Spectrometer Microscope



Overview

An advantage of the ''microscope spectrometer'' is its ability to use microscope apertures to precisely control the area of sample analysis. Flat capillaries can be used for analyzing small liquid samples, up to about 10 micro-liters in volume. Quartz or mirror-based optics can be used for studying samples from the ultraviolet (UV), down to 200 nm, to the near infrared (NIR) up to 2100 nm.

Key Takeaways

A microscope spectrometer is an analytical instrument that combines the magnification of a microscope with the spectral analysis capabilities of a spectrometer to measure microscopic samples.

Overview

A microscope spectrometer (or microspectrophotometer) integrates a microscope and a spectrometer to analyze the optical properties of very small sample areas, often on the micron or sub-micron scale. It can measure absorbance, reflectance, fluorescence, and emission spectra across a wide wavelength range, from ultraviolet (UV) to near-infrared (NIR),. These instruments are capable of non-invasive measurements, making them ideal for delicate or rare samples.

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Types and TechniquesUV-Visible-NIR Microspectrophotometers: Measure transmittance and reflectance spectra, useful for thin film thickness, colorimetry, and optical characterization of crystals or semiconductors. Raman Microspectrometers: Detect Raman scattering to identify molecular composition and structure at microscopic scales. Multimodal Microspectroscopy Systems: Combine multiple techniques such as Raman, photoluminescence, and lifetime spectroscopy on a single platform, providing versatile analysis for advanced materials and semiconductor research.

Applications

Microscope spectrometers are widely used in: Material Science: Characterizing thin films, semiconductors, and functional crystals. Pharmaceuticals and Biochemistry: Analyzing protein crystals and microscopic biological samples. Industrial Quality Control: Measuring film thickness, color masks, and optical properties in electronics and display manufacturing.

Forensics and Geology: Identifying unknown materials and mapping chemical composition at microscopic scales.

Key Features

High spatial resolution: Can analyze areas as small as sub-micron regions. Wide spectral range: UV to NIR, sometimes including fluorescence and luminescence detection. Quantitative and qualitative analysis: Provides precise spectral data for research and industrial applications.

Customizable configurations: Many systems allow integration of multiple spectroscopy techniques and automated mapping. Microscope spectrometers are essential tools for researchers and engineers who need to combine microscopic imaging with detailed spectral analysis, enabling insights into the composition, structure, and optical properties of materials at very small scales.

Article Content

Micro-spectrophotometry

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UV/Vis/NIR Microscopic Spectrophotometer

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Guide to Raman Spectroscopy

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Mass spectrometry imaging

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Brillouin microscopy: an emerging tool for mechanobiology

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Fluorescence Spectroscopy Fluorescence spectroscopy uses higher-energy photons to excite a sample, which will then emit lower energy photons. This technique has become popular for its biochemical

Ultraviolet–visible spectroscopy

UV–visible spectroscopy of microscopic samples is done by integrating an optical microscope with UV–visible optics, white light sources, a monochromator, and a sensitive detector such as a charge

Microspectroscopy solutions

Microspectrophotometry or Microspectroscopy combines the visualization of a standard microscope with the analytical tools of a spectrophotometer for material characterization on a microscopic scale. We

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Principles of Fluorescence Spectroscopy, 3rd edition, is an essential volume for students, researchers, and industry professionals in biophysics, biochemistry, biotechnology, bioengineering, biology and

Microspectrophotometer | Spectra of Microscopic Samples

Consequently, a UV microscope spectrometer proves invaluable for analyzing a wide array of samples across various applications. Microspectrophotometers are widely utilized across numerous fields,

What is the Difference Between Spectroscopy and Microscopy?

While microscopy is used to visualize objects, spectroscopy is used to determine the spectral lines and/or energy of a sample. Spectroscopy uses electromagnetic radiation at specific

X-ray fluorescence

A X-ray fluorescence spectrometer with automated sample feed in a cement plant quality control laboratory XRF scanning of the Rembrandt painting Syndics of the Drapers'' Guild A handheld XRF

Raman Imaging and Spectrometers

Raman microscopy is a technique which allows fast, non-destructive chemical analysis of solids, powders, liquids, and gases – today, Raman spectroscopy is used in many varied fields, from

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Additional source notes

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