

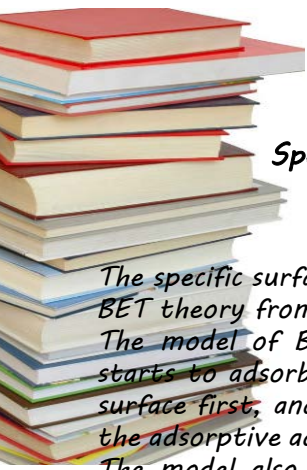
V-Sorb 2800S™

**BET and Langmuir
Surface Area Analyzer**



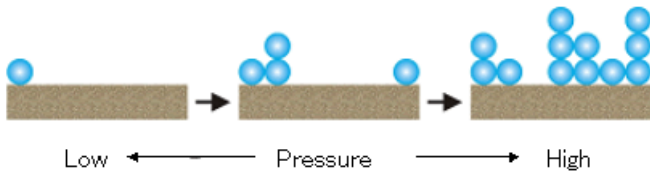
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**GOOD APPLICANTS
STRENGTHS**



Specific Surface Area (SSA) Is?

The specific surface area is usually calculated by using BET theory from the gas adsorption isotherm data. The model of BET theory is that the adsorptive starts to adsorb on the strong energy sites on the surface first, and then, as the pressure is increased, the adsorptive adsorbs on the next energy level sites. The model also takes account of the 2nd, 3rd and higher layer adsorption.



This BET theory for multi-layer adsorption is the expansion of Langmuir equation, which is for the single layer adsorption:

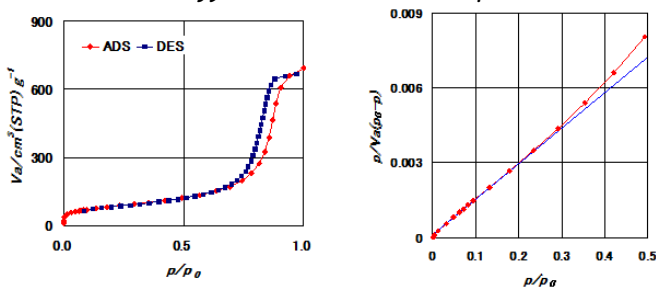
$$\frac{P}{V(P^0 - P)} = \frac{1}{CV_m} + \frac{C-1}{CV_m} \cdot \frac{P}{P^0}$$

$$C = e^{(q_1 - q_2)/RT} \quad (C: \text{constant})$$

V_m : monolayer adsorption amount

V : adsorption amount at the equilibrium pressure P

This theory well fits to type II and IV isotherms at the relative pressure between 0.05 and 0.35. The monolayer adsorption amount (V_m) and C parameter are calculated from the slope and intercept of BET-plot by using the least square fitting. C parameter represents the surface interaction energy, so it must take a positive value.



The specific surface area is calculated from this V_m and cross sectional area (σ).

$$S_{BET} = \frac{V_m}{22414} \cdot 6.02 \times 10^{23} \cdot \sigma \cdot 10^{-18}$$



2 sample degassing and 2 sample analyzing simultaneously

[V-Sorb 2800S](#) is researched and developed by Gold APP Instruments for single and multi-point BET surface area, also with Langmuir surface area and others related with SSA by using static volumetric principle.

Compared with other companies' analyzers, multi pioneered techs make it's performance much better, heighten accuracy and consistence of results, enhance measurement stability, all these lead to a leading level in international competitors. Products designed from the user perspective and equipped with fully automated operation system, a user-friendly interface makes it easy to learn, imported accessories assure stability and prolong life. Perfect design, sophisticated production and strict testing guarantee to meet customers' real demands. High cost performance of V-Sorb 2800S easily ensure your investment profits and flexible equipped peripheral can satisfy different users' requests.

Parameter

Analysis Method: static volumetric nitrogen adsorption principle

Versatility: Adsorption and desorption isotherms, Single and multi-point BET surface area, Average particle diameter estimation, t-plot external surface area, True density analysis, Langmuir surface area, carbon black (STSA), adsorption constant C

Measuring Ranges: 0.01m²/g to no known upper limit (surface area)

Accuracy: repeatability errors ≤1%

Vacuum System: V-Sorb unique monolithic manifolds and solenoid valve control system, greatly reduce the dead volume; improve the adsorbate micro-change sensitivity; enhance pore size distribution analysis resolution; decrease connecting points; strengthen sealing performance and prolonged instrument life

Coolant Level Prober: V-Sorb original coolant level control system with temperature probe, ensure the coolant level unchanged when compares with sample cells in the whole analysis process, completely eliminate the analysis errors caused by dead volume change

Sample Treatment: the whole treatment procedures are controlled by dedicated software, as well with a start time preset function which can realize unattended operation at night

Control System: programmable solenoid valve system with high integration and strong anti-interference ability, enhance instrument's stability and life

Sample Ports: two samples' analyzing and two samples' degassing concurrently

Pressure Measurement: imported sectional measuring dual pressure transducer, notably improve the measuring accuracy at low P/P₀ point, 0-1000Torr (0-133Kpa), 0-10Torr (0-1.33Kpa)

Transducer Accuracy: imported silicon thin film pressure transducer, accuracy can reach 0.1% of real reading, better than 0.1% of F.S.(full-scale), far accurate than Pirani resistance vacuum gauge(general error is 10%-15%)

Partial Pressure: P/P₀ controllable accuracy range is 5x10⁻⁶-0.998

Ultimate Vacuum: 4x10⁻²Pa (3x10⁻⁴ Torr)

Vacuum Pump: built-in bipolar vacuum pump controlled by patented software which can auto control pump's start/stop

Sample Types: powders, particle, fiber, flakes and other materials

Adsorbate Gas: high purity nitrogen (≥99.999%), Ar, Kr, CO, CO₂, C₄H₁₀ etc. non-corrosive gases are optional

Data Acquisition: high-precision and high integration data acquisition modules, minimal error, strong anti-interference ability

Data Reduction: Windows[®]-based independent developed Gold APP software[™], perfect versatility, produced full featured and multi-model reports



Advantage

A: Vacuum System

1. Unique **integral manifolds system**, decrease connecting points apparently, reduce leak rate, improve ultimate vacuum.
2. Modularity design can configure as customer requests, benefits future functions extension and instrument maintenance.
3. **Germany imported bipolar vacuum pump**, low noise, stable working, oil-return prevention; ultimate vacuum can reach $4 \times 10^{-2} \text{Pa}$ ($3 \times 10^{-4} \text{Torr}$).

B. Measures for Improving Accuracy

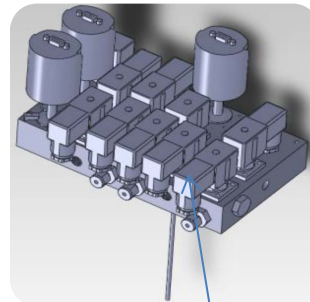
1. **Imported silicon thin film capacitive pressure transducer**, accuracy can reach 0.1% of real reading, better than 0.1% of F.S. (full-scale).
2. 0-10Torr (optional) and 0-1000Torr dual pressure transducers, sectional measurement in pressure range can reduce errors in low vacuum, 0-10Torr silicon thin film transducer is highly accurate than Pirani resistance vacuum gauge (general error is 10%-15%).
3. Unique **monolithic manifolds system**, decrease connecting points and reduce leak rate apparently.
4. Original **stepping coolant level control system**, ensure the coolant level unchanged when compares with sample cells in the whole analysis process, completely eliminate the analysis errors caused by dead volume change.
5. **Pioneered gas outlet and inlet control system** can efficiently prevent sample splash in evacuation and gas inlet process, guarantee clean manifolds and sample weight unchanged, avoid zero and liner drifting caused by transducer's macro-change.

C: Control System

1. Industry used programmable solenoid valve system, strong anti-interference ability, convenient for installation and uninstallation.
2. **Separated analysis and treatment manifolds** can prevent foreign matter to contaminate manifolds in sample treatment.

D. Data Acquisition and Reduction

1. High precision and integration data acquisition module is easy to connect, minimal errors and strong anti-interference ability; standard 485 communication mode is good for analyzer's applications extension and interconnection, can also conveniently switched to RS232 and USB modes.
2. **Multi calculating methods** for data reduction provides all-round sample analysis options; powerful data archiving and searching system helps a lot for data management.



Monolithic Installation Design System Sketch



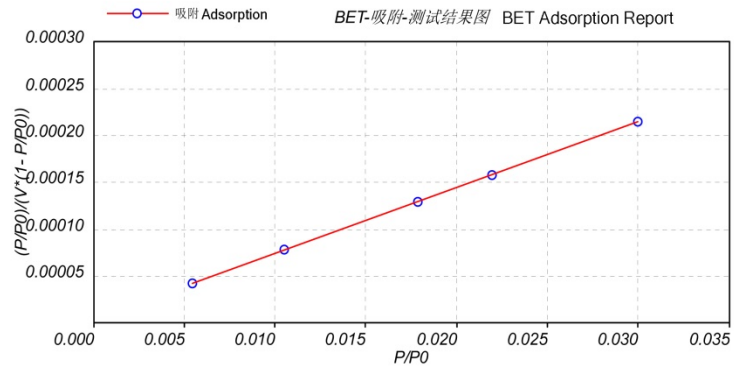
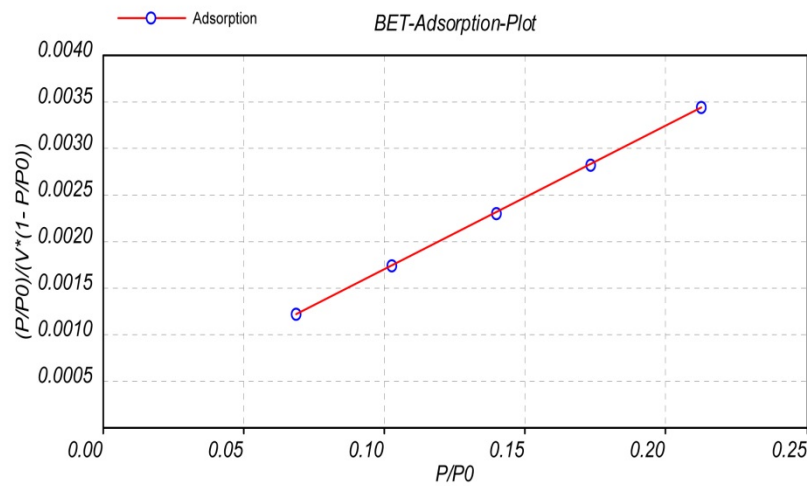
CE Approved Solenoid Valve



CE Approved Data Acquisition Module

Application

activated carbon, silica gel, active alumina oxide, molecular sieve, sepiolite, zeolite, alumina oxide, silicates, quartz, silicon carbide, lithium cobalt oxide, lithium manganese oxide, black lead, lithium nickel and cobalt, cobaltous oxide, lithium iron phosphate, lithium titanate, polymer, corrosion resister, silica, nano-calcium carbonate, zinc oxide, magnesium oxide, barium oxide, iron oxide, copper oxide, ferroferric oxide, ferrite, silver/iron/copper/ tungsten/nickel/aluminate powder, filler, inorganic filler, calcium carbonate, silica, deposited matter, suspended matter, titanium dioxide, rare earth, coal, cement, energy storage materials, catalyst, diatomaceous earth, cleansing agent, filter aid, superfine fiber, porous fabric, composite material, methane, coalbed gas etc.



BET Tabular Report

P/P0	Quantity Adsorbed(ml/g)	(P/P0)/(V*(1-P/P0))	Single point BET
0.212640	78.748516	0.003429	269.838919
0.173075	74.458462	0.002811	267.959350
0.139828	70.747012	0.002298	264.839130
0.102791	66.303545	0.001728	258.892483
0.068951	61.572219	0.001203	249.485947
Slope	Intercept	Vm(ml)	C Value
0.015480	0.000135	64.039758	115.728390
R	Multi-BET Area	Langmuir Area	
0.999996	278.731520	382.076160	

V-Sorb 2800S software can produce a completely reports for surface area, including single and multi-point BET, Langmuir surface area and so on with a detailed and comprehensive analysis data. Operators can read every P/Po point adsorbed quantity, the slope/ intercept/C value etc.

Test Report

Sr. No.		Parts	Qty.
1	Manufacturer Supplied	V-Sorb 2800S Analyzer	1 set
		Pressure Transducer 0-1000 Torr	2 sets
2		Rubber O-rings for Sample Cells Sealing	10
3		Spherical Sample Cells	10
4		V-shape Sample Funnel	10
5		Reference Material(big)	10 g
6		Reference Material(medium)	10 g
7		Reference Material(small)	10 g
		Po cell	2
8		Stainless Steel Pipe	1 m
9		10L Liquid Nitrogen Storage Dewar	1
10		Analysis Dewar	2
11		Fuse	2
12		Power Line	1
13		Data Cable	1
14		Protective Gloves	1 pair
15		User Manual (English)	1 copy
16		Software CD (English)	1
17		Po Cell	4
18		Filling Rod	5
19		Sample Cell Cleaning Brush	1
20	Funnel Cleaning Brush	1	
21	Sample Weighting Cup	1	
22	Customer Prepared	Computer (Window® 2000/2007/XP/Vista)	1 set
23		Printer	1 set
24		Gas regulator	2 set
25		40L He Gas (Purity 99.999%)	1 pot
26		40L N2 Gas (Purity 99.999%)	1 pot

Gas Flow Nitrogen Sorption Analyzers
[F-Sorb X400CE Series](#)

Gas Pycnometer True Density Analyzers
[G-DenPyc X900 Series](#)

Static Volumetric Analyzers
[V-Sorb X800 Series](#)

High Pressure Gas Sorption Analyzers
[H-Sorb X600 Series](#)

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