SHIMADZU APPLICATION NEWS

LAAN-A-MS-E004

● GASCHROMATOGRAPHY MASS SPECTROMETRY

No.M237

Separation Evaluation of 97 Pesticides using Different Columns (Part 1)

■ Introduction

Column selection is an important factor in GC/MS analyses. In addition, in batch analyses of multiple compounds, such as pesticide analyses, understanding the elution order of each component and the overlap of component peaks leads to more accurate peak identification and more efficient analysis. This Application News uses two columns (Rtx-5MS and Rtx-200MS) to analyze standard mixtures of 97 pesticides to confirm the order of component elution and to evaluate peak overlap.

■ Separation Evaluation

Table 1 shows the analytical conditions. The Standard Pesticide Mixture 21 and 22 made by Kanto Chemical Co., Ltd. were used as the samples. Fig.1 and Table 2 show the total ion chromatogram (TIC) and retention times for each component obtained by using Rtx-5MS. Fig.2 and Table 3 show the total ion chromatogram (TIC) and retention times for each component obtained by using Rtx-200MS. The components in the gray cells in Tables 2 and 3 had overlapping peaks in TIC, but these peaks were separated in mass chromatograms. Components in the yellow cells had completely overlapping retention times.

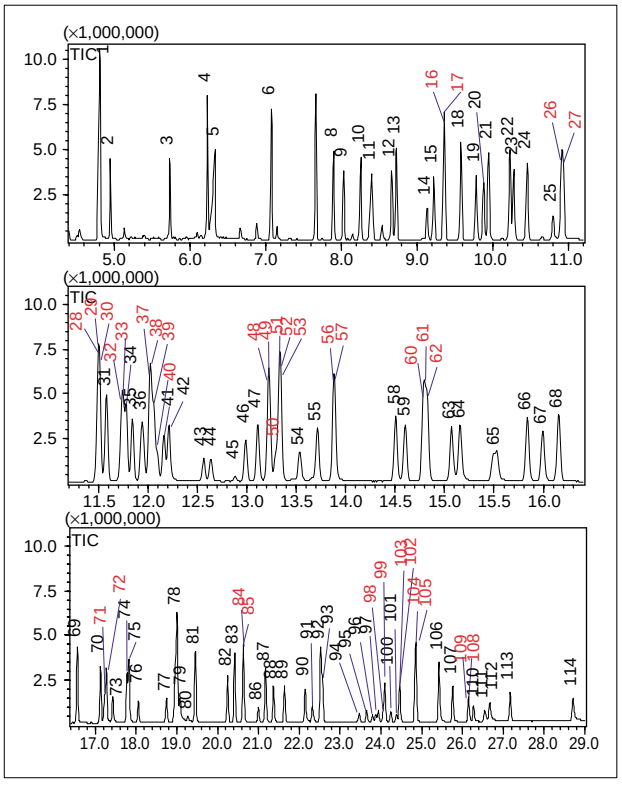

Fig.1 Rtx-5MS Total Ion Chromatogram

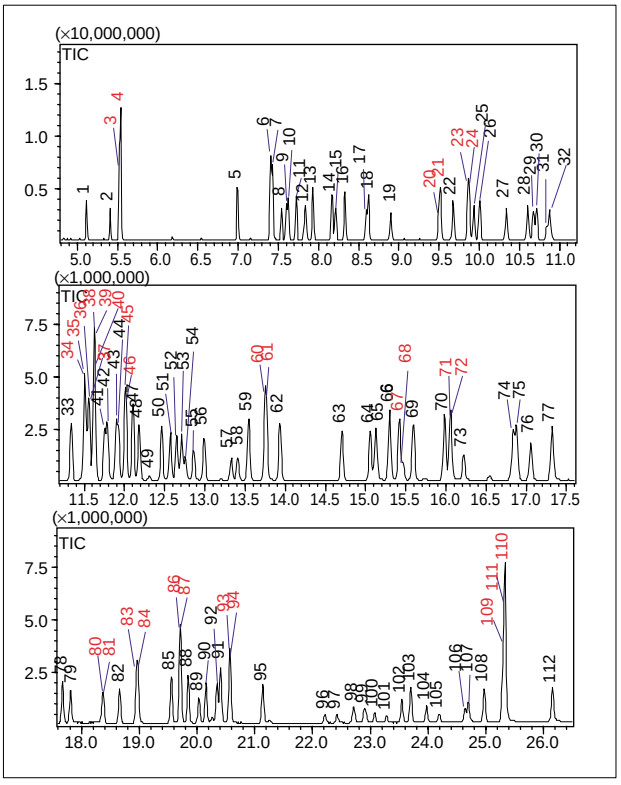

Fig.2 Rtx-200MS Total Ion Chromatogram

Table 1 Analytical conditions

-GC-			
Column	: Rtx-5MS, Rtx-200MS 30m × 0.25mm I.D. df=0.25µm	High Press.Injection	: 250kPa(1min)
Col.Temp.	: 80˚C(1min)-20˚C/min-180˚C-5˚C/min-280˚C(10min)	Inj.Temp.	: 260˚C
Carrier Gas	: He, 45.0cm/sec ; Constant Linear Velocity Mode	Injection Method	: Splitless(1min)
		Injection Volume	: 1µL
-MS-		Ionization	: EI
I.F. Temp.	: 260˚C	Scan Range	: m/z 40~470
I.S. Temp.	: 230˚C	Scan Interval	: 0.5sec

Table 2 Rtx-5MS Retention Time

ID#	Pesticide Name	R.T. (min.)	ID#	Pesticide Name	R.T. (min.)	ID#	Pesticide Name	R.T. (min.)	ID#	Pesticide Name	R.T. (min.)
1	Methamidophos	4.811	30	Pirimiphos-methyl	11.508	59	Prothiofos	14.602	88	Acrinathrin	21.369
2	Dichlorvos (DDVP)	4.95	31	Esprocarb	11.578	60	Pretilachlor	14.787	89	Pyraclofos	21.638
3	EPTC	5.736	32	Dichlofluanid	11.728	61	Tricyclazole	14.801	90	Bitertanol 1	22.145
4	Butyrate	6.233	33	Malathion	11.748	62	p,p'-DDE	14.826	91	Permethrin 1	22.322
5	Acephate	6.33	34	Benthiocarb	11.781	63	Myclobutanil	15.074	92	Pyridaben	22.526
6	Isoprocarb	7.078	35	Diethofencarb	11.842	64	Flusilazole	15.162	93	Permethrin 2	22.571
7	Fenobucarb	7.666	36	Metolachlor	11.941	65	Cyproconazole	15.528	94	Cyfluthrin 1	23.472
8	Ethoprophos	7.898	37	Fenthion	12.015	66	Chlorobenzilate	15.834	95	Cyfluthrin 2	23.655
9	Chlorpropham	8.031	38	(Z)-Dimethylvinphos	12.032	67	Fensulfothion	15.991	96	Cyfluthrin 3	23.801
10	Bendiocarb	8.257	39	Chlorpyrifos	12.061	68	p,p'-DDD	16.152	97	Cyfluthrin 4	23.876
11	Cadusafos	8.401	40	Parathion	12.093	69	Mepronil	16.565	98	Cypermethrin 1	24.052
12	α-BHC	8.667	41	Dicofol decomposition product	12.163	70	Edifenphos (EDDP)	17.13	99	Halfenprox	24.098
13	Thiometon	8.73	42	Isofenphos oxone	12.212	71	Propiconazole	17.226	100	Cypermethrin 2	24.245
14	Dimethipin	9.137	43	Fosthiazate 1	12.565	72	Lenacil	17.275	101	Cypermethrin 3	24.385
15	β-BHC	9.224	44	Fosthiazate 2	12.565	73	Propiconazole 2	17.429	102	Cypermethrin 4	24.462
16	γ-BHC	9.355	45	α-CVP	12.883	74	Tebuconazole	17.778	103	Flucythrinate 1	24.462
17	Terbufos	9.366	46	Pendimethalin	12.988	75	Thenylchlor	17.829	104	Flucythrinate 2	24.836
18	Diazinon	9.583	47	Pyrifenox–Z	13.11	76	Captafol	18.062	105	Silafluofen	24.858
19	Tefluthrin	9.786	48	Isofenphos	13.219	77	Iprodione	18.748	106	Pyrimidifen	25.428
20	δ-BHC	9.883	49	b-CVP	13.231	78	Acetamiprid	19.006	107	Fenvalerate 1	25.764
21	Etrimfos	9.947	50	Captan	13.294	79	EPN	19.077	108	Fenvalerate 2	26.155
22	Pyrimicarb	10.231	51	Quinalphos	13.331	80	Dicofol	19.275	109	Fluvalinate 1	26.147
23	Ethiofencarb	10.282	52	Triadimenol 1	13.338	81	Tebufenpyrad	19.456	110	Fluvalinate 2	26.275
24	Benfuresate	10.46	53	PAP	13.341	82	Phosalone	20.248	111	Difenoconazole 1	26.545
25	Methyl parathion	10.8	54	Triadimenol 2	13.538	83	Pyriproxyfen	20.421	112	Difenoconazole 2	26.672
26	Tolclophos-methyl	10.913	55	Chinomethionat	13.716	84	Mefenacet	20.63	113	Deltamethrin	27.172
27	Carbaryl	10.94	56	Paclobutrazol	13.885	85	Cyhalothrin 1	20.635	114	Imibenconazole	28.711
28	Methiocarb	11.49	57	Pyrifenox – E	13.883	86	Cyhalothrin 2	21			
29	Fenitrothion	11.504	58	Flutolanil	14.51	87	Fenarimol	21.174			

• Components in gray-colored cells have overlapping TIC peaks. Components in yellow-colored cells have overlaps in retention times.

Table 3 Rtx-200MS Retention Time

ID#	Pesticide Name	R.T. (min.)	ID#	Pesticide Name	R.T. (min.)	ID#	Pesticide Name	R.T. (min.)	ID#	Pesticide Name	R.T. (min.)
1	EPTC	5.109	30	Methiocarb	10.705	59	p,p'-DDD	13.534	88	Phosalone	19.834
2	Dichlorvos	5.405	31	Dicofol decomposition product	10.828	60	Paclobutrazol	13.733	89	Cyhalothrin 1	20.02
3	Butyrate	5.517	32	Pyrifenox 1	10.862	61	Chlorobenzilate	13.751	90	Bitertanol 1	20.142
4	Methamidophos	5.538	33	Carbaryl	11.327	62	Pretilachlor	13.922	91	Pyraclofos	20.331
5	Isoprocarb	6.987	34	Benfuresate	11.492	63	Flutolanil	14.695	92	Pyrimidifen	20.396
6	Fenobucarb	7.399	35	Metolachlor	11.499	64	Flusilazole	15.043	93	Silafluofen	20.552
7	Acephate	7.423	36	Chinomethionat	11.539	65	Cyproconazole	15.111	94	Cyhalothrin 2	20.563
8	Chlorpropham	7.533	37	Methyl parathion	11.553	66	Mepronil	15.288	95	Acrinathrin	21.127
9	α-BHC	7.591	38	p,p'-DDE	11.609	67	Tebufenpyrad	15.405	96	Cypermethrin 1	22.201
10	Ethoprophos	7.616	39	Malathion	11.612	68	Dicofol	15.455	97	Cyfluthrin 1	22.408
11	Bendiocarb	7.717	40	Dimethipin	11.626	69	Edifenphos (EDDP)	15.579	98	Cypermethrin 2	22.695
12	Cadusafos	7.83	41	(Z)-Dimethylvinphos	11.739	70	Pyriproxyfen	15.969	99	Cyfluthrin 2	22.892
13	Thiometon	7.924	42	Pyrifenox -2	11.774	71	Myclobutanil	16.043	100	Cypermethrin 3	23.063
14	Diazinon	8.158	43	Quinalphos	11.886	72	Propiconazole 1	16.044	101	Cyfluthrin 3	23.267
15	γ-BHC	8.202	44	Dichlofluanid	11.917	73	Propiconazole 2	16.203	102	Flucythrinate 1	23.528
16	Terbufos	8.319	45	PAP	11.993	74	Lenacil	16.821	103	Fenvalerate 1	23.687
17	β-BHC	8.583	46	Fenitrothion	12.008	75	Thenil alachlor	16.864	104	Flucythrinate 1	23.957
18	Etrimfos	8.611	47	Isofenphos	12.093	76	Captafol	17.042	105	Fenvalerate 2	24.172
19	δ-BHC	8.891	48	Prothiofos	12.168	77	Tebuconazole	17.303	106	Difenoconazole 1	24.677
20	Tefluthrin	9.491	49	α-CVP	12.295	78	Fensulfothion	17.663	107	Difenoconazole 2	24.677
21	Esprocarb	9.508	50	Isofenphos oxon	12.45	79	Tricyclazole	17.795	108	Deltamethrin	24.954
22	Pyrimicarb	9.666	51	Pendimethalin	12.558	80	Permethrin 1	18.342	109	Fluvalinate 1	25.268
23	Pirimiphos-methyl	9.849	52	β-CVP	12.651	81	Iprodione	18.366	110	Acetamiprid	25.312
24	Tolclophos-methyl	9.864	53	Parathion	12.698	82	EPN	18.649	111	Fluvalinate 2	25.325
25	Ethiofencarb	9.924	54	Triadimenol 1	12.742	83	Permethrin 2	18.94	112	Imibenconazole	26.141
26	Benthiocarb	9.996	55	Triadimenol 2	12.85	84	Fenarimol	18.964			
27	Chlorpyrifos	10.33	56	Captan	12.98	85	Mefenacet	19.542			
28	Fenthion	10.59	57	Fosthiazate 1	13.318	86	Halfenprox	19.69			
29	Diethofencarb	10.66	58	Fosthiazate 2	13.395	87	Pyridaben	19.701			

• Components in gray-colored cells have overlapping TIC peaks. Components in yellow-colored cells have overlaps in retention times.

SHIMADZU

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