A Guide to Modular NIR Spectrometers

More Options, Better Performance

Ocean Insight now has more NIR spectrometer options, with better performance advantages, for applications from determining the moisture content of fruits and grains to identifying plastics used in recycling.

Advances in NIR Spectroscopy

NIR spectroscopy has enormous potential for a variety of applications, and today is more accessible than ever. Thanks to the availability of different detectors and technologies, as well as refinements to the optical bench design of earlier generations of NIR spectrometers, users have instrument options that meet price and performance criteria at virtually every level. Here's what Ocean Insight offers:

NIRQuest+ Spectrometer (900-2500 nm)

Our flagship NIR spectrometer has been reimagined for enhanced performance. NIRQuest+ spectrometers **(Figure 1)** have a robust

optical bench design for high-sensitivity response, allowing for low limits of detection at NIR wavelengths from 900-2500. Three versions (900-1700 nm, 900-2200 nm and 900-2500 nm) are available.

Figure 1. NIRQuest+ is distinguished by high sensitivity and great thermal stability.

Also, NIRQuest+ has a thermoelectrically cooled InGaAs-array detector for great thermal stability. It is well suited for lab or industrial settings, such as on a conveyor belt or in a sample stream, as its higher sensitivity allows users to capture spectra over shorter integration times. Typical NIRQuest+ applications include detection of moisture content in food; qualification of materials for industrial applications; and monitoring of active ingredients and excipients in pharmaceutical processes.

NanoQuest Spectral Sensor (1350-2500 nm)

NanoQuest is a MEMS-based FT-IR spectrometer that provides extended spectral range and exceptional performance in a package that's considerably smaller and more affordable than traditional lab-based instrumentation. This novel spectral sensor **(Figure 2)** meets the need for a compact,

accessible instrument to qualify and quantify materials from 1350-2500 nm (7400-4000 cm^{-1}).

Figure 2. At just 70 mm x 50 mm x 25 mm, NanoQuest is small enough to fit in the palm of your hand.

Flame-NIR Spectrometer (950-1650 nm)

Figure 3. Flame-NIR is small and rugged, making it attractive for integrating into portable or handheld systems.

Although NIR spectrometers have decreased considerably in size thanks to the use of cooled InGaAs array detectors, their use in portable systems is often limited by footprint, power consumption, and cost. The Flame-NIR spectrometer overcomes many of these limitations with an uncooled NIR

detector array driven by a low-noise electronic design. The elimination of detector cooling reduces both system cost and power consumption, which when combined with a shorter optical bench, yields a spectrometer with a much smaller footprint and greater portability **(Figure 3)**.

NIR Spectrometers at Glance

	NIRQuest+	NanoQuest	Flame-NIR
Type:	InGaAs array (cooled)	FT-IR device w/Michelson interferometer on a MEMS-based chip	InGaAs array (uncooled)
Options:	NIRQuest+1.7 (900-1700 nm w/25 µm slit)	NANOQ-2.5 (1350-2500 nm w/8.0 or 16.0 nm FWHM optical resolution)	FLAME-NIR-INTSMA25 (950-1650 nm w/25 µm slit)
	NIRQuest+2.2 (900-2200 nm w/25 µm slit)		
	NIRQuest+2.5 (900-2500 nm w/25 µm slit)		
Key features:	Enhanced optical bench and aperture design	Ultra-compact footprint; wider spectral range than most shortwave IR instrumentation	Low power consumption; replaceable slits; minimal unit-to-unit variability
Benefits:	Higher sensitivity and lower limits of detection (LOD)	IR analysis attainable to integrators seeking affordable alternative to most instruments	Easily integrated into handheld or portable instrumentation
Best for:	High-speed reflection measurements, low LOD absorbance measurements	High-volume applications requiring an affordable, scalable unit	Applications requiring a small-footprint instrument w/low unit-to-unit variability
Example applications:	Moisture content for fruit sorting; plastics recycling; chemical concentration measurements	Product authentication; food characterization; chemical composition of biological samples	Identification of pharma ingredients; monitoring of hydrocarbon extraction; fat content of edible oils
Price:	$$$$	$$	$$$

NIR Spectroscopy and Machine Learning

When combined with algorithm development and machine learning capabilities like Ocean Intelligence, NIR spectrometers provide rapid, convenient and cost-effective tools to measure a large variety of analytes across many different sample types.

From agriculture and food production to the pharmaceutical and petroleum industries, the applications for today's NIR spectrometers are virtually without limits.