nanometrix
ANALYTICAL INSTRUMENTS®

Automatic Specific Surface
and Pore Size Analyzer

SPS Series

Model 112 & 222

Making world-class products

Summary

The specific surface area and pore size distribution are two important parameters for characterizing the surface properties of micro nano powder materials, the most commonly used and most reliable method for measuring them is the static volumetric method of gas adsorption. Nanometrix SPS Series Specific Surface and Pore size Analyzer can accurately analyze the specific surface area and pore size of the powder material. According to the different test functions, this series of instruments are divided into two types, SPS 112 and SPS 222, among them, the SPS 112 is equipped with a small range 10torr pressure sensor, it can effectively do micropore analysis of microporous materials with pore size above 0.7nm with adsorption pump technology.

Test principle

Under the condition of low temperature (nitrogen and argon, etc.), when the pressure of the adsorbate changes in a closed vacuum system, we can measure the pressure change before and after the gas is absorbed by the sample with a high-precision pressure sensor, and then calculate the amount of gas adsorption, depicts the isothermal desorption curve, and use various physical analysis models to analyze the specific surface area and porosity.

Schematic Diagram of Instrument Structure

Test module, special high precision temperature and pressure control (2 sets)

1000 torr pressure sensor

Degassing station (4)

Movable heating furnace

Temperature controller, temperature

Valve indicator lamp

Test bits (sets)

Low temperature adsorbed dewar and elevator (4 sets)

Inlet portEthernet communication port, power supply

Features and Advantages of SPS Series

Technical Advantage

- **Test Module** — Core design part.
  The dead space (Vd) is small, and the internal temperature (Td) is monitored and controlled in real time, which ensures the scientificity and accuracy of the determination of adsorption quantity.

- **Pressure Sensor** — Core component, a high precision capacitive thin film, type SPS 112 micropore analyzer is configured with 10torr pressure sensor makes the partial pressure of P/P0 up to 10^{-5}-10^{-6}(N2/77K) in the physical adsorption analysis.

- **Cold Free Space** — Automatic corrected by He, suitable for any powder and particle material.

- **Control of Liquid Nitrogen Surface** — Technologies such as Dewar bottle with vacuum glass inner, high efficiency sealing, small inner section and software modification are adopted to maintain the temperature of the inhomogeneous temperature field in the sample tube relatively constant (isothermal) during the test.

- **Vacuum System** — It's a Multi-channel adjustable parallel vacuum system, and can make the vacuum abstraction speed get stair-like control. It prevents the sample from being pumped into the instrument, meanwhile, the built-in anti pumping unit is designed, which can effectively avoid the pollution of the instrument.

- **Vacuum Degassing** — In-situ vacuum degassing, vacuum degassing of 2 samples at different temperatures and times can be performed simultaneously.

- **Two-stage Adsorption Pump Technology** — The 112 type uses a two-stage adsorption pump technology, which can significantly improve the vacuum degree of the test system by one to two orders of magnitude, which provides favorable conditions for the analysis of the micro-pores so that the smallest diameter of the micro-pores can be tested reaches 0.7 nm

Features and Advantages of SPS Series

- **NLDFT** — This pore analysis software uses the non-locality density function theory. This software has filled the gap in the country and meets international standards, and the analysis covers all kinds of microporous materials, such as carbon materials, molecular sieves, and so on.

Convenient Operation and User-friendly Design

- Ethernet data acquisition, guided operation software, one computer can control many instruments at the same time, remote control can be realized.

- Each adsorption equilibrium process is dynamically displayed on the test interface, through which we can understand the adsorption characteristics of the sample, monitor the process of the test, analyze the abnormal phenomena, and see the internal process of the instrument through the event bar and the indicator light., it is a user-friendly design.

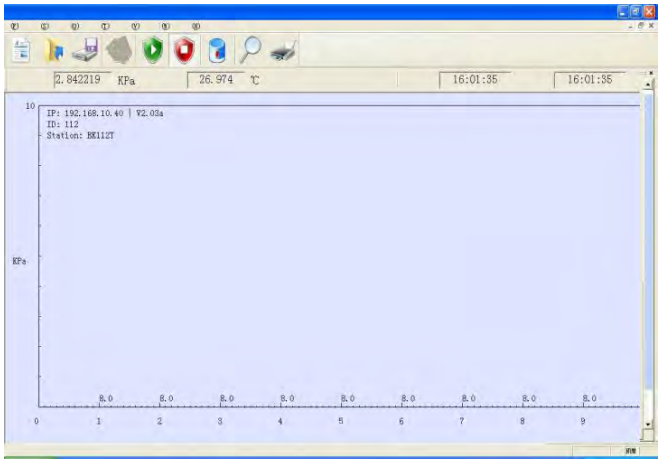
- The test data is automatically saved, this instrument supports non - online state and analysis of multiple documents, it can be copied, more than a dozen kinds of physical adsorption analysis models can be used for choice, such as BET, Langmuir, BJH, t-plots and so on.

- Pretreatment standard configuration is in-situ heating, micro movable heating furnace, the maximum heating temperature ≤400°C±1°C, 10 sections of program control can be implemented.

Control and Analysis Software

Nanometrix Software is an intelligent software for operation control, data acquisition, calculation and analysis and report generation on the Windows platform. It can communicate with the host through the LAN port and can achieve remote control.

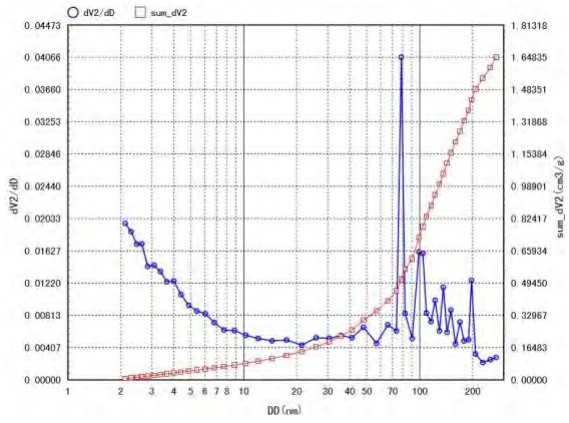
- Guided operation software, users can easily enter the next setup interface according to the automatic guidance of the software. A variety of test methods for users to choose.



- Adopt a unique intake control method, the pressure in adsorption and desorption process is optimally set in six stages. Under the condition of ensuring full adsorption and balance, the test efficiency is far higher than that of foreign instruments, which has created very valuable advantages.

- Complete physical adsorption calculation model for flexible selection, including:
  - Isothermal adsorption and desorption curve.
  - BET specific surface area (single point, multi-point).
  - Langmuir surface area.
  - External surface area (STSA).
  - BJH pore size analysis.
  - T-plot analysis.
  - DR, DA, MP method.
  - NLDFT pore size distribution.
  - The most frequent pore size, average pore size, total pore volume.
  - Adsorption curve, heat of adsorption calculation, etc.

- Typical analysis examples
  - BET repeatability error is only 0.0015m2 / g in the ultra-small specific surface area the test of Iron ore powder.
  - Analysis of BET surface area, pore size and pore volume in macroporous materials in white carbon black.



Schematic Diagram of Instrument Structure

Main Performance Parameters of the Instrument

Type	SPS 112	SPS 222
Test Principle	Gas adsorption by static volumetric method	
Adsorbed Gas	Non corrosive gases, such as N2, Ar, Kr, H2, O2, CO2, CO, NH3, CH4, etc.	
Analysis Port	2 sample tube analysis ports, alternately test	2 sample tube analysis ports, Parallel test at the same time
Range of Specific Surface Area	0.0005m2/g to the unknown upper limit; Standard sample repeat accuracy is less than± 1.0%	
Test Range of Pore Diameter	0.35nm-500nm； Pore repeated deviation is less than 0.2nm in the accurate analysis of mesoporous and large pore more than 2nm.	
Minimum Pore Volume	0.0001cm3/g	
Pressure Sensor (Analysis Station)	1000torr, ±0.15% (F.S 1	1000torr, ±0.15% (F.S) 2
Range of Relative Pressure P/P0	10^{-4}-0.998	10^{-4}-0.998
Degassing Station	The standard configuration is 2 stations in-situ degassing, which can simultaneously degas 2 samples under vacuum heating;	
Degassing Temperature	Room temperature—400 ºC accuracy1 ºC	
Vacuum Pump	Two-stage rotary vane mechanical vacuum pump, the ultimate pressure is 6.7*10-2Pa.	
Host Specification	Length 740mm×width 500mm×height 940mm, weighing about 75 Kg.	
Temperature Requirements of Environment	Room temperature, Recommended air-conditioned.	
Humidity Requirements of Environment	10%-90%	
Power Requirements	AC 110V±20V, 50/60HZ, maximum power 300W, current 5A.	
Recommended Application Fields	Carbon black, white carbon black, calcium carbonate, titanium dioxide, alumina, zinc oxide, silicon carbide and other ceramic raw materials.	Activated carbon materials, molecular sieves, catalysts, active metal oxides, MOF and other materials.

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CONTACT US

León Gto.: + 52 (477) 645 47 11

CDMX.: + 52 (55) 536 21714

ventas@nanometrix.com.mx

www.nanometrix.com.mx