

- Surface area
- Porosity
- Vapor adsorption
- High pressure adsorption
- Chemisorption
- Multi-component gas adsorption
- Fuel cell evaluation

BEL JAPAN, INC.

Specialist in Adsorption

BEL JAPAN, INC.

The specific surface area and the pore size analysis are the basic properties to evaluate the materials. Especially for fine particles, those are the essential factors to evaluate their performance. Here are BEL instruments to evaluate physical properties of material surface.

BELSORP-max

To obtain useful information about micropore, it is important to measure adsorption isotherms from the low relative pressure accurately. BELSORP-max is designed to measure wide-ranging adsorption isotherms for the surface area and the pore size distribution analysis. It can measure adsorption isotherms from the relative pressure as low as 1×10^{-8} (N_2 at 77K, Ar at 87K), using a 13.3Pa pressure transducer. Also AFSM™, the new method for free space measurements, is applied and adsorption isotherms can be measured with high reproducibility.

- Wide pressure range measurement
- Suitable for specific surface area and pore size distribution measurement. (Especially useful for micro-porous materials.)
- Adsorption isotherms of a variety of gases and vapors can be measured.
- 3 samples can be measured simultaneously.



BELSORP-mini II

BELSORP-miniII is a compact, high-precision instrument for measuring the surface area and the pore size distribution by the volumetric gas adsorption technique. AFSM™, our patented new method for measurement of free space enables BELSORP-miniII to achieve the most accurate and reproducible measurement. Powerful and easy to use software makes BELSORP-miniII ideal for both research and QC applications.

- High accuracy and high reproducibility.
- Easy to use.
- Compact design and reasonable price.
- 3 samples can be measured simultaneously.



The investigation of water vapor sorption behavior of material is important both from scientific and industrial standpoints. Measuring water vapor isotherms gives a lot of information such as hydrophilic and hydrophobic property of the particle surface. However, it had been difficult and laborious. Here are BEL instruments to measure not only water vapor adsorption but also for other organic vapor adsorption.

BELSORP-aqua³



BELSORP-aqua³ has been developed for vapor adsorption measurements. Not only water vapor but other non-corrosive organic vapors can be used as adsorptive. The pressure sensors and the valves are placed inside the air oven at 80°C to prevent the condensation of liquid adsorptive. The measurement temperature and the air oven temperature are controlled to enable the accurate measurement. Some vapors adsorb extremely slow but BELSORP-aqua³ can measure 3 samples simultaneously, therefore the high-throughput measurement is achieved.

BELSORP-aqua³ is especially useful for the research in pharmaceuticals, food, architecture and other fields.

BELQCM

Due to the high sensitivity of the Quartz Crystal Microbalance, it can be used for very low sample mass. QCM measures the change in mass by detecting the change in frequency of quartz crystal resonator.

The resonance is disturbed by the addition or removal of a small mass due to adsorption or desorption at the sample that is put on the acoustic resonator.

BELQCM can evaluate nano gram order adsorption/desorption amount that cannot be measured with conventional volumetric instruments.



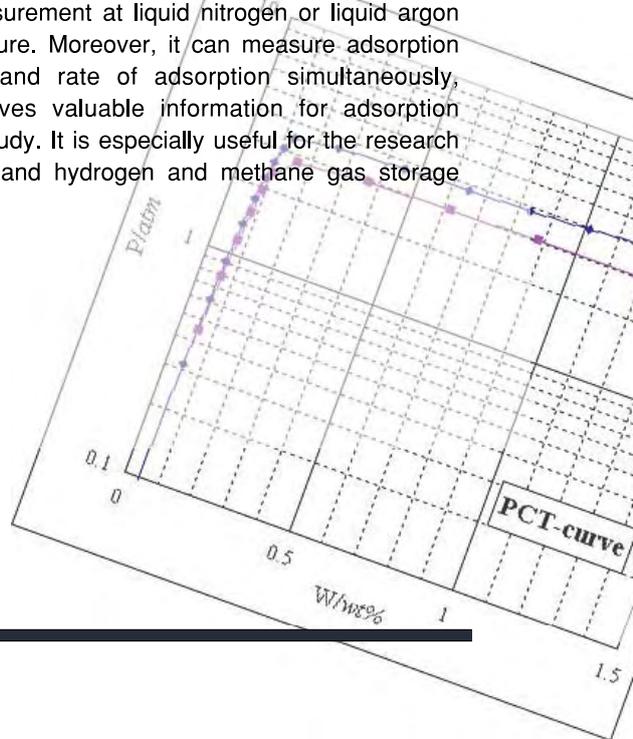
BELSORP-max

The air oven of BELSORP-max is controlled at 40°C to avoid the condensation of liquid adsorptive. As high corrosion-resistant material is used for the wetted components, various organic vapors and amines isotherms can be measured.

The importance of high pressure adsorption measurement is growing in various industries, hydrogen or methane storage, pressure swing adsorption (PSA), CO₂ absorption into high-polymer, etc. However, the instruments for measuring high pressure gas sorption are large, expensive, and difficult to use. Here, BEL instruments will provide the useful information to the researchers in both research and industrial fields.

BELSORP-HP

BELSORP-HP is a high-pressure gas adsorption instrument using the volumetric method. It can measure adsorption isotherms of non-corrosive gases, such as hydrogen, nitrogen, methane, etc. The maximum measurement pressure is 13.5MPa. BELSORP-HP is compact (table size) and easy to use. Optional liquid nitrogen level controller enables the measurement at liquid nitrogen or liquid argon temperature. Moreover, it can measure adsorption amount and rate of adsorption simultaneously, which gives valuable information for adsorption kinetic study. It is especially useful for the research of PSA, and hydrogen and methane gas storage property.



MSB-AD-H

MSB-AD-H is the gravimetric gas adsorption system with Magnetic Suspension Balance (MSB) from Rubotherm GMBH, Germany.

This system can measure adsorption isotherms of various non-corrosive gases up to 20MPa. The high-pressure adsorption measurement using the gravimetric adsorption method contains the measurement error due to the buoyancy. Also the measurement that takes long time is affected by the zero-shift, which is the cause of the measurement error. MSB-AD-H has three measurement modes and that corrects for the zero-shift and buoyancy automatically.



BELSORP-BG

BELSORP-BG is the binary gas adsorption system. The volumetric technique from BEL Japan and the gravimetric technique from Rubotherm are combined in BELSORP-BG. It provides adsorption measurement of 2 kinds of mixed gases by using unique measurement principle. Non-corrosive gases, water, amines, hydrocarbons, etc. are available to use as adsorptives. The measurement temperature range from 0 to 250°C and the maximum measurement pressure is 15MPa



BELSORP-VC

The combination of volumetric adsorption and gas chromatography allows measurement of multi-component gas adsorption. Not only adsorption amount, but insight of the dynamic adsorption behavior can be obtained. Separation coefficient of multi-component gas can also be evaluated. Compression coefficient of mixed gas can be measured automatically.

BELSORP-VC is useful for evaluation of gas storage material(MOF, porous material), adsorbent for CO₂, CO, O₂, ethylene gas separation study (PSA), hydrogen purification, and other applications whether multi-component is of interest.



BELSORP-Dyna

BELSORP-Dyna can measure breakthrough curve to measure the static properties and dynamic properties of adsorbent, such as adsorption amount and diffusivity. BELSORP-Dyna is very useful for gas separation and purification study.



Here offered the systems to evaluate the surface chemical characteristics of sample such as the amount of acid sites and strength of catalytic surface, metal dispersion metal supported catalyst, oxidization and reduction of catalyst, etc.

BELCAT

BELCAT series are powerful tools to evaluate catalyst properties. It can perform various essential analyses for catalyst evaluation such as TPD, TPReduction, TPO, Metal dispersion, BET 1 point method and pulse chemisorption measurement.

BELCAT series consists of the following three models.

BELCAT-M: BELCAT-M is the basic model of BELCAT series.

While BELCAT-M is a compact and inexpensive instrument, a variety of measurement such as pulse chemisorption, TPD, TPO/TPR, and single point BET can be performed. The temperature control and data acquisition can be carried out by a high resolution interface and the measurement software. Valves and other parts are put on the front panel in a straightforward array and that allows intuitive and easy operation.

BELCAT-B: BELCAT-B is a standard model of BELCAT series.

Temperature control, data acquisition and valve operation can be carried out automatically. Gas flow rates for carrier and pretreatment lines are controlled accurately by MFCs. A split-type electric furnace enables quick cooling. BELCAT-B can be customized as the customer's requirement. Measurement can be performed easily by setting the sample cell and entering the parameters and conditions.

BELCAT-A: BELCAT-A is the high-end model of BELCAT series.

In addition to the function of BELCAT-B, vapor dosing such as water, pyridine etc. is available. The vapor concentration can be controlled with a heater. Valves and gas plumbing are placed in the temperature controlled air oven to prevent vapors from condensation. By combining a vapor condenser with the heater, the vapor concentration can be controlled more accurately in the wider range.



BELMass

BELMass is quadrupole mass detector. BELMass software interfaces with BELCAT measurement software (automatic detection-stop function). It's heat hose enables the vapor analysis.





BELSORP-max

H₂ or CO gas chemisorption measurement is useful for determining active sites of rare metal such as Pt and Pd. Prior to this kind of chemisorption measurement, the sample has to be pretreated under the appropriate condition (oxidation, reduction). The chemisorption option allows BELSORP-max automatic sample pretreatment under gas flows. The pretreatment temperature (up to 1100°C) and procedures can be programmed by the measurement software and that enables unattended chemisorption analysis from pretreatment to repeat measurement.



BEL-METAL-3

BEL-METAL-3 is designed for pulse chemisorption measurement and it provides the metal dispersion, surface area, and particle size of metal supported on catalysts. As this system can pretreat and measure 3 samples simultaneously, it is useful for quality control. The chemisorption measurement such as ammonia and H₂S, is available with the corrosion resistant option.



BEL-METAL-1

BEL-METAL-1 is designed for pulse chemisorption measurement as well as BEL-METAL-3. This is a compact and inexpensive system.



BEL-REA

In the catalyst research field, of course, the performance of catalyst is important. Also, the research of reaction conditions is important. BEL-REA is a compact fixed-bed flow reactor. The reaction can be observed for a variety of conditions. According to user's requirements, this system can be customized.

MSB-AD-V-FC

The water adsorption amount on high functional membrane can be measured for a wide range of conditions (Pressure range : 1-10bar, Temperature range : 25-180°C, humidity range : 5-95%). In addition, the impedance and conductivity of the membrane can be measured simultaneously. This system is useful for the study of PEFC high polymer membrane.



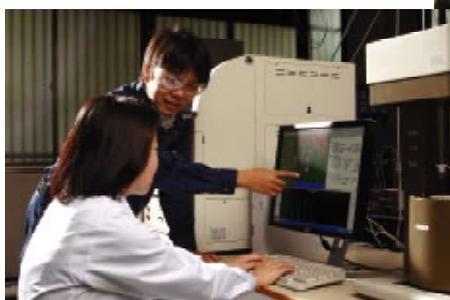
BEL-SOFC

BEL-SOFC can evaluate a unit cell of SOFC. This system is easy to operate and the unique fixation of the cell provides highly reproducible data. As the measurement at high temperature is available, BEL-SOFC is suitable for the evaluation and deterioration test of SOFC single plate cell.



Services

- Analytical laboratory
- Training courses
- Technical supports



MEMO



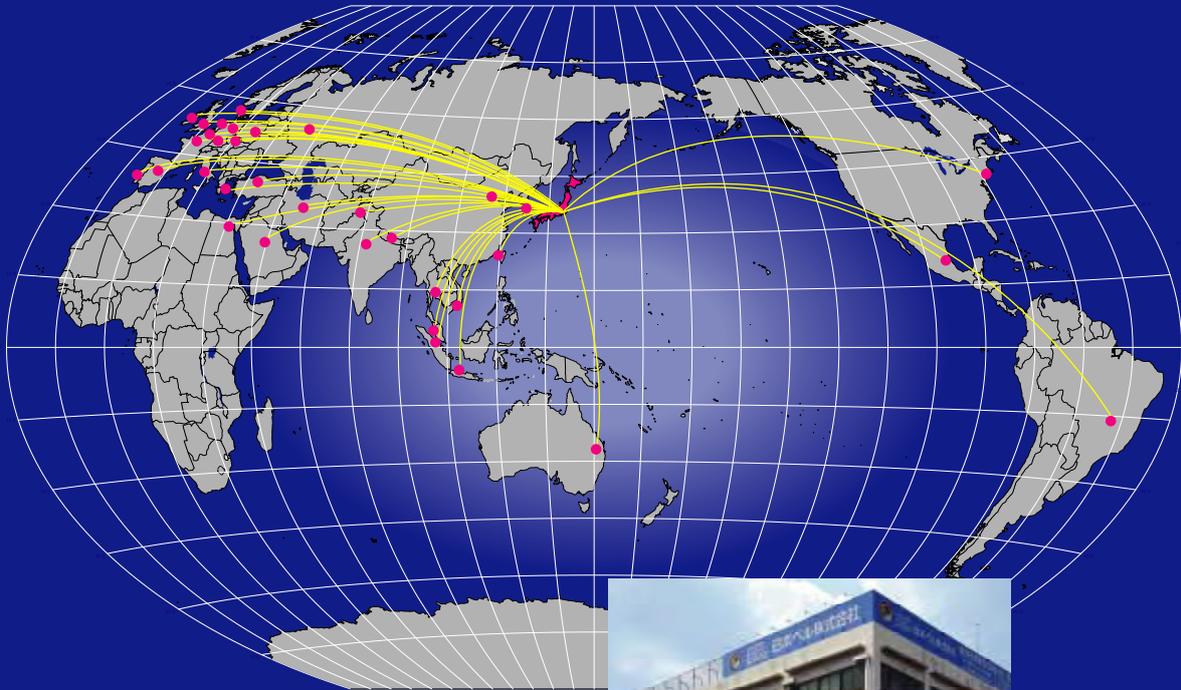
BEL JAPAN, INC.

BEL Japan, Inc. was established in 1988 as a manufacturer of volumetric gas adsorption measurement systems. The company name "**BEL**" stands for "Business for Enjoying Life". This means that every member of the company and their families will enjoy meaningful lives by cooperating each other to develop the business together and satisfy the customer's needs.

Under this motto, **BEL** has been developing ground-breaking systems, such as catalyst analyzers, world's first full automatic vapor adsorption system and much more. Additionally, **BEL** has built a high reputation with domestic and international users because of the high quality products and good customer services.

In 1996, **BEL** formed a technical partnership with Rubotherm GmbH in Germany, a manufacturer of magnetic suspension balances, which allows gravimetric measurement systems. This enables us to offer a comprehensive range of services in adsorption field.

BEL Japan, Inc. is a specialist in adsorption. We will continue to provide high quality service to our customers with high technology and originality.



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