FT-IR Spectrophotometers

www.WorldofTest.com/ft-ir-spectrophotometer

F510/520 Series FT-IR Spectrophotometers available in two models are designed to meet the high validation standards set by QA/QC, method development and analytical service laboratories. All systems in the range offer fast throughput and rapid access to reliable and dependable FTIR results, day in and day out.

F510 FT-IR Spectrophotometer

• Adopting cube-corner mirrors and precision bearings with higher stability and less sensitive to vibration.
• Fully sealed damp-proof interferometer ensures higher adaptability to the environment.
• Compatible computer and various application software with IR libraries.
• The sampling compartment is wide enough for various accessories such as defused/Specular Reflection, Horizontal ATR, Variable Angle ATR, Liquid cell and Gas cell.

Specifications

• Spectral Range: 7000 to 400 cm⁻¹
• Resolution: 1 cm⁻¹, 2 cm⁻¹, 4 cm⁻¹, 8 cm⁻¹
• Wave number Repeatability: Better than ±0.01cm⁻¹
• Scanning Speed: 0.2~2.5 cm⁻¹, Automatically optimized for detector type or manually adjustable for specific applications
• Beam splitter: KBr
• Infrared Source: External, air-cooled, high efficiency Reflex Sphere module
• Detector: DTGS, MCT (optional)
• Data system: Compatible computer
• Output: Laser printer
• Software: FT-IR software contains all routines needed for basic spectrometer operations.
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2.1 General structure of F-510 FTIR

F-510 FTIR spectrometer consists of the following parts: interferometer, sample chamber, detector, electrical system and data system. At the general layout, small module structure is adopted in the spectrometer: proper arrangement and combination of modules can satisfy needs with different testing conditions; this kind of building block structure can be extended and upgraded easily, thus to improve operation flexibility of the equipment greatly.

Blocking optical design boosts up operation flexibility, and also improves energy throughput, as shown in figure 2-1. The optical system consists of individual modules, such as interferometer, detector and sample compartment etc, linked by standard optical path interfaces in a building blocks design.

Optical path interface is precise optical transfer element. It is through flat mirror or parabolic mirror to make transformation and switching of infrared beam of light among function blocks come true. The performances and features of optical path interface system are mainly represented to be following two aspects: 1. following with a proper mode, use parallel and confocal optical forms alternatively, and change beam directions periodically, to eliminate halo effect and make effective output always staying at the highest level; 2. through adopting different optical path interface components, proper transformation among modules can be ensured, and there is no need for user to carry out any adjustment. Through optical path interfaces, F-510 FTIR spectrometer can be multilevel expanded and connect all kinds of sampling accessory, such as infrared microscope, GC/IR interface etc. Every accessory can be regarded as one module to combine with the system. They do not disturb reciprocally and can exist simultaneously. This kind of optical multifunction has much help to actual application.

Further flexibility of the system comes from modular multiprocessor data system. Every interferometer is controlled by its own PC104 microcomputer, it is separated from main computer whose data system is compatible with IBM PC, and the two data systems communicate through USB. When main computer finishes other tasks, PC104 microcomputer can carry out data collection independently. Moreover, as F-510 data system is compatible with PC, it can enter into network with other PC compatible equipment and data station etc.

2.2 Main Features of F-510 FTIR Spectrometer

2.2.1 Interferometer

F-510 FTIR spectrometer adopts cube-corner Michelson interferometer (as shown in Figure 2-2). The Michelson interferometer consists of a source, a beam splitter, a compensator, two perpendicular mirrors and a detector. The beam splitter and the compensator are plane types. The two perpendicular plane mirrors in traditional Michelson interferometer are replaced by cube-corner reflectors in cube-corner interferometer. The cube-corner moving mirror moves along the direction perpendicular to beam splitter’s coating-film surface. When an infrared beam from the source is directed into the interferometer, it is split by the beam splitter, and half transmitted and half reflected to the two cube-corner mirrors. Beams coming back from the two cube-corners are parallel with the incidence beams, and when the two beams recombine, interference will happen. Because the cube-corner moving mirror causes a path length difference in one of the beams, the interferogram will be obtained.

Interferometer of F-510 FTIR spectrometer is made fully sealed and moisture-proof. It is sealed with outside optical path by KBr window plate and lock ring. Deliquescence of KBr beam splitter and compensator can be avoided effectively. Thus requirements for operation environment are reduced.
2.2.2 Electrical System

To F-510 FTIR spectrometer, its interferometer is controlled by its own microcomputer, dependent with main computer as data system. The two parts are connected by USB interface to realize data communication. Main function of F-510 FTIR spectrometer circuit system is: interferometer servo control, data collection & processing, data communication etc. The principle graph of whole circuit system is shown in figure 2-3, which mainly comprised of one electric board (including OHP, OHC and OHS) and periphery circuit.

OHP is the circuit part of PC104 microcomputer; OHC is part of controlling circuit, and F-510 FTIR adopts embedded (PC104) microcomputer; OHS carries out infrared signal processing and uses 16 bytes A/D transformer; USB is a interface circuit, responsible for communication between PC104 microcomputer and the main computer. It features quick data transferring; and it’s a plug and play type. It can be connected with notebook PC as main computer, and also can be used in field monitoring.
2.2.3 Data System

IBM PC compatible computer is adopted in data system of F-510 FTIR spectrometer. The software can work together with third-party software under the WINDOWS operating system. At the same time, user can develop new spectrometer data operating program himself based on his own demands. Standard operating software of F-510 FTIR supplies all routine analysis operating functions of infrared spectrum.

2.3 Main Specifications of F-510 FTIR Spectrometer

The main specifications of F-510 FTIR spectrometer are as follows:

1. Wavelength range: 7800 cm\(^{-1}\) ~ 400 cm\(^{-1}\)
2. Resolution: better than 0.85 cm\(^{-1}\)
3. Wave number precision: ±0.01 cm\(^{-1}\)
4. Transmittance repeatability: 0.5%T
5. 100%T line SNR: better than 15,000:1 (RMS value, at 2100 cm\(^{-1}\), 4 cm\(^{-1}\) resolution, DTGS detector, 1 minute data collecting)
6. 100% line T inclining:
<table>
<thead>
<tr>
<th>Wavelength (cm(^{-1}))</th>
<th>100%T line (%T)</th>
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<tbody>
<tr>
<td>500 ~ 800</td>
<td>98.0 ~ 102.0</td>
</tr>
<tr>
<td>1900 ~ 2200</td>
<td>99.5 ~ 100.5</td>
</tr>
<tr>
<td>2800 ~ 3200</td>
<td>99.5 ~ 100.5</td>
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<tr>
<td>4000 ~ 4400</td>
<td>98.5 ~ 101.5</td>
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7. Scan speed: 0.4 cm/s ~ 2.5 cm/s, selectable;
8. Detector: DTGS;
9. Data system: basic configuration is all-purpose computer;
   - Memory: ≥64MB
   - CD-ROM drive
   - Hard disk: ≥10GB
   - USB interface
   - Display: high-resolution color display;
10. Output device: ink printer or laser printer.

2.4 Configuration

Standard configuration includes:
1. High performance IR source with air-cooled high-efficiency reflex sphere;
2. Cube-corner Michelson interferometer system;
3. Electrical system;
4. External optical path sampling system;
5. DTGS infrared detector system;
6. All-purpose computer data system.
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Optional FTIR Accessories:
1. Laser printer;
2. Hydraulic press;
3. Agate mortar;
4. Dehumidifier;
5. Diffuse/Specular Reflectance;
6. Horizontal ATR;
7. Variable Angle ATR;
8. Infrared microscope;
9. GC-IR interface;
10. Photo acoustic Accessory;
11. Various Gas Cells and Various Liquid Cells speculate

F520 FT-IR Spectrophotometer

- Adopting cube-corner Michelson interferometer with higher stability and less sensitive to vibrations and thermal variations than conventional interferometer.
- Fully sealed damp-proof interferometer ensures higher adaptability to the environment.
- Outside IR source design provides even high thermal stability with no need of dynamic adjustment.
- High intensity IR source adopts a reflex sphere to obtain even and stable IR radiation.
- An optional external beam allows access to the widest variety of high sensitive peripheral sampling system, such as GC/IR interface and FTIR microscope.
- The spectrometer connects to PC through a USB interface to realize automatic control and data communication.
- Compatible computer and various application software with IR libraries.
- The sampling compartment is wide enough for various accessories such as defused/Specular Reflection, Horizontal ATR, Variable Angle ATR, Liquid cell and Gas cell.

Specifications:
- Spectral Range: 7800 to 400 cm⁻¹
- Resolution: Better than 0.5 cm⁻¹
- Wavenumber Precision: ±0.01 cm⁻¹
- Scanning Speed: 0.2~2.5 cm⁻¹/s, Automatically optimized for detector type or manually adjustable for specific applications
- Signal to noise ratio: better than 15,000:1 (RMS value, at 2100 cm⁻¹, resolution: 4 cm⁻¹, detector: DTGS, 1 minute data collection)
- Beam splitter: Ge coated KBr
- Infrared Source: External, air-cooled, high efficiency Reflex Sphere module
- Detector: DTGS, MCT (optional)
- Data system: Compatible computer
- Software: FT-IR software contains all routines needed for basic spectrometer operations.