- ▶ Superior performance
- ▶ Faster analysis
- ▶ Easier operation
- ▶ Lower running cost

ICP-3000

Inductively Coupled Plasma Optical Emission Spectrometer

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ICP-3000 inductively coupled plasma emission spectrometer is a powerful performance, simultaneous full-spectrum direct-reading spectrometer developed, which is used for trace elemental analysis in diverse samples (soluble in hydrochloric acid, nitric acid, hydrofluoric acid,etc). The instrument offers capabilities with automatization, stability, reliability and ease of use. It is currently widely applied in various fields of rare earth, geological, metallurgical, chemical, environmental, clinical medicine, petroleum, semiconductor, food, biological samples, criminal science and agricultural research, etc..

Application fields

- ▶ Silicon Industrial: magnetic materials
- ▶ Metallurgical: analyze As, Bi, Pb, Sb, Sn and other impurity elements, which effect greatly the metallic materials quality
- ▶ Water analysis: analyze 8 heavy metal elements
- ▶ Geological, minera: analyze Ca, Mg, Na, Fe, Cu, Mn, Zn, Co, Ni, Au, Ag and other elements in the rock samples
- ▶ Petrochemical and Industrial: Analyze over 30 elements in crude oil, mainly Fe, Na, Mg, Ni, V, Ca, Pb, Mo, Mn, Cr, Co, Ba, As, etc.
- ▶ Pharmaceutical, health, agricultural and environmental and Food safety

Advantages

Full automation design

The instrument is thoroughly computer-controlled except the power switch, which is reliable, safe and convenient.

Peristaltic pump

A high precision 12 roller, 4 channel peristaltic pump, with speed adjustable according to the demanding, provides smooth, stable sample introduction and drain, to ensure the introduction rate consistent with the drain rate, which is adjusted as per required to stabilize the introduction system.

Auto-control of gas flow

In the sample introduction system, the carrier gas, plasma gas, auxiliary gas are controlled through the advanced mass flow controller (MFC), features continuously adjustable and stable, etc., which ensures the stability of the introduction system and the foundation for the stable light source.

Precise wavelength positioning

Intelligent, precise automatic wavelength calibration algorithm, achieves the measurement without additional peaks calibration, to ensure an accurate measurement whilst saving solution and measurement time.

Fast, accurate auto-matching

The load terminals employs the full-automatic matching technology developed by Jiangsu Skyray Instrument Co.,Ltd., features fast matching, high precision, etc., which could achieve maximum output power, enhance power efficiency, ensure the stability of the instrument whilst facilitating ignition.

Ultra-fast analysis speed

The analyst can set any suitable integration time for all the analytical lines in one exposure to achieve optimal measurement, or acquire the intensity integral value in the end of the exposure to enable the analysis faster, or specify any one or several specific line(s)to read-out(the readout time<2ms).

Powerful software analysis function

Software is easy to operate and intuitive, it offers the capability with qualitative, semi-quantitative and quantitative analysis, instrument diagnostics, intelligent optimization, flexible full-spectrum research function, strong offline reprocessing, scientifically intelligence background correction and interference cancellation algorithm, which enable the analysis more professional and accurate.

Advanced sample introduction system

The sample introduction system is efficient and stable, equipped with various nebulizers and spray chambers, it can also be equipped with high solids nebulizer, hydrogen fluoride-resistant nebulizer, etc.as per required. Besides, the autosampler developed by Skyray facilitates the operation, and further improves the analysis efficiency.

Stable, advanced solid-state RF power

The instrument employs the solid-state RF power developed by Jiangsu Skyray Instrument Co., Ltd., which is compact and delivers reliable performance with the power stability and safety, to further improve the instrument's stability and security.

Superb optical system

Adopting the echelle-prism cross-dispersion type polychromator, elegant optical optimization design maximizes the flux whilst enabling the excellent spectral resolution. No movable optical components achieves unparalleled long-term stability; Ultra-low stray light design with the unique optical design greatly reduces the background interference and further improves the detection limit. A highly efficient N_2 distributed purge system for the optical tank combined with the high-quality optics ensures deep UV analysis. especially P, S, As, etc..

Excellent performance detector

Employing the CID detector, which is advanced, mature and stable, largest-size active area, megapixel. Full-frame Imaging ability to capture the entire ICP-OES spectrum (165-900 nm) permits quantitative analysis. Non-destructive readout improves the signal-to-noise ratio of weak analyte lines and ensures the precision of results, whist enabling data acquirement and analysis faster than CCD. Excellent linear dynamic range and inherent anti-blooming capability allow the measurement of weak analyte emission signals adjacent to intense emission signals. whilst providing flexibility to choose the ideal wavelength for a method (alternative secondary and tertiary lines to overcome interferences).

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Technical parameters

RF Generator Technical Specifications

Input Power	AC 220V, 20A
Output power	700-1600W
Accuracy	2W
Working Frequency	27.12MHz
Frequency stability	＜0.05%
Output power stability	＜0.1%
Match method	auto-matching
Electromagnetic leakage radiation intensity	electric field intensity E <0.5V / m at 30cm away from the chamber

Introduction sample system technical specifications

Output coil	Inner-diameter 25mm, 3 turns
Quartz tri-concentric torch	Outer-diameter 20mm. Various center channel size models optional
High-efficient nebulizer	Concentric nebulizer outer-diameter 6mm. Vvarious models (high-salt,anti-HF, etc.)optional
Spray chamber	Scott spray chamber, the cyclonic spray chamber with outer diameter 57.2mm optional
Peristaltic pump	12-roller. 4-channel. the rotation speed can be adjusted according to the demanded flow
Total consumption(Ar)	＜14L/min
Argon flow meter/carrier gas pressure gauge specifications	Plasma gas flow meter (100-1000)L/h (1.6-16L/min) Auxiliary gas flow meter(6-60)L/h (0.1-1L/min) Carrier gas flow meter(6-60)L/h (0.1-1L/min) Carrier gas regulator valve (0.2MPa) Cooling water: Water temp. 20-25℃ Flow> 5L/min Pressure> 0.1MPa

spectrometer specifications

Ruled echelle grating	52.67 lp/mm, 64°blaze angle. the substrate is made of the Zerodur® produced by German SCHOTT. features near-zero thermal expansion coefficient . enabling outstanding performance
Prism	Ultra-pure Corning UV fused silica, transmittance 99.6% at 170nm.
Wavelength range	175nm~900nm for standard, extended to 165nm-900nm by choosing DUV optical components
Effective Focal length	430mm
Numerical aperture	F/8, ultra-high flux ensures the instrument detection limit and sensitivity
Resolution	0.0068nm@200nm
Stray light	Equivalent background concentration of 10000ppmCa solution <2ppm at As189.042nm
Optical chamber	Precisely thermostat, 35±0.1℃ Distributed N_2 purge: normal purge 2L/min, fast purge 4L/min

Detection device Technical Specifications

Detector Type	Charge injection detector (CID)
Pixel Size	27 x 27 μm,Random Access Integration (RAI)
Read mode	Full frame readout (FF), Random Access Integration (RAI) with non-destructive read (NDRO)
Linear dynamic range	10^9
Wavelength response range	165nm~1000nm
Electronic shutter	Set the integration time of each line; specify the individual line to read out(read time <2ms)
Quantum efficiency	No coating, up to 35% within 200nm UV region
Detector cooling	High efficiency triple stage thermoelectric cooling device maintains the detector at a constant - 45 ℃

Instrument Specifications

View mode	Radial view
Liquid content	0.01ppm- several thousands ppm
Solid content	0.001%—70%
Repeatability	(short-term stability) relative standard deviation RSD <0.5%
Stability	Relative standard deviation RSD <1% within 2 Hours
Analysis speed	Single line CID readout time is 2ms, analysis for all elements can be achieved within one minute
Detection limit (μg/L)	1ppb-10ppb for most elements
Instrument size	Desktop1300mm*840mm*740mm

Typical detection limit of elements

Element	Ag	Ba	Be	Ca	Cr	Cu	K	Li	Mg
Wavelength	328.068	455.403	311.107	393.366	267.716	324.754	766.49	670.784	279.553
Detection limit	1.31	0.1	0.06	0.02	1.3	1.1	4.9	0.2	0.05
Element	Mn	Mo	Na	Ni	Sr	Ti	V	Zn	
Wavelength	257.61	202.03	589.592	231.604	407.771	336.121	309.311	213.856	
Detection limit	0.22	1.11	1.43	2.19	0.034	0.42	0.88	0.47	

Instrument configuration

Fully automated matcher	Manual
The sample introduction system	Detection device
Fully automated solid-state RF power	Spectrometer
Auto-controlled cooling water apparatus	Computer system

Working environment

Store&transport temp.:15℃-25℃	Power adaptability:
Store&transport relative humidity:<70%	220±10V,
Working humidity: <70%	50-60Hz
Working temp.: 15℃-30℃	

Software advantages

ICP-3000 Software：

ICP3000 operating software can control all functions of the instrument, including plasma ignition, gas flow control (Figure 1), and security monitoring (Figure 2),etc..
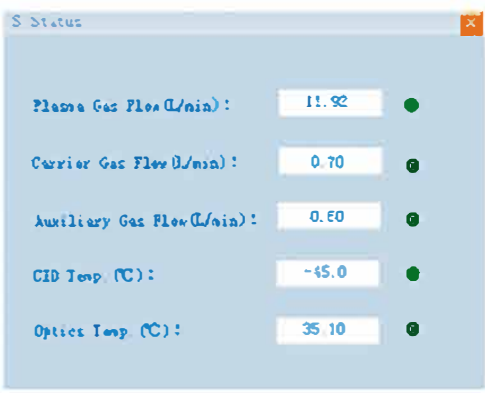

Figure 1

Figure 2

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Daily Analysis Software:

specifying the individual pixel or pixel subarray region for quantitative analysis (Figure 3 & 4).
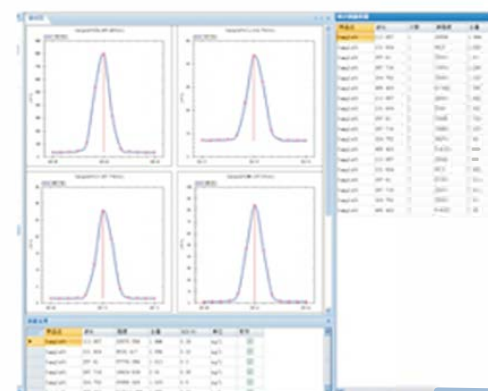

Figure 3

Figure 4

Methods & data set separation management, strong off-line re-processing function, auto or manual real-time background correction for option(Figure 5)
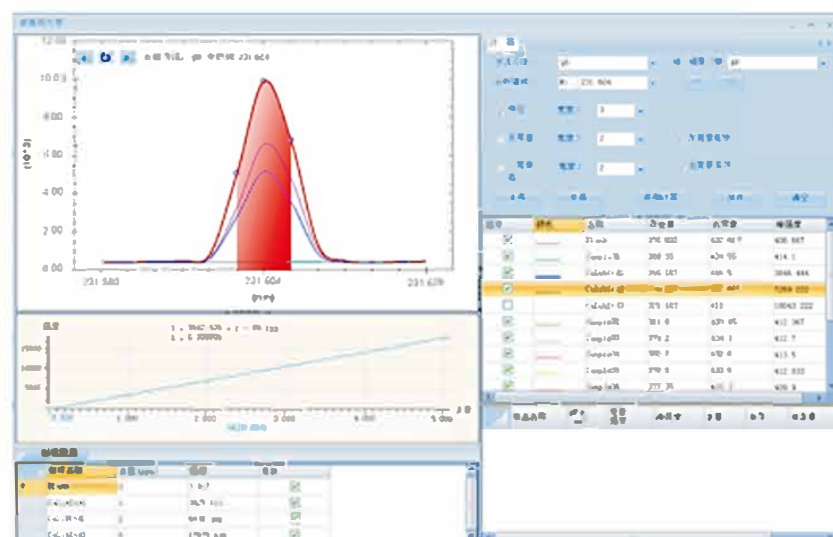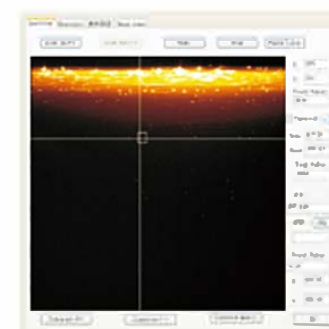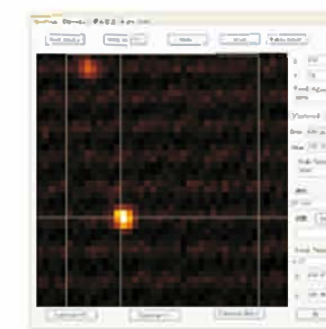

Figure 5

Default system parameters setting and user-defined mode optional.
User-optional plasma view area or software auto-select the optimal vertical view height.
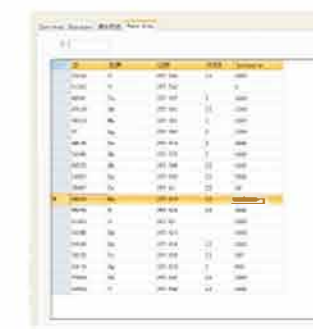
Fullframe-spectrum mode:

directly showing the whole emission spectra, directly acquiring the emission intensity, auto-peak identification, interactive spectral library, qualitative&semi-quantitative analysis of the elements (Figures 6, 7 and 8):

Figures 6

Figures 7

Figures 8

Autosampler mode:the autosampler is provided as per required.

Calibration type:multi-point calibration curve, of which the number of the standard points is not limited.

Curve fitting display:linear, auto-adjust the range.

Data report:export the report based on sample names, method names, elements, intensity, concentration, mean, standard deviation, relative standard deviation, time, date, etc., and generate the analysis report automatically.

Optional format:analysis data can be stored in user-specified data format, e. g. Excel, Word, PDF, image, etc..

Instrument structure diagram: