Multiplelabs
Turnkey Laboratories Solutions

Analytical®
Technologies Limited

BSAPA:3480

Bet Surface Area & Porosimetry Analyzers

EPCC / PRODUCTS / APPLICATION / SOFTWARE / ACCESSORIES / CONSUMABLES / SERVICES

Analytical Technologies Limited

An ISO 9001 Certified Company

www.analyticalgroup.net

Analytical Technologies Limited is a dedicated manufacturer for gas adsorption analyzers, is a high technology company that combines state-of-the-art hardwares and professional theories for nano-mate- rials determination. We originates and serves the Weapons System, relies on advantages of local talented human resource and weapons system technology and devotes into scientific instruments development, production and sale. To research and develop fully automatic and intelligent laboratory determination analyzers, provide international standards, high cost performance and state-of-the-art instruments for R&D institutes, universities and manufacturing enterprises are our unchanged mission.

Our analyzers cover:

*BET surface area analyzers (flowing gas principle & volumetric adsorption principle)
*Pore size, pore volume, pore size distribution analyzers
*High pressure and temperature adsorption analyzers
*Helium pycnometer density analyzers/ open & closed pore cell analyzers
*Thermal analysis analyzers (TG/TGA/DTA/DSC etc)

BSAPA-3480 series analyzers work for determining BET surface area mesopore & micropore data by utilizing static volumetric adsorption principle. Be designed from the user perspective and with fully automated operation system,user-friendly interface makes it easy to learn, branded accessories assure stability and prolong its life.

Equipped with 4 analysis ports and 4 pretreatment ports. The pretreatment and analysis ports are separated, can work simultaneously and independently. All testing parameters can be done through software, with full automatically operation and high accurancy data.

They are more suitable for university and commerical labs where have many samples need to be test everyday, with a high-throughput and speedy measurement.

- 10 inch embedded PC with Windows system, can contro analyzer operation automatically. Analyzer also has RS232 port for connecting bigger external display.
- 2 testing ports in each side.
- 1 Po port in each side.

- 4L stainless steel LN_2 Dewar, be covered with temperature insulainn material,can support over 72 hours working without refilling liquid nitrogen (LN_2).
- LN_2 tray can realize up/ down smoothly.
- Analyzer main power.
- Temperature probe sensor (in the middle of 3 tubes).
- transparent protective doors be printed with operation notices for testing

Features

Vacuum System

*unique monolithic manifolds system can decrease connecting points apparently, reduce gas leakage and improve ultimate vacuum.

*modularity design can configure as customer requests,benefits future functions extension and instrument maintenance.

*the atlas copco brand bipolar vacuum pump,low noise,stable working,completely provent oil-returning;

*the ultimate vacuum can reach 4x10-^{2}Pa (3x10-4Torr)

micro-welding manifolds

branded mechanical pump

DEGASSER

Surface area and porosity measurement is closely connected with materials external surface area. Besides, the key of gas sorption is the adsorbates can be efficiently attached onto particle surface or be filled into pores, thus, no more important than samples surface purity & cleaness. The purpose for sample pretreatment is to remove atmospheric contaminants on samples' surface and make room for adsorbates. Prior to any measurement the sample must be degassed to remove water and other contaminants before the surface area can be accurately measured. Samples are degassed in a vacuum at high temperatures. The highest temperature possible that will not damage the sample's structure is usually chosen in order to shorten the degassing time. IUPAC recommends that samples be degassed for at least 16 hours to ensure that unwanted vapors and gases are removed from the surface of the sample. Generally, samples that can withstand higher temperatures without structural changes have smaller degassing times.

Up to 4 samples can be pretreated currently with independent temperature controllers;

- Max temperature is up to 400°C, accuracy ±1°C;
- Programmable heating process, step is 1-10°C;
- Flow and vacuum degas modes;
- User-defined analysis gases (N2 or He are more normally used);
- Can realize fully automatically pretreatment once begin;
- PT100 with resolution 0.01°C, analysis software integrated PID theory.

Technology Features:

1. Adopts stainless steel vaccum system which has perfect sealing performance, high vacuum, stable working and long service duration;
2. Speedy heating process, saving time and improving pretreatment efficiency;
3. Easy installation and uninstallation for sample cells;
4. Unique sample antisplash system can avoid samples be vacuumed into manifolds;
5. Modularity inner structure design, convenient for installation, uninstallation and future upgrade;

6. Each sample pretreatment station has its own adjustable evacuation control.

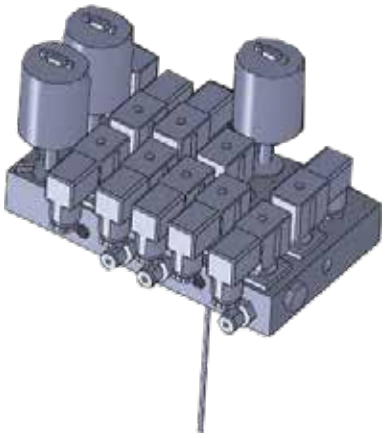
Environmental:
Ambient temperature: 10 to 50°C;
Maximum relative humidity: 90%.
Electrical: Voltage 100 - 240 VAC; Frequency: 50 or 60 Hz.
Physical:
Height 15.7 inches (40 cm)
Width11.8 inches (30 cm)
Depth 19.7 inches (50 cm)
Weight 33 lbs (20kg)

Guaranteed Data Accuracy

* branded 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.
* different pressure transducers (1000Torr, 1Torr, 0.1 Torr) be equipped, sectional measurement in pressure range can reduce errors in low vacuum.
* original stepping coolant level probe system can ensure the coolant level unchanged during the whole analysis process, completely eliminate errors caused by dead volume changement.
* pioneered gas outlet and inlet control system can efficiently prevent sample splash in vacuuming and gas input process, guarantee clean manifolds and steady sample mass, avoid zero and liner drifting caused by transducer's macro-change.

4L stainless steel Dewar

branded pneumatic valves



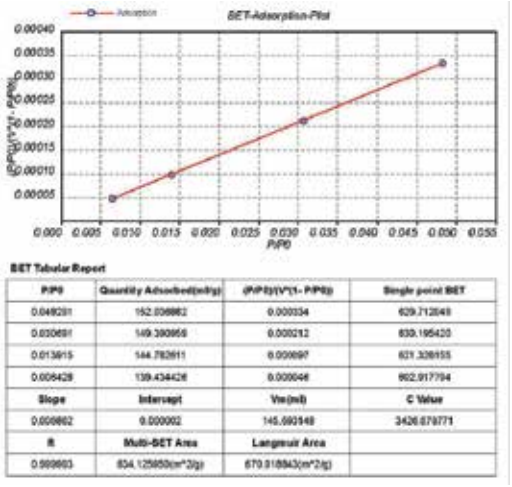
monolithic manifolds system

Control System

* branded programmable pneumatic valve system has a strong anti-interference ability, is convenient for installation and uninstallation.
* separated analysis and pretreatment manifolds can prevent foreign matters to contaminate inner pipelines.

Specs	Models	BSAPA:3480S	BSAPA:3480	BSAPA:3480P	BSAPA:3480TP
		BSAPA:3484S	BSAPA:3484	BSAPA:3484P	BSAPA:3484TP
		BSAPA:3486S			
Sample Pretreatment	Ports	4 pretreatment/degassing ports			
	Temp. Range	RT to 400 ℃			
	Vacuum Pressure	vacuuming to 0.5 pa			
	Working Mode	fully controlled by software			
Sample Testing	Principle	volumetric adsorption			
	Ports	4 testing ports work alternately(3480S, 3480, 3480P, 3480TP)			
		4 testing ports work parallel (3484S, 3484, 3484P, 3484TP)			
		6 testing ports work parallel (3486S)			
	Ultimate Pressure	$4x10^{-2}$ Pa			$4x10^{-6}$ Pa
	Accuracy	surface area repeatability ≤ ± 1.9%			
		pore size repeatability ≤ 0.02nm			
	Range	surface area only 0.0005 m^2/g to no upper limit	surfac area: 0.0005 m^2/g to no upper limit pore size: 0.35nm – 500nm		
	Partial Pressure	P/P0 accuracy range $5x10^{-6}$ – 0.998			
	Gases	N_2, Kr, CO_2, Ar, purity 99.999%			
	Working Mode	fully controlled by software			
Data Report	single-point BET*	✓	✓	✓	✓
	multi-point BET	✓	✓	✓	✓
	Langmuir surface area	✓	✓	✓	✓
	t-plot surface area	✓	✓	✓	✓
	STSA*	✓	✓	✓	✓
	true density	✓	✓	✓	✓
	BJH* mesopore		✓	✓	✓
	CO2 ice water		✓	✓	✓
	DR* & DA*		✓	✓	✓
	t-plot micropore			✓	✓
	MP micropore			✓	✓
	HK* micropore			✓	✓
	C-Y correction			✓	✓
	SF* micropore			✓	✓
	NLDFT*			✓	✓
Hardwares	Pressure Sensors	0-3 Bar/2 pc	0-3 Bar/2 pc	0-3 Bar/ 1 pc 0-1 torr/ 1 pc	0-3 Bar/ 2 pc 0-1 torr/2 pc 0-0.1 torr/ 2 pc
	Sensors Accuracy	0.15% better than full scale			
	Pipelines	integrated vacuum pipelines			stainless steel micro-welding pipelines
	Valves	solenoid valves + O-rings			pneumatic valves + VCR rings
	Vacuum Pump	mechanical pump			mechanical pump+ turbo pump
	LN_2 Dewar	4L stainless steel Dewar, can work over 72 hours without intervention.			
	Sample Tubes	quartz material			
	Dimension	net: 75x60x90 cm,80 kgs			
		gross: pkg 1: 92x73x110cm,115kgs; pkg 2: 60x75x80cm,70 kgs.			
Extra Accessories*	helium cylinder	purity over 99.99%, volume can be 10L, 20L or 40L cylinder			
	nitrogen cylinder	purity over 99.99%, volume can be 10L, 20L or 40L cylinder			
	liquid nitrogen (LN_2)	should prepare at least 10L for calibration, it is consumble thing.			
	balance (option)	precision should be 0.0001 g			

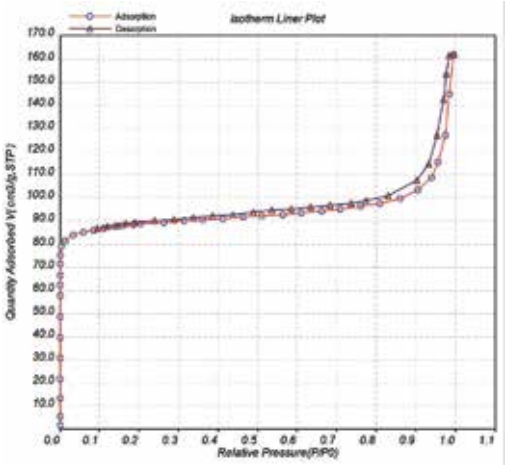
Remarks:
1. BET – Brunauer, Emmett, and Teller
2. STSA – Statistical Thickness Surface Area
3. BJH – Barrett, Joyner, and Halenda
4. DR – Dubinin-Radushkevich
5. DA – Dubinin-Astakhov
6. HK – Horvath-Kawazoe
7. SF – Saito and Foley
8. NLDFT – Non-local Density Functional Theory
9. extra accessories should be prepared by buyers because they (except balance) cannot be shipped by air.



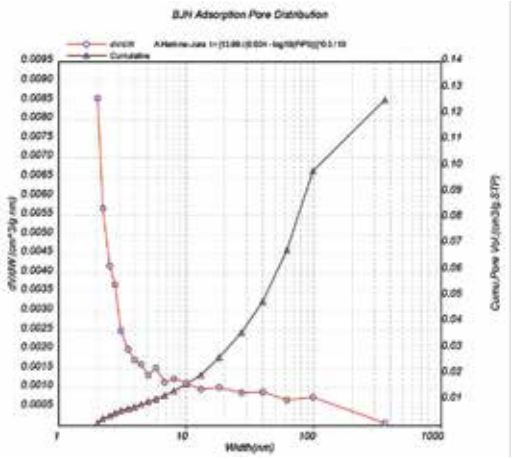
BET Tabular Report

P/P0	Quantity Adsorbed(cm3/g)	(P/P0)/(V*(1- P/P0))	Single point BET
0.048291	152.036862	0.000334	629.712648
0.030691	149.380959	0.000212	630.195420
0.013915	144.782811	0.000097	631.328155
0.008428	139.434428	0.000046	662.917794
Slope	**Intercept**	**Vm(ml)**	**C Value**
0.006862	0.000002	145.680548	3426.679771
R	**Multi-BET Area**	**Langmuir Area**	
0.999993	634.125853(m^2/g)	679.918843(m^2/g)	

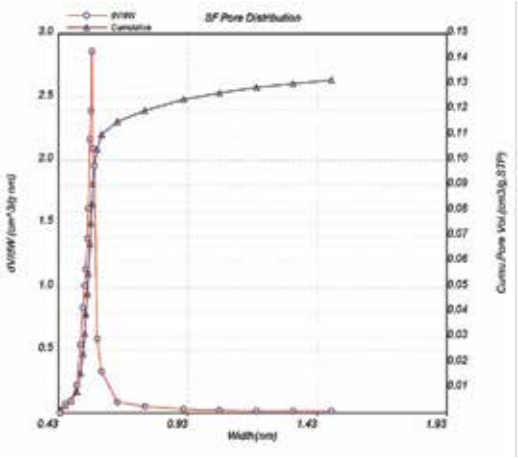
Single point BET & multi-point BET report



Adsorption & desorption isotherms



BJH (mesopore) adsorption



SF (micropore) pore distribution

Summary Report

Surface Area

SN	Items	Description	Result
1	*Single point surface area*	*P/Po=0.2612*	*284.207596(m2/g)*
2	*BET Surface Area*	*Point range:0.0097 - 0.1065*	*333.035226(m2/g)*
3	*Langmuir Surface Area*	*Monolayer adsorption model calculations*	*374.945270(m2/g)*
4	*t-Plot Micropore Area*	*A.Harkins-Jura*	*292.742575(m2/g)*
5	*t-Plot External Surface Area*	*SBET - Smicro*	*40.292652(m2/g)*
6	*BJH Adsorption cumulative surface area*	*Pore width(nm): 1.8896 - 305.6535*	*33.526459(m2/g)*
7	*BJH Desorption cumulative surface area*	*Pore width(nm):2.0047 - 305.6535*	*35.222358(m2/g)*

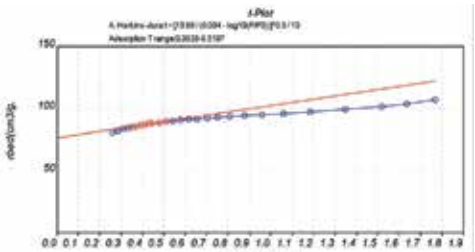
Pore Volume

SN	Items	Description	Result
1	*Single point adsorption total pore volume*	*P/Po = 0.9937, total pore volume of the critical pore width less than305.6535*	*0.172248(cm3/g)*
2	*t-Plot micropore volume*		*0.117541(cm3/g)*
3	*BJH Adsorption cumulative volume*	*Pore width range(nm)1.889773 - 305.653454*	*0.046648(cm3/g)*
4	*BJH desorption cumulative volume*	*Pore width range(nm)2.004720 - 305.653454*	*0.050898(cm3/g)*

Pore Size

SN	Items	Description	Result
1	*Total adsorption average pore width*	*By 4V/A,4 Adsorption BET specific surface area value*	*2.668624(nm)*
2	*BJH Adsorption average pore width*	*By 4V/A,4 Adsorption cumulative pore surface area*	*7.981498(nm)*
3	*BJH Desorption average pore width*	*By 4V/A,4 Desorption cumulative pore surface area*	*5.331623(nm)*
4	*BJH Median Pore width*	*Pore width range(nm):2.007987 - 305.653454*	*2.037687(nm)*
5	*SF Median Pore width*	*Pore width range(nm):0.4361 - 1.5902*	*0.557874(nm)*

Comprehensive report summary



BET Tabular Report

P/P0	Adsorbed thickness(nm)	Quantity Adsorbed(ml/g)
0.314430	0.510862	89.105710
0.261197	0.478182	88.360013
0.205463	0.440414	87.586386
0.156145	0.427878	87.282382
0.159164	0.410242	86.787067
0.132430	0.391959	86.256801
0.106509	0.372901	85.655369
0.082458	0.353786	84.960787

Slope	Intercept	C	Micro Vol.(ml/g)	Micro Area(M^2/g)	xternal Area(M^2/g
36.049037	75.969602	0.994942	0.117541	292.742575	40.292650

t-plot report

APPLICATIONS

Battery Materials:

Cathode materials:
NMC (NCM) – Lithium Nickel Cobalt Manganese Oxide (LiNiCoMnO2)
LFP – Lithium Iron Phosphate (LiFePO4/C)
LNMO – Lithium Nickel Manganese Spinel (LiNi0.5Mn1.5O4)
NCA – Lithium Nickel Cobalt Aluminum Oxide (LiNiCoAlO2)
LMO – Lithium Manganese Oxide (LiMn2O4)
LCO – Lithium Cobalt Oxide (LiCoO2) lithium titanate etc.
Anode materials: typically graphite, others like silicon, tin and its alloys. Separators: typically microporous polypropylene or polyethylene film

Petrochemical Industry:

carbon black, surfactant, white carbon black, pesticide, titanium dioxide, additive, alumina, molecular sieve catalyst, resin, carbon fiber, etc

Medical Implants:

montmorillonite powder, magnesium stearate, micropowder silica gel, talc and other lubricants, diluents such as starch and sugar, aluminum hydroxide and other pharmaceutical excipients

Environmental Protection Materials:

pine,activated carbon,bamboo charcoal,chemical carbon,zeolite molecular sieve,etc

Nano Materials:

MOF materials, nanometallic materials, nano silica, nano zinc oxide, carbon nano tubes, nano aluminum oxide, nano silicon nitride, graphene, etc

Other Powder and Granular Materials:

magnesium oxide, zirconia, calcium oxide, metal powder, ceramics, mineral powder, etc





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HPLC Servicing, Validation, Trainings and Preventive Maintenance :

HPLC Servicing :HPLC Servicing : We have team of service engineers who can attend to any make of HPLC promptly @the most affordable cost.

Trainings :We also take up preventive Maintenace to reduce downtime of HPLC's Trainings.

AMC's/CMC :AMC's/CMC :We offer user training both in-House and at customer sites on HPLC principles, operations, trouble-shooting.

Validations :Validations :We have protocols for carrying out periodic Validations as per GLP/GMP/USFDA norms.

Instruments :Instruments :We offer instruments/Renting Services Modules like pumps,detector etc. on Rent.

About Analytical Technologies

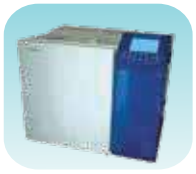
Analytical Technologies is synonymous for offering technologies for doing analysis and is the Fastest Growing Global Brand having presence in at least 96 countries across the global. Analytical Technologies Limited is an ISO:9001 Certified Company engaged in Designing, Manufaturing, Marketing & providing Services for the Analytical, Chromatography, Spectroscopy, Bio Technology, Bio Medical, Clinical Diagnostics, Material Science & General Laboratory Instrumentation. Analytical Technologies, India has across the Country operations with at least 4 Regional Offices, 6 Branch Offices & Service Centers. Distributors & Channel partners worldwide.

Our Products & Technologies

UV/VIS Spectro 2080+ Double Beam

Infra FTIR

Optima Gas Chromatograph 3007



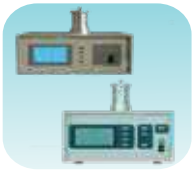
Optima Gas Chromatograph 2979 Plus

Flash Chromatograph

Atomic Absorption Spectrophotometer

Liquid Partical Counter

Optical Emission Spectrophotometer



DSC/TGA

Semi Auto Bio Chemistry Analyzer

HEMA 2062 Hematology Analyzer

Micro Plate Reader/Washer

URINOVA 2800 Urine Analyzer

Total Organic Carbon 3800

Fully Automated CLIA

NOVA-2100 Chemistry Analyzer

PCR/Gradient PCR/ RTPCR

TOC Analyzer

Laser Particle Size Analyzer

Ion Chromatograph

Water purification system

Regulatory compliances

Corporate Social Responsibility

Analytical Foundation is a nonprofit organization (NGO) found for the purpose of:

1.Research & Innovation Scientist's awards/QC Professional Award : Quality life is possible by innovation only and the innovation is possible by research only, hence ANALYTICAL FOUNDATION is committed to identify such personallities for their contributions across various field of Science and Technology and awarding them yearly. To participate for award, send us your details of research / testing / publication at Info@analyticalfoundation.org

2. Improving quality of life by offering YOGA Training courses, Work shops/Seminars etc.

3. ANALYTICAL FOUNDATION aims to DETOXIFY human minds,souls and body by means of yoga, Meditation, Ayurveda, Health Care, Awards, Media, Events, Camps etc.

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