AVANTES
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BROCHURE

SPECTROSCOPY IN DIFFERENT INDUSTRIES

SPECTROSCOPY APPLIED IN DIFFERENT INDUSTRIES

Spectroscopy is used in hundreds of applications across dozens of industries, with new uses found every day. You find spectrometers measuring light in the lab, on the manufacturing floor, and out in the field; anywhere that light exists, you can measure it. The results coming from these measurements are put to truly amazing use.

Our mission is to provide state-of-the-art measuring equipment that helps people live longer, healthier lives and helps save the planet for generations to come. Today, you can find Avantes equipment doing just that, in applications ranging from biomedical imaging to recycling efficiency to studying our climate. Whatever your spectroscopy needs may be, Avantes has the solution to make your measurement and data acquisition easier, faster, and more accurate.

This brochure goes over various applications in which Avantes' spectrometers are applied.

AGRICULTURE & FOOD

Climate changes and a growing world population increase the demands on our food supply, and create opportunities for new technologies to advance food production capabilities. Since spectroscopy enables spectral analysis of wavelengths, it's applied more and more in botany, horticulture and agriculture. Some applications examples:

Fruit sorting
Near-Infrated Spectroscopy allows the rapid, nondestructive measurement of several parameters of ripeness, and quality such as water content, soluble sugars content, acidity, etc.

Soil characterization
Soil characterization determines what manner of treatments or mitigation might be required or even what crops might be suitable for a particular area. NIR Spectroscopy allows rapid data collection on moisture content, compaction and soil density.

Leaf measurement
Direct leaf measurement provides for the characterization of a variety of plant health parameters. A handheld spectrometer is an ideal instrument for measurements such as leaf reflection or transmission.

(BIO)MEDICAL

(Bio)medical researchers utilize spectroscopy techniques for clinical and research processes. UV, visible and near-infrared wavelength ranges are measured for a variety of medical and biomedical applications. Some application examples:

Blood analysis
Co-oximetry is a spectrophotometric method to measure blood gas parameters like total hemoglobin or oxygen saturation, performed with an ultra-low stray light spectrometer.

Endoscopy
During an endoscopy procedure, measurements with a high sensitivity spectrometer can be added to provide richer details to the clinician for diagnostic purposes.

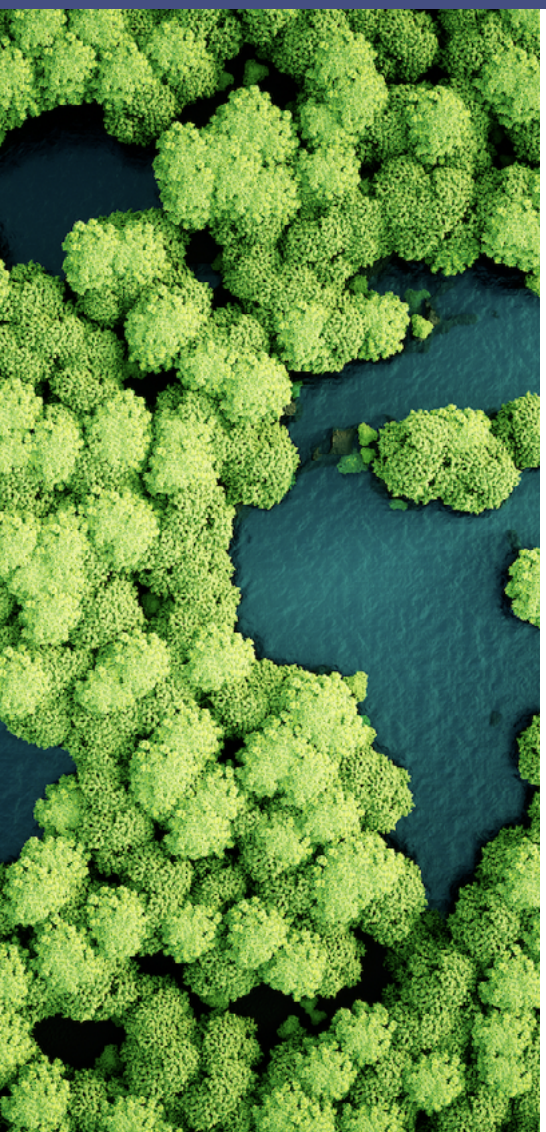
Radiation therapy
Spectroscopy can be used to determine the effectiveness of radiation therapy at reducing cancerous masses. With deep tissue reflection in the near-infrared through the use of an ultra-high sensitive spectrometer.

CHEMISTRY

In the field of chemical spectroscopy, there are an unlimited number of applications. Chemical reactions are dynamic processes that vary with changing conditions which result in various way of techniques. Some application examples:

Raman Spectroscopy
One of the most evolving techniques for monitoring chemical reactions is Raman spectroscopy, which can be performed with a **Raman Bundle**. The technique characterizes the inelastic scattering of photons in covalently bound molecules. This scattering is used to define the material's molecular fingerprint, crystallinity and other specifications. It's especially useful for product identification, reaction monitoring and remote sensing.

Fluorescence Spectroscopy
Fluorescence spectroscopy is a type of electromagnetic spectroscopy that is used to investigate the behavior of chemical compounds. It involves using a beam of light that excites the electrons in molecules of certain compounds and causes them to emit light; typically, but not necessarily, visible light. For optimal fluorescence measurements, a **high-speed spectrometer** is advised.



ENVIRONMENTAL

Spectroscopy can be used to perform measurements of water, air, refuse, soil, and sludge to safeguard the environment from growing environmental threats. Some application examples:

Contamination monitoring
A **high-speed spectrometer** can be used in contamination monitoring to indicate the presence and identification of contaminants in groundwater, air, soil, or products.

Recycling
Raman spectroscopy is used in recycling to separate different types of garbage from each other, based on the type of material, so it can be recycled in a high-quality manner.

Pollution monitoring
Differential optical absorption spectroscopy, or DOAS, is a technique that is used to monitor pollutants in the atmospheric air. These air pollution measurements are performed with an **ultra-low stray light spectrometer**.

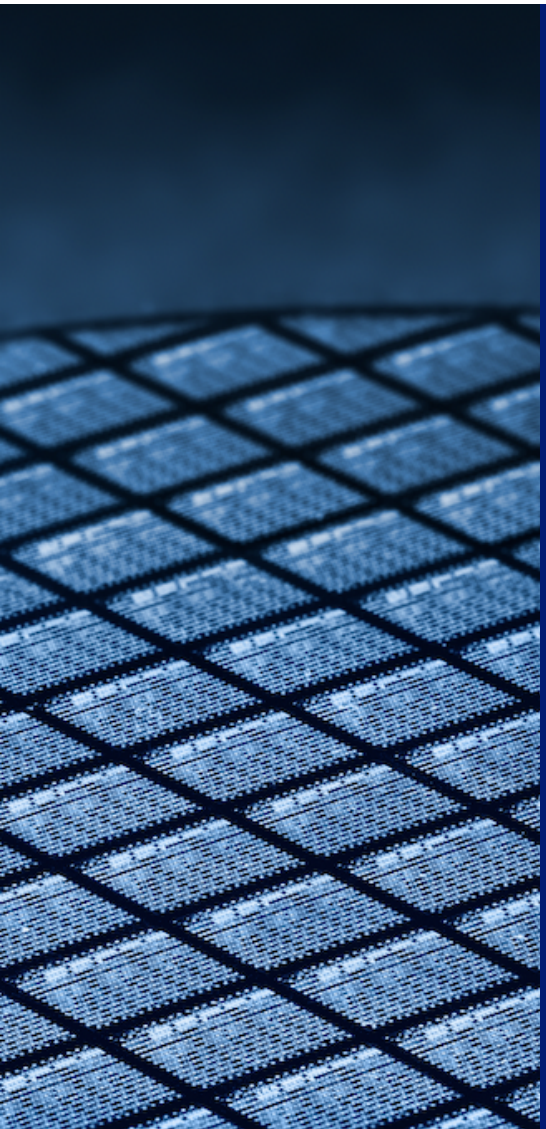
LIGHTING

The connection with spectroscopy in this market is easily made. Spectroscopy is mostly utilized for real-time monitoring and quality control before, during and after the manufacturing process. Some application examples:

Radiometry & Photometry
With radiometry the electromagnetic radiation- or wave- is measured. The wavelengths determine the amount of energy carried by the photons, and hence the "color" of the radiation.

Photometry is the measurement of radiometric sources and the interaction with the human eye. Photometry involves different parameters, such as luminous flux, luminous intensity and illuminance. For these applications, a high-speed spectrometer is ideal.

Identifying Lighting Products
LEDs and OLEDs will replace traditional lighting in the coming years. To make sure all LEDs have the same uniform lighting and color, the LEDs can be measured, in-line, with a radiometric calibrated fiber-coupled spectrometer.



SEMICONDUCTOR

The semiconductor industry can realize significant benefits from spectroscopic measurements during various stages of their processes, such as end-point detection or mechanical polishing. Some application examples:

Plasma Diagnostics
Measuring a complex yet dynamic matrix like plasma, requires high-speed acquisition combined with high resolution.
Real-time spectroscopic sampling of plasma can be realized using a high-resolution spectrometer.

Thin Film Measurements
During coating processes and after completion, thin film thickness measurements may be required. These measurements can be achieved through a reflection or transmission measurement with high-speed spectrometer.

Wafer Inspection
The inspection or probing of wafers is ideally suited to spectroscopy as it facilitates measurements of very small areas (as low as 50-100 micron spot sizes). Typical wafer probing in the semiconductor market involve a high-speed spectrometer.

SOLAR ENERGY

The measurement needs of the solar industry are quite diverse, ranging from process control applications in the manufacturing of thin-film photovoltaic panels through direct solar measurements and solar simulators. Some application examples:

Production of Solar Panels
In-line monitoring of thin-film solar panel manufacturing is a process control function that requires high-speed, 24/7 spectral data acquisition over long-duration production runs. Typical applications involve real-time plasma emission monitoring or reflection measurements in the range from 200-1700 nm during the deposition process of CIGS, CdTe, and other materials on substrate materials. **Multi-channel spectrometers** are ideally suited to inline spectroscopic measurements.

Solar Simulators
Solar simulators are a critical tool for the test and measurement of photo-voltaic arrays, but their characterization can be difficult as each manufacturer has different design features. **Irradiance calibrated, back-thinned spectrometers**, are suited for this application due to the high quantum efficiency of the detectors in the UV and NIR range.

OEM (ORIGINAL EQUIPMENT MANUFACTURER)

Avantes has many years of experience in applying spectroscopy and optical sensing technologies to numerous markets. Avantes supports OEM customers on different levels, including opto-mechanical, electronics and software, but can also assist with project management. Some examples of applications in which Avantes supported OEM customers:

Agriculture: Intelligent fertilizer application systems
Chemistry: In-situ fluorescence detection systems for adhesive curing
Food: Protein/moisture content analyzers for food and beverage
Lighting: Integrated LED characterization systems
Medical: Non-invasive tissue reflectance analyzers
Safety: Explosive-detection for plasma etch monitoring
Security: Fluorescence-based counterfeit detection systems for printing of bank notes and official documents
Semiconductor: Automated wafer inspection tooling

To fully utilize the vast possibilities of our spectrometer systems, we work closely together to fulfill your every need.

More about our OEM solutions, visit www.avantes.com/oem.

SUPPORT & ADVICE

Providing high-quality equipment is only part of what we do. The other equally important factor is the high level of service we deliver worldwide. Avantes' organization includes various specializations to provide you with the best possible service and advice.

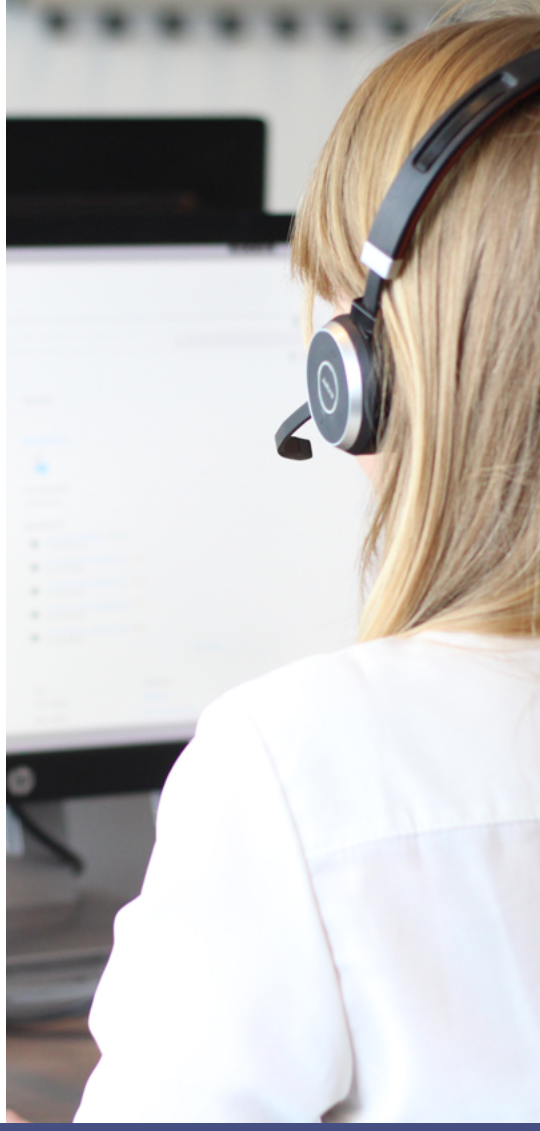
Feasibility studies
Our sales engineers perform feasibility studies to find the right solution for your application.

Support team
Our support team never sleeps and provides you with the best service.

Demo material
Our unique demo program allows you to try our equipment for free to ensure you find the perfect solution.

MyAvantes
Personal MyAvantes platform where you'll find your needed AvaSoft Software and other material for you to download.

Online support
Lots of helpful documents and videos to help with your products.



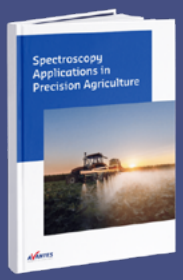
MARKET SPECIFIC EBOOKS

Avantes makes an impact with spectroscopy technology all over the world. You can encounter our products in numerous applications. Every market demands a different approach. But in each one, we contribute to science and enable our partners to make huge strides in quality, efficiency, and research.

Curious how we do this? Click on the title of the ebook to download them for free.

Chemistry eBook

Environmental eBook



Agriculture eBook

Medical eBook

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CONTACT

WE'RE HAPPY TO HELP

Curious how spectroscopy can help you reveal answers by measuring all kind of materials, in-line, at your production facility, in a lab or even in the field? Please visit our website or contact one of our technical experts, we're happy to help you.

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