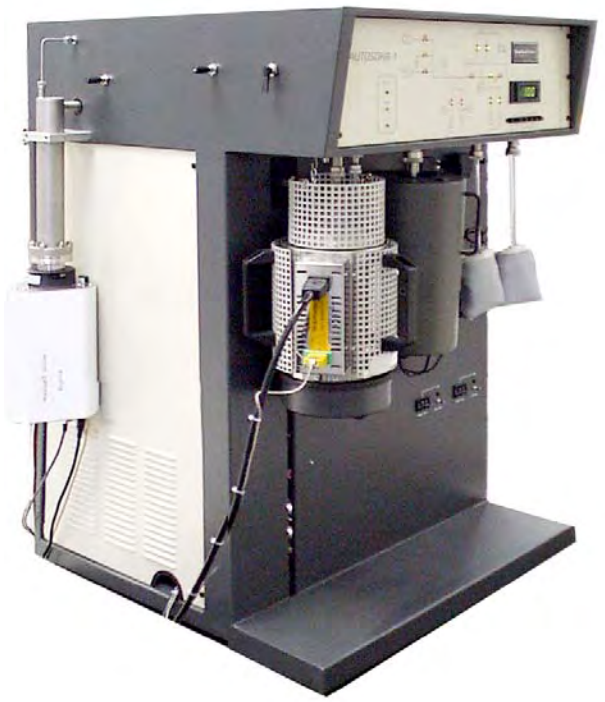
Complete Gas Sorption Analyzer with Mass Spectrometer

Autosorb®-1-C/MS Benefits

- Combines gas detection by mass spectrometry with automatic gas sorption analysis to provide a more complete surface characterization of porous solids.
- Provides In-depth catalyst characterization, including micropore size determination in a single instrument.
- Achieves detailed identification of desorbed species under controlled heating rates and atmospheres.
- Requires little bench space because of Integrated design utilizing Autosorb's proven vacuum system.

AUTOSORB®-1-C/MS



The exposed surface of many powders is often found deep within individual particles. This fact has a tremendous impact on applications of powdered solids because, even for a single solid, not all surfaces are created equal. Real surfaces are heterogeneous and their properties vary from exterior to interior as well as from one surface patch to another. Such variations can be more fully quantified by means of a complete gas sorption analyzer such as the **Autosorb®-1-C/MS**.

Temperature Programming

During a chemisorption analysis, the total number of active sites, or the active surface area, is evaluated. If one heats up the sample, the chemisorbed species tend to desorb according to how strongly they were bound to the active sites to begin with. Weaker sites normally release their chemisorbed species at lower temperatures than stronger sites.

If the sample had two distinct types of active sites, heating would release gases at two different temperatures. To quantify these releases, one can increase the sample temperature linearly and monitor the evolution of gases in a number of ways. If only a single gas is evolved, one can simply monitor the rise in pressure in a closed, pre-evacuated sample cell as a function of temperature. This could be regarded as a "Soak" Temperature Programmed Desorption (TPD) experiment.

If more than one species was desorbed, it would be necessary to identify each one as it is evolved from the sample. This can be done by attaching a Mass Spectrometer (MS) to the exit valve of the **Autosorb®-1-C** and performing the thermal desorption under a flow of inert or carrier gas. As such, this experiment would be termed Flow TPD, or Flow TPR if a reactive gas is used instead of an inert gas. With MS sampling rates in the order of seconds, this allows the evaluation in detail of fast-releasing "reactive" sites, or readsorption phenomena.

Moreover, a properly placed MS probe can sample gases from an evacuated chamber (Vacuum TPD). A clear advantage of Vacuum TPD is that desorbing species can reach the MS more quickly and without being affected by diffusion or readsorption effects through pore networks.

Over...

Quantachrome INSTRUMENTS
Optimizing particle performance

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The AUTOSORB-1-C/MS

The **Autosorb®-1-C/MS** provides physisorption, chemisorption, flow or vacuum TPD and residual gas analysis (MS) capabilities in a single unit.

1. Temperature programmed furnace: 1°C steps up to 1000°C with ramp rates up to 50°C per minute.
2. Quartz flow-through cell for chemisorption studies.
3. Floating cell guard.
4. Flexible positioning of quadrupole sensor and eletronics control unit for various models of residual gas analyzers.
5. Needle valve for mass spectrometer or optional diversion valve for GC port.

Autosorb®-1-C/MS SPECIFICATIONS

General

Range:	1 to 200 amu (400 optional)
Detectors:	Faraday Cup
	Electron Multiplier (optional)
Ion Source:	Open or Closed
Maximum Operating Pressure:	$1x10^{-4}$ (open ion source)
	$1x10^{-2}$ (closed ion source)
Resolution:	<10% of Valley
	(per AVS Standard 2.3)
Sensitivity:	$2x10^{-4}$ amps/torr
	(open ion source)
Min. Detectable Partial Pressure:	Faraday Cup ($2x10^{-11}$ torr)
	Electron Multiplier ($5x10^{-14}$ torr)

Physical

ECU Operating Temperature:	O°C to 40°C

Compliance

CE Mark:	EMC 89/336/EEC
	(electromagnetic compatibility)
	72/23/EEC
	Low Voltage Directive

SELECTED APPLICATIONS

Physisorption Studies
Micropore Analysis
Mesopore Analysis
Fractal Dimensions
Chemisorption Tests
Carbon Reactivity
Catalyst Dispersion
Surface Acidity and Basicity
TPR/TPD/TPO

WORLDWIDE

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Quantachrome INSTRUMENTS

Optimizing particle performance

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CE

http://www.quantachrome.com

US Patent No. 6,257,835
Other Patents Pending

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