FIG. 1

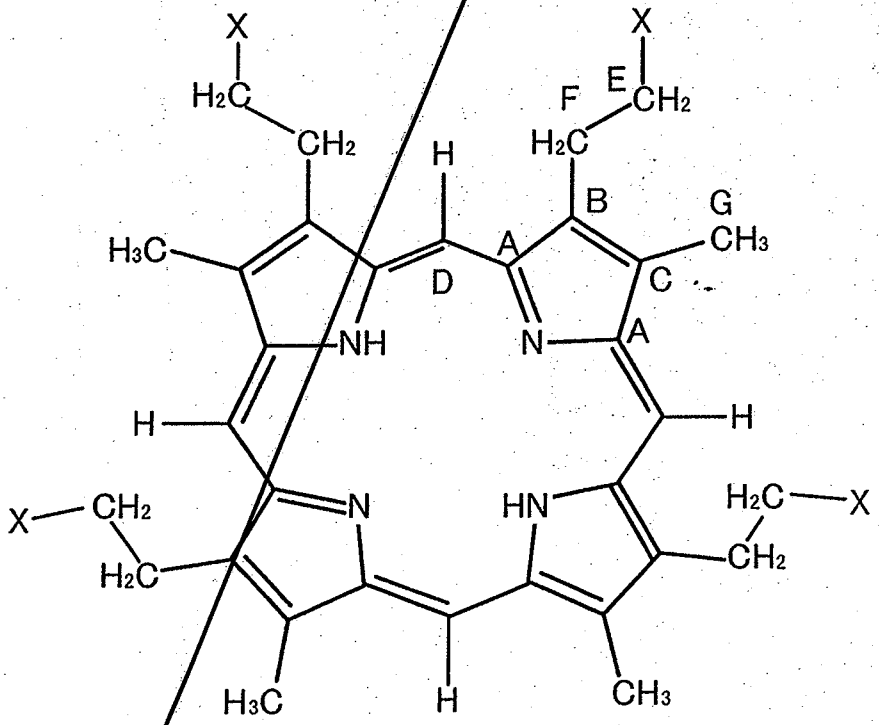

X
H2C
CH2
H
X
E
F
CH2
H2C
B
G
CH3
H3C
A
D
C
NH
N
A
H
H
X
CH2
H2C
N
HN
H2C
X
CH2
H3C
H
CH3

FIG. 2

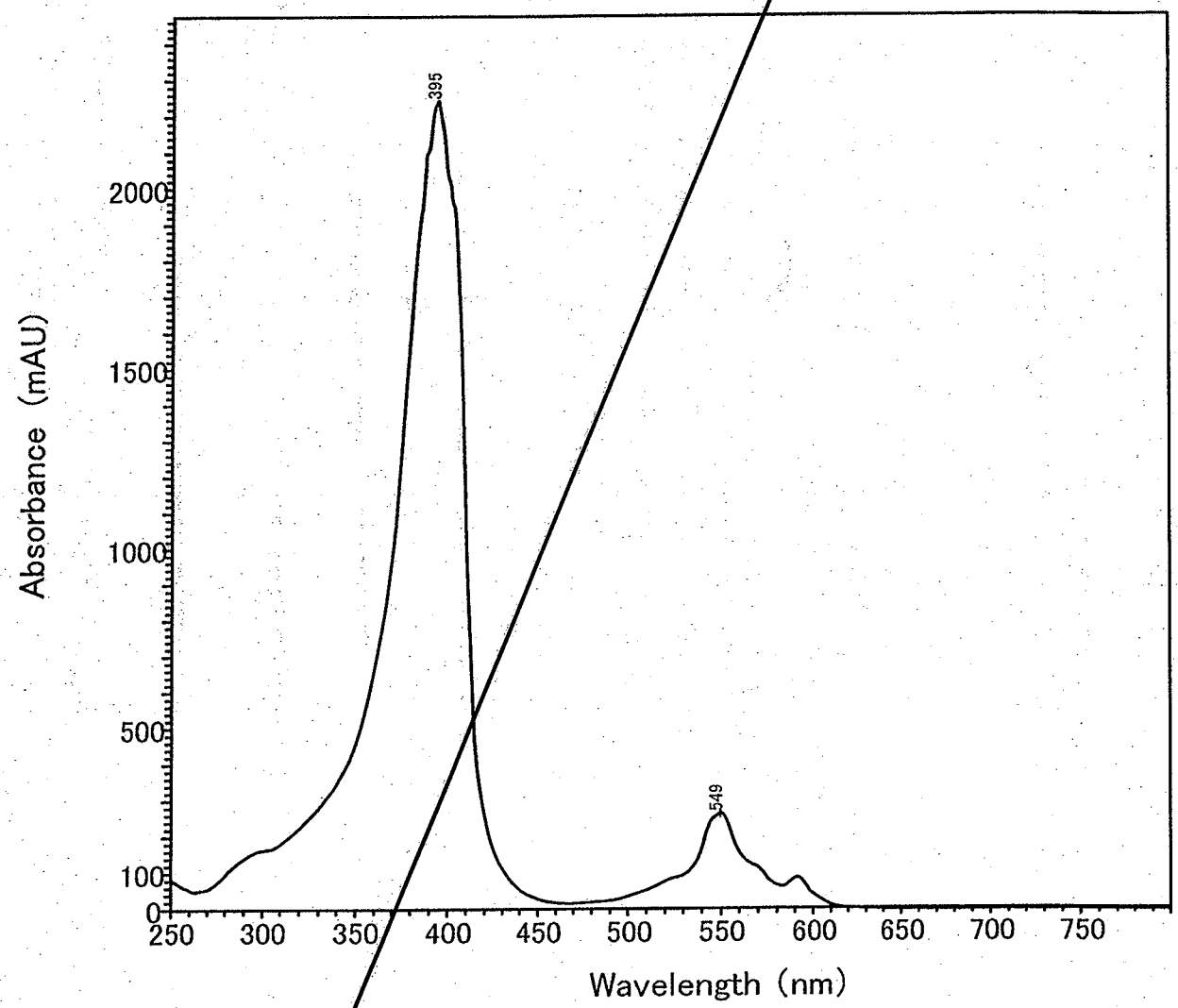

395
549
2000
1500
1000
500
100
0
250
300
350
400
450
500
550
600
650
700
750
Absorbance (mAU)
Wavelength (nm)

FIG. 3

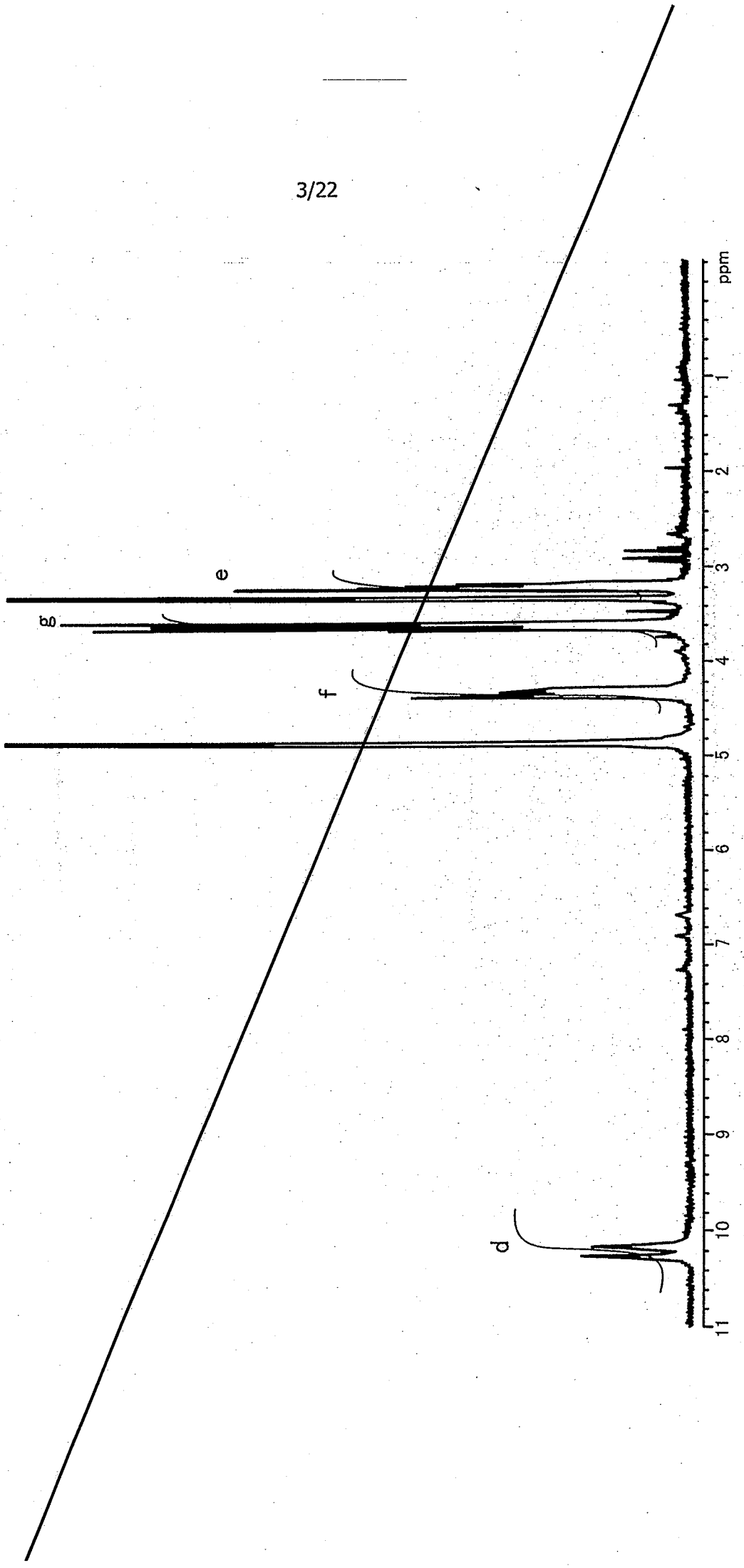


FIG. 4

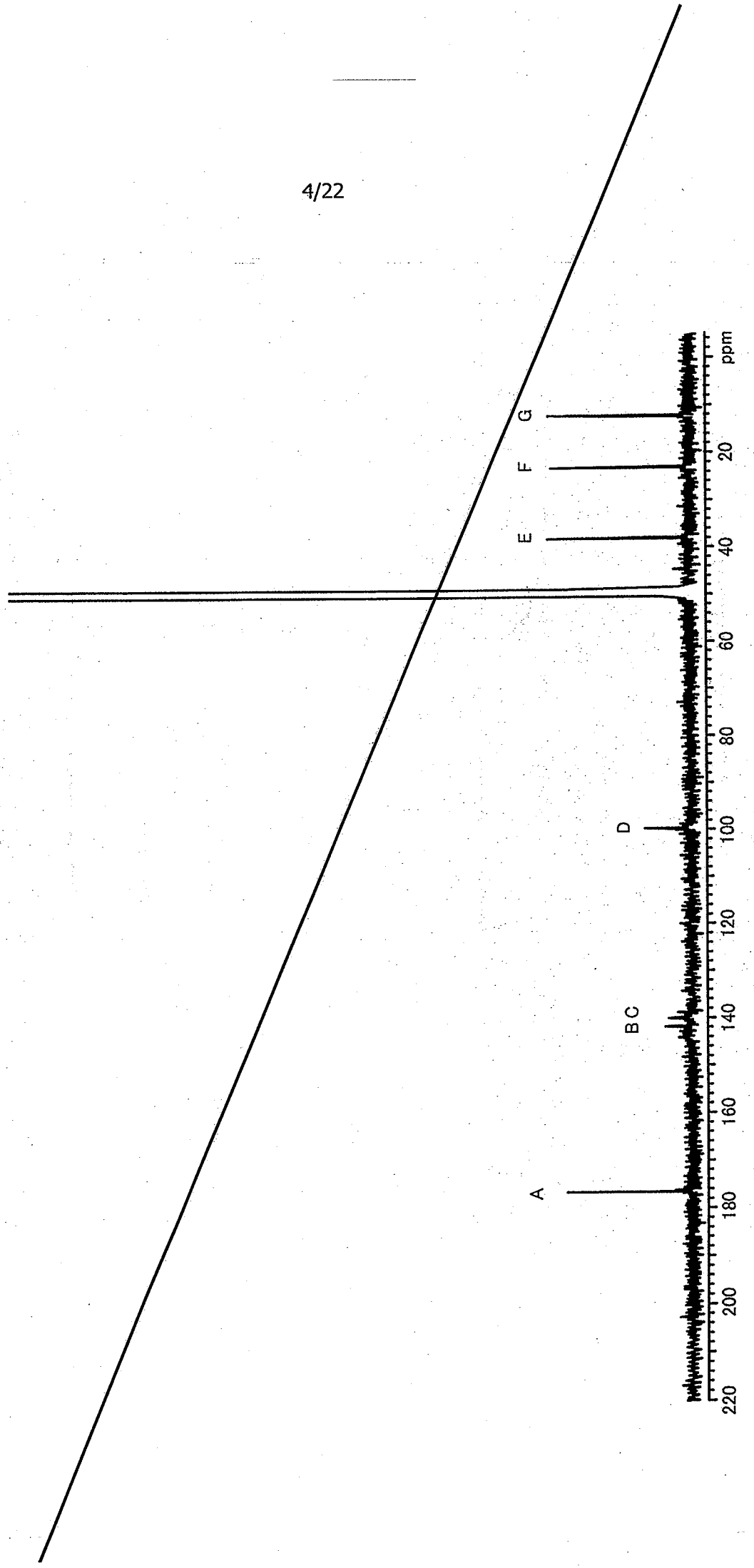


FIG. 5

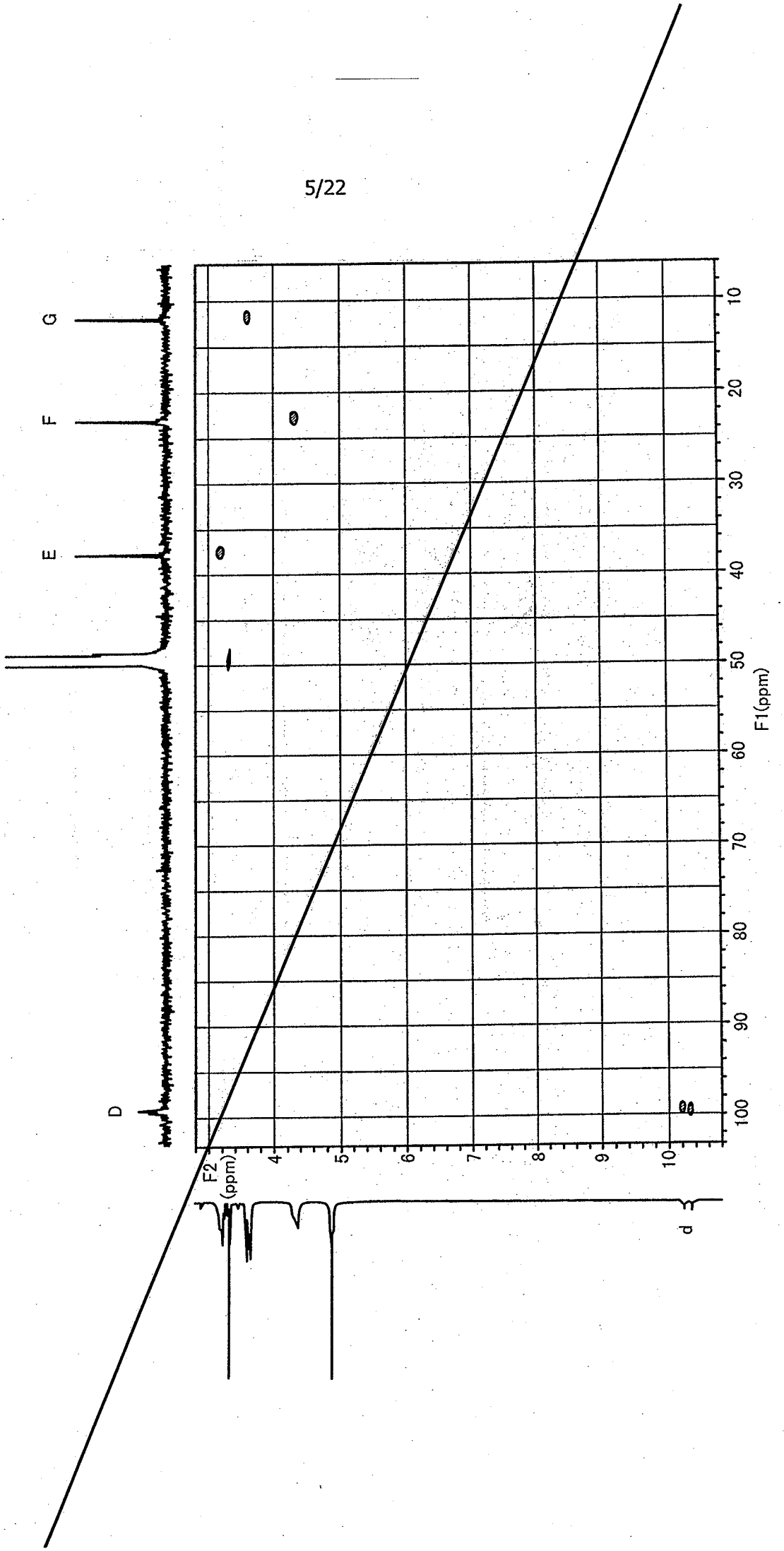


FIG. 6

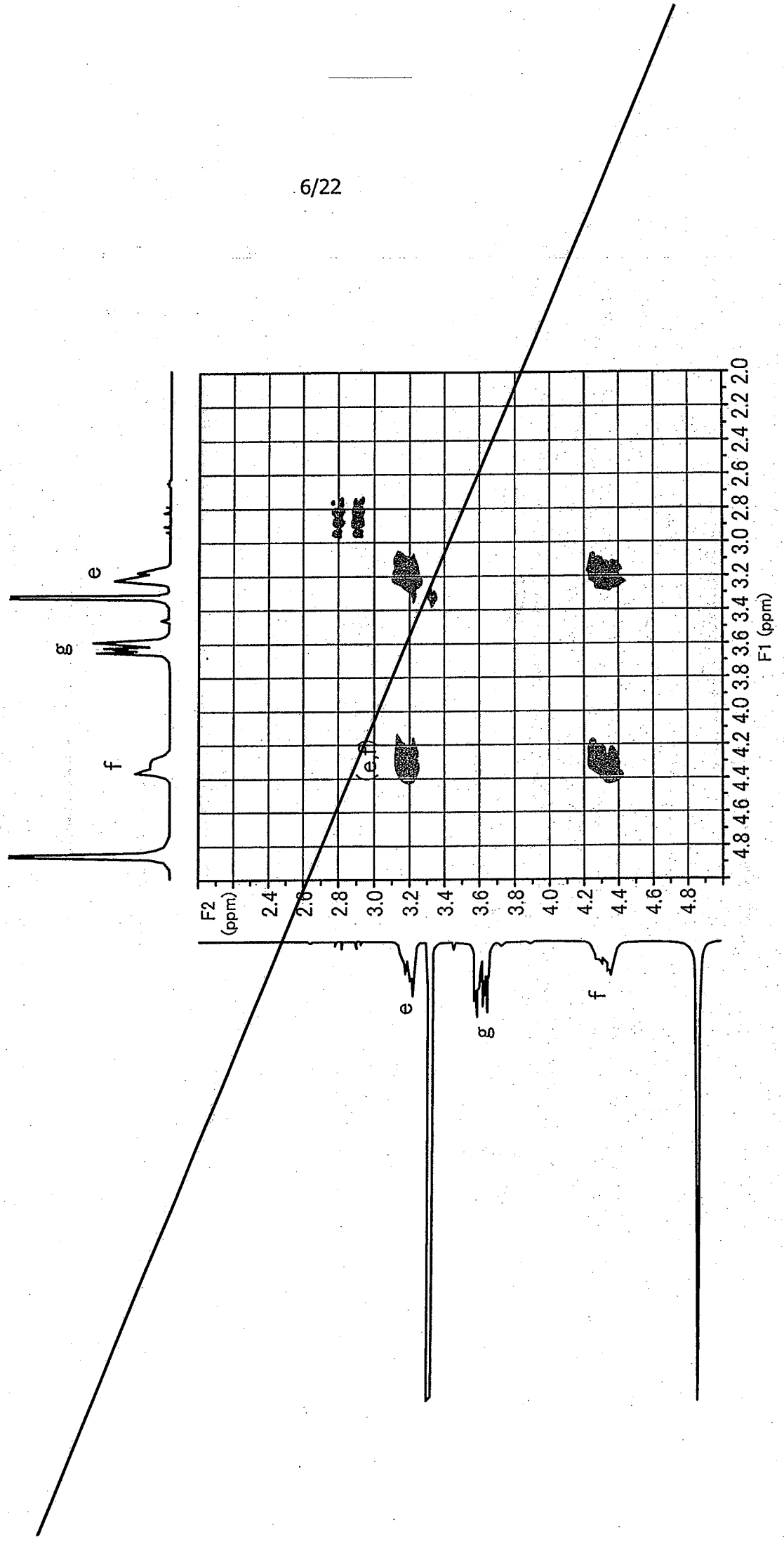


FIG. 7

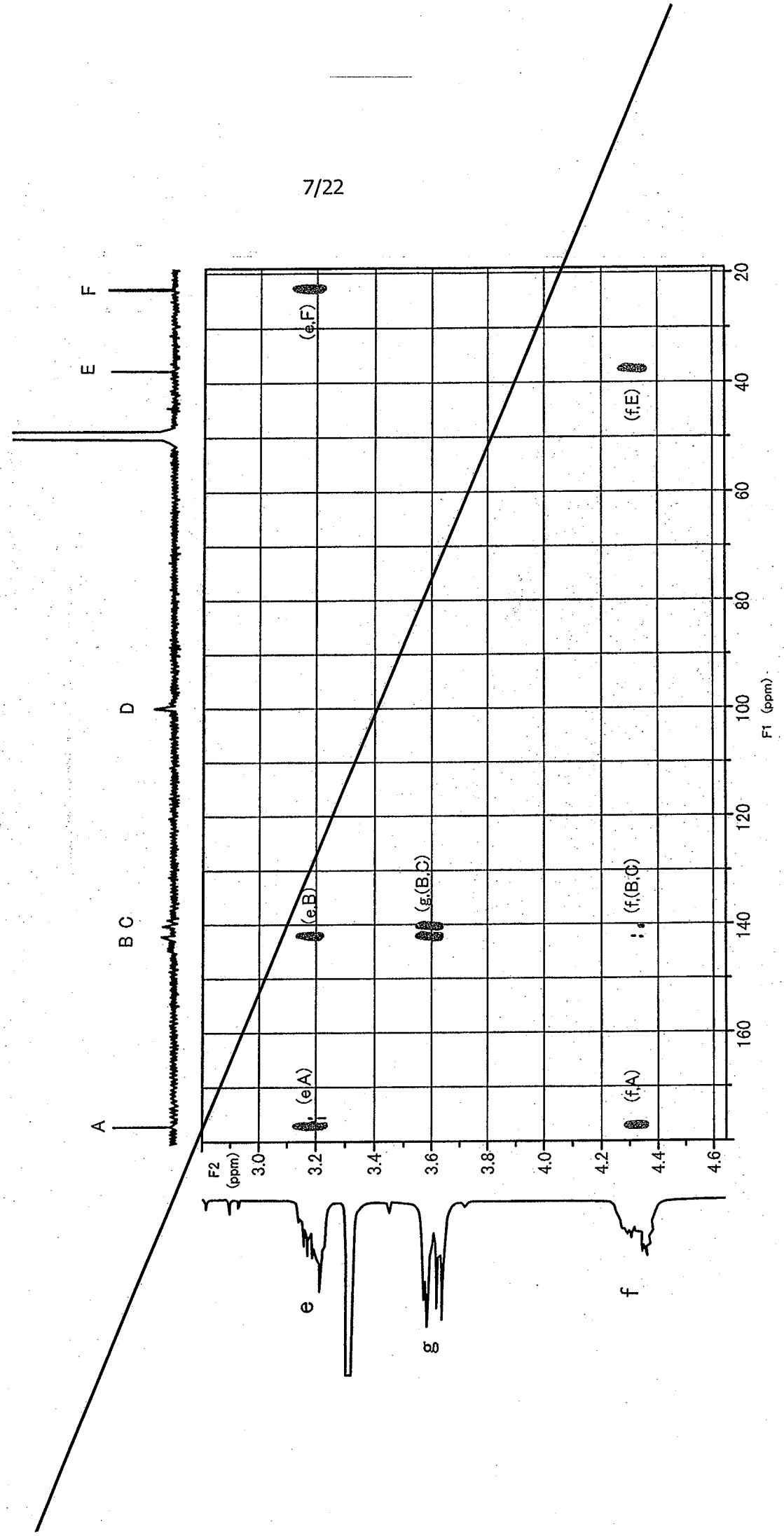


FIG. 8

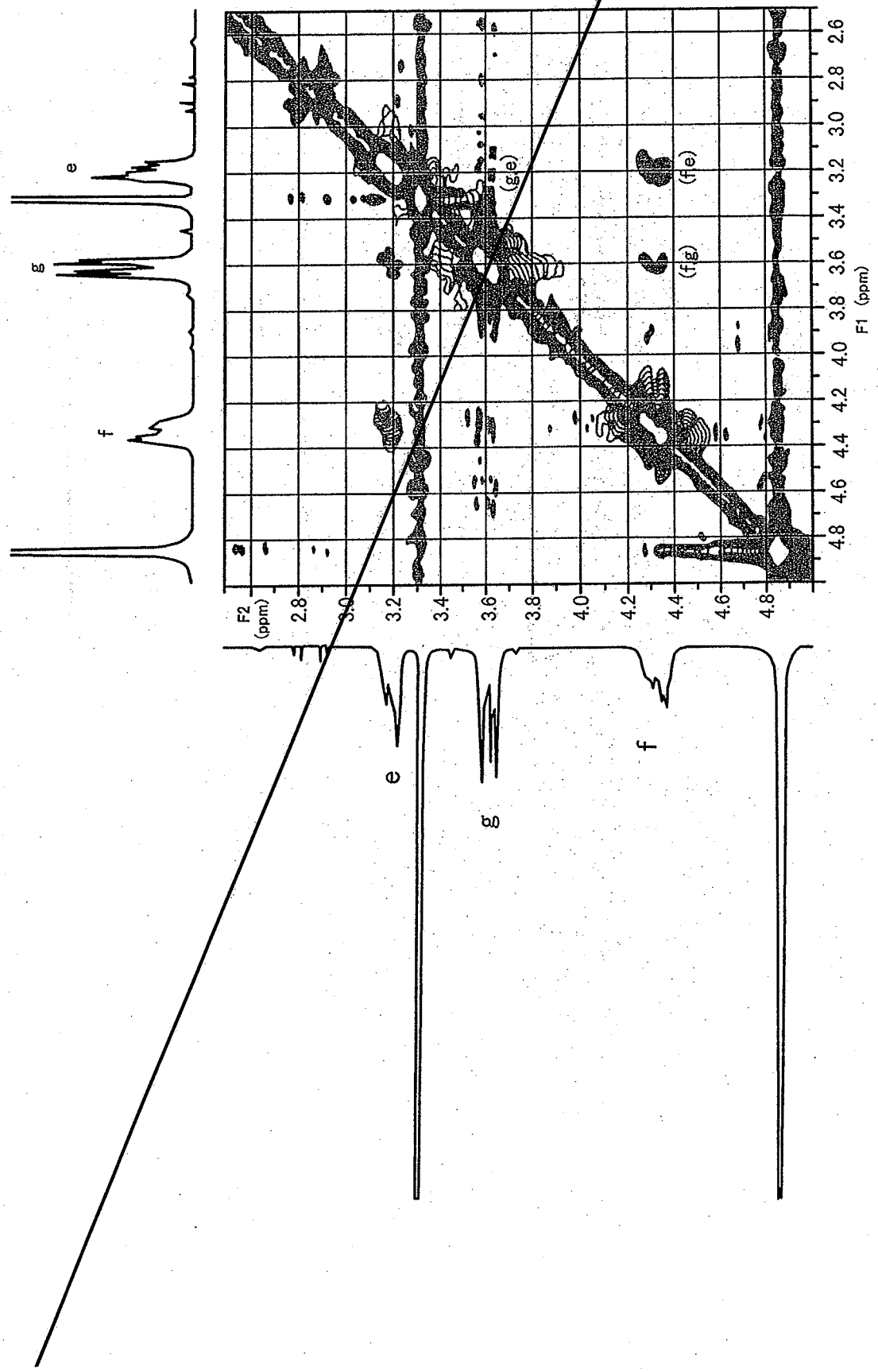


FIG. 9

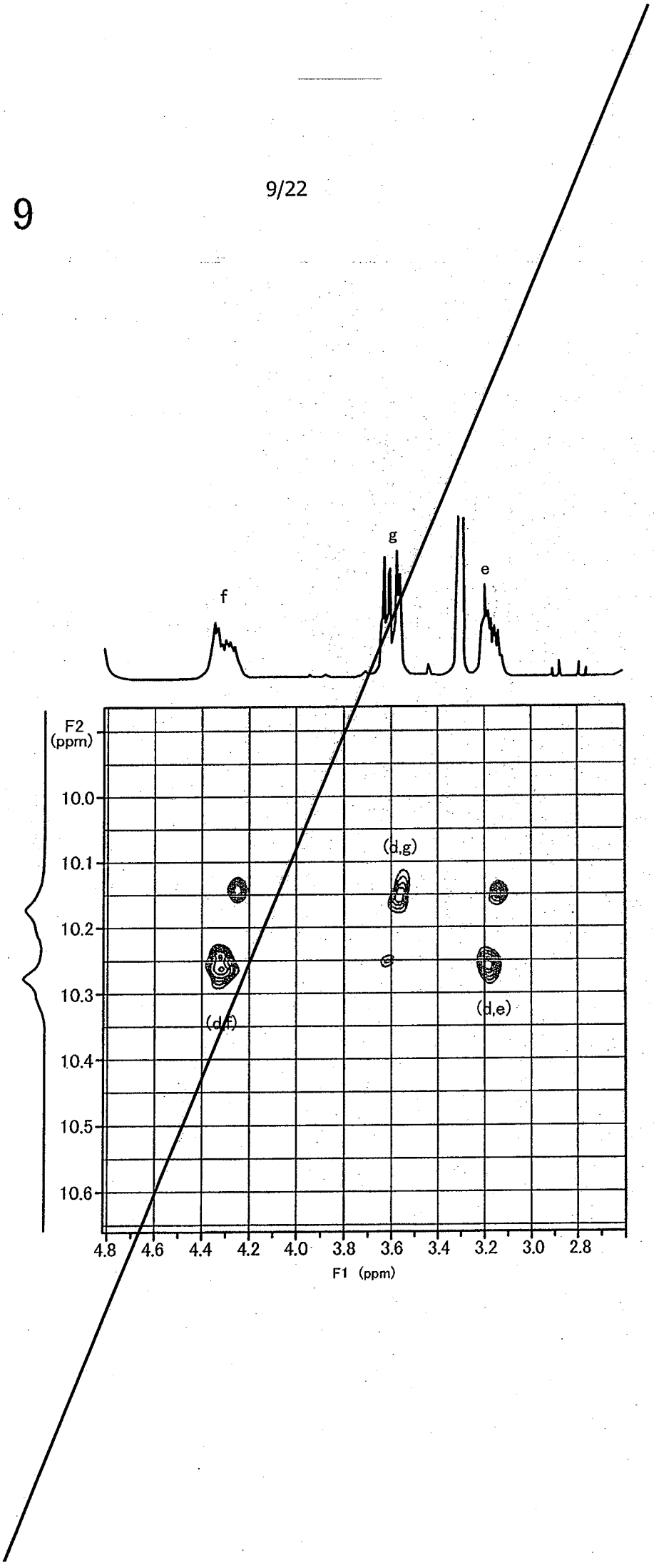

f
g
e
F2
(ppm)
10.0
10.1
10.2
10.3
10.4
10.5
10.6
(d,g)
(d,f)
(d,e)
4.8
4.6
4.4
4.2
4.0
3.8
3.6
3.4
3.2
3.0
2.8
F1 (ppm)

FIG. 10

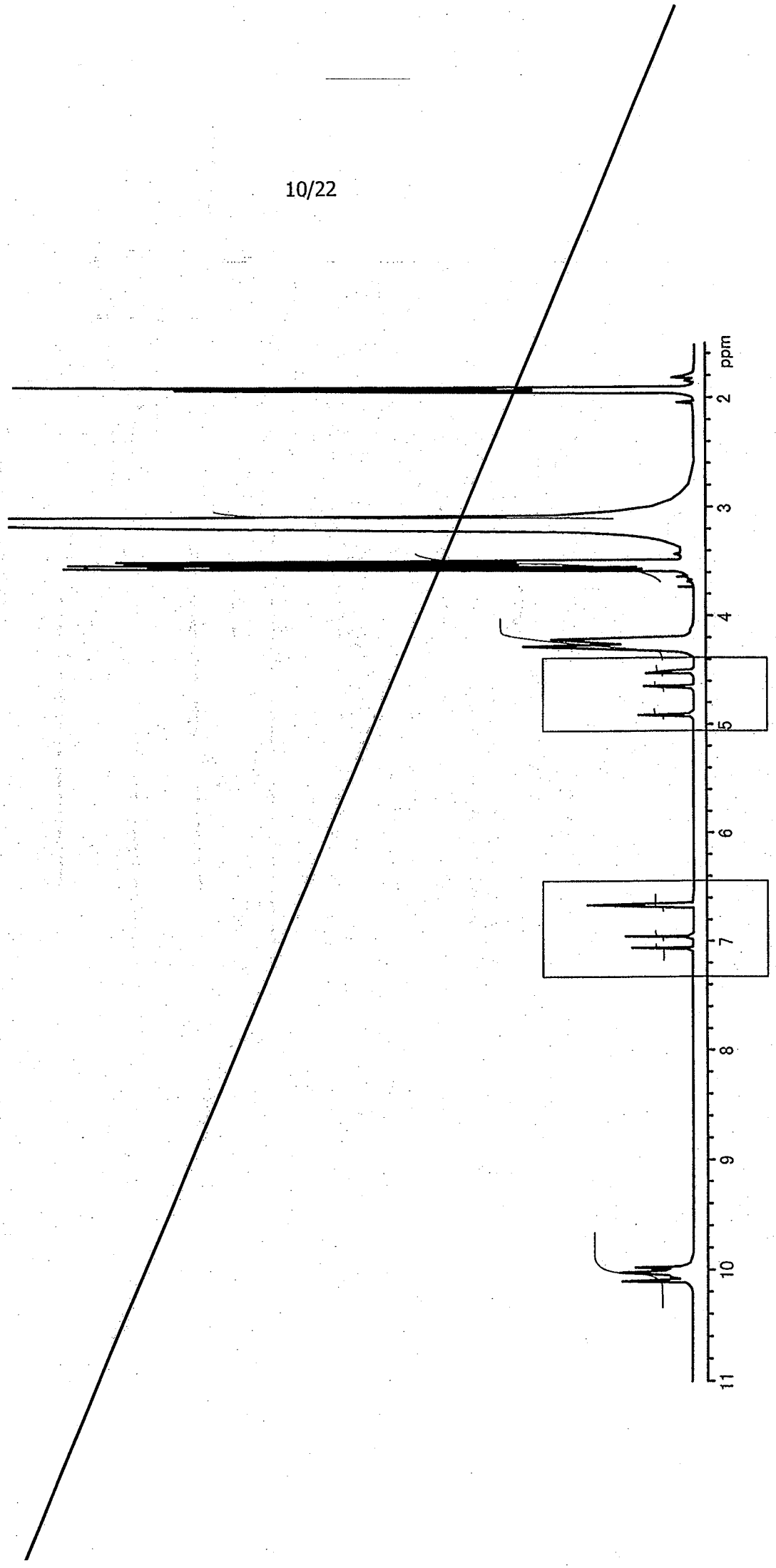


FIG. 11

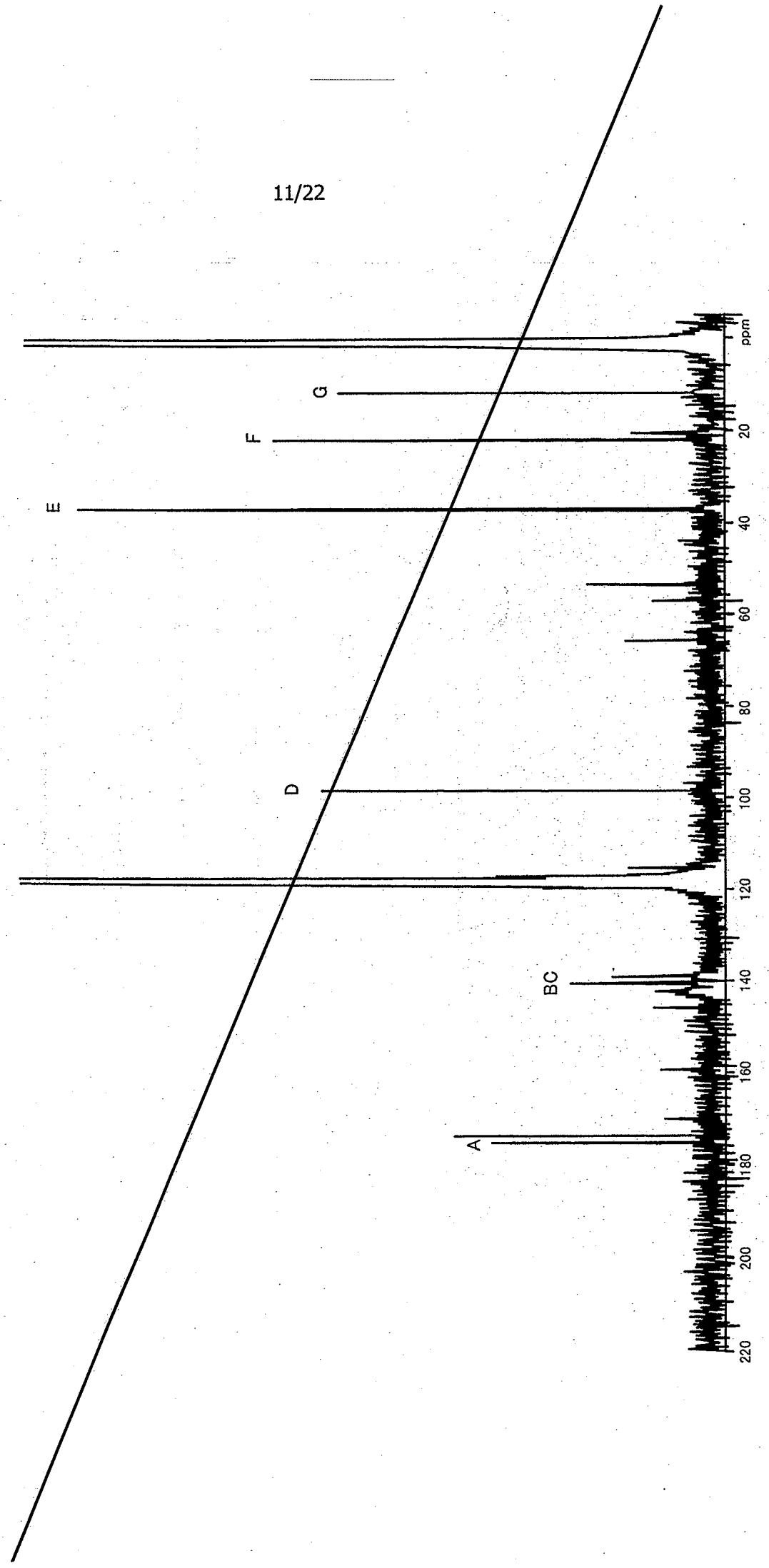


FIG. 12

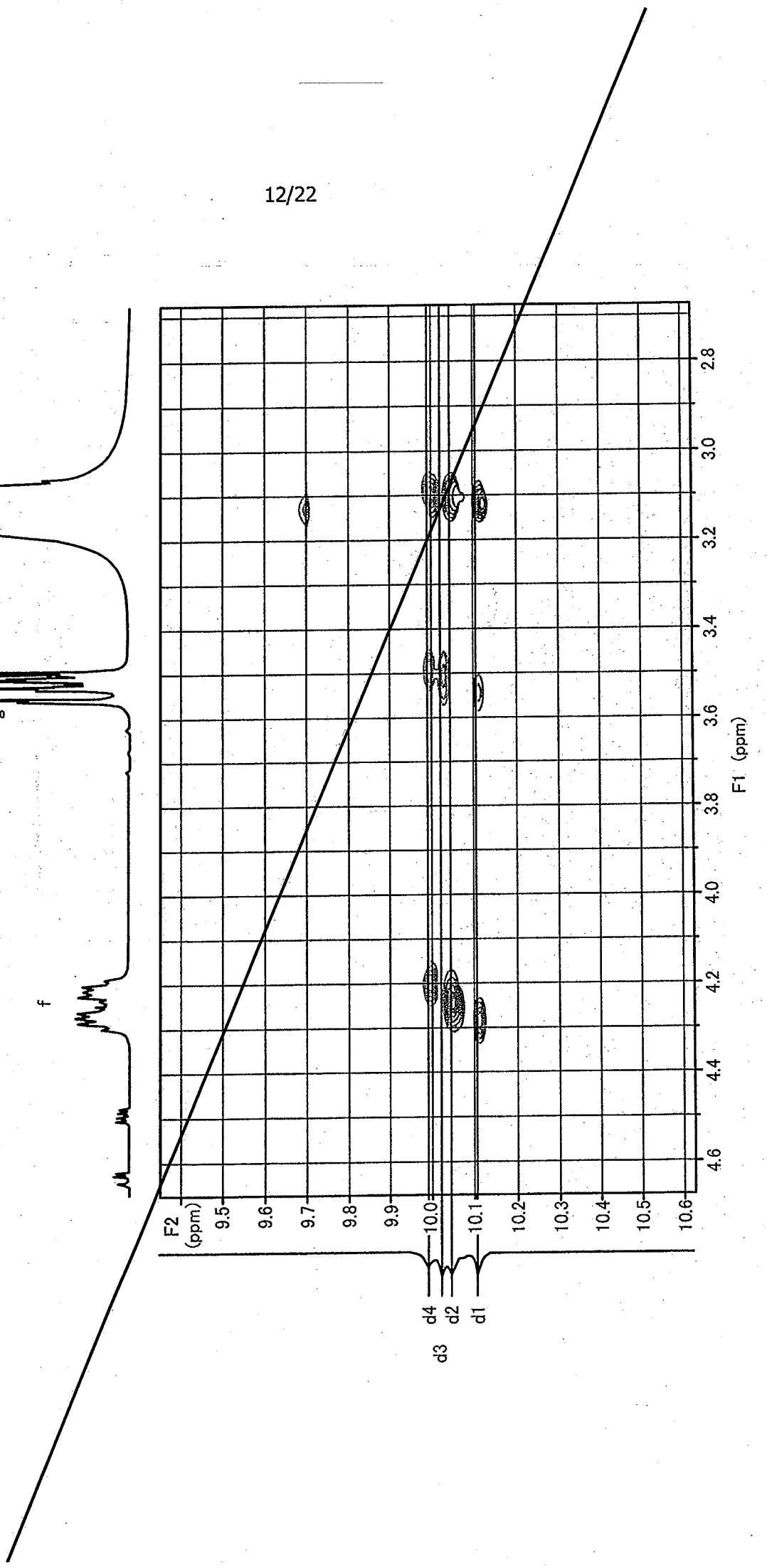

g
f
F2 (ppm)
9.5
9.6
9.7
9.8
9.9
10.0
10.1
10.2
10.3
10.4
10.5
10.6
d4
d2
d1
d3
2.8
3.0
3.2
3.4
3.6
3.8
4.0
4.2
4.4
4.6
F1 (ppm)

FIG. 13

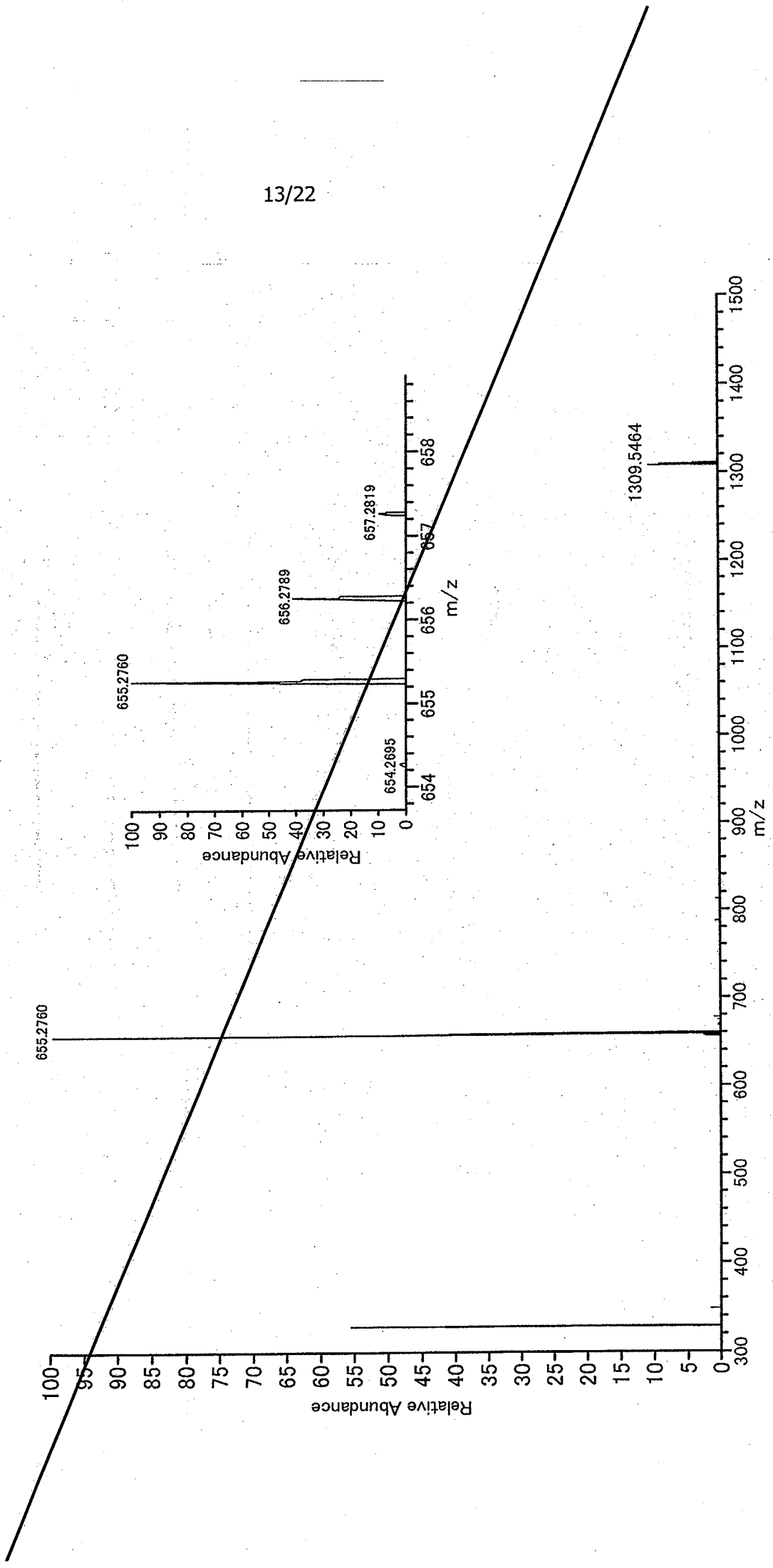

655.2760
1309.5464
Relative Abundance
m/z
655.2760
656.2789
657.2819
654.2695
Relative Abundance
m/z

FIG. 14

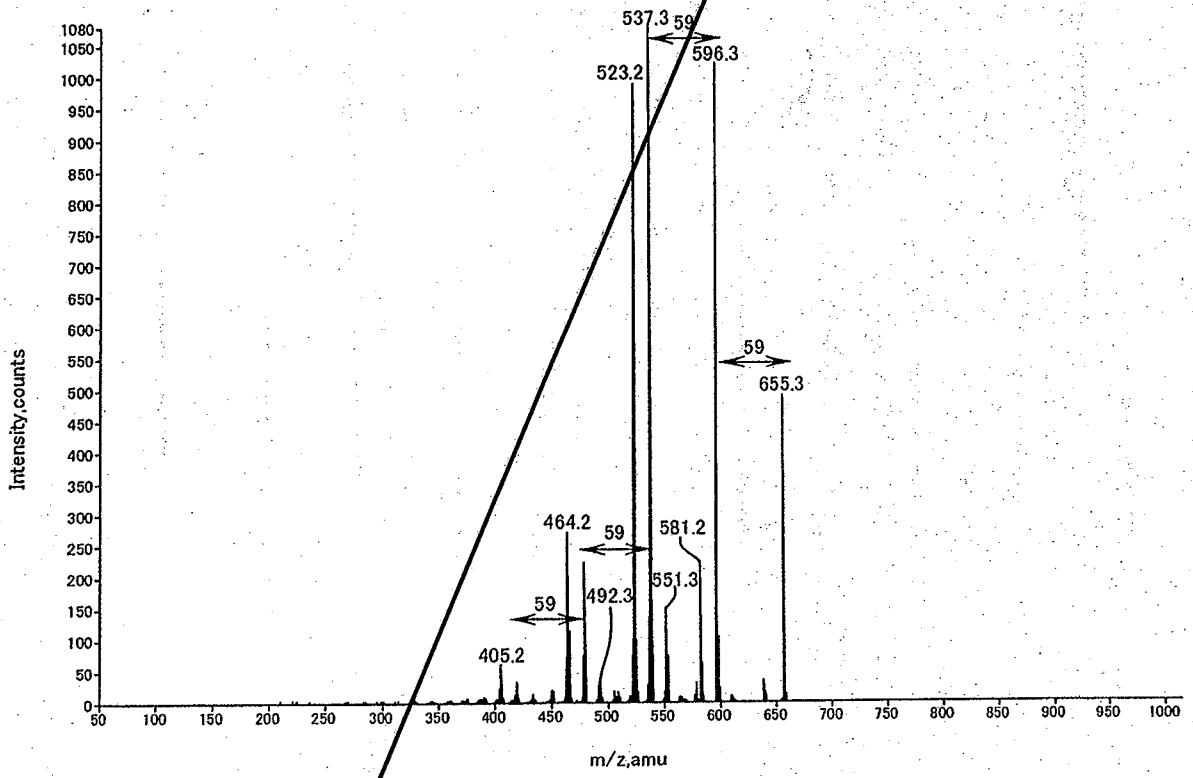

537.3
59
596.3
523.2
59
655.3
464.2
59
581.2
551.3
492.3
59
405.2
Intensity,counts
m/z,amu

FIG. 15

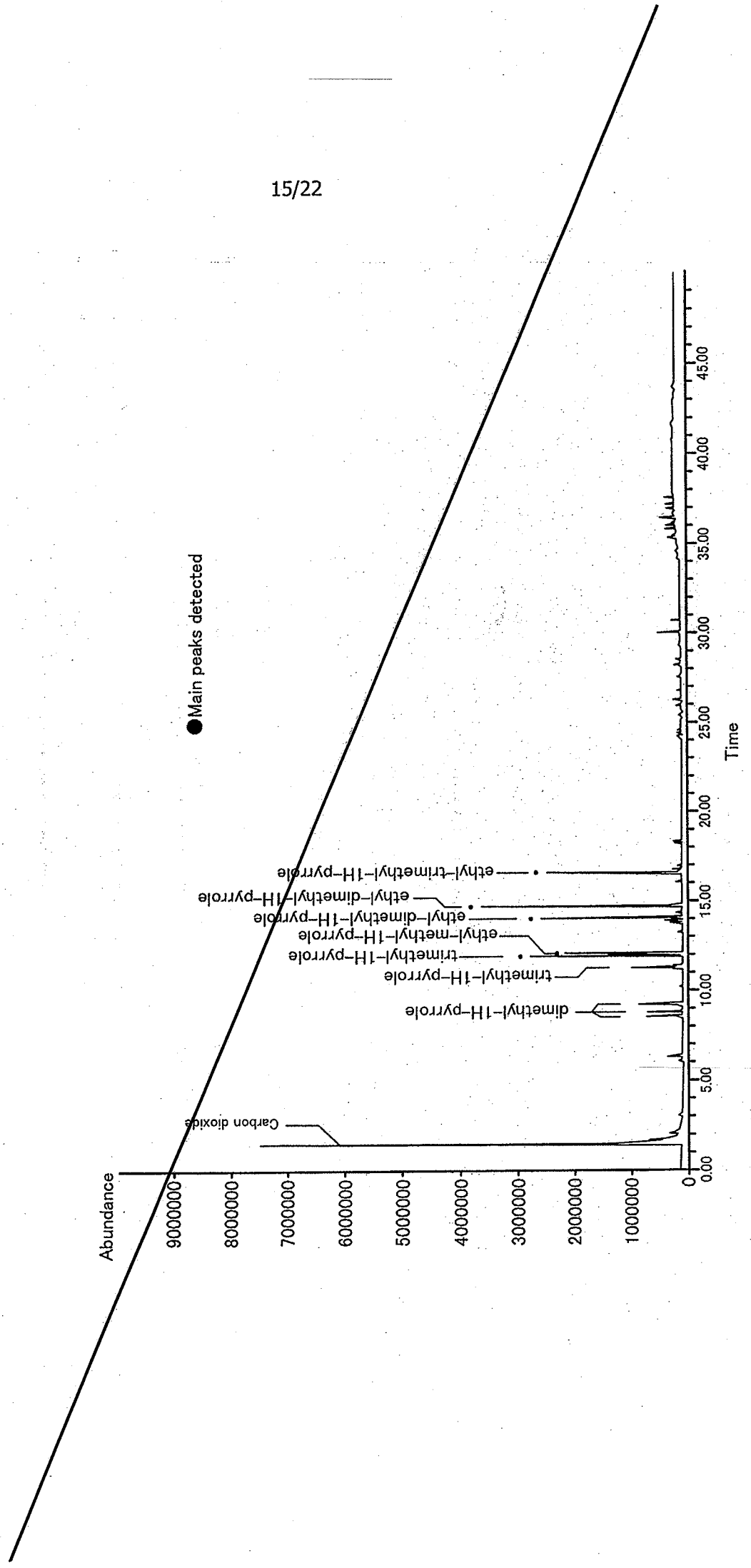

Abundance
9000000
8000000
7000000
6000000
5000000
4000000
3000000
2000000
1000000
0
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
Time
Main peaks detected
Carbon dioxide
dimethyl-1H-pyrrole
trimethyl-1H-pyrrole
trimethyl-1H-pyrrole
ethyl-methyl-1H-pyrrole
ethyl-dimethyl-1H-pyrrole
ethyl-dimethyl-1H-pyrrole
ethyl-trimethyl-1H-pyrrole

FIG. 16

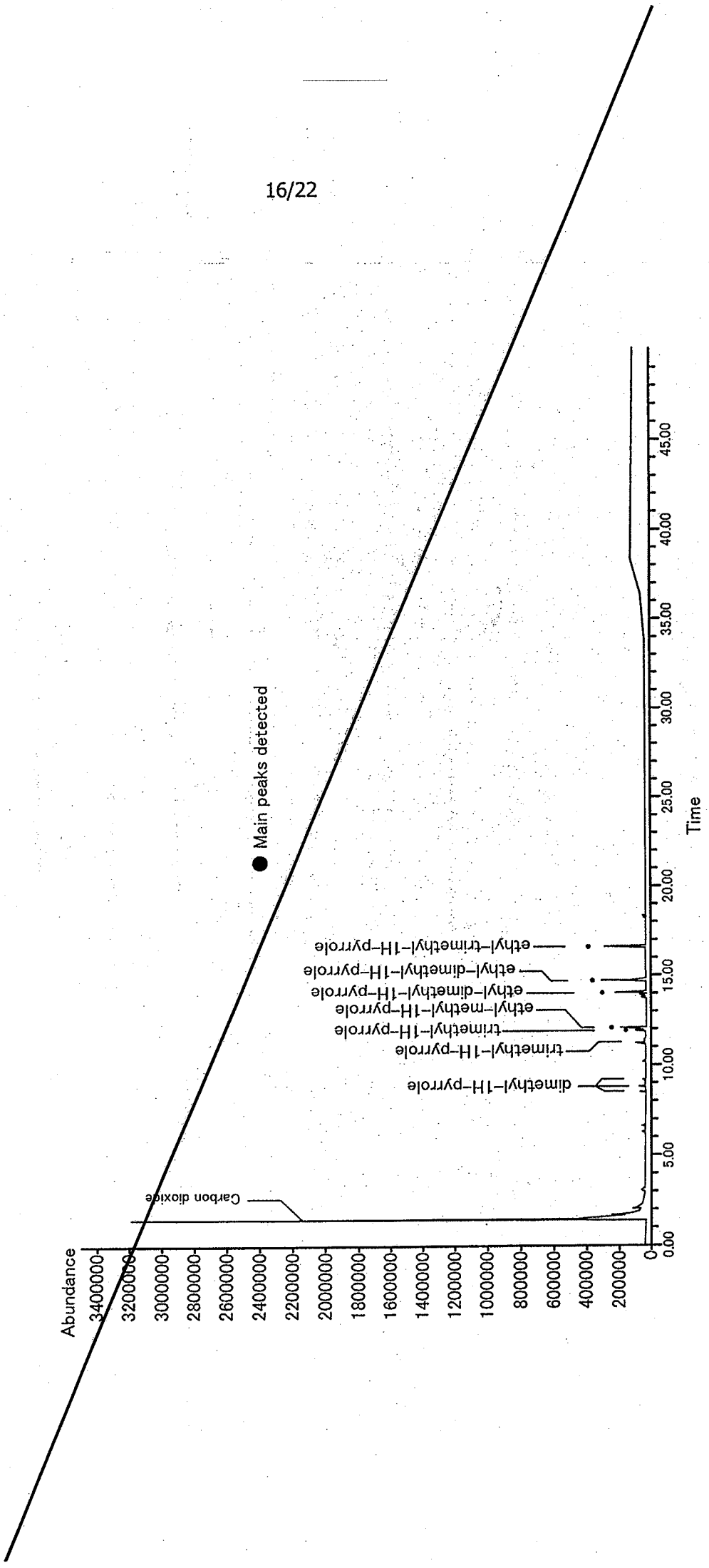

Abundance
Time
Carbon dioxide
Main peaks detected
dimethyl-1H-pyrrole
trimethyl-1H-pyrrole
trimethyl-1H-pyrrole
ethyl-methyl-1H-pyrrole
ethyl-dimethyl-1H-pyrrole
ethyl-dimethyl-1H-pyrrole
ethyl-trimethyl-1H-pyrrole

FIG. 17

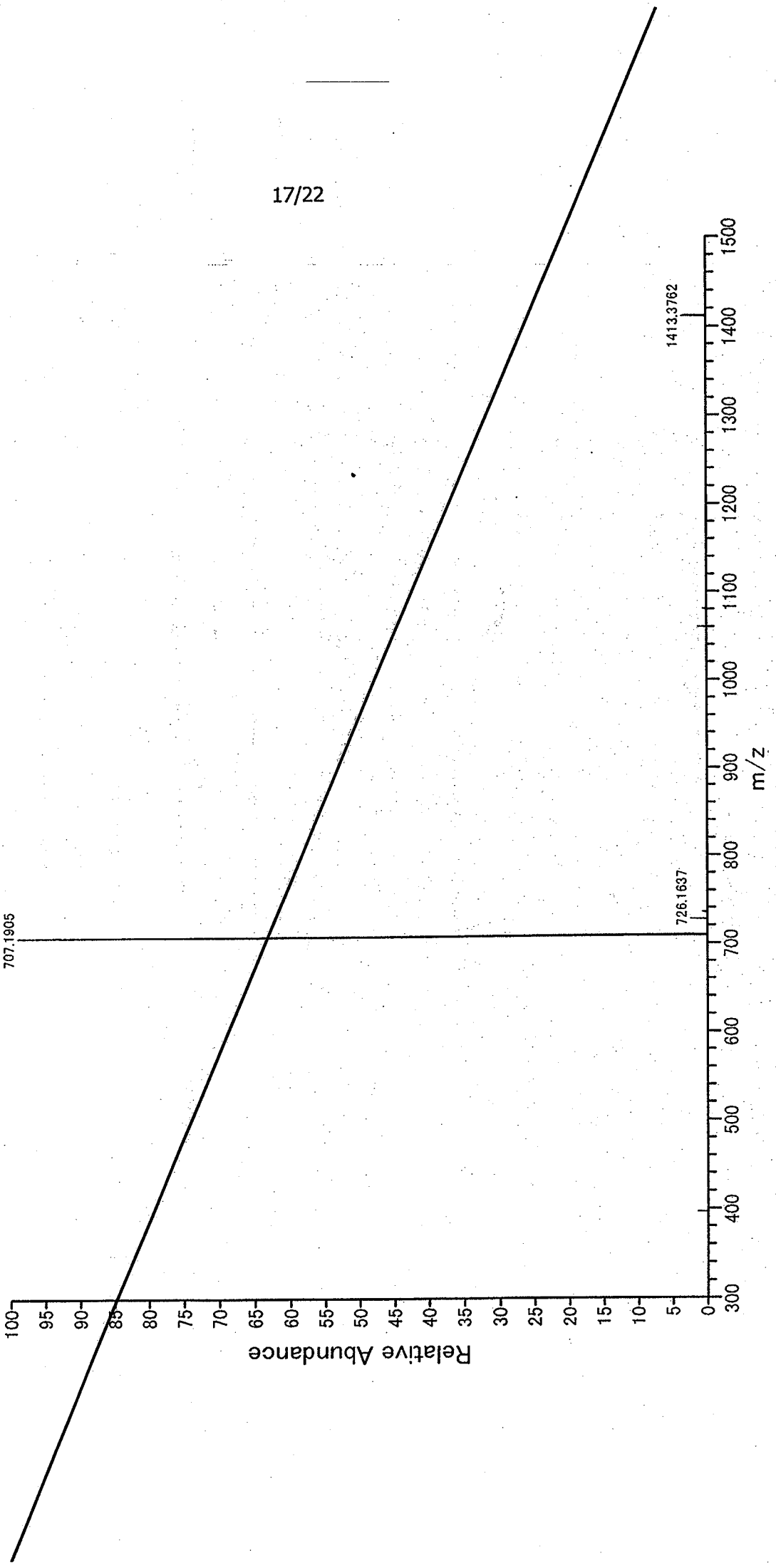

Relative Abundance
m/z
707.1905
726.1637
1413.3762
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500

FIG. 18

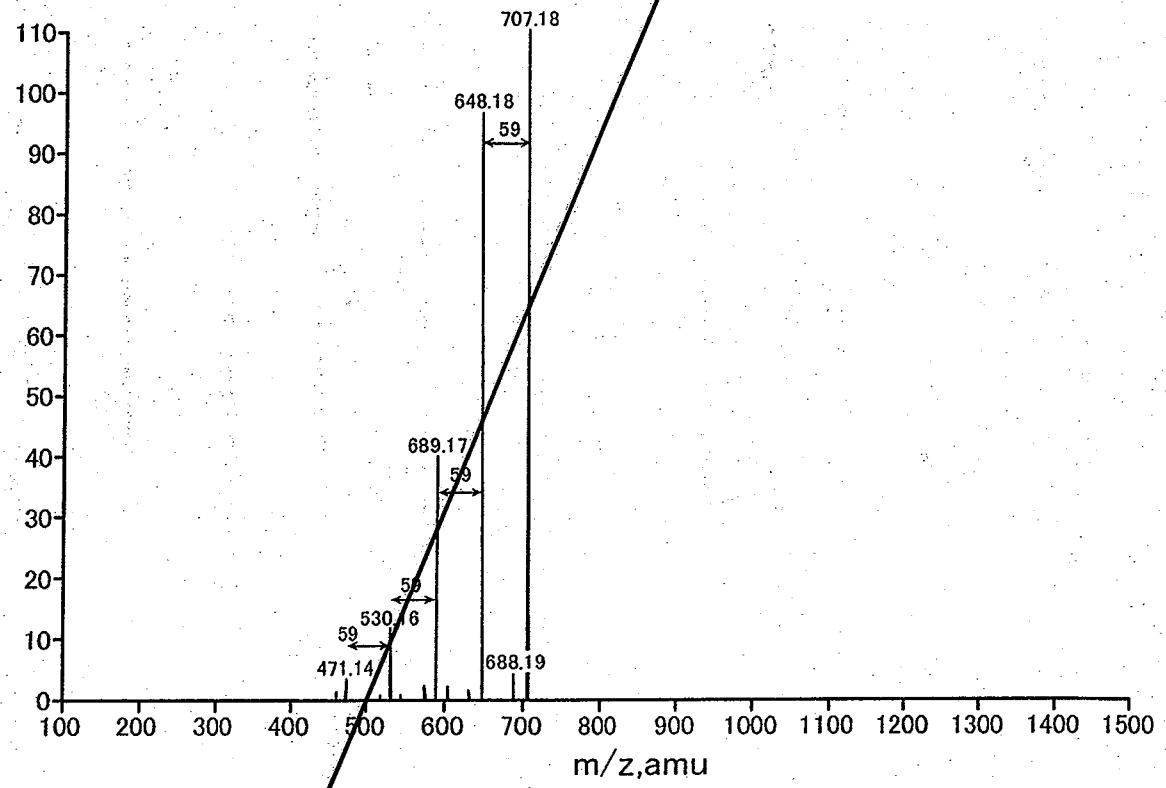

707.18
648.18
59
689.17
59
59
530.16
59
471.14
688.19
110
100
90
80
70
60
50
40
30
20
10
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
m/z,amu

FIG. 19

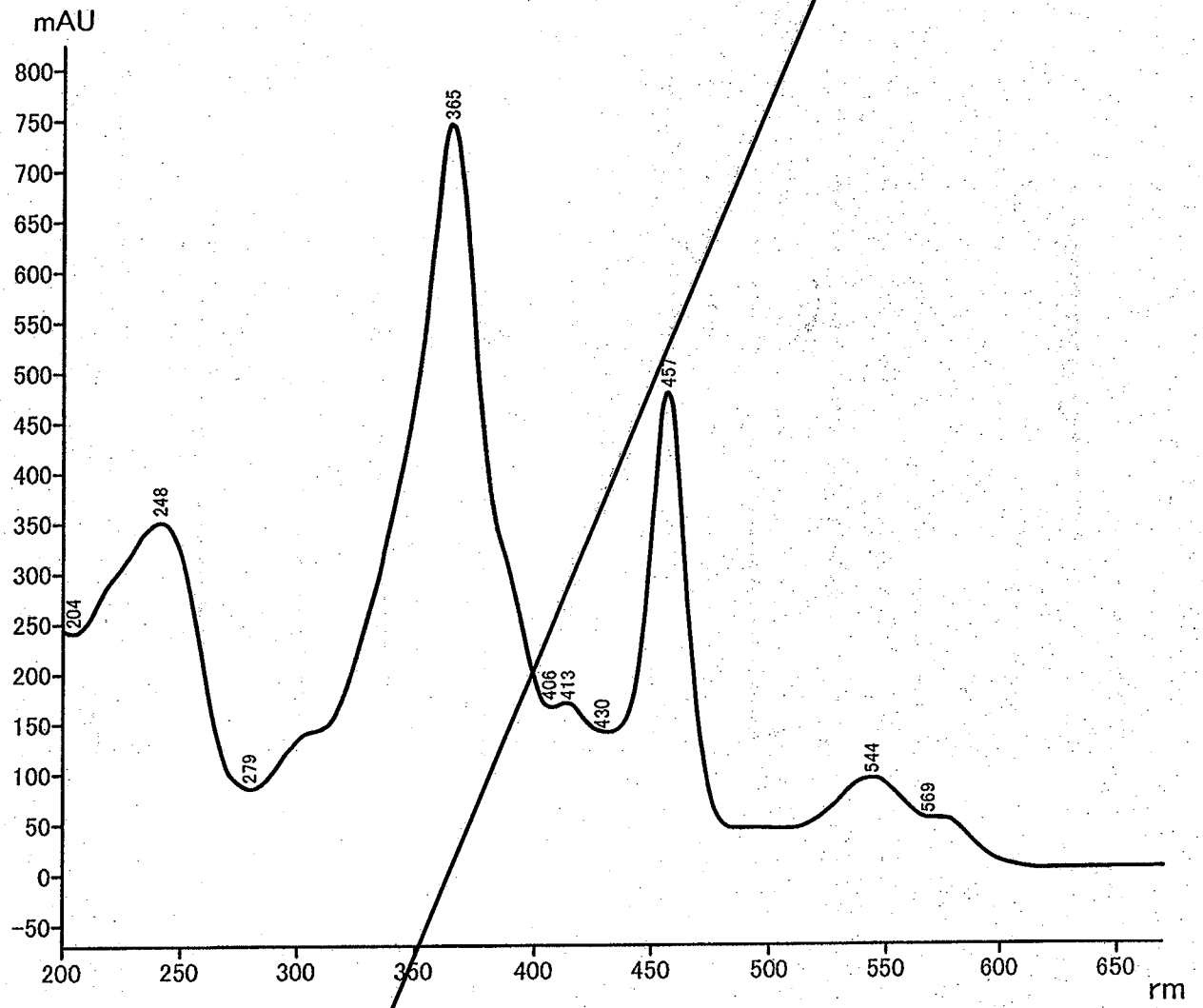

mAU
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
-50
204
248
279
365
406
413
430
457
544
569
200
250
300
350
400
450
500
550
600
650
rm

FIG. 20

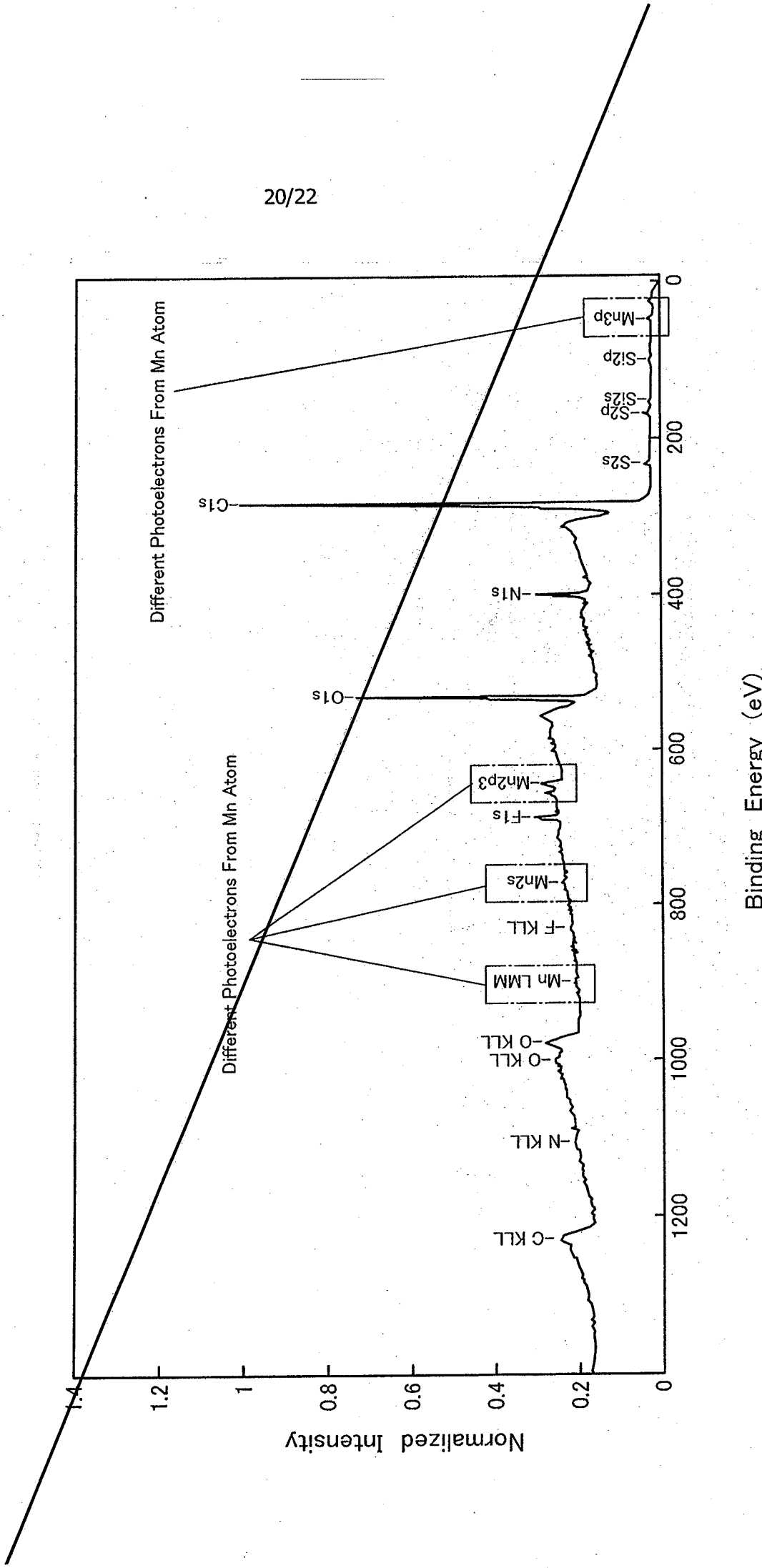

Normalized Intensity
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Binding Energy (eV)
0
200
400
600
800
1000
1200
Different Photoelectrons From Mn Atom
Different Photoelectrons From Mn Atom
Mn3p
Si2p
Si2s
S2p
S2s
C1s
N1s
O1s
Mn2p3
F1s
Mn2s
F KLL
Mn LMM
O KLL
O KLL
N KLL
C KLL

FIG. 21

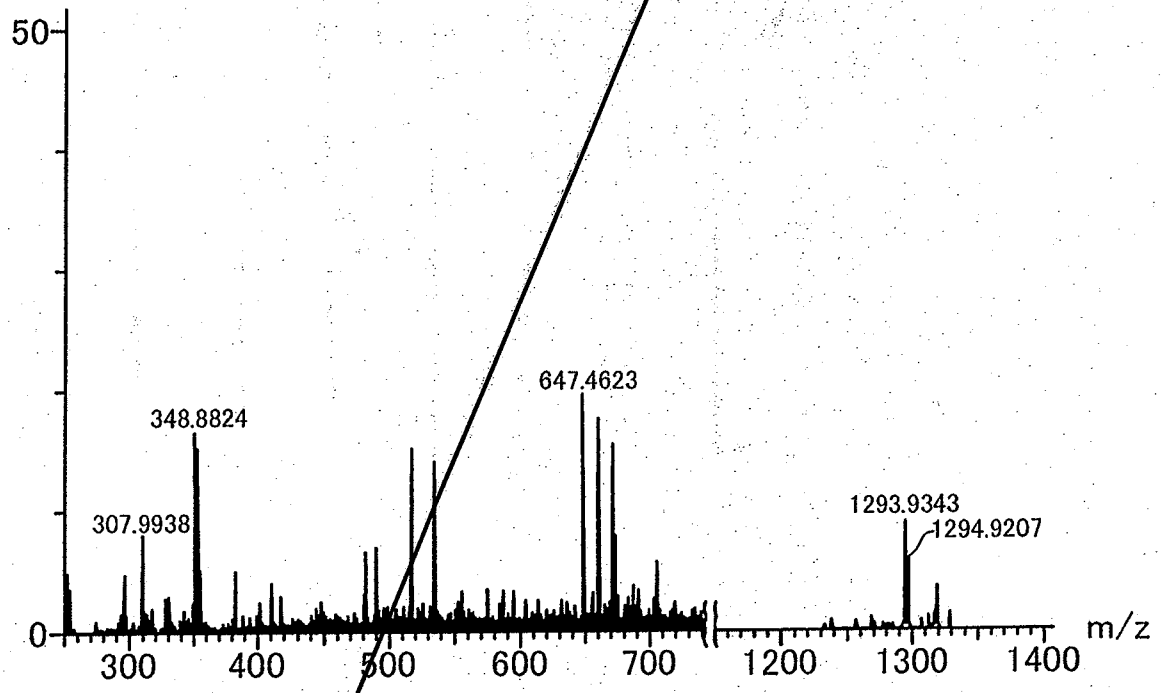

50
0
348.8824
307.9938
647.4623
1293.9343
1294.9207
300
400
500
600
700
1200
1300
1400
m/z

FIG. 22

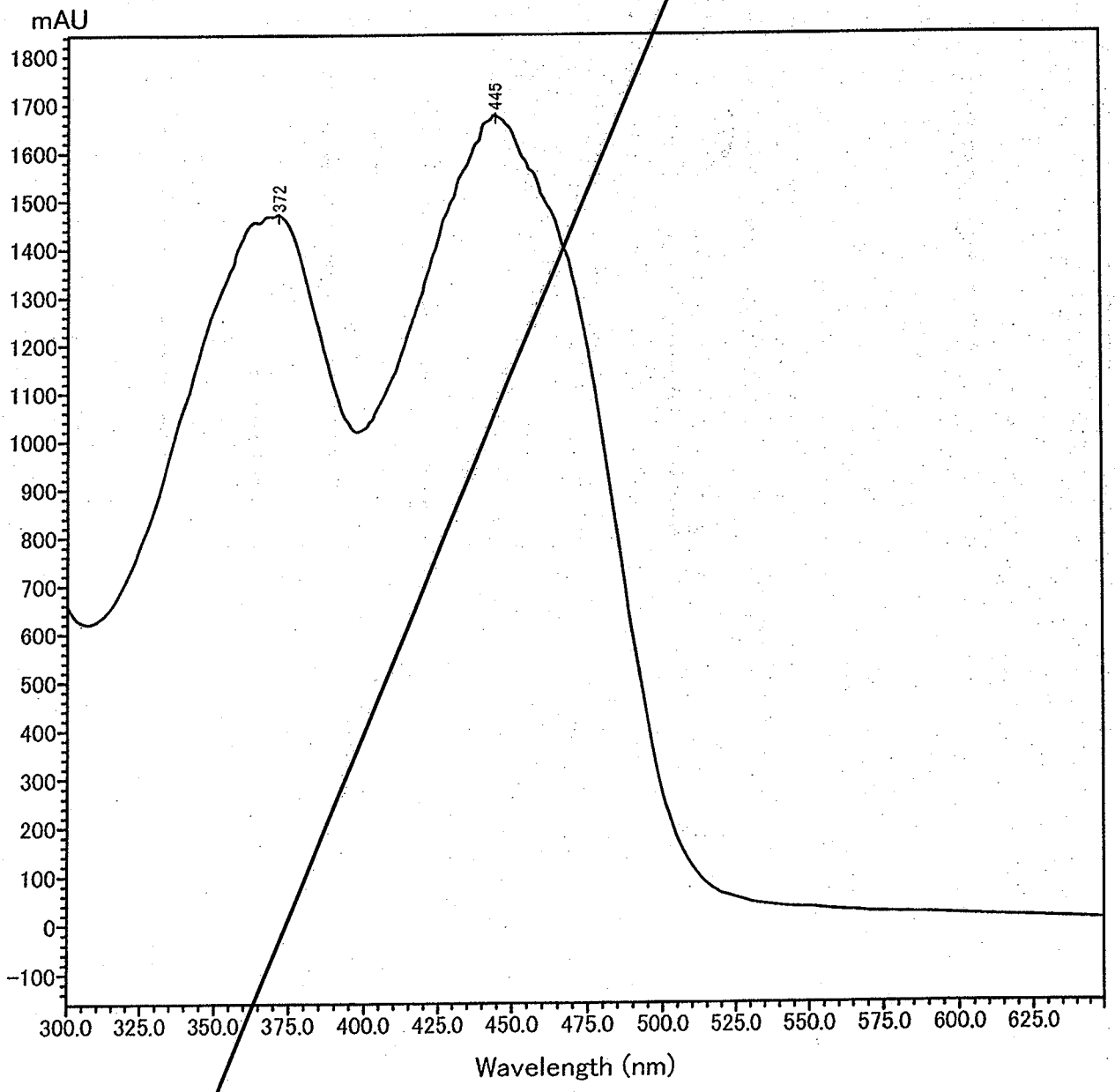

mAU
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
-100
372
445
300.0
325.0
350.0
375.0
400.0
425.0
450.0
475.0
500.0
525.0
550.0
575.0
600.0
625.0
Wavelength (nm)

FIG. 1

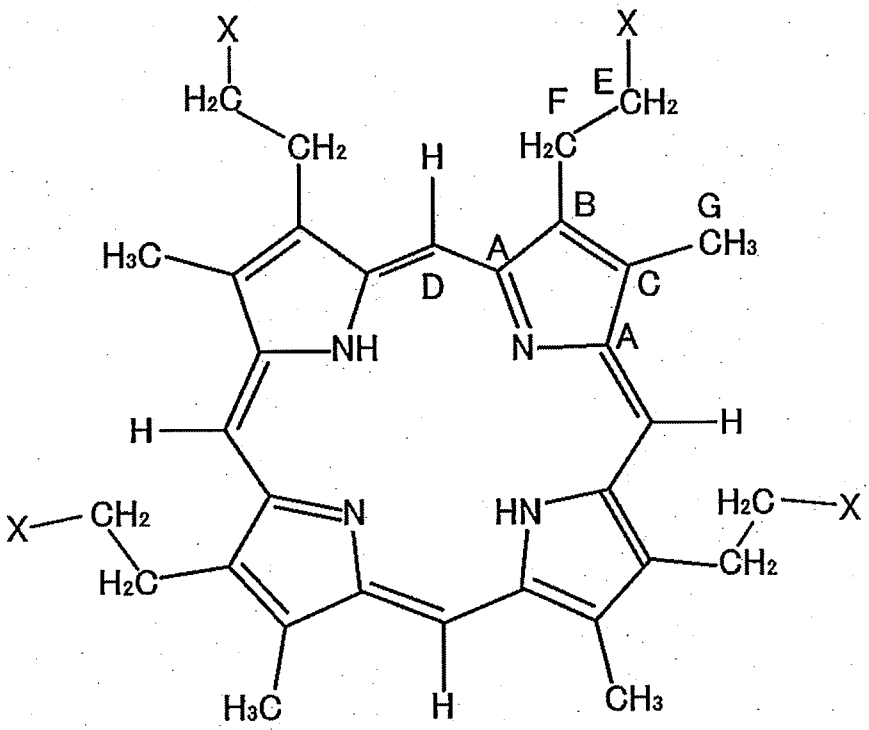

X
H2C
CH2
H
X
E
F
CH2
H2C
B
G
CH3
H3C
A
D
C
NH
N
A
H
H
X
CH2
H2C
N
HN
H2C
X
CH2
H3C
H
CH3

FIG. 2

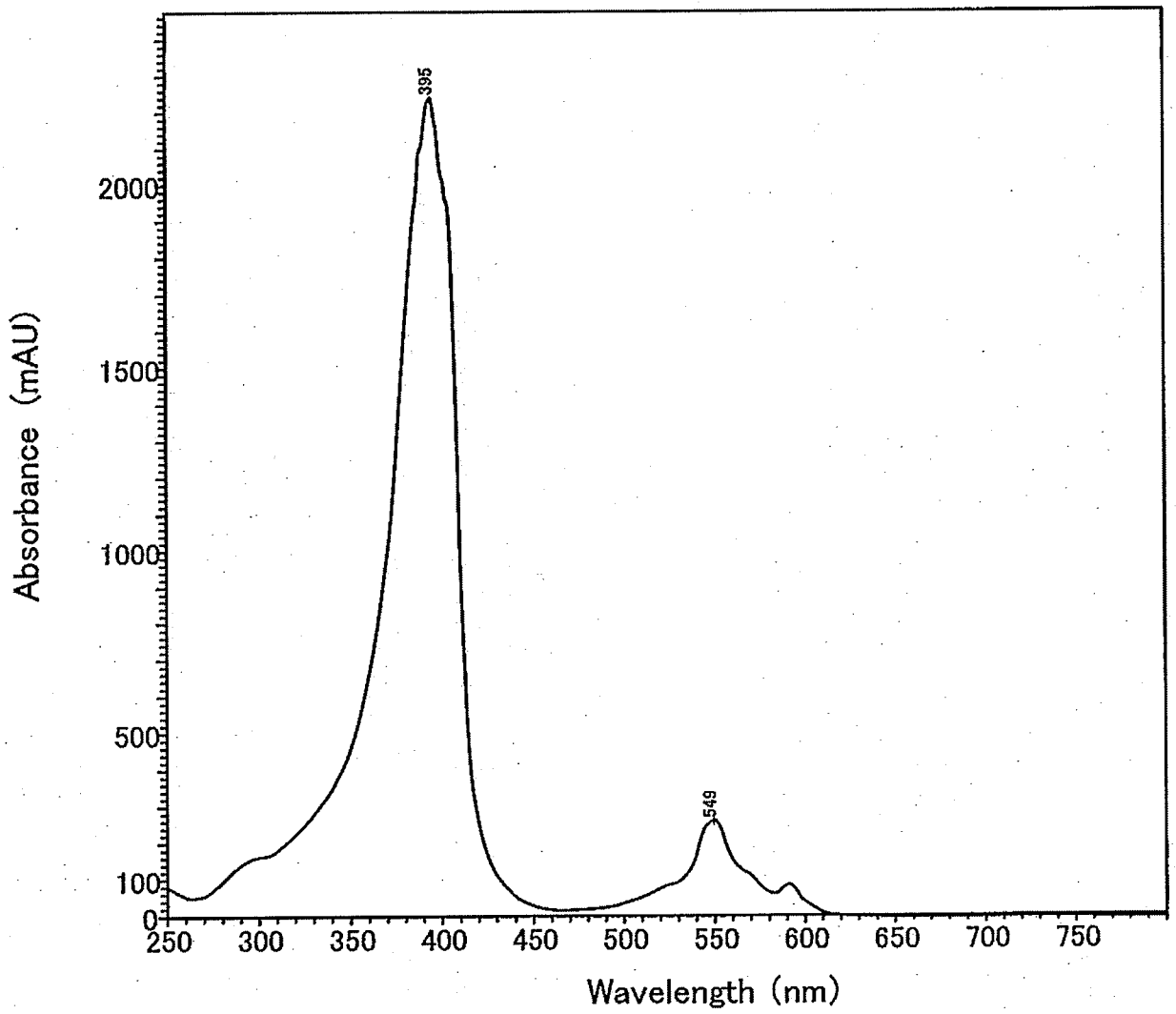

Absorbance (mAU)
2000
1500
1000
500
100
0
395
549
250
300
350
400
450
500
550
600
650
700
750
Wavelength (nm)

FIG. 3

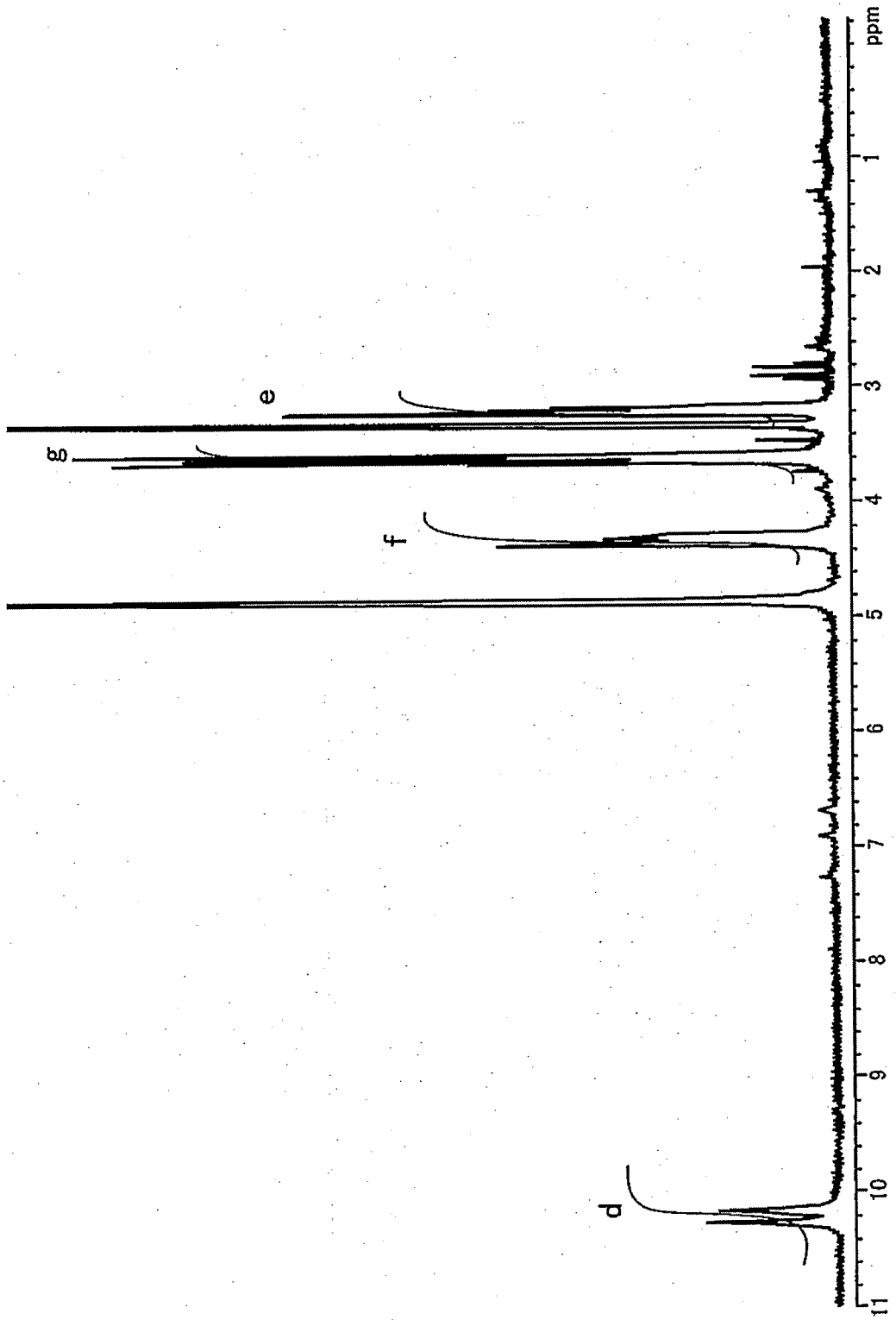


FIG. 4

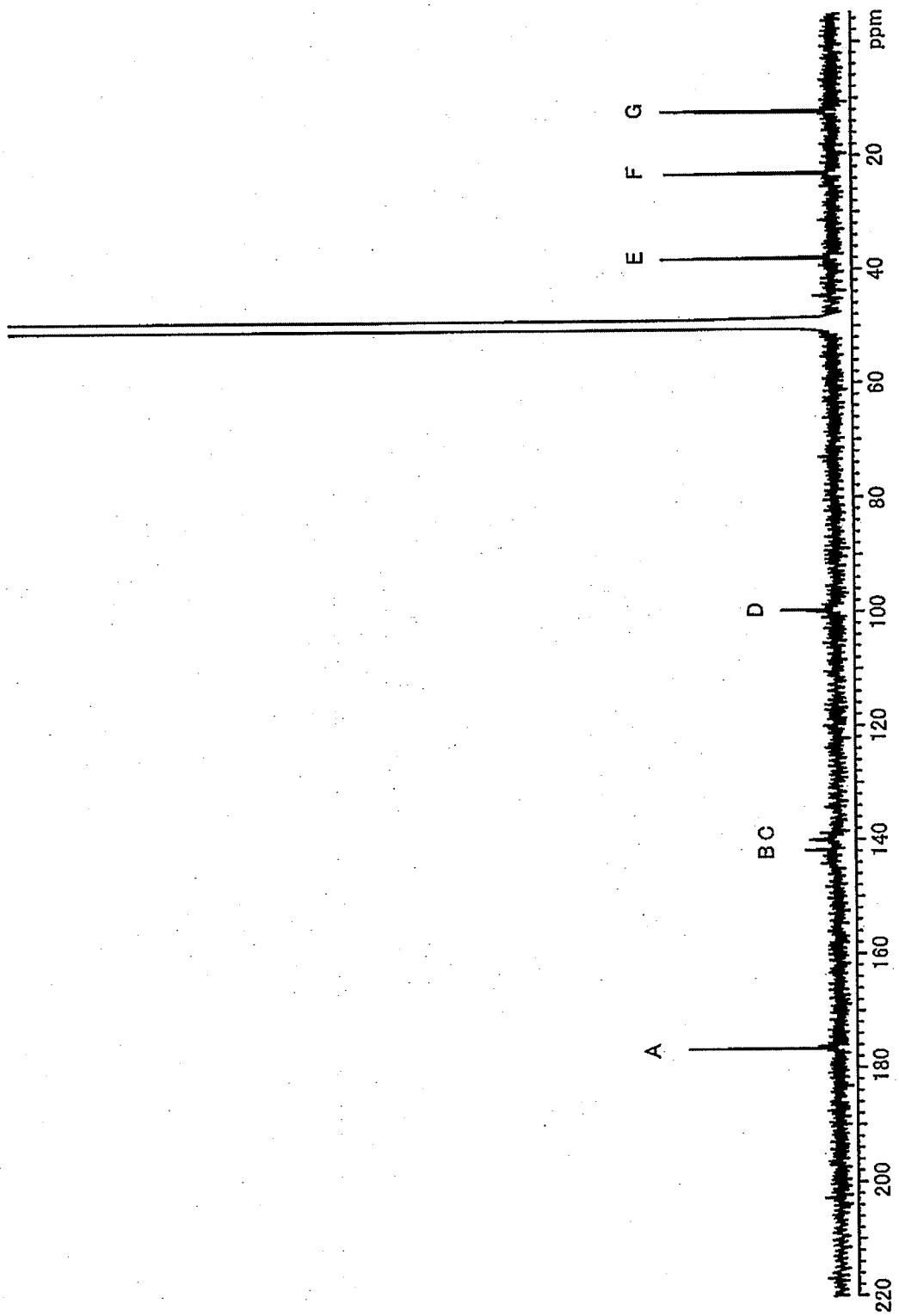


FIG. 5

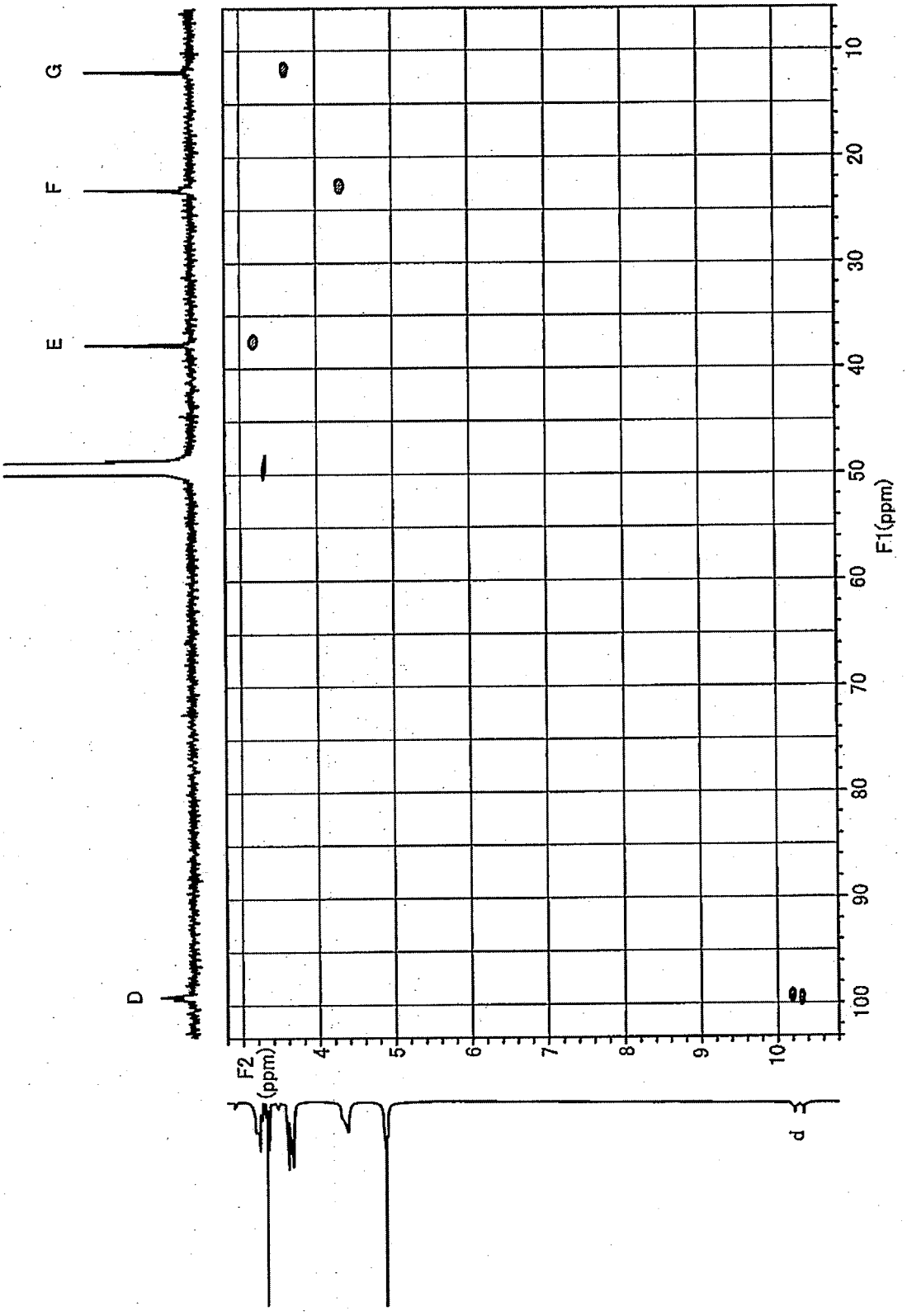


FIG. 6

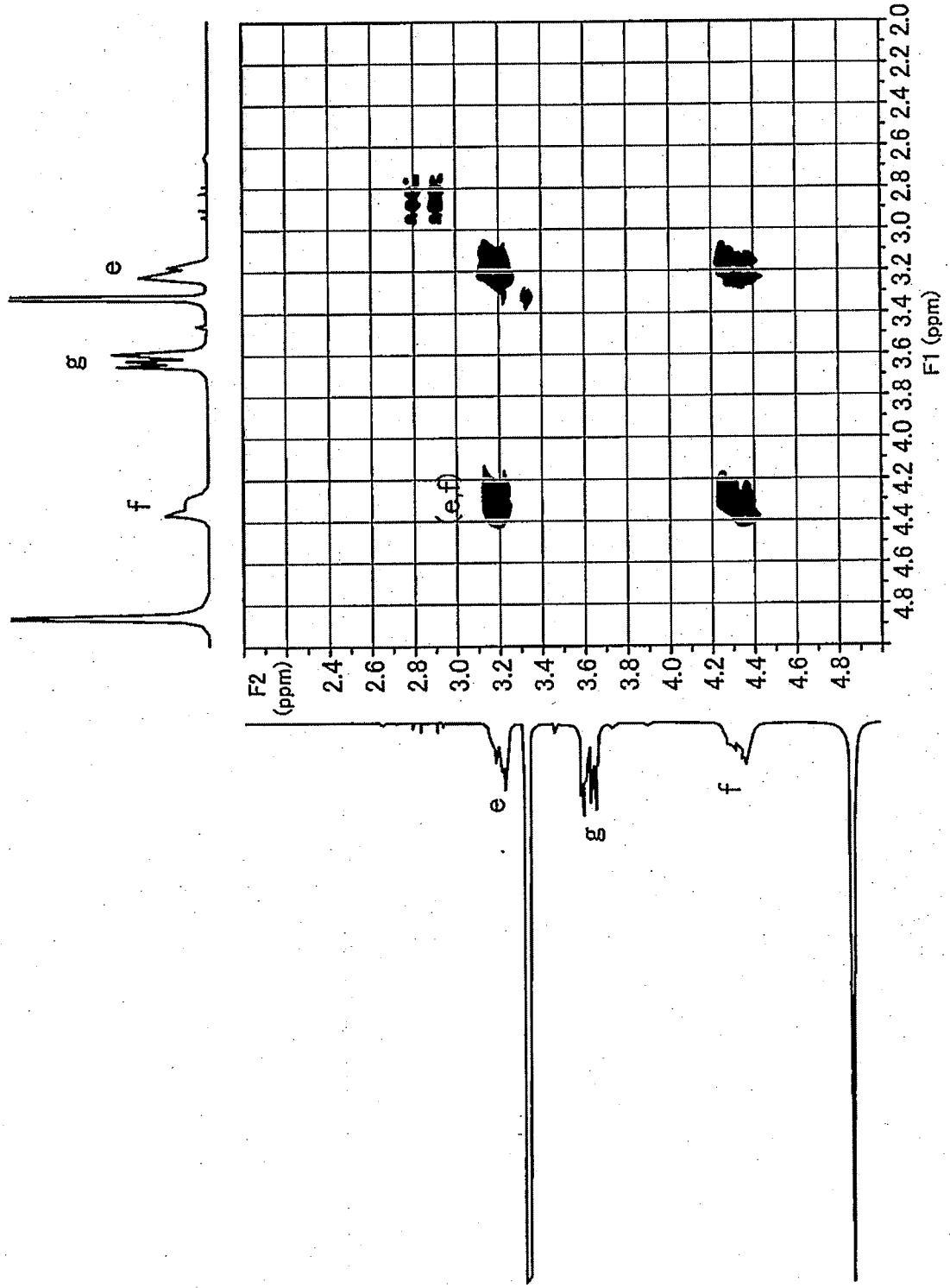


FIG. 7

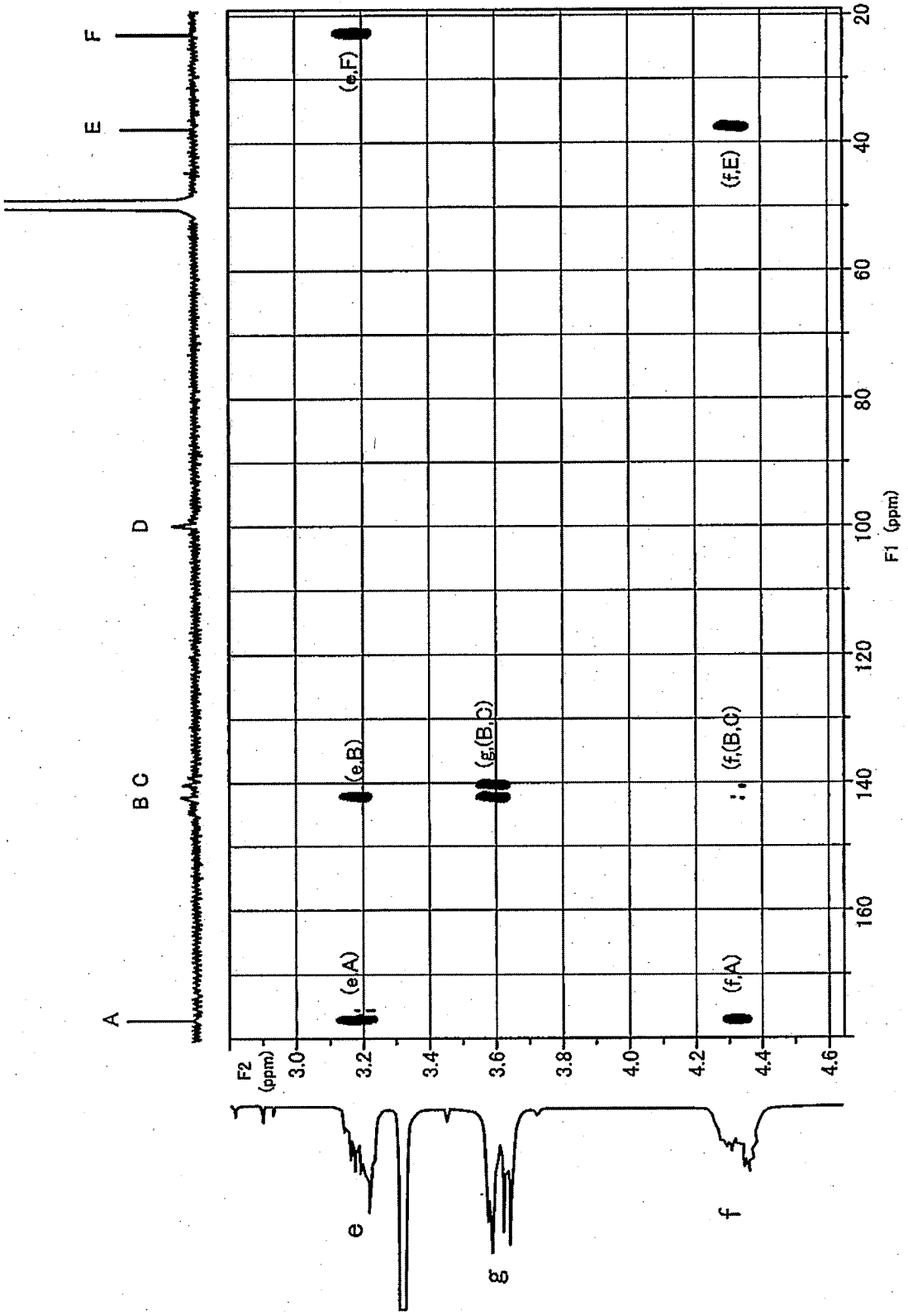


FIG. 8

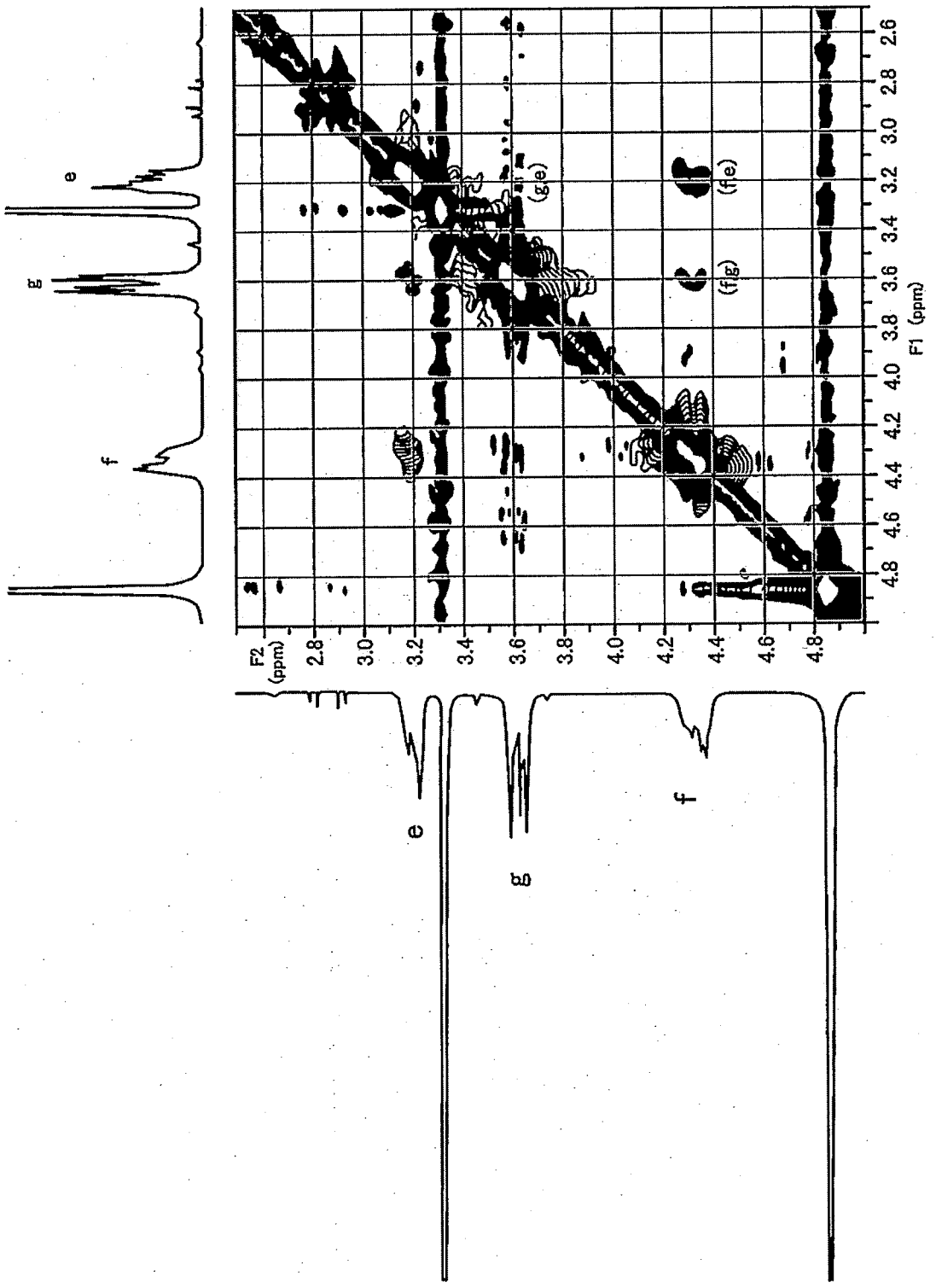


FIG. 9

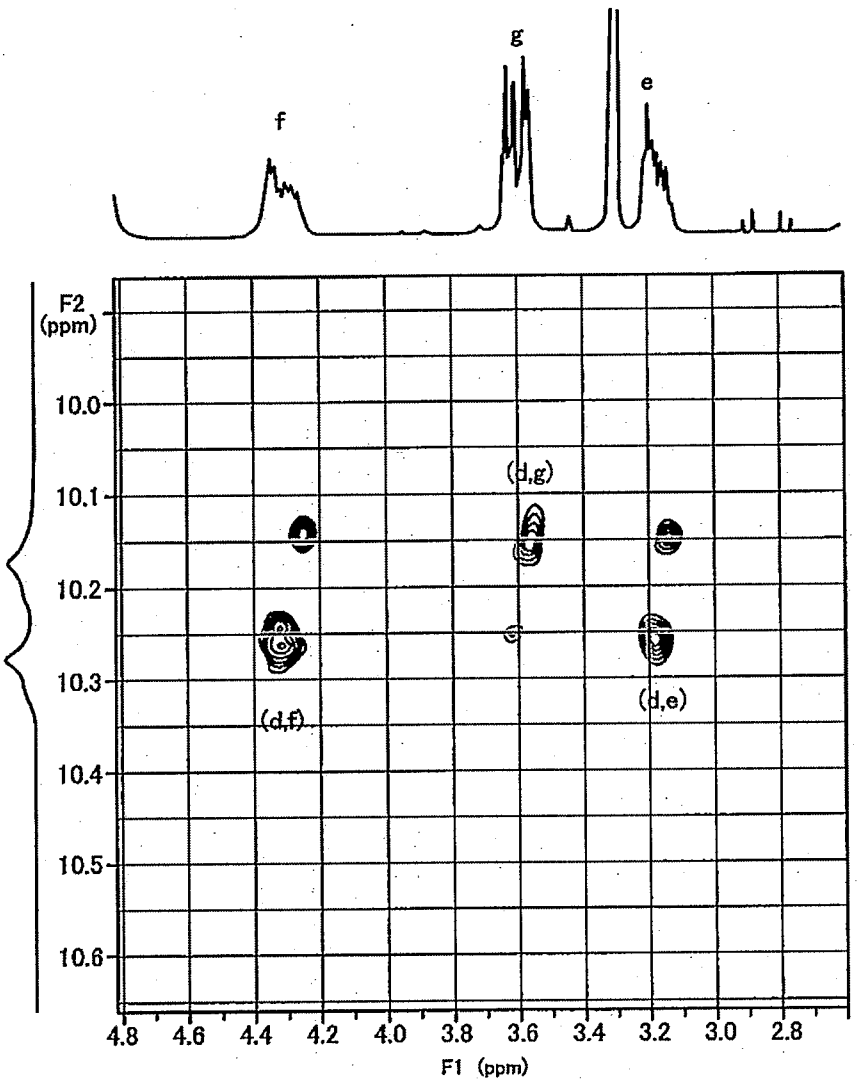

f
g
e
F2
(ppm)
10.0
10.1
10.2
10.3
10.4
10.5
10.6
(d,g)
(d,f)
(d,e)
4.8
4.6
4.4
4.2
4.0
3.8
3.6
3.4
3.2
3.0
2.8
F1 (ppm)

FIG. 10

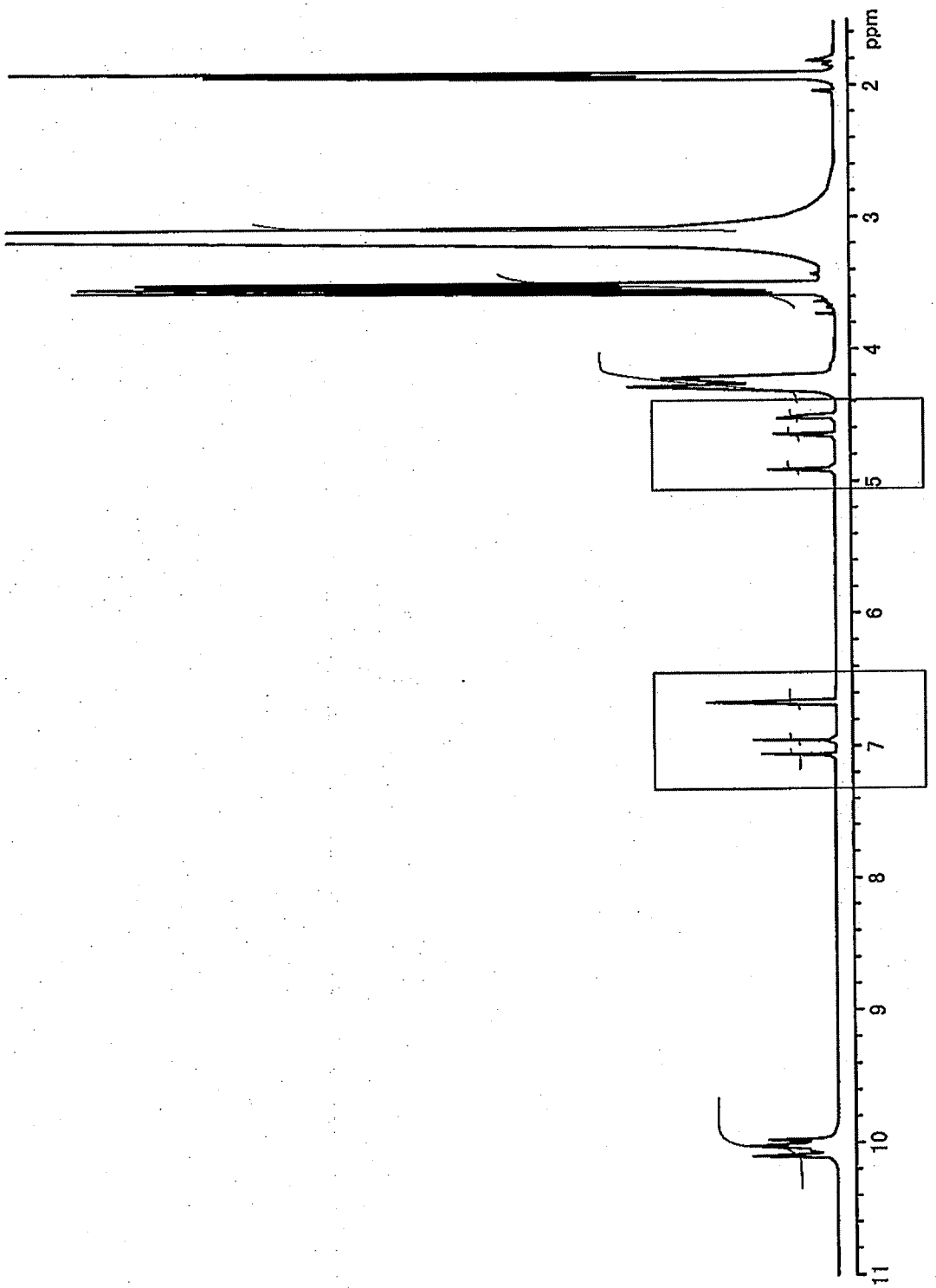


FIG. 11

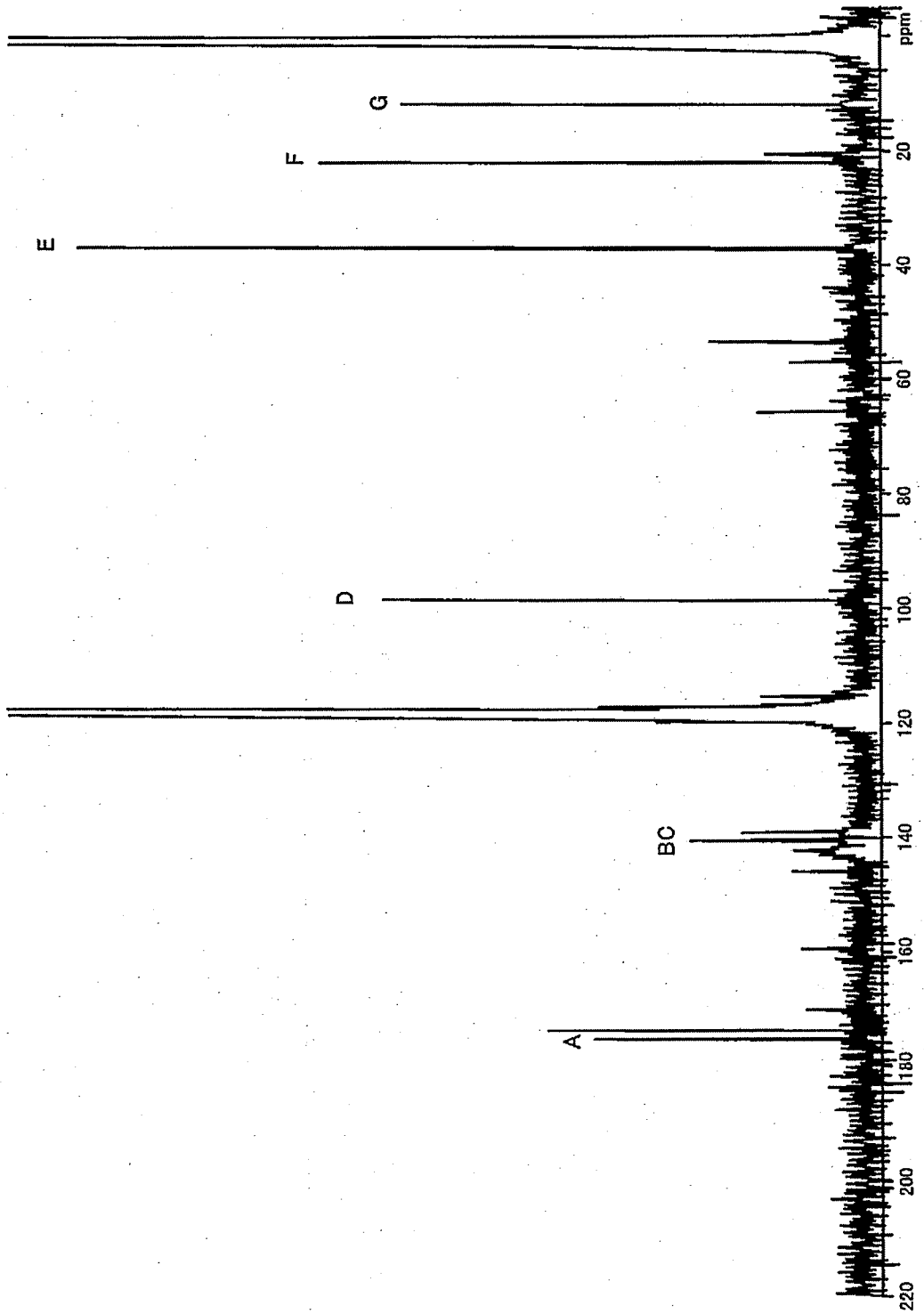


FIG. 12

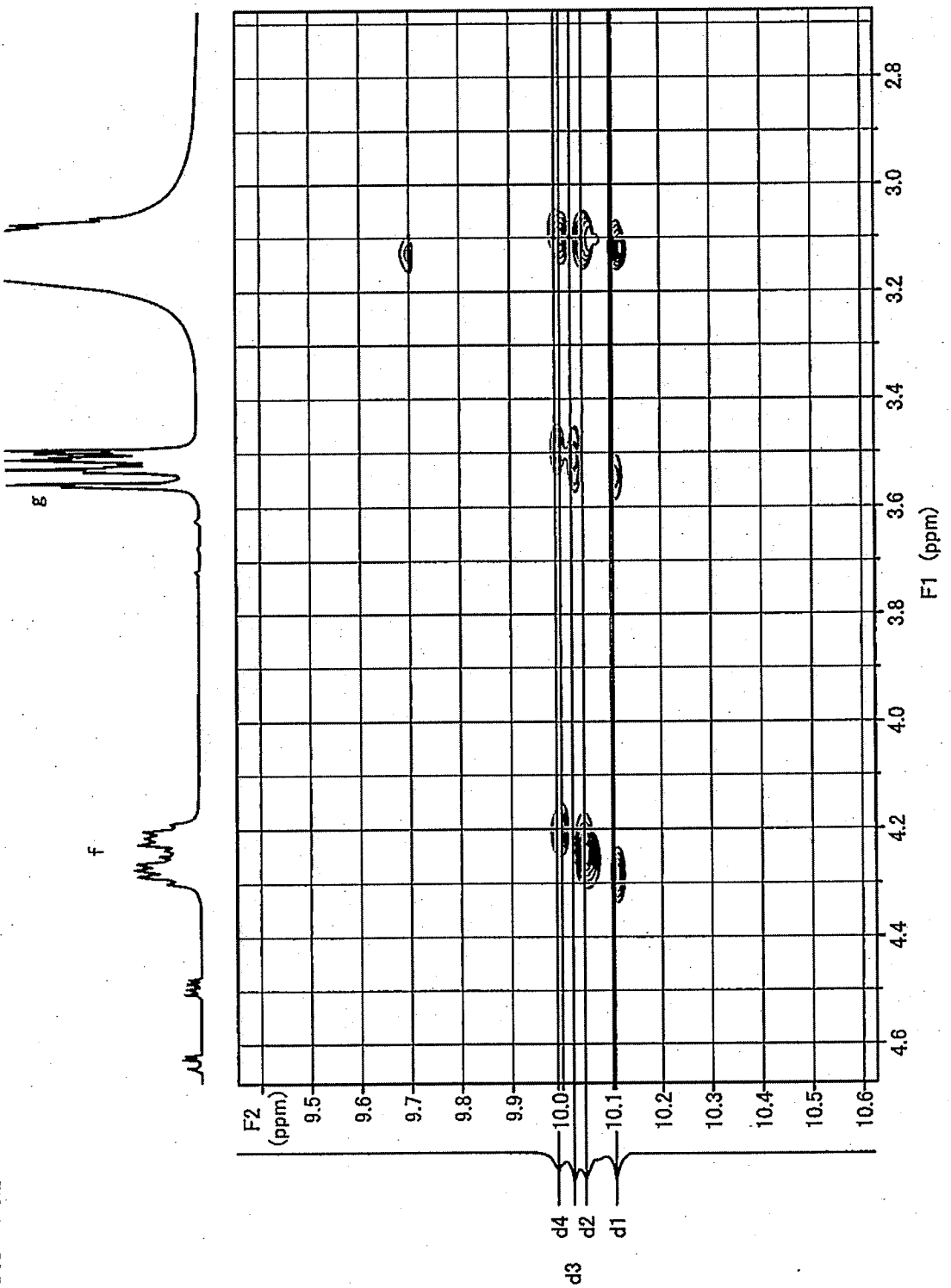

g
f
F2 (ppm)
9.5
9.6
9.7
9.8
9.9
10.0
10.1
10.2
10.3
10.4
10.5
10.6
d4
d2
d1
d3
F1 (ppm)
2.8
3.0
3.2
3.4
3.6
3.8
4.0
4.2
4.4
4.6

FIG. 13

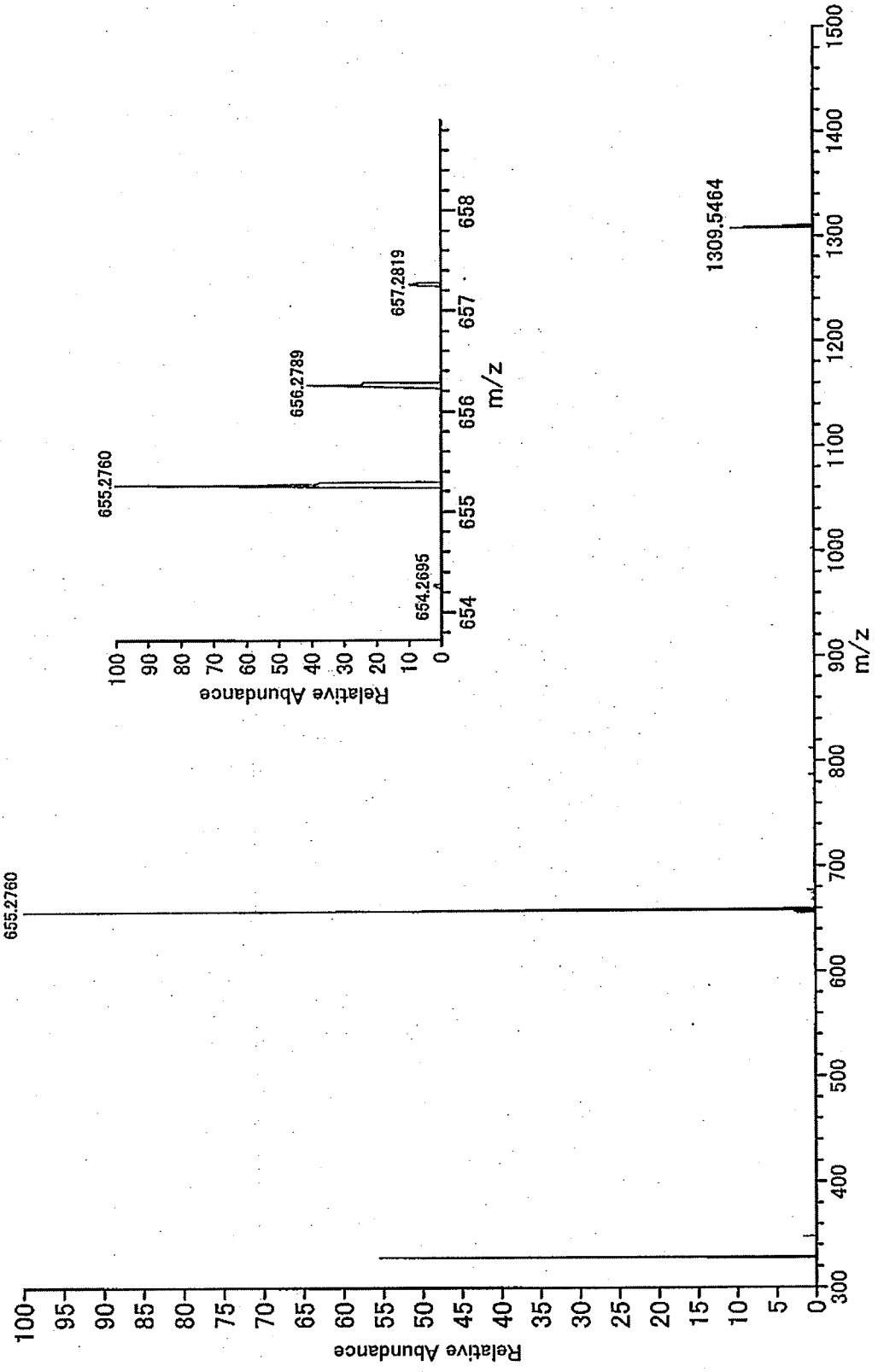

655.2760
1309.5464
Relative Abundance
m/z
655.2760
656.2789
657.2819
654.2695
Relative Abundance
m/z

FIG. 14

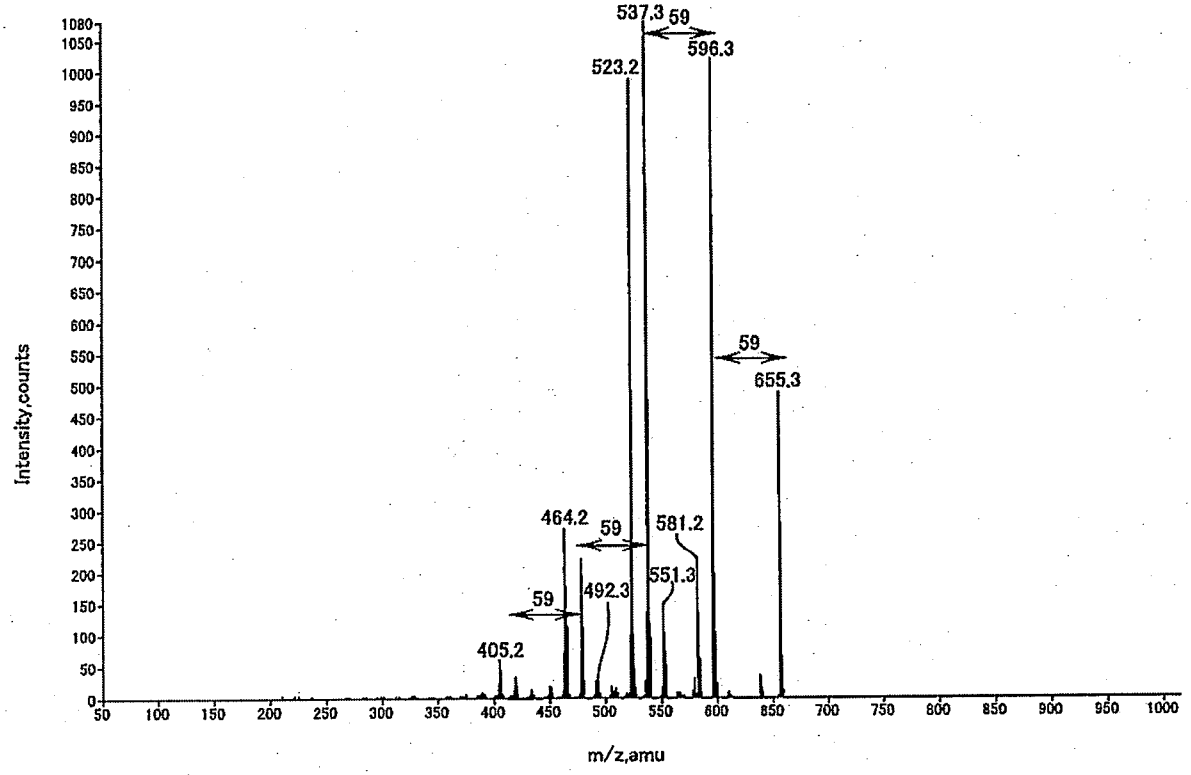

537.3
59
596.3
523.2
59
655.3
464.2
59
581.2
551.3
59
492.3
405.2
Intensity,counts
m/z,amu

FIG. 15

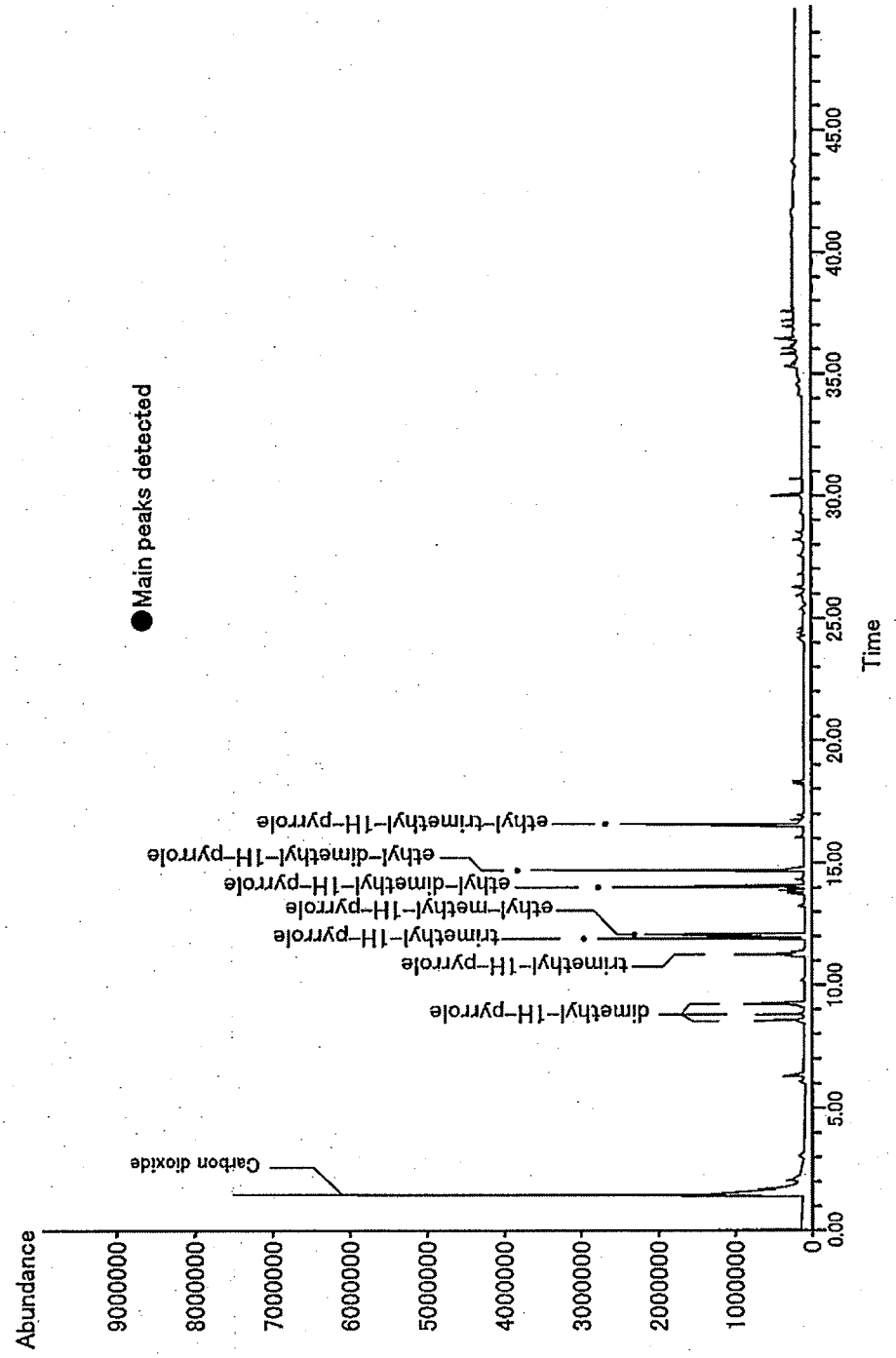

Abundance
9000000
8000000
7000000
6000000
5000000
4000000
3000000
2000000
1000000
0
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
Time
Main peaks detected
Carbon dioxide
dimethyl-1H-pyrrole
trimethyl-1H-pyrrole
trimethyl-1H-pyrrole
ethyl-methyl-1H-pyrrole
ethyl-dimethyl-1H-pyrrole
ethyl-dimethyl-1H-pyrrole
ethyl-trimethyl-1H-pyrrole

FIG. 16

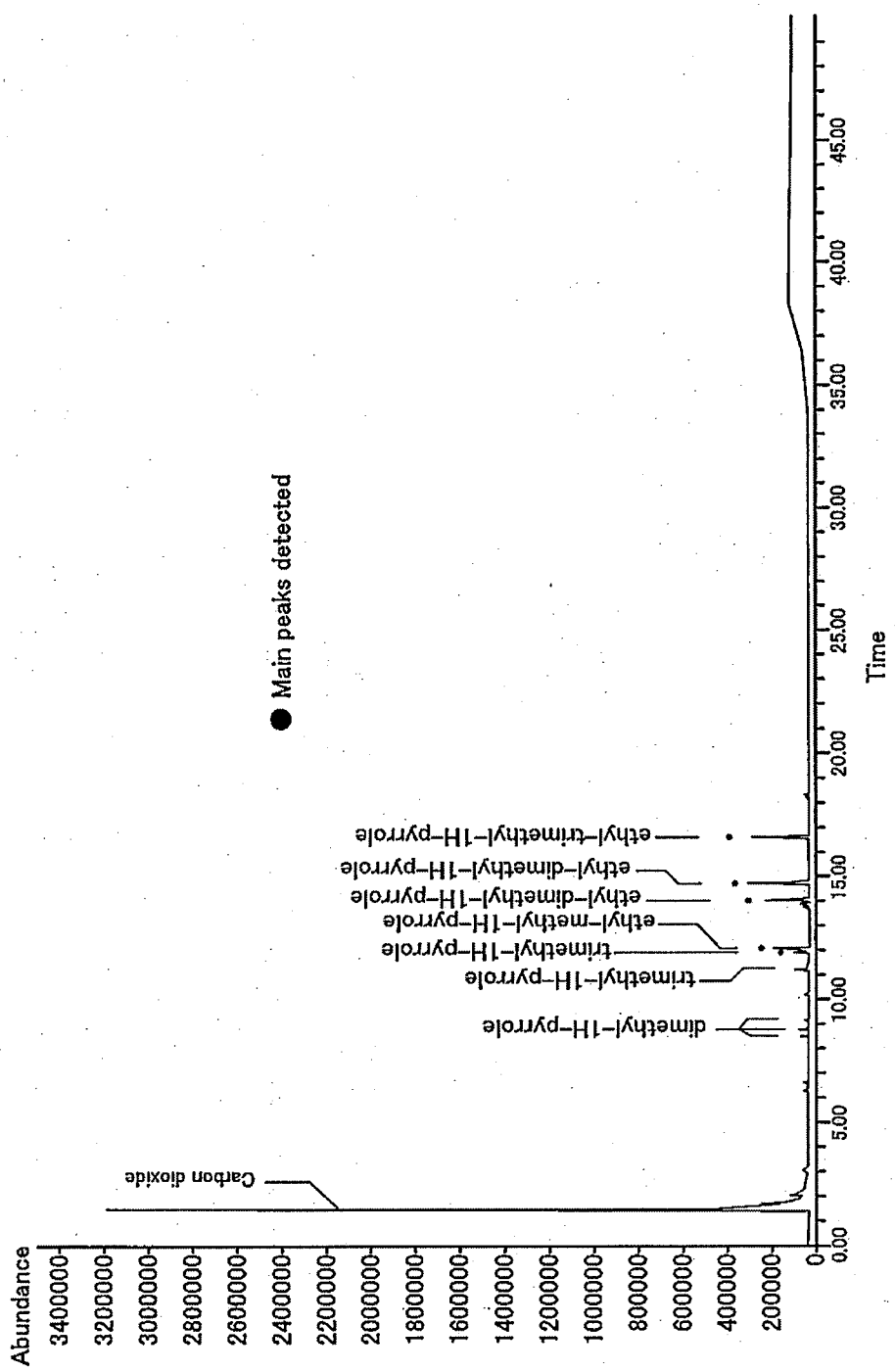

Abundance
3400000
3200000
3000000
2800000
2600000
2400000
2200000
2000000
1800000
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
Time
Carbon dioxide
dimethyl-1H-pyrrole
trimethyl-1H-pyrrole
trimethyl-1H-pyrrole
ethyl-methyl-1H-pyrrole
ethyl-dimethyl-1H-pyrrole
ethyl-dimethyl-1H-pyrrole
ethyl-trimethyl-1H-pyrrole
Main peaks detected

FIG. 17

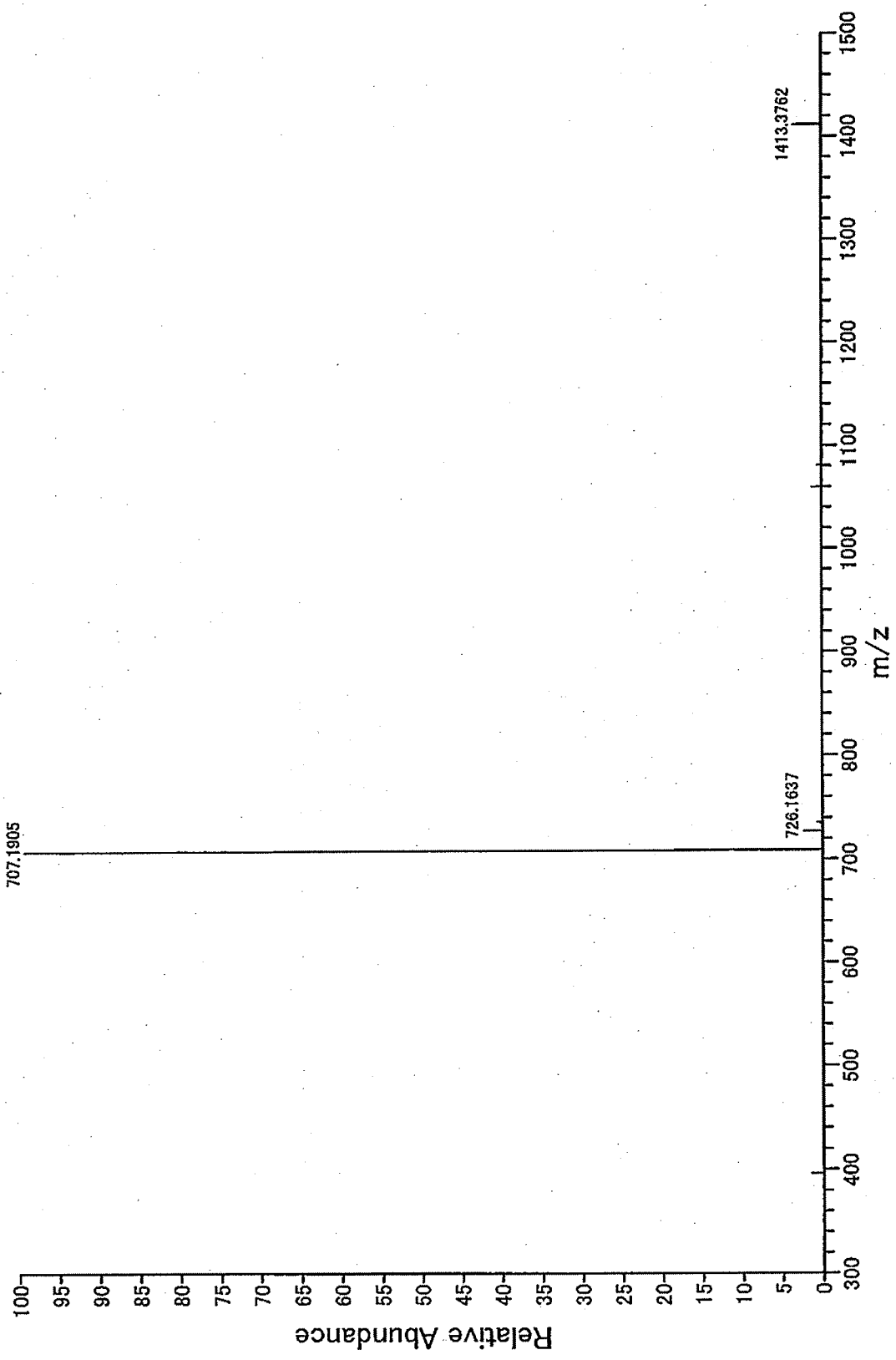

Relative Abundance
m/z
707.1905
726.1637
1413.3762
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500

FIG. 18

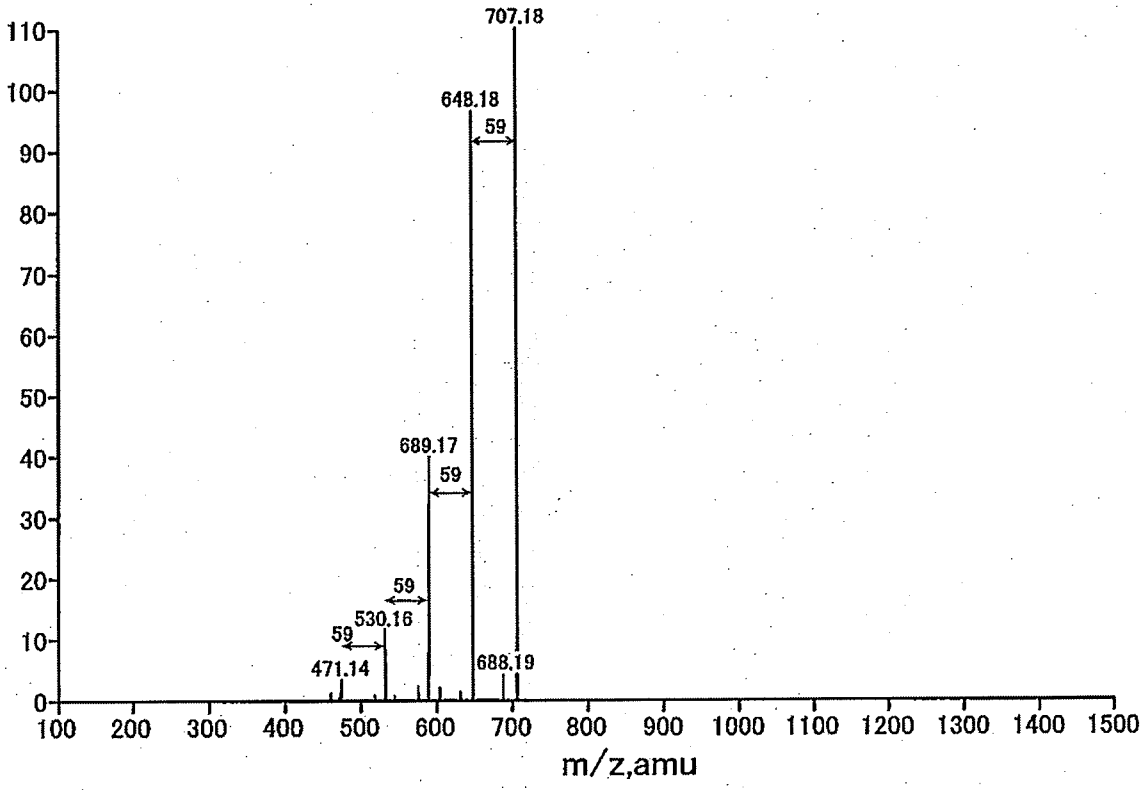

707.18
648.18
59
689.17
59
59
530.16
59
471.14
688.19
110
100
90
80
70
60
50
40
30
20
10
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
m/z,amu

FIG. 19

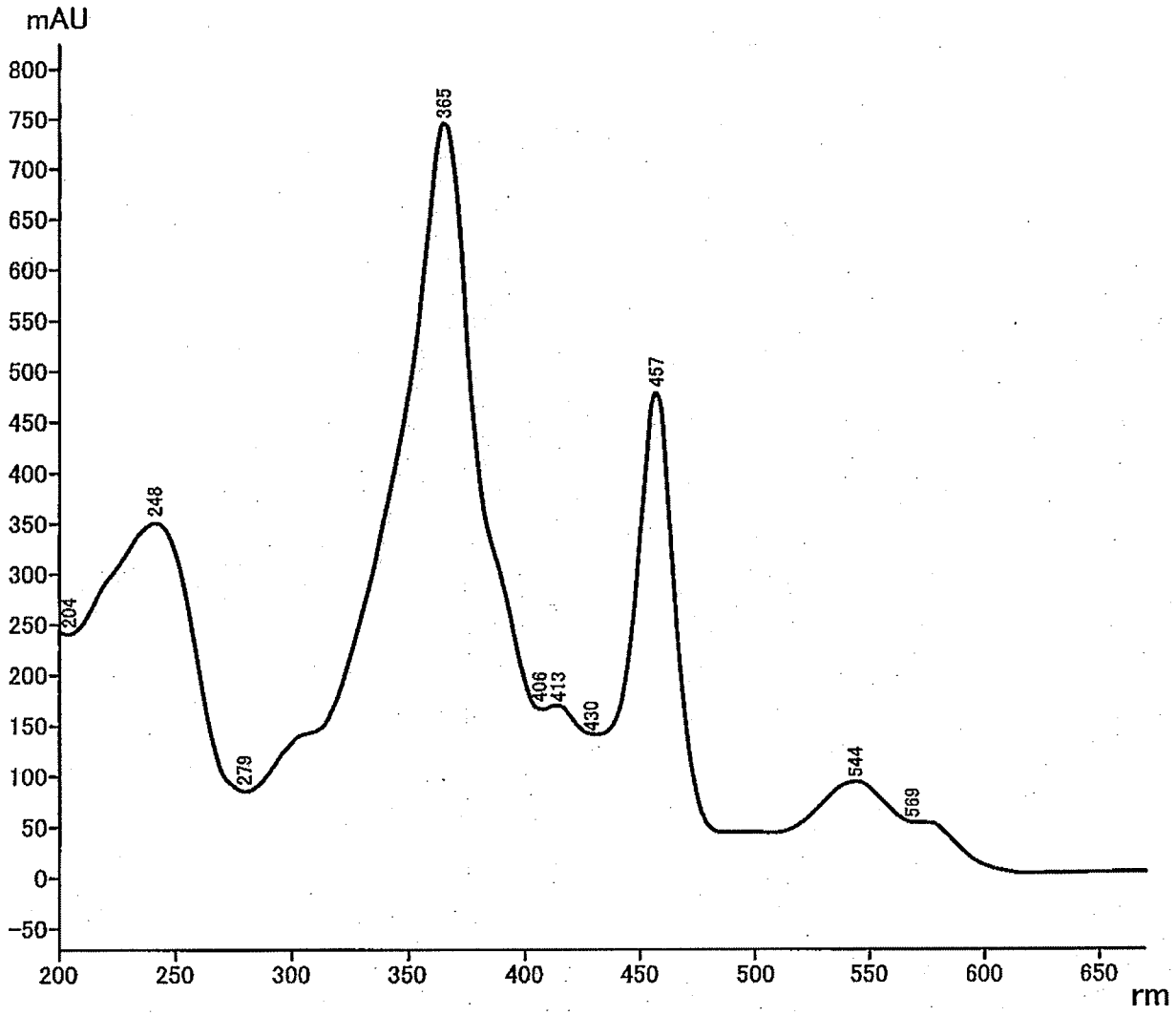

mAU
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
-50
204
248
279
365
406
413
430
457
544
569
200
250
300
350
400
450
500
550
600
650
rm

FIG. 20

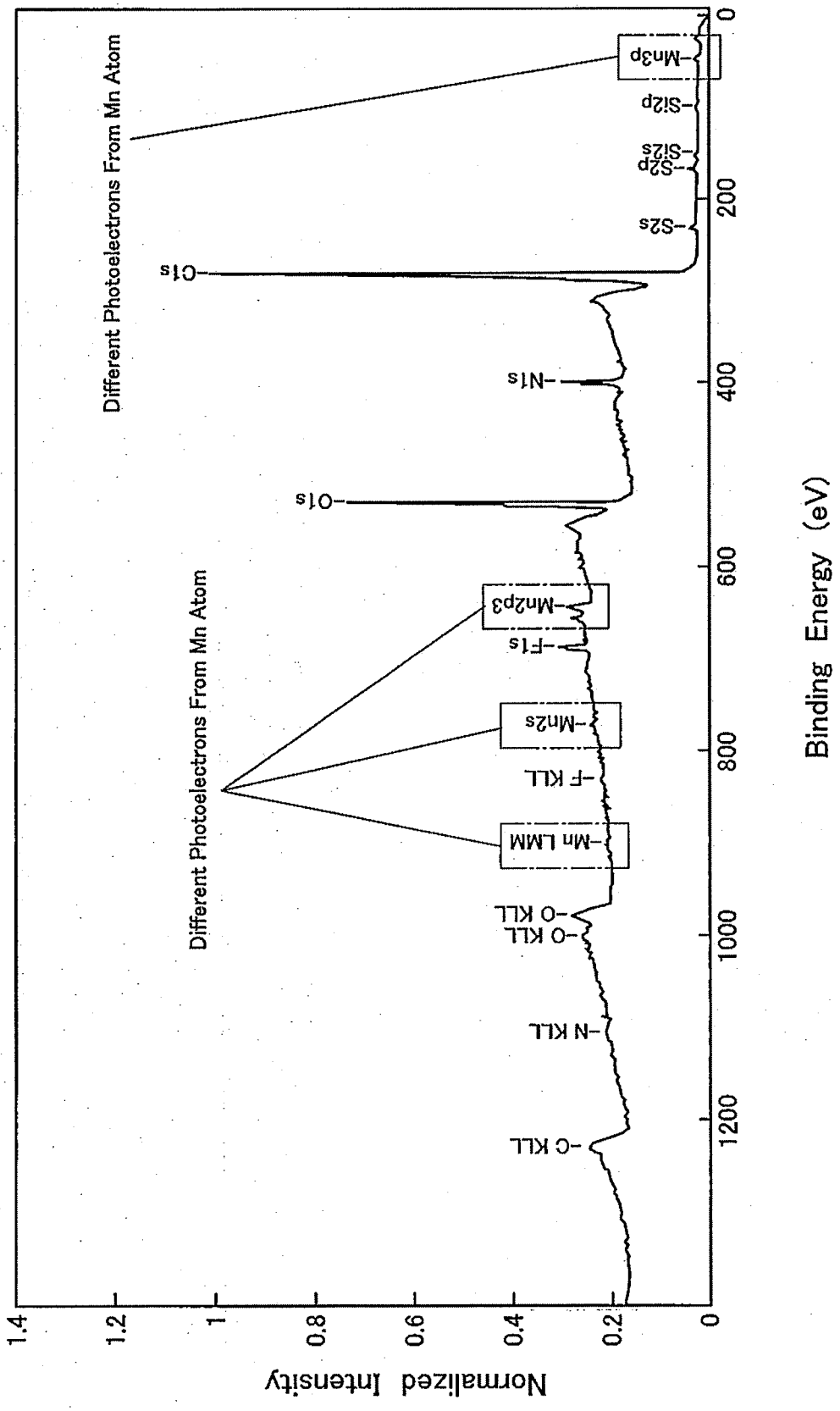

Normalized Intensity
Binding Energy (eV)
Different Photoelectrons From Mn Atom
Different Photoelectrons From Mn Atom
Mn3p
Si2p
Si2s
S2p
S2s
O1s
N1s
O1s
Mn2p3
F1s
Mn2s
F KLL
Mn LMM
O KLL
O KLL
N KLL
C KLL

FIG. 21

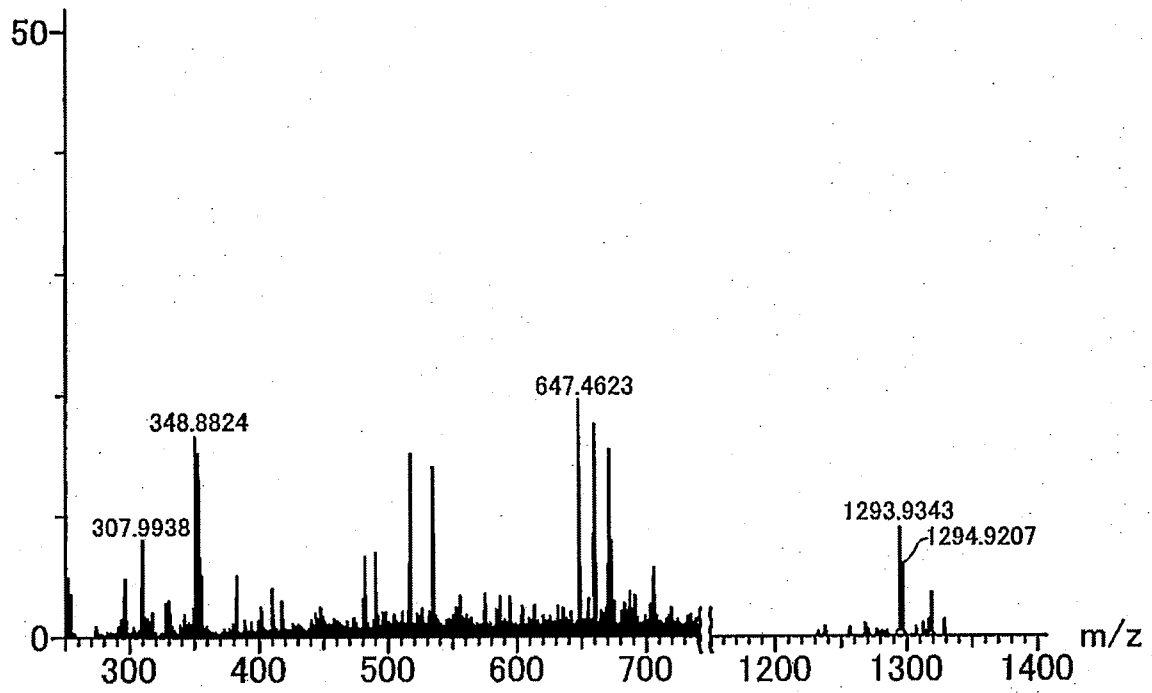
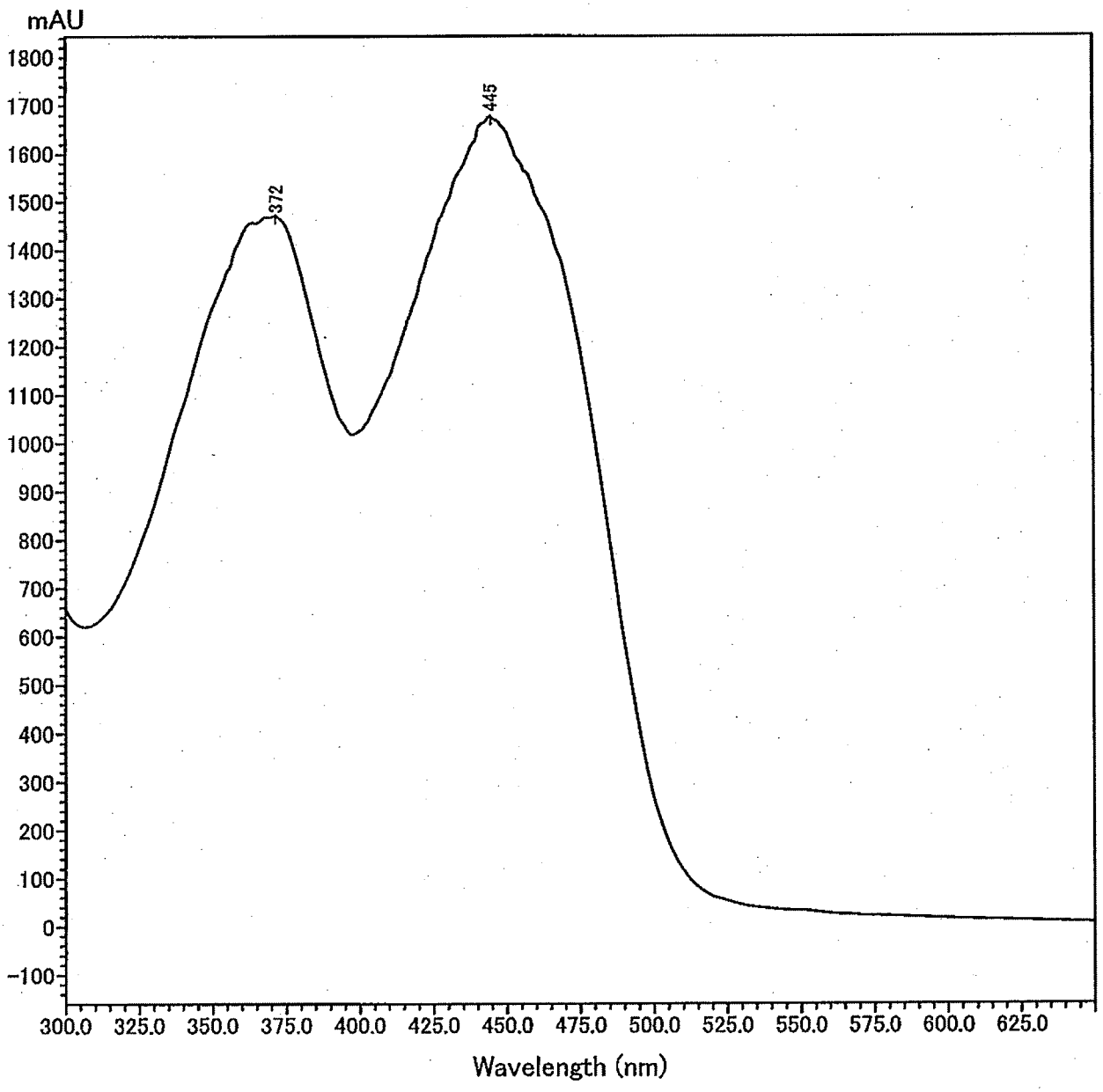

50
0
348.8824
307.9938
647.4623
1293.9343
1294.9207
300
400
500
600
700
1200
1300
1400
m/z

FIG. 22


mAU
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
-100
372
445
300.0
325.0
350.0
375.0
400.0
425.0
450.0
475.0
500.0
525.0
550.0
575.0
600.0
625.0
Wavelength (nm)