Supporting Information

Gold-Catalyzed Intermolecular Oxidation of Chiral Homopropargyl Amides: A Reliable Access to Enantioenriched Pyrrolidin-3-ones

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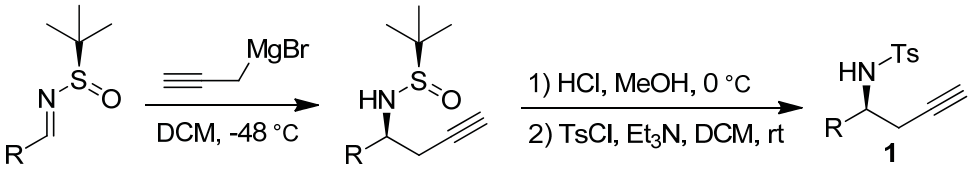
General Information. Ethyl acetate (ACS grade), hexanes (ACS grade) and anhydrous 1, 2-dichloroethane (ACS grade) were obtained commercially and used without further purification. Methylene chloride, tetrahydrofuran and diethyl ether were purified according to standard methods unless otherwise noted. Commercially available reagents were used without further purification. Reactions were monitored by thin layer chromatography (TLC) using silicycle pre-coated silica gel plates. Flash column chromatography was performed over silica gel (300-400 mesh). Infrared spectra were recorded on a Nicolet AVATER FTIR330 spectrometer as thin film and are reported in reciprocal centimeter (cm^{-1}). Mass spectra were recorded with Micromass QTOF2 Quadrupole/Time-of-Flight Tandem mass spectrometer using electron spray ionization.

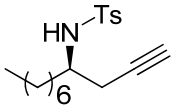
^{1}H NMR spectra were recorded on a Bruker AV-400 spectrometer and a Bruker AV-500 spectrometer in chloroform-d_3. Chemical shifts are reported in ppm with the internal TMS signal at 0.0 ppm as a standard. The data is being reported as (s = singlet, d = doublet, t = triplet, m = multiplet or unresolved, brs = broad singlet, coupling constant(s) in Hz, integration).

^{13}C NMR spectra were recorded on on a Bruker AV-400 spectrometer and a Bruker AV-500 spectrometer in chloroform-d_3. Chemical shifts are reported in ppm with the internal chloroform signal at 77.0 ppm as a standard.

Compounds **1a-1s** were prepared according to the known procedures.[1-2] Compounds **1a-1p** are known compounds,[2] except **1i**.



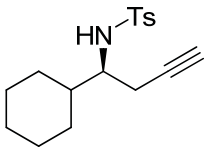
(*R*)-4-methyl-N-(undec-1-yn-4-yl)benzenesulfonamide (1a)



1a

99% ee (determined by HPLC: Chiralcel AD-H Column, 10/90 *i*-PrOH/hexane, 0.8 mL/min, 200 nm; TR = 11.65 min (major), 10.49 min (minor)).

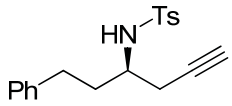
(*S*)-N-(1-cyclohexylbut-3-yn-1-yl)-4-methylbenzenesulfonamide (1b)



1b

>99% ee (determined by HPLC: Chiralpak IC Column, 10/90 *i*-PrOH/hexane, 0.6 mL/min, 200 nm; TR = 26.60 min (major), 30.09 min (minor)).

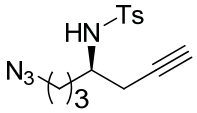
(*R*)-4-methyl-N-(1-phenylhex-5-yn-3-yl)benzenesulfonamide (1c)



1c

99% ee (determined by HPLC: Chiralpak IC Column, 10/90 *i*-PrOH/hexane, 0.6 mL/min, 200 nm; TR = 30.23 min (major), 36.29 min (minor)).

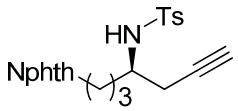
(*R*)-N-(7-azidohept-1-yn-4-yl)-4-methylbenzenesulfonamide (1d)



1d

98% ee (determined by HPLC: Chiralpak IC Column, 10/90 *i*-PrOH/hexane, 1.0 mL/min, 200 nm; TR = 25.78 min (major), 29.46 min (minor)).

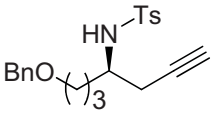
(*R*)-N-(7-(1,3-dioxoisoindolin-2-yl)hept-1-yn-4-yl)-4-methylbenzenesulfonamide (1e)



1e

97% ee (determined by HPLC: Chiralpak IC Column, 10/90 *i*-PrOH/hexane, 0.6 mL/min, 200 nm; TR = 58.43 min (major), 45.32 min (minor)).

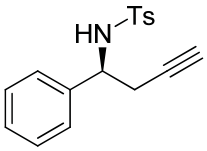
(*R*)-N-(7-(benzyloxy)hept-1-yn-4-yl)-4-methylbenzenesulfonamide (1f)



1f

98% ee (determined by HPLC: Chiralpak IC Column, 10/90 *i*-PrOH/hexane, 0.6 mL/min, 200 nm; TR = 53.42 min (major), 65.41 min (minor)).

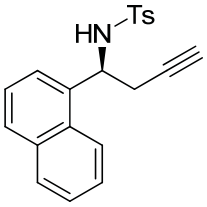
(*S*)-4-methyl-N-(1-phenylbut-3-yn-1-yl)benzenesulfonamide (1g)



1g

99% ee (determined by HPLC: Chiralpak IC Column, 10/90 *i*-PrOH/hexane, 0.6 mL/min, 200 nm; TR = 48.73 min (major), 45.73 min (minor)).

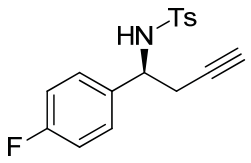
(*S*)-4-methyl-N-(1-(naphthalen-1-yl)but-3-yn-1-yl)benzenesulfonamide (1h)



1h

98% ee (determined by HPLC: Chiralpak IC Column, 10/90 *i*-PrOH/hexane, 1.0 mL/min, 200 nm; TR = 35.54 min (major), 29.35 min (minor)).

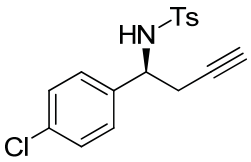
(*S*)-N-(1-(4-fluorophenyl)but-3-yn-1-yl)-4-methylbenzenesulfonamide (1i)



1i

$[\alpha]_D^{20}$ = -117.0º (c = 1.0, $CHCl_3$). 98% ee (determined by HPLC: Chiralpak IA Column, 8/92 *i*-PrOH/hexane, 0.6 mL/min, 200 nm; TR = 34.27 min (major), 36.30 min (minor)). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.61 (d, 2H, *J* = 8.4 Hz), 7.17 – 7.11 (m, 4H), 6.85 (t, 2H, *J* = 8.8 Hz), 5.73 (d, 1H, *J* = 7.2 Hz), 4.49 (q, 1H, *J* = 6.4 Hz), 2.59 (dd, 2H, *J* = 2.4 Hz, *J* = 6.0 Hz), 2.37 (s, 3H), 1.96 (t, 1H, *J* = 2.4 Hz); ^{13}C NMR (125 MHz, $CDCl_3$) δ 162.1 (d, *J* = 306.1 Hz), 143.4, 137.1, 135.2 (d, *J* = 4.0 Hz), 129.4, 128.3 (d, *J* = 10.3 Hz), 127.0, 115.0 (d, *J* = 26.9 Hz), 78.9, 72.1, 55.2, 27.2, 21.3; IR (neat): 3291(bs), 2924, 2122, 1604, 1512, 1333, 1158, 834, 737, 705, 666, 577, 550; MS (ESI, m/z): 340 (M + Na^+). HRESIMS Calcd for $[C_{17}H_{16}FNNaO_2S]^+$ (M + Na^+) 340.0785; Found 340.0783.

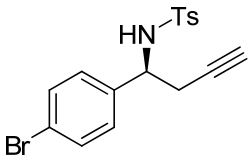
(*S*)-N-(1-(4-chlorophenyl)but-3-yn-1-yl)-4-methylbenzenesulfonamide (1j)



1j

98% ee (determined by HPLC: Chiralpak IC Column, 10/90 *i*-PrOH/hexane, 0.6 mL/min, 200 nm; TR = 39.07 min (major), 34.85 min (minor)).

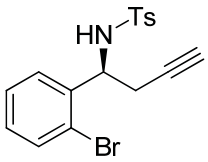
(*S*)-N-(1-(4-bromophenyl)but-3-yn-1-yl)-4-methylbenzenesulfonamide (1k)



1k

99% ee (determined by HPLC: Chiralpak IC Column, 10/90 *i*-PrOH/hexane, 0.6 mL/min, 200 nm; TR = 42.07 min (major), 37.29 min (minor)).

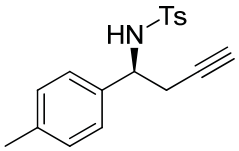
(*S*)-N-(1-(2-bromophenyl)but-3-yn-1-yl)-4-methylbenzenesulfonamide (1l)



1l

97% ee (determined by HPLC: Chiralpak IC Column, 10/90 *i*-PrOH/hexane, 0.6 mL/min, 200 nm; TR = 63.13 min (major), 40.70 min (minor)).

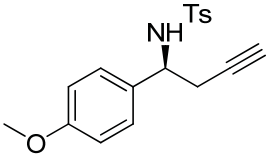
(*S*)-4-methyl-N-(1-(p-tolyl)but-3-yn-1-yl)benzenesulfonamide (1m)



1m

99% ee (determined by HPLC: Chiralpak IC Column, 10/90 *i*-PrOH/hexane, 0.6 mL/min, 200 nm; TR = 53.51 min (major), 56.69 min (minor)).

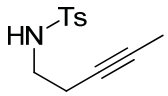
(*S*)-N-(1-(4-methoxyphenyl)but-3-yn-1-yl)-4-methylbenzenesulfonamide (1n)



1n

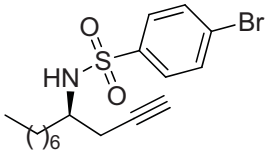
99% ee (determined by HPLC: Chiralpak IC Column, 10/90 *i*-PrOH/hexane, 0.6 mL/min, 200 nm; TR = 38.75 min (major), 36.35 min (minor)).

4-methyl-N-(pent-3-yn-1-yl)benzenesulfonamide (1o')



^{1}H NMR (400 MHz, $CDCl_3$) δ 7.76 (d, 2H, *J* = 8.4 Hz), 7.31 (d, 2H, *J* = 8.0 Hz), 4.91 (t, 1H, *J* = 6.4 Hz), 3.05 (dd, 2H, *J* = 6.4 Hz, *J* = 8.8 Hz), 2.43 (s, 3H), 2.30 – 2.25 (m, 2H), 1.74 (t, 3H, *J* = 2.8 Hz); ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.4, 137.0, 129.7, 127.0, 78.3, 74.9, 42.0, 21.5, 19.9, 3.4; IR (neat): 3283, 2920, 2850, 2174, 1598, 1422, 1327, 1160, 1093, 815, 662; MS (ESI, m/z): 260 (M + Na^+). HRESIMS Calcd for $[C_{12}H_{15}NNaO_2S]^+$ (M + Na^+) 260.0721; Found 260.0721.

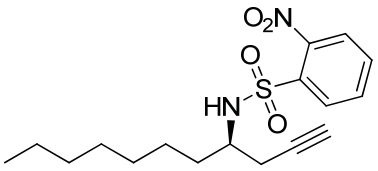
(R)-4-bromo-N-(undec-1-yn-4-yl)benzenesulfonamide (1q)



1q

$[\alpha]_D^{20}$ = + 43.4º (c = 0.3, $CHCl_3$). 99% ee (determined by HPLC: Chiralcel IB Column, 5/95 *i*-PrOH/hexane, 0.6 mL/min, 200 nm; TR = 16.13 min (major), 18.26 min (minor)). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.75 (d, 2H, *J* = 12.4 Hz), 7.65 (d, 2H, *J* = 10.8 Hz), 4.69 (d, 1H, *J* = 7.2 Hz), 3.39 – 3.33 (m, 1H), 2.30 (dd, 2H, *J* = 1.2 Hz, *J* = 3.6 Hz), 1.98 (t, 1H, *J* = 2.4 Hz), 1.55 – 1.47 (m, 2H), 1.31 – 1.23 (m, 2H), 1.22 – 1.10 (m, 8H), 0.88 (t, 3H, *J* = 6.0 Hz); ^{13}C NMR (100 MHz, $CDCl_3$) δ 140.2， 132.3, 128.6, 127.5, 79.2, 71.6, 52.0, 34.1, 31.7, 29.0, 25.6, 25.1, 22.6, 14.0; IR (neat): 3287, 2926, 2855, 2121(s), 1575, 1468, 1429, 1332, 1163, 1092, 1068, 739, 611; MS (ESI, m/z): 408 (M + Na^+). HRESIMS Calcd for $[C_{17}H_{24}BrNNaO_2S]^+$ (M + Na^+) 408.0609; Found 408.0607.

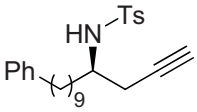
(R)-2-nitro-N-(undec-1-yn-4-yl)benzenesulfonamide (1r)



1r

$[\alpha]_D^{20}$ = + 26.4º (c = 1.0, $CHCl_3$). 99% ee (determined by HPLC: Chiralcel IB Column, 5/95 *i*-PrOH/hexane, 0.6 mL/min, 200 nm; TR = 26.85 min (major), 28.82 min (minor)). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.17 - 8.14 (m, 1H), 7.90 – 7.87 (m, 1H), 7.78 – 7.72 (m, 2H), 5.53 (d, 1H, *J* = 6.8 Hz), 3.64 – 3.57 (m, 1H), 2.37 (dd, 2H, *J* = 2.0 Hz, *J* = 4.0 Hz), 1.92 (t, 1H, *J* = 2.4 Hz), 1.66 – 1.53 (m, 2H), 1.34 – 1.07 (m, 10H), 0.86 (t, 3H, *J* = 5.6 Hz); ^{13}C NMR (100 MHz, $CDCl_3$) δ 147.6, 135.0, 133.4, 132.9, 130.3, 125.3, 79.0, 71.3, 53.3, 34.0, 31.5, 28.9, 25.4, 25.2, 22.5, 13.9; IR (neat): 3301, 2928, 2857, 2124(s), 1541, 1442, 1418, 1361, 1169, 1125, 851, 599; MS (ESI, m/z): 375 (M + Na^+). HRESIMS Calcd for $[C_{17}H_{24}N_2NaO_4S]^+$ (M + Na^+) 375.1354; Found 375.1354.

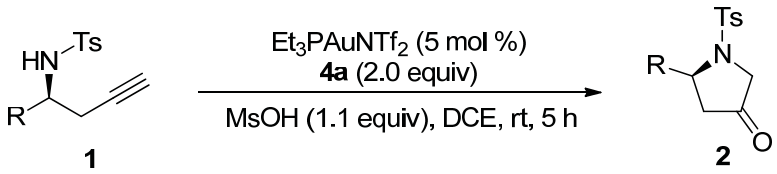
(R)-4-methyl-N-(13-phenyltridec-1-yn-4-yl)benzenesulfonamide (1s)



1s

$[\alpha]_D^{20}$ = +31.3º (c = 1.0, $CHCl_3$). 99% ee (determined by HPLC: Chiralcel AD-H Column, 5/95 *i*-PrOH/hexane, 0.8 mL/min, 200 nm; TR = 26.62 min (major), 22.34 min (minor)). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.76 (d, 2H, *J* = 8.0 H), 7.27 (t, 4H, *J* = 8.8 Hz), 7.18 – 7.15 (m, 3H), 4.67 (d, 1H, *J* = 9.2 Hz), 3.36 – 3.28 (m, 1H), 2.60 (t, 2H, *J* = 7.6 Hz), 2.41 (s, 3H), 2.27 – 2.56 (m, 2H), 1.97 (t, 1H, *J* = 2.8 Hz), 1.64 – 1.46 (m, 4H), 1.32 – 1.24 (m, 4H), 1.20 – 1.14 (m, 8H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.4, 142.8, 138.1, 129.6, 128.4, 128.2, 127.0, 125.5, 79.4, 71.4, 51.7, 35.9, 34.0, 31.5, 29.4, 29.4, 29.3, 29.2, 29.1,

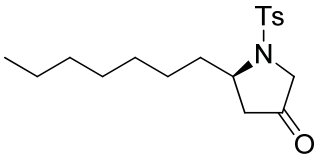
25.5, 24.9, 21.5; IR (neat): 3357, 2923, 2852, 2093, 1660, 1600, 1465, 1328, 1275, 1260, 1159, 750; MS (ESI, m/z): 448 (M + Na^+). HRESIMS Calcd for $[C_{26}H_{35}NNaO_2S]^+$ (M + Na^+) 448.2288; Found 448.2286.



General procedure:

2-Bromopyridine *N*-oxide **4a** (104.4 mg, 0.60 mmol), MsOH (3.3 mL, 0.10 M in DCE), and $Et_3PAuNTf_2$ (9.0 mg, 0.015 mmol) were added in this order to a solution of the homopropargyl amide **1** (0.30 mmol) in DCE (3.0 mL) at room temperature. The reaction mixture was stirred at rt and the progress of the reaction was monitored by TLC. The reaction typically took 5 h. Upon completion, the reaction diluted with DCM (30 mL) and washed with saturated aqueous $NaHCO_3$ (2 × 15 mL). The resulting solution was extracted again with DCM (30 mL) and the combined organic layers were dried with $MgSO_4$. The mixture was then concentrated and the residue was purified by chromatography on silica gel (eluent: hexanes/ethyl acetate) to afford the desired products **2**.

(R)-5-heptyl-1-tosylpyrrolidin-3-one (2a)

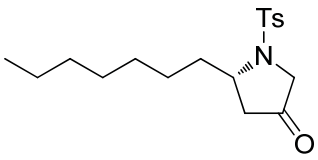


2a

Compound **2a** was prepared in 69% yield according to the general procedure. $[\alpha]_D^{20}$ = +88.0º (c = 0.35, $CHCl_3$). 99% ee (determined by HPLC: Chiralcel AD-H Column, 10/90

*i*PrOH /hexane, 1.0 mL/min, 200 nm; TR = 9.70 min (major), 13.77 min (minor)). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.72 (d, 2H, *J* = 8.5 Hz), 7.33 (d, 2H, *J* = 8.0 Hz), 4.24 – 4.18 (m, 1H), 3.79 (d, 1H, *J* = 18.5 Hz), 3.63 (d, 1H, *J* = 19.0 Hz), 2.43 (s, 3H), 2.23 (dd, 1H, *J* = 8.0 Hz, *J* = 18.0 Hz), 2.11 (dd, 1H, *J* = 1.0 Hz, *J* = 18.0 Hz), 1.72 – 1.65 (m, 1H), 1.53 – 1.46 (m, 1H), 1.37 – 1.26 (m, 10H), 0.88 (t, 3H, *J* = 6.5 Hz); ^{13}C NMR (125 MHz, $CDCl_3$) δ 210.1, 144.1, 135.1, 130.1, 127.3, 57.8, 52.9, 42.5, 35.7, 31.7, 29.2, 29.1, 25.4, 22.6, 21.5, 14.0; IR (neat): 2925, 2855, 1761(s), 1597, 1493, 1461, 1349, 1305, 1156, 1092, 1016, 664; MS (ESI, m/z): 360 (M + Na^+). HRESIMS Calcd for $[C_{18}H_{27}NNaO_3S]^+$ (M + Na^+) 360.1609; Found 360.1611.

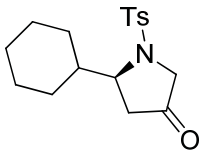
(S)-5-heptyl-1-tosylpyrrolidin-3-one (2a')



2a'

Compound **2a'** was prepared in 63% yield according to the general procedure. $[\alpha]_D^{20}$ = -58.0º (c = 0.5, $CHCl_3$). 99% ee (determined by HPLC: Chiralcel AD-H Column, 10/90 *i*PrOH /hexane, 1.0 mL/min, 200 nm; TR = 15.91 min (major), 12.09 min (minor)).

(S)-5-cyclohexyl-1-tosylpyrrolidin-3-one (2b)

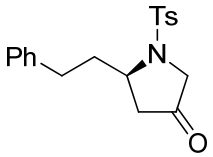


2b

Compound **2b** was prepared in 52% yield according to the general procedure. $[\alpha]_D^{20}$ = +82.2º (c = 1.0, $CHCl_3$). 99% ee (determined by HPLC: Chiralcel AS-H Column, 10/90 *i*PrOH /hexane, 1.0 mL/min, 200 nm; TR = 39.90 min (major), 30.27 min (minor)). ^{1}H

NMR (500 MHz, $CDCl_3$) δ 7.72 (d, 2H, *J* = 8.5 Hz), 7.33 (d, 2H, *J* = 8.5 Hz), 4.10 – 4.06 (m, 1H), 3.79 (d, 1H, *J* = 19.0 Hz), 3.59 (d, 1H, *J* = 19.0 Hz), 2.43 (s, 3H), 2.22 (d, 1H, *J* = 8.0 Hz), 2.03 (dd, 1H, *J* = 9.5 Hz, *J* = 18.0 Hz), 1.80 – 1.73 (m, 3H), 1.67 (d, 1H, *J* = 12.0 Hz), 1.60 – 1.52 (m, 2H), 1.26 – 1.07 (m, 3H), 1.01 – 0.93 (m, 2H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 210.7, 144.1, 135.1, 130.1, 127.2, 62.4, 53.5, 42.7, 39.5, 29.2, 28.2, 26.1, 25.9, 25.7, 21.5; IR (neat): 2926, 1761(s), 1597, 1449, 1348, 1158, 1091, 1025, 815, 663; MS (ESI, m/z): 344 (M + Na^+). HRESIMS Calcd for $[C_{17}H_{23}NNaO_3S]^+$ (M + Na^+) 344.1296; Found 344.1297.

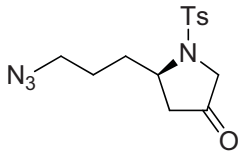
(R)-5-phenethyl-1-tosylpyrrolidin-3-one (2c)



2c

Compound **2c** was prepared in 62% yield according to the general procedure. $[\alpha]_D^{20}$ = + 41.5º (c = 1.0, $CHCl_3$). 99% ee (determined by HPLC: Chiralcel AD-H Column, 10/90 *i*PrOH /hexane, 1.0 mL/min, 200 nm; TR = 22.90 min (major), 28.87 min (minor)). ^1H NMR (500 MHz, $CDCl_3$) δ 7.67 (d, 2H, *J* = 8.5 Hz), 7.32 – 7.28 (m, 4H), 7.22 (d, 1H, *J* = 7.5 Hz), 7.18 (d, 2H, *J* = 7.0 Hz), 4.21 – 4.16 (m, 1H), 3.74 (dd, 2H, *J* = 19.0 Hz, *J* = 51.0 Hz), 2.76 – 2.67 (m, 2H), 2.43 (s, 3H), 2.24 (dd, 1H, *J* = 8.5 Hz, *J* = 18.0 Hz), 2.38 – 2.04 (m, 2H), 1.87 – 1.79 (m, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 209.6, 144.3, 140.6, 134.6, 130.1, 128.5, 128.3, 127.3, 126.2, 57.3, 53.1, 42.5, 37.3, 31.8, 21.5; IR (neat): 2923, 1760(s), 1597, 1495, 1453, 1347, 1156, 1091, 1030, 663, 587; MS (ESI, m/z): 366 (M + Na^+). HRESIMS Calcd for $[C_{19}H_{21}NNaO_3S]^+$ (M + Na^+) 366.1140; Found 366.1138.

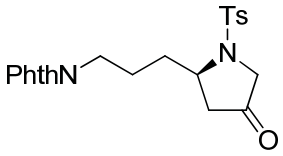
(R)-5-(3-azidopropyl)-1-tosylpyrrolidin-3-one (2d)



2d

Compound **2d** was prepared in 67% yield according to the general procedure. $[\alpha]_D^{20}$ = + 66.0º (c = 1.0, $CHCl_3$). 99% ee (determined by HPLC: Chiralcel IB Column, 10/90 *i*PrOH /hexane, 0.8 mL/min, 200 nm; TR = 22.99 min (major), 24.83 min (minor)). ^{1}H NMR(400 MHz, $CDCl_3$) δ 7.72 (d, 2H, *J* = 8.3 Hz,), 7.35 (d, 2H, *J* = 8.2 Hz), 4.28 – 4.21 (m, 1H), 3.80 (d, 1H, *J* = 18.8 Hz), 3.65 (d, 1H, *J* = 18.8 Hz), 3.67 (t, 2H, *J* = 6.0 Hz), 2.44 (s, 3H), 3.80 (dd, 1H, *J* = 18.0 Hz, *J* = 8.4 Hz), 2.10 – 2.05 (m, 1H), 1.78 – 1.63 (m, 4H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 209.6, 144.5, 134.7, 130.2, 127.3, 57.2, 52.8, 50.8, 42.5, 32.7, 25.1, 21.5; IR (neat): 2923, 2853, 2094, 1759(s), 1597, 1452, 1345, 1154, 1091, 772; MS (ESI, m/z): 345 (M + Na^+). HRESIMS Calcd for $[C_{14}H_8N_4NaO_3S]^+$ (M + Na^+) 345.0997; Found 345.0997.

(R)-2-(3-(4-oxo-1-tosylpyrrolidin-2-yl)propyl)isoindoline-1,3-dione (2e)

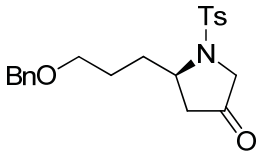


2e

Compound **2e** was prepared in 70% yield according to the general procedure. $[\alpha]_D^{20}$ = - 41.0º (c = 0.5, $CHCl_3$). 99% ee (determined by HPLC: Chiralcel OD-H Column, 15/85 *i*PrOH /hexane, 1.0 mL/min, 200 nm; TR =49.16 min (major), 60.63 min (minor)). ^{1}H NMR (400 MHz, $CDCl_3$)δ 7.86 – 7.83 (m, 2H), 7.74 – 7.72 (m, 4H), 7.33 (d, 2H, *J* = 8.0 Hz), 4.32 – 4.30 (m, 1H), 3.83 – 3.62 (m, 4H), 2.43 (s, 3H), 2.16 (dd, 1H, *J* = 20.0 Hz, *J* = 8.0 Hz), 2.04 (d, 1H, *J* = 8.0 Hz), 1.87 – 1.80 (m, 2H), 1.74 – 1.64 (m, 1H), 1.56 – 1.47 (m, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 209.9, 168.4, 144.3, 134.9, 134.0, 132.1, 130.2, 127.3, 123.3, 57.1, 52.8, 42.4, 37.1, 32.7, 24.8, 21.5; IR (neat): 2923, 1759(s), 1709(s),

1594, 1442, 1260, 1219, 1019, 772; MS (ESI, m/z): 449 (M + Na^+). HRESIMS Calcd for $[C_{22}H_{22}N_2NaO_5S]^+$ (M + Na^+) 449.1147; Found 449.1149.

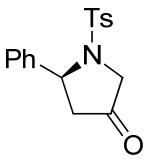
(R)-5-(3-(benzyloxy)propyl)-1-tosylpyrrolidin-3-one (2f)



2f

Compound **2f** was prepared in 60% yield according to the general procedure. $[\alpha]_D^{20}$ = +65.0º (c = 1.0, $CHCl_3$). 99% ee (determined by HPLC: Chiralcel AD-H Column, 10/90 iPrOH /hexane, 0.8 mL/min, 200 nm; TR = 30.79 min (major), 40.09 min (minor)). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.69 (d, 2H, *J* = 8.0 Hz), 7.37 – 7.26 (m, 7H), 4.49 (s, 2H), 4.26 – 4.20 (m, 1H), 3.77 (d, 1H, *J* = 18.8 Hz), 3.63 (d, 1H, *J* = 18.8 Hz), 3.56 – 3.47 (m, 2H), 2.42 (s, 3H), 2.21 – 2.06 (m, 2H), 1.81 – 1.60 (m, 4H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 210.1, 144.2, 138.4, 134.9, 130.1, 128.4, 127.7, 127.6, 127.3, 72.9, 69.5, 57.6, 52.9, 42.5, 32.5, 25.9, 21.5; IR (neat): 2979, 2888, 1759(s), 1656, 1597, 1461, 1381, 1260, 1155, 1074, 764, 749; MS (ESI, m/z): 410 (M + Na^+). HRESIMS Calcd for $[C_{21}H_{25}NNaO_4S]^+$ (M + Na^+) 410.1402; Found 410.1403.

(S)-5-phenyl-1-tosylpyrrolidin-3-one (2g)

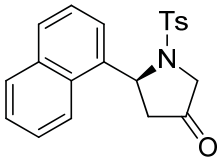


2g

Compound **2g** was prepared in 60% yield according to the general procedure. $[\alpha]_D^{20}$ = -60.0º (c = 0.5, $CHCl_3$). 99% ee (determined by HPLC: Chiralpak AD -H Column, 10/90 *i*PrOH /hexane, 1.0 mL/min, 200 nm; TR = 28.85 min (major), 31.48 min (minor)). ^{1}H

NMR (500 MHz, $CDCl_3$) δ 7.53 (d, 2H, *J* = 8.5 Hz), 7.31 – 7.26 (m, 3H), 7.23 – 7.19 (m, 4H), 5.29 (dd, 1H, *J* = 3.5Hz, *J* = 9.0 Hz), 3.95 (d, 1H, *J* = 18.5 Hz), 3.76 (d, 1H, *J* = 18.5 Hz), 2.80 (dd, 1H, *J* = 9.0 Hz, *J* = 18.5Hz), 2.56 (dd, 1H, *J* = 3.5 Hz, *J* = 18.5 Hz), 2.40 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 208.7, 144.0, 139.9, 134.8, 129.8, 128.8, 128.1, 127.3, 126.3, 60.3, 53.5, 45.7, 23.5; IR (neat): 2921, 1761(s), 1596, 1494, 1450, 1347, 1154, 1090, 660, 587; MS (ESI, m/z): 338 (M + Na^+). HRESIMS Calcd for $[C_{17}H_{17}NNaO_3S]^+$ (M + Na^+) 338.0837; Found 338.0835.

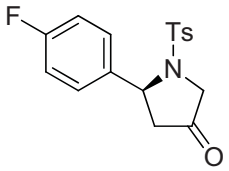
(S)-5-(naphthalen-1-yl)-1-tosylpyrrolidin-3-one (2h)



2h

Compound **2h** was prepared in 63% yield according to the general procedure. $[\alpha]_D^{20}$ = -59.5º (c = 0.5, $CHCl_3$). 99% ee (determined by HPLC: Chiralcel AD-H Column, 10/90 *i*PrOH /hexane, 1.0 mL/min, 200 nm; TR = 26.10 min (major), 32.21 min (minor)). ^1H NMR (400 MHz, $CDCl_3$) δ 7.88 – 7.85 (m, 2H), 7.77 (d, 1H, *J* = 7.2 Hz), 7.64 (d, 2H, *J* = 8.0 Hz), 7.56 – 7.49 (m, 2H), 7.39 – 7.32 (m, 2H), 7.25 (d, 2H, *J* = 5.6 Hz), 6.08 (dd, 1H, *J* = 2.8 Hz, *J* = 9.6 Hz), 4.04 (dd, 2H, *J* = 18.8 Hz, *J* = 61.6 Hz), 3.00 (dd, 1H, *J* = 9.6 Hz, *J* = 18.0 Hz), 2.60 (d, 1H, *J* = 20.4 Hz), 2.41 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 208.7, 144.2, 135.7, 134.9, 134.1, 129.9, 129.6, 129.2, 128.7, 127.4, 126.5, 125.9, 125.2, 123.3, 122.7, 58.1, 53.9, 46.0, 21.5; IR (neat): 2923, 1761(s), 1597, 1442, 1350, 1260, 1156, 1091, 1018, 773; MS (ESI, m/z): 388 (M + Na^+). HRESIMS Calcd for $[C_{21}H_{19}NNaO_3S]^+$ (M + Na^+) 388.0983; Found 388.0987.

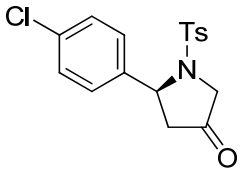
(S)-5-(4-fluorophenyl)-1-tosylpyrrolidin-3-one (2i)



2i

Compound **2i** was prepared in 62% yield according to the general procedure. $[\alpha]_D^{20}$ = -82.5º (c = 0.5, $CHCl_3$). 99% ee (determined by HPLC: Chiralpak AD -H Column, 10/90 *i*PrOH /hexane, 0.8 mL/min, 200 nm; TR = 41.96 min (major), 37.86 min (minor)).^{1}H NMR (400 MHz, $CDCl_3$) δ 7.54 (d, 2H, *J* = 8.0 Hz), 7.25 (d, 2H, *J* = 8.8 Hz), 7.19 (dd, 2H, *J* = 1.2 Hz, *J* = 8.8 Hz), 6.98 (t, 2H, *J* = 8.4 Hz), 5.24 (dd, 1H, *J* = 3.6 Hz, *J* = 9.2 Hz), 3.93 (d, 1H, *J* = 18.4 Hz), 3.76 (d, 1H, *J* = 18.4 Hz), 2.80 (dd, 1H, *J* = 9.2 Hz, *J* = 18.4 Hz), 2.53 (dd, 1H, *J* = 3.6 Hz, *J* = 18.4 Hz), 2.42 (m, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 208.2, 162.5 (d, *J* = 245.9 Hz), 144.2, 135.8 (d, *J* = 3.4 Hz), 134.8, 129.8, 128.1 (d, *J* = 8.3 Hz), 127.3, 115.7 (d, *J* = 21.6 Hz), 59.7, 53.6, 45.8, 21.5; IR (neat): 2959, 2922, 1760(s), 1598, 1510, 1347, 1152, 814, 663; MS (ESI, m/z): 356 ($M + Na^+$). HRESIMS Calcd for $[C_{17}H_{16}FNNaO_3S]^+$ ($M + Na^+$) 356.0733; Found 356.0736.

(S)-5-(4-chlorophenyl)-1-tosylpyrrolidin-3-one (2j)

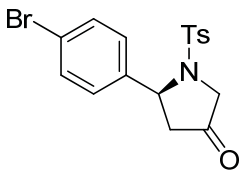


2j

Compound **2j** was prepared in 61% yield according to the general procedure. $[\alpha]_D^{20}$ = -87.5º (c = 0.5, $CHCl_3$). 99% ee (determined by HPLC: Chiralpak AD-H Column, 10/90 *i*PrOH /hexane, 1.0 mL/min, 200 nm; TR = 42.27 min (major), 37.45 min (minor)). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.54 (d, 2H, *J* = 8.0 Hz), 7.25 (d, 4H, *J* = 8.5 Hz), 7.15 (d, 2H, *J* = 8.0 Hz), 5.21 (dd, 1H, *J* = 4.0 Hz, *J* = 9.5 Hz), 3.93 (d, 1H, *J* = 18.5 Hz), 3.78 (d, 1H, *J* = 18.0 Hz), 2.80 (dd, 1H, *J* = 9.0 Hz, *J* = 18.5 Hz), 2.51 (dd, 1H, *J* = 4.0 Hz, *J* = 18.5 Hz), 2.40 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 208.0, 144.3, 138.5, 134.6, 134.1,

129.9, 128.9, 127.8, 127.3, 59.7, 53.6, 45.7, 21.5; IR (neat): 2920, 1761(s), 1597, 1491, 1346, 1184, 1152, 1089, 1004, 812, 661; MS (ESI, m/z): 372 ($M + Na^+$). HRESIMS Calcd for $[C_{17}H_{16}ClNNaO_3S]^+$ ($M + Na^+$) 372.0437; Found 372.0437.

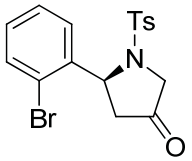
(S)-5-(4-bromophenyl)-1-tosylpyrrolidin-3-one (2k)



2k

Compound **2k** was prepared in 57% yield according to the general procedure. $[\alpha]_D^{20}$ = -82.2º (c = 0.5, $CHCl_3$). 99% ee (determined by HPLC: Chiralpak AD -H Column, 10/90 *i*PrOH /hexane, 1.0 mL/min, 200 nm; TR = 47.13 min (major), 42.81 min (minor)). ^1H NMR (500 MHz, $CDCl_3$) δ 7.54 (d, 2H, *J* = 8.5 Hz), 7.41 (d, 2H, *J* = 8.5 Hz), 7.25 (d, 2H, *J* = 8.0 Hz), 7.09 (d, 2H, *J* = 8.5 Hz), 5.20 (dd, 1H, *J* = 4.0 Hz, *J* = 9.0 Hz), 3.93 (d, 1H, *J* = 18.0 Hz), 3.78 (d, 1H, *J* = 18.0 Hz), 2.81 (dd, 1H, *J* = 8.0 Hz, *J* = 18.0 Hz), 2.51 (dd, 1H, *J* = 4.0 Hz, *J* = 18.0 Hz), 2.43 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 207.9, 144.3, 139.0, 134.6, 131.9, 129.9, 128.1, 127.4, 122.4, 59.8, 53.6, 45.7, 21.5; IR (neat): 2923, 2854, 1763(s), 1595, 1488, 1336, 1158, 1092, 1010, 812, 662; MS (ESI, m/z): 416 ($M + Na^+$). HRESIMS Calcd for $[C_{17}H_{16}BrNNaO_3S]^+$ ($M + Na^+$) 415.9932; Found 415.9938.

(S)-5-(2-bromophenyl)-1-tosylpyrrolidin-3-one (2l)

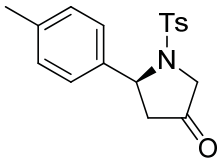


2l

Compound **2l** was prepared in 63% yield according to the general procedure. $[\alpha]_D^{20}$ = -106.0º (c = 0.2, $CHCl_3$). 98% ee (determined by HPLC: Chiralcel AD-H Column, 10/90

*i*PrOH /hexane, 1.0 mL/min, 200 nm; TR = 22.49 min (major), 21.57 min (minor)). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.68 (d, 2H, *J* = 8.5 Hz), 7.54 (dd, 1H, *J* = 1.0 Hz, *J* = 8.0 Hz), 7.42 (dd, 1H, *J* = 1.5 Hz, *J* = 8.0 Hz), 7.33 – 7.28 (m, 3H), 7.17 – 7.14 (m, 1H), 5.49 (dd, 1H, *J* = 4.5 Hz, *J* = 9.5 Hz), 3.96 (dd, 2H, *J* = 18.5 Hz, *J* = 36.5 Hz), 2.93 (dd, 1H, *J* = 9.5 Hz, *J* = 18.5 Hz), 2.45 (dd, 1H, *J* = 4.5 Hz, *J* = 18.5 Hz), 2.44 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 207.6, 144.4, 140.1, 133.9, 133.2, 130.0, 129.4, 127.9, 127.8, 127.6, 121.6, 60.3, 54.7, 45.6, 21.5; IR (neat): 2922, 2852, 1760(s), 1596, 1465, 1440, 1349, 1090, 1025, 755, 660, 588; MS (ESI, m/z): 416 (M + Na^+). HRESIMS Calcd for $[C_{17}H_{16}BrNNaO_3S]^+$ (M + Na^+) 415.9932; Found 415.9936.

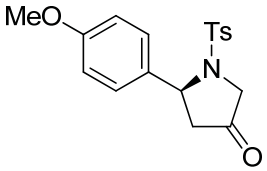
(S)-5-(p-tolyl)-1-tosylpyrrolidin-3-one (2m)



2m

Compound **2m** was prepared in 61% yield according to the general procedure. $[\alpha]_D^{20}$ = -67.3º (c = 0.5, $CHCl_3$). 99% ee (determined by HPLC: Chiralcel AD-H Column, 10/90 *i*PrOH /hexane, 1.0 mL/min, 254 nm; TR = 31.89 min (major), 34.06 min (minor)). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.54 (d, 2H, *J* = 8.5 Hz), 7.22 (d, 2H, *J* = 8.5 Hz), 7.09 (s, 4H), 5.23 (dd, 1H, *J* = 3.5 Hz, *J* = 9.5 Hz), 3.92 (d, 1H, *J* = 18.0 Hz), 3.75 (d, 1H, *J* = 18.0 Hz), 2.76 (dd, 1H, *J* = 9.5 Hz, *J* = 18.5 Hz), 2.54 (dd, 1H, *J* = 3.5 Hz, *J* = 18.5 Hz), 2.40 (s, 3H), 2.32 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 208.9, 143.9, 137.9, 136.9, 134.8, 129.7, 129.4, 127.4, 126.3, 60.1, 53.5, 45.7, 21.5, 21.0; IR (neat): 2922, 1762(s), 1596, 1514, 1349, 1157, 1091, 1043, 661, 588; MS (ESI, m/z): 352 (M + Na^+). HRESIMS Calcd for $[C_{18}H_{19}NNaO_3S]^+$ (M + Na^+) 352.0983; Found 352.0985.

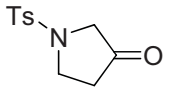
(S)-5-(4-methoxyphenyl)-1-tosylpyrrolidin-3-one (2n)



2n

Compound **2n** was prepared in 60% yield according to the general procedure. $[\alpha]_D^{20}$ = -84.0º (c = 0.5, $CHCl_3$). 99% ee (determined by HPLC: Chiralcel AD-H Column, 10/90 *i*PrOH /hexane, 1.0 mL/min, 200 nm; TR = 46.19 min (major), 51.16 min (minor)). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.53 (d, 2H, *J* = 8.5 Hz), 7.22 (d, 2H, *J* = 8.0 Hz), 7.12 (d, 2H, *J* = 8.5 Hz), 6.80 (d, 2H, *J* = 8.5 Hz), 5.24 (dd, 1H, *J* = 2.8 Hz, *J* = 9.5 Hz), 3.92 (d, 1H, *J* = 18.5 Hz), 3.79 (s, 3H), 3.74 (d, 1H, *J* = 18.5 Hz), 2.76 (dd, 1H, *J* = 9.0 Hz, *J* = 18.5 Hz), 2.54 (dd, 1H, *J* = 3.5 Hz, *J* = 18.5 Hz), 2.40 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 208.9, 159.5, 143.9, 134.9, 131.8, 129.7, 127.7, 127.4, 114.2, 59.9, 55.3, 53.5, 45.7, 21.5; IR (neat): 2924, 1761(s), 1612, 1514, 1348, 1247, 1151, 1003, 817, 663; MS (ESI, m/z): 368 (M + Na^+). HRESIMS Calcd for $[C_{18}H_{19}NNaO_4S]^+$ (M + Na^+) 368.0932; Found 368.0935.

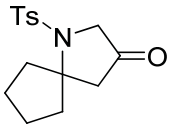
1-tosylpyrrolidin-3-one (2o)



2o

Compound **2o** was prepared in 70% yield according to the general procedure. This compound is known and the spectroscopic data match those reported.[3] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.72 (d, 2H, *J* = 8.5 Hz), 7.37 (d, 2H, *J* = 8.0 Hz), 3.55 (t, 2H, *J* = 9.0 Hz), 3.50 (s, 2H), 2.49 (t, 2H, *J* = 8.0 Hz), 2.45 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 208.2, 144.5, 131.5, 130.0, 127.9, 53.7, 44.9, 37.2, 21.5.

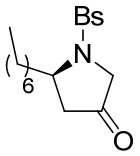
1-tosyl-1-azaspiro[4.4]nonan-3-one (2p)



2p

Compound **2p** was prepared in 55% yield according to the general procedure. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.74 (d, 2H, *J* = 8.0 Hz), 7.31 (d, 2H, *J* = 8.0 Hz), 3.82 (s, 2H), 2.54 – 2.49 (m, 2H), 2.46 (s, 2H), 2.43 (s, 3H), 1.92 – 1.85 (m, 2H), 1.67 – 1.63 (m, 2H), 1.58 – 1.50 (m, 2H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 207.9, 143.7, 137.7, 129.7, 127.2, 72.9, 55.8, 53.0, 36.3, 23.1, 21.5; IR (neat): 2958, 1767(s), 1597, 1496, 1342, 1160, 1090, 821, 663, 590; MS (ESI, m/z): 316 (M + Na^+). HRESIMS Calcd for $[C_{15}H_{19}NNaO_3S]^+$ (M + Na^+) 316.0983; Found 316.0981.

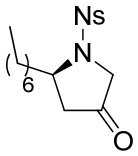
(R)-1-((4-bromophenyl)sulfonyl)-5-heptylpyrrolidin-3-one (2q)



2q

Compound **2q** was prepared in 70% yield according to the general procedure. $[\alpha]_D^{20}$ = + 38.5º (c = 0.75, $CHCl_3$). 99% ee (determined by HPLC: Chiralpak ADH Column, 10/90 *i*PrOH /hexane, 0.8 mL/min, 200 nm; TR = 12.29 min (major), 22.13 min (minor)). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.73 – 7.67 (m, 4H), 4.27 – 4.21 (m, 1H), 3.79 (dd, 2H, *J* = 19.6 Hz, *J* = 58.4 Hz), 2.34 (q, 1H, *J* = 8.0 Hz, *J* = 17.6 Hz), 2.20 – 2.15 (m, 1H), 1.74 – 1.64 (m, 1H), 1.56 – 1.48 (m, 1H), 1.36 – 1.18 (m, 10H), 0.89 (t, 3H, *J* = 6.8 Hz); ^{13}C NMR (100 MHz, $CDCl_3$) δ 209.3, 137.3, 132.8, 128.7, 128.3, 57.9, 52.7, 42.6, 35.6, 31.7, 29.2, 29.1, 25.4, 22.6, 14.0; IR (neat): 2923, 2853, 1762(s), 1574, 1468, 1352, 1158, 1089, 739, 615; MS (ESI, m/z): 424 (M + Na^+). HRESIMS Calcd for $[C_{17}H_{24}BrNNaO_3S]^+$ (M + Na^+) 424.0558; Found 424.0556.

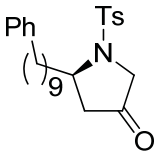
(R)-5-heptyl-1-((2-nitrophenyl)sulfonyl)pyrrolidin-3-one (2r)



2r

Compound **2r** was prepared in 65% yield according to the general procedure. $[\alpha]_D^{20}$ = -25.2º (c = 0.75, $CHCl_3$). 99% ee (determined by HPLC: Chiralpak ADH Column, 10/90 *i*PrOH /hexane, 0.8 mL/min, 200 nm; TR = 33.77 min (major), 47.45 min (minor)). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.12 (dd, 1H, *J* = 1.2 Hz, *J* = 7.6 Hz), 7.80 – 7.68 (m, 3H), 4.54 – 4.48 (m, 1H), 3.85 (dd, 2H, *J* = 18.0 Hz, *J* = 56.8 Hz), 2.76 (q, 1H, *J* = 8.8 Hz, *J* = 18.0 Hz), 2.33 (d, 1H, *J* = 18.0 Hz), 1.75 – 1.67 (m, 1H), 1.58 – 1.50 (m, 1H), 1.35 – 1.19 (m, 10H), 0.89 (t, 3H, *J* = 6.8 Hz); ^{13}C NMR (100 MHz, $CDCl_3$) δ 209.1, 143.9, 134.1, 132.4, 131.8, 131.3, 124.4, 58.5, 52.1, 43.2, 35.6, 31.6, 29.1, 29.0, 25.5, 22.5 14.0; IR (neat): 2960, 2921, 2851, 1760(s), 1537, 1454, 1358, 1260, 1219, 1019, 597; MS (ESI, m/z): 391 (M + Na^+). HRESIMS Calcd for $[C_{17}H_{24}N_2NaO_5S]^+$ (M + Na^+) 391.1304; Found 391.1306.

(R)-5-(9-phenylnonyl)-1-tosylpyrrolidin-3-one (2s)

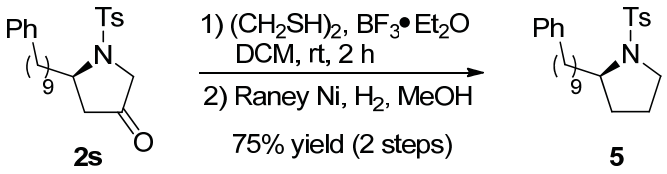


2s

Compound **2s** was prepared in 63% yield according to the general procedure. $[\alpha]_D^{20}$ = +26.5º (c = 1.0, DCM). 99% ee (determined by HPLC: Chiralcel AD-H Column, 10/90 *i*PrOH /hexane, 1.0 mL/min, 200 nm; TR = 12.59 min (major), 14.61 min (minor)). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.72 (d, 2H, *J* = 8.2 Hz,), 7.32 (d, 2H, *J* = 8.0 Hz), 7.29 – 7.25 (m, 2H), 7.19 – 7.14 (m, 3H), 4.24 – 4.17 (m, 1H), 3.79 (d, *J* = 18.8 Hz, 1H), 3.63 (d, 1H, *J* = 18.8 Hz), 2.60 (t, 2H, *J* = 7.6 Hz), 2.43 (s, 3H), 2.20 (dd, 1H, *J* = 18.0 Hz, *J* = 8.8 Hz), 2.12 – 2.07 (m, 1H), 1.77 – 1.67 (m, 1H), 1.60– 1.47 (m, 1H), 1.30 – 1.26 (m, 14H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 210.2, 144.1, 142.9, 135.1, 130.1, 128.4, 128.2, 127.3,

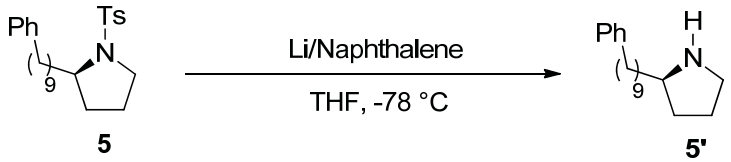
125.5, 57.8, 52.9, 42.4, 35.9, 35.7, 31.5, 29.4, 29.2, 29.1, 25.4, 21.5; IR (neat): 3289, 2924, 2853, 1762(s), 1598, 1494, 1452, 1349, 1158, 1092, 772, 587; MS (ESI, m/z): 464 ($M + Na^+$). HRESIMS Calcd for $[C_{26}H_{35}NNaO_3S]^+$ ($M + Na^+$) 464.2235; Found 464.2237.

(*R*)-2-(9-phenylnonyl)-1-tosylpyrrolidine (5)



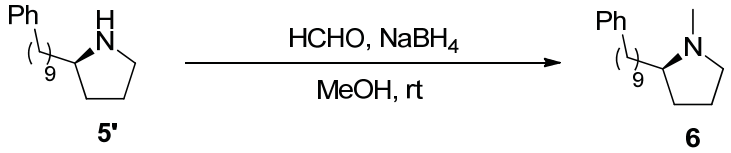
Compound **5** was prepared in 75% yield (2 steps) according to the known procedure.[4-5] $[\alpha]_D^{20}$ = -69.5° (c = 1.0, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.71 (d, 2H, *J* = 10 Hz), 7.31 – 7.26 (m, 4H), 7.18 – 7.17 (m, 3H), 3.62 – 3.55 (m, 1H), 3.40 – 3.34 (m, 1H), 3.22 – 3.16 (m, 1H), 2.62 – 2.58 (m, 2H), 2.42 (s, 3H), 1.83 – 1.73 (m, 2H), 1.63 – 1.53 (m, 4H), 1.50 – 1.43 (m, 2H), 1.30 – 1.28 (m, 12H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 143.0, 142.9, 135.2, 129.5, 128.4, 128.2, 127.5, 125.5, 60.6, 48.8, 36.4, 36.0, 31.5, 30.6, 29.6, 29.5(2), 29.4(9), 29.4(6), 29.3, 26.1, 24.1, 21.5; IR (neat): 2925, 2855, 1598, 1494, 1454, 1346, 1160, 1093, 815, 748, 699, 664, 588; MS (ESI, m/z): 450 ($M + Na^+$). HRESIMS Calcd for $[C_{26}H_{37}NNaO_2S]^+$ ($M + Na^+$) 450.2443; Found 450.2441.

(*R*)-2-(9-phenylnonyl)pyrrolidine (5')



Compound **5'** was prepared in 56% yield according to the known procedure.[2] This compound is known and the spectroscopic data match those reported.[6] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.29 – 7.25 (m, 2H), 7.18 – 7.15 (m, 3H), 3.03 – 2.97 (m, 1H), 2.95 – 2.88 (m, 1H), 2.85 – 2.78 (m, 1H), 2.60 (t, *J* = 9.5 Hz, 2H), 1.90 – 1.67 (m, 4H), 1.65 – 1.57 (m, 2H), 1.46 – 1.12 (m, 14H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 142.9, 128.4, 128.2, 125.5, 59.5, 45.8, 36.0, 35.3, 31.5, 31.4, 29.7, 29.6, 29.5, 29.4, 29.3, 27.3, 24.9.

(*R*)-1-methyl-2-(9-phenylnonyl)pyrrolidine (6, (-)-irniine)



5' 6

Compound **6** was prepared in 82% yield according to the known procedure.[6] This compound is known and the spectroscopic data match those reported.[6] $[\alpha]_D^{20}$ = -108.5 (c 0.5, MeOH). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.29 – 7.25 (m, 2H), 7.20 – 7.15 (m, 3H), 3.07 – 3.02 (m, 1H), 2.60 (t, *J* = 8.4 Hz, 2H), 2.30 (s, 3H), 2.10 (dd, *J* =18.0 Hz, *J* = 9.2 Hz, 1H), 1.98 – 1.88 (m, 2H), 1.79 – 1.72 (m, 1H), 1.68 – 1.57 (m, 4H), 1.44 – 1.39 (m, 1H), 1.37 – 1.10 (m, 13H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 142.9, 128.4, 128.2, 125.5, 66.4, 57.4, 40.5, 36.0, 33.9, 31.5, 30.8, 30.0, 29.6, 29.5, 29.4, 29.3, 26.7, 21.8.

Reference:

1. Cui, L.; Li, C.; Zhang, L. *Angew. Chem., Int. Ed.* **2010**, *49*, 9178.

2. Shu, C.; Liu, M.-Q.; Wang, S.-S.; Li, L.; Ye, L.-W. *J. Org. Chem.* **2013**, *78*, 3292.

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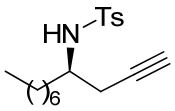
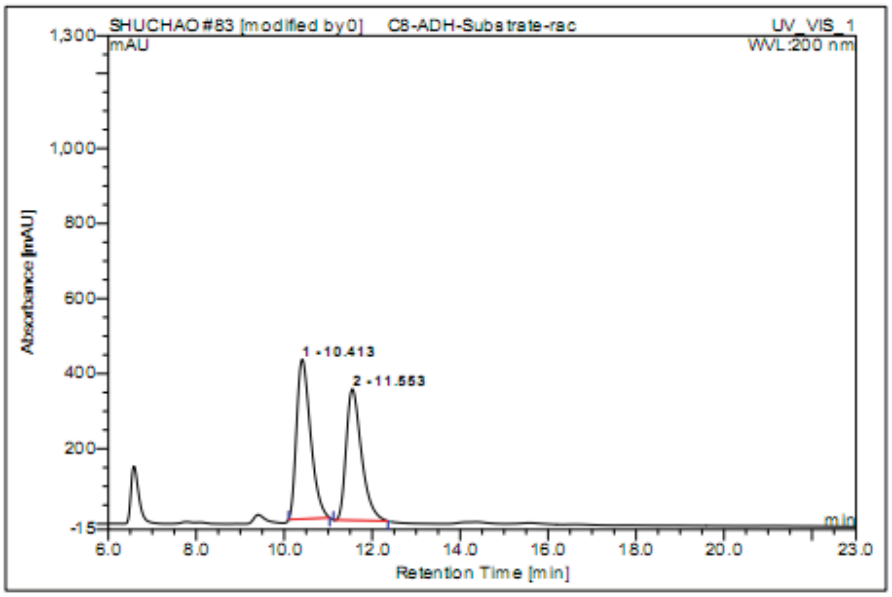
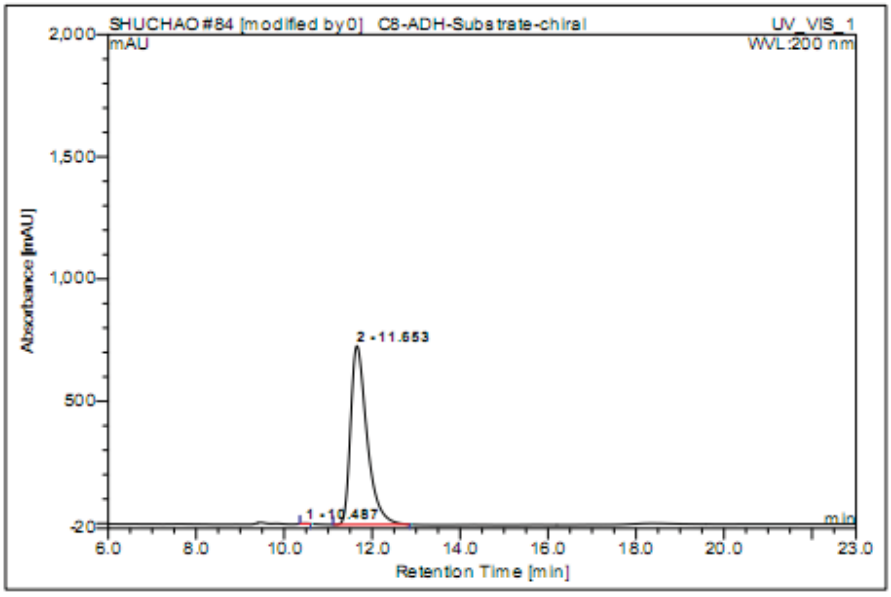
Compound **1a**



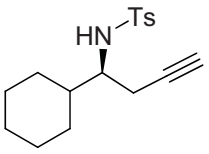


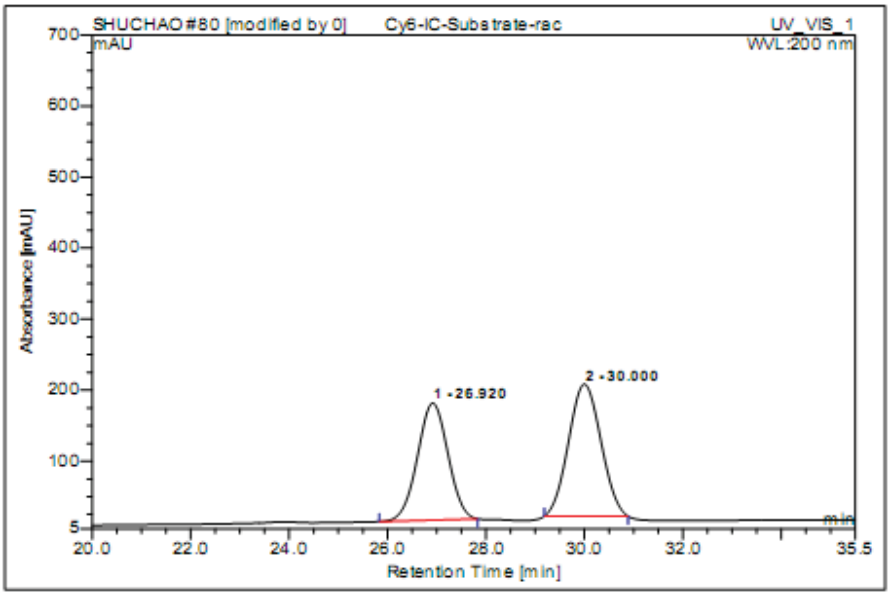
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	10.41	n.a.	424.845	157.217	52.70	n.a.	BMB*
2	11.55	n.a.	349.535	141.126	47.30	n.a.	BMB*
Total:			774.380	298.343	100.00	0.000	



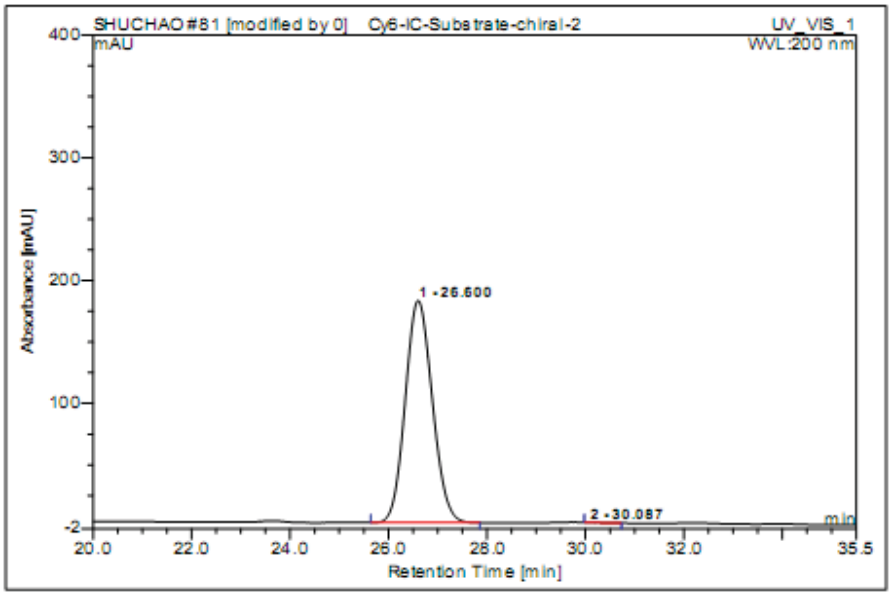
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	10.49	n.a.	1.185	0.182	0.06	n.a.	BMB*
2	11.65	n.a.	731.005	316.120	99.94	n.a.	BMB*
Total:			732.191	316.303	100.00	0.000	

Compound **1b**



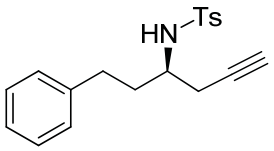


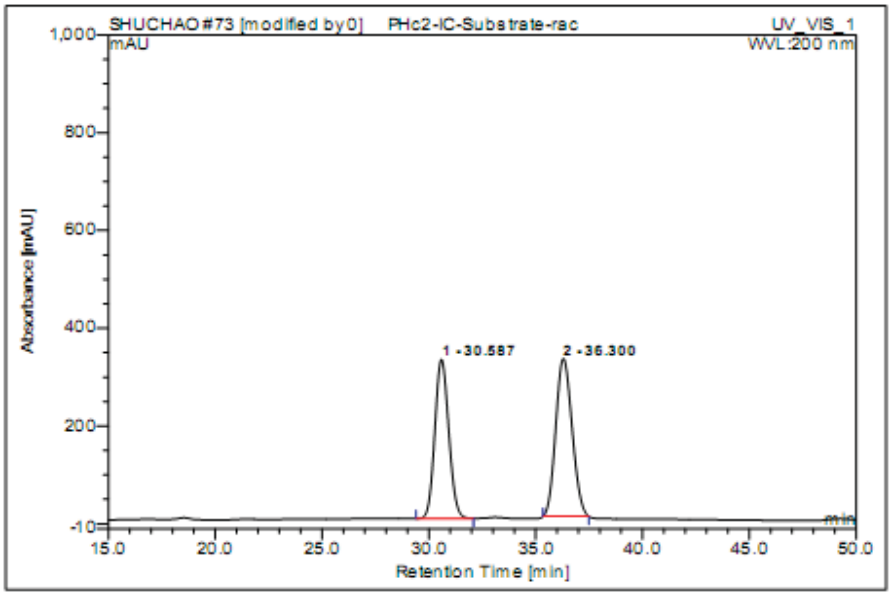
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	26.92	n.a.	164.792	118.323	45.55	n.a.	BMB*
2	30.00	n.a.	185.698	141.454	54.45	n.a.	BMB*
Total:			350.490	259.776	100.00	0.000	



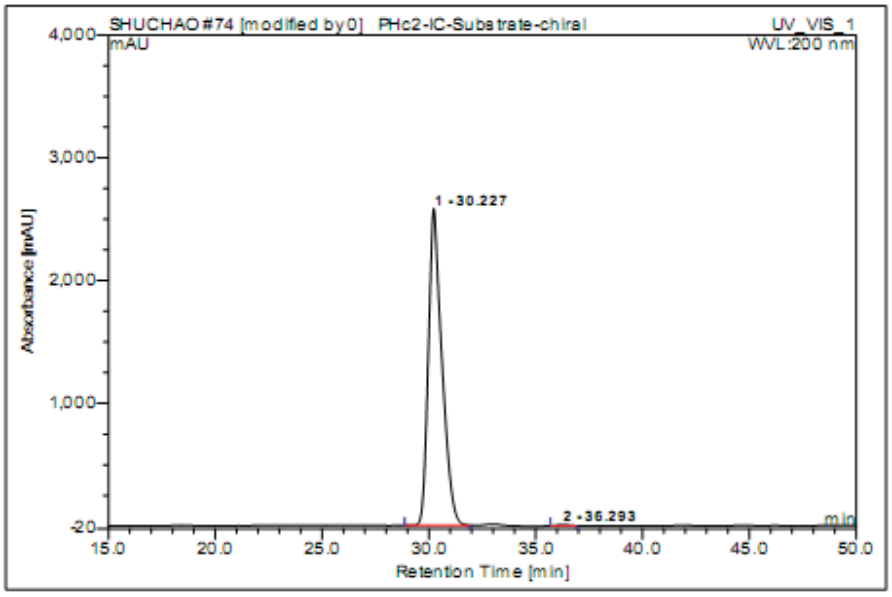
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	26.60	n.a.	180.872	115.290	99.99	n.a.	BMB
2	30.09	n.a.	0.056	0.011	0.01	n.a.	BMB*
Total:			180.928	115.301	100.00	0.000	

Compound **1c**



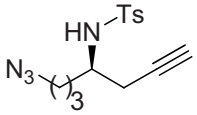


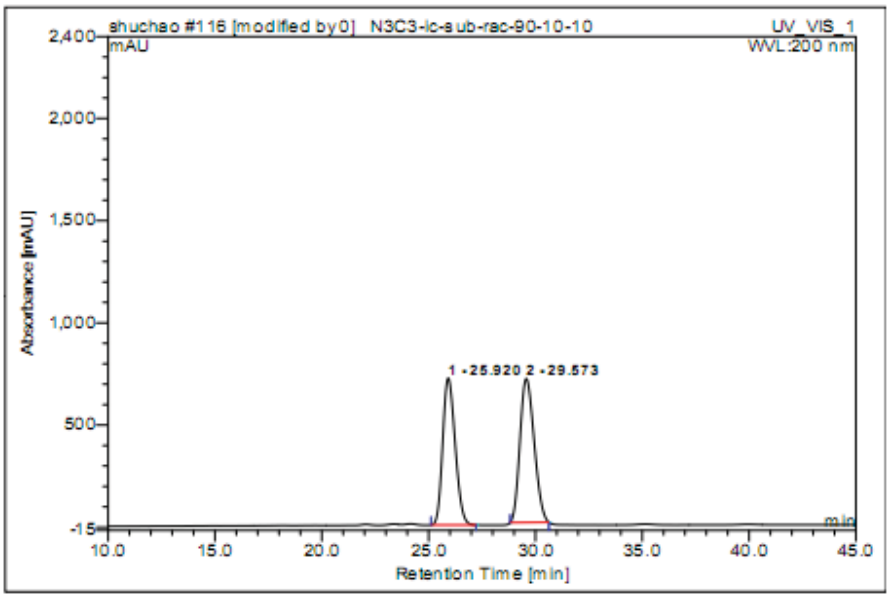
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	30.59	n.a.	325.175	246.009	46.22	n.a.	BMB
2	36.30	n.a.	322.708	286.218	53.78	n.a.	BMB*
Total:			647.883	532.226	100.00	0.000	



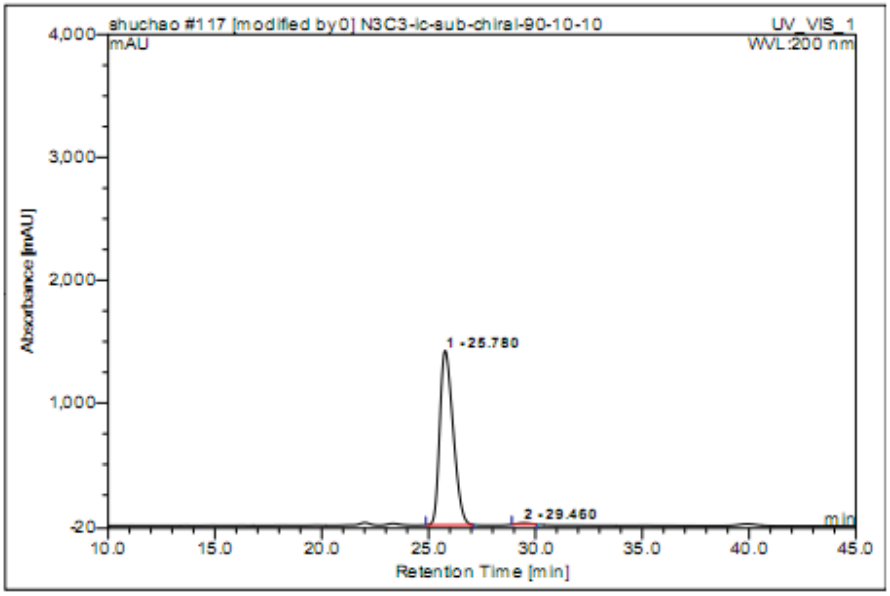
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	30.23	n.a.	2580.702	1890.344	99.71	n.a.	BMB*
2	36.29	n.a.	8.079	5.588	0.29	n.a.	BMB*
Total:			2588.781	1895.932	100.00	0.000	

Compound **1d**



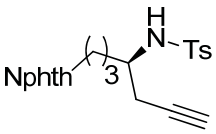


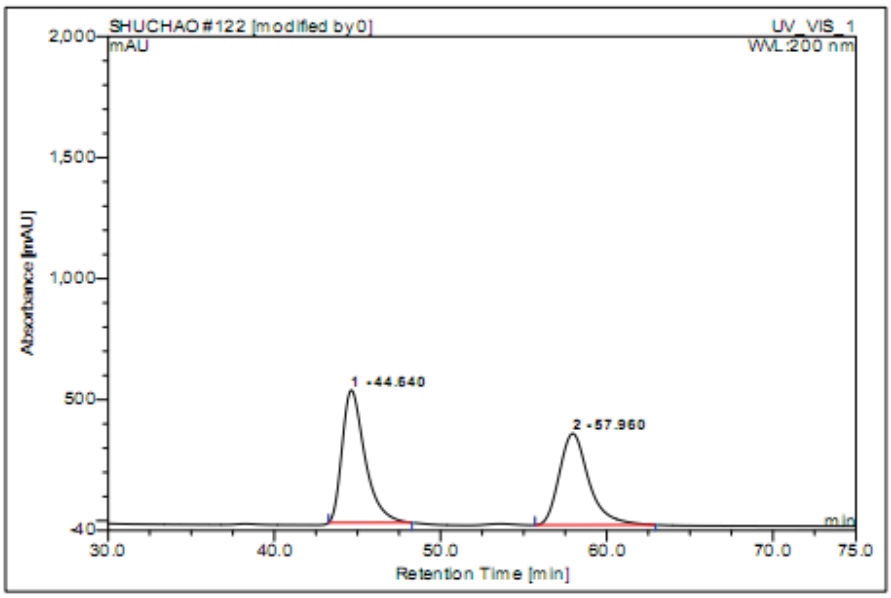
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	25.92	n.a.	718.230	486.336	47.30	n.a.	BMB*
2	29.57	n.a.	703.422	541.894	52.70	n.a.	BMB*
Total:			1421.652	1028.229	100.00	0.000	



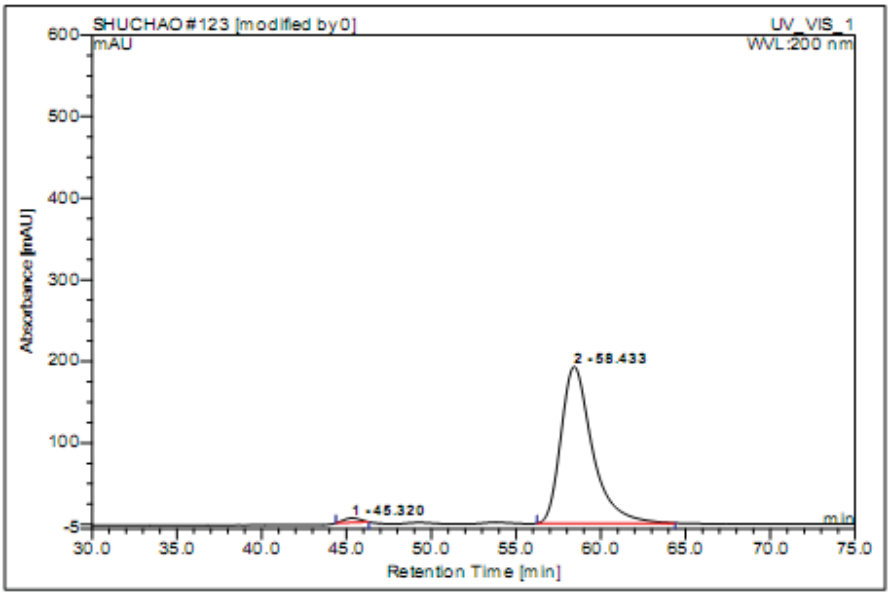
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	25.78	n.a.	1419.928	1030.001	99.21	n.a.	BMB*
2	29.46	n.a.	11.726	8.220	0.79	n.a.	BMB*
Total:			1431.655	1038.220	100.00	0.000	

Compound **1e**



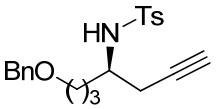


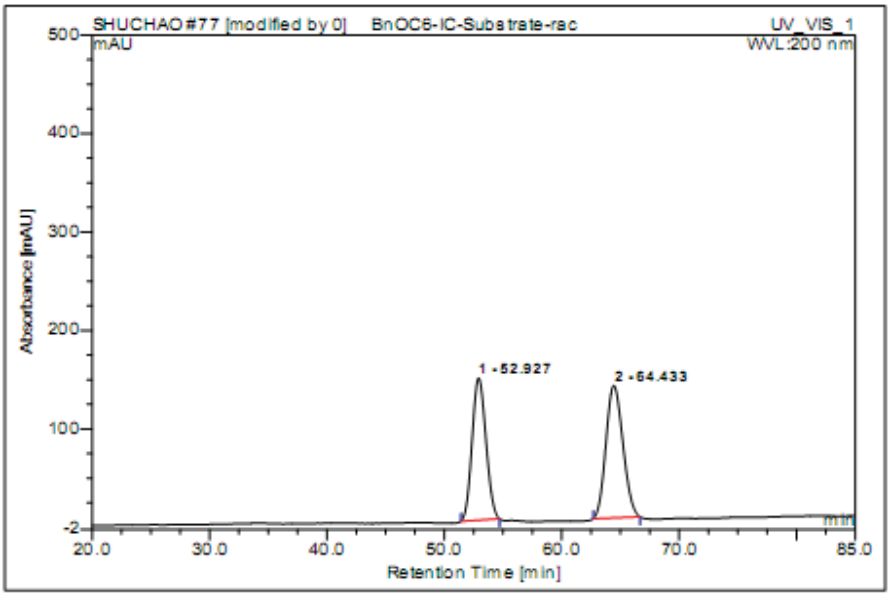
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	44.64	n.a.	546.855	872.830	52.79	n.a.	BMB*
2	57.96	n.a.	377.806	780.535	47.21	n.a.	BMB*
Total:			924.661	1653.364	100.00	0.000	



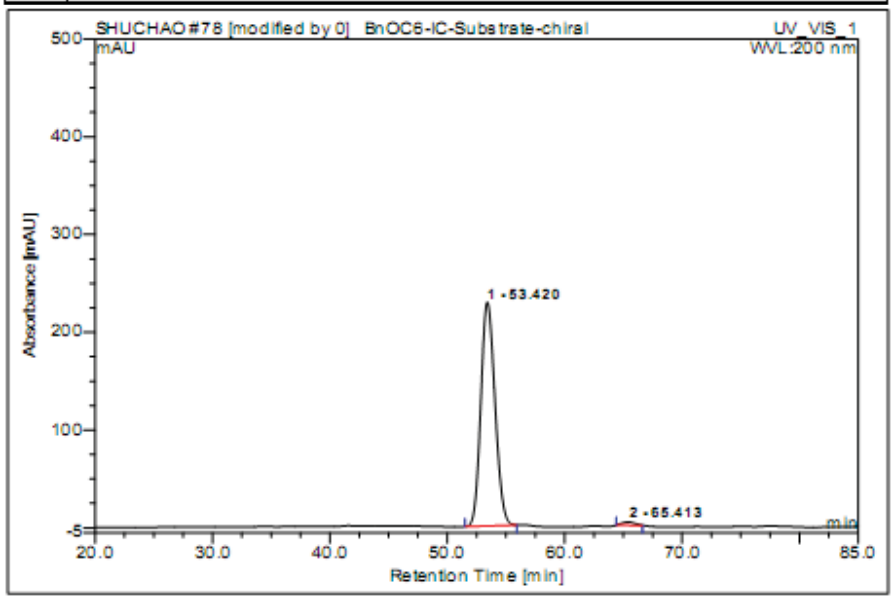
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	45.32	n.a.	5.386	6.000	1.43	n.a.	BMB*
2	58.43	n.a.	191.950	412.665	98.57	n.a.	BMB*
Total:			197.336	418.665	100.00	0.000	

Compound **1f**



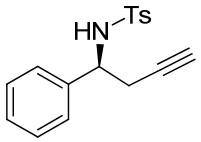


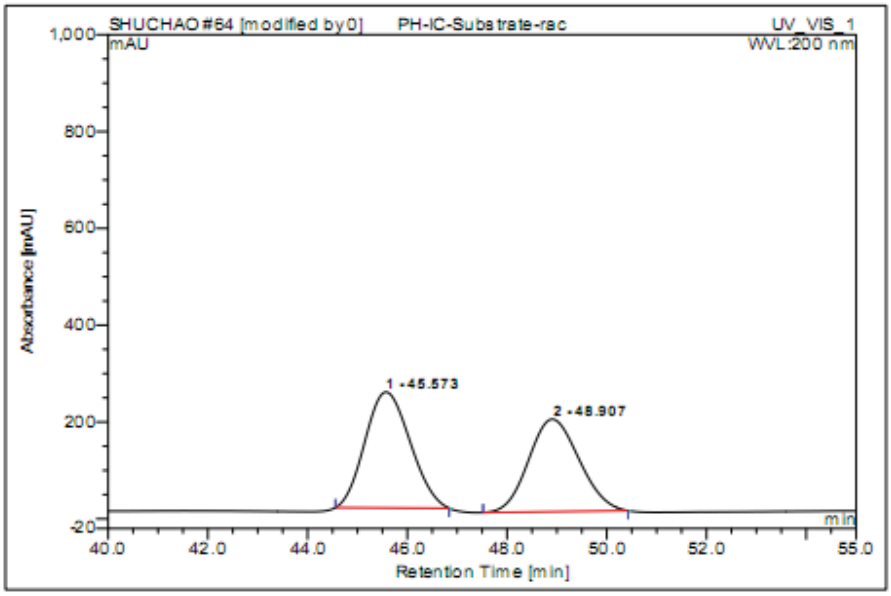
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	52.93	n.a.	144.283	197.139	46.69	n.a.	BMB*
2	64.43	n.a.	134.385	225.127	53.31	n.a.	BMB*
Total:			278.668	422.267	100.00	0.000	



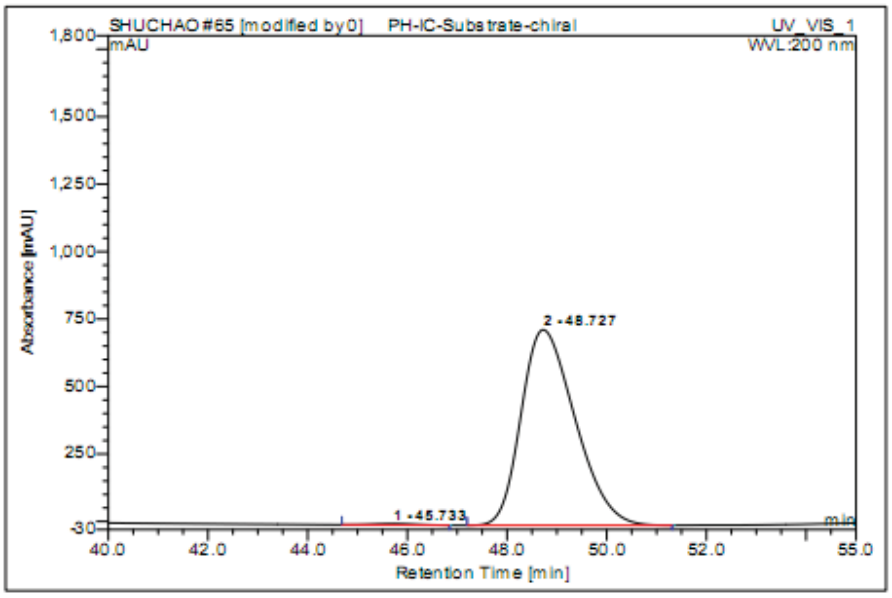
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	53.42	n.a.	228.878	320.089	98.76	n.a.	BMB*
2	65.41	n.a.	3.214	4.032	1.24	n.a.	BMB*
Total:			232.092	324.121	100.00	0.000	

Compound **1g**



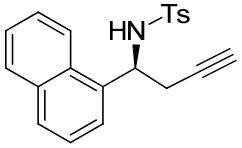


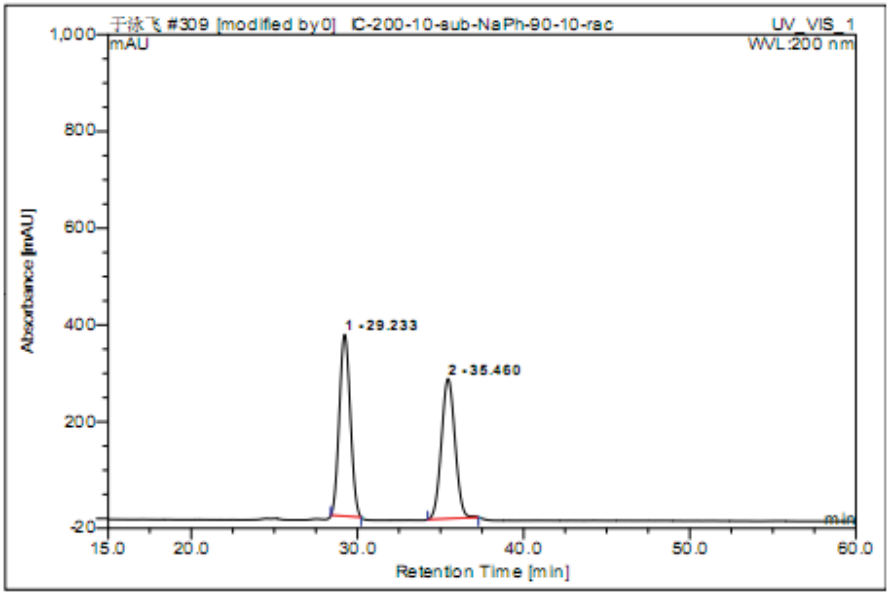
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	45.57	n.a.	239.076	250.838	52.86	n.a.	BMB*
2	48.91	n.a.	190.847	223.736	47.14	n.a.	BMB*
Total:			429.922	474.574	100.00	0.000	



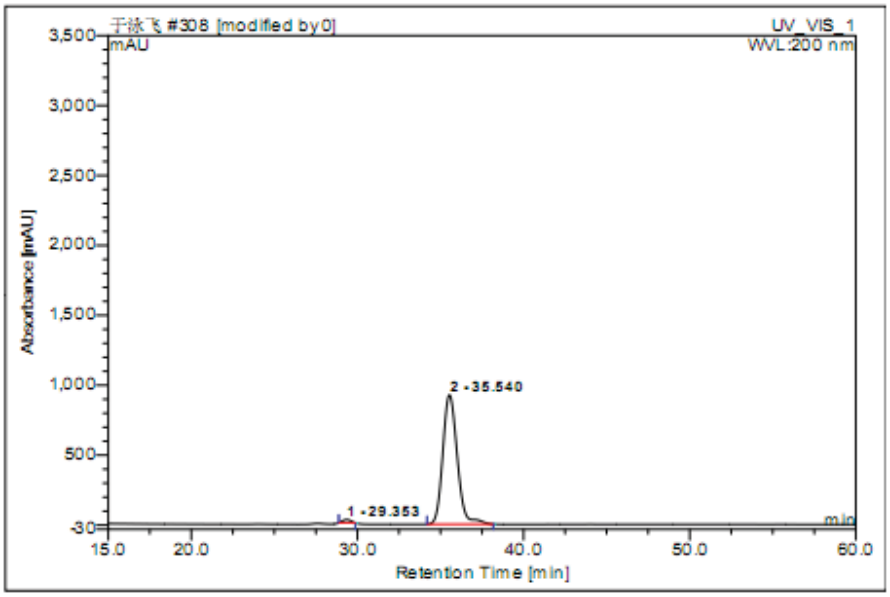
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	45.73	n.a.	4.704	4.799	0.52	n.a.	BMB
2	48.73	n.a.	724.831	909.674	99.48	n.a.	BMB
Total:			729.535	914.472	100.00	0.000	

Compound **1h**



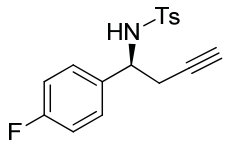


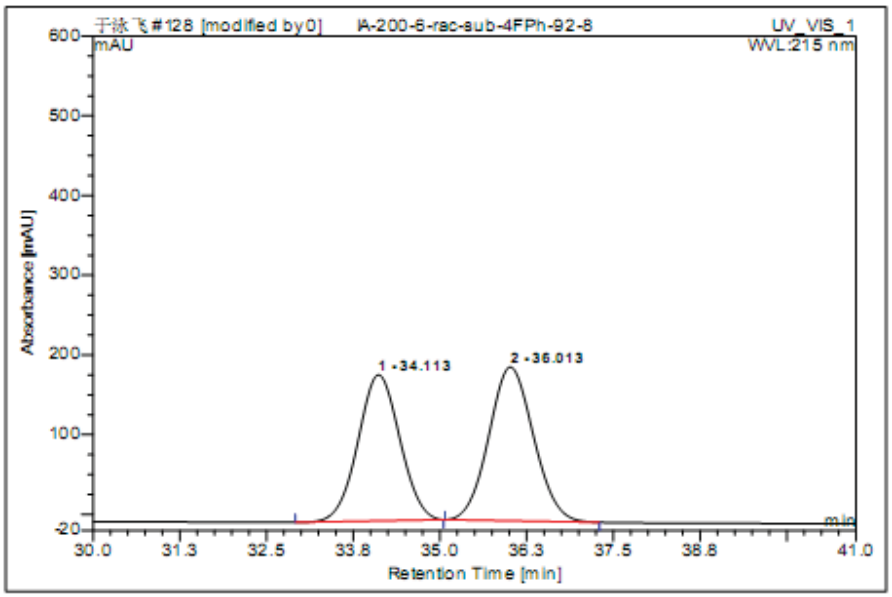
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	29.23	n.a.	375.032	287.481	51.10	n.a.	BMB*
2	35.46	n.a.	289.090	275.147	48.90	n.a.	BMB*
Total:			664.122	562.628	100.00	0.000	



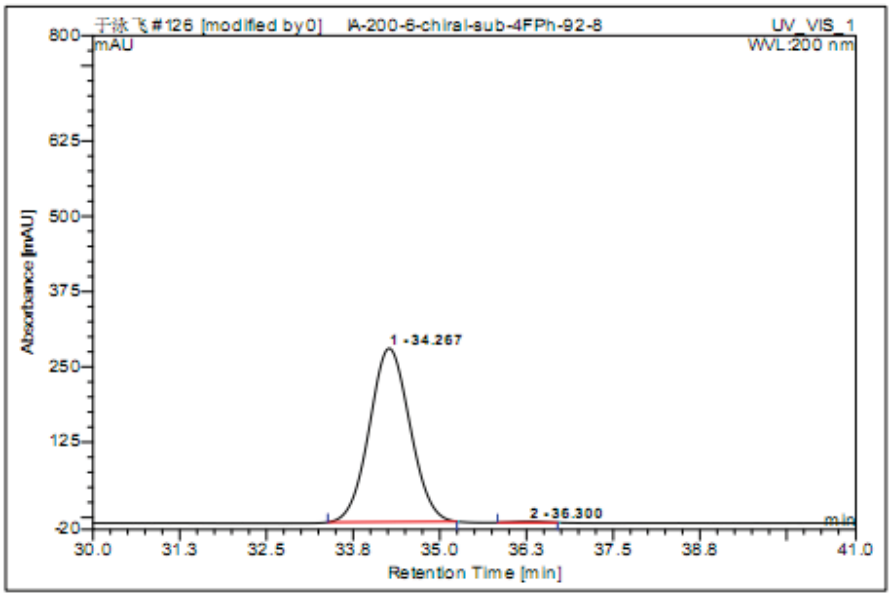
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	29.35	n.a.	23.096	13.207	1.39	n.a.	BMB*
2	35.54	n.a.	924.582	934.886	98.61	n.a.	BMB*
Total:			947.677	948.093	100.00	0.000	

Compound **1i**



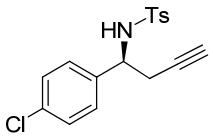


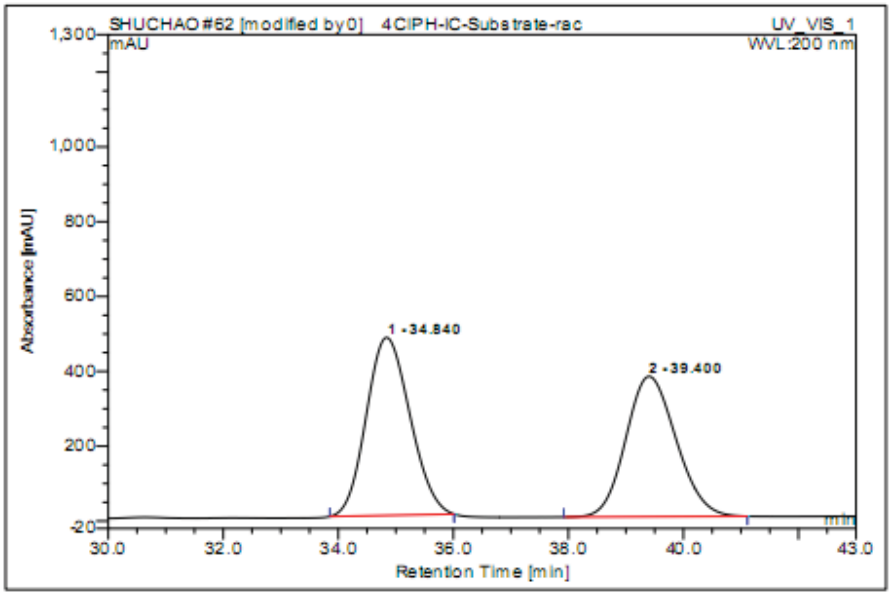
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount n.a.	Type
1	34.11	n.a.	183.185	128.242	47.05	n.a.	BMB*
2	36.01	n.a.	192.978	144.330	52.95	n.a.	BMB*
Total:			376.163	272.571	100.00	0.000	



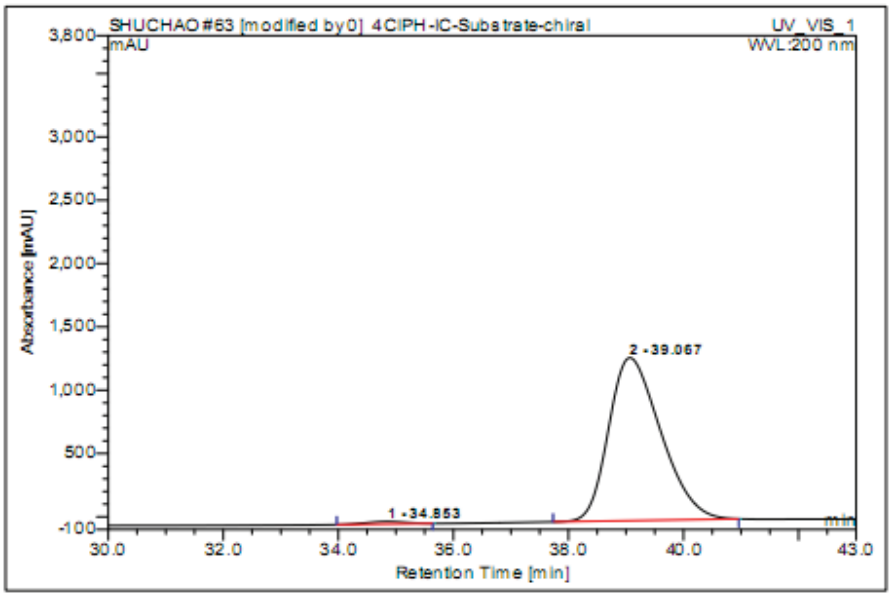
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	34.27	n.a.	287.925	195.653	99.62	n.a.	BMB*
2	36.30	n.a.	1.464	0.742	0.38	n.a.	BMB*
Total:			289.389	196.395	100.00	0.000	

Compound **1j**



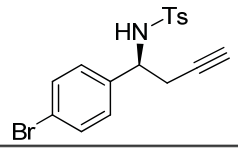


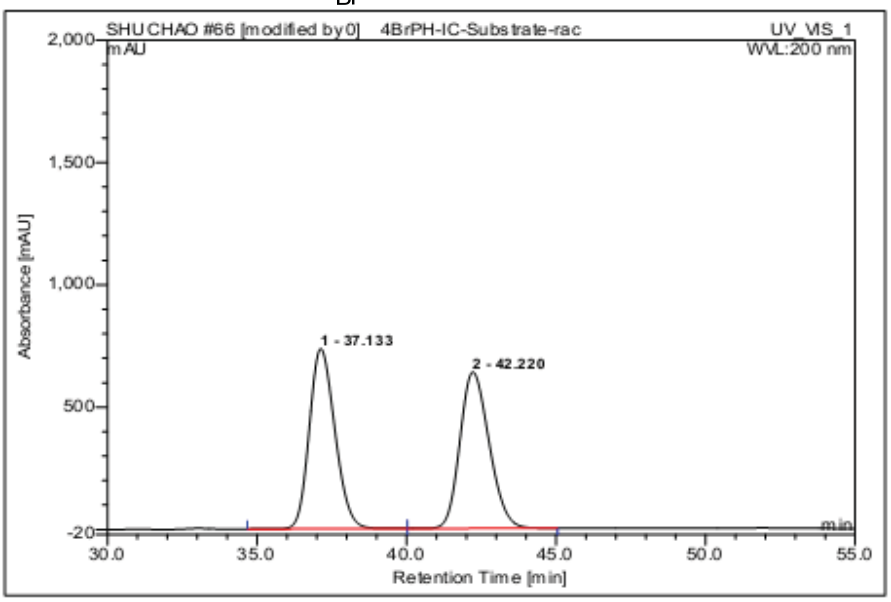
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	34.84	n.a.	475.313	418.405	52.38	n.a.	BMB*
2	39.40	n.a.	374.908	380.380	47.62	n.a.	BMB*
Total:			850.221	798.785	100.00	0.000	



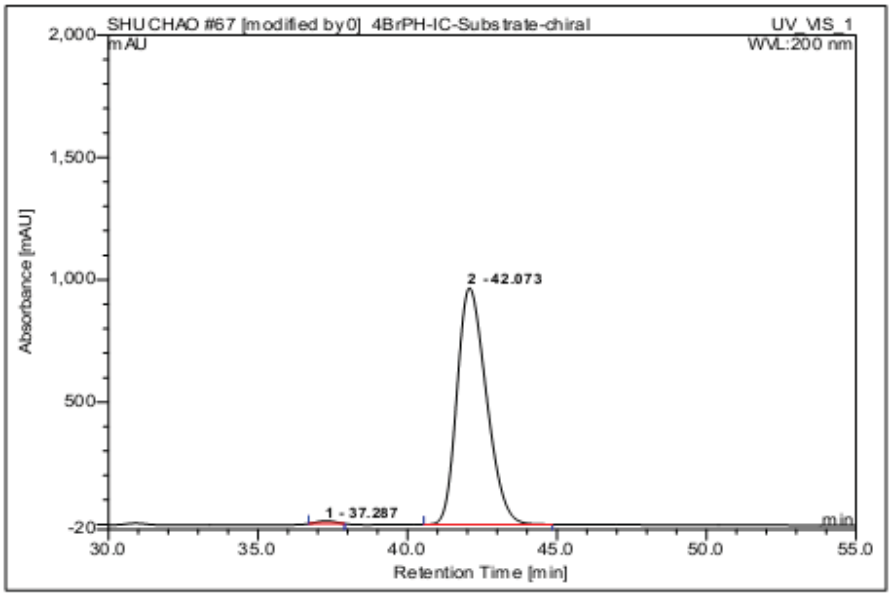
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	34.85	n.a.	19.594	15.884	1.16	n.a.	BMB*
2	39.07	n.a.	1286.020	1349.692	98.84	n.a.	BMB*
Total:			1305.613	1365.577	100.00	0.000	

Compound **1k**



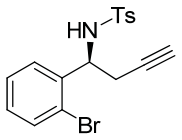


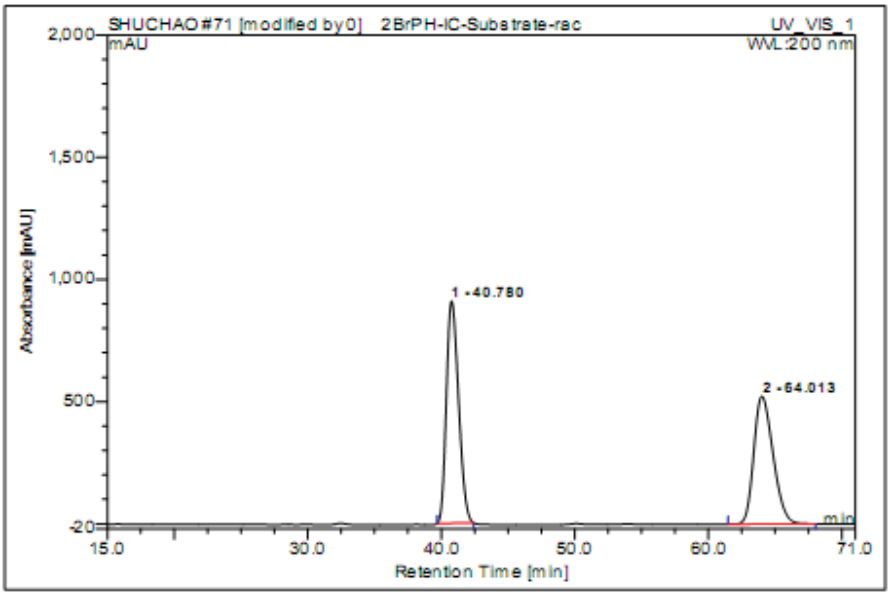
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	37.13	n.a.	735.787	731.979	50.18	n.a.	BM
2	42.22	n.a.	639.028	726.633	49.82	n.a.	MB
Total:			1374.815	1458.612	100.00	0.000	



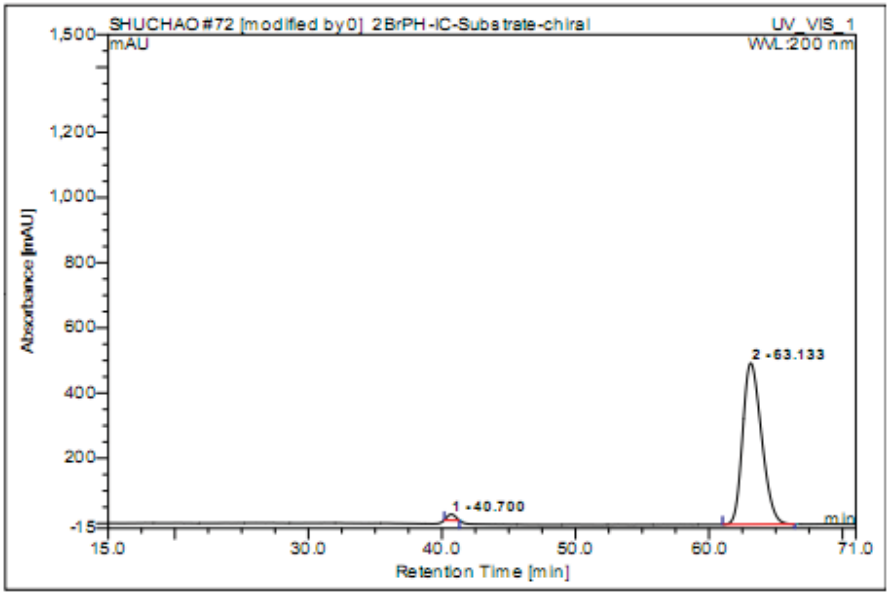
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	37.29	n.a.	11.397	7.959	0.72	n.a.	BMB*
2	42.07	n.a.	966.658	1102.836	99.28	n.a.	BMB
Total:			978.055	1110.795	100.00	0.000	

Compound **1l**



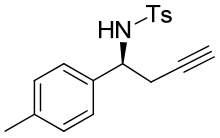


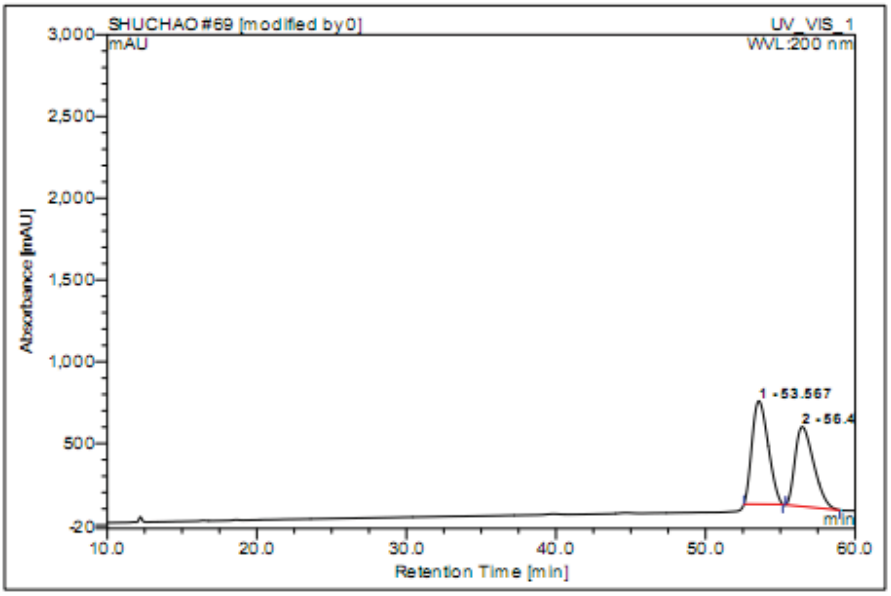
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	40.78	n.a.	908.888	961.248	52.35	n.a.	BMB*
2	64.01	n.a.	522.931	875.033	47.65	n.a.	BMB*
Total:			1431.819	1836.281	100.00	0.000	



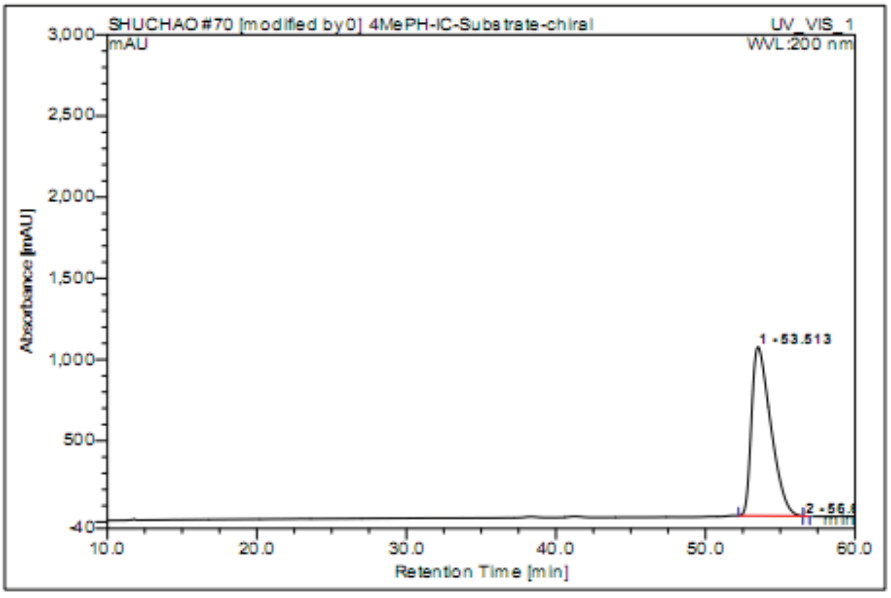
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	40.70	n.a.	18.392	12.551	1.52	n.a.	MB*
2	63.13	n.a.	494.947	812.937	98.48	n.a.	BMB
Total:			513.339	825.488	100.00	0.000	

Compound **1m**



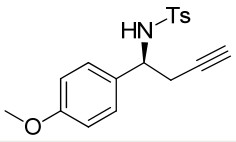


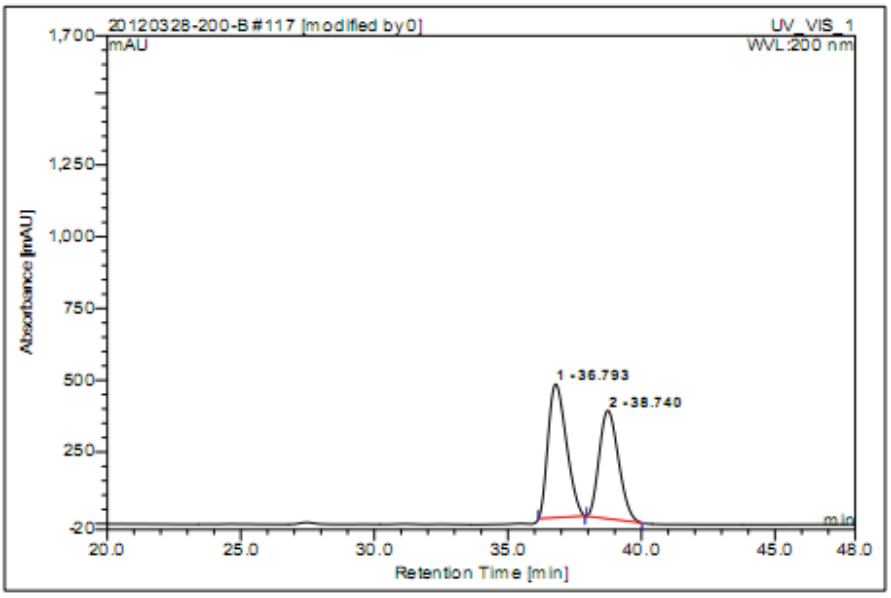
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	53.57	n.a.	630.836	791.909	52.85	n.a.	BMB*
2	56.47	n.a.	486.975	706.548	47.15	n.a.	BMB*
Total:			1117.811	1498.457	100.00	0.000	



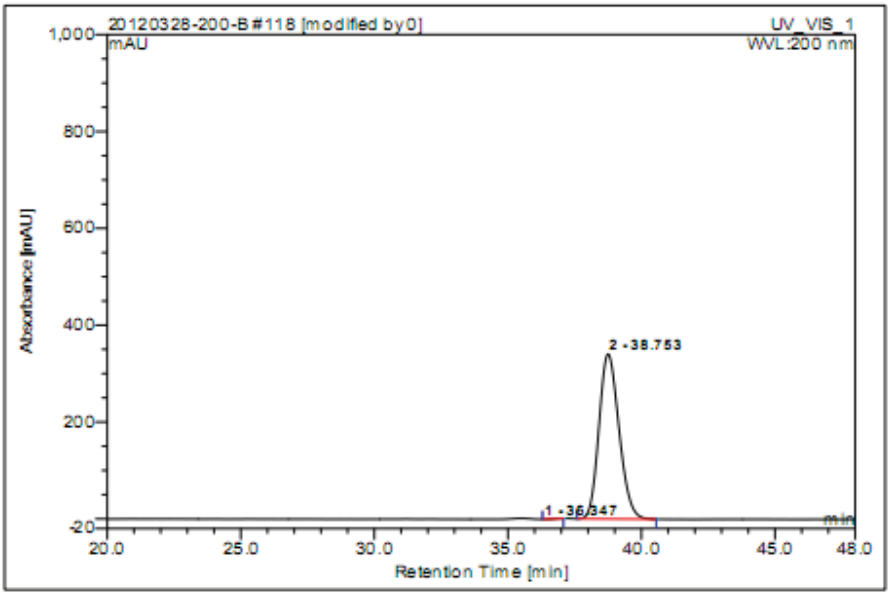
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	53.51	n.a.	1039.315	1546.986	99.99	n.a.	BMB*
2	56.69	n.a.	0.348	0.093	0.01	n.a.	BMB*
Total:			1039.663	1547.079	100.00	0.000	

Compound **1n**



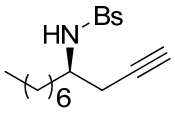


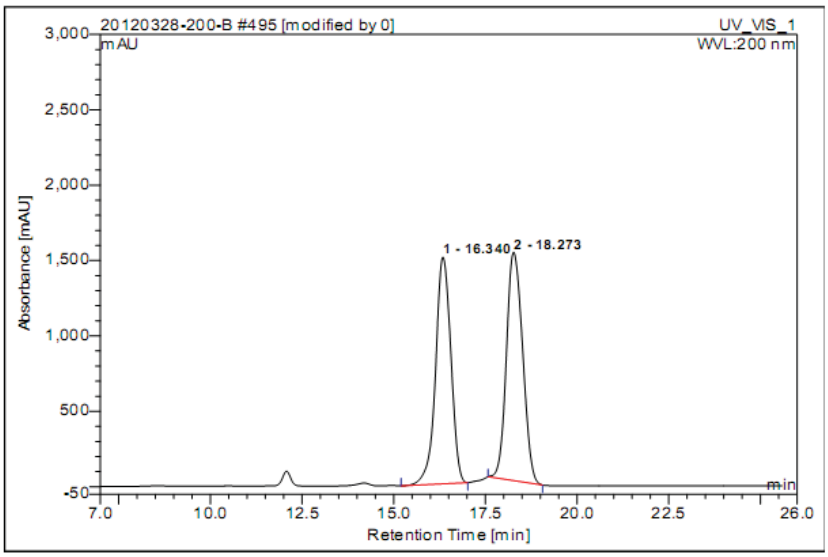
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	36.79	n.a.	464.802	370.267	53.95	n.a.	BMB*
2	38.74	n.a.	376.878	316.071	46.05	n.a.	BMB*
Total:			841.680	686.338	100.00	0.000	



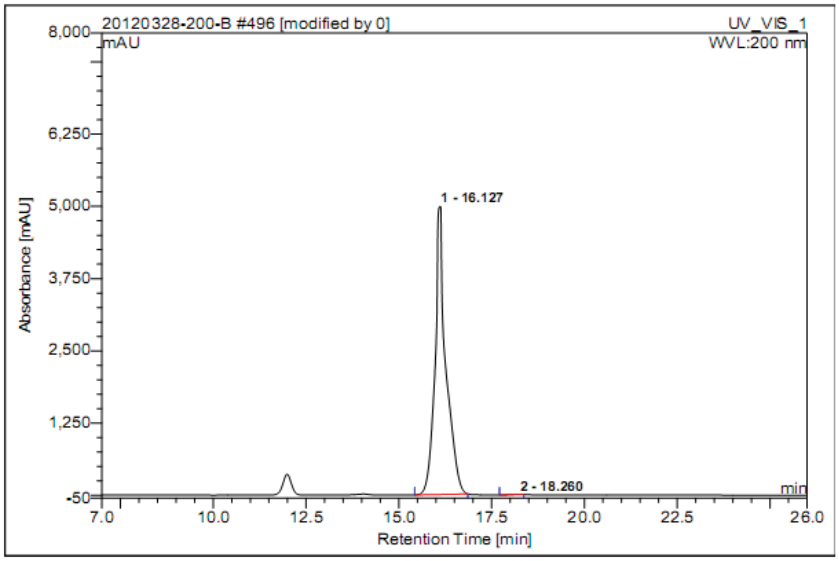
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	36.35	n.a.	0.135	0.138	0.05	n.a.	BMB*
2	38.75	n.a.	340.451	296.537	99.95	n.a.	BMB
Total:			340.586	296.675	100.00	0.000	

Compound **1q**



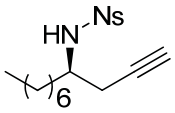


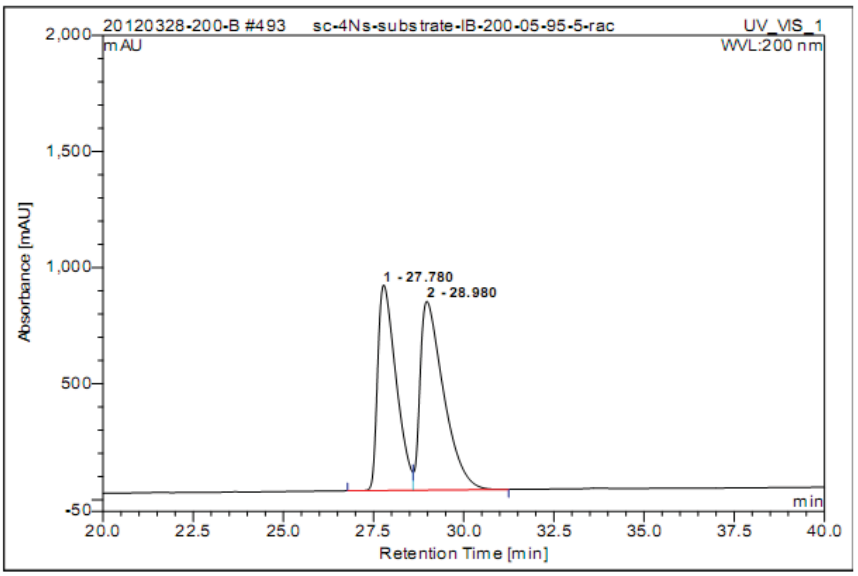
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	16.34	n.a.	1503.509	727.333	48.38	n.a.	BMB*
2	18.27	n.a.	1514.804	776.137	51.62	n.a.	BMB*
Total:			3018.313	1503.470	100.00	0.000	



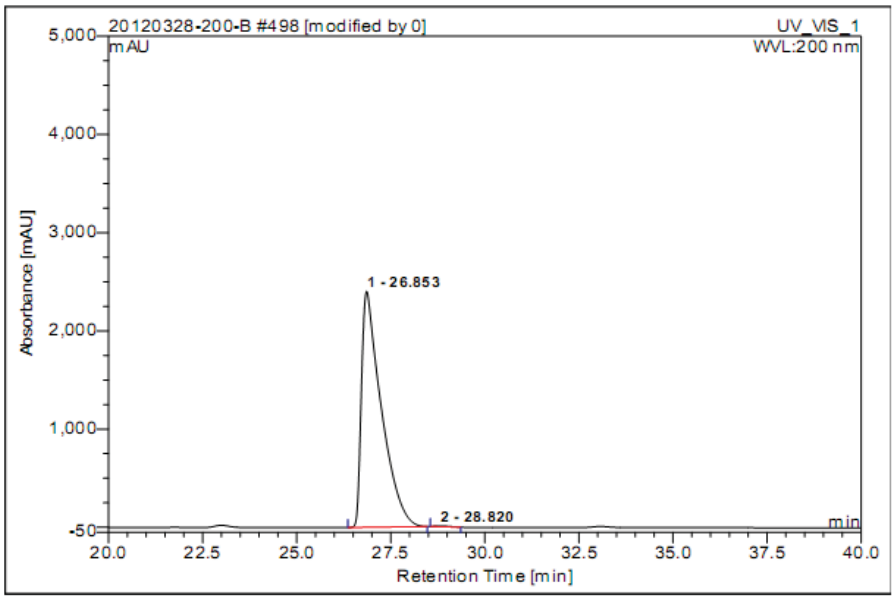
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	16.13	n.a.	4985.633	1693.797	99.94	n.a.	BMB*
2	18.26	n.a.	3.764	0.955	0.06	n.a.	BMB*
Total:			4989.397	1694.752	100.00	0.000	

Compound **1r**



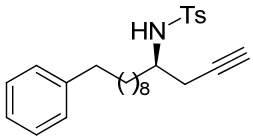


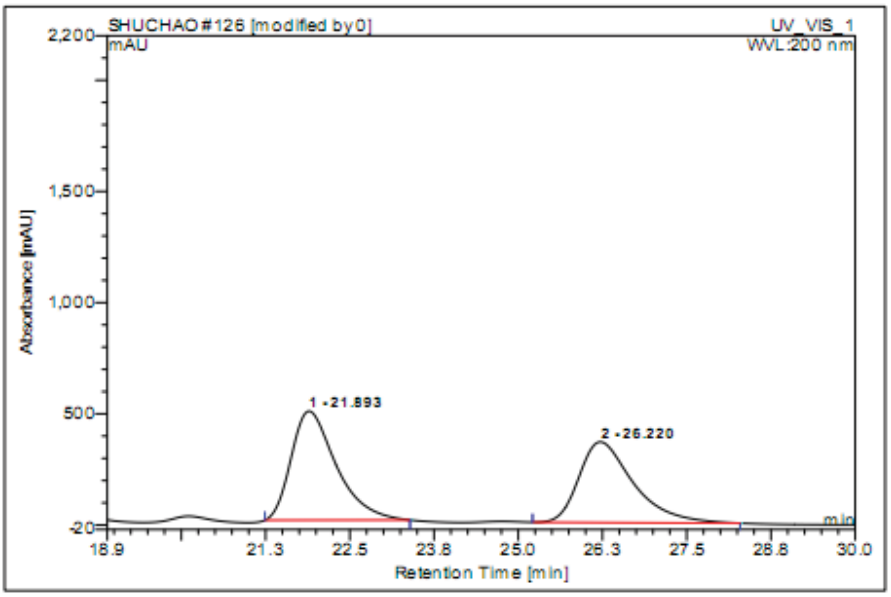
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	27.78	n.a.	885.136	523.838	45.97	n.a.	BM
2	28.98	n.a.	812.926	615.716	54.03	n.a.	MB
Total:			1698.062	1139.554	100.00	0.000	



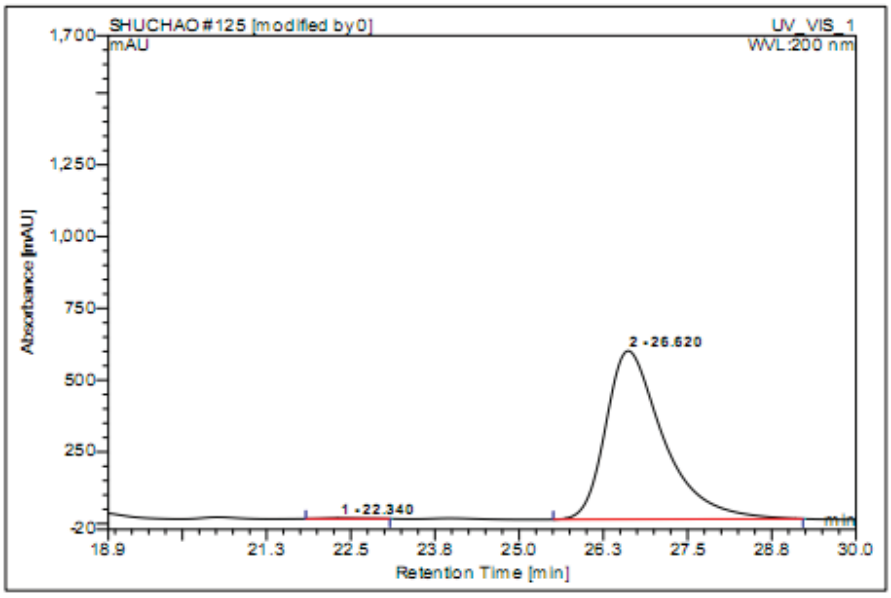
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	26.85	n.a.	2402.239	1468.068	99.77	n.a.	BMB
2	28.82	n.a.	7.031	3.446	0.23	n.a.	BMB*
Total:			2409.269	1471.514	100.00	0.000	

Compound **1s**



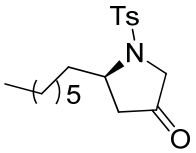


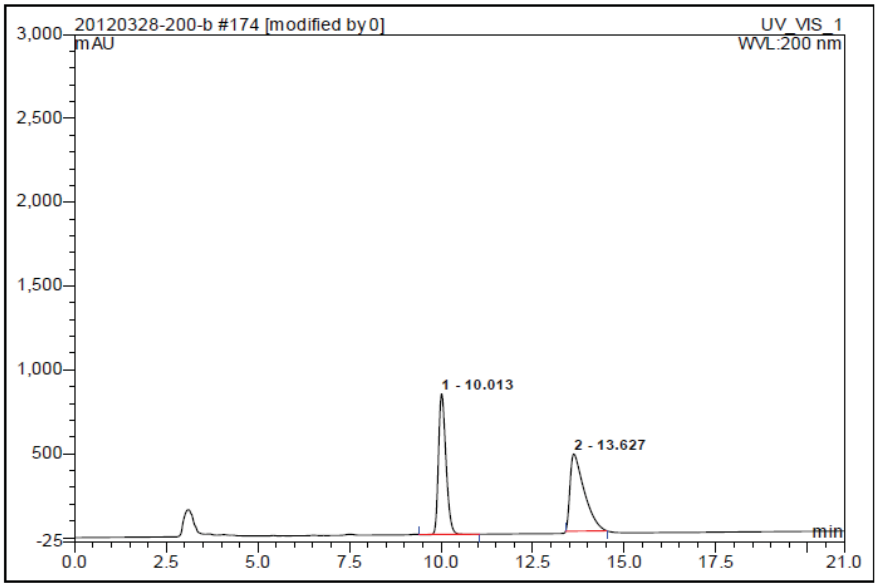
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	21.89	n.a.	489.867	379.653	52.77	n.a.	BMB*
2	26.22	n.a.	362.660	339.748	47.23	n.a.	BMB*
Total:			852.528	719.401	100.00	0.000	



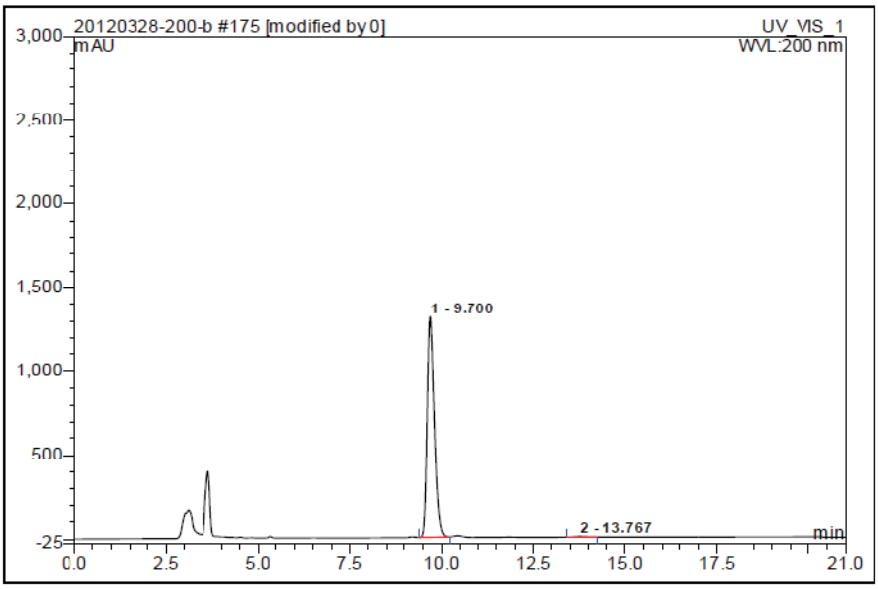
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	22.34	n.a.	2.365	1.585	0.27	n.a.	BMB*
2	26.62	n.a.	586.488	582.199	99.73	n.a.	BMB*
Total:			588.854	583.784	100.00	0.000	

Compound **2a**



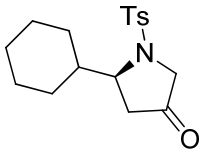


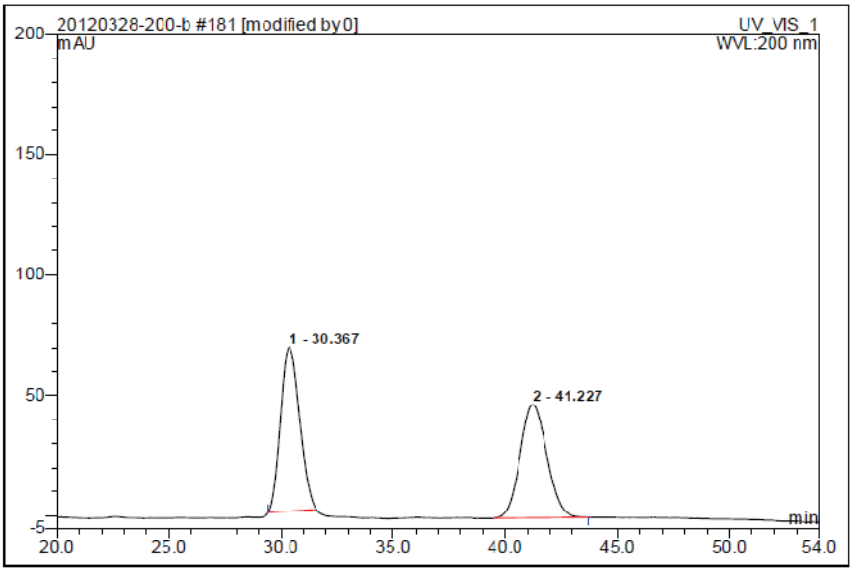
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	10.01	n.a.	837.578	197.642	48.85	n.a.	BMB*
2	13.63	n.a.	459.238	206.912	51.15	n.a.	BMB*
Total:			1296.816	404.554	100.00	0.000	



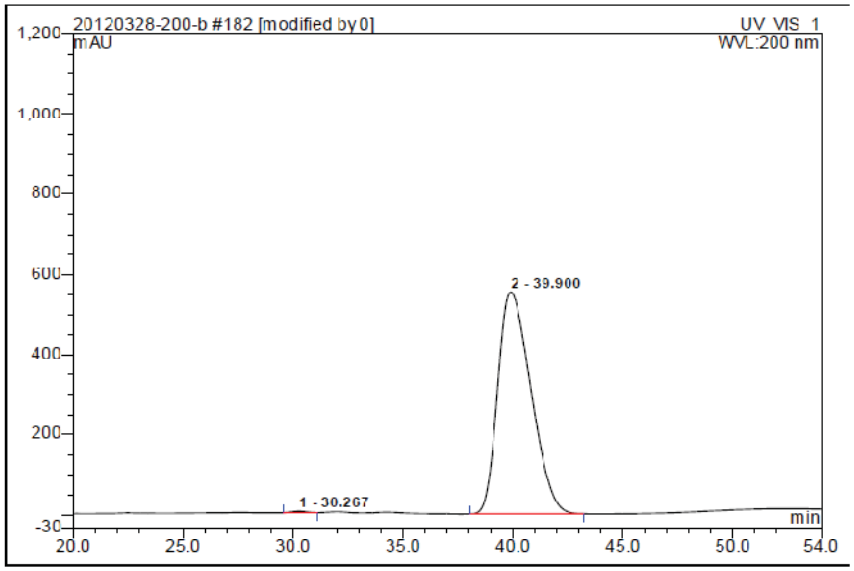
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	9.70	n.a.	1315.449	292.326	99.53	n.a.	BMB
2	13.77	n.a.	3.800	1.392	0.47	n.a.	BMB*
Total:			1319.249	293.718	100.00	0.000	

Compound **2b**



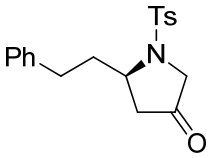


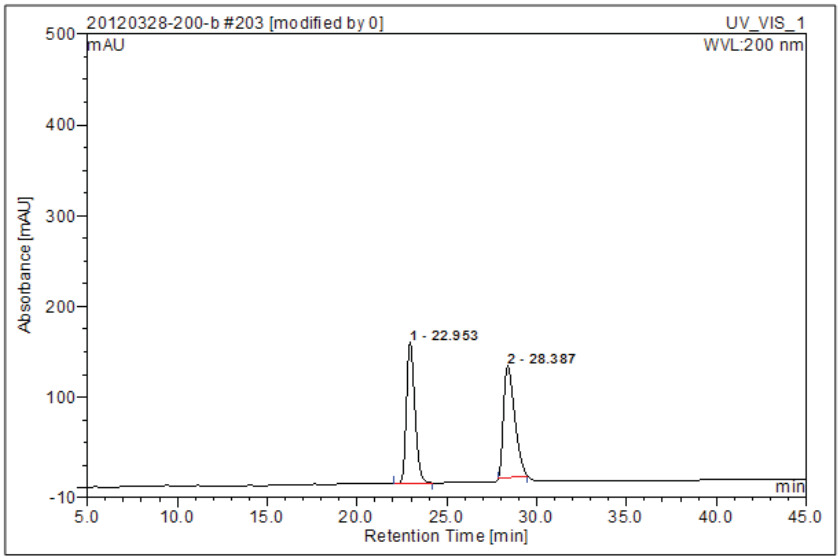
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	30.37	n.a.	60.325	66.765	50.77	n.a.	BMB*
2	41.23	n.a.	47.098	64.742	49.23	n.a.	BMB*
Total:			115.423	131.506	100.00	0.000	



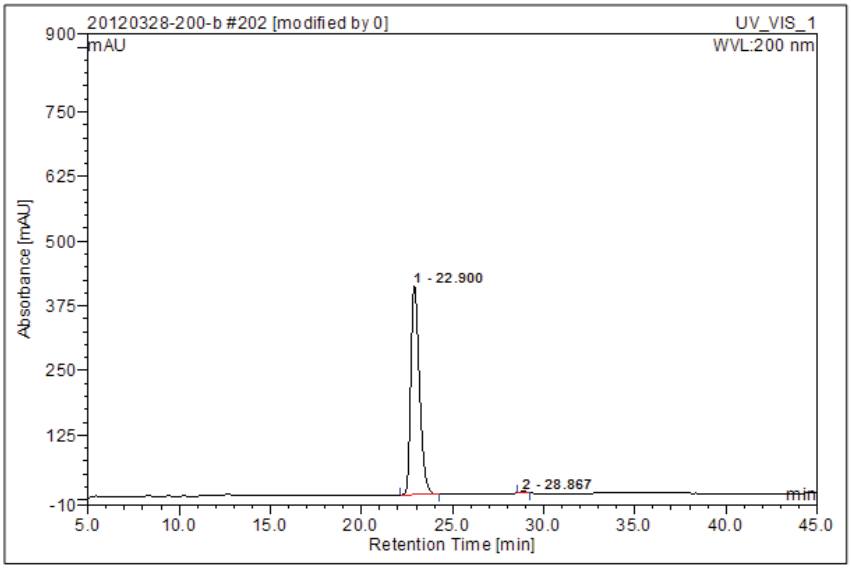
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	30.27	n.a.	3.271	2.637	0.27	n.a.	BMB*
2	39.90	n.a.	554.374	963.995	99.73	n.a.	BMB
Total:			557.644	966.632	100.00	0.000	

Compound **2c**



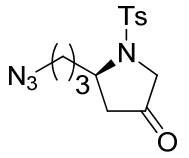


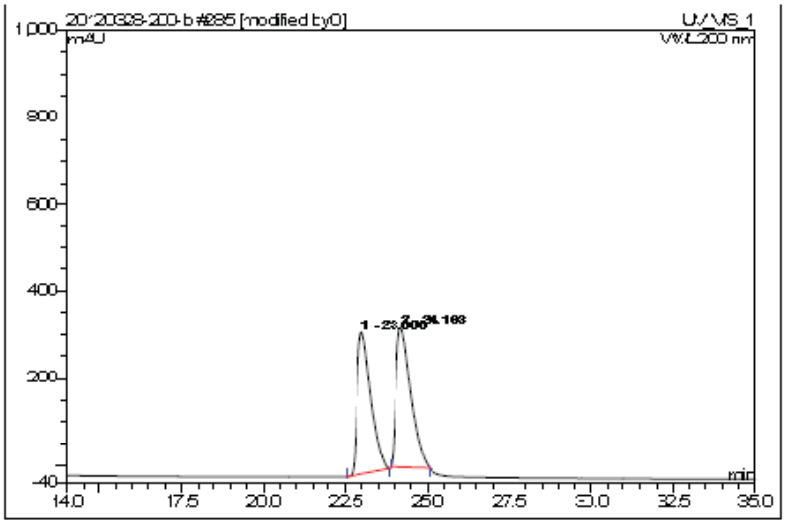
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	22.95	n.a.	155.368	84.662	48.84	n.a.	BMB*
2	28.39	n.a.	122.797	88.670	51.16	n.a.	BMB*
Total:			278.165	173.332	100.00	0.000	



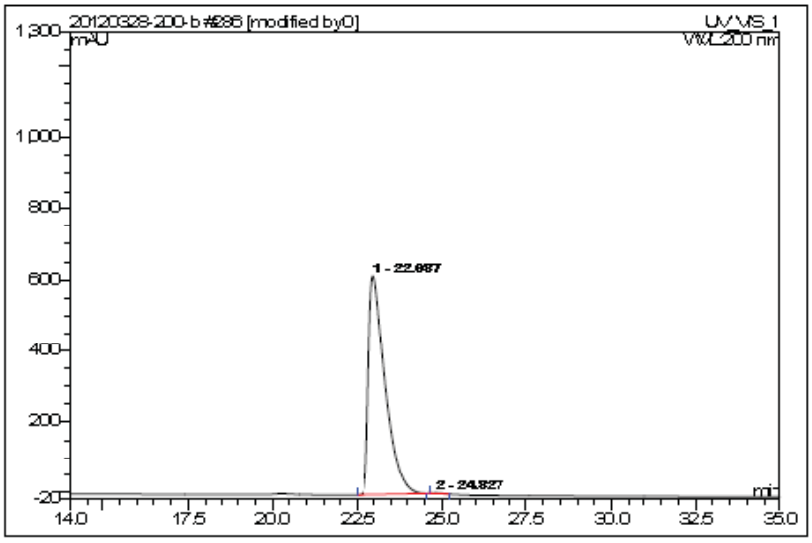
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	22.90	n.a.	403.643	221.984	99.59	n.a.	BMB
2	28.87	n.a.	2.149	0.925	0.41	n.a.	BMB*
Total:			405.792	222.909	100.00	0.000	

Compound **2d**



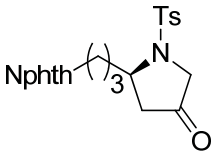


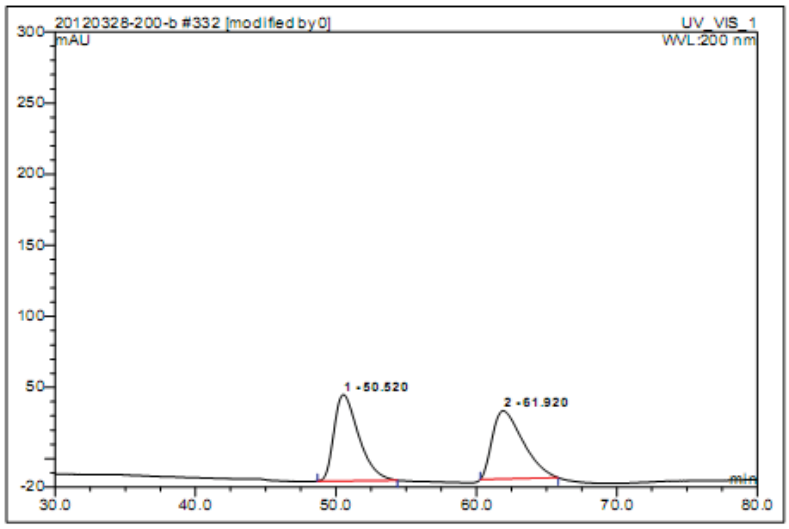
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	23.00	n.a.	324.020	155.991	48.34	n.a.	BMB*
2	24.19	n.a.	321.225	166.690	51.66	n.a.	BMB*
Total:			645.245	322.681	100.00	0.000	



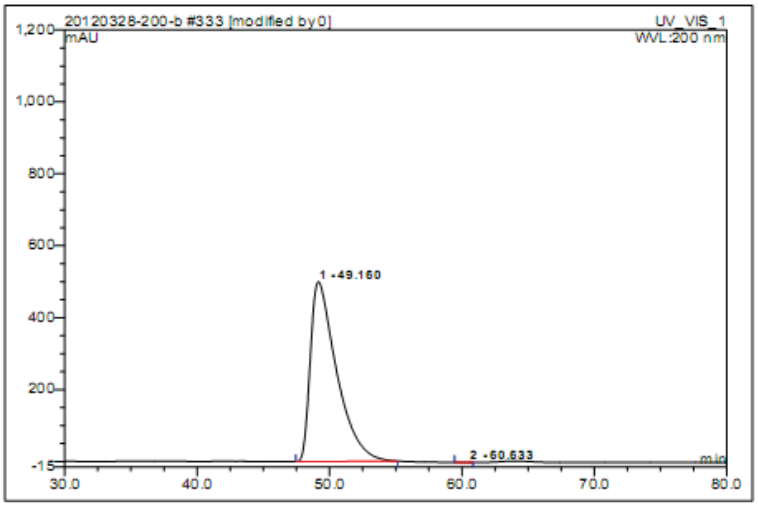
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	22.99	n.a.	616.744	352.217	99.84	n.a.	BMB
2	24.83	n.a.	1.659	0.581	0.16	n.a.	BMB*
Total:			618.404	352.798	100.00	0.000	

Compound **2e**



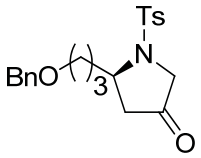


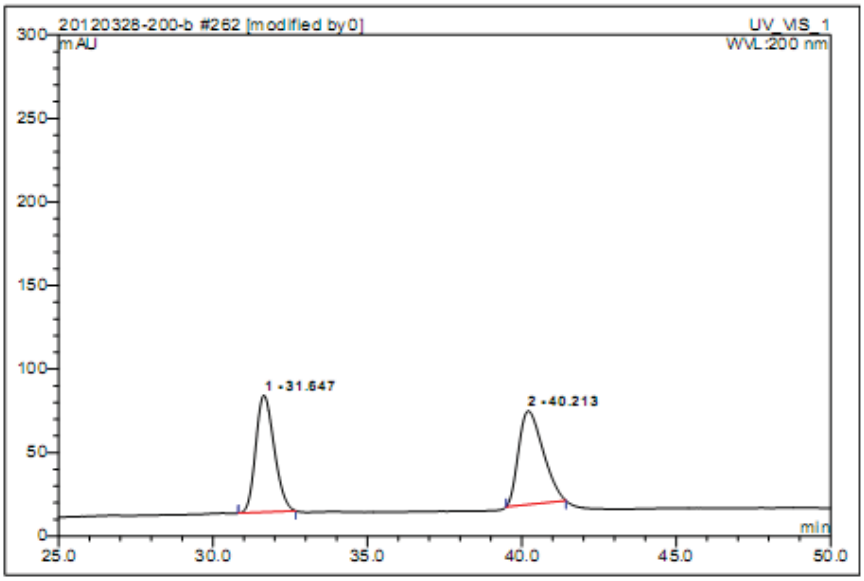
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	50.52	n.a.	60.701	124.203	50.53	n.a.	BMB
2	61.92	n.a.	47.866	121.598	49.47	n.a.	BMB*
Total:			108.566	245.801	100.00	0.000	



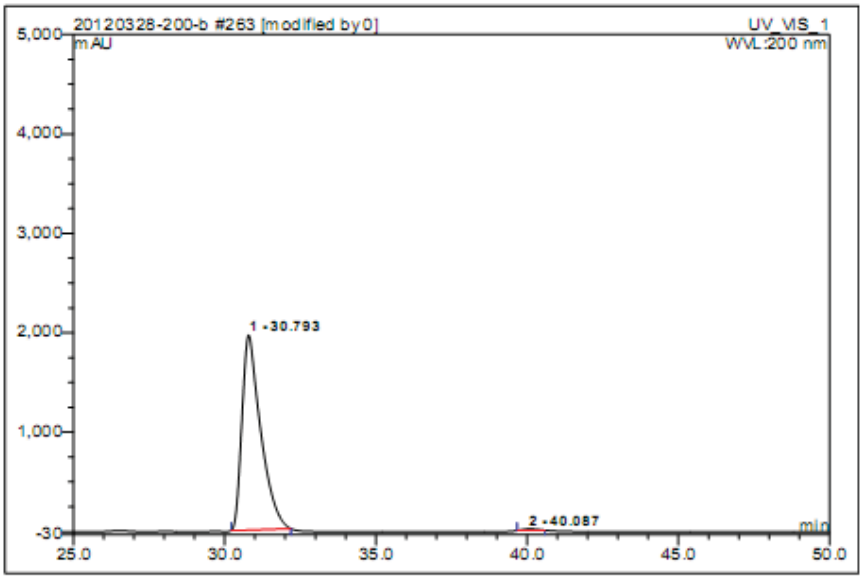
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	49.16	n.a.	499.737	1147.743	99.99	n.a.	BMB
2	60.63	n.a.	0.096	0.090	0.01	n.a.	BMB*
Total:			499.833	1147.834	100.00	0.000	

Compound **2f**



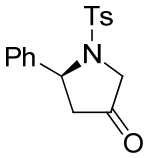


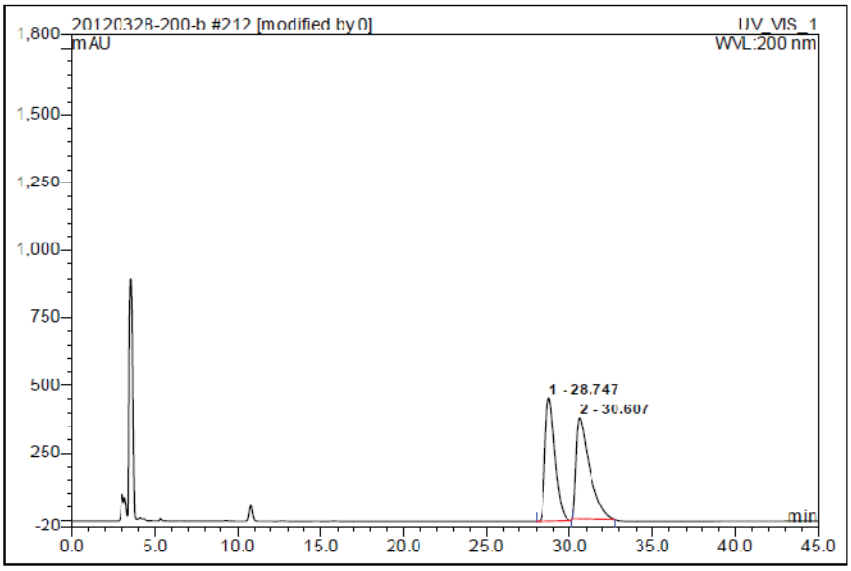
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	31.65	n.a.	69.854	48.560	48.56	n.a.	BMB*
2	40.21	n.a.	55.950	51.433	51.44	n.a.	BMB*
Total:			125.804	99.992	100.00	0.000	



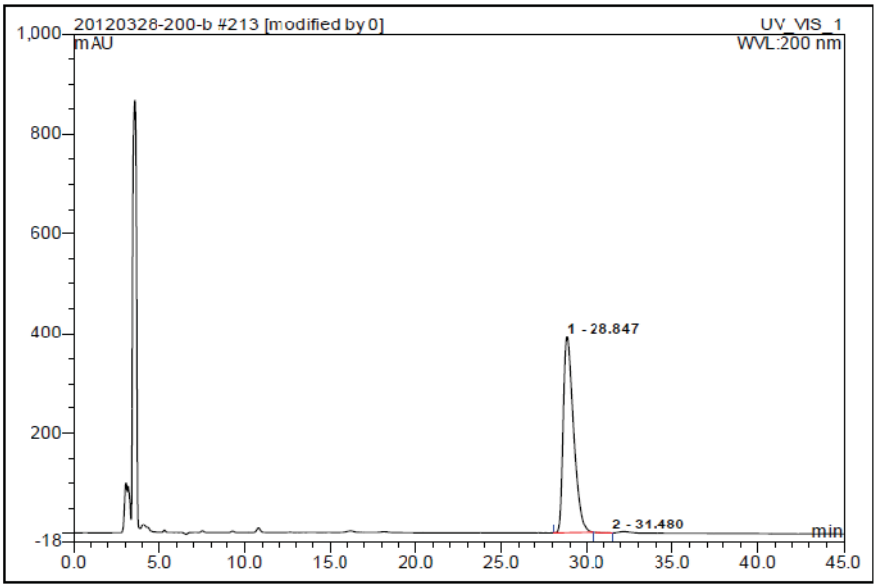
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	30.79	n.a.	1961.728	1406.748	99.45	n.a.	BMB*
2	40.09	n.a.	13.703	7.728	0.55	n.a.	BMB*
Total:			1975.431	1414.477	100.00	0.000	

Compound **2g**



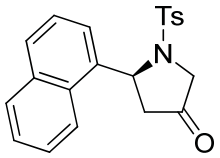


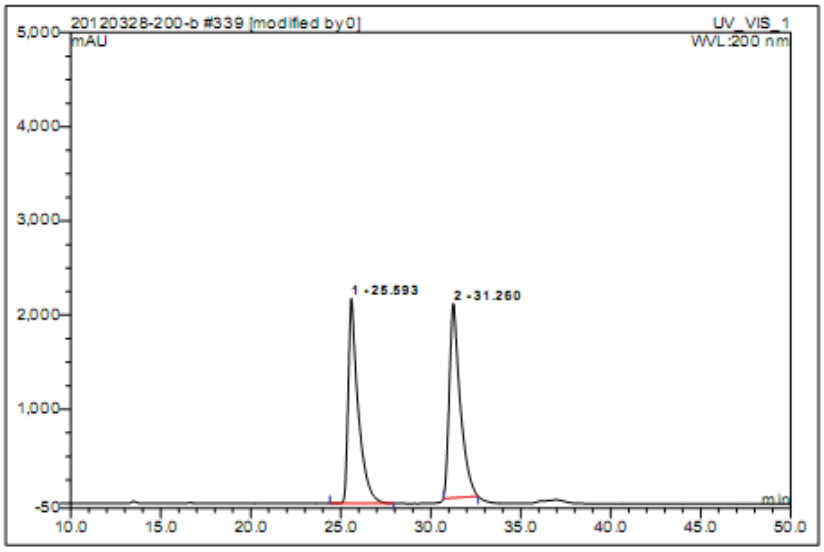
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	28.75	n.a.	454.907	308.005	47.09	n.a.	BMB*
2	30.61	n.a.	372.452	346.072	52.91	n.a.	BMB*
Total:			827.358	654.077	100.00	0.000	



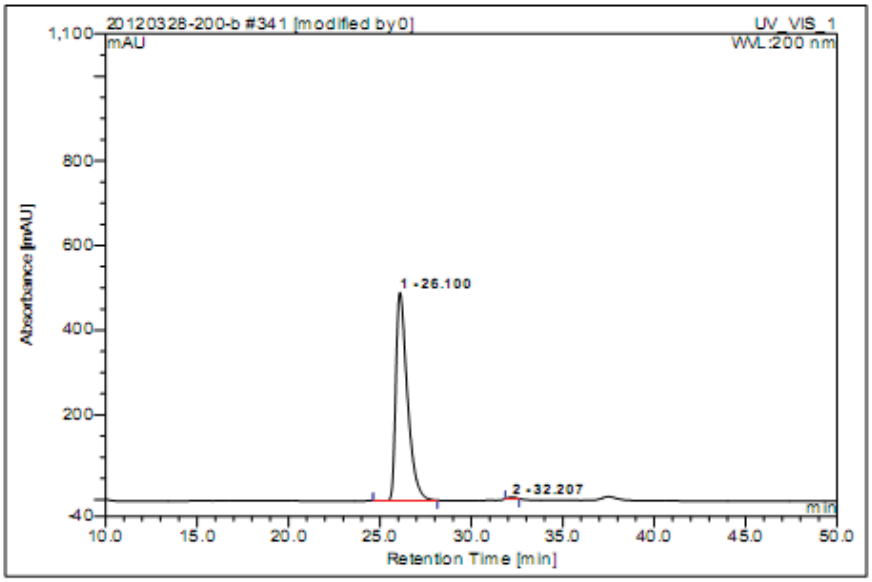
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	28.85	n.a.	393.346	271.434	99.90	n.a.	BMB*
2	31.48	n.a.	0.075	0.281	0.10	n.a.	BMB*
Total:			393.420	271.716	100.00	0.000	

Compound **2h**



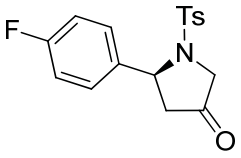


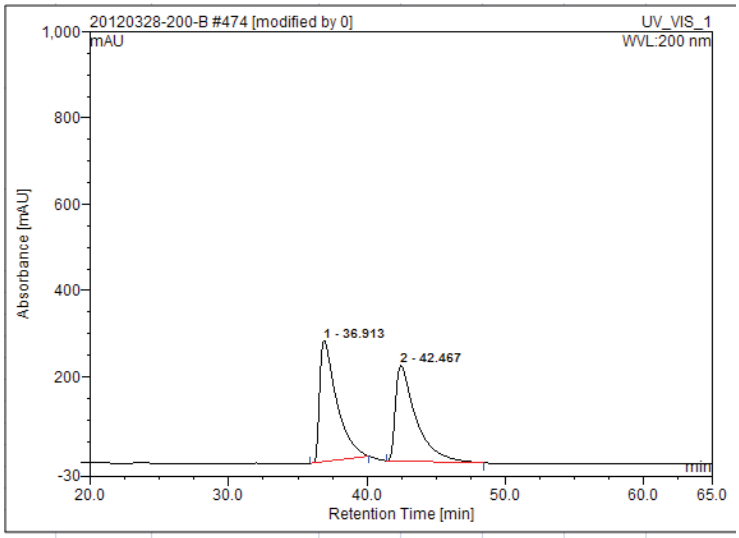
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	25.59	n.a.	2176.132	1389.687	49.17	n.a.	BMB*
2	31.26	n.a.	2063.635	1436.770	50.83	n.a.	BMB*
Total:			4239.767	2826.457	100.00	0.000	



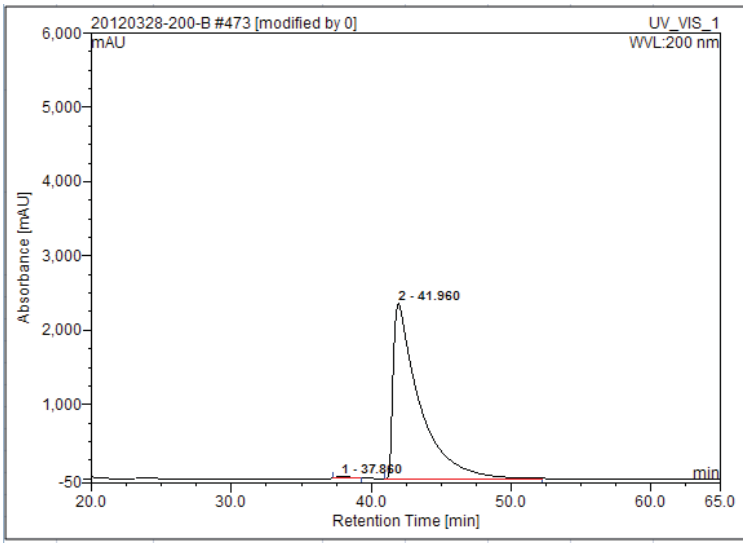
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	26.10	n.a.	491.527	358.998	99.49	n.a.	BMB*
2	32.21	n.a.	3.951	1.856	0.51	n.a.	BMB*
Total:			495.478	360.854	100.00	0.000	

Compound **2i**



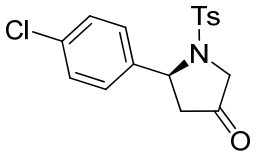


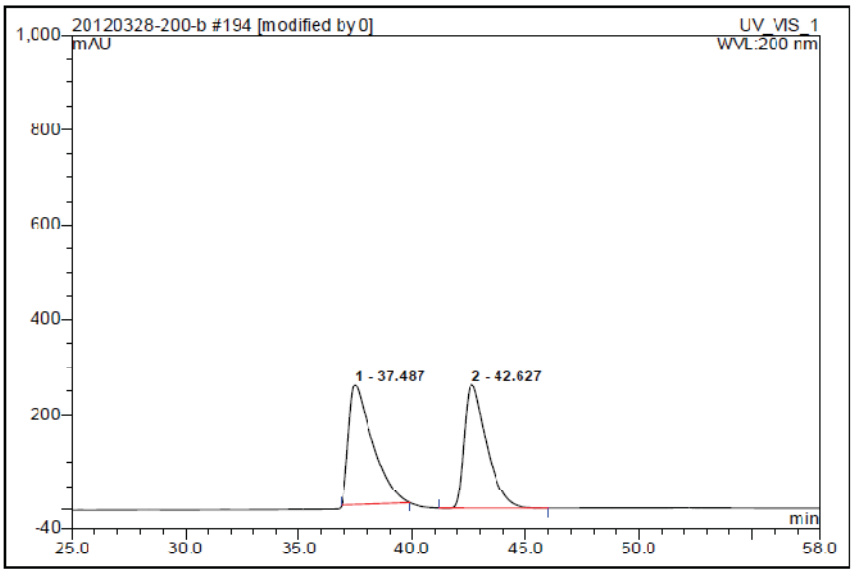
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	36.91	n.a.	280.222	401.925	51.37	n.a.	BMB*
2	42.47	n.a.	220.946	380.490	48.63	n.a.	BMB*
Total:			501.169	782.415	100.00	0.000	



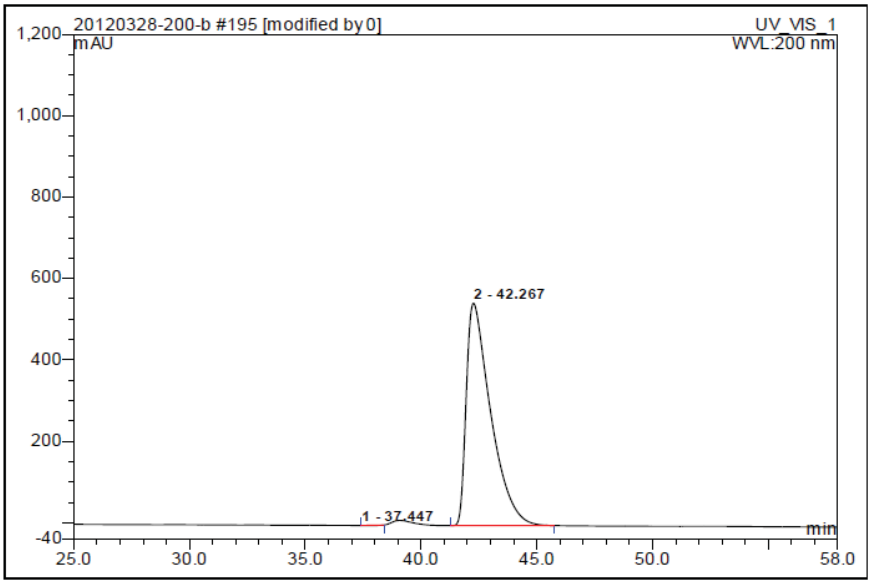
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	37.86	n.a.	27.468	27.968	0.55	n.a.	BMB*
2	41.96	n.a.	2357.842	5070.208	99.45	n.a.	BMB
Total:			2385.310	5098.176	100.00	0.000	

Compound **2j**



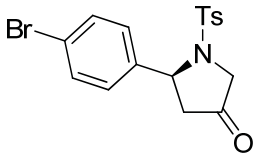


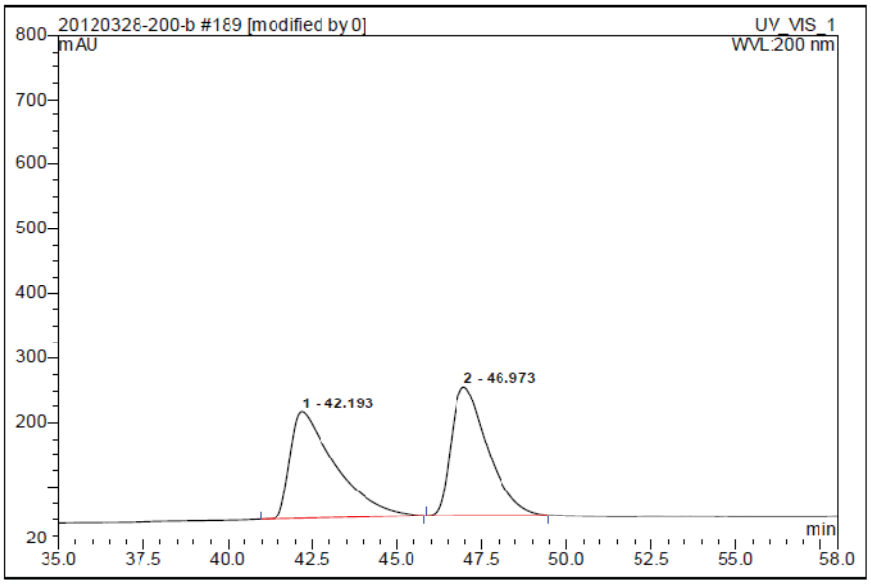
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	37.49	n.a.	253.738	311.874	51.01	n.a.	BMB*
2	42.63	n.a.	261.855	299.583	48.99	n.a.	BMB*
Total:			515.593	611.458	100.00	0.000	



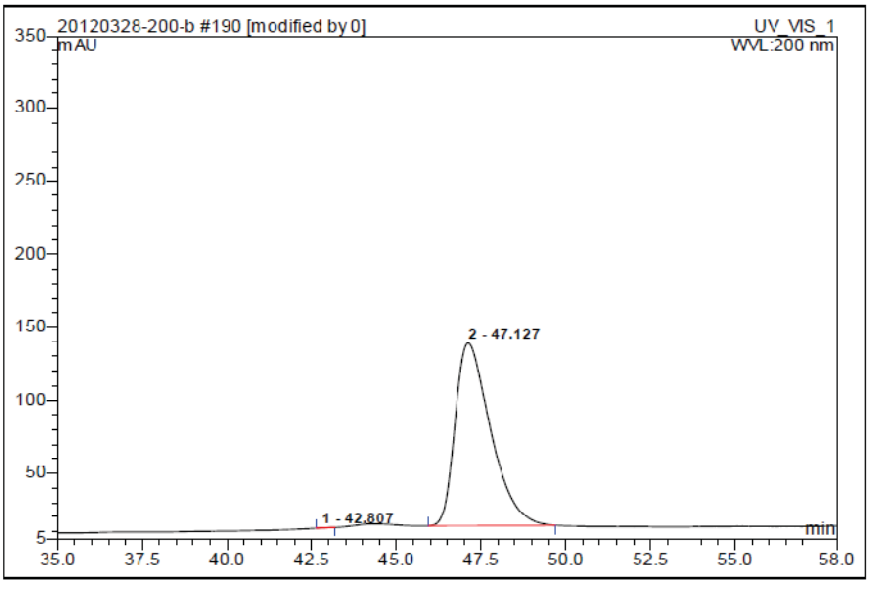
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	37.45	n.a.	0.092	0.387	0.06	n.a.	BMB*
2	42.27	n.a.	546.260	668.088	99.94	n.a.	BMB
Total:			546.353	668.476	100.00	0.000	

Compound **2k**



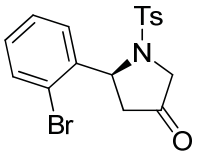


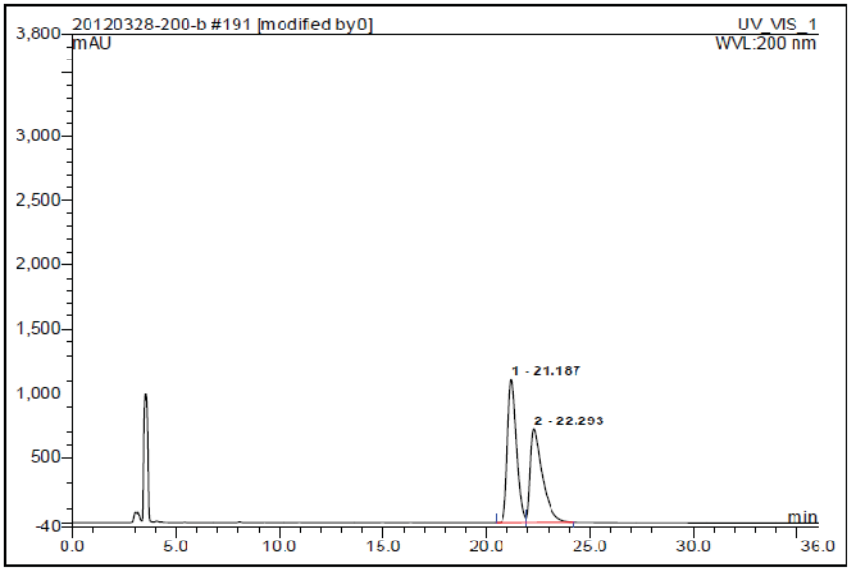
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	42.19	n.a.	163.338	252.473	50.58	n.a.	BMB*
2	46.97	n.a.	198.443	246.718	49.42	n.a.	BMB*
Total:			361.781	499.192	100.00	0.000	



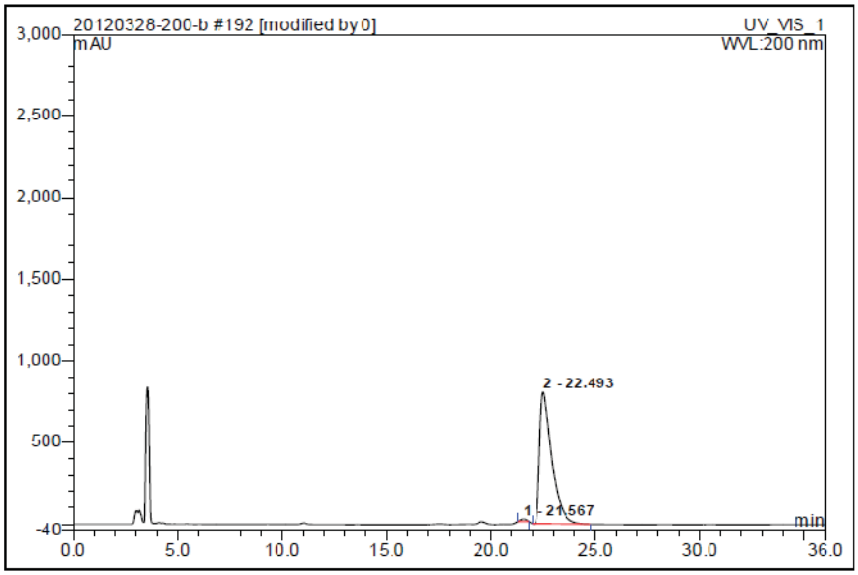
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	42.81	n.a.	0.113	0.033	0.02	n.a.	BMB*
2	47.13	n.a.	125.032	152.817	99.98	n.a.	BMB
Total:			125.145	152.849	100.00	0.000	

Compound **2l**



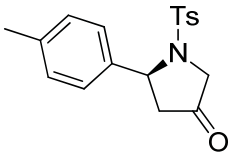


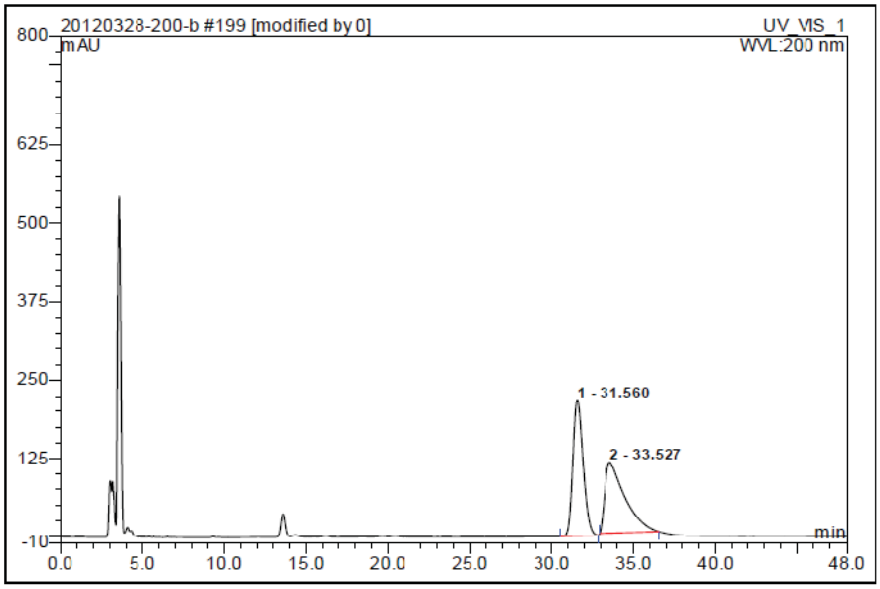
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	21.19	n.a.	1110.329	539.675	53.09	n.a.	BM *
2	22.29	n.a.	720.394	476.856	46.91	n.a.	MB*
Total:			1830.723	1016.531	100.00	0.000	



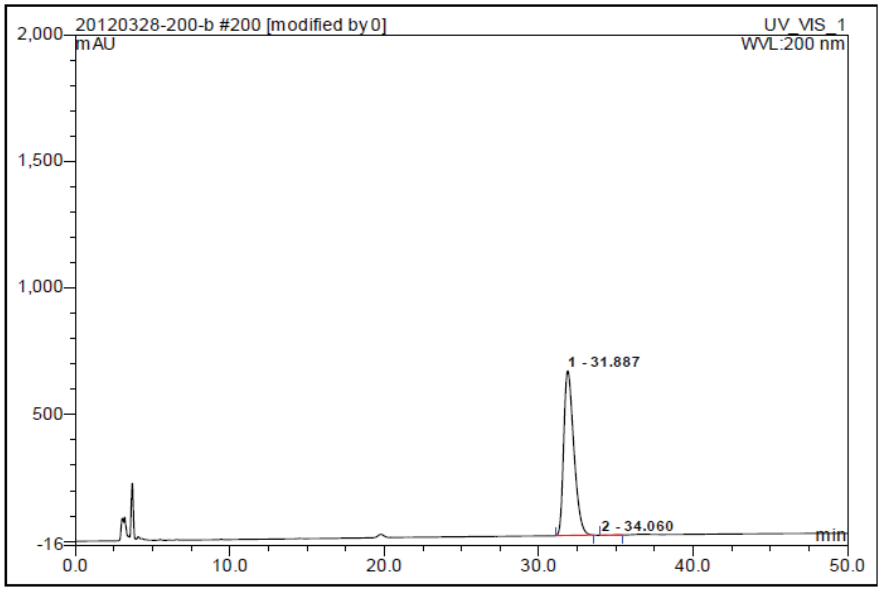
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	21.57	n.a.	13.648	1.169	0.77	n.a.	BMB*
2	22.49	n.a.	806.700	536.655	99.23	n.a.	BMB*
Total:			820.348	540.824	100.00	0.000	

Compound **2m**



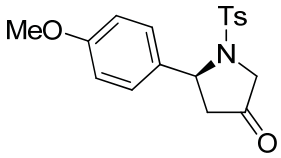


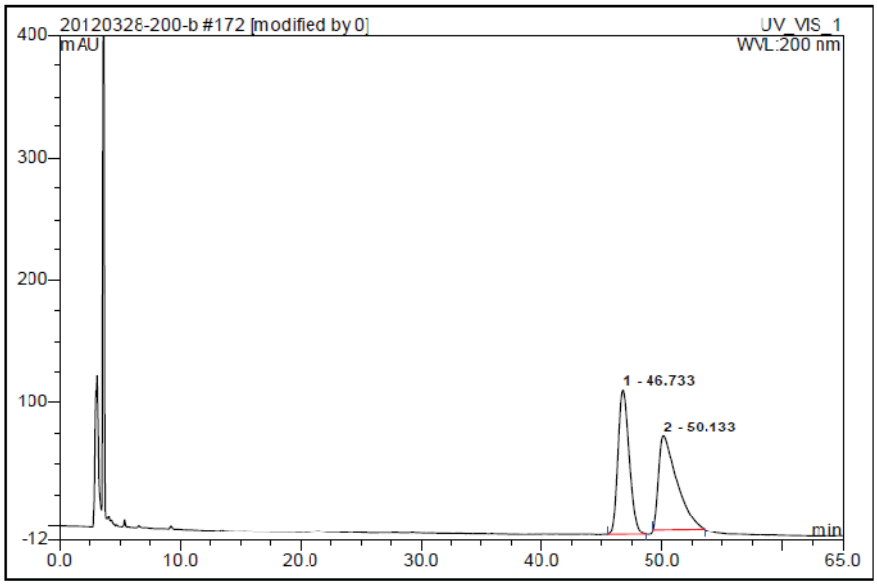
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	31.56	n.a.	216.688	156.299	49.44	n.a.	BMB*
2	33.53	n.a.	113.212	159.840	50.56	n.a.	BMB*
Total:			329.900	316.139	100.00	0.000	



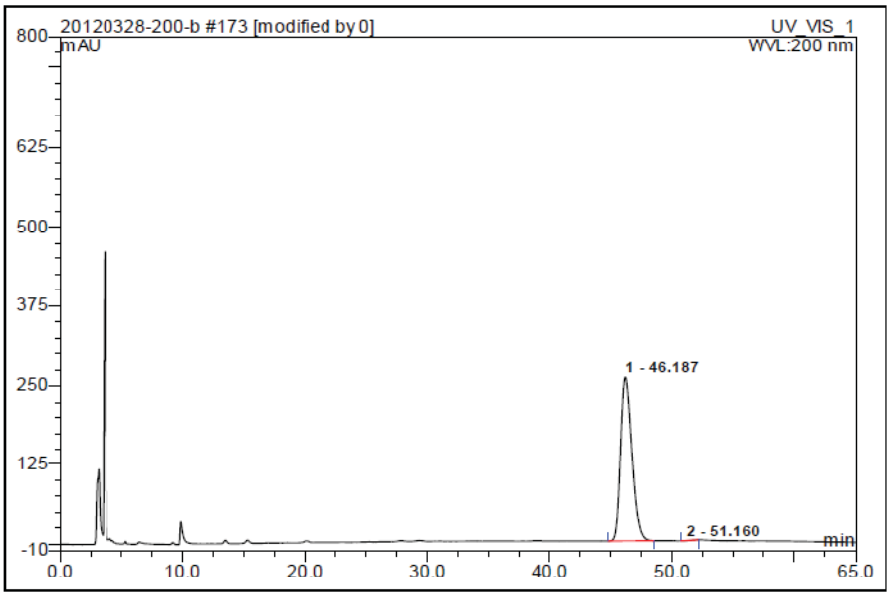
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	31.89	n.a.	649.524	493.845	99.98	n.a.	BMB*
2	34.06	n.a.	0.091	0.090	0.02	n.a.	BMB*
Total:			649.615	493.936	100.00	0.000	

Compound **2n**



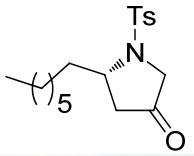


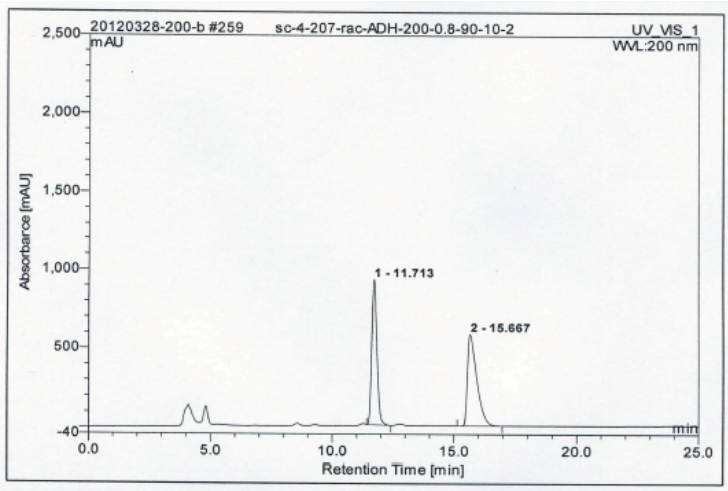
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	46.73	n.a.	117.633	124.689	48.65	n.a.	BMB
2	50.13	n.a.	75.930	131.588	51.35	n.a.	BMB*
Total:			193.563	256.277	100.00	0.000	



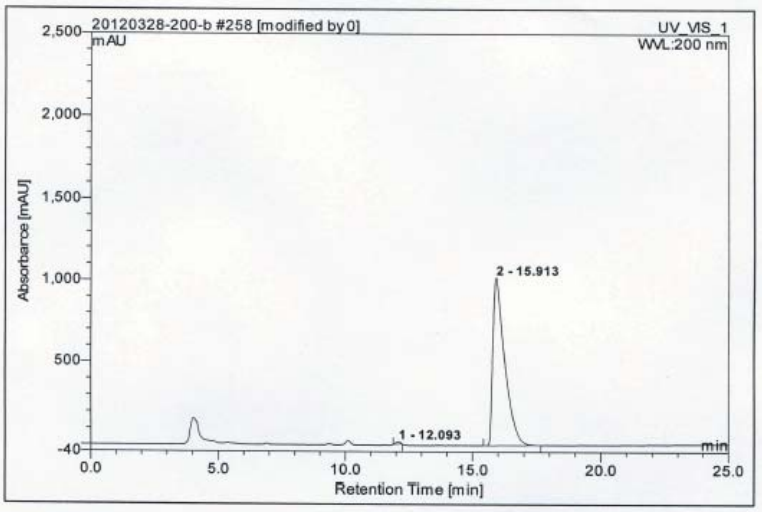
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	46.19	n.a.	258.555	275.138	99.93	n.a.	BMB
2	51.16	n.a.	0.329	0.190	0.07	n.a.	BMB*
Total:			258.884	275.329	100.00	0.000	

Compound **2a'**



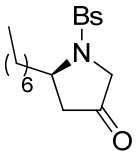


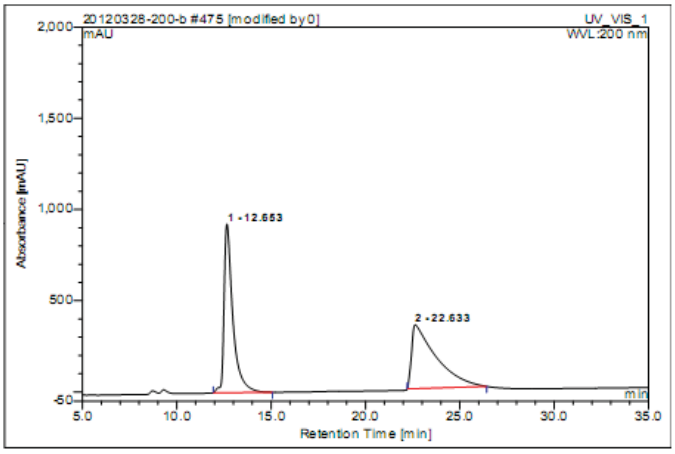
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	11.71	n.a.	924.492	225.516	46.77	n.a.	BMB
2	15.67	n.a.	581.912	256.696	53.23	n.a.	BMB
Total:			1506.404	482.211	100.00	0.000	



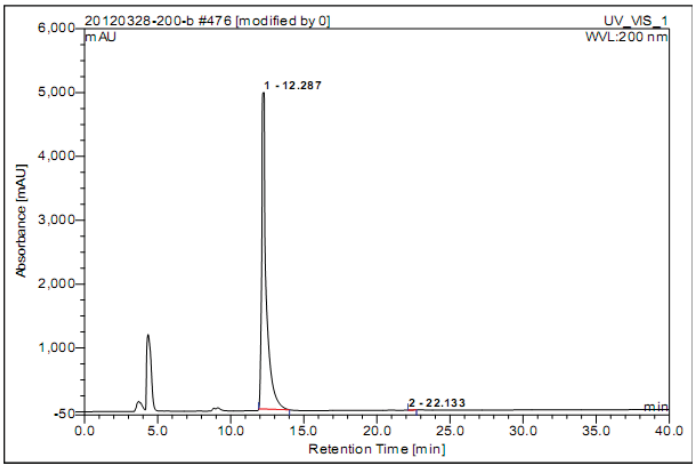
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	12.09	n.a.	15.178	3.027	0.56	n.a.	BMB*
2	15.91	n.a.	1019.365	540.498	99.44	n.a.	BMB
Total:			1034.543	543.525	100.00	0.000	

Compound **2q**



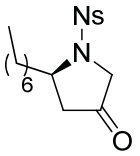


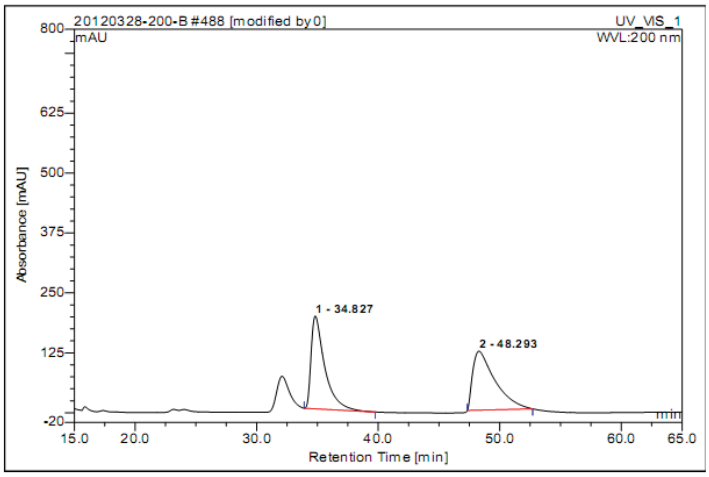
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	12.65	n.a.	924.460	500.170	48.79	n.a.	BMB*
2	22.63	n.a.	349.653	525.006	51.21	n.a.	BMB*
Total:			1274.113	1025.176	100.00	0.000	



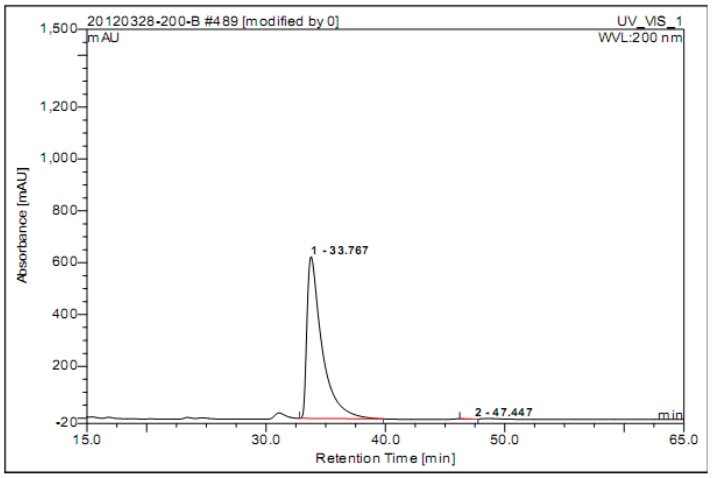
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	12.29	n.a.	4957.102	1824.678	99.98	n.a.	BMB*
2	22.13	n.a.	0.070	0.374	0.02	n.a.	BMB*
Total:			4957.171	1825.052	100.00	0.000	

Compound **2r**



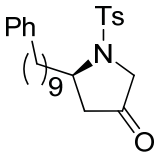


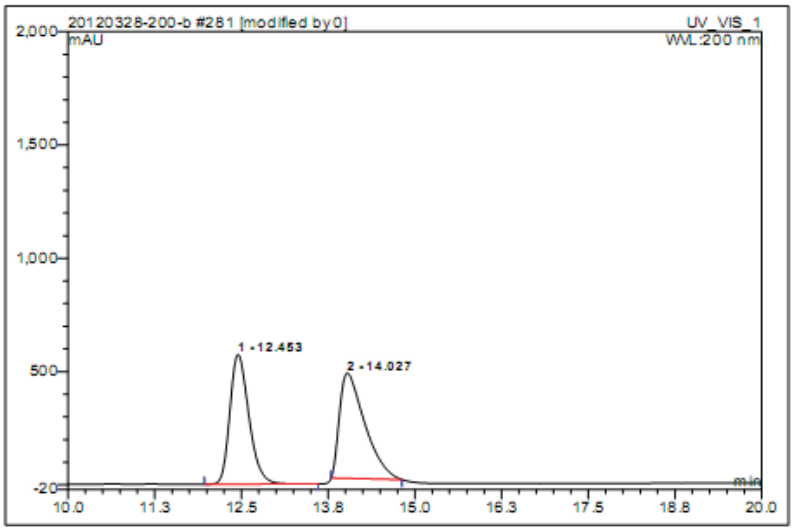
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	34.83	n.a.	193.595	251.957	49.04	n.a.	BMB
2	48.29	n.a.	123.098	261.771	50.96	n.a.	BMB*
Total:			316.693	513.728	100.00	0.000	



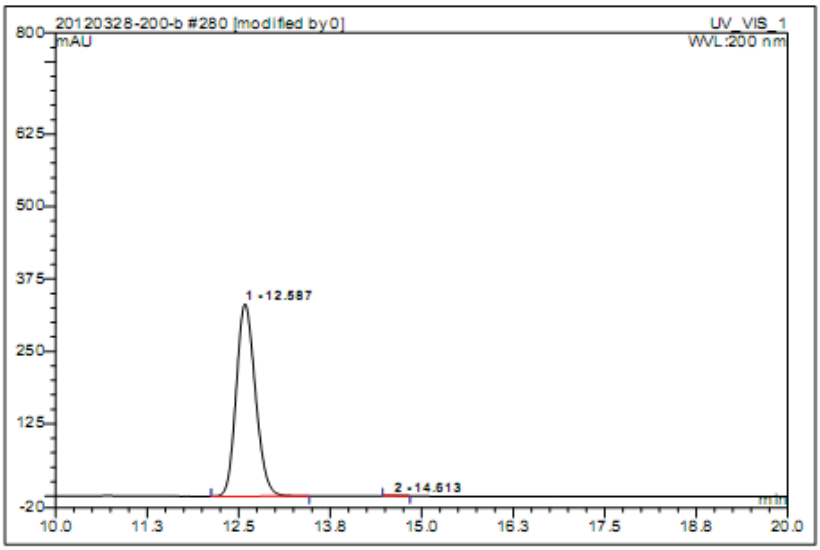
No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	33.77	n.a.	623.531	910.438	99.93	n.a.	BMB
2	47.45	n.a.	0.720	0.665	0.07	n.a.	BMB*
Total:			624.251	911.102	100.00	0.000	

Compound **2s**

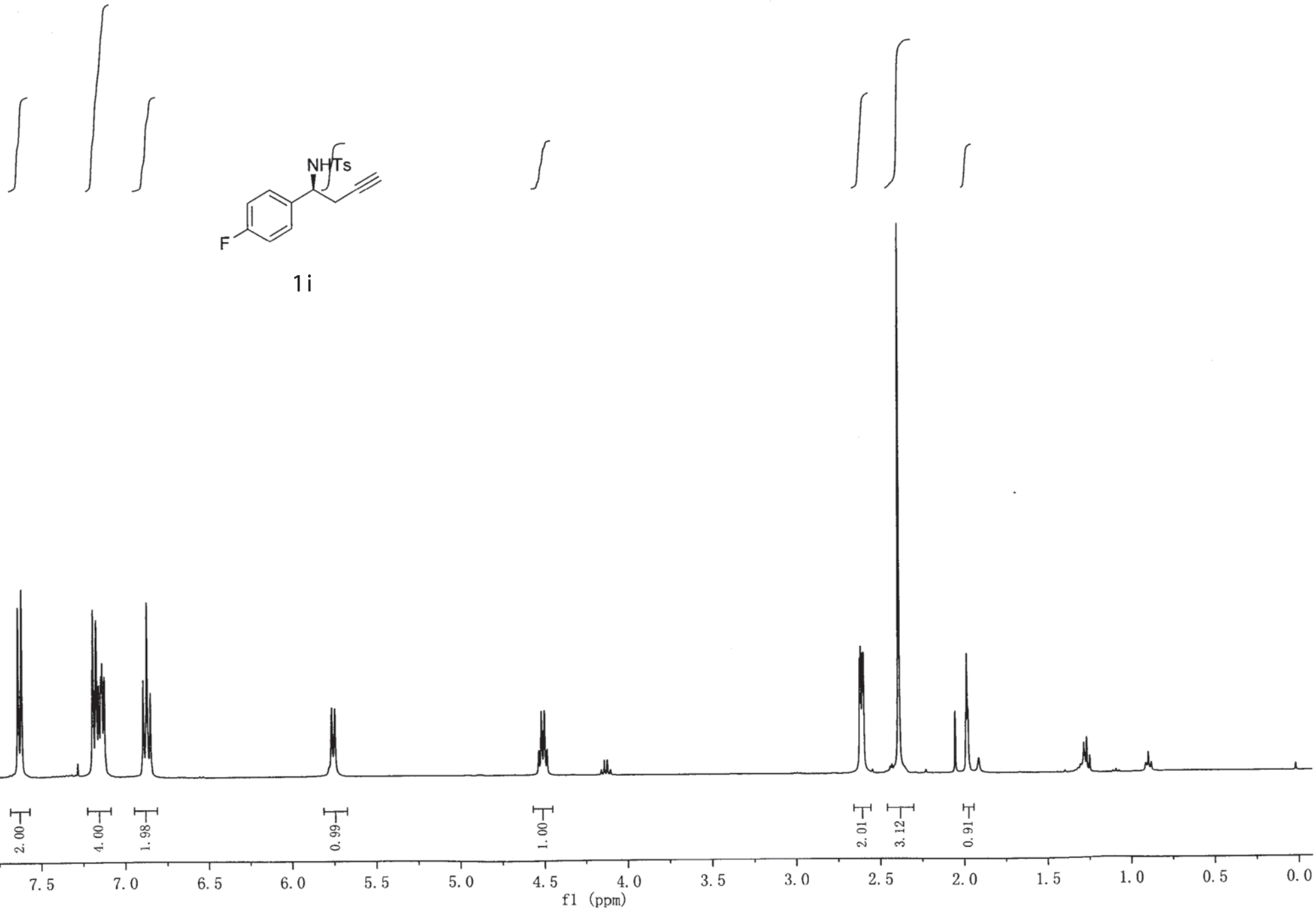


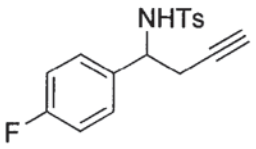


No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	12.45	n.a.	571.374	181.836	48.07	n.a.	BMB*
2	14.03	n.a.	464.315	196.409	51.93	n.a.	BMB*
Total:			1035.690	378.245	100.00	0.000	



No.	Ret.Time min	Peak Name	Height mAU	Area mAU*min	Rel.Area %	Amount	Type
1	12.59	n.a.	332.000	101.202	99.88	n.a.	BMB
2	14.61	n.a.	0.537	0.126	0.12	n.a.	BMB*
Total:			332.537	101.328	100.00	0.000	





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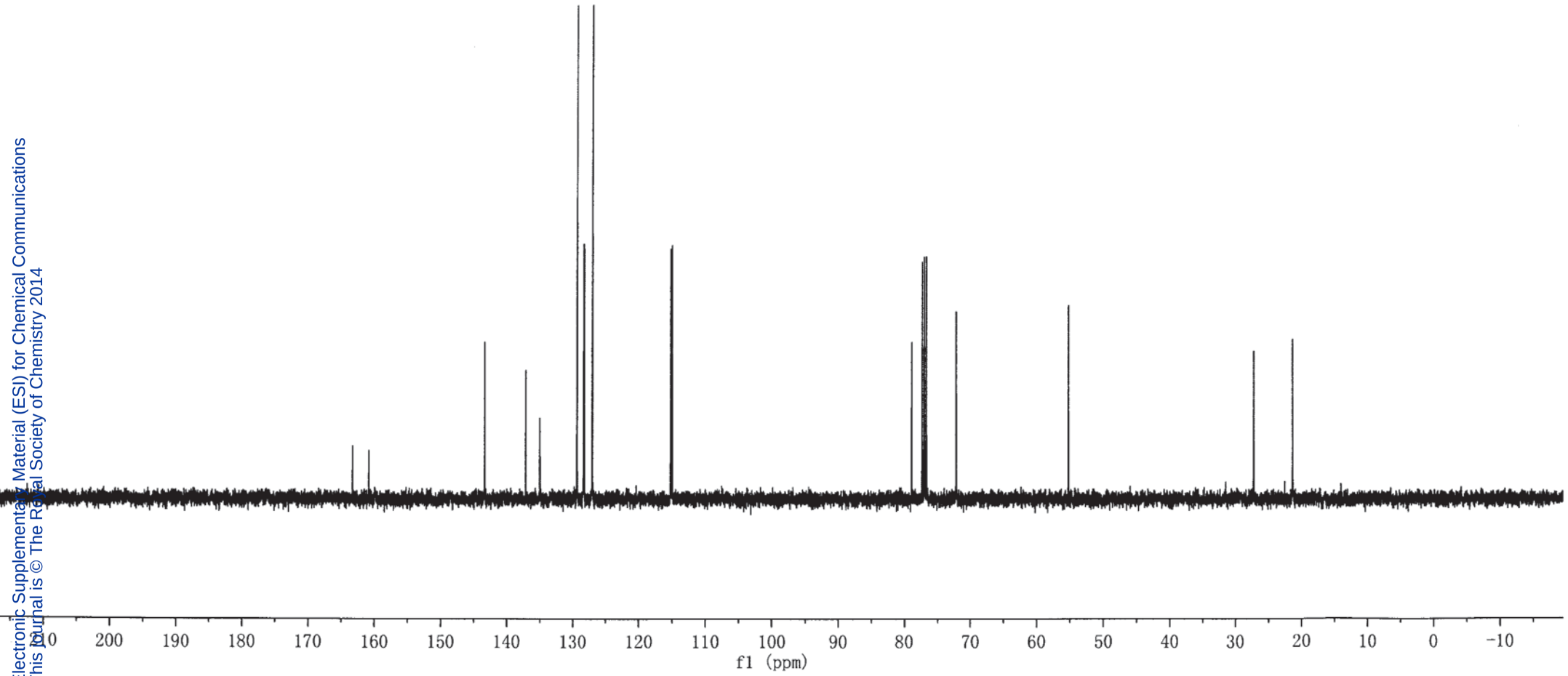

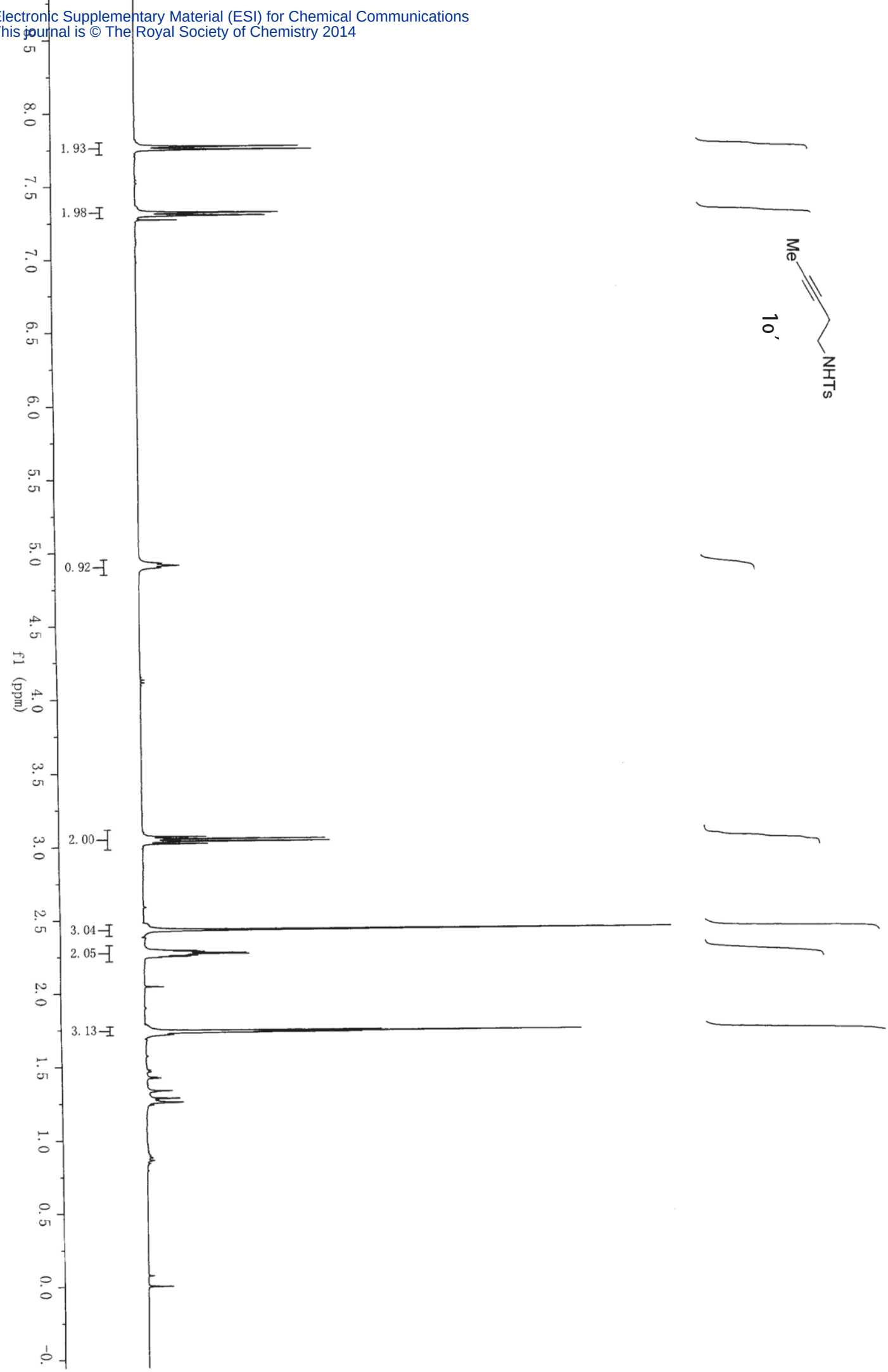

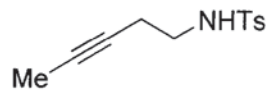

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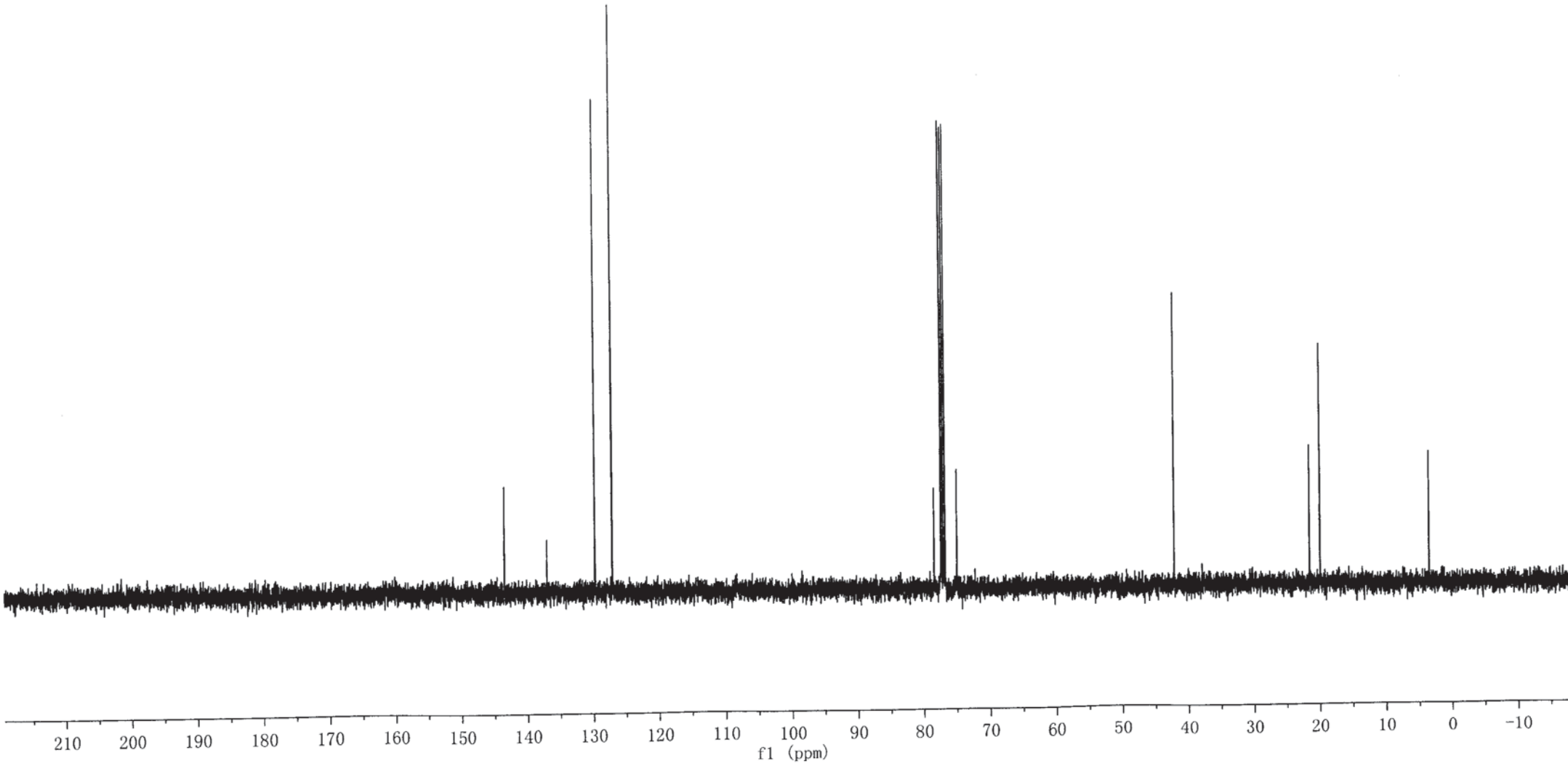

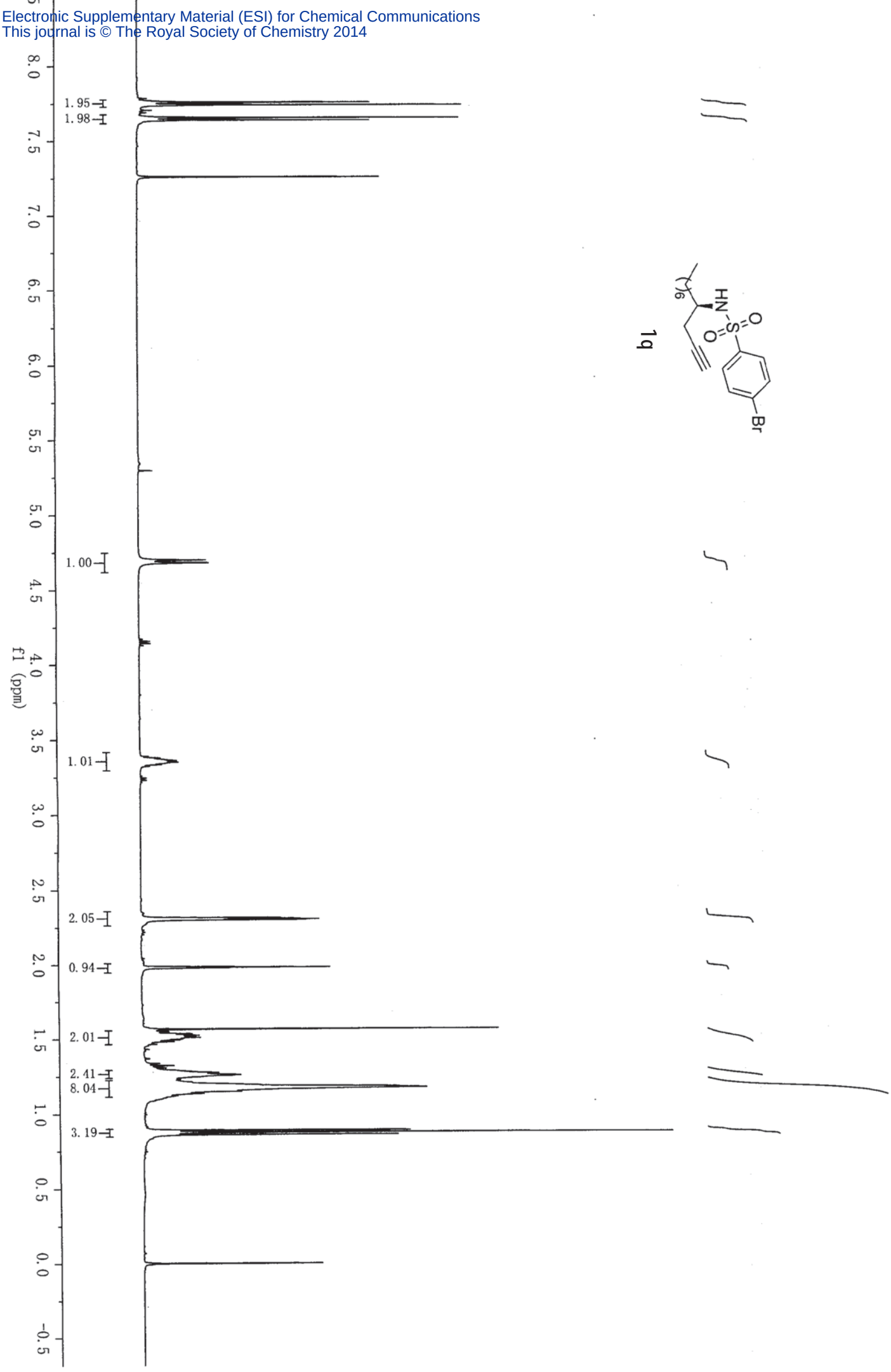

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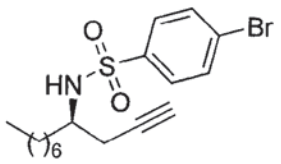

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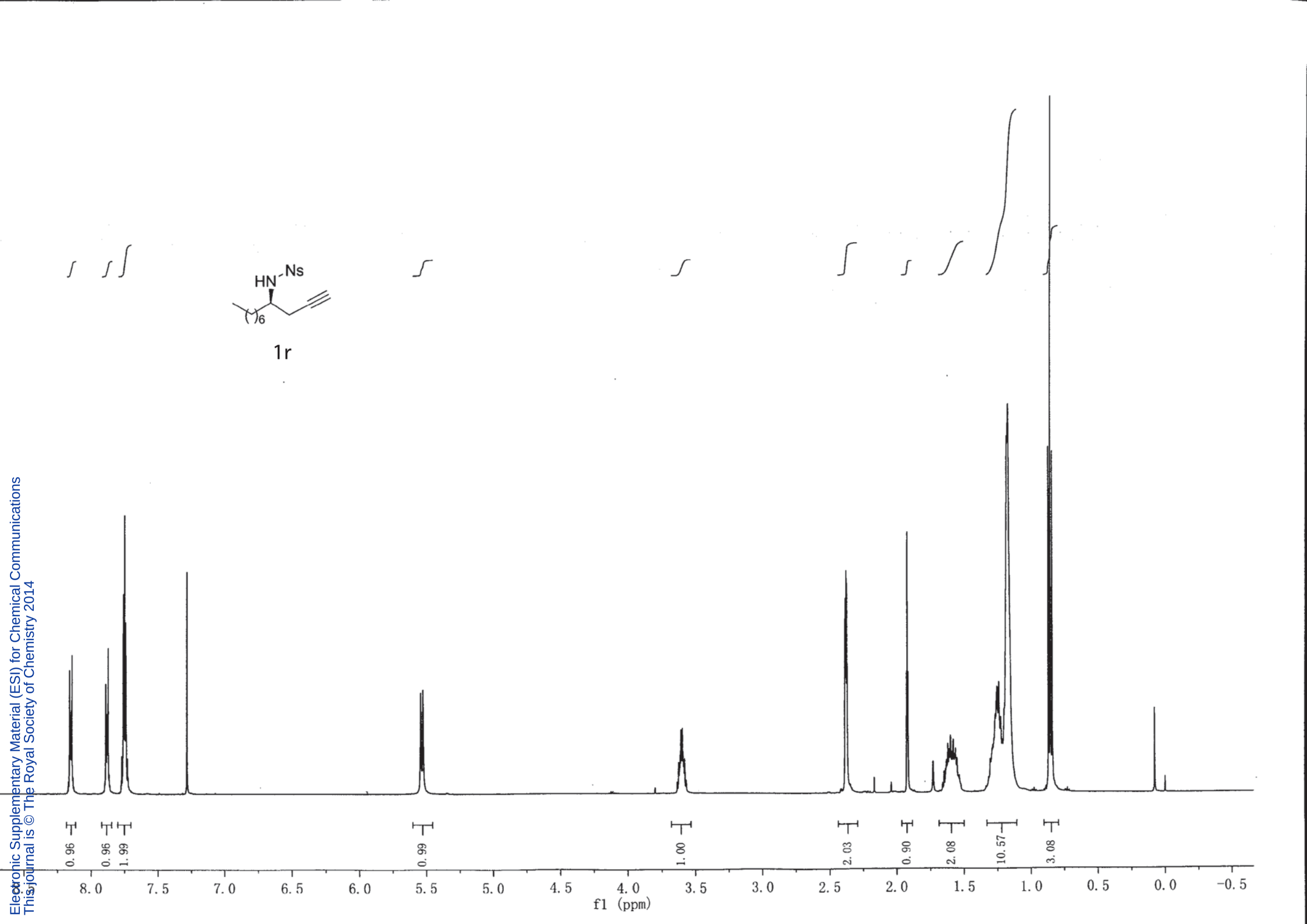

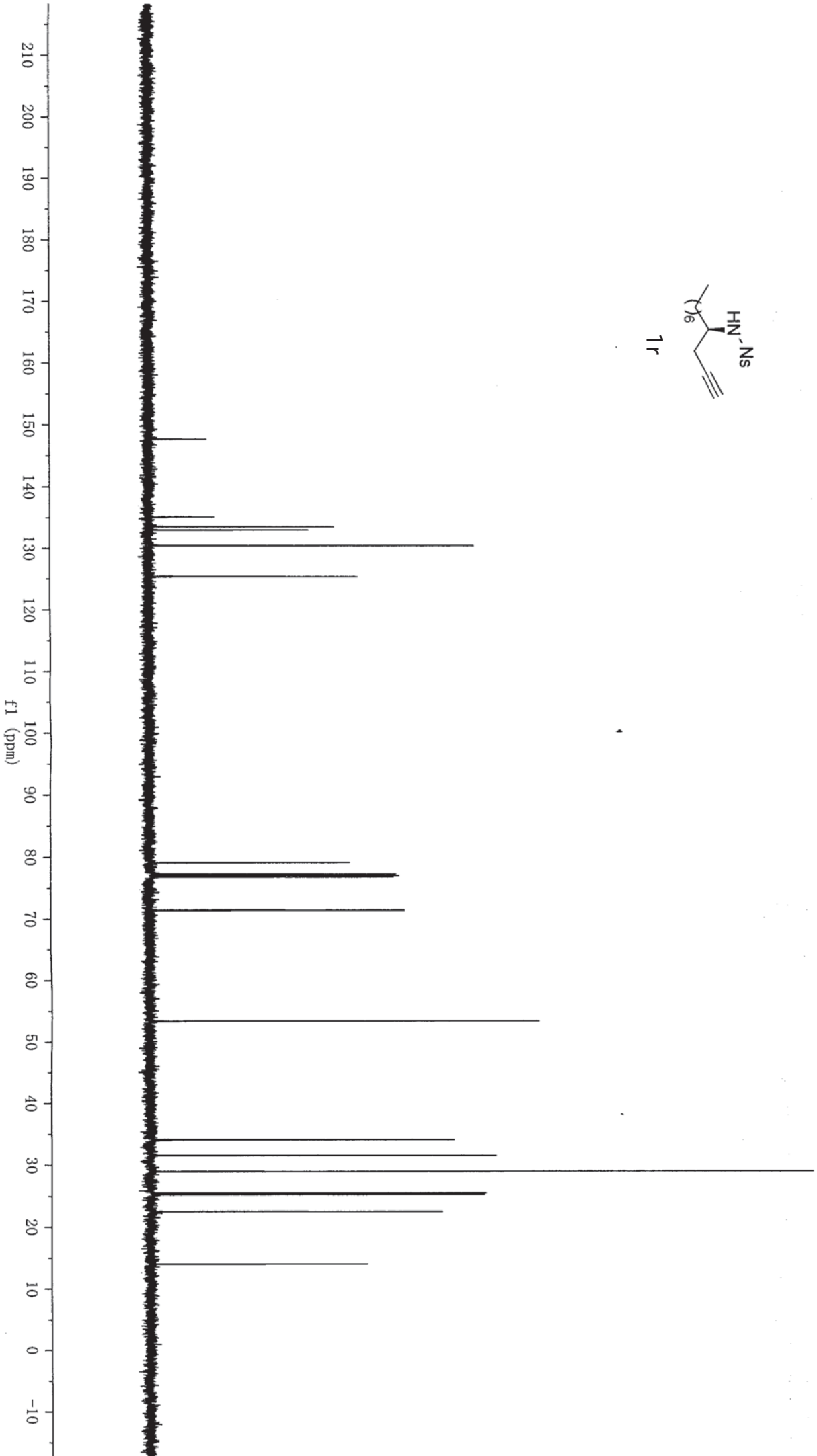

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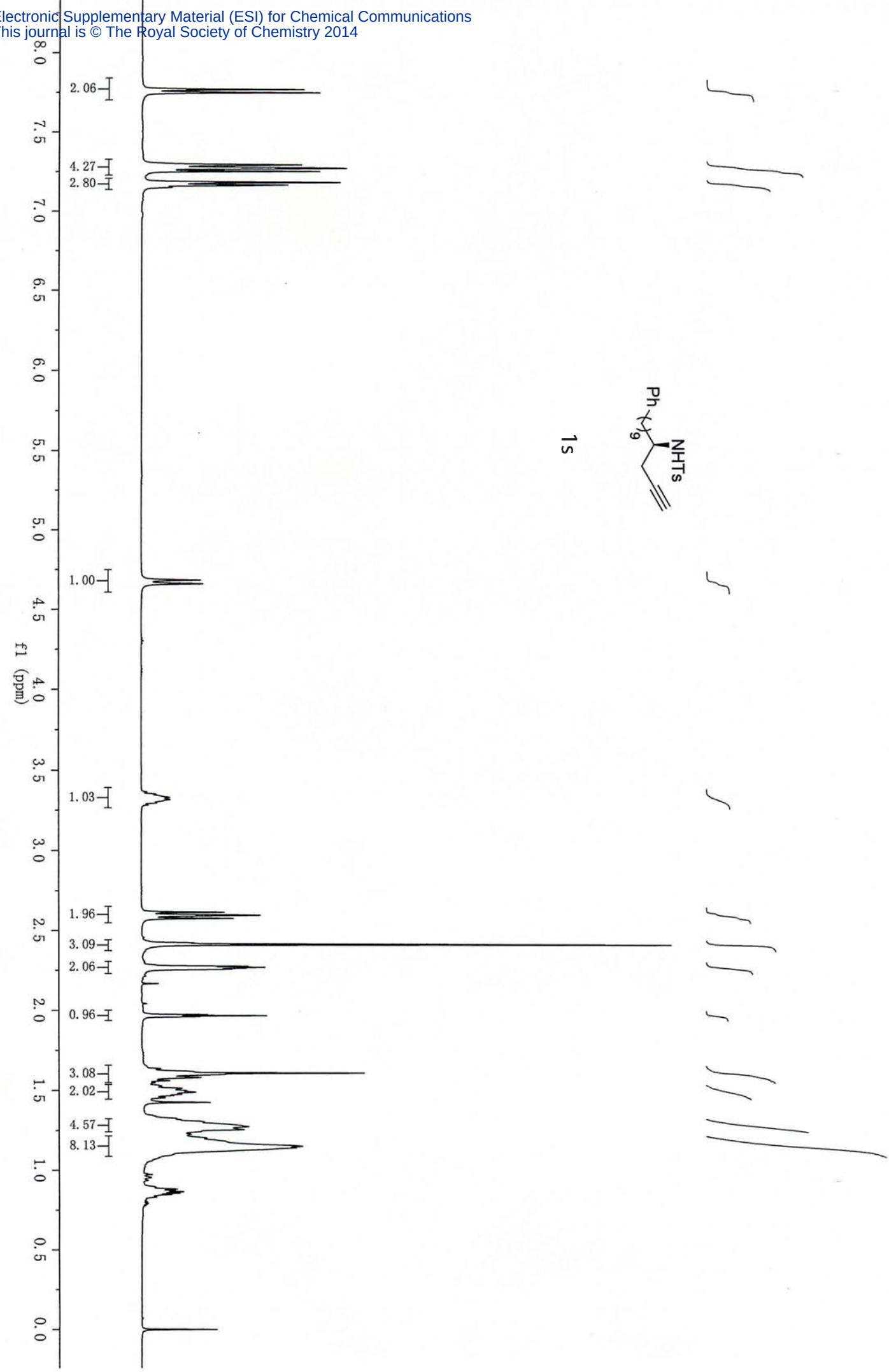

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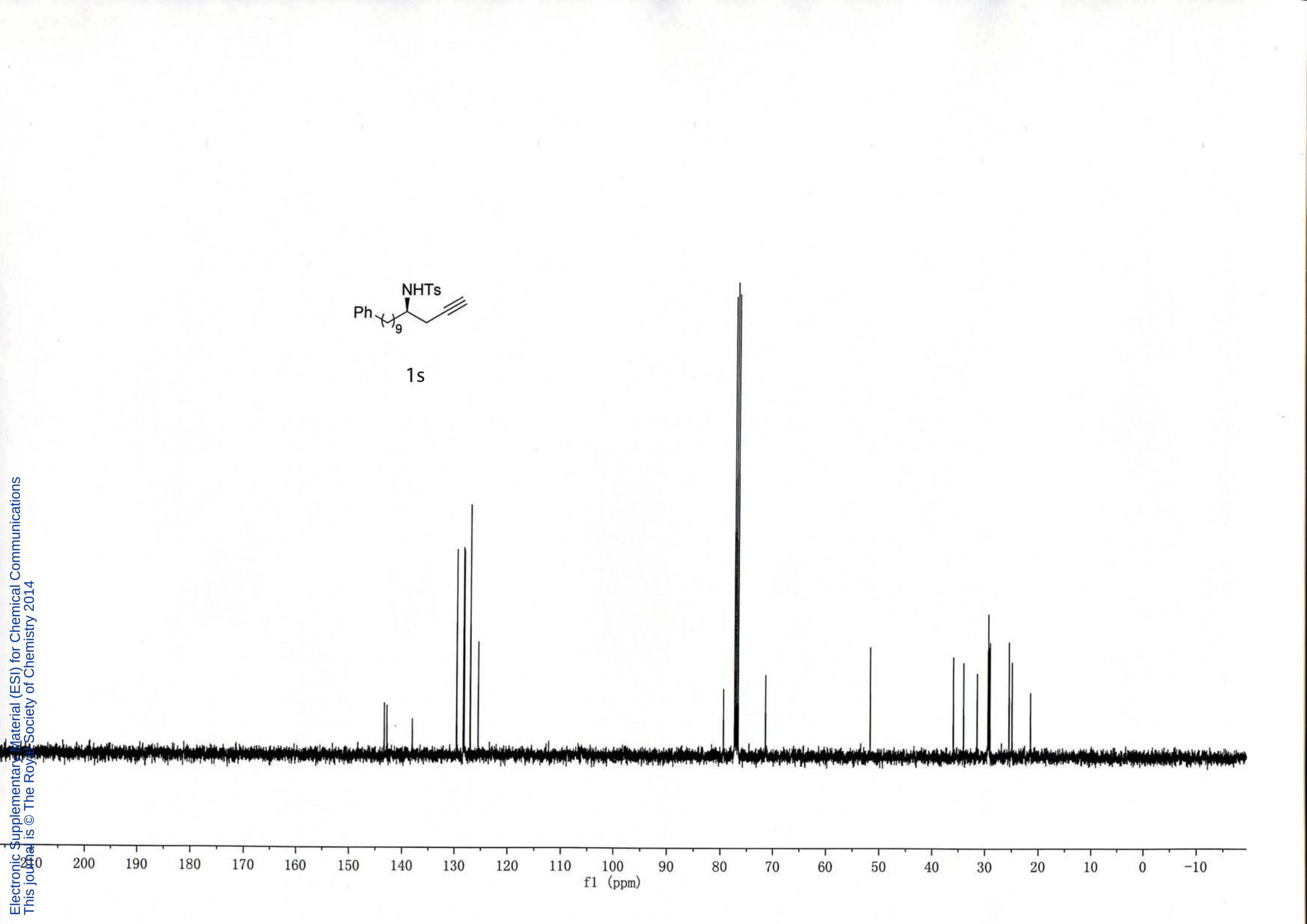

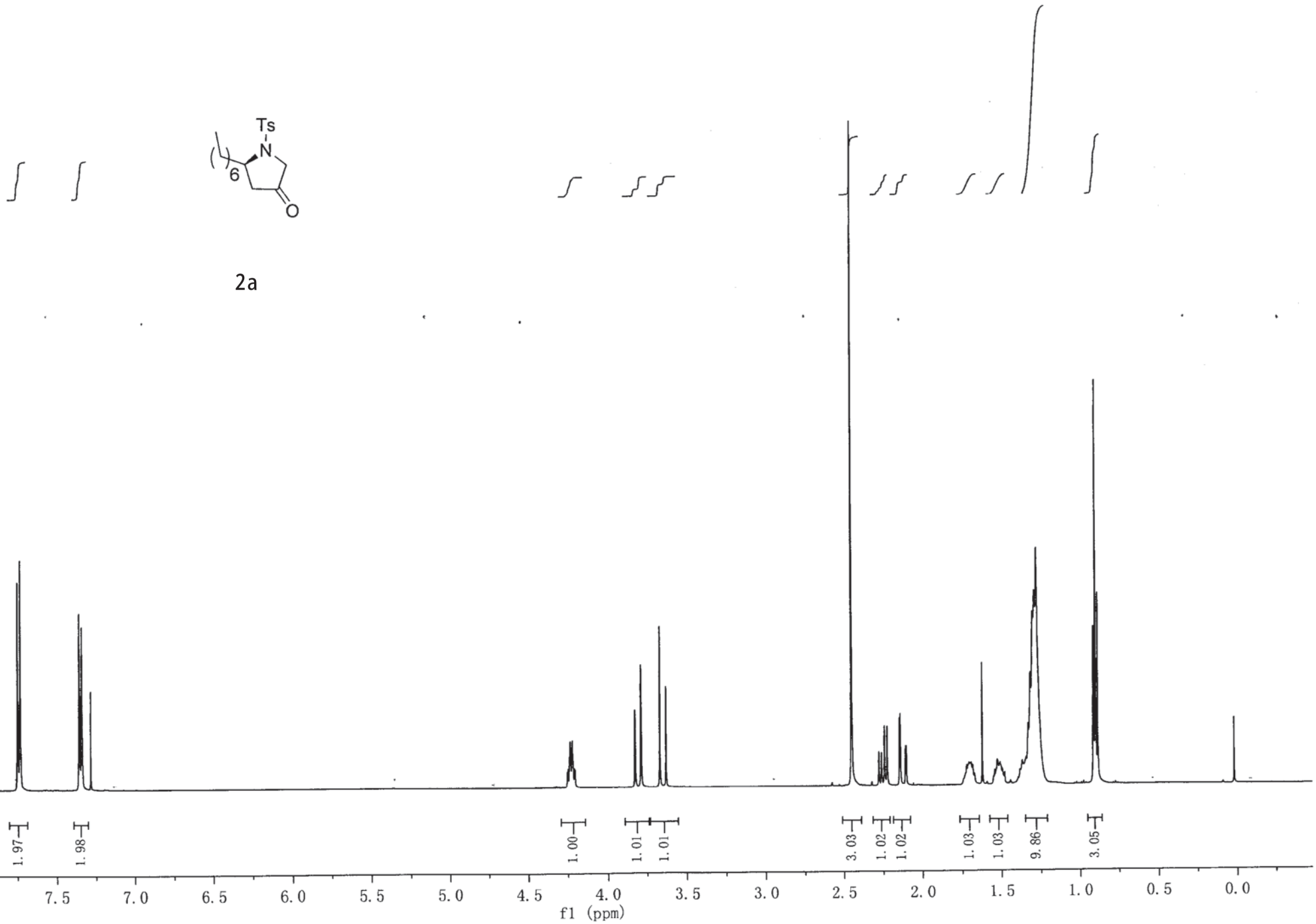

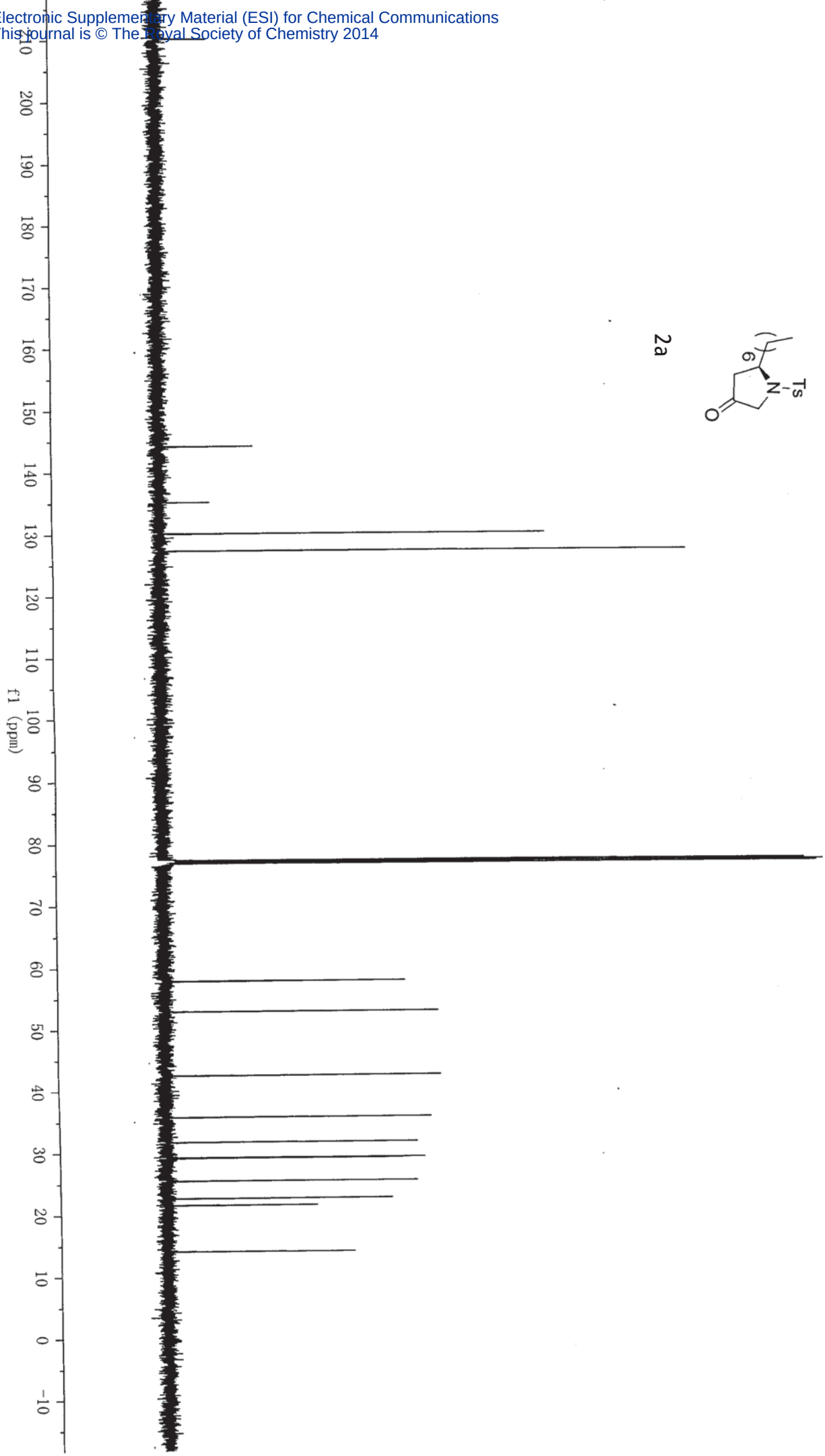

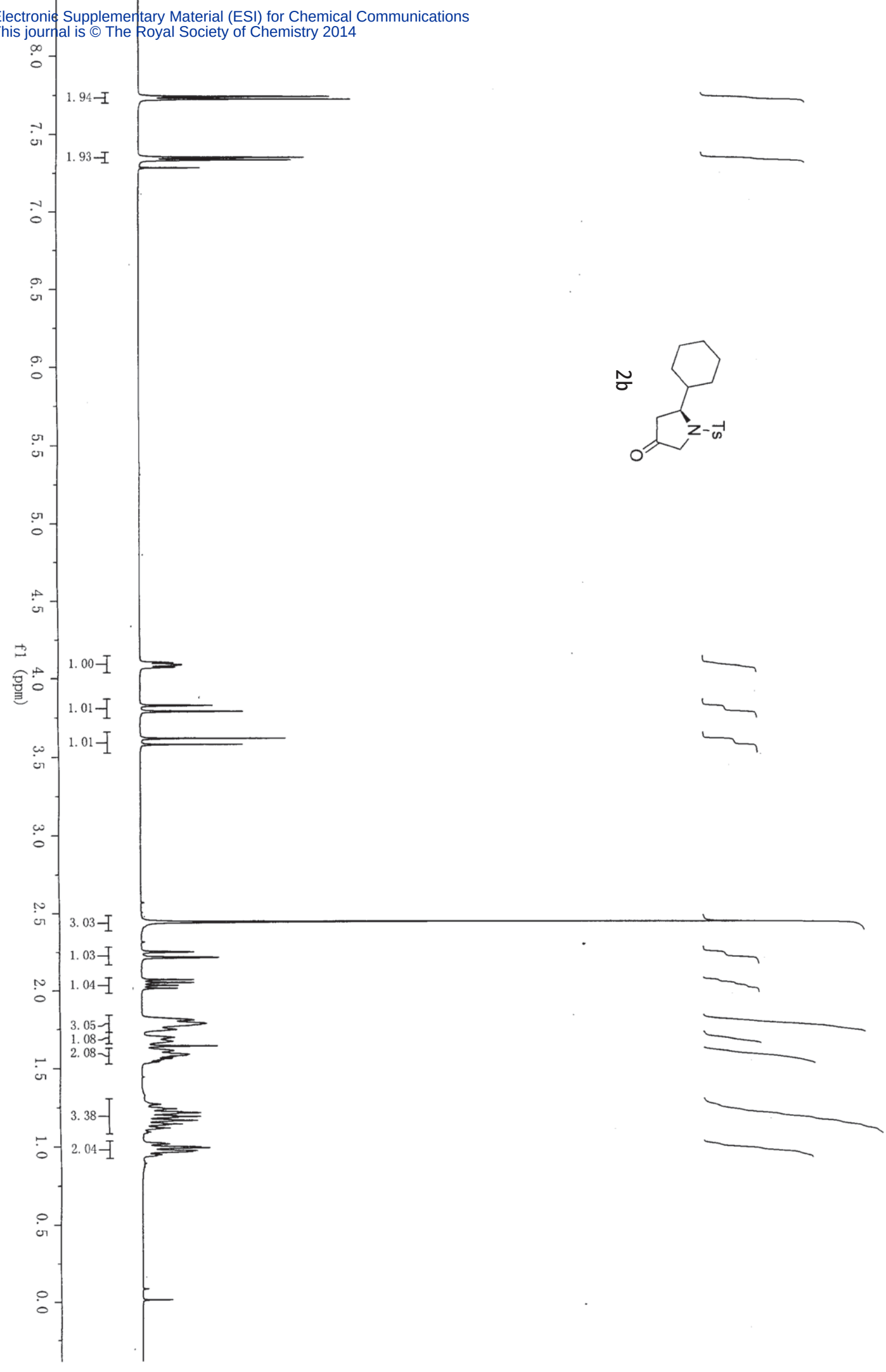

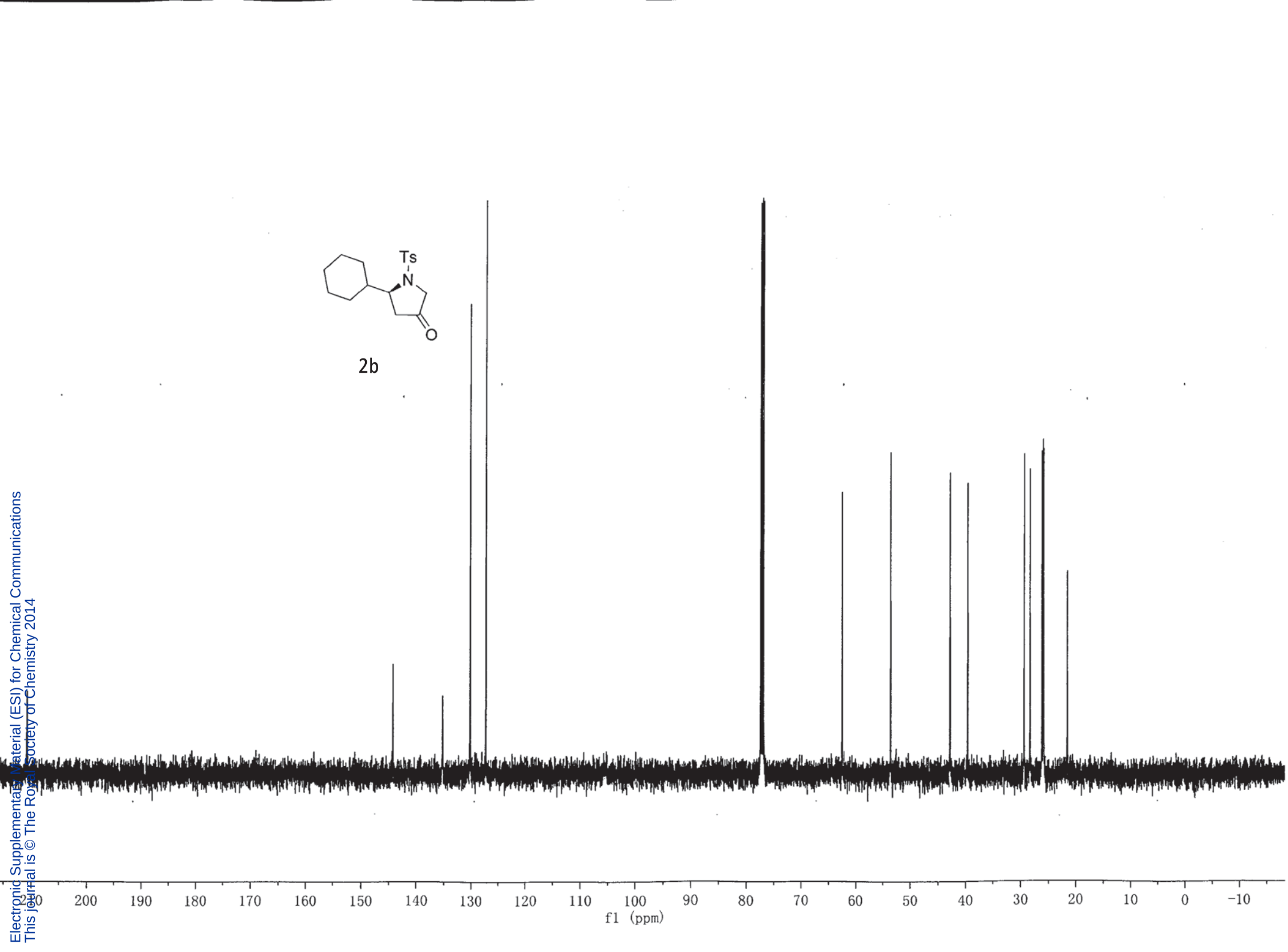

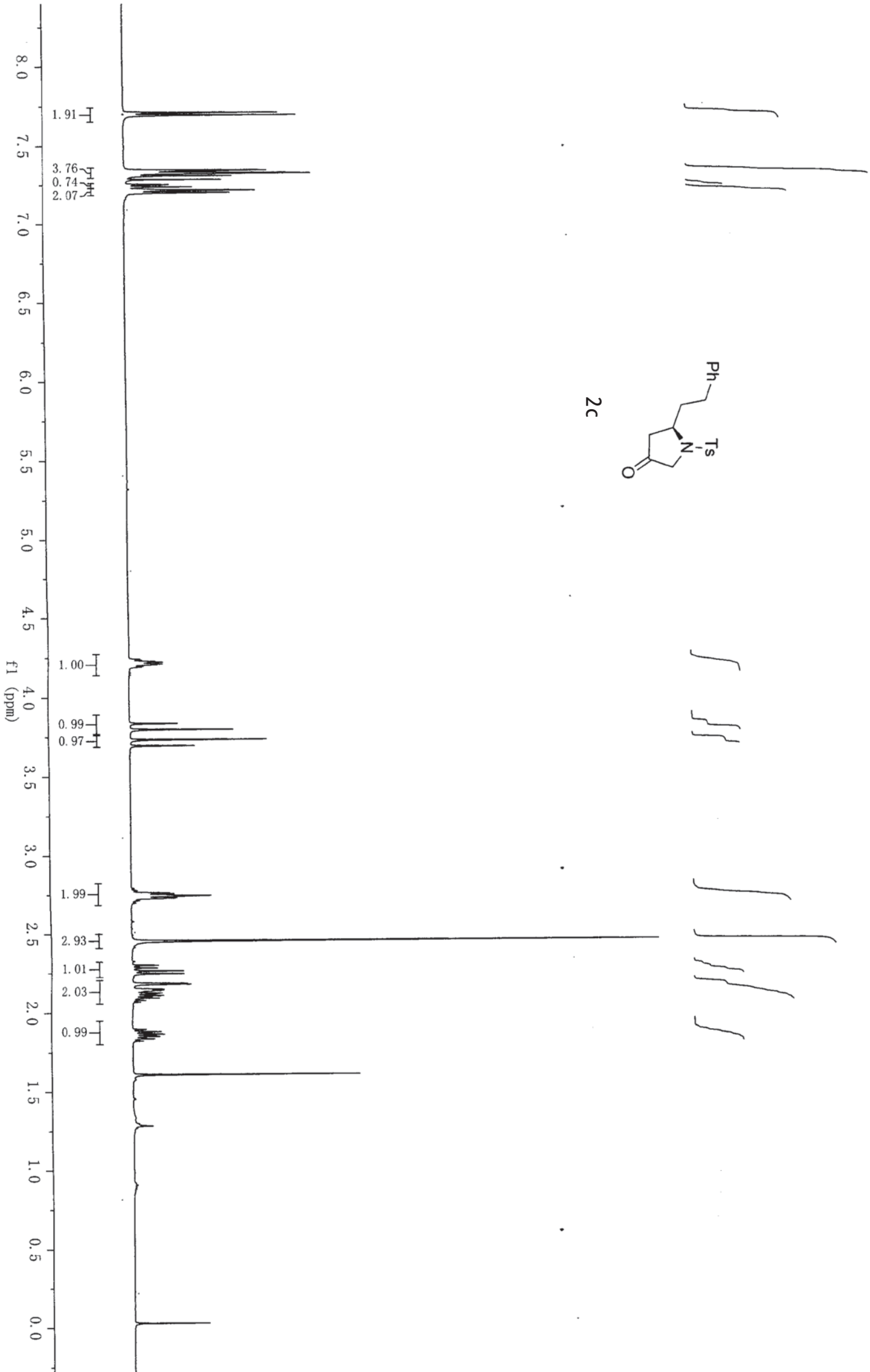

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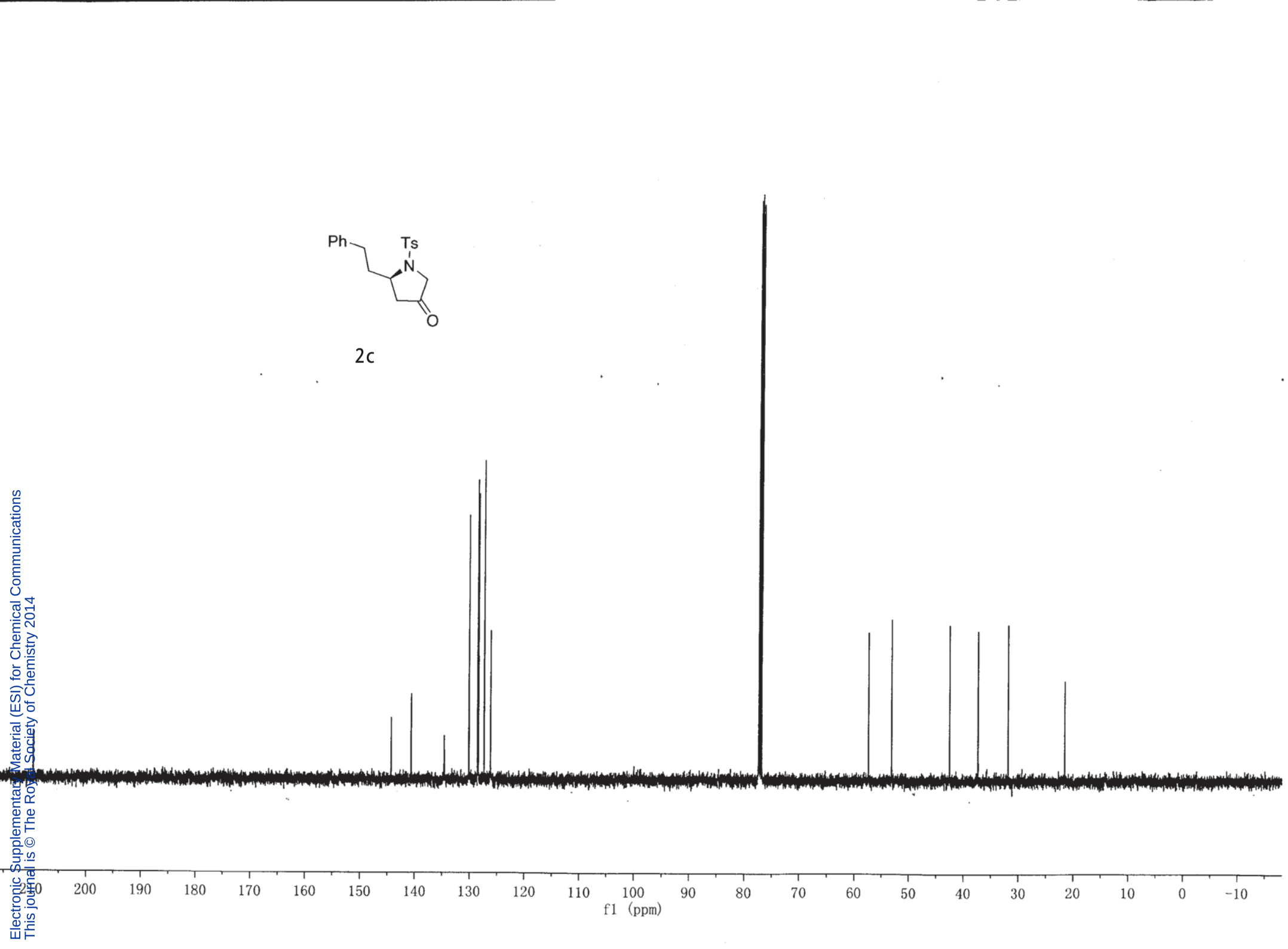

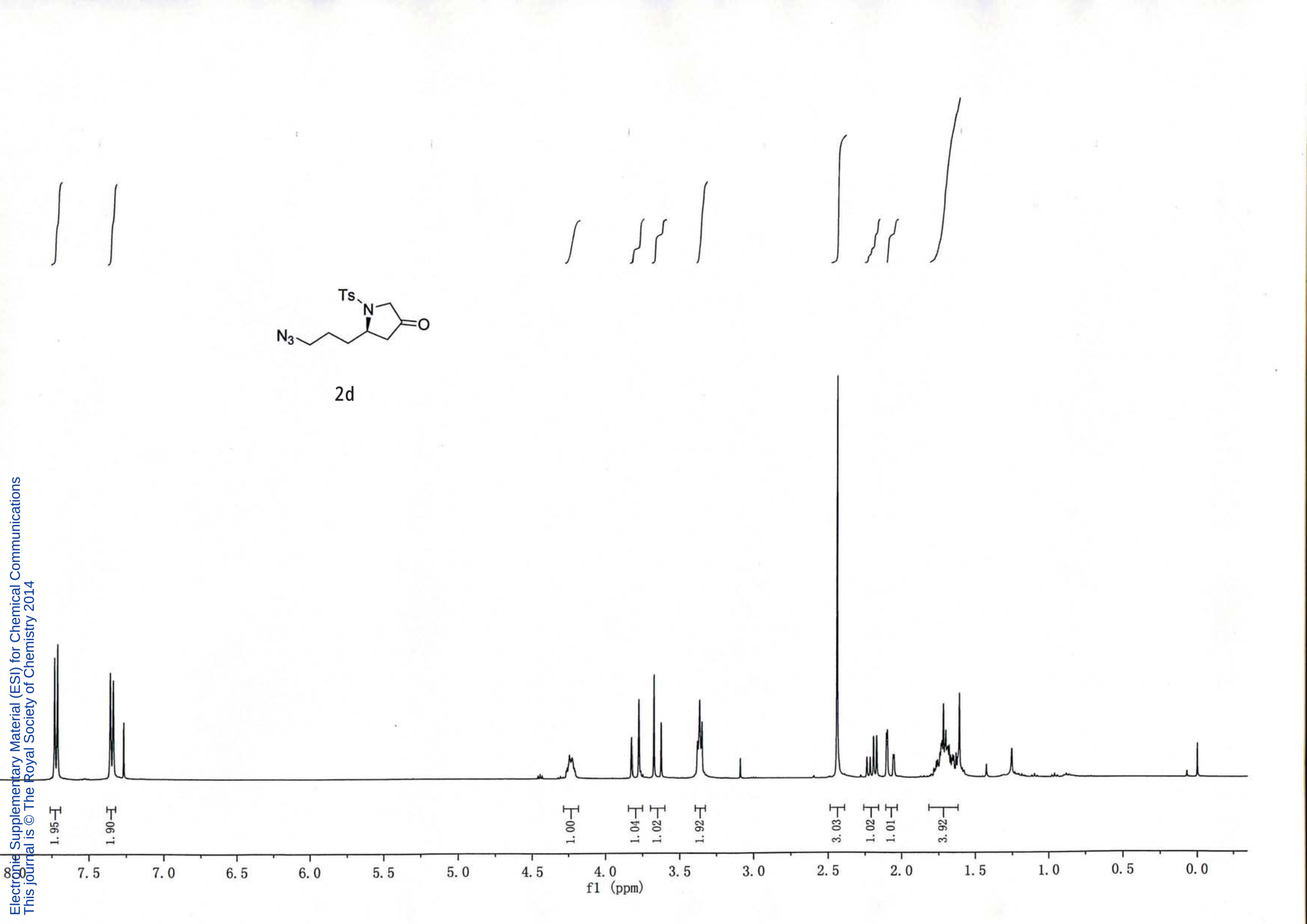

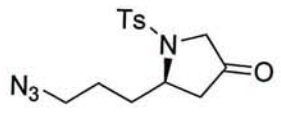

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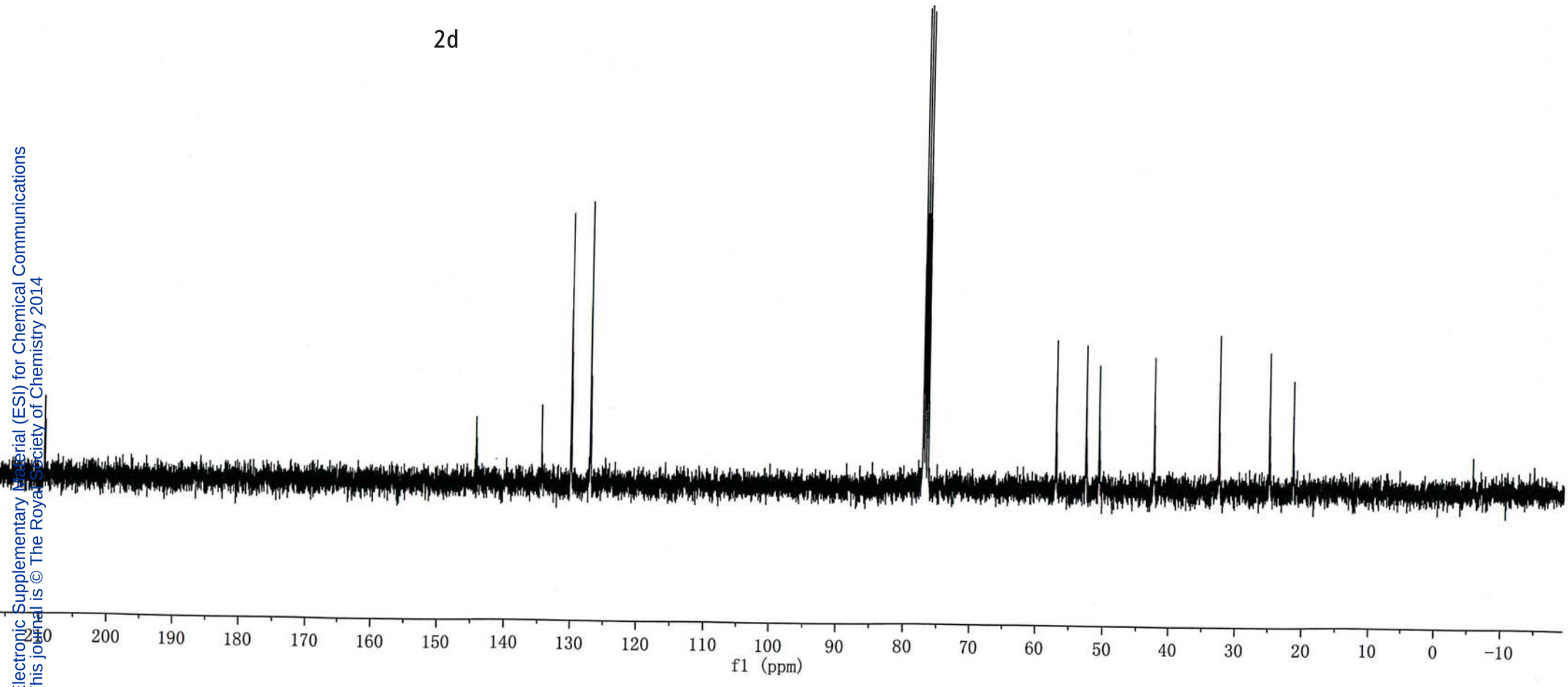

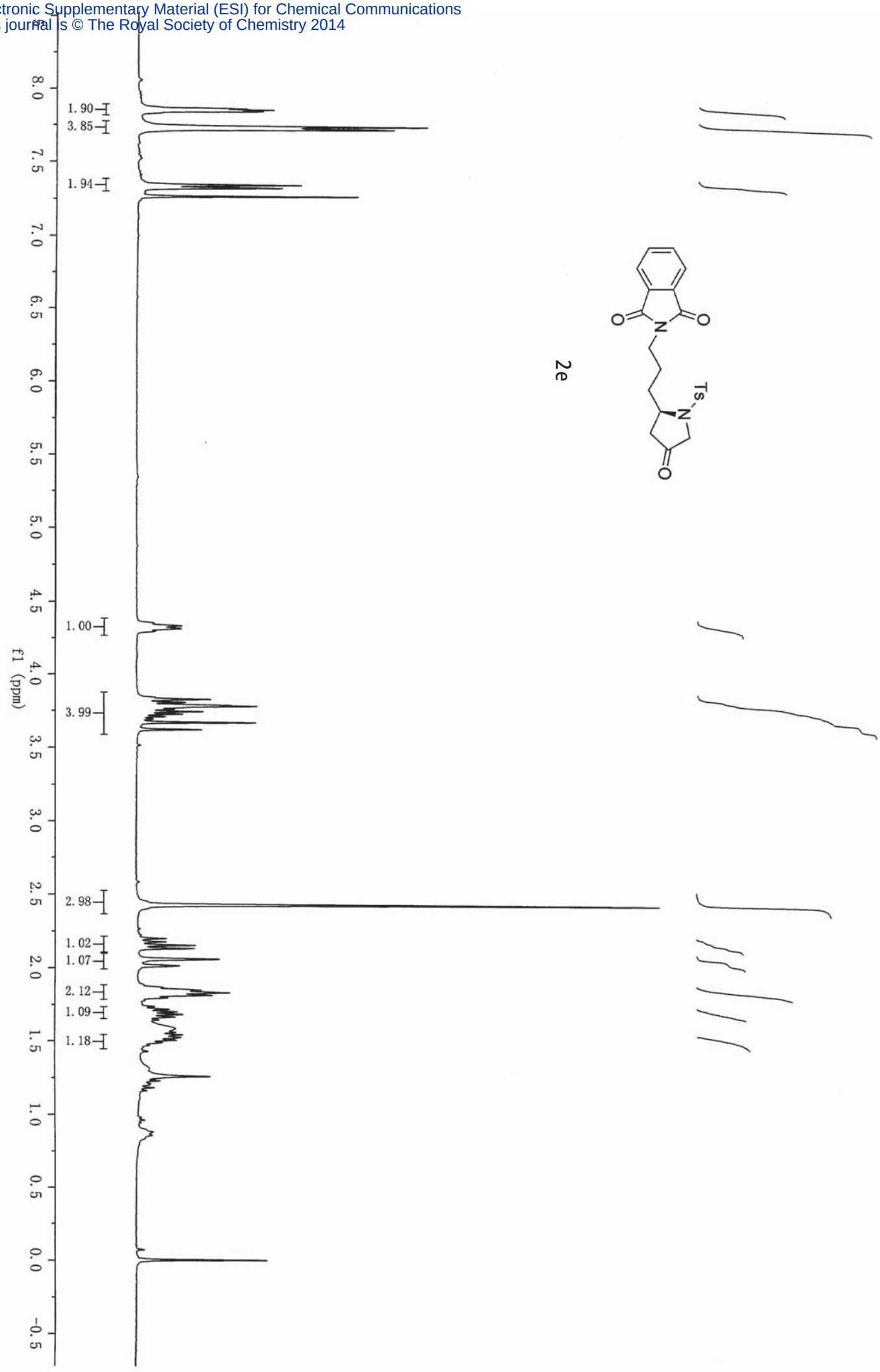

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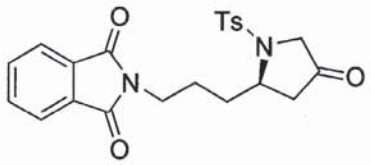

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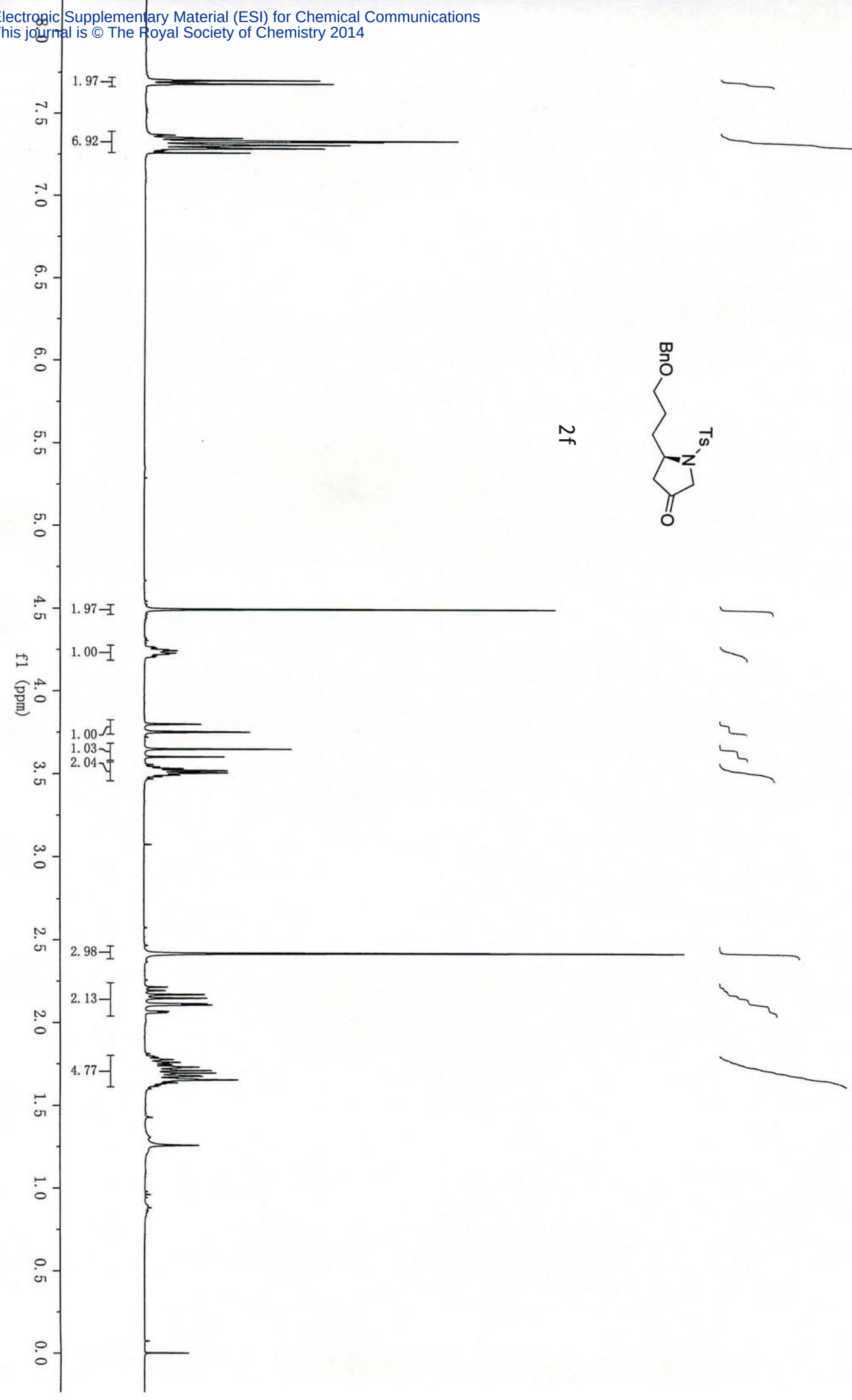

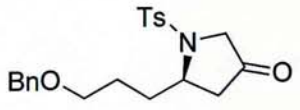

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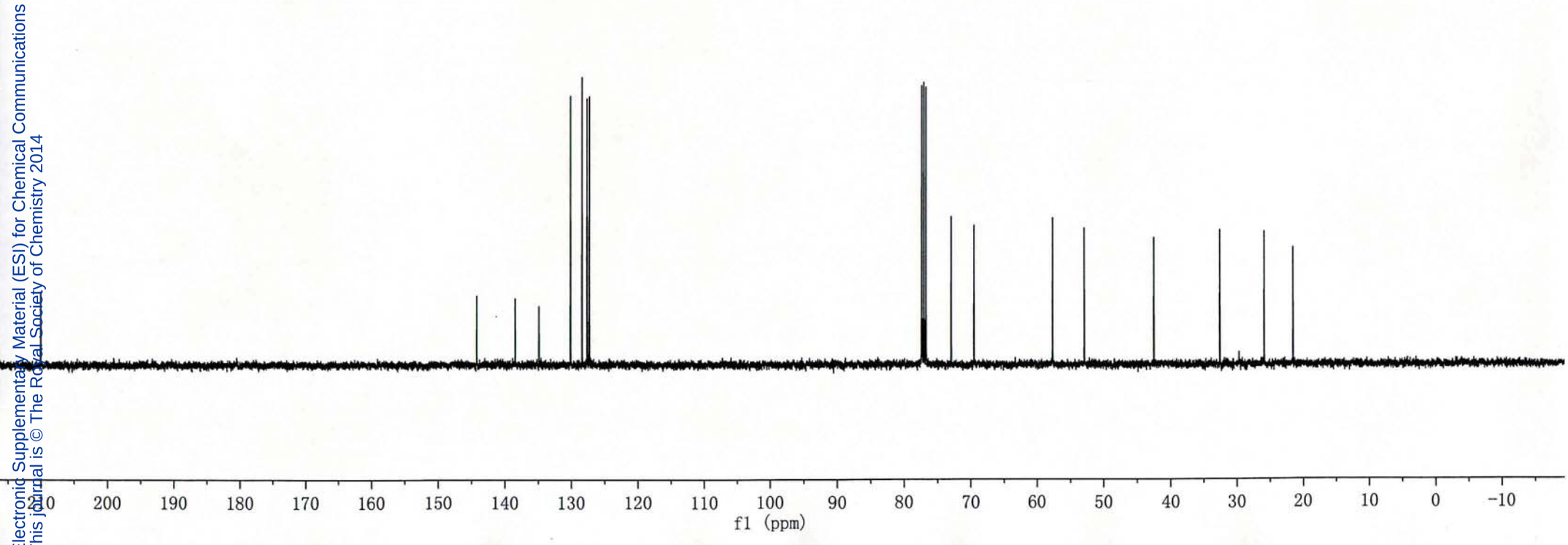

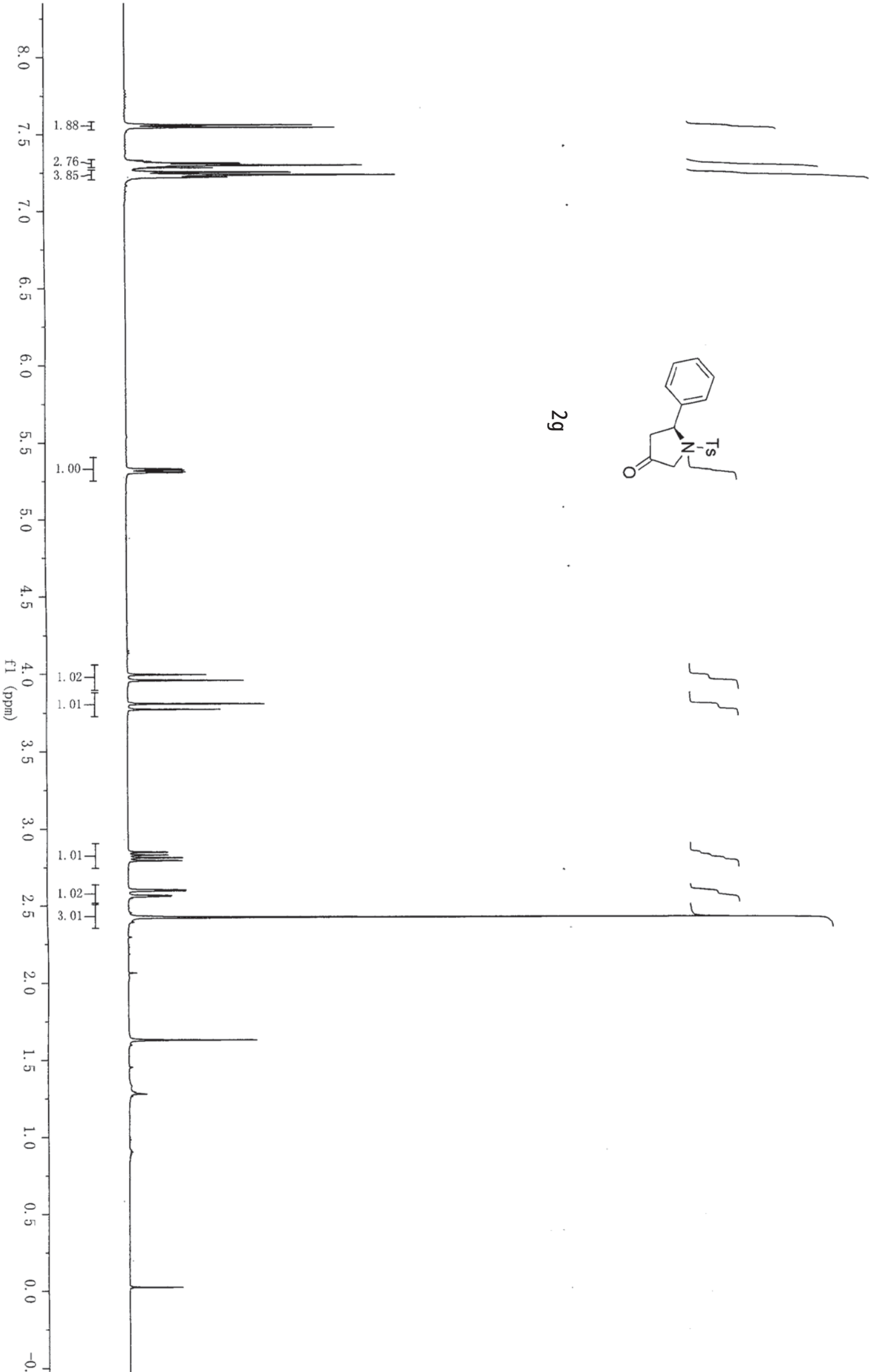

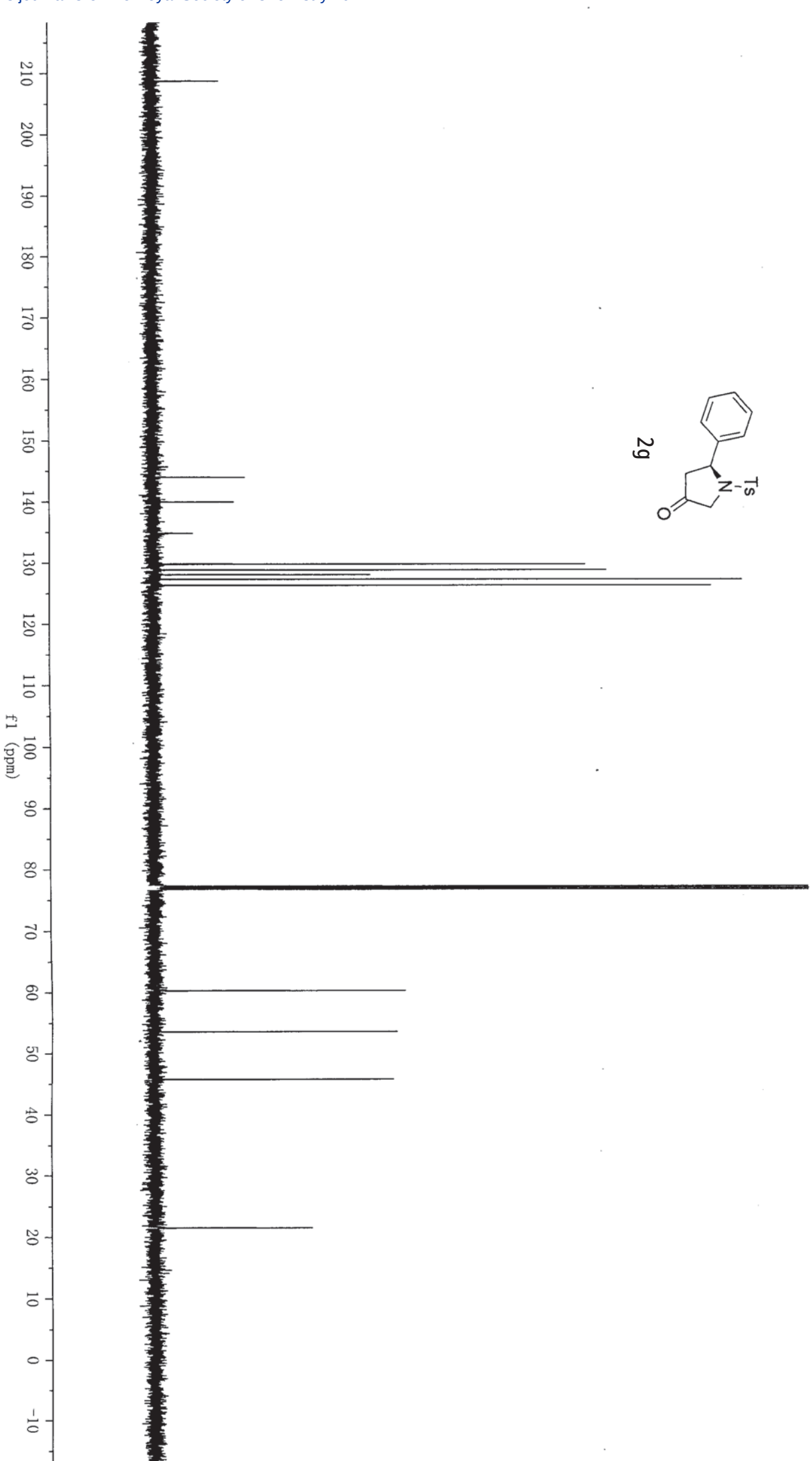

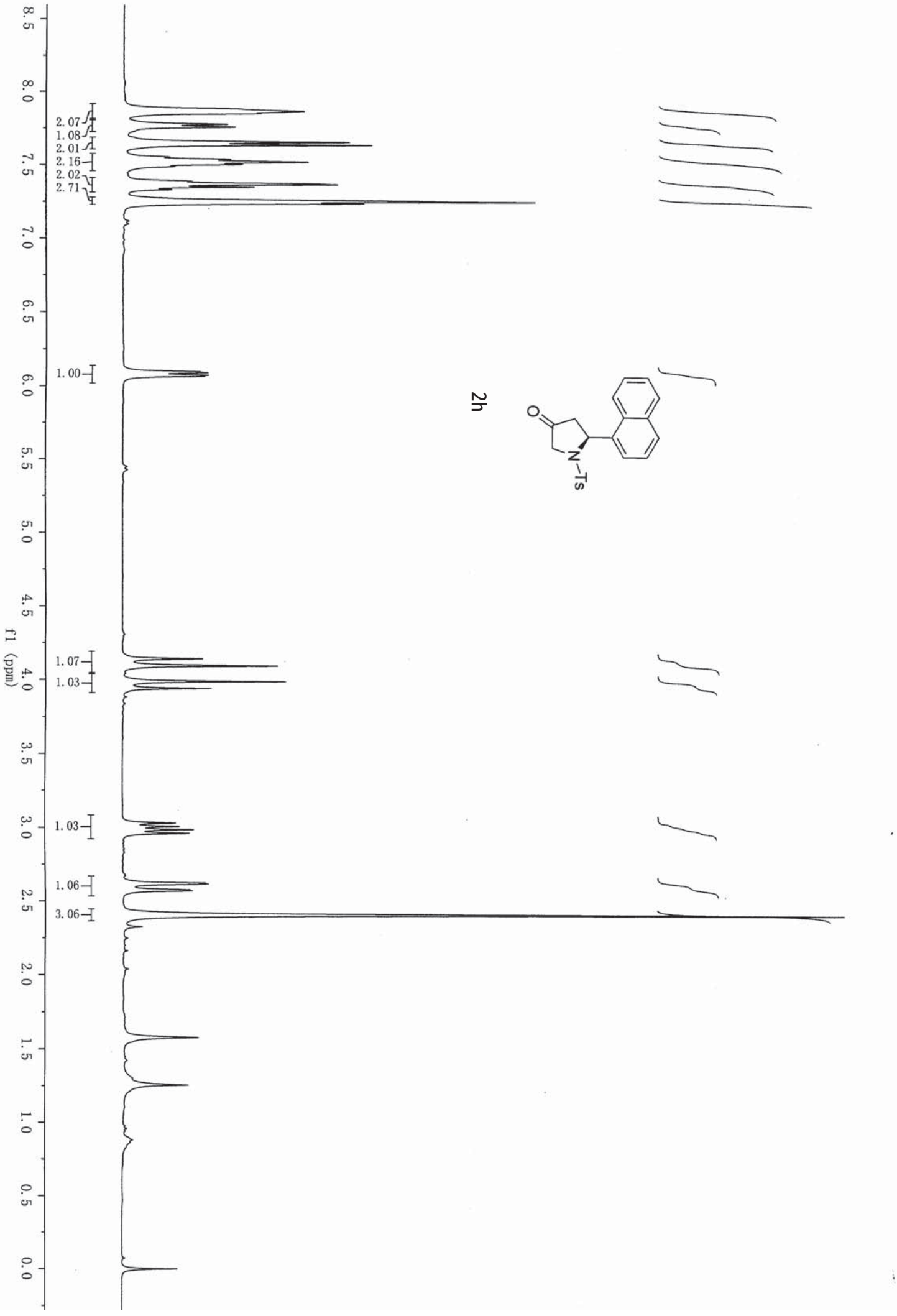

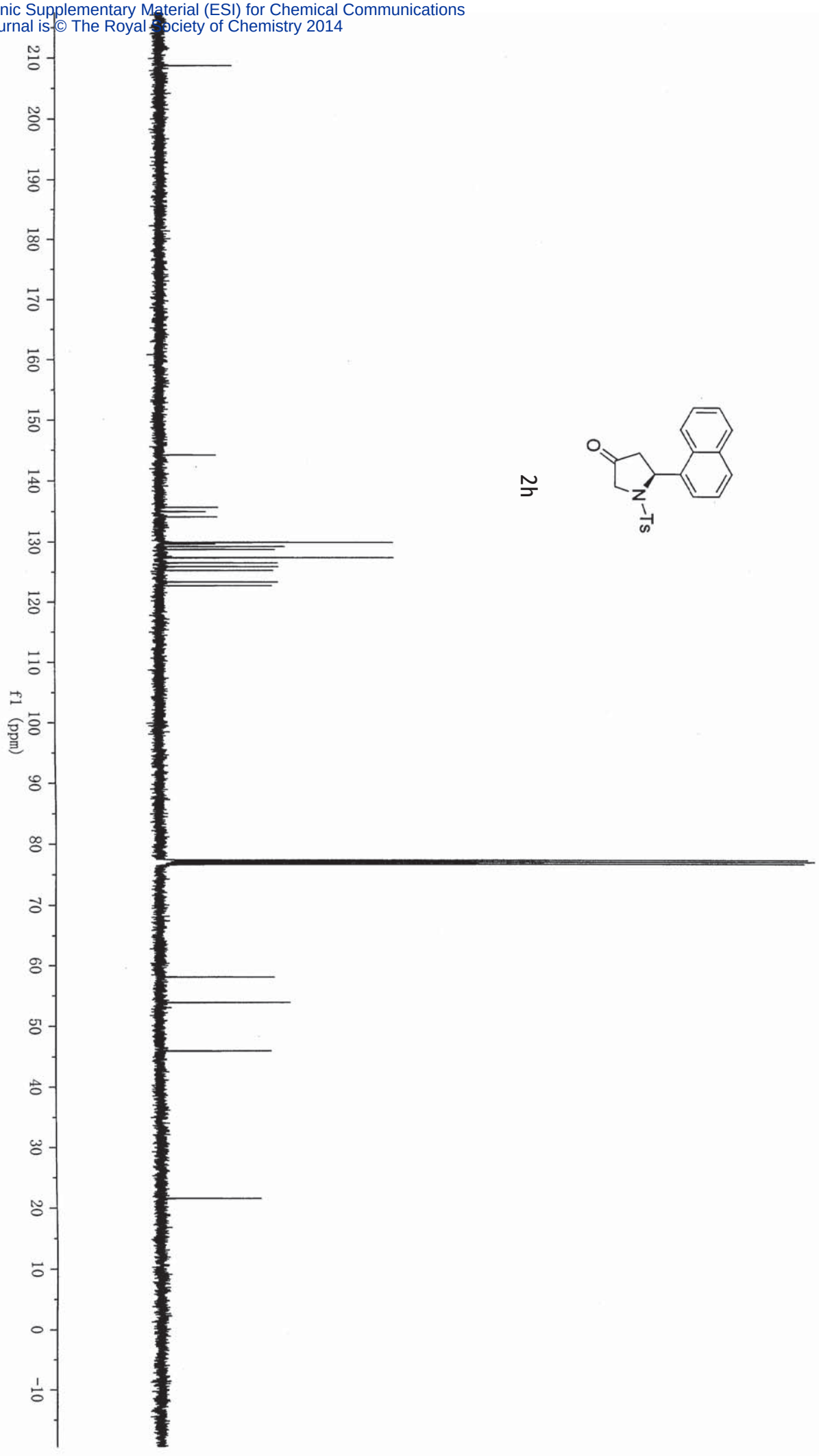

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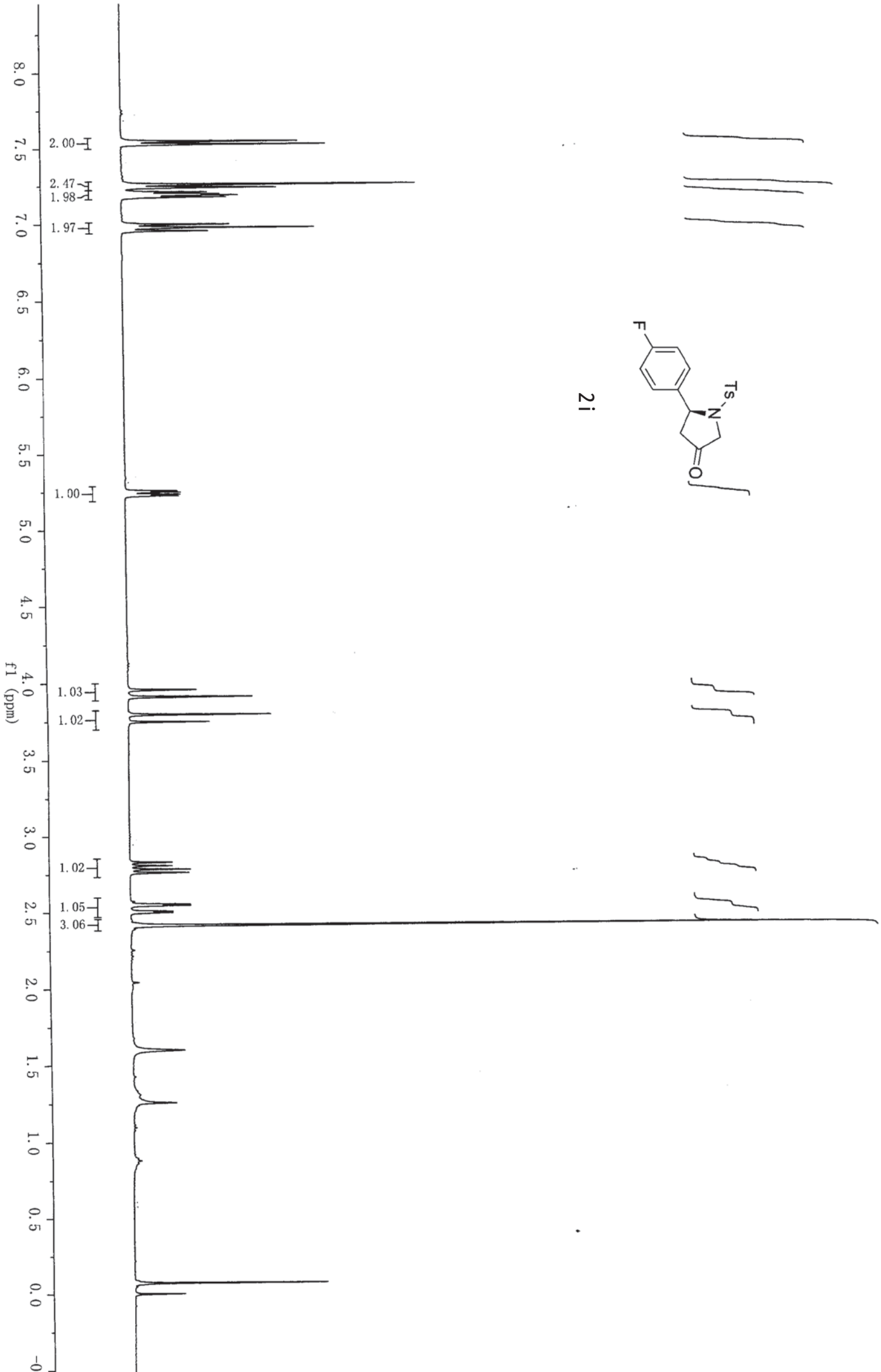

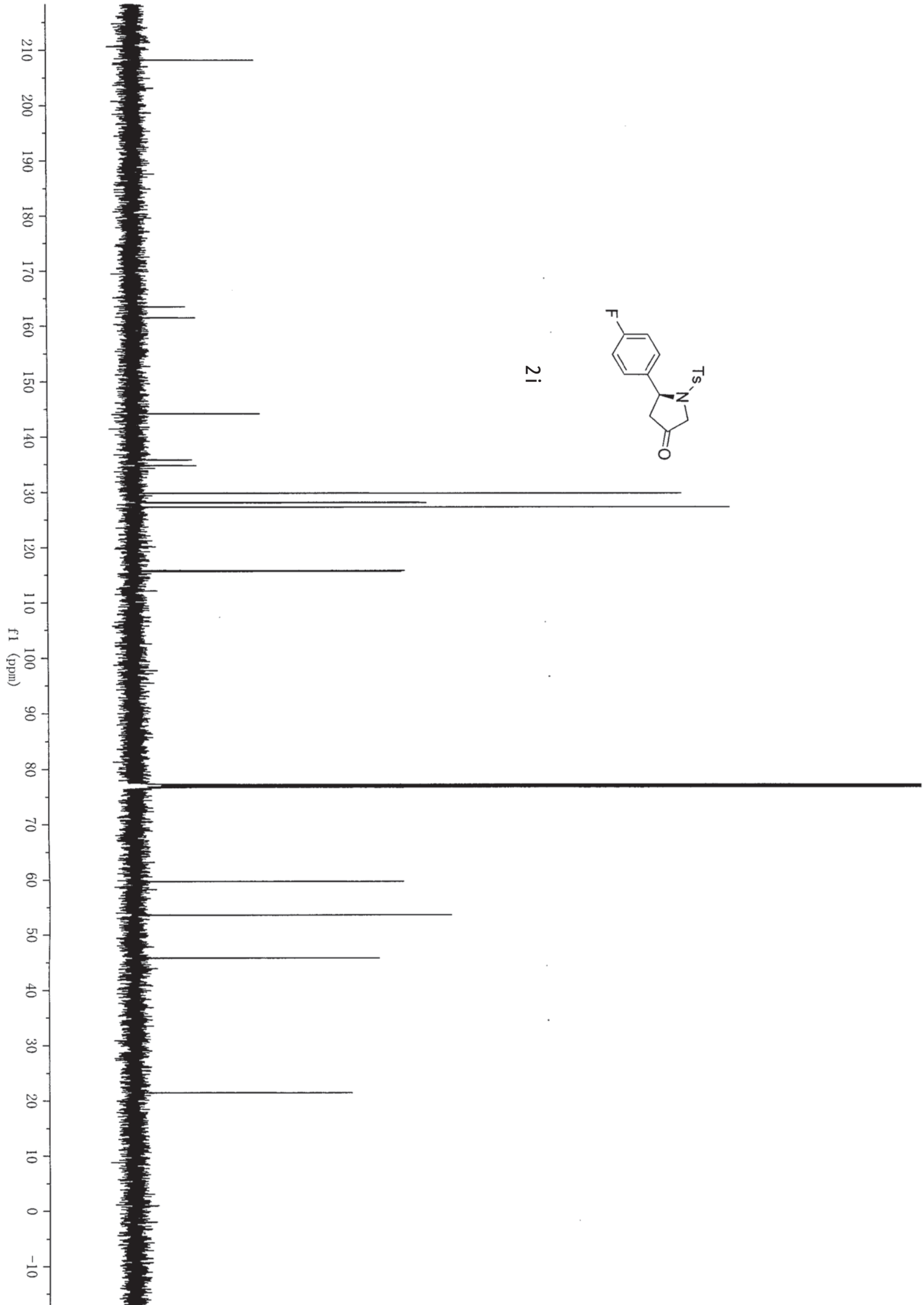

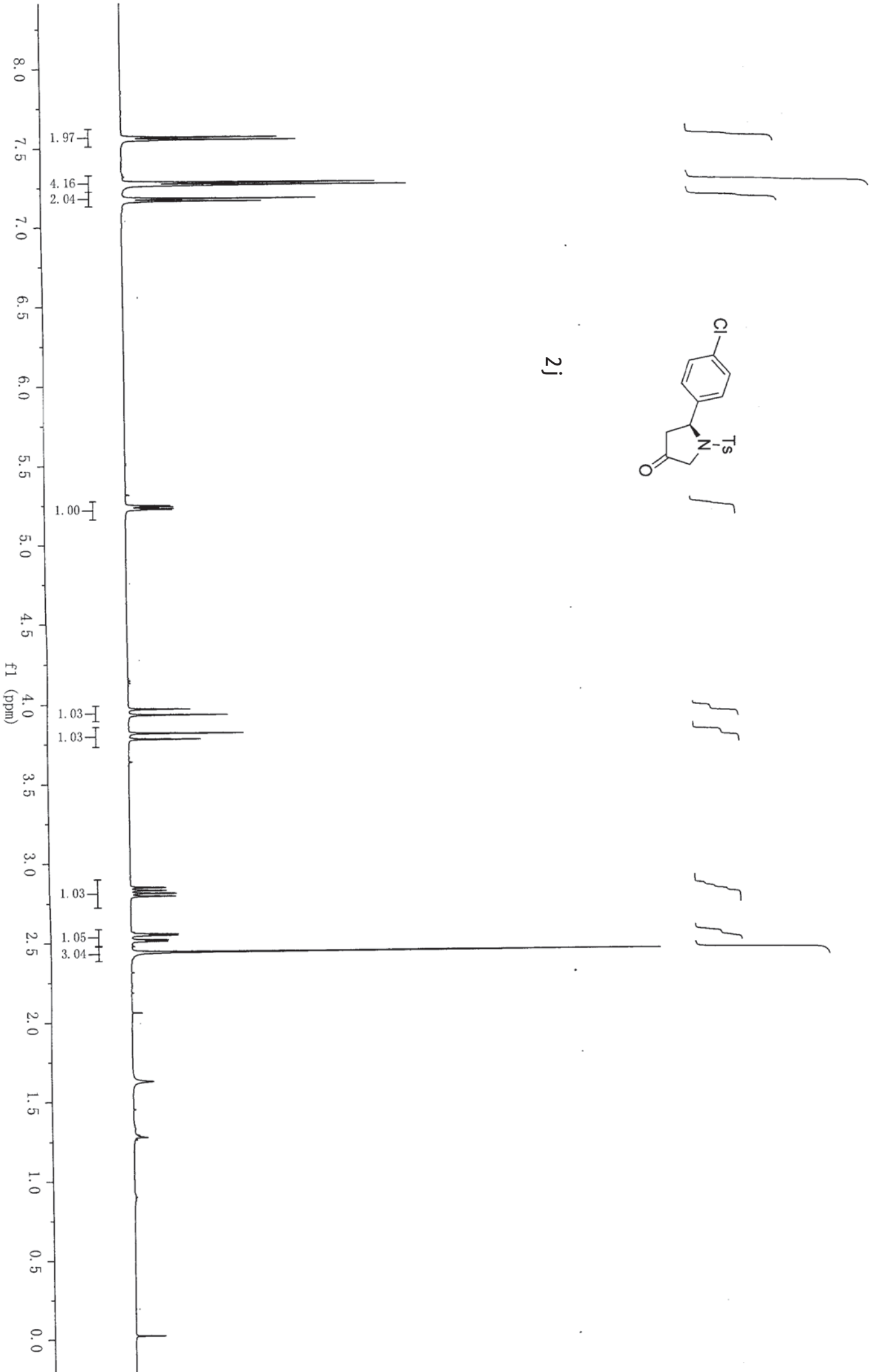

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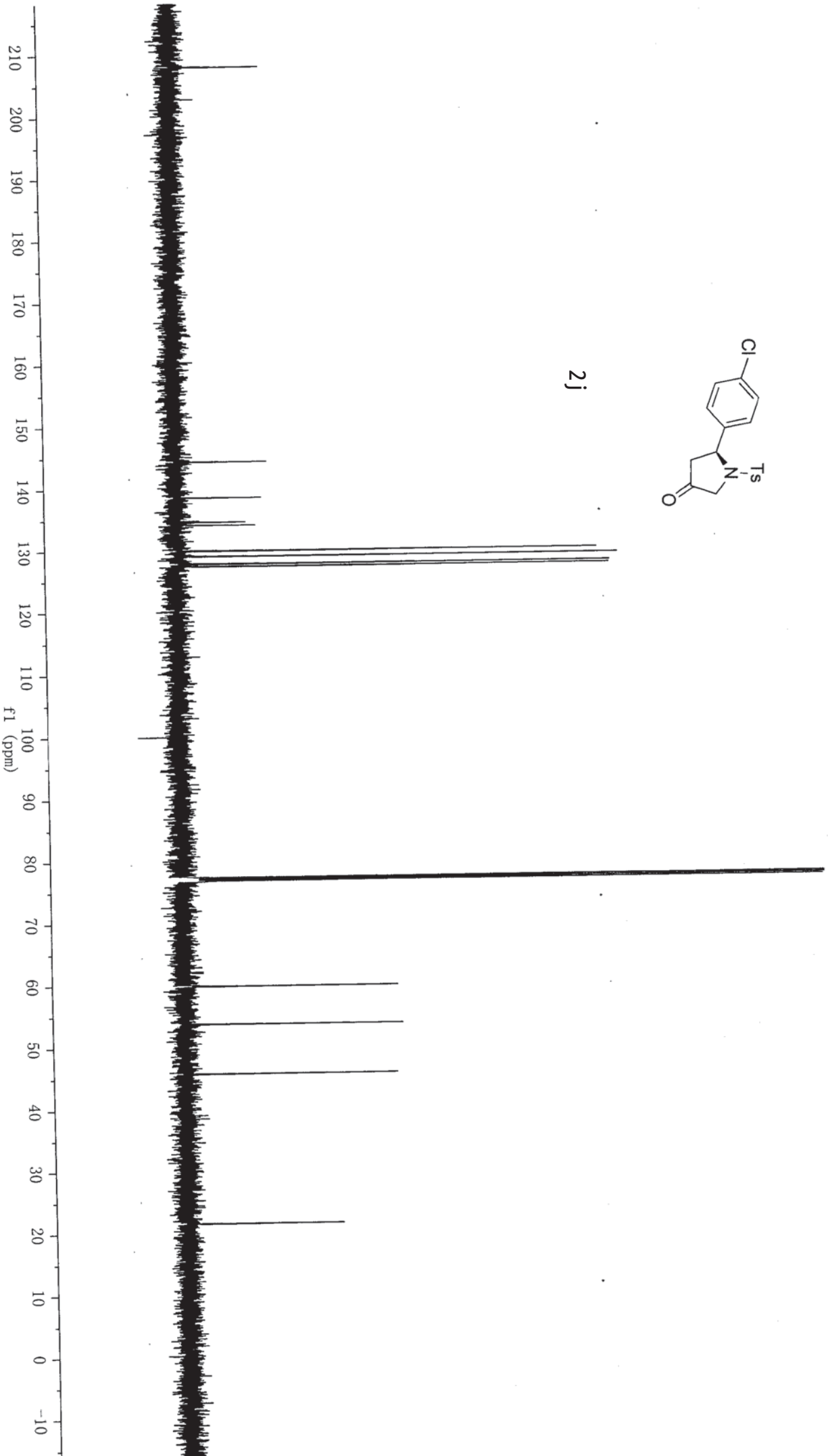

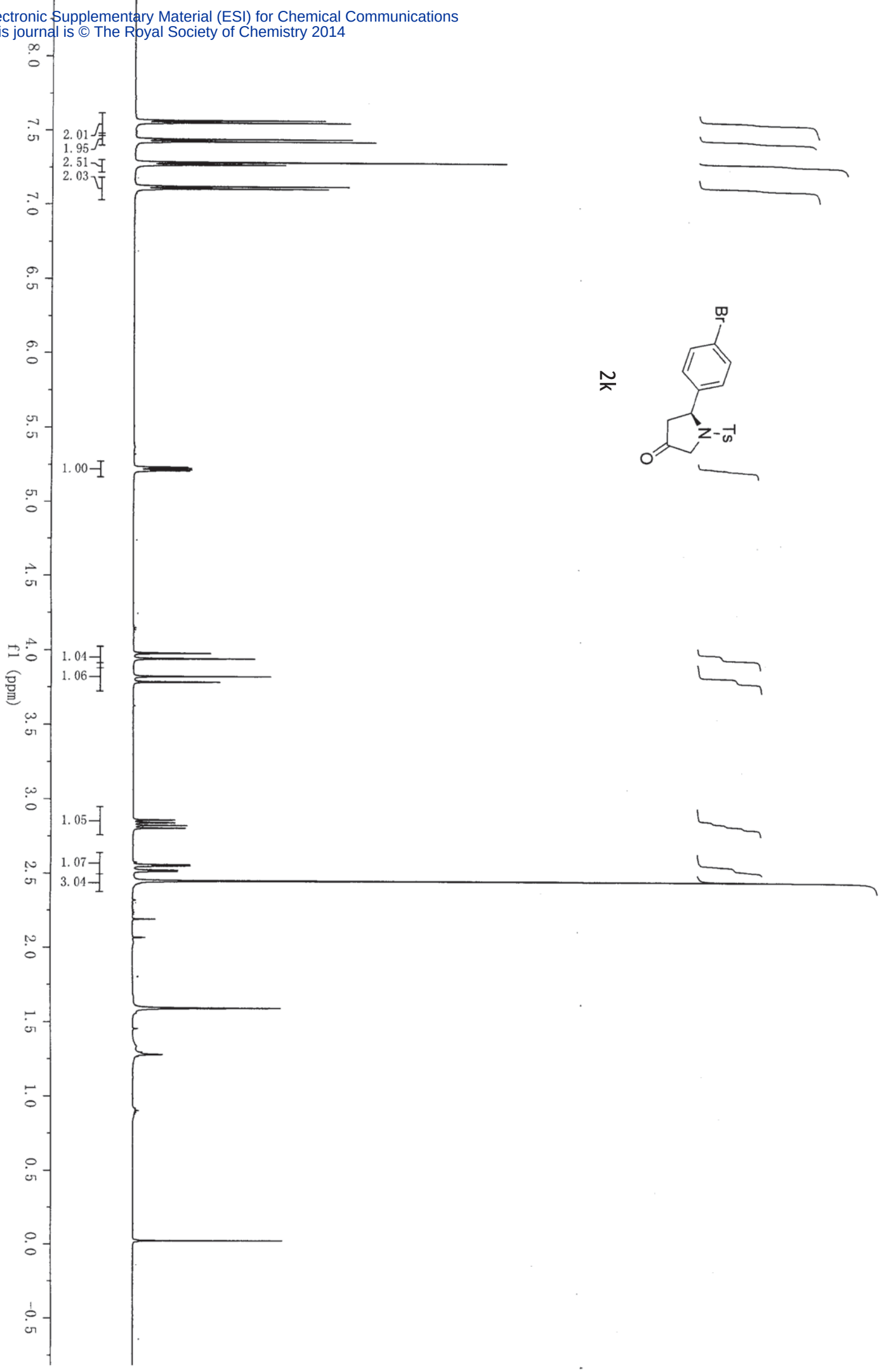

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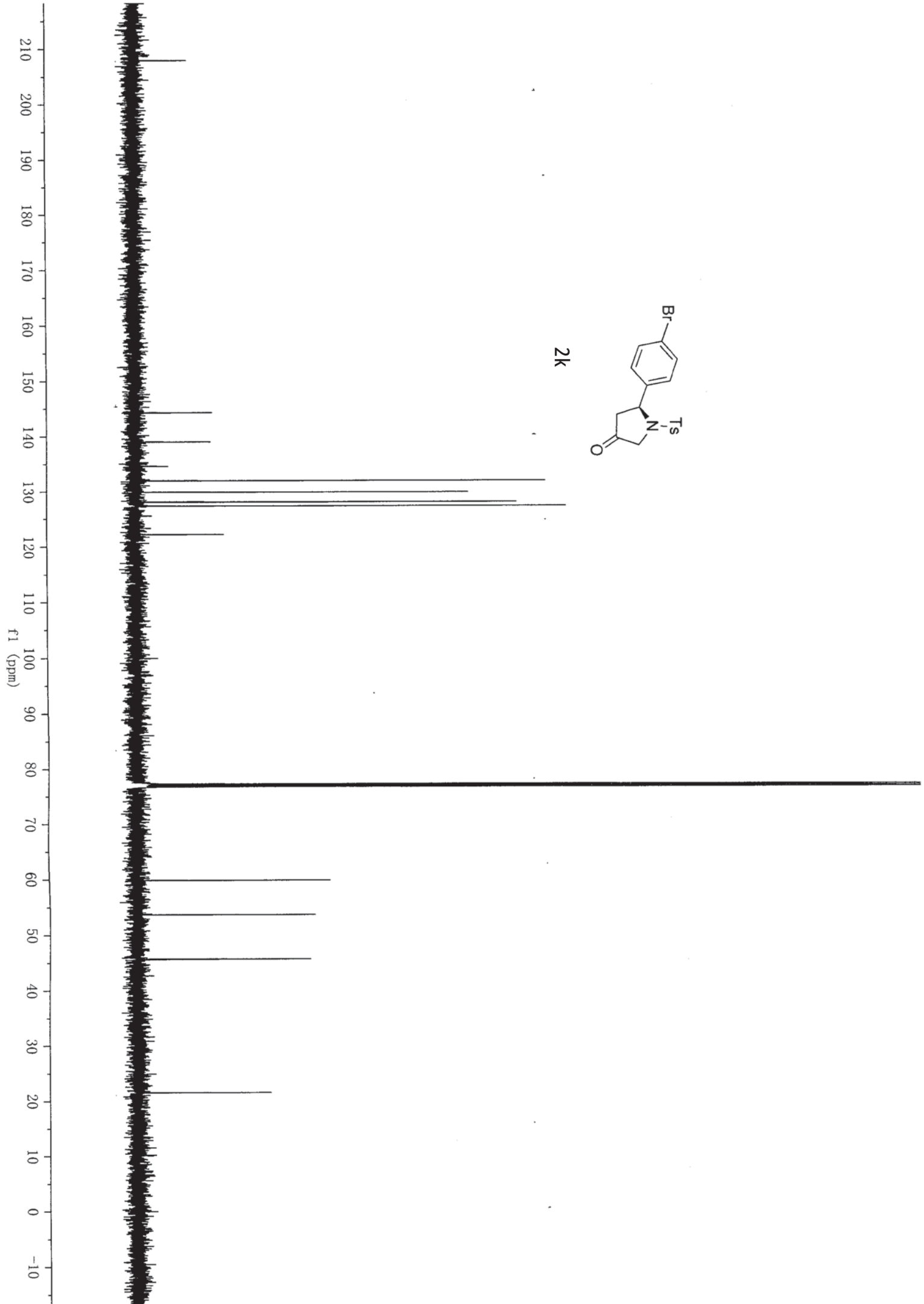

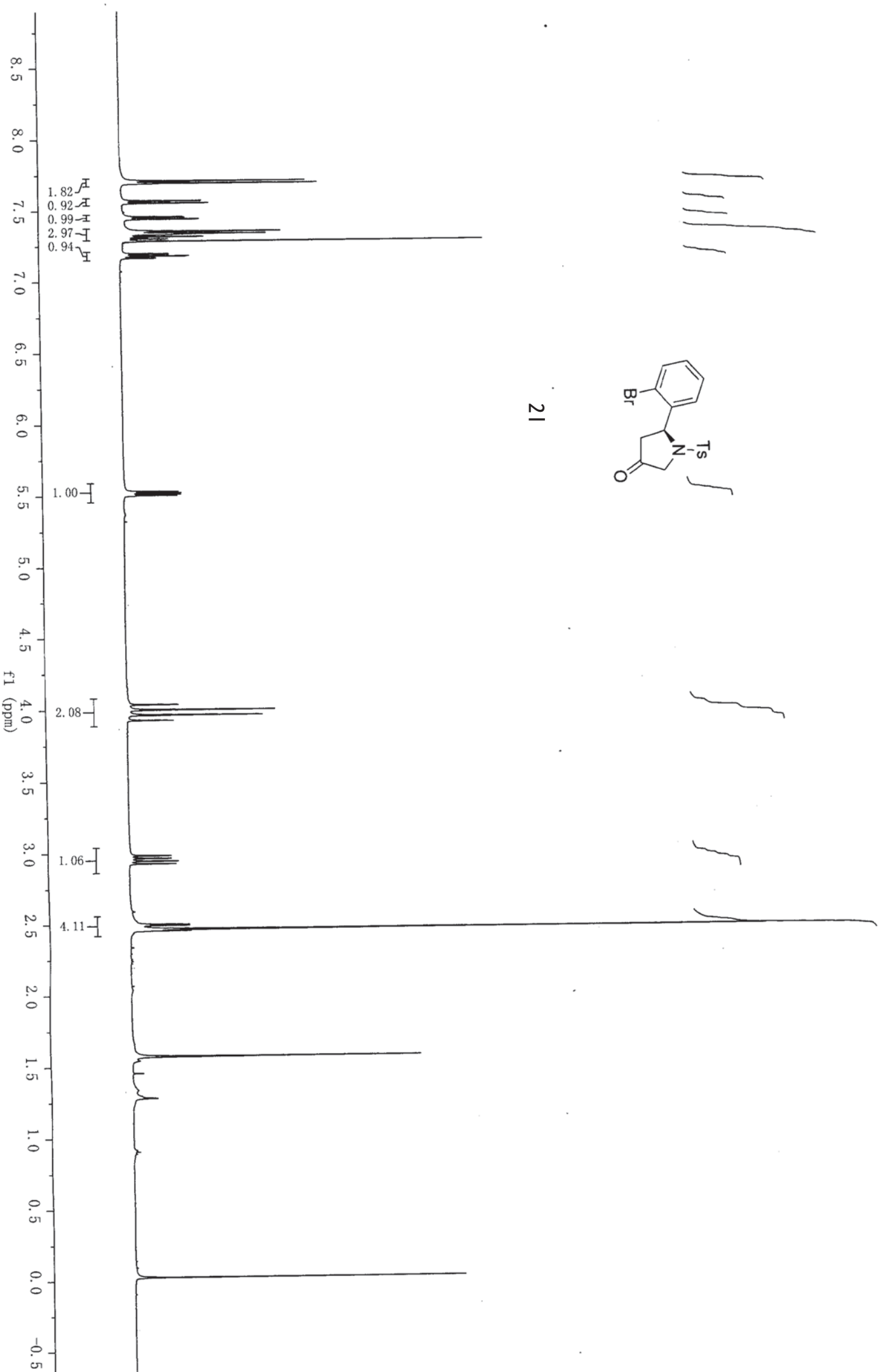

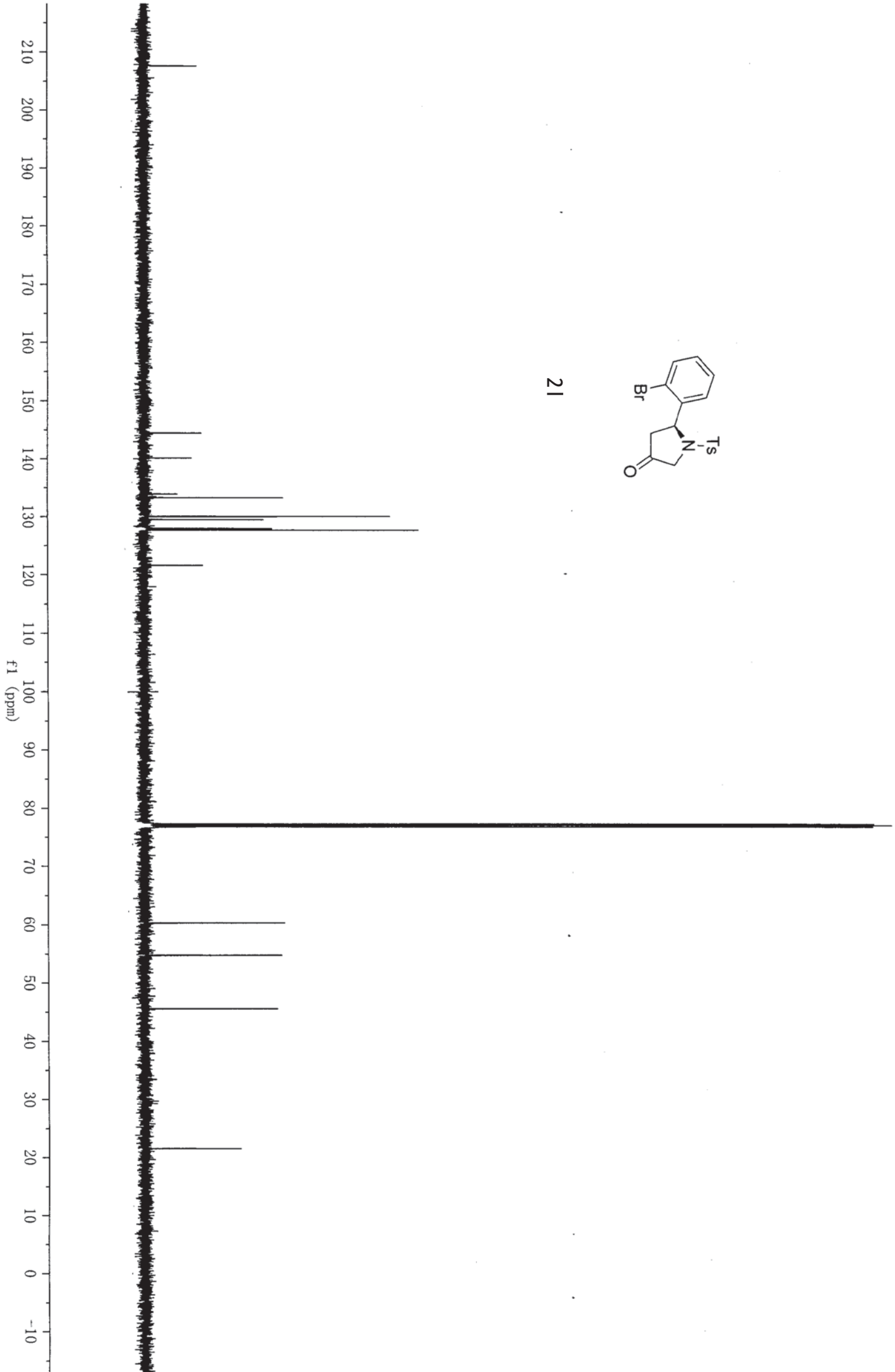

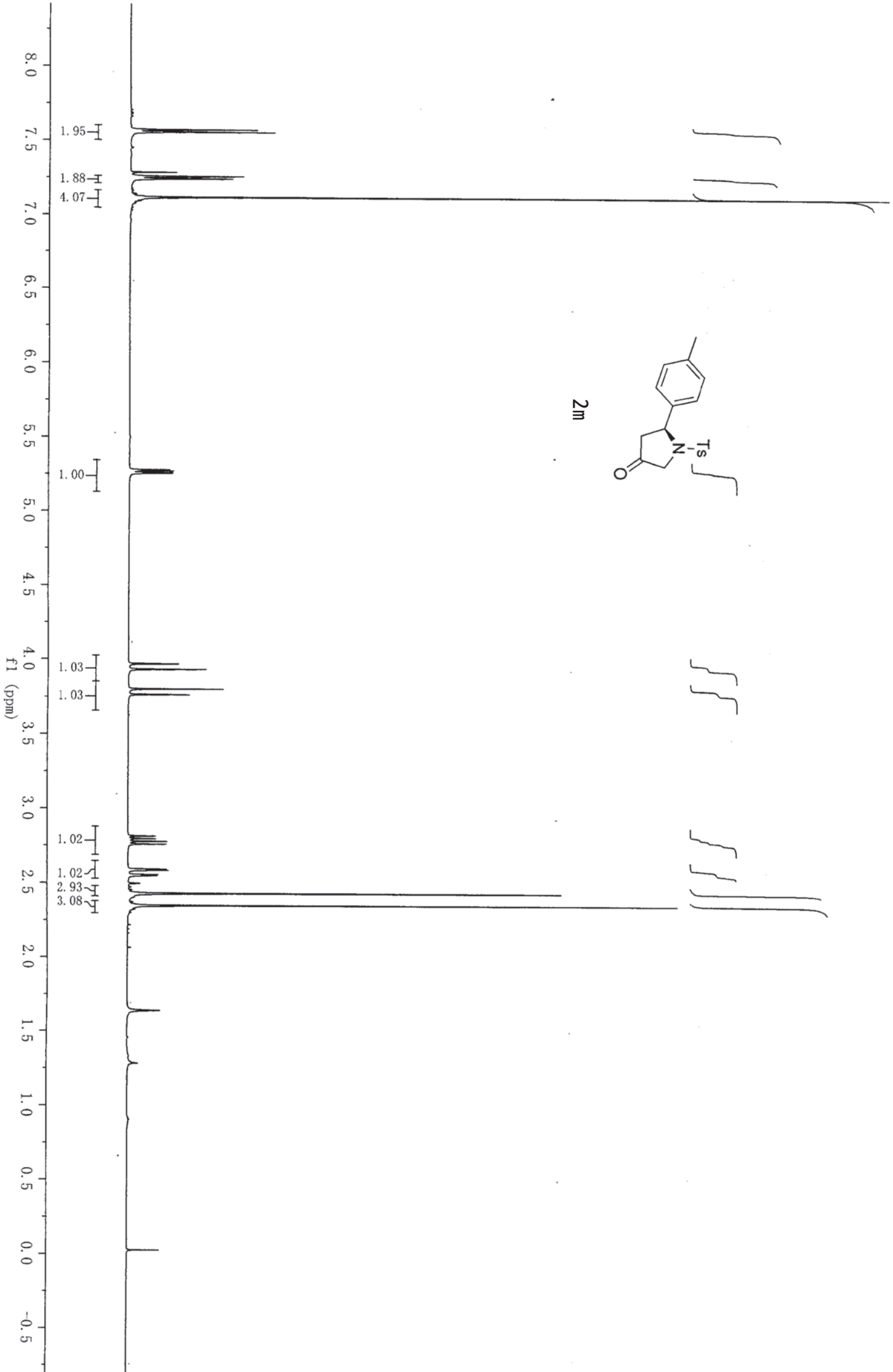

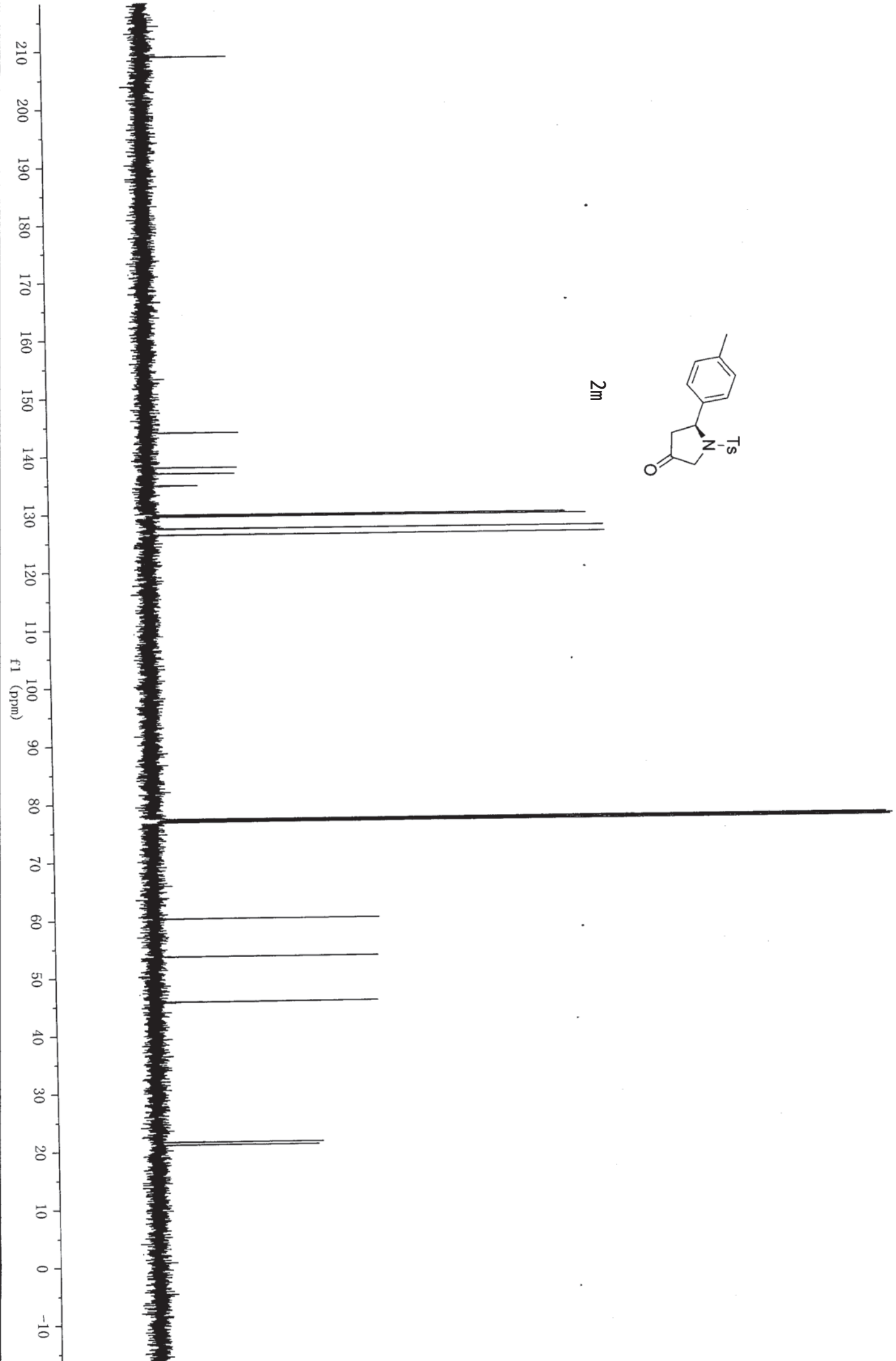

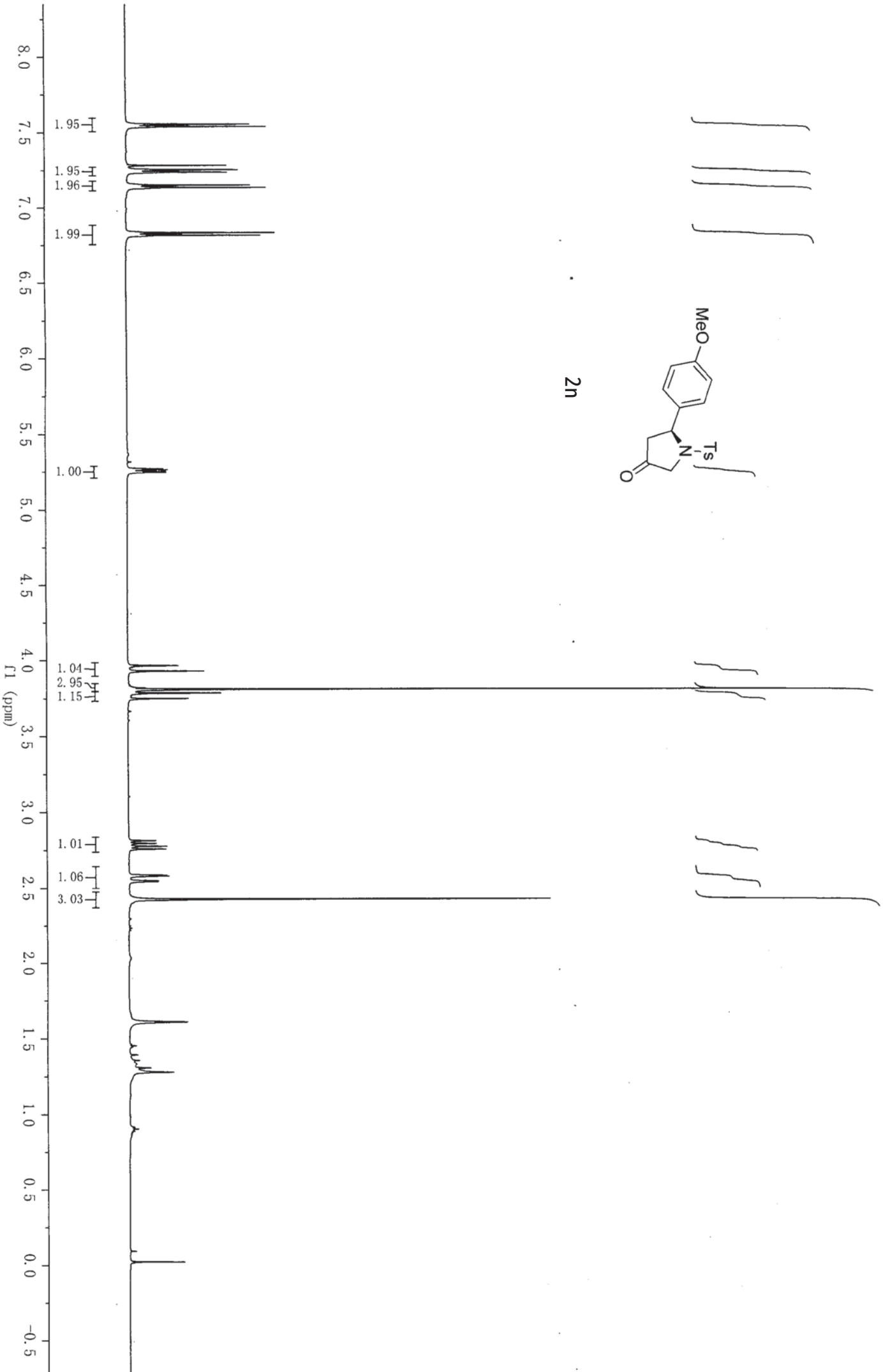

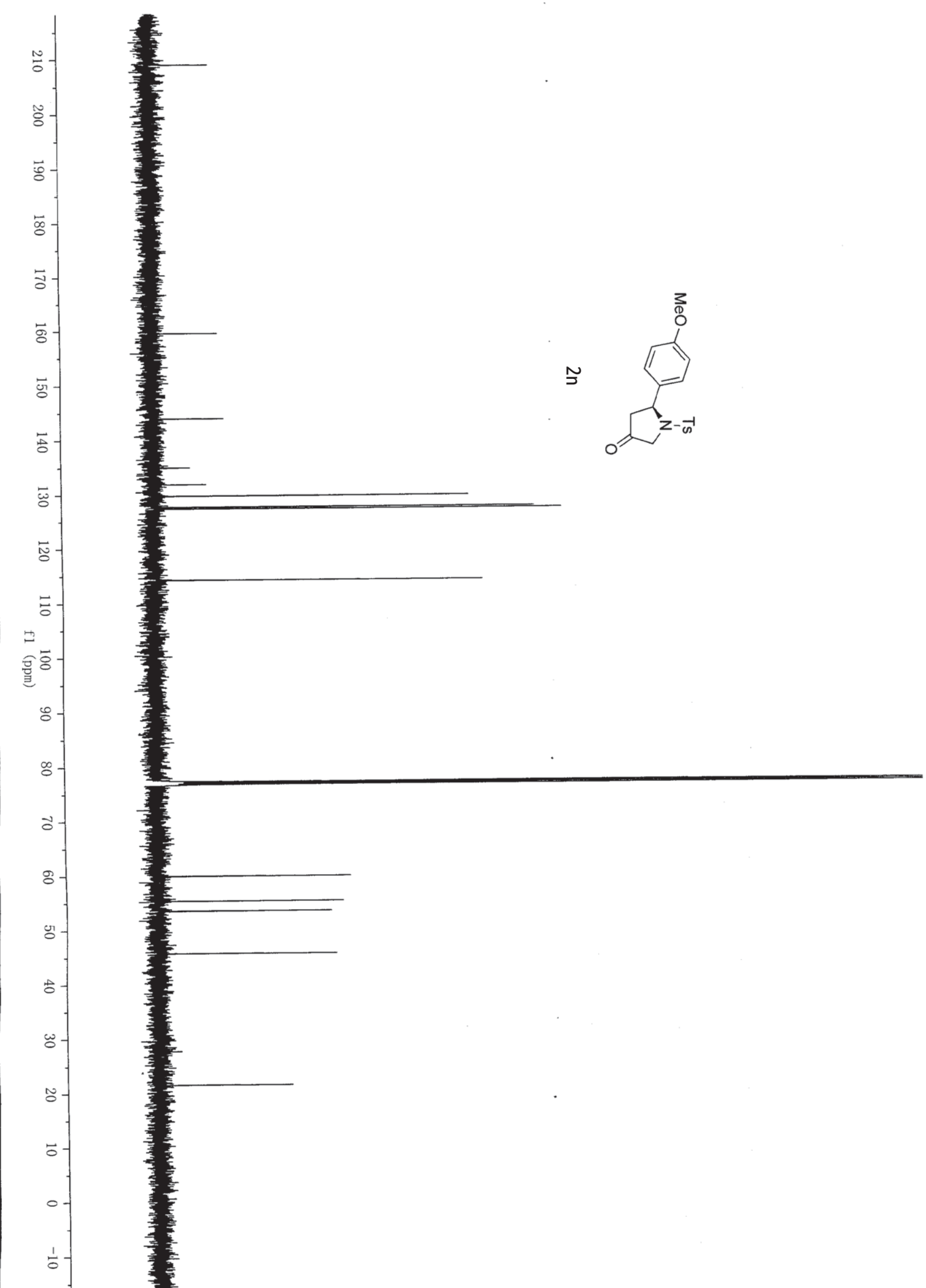

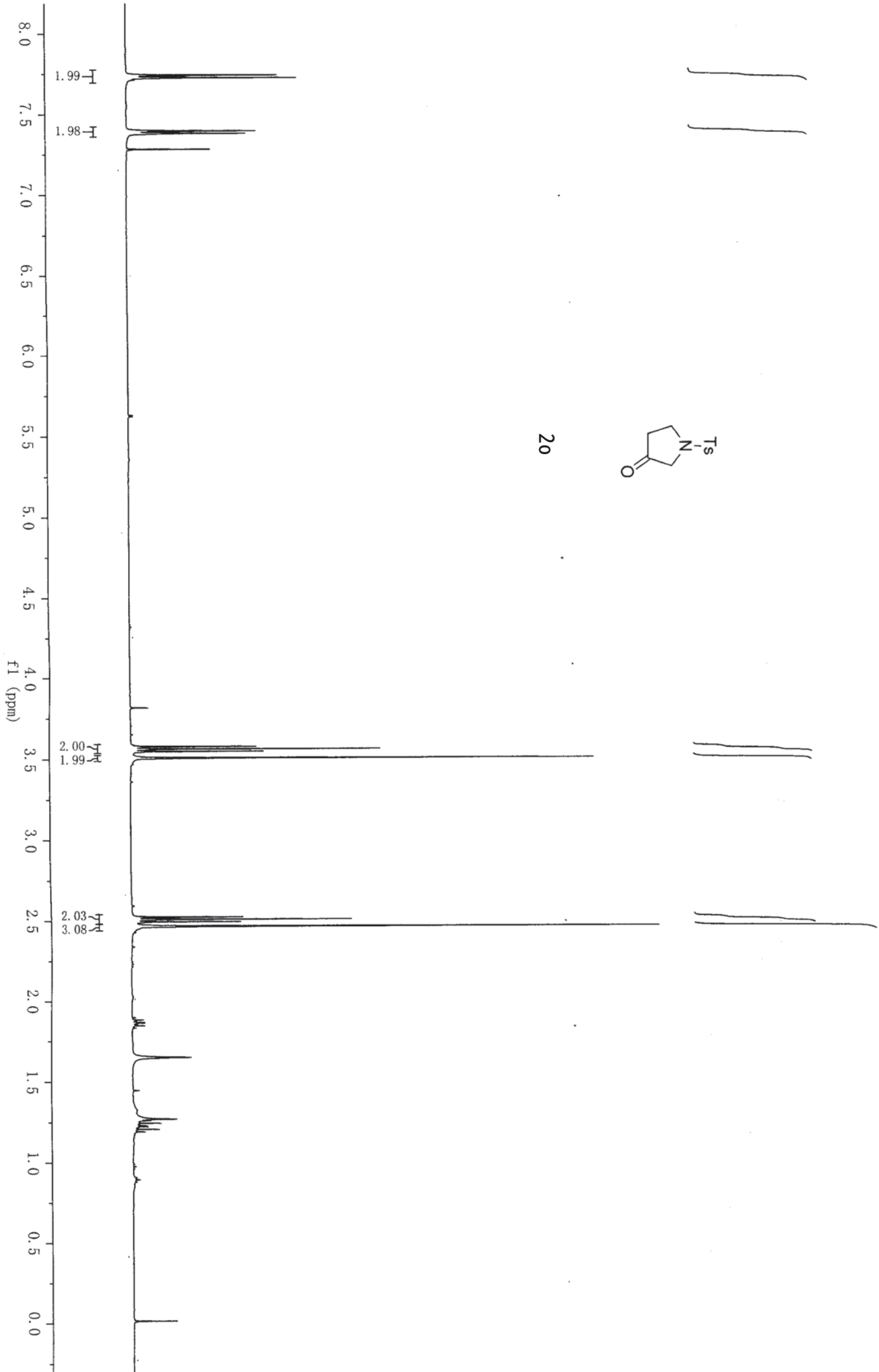

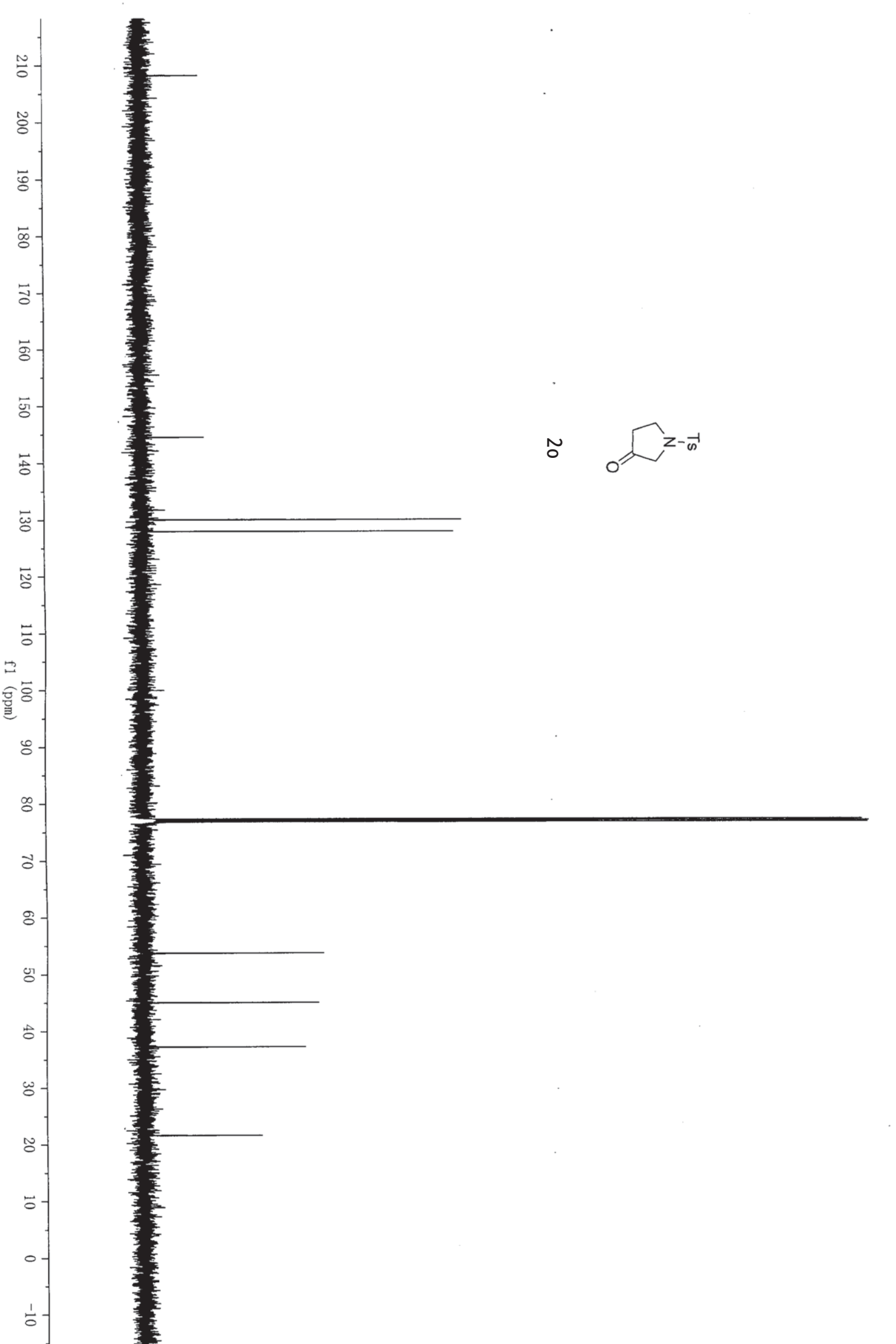

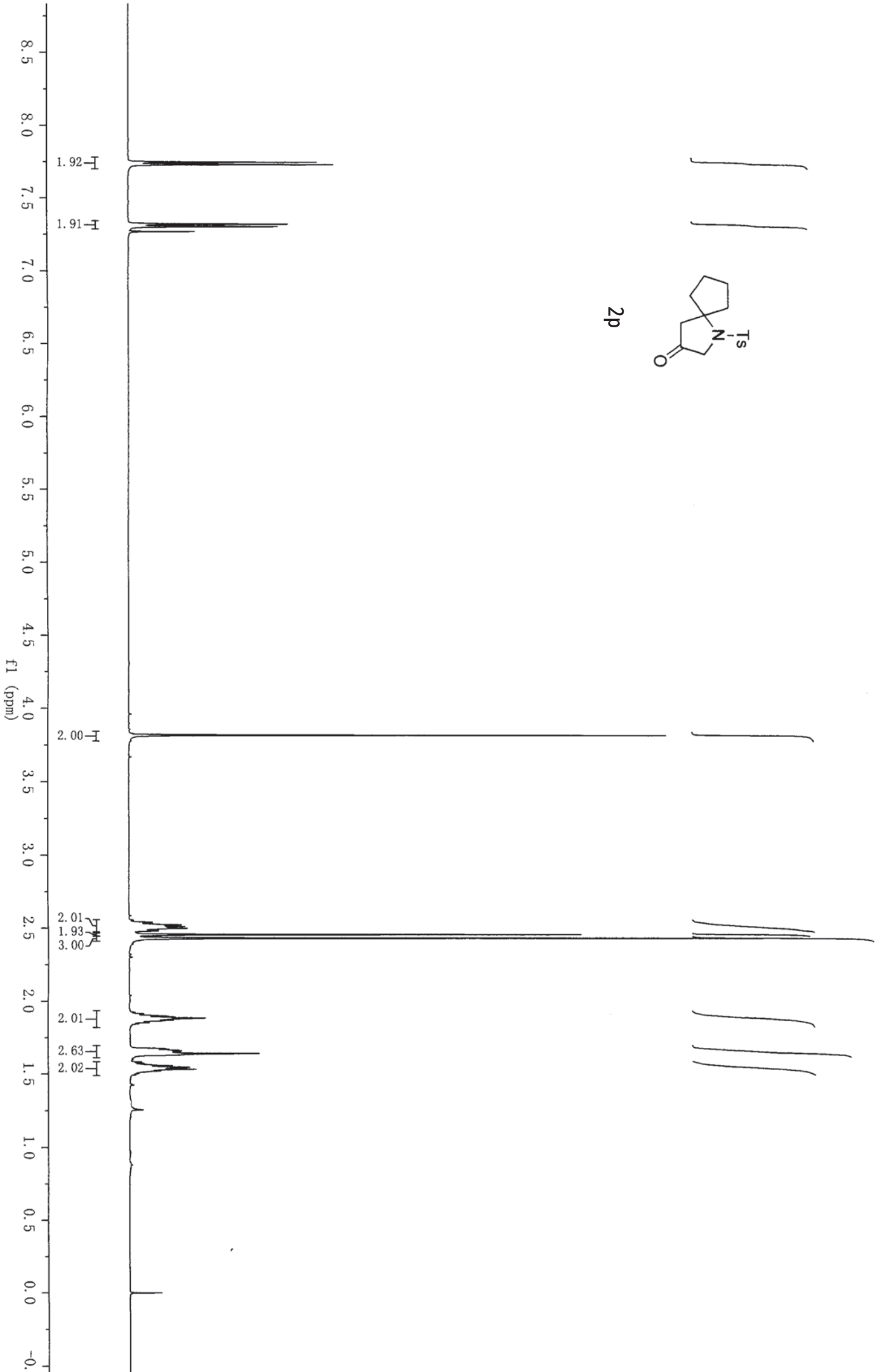

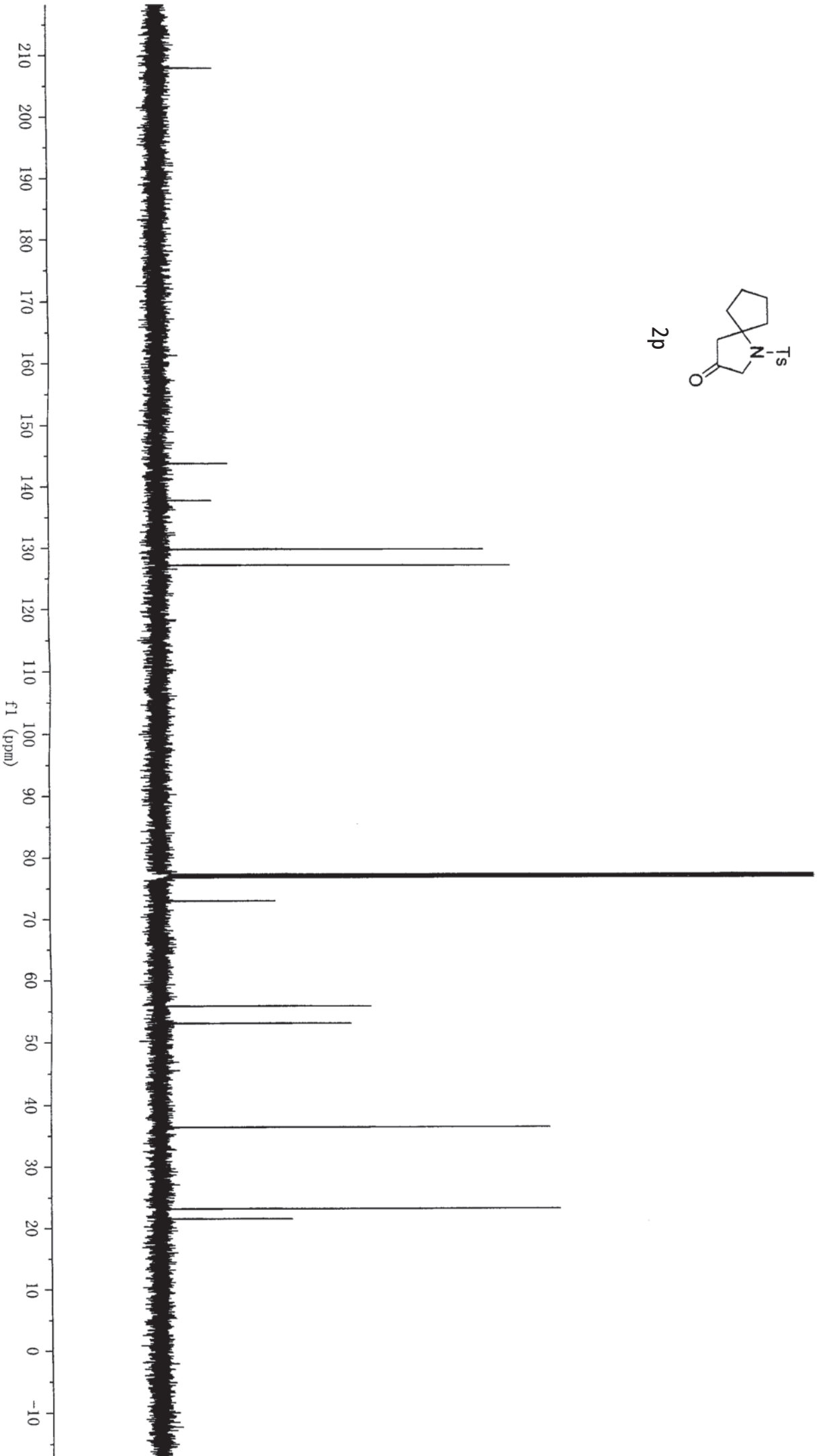

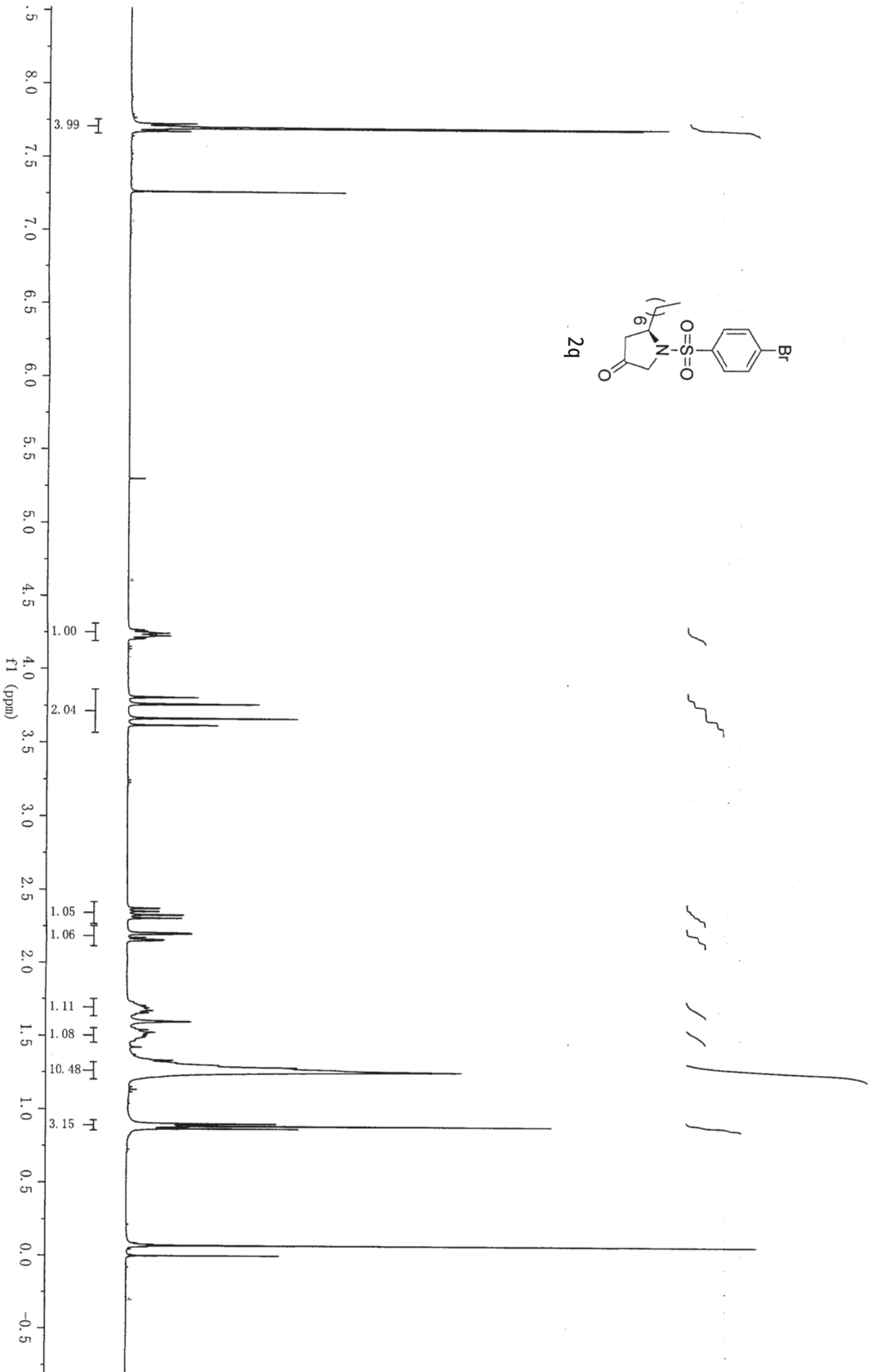

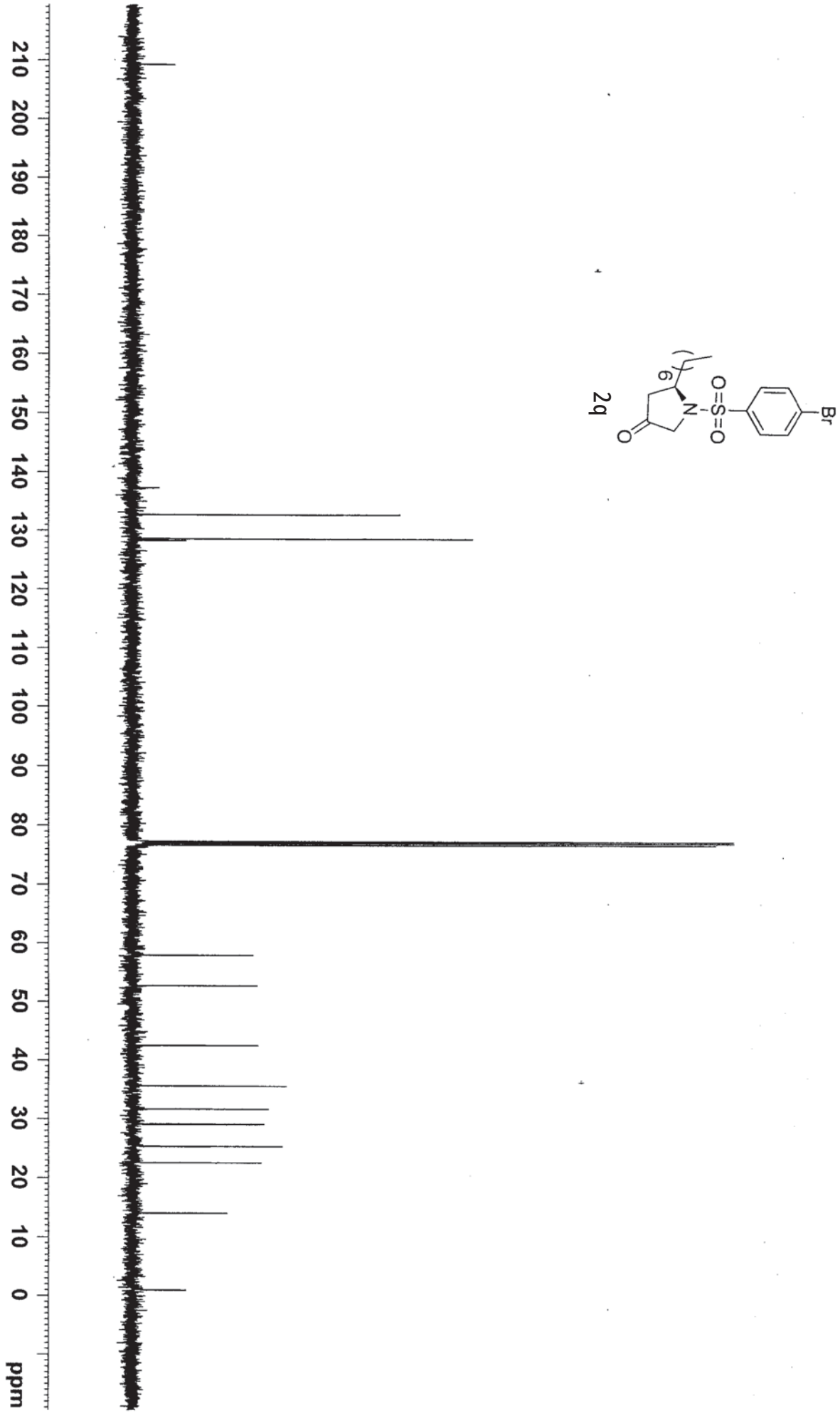

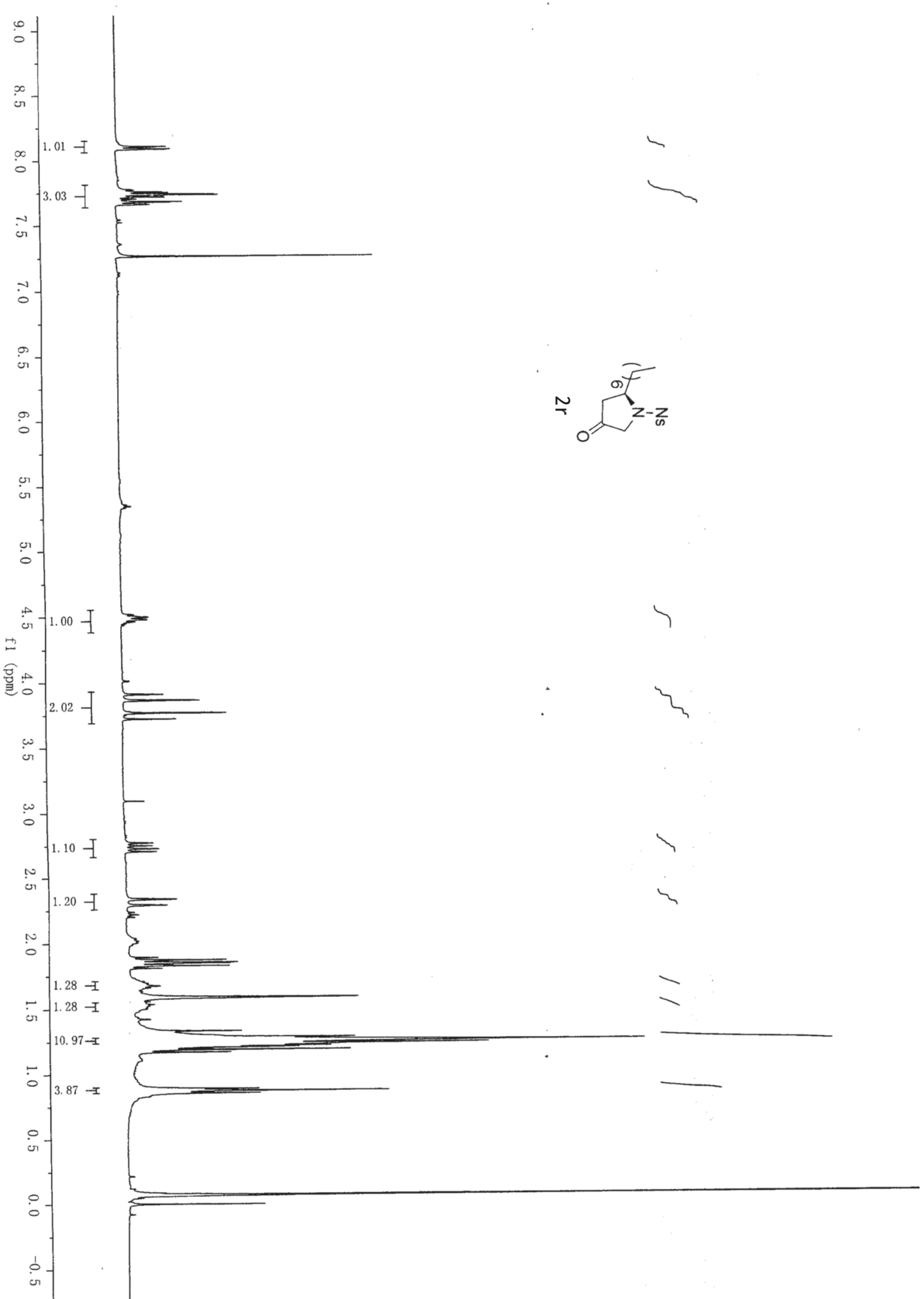

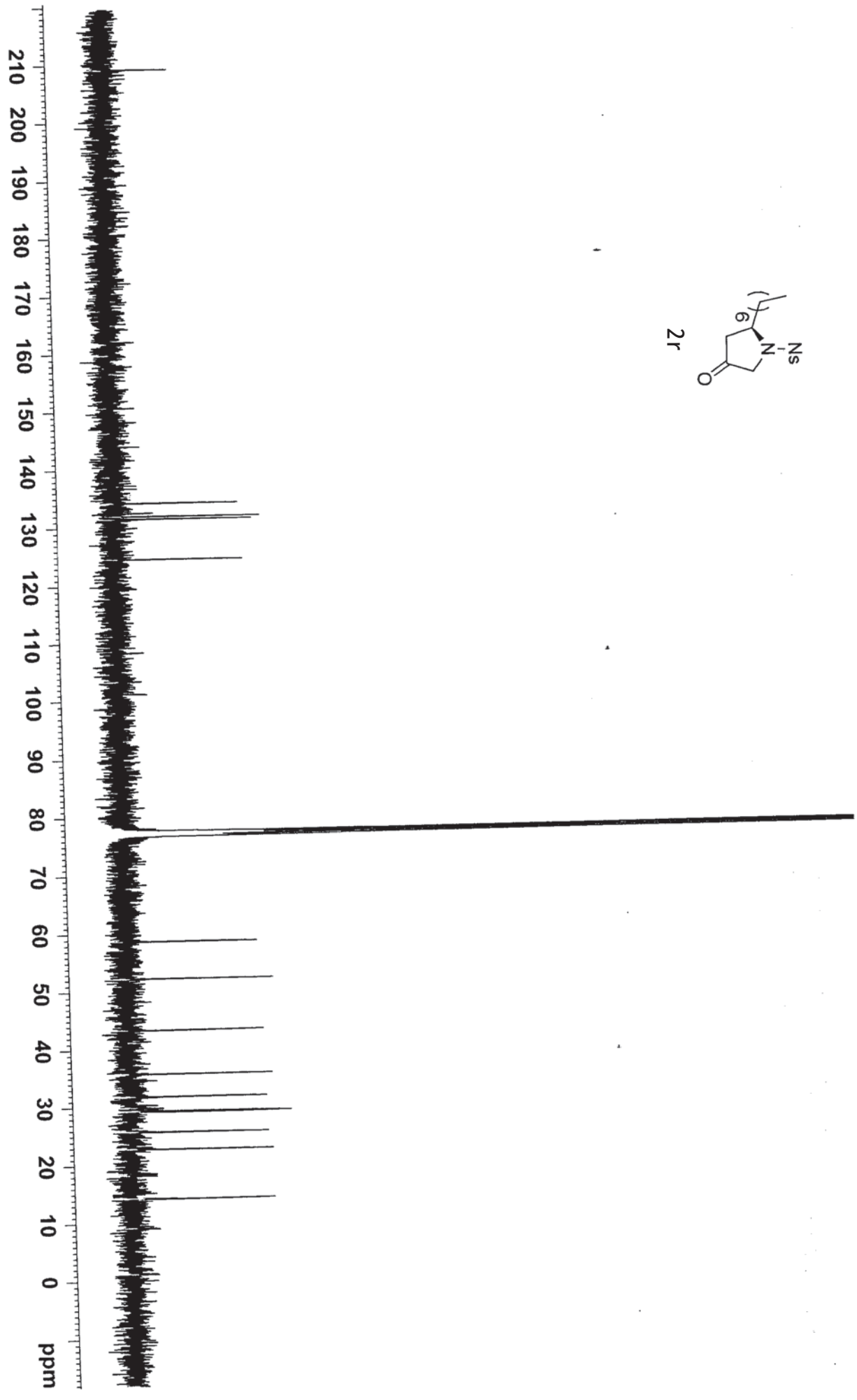

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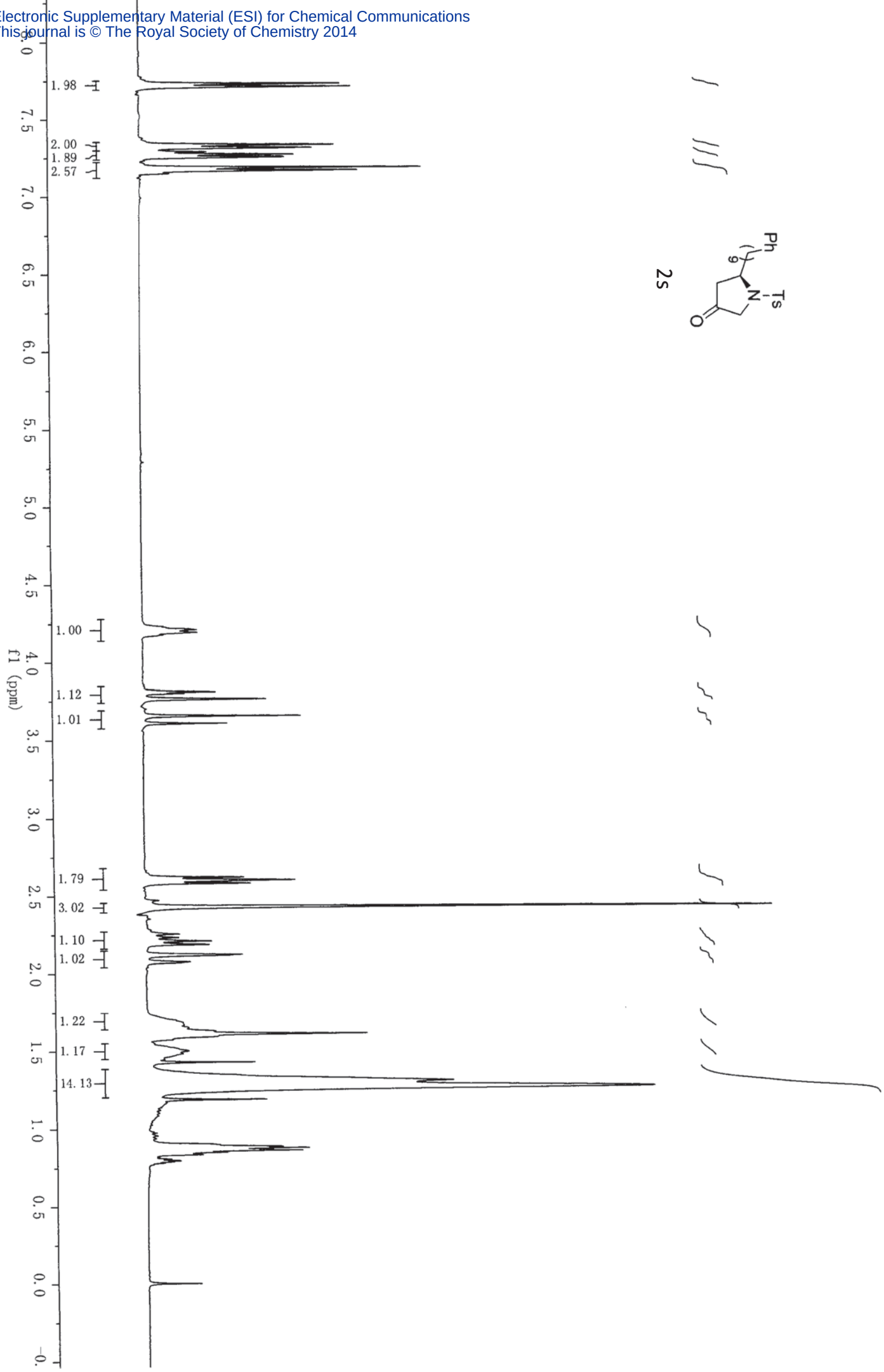

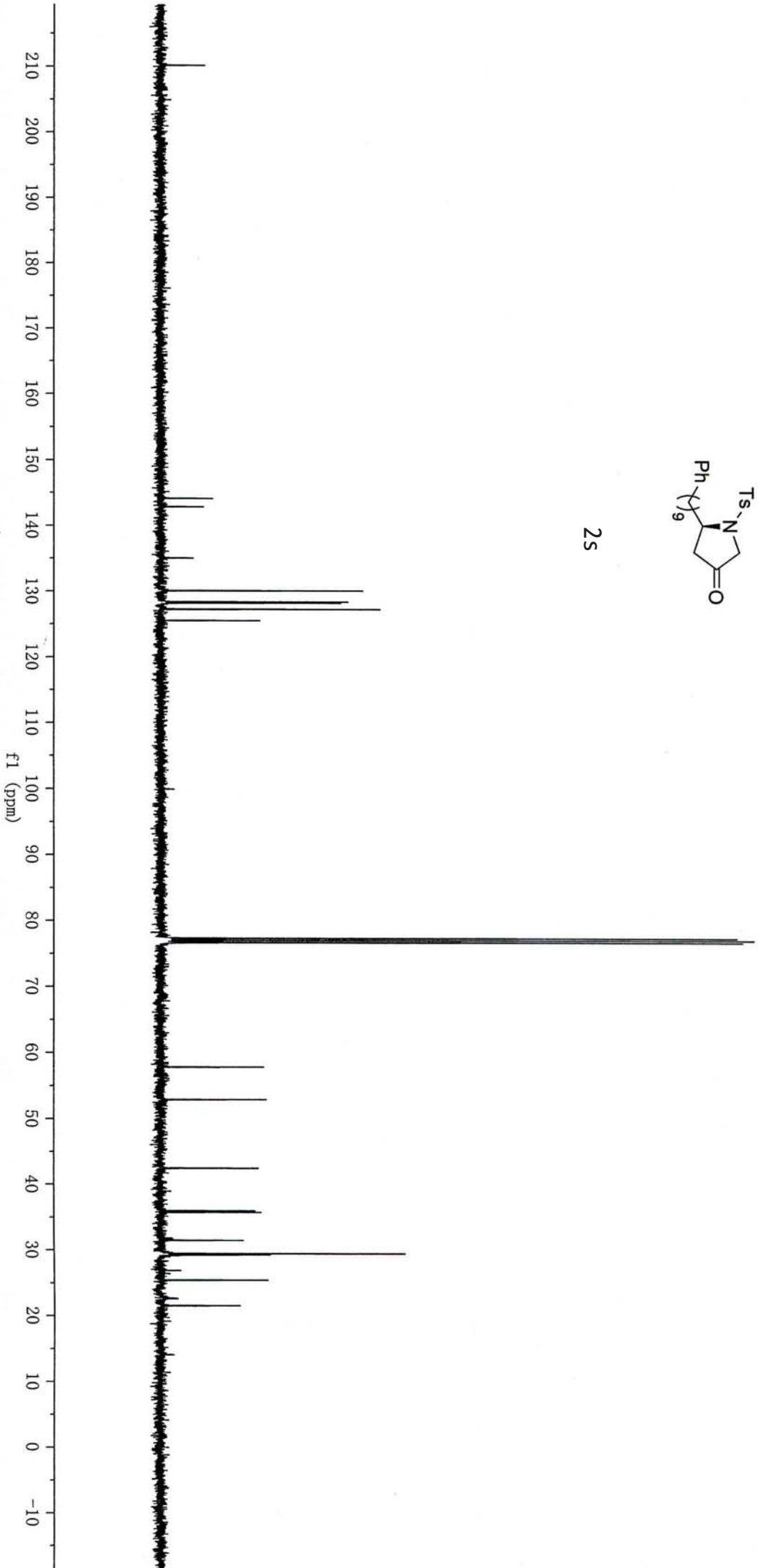

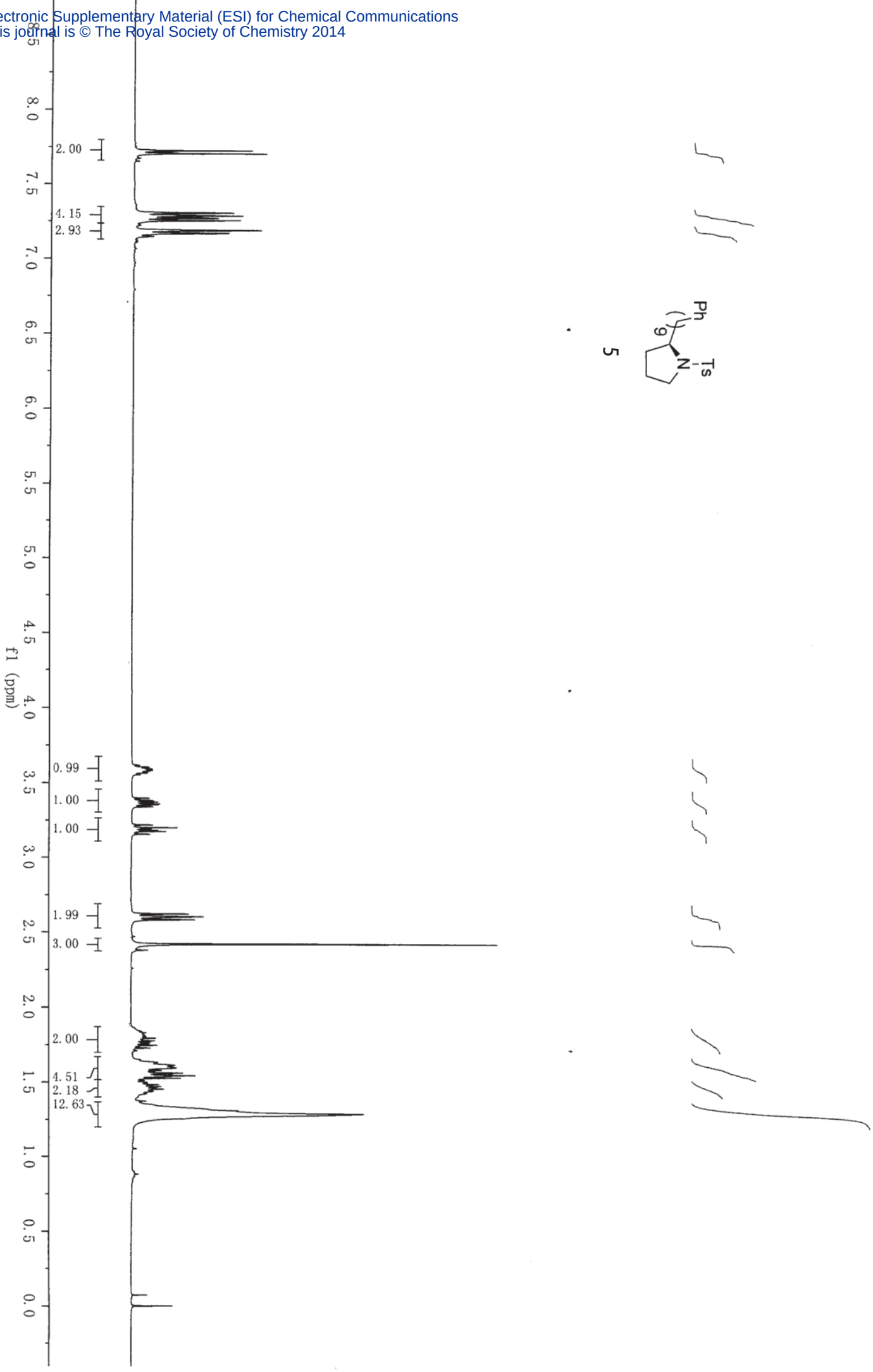

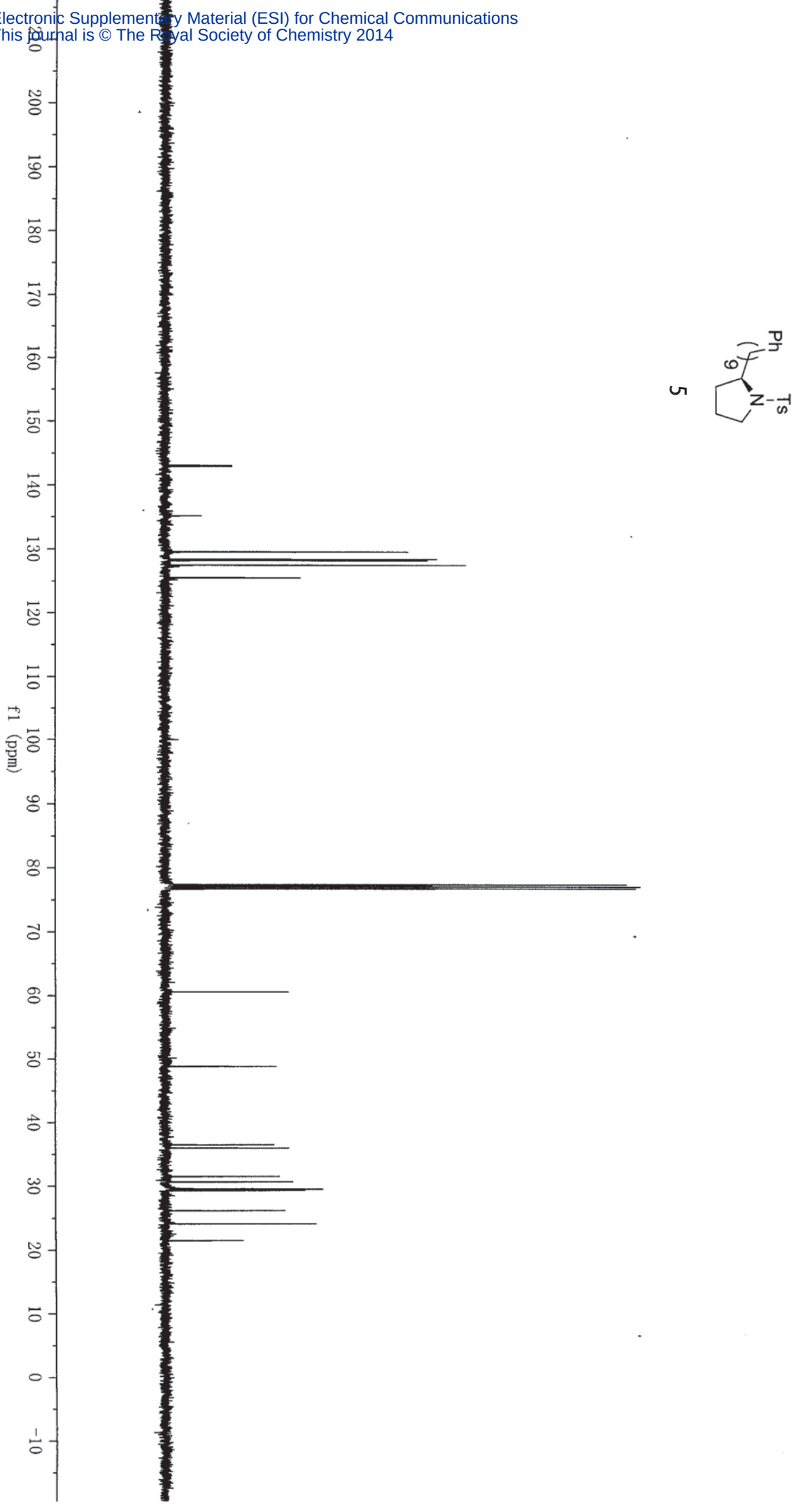

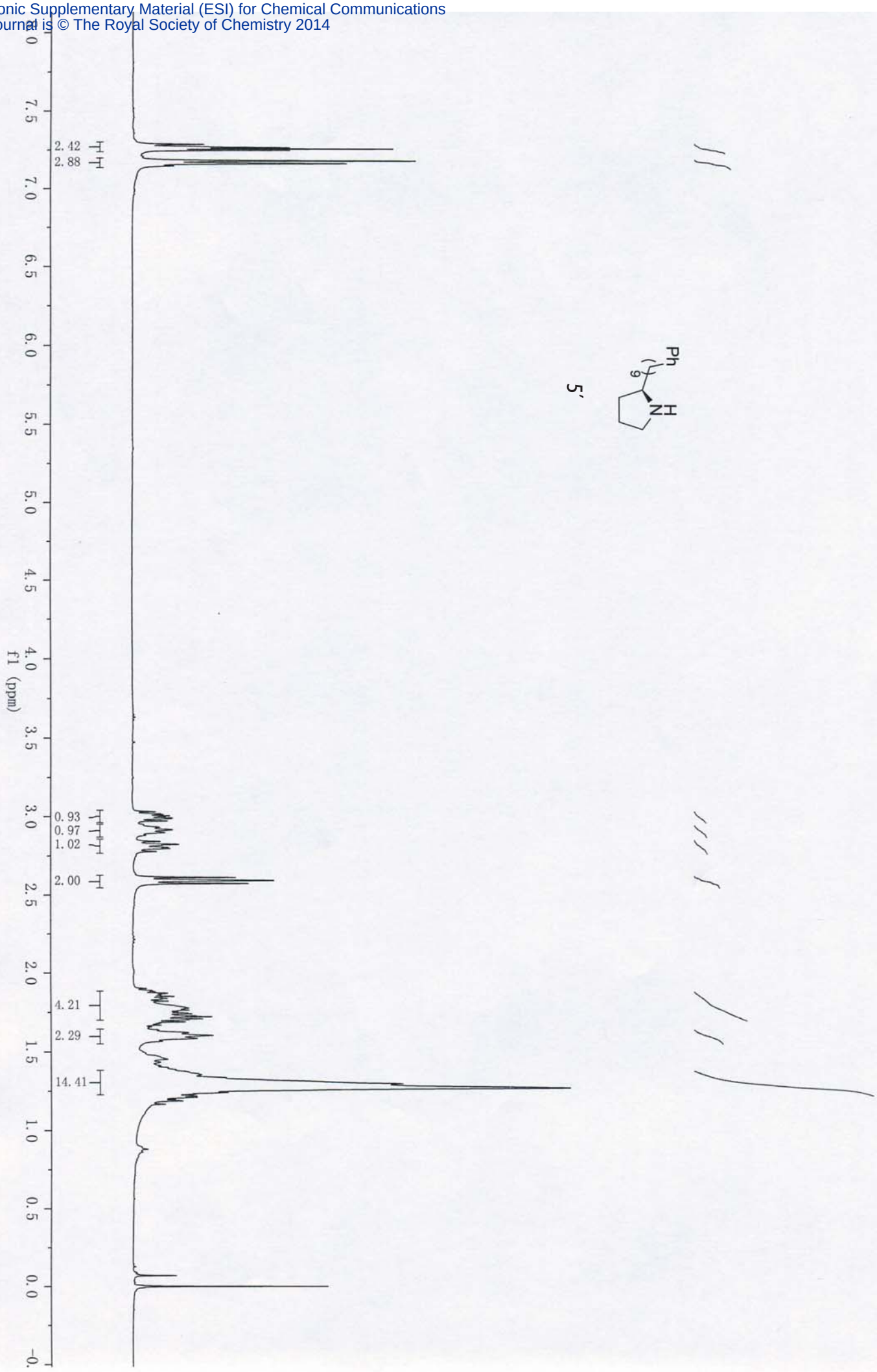

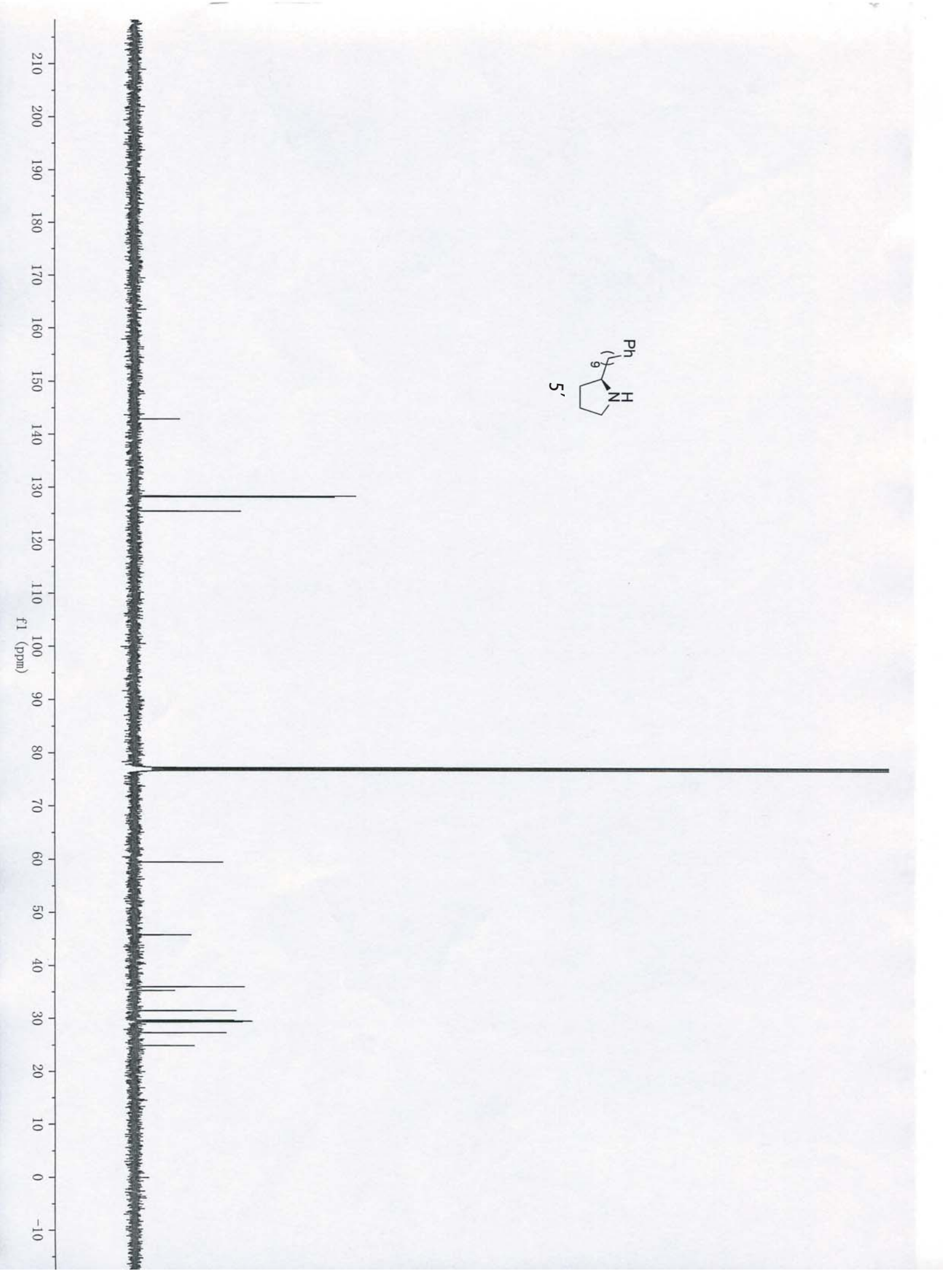

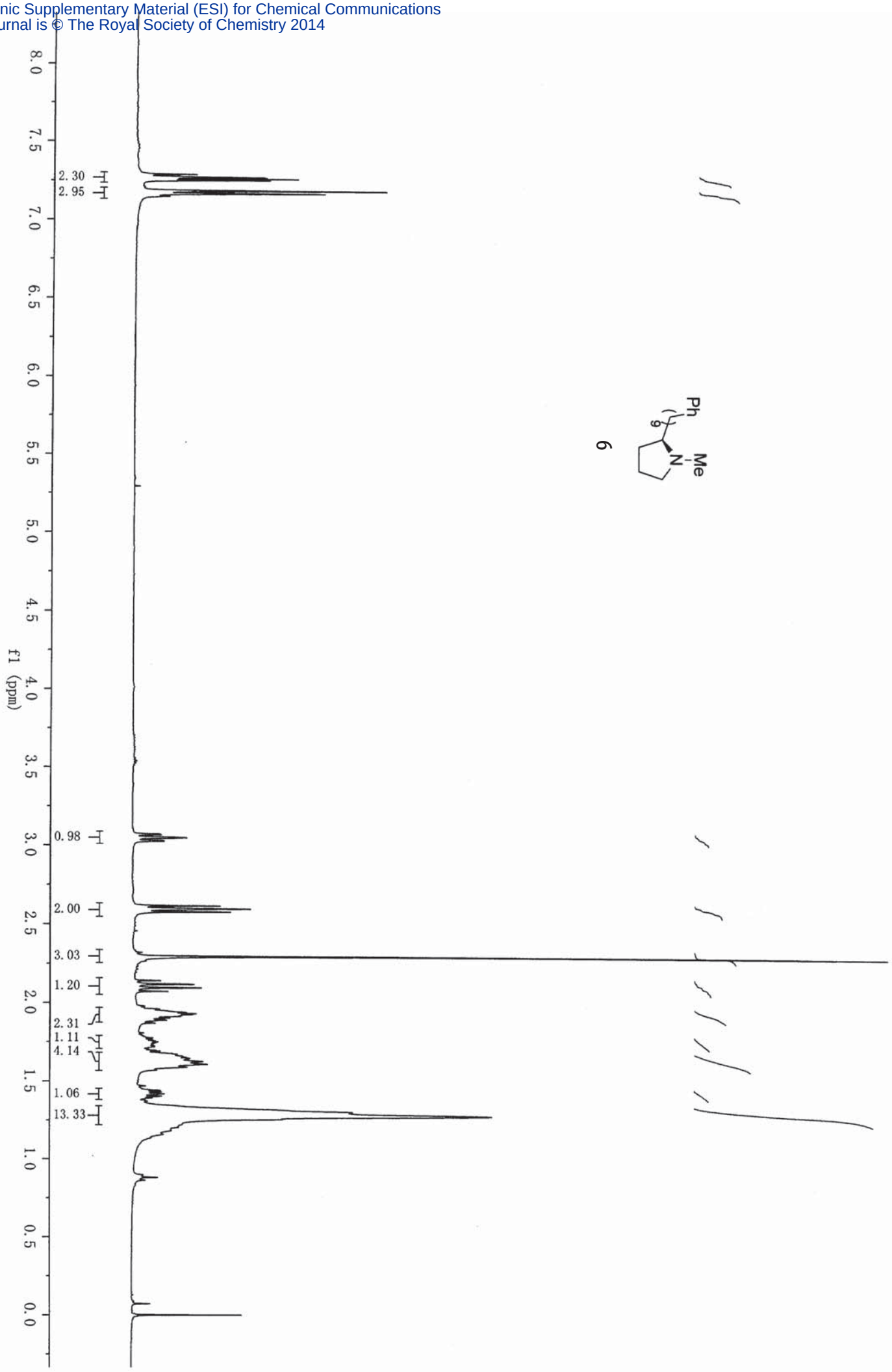

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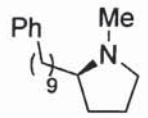

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