

What types of monochromators are there in spectrophotometers



Overview

Monochromators are used in many optical measuring instruments and in other applications where tunable monochromatic light is wanted. Sometimes the monochromatic light is directed at a sample and the reflected or transmitted light is measured. Sometimes white light is directed at a sample and the monochromator is used to analyze the reflected or transmitted light.

Key Takeaways

Monochromators in spectrophotometers are primarily classified as prism monochromators and diffraction grating monochromators, with designs like the Czerny-Turner arrangement being widely used. Prism Monochromators

Prism monochromators use a prism as the dispersive element to separate light into its component wavelengths. The prism relies on the variation of the refractive index with wavelength, causing different colors to bend at different angles. For example, blue light is refracted more than red light. Prism monochromators are often preferred for ultraviolet (UV) applications because materials like quartz can transmit UV light, whereas glass absorbs it. However, prisms can have limitations such as material degradation in certain infrared (IR) applications and higher cost for specialized materials like sapphire .

Diffraction Grating Monochromators



Diffraction grating monochromators use a grating with closely spaced lines to diffract light, separating it into different wavelengths based on interference. Gratings can provide higher spectral resolution and are more commonly used in modern spectrophotometers. The Czerny-Turner design is a popular configuration, featuring two concave mirrors and a diffraction grating. Light enters through an entrance slit, is collimated by the first mirror, dispersed by the grating, and focused by the second mirror onto an exit slit or detector. This design allows precise wavelength selection and high efficiency .

Other Considerations

Monochromators can also be classified based on the number of stages:

- Single monochromators: Use one dispersive element and are simpler but may have higher stray light.
- Double monochromators: Use two dispersive elements in series to improve spectral purity and reduce stray light, often used in sensitive measurements like fluorescence spectroscopy .

Key Components

Regardless of type, a monochromator typically includes:

- Entrance slit – controls the incoming light beam.
 - Collimating mirror – makes light rays parallel.
 - Dispersive element – prism or diffraction grating.
 - Focusing mirror or camera – directs dispersed light to the exit.
 - Exit slit or detector – selects the desired wavelength for measurement .
- In summary, prism and diffraction grating monochromators are the main types used in spectrophotometers, with the Czerny-Turner grating design being the most common due to its versatility, high resolution, and efficiency. The choice depends on the wavelength range, spectral resolution, and application requirements.

Article Content

Monochromator

Monochromators are used in many optical measuring instruments and in other applications where tunable monochromatic light is wanted. Sometimes the monochromatic light is directed at a sample and the reflected or transmitted light is measured. Sometimes white light is directed at a sample and the monochromator is used to analyze the reflected or transmitted light. Two monochromators are used in many fluorometers; one monochromator is used to select the excitation wavelength and a second mon

Monochromators & Spectrographs — Comprehensive Guide

Monochromators and spectrographs are optical instruments that separate polychromatic light into its constituent wavelengths using a

Monochromators

A monochromator is incorporated into fluorescence spectrophotometers and emission spectrometers to determine the wavelength of

Monochromators and Spectrophotometer.ppt

It describes the key components of spectrophotometers including light sources, wavelength selectors like filters and

7.3: Wavelength Selectors

Monochromators A monochromator is a scanning type of wavelength selector. Originally based on glass or quartz prisms, current

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Many types of spectrometers and spectrophotometers rely on monochromators for light production of a uniform wavelength. In a

Monochromators : Shimadzu (Europe)

A monochromator is incorporated into fluorescence spectrophotometers and emission spectrometers to determine the wavelength of

Monochromators Selection Guide: Types, Features, Applications

Monochromators are optical subassemblies used to isolate narrow portions of a light spectrum. They accept polychromatic input from

Spectrometers and Monochromators | Springer Nature Link

The solution is the so-called order-sorting filter. There are two types of order-sorting filters, being used in compact fiber

What is a monochromator and how does it work in optical spectroscopy?

Applications of Monochromators in Spectroscopy Monochromators play a crucial role in various types of spectroscopy,

Monochromators in Spectroscopy: Selecting Specific Wavelengths for ...

In advanced monochromators, motorized controls provide further precision and assist in optimal wavelength selection.

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