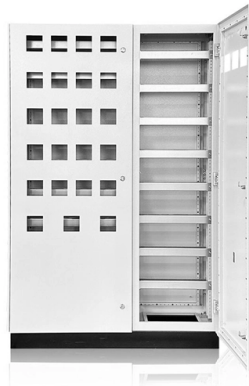


What is the temperature of the optical tube in a spectrometer



Overview

A Mass-Selective Variable-Temperature Drift Tube Ion Mobility-Mass. A hybrid ion mobility-mass spectrometer (IM-MS) incorporating a variable-temperature.

Key Takeaways

Optical tubes in spectrometers should generally be operated and stored within 10°C to 40°C to maintain accuracy, prevent thermal expansion effects, and ensure long-term reliability.

Operational Temperature Guidelines

Spectrometers, including UV-Vis and reflection-based instruments, are sensitive to temperature variations. Operating below 10°C or above 40°C can cause thermal contraction or expansion of internal optics, leading to inaccurate measurements and potential calibration failures. For UV-Vis spectrophotometers, the ideal sample surface temperature is typically 10°C to 35°C, as higher temperatures can alter color or absorbance readings due to thermochromic effects in certain materials.

Photomultiplier tubes (PMTs), commonly used in spectrometers for low-light detection, also require careful temperature management. Extreme temperatures can affect electron emission efficiency and gain stability, reducing sensitivity and reliability.

PM



TS are generally designed to operate within standard laboratory temperature ranges, and sudden temperature changes should be avoided to prevent condensation on internal components. Temperature Effects on Spectroscopic

Measurements Temperature influences spectroscopic data in several ways: Molecular motion: Higher temperatures increase molecular motion, causing broader spectral lines due to Doppler and collisional effects. Intermolecular interactions: Temperature changes can shift spectral peaks by altering hydrogen bonding or van der Waals forces.

Conformational changes: Elevated temperatures may induce structural changes in molecules, affecting absorption maxima and band intensities. To mitigate these effects, temperature-controlled cells or heating/cooling stages are often used, especially in UV-Vis and IR spectroscopy, to maintain precise sample and optical tube temperatures.

Storage and Humidity Considerations

Spectrometers should be stored within the 10°C to 40°C range and in environments with relative humidity below 85% to prevent condensation on optical components. Exposure to extreme heat or cold, such as leaving the device in a car, can degrade internal optics and electronics, shortening the instrument's lifespan.

Best Practices

Allow the spectrometer to stabilize in a controlled environment for at least 30 minutes if it has been exposed to extreme temperatures. Avoid direct sunlight or hot surfaces when measuring samples. Use temperature-controlled cuvettes or optical cells for experiments requiring high precision.

Regularly calibrate the instrument at the operational temperature to account for minor thermal effects. By adhering to these temperature requirements, optical tubes in spectrometers can maintain accuracy, sensitivity, and long-term reliability across a wide range of analytical applications.

Article Content

A Mass-Selective Variable-Temperature Drift Tube Ion Mobility-Mass ...

A hybrid ion mobility-mass spectrometer (IM-MS) incorporating a variable-temperature (80-400 K) drift tube is presented. The instrument utilizes an electron ionization (EI) source for fundamental small

AA_Family_Bro_16pp.qxd

Simplify method development for all users using the powerful and convenient SRM Wizard. An optimization study for Pb with phosphate modifier is shown. The Constant Temperature Zone

Inductively coupled plasma atomic emission spectroscopy

It is a type of emission spectroscopy that uses the inductively coupled plasma to produce excited atoms and ions that emit electromagnetic radiation at wavelengths characteristic of a particular element.

Spectrometer

Optical spectrometers (often simply called "spectrometers"), in particular, show the intensity of light as a function of wavelength or of frequency. The different wavelengths of light are separated by refraction

Atomic Absorption Spectroscopy (AAS) | PDF

It details the principles of operation, including the role of light sources such as hollow cathode lamps, and explains the effects of temperature, excitation states, and line broadening on measurement

ICP-OES System and Technologies | Thermo Fisher Scientific

The spectrometer is comprised of two sections, the fore-optics, and either a mono- or polychromator. When the light exits the mono- or polychromator, it is focused onto the detector and the derived

Optical Spectrometers introduction

For example, an AvaSpec StarLine (UV/VIS) spectrometer can be combined with a NIRLine spectrometer to enable measurements from 200-2500 nm in a single instrument.

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Temperature-Dependent Optical and Polaritonic Properties of

A comparative study of the optical and polaritonic properties of excitons in hBN-encapsulated monolayer TMDs close to the homogeneous linewidth is presented.
Reflection

EL-Cell ECC-Opto-Std Reflective-Mode Optical Characterization Module

Overview The EL-Cell ECC-Opto-Std Reflective-Mode Optical Characterization Module is an engineered electrochemical cell platform designed for in situ and operando optical interrogation of working

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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

Eoguar HS2000 Pro-TEC Passive-Cooled Array Fiber Optic Spectrometer

Overview The Eoguar HS2000 Pro-TEC is a high-sensitivity, passive-cooled array fiber optic spectrometer engineered for demanding low-light spectroscopic applications in research and

Ansys | Engineering Simulation Software

Ansys engineering simulation and 3D design software delivers product modeling solutions with unmatched scalability and a comprehensive multiphysics foundation.

Thorlabs · Quartz Tungsten-Halogen Lamp

The QTH10 (/M) Quartz Tungsten-Halogen Lamp offers broadband emission (400 - 2200 nm) with a typical optical output power of 50 mW. The included universal power supply comes with common

ALTOS® Figure-8 Loose Tube, Gel-Free Cable | Corning

Corning ALTOS® figure-8 gel-free cables are self-supporting aerial cables designed for easy and economical one-step installation. The loose tube design provides stable performance over a wide

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This document is for preliminary research. Verify specifications against current standards, product documentation and project requirements.

