

APPLICATION NOTE 213WA1101B

High Purity Analyser

ASTM D2504, D2505

About G·A·S

Global Analyser Solutions offers custom configured GC analysers for complex separations, data processing and reporting. We have over 35 years of experience in designing and building turnkey analysers for many application fields. We invite you to take advantage of our latest hardware, software and column technologies to achieve the best possible results.

Our analysers are designed to meet many accepted standard methods (like ASTM, UOP, ISO, etc.) in the Oil and Gas industry. The efficient hardware configurations are based on proven GC technology, resulting in rigid instruments with an optimal return on investment. The G-A-S High Purity Analyser (HPA) is the customised solution for determination of volatile components like permanent gases in several samples, such as bulk gases and hydrocarbon streams, according to ASTM D2504 and D2505.

Introduction

The High Purity Analyser is the standard tool for gas suppliers in determining the quality of bulk gases. Their clients demand high purity with exact specification for various applications like instrumental use and industrial production. Refiners need to know the trace amount of permanent gases in various light hydrocarbon streams.

For purity determination permanent gases need to be analysed at ppb level. Therefore the TCD detector, which is commonly used for this group of components, cannot be used, since it only offers sensitivity at low ppm level. The PDD (Pulsed Discharge Detector) is the obvious choice for analysing impurities at ppb level. For this type of analysis, not only the detector, but the total analyser design is crucial for reaching the lowest detection limits. The high sensitivity will only be obtained when correct couplings, materials and analyser diagrams are applied. Global Analyser Solution has experience for many years with PDD detection, and is therefore able to reach detection limits of 10ppb or better. Due to the correct analyser design, truly robust operation is offered.



Figure 2. TraceGC equipped with PPD detection and diaphragm valves with internal purge for low background level. The system has an optional LPG inlet with vaporiser. Enlarged view of the diaphragm valve

Applications

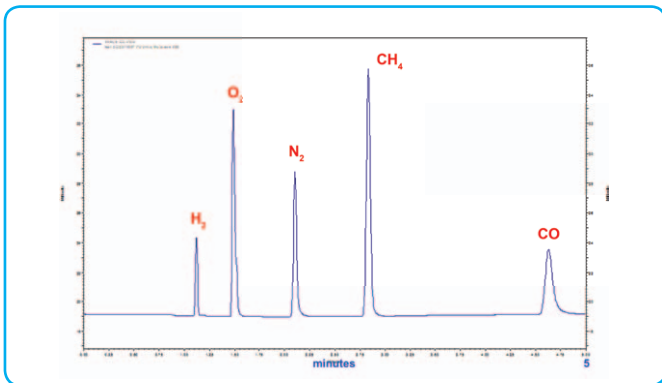


Figure 2. Permanent gases at 10 ppm level (analyser from figure 1).

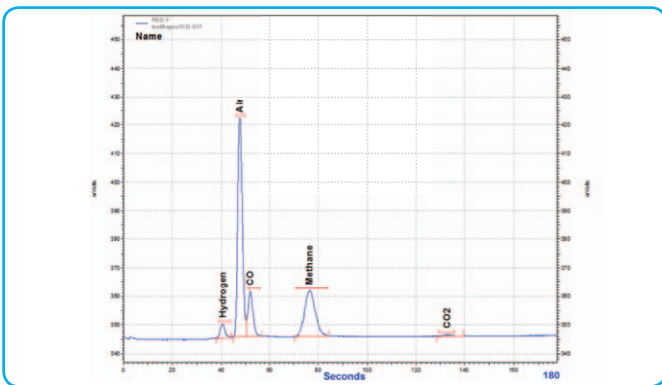


Figure 3. ppm level permanent gases in xenon

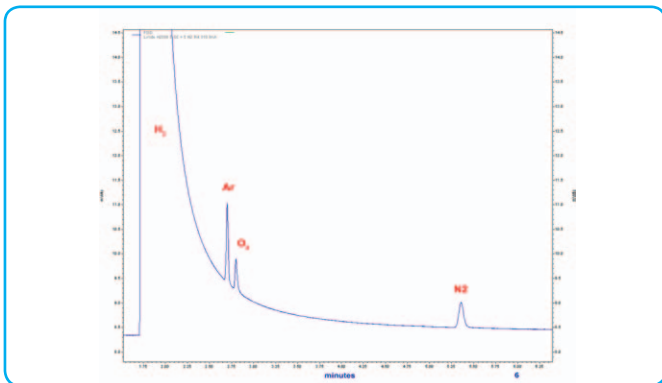


Figure 4. Permanent gases in hydrogen (10 ppm), including Ar/O₂ separation

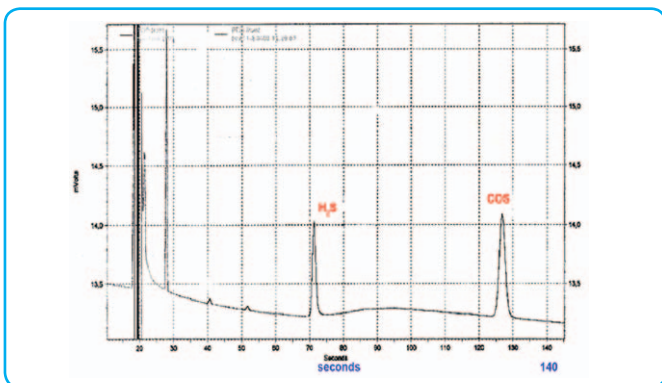


Figure 5. Sulfur at 3 ppm level using PDD. Detection limit is 20 ppb.

Very sensitive.....

Figure 2 shows the chromatogram of a 10 ppm mixture of permanent gases. The used column is Molsieve 5A PLOT with 0.53 mm internal diameter (wide bore). The analyser is also available with 1/8" packed columns; detection limits are 2 times higher in that case, see the table below for more details. The system has a backflush configuration to protect analysis column and PDD for high percentage matrix components, like C₂ and higher hydrocarbon streams, or more aggressive media. The High Purity Analyser has an optional second analysis channel available as well, for instance for CO₂. Preferable this channel is equipped with a second PDD, but it can also be combined with the first channel, for budget reasons.

Detection limits High Purity Analyser

H ₂	15 ppb
O ₂	8 ppb
N ₂	10 ppb
CH ₄	8 ppb
CO	20 ppb

The results are based on 3 * noise level, using the chromatogram of figure 2. Wide-bore columns (0.53mm ID) were used for best results. With packed columns detection limits are 2 times higher.

ppb argon in oxygen detection

Detection of ppb Ar in bulk O₂ is normally very challenging because these components can hardly be separated in this concentration ratio. Therefore the HPA has an optional DeOxy facility available. This selective trap removes oxygen completely, without affecting the argon level. The trap is regenerated in situ after appr. 100 analysis, depending on the used injection volume.

Universal detector

The PDD is a universal detector, that can detect in principle every component except helium. The HPA is therefore suitable for many other applications like the analysis of impurities in (dry) hydrochloric acid, silane, SF₆ and others. Figure 3 shows the analysis of permanent gases in xenon (note CO and CO₂ are analysed on a single column). Figure 4 demonstrates the analysis of impurities in hydrogen, including separation of Ar and O₂, with 30 ppb detection limit. The chromatogram of figure 5 shows determination of sulfur components. The detection limit is 20 ppb in this case for H₂S and COS.



Figure 6. Pulsed Discharge Detector.

Specifications

FEATURES & BENEFITS

- * Very sensitive detection of various components down to 10 ppb or better
- * Robust en reliable analyser design using diaphragm valves with internal purge
- * ASTM D2504, D2505 and many other applications
- * Factory tuned for required standardised method
- * On site installation and familiarisation



Figure 6. CompactGC equipped with PPD detection and diaphragm valves: very sensitive detection on a small footprint. For application examples on CompactGC: see figure 3, 4 and 5

- Standardised methods:** ASTM D2504, D2505
- Configuration:** 1-3 channel instrument based on Thermo Trace or CompactGC and PDD. Available injection types: GSV or LSV. Packed, wide-bore or capillary columns
- Optional:**
- Vaporiser or Pressure Facility for LPG samples
 - DeOxy facility: Oxygen trap including regeneration facility
- Sample tubing:** Sulfinert® tubing for inert sample path
- Application:** Custom configured analyser for the analysis of permanent gases (ASTM D2504, D2505) and other components in various samples
- Range:** 8 ppb - 100 ppm, dependant on the component. See also page 3
- Detection limit:** <10 ppb dependant on the component
- Repeatability:** 3 % RSD or better, depending on concentration level
- Sample requirements:** See our pre-installation guide for additional requirements.

For more information:

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