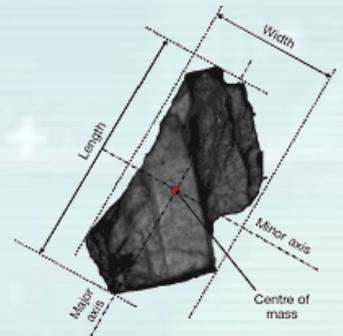
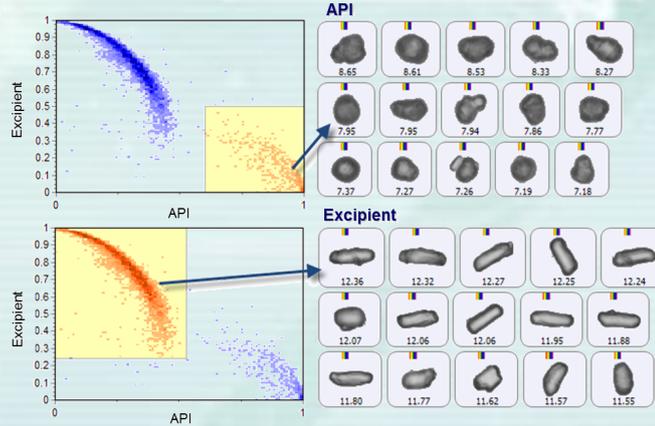
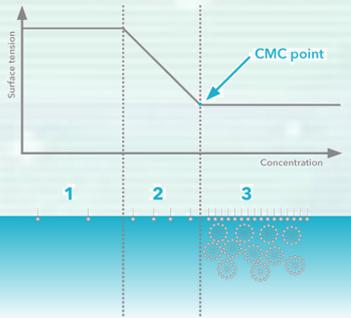
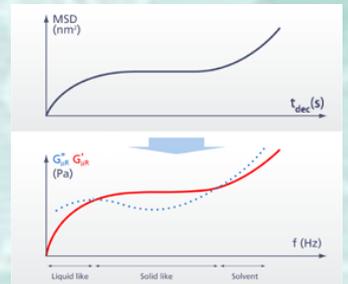
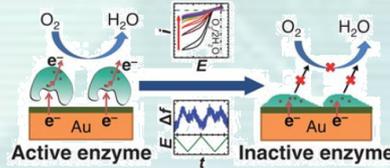
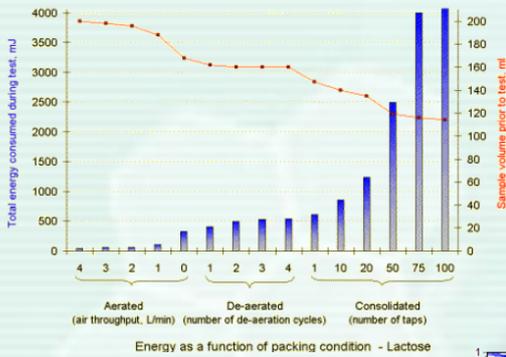


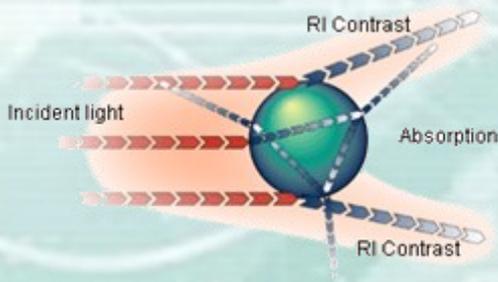
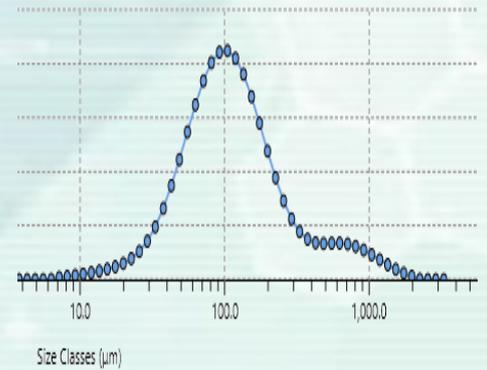


Particular Sciences



BET Surface Area Report
 BET Surface Area: $0.2878 \pm 0.0032 \text{ m}^2/\text{g}$
 Slope: $18.752589 \pm 0.216488 \text{ g}/\text{cm}^2 \text{ STP}$
 Y-Intercept: $0.858033 \pm 0.027631 \text{ g}/\text{cm}^2 \text{ STP}$
 C: 22.855313
 Qm: $0.0510 \text{ cm}^3/\text{g STP}$
 Correlation Coefficient: 0.9996670
 Molecular Cross-Sectional Area: 0.2100 nm^2

Relative Pressure (P/P ₀)	Quantity Adsorbed (cm ³ /g STP)	1/(Q(P ₀ /P - 1))
0.057987758	0.0312	1.972687
0.077112842	0.0362	2.309852
0.100679248	0.0410	2.729777
0.117259453	0.0438	3.033503
0.138810974	0.0469	3.438857
0.162835665	0.0497	3.910439
0.187229360	0.0524	4.399210





Particular Sciences was formed almost 25 years ago to provide specialist support in material characterisation technologies for chemists, biologists, researchers and industrial clients in Ireland, North and South.

“This is a niche business, filling what was previously a gap in the scientific infrastructure , one that was limiting the adoption of new analytical technologies.

We started in business with one product range, a compact customer base, one employee and grew with the market. Ireland is still attracting industrial multinationals and the scientific infrastructure is maturing to support these.

We supply instruments and service to over 200 companies across pharmaceutical, chemical, minerals, food, pigment sectors and increasingly into research areas where nanotechnology and biotechnology applications are at the top of the list.

Particular Sciences represents a select group of specialist companies like Malvern, Micromeritics and Biolin Scientific who are clear leaders in their fields. Some may not realise the extent our product range, so this brochure gives a view of our specialist instruments and equipment. There are also some new models from old friends and novel technologies looking for applications.

Particular Sciences hold true to their original concept as we concentrate on material sciences. We strive to offer the level of support as our principals provide so that you can maximise the use of the technologies you purchase. “



Sean P. Quilty

Particular Sciences Ltd



The companies we represent

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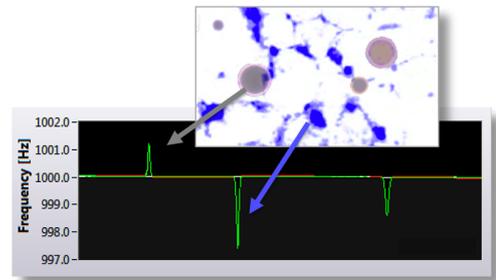
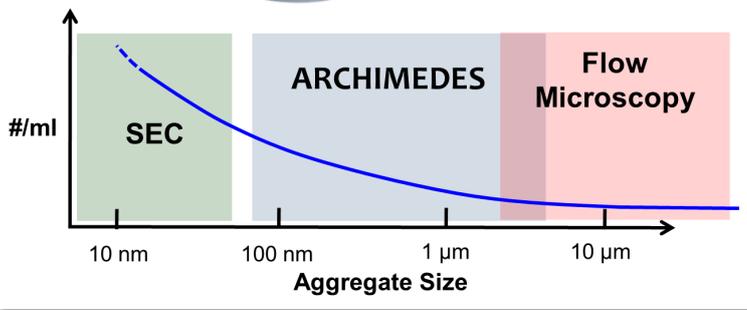
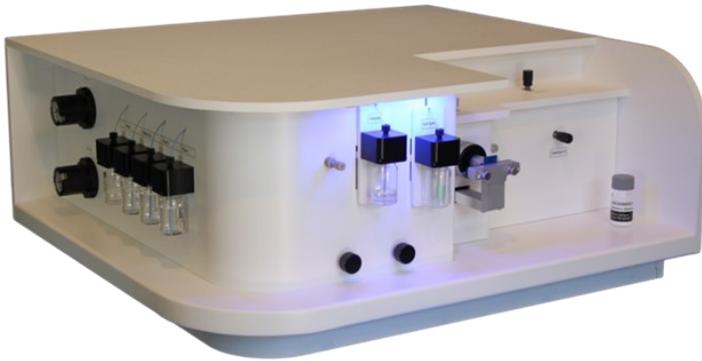
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Archimedes

Sub-micron particle metrology

Archimedes is a new, innovative instrument that uses the technique of resonant mass measurement to detect and accurately count particles in the size range 50nm – 5µm, and reliably measure their buoyant mass, dry mass and size. Particularly useful for the characterization of protein aggregates in formulation or buffer, Archimedes is also able to distinguish between proteinaceous material and contaminants such as silicone oil by means of comparing their relative resonant frequencies and buoyant masses as seen in the slide below.



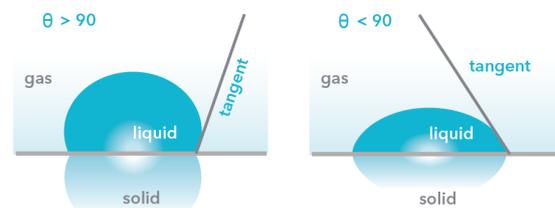
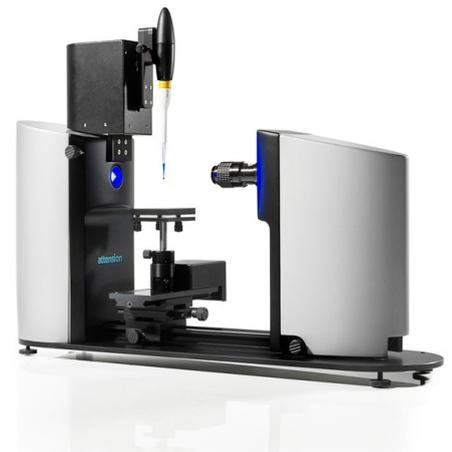
Biolin:

Attension

Tensiometry

Attension is the Biolin Scientific brand of tensiometers for all types of surface measurements. Tensiometry is the measurement of the surface tension of liquids, and can be performed optically on a pendant or sessile drop as with bench top **Theta tensiometers** shown in the photo or on a force system such as the **Sigma series** shown on next page.

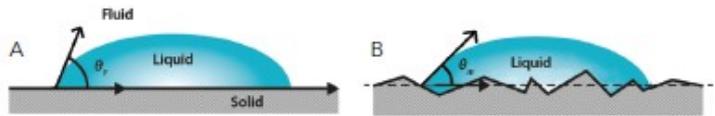
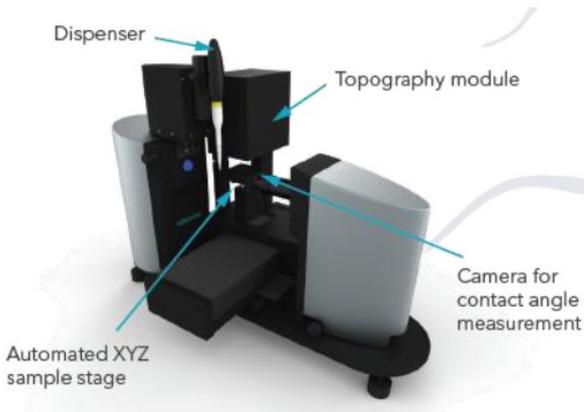
All Theta models offer Contact Angle measurements on surfaces to assess the wetting or wettability; where a $\theta < 90$ degrees indicates good wetting and > 90 is poor wetting; also adsorption studies and techniques from static and dynamic contact angles to surface / interfacial tensions, drop volume and surface free energy.





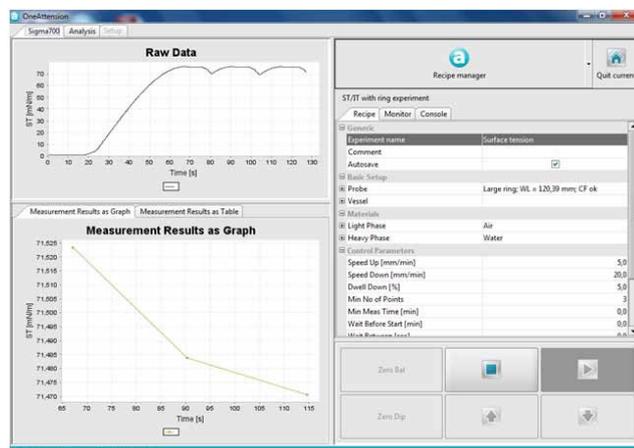
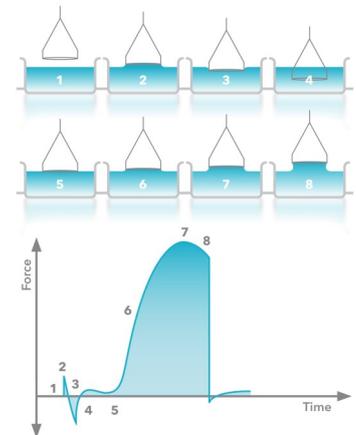
The “OneAttention” software enables superior analysis of drop shapes using the Young–Laplace equation which fits the entire drop profile and is the reference method. OneAttention is all-inclusive with no separate software modules. It features an intuitive user interface, live analysis, configurable user groups and accounts and a pre-set liquid database.

Attention 3D Topography module on Theta measures the roughness of surfaces on coatings, materials and medical implants as well as contact angle, at the same location.



Sigma Force tensiometers, like shown below, work with mass balances to measure the force of meniscus between a solid like the Wilhelmy Plate and a liquid. Or have push and pull modes with Du Nouy rings (shown in diagrams) or with a Platinum Rod.

Force tensiometry used in Sigma has become the method of choice for many industrial standards. It is also the most widely used technique for measuring critical micelle concentration of surfactants. In addition, it is the only method to determine the absorption and contact angle of a packed powder or of fibre beds using the Washburn method. The wetting of textiles and individual fibres can also be studied with Sigma force tensiometers.





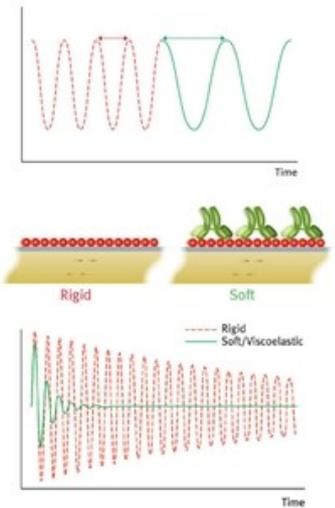
Biolin: Qsense Quartz Crystal Microbalance with Dissipation

Q-Sense develops research instruments based on their patented Quartz Crystal Microbalance with Dissipation monitoring (QCM-D) technology. These products are suitable for studying molecular interactions and surface science, mass and structural changes at the nanoscale level.

The QCM method is based on a vibrating quartz crystal sensor (acoustic resonator). Measurements are made of changes in vibration frequency in response to reactions that occur on the sensor surface.

QCM-D uniquely monitors the frequency and energy dissipation response of the freely oscillating sensor. QCM-D enables real-time, label free measurements of molecular adsorption and/or interactions on various surfaces. In addition to adsorbed mass (ng/cm² sensitivity), measured as changes in frequency of the quartz crystal, the dissipation parameter (D) provides novel insights regarding structural (viscoelastic) properties of adsorbed layers.

Qsense have just launched a new high end automatic system, the **Omega auto** to extend the range from stand alone E1 to a four sensor E4 and now the multipurpose Omega with 8 sensors in 4 pairs for kinetics and unattended workload.



Biolin: KSV NIMA Langmuir troughs

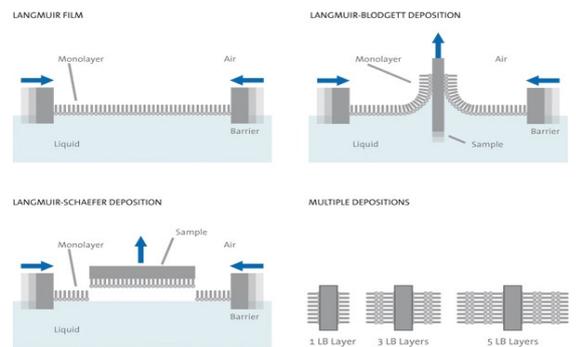
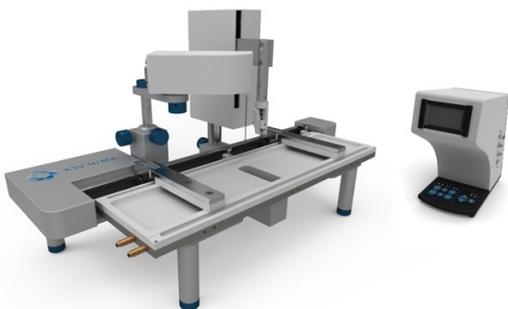
KSV NIMA produce high quality Langmuir and Langmuir Blodgett troughs for monolayer production and

experimentation.

These come in various sizes and budget levels, with accessories and extra

facilities to suit any requirement you may have. KSV and NIMA were well regarded before joining forces and now can be said to make the best thought-out, best engineered and most reliable LB troughs in the world.

And for all that, it is not that expensive to own the best in Langmuir troughs.



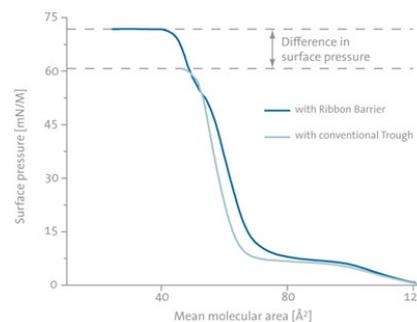


Newly released is the KSV NIMA **Ribbon Barrier Trough** for studying lung surfactants at high compression without leakage. It can also be used to deposit monolayers at high



LANGMUIR RIBBON BARRIER TROUGH TOP

packing densities onto solid samples. Deposition enables further characterisation of your film with complementary techniques such as QCM-D and AFM.



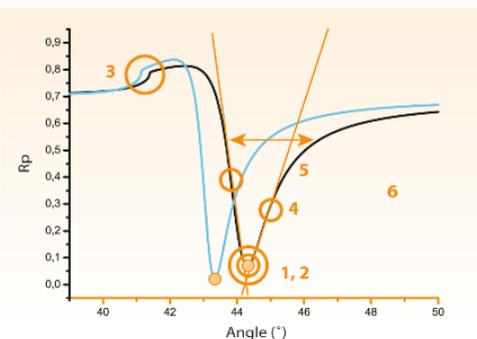
KSV NIMA also produce the **Interfacial Shear Rheometer**, a wide range of **Dip Coaters** and the FTIR based **PM-IRRAS** system for advanced characterisation.

A **Brewster Angle Microscope (BAM)** option enables the visualization of Langmuir monolayers or adsorbate films at the air-water interface. In conjunction with a Langmuir Trough, it enables the study of Monolayer/film behaviours like phase changes, phase separation, domain size, shape and packing. When combined with a KSV NIMA L or LB Trough, observation can be performed during compression/expansion at known surface pressures.

Bionavis SPR Navi Surface Plasma Resonance

"Bionavis strive to develop Surface Plasmon Resonance (SPR) technology beyond today's understanding. We manufacture SPR instruments with superior features and performance." The new 6 sample SPR Navi™ 210A has been developed in collaboration with **Dr. Janusz Sadowski** who was the main driver in the research of SPR technique at VTT for over 20 years, and **Dr. Ulf Jönsson**, the founder and former CEO of Biacore, the company that pioneered the use of SPR spectroscopy for protein interaction analysis.

The SPR Navi™ 210 A instrument offers unique Modular Multi-Parametric Surface Plasmon Resonance (**MP-SPR**) that gets your research beyond traditional SPR (single-parameter sensogram) measurements performed by conventional instruments with focused beam, fixed angle set-up like Biacore offer.



How does this happen? Well it's a true multi-angle goniometer (40~78 degrees) with multiwavelength laser capability.

This means you can distinguish between bulk buffer effects and molecular binding and see events outside the narrow angular range of traditional focussed optics SPR.

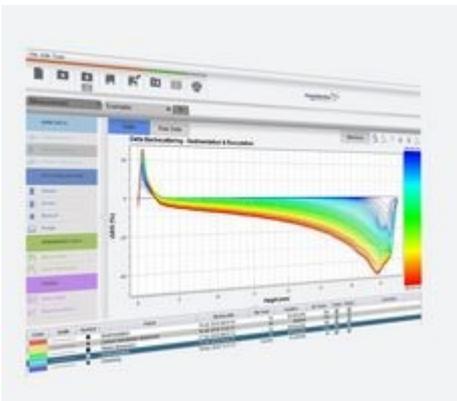




Formulation: Turbiscan Sample stability

Founded by Gérard Meunier, Formulation's first product gave formulation chemists a tool, the MA1000, to assess the stability of complex systems for the first time. They have since developed a complete range of instruments from dedicated **Heavy Oil** testers to the general purpose **Lab / Lab Expert** to **AGS** with temperature zones and automatic sample station. Turbiscan is used by over 1,400 labs in >40 countries, because they can profile and quantify subtle changes in your emulsion and suspension and Turbiscan shortens your testing times.

Turbiscan software (version 2.0) is now being released with a novel stability Index (**TSI**) to quantify, compare and graph samples globally or in zones without complex user interactions.



Along with this innovation, Formulation are introducing a 6 sample instrument with a 4~80C range and a compact foot print — the new **Turbiscan Tower** also has an inbuilt LCD panel. All Turbiscans use temperature to accelerate changes. There is no centrifugal stress to alter your materials natural structure or conflict with bottle tests.



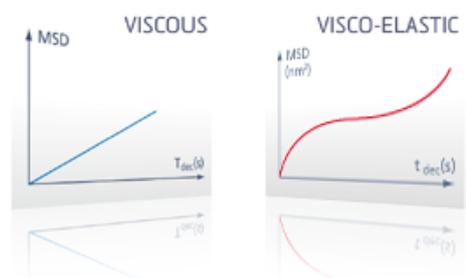
Formulation: Rheolaser Microrheology

Formulation's Rheolaser utilises Diffusing Wave Spectroscopy (DWS) for concentrated emulsions and creams to characterise the microRheology of materials.

As the Rheolaser doesn't use any external force, the technique is "Passive microRheology" with no external stress, so the measurement is made at rest. The only force acting on the particles is due to native thermal energy (Brownian Motion), and the response is measured by probing the time-dependent Mean Square Displacement of the particle (MSD).



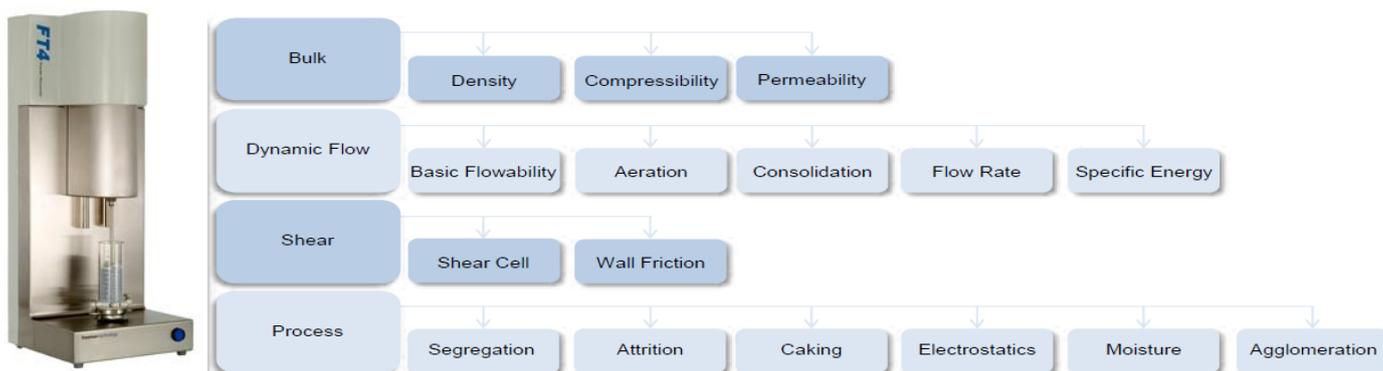
In this, the displacement of the particles in a purely viscous fluid grows linearly in time, whereas in an elastic fluid the particles are limited in their displacement.





Freeman Technology FT4 Powder flow testing and Rheology

Freeman Technology's business is understanding powder flow behaviour and the design of instrumentation for powder characterisation. The FT4 Powder Rheometer is a universal powder tester, three instruments in one – a **dynamic flow tester** using patented technology, a **shear cell tester** and a **compression tester**. FT4 comprehensively characterises all types of powders, and the available tests reflect the complexity of powders in contrast to simple, single-number assessments of flowability.

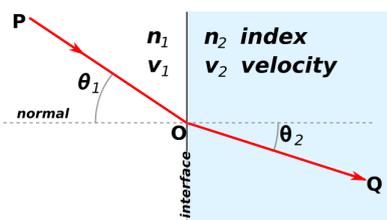


This gives you essential information to improve the consistency and efficiency of your powder processing.

Index Instruments Refractive Index

Index Instruments have manufactured Scientific Instruments for over 30 years in their premises near Cambridge. They specialise in Refractive Index technologies supplying the Confectionery, Food, Beverage, Pharmaceutical, Petrochemical, Essential Oils, Agriculture, Education and Sugar Industries.

Refractive Index as we know from **Snell's Law** covers the bending of light as it passes between media; a phenomena that is caused by a change in the speed of the light between the media.





Lamy Rheology Viscometry and Texture

Lamy Rheology with a long history in contract manufacture have been designing and manufacturing their own range of viscometer products in their base near Lyon, France since 2006. Lamy distribute worldwide and their entry level viscometers are great value, the novel “Black One” costs less than €2,500 (vat extra) complete with accessories.



The Low Shear LS400 uniquely measures low viscosities at low shear rates and with small sample volumes. This uses a COUETTE principle of rotating cup and fixed bob to measure the Torque; the LS400 rotates at 0.1 to 100 rpm and Torque goes from 0 to 0.006 mNm in 5 ranges.

A new product from Lamy is the affordable **Tex'an 200** texture analyser shown at Pittcon and Achema. This system allows measurement of “simple compression”, TPA tests, BLOOM tests and TRACTION in food, pharmaceutical and cosmetic industries.



Malvern: Mastersizer 3000 Laser Diffraction Sizing

Malvern Instruments' range of particle analysers has evolved to meet the needs of users in industry and academia. Through continuous innovation with laser diffraction technology, Mastersizer has become the **gold standard** particle size analyser. Mastersizer has always offered good software, reliable optics and full validation support. Now we have a completely new Mastersizer with novel software, advanced engineering; a totally new bench designed for the next decade! The all new Mastersizer 3000 analyser sizes particles from **3.5 millimeter** right down to **10 nanometer** in the smallest of instrument footprints.

To complete the system completely new dispersion units offer simply the best in sample dispersion.

The **Aero S dry powder dispersion** accessory offers choice of venturi and sample trays, air pressure and feed rate, The dedicated air cell has inlet air filters, is secure to fit in seconds and very easy to clean. The vacuum collector couples to the air cell without any further manual intervention!





The **Hydro MV and LV** offer automatic liquid dispersion for solvents and aqueous systems in medium volume and large volume tanks respectively. These are completely new designs that work with a new wet flow cell designed to keep clean for longer. Both feature inbuilt flow path sonication. The **Hydro EV** is an affordable, manual, dip-in wet sample dispersion unit that can be used with standard laboratory glassware. It also has flow path sonication. The flow cell features a new window/seal design, easy to split and clean in a quick fit cassette.



The **Mastersizer 3000 software** has a very wide range of facilities in a fresh layout of records, graphs and tables that is easy to use and to tailor for your own needs. Features like Data Quality, trend plots, result overlays and SOP player (that effectively automates sequences of measurements) for method development all come together to make this a powerful system for optimizing and validating methods. You can even emulate MS2000 (and other systems) analyses in MS3000 software and evaluate older designs using Lens Range emulation analyses.

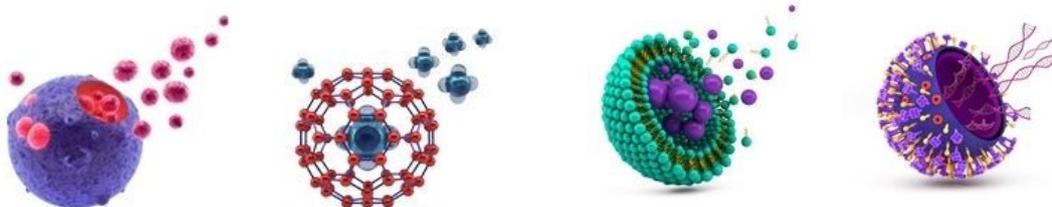


Malvern

NanoSight

NTA technology

The NanoSight range of instruments utilizes Nanoparticle Tracking Analysis (NTA) to characterize particles from 10nm –2000nm* in suspension. Each particle is individually but simultaneously analyzed by direct observation and measurement of diffusion events. This particle-by-particle methodology produces high resolution results for particle size distribution and concentration, while visual validation provides users with additional confidence in their data. Both particle size and concentration are measured, while a fluorescence mode provides differentiation of labelled or naturally fluorescing particles. Applications include Exosomes, Nanotoxicology, drug delivery and viruses.

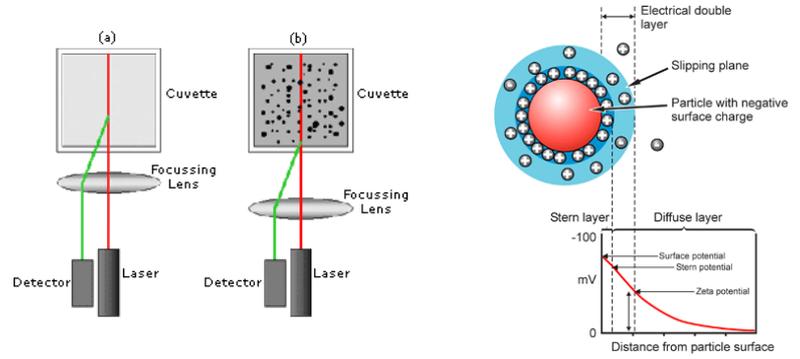
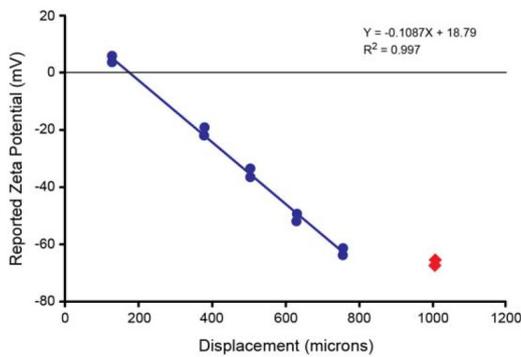




Malvern: Zetasizer Nano, mV and APS

The premium ranges of sub-micron instruments with the highest sensitivity and widest range of measured parameters and options available. This is the world's most popular system for the measurement of particle sizes from 0.6nm and molecular size from 980 Da using Dynamic Light Scattering. Add to this zeta potential and electrophoretic mobility using Laser Doppler Microelectrophoresis, and molecular weight using Static Light Scattering, and the Zetasizer Nano range is a formidable system.

Dynamic Light Scattering



A new option for the Zetasizer range is the *Solid Surface Cell* that facilitates measuring the Zp of a surface or adsorbed material using tracer particles and stepping the measurement position incrementally from the surface in a series of measurements—and extrapolating back to the real surface.

	uV	APS	Nano S90	Nano S	Nano ZS	Nano ZSP
Size Techniques	DLS Sizer, SLS SEC detector	Multi-sample (96, 384 wells)	Size 90 degree	Size NIBS 13 degree	Size NIBS 13 & 173 degree	Size NIBS 13 & 173 degree
Zeta Potential	.	.	.	.	M3 PALS	M3 PALS
Laser/optics	60mW 830nm, single mode fibre	60mW 830nm, single mode fibre	HeNe 4mW	HeNe 4mW	HeNe 4mW	HeNe 10mW
Min volume	2 µl batch 8 µl flow	20 µl	20 µl	12 µl	12 µl	12 µl
Lysozyme size sensitivity	0.1 mg/ml	0.1 mg/ml	10 mg/ml	0.1 mg/ml	0.1 mg/ml	0.1 mg/ml
Toluene counts	180 kcps	.	2 kcps	150 kcps	150 kcps	300 kcps
Zp protein sensitivity	.	.	.	.	10 mg/ml *	1 mg/ml
Special Zeta cells	.	.	.	.	High conc. Solid surface	High Conc. Solid surface
New Protein software	.	.	.	option	option	standard
Micro-rheology	.	.	.	.	option	option

Also new is the tracer-particle DWS *Microrheology* facility launched with the ZSP and available as a retrofit for all Zetasizer Nano ZS users. This software is for studying viscoelastic properties of samples in dilute systems.

The *Nano ZSP* also features a completely new *Protein measurement* package for protein charge, protein mobility and protein interactions.

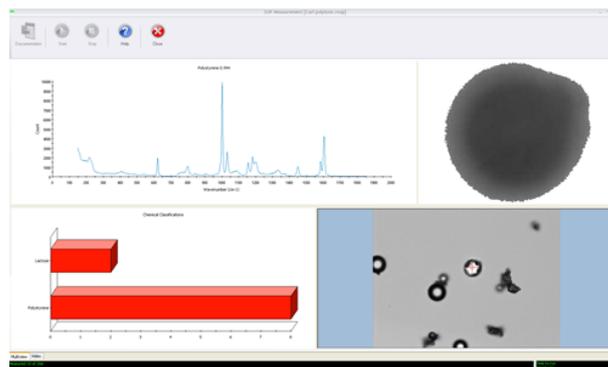


Malvern: Morphologi Vision and Chemical Imaging



The Malvern Morphologi G3 automated particle characterisation system is an analytical tool that can provide high quality images AND statistically useful particle shape and particle size measurements.

The G3 can analyze powders dry using its inbuilt dispersion system, or can work with special slides in holders (like the useful filter holders) to suit your application. Wet dispersions and evaporated samples are also catered for. A new development is a chemical imaging variant the G3-ID that integrates automated size/shape analysis of particles from 0.5 micron to 10 mm with chemical identification provided by Raman microscopy.



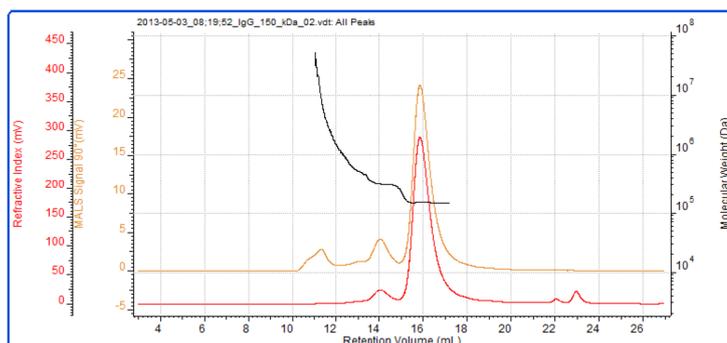
Best in class particle morphological analysis by Malvern Instruments coupled with best in class Raman spectroscopy by Kaiser Optical Systems Inc. means unparalleled performance, ease of use, and commitment to customer satisfaction.

Malvern: Viscotek SEC & GPC with Intrinsic Viscosity and SEC MALS

Gel Permeation Chromatography/Size Exclusion Chromatography (GPC/SEC) is the technique of choice for characterization of molecular weight and molecular structure of proteins, natural polymers and synthetic polymers.

If you are looking for a complete GPC system or just an additional detector for your existing system we can help. The Viscotek TDA sets the standard for multi-detector analysis with refractive index, viscometer and light scattering detectors acting in concert, providing complementary data on the macromolecules being analysed, and together offering Universal Calibration and Absolute Mol. Wt.

For BioPolymers and proteins SEC MALS is the standard technology and Viscotek now offer a 20 angle true SEC MALS system for characterising samples, like IgG Molecular weight 147 kDa in this 3 peak trace.





Malvern: Kinexus & Bohlin Rotational Rheology

Kinexus is a unique Rheometer designed for tomorrow's rheology needs across all industries and application areas. Designed by Malvern from the ground up, the Kinexus rheology platform is the result of intensive product development. Kinexus enables you to analyze the rheology (flow/deformation properties) of your materials from liquids to solids, from processability to product performance, from temperature to time dependence and from simple viscosity to complex viscoelastic parameters.

The Bohlin range of Gemini II rotational Rheometers are still available and fill many special niches and applications, such as the Gemini HR Nano that offers nano-torque levels and enables users to probe weak or sensitive material structures, yet retains a continuous torque range to 200mNm. The patented Rotonetic 2 drive technology brings an unsurpassed range and sensitivity to control torque and speed across all steady, dynamic and transient modes.



Malvern: Rosand Capillary Rheology

Rosand Capillary Rheometers simulate the high shear rate conditions of plastic processing operations, such as extrusion molding.

In a Rosand system the heated sample is extruded through a die of known dimensions and the shear pressure drop at set volumetric flow rates is recorded. The basic output is a viscosity versus shear rate graph, but you can also do extensional viscosity in twin barrel systems and many special tests.

The bench top RH2000 that is suitable for most tests is shown at right. Rosand also supply top of the range floor standing systems in strong H frames for unsurpassed Rheometer performance in terms of speed control, accuracy, and dynamic operating range.





Malvern: Parsum

Process size probe

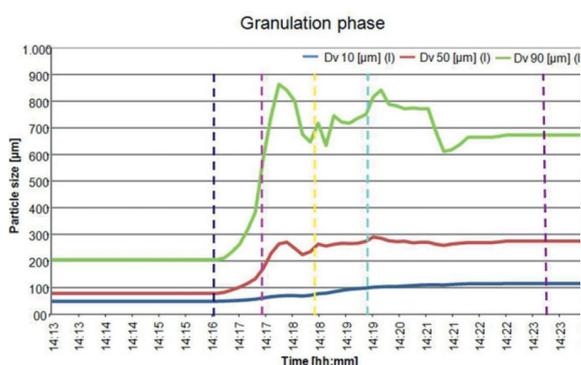


Malvern's newest sensor is specifically designed to measure the size and velocity of larger particles and granulates for chemical and food industries. **Parsum Real Time Sensor** is a probe for measuring particles with an average size of 50–6000µm and at velocities from 0.01 to 50 m/s. The probe can be easily installed directly into any gravity or pneumatic process line.

The Parsum probe simultaneously measures particle size and velocity of individual particles. In wet



granulation like this *high shear wet granulation* process, the Parsum was able to precisely detect the **Granulation End Point** and even a late reduction of loose aggregates, all in a robust package (see a real world installation photo).



Malvern: Spraytec

Spray droplet sizing

Malvern Instruments' Spraytec is a laser diffraction particle size system specifically designed to address the unique requirements of aerosol and spray droplet characterization across a wide range of industries and applications. The Spraytec provides in-situ, real-time droplet measurements in a fully validated package, giving accurate and reproducible results, time and again.



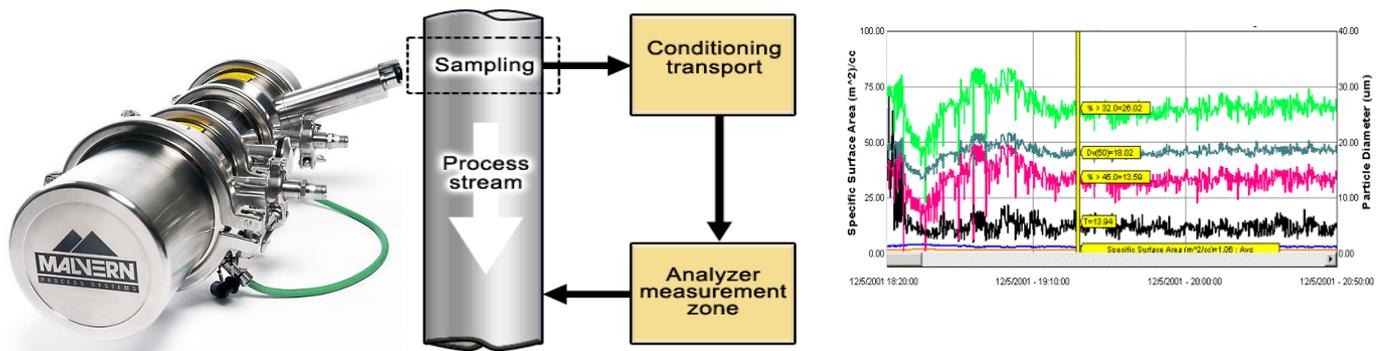
The 10kHz sampling rate, 0.1~2000 micron size range and the wide range of accessories make Spraytec an industry standard for continuous and intermittent spray studies.





Malvern: Insitec Process sizing

Malvern Instruments' laser diffraction technology is at the heart of the Insitec system. Its robustness has allowed implementation of the Insitec sensor so that it copes easily with the rigours and demands of an industrial process environment. The sensor's lenses allow the tuning of the instrument to the needs of the process. The instrument is watertight and dustproof, and certified to industrial protection rating IP66. It is CE badged and meets industrial grade electromagnetic compatibility (EMC) requirements for safe, reliable operation. ATEX versions, IS systems, polished surfaces and life cycle documentation are all available.



Microfluidics Particle Size Reduction

Microfluidics Corporation have a unique technology for particle size reduction in a flowing system. Their HQ is Boston, Mass. and they have a base in Lampertheim near Frankfurt with a team of specialists and engineers ready to support customers worldwide.

Microfluidics' high shear particle reduction technology is an ideal match with our expertise in measuring Nano particles in suspension. Many customers reduce size by milling or with classic homogeniser systems. This offers a different approach, one that is scalable to process levels.

The LV1 system shown to the right is a complete package with internal pumps for cell disruption at small scales. Its an ideal, desktop system for those wanting to extract enzymes, DNA or internal cell components.

The general purpose M110 shown below right works with external gas pressure, can operate at higher flow rates and shears and is scalable to the largest industrial systems. Their newest technology is MRT, a system that reacts two fluid streams under pressure and shear, to limit the size of any resulting crystals.





Micromeritics: Gemini BET SSA

The Gemini systems have evolved from a microprocessor controlled, multi-point Nitrogen BET SSA analyzer in 1990 to the latest compact BET system for routine labs with isotherm needs.

Gemini runs with an empty reference tube alongside the standard sample tube. This arrangement corrects for thermal issues and ensures fast, quality data. Indeed Gemini is probably the N₂ BET of choice for low surface area materials, such is the performance that comes from its unique design.

Now available with a standard or large volume Dewar, an optional dedicated Po tube, choice of keypad control or real time PC operation, the Gemini is more than a starter system. Users can tackle longer isotherms and avail of the larger volume of liquid nitrogen and Po tube to ensure that Liquid N₂ stays above the sample, and that atmospheric pressure is corrected for.

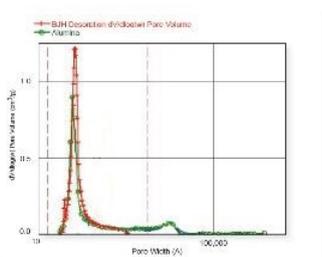


Micromeritics: TriStar II and II Plus BET SSA

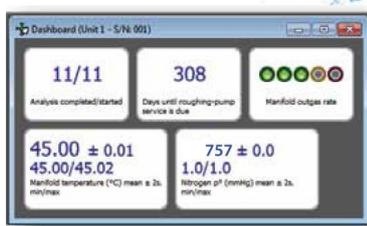
The industry standard TriStar 3020 has 3 ports for simultaneous BET and gas adsorption isotherms. It offers 21CFR Part 11 compliance and its performance in sensitivity, reproducibility, reliability and throughput exceed all expectations. Standard features include unique Isothermal jackets, filler rods to reduce free space and a selection of different tubes for samples. Tristar II is truly a workhorse for the busier lab where surface area and mesotherm work is concerned.

The latest **Tristar II** has a small footprint, choice of vacuum pumps and a Kr option that extends the SSA limit below 0.5 m² of total surface in the tube, letting you work with materials with 0.1 m²/gm SSA.

Tristar II Plus is a new version with corrosion resistant manifold, a new 40hr Dewar and all the latest MicroActive software facilities embedded to make reporting and analysis a breeze. For example this integrated plot of BJH pore distribution extended with Hg intrusion data is now possible.



Overlay of BJH desorption and mercury intrusion log differential pore size distributions for alumina pellets





Micromeritics: ASAP 2020HD Physisorption system

The ASAP range since launch has become the definitive high end physisorption gas analyzer in the research world. This is based on the numbers of literature citations for ASAP, and not just instrument installations.

Core to the ASAP's design is the dual vacuum system with separate lines for sample degas and for analysis. Oil-free "dry" vacuum option to prevent oil contamination and High Vacuum options for use with Krypton are

available. For Micropore work there are 1 micron transducers and in the 2020 HD (the High Definition version) there are 0.1 micron transducers to go an order of magnitude lower before starting your isotherm – ideal for MOF work. ASAP 2020HD has a range of other improvements (including Hi-AC), all aimed at higher resolution and improved accuracy in your isotherms.

In software ASAP has the complete package, including pioneering Non-Local Density Functional Theory (NLDFT) and over 20 models available. What else? Well, 12 gas inlet lines for maximum flexibility and the ability to connect your output to a mass spectrometer.



Micromeritics: ASAP 2050 Xtended Pressure Isotherms

The ASAP® 2050 Xtended Pressure Sorption Analyser is capable of collecting high-resolution, high-pressure adsorptive isotherms from vacuum to 10 atmospheres. While retaining many design elements of the popular ASAP 2020, the ASAP 2050 offers an extended range of capabilities that enables the instrument to obtain data in an elevated-pressure environment. The instrument also allows the user to collect traditional isotherms for determining surface area and porosity, but not in the ultra vacuum micropore regions.

- ⇒ An optional chiller Dewar and recirculating bath allow the ASAP 2050 to be operated indefinitely – the instrument also supports the use of a standard Dewar with cryogen (typically liquid nitrogen or argon) that will provide at least 50 hours of unattended analysis without refilling the Dewar
- ⇒ Straight-walled, stainless-steel sample tubes are capable of safe operation up to 150 psi
- ⇒ Rapid collection of non-monotonic isotherms with standard isotherm cycling software
- ⇒ Special degas heating mantles can be used to prepare samples in situ on the analysis port prior to analysis
- ⇒ Temperatures at each degas port, and the rate of temperature change, can be set and monitored individually from a few degrees above ambient to 450 C
- ⇒ A user specified pressure setting protects the sample from steaming or damage during sample preparation





Micromeritics: 3 Flex 3500 Multi sample High Resolution Micropore

The all-new 3Flex was engineered down to the smallest detail to improve sample throughput, stabilize temperatures, reduce outgassing and most important increase the resolution and range of your micropore isotherms. With three configurable analysis ports for high throughput 3Flex can operate two or three micropore ports to meet current or future needs.

- ⇒ Standard mesopore, micropore, or physisorption ready instrument (Nitrogen or Krypton BET SSA), 5 gas ports
- ⇒ Pneumatically actuated, hard seal valves provide ultra-clean, leak-free operation
- ⇒ Stainless steel gas inlets, VCR fittings, and analysis manifold
- ⇒ Interactive Micro Active Software for data analysis with user-defined report options
- ⇒ Advanced instrument diagnostics
- ⇒ Small footprint conserves valuable lab space



Micromeritics: ASAP 2020 Chemi Chemisorption

Micromeritics offer several gas adsorption systems designed for catalysis research, for working with reactive or corrosive gases and for chemical rather than physical assessment of surfaces.

The starting point is their Flowsorb systems with manual controls and TPD options shown right.

The ASAP range has a full 2020 Chemi package to work with flowing gases over reactive samples, with temperature control, inlets, gas switching, corrosion resistance, heated manifolds and gas lines. Detectors are provided to allow analysis with condensable vapours. Sample preparation occurs in situ to prevent contamination prior to analysis. Samples can be prepared at high temperatures (up to 1100 C) and at low pressures ($<10^{-5}$ mmHg).

A benefit of using ASAP 2020 as your platform is the modularity of the system. With the correct 2020 versions, it is easy to move between BET, Isotherm, Micropore and Chemi work.





Micromeritics: Autochem II Chemisorption

AutoChem II 2920 is an automated chemisorption analyzer that can provide the ability to conduct a comprehensive array of precise studies of chemical adsorption and temperature-programmed reactions. With this single instrument, you can acquire information about the physical properties of your catalyst, catalyst support or other materials. It can determine percent of metal dispersion, active metal surface area, acid strength, surface acidity, distribution of strength of active sites, BET surface area, and more. AutoChem II safely performs pulse chemisorption, temperature-programmed reduction (TPR), desorption (TPD), oxidation (TPO), and reaction analyses and does it automatically. This unit is also available in a Corrosion Resistant version AutoChem 2950 HP is a bench-top, microreactor system designed for catalyst characterization up to 70 atmospheres ideal for researchers who want to conduct experiments and characterize their materials at conditions approaching commercial operation.



Micromeritics: AutoPore V new Mercury Porosimeter

Micromeritics' AutoPore V 9600 Series characterise a material's porosity by applying various levels of pressure on a sample immersed in mercury. The pressure required to intrude mercury into the sample's pores is inversely proportional to the size of the pores. This is called Mercury Porosimetry, or "mercury intrusion."

The AutoPore V Series Mercury Porosimeters can determine a broader pore size distribution more quickly and accurately than other methods. This instrument also features enhanced safety features and offers new data reduction and reporting choices that provide more information about pore geometry and the fluid transport characteristics of your material.

- * Easy to use penetrometers,
- * Easy high pressure sample port loading,
- * MicroActive reporting software

A NEW BENCHMARK FOR SAFETY

Mercury Collection Trays -
Safe collection of mercury for disposal in the case of compromised penetrometer seals or operator error resulting in broken penetrometers.

Mercury Temperature Sensor
The ability to set a temperature limit in manual mode allows the display of a warning message if the temperature is exceeded.

Mercury Vapor Detection Device
Hand held device to check localized mercury vapor levels that exceed defined safety limits. Portable device allows point checks at the instrument or any location within the lab exposed to mercury.

Mercury Vapor Capture Filter
Affixed to vacuum pump, this filter prevents release of mercury vapors. This is a superior solution to cold trap dewars used in competitive instruments, particularly if the cryogen level is insufficiently maintained.



Triple Fail Safe-No. 1 Penetrometer Safety Cap

In case of operator error, this device prevents the penetrometer or rod being released from port unintentionally.

Triple Fail Safe-No. 2 Interlock on Locking Cap

Verifies that capacitance detector is installed on low-pressure port, automatically suspends run, and permits user to check filling of the penetrometer prior to run.

Triple Fail Safe-No. 3 System Pressure Vent on Manifold

Works in concert with Cap interlock to automatically vent system pressure if above ambient pressure and error condition is detected.

Improved Mercury Funnel Design

Attached screw cap and funnel-shaped opening eliminates mercury contamination and possible drip spillage associated with separate detached filling funnel. Attached screw cap prevents loose cap and possible vapor release.

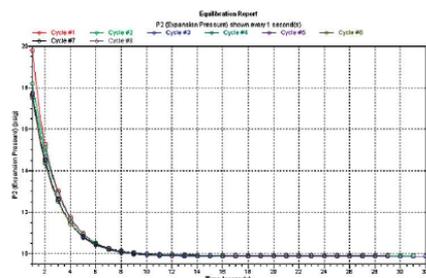
Software Control for Fine Powder Samples

Prevents fine powder from accidental aspiration into low-pressure ports during analysis by using intelligent evacuation controlled by sample type.



Micromeritics: Accupyc II Helium Pycnometer

The AccuPyc II 1340 Helium Pycnometer is fast, fully automatic and facilitates sample volume and density calculations for a wide variety of powders, solids, and slurries, with measuring sample volumes from 0.01 to 350 cm³. The instrument performs most analyses in less than three minutes with staggering accuracy. It is the gold standard in density testing. The standard AccuPyc II 1340 consists of



Pressure equilibration versus time plot for eight analysis cycles for glass sample illustrating the rate at which pressure equilibrates during analysis.

Cycle#	Volume (cm ³)	Volume Deviation (cm ³)	Density (g/cm ³)	Density Deviation (g/cm ³)	Elapsed Time (min:sec)	Temperature (°C)
1	2.9188	-0.0008	3.8072	-0.0008	8:00	23.84
2	2.9125	-0.0017	3.8096	-0.0023	10:20	23.89
3	2.9121	-0.0008	3.8076	-0.0022	12:55	23.90
4	2.9147	0.0005	3.8077	-0.0008	15:33	23.89
5	2.9161	0.0016	3.8077	-0.0018	17:45	23.91
6	2.9131	-0.0011	3.8076	-0.0015	20:17	23.82
7	2.9137	-0.0017	3.8064	-0.0023	22:34	23.82
8	2.9108	-0.0016	3.8042	-0.0021	24:00	23.83
9	2.9140	0.0008	3.8066	-0.0008	27:00	23.88
10	2.9134	0.0012	3.8047	-0.0017	29:28	23.89

Summary Data		Average	Standard Deviation
Volume:		2.9142 cm ³	0.0012 cm ³
Density:		3.8064 g/cm ³	0.0012 g/cm ³

an integrated control/analysis module. For users who require higher throughput, up to five additional analysis modules can be operated by a single controlling unit. Naturally, each module has its own gas connection and each module can contain a different size sample chamber. Accupyc offers an optional Peltier cooling module of the cell temperature for demanding samples and applications.



Micromeritics: Geopyc Envelope density

The GeoPyc 1360 Envelope Density Analyser measures the envelope density of porous objects of irregular size and shape. Envelope density, or bulk density as it is sometimes called, is the mass of an object divided by its volume where the volume includes that of its pore and small cavities. Envelope density information is useful in characterizing catalysts, structural foams, insulators, ceramics, powder metallurgy objects, and other manufactured goods larger than 2mm.

The GeoPyc follows a displacement technique that uses a quasi-fluid having a high degree of flowability called **DryFlo**. The sample is placed in a bed of DryFlo which is agitated and gently consolidated about the sample. The GeoPyc collects the displacement data, performs the calculations, and displays and or prints the results.



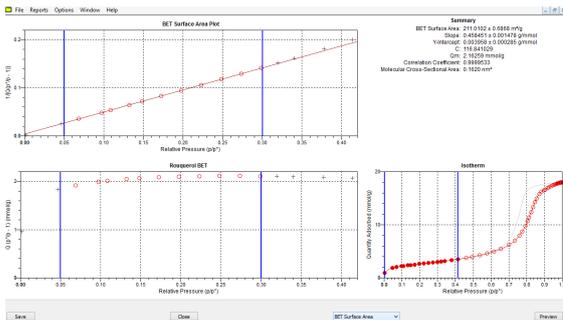
The unit can also report **percentage porosity** and **specific pore volume** when a sample's absolute density information (density excluding pore and small cavity volume) is obtained from a Micromeritics AccuPyc helium pycnometer is entered. This is especially useful for **pharmaceutical roller compactor** studies.



Micromeritics: MicroActive Interactive software and reporting

Micromeritics' innovative **MicroActive software** allows users to **interactively** evaluate isotherm data from Micromeritics ASAP, TriStar, and Gemini gas adsorption instruments (and all their *.smp files).

Users can easily include or exclude data, fitting the desired range of experimentally acquired data points using interactive, movable calculation bars. Isotherms can be viewed on either a linear or log scale and are available to the user under each calculation model. There is no need to generate reports to review results – see it graphically and interactively on screen.



The example shown here has bar limits for the calculation range between 0.05 and 0.3 P/P₀ selected. The sample was a high SSA material with excellent linearity...but you can see what restricting the top end would do to the calculated BET. Easy, quick, reliable, advanced.



Micromeritics: Particulate Systems

Micromeritics offer a selection of OEM specialised instruments under this brand, including the **HPVA instrument** designed to measure the high-pressure adsorption isotherms with hydrogen, methane, carbon dioxide and other gases using the static volumetric method. Typical applications for this instrument include catalysts, zeolites, activated carbons, carbon nanotubes, and hydrides. Understanding the adsorption characteristics of materials is critical in the research and advancement of hydrogen storage, fuel cells and batteries, stack gas scrubbers, and hydrocarbon traps.

- ⇒ Pressure Ranges from ultra-high vacuum to 200 bars.
- ⇒ Temperatures from cryogenic to 500 °C. Excellent control of sample temperature by means of a constant temperature bath.

SPECTester Material Segregation Tester

The innovative SPECTester measures your sample with up to 6 unique components and, with a touch of the finger, reports the pattern and the magnitude of sample material segregation. Fully automated, it provides data about: component concentrations, particle size differences, product uniformity, and up to 4 specific segregation mechanisms.





Micromeritics: Elzone II Particle Counter

The new Elzone® II 5390 Particle Size Analyzer utilizes the electrical sensing zone method to size samples without regard to optical properties, densities, colors, and shapes. The Elzone quickly and accurately determines the size, number, concentration, and mass of a wide variety of organic and inorganic materials.

With automated routines for start-up, run and shut-down; blockage detection and clearing, flushing/rinsing and calibration, the Elzone determines particle size in a range suitable for a wide variety of industrial, biological, and geological specimens. A high level of accuracy and resolution, speed, ease-of-use, and compact size make the Elzone equally suitable for industry, quality control, and research and development laboratories.



Optical Activity Polarimeters

Optical Activity are a leading manufacturer of digital Polarimeters for R&D and QC. They manufacture a full range from routine, low cost units, through mid range systems to the highest specification instruments available. Moreover they also provide a very wide range of sample tubes and certified, traceable standards.

The range of high quality polarimeter sample tubes can be used in almost all polarimeter applications, whether you need to measure the smallest amount of an expensive essential oil, or, if you have litres of sample, one of our tubes is sure to be suitable.

The highest accuracy polarimeters are the PolAAR Series consisting of eight models – with options of single wavelength, dual wavelength or multi wavelength, a choice of two or three figure accuracy and simple or full alphanumeric keypads. All versions are full circle polarimeters with a reading range of ± 90 angular degrees (in excess of ± 250 sugar degrees) and can be 21 CFR Part II compliant





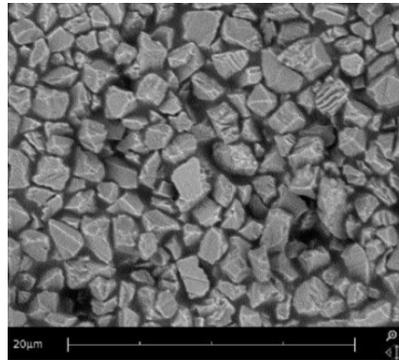
Phenom World

Desk Top Electron Microscopy

To complement light microscopy and laser particle analysers, electron microscopy offers unrivalled information on size, shape and surface characteristics. The **Phenom Pure**, for example is highly affordable yet can produce quality images in minutes.

Featuring a simple sample loading system, easy to use software and a B&W camera to “look around” the sample you get from 20X to 20,000 X magnifications—ideal for most powders and many materials you cant take down to a dedicated EM unit.

Or you can move up to a **Phenom Pro** and extend the range up to 100,000X magnification, a colour camera for 20x to 120x ranges and 5kV or 10kV acceleration voltages.



Postnova Analytics:

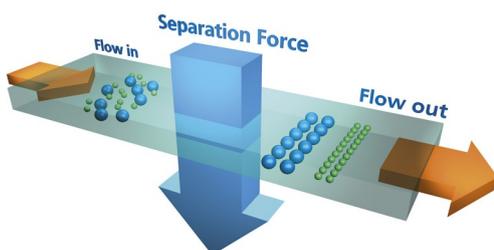
FFF

Asymmetric Field Flow Fractionation

Postnova Analytics are based in Landsberg west of Munich, Germany and in Salt Lake City, Utah, USA where FFF was first developed by Professor Giddings. They are simply the world leaders in Field Flow Fractionation technology (FFF) and especially in Asymmetric Flow FFF. This is an ideal technology for separating nano-particles and biotech materials prior to analysis by DLS or SLS and complements Zetasizer

SEC in flow mode for those who want a flexible and powerful system to size eluting particles and molecules.

FFF-LS technology is applied to separate and characterize biopolymers, synthetic macromolecules, proteins, antibodies, liposomes and nanoparticles for molar mass, particle size and branching conformation.



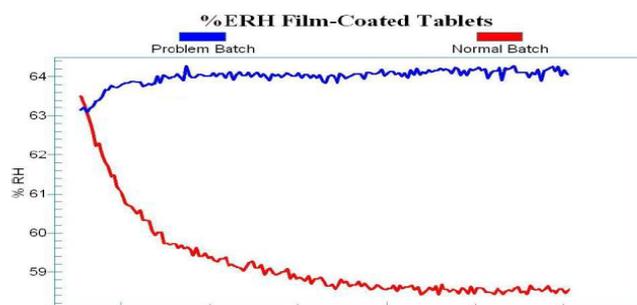


Relequa

Rapid moisture profiling of powders

Relequa is a unique analytical tool that provides information previously not readily available to the pharmaceutical or food industry. Its method of moisture profiling analysis gives instant data about moisture adsorption or evolution from pharmaceutical materials and products.

Designed and manufactured in Ireland, Relequa uses the principle of **Equilibrium Relative Humidity (ERH)** to produce data on moisture problems. Measuring the profile gives enormous insight into moisture impact on pharmaceuticals, excipients and foods.



Sequoia Scientific

Field and submersible particle sizing instruments

Sequoia Scientific began operations in 1995 and are now based in Seattle (WA) in the USA.

Their mission is to develop scientific instruments for research and measurements in aquatic environments. They produce unique particle sizing instruments, not just splash proof or watertight; but submersible in some cases down to 6000m.

The core product LISST-100x shown on the far right of the photo is a rugged, submersible unit that can be left underwater for months, passively collecting data on the size of particles suspended in that environment. The size range is 1.25 ~ 250 or 2.5~500 microns, and the data is transferred to PC and software analysis when recovered to the surface.



Variants like the LISST-LX unit can measure settling velocities in 8 size classes in situ. The aerodynamically shaped LISST-SL is a self contained isokinetic sampling and sizing system for use in flowing streams and rivers; again it operates unattended under water, you process the data on subsequent retrieval..

The portable (yellow) box is a self contained, battery operated particle sizer for field use with solid wastes or sediments or dirty water samples. The results are held in ASCII files for upload to PC and for Excel reporting when you return to the Lab/Office.

The other (Perspex) box is a fixed location monitor to facilitate upstream/downstream waters where you need to check on loads of contaminants or outfalls etc. Again it sizes the sediment loads for you and holds the data.



SMS: Intrinsic Water DVS

The development of Dynamic Vapour Sorption (DVS) by Professor Darryl Williams revolutionized vapour sorption measurements in 1994. The manual desiccator test was brought into the modern world of isotherms and computerized data capture and walk away operation. All SMS models are designed, developed and produced in house. The latest DVS models include a new, purpose designed SMS Ultra-Balance, replacing dated Cahn technology.

The neat Intrinsic system shown right is the ideal instrument for routine use in a QC lab or busy company.

Within R & D, applications range from studying polymorphism and stability to studies of the bulk and surface adsorption effects of water and organic vapors. It's also a QC analysis technique for both scale-up and production, and can be found measuring the efficacy and permeability of packaging materials, and the effects of humidity and temperature on the samples within the packaging.

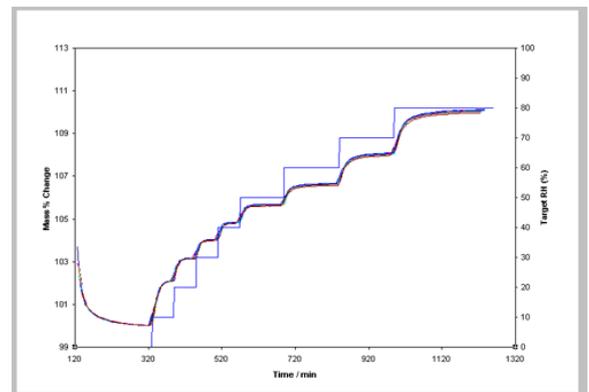


SMS: Advantage Water & solvent DVS

The DVS Advantage is the most advanced and versatile dynamic gravimetric vapour sorption capabilities in the SMS range; indeed it is the most complete system on the market.

Applications in food, pharmaceuticals, fibres, films and porous materials are supported with extensive applications experience, and include simple stability testing using water isotherms up to sophisticated prediction of solid-solid interactions.

- ⇒ Sample pre-heating.
- ⇒ Organic vapours facilities
- ⇒ Active control of relative humidity and organic vapour.
- ⇒ Flexible sample geometry.
- ⇒ Options of video microscopy and NIR or Raman.
- ⇒ Typical 1 to 30mgm samples
- ⇒ Full vapour safety sensors & interlocks
- ⇒ Resolution from 0.05 μg m
- ⇒ 21 CFR part 11 compliance





SMS: DVS – Vacuum DVS

The new Dynamic DVS–Vacuum allows adsorption/sorption experiments from atmospheric down to 10^{-3} Torr.

The adsorption of vapours on porous materials is important within numerous industries. Traditional gravimetric methods are based on using a ‘static’ vacuum technique. This method is limited by the fact that ‘out-gassing’ significantly contributes to the measured pressure and hence sorption measurements.

You can now obtain accurate sorption properties of your porous materials (with Solvents or Gases) using the latest DVS–Vacuum analyzer.



- ⇒ System can operate in static or dynamic vacuum modes for sorption and desorption via the use of both upstream and downstream pressure control from atmosphere down to 10^{-6} Torr.
- ⇒ Ultimate requested pressure inside vacuum chamber is always maintained via our dynamic vacuum mode. This has the advantage of eliminating system out gassing issues at low pressures
- ⇒ Wide Temperature Range of 25 to 85 °C

SMS: Surface Energy Analyser IGC

Unique to SMS is an instrument that uses pulses of solvent vapour to probe the surface and bulk properties of particulate and fibrous samples. Fine-tuning the probe molecules enables a wealth of fundamental physico-chemical properties to be elucidated including powder surface energies, acid/base/polar functionality of surfaces, diffusion kinetics and solubility parameters. The Surface Energy Analyser (SEA) offers an easy to use package of this technology, commonly known as Inverse Gas Chromatography (IGC) for Surface Energetics and Surface Energy Heterogeneity Mapping.

- o Unrivalled Accuracy
- o Fully Automated
- o Humidity Control
- o Sample Preconditioning
- o Wide Temperature Range
- o Heats of Sorption
- o Sorption Isotherms
- o Phase Transitions
- o Diffusion Kinetics



Particular Sciences provide a complete service for the products we supply.

We are the sole agents in Ireland (North and South) for these and our field engineers and sales engineers are trained and certified by the instrument manufacturers. We have direct access to these manufacturers service files and updates and can supply the latest software and firmware.

Sales Demonstrations Sample evaluation Equipment rental Finance arranged
Installations Qualifications (IQ/OQ) Training Preventative Maintenance (PM)
E mail & phone support Field Service Service Contracts

Office based support:

Video Conference facility (polycom) Telephone conferencing Skype conferencing
Email support Telephone support
Laboratory facilities for sample/method evaluations

Office: Anne Dempsey (manager), Iwona Pompka (marketing),
Danielle Dempsey (support), Aoife Ó Murchú (sales)

Support: Dr. John Fleming (manager), Arthur O'Kelly

Sales: Gerry Power (manager), John Sloane



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