Working Principle of Agilent Imported Spectrometer

Overview

Basics of LC/MS With a focus on the fundamentals of LC/MS, this primer explains the basic principle of operation, theory and technique for the liquid chrom.

Key Takeaways

Agilent spectrometers operate by measuring the interaction of light with a sample, converting absorbed or transmitted light into a spectral fingerprint for analysis.

Overview

Agilent spectrometers, such as the Cary 630 FTIR, use Fourier Transform Infrared (FTIR) spectroscopy to identify and quantify molecular compounds. The instrument directs an infrared light source through a sample, and a detector measures the intensity of light absorbed at different wavelengths. Each molecule absorbs light at characteristic frequencies, producing a unique spectral fingerprint that allows identification and quantification of compounds in mixtures.

Core Components and Function

Light Source: Emits a broad spectrum of infrared or visible light depending on the spectrometer type.

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In FTI

R systems, this is typically a mid-infrared source. Interferometer (FTIR-specific): The Michelson interferometer is central to Agilent FTIR spectrometers. It splits the light into two beams, reflects them off mirrors, and recombines them to produce an interference pattern.

This pattern encodes the spectral information of the sample. Sample Interaction: The recombined light passes through or reflects off the sample. Molecules in the sample absorb specific wavelengths, altering the interference pattern.

Detector: Measures the intensity of transmitted or reflected light. The detector converts light signals into electrical signals, which are then processed to generate a spectrum. Data Processing: In FTIR, a Fourier Transform converts the raw interferogram into a conventional spectrum showing absorbance versus wavelength.

In UV-Vis spectrophotometers, the Beer-Lambert law relates absorbance to concentration, allowing quantitative analysis.

Additional Principles

Diffraction Gratings and Monochromators: In UV-Vis or other optical spectrometers, a diffraction grating or prism separates light into its constituent wavelengths. The monochromator selects a specific wavelength to pass through the sample, enhancing resolution and accuracy. Signal Interpretation: The resulting spectrum provides qualitative and quantitative information.

Peaks correspond to specific molecular vibrations (FTIR) or electronic transitions (UV-Vis), enabling identification of chemical structures and concentrations.

Summary

Agilent spectrometers combine precise optical components, sample interaction, and advanced data processing to measure light absorption or transmission.

FTI

R models like the Cary 630 use interferometry for high-resolution spectral analysis, while UV-Vis models rely on monochromators and diffraction gratings. The working principle is fundamentally based on light-matter interaction, producing a spectral fingerprint that reveals molecular composition and concentration.

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Article Content

Basics of LC/MS

With a focus on the fundamentals of LC/MS, this primer explains the basic principle of operation, theory and technique for the liquid chromatograph (LC), the mass spectrometer (MS), ion source,

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Agilent LC/MS enables a wide array of applications by combining sample preparation, liquid chromatography (LC), mass spectrometry (MS), and dedicated software tools like compound

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PDF file

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UV-Vis Spectrometer Manual (Cary 5000)

The Agilent Technologies Cary 5000 UV-Vis-NIR spectrometer offers high quality photometric performance with a 200 – 3300 nm spectral range. The Cary 5000 facilitates both absorbance and

Spectrometer

Spectrometer is a broad term often used to describe instruments that measure a continuous variable of a phenomenon where the spectral components are somehow mixed. In visible light a spectrometer can

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Discover how mass spectrometry identifies and analyzes molecules. Learn its principle, parts, step-by-step process, and key applications in science.

ICP-MS: Principle of operation and instrumentation

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Samples are introduced as aqueous solutions or - e.g. after laser ablation - as dry aerosols into the inductively coupled plasma (ICP). The elements present in the sample are ionised in the argon

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he most common form of data representation in a sample using the mass spectrometer. A histogram is attached to the mass spectrometer, and this represents the graphical approximate distribution of the

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Agilent AA spectrometers have several safety features in place to prevent flashbacks, and flashbacks are very rare in circumstances where instruments are properly maintained.

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Basics of LC/MS

Learn about the basics of liquid chromatography mass spectrometry. With a focus on the fundamentals of LC/MS, this primer explains the basic principle of

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