

Aludra

Gas Chromatograph – Mass Spectrometer (Quadrupole)



GC-MS





ISO 9001
Quality Accreditation

GBC has always placed a strong emphasis on quality in all aspects of our operation, from design and manufacture to the provision of service and support to our customers, and we are fully committed to continuous evaluation and improvement in all areas.

The GBC Quality Management System has been accredited to the ISO 9001 quality standard by Lloyd's Register Quality Assurance Limited. This certification is your assurance that the procedures and processes used to produce the goods and services which GBC provides comply with the relevant International Standard, and demonstrates commitment to meeting the needs and expectations of our customers.

Since 1978 GBC has been at the forefront of scientific technological development, manufacturing and marketing a wide range of award winning, quality scientific instruments.

GBC's Product lines



Visionary Technology

GBC Scientific Equipment will advance people's knowledge and their capacity to enhance the quality of life for all humankind.



Aludra GC-MS (Quadrupole)



GBC produces a wide range of quality analytical instrumentation. GBC has been the proud recipient of many international design and export awards, acknowledging the superior standard and world acceptance of both the organisation and the products. The company's head office is based in Melbourne, Australia. 45 years after its inception, GBC is renowned as both progressive and successful.

The Aludra Gas Chromatograph Mass Spectrometer (GC-MS) is the latest product from GBC. It provides a number of features, flexible configurations and solutions for each customers' application requirements.

Quadrupole

New Chemical Ionization (CI) source expands the range of applications

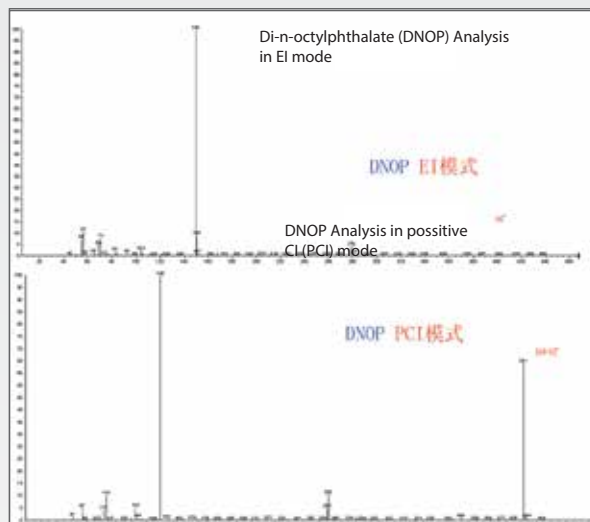
Switching between Electron Ionization (EI) source and CI source is quick and easy. When performing qualitative and quantitative analysis of combustible samples, or analysis where the response in EI mode is low, such as for certain pesticides, a CI source can effectively lower the detection limit.



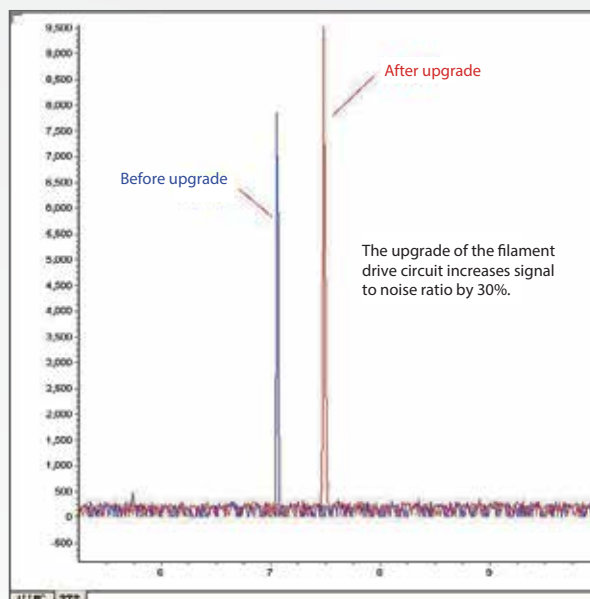
Chemical Ionization Source (Optional)

The newly designed ion optics system optimizes ion counts and transmission characteristics, effectively improving sensitivity and resolution, while reducing neutral particle noise.

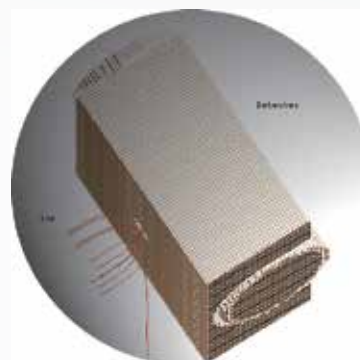
- The optimized ion source filament control circuit has two modes: constant emission and constant reception. In constant reception mode, the maximum change to the electron flow within a 30-minute period is 0.02 μA . Due to the enhanced performance of the feedback system, the stability of the ion signal has been improved. The innovative voltage offset technology optimizes the spatial distribution of the electron beam which improves the signal to noise ratio by 30%.
- The ion source optical system uses a redesigned magnetic field to more accurately focus the ion beam, which reduces the adverse effects of excessive magnetic fields on the ion trajectory of back-end ion optics system, and improves the ion transmission, and thereby enhances the mass resolution and signal to noise ratio.
- The vertical focus detector system utilizes a high-gain, low dark current electronic multiplier and polished mirror parabolic dynode to decrease neutral noise and background interference of filament photons while increasing high mass end response.



DNOP Analysis Results



Analysis of octafluoronaphthalene (OFN)

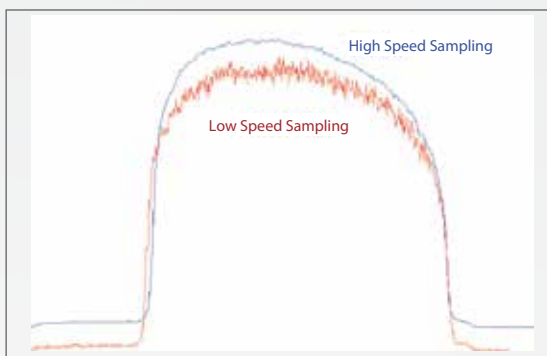


Vertical Focus Detector

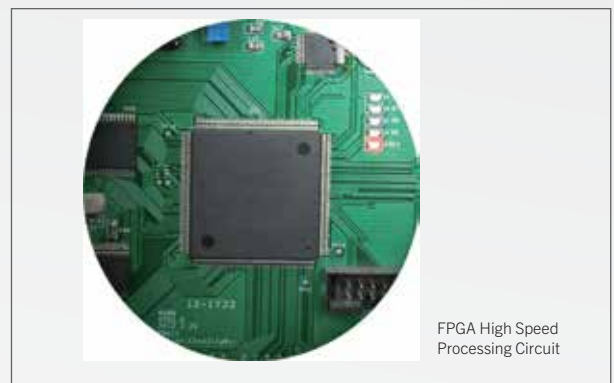
Advanced Improvement technique

The quadrupole circuit control system achieves equal peak width identification within the full mass range and optimizes conduction rates.

- The sampling system utilizes the most advanced FPGA processing technology. Sampling frequency has been increased to 1 MHz. More data points are processed. Signal stability has been improved. Digital I/O communicates with the workstation software via a USB port. DC dynamic compensation technique significantly improves the relative transmission rate of target ions. M/Z 502 has been increased from 6.4% to 37.6%.



FPGA Sampling System



- Pre-amplifier circuit utilizes shorter analog signal transmission lines, and enhanced shielding against electromagnetic interference. Electrostatic noise has been reduced by one-third, and linear dynamic range has been increased to 105 with linearity in the range of $10^{-12}g$ to $10^{-7}g$.
- Data communication interface connection with the workstation software is completed within 30 seconds.
- Rigorous fault alarm functions for protection of pump power, axis temperature, and each subcomponent's temperature and high voltage output. Even a new user will not need to worry about damage to the instrument caused by operation error. Advanced warning function will alert the user to potential issues that may cause significant damage or loss of supplies to help users reduce cost and improve efficiency.

High Performance, High Spec Vacuum System

- Vacuum system utilizes a 250 L/s turbo pump and a 10 m^3/min two-stage rotary vane mechanical pump is used with large diameter capillary columns to enhance analysis speed and sensitivity. The whole vacuum system combines noise isolation technology with an intelligent noise reduction box to provide a clean high vacuum and a quiet laboratory environment.
- Wide range cold cathode vacuum gauge allows vacuum measurement from atmospheric pressure to 10^{-7} Pa. Additionally, it features long usage life, no consumables, no special maintenance and low cost.



High Performance Turbo Molecular Pump

Practicality

Gas Chromatograph and Sample Introduction Unit

- Simple and elegant design, with a distinctive, user friendly GC control panel. Interface was specifically designed to minimize user errors.
- The EPC gas control uses our patented EPC control unit with pressure or flow control mode. Purge valve is electronically controlled to minimize sample diffusion and loss. Split / splitless sample injection modes are available to satisfy various application requirements. Automated gas saver function effectively reduces operating costs. Original instant valve switch technology with no dead volume is used to eliminate long waiting times for stable pressure when valve switches open in splitless injection mode. This effectively improves peak shape and retention repeatability.
- Optimized GC temperature control system increases accuracy of oven temperature control to $\pm 0.03\text{ }^{\circ}\text{C}$ to improve analysis repeatability. The built-in installation positions of nitrogen, hydrogen and air gas paths are compatible with other chromatography detectors according to users' needs. Temperature programmed repeatability has been improved which results in sharper peaks of the heavy compounds in oils.
- Unique CI reagent gas flow control module uses feedback control that automatically adjusts reagent gas flows in proportion to the preset CI gas target ions to an optimum level, thereby ensuring high CI analysis repeatability while saving on reaction gas.
- Simple and practical direct liquid and solid inlet probe option allows fast structural analysis of unknown compounds, providing a powerful tool for chemical synthesis applications. Unique removable probe heater is easy to replace in case of damage or contamination. The maximum temperature is $650\text{ }^{\circ}\text{C}$.
- Compatible with standard conventional GC columns.
- Optional autosampler.
- Software can be configured for several optional peripheral accessories. Purge and trap concentrator, liquid autosampler, thermal desorption, headspace sampler, among others can be easily setup, configured, and controlled. Additional DO (Digital Output) port can be used for external device control.
- Innovative rotatable liquid autosampler can rotate 360° on the horizontal plane. The autosampler can be easily removed from the mount to simplify the GC maintenance.



360° Inlet



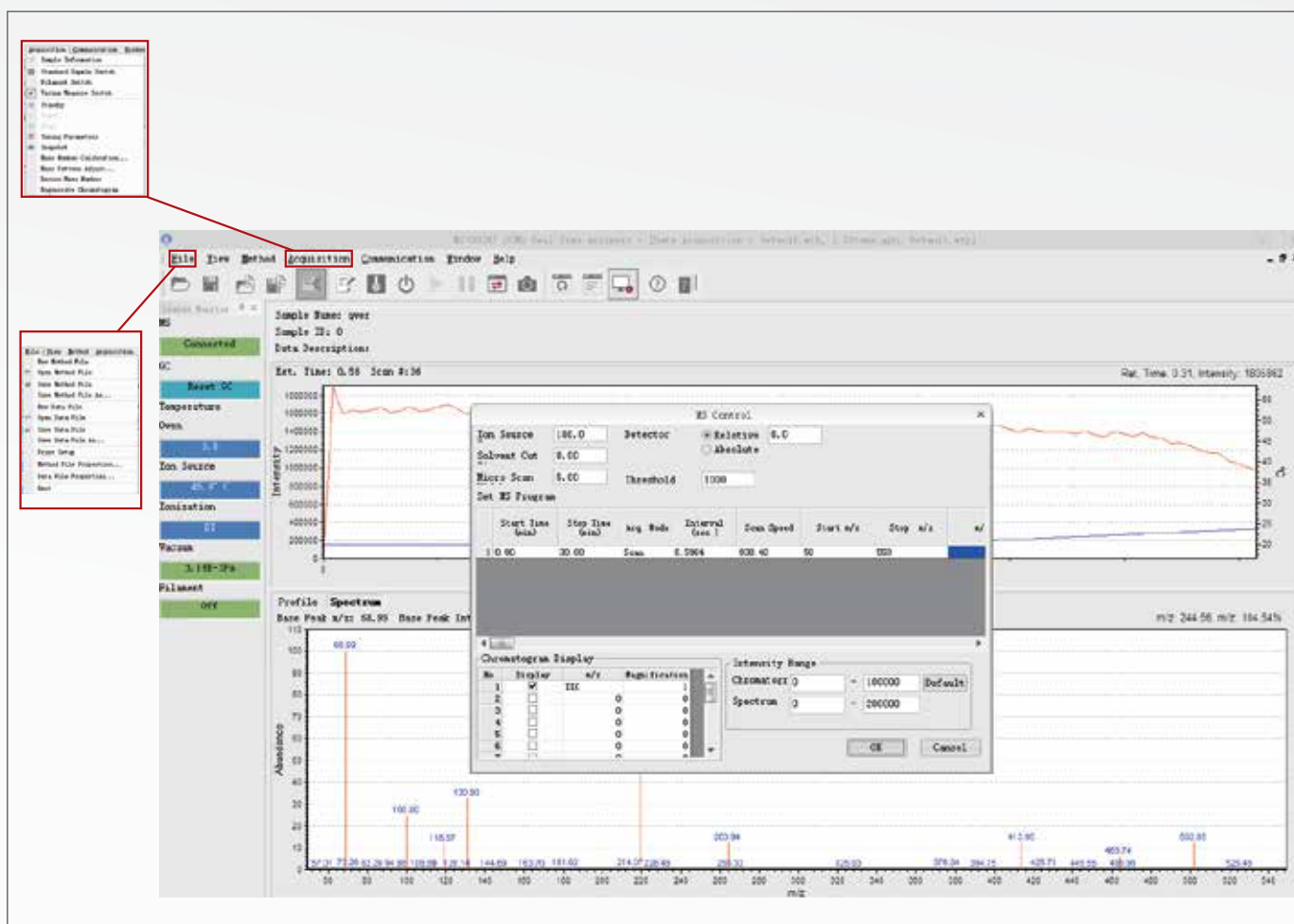
Direct Injection Probe (DIP)

Powerful Software System

Our user friendly software interface provides ease of use along with a powerful array of features for the advanced user. MS3200RT & MS3000P provide practical and accessible solutions for our user's analytical needs.

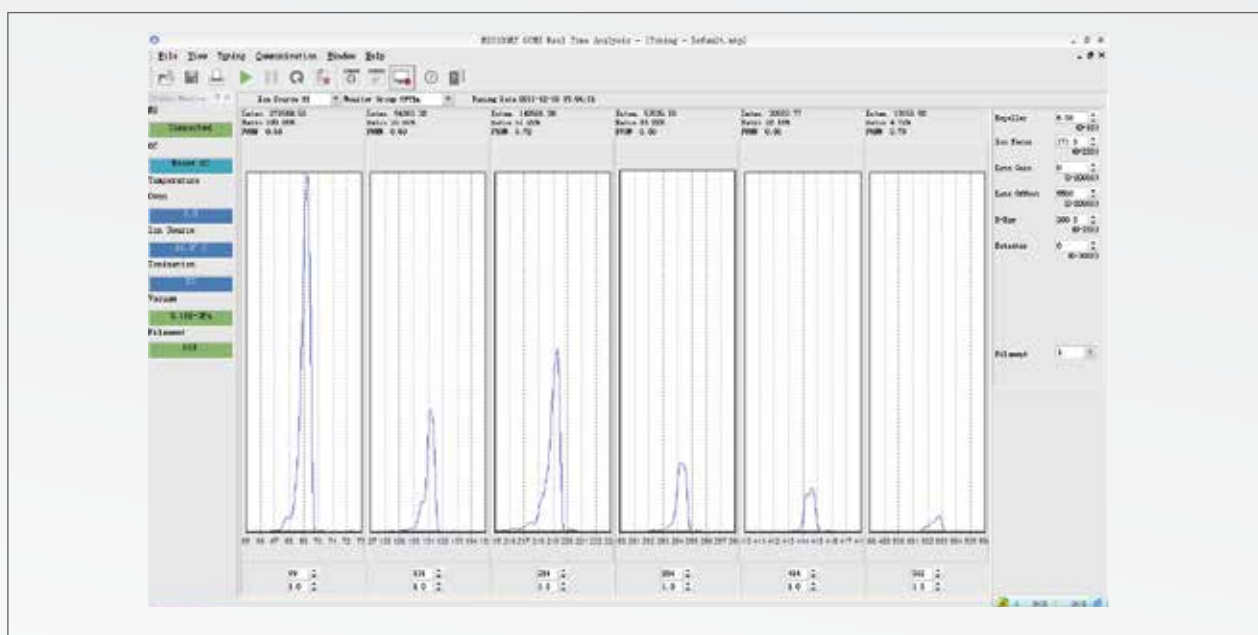
MS3200RT Data Acquisition and Control Application

- Chromatograms, mass spectra, parameters and instrument status are displayed simultaneously in a clean interface. Users can easily reference all relevant information during the analysis.
- Available scanning modes include Scan, Selected Ion Monitoring (SIM), or alternating Scan and SIM. Select scan mode based on desired analytical speed and quality.
- All analysis parameters can be controlled through software, including carrier gas flow, pressure, column oven temperature, inlet temperature, etc. Automated GC-MS safe power down procedure can be initiated from the software.
- Analysis method can be easily exported and imported. Instrument status parameters are displayed in real time. Alarms are shown in noticeable colors. The automated low vacuum protection function protects fragile parts such as the filament, detector, etc.



MS3200RT Real-time high-speed data acquisition software

- Total Ion Chromatogram and mass spectrum are displayed in the same interface to allow for easy comparison. Mass spectrum can be displayed as a processed bar graph or as raw data.
- Snap spectrum transfer function by one click imports real-time files into the data processing software for qualitative and quantitative analysis.
- The software offers a standard function menu for new users. Advanced users can use shortcut command keys for quicker access to features. Start, stop, and other actions can be performed by using accessible buttons on the main interface.
- Both manual and automatic mass spectrum tuning are provided. Tuning conditions include resolution, sensitivity, abundance ratio, among others. These can be set according to analysis requirements. In manual tuning mode, effects of any changes in parameters on the mass signals can be observed. Manual tuning is suitable for both special application requirements and users with strong background in mass spectroscopy. Parameters and mass spectra are shown together for easy observation.
- Software can perform a vacuum leak check function, which is essential for instrument maintenance.

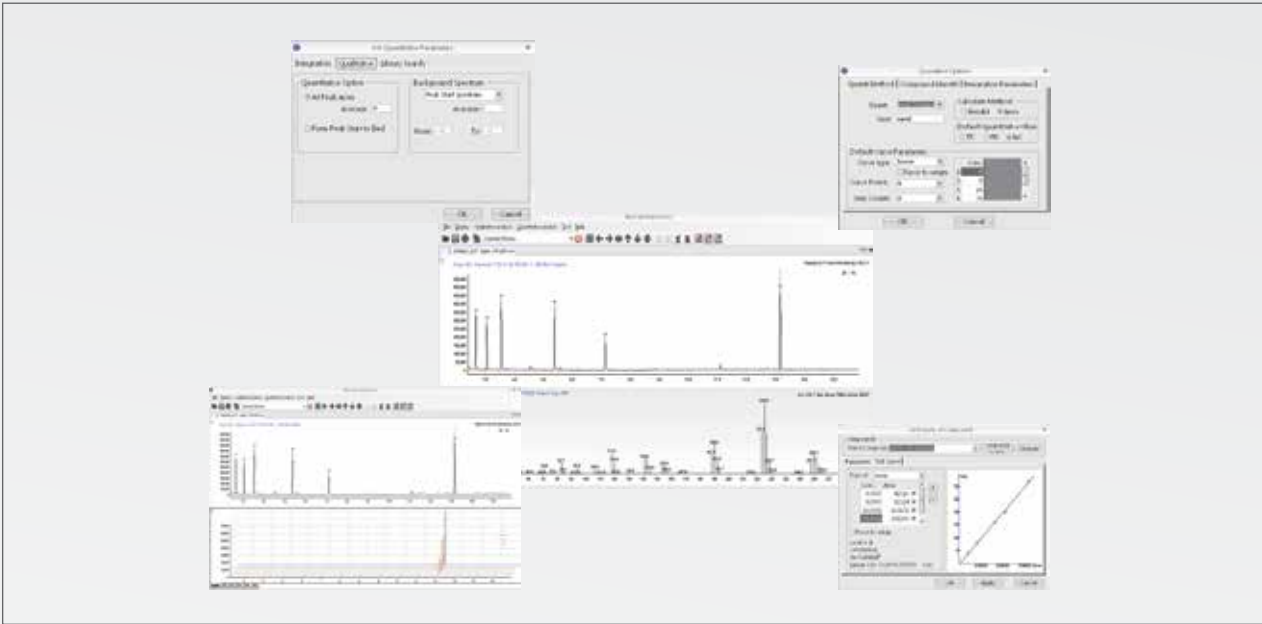


Comprehensive Auto Tuning Interface

- Instrument status can be monitored in the tuning interface so as to protect the instrument.
- Switch between EI (Electron Ionization) and CI (Chemical Ionization) modes. Turn on/off the calibration compound.
- Tuning reports can be quickly printed after tuning is complete.
- Remote instrument diagnostic functions provide fast and professional technical assistance for your instrument anywhere in the world.

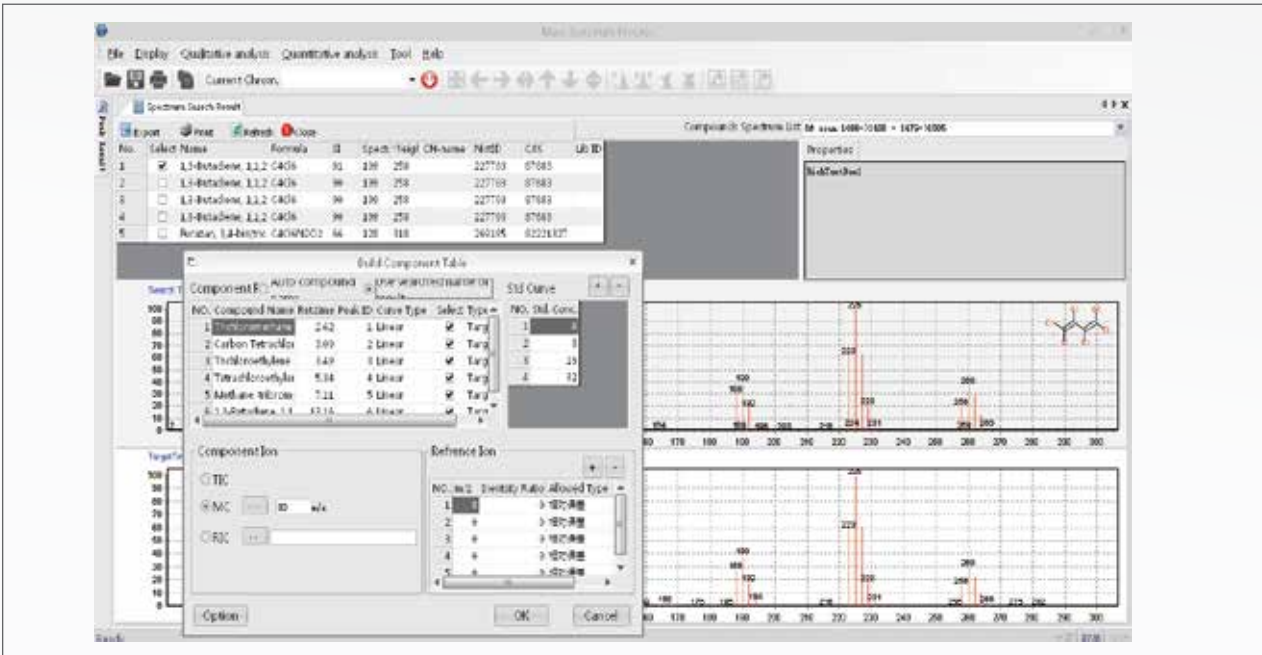
MS3200P Data Processing Application

- All data processing methods are provided. The Total Ion Chromatogram (TIC), mass spectrum, single ion chromatogram (MC), multiple ion chromatograms (MIC) are displayed on one screen for easy recognition and comparison of peak purity.
- For qualitative analysis, the number of similar compounds displayed in the qualitative report can be set according to requirements. Report contents can be configured to obtain a more compact qualitative report.
- Quantitative functions include standard method, internal standard method, normalization method and corrected normalization method. MC, TIC, MIC can all be integrated upon and quantified.
- The three dimensional rendering function displays retention time, intensity, and mass number more intuitively in the same coordinate system.



Powerful Data Processing System

- MS3200 MS software comes with professional petroleum data analysis tools for rapid analysis of petroleum chemical products for quality process control. Features include spectrum calculation, compound group screening and group composition export. The SNR calculation tool helps to evaluate the performance of instrument at any time. The spectrum addition and subtraction function is used to correct for the interferences caused by system background noise.
- Data files are exported in CDF formats and can be imported by other software.
- Other features include a concise display layout, flexible qualitative approach of peaks, powerful batch processing capabilities and full quantitative methods.
- Standard spectra library provides manual single component query, and batch query. User defined libraries can be used for special applications.

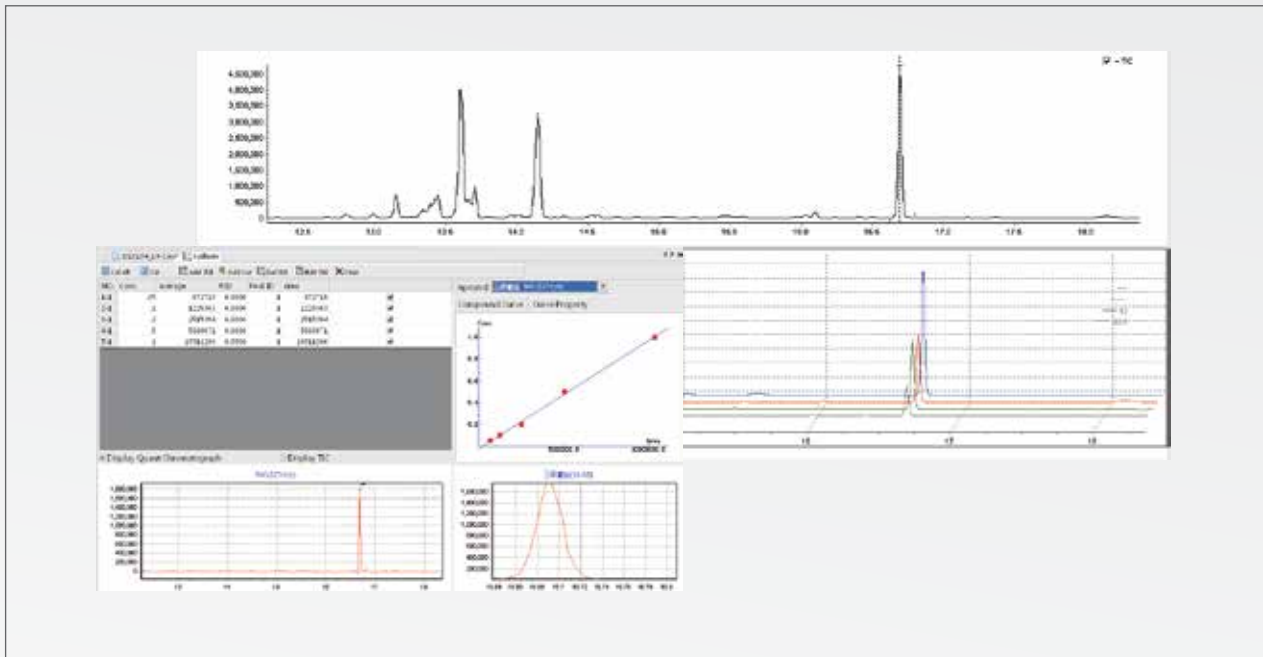


Multicomponent Fast Batch Qualitative and Quantitative Analysis

Applications

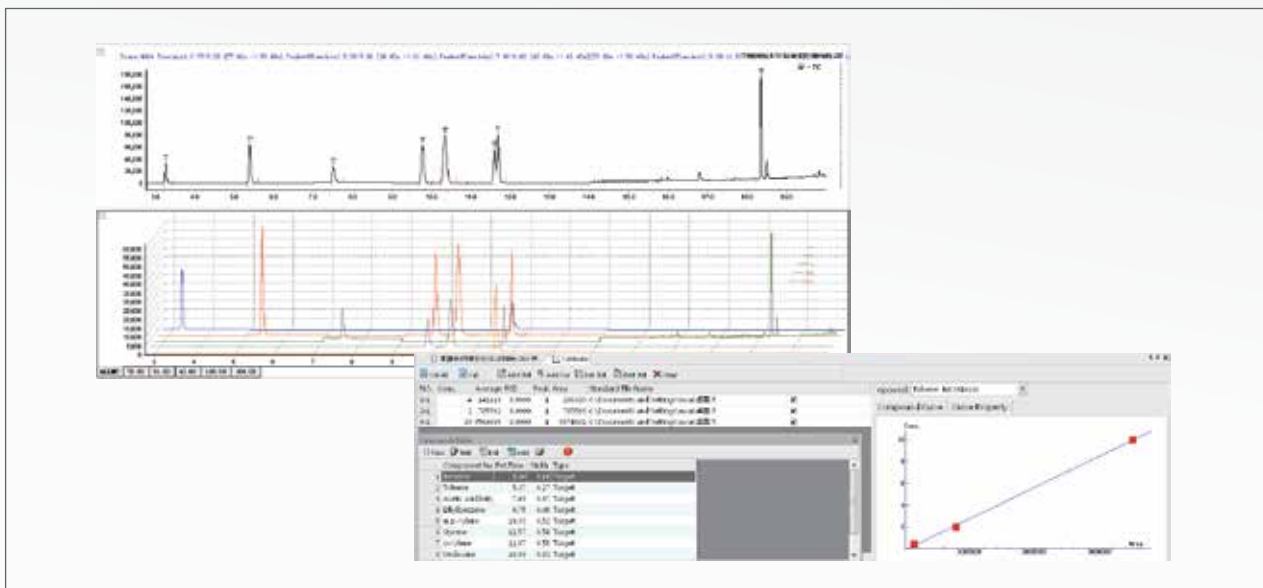
The excellent performance of the Aludra makes it suitable for applications in various fields including food safety, environmental safety, chemicals, and others.

- **Detection of Melamine in Milk**



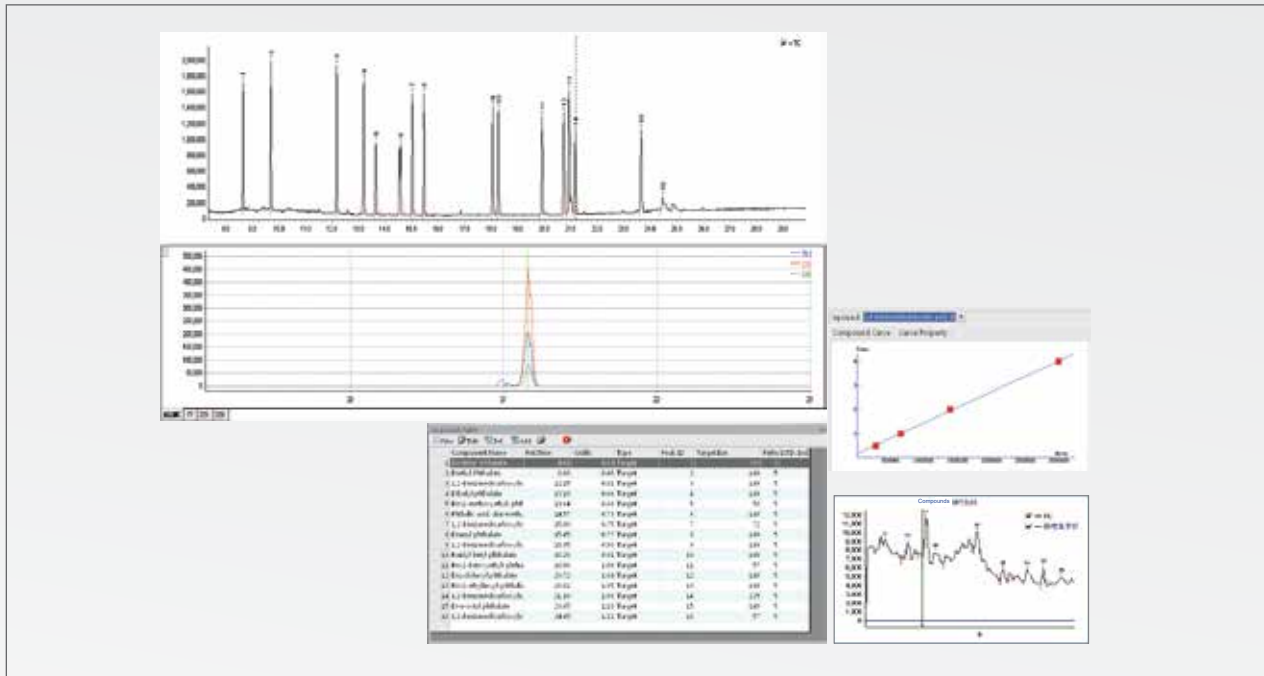
The detection limit is stable at 0.01 mg/kg. Linearity remains excellent between 0.05 - 50 mg/L. Recovery of added standard is between 85% - 108%. Relative standard deviation is less than 5%. Correlation coefficient is above 0.999. Results comply with GB / T 22388-2008 standard.

- **Analysis of Volatile Organic Compounds (VOC) in Drinking Water or Surface Water**



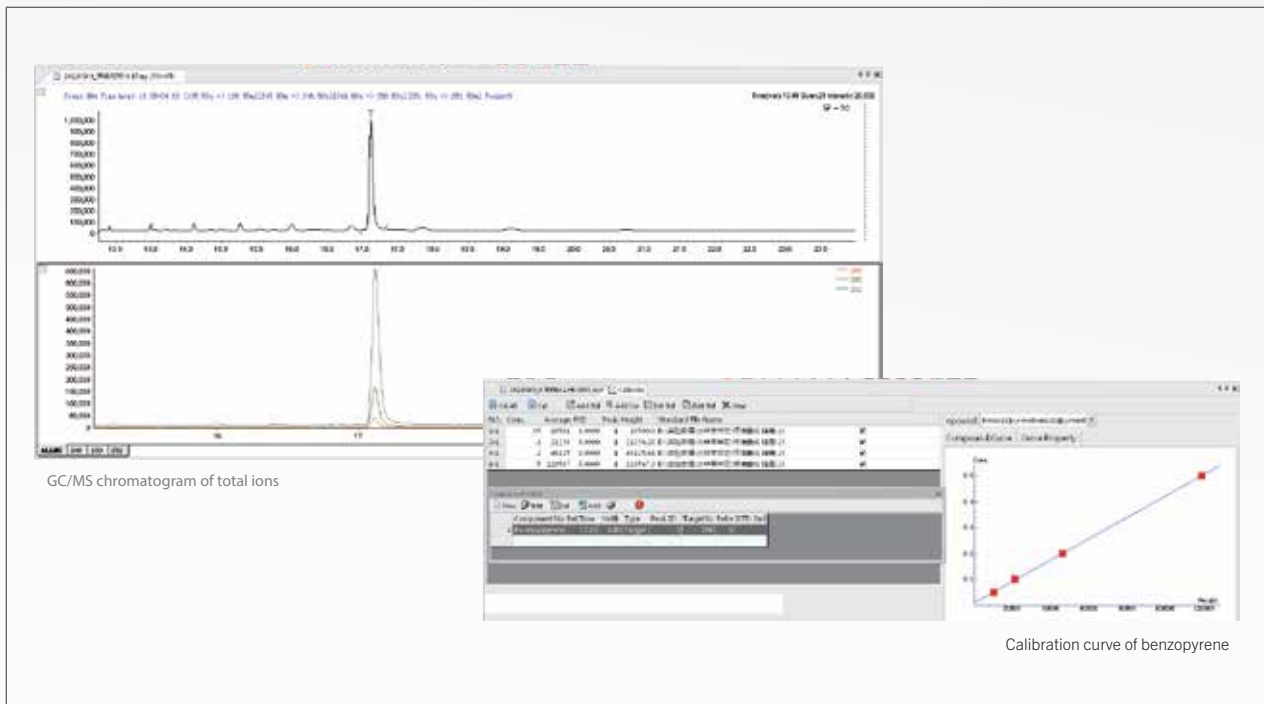
Using external standard method, range of linearity is 0.5 - 100 µg/L. Correlation coefficient of each component is between 0.993 ~ 0.9992. The lowest detection limit is 0.001 mg/L for vinyl chloride. The instrument shows excellent performance in VOC analysis of drinking water in compliance with EPA method 502.2 and GB5749-2006.

• Detection of Plasticizer in Liquors



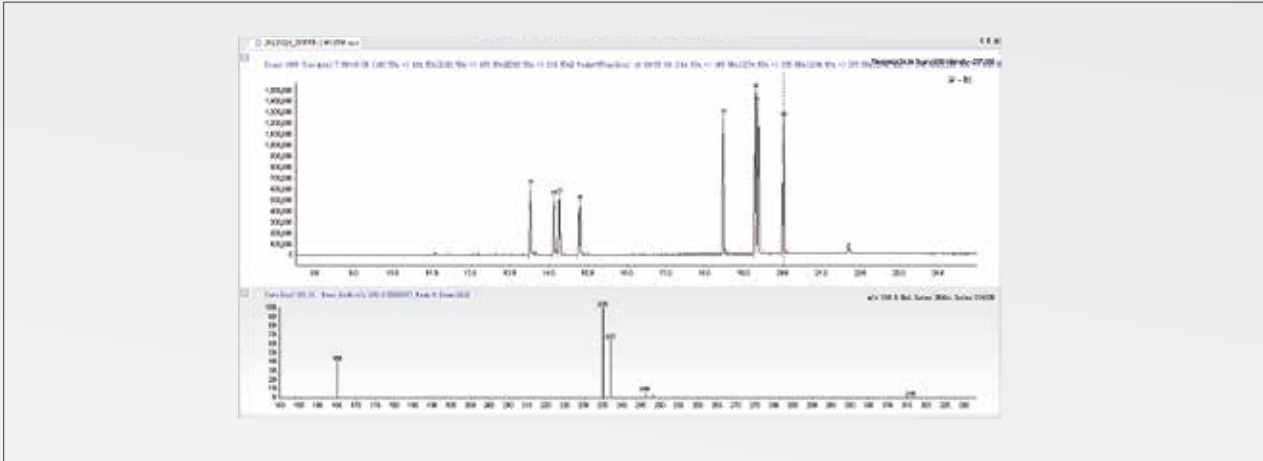
16 types of phthalates in liquor are analyzed simultaneously. Range of linearity is 0.08 - 1.6 µg/mL. Recovery of added standard is between 70% - 119%. The lowest detection limit achieved is 1.06 µg/kg for DEP. Shows excellent contamination resistance. After 1 month of continuous use, background signal remains within spec.

• Trace PAHs Detection

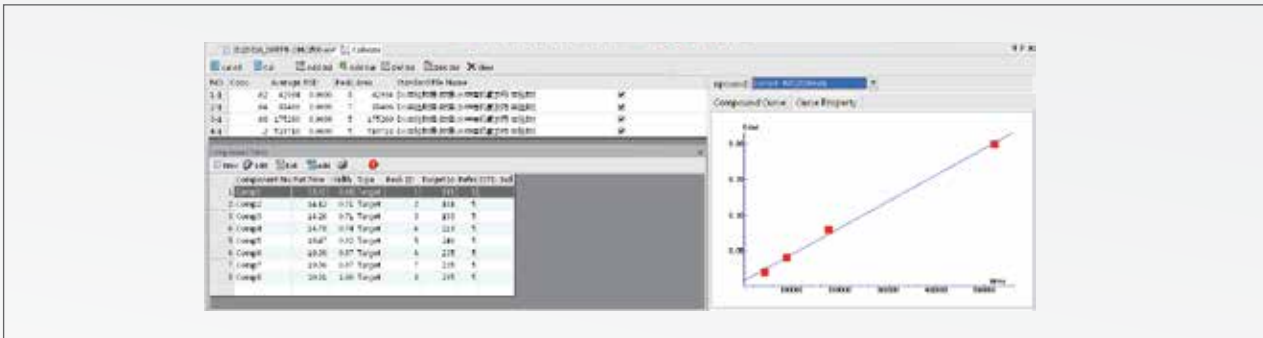


Linear correlation coefficient is more than 0.999 in the concentration range of 0.05 - 0.5 µg/mL. Relative standard deviation is less than 6%. The lowest detection quality for benzopyrazole is 0.05 ng.

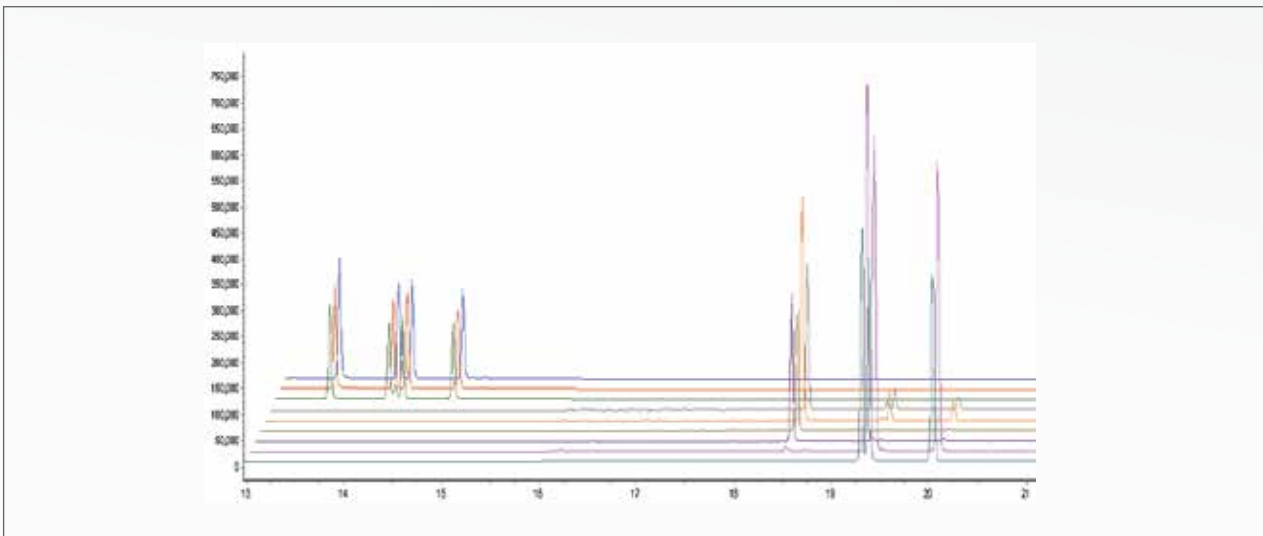
- Detection of Organochlorine Pesticide



Total ion chromatogram of organochlorine pesticide in the sample



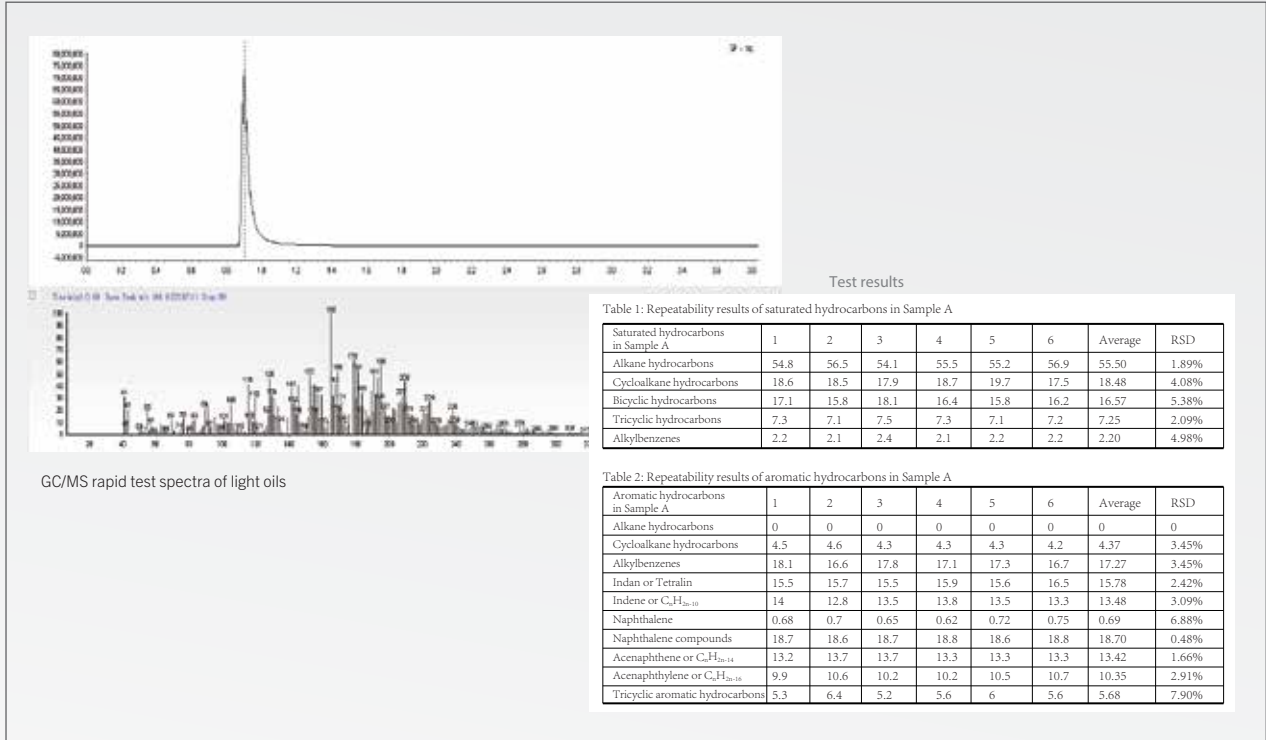
Calibration curve of eight types of analytes



Three-dimensional mass chromatogram of target ions

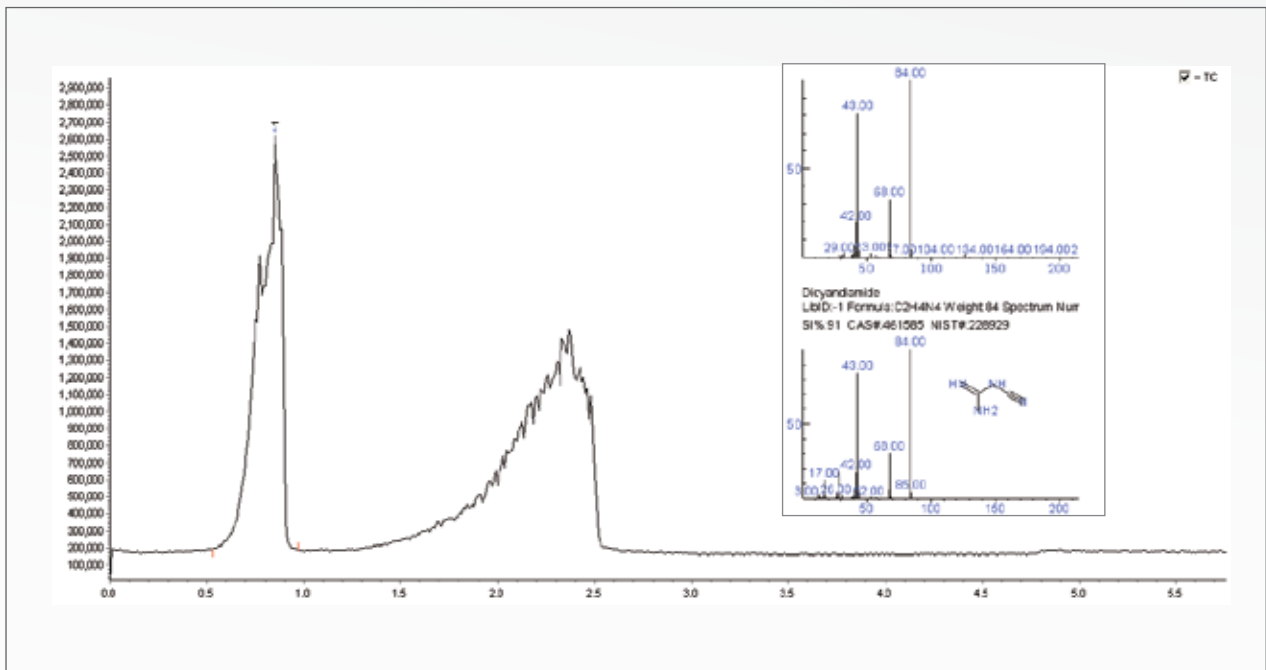
In ion monitoring mode, the analysis of organochlorine pesticide provides reliable data. Range of linearity is 0.012 - 0.2 $\mu\text{g/mL}$. Relative standard deviation is less than 10%.

• Rapid Semi-quantitative Analysis of Hydrocarbons



By using a 10 m hollow column combined with crude oil analysis software and rapid GC column oven heating, quantitative results of hydrocarbon group compositions can be obtained within 2 min.

• Qualitative Analysis of Unknown Samples Using Direct Injection Probe



Rapid qualitative analysis of dicyandiamide using DIP

Flexibility and Expandability

Flexible Configurations

- **The following configurations are applicable to water quality testing**

(applicable to EPA Method 502.2)

Purge and trap analyzer + Aludra + MS3200 software package + DB-624 (30 m × 0.25 mm × 1.4 μm) fused silica capillary column

Headspace sampler + Aludra + MS3200 software package + DB-624 (30 m × 0.25 mm × 1.4 μm) fused silica capillary column

Applicable to quantitative detection of volatile organic compounds in surface water, drinking water and reservoir water.

- **Economical configuration applicable to ambient air quality monitoring**

EW-3TD thermal desorption device + Aludra + MS3200 software package + equivalent DB-5MS column (30 m × 0.25 mm × 0.25 μm) moderately polar column

Applicable to air quality testing in indoor environments and public spaces. Provides high sensitivity for TVOC and other common harmful gases.

- **Typical configuration applied to conventional laboratory analysis**

Autosampler + Aludra + MS3200 software package + DB-5MS (30 m × 0.25 mm × 0.25 μm) fused silica capillary column

Suitable for qualitative and quantitative analysis of most organic compounds such as spices and perfumes, pesticides, batch sample analysis of PAHs.

- **Configuration applicable to quality control in a chemical synthesis process**

DIP100 + Aludra + MS3200 software package + DB-5MS (30 m × 0.25 mm × 0.25 μm) fused silica capillary column

Applicable to rapid qualitative analysis of chemical synthesis intermediates and final products and quantitative analysis combined with GC sample introduction.

- **Mobile laboratory mounted in monitoring van**

Analytical laboratory can be mounted to a mobile laboratory platform for rapid investigation of chemical contaminants in cases of food safety and environmental pollution emergencies.



Technical Specifications

Working Conditions	
Power	220 V, 50 Hz
Temperature	15 °C - 35 °C
Humidity	25% - 80% RH
Specifications	
Gas Chromatograph	
• Column oven	
Temperature stability	±0.03 °C
Maximum heating rate	40 °C / min
Maximum run time	999.99 min
14-segment programmable temperature control	
Cooling speed: from 400 to 50 °C in less than 5 min. (300 s)	
Column head pressure setting: 0 ~ 100 psi	
• Split/splitless inlet (3rd generation EPC)	
Maximum temperature: 400 °C	
Electronic controlled pressure, flow rate and split ratio	
Pressure range: 0-999 kPa	
Flow range: 0-200 mL/min	
• Autosampler (optional)	
Mass Spectrometer	
• Main Specifications	
Mass range	1.5 – 1100.0 amu
Mass stability	Better than 0.1 amu/48 h
Resolution	Unit mass
Sensitivity	DB-5MS 30m*0.25mm*0.25um fused silica capillary column or similar column.
	El source, full scan: (range 100 – 300 amu).
	1 pg OFN S/N≥1500 : 1
Maximum scan rate	10,000 amu/s

Dynamic range	10 ⁵
• Ion source	Electron impact ionization source (EI), standard.
	Chemical ionization source (CI), optional.
Dual filaments	Programmable switch
Maximum filament current	3 A
Emission current	10 – 350µA adjustable
Ionization energy	5 – 150eV adjustable
Ion source temperature	150 – 320 °C adjustable, individually controlled
• Mass analyzer	Quadrupole.
	Full scan, Selected Ion Monitoring (SIM) and acquisition.
	At most 128 groups in SIM mode. At most 128 ions in each group.
• Detector	Electron multiplier + high-energy dynode back focusing assembly
• GC-MS interface	
Individually controlled through transmission cable, 150 – 320 °C adjustable	
• Vacuum system	
Turbo molecular pump (250 L/s), mechanical pump (180 L/min)	
Wide range compound cold cathode gauge	
Data processing system	
Hardware	Computer
Printer	Laser printer (optional)
Software	MS3200RT Real-time data acquisition application and MS3200P data processing application
Optional Accessories	
DIP 100 liquid/solid direct injection probe assembly	
Thermal desorption device	
Dynamic headspace sampler	
Purge-and-trap sample concentrator	

Ordering Information

99-0735-00 **Aludra GC-MS (Quadrupole)**

Each Aludra is supplied with gas chromatograph, quadrupole mass analyzer, capillary column, computer and software.

Accessories

99-0736-00	Autosampler EW-AS 800 basic version 19 position
99-0737-00	Autosampler EW-AS 810 156 position
96-0325-00	NIST Spectrum Library
96-0338-00	Vacuum lock
96-0326-00	PCI chemical ionization source kit
96-0327-00	Add FID (Aludra)
96-0328-00	Air circuit electronic flow control-EPC
96-0330-00	DIP-110 direct injection system
96-0331-00	OI Eclipse 4760 purging, trapping and concentration instrument – applicable to water quality samples
96-0332-00	Headspace sampler model EW-2HS semi-automatic with 10 sample positions
96-0333-00	Headspace sampler model EW-3HS automatic 12 vials
96-0334-00	Headspace sampler model EW-5HS fully automatic 40 vials
96-0329-00	Headspace sample model EW-6HS fully automatic 36 vials
96-0335-00	Headspace sampler model EW-7HS semi-automatic 9 vials
96-0336-00	Headspace sampler model EW-8HS fully automatic 20 vials
96-0337-00	Analytical tube activator JH-1

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GBC Scientific Equipment
Manufacturer of world-class scientific instruments and accessories
— AAS, HPLC, ICP-OES, ICP-TOFMS, UV-Vis and XRD

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