

HIGH PERFORMANCE LIQUID CHROMATOGRAPHY No. L240

Analysis of Aldehydes and Ketones in Atmosphere by High Performance Liquid Chromatograph

Recently, organic compounds contained in the atmosphere in the room or exhaust gases have come to call much attention. Particularly, most of volatile organic compounds like ketones and aldehydes are carcinogenic substances.

In addition, it is pointed out that depending on the exposure quantity, these organic compounds may cause sensitivity reaction, allergy, intoxication, and so on. It is known that in house environment the above

gases are generated from the adhesives used for the wall paper and vinyl cloth as well as from solvents of paints and varnish. Moreover, various aldehydes and ketones are contained in the exhaust gases.

Introduced in this article is the analysis by HPLC of aldehydes and ketones in the atmosphere in the house and in the open air.

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■ Analysis of Aldehydes and Ketones in the Atmosphere in the House

Concerning the monitoring and methods of analysis of harmful pollution materials in the environmental atmosphere, recommended methods for the analysis of 189 compounds have already been indicated by EPA (the Environmental Protection Agency, USA). Introduced in this article is an analysis of aldehydes in an air sample taken from inside the house in accordance with the analytical method recommended by EPA (TO METHOD-11).

By the "TO METHOD-11", an analytical method is proposed, whereby the sample air is passed through a silica gel cartridge coated with dinitro-phenylhydrazine (DNPH) in a acidic condition, and aldehydes and ketones are trapped as DNPH derivatives and are extracted by an organic solvent. This method allows highly efficient concentration of aldehydes or ketones to be made.

For the above method, a DNPH cartridge column was directly attached to the pump (Shimadzu VPC-10) by which an air sample was taken from the atmosphere, and after concentration, the sample was eluted with acetonitrile, and the solution was subjected to analysis.

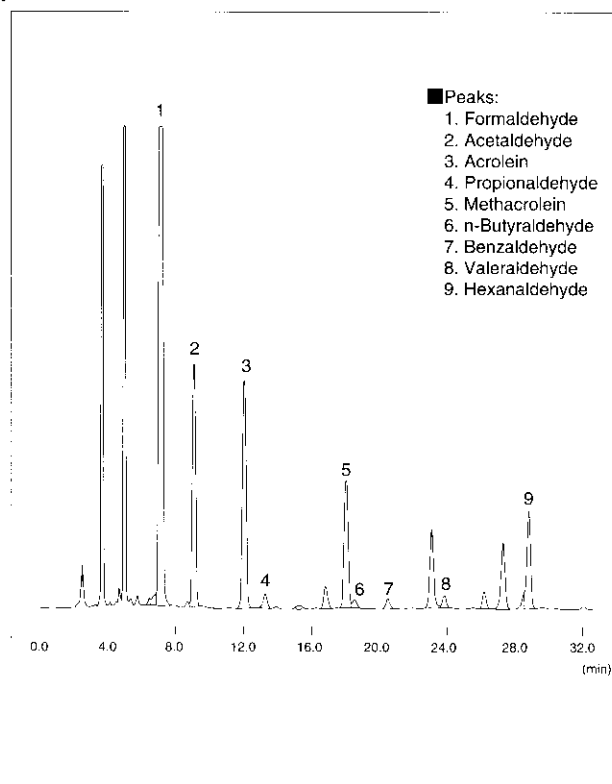


Fig.1 Analysis of Aldehydes and Ketones Taken from a Nursery Room

■ Analysis of Aldehydes and Ketones in Exhaust Gas

Next, an example of analysis of aldehydes and ketones in automobile exhaust gas is introduced here. When separating a sample of automobile exhaust gas by reversed phase chromatography and measuring the absorbances of the compounds contained, analysis becomes difficult because of the kinds of foreign substances and the large quantities of the components. Particularly, with respect to formaldehyde, which is characteristic of fast elution, overlapping or distortion of the peaks sometimes appear as shown in Fig. 2.

In such a case, use of methanol added to mobile solution A as shown in A may sometimes become effective.

Fig. 4 shows the results of analysis of 14 kinds of compounds in the group of aldehydes and ketones. (The samples were by courtesy of the Traffic Safety and Nuisance Research Institute, the Ministry of Transport.)

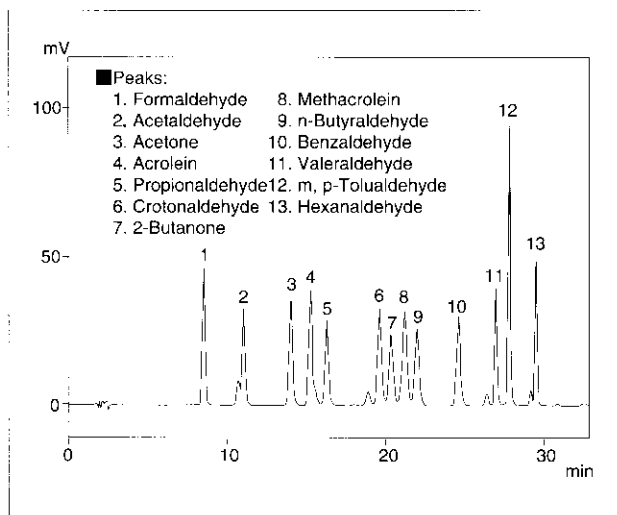


Fig. 4 Analysis of Standard Sample (each 1ppm, 10 μ L)

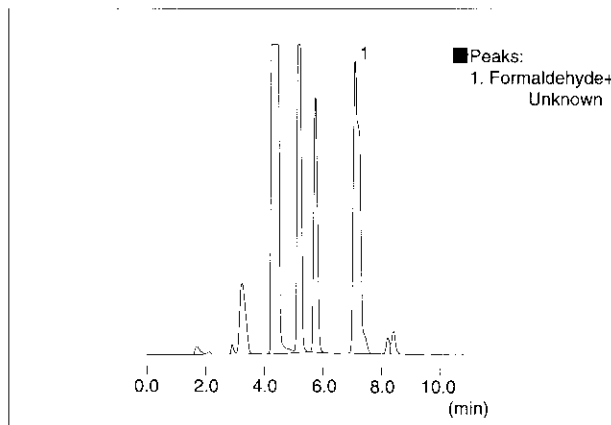


Fig. 2 Chromatogram of Formaldehyde Overlapped with Unknown Peak

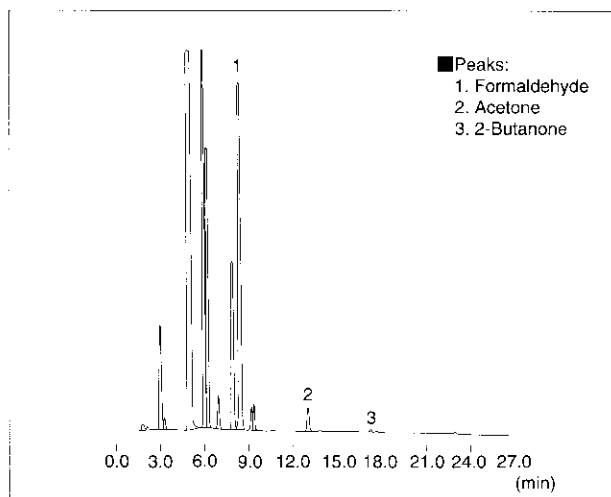


Fig. 3 Analysis of Exhaust Gas

Table 1 Analytical Conditions

Column	: STR ODS-II (4.6mmI.D. \times 150mmL.)
Mobile Phase	: A \rightarrow B Gradient Elution Method
	A: Water/Tetrahydrofuran/Methanol=70/10/20 (v/v/v)
	B: Water/Acetonitrile=30/70 (v/v)
Flow Rate	: 1.0mL/min.
Temperature	: 45°C
Inj. volume	: 10 μ L
Detection	: SPD-10AV at 365nm