FISON


# Gas Chromatography-Mass Spectrometry

## FM-GCMS-A100

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## 1. Introduction

**Gas Chromatography-Mass Spectrometry FM-GCMS-A100** supports an inlet temperature of up to 450°C, enabling a wide range of compound analysis. This is equipped with a turbo molecular pump, which maintains a stable vacuum environment essential for accurate analysis. Its column oven can achieve heating rates up to 120°C/min, facilitating faster analyses. Our GC-MS includes a dynode electron multiplier for superior sensitivity and detection of analytes.

## 2. Features

1. Versatile split injection modes
2. Integrated data processing system
3. Automated compound identification
4. High-speed scanning capability
5. Enhanced ion source efficiency

## 3. Specifications

| Model | FM-GCMS-A100 |
|---|---|
| **Inlet Temperature** | Max. 450°C |
| **Pressure Range** | 0 to 100 psi (±0.002 psi) |
| **Pressure Control Mode** | Electronic Pressure Control (EPC), supports Constant Volume (CV) and Constant Current (CC) |
| **Split Mode** | Split/Splitless, max. split ratio: 1000:1 |
| **Column Oven Temperature** | Room temperature + 4°C to 450°C |
| **Heating Rate** | Up to 120°C/min |
| **Temperature Programming** | 7 stages / 8 platforms |
| **Auto Sampler** | Optional |
| **EI Source Ionization Energy** | Adjustable from 5 eV to 250 eV |
| **Mass Range** | 1.5 to 1000 amu |
| **Resolution** | Unit resolution (full width at half maximum) |
| **Ion Source Temperature** | 100 to 350°C |
| **Filament Emission Current** | 0 to 350 μA |
| **GC-MS Temperature Interface** | Max. 450°C |
| **Stability** | ±0.10 amu over 48 hours |
| **Sensitivity** | Full scan, 1 pg OFN at m/z 272 with S/N ≥ 30:1 (RMS) |
| **Scan Rate** | Up to 10,000 amu/s |
| **Vacuum** | Turbo molecular pump (67 L/s) |
| **Detector** | High-energy dynode electron multiplier |
| **Power Consumption** | 3000W |
| **Dimensions (L×H×W)** | 500 ×480 ×1200 mm |
| **Weight** | 200kg |

## 4. Applications

Gas Chromatography-Mass Spectrometry FM-GCMS-A100 is widely used in environmental monitoring, food safety, petrochemical analysis, and pharmaceutical research. It is essential for detecting pollutants, analyzing additives, and identifying trace compounds in various industries.

# 5. Operations

## 5.1 Analysis of phthalates

### 1) Analysis Condition

**Column:** DB-5MS, 30 m × 0.25 mm × 0.25 μm
**Injection Mode:** Splitless
**Injection Time:** 1.2 min
**Carrier Gas Flow Rate:** 1 mL/min (constant flow mode)
**Inlet Temperature:** 280°C
**Ion Source Temperature:** 250°C
**Interface Temperature:** 280°C
**Solvent Rinse Time:** 4 min
**Oven Temperature:** 60°C (hold for 4 min)

### 2) Phthalates standard spectra and parameters

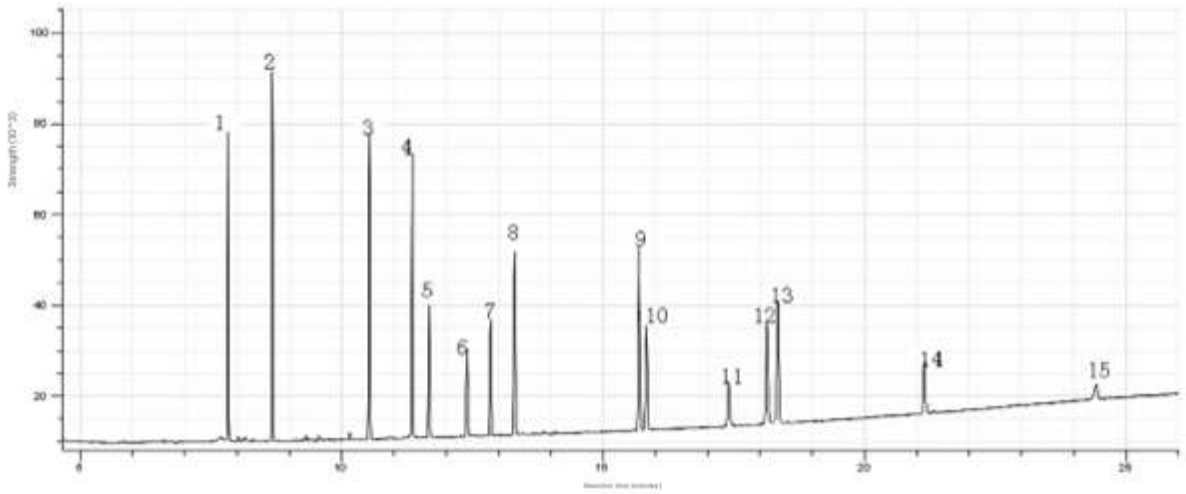


**Figure 1** Kinds of phthalates standard TIC

**Phthalates component name, retention time, and characteristic ions**

| Ingredient Name | Retention time (min) | Target ion (m/z) | Reference ion (m/z) |
|---|---|---|---|
| Dimethyl phthalate (DMP) | 7.83 | 163 | 77,133 |
| Diethyl phthalate (DEP) | 8.68 | 149 | 177,176 |
| Phthalic acid diisobutyl (DIBP) | 10.53 | 149 | 57,150 |
| Dibutyl phthalate (DBP) | 11.36 | 149 | 150,205 |

| | | | |
|---|---|---|---|
| Phthalate,di(2 - methoxy) ester (DMEP) | 11.68 | 59 | 149 and 104 haplotypes |
| Phthalate,di(4–methoxy - 2 - pentyl) carbonate BMPP) | 12.40 | 149 | 85,167 |
| Phthalate, bis (2-ethoxy)-ethyl ester (DEEP) | 12.85 | 149 | 73,72 |
| Dipentyl phthalate ester (DPP) | 13.31 | 149 | 150,237 |
| Phthalate, dihexyl ester(DHXP) | 15.69 | 149 | 150,251 |
| Phthalate, butyl benzyl phthalate (BBP) | 15.83 | 149 | 91,206 |
| Phthalic acid (2-butoxy)ethyl (DBEP) | 17.40 | 149 | 57,193 |
| Phthalate, dicyclohexyl phthalate (DCHP) | 18.13 | 149 | 167,249 |
| Phthalate, di (2-ethyl)hexyl acrylate (DEHP) | 18.35 | 149 | 167,279 |
| Phthalate,di-n-octyl phthalate (DNOP) | 21.15 | 149 | 150,279 |
| O-dinonyl phthalate (DNP) | 24.43 | 149 | 150,293 |

## 5.2 Analysis of polybrominated biphenyls, polybrominated diphenyl ethers

**Analysis Condition**

**Column:** DB-5MS, 15 m × 0.25 mm × 0.1 μm
Injection Mode: Splitless
Injection Time: 1.2 min
Carrier Gas Flow: 1.3 mL/min (constant flow mode)
Inlet Temperature: 280°C
Ion Source Temperature: 280°C
Interface Temperature: 310°C
Solvent Clearing Time: 3 min
Scan Range: 50–1000 m/z
**Column Temperature Program**:

- Initial Temperature: 100°C (hold for 2 min)
- Ramp Rate: 20°C/min to 240°C
- Ramp Rate: 30°C/min to 320°C (hold for 5 min)

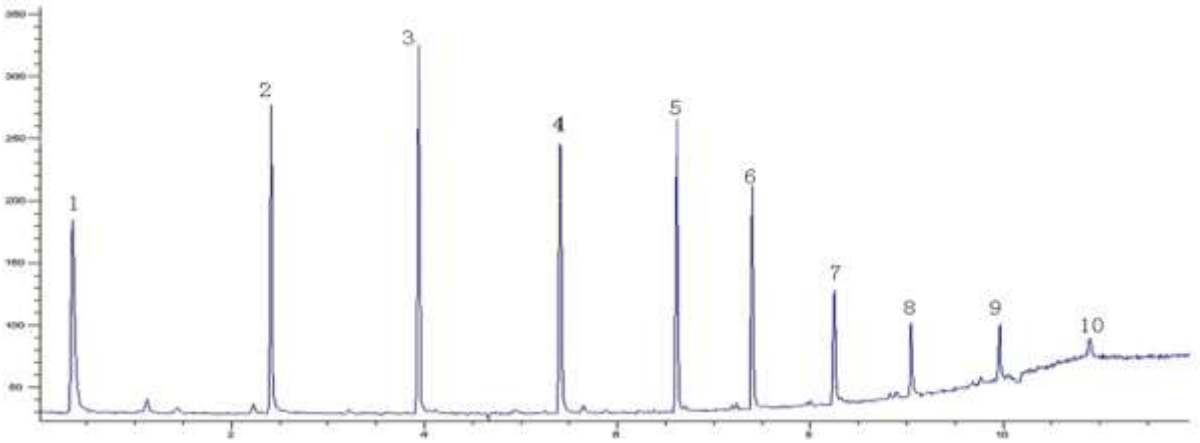


**Figure-2** Polybrominated diphenyl ethers standard solution TIC Figure (2mg / L)

**Polybrominated diphenyl ethers component name, retention time and characteristic ions**

| Ingredient Name | Retention time/min | Reference ion |
|---|---|---|
| A polybrominated diphenyl ether monobromobiphenyl ether | 0.373 | 250,248,141 |
| Dibromobiphenyl ether dibromobiphenyl ether | 2.392 | 328,326,168 |
| The three polybrominated diphenyl ethers tribromobiphenyl ether | 3.918 | 408,406,248 |
| Tetrabromodiphenyl ether tetrabromobiphenyl ether | 5.382 | 488,486,326 |
| Pentabromodiphenylether pentabromobiphenyl ether | 6.629 | 564,406,404 |
| Six polybrominated diphenyl ethers hexabromobiphenyl ether | 7.374 | 643,484,482 |
| Seven polybrominated diphenyl ethers heptabromobiphenyl ether | 8.251 | 722,562,456 |
| Octa octabromobiphenyl ether | 9.108 | 801,642,639 |
| Nine polybrominated diphenyl ethers nonabromobiphenyl ether | 9.947 | 881,721,719 |
| Decabromodiphenyl ether decabromobiphenyl ether | 10.752 | 959,799,797 |

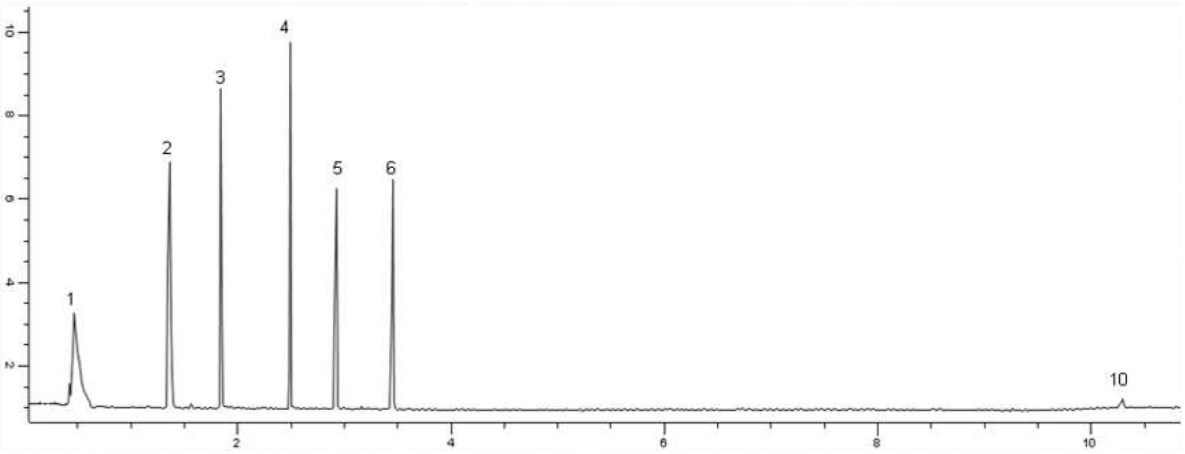


**Figure-3** part of the standard solution of polybrominated diphenyl TIC Figure (5mg / L)

**Part of polybrominated biphenyls component name, retention time and characteristic ions**

| Ingredient Name | Retention time/min | Reference ion |
|---|---|---|
| Monobromobiphenyl monobromobiphenyl | 0.472 | 234,232,152 |
| Dibromobiphenyl dibromobiphenyl | 1.356 | 312,310,152 |
| Tribromobiphenyl tribromobiphenyl | 1.844 | 392,390,230 |
| Tetrabromodiphenyl tetrabromobiphenyl | 2.503 | 470,310,308 |
| Pentabromodiphenyl pentabromobiphenyl | 2.927 | 550,390,388 |
| Hexabromobiphenyl hexabromobiphenyl | 3.456 | 628,468,466 |
| Decabromodiphenyl decabromobiphenyl | 10.303 | 944,783,781 |

## 5.3 Analysis of Pesticide Residues

### 1) Organophosphorus pesticide analysis

**Column**: DB-5MS, 30m x 0.25mm x 0.25μm
**Injection port temperature**: 230°C
**Interface temperature**: 260°C
**Ion source temperature**: 220°C
**Oven temperature program**:

- 50°C (hold for 2 min)
- Ramp at 25°C/min to 200°C (hold for 7 min)
- Ramp at 20°C/min to 280°C (hold for 5 min)

**Carrier gas flow rate**: 1 mL/min (splitless injection)
**Injection time**: 1 min
**Scan range**: 45–400 m/z
**Solvent delay**: 5 min

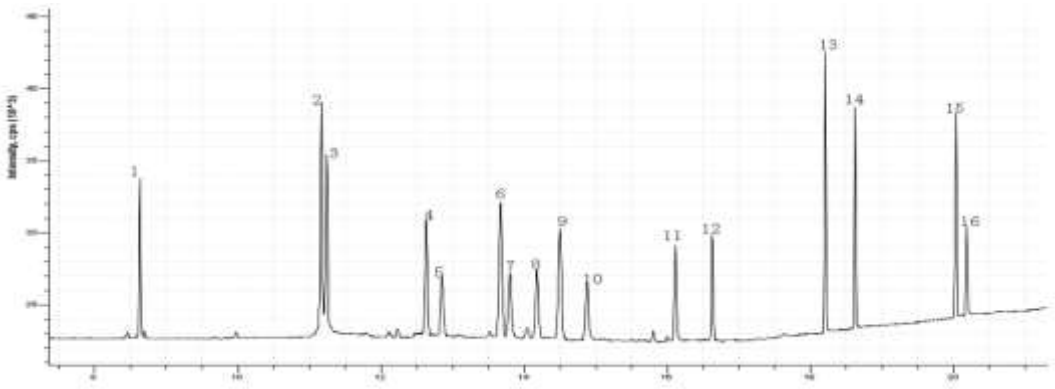

**Figure-4** 16 kinds of organic phosphorus standard solution TIC Figure

**Dichlorvos:**
2. Diazinon
3. Fonofos
4. Chlorpyrifos-methyl
5. Methyl parathion
6. Methyl Pirimiphos;
7. Fenitrothion
8. Malathion
9. Chlorpyrifos
10. Parathion
11. A poisonous insect
12. Methidathion
13. B parathion
14. Carbophenothion
15. Phosalone
16. Methyl Azinphos

## 2) Organochlorine pesticide analysis

Of 13 organochlorine test conditions:
**Column**: DB-5MS, 30m x 0.25mm x 0.25μm
**Injection port temperature**: 260°C
**Oven temperature program**:
- Ramp from 90°C to 200°C at 20°C/min (hold for 10 min)
- Ramp from 200°C to 280°C at 35°C/min (hold for 3 min)

**Carrier gas flow rate**: 1 mL/min (splitless injection)
**Injection time**: 1 min
**Interface temperature**: 280°C
**Ion source temperature**: 240°C
**Scan range**: 45–400 m/z
**Solvent delay**: 4 min

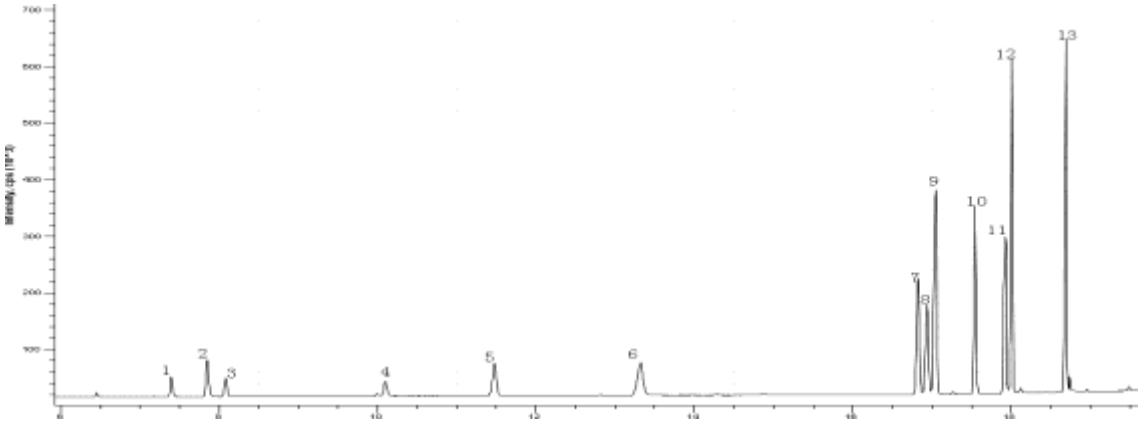


**Figure-5** 13 Organochlorine standard solution TIC Figure

1. A-BHC
2. B-BHC
3. Γ-BHC heptachlor

4,5. Aldrin.

6. Heptachlor EPOXIDE
7. 4,4'-DDD
8. Di reagents
9. 2,4'-DDD
10. Endrin
11. 4'4 -DDD
12. 2,4'-DDT
13. 4,4'- DDT

## 5.4 Polycyclic aromatic hydrocarbons analysis

**Analytical Conditions**

**Column**: DB-5MS, 30m x 0.25mm x 0.25µm
**Ion source temperature**: 300°C
**Inlet temperature**: 280°C
**Interface temperature**: 280°C
**Carrier gas flow rate**: 1 mL/min (high purity He)
**Injection method**: Splitless
**Injection time**: 1 min
**Oven temperature program**:

- 50°C (hold for 1 min)
- Ramp at 25°C/min to 200°C
- Ramp at 8°C/min to 315°C (hold for 5 min)

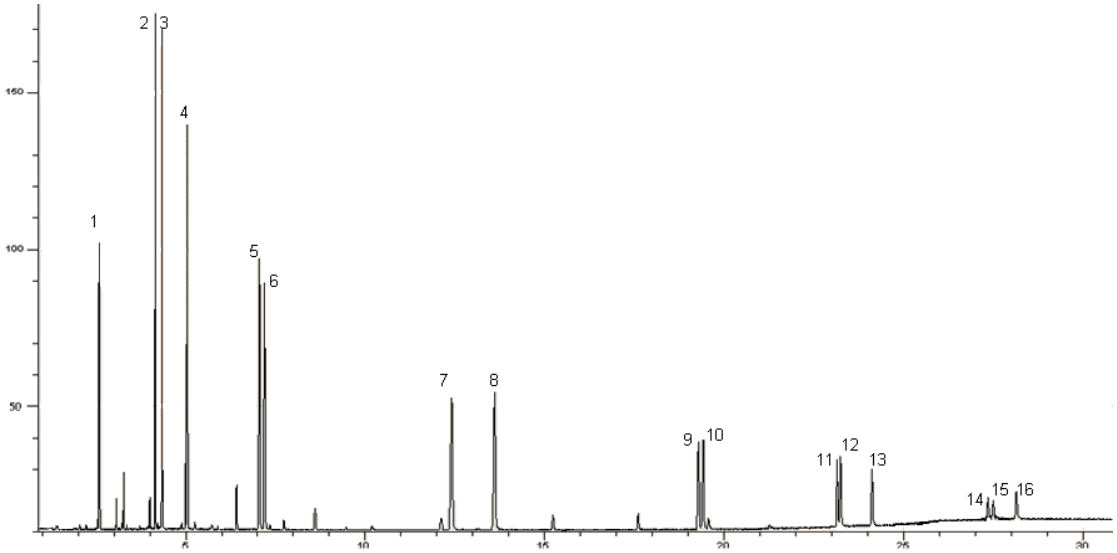


**Figure-6** 16 PAHs the standard samples TIC Figure

## 5.5 The analysis of volatile organic compounds (VOC)

**Headspace Conditions:**

1) **Pressure**:
   - Pressure: 0.12 MPa
   - Inlet pressure: 0.07 MPa
   - Pressure time: 0.3 minutes
   - Injection time: 0.1 minutes
   - Sample Chamber Temperature: 80 °C
   - Valve Box Temperature: 80 °C
   - Line Temperature: 90 °C
2) **GC Conditions:**
   - **Column**: 60 m × 0.32 mm × 1.8 μm (HP-VOC)
   - **Oven Temperature**:
     40 °C (initial hold time: 2 minutes)
     15 °C/min ramp to 100 °C (hold for 1 minute)
     5 °C/min ramp to 180 °C
   - **Column Flow**: 1.5 mL/min
   - **Split Ratio**: 10:1
   - **Inlet Temperature**: 180 °C
   - **Carrier Gas**: High purity helium
3) **MS Conditions:**
   - Interface Temperature: 180 °C
   - Ion Source Temperature: 200 °C

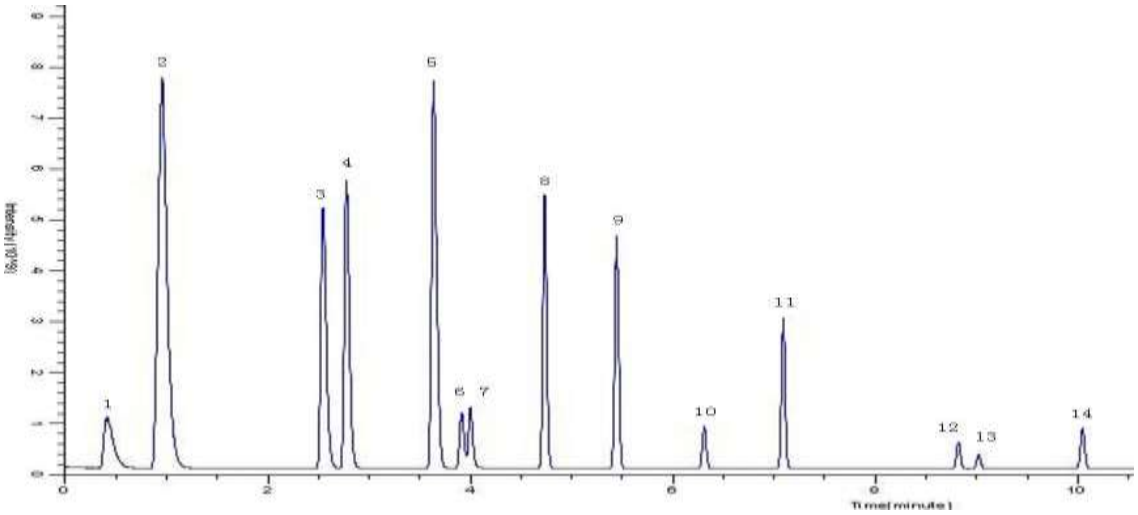


**Figure 7:** The 14 VOC Standards TIC Figure

1) Ethanol
2) Isopropanol
3) Butanone
4) Ethyl acetate
5) Isopropyl acetate
6) Benzene
7) Glycol methyl ether
8) n-Propyl acetate
9) 4-Methyl-2-pentanone
10) Toluene
11) Acetic acid
12) n-Butyl acetate
13) Ethylbenzene
14) Xylene
15) Cyclohexyl ketone

## 5.6 Analysis of Formaldehydes

**Analytical conditions:**

1) **Column:**
   - Column Type: DB-5MS
   - Dimensions: 30 m × 0.25 mm × 0.25 µm
2) **GC Inlet Conditions:**
   - Inlet Temperature: 25 °C
   - Injection Volume: 1 µL
   - Injection Mode: Splitless
   - Splitless Injection Time: 1 minute
   - Solvent Delay: 4 minutes
   - Carrier Gas Flow Rate: 1 mL/min
3) **MS Conditions:**
   - Interface Temperature: 280 °C
   - Ion Source Temperature: 240 °C
   - Scan Range: 50-300 amu
4) **Oven Temperature Program:**
   - Initial Temperature: 80 °C (hold for 2 minutes)
   - Ramp Rate: 30 °C/min to 250 °C (hold for 5 minutes)

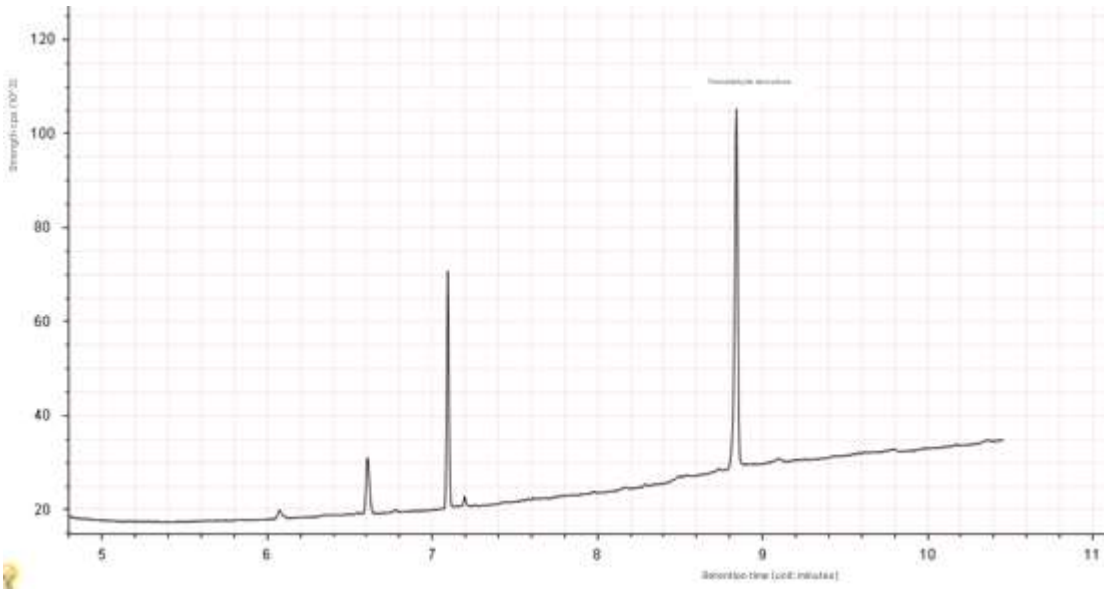


**Figure-8** formaldehyde derivatives TIC Figure

## 5.7 Azo dyes

**Analysis Condition**

1) **Column:**
   - Column Type: DB-5MS
   - Dimensions: 30 m × 0.25 mm × 0.25 µm
2) **GC Inlet Conditions:**
   - Inlet Temperature: 260 °C
   - Injection Mode: Splitless
   - Injector Time: 1 minute
   - Carrier Gas Flow Rate: 1.2 mL/min (High purity He)
3) **MS Conditions:**
   - Ion Source Temperature: 200 °C
   - Interface Temperature: 270 °C
   - Scan Range: 35-350 amu
4) **Oven Temperature Program:**
   - Initial Temperature: 60 °C (hold for 1 minute)
   - Ramp Rate: 8 °C/min to 210 °C (hold for 10 minutes)
   - Ramp Rate: 2 °C/min to 215 °C (hold for 1 minute)
   - Ramp Rate: 20 °C/min to 260 °C (hold for 2 minutes)

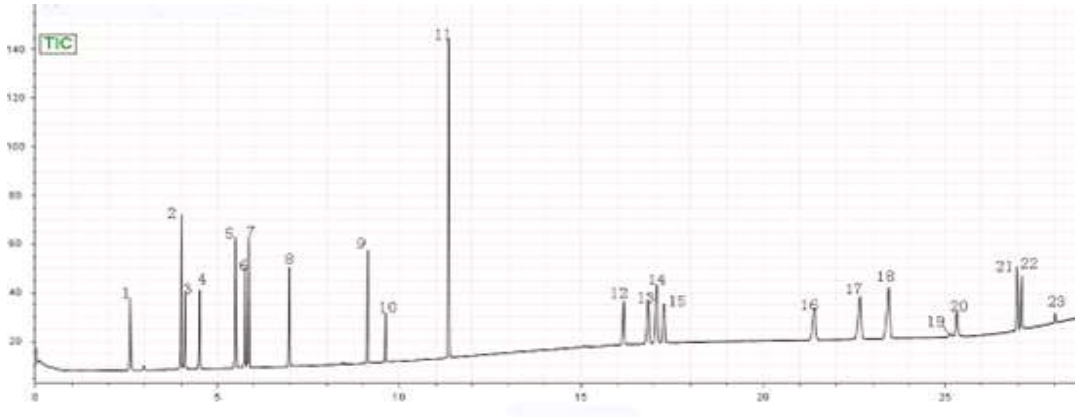


**Figure-9** 23 kinds of azo dyes TIC figure

1) 4-Amino-biphenyl
2) Benzidine
3) 4-Chloro-o-toluidine
4) 2-Naphthylamine
5) O-Aminoazobenzene
6) Toluene
7) Chloroaniline
8) 2,4-Amino-anisole
9) 4,4'-Diamino-diphenylmethane
10) 3,3'-Dichlorobenzidine
11) 3,3'-Dimethoxybenzidine
12) 3,3'-Dimethylbenzidine
13) 3,3'-Dimethyl-4,4'-diaminodiphenyl
14) 2-Methoxy-5-methylaniline
15) 4,4'-Alkylene-methyl-di-(2-chloroaniline)
16) 4,4'-Diaminodiphenyl ether
17) 4,4'-Diaminodiphenyl sulfide
18) o-Toluidine
19) 2,4-Diaminotoluene
20) 2,4,5-Trimethylaniline
21) Anisidine
22) 2,4-Dimethylaniline
23) 2,6-Xylene aniline
24) 4-Aminoazobenzene

## 5.8 The analysis of Tetrabromo bisphenol A, bisphenol A

**Analysis conditions:**

1) **Column:**
   - Column Type: DB-5MS
   - Dimensions: 30 m × 0.25 mm × 0.25 μm
2) **GC Inlet Conditions:**
   - Inlet Temperature: 280 °C
   - Injection Volume: 1 μL
   - Injection Mode: Splitless
   - Solvent Delay: 4 minutes
   - Carrier Gas Flow Rate: 1.2 mL/min (High purity He)
3) **MS Conditions:**
   - Interface Temperature: 300 °C
   - Ion Source Temperature: 260 °C
   - Scan Range: 60-650 amu
4) **Oven Temperature Program:**
   - Initial Temperature: 100 °C (hold for 2 minutes)
   - Ramp Rate: 30 °C/min to 310 °C (hold for 8 minutes)

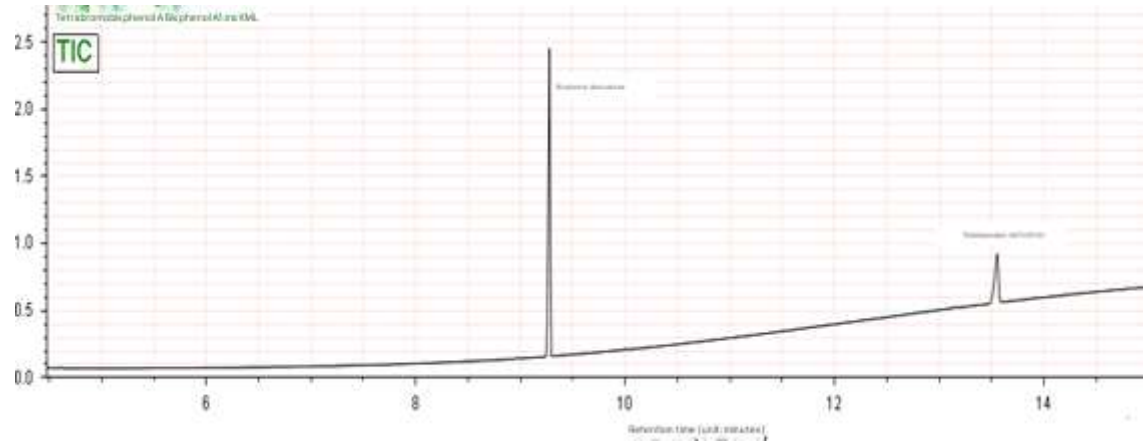


**Figure-10:** Tetrabromobisphenol A, bisphenol A derivatives

## 5.9 Chlorophyll analysis

**Analysis Condition**

**Column:** DB-5MS, 30 m × 0.25 mm × 0.25 µm
**Injection Type:** Split injection, Split ratio: 10:1
**Carrier Gas Flow Rate:** 1 mL/min
**Inlet Temperature:** 240 °C
**Interface Temperature:** 270 °C
**Ion Source Temperature:** 240 °C
**Scan Range:** 50-320 amu
**Oven Temperature Program:** 100 °C (initial), ramp 10 °C/min to 240 °C (hold for 1 min).

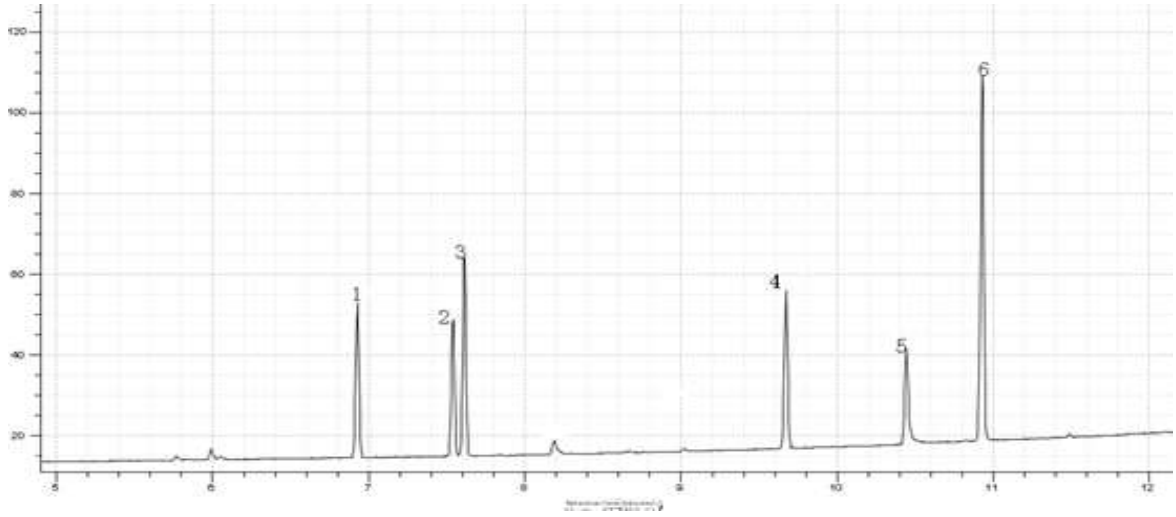


**Figure-11** Chlorophenol derivatives TIC

1) Pentachlorophenol
2) 2,3,4,5-Tetrachlorophenol
3) 2,3,5,6-Tetrachlorophenol
4) 2,4,6-Trichlorophenol

5) 2,3,5-Trichlorophenol
6) 2,4,5-Trichlorophenol

## 5.10 Analysis of dimethyl fumarate

**Analysis Conditions**

**Column:** DB-5MS, 30 m × 0.25 mm × 0.25 µm
**Interface Temperature:** 280 °C
**Inlet Temperature:** 280 °C
**Ion Source Temperature:** 230 °C
**Carrier Gas Flow Rate:** 1 mL/min
**Injection Type:** Splitless
**Splitless Time**: 1 min
**Oven Temperature Program:**

- 60 °C (initial)
- Ramp 5 °C/min to 100 °C
- Ramp 25 °C/min to 280 °C (hold for 10 min)

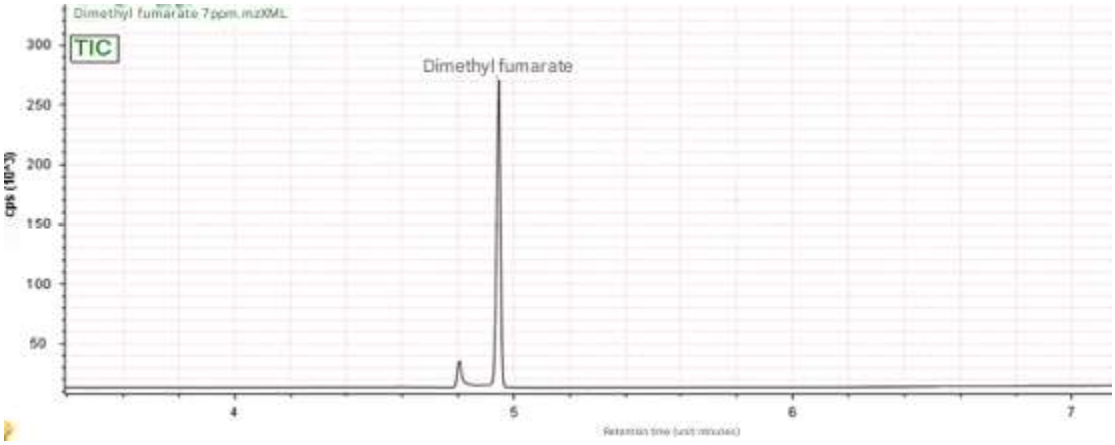


**Figure-12:** Dimethyl fumarate TIC Figure

## 5.11 Organotin analysis

**Analysis Condition**

**Column:** DB-5MS, 30 m × 0.25 mm × 0.25 µm
**Ion Source Temperature:** 250 °C
**Inlet Temperature:** 260 °C
**Interface Temperature:** 280 °C
**Carrier Gas Flow Rate:** 1.1 mL/min (high purity He)
**Injection Mode:** Splitless injection
**Injection Time:** 1 min
**Solvent Delay:** 2.5 min
**Oven Temperature Program:**

- 50 °C (hold for 1.5 min)
- Ramp 10 °C/min to 300 °C (hold for 4 min)

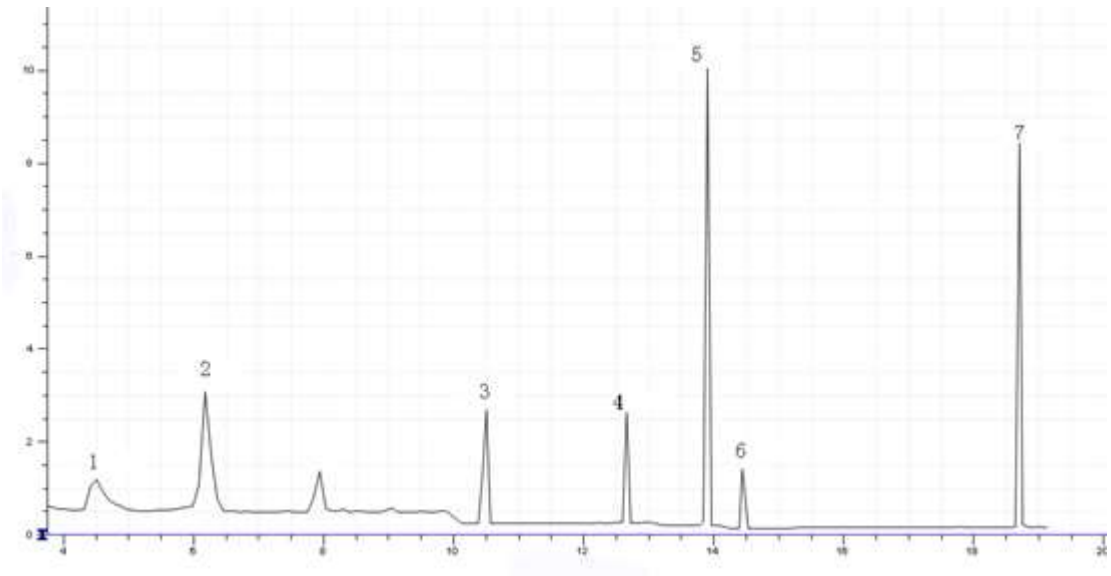


**Figure-13:** Kinds of organotin derivatives SIM scan spectra

1) Dimethyltin
2) Trimethyltin
3) Tributyltin
4) Dibutyltin
5) Phenyltin
6) Tributyltin
7) Diphenyltin

## 6. Accessories

| Accessories | Quantity |
|---|---|
| Mechanical Pump | 1 Pc |
| GC-MS Column | 1 Pc |
| Network Cable | 1 Pc |
| Series Port Cable | 1 Pc |
| Power cable | 5 Pcs |
| Corrugated pipe | 1 Meter |
| Clamp hoop | 2 Pcs |
| Seal ring | 2 Pcs |
| Wrench - 5.5mm, 7mm | 1 Pc |
| Wrench-10mm, 12mm | 1 Pc |
| Wrench -8mm, 10mm | 1 Pc |
| Tweezers | 1 Pc |
| Cross Screwdriver - Φ6×120， ph2 | 1 Pc |
| Cross Screwdriver- Φ2×50， ph1 | 1 Pc |
| Straight Screwdriver | 1 Pc |
| Monkey Wrench | 1 Pc |
| Allen Wrench | 1 Pc |
| Sleeve | 1 Pc |
| 15% Graphite /85% Vespel Ferrule | 10 Pcs |
| Syringe | 1 Pc |
| Column Cutter | 1 Pc |
| Liner | 1 Pc |
| Fuse | 2 Pcs |
| Plastic Corrugated pipe | 1.5 Meter |
| Sylphon Bellows Connector | 1 Pc |
| Hose clamp | 1 Pc |
| Ion Source Holder | 1 Pc |
| Column measuring tool | 1 Pc |
| Stainless Steel Tube | 7 Meter |
| 1/8"Ferrule | 1 Pc |
| Valve Connector | 2 Pcs |
| O-ring - 2.5×1.8 | 5 Pcs |
| O-ring - 1.8×1.8 | 1 Pc |
| O-ring | 5 Pcs |
| Glass Wool | 1 Pc |
| Front Ferrule | 3 Pcs |
| Back Ferrule | 3 Pcs |
| Injection port Wrench | 1 Pc |
| Glass Liner | 1 Pc |
| Moisture Trap | 1 Pc |
| Oxygen Trap | 1 Pc |
| Trap Bracket | 1 Pc |

| | |
|---|---|
| Ribbon | 8 Pcs |
| Injection Septum | 1 Pc |
| Ethernet switch | 1 Pc |