Global Analyser Solutions



# $H_2S$, COS, arsine, phosphine in ethylene and propylene

## PG700



- highly sensitive: <1 ppb
- single method, single run
- automatic calibration via permeation tubes
- GC-MS with AEI source for ultra low detection limits

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# $H_2S$, COS, arsine, phosphine in ethylene and propylene

$H_2S$, COS, arsine, and phosphine are extremely damaging to downstream catalysts in hydrocarbon processing. Even ppb-level concentrations in ethylene and propylene streams can poison the precious metal catalysts used in polymer plants. The ability to detect these contaminants at very low levels enables olefin producers to mitigate and remove these impurities effectively.

## Principle of operation

Figure 1 shows the analyser schematic. The gas sample is injected via a GSV onto a high-resolution column to separate matrix peaks from target impurities. Liquefied samples are vaporised using the optional GAS Vaporiser or transferred to a Tedlar bag. Active compounds require an inert flow path to minimise adsorption. The ISQ 7610 GC-MS provides very high sensitivity; with the optional AEI source, detection limits further decrease to the required levels. SIM acquisition at m/z 33, 34, 60, 76 and 78 achieved LODs below 1 ppb.

## Specification

- Thermo Trace GC1600 with gas injection valve (GSV)
- ISQ 7610 GC-MS with AEI (Advanced Electron Impact)
- Capillary column
- Minimum detectability: <1 ppb
- Repeatability: <5 % at 10 ppb
- Linearity: $R^2$ > 0.996 (2-50 ppb)

## Results

Figure 2 shows chromatograms for arsine and phosphine of 10 ppb concentration level. Quantitation ions were m/z 76 and 78 (arsine) and 33 and 34 (phosphine). Detection limits <1 ppb were obtained from 100 µL injections. Repeatability at 10 ppb was 4.8 % RSD for arsine and 3.2 % RSD for phosphine (n=10). Linearity ($r^2$) = 0.998 over 2–50 ppb.

Figure 3 shows chromatograms of 2-50 ppb $H_2S$ and COS. Quantification masses were 33, 34 ($H_2S$) and 60 (COS). The linearity is: $H_2S$: $R^2$=0.996; COS: $R^2$=0.999.

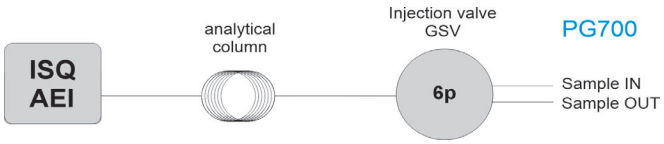



**Figure 1** Schematic diagram

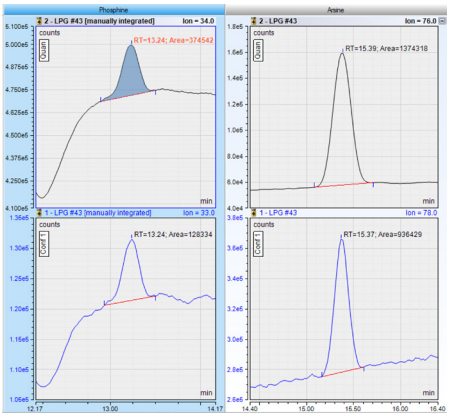


**Figure 2** Mass chromatograms of arsine and phosphine, 10 ppb level

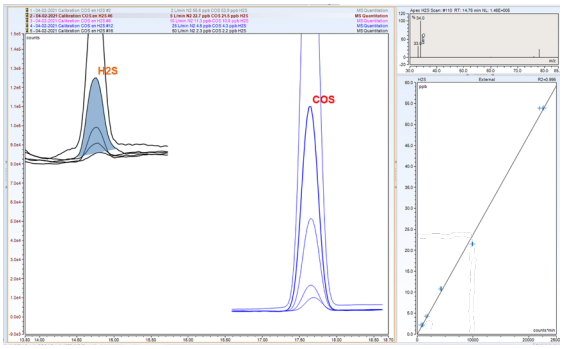



**Figure 3** Overlay of 5 $H_2S$/COS concentration levels:
$H_2S$: 2.2, 4.3, 10.8, 21.5 and 53.9 ppb
COS: 2.3, 4.5, 11.3, 22.7 and 56.6 ppb

**Results were obtained in cooperation with SGS Nederland B.V, Vlissingen, Mr. K. Spaas and Mr. J. Verkuil.**

| Ordering information | PG70X - ABCDE | | | |
|---|---|---|---|---|
| code X | 0 | 1 | 2 | 3 |
| GC model, power | 1600, 230V | 1610, 230V | 1600, 115V | 1610, 115V |

For the selection of options (e.g. Valve type and passivation, Pump and vacuum sampling, Rotameter and sample connections, Pressure and moisture sensors, Hydrogen sensor for safety shut-off, GC oven cryo valves, Power plug type and more), see the options table in the order guide.

**About GAS**

Global Analyser Solutions provides GC & GC-MS solutions for Energy, Refinery, Chemical and Environmental markets. Our analysers address a broad spectrum of measuring requirements with high precision and reliability. Please reach out for more information on our website. www.gassite.com