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Application News

No. G292A

Gas Chromatograph

Analysis of Lower Aliphatic Aldehydes using Nexis GC-2030

Lower aliphatic aldehydes are known to be associated with sick building syndrome. Thus various regulations require strict control of their concentrations. A common method of analyzing lower aliphatic aldehydes is to utilize 2,4-dinitrophenylhydrazine (DNPH) derivatization. Trace level analysis of these compounds is then enabled by using a flame thermionic detector (FTD/NPD).

In this applications news, methods for collecting aldehydes in atmospheric air, extraction and elution using commercially available cartridges and the analysis of lower aliphatic aldehydes using GC-2030 with FTD-2030 are described.

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Fig. 1 Nexis GC-2030

Sample Collection Method

In this set-up, two commercially available cartridges saturated with 2,4-dinitrohydrazine are connected in series. The pump flow rate is set to about 0.1 L / min, and air sample is collected for 24 hours continuously. The amount of air extraction can be measured by using an integrating flow meter. In order to prevent decomposition of aldehyde-DNPHs by atmospheric ozone, install an ozone scrubber cartridge in front of the collection cartridge (Fig. 2).

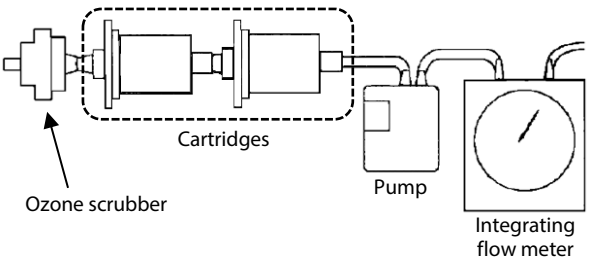


Fig. 2 Schematic Diagram of Collection Method

Cartridge Elution Method

The aldehydes react in the cartridge to form aldehyde-DNPHs and is eluted with acetonitrile. During elution, unreacted DNPH which may interfere with the analysis may also be eluted. This can be remove by using a cation exchange resin. Since acetonitrile can also be detected by FTD, the eluate should further be extracted with ethyl acetate (Fig. 3).

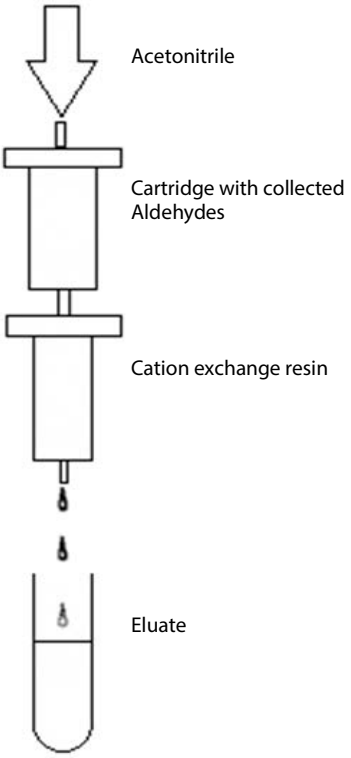
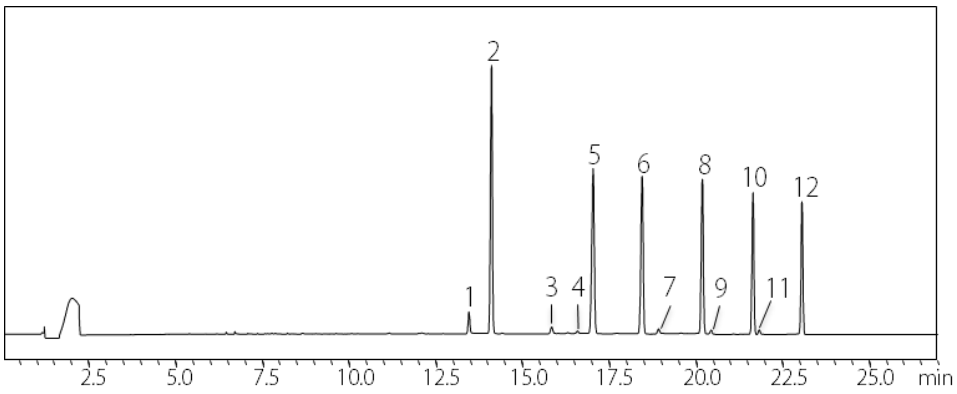


Fig. 3 Schematic Diagram of Elution Method Collection Method

Note

Trace amounts of aldehydes may also be present in containers, cartridges and in some reagents. Therefore, it is important to always analyze a blank before the actual sample. Depending on the cleanliness of the environment where extraction is performed, it is also possible that unwanted contaminants can make their way to the sample extract.

Analysis Results



1 : acetaldehyde-DNPH1
2 : acetaldehyde-DNPH2
3 : propionaldehyde-DNPH1
4 : i-butylaldehyde-DNPH1
5 : propionaldehyde-DNPH2
6 : i-butylaldehyde-DNPH2
7 : n-butylaldehyde-DNPH1
8 : n-butylaldehyde-DNPH2
9 : i-valeraldehyde-DNPH1
10: i-valeraldehyde-DNPH2
11: n-valeraldehyde-DNPH1
12: n-valeraldehyde-DNPH2

Fig. 4 Chromatogram for DNPH-Derivatized Lower Aliphatic Aldehydes (1 µg/mL Ethyl Acetate Solution)

* Stereoisomers exist for C2 and subsequent aldehydes-DNPH

Instruments Used and Analytical Conditions

Gas Chromatograph	Nexis GC-2030
Flame Thermionic Detector	FTD-2030
Autosampler	AOC-20i
Software	LabSolutions LC/GC
Injection Unit Temp.	200 °C
Carrier Gas	He (99.999 %)
Carrier Gas Control	Constant linear velocity (41.7 cm/sec, purge flowrate: 3 mL/min)
Injection Mode	Splitless (Sampling time: 1 min; then split (1:30))
Sample Injection Volume	1µL
Column	SH-5 (0.25 mm I.D. × 30 m, d.f. 0.25 µm) *1
Column Temp.	80 °C (1 min) - 20 °C/min - 200 °C (10 min) – 5 °C/min – 250 °C (0 min) Total 27 min
Detector Temp.	280 °C
Current	1.00 pA
Detector Gas Flowrate	H_2: 1.5 mL/min, Air: 145 mL/min
Makeup Gas Flowrate	27.5 mL/min (He)

*1 P/N: 221-75701-30

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