



Electron capture detector.

Gas chromatography with HiQ® specialty gases.

Gas chromatography

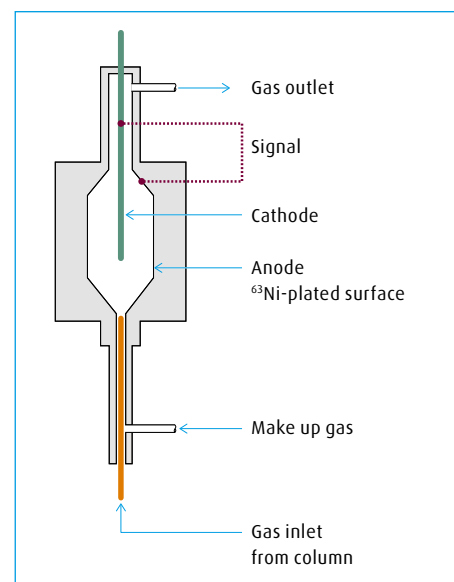
Information about gas chromatography in general can be found in the application sheet "Gas chromatography" (GC).

Electron capture detector

Environmental measurements of deposits, water and air are becoming more and more important in all parts of the world. One group of environmental threats are polyhalogenated organic compounds, such as polychlorinated biphenyls (PCBs), pesticides and other halogenated organics. Even small concentrations are causing damages and it is of great importance to be able to analyse those compounds correctly at low concentrations (ppm and ppb). GC using an electron capture detector (ECD) is a very sensitive method and is well suited for analysis of such polyhalogenated organic compounds.

Analysis using the ECD

In the electron capture detector, a beta emitter, such as radioactive tritium or ^{63}Ni , is used to ionise the carrier gas. Fast beta particles generated by the radioactive source collide with the molecules of the carrier or make-up gas. By impact ionisation, free slow-moving electrons are produced, which generate a measurable and steady current. If the GC effluent contains organic molecules with electronegative functional groups, such as halogens, phosphorous, peroxides and nitro groups, electrons will be captured and the current will be reduced. In comparison to a signal without sample compounds, the reduction in electron flow is proportional to the quantity of electrophile sample components.



Gases

An important facet of GC with an ECD is the carrier gas. The carrier gas transfers the sample from the injector, through the column and into the ECD. As for all GC techniques, the carrier gas must be inert and may not be adsorbed by the column material. Because the ECD is sensitive to water, the carrier gas must be dry. Besides, the halocarbon content must be as small as possible, since halocarbons are the typical compounds to be analysed with the ECD. Halocarbon-free helium or nitrogen are therefore essential as carrier gases for the ECD. To generate free slow-moving electrons, the ECD requires nitrogen or methane, where methane is used in a form of a methane/argon mixture. Both nitrogen and the methane mixture are used as make up gases as well as carrier gases. Like all chromatographic analytical processes, gas chromatography is a relative method, i. e. calibration with a standard mixture is required. In a first analysis, a certified standard mixture is measured. By comparable measurements, the sample components can be identified and their proportion, and thereby their concentration, determined.

The selection of gases, fittings and pipes as well as the installation is crucial to preserve the sensitivity, detection limits and reproducibility of a detector. Particular attention should be paid to these choices.

HiQ® product program

The HiQ specialty gas product program offers a wide range of pure gases, calibration mixtures and equipment as well as components that fulfill the requirements in terms of analytical techniques, such as GC using an ECD.

Carrier and make up gases

To obtain optimal analytical results, Linde recommends the following gas qualities for analysis using an ECD:

Specifications

	HiQ Helium 5.5 ECD	HiQ Nitrogen 5.5 ECD	HiQ Hydrogen 5.5 ECD
O ₂	≤ 1 ppm	≤ 1 ppm	≤ 1 ppm
N ₂	≤ 2 ppm		
Halocarbons as SF ₆	≤ 1 ppb	≤ 1 ppb	≤ 1 ppb
C _n H _m	≤ 0.1 ppm	≤ 0.1 ppm	≤ 0.1 ppm
H ₂ O	≤ 1 ppm	≤ 1 ppm	≤ 1 ppm
CO	≤ 0.5 ppm	≤ 0.5 ppm	≤ 0.5 ppm
CO ₂	≤ 0.5 ppm	≤ 0.5 ppm	≤ 0.5 ppm
Product code	118	138	129

	HiQ 5% Methane in Argon ECD	HiQ 10% Methane in Argon ECD
Component concentration	5 % CH ₄	10 % CH ₄
Balance gas	Argon	Argon
O ₂	< 1 ppm	< 1 ppm
H ₂ O	< 1 ppm	< 1 ppm
Halocarbons as SF ₆	< 1 ppb	< 1 ppb
Product code	6172	6173

Calibration mixtures

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

Specialty equipment

Linde's REDLINE® represents premium Specialty Equipment including cylinder regulators and the full range of equipment required for fixed gas distribution systems installations. REDLINE stretches from wall mounted automatic switch-over gas panels to shut off valves and furniture mounted point of use regulators. All REDLINE components are designed for use with high purity specialty gases up to 6.0 grade (99.9999%).

Recommended cylinder regulator

The REDLINE single stage regulator C200/1 for carrier and auxiliary gases. For calibration gases, the 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 using an ECD, we recommend a C200 regulator in brass with a shut-off valve.

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 consult your local Linde sales representative or visit our [website http://hiq.linde-gas.com](http://hiq.linde-gas.com).

Go to the HiQ smart phone site:



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