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# The optimal spectroscopic method for your gas measurement: Focus on selectivity, sensitivity and application range

## Introduction

In gas measurement technology, various spectroscopic techniques play a crucial role in the analysis and quantification of gases. Two such techniques are NDIR spectroscopy (Non-Dispersive Infrared Spectroscopy) and Raman spectroscopy. Although both methods can provide valuable information, they offer different advantages and are suitable for different applications. This article takes a closer look at the advantages of NDIR spectroscopy compared to Raman spectroscopy for gas measurement technology.

## Selectivity

NDIR spectroscopy is based on the specific absorption of infrared radiation by certain gas molecules. Each gas has a unique absorption spectrum in the infrared range that distinguishes it from other gases. By selecting the appropriate wavelength of infrared radiation, NDIR spectroscopy can target a specific gas and distinguish it from other gases in the mixture. This allows for high selectivity and accuracy in the measurement of gases. In contrast, Raman spectroscopy is based on the scattering of light, resulting in a complex spectrum. Assigning specific peaks to specific gases can be difficult, especially if the spectrum is overlaid by other molecules.

## Sensitivity

NDIR spectroscopy offers high sensitivity for certain gases, especially when high-resolution detectors and optimised measurement conditions are used. The absorption bands in the infrared range are often intense and enable the detection of even the lowest concentrations of gases. This is particularly important in applications where accurate monitoring of trace gases is required. Raman spectroscopy, on the other hand, often requires higher gas pressures to generate sufficiently strong Raman signals. This can result in a higher detection limit and reduced sensitivity for trace gases.

## Wide scope of application

NDIR spectroscopy is particularly well suited for the detection and measurement of gases that have characteristic absorption bands in the infrared range. Just a few examples are carbon dioxide (CO2), carbon monoxide (CO), methane (CH4) and nitrogen oxides (NOx). These gases are of great importance in many industrial processes, environmental monitoring and safety. Raman spectroscopy, on the other hand, is more versatile and can analyse a wider range of molecules, including organic compounds, inorganic substances, polymers, etc. So if a wide range of analysis is required, Raman spectroscopy might be the better choice.

## Interference

NDIR spectroscopy is less susceptible to interference from background gases or foreign substances. Since the measurement is based on specific absorption bands, other gases or impurities in the sample gas are less likely to influence the results. NDIR spectroscopy can also work at higher pressures, which is helpful to minimise the influences of background gas components. Interferences can occur with Raman spectroscopy, especially if fluorescent substances are present in the sample or if complex sample matrices are present. These can overlay the Raman spectrum and make the analysis more difficult.

## Easy handling

NDIR spectroscopy generally requires less complex instrumentation and is easier to handle. The NDIR detectors are often stable, robust components and do not require complex adjustment. Raman spectroscopy, on the other hand, requires special laser systems that must be precisely aligned with the sample to obtain accurate measurements. Raman spectroscopy also requires appropriate sample preparation, as Raman signals are usually weak and require optimised sample presentation.

## Summary

In conclusion, NDIR spectroscopy is beneficial in many gas measurement applications due to its selective and sensitive absorption measurements, wide application range and ease of use. Raman spectroscopy has its own strengths and can be useful in other areas of chemical analysis and material characterisation. The choice of the appropriate technique always depends on the specific requirements of the application.


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