

Agilent 4200 Microwave Plasma-Atomic Emission Spectrometer

CHANGE IS IN THE AIR

The Measure of Confidence



Agilent Technologies

RUNS ON AIR

Analyze a broader range of samples while benefiting from the lowest cost of ownership.

The safer, cost efficient Agilent 4200 MP-AES has higher sensitivity, detection limits down to sub ppb levels, speed that goes beyond flame Atomic Absorption (AA), and no combustible gases. Best of all, the next generation Agilent 4200 MP-AES runs on air.

The Agilent 4200 MP-AES delivers:

- Lowest cost of ownership — the Agilent 4200 MP-AES runs unattended without flammable or expensive gas supply, dramatically reducing your operating costs
- Improved laboratory safety — in addition to eliminating flammable and oxidizing gases, the 4200 MP-AES eliminates the need to plumb multiple gases into the laboratory, or manually transport and handle gas cylinders
- High-performance — magnetically excited microwave plasma source provides superior detection limits to flame AA
- Ease of use — application-specific software applets plus plug-and-play hardware ensure any user can set up quickly without method development or alignment, and with minimal training
- Robustness and reliability — ideal for industries such as mining, food and agriculture, chemicals, petrochemicals, manufacturing, and for remote locations



Resource conservation protocols save time and gas... and can even help save the environment.

The Agilent 4200 MP-AES eliminates combustible gas usage, gas transportation, and standby power consumption. So you can use less gas and electricity, and help conserve our natural resources.

PROVEN MP-AES TECHNOLOGY

Our users talk about the benefits of MP-AES technology for their laboratory.

"With the MP-AES instrument Agilent seems to have hit a homerun for both gold analysis and base metal analysis. It provides superior detection limits and vastly expanded calibration range – this enables quick easy analysis at trace levels as well as eliminates the need for time consuming dilutions of higher grade samples. All of this at an affordable price of well below that of ICP-OES and only slightly higher than top of the line AA units."

— **BOBBY JOE REICHEL**
NEWMONT MINING CORPORATION,
USA

"The results we have seen for our aqua regia soil extract samples are convincing, and those results are in very good agreement with the round robin, which was performed Europe-wide on those samples."

— **FRANK SYMOSSEK**
SACHSENFORST, GERMANY

"Two important advantages of this instrument are its low running costs and laboratory safety, as no expensive or flammable gases are required. Considering cost, performance and multi-element capabilities, the Agilent MP-AES is a suitable and efficient alternative to flame AA for this application (determination of silicon in diesel and biodiesel) and presents better performance for critical elements such as the one investigated here."

— **PROF. JOAQUIM A. NÓBREGA**
FEDERAL UNIVERSITY OF SÃO
CARLOS, BRAZIL

For your application

Agilent is committed to providing solutions for your application. We have the technology, platforms, and expert guidance you need to be successful.

	FOOD & AGRICULTURE	GEOCHEMICAL	CHEMICAL & PETROCHEMICAL	ENVIRONMENTAL
Common applications for the Agilent 4200 MP-AES	<ul style="list-style-type: none"> Major elements in foods, beverages and agricultural samples Cations in soils Nutrients in soils Metals in soil extracts Metals in agricultural soil samples Analysis of fertilizers 	<ul style="list-style-type: none"> Geochem samples in aqua regia digests Trace elements in geological samples Trace level gold in cyanide leach Analysis of high purity gold Platinum group elements in ore grade material Various elements in plating solutions 	<ul style="list-style-type: none"> Additives in lubricating oils Wear metal contaminants in used oils Analysis of coolant Analysis of petroleum, diesel and biodiesel fuel Major elements in polymers Analysis of raw chemicals for contaminant levels 	<ul style="list-style-type: none"> Hg, Pb, Cd and Cr in electronics and plastics (for WEEE/RoHs compliance) Heavy metals in soils As, Sb and Se in sediments and waste Analysis of waste waters, sediments and soils Analysis of plant waste products

MAKE THE CHANGE TO AIR

The Agilent 4200 MP-AES is the next generation of proven MP-AES technology, offering significantly lower cost of ownership and safe, unattended analysis without the need for flammable or expensive gases.

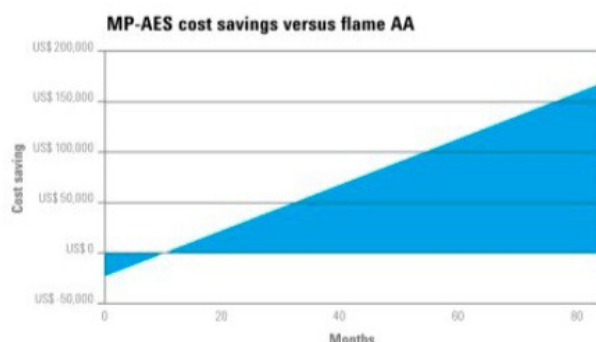
Lowest cost of ownership

Gas supply is one of the highest costs associated with elemental analysis. Because the 4200 MP-AES runs on air, it vastly reduces the cost of ownership and eliminates the need for ongoing supply of flammable or expensive gases.

- Using the Agilent 4107 Nitrogen Generator, nitrogen is extracted from the air to provide a continuous nitrogen supply for plasma operation
- Increase sample throughput with safe, reliable, unattended multi-element analysis
- Eliminate hollow cathode lamps, deuterium lamps for background correction, and burner blockage
- Eliminate standby operating costs. When the Agilent 4200 MP-AES is off, no gas or power is used. Simply switch it on again when needed for analysis.

Safety you can rely on

- No expensive acetylene and nitrous oxide gases, and no danger of flammable gas leaks
- No need to plumb multiple gases into the laboratory, making it ideal for remote locations such as mine sites or environmental monitoring stations
- No need to order, connect or replace cylinders, reducing your ongoing operating and servicing costs
- No transport or manual cylinder handling risks, and no risk of frozen regulators in cold climates
- No greenhouse gas emissions —the Agilent 4200 MP-AES has zero fuel-based carbon emissions



Saving you money

For example, for the analysis of five elements in 100 samples measured three days per week, savings start within eight months. After 36 months, you'll save* over \$80,000 in operating costs!

* Savings may vary depending on factors including local gas costs, number and type of elements, etc.

Visit the online MP-AES cost savings estimator to review your potential cost savings at www.agilent.com/chem/runsonair.

REDEFINING ELEMENTAL ANALYSIS

The Agilent 4200 MP-AES makes at-site analysis a reality. With rugged, reliable hardware, and intuitive software, any user can quickly become an expert.

High performance for difficult samples

- Robust, magnetically excited microwave plasma source handles difficult matrices with ease, including fuels and organic solvents, geochemical samples, fertilizers and foods
- The Agilent 4200 MP-AES produces sensitivity, linear dynamic range, detection limits and analysis speed superior to flame AA
- Innovative torch design is vertically positioned for best performance with difficult samples, and features end-on axial viewing for excellent detection limits

Fast and easy to use

- Easy-to-use, application-specific software applets automatically load a pre-set method so you can start analysis immediately without method development or alignment, and with minimal training
- Reliable torch loader automatically aligns the torch and connects gases for fast start up and reproducible performance
- Easy access to sample introduction components aid routine maintenance and troubleshooting, minimizing downtime
- The optional inert MP-AES torch enables direct measurement of HF digests, eliminating the need for a neutralization step, improving productivity and efficiency

Lowest cost of ownership, improved laboratory safety, higher throughput, and easy to use — it's time to switch to the Agilent 4200 MP-AES.

Torch installation in three easy steps

1

Open
the torch
loader



2

Insert
the torch



3

Close
the torch
loader



INTUITIVE SOFTWARE THAT SAVES YOU TIME

Application-specific software simplifies your workflow.

With a familiar worksheet interface, automated method development, and software applets that include pre-set method templates, the Agilent MP Expert software saves you time.

- Wavelength and optimum parameters are preset and automatically recalled as you select the elements you need
- The comprehensive spectral library highlights potential interferences as you select each wavelength
- Spectral interferences are easily corrected for using the well characterized Inter Element Correction (IEC) technique established on ICP-OES, or the powerful Fast Linear Interference Correction (FLIC) technique
- Results are clearly displayed on screen, with large format number results for the current sample enabling easy tracking, even across a busy laboratory
- The instrument status display provides a comprehensive overview of current status and diagnostics for easy trouble shooting
- Recall and review previously stored data at any time, even while an analysis is in progress
- Quality control standards can be easily included to verify and confirm results during analysis
- Easily transfer results to a LIMS or other application using the flexible data exporting options
- MP Expert software is available in your choice of nine languages, so anybody can be confident running the system

Three steps to analysis

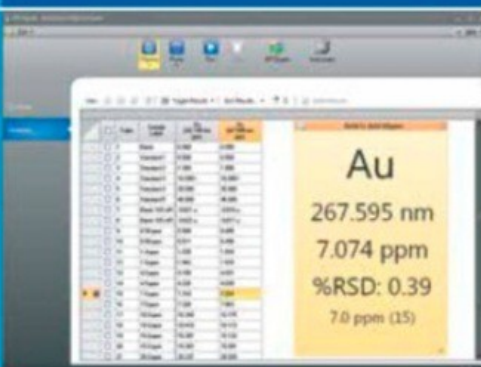
1

Click the icon. The applet automatically loads the pre-set method



2

Enter sample labels, sample type, and weight/volume correction factors



3

Load samples and run the analysis



HOW IT WORKS

The excitation source of the Agilent 4200 MP-AES is unique — a magnetically excited microwave plasma.

Robust and reliable

At the heart of this plasma generation system is a robust and reliable industrial magnetron — technology long proven in millions of microwave ovens around the world. By using the magnetic field rather than the electric field to couple the microwave energy into the plasma, the Agilent 4200 MP-AES produces a robust plasma — expanding your application range.

Light emission from the plasma is directed to a wide range, low noise charge coupled device (CCD) detector — measuring spectra and background simultaneously while providing excellent detection limits and precision.

Expanded Application Range

The tuned waveguide and the mass flow control on the nebulizer gas enable a broader range of applications to be performed.

Enhanced stability and precision

Solid state CCD detector provides simultaneous background or interference correction.

Lowest cost of ownership

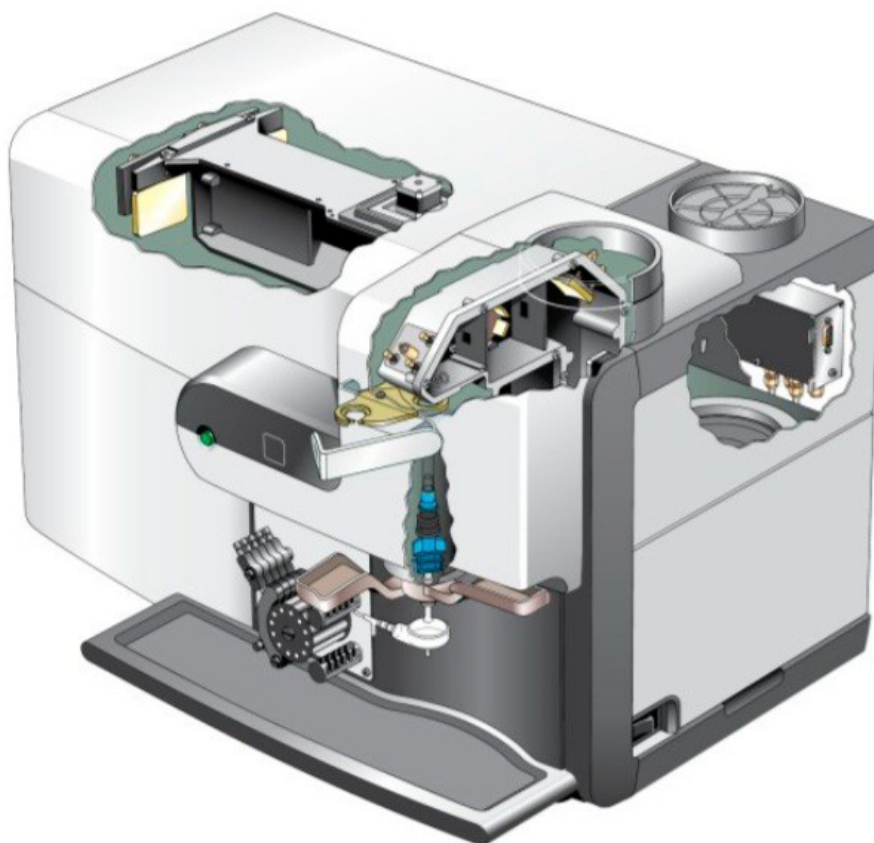
The nitrogen generator eliminates on-going gas requirements, dramatically reducing operating costs.

Safe and efficient

By running on air, the Agilent 4200 MP-AES eliminates flammable or oxidizing gases and the safety concerns of gas handling in your lab.

Plug-and-play hardware

Torch loader eliminates time consuming torch alignment and gas connections, getting you up and running fast.



Rugged

The standard sample introduction components can handle almost all sample types from organics to acidic aqueous solutions.

Organic capabilities

Analyze organic samples quickly and efficiently using the external gas control module (EGCM), which injects air into the plasma, eliminating carbon buildup and reducing background.

Reliable

The optional optics purge and the innovative wavelength drive makes the 4200 MP-AES perfect for repeatable analysis in harsh on-site laboratory environments.

FOOD AND AGRICULTURE APPLICATIONS



With high sample throughput and fast sequential measurement, the Agilent 4200 MP-AES is ideal for food screening laboratories.

The Agilent 4200 MP-AES is ideal for contract laboratories where fast turn around is key, including small to mid-sized screening laboratories needing to determine essential nutrients and elements at major levels, and toxic elements at trace levels.

- With the lowest cost of ownership, the Agilent 4200 MP-AES will give you the edge over your competition by reducing your cost per analysis and improving performance
- Eliminate downtime waiting for gas refills, and achieve fast sample turn around with safe, reliable unattended analysis
- Reduce sample preparation. The axially viewed vertical plasma handles your toughest samples — from food and soil digests to high salt soil extractions
- Achieve more than twice the sample throughput of conventional flame AA systems and never have to change burners/gases for different elements again
- Rapid method development and fast start-up means any user can achieve optimum performance
- Use the MultiCal feature in MP Expert software to analyze elements at high and low levels in the same analysis
- Complete wavelength coverage means you can avoid spectral interferences from majors by simply choosing another wavelength
- Include P and S in your elemental analysis suite with better detection limits using the MP-AES plasma emission technology

Measured value and % recovery

Certified Reference Material	Ca % (% Recovery)	Mg % (% Recovery)	K % (% Recovery)	Cu mg/kg (% Recovery)	Fe mg/kg (% Recovery)	Zn mg/kg (% Recovery)
NIES No 7 Tea Leaves	0.314 (98)	0.15 (98)	1.86 (100)	7 (100)	—	—
NIES No 10c Rice Flour	0.0095 (100)	0.127 (102)	0.279 (101)	4 (98)	10.6 (93)	21.8 (94)
NIST 1577 Bovine Liver	0.0131 (106)	0.0625 (103)	1.000 (103)	185 (96)	266 (99)	125 (96)
T08420C Grapefruit Juice	0.0158 (109)	0.0091 (99)	0.1100 (100)	—	—	—

Wide dynamic range for agriculture applications

Results from analysis of acid extractable minor and major elements in agriculture and juice samples demonstrate the wide dynamic range and accuracy of the Agilent 4200 MP-AES.

AGILENT 4200 MP-AES

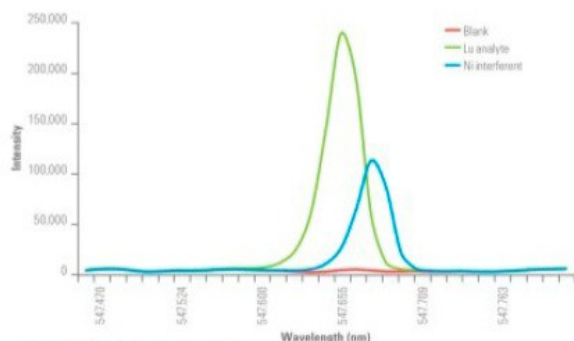
GEOCHEMICAL APPLICATIONS



Revolutionize the way you do your business. With no ongoing-gas requirements, you can locate the Agilent 4200 MP-AES where your samples are.

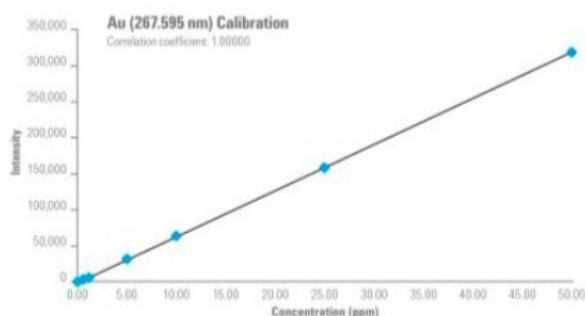
The Agilent 4200 MP-AES expands your application range. With no flammable gases and no cylinder handling hazards, the Agilent 4200 MP-AES is ideal for remote field placement.

- Slash your operating costs — replacing your flame AA with the Agilent 4200 MP-AES can pay for itself in a matter of months, based on gas savings alone
- Improve your productivity — with no need for ongoing gas supply, remote sites and mobile laboratories will never again have to deal with the issue of sourcing gas, or having gas delivered to a remote location
- Accuracy even with difficult samples — vertical plasma torch provides excellent performance for tough samples with axial viewing for the best sensitivity
- The optional inert MP-AES torch enables direct measurement of metals in ore digests prepared using HF acid mixtures, eliminating the inefficient neutralization step



FLIC spectral deconvolution

Fast Linear Interference Correction (FLIC) enables automated interferent subtraction from the emission spectrum of the analyte of interest. Shown here is the FLIC model of a lutetium analyte peak, nickel interferent peak and blank emission.



Accurate and precise gold analysis

With better performance than flame AA, the 4200 MP-AES provides low ppb detection limits for gold. Shown is the excellent precision, extended range, and superb linearity, even in the most difficult geological matrices.



Accurate recoveries in increasing matrix complexity

Geochemical samples in complex matrices are easily handled using the robust 4200 MP-AES. Consistent recoveries for Ag and Pb with increasing %TDS from 0-3% are shown.

AGILENT 4200 MP-AES

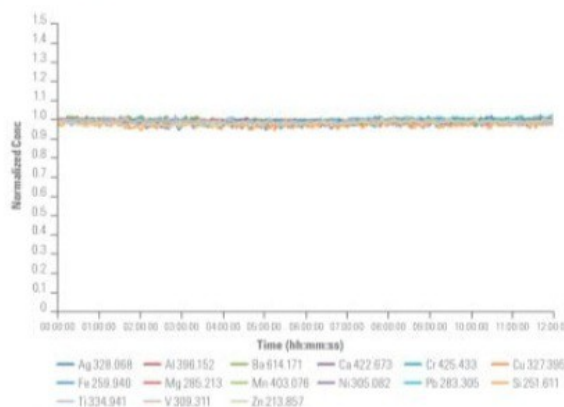
CHEMICAL AND PETROCHEMICAL APPLICATIONS



Production demands and efficiency improvements impose increasingly tough demands on your business. Use the rugged and reliable Agilent 4200 MP-AES to provide fast, accurate results for difficult samples.

With the lowest cost of ownership and improved ease of use, the reliable Agilent 4200 MP-AES is ideal for challenging samples — from volatile organic solvents to used engine oils.

- Vertically oriented torch minimizes blockages, improving long term stability and reducing downtime
- Set up is easy — just plug in the External Gas Control Module (EGCM). No special torch or plasma settings are required
- EGCM injects air into the plasma, preventing carbon build up and reducing background
- Air injection rate is software controlled, and can be changed as you switch between different elements in the sample
- Rapid method development — auto-optimization enables you to select the optimum settings for each wavelength
- Perform sulfur determinations using a nitrogen purge of the optics



Excellent long term stability

Shown is an organics solution (ShellSol) achieving <2% RSD repeatability for all elements over 12 hours, using the Agilent 4200 MP-AES with the OneNeb nebulizer. Data was gathered under controlled laboratory environmental conditions within the instrument operating specification.

AGILENT 4200 MP-AES

ENVIRONMENTAL APPLICATIONS



With simplicity and accuracy, the Agilent 4200 MP-AES is the right choice for the analysis of a broad range of environmental matrices.

The 4200 MP-AES enables you to make the right decisions for your waste disposal—ideal for QA/QC analysis of production streams and monitoring of metals content in solid and liquid waste.

- Simplify your analysis with auto optimization and auto background correction
- Measure your toughest samples accurately with a robust vertical plasma
- Reduce sample preparation of complex hydrofluoric (HF) acid digests using an inert sample introduction system that eliminates the need for a neutralization step, improving your productivity and efficiency

% Recoveries of soil matrices

Certified Reference Material (CRM)	% Recoveries					
	Cu	Fe	Mn	P	Pb	Ti
2709a San Joaquin soil	101	98	104	92	106	98
2710a Montana I soil	100	98	105	97	98	95
2711a Montana II soil	105	102	106	96	101	94

Accurate recoveries for a variety of solid waste samples

Shown are the recoveries of 3 soil CRMs after digestions with a complex acid mix, including HF acid. The digest was analyzed on the 4200 MP-AES using the inert sample introduction system. Excellent accuracy was achieved showing less than 10% deviation across 6 different elements.

PERFORMANCE ENHANCING ACCESSORIES



4107 Nitrogen Generator
for lowest cost of operation



SPS 4 autosampler
for unattended multi-element analysis



Multi-mode Sample Introduction System (MSIS)
for sub ppb detection of As, Hg and Se



Switching Valve System (SVS 1+)
for improved productivity



External Gas Control Module (EGCM)
for analysis of organic solvents and sulfur

For more information

Learn more

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