DVS
Intrinsic PLUS

Surface Measurement Systems
World Leader in Sorption Science

Dynamic Gravimetric Vapor Sorption Analyzer

The smallest automated DVS for complex water sorption challenges

www.surfacemeasurementsystems.com

DVS Intrinsic PLUS

The easy-to-use solution to complex water sorption challenges from Surface Measurement Systems:

- High quality water isotherms and efficient water activity measurements
- Step-by-step software wizards guide users through routine procedures
- Smallest, compact design that makes optimal use of limited bench space - only 26cm wide
- Advanced electronics and simplified user interface
- Accommodates wide variety of sample geometries and up to 5 gram capacity
- SMS UltraBalance™ provides unrivalled sensitivity and baseline stability
- Built-in Network Connectivity for easy data sharing and remote analysis
- Supports 21 CFR part 11

Ultrabalance™

Applications

- Studying hygroscopicity of powders, fibers and solids
- Kinetics of water sorption and desorption
- Water induced morphology changes

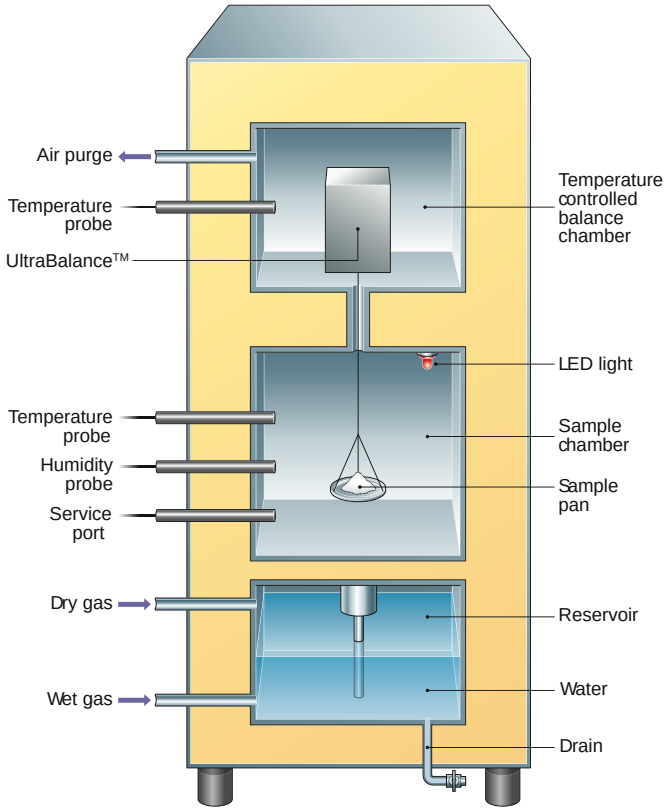
- Food shelf-life prediction studies
- TEWL/ Transepidermal Water Loss
- MVTR/ Moisture Vapor Transmission Rate determination
- Calculation of Diffusion Coefficients
- Sorption Modeling
- Moisture Compatibility
- Water Activity Measurements

Materials Studied

- Pharmaceuticals: powders, tablets, API's and excipient materials
- Food: powders, processed food, biscuits
- Natural materials: grains/seed, wood, biomass
- Building materials: aggregates, cement, ceramics
- Personal care products: cosmetics, hair care, contact lenses
- Packaging materials: paper, plastics

The benefits of water sorption measurements

The water sorption properties of solid materials are recognized as critical factors in determining their storage, stability, processing and application performance. These properties are routinely determined for many natural and man-made materials and have traditionally been evaluated by storing samples in sealed jars containing saturated salt solutions of established relative humidity and then regularly weighing these samples until equilibrium is reached. The DVS Intrinsic provides a number of advantages over these methods:



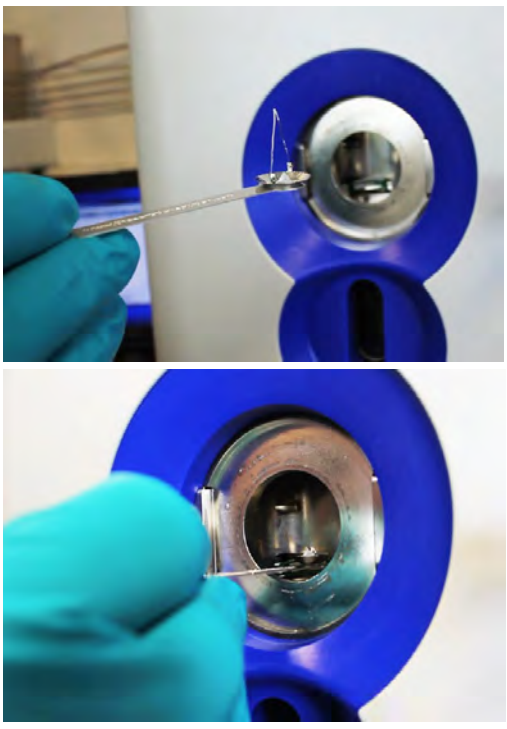
Schematic of the main components of DVS Intrinsic

(i) The DVS Intrinsic technique, due to optimized vapor flow, reduces the time required to reach equilibrium, measured in minutes rather than days. Simultaneously the dynamic flow of moisture reduces the need for large sample sizes, requiring only a few milligrams of sample.

(ii) Due to the dynamic flow of vapor, the sample never needs to be removed from the instrument, eliminating errors and contamination associated with removing samples from storage containers in previous methods.

(iii) The DVS Intrinsic allows for kinetic water sorption/desorption data to be collected in real time, which is impossible in static methods.

(iv) The DVS Intrinsic technique reduces labor and operational costs by allowing skilled scientists and technicians to be more productive.

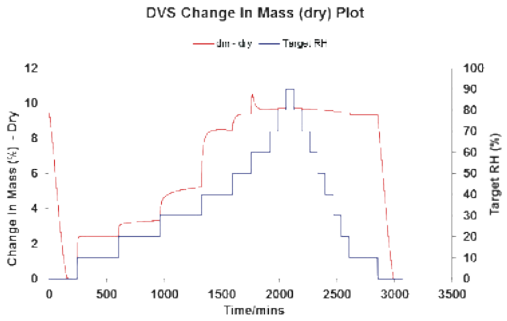


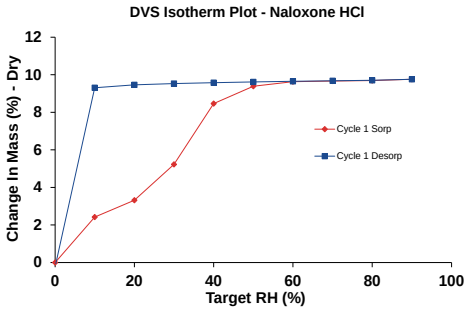
DVS Intrinsic sample metal pan

"The DVS Intrinsic Plus is a highly sensitive, accurate, and fast analyzer for the automated determination of moisture sorption properties of solids"

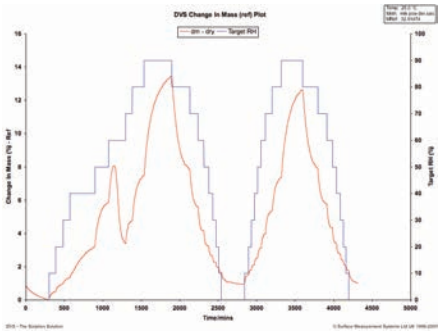
Applications

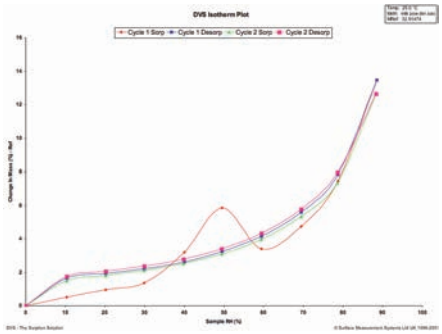
API hydrate formation and loss



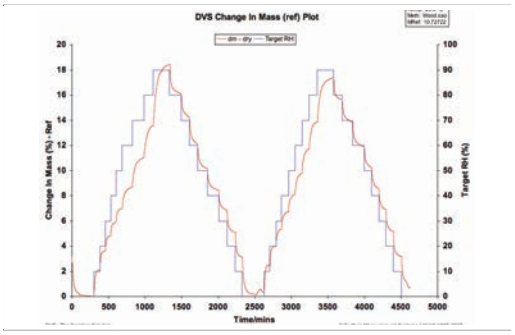


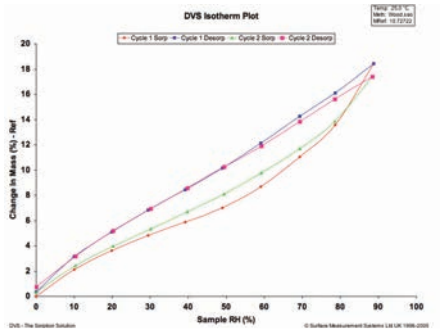
Amorphous lactose recrystallization



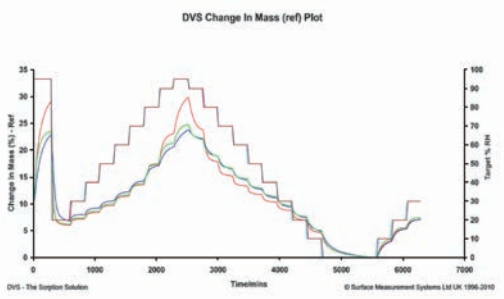


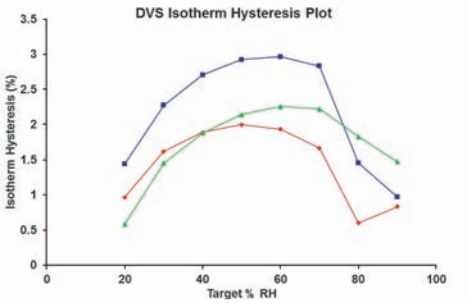
Wood fiber, two sorption cycles



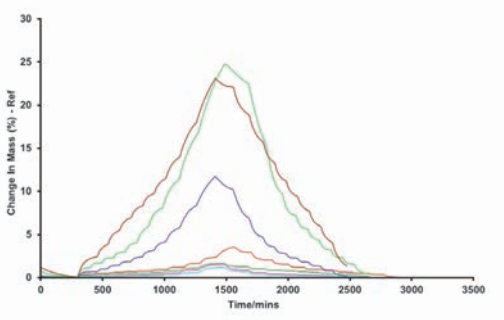


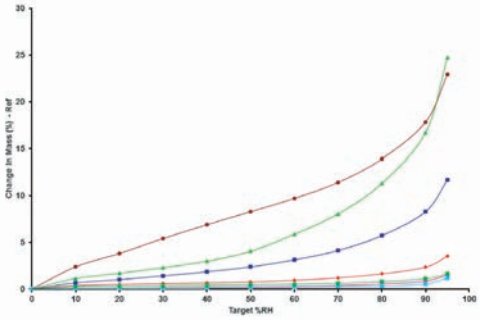
Hair with treatment comparison



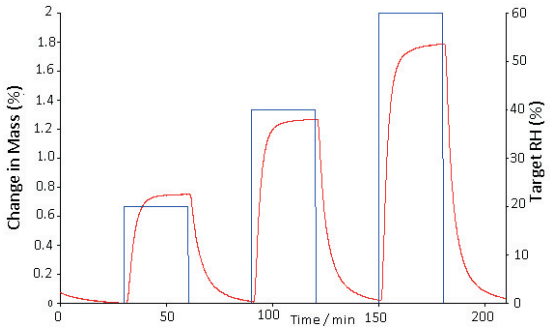


Building materials sorption compatibility

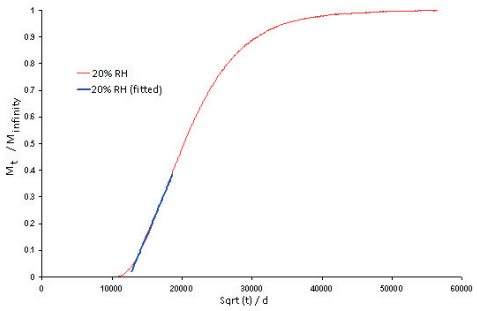




Moisture Diffusion/Permeation



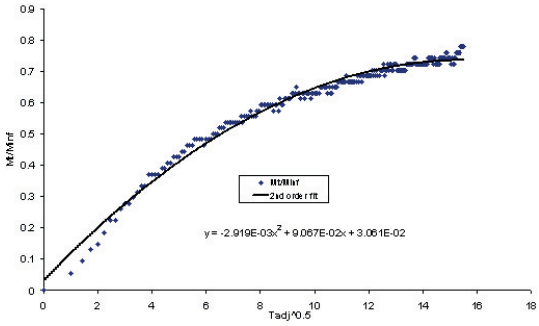
Sorption and desorption kinetics for a 7.5um polyimide film.



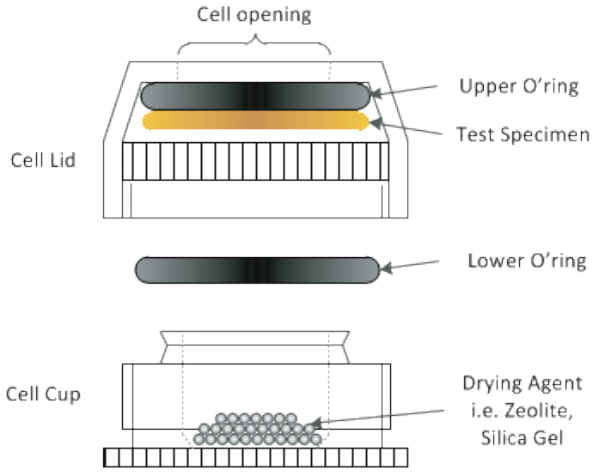
Diffusion plot for 0% RH to 20% RH step in humidity for a 7.5µm polyimide film.

Previous RH (%)	Target RH (%)	Diffusion Coeff. (cm2/s)	R-squared (%)
0.0	20.0	7.63E-10	99.55
20.0	0.0	4.38E-10	99.58
0.0	40.0	9.04E-10	99.52
40.0	0.0	6.05E-10	99.59
0.0	60.0	9.30E-10	99.54
60.0	0.0	6.55E-10	99.57

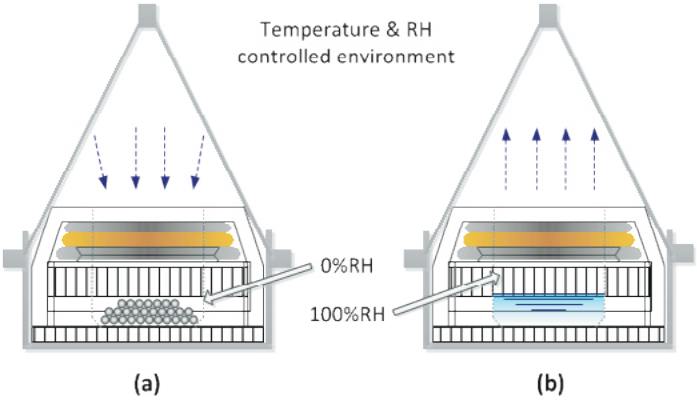
Diffusion coefficients from initial slopes.



Polynomial fit for particle diffusion calculation. Moisture diffusion coefficient for an amorphous pharmaceutical powder at 25C and 40%RH with $\sigma = 0.11 \times 10^{-11}$ cm²/s.

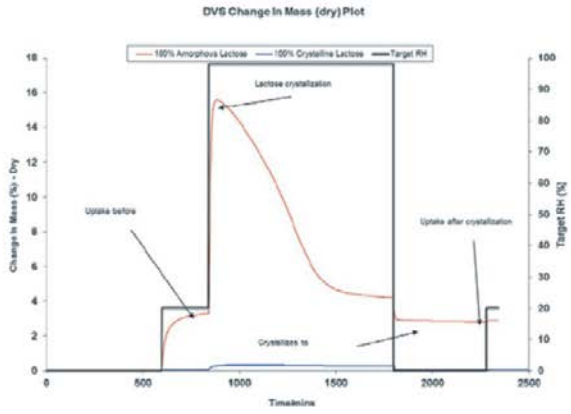


Experimental set-up for moisture vapour transmission rate measurement.

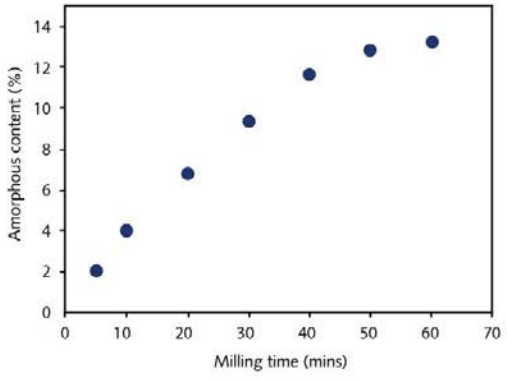


Payne type diffusion cell with DVS metal sample pan (C-WM-017) for (a) dry cup method and (b) wet cup method.

Amorphous Content



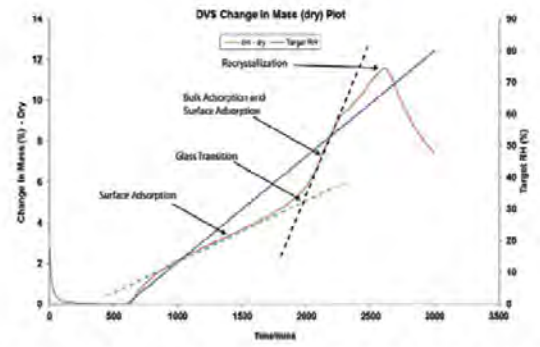
Amorphous content mass change and crystallization due to moisture.



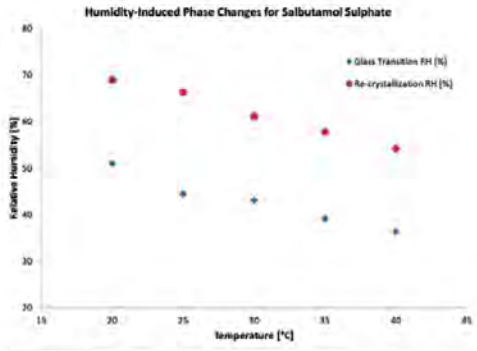
Influence of milling time on amorphous content of 100% crystalline lactose using DVS.

Applications Continued

Moisture Induced Glass Transition



Moisture induced glass transition and crystallization of salbutamol sulphate.



Glass Transition and crystallization RH (%) for salbutamol sulphate.

Technical Specifications

Temperature

Temperature controlled enclosure

Control range: 20 °C to 40 °C

Temperature accuracy: ± 0.2 °C

Flow Control

High accuracy digital mass flow controllers

Wide dynamic range - turndown ratio 1000:1

Carrier Gas: Dry air or Nitrogen

Inlet pressure: 2.5 to 4 bar

Regulated pressure: 2 bar

Flow rate: 0 -200 sccm

Relative Humidity

Relative humidity range from 0% to 98% (±0.5%) RH for 20°C to 40°C [1]

Relative humidity resolution: ± 0.1%

In-line real time Humidity Probe for Relative Humidity measurements and control

Mass Measurement

Ultrabalance Low Mass

Maximum load: 1000 mg

Mass change: ±150 mg

Resolution: 0.01 µg

Balance noise: ≤ 0.3 µg [2]

Ultrabalance High Mass

Maximum load: 5000 mg

Mass change: ±1000 mg

Resolution: 0.1 µg

Balance noise: ≤ 3 µg [2]

Solvent Reservoir

Reservoir capacity: 100ml

System Information

Dimensions:	470 mm (W) x 260 mm (H) x 390 mm (D)
	18.5" x 10.23" x 15.35"
Weight:	22 kg (48.8 lb)
Electrical:	100-240 V, 50/60 Hz, 300W

System Software

DVS Control Software

- Experimental stages may be based on fixed-time or a user-defined dm/dt criteria
- Experiments may include half, full or multiple partial pressure or temperature cycles

DVS Analysis Software

- Isotherms
- Permeability and diffusion
- Kinetics information
- Specific Surface Area
- Amorphous content
- Heat of sorption
- T_g determinations

Software Options

Standard

- Control Software
- Standard Analysis

Advanced

- Advanced Analysis Suite
- Isotherm Analysis Suite

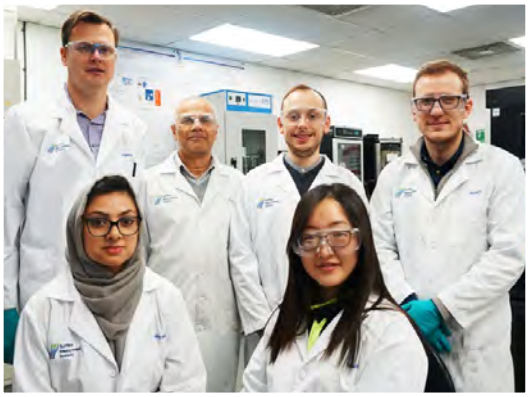
21CFR Part 11 software solution (optional)

Footnotes

[1] 1-σ confidence level with %RH or P/Po calibration performance based on SMS factory certified methods (Salts Calibrations)

[2] Root mean square (averaged over 24 hours)

About Us



Surface Measurement Systems Ltd. develops and engineers innovative experimental techniques and instrumentation for physico-chemical characterization of complex solids. Our range of characterization instruments and scientific/engineering techniques has helped solve difficult problems in the pharmaceutical, biomaterial, polymer, catalyst, chemical, cosmetic and food industries, and are used by hundreds of leading laboratories and universities throughout the world.

Why us?

- Invented the DVS Technology with over 25 years of continuous innovation
- Every instrument is built upon the knowledge and experience of our industry leading sorption scientists
- Our service team provides uncompromising support to our customers and partners
- Outstanding instrument performance
- Most complete and intuitive Windows™ software for experimental control and analysis
- Winner of Innovation Award 2018 and ISO 9001:2015 Compliance

Surface Measurement Systems
World Leader in Sorption Science

ISO 9001:2015

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version 1.0
15042020

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