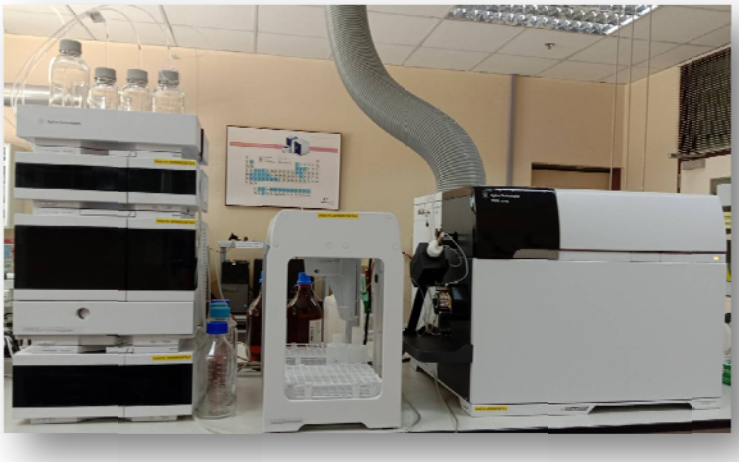
Liquid Chromatography-Inductively Couple Plasma Mass Spectrometry (LC-ICP-MS)

LC Agilent 1260 Infinity II



7900 ICP-MS

Autosampler

Brand : Agilent

Model : 7900 ICP-MS

Location : K640 Room, 6th Floor, Chaloemprakiet Building, Phyathai Campus

Custodian : PRADUP MESAWAT

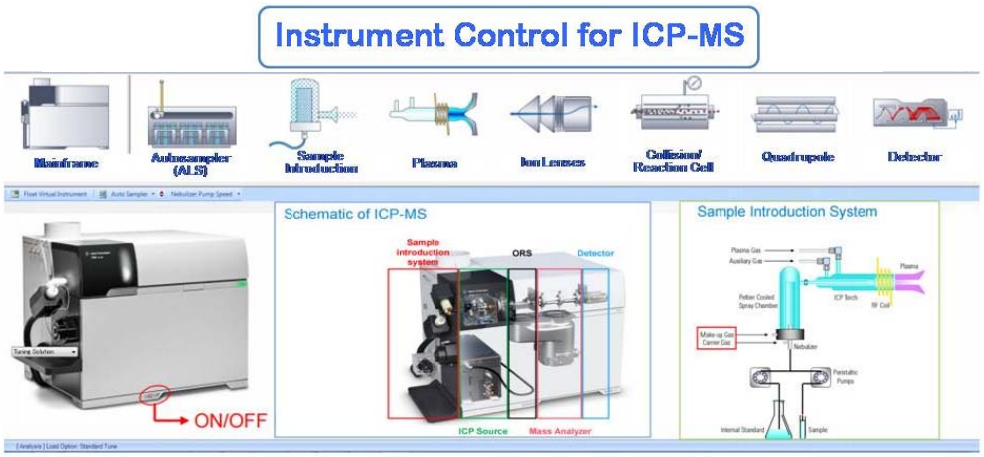
Description:

The Agilent 7900 ICP-MS is a flexible single quadrupole ICP mass spectrometer that provides the industry's best matrix tolerance, most effective helium collision mode, lowest detection limits, and widest dynamic range. As a result, you can be confident you are reporting accurate data every time, even at trace levels, whatever your sample types.

Applications:

The flexibility needed for research and advanced analysis such as

- High sensitivity and fast acquisition of transient signals
- Analysis of speciation
- Analysis of single nanoparticles (spICP-MS), single cells



Specification LC-ICP-MS

Sample introduction	Specification
SPS 4 Autosampler	High-capacity (up to 768 samples) autosampler. An environmental enclosure, rinse and probe options also make it ideal for ultra-trace applications.
Nebulizer	Concentric nebulizer with low sample flow rate as standard (~0.2 mL/min): Micro mist: Low matrix Mira mist: High matrix
Spray chamber	Quartz, low-volume, Scott-type double pass spray chamber, provides improved removal of larger aerosol droplets, compared to cyclonic or impact bead designs. Peltier-cooling eliminates the need for a separate external cooling water supply. Controlled temperature range: -5 °C to +20 °C (with instrument cooling water at 15-30 °C)
Peristaltic pump	Low-pulsation, high-precision, 10-roller peristaltic pump, with three separate channels for precise delivery of sample and internal standard (ISTD), plus spray chamber drain.
Ultra High Matrix Introduction (UHMI):	UHMI aerosol dilution technology (option) extends the matrix tolerance, samples containing of % levels of total dissolved solids (TDS), while eliminating the added costs, time and potential errors of conventional liquid dilution
Plasma	**Specification**
RF generator	High power-transfer efficiency and maintenance-free solid state digital drive 27 MHz RF generator with variable-frequency impedance matching. Provides significantly improved tolerance of changes in sample matrix; even highly volatile organic solvents can be introduced without affecting plasma stability. • RF power range: 500 W to 1600 W
Torch	Easy-mount, quartz torch with 1.0 and 2.5 mm internal diameter injector. The exceptionally wide torch injector produces highly robust plasma that efficiently decomposes the sample matrix, reducing interference and minimizing routine interface cleaning.
Torch position	Stepper-motor controlled in three axes (horizontal, vertical and sampling depth) in 0.1 mm steps. The torch is automatically realigned with the interface following maintenance. • Horizontal and vertical position range: ±2 mm • Sampling depth: 3 to 28 mm
ShieldTorch System	ShieldTorch System (STS) precisely controls plasma potential and ion energy-essential to achieve high performance He mode.

Plasma	Specification
Robust preset plasma conditions	Plasma conditions are robust and easily reproduced using the pre-set plasma function within MassHunter- no manual tuning is required. Signal suppression for high ionization potential elements such as Be, Zn, As and Cd in 10 vol % HNO_3 matrix is typically less than 10% (Plasma mode: General Purpose).
Interface	**Specification**
Sampling cone	1 mm diameter orifice, Ni-tipped or Pt-tipped (option) with Cu base. Easy access to the interface region for routine maintenance; no tools are required for removal/refitting of sampling cone.
Skimmer cone	0.45 mm diameter orifice, Ni or Pt-tipped (option). Precisely controlled skimmer tip temperature ensures minimal matrix condensation, providing good tolerance to high matrix samples. Small skimmer orifice reduces matrix contamination of the high vacuum region, reducing maintenance.
Ion Lens	The ion lens provides high ion transmission (> 1GHz/ppm sensitivity at <2.5% CeO/Ce) and low backgrounds to deliver superior detection limits. The ion lens design also ensures that fixed voltages can be used to achieve optimum ion transmission across the mass range.
Extraction lens	Positioned behind the skimmer cone, the extraction lens focuses the ions as they enter the intermediate vacuum stage, minimizing space charge effects and reducing mass bias.
Off-axis Omega lens	This double deflection lens protects the ORS4 cell and high vacuum region from contamination, by rejecting neutral species from the ion beam. This contributes to the minimal mass bias and low background noise
Octopole Reaction System	The incorporates a new, 4th generation cell, the ORS4, which provides fast cell gas switching and the most effective interference removal using kinetic energy discrimination (KED) in He mode.
Octopole	The octopole ion guide provides superior ion focusing, minimizing ion scattering and ensuring that high sensitivity is maintained at the high cell pressures required for effective KED.
He cell mode as standard	Only the combination of narrow ion energy distribution (due to ShieldTorch) and the octopole-based cell enables efficient removal of interferences using an inert cell gas (He) and KED. The use of He cell gas also eliminates safety issues related to reactive gases such as H_2, H_2 mixes or NH_3.
Cell gas control	

Mass Analyzer	Specification
Quadruple mass spectrometer	Uses a true hyperbolic quadruple, unique in ICP-MS, operating at high (3 MHz) frequency. A hyperbolic profile quadruple provides superior ion transmission, resolution and abundance sensitivity at standard settings, so eliminating the need for multiple resolution settings to separate adjacent peaks. • Mass range: 2–260 amu
Quadruple mass spectrometer	• Mass scan speed: • Slew rate (Li to U, no intervening peaks): 56.6 million amu/s • Scan speed (Li to U, plus data collection at 40 intervening masses): >3,000 amu/s • Abundance Sensitivity (at Cs): • Low Mass side: 5×10^{-7} • High Mass side: 1×10^{-7}
Orthogonal detector system (ODS):	The ODS delivers higher sensitivity, lower background, and a wider linear dynamic range-up to 11 orders of magnitude from 0.1 cps to 10 Gcps. Fast measurement of transient signals is provided, due to the use of a proprietary analog amplifier, which operates at the same short integration time (100 μsec) in both pulse and analog mode. There is no settling time between measurements in fast TRA mode.
Vacuum system	Three-stage differential vacuum system using a single, split-flow turbo molecular pump and single external rotary pump for fast pump-down and simple maintenance. No need to manually start the vacuum system following an overnight power failure.

Standard for ICP-MS	
Mix Standard 10 ug/mL	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cs, Cu, Fe, Ga, K, Li, Mg, Mn, Na, Ni, Pb, Rb, Se, Sr, Tl, U, V, Zn (27 elements)
Mix Standard 100 mg/L	Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Ni, Pb, Se, Th, Tl, U, V, Zn (18 elements)

Guaranteed performance

For each specification, the actual instrument factory test certificate of Guaranteed Performance is included with every 7900 ICP-MS instrument.

Specification (units)	Element/Ratio	7900 ICP-MS
Sensitivity (Mcps/ppm)	Li (7)	55
	Y (89)	320
	Tl (205)	250
Background (cps)	No gas (9u)	1
Oxide ratio (%)	CeO/Ce	1.5
	CeO/Ce (HMI-25)	0.5
Doubly-charged ratio (%)	Ce^{2+}/Ce	3
No gas mode detection	Be (9)	0.2
Limits (ppt)	In (115)	0.05
	Bi (209)	0.08
He mode detection limits (ppt)*	As (75)	20
	Se (78)	40
H_2 mode detection limits (ppt)**	Se (78)	1
Short-term stability (%RSD)	Li, Y, Yl	2
Long-term stability (%RSD)	Li, Y, Yl	3
Isotope ratio precision (%RSD)	Ag (107)/Ag (109)	0.1

* He mode detection limits for As and Se are performed in a matrix of 1%HNO_3, 2%HCl and 100 ppm Ca, demonstrating the effective removal of both ArCl and CaCl interfaces. All other tests are performed in matrix of 1% HNO_3.

** Applies when optional H_2 cell gas line is fitted.

Site requirements and safety

Utilities

Electricity supply	Voltage	Single Phase, 200-240V, 50/60Hz
	Current	30 A
Cooling water	Inlet temperature	15-40 °C
	Minimum flow rate	5 L/min
	Inlet pressure	230-400 kPa (71-100 psi)
As gas supply	Minimum purity	99.99%
	Maximum flow rate	20 L/min
	Supply pressure	500-700 kPa (71-100 psi)
Cell gas supply	Minimum purity	99.999%
	Maximum flow rate	12 mL/min for He and 10 mL/min for H_2
	Supply pressure	90-130 kPs (13-18.8 psi) for He and 20-60 kPa (2.5-8.7 psi) for H_2
Exhaust duct	Vent type	Single vent, 150 mm diameter
	Flow rate	5-7 m^3/min

LC Agilent 1260 Infinity II

Variable Wavelength Detector (G7114A): Detector

Column Compartment (G7130A): Column controller

Vialsampler (G7129A): Autosampler

Quaternary VL (G7111A): Pump

Agilent 1260 Infinity II Quaternary VL (G7111A)

Performance Specifications

Type	Specification
Hydraulic system	Dual piston in series pumps with servo-controlled variable stroke drive. power transmission by gears and ball screws, floating pistons
Settable flow range	Set point 0.001 – 10 mL/min, in 0.001 mL/min increments
Recommended flow range	0.2 – 10. mL/min
Flow precision	≤0.07% RSD, or ≤0.02 min SD whatever is greater
Flow accuracy	±1% or 10 µL/min whatever is greater, pumping degassed H_2O at 10 MPa (100bar)
Compressibility compensation	User-selectable, based on mobile phase compressibility
Recommended pH range	1.0 – 12.5, solvents with pH <2.3 should not contain acids which attack stainless steel
Gradient formation	Low pressure quaternary mixing/gradient capability using proprietary high-speed proportioning valve
Delay volume	600 – 900 µL, dependent on back pressure; measured with water at 1 mL/min (water/caffeine tracer)
Settable composition range	0 – 100% in 0.1% Increments
Composition precision	<0.2% RSD or <0.04min SD, whatever is greater
Integrated degassing unit	Number of channels: 4 Internal volume per channel: 1.5 mL
Safety and maintenance	Extensive diagnostics, error detector and display through Agilent LabAdvisor, leak detection, safe leak handling, leak output signal for shutdown of the pumping system.
GLP features	Early maintenance feedback (EMF) for continuous tracking of instrument usage in terms of seal wear and volume of pumped mobile phase with pre-defined and user settable limits and feedback messages. Electronic records of maintenance and errors.

Agilent 1260 Infinity II Vialsampler (G7129A)

Performance Specifications

Type	Specification	Comment
Injection range	0.1 – 100 µL in 0.1 µL increments with 100 µL up to 60 MPa 0.1 – 900 µL in 0.1 µL increments with 900 µL up to 40 MPa	Up to 1800 µL with multiple draw (hardware modification required)
Precision	<0.25% RSD of peak areas from 5 µL to 100 µL	Measured caffeine
Pressure range	0 – 60 MPa (0 – 600 bar, 0 – 8702 psi) 0 – 40 MPa (0 – 400 bar, 0 – 5801 psi)	For 900 µL analytical Head
Sample viscosity range	0.2 – 5 cp	
Sample capacity	132 × 2 mL vial (two trays default) 100 × 2 mL vial (two classic trays optional) 36 × 6 mL vial (two trays optional)	
Carry over	<0.004% (40 ppm) with needle wash	
Injection cycle time	18 s for draw speed 200 µL/min Ejection speed: 200 µL/min Injection volume: 1 µL	
Minimum sample volume	1 µL from 5 µL sample in 100 µL microvial, or 1 µL from 10 µL sample in 300 µL microvial	Needle height offset has to be adapted to ensure that needle doesn't touch vial bottom. Default needle height = 0 equates to 2 mm above the vial Drivers

Agilent Infinity Lab LC Series Integrated Column Compartment (G7130A)

Performance Specifications

Type	Specification	Comment
Temperature range	5 °C above ambient to 80 °C	
Column capacity	2 columns up to 30 cm and 4.6 mm ID	
Temperature stability	±0.10 °C sensor	
Temperature accuracy	±0.5 K	At sensor
Warm up time	20 – 40 °C in 5 min	

Agilent 1260 Infinity II Variable Wavelength Detector (G7114A)

Performance Specifications

Type	Specification
Detector type	Double-beam photometer
Maximum data rate	120 Hz (single wavelength detection) 2.5 Hz (dual wavelength detection)
Noise	<±0.25*10^{-5} AU, at 230 nm (single wavelength detection) <±0.80*10^{-5} AU, at 230 nm and 254 nm (dual wavelength detection)
Drift	<±1.10*10^{-4} AU, at 230 nm
Linearity	>2.5 AU upper limit
Wavelength range	190 – 600 nm
Wavelength accuracy	±1 nm, self-calibration with deturium lines, verification with holmium oxide filter
Wavelength precision	<±0.1 nm
Slit width	6.5 nm typical over whole wavelength range
Time programmable	Wavelength, polarity, peak width, lamp on/off
Flow cells	*Standard:* 14 µL volume, 10 mm cell path length and 40 bar (588 psi) pressure maximum
Spectral tools	Stop-flow wavelength scan
GLP	Early maintenance feedback (EMF) for continuous tracking of instrument usage in terms of lamp burn time with user settable limits and feedback messages. Electronic records of maintenance and errors. RFID for electronics records of flow cell and UV lamp conditions (path length, volume, product number, serial number, test passed, and usage). Verification of wavelength accuracy with built-in holmium oxide filter.
Safety and maintenance	Extensive diagnostics, error detection and display. Leak detection, safe leak handling, leak output signal for shutdown of pumping system. Low voltages in major maintenance areas. Tracking of flow cells and lamps with RFID (radio frequency identification) tags