Introduction of a Multi-Detector GC System

Application News No. G237 introduced a multi-column, multi-detector GC system that makes it possible to acquire more detailed separation information easily. This Application News introduces a multi-detector GC system that allows information to be obtained from three detectors by a single injection.

A structural diagram of the multi-detector GC system is shown in Fig.1. A single column is connected to the lower part of the split/splitless injection port. A universal X press-tight connector is connected to the column outlet and inert guard columns of the same length are connected to the outlets of the X press-tight connector. Each column outlet is then connected to the three detectors. The injected sample is vaporized in the injection port and introduced into the column. The sample separated by the column is splitted in three directions at the column outlet, and then detected by each detector. The detector signal is sent to the GCsolution software and processing is conducted simultaneously on the data from the 3 channels. Detector 1 uses FID, detector 2 uses FTD, and detector 3 uses FPD. Chromatograms of the standard mixtures analyzed using the split injection method is shown in Fig.2. For the standard mixtures, compounds (Isoamylacetate, Ethylcaprylate) which are sensitive only to FID, a compound (DMF) highly sensitive to FTD, and compounds (DMDS, DMSO) highly sensitive to FPD, and a compound (Allylisothiocyanate) sensitive to all three detectors were mixed. Tables 1-6 show these retention times and the repeatability of peak areas.

The column branches into three directions at the column outlet but excellent retention times were seen for all three detectors and the results match very closely. Further, the figures show that both retention times and peak area repeatability were very good. Figs.3-5 show calibration curves of each detector. Linearity was also good. All the signals of 3 channels can be monitored and processed simultaneously in a single screen, using a GCsolution software.

The multi-detector GC system can be extremely useful for the analyses of complicated matrix components such as fragrances, food and pesticides residues, since data from multiple detectors can be obtained efficiently.
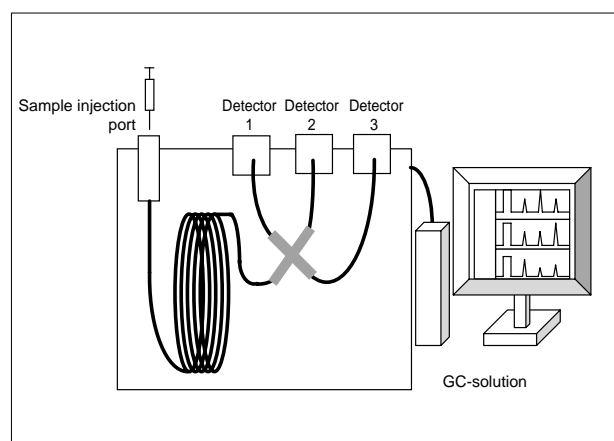

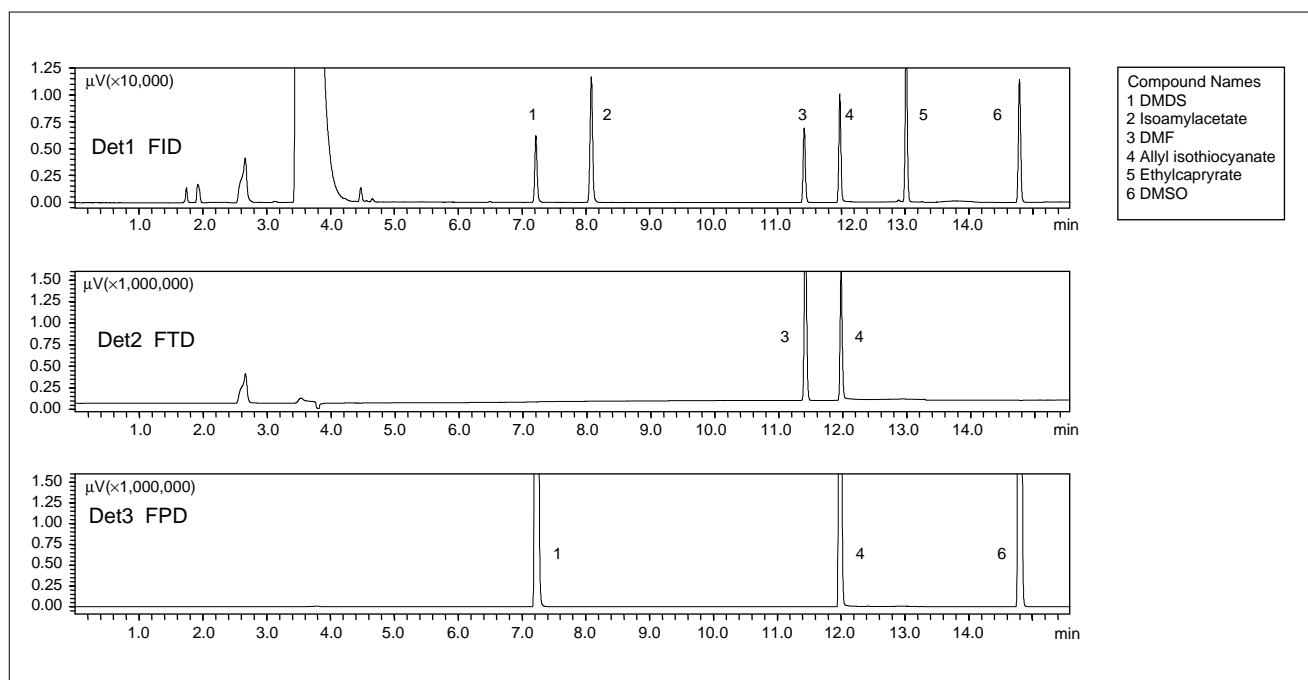**Fig.1 Diagram of Multi-Detector GC System**

Compound Names
1 DMDS
2 Isoamylacetate
3 DMF
4 Allyl isothiocyanate
5 Ethylcapryrate
6 DMSO

Fig.2 Chromatograms of Standards Mixtures

Table 1 Repeatability of Retention Time (min) Ch1 (FID) (20 mg/L solution)

	DMDS	Isoamyl acetate	DMF	Allyl iso thiocyanate	Ethyl caprylate	DMSO
1	7.214	8.083	11.417	11.976	13.015	14.790
2	7.213	8.082	11.417	11.975	13.014	14.789
3	7.214	8.083	11.417	11.975	13.015	14.789
4	7.213	8.082	11.417	11.975	13.015	14.790
5	7.213	8.082	11.417	11.975	13.015	14.789
mean	7.214	8.083	11.417	11.976	13.015	14.789
SD	0.0002	0.0002	0.0002	0.0003	0.0003	0.0005
CV%	0.0028	0.0030	0.0021	0.0023	0.0022	0.0033

Table 2 Repeatability of Retention Time (min) Ch2 (FTD) (20 mg/L solution)

	DMDS	Isoamyl acetate	DMF	Allyl iso thiocyanate	Ethyl caprylate	DMSO
1	–	–	11.417	11.976	–	–
2	–	–	11.416	11.975	–	–
3	–	–	11.416	11.975	–	–
4	–	–	11.416	11.975	–	–
5	–	–	11.416	11.975	–	–
mean	–	–	11.416	11.975	–	–
SD	–	–	0.0005	0.0005	–	–
CV%	–	–	0.0039	0.0037	–	–

Table 3 Repeatability of Retention Time (min) Ch3 (FPD) (20 mg/L solution)

	DMDS	Isoamyl acetate	DMF	Allyl iso thiocyanate	Ethyl caprylate	DMSO
1	7.217	–	–	11.979	–	14.792
2	7.217	–	–	11.978	–	14.791
3	7.217	–	–	11.979	–	14.792
4	7.217	–	–	11.979	–	14.792
5	7.217	–	–	11.979	–	14.792
mean	7.217	–	–	11.979	–	14.792
SD	0.0000	–	–	0.0005	–	0.0005
CV%	0.0000	–	–	0.0037	–	0.0030

Table 4 Repeatability of peak area (μV*s) Ch1 (FID) (20 mg/L solution)

	DMDS	Isoamyl acetate	DMF	Allyl iso thiocyanate	Ethyl caprylate	DMSO
1	3151	6535	3331	4572	7447	5481
2	3100	6456	3327	4610	7461	5478
3	3130	6454	3336	4611	7449	5462
4	3118	6483	3276	4580	7412	5411
5	3085	6437	3321	4550	7358	5400
mean	3117	6473	3318	4585	7425	5446
SD	26	38	24	26	42	38
CV%	0.82	0.59	0.73	0.57	0.56	0.7

Table 5 Repeatability of peak area (μV*s) Ch2 (FTD) (20 mg/L solution)

	DMDS	Isoamyl acetate	DMF	Allyl iso thiocyanate	Ethyl caprylate	DMSO
1	–	–	1157890	805225	–	–
2	–	–	1178588	791486	–	–
3	–	–	1174503	808450	–	–
4	–	–	1154166	796770	–	–
5	–	–	1164500	795282	–	–
mean	–	–	1165929	799443	–	–
SD	–	–	10474	7112	–	–
CV%	–	–	0.9	0.89	–	–

Table 6 Repeatability of peak area (μV*s) Ch3 (FPD) (20 mg/L solution)

	DMDS	Isoamyl acetate	DMF	Allyl iso thiocyanate	Ethyl caprylate	DMSO
1	8374897	–	–	1962559	–	8102187
2	8392966	–	–	1975314	–	8159604
3	8345381	–	–	1963620	–	8079591
4	8236978	–	–	1937979	–	7975791
5	8194016	–	–	1931673	–	7965657
mean	8308848	–	–	1954229	–	8056566
SD	88211	–	–	18540	–	83692
CV%	1.06	–	–	0.95	–	1.04

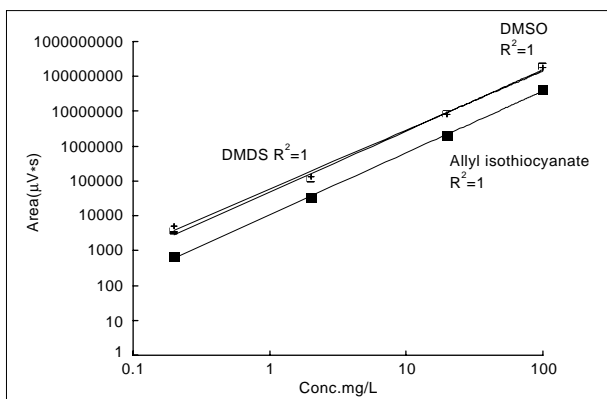**Fig.3 Calibration Curves by FID (2-100 mg/L)**
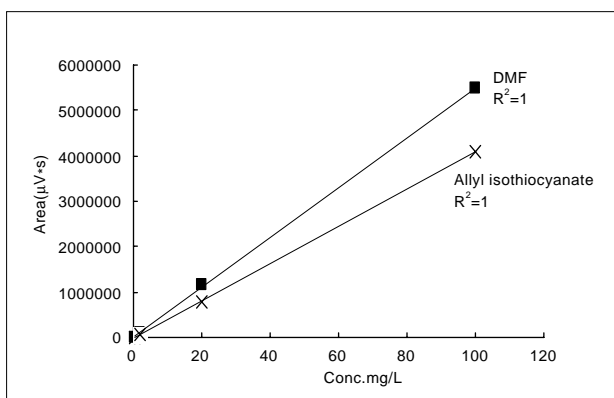

Fig.5 Calibration Curves by FPD (0.2-100 mg/L)

Fig.4 Calibration Curves by FTD (0.2-100 mg/L)

Analytical Condition
Model :
 GC-2010AF/AOC (FID,FTD,FPD), GCsolution
Column:Rtx-wax 30 m × 0.32 mm I.D. df=0.5 μm(Restek)
(The outlet of capillary column was connected to Universal X press-tight
connector (Restek) and three deactivated open tube columns
(40 cm × 0.25 mm I.D.Restek) were connected to other three outlets of connector.)
Det1 : FID
Det2 : FTD
Det3 : FPD(S-mode)
Column Temp.   : 40 ˚C(3 min)-10 ˚C/min-220 ˚C(5 min)
Carrier Gas   : He(2.16 mL/min, 68.6 kPa)
                      35 cm/s Constant Linear Velocity Mode
Det.Temp.   : 250 ˚C,Inj.Temp.: 250 ˚C
Injection Method : Split 1:10, Injection Volume:1 μL
Std Conc.   : DMDS, Isoamylacetate, DMF, Allyl isothiocyanate,
                      Ethylcapryrate, DMSO 0.2~100 mg/L each in THF

Related Products Some products may be updated to newer models.

> **GC-2010 Pro**
> Gas Chromatograph

Related Solutions

> Food Contamination

> Hydrocarbon Processing Industry (Petrochemical, Ch

> Price Inquiry

> Product Inquiry

> Technical Service / Support Inquiry

> Other Inquiry