JEWELBLU OPTICAL SYSTEMS

Basic Structure and Price of a Spectrometer

Overview

An optical spectrometer (spectrophotometer, spectrograph or spectroscope) is an instrument used to measure properties of light over a specific portion of the electromagnetic spectrum, typically used in spectroscopic analysis to identify materials. The variable measured is most often the irradiance of the light but could also, for instance, be the polarization state.

Key Takeaways

A spectrometer typically consists of a light source, entrance slit, dispersive element (prism or diffraction grating), sample holder, detector, and readout system, with prices ranging from a few thousand to over $50,000 depending on type and features.Basic Structure

A spectrometer is designed to measure light properties across specific wavelengths. The main components include:

• Light Source: Provides the initial beam of light, which can be a tungsten lamp, deuterium lamp, or laser depending on the wavelength range required .

• Entrance Slit: Controls the amount of light entering the spectrometer, affecting both resolution and intensity .

• Dispersive Element (Monochromator): A prism or diffraction grating separates light into its constituent wavelengths, allowing precise measurement of specific spectral regions .

• Sample Holder: Positions the material under study in the path of the light beam, enabling absorption, transmission, or emission analysis .

• Detector: Measures the intensity of light after interaction with the sample and converts it into an electrical signal .

• Readout/Output System: Processes the detector signal and displays the results, often as a spectrum graph or numerical data . Optional components may include filters to block higher-order light and mirrors or lenses to route light efficiently within the instrument .
Price Range

The cost of a spectrometer varies widely based on type, technology, and application:

• Basic UV-Vis benchtop spectrophotometers: Typically start at a few thousand dollars, suitable for general laboratory use .

• Fluorescence spectrometers: Higher sensitivity instruments for low-concentration biomolecule detection, often costing tens of thousands of dollars due to specialized optics and detectors .

• Near-Infrared (NIR) spectrometers: Used for pharmaceutical or material analysis, may require custom calibration and can also exceed $50,000 . Factors influencing price include spectral range, resolution, automation, sample handling capabilities, and brand reputation. Choosing the right spectrometer depends on the required precision, sample type, and intended application.

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Infrared SpectrometersAtomic AbsorptionAtomic EmissionAtomic FluorescenceAcknowledgementsReferencesDevelopersInfrared spectrometers are used to measure the wavelength and intensity of the absorption of infrared radiation by a sample. The measurements provide valuable chemical composition information.See more on encyclopedia e.engin.umich ScienceDirect

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Three basic elements are present: a radiation source, a monochromator, and a transducer. It is usual for the source to emit radiation

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