

## Analysis of Formaldehyde in Air using Post-column Derivatization by High Performance Liquid Chromatography

### Introduction

It is becoming a big concern that aldehydes such as the formaldehyde and acetaldehyde as an environmental pollutant may contaminate the environment such as the atmosphere, lakes and marshes, reservoirs, and rivers. Therefore, it is monitored under various regulations like Air Pollution Control Law, Water Supply Law, and Offensive Odor Control Law in Japan. As a method to measure aldehydes in the atmosphere using HPLC, the general method employed is to collect aldehydes in the atmosphere using the sampler enclosing silicagel containing 2,4- DNPH and extracting aldehydes derivatized after collection by the acetonitrile. JASCO has introduced the analysis of formaldehyde and acetaldehyde by the post column fluorescence derivatization method using 1,3- cyclohexanedione as a labeling reagent.

This method is used to analyze aldehydes in the atmosphere. As a result, aldehydes in the atmosphere extracted by water were analyzed successfully as well as the source of aldehydes in water.

**Keyword :** Aldehydes, Passive gas tube, 1,3-Cyclohexanedione, Post column derivatization method, Shodex RSpak KC-811 6E, Fluorescence detector



Jasco PU-2080, DG-2080-53, LG-2080-02, AS-2055, CO-2060, UV-2070

**JASCO INC.**

28600 Mary's Court, Easton, MD 21601 USA  
Tel: (800) 333-5272, Fax: (410) 822-7526

Application Library: <http://www.jascoinc.com/applications>

## Experimental Equipment:

Eluent pump:	PU-2080
Reagent pump:	PU-2085
Degasser:	DG-2080-53
Autosampler:	AS-2057
Column oven:	CO-2060
Reaction oven:	RO-2061
Detector:	FP-2020

## Conditions:

Column:	Shodex RSpak KC-811 6E (6.0 mmID x 250 mmL)
Eluent:	3 mM Perchloric acid
Flow rate:	1.0 mL/min
Reagent:	1,3-Cyclohexanedione in ammonium acetate buffer
Reagent flow rate:	0.4 mL/min
Column temp.:	60°C
Reaction temp.:	120°C
Wavelength:	Ex. 366 nm, Em. 440 nm, Gain x10
Injection volume:	50 µL
Standard sample:	Formaldehyde 0.1 mg/mL

## Results

In figure 1, the 1,3-cyclohexanedione reaction during the post column derivatization method is shown and figure 2 illustrates system flow diagram.

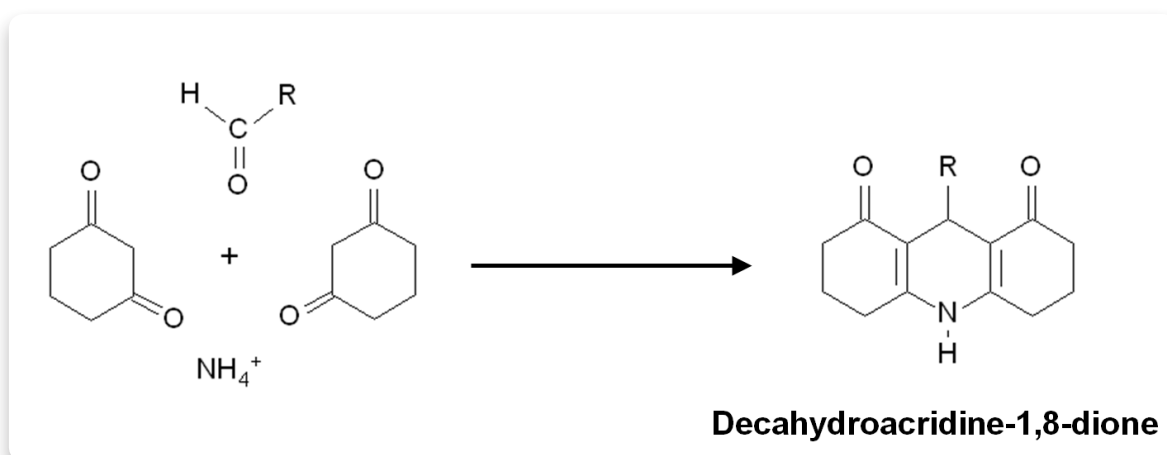
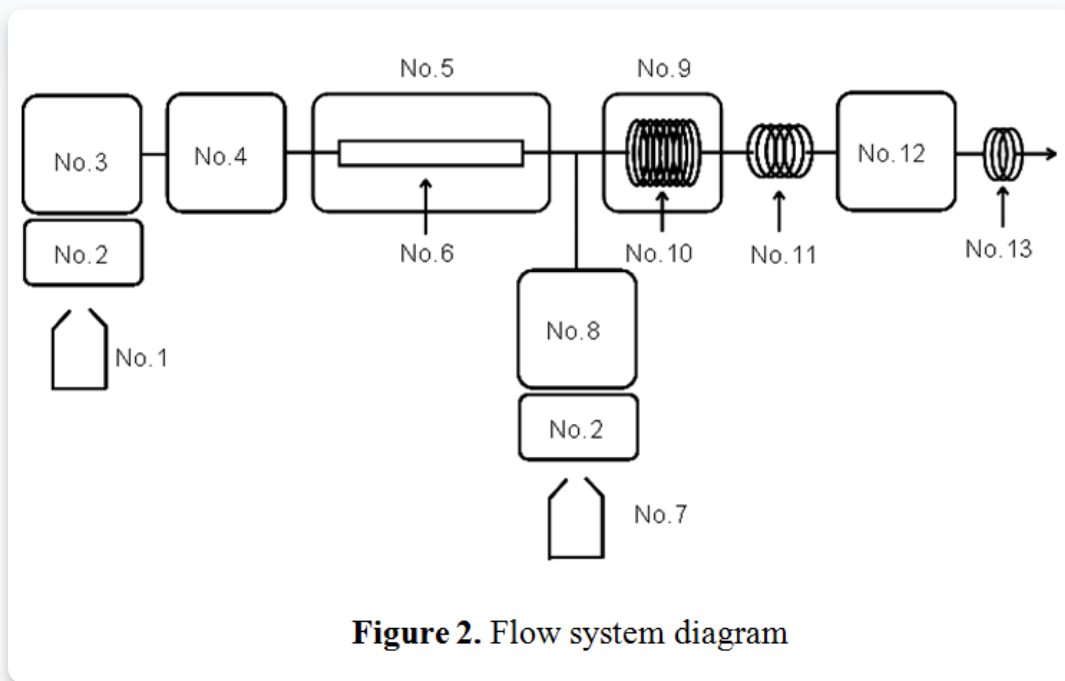


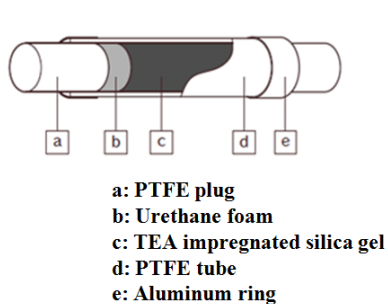
Figure 1. 1,3-Cyclohexanedione reaction during the post column derivatization method.



**Figure 2.** Flow system diagram

- No.1 : Eluent
- No.2 : Degasser (DG-2080-53)
- No.3 : Pump for eluent (PU-2080)
- No.4 : Autosampler (AS-2057)
- No.5 : Column oven (CO-2060)
- No.6 : Column (Shodex RSpak KC-811 6E)
- No.7 : Reagent
- No.8 : Pump for reagent (PU-2085)
- No.9 : Reaction oven (RO-2061)
- No.10: Reaction coil
- No.11: Cooling coil
- No.12: Fluorescence detector (FP-2020)
- No.13: Backpressure coil

Figure 3 explains the usage of the passive gas tube for collecting the sample in the atmosphere and figure 4 shows the extraction method from the passive gas tube.



Exposed this tube to atmosphere for 24 hours for collection.



Take out the TEA impregnated silica gel

**Adsorption agent (TEA impregnated silica gel)**

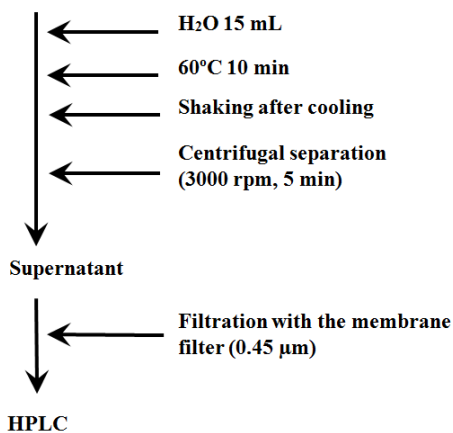


Figure 3. Usage of passive gas tube for collecting the sample in atmosphere

Figure 4. Extraction method from passive gas tube

Figure 5 shows the chromatogram of the sample in the laboratory atmosphere collected by the passive gas tube. The calculated concentration of formaldehyde obtained was 0.0054 mg/L.

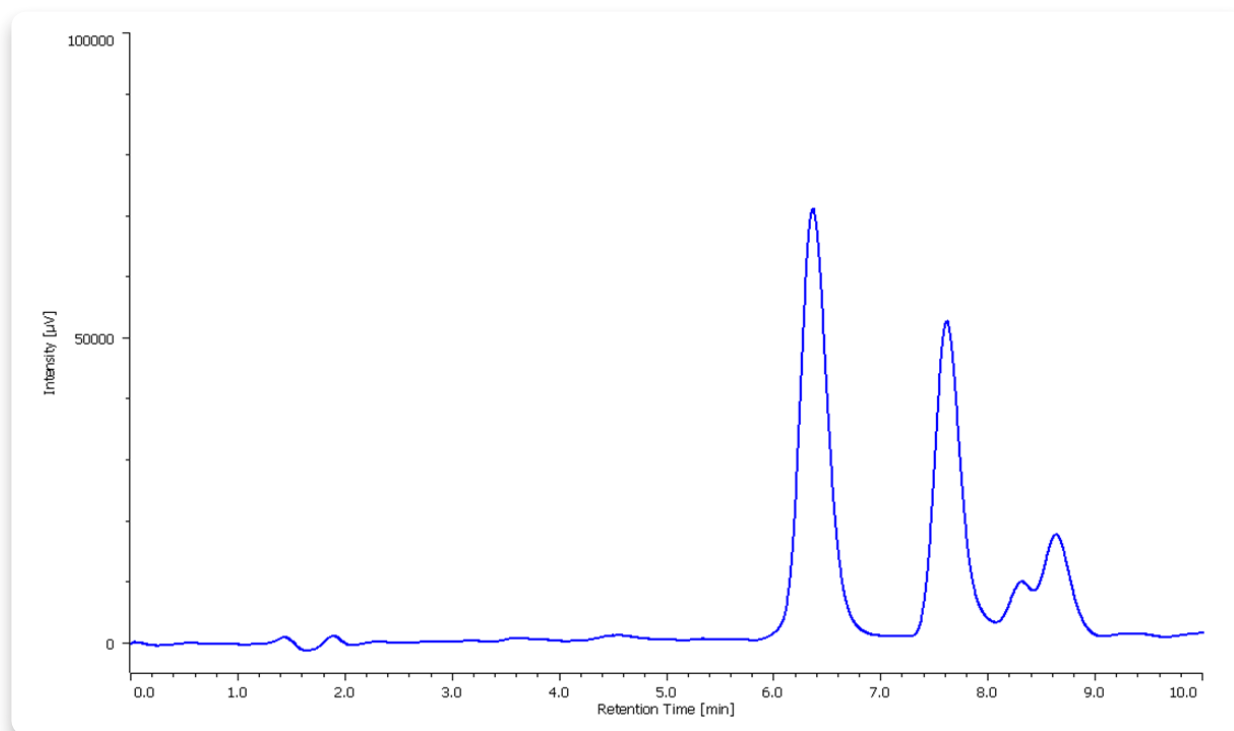


Figure 5. Chromatogram of sample in the laboratory atmosphere.  
Formaldehyde [0.0054 mg/L]