Composition: Spectrometry (GC – MS)

Do I know the gas composition? > Composition: Spectrometry (GC – MS)

Summary

with GC (Gas Chromatograph) and MS (Mass Spectrometry) is a laboratory based analytical technique that combines the features of gas-chromatography and mass spectrometry to identify different substances within a gas sample extracted from a flare line to determine its composition.

How it Works

The GC-MS method is composed of two major components, these are the gas chromatograph and the mass spectrometer.

The gas chromatograph utilises a capillary column which separates the molecules as the sample travels the length of the column. The molecules are retained by the column and then elute (come off) from the column at different times (called the retention time), this then allows the mass spectrometer downstream to capture, ionise, accelerate, deflect, and detect the ionized molecules separately.

The mass spectrometer does this by breaking each molecule into ionised fragments and detecting these fragments using their mass-to-charge ratio.

These two components, used together, allow a much finer degree of molecule identification than either unit used separately.

It is not possible to make an accurate identification of a particular molecule by gas chromatography or mass spectrometry alone.

The mass spectrometry process normally requires a very pure sample while gas chromatography using a traditional detector (e.g., flame ionisation detector) cannot differentiate between multiple molecules that happen to take the same amount of time to travel through the column (i.e., have the same retention time), which results in two or more molecules that co-elute.

Sometimes two different molecules can also have a similar pattern of ionised fragments in a mass spectrometer. Combining the two processes reduces the possibility of error, as it is extremely unlikely that two different molecules will behave in the same way in both a gas chromatograph and a mass spectrometer.
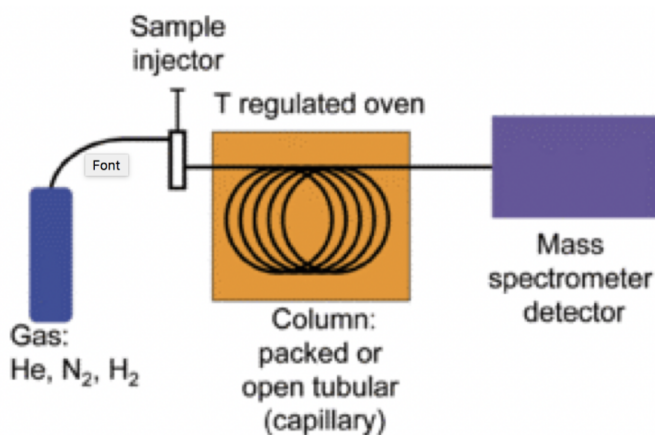

Figure 1: Principles of Spectrometry (GC - MS) method

Spectrometry (GC – MS) is not widely used in the Oil and Gas Industry.

Advantages

☑ High accuracy

☑ Low uncertainty

Limitations

☒ Mainly laboratory based method

☒ Periodic update (daily, weekly, monthly)

☒ High equipment costs

Go Deeper

- [Thermofisher](#)

- [Agilent](#)

Case study

No case study available at this time.
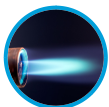

Do I know the gas composition?

 [Composition: On-Line](#)

 [Composition: Laboratory Analysis](#)

 [Composition: Specific Gravity Analyser (Relative Density)](#)

 [Composition: Wobbe Index Analyser (Calorimeter)](#)

 [Composition: Gas Chromatograph](#)