VISERION
RAMAN SPECTROSCOPY

CHAUVIN ARNOUX
INDATECH

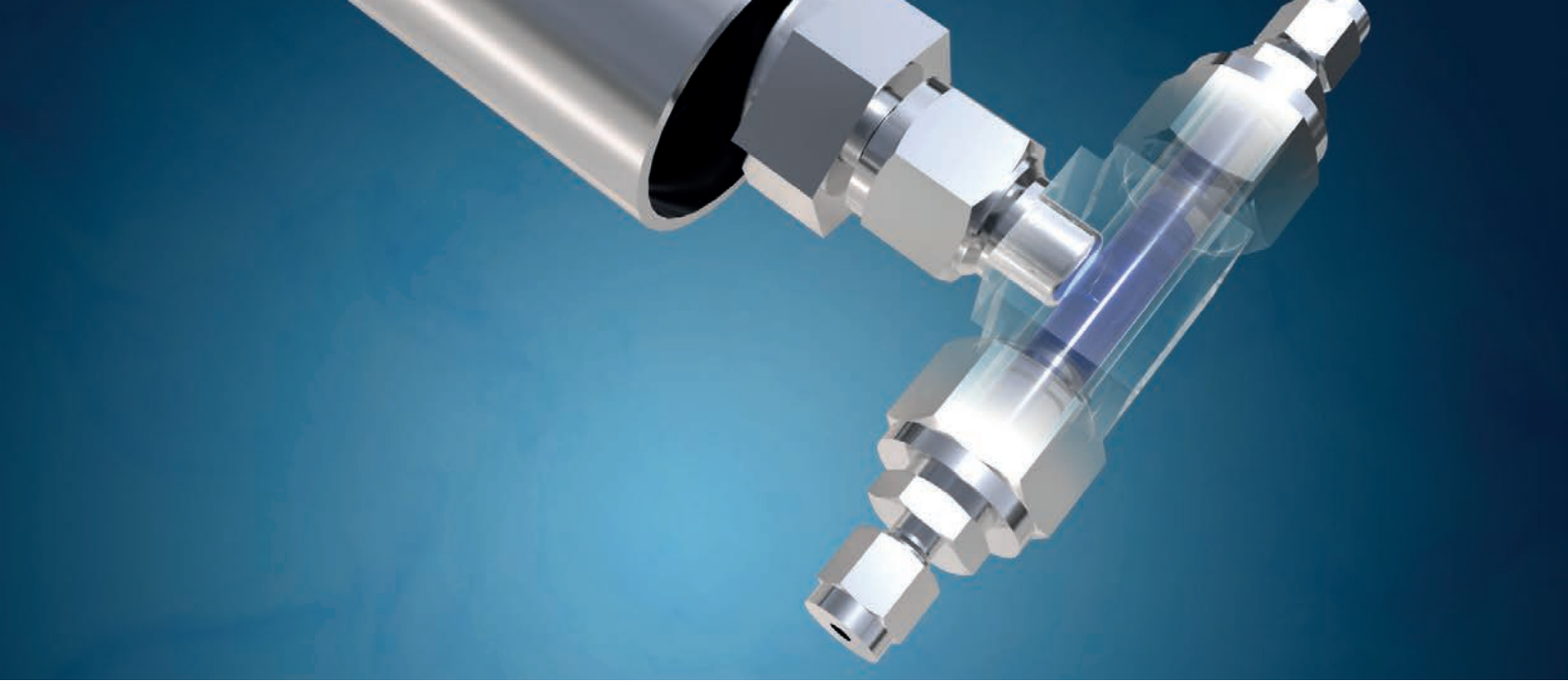
Multichannel Viserion
Monitor and control your biotechnological or chemical processes

Measure **Control** **Improve**

Non-invasive and non-destructive analyses possible with Viserion:

- Analysis suitable for multiple matrices, without prior preparation of the sample
- High selectivity for measurements on complex blends
- Production monitoring (cell culture, chemical industry)
- Inspection of finished products through a plastic or glass container
- Remote measurement via optical fiber

Measure up



Raman spectroscopy is a non-invasive, non-destructive method for observing and characterizing the molecular composition of a material. This method makes use of the phenomenon of inelastic scattering, in which a molecule re-emits light at frequencies different from the incoming laser.

The analysis of the re-emission bands specific to the chemical medium ensures considerable specificity thanks to the type of energy transition involved, the vibrational transition. This technology is particularly suitable for liquid media, because water is almost inactive in terms of Raman emission, due to its very low polarizability.

Developed for industrial environments

Unique on the market, Viserion provides **4 simultaneous measurements** by means of **4 probes and 4 lasers**. This system also allows the use of longer integration times when the conditions require it (up to several minutes): **the best option for high-accuracy measurements** in demanding environments.

The Raman equipment is equipped with a **deep cooling system** at very low temperature (-60°C). This very low-noise measurement guarantees stability over time and in the harsh conditions sometimes imposed in industrial circuits.

The computer is integrated in the stainless-steel casing to make it as rugged as possible. In addition, it is capable of communicating with other production PLC software products by using the OPC-UA **communication protocol**. Several interlock systems ensure **laser safety**.

3 markets concerned

PHARMA | BIOTECHNOLOGY | CHEMICALS

Advantages

As well as its simultaneous multichannel measurement capability compared with the standard multiplexing approach, the 4 simultaneous lasers offer significant advantages:

- **Quicker analysis time per batch** (since, unlike multiplexing, here all the channels are measured at the same time)
- **More rugged.** Three measurement channels capable of operating independently, unlike multiplexing (where a laser failure can be critical for all the measurement channels)
- More redundancy for a **continuous process** (the channel is measured by different lasers and probes)
- Possibility of **combining different lasers**, different emission wavelengths, emission power, etc.
- In the event of a problem on a channel, another may immediately take its place without having to change the laser.

Your partner for industry 4.0

Viserion includes an industrial PC with the Viserion Ready firmware.

Viserion Ready allows:

- modulation of measurement acquisition over the integration time, as well as the number of scans and the power of the laser,
- **integration of several chemometric models**, e.g. from toolboxes like PLS_Toolbox (PCA, PLS, SVM & ANN models). Once these models have been uploaded, it is possible to display the monitoring of the process's critical parameters.

Thanks to this **rugged design**, the system can be used in production environments with the possibility of control via the OPC-UA communication protocol. This type of integration **enables full production automation** and the implementation of feedback loops to **guarantee process performance and quality at all times**.

Adaptable to your needs

The measuring interface with the process is crucially important. Indeed, the measuring probe provides a direct interface between the medium to be analyzed, the process equipment and the measuring instrument. For this reason, Indatech has developed a whole ecosystem around the head of the Raman optical probe.

- **An immersed probe** for in-line or at-line monitoring through a sapphire window,
- **An in-line measuring cell** for monitoring the evolution of downstream production; the cell is made of stainless steel,
- **An at-line measuring cell** for measuring in vials of various appearances; this cell is called the Vial Analyzer.

Two possible configurations

Each excitation wavelength has advantages and disadvantages for a given application, so there must be a choice adapted to the requirement in order to optimize measurement.

- **785 nm Raman laser:**

The most popular excitation wavelength, offering a compromise between Raman signal intensity, sensitivity to fluorescence, measurement range, cost and overall performance.

- **830 nm Raman laser:**

A wavelength minimizing fluorescence which is more suitable for certain dark-colored samples (dyes, oils, colored polymers), but which also increases the integration time and reduces the measurement range.

3 possible applications

- **Monitoring** of cell culture in biotechnology, **quantification** of products of interest (antibodies, nutrients)
- **Qualification and quantification** of the active ingredients in complex blends in the chemical industry (detergents, dyes)
- **Qualification** of finished products in the laboratory

Example of industrial application

Real-time in-situ monitoring of antibody glycosylation site occupancy during CHO cell culture in the bioreaction

When connected to a bioreactor for antibody production by CHO cell culture under perfusion, Viserion made it possible to:

- **Check the quantity** of glycosylated and non-glycosylated antibodies
- **Quantify** the nutrients in the medium (glucose, lactates, etc.) and monitor the evolution of the various glycoforms of glycosylated antibodies
- **Provide this information** to the operator and the controlling PLC in **just a few minutes**

Technical specifications

Technology		Non-destructive* Raman analyzer of chemical, pharmaceutical and chemical media.
Light source		Up to 4 Raman lasers, at a power of 500 mW. Possibility of emission at 785 or 830 nm
Spectrometer		1 multichannel measuring spectrometer
Spectral range	**@785 nm** **@830 nm**	250 – 3,200 cm^{-1} 250 – 2,900 cm^{-1}
Spectral resolution		6 cm^{-1}
Samples		Samples of various natures in various states, in particular light to dense liquids, colored media, as well as solid matrices (vials, cups, etc.)
Measurement time		Integration time between 0.1 and 240 seconds, possibility of several scans per measurement and display of the mean spectrum
Measurement processing		Real-time display of the spectra from the sample measured by means of the Viserion Ready firmware, with integration of specific models and prediction of the data. Compatibility with the "Simca" software from Sartorius and "PLS_Toolbox" from Eigenvector.
Environmental temperature		5 – 40°C
Relative humidity (uncondensed)		5 – 90 %
PC		Fanless industrial PC integrated in the Raman unit
Casing		Stainless-steel unit, H 700 x L 500 x W 250 mm (dimensions including internal PC), CE
Laser safety		Compliant with EN-NF 60825-1: ▪ Class IV marking (unit) and Class IIIB marking (probe) ▪ Interlock system on the probe and the casing door ▪ Manual reset of interlock if circuit broken ▪ Key to activate/deactivate the laser (one per laser) ▪ Emergency stop button

*Caution necessary with some solid and/or very dark samples

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