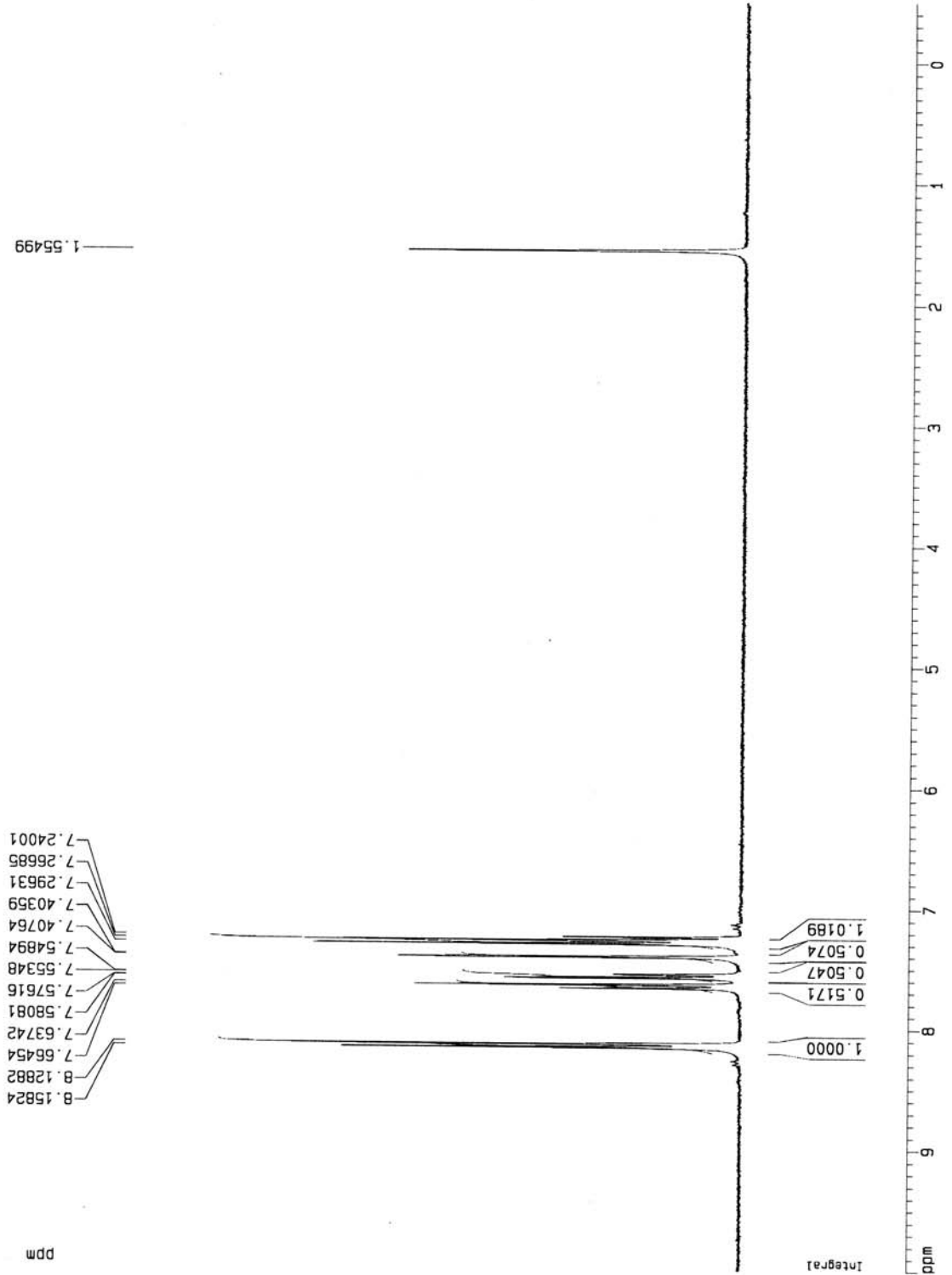


```

Current Data Parameters
NAME: 1151601
PROCNO: 1
F2 - Acquisition Parameters
Date_: 20070712
Time: 14.12
INSTRUM: spect
PROBHD: 5 mm BBO
PULPROG: zgpg30
TD: 65536
SFO: 300.136
AQ: 0.48646374
RG: 327.68
SI: 32768
SF: 300.136000000 MHz
FIDRES: 0.274428 Hz
AQ: 1.8615936 sec
RG: 327.68
SI: 32768
SF: 300.136
TE: 300.2 K
D1: 1.50000000 sec
===== CHANNEL f1 =====
NUC1: 13
P1: 0.00 sec
PL1: 0.00 dB
SFO1: 300.136000 MHz
F2 - Processing parameters
SI: 32768
SF: 300.136000000 MHz
WDW: EM
SSB: 0
GB: 0
PC: 1.00
D0: 0.00000000 sec
D1: 0.00000000 sec
D2: 0.00000000 sec
D3: 0.00000000 sec
D4: 0.00000000 sec
D5: 0.00000000 sec
D6: 0.00000000 sec
D7: 0.00000000 sec
D8: 0.00000000 sec
D9: 0.00000000 sec
D10: 0.00000000 sec
D11: 0.00000000 sec
D12: 0.00000000 sec
D13: 0.00000000 sec
D14: 0.00000000 sec
D15: 0.00000000 sec
D16: 0.00000000 sec
D17: 0.00000000 sec
D18: 0.00000000 sec
D19: 0.00000000 sec
D20: 0.00000000 sec
D21: 0.00000000 sec
D22: 0.00000000 sec
D23: 0.00000000 sec
D24: 0.00000000 sec
D25: 0.00000000 sec
D26: 0.00000000 sec
D27: 0.00000000 sec
D28: 0.00000000 sec
D29: 0.00000000 sec
D30: 0.00000000 sec
D31: 0.00000000 sec
D32: 0.00000000 sec
D33: 0.00000000 sec
D34: 0.00000000 sec
D35: 0.00000000 sec
D36: 0.00000000 sec
D37: 0.00000000 sec
D38: 0.00000000 sec
D39: 0.00000000 sec
D40: 0.00000000 sec
D41: 0.00000000 sec
D42: 0.00000000 sec
D43: 0.00000000 sec
D44: 0.00000000 sec
D45: 0.00000000 sec
D46: 0.00000000 sec
D47: 0.00000000 sec
D48: 0.00000000 sec
D49: 0.00000000 sec
D50: 0.00000000 sec
D51: 0.00000000 sec
D52: 0.00000000 sec
D53: 0.00000000 sec
D54: 0.00000000 sec
D55: 0.00000000 sec
D56: 0.00000000 sec
D57: 0.00000000 sec
D58: 0.00000000 sec
D59: 0.00000000 sec
D60: 0.00000000 sec
D61: 0.00000000 sec
D62: 0.00000000 sec
D63: 0.00000000 sec
D64: 0.00000000 sec
D65: 0.00000000 sec
D66: 0.00000000 sec
D67: 0.00000000 sec
D68: 0.00000000 sec
D69: 0.00000000 sec
D70: 0.00000000 sec
D71: 0.00000000 sec
D72: 0.00000000 sec
D73: 0.00000000 sec
D74: 0.00000000 sec
D75: 0.00000000 sec
D76: 0.00000000 sec
D77: 0.00000000 sec
D78: 0.00000000 sec
D79: 0.00000000 sec
D80: 0.00000000 sec
D81: 0.00000000 sec
D82: 0.00000000 sec
D83: 0.00000000 sec
D84: 0.00000000 sec
D85: 0.00000000 sec
D86: 0.00000000 sec
D87: 0.00000000 sec
D88: 0.00000000 sec
D89: 0.00000000 sec
D90: 0.00000000 sec
D91: 0.00000000 sec
D92: 0.00000000 sec
D93: 0.00000000 sec
D94: 0.00000000 sec
D95: 0.00000000 sec
D96: 0.00000000 sec
D97: 0.00000000 sec
D98: 0.00000000 sec
D99: 0.00000000 sec
D100: 0.00000000 sec

```



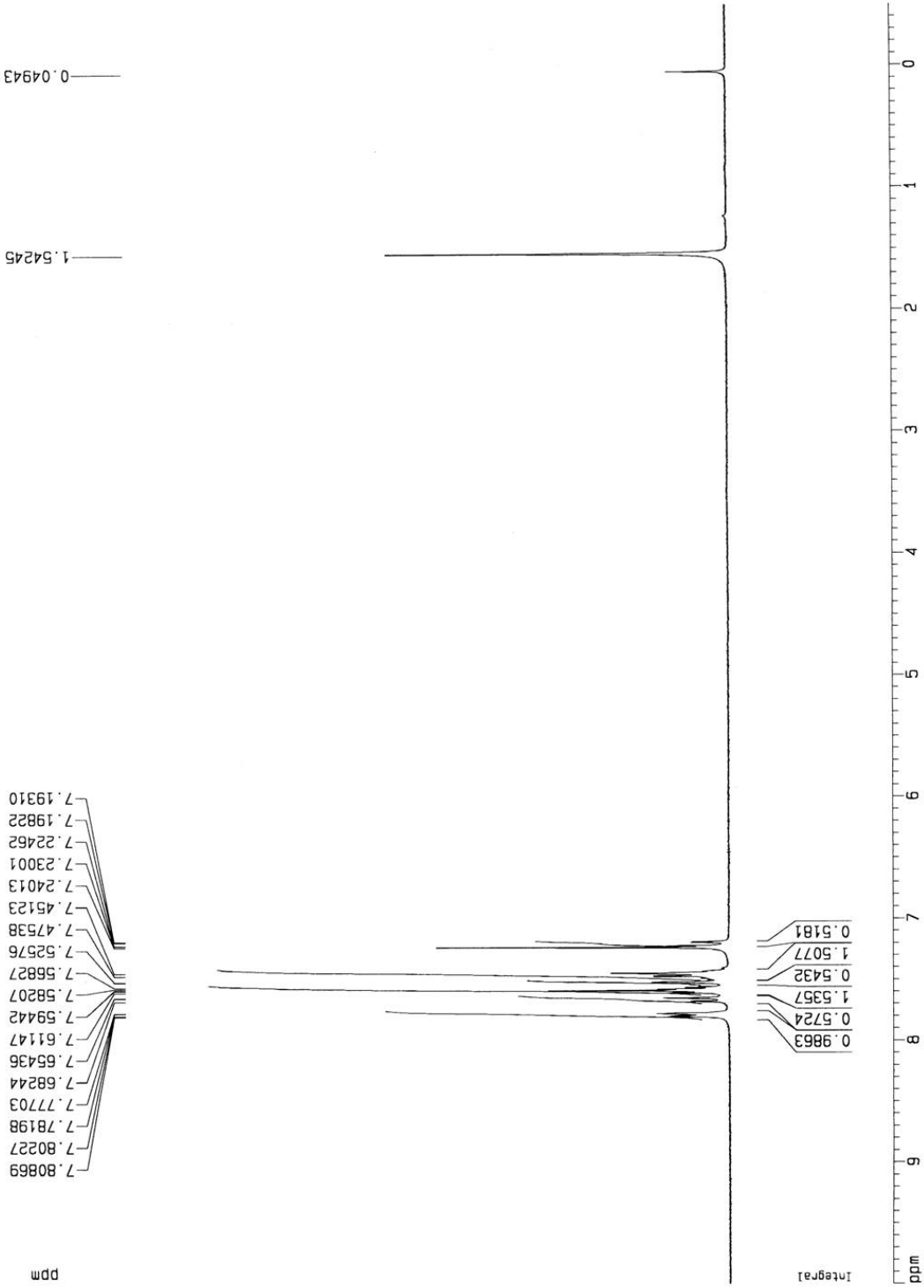
附圖 1,2,7-Dibromo-9,9-di(4-nitrophenyl)fluorine, 化合物 A1 的 ¹H-NMR 光譜圖


```

Current Data Parameters
Name: M3-2
EXPNO: 1
PROCNO: 1
F2 - Acquisition Parameters
Date_ : 20071217
Time: 17.32
INSTRUM: spect
PROBHD: 5 mm BBO
PULPROG: zgpg30
SOLVENT:
NS: 2048
DS: 4
SWH: 406.403 Hz
FIDRES: 1.6215000 Hz
AQ: 1448.2
RG: 11.50
DE: 6.50
TE: 300.2
DQ: 1.5000000 Hz
===== CHANNEL f1 =====
NUC1:
P1: 9.30
PC: 300.1318000 MHz
SFO1: 300.1318000 MHz
F2 - Processing parameters
SI: 32768
SF: 300.1318000 MHz
WDW: EM
SSB: 0
LB: 0.1 Hz
GB: 0
PC: 1.00
F3 - NMR 3D/4D parameters
C1:
C2:
C3:
C4:
C5:
C6:
F1: 300.130 Hz
F2: 300.130 Hz
F3: -150.07 Hz
NUC2:
NUC3:
=====

```

M3-2

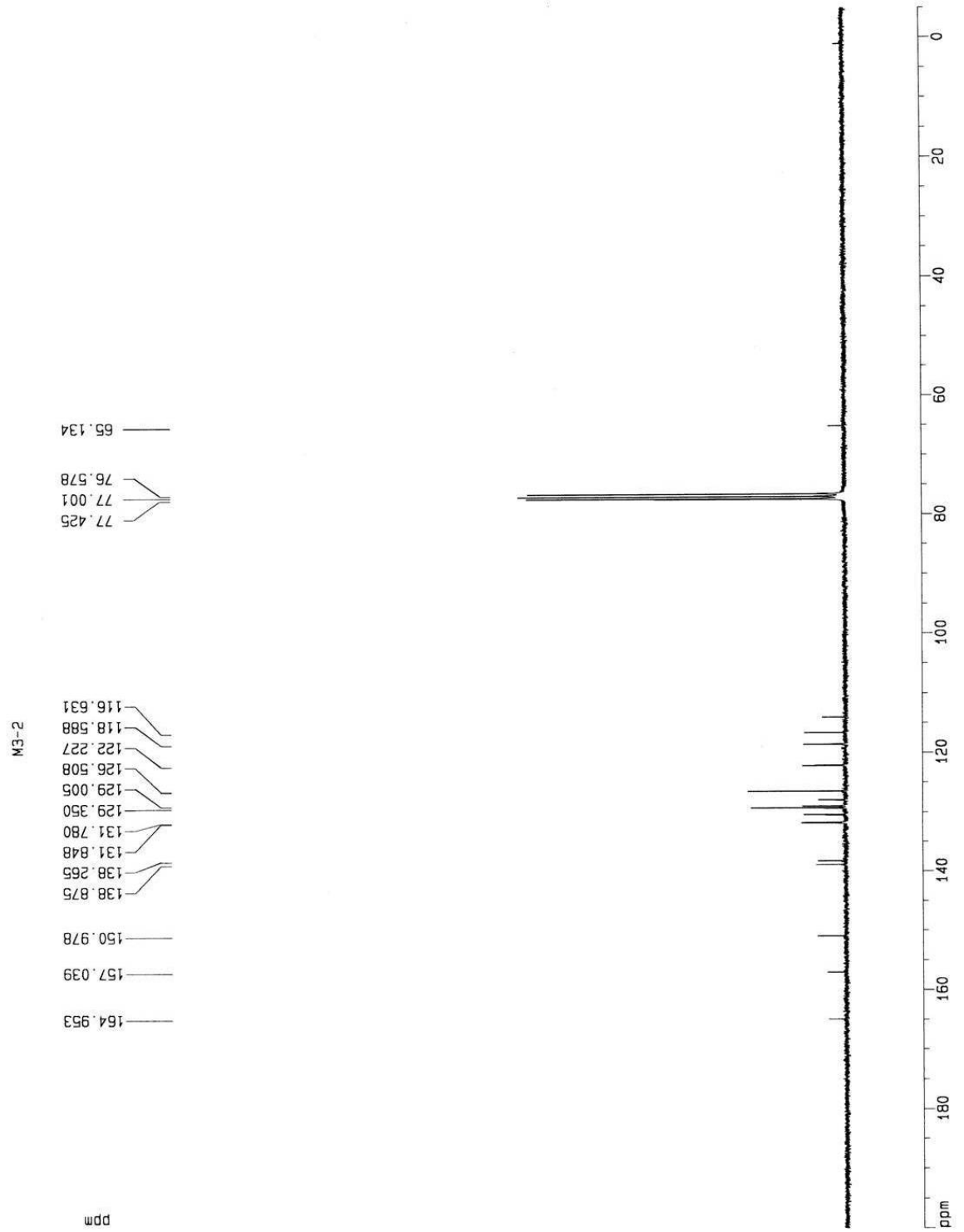


附圖 3. 2,7-Dibromo-9,9-bis[5-(3-phenyl-2,1-benzisoxazolyl)]fluorine，化合物 A2 的 ¹H-NMR 光譜圖

```

Current Data Parameters
NAME: (P)15443
PROCNO: 1
F2 - Acquisition Parameters
Date_: 2001107
Time: 14.41
INSTRUM: spect
PROBHD: 5 mm BBO
PULPROG: zgpg30
SOLVENT: DMSO
NS: 2004
DS: 4
SWH: 18000.000 Hz
FIDRES: 0.350000 Hz
AQ: 0.000000 sec
RG: 1.729812
DE: 6.250000
TE: 300.2 K
D1: 1.500000 sec
D11: 0.000000 sec
D12: 0.000000 sec
***** CHANNEL f1 *****
NUC1: 13C
P1: 9.00 uSec
PL1: -1.00 dB
SFO1: 75.475000 MHz
***** CHANNEL f2 *****
CPDPRG2: Mzgpg30
NUC2: 1H
P2: 9.00 uSec
PL2: -1.00 dB
SFO2: 400.146000 MHz
F2 - Processing parameters
SI: 32768
SF: 75.475000 MHz
WDW: EM
SSB: 0
GB: 0
PC: 1.00
ID: MZ PG1 parameters
SI: 32768
SF: 75.475000 MHz
FIDRES: 0.350000 Hz
RG: 1.729812
DE: 6.250000
TE: 300.2 K
D1: 1.500000 sec
D11: 0.000000 sec
D12: 0.000000 sec

```



附圖 4. 2,7-Dibromo-9,9-bis[5-(3-phenyl-2,1-benzisoxazolyl)]fluorine, 化合物 A2 的 ¹³C-NMR 光譜圖

Current Data Parameters
 NAME: 01100003
 PROBNM: 1
 FT: Acquisition Parameters
 DATE_: 20090811
 TIME: 10:00:11
 INSTRUM: spect
 PULPROG: zgpg30
 SOLVENT: DMSO
 NS: 32
 DS: 4
 SWH: 4066.603 Hz
 FIDRES: 0.276608 Hz
 AQ: 1.19625444
 RG: 382.5
 EC: 11.8150 Hz
 IC: 11.8150 Hz
 TE: 300.2 K
 D1: 1.5000000 sec

===== CHANNEL f1 =====
 P1: 13.20 Hz
 PL1: 0.00 dB
 SFO1: 300.135000 MHz

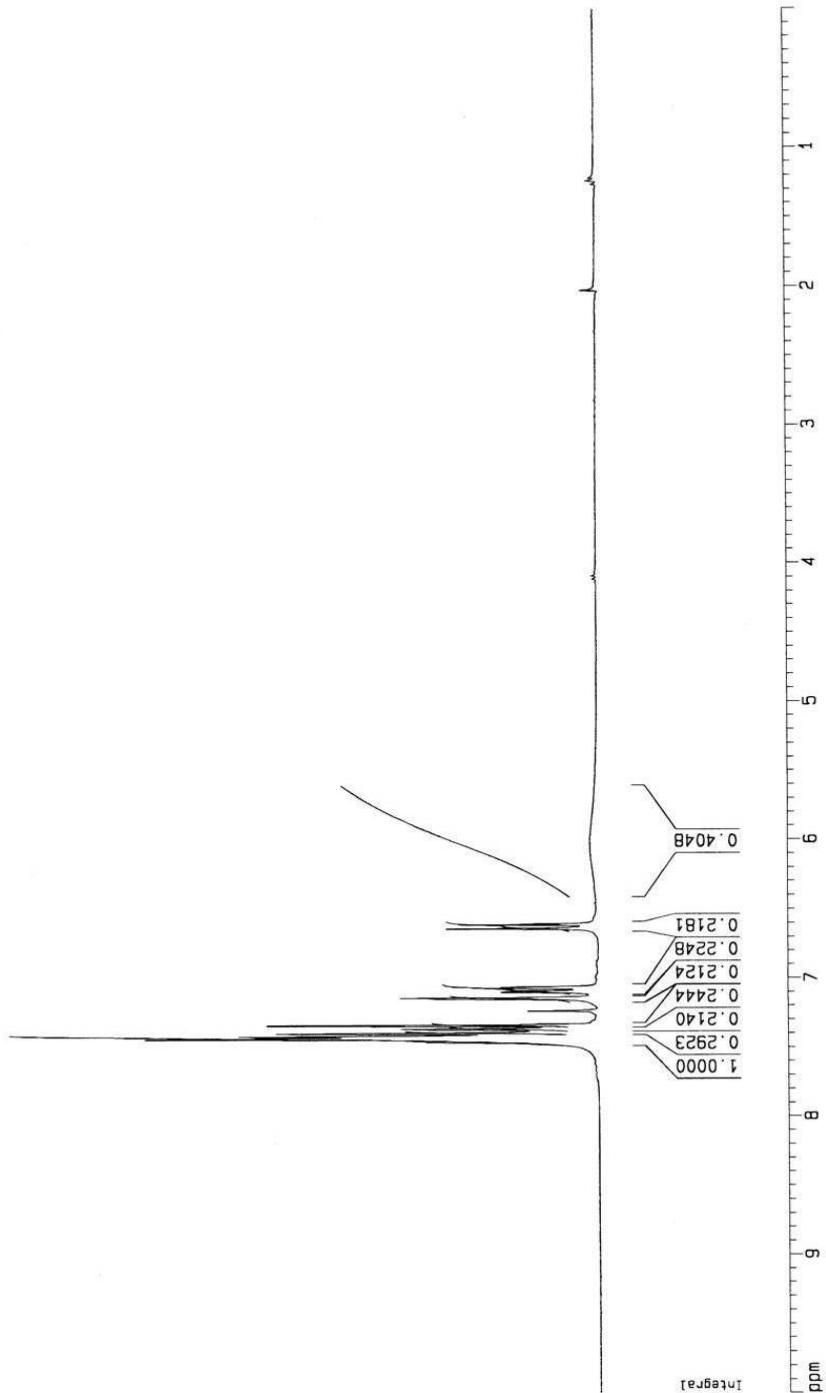
===== PROCESSING PARAMETERS =====
 SI: 300.135000 MHz
 SF: 300.135000 MHz
 DS: 4
 SW: 0.00 Hz
 W: 0.00 Hz
 FWHM: 1.00 Hz
 GB: 0.00 Hz
 CB: 0.00 Hz
 F1: 300.135000 MHz
 PC: 0.00 Hz
 PRACH: 0.40000000 Hz
 HSCN: 127.71480 Hz/cm

M3-3 U1 CDC13

6.61290
 6.64161
 7.06720
 7.07413
 7.09589
 7.10288
 7.14447
 7.15127
 7.23981
 7.34383
 7.36836
 7.40138
 7.42356
 7.44126
 7.45516
 7.45514

2.02741

ppm



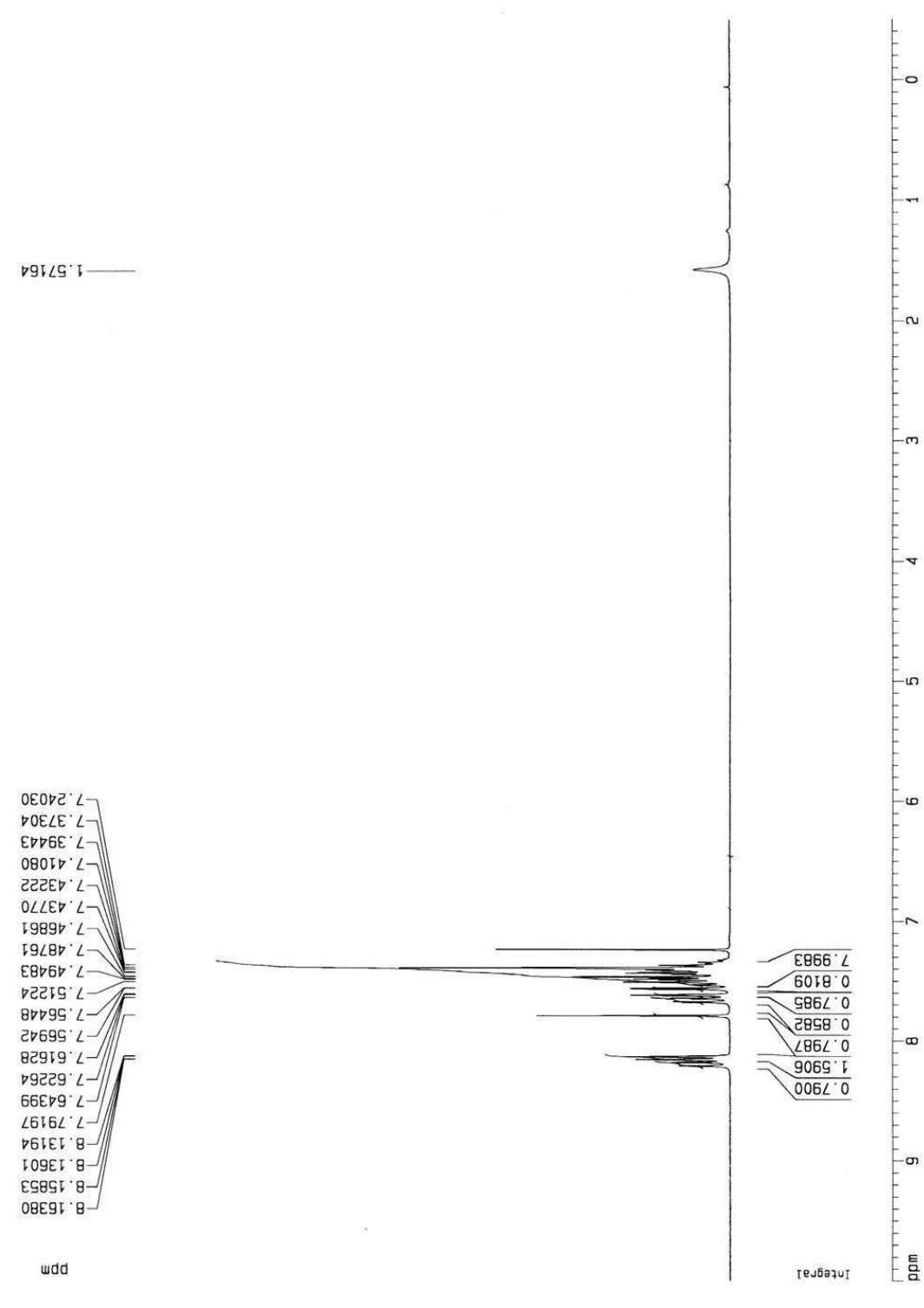
附圖 5. 2,7-Dibromo-9,9-bis(4-amino-3-benzoylphenyl)fluorene，化合物 A3 的 ¹H-NMR 光譜圖


```

Current Data Parameters
NAME: M3-4
EXPNO: 1
PROCNO: 1
PROCNAME:
AQ: 0.0500000
RG: 327.500
SF: 300.1350000
WDW: EM
SSB: 0
LB: 0.1000000
GB: 0
PC: 1.0000000
LO: 300.1350000
NUC1: 13C
P1: 8.0000000
PL1: -2.0000000
SFO1: 300.1350000
SI: 327.5000000
SF2: 300.1350000
SI2: 327.5000000
SF3: 300.1350000
SI3: 327.5000000
SF4: 300.1350000
SI4: 327.5000000
SF5: 300.1350000
SI5: 327.5000000
SF6: 300.1350000
SI6: 327.5000000
SF7: 300.1350000
SI7: 327.5000000
SF8: 300.1350000
SI8: 327.5000000
SF9: 300.1350000
SI9: 327.5000000
SF10: 300.1350000
SI10: 327.5000000
SF11: 300.1350000
SI11: 327.5000000
SF12: 300.1350000
SI12: 327.5000000
SF13: 300.1350000
SI13: 327.5000000
SF14: 300.1350000
SI14: 327.5000000
SF15: 300.1350000
SI15: 327.5000000
SF16: 300.1350000
SI16: 327.5000000
SF17: 300.1350000
SI17: 327.5000000
SF18: 300.1350000
SI18: 327.5000000
SF19: 300.1350000
SI19: 327.5000000
SF20: 300.1350000
SI20: 327.5000000
SF21: 300.1350000
SI21: 327.5000000
SF22: 300.1350000
SI22: 327.5000000
SF23: 300.1350000
SI23: 327.5000000
SF24: 300.1350000
SI24: 327.5000000
SF25: 300.1350000
SI25: 327.5000000
SF26: 300.1350000
SI26: 327.5000000
SF27: 300.1350000
SI27: 327.5000000
SF28: 300.1350000
SI28: 327.5000000
SF29: 300.1350000
SI29: 327.5000000
SF30: 300.1350000
SI30: 327.5000000
SF31: 300.1350000
SI31: 327.5000000
SF32: 300.1350000
SI32: 327.5000000
SF33: 300.1350000
SI33: 327.5000000
SF34: 300.1350000
SI34: 327.5000000
SF35: 300.1350000
SI35: 327.5000000
SF36: 300.1350000
SI36: 327.5000000
SF37: 300.1350000
SI37: 327.5000000
SF38: 300.1350000
SI38: 327.5000000
SF39: 300.1350000
SI39: 327.5000000
SF40: 300.1350000
SI40: 327.5000000
SF41: 300.1350000
SI41: 327.5000000
SF42: 300.1350000
SI42: 327.5000000
SF43: 300.1350000
SI43: 327.5000000
SF44: 300.1350000
SI44: 327.5000000
SF45: 300.1350000
SI45: 327.5000000
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SI46: 327.5000000
SF47: 300.1350000
SI47: 327.5000000
SF48: 300.1350000
SI48: 327.5000000
SF49: 300.1350000
SI49: 327.5000000
SF50: 300.1350000
SI50: 327.5000000
SF51: 300.1350000
SI51: 327.5000000
SF52: 300.1350000
SI52: 327.5000000
SF53: 300.1350000
SI53: 327.5000000
SF54: 300.1350000
SI54: 327.5000000
SF55: 300.1350000
SI55: 327.5000000
SF56: 300.1350000
SI56: 327.5000000
SF57: 300.1350000
SI57: 327.5000000
SF58: 300.1350000
SI58: 327.5000000
SF59: 300.1350000
SI59: 327.5000000
SF60: 300.1350000
SI60: 327.5000000
SF61: 300.1350000
SI61: 327.5000000
SF62: 300.1350000
SI62: 327.5000000
SF63: 300.1350000
SI63: 327.5000000
SF64: 300.1350000
SI64: 327.5000000
SF65: 300.1350000
SI65: 327.5000000
SF66: 300.1350000
SI66: 327.5000000
SF67: 300.1350000
SI67: 327.5000000
SF68: 300.1350000
SI68: 327.5000000
SF69: 300.1350000
SI69: 327.5000000
SF70: 300.1350000
SI70: 327.5000000
SF71: 300.1350000
SI71: 327.5000000
SF72: 300.1350000
SI72: 327.5000000
SF73: 300.1350000
SI73: 327.5000000
SF74: 300.1350000
SI74: 327.5000000
SF75: 300.1350000
SI75: 327.5000000
SF76: 300.1350000
SI76: 327.5000000
SF77: 300.1350000
SI77: 327.5000000
SF78: 300.1350000
SI78: 327.5000000
SF79: 300.1350000
SI79: 327.5000000
SF80: 300.1350000
SI80: 327.5000000
SF81: 300.1350000
SI81: 327.5000000
SF82: 300.1350000
SI82: 327.5000000
SF83: 300.1350000
SI83: 327.5000000
SF84: 300.1350000
SI84: 327.5000000
SF85: 300.1350000
SI85: 327.5000000
SF86: 300.1350000
SI86: 327.5000000
SF87: 300.1350000
SI87: 327.5000000
SF88: 300.1350000
SI88: 327.5000000
SF89: 300.1350000
SI89: 327.5000000
SF90: 300.1350000
SI90: 327.5000000
SF91: 300.1350000
SI91: 327.5000000
SF92: 300.1350000
SI92: 327.5000000
SF93: 300.1350000
SI93: 327.5000000
SF94: 300.1350000
SI94: 327.5000000
SF95: 300.1350000
SI95: 327.5000000
SF96: 300.1350000
SI96: 327.5000000
SF97: 300.1350000
SI97: 327.5000000
SF98: 300.1350000
SI98: 327.5000000
SF99: 300.1350000
SI99: 327.5000000
SF100: 300.1350000
SI100: 327.5000000

```

M3-4



附圖 9. 單體 Q1 的 ¹H-NMR 光譜圖

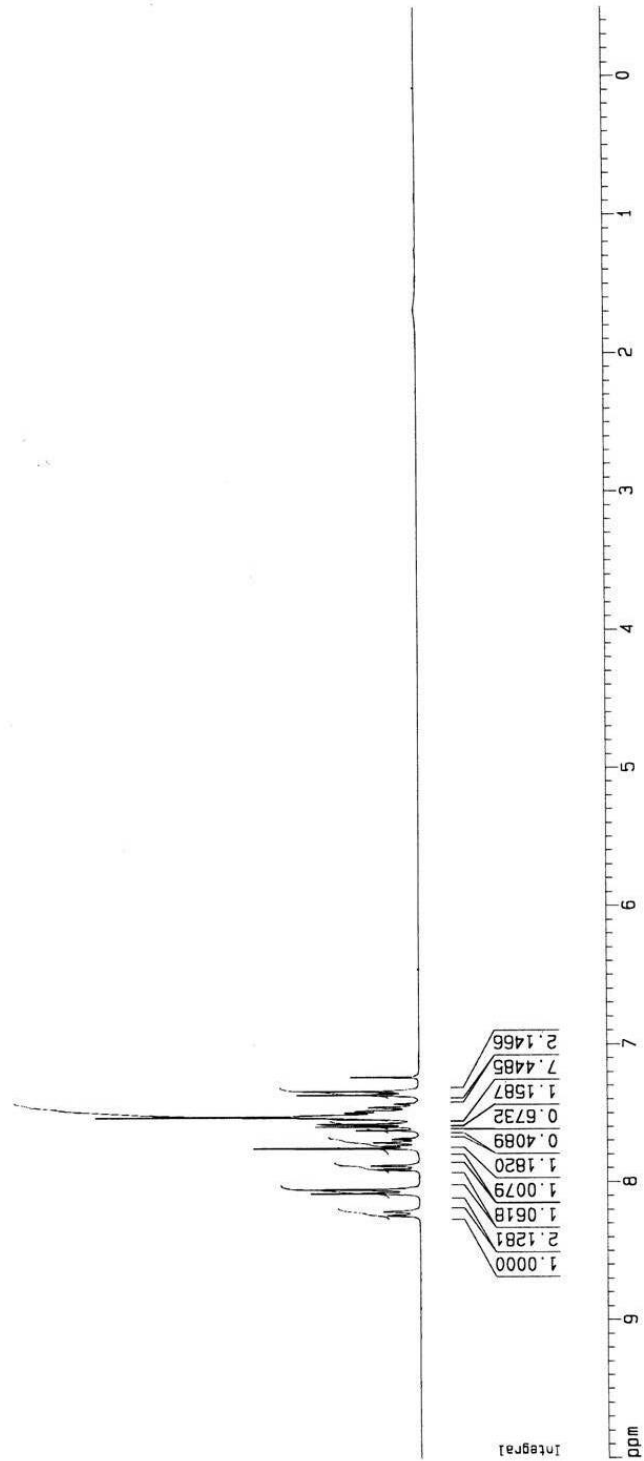

```

Current Data Parameters
NAME:          1
EXPNO:        1
PROCNO:       1
PROCNAME:     1
DATE_ETIME:   20170707 12:32
INSTRUM:      spect
PROBHD:       5 mm BBO
PULPROG:      zgpg30
TD:           65536
SFO:          500.136
AQ:           0.10000000
RG:           655.347
SI:           1
SF:           500.136000000
WDW:          EM
SSB:          0
LB:           0.100000000
GB:           0
PC:           1.000000000
===== CHANNEL f1 =====
NUC1:          13C
P1:           12.000000000
PL1:          0.000000000
SFO1:         125.760000000 MHz
===== Processing parameters =====
SI:           300.130000000 MHz
WDW:          EM
SSB:          0
LB:           0.100000000
GB:           0
PC:           1.000000000
===== ID parameters =====
CA:           125.000000000 MHz
CPDPRGAM:    zgpg30
PCPDPRGAM:   zgpg30
F1:           500.136000000 MHz
F2:           125.760000000 MHz
RGPR:        655.347
PR:           0.100000000
PREFREQ:     6.446812500 MHz
NUC2:         13C
=====

```

7.21433
8.08247
8.05433
7.75518
7.59789
7.58304
7.57771
7.54404
7.54084
7.53441
7.52622
7.51718
7.51160
7.5073
7.49548
7.48934
7.48510
7.36893
7.34077
7.23995

ppm



附圖 11. 單體 Q2 的 ¹H-NMR 光譜圖


```

Current Data Parameters
NAME:          PF-Q1
EXPNO:         1
PROCNO:        1
PROBHD:        5 mm BBO
PULPROG:       zgpg30
TD:            65536
SOLVENT:       CDCl3
NS:            2048
DS:            4
SWH:           4096.0 Hz
FIDRES:        0.274459 Hz
AQ:            1.86205 sec
RG:            327.5
DM:            111.200 kHz
DE:            300.0 K
TE:            300.2 K
D1:            1.50000000 sec

===== CHANNEL f1 =====
NUC1:           13C
P1:            13.00 nsec
PL1:           -3.00 dB
SFO1:          101.625000 MHz

F2 - Processing parameters
SI:            327.696 MHz
SF:            300.135000 MHz
WDW:           EM
SSB:           0
LB:            0.10 Hz
GB:            0
PC:            1.00

===== CHANNEL f2 =====
NUC2:           1H
P2:            12.00 nsec
PL2:           -3.00 dB
SFO2:          500.135000 MHz

===== CHANNEL f3 =====
NUC3:           13C
P3:            13.00 nsec
PL3:           -3.00 dB
SFO3:          101.625000 MHz

===== CHANNEL f4 =====
NUC4:           1H
P4:            12.00 nsec
PL4:           -3.00 dB
SFO4:          500.135000 MHz

===== CHANNEL f5 =====
NUC5:           13C
P5:            13.00 nsec
PL5:           -3.00 dB
SFO5:          101.625000 MHz

===== CHANNEL f6 =====
NUC6:           1H
P6:            12.00 nsec
PL6:           -3.00 dB
SFO6:          500.135000 MHz

===== CHANNEL f7 =====
NUC7:           13C
P7:            13.00 nsec
PL7:           -3.00 dB
SFO7:          101.625000 MHz

===== CHANNEL f8 =====
NUC8:           1H
P8:            12.00 nsec
PL8:           -3.00 dB
SFO8:          500.135000 MHz

===== CHANNEL f9 =====
NUC9:           13C
P9:            13.00 nsec
PL9:           -3.00 dB
SFO9:          101.625000 MHz

===== CHANNEL f10 =====
NUC10:          1H
P10:           12.00 nsec
PL10:          -3.00 dB
SFO10:         500.135000 MHz

===== CHANNEL f11 =====
NUC11:          13C
P11:           13.00 nsec
PL11:          -3.00 dB
SFO11:         101.625000 MHz

===== CHANNEL f12 =====
NUC12:          1H
P12:           12.00 nsec
PL12:          -3.00 dB
SFO12:         500.135000 MHz

===== CHANNEL f13 =====
NUC13:          13C
P13:           13.00 nsec
PL13:          -3.00 dB
SFO13:         101.625000 MHz

===== CHANNEL f14 =====
NUC14:          1H
P14:           12.00 nsec
PL14:          -3.00 dB
SFO14:         500.135000 MHz

===== CHANNEL f15 =====
NUC15:          13C
P15:           13.00 nsec
PL15:          -3.00 dB
SFO15:         101.625000 MHz

===== CHANNEL f16 =====
NUC16:          1H
P16:           12.00 nsec
PL16:          -3.00 dB
SFO16:         500.135000 MHz

===== CHANNEL f17 =====
NUC17:          13C
P17:           13.00 nsec
PL17:          -3.00 dB
SFO17:         101.625000 MHz

===== CHANNEL f18 =====
NUC18:          1H
P18:           12.00 nsec
PL18:          -3.00 dB
SFO18:         500.135000 MHz

===== CHANNEL f19 =====
NUC19:          13C
P19:           13.00 nsec
PL19:          -3.00 dB
SFO19:         101.625000 MHz

===== CHANNEL f20 =====
NUC20:          1H
P20:           12.00 nsec
PL20:          -3.00 dB
SFO20:         500.135000 MHz

===== CHANNEL f21 =====
NUC21:          13C
P21:           13.00 nsec
PL21:          -3.00 dB
SFO21:         101.625000 MHz

===== CHANNEL f22 =====
NUC22:          1H
P22:           12.00 nsec
PL22:          -3.00 dB
SFO22:         500.135000 MHz

===== CHANNEL f23 =====
NUC23:          13C
P23:           13.00 nsec
PL23:          -3.00 dB
SFO23:         101.625000 MHz

===== CHANNEL f24 =====
NUC24:          1H
P24:           12.00 nsec
PL24:          -3.00 dB
SFO24:         500.135000 MHz

===== CHANNEL f25 =====
NUC25:          13C
P25:           13.00 nsec
PL25:          -3.00 dB
SFO25:         101.625000 MHz

===== CHANNEL f26 =====
NUC26:          1H
P26:           12.00 nsec
PL26:          -3.00 dB
SFO26:         500.135000 MHz

===== CHANNEL f27 =====
NUC27:          13C
P27:           13.00 nsec
PL27:          -3.00 dB
SFO27:         101.625000 MHz

===== CHANNEL f28 =====
NUC28:          1H
P28:           12.00 nsec
PL28:          -3.00 dB
SFO28:         500.135000 MHz

===== CHANNEL f29 =====
NUC29:          13C
P29:           13.00 nsec
PL29:          -3.00 dB
SFO29:         101.625000 MHz

===== CHANNEL f30 =====
NUC30:          1H
P30:           12.00 nsec
PL30:          -3.00 dB
SFO30:         500.135000 MHz

===== CHANNEL f31 =====
NUC31:          13C
P31:           13.00 nsec
PL31:          -3.00 dB
SFO31:         101.625000 MHz

===== CHANNEL f32 =====
NUC32:          1H
P32:           12.00 nsec
PL32:          -3.00 dB
SFO32:         500.135000 MHz

===== CHANNEL f33 =====
NUC33:          13C
P33:           13.00 nsec
PL33:          -3.00 dB
SFO33:         101.625000 MHz

===== CHANNEL f34 =====
NUC34:          1H
P34:           12.00 nsec
PL34:          -3.00 dB
SFO34:         500.135000 MHz

===== CHANNEL f35 =====
NUC35:          13C
P35:           13.00 nsec
PL35:          -3.00 dB
SFO35:         101.625000 MHz

===== CHANNEL f36 =====
NUC36:          1H
P36:           12.00 nsec
PL36:          -3.00 dB
SFO36:         500.135000 MHz

===== CHANNEL f37 =====
NUC37:          13C
P37:           13.00 nsec
PL37:          -3.00 dB
SFO37:         101.625000 MHz

===== CHANNEL f38 =====
NUC38:          1H
P38:           12.00 nsec
PL38:          -3.00 dB
SFO38:         500.135000 MHz

===== CHANNEL f39 =====
NUC39:          13C
P39:           13.00 nsec
PL39:          -3.00 dB
SFO39:         101.625000 MHz

===== CHANNEL f40 =====
NUC40:          1H
P40:           12.00 nsec
PL40:          -3.00 dB
SFO40:         500.135000 MHz

===== CHANNEL f41 =====
NUC41:          13C
P41:           13.00 nsec
PL41:          -3.00 dB
SFO41:         101.625000 MHz

===== CHANNEL f42 =====
NUC42:          1H
P42:           12.00 nsec
PL42:          -3.00 dB
SFO42:         500.135000 MHz

===== CHANNEL f43 =====
NUC43:          13C
P43:           13.00 nsec
PL43:          -3.00 dB
SFO43:         101.625000 MHz

===== CHANNEL f44 =====
NUC44:          1H
P44:           12.00 nsec
PL44:          -3.00 dB
SFO44:         500.135000 MHz

===== CHANNEL f45 =====
NUC45:          13C
P45:           13.00 nsec
PL45:          -3.00 dB
SFO45:         101.625000 MHz

===== CHANNEL f46 =====
NUC46:          1H
P46:           12.00 nsec
PL46:          -3.00 dB
SFO46:         500.135000 MHz

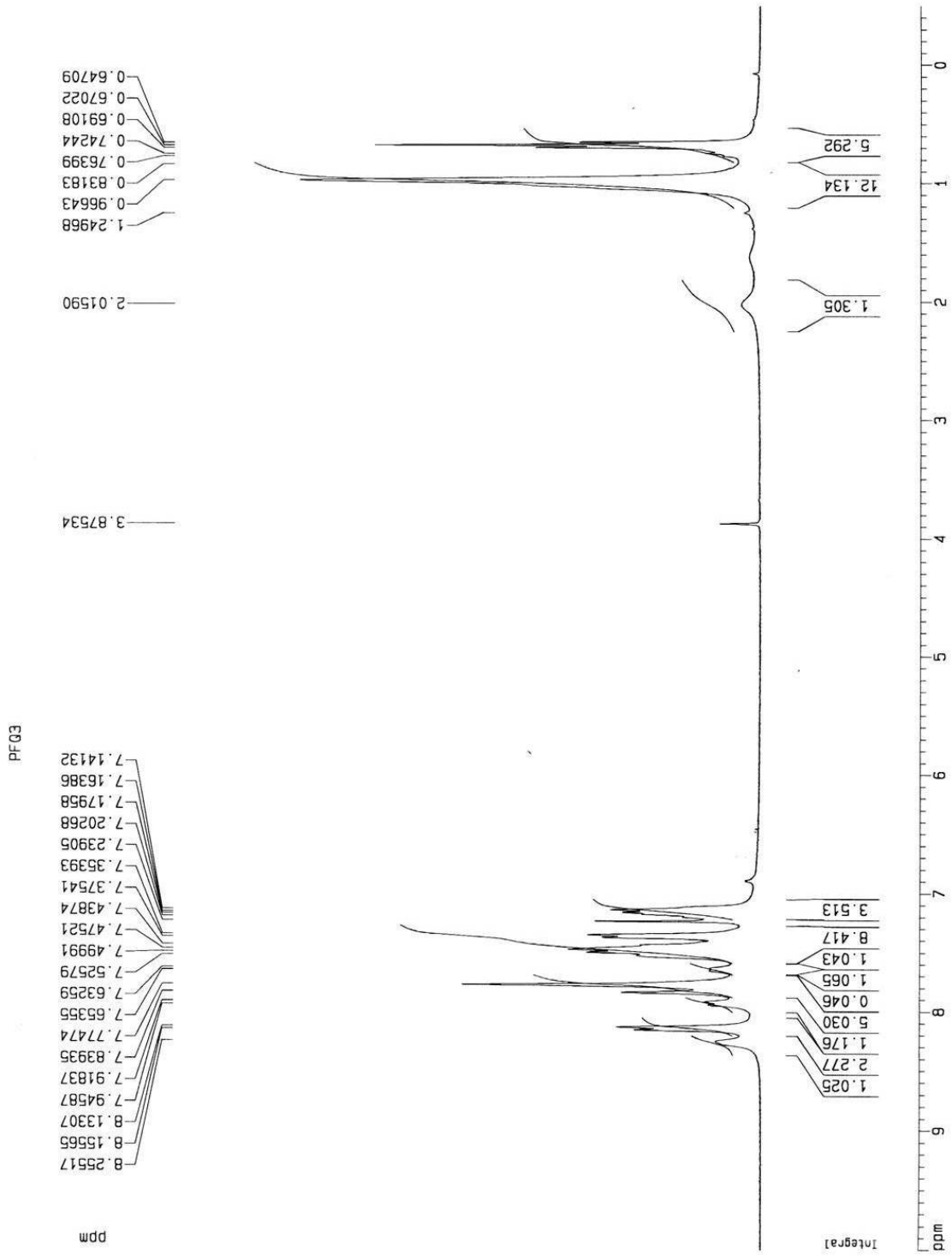
===== CHANNEL f47 =====
NUC47:          13C
P47:           13.00 nsec
PL47:          -3.00 dB
SFO47:         101.625000 MHz

===== CHANNEL f48 =====
NUC48:          1H
P48:           12.00 nsec
PL48:          -3.00 dB
SFO48:         500.135000 MHz

===== CHANNEL f49 =====
NUC49:          13C
P49:           13.00 nsec
PL49:          -3.00 dB
SFO49:         101.625000 MHz

===== CHANNEL f50 =====
NUC50:          1H
P50:           12.00 nsec
PL50:          -3.00 dB
SFO50:         500.135000 MHz

```

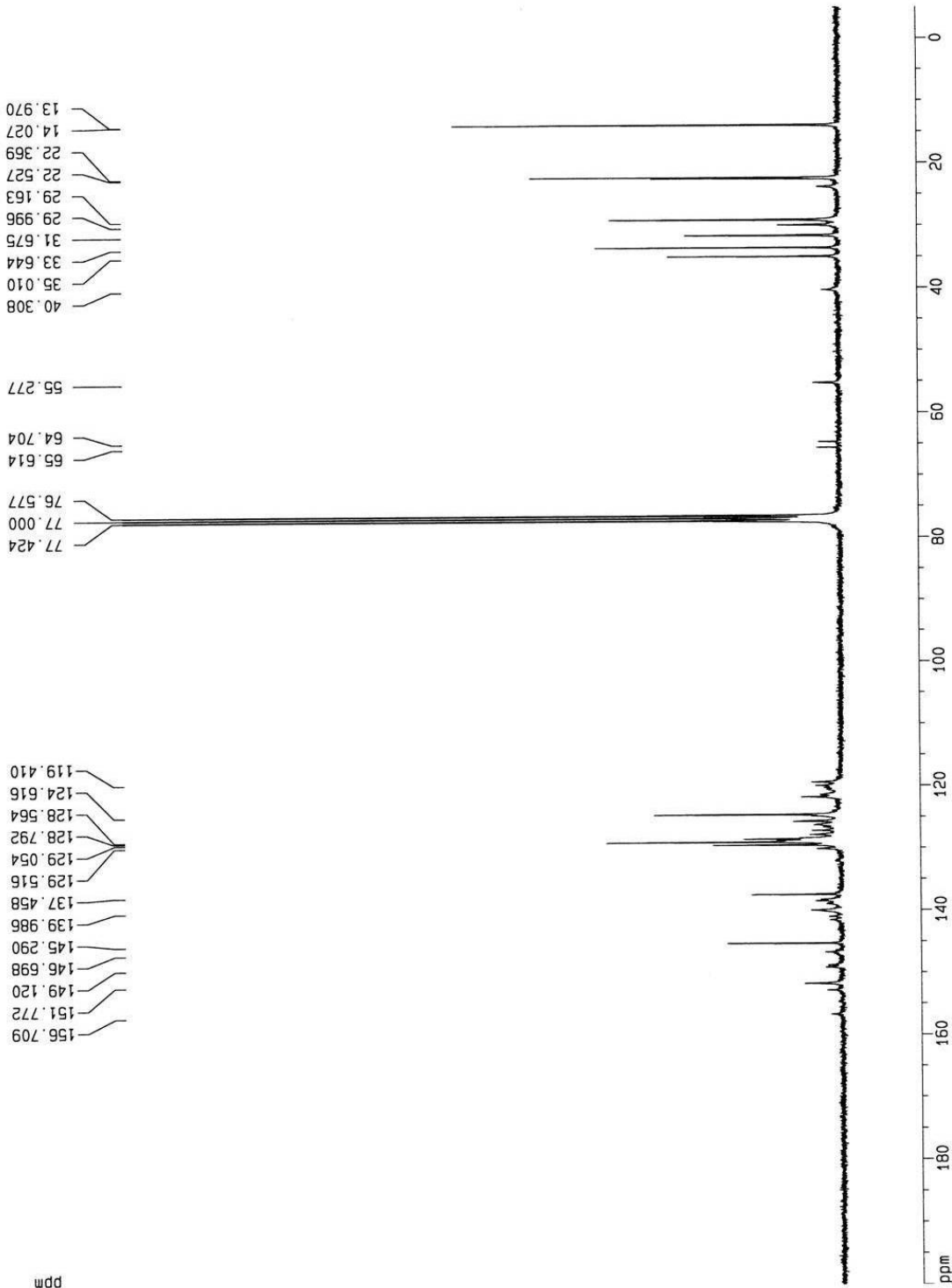


附圖 13. 高分子 PF-Q1 的 ¹H-NMR 光譜圖


```

Current Data Parameters
NAME: 01131314
EXPNO: 1
PROCNO: 1
F2 - Acquisition Parameters
Date_ : 20040526
Time: 12:27
INSTRUM: spect
PROBHD: 5 mm WB
PULPROG: zgpg30
TD: 65536
AQ: 0.0417
RG: 320
SFO: 125.761 MHz
FIDRES: 18632.383 Hz
AQRES: 0.287506 Hz
RGRES: 1.7250 Hz
DE: 1.7250 Hz
TE: 300.2 K
D1: 1.50000000 sec
d11: 0.00000000 sec
d12: 0.00000000 sec
----- CHANNEL f1 -----
NUC1: 13C
P1: 9.00 uSec
PL1: 1.00 dB
SFO1: 75.4752879 MHz
----- CHANNEL f2 -----
NUC2: 1H
P2: 18.00 uSec
PL2: 1.00 dB
SFO2: 300.1372000 MHz
F2 - Processing parameters
SI: 32768
SF: 75.4677334 MHz
WDW: EM
SSB: 0
LB: 1.0 Hz
GB: 0
PC: 1.00
SFO: 75.4677334 MHz
----- 1D NMR g101 parameters -----
SI: 32768
SF: 75.4677334 MHz
WDW: EM
SSB: 0
LB: 1.0 Hz
GB: 0
PC: 1.00
SFO: 75.4677334 MHz
----- 1D NMR g102 parameters -----
SI: 32768
SF: 75.4677334 MHz
WDW: EM
SSB: 0
LB: 1.0 Hz
GB: 0
PC: 1.00
SFO: 75.4677334 MHz

```



附圖 18. 高分子 PF-QA 的 ¹³C-NMR 光譜圖


```

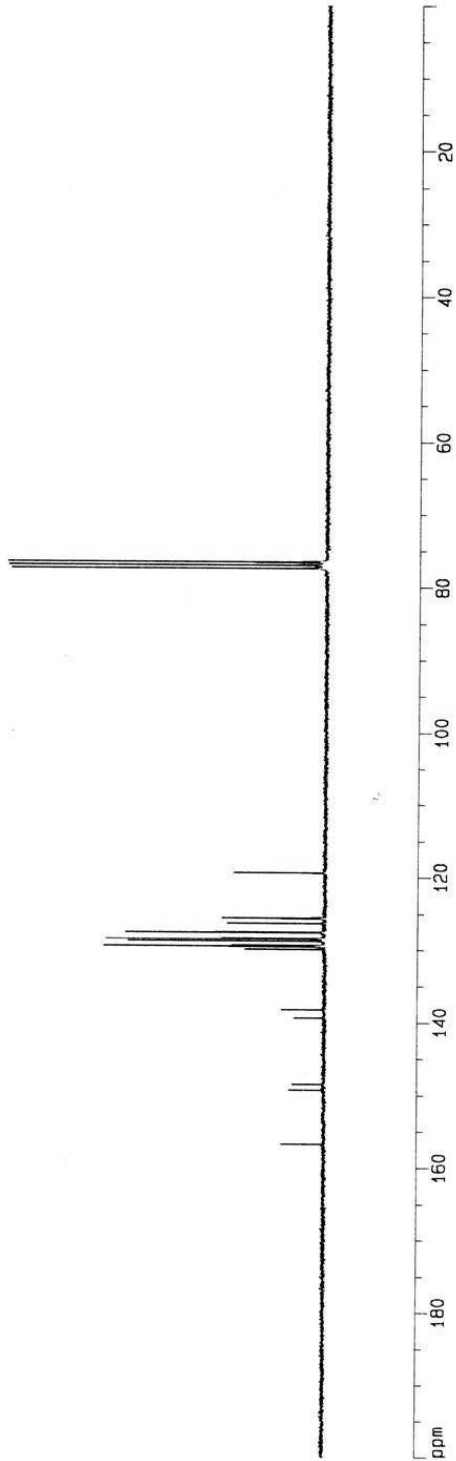
Current Data Parameters
Name: 51120703
PROCNO: 1
F2 - Acquisition Parameters
Date_: 06/20/02
Time: 11.00
INSTRUM: spect
PROBHD: 5 mm BBO
PULPROG: zgpg30
SOLVENT: ANIOLN
NS: 1377
DS: 4
AQ: 1.8822303 Hz
RG: 327.5
AQ2: 1.7000000 Hz
RG2: 327.5
DE: 6.50 mm
TE: 300.0 K
D1: 1.5000000 sec
d11: 0.0300000 sec
D12: 0.0500000 sec
----- CHANNEL f1 -----
NUC1: 13C
P1: 8.0000000 sec
PL1: 0.00 dB
SFO1: 75.4750000 MHz
----- CHANNEL f2 -----
NAME: 1H
NUC2: 1H
P2: 15.0000000 sec
PL2: 0.00 dB
SFO2: 400.1460000 MHz
F2 - Processing parameters
SI: 32768
SF: 75.4677500 MHz
WDW: EM
SSB: 0
LB: 1.00 Hz
GB: 0
PC: 1.00
ID: 1H FID Parameters
RG: 327.5
SFO: 400.1460000 MHz
F1: 15000.00 Hz
F2: 0.00 Hz
AQ: 1.8822303 Hz
RG2: 327.5
PCPD: 0.0000000 sec

```

77.420
76.997
76.574

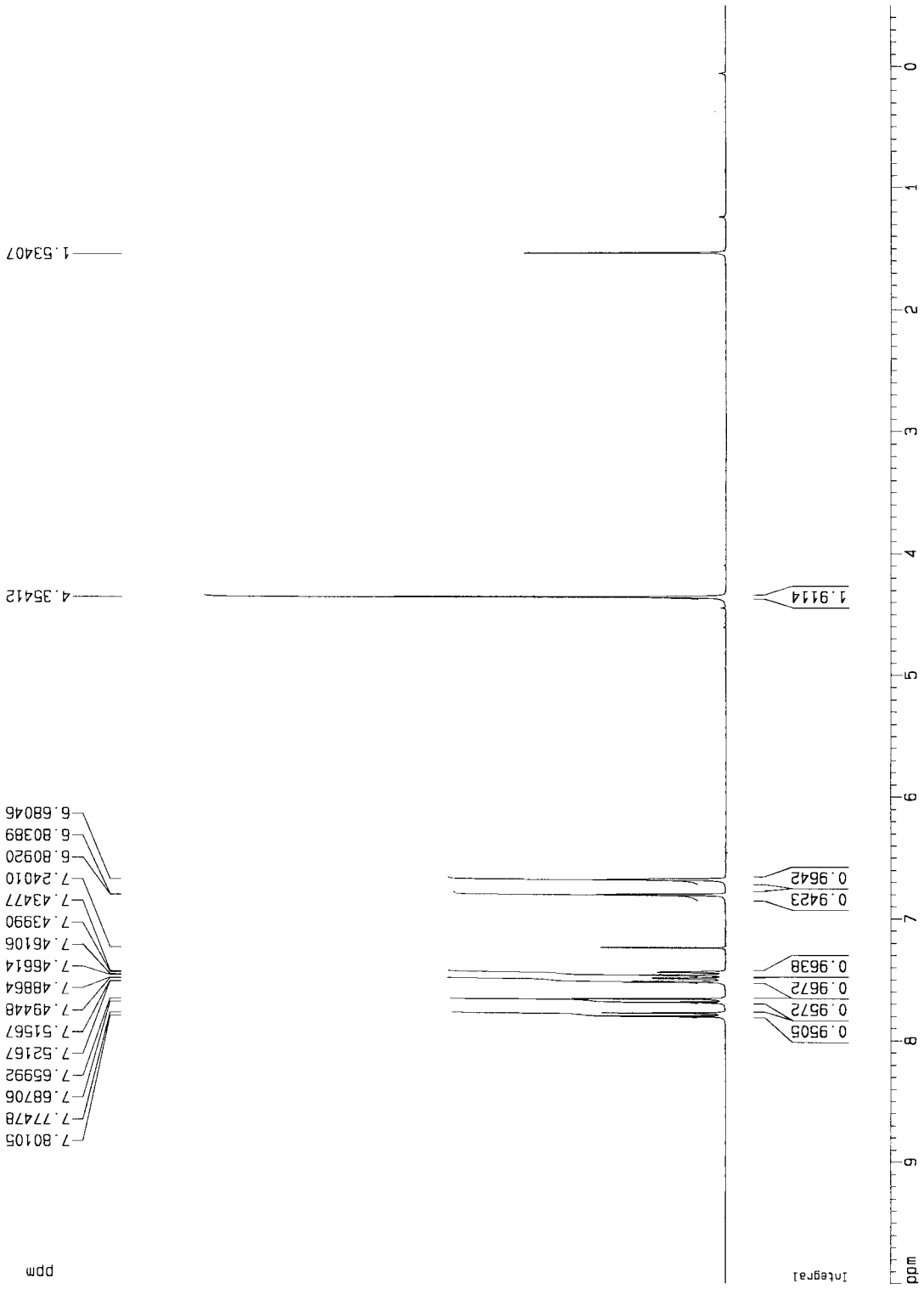
156.809
149.356
148.568
139.406
138.301
129.530
128.826
128.580
127.622
119.385

ppm



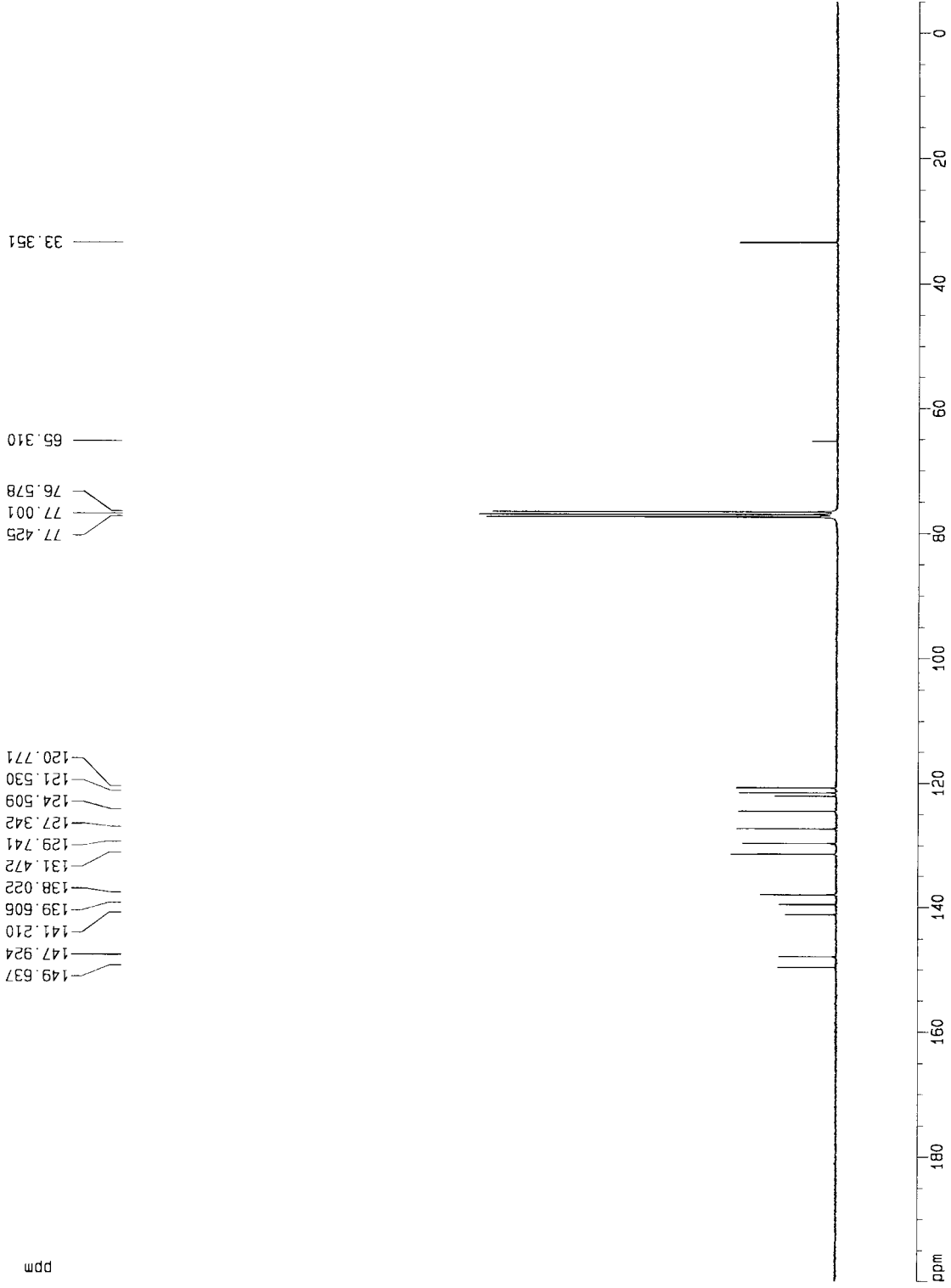
附圖 20. 2,4-Diphenylquinoline 的 ¹³C-NMR 光譜圖

Sample Name: 21-27-7
 Date: 20120303
 Operator: 1
 Instrument: 1
 P1: 1.00000000
 P2: 1.00000000
 P3: 1.00000000
 P4: 1.00000000
 P5: 1.00000000
 P6: 1.00000000
 P7: 1.00000000
 P8: 1.00000000
 P9: 1.00000000
 P10: 1.00000000
 P11: 1.00000000
 P12: 1.00000000
 P13: 1.00000000
 P14: 1.00000000
 P15: 1.00000000
 P16: 1.00000000
 P17: 1.00000000
 P18: 1.00000000
 P19: 1.00000000
 P20: 1.00000000
 P21: 1.00000000
 P22: 1.00000000
 P23: 1.00000000
 P24: 1.00000000
 P25: 1.00000000
 P26: 1.00000000
 P27: 1.00000000
 P28: 1.00000000
 P29: 1.00000000
 P30: 1.00000000
 P31: 1.00000000
 P32: 1.00000000
 P33: 1.00000000
 P34: 1.00000000
 P35: 1.00000000
 P36: 1.00000000
 P37: 1.00000000
 P38: 1.00000000
 P39: 1.00000000
 P40: 1.00000000
 P41: 1.00000000
 P42: 1.00000000
 P43: 1.00000000
 P44: 1.00000000
 P45: 1.00000000
 P46: 1.00000000
 P47: 1.00000000
 P48: 1.00000000
 P49: 1.00000000
 P50: 1.00000000
 P51: 1.00000000
 P52: 1.00000000
 P53: 1.00000000
 P54: 1.00000000
 P55: 1.00000000
 P56: 1.00000000
 P57: 1.00000000
 P58: 1.00000000
 P59: 1.00000000
 P60: 1.00000000
 P61: 1.00000000
 P62: 1.00000000
 P63: 1.00000000
 P64: 1.00000000
 P65: 1.00000000
 P66: 1.00000000
 P67: 1.00000000
 P68: 1.00000000
 P69: 1.00000000
 P70: 1.00000000
 P71: 1.00000000
 P72: 1.00000000
 P73: 1.00000000
 P74: 1.00000000
 P75: 1.00000000
 P76: 1.00000000
 P77: 1.00000000
 P78: 1.00000000
 P79: 1.00000000
 P80: 1.00000000
 P81: 1.00000000
 P82: 1.00000000
 P83: 1.00000000
 P84: 1.00000000
 P85: 1.00000000
 P86: 1.00000000
 P87: 1.00000000
 P88: 1.00000000
 P89: 1.00000000
 P90: 1.00000000
 P91: 1.00000000
 P92: 1.00000000
 P93: 1.00000000
 P94: 1.00000000
 P95: 1.00000000
 P96: 1.00000000
 P97: 1.00000000
 P98: 1.00000000
 P99: 1.00000000
 P100: 1.00000000



附圖 21. 2,7- Dibromo -2',7' - bis(bromomethyl) -9,9'-spirobifluorene , 化合物 B1 的 ¹H-NMR 光譜圖

Current: Data Parameters
 EXPNO 2
 PROCNO 1
 F2 - Acquisition Parameters
 Date_ 20070824
 Time 22:24
 INSTRUM spect
 PULPROG zgpg30
 ALPROG zgpg30
 RG 327.500
 SOLVENT CDCl3
 NS 1024
 DS 4
 SWH 18823.363 Hz
 FWHM 1.226336 Hz
 AQ 7.288124 sec
 RG 327.500
 DE 6.500 dB
 TE 300.2 K
 D1 0.00000000 sec
 DELT 0.00000000 sec
 O12 0.00000000 sec
 ===== CHANNEL f1 =====
 NUC1 13C
 P1 1.00000000 sec
 PL1 0.00 dB
 SFO1 75.4782713 MHz
 ===== CHANNEL f2 =====
 CPDPRG2 waltz16
 PULPROG zgpg30
 PL1 0.00 dB
 PL2 0.00 dB
 PL3 0.00 dB
 PL4 0.00 dB
 PL5 0.00 dB
 SFO2 300.1350000 MHz
 F2 - Processing parameters
 SI 327.5000000 MHz
 SF 75.4782713 MHz
 DD 0.00000000 sec
 EQ 1.00 Hz
 GB 0
 HC 1.00
 D0 NMR pulse parameters
 PR 0.00000000 sec
 P1 1.00000000 sec
 P2 0.00000000 sec
 P3 1.00000000 sec
 P4 0.00000000 sec
 P5 1.00000000 sec
 P6 0.00000000 sec
 P7 0.00000000 sec
 P8 0.00000000 sec
 P9 0.00000000 sec
 P10 0.00000000 sec
 P11 0.00000000 sec
 P12 0.00000000 sec
 P13 0.00000000 sec
 P14 0.00000000 sec
 P15 0.00000000 sec
 P16 0.00000000 sec
 P17 0.00000000 sec
 P18 0.00000000 sec
 P19 0.00000000 sec
 P20 0.00000000 sec
 P21 0.00000000 sec
 P22 0.00000000 sec
 P23 0.00000000 sec
 P24 0.00000000 sec
 P25 0.00000000 sec
 P26 0.00000000 sec
 P27 0.00000000 sec
 P28 0.00000000 sec
 P29 0.00000000 sec
 P30 0.00000000 sec
 P31 0.00000000 sec
 P32 0.00000000 sec
 P33 0.00000000 sec
 P34 0.00000000 sec
 P35 0.00000000 sec
 P36 0.00000000 sec
 P37 0.00000000 sec
 P38 0.00000000 sec
 P39 0.00000000 sec
 P40 0.00000000 sec
 P41 0.00000000 sec
 P42 0.00000000 sec
 P43 0.00000000 sec
 P44 0.00000000 sec
 P45 0.00000000 sec
 P46 0.00000000 sec
 P47 0.00000000 sec
 P48 0.00000000 sec
 P49 0.00000000 sec
 P50 0.00000000 sec
 P51 0.00000000 sec
 P52 0.00000000 sec
 P53 0.00000000 sec
 P54 0.00000000 sec
 P55 0.00000000 sec
 P56 0.00000000 sec
 P57 0.00000000 sec
 P58 0.00000000 sec
 P59 0.00000000 sec
 P60 0.00000000 sec
 P61 0.00000000 sec
 P62 0.00000000 sec
 P63 0.00000000 sec
 P64 0.00000000 sec
 P65 0.00000000 sec
 P66 0.00000000 sec
 P67 0.00000000 sec
 P68 0.00000000 sec
 P69 0.00000000 sec
 P70 0.00000000 sec
 P71 0.00000000 sec
 P72 0.00000000 sec
 P73 0.00000000 sec
 P74 0.00000000 sec
 P75 0.00000000 sec
 P76 0.00000000 sec
 P77 0.00000000 sec
 P78 0.00000000 sec
 P79 0.00000000 sec
 P80 0.00000000 sec
 P81 0.00000000 sec
 P82 0.00000000 sec
 P83 0.00000000 sec
 P84 0.00000000 sec
 P85 0.00000000 sec
 P86 0.00000000 sec
 P87 0.00000000 sec
 P88 0.00000000 sec
 P89 0.00000000 sec
 P90 0.00000000 sec
 P91 0.00000000 sec
 P92 0.00000000 sec
 P93 0.00000000 sec
 P94 0.00000000 sec
 P95 0.00000000 sec
 P96 0.00000000 sec
 P97 0.00000000 sec
 P98 0.00000000 sec
 P99 0.00000000 sec
 P100 0.00000000 sec



附圖 22. 2,2',7,7'-dibromo-9,9'-spirobifluorene, 化合物 B1 的 ¹³C-NMR 光譜圖

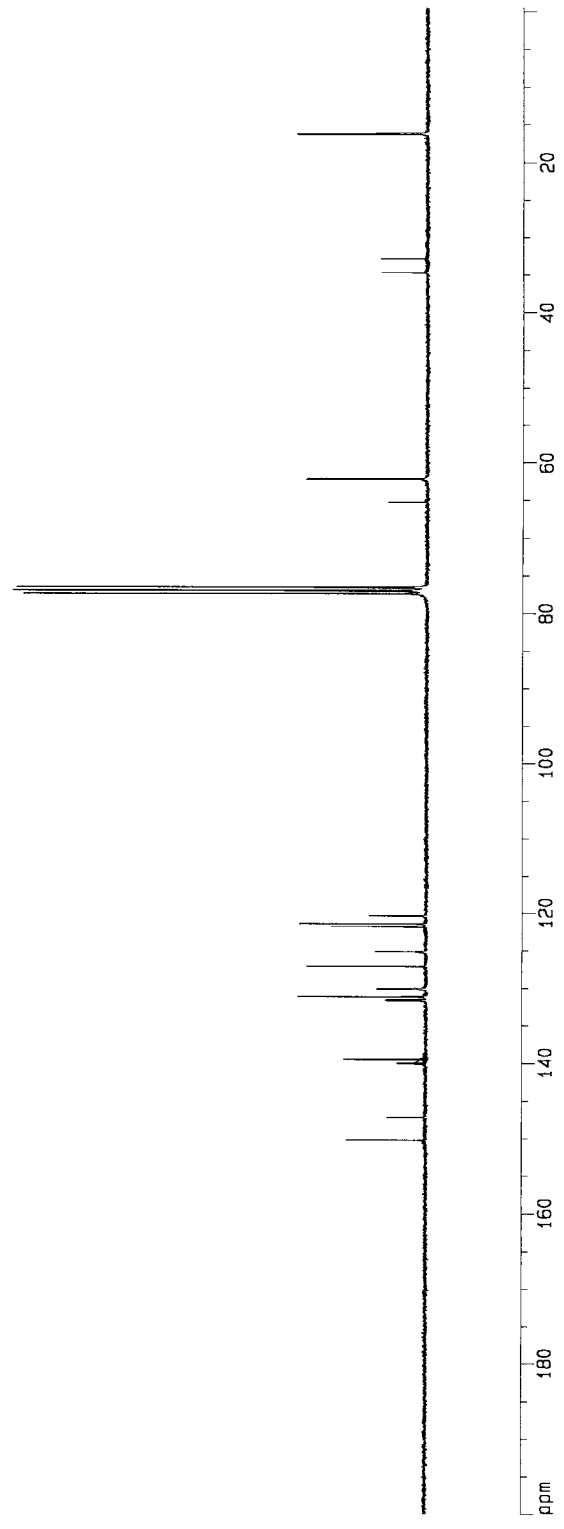

```

Current Data Parameters
NAME      P1110563
PROBHD    1
-----
F2 - Acquisition Parameters
DATE_    20031112
TIME     14:41
INSTRUM  spect
PROBHD   5 mm BBO
PULPROG  zgpg30
TD        65536
SOLVENT  CHL
AQ        34.51
RG        34.51
OR        1882.30 Hz
FIDRES   0.391580 Hz
AQRES    1.792588 Hz
RGRES    1.792588 Hz
SFORES   26.556 MHz
SFORES   26.556 MHz
TE        300.2 K
D1        1.50000000 SEC
d11       0.05000000 SEC
d12       0.05000000 SEC
d13       0.05000000 SEC
-----
===== CHANNEL f1 =====
NUC1      13C
P1        9.00 uSec
PL        0 dB
SFO1      75.475349 MHz
===== CHANNEL f2 =====
CPDPRG2   waltz16
NUC2      1H
P2        9.00 uSec
PL2       -2.00 dB
PL12      19.00 dB
PL13      19.00 dB
SFO2      300.131506 MHz
-----
F2 - Processing parameters
SI        32768
SF        75.475349 MHz
WDW       EM
SSB       0
LB        1.00 Hz
GB        0
PC        1.00
-----
ID AND PULS PARAMETERS
CA        23.20 uS
CF        200.00 MHz
FI        15089.35 MHz
PP        -5.500 uS
PRANCH    8 23151 20V/2u
HCON      643.88446 Hz/2.0u

```

150.246
 147.244
 147.207
 140.094
 139.552
 131.678
 131.161
 127.137
 121.823
 121.527
 120.447
 120.413
 77.421
 76.998
 76.574
 65.236
 62.202
 62.111
 34.691
 32.863
 16.211
 16.131

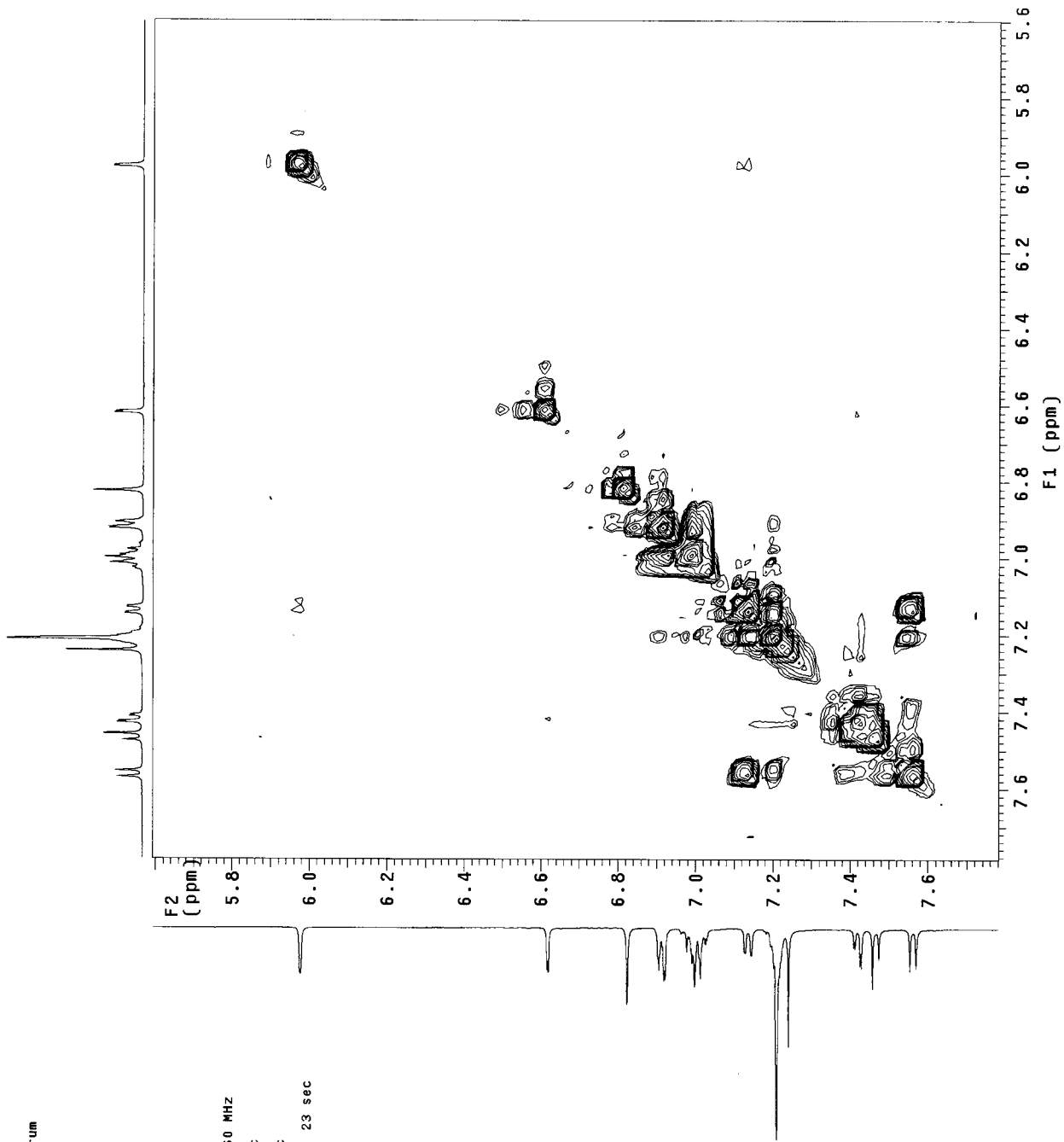
ppm



附圖 24. 2, 7-Dibromo-2',7'-bis(diethoxyphosphorylmethyl)-9,9'-spirobifluorene，化合物 B2 的 ¹³C-NMR 光譜圖

B3 with H-H gCOSY spectrum
in CDCl₃ at INOVA 5mm

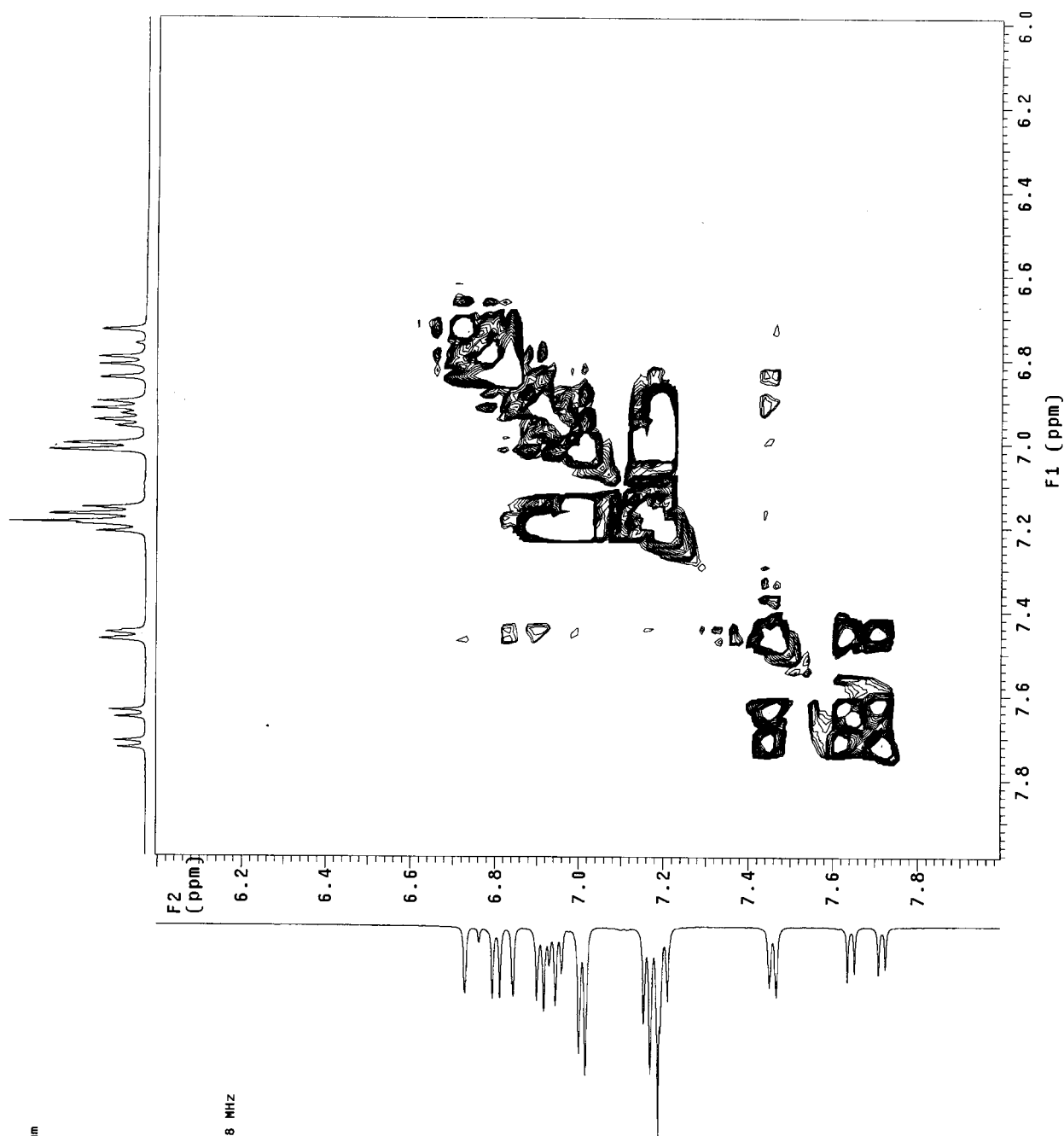
Solvent: CDCl₃
Temp. 30.0 C / 303.1 K
INOVA-500 "INOVA500-A"
Relax. delay 1.000 sec
Acq. time 0.136 sec
Width 7509.6 Hz
2D Width 7509.6 Hz
64 repetitions
128 increments
OBSERVE H1, 499.8389860 MHz
DATA PROCESSING
Sg. sine bell 0.068 sec
F1 DATA PROCESSING
Sg. sine bell 0.017 sec
FT size 2048 x 2048
Total time 2 hr, 38 min, 23 sec



附圖 26. 2,7-Dibromo-2',7'-bis(2,2-diphenylvinyl)-9,9'-spirobifluorene, 化合物 B3 的 ¹H-¹H COSY 光譜圖

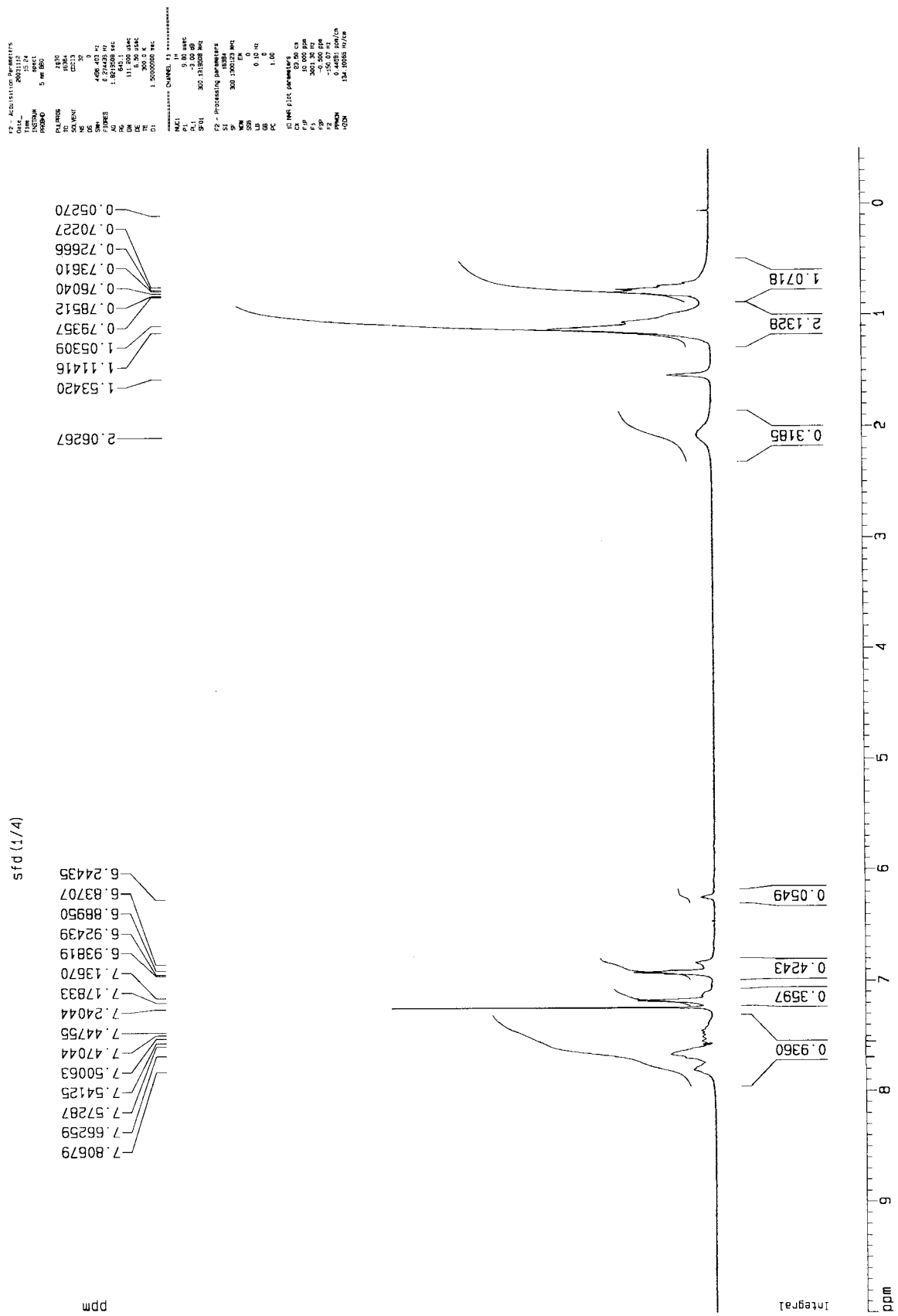
B4 with H-HgCOSY spectrum
in CDCl₃ at INOVA 5mm

Solvent: CDCl₃
Temp: 30.0 C / 303.1 K
INVA-500 "INVA500-A"
Relax. delay 1.000 sec
Acq. time 0.136 sec
Width 7509.6 Hz
ZD Width 7509.6 Hz
ZD repetitions
ZD increments
OBSERVED F1 99.6390118 MHz
DATA PROCESSING
SI F1 ENROLL 0.068 sec
F1 DATA PROCESSING
Sg sine bell 0.017 sec
FT size 2048 x 2048
Total time 20 min, 3 sec



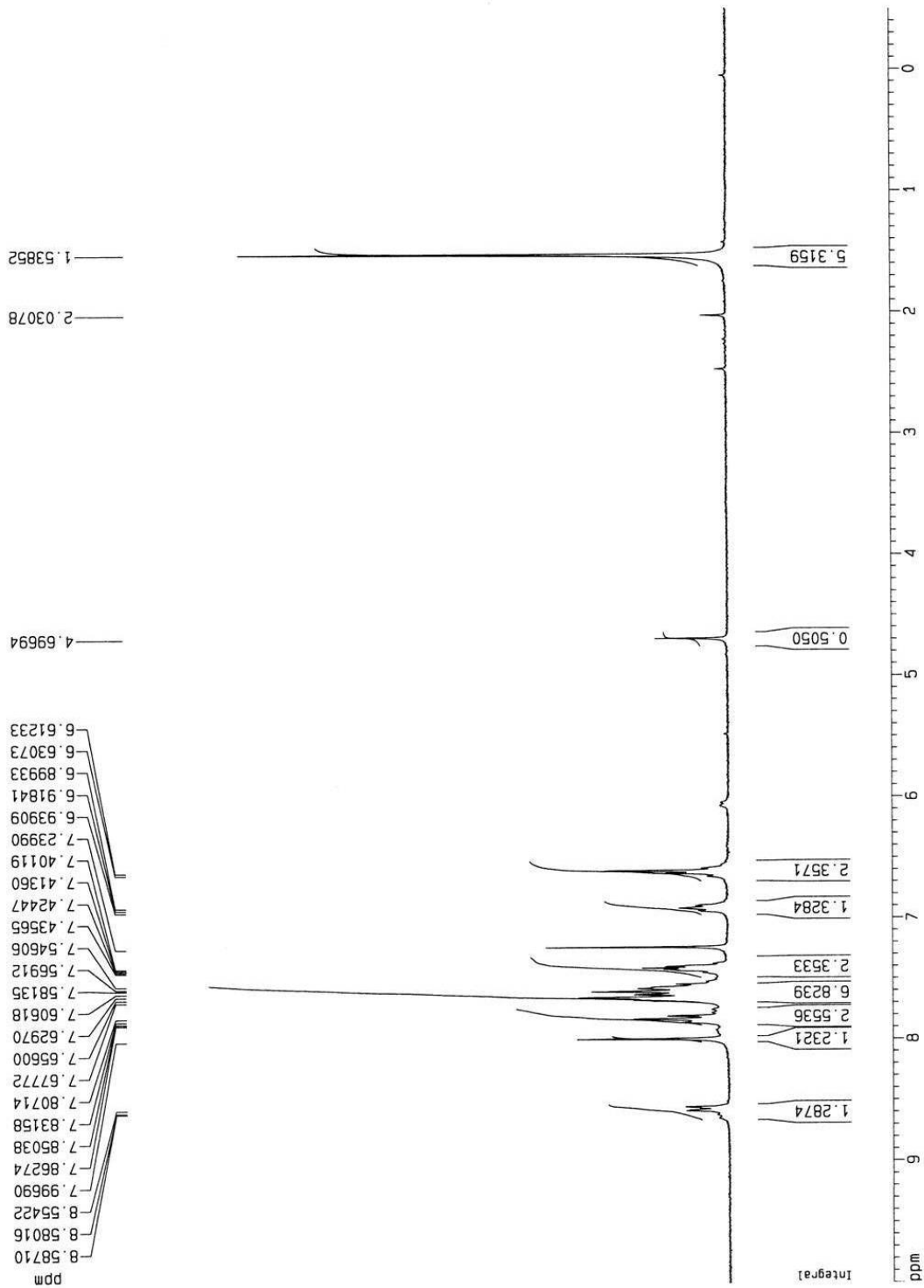
附圖 29. 2,7-Dibromo-2',7'- bis[4'-(diphenylamino)styryl]- 9,9'-spirobifluorene, 化合物 B4 的 ¹H-¹H COSY 光譜圖

附圖 32. 高分子 SFD(1/4)的 ¹H-NMR 光譜圖




```

Current Data Parameters
=====
F1 - Acquisition Parameters
Date_   20110725
Time    23:17
INSTRUM spect
PROBHD  5 mm BBO
PULPROG zgpg30
TD      65536
SOLVENT  DMSO
NS      4096
DS      4
SWH      12.500 MHz
FIDRES   0.163143 Hz
AQ      0.0645161 sec
RG      327.680
GB      0
PC      1.00
===== CHANNEL f1 =====
NUC1     13  C
P1      1.500000 sec
PL1     0.000000 dB
SFO1    125.7611536 MHz
===== CHANNEL f2 =====
NUC2     1  H
P2      0.000000 sec
PL2     0.000000 dB
SFO2    500.1360545 MHz
===== PROCESSING PARAMETERS =====
SI      32768
SF      500.1360545 MHz
WDW     EM
SS      300.0000000 MHz
LB      3.0000000 Hz
GB      0
PC      1.00
===== NMR 3D1C1 Parameters =====
SI      32768
SF      500.1360545 MHz
WDW     EM
SS      300.0000000 MHz
LB      3.0000000 Hz
GB      0
PC      1.00
=====
  
```

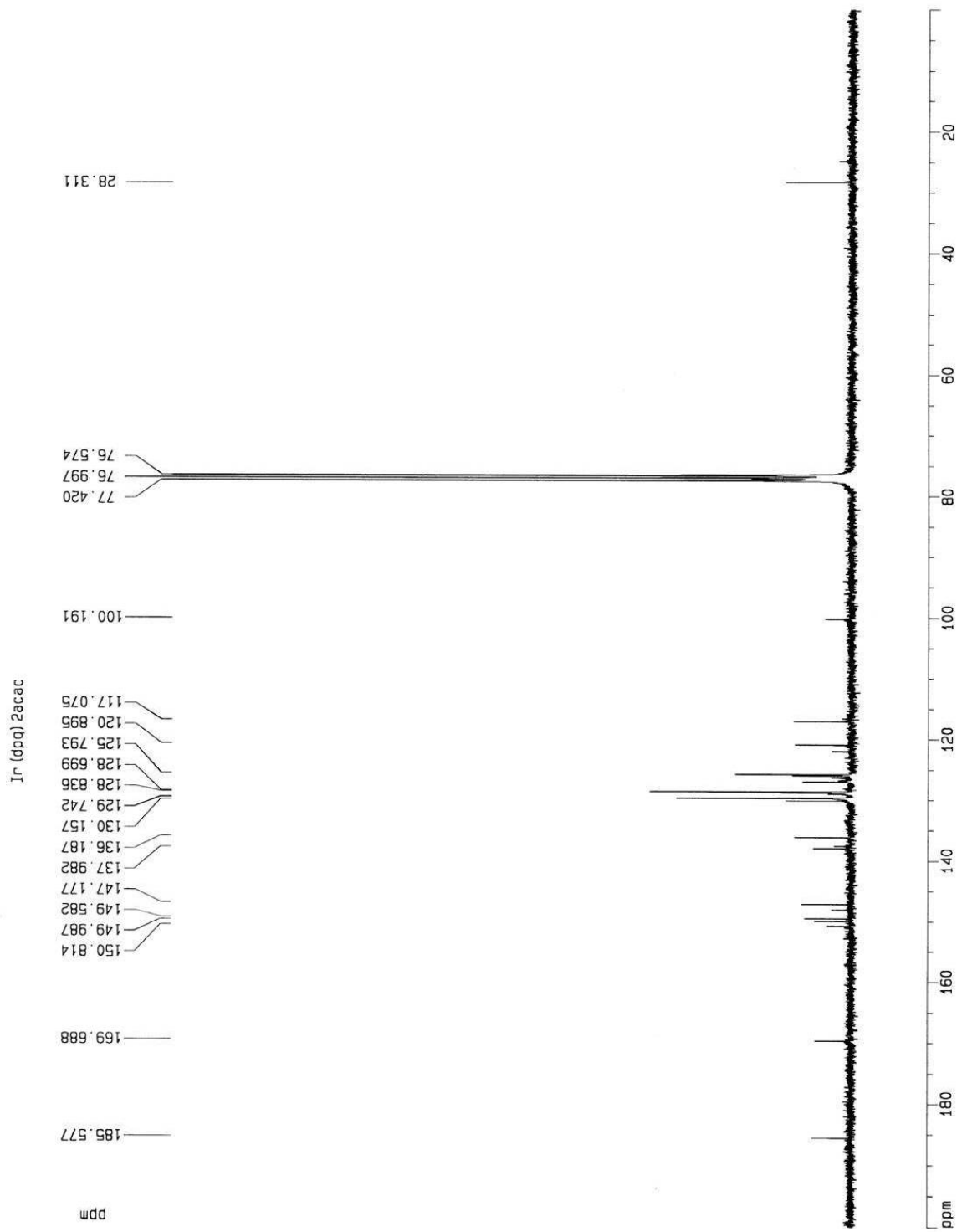


附圖 36. Ir(dpq)₂acac 的 ¹H-NMR 光譜圖

```

Current Data Parameters
NAME: P1102703
PROCNO: 1
F2 - Acquisition Parameters
Date_ 20051108
Time 09:11:11
INSTRUM spect
PROBHD 5 mm BBO
PULPROG zgpg30
AQ 1.52000000
SOLVENT d2o
NS 1520
DS 4
SWH 18000.000 Hz
FIDRES 0.30000000 Hz
AQRES 1.74000000 Hz
RG 768.000000
AQ 1.74000000 Hz
RG 768.000000
DE 8.000000 Hz
TE 300.2 K
D1 1.00000000 sec
D11 0.05000000 sec
D12 0.05000000 sec
D13 0.00000000 sec
----- CHANNEL f1 -----
NUC1 13C
P1 1.00000000 sec
PL1 0.00000000 dB
SFO1 75.4257200 MHz
----- CHANNEL f2 -----
CONTR1 1.00000000
NUC2 1H
P2 1.00000000 sec
PL2 0.00000000 dB
SFO2 500.1315000 MHz
F2 - Processing parameters
SI 32768
SF 75.4257200 MHz
WDW EM
SSB 0
GB 0
PC 1.00000000
ID MRB310C parameters
SI 32768
SF 75.4257200 MHz
FIDRES 0.30000000 Hz
AQRES 1.74000000 Hz
RG 768.000000
DE 8.000000 Hz
TE 300.2 K
D1 1.00000000 sec
D11 0.05000000 sec
D12 0.05000000 sec
D13 0.00000000 sec
PROCNO 1102703
F2 - Processing parameters

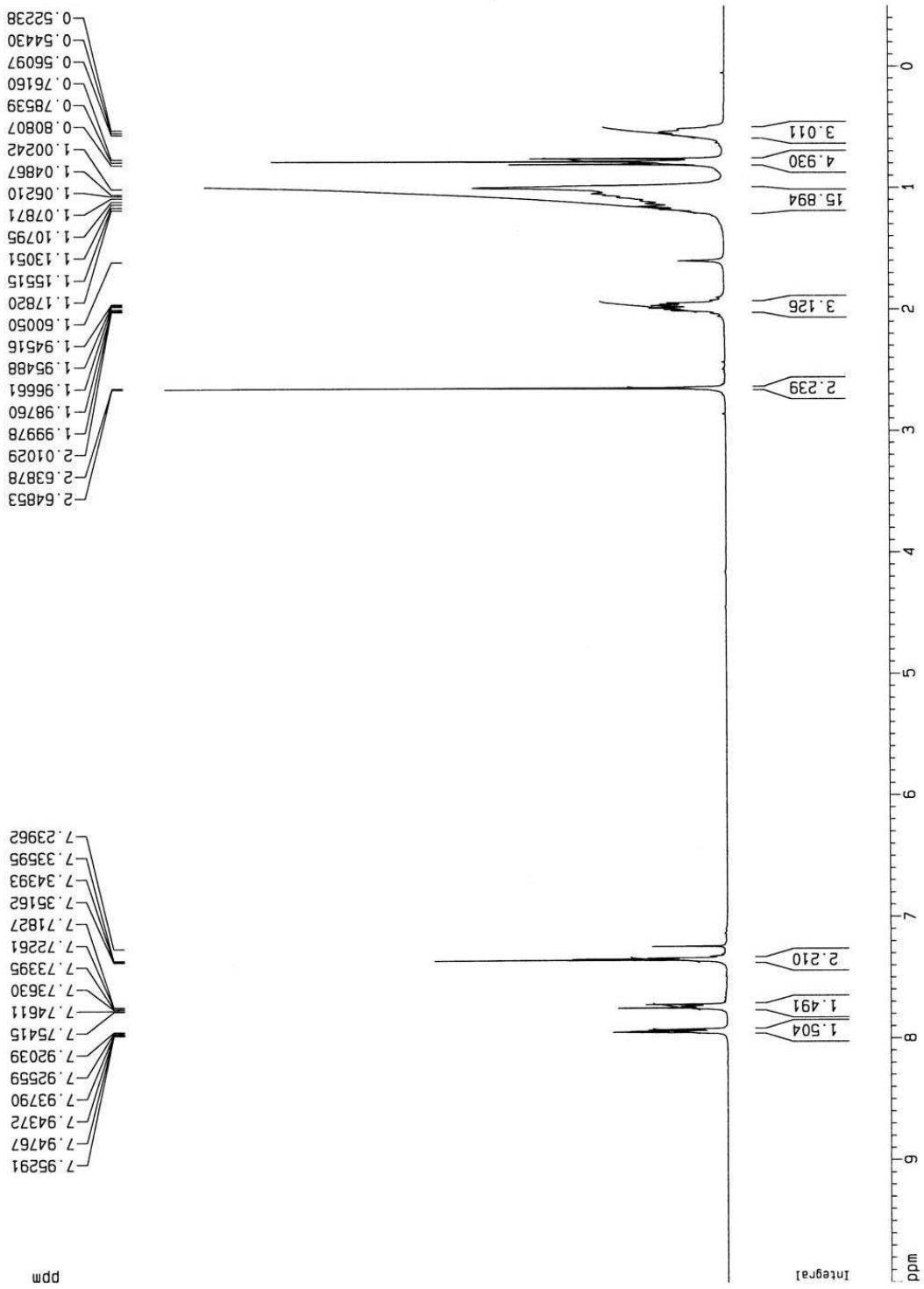
```



附圖 37. Ir(dpq)₂acac 的 ¹³C-NMR 光譜圖

Collect Data Parameters
 NAME: 01110963
 PROCNO: 1
 Date_: 20031207
 Time: 23.19
 F2 - Acquisition Parameters
 INSTRUM: spect
 PRBPROG: zgpg30
 PULPROG: zgpg30
 TO: 1320
 SI: 65536
 SF: 400.1460150
 AQ: 0.21478 Hz
 UG: 499.425
 FIDRES: 0.21478 Hz
 ARO: 1.50000000
 DE: 111.300 usec
 TE: 300.2 K
 D1: 1.50000000 sec
 ===== CHANNEL f1 =====
 NU1: 9.80 usec
 PL1: -3.50 dB
 SF1: 300.1350500 MHz
 F2 - Processing parameters
 SI: 300.1350500 MHz
 SF: 300.1350500 MHz
 DS: 4
 SS: 0
 LB: 0.10 Hz
 GB: 0
 PC: 1.00
 F2 - MRSF10 Parameters
 CA: 23.30 usec
 CB: 30.00 usec
 CD: 300.1350500 MHz
 CE: 300.1350500 MHz
 CF: -3.500 dB
 CG: 0.00000000
 CH: 0.00000000
 CI: 0.00000000
 CM: 134.10000 Hz/Hz

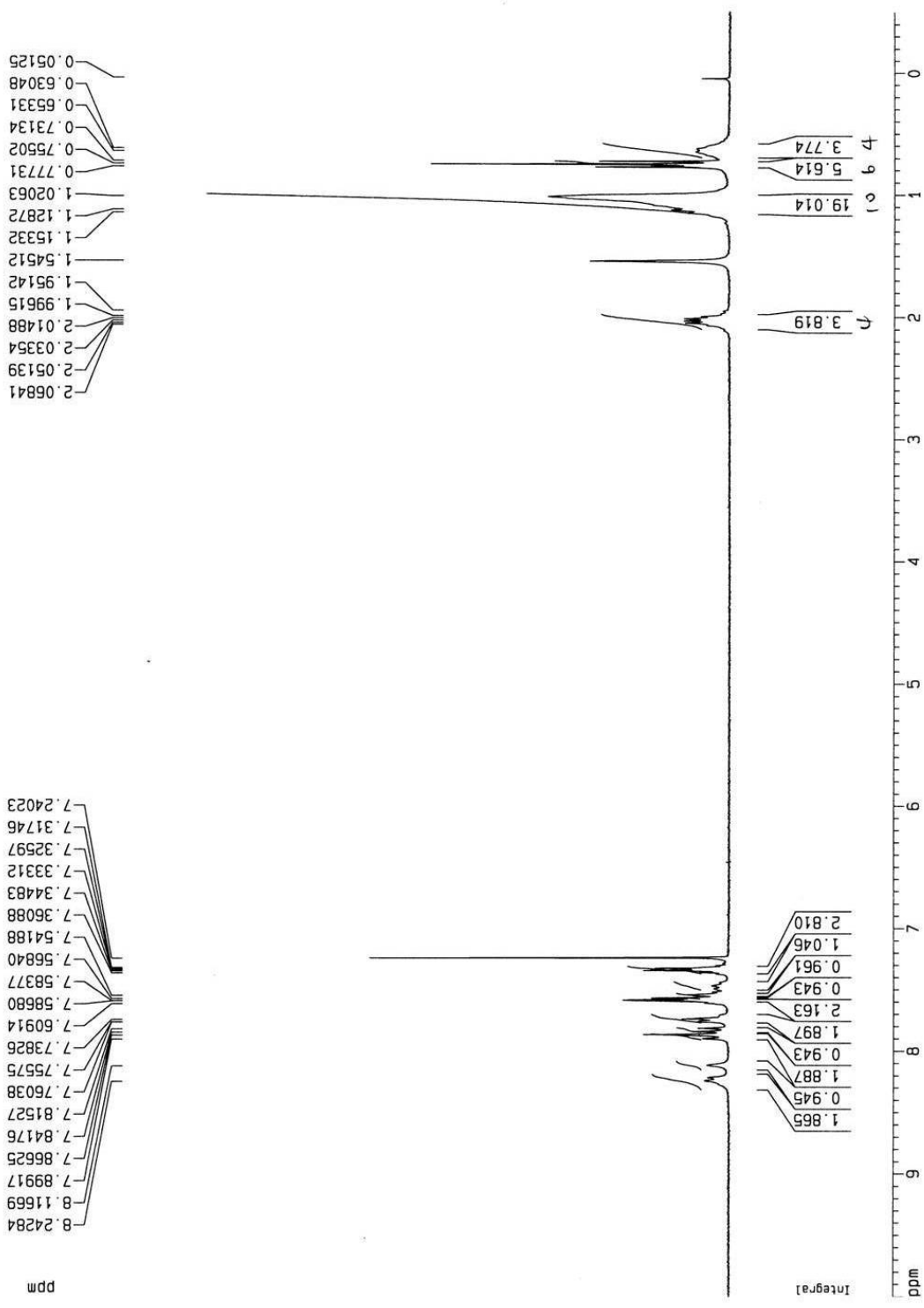
C1



附圖 38. 2-Acetyl-9,9-dioctylfluorene, 化合物 C1 的 ¹H-NMR 光譜圖

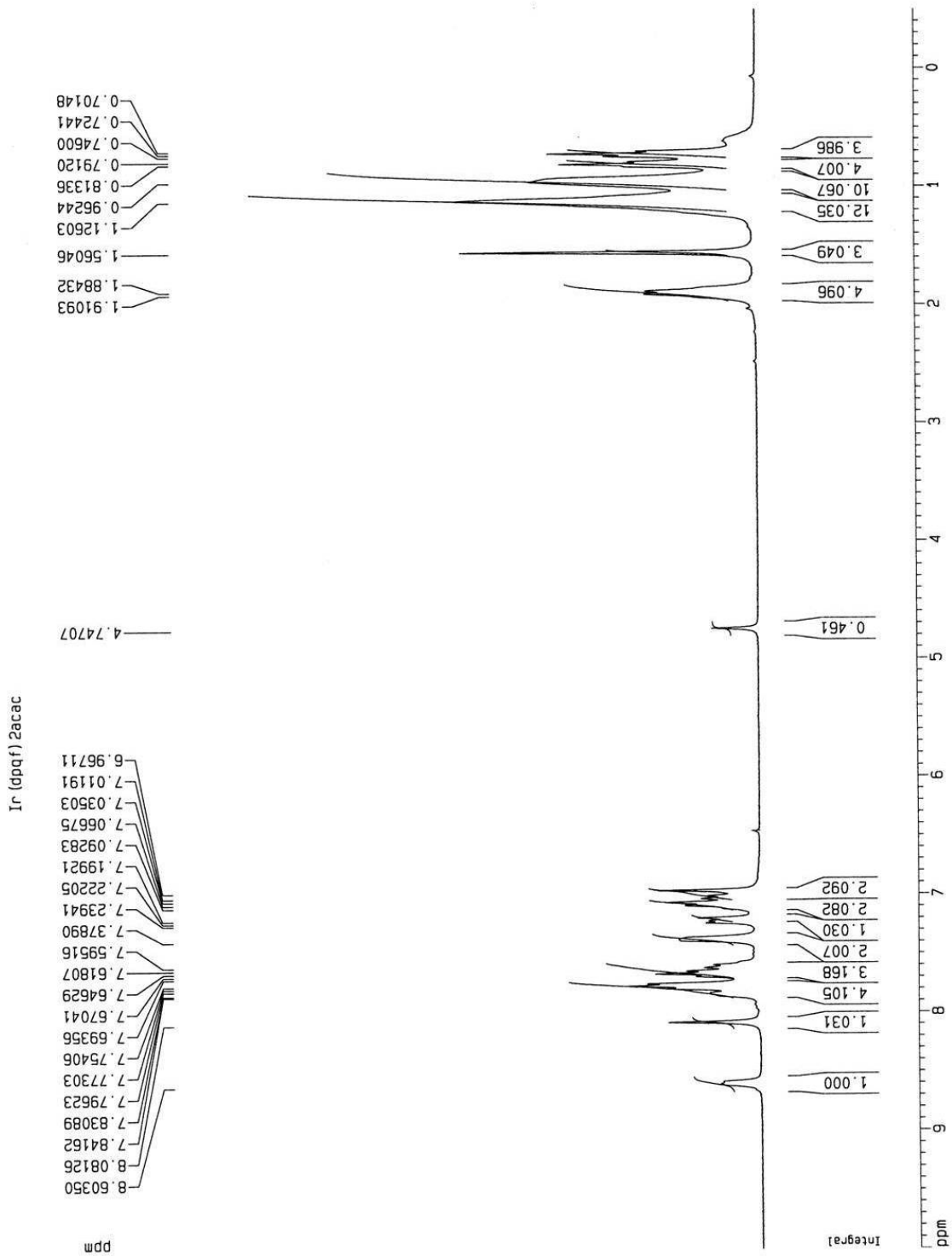
Current Data Parameters
 NAME: 81104328
 PROCNO: 1
 12 - Acquisition Parameters
 DATE_: 20060328
 TIME: 11.31
 INSTRUM: spect
 PROBHD: 5 mm BBO
 PULPROG: zgpg30
 NS: 1930
 DS: 4
 SWH: 12.500 MHz
 F2: 499.943 MHz
 AQ: 0.16317000 sec
 RG: 1024
 B4: 1.00000000 sec
 SFO: 500.1362500 MHz
 D1: 1.50000000 sec
 12 - Processing parameters
 SI: 300.1362500 MHz
 SF: 300.1362500 MHz
 FIDRES: 0.10000000
 SFOFF: 0.00000000
 PC: 1.00
 13 NMR 3100 PARAMETERS
 F1: 27.00 MHz
 F2: 10.00 MHz
 F3: 300.1362500 MHz
 F4: 300.1362500 MHz
 F5: 300.1362500 MHz
 F6: 300.1362500 MHz
 PPM0: 0.46800000
 PPM1: 124.10000000

22



附圖 40. 2-(9,9-dioctyl-9H-2-fluorenyl)-4-phenylquinoline, 化合物 C2 的 ¹H-NMR 光譜圖

Control Data Parameters
 NAME: B113180A
 PROCNO: 1
 F2 - Acquisition Parameters
 DATE_: 20040318
 TIME_: 14:21
 INSTRUM: spect
 PROBHD: 5 mm BBO
 PULPROG: zgpg30
 DS: 4
 SWH: 13000.000 Hz
 FIDRES: 0.090000 Hz
 AQ: 1.4517000 sec
 RG: 655
 GB: 1
 PC: 1.5000000 sec
 FWHM: 1.5000000 Hz
 AVERAGING: DMRG: 16
 SFO1: 500.136000 MHz
 SFO2: 300.135000 MHz
 F2 - Processing parameters
 SI: 15384
 SF: 300.135000 MHz
 WF: 0
 SSB: 0
 DC: 0
 GB: 1
 PC: 1.00
 F2 - MRB (H) Parameters
 SI: 15384
 SF: 300.135000 MHz
 WF: 0
 SSB: 0
 DC: 0
 GB: 1
 PC: 1.00
 F2 - MRB (H) Parameters
 SI: 15384
 SF: 300.135000 MHz
 WF: 0
 SSB: 0
 DC: 0
 GB: 1
 PC: 1.00
 F2 - MRB (H) Parameters
 SI: 15384
 SF: 300.135000 MHz
 WF: 0
 SSB: 0
 DC: 0
 GB: 1
 PC: 1.00

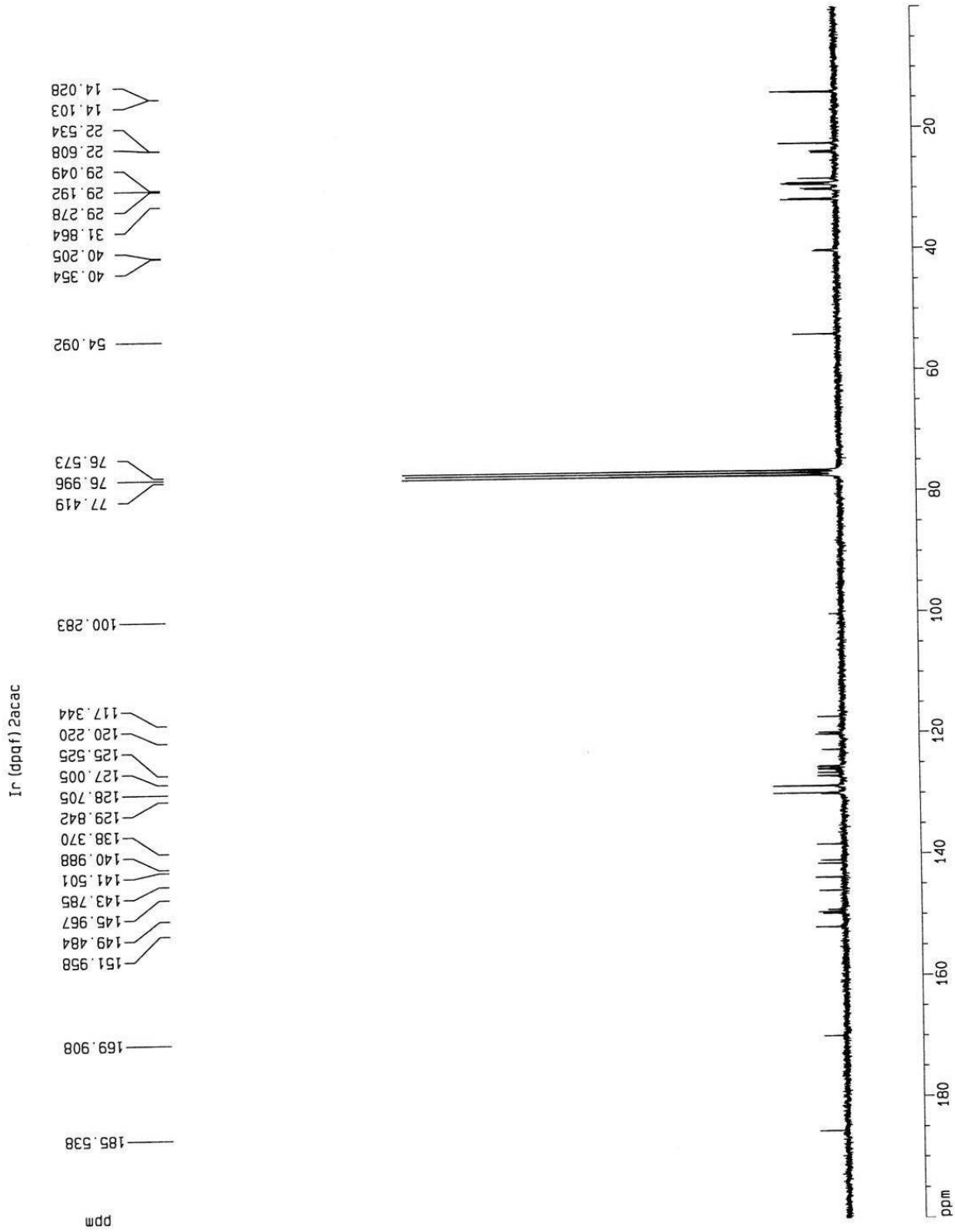


附圖 42. Ir(pfq)₂acac 的 ¹H-NMR 光譜圖

```

Current Data Parameters
Name:          s1031804
PROCNO:       1
F2 - Acquisition Parameters
Date_:        20060318
Time:         14.10
INSTRUM:      spect
PROBHD:       5 mm BBO
PULPROG:      zgpg30
SOLVENT:      CDCl3
NS:           8
DS:           4
SWH:          16633.792 Hz
AQ:           1.7490068 sec
RG:           327.5
GB:           0
PC:           1.00
AP:           1.7490068 sec
DE:           20.500 uV
TE:           300.2 K
D1:           1.50000000 sec
d11:          0.00000000 sec
d12:          0.00000000 sec
d13:          0.00000000 sec
----- CHANNEL f1 -----
NUC1:         13C
P1:           9.00 uV
PL1:          0.00 dB
SFO1:         75.473378 MHz
----- CHANNEL f2 -----
CPDPRG2:     waltz16
NUC2:         13C
P2:           90.00 uV
PL2:          -3.00 dB
SFO2:         75.473378 MHz
F1:           300.1315056 MHz
F2:           300.1315056 MHz
F2 - Processing parameters
SI:           327.5
SF:           75.4672523 MHz
WDW:          EM
SSB:          0
LB:           1.00 Hz
GB:           0
PC:           1.00
RG:           327.5
AP:           1.749
DE:           20.500 uV
TE:           300.2 K
D1:           1.50000000 sec
d11:          0.00000000 sec
d12:          0.00000000 sec
d13:          0.00000000 sec
-----
IS: MDE 5164 Parameters
SI:           327.5
SF:           200.000 MHz
F1:           150.000 MHz
F2:           0.000 MHz
F3:           0.000 MHz
NUC1:         13C
NUC2:         13C
P1:           9.00 uV
PL1:          0.00 dB
SFO1:         75.4672523 MHz

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附圖 43. Ir(pfq)₂acac 的 ¹³C-NMR 光譜圖

附表一 Ir(dpq)₂acac X-ary 晶格繞射數據

Table 2. Bond lengths [Å] and angles [°] for ic10619.

Ir-C(1)	1.963(4)	Ir-C(22)	1.973(4)
Ir-N(2)	2.066(3)	Ir-N(1)	2.072(3)
Ir-O(2)	2.170(3)	Ir-O(1)	2.176(3)
O(1)-C(44)	1.264(6)	O(2)-C(46)	1.279(6)
N(1)-C(7)	1.344(5)	N(1)-C(15)	1.399(5)
N(2)-C(28)	1.355(5)	N(2)-C(36)	1.386(5)
C(1)-C(2)	1.409(6)	C(1)-C(6)	1.414(5)
C(2)-C(3)	1.376(6)	C(3)-C(4)	1.382(7)
C(4)-C(5)	1.374(6)	C(5)-C(6)	1.396(6)
C(6)-C(7)	1.458(6)	C(7)-C(8)	1.403(6)
C(8)-C(9)	1.356(6)	C(9)-C(10)	1.435(6)
C(9)-C(16)	1.495(6)	C(10)-C(11)	1.411(6)
C(10)-C(15)	1.423(6)	C(11)-C(12)	1.360(7)
C(12)-C(13)	1.393(7)	C(13)-C(14)	1.344(7)
C(14)-C(15)	1.406(6)	C(16)-C(21)	1.376(7)
C(16)-C(17)	1.392(7)	C(17)-C(18)	1.385(7)
C(18)-C(19)	1.373(8)	C(19)-C(20)	1.376(8)
C(20)-C(21)	1.388(7)	C(22)-C(23)	1.406(6)
C(22)-C(27)	1.410(6)	C(23)-C(24)	1.375(7)
C(24)-C(25)	1.386(7)	C(25)-C(26)	1.372(6)
C(26)-C(27)	1.397(6)	C(27)-C(28)	1.453(6)
C(28)-C(29)	1.407(6)	C(29)-C(30)	1.361(6)
C(30)-C(31)	1.434(6)	C(30)-C(37)	1.488(6)
C(31)-C(32)	1.402(6)	C(31)-C(36)	1.421(6)
C(32)-C(33)	1.360(7)	C(33)-C(34)	1.399(7)
C(34)-C(35)	1.351(6)	C(35)-C(36)	1.404(6)
C(37)-C(38)	1.383(6)	C(37)-C(42)	1.395(6)
C(38)-C(39)	1.399(6)	C(39)-C(40)	1.361(7)
C(40)-C(41)	1.375(8)	C(41)-C(42)	1.384(6)
C(43)-C(44)	1.520(8)	C(44)-C(45)	1.388(8)
C(45)-C(46)	1.379(8)	C(46)-C(47)	1.513(8)
C(1)-Ir-C(22)	93.29(17)	C(1)-Ir-N(2)	95.74(15)
C(22)-Ir-N(2)	80.10(15)	C(1)-Ir-N(1)	79.74(15)
C(22)-Ir-N(1)	96.44(15)	N(2)-Ir-N(1)	174.19(13)
C(1)-Ir-O(2)	175.81(14)	C(22)-Ir-O(2)	90.33(15)
N(2)-Ir-O(2)	82.79(13)	N(1)-Ir-O(2)	101.97(13)
C(1)-Ir-O(1)	91.14(15)	C(22)-Ir-O(1)	175.37(14)
N(2)-Ir-O(1)	100.82(13)	N(1)-Ir-O(1)	83.01(13)
O(2)-Ir-O(1)	85.29(12)	C(44)-O(1)-Ir	126.6(3)
C(46)-O(2)-Ir	126.8(3)	C(7)-N(1)-C(15)	118.2(3)
C(7)-N(1)-Ir	113.9(3)	C(15)-N(1)-Ir	127.9(3)
C(28)-N(2)-C(36)	118.5(3)	C(28)-N(2)-Ir	113.3(3)
C(36)-N(2)-Ir	128.2(3)	C(2)-C(1)-C(6)	116.2(4)
C(2)-C(1)-Ir	128.1(3)	C(6)-C(1)-Ir	115.5(3)
C(3)-C(2)-C(1)	121.5(4)	C(2)-C(3)-C(4)	120.9(4)
C(5)-C(4)-C(3)	119.9(4)	C(4)-C(5)-C(6)	119.8(4)
C(5)-C(6)-C(1)	121.7(4)	C(5)-C(6)-C(7)	124.5(4)
C(1)-C(6)-C(7)	113.6(4)	N(1)-C(7)-C(8)	121.2(4)
N(1)-C(7)-C(6)	114.7(4)	C(8)-C(7)-C(6)	124.0(4)
C(9)-C(8)-C(7)	122.8(4)	C(8)-C(9)-C(10)	117.6(4)
C(8)-C(9)-C(16)	120.3(4)	C(10)-C(9)-C(16)	122.1(4)
C(11)-C(10)-C(9)	118.5(4)	C(11)-C(10)-C(9)	123.3(4)
C(15)-C(10)-C(9)	118.2(4)	C(12)-C(11)-C(10)	121.1(5)
C(11)-C(12)-C(13)	119.3(5)	C(14)-C(13)-C(12)	121.9(5)

C(13)-C(14)-C(15)	120.4(5)	N(1)-C(15)-C(14)	119.8(4)
N(1)-C(15)-C(10)	121.6(4)	C(14)-C(15)-C(10)	118.6(4)
C(21)-C(16)-C(17)	119.0(4)	C(21)-C(16)-C(9)	121.8(4)
C(17)-C(16)-C(9)	119.1(4)	C(18)-C(17)-C(16)	120.2(5)
C(19)-C(18)-C(17)	120.1(5)	C(18)-C(19)-C(20)	120.2(5)
C(19)-C(20)-C(21)	119.7(5)	C(16)-C(21)-C(20)	120.8(5)
C(23)-C(22)-C(27)	116.9(4)	C(23)-C(22)-Ir	128.0(3)
C(27)-C(22)-Ir	115.0(3)	C(24)-C(23)-C(22)	121.1(4)
C(23)-C(24)-C(25)	120.9(4)	C(26)-C(25)-C(24)	119.8(4)
C(25)-C(26)-C(27)	119.8(4)	C(26)-C(27)-C(22)	121.4(4)
C(26)-C(27)-C(28)	124.4(4)	C(22)-C(27)-C(28)	114.0(4)
N(2)-C(28)-C(29)	120.7(4)	N(2)-C(28)-C(27)	114.9(4)
C(29)-C(28)-C(27)	124.2(4)	C(30)-C(29)-C(28)	122.5(4)
C(29)-C(30)-C(31)	117.6(4)	C(29)-C(30)-C(37)	120.3(4)
C(31)-C(30)-C(37)	122.1(4)	C(32)-C(31)-C(36)	118.5(4)
C(32)-C(31)-C(30)	123.1(4)	C(36)-C(31)-C(30)	118.4(4)
C(33)-C(32)-C(31)	121.5(4)	C(32)-C(33)-C(34)	119.5(4)
C(35)-C(34)-C(33)	121.0(5)	C(34)-C(35)-C(36)	120.9(4)
N(2)-C(36)-C(35)	119.7(4)	N(2)-C(36)-C(31)	121.6(4)
C(35)-C(36)-C(31)	118.7(4)	C(38)-C(37)-C(42)	118.7(4)
C(38)-C(37)-C(30)	119.5(4)	C(42)-C(37)-C(30)	121.8(4)
C(37)-C(38)-C(39)	120.5(5)	C(40)-C(39)-C(38)	119.9(5)
C(39)-C(40)-C(41)	120.3(5)	C(40)-C(41)-C(42)	120.5(5)
C(41)-C(42)-C(37)	120.1(5)	O(1)-C(44)-C(45)	126.8(5)
O(1)-C(44)-C(43)	115.0(5)	C(45)-C(44)-C(43)	118.2(5)
C(46)-C(45)-C(44)	127.6(5)	O(2)-C(46)-C(45)	126.4(5)
O(2)-C(46)-C(47)	114.4(5)	C(45)-C(46)-C(47)	119.1(5)

Symmetry transformations used to generate equivalent atoms: