

Supporting Information

Selectfluor-Mediated Construction of 3-Arylselenenyl and 3,4-Bisarylselenenyl Spiro[4.5]trienones *via* Cascade Annulation of *N*-Phenylpropiolamides with Diselenides

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1 General information

All chemicals were commercially available and used as received without further. Column chromatography was performed using 300-400 mesh silica. Nuclear magnetic resonance spectra were recorded on Bruker Avance 400 MHz spectrometer. ^1H NMR spectra are recorded in parts per million from tetramethylsilane. Data were reported as follows: chemical shift, multiplicity (s = singlet, d = doublet, t = triplet, m = multiplet and br = broad), coupling constant in Hz and integration. ^{13}C NMR spectra were recorded in parts per million from tetramethylsilane. ^{19}F NMR spectra were recorded in parts per million with fluorobenzene as external standard. High resolution mass spectra (HR MS) were obtained on Thermo Scientific LTQ Orbitrap XL instrument using the ESI technique. IR spectra were recorded on WQF-510 Fourier transform infrared spectrophotometer. Melting points were measured on an XT4A microscopic apparatus uncorrected.

2 Screening the reaction conditions

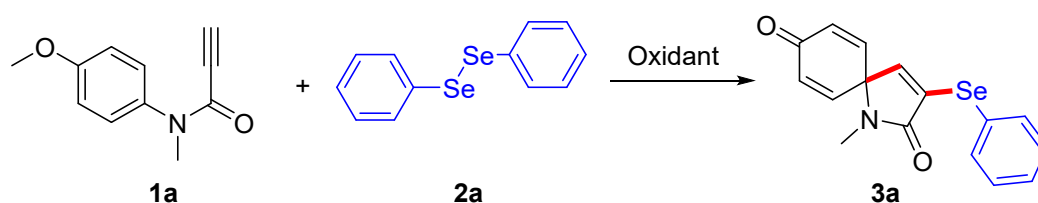


Table S1 Screening the molar ratio of **1a** and **2a**^a

Entry	the molar ratio of 1a and 2a	Yields (%) ^b
1	1 : 0.5	40
2	1 : 1.0	75
3	1 : 1.5	72
4	1 : 2.0	69

^a Reaction conditions: *N*-(4-methoxyphenyl)-*N*-methylpropiolamide **1a** (0.2 mmol, 37.8 mg), diphenyl diselenide **2a**, Selectfluor agen (0.2 mmol, 70.8 mg) in CH_3CN (2.0 mL) at 40 °C for 4.0 h.

^b Isolated yield.

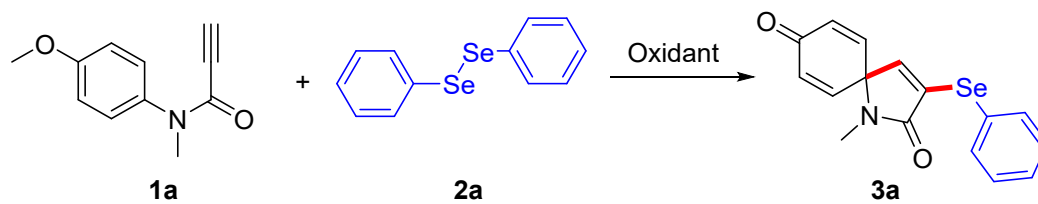


Table S2 Screening the molar ratio of **1a** and **2a**^a

Entry	Reaction temperature (°C)	Yields (%) ^b
1	20	40
2	40	75
3	60	75
4	80	72

^a Reaction conditions: *N*-(4-methoxyphenyl)-*N*-methylpropiolamide **1a** (0.2 mmol, 37.8 mg), diphenyl diselenide **2a** (0.2 mmol, 62.8 mg), Selectfluor agen (0.2 mmol, 70.8 mg) in CH₃CN (2.0 mL) for 4.0 h.

^b Isolated yield.

3 Copies of spectra of products

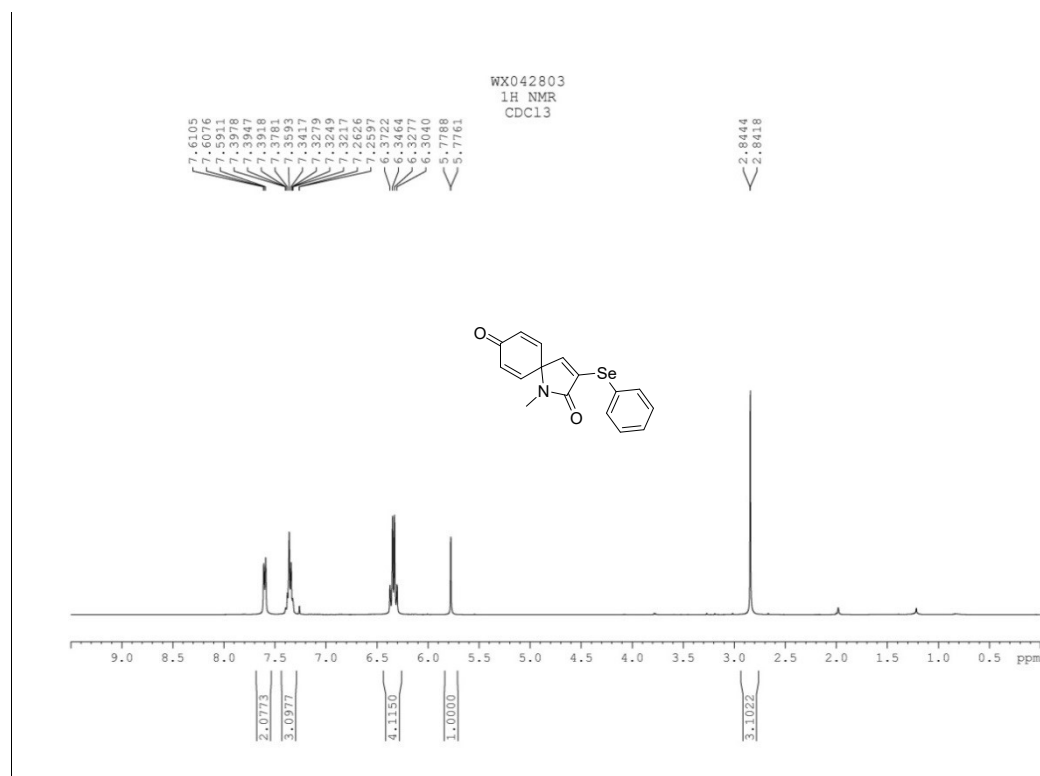


Fig. 1 ¹H NMR spectrum of compound **3a**

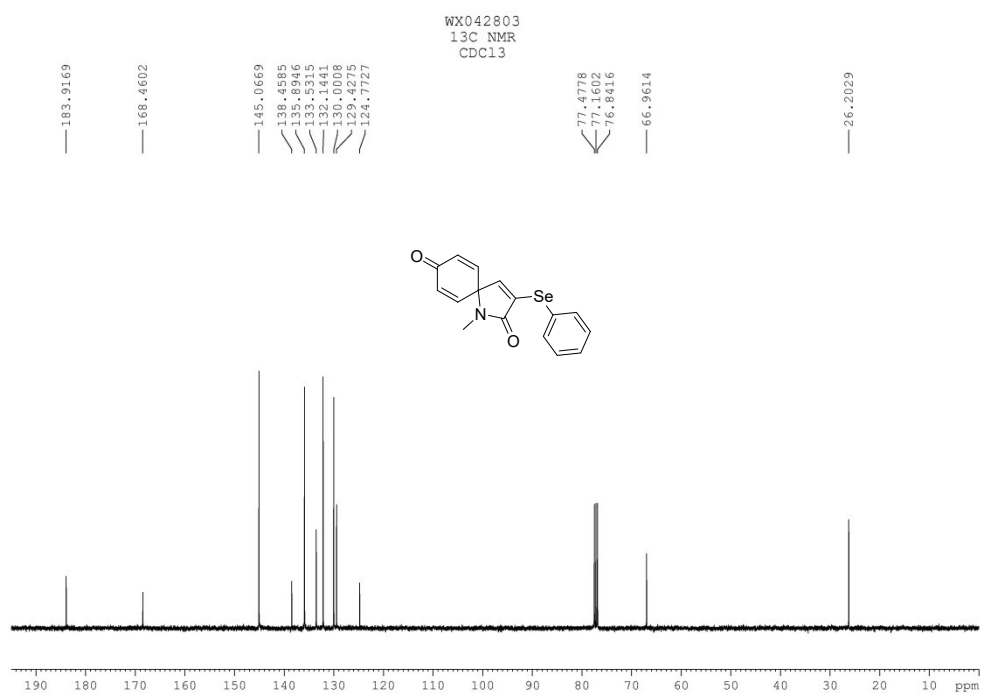


Fig. 2 ¹³C NMR spectrum of compound 3a

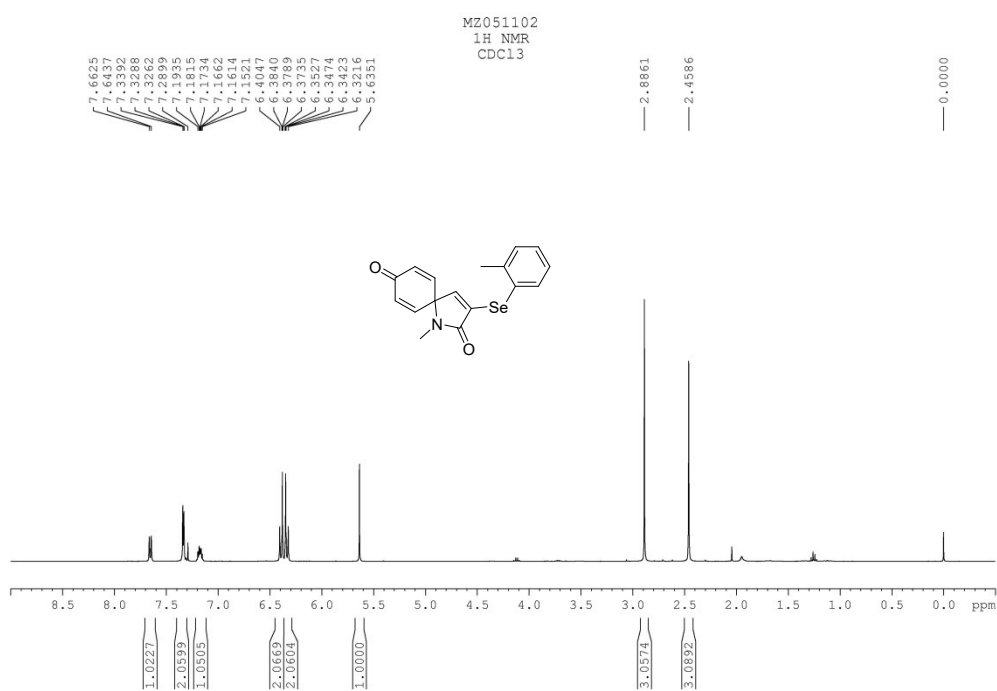


Fig. 3 ¹H NMR spectrum of compound 3b

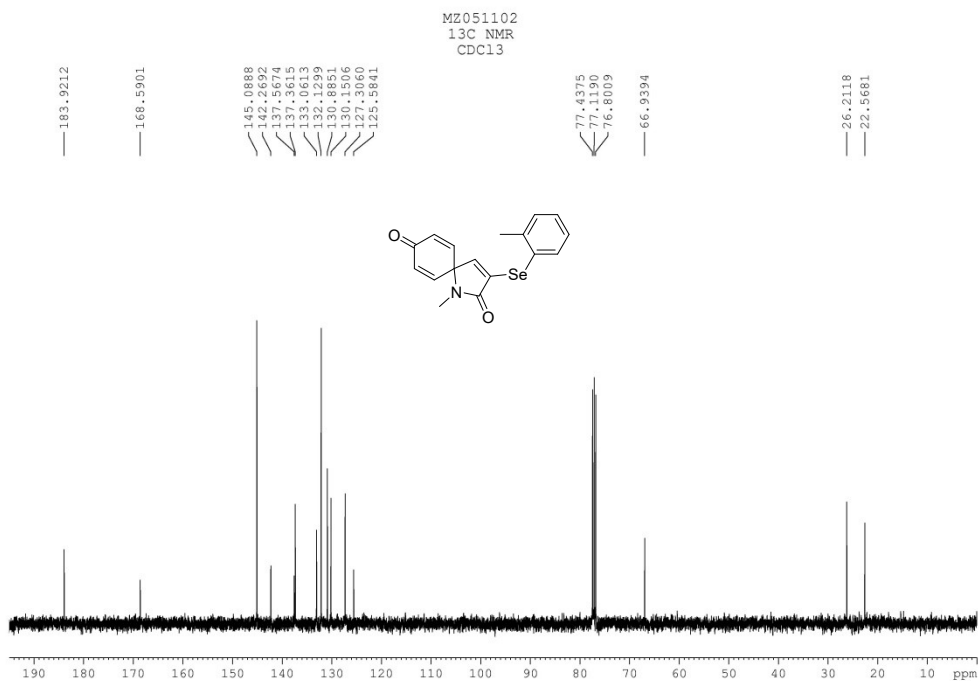


Fig. 4 ¹³C NMR spectrum of compound 3b

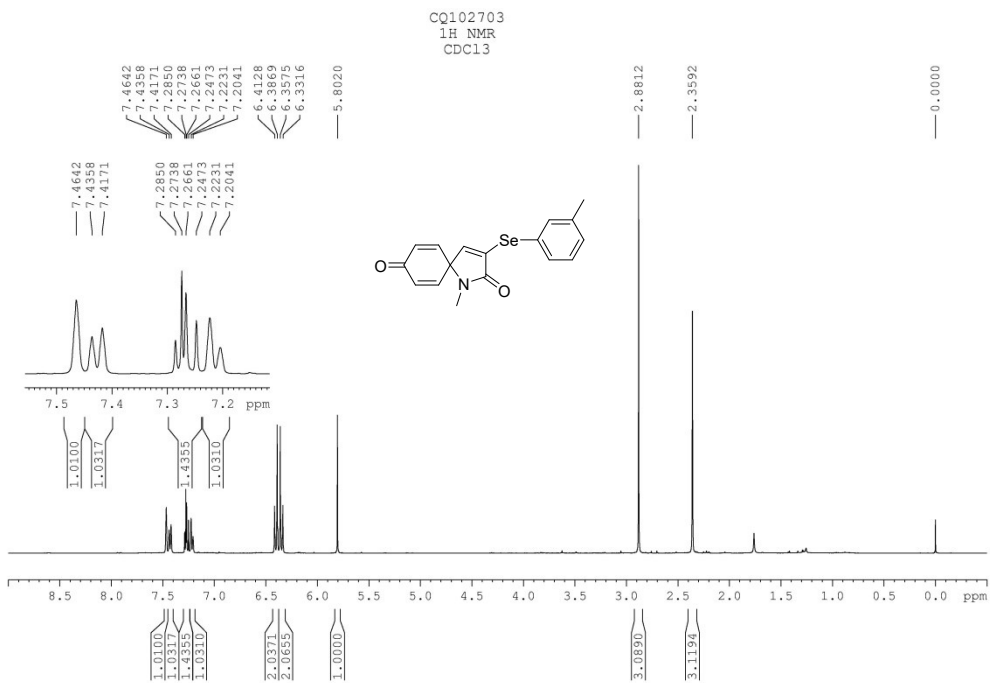


Fig. 5 ¹H NMR spectrum of compound 3c

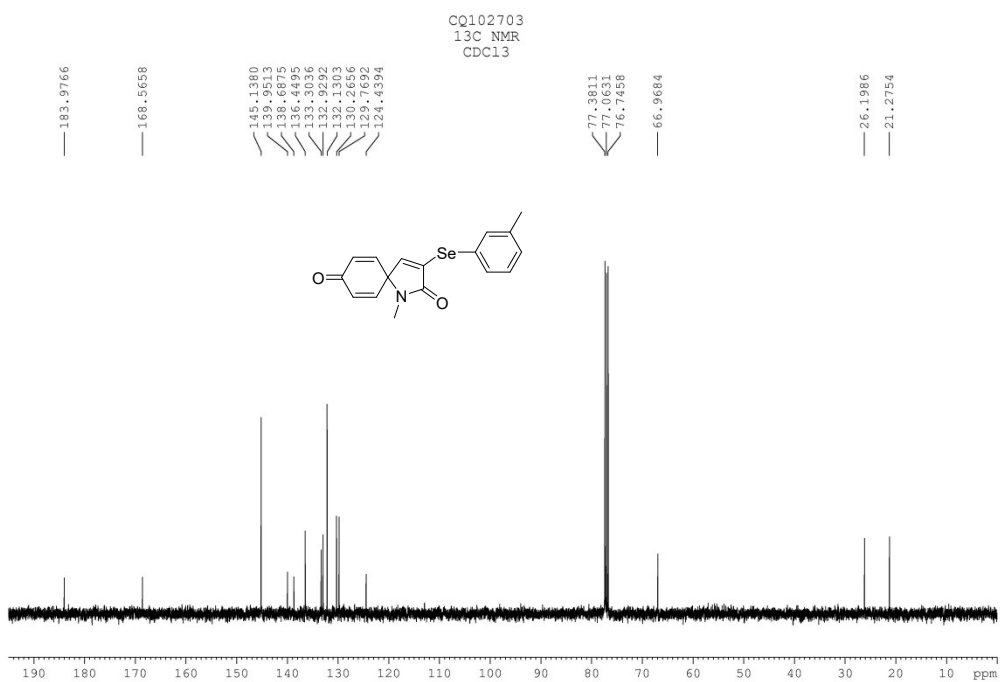


Fig. 6 ¹³C NMR spectrum of compound 3c

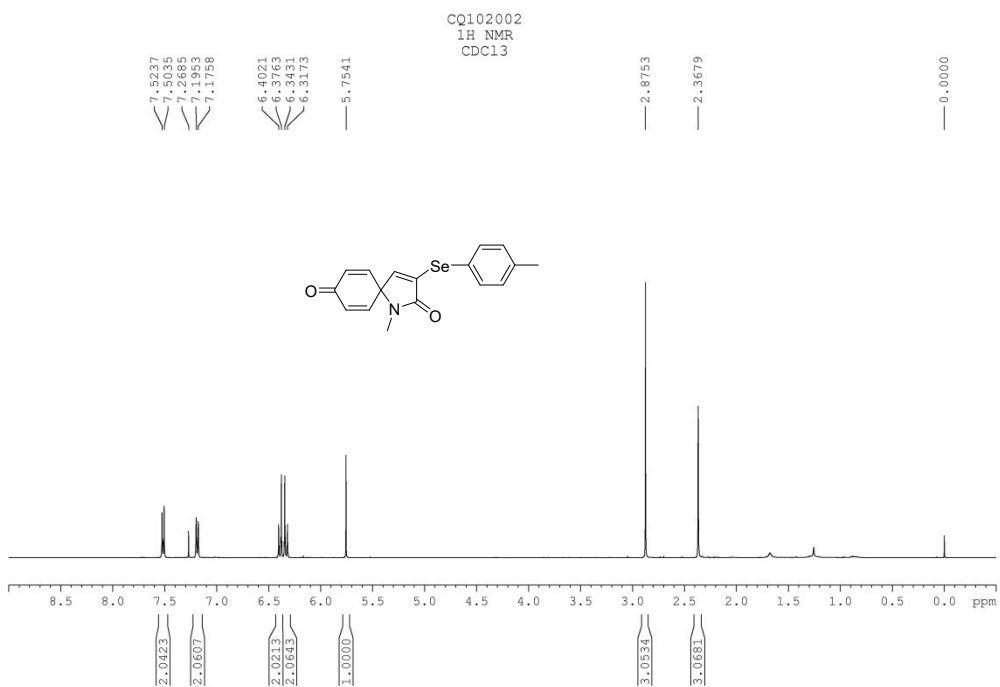


Fig. 7 ¹H NMR spectrum of compound 3d

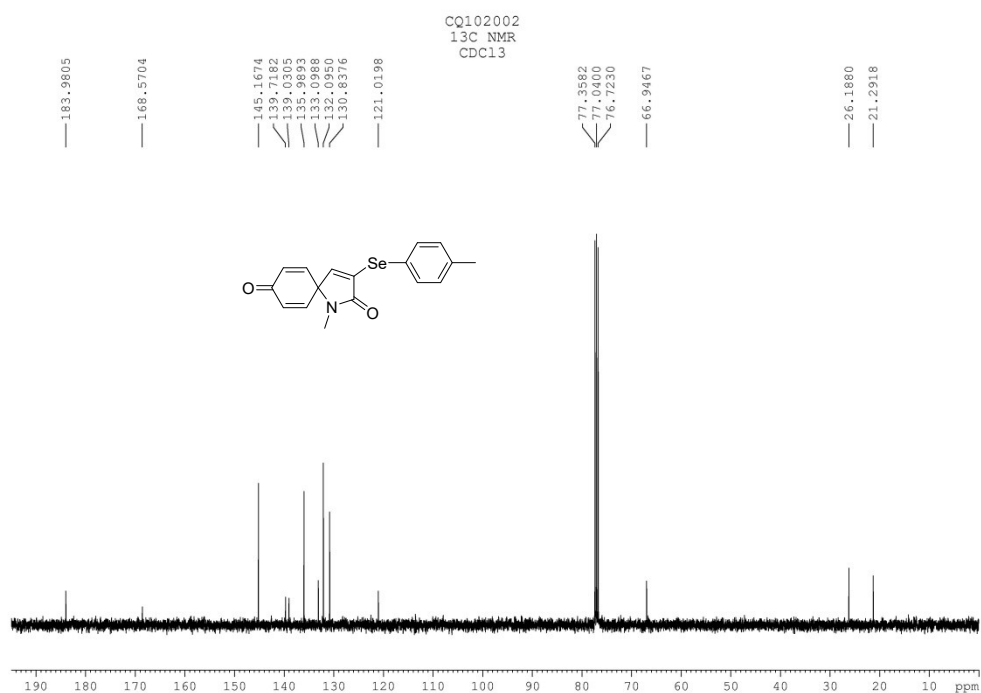


Fig. 8 ^{13}C NMR spectrum of compound **3d**

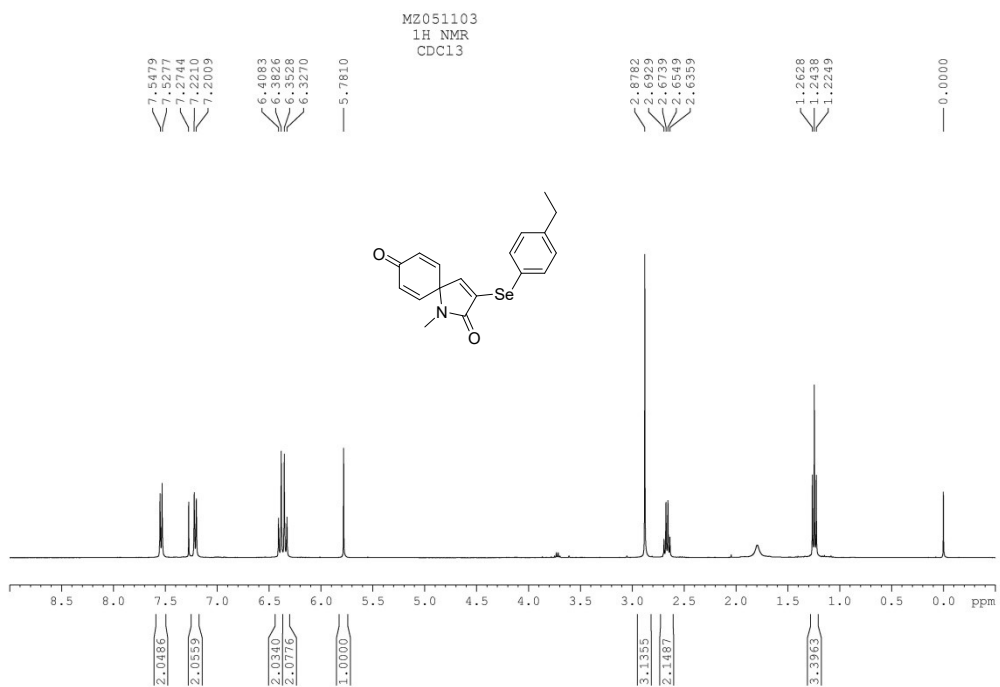


Fig. 9 ^1H NMR spectrum of compound **3e**

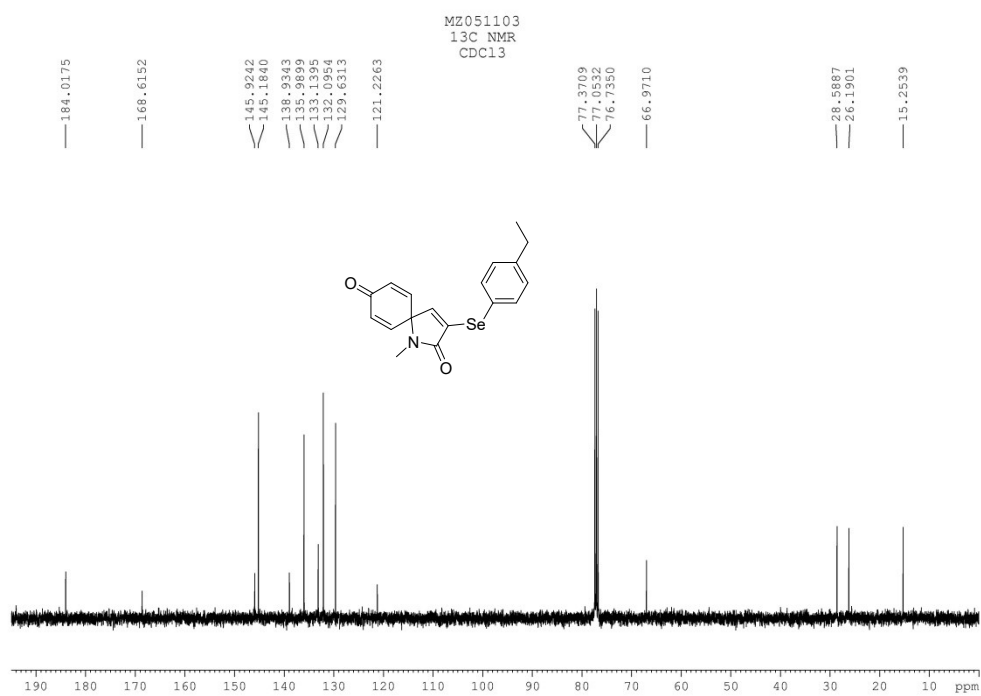


Fig. 10 ^{13}C NMR spectrum of compound 3e

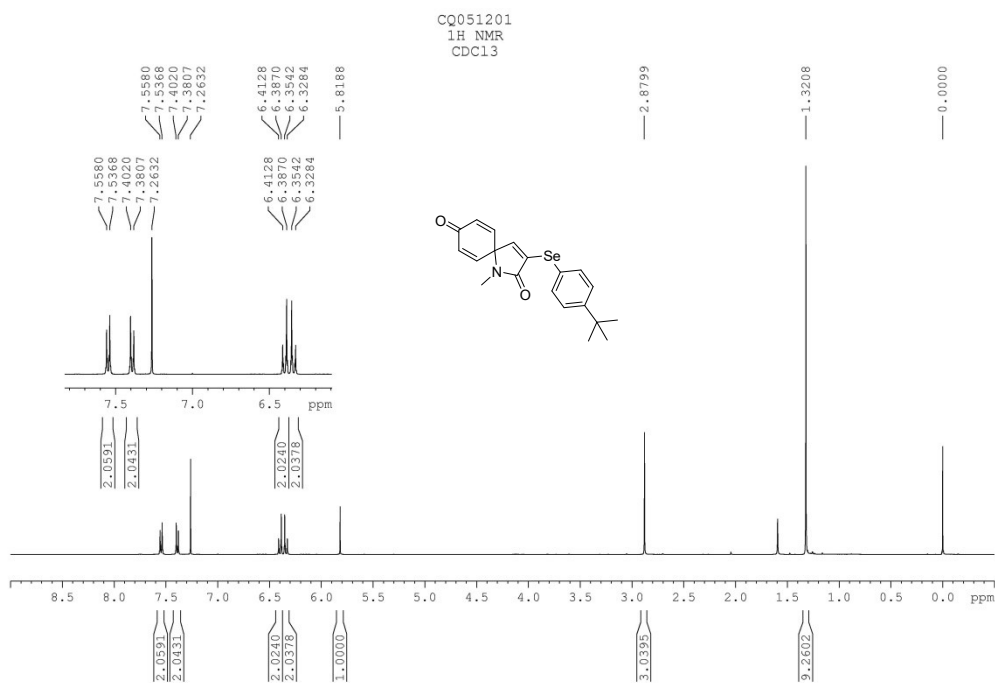


Fig. 11 ^1H NMR spectrum of compound 3f

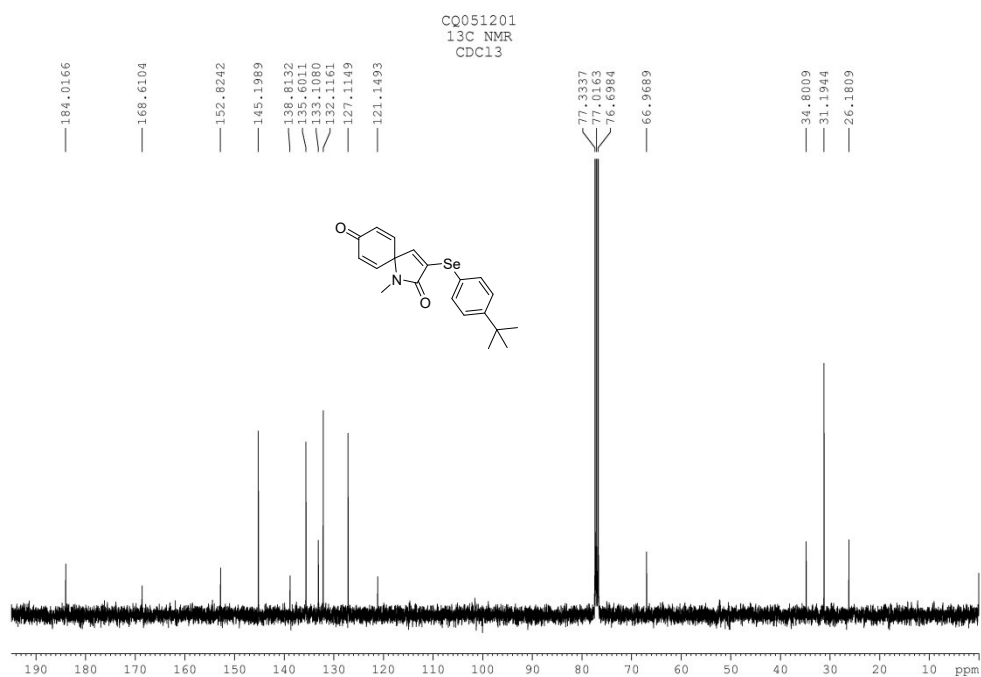


Fig. 12 ^{13}C NMR spectrum of compound 3f

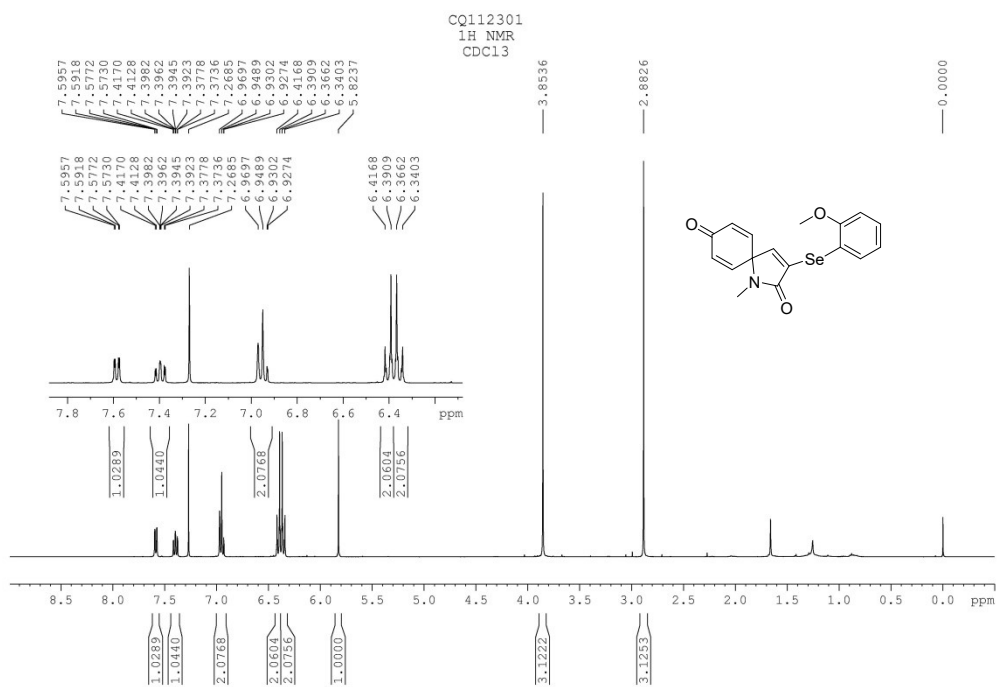


Fig. 13 ^1H NMR spectrum of compound 3g

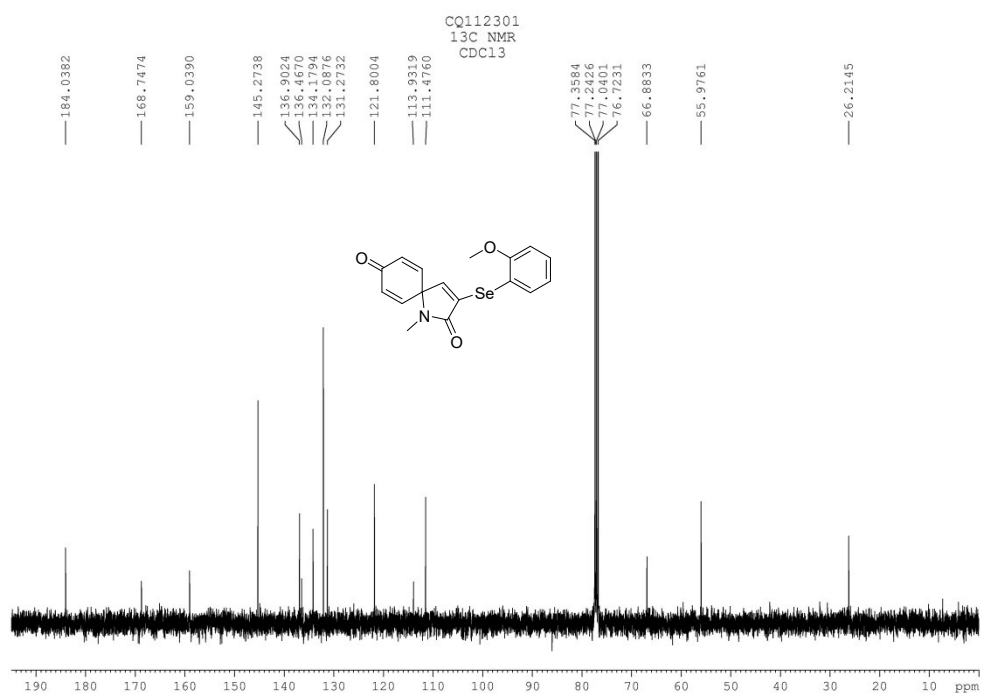


Fig. 14 ¹³C NMR spectrum of compound **3g**

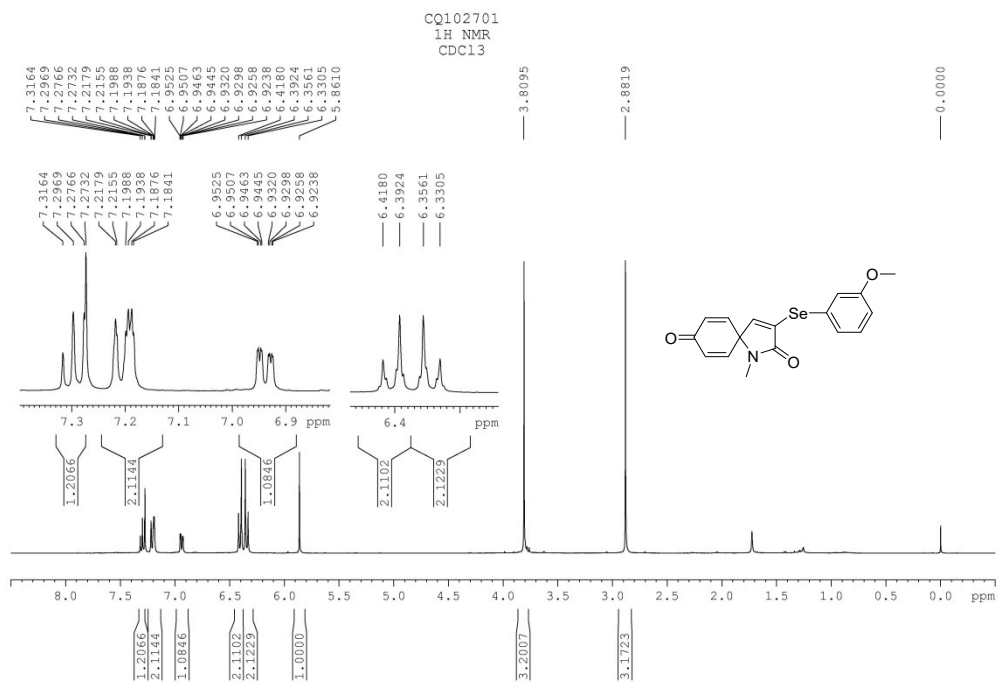


Fig. 15 ¹H NMR spectrum of compound **3h**

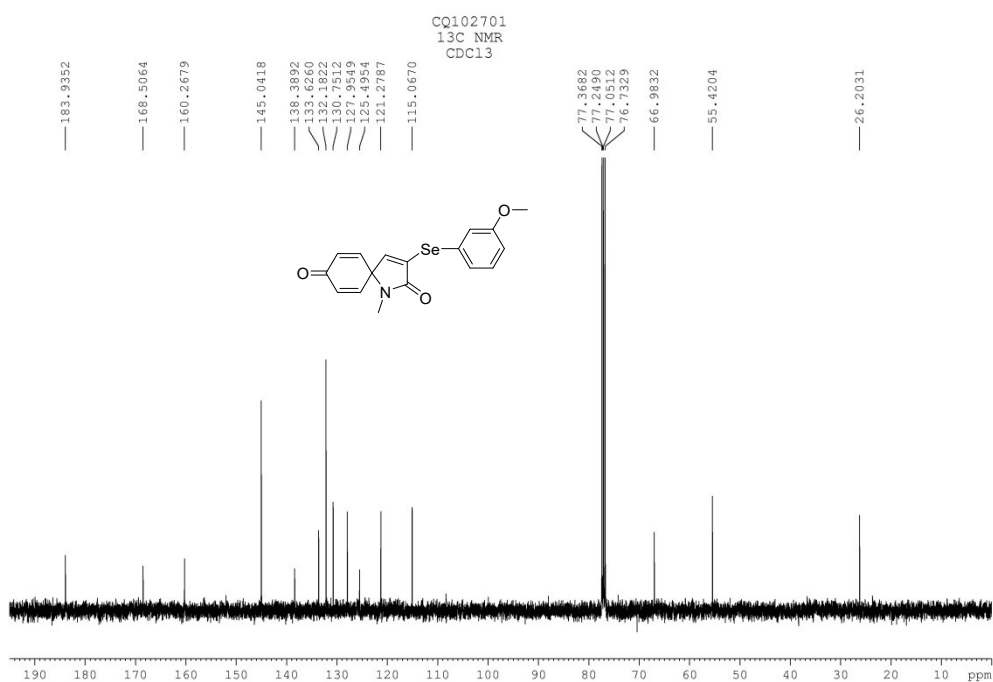


Fig. 16 ¹³C NMR spectrum of compound 3h

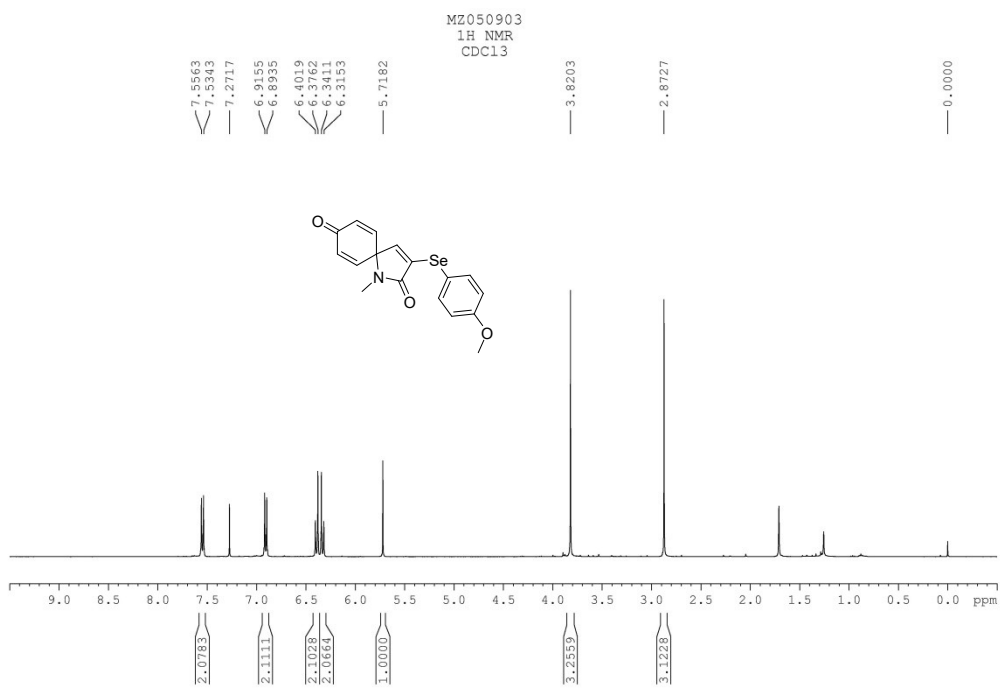


Fig. 17 ¹H NMR spectrum of compound 3i

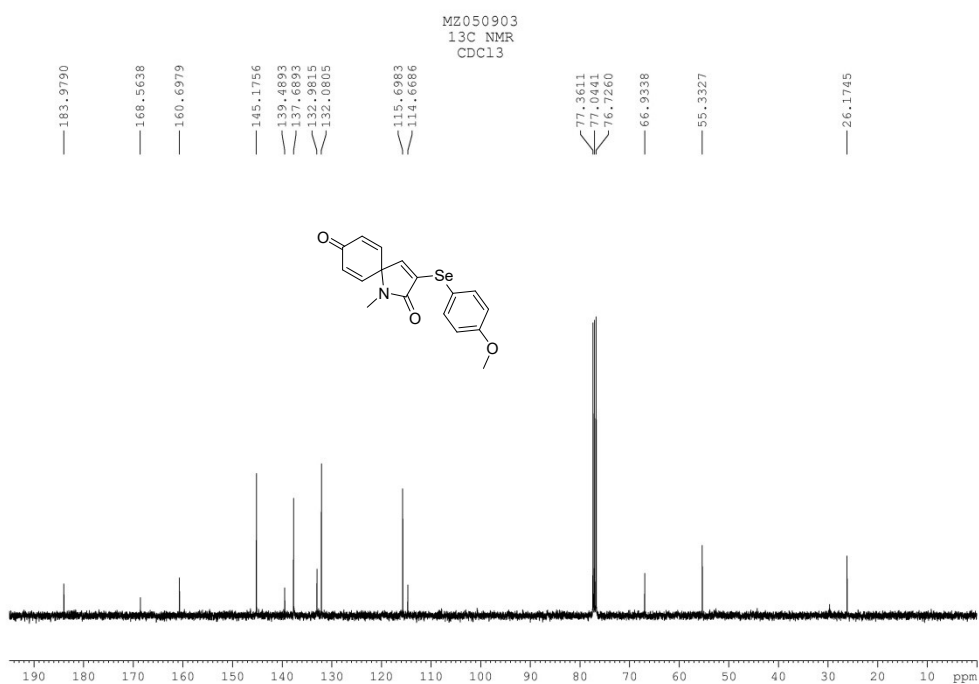


Fig. 18 ¹³C NMR spectrum of compound 3i

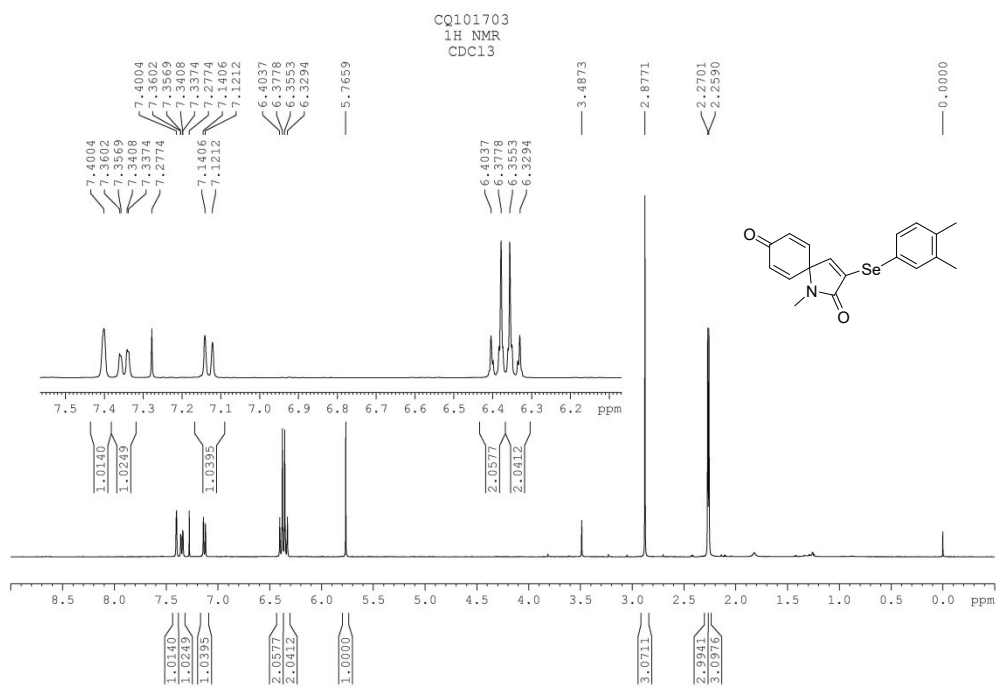


Fig. 19 ¹H NMR spectrum of compound 3j

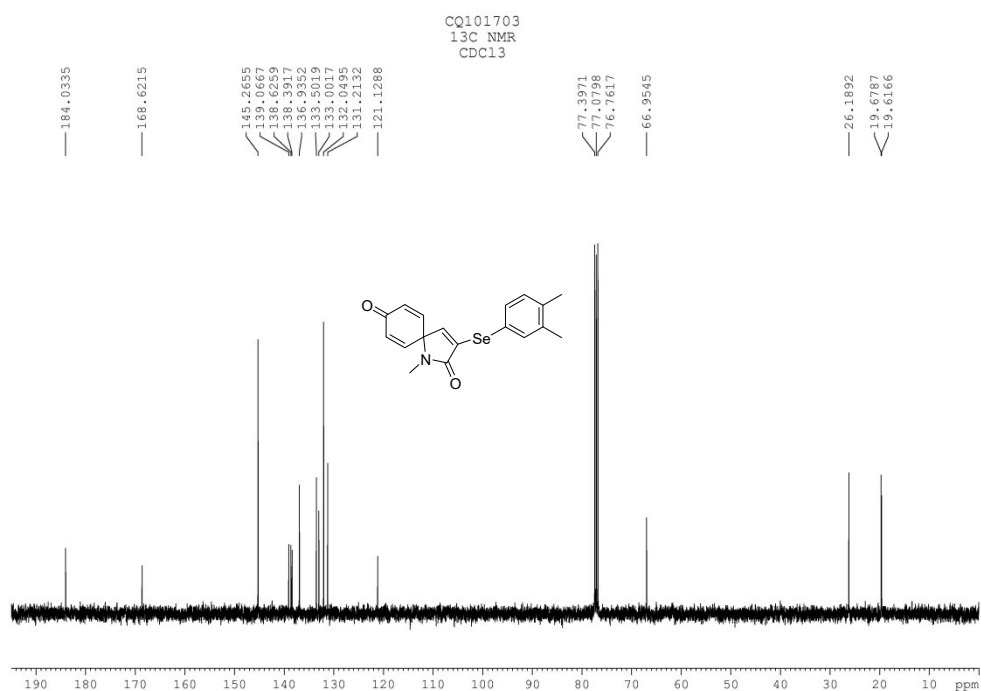


Fig. 20 ¹³C NMR spectrum of compound 3j

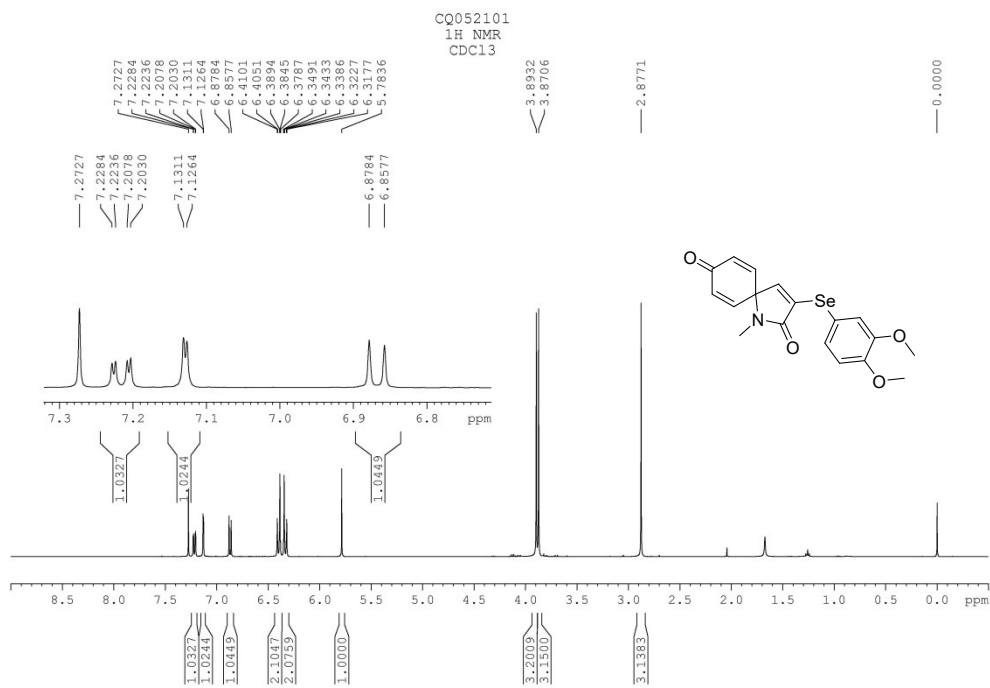


Fig. 21 ¹H NMR spectrum of compound 3k

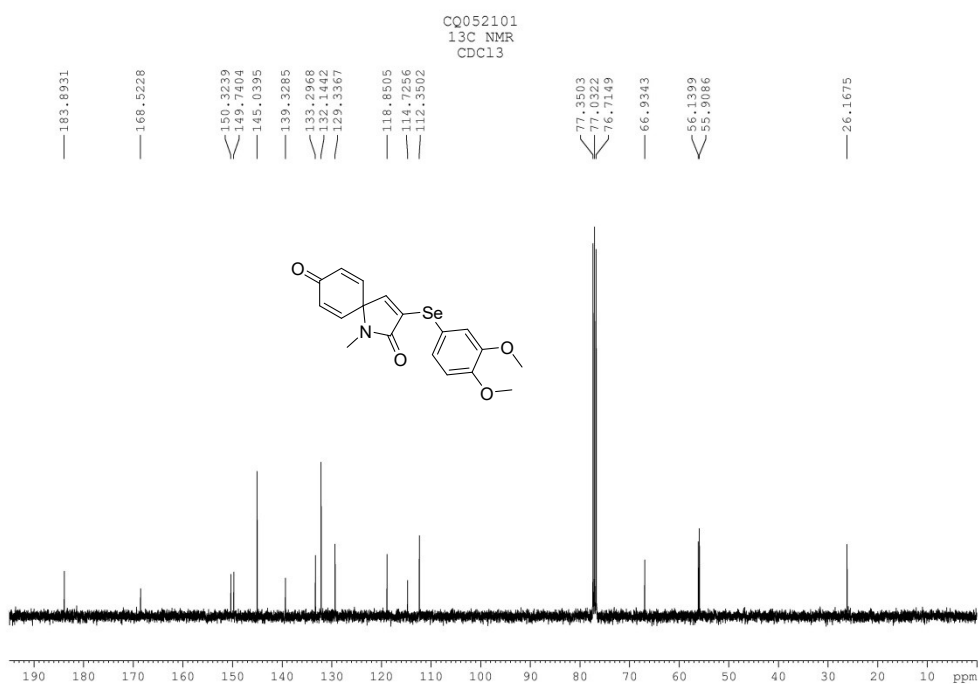


Fig. 22 ^{13}C NMR spectrum of compound **3k**

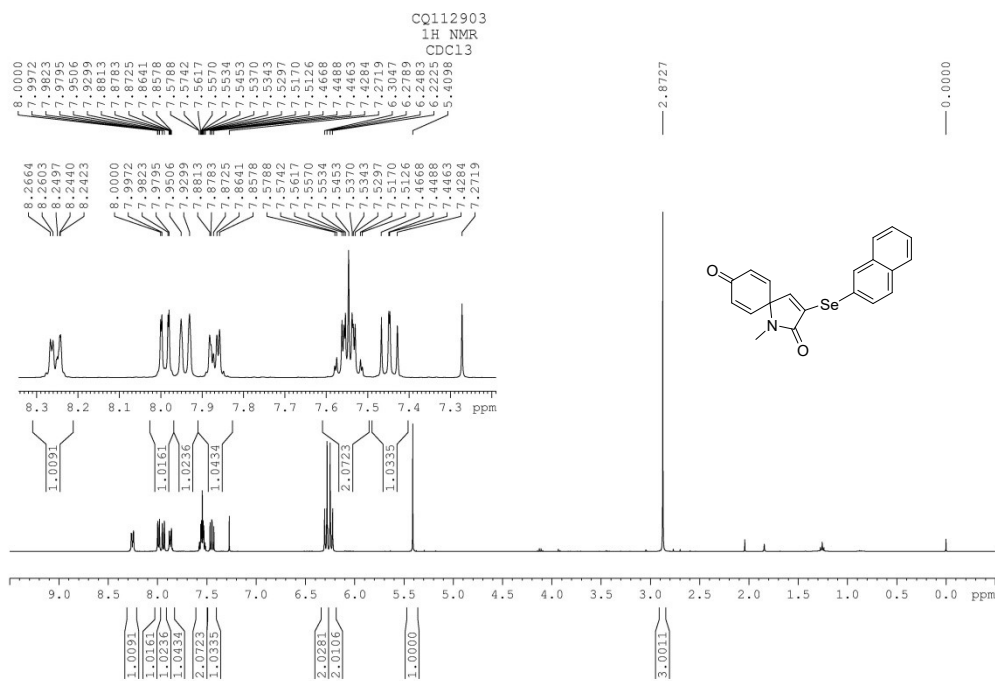


Fig. 23 ^1H NMR spectrum of compound **3l**

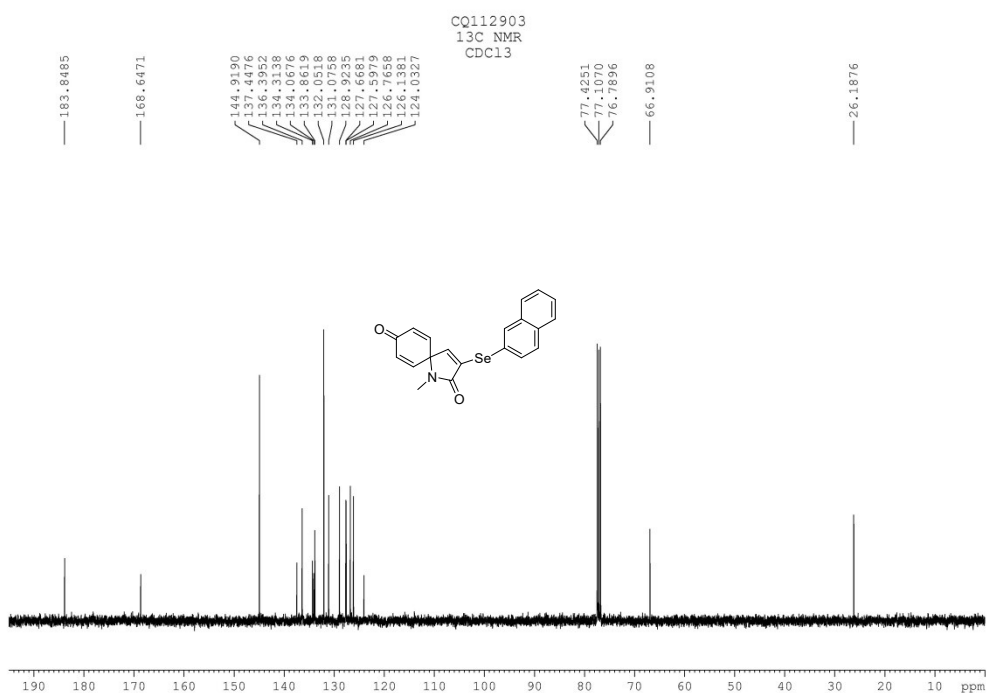


Fig. 24 ¹³C NMR spectrum of compound 3l

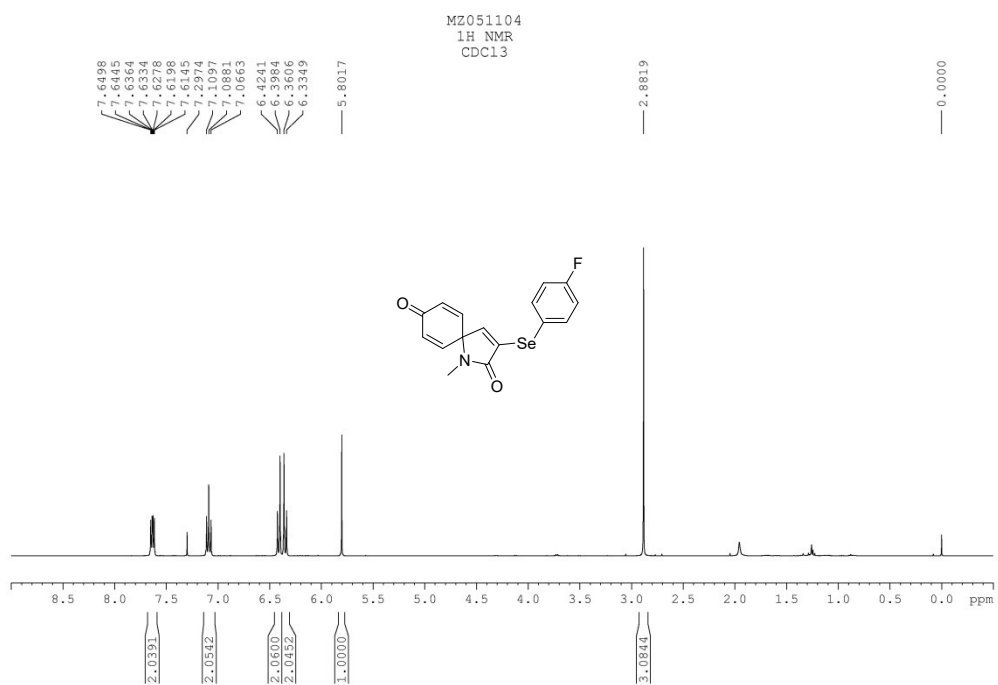


Fig. 25 ¹H NMR spectrum of compound 3m

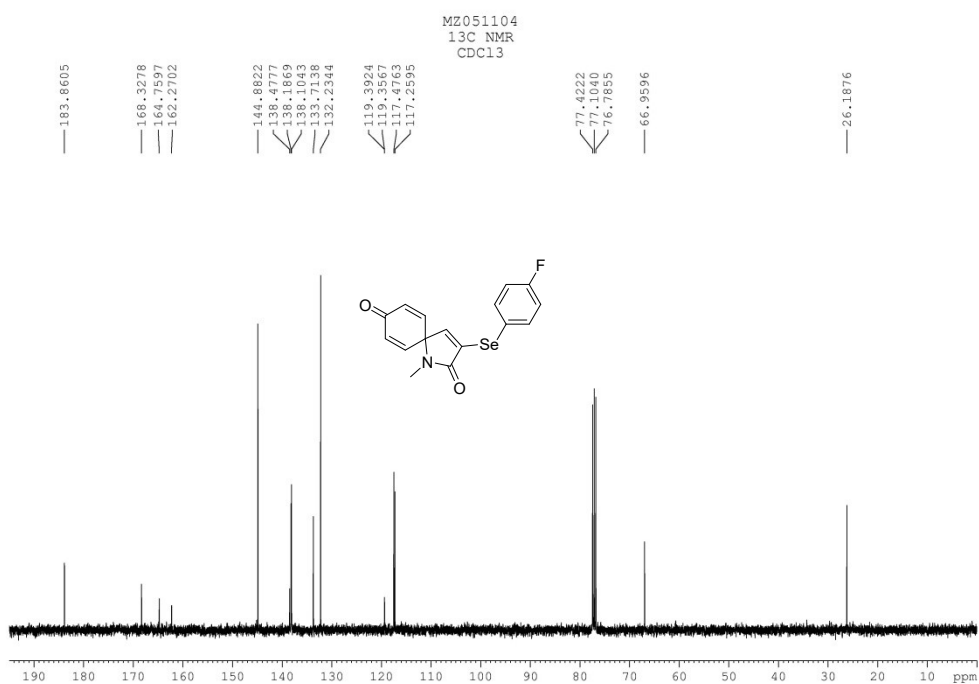


Fig. 26 ¹³C NMR spectrum of compound **3m**

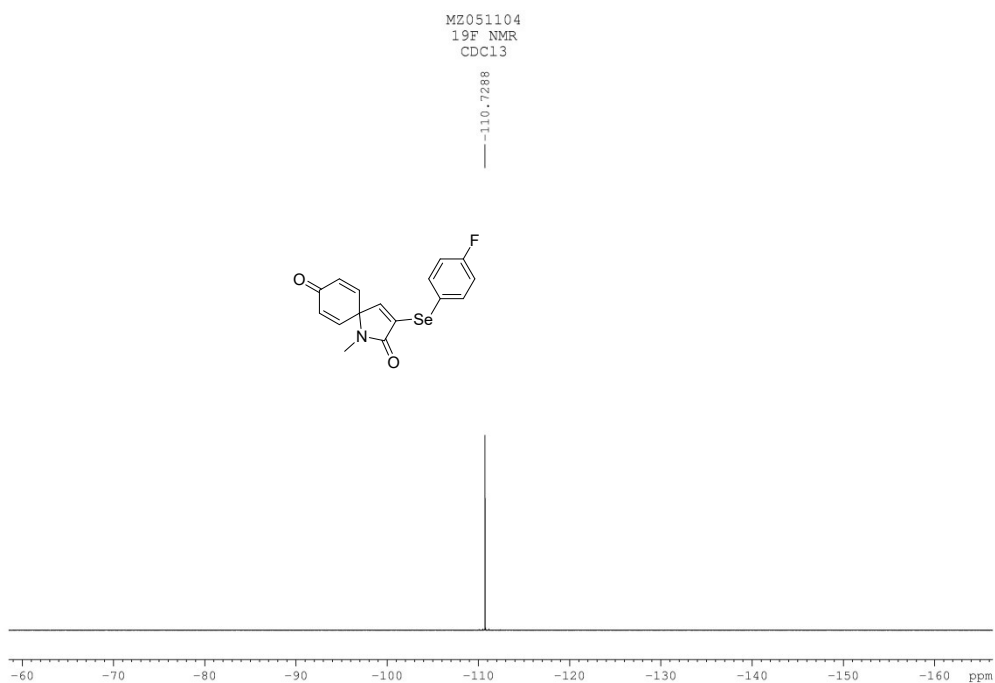


Fig. 27 ¹⁹F NMR spectrum of compound **3m**

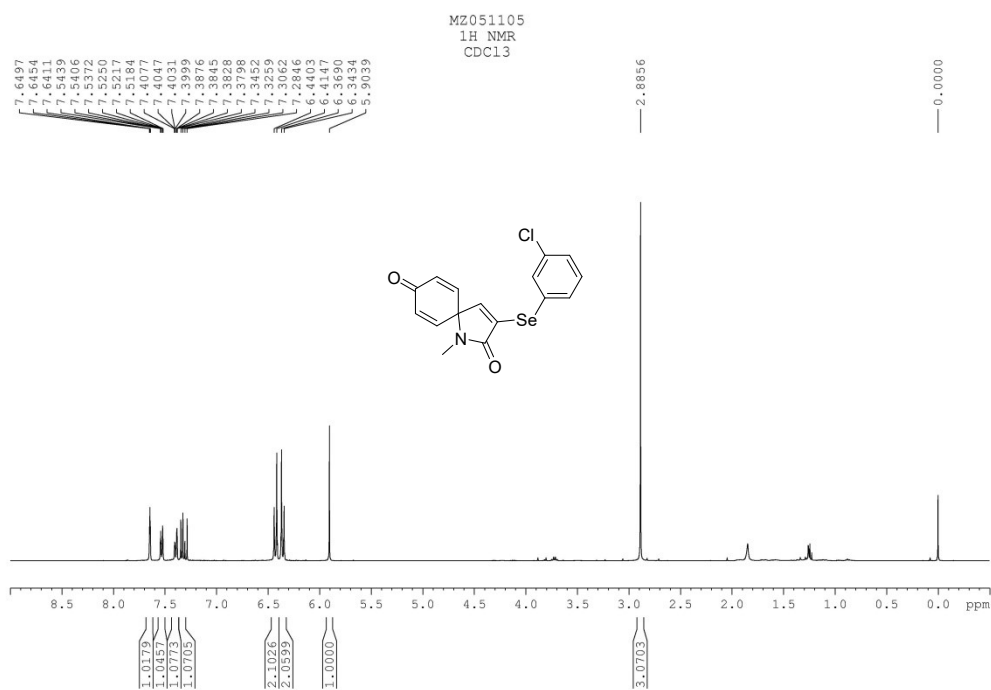


Fig. 28 ^1H NMR spectrum of compound **3n**

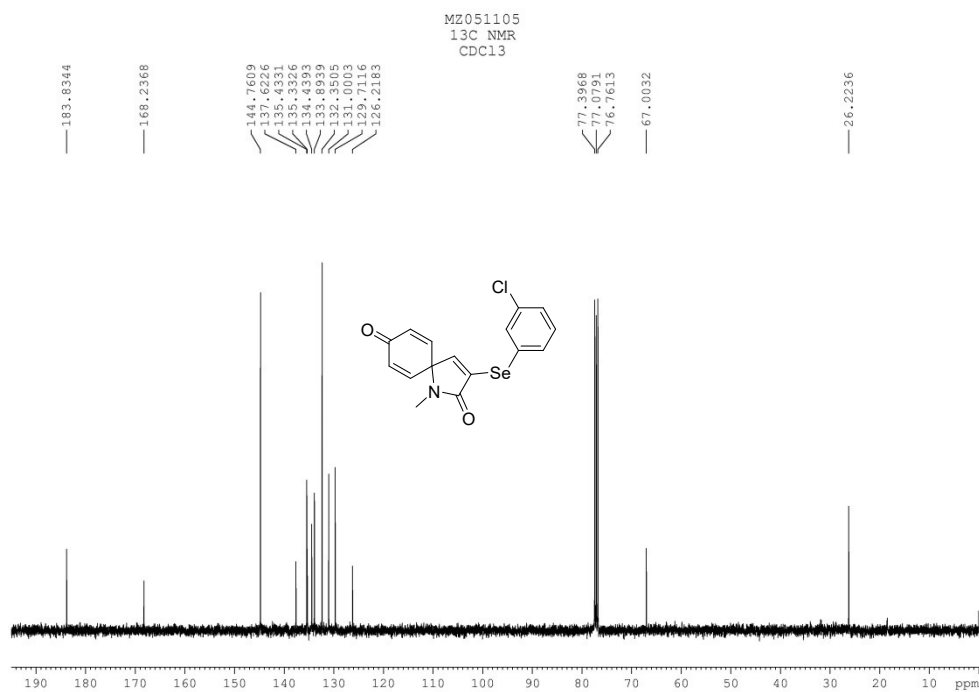


Fig. 29 ^{13}C NMR spectrum of compound **3n**

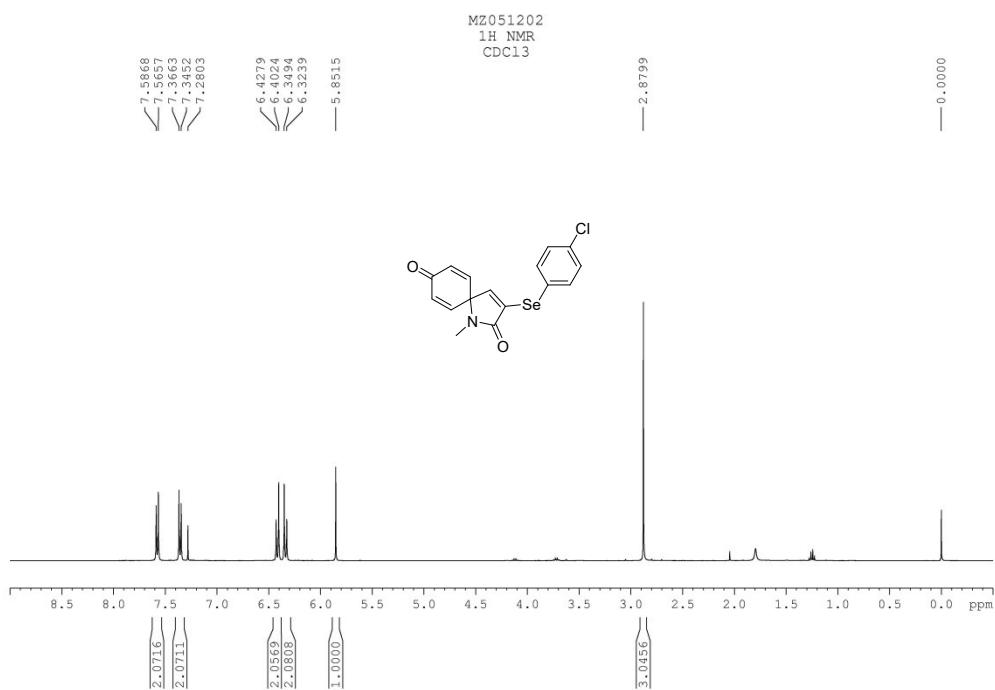


Fig. 30 ^1H NMR spectrum of compound **3o**

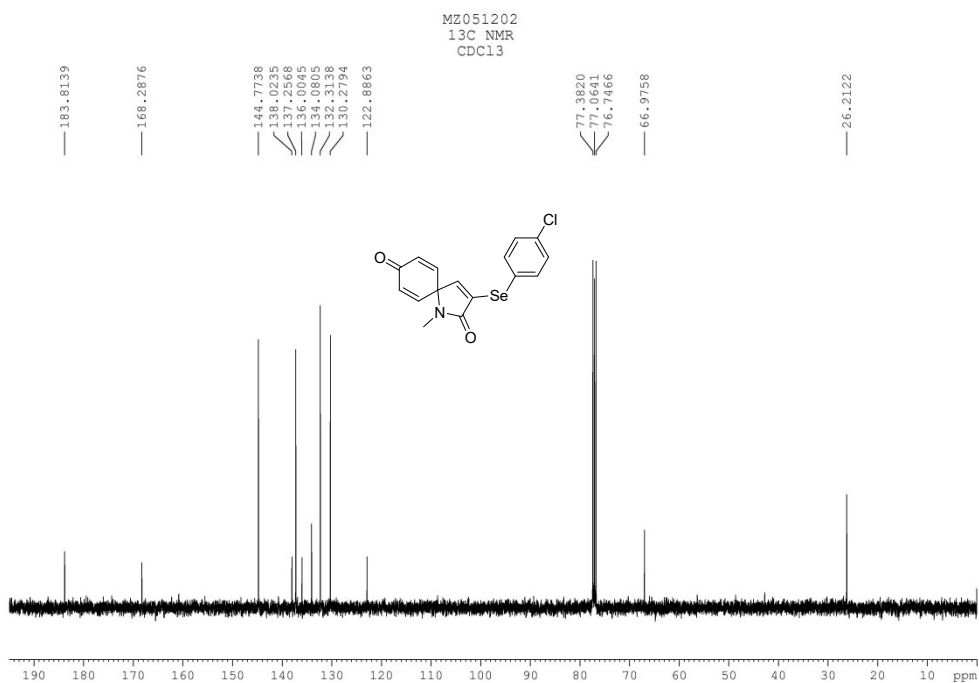


Fig. 31 ^{13}C NMR spectrum of compound **3o**

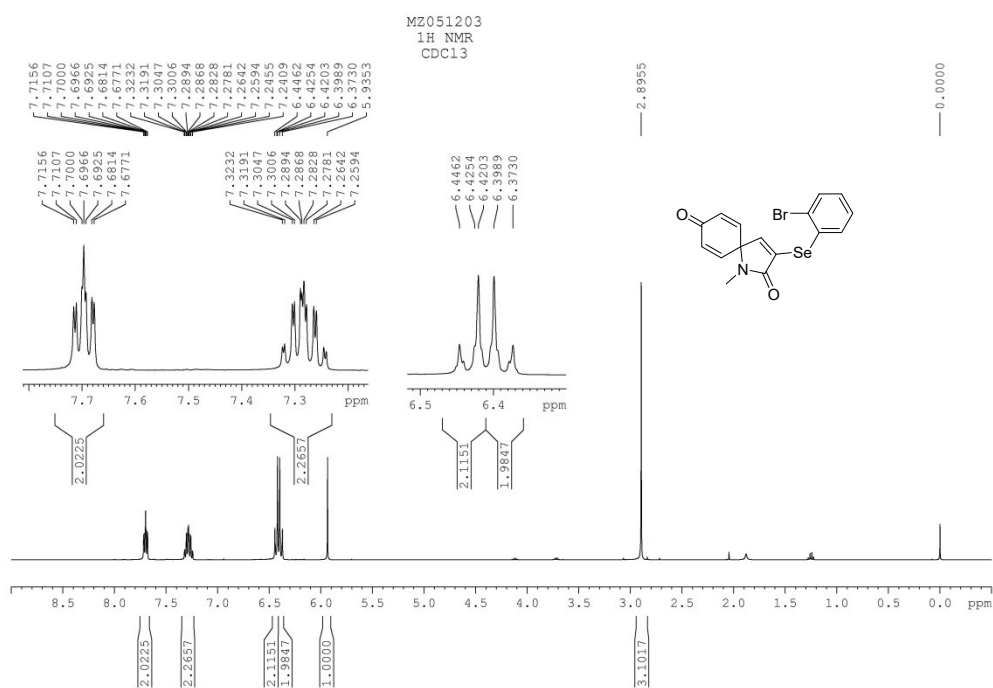


Fig. 32 ^1H NMR spectrum of compound 3p

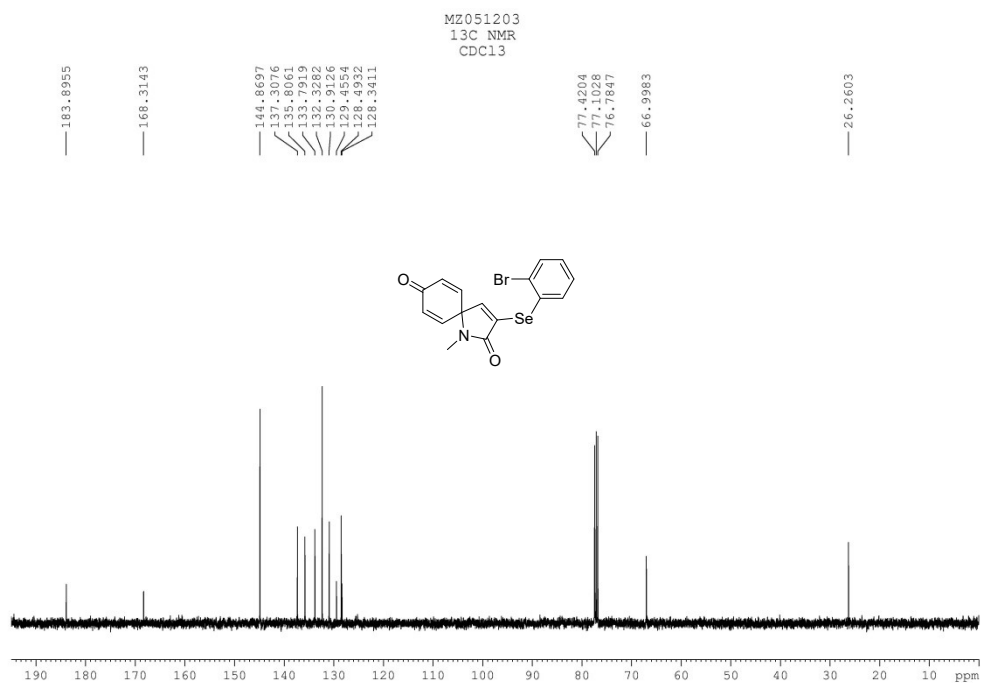


Fig. 33 ^{13}C NMR spectrum of compound 3p



Fig. 34 ^1H NMR spectrum of compound **3q**

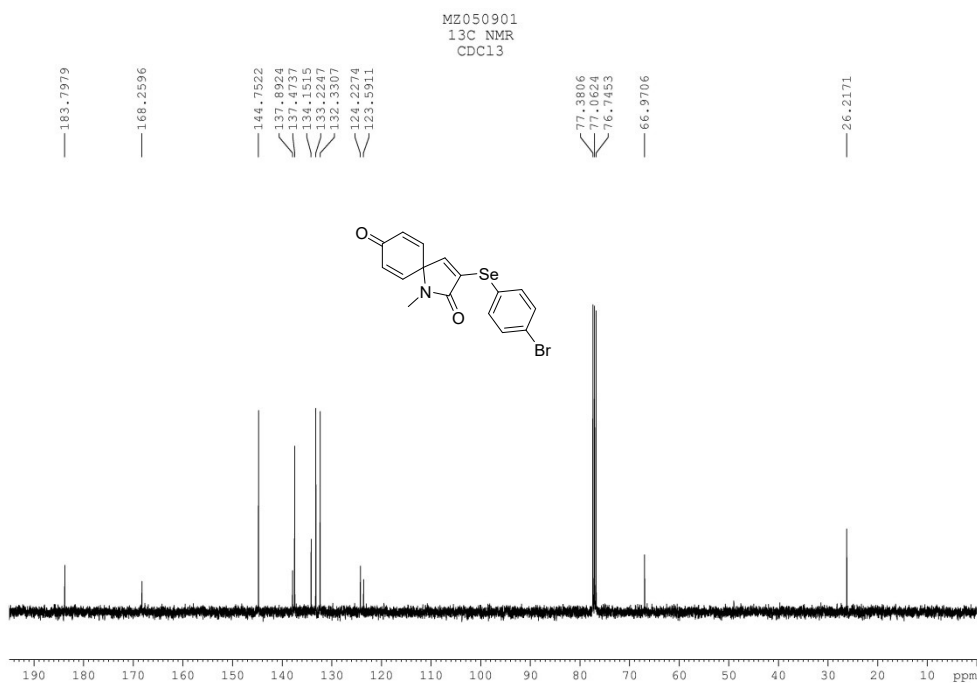


Fig. 35 ^{13}C NMR spectrum of compound **3q**

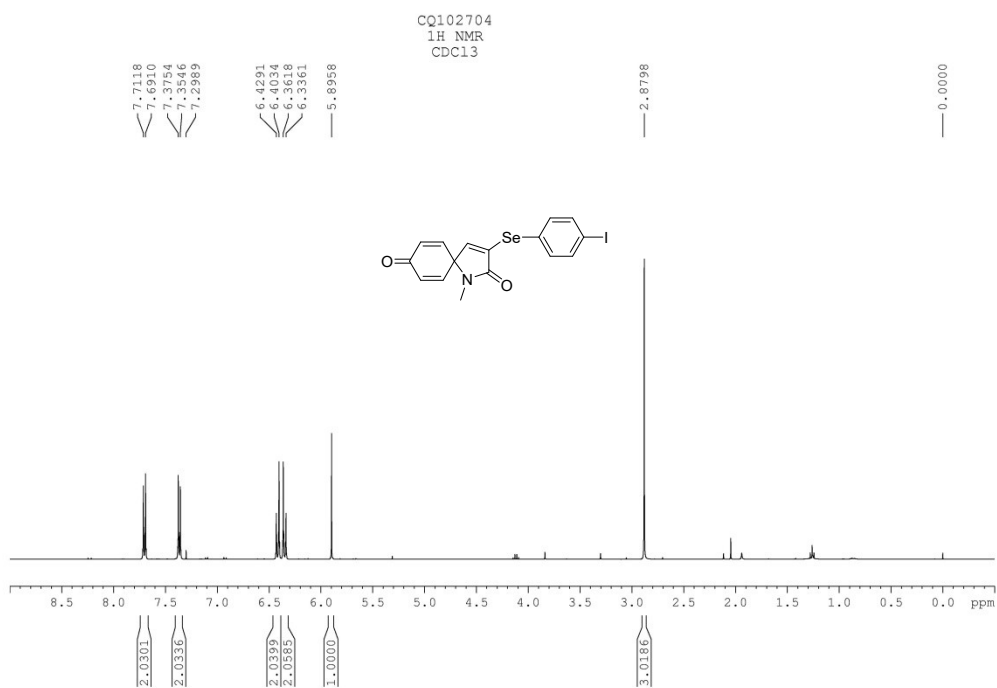


Fig. 36 ^1H NMR spectrum of compound **3r**

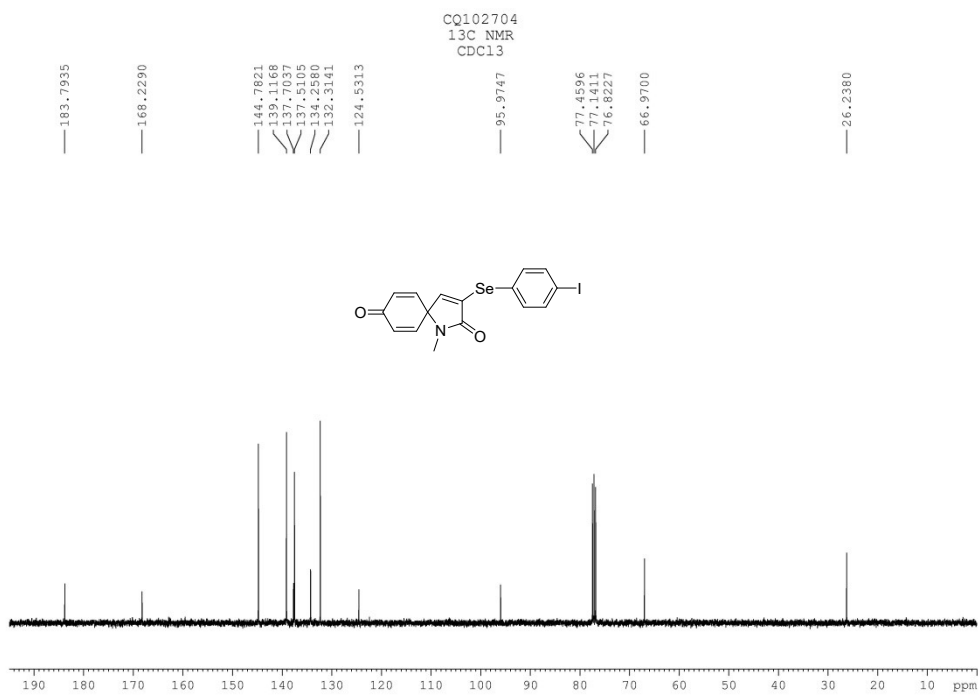


Fig. 37 ^{13}C NMR spectrum of compound **3r**



Fig. 38 ¹H NMR spectrum of compound **3s**

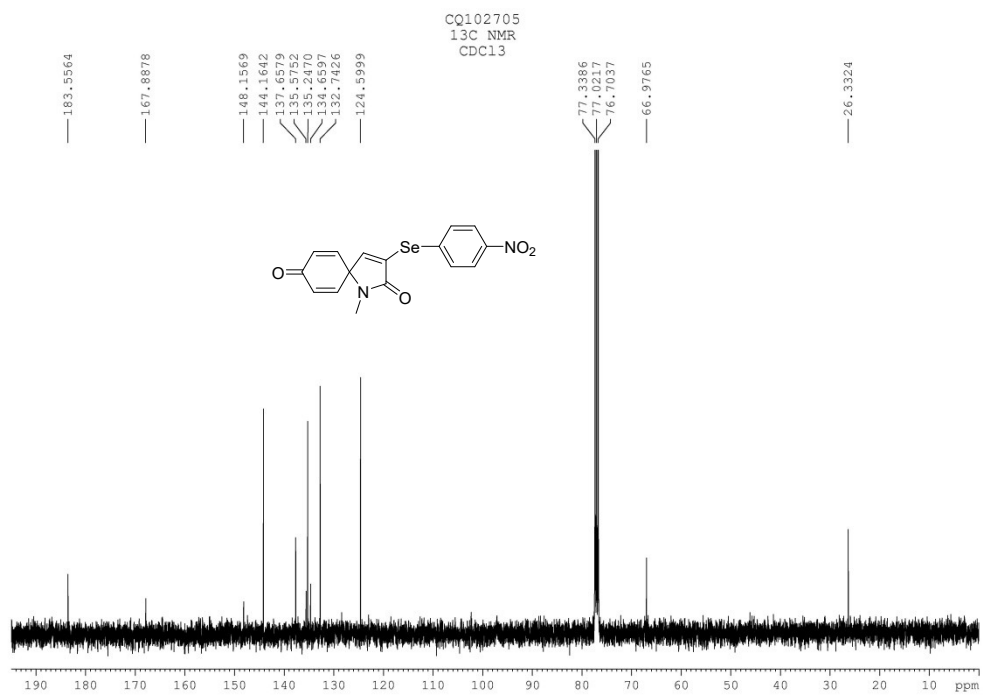


Fig. 39 ¹³C NMR spectrum of compound **3s**

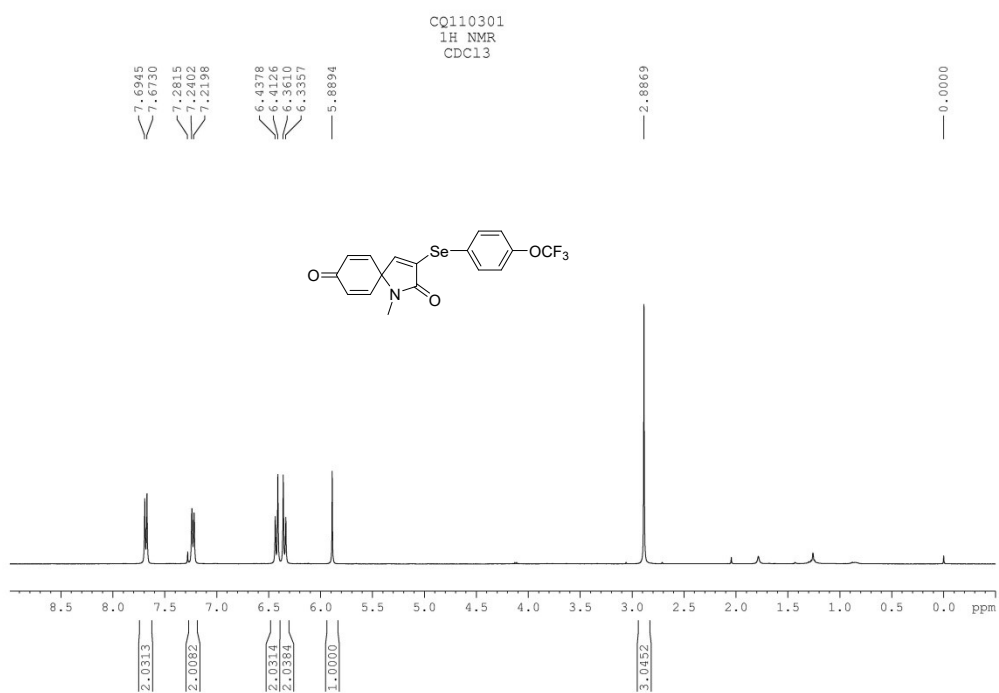


Fig. 40 ¹H NMR spectrum of compound **3t**

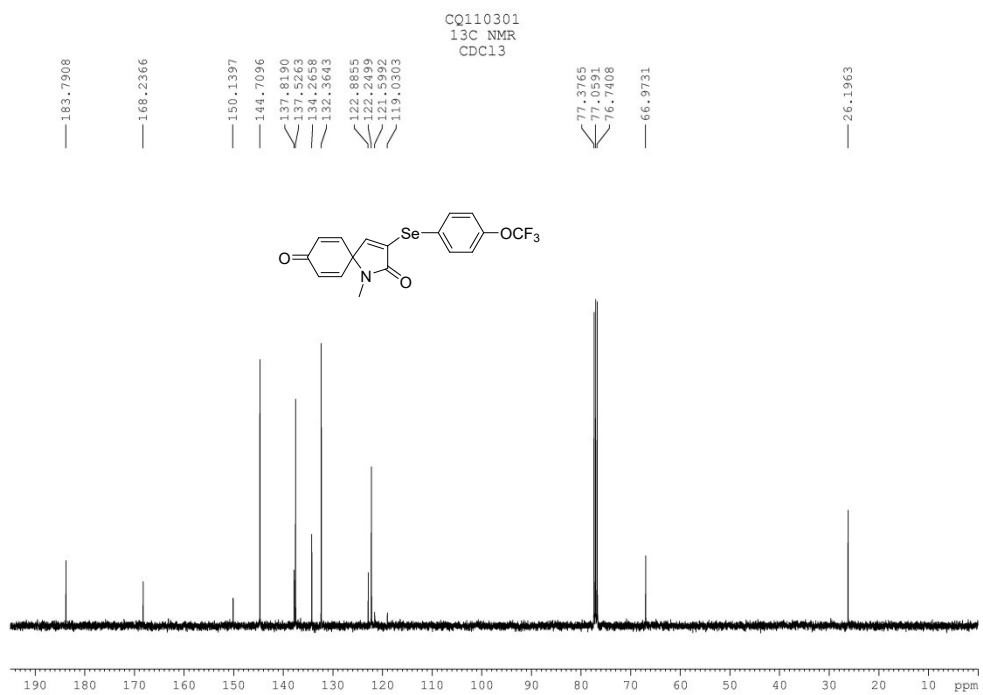


Fig.41 ¹³C NMR spectrum of compound **3t**

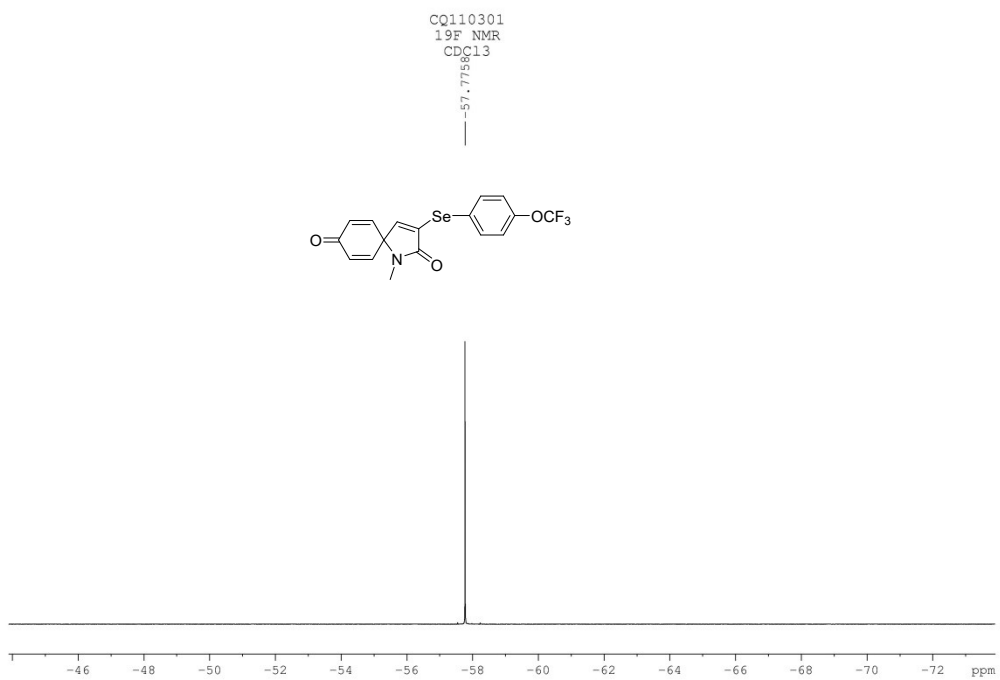


Fig.42 ¹⁹F NMR spectrum of compound **3t**

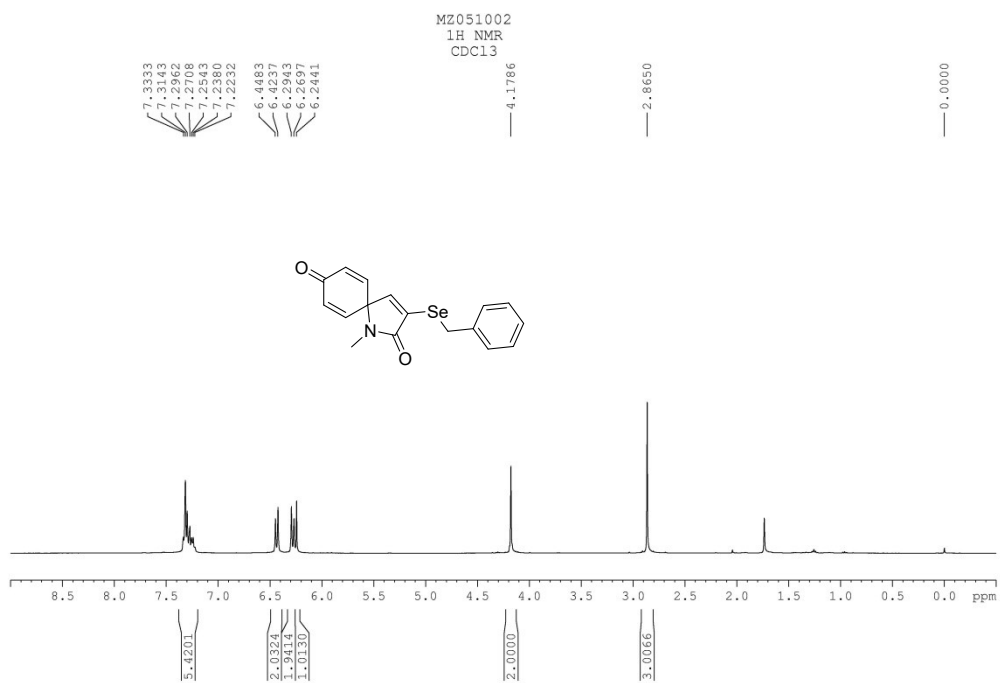


Fig. 43 ¹H NMR spectrum of compound **3u**

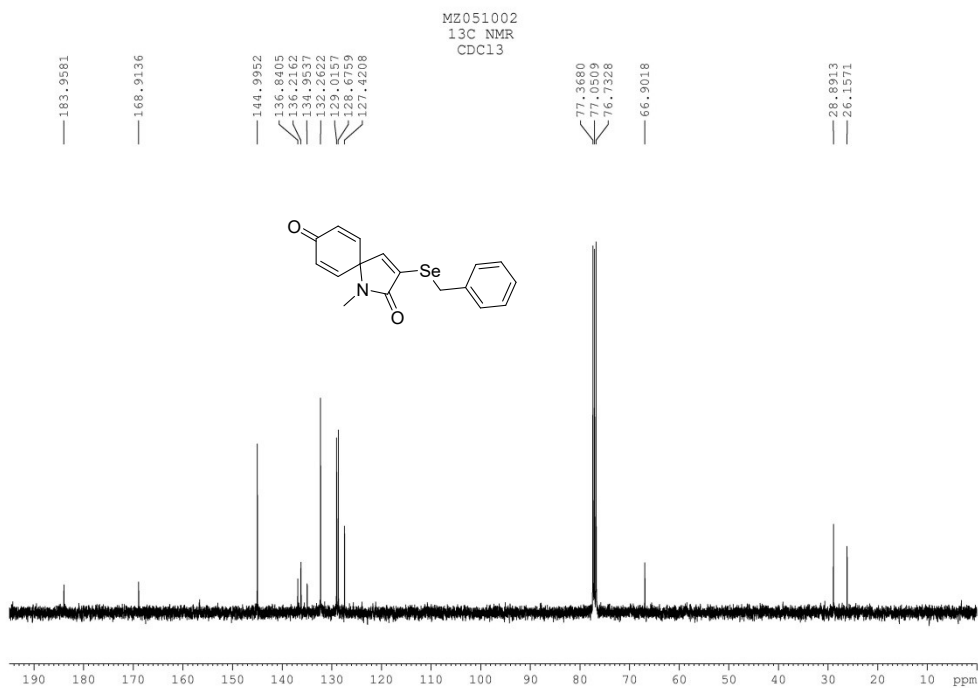


Fig. 44 ¹³C NMR spectrum of compound 3u

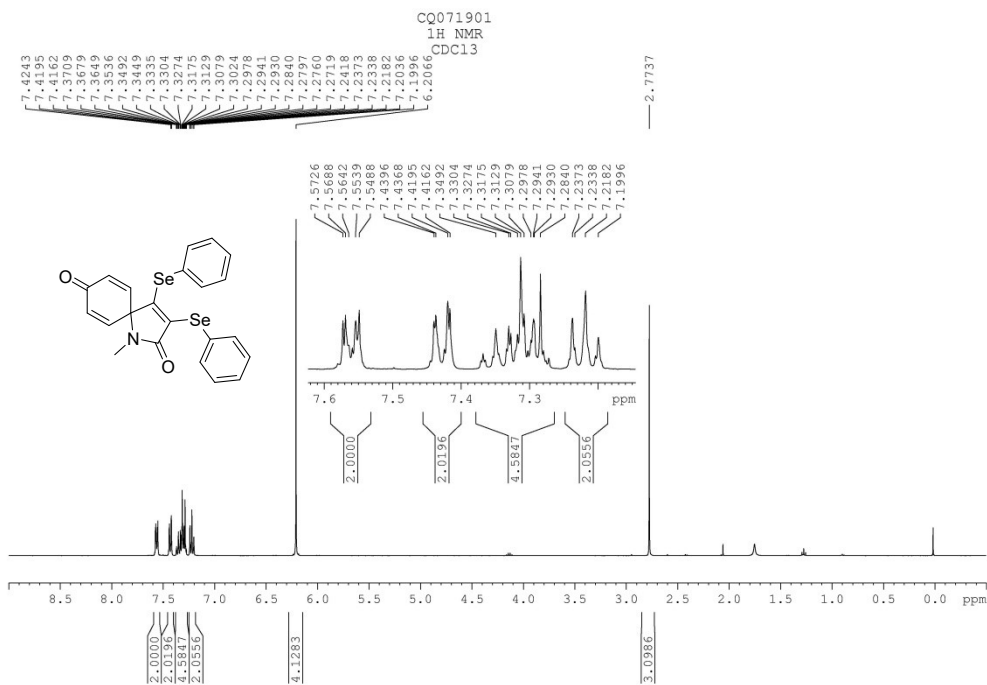


Fig. 45 ¹H NMR spectrum of compound 5a

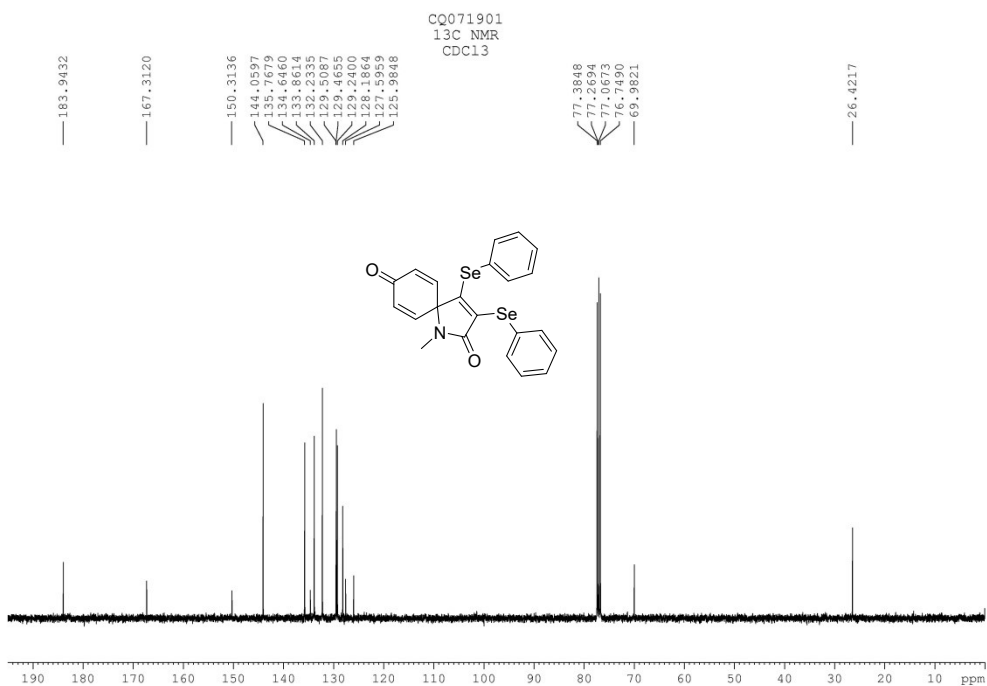


Fig. 46 ^{13}C NMR spectrum of compound 5a

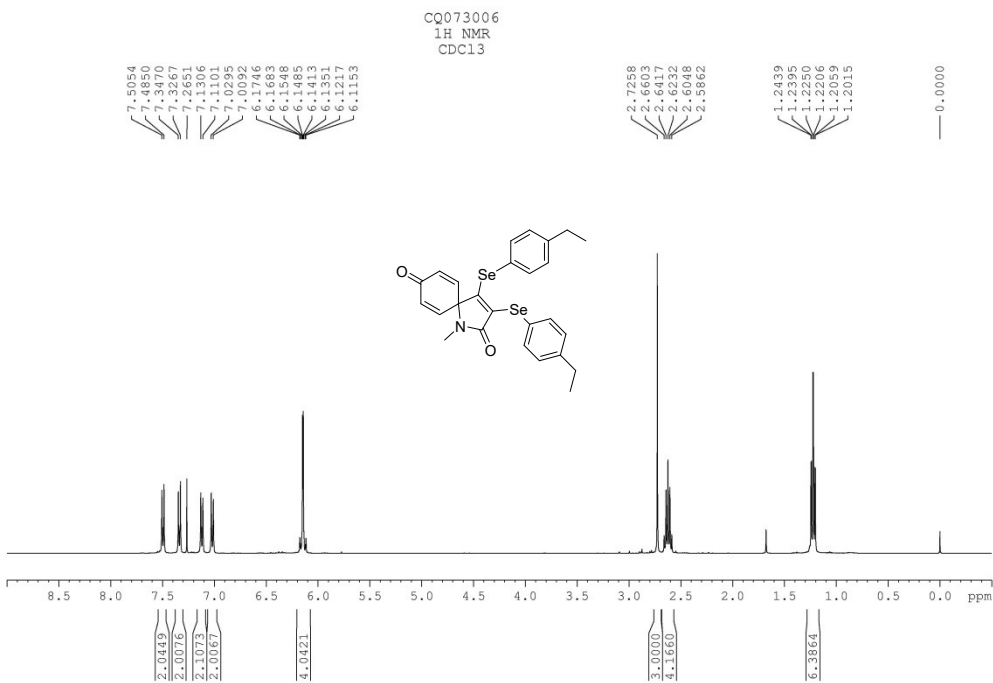


Fig. 47 ^1H NMR spectrum of compound 5b

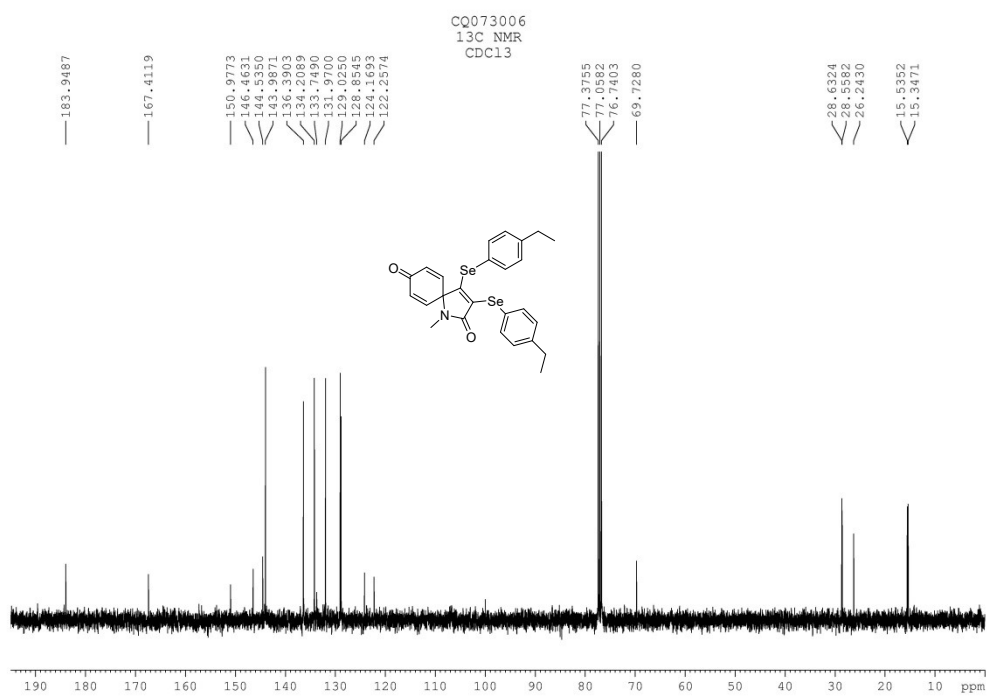


Fig. 48 ^{13}C NMR spectrum of compound 5b

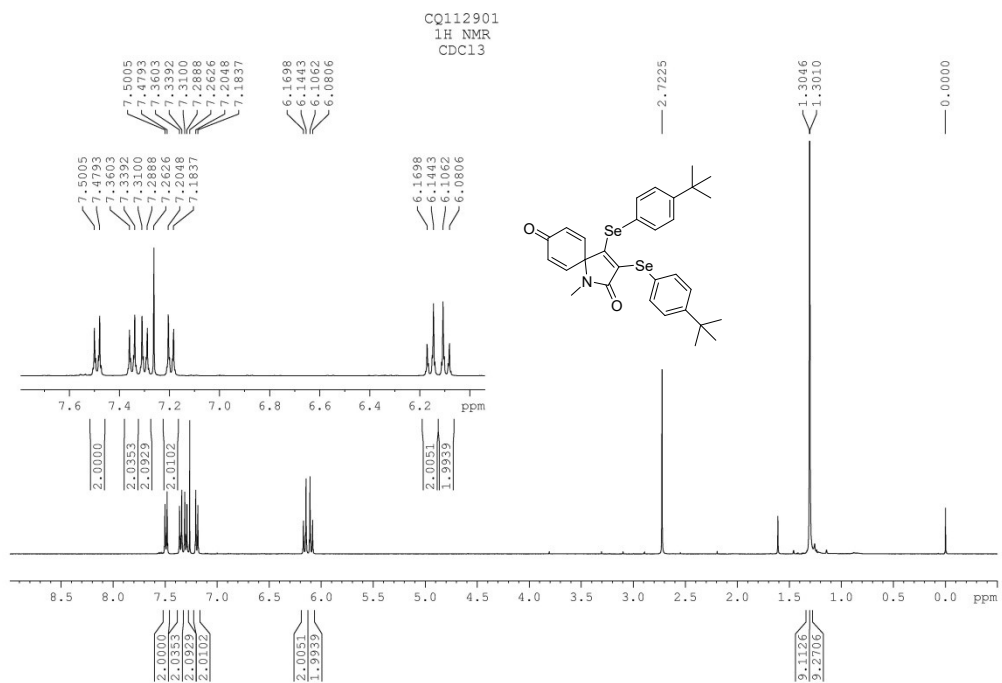


Fig. 49 ^1H NMR spectrum of compound 5c

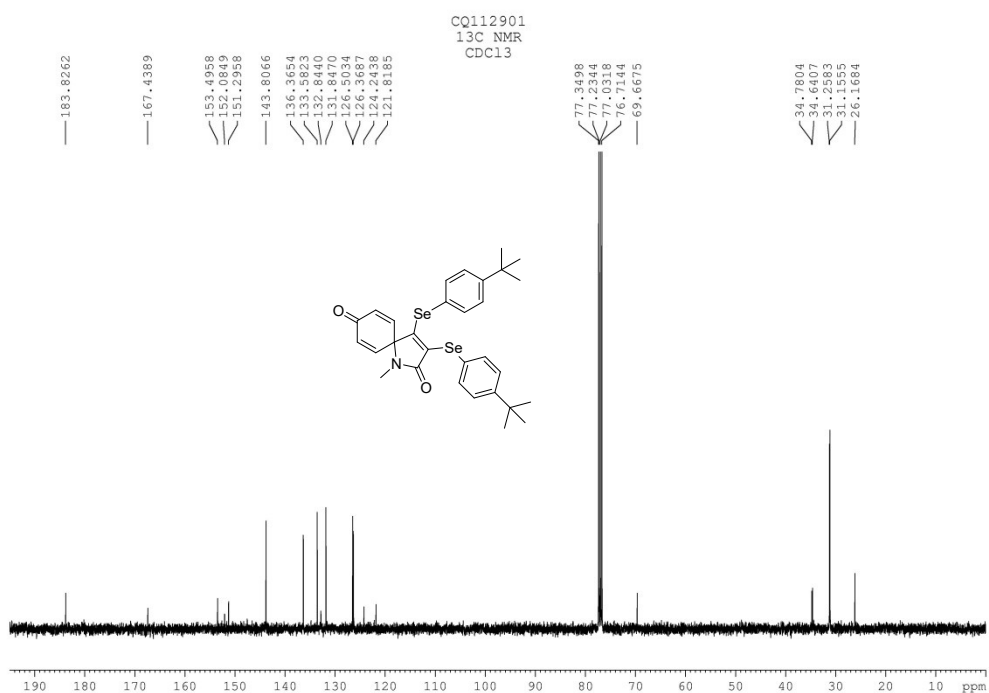


Fig. 50 ¹³C NMR spectrum of compound 5c

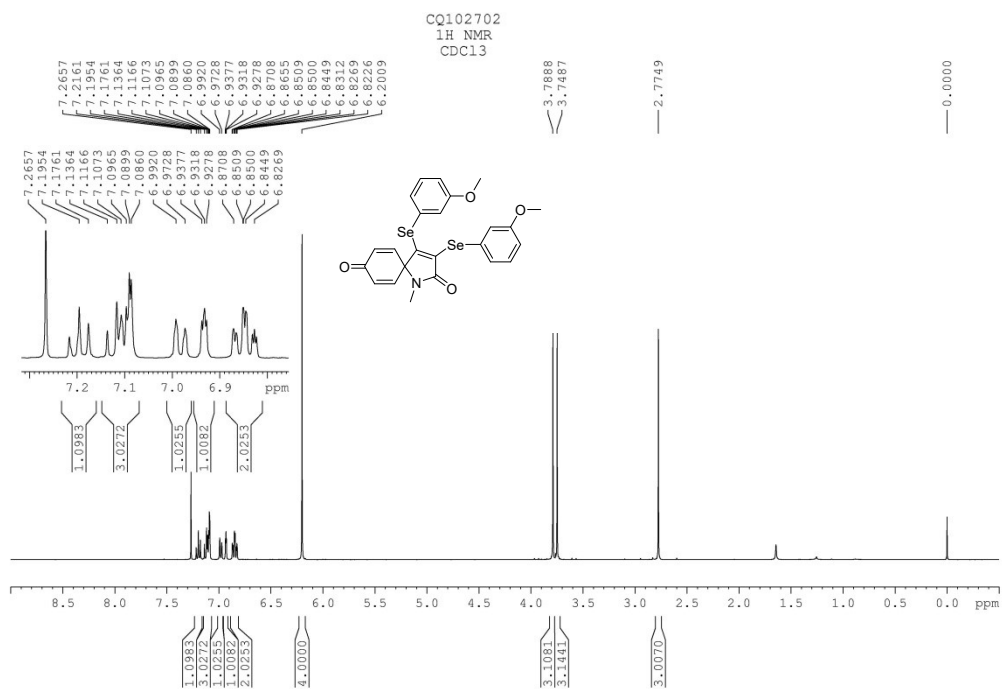


Fig. 51 ¹H NMR spectrum of compound 5d

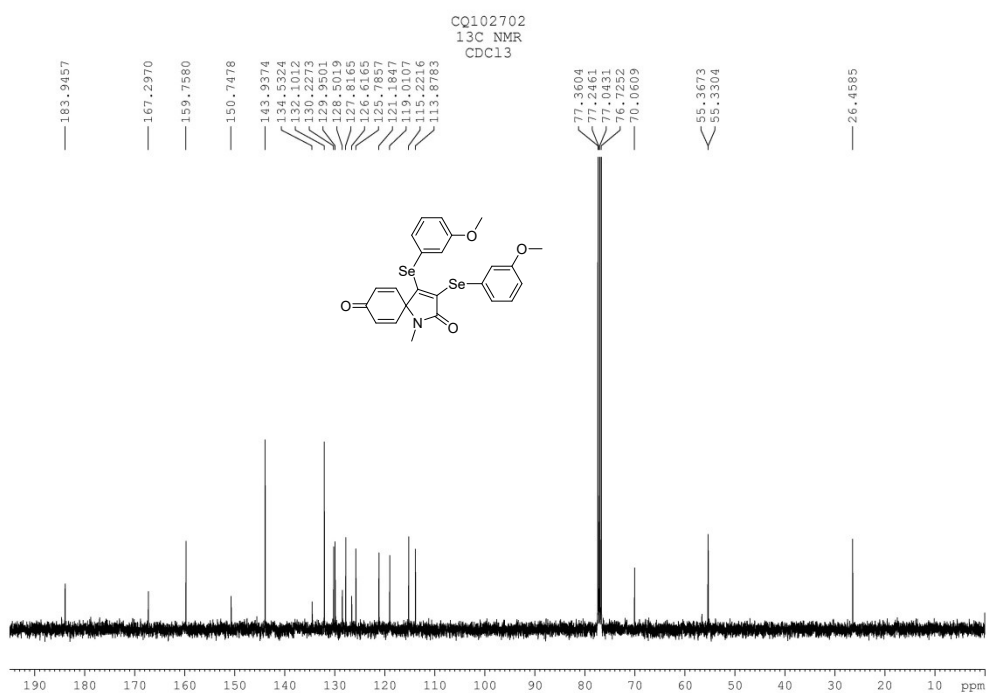


Fig. 52 ¹³C NMR spectrum of compound 5d

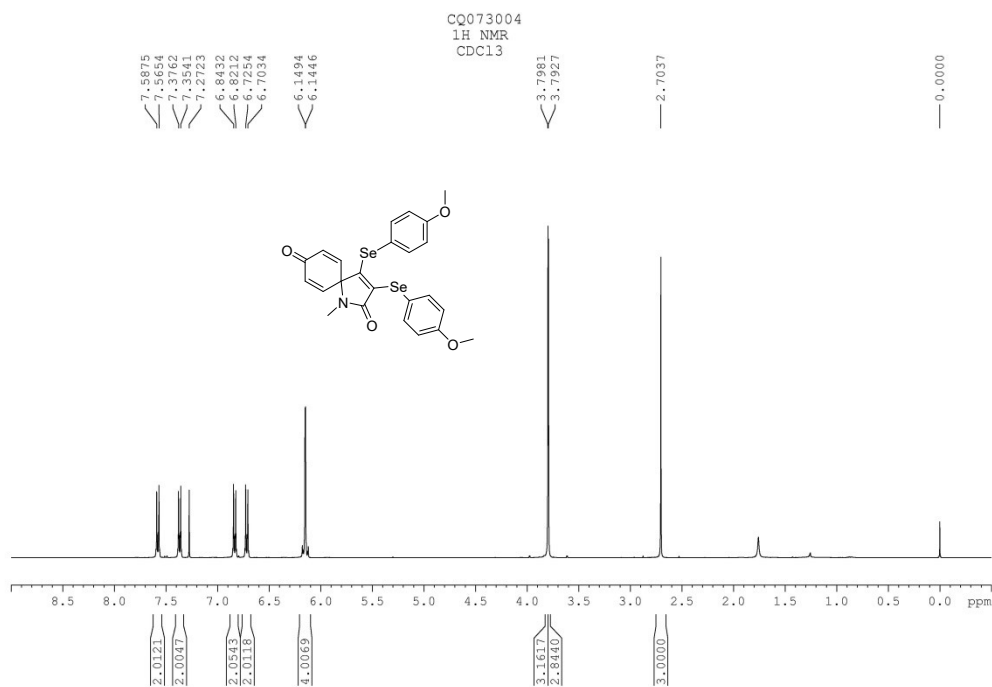


Fig. 53 ¹H NMR spectrum of compound 5e

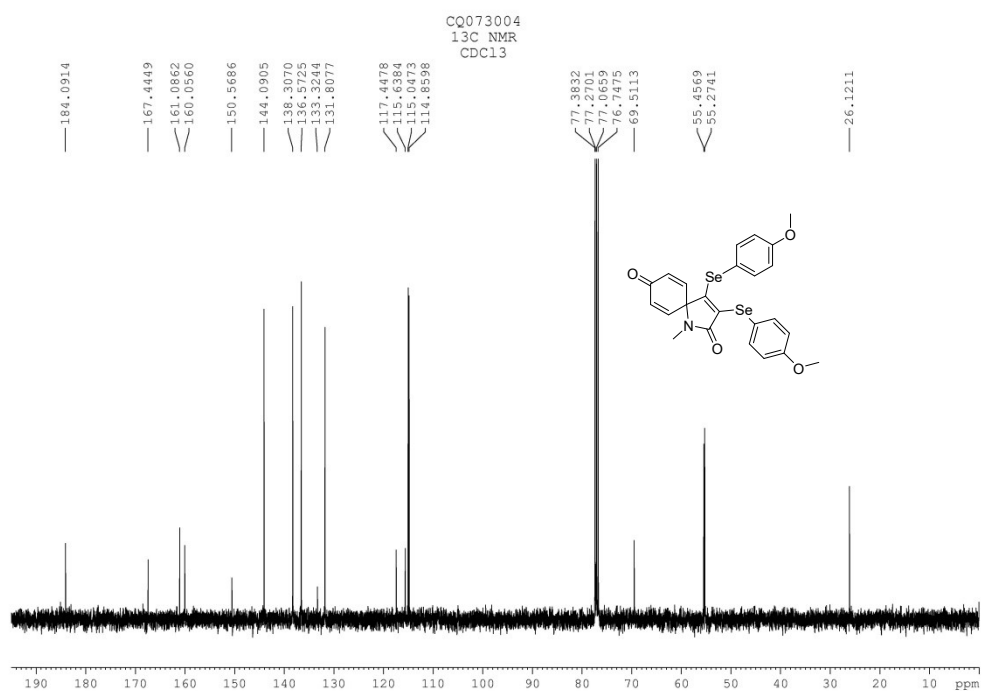


Fig. 54 ¹³C NMR spectrum of compound 5e

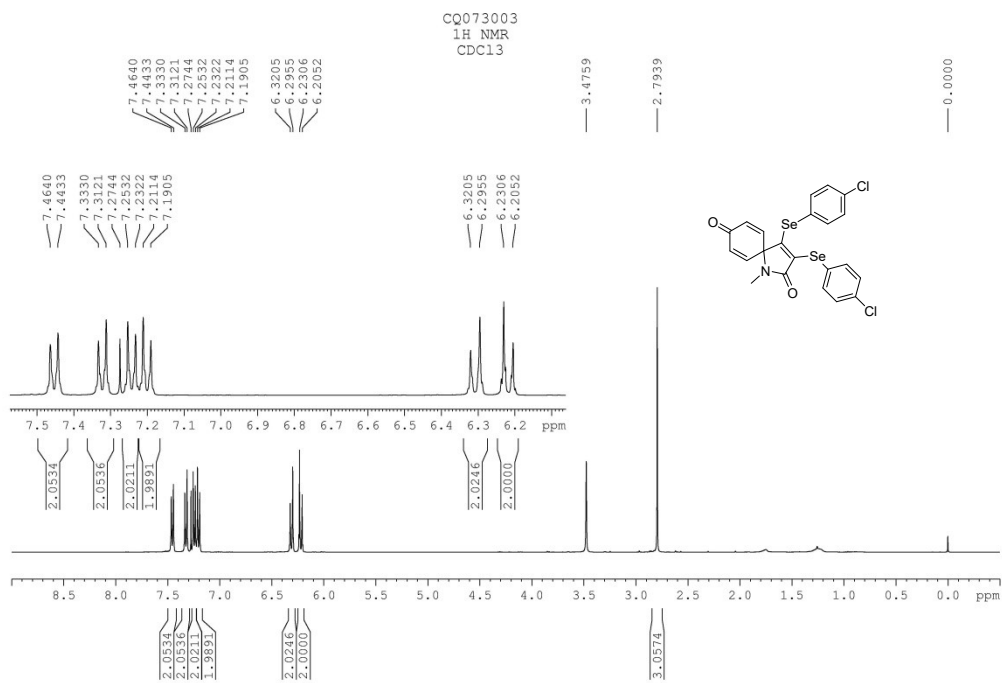


Fig. 55 ¹H NMR spectrum of compound 5f

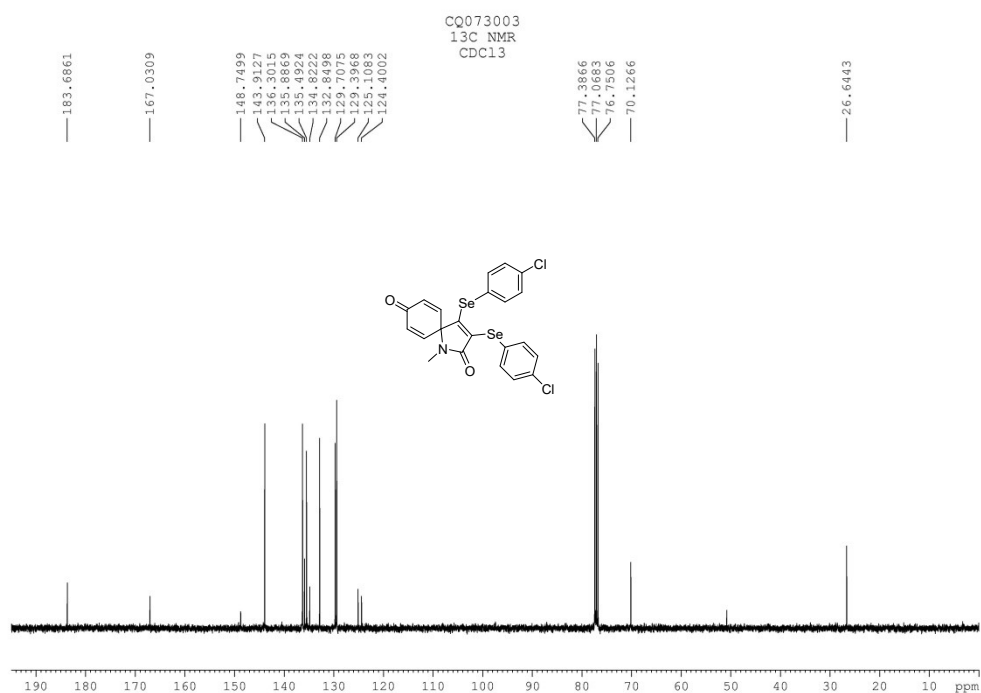


Fig. 56 ¹³C NMR spectrum of compound 5f

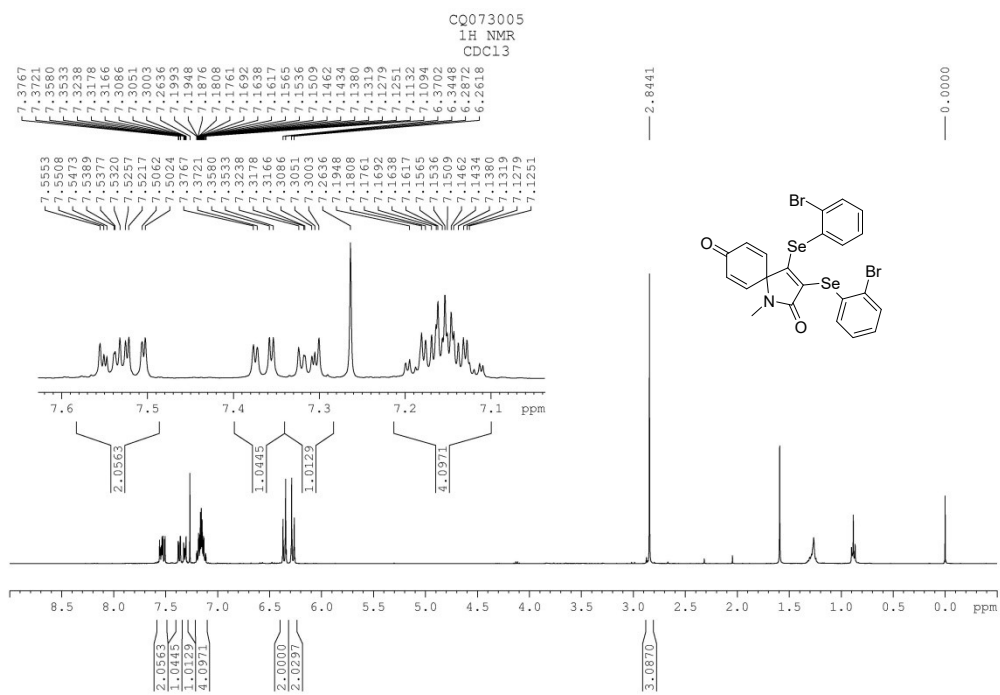


Fig. 57 ¹H NMR spectrum of compound 5g

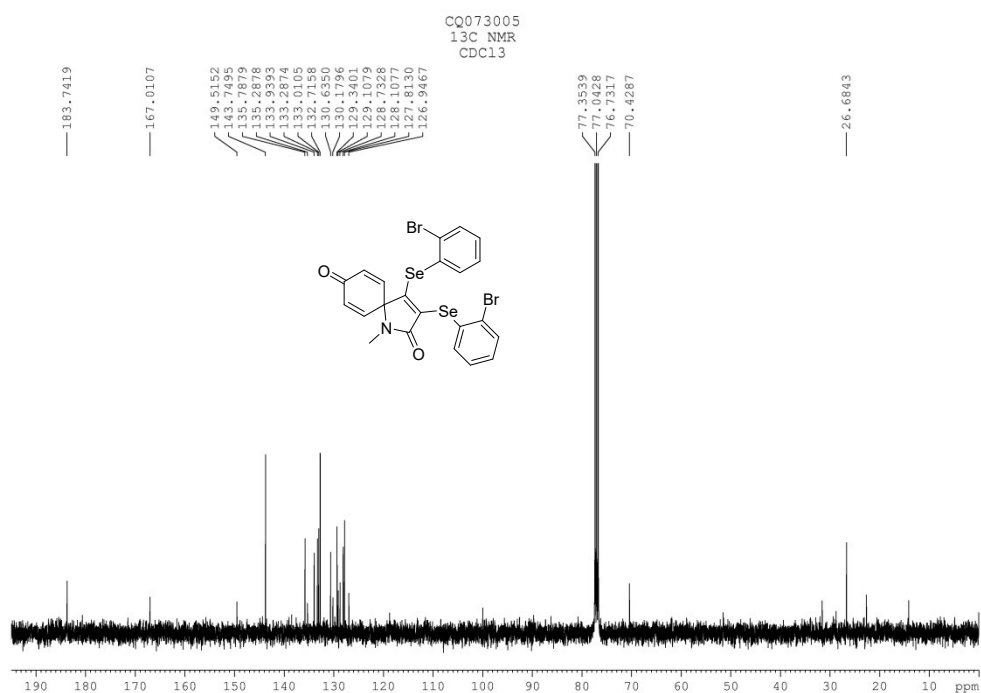


Fig. 58 ¹³C NMR spectrum of compound 5g

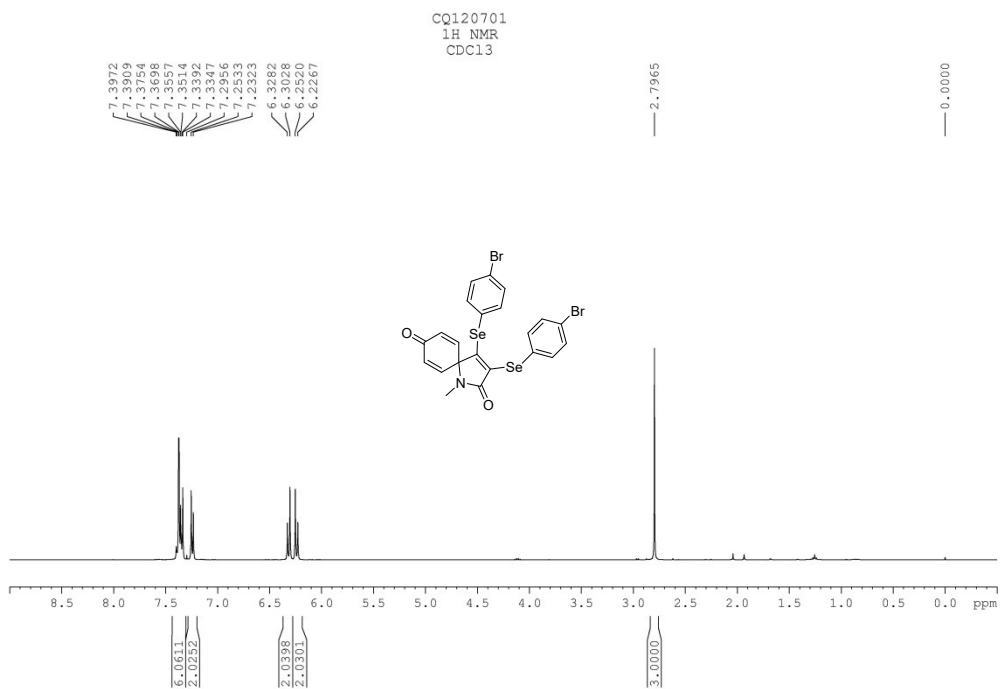


Fig. 59 ¹H NMR spectrum of compound 5h

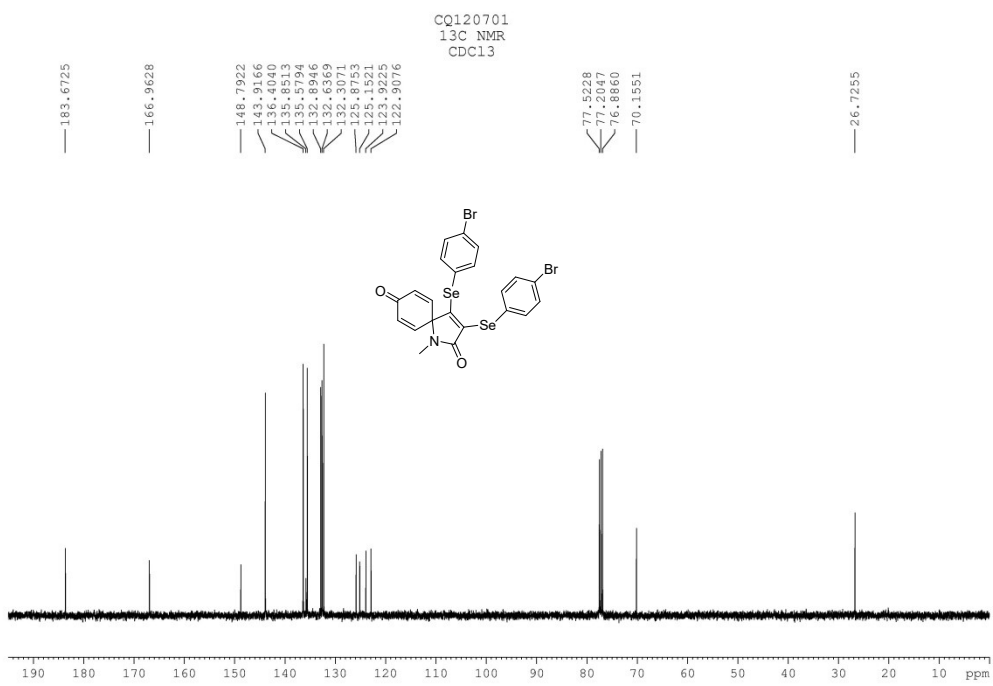


Fig. 60 ¹³C NMR spectrum of compound 5h

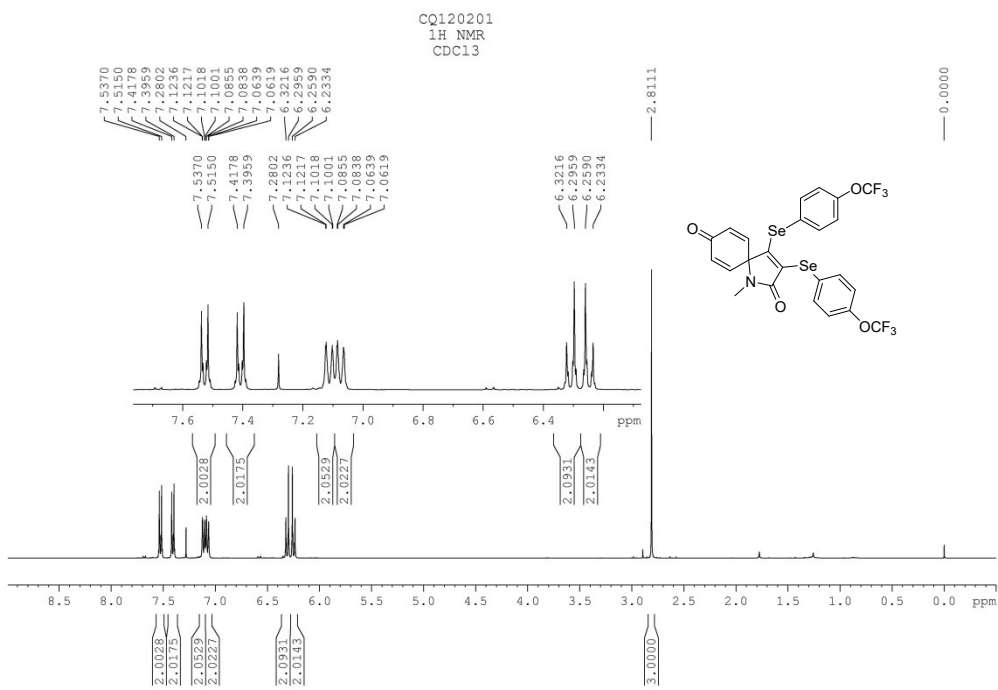


Fig. 61 ¹H NMR spectrum of compound 5i

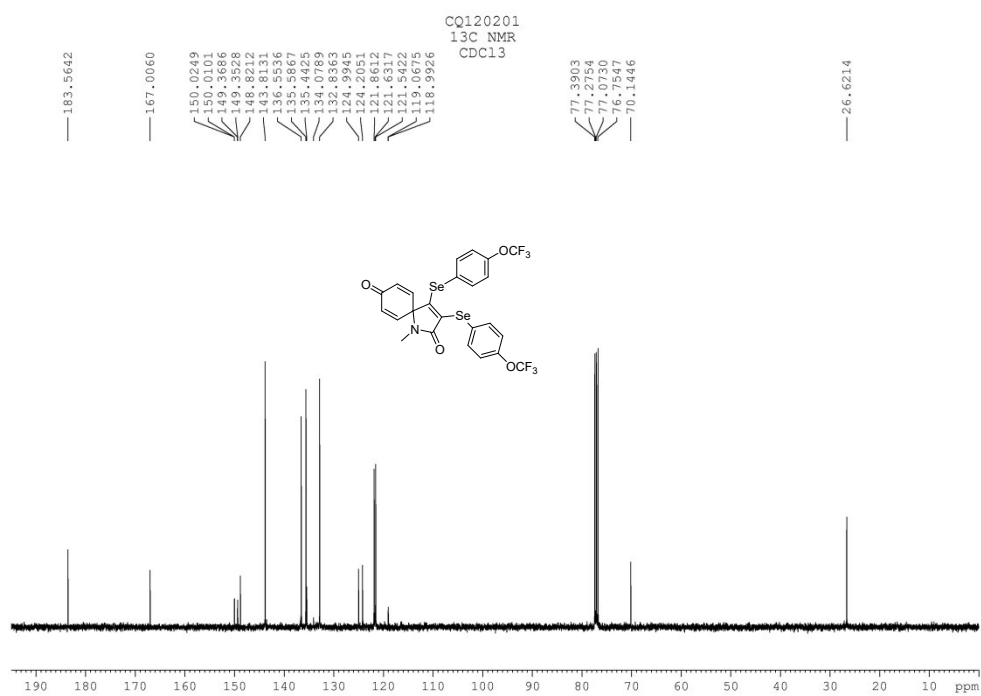


Fig. 62 ^{13}C NMR spectrum of compound **5i**

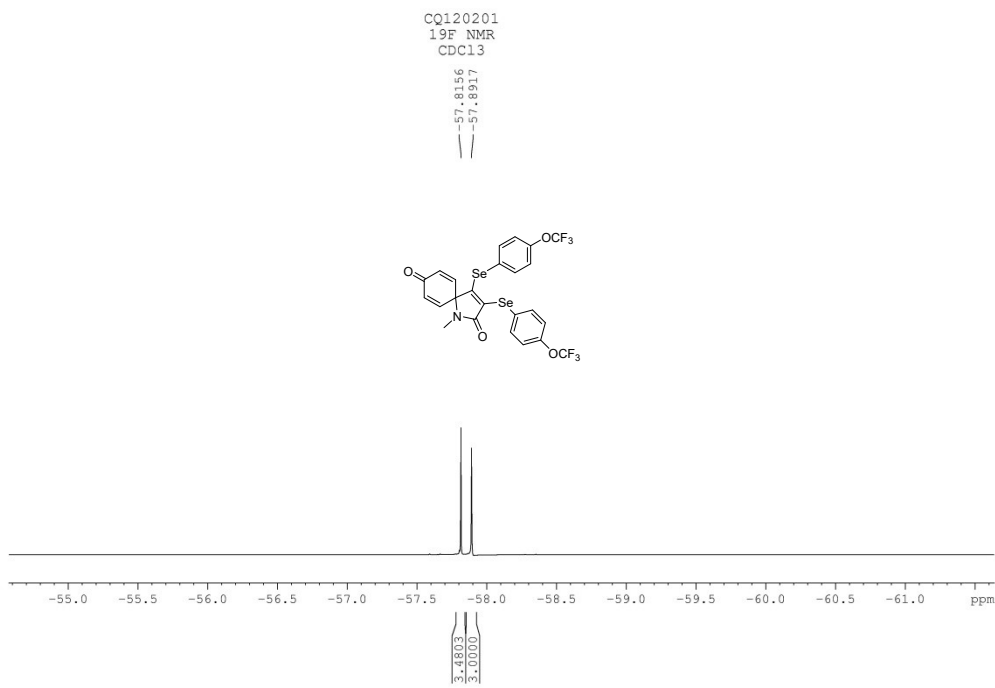


Fig. 63 ^{19}F NMR spectrum of compound **5i**

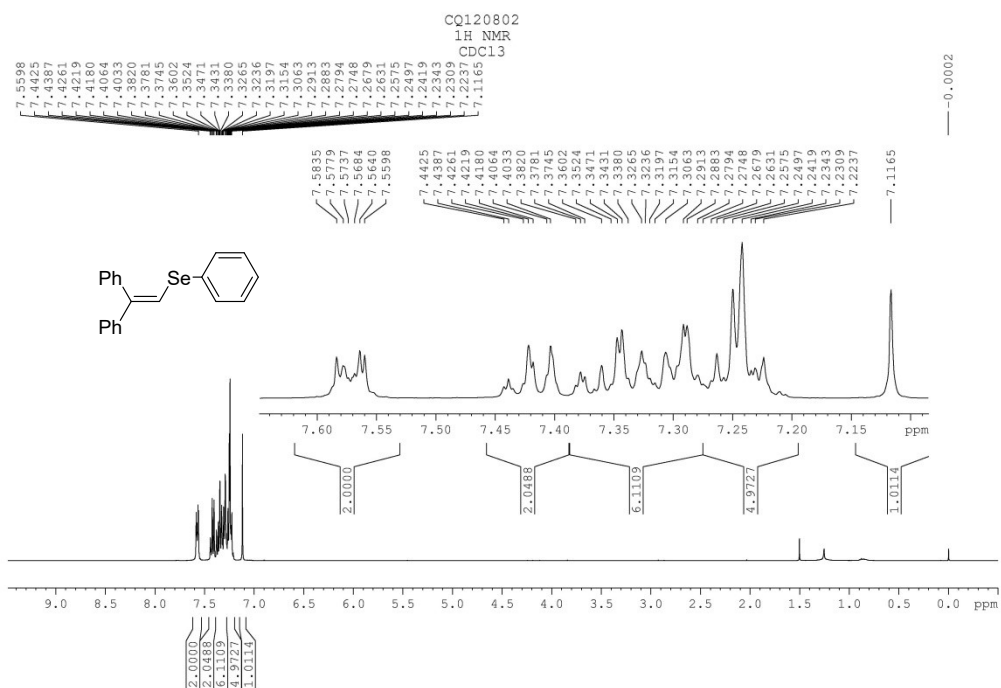


Fig. 64 ¹H NMR spectrum of compound 6

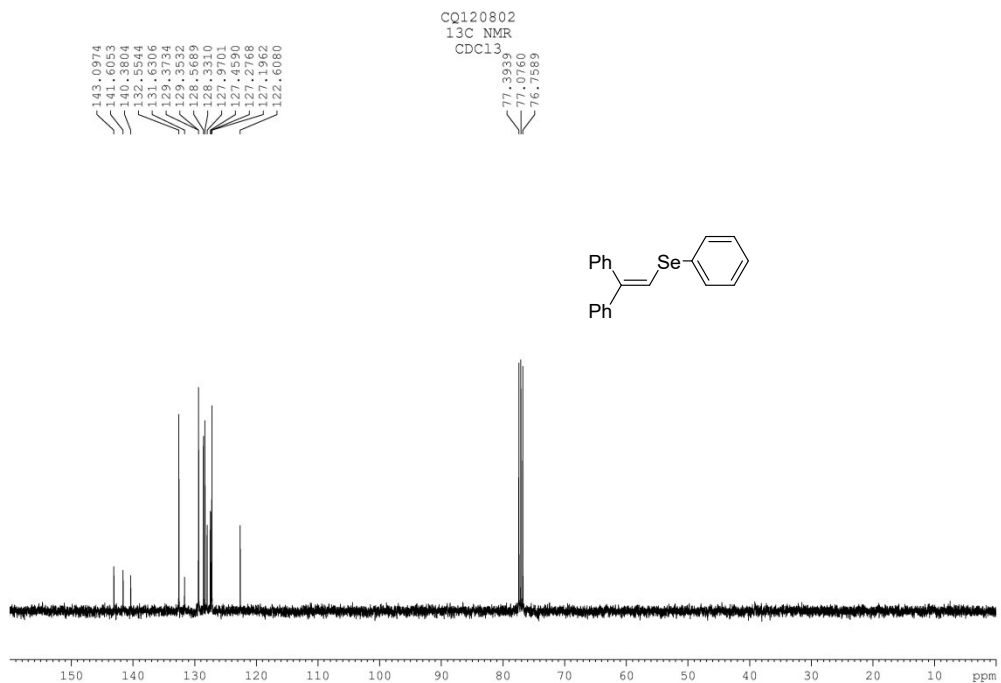


Fig. 65 ¹³C NMR spectrum of compound 6