

# Application News

## No. G288

### Gas Chromatograph

## High-Sensitivity Simultaneous Analysis of Inorganic Gases and Light Hydrocarbons using Nexis GC-2030 Dual BID System

Analyses for inorganic gases and light hydrocarbons are implemented in a variety of fields including petrochemistry, catalysts, batteries and other resource and energy fields, and environmental fields.

The barrier discharge ionization detector (BID) installed in Nexis GC-2030 gas chromatograph is capable of detecting a wide variety of components with high sensitivity\*. Thanks to Shimadzu's proprietary barrier discharge technology, this detector features high sensitivity while maintaining the same level of stability as the previous general-purpose detectors.

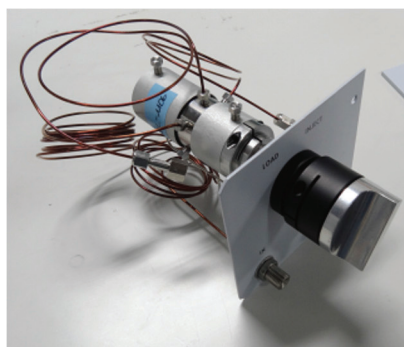
In this Application News, we introduce a high-sensitivity simultaneous analysis of inorganic gases and light hydrocarbons using Nexis GC-2030 gas chromatograph, which is equipped with two columns and two BID detectors.

\*Unable detect to helium and neon

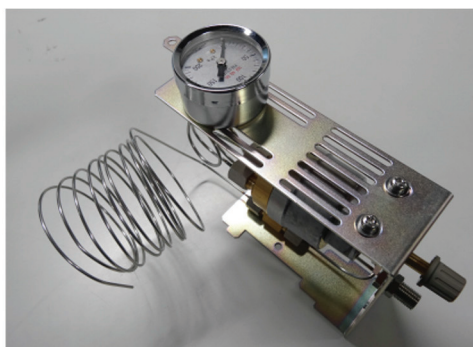
### ■ Instruments and Analytical Conditions

In this analysis, the MGS-2030 gas sampler was used for the introduction of gas into the instrument; the column was connected using the SPLITTER-INJ. The MGS-2030 is a manual gas sampler. A purge mechanism is included to reduce the leakage of peripheral air into the system. The SPLITTER-INJ refers to a special injection unit that permits split injection of the sample without requiring that it pass through the standard split/splitless injection unit. Using the MGS-2030 for sample gas injection together with the SPLITTER-INJ unit, it is possible to quantitatively analyze trace level air components, including Oxygen (O<sub>2</sub>), Nitrogen (N<sub>2</sub>), etc., with high accuracy.

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Valve Unit



Manual Flow Controller for Purge

Fig. 1 MGS-2030 Gas Sampler

Table 1 Analytical Conditions

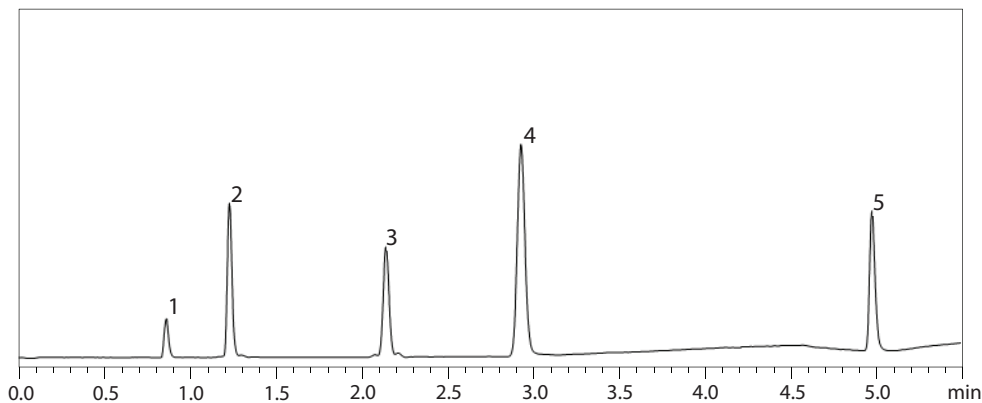
Model	: Nexis GC-2030
Detector	: BID-2030
Gas Sampler	: MGS-2030
Column	: Line1: Rt-Msieve 5A (0.32 mm I.D. × 15 m, d.f. = 30 μm) Line2: Rt-Q-BOND (0.32 mm I.D. × 30 m, d.f. = 10 μm)
Column Temperature	: 40 °C (3 min) - 40 °C /min - 200 °C (2 min) Total 9 min
Injection Mode	: Split 1 : 10
Purge Gas	: 3 mL/min (He)
Carrier Gas Controller	: Pressure (He)
Pressure Program	: 114 kPa (5 min) - 100 kPa/min - 200 kPa (3.14 min) Total 9 min
Detector Temperature	: 280 °C
Discharge Gas	: 50 mL/min (He)
Injection Volume	: 1 mL

■ Analysis Results

Only specific types of separation columns can be used for separation of inorganic gases and light hydrocarbons, and it is sometimes impossible to use a single column to separate all of the target components. Utilizing a dual

capillary column system, constructed using two detectors and two columns, enables faster, higher separation analysis of inorganic gases and light hydrocarbons than methods using only one column.

Line 1 Rt-Msieve5A Column



- 1: Hydrogen
- 2: Oxygen
- 3: Nitrogen
- 4: Methane
- 5: Carbon monoxide
- 6: Air + Carbon monoxide
- 7: Methane
- 8: Carbon dioxide
- 9: Ethylene
- 10: Acetylene
- 11: Ethane
- 12: Water

Line 2 Rt-Q-BOND Column

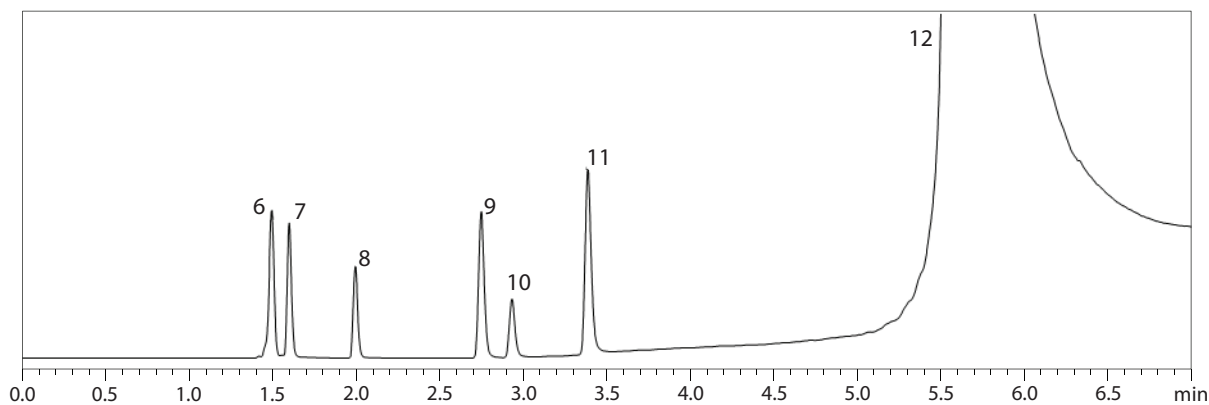


Fig. 2 Chromatogram for 5 ppm Mixed Gas\* \* Helium balance

Table 2 Repeatability of Area Values ( $\mu\text{V} \times \text{sec}$ ) for Each Component

	1	2	3	4	5	6	Ave.	RSD%
Hydrogen	3996	4010	4040	4052	4096	4105	4050	1.10
Oxygen	15036	14983	15023	14973	15009	15067	15015	0.23
Nitrogen	17021	16490	16510	16472	16566	16589	16608	1.25
Methane	35142	35412	35561	35625	35784	35970	35582	0.81
Carbon monoxide	17143	17237	17330	17371	17441	17499	17337	0.76
Carbon dioxide	25817	25812	25829	25779	25925	26010	25862	0.34
Ethylene	49433	49439	49527	49481	49714	49833	49571	0.33
Acetylene	37416	37436	37446	37440	37604	37717	37510	0.33
Ethane	67092	67187	67263	67357	67579	67701	67363	0.35

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