

**Facile synthesis and nematicidal activity evaluation of thiophosphinyl
amide [(Pz)₂P(S)NHR] and thiophosphonyl diamide [(Pz)P(S)(NHR)₂] (Pz =
1,3,5-trimethylpyrazole, R = Biphenyl derivatives)**

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2. IR spectra of 1a-2h	26
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1. ^1H , ^{13}C and ^{31}P NMR spectra of **1a-2h**.

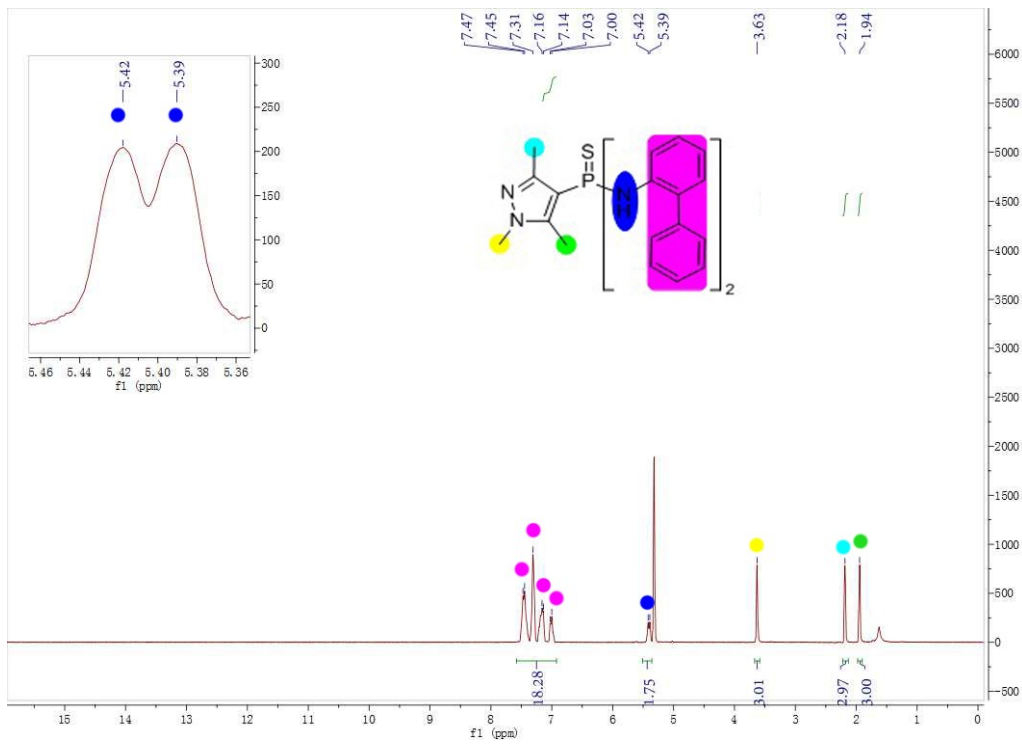


Fig. 1 ^1H NMR spectrum of **1a** (300 MHz, CD_2Cl_2 , 298 K).

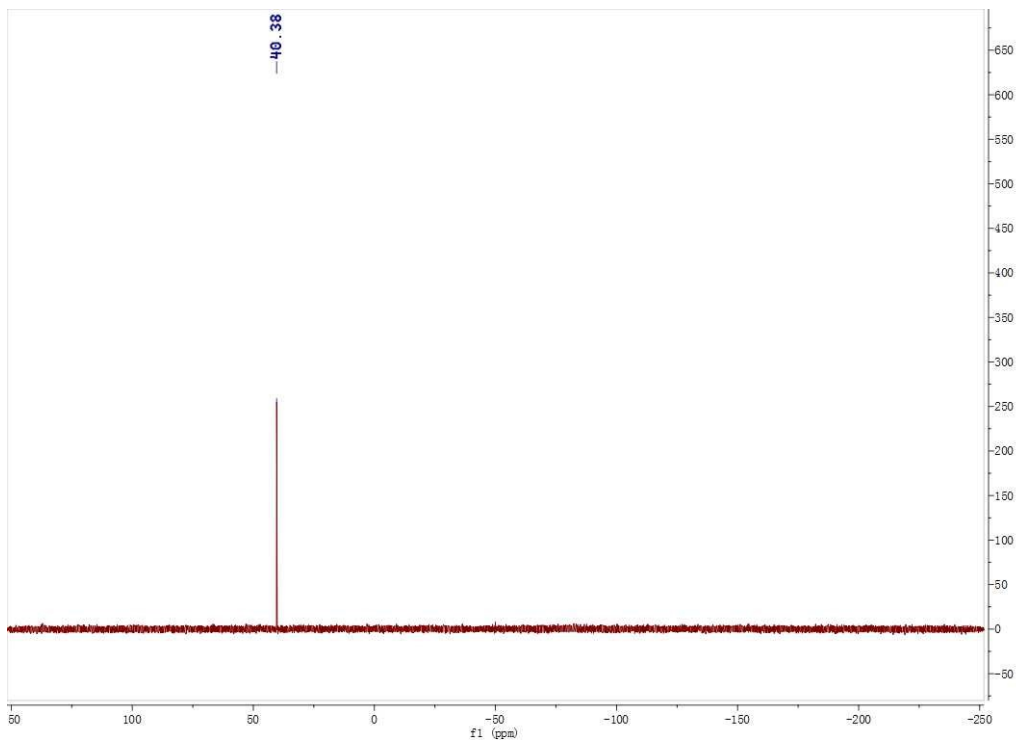


Fig. 2 ^{31}P NMR spectrum of **1a** (121.5 MHz, CD_2Cl_2 , 298 K).

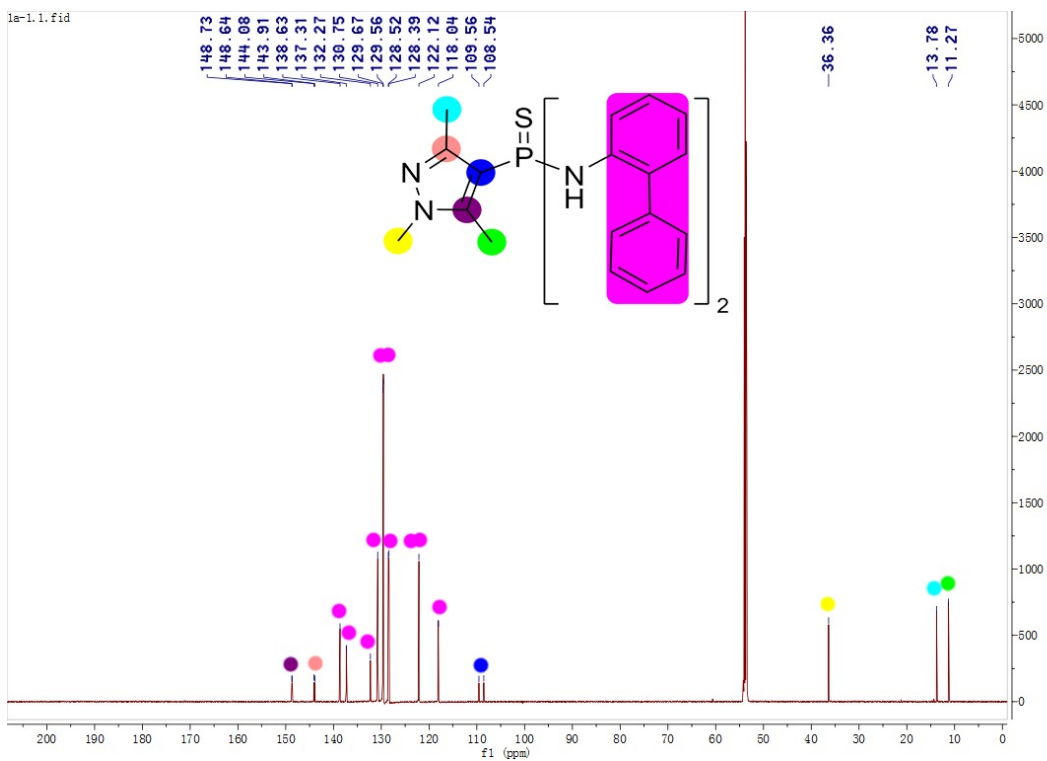


Fig. 3 ^{13}C NMR spectrum of **1a** (150 MHz, CD_2Cl_2 , 298 K).

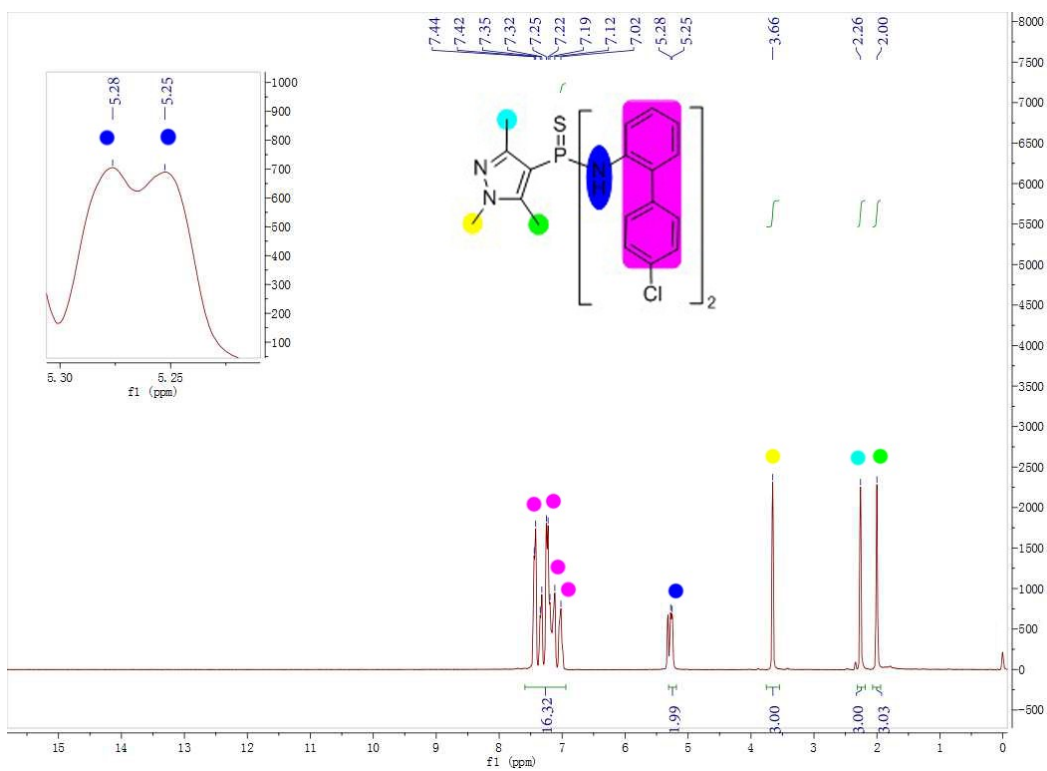


Fig. 4 ^1H NMR spectrum of **1b** (300 MHz, CD_2Cl_2 , 298 K).

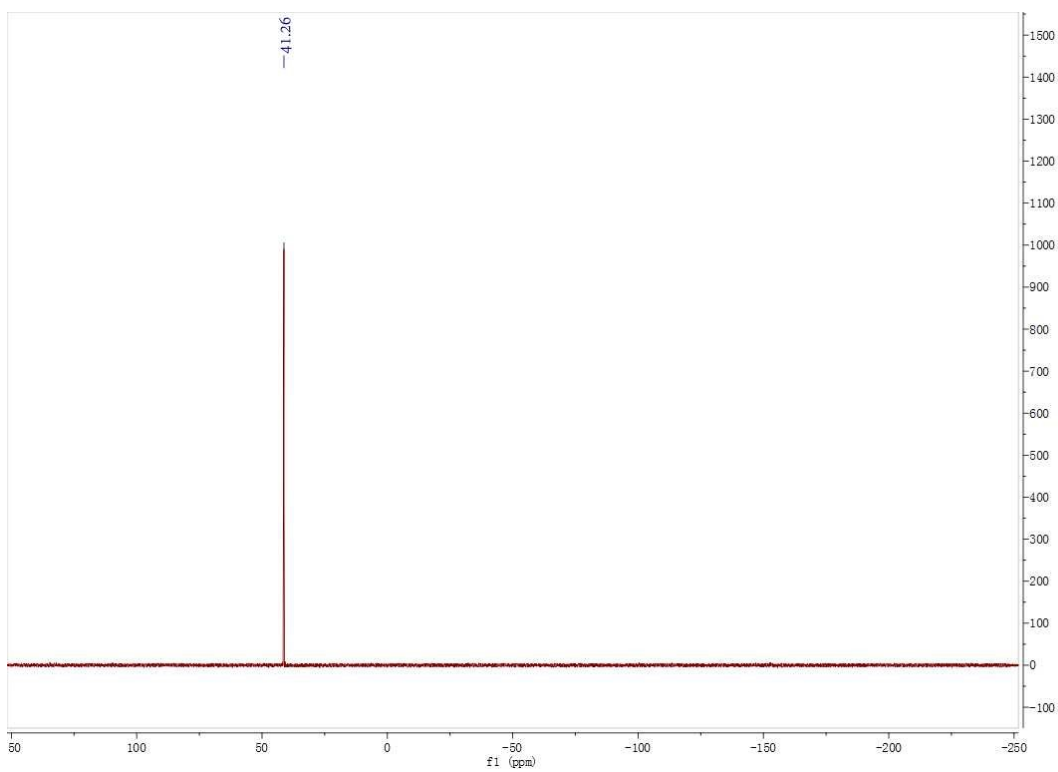


Fig. 5 ³¹P NMR spectrum of **1b** (121.5 MHz, CD₂Cl₂, 298 K).

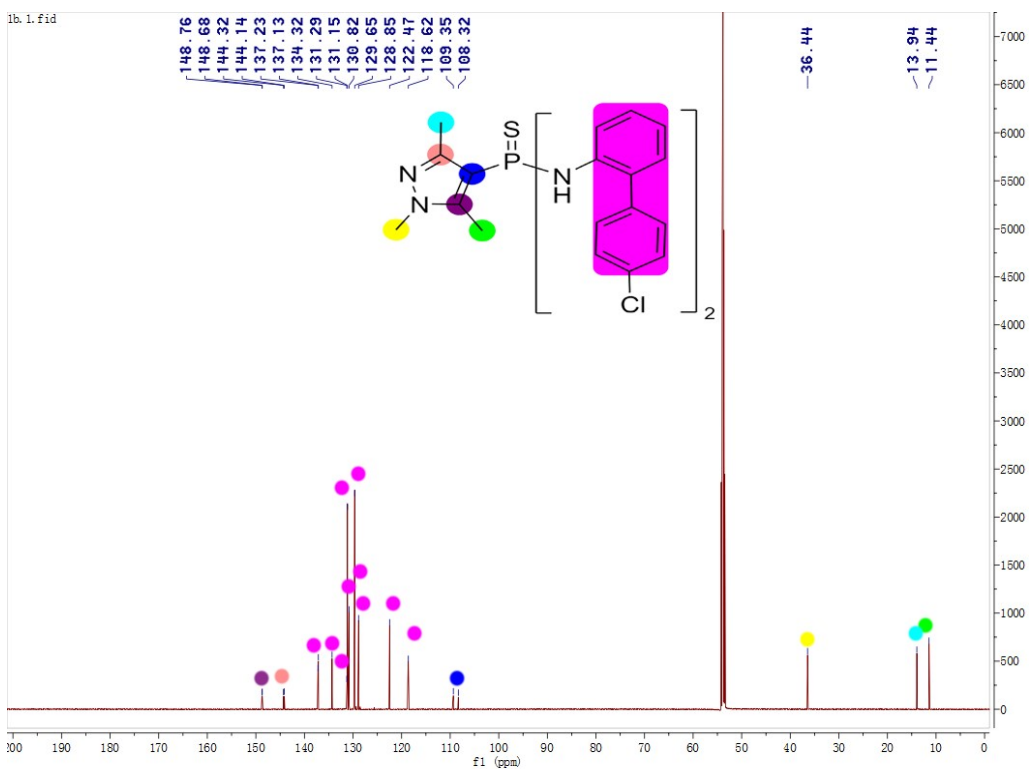


Fig. 6 ¹³C NMR spectrum of **1b** (150 MHz, CD₂Cl₂, 298 K).

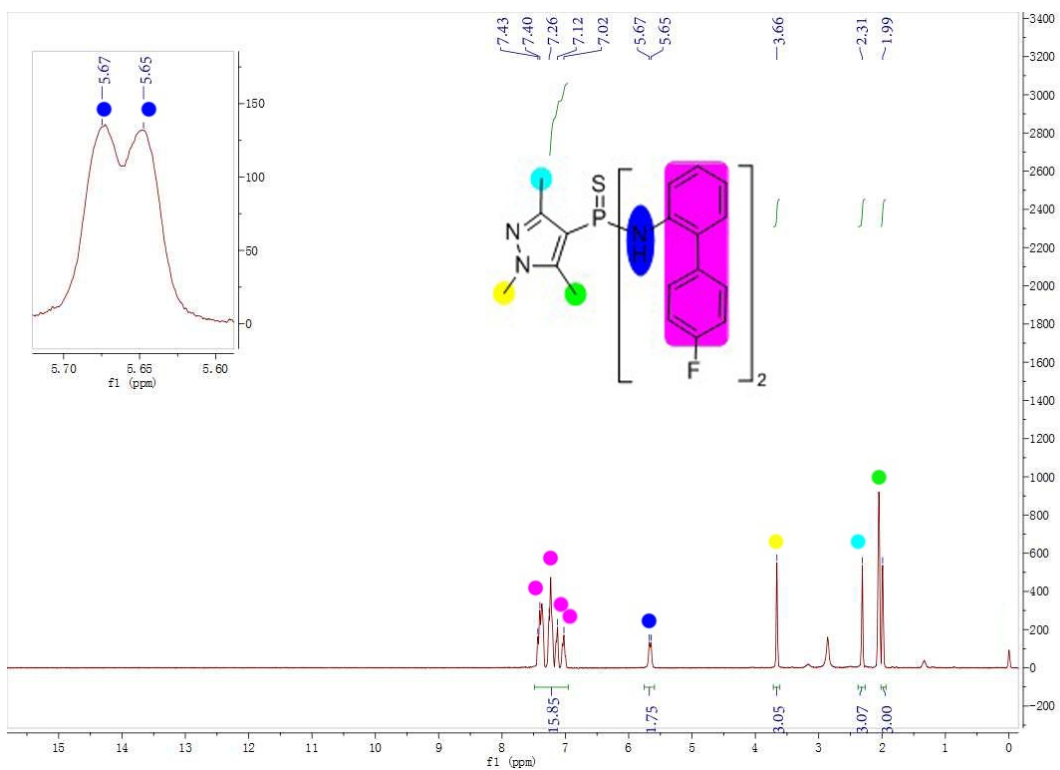


Fig. 7 ^1H NMR spectrum of **1c** (300 MHz, CD_3CN , 298 K).

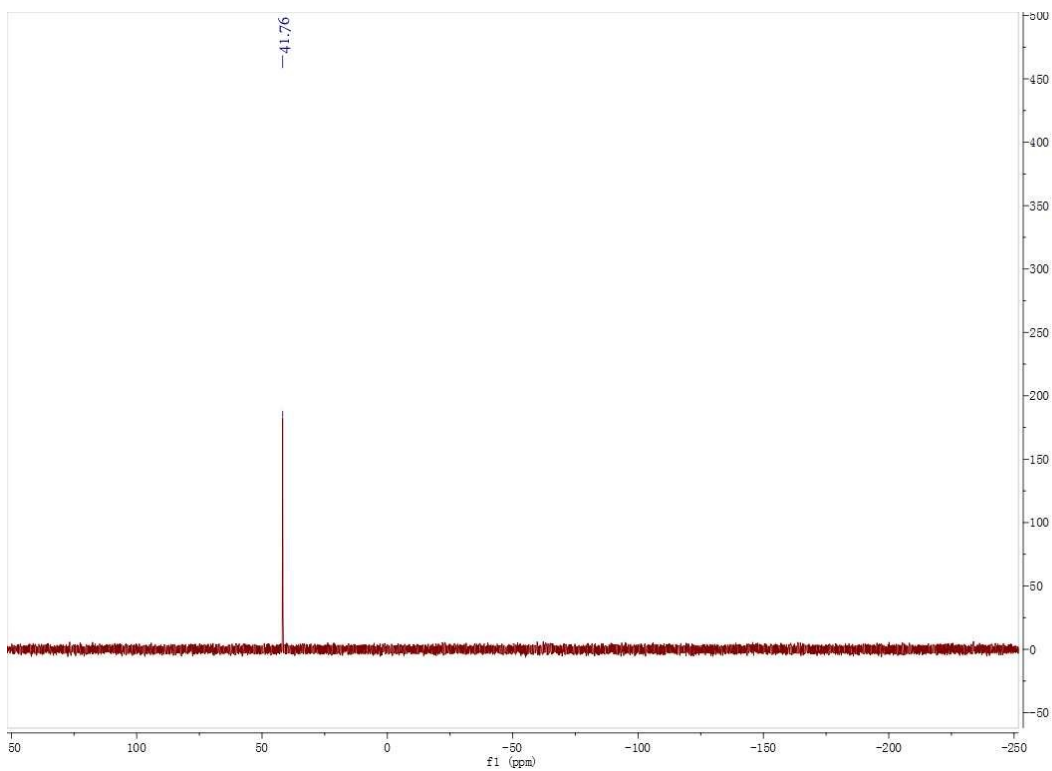
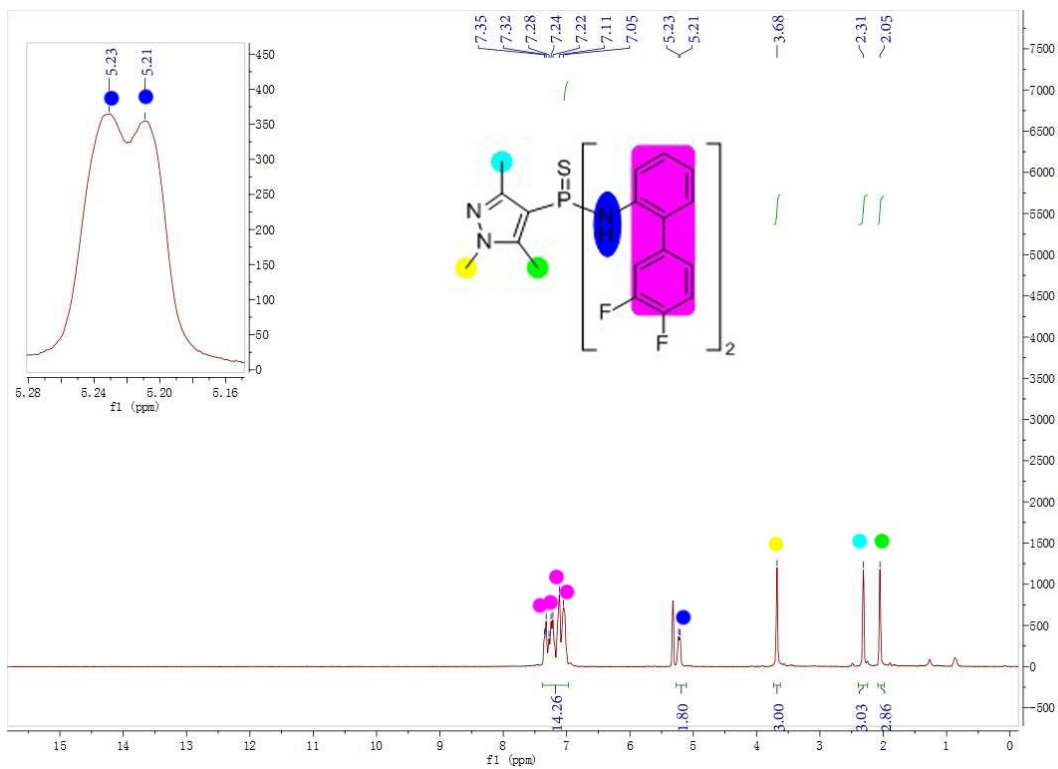
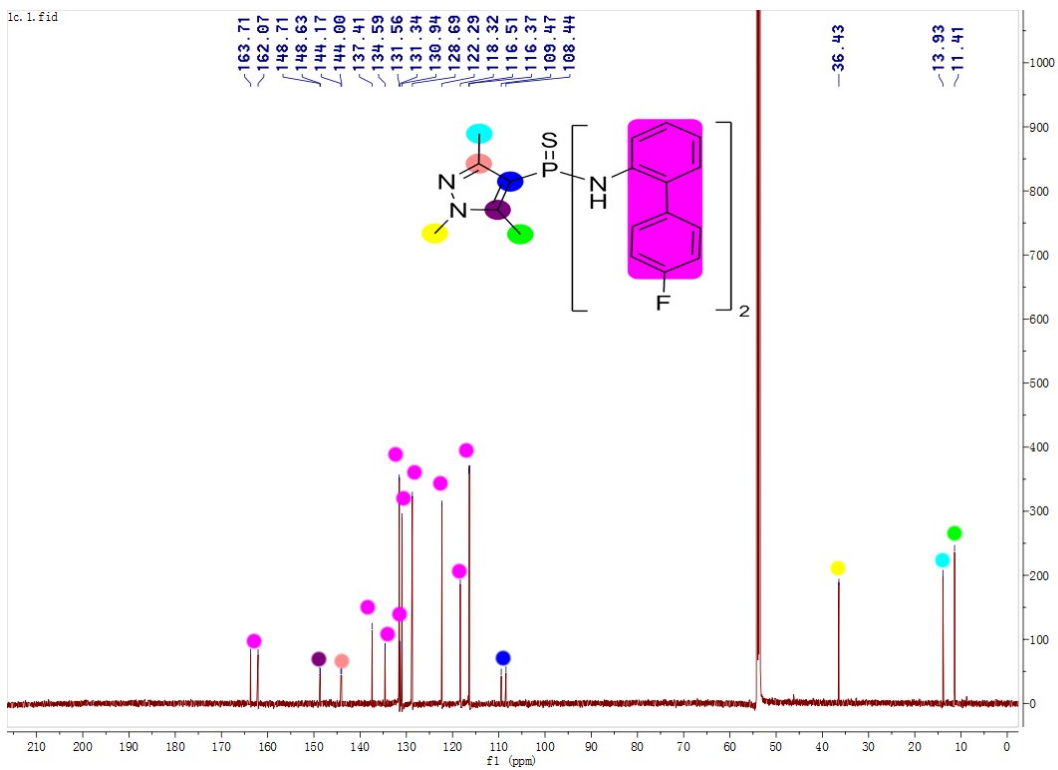


Fig. 8 ^{31}P NMR spectrum of **1c** (121.5 MHz, CD_3CN , 298 K).



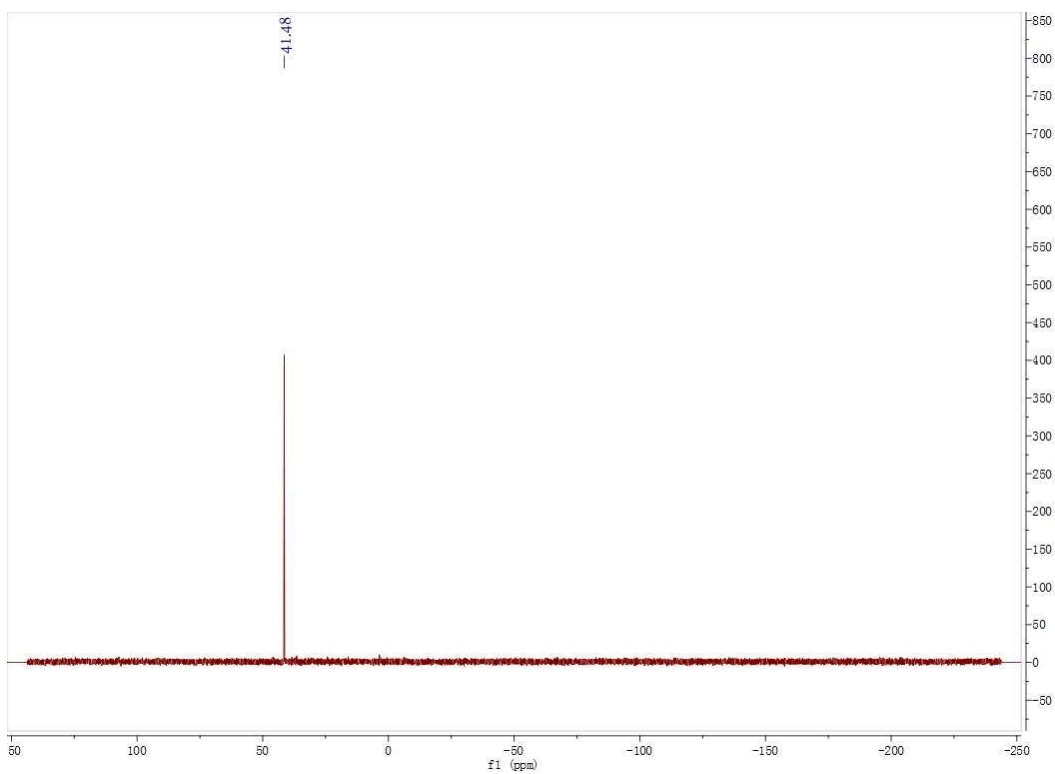


Fig. 11 ³¹P NMR spectrum of **1d** (121.5 MHz, CD₂Cl₂, 298 K).

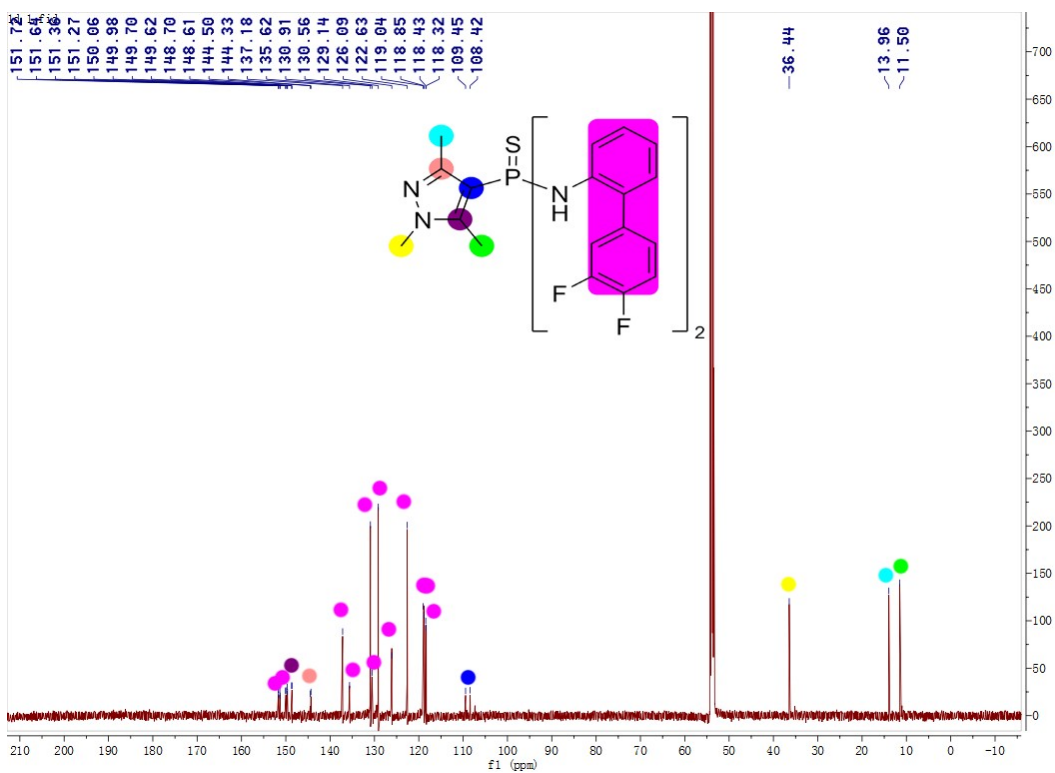


Fig.12 ¹³C NMR spectrum of **1d** (150 MHz, CD₂Cl₂, 298 K).

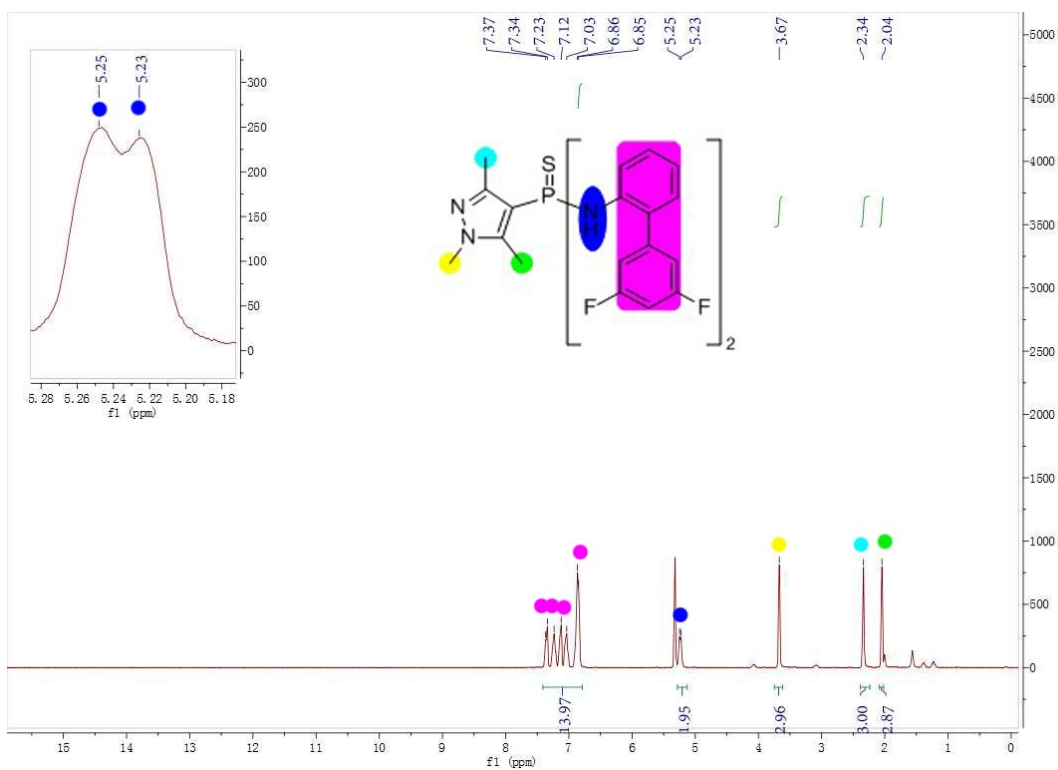


Fig. 13 ^1H NMR spectrum of **1e** (300 MHz, CD_2Cl_2 , 298 K).

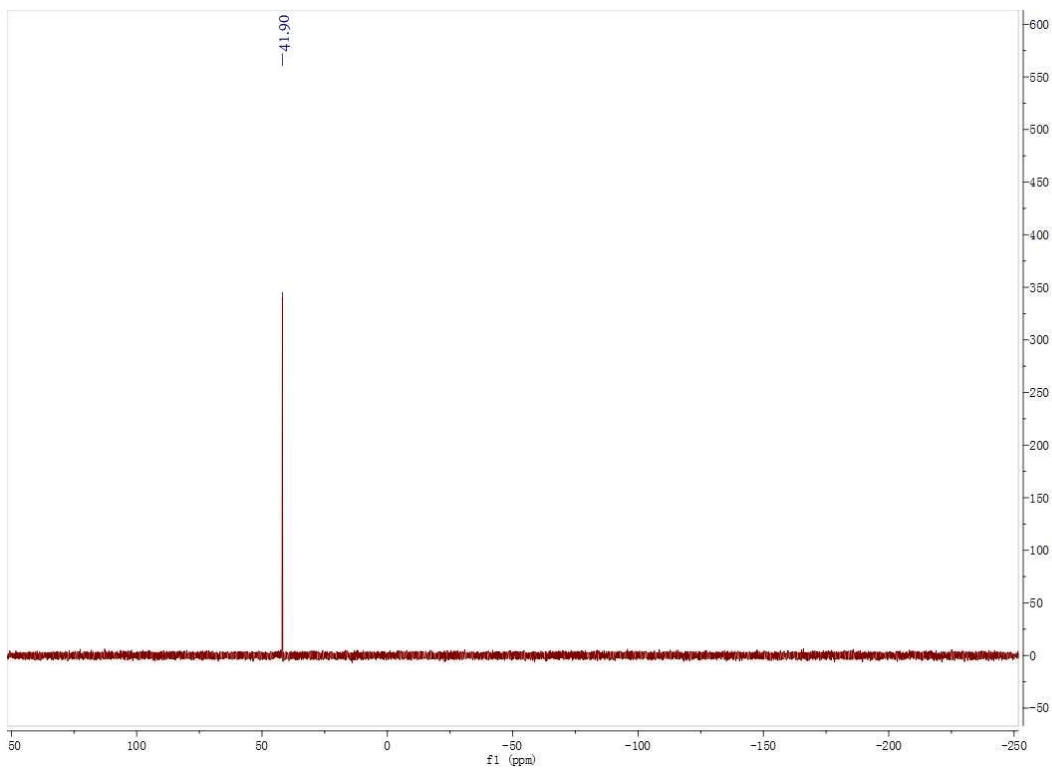


Fig. 14 ^{31}P NMR spectrum of **1e** (121.5 MHz, CD_2Cl_2 , 298 K).

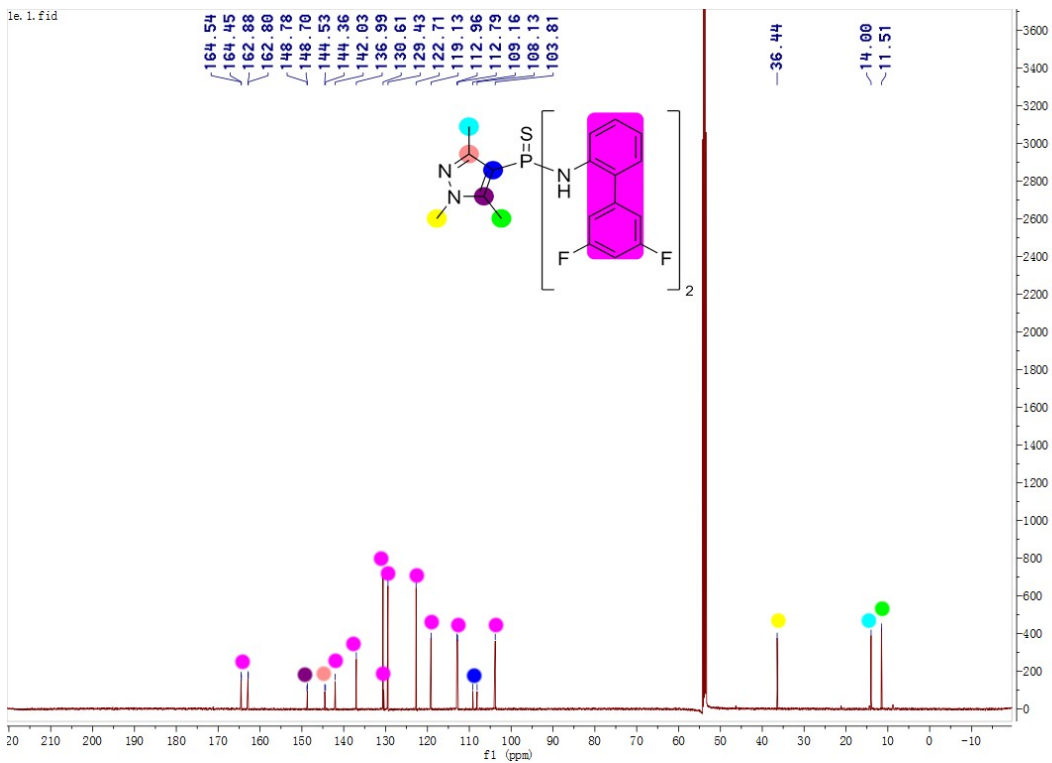


Fig. 15 ^{13}C NMR spectrum of **1e** (150 MHz, CD_2Cl_2 , 298 K).

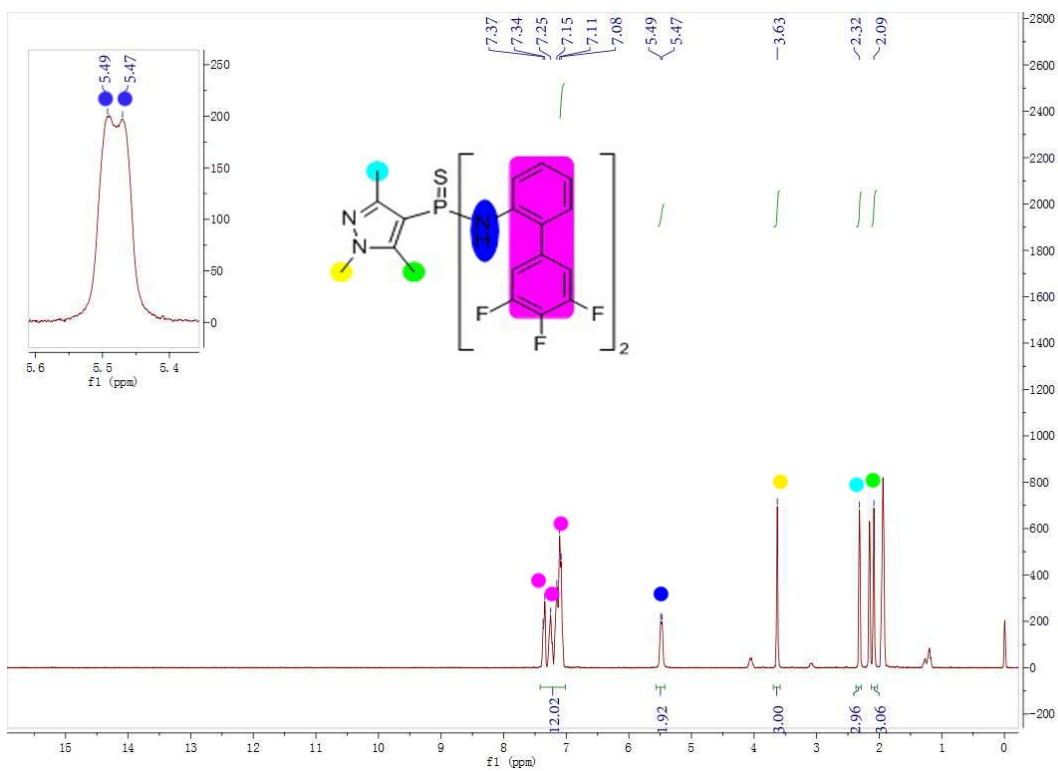


Fig. 16 ^1H NMR spectrum of **1f** (300 MHz, CD_3CN , 298 K).

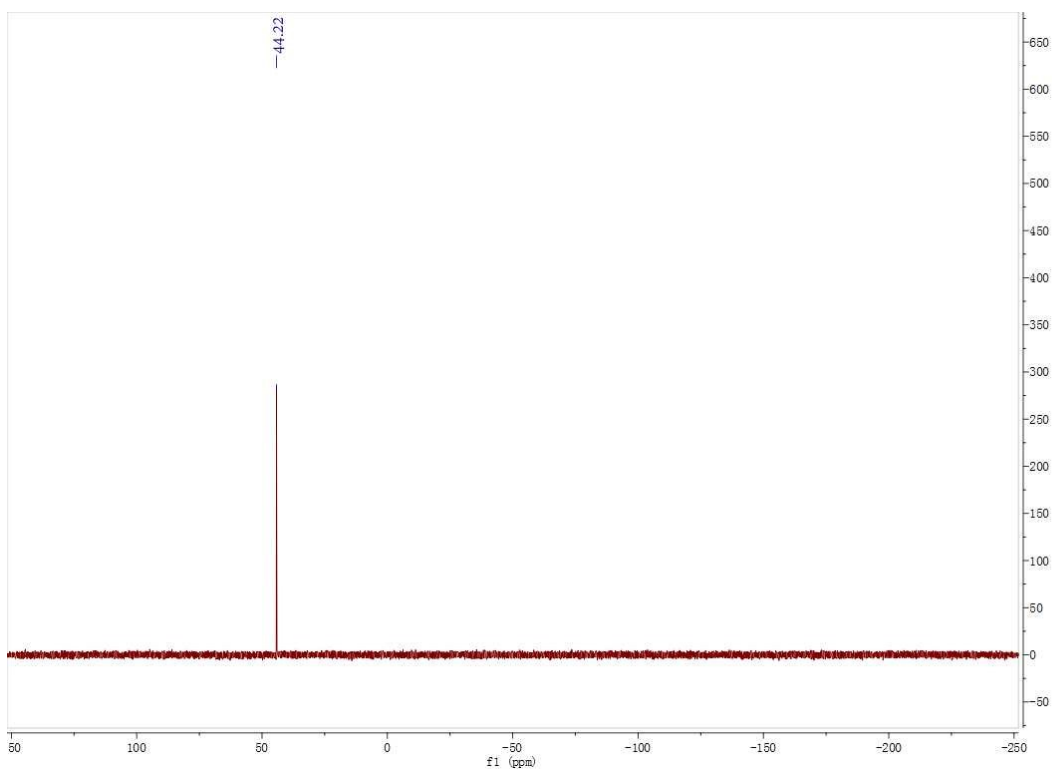


Fig. 17 ³¹P NMR spectrum of **1f** (121.5 MHz, CD₃CN, 298 K).

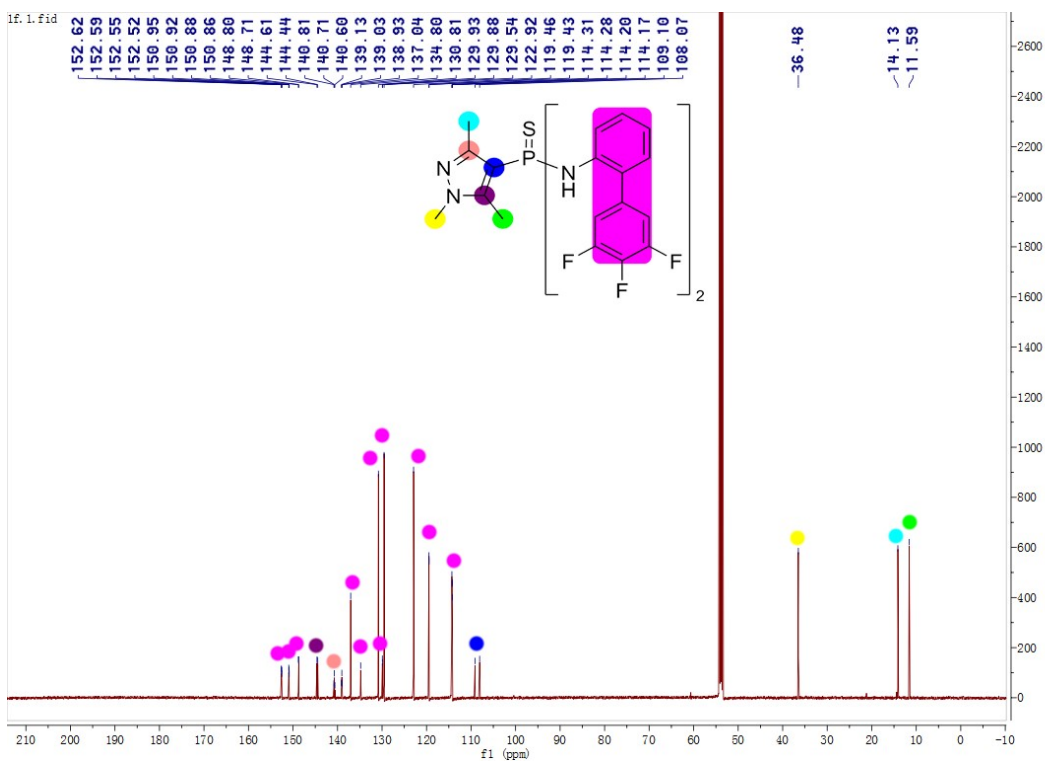


Fig. 18 ¹³C NMR spectrum of **1f** (150 MHz, CD₂Cl₂, 298 K).

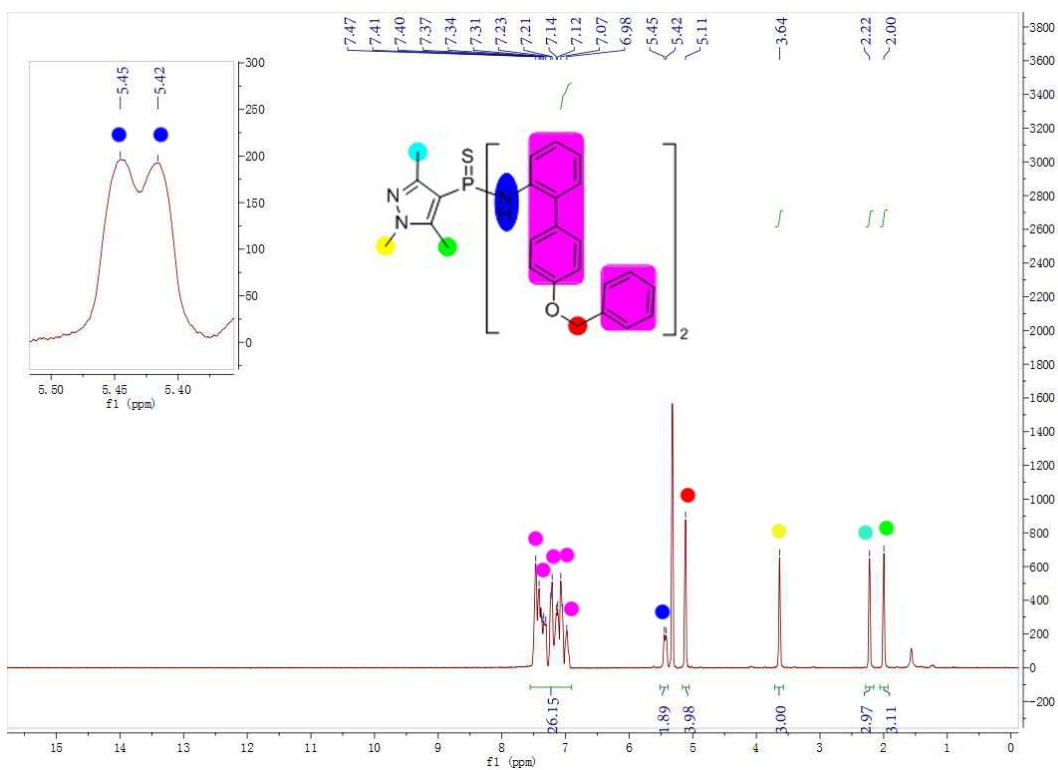


Fig. 19 ^1H NMR spectrum of **1g** (300 MHz, CD_2Cl_2 , 298 K).

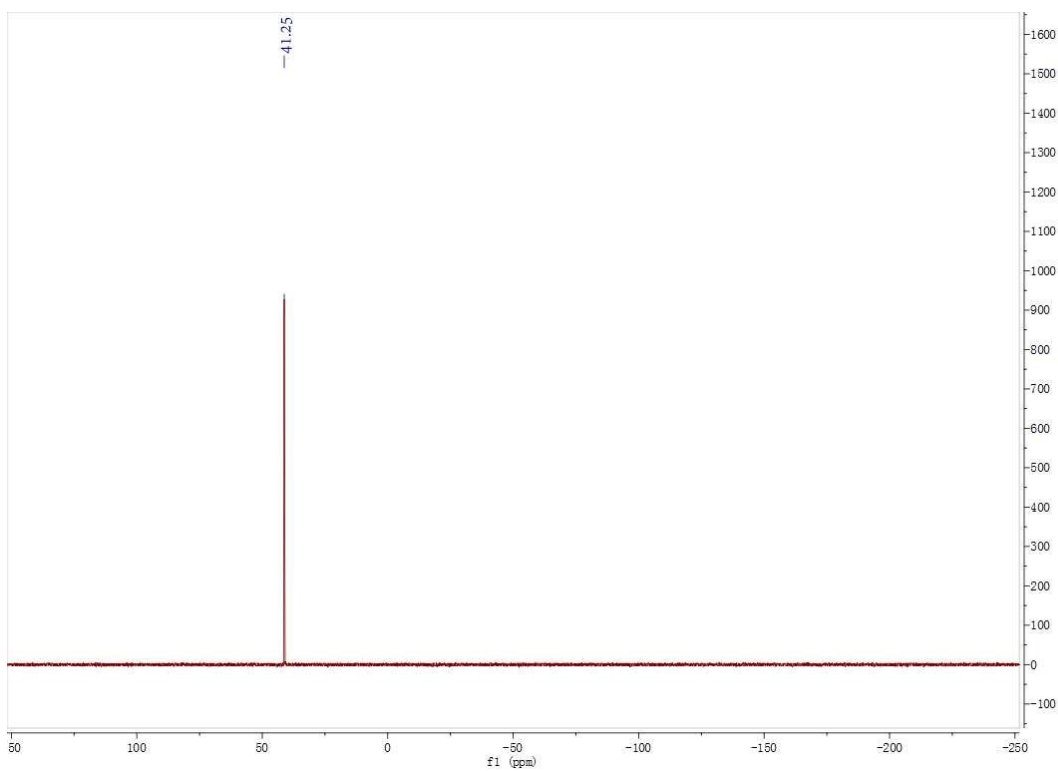


Fig. 20 ^{31}P NMR spectrum of **1g** (121.5 MHz, CD_2Cl_2 , 298 K).

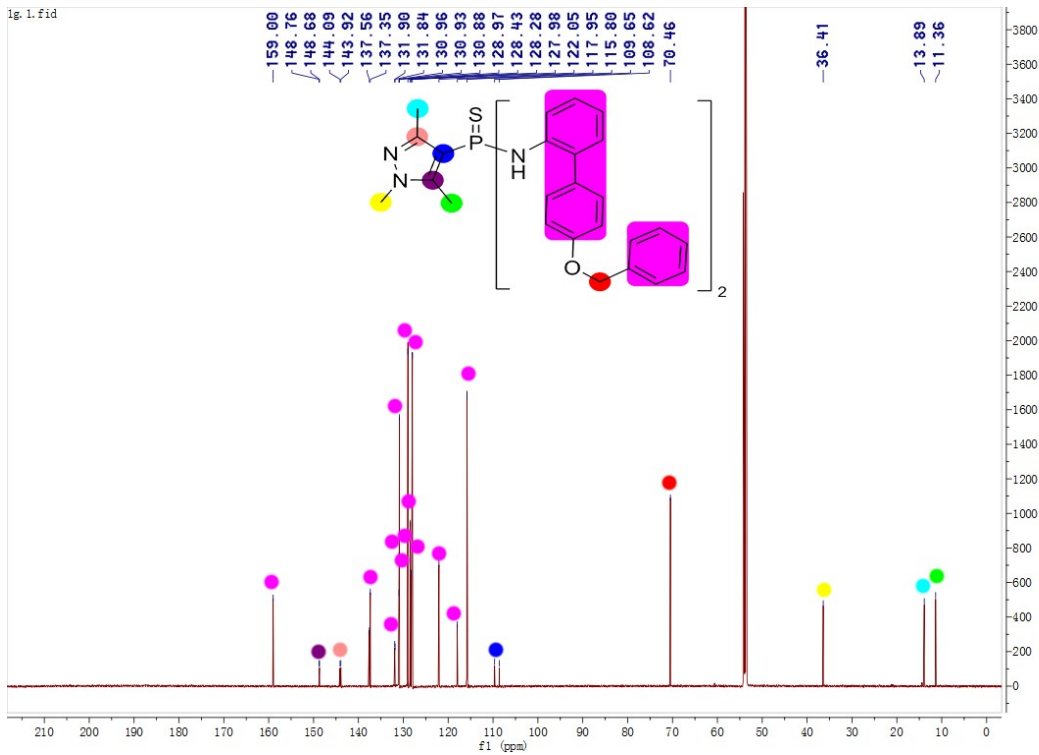


Fig. 21 ^{13}C NMR spectrum of **1g** (150 MHz, CD_2Cl_2 , 298 K).

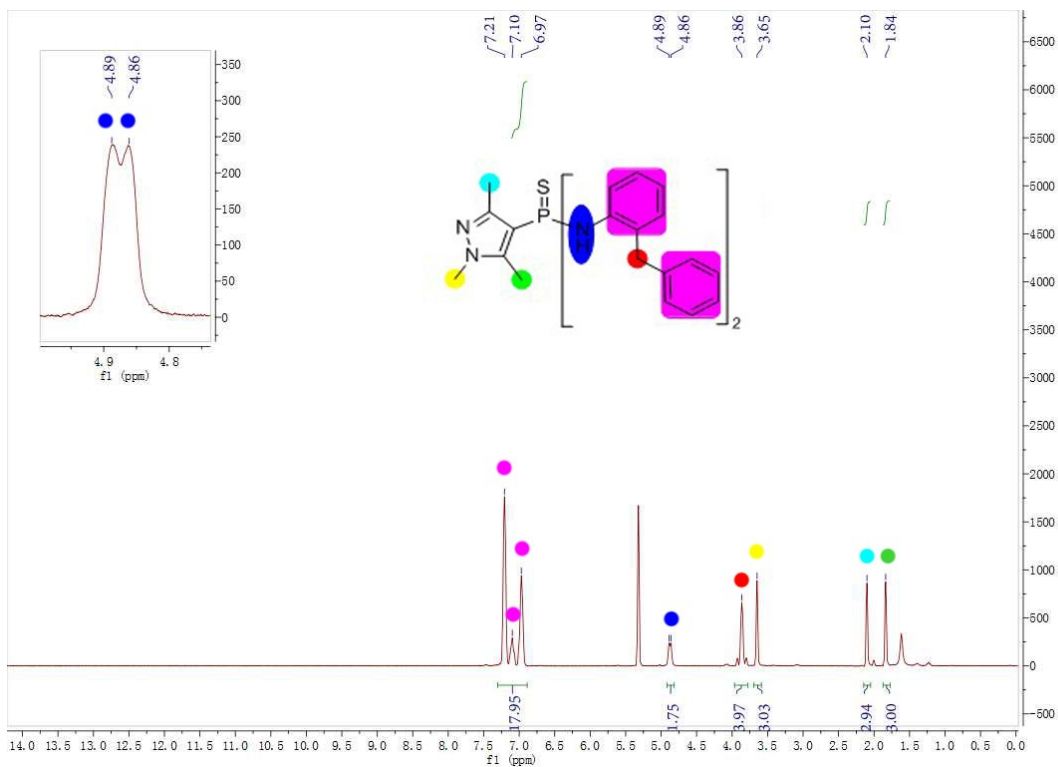


Fig. 22 ^1H NMR spectrum of **1h** (300 MHz, CD_2Cl_2 , 298 K).

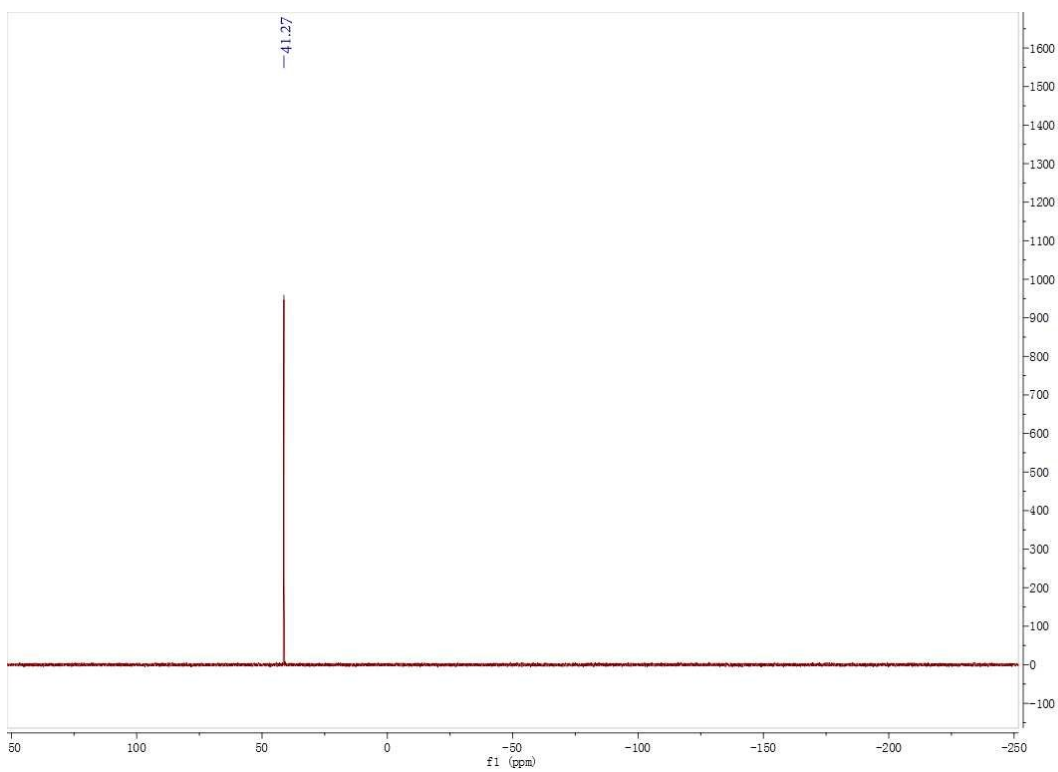


Fig. 23 ³¹P NMR spectrum of **1h** (121.5 MHz, CD₂Cl₂, 298 K).

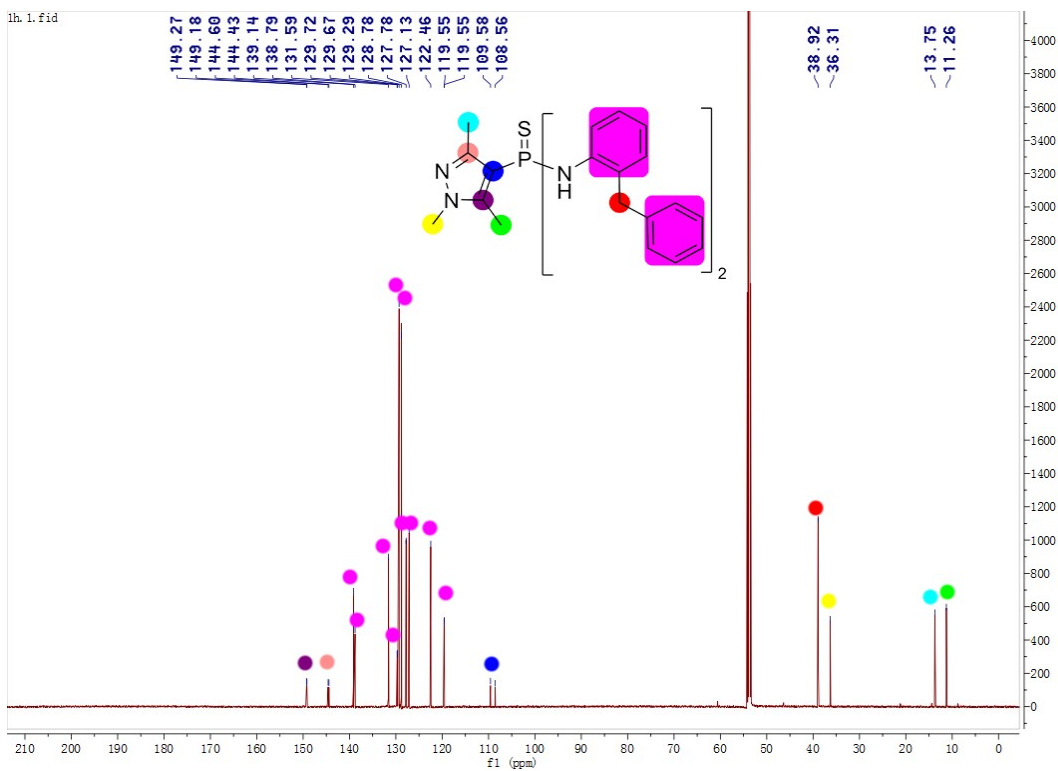


Fig. 24 ¹³C NMR spectrum of **1h** (150 MHz, CD₂Cl₂, 298 K).

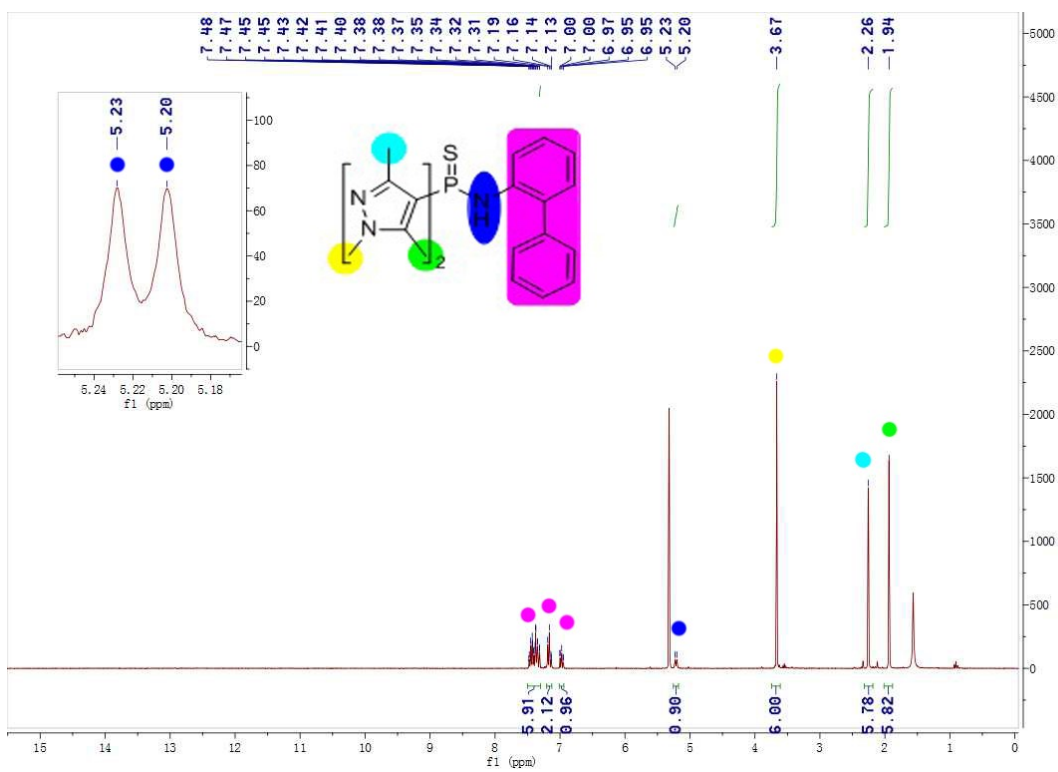


Fig. 25 ^1H NMR spectrum of **2a** (300 MHz, CD_2Cl_2 , 298 K).

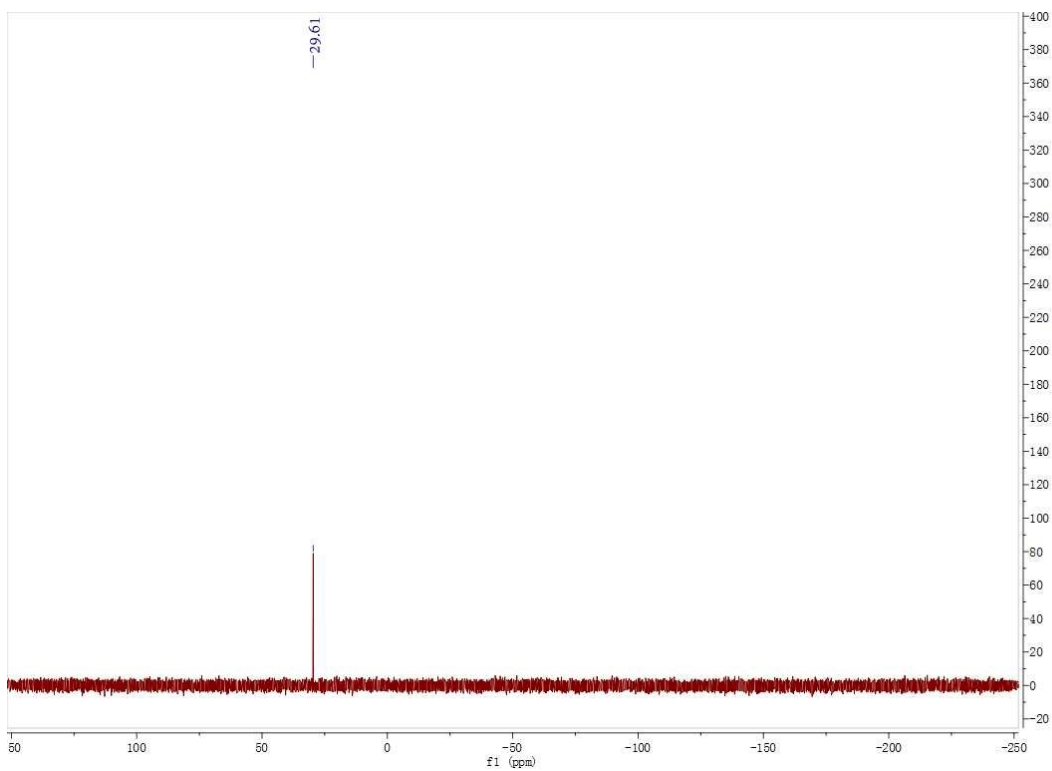


Fig. 26 ^{31}P NMR spectrum of **2a** (121.5 MHz, CD_2Cl_2 , 298 K).

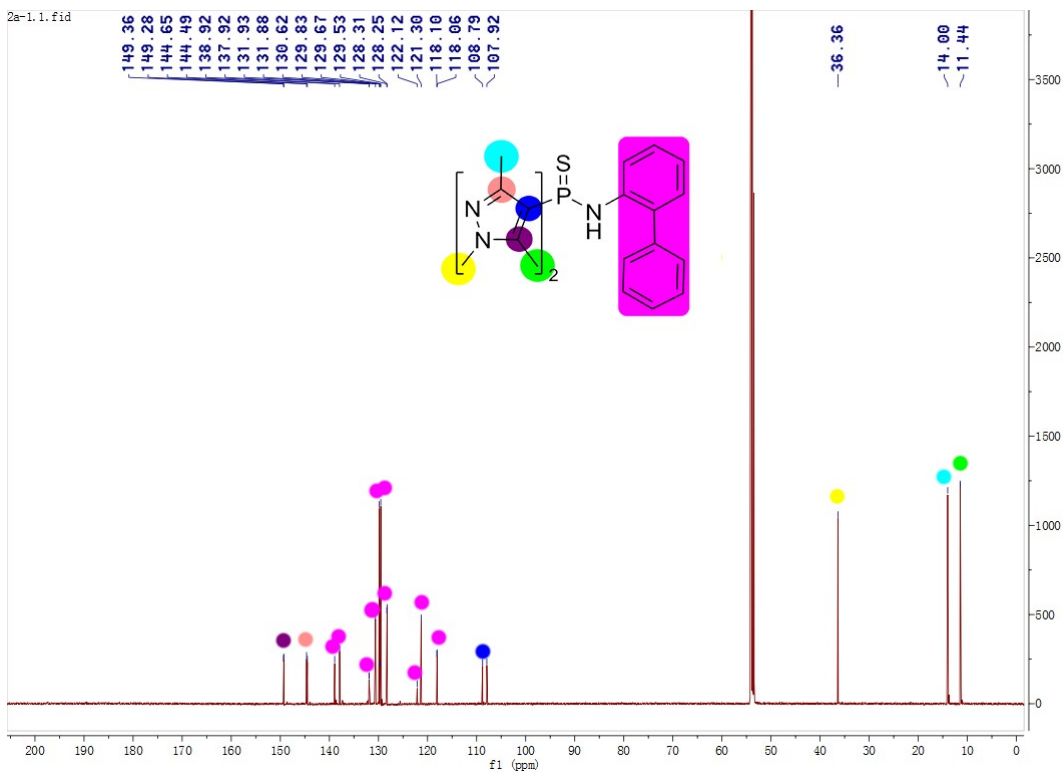


Fig. 27 ^{13}C NMR spectrum of **2a** (150 MHz, CD_2Cl_2 , 298 K).

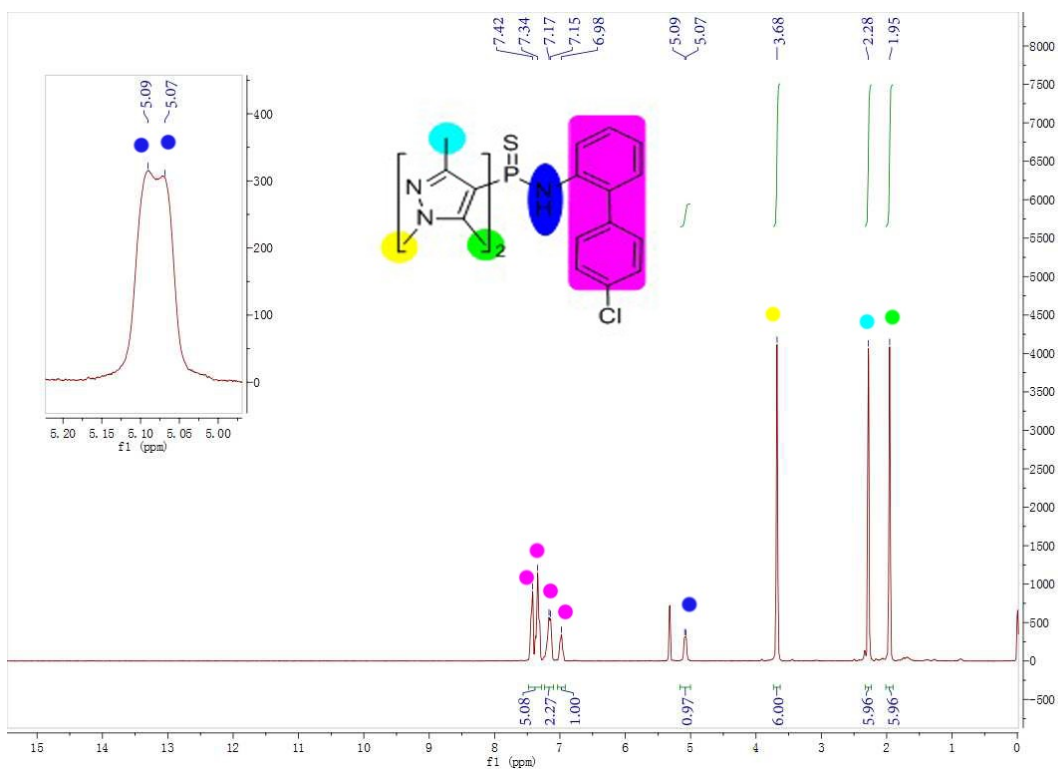


Fig. 28 ^1H NMR spectrum of **2b** (300 MHz, CD_2Cl_2 , 298 K).

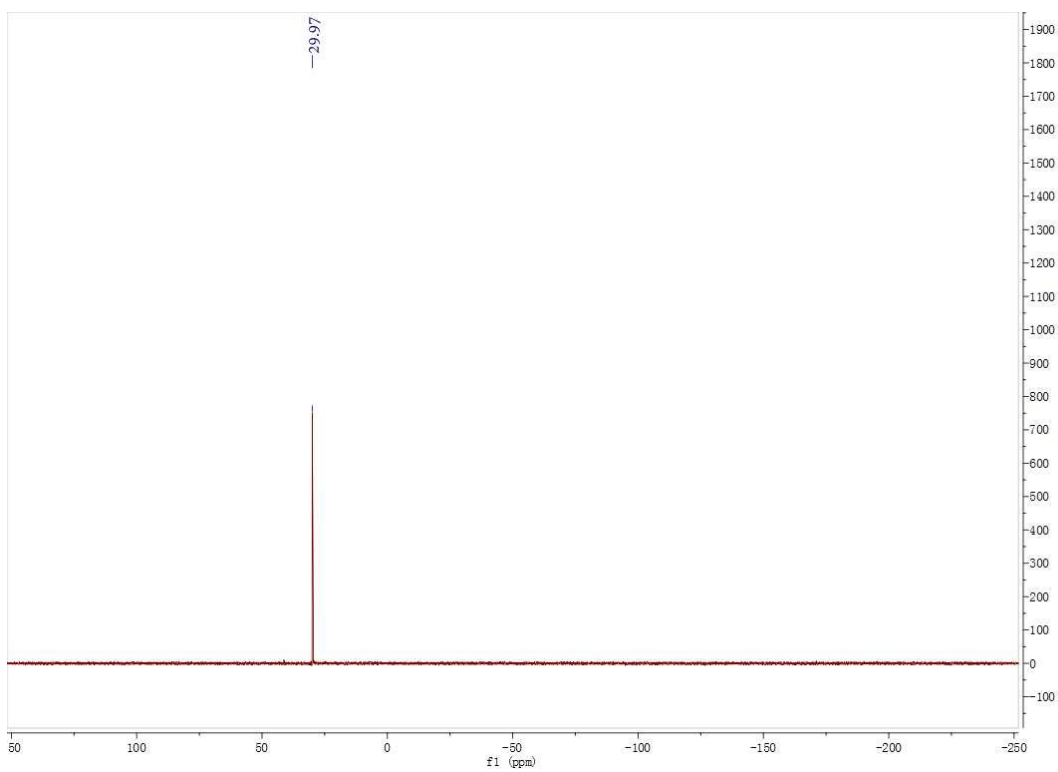


Fig. 29 ^{31}P NMR spectrum of **2b** (121.5 MHz, CD_2Cl_2 , 298 K).

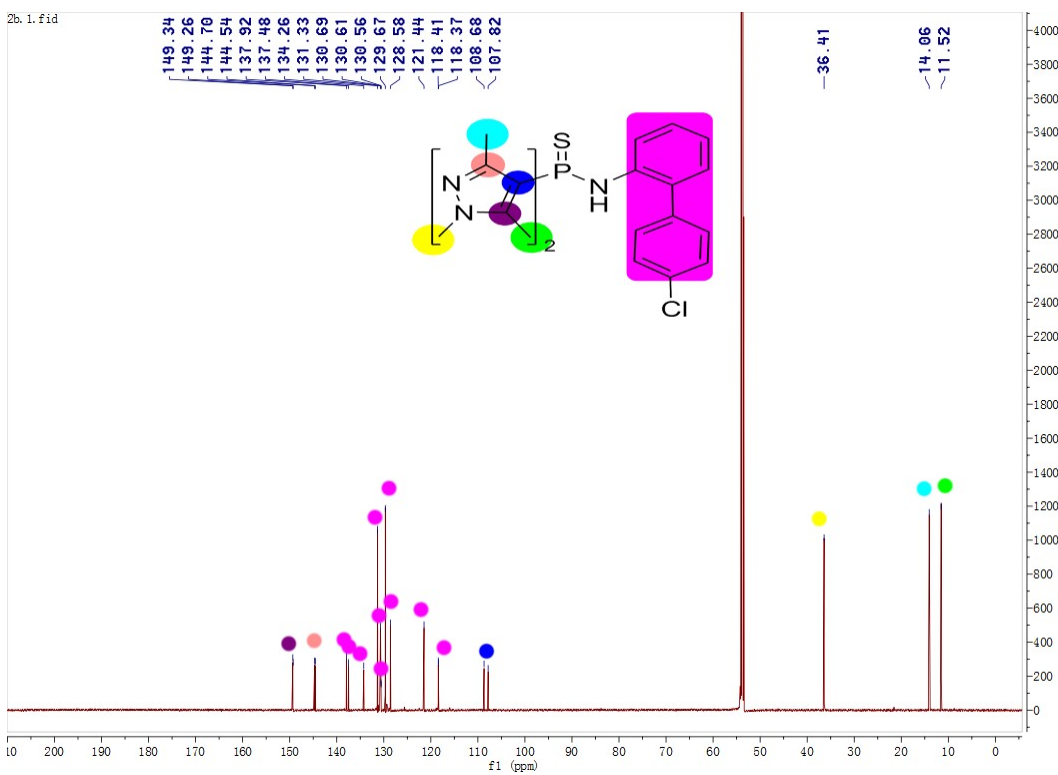


Fig. 30 ^{13}C NMR spectrum of **2b** (150 MHz, CD_2Cl_2 , 298 K).

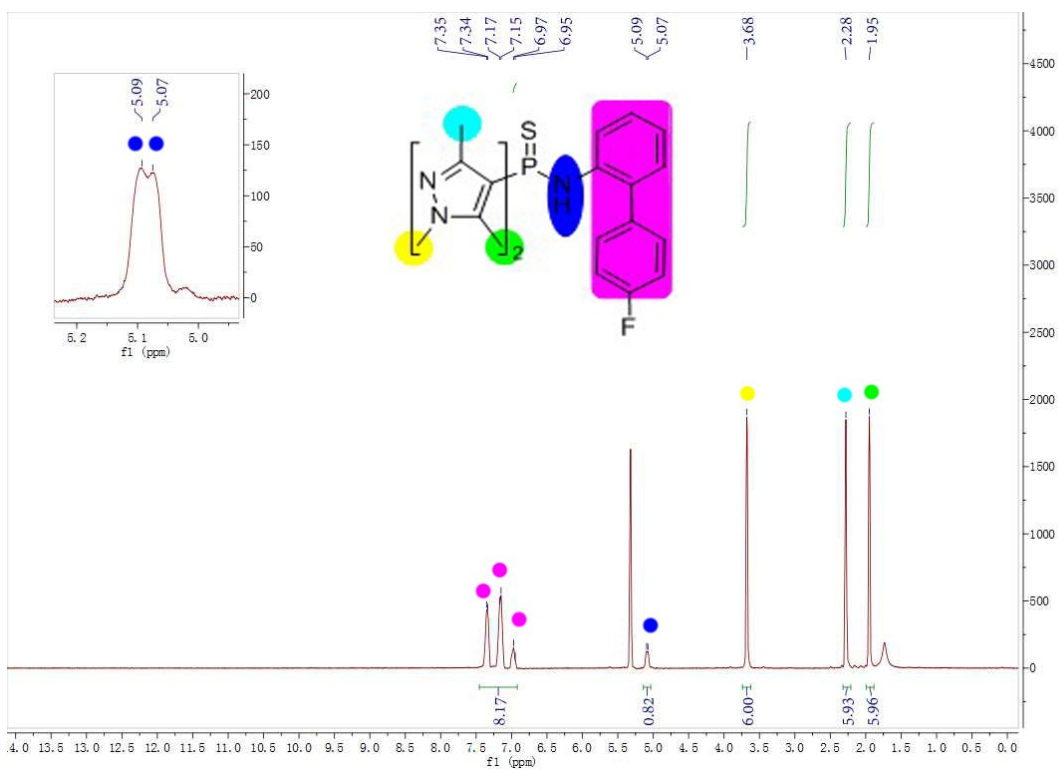


Fig. 31 ^1H NMR spectrum of **2c** (300 MHz, CD_2Cl_2 , 298 K).

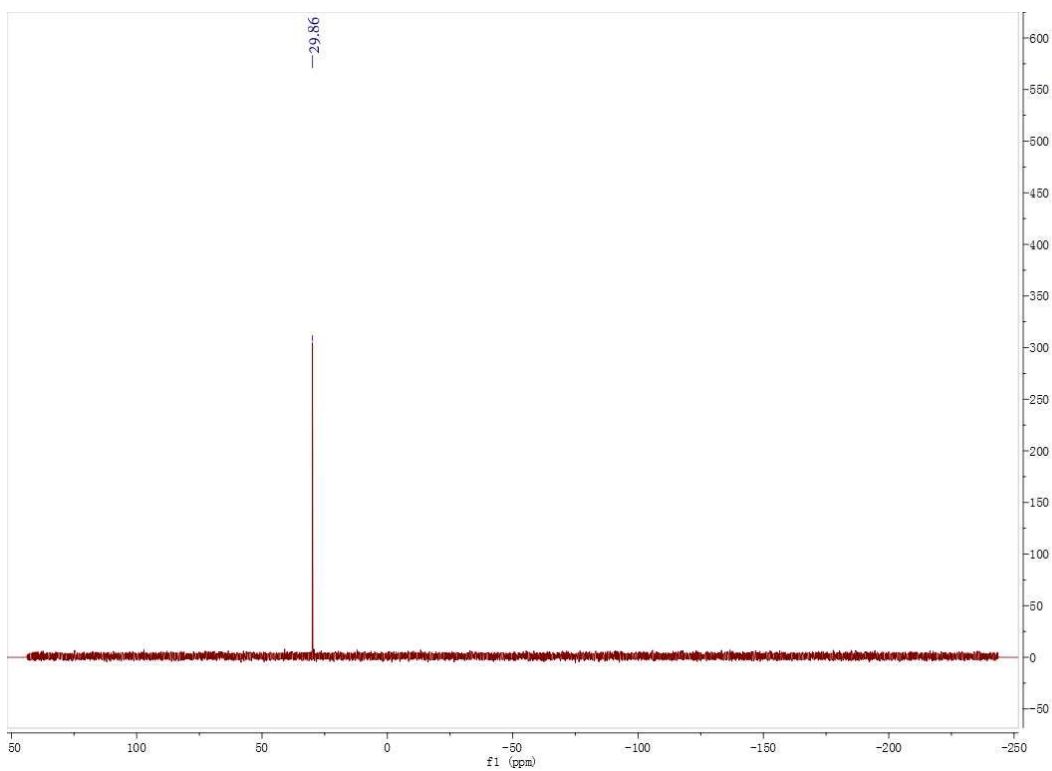


Fig. 32 ^{31}P NMR spectrum of **2c** (121.5 MHz, CD_2Cl_2 , 298 K).

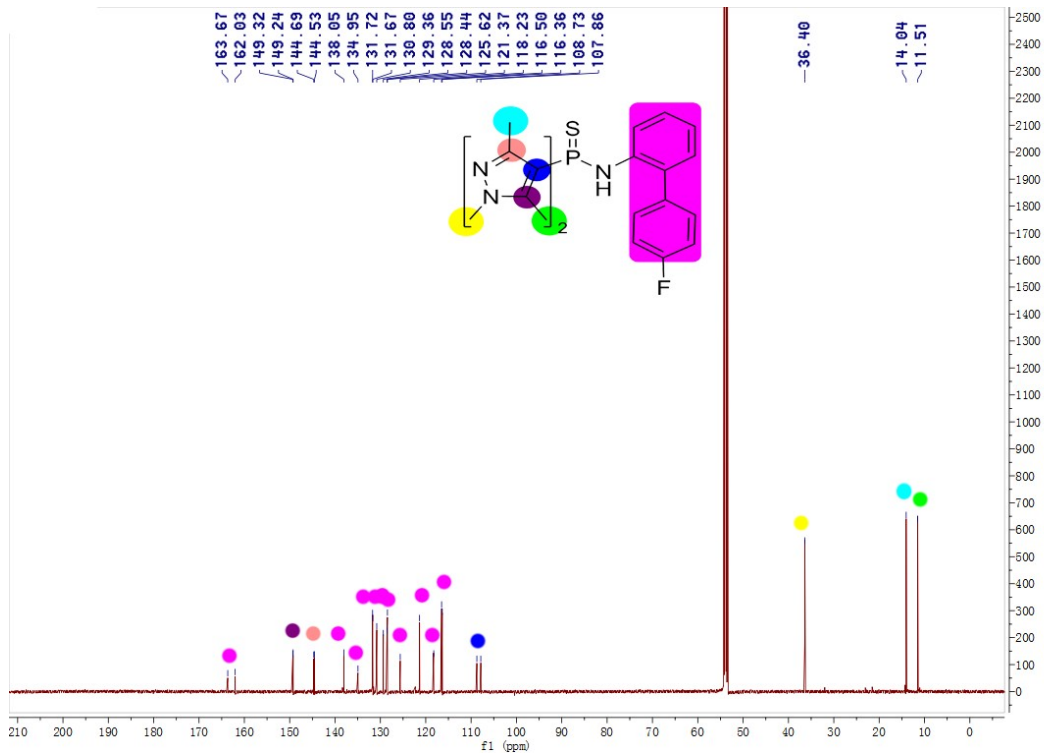


Fig. 33 ^{13}C NMR spectrum of **2c** (150 MHz, CD_2Cl_2 , 298 K).

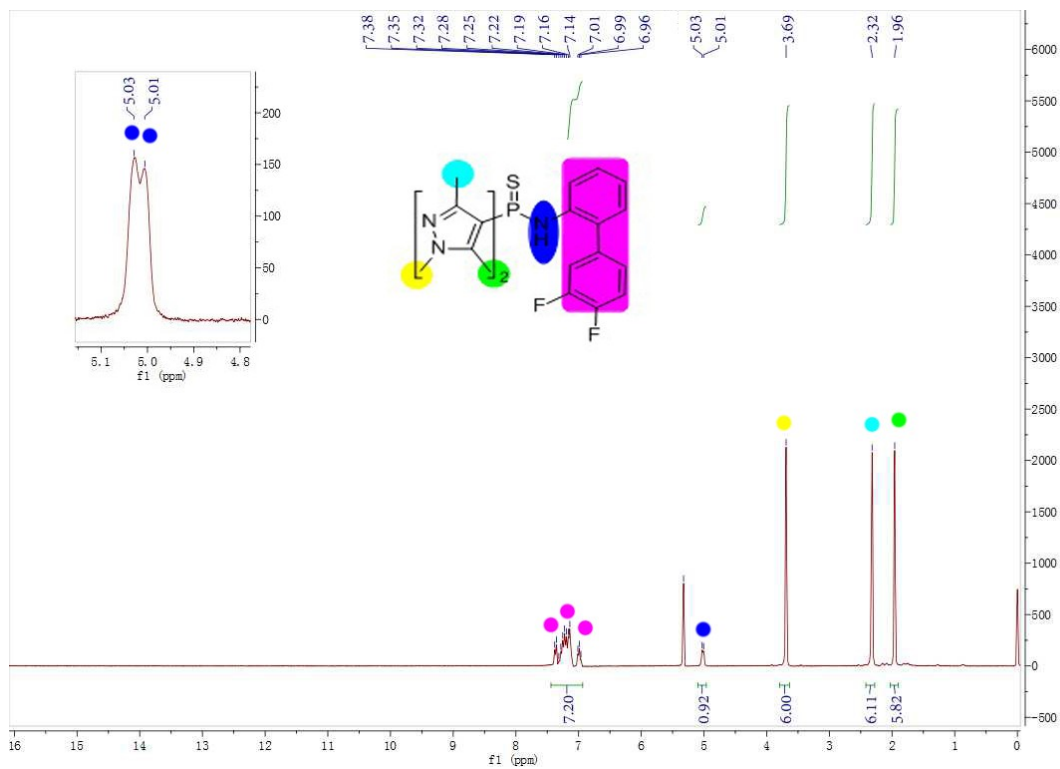


Fig. 34 ^1H NMR spectrum of **2d** (300 MHz, CD_2Cl_2 , 298 K).

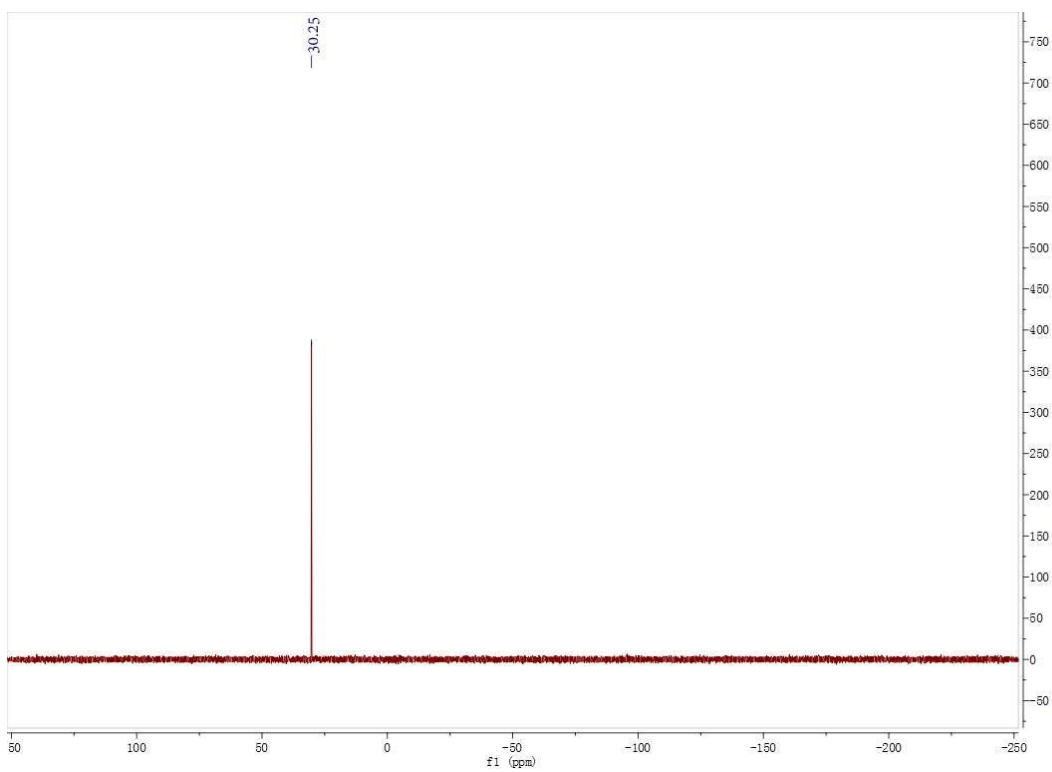


Fig. 35 ³¹P NMR spectrum of **2d** (121.5 MHz, CD₂Cl₂, 298 K).

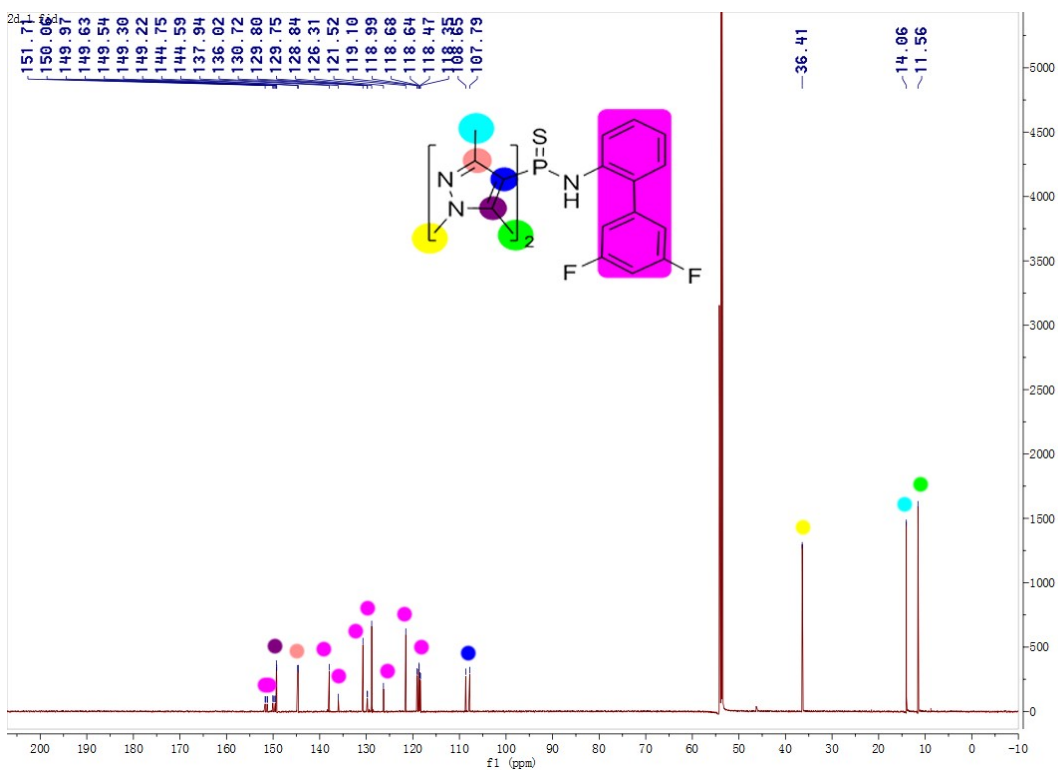


Fig. 36 ¹³C NMR spectrum of **2d** (150 MHz, CD₂Cl₂, 298 K).

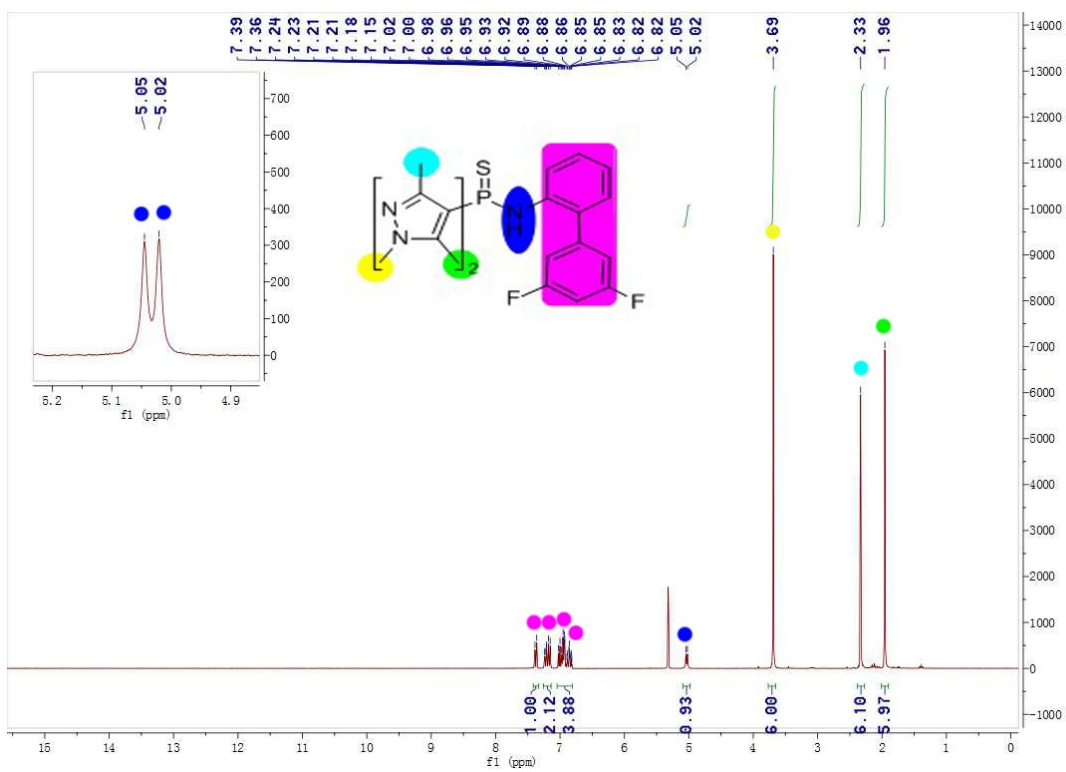


Fig. 37 ^1H NMR spectrum of **2e** (300 MHz, CD_2Cl_2 , 298 K).

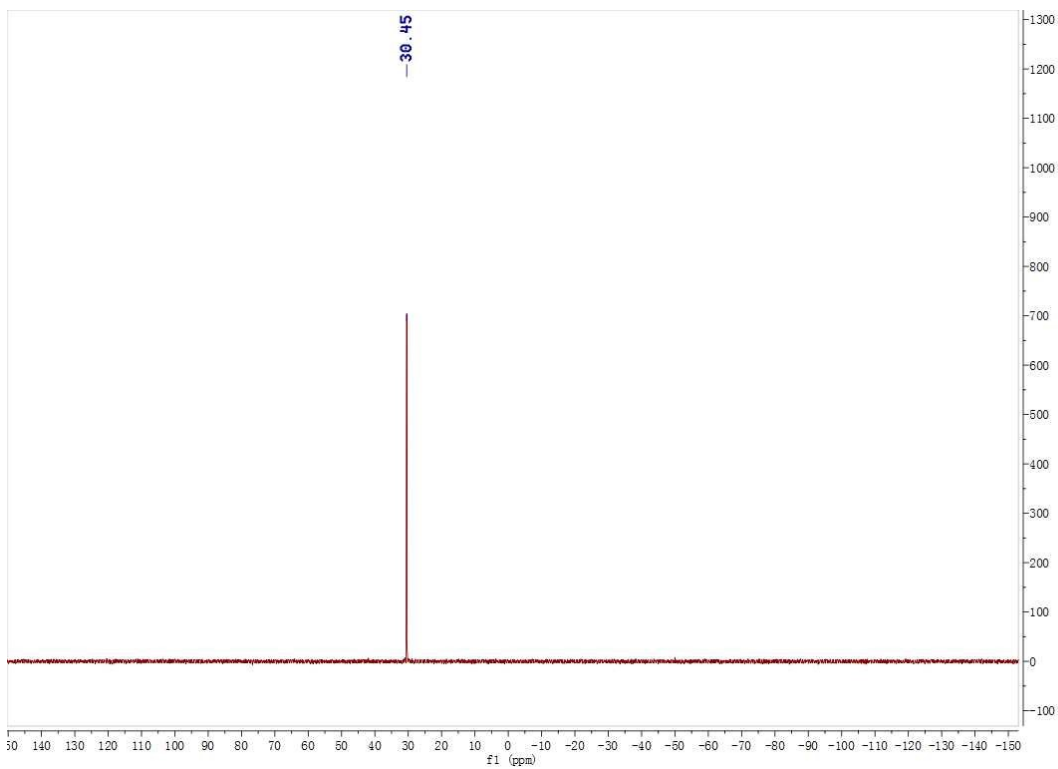


Fig. 38 ^{31}P NMR spectrum of **2e** (121.5 MHz, CD_2Cl_2 , 298 K).

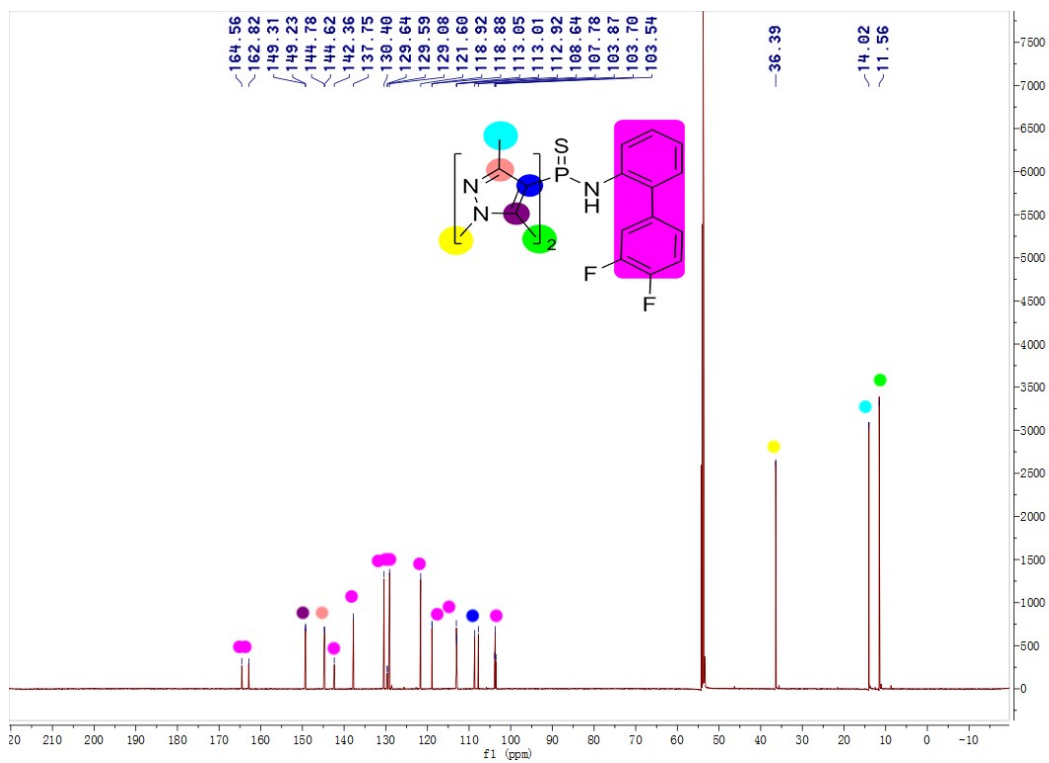


Fig. 39 ^{13}C NMR spectrum of **2e** (150 MHz, CD_2Cl_2 , 298 K).

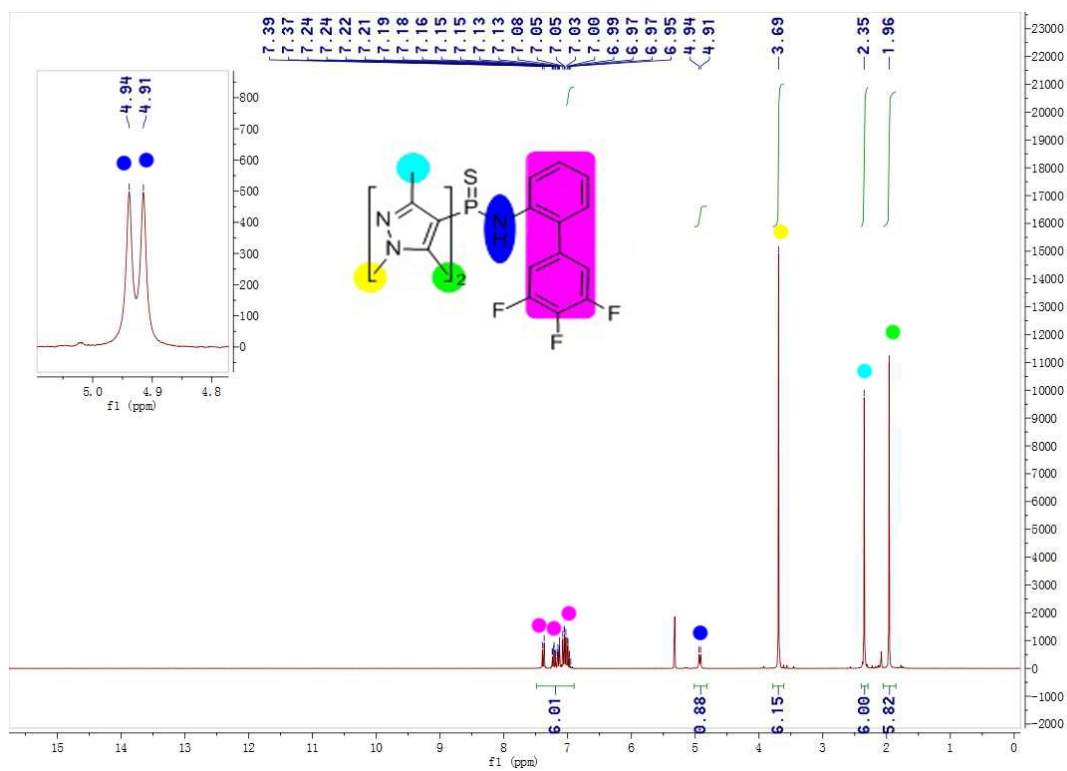


Fig. 40 ^1H NMR spectrum of **2f** (300 MHz, CD_2Cl_2 , 298 K).

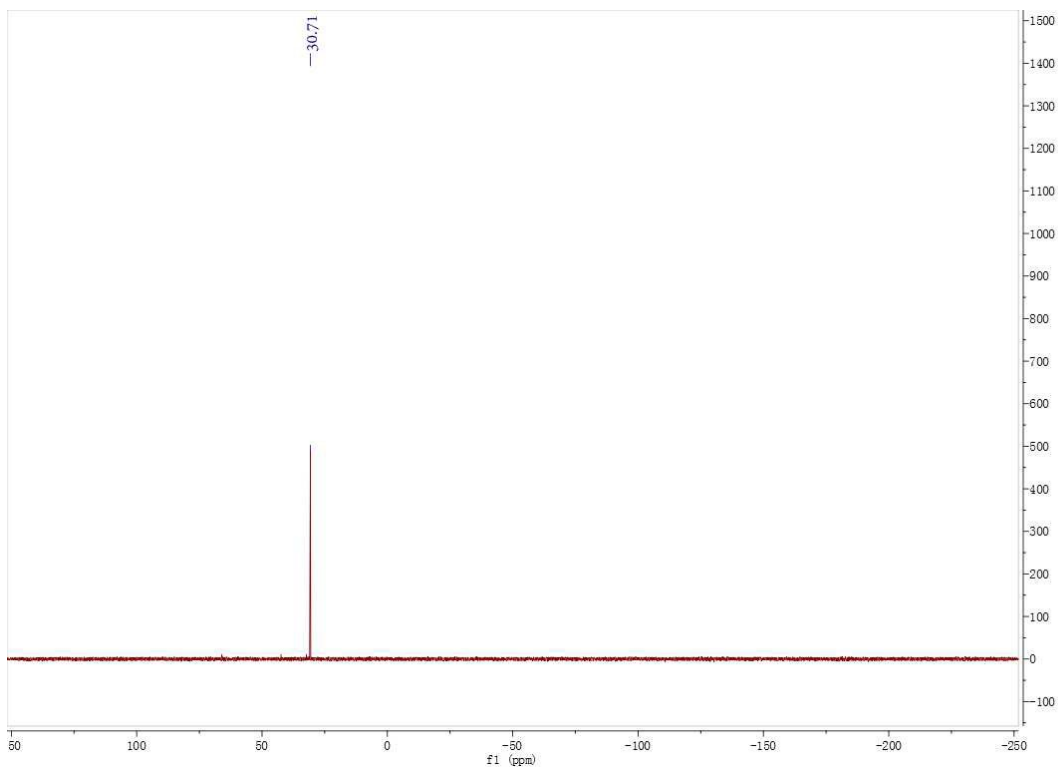


Fig. 41 ³¹P NMR spectrum of **2f** (121.5 MHz, CD₂Cl₂, 298 K).

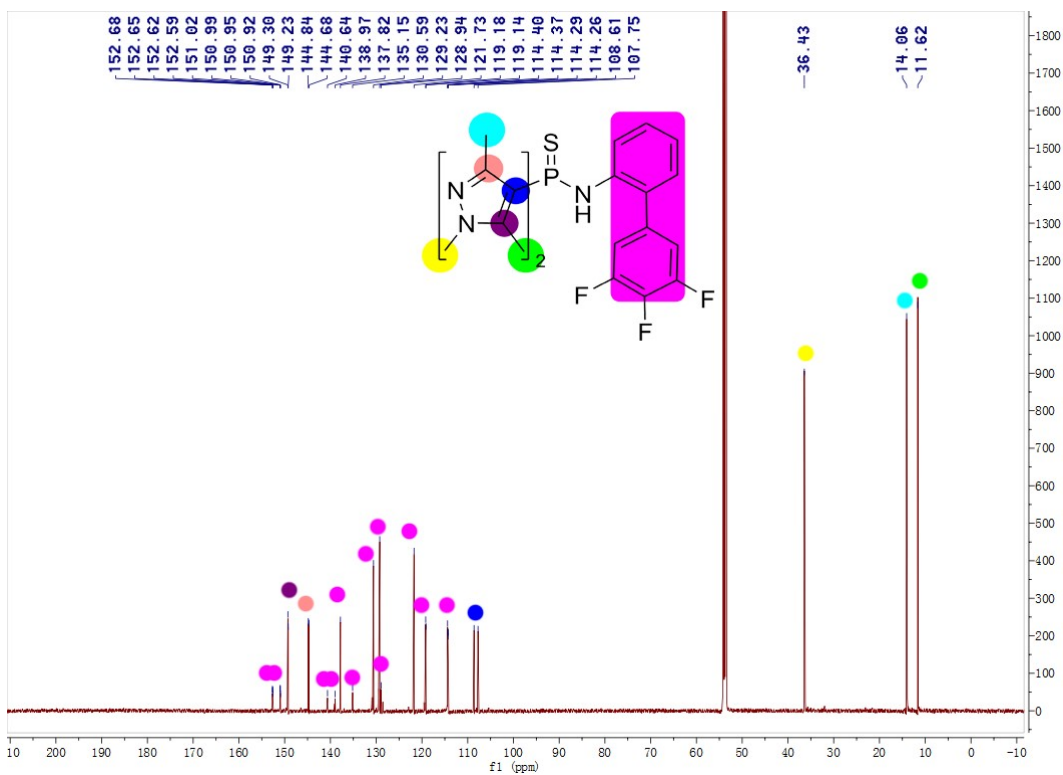


Fig. 42 ¹³C NMR spectrum of **2f** (150 MHz, CD₂Cl₂, 298 K).

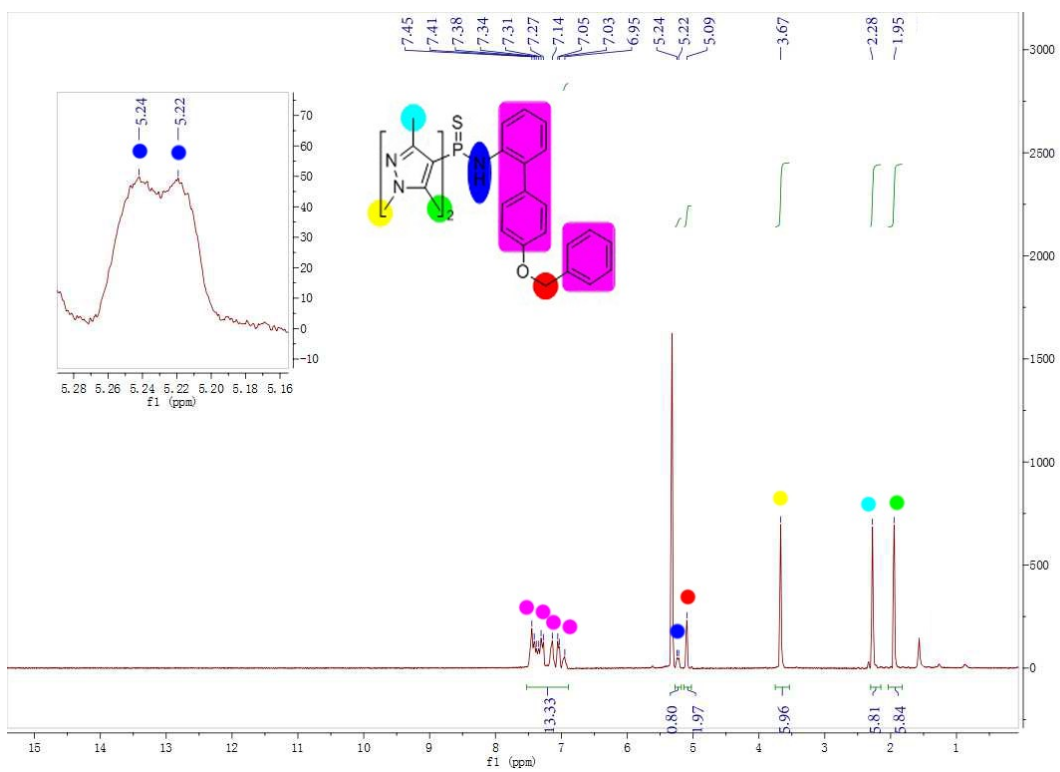


Fig. 43 ^1H NMR spectrum of **2g** (300 MHz, CD_2Cl_2 , 298 K).

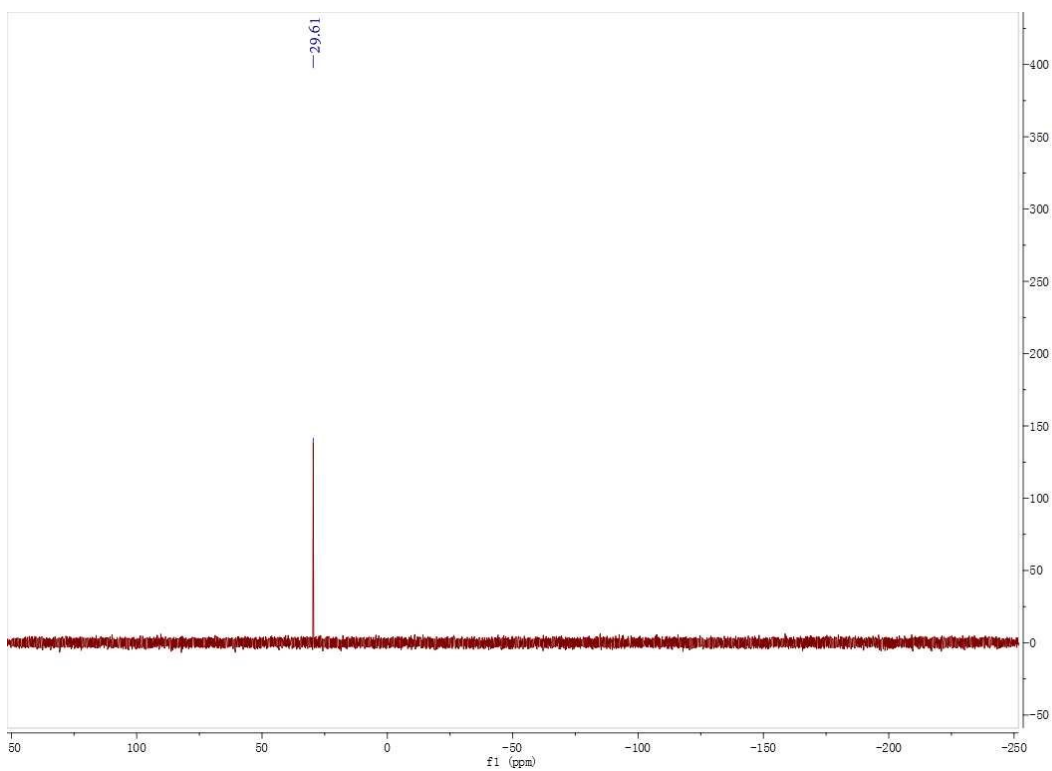


Fig. 44 ^{31}P NMR spectrum of **2g** (121.5 MHz, CD_2Cl_2 , 298 K).

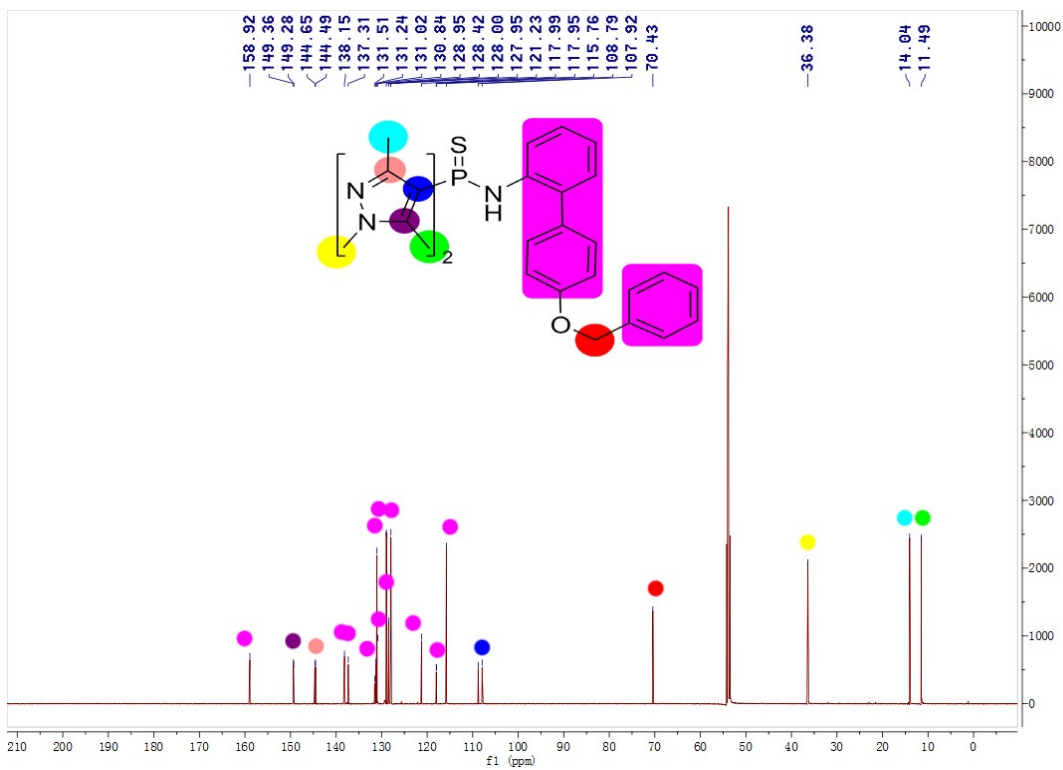


Fig. 45 ^{13}C NMR spectrum of **2g** (150 MHz, CD_2Cl_2 , 298 K).

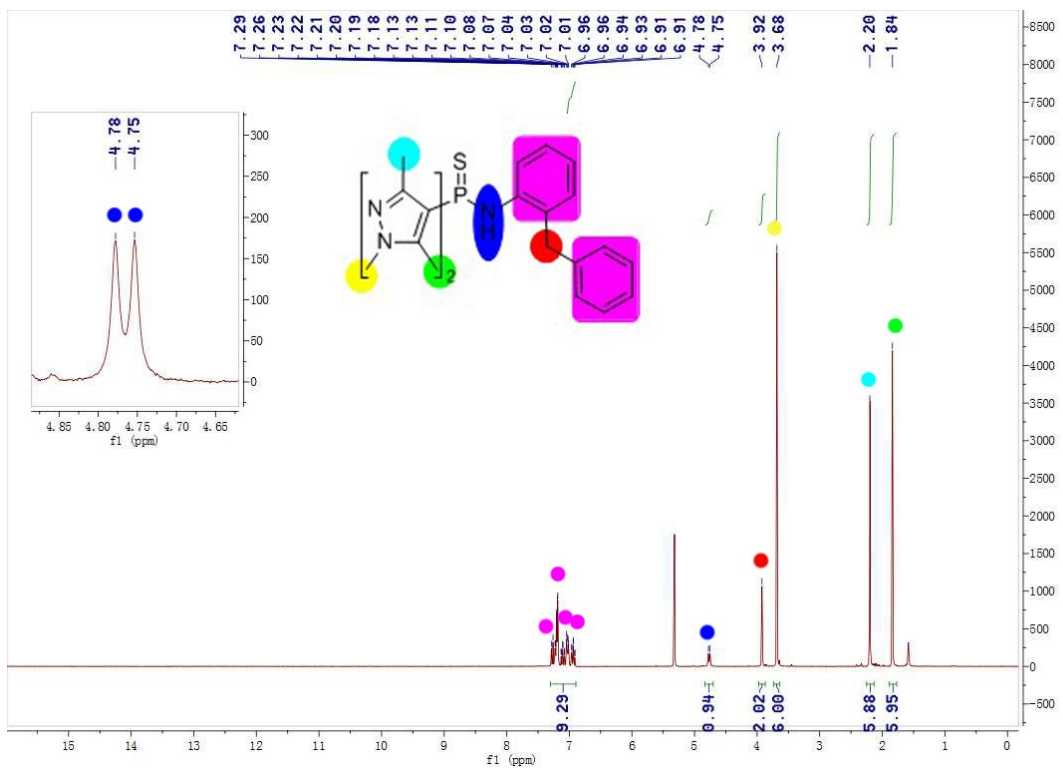


Fig. 46 ^1H NMR spectrum of **2h** (300 MHz, CD_2Cl_2 , 298 K).

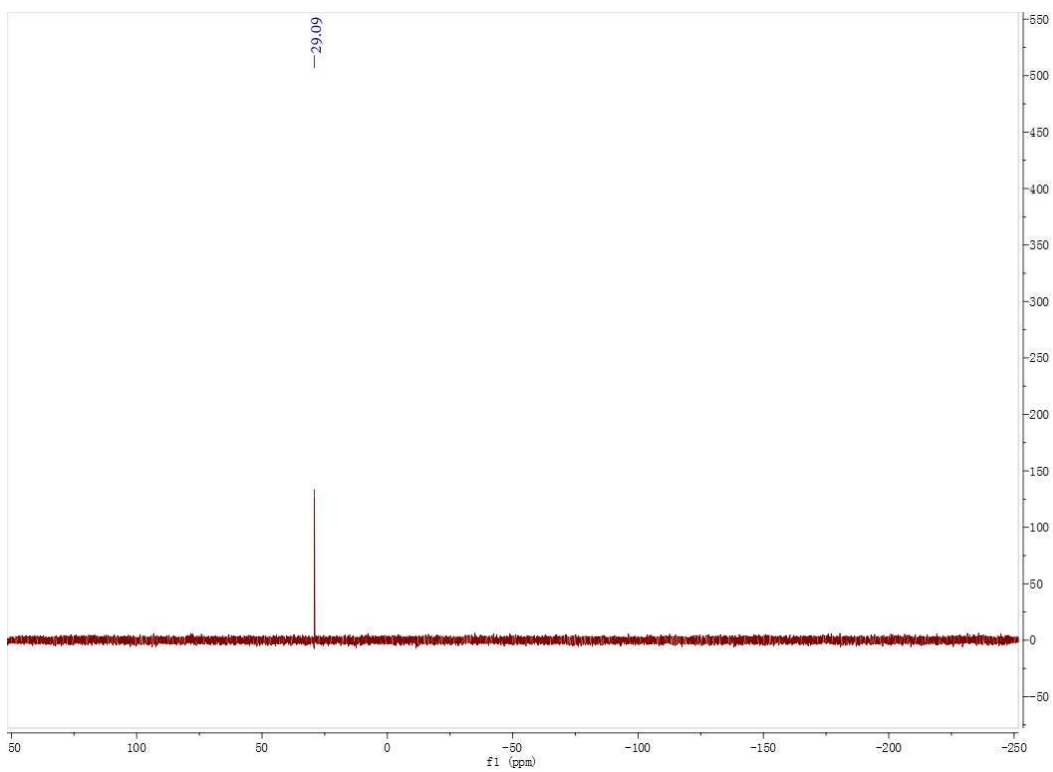


Fig. 47 ³¹P NMR spectrum of **2h** (121.5 MHz, CD₂Cl₂, 298 K).

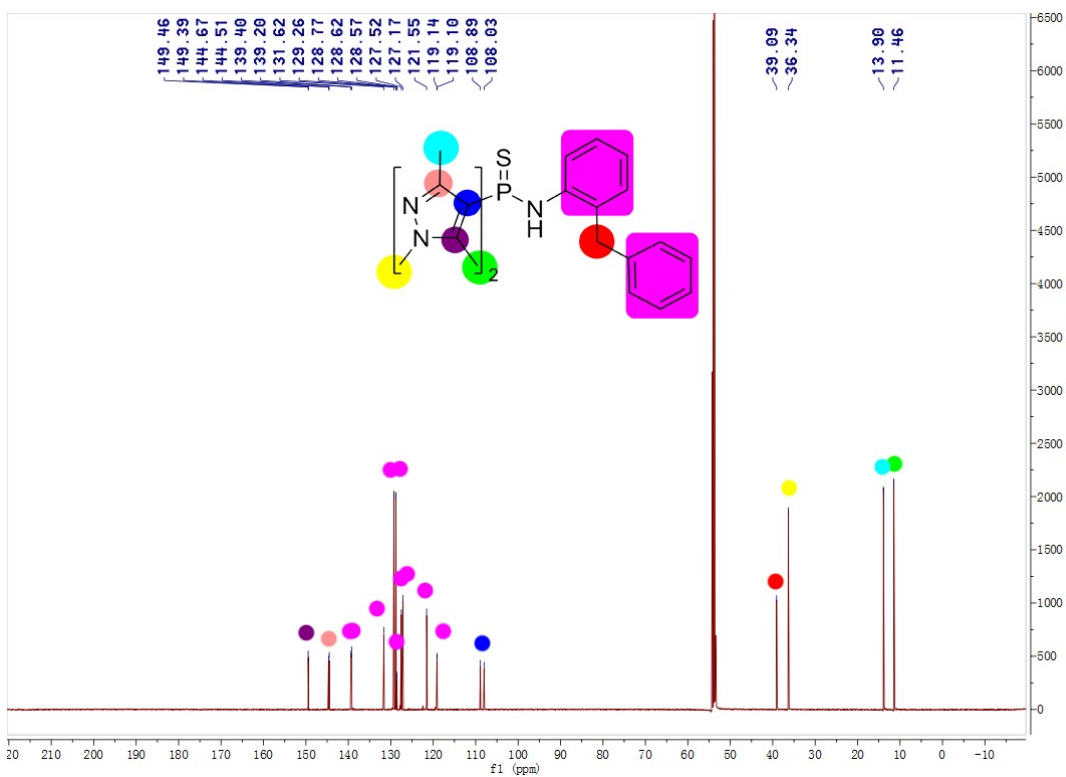


Fig. 48 ¹³C NMR spectrum of **2h** (150 MHz, CD₂Cl₂, 298 K).

2. IR spectra of 1a-2h.

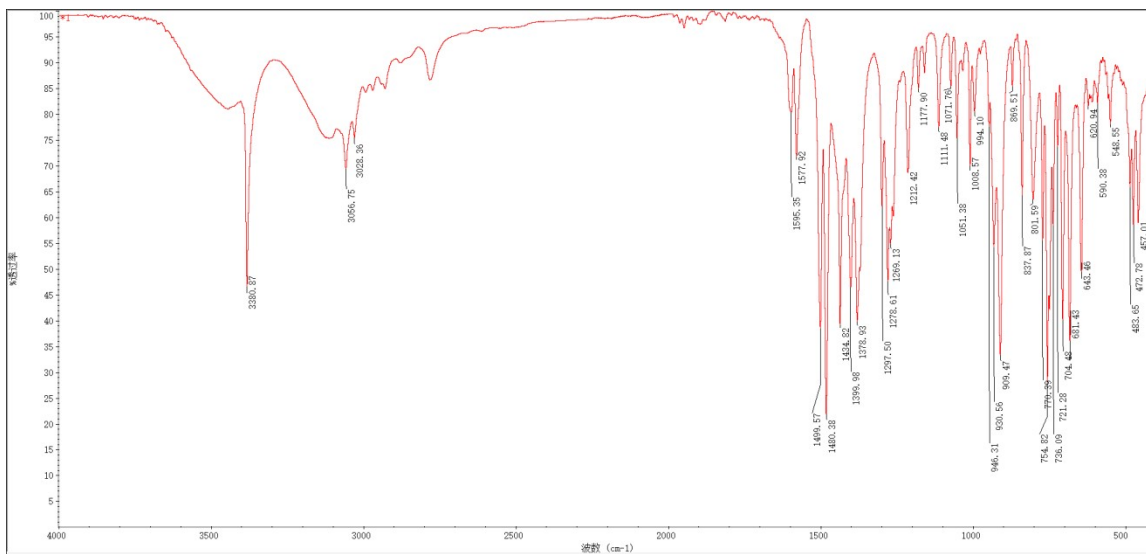


Fig. 49 IR spectrum of 1a.

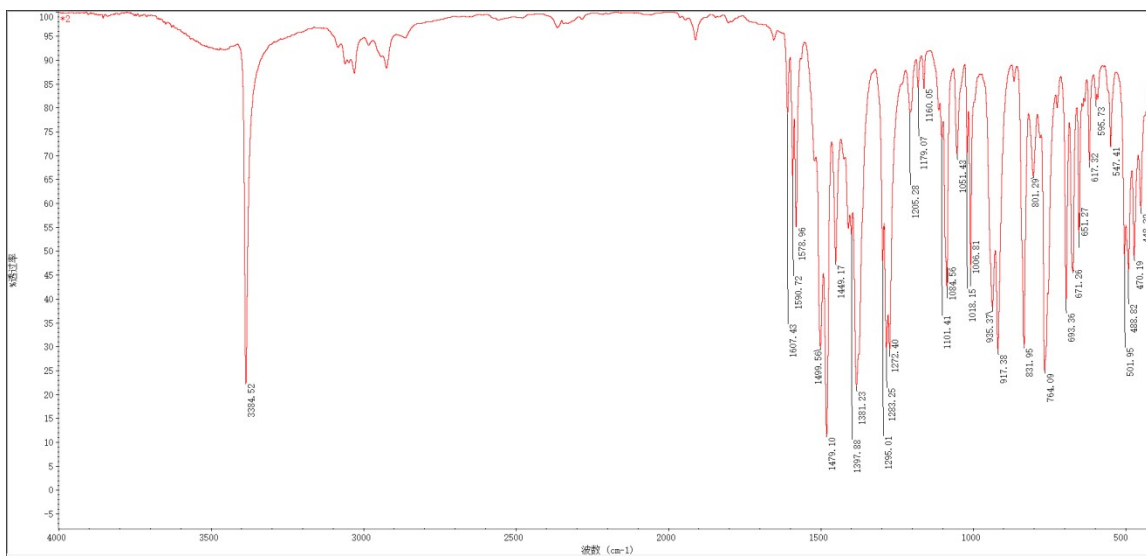


Fig. 50 IR spectrum of 1b.

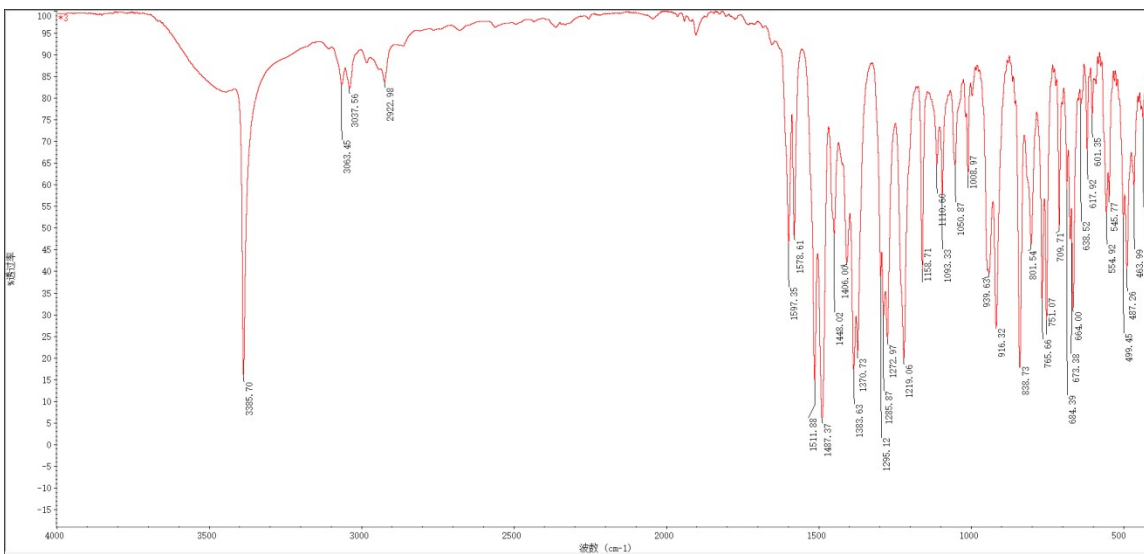


Fig. 51 IR spectrum of **1c**.

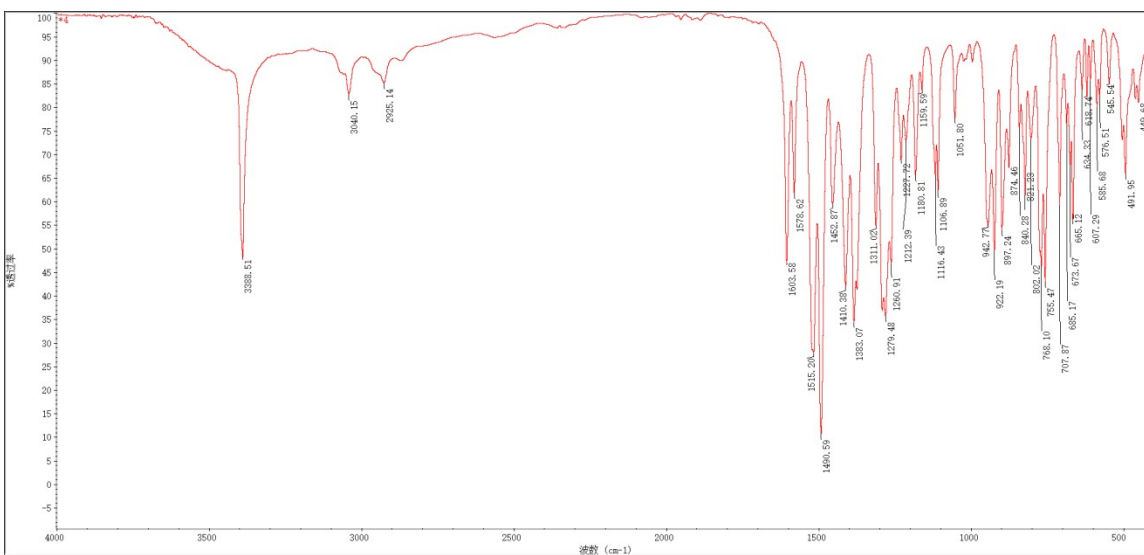


Fig. 52 IR spectrum of **1d**.

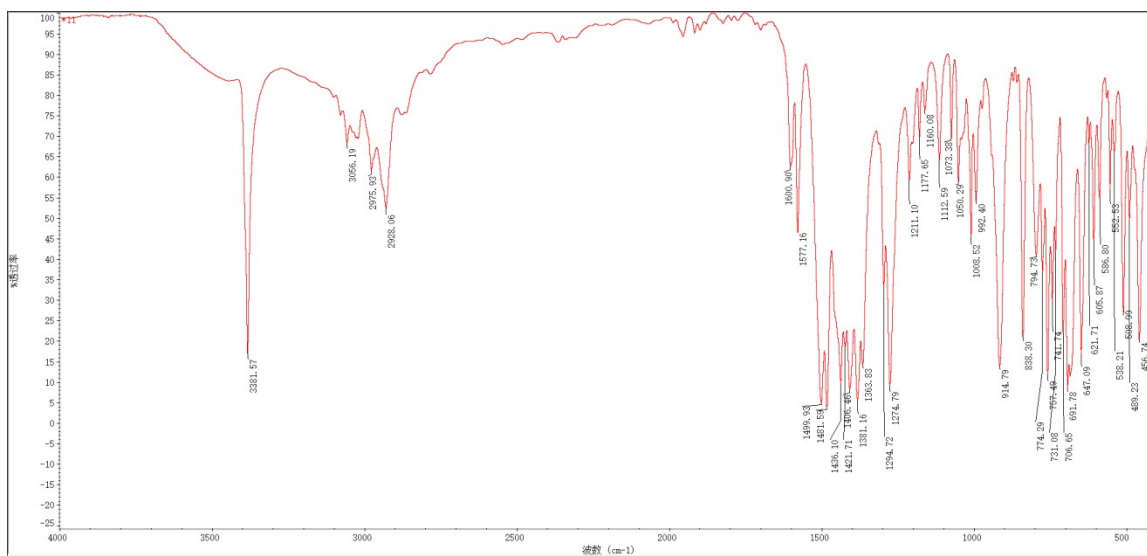


Fig. 53 IR spectrum of **1e**.

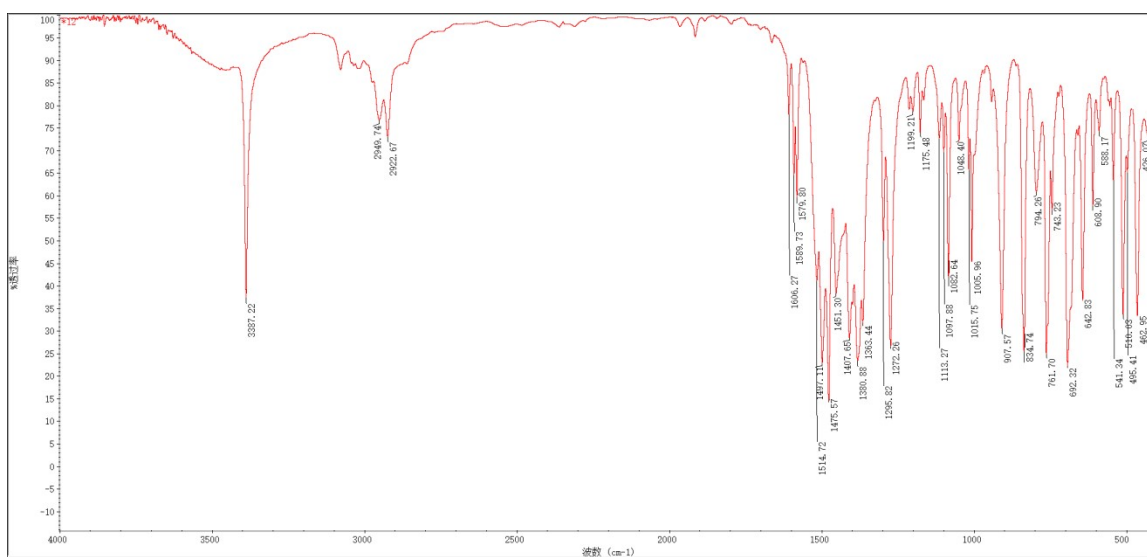


Fig. 54 IR spectrum of **1f**.

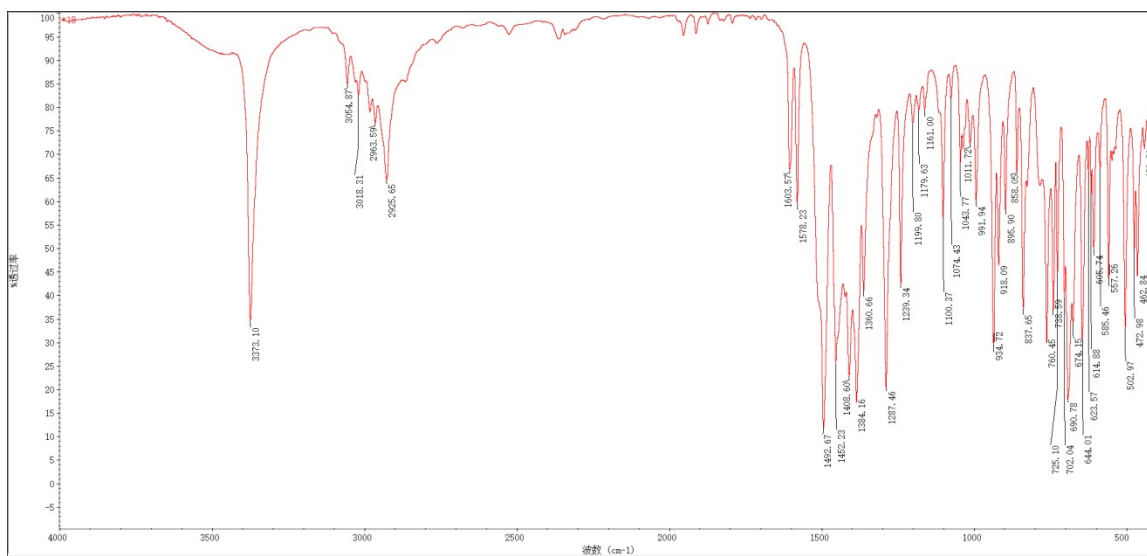


Fig. 55 IR spectrum of **1g**.

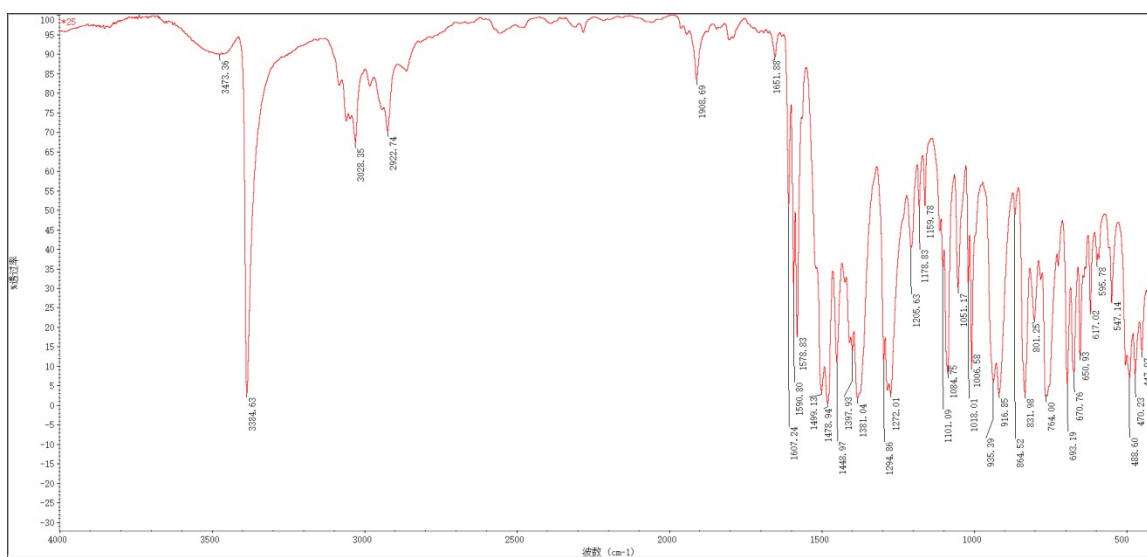


Fig. 56 IR spectrum of **1h**.

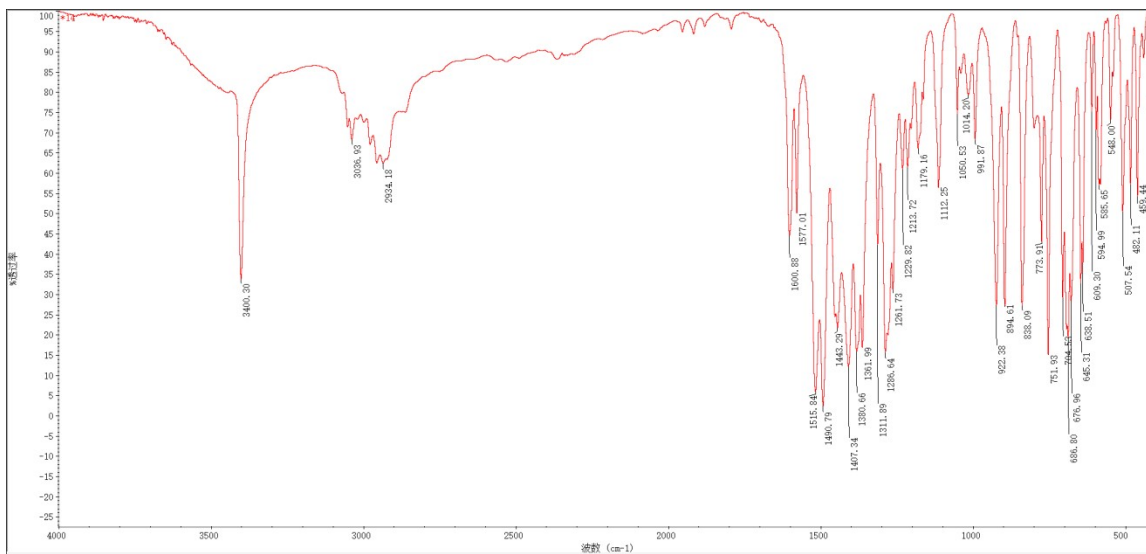


Fig. 57 IR spectrum of 2a.

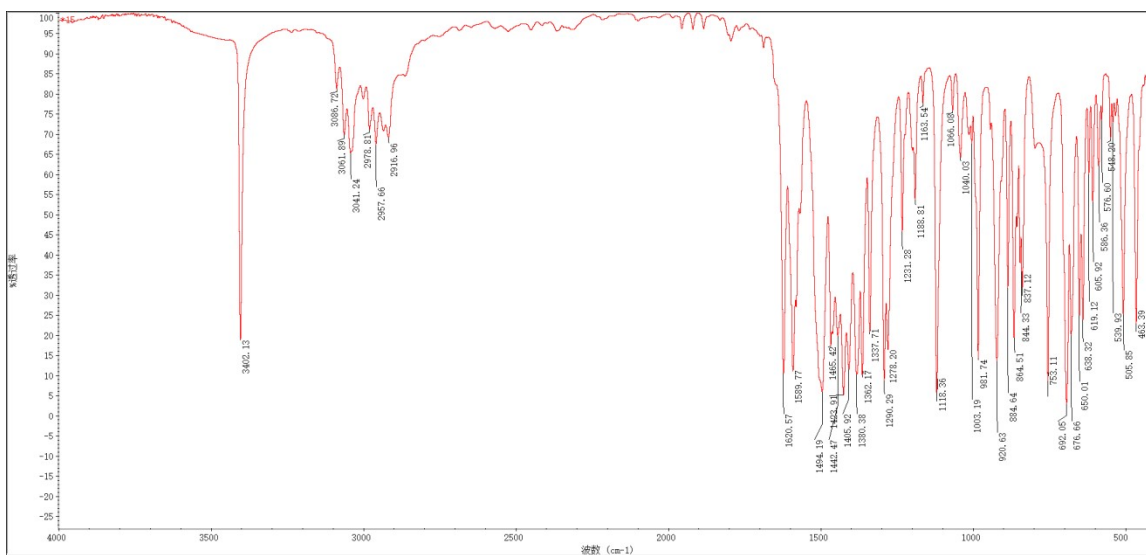


Fig. 58 IR spectrum of 2b.

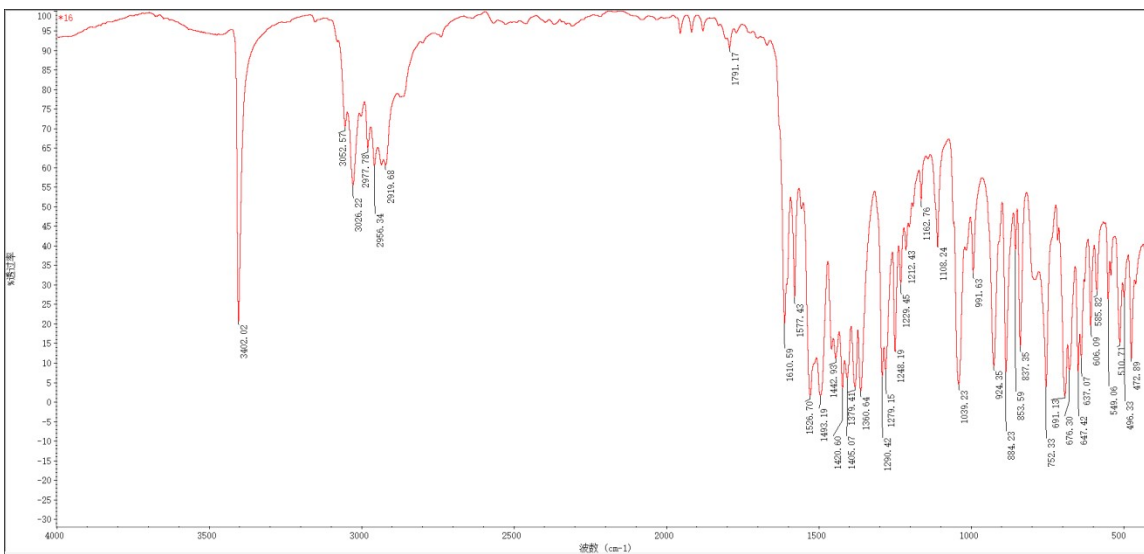


Fig. 59 IR spectrum of 2c.

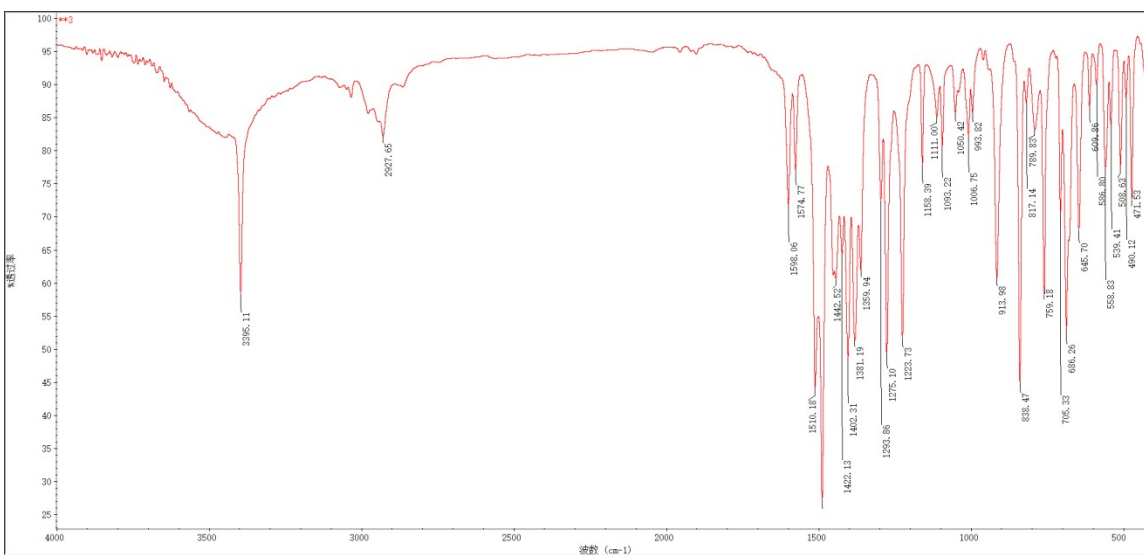


Fig. 60 IR spectrum of 2d.

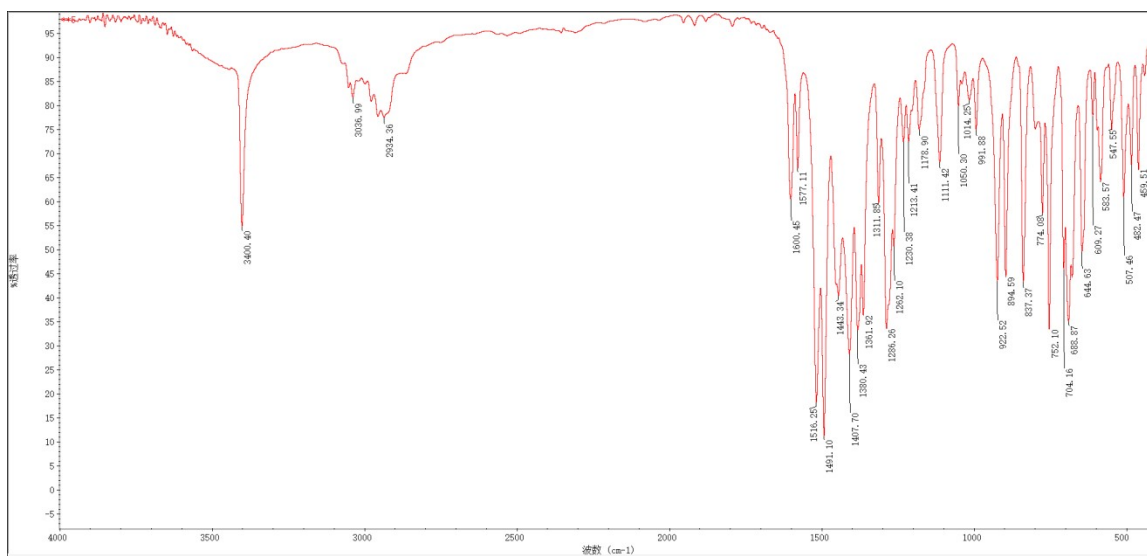


Fig. 61 IR spectrum of 2e.

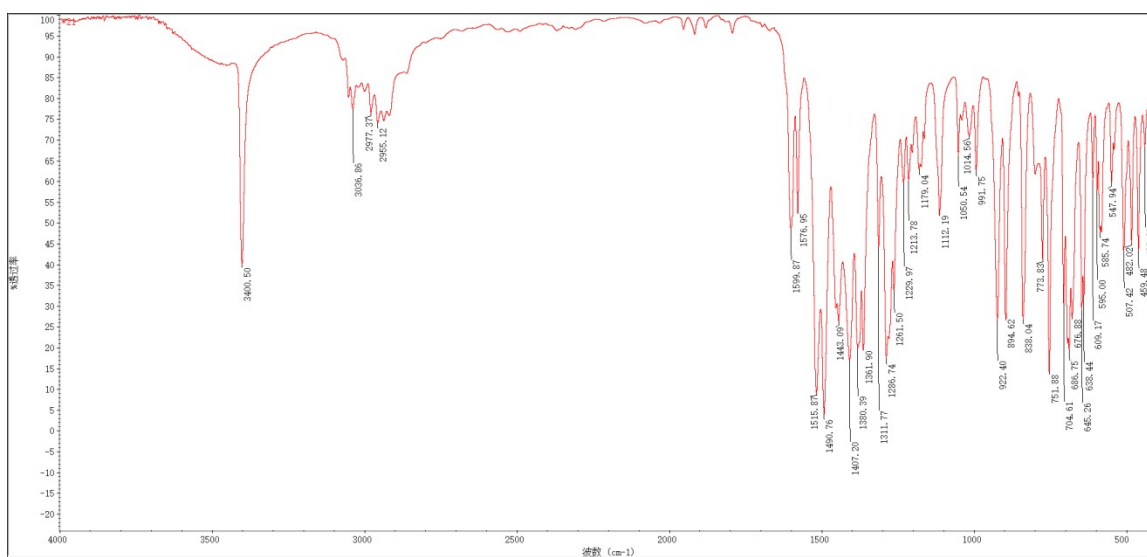


Fig. 62 IR spectrum of 2f.

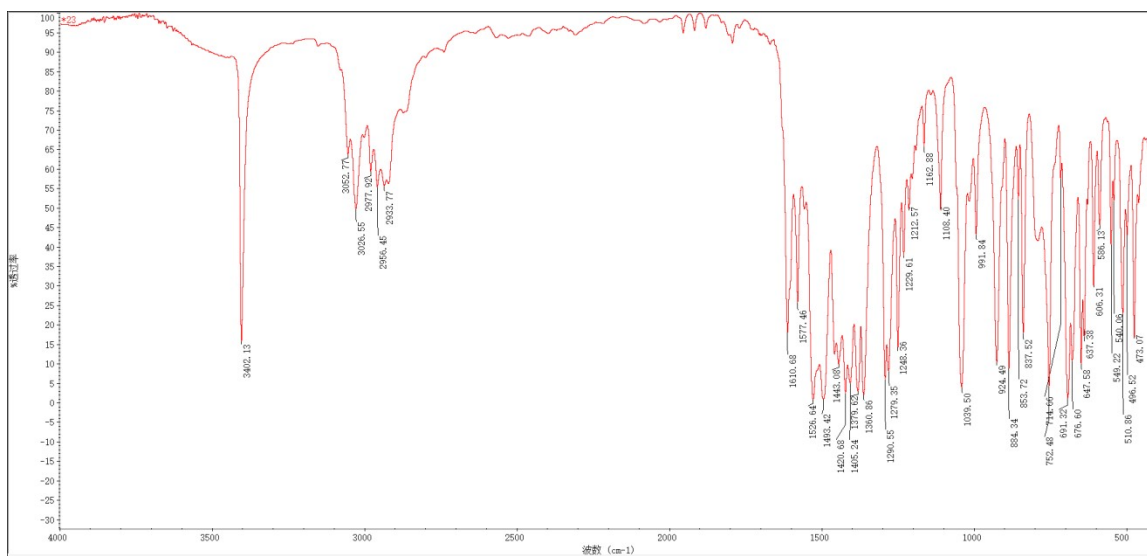


Fig. 63 IR spectrum of **2g**.

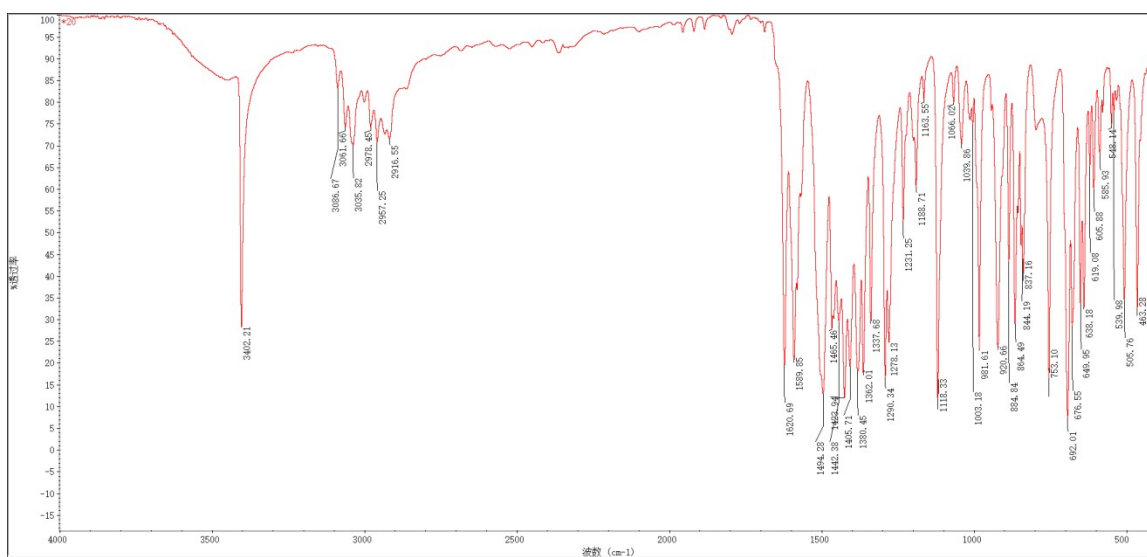


Fig. 64 IR spectrum of **2h**.

3. Mass spectra of **1a-2h**.

20210421-81-1 #13-18 RT: 0.20-0.29 AV: 6 SB: 8 0.04-0.15 NL: 1.64E8
T: + c ESI Q1MS [100.000-1000.000]

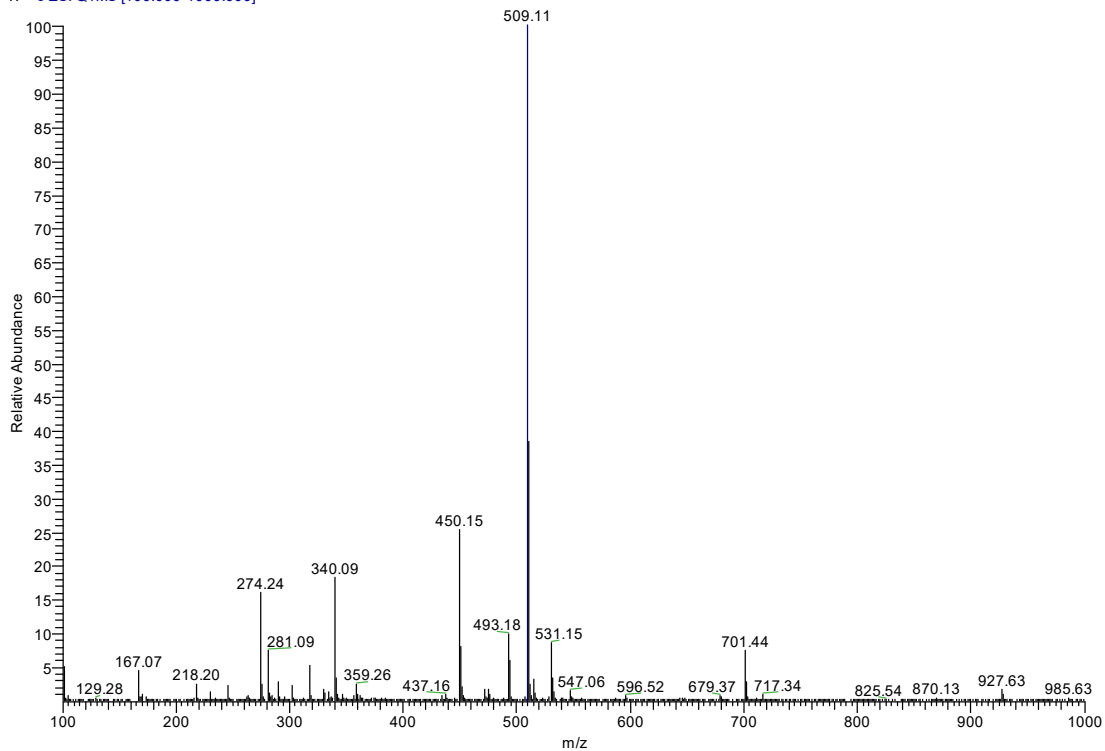


Fig. 65 MS spectrum of **1a**.

20210421-81-2 #16-19 RT: 0.25-0.30 AV: 4 SB: 8 0.04-0.15 NL: 3.19E7
T: + c ESI Q1MS [100.000-1000.000]

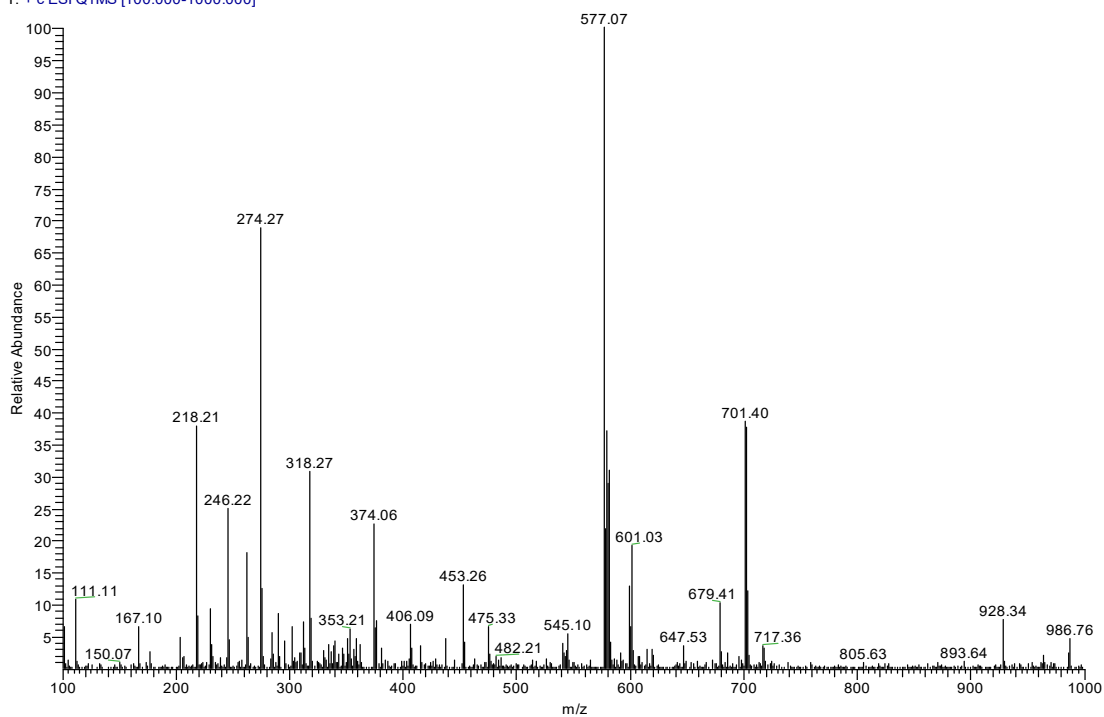


Fig. 66 MS spectrum of 1b.

20210421-81-3 #13-17 RT: 0.22-0.28 AV: 5 SB: 8 0.03-0.15 NL: 1.46E8
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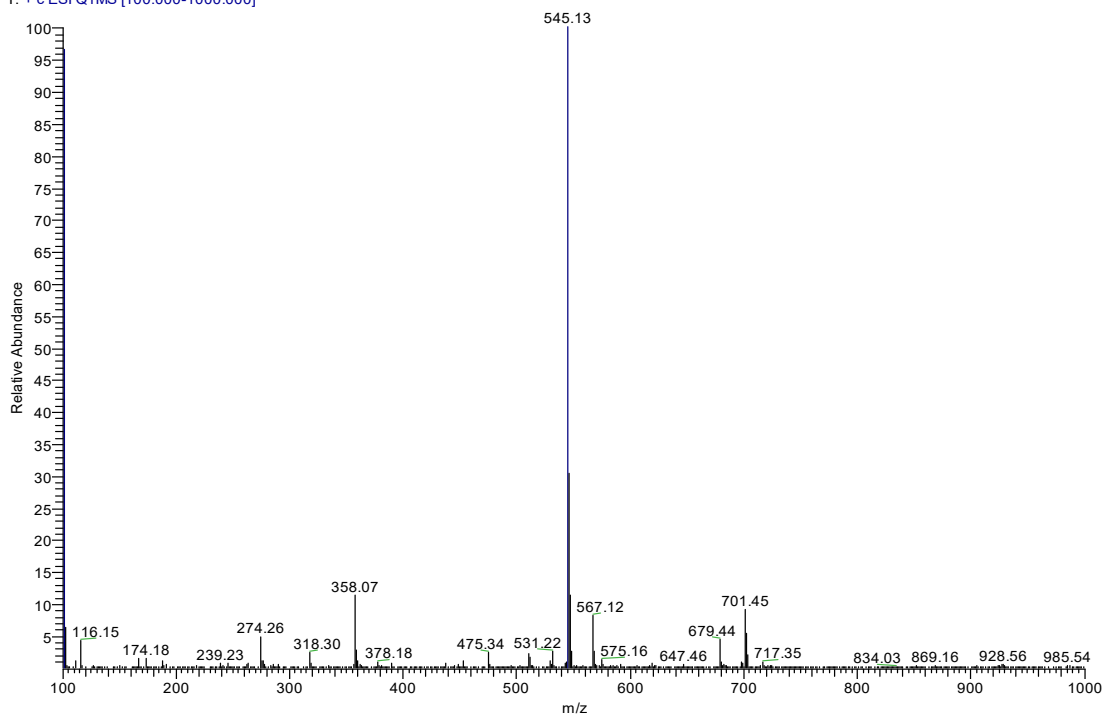


Fig. 67 MS spectrum of 1c.

20210421-81-4 #14-18 RT: 0.22-0.29 AV: 5 SB: 8 0.04-0.15 NL: 1.82E8
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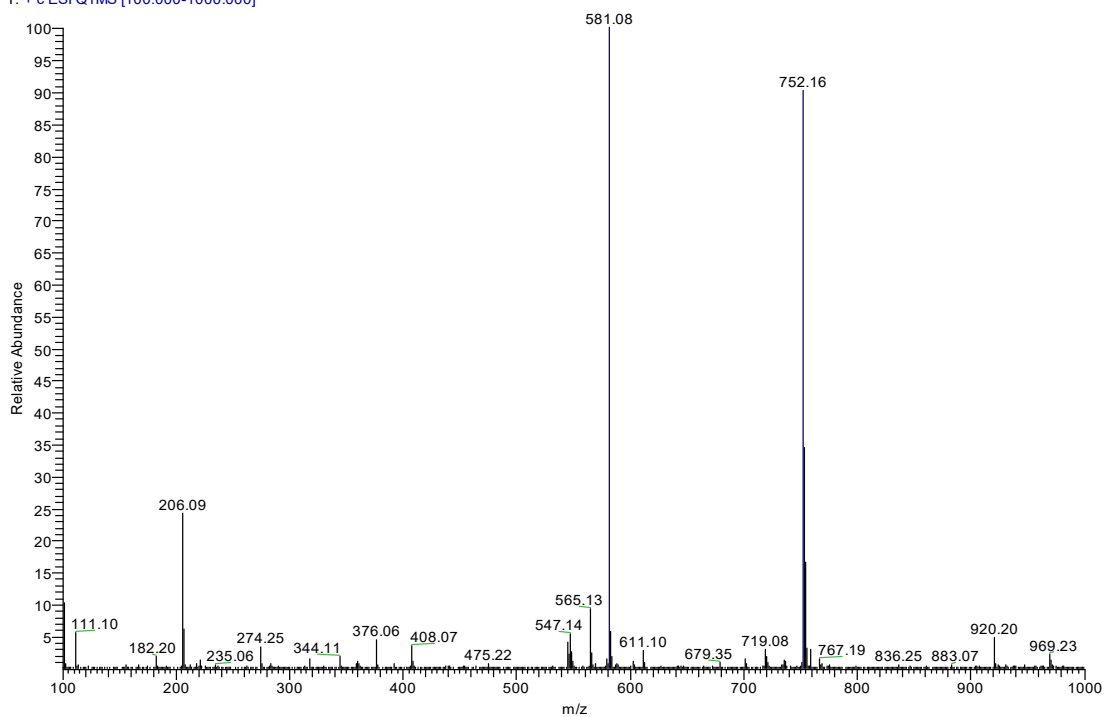


Fig. 68 MS spectrum of 1d.

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T: + c ESI Q1MS [100.000-1000.000]

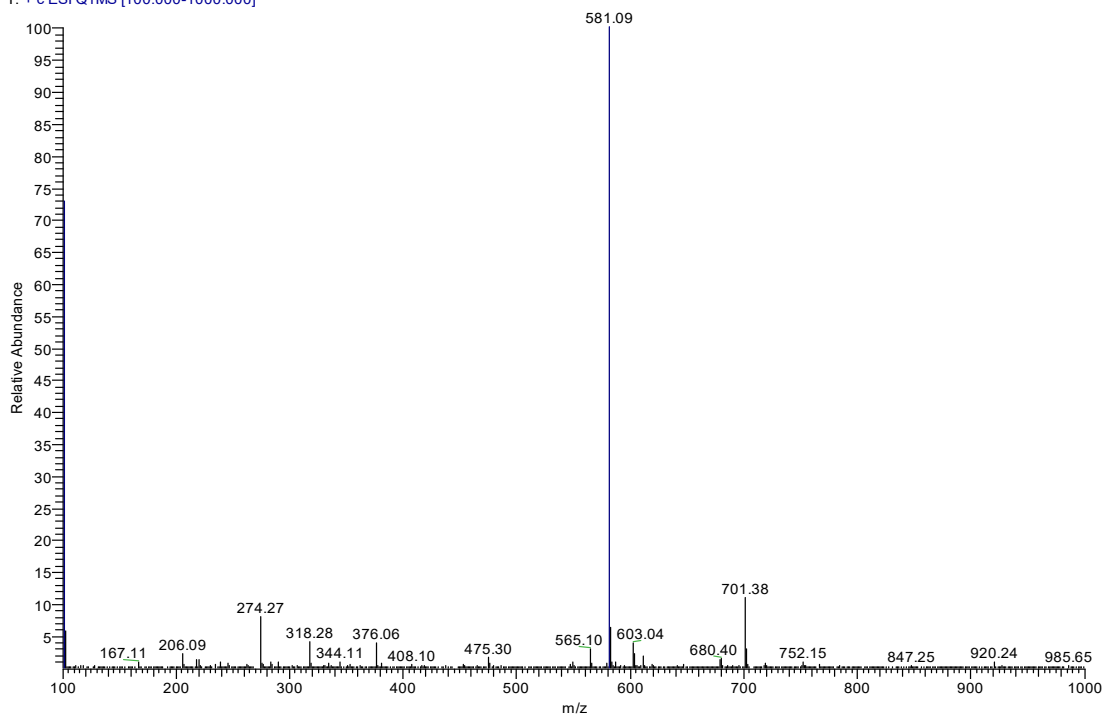


Fig. 69 MS spectrum of 1e.

20210421-81-6 #12-17 RT: 0.19-0.28 AV: 6 SB: 9 0.03-0.16 NL: 7.11E7
T: + c ESI Q1MS [100.000-1000.000]

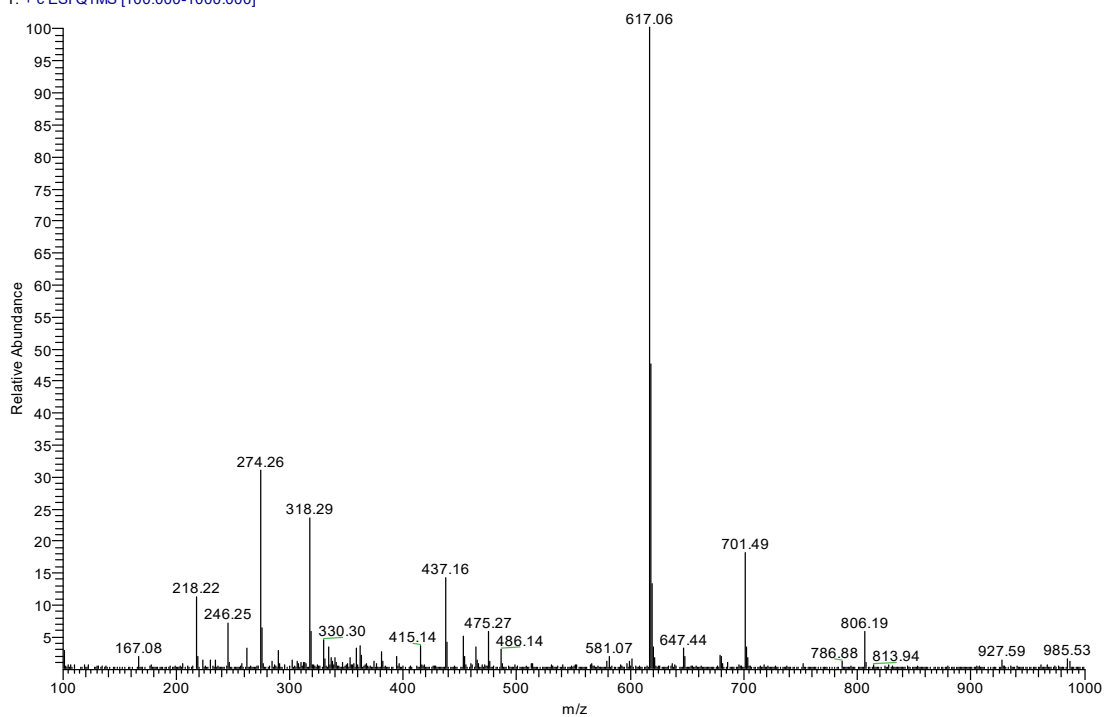


Fig. 70 MS spectrum of **1f**.

20210421-81-7 #13-17 RT: 0.20-0.27 AV: 5 SB: 8 0.04-0.15 NL: 6.92E7
T: + c ESI Q1MS [100.000-1000.000]

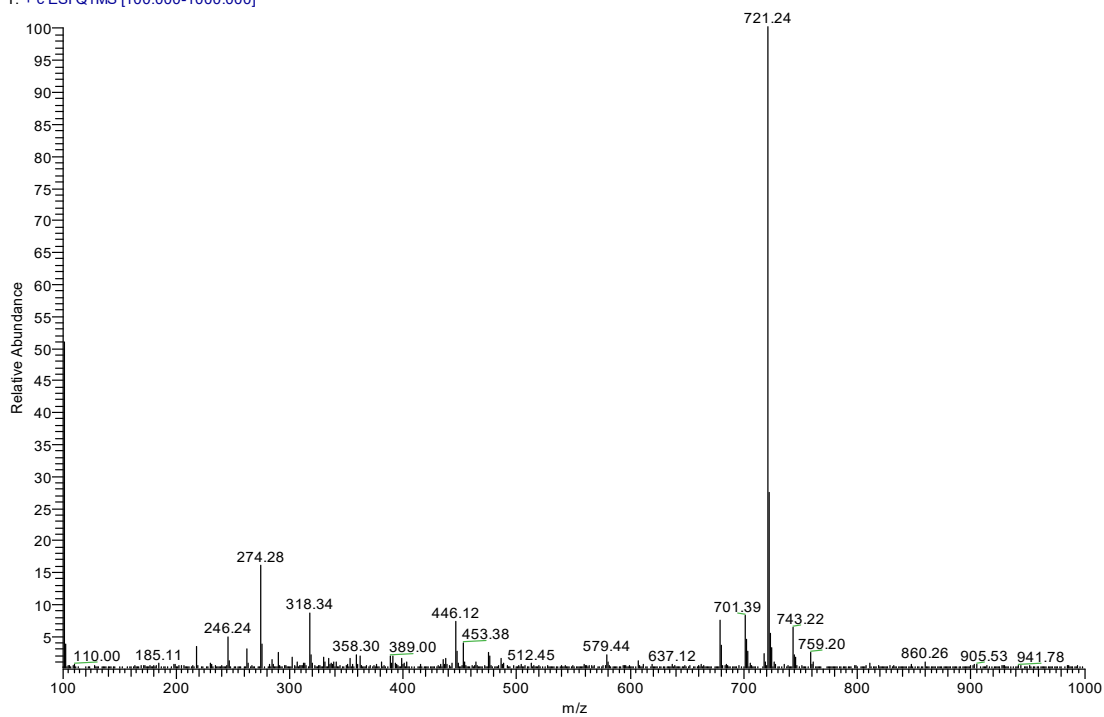


Fig. 71 MS spectrum of **1g**.

20210421-81-8 #13-18 RT: 0.21-0.30 AV: 6 SB: 9 0.03-0.16 NL: 9.06E7
T: + c ESI Q1MS [100.000-1000.000]

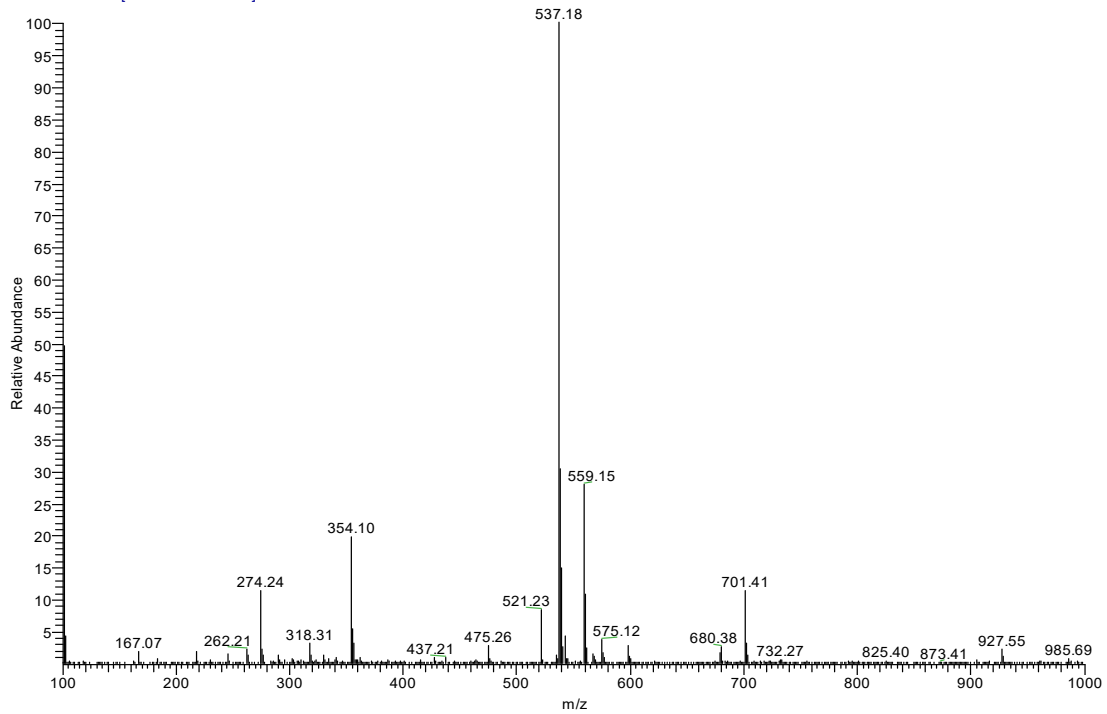


Fig. 72 MS spectrum of 1h.

20210421-81-9 #15-19 RT: 0.25-0.31 AV: 5 SB: 9 0.03-0.16 NL: 1.41E8
T: + c ESI Q1MS [100.000-1000.000]

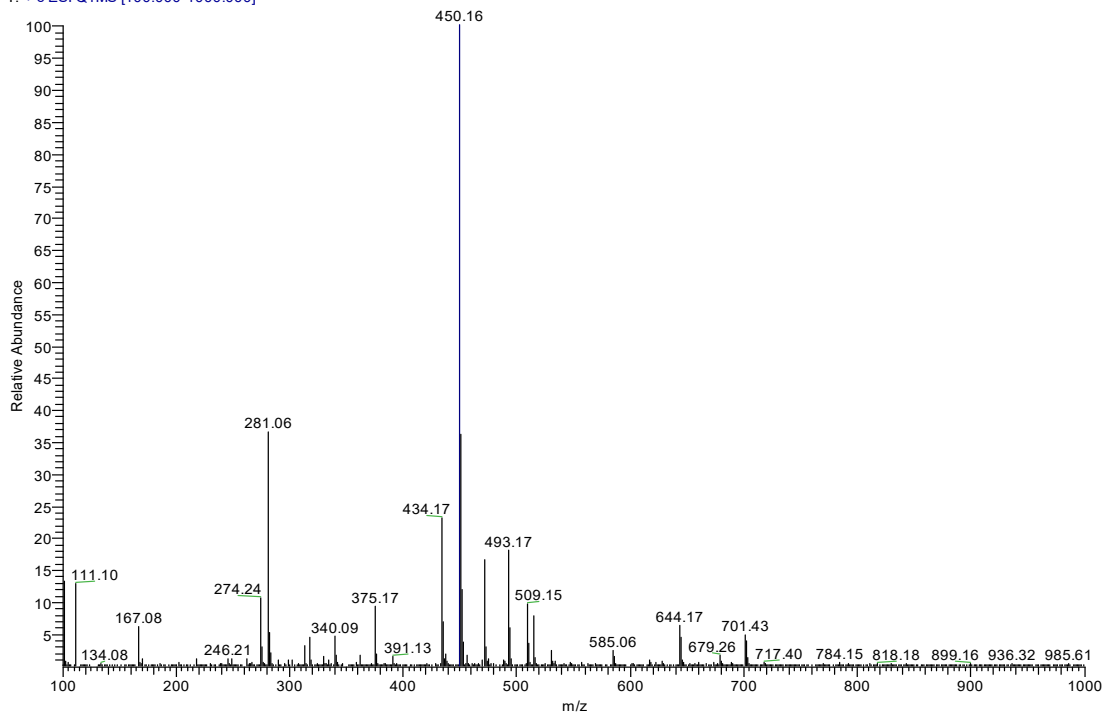


Fig. 73 MS spectrum of 2a.

20210421-81-10 #13-18 RT: 0.20-0.29 AV: 6 SB: 8 0.04-0.15 NL: 7.53E7
T: + c ESI Q1MS [100.000-1000.000]

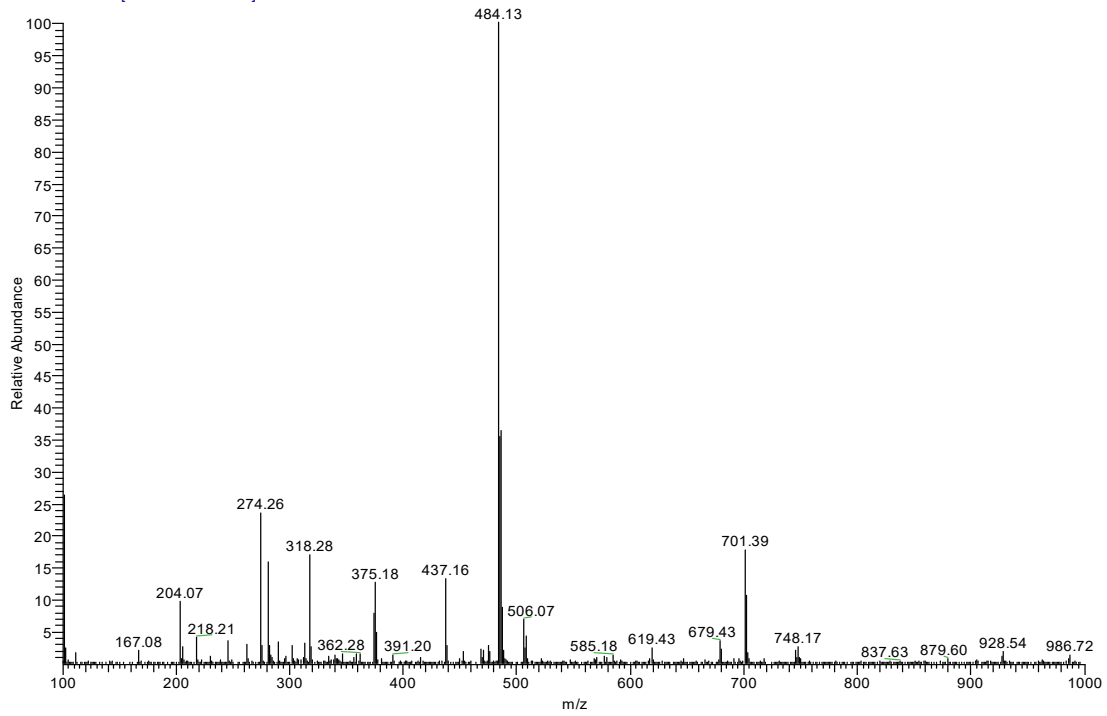


Fig. 74 MS spectrum of **2b**.

20210421-81-11 #13-19 RT: 0.21-0.31 AV: 7 SB: 8 0.04-0.16 NL: 1.23E8
T: + c ESI Q1MS [100.000-1000.000]

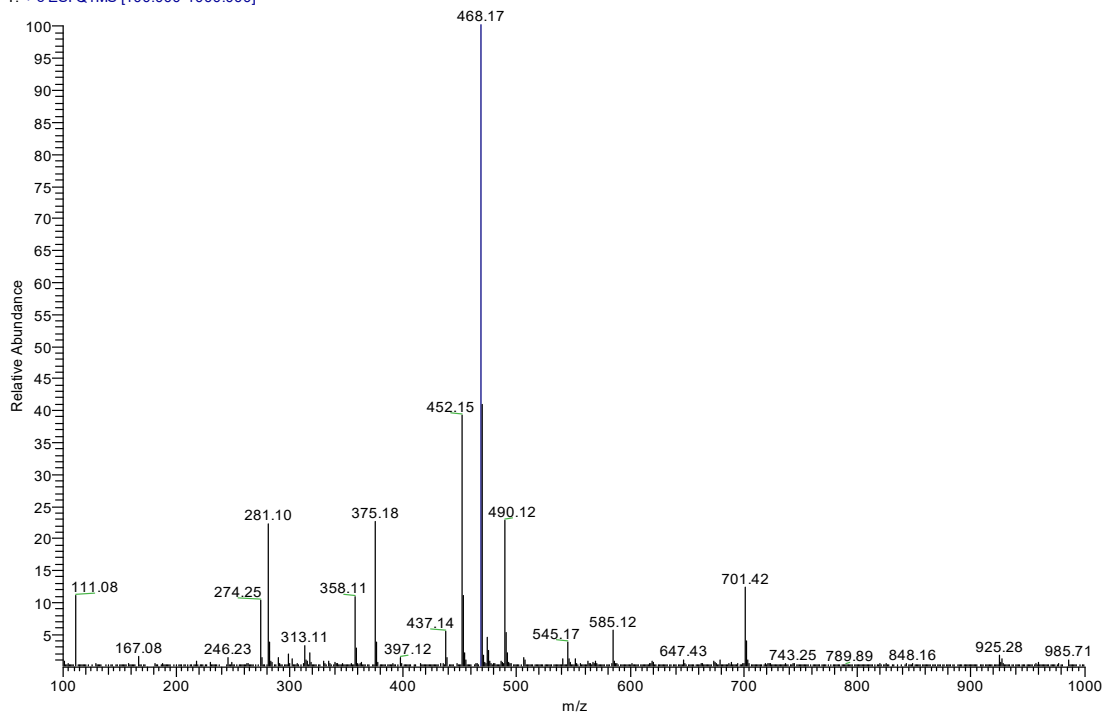


Fig. 75 MS spectrum of **2c**.

20210421-81-12 #12-21 RT: 0.19-0.34 AV: 10 SB: 8 0.04-0.16 NL: 1.62E8
T: + c ESI Q1MS [100.000-1000.000]

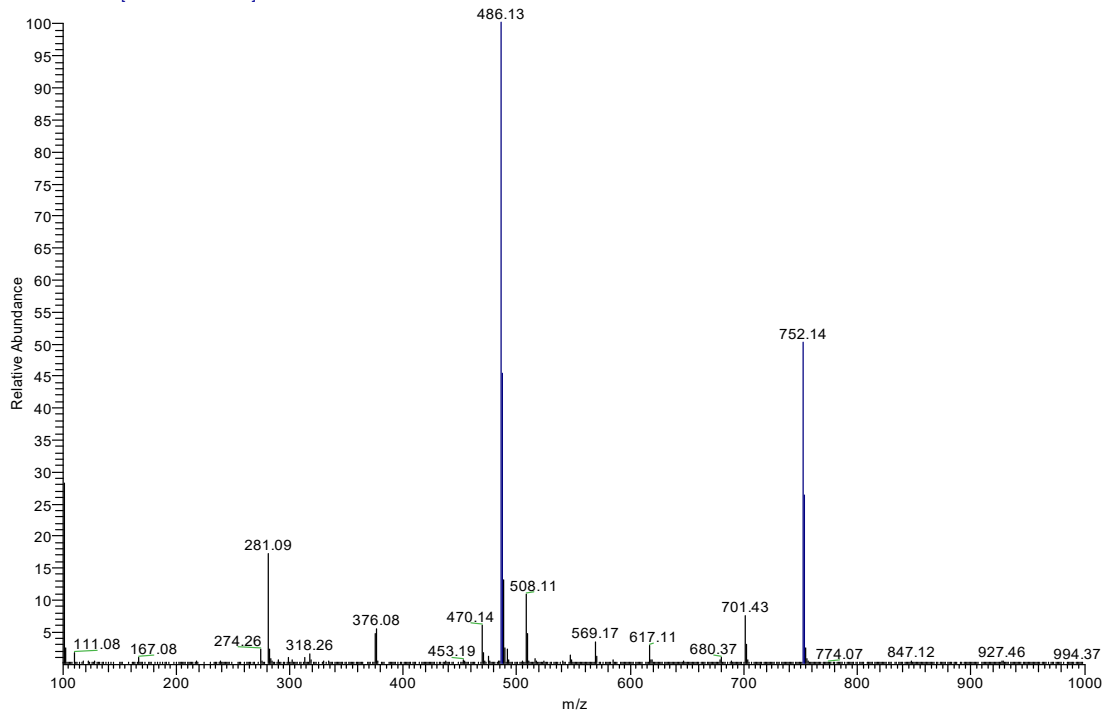


Fig. 76 MS spectrum of 2d.

20210421-81-13 #14-24 RT: 0.22-0.39 AV: 11 SB: 8 0.04-0.16 NL: 1.50E8
T: + c ESI Q1MS [100.000-1000.000]

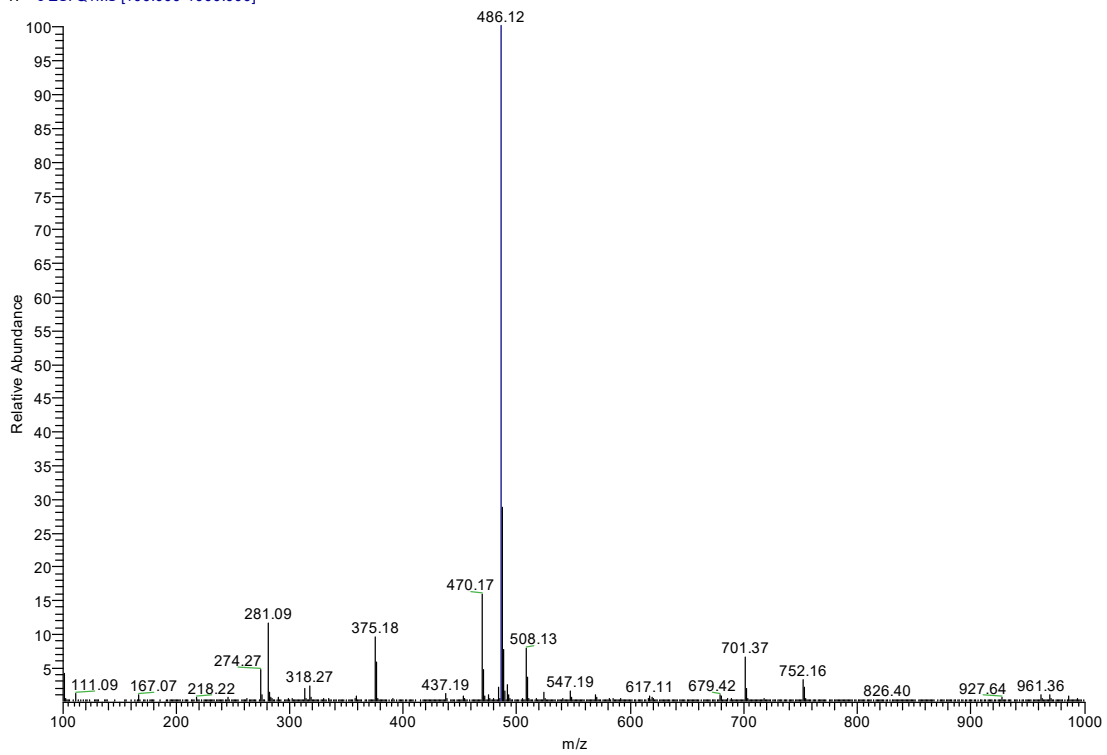


Fig. 77 MS spectrum of **2e**.

20210421-81-14 #13-19 RT: 0.21-0.31 AV: 7 SB: 8 0.04-0.16 NL: 9.75E7
T: + c ESI Q1MS [100.000-1000.000]

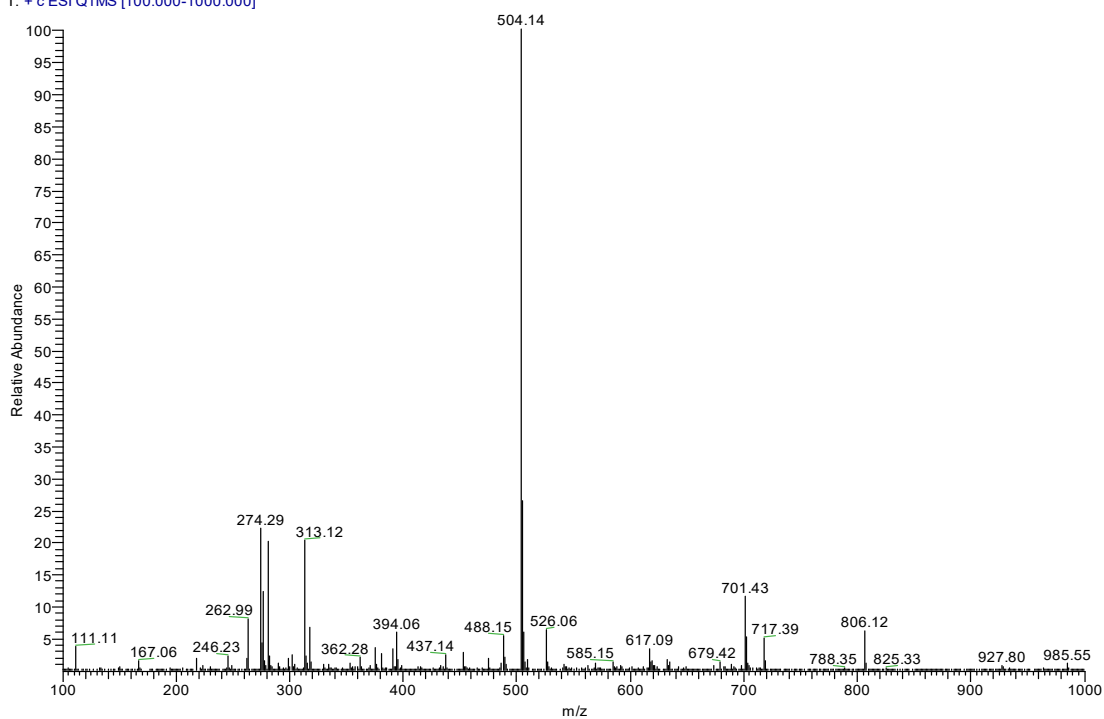


Fig. 78 MS spectrum of **2f**.

20210421-81-15 #14-22 RT: 0.22-0.35 AV: 9 SB: 8 0.04-0.15 NL: 1.69E8
T: + c ESI Q1MS [100.000-1000.000]

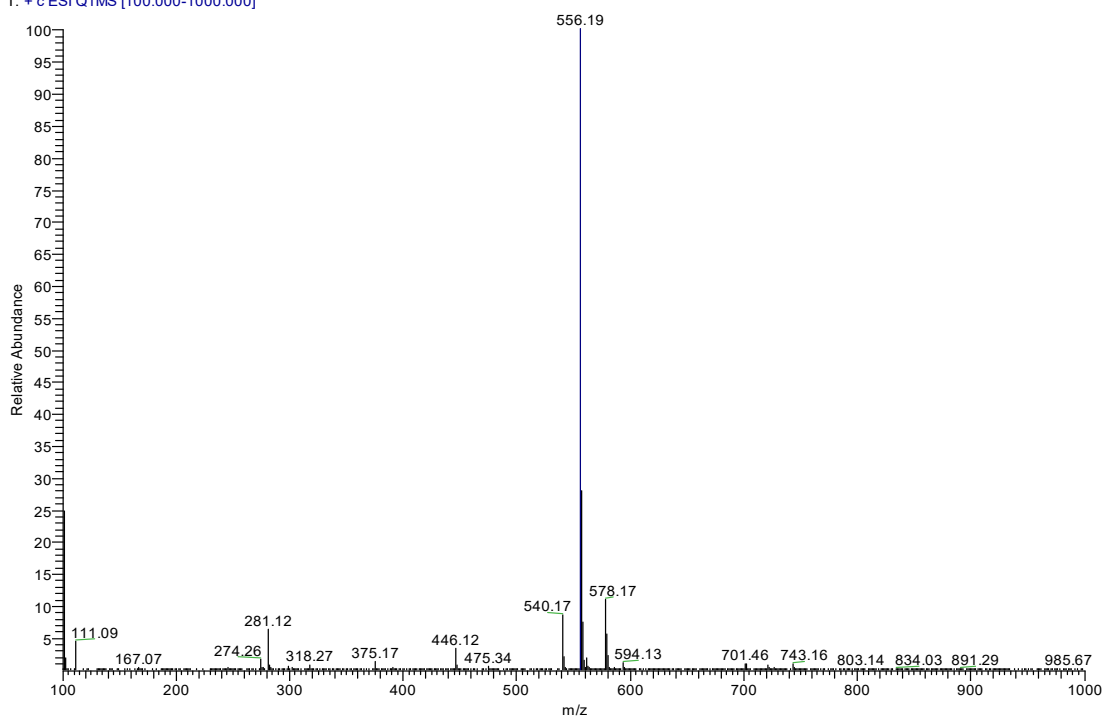


Fig. 79 MS spectrum of **2g**.

20210421-81-16 #14-21 RT: 0.22-0.34 AV: 8 SB: 8 0.04-0.15 NL: 2.28E8
T: + c ESI Q1MS [100.000-1000.000]

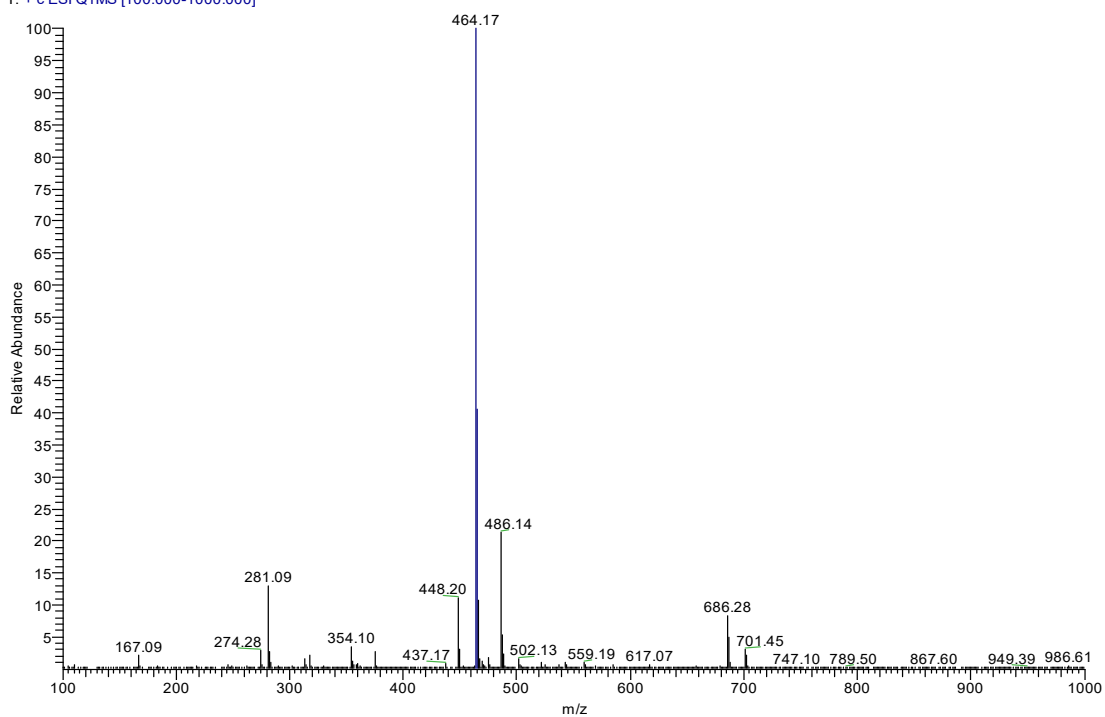


Fig. 80 MS spectrum of **2h**.