Electronic Supplementary Material (ESI) for RSC Advances.

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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Contents

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

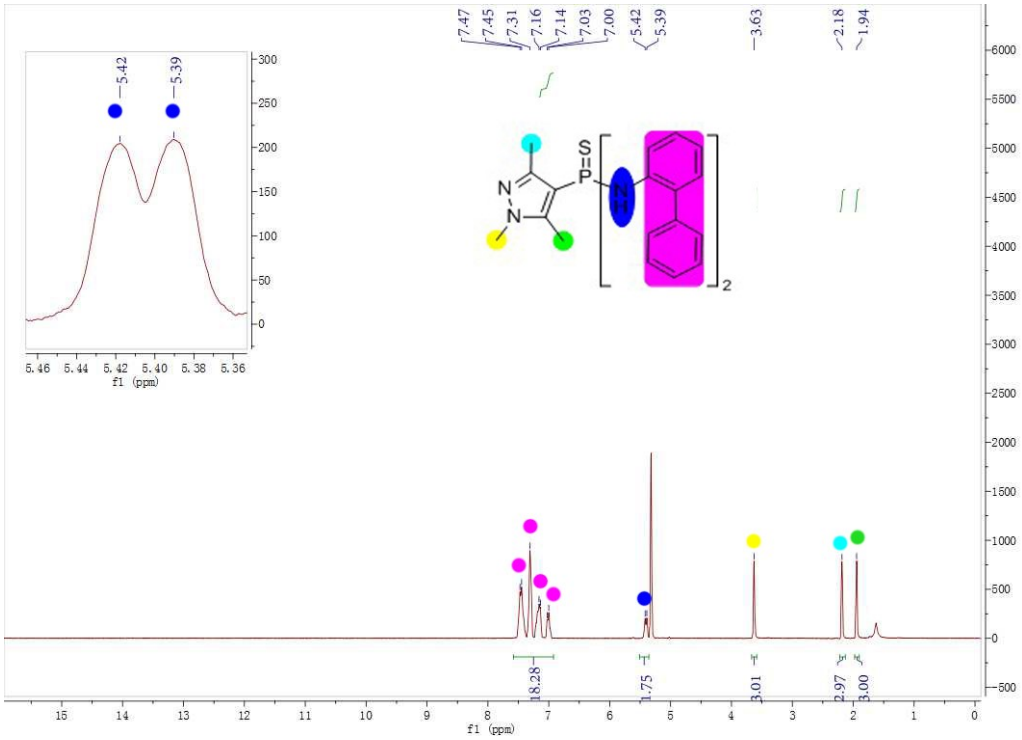

Fig. 1 ^{1}H NMR spectrum of **1a** (300 MHz, CD_2Cl_2, 298 K).

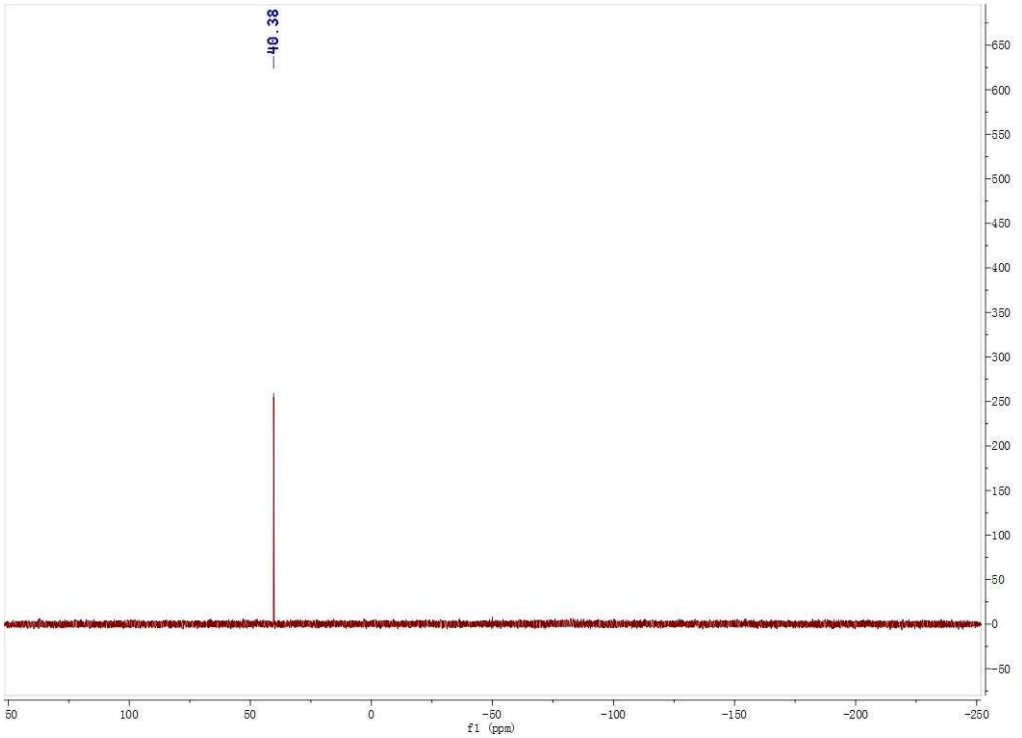

Fig. 2 ^{31}P NMR spectrum of **1a** (121.5 MHz, CD_2Cl_2, 298 K).

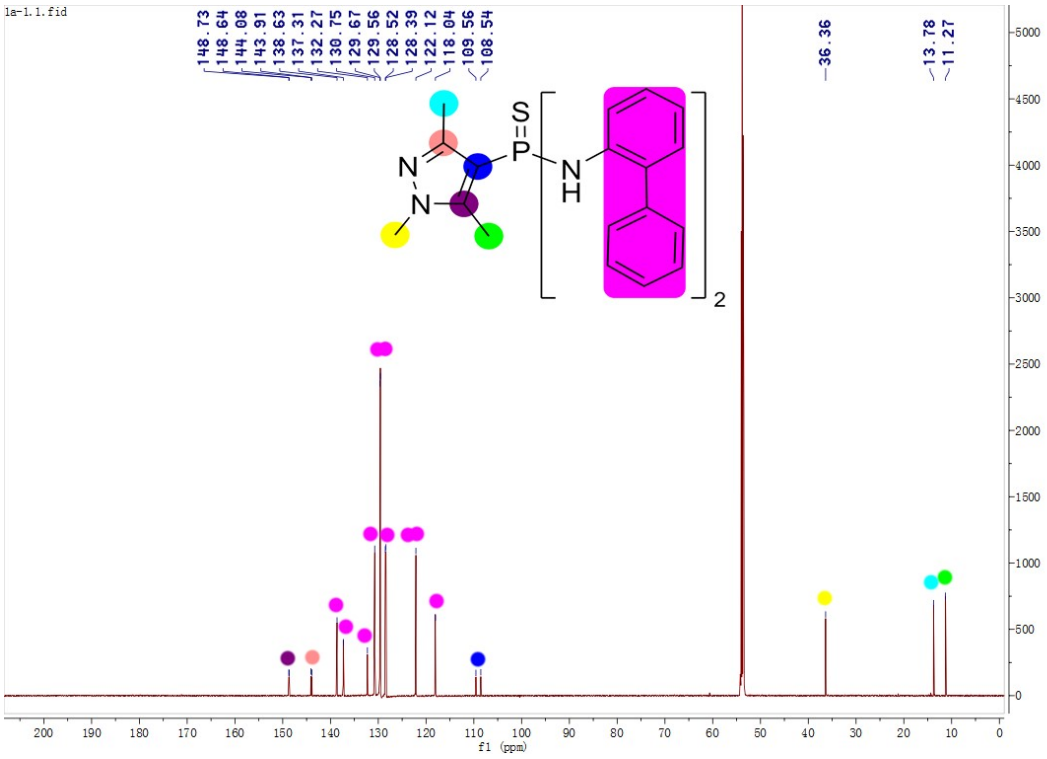

Fig. 3 ^{13}C NMR spectrum of **1a** (150 MHz, CD_2Cl_2, 298 K).

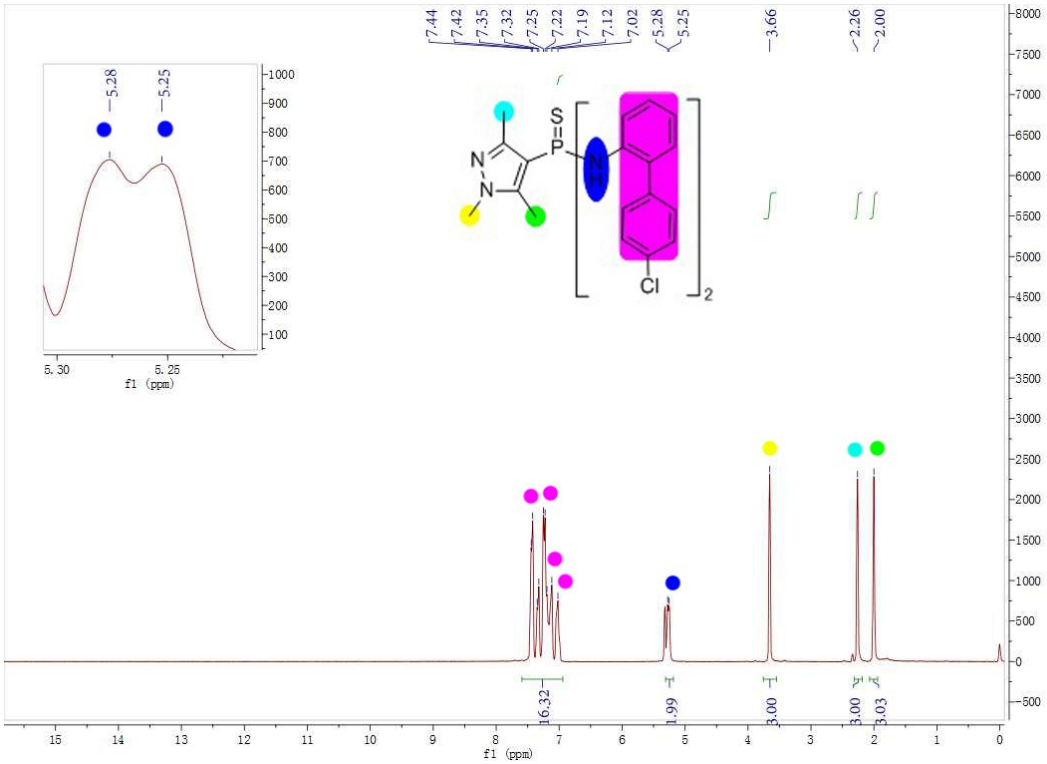

Fig. 4 ^{1}H NMR spectrum of **1b** (300 MHz, CD_2Cl_2, 298 K).

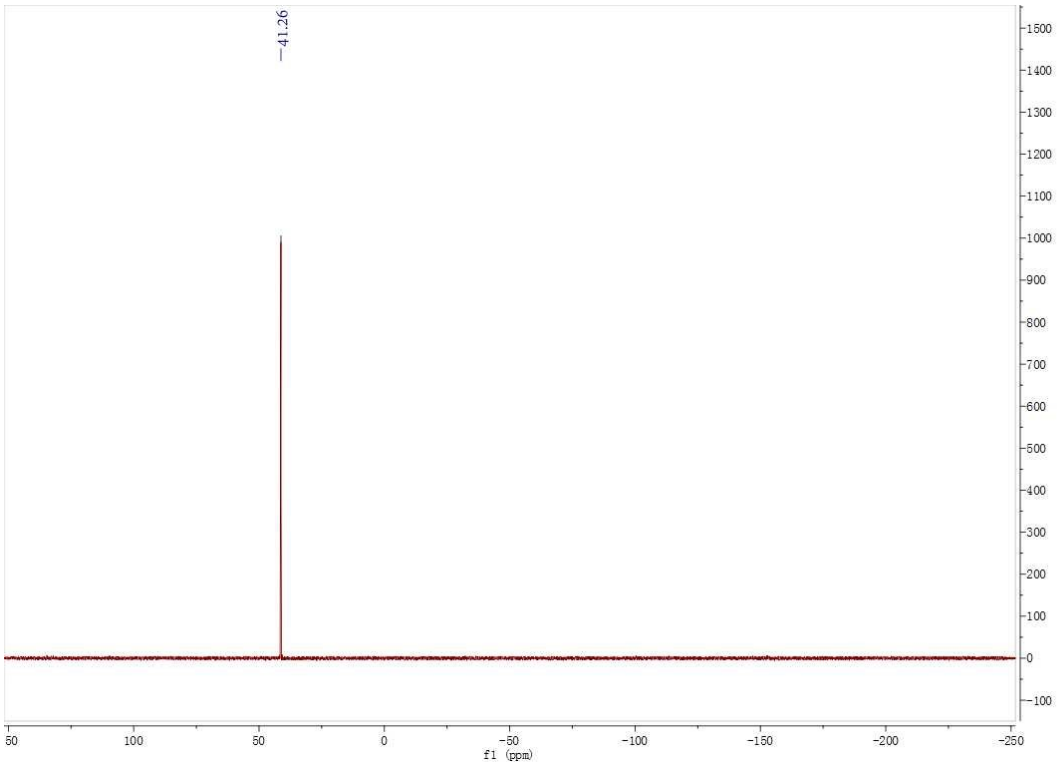

Fig. 5 ^{31}P NMR spectrum of **1b** (121.5 MHz, CD_2Cl_2, 298 K).

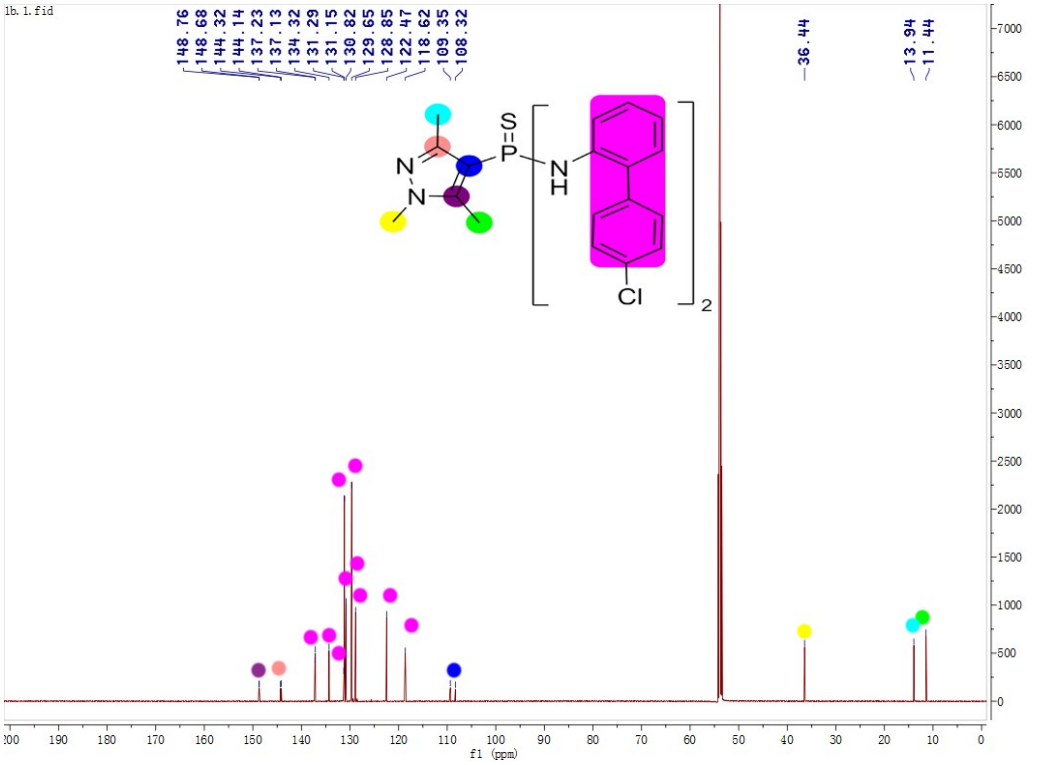

Fig. 6 ^{13}C NMR spectrum of **1b** (150 MHz, CD_2Cl_2, 298 K).

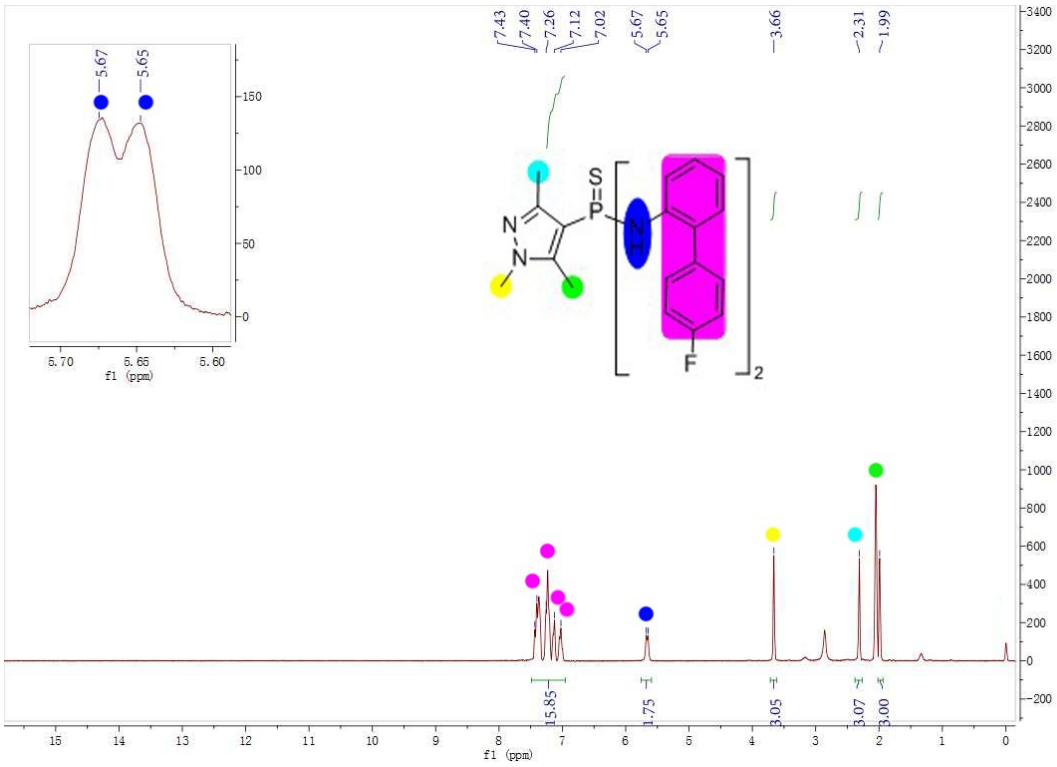

Fig. 7 ^{1}H NMR spectrum of **1c** (300 MHz, CD_3CN, 298 K).

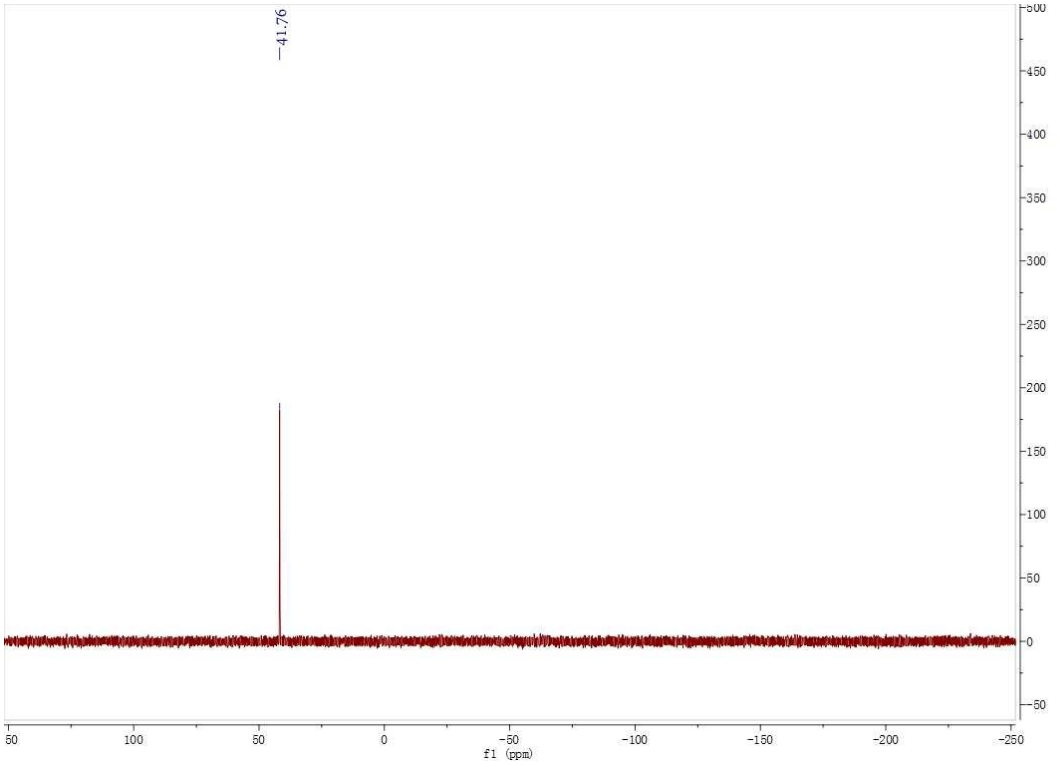

Fig. 8 ^{31}P NMR spectrum of **1c** (121.5 MHz, CD_3CN, 298 K).

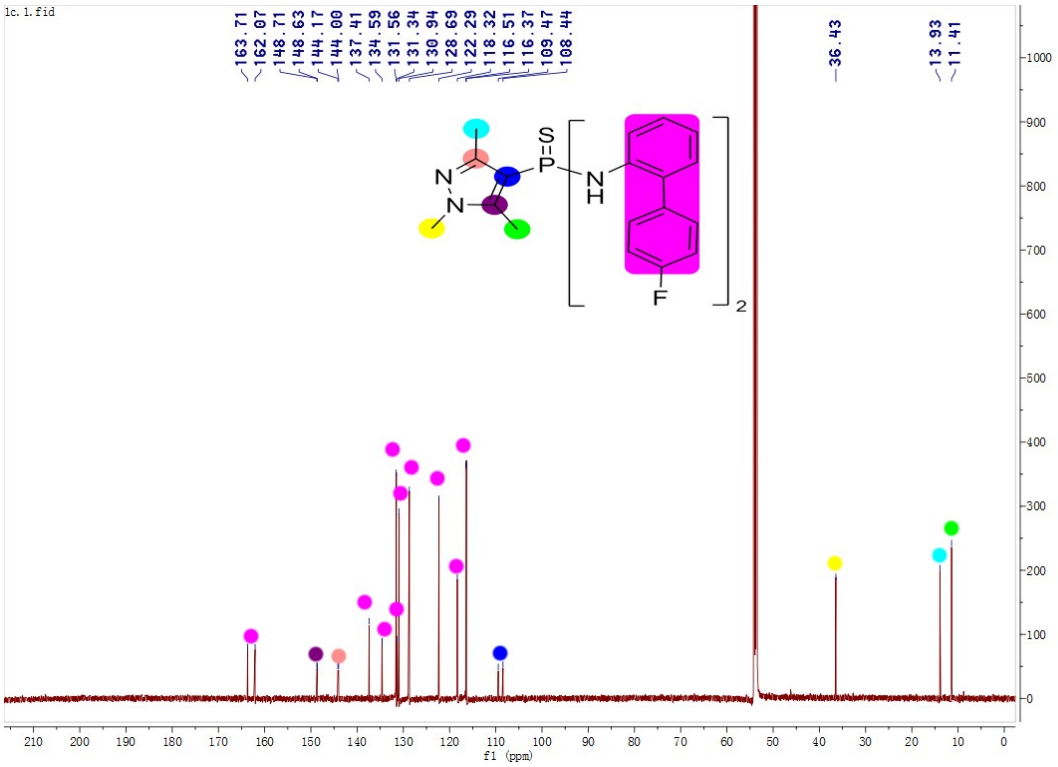

Fig. 9 ^{13}C NMR spectrum of **1c** (150 MHz, CD_2Cl_2, 298 K).

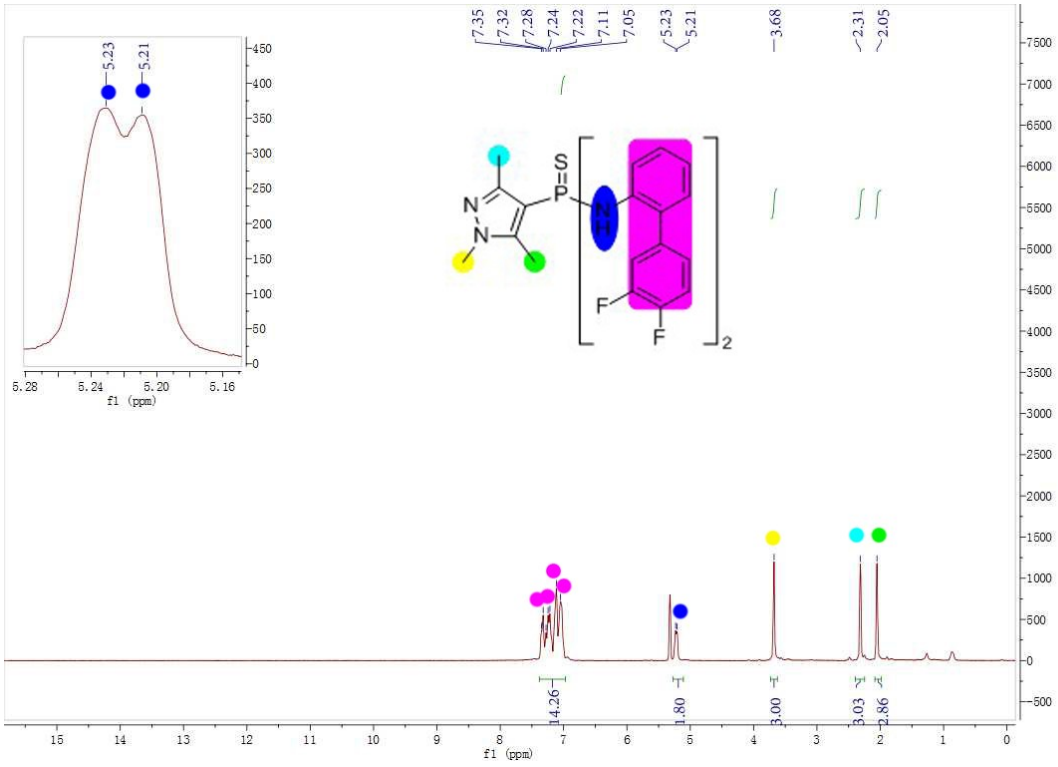

Fig. 10 ^{1}H NMR spectrum of **1d** (300 MHz, CD_2Cl_2, 298 K).

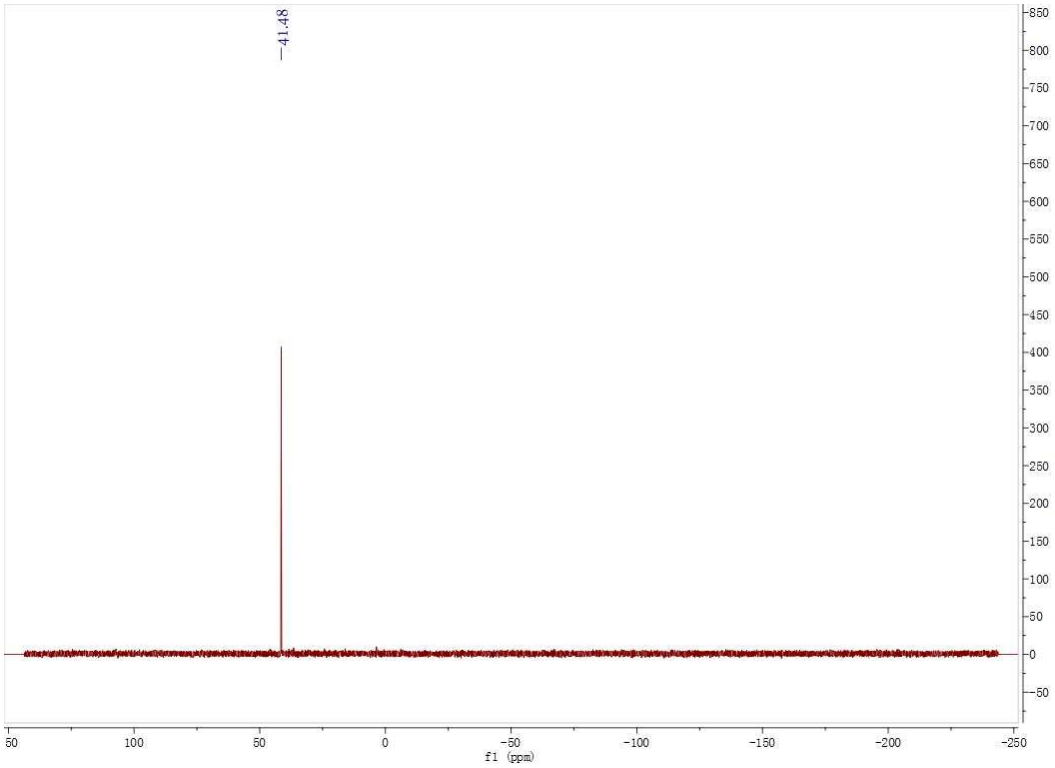

Fig. 11 ^{31}P NMR spectrum of **1d** (121.5 MHz, CD_2Cl_2, 298 K).

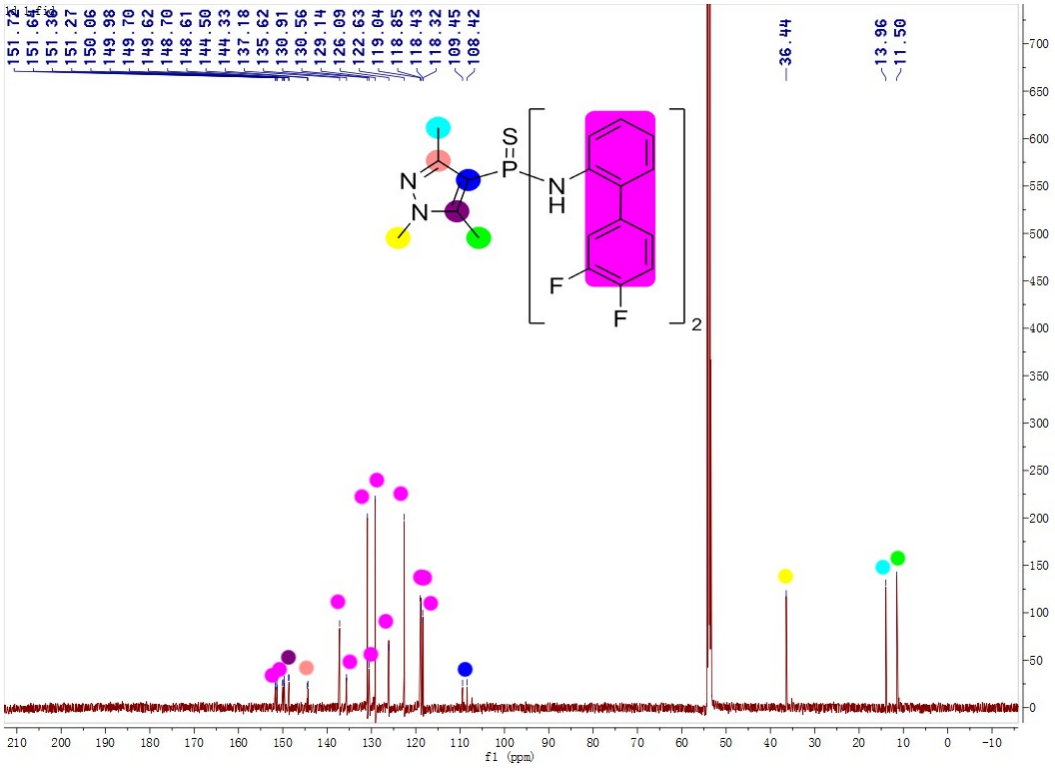

Fig.12 ^{13}C NMR spectrum of **1d** (150 MHz, CD_2Cl_2, 298 K).

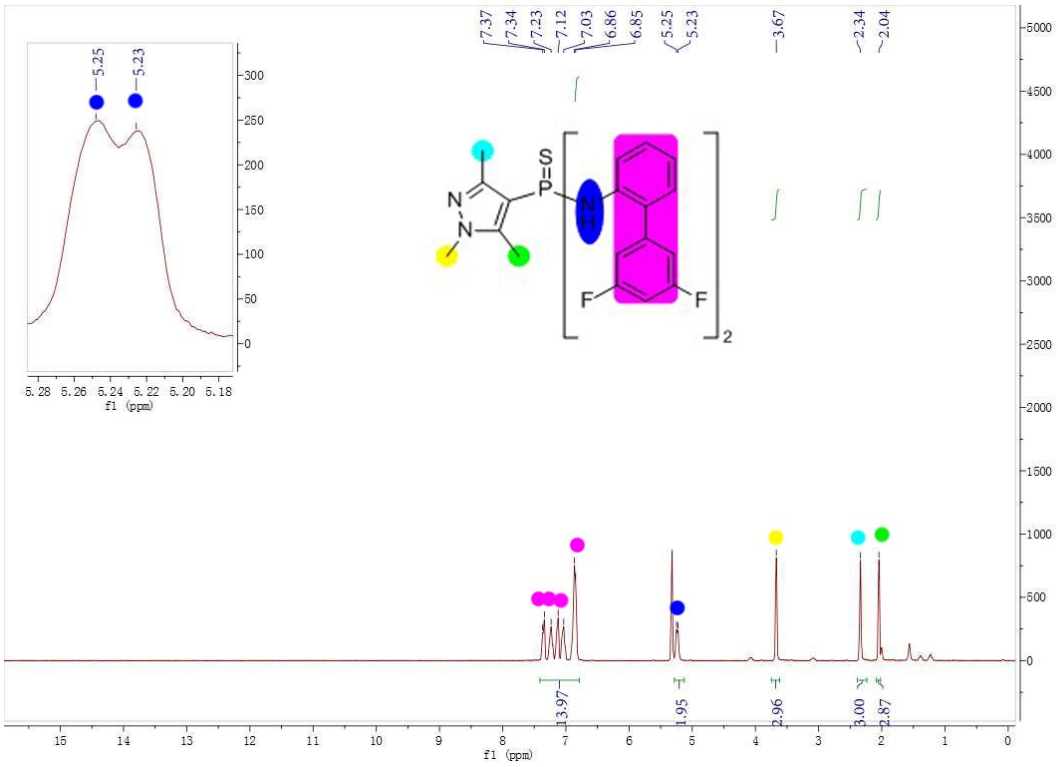

Fig. 13 ^{1}H NMR spectrum of **1e** (300 MHz, CD_2Cl_2, 298 K).

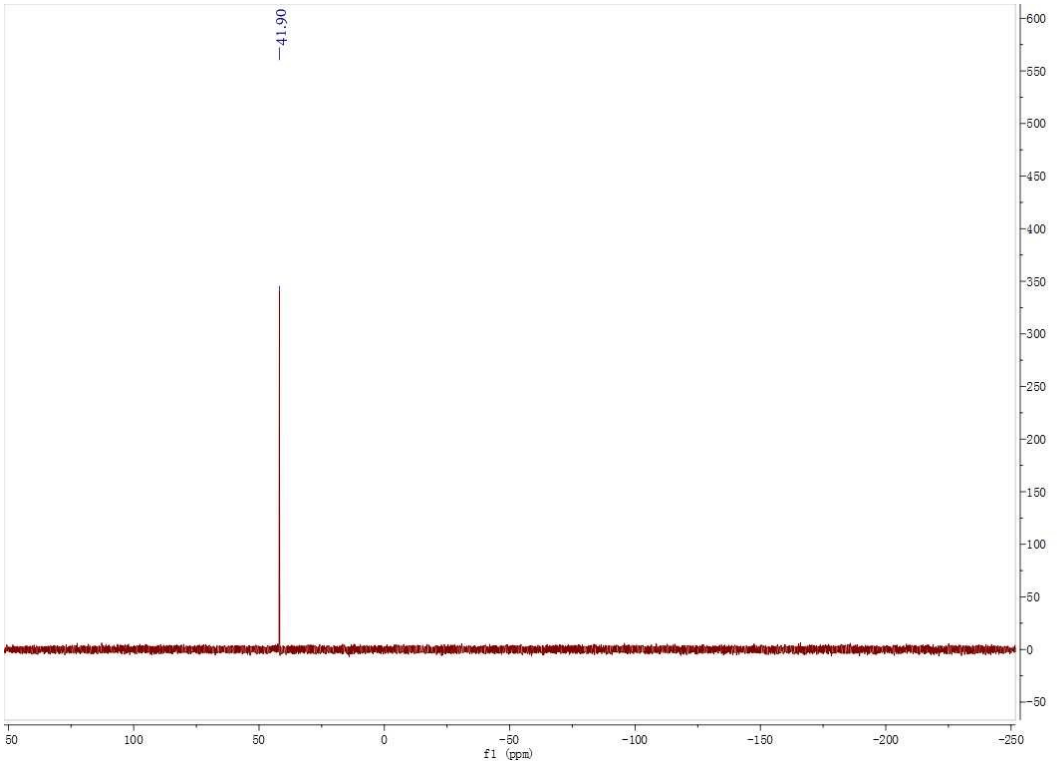

Fig. 14 ^{31}P NMR spectrum of **1e** (121.5 MHz, CD_2Cl_2, 298 K).

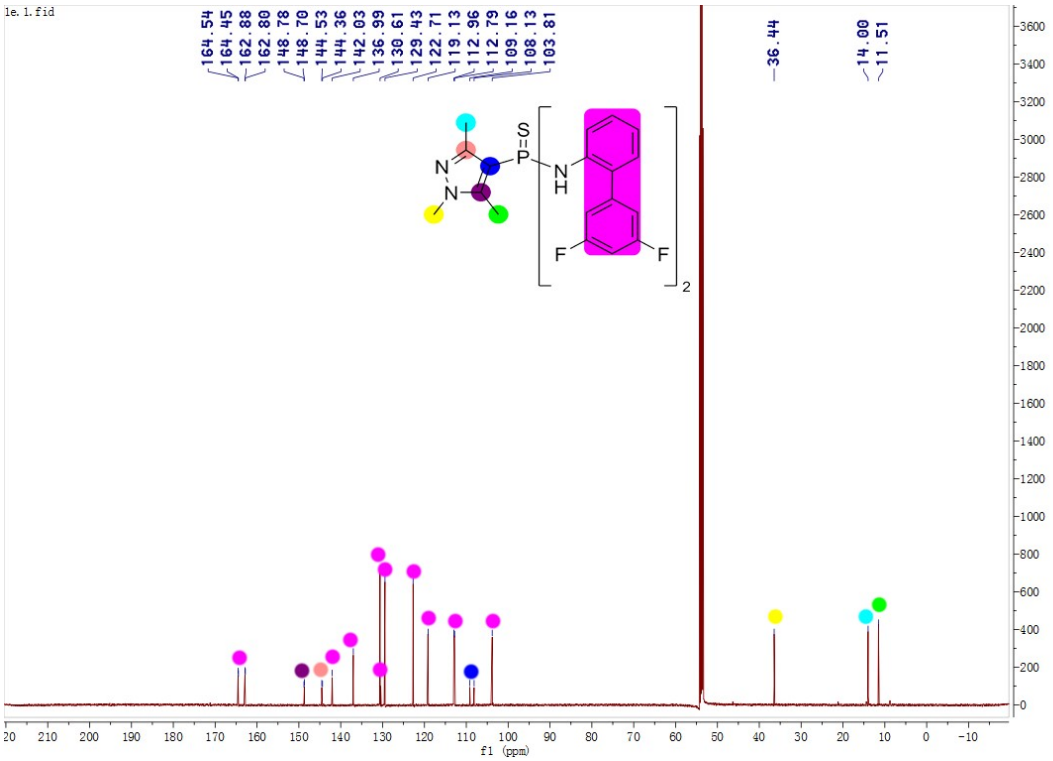

Fig. 15 ^{13}C NMR spectrum of **1e** (150 MHz, CD_2Cl_2, 298 K).

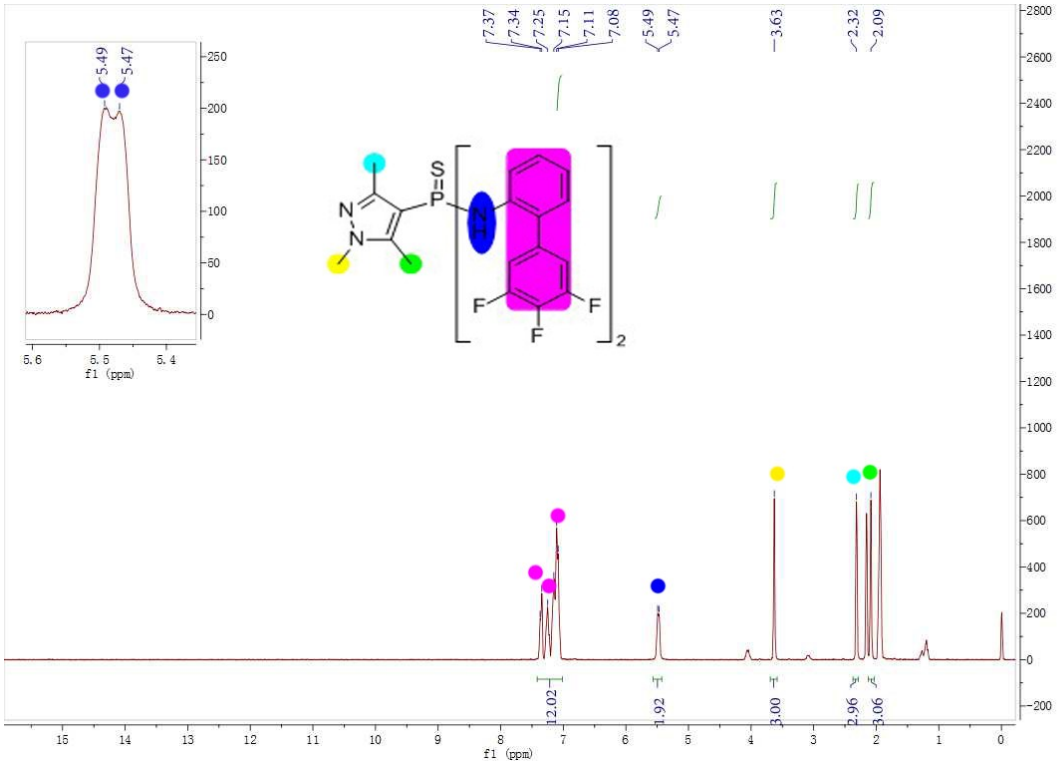

Fig. 16 ^{1}H NMR spectrum of **1f** (300 MHz, CD_3CN, 298 K).

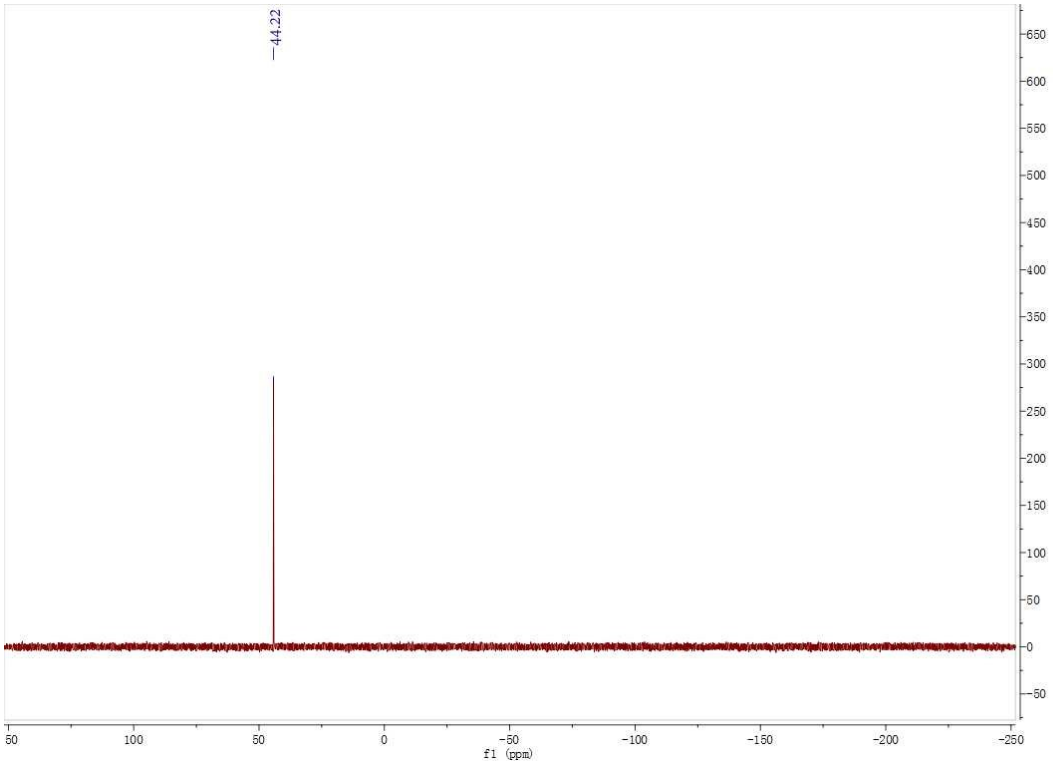

Fig. 17 ^{31}P NMR spectrum of **1f** (121.5 MHz, CD_3CN, 298 K).

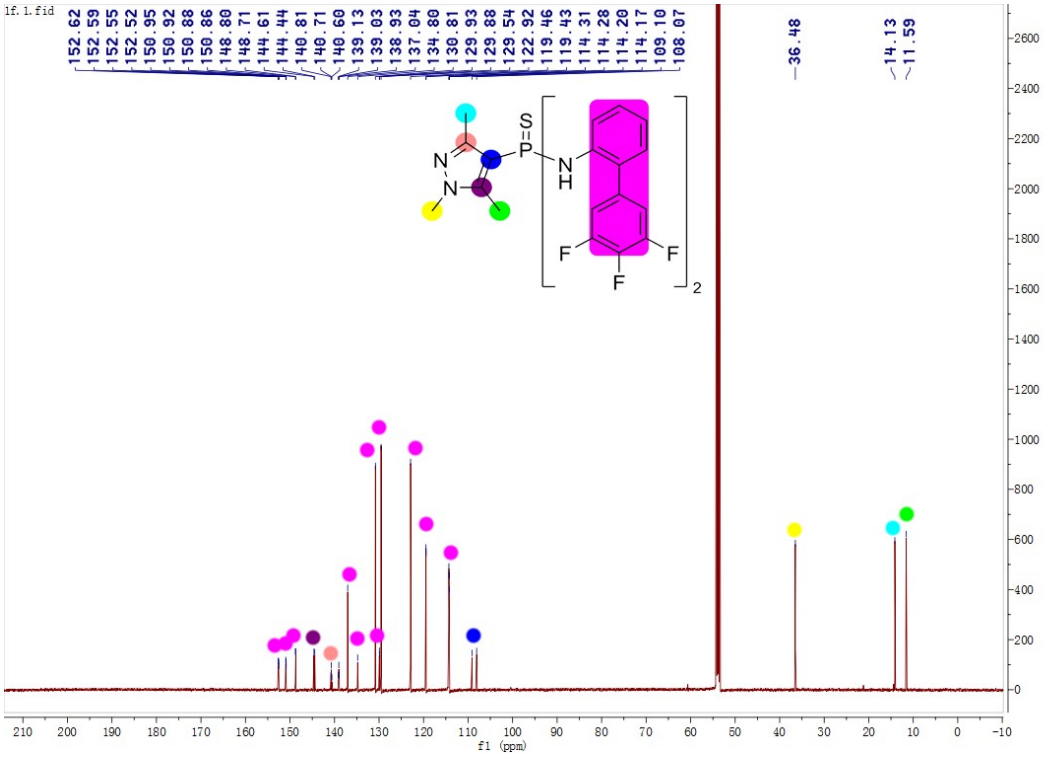

Fig. 18 ^{13}C NMR spectrum of **1f** (150 MHz, CD_2Cl_2, 298 K).

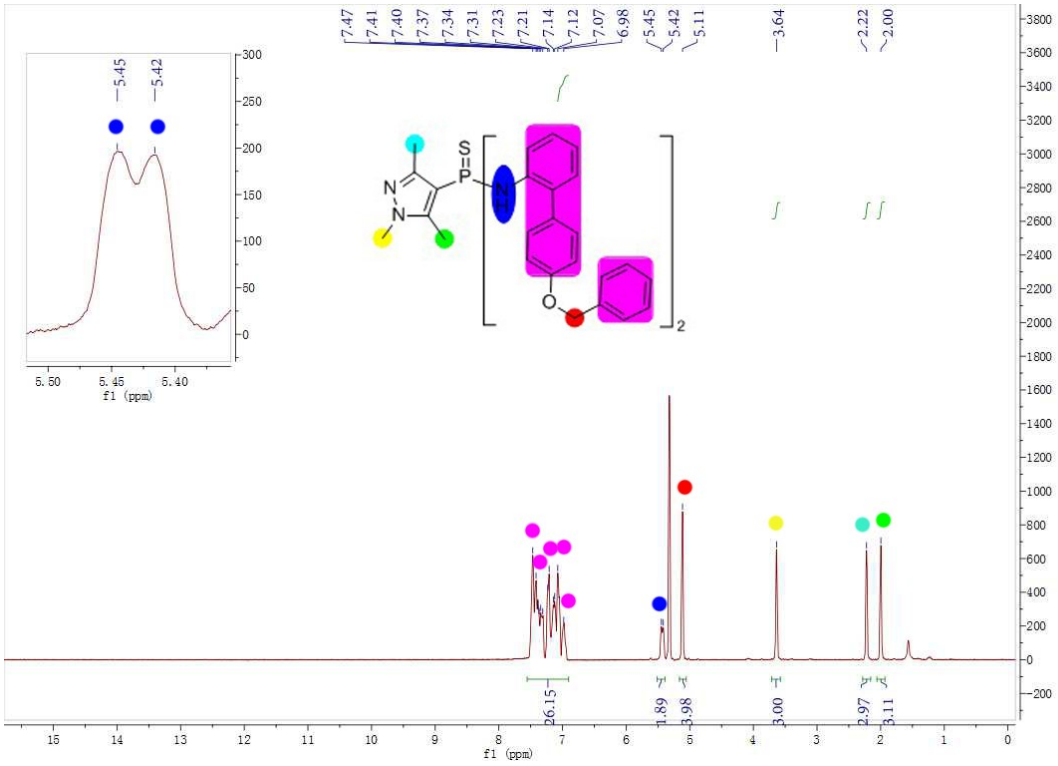

Fig. 19 ^{1}H NMR spectrum of **1g** (300 MHz, CD_2Cl_2, 298 K).

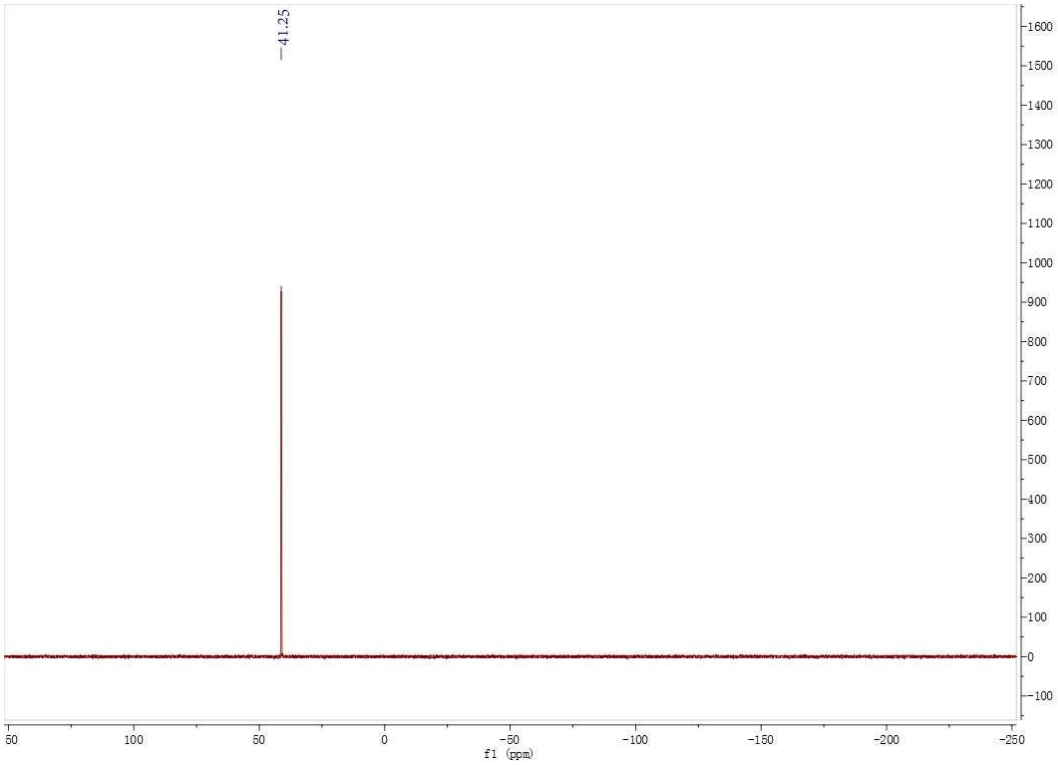

Fig. 20 ^{31}P NMR spectrum of **1g** (121.5 MHz, CD_2Cl_2, 298 K).

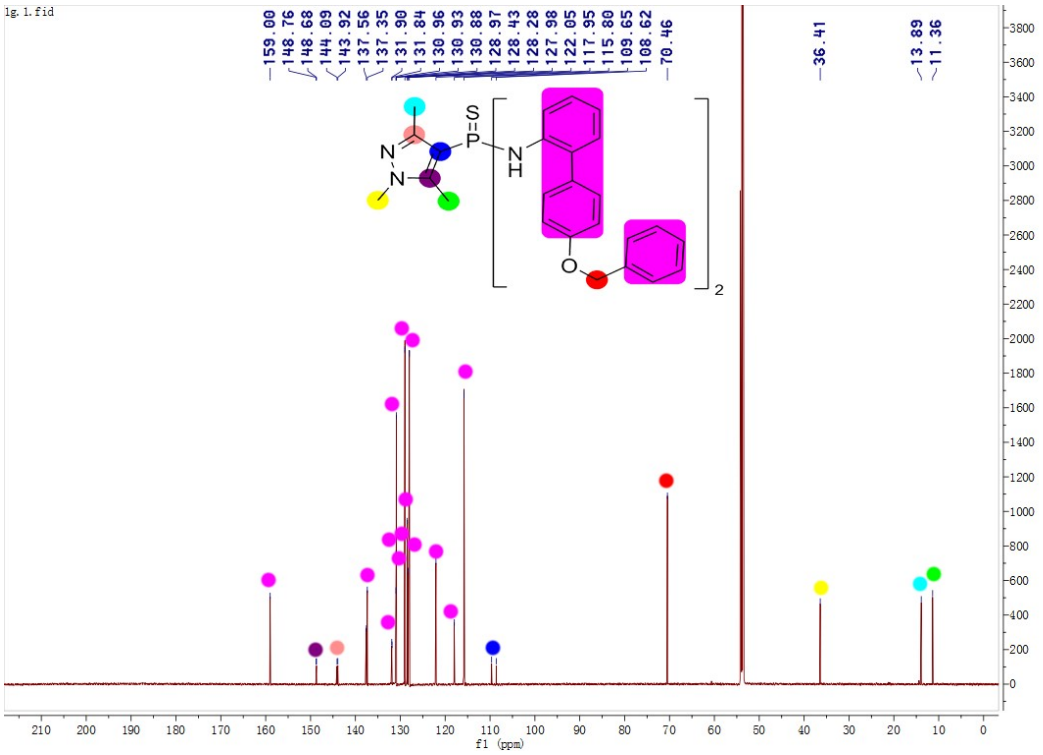

Fig. 21 ^{13}C NMR spectrum of **1g** (150 MHz, CD_2Cl_2, 298 K).

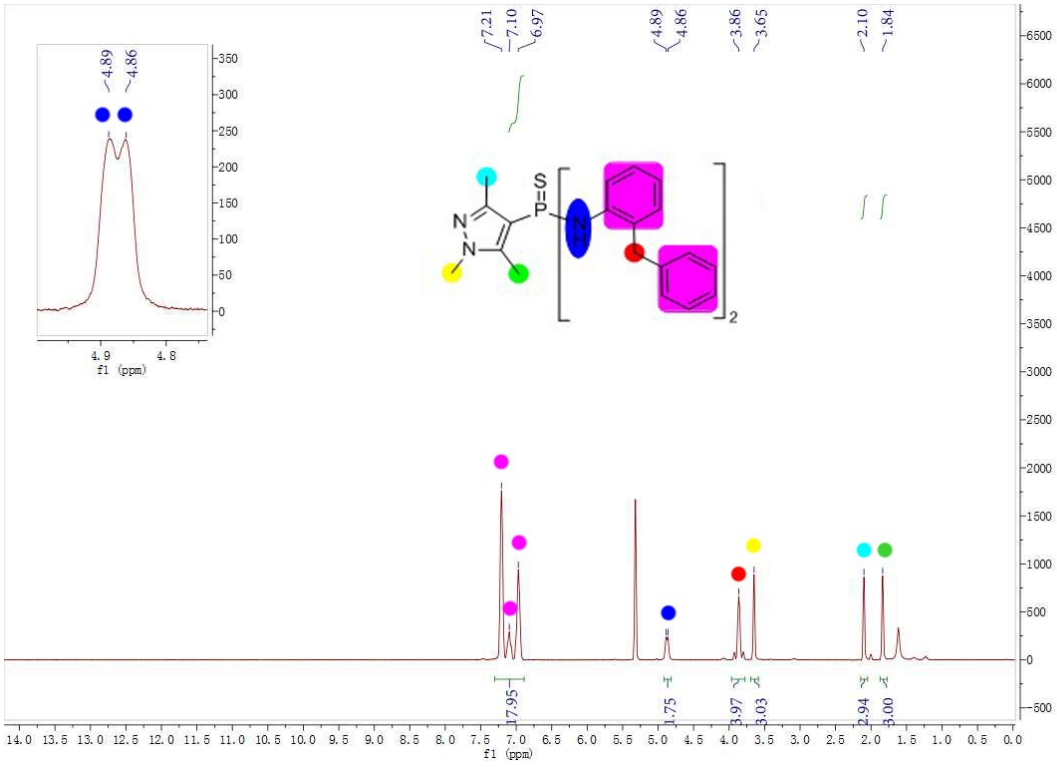

Fig. 22 ^{1}H NMR spectrum of **1h** (300 MHz, CD_2Cl_2, 298 K).

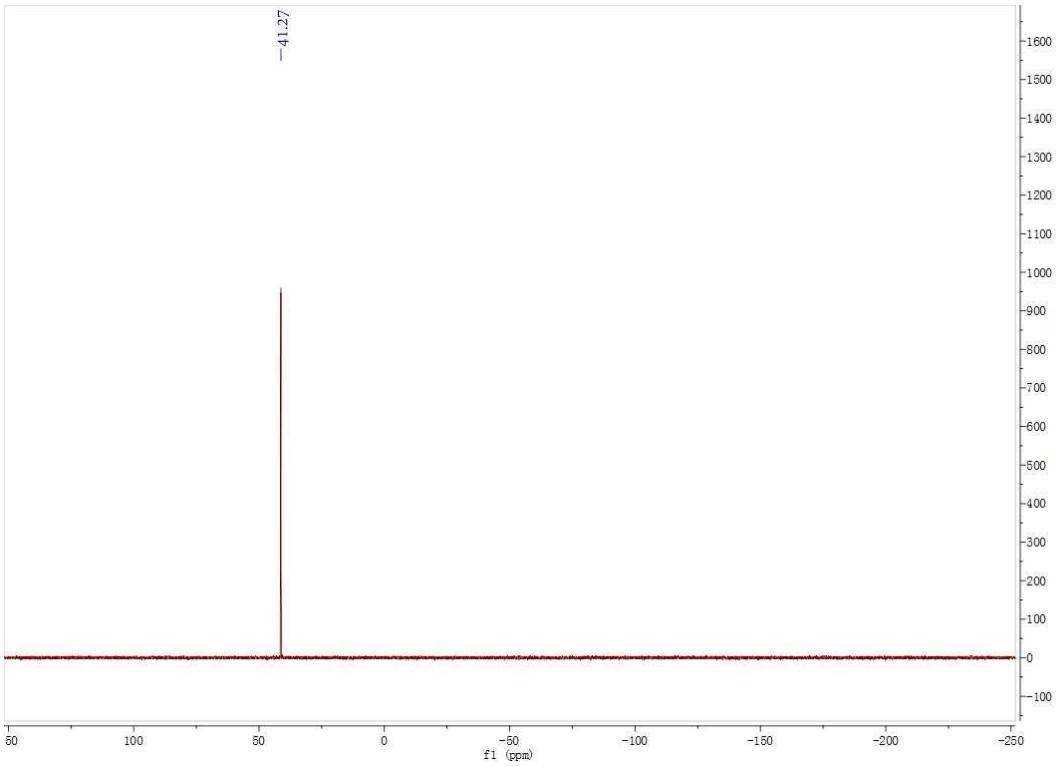

Fig. 23 ^{31}P NMR spectrum of **1h** (121.5 MHz, CD_2Cl_2, 298 K).

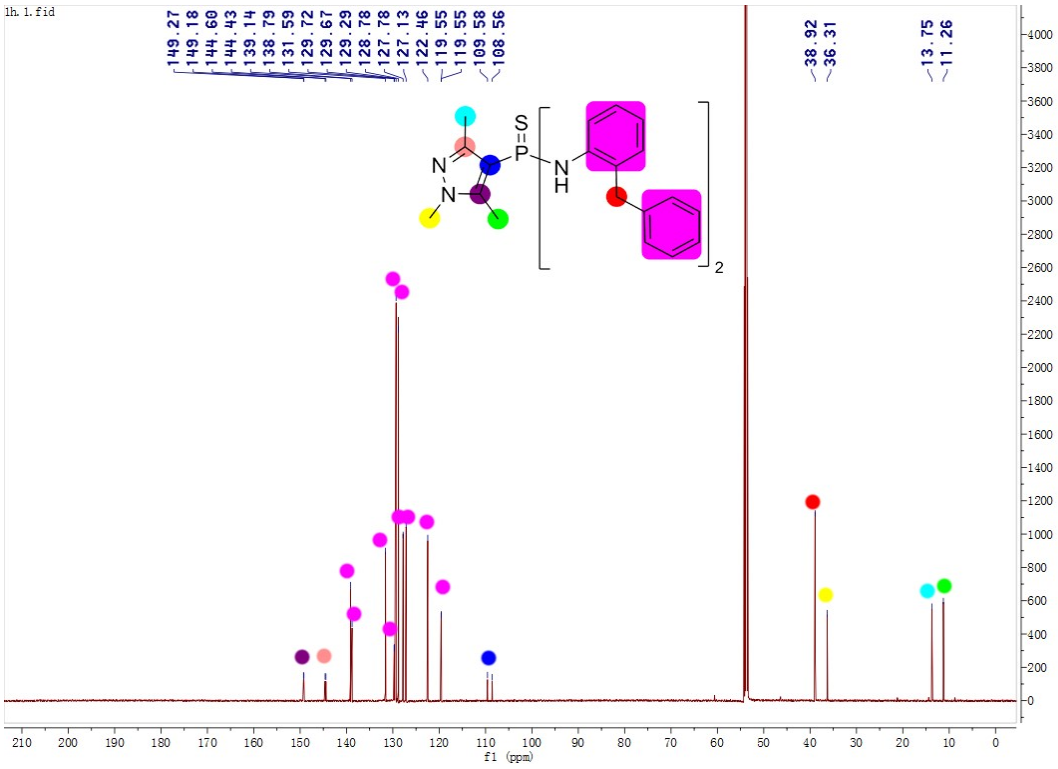

Fig. 24 ^{13}C NMR spectrum of **1h** (150 MHz, CD_2Cl_2, 298 K).

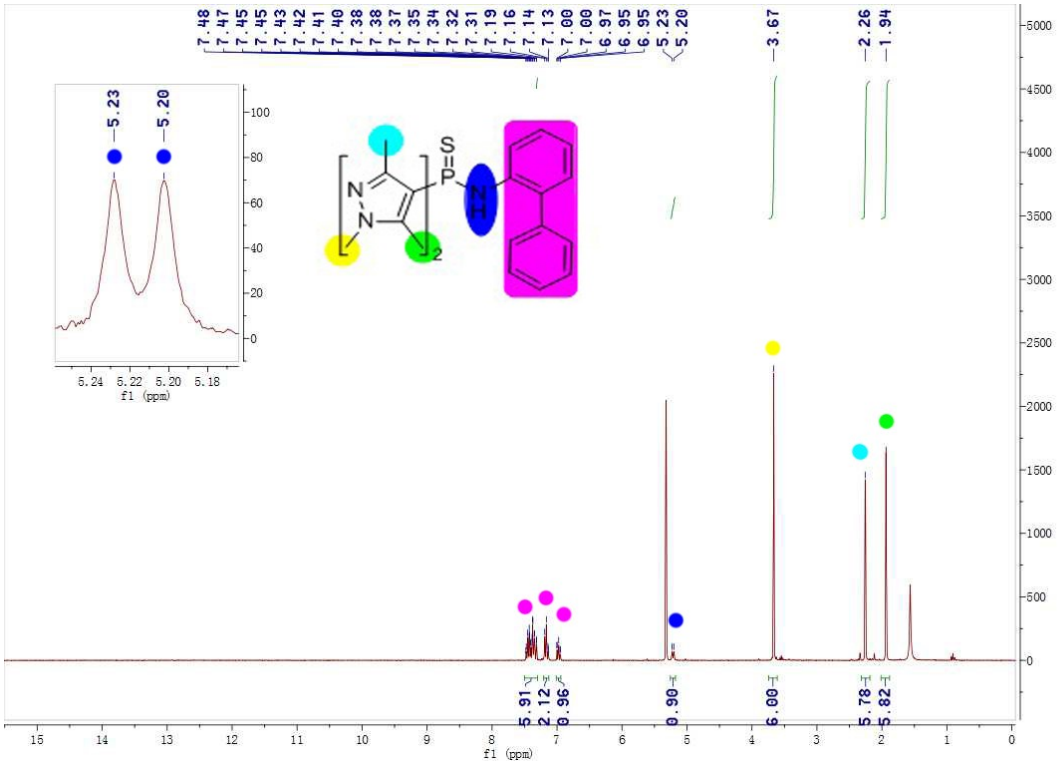

Fig. 25 ^{1}H NMR spectrum of **2a** (300 MHz, CD_2Cl_2, 298 K).

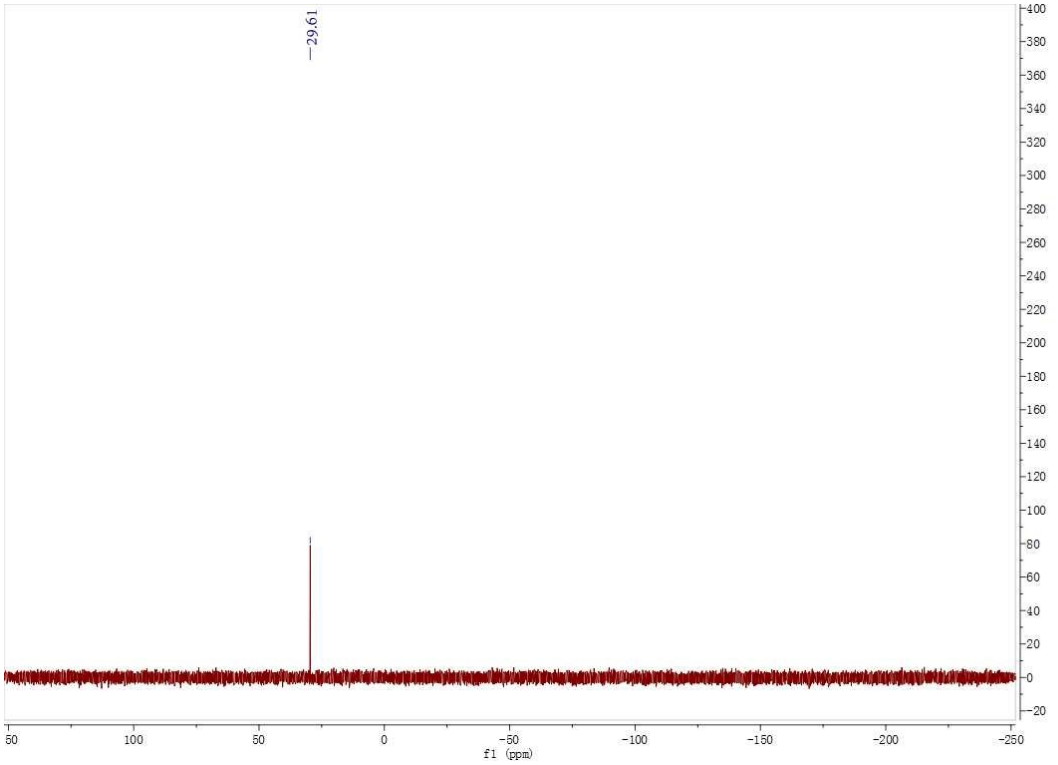

Fig. 26 ^{31}P NMR spectrum of **2a** (121.5 MHz, CD_2Cl_2, 298 K).

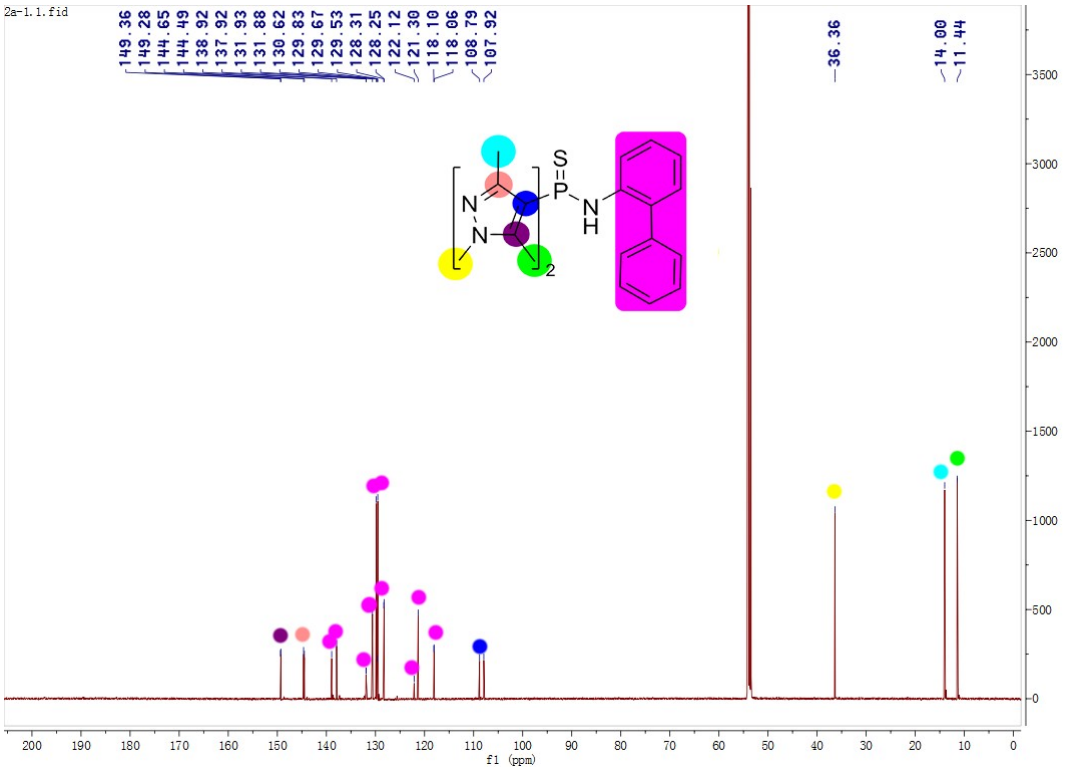

Fig. 27 ^{13}C NMR spectrum of **2a** (150 MHz, CD_2Cl_2, 298 K).

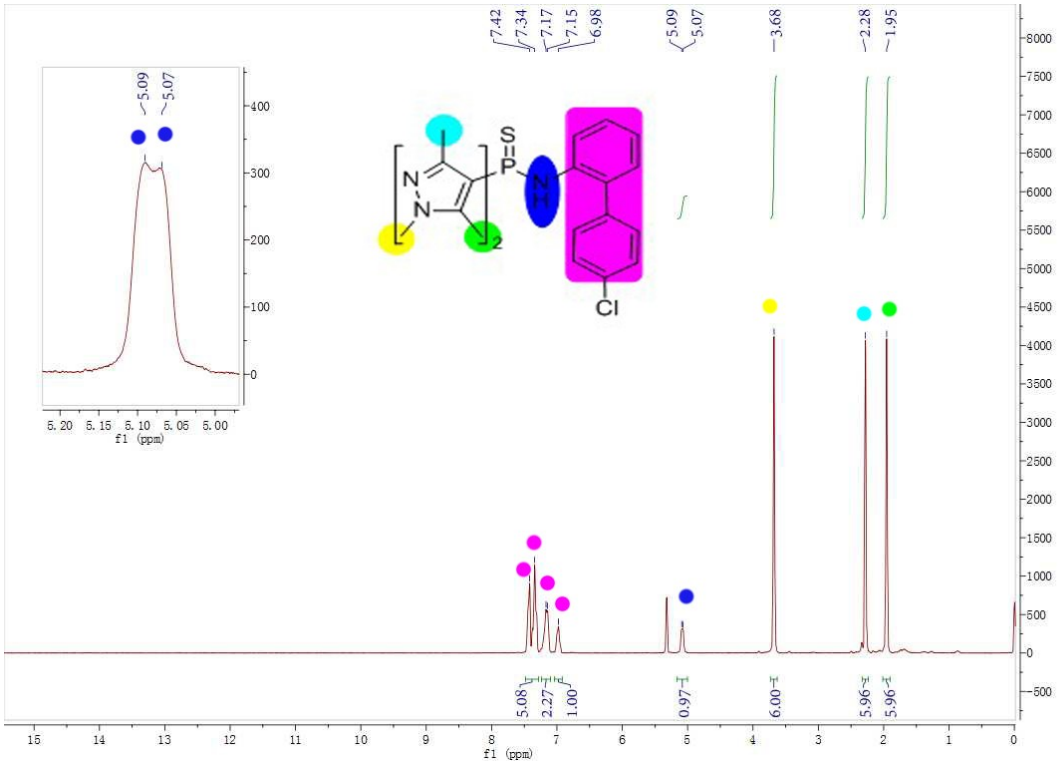

Fig. 28 ^{1}H NMR spectrum of **2b** (300 MHz, CD_2Cl_2, 298 K).

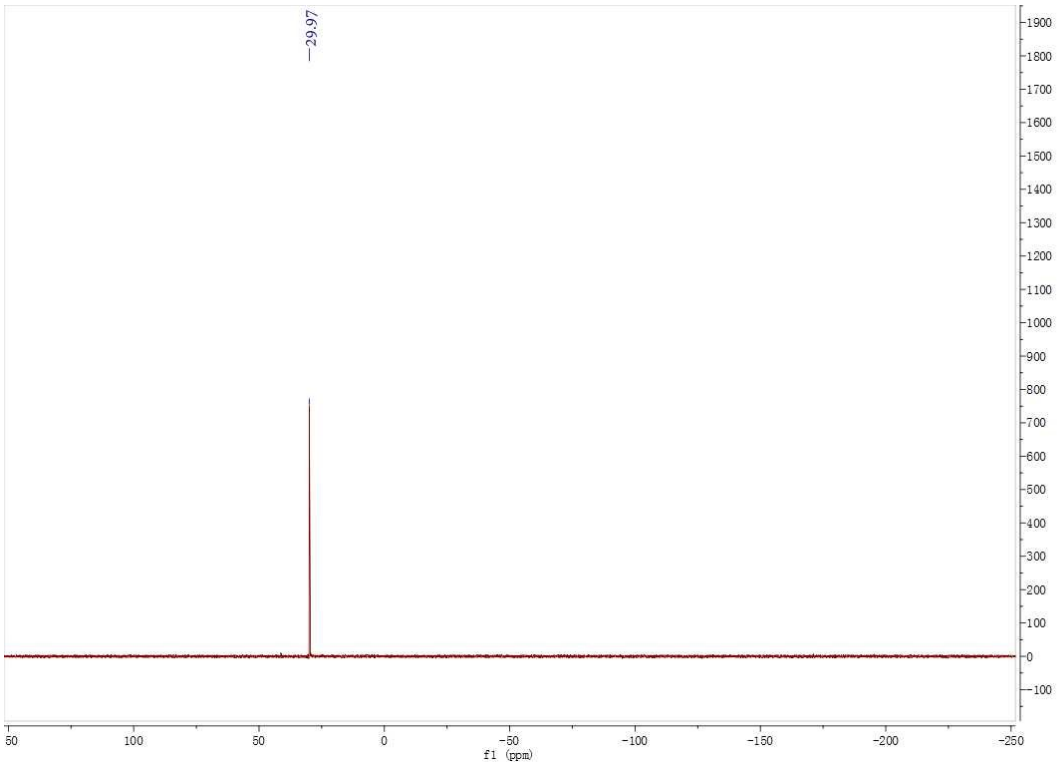

Fig. 29 ^{31}P NMR spectrum of **2b** (121.5 MHz, CD_2Cl_2, 298 K).

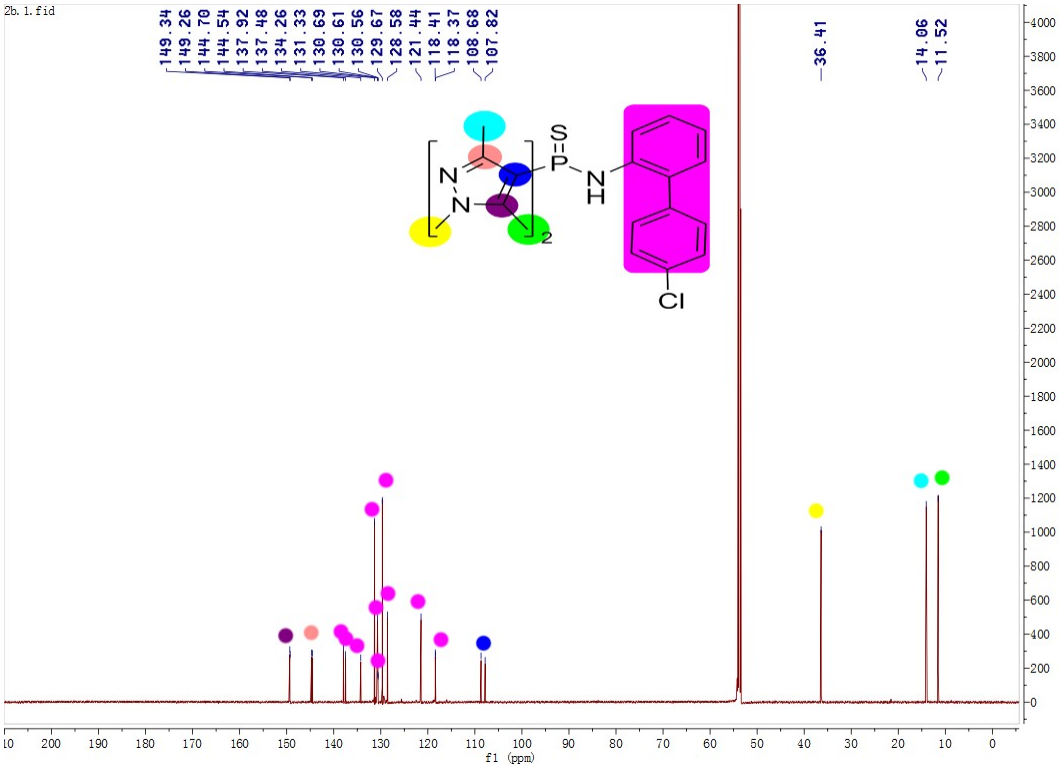

Fig. 30 ^{13}C NMR spectrum of **2b** (150 MHz, CD_2Cl_2, 298 K).

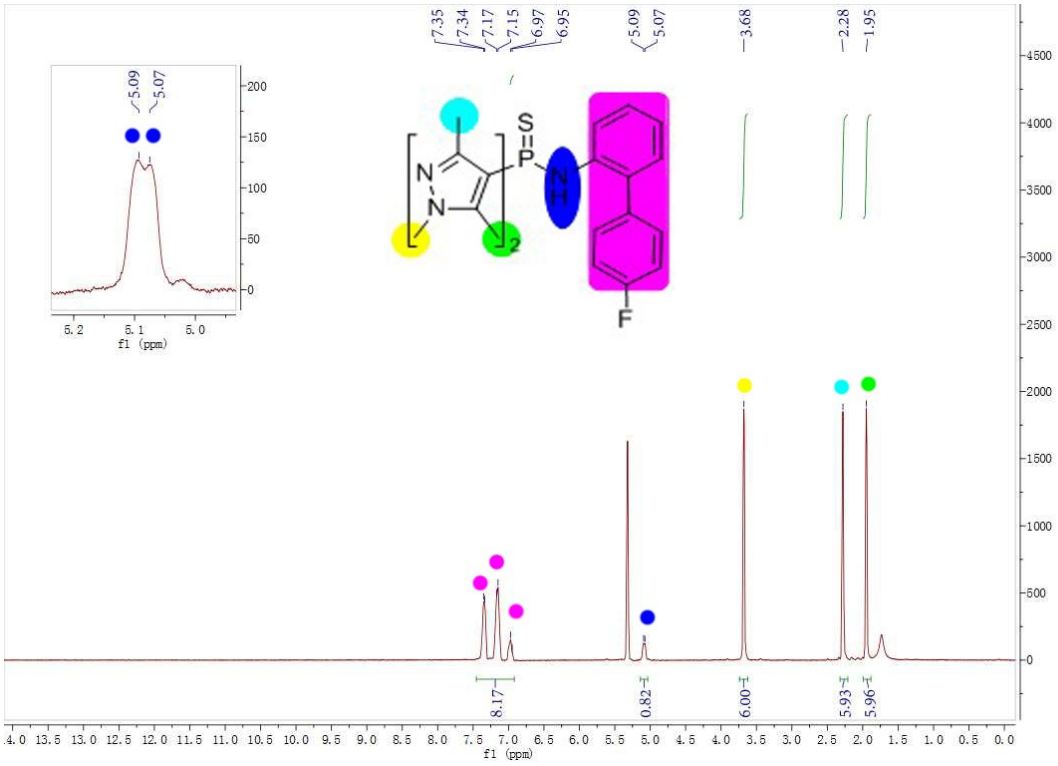

Fig. 31 ^{1}H NMR spectrum of **2c** (300 MHz, CD_2Cl_2, 298 K).

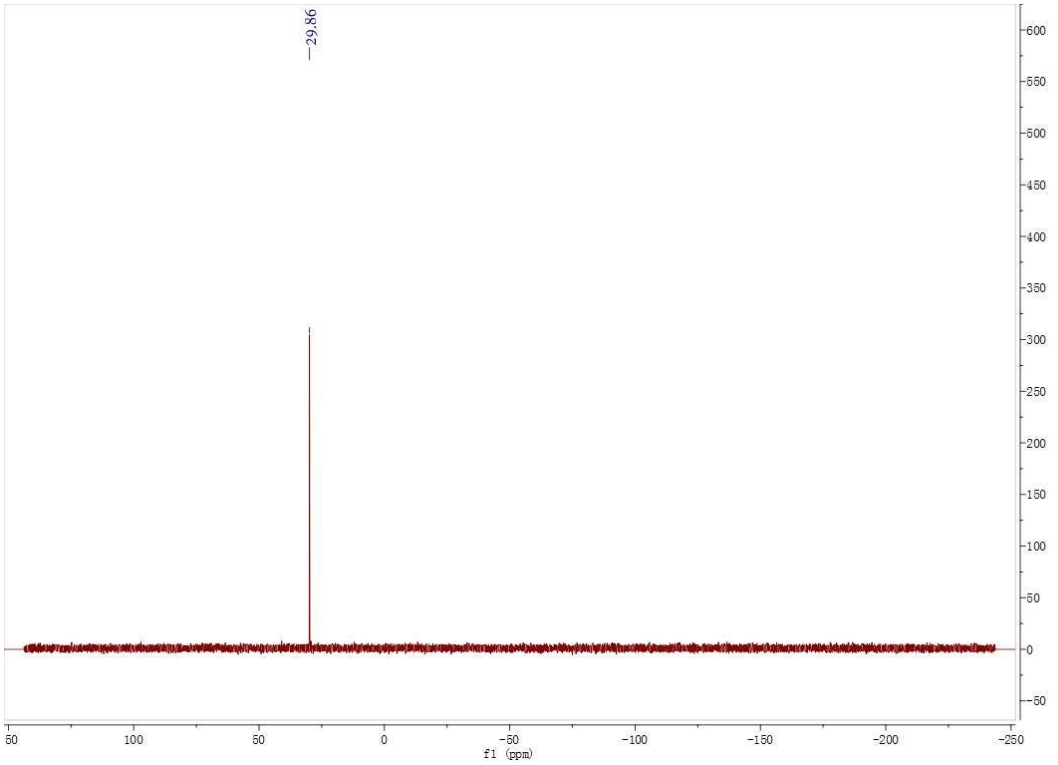

Fig. 32 ^{31}P NMR spectrum of **2c** (121.5 MHz, CD_2Cl_2, 298 K).

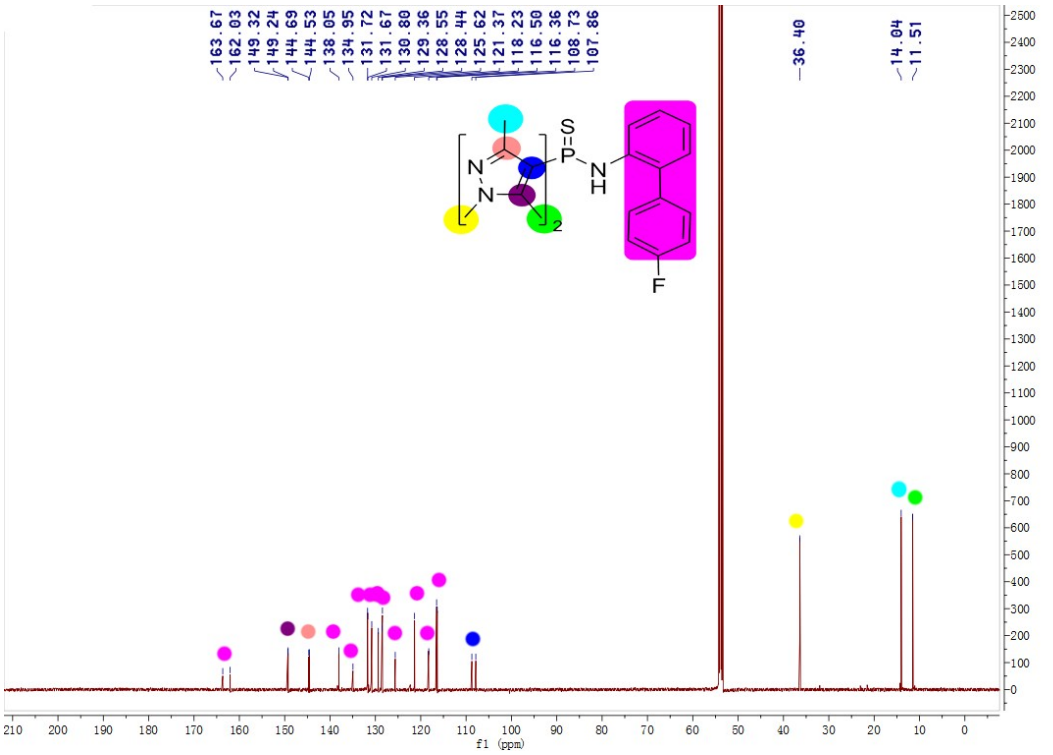

Fig. 33 ^{13}C NMR spectrum of **2c** (150 MHz, CD_2Cl_2, 298 K).

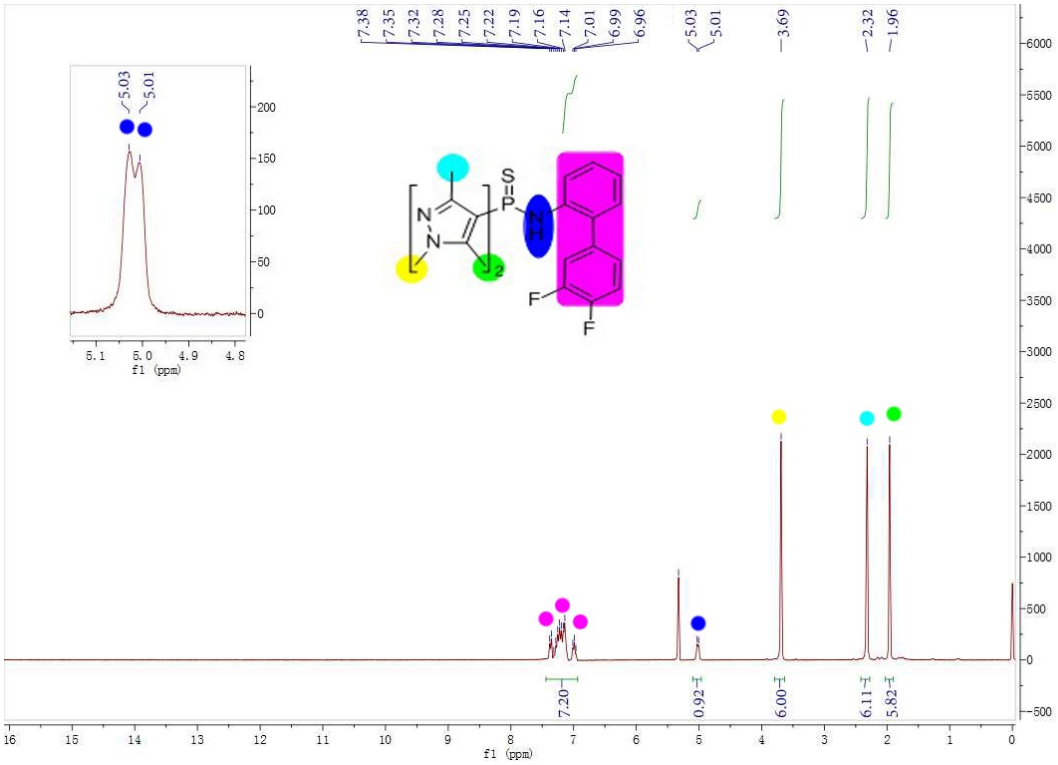

Fig. 34 ^{1}H NMR spectrum of **2d** (300 MHz, CD_2Cl_2, 298 K).

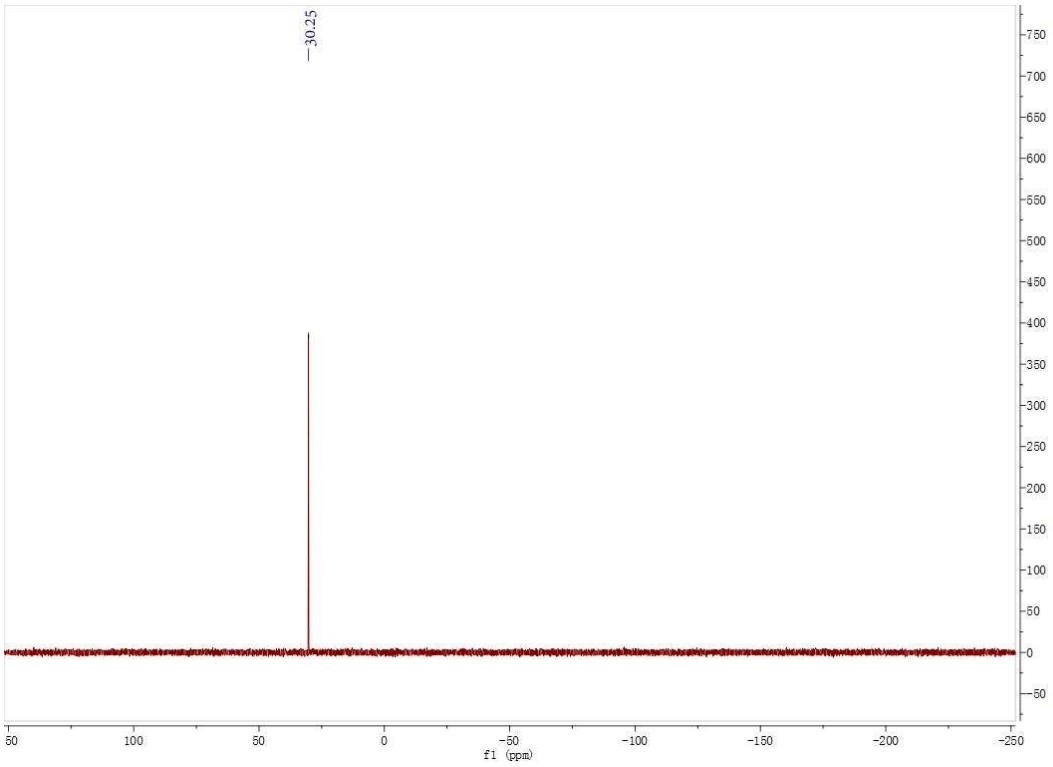

Fig. 35 ^{31}P NMR spectrum of **2d** (121.5 MHz, CD_2Cl_2, 298 K).

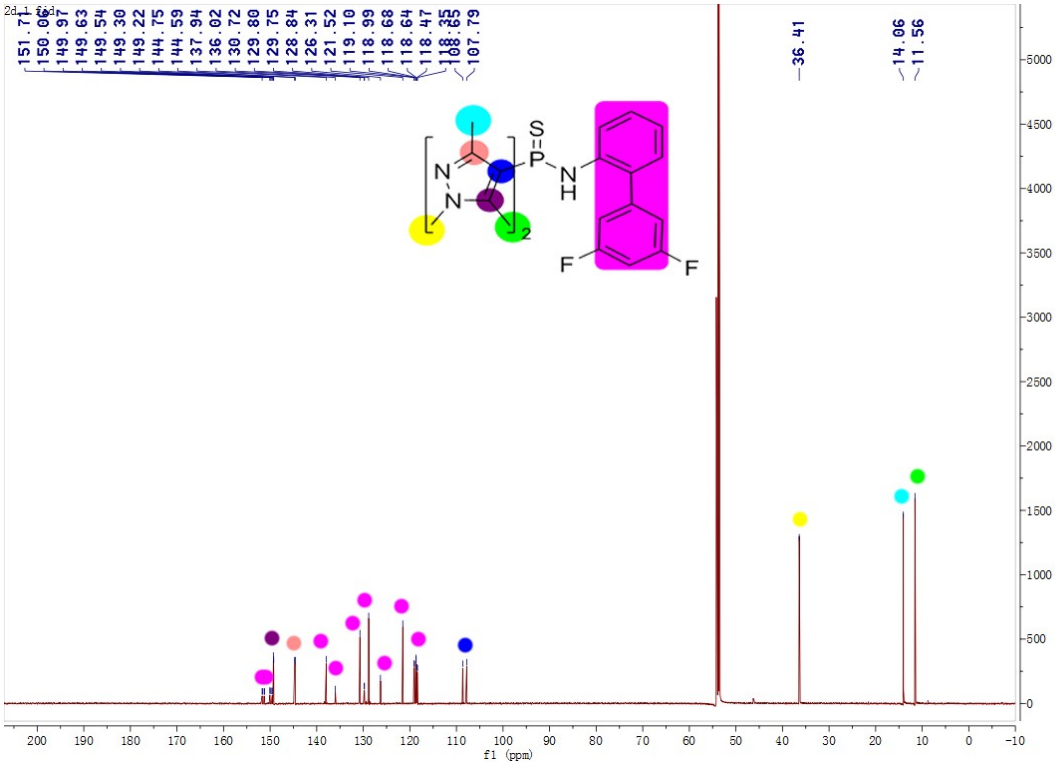

Fig. 36 ^{13}C NMR spectrum of **2d** (150 MHz, CD_2Cl_2, 298 K).

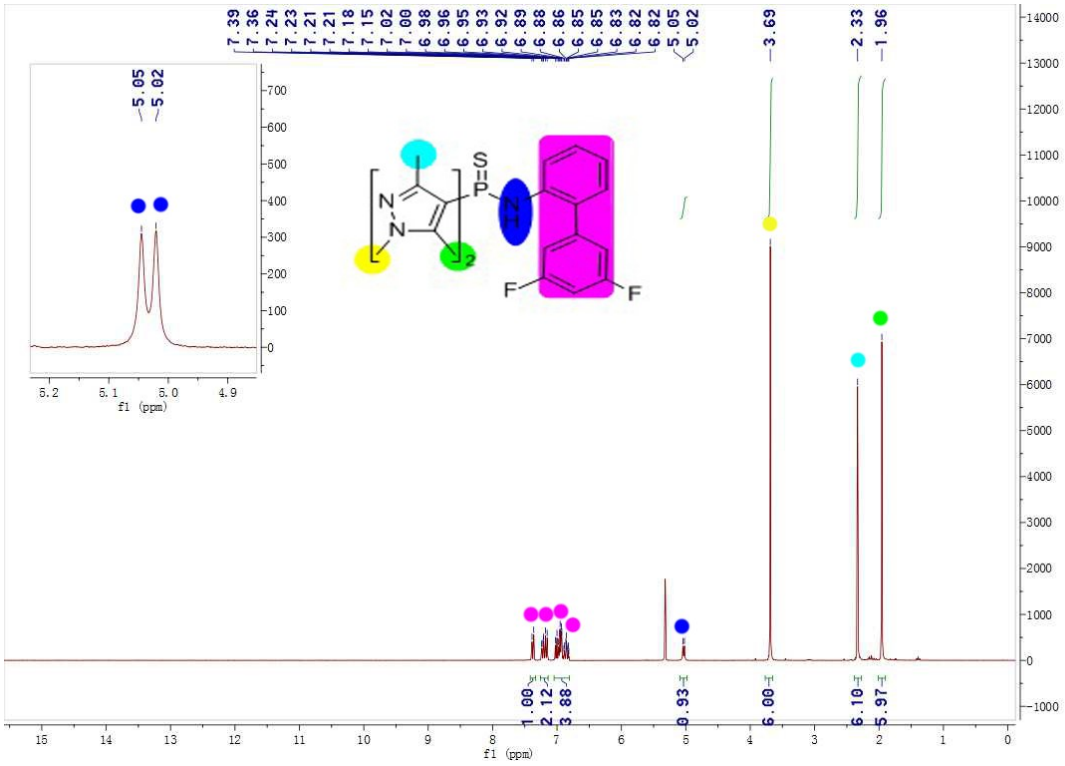

Fig. 37 ^{1}H NMR spectrum of **2e** (300 MHz, CD_2Cl_2, 298 K).

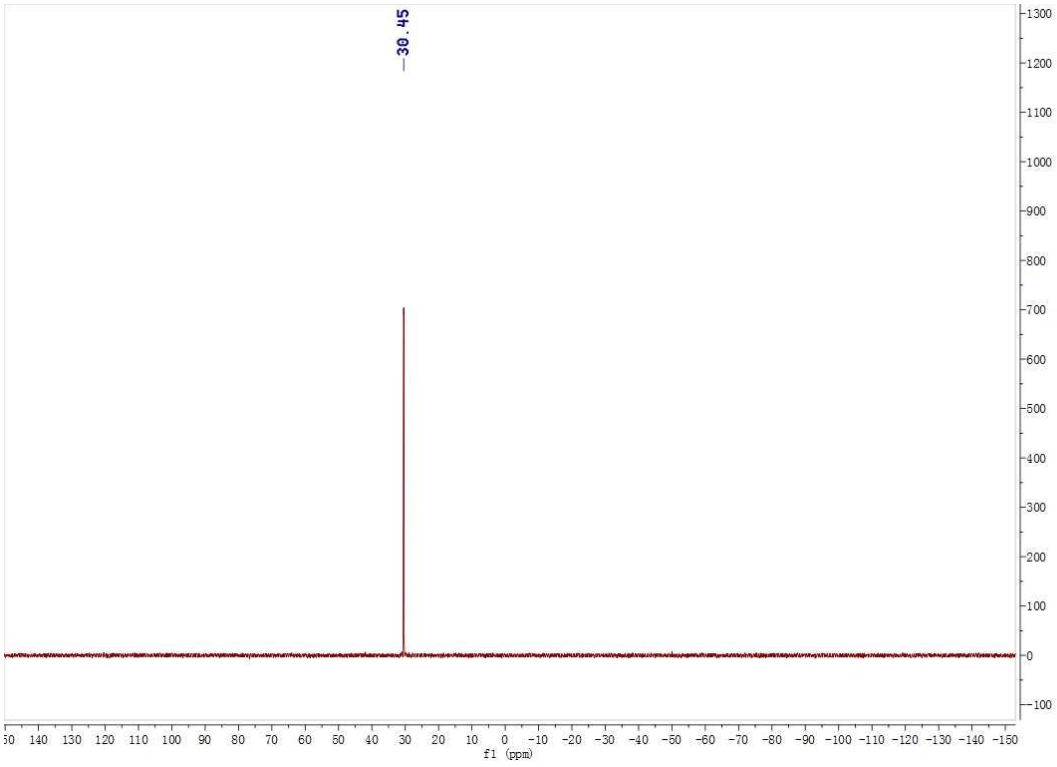

Fig. 38 ^{31}P NMR spectrum of **2e** (121.5 MHz, CD_2Cl_2, 298 K).

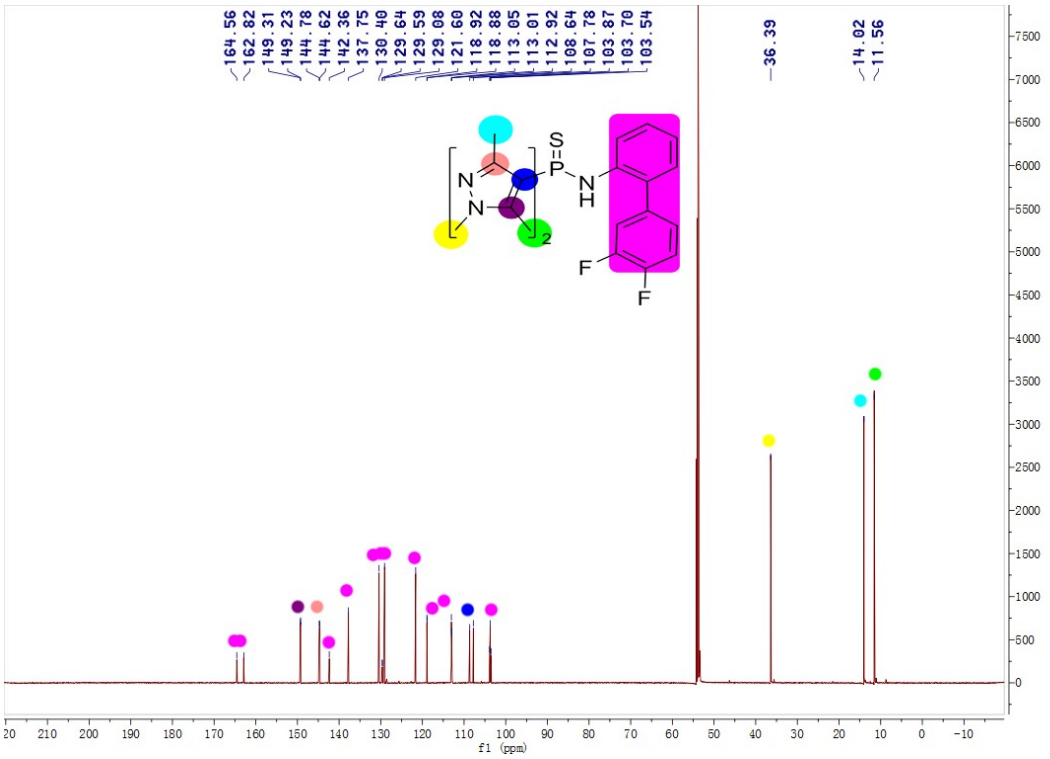

Fig. 39 ^{13}C NMR spectrum of **2e** (150 MHz, CD_2Cl_2, 298 K).

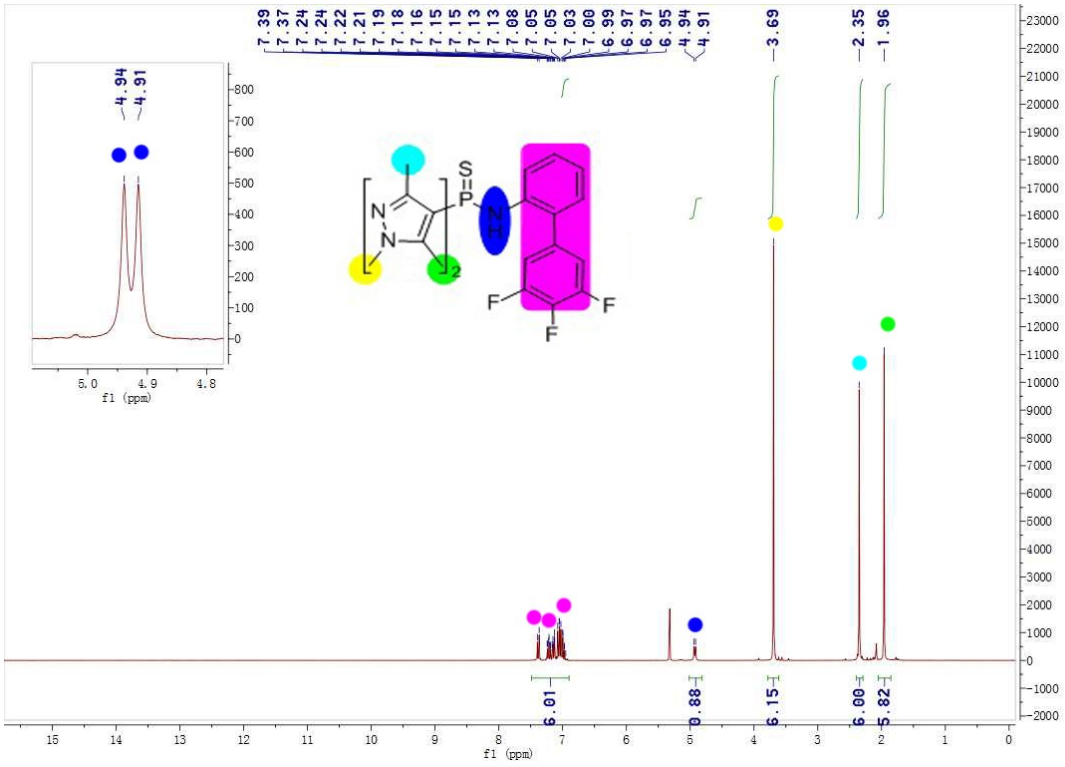

Fig. 40 ^{1}H NMR spectrum of **2f** (300 MHz, CD_2Cl_2, 298 K).

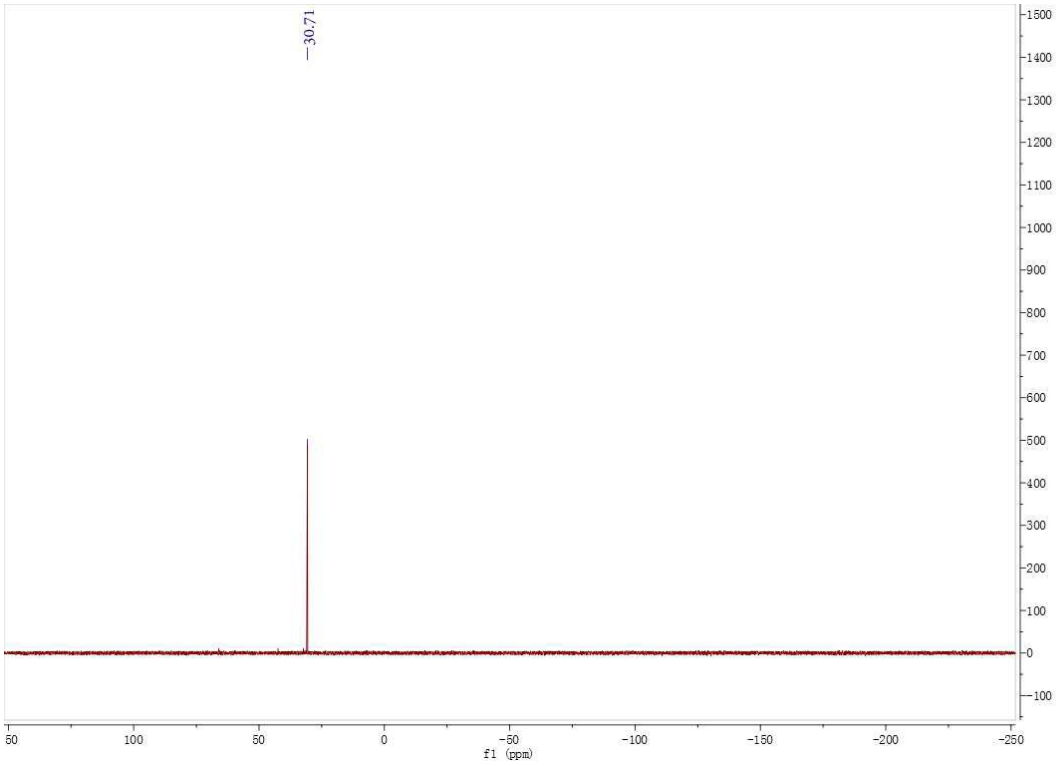

Fig. 41 ^{31}P NMR spectrum of **2f** (121.5 MHz, CD_2Cl_2, 298 K).

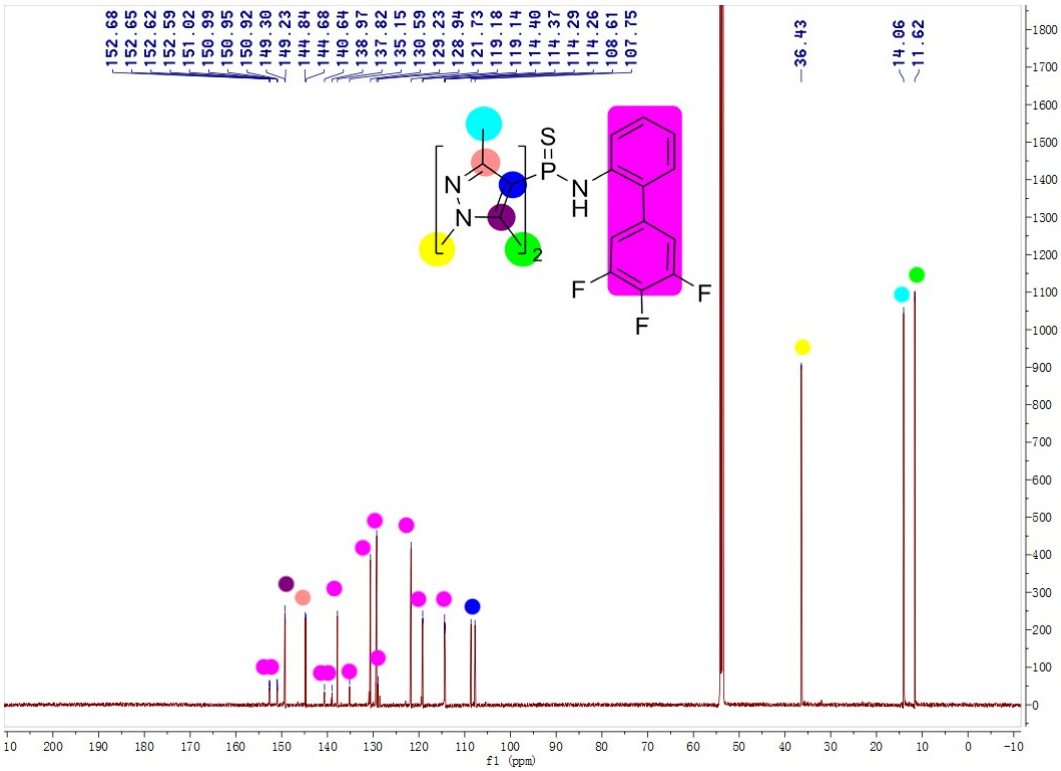

Fig. 42 ^{13}C NMR spectrum of **2f** (150 MHz, CD_2Cl_2, 298 K).

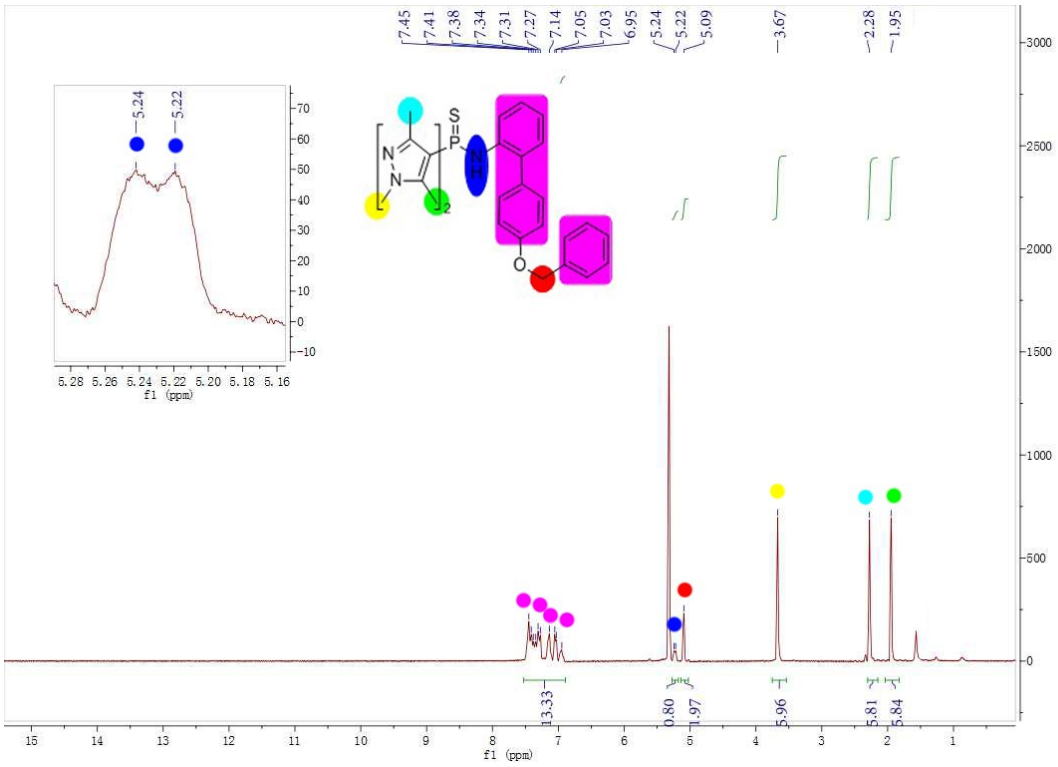

Fig. 43 ^{1}H NMR spectrum of **2g** (300 MHz, CD_2Cl_2, 298 K).

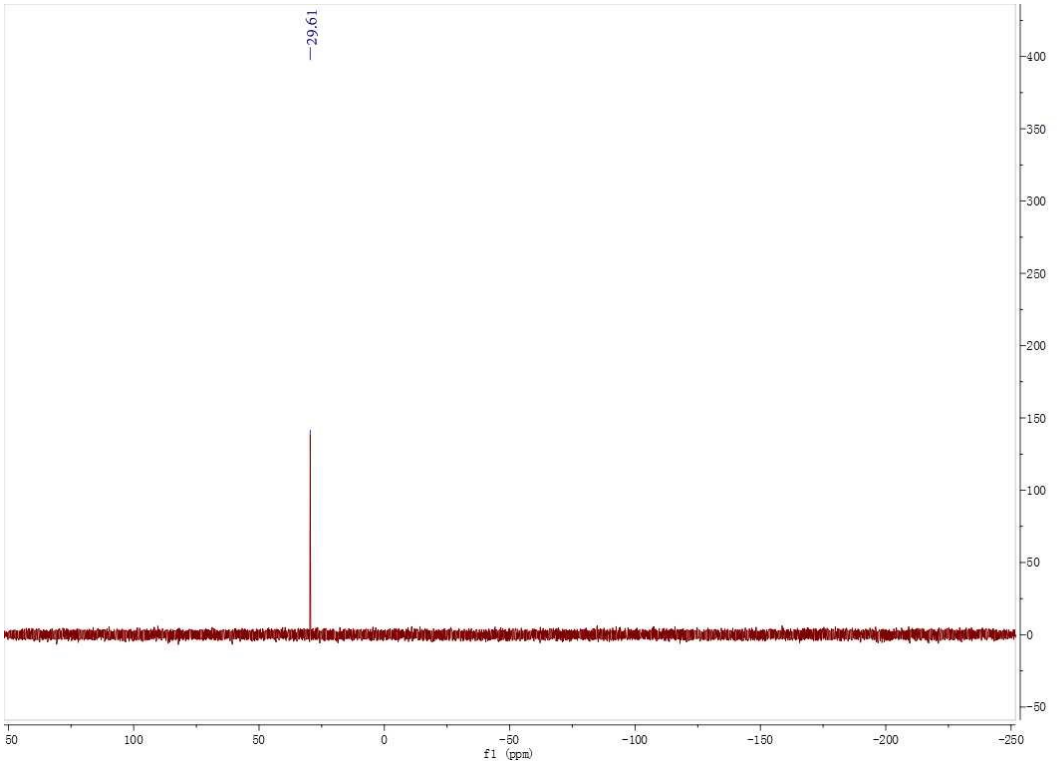

Fig. 44 ^{31}P NMR spectrum of **2g** (121.5 MHz, CD_2Cl_2, 298 K).

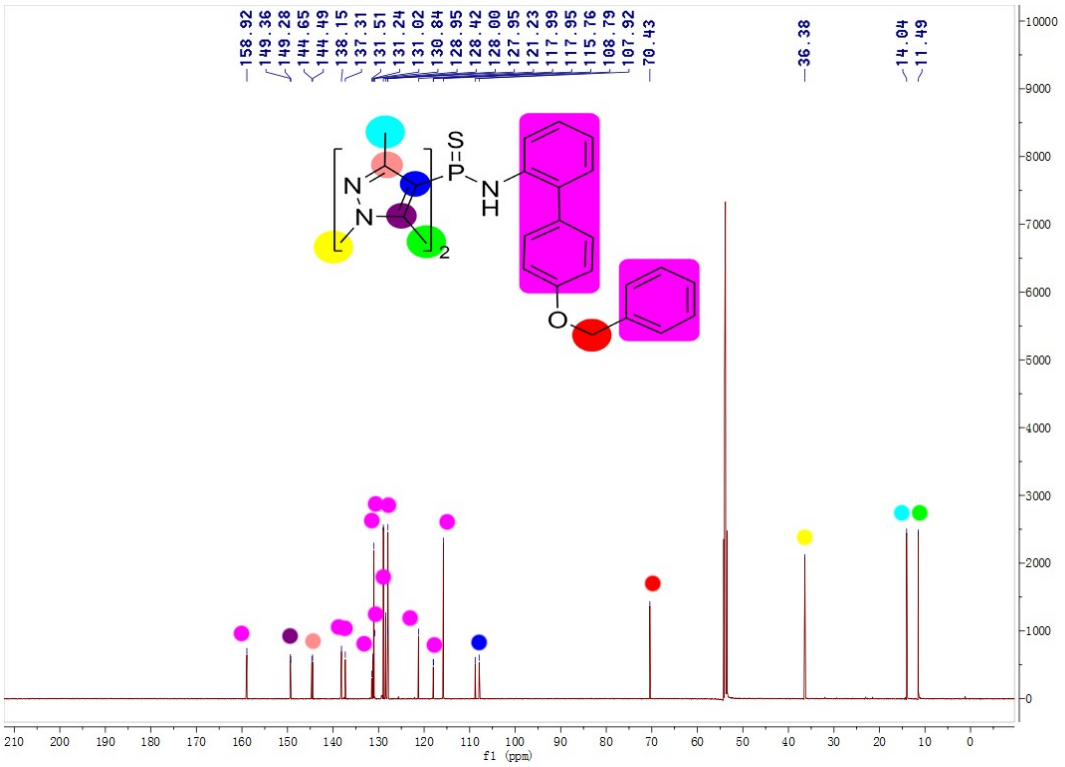

Fig. 45 ^{13}C NMR spectrum of **2g** (150 MHz, CD_2Cl_2, 298 K).

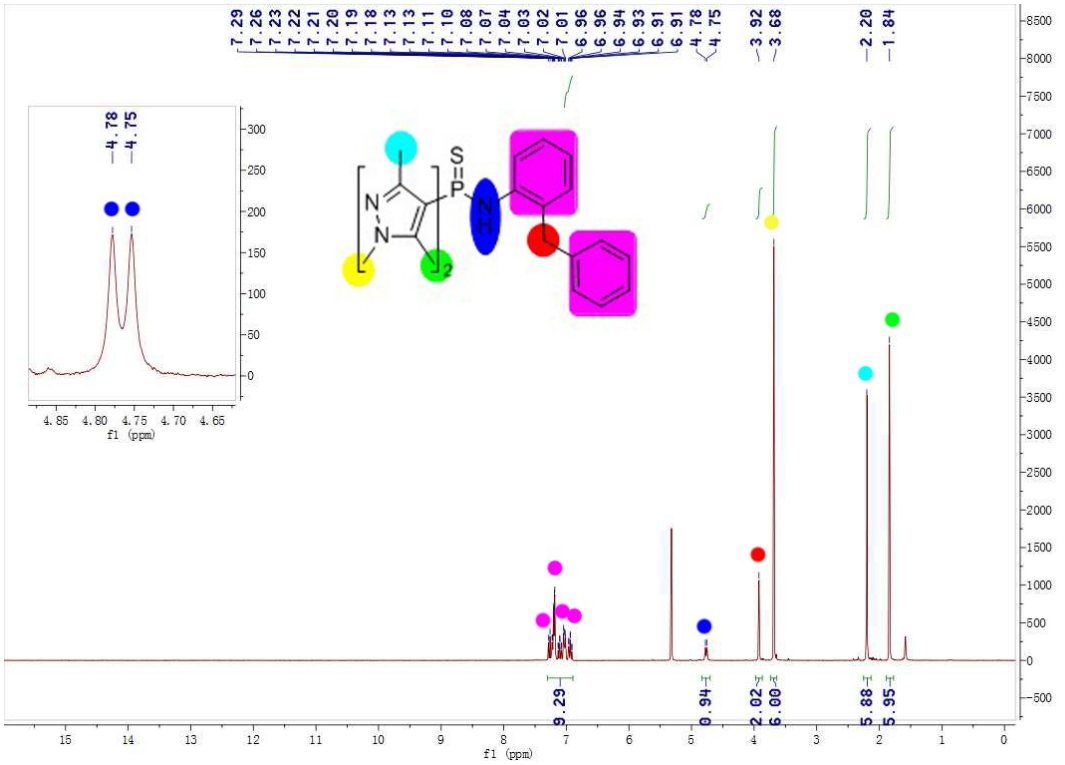

Fig. 46 ^{1}H NMR spectrum of **2h** (300 MHz, CD_2Cl_2, 298 K).

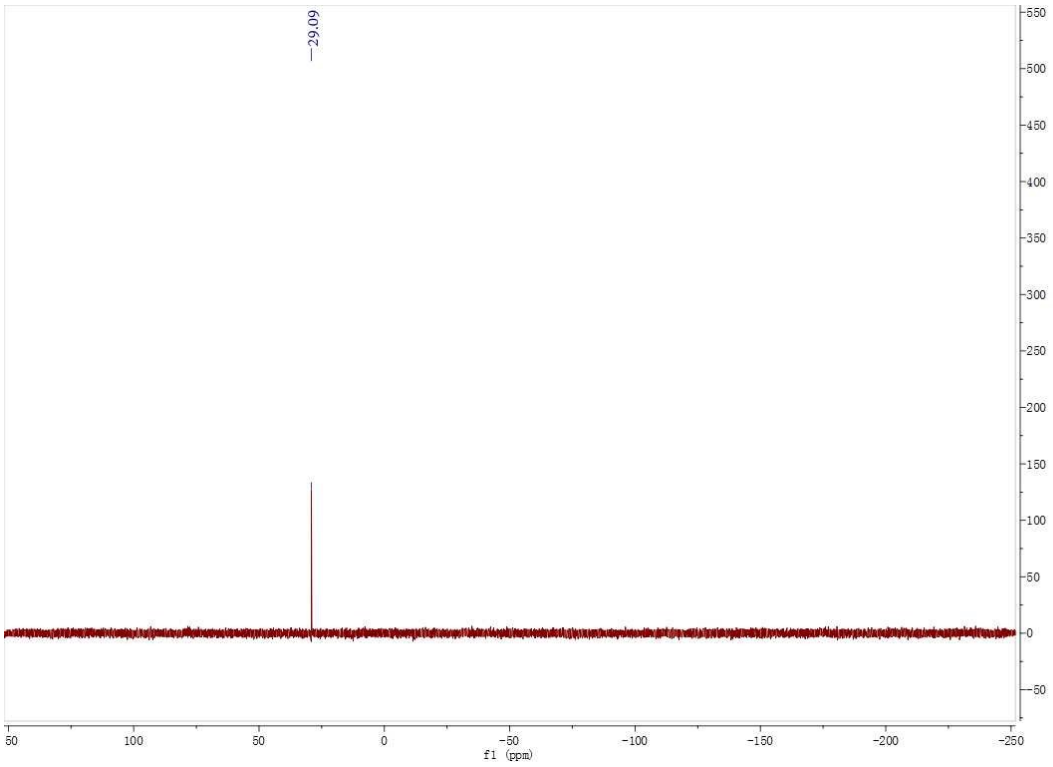

Fig. 47 ^{31}P NMR spectrum of **2h** (121.5 MHz, CD_2Cl_2, 298 K).

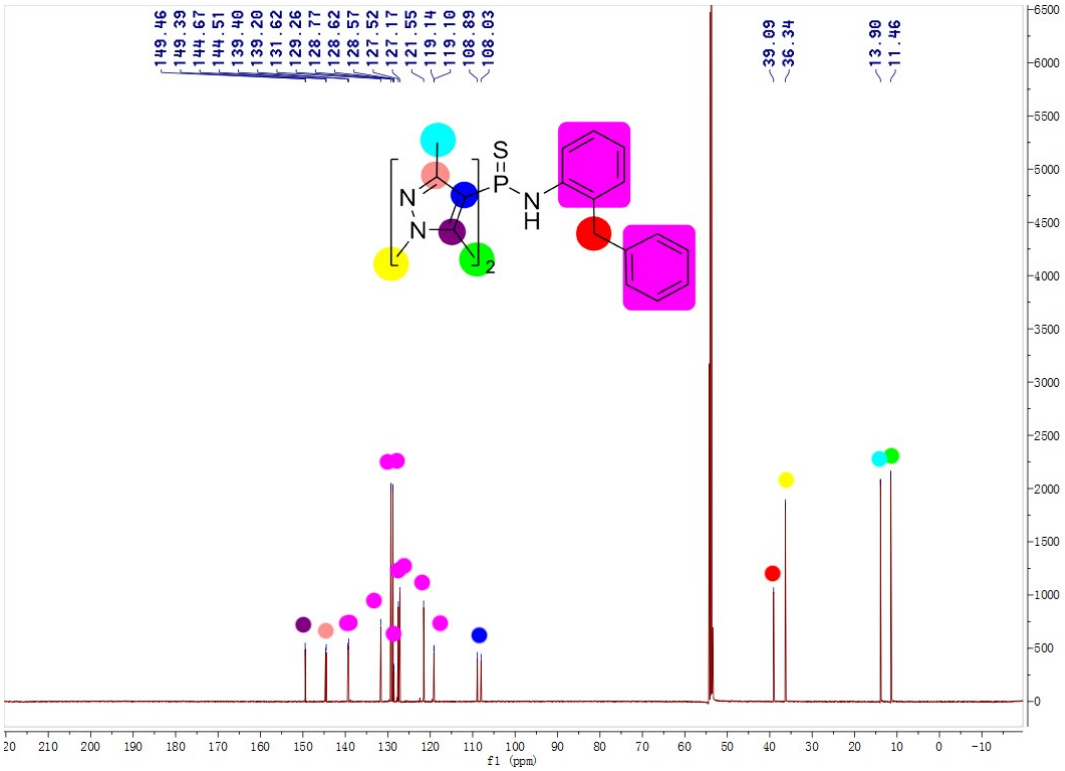

Fig. 48 ^{13}C NMR spectrum of **2h** (150 MHz, CD_2Cl_2, 298 K).

2. IR spectra of **1a**-**2h**.

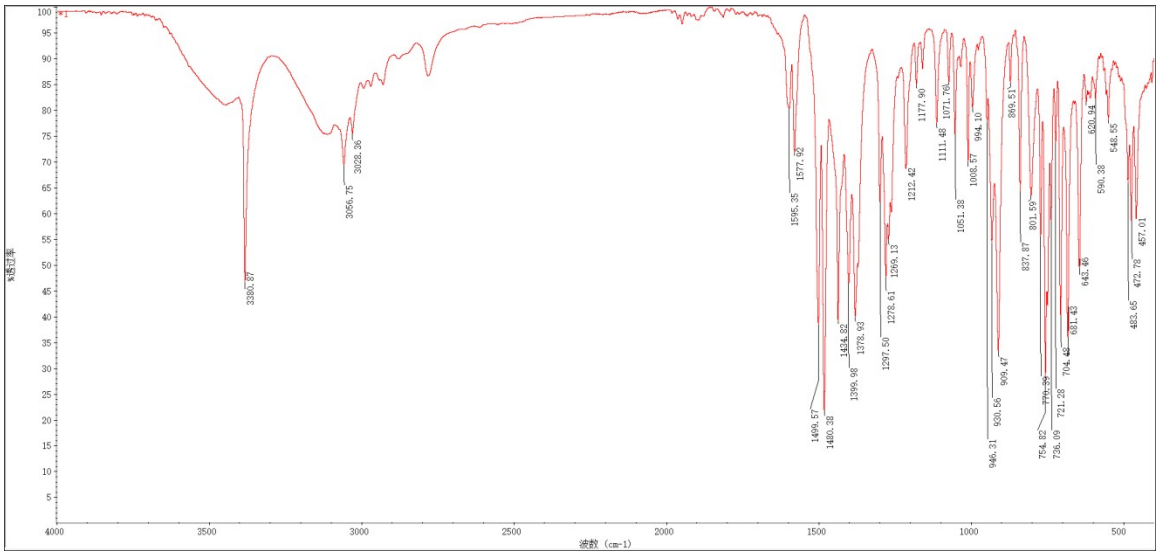

Fig. 49 IR spectrum of **1a**.

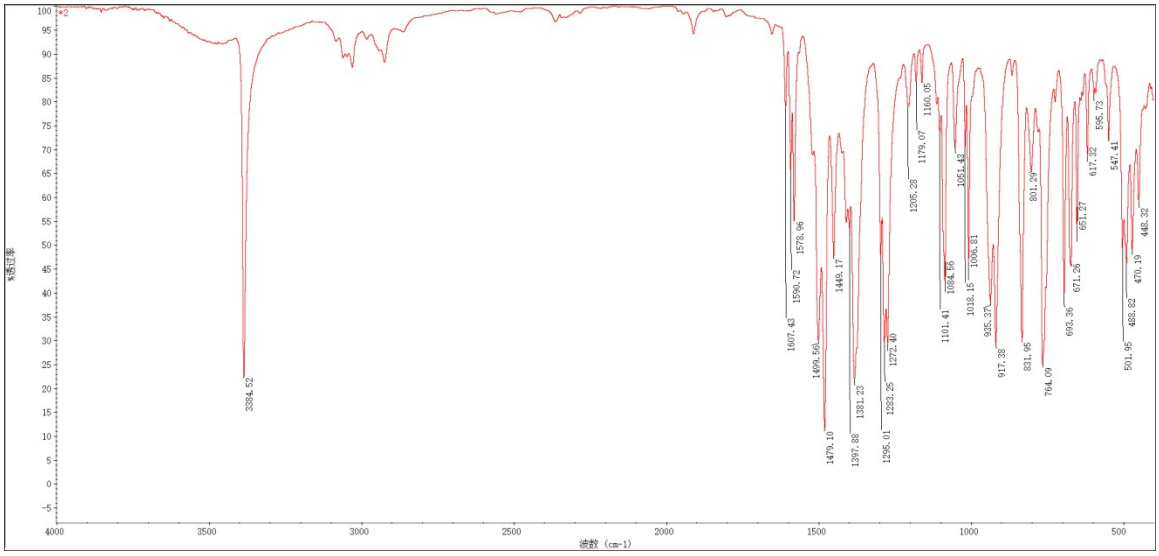

Fig. 50 IR spectrum of **1b**.

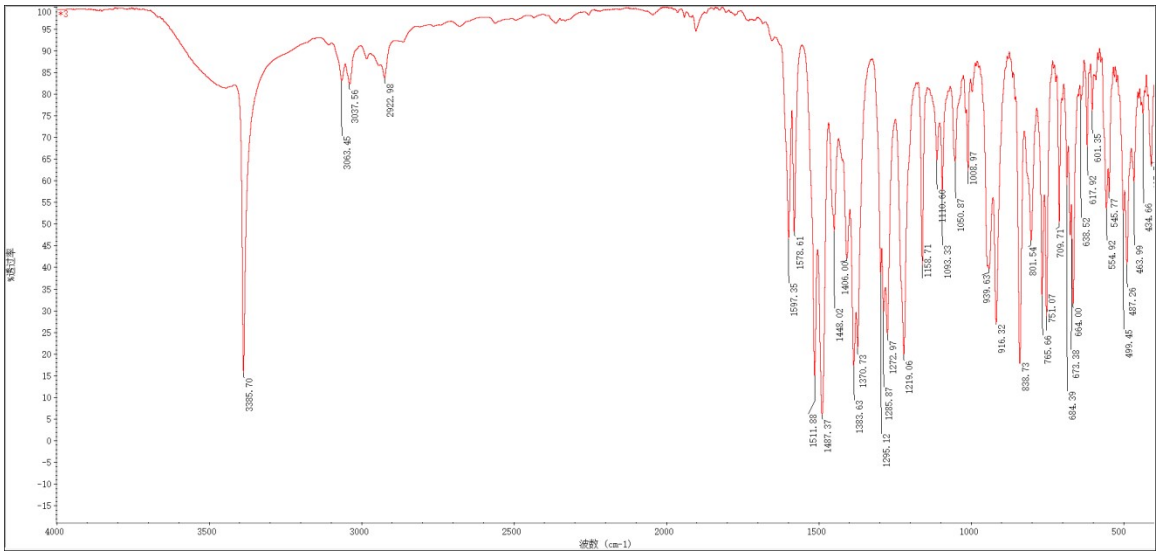

Fig. 51 IR spectrum of **1c**.

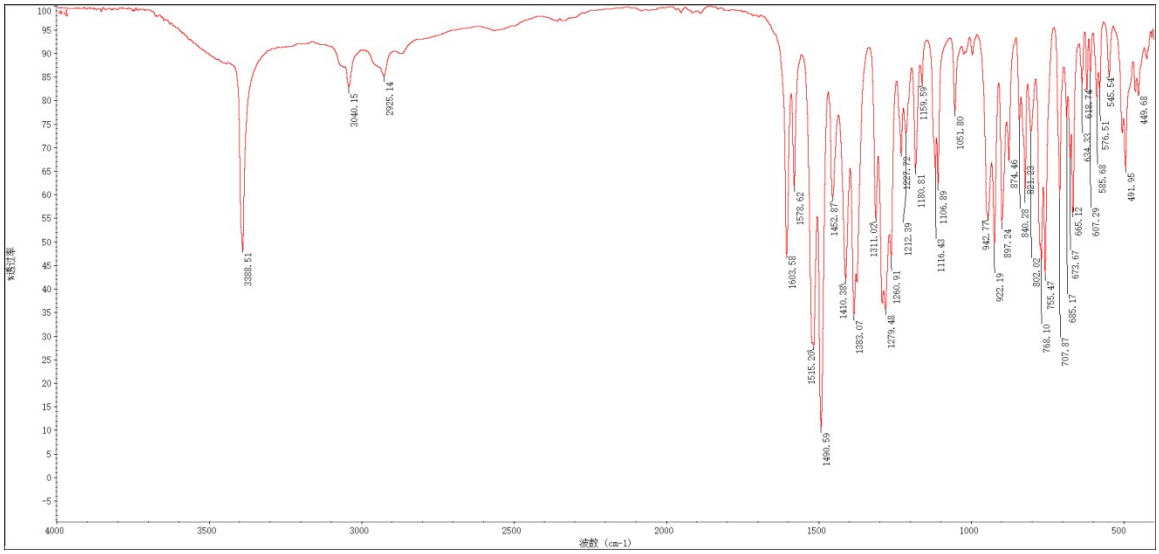

Fig. 52 IR spectrum of **1d**.

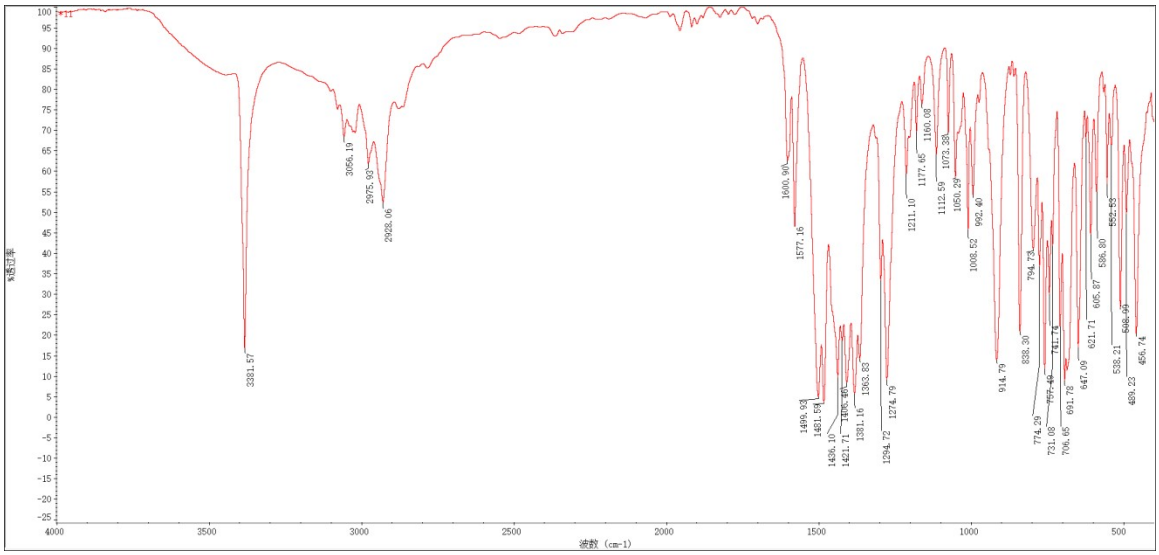

Fig. 53 IR spectrum of **1e**.

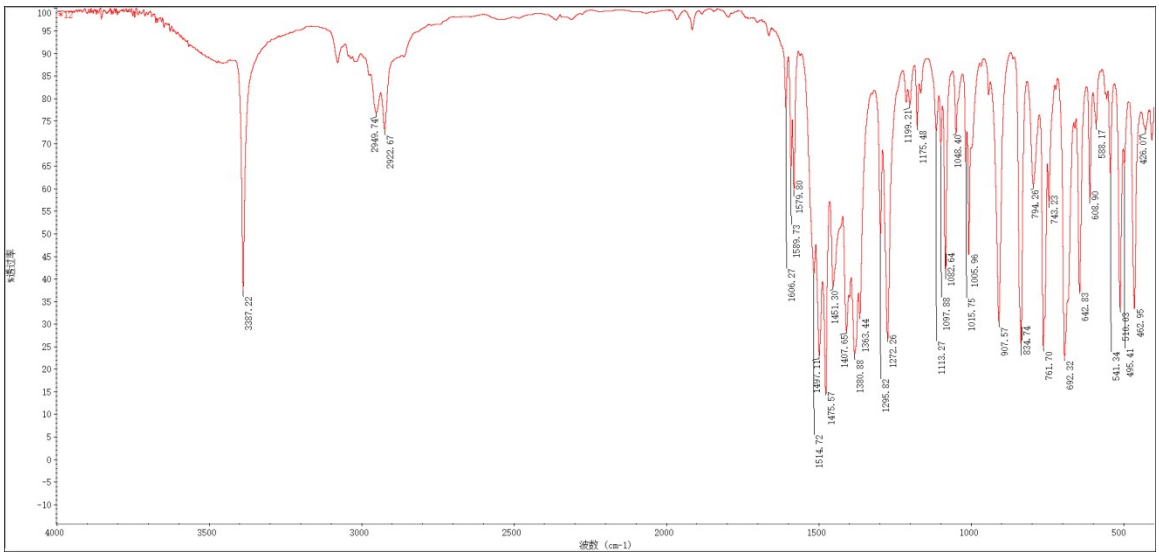

Fig. 54 IR spectrum of **1f**.

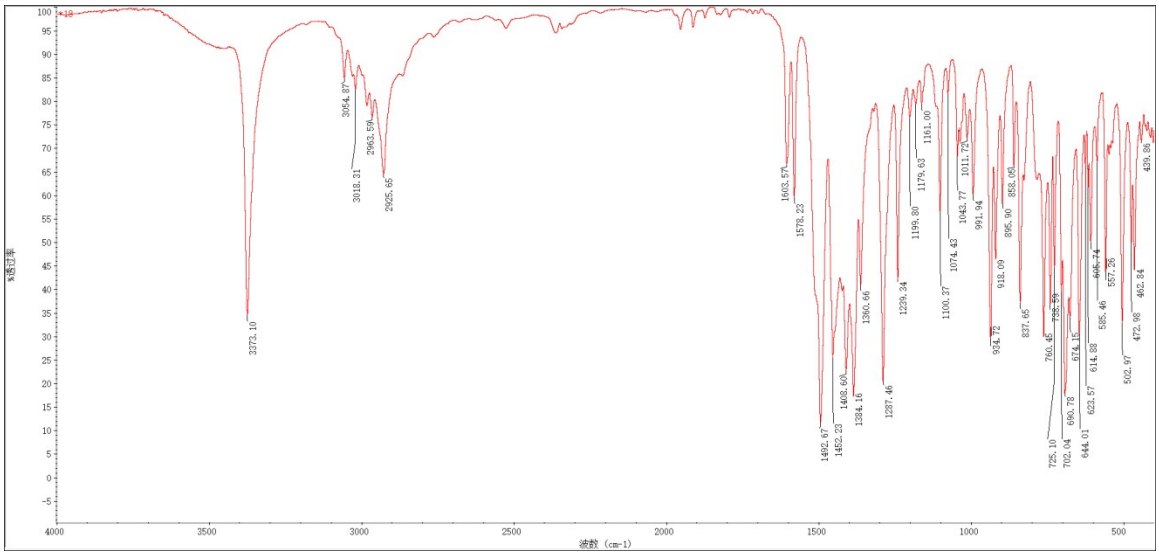

Fig. 55 IR spectrum of **1g**.

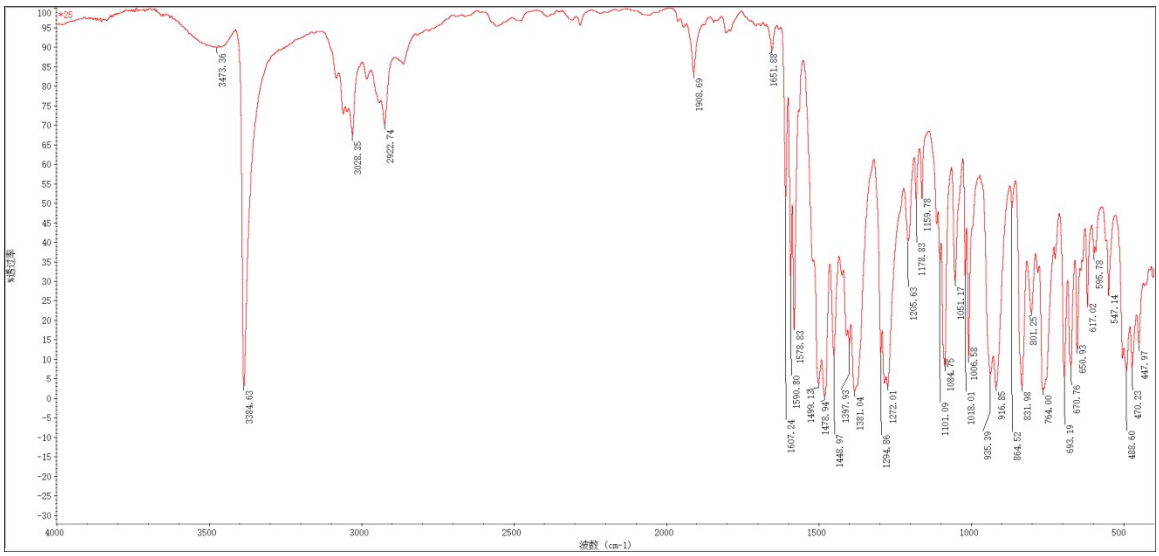

Fig. 56 IR spectrum of **1h**.

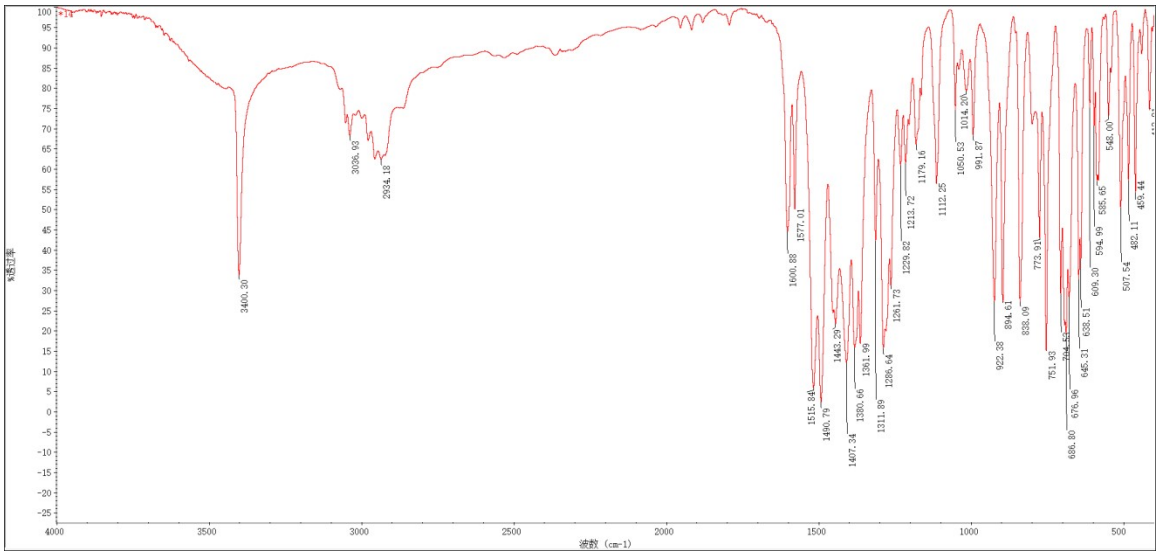

Fig. 57 IR spectrum of **2a**.

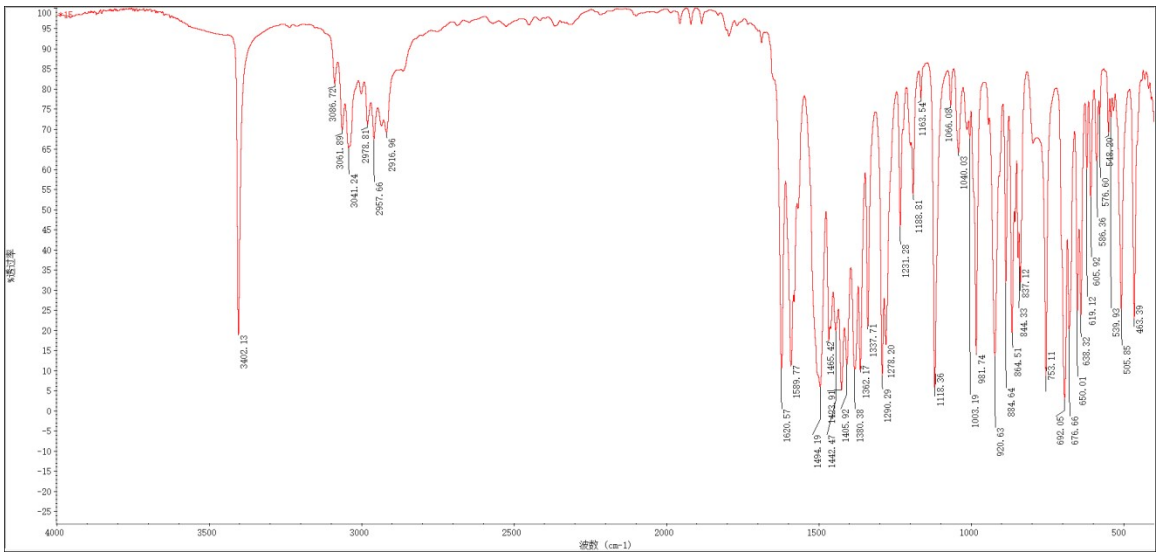

Fig. 58 IR spectrum of **2b**.

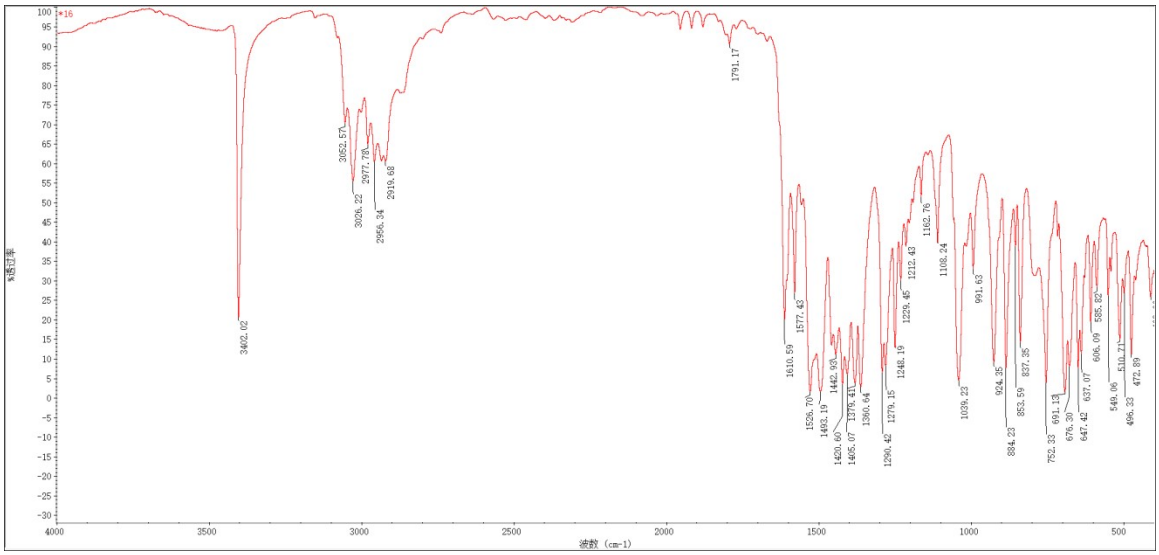

Fig. 59 IR spectrum of **2c**.

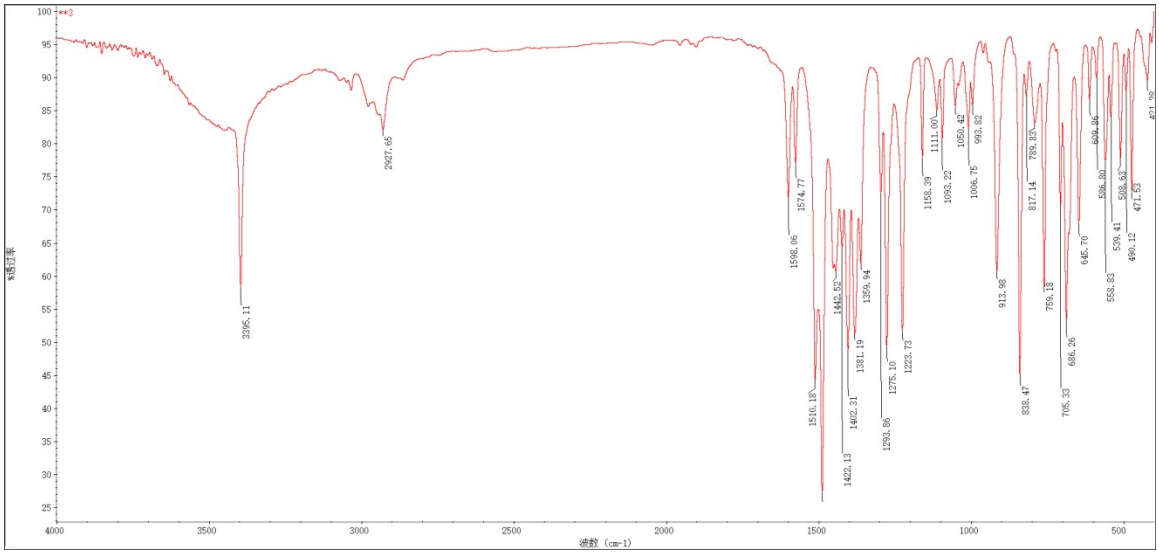

Fig. 60 IR spectrum of **2d**.

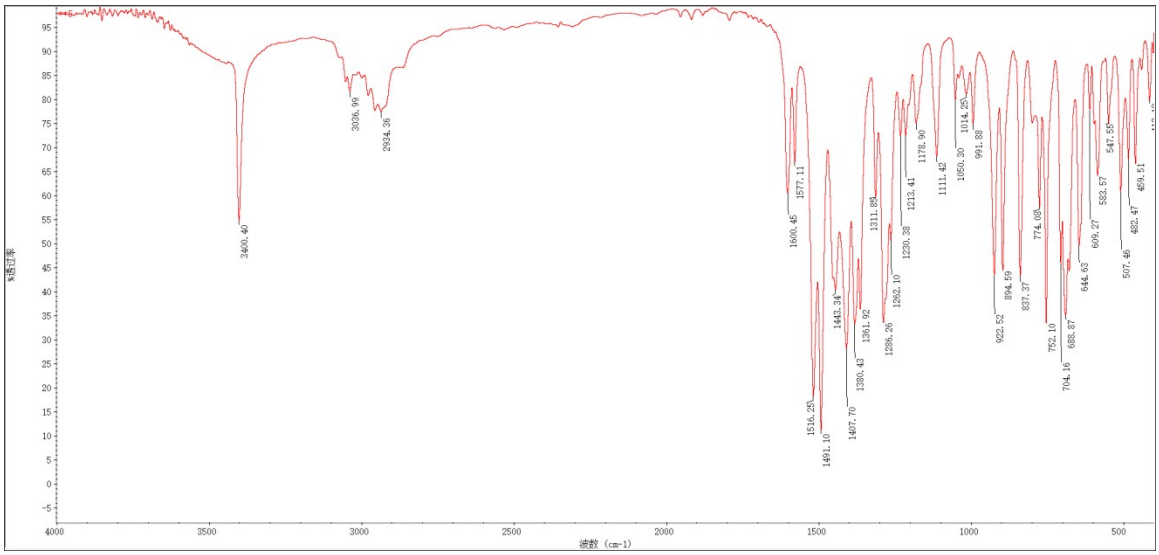

Fig. 61 IR spectrum of **2e**.

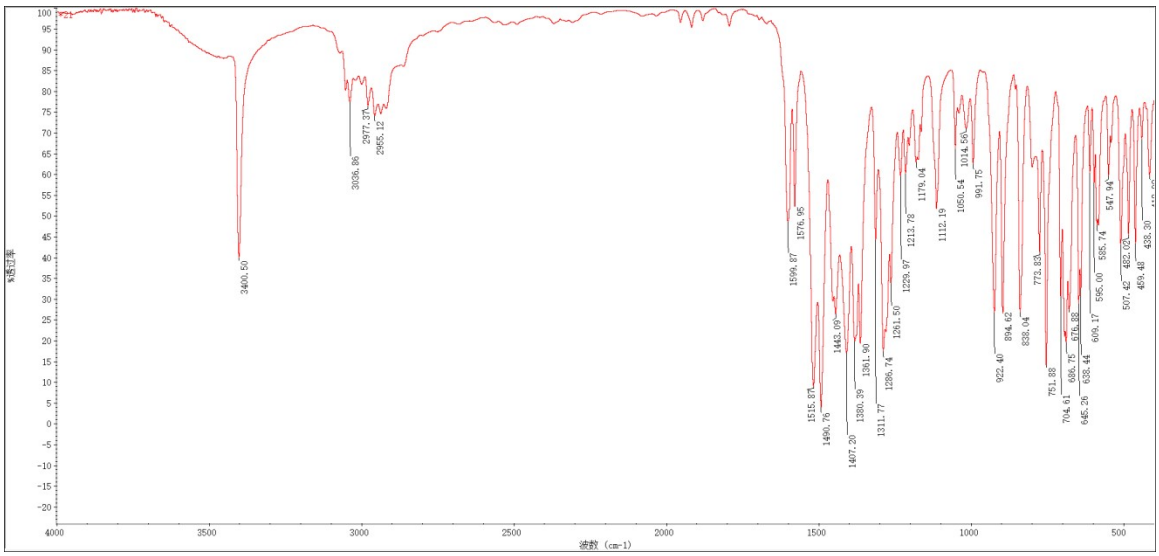

Fig. 62 IR spectrum of **2f**.

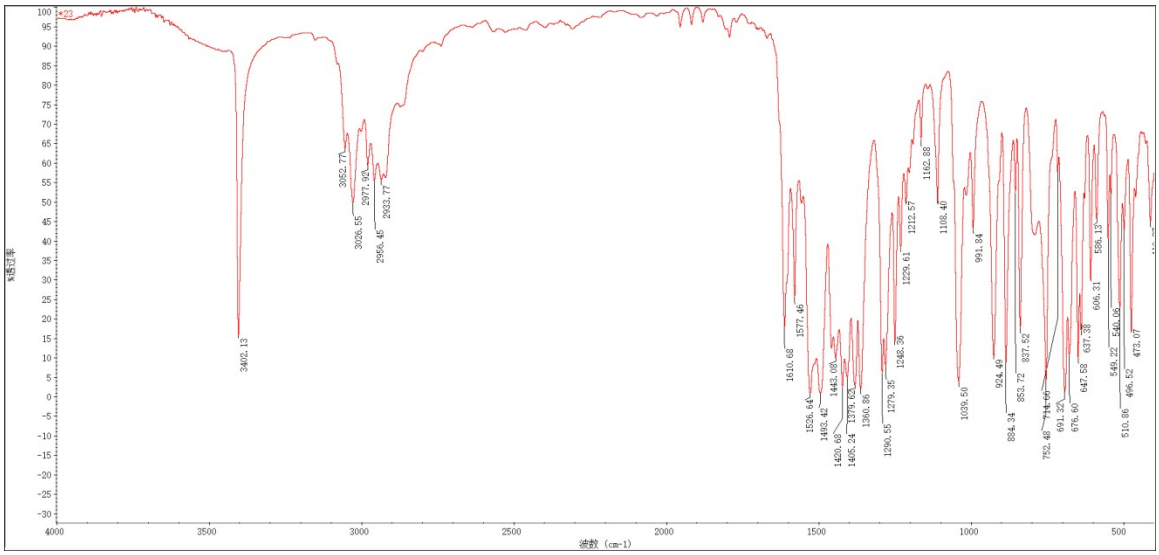

Fig. 63 IR spectrum of **2g**.

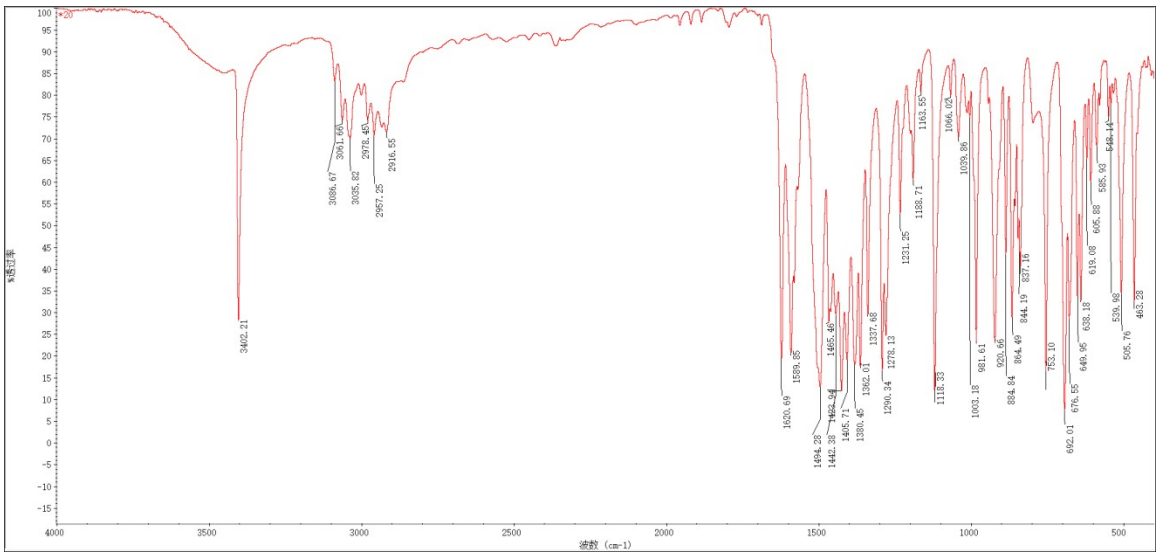

Fig. 64 IR spectrum of **2h**.

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

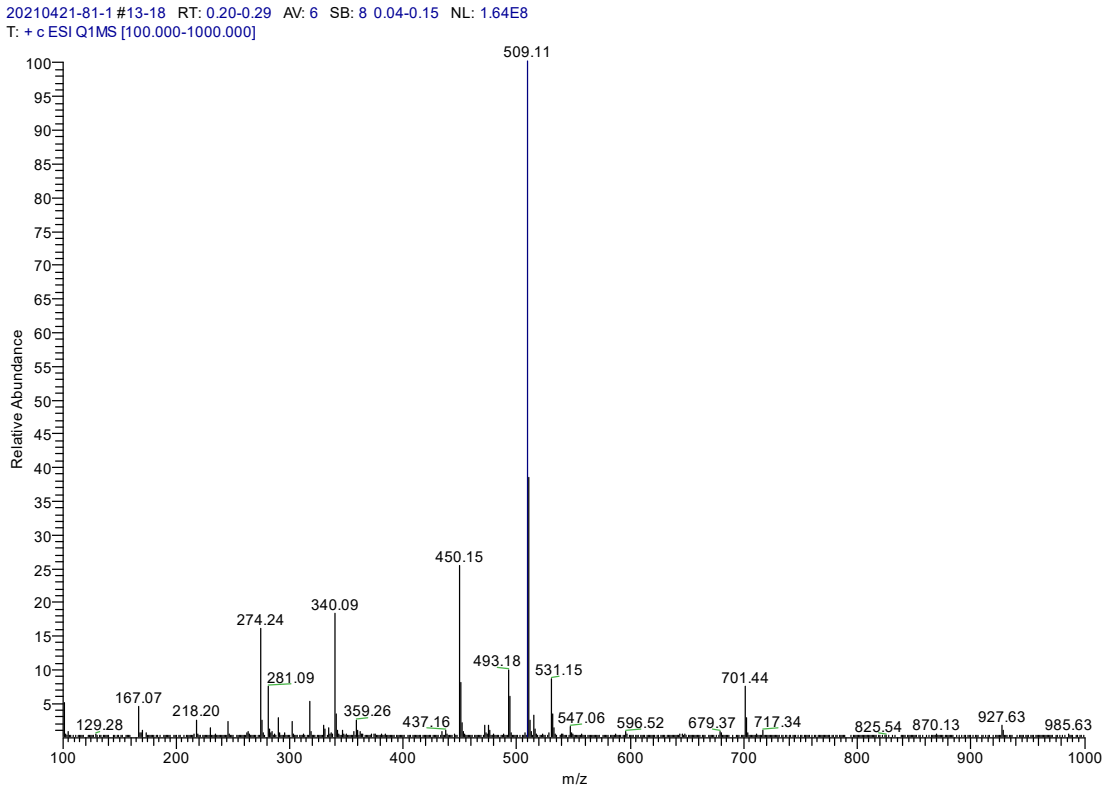

Fig. 65 MS spectrum of **1a**.

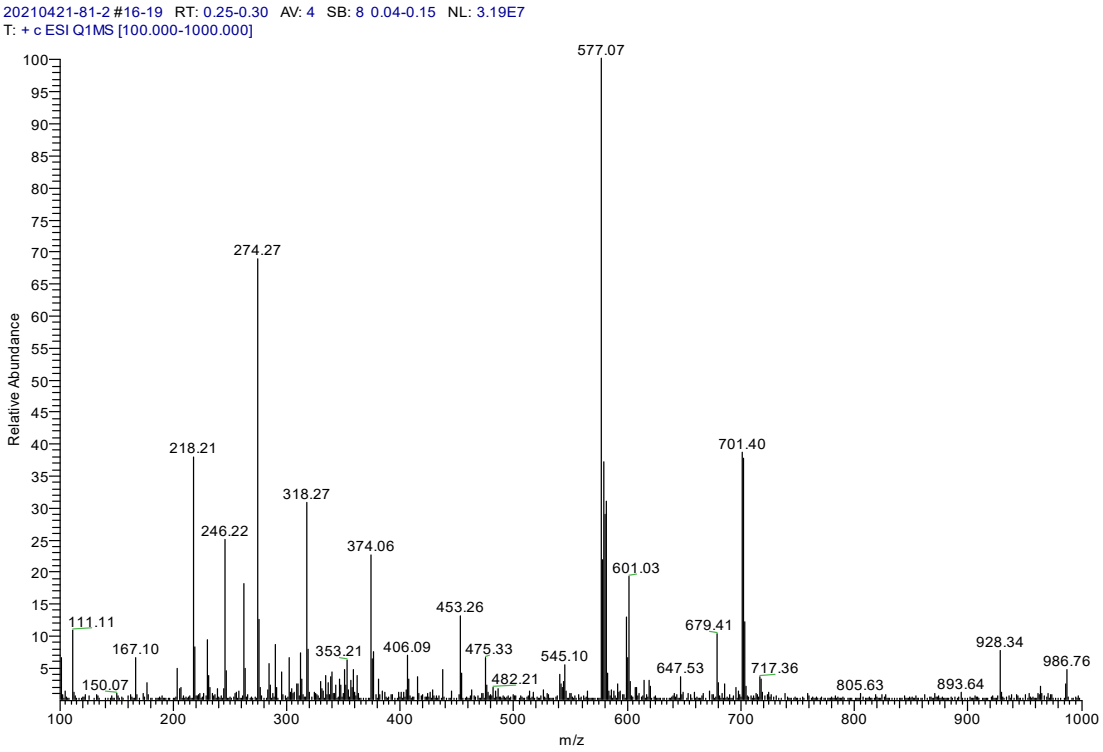

Fig. 66 MS spectrum of **1b**.

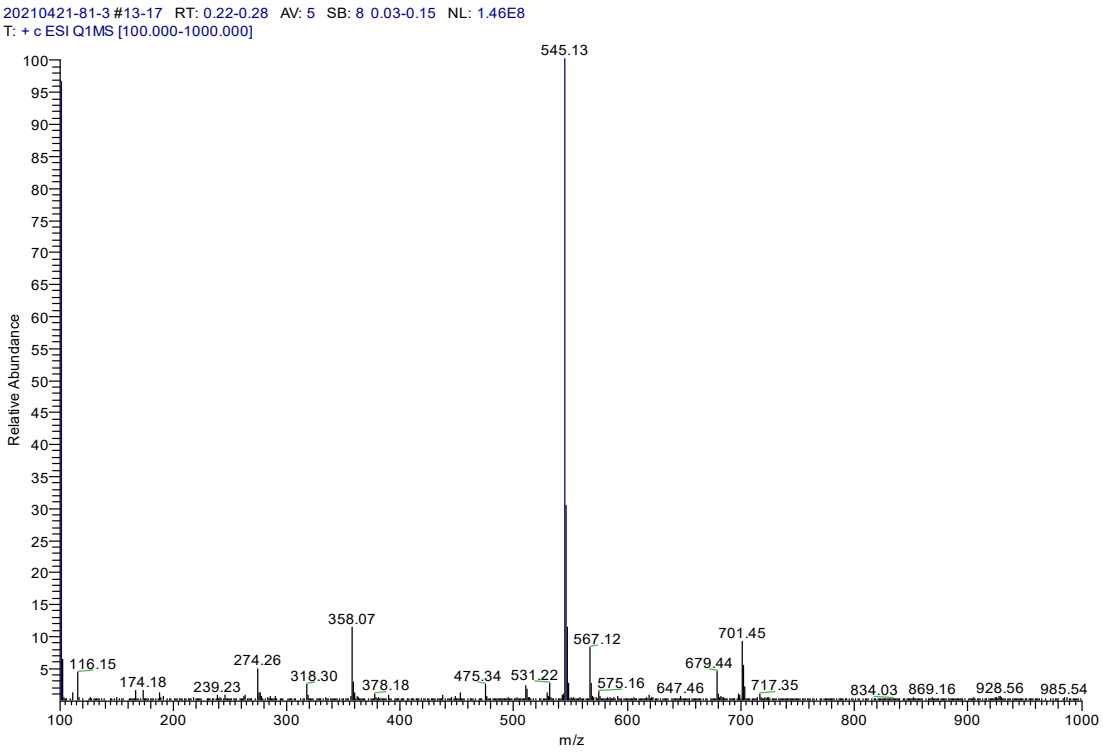

Fig. 67 MS spectrum of **1c**.

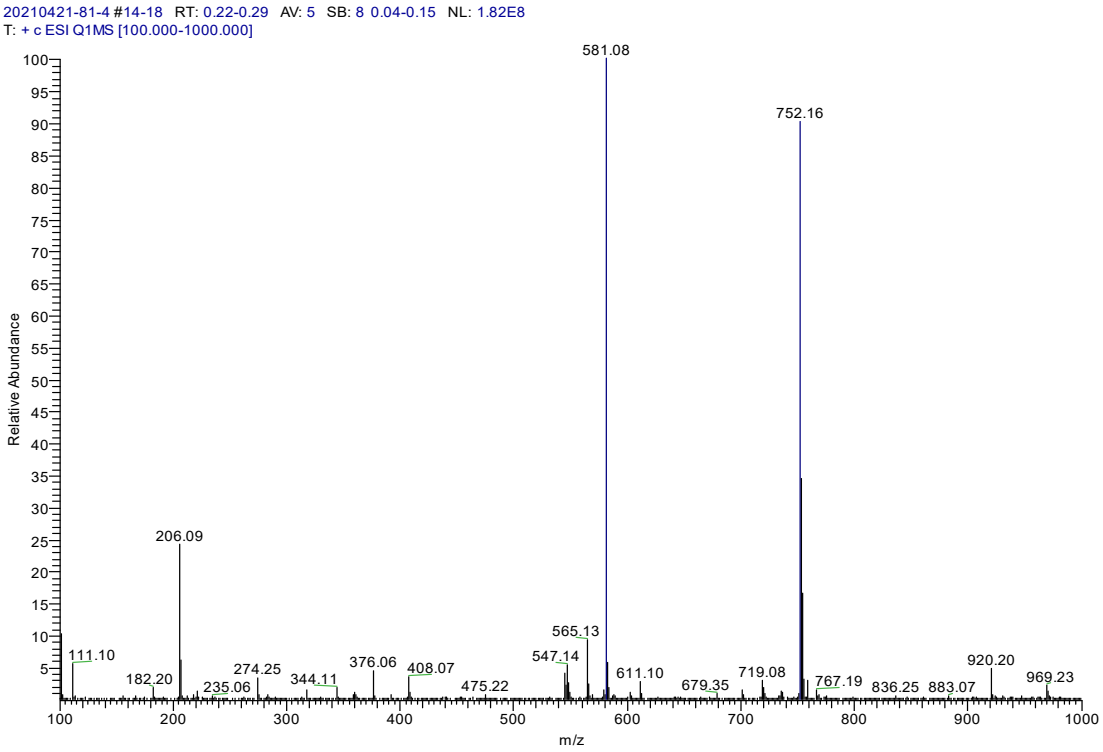

Fig. 68 MS spectrum of **1d**.

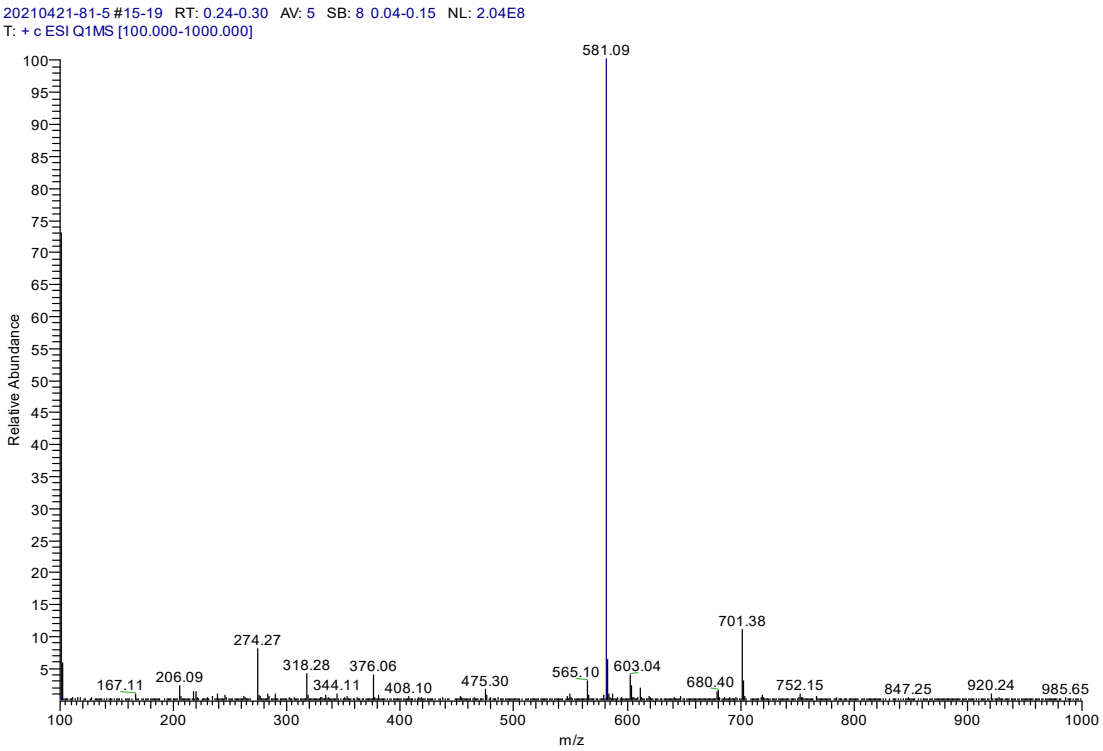

Fig. 69 MS spectrum of **1e**.

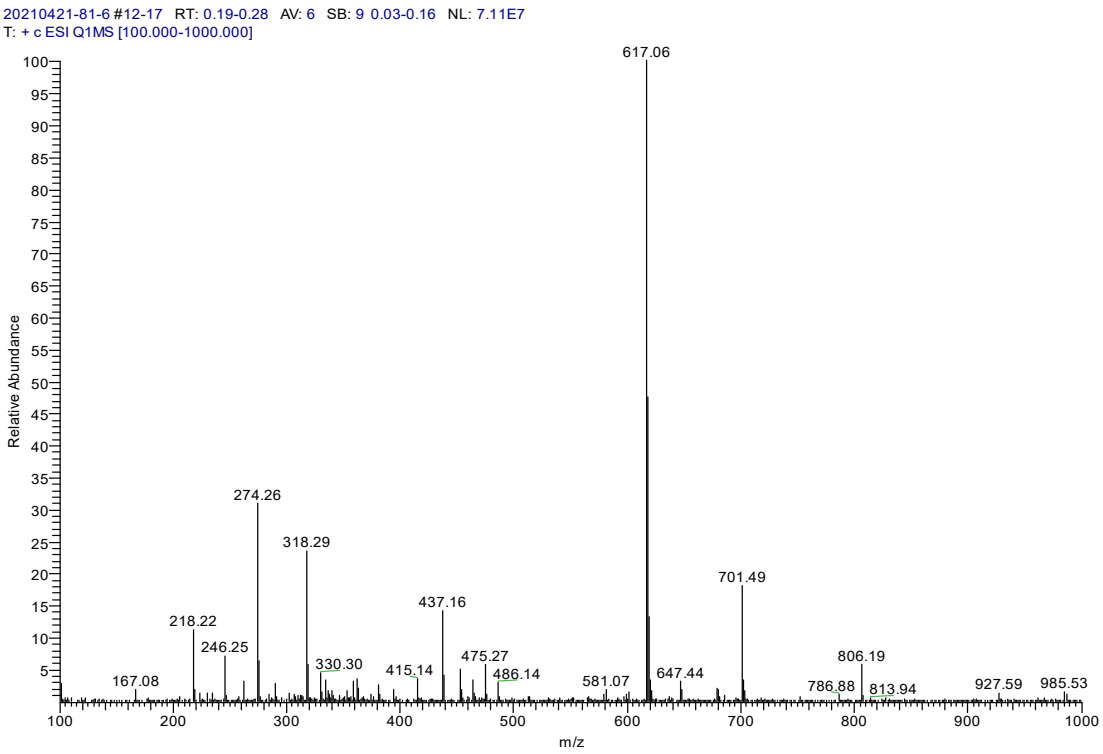

Fig. 70 MS spectrum of **1f**.

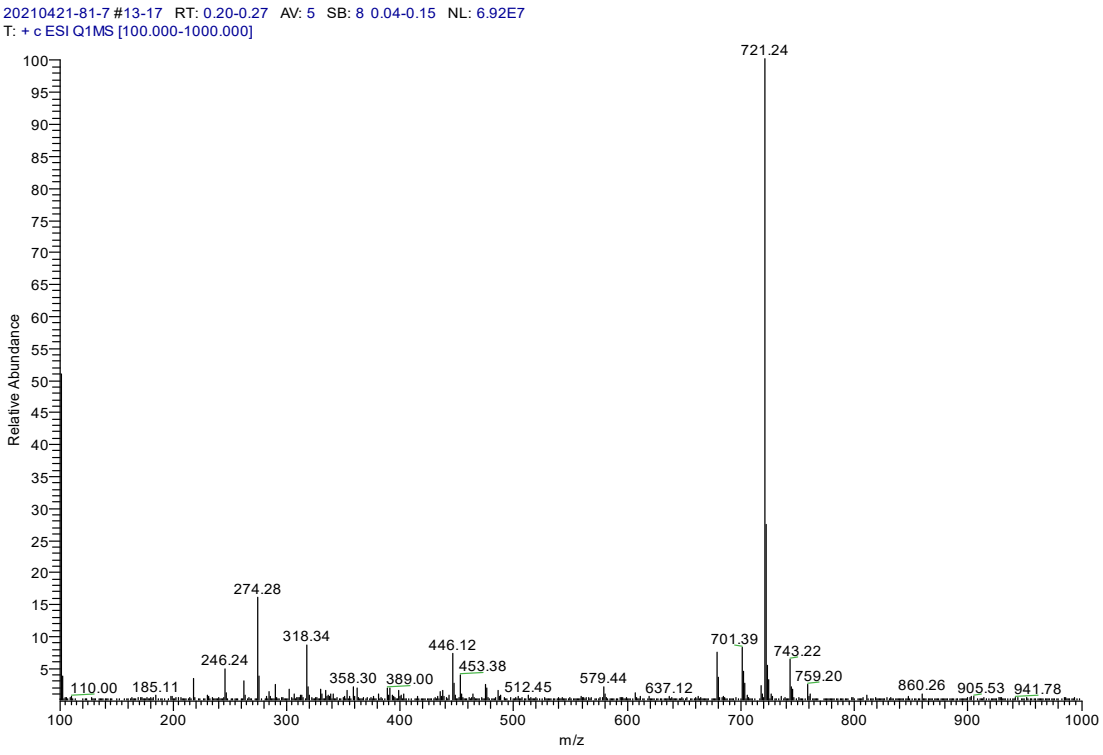

Fig. 71 MS spectrum of **1g**.

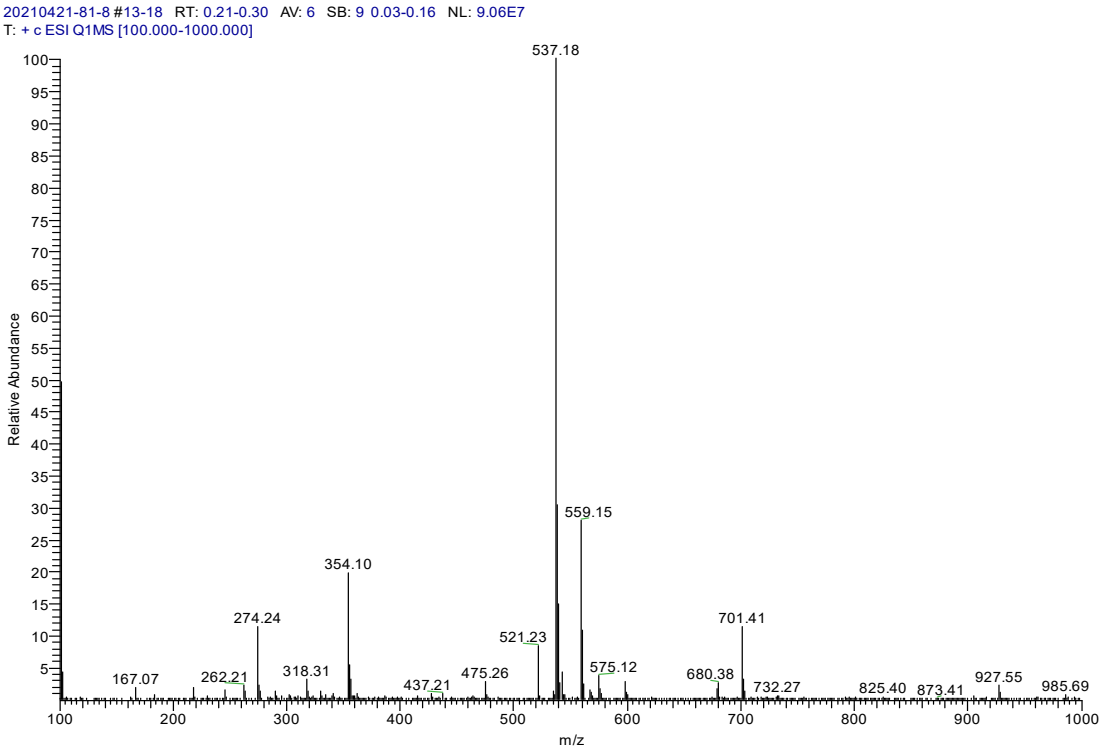

Fig. 72 MS spectrum of **1h**.

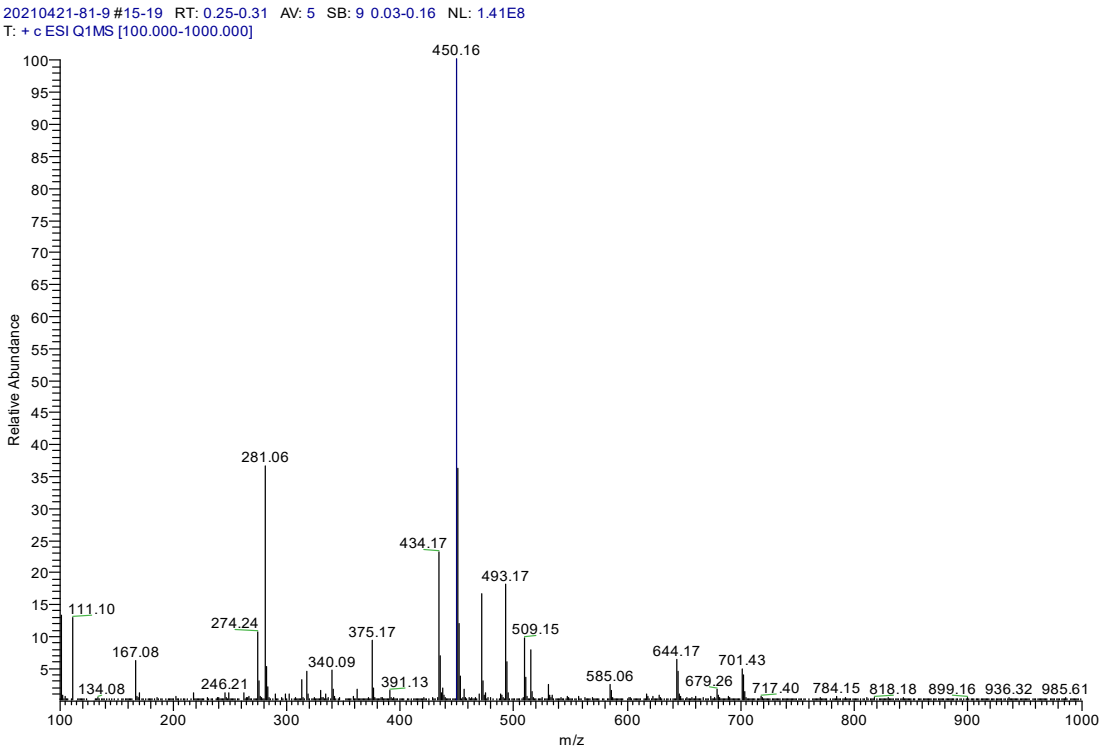

Fig. 73 MS spectrum of **2a**.

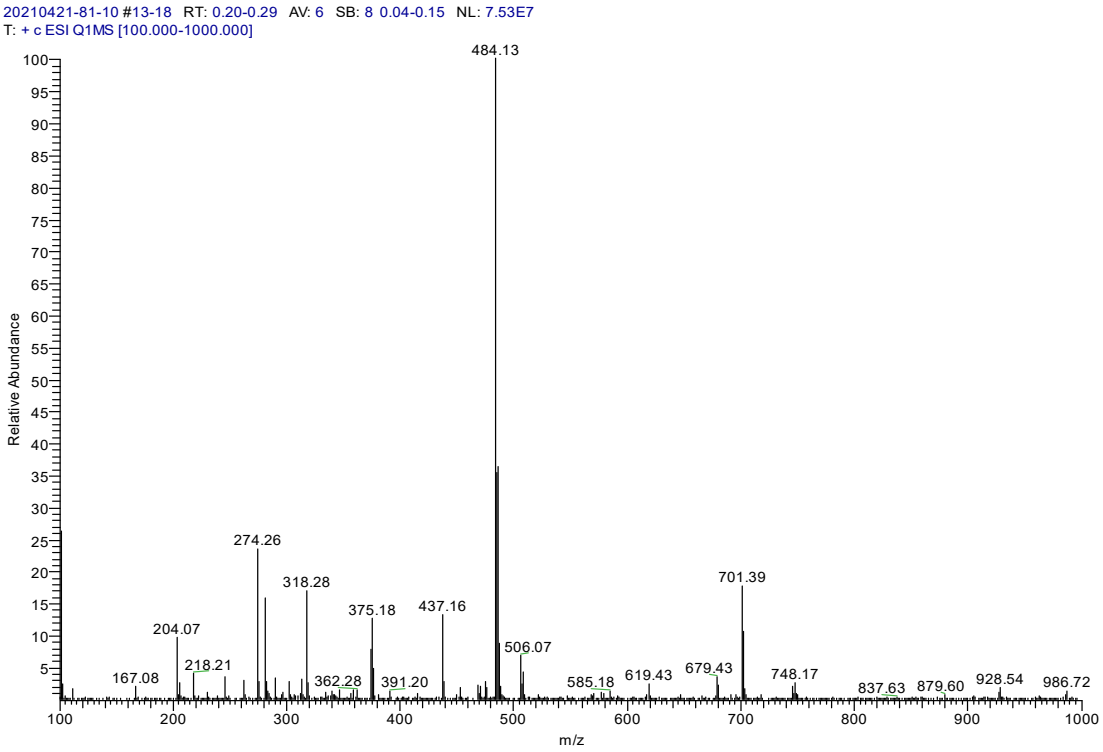

Fig. 74 MS spectrum of **2b**.

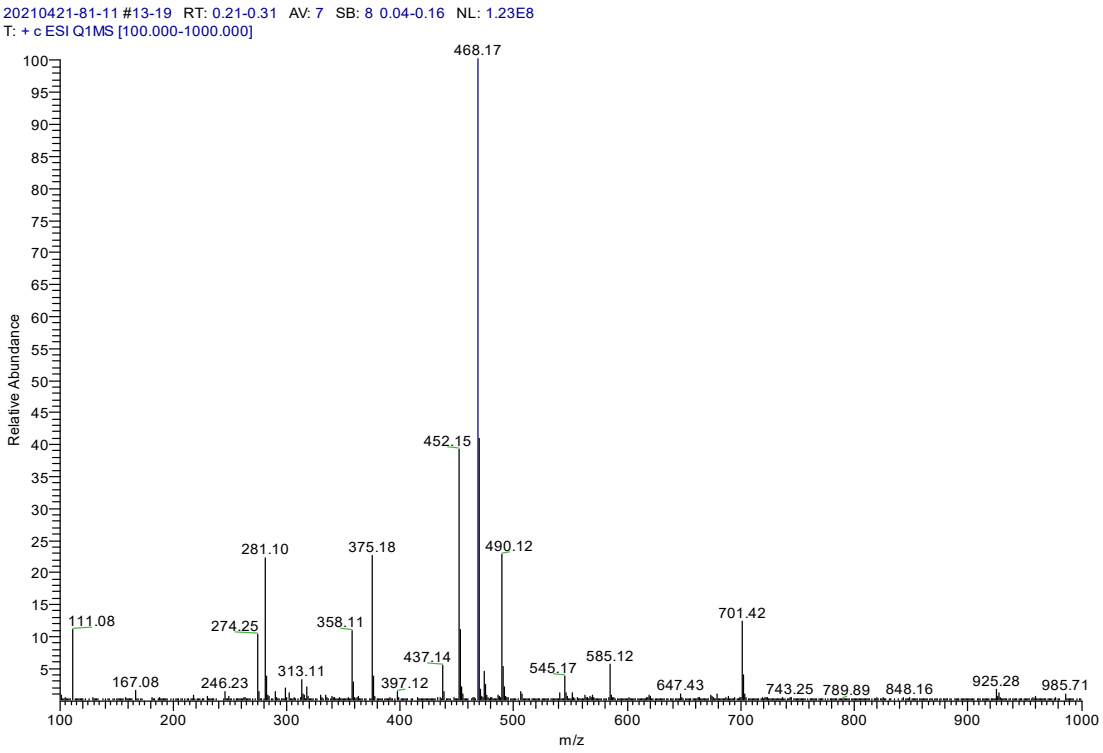

Fig. 75 MS spectrum of **2c**.

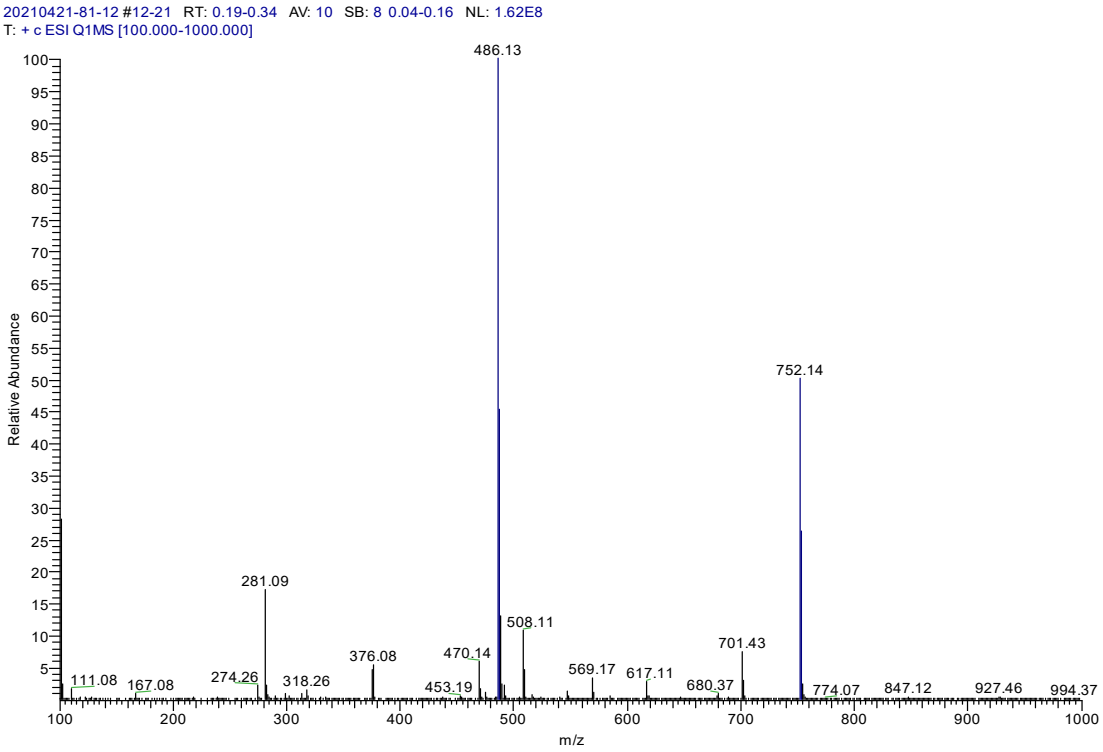

Fig. 76 MS spectrum of **2d**.

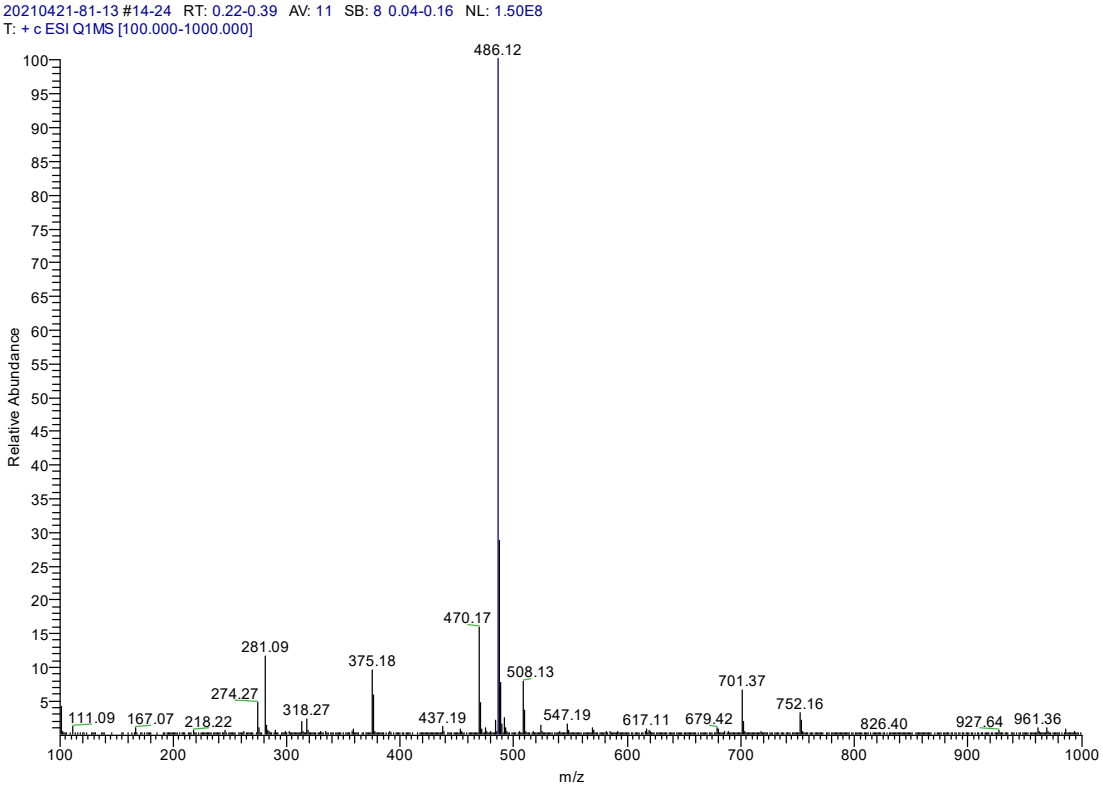

Fig. 77 MS spectrum of **2e**.

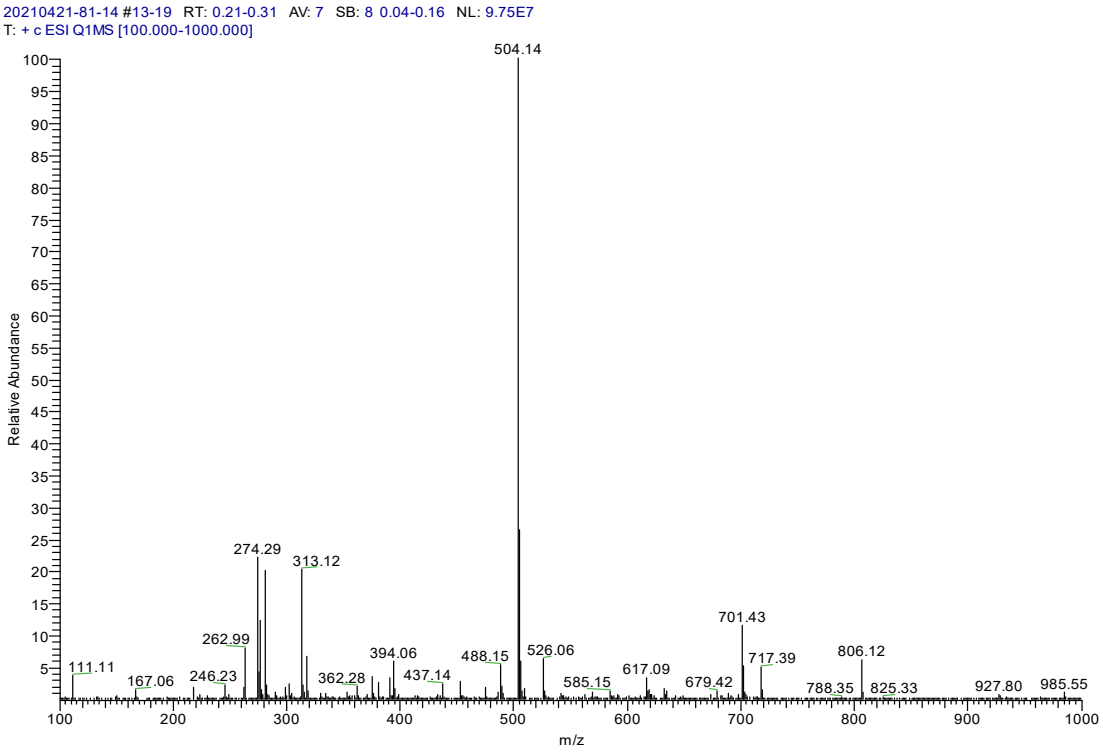

Fig. 78 MS spectrum of **2f**.

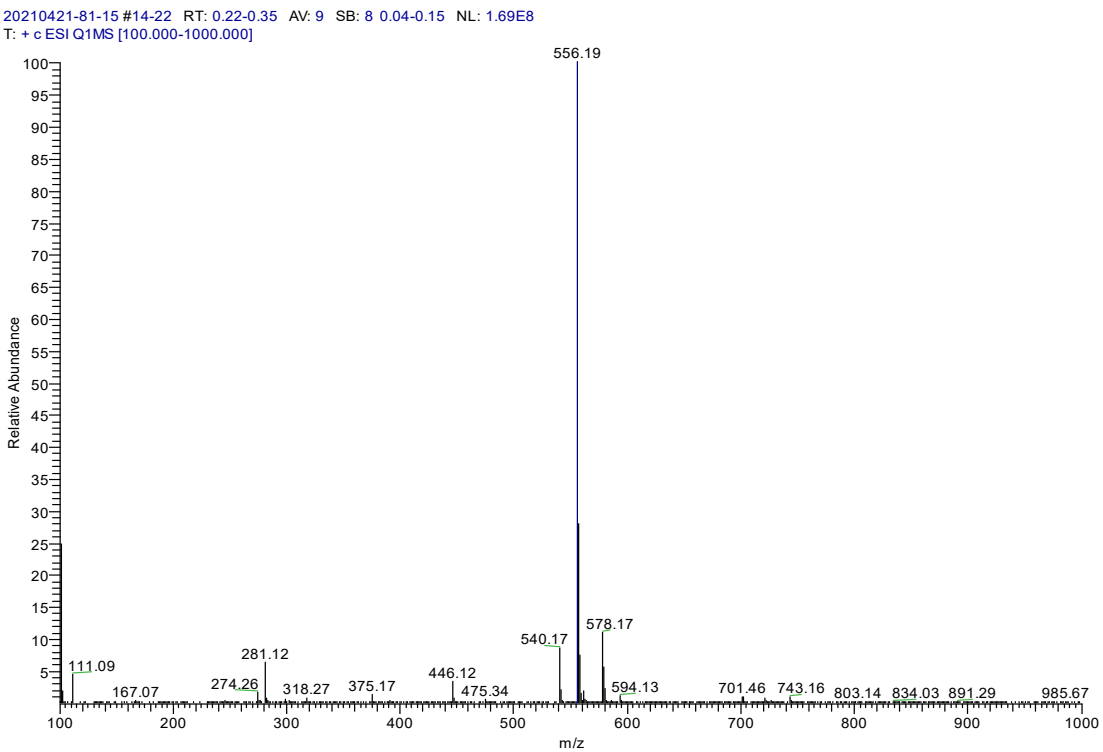

Fig. 79 MS spectrum of **2g**.

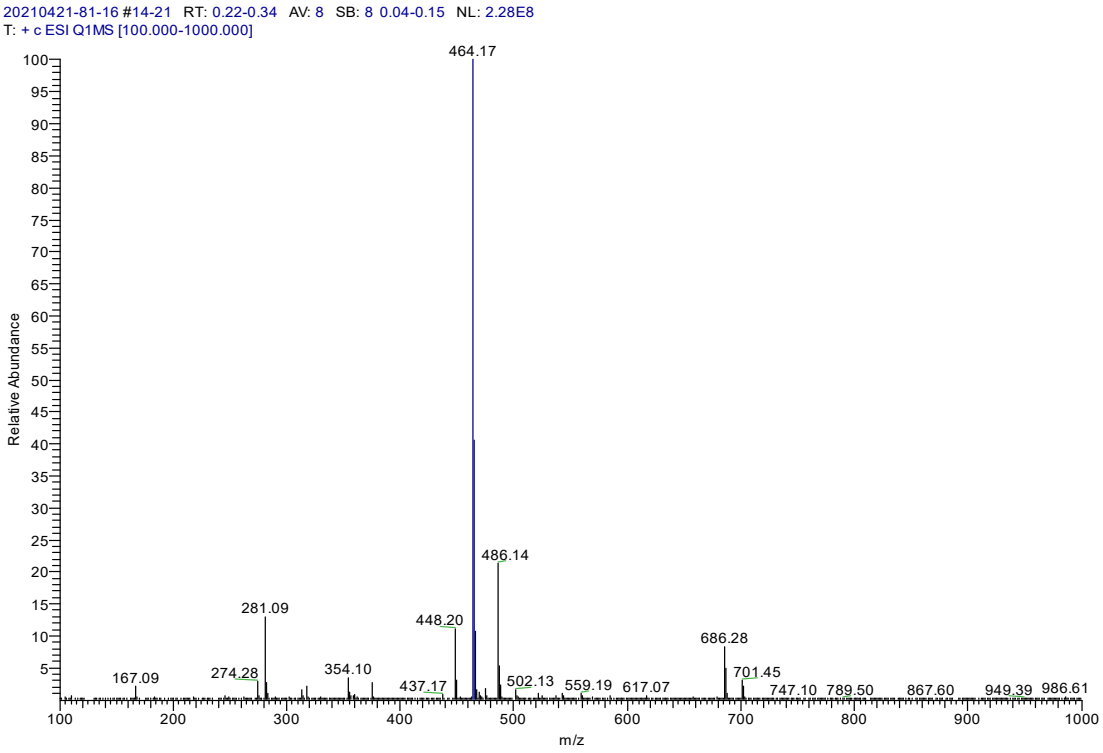

Fig. 80 MS spectrum of **2h**.