Measuring Total Sulfur Directly in Natural Gas (Multi-Component)

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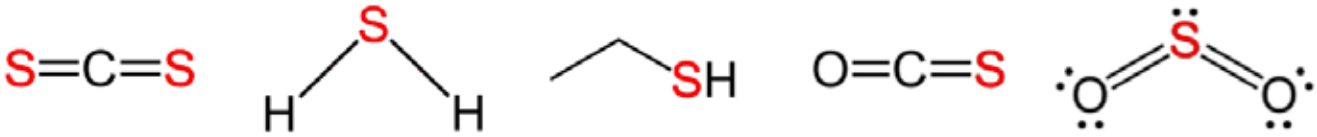


Application Summary

Measurement: **Total Sulfur (up to 5 sulfur compounds)**

Detector: **OMA-300 Process Analyzer**

Process Stream: **hydrocarbon fuels**

Introduction

The ASTM method for total sulfur analysis calls for oxidation of all present sulfur compounds to sulfur dioxide for straightforward measurement. When a stream contains many different sulfur species, or unknown exotic sulfur compounds, this method is usually the only option.

The OMA-300 Total Sulfur Direct Analyzer takes a different approach, measuring up to 5 sulfur compounds directly in the unaltered sample using powerful multi-component analysis software and a high-resolution UV-Vis spectrophotometer.

The OMA-300 Total Sulfur Direct has compelling benefits for the process operator:

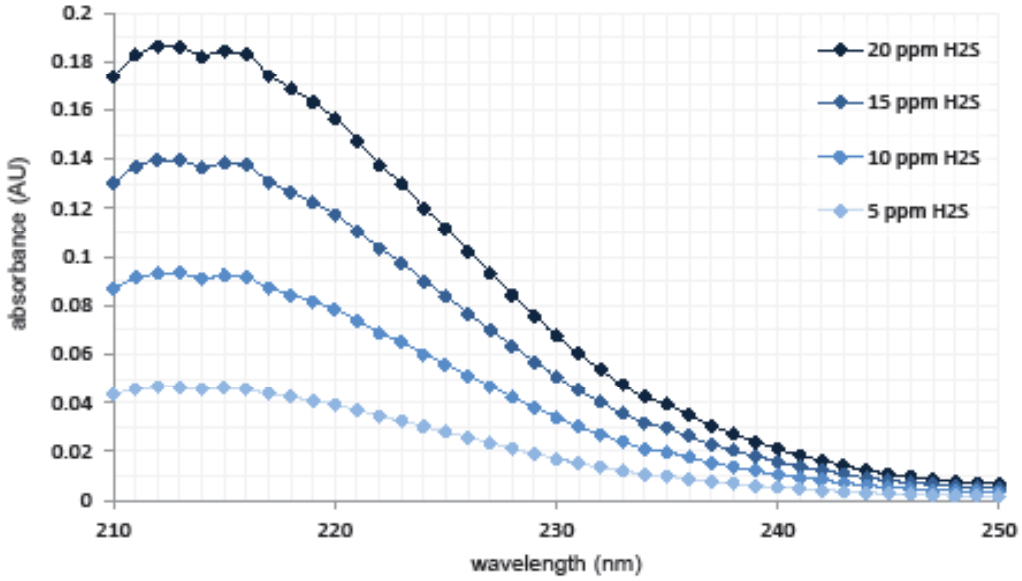
- Richer data through individual concentration measurement of each constituent sulfur species
- Decades of proven reliability measuring multiple sulfur compounds simultaneously
- Highly suitable for natural gas applications (e.g. pipeline gas)

Sulfur Compound Absorbance Curves

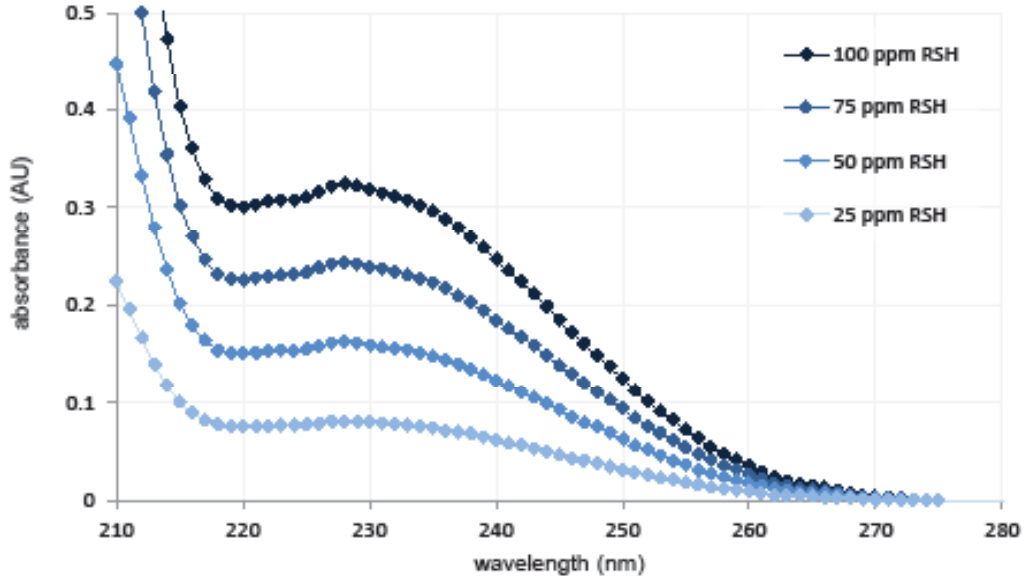
Any single photodiode measurement is vulnerable to noise, signal saturation, or unexpected interference. This susceptibility to error makes a lone photodiode data point an unreliable indicator of one chemical's absorbance.

As accepted in the lab community for decades, the best way to neutralize this type of error is to use collateral data in the form of 'confirmation wavelengths,' i.e. many data points at many wavelengths instead of a single wavelength:

H_2S



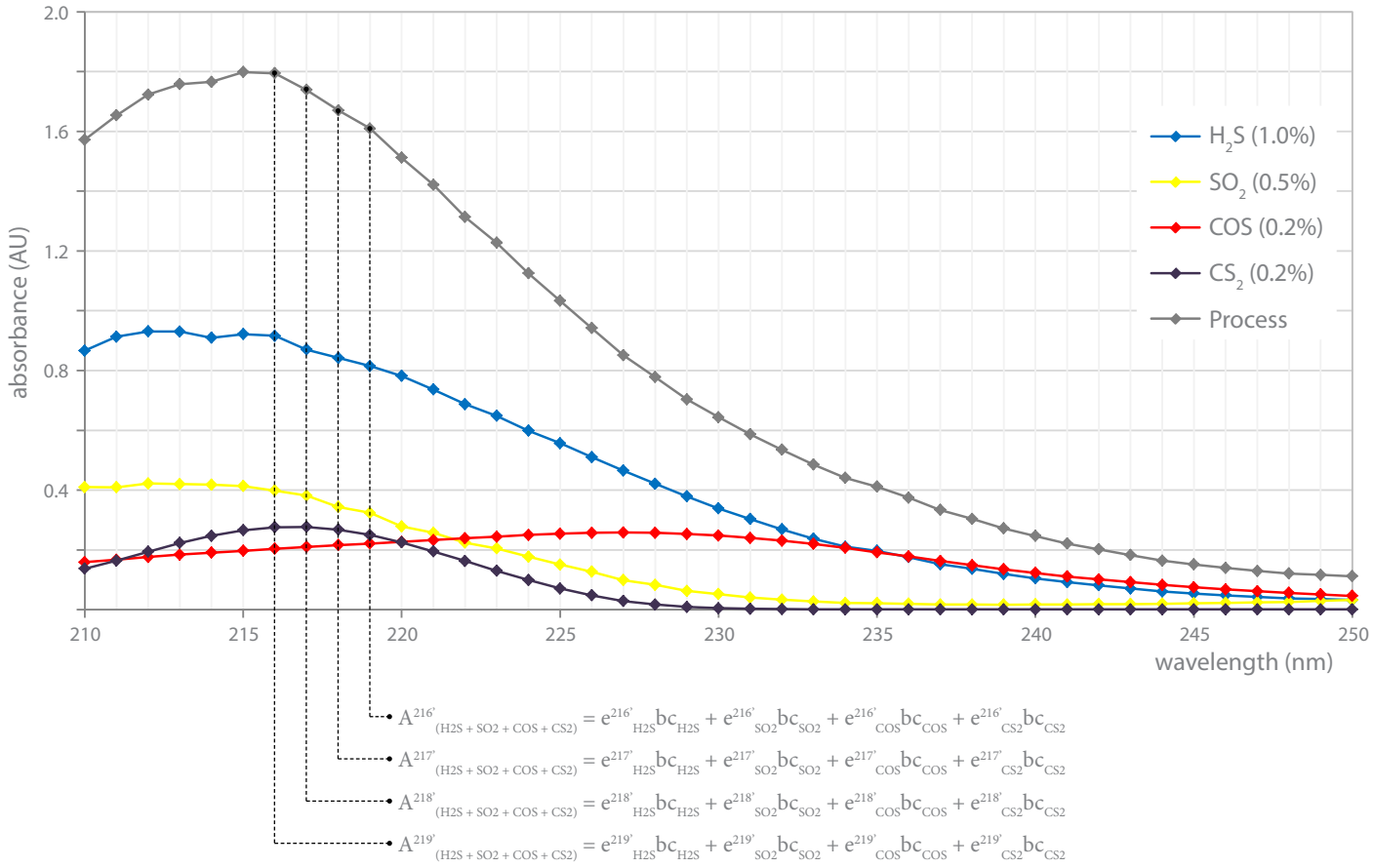
RSH



In the figures above, each diamond represents a single photodiode and data point. The OMA measures absorbance at each integer wavelength within the measurement wavelength range and produces analyte absorbance curves. This use of 'confirmation wavelengths' instead of simple peak absorbance measurement serves to eradicate the effect of noise at any single photodiode, allowing for much more accurate analysis free from cross-interference with light.

Multi-Component Total Sulfur Analysis

Each photodiode supplies one data point of absorbance information at an integer wavelength. The OMA's ECLIPSE software continuously solves a matrix of equations from all these data points simultaneously to de-convolute each compound's absorbance curve from the total sample absorbance:



In the analysis, we use a 4-component equation:

$$A'_{(w+x+y+z)} = A'_w + A'_x + A'_y + A'_z = e'_w bc_w + e'_x bc_x + e'_y bc_y + e'_z bc_z$$

where *A'* is the absorbance at wavelength *', e'* is the molar absorptivity coefficient at wavelength *', c* is concentration, and *b* is the path length of the flow cell. In the image above, four such equations (at 216nm, 217nm, 218nm, and 219nm) are shown. In reality, the matrix includes one equation from every single integer wavelength in the measurement wavelength range.

This matrix of data from many wavelengths provides far more accurate multi-component analysis within a spectral region that has heavily overlapping absorbances from each analyte.

For performance specifications within your application, please inquire directly with a sales office.

For technical details about the OMA-300 Process Analyzer, see the data sheet:
http://aai.solutions/documents/AA_DS001A_OMA300.pdf

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