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Application News

No. G320

Gas Chromatography

# Packed Column Analysis of Ethanol in Liquor Using Nexis™ GC-2030 (FID)

The Nexis GC-2030 gas chromatograph has recently begun to support packed columns. The detectors compatible with packed columns are a flame ionization detector (FID) and a thermal conductivity detector (TCD).

In this article, the amount of ethanol in liquor was analyzed using the Nexis GC-2030 (FID) with a glass-packed column in accordance with the analytical method prescribed by the Japanese National Tax Agency.

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## Packed Column Support System

The glass column that can be installed into the Nexis GC-2030, a system compatible with packed columns, is the same as that used for the GC-17 or GC-2010, and it can be shared between these instruments.

Using the FID-2030Packed kit (P/N: S221-85191-41), the FID-2030 can be easily modified to become a packed FID by:

- Replacing the standard nozzle for the FID with one for a packed FID;
- Removing the FID's capillary column adaptor.

Fig. 1 shows the appearance of the instrument and an example of glass column installation.


**Fig. 1 Appearance of Nexis™ GC-2030 and Example of Glass Column Installation**

## Extendable to Dual Line

A packed column analysis of samples with a column temperature program may cause greater baseline drift due to the elution of the liquid phase from the column, which can affect identification or quantitative processing.

The FID-2030 (compatible with packed columns) can be extended to a dual line system comprising a reference line, which has a sample vaporization chamber, column and detector, for elimination of baseline drift, as well as the sample line for analyzing samples.

## Example of Analysis
## Analysis of Ethanol in Liquor

According to the analytical method prescribed by the Japanese National Tax Agency, ethanol, as the standard sample, was diluted with water and prepared at concentrations of 5%, 10%, 15% and 20% (v/v). To 0.1 mL of each ethanol standard solution, 0.9 mL of the internal standard solution (acetone) was added to make samples that were analyzed to create the calibration curve. Actual samples of beer and Japanese sake available on the market were prepared. In the same manner as above, 0.9 mL of the internal standard solution was added to 0.1 mL of each liquor sample. These samples were analyzed, and the ethanol was quantified using the calibration curve created.

## Analysis Conditions

Table 1 lists the configuration of the instrument used for analysis and the analysis conditions.

**Table 1 Instrument Configuration and Analysis Conditions**

| | |
|---|---|
| Model | : Nexis GC-2030 /AOC-20i +SINJ-2030+FID-2030Packed Kit |
| Injection Mode | : Direct |
| Injection Volume | : 1.0 µL |
| Injection Temp. | : 200 °C |
| Carrier Gas | : $N_2$ |
| Carrier Gas Control | : Constant flow rate (35 mL/min) |
| Column | : PEG 1000 10% CW 60/80 AW-DMCS (2 m × 3 mm I.D.) |
| Column Temp. | : 100 °C |
| Detector | : Flame ionization detector (FID) |
| Detector Temp. | : 200 °C |
| Detector Gas | : $H_2$ 32.0 mL/min, Air 200 mL/min (no makeup gas required) |

## Chromatogram and Calibration Curve for Standard Samples

The chromatogram of the standard samples are shown in Fig. 2, and the calibration curve is shown in Fig. 3.

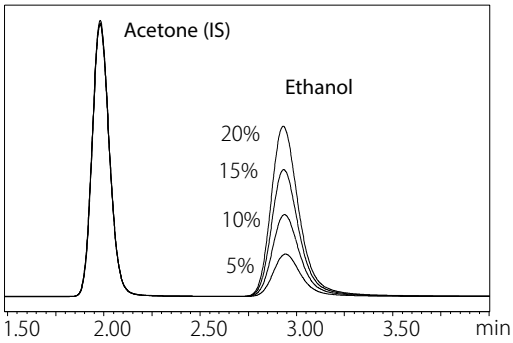


**Fig. 2 Chromatogram of Standard Samples**

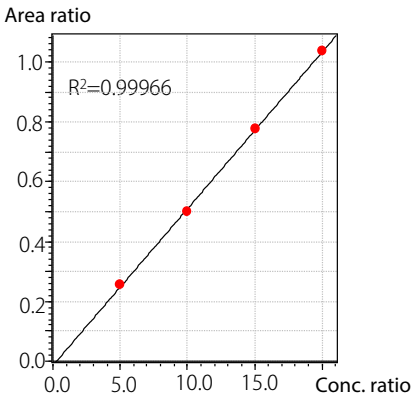


**Fig. 3 Calibration Curve for Ethanol**

## Chromatogram of Actual Samples and Quantitative Results for Ethanol

The quantitative results for beer and Japanese sake are shown in Table 2.

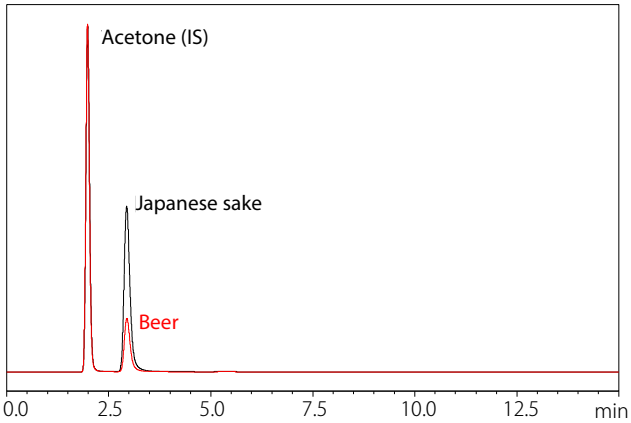


**Fig. 4 Chromatogram of Actual Samples**

**Table 2 Quantitative Results for Beer and Japanese Sake**

| | Beer | Japanese sake |
|---|---|---|
| Concentration value of analysis (%) n = 1 | 5.287 | 15.514 |
| n = 2 | 5.286 | 15.517 |
| n = 3 | 5.288 | 15.516 |
| n = 4 | 5.285 | 15.524 |
| n = 5 | 5.287 | 15.523 |
| n = 6 | 5.29 | 15.525 |
| n = 7 | 5.288 | 15.519 |
| n = 8 | 5.288 | 15.532 |
| n = 9 | 5.289 | 15.532 |
| n = 10 | 5.294 | 15.533 |
| Average | 5.288 | 15.524 |
| %RSD | 0.047 | 0.045 |

## Conclusion

With a glass packed column connected to the FID modified for packed columns in the Nexis GC-2030, ethanol in liquor was analyzed using a single line FID. The average concentrations of ethanol in liquor obtained using the same samples with the GC-2014 gas chromatograph are as follows: 5.31 (%RSD: 0.413) in beer and 15.56 (%RSD: 0.138) in Japanese sake. As these results are the same as those obtained using packed columns in conjunction with the GC-2014, they confirmed that packed analysis with GC-2030 could obtain favorable results.

**Optional Information on Nexis GC-2030**

The Nexis GC-2030 system makes a wide variety of useful options available.

<Oven light>
The light illuminating the entire oven makes column replacement easy. The moderate brightness illuminates the column connection areas while minimizing strain on the operator.



First Edition: Jun. 2020

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