Global Analyser Solutions

Catalysis reaction gas analyser

- Analysis of permanent gases, hydrocarbons, aromatics, oxygenates, sulphur, etc.
- Fast: result in seconds
- Small 19" footprint
- Highly robust
- Exchangeable columns, programmable column
- Detectors: TCD, FID, PFPD, PDD, ePD, MS, VUV Luma

Get ready for ***tomorrow's analytics***

Global Analyser Solutions

GAS offers custom configured GC analysers for many application fields for over 50 years. GAS analysers are designed to meet many standardised methods from GPA, ASTM, UOP, ISO, EN and others. The efficient configurations are based on proven GC technology, resulting in robust, highly productive instruments with an optimal return on investment.

For monitoring reaction gases of catalysts, fast analysers for a wide range of components are demanded. Often limited space is available, and high robustness is essential because experiments may run 24/7 continuously. A flexible configuration is appreciated because the list of required components may change over time. The GAS CompactGC$^{4.0}$ is a proven and widely appreciated solution for these requirements.

Fast analysis using 1-4 analytical channels
Various available detectors

CompactGC$^{4.0}$ features up to 4 analytical channels for measuring a wide range of components. Various available detectors offer analysis from ppb to %, and provide selective detection in a complex sample matrix. TCD (Thermal Conductivity Detector) can analyse all components from ppm to %, while PDD (Pulsed Discharge Detector) operates in the ppb/ppm range. PFPD (Pulsed Flame Photometric Detector) analyses sulphur species down to 25 ppb, while FID (Flame Ionisation Detector) detects hydrocarbons over a wide concentration range. Other available detectors are ePD (Enhanced Plasma Detector), VUV LUMA (Photo Diode Array detector, fig 11), and MS (Mass Spectrometer).

A common configuration is shown in figure 1. Two channels with TCD are used for analysing permanent gases, followed by an FID channel for hydrocarbons and other organic components. The system is completed with a PFPD channel for sensitive and selective detection of sulphur components. The channels work in parallel, injecting and detecting the components simultaneously. Backflush columns are used to protect the analytical columns from high boiling components entering, and also for shortening the analysis time. Each column has a separate temperature setting for optimising separation and analysis time, which is usually shorter than 2 minutes.
Analysis time equals runtime, meaning the next analysis can start immediately after the previous one; no additional flush or conditioning is required. On the next page are example chromatograms. Figure 2 show the inside of a 4 channel CompactGC$^{4.0}$

Programmable column oven

A programmable column oven is available for samples with a large boiling point range. The column is directly heated by a low mass nickel wire, resulting in efficient heating with fast heating rates up to 500 °C/min. See figure 3.

Figure 2
4- channel CompactGC$^{4.0}$.

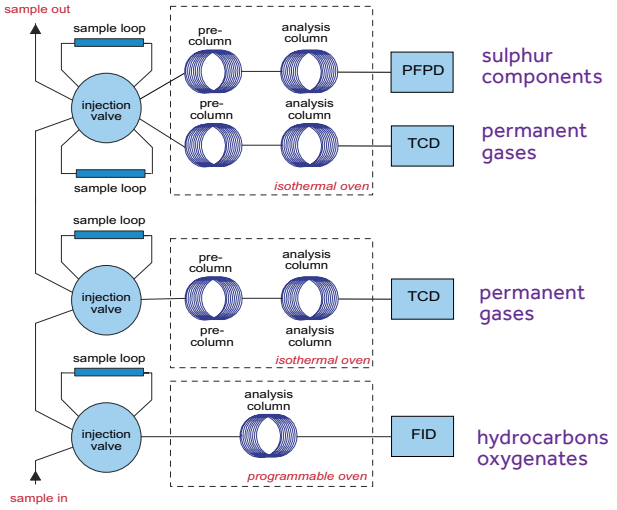

Figure 1. Example configuration CompactGC$^{4.0}$

Sampling from small volume / low pressure samples

In research experiments, low pressure or small volume reactors are often used, making accurate sampling challenging. CompactGC$^{4.0}$ offers a solution for low pressure and small volume sampling by vacuuming the sample loops down to 4 mbar. This means that only a few millilitres of the available sample are sufficient, and carry over is avoided. CompactGC$^{4.0}$, along with its sampling options and data system, can be mounted in a 19" cabinet (figure 12).

Multiple sampling points

Multiple sampling streams from different reactors or catalysts are analysed by a single instrument by using a stream selector valve, see figure 10. The sequence is programmed flexibly by the Chromeleon data system.

Robust & flexible

Robust diaphragm process valves guarantee unattended operation for many years (figure 13). Columns are replaced by the user in a minute, providing low operational costs and high flexibility.

Figure 3.
Capillary column with resistive heating provides fast heating rates and short run time.

Results

Figure 4-9 show example chromatograms. Please contact us for other applications.

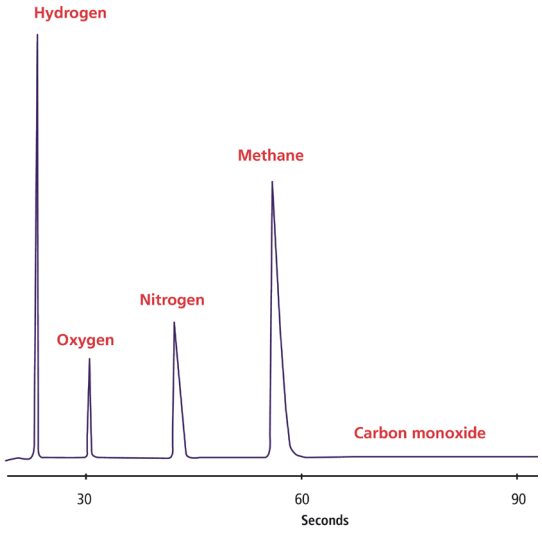

Figure 4. Permanent gases on Molsieve / TCD

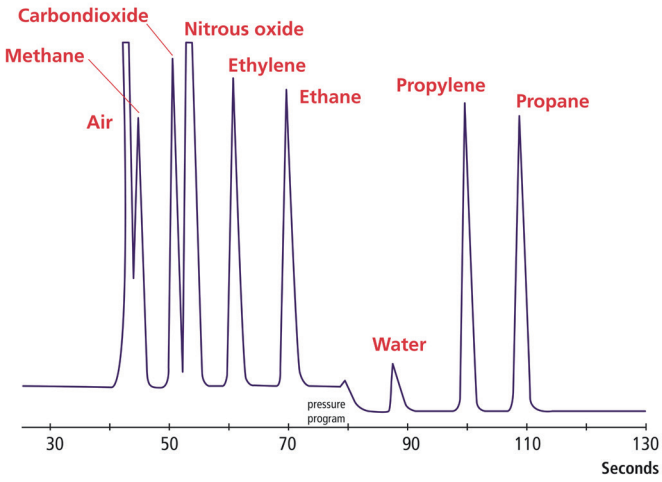

Figure 5. Permanent gases on RT-QBond / TCD

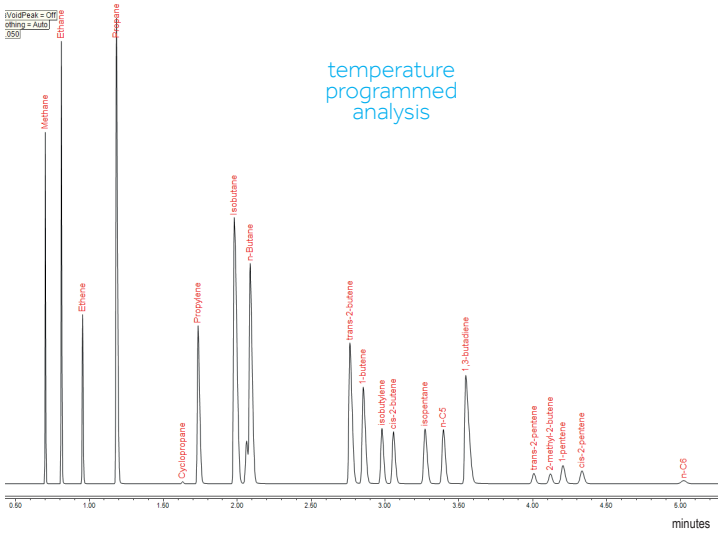

Figure 6. Hydrocarbons on MXT-Alumina-MAPD (50-200 °C) / FID

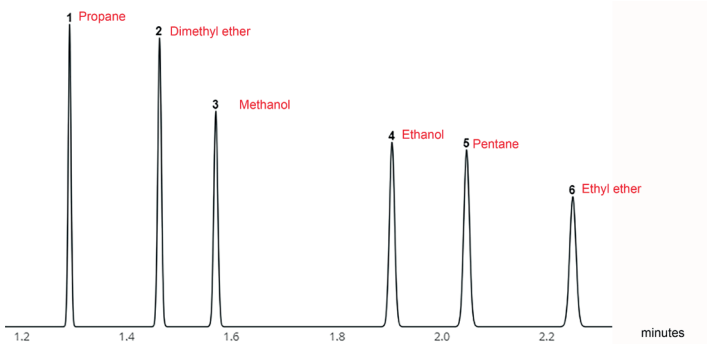

Figure 7. Ethers, alcohols and hydrocarbons on Rtx-502.2 / FID

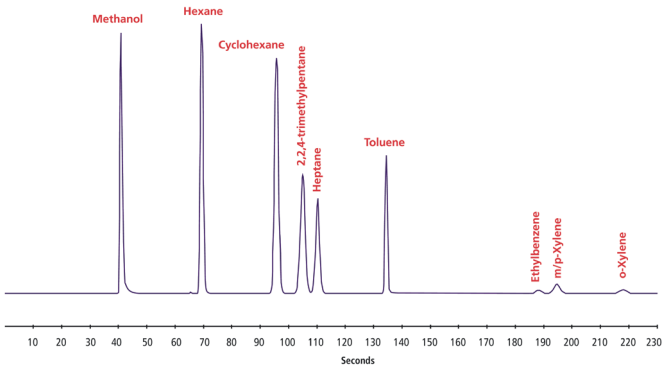

Figure 8. Hydrocarbons, aromatics and oxygenates on Rtx-1 / FID.

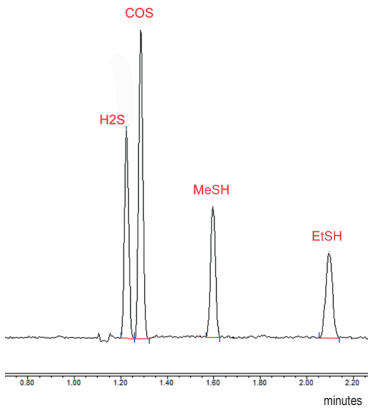

Figure 9. Sulphur components (sub-ppm level) / PFPD

Specification

Application:	Custom configured analyser for the analysis of catalysis reaction gases. For gaseous samples containing hydrocarbons, permanent gases, sulphur components, oxygenates, aromatics and others
Configuration:	1-4 channel analyser based on GAS CompactGC$^{4.0}$
Detectors:	TCD, FID, PFPD, PDD, ePD, MS, VUV LUMA PDA (fig. 11)
Column ovens:	Isothermal or temperature programmed
Optional:	- additional channels for ammonia, trace H_2, siloxanes, terpenes, heavier hydrocarbons and others - stream selection valve - stop flow valve - option for small volume sampling (requires only 1-2 ml)
Sample tubing:	Sulfinert® tubing for inert sample path (sulphur analysis)
Sample requirements:	See our pre-installation guide for additional requirements
Analysis Time:	depends on application; typical 2 minutes
Minimum detectability:	(dependent on sample matrix, component and retention time) TCD < 5 ppm FID < 0.1 ppm PFPD <25 ppb PDD < 10 ppb MS <1 ppb (AEI) VUV LUMA <50 ppb
Accuracy:	Dependent on external calibration and repeatability
Repeatability:	< 1 % RSD
Data systems:	Chromeleon, OpenLab

Figure 10.
Stream selector for analysing multiple streams

Figure 11.
VUV LUMA Photo Diode Array detector

Figure 12.
Cabinet enclosure with 2 CompactGC's, data system and sampling option

Figure 13.
Robust diaphragm valve with internal purge for millions of error-free injections