0.47263
 Y-Intercept: 0.00446 cm3/g STP
 Vm: 2.09502 cm3/g STP
 C: 106.89248
 Correlation Coefficient (Cc): 0.99992

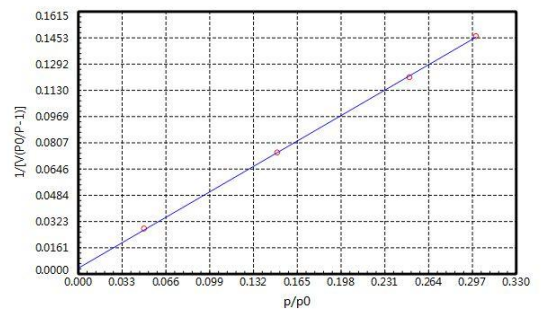
BET Surface Area Plot



ID	p/p0	V(cm3/g STP)	1/[V(P0/P-1)]
1	0.05000	1.90429	0.02764
2	0.10000	2.14198	0.05187
3	0.15000	2.31909	0.07609
4	0.20000	2.52773	0.09890
5	0.25000	2.72596	0.12228

BET Surface Area: 9.14797 m2/g
 Slope: 0.47243
 Y-Intercept: 0.00418 cm3/g STP
 Vm: 2.09816 cm3/g STP
 C: 114.10706
 Correlation Coefficient (Cc): 0.99988

BET Surface Area Plot



ID	p/p0	V(cm3/g STP)	1/[V(P0/P-1)]
1	0.05000	1.87720	0.02804
2	0.15000	2.35269	0.07501
3	0.25000	2.75046	0.12119
4	0.30000	2.91954	0.14679

Specification

Type	Surface DX	Surface DA
Test principle	Low temperature nitrogen adsorption, dynamic method	
Distinction	Adventurous adsorption technique	Traditional desorption technique
	Recording adsorption data, same as static volumetric method. Separate analysis stations are suitable for testing sample with low surface area (< 10 m ² /g).	Recording desorption data, analysis stations are not mutual independence but parallel. It is not suitable for accurately measure sample with low surface area (less than 10 m ² /g) illustrated by gentle peak.
Test Method	Reference method; Single point BET; Multi-point BET.	Reference method; Single point BET; Multi-point BET.
Adsorbate and Carrier Gas	High purity nitrogen (99.999%); High purity helium (99.999%).	
Range of P/P ₀	0.05~0.3	
Range of BET Surface Area	0.01 m ² /g to the infinity; (It is not suitable for detecting micropore materials).	
Repeatability	Typically better than ± 1.0% (carbon black)	Typically better than ± 1.5% (carbon black)
Analysis Stations	4	4
Efficiency	5 min per sample (reference method); 25 min per sample (multi-point BET)	9 min per sample (reference method); 30 min per sample (multi-point BET)
Overall Dimension	Depth: 610 mm; Width: 460 mm; Height: 680 mm; Weight: 48 kg.	
Ambient Temperature	15-40 °C	
Relative Humidity	30%-60%	
Electrical Supply	AC220V±20V, 50-60 Hz, maximum power300 W;	

Applications

Applied Field	Typical Materials	Details
Material Research	ceramic powder, metal powder, nanotube	According to surface area value of nanotube, hydrogen storage capacity can be predicted.
Chemical Engineering	carbon black, amorphous silica, zinc oxide, titanium dioxide	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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