

How to use an ultrafast spectrometer



Overview

Dynamics on the femtosecond time scale are in general too fast to be measured electronically. Most measurements are done by employing a sequence of ultrashort light pulses to initiate a process and record its dynamics. The temporal width (duration) of the light pulses has to be on the same scale as the dynamics that are to be measured or even shorter. are tunable lasers that emit red and near-infrared light (700 nm- 1100 nm).

AI Overview

Using an ultrafast spectrometer involves setting up a pump-probe experiment, controlling femtosecond laser pulses, and scanning time delays to capture ultrafast dynamics in your sample. Understanding the Basics Ultrafast spectroscopy uses ultrashort laser pulses, typically less than 100 femtoseconds, to study rapid processes such as electronic excitations, vibrational dynamics, and solvation effects in molecules and solids . The core principle is the pump-probe technique: a pump pulse excites the system, and a delayed probe pulse measures the resulting changes in absorption, emission, or other observables . Setting Up the Experiment Laser Source: Use a Ti:sapphire laser oscillator for femtosecond pulses (700–1100 nm). For higher pulse energies, employ chirped pulse amplification and regenerative amplifiers . Pump and Probe Pulses: Split the laser output into two beams. The pump pulse excites the sample, while the probe pulse interrogates it after a controlled delay . Delay Control: A translation stage adjusts the optical path length of the probe beam, allowing femtosecond-precision timing between pump and probe pulses. Scanning this delay reconstructs the time-resolved dynamics . Sample Preparation: Ensure the sample is compatible with ultrafast measurements (e.g., thin films, solutions, or gas-phase molecules) and properly aligned in the beam path . Operating the Spectromet...

Article Content

Ultrafast spectroscopy of liquids using extreme-ultraviolet to soft-X ...

Advances in ultrafast short-wavelength sources have enabled major breakthroughs in ultrafast spectroscopy of liquids and solutions. This Review highlights the advances in this field,

Ultrafast laser spectroscopy

Ultrafast laser spectroscopy Ultrafast laser spectroscopy is a category of spectroscopic techniques using ultrashort pulse lasers for the study of dynamics on extremely short time scales (attoseconds to

ULTRAFAST SPECTROSCOPY

In summary, ultrafast laser spectroscopy has become a very useful tool in the study of the dynamics of atoms and molecules in a range of environments from gas phase to solid state.

Ultrafast Spectroscopy: ChemPhotoChem

Ultrafast excited-state relaxation dynamics in a push-pull stilbene are studied with femtosecond pump/broadband-probe

Chasing the Wind: Ultrafast Spectroscopy Captures

Ultrafast spectroscopy systems continue to become more compact without any compromise to integration, automation, and accessibility. By Greta Bucyte,

University of Fribourg physicists create a new state of matter

Physicists at the University of Fribourg have used ultrafast light pulses to create a new, fleeting state of matter for the first time.

Eos Transient Absorption Spectrometer | Ultrafast Systems

EOS is a unique (Patent No.: US 7,817,270 B2) broadband pump-probe nanosecond Transient Absorption Spectrometer designed to work with a wide

Emerging ultrafast techniques for studying quantum materials

In quantum materials, emergent functional properties resulting from strong correlations or electronic topology offer opportunities for new applications. Over the past decade, ultrafast

Ultrafast Laser Spectroscopy

Ultrafast spectroscopy uses ultrashort laser pulses to study atomic and molecular structure and dynamics on extremely short time scales. Several methods of ultrafast laser spectroscopy have been

Ultrafast Laser Spectroscopy and Imaging Techniques

This article delves into recent advancements in ultrafast laser technologies and collaborative research efforts that have propelled the field of ultrafast spectroscopy, enabling unprecedented insights into

Tailored-light photocurrent spectroscopy for probing time-reversal ...

While these photocurrents are used in electronic applications, such as current sources, switches, and photovoltaics, their presence can also be used to probe material properties in and out of equilibrium,

Ultrafast transient absorption spectroscopy: principles

This can be achieved by making use of ultrafast transient absorption spectroscopy. The basic principles of this technique, instrumentation, and some

ULTRAFAST SPECTROSCOPY

Ultrafast spectroscopic techniques have been used to observe rotational and vibrational dynamics in molecules. Electronic motion has been explored in semiconductor systems. The key is that the

Ultrafast Spectroscopy

In both the visible and infrared regions of the spectrum, ultrafast spectroscopy provides a wealth of dynamical information in the bulk and at interfaces (Fig. 2). The simplest form of ultrafast

Ultrafast Spectroscopy: Fundamentals and Applications

This Special Issue is dedicated to ultrafast spectroscopy, both its fundamental aspects and in its applications. As regards the fundamental aspects, we want to

Ultrafast laser spectroscopy

Overview
Attosecond-to-picosecond spectroscopy
Picosecond-to-nanosecond spectroscopy
External links

Dynamics on the femtosecond time scale are in general too fast to be measured electronically. Most measurements are done by employing a sequence of ultrashort light pulses to initiate a process and record its dynamics. The temporal width (duration) of the light pulses has to be on the same scale as the dynamics that are to be measured or even shorter. Ti-sapphire lasers are tunable lasers that emit red and near-infrared light (700 nm- 1100 nm).
Ti-sapphire laser

Understanding Ultrafast Spectroscopy: A Complete Guide for

Ultrafast spectroscopy has revolutionized our understanding of molecular dynamics, enabling scientists to observe chemical reactions and physical processes on timescales previously

Techniques of Ultrafast Spectroscopy | Springer Nature Link

This chapter begins with a general introduction to ultrafast spectroscopy, considers the limits of time and frequency resolution, and reviews the linear and nonlinear propagation of light pulses in a dispersive

Ultrafast Spectroscopy

The use of ultrafast spectroscopy to gain a detailed knowledge of chemical reactions (including their TSs) is a revolutionary way not only to understand the reaction mechanism but also to increase

TECHNIQUES OF ULTRAFAST SPECTROSCOPY

I. A. Introduction to Ultrafast Spectroscopy accessible to optical measurements. Even before the invention of the first laser, classical spectroscopy was a well-developed scienc

Understanding Ultrafast Spectroscopy: A Complete Guide for

This guide is written for students and early-career researchers who want a practical, experiment-oriented entry point into ultrafast spectroscopy. Core idea: watching motion in real time

Helios Transient Absorption Spectrometer | Ultrafast Systems

HELIOS is an automated femtosecond Transient Absorption Spectrometer designed to work with a variety of amplified

Applications of ultrafast nano-spectroscopy and nano-imaging

Innovation in microscopy has often been critical in advancing both fundamental science and technological progress. Notably, the evolution of ultrafast near-field optical nano-spectroscopy and

SPECTROMETERS & ACCESSORIES

SPECTROMETERS & ACCESSORIES TIME-RESOLVED ABSORPTION Transient Absorption, aka pump-probe, is a widely used time-resolved spectrometry

Ultrafast nano-imaging and nano-spectroscopy

Ultrafast near-field microscopy unites femtosecond optical spectroscopy with nanometre spatial resolution to image non-equilibrium material dynamics beyond the diffraction limit. This Primer ...

(PDF) Ultrafast Spectroscopy at the Central Laser

PDF | In this article, we will examine ultrafast spectroscopy techniques and applications, covering time-resolved infrared (TR-IR) spectroscopy, time... |

HOW TO USE IT !

Coupling your beam into the d-scan is easily achieved in less than one minute and a full measurement takes less than 10 seconds. d-scan traces are very intuitive and a proprietary algorithm provides

Ultrafast Systems | Products for time-resolved spectrometry

Ease of use is very important for our lab, where people range from very experienced to first-timers. As a result most of the time in the lab is spent on experiments and everyone loves using the Ultrafast

Contact Us

For more information, pricing, or custom solutions, please contact us:

Website: <https://www.introspec.co.za>

Email: info@introspec.co.za

Phone: +27 73 849 2156

Address: 25 Riebeek Street, Cape Town, 8001, South Africa

This document is for informational purposes only. Specifications subject to change without notice.

