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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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).

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).

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

![Chromatogram for DNPH-Derivatized Lower Aliphatic Aldehydes (1 μg/mL Ethyl Acetate Solution)]

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**: 1 mL
- **Column**: Rtx®-5 (0.25 mm I.D. × 30 m, d.f. 0.25 mm)
- **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**: H₂: 1.5 mL/min, Air: 145 mL/min
- **Makeup Gas Flowrate**: 27.5 mL/min (He)