



TORONTECH



FTIR SPECTROMETERS - FOURIER TRANSFORM INFRARED SPECTROSCOPY

FTIR Spectrometers – Fourier Transform Infrared Spectroscopy is a method for obtaining the infrared spectrum of absorption or emission from solids, liquids, or gases. An FTIR spectrometer captures high-resolution spectral data across a broad spectral range simultaneously.

This offers a substantial benefit compared to a dispersive spectrometer, which only measures intensity within a limited wavelength range at any given moment.

APPLICATIONS

FTIR spectrometers are used wherever laboratories need to confirm material identity, compare unknowns, and evaluate chemical composition through infrared spectra.

Pharmaceutical and Chemical Identification

Verify raw materials, excipients, intermediates, and finished products by matching measured spectra against reference libraries and known standards.

Polymer and Materials Analysis

Differentiate polymers, additives, coatings, fibers, and composites and investigate contamination, degradation, and formulation changes.

Quality Control and Incoming Inspection

Use FTIR for fast identity checks, out-of-specification investigations, and lot-to-lot comparison in routine laboratory workflows.

Research, Forensics, and Failure Analysis

Support unknown identification, residue analysis, and root-cause work where molecular fingerprinting is needed.

FTIR Spectrometers – Fourier Transform Infrared Spectroscopy

System Highlights

- Exceptional sensitivity and stability
- Real-time instrument health monitoring
- Multiple communication options for data transfer
- Flexible accessory support for varied testing needs
- Software workstation with optional 21 CFR Part 11 compliance support

The software database includes specialized IR libraries covering pharmaceutical ingredients and excipients, polymers, chemicals, organic reagents, veterinary products, minerals, oils and additives, fibers, catalysts, gases, and gemstones.

Instrument Options

- **Real-Time Instrument Diagnostics** for operating-status and performance monitoring.
- **Multiple Detector Options** including standard pyroelectric, temperature-stabilized pyroelectric, and semiconductor-cooled MCT detectors.
- **Wired and Wireless Communication** through Ethernet and Wi-Fi for remote access and data management.
- **Large Sample Chamber** that supports common accessories such as liquid cells, ATR, microscopes, and future additions.

FTIR Spectrometers – Fourier Transform Infrared Spectroscopy

FEATURES

- **High-Sensitivity Optical System**

A cube-corner Michelson interferometer, combined with patented fixed mirror alignment technology (Utility model ZL 2013 20099730.2: fixed mirror alignment assembly), ensures long-term stability without requiring dynamic alignment, which otherwise demands complex electronic circuits. The mirrors are gold-coated to maximize light throughput, enhancing detection sensitivity.

- **High-Stability Modular Partition Design**

Featuring a compact, modular design laid out on a cast aluminum base, this structure balances mechanical robustness with efficient heat dissipation. Its resistance to deformation, vibration, and thermal fluctuations greatly improves both mechanical stability and long-term operational consistency.

- **Advanced Multi-Sealed Moisture-Proof Design**

Incorporates multiple sealed interferometers and a high-capacity desiccant cartridge with an easy-to-view window for monitoring and replacement. Real-time temperature and humidity monitoring protects the optical system from high temperatures, humidity, and chemical corrosion.

- **Innovative Integrated Electronic System**

Equipped with high-sensitivity pyroelectric detector pre-amplifier technology, dynamic gain amplification, 24-bit high-precision A/D conversion, real-time control, digital filtering, and network communication. This ensures high-quality, real-time data collection and rapid data transmission.

- **Enhanced Electromagnetic Interference Protection**

The electronic system complies with CE certification and electromagnetic compatibility standards, minimizing electromagnetic radiation and adhering to environmentally friendly design principles.

- **High-Intensity IR Source Assembly**

Uses a high-intensity, long-lasting IR source module, optimized for the fingerprint region with a reflex sphere design for consistent IR radiation. An isolated IR source module and spacious heat dissipation chamber ensure greater thermal stability and stable optical interference.

THEORY & METHOD

An FTIR spectrometer identifies materials by measuring how they absorb infrared light. Every chemical bond vibrates at characteristic frequencies, so the pattern of absorbed infrared light acts as a molecular fingerprint that reveals what a sample is made of.

The Role of the Interferometer

Instead of measuring one wavelength at a time, an FTIR spectrometer measures all infrared wavelengths at once using a Michelson interferometer. A beamsplitter divides the infrared beam into two paths. One path reflects off a fixed mirror; the other reflects off a moving mirror. When the two beams recombine, the changing path difference makes the wavelengths reinforce and cancel in a pattern called an interferogram.

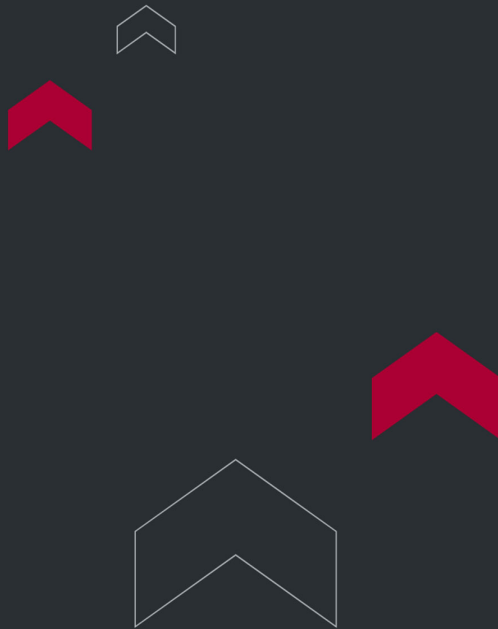
From Interferogram to Spectrum

The interferogram contains the response of every infrared wavelength at the same time, but in a form the eye cannot read. The instrument applies a mathematical operation, the Fourier transform, to convert the interferogram into a familiar spectrum of absorption versus wavenumber. Measuring all wavelengths together gives FTIR a strong signal and fast results compared with older dispersive instruments. The resulting spectrum is then compared against reference libraries to confirm material identity and detect impurities.

TECHNICAL SPECIFICATIONS

Interferometer	Cube-corner Michelson interferometer	
Beam splitter	Multilayer Ge coated KBr	
Detector	High sensitivity pyroelectric module (standard)	Temperature stabilized, MCT detector (optional)

IR Source	High intensity, long lifetime, air-cooled IR source	
Wavenumber Range	7800cm-1~350cm-1	
Resolution	0.85 cm-1	
Signal to noise ratio	Better than 20,000:1 (RMS value, at 2100cm-1 ~ 2000cm-1 or 2100cm-1 ~ 2200cm-1, resolution: 4cm-1, detector: pyroelectric, 1 minute data collection)	
Wavenumber Accuracy	±0.01 cm-1	
Scanning Speed	Microprocessor control, different scanning speed selectable.	
Software	MainFTOS Suite software workstation, compatible to all version Windows OS	Various specialized functional software modules (optional)
Communication	Ethernet interface & WIFI wireless communication	
Data Output	Standard data format, report generation and output	
Status Diagnosis	Power on self-check, real-time temperature and humidity monitoring and reminders	
Certification	FDA 21 CFR Part11 compliance, IQ/OQ/PQ (Optional)	
Environment Conditions	Temperature: 10°C□ 30°C□ Humidity: less than 60%	
Power Supply	Universal between 110V - 220V	
Dimensions & Weight	490 x 420 x 240mm, 23.2kg	
Accessories	Transmission sample holder (Standard)	Optional accessories such as gas cell, liquid cell, Defused/Specular Reflection, single/multi reflection ATR, etc.



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