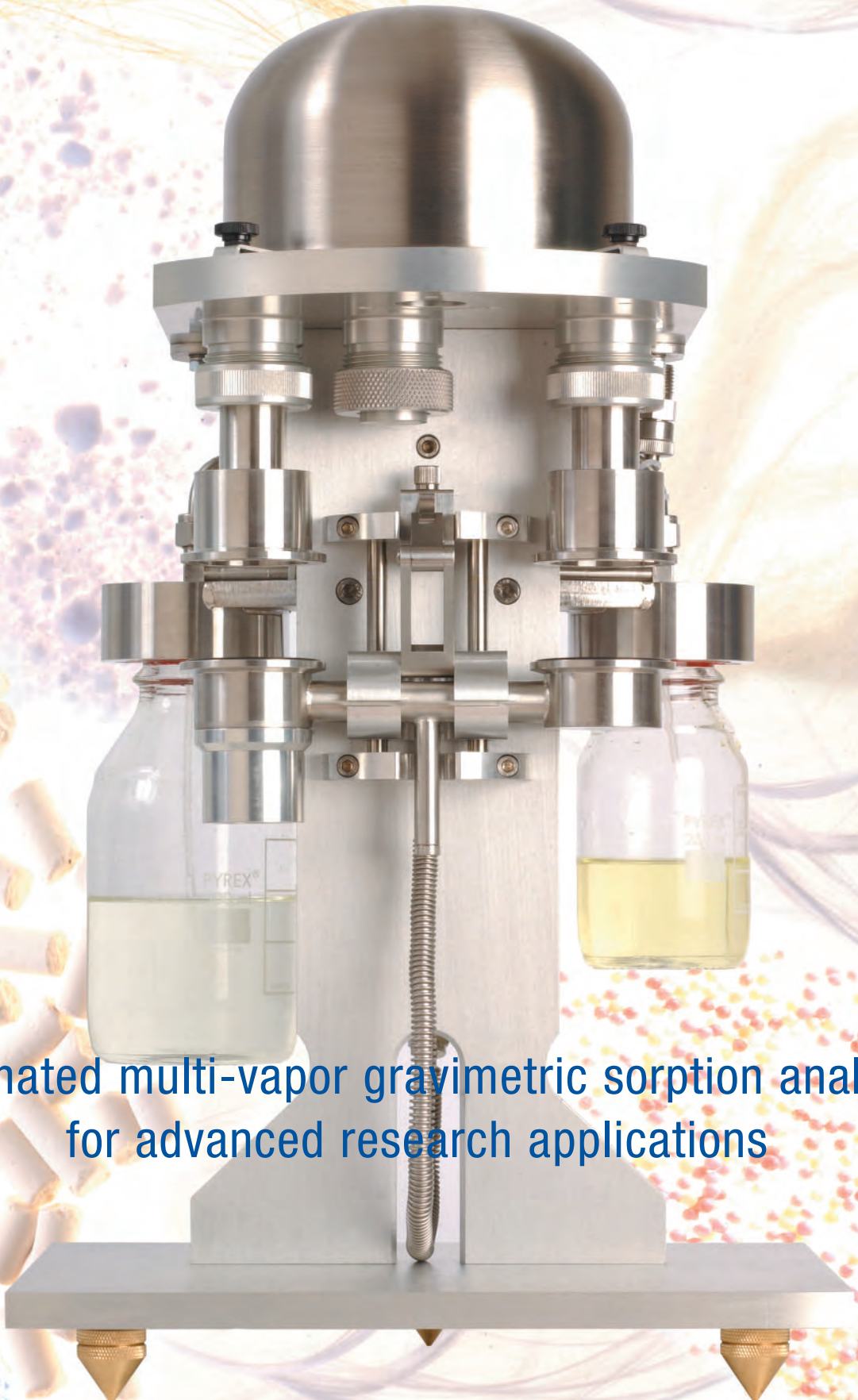**Surface Measurement Systems**
World Leader in Sorption Science

DVS Advantage

Automated multi-vapor gravimetric sorption analyzer for advanced research applications

Automated multi-vapor gravimetric sorption analyzer for advanced research applications

Key benefits of the DVS Advantage

- Single finger access for fast sample loading.

- High performance digital microbalance.

- Pre-heating of the sample up to 150°C.

- Full digital control of sample pre-heater and analysis temperatures.

- Multiple vapor reservoirs for rapid change from water to organic solutes.

- Multi-component vapor capability option.

- Unique in line transducer technology for measuring real time organic or water vapor concentrations.

- NIR and Raman fibre optic ready instruments.

- DVS Color Video option with full data annotation of digital images.

- Modular sample manifold.

- Smart Windows XP operator interface with full 21CFR part 11 compliance.

- Comprehensive data analysis macros and advanced macros with 21CFR part 11 compliance.

- Optional comprehensive Isotherm software.

- Second-generation organic leak sensor.

- Dedicated worldwide applications and technical support.

The DVS Advantage
(patent pending)

Dynamic Vapor Sorption with the Advantage

DVS Advantage combines the best in microbalance, gas flow and vapor measurement technologies to deliver unsurpassed performance in terms of experimental design as well as instrument accuracy and repeatability.

The Advantage uses a dry carrier gas, usually nitrogen, and the user can select one of any two vapor sources. Precise control of the ratio of saturated and dry carrier gas flows is enabled with mass flow control combined with the use of unique real time vapor concentration monitoring for both water and organics. A known concentration of the selected vapor then flows over a sample suspended from a recording ultra-microbalance, which measures the weight change caused by sorption or desorption of the vapor molecule. It is these dynamic flow conditions that enable the sorption/desorption process to be so rapidly studied.

The sample may be pre-heated if desired as a further experimental option, and which in some cases may speed up the analysis cycle time as in the case of bulk absorption or the drying of inorganic hydrates. This heating can be as a single step, or at a controlled ramp rate of temperature.

The temperature of the whole system is user selectable and precisely controlled under closed loop conditions to ensure that the solute vapor pressure at the sample is constant. Isolation valves at the solvent reservoirs ensure there is no solute contamination of the sample area when p/p_o of zero is requested, ensuring that a true p/p_o zero is always obtained.

The incredible sensitivity and precision of DVS Advantage enables the use of very small samples (typically 1 – 30mg) thus allowing equilibrium to be reached even more quickly.

Safety being paramount, there is a fully automated inert gas purge facility, and organic leak sensor system shut down interlock in the case of accidental organic vapor release.

The instrument is fully programmable and controlled by DVS Advantage software through a smart operator interface that meets the highest standards of data integrity and security. A full suite of data analysis modules running under Excel® allow one-click calculations and reports to be generated.

DVS Advantage schematic
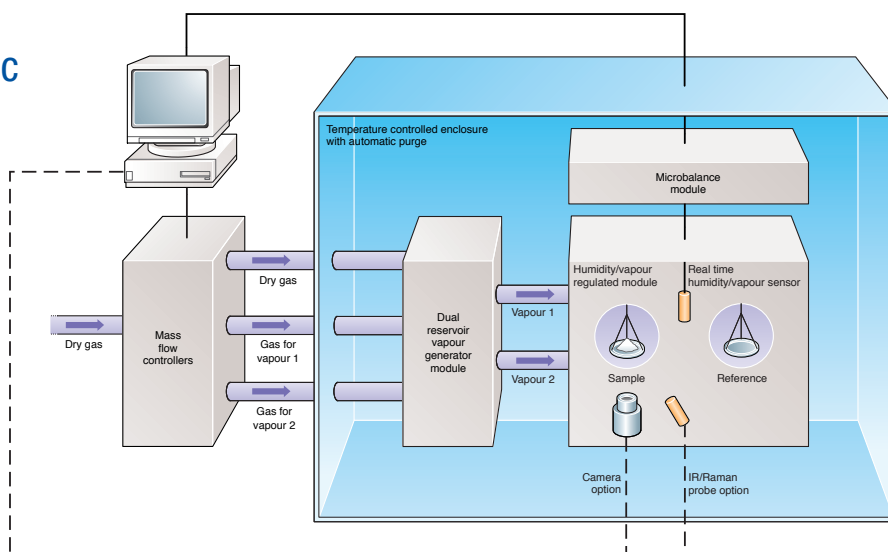
DVS Advantage Microscope option

The DVS microscope provides an integrated solution for the microscopic visualisation of samples during DVS experiments.
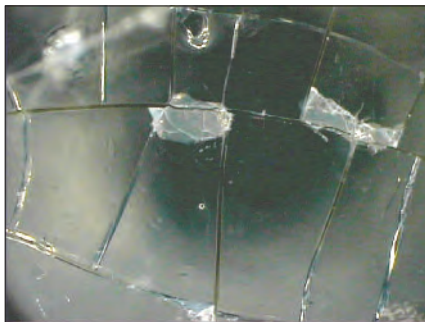
- High resolution camera
- 50x to 200x Lens
- Integrated optical fibre light source
- Integrated DVS Advantage control software
- Digital storage of captured images
- Overlay graphics with date/time/temperature/ vapor pressure
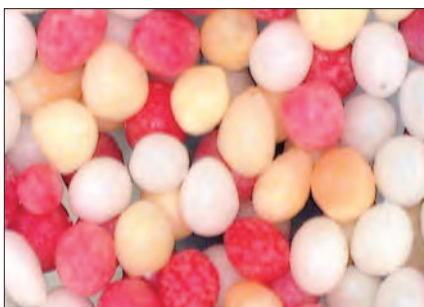
Effect of reducing humidity on PMMA

2 hours at 98.5%RH

18 hours at 90.5%RH

Timed release drug capsules exposed to controlled humidity


1 hour at 90%RH

4 hours at 90%RH

DVS Advantage Control software

The all new control software enables a full range of conditions to be defined for isothermal and isohumidity (or constant partial pressure) sorption experiments.

Complex protocols for multiple experiments using sample pre-heating, different solvents, with change of sample temperatures and time, with ramp or step changes, can be set up, and run fully automatically, thus releasing valuable operator time.
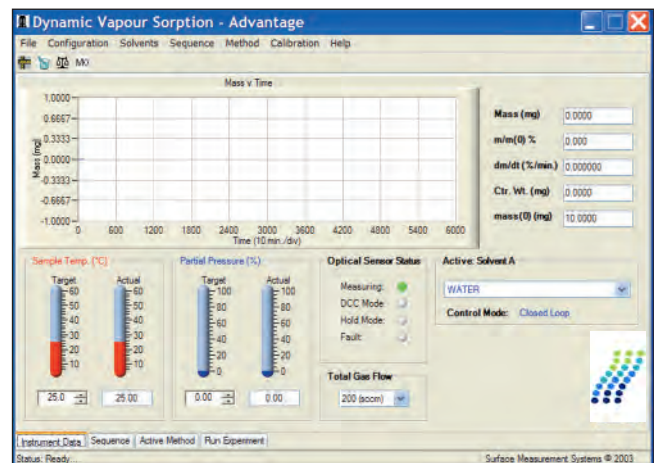
Control software screen shot

DVS Advantage Analysis and advanced analysis software

Simple transfer to an Excel® environment, using the DVS Advantage analysis software, opens up a range of options depending upon the nature of the application.

- Calibration and balance taring
- Isotherms
- Kinetic information
- BET Surface areas
- Heat of sorption
- Surface energetics
- Vapor pressure
- Amorphous content

Isotherm Analysis software

Unique in one package, single key report generation from more than 20 different models:

- Data for the prediction of shelf life and storage stability (water isotherms)
- Understanding solvent interactions
- Understanding hysteresis
- Characterising surfaces

Examples of DVS Applications

- Moisture uptake behavior of food and natural materials.
- Stability and caking of food ingredients.
- Moisture diffusion into blister packaging systems.
- Moisture sorption of hydrophobic pharmaceutical materials.
- Surface energies and surface areas of powders using organic vapor probes.
- Determination of deliquescence points.
- Moisture-induced glass transition in an amorphous material.
- Determination of amorphous contents.
- Pharmaceutical stability, drying and thermal degradation.
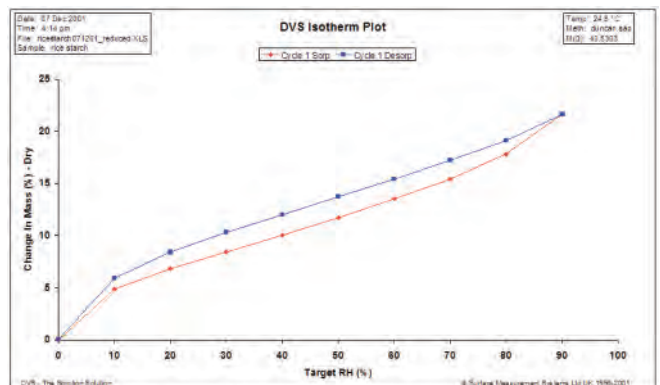- Adsorption of porous materials.
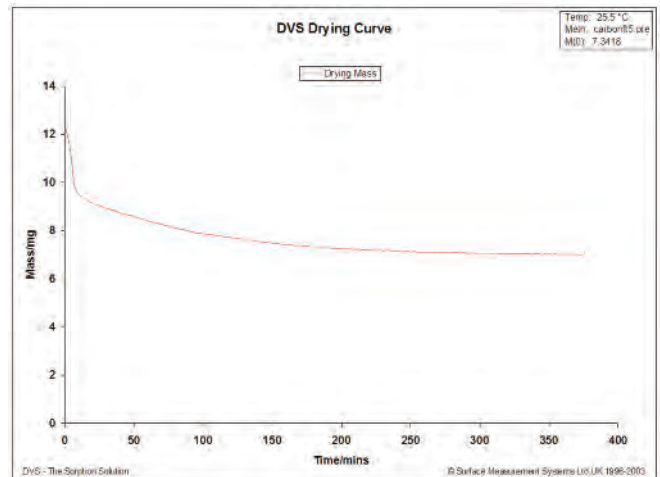
DVS pre-heating – CoCl$_2$ hexahydrate drying at 200ºC

Moisture sorption behavior of rice starch at 25ºC – 2-cycle experiment
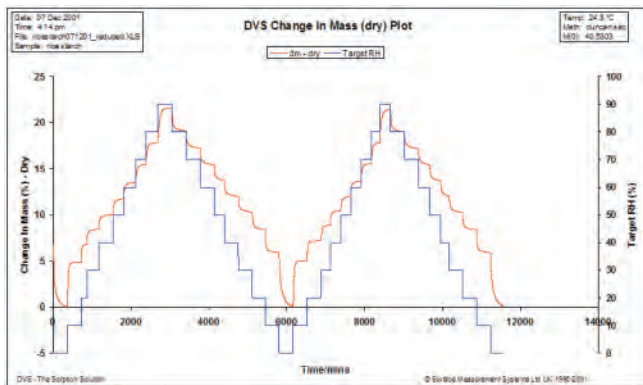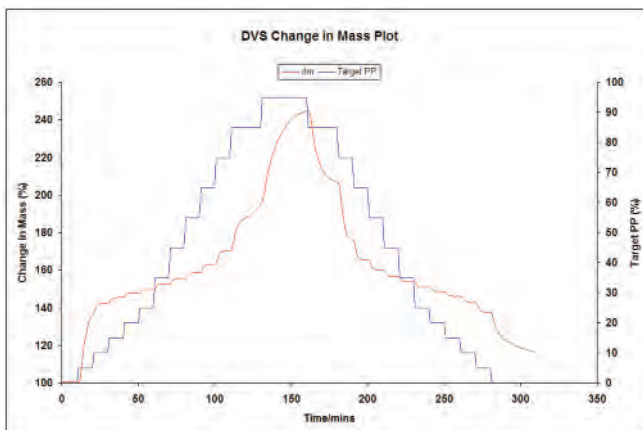

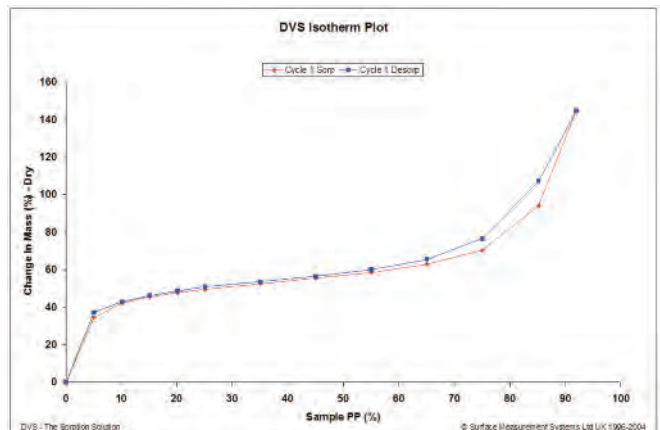
DVS change in mass plot

DVS isotherm plot

Cyclohexane on activated carbon at 25ºC – closed loop

DVS change in mass plot

DVS isotherm plot

DVS Advantage instrument range

MODEL	Advantage 1	Advantage 2
Sample mass	1.5g	5g
Dynamic range	150mg	1g
Minimum suggested sample mass	1mg	20mg
Sensitivity	0.1µg	1.0µg
Sample pre-heater temperature range	Up to 150°C	Up to 150°C
Temperature range	5–60°C**	5–60°C**
Humidity range	0–98% RH	0–98% RH
RH accuracy (+/- σ)	+/- 0.5% RH	+/- 0.5% RH
Vapor concentration range	0-90% p/p_o	0-90% p/p_o
Vapor pressure accuracy (+/- σ)	+/- 0.7% p/p_o	+/- 0.7% p/p_o
Gas (N_2) requirement	0–200 sccm	0–200 sccm

**Extended (ET) temperature option 20–85ºC.

Due to continuing product improvements, specifications are subject to change. At least 4 weeks notice will be given.

The Surface Measurement Systems scientific support advantage

A dedicated team of PhD scientists based in two continents is available to assist with application and experimental design questions. They are supported by fully equipped laboratories providing all the necessary resources to demonstrate feasibility, and also to provide analysis on a contract basis if desired.

While the DVS Advantage technology is inherently reliable, worldwide service and technical support is available, including on-demand and planned maintenance contracts.

Design: Kingfisher Design • Photography: Michael Owen • Illustration: Andrew Green

WORLDWIDE

Surface Measurement Systems Ltd.

Unit 5 Wharfside Rosemont Road,

Alperton, London, HA0 4PE, UK

Phone: +44 208 795 9400
Fax: +44 208 795 9444
Email: info@smsuk.co.uk

NORTH AMERICA & MEXICO

Surface Measurement Systems

2222 South 12th Street, Suite D

Allentown, PA 18103

Phone: +1 610 798 8299
Fax: +1 610 798 0334
Email: info@smsna.com