TEST REPORT

APPLICANT : KOREA-TAU
ADDRESS : 204, Seongyeon-ro, Seongyeon-myeon,
Seosan-si, Chungcheongnam-do, Korea

REPORT NO. RT23R-S5088-001-E DATE: Aug. 14, 2023

SAMPLE DESCRIPTION	: The following submitted sample(s) said to be:-
NAME/TYPE OF PRODUCT	: HT-Z1
SAMPLE ID NO.	: RT23R-S5088-001
MANUFACTURER/VENDOR	: KOREA-TAU
NAME OF BUYER	: SAMSUNG ELECTRONICS
SAMPLE RECEIVED	: Aug. 08, 2023
TESTING DATE	: Aug. 08, 2023 ~ Aug. 14, 2023
TEST METHOD(S)	: Please see the following page(s).
TEST RESULT(S)	: Please see the following page(s).

* Note 1 : The test results presented in this report refer only to the object tested.
* Note 2 : This report shall not be reproduced except in full without the written approval of the testing laboratory.

Approved by,

Jade Jang / Lab. Technical Manager

Authorized by,

Bo Park / Lab. General Manager

Authenticity check

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TEST REPORT

REPORT NO. RT23R-S5088-001-E DATE: Aug. 14, 2023

SAMPLE ID NO. : RT23R-S5088-001
SAMPLE DESCRIPTION : HT-Z1

TEST ITEM	UNIT	TEST METHOD	MDL	RESULT
Ethylene glycol monomethyl Ether (2-Methoxyethanol)	mg/kg	With reference to Intertek In-house method, determined by GC/MS	10	N.D.
Ethylene glycol monoethyl Ether (2-Ethoxyethanol)	mg/kg		10	N.D.
Ethylene glycol monomethyl ether acetate (2-Methoxyethyl acetate)	mg/kg		10	N.D.
Ethylene glycol monoethyl ether acetate (2-Ethoxyethyl acetate)	mg/kg		10	N.D.
Diethylene glycol dimethyl ether (Bis(2-methoxyethyl)ether)	mg/kg		10	N.D.
N,N-Dimethyl formamide (DMF)	mg/kg		10	N.D.
N,N-Dimethylacetamide (DMAC)	mg/kg		10	N.D.
Toluene	mg/kg	With reference to US EPA 5021A/8260C, determined by Headspace-GC/MS	10	N.D.
n-Hexane	mg/kg		10	N.D.
1-Bromopropane	mg/kg		10	N.D.
2-Bromopropane	mg/kg		10	N.D.

Tested by : Hayan Park

Notes : mg/kg = ppm = parts per million
< = Less than
N.D. = Not detected (<MDL)
MDL = Method detection limit
Remark : Headspace conditions
- Oven temperature : 90 ℃
- Heating time : 30 min

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TEST REPORT

REPORT NO. RT23R-S5088-001-E DATE: Aug. 14, 2023

SAMPLE ID NO. : RT23R-S5088-001
SAMPLE DESCRIPTION : HT-Z1

TEST ITEM	UNIT	TEST METHOD	MDL	RESULT
Benzene	mg/kg	With reference to US EPA 5021A/8260C, determined by Headspace-GC/MS	1	N.D.
Trichloroethylene (TCE)	mg/kg		1	N.D.
Tetrachloroethylene (PCE)	mg/kg		1	N.D.
Dichloromethane	mg/kg		1	N.D.
Carbon tetrachloride (CCl_4)	mg/kg		1	N.D.
Chloroform	mg/kg		1	N.D.
1,3-Butadiene	mg/kg		1	N.D.
Vinyl chloride	mg/kg		1	N.D.
Acrylonitrile	mg/kg		1	N.D.
1,2-Dichloropropane	mg/kg		1	N.D.
Ethylene oxide	mg/kg	With reference to Intertek In-house method, determined by GC/ECD	1	N.D.
Formaldehyde	mg/kg	With reference to US EPA8315A, determined by HPLC/DAD	1	N.D.

Tested by : Hayan Park, Jooyeon Lee

Notes : mg/kg = ppm = parts per million
< = Less than
N.D. = Not detected (<MDL)
MDL = Method detection limit
Remark : Headspace conditions
- Oven temperature : 90 ℃
- Heating time : 30 min

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TEST REPORT

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SAMPLE ID NO. : RT23R-S5088-001
SAMPLE DESCRIPTION : HT-Z1

* View of sample as received;-

***** End of Report *****

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Appendix ;

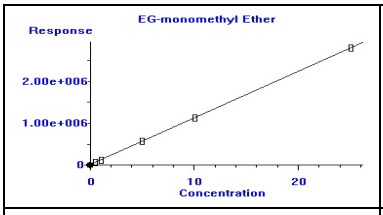
A. Ethylene Glycol

1. Preparation & Conditions

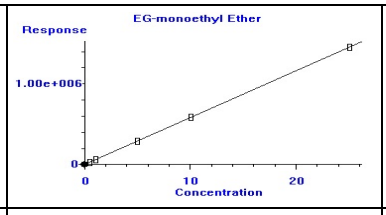
- Sample 1 g was extracted with solvent, using ultrasonic extraction. And then analyzed by GC/MS.

Test item	Column	Standard	DL	Initial oven temp.	Oven condition	Injection mode	Detection mode
2-Methoxyethanol	DB-624	Sigma Aldrich	1 mg/L	70 ℃	10℃/min to 250 ℃	Split-less	SIM
2-Ethoxyethanol							
2-Methoxyethyl acetate							
2-Ethoxyethyl acetate							
Bis(2-methoxyethyl)ether							
DMFa							
DMAc							

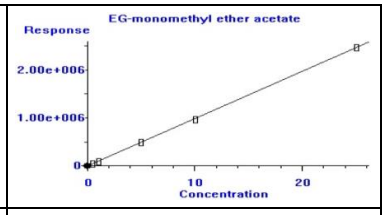
2. Information of calibration curve



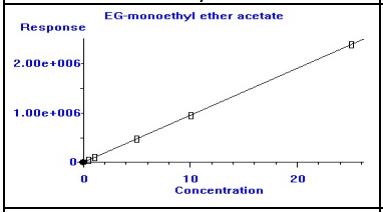
2-Methoxyethanol



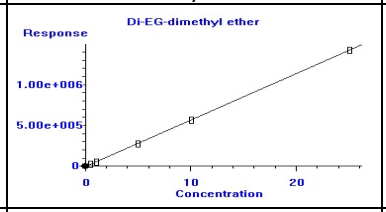
2-Ethoxyethanol



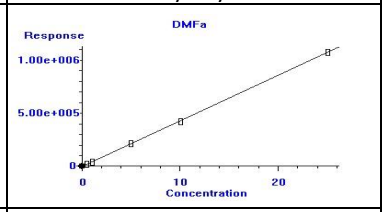
2-Methoxyethyl acetate



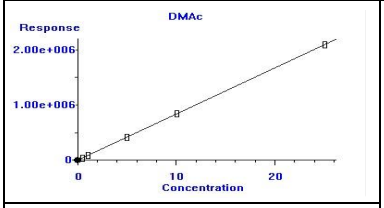
2-Ethoxyethyl acetate



Bis(2-methoxyethyl)ether



DMFa



DMAc

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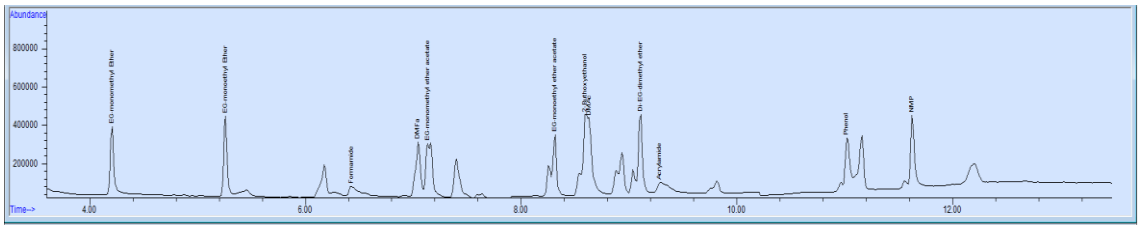
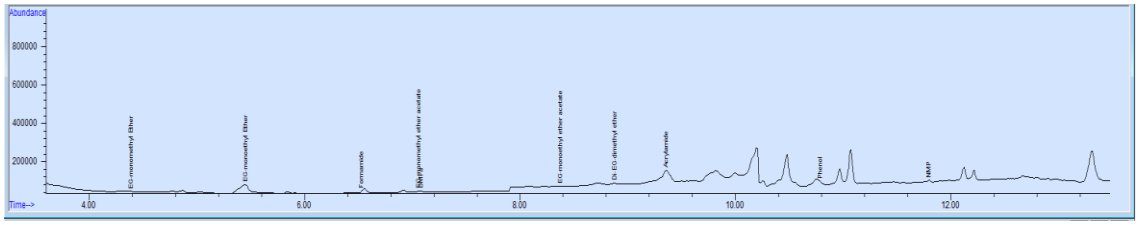
3. Chromatograph of Standard & Sample



Standard chromatogram-2-Methoxyethanol, 2-Ethoxyethanol, 2-Methoxyethyl acetate, 2-Ethoxyethyl acetate, Bis(2-methoxyethyl)ether, DMFa, DMAc



Sample chromatogram

4. Calculation and Result

Test item	Sample weight (g)	Final volume (mL)	Analyzed value (mg/L)	Calibration range	Result (mg/kg)
2-Methoxyethanol	1	10	N.D.	0.5 mg/L~ 25 mg/L	N.D.
2-Ethoxyethanol			N.D.		N.D.
2-Methoxyethyl acetate			N.D.		N.D.
2-Ethoxyethyl acetate			N.D.		N.D.
Bis(2-methoxyethyl)ether			N.D.		N.D.
DMFa			N.D.		N.D.
DMAc			N.D.		N.D.

$$\text{Result (mg/kg)} = \frac{\text{Analyzed value (mg/L)} \times 10\ \text{mL}}{\text{Sample weight (g)}}$$

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B. VOCs

1. Preparation & Conditions

- Preparation : Sample was volatilized in headspace vial. And then volatilized gas was analyzed by GC/MS.

Test item	Column	Standard	DL	Initial oven temp.	Oven condition	Injection mode	Detection mode
Toluene	DB-624	Accu standard	1 mg/L	40 ℃	5 ℃/min to 250 ℃	Split 5:1	SIM
n-Hexane							
1-Bromopropane							
2-Bromopropane							
Benzene							
Trichloroethylene (TCE)							
Tetrachloroethylene (PCE)							
Dichloromethane							
Carbon tetrachloride							
Chloroform							
1,3-Butadiene							
Vinyl chloride							
Acrylonitrile							
1,2-Dichloropropane							

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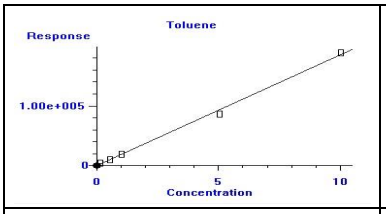
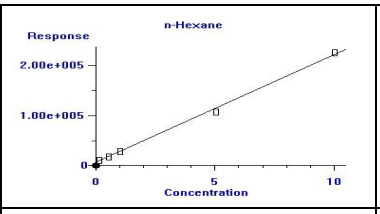
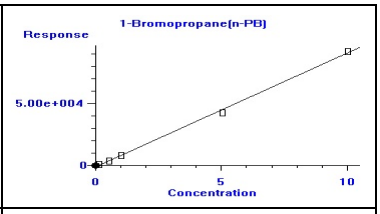
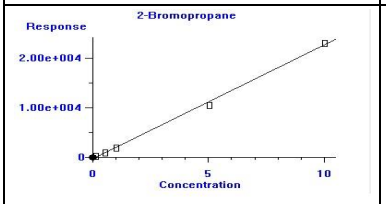
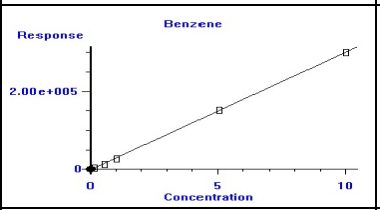
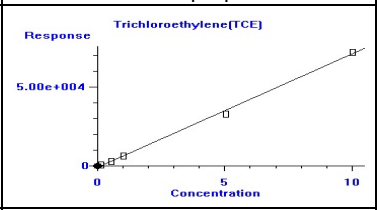
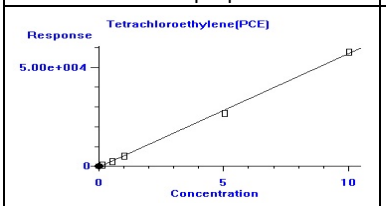
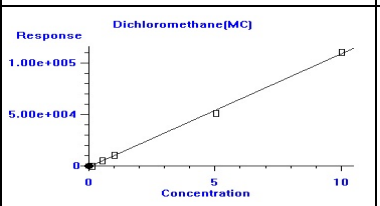
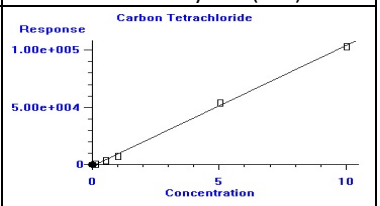
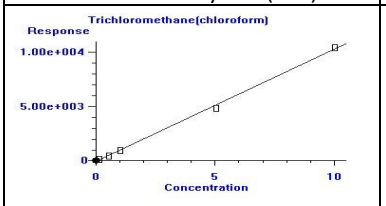
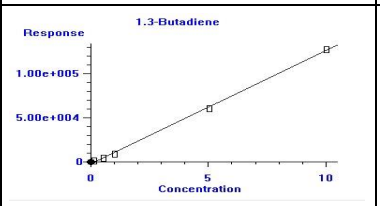
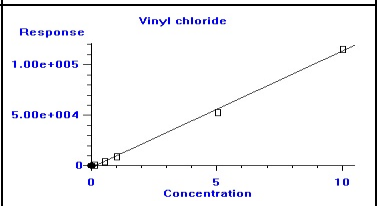
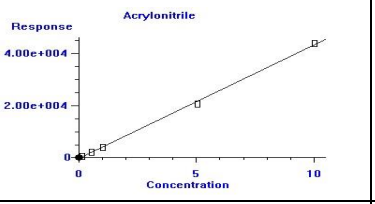
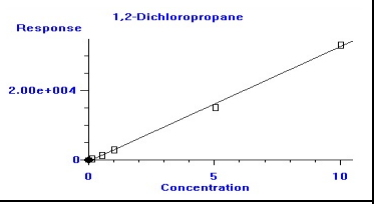
2. Information of calibration curve

		
Toluene	n-Hexane	1-Bromopropane
		
2-Bromopropane	Benzene	Trichloroethylene (TCE)
		
Tetrachloroethylene (PCE)	Dichloromethane	Carbon tetrachloride
		
Chloroform	1,3-Butadiene	Vinyl chloride
		
Acrylonitrile	1,2-Dichloropropane	

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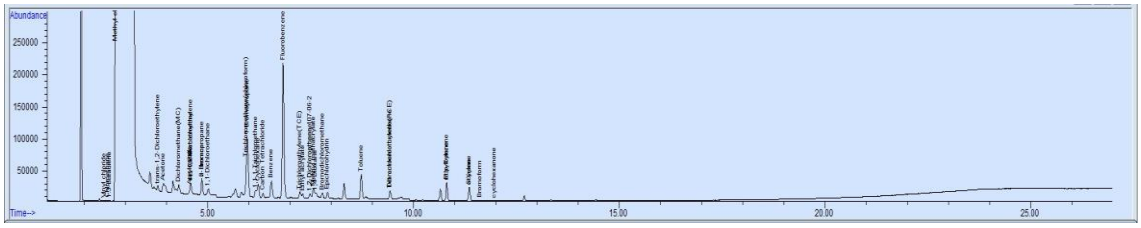
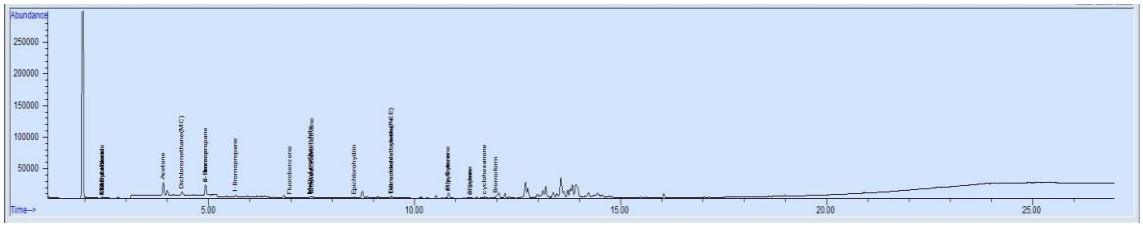
3. Chromatograph of Standard & Sample



Standard chromatogram – Toluene, n-Hexane, 1-Bromopropane, 2-Bromopropane, Benzene, TCE, PCE, Dichloromethane, Carbon tetrachloride, Chloroform, 1,3-Butadiene, Vinyl chloride, Acrylonitrile, 1,2-Dichloropropane



Sample chromatogram

4. Calculation and Result

Test item	Sample weight (g)	Final volume (mL)	Analyzed value (mg/L)	Calibration range	Result (mg/kg)
Toluene	1	10	N.D.	0.1 mg/L ~ 10 mg/L	N.D.
n-Hexane			N.D.		N.D.
1-Bromopropane			N.D.		N.D.
2-Bromopropane			N.D.		N.D.
Benzene			N.D.		N.D.
Trichloroethylene			N.D.		N.D.
Tetrachloroethylene			N.D.		N.D.
Dichloromethane			N.D.		N.D.
Carbon tetrachloride			N.D.		N.D.
Chloroform			N.D.		N.D.
1,3-Butadiene			N.D.		N.D.
Vinyl chloride			N.D.		N.D.
Acrylonitrile			N.D.		N.D.
1,2-Dichloropropane			N.D.		N.D.

$$\text{Result (mg/kg)} = \frac{\text{Analyzed value (mg/L)} \times 10\ \text{mL}}{\text{Sample weight (g)}}$$

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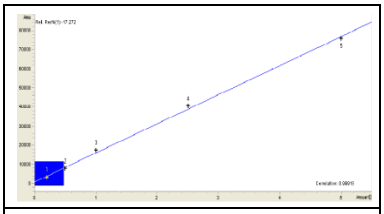
C. Ethylene oxide

1. Preparation & Conditions

- Preparation : Sample 1 g was extracted with solvent, using ultrasonic extraction and derivatization. And then analyzed by GC/ECD.

Test item	Column	Standard	DL	Initial oven temp.	Oven condition	Injection mode
Ethylene oxide	DB-5	Sigma Aldrich	0.5 mg/L	60 ℃	20℃/min to 120 ℃, 20℃/min to 200 ℃	Split-less

2. Information of calibration curve



Ethylene oxide

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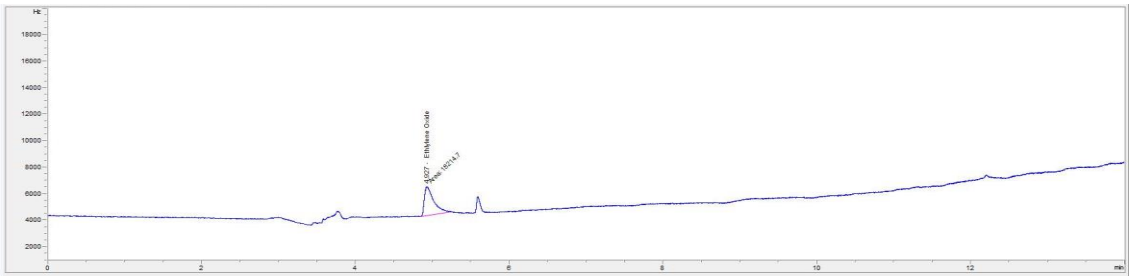
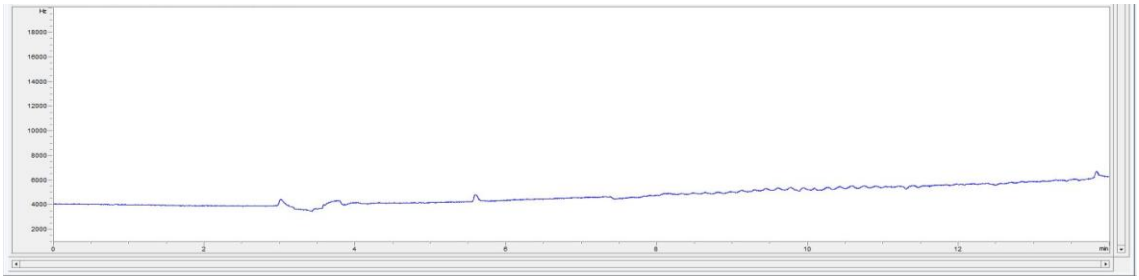
3. Chromatograph of Standard & Sample



Standard chromatogram-Ethylene oxide



Sample chromatogram

4. Calculation and Result

Test item	Sample weight (g)	Final volume (mL)	Analyzed value (mg/L)	Calibration range	Result (mg/kg)
Ethylene oxide	1	5	N.D.	0.2 mg/L 5 mg/L	N.D.

$$\text{Result (mg/kg)} = \frac{\text{Analyzed value (mg/L)} \times 5\ \text{mL}}{\text{Sample weight (g)}}$$

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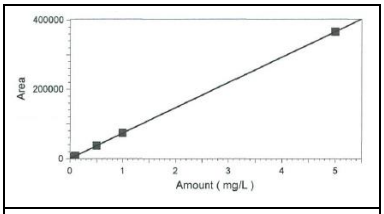
D. Formaldehyde

1. Preparation & Conditions

- Preparation : Sample was extracted with solvent and derivatization with DNPH. And then analyzed by HPLC.

Test item	Column	Standard	DL	Initial oven Temp.	Oven condition	Inlet mode	Detection mode
Formaldehyde	C18	Accustandard	0.1 mg/L	-	Gradient ACN:Water (60:40)	Flow : 1 ml/min	Wavelength 360 nm

2. Information of calibration curve



Formaldehyde

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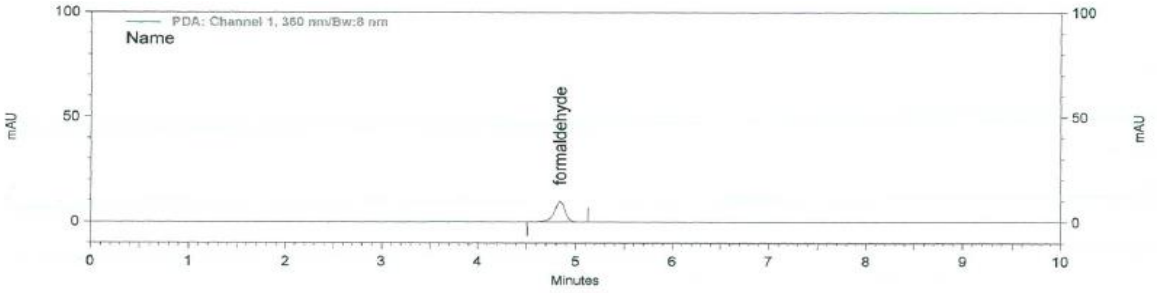
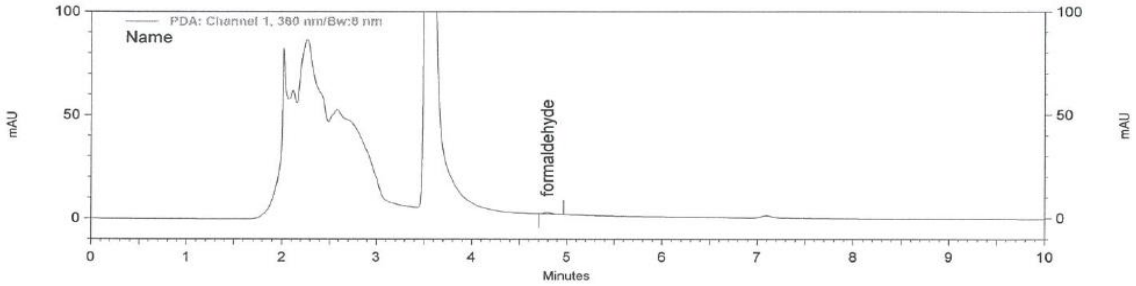
3. Chromatograph of Standard & Sample



Standard chromatogram-Formaldehyde



Sample chromatogram

4. Calculation and Result

Item	Sample (g)	Final Volume (mL)	Analyzed value (mg/L)	Calibration range	Result (㎎/kg)
Formaldehyde	5	50	N.D.	0.05 mg/L ~ 5 mg/L	N.D.

$$\text{Result (㎎/kg)} = \frac{\text{Analyzed value (mg/L)} \times 50\ \text{mL}}{\text{Sample (g)}}$$

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