Supporting information for

Ultrasound assisted multicomponent reactions: a green method for the synthesis of highly functionalized selenopyridines using reusable polyethylene glycol as reaction medium†

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Contents

General Experimental Information

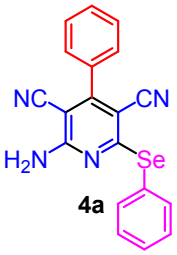
All the reagents were purchased from commercial sources and used without further purification. All the reactions were monitored by TLC on Merck GF 254 with detection by UV light and/or using iodine vapor chamber for visualization. IR spectra were recorded on a Shimadzu Affinity 1, FTIR spectrophotometer. ^{1}H and ^{13}C NMR was recorded on a Bruker Avance II 400 and Jeol 500 MHz spectrometer in DMSO-d_6 or DMSO-d_6+$CDCl_3$ using TMS as internal reference. CHN analyses were carried out either on in an Elementar Vario EL III or Perkin-Elmer 2400 II elemental analyzers. Zeiotech water bath was used for ultrasonication reactions. Melting points were recorded using SRS EZ- Melt automated melting point apparatus by capillary methods and uncorrected.

General procedure for the synthesis of 2-amino-4-aryl/alkyl-6-(phenylselanyl)pyridine-3,5-dicarbonitrile (4a-4k and 5a-5b): A mixture of aldehyde (1.0 mmol), malononitrile (2.0 mmol) and benzeneselenol (1.0 mmol) in 2.0 ml PEG-400 was taken in a 10 ml vial and was placed in an ultrasonic bath filled with water. This mixture was then irradiated at room temperature for appropriate time as mentioned in the Table 1. The progress of the reaction was monitored by TLC. After completion of the reaction, it was removed from the ultrasonic bath and 2.0 ml ethanol was added followed by stirring to obtain the solid precipitate. The precipitate was then filtered off and washed with ethanol and dried under reduced pressure. The isolated solid was pure enough for further characterization. (In some cases where, solid precipitates were not observed after addition of ethanol it was kept as such for 1-2 days in ethanolic solution for slow evaporation to get the precipitates, Eg., **4g** and **4h**).

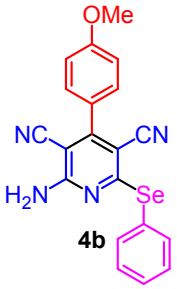
X-ray Analysis and Structure Refinement.

Data were collected on a Bruker SMART CCD4 X-ray diffraction instrument using graphite-monochromated Mo-Kα radiation (α = 0.71073 Å) at 100 K. The crystal was solved by direct methods using the *SIR92* program[1] and refined using full-matrix least squares on F^2 (*SHELX97*).[2] The structure was expanded using Fourier techniques. All non-hydrogen atoms were refined anisotropically. Hydrogen atoms were placed at geometrically idealized positions. Table 3 contains the final refinement parameters for **4b**. All of these software packages were the integrated *WINGX* software package. CCDC 1004592 contains the supplementary crystallographic data for this paper. Copies of this information can be obtained free of charge upon application to CCDC, 12 Union Road, Cambridge CB21EZ, U.K. (fax 44-1223/336-033; e-mail deposit@ccdc.cam.ac.uk).

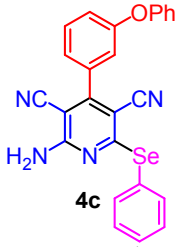
2-amino-4-phenyl-6-(phenylselanyl)pyridine-3,5-dicarbonitrile (4a): White solid; Yield: 76%, m.p. 220-222 °C; IR (KBr): 3471, 3346, 3210, 3062, 2221, 2210, 1623, 1607, 1532, 1261, 833, 748 cm^{-1}; ^1H NMR (400 MHz, DMSO-d_6 + $CDCl_3$) δ (ppm): 7.81 (bs, 2H, -NH_2), 7.69-7.66 (m, 2H, Ar-H), 7.60-7.52 (m, 6H, Ar-H), 7.48-7.42 (m, 2H, Ar-H); ^{13}C NMR (100 MHz, DMSO-d_6 + $CDCl_3$) δ (ppm): 165.0, 159.6, 157.9, 135.5, 133.8, 130.3, 129.4, 129.1, 128.7, 128.3, 125.9, 115.7, 114.9, 96.3, 87.5; Anal. calcd. for $C_{19}H_{12}N_4Se$: C, 60.81; H, 3.22; N, 14.93 %. Found: C, 60.84; H, 3.25; N, 14.95 %.



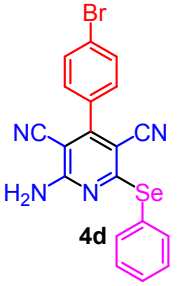
2-amino-4-(4-methoxyphenyl)-6-(phenylselanyl)pyridine-3,5-dicarbonitrile (4b): White solid; Yield: 82%, m.p. 247-249 °C; IR (KBr): 3443, 3331, 3225, 3090, 2982, 2845, 2228, 2212, 1638, 1606, 1544, 1419, 1288, 1259, 1189, 1018, 835, 810, 746 cm^{-1}; ^1H NMR (400 MHz, DMSO-d_6 + $CDCl_3$) δ (ppm): 7.71 (bs, 2H, -NH_2), 7.69-7.65 (m, 2H, Ar-H), 7.50 (d, J = 8.8 Hz, 2H, Ar-H), 7.47-7.41 (m, 3H, Ar-H), 7.11 (d, J = 8.8 Hz, 2H, Ar-H), 3.86 (s, 3H, -OCH_3); ^{13}C NMR (100 MHz, DMSO-d_6 + $CDCl_3$) δ (ppm): 165.1, 160.8, 159.7, 157.5, 135.5, 130.1, 129.3, 128.9, 126.0, 125.6, 115.9, 115.2, 114.0, 96.3, 87.3, 55.2; Anal. calcd. for $C_{20}H_{14}N_4OSe$: C, 59.27; H, 3.48; N, 13.82 %. Found: C, 59.31; H, 3.51; N, 13.86 %.



2-amino-4-(3-phenoxyphenyl)-6-(phenylselanyl)pyridine-3,5-dicarbonitrile (4c): White solid; Yield: 84%, m.p. 242-244 °C; IR (KBr): 3435, 3328, 3216, 3061, 2225, 2213, 1627, 1583, 1544, 1517, 1485, 1439, 1312, 1264, 1243, 1225, 1022, 952, 859, 745 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ (ppm): 7.85 (bs, 2H, -NH_2), 7.65-7.63 (m, 2H, Ar-H), 7.58 (t, J = 8.0 Hz, 1H, Ar-H), 7.47-7.37 (m, 5H, Ar-H), 7.31-7.29 (m, 1H, Ar-H), 7.22-7.15 (m, 3H, Ar-H), 7.08-7.06 (m, 2H, Ar-H); ^{13}C NMR (125 MHz, DMSO-d_6) δ (ppm): 164.9, 159.5, 157.1, 156.5, 156.0, 135.5, 130.7, 130.2, 129.6, 129.2, 125.9, 123.9, 123.5, 118.8, 118.6, 116.0, 115.0, 96.3, 87.6; Anal. calcd. for $C_{25}H_{16}N_4OSe$: C, 64.24; H, 3.45; N, 11.99 %. Found: C, 64.26; H, 3.48; N, 12.03 %.

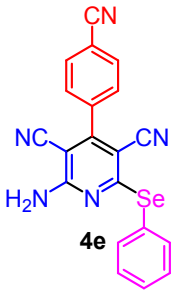


2-amino-4-(4-bromophenyl)-6-(phenylselanyl)pyridine-3,5-dicarbonitrile (4d): Brown solid; Yield: 71%, m.p. 238-240 °C; IR (KBr): 3437, 3368, 3233, 3081, 2227, 1638, 1552, 1251, 751 cm^{-1}; ^1H NMR (400 MHz, DMSO-d_6 + $CDCl_3$) δ



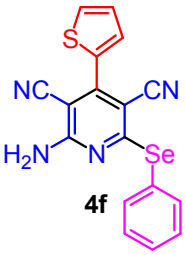
(ppm): 7.96 (s, 2H, -NH_2), 7.76 (d, J = 8.4 Hz, 2H, Ar-H), 7.67-7.65 (m, 2H, Ar-H), 7.48 (d, J = 8.4 Hz, 2H, Ar-H), 7.46-7.41 (m, 3H, Ar-H); ^{13}C NMR (100 MHz, DMSO-d_6 + $CDCl_3$) δ (ppm): 165.3, 159.5, 156.5, 135.5, 132.8, 131.7, 130.3, 129.3, 128.9, 125.8, 124.2, 115.4, 114.7, 96.1, 87.2; Anal. calcd. For $C_{19}H_{11}BrN_4Se$: C, 50.24; H, 2.44; N, 12.34 %. Found: C, 50.27; H, 2.46; N, 12.38 %.

2-amino-4-(4-cyanophenyl)-6-(phenylselanyl)pyridine-3,5-dicarbonitrile (4e): Yellow solid; Yield: 85%, m.p. 272-274 ^{o}C; IR (KBr): 3396, 3317, 3224, 3086, 2239, 2217, 1640, 1545, 1522, 1462, 1440, 1316, 1254, 1019, 998, 839, 743, 694, 665, 586 cm^{-1}; ^{1}H NMR (500 MHz, DMSO-d_6) δ (ppm): 8.07 (dd, J = 6.6, 1.8 Hz, 2H, Ar-H), 7.97 (bs, 2H, -NH_2), 7.78 (dd, J = 6.6, 1.8 Hz, 2H, Ar-H), 7.67- 7.65 (m, 2H, Ar-H), 7.47-7.44 (m, 3H, Ar-H); ^{13}C NMR (125 MHz, DMSO-d_6) δ (ppm): 165.4, 159.8, 157.0, 138.9, 135.9, 133.1, 130.1, 130.0, 129.7, 126.2, 118.6, 116.0, 115.1, 113.5, 96.5, 87.8; Anal. calcd. for $C_{20}H_{11}N_5Se$: C, 60.01; H, 2.77; N, 17.50 %. Found: C, 60.04; H, 2.80; N, 17.54 %.



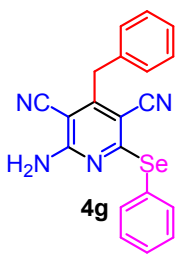
4e

2-amino-6-(phenylselanyl)-4-(thiophen-2-yl)pyridine-3,5-dicarbonitrile (4f): Brown solid; Yield: 87%, m.p. 201-203 ^{o}C; IR (KBr): 3482, 3364, 3207, 3093, 3060, 2223, 2199, 1617, 1545, 1517, 1507, 1430, 1312, 1241, 1021, 982, 850, 771, 718, 681, 670 cm^{-1}; ^{1}H NMR (500 MHz, DMSO-d_6) δ (ppm): 7.95 (dd, J = 5.0, 1.3 Hz, 1H, Ar-H), 7.87 (bs, 2H, -NH_2), 7.67-7.65 (m, 2H, Ar-H), 7.57 (dd, 5.0, 1.3 Hz, 1H, Ar-H), 7.47-7.41 (m, 3H, Ar-H), 7.28 (dd, 5.0, 3.7 Hz, 1H, Ar-H); ^{13}C NMR (125 MHz, DMSO-d_6) δ (ppm): 165.6, 159.8, 150.4, 135.6, 132.6, 131.4, 130.9, 129.6, 129.2, 128.0, 125.9, 116.0, 115.2, 96.1, 87.3; Anal. calcd. for $C_{17}H_{10}N_4SSe$: C, 53.55; H, 2.64; N, 14.69 %. Found: C, 53.58; H, 2.68; N, 14.73 %.



4f

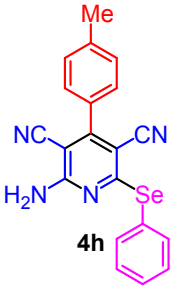
2-amino-4-benzyl-6-(phenylselanyl)pyridine-3,5-dicarbonitrile (4g): White solid; Yield: 67%, m.p. 197-199 ^{o}C; IR (KBr): 3471, 3357, 3221, 3089, 2967, 2845, 2226, 2189, 1623, 1521, 1351, 1247, 1019, 913, 726, 668 cm^{-1}; ^{1}H NMR (500 MHz, DMSO-d_6) δ (ppm): 7.88 (bs, 2H, -NH_2), 7.71-7.62 (m, 2H, Ar-H), 7.42-7.41 (m, 3H, Ar-H), 7.34-7.29 (m, 5H, Ar-H), 4.11 (s, 2H, -CH_2-); ^{13}C NMR (125



4g

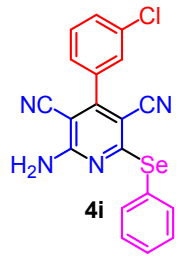
MHz, DMSO-d_6) δ (ppm): 165.1, 159.7, 158.0, 136.0, 135.4, 129.3, 128.9, 128.6, 128.3, 127.0, 125.9, 115.6, 114.8, 96.9, 87.9, 38.4; Anal. calcd. for $C_{20}H_{14}N_4Se$: C, 61.70; H, 3.62; N, 14.39 %. Found: C, 61.73; H, 3.66; N, 14.44%.

2-amino-6-(phenylselanyl)-4-p-tolylpyridine-3,5-dicarbonitrile (4h): Yellow solid; Yield: 68%, m.p. 214-216 ^oC; IR (KBr): 3467, 3359, 3218, 3071, 2933, 2829, 2219, 1636, 1552, 1465, 1252, 1191, 1007, 841, 762 cm^{-1}; ^1H NMR (400 MHz, DMSO-d_6 + $CDCl_3$) δ (ppm): 7.65 (bs, 2H, -NH_2), 7.61-7.57 (m, 2H, Ar-H), 7.50-7.46 (m, 3H, Ar-H), 7.42 (d, J = 8.1 Hz, 2H, Ar-H), 7.37 (d, J = 8.1 Hz, 2H, Ar-H), 2.43 (s, 3H, -CH_3); ^{13}C NMR (100 MHz, DMSO-d_6 + $CDCl_3$) δ (ppm): 166.3; 159.7, 158.3, 140.2, 134.7, 130.9, 129.4, 129.2, 129.1, 128.2, 127.3, 115.2, 115.0, 93.4, 86.9, 21.0; Anal. calcd. for $C_{20}H_{14}N_4Se$: C, 61.70; H, 3.62; N, 14.39 %. Found: C, 61.74; H, 3.65; N, 14.44 %.



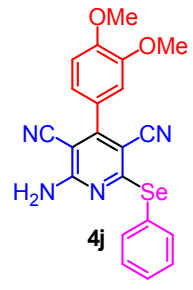
4h

2-amino-4-(3-chlorophenyl)-6-(phenylselanyl)pyridine-3,5-dicarbonitrile (4i): Yellow solid; Yield: 81%, m.p. 258-260 ^oC; IR (KBr): 3441, 3338, 3229, 3067, 2223, 1641, 1538, 1467, 1323, 1256, 1038, 759, 721 cm^{-1}; ^1H NMR (400 MHz, DMSO-d_6 + $CDCl_3$) δ (ppm): 7.74 (bs, 2H, -NH_2), 7.63-7.56 (m, 5H, Ar-H), 7.50-7.47 (m, 4H, Ar-H); ^{13}C NMR (100 MHz, DMSO-d_6 + $CDCl_3$) δ (ppm): 166.4, 159.5, 156.7, 135.7, 134.7, 133.5, 130.5, 130.2, 129.5, 129.2, 128.1, 127.1, 127.0, 114.8, 114.6, 93.3, 87.0; Anal. calcd. for $C_{19}H_{11}ClN_4Se$: C, 55.70; H, 2.71; N, 13.67 %. Found: C, 55.74; H, 2.75; N, 13.72%.



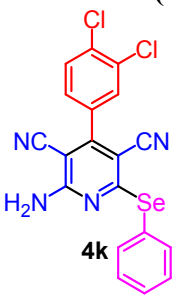
4i

2-amino-4-(3,4-dimethoxyphenyl)-6-(phenylselanyl)pyridine-3,5-dicarbonitrile (4j): White solid; Yield: 86%, m.p. 232-234^oC; IR (KBr): 3438, 3328, 3219, 3088, 2978, 2837, 2826, 2221, 2218, 1640, 1617, 1538, 1423, 1276, 1249, 1191, 1027, 838, 827, 752 cm^{-1}; ^1H NMR (400 MHz, DMSO-d_6 + $CDCl_3$) δ (ppm): 7.61 (bs, 2H, -NH_2), 7.60-7.56 (m, 2H, Ar-H), 7.50-7.47 (m, 3H, Ar-H), 7.15 (s, 1H, Ar-H), 7.13-7.11 (bs, 2H, Ar-H), 3.88 (s, 3H, -OCH_3), 3.84 (s, 3H,-OCH_3); ^{13}C NMR (100 MHz, DMSO-d_6 + $CDCl_3$) δ (ppm): 166.3, 159.8, 158.0, 150.4, 148.3, 134.7, 129.4, 129.2, 127.3, 125.7, 121.5, 115.4, 115.3, 112.1, 111.3, 93.4, 86.9, 55.6, 55.5; Anal. calcd. for $C_{21}H_{16}N_4O_2Se$: C, 57.94; H, 3.70; N, 12.87 %. Found: C, 57.98; H, 3.73; N, 12.92%.



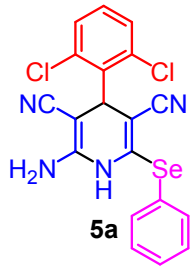
4j

2-amino-4-(3,4-dichlorophenyl)-6-(phenylselanyl)pyridine-3,5-dicarbonitrile (4k): White solid; Yield: 78%, m.p. 197-199 °C; IR (KBr): 3438, 3324, 3217, 3059, 2221, 1652, 1529, 1451, 1329, 1242, 1153, 1033, 762, 718 cm^{-1}; ^1H NMR (400 MHz, DMSO-d_6 + $CDCl_3$) δ (ppm): 7.78 (bs, 2H, -NH_2), 7.75 (s, 1H, Ar-H), 7.73-7.72 (m, 1H, Ar-H), 7.59-7.55 (m, 3H, Ar-H), 7.51-7.47 (m, 3H, Ar-H); ^{13}C NMR (100 MHz, DMSO-d_6 + $CDCl_3$) δ (ppm): 166.8, 159.5, 155.4, 134.7, 133.9, 133.7, 132.1, 130.8, 130.1, 129.3, 129.0, 128.1, 127.0, 114.6, 114.5, 93.2, 86.7; Anal. calcd. for $C_{19}H_{10}N_4Se$: C, 51.38; H, 2.27; N, 12.61 %. Found: C, 51.41; H, 2.31; N, 12.66 %.



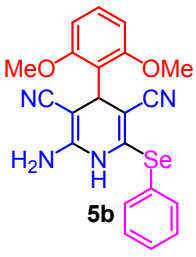
4k

2-amino-4-(2,6-dichlorophenyl)-6-(phenylselanyl)-1,4-dihydropyridine-3,5-dicarbonitrile (5a): White solid; Yield: 87%, m.p. 282-284 °C; IR (KBr): 3457, 3362, 3241, 3077, 2962, 2870, 2224, 2183, 1652, 1614, 1507, 1437, 1248, 1107, 1009, 752, 746, 685, 557 cm^{-1}; ^1H NMR (500 MHz, DMSO-d_6) δ (ppm): 9.21 (s, 1H, -NH-), 7.61-7.59 (m, 2H, Ar-H), 7.51-7.49 (m, 2H, Ar-H), 7.42-7.41(m, 3H, Ar-H), 7.35-7.33 (m, 1H, Ar-H), 5.97 (s, 2H, -NH_2), 5.59 (s, 1H, -CH-); ^{13}C NMR (125 MHz, DMSO-d_6) δ (ppm): 151.4, 138.8, 135.3, 132.7, 130.2, 129.9, 128.7, 126.9, 119.9, 118.3, 89.2, 52.2, 38.0; Anal. calcd. for $C_{19}H_{12}Cl_2N_4Se$: C, 51.14; H, 2.71; N, 12.56 %. Found: C, 51.17; H, 2.75; N, 12.60 %.



5a

2-amino-4-(2,6-dimethoxyphenyl)-6-(phenylselanyl)-1,4-dihydropyridine-3,5-dicarbonitrile (5b): White solid; Yield: 90%, m.p. 224-226 °C; IR (KBr): 3437, 3337, 3228, 3072, 3018, 2978, 2937, 2883, 2732, 2217, 2192, 1662, 1651, 1607, 1487, 1340, 1238, 1107, 1041, 773, 749, 662, 561 cm^{-1}; (400 MHz, DMSO-d_6 + $CDCl_3$) δ (ppm): 8.99 (s, 1H, -NH-), 7.46-7.43 (m, 4H, Ar-H), 7.38-7.34 (m, 1H, Ar-H), 7.23 (t, J = 8.4 Hz, 1H, Ar-H), 6.68 (d, J = 8.4, 2H, Ar-H), 5.62 (s, 2H, -NH_2), 5.08 (s, 1H, -CH-), 3.74 (s, 6H, -OCH_3); ^{13}C NMR (125 MHz, DMSO-d_6 + $CDCl_3$) δ (ppm): 158.4, 151.5, 140.4, 131.2, 129.6, 129.3, 128.9, 127.8, 120.9, 118.5, 118.4, 104.7, 91.5, 56.1, 53.6, 31.3; Anal. calcd. for $C_{21}H_{18}N_4O_2Se$: C, 57.67; H, 4.15; N, 12.81 %. Found: C, 57.69; H, 4.19; N, 12.86 %.



5b

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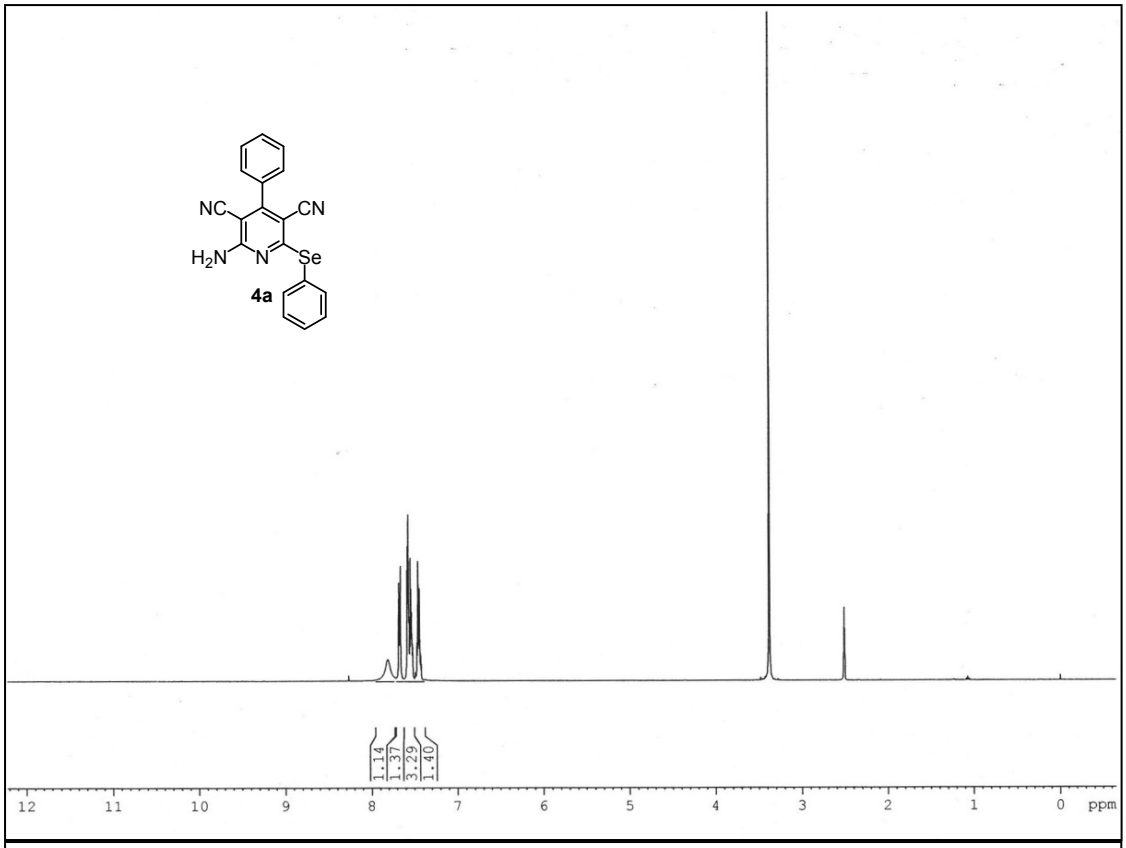
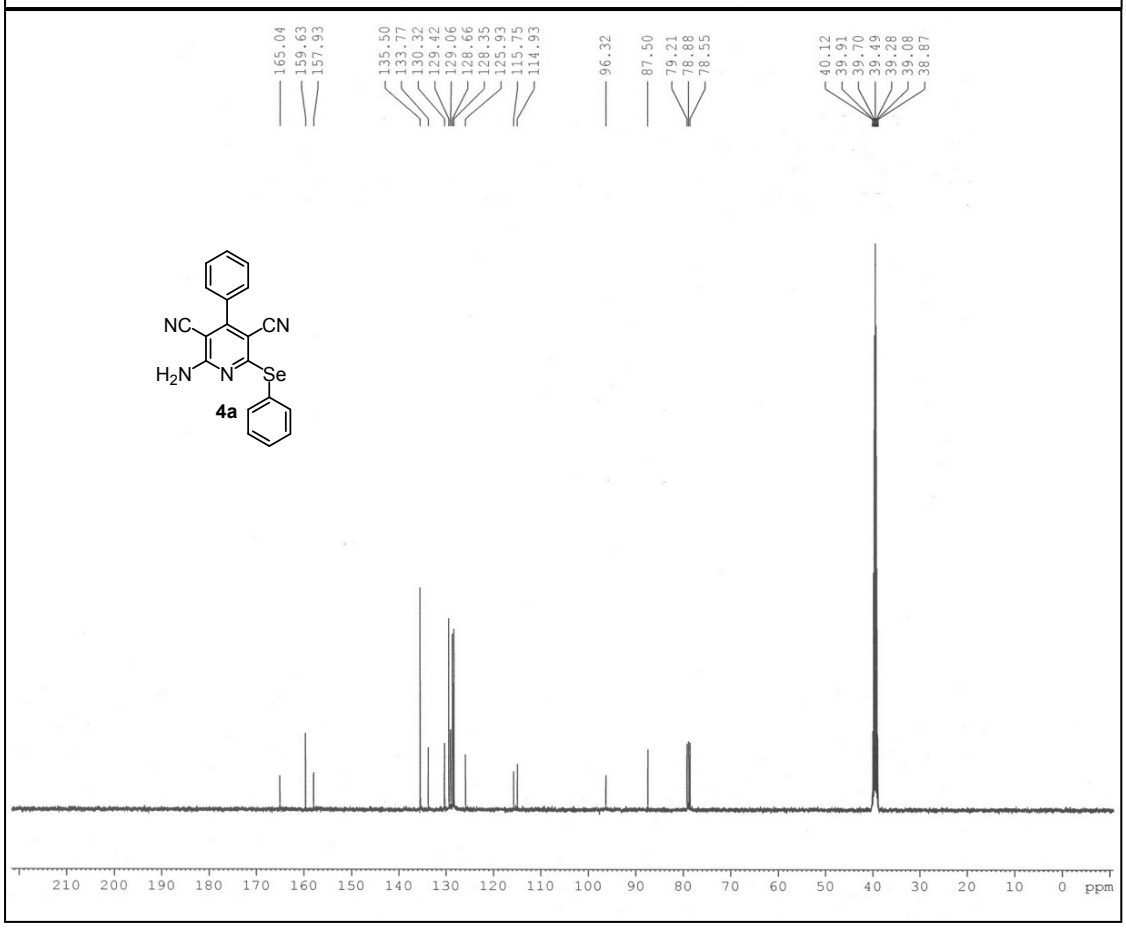
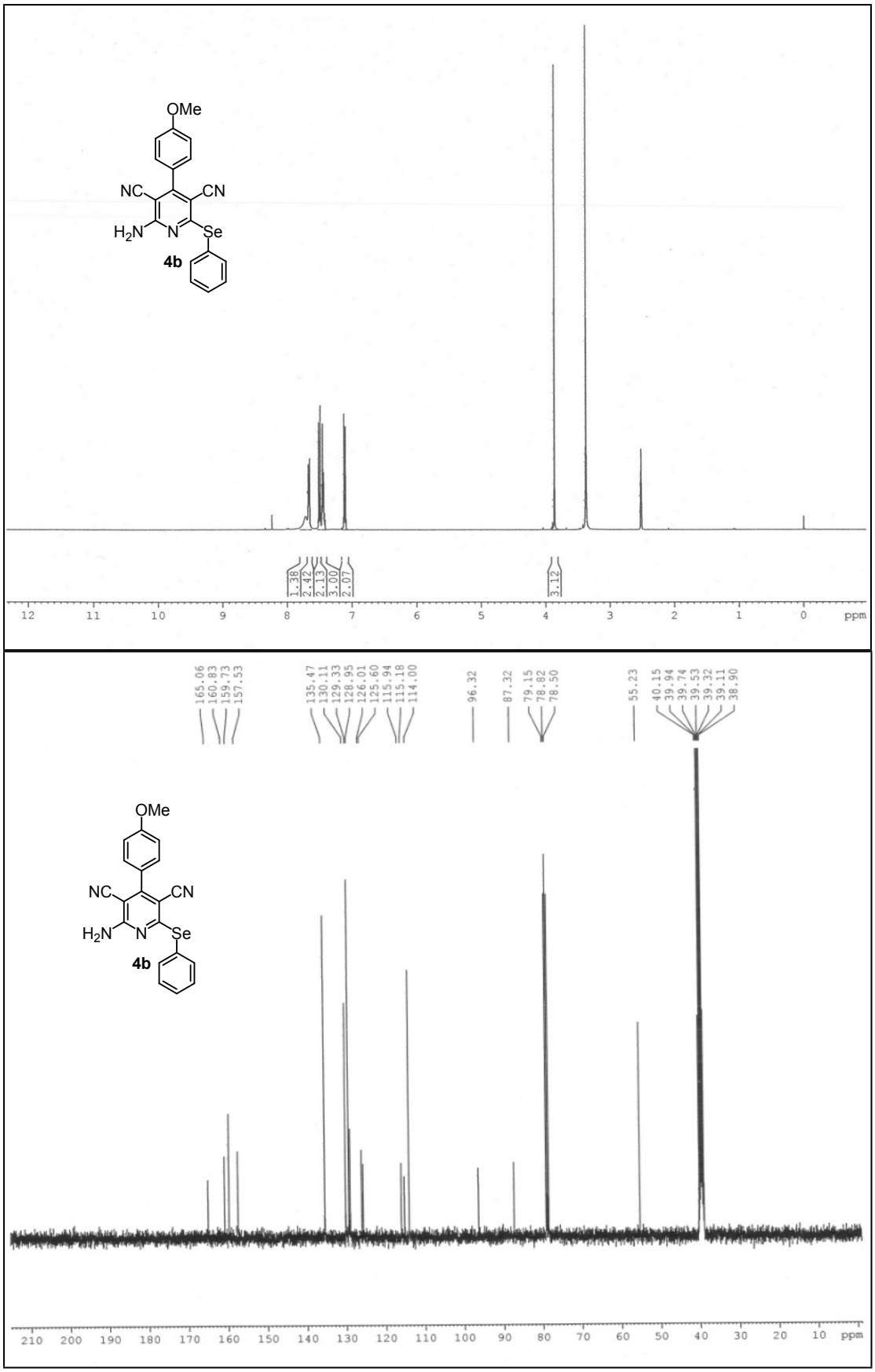
^{1}H and ^{13}C NMR spectra of 4a

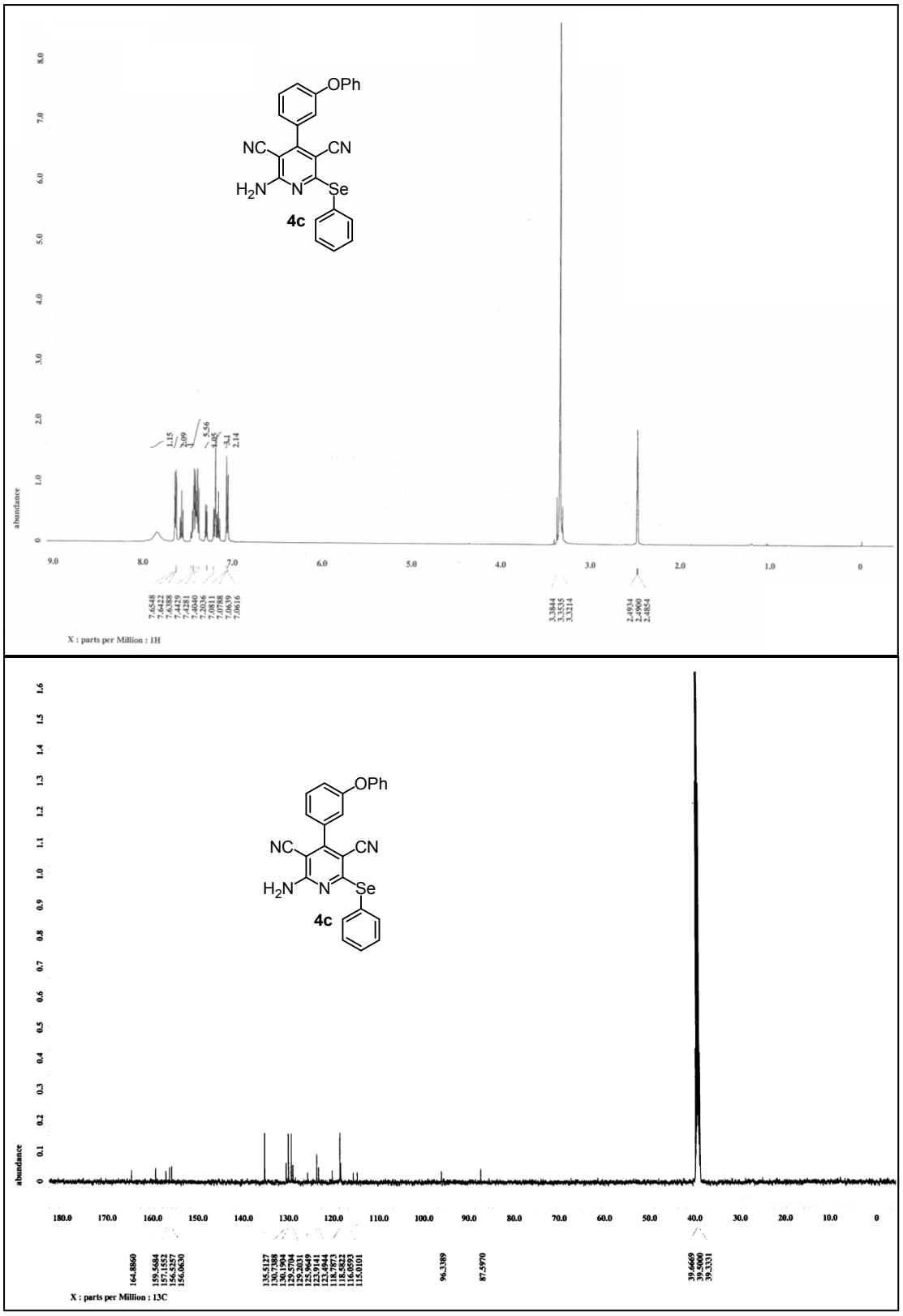




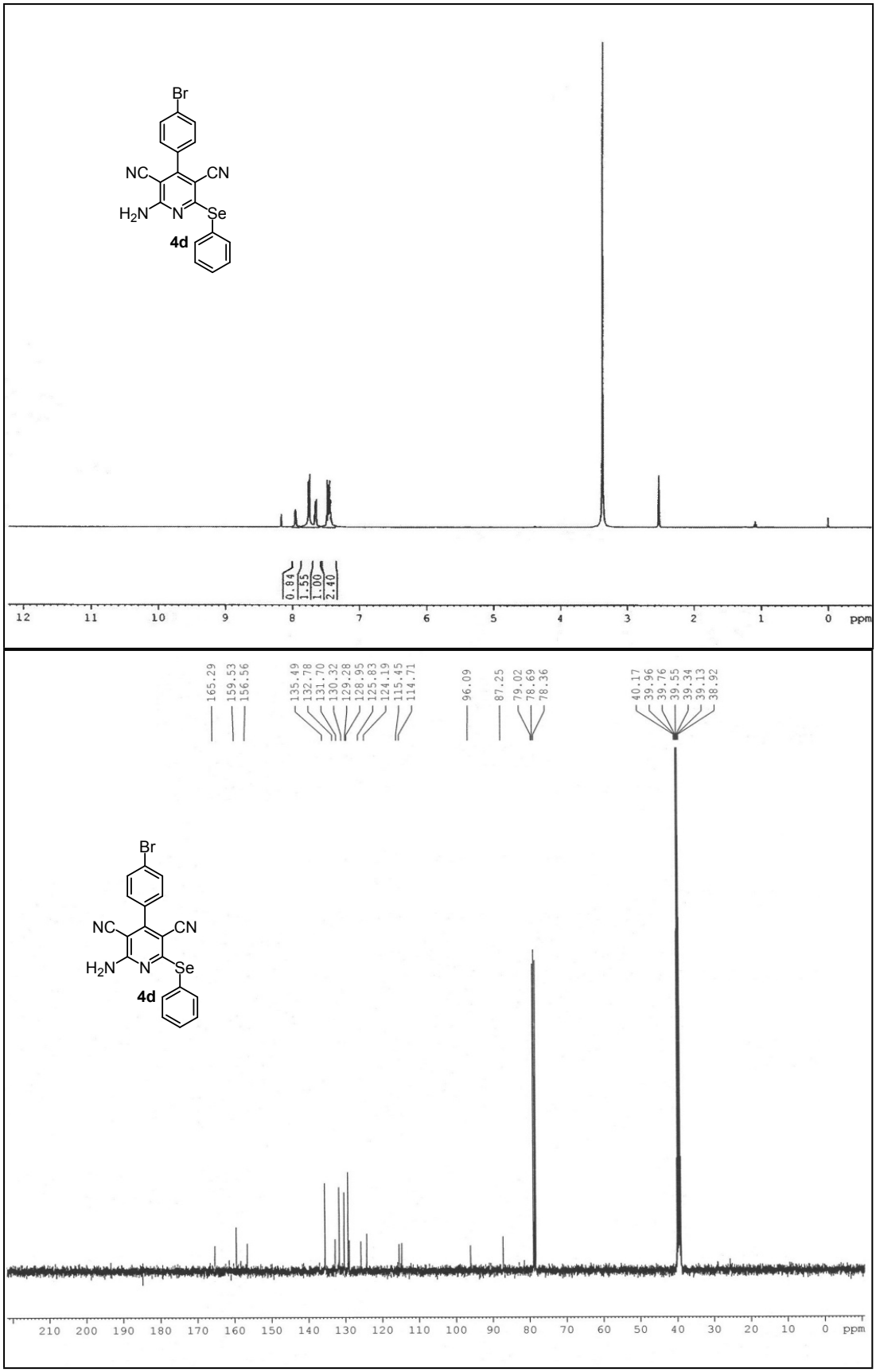
^{1}H and ^{13}C NMR spectra of 4b



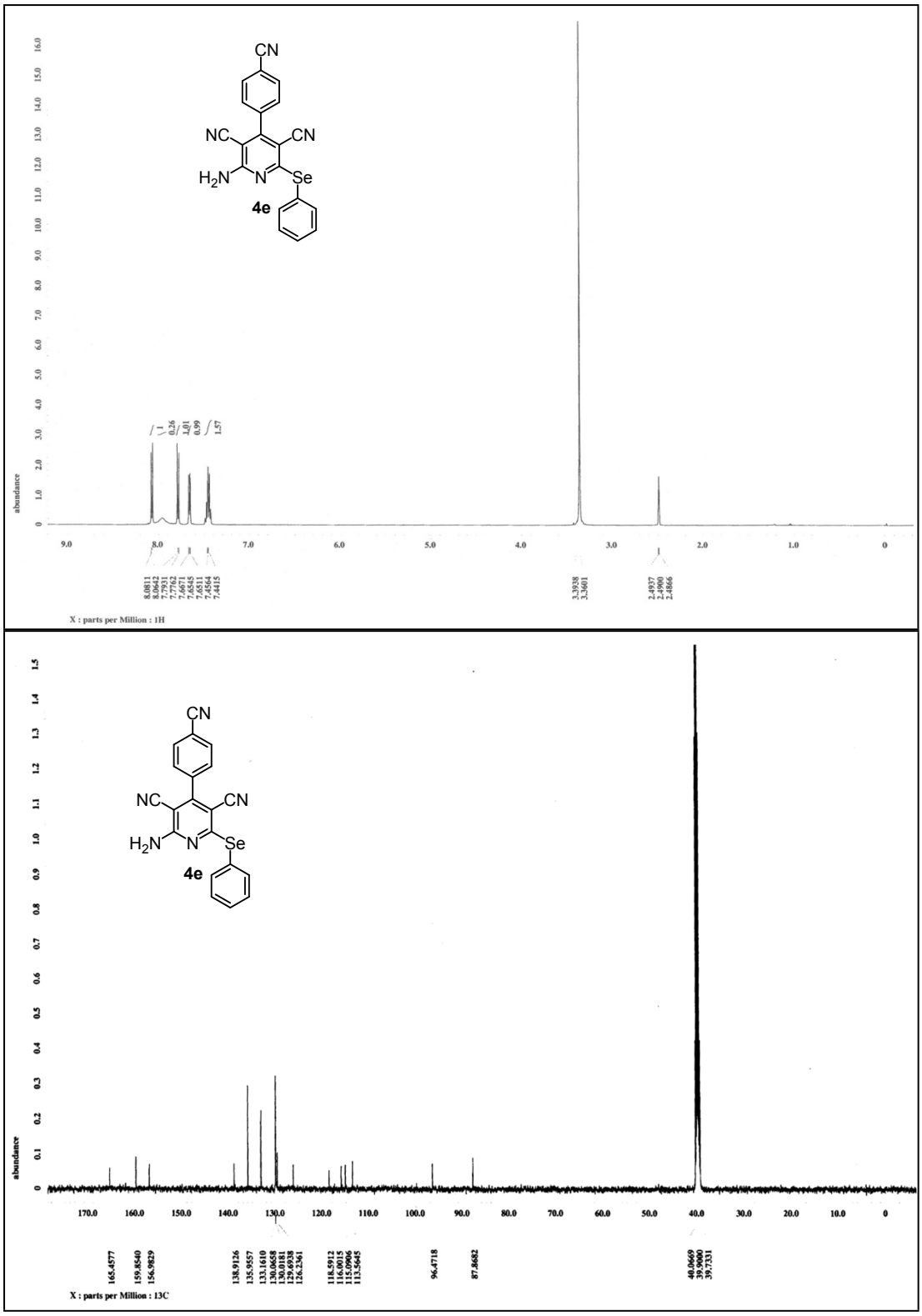
^{1}H and ^{13}C NMR spectra of 4c



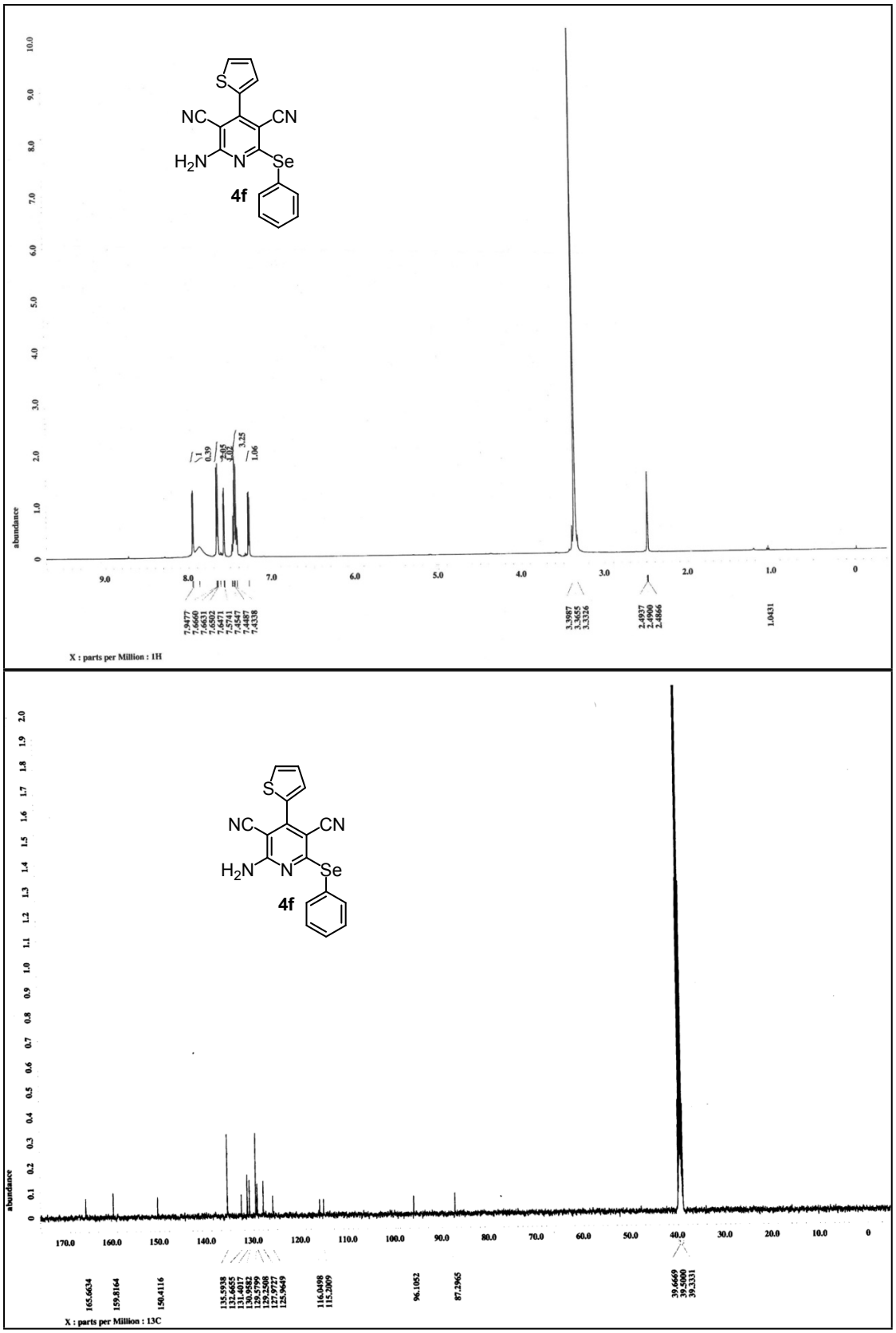
^{1}H and ^{13}C NMR spectra of 4d



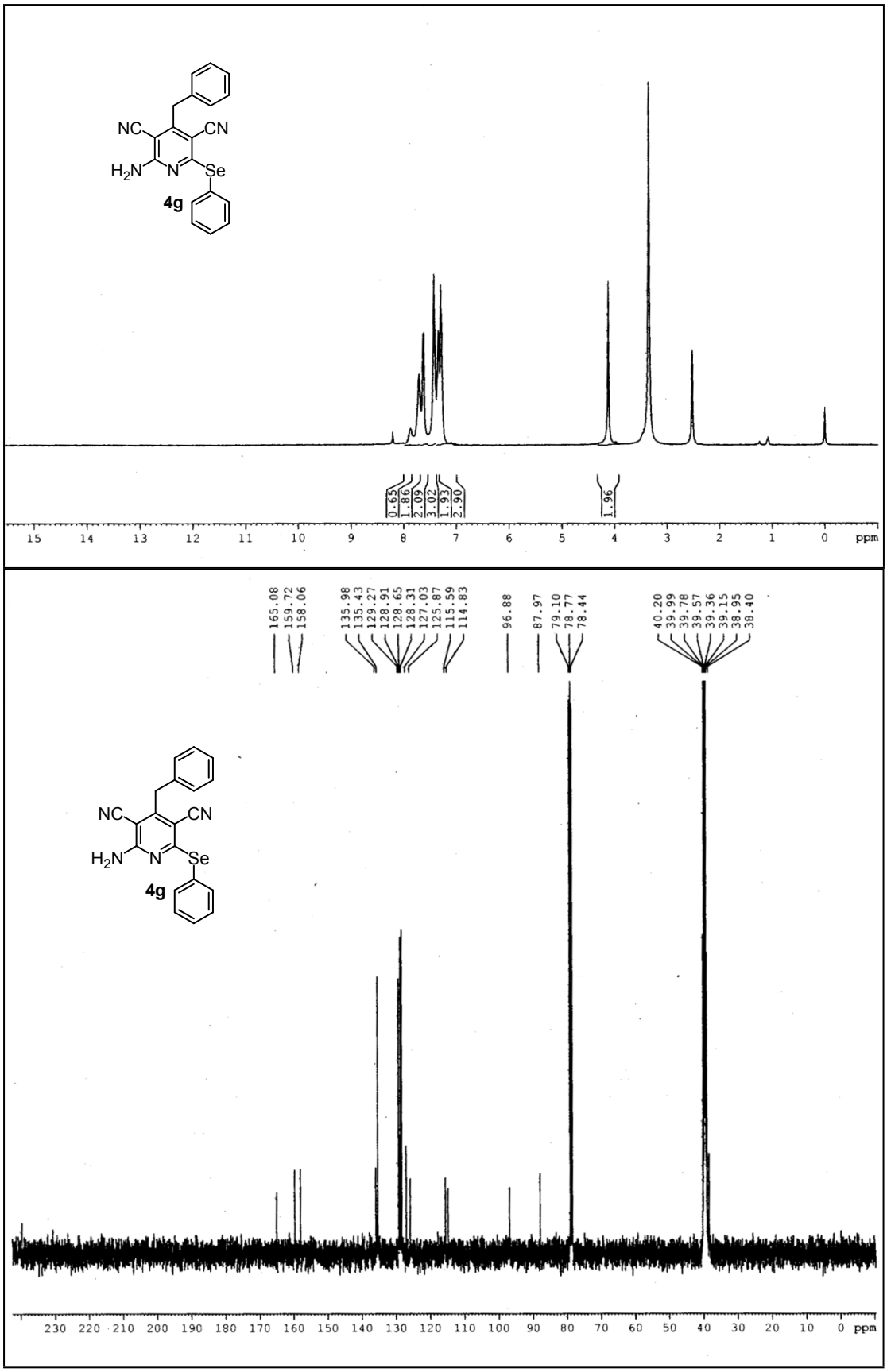
^{1}H and ^{13}C NMR spectra of 4e



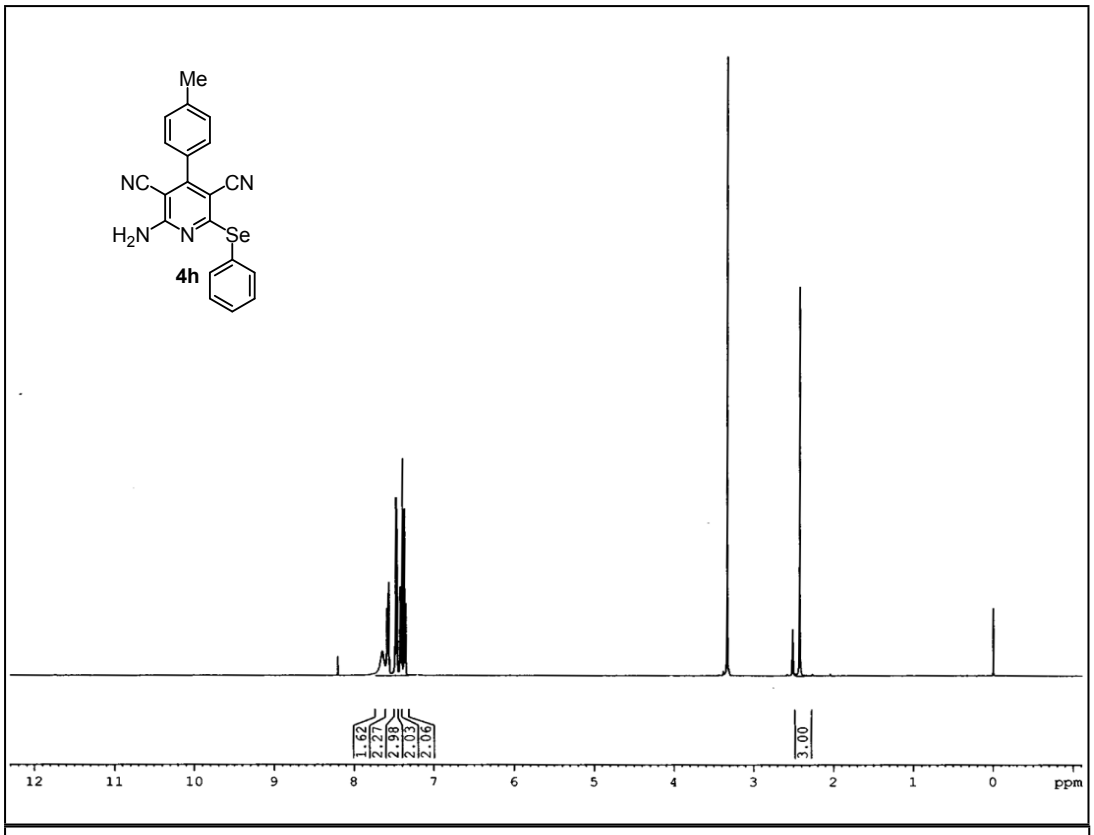
^{1}H and ^{13}C NMR spectra of 4f

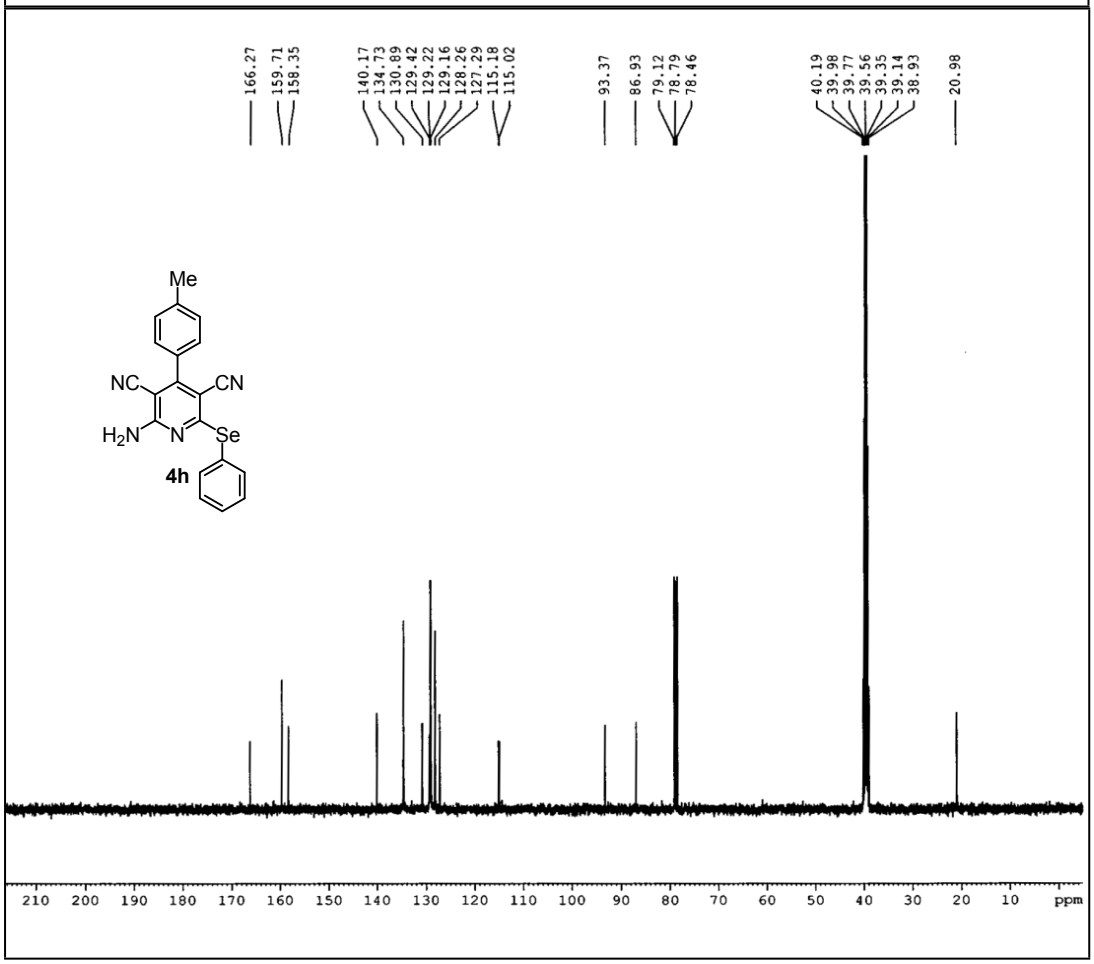


^{1}H and ^{13}C NMR spectra of 4g

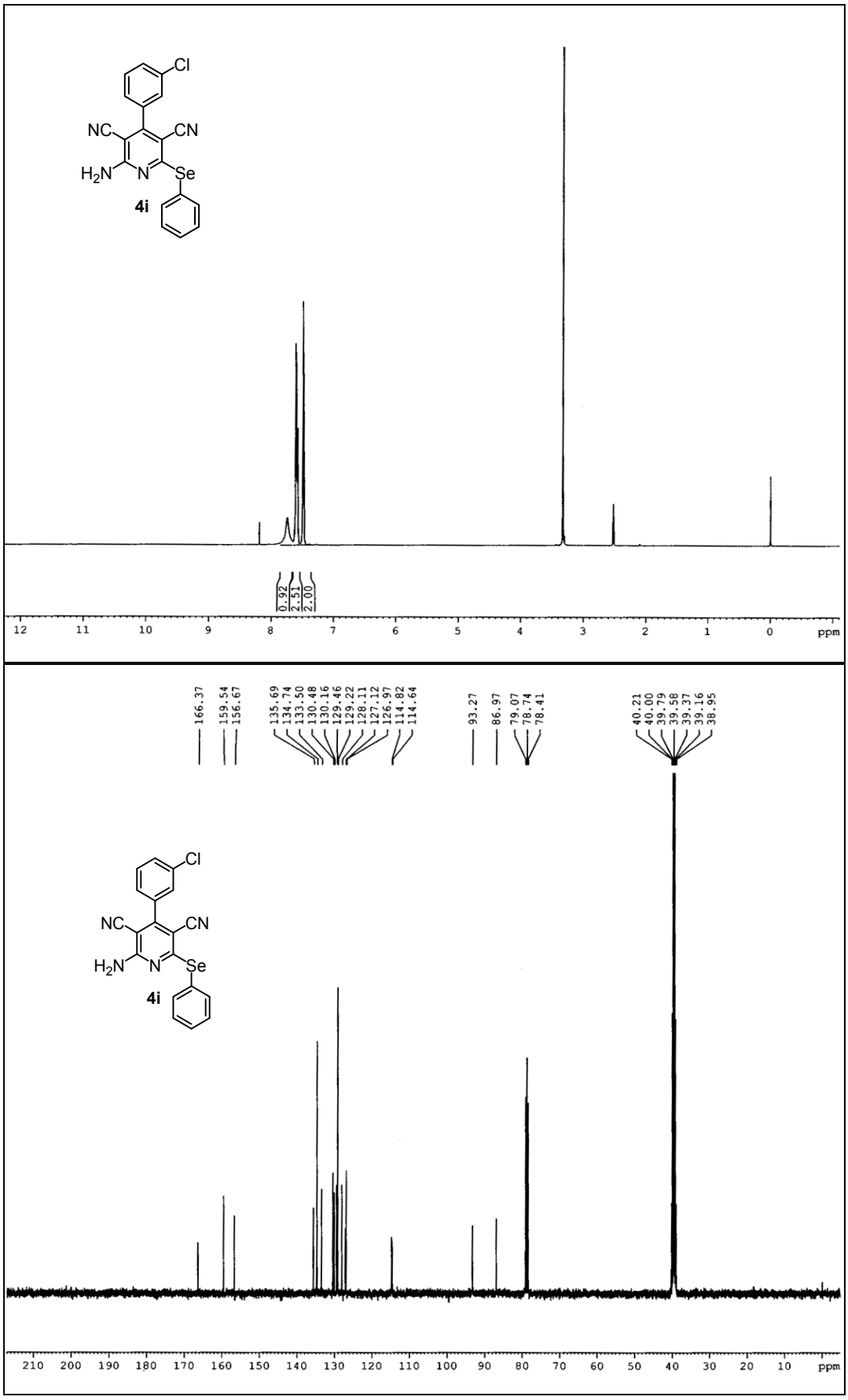


^{1}H and ^{13}C NMR spectra of 4h

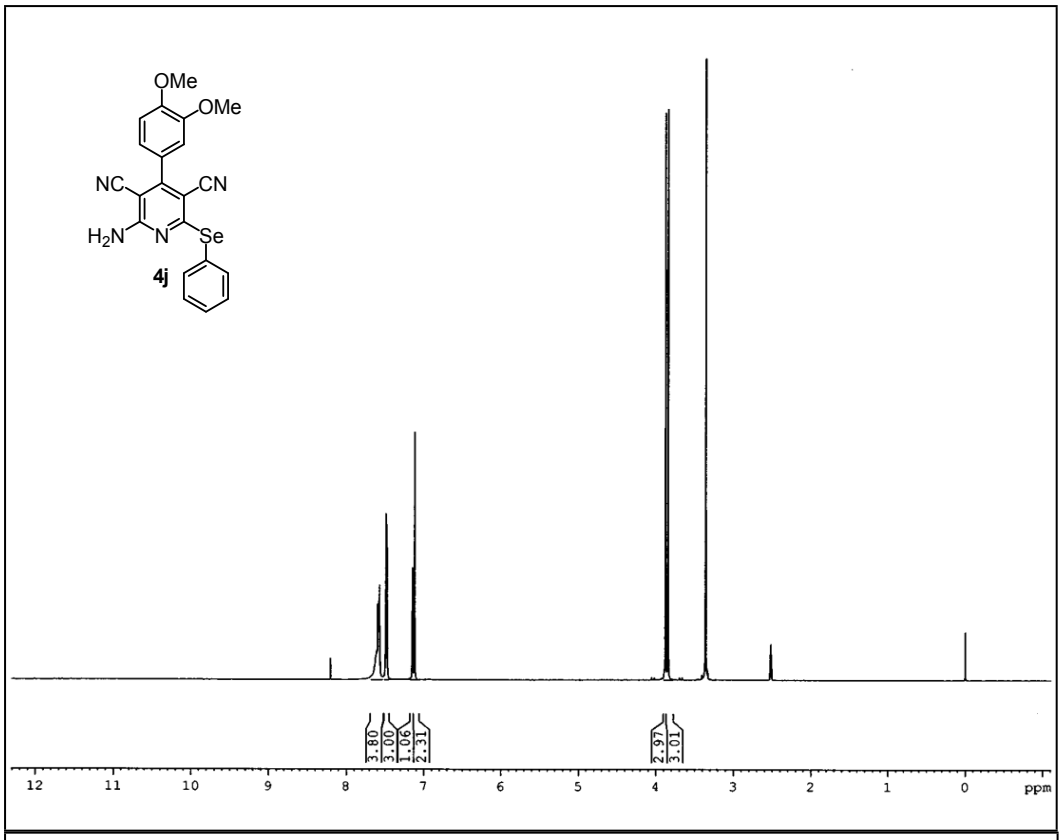


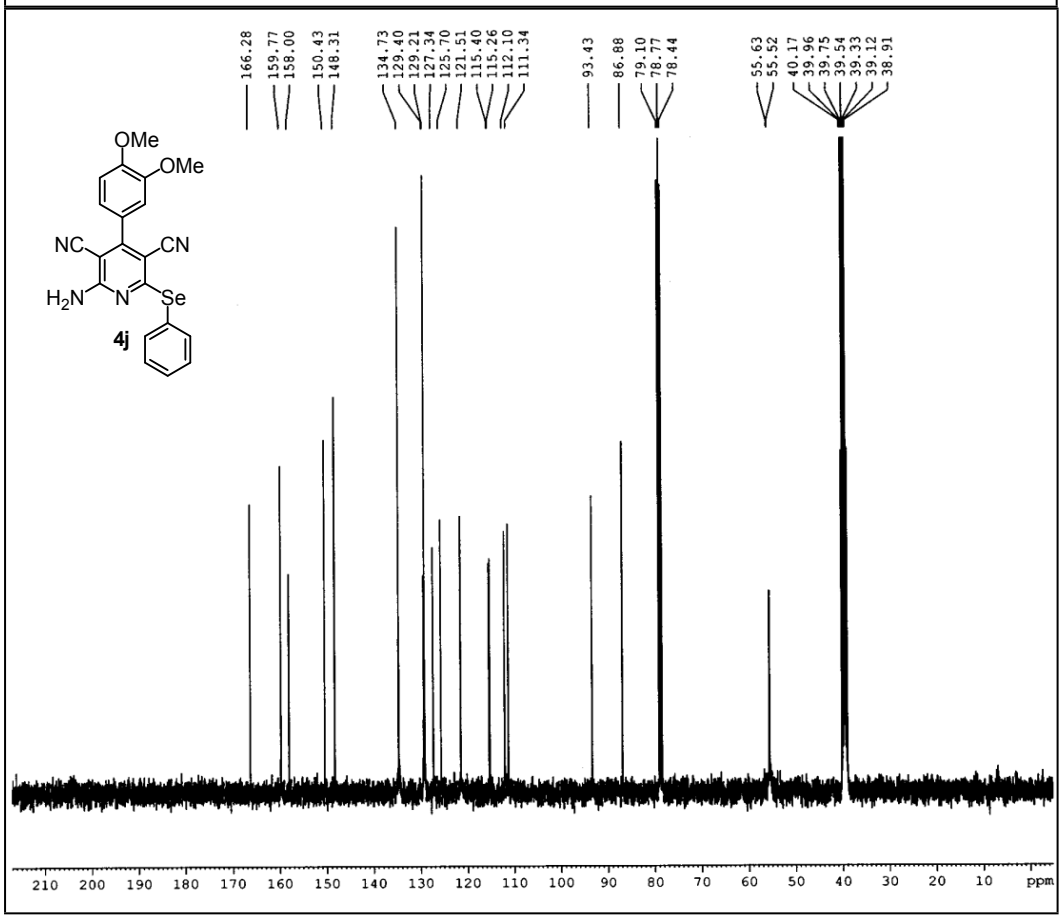


^{1}H and ^{13}C NMR spectra of 4i

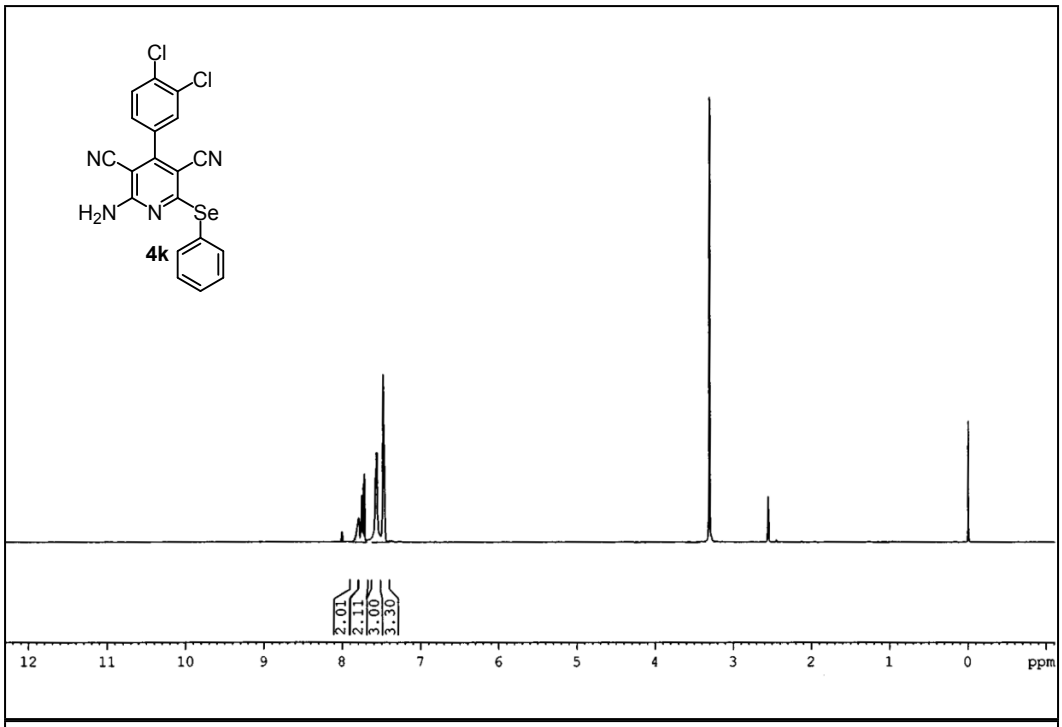


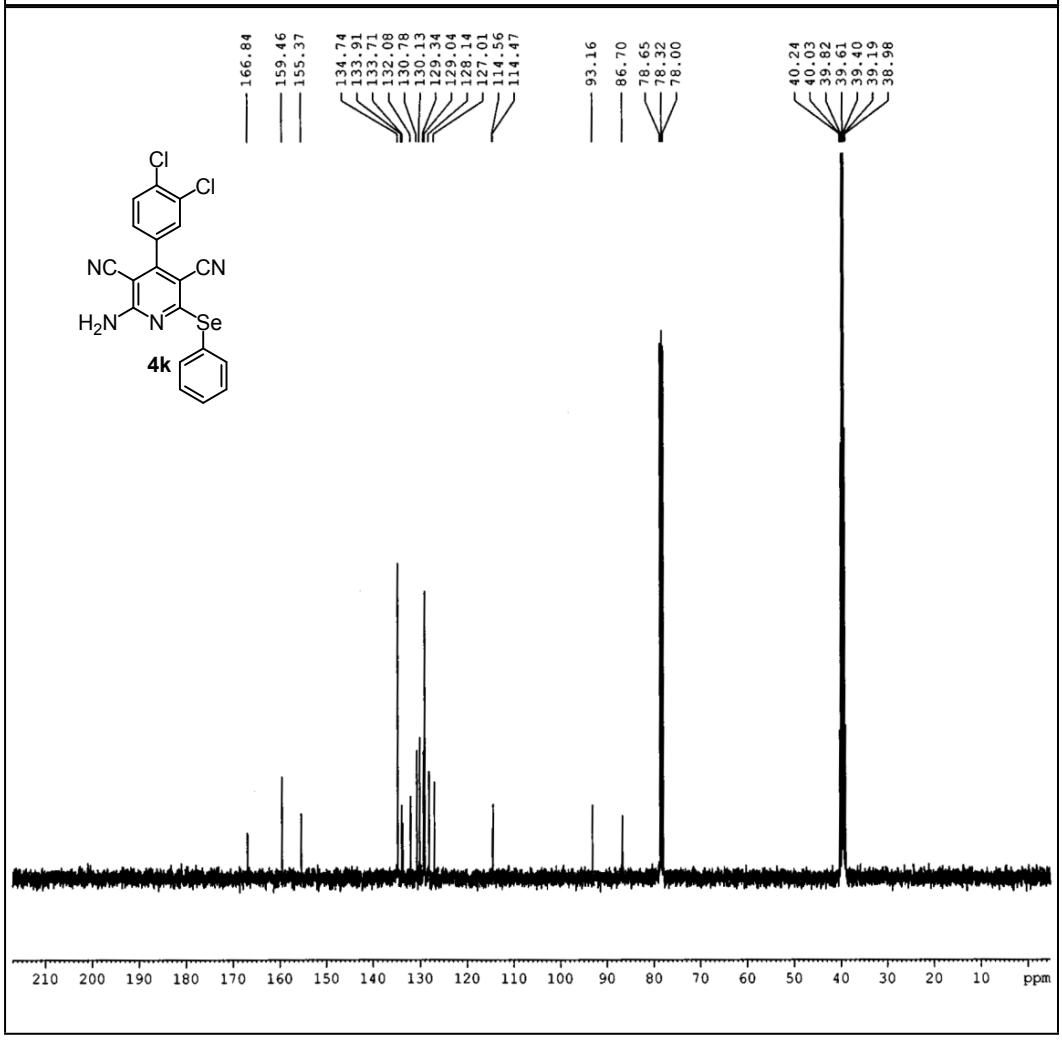
^{1}H and ^{13}C NMR spectra of 4j



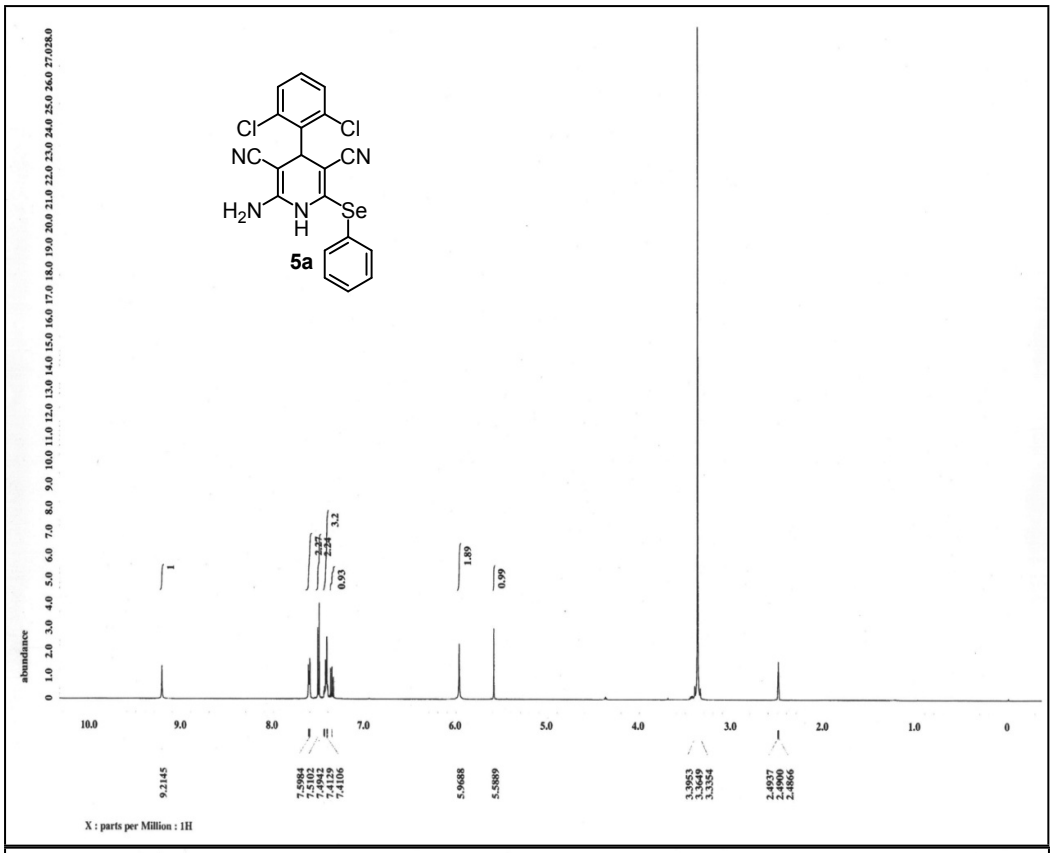


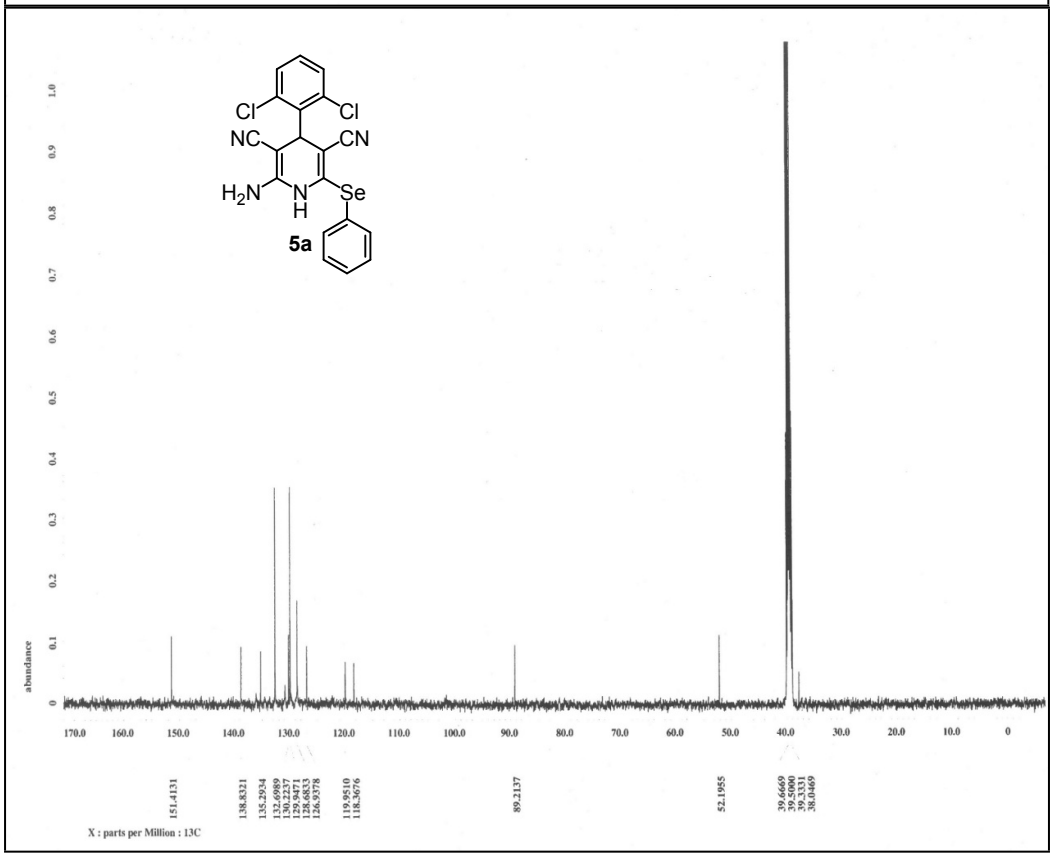
^{1}H and ^{13}C NMR spectra of 4k



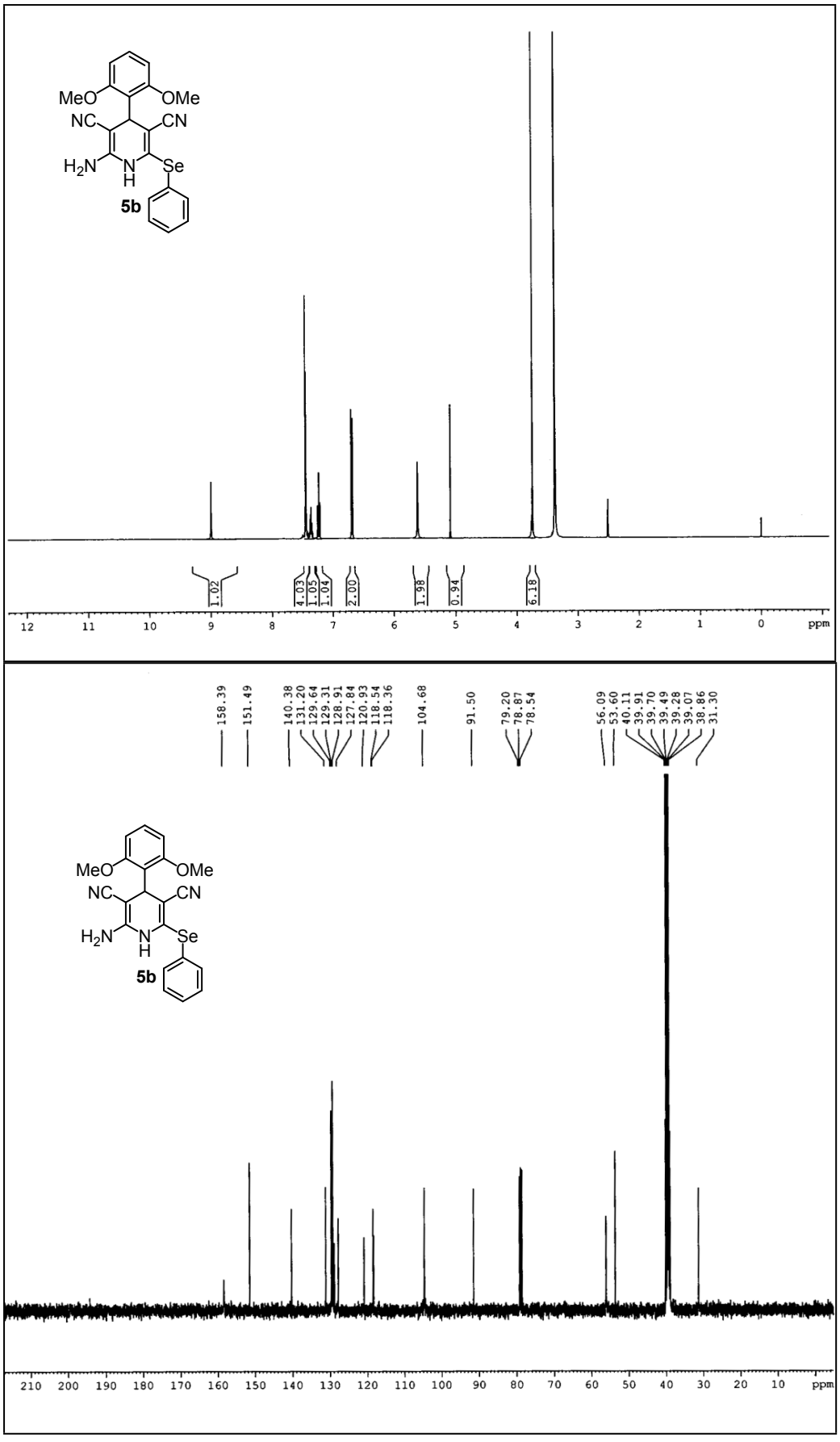


^{1}H and ^{13}C NMR spectra of 5a





^{1}H and ^{13}C NMR spectra of 5b



Crystallographic Informations

Table 3. Crystallographic Data for compound **4b**

Identification code	**4b**
empirical formula	C_{20} H_{14} N_4 O Se
fw	405.31
cryst color	Yellow
cryst size (mm)	0.29×0.20×0.15
cryst syst	Monoclinic
space group	*P*21/n
a (Å)	7.9301(5)
b (Å)	18.6114(12)
c (Å)	11.7983(8)
α (deg)	90.00
β (deg)	96.431(2)
γ (deg)	90.00
V (Å ^{3})	1730.4(2)
*D*calcd (mg m^{-3})	1.556
Z	4
μ(Mo-Kα) (mm^{-1})	2.187
F(000)	816
2θ range	2.79 - 25.49
reflns measd	3230
indep refln	2728 [*R*(int) = 0.0491]
reflns obsd [$I > 2\sigma(I)$]	3230
no. of param	243
final R1, wR2 (obsd data)	R1 = 0.0320, wR2 = 0.0743
GOF (obsd data)	1.037
CCDC no.	1004592

Table 4. Hydrogen bonds distances and angles for the compounds **4b** (Å, °)

D–H···A	D–H/ Å	H···A/ Å	D···A/ Å	D–H···A/ (°)
N4–H1N4···N3	0.82(2)	2.26(2)	3.056(3)	162(2)
N4–H2N4···O1	0.84(4)	2.45(3)	3.146(3)	141(3)
C19–H19···N1	0.93(0)	2.49(0)	3.342(3)	153(0)
C20–H20A···N3	0.96(0)	2.46(0)	3.344(3)	154(0)

Table 5. Bond distances (in Å) and bond angles (in °) of **4b**.

Bond distances (Å)					
C1–C2	1.382(4)	C1–C6	1.390(3)	C14–C15	1.393(3)
C1–Se1	1.913(2)	C2–C3	1.390(4)	C15–C16	1.379(3)
C3–C4	1.377(4)	C4–C5	1.391(4)	C17–O1	1.367(3)
C5–C6	1.377(3)	C7–N1	1.325(3)	C18–C19	1.380(3)
C7–C8	1.402(3)	C7–Se1	1.909(2)	C14–C19	1.396(3)
C8–C9	1.406(3)	C8–C12	1.438(3)	C16–C17	1.390(3)

C9–C10	1.395(3)	C9–C14	1.477(3)	C17–C18	1.381(3)
C10–C11	1.420(3)	C10–C13	1.430(3)	C20–O1	1.436(3)
C11–N4	1.341(3)	C11–N1	1.344(3)	C13–N3	1.147(3)
C12–N2	1.145(3)				
Bond angles (°)					
C1–C2–C3	119.5(2)	C2–C1–Se1	117.62(19)	N1–C7–C8	124.4(2)
C2–C1–C6	120.4(2)	C17–O1–C20	115.84(19)	C8–C7–Se1	117.68(17)
C6–C1–Se1	121.63(19)	C3–C4–C5	119.2(2)	C7–C8–C12	119.1(2)
C4–C3–C2	120.6(2)	C5–C6–C1	119.3(2)	C10–C9–C8	116.7(2)
C6–C5–C4	120.9(2)	N1–C7–Se1	117.82(18)	C8–C9–C14	123.0(2)
C9–C10–C13	121.8(2)	C7–C8–C9	118.8(2)	C11–C10–C13	117.9(2)
N4–C11–N1	116.3(2)	C9–C8–C12	122.1(2)	N4–C11–C10	121.8(2)
N1–C11–C10	121.9(2)	C10–C9–C14	120.3(2)	N2–C12–C8	177.5(3)
N3–C13–C10	175.8(3)	C9–C10–C11	120.3(2)	C15–C14–C19	118.1(2)
C15–C14–C9	122.5(2)	C19–C14–C9	119.4(2)	C19–C18–C17	119.8(2)
C16–C15–C14	121.0(2)	C15–C16–C17	119.9(2)	C7–N1–C11	117.7(2)
O1–C17–C18	123.9(2)	O1–C17–C16	116.2(2)	C7–Se1–C1	101.56(10)
C18–C17–C16	119.9(2)	C18–C19–C14	121.2(2)		

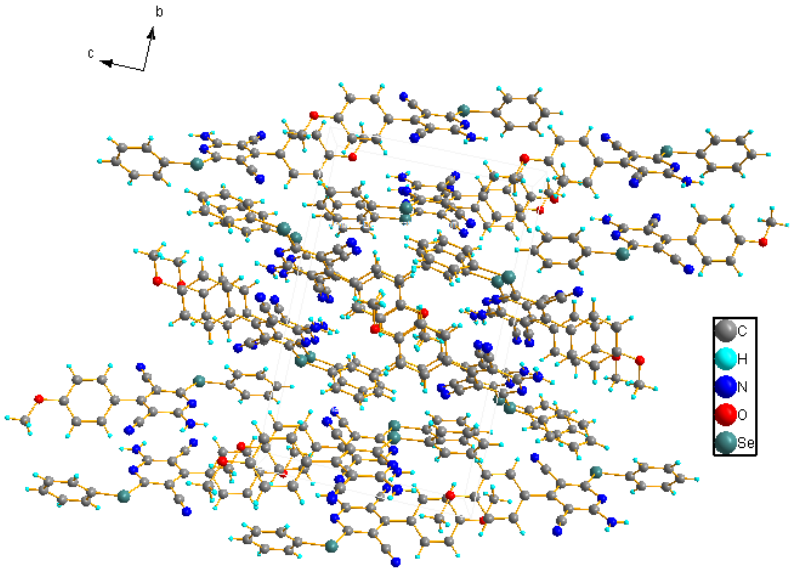


Fig 4. The 2D layer structure of **4b**

References
(1) Altomare, A.; Cascarano, G.; Giacovazzo, C.; Guagliardi, A. J. Appl.Crystallogr. 1993, 26, 343.
(2) Sheldrick, G. M. SHELX97; University of Goettingen: Goettingen,Germany, 1997.