Polymer Material Spectrometer



Overview

Spectroscopic Polymer Characterization This section describes applications of the spectroscopy of SP and polymer-guided waves for the observation of format.

Key Takeaways

FTIR and NIR spectrometers are the primary tools for polymer identification, characterization, and quality control, offering both laboratory and portable solutions.

FTIR Spectroscopy for Polymers

Fourier Transform Infrared (FTIR) spectrometers are widely used for polymer material identification due to their ability to analyze functional groups and generate unique spectral fingerprints for each polymer type.

FTI

R provides nondestructive, in-situ sampling and rapid qualitative and quantitative information, making it ideal for confirming polymer identity, determining copolymer ratios, and verifying raw materials. Portable handheld FTIR devices, such as the Agilent 4300, allow fast, out-of-laboratory analysis with minimal sample preparation, enabling real-time quality control and material characterization.

Near-

Infrared (NIR) SpectroscopyNIR spectroscopy is another powerful technique for polymer analysis, particularly for bulk materials and process monitoring.

NI

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R spectrometers measure overtone and combination bands of C-H, N-H, and O-H vibrations, which are abundant in polymer chemistry. FT-NIR spectrometers offer high resolution, reproducibility, and simultaneous wavelength measurement, making them suitable for off-line, at-line, and on-line applications in polymer manufacturing.

NI

R spectroscopy can determine chemical and physical properties such as hydroxyl number, acid value, residual moisture, melt flow index, density, viscosity, and degree of polymerization.

Portable and Handheld Solutions

For on-site polymer identification, handheld NIR devices provide rapid results, often within seconds, without sample preparation. These devices can distinguish between common polymers like PP, PE, PET, PS, PVC, ABS, and more, including subtle differences such as LDPE vs HDPE or PA6 vs PA66. They are particularly useful in plastic sorting, recycling, and waste management, connecting to mobile apps for instant analysis and data management.

Laboratory-

Based Instruments

Laboratory FTIR and NIR spectrometers, such as PerkinElmer's Spectrum Two™ IR system or Spotlight™ IR imaging systems, offer high sensitivity, extensive polymer libraries, and advanced software for detailed polymer identification and quantitation. These systems can also be combined with thermal analysis, pyrolysis-GC/MS, or ICP-MS for high-sensitivity analysis of organic and inorganic additives, microplastics, and complex polymer formulations.

Choosing the Right Spectrometer

When selecting a spectrometer for polymer materials, consider: Application type: laboratory research, process monitoring, or on-site identification. Polymer complexity: simple bulk polymers vs. microplastics or copolymers. Speed and throughput: handheld NIR for rapid sorting, FTIR for detailed characterization.

Data analysis needs: availability of spectral libraries, software, and calibration models. Budget and portability: handheld devices are cost-effective for field use, while lab instruments provide higher sensitivity and versatility. In summary, FTIR and NIR spectrometers provide complementary capabilities for polymer analysis.

FTI

R excels in detailed chemical characterization and laboratory applications, while NIR, especially in handheld form, is ideal for rapid, non-destructive, and on-site polymer identification and quality control.

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Article Content

Spectroscopic Polymer Characterization

This section describes applications of the spectroscopy of SP and polymer-guided waves for the observation of formation and swelling of polymer films, investigation of diffusion and interaction of

Spectroscopical Analysis of Polymers: Techniques and Applications

Abstract This chapter proposes a thorough overview of various spectroscopic methods used in the analysis of polymers. Understanding the molecular structures and composition of

Mass spectrometry of polymers: A tutorial review

The aim of this tutorial review is to illustrate the capabilities of MS for the characterization of large, complex polymers and emphasize its potential as a

Advanced Technologies for Creating and Analyzing Polymers

Determine nitrogen, carbon, hydrogen, sulfur and oxygen in the material characterization and quality control testing of polymers with the Thermo Scientific FlashSmart Elemental Analyzer.

Polymer Analysis

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Polymer Identification

These are instruments of choice for researchers involved in the identification and quantification of synthetic polymer microbeads, as well as for analyzing other compounds in water – everything from

FTIR-Plastics: A Fourier Transform Infrared Spectroscopy dataset for ...

Through FTIR (Fourier Transform Infrared Spectroscopy) analysis, detailed information about the spectra corresponding to each plastic is sought, with their characteristic bands contributing

Polymers

The handheld spectrometer can identify over 40 polymers in different forms (such as plastic rods, granules, foils, and plates), colors, and surface textures (rough or

Spectroscopy

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Enable measurement in transmission or reflection mode (also ATR) of polymer materials: The measurement in the UV-VIS-NIR spectroscope is used to follow

Polymer Materials Identification

FTIR spectrometers provide both nondestructive and in-situ sampling, and rapid qualitative and quantitative information to identify the specific formulations of polymers. This helps to optimize

Advanced Technologies for Creating and Analyzing Polymers

FTIR spectroscopy is a powerful analytical technique used to analyze materials across a broad range of industries, including pharmaceutical, polymer/petrochemical, specialty chemical, semiconductor,

Mass spectrometry as a tool to advance polymer science

Mass spectrometry has evolved into a highly useful tool for materials science, enabling polymer chemists to essentially assess the fate of macromolecules chain by chain.

Polymer Materials Identification

Handheld FTIR Solutions for On-site Analysis Listen as Agilent expert Dr. Yanqui Wang reviews fundamental principles of IR spectroscopy, describes key attributes of the Agilent 4300 handheld

Resources for Creating and Analyzing Polymers

Polymer analysis with FTIR spectroscopy For polymer method development, deformulation, troubleshooting, and research, the Thermo Scientific Nicolet iS50 FTIR Spectrometer is the ideal

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FTIR-Plastics: A Fourier Transform Infrared Spectroscopy dataset for ...

This work introduces two datasets: FTIR-Plastics-C4 (Fourier Transform Infrared Spectroscopy, in plastics, at a wavenumber spectral resolution of 4 cm

NIR spectroscopy in the polymer industry: The ideal tool

Overview of near-infrared spectroscopy and how polymer manufacturers can benefit from using the NIR technology.

Raman Spectroscopy for Polymer Analysis

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Raman spectroscopy provides numerous inherent advantages over other techniques for polymer investigation. These include excellent material

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