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ЭЛЕМЕНТ

Nuclear Magnetic Resonance Spectrometer

ZT-N400

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Nuclear Magnetic Resonance Spectrometer ZT-N400

Nuclear Magnetic Resonance (NMR) Spectroscopy is a powerful analytical technique used primarily to determine the structure of organic compounds, study molecular dynamics, and analyze the composition of various substances. It leverages the magnetic properties of certain atomic nuclei to provide detailed information about the physical and chemical properties of the atoms or molecules in which they are contained.

Product Introduction

ZT-N400 is an intelligent liquid-state NMR spectrometer.The spectrometer system consists of a superconducting magnet with ultra-high homogeneity and ultra-shielding, a multifunctional intelligent console, and a high-sensitivity fully automated tuning probe, along with other modules.

ZT-N400 includes multiple highly integrated RF transceivers. The improved design enhances the performance of tuning ,shimming and auto sample changing, effectively reducing experimental time.

Accessories such as the intelligent control screen expand the management interface of the NMR system. Sample insertion and ejection can be con- trolled and monitored via a touchscreen, elevat- ing the flexibility of various experiments.

ZT-N400 combines high-performance hardware and intelligent software, providing users with a more reliable and convenient NMR experimental platform.

Product Highlights

Expansibility

- Distributed architecture design
- Enables flexible instrument configuration and upgrade capabilities

Performance

- Timing resolution ≤4 ns, frequency resolution ≤0.0005 Hz
- Supports fast automatic sample changing, with sample change time reduced to the second level

Intelligence

- Intelligent control screen
- Remote access and control
- Provides users with more options for managing the NMR spectrometer

Product Features

01 Low consumption, highly homogeneous, ultra-shielded 400 MHz superconducting magnet

02 High-sensitivity auto tuning probe supporting detection of various atomic nuclei

03 Advanced distributed console which is expandable to 8 independent transceiver RF channels. timing resolution: ≤4 ns, freguency resolution: ≤0.0005 Hz

04 High throughout and efficient auto sample changer with 72 slots, installed at the waist of the magnet, supports fast sample changing

05 Intelligent control screen allows users to monitor instrument status and control sample entry and exit directly from the touchscreen

06 Intelligent software allows users to remote power on/off of the spectrometer and real-time monitoring of experiments and equipment status

ZT-N400 Module Introduction

The sub-modules of the ZT-N400 NMR Spectrometer primarily consist of the magnet, console, probe, and preamplifier. Controlled by advanced software, the spectrometer system can accurately collect and analyze experimental data, providing users with more comprehensive and precise analytical results. The intelligent control screen and remote control capabilities optimize the user experience.

Magnet

- 9.39 Tesla magnetic field
- 54 mm standard bore, compatible with various probes
- Long liquid helium hold time
- Liquid helium level gauge including alarm functions for low helium level
- Intelligent control screen providing quick access to system status

Console

- RF transceiver channels:default 2,expandable to 8
- High-precision digital control with 4 ns timing resolution, 0.0005 Hz frequency resolution, and 0.001° phase resolution. Frequency, amplitude, and phase can be set simultaneously in 4 ns
- High-speed data acquisition with 16-bit amplitude resolution and 250 Msps sampling rate
- 12.5 MHz maximum receiver spectral width
- Enable software-controlled console power-up and power-down

Probe

- Suitable for 5 mm diameter sample tubes
- ^{1}H, ^{13}C, ^{15}N, ^{31}P, ^{19}F, ^{109}Ag, and other nuclei
- Equipped with deuterium lock channel
- Supports manual and automatic tuning
- Z Gradient strength:50G/cm maximum
- High sensitivity and resolution
- Wide temperature range
- Capable of ^{19}F NMR experiment with ^{1}H decoupling and ^{1}H NMR experiment with ^{19}F decoupling.

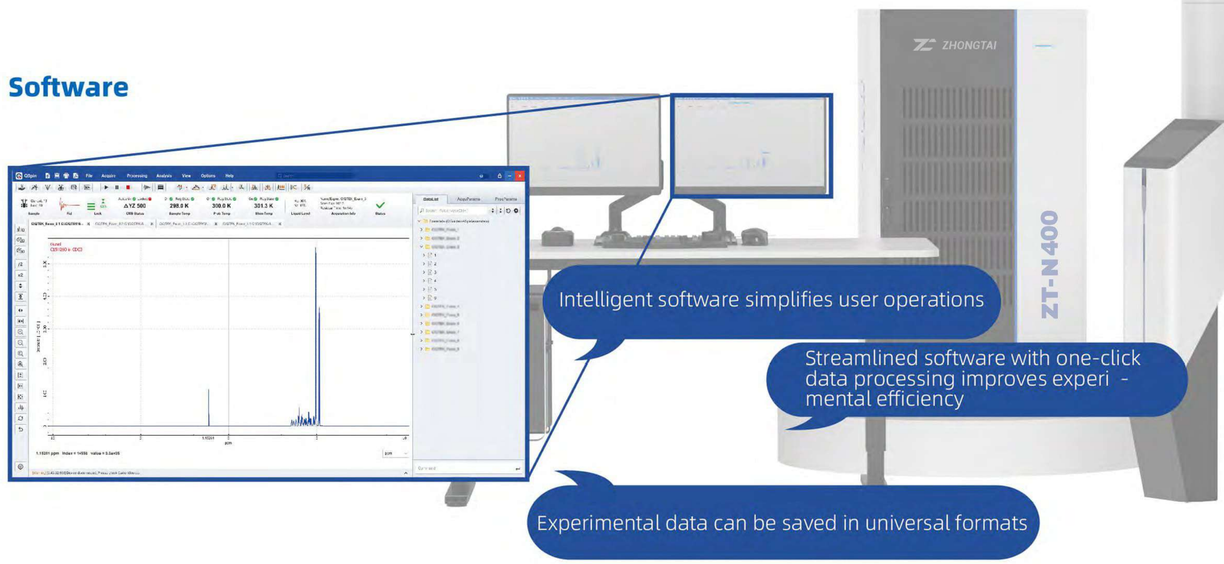
Preamplifier

- Preamplifier separated from the console
- Multi-channel preamplifier
- Low noise minimizes impact on signal acquisition
- Built-in dynamic transmit-receive switch on all channels
- Expandable design

Auto Sample Changer

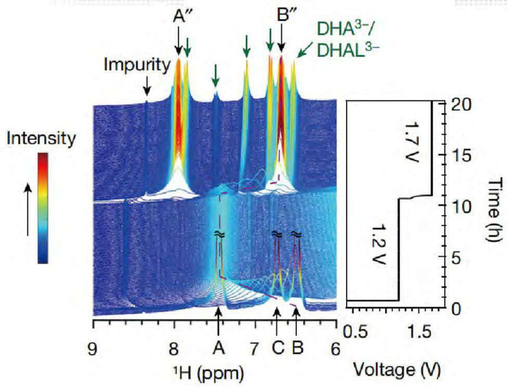
- High throughout : Optimized space utilization with up to 72 slots
- Safe and user-friendly : Waist-mounted design with bidirectional free rotation
- Effective: Additional storage tube for rapid sample changing in seconds

Software



ZT-N400 Application Areas

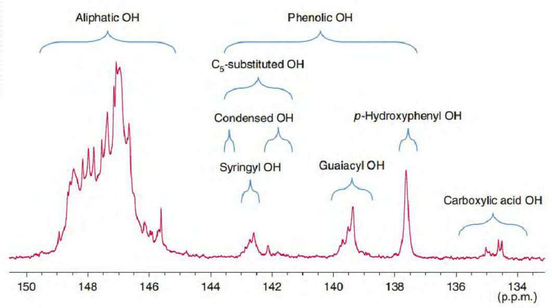
Application Examples



^{1}H NMR spectra of 100 mM DHAQ during a potential hold at 1.2 V and 1.7 V, following charging at 100 mA.

Research on redox flow batteries requires fundamental insight at the molecular level to improve performance. By applying in situ nuclear magnetic resonance (NMR) methods to the electrolyte,electrolyte decomposition and battery self-discharge canbe explored in real time.

Reference: Nature, 2020, 579(7798): 224-228.



The quantitative ^{31}P NMR partial spectrum of a hardwood poplar lignin derived with TMDP using NHND as an internal standard

In lignin, groups with unstable protons can react with phosphorus-containing reagents to form phosphorus-containing derivatives. By using the technique of quantitative ^{31}P NMR spectroscopy, the quantity and structure of functional groups such as carboxyl and hydroxyl groups can be studied.

Reference: Nature Protocols, 2019, 14(9): 2627-2647.

Application Fields

Chemistry Field
- Study of chemical reaction kinetics
- Determination of catalyst structures
- Analysis of intermediate
- Screening and combinatorial synthesis of
- compound libraries
- Identification of unknown products

Environmental Science Field
- Detection of heavy metals and radionuclides(HMR)
- Analysis of phosphorus forms and environment
- Study of soil organic matter(SOM) and stability
- Analysis of atmospheric aerosols

Energy Field
- Research on electrolyte for sodium and lithium batteries
- Analysis of battery electrode
- Analysis of liquid fuel and lubricant components
- Study of photochemical catalytic in hydrogen energy

Biological Science Field
- Determination of structures of bacterial RNA
- Identification mechanisms of protein complex interaction
- Biological structure analysis of membrane proteins and fibrils
- Analysis of cellular biomolecular complexes
- Analysis of biological metabolites

Food Field
- Analysis of fatty acid components
- Detection of adulteration and quality control
- Identification of agricultural produce origins
- Detection of food additives

Pharmaceutical Field
- Analysis of disease-causing proteins
- Study and inhibition of virus life cycles
- Analysis of cancer cell development and inhibition processes
- Mechanism of drug action and antibody research
- High-throughput drug screening

ZT-N400 Specifications

Magnet	Magnetic Field Strength	9.39 Tesla
	Bore Diameter	54 mm
	The radial 5 Gauss line	0.6 m
	The vertical 5 Gauss line	1.0 m
Console	Transceiver RF Channels	default 2, expandable to 8
	Frequency Resolution	0.0005 Hz
	Timing Resolution	4 ns
	Phase Resolution	0.001°
	RF Frequency Range	5-1300 MHz
	Digital Resolution	16 bit
	Maximum Receiver Spectral Width	12.5 MHz
Probe	Detected Nuclei	^{1}H, ^{13}C, ^{15}N, ^{31}P, ^{19}F, ^{109}Ag, and other nuclei
	Deuterium Lock	Supported
	Z Gradient Strength	50 G/cm maximum
	Tuning and Matching	Supports rapid automatic tuning and matching
Software	Operating System	Windows
	Language	English
	Supported Experiments	Data acquisition and processing capability for 1D, 2D, and other NMR experiments
	Experimental Data	Includes common NMR experimental methods Experimental data can be saved in universal formats
	Pulse	Supports pulse sequence editing and graphical interface
	Remote Control	Enable software-controlled console power-up and power-down
Auto Sample changer	Slots	72
	Installation Position	At the waist of the magnet
	Rotation Direction	Bidirectional rotation
	Fast Sample Changing	Equipped with the automatic storage tube, allowing the next sample to be prepared in advance