

Efficient Synthesis Multisubstituted 2-Alkenylpyridines via 2,3-Rearrangement of *O*-Homoallenyllic Oximes

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Supporting Information

Contents

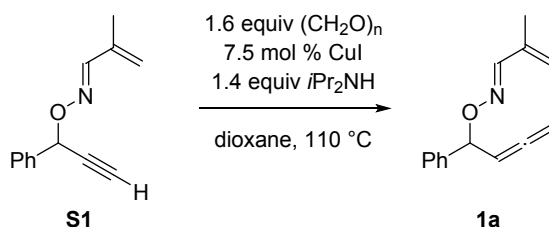
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1. General Information

^1H and ^{13}C NMR spectra were recorded on a JEOL JNM-ECS400 (400 MHz for ^1H and 100 MHz for ^{13}C) spectrometer. Chemical shifts are reported in ppm relative to CHCl_3 (δ 7.26) and THF (δ 3.62) for ^1H and CDCl_3 (δ 77.00) and THF- d_8 (δ 68.03) for ^{13}C . ^1H NMR data are reported as follows: chemical shift, integration, multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, sext = sextet, sept = septet, dd = double doublet, dt = double triplet, dq = double quartet, ddt = double double triplet, br = broad, m = multiplet) and coupling constants (Hz). Infrared spectra were recorded on a JASCO FT/IR-4100 spectrometer. High-resolution mass spectra analysis was performed on a Bruker Daltonics solariX FT-ICR-MS spectrometer at the Research and Analytical Center for Giant Molecules, Graduate School of Science, Tohoku University. Flash column chromatography was performed with Kanto Chemical silica gel 60N (spherical, neutral, 40-50 μm). Analytical thin layer chromatography (TLC) was performed on Merck precoated TLC plates (silica gel 60 F₂₅₄). Microwave-assisted reaction was conducted by using a CEM DiscoverTM.

2. General procedure for preparation of 1

O-Homoallenyl oxime **1a** was prepared from *O*-propargyl oxime¹ according to reported procedure.²

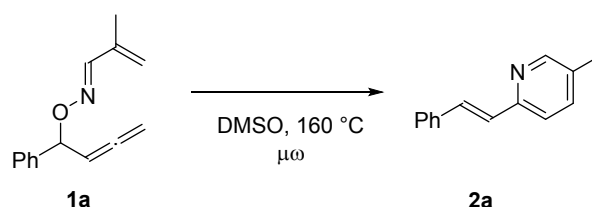


To a mixture of **S1** (0.995 g, 5.0 mmol), paraformaldehyde (0.239 g, 1.6 equiv), and CuI (71.3 mg, 0.375 mmol) was added dioxane (7.5 mL) under argon atmosphere. The solution was heated until 110 $^\circ\text{C}$ and diisopropylamine was added to the solution. The solution was stirred at 110 $^\circ\text{C}$ for 5 hours. After cooling, saturated aqueous ammonium chloride was added to the solution. The reaction mixture was extracted with ether and washed twice with saturated aqueous ammonium chloride and once with brine. The organic layer was dried over sodium sulfate. After removing solvents in vacuo, the crude compound was purified with Merck silica gel column chromatography using hexane/ethyl acetate/triethylamine (200 mL/10 mL/1 drop) as eluent to obtain **1a** (0.540 g, 51% yield)

1) I. Nakamura, D. Zhang, M. Terada, *J. Am. Chem. Soc.* 2010, **132**, 7884

2) H. Luo, S. Ma, *Eur. J. Org. Chem.* **2013**, 3041.

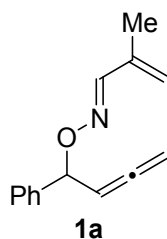
3. General procedure for microwave assisted reaction of 1



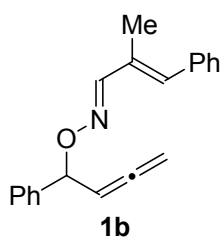
A solution of **1a** (42.6 mg, 0.2 mmol) in DMSO (2 mL) in a glass vial without sealing was irradiated at 160 $^\circ\text{C}$ (power input 200 W) with stirring for 4 hours. After cooling, the reaction mixture was poured into water and extracted with dichloromethane three times. The organic layer was dried over sodium sulfate and evaporated under reduced pressure. The crude product was purified by silica gel column chromatography using hexane/ethyl acetate (5/1) as eluent to obtain **2a** (31.2 mg, 80% yield).

Warning: the use of sealed vessel may be dangerous even with pressure and temperature control.

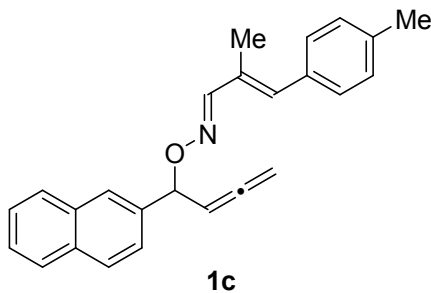
4. Analytical data of 1



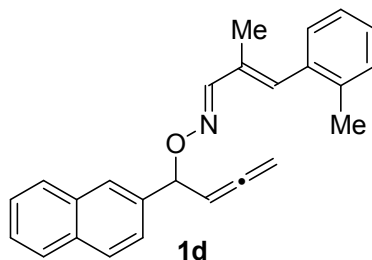
(E)-methacrylaldehyde O-(1-phenylbuta-2,3-dienyl) oxime (1a). ^1H NMR (400 MHz, CDCl_3) δ 7.83 (s, 1H), 7.39-7.27 (m, 5H), 5.68 (d, $J = 6.9$ Hz, 2H), 5.52 (q, $J = 6.9$ Hz, 1H), 5.32 (s, 1H), 5.20 (s, 1H), 4.86-4.76 (m, 2H), 1.87 (s, 3H). ^{13}C NMR (100 MHz, CDCl_3) δ 209.04, 152.16, 140.29, 139.03, 128.25, 127.84, 127.10, 121.75, 92.03, 83.09, 76.80, 17.21. IR (neat) 3064, 3031, 2979, 2923, 1955, 1494, 1453, 1379, 1302, 1078, 1047, 1007, 972, 942, 902, 848 cm^{-1} . HRMS (ESI) calcd. for $(\text{M}+\text{Na})^+$ 236.1045, found. 236.1045.



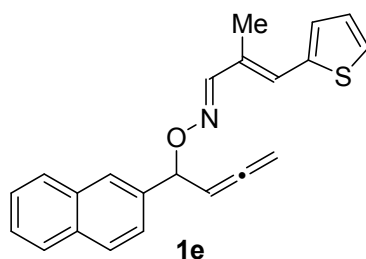
(1E,2E)-2-methyl-3-phenylacrylaldehyde O-(1-phenylbuta-2,3-dienyl) oxime (1b). ^1H NMR (400 MHz, CDCl_3) δ 7.93 (s, 1H), 7.43-7.24 (m, 10H), 6.62 (s, 1H), 5.72 (dt, $J = 7.3, 1.8$ Hz, 1H), 5.55 (q, $J = 7.3$ Hz, 1H), 4.88-4.78 (m, 2H), 2.07 (s, 3H). ^{13}C NMR (100 MHz, CDCl_3) δ 209.03, 154.41, 140.34, 136.52, 136.22, 132.37, 129.28, 128.27, 127.84, 127.46, 127.10, 99.85, 92.06, 83.14, 76.85, 13.137. IR (neat) 3061, 3029, 2986, 2959, 2920, 1955, 1600, 1493, 1451, 1361, 1300, 1198, 1078, 1046, 1028, 1004, 941, 848 cm^{-1} . MS (FD) calcd. for $(\text{M})^+$ 289.1466, found. 289.1467.



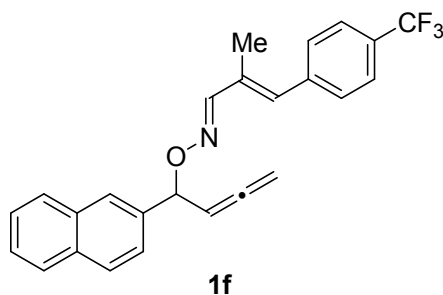
(1E,2E)-2-methyl-3-p-tolylacrylaldehyde O-1-(naphthalen-2-yl)buta-2,3-dienyl oxime (1c). ^1H NMR (400 MHz, CDCl_3) δ 7.96 (s, 1H), 7.86-7.82 (m, 4H), 7.53 (dd, $J = 1.3, 8.2$ Hz, 1H), 7.50-7.45 (m, 2H), 7.24 (d, $J = 8.2$ Hz, 2H), 7.16 (d, $J = 8.2$ Hz, 2H), 6.59 (s, 1H), 5.87 (d, $J = 6.8$ Hz, 1H), 5.62 (q, $J = 6.8$ Hz, 1H), 4.88-4.79 (m, 2H), 2.35 (s, 3H), 2.05 (s, 3H). ^{13}C NMR (100 MHz, CDCl_3) δ 209.10, 154.71, 137.91, 137.44, 136.38, 133.67, 133.15, 133.03, 131.52, 129.31, 129.27, 129.00, 128.10, 128.00, 127.65, 126.00, 125.99, 125.93, 125.14, 92.06, 83.16, 21.26, 13.17. IR (neat) 3726, 3705, 3623, 3594, 3054, 3022, 2985, 2919, 1955, 1602, 1509, 1443, 1363, 1126, 1048, 1019, 939 cm^{-1} . HRMS (ESI) calcd. for $(\text{M}+\text{Na})^+$ 376.1671, found. 376.1671.



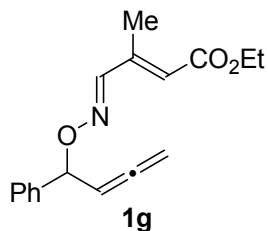
(1E,2E)-2-methyl-3-*o*-tolylacrylaldehyde *O*-1-(naphthalen-2-yl)buta-2,3-dienyl oxime (1d). ¹H NMR (400 MHz, CDCl₃) δ 8.02 (s, 1H), 7.88-7.48 (m, 4H), 7.54 (d, J = 8.7 Hz, 1H), 7.48-7.46 (m, 2H), 7.18 (s, 4H), 6.68 (s, 1H), 5.88 (d, J = 6.4 Hz, 1H), 5.63 (q, J = 6.4 Hz, 1H), 4.89-4.79 (m, 2H), 2.23 (s, 3H), 1.91 (s, 3H). ¹³C NMR (100 MHz, CDCl₃) δ 209.06, 154.18, 137.87, 136.58, 135.41, 133.14, 133.03, 132.61, 129.93, 129.09, 128.10, 128.00, 127.65, 127.59, 126.01, 125.95, 125.38, 125.14, 92.03, 83.19, 19.89, 13.013. IR (neat) 3714, 3653, 3056, 3019, 2984, 2920, 1955, 1601, 1509, 1481, 1440, 1362, 1299, 1270, 1207, 1171, 1126, 1046, 999, 854 cm⁻¹. HRMS (ESI) calcd. for (M+Na)⁺376.1671, found. 376.1671.



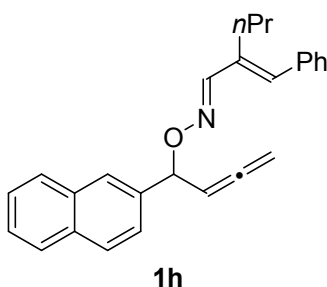
(1E,2E)-2-methyl-3-(thiophen-2-yl)acrylaldehyde *O*-1-(naphthalen-2-yl)buta-2,3-dienyl oxime (1e). ¹H NMR (400 MHz, CDCl₃) δ 7.92 (s, 1H), 7.85-7.81 (m, 4H), 7.53 (d, J = 8.2 Hz, 1H), 7.49-7.44 (m, 2H), 7.36 (d, J = 4.5 Hz, 1H), 7.15 (d, J = 3.8 Hz, 1H), 7.04 (t, J = 4.5 Hz, 1H), 6.75 (s, 1H), 5.87 (d, J = 6.8 Hz, 1H), 5.62 (q, J = 6.8 Hz, 1H), 4.88-4.79 (m, 2H), 2.14 (s, 3H). ¹³C NMR (100 MHz, CDCl₃) δ 209.06, 154.04, 140.00, 137.81, 133.12, 133.02, 129.69, 129.28, 129.01, 128.09, 128.01, 127.63, 127.39, 127.11, 126.01, 125.99, 125.95, 125.10, 92.00, 83.26, 13.28. IR (neat) 3104, 3057, 3020, 2985, 1955, 1603, 1508, 1421, 1362, 1331, 1299, 1250, 1217, 1178, 1126, 1045, 1003, 939 cm⁻¹. HRMS (ESI) calcd. for (M+Na)⁺ 368.1079, found.368.1079.



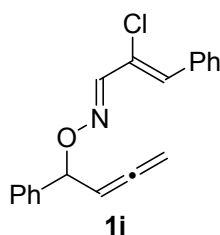
(1E,2E)-2-methyl-3-(4-(trifluoromethyl)phenyl)acrylaldehyde *O*-1-(naphthalen-2-yl)buta-2,3-dienyl oxime (1f). ¹H NMR (400 MHz, CDCl₃) δ 7.88 (s, 1H), 7.77-7.70 (m, 4H), 7.51 (d, J = 8.2 Hz, 2H), 7.44 (d, J = 5.0 Hz, 1H), 7.38 (d, J = 5 Hz, 2H), 7.32 (d, J = 8.2 Hz, 2H), 6.53 (s, 1H), 5.80 (d, J = 6.8 Hz, 1H), 5.55 (q, J = 6.8 Hz, 1H), 4.78-4.74 (m, 2H), 1.96 (s, 3H). ¹³C NMR (100 MHz, CDCl₃) δ 209.10, 153.82, 145.25, 140.00, 137.70, 134.48, 134.41, 133.14, 133.08, 129.38, 128.09, 128.05, 127.66, 126.07, 126.03, 125.15, 125.07, 91.90, 83.44, 77.08, 13.18. IR (neat) 3713, 3654, 3611, 3058, 2988, 2925, 1955, 1615, 1509, 1442, 1411, 1364, 1326, 1165, 1122, 1068, 1015, 972, 943, 855 cm⁻¹. HRMS (ESI) calcd. for (M+Na)⁺ 430.1389, found.430.1389.



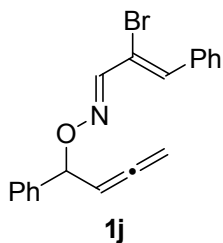
(2E,4E)-ethyl 3-methyl-4-(1-phenylbuta-2,3-dienyloxime)but-2-enoate (1g). ¹H NMR (400 MHz, CDCl₃) δ 7.77 (s, 1H), 7.40-7.28 (m, 5H), 5.88 (s, 1H), 5.73 (d, J = 6.8 Hz, 1H), 5.52 (q, J = 6.8 Hz, 1H), 4.89-4.79 (m, 2H), 4.19 (q, J = 6.8 Hz, 2H), 2.285 (s, 3H), 1.29 (t, J = 6.8 Hz, 3H). ¹³C NMR (100 MHz, CDCl₃) δ 209.13, 166.09, 152.20, 148.14, 139.70, 128.34, 128.09, 127.10, 123.85, 91.65, 83.91, 77.03, 60.18, 14.22, 13.06. IR (neat) 3725, 3706, 3624, 3599, 3421, 3064, 3032, 2982, 2936, 2904, 2387, 2360, 2341, 2335, 2292, 1956, 1625, 1453, 1395, 1367, 1354, 1276, 1096, 1078, 1053, 1000, 848 cm⁻¹. HRMS (ESI) calcd. for (M+Na)⁺ 308.1257, found. 308.1257.



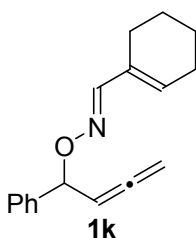
(1E,2E)-2-benzylidenepentanal O-(1-naphthalen-2-yl)buta-2,3-dienyl oxime (1h). ¹H NMR (400 MHz, CDCl₃) δ 7.80-7.74 (m, 5H), 7.46 (d, J = 8.7 Hz, 1H), 7.41-7.39 (m, 2H), 7.29-7.18 (m, 5H), 6.5 (s, 1H), 5.79 (d, J = 6.4 Hz, 1H), 5.55 (q, J = 6.4 Hz, 1H), 4.78-4.75 (m, 2H), 2.39 (t, J = 8.7 Hz, 2H), 1.463 (tq, J = 8.7, 6.7 Hz, 2H), 0.81 (t, J = 6.7 Hz, 3H). ¹³C NMR (100 MHz, CDCl₃) δ 209.16, 153.62, 137.74, 137.26, 136.48, 136.05, 133.14, 133.03, 128.89, 128.35, 128.08, 127.97, 127.63, 127.45, 126.13, 125.99, 125.94, 125.17, 91.93, 83.20, 76.86, 28.78, 22.00, 14.30. IR (neat) 3714, 3654, 3611, 3055, 3022, 2959, 2928, 2869, 1954, 1600, 1508, 1402, 1464, 1454, 1375, 1298, 1269, 1172, 1126, 1090, 1019, 972, 941, 892, 857 cm⁻¹. HRMS (ESI) calcd. for (M+Na)⁺ 390.1828, found. 390.1828.



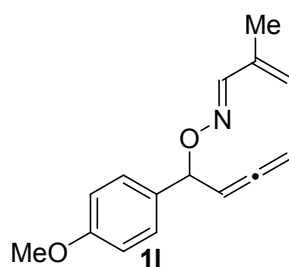
(1E,2Z)-2-chloro-3-phenylacrylaldehyde O-(1-phenylbuta-2,3-dienyl) oxime (1i). ¹H NMR (400 MHz, CDCl₃) δ 7.98 (s, 1H), 7.74 (d, J = 7.3 Hz, 2H), 7.44-7.28 (m, 8H), 6.83 (s, 1H), 5.80 (d, J = 6.9 Hz, 1H), 5.56 (d, J = 6.9 Hz, 1H), 4.90-4.79 (m, 2H). ¹³C NMR (100 MHz, CDCl₃) δ 209.14, 149.12, 139.76, 133.80, 133.68, 129.97, 129.15, 128.42, 128.34, 128.07, 127.17, 125.30, 91.84, 83.80, 77.11. IR (neat) 3062, 3029, 2918, 1955, 1606, 1494, 1447, 1285, 1197, 1164, 1119, 1077, 1001, 951, 848 cm⁻¹. MS (FD) calcd. for (M)⁺ 309.0920, found. 309.0921.



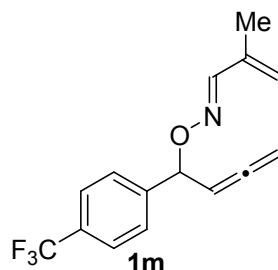
(1E,2Z)-2-bromo-3-phenylacrylaldehyde O-(1-phenylbuta-2,3-dienyl) oxime (1j). ¹H NMR (400 MHz, CDCl₃) δ 7.97 (s, 1H), 7.76 (d, J = 6.9 Hz, 2H), 7.43-7.30 (m, 8H), 7.17 (s, 1H), 5.80 (dt, J = 6.9, 1.8 Hz, 1H), 5.57 (q, J = 6.9 Hz, 1H), 4.90-4.80 (m, 2H). ¹³C NMR (100 MHz, CDCl₃) δ 209.19, 149.90, 139.57, 136.83, 134.52, 129.81, 129.18, 128.34, 128.30, 128.09, 127.21, 115.72, 91.79, 83.82, 77.08. IR (neat) 3062, 3030, 2918, 1954, 1602, 1492, 1446, 1282, 1154, 1029, 950, 848 cm⁻¹. MS (FD) calcd. for (M)⁺ 353.0415, found. 353.0410.



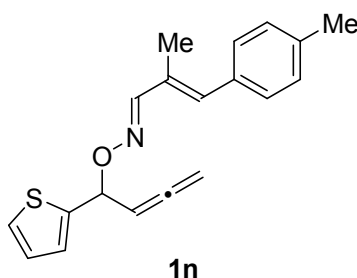
(E)-cyclohex-1-enecarbaldehyde O-(1-phenylbuta-2,3-dienyl) oxime (1k). ¹H NMR (400 MHz, CDCl₃) δ 8.62 (s, 1H), 7.73 (s, 1H), 7.39-7.26 (m, 5H), 5.96 (t, J = 3.7 Hz, 1H), 5.64 (d, J = 6.9 Hz, 1H), 5.51 (q, J = 6.9 Hz, 1H), 4.85-4.75 (m, 2H), 2.21 (m, 2H), 2.15 (m, 2H), 1.62 (sext, J = 3.2 Hz, 3H). ¹³C NMR (100 MHz, CDCl₃) δ 208.98, 152.77, 140.54, 135.69, 133.17, 128.21, 127.72, 127.09, 92.18, 82.76, 76.73, 25.97, 23.45, 22.233, 21.83. IR (neat) 3062, 3030, 2982, 2930, 2859, 2360, 1955, 1638, 1494, 1451, 1434, 1347, 1301, 1267, 1188, 1077, 1020, 970, 912, 844 cm⁻¹. MS (FD) calcd. for (M)⁺ 253.1467, found. 253.1468.



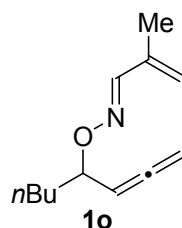
(E)-methacrylaldehyde O-(1-(4-methoxyphenyl)buta-2,3-dienyl) oxime (1l). ¹H NMR (400 MHz, CDCl₃) δ 7.80 (s, 1H), 7.33 (d, J = 8.7 Hz, 2H), 6.89 (d, J = 8.7 Hz, 2H), 5.63 (d, J = 6.8 Hz, 1H), 5.53 (q, J = 6.8 Hz, 2H), 5.32 (t, J = 1.8 Hz, 1H), 5.19 (s, 1H), 4.86-4.76 (m, 2H), 3.81 (s, 3H), 1.88 (s, 3H). ¹³C NMR (100 MHz, CDCl₃) δ 208.92, 159.26, 152.04, 139.05, 132.32, 128.53, 121.69, 113.62, 92.07, 82.65, 76.80, 55.23, 17.23. IR (neat) 3085, 2997, 2955, 2925, 2835, 1956, 1612, 1585, 1512, 1455, 1442, 1303, 1247, 1175, 1036, 1003, 941, 903, 847, 828 cm⁻¹. MS (FD) calcd. for (M)⁺ 243.1259, found. 243.1260.



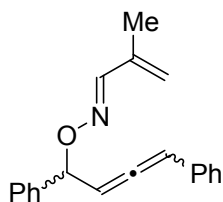
(*E*)-methacrylaldehyde *O*-(1-(4-(trifluoromethyl)phenyl)buta-2,3-dienyl) oxime (1m). ^1H NMR (400 MHz, CDCl_3) δ 7.84 (s, 1H), 7.61 (d, $J = 8.2$ Hz, 2H), 7.48 (d, $J = 8.2$ Hz, 2H), 5.73 (d, $J = 6.9$ Hz, 1H), 5.49 (q, $J = 6.9$ Hz, 1H), 5.35 (s, 1H), 5.23 (s, 1H), 4.87-4.78 (m, 2H), 1.85 (s, 3H). ^{13}C NMR (100 MHz, CDCl_3) δ 209.10, 152.56, 144.4, 138.79, 129.68, 127.30, 125.18 (q, $J = 3.8$ Hz), 123.50, 122.32, 91.53, 82.33, 17.17. IR (neat) 3089, 2982, 2958, 2925, 1956, 1620, 1417, 1322, 1164, 1124, 1066, 1014, 974, 940, 905, 846 cm^{-1} . HRMS (ESI) calcd. for $(\text{M}+\text{Na})^+$ 304.0919, found. 304.0919.



(1*E*,2*E*)-2-methyl-3-*p*-tolylacrylaldehyde *O*-(1-(thiophen-2-yl)buta-2,3-dienyl) oxime (1n). ^1H NMR (400 MHz, CDCl_3) δ 7.88 (s, 1H), 7.30 (d, $J = 4.8$ Hz, 1H), 7.25 (d, $J = 8.2$ Hz, 2H), 7.17 (d, $J = 8.2$ Hz, 2H), 7.10 (d, $J = 4.8$ Hz, 1H), 6.99 (t, $J = 4.8$ Hz, 1H), 6.59 (s, 1H), 5.91 (d, $J = 6.8$ Hz, 1H), 5.62 (q, $J = 6.8$ Hz, 1H), 4.94-4.85 (m, 2H), 2.35 (s, 3H), 2.11 (s, 3H). ^{13}C NMR (100 MHz, CDCl_3) δ 208.99, 154.79, 143.31, 137.49, 136.56, 133.64, 131.45, 129.27, 129.01, 126.42, 125.74, 125.64, 91.67, 78.77, 21.26, 13.16. IR (neat) 3851, 3714, 3653, 36123022, 2986, 2957, 2919, 1955, 1675, 1611, 1581, 1509, 1437, 1362, 1291, 1229, 1184, 1113, 1039, 1019, 991, 935, 883, 854 cm^{-1} . HRMS (ESI) calcd. for $(\text{M}+\text{Na})^+$ 332.1079, found.332.1079.

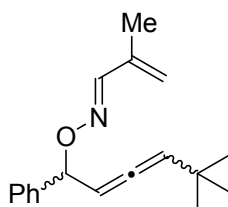


(*E*)-methacrylaldehyde *O*-(octa-1,2-dien-4-yl) oxime (1o). ^1H NMR (400 MHz, CDCl_3) δ 7.75 (s, 1H), 5.32 (t, $J = 1.37$ Hz, 2H), 5.27 (q, $J = 6.9$ Hz, 1H), 5.18 (s, 1H), 4.85-4.75 (m, 2H), 4.63-4.56 (m, 1H), 1.91 (s, 3H), 1.82-1.73 (m, 1H), 1.70-1.60 (m, 1H), 1.45-1.34 (m, 4H), 0.91 (t, $J = 7.3$ Hz, 3H). ^{13}C NMR (100 MHz, CDCl_3) δ 208.55, 151.38, 139.18, 121.20, 91.68, 81.03, 76.13, 33.52, 27.53, 22.57, 17.25, 14.02. IR (neat) 3087, 2956, 2932, 2872, 2861, 1957, 1627, 1582, 1455, 1432, 1379, 1344, 1114, 1039, 1002, 943, 897, 842 cm^{-1} . HRMS (ESI) calcd. for $(\text{M}+\text{H})^+$ 216.1358, found. 216.1358.



1p
(dr=52:48)

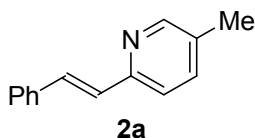
(E)-methacrylaldehyde O-(1,4-diphenylbuta-2,3-dienyl) oxime (1p). ^1H NMR (400 MHz, CDCl_3) δ 7.98 (s, 1H), 7.83 (s, 1H), 7.45-7.24 (m, 20H), 6.29 (dd, $J = 1.8, 6.4$ Hz, 1H), 6.24 (dd, $J = 1.8, 6.4$ Hz, 1H), 5.94 (t, $J = 6.4$ Hz, 1H), 5.90 (t, $J = 6.4$ Hz, 1H), 5.77 (d, $J = 6.4$ Hz, 1H), 5.74 (d, $J = 6.4$ Hz, 1H), 5.36 (s, 1H), 5.30 (s, 1H), 5.24 (s, 1H), 5.16 (s, 1H), 1.92 (s, 3H), 1.87 (s, 3H). ^{13}C NMR (100 MHz, CDCl_3) δ 206.19, 205.88, 152.48, 152.36, 133.87, 128.52, 128.41, 128.35, 127.98, 127.14, 127.07, 127.04, 126.96, 126.88, 121.97, 121.85, 96.94, 96.90, 96.73, 96.26, 83.50, 83.12, 77.18, 77.00, 76.82, 17.26, 17.18. IR (neat) 3084, 3062, 3030, 2955, 2922, 2852, 1952, 1878, 1806, 1626, 1598, 1582, 1495, 1455, 1301, 1074, 1047, 1005, 941, 910, 877 cm^{-1} . HRMS (ESI) calcd. for $(\text{M}+\text{H})^+$ 312.1358, found. 312.1358.



1q
(dr=51:49)

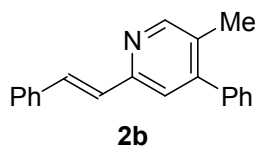
(E)-methacrylaldehyde O-(5,5-dimethyl-1-phenylhexa-2,3-dienyl) oxime (1q). ^1H NMR (400 MHz, CDCl_3) δ 7.84 (s, 1H), 7.83 (s, 1H), 7.37-7.32 (m, 10H), 5.65 (t, $J = 6.4$ Hz, 1H), 5.63 (t, $J = 6.4$ Hz, 1H), 5.55 (t, $J = 6.4$ Hz, 1H), 5.54 (t, $J = 6.4$ Hz, 1H), 5.32 (s, 1H), 5.32 (s, 1H), 5.23 (dd, $J = 1.8, 6.4$ Hz, 1H), 5.19 (s, 1H), 5.19 (s, 1H), 5.16 (dd, $J = 1.8, 6.4$ Hz, 1H), 1.87 (s, 1H), 1.86 (s, 3H), 0.97 (s, 9H), 0.94 (s, 9H). ^{13}C NMR (100 MHz, CDCl_3) δ 202.63, 202.03, 152.01, 140.79, 140.35, 139.09, 128.11, 127.66, 127.55, 127.16, 127.05, 121.60, 121.58, 105.06, 104.97, 94.71, 94.62, 83.93, 83.76, 31.86, 31.82, 29.97, 29.94, 17.25, 17.23. IR (neat) 3087, 3064, 3031, 2960, 2927, 2901, 2865, 1964, 1878, 1803, 1474, 1454, 1362, 1306, 1251, 1188, 1045, 1005, 974, 940, 896, 874 cm^{-1} . MS (FD) calcd. for $(\text{M})^+$ 269.1779, found. 269.1777.

5. Analytical data of **2** and **3**

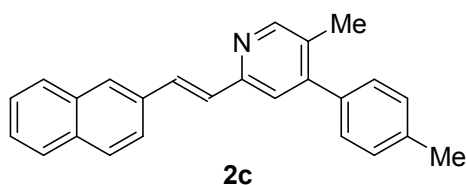


2a

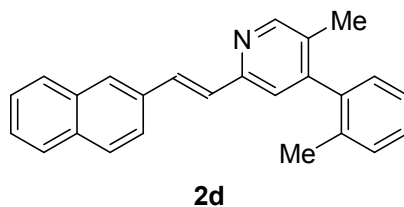
(E)-5-methyl-2-styrylpyridine (2a). ^1H NMR (400 MHz, CDCl_3) δ 8.44 (s, 1H), 7.57 (d, $J = 7.8$ Hz, 2H), 7.56 (d, $J = 16.5$ Hz, 1H), 7.47 (dd, $J = 7.8, 1.4$ Hz, 1H), 7.36 (t, $J = 7.8$ Hz, 2H), 7.33-7.28 (m, 2H), 7.15 (d, $J = 16.5$ Hz, 1H), 2.35 (s, 3H). ^{13}C NMR (100 MHz, CDCl_3) δ 153.00, 150.12, 137.04, 136.82, 131.67, 131.63, 128.69, 128.10, 127.93, 126.96, 121.55, 18.32. IR (neat) 3034, 2992, 2920, 2360, 2327, 1636, 1595, 1559, 1494, 1477, 1447, 1378, 1026, 988, 977, 964, 874, 823 cm^{-1} . HRMS (ESI) calcd. for $(\text{M}+\text{Na})^+$ 218.0940, found. 218.0940.



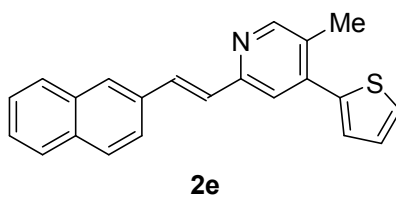
(E)-5-methyl-4-phenyl-2-styrylpyridine (2b). ¹H NMR (400 MHz, CDCl₃) δ 8.49 (s, 1H), 7.6 (d, J = 16.0 Hz, 1H), 7.56 (d, J = 7.8 Hz, 2H), 7.49-7.33 (m, 7H), 7.3-7.25 (m, 2H), 7.18 (d, J = 17.0 Hz, 1H), 2.27 (s, 3H). ¹³C NMR (100 MHz, CDCl₃) δ 153.42, 151.16, 149.67, 139.18, 136.75, 131.84, 129.21, 128.67, 128.49, 128.43, 128.12, 127.94, 127.80, 126.95, 122.36, 17.09. IR (neat) 3368, 3080, 3057, 3024, 2993, 2923, 2853, 1951, 1877, 1815, 1636, 1590, 1538, 1495, 1477, 1447, 1383, 1074, 1045, 969 892 cm⁻¹. HRMS (ESI) calcd. for (M+Na)⁺ 294.1253, found. 294.1253.



(E)-5-methyl-2-(2-(naphthalen-2-yl)vinyl)-4-p-tolylpyridine (2c). ¹H NMR (400 MHz, CDCl₃) δ 8.50 (s, 1H), 7.91 (s, 1H), 7.84-7.74 (m, 5H), 7.49-7.42 (m, 2H), 7.32-7.25 (m, 6H), 2.43 (s, 3H), 2.29 (s, 3H). ¹³C NMR (100 MHz, CDCl₃) δ 153.40, 151.18, 149.66, 137.83, 136.22, 134.29, 133.56, 133.21, 131.81, 129.30, 129.13, 128.43, 128.30, 128.17, 128.13, 127.65, 127.52, 126.29, 126.08, 123.57, 122.51, 21.24, 17.19. IR (neat) 3053, 2920, 1633, 1590, 1510, 1479, 1376, 1270, 1040, 970, 889, 862 cm⁻¹. HRMS (ESI) calcd. for (M+Na)⁺ 358.1566, found. 358.1566.

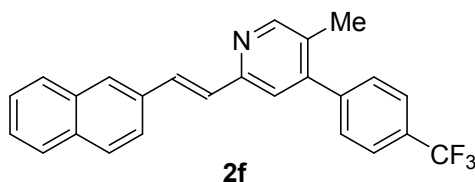


(E)-5-methyl-2-(2-(naphthalen-2-yl)vinyl)-4-o-tolylpyridine (2d). ¹H NMR (400 MHz, CDCl₃) δ 8.44 (s, 1H), 7.82 (s, 1H), 7.75-7.65 (m, 5H), 7.40-7.34 (m, 2H), 7.27-7.15 (m, 5H), 7.01 (d, J = 7.7 Hz, 1H), 2.02 (s, 3H), 1.99 (s, 3H). ¹³C NMR (100 MHz, CDCl₃) δ 153.20, 150.70, 150.03, 138.72, 134.99, 134.22, 133.55, 133.22, 131.95, 130.12, 128.31, 128.13, 128.07, 128.02, 127.64, 127.56, 126.30, 126.29, 126.11, 125.83, 125.67, 123.53, 122.30, 19.67, 16.50. IR (neat) 3055, 2922, 1632, 1591, 1539, 1477, 1375, 1252, 971, 889, 862 cm⁻¹. HRMS (ESI) calcd. for (M+H)⁺ 336.1746, found. 336.1746.

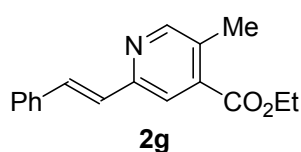


(E)-5-methyl-2-(2-(naphthalen-2-yl)vinyl)-4-(thiophen-2-yl)pyridine (2e). ¹H NMR (400 MHz, CDCl₃) δ 8.50 (s, 1H), 7.93 (s, 1H), 7.84-7.76 (m, 5H), 7.48-7.43 (m, 4H), 7.32-7.28 (m, 2H), 7.18-7.16 (m, 1H), 2.48 (s, 3H). ¹³C NMR (100 MHz, CDCl₃) δ 153.66, 151.86, 141.85, 140.39, 134.19, 133.57, 133.27, 132.13, 128.69, 128.68, 128.33, 128.16, 127.85, 127.67, 127.64, 126.83, 126.77, 126.33, 126.15, 123.60, 122.07, 18.28. IR (neat) 3054, 3019, 2996, 2952, 2922, 2861, 1667, 1632,

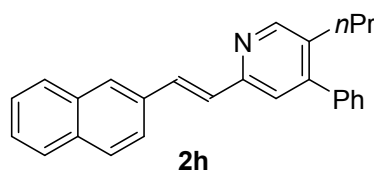
1588, 1540, 1507, 1479, 1434, 1373, 1254, 1124, 1018, 970, 889 cm⁻¹. HRMS (ESI) calcd. for (M+H)⁺328.1154, found.328.1154.



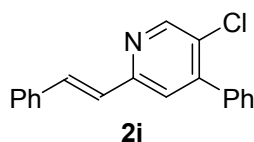
(E)-5-methyl-2-(2-(naphthalen-2-yl)vinyl)-4-(4-(trifluoromethyl)phenyl)pyridine (2f). ¹H NMR (400 MHz, CDCl₃) δ 8.46 (s, 1H), 7.84 (s, 1H), 7.76-7.66 (m, 7H), 7.41-7.36 (m, 4H), 7.22 (d, J = 16 Hz, 1H), 7.17 (d, J = 16 Hz, 1H), 2.19 (s, 3H). ¹³C NMR (100 MHz, CDCl₃) δ 158.87, 153.55, 151.07, 148.59, 142.71, 133.99, 133.53, 133.32, 132.68, 129.67, 129.04, 128.92, 128.39, 128.17, 127.81, 127.39, 126.38, 126.26, 125.51, 125.47, 123.49, 122.12, 17.00. IR (neat) 3056, 2989, 2924, 1617, 1592, 1540, 1508, 1479, 1408, 1375, 1323, 1165, 1120, 1068, 1038, 1016, 959, 889 cm⁻¹. HRMS (ESI) calcd. for (M+H)⁺ 390.1464, found.390.1464.



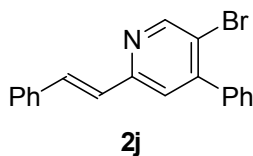
(E)-ethyl 5-methyl-2-styrylisonicotinate (2g). ¹H NMR (400 MHz, CDCl₃) δ 8.53 (s, 1H), 7.79 (s, 1H), 7.64 (d, J = 16.5 Hz, 1H), 7.57 (d, J = 7.8 Hz, 2H), 7.37 (d, J = 7.8 Hz, 2H), 7.32-7.27 (m, 1H), 7.18 (d, J = 16.5 Hz, 1H), 4.42 (q, J = 6.8 Hz, 2H), 2.56 (s, 3H), 1.43 (t, J = 6.8 Hz, 3H). ¹³C NMR (100 MHz, CDCl₃) δ 166.23, 154.05, 152.69, 137.27, 136.45, 132.56, 131.59, 128.69, 128.33, 127.04, 121.52, 61.51, 18.10, 14.22. IR (neat) 3081, 3057, 3024, 2980, 2928, 1723, 1636, 1589, 1495, 1474, 1449, 1395, 1377, 1284, 1257, 1225, 1207, 1190, 1080, 1020, 967 cm⁻¹. HRMS (ESI) calcd. for (M+Na)⁺ 290.1151, found. 290.1151.



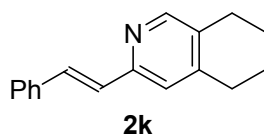
(E)-2-(2-(naphthalen-2-yl)vinyl)-4-phenyl-5-propylpyridine (2h). ¹H NMR (400 MHz, CDCl₃) δ 8.43 (s, 1H), 7.8 (s, 1H), 7.72-7.65 (m, 5H), 7.37-7.29 (m, 5H), 7.24-7.17 (m, 4H), 2.50 (t, J = 7.7 Hz, 2H), 1.38 (tq, J = 7.7, 7.3 Hz, 2H), 0.73 (t, J = 7.3 Hz, 3H). ¹³C NMR (100 MHz, CDCl₃) δ 153.03, 150.79, 149.65, 139.26, 134.22, 133.88, 133.52, 133.17, 131.90, 128.40, 128.33, 128.27, 128.08, 128.03, 127.78, 127.61, 127.52, 126.26, 126.06, 123.51, 122.82, 32.12, 24.15, 13.84. IR (neat) 3057, 2960, 2930, 2870, 1634, 1587, 1536, 1507, 1495, 1477, 1443, 1378, 1268, 1215, 1189, 1124, 1073, 1046, 1019, 970, 888, 862 cm⁻¹. HRMS (ESI) calcd. for (M+H)⁺ 350.1903, found.350.1903.



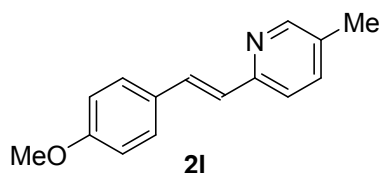
(E)-5-chloro-4-phenyl-2-styrylpyridine (2i). ¹H NMR (400 MHz, CDCl₃) δ 8.62 (s, 1H), 7.635 (d, J = 16.0 Hz, 1H), 7.55 (d, J = 7.3 Hz, 2H), 7.50-7.43 (m, 5H), 7.38-7.33 (m, 3H), 7.28 (t, J = 7.3 Hz, 1H), 7.14 (d, J = 16.0 Hz, 1H). ¹³C NMR (100 MHz, CDCl₃) δ 154.17, 149.76, 147.82, 136.66, 136.32, 133.49, 128.53, 128.81, 128.74, 128.85, 128.38, 128.11, 127.11, 126.60, 123.54. IR (neat) 3081, 3057, 3027, 2924, 2852, 1950, 1886, 1812, 1634, 1579, 1523, 1495, 1459, 1445, 1372, 1307, 1253, 1221, 1206, 1183, 1157, 1097, 1074, 1031, 1016, 999, 966, 922, 891, 851 cm⁻¹. HRMS (ESI) calcd. for (M+Na)⁺



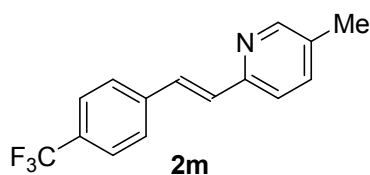
(E)-5-bromo-4-phenyl-2-styrylpyridine (2j). ^1H NMR (400 MHz, CDCl_3) δ 8.76 (s, 1H), 7.65 (d, $J = 16.0$ Hz, 1H), 7.57 (d, $J = 7.3$ Hz, 2H), 7.47 (s, 6H), 7.37-7.30 (m, 5H), 7.13 (d, $J = 16.0$ Hz, 1H). ^{13}C NMR (100 MHz, CDCl_3) δ 154.60, 152.18, 150.07, 138.34, 136.31, 133.63, 128.78, 128.60, 128.36, 127.16, 126.62, 123.87, 118.67. IR (neat) 3081, 3056, 3027, 2924, 2852, 1950, 1882, 1813, 1681, 1634, 1599, 1576, 1518, 1494, 1458, 1447, 1371, 1183, 1080, 1029, 1008, 968, 922, 891 cm^{-1} . HRMS (ESI) calcd. for $(\text{M}+\text{Na})^+$ 358.0201, found. 358.0201.



(E)-3-styryl-5,6,7,8-tetrahydroisoquinoline (2k). ^1H NMR (400 MHz, CDCl_3) δ 8.29 (s, 1H), 7.58-7.52 (m, 3H), 7.36 (t, $J = 7.3$ Hz, 2H), 7.27 (t, $J = 7.3$ Hz, 1H), 7.11 (d, $J = 16.5$ Hz, 1H), 7.09 (s, 1H), 2.75 (m, 4H), 1.82 (sext, $J = 3.2$ Hz, 4H). ^{13}C NMR (100 MHz, CDCl_3) δ 152.42, 150.24, 146.47, 136.96, 131.90, 131.16, 128.62, 128.13, 127.90, 126.88, 122.13, 28.72, 26.14, 22.62, 22.39. IR (neat) 3369, 3079, 3056, 3023, 2990, 2930, 2880, 2858, 2836, 1950, 1875, 1811, 1668, 1636, 1594, 1556, 1495, 1475, 1448, 1433, 1394, 1353, 1329, 1305, 1293, 1245, 1201, 1157, 1134, 1072, 1027, 968, 940, 920, 905, 877, 845 cm^{-1} . MS (FD) calcd. for $(\text{M})^+$ 235.1361, found. 235.1361.

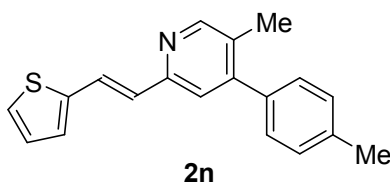


(E)-2-(4-methoxystyryl)-5-methylpyridine (2l). ^1H NMR (400 MHz, CDCl_3) δ 8.41 (s, 1H), 7.53-7.49 (m, 3H), 7.46-7.43 (m, 1H), 7.26 (d, $J = 8.7$ Hz, 1H), 7.02 (d, $J = 16.5$ Hz, 1H), 6.91 (d, $J = 8.7$ Hz, 2H), 3.83 (s, 3H), 2.33 (s, 3H). ^{13}C NMR (100 MHz, CDCl_3) δ 159.62, 153.28, 149.96, 136.97, 131.17, 131.13, 129.57, 128.22, 125.77, 121.18, 114.09, 55.27, 18.25. IR (neat) 3032, 2999, 2953, 2919, 2863, 2837, 1634, 1601, 1573, 1509, 1478, 1439, 1421, 1298, 1247, 1173, 1026, 978, 833 cm^{-1} . HRMS (ESI) calcd. for $(\text{M}+\text{Na})^+$ 248.1045, found. 248.1046.

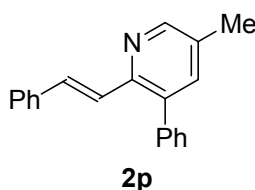


(E)-5-methyl-2-(4-(trifluoromethyl)styryl)pyridine (2m). ^1H NMR (400 MHz, CDCl_3) δ 8.46 (s, 1H), 7.655 (d, $J = 8.2$ Hz, 2H), 7.61 (d, $J = 8.2$ Hz, 2H), 7.59 (d, $J = 16.5$ Hz, 1H), 7.49 (d, $J = 8.2$ Hz, 1H), 7.31 (d, $J = 8.2$ Hz, 1H), 7.22 (d, $J = 16.5$ Hz, 1H), 2.36 (s, 3H). ^{13}C NMR (100 MHz, CDCl_3) δ 152.23, 150.28, 140.30, 137.13, 132.36, 130.23, 129.98, 129.47, 127.01, 125.58 (q, $J = 3.8$ Hz), 122.06, 18.35. IR (neat) 2927, 2853, 1615, 1541, 1481, 1415, 1325, 1167, 1129,

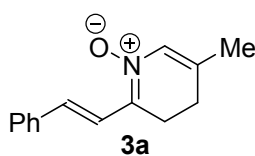
1108, 1068, 974, 837 cm⁻¹. HRMS (ESI) calcd. for (M+Na)⁺ 286.0814, found. 286.0814.



(E)-5-methyl-2-(2-(thiophen-2-yl)vinyl)-4-p-tolylpyridine (2n). ¹H NMR (400 MHz, CDCl₃) δ 8.37 (s, 1H), 7.66 (d, J = 16.4 Hz, 1H), 7.20-7.05 (m, 7H), 6.93-6.88 (m, 2H), 2.33 (s, 3H), 2.19 (s, 3H). ¹³C NMR (100 MHz, CDCl₃) δ 152.90, 151.06, 149.71, 142.31, 137.82, 136.10, 129.19, 129.09, 128.39, 127.66, 127.40, 127.08, 125.16, 124.88, 122.46, 21.22, 17.18. IR (neat) 3025, 2952, 2920, 2864, 1664, 1628, 1591, 1539, 1511, 1479, 1445, 1383, 1240, 1199, 1112, 1041, 960, 893, 855 cm⁻¹. HRMS (ESI) calcd. for (M+H)⁺ 292.1154, found. 292.1154.



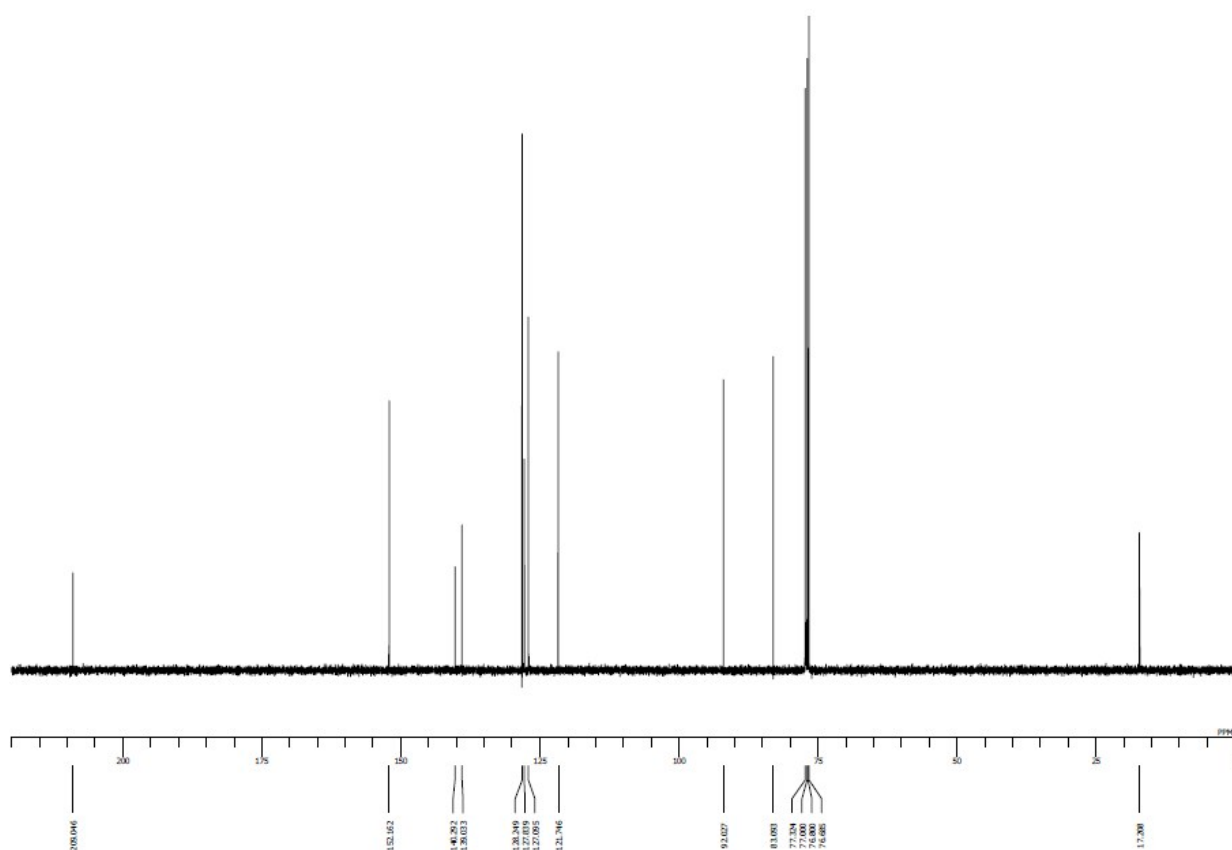
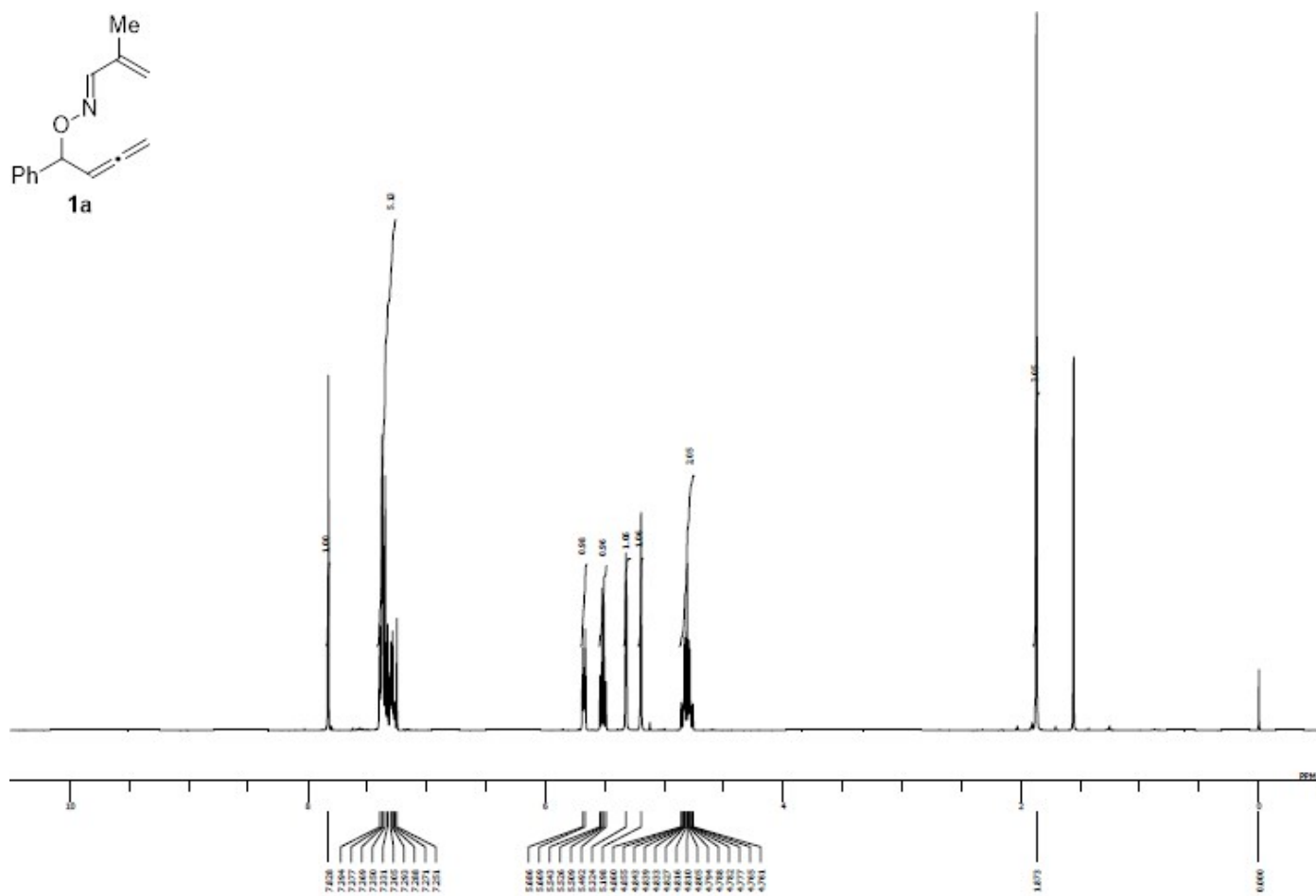
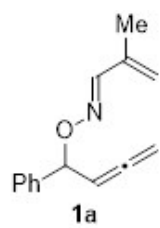
(E)-5-methyl-3-phenyl-2-styrylpyridine (2p). ¹H NMR (400 MHz, CDCl₃) δ 8.47 (d, J = 1.8 Hz, 1H), 7.76 (d, J = 15.6 Hz, 1H), 7.50-7.38 (m, 8H), 7.29 (t, J = 7.8 Hz, 1H), 7.23 (t, J = 7.8 Hz, 1H), 7.16 (d, J = 15.6 Hz, 1H), 2.38 (s, 3H). ¹³C NMR (100 MHz, CDCl₃) δ 149.75, 149.02, 139.13, 138.42, 137.19, 135.93, 132.44, 131.50, 129.64, 128.55, 128.40, 127.88, 127.60, 127.07, 125.43, 18.16. IR (neat) 3079, 3055, 3026, 2920, 1951, 1881, 1826, 1633, 1596, 1577, 1550, 1493, 1452, 1426, 1402, 1323, 1257, 1218, 1178, 1156, 1073, 1051, 1025, 971, 892 cm⁻¹. MS (FD) calcd. for (M)⁺ 271.1361, found. 271.1360.



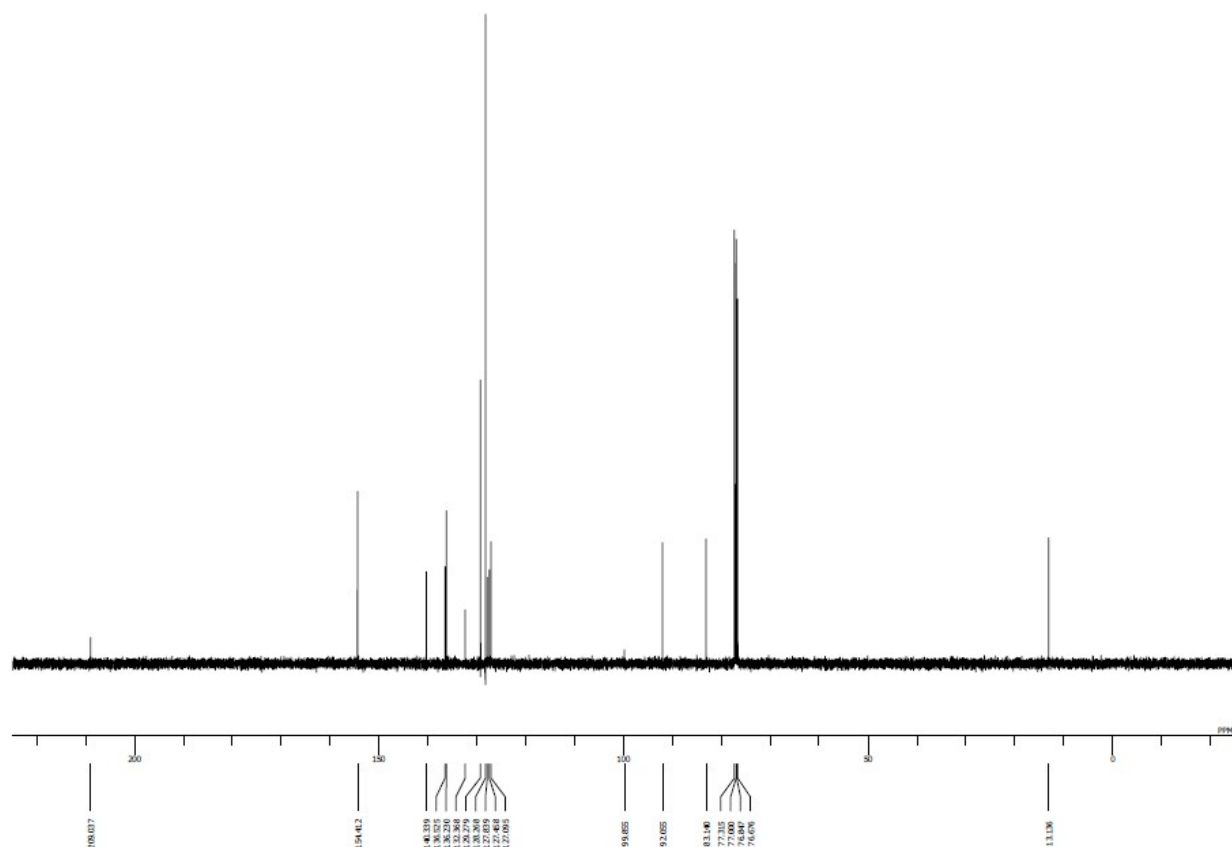
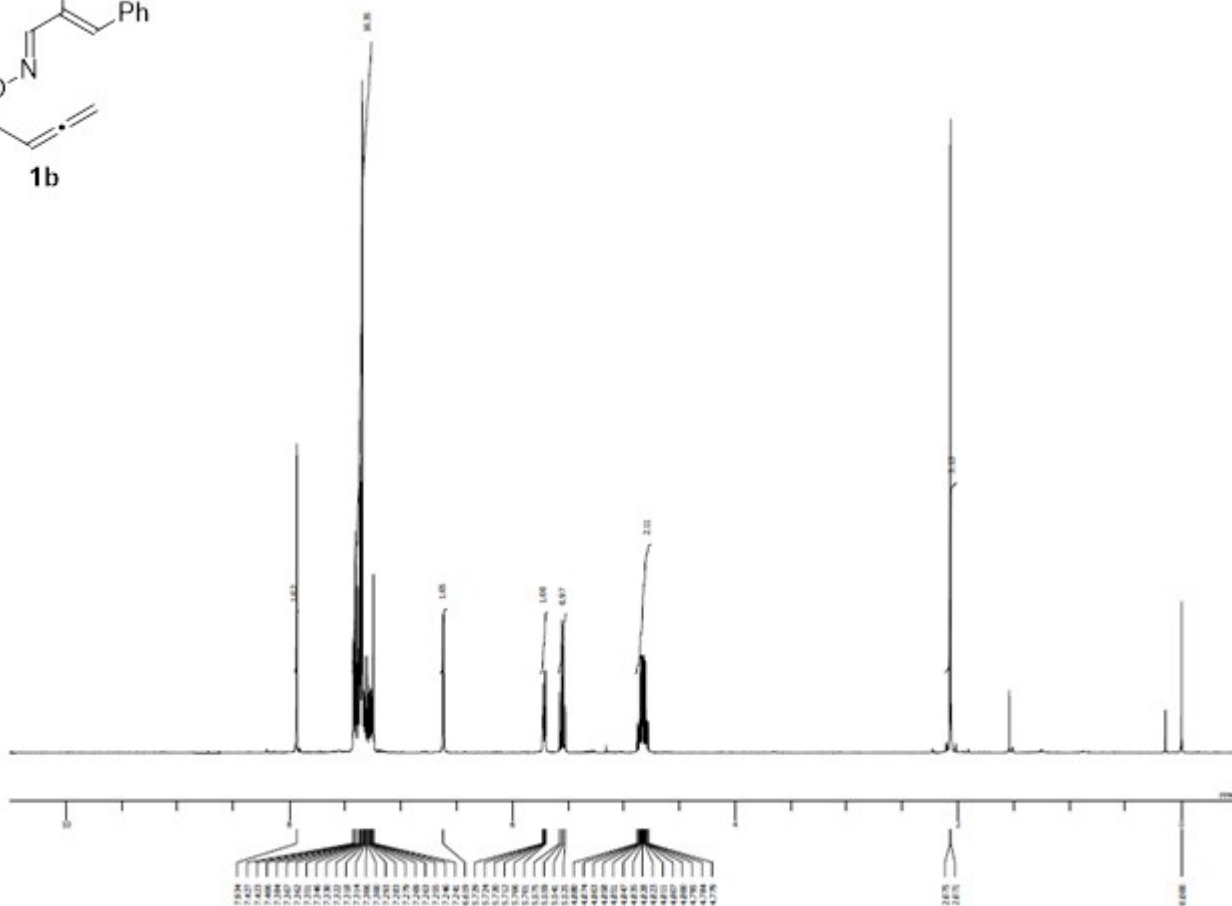
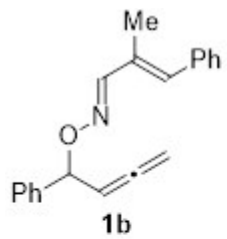
(E)-5-methyl-2-styryl-3,4-dihydropyridine 1-oxide (3a). ¹H NMR (400 MHz, CDCl₃) δ 7.85 (d, J = 16.9 Hz, 1H), 7.61-7.55 (m, 2H), 7.36-7.35 (m, 2H), 7.35-7.30 (m, 1H), 7.02 (d, J = 16.9 Hz, 1H), 6.52 (s, 1H), 2.86 (t, J = 8.7 Hz, 2H), 2.30 (t, J = 8.7 Hz, 2H), 1.89 (s, 3H). ¹³C NMR (100 MHz, CDCl₃) δ 139.68, 138.05, 134.51, 133.08, 131.88, 129.02, 128.82, 127.44, 119.06, 24.33, 22.62, 19.65. IR (neat) 3371, 3058, 2925, 1663, 1631, 1601, 1505, 1449, 1389, 1261, 1219, 1164, 1028, 969 cm⁻¹. HRMS (ESI) calcd. for (M+Na)⁺ 236.1045, found. 236.1046.

6.¹H and ¹³C NMR chart for 1, 2, and 3

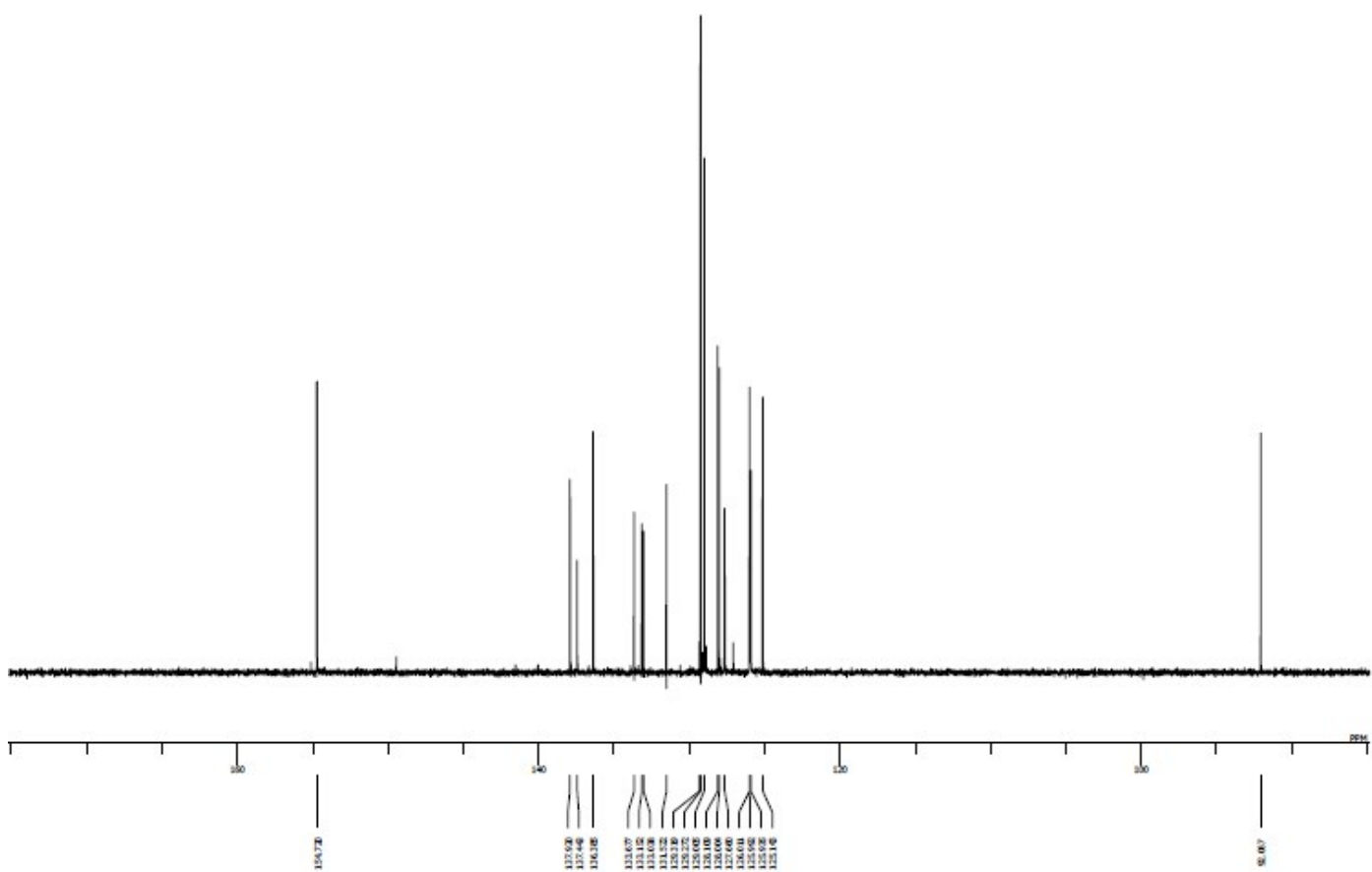
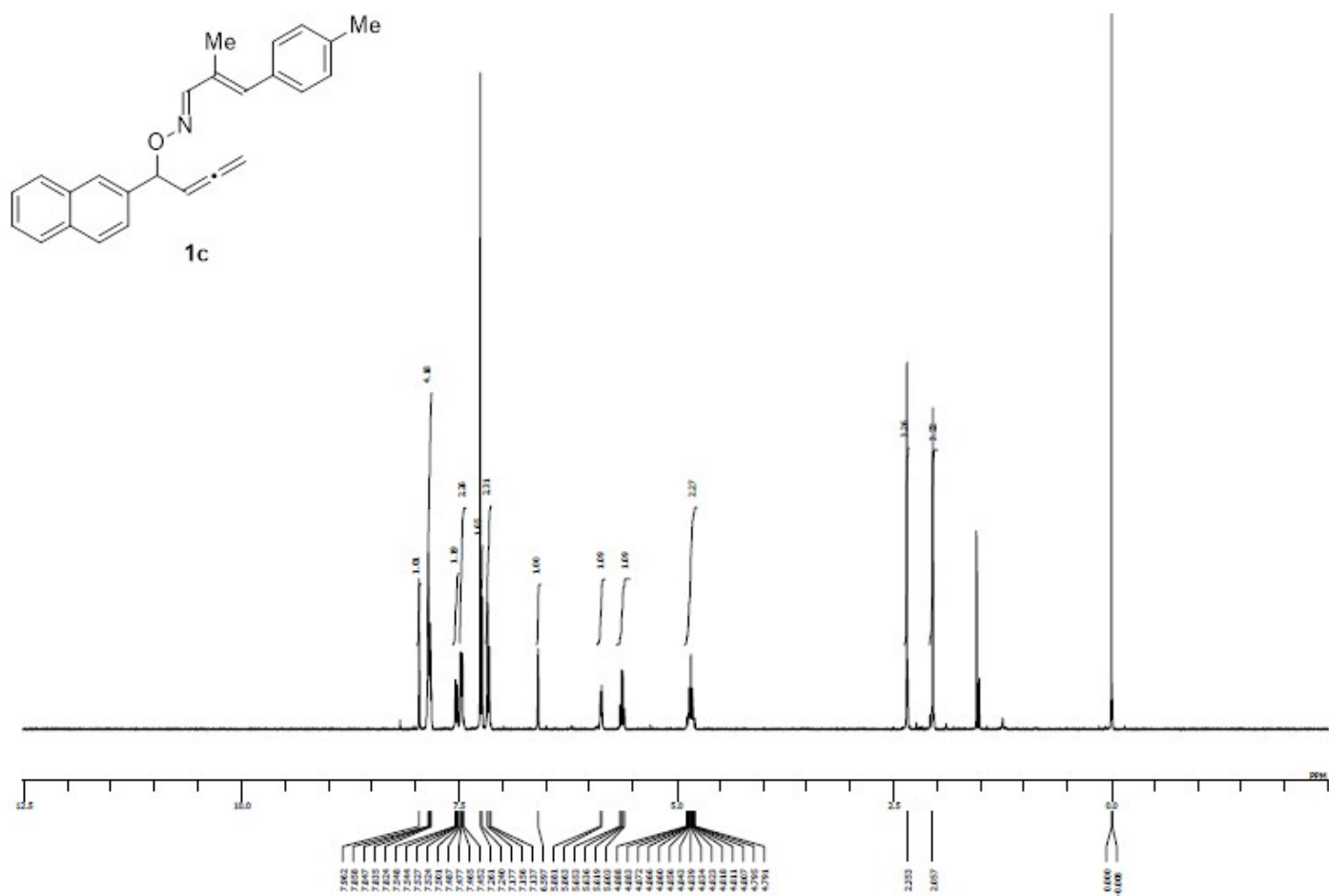
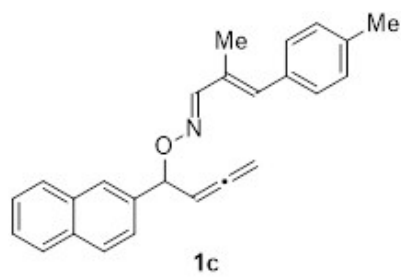
(*E*)-methacrylaldehyde *O*-(1-phenylbuta-2,3-dienyl) oxime (1a)



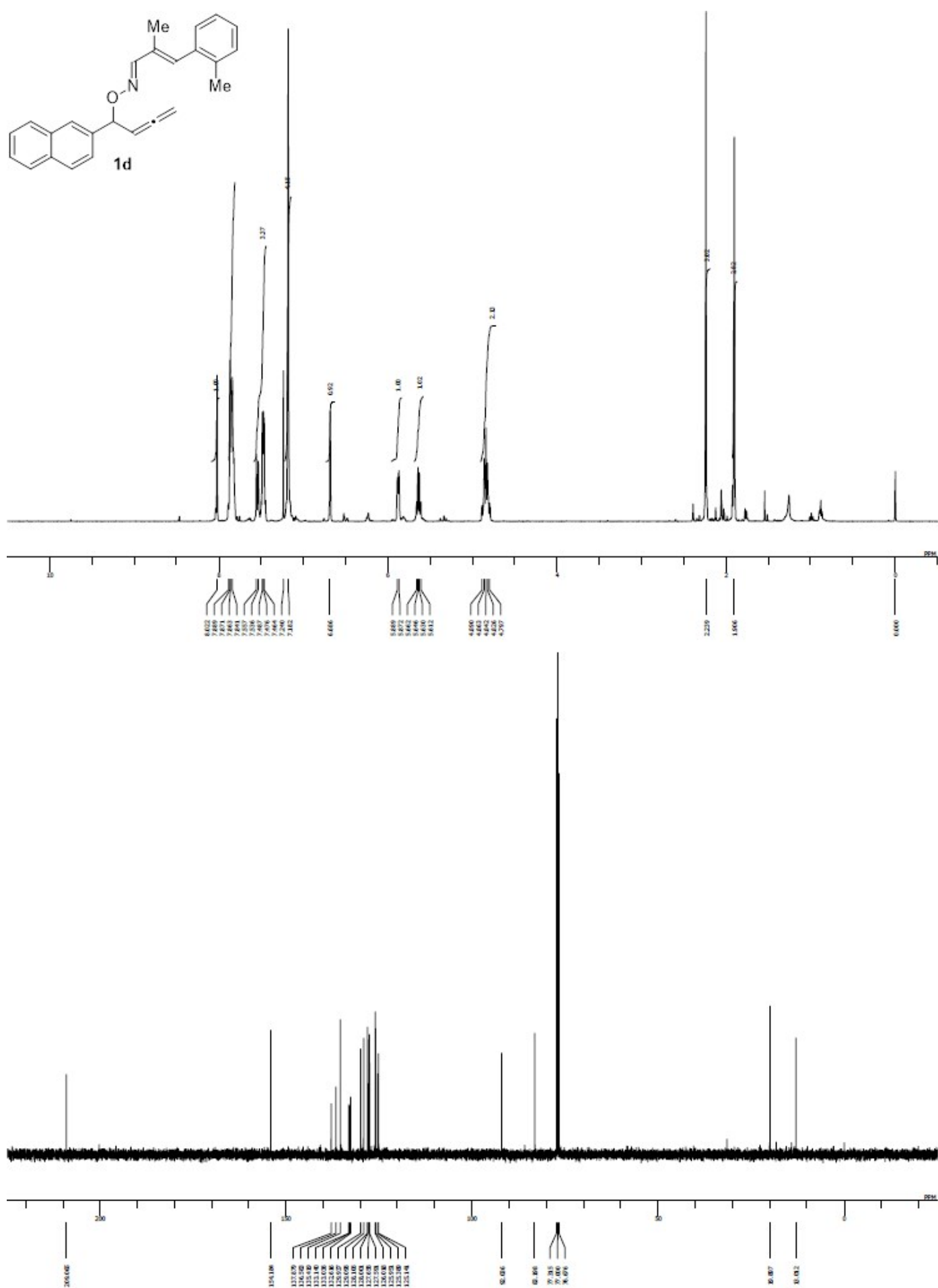
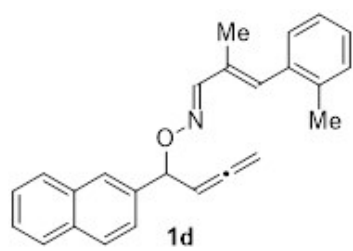
(1*E*,2*E*)-2-methyl-3-phenylacrylaldehyde *O*-(1-phenylbuta-2,3-dienyl) oxime (**1b**)



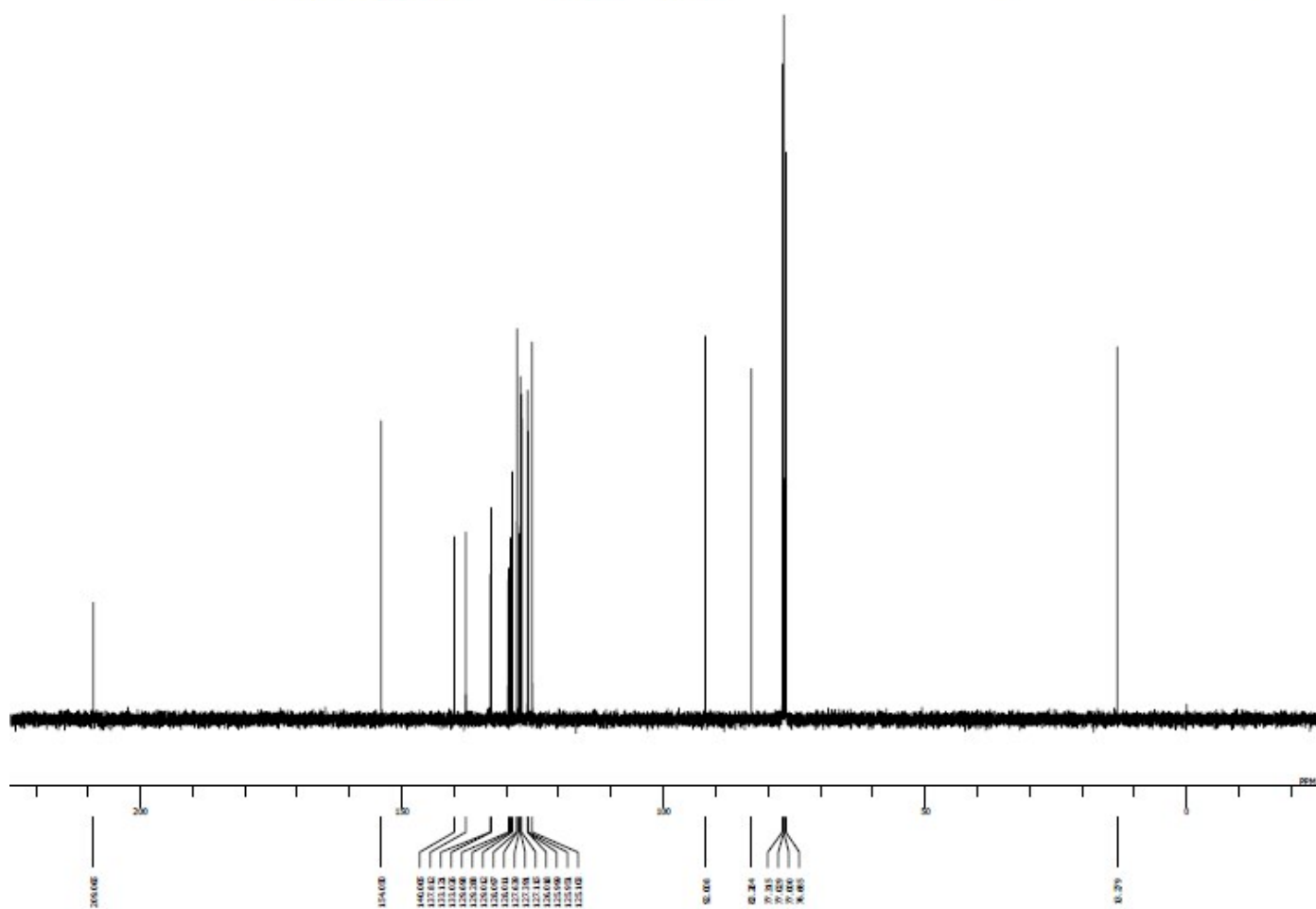
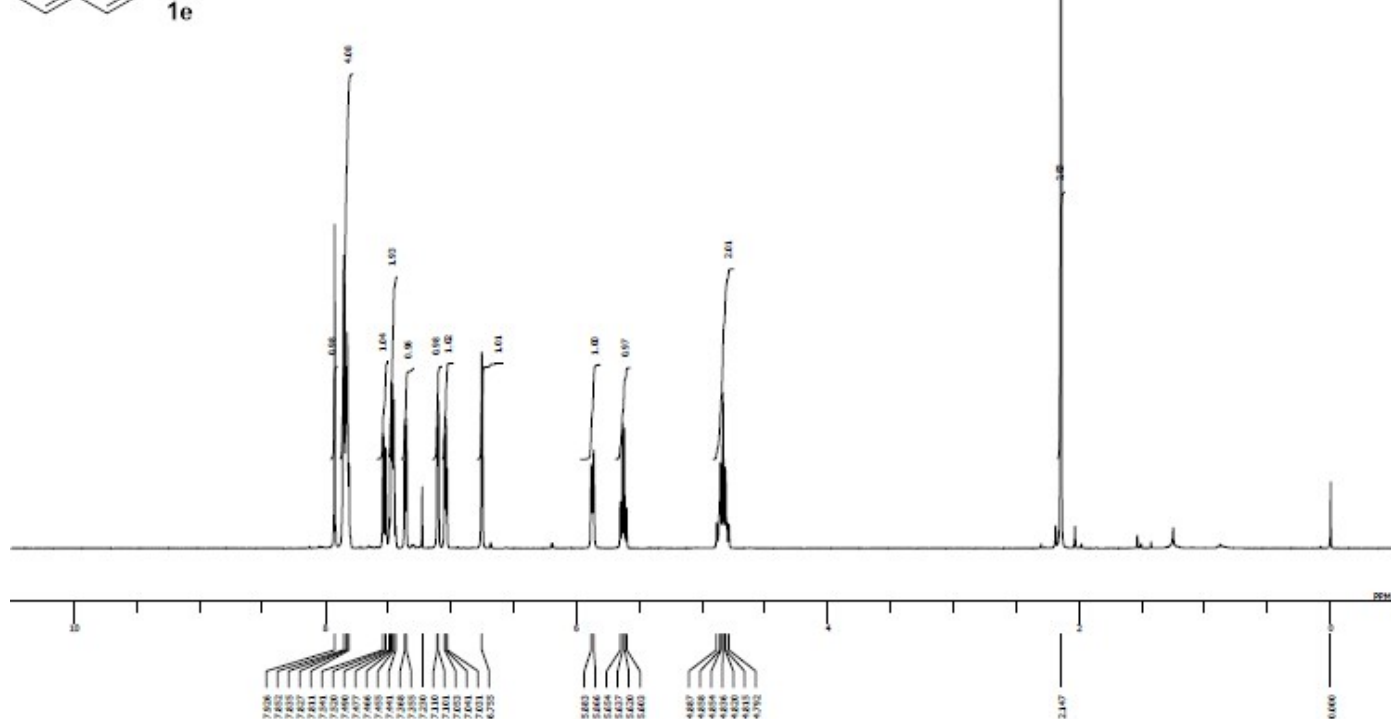
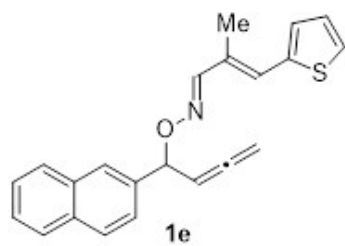
(1E,2E)-2-methyl-3-p-tolylacrylaldehyde O-1-(naphthalen-2-yl)buta-2,3-dienyl oxime (1c).



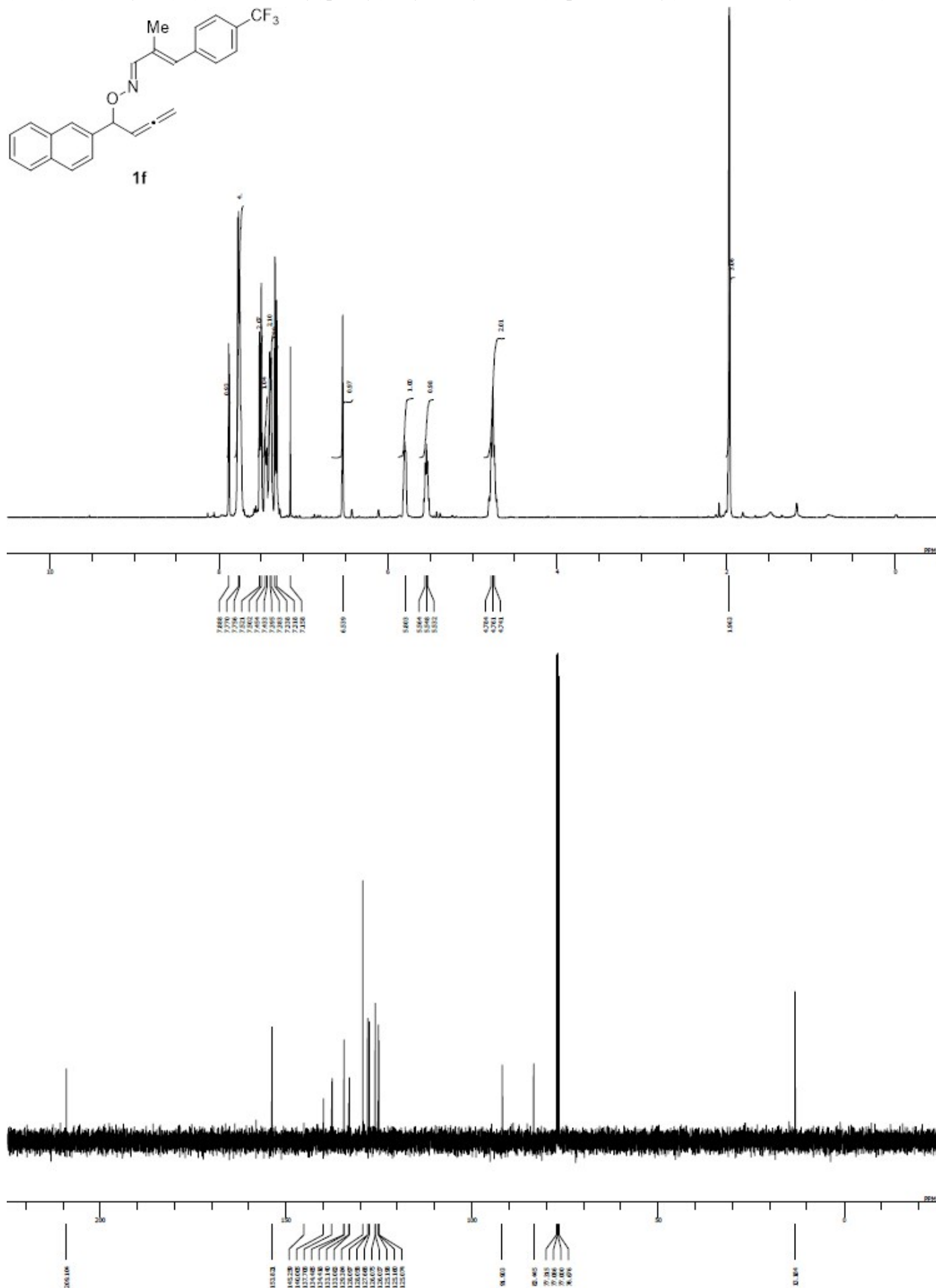
(1E,2E)-2-methyl-3-o-tolylacrylaldehyde O-1-(naphthalen-2-yl)buta-2,3-dienyl oxime (1d).



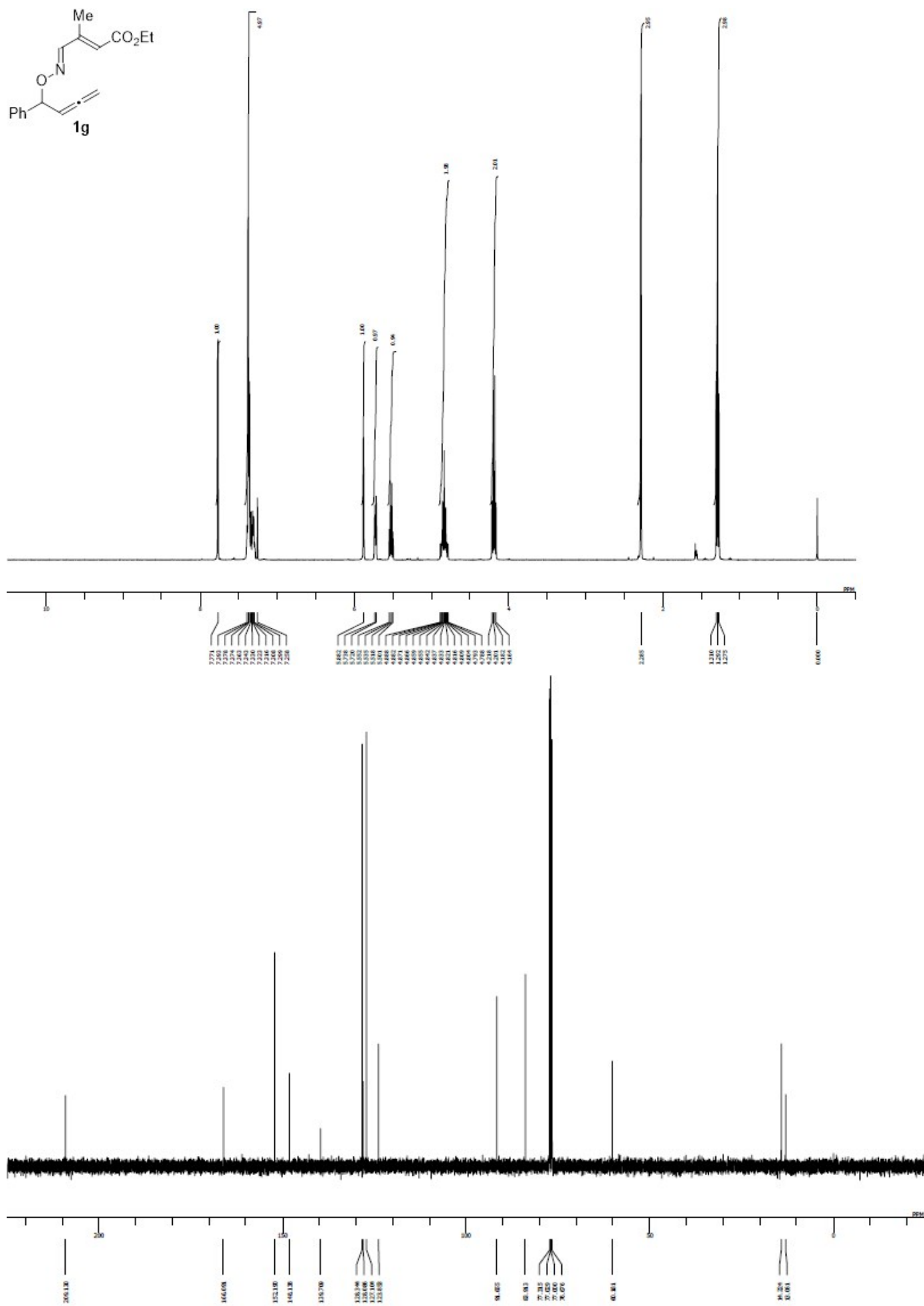
(1E,2E)-2-methyl-3-(thiophen-2-yl)acrylaldehyde O-1-(naphthalen-2-yl)buta-2,3-dienyl oxime (1e).



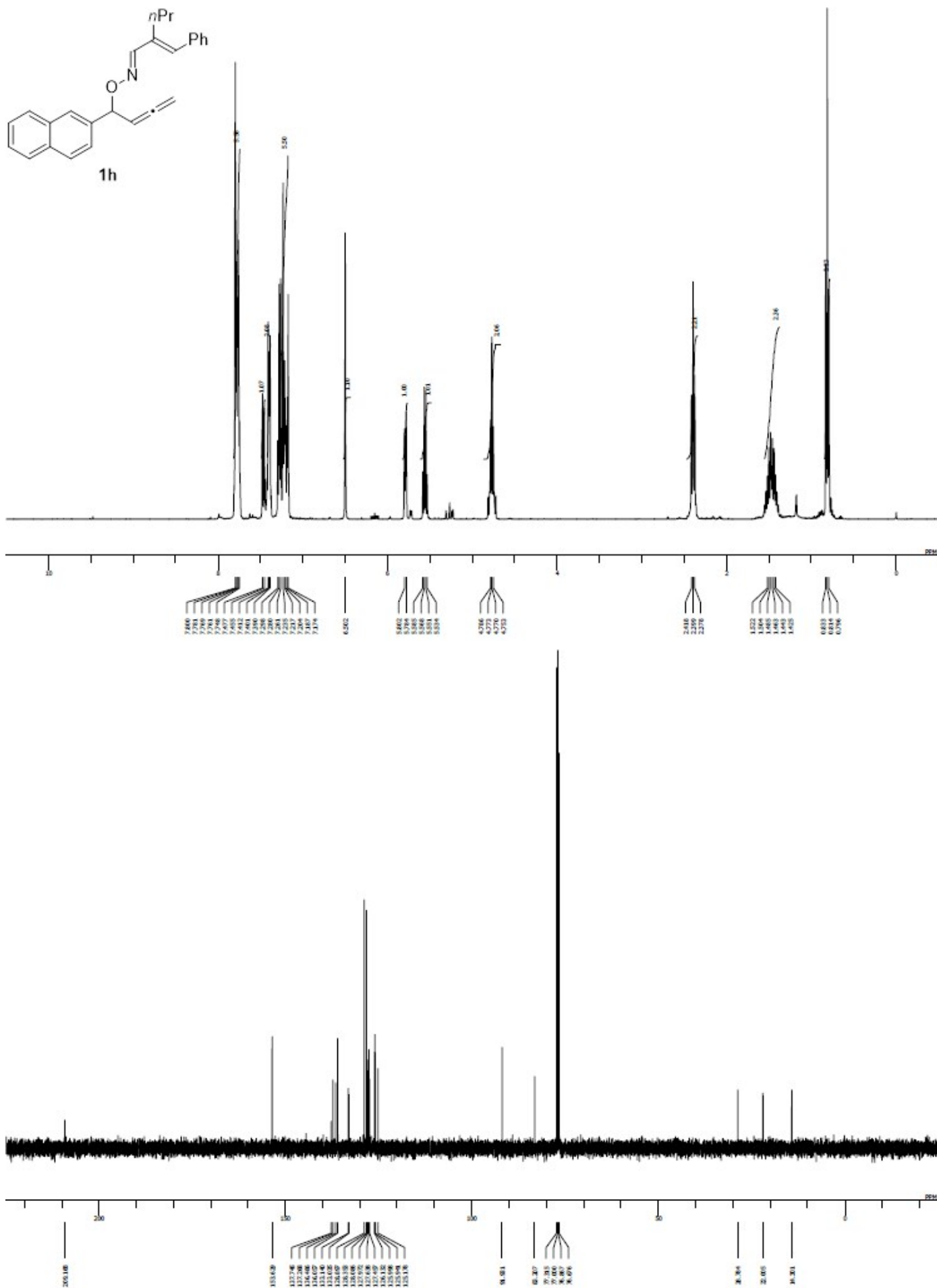
(1*E*,2*E*)-2-methyl-3-(4-(trifluoromethyl)phenyl)acrylaldehyde *O*-1-(naphthalen-2-yl)buta-2,3-dienyl oxime (1f).



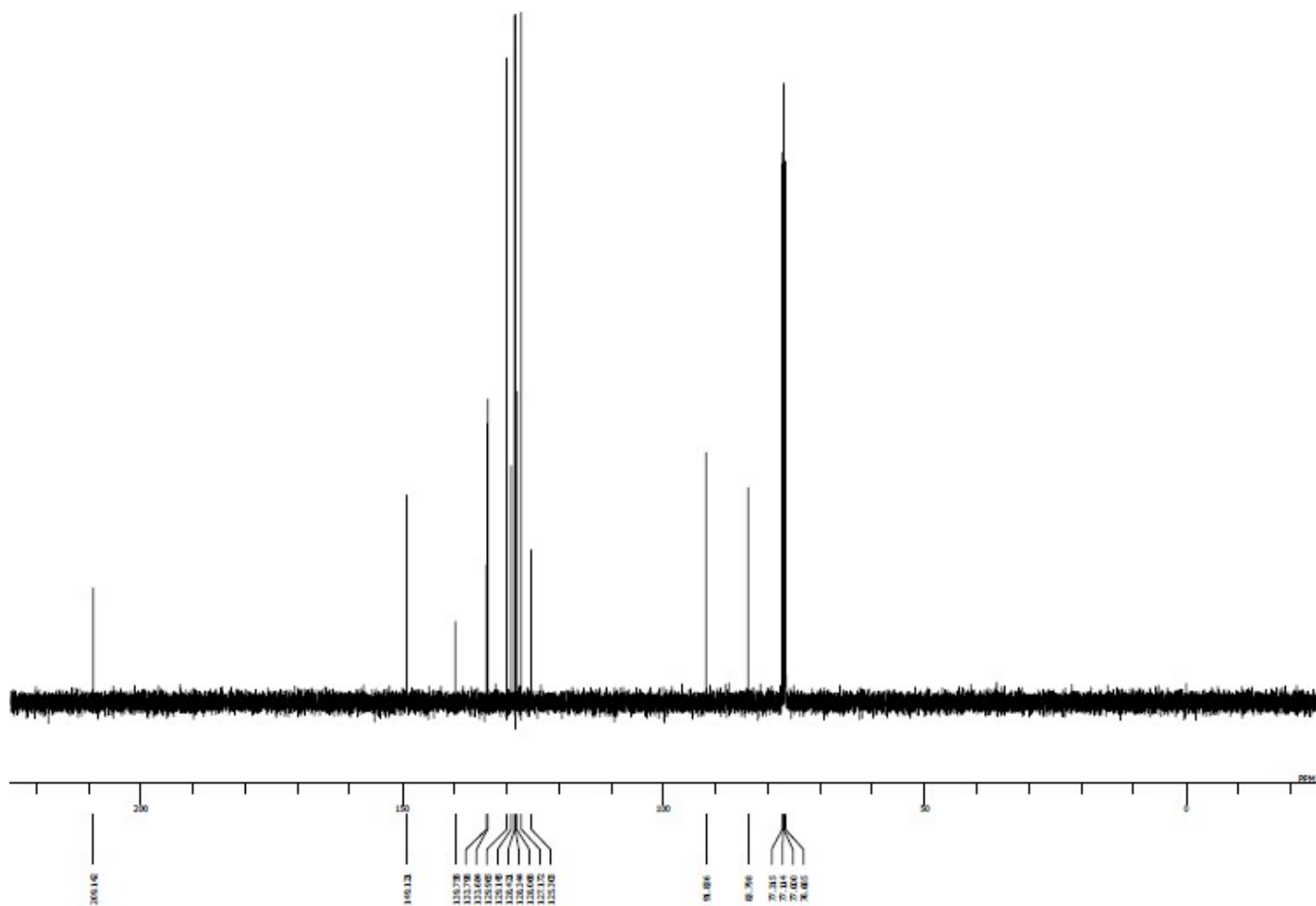
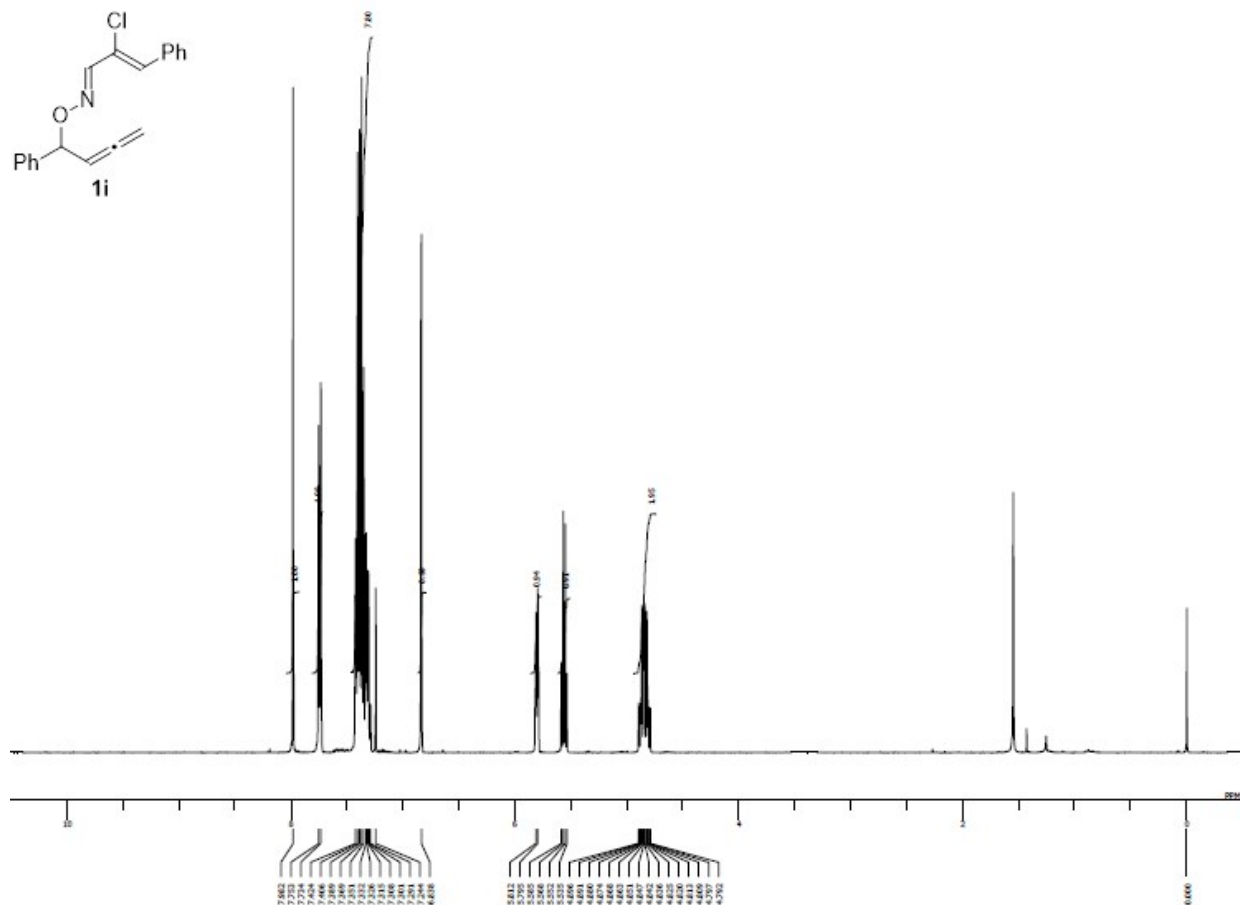
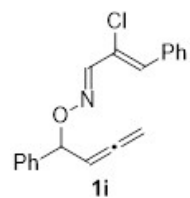
(2*E*,4*E*)-ethyl 3-methyl-4-(1-phenylbuta-2,3-dienyloxyimino)but-2-enoate (1g).



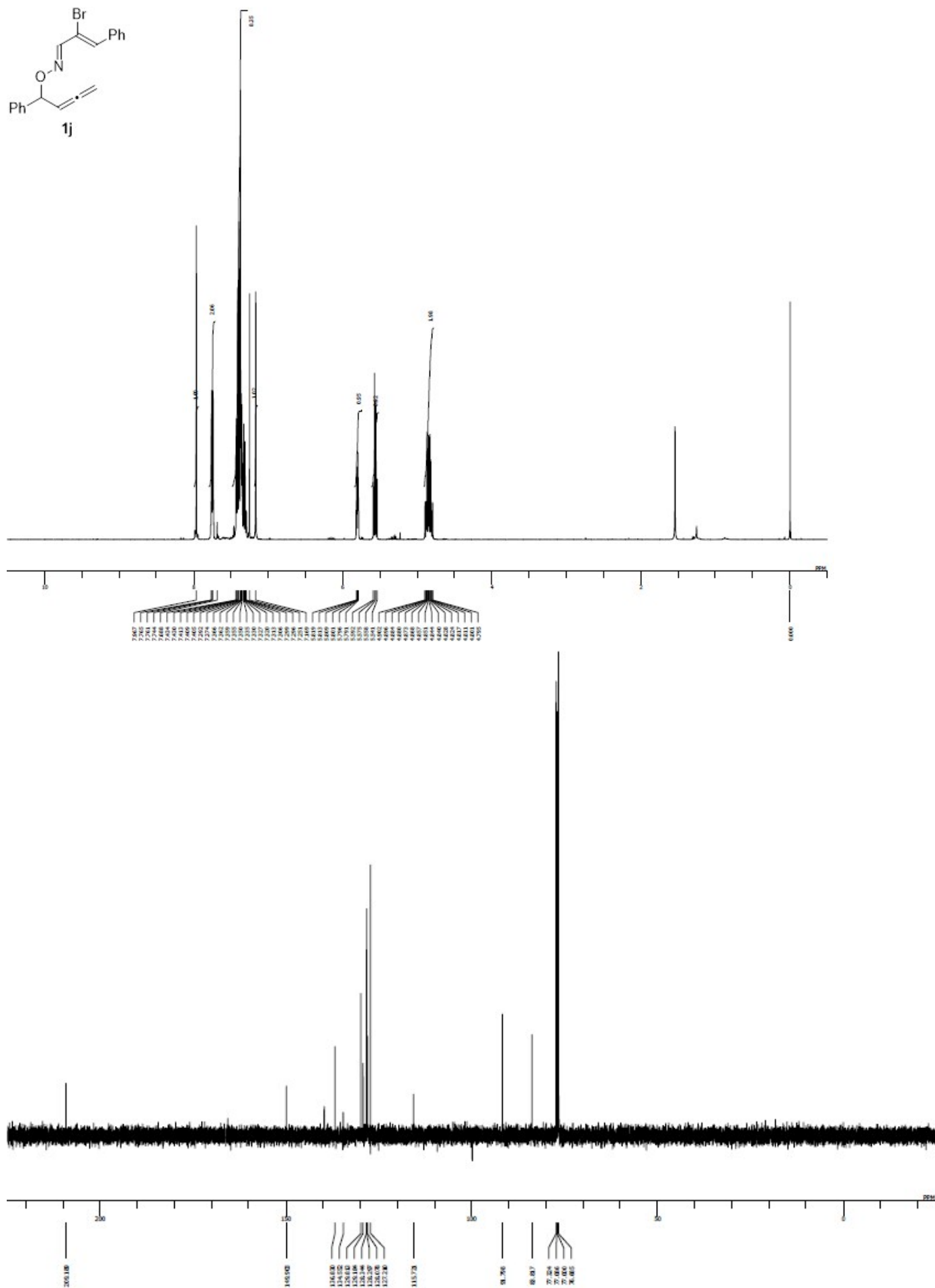
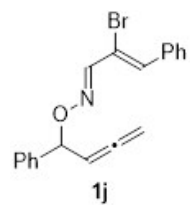
(1E,2E)-2-benzylidenepentanal O-1-(naphthalen-2-yl)buta-2,3-dienyl oxime (1h).



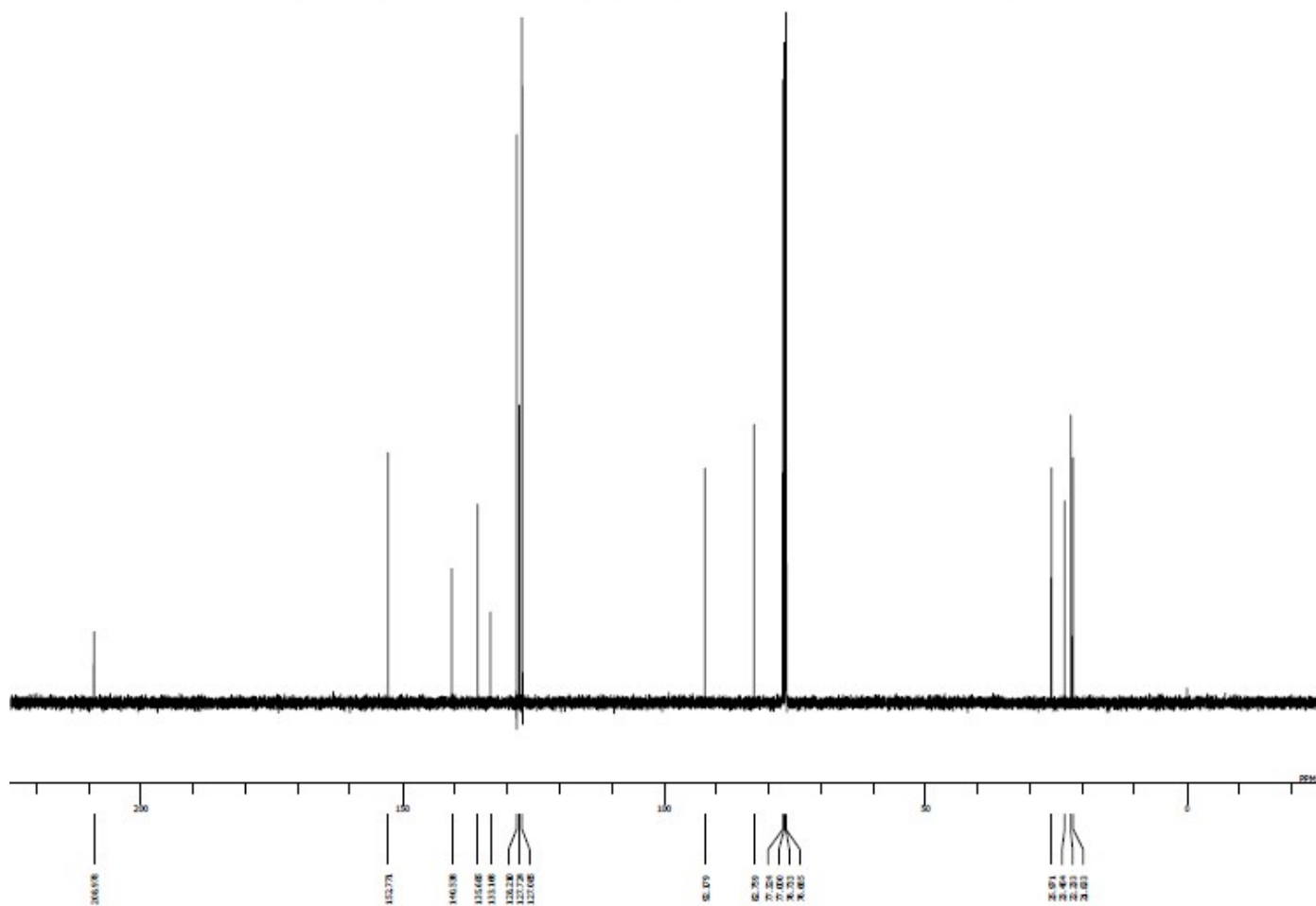
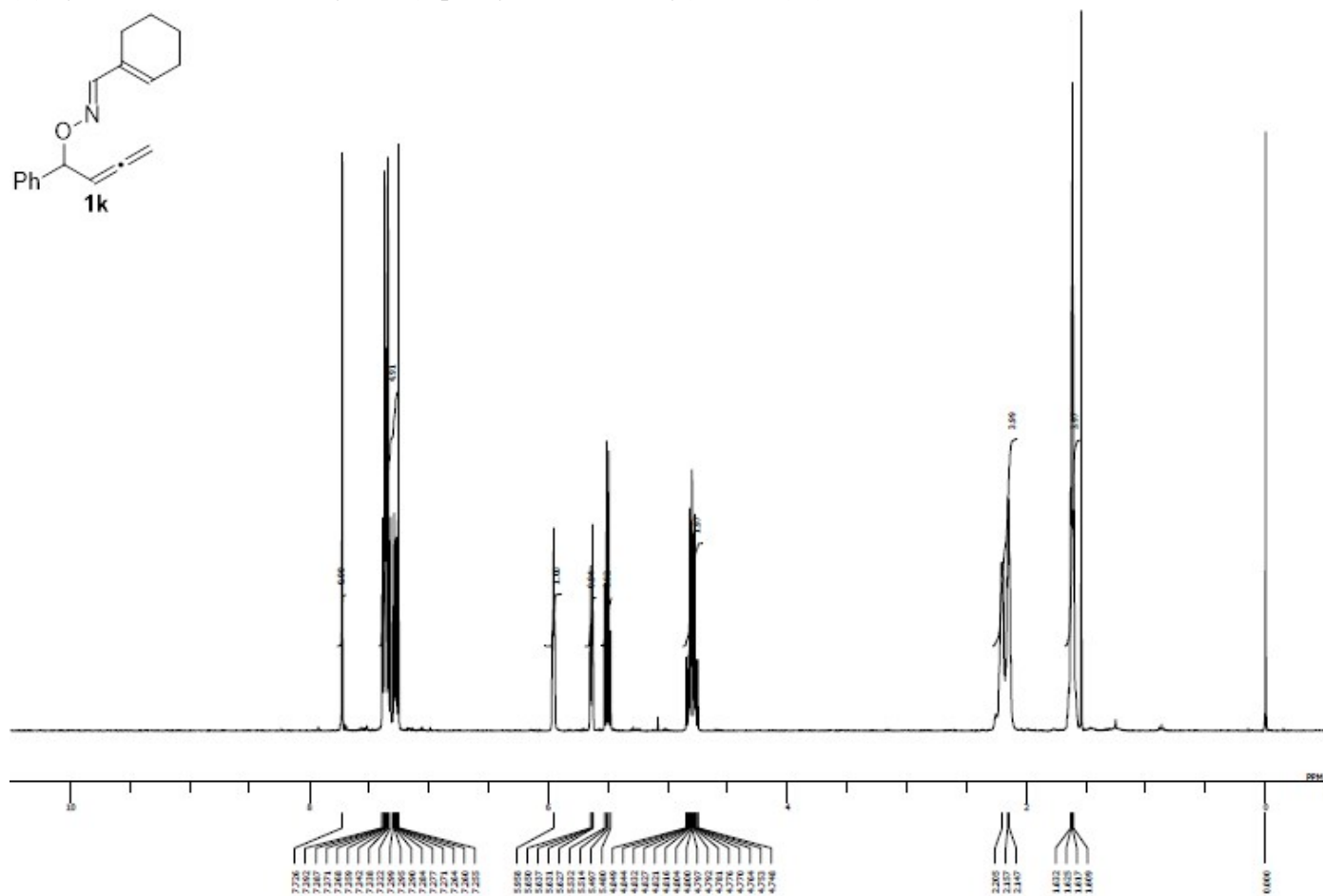
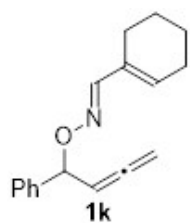
(1*E*,2*Z*)-2-chloro-3-phenylacrylaldehyde *O*-(1-phenylbuta-2,3-dienyl) oxime (**1i**).



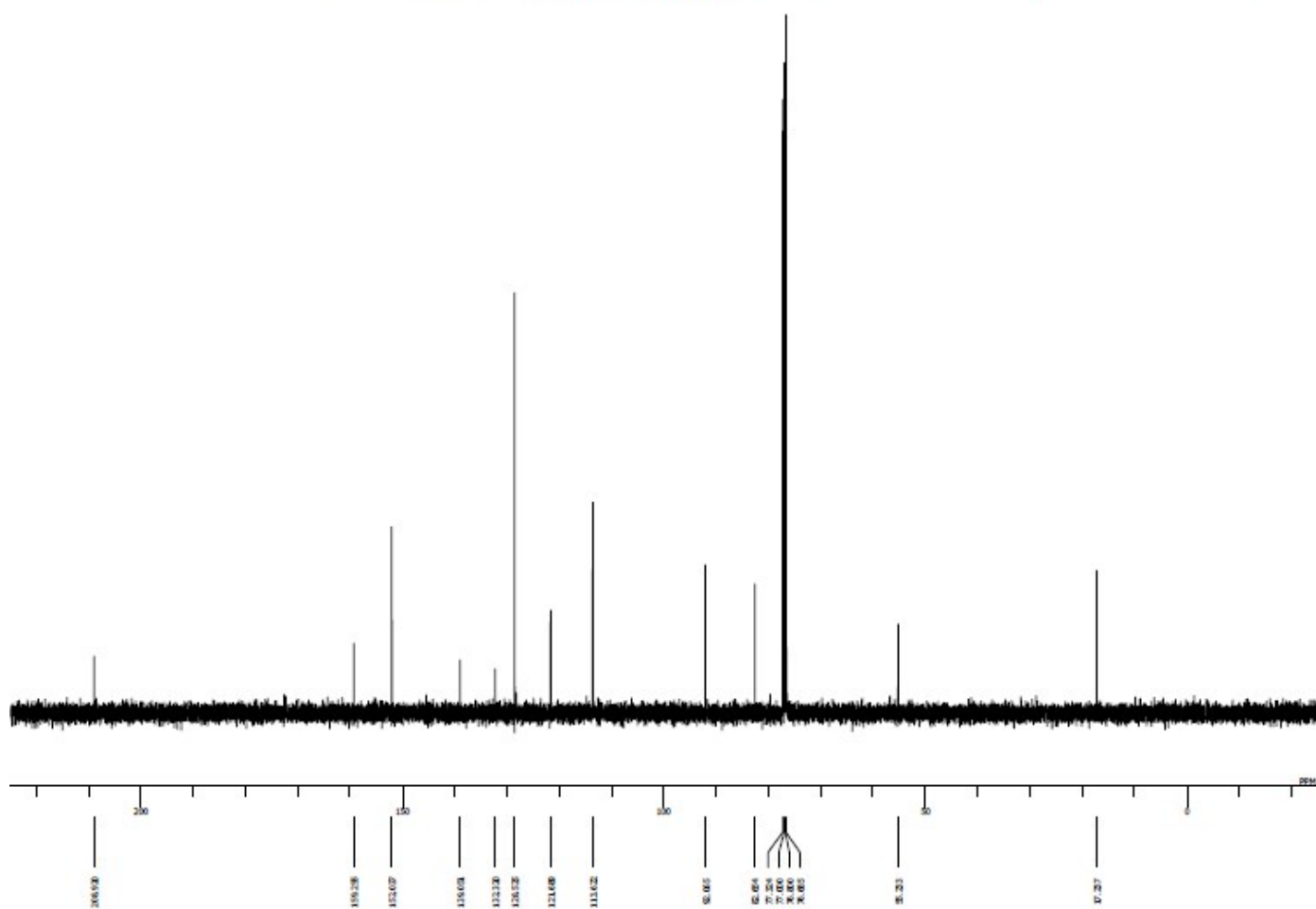
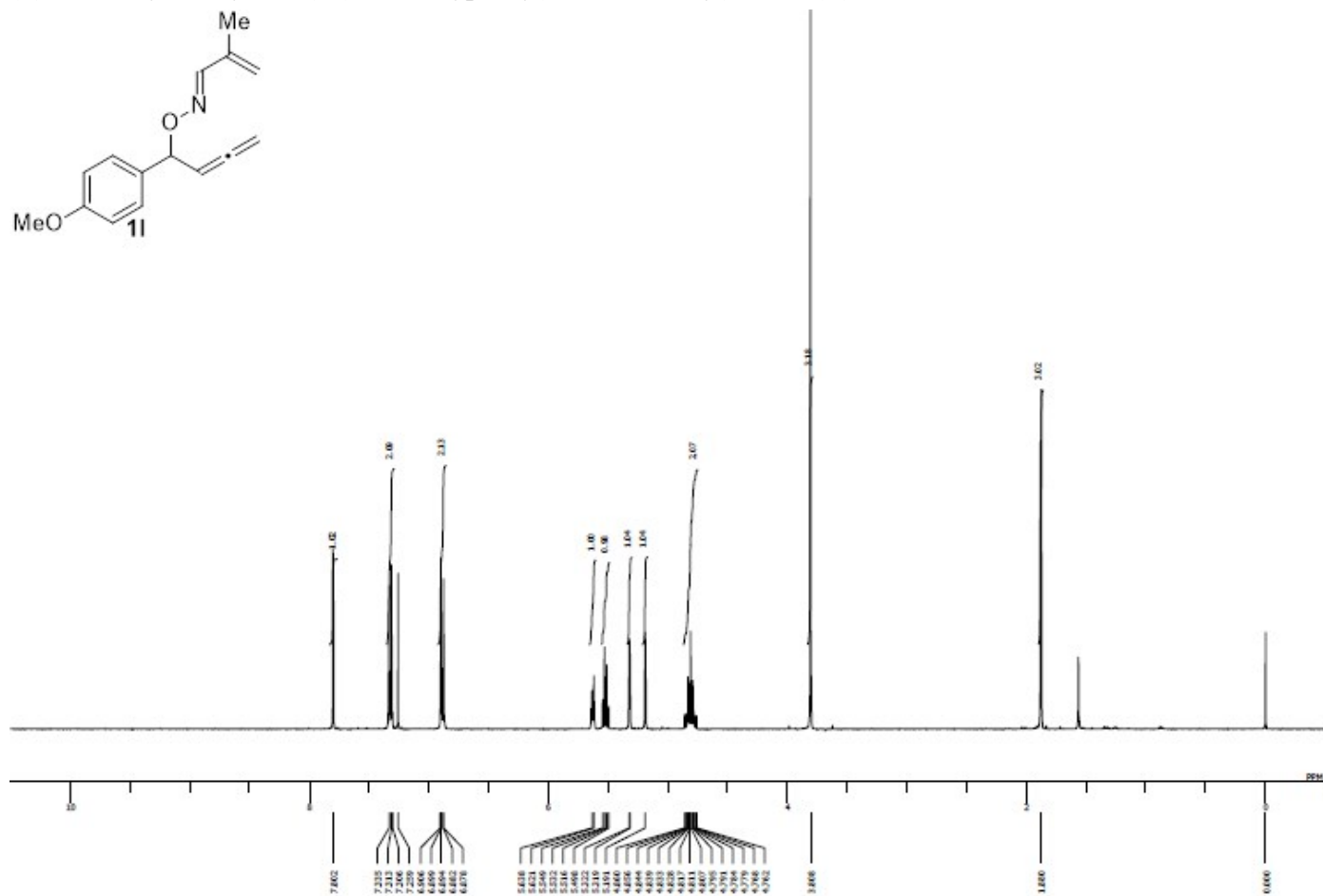
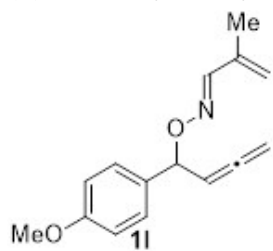
(1*E*,2*Z*)-2-bromo-3-phenylacrylaldehyde *O*-(1-phenylbuta-2,3-dienyl) oxime (**1j**).



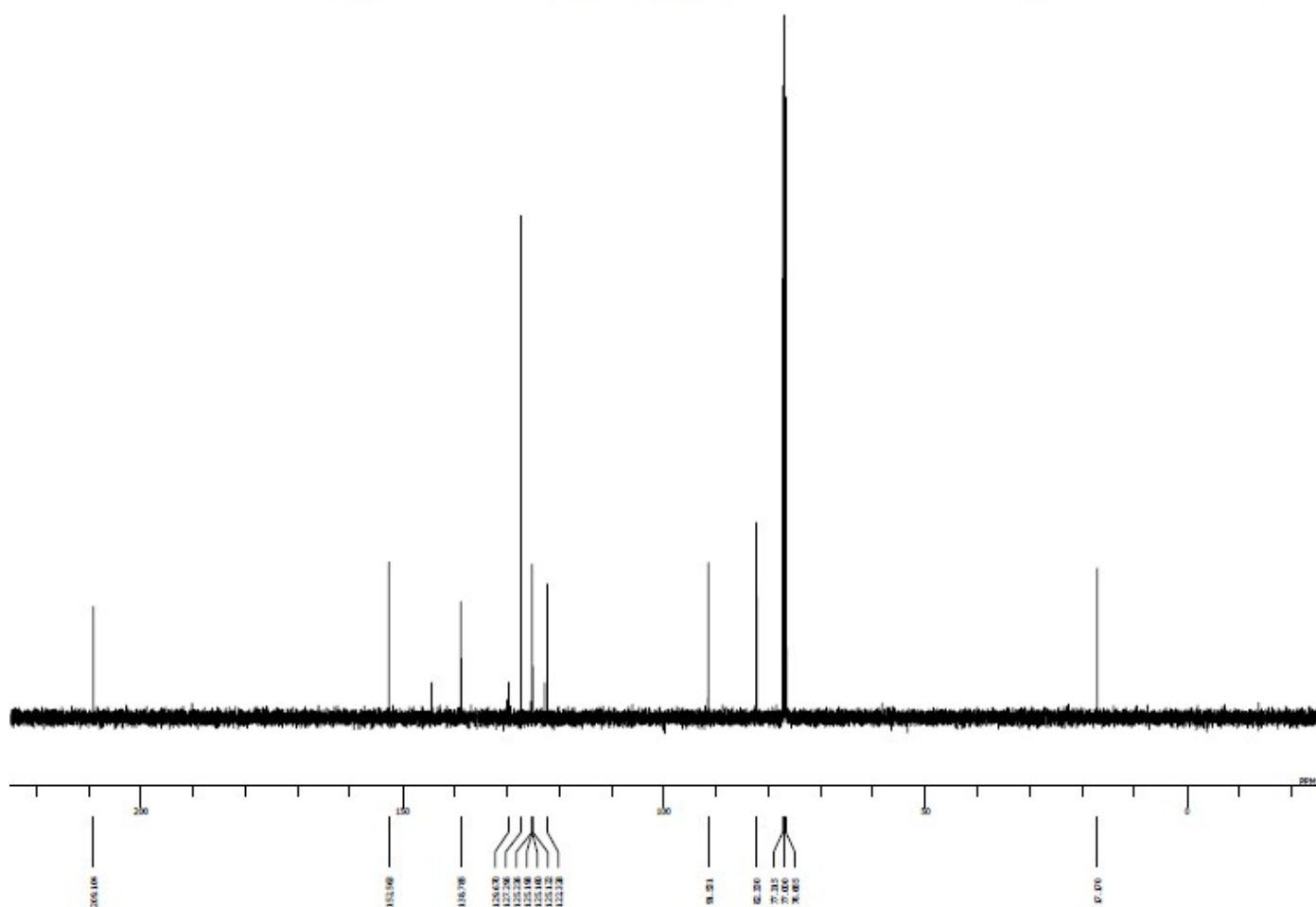
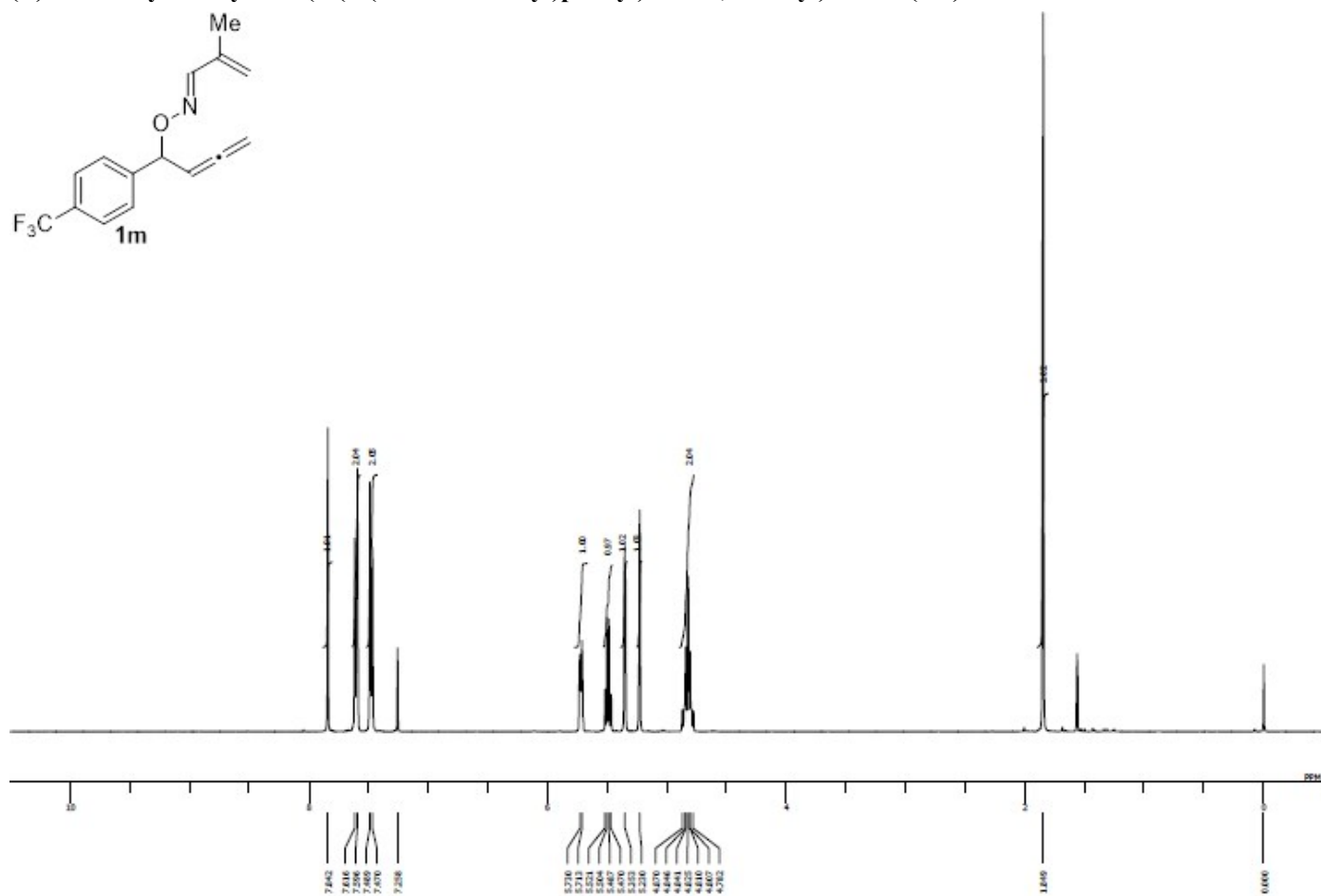
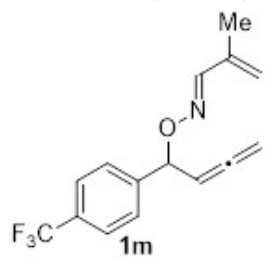
(*E*)-cyclohex-1-enecarbaldehyde *O*-(1-phenylbuta-2,3-dienyl) oxime (**1k**).



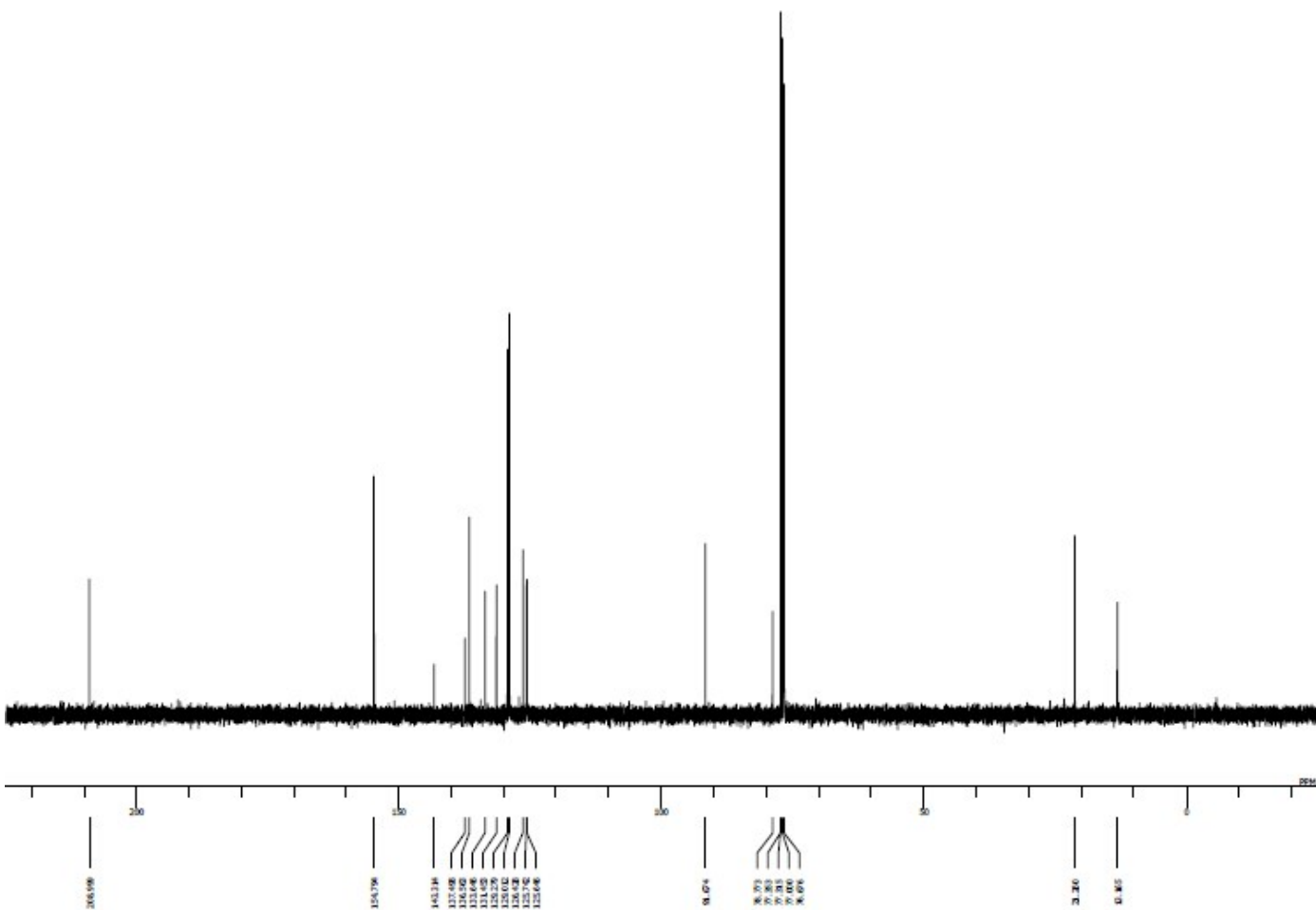
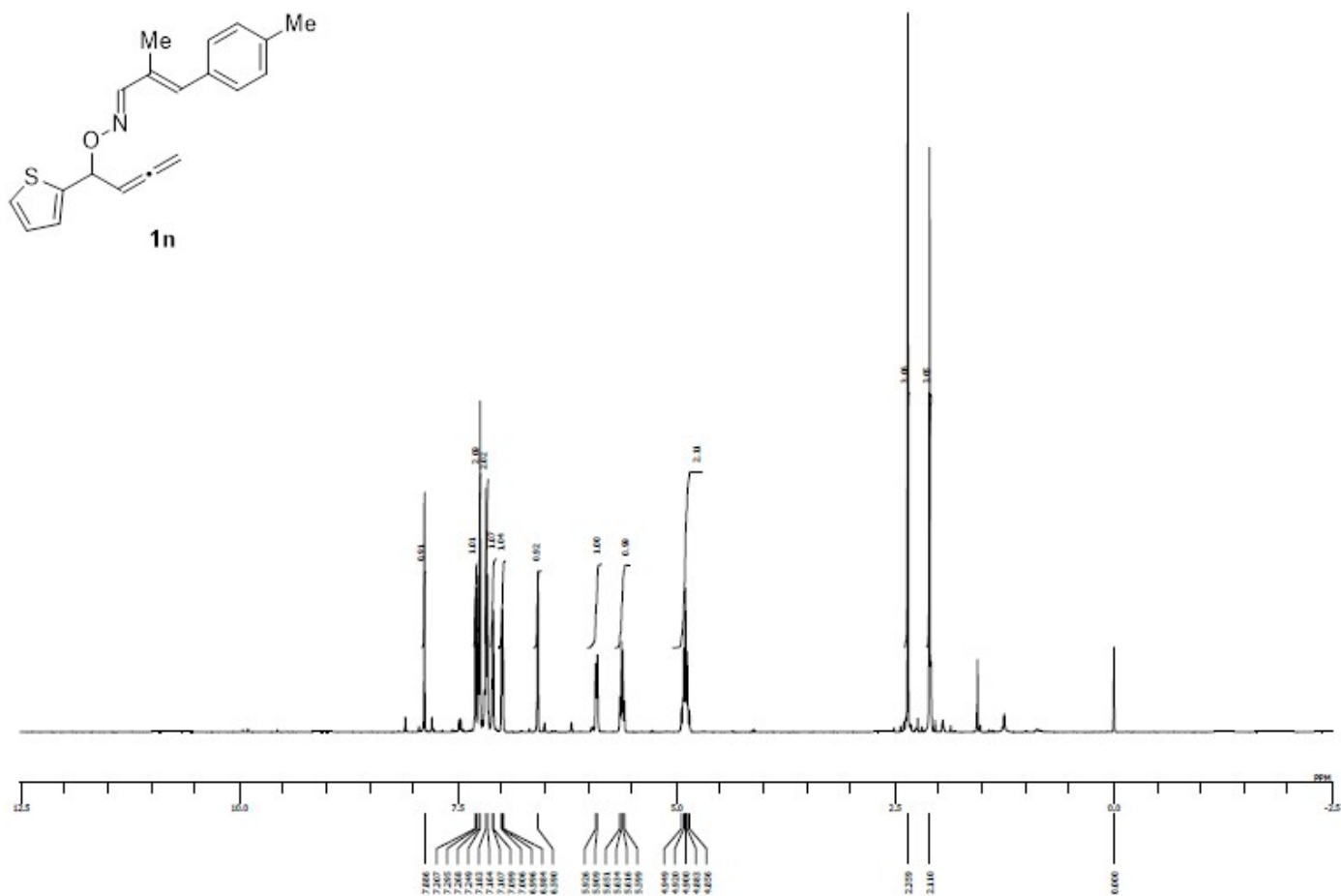
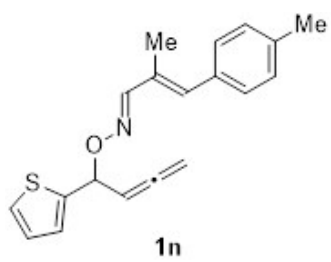
(E)-methacrylaldehyde O-(1-(4-methoxyphenyl)buta-2,3-dienyl) oxime (11).



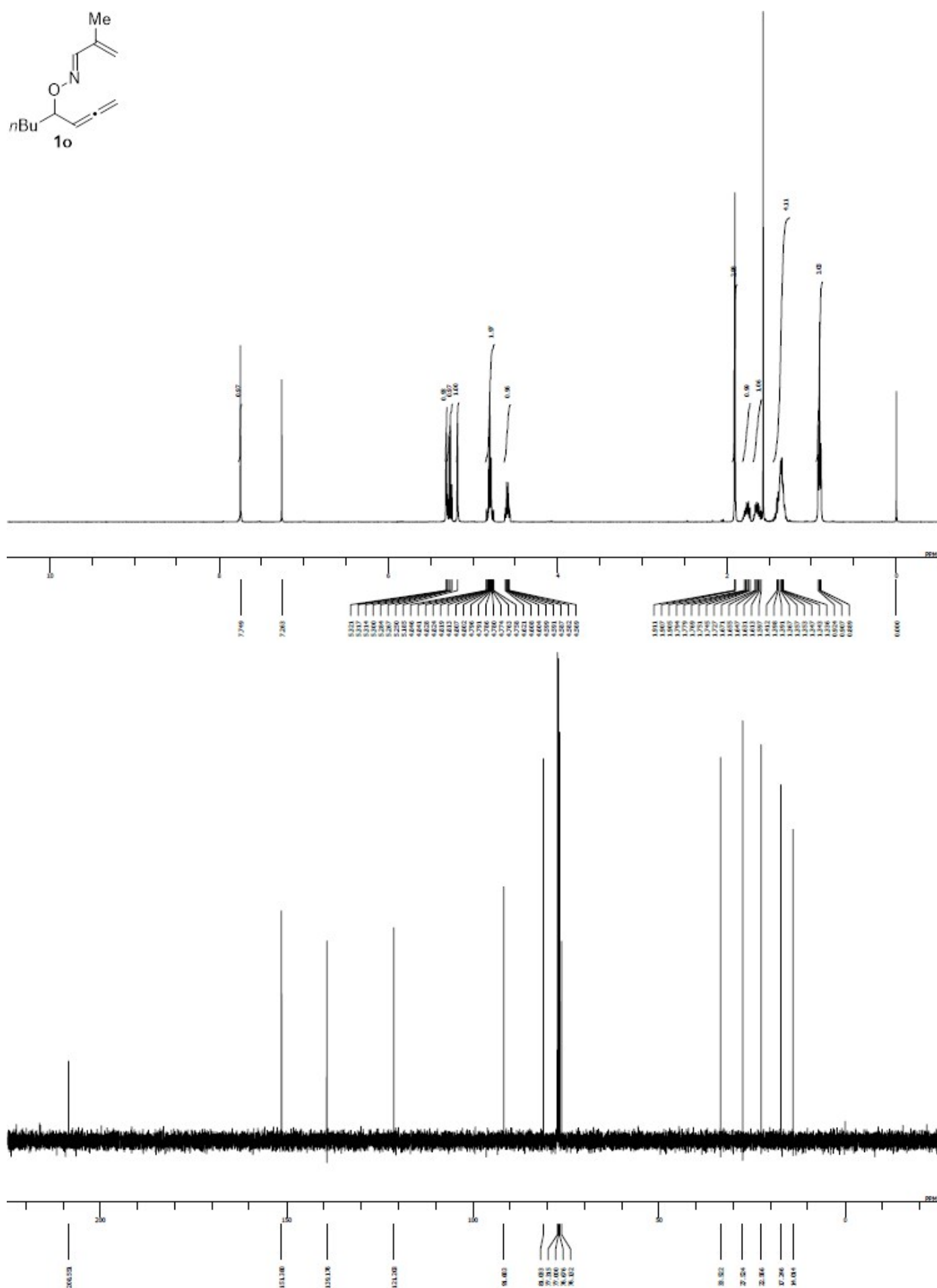
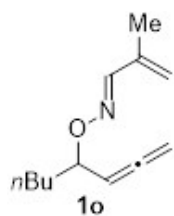
(*E*)-methacrylaldehyde *O*-(1-(4-(trifluoromethyl)phenyl)buta-2,3-dienyl) oxime (1m).



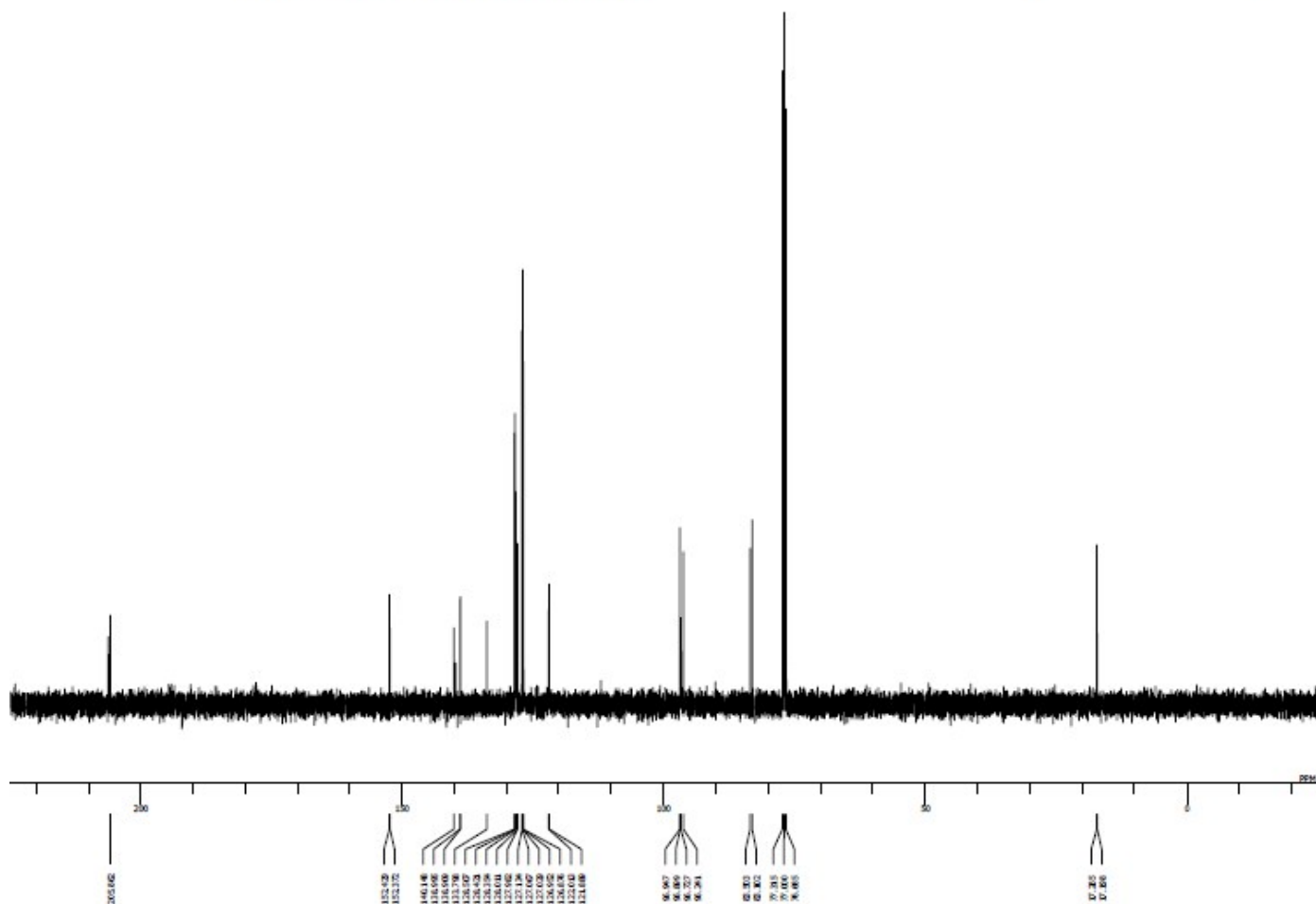
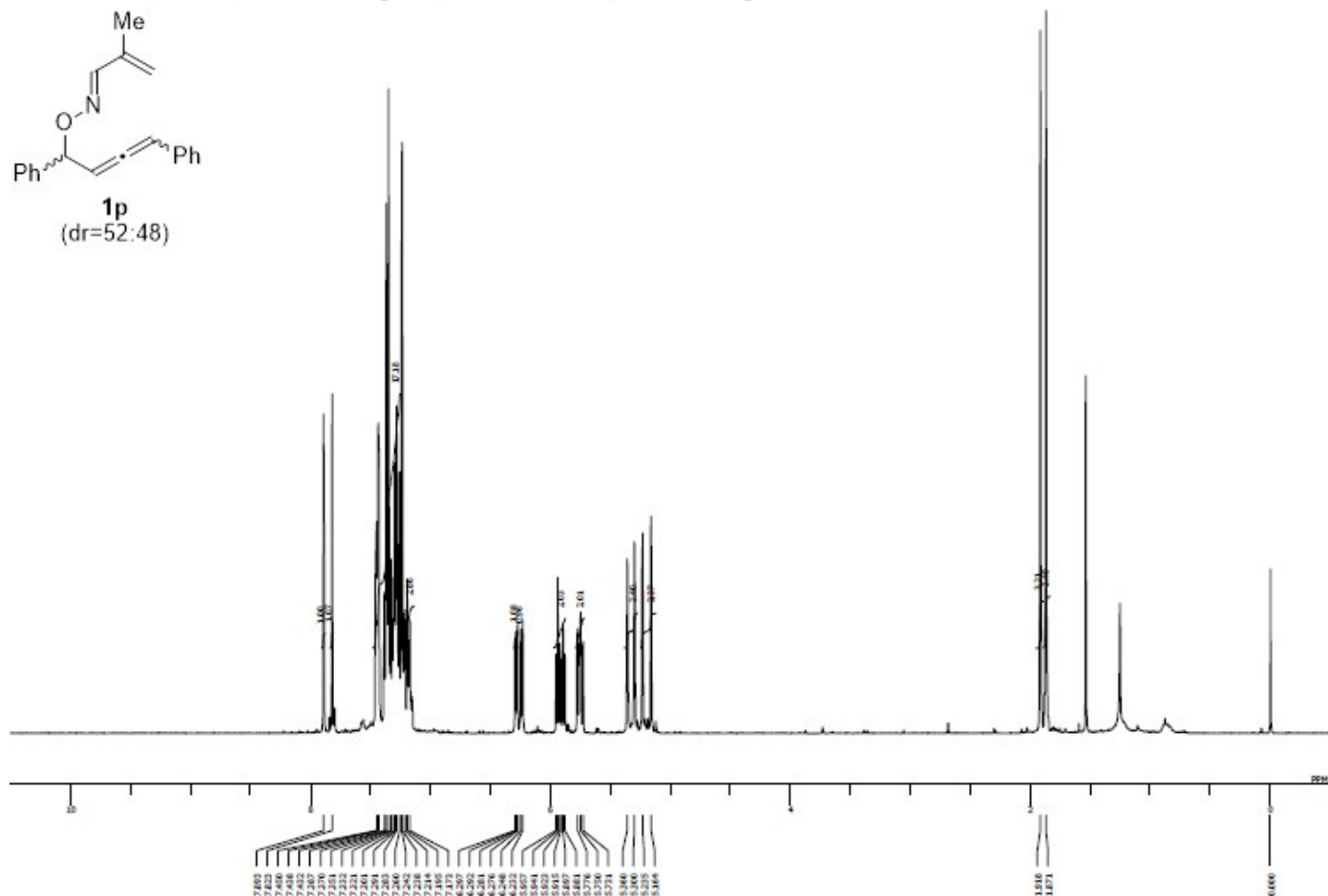
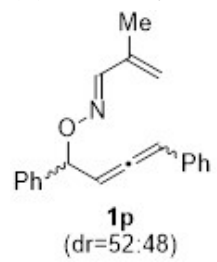
(1*E*,2*E*)-2-methyl-3-*p*-tolylacrylaldehyde *O*-1-(thiophen-2-yl)buta-2,3-dienyl oxime (**1n**).



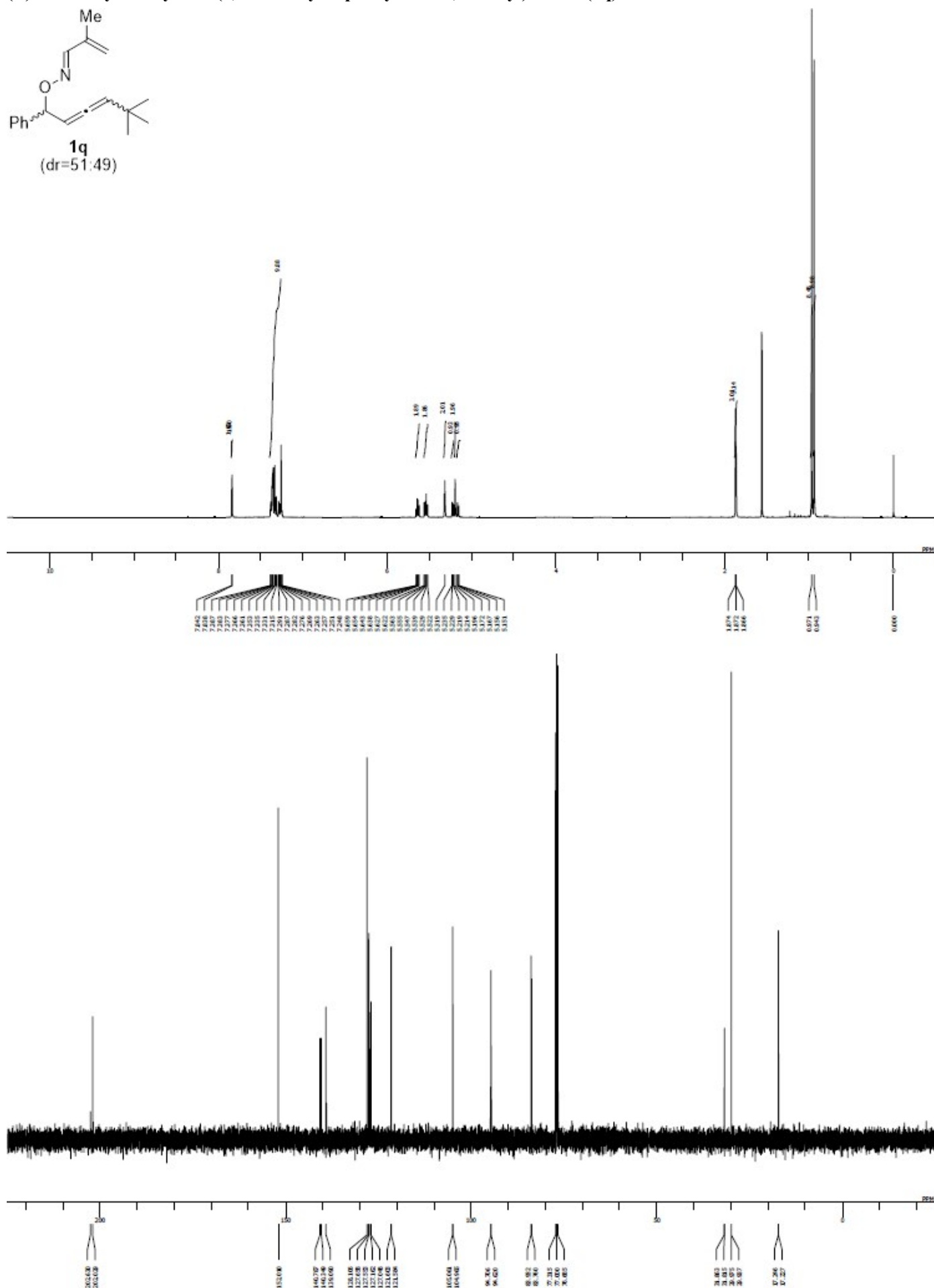
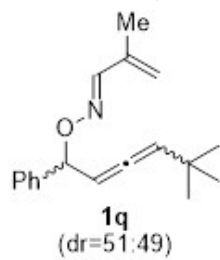
(E)-methacrylaldehyde O-(octa-1,2-dien-4-yl) oxime (1o).



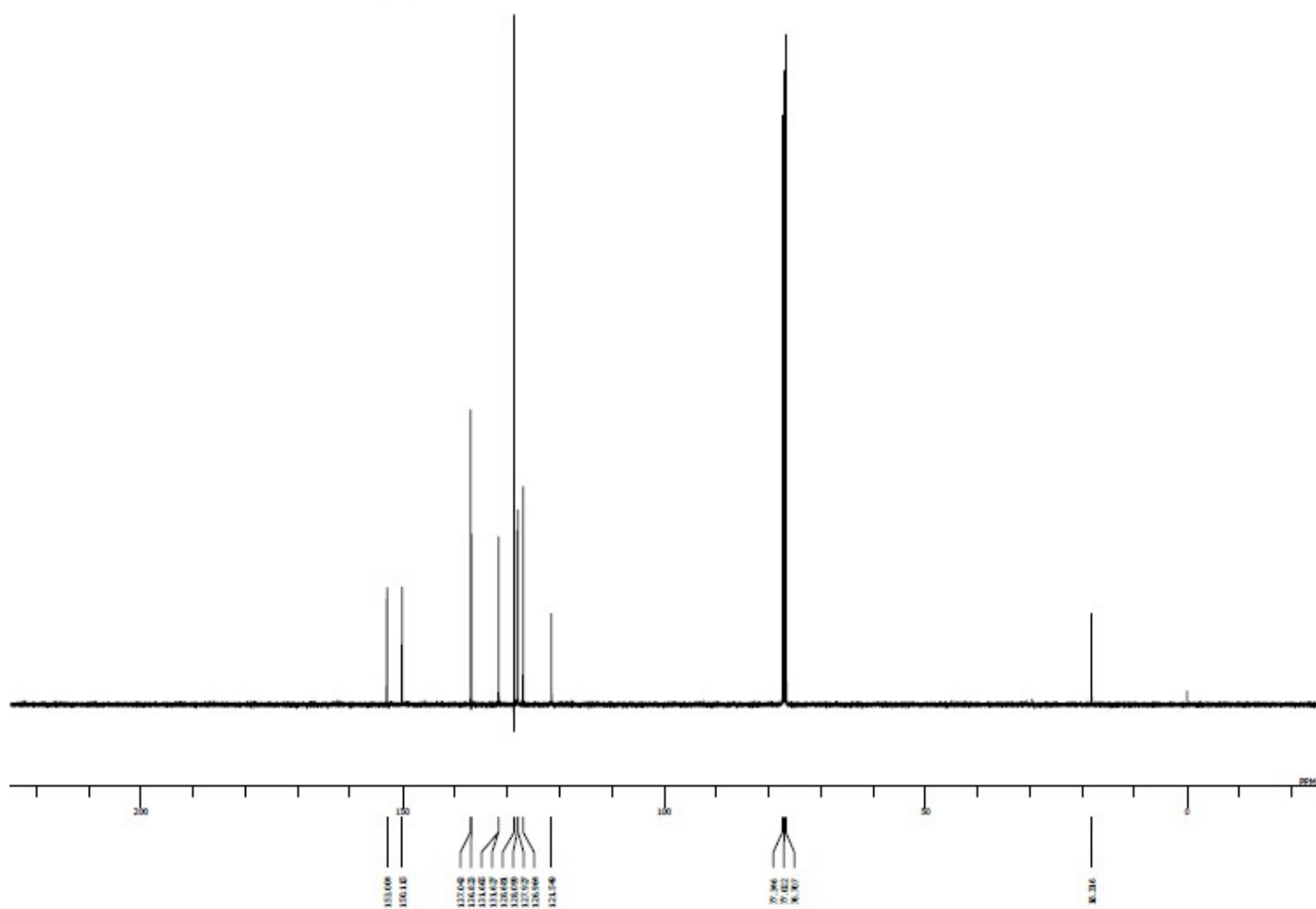
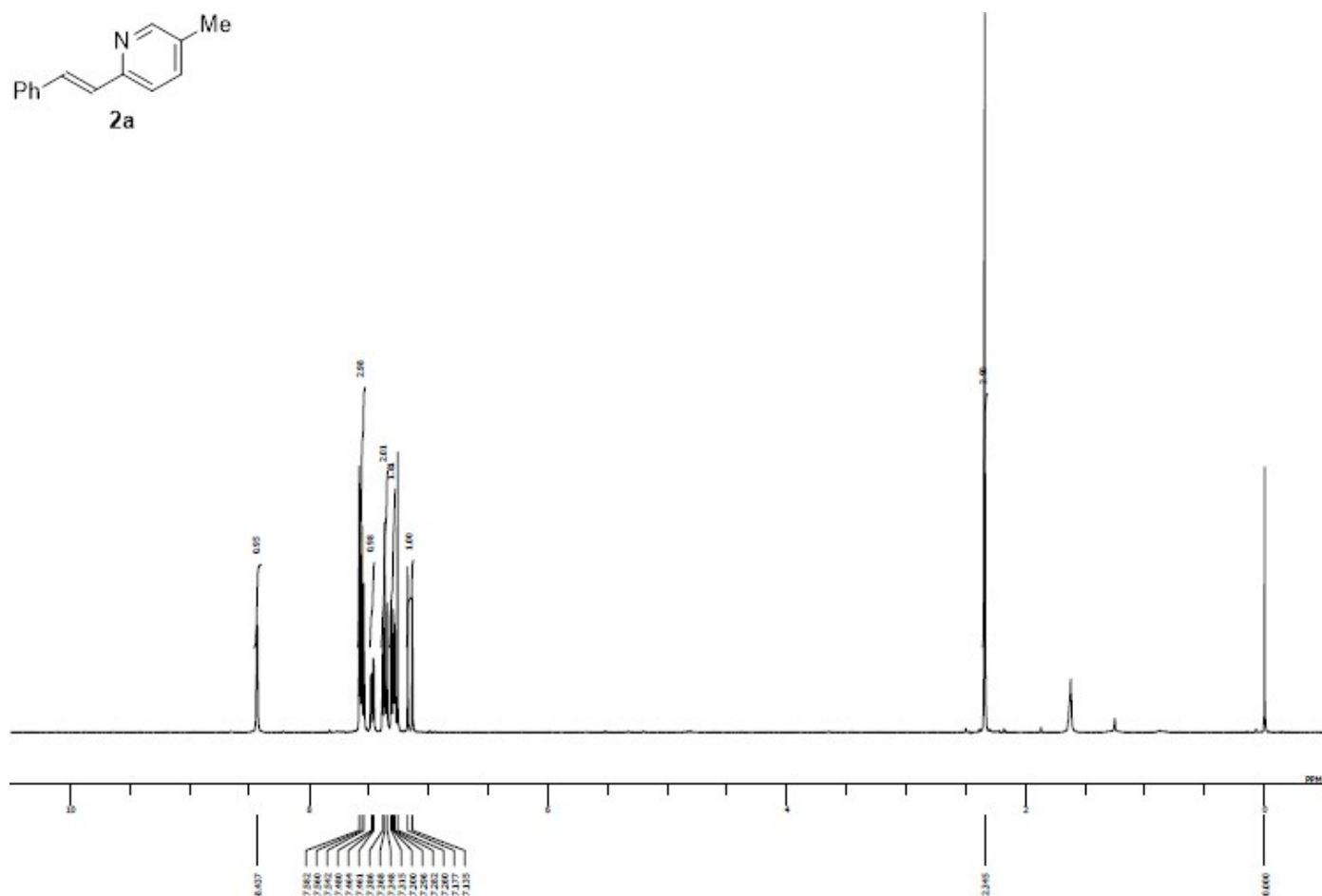
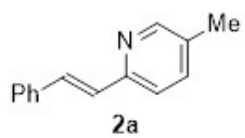
(E)-methacrylaldehyde O-(1,4-diphenylbuta-2,3-dienyl) oxime (1p).



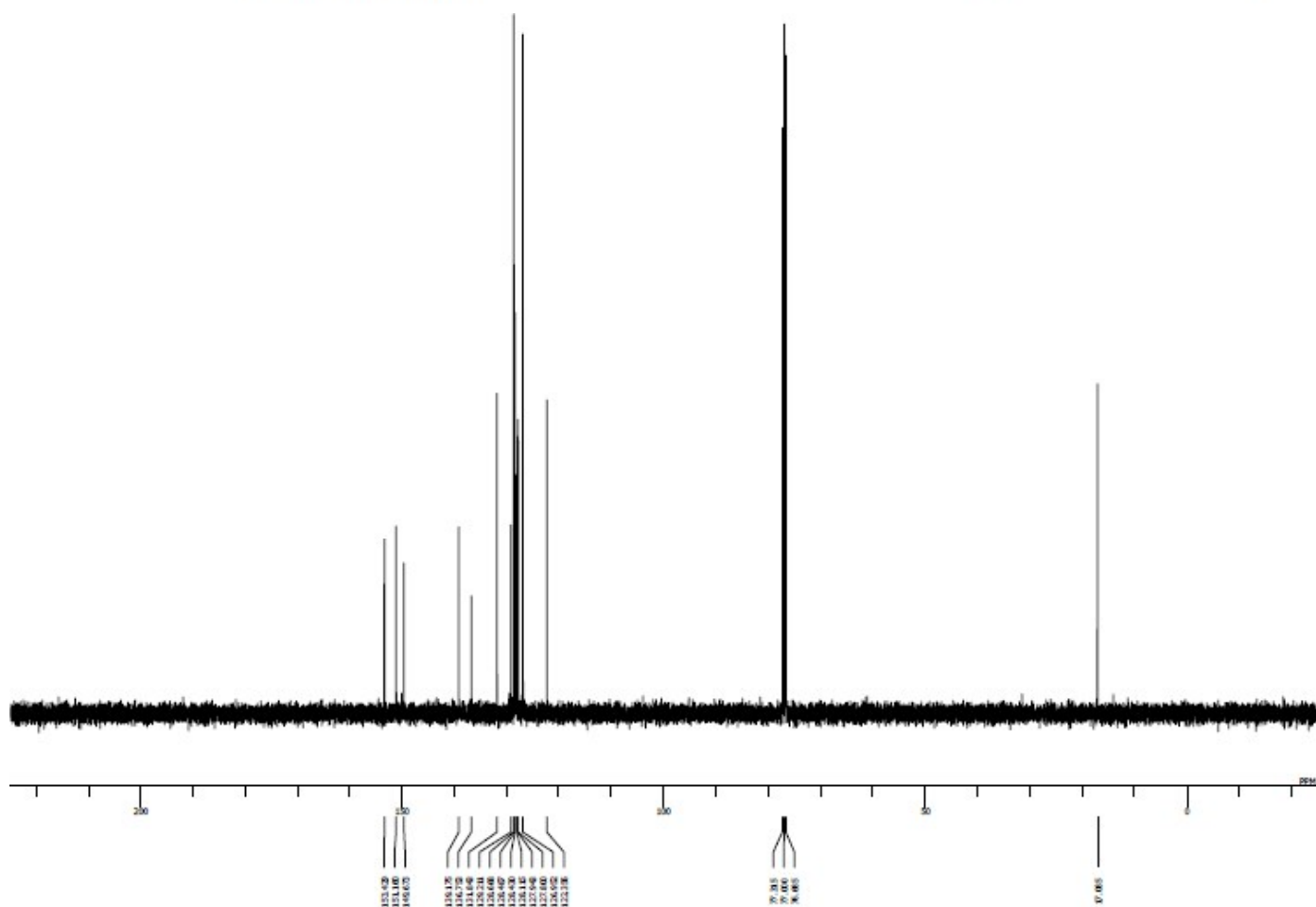
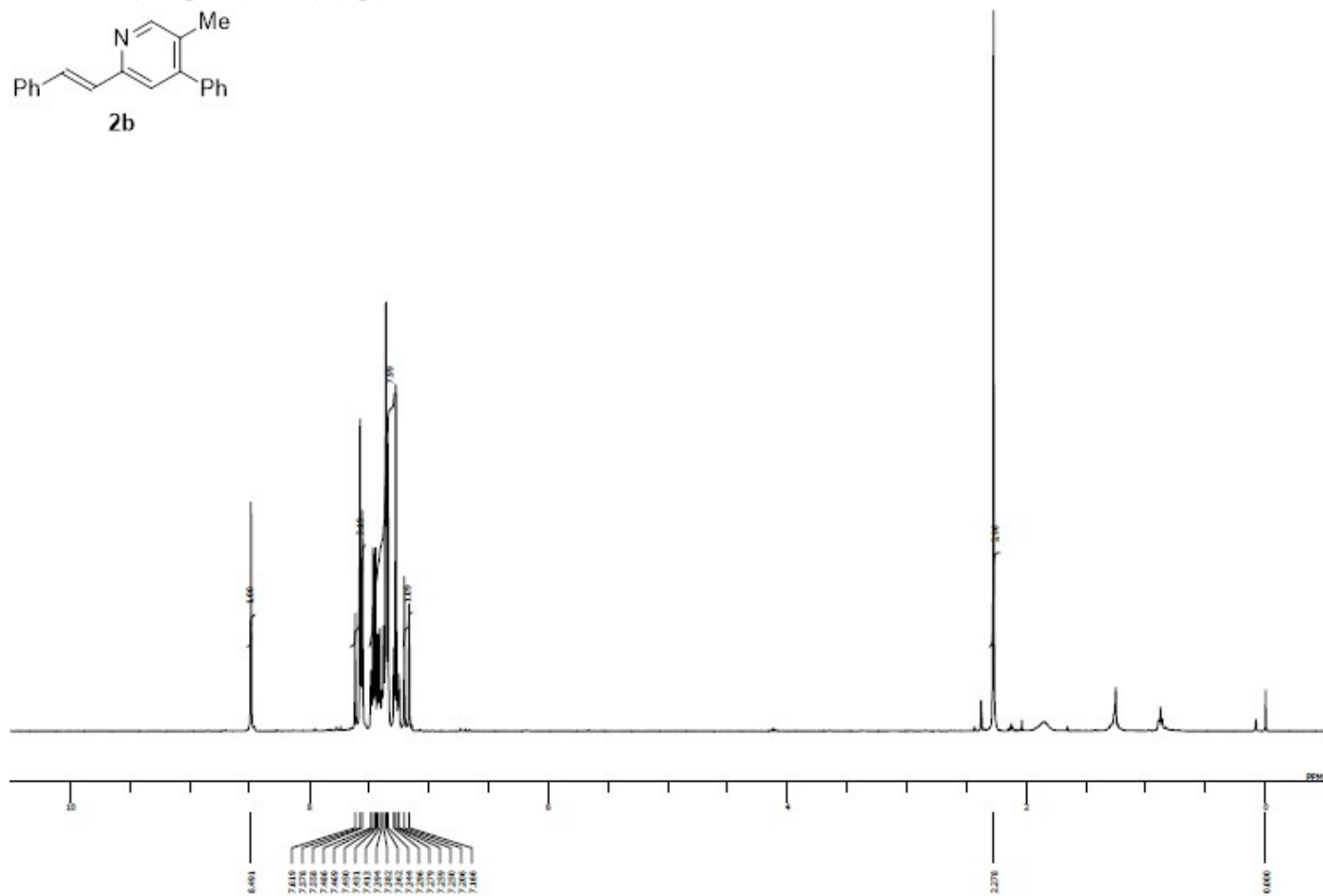
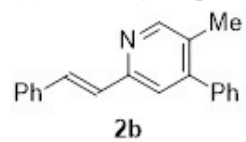
(E)-methacrylaldehyde O-(5,5-dimethyl-1-phenylhexa-2,3-dienyl) oxime (1q).



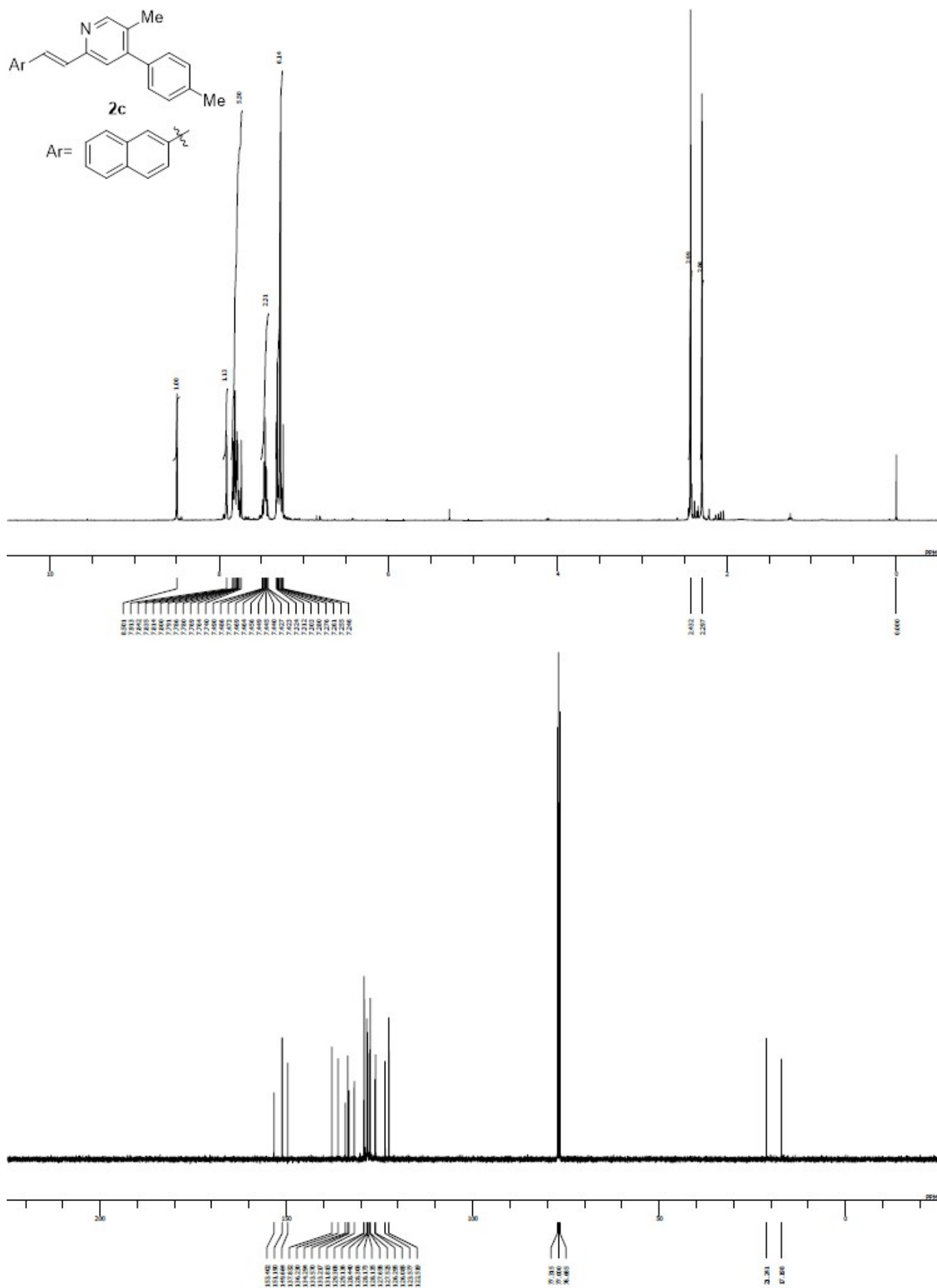
(E)-5-methyl-2-styrylpyridine (2a).



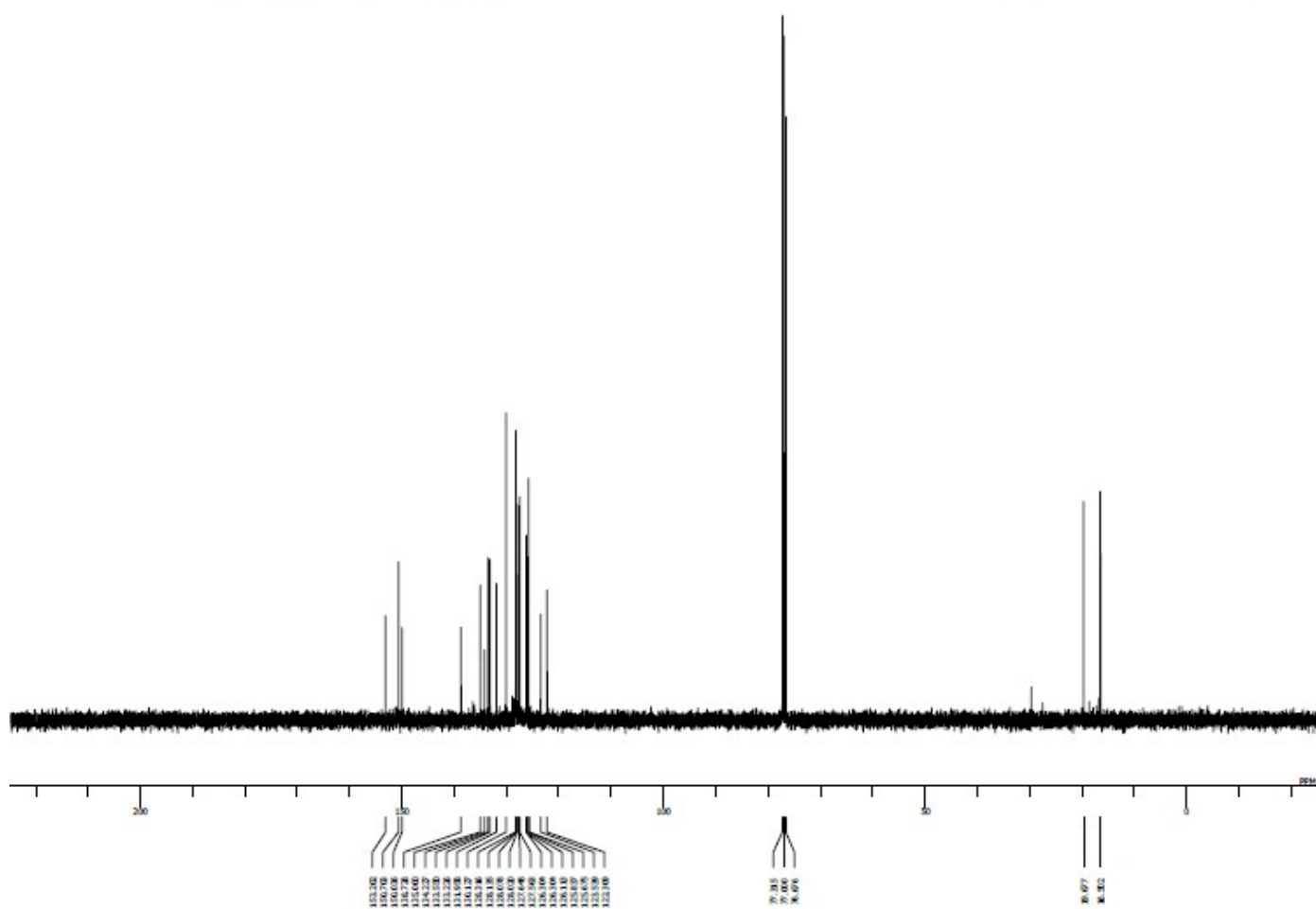
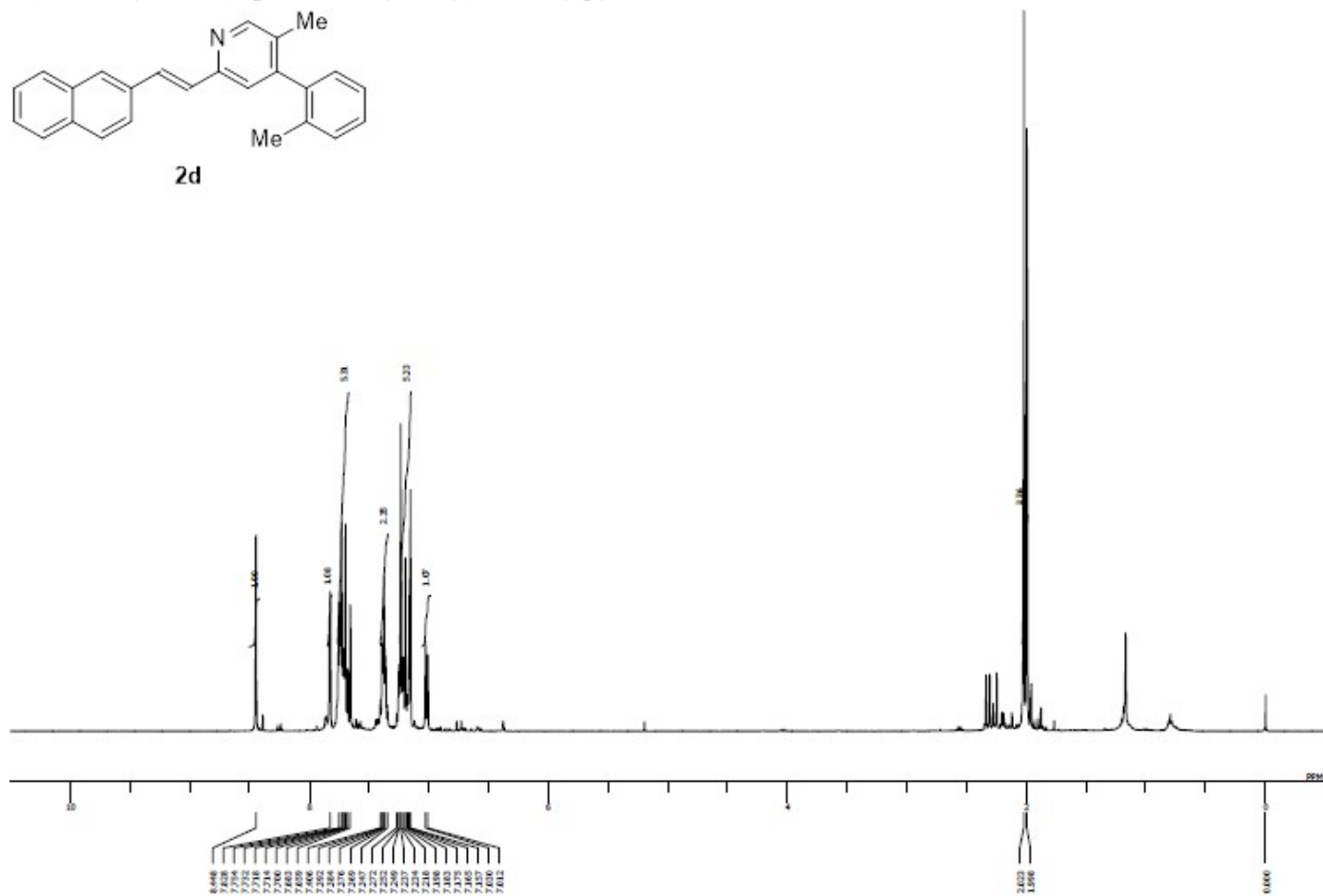
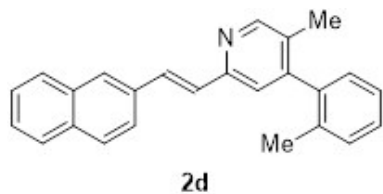
(E)-5-methyl-4-phenyl-2-styrylpyridine (2b).



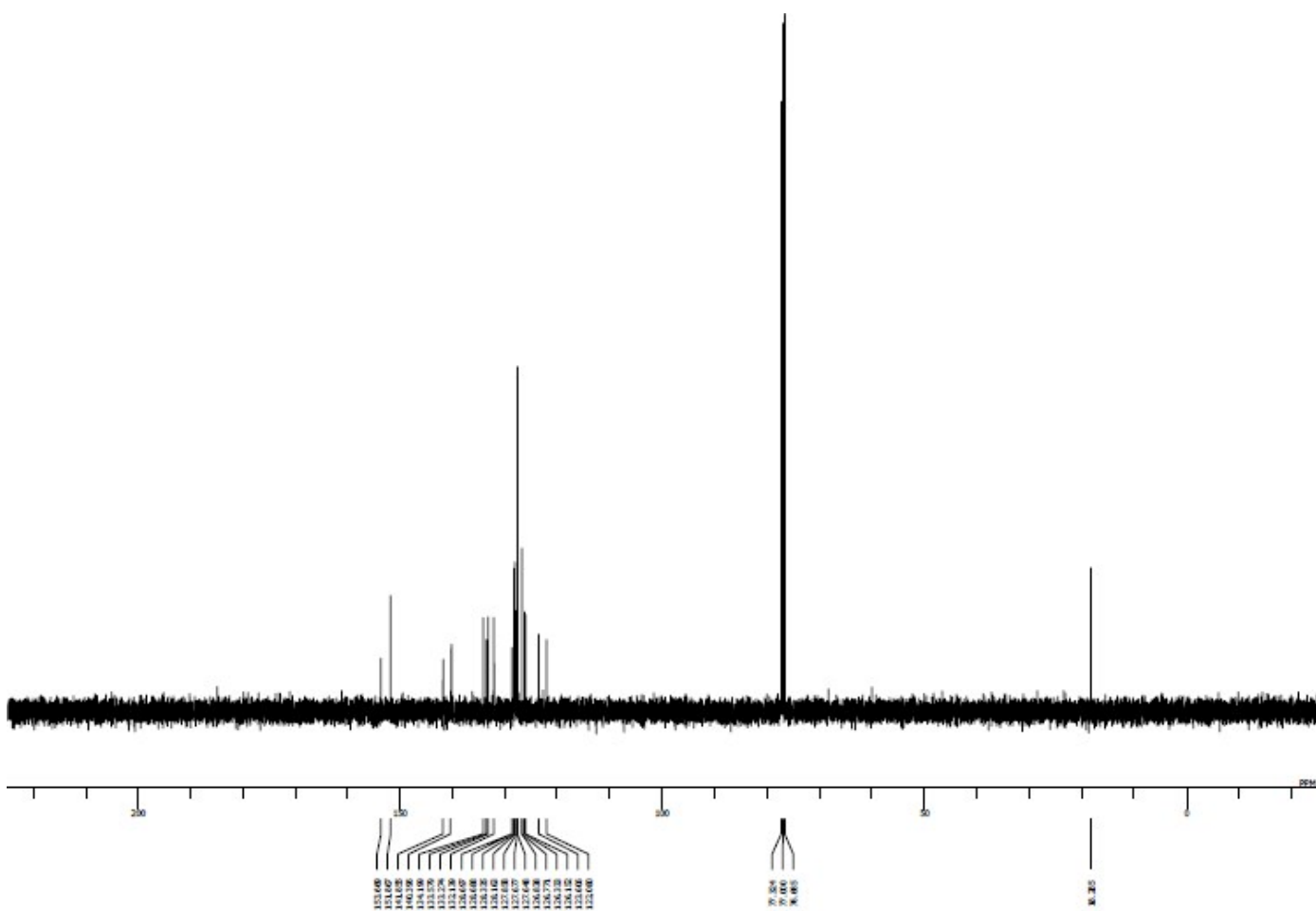
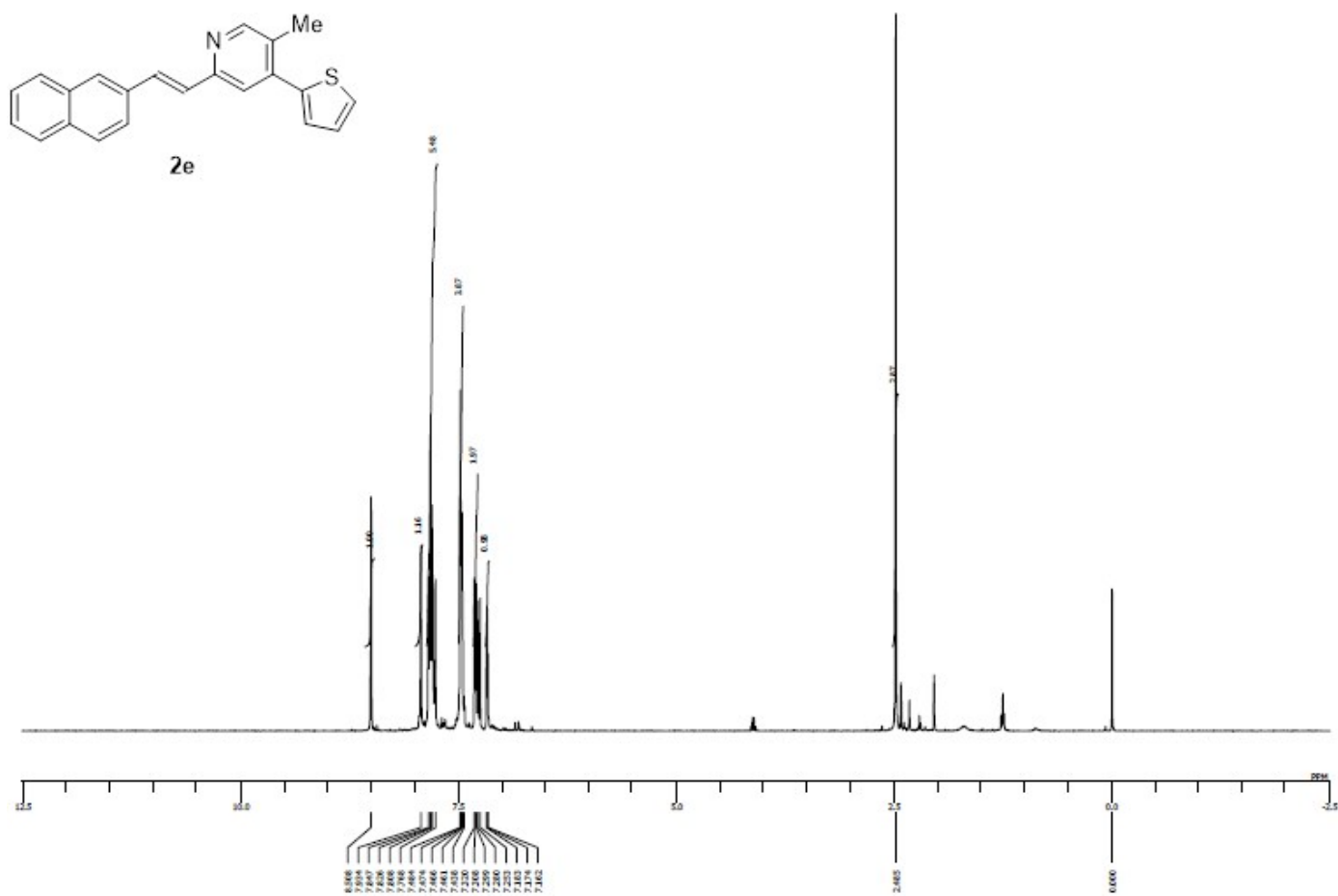
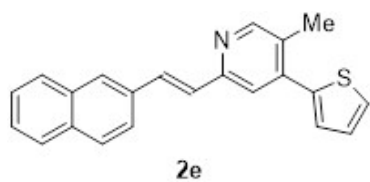
(E)-5-methyl-2-(2-(naphthalen-2-yl)vinyl)-4-p-tolylpyridine (2c).



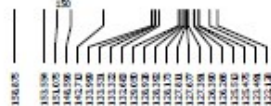
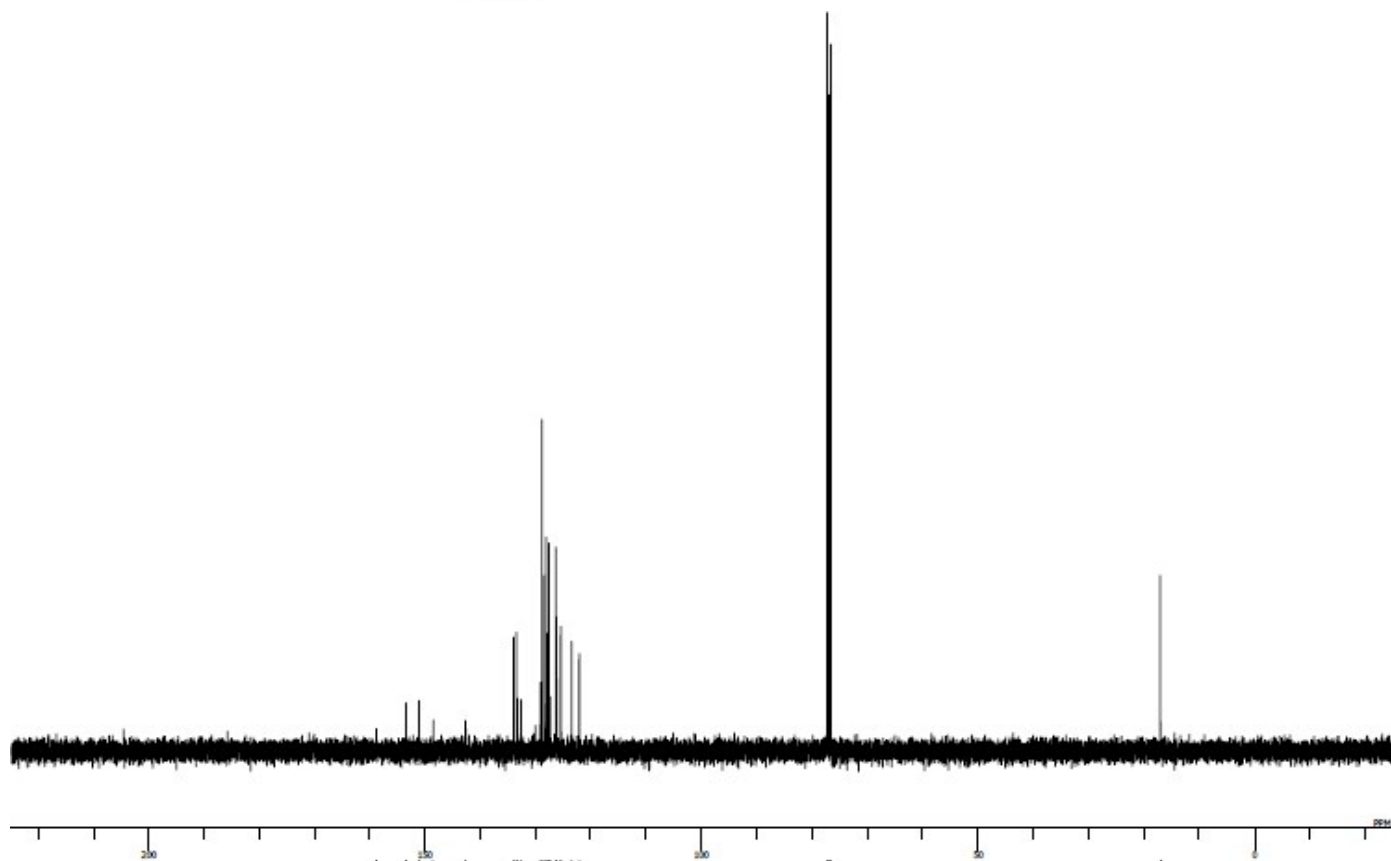
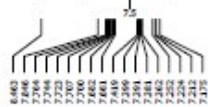
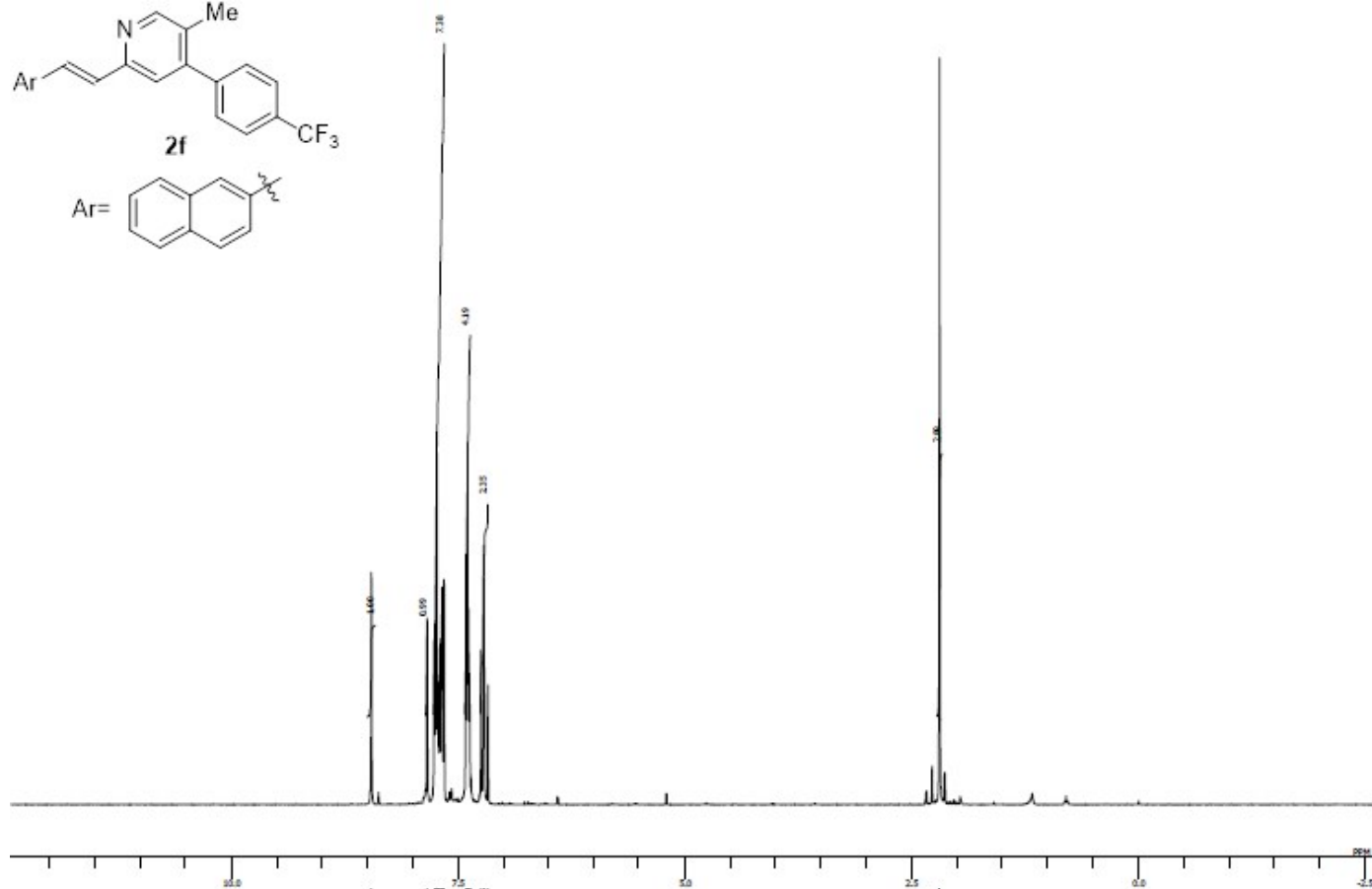
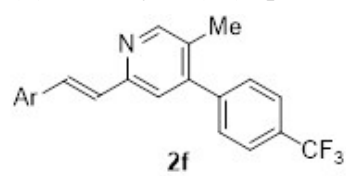
(E)-5-methyl-2-(2-(naphthalen-2-yl)vinyl)-4-*o*-tolylpyridine (2d).



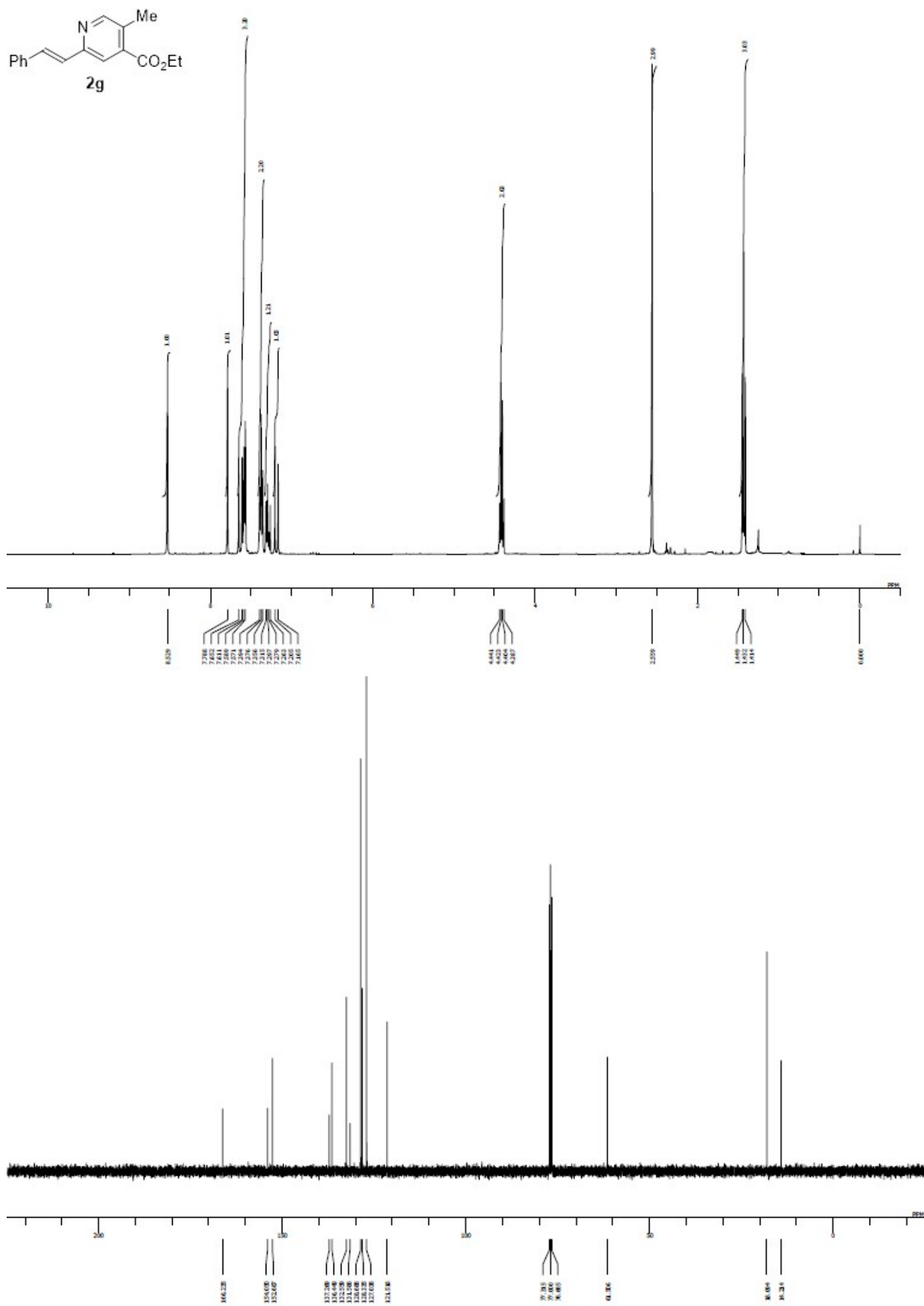
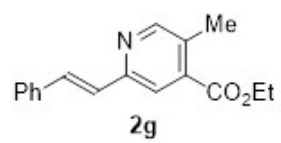
(*E*)-5-methyl-2-(2-(naphthalen-2-yl)vinyl)-4-(thiophen-2-yl)pyridine (2e).



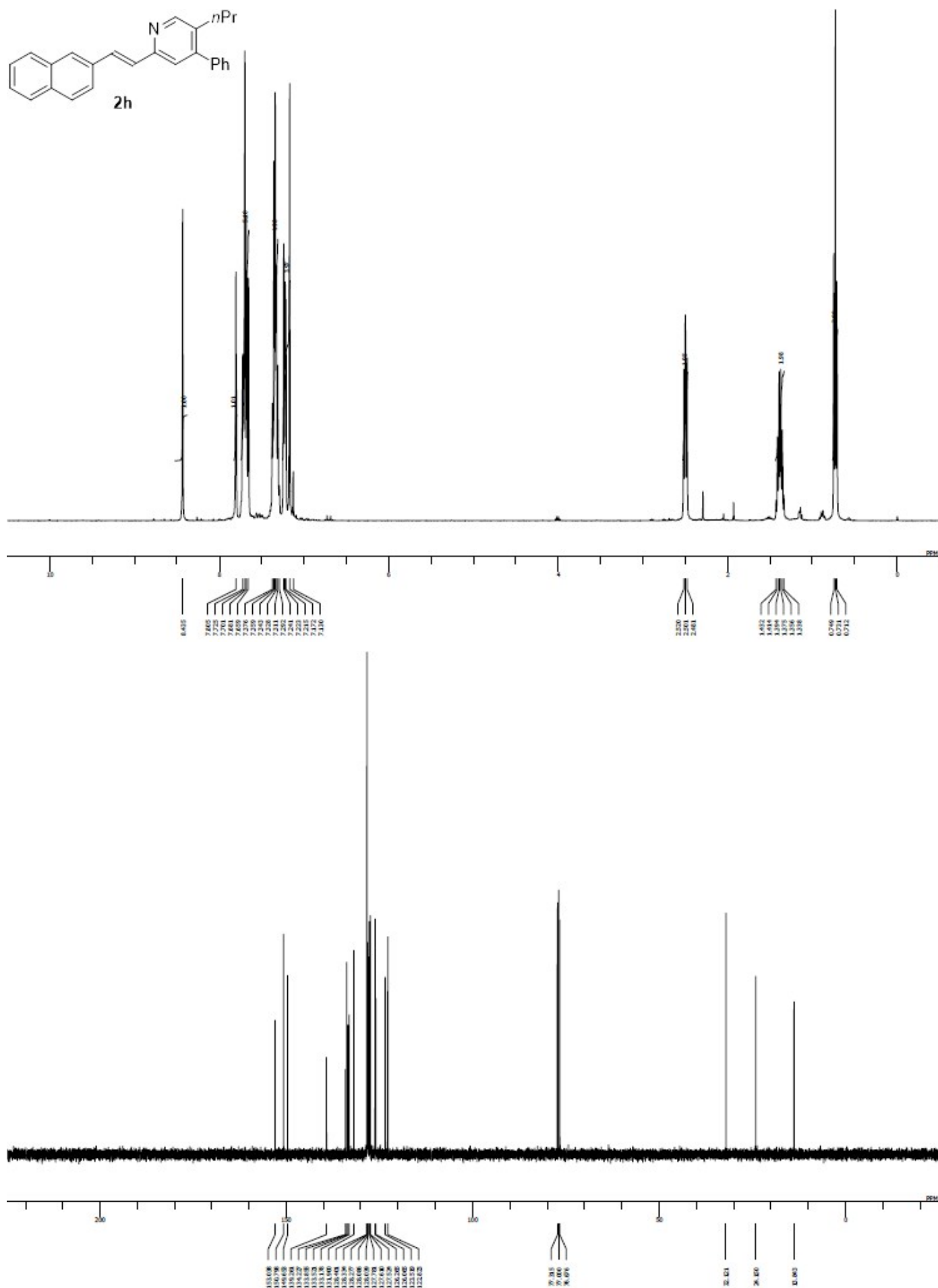
(*E*)-5-methyl-2-(2-(naphthalen-2-yl)vinyl)-4-(4-(trifluoromethyl)phenyl)pyridine (2f).



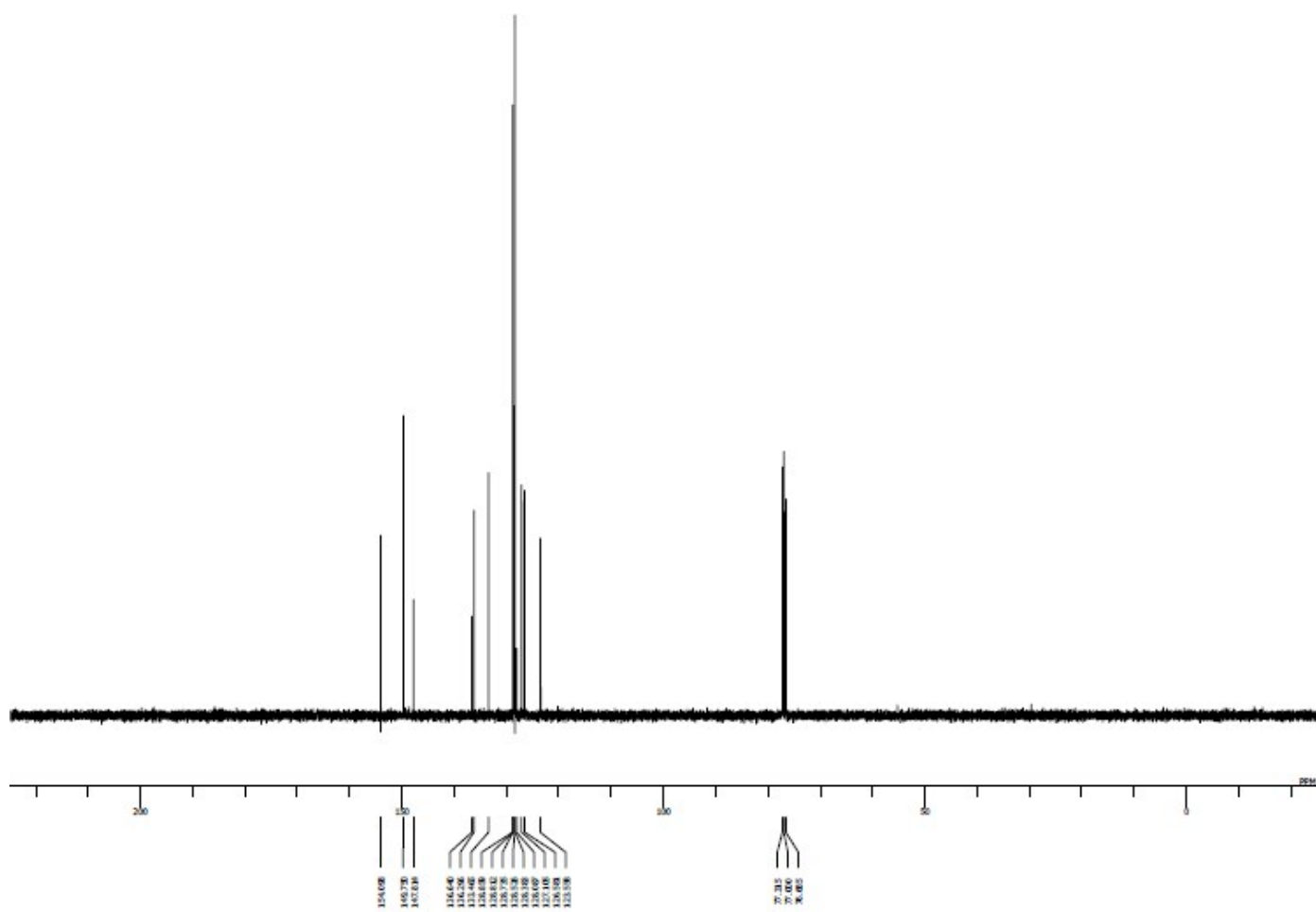
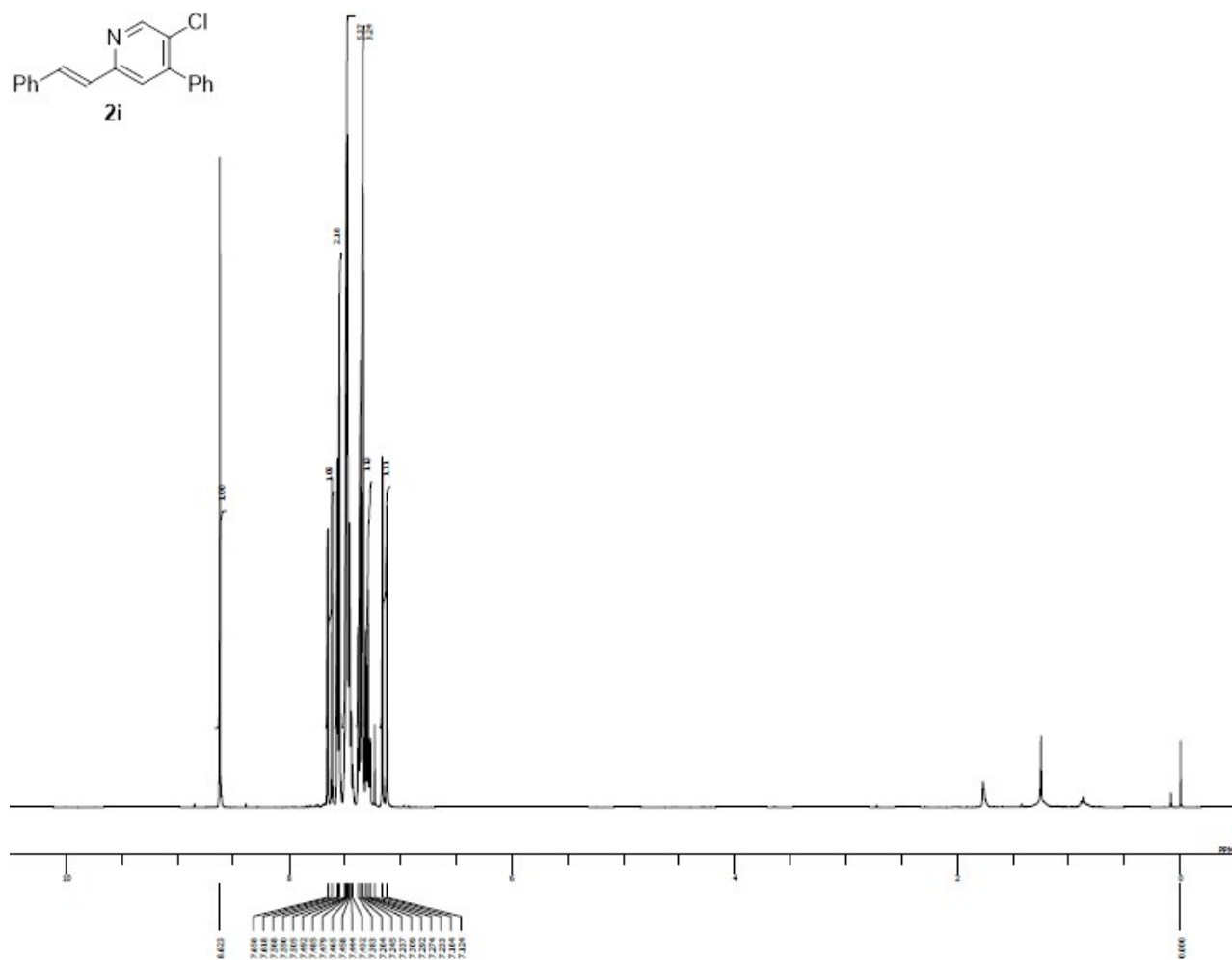
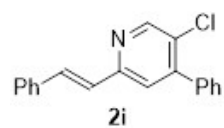
(E)-ethyl 5-methyl-2-styrylisonicotinate (2g).



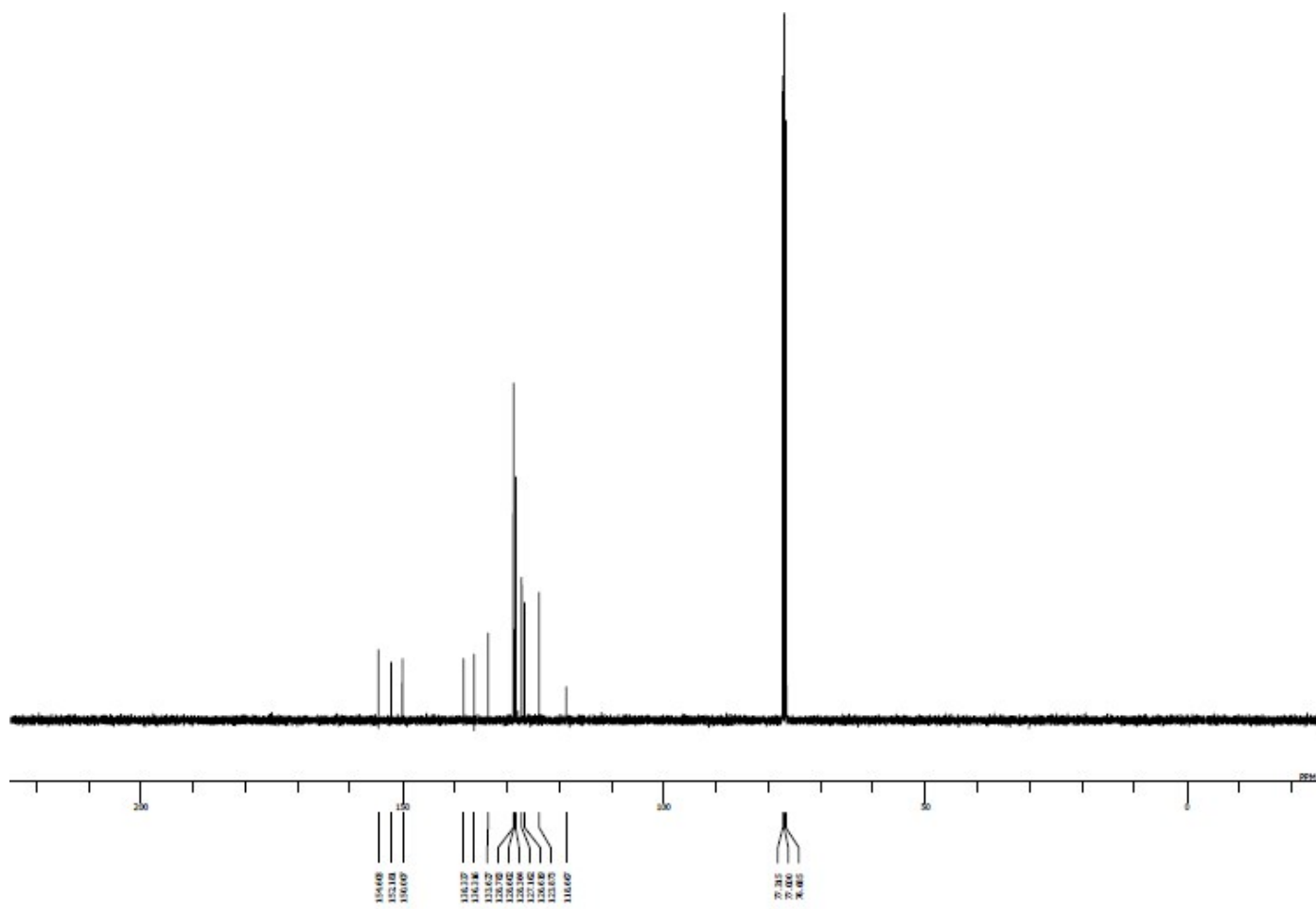
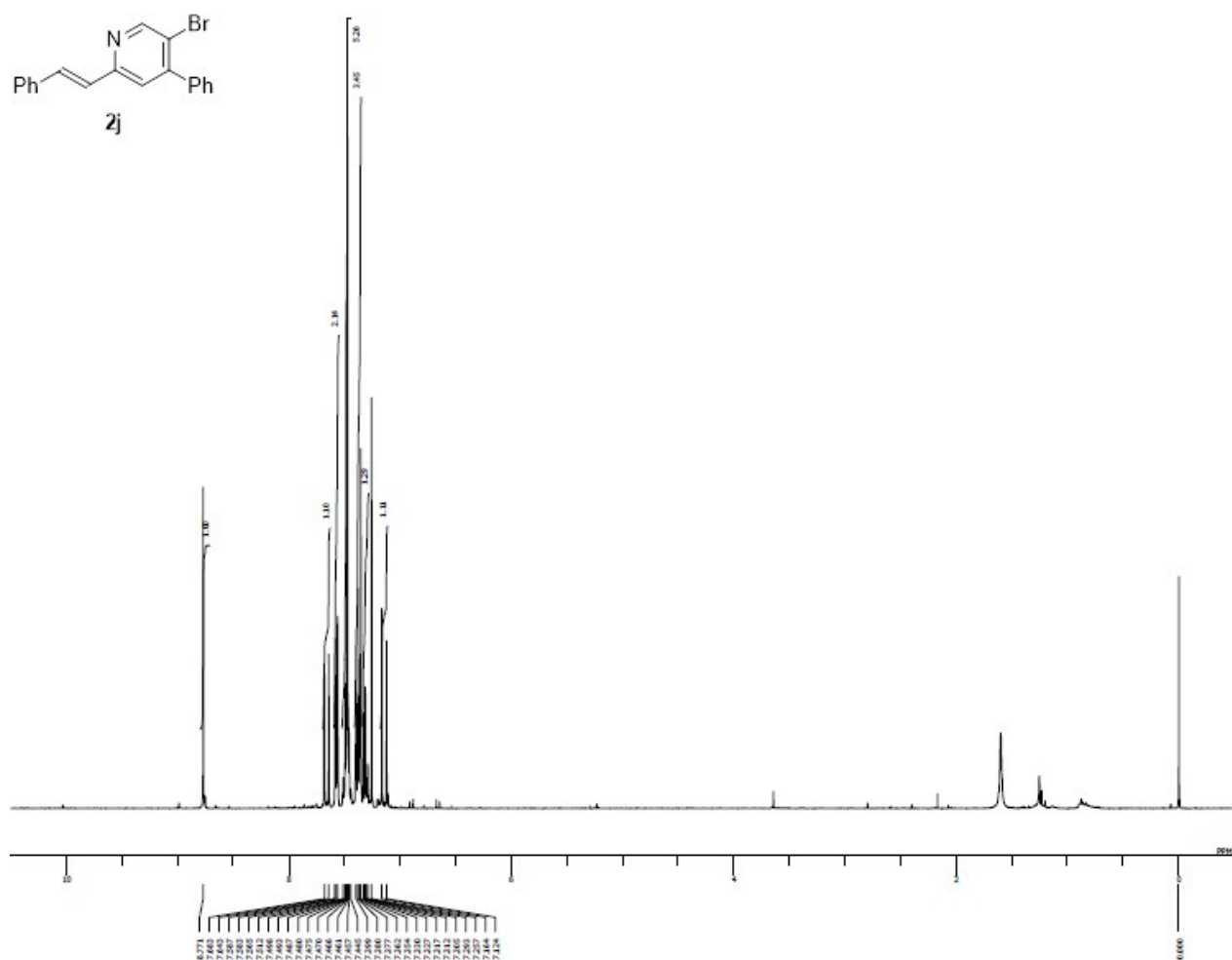
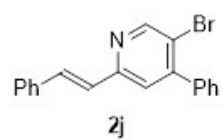
(E)-2-(2-(naphthalen-2-yl)vinyl)-4-phenyl-5-propylpyridine (2h).



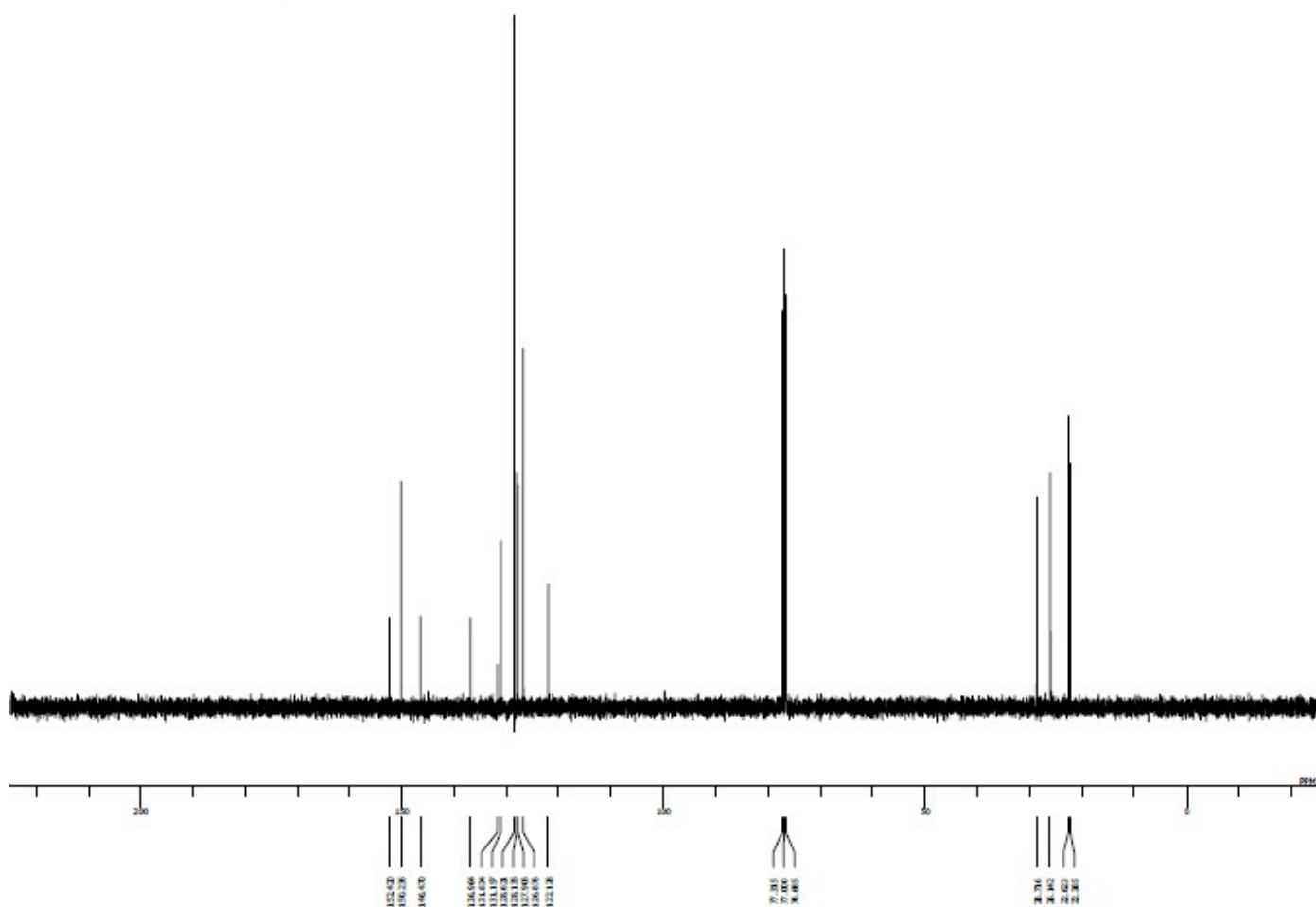
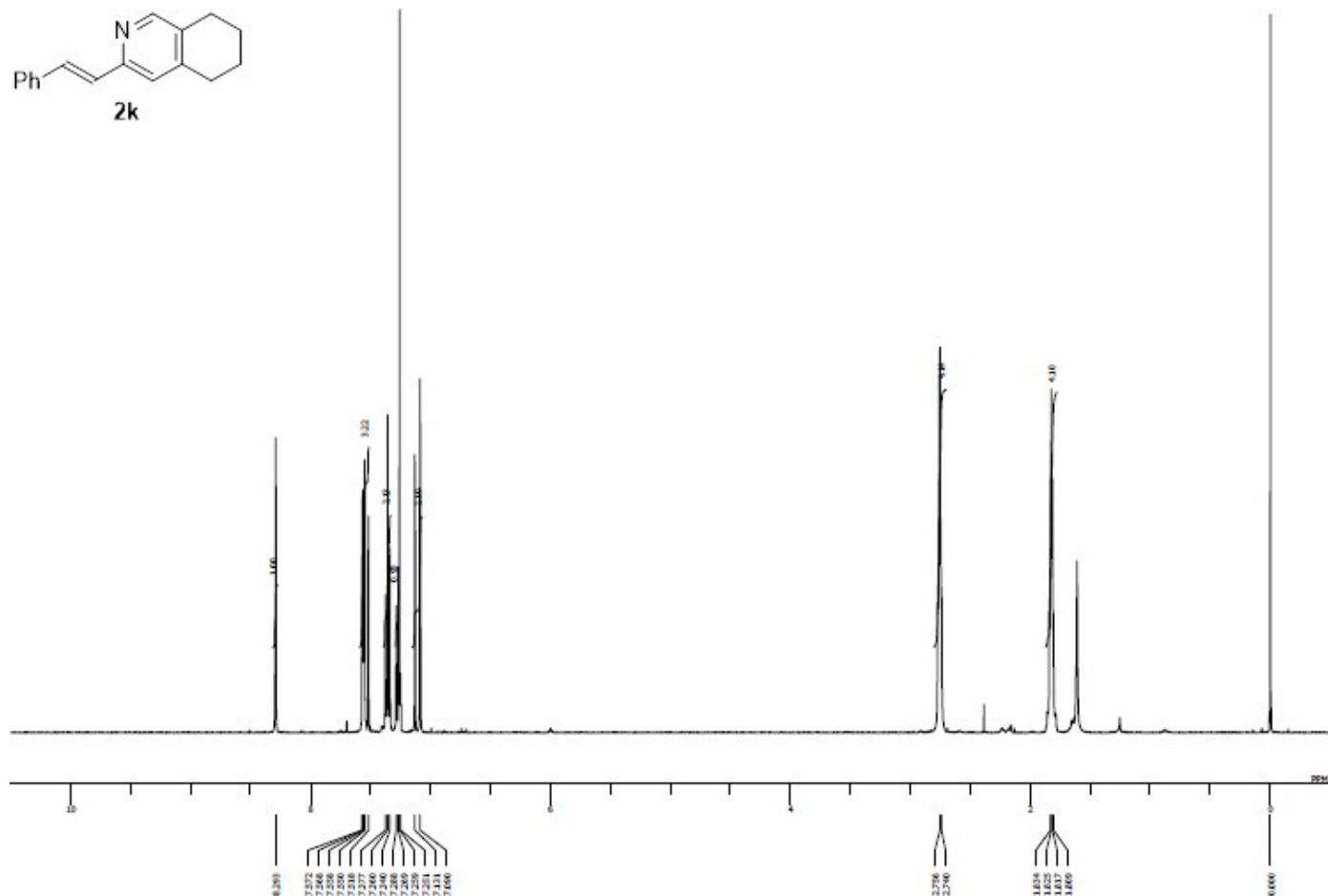
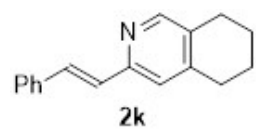
(E)-5-chloro-4-phenyl-2-styrylpyridine (2i).



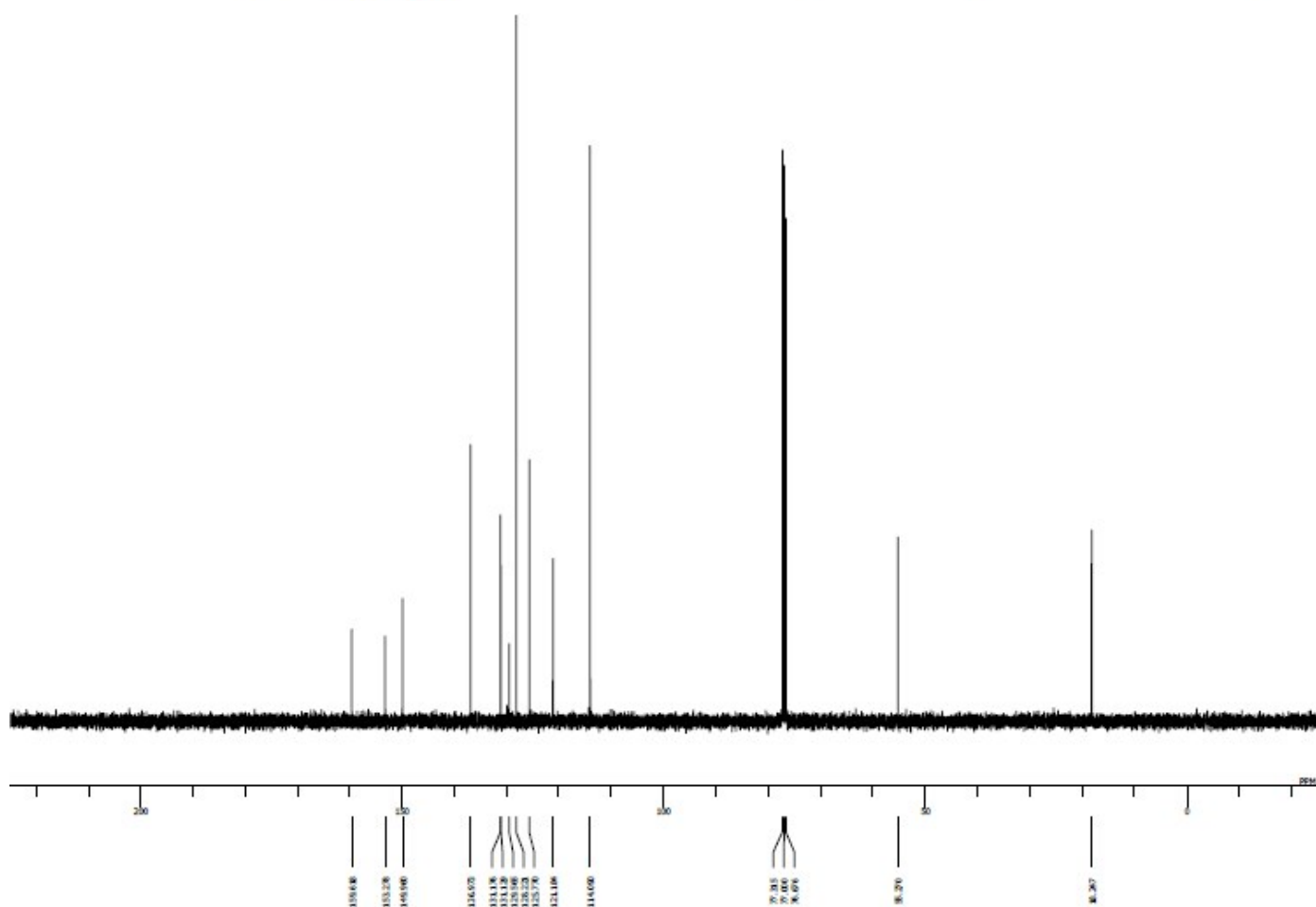
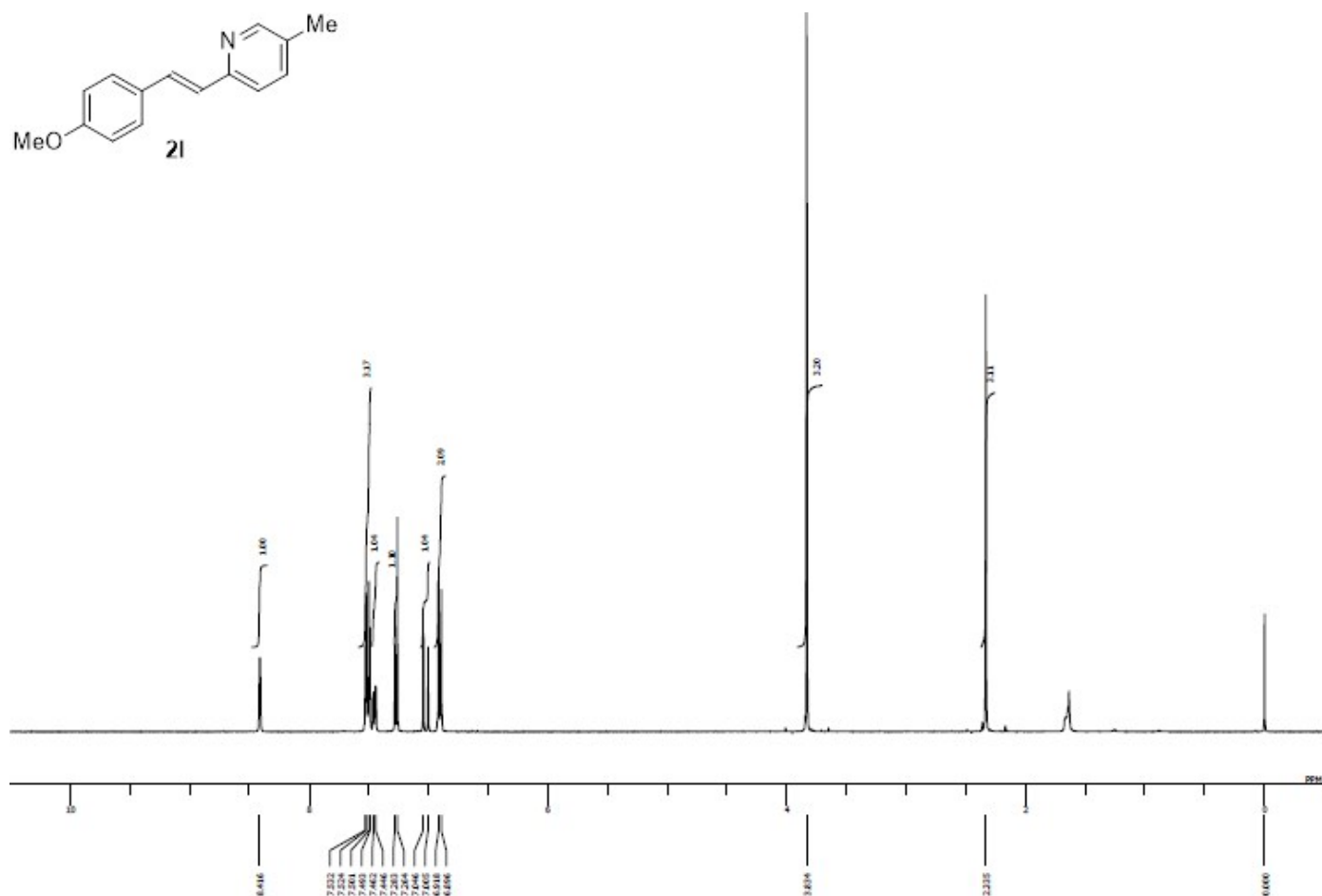
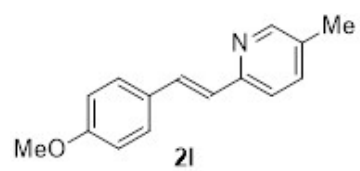
(E)-5-bromo-4-phenyl-2-styrylpyridine (2j).



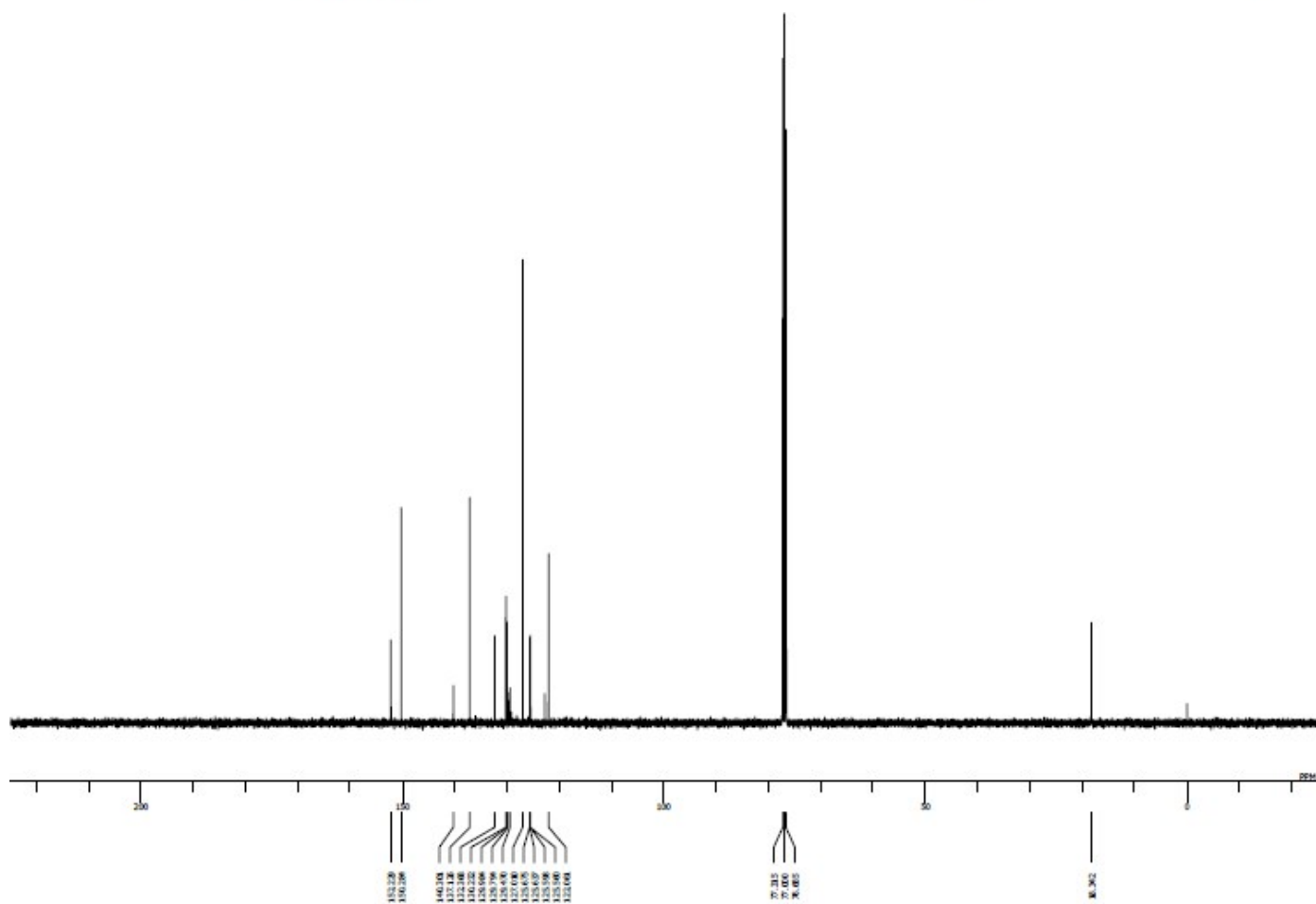
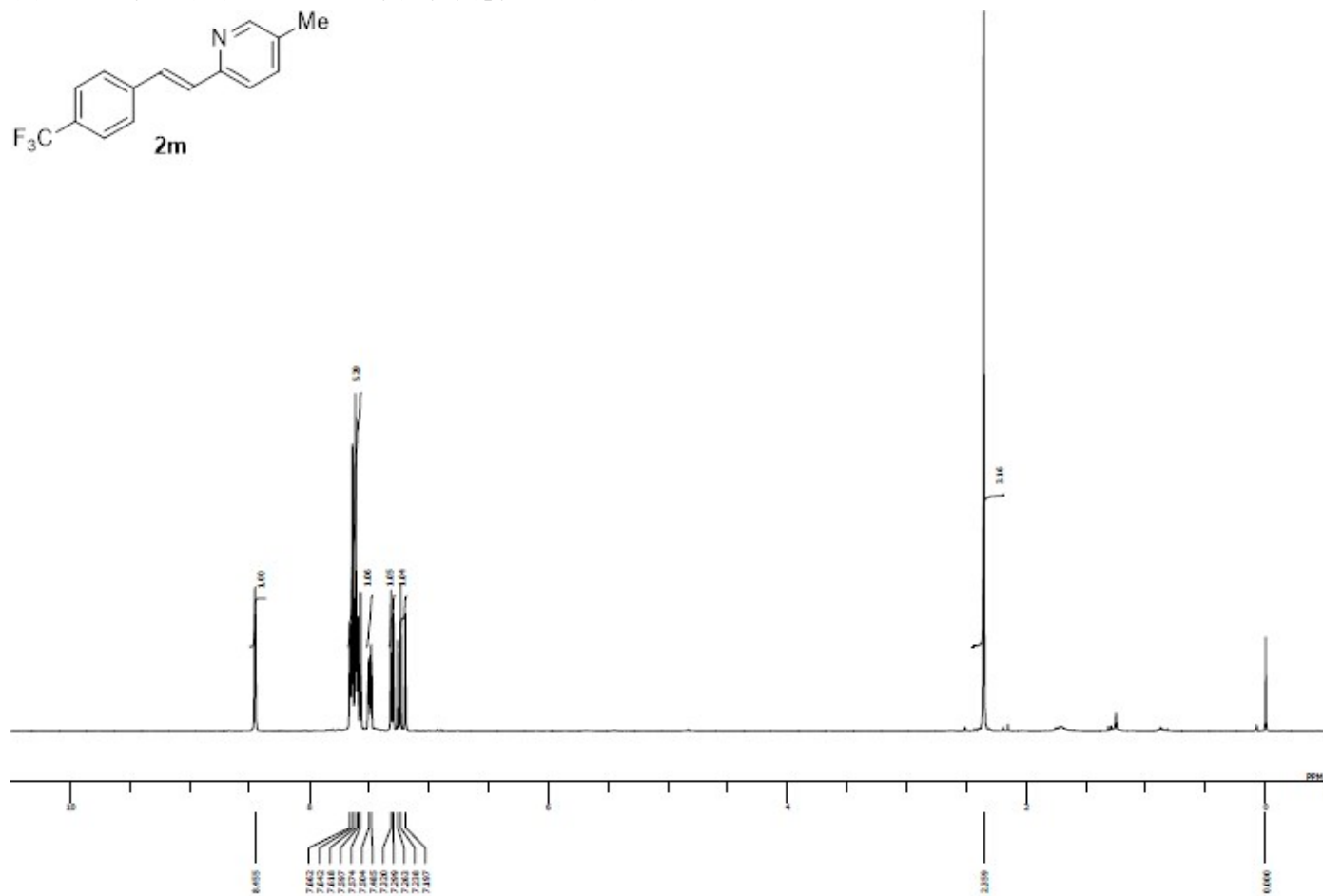
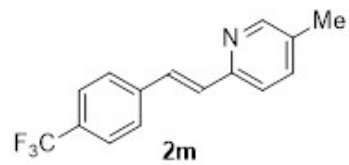
(*E*)-3-styryl-5,6,7,8-tetrahydroisoquinoline (**2k**).



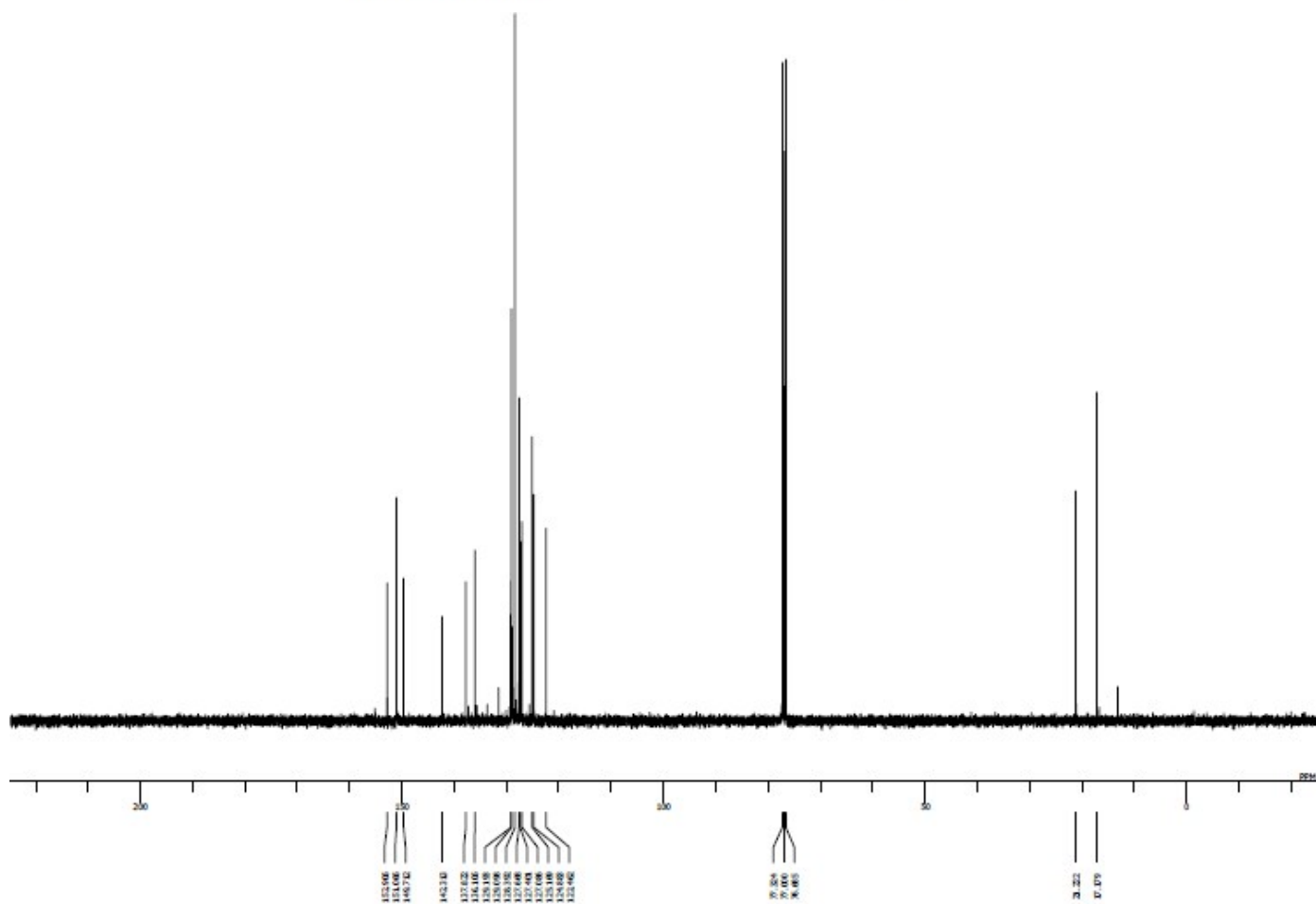
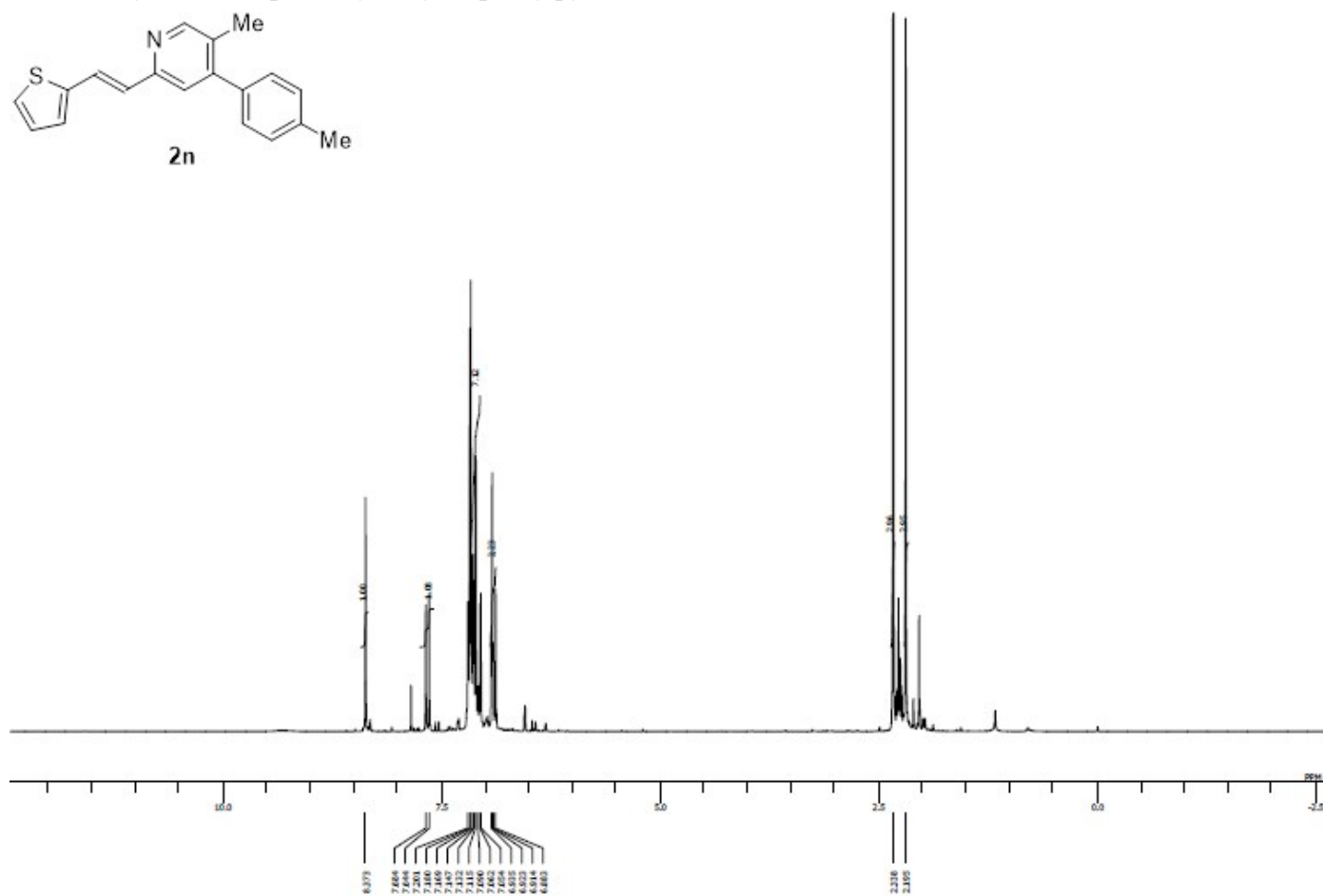
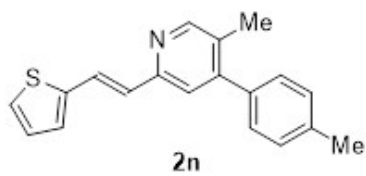
(E)-2-(4-methoxystyryl)-5-methylpyridine (21).



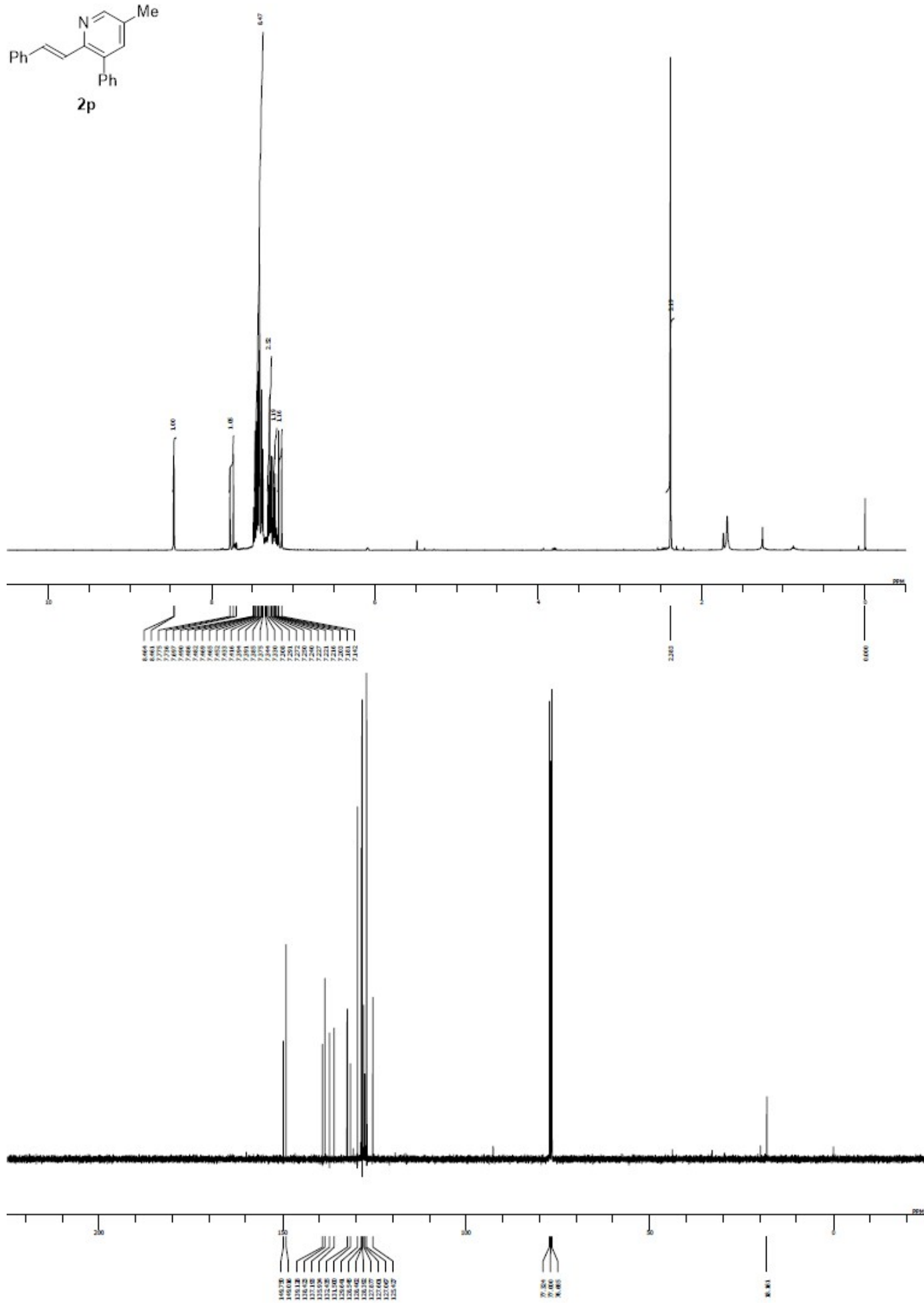
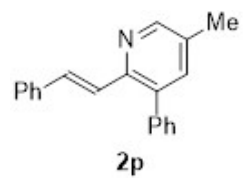
(E)-5-methyl-2-(4-(trifluoromethyl)styryl)pyridine (2m).



(E)-5-methyl-2-(2-(thiophen-2-yl)vinyl)-4-p-tolylpyridine (2n).



(E)-5-methyl-3-phenyl-2-styrylpyridine (2p).



(E)-5-methyl-2-styryl-3,4-dihydropyridine 1-oxide (3a).

