Porous Materials, Inc.

The PMI Advanced

BET SORPTOMETER

BET-201-AELC-2OS

Not just products...solutions!

Description

The Fully automated equipment is intended for measurement of adsorption characteristics of various gases on catalysts for multipurpose applications. This unit is capable of measuring a wide range of adsorption isotherms for the estimation of sorption/physisorptions, chemisorptions and vapor adsorption characteristics, surface area, pore size distribution, including micro pore size distribution analysis by using gas adsorption. The unit is fully automated and has all the accessories and features for sample preparation & treatment. It is advantageous to have provisions for attachment of a mass spec or a GC at a later stage.

Application

PMI's BET Sorptometer has a multitude of applications in industries worldwide. Some applicable industries include Rock cores, Rubber, Automotive, Chemical, Ceramic, Paper, Battery Separator, Fuel Cells, Filtration, Pharmaceuticals, and Powder Metallurgy.

Principle

When clean surface is exposed to a gas, an adsorbed film forms on the surface. Adsorbed films also form on the surface of pores within a material and vapor can condense in the pores. At a constant temperature, the amount of adsorbed/condensed gas on a surface depends on the pressure of the gas. Measurement of the amount of adsorption/condensation as a function of pressure can give information on the pore structure. The PMI Sorptometers use gas adsorption/condensation to analyze pore characteristics. Further, measurement of pressure as a function of time provides the kinetics information of adsorption.

PHYSISORPTION

Surface Area: The unit has the capability of carrying out physisorption of various gases and have features to measure the adsorption/desorption isotherms, surface area (langmuir, BET), pore size, pore volume and micro pore distribution. Quoted Equipment has been capable of measuring at least two samples simultaneously. The system has been capable of measuring surface area in the range of 0.01 m^2/g to no upper limit (nitrogen) and 0.0005 m^2/g to no upper limit (krypton).

Pore diameter: The system has capability of measuring pore diameter in the range of 3.5 -5000 Å and micro pore volume detectable within the range of 0.0001 cc/g or lesser.

Analysis station: The system have minimum two analysis station with micro pore facility, which has not been shared with the degas stations. They have dedicated imported vacuum pumps having capability 5×10^{-10} mbar or better.

Adsorbents: The system has been designed to use gases like N_2, CO_2, H_2, CO, NH_3, and CH etc. The quoted system have been at least 12 gas inlet ports (6 for physisorption, 6 for chemisorptions in addition to 1 no. free space He inlet, 1 no. degas back fill inlet and 1 vapor inlet).

Vapor Adsorption: The system manifold has been temperature monitored and designed with corrosive resistant material and it has option to do vapor adsorption at least at one port or more.

Pressure Transducers: The system has been equipped with pressure transducers in different ranges like 1000 mm Hg, 10 mm Hg and 0.1 mm Hg. The system has been enabled with full range adsorption measurement including micro pore measurement. The pressure transducers have high resolution and accuracy with high stability. The manufacturer/offer have provided the resolution and accuracy data of these transducers.

Degassing facility: At least two vacuum degassing stations which can be upgradeable, each consisting of sample port, heating mantle with over temperature protection, PC programmable ramp/hold/test protocols. Each degas port has been served by separate vacuum system and a dedicated cold trap. Temperature range ambient to 450°C. Temperature accuracy = ± 1% of set point at thermocouple. Ultimate degas vacuum has been 10-9 mm Hg or better and it has not been shared with analysis port.

Other facility: The system has features for automated real time free space measurement. The design of the unit has en sure isothermal conditions during the sample analysis. It has liquid nitrogen level sensor which is capable of at least 90 Hours of uninterrupted analysis without coolant refill. Dewar flask for liquid nitrogen (5 liter and 30 liter) will be provided with the offer. Certified reference standards to be supplied for while making adsorption studies.

Power Supply: 220V +- 50Hz

PHYSISORPTION (CONT...)

- ***Analysis capability:*** The system have facility for followings:
- ***Isotherms:*** Up to 1000 data points (per station), adsorption and/or desorption, hysteresis scanning.
- ***Surface area:*** Single and multi-point BET, Adsorption and desorption isotherms, Langmuir surface area with slope, intercept, constant and correlation co-efficient, STSA, BJH
- ***Micro pores:*** NLDFT, QSDFT, Monte-Carlo, t-plot, alpha-s method, MP method, Dubanin-Radushkevich, Dubanin- Astakhov methods.
- ***Meso pores:*** NLDFT, BJH, DH also it has total pore volume and average pore size. Automatic BET point selector for micro porous materials.
- Heat of adsorption, Freundlich and Temkin isotherms, crystallite size from chemisorptions studies, metal surface area and metal dispersion, Frenkel-Halsey Hill and Broekhoff-de $_{2}$ $_{2}$ thickness curve.
- ***DFT to generate:*** micro pore and mesopore distribution pore volume distribution of pore size, surface energy distribution and surface area distribution of pore size using slit and cylindrical shape models for Ar, CO and N as adsorbate.
- The software allows the user to enter any isotherm into the system by way of a data file or table for calculating thickness curves for t-plots, alpha-s plot and BJH pore size distribution. There is capability to overlay the reference isotherm with other plotted data for comparison.
- The analysis station has been served by a turbo-pump backed by a dry diaphragm pump.

CHEMISORPTION

Analysis station: The system have one or more Pretreatment/analysis station consisting of a sample port, a high temperature furnace, furnace controller, automatic isolation/vent valve.

Treatment and method: System have allowed uninterrupted, single or repeated cycles of same or different treatments and analyses with user selectable program variables such as method type, method order, temperature ramp rate, temperature set point, time, out gassing rate and gas switching.

Furnace: Temperature range Ambient to 1100°C with 1°C increments; temperature ramp rates 1°C - 20°C/minute. Furnace cooling have active cooling with built-in fan.

Others:

- The system has features for dead space measurement and chemisorptions analysis at a predefined temperature.
- The manifold assembly, the O rings has been resistant to reactive gases.
- Necessary certified reference samples will be supplied with the equipment.
- All Kits for water vapor analysis, hydrocarbon vapor analysis, analyzing vapor at varying temperature will be included.
- All accessories for handling powders and extrudates have been provided.

TCD (Thermal conductivity detector) for TDP/TPR/TPO: System has built-in thermal conductivity detector with cold trap to expand chemisorptions measurement from static volumetric to flow-based methods including

TPR: Temperature programmed reduction
TPD: Temperature programmed desorption
TPO: Temperature programmed oxidation
And metal surface measurements through pulse titration.

Essential Accessories

Sample Tubes /holders:

- Variable IDs (inner diameter) of the sample tubes/holders (for sample of powder/pellet/granules form) compatible with the surface area analyzer to be supplied; volumes in the range 0.5 – 5 cc.
- Sample holder for fine powders have provision to vacuum seal. For Chemisorptions, Quartz flow thru sample tube with Appropriate design and associated accessories like quartz wool etc. For handling powders and extradites will be provide.
- 6 mm sample cell large bulb 20 nos.
- 6 mm sample cell small bulb 40 nos.
- 9 mm sample cell large bulb 20 nos.
- 9 mm sample cell small bulb 20 nos.
- 6 mm filler rod 20 nos.
- 9 mm filler rod 20 nos.
- Sample cell for vapor sorption analysis 6 nos.
- Solid sample transfer funnel 2 nos.
- Additional flanges/adapters for 6mm sample cell 10 nos. and 9mm sample cells 10 nos.
- Additional reference cells 2 nos.
- All types of O-rings/valves/ferrules- 5 No. for both gas and vapor analysis, recirculation bath, H2O RTD Float sensor
- UPS – 30 min back up of whole system 3KVA. (1 Year Warranty)

Electronic Weighing Balance:

Electronic Weighing Balance: Accuracy up to 0.1 mg level (10-4 g or better) having maximum weighing capacity of ~ 200 gm (one number), supplied from reputed manufactures.

COMPUTER: Compatible latest high performance computer dedicated to the equipment for faster data acquisition and processing

- Intel Core i5 2.50gHz 3rd generation processor, 8MB Cache
- Seagate HDD 500GB Transcend DDR3 RAM 2*4GB
- Intel Original Z77 Motherboard
- LD DVD-RW, Flat panel monitor LCD 17"
- i-Ball Stunner Cabinet with 500W SMPS
- Guaranteed for a period of 2 years from the date of PMI BET Multipurpose Surface Area & pore size analyzer
- Commissioning: Computer is integrated with the equipment and the required soft ware's are installed
- Software: Suitable software and other interfacing & integration for carrying out the measurement and analysis with high levels of reliability and accuracy.

Software

Suitable Microsoft software and other interfacing & integration for carrying out the measurement and analysis with high levels of reliability and accuracy. Software has been capable of performing the following tasks:

- Generate both 'Single- and Multi- point BET specific surface area'
- Generate all the measured 'Adsorption and Desorption Isotherms'
- Langmuir surface area with slope, intercept, constant and correlation co-efficient
- Mesopore volume and Mesopore area distribution by BJH, HK and other models
- T-plot for micro pore area & volume
- Density functional theory to generate various parameters, e.g.,:
- Micro pore and mesopore distributions

Sales & Services

Our sales team is dedicated to helping our customers find which machine is right for their situation. We also offer custom machines for customers with unique needs. To find out what we can do for you, contact us.

We are committed to customer support including specific service products, short response times & customer specific solutions. To quickly & flexibly meet our customer's requirement, we offer a comprehensive range of services.

Customize your machine today!

Disclaimer : *Other specifications of this product are also available. Design subject to change without notice.*

The most advanced, accurate, easy to use and reproducible Sorptometers in the world.

Celebrating

35

years

of solutions

20 Dutch Mill Rd, Ithaca, NY 14850, USA
Toll Free (US & Canada): 1-800-TALK-PMI (1-800-825-5764)
Phone: 607-257-5544 Fax: 607-257-5639

Email: info@pmiapp.com www.pmiapp.com

PMI Porous Materials, Inc.

PROUDLY MADE IN USA