Supporting Information

Cyclization of Sulfide, Ether or Tertiary Amine Tethered N-sulfonyl-1,2,3-triazoles: A Facile Synthetic Protocol to 3-Substituted Isoquinolines or Dihydroisoquinolines

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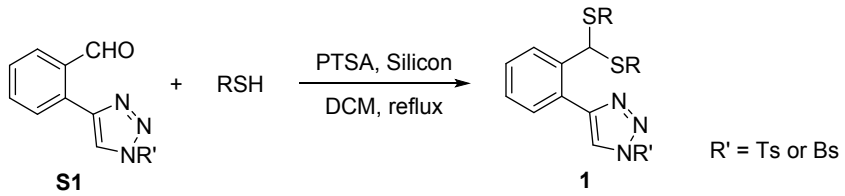
General Remarks: ^{1}H NMR spectra were recorded on a Bruker AM-400 spectrometer for solution in $CDCl_3$ with tetramethylsilane (TMS) as internal standard; J-values are in Hz. Mass spectra were recorded with a HP-5989 instrument. All of the compounds reported in this paper gave satisfactory HRMS analytic data. Melting points were determined on a digital melting point apparatus and temperatures were uncorrected. Infrared spectra were recorded on a Perkin-Elmer PE-983 spectrometer with absorption in cm^{-1}. THF, toluene and Et_2O were distilled from sodium (Na) under argon (Ar) atmosphere. CH_3CN, 1,2-dichloroethane, dichloromethane and chloroform were distilled from CaH_2 under argon (Ar) atmosphere. Commercially obtained reagents were used without further purification. All reactions were monitored by TLC with Huanghai GF254 silica gel coated plates. Flash column chromatography was carried out using 300-400 mesh silica gel at increased pressure.

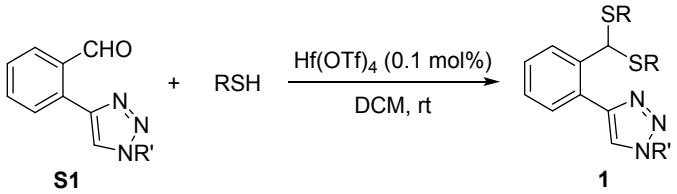
General procedure for the synthesis of compounds 1a-1l, 1r, 1s:



S1 1

A mixture of corresponding **S1**[1] (5.0 mmol), RSH (1.5 eq), PTSA (0.2 eq) and silicon (500 mg) in DCM (10 mL) was stirred at 50 °C for an appropriate time. After completion of the reaction as indicated by TLC, the solvent was removed under reduced pressure and the residue was purified by silica gel column flash chromatography (eluent: petroleum ether / ethyl acetate = 10 / 1) to afford the products **1** in moderate yields.

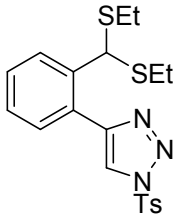
General procedure for the synthesis of compounds 1m-1q:



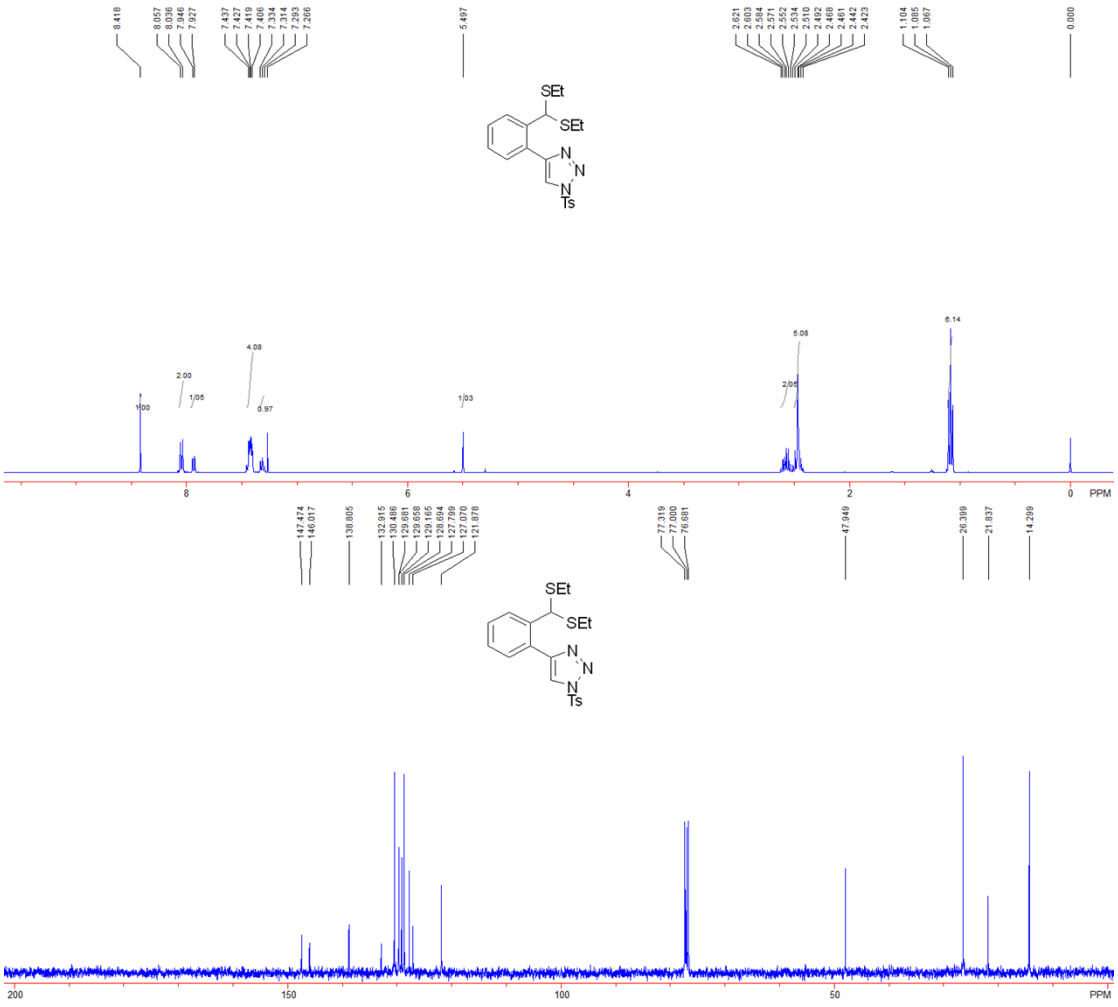
S1 1

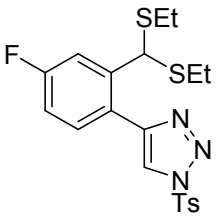
A mixture of corresponding **S1**[1] (5.0 mmol), RSH (1.5 eq), $Hf(OTf)_4$ (0.001 eq) in DCM (10 mL) was stirred at room temperature for an appropriate time. After completion of the reaction as indicated by TLC, the solvent was removed under reduced pressure and the residue was purified by silica gel column flash chromatography (eluent: petroleum ether / ethyl acetate = 10 / 1) to afford the products **1** in moderate yields.

Spectroscopic Data of Substrates 1

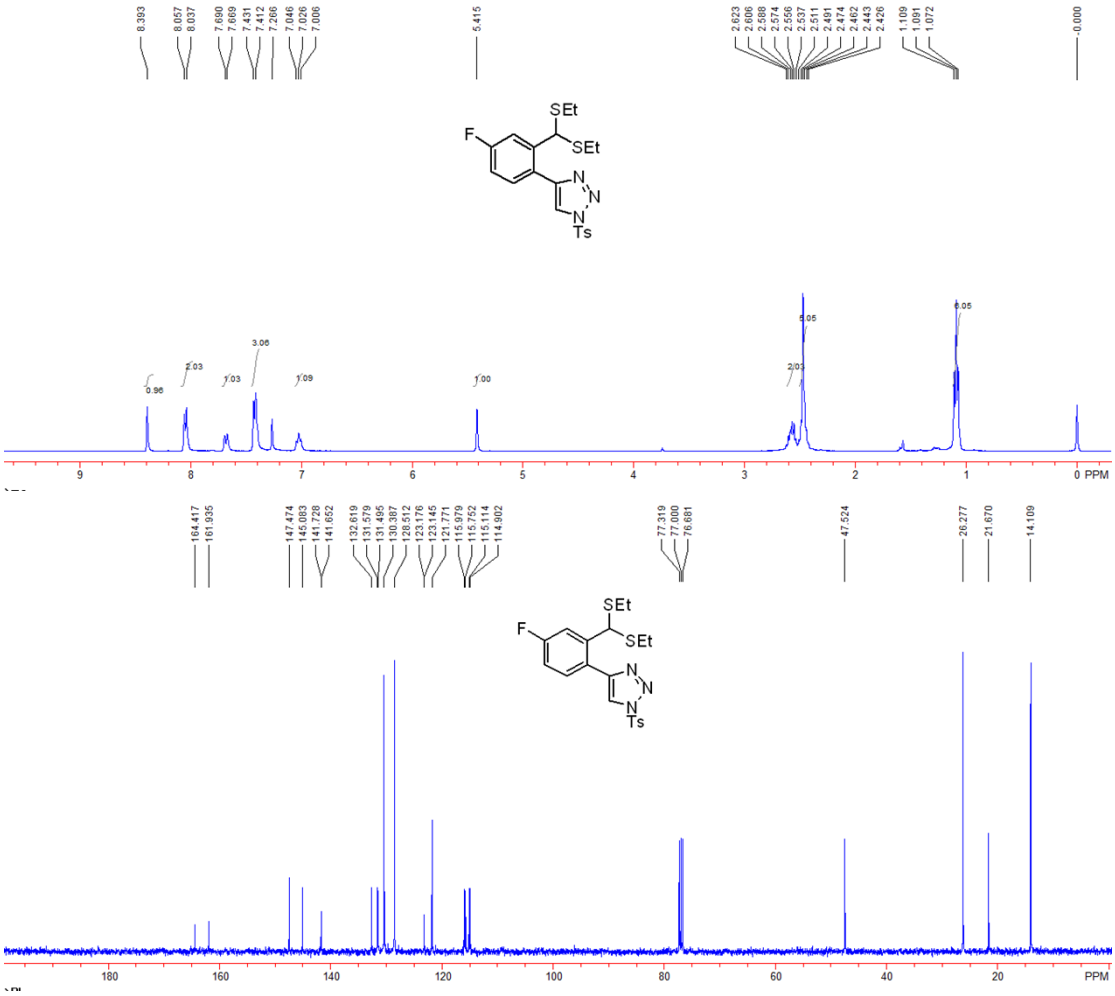


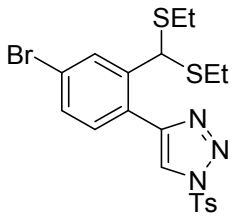
4-(2-(bis(ethylthio)methyl)phenyl)-1-tosyl-1*H*-1,2,3-triazole **1a**: a white solid; Mp: 80-81 °C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.09 (t, J = 7.2 Hz, 6H), 2.42-2.51 (m, 5H), 2.53-2.63 (m, 2H), 5.50 (s, 1H), 7.31 (dd, $J_1 = J_2$ = 8.0 Hz, 1H), 7.41-7.44 (m, 4H), 7.94 (d, J = 8.0 Hz, 1H), 8.05 (d, J = 8.4 Hz, 2H), 8.42 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.3, 21.8, 26.4, 47.9, 121.9, 127.1, 127.8, 128.7, 129.2, 129.66, 129.68, 130.5, 132.9, 138.8, 146.0, 147.5; IR (CH_2Cl_2) ν 3151, 2972, 2930, 2873, 2253, 1595, 1449, 1397, 1196, 1176, 1092, 986, 904, 725, 669 cm^{-1}; HRMS (ESI) Calcd. for $C_{18}H_{18}N_3O_2S_2$ $(M\text{-}EtS)^+$: 372.0835, found: 372.0839.



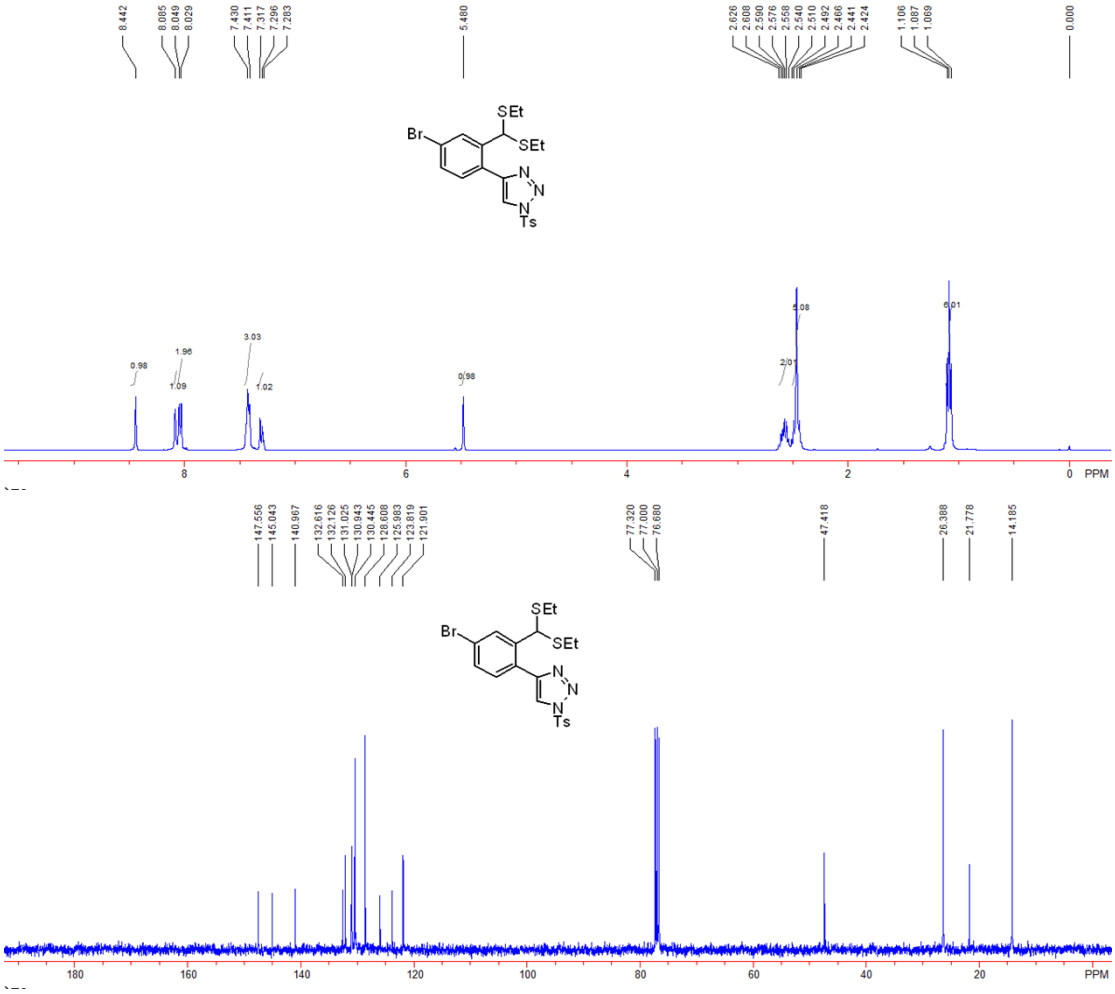


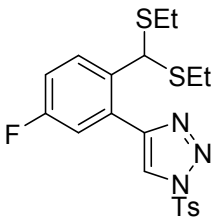
4-(2-(bis(ethylthio)methyl)-4-fluorophenyl)-1-tosyl-1*H*-1,2,3-triazole **1b**: a white solid; Mp: 101-102 °C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.09 (t, J = 7.2 Hz, 6H), 2.43-2.52 (m, 5H), 2.53-2.63 (m, 2H), 5.42 (s, 1H), 7.03 (dd, $J_1 = J_2$ = 8.0 Hz, 1H), 7.41-7.44 (m, 3H), 7.68 (d, J = 8.0 Hz, 1H), 8.05 (d, J = 8.0 Hz, 2H), 8.39 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.1, 21.7, 26.3, 47.5, 115.0 (d, J = 21.2 Hz), 115.9 (d, J = 22.7 Hz), 121.8, 123.2 (d, J = 3.1 Hz), 128.5, 130.4, 131.5 (d, J = 8.4 Hz), 132.6, 141.7 (d, J = 7.6 Hz), 145.1, 147.5, 163.2 (d, J = 248.2 Hz); IR (CH_2Cl_2) ν 3143, 2967, 2927, 2871, 1609, 1394, 1194, 988, 701 cm^{-1}; HRMS (ESI) Calcd. for $C_{18}H_{17}FN_3O_2S_2$ $(M\text{-}EtS)^+$: 390.0741, found: 390.0744.



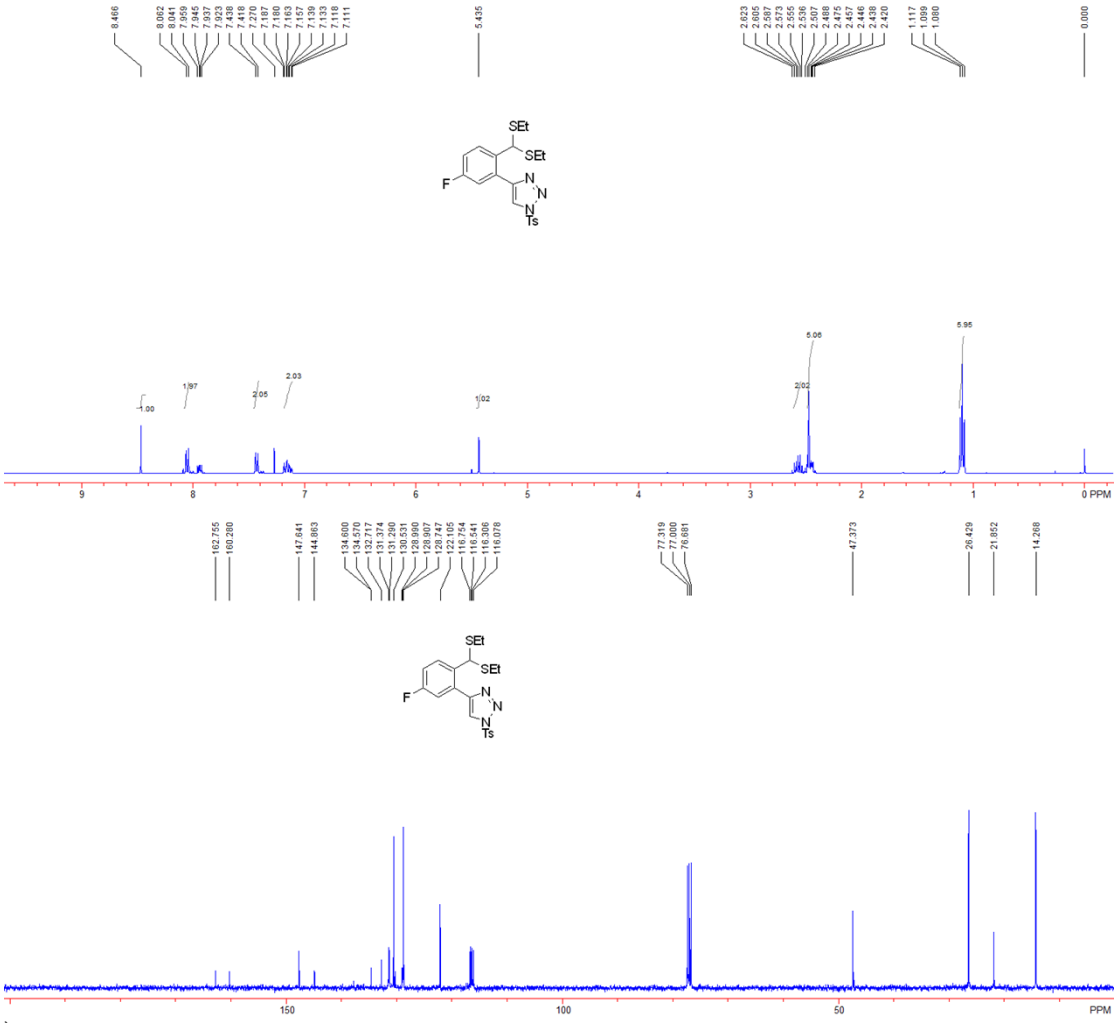


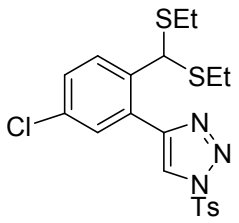
4-(2-(bis(ethylthio)methyl)-4-bromophenyl)-1-tosyl-1*H*-1,2,3-triazole **1c**: a white solid; Mp: 99-100 °C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.09 (t, *J* = 7.2 Hz, 6H), 2.42-2.51 (m, 5H), 2.54-2.63 (m, 2H), 5.48 (s, 1H), 7.31 (d, *J* = 8.4 Hz, 1H), 7.41-7.43 (m, 3H), 8.04 (d, *J* = 8.0 Hz, 2H), 8.09 (s, 1H), 8.44 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.2, 21.8, 26.4, 47.4, 121.9, 123.8, 126.0, 128.6, 130.4, 130.9, 131.0, 132.1, 132.6, 141.0, 145.0, 147.6; IR (CH_2Cl_2) ν 3144, 2968, 2926, 2870, 1954, 1394, 1195, 1175, 987, 669 cm^{-1}; HRMS (ESI) Calcd. for $C_{20}H_{23}BrN_3O_2S_3$ $(M+H)^+$: 512.0130, found: 512.0131.



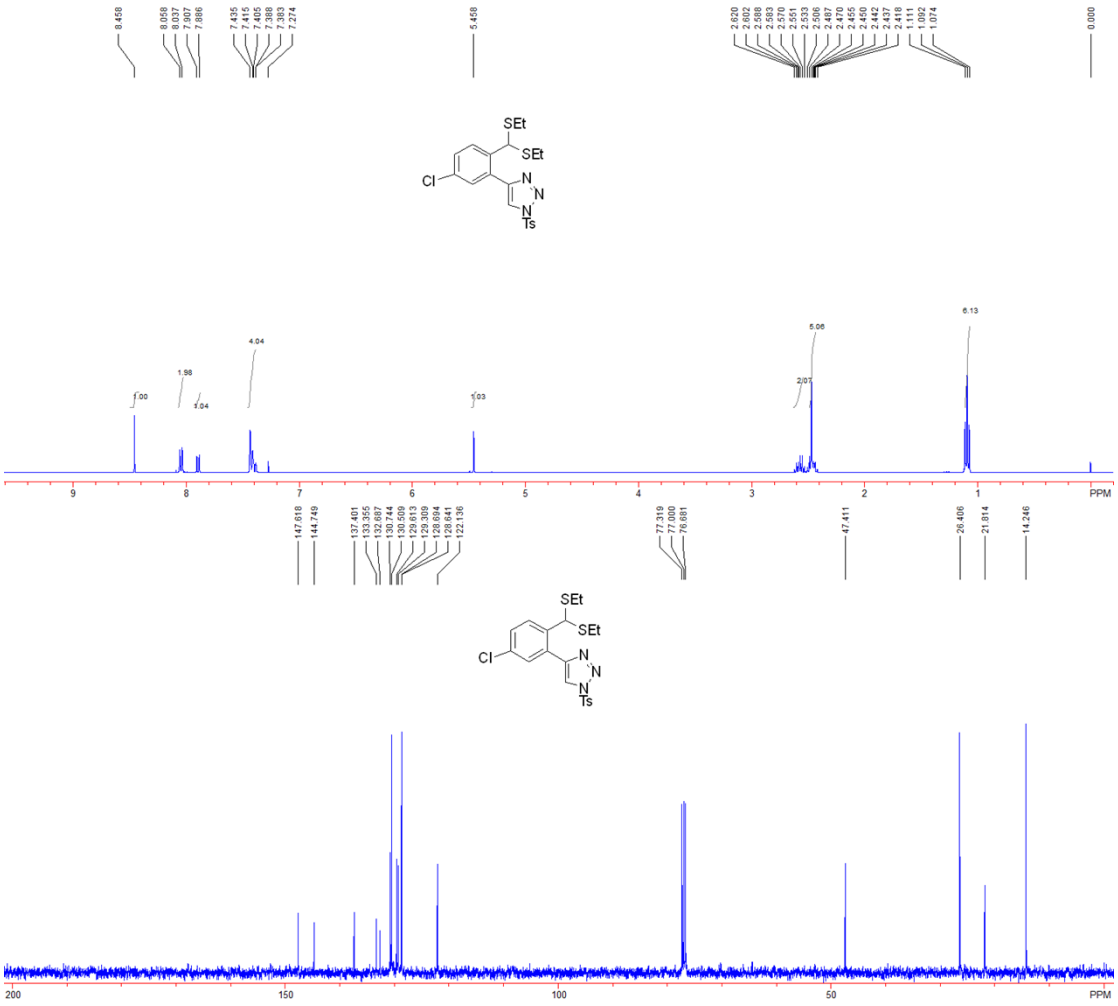


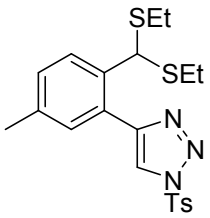
4-(2-(bis(ethylthio)methyl)-5-fluorophenyl)-1-tosyl-1*H*-1,2,3-triazole **1d**: a white solid; Mp: 108-110 °C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.10 (t, *J* = 7.2 Hz, 6H), 2.42-2.51 (m, 5H), 2.53-2.63 (m, 2H), 5.44 (s, 1H), 7.11-7.19 (m, 2H), 7.43 (d, *J* = 8.0 Hz, 2H), 7.92-7.96 (m, 1H), 8.05 (d, *J* = 8.0 Hz, 2H), 8.47 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.3, 21.9, 26.4, 47.4, 116.2 (d, *J* = 22.8 Hz), 116.6 (d, *J* = 21.3 Hz), 122.1, 128.7, 128.9 (d, *J* = 8.3 Hz), 130.5, 131.3 (d, *J* = 8.4 Hz), 132.7, 134.6 (d, *J* = 3.0 Hz), 144.9, 147.6, 161.5 (d, *J* = 247.5 Hz); IR (CH_2Cl_2) ν 3147, 2971, 2928, 2872, 2255, 1586, 1481, 1398, 1196, 1177, 1002, 909, 731, 670 cm^{-1}; HRMS (ESI) Calcd. for $C_{18}H_{17}FN_3O_2S_2$ $(M\text{-}EtS)^+$: 390.0741, found: 390.0740.



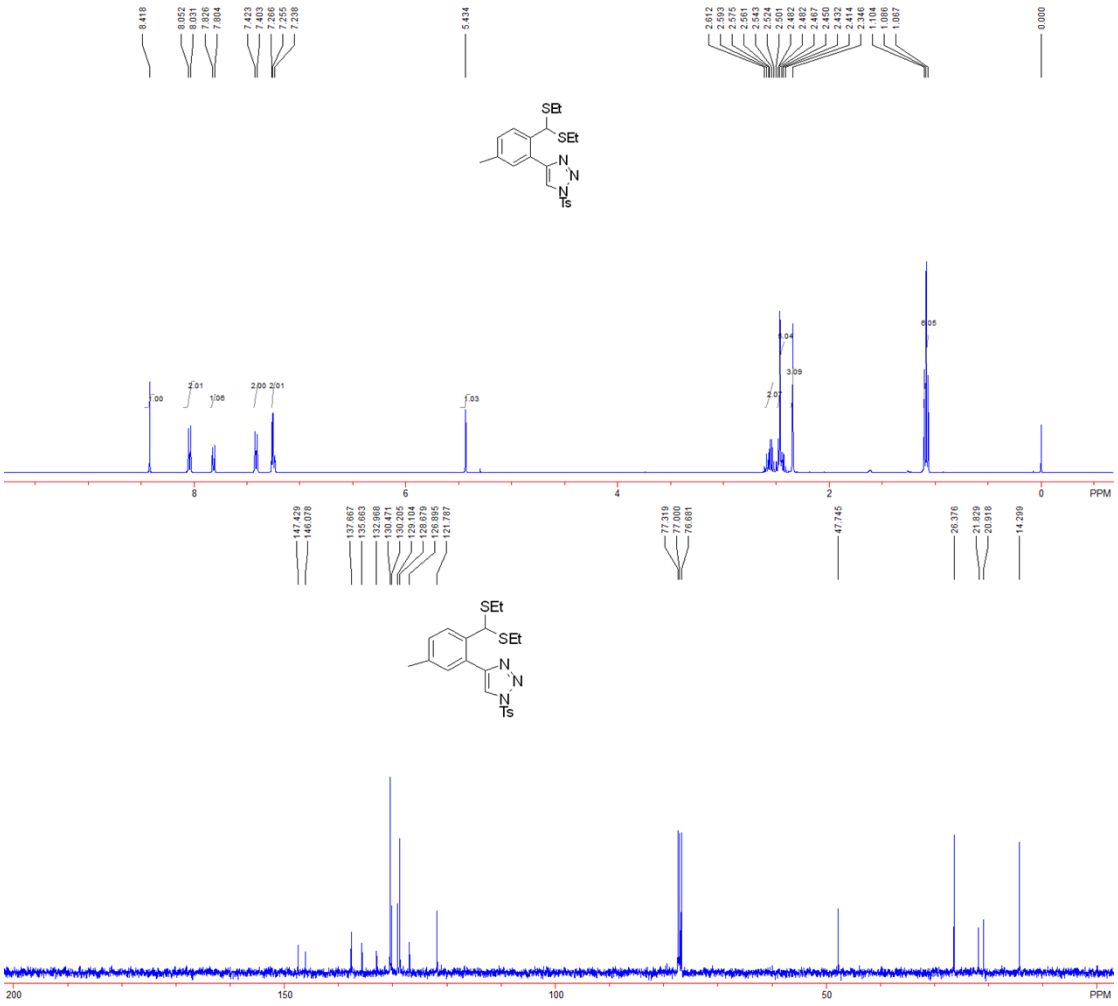


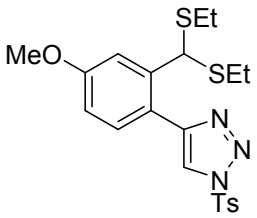
4-(2-(bis(ethylthio)methyl)-5-chlorophenyl)-1-tosyl-1*H*-1,2,3-triazole **1e**: a white solid; Mp: 129-131 ^{o}C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.09 (t, *J* = 7.2 Hz, 6H), 2.41-2.51 (m, 5H), 2.53-2.62 (m, 2H), 5.46 (s, 1H), 7.38-7.44 (m, 4H), 7.90 (d, *J* = 8.4 Hz, 1H), 8.05 (d, *J* = 8.4 Hz, 2H), 8.46 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.2, 21.8, 26.4, 47.4, 122.1, 128.6, 128.7, 129.3, 129.6, 130.5, 130.7, 132.7, 133.4, 137.4, 144.7, 147.6; IR (CH_2Cl_2) ν 3144, 2968, 2927, 2871, 2252, 1594, 1455, 1394, 1196, 1176, 1091, 995, 812, 734, 670 cm^{-1}; HRMS (ESI) Calcd. for $C_{18}H_{17}ClN_3O_2S_2$ $(M\text{-}EtS)^+$: 406.0445, found: 406.0448.



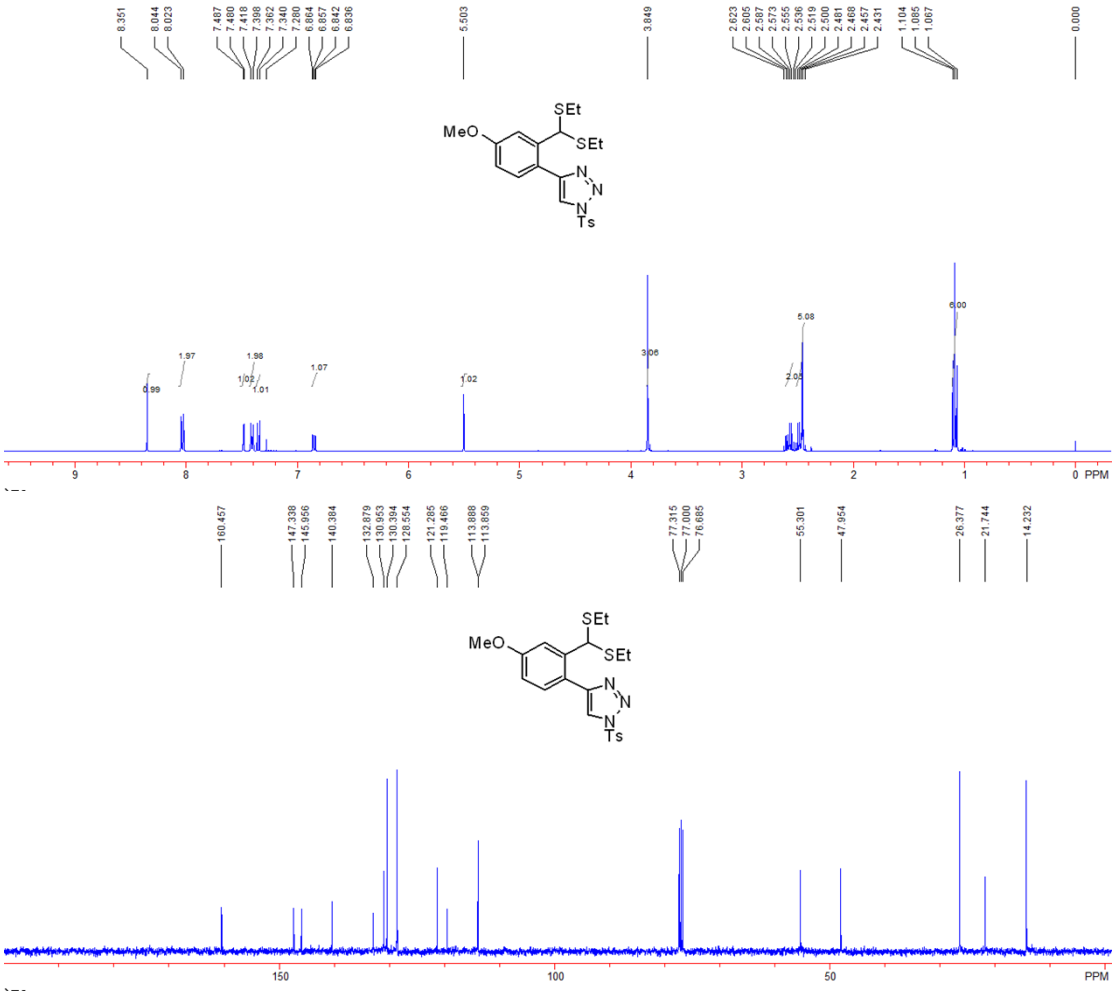


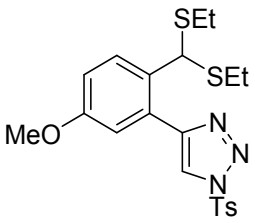
4-(2-(bis(ethylthio)methyl)-5-methylphenyl)-1-tosyl-1*H*-1,2,3-triazole **1f**: a white solid; Mp: 99-100 °C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.09 (t, *J* = 7.2 Hz, 6H), 2.35 (s, 3H), 2.41-2.51 (m, 5H), 2.52-2.62 (m, 2H), 5.43 (s, 1H), 7.23-7.27 (m, 2H), 7.41 (d, *J* = 8.4 Hz, 2H), 7.82 (d, *J* = 8.8 Hz, 1H), 8.04 (d, *J* = 8.4 Hz, 2H), 8.42 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.3, 20.9, 21.8, 26.4, 47.7, 121.8, 126.9, 128.7, 129.1, 130.2, 130.5, 133.0, 135.7, 137.7, 146.1, 147.4; IR (CH_2Cl_2) ν 3145, 2962, 2925, 2870, 2253, 1594, 1451, 1393, 1195, 1176, 1092, 991, 907, 729, 669 cm^{-1}; HRMS (ESI) Calcd. for $C_{19}H_{20}N_3O_2S_2$ $(M\text{-}EtS)^+$: 386.0991, found: 386.0995.



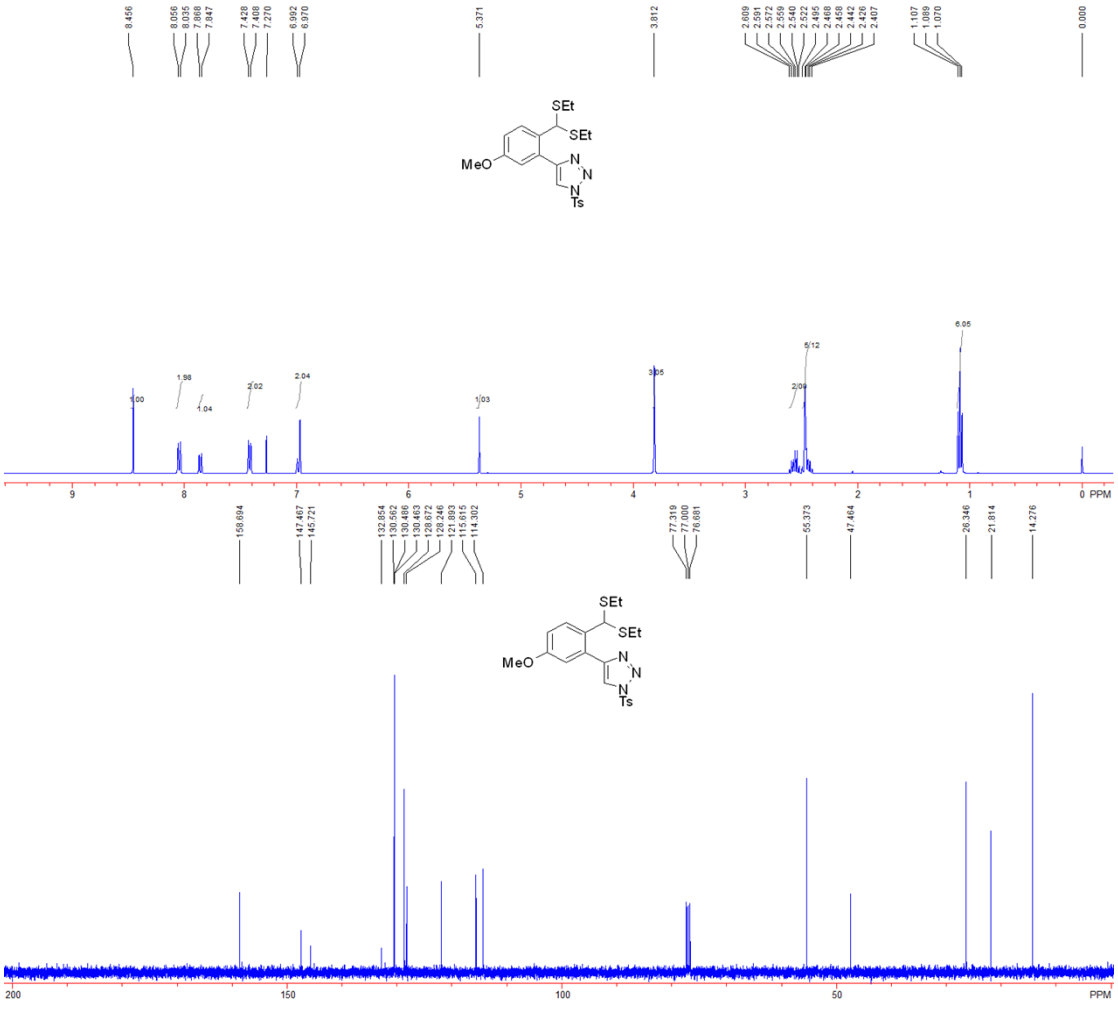


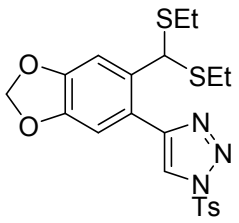
4-(2-(bis(ethylthio)methyl)-4-methoxyphenyl)-1-tosyl-1*H*-1,2,3-triazole **1g**: a white solid; Mp: 96-97 °C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.09 (t, *J* = 7.2 Hz, 6H), 2.43-2.52 (m, 5H), 2.53-2.63 (m, 2H), 3.85 (s, 3H), 5.50 (s, 1H), 6.85 (dd, *J* = 2.8 Hz, *J* = 8.8 Hz, 1H), 7.35 (d, *J* = 8.8 Hz, 1H), 7.41 (d, *J* = 8.0 Hz, 2H), 7.48 (d, *J* = 2.8 Hz, 1H), 8.03 (d, *J* = 8.0 Hz, 2H), 8.35 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.2, 21.7, 26.4, 48.0, 55.3, 113.86, 113.89, 119.5, 121.3, 128.6, 130.4, 131.0, 132.9, 140.4, 146.0, 147.3, 160.5; IR (CH_2Cl_2) ν 3143, 2964, 2927, 2837, 1609, 1594, 1392, 1194, 1176, 986, 736, 669 cm^{-1}; HRMS (ESI) Calcd. for $C_{21}H_{26}N_3O_3S_3$ $(M\text{-}EtS)^+$: 464.1131, found: 464.1133.



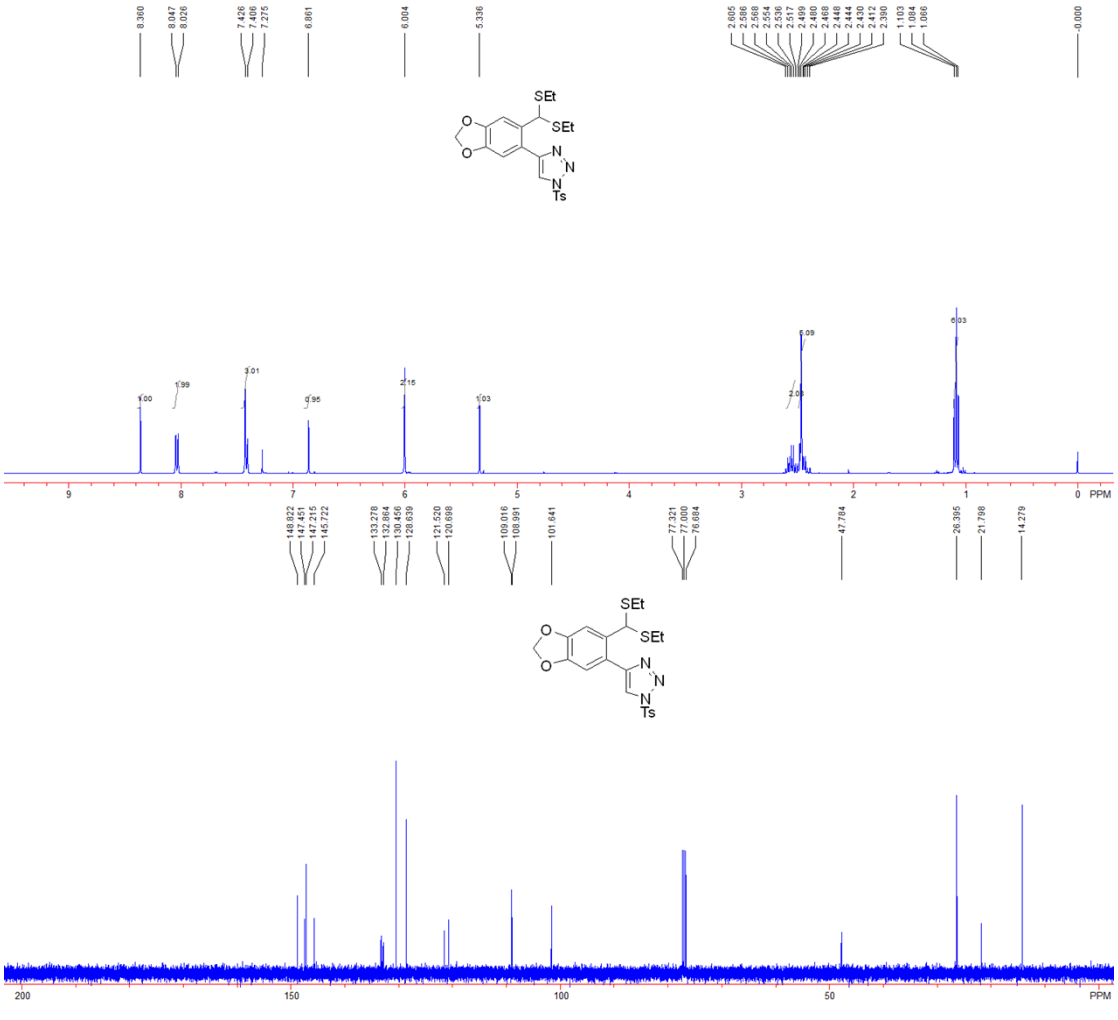


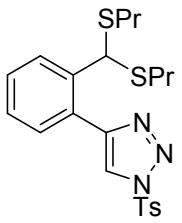
4-(2-(bis(ethylthio)methyl)-5-methoxyphenyl)-1-tosyl-1*H*-1,2,3-triazole **1h**: a white solid; Mp: 99-101 ^{o}C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.09 (t, *J* = 7.2 Hz, 6H), 2.40-2.53 (m, 5H), 2.54-2.61 (m, 2H), 3.81 (s, 3H), 5.37 (s, 1H), 6.97 (s, 1H), 6.98 (d, *J* = 8.4 Hz, 1H), 7.42 (d, *J* = 8.0 Hz, 2H), 7.86 (d, *J* = 8.4 Hz, 1H), 8.05 (d, *J* = 8.0 Hz, 2H), 8.46 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.3, 21.8, 26.3, 47.5, 55.4, 114.3, 115.6, 121.9, 128.2, 128.7, 130.46, 130.49, 130.6, 132.9, 145.7, 147.5, 158.7; IR (CH_2Cl_2) ν 3145, 2963, 2923, 2864, 2253, 1607, 1594, 1394, 1195, 1175, 1091, 996, 907, 728, 669 cm^{-1}; HRMS (ESI) Calcd. for $C_{19}H_{20}N_3O_3S_2$ $(M\text{-}EtS)^+$: 402.0941, found: 402.0945.



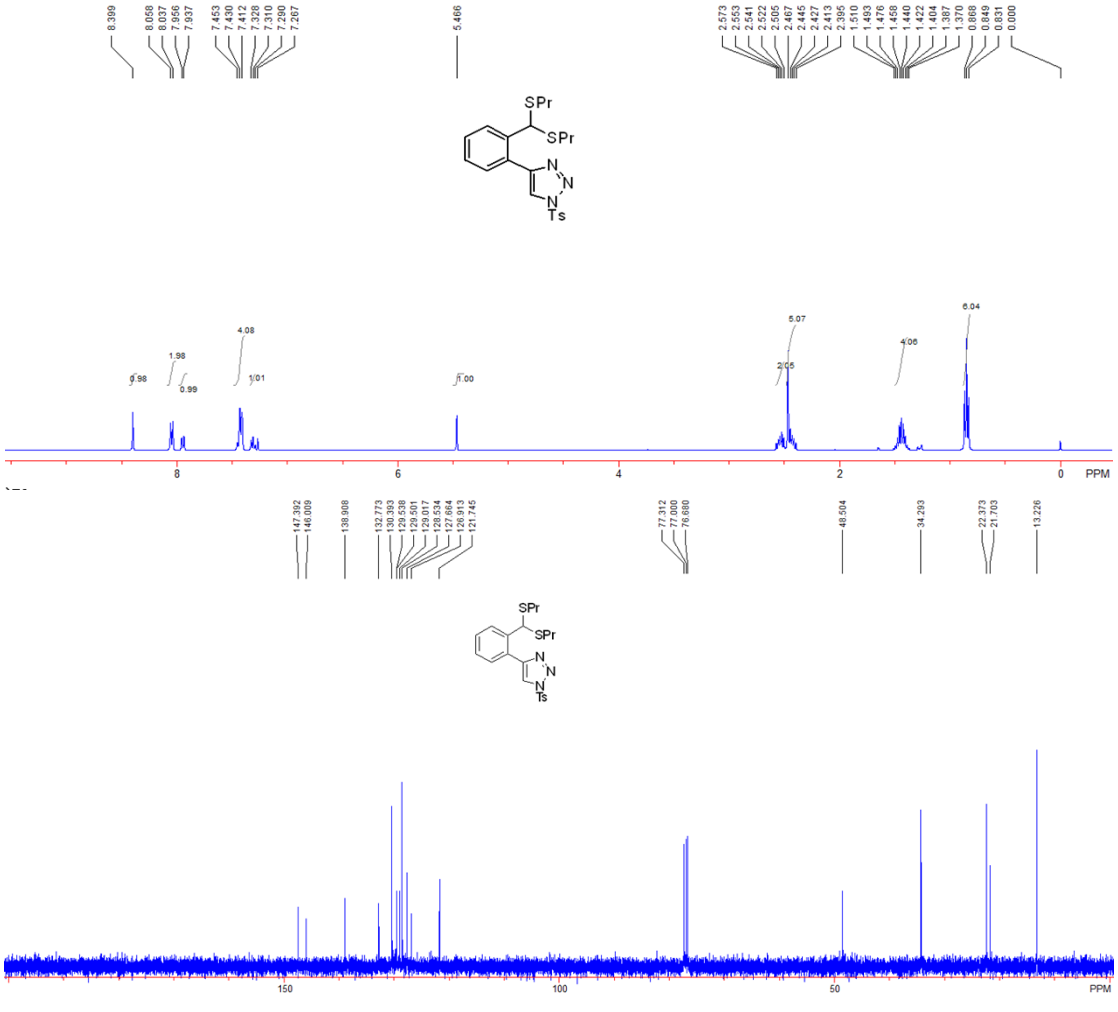


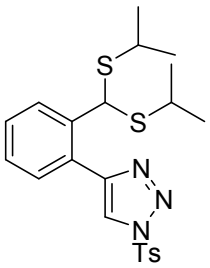
4-(6-(bis(ethylthio)methyl)benzo[d][1,3]dioxol-5-yl)-1-tosyl-1*H*-1,2,3-triazole **1i**: a white solid; Mp: 117-119 ^{o}C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.08 (t, *J* = 7.2 Hz, 6H), 2.39-2.52 (m, 5H), 2.53-2.61 (m, 2H), 5.34 (s, 1H), 6.00 (s, 2H), 6.86 (s, 1H), 7.42 (d, *J* = 8.0 Hz, 2H), 7.43 (s, 1H), 8.04 (d, *J* = 8.0 Hz, 2H), 8.36 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.3, 21.8, 26.4, 47.8, 101.6, 108.99, 109.02, 120.7, 121.5, 128.6, 130.5, 132.9, 133.3, 145.7, 147.2, 147.5, 148.8; IR (CH_2Cl_2) ν 3150, 2968, 2927, 2253, 1595, 1478, 1394, 1195, 1175, 1085, 980, 905, 726, 670 cm^{-1}; HRMS (ESI) Calcd. for $C_{19}H_{18}N_3O_4S_2$ $(M\text{-}EtS)^+$: 416.0733, found: 416.0730.



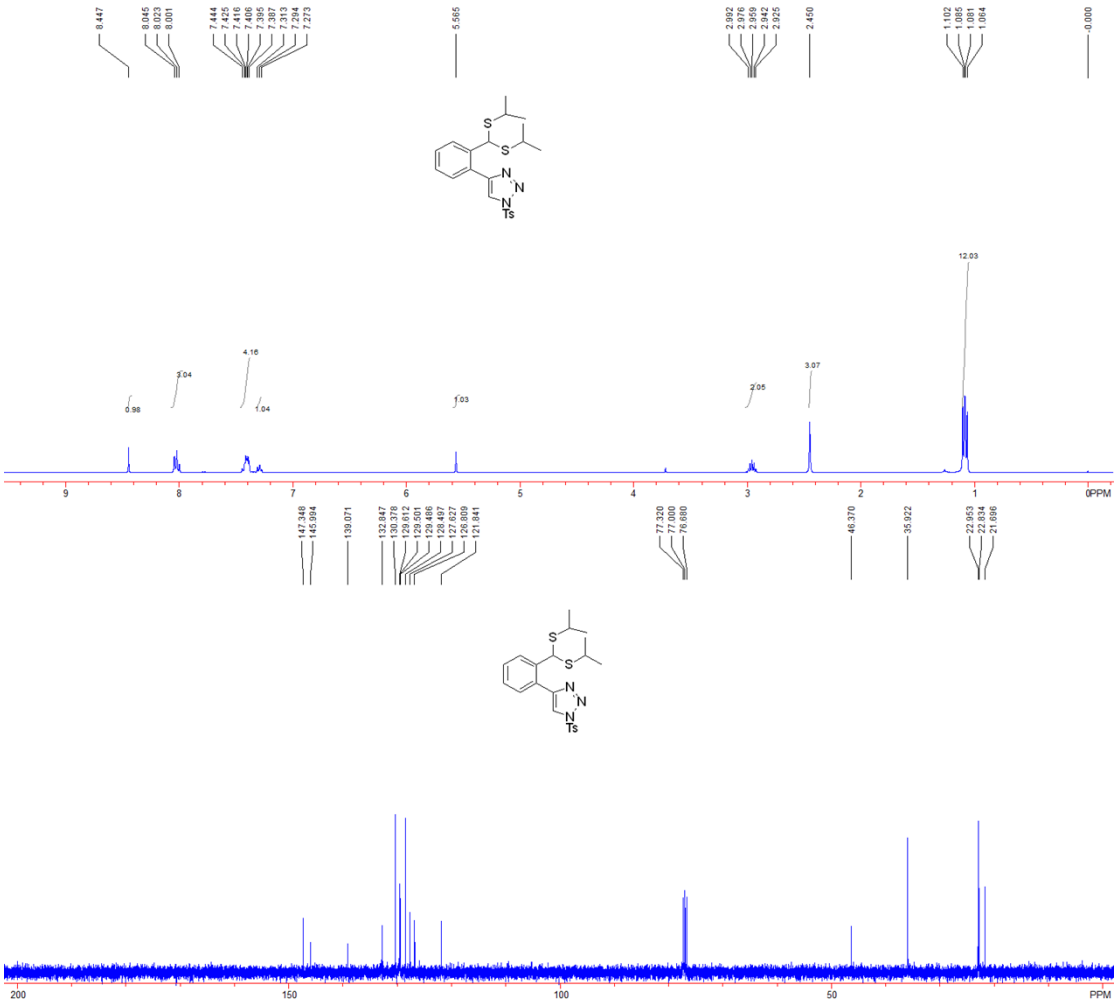


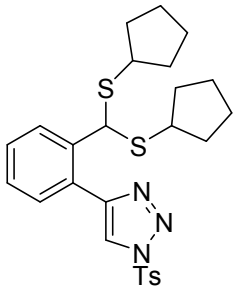
4-(2-(bis(propylthio)methyl)phenyl)-1-tosyl-1*H*-1,2,3-triazole **1j**: a white solid; Mp: 90-92 ^{o}C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 0.85 (t, J = 7.6 Hz, 6H), 1.37-1.51 (m, 4H), 2.40-2.47 (m, 5H), 2.51-3.57 (m, 2H), 5.47 (s, 1H), 7.31 (dd, J_1 = J_2 = 8.0 Hz, 1H), 7.41-7.46 (m, 4H), 7.95 (d, J = 8.0 Hz, 1H), 8.05 (d, J = 8.4 Hz, 2H), 8.40 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 13.2, 21.7, 22.4, 34.3, 48.5, 121.7, 126.9, 127.7, 128.5, 129.0, 129.50, 129.54, 130.4, 132.8, 138.9, 146.0, 147.4; IR (CH_2Cl_2) ν 3145, 2962, 2929, 2872, 1594, 1396, 1196, 988, 741, 689 cm^{-1}; HRMS (ESI) Calcd. for $C_{19}H_{20}N_3O_2S_2$ $(M\text{-}PrS)^+$: 386.0991, found: 386.0993.



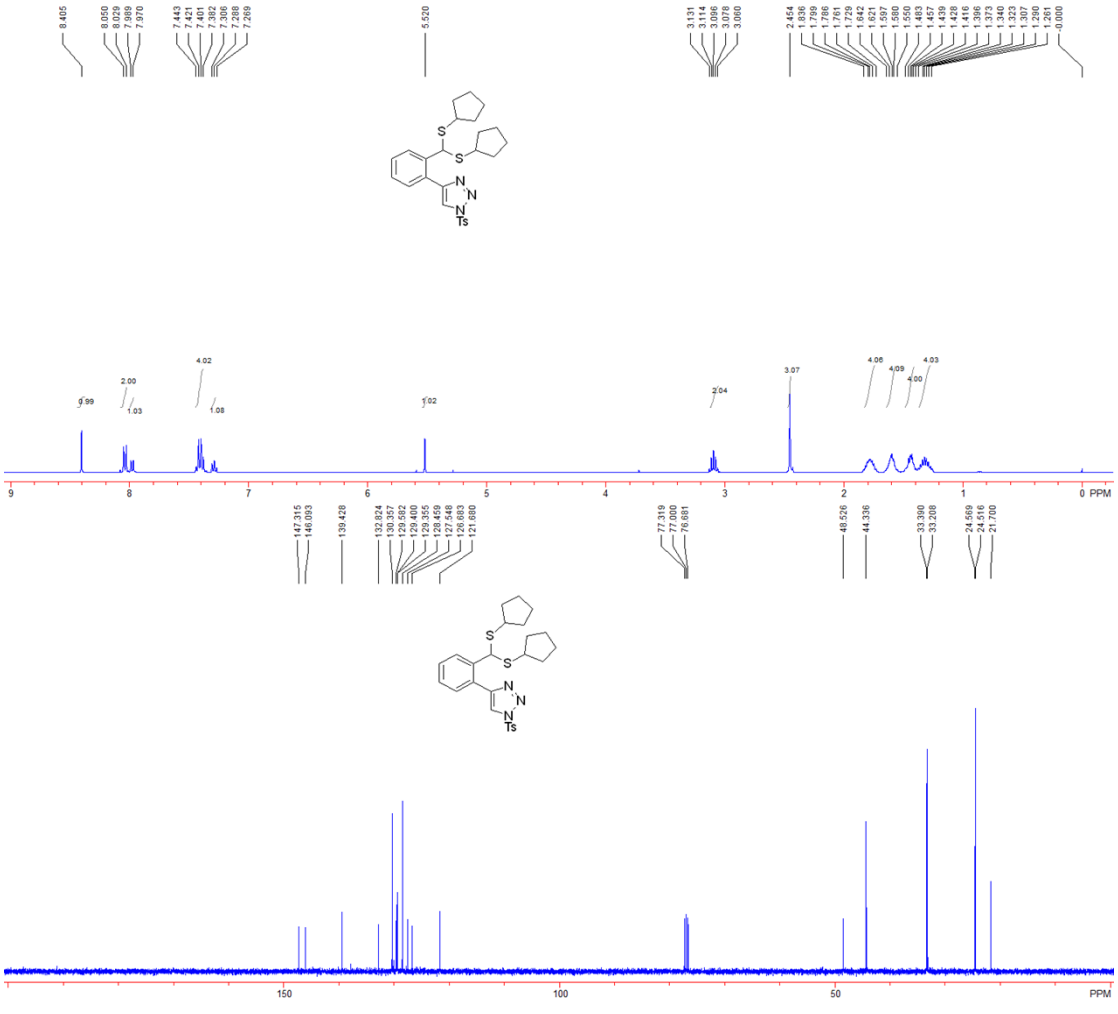


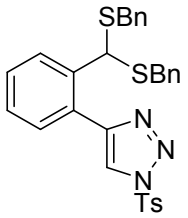
4-(2-(bis(isopropylthio)methyl)phenyl)-1-tosyl-1*H*-1,2,3-triazole **1k**: a white solid; Mp: 121-122 ^{o}C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.07 (d, J = 6.8 Hz, 6H), 1.09 (d, J = 6.8 Hz, 6H), 2.45 (s, 3H), 2.92-3.00 (m, 2H), 5.57 (s, 1H), 7.29 (dd, $J_1 = J_2$ = 8.4 Hz, 1H), 7.38-7.45 (m, 4H), 8.00-8.05 (m, 3H), 8.45 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 21.7, 22.8, 23.0, 35.9, 46.4, 121.8, 126.8, 127.6, 128.5, 129.49, 129.50, 129.6, 130.4, 132.8, 139.1, 146.0, 147.3; IR (CH_2Cl_2) ν 3059, 2956, 2924, 2864, 1593, 1393, 1195, 987, 736, 669 cm^{-1}; HRMS (ESI) Calcd. for $C_{19}H_{20}N_3O_2S_2$ (M-^{i}PrS)$^{+}$: 386.0991, found: 386.0995.



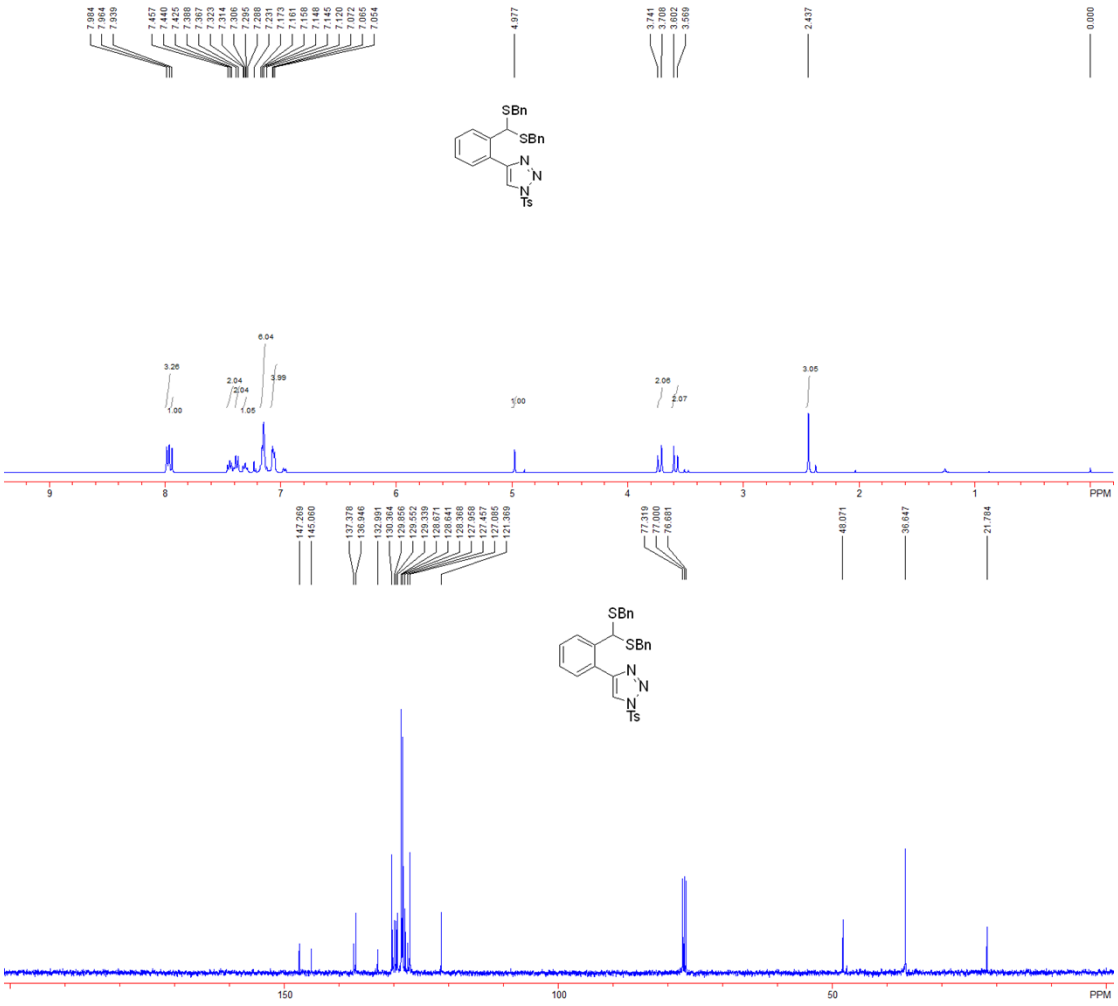


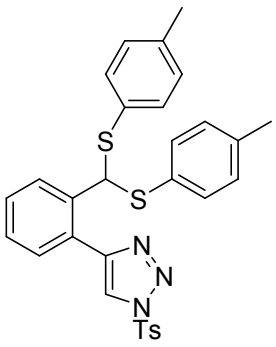
4-(2-(bis(cyclopentylthio)methyl)phenyl)-1-tosyl-1*H*-1,2,3-triazole **1l**: a white solid; Mp: 136-138 ^{o}C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.26-1.34 (m, 4H), 1.37-1.49 (m, 4H), 1.55-1.65 (m, 4H), 1.72-1.84 (m, 4H), 2.45 (s, 3H), 3.06-3.14 (m, 2H), 5.52 (s, 1H), 7.29 (dd, $J_1 = J_2 = 7.6$ Hz, 1H), 7.38-7.45 (m, 4H), 7.98 (d, $J = 7.6$ Hz, 1H), 8.04 (d, $J = 8.4$ Hz, 2H), 8.41 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 21.7, 24.5, 24.6, 33.2, 33.4, 44.3, 48.5, 121.7, 126.7, 127.5, 128.5, 129.36, 129.40, 129.6, 130.4, 132.8, 139.4, 146.1, 147.3; IR (CH_2Cl_2) ν 3146, 3061, 2953, 2866, 1594, 1393, 1195, 986, 735, 669 cm^{-1}; HRMS (ESI) Calcd. for $C_{21}H_{22}N_3O_2S_2$ $(M\text{-}C_5H_9S)^+$: 412.1148, found: 412.1151.



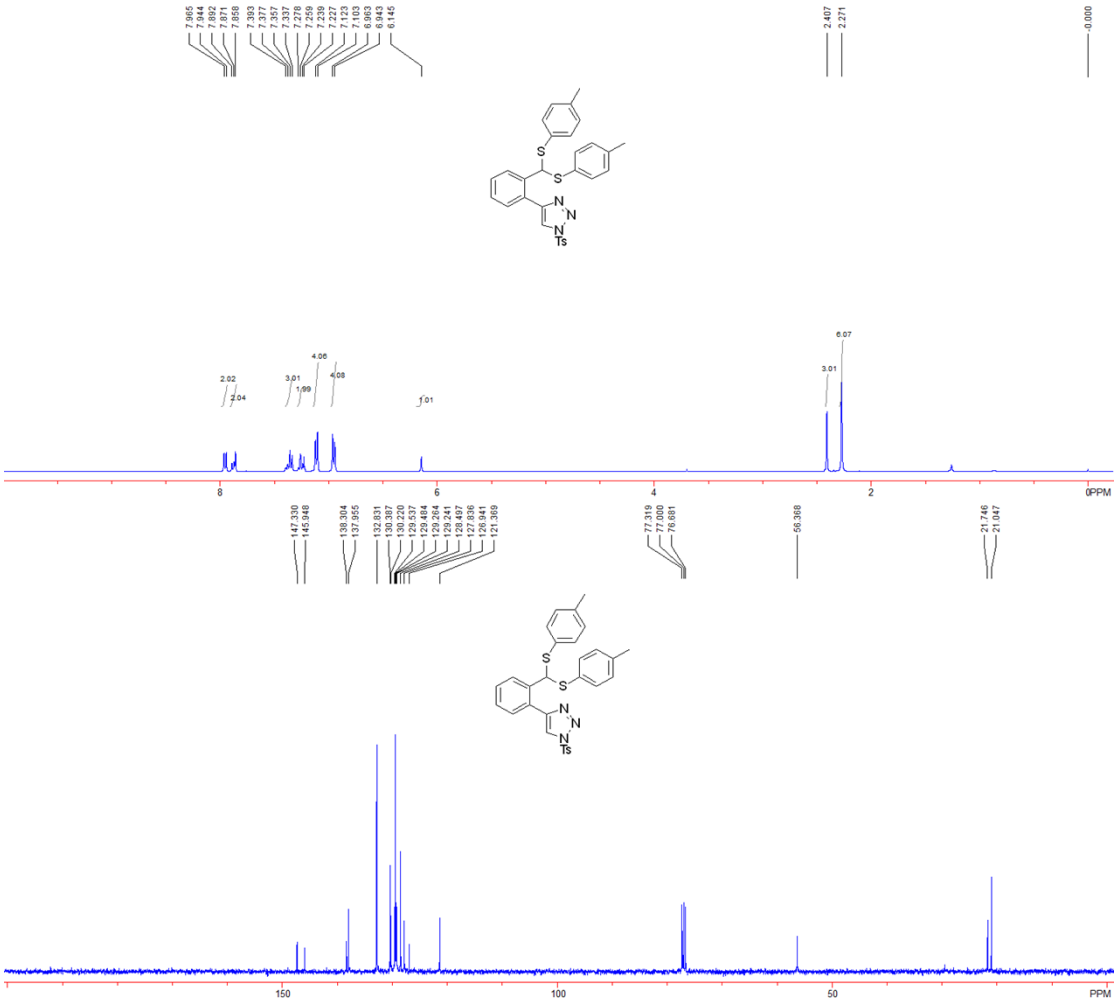


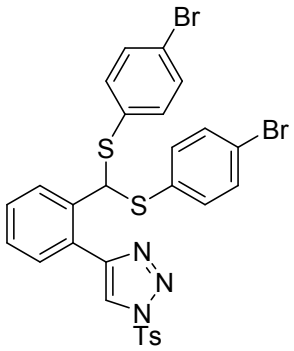
4-(2-(bis(benzylthio)methyl)phenyl)-1-tosyl-1*H*-1,2,3-triazole **1m**: a white solid; Mp: 81-82 ^{o}C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 2.44 (s, 3H), 3.59 (d, *J* = 13.2 Hz, 2H), 3.72 (d, *J* = 13.2 Hz, 2H), 4.98 (s, 1H), 7.05-7.08 (m, 4H), 7.12-7.18 (m, 6H), 7.28-7.33 (m, 1H), 7.38 (d, *J* = 8.4 Hz, 2H), 7.42-7.46 (m, 2H), 7.94 (s, 1H), 7.97 (d, *J* = 8.0 Hz, 3H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 21.8, 36.6, 48.1, 121.4, 127.1, 127.5, 128.0, 128.4, 128.6, 128.7, 129.3, 129.6, 129.9, 130.4, 133.0, 136.9, 137.4, 145.1, 147.3; IR (CH_2Cl_2) ν 3138, 3061, 3028, 2920, 1594, 1494, 1393, 1195, 986, 762, 667 cm^{-1}; HRMS (ESI) Calcd. for $C_{30}H_{28}N_3O_2S_3$ $(M+H)^+$: 558.1338, found: 558.1338.



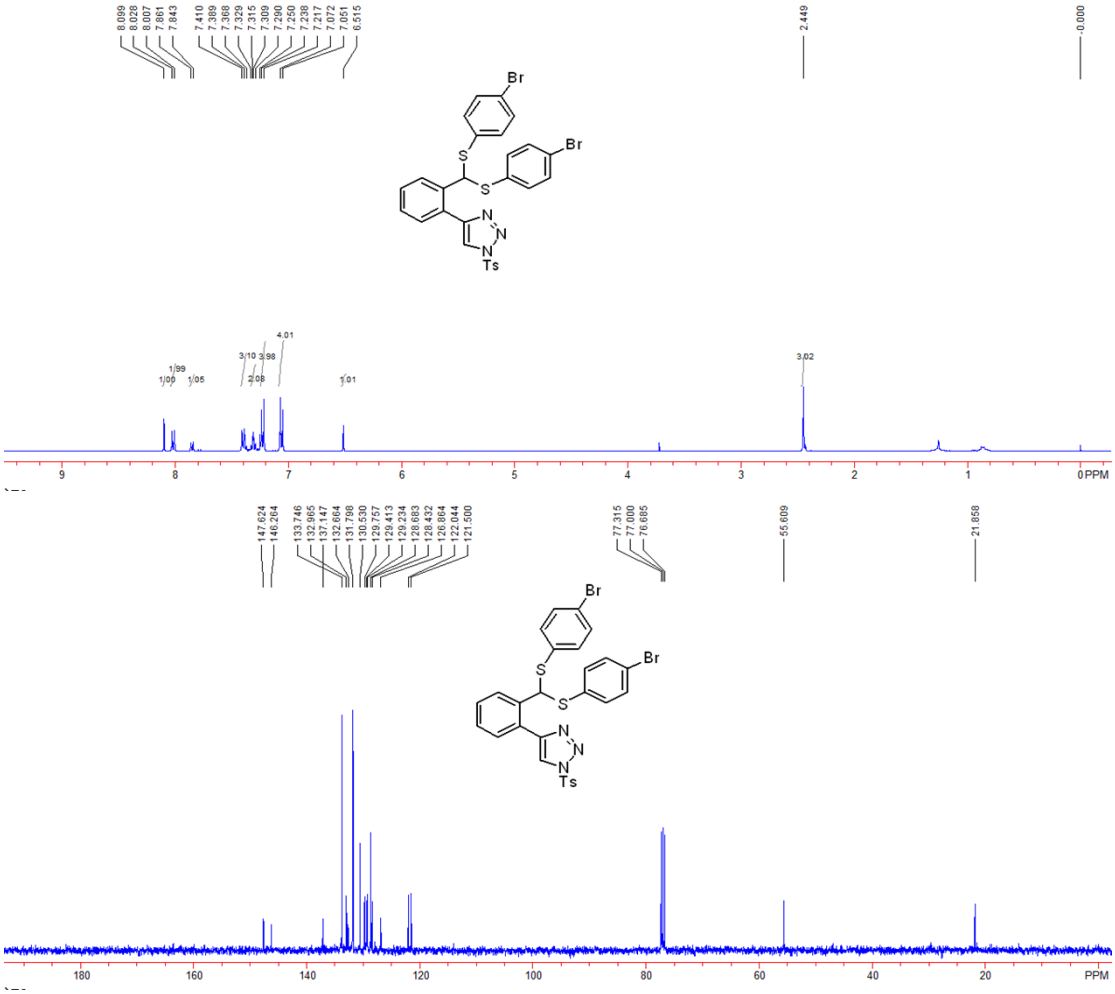


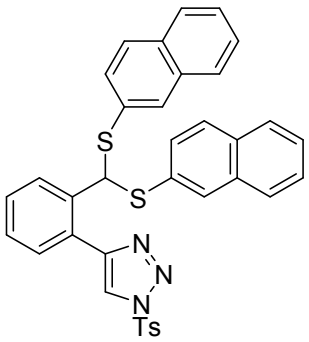
4-(2-(bis(p-tolylthio)methyl)phenyl)-1-tosyl-1*H*-1,2,3-triazole **1n**: a white solid; Mp: 90-92 °C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 2.27 (s, 6H), 2.41 (s, 3H), 6.15 (s, 1H), 6.95 (d, *J* = 8.0 Hz, 4H), 7.11 (d, *J* = 8.0 Hz, 4H), 7.22-7.28 (m, 2H), 7.33-7.40 (m, 3H), 7.86 (s, 1H), 7.88 (d, *J* = 8.4 Hz, 1H), 7.95 (d, *J* = 8.4 Hz, 2H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 21.0, 21.7, 56.4, 121.4, 126.9, 127.8, 128.5, 129.2, 129.3, 129.48, 129.54, 130.2, 130.4, 132.8, 138.0, 138.3, 145.9, 147.3; IR (CH_2Cl_2) ν 3146, 3053, 2922, 2858, 1594, 1394, 1264, 1195, 988, 734, 669 cm^{-1}; HRMS (ESI) Calcd. for $C_{23}H_{20}N_3O_2S_2$ $(M\text{-}C_7H_7S)^+$: 434.0991, found: 434.0995.



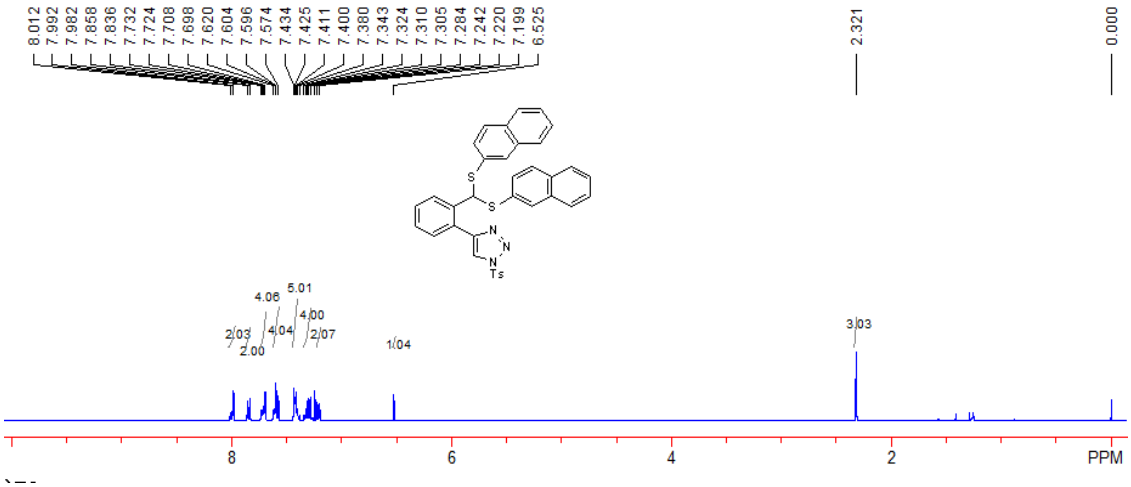


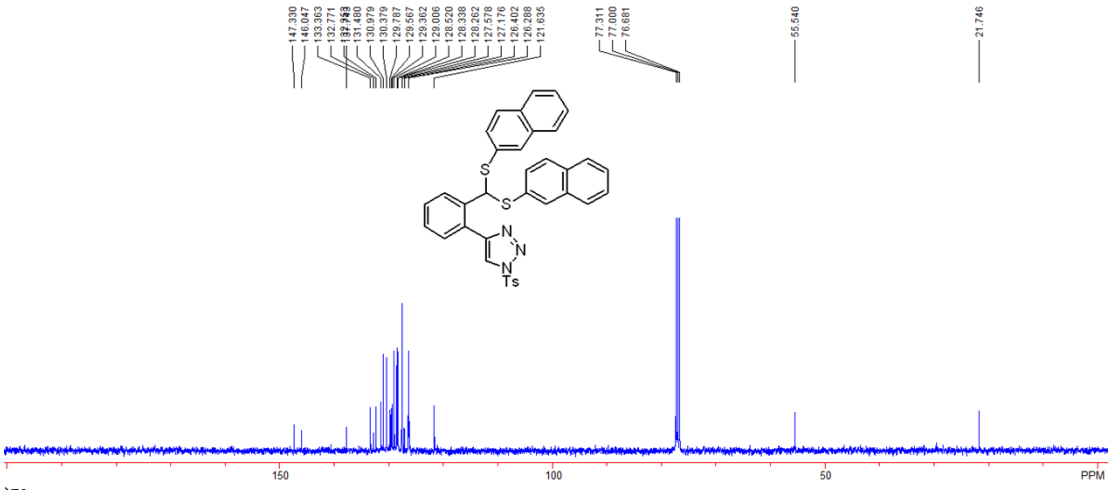
4-(2-(bis((4-bromophenyl)thio)methyl)phenyl)-1-tosyl-1*H*-1,2,3-triazole **1o**: a white solid; Mp: 117-119 ^{o}C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 2.45 (s, 3H), 6.52 (s, 1H), 7.06 (d, *J* = 8.4 Hz, 4H), 7.23 (d, *J* = 8.4 Hz, 4H), 7.29-7.33 (m, 2H), 7.36-7.41 (m, 3H), 7.85 (d, *J* = 7.2 Hz, 1H), 8.02 (d, *J* = 8.4 Hz, 2H), 8.10 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 21.9, 55.6, 121.5, 122.0, 126.9, 128.4, 128.7, 129.2, 129.4, 129.8, 130.5, 131.8, 132.7, 133.0, 133.7, 137.1, 146.3, 147.6; IR (CH_2Cl_2) ν 3144, 3063, 2923, 2853, 1594, 1472, 1393, 1194, 1089, 1008, 811, 668 cm^{-1}; HRMS (ESI) Calcd. for $C_{22}H_{17}BrN_3O_2S_2$ (M-C_6H_4BrS)$^{+}$: 497.9940, found: 497.9932.

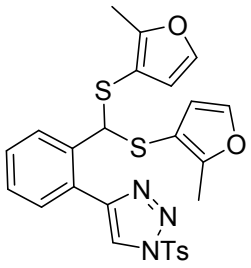




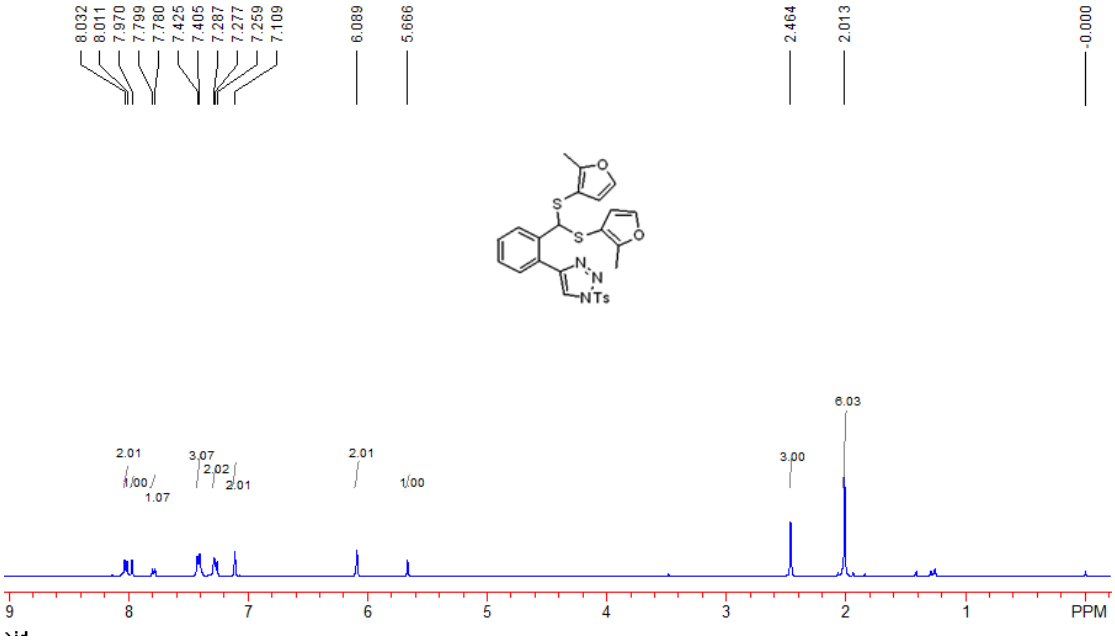
4-(2-(bis(naphthalen-2-ylthio)methyl)phenyl)-1-tosyl-1*H*-1,2,3-triazole **1p**: a colorless oil; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 2.32 (s, 3H), 6.53 (s, 1H), 7.21 (d, *J* = 8.4 Hz, 2H), 7.28-7.35 (m, 4H), 7.38-7.44 (m, 5H), 7.57-7.62 (m, 4H), 7.69-7.74 (m, 4H), 7.85 (d, *J* = 8.4 Hz, 2H), 7.98 (s, 1H), 8.00 (d, *J* = 8.4 Hz, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 21.7, 55.5, 121.6, 126.3, 126.4, 127.2, 127.6, 128.26, 128.34, 128.5, 129.0, 129.4, 129.6, 129.8, 130.4, 131.0, 131.5, 132.4, 132.8, 133.4, 137.7, 146.0, 147.3; IR (CH_2Cl_2) ν 3144, 3054, 2926, 2870, 2251, 1593, 1501, 1394, 1195, 1178, 1091, 988, 907, 812, 729, 669 cm^{-1}; HRMS (ESI) Calcd. for $C_{26}H_{20}N_3O_2S_2$ (M-$C_{10}H_7S$)$^+$: 470.0991, found: 470.0994.

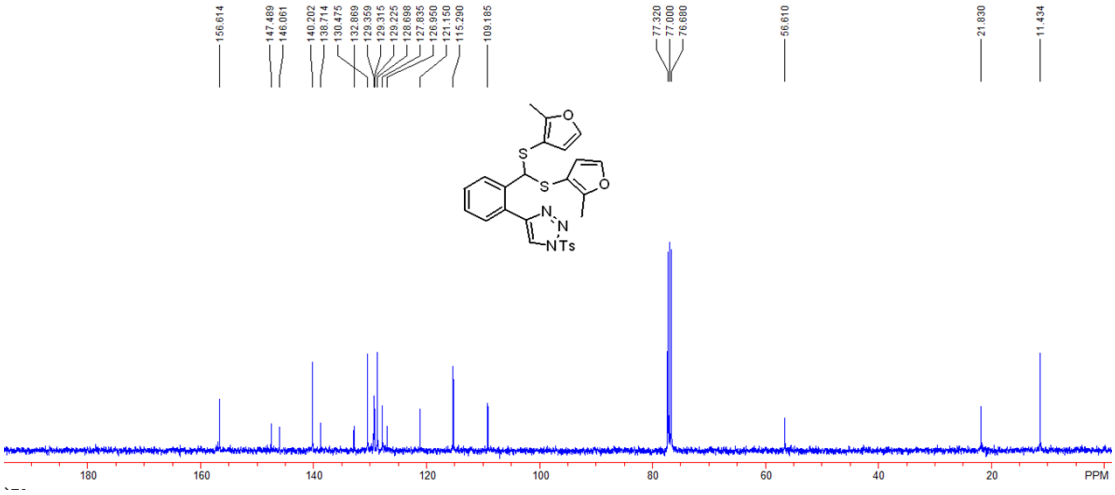


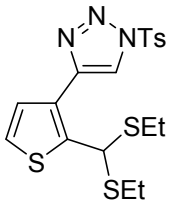




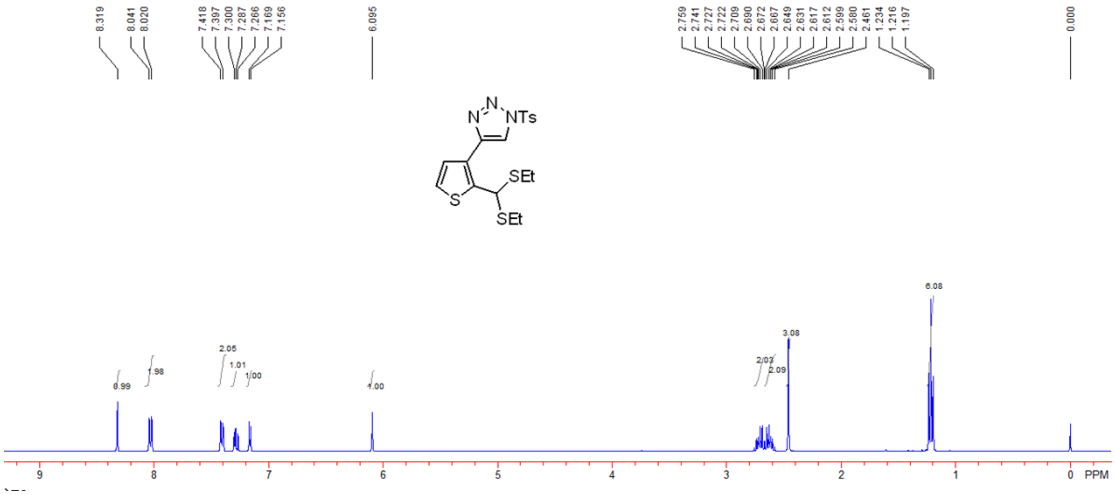
4-(2-(bis((2-methylfuran-3-yl)thio)methyl)phenyl)-1-tosyl-1*H*-1,2,3-triazole **1q**: a colorless oil; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 2.01 (s, 6H), 2.46 (s, 3H), 5.67 (s, 1H), 6.09 (s, 2H), 7.11 (s, 2H), 7.27-7.29 (m, 2H), 7.40-7.43 (m, 3H), 7.79 (d, *J* = 7.6 Hz, 1H), 7.97 (s, 1H), 8.02 (d, *J* = 8.4 Hz, 2H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 11.4, 21.8, 56.6, 109.2, 115.3, 121.2, 127.0, 127.8, 128.7, 129.2, 129.3, 129.4, 130.5, 132.9, 138.7, 140.2, 146.1, 147.5, 156.6; IR (CH_2Cl_2) ν 3144, 2959, 2920, 2851, 2360, 2341, 1594, 1396, 1196, 989, 701, 669 cm^{-1}; HRMS (ESI) Calcd. for $C_{26}H_{24}N_3O_4S_3$ $(M+H)^+$: 538.0923, found: 538.0924.

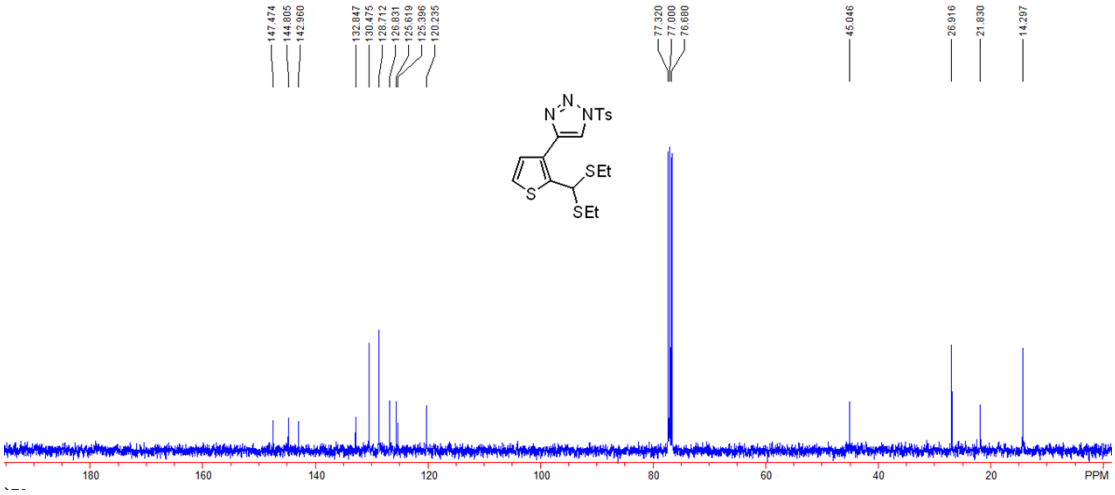


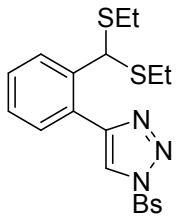




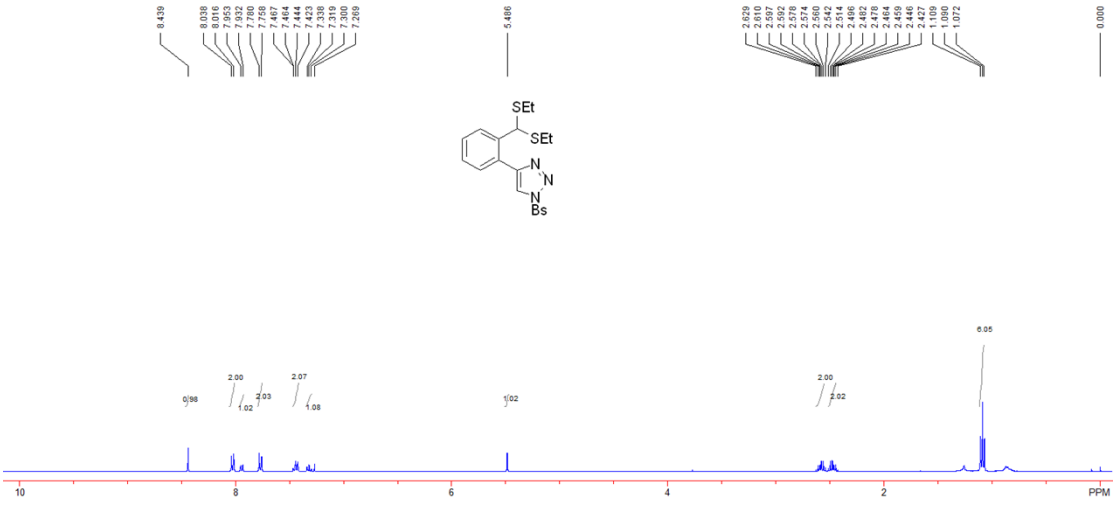
4-(2-(bis(ethylthio)methyl)thiophen-3-yl)-1-tosyl-1*H*-1,2,3-triazole **1r**: a white solid; Mp: 106-107 °C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.22 (t, *J* = 7.2 Hz, 6H), 2.46 (s, 3H), 2.58-2.67 (m, 2H), 2.67-2.76 (m, 2H), 6.10 (s, 1H), 7.16 (d, *J* = 5.2 Hz, 1H), 7.29 (d, *J* = 5.2 Hz, 1H), 7.41 (d, *J* = 8.4 Hz, 2H), 8.03 (d, *J* = 8.4 Hz, 2H), 8.32 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.3, 21.8, 26.9, 45.0, 120.2, 125.4, 125.6, 126.8, 128.7, 130.5, 132.8, 143.0, 144.8, 147.5; IR (CH_2Cl_2) ν 3143, 2968, 2926, 2870, 1594, 1449, 1391, 1195, 1175, 1004, 735, 670 cm^{-1}; HRMS (ESI) Calcd. for $C_{16}H_{16}N_3O_2S_3$ $(M\text{-}EtS)^+$: 378.0399, found: 378.0404.

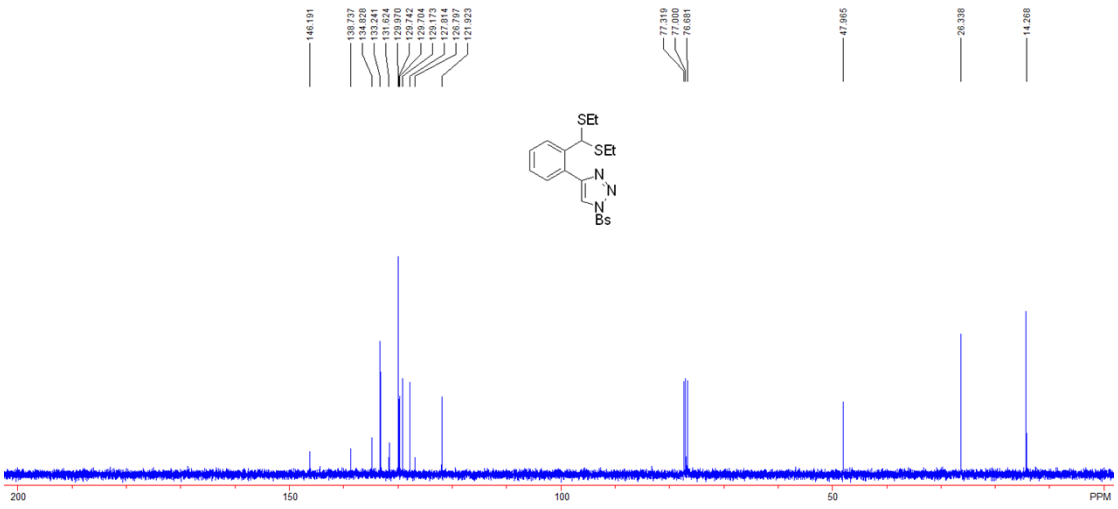






4-(2-(bis(ethylthio)methyl)phenyl)-1-((4-bromophenyl)sulfonyl)-1*H*-1,2,3-triazole **1s**: a white solid; Mp: 91-92 ^{o}C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.09 (t, *J* = 7.2 Hz, 6H), 2.42-2.52 (m, 2H), 2.54-2.63 (m, 2H), 5.49 (s, 1H), 7.26-7.34 (m, 1H), 7.42-7.47 (m, 2H), 7.77 (d, *J* = 8.8 Hz, 2H), 7.94 (d, *J* = 8.4 Hz, 1H), 8.03 (d, *J* = 8.8 Hz, 2H), 8.44 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.3, 26.3, 48.0, 121.9, 126.8, 127.8, 129.2, 129.70, 129.74, 130.0, 131.6, 133.2, 134.8, 138.7, 146.2; IR (CH_2Cl_2) ν 3140, 2969, 2926, 2869, 1572, 1471, 1398, 1275, 1192, 986, 747, 699 cm^{-1}; HRMS (ESI) Calcd. for $C_{17}H_{15}BrN_3O_2S_2$ $(M\text{-}EtS)^+$: 435.9784, found: 435.9785.

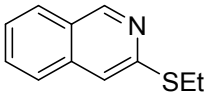



146.191
138.737
134.828
133.241
131.624
129.970
129.705
129.704
129.173
127.814
126.797
121.923
77.319
77.000
76.681
47.965
26.338
14.268
SEt
SEt
N
N
N
Bs
200
150
100
50
PPM

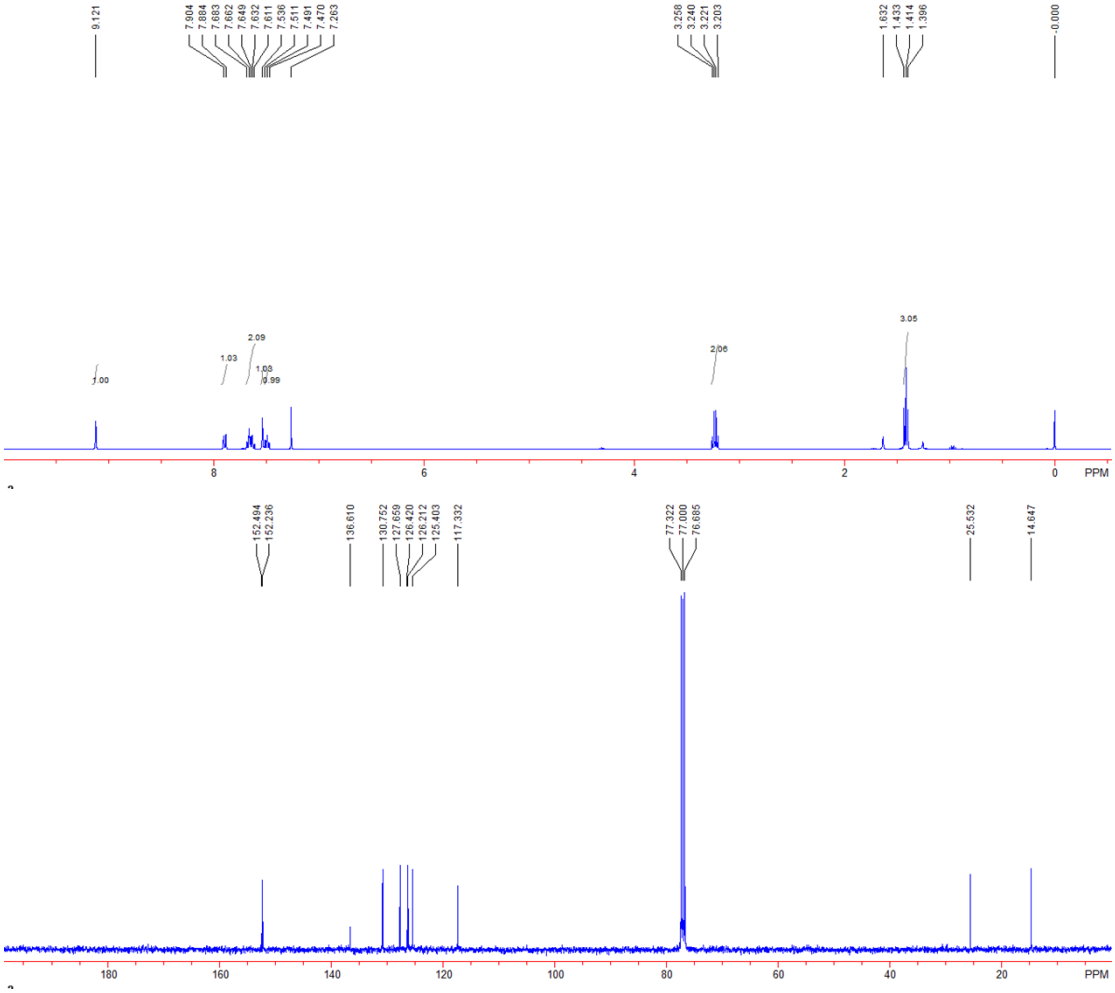
General procedure for the synthesis of compounds 2

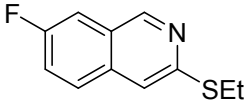
A solution of compound **1** (0.2 mmol) in dry 1,2-dichloroethane (4 mL) was stirred at 110 ^{o}C in a well-sealed tube under N_2 for an appropriate time. After completion of the reaction as indicated by TLC, the reaction was cooled to room temperature, and the mixture was purified by silica gel column flash chromatography (eluent: petroleum ether / ethyl acetate = 20 / 1) to afford the products **2** in moderate to good yields.

Spectroscopic Data of Substrates 2:



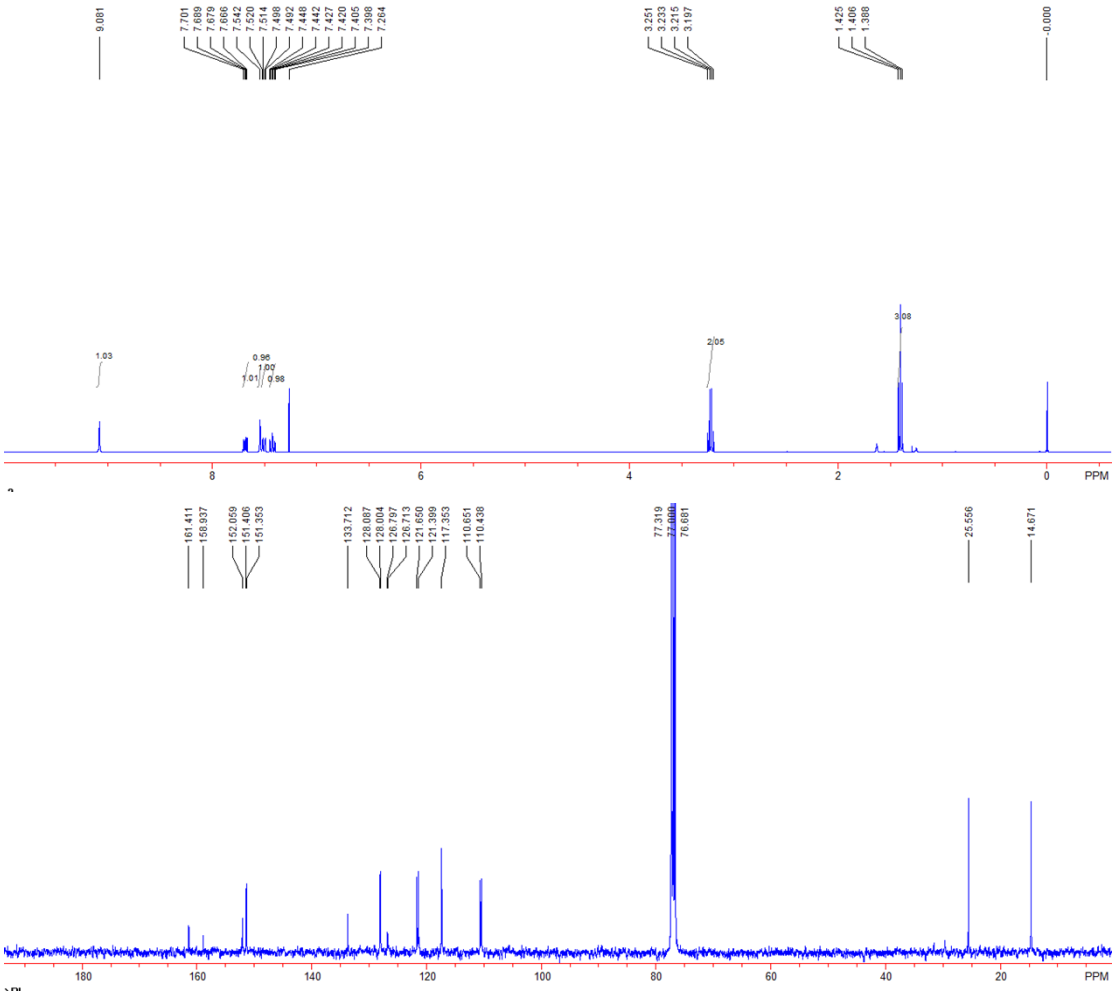
3-(ethylthio)isoquinoline **2a**: 30 mg, 80% yield (for **1a**); 31 mg, 82% yield (for **1s**); a yellow oil; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.41 (t, J = 7.6 Hz, 3H), 3.23 (q, J = 7.6 Hz, 2H), 7.49 (dd, $J_1 = J_2$ = 8.0 Hz, 1H), 7.54 (s, 1H), 7.61-7.69 (m, 2H), 7.89 (d, J = 8.0 Hz, 1H), 9.12 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.6, 25.5, 117.3, 125.4, 126.2, 126.4, 127.7, 130.8, 136.6, 152.2, 152.5; IR (CH_2Cl_2) ν 3054, 2965, 2926, 2870, 1726, 1623, 1569, 1428, 1073, 747, 666 cm^{-1}; HRMS (ESI) Calcd. for $C_{11}H_{12}NS$ $(M+H)^+$: 190.0685, found: 190.0685.

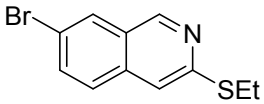




3-(ethylthio)-7-fluoroisoquinoline **2b**: 32 mg, 77% yield, a colorless oil; ^{1}H NMR ($CDCl_3$, 400

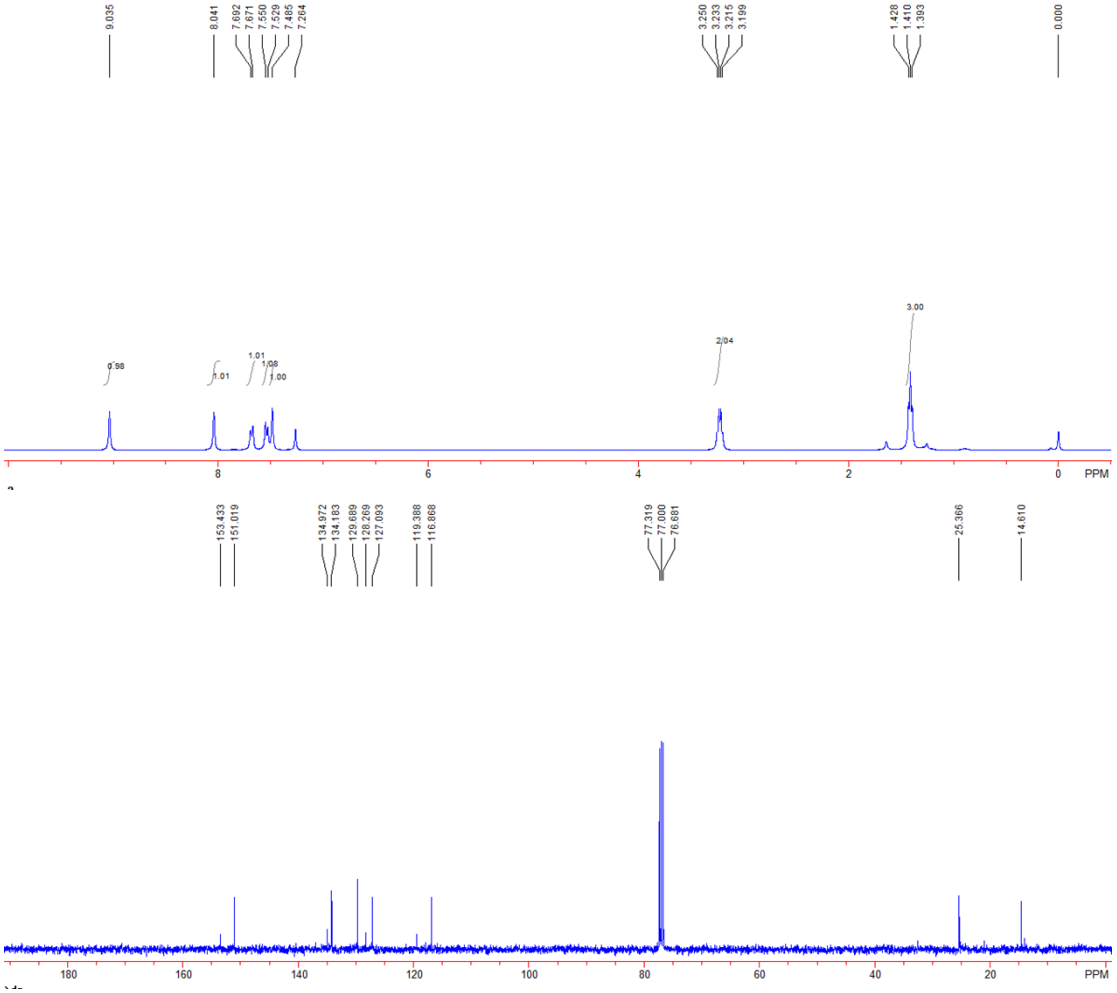
MHz, TMS) δ 1.41 (t, J = 7.2 Hz, 3H), 3.22 (q, J = 7.2 Hz, 2H), 7.42 (ddd, J_1 = 2.4 Hz, J_2 = J_3 = 8.8 Hz, 1H), 7.51 (dd, J = 2.4 Hz, J = 8.8 Hz, 1H), 7.54 (s, 1H), 7.68 (dd, J = 4.8 Hz, J = 8.8 Hz, 1H), 9.08 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.7, 25.6, 110.5 (d, J = 21.3 Hz), 117.4, 121.5 (d, J = 25.1 Hz), 126.8 (d, J = 8.4 Hz), 128.0 (d, J = 8.3 Hz), 133.7, 151.4 (d, J = 5.3 Hz), 152.1, 160.2 (d, J = 247.4 Hz); IR (CH_2Cl_2) ν 2968, 2927, 2870, 1722, 1571, 1489, 1192, 1138, 910, 750 cm^{-1}; HRMS (ESI) Calcd. for $C_{11}H_{11}FNS$ $(M+H)^+$: 208.0591, found: 208.0595.

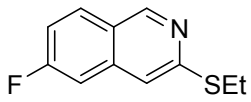




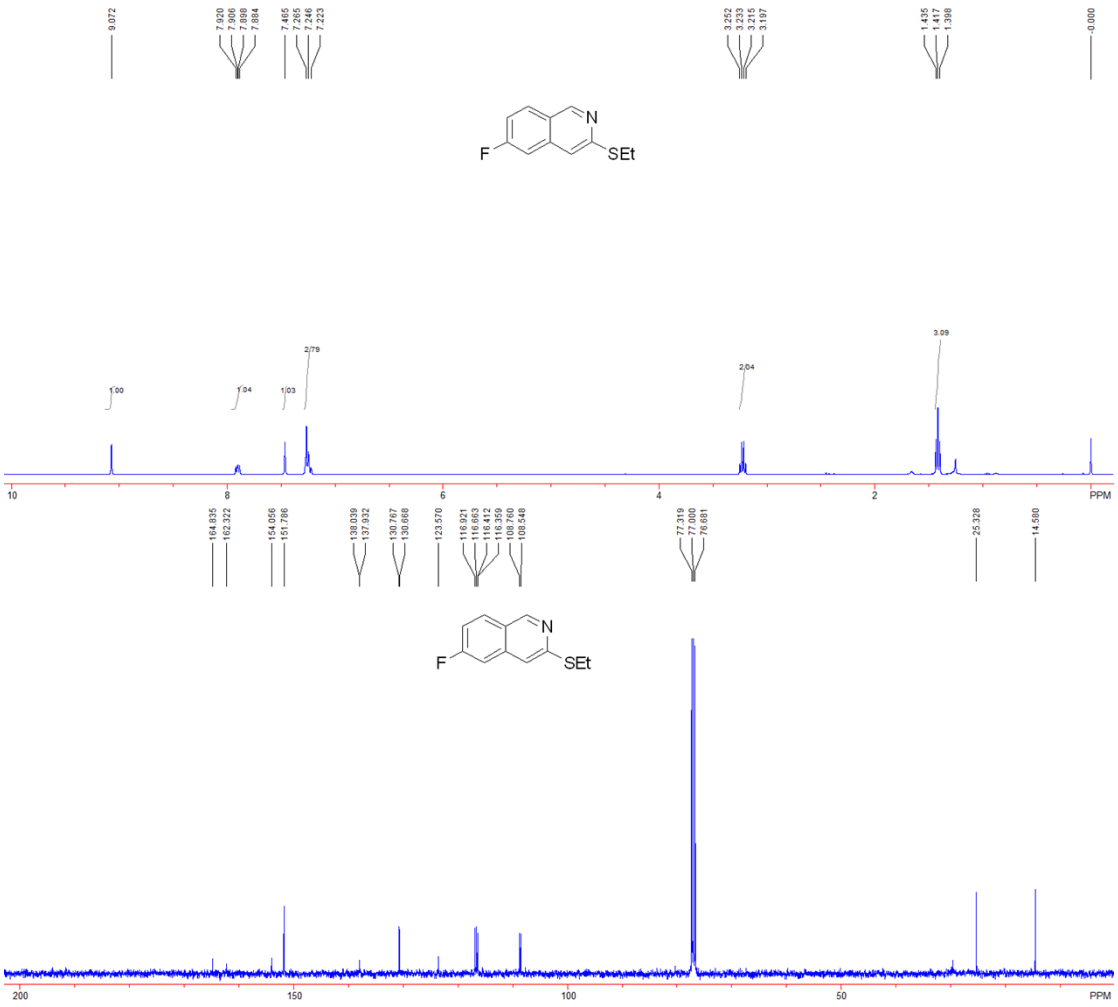
7-bromo-3-(ethylthio)isoquinoline **2c**: 30 mg, 56% yield, a white solid; Mp: 74-75 ^{o}C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.41 (t, J = 7.2 Hz, 3H), 3.22 (q, J = 7.2 Hz, 2H), 7.49 (s, 1H), 7.54 (d, J = 8.4 Hz, 1H), 7.68 (d, J = 8.4 Hz, 1H), 8.04 (s, 1H), 9.04 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.6, 25.4, 116.9, 119.4, 127.1, 128.3, 129.7, 134.2, 135.0, 151.0, 153.4; IR (CH_2Cl_2) ν 3049, 2966, 2925, 2868, 1728, 1557, 1471, 1068, 867, 664 cm^{-1}; HRMS (ESI) Calcd. for

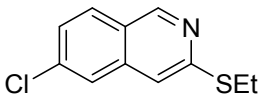
$C_{11}H_{11}BrNS$ $(M+H)^+$: 267.9790, found: 267.9794.



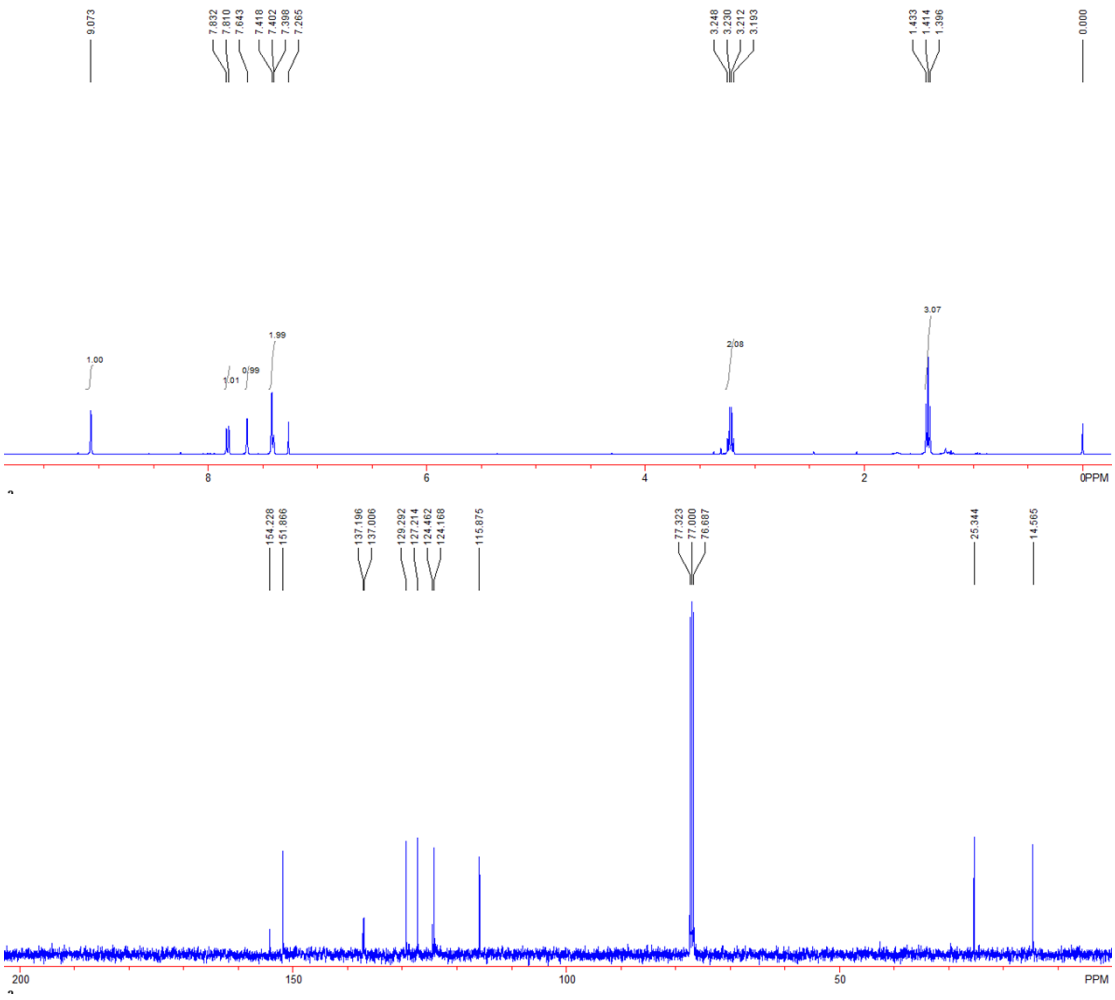


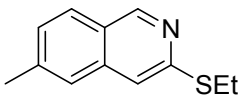
3-(ethylthio)-6-fluoroisoquinoline **2d**: 28 mg, 67% yield, a colorless oil; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.42 (t, J = 7.2 Hz, 3H), 3.22 (q, J = 7.2 Hz, 2H), 7.22-7.27 (m, 2H), 7.47 (s, 1H), 7.90 (dd, J = 5.6 Hz, J = 8.8 Hz, 1H), 9.07 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.6, 25.3, 108.7 (d, J = 21.2 Hz), 116.4 (d, J = 5.3 Hz), 116.8 (d, J = 25.8 Hz), 123.6, 130.7 (d, J = 9.9 Hz), 138.0 (d, J = 10.7 Hz), 151.8, 154.1, 163.6 (d, J = 251.3 Hz); IR (CH_2Cl_2) ν 2969, 2928, 2864, 1632, 1492, 1399, 1203, 1121, 1078, 908, 754, 652 cm^{-1}; HRMS (ESI) Calcd. for $C_{11}H_{11}FNS$ $(M+H)^+$: 208.0591, found: 208.0593.



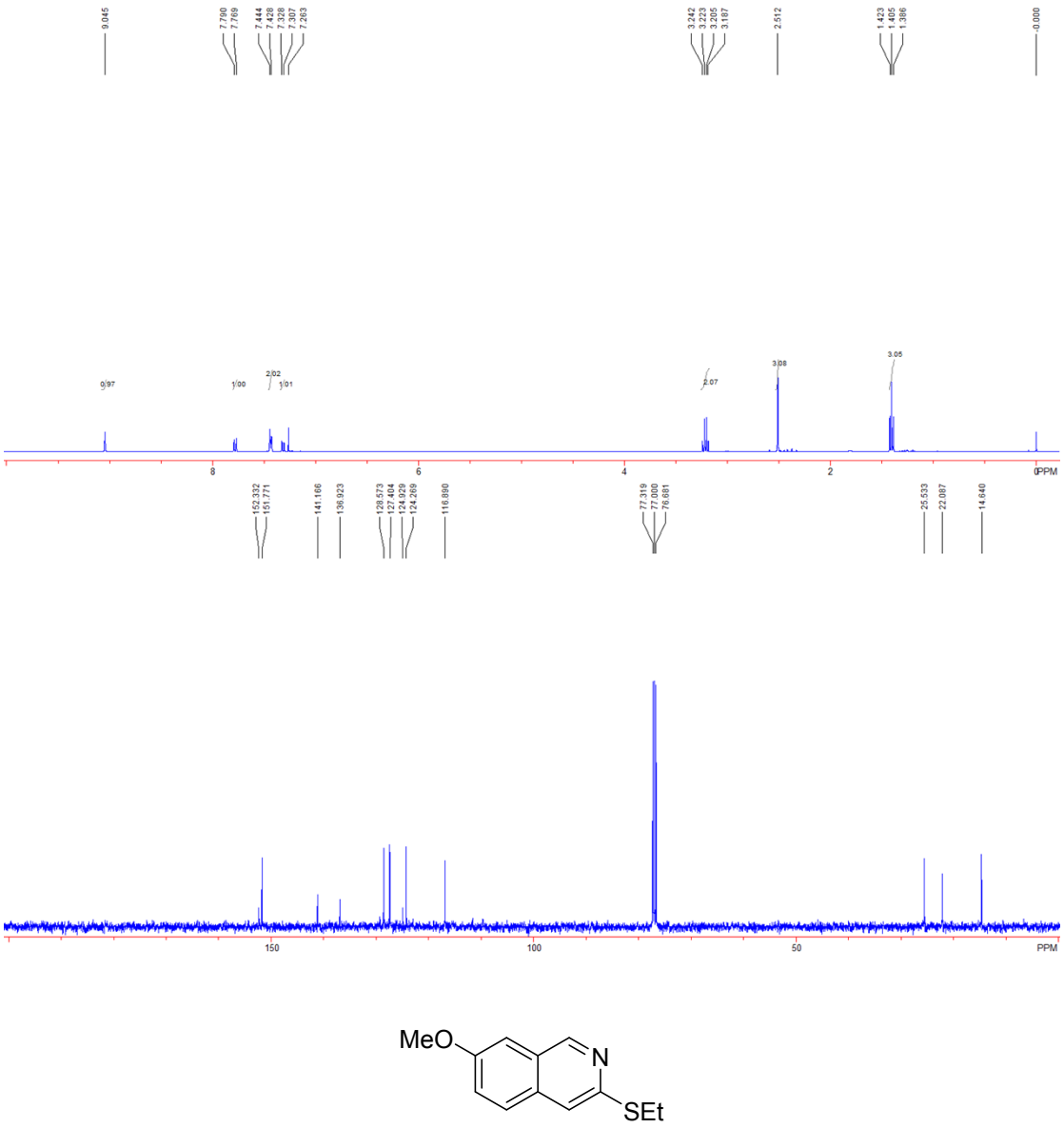


6-chloro-3-(ethylthio)isoquinoline **2e**: 36 mg, 81% yield, a white solid; Mp: 59-61 ^{o}C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.41 (t, J = 7.2 Hz, 3H), 3.22 (q, J = 7.2 Hz, 2H), 7.40 (s, 1H), 7.41 (d, J = 8.0 Hz, 1H), 7.64 (s, 1H), 7.82 (d, J = 8.0 Hz, 1H), 9.07 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.6, 25.3, 115.9, 124.2, 124.5, 127.2, 129.3, 137.0, 137.2, 151.9, 154.2; IR (CH_2Cl_2) ν 3045, 2967, 2926, 2870, 1726, 1615, 1477, 1298, 1080, 944, 805, 661 cm^{-1}; HRMS (ESI) Calcd. for $C_{11}H_{11}ClNS$ $(M+H)^+$: 224.0295, found: 224.0298.

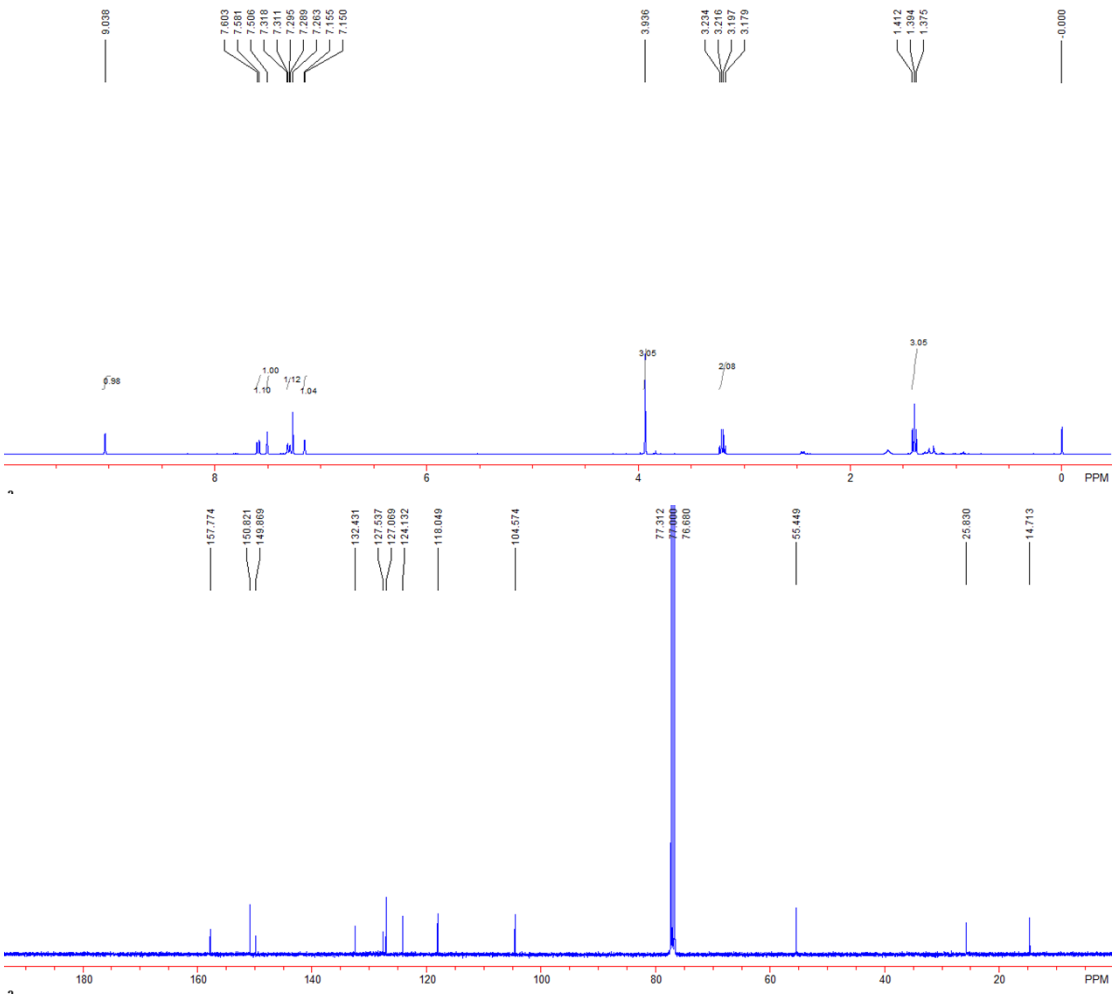


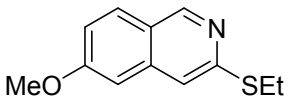


3-(ethylthio)-6-methylisoquinoline **2f**: 37 mg, 91% yield, a white solid; Mp: 62-64 ^{o}C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.41 (t, J = 7.2 Hz, 3H), 2.51 (s, 3H), 3.21 (q, J = 7.2 Hz, 2H), 7.32 (d, J = 5.6 Hz, 1H), 7.42-7.45 (m, 2H), 7.78 (d, J = 8.4 Hz, 1H), 9.05 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.6, 22.1, 25.5, 116.9, 124.3, 124.9, 127.4, 128.6, 136.9, 141.2, 151.8, 152.3; IR (CH_2Cl_2) ν 3027, 2965, 2929, 2869, 1626, 1568, 1489, 1426, 1189, 1074, 807, 668 cm^{-1}; HRMS (ESI) Calcd. for $C_{12}H_{14}NS$ $(M+H)^+$: 204.0841, found: 204.0844.

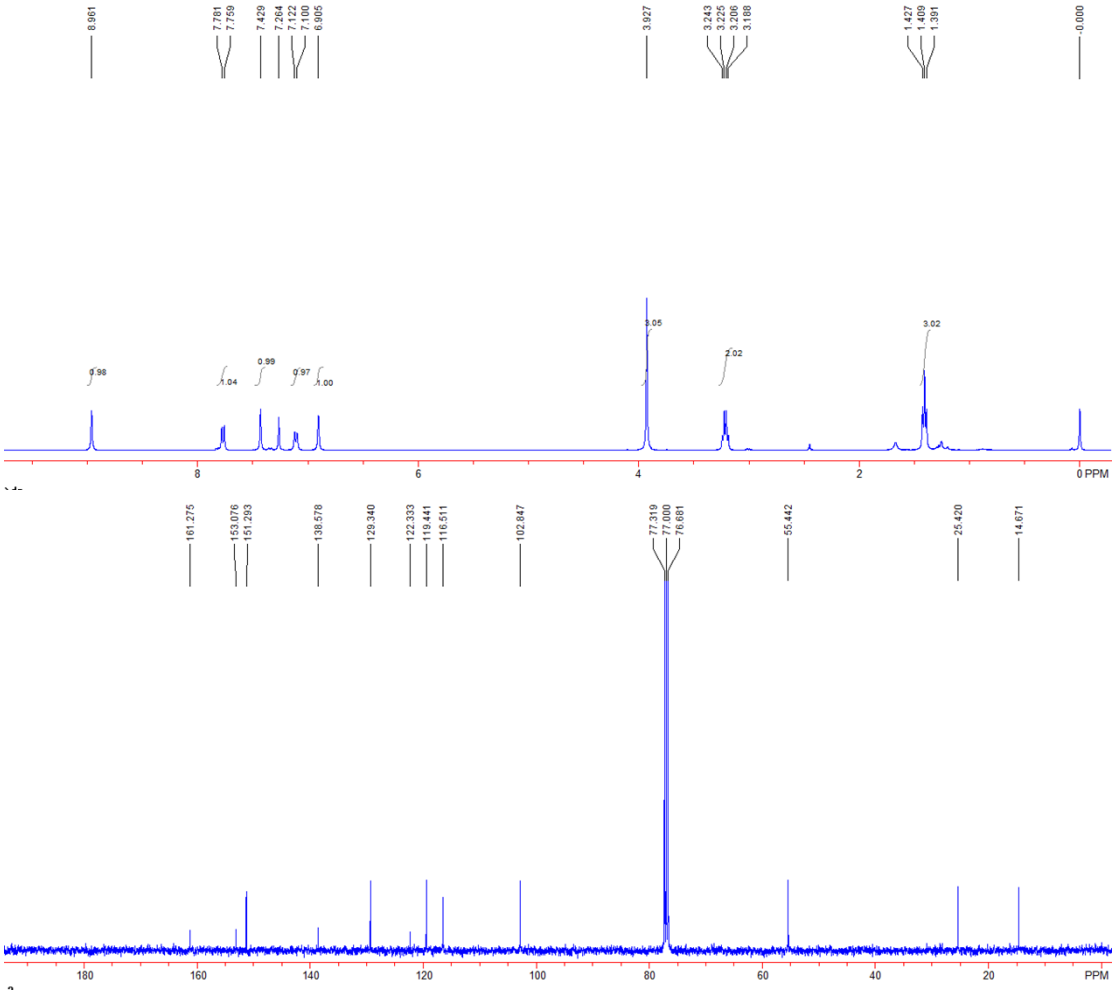


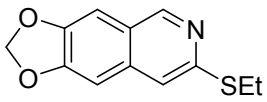
3-(ethylthio)-7-methoxyisoquinoline **2g**: 24 mg, 55% yield, a yellow oil; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.39 (t, *J* = 7.6 Hz, 3H), 3.21 (q, *J* = 7.6 Hz, 2H), 7.15 (d, *J* = 2.0 Hz, 1H), 7.30 (dd, *J* = 2.0 Hz, *J* = 8.8 Hz, 1H), 7.51 (s, 1H), 7.59 (d, *J* = 8.8 Hz, 1H), 9.04 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.7, 25.8, 55.4, 104.6, 118.0, 124.1, 127.1, 127.5, 132.4, 149.9, 150.8, 157.8; IR (CH_2Cl_2) ν 3005, 2964, 2927, 2870, 1625, 1573, 1490, 1276, 1211, 911, 764, 750 cm^{-1}; HRMS (ESI) Calcd. for $C_{12}H_{14}NOS$ $(M+H)^+$: 220.0791, found: 220.0794.



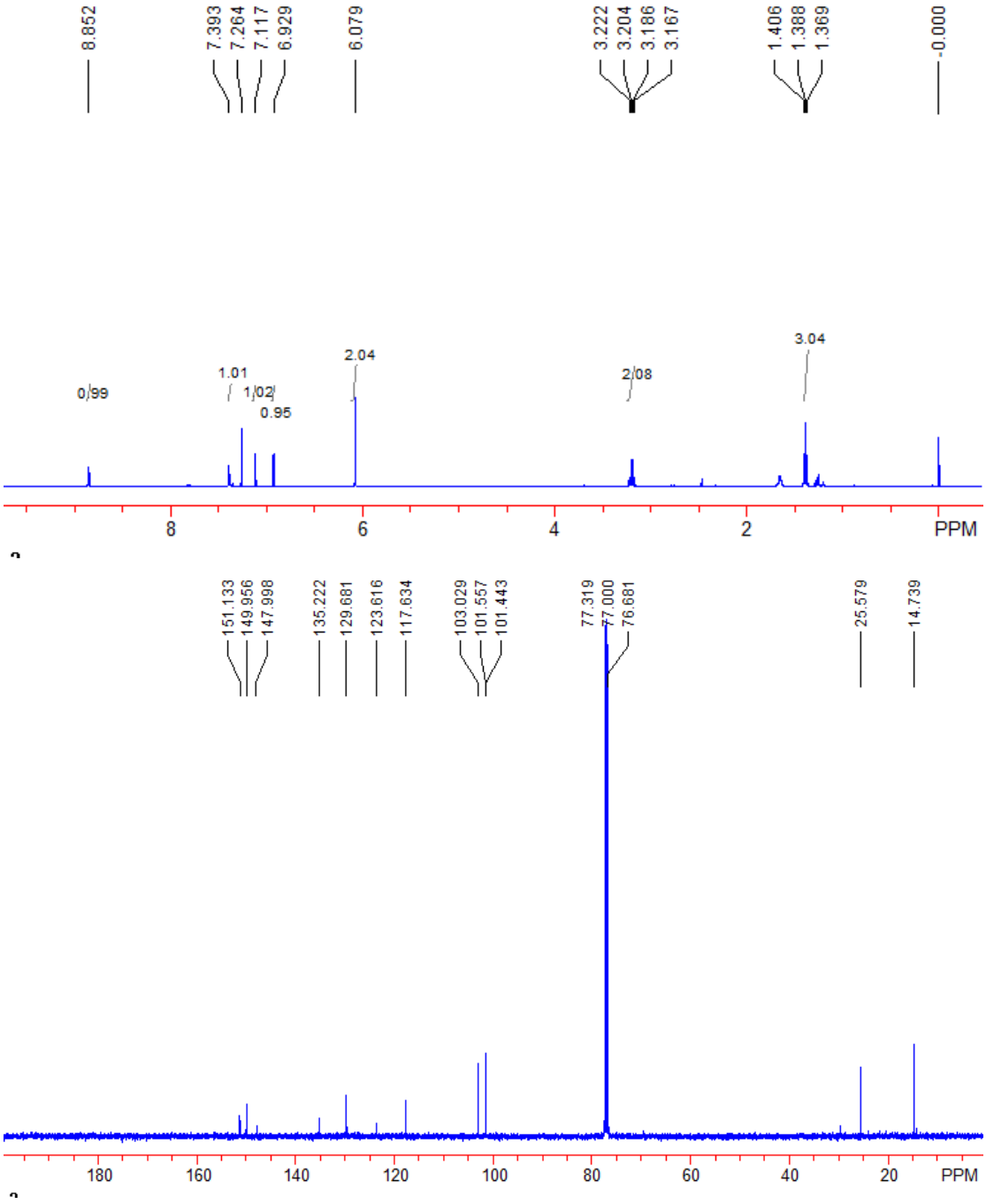


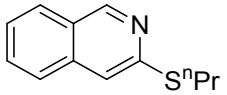
3-(ethylthio)-6-methoxyisoquinoline **2h**: 33 mg, 75% yield, a yellow oil; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.41 (t, *J* = 7.2 Hz, 3H), 3.22 (q, *J* = 7.2 Hz, 2H), 3.93 (s, 3H), 6.91 (s, 1H), 7.11 (d, *J* = 8.8 Hz, 1H), 7.43 (s, 1H), 7.77 (d, *J* = 8.8 Hz, 1H), 8.96 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.7, 25.4, 55.4, 102.8, 116.5, 119.4, 122.3, 129.3, 138.6, 151.3, 153.1, 161.3; IR (CH_2Cl_2) ν 2962, 2929, 1622, 1492, 1395, 1221, 1129, 1079, 866, 736, 652 cm^{-1}; HRMS (ESI) Calcd. for $C_{12}H_{14}NOS$ $(M+H)^+$: 220.0791, found: 220.0790.





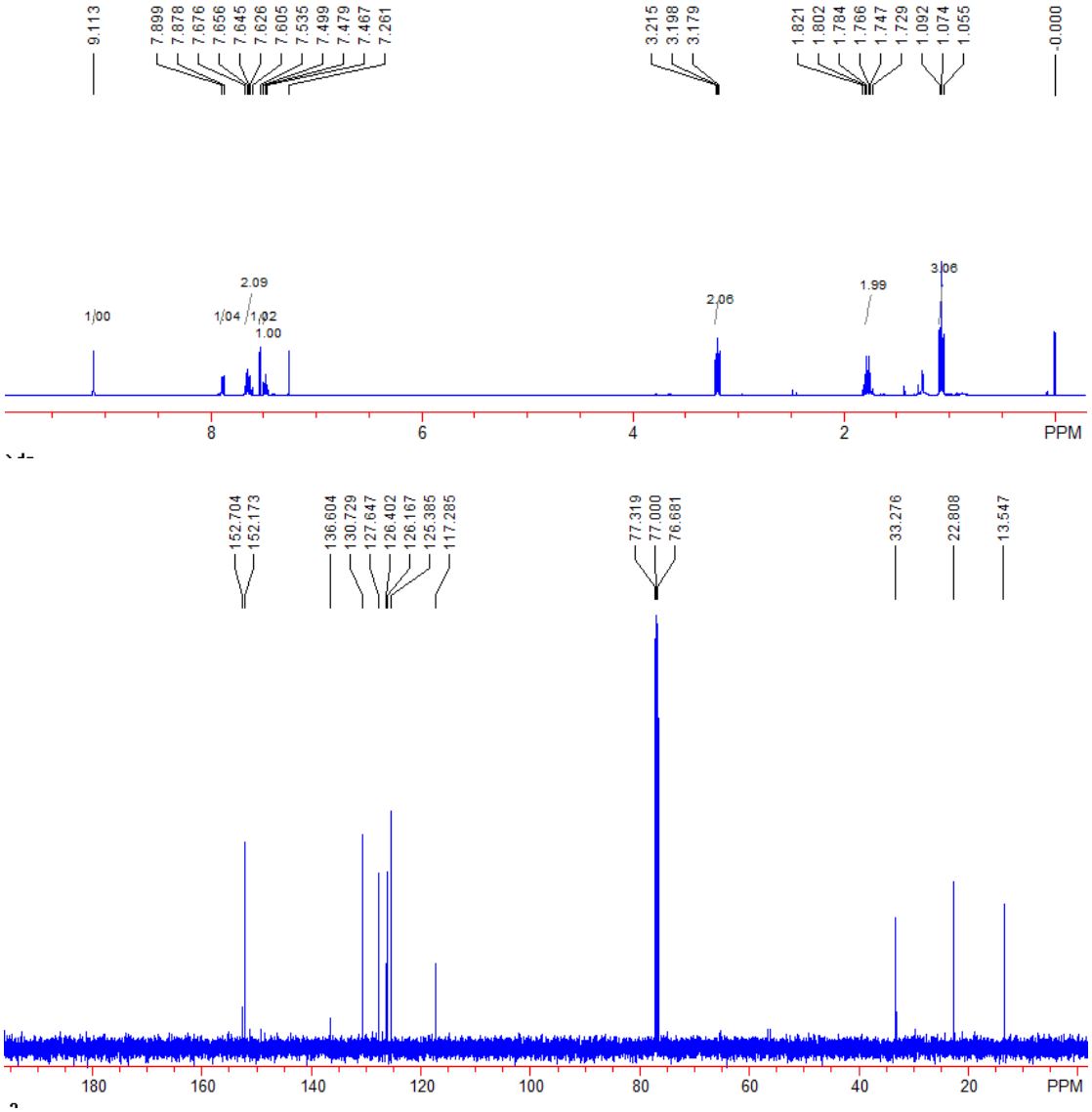
7-(ethylthio)-[1,3]dioxolo[4,5-g]isoquinoline **2i**: 30 mg, 64% yield, a white solid; Mp: 61-63 ^{o}C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.39 (t, *J* = 7.2 Hz, 3H), 3.20 (q, *J* = 7.2 Hz, 2H), 6.08 (s, 2H), 6.93 (s, 1H), 7.12 (s, 1H), 7.39 (s, 1H), 8.85 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.7, 25.6, 101.4, 101.6, 103.0, 117.6, 123.6, 129.7, 135.2, 148.0, 150.0, 151.1; IR (CH_2Cl_2) ν 2966, 2924, 1616, 1586, 1478, 1449, 1228, 1038, 958, 747, 751 cm^{-1}; HRMS (ESI) Calcd. for $C_{12}H_{12}NO_2S$ $(M+H)^+$: 234.0583, found: 234.0581.

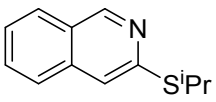




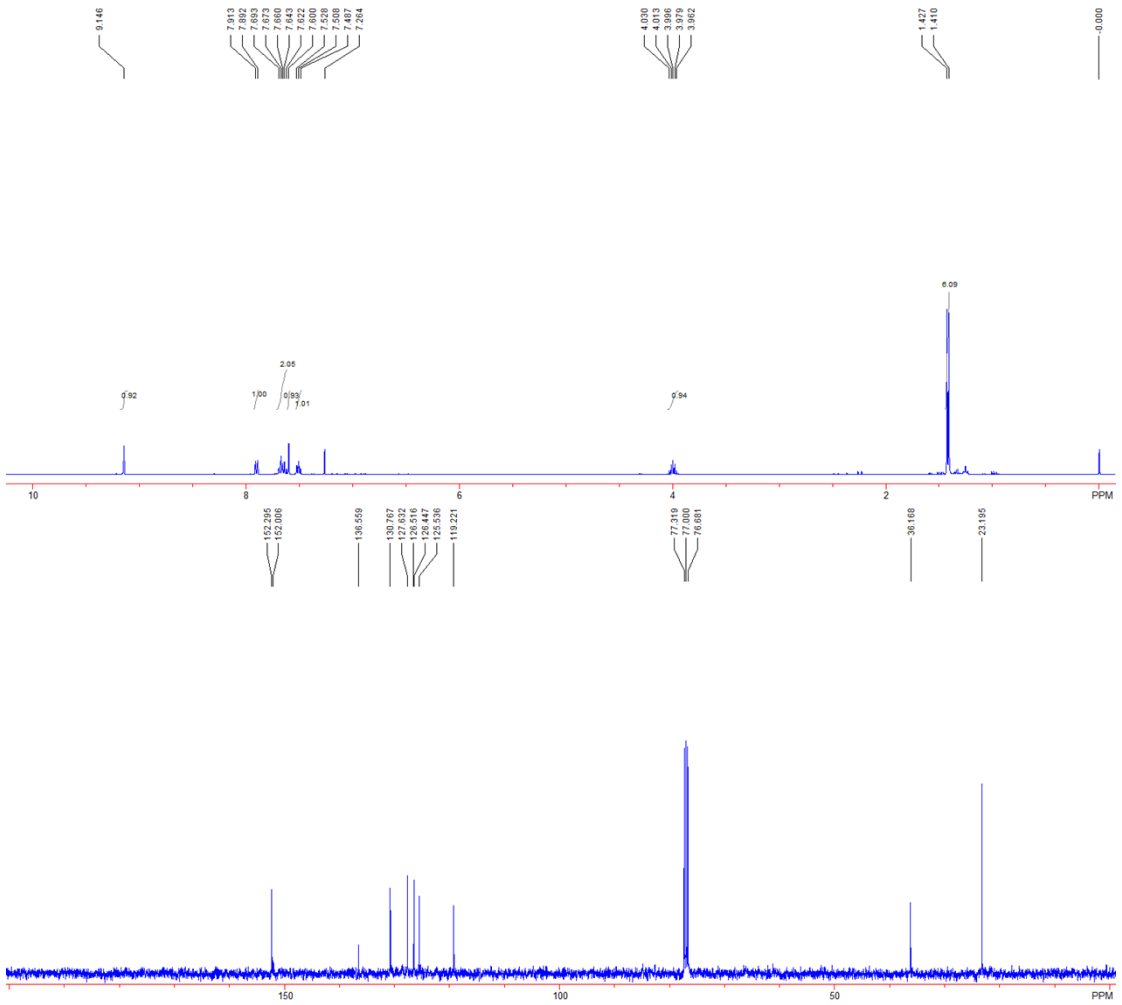
3-(propylthio)isoquinoline **2j**: 35 mg, 86% yield, a yellow oil; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.07 (t, J = 7.2 Hz, 3H), 1.72-1.83 (m, 2H), 3.20 (t, J = 7.2 Hz, 2H), 7.48 (t, J = 8.0 Hz, 1H), 7.54 (s, 1H), 7.61-7.68 (m, 2H), 7.89 (d, J = 8.0 Hz, 1H), 9.11 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 13.5, 22.8, 33.3, 117.3, 125.4, 126.2, 126.4, 127.6, 130.7, 136.6, 152.2, 152.7; IR (CH_2Cl_2) ν 3053, 2963, 2929, 2871, 1729, 1623, 1570, 1274, 1071, 856, 749 cm^{-1}; HRMS (ESI)

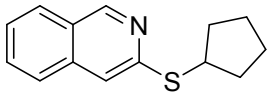
Calcd. for $C_{12}H_{14}NS$ $(M+H)^+$: 204.0841, found: 204.0847.



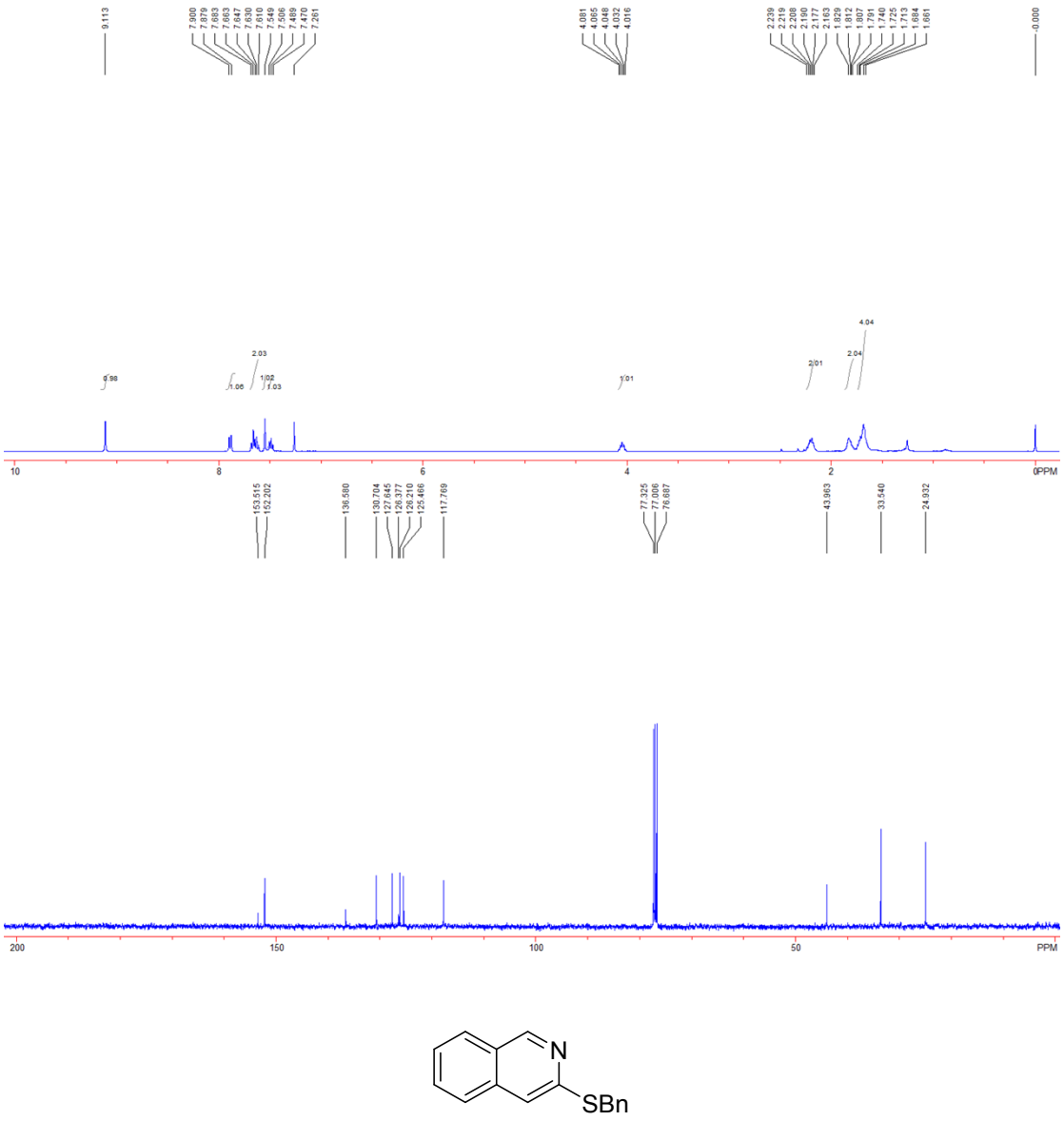


3-(isopropylthio)isoquinoline **2k**: 36 mg, 89% yield, a yellow oil; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.42 (d, J = 6.8 Hz, 6H), 3.96-4.03 (m, 1H), 7.51 (t, J = 8.4 Hz, 1H), 7.60 (s, 1H), 7.62-7.70 (m, 2H), 7.90 (d, J = 8.4 Hz, 1H), 9.15 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 23.2, 36.2, 119.2, 125.5, 126.4, 126.5, 127.6, 130.8, 136.6, 152.0, 152.3; IR (CH_2Cl_2) ν 3053, 2962, 2925, 2864, 1622, 1569, 1426, 1073, 1052, 873, 746, 681 cm^{-1}; HRMS (ESI) Calcd. for $C_{12}H_{14}NS$ $(M+H)^+$: 204.0841, found: 204.0844.

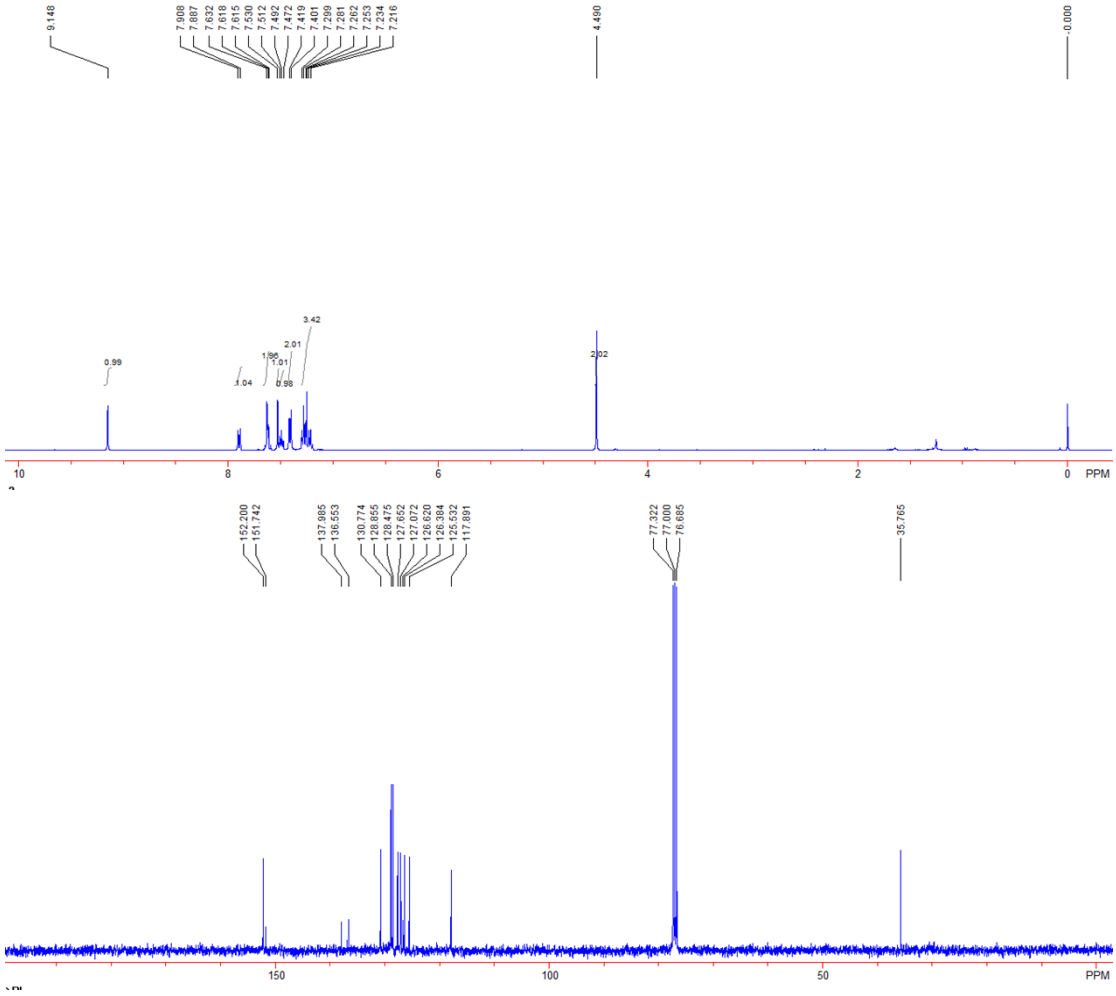


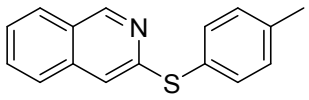


3-(cyclopentylthio)isoquinoline **2l**: 37 mg, 81% yield, a colorless oil; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.66-1.80 (m, 4H), 1.80-1.83 (m, 2H), 2.16-2.24 (m, 2H), 4.01-4.09 (m, 1H), 7.49 (dd, J_1 = J_2 = 7.6 Hz, 1H), 7.55 (s, 1H), 7.61-7.69 (m, 2H), 7.89 (d, J = 8.4 Hz, 1H), 9.11 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 24.9, 33.5, 44.0, 117.8, 125.5, 126.2, 126.4, 127.6, 130.7, 136.6, 152.2, 153.5; IR (CH_2Cl_2) ν 3053, 2954, 2865, 1727, 1622, 1568, 1448, 1313, 1070, 869, 745, 666 cm^{-1}; HRMS (ESI) Calcd. for $C_{14}H_{16}NS$ $(M+H)^+$: 230.0998, found: 230.1001.

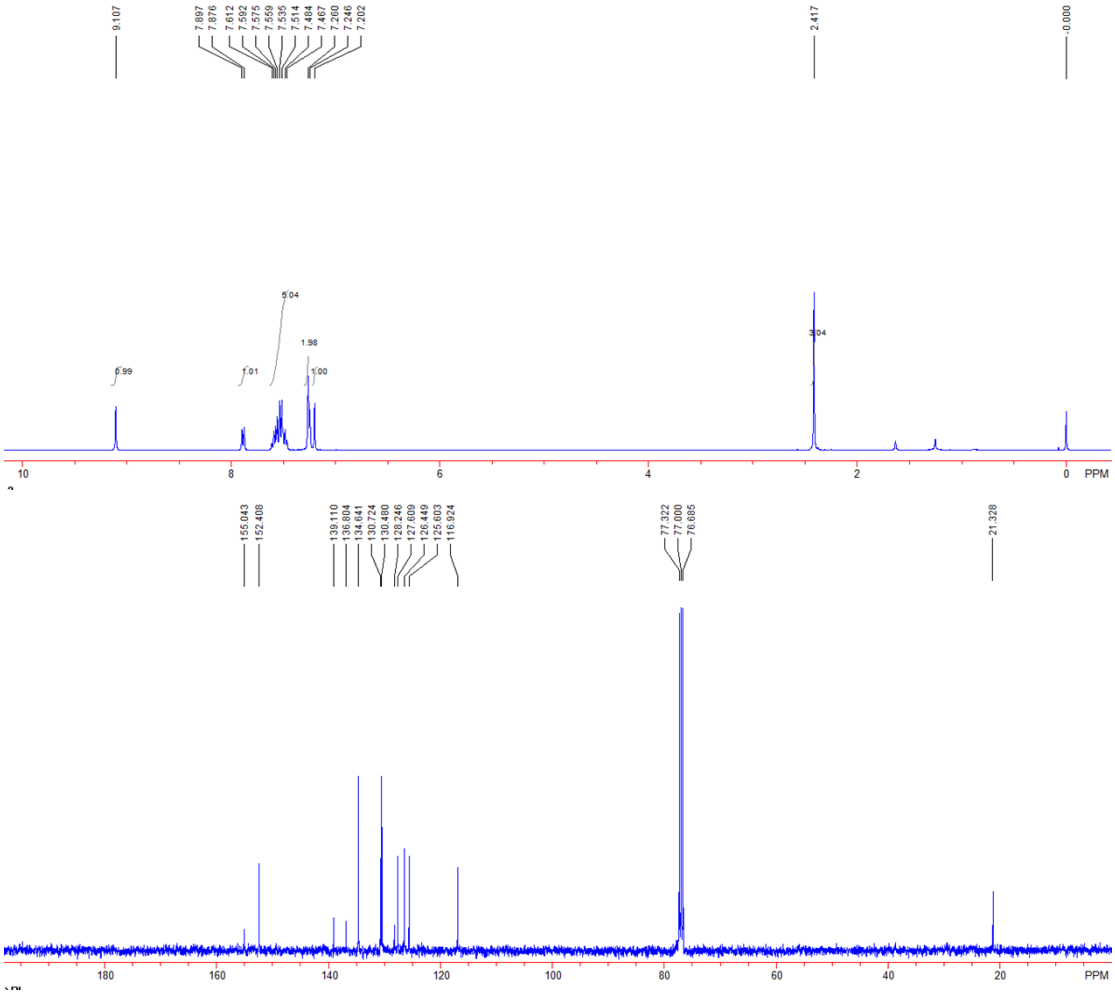


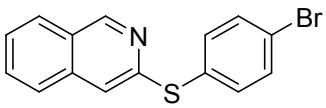
3-(benzylthio)isoquinoline **2m**: 44 mg, 88% yield, a white solid; Mp: 57-59 ^{o}C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 4.49 (s, 2H), 7.21-7.30 (m, 3H), 7.41 (d, J = 7.2 Hz, 2H), 7.47-7.52 (m, 1H), 7.53 (s, 1H), 7.61-7.64 (m, 2H), 7.90 (d, J = 8.4 Hz, 1H), 9.15 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 35.8, 117.9, 125.5, 126.4, 126.6, 127.1, 127.7, 128.5, 128.9, 130.8, 136.6, 138.0, 151.7, 152.2; IR (CH_2Cl_2) ν 3058, 3028, 2924, 2850, 1719, 1623, 1568, 1453, 1274, 1070, 872, 749, 665 cm^{-1}; HRMS (ESI) Calcd. for $C_{16}H_{14}NS$ $(M+H)^+$: 252.0841, found: 252.0845.



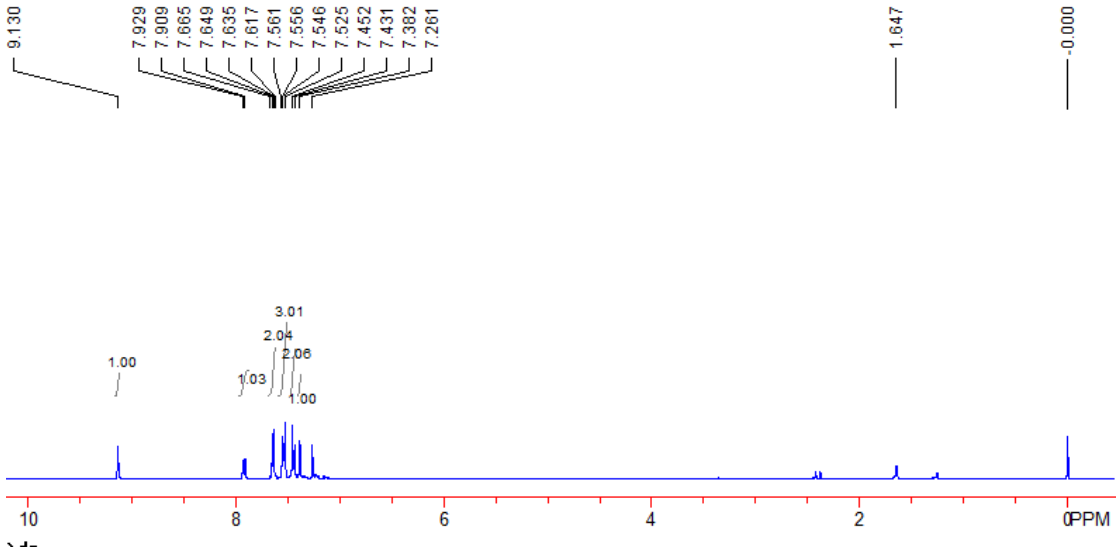


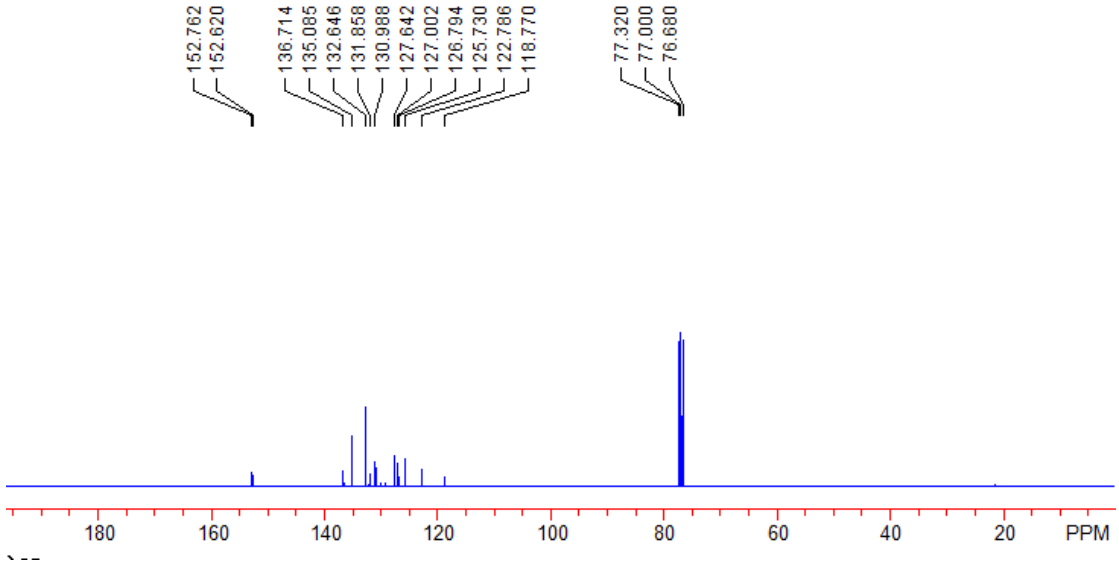
3-(p-tolylthio)isoquinoline **2n**: 38 mg, 76% yield, a white solid; Mp: 93-94 ^{o}C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 2.42 (s, 3H), 7.20 (s, 1H), 7.24-7.26 (m, 2H), 7.46-7.62 (m, 5H), 7.89 (d, J = 8.4 Hz, 1H), 9.11 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 21.3, 116.9, 125.6, 126.4, 127.6, 128.2, 130.5, 130.7, 134.6, 136.8, 139.1, 152.4, 155.0; IR (CH_2Cl_2) ν 3054, 3023, 2921, 2851, 1622, 1569, 1421, 1273, 1064, 872, 750, 665 cm^{-1}; HRMS (ESI) Calcd. for $C_{16}H_{14}NS$ $(M+H)^+$: 252.0841, found: 252.0844.

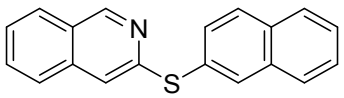




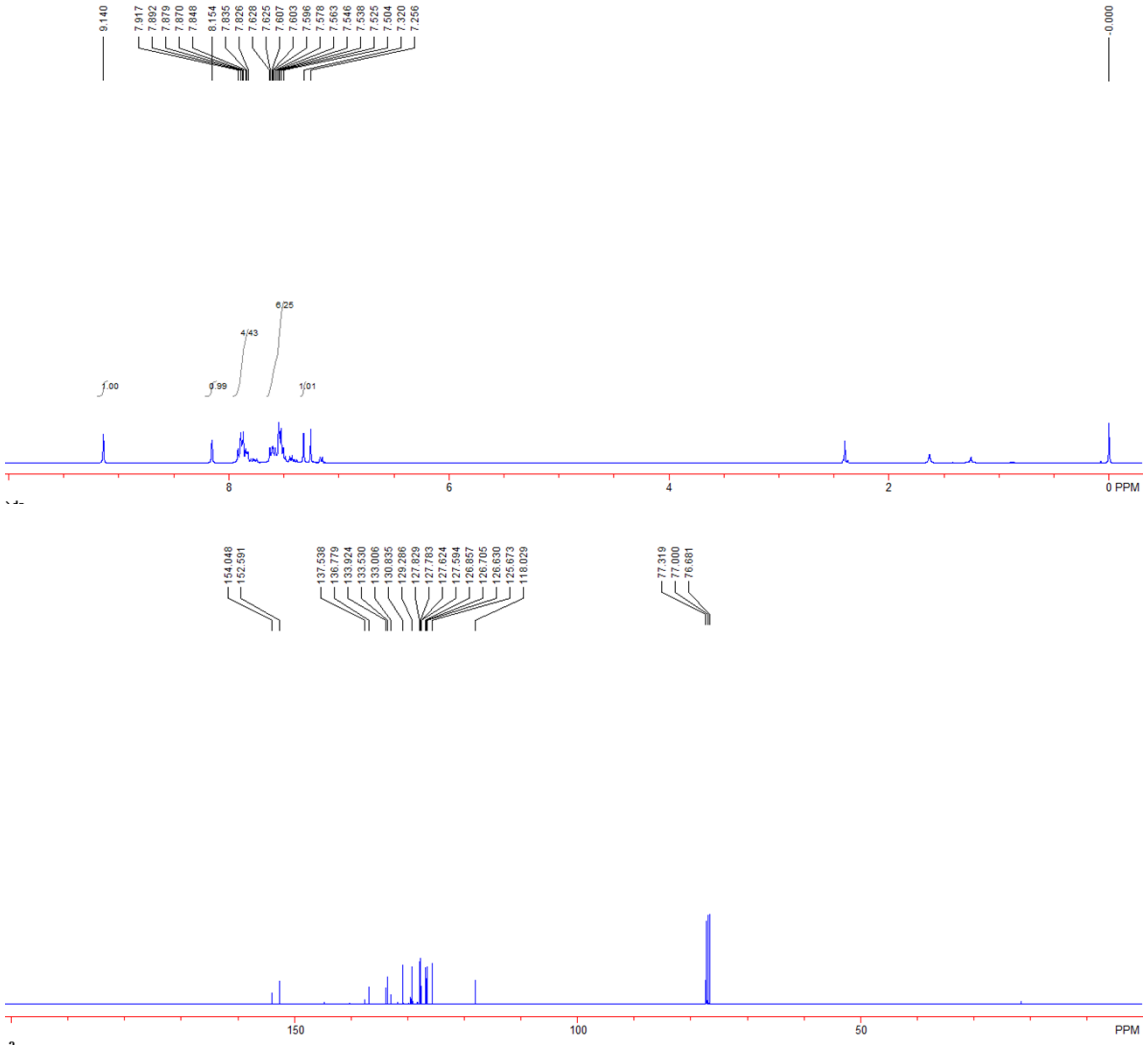
3-((4-bromophenyl)thio)isoquinoline **2o**: 47 mg, 75% yield, a white solid; Mp: 97-98 ^{o}C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 7.38 (s, 1H), 7.44 (d, J = 8.4 Hz, 2H), 7.52-7.57 (m, 3H), 7.61-7.67 (m, 2H), 7.92 (d, J = 8.0 Hz, 1H), 9.13 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 118.8, 122.8, 125.7, 126.8, 127.0, 127.6, 131.0, 131.9, 132.6, 135.1, 136.7, 152.6, 152.8; IR (CH_2Cl_2) ν 3054, 3007, 2989, 2922, 1622, 1568, 1470, 1275, 1063, 1009, 750 cm^{-1}; HRMS (ESI) Calcd. for $C_{15}H_{11}BrNS$ $(M+H)^+$: 315.9790, found: 315.9794.

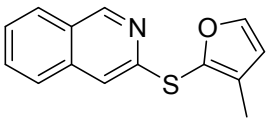




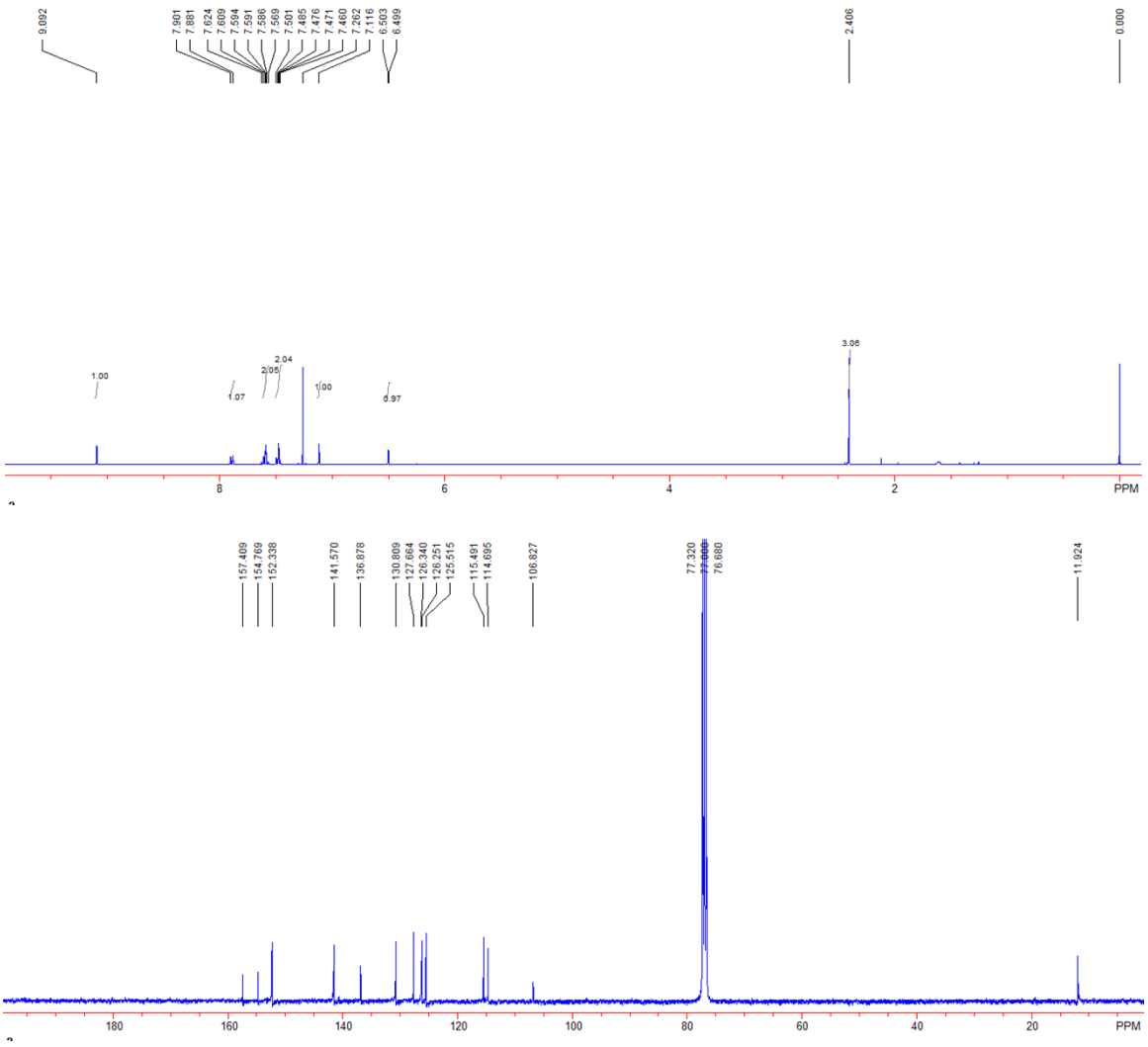


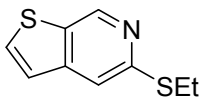
3-(naphthalen-2-ylthio)isoquinoline **2p**: 48 mg, 84% yield, a white solid; Mp: 82-83 ^{o}C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 7.32 (s, 1H), 7.50-7.63 (m, 6H), 7.82-7.92 (m, 4H), 8.15 (s, 1H), 9.14 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 118.0, 125.7, 126.6, 126.7, 126.9, 127.59, 127.62, 127.78, 127.83, 129.3, 130.8, 133.0, 133.5, 133.9, 136.8, 137.5, 152.6, 154.0; IR (CH_2Cl_2) ν 3052, 2923, 2852, 1621, 1567, 1421, 1061, 813, 749, 655 cm^{-1}; HRMS (ESI) Calcd. for $C_{19}H_{14}NS$ $(M+H)^+$: 288.0841, found: 288.0845.



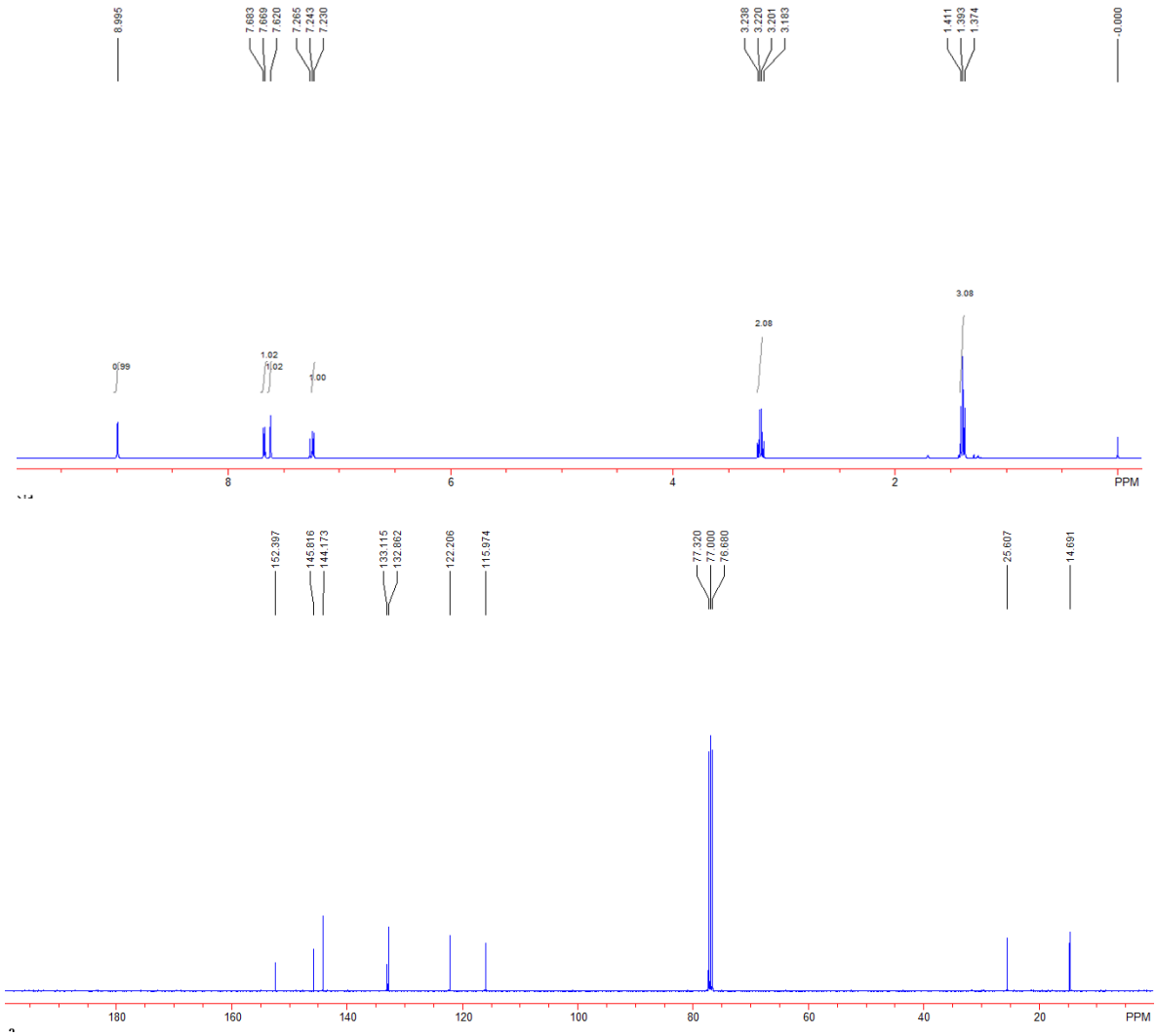


3-((3-methylfuran-2-yl)thio)isoquinoline **2p**: 30 mg, 62% yield, a white solid; Mp: 57-59 ^{o}C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 2.41 (s, 3H), 6.50 (d, J = 1.6 Hz, 1H), 7.12 (s, 1H), 7.46-7.51 (m, 2H), 7.56-7.63 (m, 2H), 7.89 (d, J = 8.0 Hz, 1H), 9.09 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 11.9, 106.8, 114.7, 115.5, 125.5, 126.25, 126.34, 127.7, 130.8, 136.9, 141.6, 152.3, 154.8, 157.4; IR (CH_2Cl_2) ν 3054, 2958, 2919, 2851, 1622, 1569, 1421, 1144, 888, 733, 665 cm^{-1}; HRMS (ESI) Calcd. for $C_{14}H_{12}NOS$ $(M+H)^+$: 242.0634, found: 242.0644.



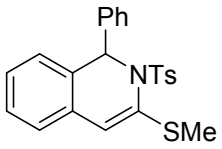


5-(ethylthio)thieno[2,3-c]pyridine **2q**: 24 mg, 62% yield, a yellow oil; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.39 (t, J = 7.2 Hz, 3H), 3.21 (q, J = 7.2 Hz, 2H), 7.24 (d, J = 5.2 Hz, 1H), 7.62 (s, 1H), 7.68 (d, J = 5.2 Hz, 1H), 9.00 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.7, 25.6, 116.0, 122.2, 132.9, 133.1, 144.2, 145.8, 152.4; IR (CH_2Cl_2) ν 3095, 2966, 2924, 2867, 1574, 1533, 1295, 1110, 816, 764, 714 cm^{-1}; HRMS (ESI) Calcd. for $C_9H_{10}NS_2$ $(M+H)^+$: 196.0249, found: 196.0250.

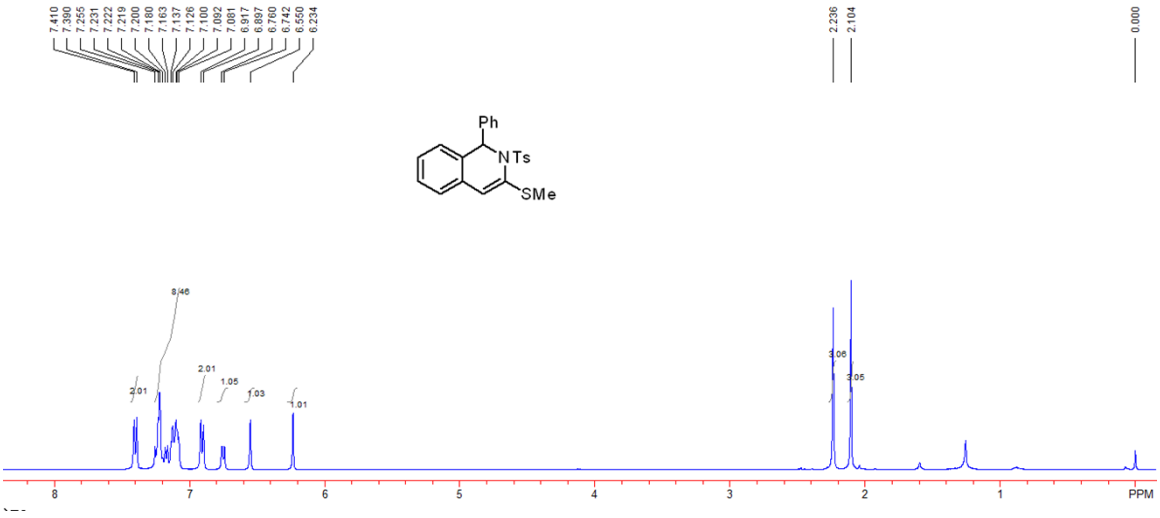

8.995
7.683
7.669
7.620
7.265
7.243
7.230
3.238
3.220
3.201
3.183
1.411
1.393
1.374
0.000
0.99
1.02
1.02
1.00
2.08
3.08
8
6
4
2
PPM
152.397
145.616
144.173
133.115
132.862
122.206
115.974
77.320
77.000
76.680
25.607
14.691
180
160
140
120
100
80
60
40
20
PPM

General procedure and spectroscopic data of compound 4:

A solution of compound **3** (0.2 mmol), TsN_3 (0.2 mmol), CuTc (0.01 mmol) in toluene (4 mL) was stirred at room temperature for an appropriate time. After completion of the reaction as indicated by TLC, the mixture was purified by silica gel column flash chromatography (eluent: petroleum ether / ethyl acetate = 20 / 1) to afford the product **4**.



3-(methylthio)-1-phenyl-2-tosyl-1,2-dihydroisoquinoline **4**: 47 mg, 58% yield, a white solid; Mp: 73-75 ^{o}C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 2.10 (s, 3H), 2.24 (s, 3H), 6.23 (s, 1H), 6.55 (s, 1H), 6.75 (d, J = 7.2 Hz, 1H), 6.91 (d, J = 8.0 Hz, 2H), 7.08-7.24 (m, 8H), 7.40 (d, J = 8.0 Hz, 2H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 15.7, 21.4, 62.0, 119.9, 124.2, 126.9, 127.4, 127.6, 127.7, 127.78, 127.82, 128.0, 128.4, 130.5, 130.9, 133.8, 135.2, 138.6, 143.4; IR (CH_2Cl_2) ν 3062, 2960, 2923, 2853, 1597, 1493, 1344, 1261, 1165, 1123, 988, 800, 663 cm^{-1}; HRMS (ESI) Calcd. for $C_{23}H_{22}NO_2S_2$ $(M+H)^+$: 408.1086, found: 408.1089.



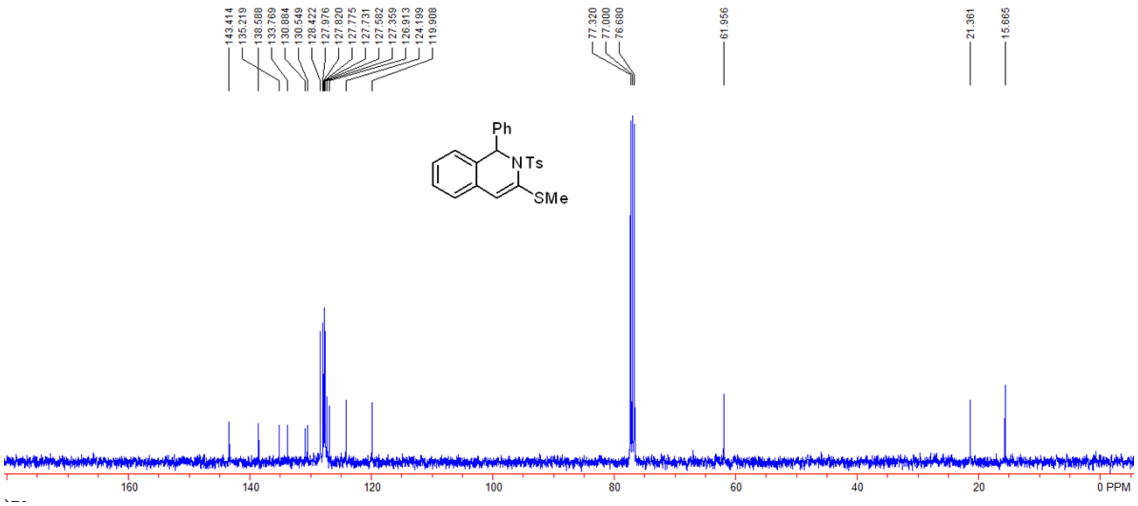
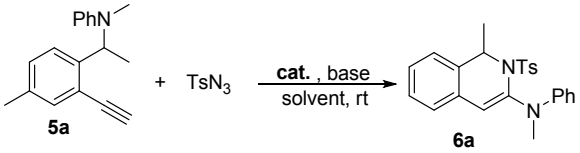

143.414
135.219
138.588
133.769
130.884
130.549
128.422
127.976
127.820
127.775
127.731
127.582
127.359
126.913
124.199
119.908
77.320
77.000
76.680
61.956
21.361
15.665
Ph
NTs
SMe
160
140
120
100
80
60
40
20
0 PPM

Table S1. Optimization of the reaction conditions of **5a**.

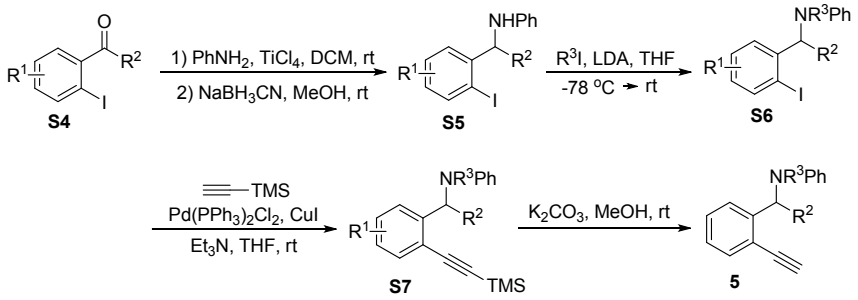


entry[a]	cat.	base	solvent	time (h)	yield (%)[b]
1	CuTc	-	$CHCl_3$	24	33
2	CuTc	Et_3N	$CHCl_3$	10	53
3	CuTc	DIPEA	$CHCl_3$	10	55
4	CuTc	DBU	$CHCl_3$	14	-
5	CuTc	Pyridine	$CHCl_3$	14	37
6[c]	CuTc	DIPEA	$CHCl_3$	8	48
7	CuCl	DIPEA	$CHCl_3$	10	71 (70)[d]
8	CuBr	DIPEA	$CHCl_3$	10	42
9	CuI	DIPEA	$CHCl_3$	10	45
10	CuCl	DIPEA	Toluene	10	40
11	CuCl	DIPEA	DCM	10	57
12	CuCl	DIPEA	DCE	10	44
13	CuCl	DIPEA	THF	10	-
14	CuCl	DIPEA	CH_3CN	10	50

[a] Unless otherwise specified, all reactions were performed with **5a** (0.10 mmol), TsN_3, [Cu] (0.005mmol) and solvent (1.0 mL). [b] Yields are determined by ^1H NMR using 1,3,5-trimethoxybenzene as an internal standard. [c] 3.0 equiv of DIPEA was used. [d] Isolated yield.

General procedure for the synthesis of compounds 5

As shown in Scheme S2, the compounds **5** were synthesized from the commercially available compound **S4** according to the previous literature.[2-4]



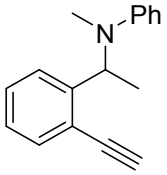
Scheme S2

Compound **S4** (10.0 mmol) was dissolved in dry CH_2Cl_2 (20 mL) and $TiCl_4$ (12.0 mmol) was added. The reaction mixture was cooled to 0 °C and $PhNH_2$ (22.0 mmol) was added. The resulting mixture was stirred for 6 h at room temperature under argon. The reaction was quenched with a methanolic solution of $NaBH_3CN$ (5.0 M solution, 12.0 mmol) and stirred for an additional 1 h at the same temperature. The mixture was made to be basic (pH~10) with 5.0 M aqueous solution of NaOH and filtered. The filtrate was partitioned between ethyl acetate (50 mL) and water (50 mL). The organic layer was separated, washed with water (2 × 50 mL) and brine (50 mL), dried over $MgSO_4$. Evaporation of the solvent under reduced pressure afforded the crude product of benzylamine derivative (**S5**).

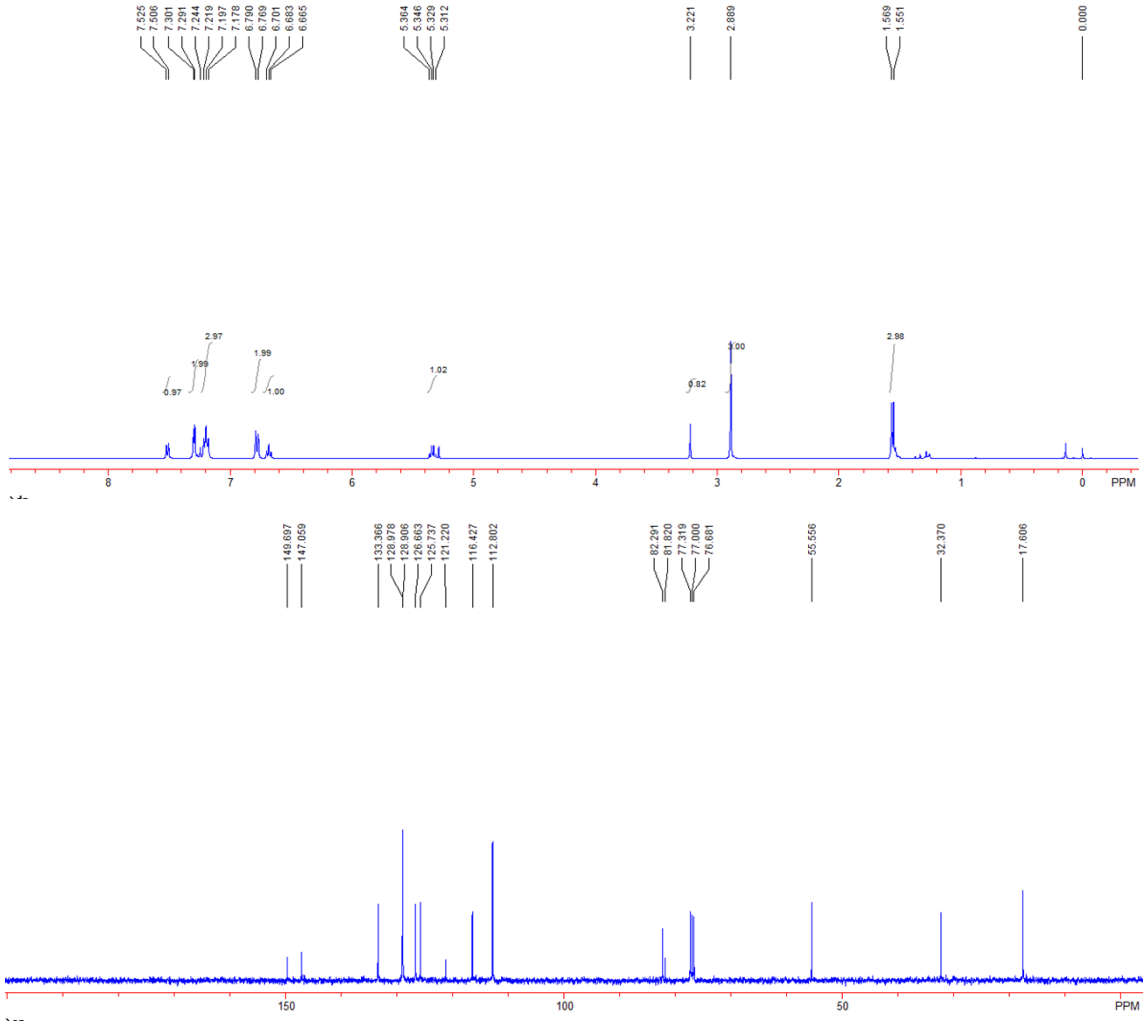
A solution of corresponding benzylamine derivative (**S5**) (7.0 mmol) in dry THF (15 mL) was added dropwise over a solution of LDA (2 M in THF, 7.7 mmol) at −78 °C. The reaction mixture was stirred for 1 h at this temperature and iodomethane or iodoethane (7.0 mmol) was added at –78 ºC. After five minutes at −78 ºC, the resulting solution was allowed to warm up to rt and stirred at this temperature for 10 h. The reaction was quenched by the addition of sat. NH_4Cl (20 mL). Et_2O (20 mL) was added, the organic layer was separated, and the aqueous phase was extracted with CH_2Cl_2 (2 × 20 mL). The combined organic extracts were washed with brine (2 × 20 mL). The organic layer was separated, dried over anhydrous Na_2SO_4 and evaporated under reduced pressure. The residue was purified by flash column chromatography on silica gel (PE/ethyl acetate = 40:1) to give compound **S6** (60~90% yield for two steps).

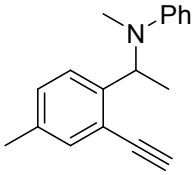
$Pd(PPh_3)_2Cl_2$ (0.10 mmol) and CuI (0.25 mmol) were transferred to a round bottom flask and placed under a N_2 atmosphere. In a separate flask, a 1:1 THF/Et_3N mixture (25 mL) was bubbled with N_2 for 30 min to purge of the dissolved oxygen. After that it was transferred into the round bottom flask. In a separate flask, compound **S6** (5.0 mmol) and silyl acetylene (6.0 mmol) were dissolved in anhydrous THF (10 mL), and added to the reaction mixture. The reaction mixture was stirred at rt for 5 h, during this period the reaction progress was monitored by TLC. After completion, the reaction mixture was washed with aqueous HCl (50 mL, 2 M) and extracted with CH_2Cl_2 (3 × 15 mL). The combined organic fractions were dried over $MgSO_4$, filtered, and the solvent was evaporated to provide the crude product **S7**. Next, the crude product **S7** was dissolved in MeOH (10 mmol), then K_2CO_3 (1 mmol) was added to the solution. The mixture was stirred at rt for 1 h. After completion, the reaction mixture was extracted with CH_2Cl_2 (3 × 15 mL). The combined organic fractions were dried over $MgSO_4$, filtered, and evaporated under reduced pressure. The residue was purified by flash column chromatography on silica gel (PE/ethyl acetate = 50:1) to give compounds **5** (90~95% yields for two steps).

Spectroscopic Data of Substrates 5:

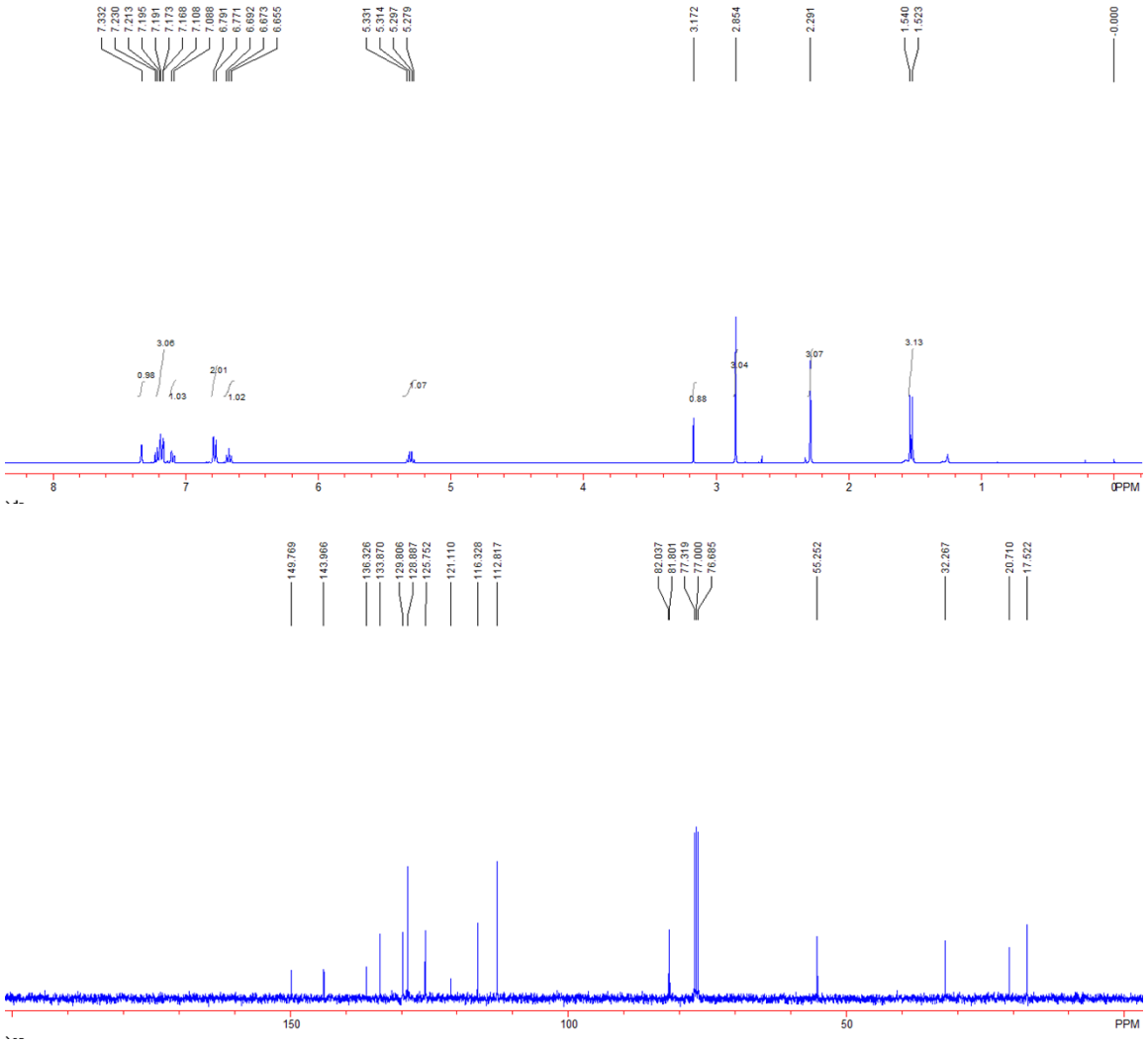


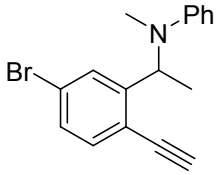
N-(1-(2-ethynylphenyl)ethyl)-N-methylaniline **5a**: a yellow oil; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.56 (d, J = 7.2 Hz, 3H), 2.89 (s, 3H), 3.22 (s, 1H), 5.34 (q, J = 7.2 Hz, 1H), 6.68 (dd, J_1 = J_2 = 7.6 Hz, 1H), 6.78 (d, J = 8.4 Hz, 2H), 7.17-7.25 (m, 3H), 7.30 (d, J = 8.4 Hz, 2H), 7.52 (d, J = 7.6 Hz, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.4, 18.5, 40.5, 55.0, 81.7, 82.4, 113.5, 116.3, 121.4, 125.6, 126.6, 128.9, 129.0, 133.2, 147.3, 148.2; IR (CH_2Cl_2) ν 3290, 2973, 2875, 2103, 1597, 1503, 1159, 1084, 991, 748, 691 cm^{-1}; HRMS (ESI) Calcd. for $C_{17}H_{18}N$ $(M+H)^+$: 236.1434, found: 236.1437.



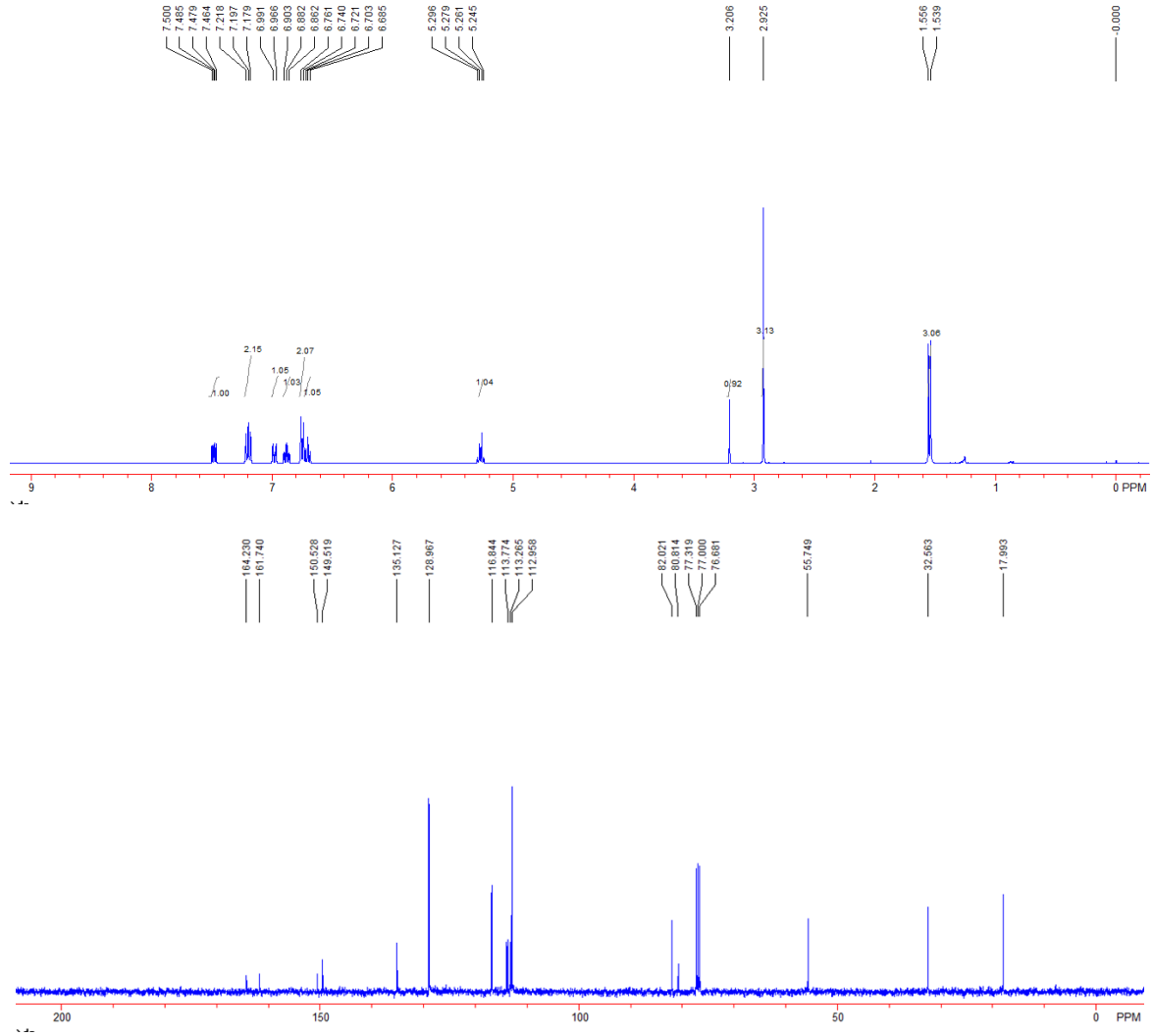


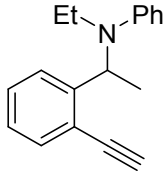
N-(1-(2-ethynyl-4-methylphenyl)ethyl)-N-methylaniline **5b**: a yellow oil; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.53 (d, J = 6.8 Hz, 3H), 2.29 (s, 3H), 2.85 (s, 3H), 3.17 (s, 1H), 5.31 (q, J = 6.8 Hz, 1H), 6.67 (dd, $J_1 = J_2$ = 7.6 Hz, 1H), 6.78 (d, J = 8.0 Hz, 2H), 7.10 (d, J = 8.0 Hz, 1H), 7.16-7.23 (m, 3H), 7.33 (s, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 17.5, 20.7, 32.3, 55.3, 81.8, 82.0, 112.8, 116.3, 121.1, 125.8, 128.9, 129.8, 133.9, 136.3, 144.0, 149.8; IR (CH_2Cl_2) ν 3285, 2974, 2875, 2101, 1597, 1504, 1159, 1121, 991, 748, 691 cm^{-1}; HRMS (ESI) Calcd. for $C_{18}H_{20}N$ $(M+H)^+$: 250.1590, found: 250.1594.



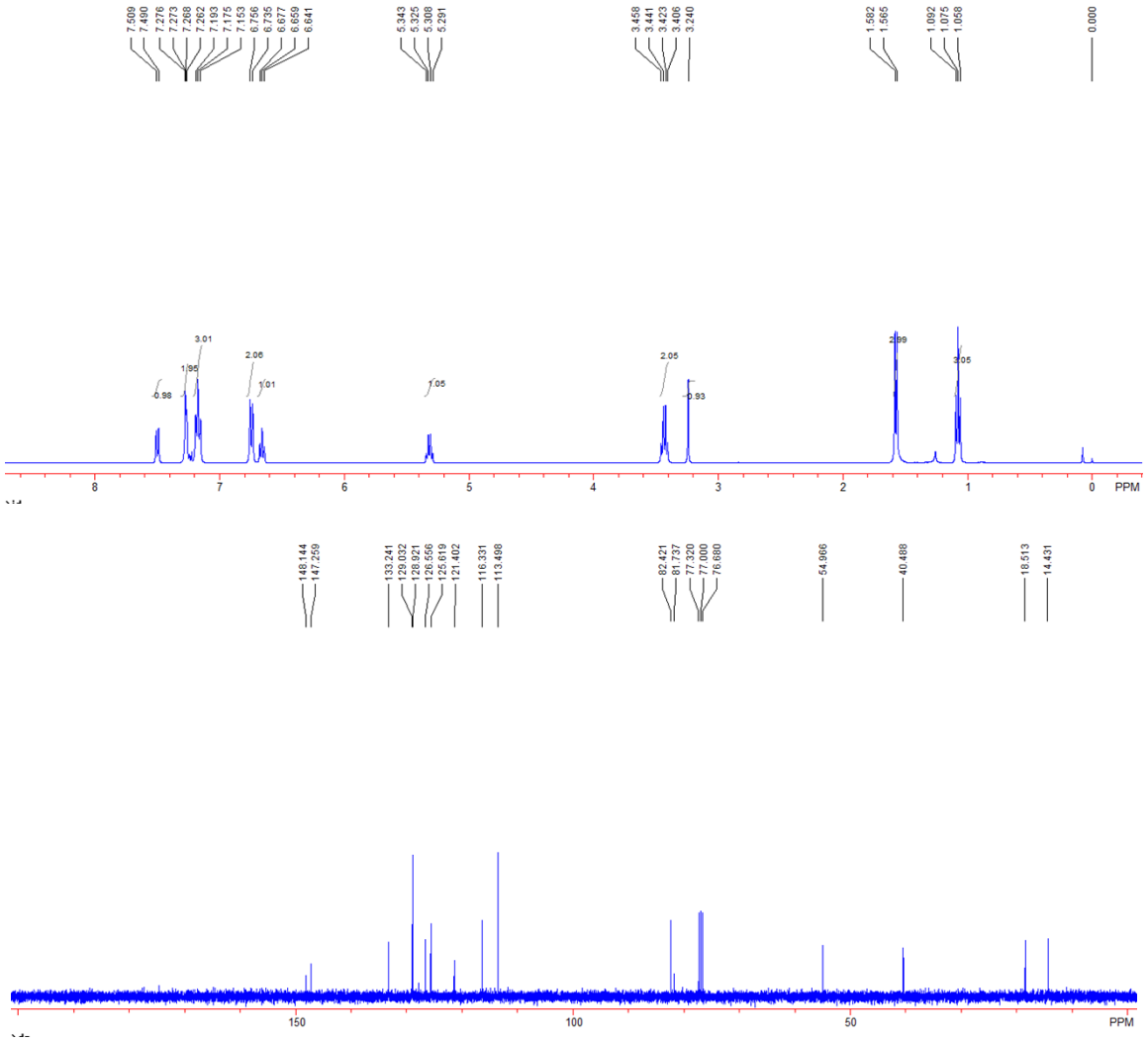


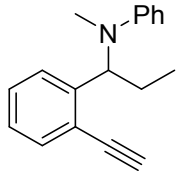
N-(1-(5-bromo-2-ethynylphenyl)ethyl)-N-methylaniline **5c**: a yellow oil; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.55 (d, J = 6.8 Hz, 3H), 2.93 (s, 3H), 3.21 (s, 1H), 5.27 (q, J = 6.8 Hz, 1H), 6.70 (dd, $J_1 = J_2$ = 7.2 Hz, 1H), 6.75 (d, J = 8.4 Hz, 2H), 6.88 (dd, $J_1 = J_2$ = 8.4 Hz, 1H), 6.98 (d, J = 8.4 Hz, 1H), 7.20 (dd, $J_1 = J_2$ = 8.4 Hz, 2H), 7.48 (dd, J_1 = 6.0 Hz, J_2 = 8.4, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 18.0, 32.6, 55.7, 80.8, 82.0, 113.0, 113.3, 113.8, 116.8, 129.0, 135.1, 149.5, 150.5, 161.7, 164.2; IR (CH_2Cl_2) ν 3298, 2977, 2878, 2104, 1598, 1504, 1151, 1130, 994, 748, 691 cm^{-1}.



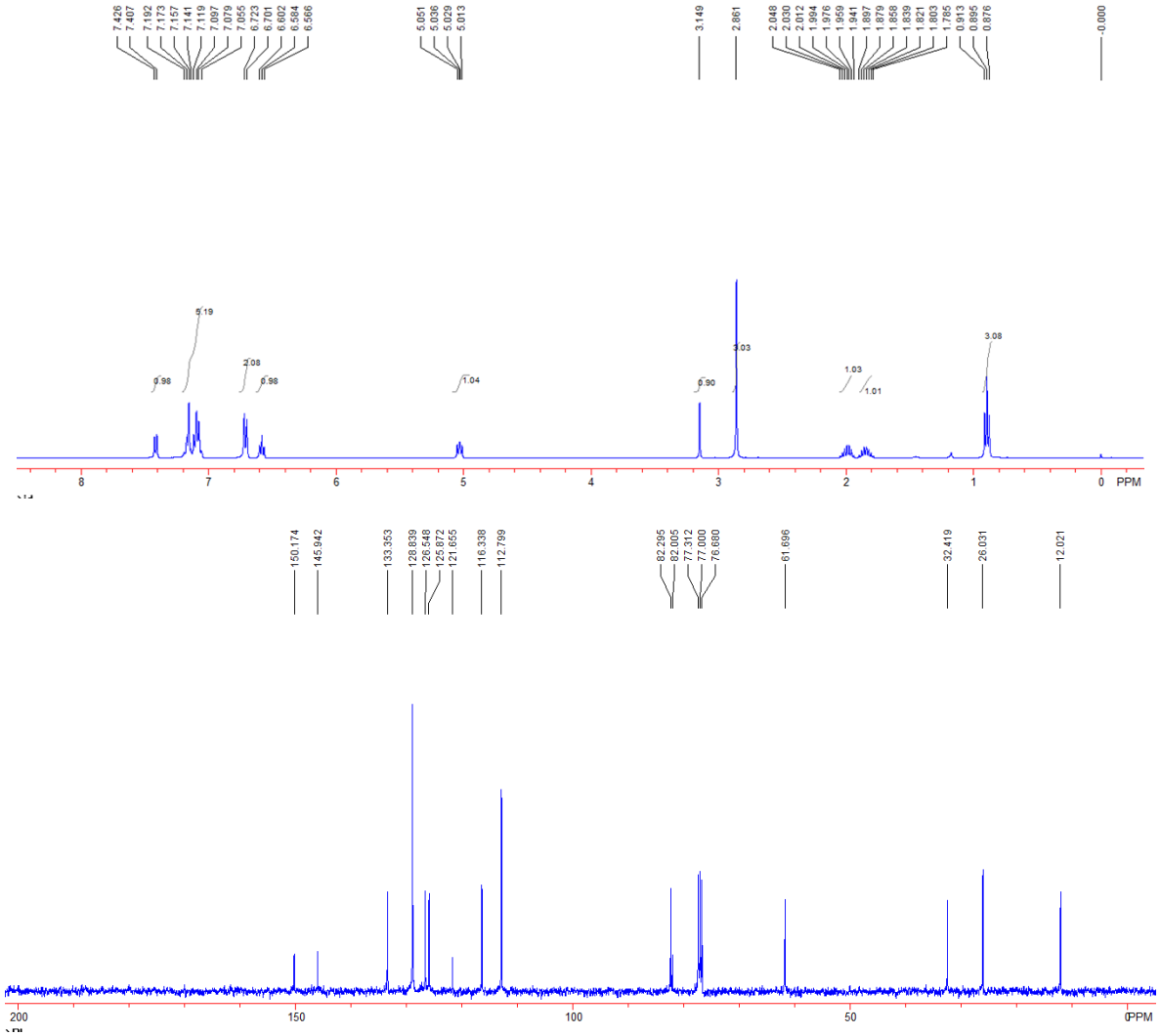


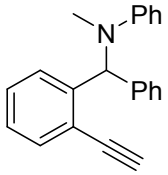
N-ethyl-N-(1-(2-ethynylphenyl)ethyl)aniline **5d**: a yellow oil; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.08 (t, J = 6.8 Hz, 3H), 1.57 (d, J = 6.8 Hz, 3H), 3.24 (s, 1H), 3.43 (q, J = 6.8 Hz, 2H), 5.32 (q, J = 6.8 Hz, 1H), 6.66 (dd, J_1 = J_2 = 7.6 Hz, 1H), 6.75 (d, J = 8.4 Hz, 2H), 7.15-7.20 (m, 3H), 7.26-7.28 (m, 2H), 7.50 (d, J = 7.6 Hz, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 14.4, 18.5, 40.5, 55.0, 81.7, 82.4, 113.5, 116.3, 121.4, 125.6, 126.6, 128.9, 129.0, 133.2, 147.3, 148.2; IR (CH_2Cl_2) ν 3291, 2974, 2871, 2102, 1596, 1503, 1194, 1089, 988, 747, 647 cm^{-1}; HRMS (ESI) Calcd. for $C_{18}H_{20}N$ $(M+H)^+$: 250.1590, found: 250.1593.



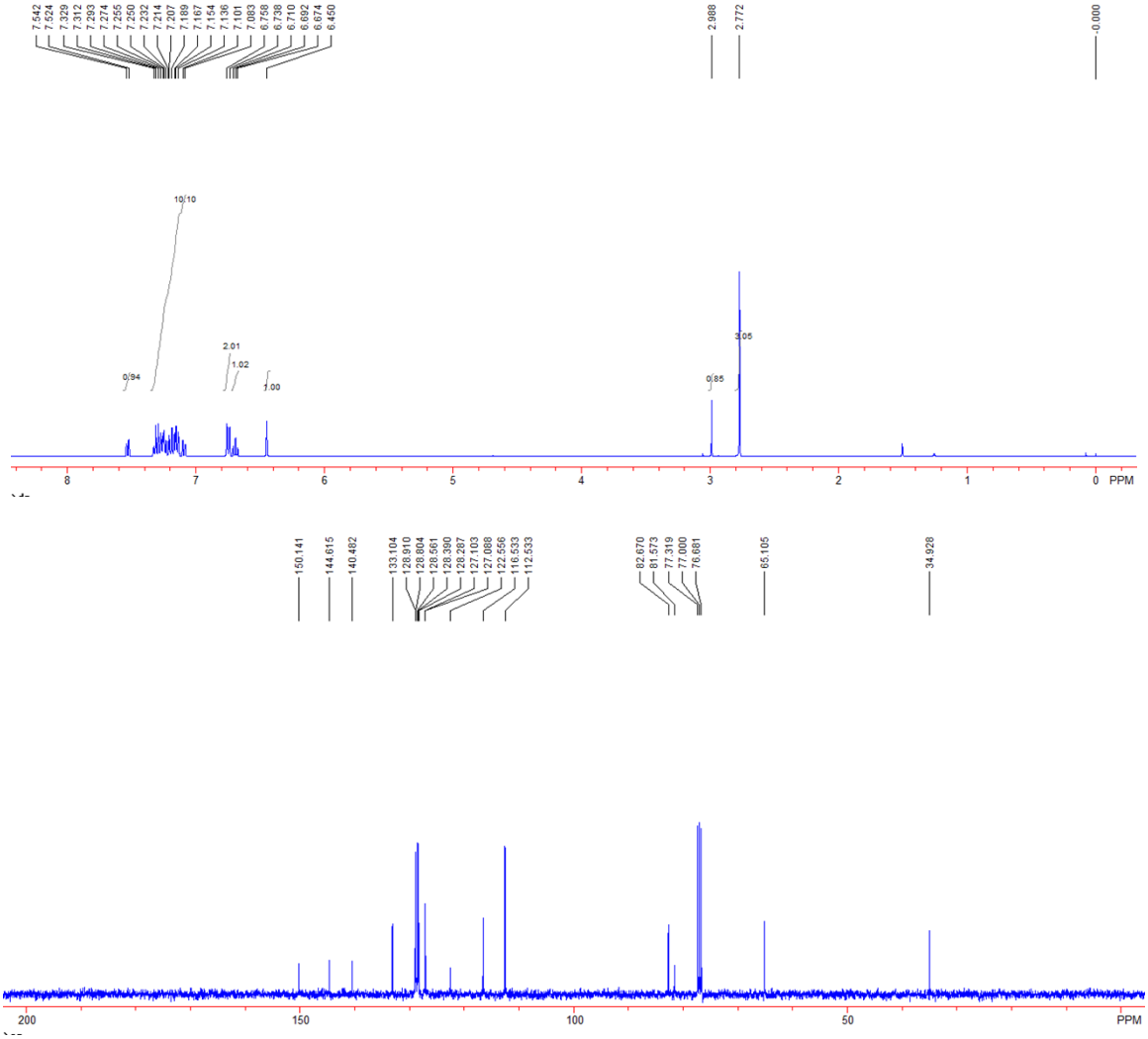


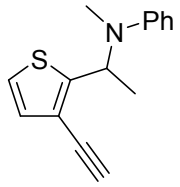
N-(1-(2-ethynylphenyl)propyl)-N-methylaniline **5e**: a yellow oil; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 0.90 (t, J = 7.2 Hz, 3H), 1.78-1.90 (m, 1H), 1.94-2.05 (m, 1H), 2.86 (s, 3H), 3.15 (s, 1H), 5.03 (dd, J_1 = 6.0 Hz, J_2 = 8.8 Hz, 1H), 6.58 (dd, J_1 = J_2 = 7.6 Hz, 1H), 6.71 (d, J = 8.8 Hz, 2H), 7.05-7.20 (m, 5H), 7.42 (d, J = 7.6 Hz, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 12.0, 26.0, 32.4, 61.7, 82.0, 82.3, 112.8, 116.3, 121.7, 125.9, 126.5, 128.8, 133.4, 145.9, 150.2; IR (CH_2Cl_2) ν 3291, 2965, 2875, 2102, 1598, 1504, 1159, 1102, 989, 749, 692 cm^{-1}; HRMS (ESI) Calcd. for $C_{18}H_{20}N$ $(M+H)^+$: 250.1590, found: 250.1593.



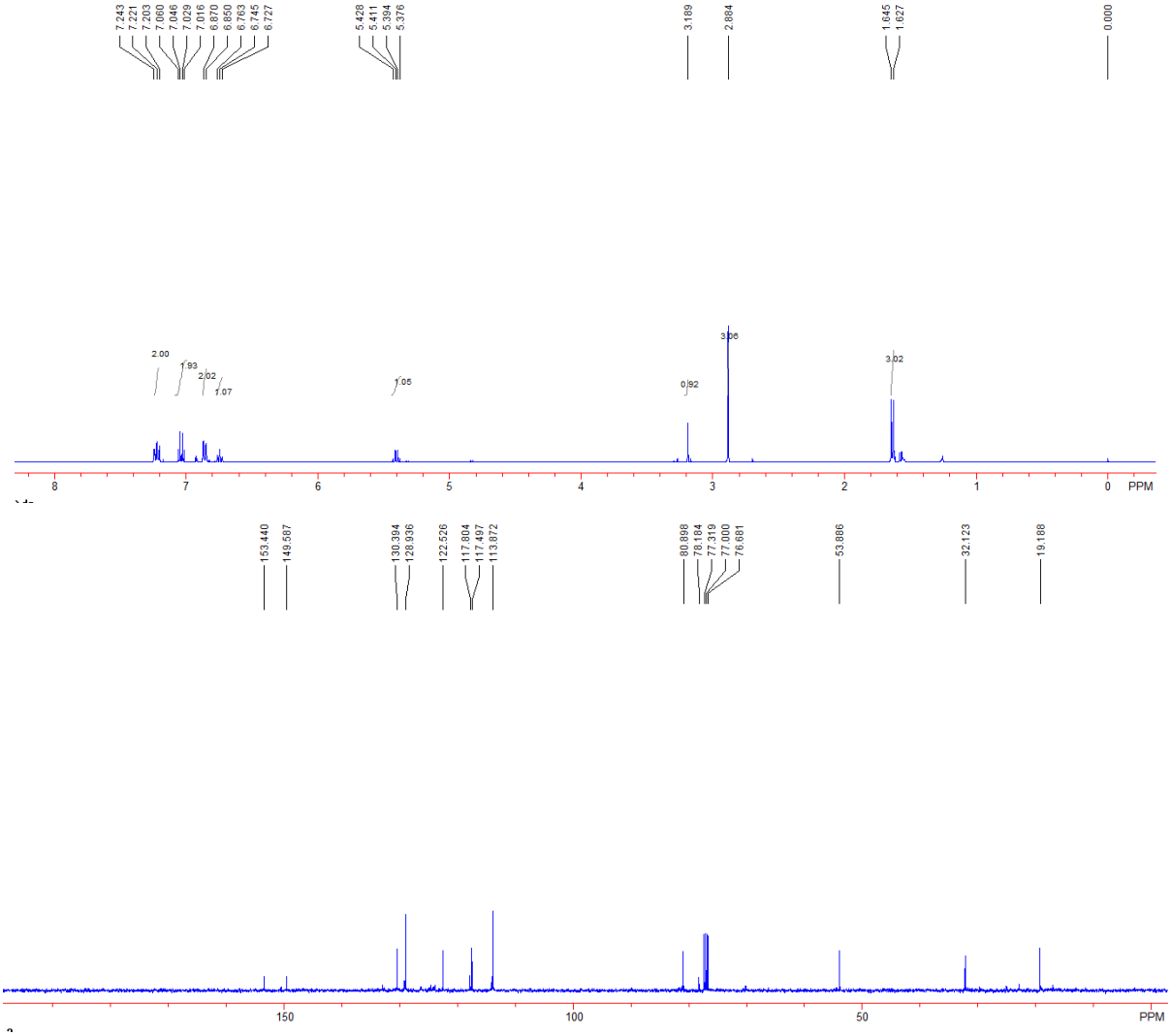


N-((2-ethynylphenyl)(phenyl)methyl)-N-methylaniline **5f**: a yellow oil; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 2.77 (s, 3H), 2.99 (s, 1H), 6.45 (s, 1H), 6.69 (dd, $J_1 = J_2 = 7.2$ Hz, 1H), 6.75 (d, $J =$ 8.0 Hz, 2H), 7.08-7.33 (m, 10H), 7.53 (d, $J = 7.2$ Hz, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 34.9, 65.1, 81.6, 82.7, 112.5, 116.5, 122.6, 127.09, 127.10, 128.3, 128.4, 128.6, 128.8, 128.9, 133.1, 140.5, 144.6, 150.1; IR (CH_2Cl_2) ν 3284, 3026, 2890, 2104, 1598, 1504, 1159, 1111, 990, 747, 695, 651 cm^{-1}; HRMS (ESI) Calcd. for $C_{22}H_{20}N$ $(M+H)^+$: 298.1590, found: 298.1592.





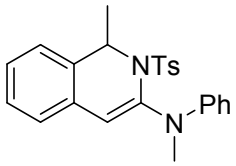
N-(1-(3-ethynylthiophen-2-yl)ethyl)-N-methylaniline **5g**: a yellow oil; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.64 (d, J = 7.2 Hz, 3H), 2.88 (s, 3H), 3.19 (s, 1H), 5.40 (q, J = 7.2 Hz, 1H), 6.75 (dd, J_1 = J_2 = 7.2 Hz, 1H), 6.86 (d, J = 8.0 Hz, 2H), 7.02 (d, J = 5.2 Hz, 1H), 7.05 (d, J = 5.2 Hz, 1H), 7.22 (dd, J_1 = J_2 = 7.2 Hz, 2H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 19.2, 32.1, 53.9, 78.2, 80.9, 113.9, 117.5, 117.8, 122.5, 128.9, 130.4, 149.6, 153.4; IR (CH_2Cl_2) ν 3288, 2976, 2850, 2103, 1598, 1563, 1503, 1113, 991, 749, 691 cm^{-1}; HRMS (ESI) Calcd. for $C_{15}H_{16}NS$ $(M+H)^+$: 242.0998, found: 242.1000.



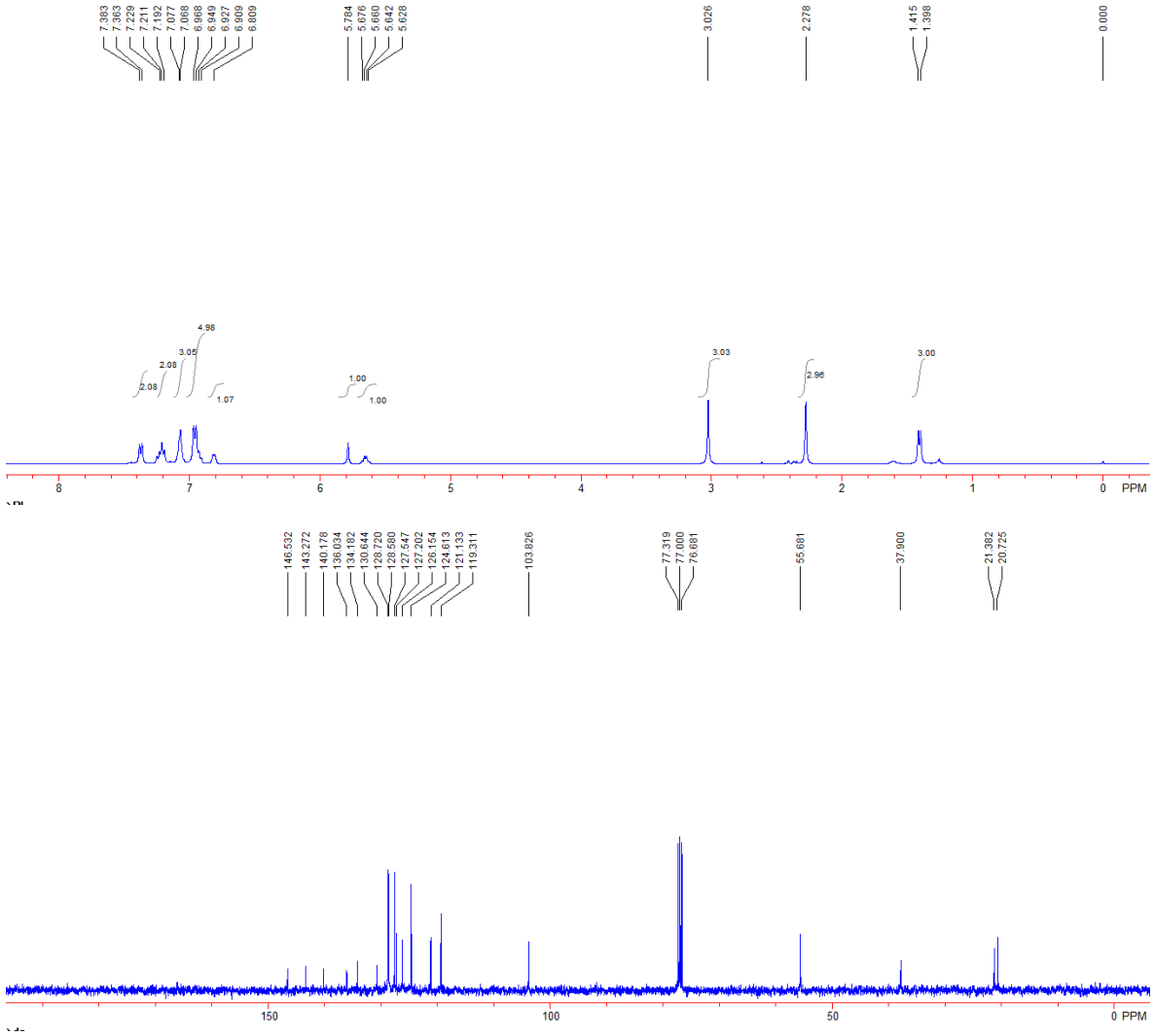
General procedure for the synthesis of compounds 6

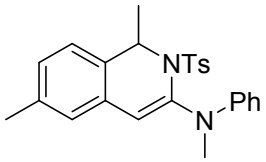
A solution of compound **5** (0.2 mmol), TsN_3 (0.24 mmol), DIPEA (0.2 mmol) and CuCl (0.01 mmol) in dry $CHCl_3$ (2 mL) was stirred at room temperature for an appropriate time. After completion of the reaction as indicated by TLC, the reaction mixture was purified by silica gel column flash chromatography (eluent: petroleum ether / ethyl acetate = 20 / 1) to afford the products **6** in moderate to good yields.

Spectroscopic Data of Substrates 6:

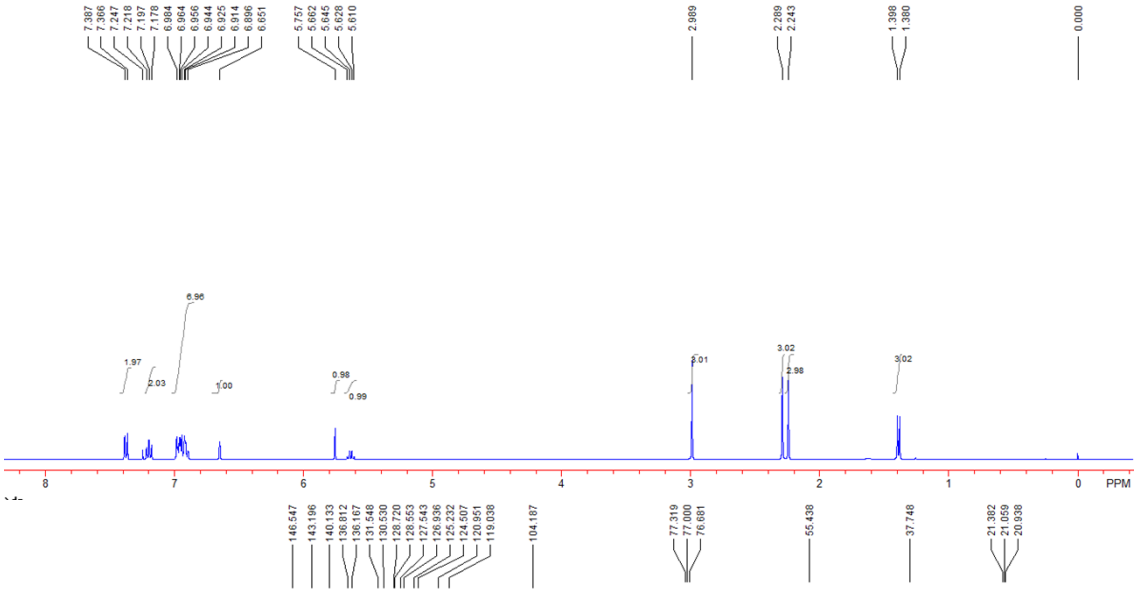


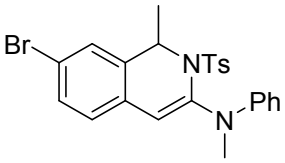
N,1-dimethyl-N-phenyl-2-tosyl-1,2-dihydroisoquinolin-3-amine **6a**: 57 mg, 70% yield, a white solid; Mp: 99-101 ^{o}C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.41 (d, J = 6.8 Hz, 3H), 2.28 (s, 3H), 3.03 (s, 3H), 5.65 (q, J = 6.8 Hz, 1H), 5.78 (s, 1H), 6.81 (s, 1H), 6.90-6.97 (m, 5H), 7.06-7.08 (m, 3H), 7.19-7.23 (m, 2H), 7.37 (d, J = 8.0 Hz, 2H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 20.7, 21.4, 37.9, 55.7, 103.8, 119.3, 121.1, 124.6, 126.2, 127.2, 127.5, 128.6, 128.7, 130.6, 134.2, 136.0, 140.2, 143.3, 146.5; IR (CH_2Cl_2) ν 3063, 2964, 2926, 2869, 1596, 1496, 1348, 1183, 1011, 972, 754, 697 cm^{-1}; HRMS (ESI) Calcd. for $C_{24}H_{25}N_2O_2S$ $(M+H)^+$: 405.1631, found: 405.1633.



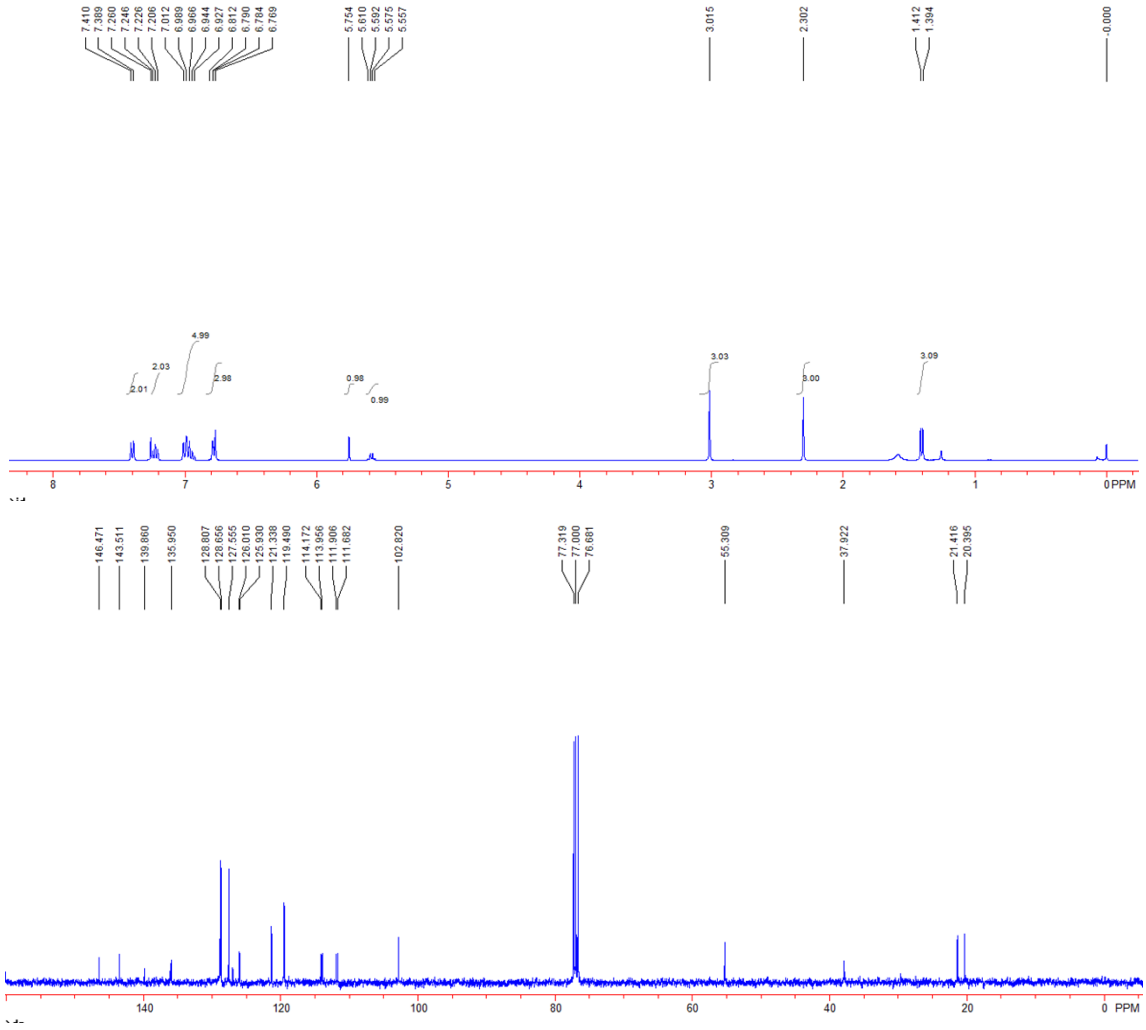


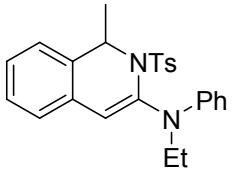
N,1,6-trimethyl-N-phenyl-2-tosyl-1,2-dihydroisoquinolin-3-amine **6b**: 55 mg, 66% yield, a white solid; Mp: 105-106 °C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.39 (d, J = 7.2 Hz, 3H), 2.24 (s, 3H), 2.29 (s, 3H), 2.99 (s, 3H), 5.64 (q, J = 7.2 Hz, 1H), 5.76 (s, 1H), 6.65 (s, 1H), 6.89-6.99 (m, 7H), 7.20 (dd, $J_1 = J_2$ = 8.0 Hz, 2H), 7.38 (d, J = 8.4 Hz, 2H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 20.9, 21.1, 21.4, 37.7, 55.4, 104.2, 119.0, 121.0, 124.5, 125.2, 126.9, 127.5, 128.6, 128.7, 130.5, 131.5, 136.2, 136.8, 140.1, 143.2, 146.5; IR (CH_2Cl_2) ν 3026, 2978, 2926, 2869, 1595, 1494, 1354, 1185, 977, 756, 695 cm^{-1}; HRMS (ESI) Calcd. for $C_{25}H_{27}N_2O_2S$ $(M+H)^+$: 419.1788, found: 419.1789.





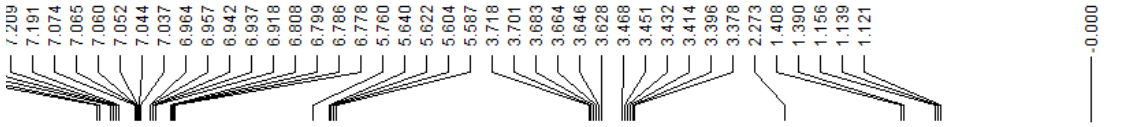
N,1,6-trimethyl-N-phenyl-2-tosyl-1,2-dihydroisoquinolin-3-amine **6c**: 48 mg, 50% yield, a white solid; Mp: 144-146 °C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.40 (d, J = 7.2 Hz, 3H), 2.30 (s, 3H), 3.02 (s, 3H), 5.58 (q, J = 7.2 Hz, 1H), 5.75 (s, 1H), 6.76-6.82 (m, 3H), 6.92-7.02 (m, 5H), 7.23 (dd, J_1 = J_2 = 8.0 Hz, 2H), 7.40 (d, J = 8.4 Hz, 2H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 20.4, 21.4, 37.9, 55.3, 102.8, 111.7, 111.9, 114.0, 114.2, 119.5, 121.3, 125.9, 126.0, 127.6, 128.7, 128.8, 136.0, 139.9, 143.5, 146.5; IR (CH_2Cl_2) ν 3050, 2970, 2924, 2852, 1597, 1493, 1348, 1167, 933, 761, 699 cm^{-1}.

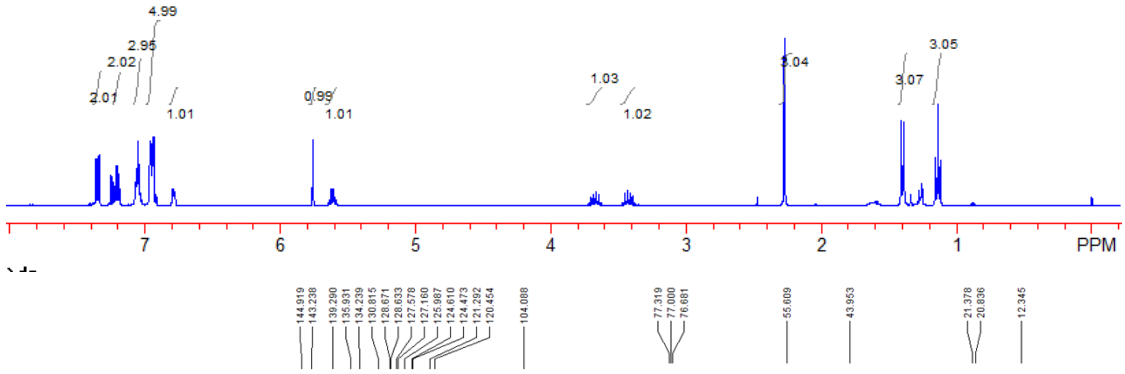


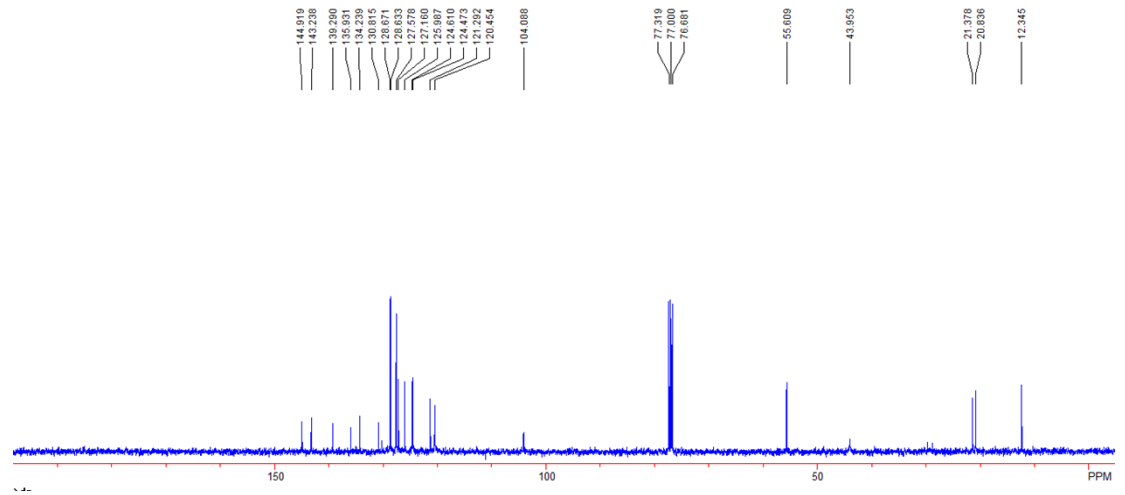


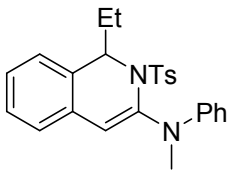
N-ethyl-1-methyl-N-phenyl-2-tosyl-1,2-dihydroisoquinolin-3-amine **6d**: 52 mg, 62% yield, a white solid; Mp: 100-102 °C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.14 (t, J = 6.8 Hz, 3H), 1.40

(d, J = 7.2 Hz, 3H), 2.27 (s, 3H), 3.42 (dt, J_1 = 14.4 Hz, J_2 = 6.8 Hz, 1H), 3.67 (dt, J_1 = 14.4 Hz, J_2 = 6.8 Hz, 1H), 5.61 (q, J = 7.2 Hz, 1H), 5.76 (s, 1H), 6.78-6.81 (m, 1H), 6.91-6.97 (m, 5H), 7.03-7.08 (m, 3H), 7.19-7.25 (m, 2H), 7.35 (d, J = 8.4 Hz, 2H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 12.3, 20.8, 21.4, 44.0, 55.6, 104.1, 120.5, 121.3, 124.5, 124.6, 126.0, 127.2, 127.6, 128.6, 128.7, 130.8, 134.2, 135.9, 139.3, 143.2, 144.9; IR (CH_2Cl_2) ν 3061, 2975, 2926, 2853, 1597, 1494, 1349, 1167, 978, 757, 698 cm^{-1}; HRMS (ESI) Calcd. for $C_{25}H_{27}N_2O_2S$ $(M+H)^+$: 419.1788, found: 419.1800.

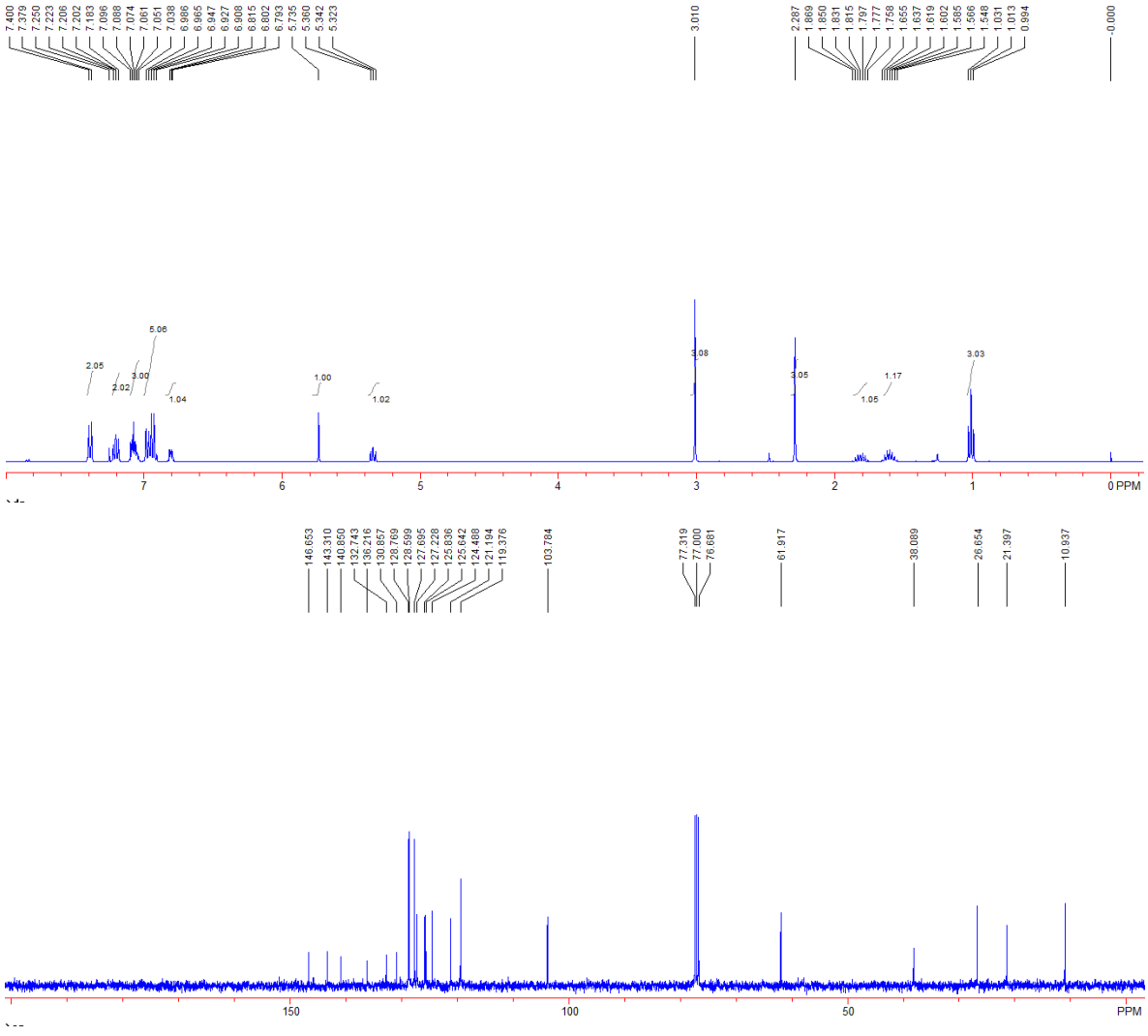


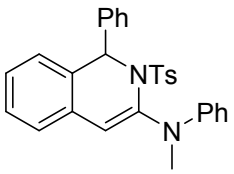




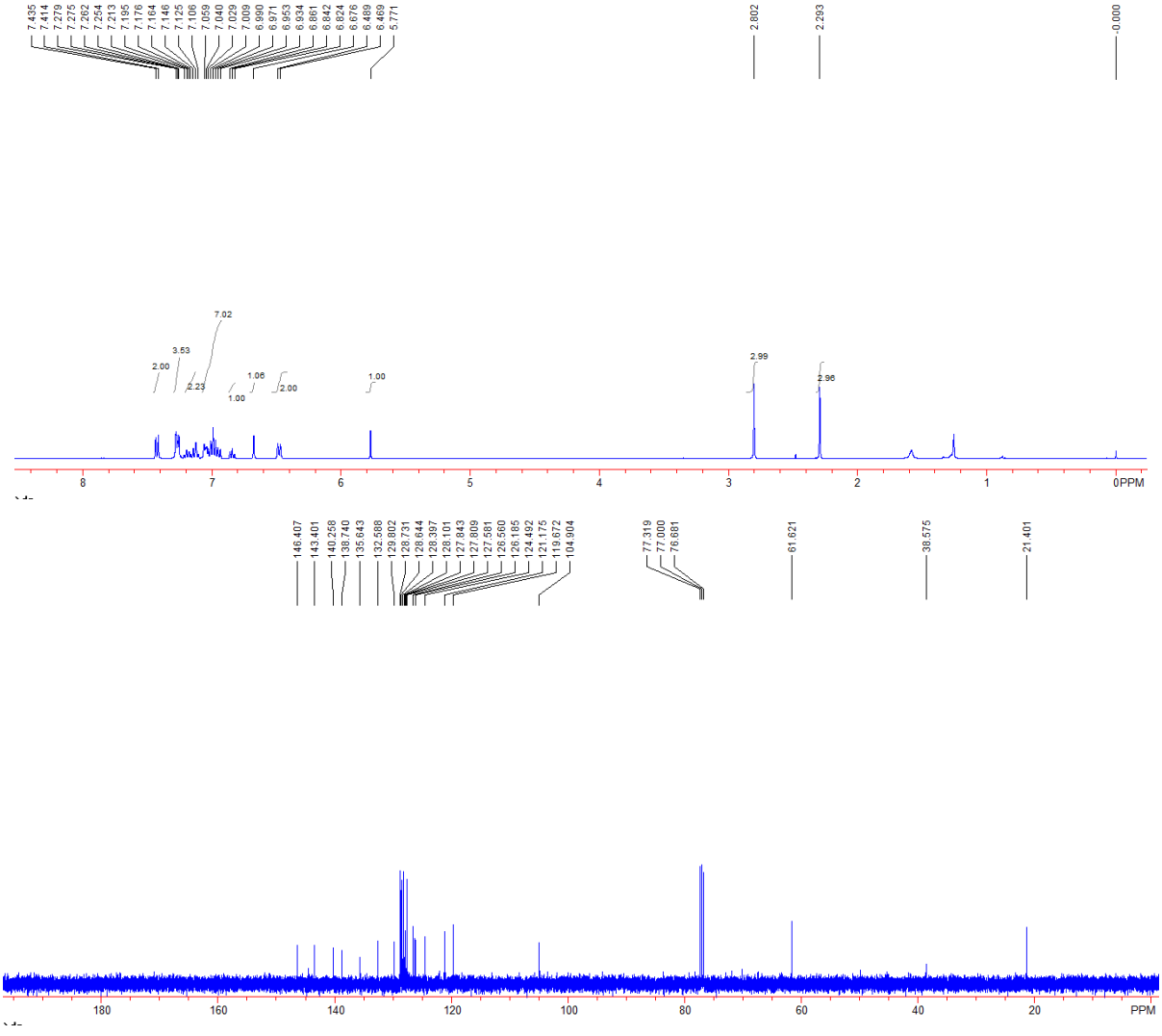


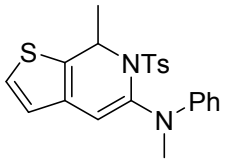
1-ethyl-N-methyl-N-phenyl-2-tosyl-1,2-dihydroisoquinolin-3-amine **6e**: 60 mg, 72% yield, a white solid; Mp: 101-103 ^{o}C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.01 (t, *J* = 7.2 Hz, 3H), 1.54-1.66 (m, 1H), 1.75-1.87 (m, 1H), 2.29 (s, 3H), 3.01 (s, 3H), 5.34 (t, *J* = 7.2 Hz, 1H), 5.74 (s, 1H), 6.79-6.82 (m, 1H), 6.91-6.99 (m, 5H), 7.03-7.10 (m, 3H), 7.18-7.25 (m, 2H), 7.39 (d, *J* = 8.4 Hz, 2H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 10.9, 21.4, 26.7, 38.1, 61.9, 103.8, 119.4, 121.2, 124.5, 125.6, 125.8, 127.2, 127.7, 128.6, 128.8, 130.9, 132.7, 136.2, 140.9, 143.3, 146.7; IR (CH_2Cl_2) ν 3061, 2963, 2926, 2856, 1596, 1498, 1359, 1168, 977, 758, 696 cm^{-1}; HRMS (ESI) Calcd. for $C_{25}H_{27}N_2O_2S$ $(M+H)^+$: 419.1788, found: 419.1791.



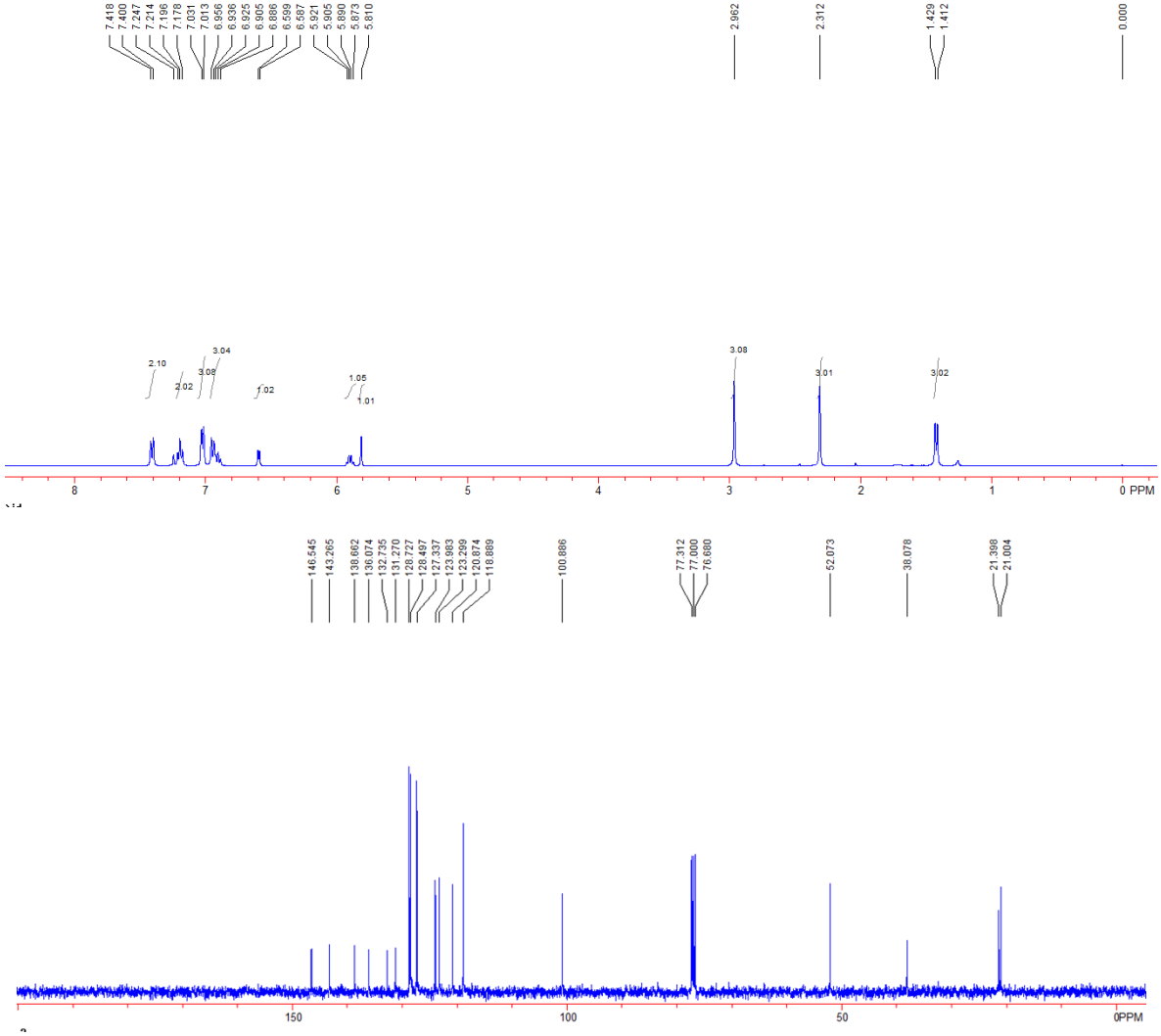


N-methyl-N,1-diphenyl-2-tosyl-1,2-dihydroisoquinolin-3-amine **6f**: 75 mg, 80% yield, a white solid; Mp: 162-164 ^{o}C; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 2.29 (s, 3H), 2.80 (s, 3H), 5.77 (s, 1H), 6.48 (d, J = 8.0 Hz, 2H), 6.68 (s, 1H), 6.84 (dd, J_1 = J_2 = 7.6 Hz, 1H), 6.93-7.06 (m, 7H), 7.10-7.22 (m, 2H), 7.25-7.28 (m, 4H), 7.42 (d, J = 8.4 Hz, 2H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 21.4, 38.6, 61.6, 104.9, 119.7, 121.2, 124.5, 126.2, 126.6, 127.6, 127.81, 127.84, 128.1, 128.4, 128.6, 128.7, 129.8, 132.6, 135.6, 138.7, 140.3, 143.4, 146.4; IR (CH_2Cl_2) ν 3055, 2922, 2852, 1598, 1497, 1348, 1169, 967, 747, 696 cm^{-1}; HRMS (ESI) Calcd. for $C_{29}H_{27}N_2O_2S$ $(M+H)^+$: 467.1788, found: 467.1787.



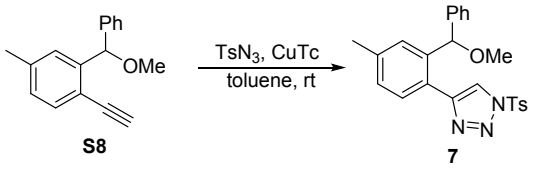


N,7-dimethyl-N-phenyl-6-tosyl-6,7-dihydrothieno[2,3-c]pyridin-5-amine **6g**: 65 mg, 79% yield, a yellow oil; ^{1}H NMR ($CDCl_3$, 400 MHz, TMS) δ 1.42 (d, J = 6.8 Hz, 3H), 2.31 (s, 3H), 2.96 (s, 3H), 5.81 (s, 1H), 5.90 (q, J = 6.8 Hz, 1H), 6.59 (d, J = 4.8 Hz, 1H), 6.88-6.96 (m, 3H), 7.01-7.04 (m, 3H), 7.20 (dd, J_1 = J_2 = 7.2 Hz, 2H), 7.41 (d, J = 7.2 Hz, 2H); ^{13}C NMR ($CDCl_3$, 100 MHz, TMS) δ 21.0, 21.4, 38.1, 52.1, 100.9, 118.9, 120.9, 123.3, 124.0, 127.3, 128.5, 128.7, 131.3, 132.7, 136.1, 138.7, 143.3, 146.5; IR (CH_2Cl_2) ν 3063, 2969, 2925, 2816, 1596, 1495, 1344, 1165, 956, 754, 693 cm^{-1}; HRMS (ESI) Calcd. for $C_{22}H_{23}N_2O_2S_2$ $(M+H)^+$: 411.1195, found: 411.1199.

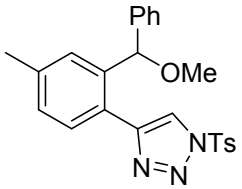


General procedure and spectroscopic data of compound 7:

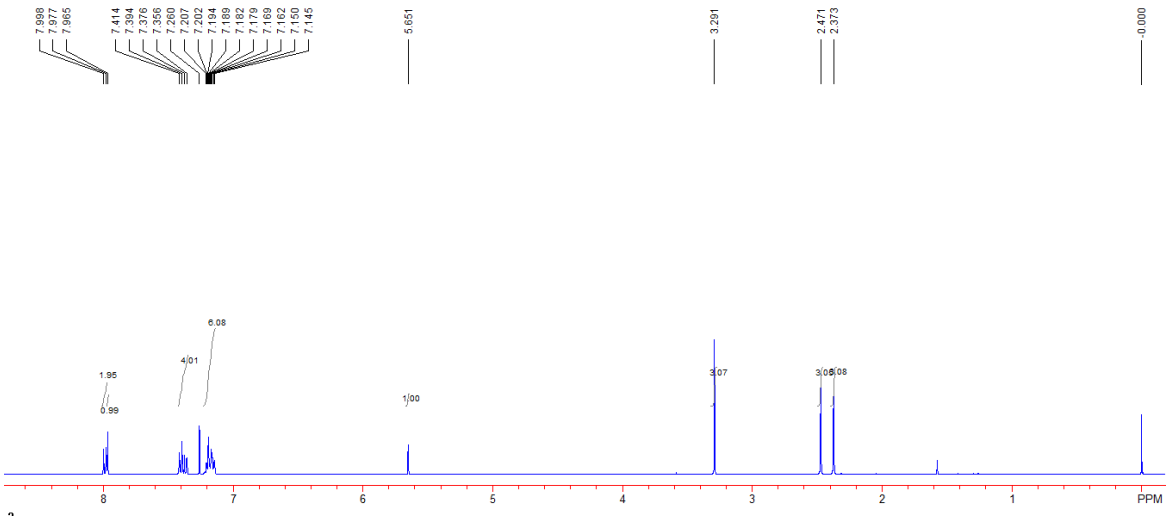
Compound **S8** were synthesized according to the previous literature.[5,6]



A mixture of corresponding **S8**[5] (5.0 mmol), TsN_3(5.0 mmol), and CuTc (0.25 mmol) in DCM (10 mL) was stirred at room temperature for an appropriate time. After completion of the reaction as indicated by TLC, the solvent was removed under reduced pressure and the residue was purified by silica gel column flash chromatography (eluent: petroleum ether / ethyl acetate = 4 / 1) to afford the compound **7**.



4-(2-(methoxy(phenyl)methyl)-4-methylphenyl)-1-tosyl-1*H*-1,2,3-triazole **7**: a colorless oil; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 2.37 (s, 3H), 2.47 (s, 3H), 3.29 (s, 3H), 5.65 (s, 1H), 7.14-7.21 (m, 6H), 7.35-7.42 (m, 4H), 7.97 (s, 1H) 7.99 (d, J = 8.4 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$, TMS) δ 21.1, 21.5, 56.5, 81.2, 121.6, 124.9, 126.9, 127.1, 127.9, 128.29, 128.31, 128.4, 129.8, 130.2, 132.7, 139.1, 139.5, 140.7, 146.2, 147.1; IR (CH_2Cl_2) ν 3150, 2919, 2820, 1594, 1391, 1321, 1194, 1090, 955, 812, 732, 668 cm^{-1}; HRMS (ESI) Calcd. for $C_{24}H_{24}N_3O_3S$ $(M+H)^+$: 434.1533. Found: 434.1529.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7.179
7.169
7.162
7.155
7.145
5.651
3.291
2.471
2.373
0.000
6.08
4.01
1.95
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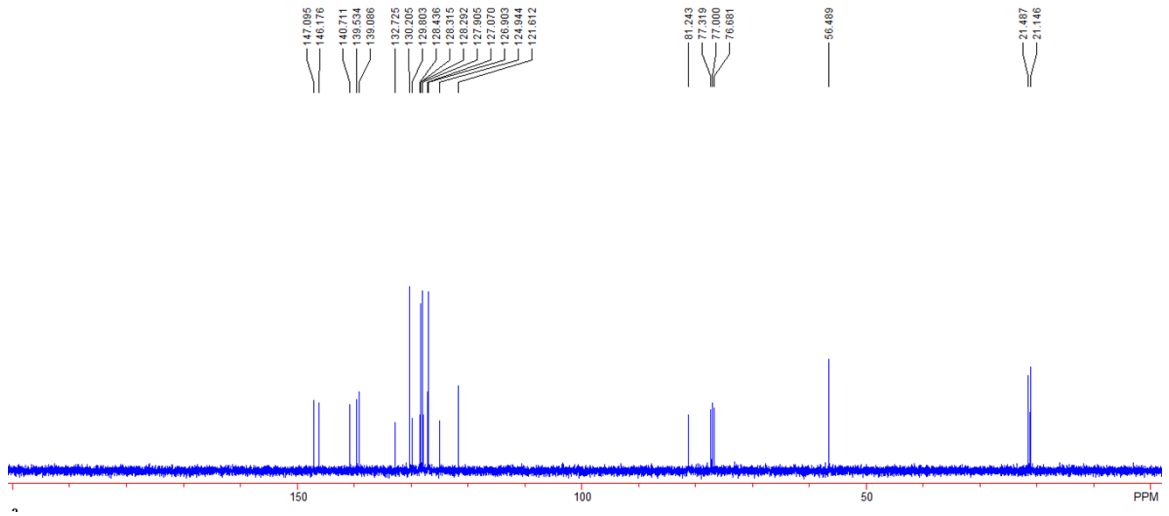
1.00
3.07
3.05
3.08
8
7
6
5
4
3
2
1
PPM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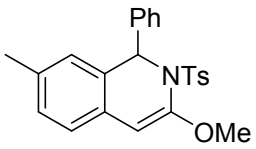
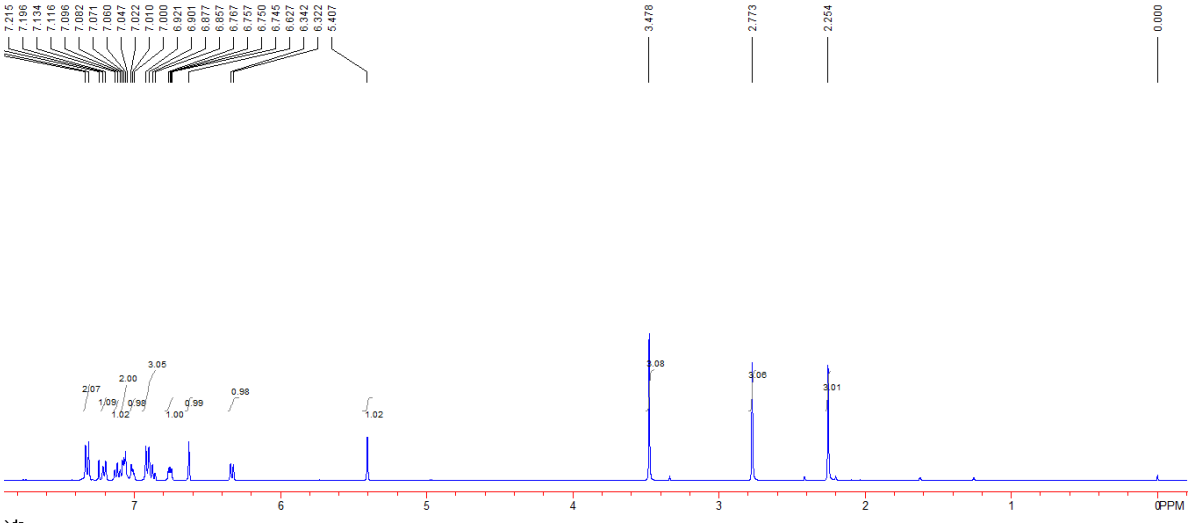
126.603
124.944
121.612
81.243
77.319
77.000
76.681
56.489
21.487
21.146
150
100
50
PPM

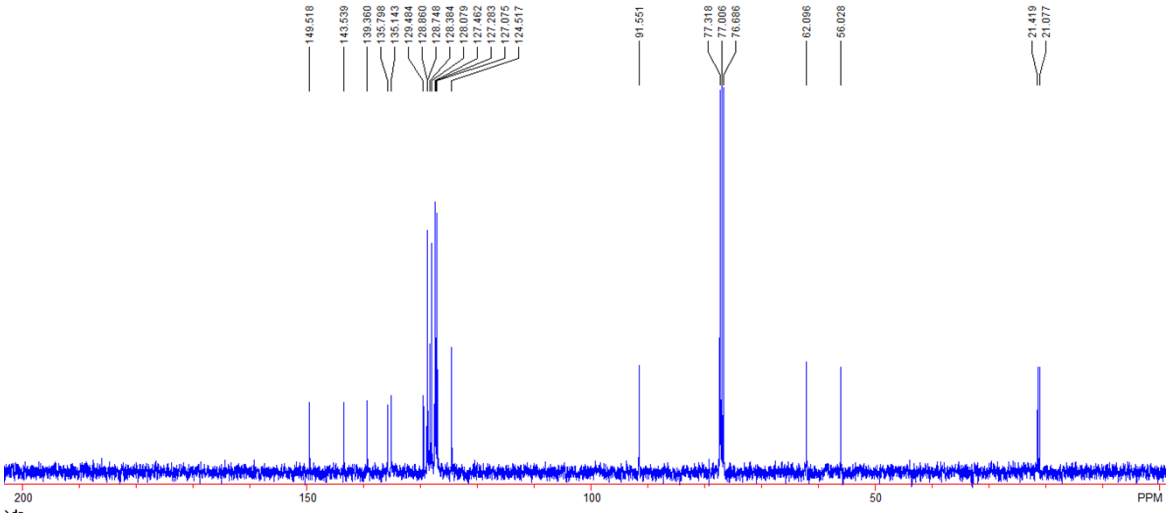
General procedure and spectroscopic data of compound 8:

A solution of compound **7** (0.2 mmol) in dry 1,2-dichloroethane (4 mL) was stirred at 80 °C under N_2 for an appropriate time. After completion of the reaction as indicated by TLC, the reaction was cooled to room temperature, and the mixture was purified by silica gel column flash chromatography (eluent: petroleum ether / ethyl acetate = 20 / 1) to afford the product **8**.

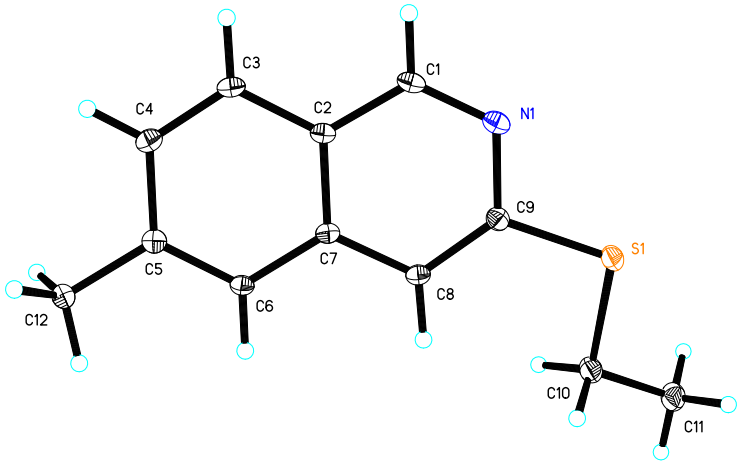


3-methoxy-7-methyl-1-phenyl-2-tosyl-1,2-dihydroisoquinoline **8**: 34 mg, 42%, a white solid; Mp: 52-54 °C. ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 2.25 (s, 3H), 2.77 (s, 3H), 3.48 (s, 3H), 5.41 (s, 1H), 6.33 (d, J = 8.0 Hz, 1H), 6.63 (s, 1H), 6.74-6.77 (m, 1H), 6.87 (d, J = 7.6 Hz, 1H), 6.91 (d, J = 8.4 Hz, 2H), 7.00-7.14 (m, 4H), 7.21 (d, J = 7.6 Hz, 1H), 7.33 (d, J = 8.0 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$, TMS) δ 21.1, 21.4, 56.0, 62.1, 91.6, 124.5, 127.1, 127.3, 127.5, 128.1, 128.4, 128.7, 128.9, 129.5, 135.1, 135.8, 139.4, 143.5, 149.5; IR (CH_2Cl_2) ν 3066, 2930, 2839, 1638, 1572, 1453, 1310, 1265, 1195, 1087, 981, 742, 676 cm^{-1}. HRMS (ESI) Calcd. for $C_{24}H_{24}NO_3S$ $(M+H)^+$: 406.1471. Found: 406.1470.

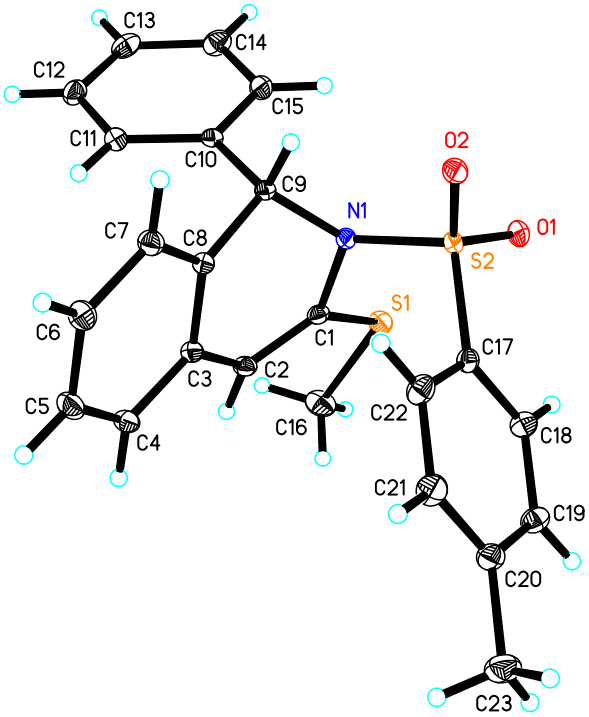



149.518
143.539
139.360
135.798
135.143
129.484
128.860
128.748
128.384
128.079
127.462
127.283
127.075
124.517
91.551
77.318
77.006
76.686
62.096
56.028
21.419
21.077
200
150
100
50
PPM

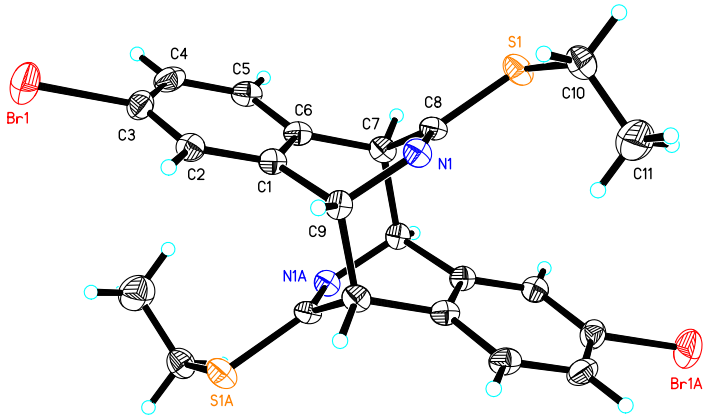
X-ray Crystal Data



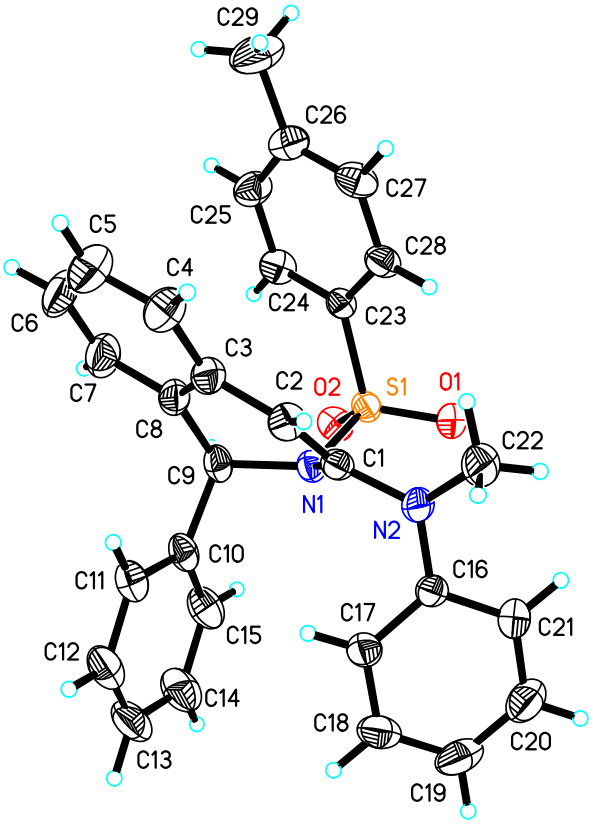
The crystal data of **2f** have been deposited in CCDC with number 1057819. Empirical Formula: $C_{12}H_{13}NS$; Formula Weight: 203.29; Crystal Color, Habit: colorless, Crystal Dimensions: 0.25 x 0.08 x 0.01 mm; Crystal System: Monoclinic; Lattice Parameters: a = 5.9732(9)Å, b = 7.2898(11)Å, c = 11.9181(19)Å, $\alpha = 90^{o}$, $\beta = 100.646(3)^{o}$, $\gamma = 90^{o}$, V = 510.02(14)Å^3; Space group: P 1 21 1; Z = 2; D_{calc} = 1.324 g/cm^3; F_{000} = 216; Final R indices [I>2sigma(I)] R1 = 0.0367, wR2 = 0.0874.



The crystal data of **4** have been deposited in CCDC with number 1400768. Empirical Formula: $C_{23}H_{21}NO_2S_2$; Formula Weight: 407.53; Crystal Color, Habit: colorless, Crystal Dimensions: 0.25 x 0.2 x 0.15 mm^3; Crystal System: Monoclinic; Lattice Parameters: a = 32.732(2)Å, b = 9.3213(7)Å, c = 12.9047(9)Å, $\alpha = 90^o$, $\beta = 92.3470(10)^o$, $\gamma = 90^o$, V = 3934.0(5)$Å^3$; Space group: P 1 2/c 1; Z = 8; D_{calc} = 1.376 g/cm^3; F_{000} = 1712; Final R indices [I>2sigma(I)] R1 = 0.0365, wR2 = 0.0982.



The crystal data of **9c** have been deposited in CCDC with number 1037619. Empirical Formula: $C_{22}H_{20}Br_2N_2S_2$; Formula Weight: 536.34; Crystal Color, Habit: colorless, Crystal Dimensions: 0.145 x 0.087 x 0.045 mm; Crystal System: Monoclinic; Lattice Parameters: a = 21.883(3)Å, b = 4.8646(8)Å, c = 17.600(2)Å, α = 90°, β = 109.120(3)°, γ = 90°, V = 2134.0(5)Å^3; Space group: C 2/c; Z = 4; D_{calc} = 1.669 g/cm^3; F_{000} = 1072; Final R indices [I>2sigma(I)] R1 = 0.0485, wR2 = 0.1158.



The crystal data of **6f** have been deposited in CCDC with number 1421028. Empirical Formula: $C_{29}H_{26}N_2O_2S$; Formula Weight: 466.58; Crystal Color, Habit: colorless, Crystal Dimensions: 0.210 x 0.170 x 0.130 mm^3; Crystal System: Monoclinic; Lattice Parameters: a = 13.134(2)Å, b = 15.776(3)Å, c = 12.1965(19)Å, α = 90°, β = 106.946(4)°, γ = 90°, V = 2417.5(7)$Å^3$; Space group: P 21/c; Z = 4; D_{calc} = 1.282 g/cm^3; F_{000} = 984; Final R indices [I>2sigma(I)] R1 = 0.0659, wR2 = 0.1457.

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