

Spectrometer Composition Diagram



Overview

Explore the components and structure of a spectrometer in this detailed diagram. Understand the parts and their functions for accurate measurements and analysis.

Key Takeaways

A spectrometer consists of a light source, entrance slit, dispersing element (prism or diffraction grating), focusing optics, sample holder, detector, and output system, all arranged to separate and measure light by wavelength.

Core Components and Layout

Light Source: Provides the initial beam of light, which can be broad-spectrum (tungsten or deuterium lamps) or monochromatic (lasers), depending on the application (). **Entrance Slit:** Controls the amount of light entering the spectrometer and affects resolution. A narrow slit improves spectral resolution but reduces intensity ().

Collimating Optics: Lenses or mirrors (collimators) produce a parallel beam of light from the entrance slit, preparing it for dispersion (). **Dispersing Element:** Separates light into its component wavelengths. This can be a prism (refractive dispersion) or a diffraction grating (diffractive dispersion).

The choice affects spectral resolution and efficiency (). **Focusing Optics:** Lenses or mirrors focus the dispersed light onto the detector. In modern designs, mirrors are often used in configurations like the Czerny-Turner to reduce stray light and improve compactness ().

Sample Holder: The material under study is placed here. Light interacts with the sample, undergoing absorption, transmission, or emission, which is then analyzed ().
Detector: Converts the light into an electrical signal.

Common detectors include photodiodes, CCD arrays, or photomultiplier tubes, depending on sensitivity and wavelength range (). **Output System:** Displays or records the spectral data, often as intensity versus wavelength graphs, enabling analysis of the sample's properties ().

Common Spectrometer Configurations

Prism Spectrometer: Uses a prism to refract light, forming a spectrum on the detector. Simple and classical design (). **Diffraction Grating Spectrometer:** Uses a grating to disperse light at different angles for each wavelength.

Often combined with mirrors in Czerny-Turner or Ebert configurations for compact, high-resolution instruments (). **Transmission Grating Spectrometer:** Light passes through a grating in Littrow configuration, commonly used for diode-array spectrometers ().

Optical Path Overview

Light from the source passes through the entrance slit, is collimated, dispersed by the prism or grating, focused by optics, interacts with the sample, and finally reaches the detector. Each wavelength is mapped to a specific position on the detector, allowing precise measurement of spectral intensity (). Understanding this structure is essential for designing, using, or interpreting spectrometer data, as each component directly affects resolution, sensitivity, and accuracy.

Article Content

Spectrometer Diagram and Its Components

Explore the components and structure of a spectrometer in this detailed diagram. Understand the parts and their functions for accurate measurements and analysis.

Spectrometer Explained: Diagram, Types & Applications

In this article, we will understand what is a spectrometer, its diagram, important components and also discuss the common types of spectrometers and applications.

Optical spectrometer

A spectrometer is the general term for describing a combination of spectral apparatus with one or more detectors to measure the intensity of one or more spectral bands.

Spectrometer

Figure 3 depicts the important features of simple instrumentation that can be used for absorption spectroscopy, and a typical spectrum.

Spectrometers – Visual Encyclopedia of Chemical Engineering

A spectrophotometer consists of a light source, diffraction grating, monochromator, and a detector, as shown below. The light source emits radiation in the visible, infrared, or ultraviolet regions of the

Basic spectrometer components: (a) block diagram of spectrometer ...

Basic spectrometer components: (a) block diagram of spectrometer components and (b) illustration of a basic monochromator for excitation and emission wavelength selection.

LET'S BUILD A SPECTROMETER

In these pages, we offer you information to build a homemade spectrometer capable of emulating the ones you can find in technical

Schematic of the spectrometer structure and the corresponding ...

In this work, we report a single-pixel-photodetector spectrometer with a spectral range from 480 nm to 820 nm, based on the AlGaAs/GaAs p-graded-n junction with a voltage-tunable optical response.

Spectrometer

There are three main components in all spectrometers; these components can vary widely between instruments for specific applications and levels of resolution.

Spectrometer Explained: Diagram, Types & Applications

Learn how a spectrometer works, explore its diagram, different types, and key applications in science, research, medicine, and industry.

Spectroscope | Definition, Diagram & Parts

Learn the spectroscope definition, what spectroscopes do, and how spectroscopes work. Explore spectroscopes parts and functions and see a spectroscope diagram.

10: Introduction to Spectroscopy

A spectrometer can separate the component colors coming either directly from an emission source or from the light transmitted through a sample. A top-down diagram of a spectrometer is shown in Figure 2.

4.11: Mass Spectrometry

Secondary ion mass spectrometry (SIMS) is an analytical method which has very low detection limits, is capable of analyzing over a broad dynamic range, has high sensitivity, and has

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Mass spectrometry is an efficient method to elucidate the chemical composition of a sample or molecule. More recently, it has been used to classify biological products, in particular proteins and protein

Mass Spectrometry

By designing mass spectrometers that can determine m/z values accurately to four decimal places, it is possible to distinguish different formulas having the same nominal mass. The table on the right

Schematic Diagram Of A Simple Mass Spectrometer

Schematic Diagram Of A Simple Mass Spectrometer Mass spectrometry is a powerful analytical technique used by scientists to identify and

How do mass spectrometers work?

In modern spectrometers, you slowly vary the magnetic field so each separate ion beam hits the detector in turn. How does it work in reality? Artwork:

HPLC: Principle, Instrumentation, Steps, Types, Uses, Diagram

High-performance liquid chromatography (HPLC) is a liquid chromatography method that is used to separate and analyze components in liquid mixtures. HPLC separates the components of a

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