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MOEMS NIR SPECTROMETERS

FOR PHARMACEUTICAL ANALYSIS

What makes near-infrared (NIR) spectroscopy useful for pharmaceutical R&D?

Many chemicals have spectral signatures in the NIR, which one can use to characterize samples.

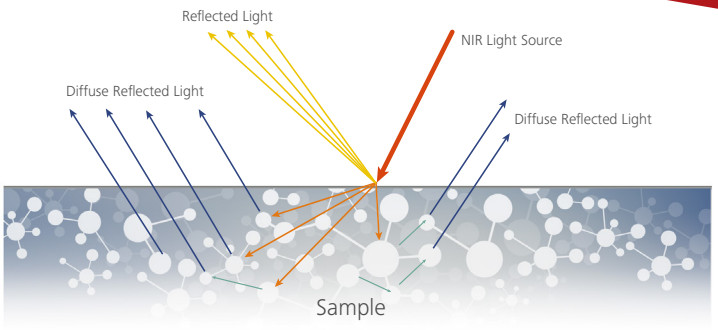
Where can NIR spectroscopy be used in pharmaceutical manufacturing?

One can track spectral signatures and related characteristics to ensure manufacturing consistency in chemical concentration and purity, avoiding issues in quality assurance and providing higher quality control.

How can NIR spectroscopy improve pharmaceutical product quality?

Characteristics obtained based on changing intensities of peaks at known spectral signatures in the NIR allow one to adjust recipes to enhance yield, extend shelf-life, and authenticate chemistries.

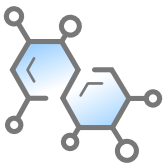
Today, MOEMS-based compact NIR spectrometers such as FTIR, FPI, and grating-based systems are able to replace the traditional benchtop models, which result in several benefits for the pharmaceutical market:



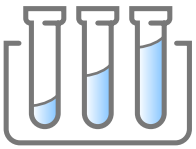
Diffuse reflectance spectroscopy (see illustration above) is a powerful optical technique where light irradiated onto a sample is reflected by the particles covering the sample's surface while the rest of the light penetrates the sample.

The light inside the sample is repeatedly diffused through refractive transmission, light scattering, and surface reflection. This generates a spectral signature that is then read out by spectrometers for various types of drug analysis such as the following:

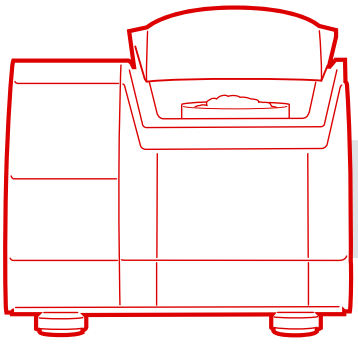
Drug Chemistries Authentication



Drug Structure Identification

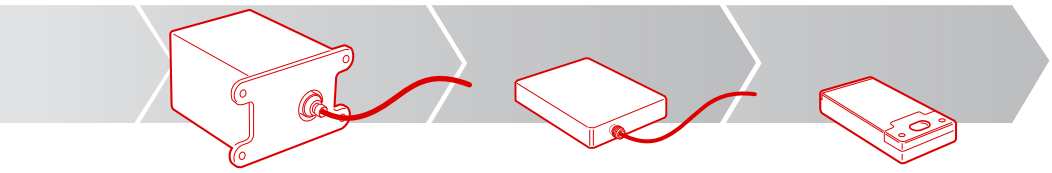


Drug Concentration Analysis



Benchtop System

Move from Lab to In-Line Process > Reduce System Size & Cost > Shorten Analysis Time



Performance comparison using 3 spectrometers and a special diffuse reflection light source

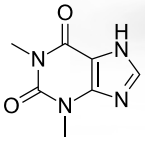
Three types of MOEMS spectrometers were used in controlled experiments to evaluate the compact systems' performance vs. a benchtop's, using theophylline, a phosphodiesterase inhibiting drug used in therapy for respiratory diseases such as chronic obstructive pulmonary disease (COPD) and asthma.

FTIR Engine | Grating-Type Mini-Spectrometer | MEMS-FPI Module

Diffuse reflection signals are generally very weak, so developing solutions for increasing reflected light is a priority.

This special light source is designed for this purpose, providing an ideal structure for signal enhancement.

Different concentrations of theophylline tablets were used for the experiment.



10%
20%
30%

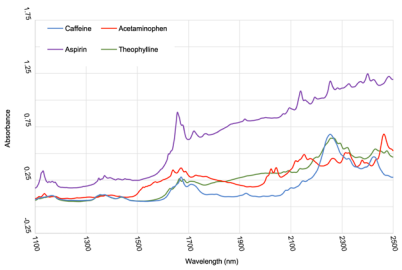
Experiment's Results:

Each spectrometer was able to detect the NIR absorbency of the various samples.

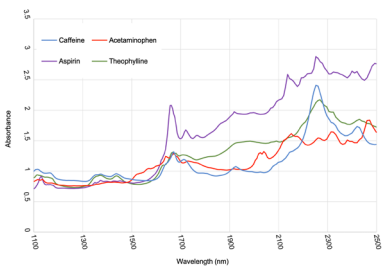
Using theophylline's spectral signature at 1680 nm, we can apply analytical techniques to clearly define differences in concentration. Techniques such as 2nd derivative analysis can be used to enhance the spectral signatures from the spectrometers, and Zero-Filling can be used in the FTIR to enhance the separation between absorption peaks.

Identification

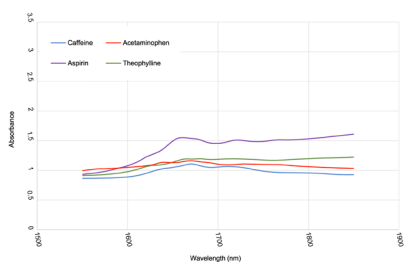
Benchtop Data



FTIR Spectrometer Data

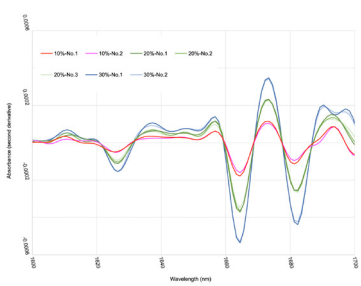


FPI Spectrometer Data

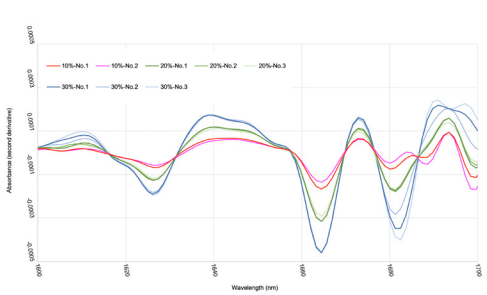


Concentration Analysis

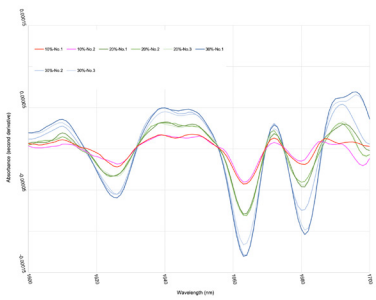
Benchtop Data



FTIR Data (With Zero-Filling Applied)



FPI Data (2nd Derivative)



Contact us to help you make the right selection for your spectrometer applications.

Learn more at www.hama-spectro.com
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