

# BETSAA

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## BET Surface Area Analyzer



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

**Analytical Technologies Limited**

An ISO 9001 Certified Company

[www.analyticalgroup.net](http://www.analyticalgroup.net)

## ►► Description

The BETSAA are the instruments of choice for hundreds of labs globally. These rapid, high-throughput vacuum volumetric gas sorption analyzers provide quality control and research labs alike with the surface area and pore size analysis capabilities they require – and all this at an affordable price. Either two or four analysis stations with four built-in vacuum or flow degassing stations reduce the overall bench space while maximizing performance. A 21 CFR Part 11 compliant version of the software is available for pharmaceutical customers.

## ►► Feature

- Surface Area Analysis
- Mesopore Size Distribution
- Standard Micropore Analysis
- Degassing Ports
- Analysis Stations
- Color Touchscreen
- Live Graphical/Tabular Display of Analyses
- Local and Remote PC Control
- Extended Life Dewar
- Robust Coolant Level Sensor
- Flow Degassing
- Vacuum Degassing
- Dedicated Po Cell
- Dedicated Po Transducer
- Dedicated Backfill Transducer

## ►► Applications

- Carbon for rubber, adsorbents (gas separation and water purification), gas masks, inks, laser printers and copiers.
- Catalysts for the automotive, fertilizer, fuel cell and petrochemical industries.
- Organic materials for adhesives, chromatography, cosmetics, foodstuffs, detergents, explosives, ion exchange resins, pharmaceuticals and plastics.
- Minerals such as alumina, clays, hydroxyapatite, pigments, phosphates, silicas, zirconia, etc., used for abrasives, adsorbents, biomaterials, ceramics, cements, desiccants, fillers, papers and paints.
- Powdered metals and ferrites for batteries, pressure formed/ sintered products, electronics, magnets and magnetic tape.

## ►► Specifications

Measurement types	B.E.T., STSA, adsorption isotherm, desorption isotherm
Surface area range	0.01 m <sup>2</sup> / g to no known upper limit
Pore size range	0.35 to 500 nm (3.5 to 5000 Å)
Minimum pore volume (liquid)	2.2 x 10 <sup>-6</sup> ml / g
Minimum pore volume (STP)	0.0001 cc / g
Nitrogen	√
Other non-corrosive gases (Ar, CO <sub>2</sub> , H <sub>2</sub> , C <sub>4</sub> H <sub>10</sub> , etc.)	√
Preparation ports	4
Temperature range	ambient - 450°C*, 1°C intervals
Programmable heating protocols	Multi-step ramp rates / hold times
Accuracy (% of span)	±0.1
A/D converter	24-bit
Minimum pressure (mm Hg) resolution	6 x 10 <sup>-5</sup>
Minimum relative pressure P/Po (N <sub>2</sub> ) resolution	6 x 10 <sup>-8</sup>
Dimensions (WxDxH)	61.6 cm x 49.2 cm x 82.9 cm
Weight	43 kg (95 lbs.)
Electrical	100-240 V, 50/60 Hz

## ►► Physisorption Analysis Systems: BET Surface Area & Porosity Measurement

- High throughput analysis system with 3 analysis ports.
- The system has ONE port of true N<sub>2</sub> Micropore analysis with all ports able to perform N<sub>2</sub> mesopore analysis.
  - \* Minimum measurable surface area: 0.01 m<sup>2</sup>/g (N<sub>2</sub>) 0.0005 m<sup>2</sup>/g (Krypton)
  - \* Pore Diameter Range: 3.5 - 5000 Angstroms
  - \* Micropore Volume Detectable within O.O:JC1 cc/g
- Adsorptive Gas Inlets: Six(S) user definable gas inlets
- The system has the option to upgrade to full (Three Ports) micropore analysis capability in the field without having to ship the upgrade process.
- The system has 1000 Torr, 10 Torr, and 0.1 Torr transducers to measure surface area and porosity for a wide range of materials.
  - \* 1000 Torr Transducers in the system can be 5 or more
  - \* 10 Torr Transducers in the system can be 2 or more
  - \* 1 unit of 0.1 Torr Transducer
- The analysis system has a dedicated saturation pressure measurement transducer to measure the realtime saturation pressure of the cryogen.
- The individual Ports their own dedicated transducers are not shared with the other ports for an accurate pressure measurement of each port independent of other ports
- The instrument has an active temperature controlled manifold at 45+/- 0.05C to provide the utmost accurate adsorbed gas quantitation using gas law principle.
- The instrument has a high accuracy analogue-to-digital conversion of 25 bit resolution or better for gas pressure measurements used in the systems
- Gas Dosing and evacuation control: The system has a servo valve to control the dosing/evacuation of adsorptive gases.
- The lowest achievable N<sub>2</sub> dosing relative pressure of 10<sup>-9</sup> P/P<sub>0</sub> with appropriate microporous materials.

- The gas control utilizing Pneumatic control valve with 316L stainless steel body, fully contained PCTFE seal seat design with VCR face seal.
  - \* The gas diaphragm valves shall have excellent resistance to contamination
  - \* Improved helium leak test performance
  - \* Used compressed-air to turn-on/off to prevent heating up the minute gases within the gas valve
- Sample Elutriation protection - The system protection filter frit in each ports to prevent fine powders accidentally sucked into the manifold during evacuation step
- Cryogen Control Method -
  - \* Reliable solution with no consumables required in the long run of using the instrument
  - \* The jacketed sample tube for maintaining constant cold/warm zone throughout the measurement process
  - \* Dewar movement during analysis during normal operations process to prevent temperature fluctuations during the course of analysis
  - \* Option to refill liquid nitrogen during the analysis
- Analysis Dewar: The capacity of the dewar is  $\geq 3.2$ Liter or better
- Sample Tubes
  - \* 12mm diameter glass sample tube for easy loading/unloading sample and easy cleaning.
  - \* Sample tube has a sealing mechanism to prevent ambient gas from entering into the sample tube after degassed,
  - \* The sample tube has a flat-bottom design for best performance in heat dissipation as the gas adsorption is an exothermic process.

## ▶▶ Vacuum System

- The vacuum system for the analysis has a high performance hybrid turbo pumping system.
- The roughing pump of the vacuum system has a dry pumping system comprising of 4 stages pumping which achieves vacuum level of 1.1 Torr.
- The ultimate vacuum level is less than  $3.75 \times 10^{-10}$  mmHg
- The system has a dual hybrid gauge - Cold Cathode+ Pirani gauge for the most accurate vacuum measurement

## ▶▶ Degasser System

- Less than SIX(6) degas ports for high-throughput sample preparations
- The degas system uses either vacuum degassing method OR Flow degassing method.
- The temperature range of the degasser from ambient to 450 °C with computer controllable ramping rate and duration of degas.
- The degasser up to 5 ramp and soak cycles
- Each degasser port has their own independent temperature control systems
- The degasser programmable ramp rate from 5°C/min to 20°C/min
- The degasser is fully automated under full PC control without manual intervention from start to end

## ▶▶ Chemisorption Analysis System: Catalyst Dispersion, TPR/TPD/TPO/Pulse Chemisorption

- The system added functionality to perform chemisorption analysis using the static chemisorption analysis as well as dynamic chemisorption analysis method
- High temperature furnace capable to heat up to 1100°C provide quick and accurate ramp rates to desired temperature with precise temperature control and repeatability( $\pm 1$  °C)
- The chemisorption system VCR seal system provides high levels of system cleanliness, low outgas rates
- Quick transition between chemisorption and physisorption within minutes
- High-precision Mass Flow Controller provides accurate, programmable gas control up to 200ml/min

- Sixteen gas inlets allow multiple probe gases to be investigated maximizing efficiency and range of applications.
- Sample cell made from quartz for high-temperature, high-precision quartz cell improves the accuracy and sensitivity for challenging analysis.
- The system is able to perform static chemisorption analysis for studies of %Metal dispersion, Metal surface area, metal crystallite sizes etc.
- The system is able to perform dynamic chemisorption analysis with the integral thermal conductivity Detector(TCD) build-in the system.
- The dynamic chemisorption analysis includes;
  - \* Temperature Controlled Reduction(TPR)
  - \* Temperature Controlled Desorption(TPD)
  - \* Temperature Controlled Oxidation (TPO)
  - \* Temperature Controlled Reactions(TPRx)
  - \* Pulse-Chemisorption/Gas Titration
- Includes a localized injection loop option for automated pulse chemisorption.
- Connected to FOUR(4) gas inlets for flexibility to control various probe gases.
- The system has a cold trap to trap unwanted gas/vapor species from the reaction preventing it from going to the TCD detector.
- External connection port ready for future upgrade for external detector connection which is able to be trigger from the system for stop/start of external detector such as Mass Spectrometer etc.

## ▶▶ **Data Reduction & Reporting**

- The data reduction software compatible with the latest Microsoft<sup>TM</sup> Windows 64 Bit Operating system
- The data reduction software fully interactive with full graphical interface.

- The data reduction software also includes the following advanced OFT models
  - \* Advanced Dual DFT model can be combined N<sub>2</sub>/Co<sub>2</sub> isotherm to provide a complete spectrum of pore size distribution from ultra micropore to mesopore.
  - \* Heterogeneous Surface DFT Model for nano-materials.
- Static Chemisorption- The software can perform data reduction to obtain % Metal Dispersion, Active Metal surface area, crystallite Size(hemisphere) etc from Static Chemisorption experiment.
  - \* Difference Method to deduce the chemisorption from overall adsorption for static chemisorption data reduction
  - \* Freundlich Method to deduce the chemisorption from overall adsorption for static chemisorption data reduction
  - \* Sinfelt Method to deduce the chemisorption from overall adsorption for static chemisorption data reduction
  - \* Langmuir Method to deduce the chemisorption from overall adsorption for static chemisorption data reduction
  - \* Temkin Method to deduce the chemisorption from overall adsorption for static chemisorption data reduction
- Dynamic Chemisorption
  - \* The software peak editor to integrate TCD signals for all dynamic chemisorption experiment.
  - \* calibration of TCD signal to concentration of sorbed gases.
  - \* Able to add user define Stoichiometry factor for any specific reaction.
  - \* Extensive active metal library which can can also edited and expanded when necessary.
  - \* Auto integrate all TCD peaks and has the flexibility for manual integrate the TCD peaks when necessary.
  - \* Import MS signal for ker process and can overlay with TCD signa! in the same report.
  - \* Process TPR analysis data.
  - \* Process TPD data and calculates Heat of Desorption from multiple runs of TPD data of different temperatures.

## ▶▶ Instrument Control Software

- Easy Graphical User Interface for user to control/monitor all aspects of the instrument
- Method wizard to assist user to create a method of analysis
- Smart monitoring for the system health and user can obtain suite of information for full critical system component functioning, through real-time analysis views.
- Store methods in the library as template.
- Automatic diagnostics analysis to determine the health states of the instrument when instrument is idle.

## Regulatory compliances



## Corporate Social Responsibility

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



# Analytical Foundation

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 personalities 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](mailto:Info@analyticalfoundation.org)

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

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

## Reach us @



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