

Gas Chromatography. Flame Ionization Detector.

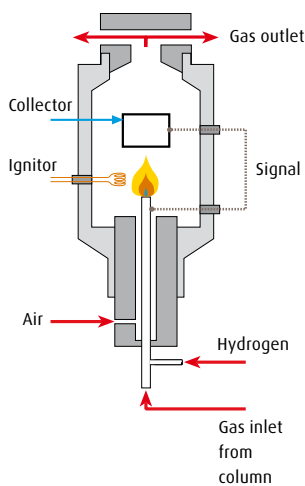
Gas chromatography

Information about gas chromatography in general can be found in the application sheet "Gas Chromatography" (GC).

Flame ionization detector

Flame Ionization Detector (FID) is one of the most used detectors for gas chromatography (GC). The application area is wide. For example, petrol for air planes, kerosines, are carefully analyzed with GC-FID as a routine control. The composition of the kerosines is of great importance for the energy conversion. A completely different area is packaging of food. Your take-away hamburger is wrapped in an insulating polystyrene box. During the processing of polystyrene different hydrocarbons are added to create the end-product. When polystyrene is used within food industry, it is crucial that the product is analyzed for any residues of the hydrocarbons, since they can harm the quality of the food and your health.

Analyze with GC-FID



The GC-FID is well suited for analysis of hydrocarbons such as methane, ethane, acetylene etc., but also for organic substances containing hydrocarbons and for volatile organic compounds (VOCs). In an FID the sample undergoes a combustion in a hydrogen/synthetic air flame. Ions and free electrons are formed in the flame. The charged particles produce a measurable current flow in the gap between two electrodes in the detector. The resulting current flow is of greater strength than the signal produced by the pure carrier gas and the fuel gas flame alone. This signal differential provides information about the sample. The current is proportional to the information which depends on the composition of the separated sample.

The FID is a general detector which, with extra configurations, can be used for more specific components. For example, with placing a methanizer ahead of the FID, components containing carbon can undergo a formation to methane and thereby be suited for further FID analysis. CO and CO₂ are commonly analyzed this way. For determination of organic nitrogen/phosphorus compounds a different FID configuration is needed. The sample passes a heated alkali source where charged particles are formed in contact with the alkali source. This method is normally named alkali flame ionization, also named thermionic detector and belongs to the group of detectors in which thermal energy is used as source for ionization. The abbreviation of this method is often NPD.

Flame ionization detectors are extremely sensitive and have a wide range of linearity. The only disadvantage is that it consumes the sample.

Gases

An important facet of the GC-FID is the use of a carrier gas to transfer the sample from the injector, through the column and into the FID-detector. The carrier gas must be inert and may not be adsorbed by the column material. Helium or nitrogen are normally used as carrier gas with GC-FID, and sometimes hydrogen.

The detector gases, hydrogen and synthetic air, serve respectively as fuel gas and oxidizing gas during the combustion process. Since hydrocarbon impurities, moisture and oxygen produce a greater baseline noise which has an adverse effect on the detection limit, these impurities in the detector gases should be kept as low as possible.

Like all chromatographic analytical processes, gas chromatography is a relative method, i.e. calibration with a standard mixture is required, both to check linearity and as calibration for the sample.

HiQ® product program

The HiQ® product program offers a wide range of pure gas qualities, calibration mixtures and equipment as well as components that fulfill the demands concerning analytical techniques such as Gas Chromatography - Flame Ionization Detector, (GC-FID).

Carrier and detector gases

To obtain optimal analytical results, AGA recommends the following gas qualities for GC-FID analysis:

Carrier gas	Instrument helium 4.6 or	product code 2057
	Instrument nitrogen 5.0	product code 2093
Fuel gas Oxidizing gas	Instrument hydrogen 4.5	product code 2056
	Instrument synthetic air 5.0	product code 2141

Specifications	Instrument He 4.6	Instrument N2 5.0	Instrument H2 4.5	Instrument synthetic air 5.0
Detector gases	O ₂	≤ 5 ppm	≤ 3 ppm	≤ 5 ppm
	CO			≤ 1 ppm
	CO ₂			≤ 1 ppm
	C _n H _m	≤ 1 ppm	≤ 1 ppm	≤ 0.1 ppm
	H ₂ O	≤ 5 ppm	≤ 3 ppm	≤ 5 ppm
	Product code	2057	2093	2065

Reduce the number of cylinders or H2 volume in your lab For research and special quality control analysis higher purities are available e.g., the 'Detector' qualities. You will find those and other purities in the HiQ® product program.
 Alternatives are:

N2 chrocar 40%	(40% H2 in N2)	product code 2536
He chrocar 8,5%	(8,5% H2 in He)	product code 2534
He chrocar 40%	(40% H2 in He)	product code 2535

Calibration mixtures AGA can offer a range of calibration and test gases for the FID detector to measure and calibrate the linearity of the detector, reproducibility and lifetime performance of the columns:

Composition	CH ₄ , C ₂ H ₆ , C ₃ H ₈ , n-C ₄ H ₁₀ & i-C ₄ H ₁₀ in N ₂	C ₂ H ₄ , C ₃ H ₆ , i-C ₄ H ₈ , cis-2-C ₄ H ₈ & t-2-C ₄ H ₁₀ in N ₂	
Name	Product code	Name	Product code
Alkane chrocal 10 ppm	2542	Alkene chrocal 10 ppm	2545
Alkane chrocal 100 ppm	2543	Alkene chrocal 100 ppm	2546
Alkane chrocal 1000 ppm	2544	Alkene chrocal 1000 ppm	2547

For other calibration mixtures please look into the HiQ® product catalog or ask your local sales representative.

Recommended central gas supply HiQ® REDLINE central gas supply systems for inert and non-reactive gases. Group green for single gas supply panels designed for pure gases and mixtures. Group blue for single stage supply panels with internal purging designed for high purity gases and mixtures including flammable gases.

Recommended cylinder regulator HiQ® REDLINE single stage regulator, C200/1 for carrier and auxiliary gases. For calibration gases HiQ® REDLINE two stage regulator, C200/2 provides a stable secondary outlet pressure. C200 regulators can be plain or equipped with a shut-off valve (type A) or a needle valve (type B). For GC-FID we recommend a C200 regulator in brass with a shut-off valve.

HiQ® REDLINE		Outlet pressure		Product code
		bar	psi	
Single stage	C200/1 A, brass	0.2-3	3-45	3100
Single stage	C200/1 A, brass	0.5-6	8-85	5467
Two stage	C200/2 A, brass	0.2-3	3-45	5482

More information Please look into our HiQ® catalog 'Biotech, Chemical, Petrochemical & Pharma-ceutical', look into our web site, <http://hiq.aga.com>, or contact your local AGA sales representative.

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