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Application News

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Gas Chromatography

Use of Jetanizer™ as an effective tool for CO and CO_2 determination at low concentration

User Benefits

- The use of a methanizer inside an FID nozzle (Jetanizer™) is a simple solution for detection of CO and CO_2 with lower sensitivity than the TCD detector
- The Jetanizer™ offers a new solution for capillary column systems that was not available before within Shimadzu.
- Due to the very simple design of the Jetanizer™ it makes this solution very attractive for customers considering its straightforward installation and operation

Introduction

The use of methanizer as an effective tool for CO and CO_2 detection is well known. Due to the low sensitivity of TCD detectors using the FID becomes essential. Since there is a necessity of a catalytic conversion of CO and CO_2 to methane in order to be detected in FID detectors, methanizers are found to be an attractive and relatively simple solution. However, there is a lack of resources of methanizer for capillary column solutions (only packed column methanizers are available in Europe). Therefore, an easy and feasible solution is needed in order to cover the new requirements of the market where capillary column demand is increasing.

The Jetanizer™ is an accessory produced by the Activated Research Company® which can be considered as an in-jet methanizer with a similar design as a standard nozzle of the FID. Its robust and simple design makes the Jetanizer™ an effective solution for detection of CO and CO_2 at low ppm level. Furthermore, unlike traditional methanizers it has a non-nickel catalyst showing a high resistance towards high concentrations of oxygen inside the sample.

In this study, it was intended to test the Jetanizer™ inside a GC-2030 in order to evaluate the reliability and accuracy of the measurements as well as the reproducibility of the results obtained.

Furthermore, the linearity for CO_2 was investigated by using different gas mixtures.

Sample Preparation and Calibration

A gas standard mixture containing different permanent gases with a concentration of 5 ppm in Helium was used for the main test of the Jetanizer (table 1). For the linearity test of CO_2 two more gas standard mixtures containing different concentrations of CO_2 were also measured (tables 2 and 3).
The cylinders where connected to the GC valve box inlet with a controlled flow of around 30 ml/min.

Table 1: Standard gas mixture 1

Compound	Concentration (ppm)
CO_2	5
CO	5
CH_4	5
Ar	5
H_2	5
N_2	5
O_2	5
He	Rest

Table 2: Standard gas mixture 2

Compound	Concentration (%)
CO_2	1
CO	1
CH_4	1
H_2	1
N_2	1
O_2	1
He	94

Table 3: Standard gas mixture 3

Compound	Concentration (%)
H_2	0.065
CO_2	0.5
O_2	1
N_2	1.035
Ar	97.4

▪ Results

Right after the installation of the Jetanizer™ in the first measurements using the standard mix 1, the three peaks related to carbon monoxide, methane and carbon dioxide, can be clearly seen(figure 1).

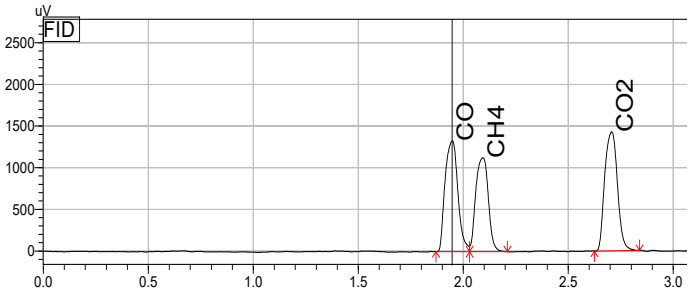

Figure 1: Chromatograms obtained for the measurements of standard gas mixture 1

Afterwards, the same standard was used to corroborate the reproducibility of the system. Figure 2 clearly shows the high reproducibility for the results obtained with a %RSD below 1% for 6 measurements (n=6).

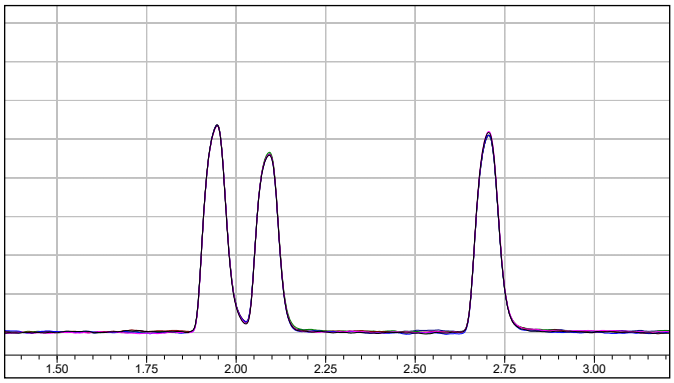

Figure 2: Reproducibility of measurements for Jetanizer™ using standard mixture 1

Furthermore, with the results obtained for these measurements it was possible to calculate a limit of detection of around 0.2 ppm for the three compounds.

Finally, the linearity of the system was probed by producing a calibration curve for CO_2 (figure 3) by using the standard gas mixtures 1, 2 and 3, where the CO_2 concentration was 5ppm ,1 % and 0.5 % respectively.

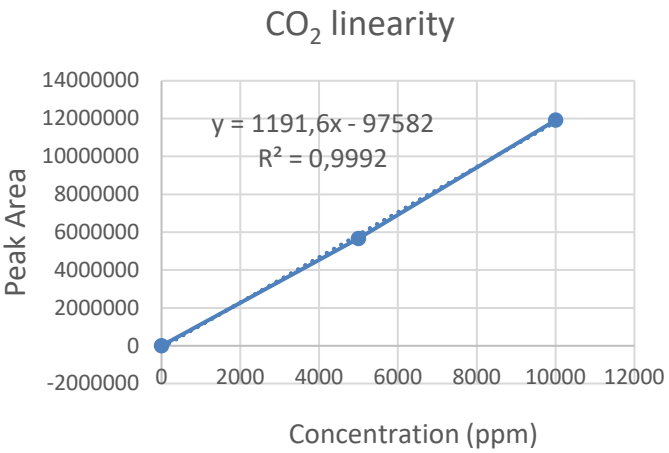

Figure 3: Calibration curve for carbon dioxide

As observed in figure 3 the linear regression analysis performed for the calibration curve resulted in a high degree of linearity within the concentration range studied.

▪ The Package

❑ *Main Unit*

Nexis GC-2030

❑ *Accessory*

Half size option box (for two different valves installation)

❑ *Main Consumables*

SH-Rt-Q-BOND PLOT column (30 m x 0.32 mm x 10 µm; P/N 221-75764-30)

Jetanizer™ for GC-2030 (P/N 220-94673-30)

❑ *Software*

LabSolutions LCGC

Figure 4: Nexis GC-2030 with side mounted valve box

▪ Conclusion

The use of Jetanizer™ is an attractive solution for the analysis of carbon dioxide and carbon monoxide at low concentrations. Its simple design and installation as well as its capability to operate with capillary columns make this accessory a promising solution besides the typical methanizers known so far.

The main results obtained in these measurements guarantee a high reliability and accuracy of the system. Furthermore, it was also probed that the limit of detection obtained reaches the sub-ppm level which is crucial for typical applications where methanizers are needed.

Jetanizer is a trademark of Activated Research Company ®

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