

Entrust the Analysis of Generated Gases and Reaction Gases to Us!

An Introduction to Shimadzu Gas Chromatographs



The analysis of generated gases and reaction gases requires an optimized system. At Shimadzu, we provide the optimal solutions to suit our customers' needs.

Analysis of Gases Inside Lithium Ion Rechargeable Batteries

Optimized System Suits the Analysis Objectives and Can Even Accommodate Multi-Component Analysis!

When evaluating the degradation of lithium ion rechargeable batteries, it is necessary to analyze the gases generated inside the battery. The structure of the gases and the quantity of each component can be investigated by injecting a sample of the internal gases into a gas chromatograph.

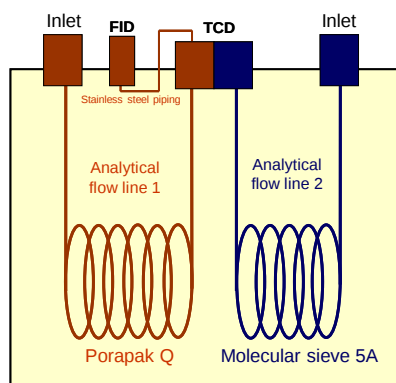
For this analysis, a GC-2014 gas chromatograph with a dual analytical flow line configuration was used to measure inorganic gas components (O_2 , N_2 , CO , and CO_2) and light hydrocarbon components (CH_4 , C_2H_4 , C_2H_6 , C_3H_6 , and C_3H_8).

The internal gas was sampled by inserting a gas-tight syringe into a structurally weak part of the lithium ion rechargeable battery, such as the pressure check valve. The sampled gas was diluted with a gas, such as argon, and then injected into the gas chromatograph.

In analytical flow line 1, which utilizes a Porapak Q column, TCD and FID are connected in series, enabling the measurement of CO_2 and light hydrocarbons from a single injection.

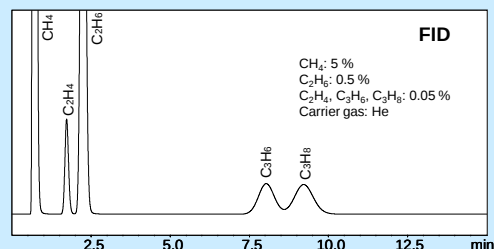
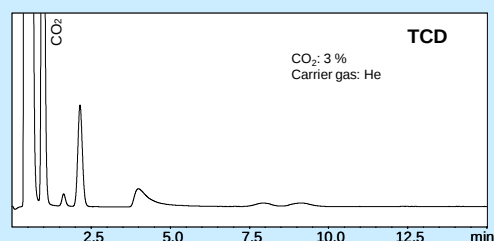


Shimadzu GC-2014 Gas Chromatograph



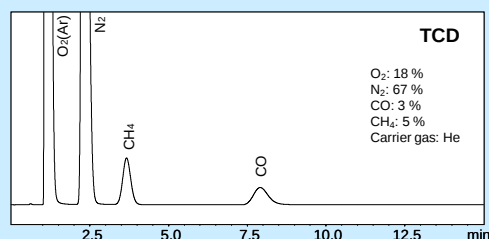
Schematic of the Analytical Flow Lines Inside the GC

Note 1: This is an offline sample injection from a gas-tight syringe.
Note 2: Sampling should ideally be performed in a glove box or other environment where the sample will not mix with air.



Analysis Data (Standard Gases)
from Analytical Flow Line 1

Note: Measured with TCD and FID connected in series



Analysis Data (Standard Gases)
from Analytical Flow Line 2

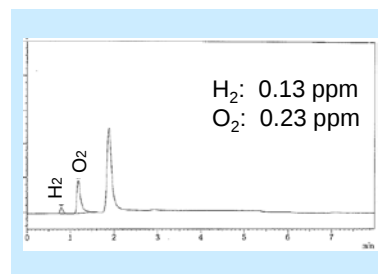
Analysis of Gases Generated by the Splitting of Water Using a Photocatalyst

Capable of High-Sensitivity Measurements at the Sub-ppm Level! Can also Accommodate Measurement Value Pressure Corrections!

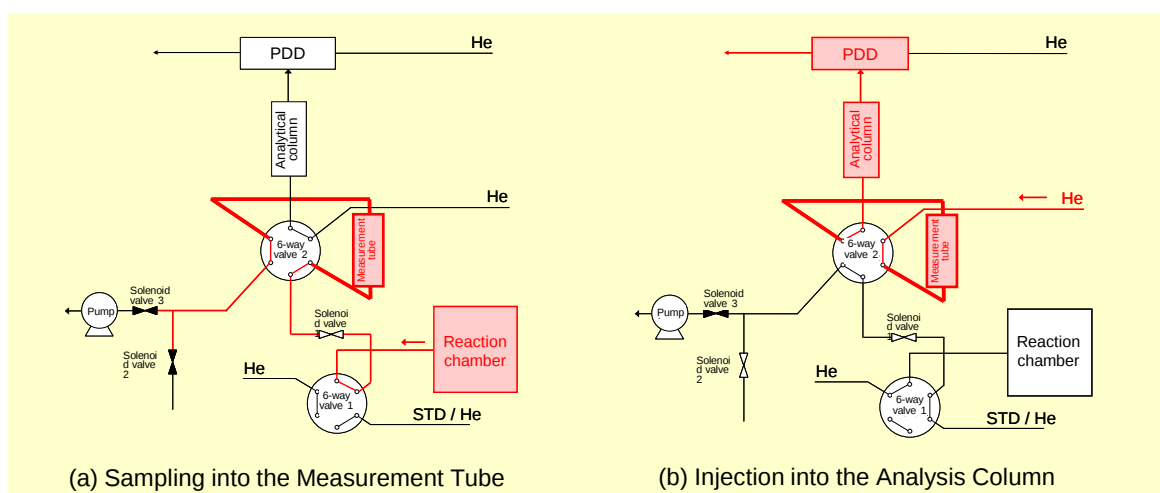
In the splitting of water using a photocatalyst, high-sensitivity measurements of the H_2 and O_2 generated must be performed in order to evaluate the catalyst efficiency. The gases generated inside the reaction chamber are sampled automatically to avoid contact with the outside air, and then measured at high sensitivity using a PDD (pulsed discharge detector). Introduced here is an analysis system combining the GC-2014 gas chromatograph, which is equipped with a PDD, with an automatic sampling line.

Flow Channel Configuration

The system's flow channels are shown in the figures below (a and b). The inside of the measurement tube is evacuated using a pump. The sample gas is then aspirated from inside the reaction chamber into the measurement tube through the operation of a solenoid valve (a). Next, 6-way valve 2 switches over, and the sample gas in the measurement tube is injected into the analysis column. After analysis in the column, the gas is measured by the PDD (b). All of the operations, from sampling to measurement, are performed automatically. In addition, measurements can be performed with only a few mL of sample gas.



PDD Analysis Data from Automatic Sampling
(Diluted Standard Gases)



Features of the GC-2014

Excellent Expandability

Can be equipped with up to three injection units and four detectors, and can accommodate both capillary and packed columns.

Can accommodate a variety of analysis needs.

High-Level Basic Performance

Incorporates high-end technology cultivated in our flagship models (the GC-2010 series).

Achieves excellent repeatability and sensitivity.

Other Analysis Systems

- Analysis of trace impurities in inorganic gases
- Analysis of trace components in automotive exhaust
- Analysis of trace quantities of ethylene oxide in air
- Structural analysis of LNG (liquefied natural gas)
- Analysis of trace quantities of ethylene generated by fruits and vegetables
- Analysis of trace quantities of N_2O in soil and air samples
- Analysis of trace impurities in ethylene and propylene

Shimadzu can provide the optimal system to suit a variety of requirements.



Shimadzu Corporation

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