



Agilent 4210 Microwave Plasma-Atomic Emission Spectrometer

## **ELEMENTAL ANALYSIS THAT RUNS ON AIR**



## RUNS ON AIR

### Elemental analysis using only air.

The Agilent 4210 MP-AES has high sensitivity, detection limits down to sub ppb levels and is faster than conventional flame Atomic Absorption (AA). Best of all, the Agilent 4210 MP-AES runs on air instead of combustible gases.

#### The Agilent 4210 MP-AES delivers:

- Lowest cost of ownership — the Agilent 4210 MP-AES runs unattended without expensive flammable gas supply, dramatically reducing your operating costs
- Improved laboratory safety — in addition to eliminating flammable and oxidizing gases, the 4210 MP-AES eliminates the need to plumb multiple gases into the laboratory, or manually transport and handle gas cylinders
- High-performance — a 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
- Extend the performance — a range of accessories such as a humidifier, the AVS 4 four port switching valve and the Isomist temperature controlled spray chamber, extend the instrument's capabilities, delivering accurate analysis of even your toughest samples
- Robustness and reliability — ideal for industries such as mining, food and agriculture, chemicals, petrochemicals, manufacturing, remote locations and for applications such as environmental monitoring with high sample volumes
- Remote control — The Automation Software pack allows remote control of the instrument, with status updates and results relayed to you in real time



The Agilent 4210 MP-AES eliminates combustible gas usage, gas transportation, and standby power consumption. So you can use less gas and electricity.



Resource conservation protocols save time, reduce gas consumption and greenhouse gas emissions

## PROVEN MP-AES TECHNOLOGY

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

*“Agilent’s MP-AES is well suited for the rapid elemental analysis of wine and spirits. Because it is automated, it is easy to load and use, and frees-up valuable staff time with its walk-away platform. Replacing our AA instruments with the Agilent’s MP-AES has enabled us to increase both the volume and range of samples we can analyze. The platform is robust and can quickly perform sensitive multi-element analyses on a single sample, and provides rich analysis data with its impressive software capabilities. Its lack of drift provides a consistent QC range—even after 180 sample runs—which was not the case with the AA instrument. I would recommend Agilent’s MP-AES to all labs conducting elemental analysis in the wine industry.”*

**—MR. JOHN ERASMUS**, DISTELL, SOUTH AFRICA

*“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 a 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

## HARNESS THE POWER OF AIR

**By using air instead of expensive flammable gases the Agilent 4210 MP-AES costs little to run and is safe to leave unattended.**

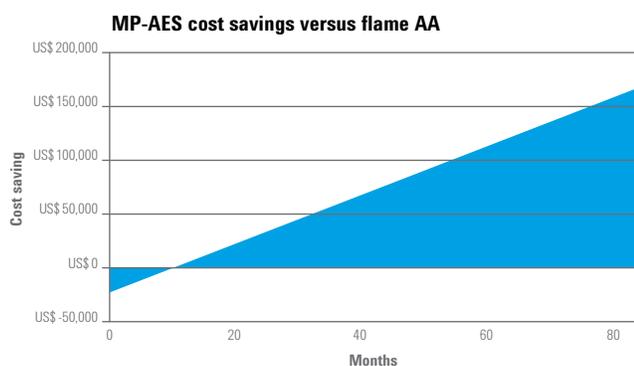
### Lowest cost of ownership

Gas supply is one of the highest costs associated with elemental analysis. Because the 4210 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 compressed air to provide a continuous nitrogen supply for plasma operation
- Reduce labor costs with safe, reliable, unattended multi-element analysis
- Increase sample throughput and prolong the lifetime of your sample introduction components with the advanced valve system, AVS 4
- Eliminate hollow cathode lamps, deuterium lamps for background correction, and burner blockage
- Eliminate standby operating costs. When the Agilent 4210 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 4210 MP-AES has zero fuel-based carbon emissions



### Saving you money

In this example, the analysis of five elements in 100 samples measured three days per week, means 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/mp-aes](http://www.agilent.com/chem/mp-aes)

# CHANGE THE WAY YOU WORK

**The Agilent 4210 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 4210 MP-AES has superior sensitivity, linear dynamic range, detection limits and analysis speed compared 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 Advanced Valve System (AVS 4) four port switching valve fully integrates with the 4210 hardware and software, simplifying setup and method development

## Torch installation in three easy steps



## 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
- Accessory controls, such as those for the AVS 4 switching valve and the IsoMist temperature controlled spray chamber are included in the software for simplified set up
- Results are clearly displayed on screen, with a large format display of 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
- A diagnostics dashboard gives real-time feedback on instrument status to ensure maximum instrument uptime
- 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

The diagram illustrates the three steps of the analysis workflow. Step 1 shows a grid of application-specific icons: Agriculture, Beverages, Chemicals, Energy, Food, Fuels, Industrial, and Metals. Step 2 shows a screenshot of the software's data entry interface, displaying a table of sample parameters and a large summary card for Gold (Au) with values: 267.595 nm, 7.074 ppm, %RSD: 0.39, and 7.0 ppm (LS). Step 3 shows a control panel with buttons for Pump, Run, Stop, and MP Expert, with a mouse cursor clicking the Run button.

## HOW IT WORKS

**The excitation source of the Agilent 4210 MP-AES is unique — a magnetically excited microwave plasma.**

Lowest cost of ownership, improved laboratory safety, better performance than flame AA, and easier to use — it's time to switch to the Agilent 4210 MP-AES.

### **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 4210 MP-AES eliminates flammable or oxidizing gases and the safety concerns of gas handling in your lab.

### **Rugged**

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

### **Plug-and-play hardware**

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

### **Reliable**

The optional optics purge and the innovative wavelength drive makes the 4210 MP-AES perfect for repeatable analysis in harsh on-site laboratory environments.



### **Enhanced stability and precision**

Solid state CCD detector provides simultaneous background or interference correction.

### **Wide application range**

The tuned waveguide, mass flow control on the nebulizer gas, a humidifier and optional accessories enable a broad range of applications to be performed.

## FOOD AND AGRICULTURE APPLICATIONS



**With high sample throughput and fast sequential measurement, the Agilent 4210 MP-AES is ideal for food screening laboratories.**

The Agilent 4210 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 4210 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 a wide range of samples — from food and soil digests to high salt soil extractions
- Improved long term stability with integrated nebulizer gas humidification as standard on the 4210 MP-AES
- Increase your sample throughput, compared to conventional flame AA systems, and never have to change burners/gases for different elements again
- Complete wavelength coverage means you can avoid spectral interferences from majors by simply choosing another wavelength
- Achieve rapid sub-ppb detection of As, Hg and Se with the Multimode Sample Introduction System (MSIS)
- 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 MP-AES, Agilent Publication numbers: 5991-3613EN, 5991-3777EN and 5990-8685EN.

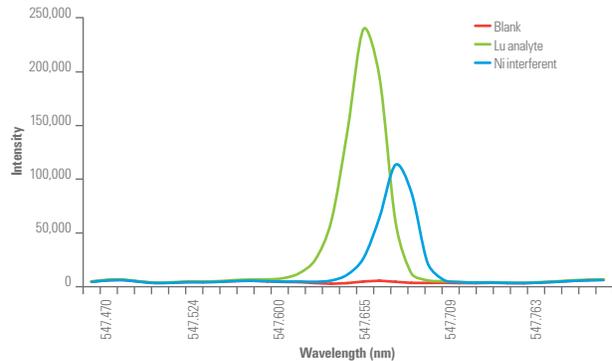
# GEOCHEMICAL APPLICATIONS



**Revolutionize the way you do business. With no ongoing-gas requirements, you can locate the Agilent 4210 MP-AES where your samples are.**

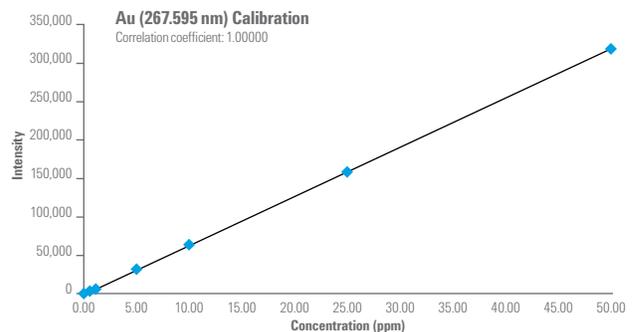
The Agilent 4210 MP-AES expands your application range. With no flammable gases and no cylinder handling hazards, the Agilent 4210 MP-AES is ideal for remote field placement.

- Slash your operating costs — replacing your flame AA with the Agilent 4210 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
- The optional AVS 4 switching valve reduces sample load on the sample introduction system, minimizing exposure to aggressive chemicals and harsh samples, further reducing costs by increasing life-time of consumables



## 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 4210 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.

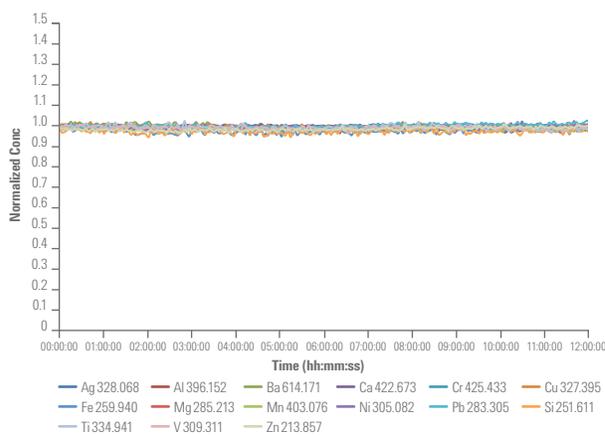
## CHEMICAL AND PETROCHEMICAL APPLICATIONS



**Production demands and efficiency improvements impose increasingly tough demands on your business. Use the rugged and reliable Agilent 4210 MP-AES to provide fast, accurate results for difficult samples.**

With the lowest cost of ownership and improved ease of use, the reliable Agilent 4210 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
- The optional IsoMist programmable temperature controlled spray chamber accurately controls the temperature of the sample introduction system for improved stability with volatile organic solvents and viscous oils samples



### Excellent long term stability

Shown is an organics solution (ShellSol) achieving <2% RSD repeatability for all elements over 12 hours. Data collected on Agilent MP-AES instrument.

# ENVIRONMENTAL APPLICATIONS



**With simplicity and accuracy, the Agilent 4210 MP-AES is the right choice for the analysis of a broad range of environmental matrices.**

The 4210 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
- Achieve excellent long term precision for elevated salt-matrix samples using the humidifier accessory
- 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
- Utilize the Automation Software Pack to assist with remote operation of the MP-AES when it is located near to the sample, away from your lab

## % Recoveries of soil matrices

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

## 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. Excellent accuracy was achieved showing less than 10% deviation across 6 different elements. Agilent Publication number: 5991-5991EN.

## Agilent leads the way in atomic spectroscopy innovation.

Our portfolio offers the most diverse application coverage for AA, ICP-OES and ICP-MS, while unique MP-AES and ICP-QQQ technologies deliver new possibilities for your lab.

Beyond our industry-leading instruments, we provide genuine Agilent parts and supplies, CrossLab Services, and more to help you maximize your productivity and data quality.

Learn more

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