

High-Sensitivity Analysis of Impurities in Gas (1)

Gases used in a variety of fields, such as industrial, medical, and food, typically have to meet the established quality standards, which vary according to the application. This requires performing gas purity tests. The Shimadzu Tracera high-sensitivity gas chromatograph is equipped with a barrier discharge ionization detector (BID) that permits the simultaneous high-sensitivity analysis of inorganic gases and lower hydrocarbons.

This data sheet introduces the impurity analysis of ethylene and carbon dioxide food additives using Tracera.

Analysis Examples

1. Analysis of Impurities in Ethylene

Ethylene is an important chemical used as feedstock in a variety of applications and its purity is essential. Fig. 1 shows an ethylene chromatograph. H₂ (30 ppm), CO (2 ppm), CO₂ (15 ppm), and CH₄ (30 ppm) were detected as trace impurities.

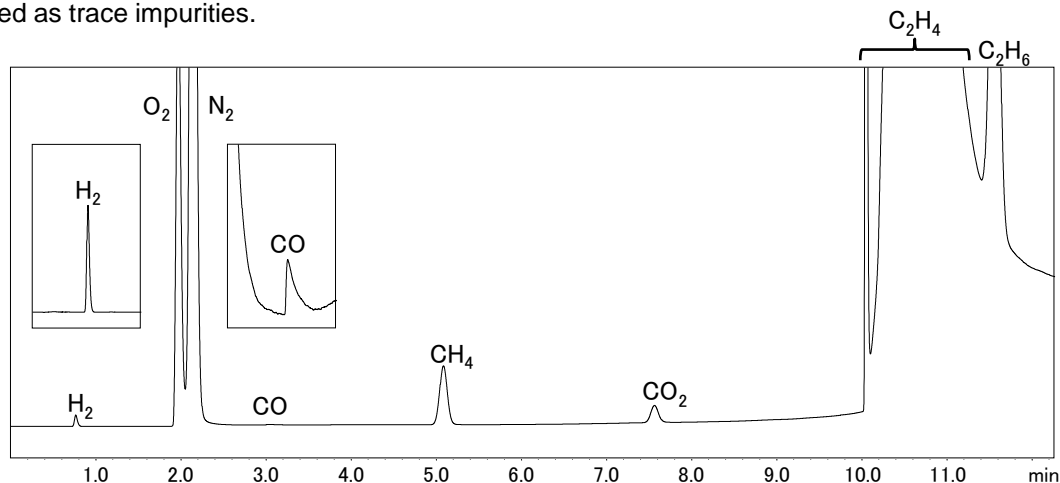


Fig. 1: Chromatogram of Impurities in Ethylene Note: With baseline correction

2. Impurity Analysis of Carbon Dioxide Food Additive

Quality standards have been established for carbon dioxide gas used as food additives to ensure that it contains no components harmful to human health.

Fig. 2 shows the chromatogram of a carbon dioxide food additive. Trace impurities of CH₄ (2.2 ppm) and C₂H₄ (1.5 ppm) were detected.

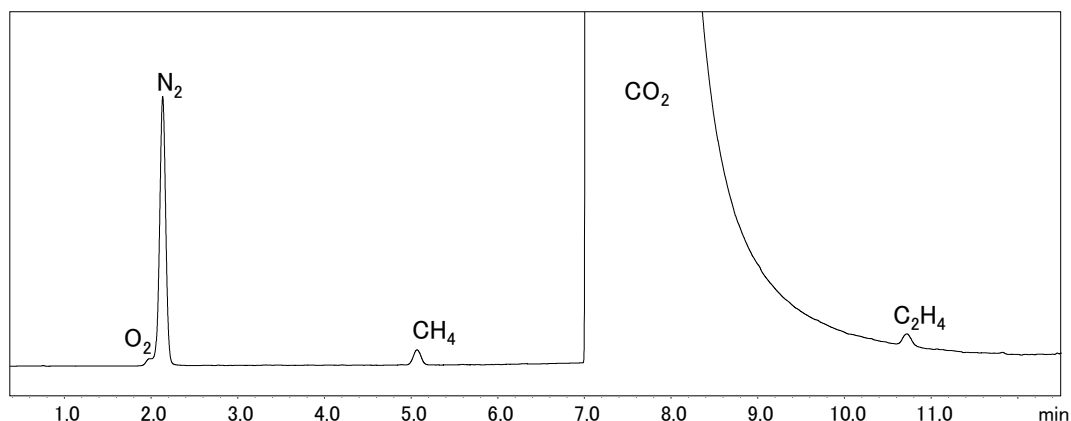


Fig. 2: Chromatogram of Impurities in Carbon Dioxide Food Additive

Note: With baseline correction

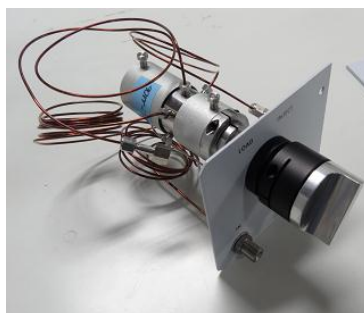
Instruments Used

Gas Chromatograph	Tracera (GC-2010 Plus A + BID-2010 Plus)
Gas Sampler	MGS-2010
Software	GCsolution



Tracera

Fig. 3: Shimadzu Tracera High-Sensitivity Gas Chromatograph



Valve Assembly



Manual Flow Controller for Purging

Fig. 4: MGS-2010 Gas Sampler

The MGS-2010 is a manual gas sampler for the GC-2010 Plus. It is equipped with a purge mechanism to reduce leakage of ambient air into the device. Using the helium-purged MGS-2010 to inject the sample gas when analyzing atmospheric components such as O₂ and N₂ with Tracera can reduce contamination from atmospheric air.

Analytical Conditions

Column	Micropacked ST
Column temp.	35 °C (2.5 min) – 20 °C /min - 250 °C (0 min) - 15 °C /min - 270 °C (5.42 min) Total: 20 min
Carrier gas	He
Carrier gas control	Pressure
Pressure program	250 kPa (2.5 min) – 15 kPa/min – 400 kPa (7.5 min) (He)
Injection mode	Split (1:5)
Injection port temp.	150 °C
Detector temp.	280 °C
Discharge gas	He: 70 mL/min
Injection volume	1 mL

First Edition: July, 2013