V-Sorb 2800P™

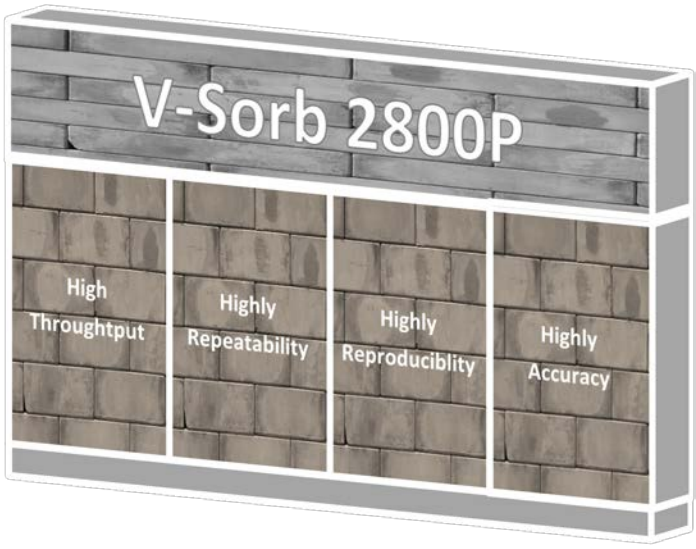
Surface Area and Micropore Analysis System

Gold APP Instruments China

Lead You to Particle World Better

Two Stations Analyzer

For BET\Langmuir\BJH\t-plot\HK\SF\DA\DR...



Vacuum System

- Unique *monolithic manifolds* system, decrease connecting points apparently, reduce leak rate, improve ultimate vacuum.
- *Modularity design* can configure as customer requests, benefits future functions extension and instrument maintenance.
- Atlas Copco brand *bipolar vacuum pump*, low noise, stable working, avoid oil-returning; ultimate vacuum can reach $4x10^{-2}$Pa ($3x10^{-4}$Torr).

Programmable Japan Pneumatic Valves

Inficon Brand Pressure Transducer

Guaranteed Data

Accuracy

- Imported silicon thin film *capacitive pressure transducer,* accuracy can reach 0.1% of real reading, better than 0.1% of F.S. (full-scale). Pressure resolution is 0.016 mmHg.
- 0-1Torr and 0-1000Torr dual transducers, sectional measurement in pressure range can reduce errors in low vacuum, *0-1Torr 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 prober 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.

Control System

- Industry used *programmable pneumatic valve system*, strong anti-interference ability, convenient for installation and uninstallation.
- Separated analysis and pretreatment manifolds can prevent foreign matters to contaminate manifolds in sample pretreatment.

316L VCR Stainless Steel Manifolds

Application Fields

Battery: with the development of industrial technology, energy becomes the focus of social problems. Non-renewable energy sources' exhaustion and environment pollution force human to explore new and alternative energy. Battery, especially the energy storage battery, is favored by people for its low-pollution and renewable and hopefully to be the alternative energy in future, obtains a bright and broad development prospect. Storage materials, the critical parts in battery, must have a qualified surface area performance, too big or too small surface area will greatly affects battery performance and hence surface area proves to be the most crucial physical index.

Catalysts have been employed in chemical industries for many years and their performance became more and more powerful. The active surface area and porous structures of catalysts have a strong influence on production rates. Big surface area and porous are two obvious features for catalysts, what is more important is these two also can increase the contact area for catalysts and reactive materials to improve - catalytic efficiency. Thus, specific surface area and pore volume are determined indexes to judge whether catalysts are qualified or not.

Carbon black reinforcement is widely used in rubber industry as one very mature technology. Many alternatives, such as carbon-white, have been explored to replace carbon black in recent years. Study approved that reinforcing filler's external surface area, exclusive of micropore, has great influence on reinforcement performance in carbon black reinforcement techniques, therefore, it needs to analysis the external surface area of reinforcement in carbon black industry.

Cement plays a role as binder and the binding performance has closely relation with its specific surface area. Blaine method had been used for former cement specific surface area analyzing, but this method brought bigger measure errors which can not meet nowadays high quality demands for modern buildings. The use of higher precision gas sorption method is an irresistible trend to determine cement specific surface area.

Zeolites are natural or synthetic crystalline aluminosilicates which have a repeating pore network and release water at high temperature. Zeolites are polar in nature.

They are manufactured by hydrothermal synthesis of sodium aluminosilicate or another silica source in an autoclave followed by ion exchange with certain cations (Na+, Li+, Ca2+, K+, NH4+). The channel diameter of zeolite cages usually ranges from 2 to 9 Å (200 to 900 pm). The ion exchange process is followed by drying of the crystals, which can be pelletized with a binder to form macroporous pellets.

Painting and coatings, in many cases, are applied to improve surface properties of the substrate, such as appearance, adhesion, wetability, corrosion resistance, wear resistance, and scratch resistance. Pigment of filler's surface area and porosity are key factors for them. In other cases, in particular in printing processes and semiconductor device fabrication, the coating forms an essential part of the finished product.

- V-Sorb 2800P system adopts static volumetric nitrogen adsorption method to determine:

- Single and multi-point BET (Brunauer, Emmett, and Teller) surface area and Langmuir surface area
- 0.01m^2/g to no upper limit(Nitrogen), 0.005 m^2/g (Krypton)—surface area
- Pore volume and pore size distributions (0.35-500nm) by the BJH (Barrett, Joyner, and Halenda) method
- User defined pore volume and total pore volume in a pore size range
- True density analysis
- Micropore distribution by the HK and SF method
- Total micropore volume by the t-Plot
- Adsorption & desorption isothermal curve
- Average particle diameter estimation
- T-plot method external surface area analysis
- Dubinin-Radushkevich (D-R)
- Dubinin-Astakhov (D-A)

- Repeatability errors ≤1%
- V-Sorb original coolant level control system with temp. 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

- Gas Calibration: Can choose He (99.999%) to calibrate the cold volume
- The whole pretreatment procedures are controlled by dedicated software, as well with a start time delay function which can realize unattended operation at night
- Two samples' analyzing and two samples' degassing concurrently
- P/Po controllable accuracy range is $5x10^{-6}$-0.998
- Ultimate Vacuum is $4x10^{-2}$Pa ($3x10^{-4}$Torr)

- Built-in Atlas Copco brand bipolar vacuum pump controlled by patented software which can auto control pump's start/stop
- Using high purity nitrogen (≥99.999%) and other non-corrosive gases (Ar, CO_2, H_2, CO etc.)
- Can be upgrade to higher level models: V-Sorb 2800TP (equip with turbo molecular vacuum pump), V-Sorb 4800P (4 stations), V-Sorb 4800TP (4 stations with turbo molecular vacuum pump)

Windows® Based V-Sorb™ Software

High precision and integration data acquisition module is easy to connect, minimal errors and strong anti-interference ability;

Standard RJ45 communication mode is good for analyzer's applications extension and interconnection, can also conveniently switched to RS232 and USB modes.

Multi calculating methods for data reduction provides all-round sample analysis options

Powerful data archiving and searching system helps a lot for data management.

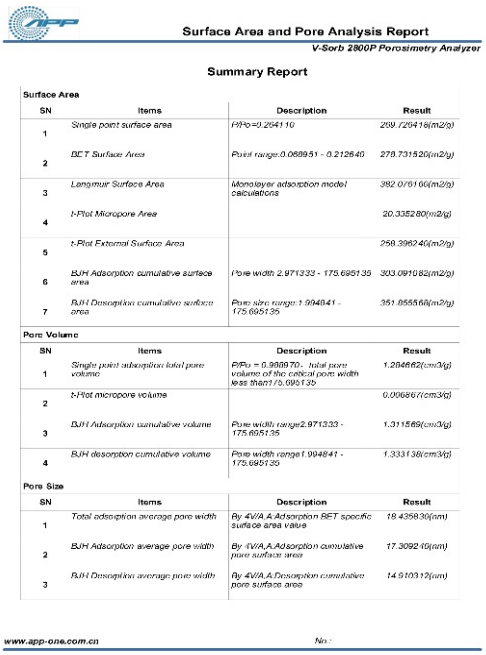
One computer can control more than 10 Gold APP Instruments analyzers, save valuable lab space.

The whole analysis process can be monitored by PC.

Analysis log is available for data analysis and breakdown analysis.

PDF, Excel etc. formats reports are supportable for printing and liner processing.

Capable of degassing samples by setting delay time. This function is especially useful for busy labs at night operation.



Surface Area and Pore Analysis Report

V-Sorb 2800P Porosimetry Analyzer

Summary Report

Surface Area

SN	Items	Description	Result
1	Single point surface area	P/P0=0.264110	269.729418(m2/g)
2	BET Surface Area	Point range:0.068951 - 0.212640	278.731520(m2/g)
3	Langmuir Surface Area	Monolayer adsorption model calculations	382.076160(m2/g)
4	t-Plot Micropore Area		20.335280(m2/g)
5	t-Plot External Surface Area		258.396240(m2/g)
6	BJH Adsorption cumulative surface area	Pore width 2.971333 - 175.695135	303.091082(m2/g)
7	BJH Desorption cumulative surface area	Pore size range:1.994841 - 175.695135	351.855566(m2/g)

Pore Volume

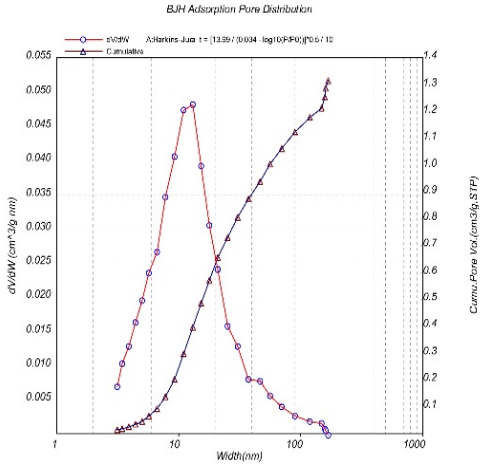
SN	Items	Description	Result
1	Single point adsorption total pore volume	P/P0 = 0.988970, total pore volume of the cellcal pore width less than175.695135	1.284662(cm3/g)
2	t-Plot micropore volume		0.006867(cm3/g)
3	BJH Adsorption cumulative volume	Pore width range2.971333 - 175.695135	1.311569(cm3/g)
4	BJH desorption cumulative volume	Pore width range1.994841 - 175.695135	1.333138(cm3/g)

Pore Size

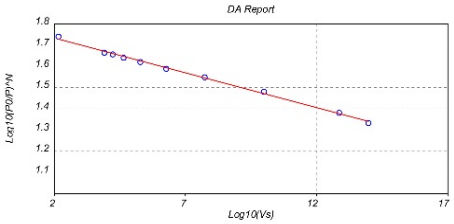
SN	Items	Description	Result
1	Total adsorption average pore width	By 4V/A,A:Adsorption BET specific surface area value	18.435830(nm)
2	BJH Adsorption average pore width	By 4V/A,A:Adsorption cumulative pore surface area	17.309240(nm)
3	BJH Desorption average pore width	By 4V/A,A:Desorption cumulative pore surface area	14.910312(nm)

www.app-one.com.cn No.:

Manufacturer: APP Instrument V-Sorb 2800P Porosimetry Analyzer Support: (8610)88498158



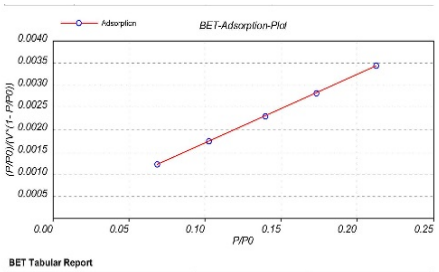
BJH Adsorption Pore Distribution



DA Report

BJH Adsorption Pore Distribution Report

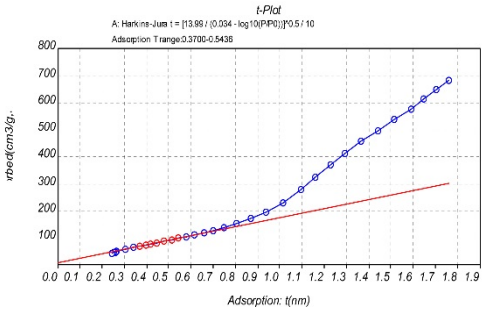
P/P0	Pore range(nm)	Average width(nm)	Incre. Pore Vol.(ml/g)	Cumu.Pore Vol.(cm3/g,STP)	Incre. Pore Surf.(m2/g)	Cumu. Pore Surf.(m2/g)	Adsorbed (cm3/g,STP)
0.988970	175.7 - 175.7	175.7	0.005053	1.311569	0.120095	303.091082	830.528648
0.987412	175.7 - 154.3	165.0	0.005048	1.286148	0.124409	302.471087	814.846430
0.987127	154.3 - 150.9	152.6	0.008296	1.251726	0.209560	301.623113	791.590379
0.985805	150.9 - 137.1	144.0	0.034239	1.212147	0.914078	300.612715	751.299484
0.980811	137.1 - 102.0	119.6	0.056883	1.177908	1.906432	299.698637	716.862821
0.974826	102.0 - 78.3	90.2	0.059065	1.120925	2.620303	297.792205	681.753932
0.968158	78.3 - 62.3	70.3	0.060553	1.061859	3.444879	295.171902	646.368236
0.960676	62.3 - 50.8	56.6	0.063090	1.001306	4.460635	291.727222	610.130500
0.952206	50.8 - 42.1	46.5	0.066075	0.938216	5.687963	287.266587	572.833108
0.939515	42.1 - 33.6	37.8	0.067187	0.872140	7.100746	281.578624	535.478022
0.926111	33.6 - 27.7	30.7	0.074420	0.804953	9.711545	274.477879	495.152613
0.909599	27.7 - 22.9	25.3	0.076189	0.730533	12.052700	264.766334	454.593532
0.892236	22.9 - 19.3	21.1	0.084738	0.654344	16.079650	252.713634	410.714297
0.873051	19.3 - 16.5	17.9	0.085589	0.569606	19.123053	236.633984	367.202888
0.851327	16.5 - 14.2	15.3	0.091017	0.484016	23.746707	217.510931	321.831727
0.825981	14.2 - 12.2	13.2	0.096412	0.393000	29.299485	193.764224	274.569145
0.790069	12.2 - 10.1	11.1	0.096543	0.296588	34.671480	164.464739	226.747389
0.749785	10.1 - 8.5	9.3	0.065509	0.200044	28.155545	129.793259	192.591881
0.706552	8.5 - 7.2	7.9	0.043718	0.134536	22.241640	101.637714	167.948399
0.656810	7.2 - 6.1	6.7	0.028778	0.090817	17.217513	79.396074	149.127504
0.608789	6.1 - 5.3	5.7	0.018803	0.062039	13.100444	62.178561	135.300406
0.561144	5.3 - 4.7	5.0	0.012362	0.043237	9.849915	49.078118	124.569520



BET-Adsorption-Plot

BET Tabular Report

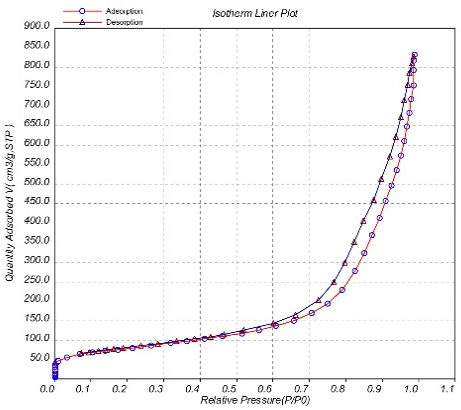
P/P0	Quantity Adsorbed(ml/g)	(P/P0)/V*(1- P/P0))	Single point BET
0.212640	78.748516	0.003429	269.838819
0.173075	74.458482	0.002811	267.959350
0.139828	70.747012	0.002298	264.839130
0.102791	66.303545	0.001728	258.892483
0.068951	61.572219	0.001203	249.485947
Slope	Intercept	Vm(ml)	C Value
0.015480	0.000135	64.039758	115.728390
R	Multi-BET Area	Langmuir Area	
0.999996	278.731520	382.076160	



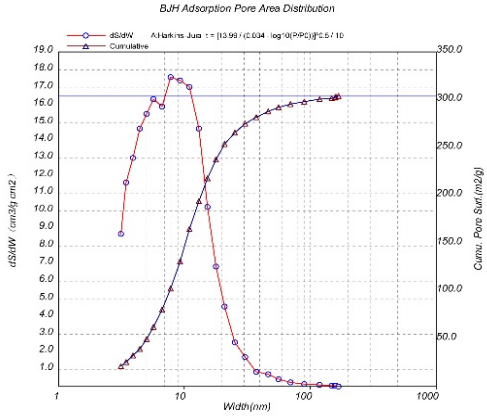
t-Plot

A: Harkins-Jura t = [13.99 / (0.034 - log10(P/P0))]^0.5 / 10

Adsorption Trange:0.3700-0.5436



Isotherm Liner Plot



BJH Adsorption Pore Area Distribution

SR.	Supplier	Parts	Qty.
1	Gold APP Instruments Supplied	V-Sorb 2800P Analyzer	1 set
2		Analysis Software (English)	1 copy
3		Rubber O-rings for Sample Cells Sealing	10 pcs
4		Spherical Sample Cells	10 pcs
5		V-shape Sample Funnel	10 pcs
6		Reference Material(large value)	10 g
7		Reference Material(medium value)	10 g
8		Reference Material(small value)	10 g
9		Copper Gas Pipe	2 m
10		Analysis Dewar	2 pcs
11		Fuse	2 pcs
12		RJ 45 Cable	2 pcs
13		Protective Gloves	1 pair
14		User Manual (English)	1 copy
15		P_o Cell	4 pcs
16		Filling Rod	8 pcs
17		Sample Cell Cleaning Brush	1 pc
18		Funnel Cleaning Brush	1 pc
19		Sample Weighting Cup	1 pc
20	Customer Prepared	Power Cable	1 pc
21		0.0001 Precision Balance	1 set
22		Computer (Win 20/7/8/XP/Vista etc)	1 set
23		Printer (not a must)	1 set
24		Gas Regulator (should fit 1/8" NPT gas pipe, max reading is larger than 0.6 Mpa.)	2 sets
25		Liquid Nitrogen (purity 99.999%)	1 pot
27		He Gas (purity 99.999%)	1 cylinder
28		N_2 Gas (purity 99.999%)	1 cylinder

Our policy of continuous development may cause the information and specifications contained herein to change without notice or liability.

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