AVANTES
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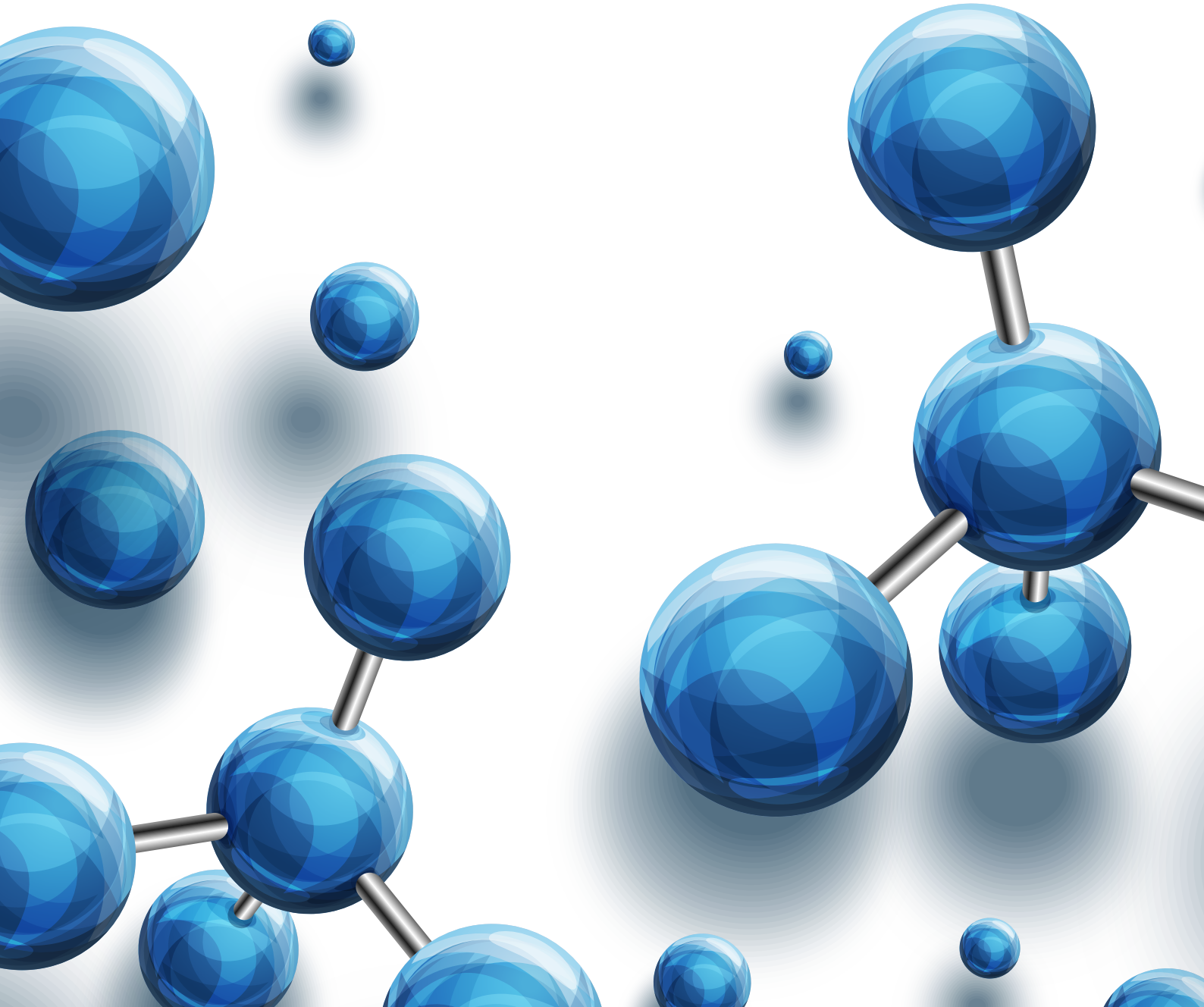
BROCHURE

RAMAN SPECTROSCOPY

IDENTIFYING THE UNKNOWN



RAMAN SPECTROSCOPY

Raman spectroscopy is a molecular measurement technique that characterizes the inelastic scattering of photons in covalently bound molecules. This scattering is then used to **define what is known as the material's molecular fingerprint, crystallinity, and other specifications.**

Because each material has a unique Raman spectrum, it is an ideal technique to identify and qualify the compositing and presence of substances.

In its early years, Raman was only found in laboratories, but this technique is now widely used in the spectroscopic community. It provides an invaluable analytical tool for molecular fingerprinting and monitoring changes in molecular bond structure (state changes, stresses/strains).

Nowadays, you can find Raman in applications ranging from airport security screening to medical and high-end university research.

At Avantes we have almost 30 years of experience in the development of empowering spectroscopy solutions and will guide you in finding your Raman setup.

RAMAN & AVANTES

With a wide variety of Raman products available it can be difficult to find a company that matches the needs for your application. Why Avantes is the right partner for your Raman setup? We happily explain why:

In-house Development & Partnership Approach
Our headquarters in the Netherlands houses a state-of-the-art manufacturing facility. It is our global center of designing and manufacturing our products and software. With all this in-house knowledge, we can follow a methodical needs analysis and solution definition process, together with you to ensure we develop a solution that perfectly aligns with your needs.

TE Cooling
All AvaRaman spectrometers have a Peltier cooling system, that provides ΔT down to -35°C cooling to ambient for superior dark noise reduction, keeping the detector at a steady 5°C. This temperature is stable within a 0.1°C bandwidth, thanks to the PID controller. The TEC cooling enables the use of longer integration times to enhance detection of small signals.

Optical Bench Design
Our spectrometers are developed with a symmetrical Czerny-Turner design. Light enters the optical bench through a standard SMA-905 connector and is collimated by a spherical mirror. A plain grating diffracts the collimated light after which a second spherical mirror focuses the resulting diffracted light. An image of the spectrum is projected onto a 1-dimensional linear detector array.

SPECTROMETERS

To ensure you find your most ideal Raman measurement setup, we created multiple setups for you to choose from.

AvaRaman Bundles

We joined forces with two partners to offer you three Raman bundles. All bundles consist of a **high-performing spectrometer, a unique laser-probe combination, and our Raman Software**. The Highsense Bundle has a higher quantum efficiency in NIR and better signal to noise performance. For weak Raman signals we recommend the Performance Bundle. When strong signals are available, the Basic Bundle is the right pick.

Highsense Bundle: For the most challenging applications. This bundle uses the AvaSpec-Hero for detection. The high-end cooled backthinned detector, low-noise electronics and optical bench with high Numerical Aperture, results in excellent Signal to Noise and Dynamic Range.

Performance Bundle: For demanding applications. Cooling enables you to work with longer integration times, yet keeping the thermal noise limited.

Basic Bundle: For basic applications. Based on an uncooled spectrometer this is the entry bundle for reasonable strong signals.

AvaRaman

The AvaRaman contains a high-sensitivity spectrometer and a 532 nm or 785 nm laser to give you the best result for your measurements. The system is appropriately configured according to the wavelength of the laser. The power of the laser source is adjustable via software.

We integrated our AvaSpec-HERO into the system. Due to the lower dark noise the performance upgrades. The superior signal-to-noise ratio (800:1) is important when you're dealing with small signals. The higher NA optical bench results in a better sensitivity. **This will lead to more photons impinging on the detector.**

AvaRaman is available in three options, all containing a TE cooled spectrometer to provide accurate and reproducible results.
The difference in these options is in the signal to noise ratio, resolution, raman shift, laser output, wavelength and bandwith.

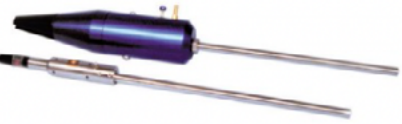
Technical data:

Click this link to discover all technical data of the **AvaRaman and AvaRaman Bundles**

LASERS & PROBES

Lasers

Our lasers are ideal for Raman due to their narrow bandwidth (<0.1 nm): an exact wavelength is critical for the correct excitation of molecules. In addition their drift fluctuation is low: under 0.25% over a period of 8 hours, which is perfect for reaction monitoring. The lasers are available in various wavelengths.



Probes

Special Raman probes are available for both fluids and solid substances. They feature different focal lengths, special versions for high temperature and/or high pressure are available. They are optimized for various specific excitation wavelengths. We offer four probe variations:

Raman-PRB	Raman-PRB-FP	Raman-PRB-FIP	Raman-PRB-FC
3/8" SS focusing probe, 200 µm excitation fiber, 400 µm read fiber. It can withstand 80°C. Manual shutter included, 1.5 m fibers. Spotsize at sample 90-140 micron. Multiple focal lengths available.	1/2" SS focusing probe, 200 µm excitation fiber, 400 µm read fiber. It can withstand 80°C. Spotsize at sample 90-140 micron. Multiple focal lengths available.	5/8" SS immersible focusing probe for in-situ measurements, 200 µm excitation fiber, 400 µm read fiber. It can withstand 200°C. Spotsize at sample 90-140 micron.	3/8" SS immersible process probe for in-situ measurements, 200 µm excitation fiber, 400 µm read fiber. Withstands 500°C and 3000psi. The probe optics provide background filtering. Spotsize at sample 90-140 micron.

SOFTWARE

Our in-house designed software, **AvaSoft-Raman**, enables full control over your Raman spectroscopy system and is included into your system. In addition to most features of AvaSoft-Full, it also features:

- Auto-calibration routines to determine the excitation laser peak (calibration tile is needed, sold separately)
- Integration of time progress bar to indicate integration time status for longer spectral acquisitions
- View signal in normalized counts
- Software baseline correction for fluorescence suppression
- Process control add-on module is available for online analyses and control.

Also available is **Panorama© software**, a sophisticated modular spectroscopy software platform for end users who require special analytical functions. It enables manipulation of all 2D and 3D spectroscopic data with just a few mouse clicks. It also features mathematical noise reduction, functional group assignment and advanced reaction-monitoring capabilities.

Panorama Light© software is a slim version of Panorama© which is only available in combination with our AvaRaman bundles. It offers:

- 2D & 3D data visualization
- Searching in libraries
- Archiving in spectral libraries, including additional information
- Conversion of many known data formats

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