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DITEE SWORD 510

ICP-OES Inductively Coupled Plasma Optical Emission Spectrometer

— Exceptional Performance, Defining a New Standard for Elemental Analysis —









Guangdong DITEE Scientific & Technical Co., Ltd.



Product Overview

The DITEE SWORD 510 ICP-OES is an inductively coupled plasma optical emission spectrometer based on advanced full-spectrum direct reading technology, representing the cutting edge of modern elemental analysis. It integrates three core technologies: a cross-dispersion optical system combining an echelle grating and a prism, a scientific-grade large-format CCD detector, and a fully digital solid-state RF generator, establishing its exceptional benchmark in accuracy, stability, and analytical efficiency. The instrument is designed to provide high-end laboratories with comprehensive, high-speed, simultaneous analytical solutions for elements ranging from ultra-trace to major levels, meeting the most demanding scientific research and industrial quality control requirements.

The SWORD 510 achieves full wavelength coverage from 165-870nm and the capability for "single exposure, full spectrum simultaneous detection." Combined with its highly automated design, it can complete precise measurements of nearly 70 elements in a single sample within one minute. The instrument features fully automatic one-click ignition, intelligent wavelength calibration, and real-time visual monitoring of the plasma flame, greatly simplifying the operational workflow and reducing reliance on operator skill. Its modular sample introduction system allows for flexible configuration with hydrofluoric acid-resistant, high-salt, organic-specific attachments, and deep refrigeration devices, enabling it to handle various demanding samples, from routine water quality to complex petrochemical oils and high-salt solutions.

Designed specifically for diverse application scenarios, the SWORD 510 is a reliable analytical tool in fields such as environmental monitoring, geology and minerals, metallurgy and materials, petroleum and chemicals, and food and drug safety. The instrument incorporates a comprehensive safety protection system, including argon monitoring, flame sensing, and circuit protection, ensuring operational safety and long-term, stable equipment operation. Combined with the full lifecycle technical support provided by DITEE, the SWORD 510 is not only a powerful tool for obtaining accurate data but also a solid partner ensuring laboratory efficiency and continuous innovation.

Application Fields

The DITEE SWORD 510 Full Spectrum Direct Reading ICP-OES, through its professional configurations like the high-salt resistant nebulizer and torch, and oxygen-assisted combustion system, effectively addresses challenges such as carbon deposition and high salinity, making it a reliable tool for petrochemical laboratories for precise quality control and in-depth R&D. Leveraging its exceptional stability, excellent resistance to complex matrix interference, and specialized sample introduction accessories, the SWORD 510 provides comprehensive elemental analysis solutions for the petrochemical industry, covering raw materials, production processes, and final products.



Crude Oil & By-products Analysis

Precisely determines key metal contents such as Vanadium (V), Nickel (Ni), Iron (Fe), and Sodium (Na) in crude oil and heavy oil, providing critical data for crude oil evaluation, catalytic process optimization, and equipment corrosion prevention.



Fuel Oil Quality Monitoring

Comprehensively monitors elements like Silicon (Si), Lead (Pb), Manganese (Mn), and Iron (Fe) in gasoline and diesel, effectively identifying contaminants and illegal additives to ensure product cleanliness and compliance with environmental regulations. Coupled with a dedicated refrigeration system (-35°C), it ensures stable and accurate analysis of highly volatile oil samples.



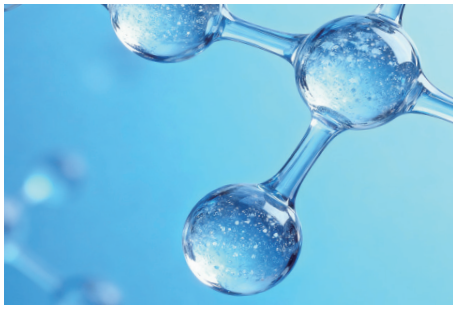
Lubricating Oil & Additives Analysis

Efficiently analyzes the content of additive elements like Calcium (Ca), Zinc (Zn), Phosphorus (P), and Magnesium (Mg) in new lubricating oils and additives; simultaneously, it accurately determines wear metals (e.g., Fe, Cu, Al, Cr), contaminant elements (e.g., Si, Na), and additive depletion in used oils, providing core evidence for predictive equipment maintenance. The instrument supports direct oil injection methods compliant with industry standards.



Automotive Urea Solution Testing

Strictly monitors impurity elements like Sodium (Na), Potassium (K), Calcium (Ca), Magnesium (Mg), and Aluminum (Al) in automotive urea (AdBlue), preventing catalyst poisoning in SCR systems and ensuring compliant vehicle exhaust emissions.



Petrochemical Processes & Derivatives

Applied in purity control for fuels and chemical feedstocks like methanol and ethanol. Also, can be used for sensitive detection of rare earth elements in oilfield tracers, serving the oil and gas exploration and development sector.

Core Technologies and Performance Features

Exceptional Optical System and Detector

- **Precision Spectroscopic System:**

  Utilizes echelle grating + prism cross-dispersion technology. The optical path has no moving parts, ensuring excellent long-term stability and spectral resolution. With a 440mm focal length, the optical structure is robust and highly resistant to interference.

- **Scientific-Grade CCD Detector:**

  A self-developed megapixel, large-format CCD detector achieves full wavelength coverage from 165-870nm. A single exposure completes the simultaneous collection of all analytical spectral lines, greatly enhancing analysis efficiency and the temporal consistency of data.

- **Ultra-Low Stray Light Design:**

  Unique optical design and component selection significantly reduce background interference, effectively improving the signal-to-noise ratio, thereby achieving lower instrument detection limits.



optical path



CCD



Comprehensive Safety Protection System

- **Argon Pressure Monitoring & Automatic Protection:**
  Monitors argon supply pressure in real-time. Automatically cuts power and triggers audible/visual alarms when pressure falls below the safety threshold, preventing equipment damage such as torch burn-out due to gas interruption.

- **Intelligent Flame Monitoring:**
  A high-sensitivity optical fiber sensor monitors the plasma flame status in real-time; it can immediately and automatically shut down relevant systems upon abnormal flame extinction.

- **Rapid and Precise Torch Positioning:**
  Utilizes a patented torch auxiliary installation tool, enabling one-second rapid concentric positioning of the torch and coil, ensuring optimal plasma position stability for stable test signals.



Stable and Reliable Sample Introduction and Plasma System

Separated Sample Introduction System:

The spray chamber and torch adopt a split design, effectively isolating the plasma's high temperature from affecting nebulization efficiency and providing an intuitive observation window for the sample introduction status. Combined with the patented extended spray chamber, it achieves efficient gas-liquid separation and reduces water vapor interference.

High-Precision Fully Digital Solid-State RF Power Supply:

Operating frequency of 27.12 MHz, power output stability < 0.01%. Equipped with comprehensive water, gas, and electrical overload protection functions, ensuring safe equipment operation and extremely low failure rates.

Precise Gas Flow Control System:

Plasma gas, auxiliary gas, and carrier gas are all controlled by high-precision mass flow controllers. The flow is continuously adjustable and precisely controlled, providing a solid foundation for stable plasma excitation and ensuring data reproducibility.

High Degree of Automation and Intelligence

Fully Automatic One-Click Ignition:

Incorporates advanced automatic impedance matching technology. Software-controlled fully automatic one-click ignition of the plasma is simple to operate and has a high success rate.

Intelligent Wavelength Calibration:

The system automatically executes wavelength calibration algorithms upon startup, requiring no manual intervention, greatly saving calibration time and operational costs, and ensuring data accuracy.

Real-Time Visual Plasma Monitoring:

Integrated high-definition full-color camera system allows operators to observe the plasma flame shape, torch status, and central tube carbon buildup in real-time via the software interface, facilitating timely maintenance and fault diagnosis.

Professional Application Expansion Capabilities

Dedicated Sample Introduction Accessories:

Can be configured with the STCC-BOX organic sample introduction refrigeration system (cooling down to -25°C to -35°C), effectively suppressing the volatilization of oil samples and other volatile samples, improving sample introduction stability and data accuracy. Optional oxygen-assisted combustion system prevents carbon buildup from organic samples.

Corrosion-Resistant Configuration:

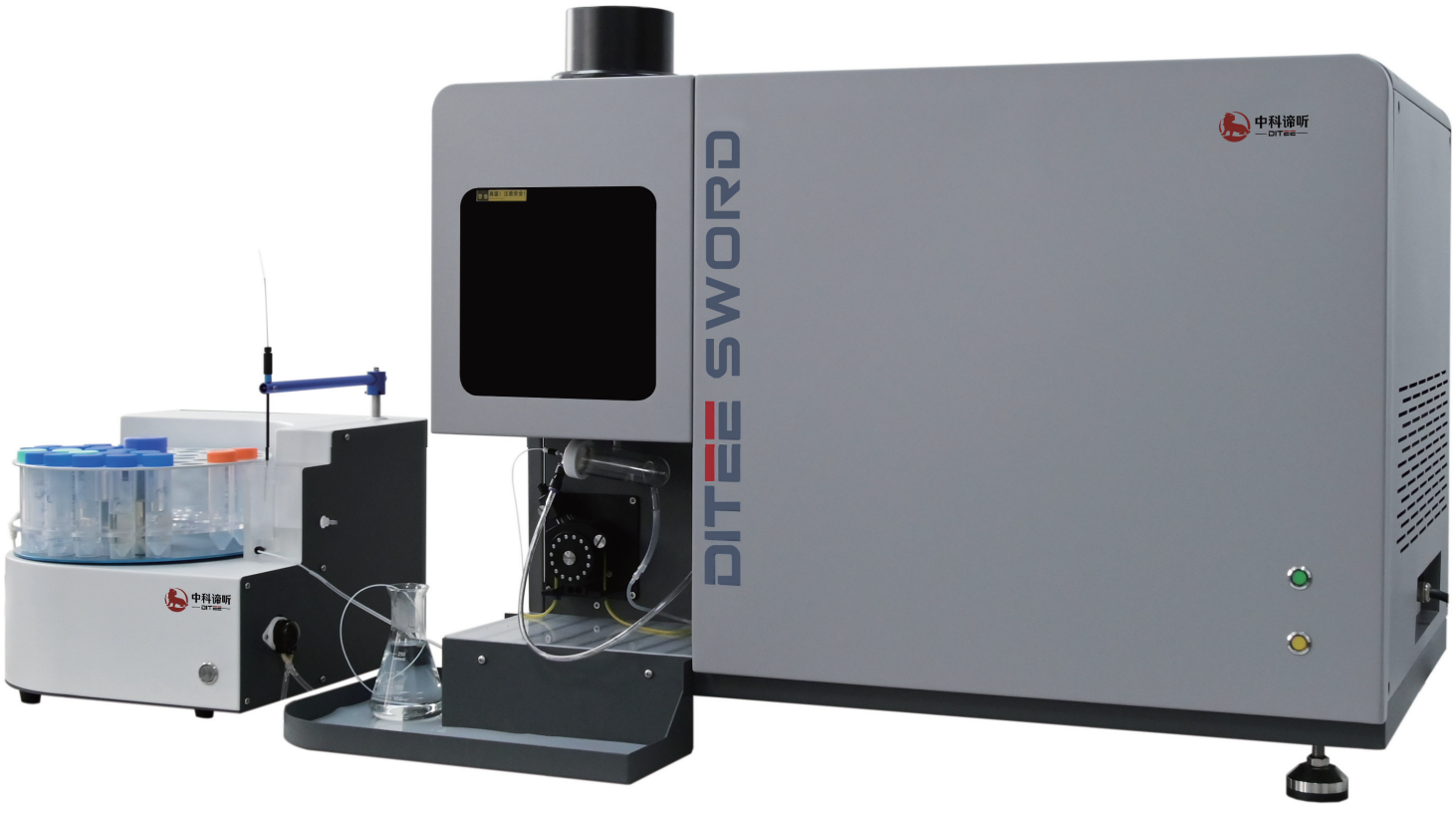
Provides a Teflon-based hydrofluoric acid-resistant system (nebulizer, spray chamber) to meet the analysis needs of samples containing hydrofluoric acid.

High-Salt and Organic Sample Solutions:

Equipped with quartz torches of different diameters and high-salt nebulizers to effectively handle high-salinity and organic solvent samples.

Technical Specification Summary

Item	Parameters
Optical System	Echelle Grating + Prism Cross Dispersion, Focal Length 440mm
Wavelength Range	165 nm ~ 870 nm
Detector	Scientific-Grade Large-Format CCD, Cooled
RF Generator	27.12 MHz, All Solid-State Design, Power 500W-1600W Adjustable, Stability <0.01%
Analysis Speed	Measurement of nearly 70 elements in a single sample can be completed within 1 minute
Stability	Relative Standard Deviation (RSD) ≤ 1.5% (Typically better)
Power Requirements	220 V ±10%, 50/60 Hz, 30A, Single Phase, Independent Ground Required (< 2 Ω)
Operating Gases	Argon (Purity ≥99.99%), Nitrogen (Purity ≥99.999%, for optical compartment purging)
Dimensions	1200 mm (L) × 869 mm (W) × 738.5 mm (H)



About DITEE Scientific

DITEE Scientific was established in 2020, and is an innovative technology enterprise integrating R&D, production, sales, and maintenance. The research experts at DITEE Scientific come from the Guangdong Academy of Sciences and have been engaged in the development of spectroscopic instruments since the 1960s. Currently, DITEE Scientific is equipped with a team of professionals who have long been involved in the R&D of analytical instruments, instrument production, and analytical applications. We possess strong problem-solving capabilities and are committed to meeting the ever-changing customer demands in the market, striving to create high-quality products and services.

Research and Development History

In the 1960s, the first generation of domestic spectroscopy experts start their research at the Guangdong Academy of Sciences.

Since 2020, several key patents based on atomic emission spectroscopy have been obtained.

In 2014, started research of OA800 Oil Analysis Spectrometer (RDE-OES).

In 2015, the Guangdong Provincial Department of Finance support the research of RDE-OES.

In 2018, the demo of the RDE-OES passed third-party testing.

In 2020, DITEE Scientific established.

In 2023, obtained the certification for high-tech enterprises.

In 2024, launched the ICP-OES and the MP-AES.

Quality Management System Certification: ISO 9001: 2015, NOA2208630

Environmental Management System Certification: ISO 14001: 2015, NOA2208629

Occupational Health and Safety Management System Certification: ISO 45001: 2018, NOA2208628

Professional technical support and excellent after-sales service

Users need to ensure that the instruments operate normally at all times.

DITEE Scientific has a team of experienced engineers who provide performance assurance service plans for every instrument. Professional engineers offer high-value customized services to ensure the normal operation and prolong the lifespan of the instruments, including but not limited to preventive maintenance, application method establishment, professional consulting, and customized training.

DITEE Scientific provides users with lifelong services for spare parts, consumables, repair and maintenance, and technical support.

www.rogetscientific.com

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