Supporting Information

TEMPO Promoted Direct Multi-functionalization of Terminal Alkynes with 2-Oxindoles/Benzofuran-2(3*H*)-one

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1. General information

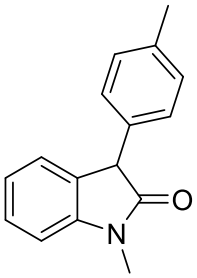
All reagents were used as purchased without further purification unless otherwise noted. Schlenk techniques were used in all reactions. Substrate **1** was prepared according to the literature procedures[1, 2] and alkynes were obtained from commercially suppliers.

Analytical thin layer chromatography was performed on TLC Silica gel and visualization was accomplished with short wave UV light. Melting points were measured on Beijing Tech X-4 apparats without correction. ^{1}H NMR and ^{13}C NMR were recorded on a Bruker 300 MHz, 400 MHz or 500 MHz Spectrometer using TMS as internal reference. The chemical shifts (δ) and coupling constants (J) were expressed in ppm and Hz respectively. The abbreviations used for explaining the multiplicities were as follows: s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet, br = broad. High resolution mass spectra (HRMS) were measured using electrospray ionization (ESI) or atmospheric pressure chemical ionization (APCI) mass spectrometer. Infrared (FT-IR) spectra were recorded on a Nicolet 6700 FT-IR spectrometer.

2. Substrate preparation

2.1 Characterization data for products

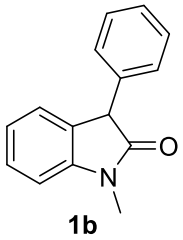
1-methyl-3-(p-tolyl)indolin-2-one (1a)[1b]



1a

Pale yellow solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.32 (t, *J* = 7.7 Hz, 1H), 7.18-7.11 (m, 3H), 7.06 (dd, *J* = 15.0, 7.7 Hz, 3H), 6.89 (d, *J* = 7.8 Hz, 1H), 4.57 (s, 1H), 3.24 (s, 3H), 2.32 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 176.3, 144.6, 137.4, 133.7, 129.7, 129.2, 128.5, 128.4, 125.1, 122.8, 108.2, 51.8, 26.6, 21.2.

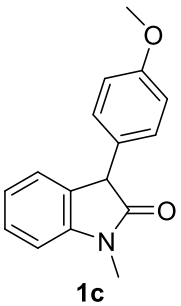
1-methyl-3-phenylindolin-2-one (1b) [1b]



1b

Pale yellow solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.37-7.26 (m, 4H), 7.23-7.13 (m, 3H), 7.06 (t, *J* = 7.4 Hz, 1H), 6.90 (d, *J* = 7.8 Hz, 1H), 4.61 (s, 1H), 3.26 (s, 3H)； ^{13}C NMR (101 MHz, $CDCl_3$) δ 176.1, 144.7, 136.8, 129.0, 128.6, 127.7, 125.20, 122.9, 108. 3, 52.2, 26.6.

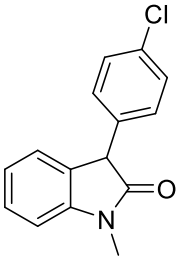
3-(4-methoxyphenyl)-1-methylindolin-2-one (1c) [1b]



1c

White solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.33 (t, *J* = 7.7 Hz, 1H), 7.16 (d, *J* = 7.3 Hz, 1H), 7.12 (d, *J* = 8.6 Hz, 2H), 7.06 (t, *J* = 7.5 Hz, 1H), 6.88 (dd, *J* = 10.9, 8.3 Hz, 3H), 4.56 (s, 1H), 3.78 (s, 3H), 3.24 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 176.5, 159.2, 144.6, 129.6, 129.3, 1288, 128.5, 125.2, 122.8, 114.5, 108.3, 55.5, 51.4, 26.6.

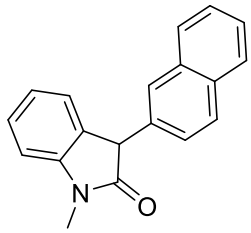
3-(4-chlorophenyl)-1-methylindolin-2-one (1d) [1b]



1d

White solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.35 (t, *J* = 7.7 Hz, 1H), 7.30 (d, *J* = 8.4 Hz, 2H), 7.18 -7.12 (m, 3H), 7.08 (t, *J* = 7.4 Hz, 1H), 6.90 (d, *J* = 7.8 Hz, 1H), 4.58 (s, 1H), 3.25 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 175.7, 144.6, 135.2, 133.7, 129.9, 129.2, 128.8, 128.4, 125.2, 123.0, 108.5, 51.5, 26.7.

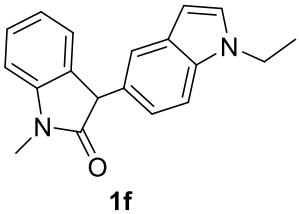
1-methyl-3-(naphthalen-2-yl)indolin-2-one (1e) [1a]



1e

Pale yellow solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.79 (t, *J* = 7.9 Hz, 3H), 7.70 (s, 1H), 7.50-7.41 (m, 2H), 7.36 (t, *J* = 7.7 Hz, 1H), 7.28-7.22 (m, 2H), 7.19 (d, *J* = 7.4 Hz, 1H), 7.08 (t, *J* = 7.5 Hz, 1H), 6.94 (d, *J* = 7.8 Hz, 1H), 4.78 (s, 1H), 3.29 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 176.1, 144.7, 134.2, 133.6, 132.9,129.1, 128.9, 128.7, 128.0, 127.8, 127.7, 126.4, 126.3, 126.1, 125.3, 123.0, 108.4, 52.4, 26.7.

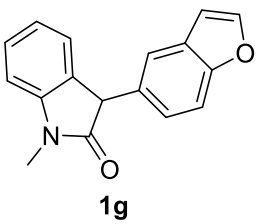
3-(1-ethyl-1H-indol-5-yl)-1-methylindolin-2-one (1f) [1a]



1f

Pale yellow solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42 (s, 1H), 7.36-7.27 (m, 2H), 7.19 (d, *J* = 7.3 Hz, 1H), 7.09 (d, *J* = 3.1 Hz, 1H), 7.07-6.99 (m, 2H), 6.90 (d, *J* = 7.8 Hz, 1H), 6.41 (d, *J* = 2.9 Hz, 1H), 4.69 (s, 1H), 4.14 (d, *J* = 7.3 Hz, 2H), 3.26 (s, 3H), 1.43 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 177.1, 144.6, 135.3, 130.1, 129.1, 128.3, 127.6, 127.5, 125.3, 122.7, 122.0, 120.9, 109.9, 108.1, 101.2, 52.38, 4.2, 26.6, 15.6.

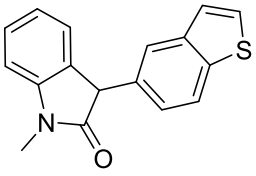
3-(benzofuran-5-yl)-1-methylindolin-2-one (1g) [1a]



1g

White solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.60 (d, *J* = 2.1 Hz, 1H), 7.44 (dd, *J* = 9.3, 5.1 Hz, 2H), 7.34 (t, *J* = 7.7 Hz, 1H), 7.18 (d, *J* = 7.2 Hz, 1H), 7.13-7.03 (m, 2H), 6.96-6.88 (m, 1H), 6.70 (d, *J* = 1.3 Hz, 1H), 4.70 (s, 1H), 3.27 (d, *J* = 2.7 Hz, 3H)； ^{13}C NMR (101 MHz, $CDCl_3$) δ 176.5, 154.6, 145.6, 144.6, 131.4, 129.5, 128.6, 128.1, 125.2, 124.9, 122.9, 121.2, 111.9, 108.3, 106.7, 52.1, 26.6.

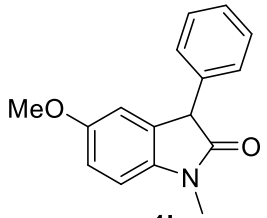
3-(benzo[b]thiophen-5-yl)-1-methylindolin-2-one (1h) [1a]



1h

Pale yellow solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.83 (d, *J* = 8.4 Hz, 1H), 7.66 (s, 1H), 7.43 (d, *J* = 5.4 Hz, 1H), 7.36 (t, *J* = 7.7 Hz, 1H), 7.27 (d, *J* = 5.6 Hz, 1H), 7.17 (dd, *J* = 12.6, 4.4 Hz, 2H), 7.08 (t, *J* = 7.5 Hz, 1H), 6.93 (d, *J* = 7.8 Hz, 1H), 4.73 (s, 1H), 3.28 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 176.3, 144.7, 140.2,139.2, 132.9, 129.2, 128.6, 127.2, 125.3, 124.8, 123.9, 123.6, 123.1,122.9, 108.4, 52.2, 26.7.

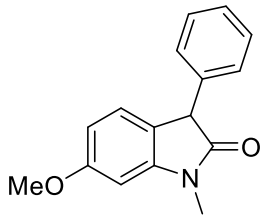
5-methoxy-1-methyl-3-phenylindolin-2-one (1i) [1b]



1i

Yellow solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.38-7.24 (m, 3H), 7.23 -7.17 (m, 2H), 6.86 (dd, *J* = 8.5, 2.3 Hz, 1H), 6.80 (d, *J* = 8.3 Hz, 2H), 4.58 (s, 1H), 3.75 (s, 3H), 3.23 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 175.8 , 156.3, 138.2, 136.8, 130.2, 129.0, 128.6, 127.69, 113.0, 112.5, 108.6, 56.0, 52.6, 26.7.

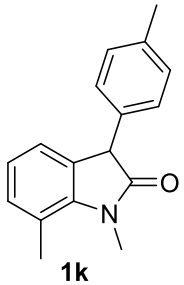
6- methoxy-1-methyl-3-phenylindolin-2-one (1j)[1b]



1j

White yellow solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.32 (t, *J* = 7.1 Hz, 2H), 7.28-7.24 (m, 1H), 7.22-7.17 (m, 2H), 7.06 (d, *J* = 8.1 Hz, 1H), 6.57 (dd, *J* = 8.2, 2.2 Hz, 1H), 6.48 (d, *J* = 2.2 Hz, 1H), 4.55 (s, 1H), 3.85 (s, 3H), 3.22 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 176.8, 160.6, 145.9, 137.2, 129.0, 128.5, 127.6, 125.8, 120.8, 106.6, 96.3, 55.7, 51., 26.61.

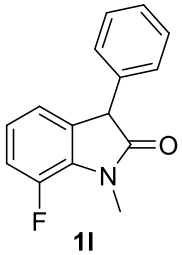
1,7-dimethyl-3-(p-tolyl)indolin-2-one (1k) [1b]



1k

Pale yellow solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.28 (s, 1H), 7.13 (d, *J* = 7.9 Hz, 2H), 7.09-7.00 (m, 3H), 6.95 (dd, *J* = 16.5, 7.2 Hz, 2H), 4.52 (s, 1H), 3.52 (s, 3H), 2.62 (s, 3H), 2.32 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 177.1, 142.4, 137.3, 134.2, 132.1, 129.9, 129.7, 128.4, 123.2, 122.7, 119.8, 51.6, 30.0, 21.2, 19.2.

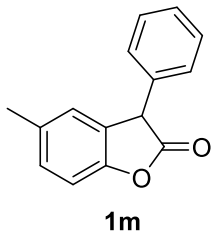
7-fluoro-1-methyl-3-phenylindolin-2-one (1l) [1b]



1l

Pale yellow solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.37-7.27 (m, 3H), 7.22-7.16 (m, 2H), 7.09-7.01 (m, 1H), 7.01-6.96 (m, 1H), 6.94 (t, *J* = 5.6 Hz, 1H), 4.62 (s, 1H), 3.47 (d, *J* = 2.7 Hz, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 175.7, 149.0, 136.4, 131.7, 131.2, 129.1, 128.5, 127.9, 123.3, 123.3, 121.1, 121.0, 116.6, 116.4, 52.3, 52.3, 29.1, 29.1.

5-methyl-3-phenylbenzofuran-2(3H)-one (1m) [2]

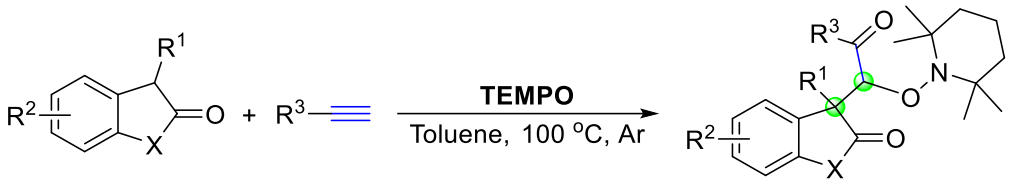


1m

White solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.41-7.30 (m, 3H), 7.25-7.20 (m, 2H), 7.15 (d, *J* = 8.3 Hz, 1H), 7.07 (d, *J* = 8.2 Hz, 1H), 7.01 (s, 1H), 4.85 (s, 1H), 2.33 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 175.6, 152.0, 135.5, 134.3, 129.9, 129.3, 128.5, 128.3, 127.1, 125.9, 110.6, 50.1, 21.2.

3. Synthetic procedures and characterization data

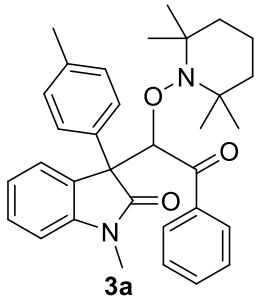
3.1 general procedure



1 2 3

Oxindole 1 (0.1 mmol) were placed in a 10 mL argon-filled flask-tube. A solution of alkyne 2 (0.8 mmol, if liquid) and TEMPO 3 (0.4 mmol) in toluene (2 mL) was added at RT. The reaction mixture was heated to 100 °C and stirred for 12 hours. The resulting mixture was directly subjected to flash column chromatography on silica gel to afford the desired products.

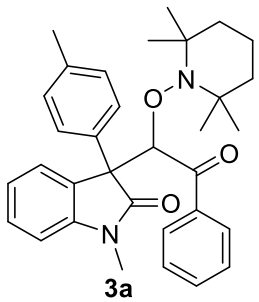
1 -methyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-3-(p-tolyl)indolin-2-one (major 3a)



3a
major

Pale yellow solid. 47% yield. mp 178-180 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.34 (d, *J* = 7.5 Hz, 1H), 7.85 (d, *J* = 7.4 Hz, 2H), 7.42 (d, *J* = 7.4 Hz, 1H), 7.32 (t, *J* = 7.5 Hz, 2H), 7.16 (dd, *J* = 15.5, 7.1 Hz, 4H), 6.80 (t, *J* = 8.4 Hz, 3H), 6.38 (s, 1H), 3.14 (s, 3H), 2.09 (s, 3H), 1.41 (s, 3H), 1.30 (d, *J* = 14.5 Hz, 3H), 1.14-0.98 (m, 3H), 0.80 (s, 3H), 0.57 (s, 3H), 0.43 (s, 3H).^{13}C NMR (101 MHz, $CDCl_3$) δ 201.2, 177.6, 144.8, 140.7, 137.2, 133.6, 132.5, 130.4, 129.1, 129.0, 128.20, 128.15, 128.0, 127.6, 122.3, 107.8, 83.2, 61.8, 60.2, 41.2, 40.3, 33.5, 33.4, 26.7, 21.0, 19.9, 17.0. IR ν_{max} (KBr, film, cm^{-1}): 3054, 3004, 2964, 2932, 1713, 1610, 1471, 1260, 1026, 799. HRMS (ESI): calcd for $C_{33}H_{39}N_2O_3^+$ $[M+H]^+$: 511.29552, found: 511.29498.

1-methyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-3-(p-tolyl)indolin-2-one (minor 3a)

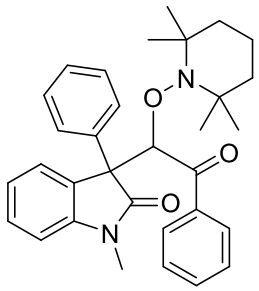


3a
minor

Pale yellow solid. 17% yield. mp, 151-153 °C; 1H NMR (500 MHz, CDCl3) δ 8.07-8.00 (m, 3H), 7.81 (d, J = 8.2 Hz, 2H), 7.52 (s, 1H), 7.44 (t, J = 7.6 Hz, 2H), 7.39 (s, 1H), 7.23 (s, 1H), 7.13 (d, J = 8.1 Hz, 2H), 6.85 (d, J = 7.7 Hz, 1H), 6.17 (s, 1H), 3.02 (s, 3H), 2.32 (s, 3H), 1.25 (d, J = 13.3 Hz, 4H), 1.14 (s, 5H), 0.85 (s, 6H), 0.63 (s, 3H); 13C NMR

(126 MHz, CDCl3) δ 201.38, 176.34, 143.78, 139.69, 137.53, 133.89, 132.67, 129.49, 129.42, 128.88, 128.79, 128.76, 128.31, 128.14, 121.87, 108.31, 85.41, 61.69, 60.12, 58.87, 41.15, 40.48, 33.43, 32.91, 26.51, 21.46, 21.13, 20.49, 17.03. IR ν_{max} (KBr, film, cm^{-1}): 3055, 3005, 2963, 2931, 1705, 1611, 1471, 1260, 1023, 800. HRMS (ESI): calcd for $C_{33}H_{39}N_2O_3^+$ [M+H]+: 511.29552, found: 511.29495.

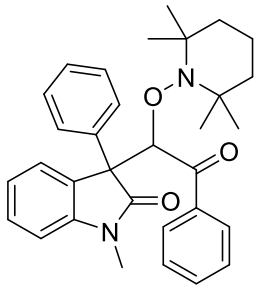
1-methyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-3-phenylindolin-2-one (major 3b)



3b
major

Yellow solid. 47% yield. mp 176-178 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.42 (d, *J* = 7.5 Hz, 1H), 7.90 (d, *J* = 7.5 Hz, 2H), 7.49 (t, *J* = 7.3 Hz, 1H), 7.37 (q, *J* = 7.7 Hz, 5H), 7.22 (t, *J* = 7.6 Hz, 1H), 7.10-7.02 (m, 3H), 6.89 (d, *J* = 7.7 Hz, 1H), 6.45 (s, 1H), 3.22 (s, 3H), 1.511.35 (m, 6H), 1.16 (t, *J* = 15.8 Hz, 3H), 0.88 (s, 3H), 0.64 (s, 3H), 0.52 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 201.2, 177.4, 144.8, 140.7, 136.5, 132.5, 130.4, 129.0, 128.29, 128.25, 128.2, 127.8, 127.7, 127.6, 122.3, 107.9, 83.4, 61.8, 60.4, 60.2, 41.2, 40.3, 33.6, 33.4, 26.8, 20.0, 17.0. IR ν_{max} (KBr, film, cm^{-1}): 3057, 3006, 2925, 1709, 1670, 1688, 1684, 1614, 1492, 1447, 1108, 753. HRMS (ESI): calcd for $C_{32}H_{37}N_2O_3^+$ $[M+H]^+$: 497.27987, found: 497.27972**.**

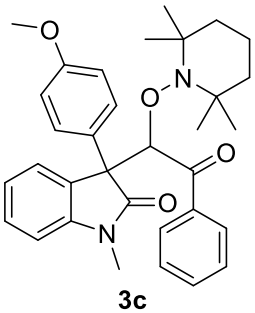
1-methyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-3-phenylindolin-2-one (minor 3b)



3b
minor

Pale yellow solid. 18% yield. mp 146-148 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.04 (d, *J* = 7.6 Hz, 3H), 7.96 (d, *J* = 7.7 Hz, 2H), 7.51 (d, *J* = 7.2 Hz, 1H), 7.43 (dd, *J* = 14.9, 7.6 Hz, 3H), 7.33 (d, *J* = 7.8 Hz, 2H), 7.24 (s, 1H), 6.85 (d, *J* = 7.7 Hz, 1H), 6.19 (s, 1H), 3.03 (s, 3H), 1.24 (d, *J* = 12.2 Hz, 4H), 1.14 (s, 5H), 0.83 (s, 6H), 0.64 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 201.2, 176.2, 143.9, 139.8, 137.0, 132.7, 129.4, 129.3, 128.9, 128.3, 128.2, 127.9, 121.9, 108.4, 85.6, 61.7, 60.2, 59.2, 47.4, 41.2, 40.6, 33.4, 32.9, 26.5, 21.5, 20.5, 17.0. IR ν_{max} (KBr, film, cm^{-1}): 3056, 3004, 2962, 2928, 1705, 1700, 1612, 1492, 1447,1024, 756. HRMS (ESI): calcd for $C_{32}H_{37}N_2O_3^+$ $[M+H]^+$: 497.27987, found: 497.27985.

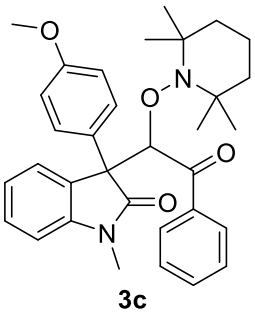
3-(4-methoxyphenyl)-1-methyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)indolin-2-one (major 3c)



3c
major

Pale yellow solid. 43% yield.mp 170-172 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.40 (d, *J* = 7.5 Hz, 1H), 7.89 (d, *J* = 7.6 Hz, 2H), 7.49 (t, *J* = 7.3 Hz, 1H), 7.37 (dd, *J* = 13.9, 6.4 Hz, 3H), 7.34-7.28 (m, 2H), 7.26 (s, 1H), 7.21 (t, *J* = 7.6 Hz, 1H), 6.88 (d, *J* = 7.7 Hz, 1H), 6.59 (d, *J* = 8.8 Hz, 2H), 6.41 (s, 1H), 3.65 (s, 3H), 3.22 (s, 3H), 1.43 (d, *J* = 27.5 Hz, 6H), 1.14 (d, *J* = 11.8 Hz, 3H), 0.88 (s, 3H), 0.65 (s, 3H), 0.52 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 201.3, 177.7, 158.9, 144.7, 140.7, 132.5, 130.3, 129.0, 128.4, 128.22, 128.19, 127.9, 122.3, 113.7, 107.8, 83.3, 61.8, 60.1, 59.6, 55.3, 41.2, 40.3, 33.6, 33.4, 26.7, 19.9, 17.0. IR ν_{max} (KBr, film, cm^{-1}): 3055, 3004, 2932, 1713, 1699, 1608, 1558, 1252, 806. HRMS (ESI): calcd for $C_{33}H_{39}N_2O_4^+$ $[M+H]^+$: 527.29043, found: 527.29041.

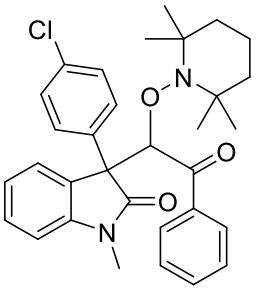
3-(4-methoxyphenyl)-1-methyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)indolin-2-one (minor 3c)



3c
minor

Yellow solid. 16% yield. mp 148-150 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.06-7.99 (m, 3H), 7.85 (d, *J* = 8.9 Hz, 2H), 7.51 (d, *J* = 7.3 Hz, 1H), 7.47-7.35 (m, 3H), 7.27 -7.19 (m, 1H), 6.86 (t, *J* = 8.0 Hz, 3H), 6.14 (s, 1H), 3.78 (s, 3H), 3.02 (s, 3H), 1.26 (d, *J* = 6.7 Hz, 4H), 1.14 (s, 5H), 0.88 (d, *J* = 4.9 Hz, 6H), 0.63 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 201.4, 176.5 , 159.3, 143.9, 139.7, 132.7, 130.1, 129.6, 129.4, 129.1, 128.7, 128.3, 128.2, 121.9, 113.6, 108.4, 85.6, 61.7, 60.2, 58.6, 55.5, 41.2, 40.6, 33.5, 32.9, 26.5, 21.5, 20.6, 17.1. IR ν_{max} (KBr, film, cm^{-1}): 2929, 1706, 1610, 1254, 805. HRMS (ESI): calcd for $C_{33}H_{39}N_2O_4^+$ $[M+H]^+$: 527.29043, found: 4527.29016.

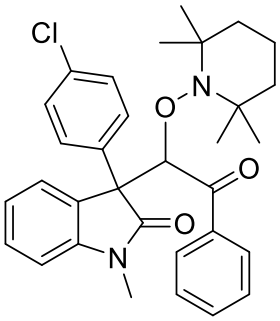
3-(4-chlorophenyl)-1-methyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)indolin-2-one (major 3d)



3d
major

Pale yellow solid. 46% yield. mp 171-173 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.38 (d, *J* = 7.5 Hz, 1H), 7.91 (d, *J* = 7.9 Hz, 2H), 7.52 (t, *J* = 7.1 Hz, 1H), 7.40 (dd, *J* = 14.4, 7.2 Hz, 3H), 7.33 (s, 1H), 7.24 (dd, *J* = 13.7, 6.0 Hz, 2H), 7.03 (d, *J* = 8.5 Hz, 2H), 6.90 (d, *J* = 7.7 Hz, 1H), 6.40 (s, 1H), 3.23 (s, 3H), 1.50 -1.34 (m, 6H), 1.21-1.05 (m, 3H), 0.87 (s, 3H), 0.63 (s, 3H), 0.51 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 201.0, 177.1, 144.7, 140.5, 135.2, 133.6, 132.8, 130.3, 129.2, 129.1, 128.5, 128.4, 128.4, 127.3, 122.5, 108.0, 83.3, 61.9, 60.2, 59.9, 41.1, 40.2, 33.5, 33.3, 26.8, 20.0, 19.9, 17.0. IR ν_{max} (KBr, film, cm^{-1}): 3055, 3004, 2930, 1713, 1700, 1610, 1492, 1471, 1096, 804. HRMS (ESI): calcd for $C_{32}H_{36}ClN_2O_3^+$ $[M+H]^+$: 531.24090, found: 531.24060.

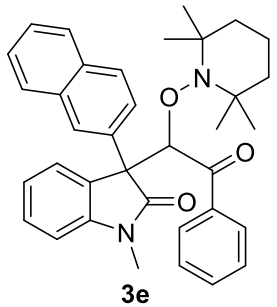
3-(4-chlorophenyl)-1-methyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)indolin-2-one (minor 3d)



3d
minor

Brown solid. 13% yield.mp 142-144 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.01 (t, *J* = 7.0 Hz, 3H), 7.90 (d, *J* = 8.7 Hz, 2H), 7.52 (d, *J* = 7.3 Hz, 1H), 7.47-7.37 (m, 3H), 7.31 (d, *J* = 8.6 Hz, 2H), 7.25 (d, *J* = 6.3 Hz, 1H), 6.87 (d, *J* = 7.7 Hz, 1H), 6.13 (s, 1H), 3.03 (s, 3H), 1.38-1.21 (m, 4H), 1.14 (s, 5H), 0.87 (d, *J* = 3.9 Hz, 6H), 0.64 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 200.9, 175.9, 143.8, 139.6, 135.7, 133.9, 132.8, 130.4, 129.4, 129.0, 128.8, 128.5, 128.4, 128.3, 122.1, 108.6, 85.4, 61.9, 60.3, 58.7, 41.2, 40.5, 33.4, 33.0, 26.6, 21.5, 20.6, 17.0. IR ν_{max} (KBr, film, cm^{-1}): 3055, 2927, 2870, 1706, 1700, 1611, 1490, 1471, 1260, 1096, 802. HRMS (ESI): calcd for $C_{32}H_{36}ClN_2O_3^+$ $[M+H]^+$: 531.24090, found: 531.24072.

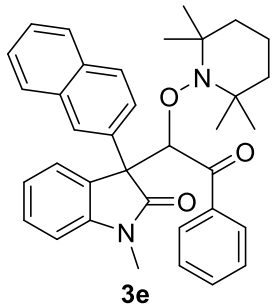
1,5-dimethyl-3-(naphthalen-2-yl)-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)indolin-2-one (major 3e)



3e
major

Yellow solid. 18% yield. mp 183-185 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.50 (d, *J* = 7.4 Hz, 1H), 7.87 (d, *J* = 7.3 Hz, 2H), 7.73 (s, 1H), 7.64 (d, *J* = 7.6 Hz, 1H), 7.53 (t, *J* = 4.0 Hz, 3H), 7.46 (d, *J* = 7.4 Hz, 1H), 7.43-7.38 (m, 1H), 7.37-7.30 (m, 4H), 6.93 (d, *J* = 7.7 Hz, 1H), 6.58 (s, 1H), 3.24 (s, 3H), 1.51 (s, 3H), 1.42 (d, *J* = 9.2 Hz, 3H), 1.18 (s, 3H), 0.89 (d, *J* = 5.7 Hz, 3H), 0.65 (s, 3H), 0.53 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 201.2, 177.4, 144.8, 140.6, 133.1, 132.7, 132.5, 130.5, 129.1 , 128.3, 128.2, 127.93, 127.87, 127.4, 127.2, 126.0, 125.9, 125.5, 122.5, 107.9, 83.4, 61.9, 60.7, 60.2, 41.2, 40.3, 33.6, 33.4, 26.8, 20.0, 17.0. IR ν_{max} (KBr, film, cm^{-1}): 3056, 2936,2925, 1713, 1610, 1471, 1260, 757. HRMS (ESI): calcd for $C_{36}H_{39}N_2O_3^+$ $[M+H]^+$: 547.29552, found: 547.29529.

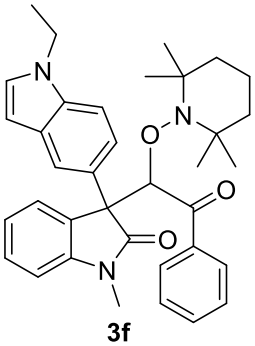
1,5-dimethyl-3-(naphthalen-2-yl)-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)indolin-2-one (minor 3e)



3e
minor

Yellow solid. 12% yield. mp 183-185 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.23 (d, *J* = 7.3 Hz, 2H), 8.15 (d, *J* = 7.4 Hz, 1H), 8.07 (d, *J* = 7.3 Hz, 2H), 7.86-7.77 (m, 3H), 7.53 (d, *J* = 7.1 Hz, 1H), 7.47-7.42 (m, 4H), 7.31 (d, *J* = 7.5 Hz, 1H), 6.88 (d, *J* = 7.7 Hz, 1H), 6.31 (s, 1H), 3.05 (s, 3H), 1.25 (s, 3H), 1.12 (d, *J* = 21.9 Hz, 6H), 0.74 (d, *J* = 12.2 Hz, 6H), 0.66 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 201.2, 178.4, 142.5, 140.7, 137.1, 134.0, 132.4, 132.0, 129.1, 129.0, 128.5, 128.2, 128.1, 127.8, 122.0, 119.1, 83.5, 61.7, 60.1, 59.3, 41.2, 40.3, 33.6, 33.3, 30.4, 21.0, 20.1, 20.0, 19.6, 17.0. IR ν_{max} (KBr, film, cm^{-1}): 3055, 3004, 2962, 2928, 1705, 1611, 1471, 1024,756. HRMS (ESI): calcd for $C_{36}H_{39}N_2O_3^+$ $[M+H]^+$: 547.29552, found: 547.29517.

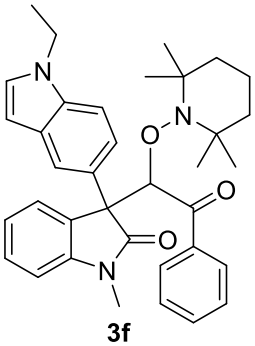
3-(1-ethyl-1H-indol-5-yl)-1-methyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)indolin-2-one (major 3f)



3f
major

Pale yellow solid. 36% yield. mp 169-171 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.50 (d, *J* = 7.4 Hz, 1H), 7.87 (d, *J* = 7.3 Hz, 2H), 7.51 (d, *J* = 1.4 Hz, 1H), 7.45 (t, *J* = 7.3 Hz, 1H), 7.35 (dt, *J* = 15.2, 7.1 Hz, 3H), 7.29 -7.24 (m, 2H), 6.96 (dd, *J* = 14.6, 5.9 Hz, 2H), 6.89 (d, *J* = 7.6 Hz, 1H), 6.56 (s, 1H), 6.23 (d, *J* = 2.9 Hz, 1H), 4.00 (q, *J* = 7.3 Hz, 2H), 3.21 (s, 3H), 1.51 (s, 3H), 1.44-1.27 (m, 6H), 1.14 (d, *J* = 11.6 Hz, 3H), 0.89 (s, 3H), 0.66 (s, 3H), 0.52 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 201.4, 178.2, 144.8, 140.9, 135.2, 132.2, 130.5, 129.0, 128.7, 128.6, 128.0, 128.0, 127.2, 127.2, 122.2, 121.3, 120.4, 109.0, 107.7, 101.6, 83.3, 61.8, 60.5, 60.1, 41.2, 41.0, 40.3, 33.6, 33.5, 26.7, 19.9, 17.0, 15.5. IR ν_{max} (KBr, film, cm^{-1}): 3054, 3004, 2971, 2932, 1709, 1699, 1609, 1471, 1372, 1025, 754. HRMS (ESI): calcd for $C_{36}H_{42}N_3O_3^+$ $[M+H]^+$: 564.32276, found: 564.32220.

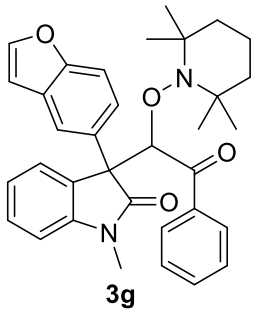
3-(1-ethyl-1H-indol-5-yl)-1-methyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)indolin-2-one (minor 3f)



3f
minor

Pale yellow solid. 11% yield. mp 159 -161 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.13 (d, *J* = 7.3 Hz, 1H), 8.06 (dd, *J* = 12.4, 4.4 Hz, 3H), 7.91 (dd, *J* = 8.8, 1.7 Hz, 1H), 7.51 (d, *J* = 7.2 Hz, 1H), 7.43 (dd, *J* = 13.6, 6.3 Hz, 2H), 7.38 (d, *J* = 6.9 Hz, 1H), 7.31 -7.27 (m, 1H), 7.24 (s, 1H), 7.07 (d, *J* = 3.1 Hz, 1H), 6.84 (d, *J* = 7.7 Hz, 1H), 6.43 (d, *J* = 3.0 Hz, 1H), 6.28 (s, 1H), 4.14 (q, *J* = 7.2 Hz, 2H), 3.02 (s, 3H), 1.41 (t, *J* = 7.3 Hz, 4H), 1.26 (s, 3H), 1.17-1.08 (m, 5H), 0.77 (d, *J* = 11.5 Hz, 6H), 0.65 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 201.9, 177.1, 143.9, 139.9, 135.4, 132.5, 130.3, 129.5, 129.0, 128.6, 128.3, 128.0, 127.6, 127.4, 122.4, 121.8, 108.9, 108.2, 101.7, 85.9, 61.7, 60.1, 59.3, 41.2, 40.6, 33.5, 32.8, 26.5, 21.5, 20.4, 17.1, 15.5. IR ν_{max} (KBr, film, cm^{-1}): 3058, 3003, 2927, 1705, 1626, 1506,1471,1260, 1079, 802. HRMS (ESI): calcd for $C_{36}H_{42}N_3O_3^+$ $[M+H]^+$: 564.32276, found: 564.32123.

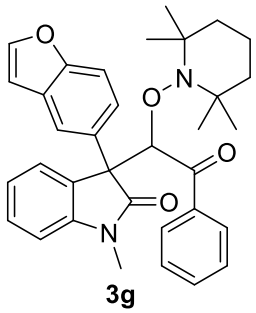
3-(benzofuran-5-yl)-1-methyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)indolin-2-one (major 3g)



3g
major

Pale yellow solid. 35% yield. mp 188-190 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.47 (d, *J* = 7.4 Hz, 1H), 7.86 (d, *J* = 7.3 Hz, 2H), 7.57 (d, *J* = 1.6 Hz, 1H), 7.50 -7.45 (m, 2H), 7.42-7.31 (m, 4H), 7.29-7.23 (m, 2H), 7.17 (d, *J* = 8.8 Hz, 1H), 6.91 (d, *J* = 7.7 Hz, 1H), 6.54 -6.48 (m, 2H), 3.23 (s, 3H), 1.51-1.35 (m, 6H), 1.17 (s, 3H), 0.89 (s, 3H), 0.66 (s, 3H), 0.53 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 201.4, 177.8, 154.3, 145.2, 144.8, 140.7, 132.5, 131.1, 130.4, 129.0, 128.3, 128.2, 128.1, 127.4, 124.2, 122.4, 120.8, 111.0, 107.9, 106.9, 100.1, 83.5, 77.4, 61.8, 60.2, 60.2, 41.2, 40.3, 33.6, 33.4, 26.8, 20.0, 17.0. IR ν_{max} (KBr, film, cm^{-1}): 2966,2938, 1709, 1691, 1611, 1466, 1372, 1078, 776. HRMS (ESI): calcd for $C_{34}H_{39}N_2O_4^+$ $[M+H]^+$: 537.27478, found: 537.27466.

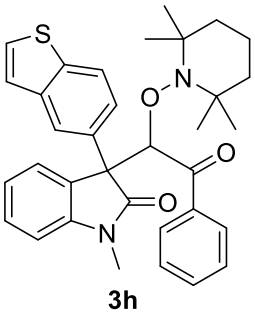
3-(benzofuran-5-yl)-1-methyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)indolin-2-one (minor 3g)



3g
minor

Pale yellow solid. 12% yield. mp 164-166 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.15-8.09 (m, 2H), 8.06 (d, *J* = 7.3 Hz, 2H), 7.98 (s, 1H), 7.59 (d, *J* = 2.1 Hz, 1H), 7.53 (s, 1H), 7.44 (ddd, *J* = 11.8, 9.0, 5.2 Hz, 5H), 6.87 (d, *J* = 7.7 Hz, 1H), 6.74 (d, *J* = 1.3 Hz, 1H), 6.23 (s, 1H), 1.24 (d, *J* = 13.7 Hz, 3H), 1.13 (d, *J* = 9.6 Hz, 6H), 0.77 (d, *J* = 8.4 Hz, 6H), 0.64 (s, 3H).^{13}C NMR (101 MHz, $CDCl_3$) δ 201.4, 176.6, 154.6, 145.5, 143.9, 139.7, 132.7, 131.6, 129.8, 129.5, 128.9, 128.3, 128.3, 127.4, 125.4, 122.0, 121.9, 110.9, 108.4, 107.1, 85.9, 61.7, 60.2, 59.1, 41.2, 40.5, 33.4, 32.8, 26.6, 21.5, 20.4, 17.0. IR ν_{max} (KBr, film, cm^{-1}): 2963, 2928, 1703, 1611, 1467, 1260, 1024,800. HRMS (ESI): calcd for $C_{34}H_{39}N_2O_4^+$ $[M+H]^+$: 537.27478, found: 537.27490.

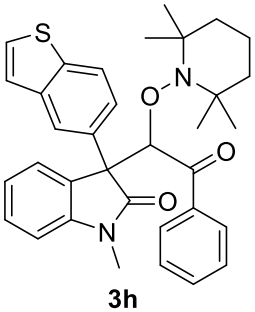
3-(benzothiophen-5-yl)-1-methyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)indolin-2-one (major 3h)



3h
major

Yellow solid. 37% yield. mp 187- 189 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.48 (d, *J* = 7.5 Hz, 1H), 7.87 (d, *J* = 7.4 Hz, 2H), 7.75 (d, *J* = 1.4 Hz, 1H), 7.55 (d, *J* = 8.6 Hz, 1H), 7.46 (d, *J* = 7.3 Hz, 1H), 7.41 (dd, *J* = 4.2, 2.5 Hz, 1H), 7.37 (d, *J* = 4.4 Hz, 1H), 7.34 (d, *J* = 7.6 Hz, 1H), 7.32-7.21 (m, 3H), 7.06 (d, *J* = 5.4 Hz, 1H), 6.92 (d, *J* = 7.7 Hz, 1H), 6.53 (s, 1H), 3.23 (s, 3H), 1.50 (s, 3H), 1.40 (t, *J* = 10.9 Hz, 3H), 1.15 (d, *J* = 17.3 Hz, 3H), 0.89 (s, 3H), 0.65 (s, 3H), 0.53 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 201.3, 177.6, 144.8, 140.7, 139.7, 139.0, 132.9, 132.5, 130.4, 129.0, 128.3, 128.2, 127.9, 126.6, 124.2, 124.0, 123.0, 122.5, 122.3, 107.9, 83.4, 77.4, 61.8, 60.4, 60.2, 41.2, 40.3, 33.6, 33.5, 26.8, 19.9, 17.0. IR ν_{max} (KBr, film, cm^{-1}): 3097, 2965, 2940, 1712, 1611, 1474, 1372, 1038, 759. HRMS (ESI): calcd for $C_{34}H_{37}N_2O_3S^+$ $[M+H]^+$: 553.25194, found: 553.25220.

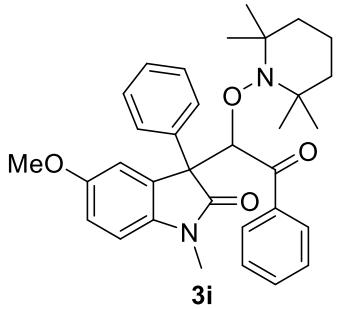
3-(benzothiophen-5-yl)-1-methyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)indolin-2-one (minor 3h)



3h
minor

Pale yellow solid. 10 % yield. mp 171-173 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.31 (d, *J* = 1.3 Hz, 1H), 8.12 (d, *J* = 7.4 Hz, 1H), 8.05 (t, *J* = 7.1 Hz, 3H), 7.85 (d, *J* = 8.7 Hz, 1H), 7.52 (d, *J* = 7.4 Hz, 1H), 7.47-7.38 (m, 5H), 7.31 (d, *J* = 5.6 Hz, 1H), 6.87 (d, *J* = 7.7 Hz, 1H), 6.26 (s, 1H), 3.04 (s, 3H), 1.24 (d, *J* = 14.2 Hz, 3H), 1.15 (s, 6H), 0.76 (s, 6H), 0.65 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 201.3, 176.4, 143.9, 139.7, 139.3, 133.3, 132.7, 129.6, 129.5, 128.9, 128.3, 128.3, 126.8, 125.2, 124.4, 124.2, 122.1, 122.1, 108.5, 85.7, 61.8, 60.2, 59.2, 41.2, 40.5, 33.4, 32.8, 26.6, 21.5, 20.4, 17.0. IR ν_{max} (KBr, film, cm^{-1}): 3054, 3004, 2930, 1703, 1611, 1471, 1371, 1024, 799. HRMS (ESI): calcd for $C_{34}H_{37}N_2O_3S^+$ $[M+H]^+$: 553.25194, found: 553.25128.

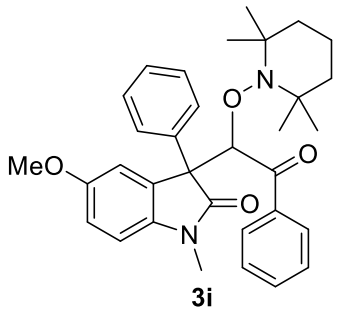
5-methoxy-1-methyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-3-phenylindolin-2-one (major 3i)



3i
major

Yellow solid. 33% yield. mp 121-123 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.19 (d, *J* = 2.3 Hz, 1H), 7.91 (d, *J* = 7.5 Hz, 2H), 7.50 (t, *J* = 7.3 Hz, 1H), 7.42-7.31 (m, 4H), 7.26 (s, 1H), 7.06 (dd, *J* = 5.2, 1.5 Hz, 3H), 6.93 (dd, *J* = 8.4, 2.5 Hz, 1H), 6.80 (d, *J* = 8.4 Hz, 1H), 6.46 (s, 1H), 3.91 (s, 3H), 3.20 (s, 3H), 1.49 (s, 3H), 1.39 (d, *J* = 13.0 Hz, 3H), 1.15 (d, *J* = 17.3 Hz, 3H), 0.88 (s, 3H), 0.66 (s, 3H), 0.54 (s, 3H)；^{13}C NMR (101 MHz, $CDCl_3$) δ 201.5, 177.1, 155.9, 140.7, 138.5, 136.7, 132.6, 129.1, 128.9, 128.3, 128.2, 127.7, 127.5, 116.8, 114.3, 108.2, 83.2, 61.9, 61.0, 60.1, 56.4, 41.1, 40.2, 33.6, 33.3, 26.8, 20.0, 19.9, 17.0. IR ν_{max} (KBr, film, cm^{-1}): 3058, 3003, 1709, 1597, 1471, 1240, 1037,807. HRMS (ESI): calcd for $C_{33}H_{39}N_2O_4^+$ $[M+H]^+$: 527.29043, found: 527.29016.

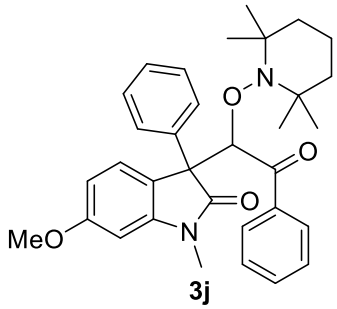
5-methoxy-1-methyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-3-phenylindolin-2-one (minor 3i)



3i
minor

Yellow solid. 7% yield. mp 159-161 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.04 (d, *J* = 7.6 Hz, 2H), 7.97 (d, *J* = 7.6 Hz, 2H), 7.71 (d, *J* = 2.3 Hz, 1H), 7.51 (d, *J* = 7.3 Hz, 1H), 7.44 (t, *J* = 7.5 Hz, 2H), 7.34 (t, *J* = 7.4 Hz, 2H), 7.28 (d, *J* = 7.1 Hz, 1H), 6.94 (dd, *J* = 8.4, 2.3 Hz, 1H), 6.75 (d, *J* = 8.5 Hz, 1H), 6.20 (s, 1H), 3.91 (s, 3H), 3.00 (s, 3H), 1.26 (s, 4H), 1.19-1.08 (m, 5H), 0.83 (d, *J* = 11.8 Hz, 7H), 0.68 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 201.2, 175.8, 155.4, 139.7, 137.6, 136.9, 132.7, 130.6, 129.5, 128.9, 128.33, 128.25, 127.8, 116.6, 112.8, 108.4, 85.4, 77.4, 61.7, 60.2, 59.5, 56.2, 41.2, 40.5, 26.6, 21.5, 20.5, 17.0. IR ν_{max} (KBr, film, cm^{-1}): 3056, 2962, 2928, 1703, 1458, 1260, 1037, 801. HRMS (ESI): calcd for $C_{33}H_{39}N_2O_4^+$ $[M+H]^+$: 527.29043, found: 527.29053.

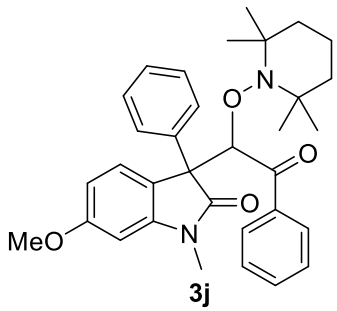
6-methoxy-1-methyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-3-phenylindolin-2-one (major 3j)



3j
major

Pale yellow solid. 46% yield. mp161-163 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.28 (d, *J* = 8.4 Hz, 1H), 7.88 (d, *J* = 7.4 Hz, 2H), 7.48 (t, *J* = 7.3 Hz, 1H), 7.37 (dd, *J* = 9.8, 5.5 Hz, 4H), 7.09-7.01 (m, 3H), 6.73 (dd, *J* = 8.4, 2.3 Hz, 1H), 6.47 (d, *J* = 2.3 Hz, 1H), 6.41 (s, 1H), 3.89 (s, 3H), 3.20 (s, 3H), 1.44 (d, *J* = 24.9 Hz, 6H), 1.17 (s, 3H), 0.90 (s, 3H), 0.65 (s, 3H), 0.58 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 201.4, 177.9, 160.3, 146.0, 140.7, 136.8, 132.5, 131.03, 129.0, 128.3, 128.2, 127.9, 127.5, 119.5, 106.0, 95.9, 83.3, 61.8, 60.1, 59.9, 55.7, 41.2, 40.3, 33.6, 33.4, 26.8, 20.1, 20.0, 17.0. IR ν_{max} (KBr, film, cm^{-1}): 3058, 3003, 2932, 1714, 1624, 1506, 1472, 1373, 1078, 738. HRMS (ESI): calcd for $C_{33}H_{39}N_2O_4^+$ $[M+H]^+$: 527.29043, found: 527.29047.

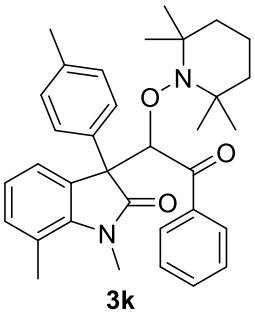
6-methoxy-1-methyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-3-phenylindolin-2-one (minor 3j)



3j
minor

Yellow solid. 14% yield. mp 82-84 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.28 (d, *J* = 8.4 Hz, 1H), 7.88 (d, *J* = 7.4 Hz, 2H), 7.48 (d, *J* = 7.4 Hz, 1H), 7.37 (dd, *J* = 9.8, 5.5 Hz, 4H), 7.10-6.99 (m, 3H), 6.73 (dd, *J* = 8.4, 2.3 Hz, 1H), 6.47 (d, *J* = 2.3 Hz, 1H), 6.41 (s, 1H), 3.89 (s, 3H), 3.20 (s, 3H), 1.44 (d, *J* = 24.9 Hz, 6H), 1.17 (s, 3H), 0.90 (s, 3H), 0.65 (s, 3H), 0.58 (s, 3H).^{13}C NMR (101 MHz, $CDCl_3$) δ 201.3, 176.7, 160.2, 145.1, 139.8, 137.6, 132.7, 129.44, 129.41, 128.9, 128.3, 128.2, 127.8, 121.0, 106.0, 96.3, 85.4, 61.7, 60.2, 58.8, 55.5, 41.2, 40.6, 33.5, 32.9, 26.5, 21.5, 20.5, 17.0. IR ν_{max} (KBr, film, cm^{-1}): 3055, 2962, 2928, 1703, 1610, 1471, 1373, 1260, 1023, 797. HRMS (ESI): calcd for $C_{33}H_{39}N_2O_4^+$ $[M+H]^+$: 527.29043, found: 527.28955.

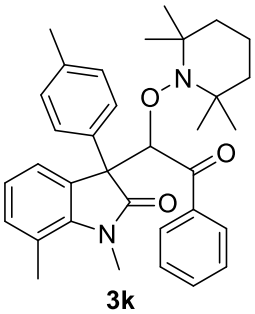
1,7-dimethyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-3-(p-tolyl)indolin-2-one (major 3k)



3k
major

Yellow solid. 46% yield. mp 185-187 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.24-8.17 (m, 1H), 7.91 (d, *J* = 7.5 Hz, 2H), 7.48 (d, *J* = 7.3 Hz, 1H), 7.38 (t, *J* = 7.6 Hz, 2H), 7.22 (d, *J* = 8.1 Hz, 2H), 7.06 (d, *J* = 4.5 Hz, 2H), 6.85 (d, *J* = 8.1 Hz, 2H), 6.42 (s, 1H), 3.50 (s, 3H), 2.60 (s, 3H), 2.16 (s, 3H), 1.46-1.35 (m, 6H), 1.17 (s, 3H), 0.91 (s, 3H), 0.65 (s, 3H), 0.58 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 201.2, 178.4, 142.5, 140.7, 137.1, 134.0, 132.4, 132.0, 129.1,129.0, 128.5, 128.2, 127.8, 122.0, 119.1, 83.5, 61.7, 60.1, 59.3, 41.2, 40.3, 33.6, 33.3, 30.4, 21.0, 20.1, 20.0, 19.6, 17.0. IR ν_{max} (KBr, film, cm^{-1}): 3055, 3003, 2929, 1703, 1596, 1458, 1362, 799. HRMS (ESI): calcd for $C_{33}H_{39}N_2O_3^+$ $[M+H]^+$: 525.31117, found: 525.31049.

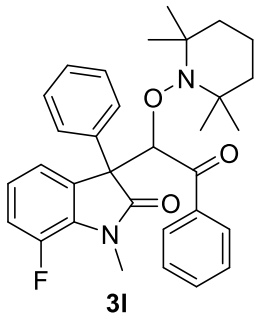
1,7-dimethyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-3-(p-tolyl)indolin-2-one (minor 3k)



3k
minor

Pale yellow solid. 18% yield. mp 158-160 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.04 (d, *J* = 7.5 Hz, 2H), 7.90 (t, *J* = 4.3 Hz, 1H), 7.78 (d, *J* = 8.2 Hz, 2H), 7.51 (d, *J* = 7.2 Hz, 1H), 7.43 (t, *J* = 7.5 Hz, 2H), 7.26 (s, 1H), 7.11 (t, *J* = 6.6 Hz, 4H), 6.18 (s, 1H), 3.28 (s, 3H), 2.53 (s, 3H), 2.31 (s, 3H), 1.26 (s, 4H), 1.13 (s, 5H), 0.85 (d, *J* = 11.9 Hz, 6H), 0.65 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 201.4, 177.1, 141.6, 139.9, 137.4, 134.2, 132.6, 132.0, 130.1, 129.4, 128.9, 128.8, 128.3, 126.9, 121.6, 119.6, 85.6, 61.7, 60.2, 58.2, 41.2, 40.6, 33.4, 33.0, 30.0, 21.5, 21.1, 20.6, 19.5, 17.1. IR ν_{max} (KBr, film, cm^{-1}): 2963, 2928, 1702, 1596, 1458, 1260, 799. HRMS (ESI): calcd for $C_{33}H_{39}N_2O_3^+$ $[M+H]^+$: 525.31117, found: 525.31134.

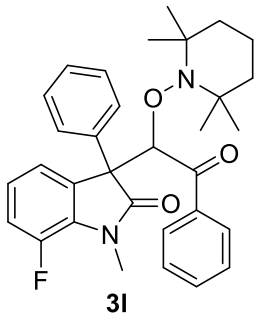
7-fluoro-1-methyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-3-phenylindolin-2-one (major 3l)



3l
major

Pale yellow solid. 40% yield. U mp 154-156 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.25 (d, *J* = 7.3 Hz, 1H), 7.90 (d, *J* = 7.6 Hz, 2H), 7.50 (t, *J* = 7.3 Hz, 1H), 7.39 (t, *J* = 7.6 Hz, 2H), 7.34-7.28 (m, 2H), 7.11 (ddd, *J* = 25.2, 10.4, 4.6 Hz, 5H), 6.45 (s, 1H), 3.45 (d, *J* = 2.9 Hz, 3H), 1.50-1.34 (m, 6H), 1.17 (dd, *J* = 22.1, 12.2 Hz, 3H), 0.94 (s, 3H), 0.64 (s, 3H), 0.55 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 201.0, 177.1, 149.3, 146.9, 140.6, 136.2, 132.6, 131.5, 131.4, 130.61, 130.58, 129.1, 128.4, 128.3, 127.7, 127.6, 126.33, 126.29, 122.5, 122.4, 116.2, 116.0, 83.5, 61.9, 60.6, 60.2, 41.2, 40.3, 33.5, 33.3, 29.4, 29.3, 20.0, 17.0. IR ν_{max} (KBr, film, cm^{-1}): 3059, 3004, 2930, 1717, 1627, 1596, 1447, 1250, 737. HRMS (ESI): calcd for $C_{32}H_{36}FN_2O_3^+$ $[M+H]^+$: 515.27045, found: 515.26990.

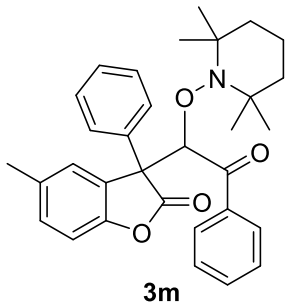
7-fluoro-1-methyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-3-phenylindolin-2-one (minor 3l)



3l
minor

Pale yellow solid. 17% yield. mp 161-163 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.25 (d, *J* = 7.3 Hz, 1H), 7.90 (d, *J* = 7.4 Hz, 2H), 7.50 (t, *J* = 7.3 Hz, 1H), 7.39 (t, *J* = 7.6 Hz, 2H), 7.34-7.29 (m, 2H), 7.10 (ddd, *J* = 25.2, 7.2, 5.6 Hz, 5H), 6.45 (s, 1H), 3.45 (d, *J* = 3.0 Hz, 3H), 1.45 (d, *J* = 24.4 Hz, 6H), 1.21-1.10 (m, 3H), 0.94 (s, 3H), 0.64 (s, 3H), 0.55 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 200.8, 176.9, 1489.0, 146.6, 140.3, 135.9, 132.4, 131.2, 131.1, 130.3, 128.8, 128.1, 128.0, 127.5, 127.4, 126.1 , 126.0, 122.24, 122.17 , 116.0 , 115.8, 83.2, 61.6, 60.4, 60.0, 40.9, 40.0, 33.3 , 33.1 , 29.14 , 29.07, 19.8, 16.7 . IR ν_{max} (KBr, film, cm^{-1}): 3059, 3004, 2931, 1717,1628, 1489, 1447, 1365, 1124, 738. HRMS (ESI): calcd for $C_{32}H_{36}FN_2O_3^+$ $[M+H]^+$: 515.27045, found: 515.26990.

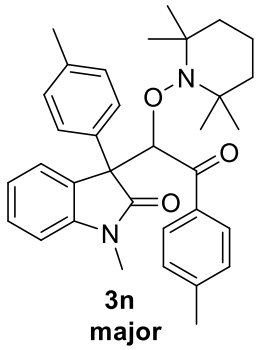
5-methyl-3-(2-oxo-2-phenyl-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-3-phenylbenzofuran-2(3H)-one (major 3m)



3m

Yellow mixture. 73% yield. mp 116-118 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.12 (s, 1H), 7.88-7.83 (m, 2H), 7.51 (t, *J* = 7.4 Hz, 1H), 7.41 (ddd, *J* = 20.5, 10.3, 5.5 Hz, 4H), 7.18-7.11 (m, 4H), 7.05 (d, *J* = 8.1 Hz, 1H), 6.39 (s, 1H), 2.44 (s, 3H), 1.42 (s, 6H), 1.17 (dd, *J* = 10.6, 5.9 Hz, 3H), 1.00 (s, 3H), 0.66 (s, 3H), 0.61 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 200.4, 177.7, 152.1, 140.2, 135.0, 133.4, 132.8, 132.1, 130.6, 129.6, 129.0, 128.6, 128.3, 128.1, 127.8, 127.0, 125.7, 110.1, 83.6, 62.2, 60.3, 59.4, 41.1, 40.3, 33.5, 33.2, 21.5, 20.4, 20.0, 17.0. IR ν_{max} (KBr, film, cm^{-1}): 3060, 3004, 2930, 1798, 1695, 1489, 1447, 1223, 811. HRMS (ESI): calcd for $C_{32}H_{36}NO_4^+$ $[M+H]^+$: 498.26389, found: 498.26346.

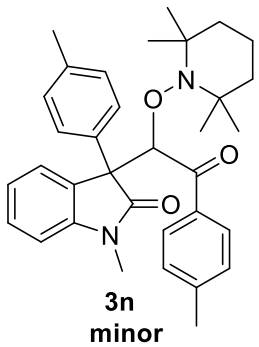
1-methyl-3-(2-oxo-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)-2-(p-tolyl)ethyl)-3-(p-tolyl)indolin-2-one (major 3n)



3n major

Pale yellow solid. 43% yield. mp 174-176 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.43 (d, *J* = 7.5 Hz, 1H), 7.86 (d, *J* = 8.1 Hz, 2H), 7.35 (t, *J* = 7.4 Hz, 1H), 7.30-7.04 (m, 5H), 6.91-6.81 (m, 3H), 6.44 (s, 1H), 3.21 (s, 3H), 2.40 (s, 3H), 2.16 (s, 3H), 1.47 (s, 3H), 1.38 (t, *J* = 12.9 Hz, 3H), 1.13 (dd, *J* = 21.1, 12.0 Hz, 3H), 0.86 (s, 3H), 0.62 (s, 3H), 0.48 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 200.1, 177.5, 144.6, 143.1, 138.0, 136.9, 133.6, 130.2, 129.2, 128.84, 128.75, 127.93, 127.89, 127.3, 122.1, 107.5, 82.8, 61.5, 60.1, 59.9, 41.0, 40.0, 33.23, 33.18, 26.5, 21.6, 20.8, 19.7, 16.8. IR ν_{max} (KBr, film, cm^{-1}): 3052, 3003, 2930, 1713, 1608, 1472, 1370, 1025, 778. HRMS (ESI): calcd for $C_{34}H_{41}N_2O_3^+$ $[M+H]^+$: 525.31117, found: 525.31085.

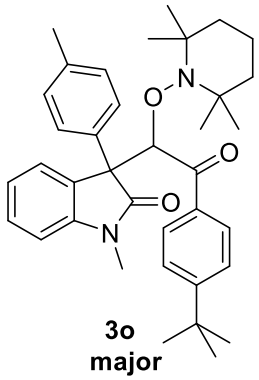
1-methyl-3-(2-oxo-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)-2-(p-tolyl)ethyl)-3-(p-tolyl)indolin-2-one (minor 3n)



3n minor

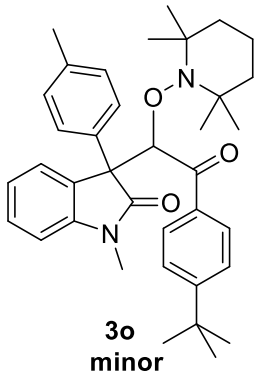
Pale yellow solid. 12% yield. mp 147-149 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.02 (d, J = 7.2 Hz, 1H), 7.94 (d, *J* = 8.2 Hz, 2H), 7.81 (d, *J* = 8.3 Hz, 2H), 7.38 (dd, *J* = 7.7, 6.7 Hz, 1H), 7.22 (t, *J* = 8.3 Hz, 3H), 7.12 (d, *J* = 8.1 Hz, 2H), 6.83 (d, *J* = 7.7 Hz, 1H), 6.14 (s, 1H), 3.01 (s, 3H), 2.40 (s, 3H), 2.31 (s, 3H), 1.24 (d, J = 12.3 Hz, 4H), 1.13 (s, 5H), 0.85 (s, 6H), 0.63 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 200.7, 176.3, 143.9, 143.3, 137.5, 137.4, 1341, 129.6, 129.1, 128.9, 128.1, 121.8, 108.3 , 85.5, 61.7, 60.1, 59.0, 41.3, 40.6, 33.5, 33.0, 26.5, 21.8, 21.5, 21.1, 20.5, 17.1; IR ν_{max} (KBr, film, cm^{-1}): 2929, 1706, 1608, 1472, 1287, 1072, 755. HRMS (ESI): calcd for $C_{34}H_{41}N_2O_3^+$ $[M+H]^+$: 525.31117, found: 525.31061.

3-(2-(4-(tert-butyl)phenyl)-2-oxo-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-1-methyl-3-(p-tolyl)indolin-2-one (major 3o)



Yellow solid. 47% yield. mp 170-172 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.41 (d, *J* = 7.4 Hz, 1H), 7.85 (d, *J* = 8.4 Hz, 2H), 7.36 (dd, *J* = 19.0, 8.0 Hz, 3H), 7.25-7.19 (m, 3H), 6.85 (dd, *J* = 12.4, 8.0 Hz, 3H), 6.43 (s, 1H), 3.21 (s, 3H), 2.15 (s, 3H), 1.48 (s, 3H), 1.43-1.29 (m, 13H), 1.14 (d, *J* = 11.8 Hz, 3H), 0.87 (s, 3H), 0.65 (s, 3H), 0.50 (s, 3H); 13C NMR (101 MHz, CDCl3) δ 200.7, 177.6, 156.0, 144.7, 138.1, 137.0, 133.6, 130.3, 129.0, 128.9, 128.1, 128.0, 127.6, 125.0, 122.2, 107.7, 83.2, 61.7 , 60.0 , 60.0 , 41.1 , 40.2 , 35.1 , 33.5 , 33.4 , 31.2 , 26.7 , 21.0 , 19.9 , 17.0. IR ν_{max} (KBr, film, cm^{-1}): 3052,3003, 2965, 2932, 1713, 1608, 1471, 1371,1025, 822, 754. HRMS (ESI): calcd for $C_{37}H_{47}N_2O_3^+$ $[M+H]^+$: 567.35812, found: 567.35767.

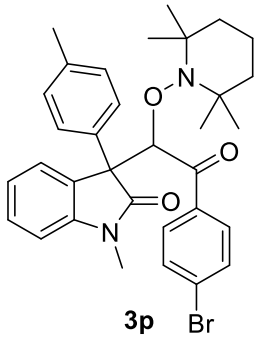
3-(2-(4-(tert-butyl)phenyl)-2-oxo-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-1-methyl-3-(p-tolyl)indolin-2-one (minor 3o)



Yellow solid. 21% yield. mp 131-133 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.03 (d, *J* = 7.3 Hz, 1H), 7.97 (d, *J* = 8.5 Hz, 2H), 7.81 (d, *J* = 8.3 Hz, 2H), 7.43 (d, *J* = 8.5 Hz, 2H), 7.38 (s, 1H), 7.23 (d, *J* = 7.6 Hz, 1H), 7.12 (d, *J* = 8.1 Hz, 2H),

6.83 (d, *J* = 7.7 Hz, 1H), 6.14 (s, 1H), 3.01 (s, 3H), 2.31 (s, 3H), 1.34 (s, 12H), 1.30-1.20 (m, 4H), 1.15 (d, J = 8.8 Hz, 5H), 0.86 (d, J = 4.6 Hz, 6H), 0.64 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 200.8, 176.4, 156.1, 143.9, 137.5, 137.14, 134.08, 129.7, 129.4, 128.9, 128.1, 125.3, 121.8, 108.3, 85.7, 61.7, 60.1, 59.0, 41.2, 40.5, 35.2, 33.5, 32.9, 31.3, 26.5, 21.5, 21.1, 20.6, 17.1. IR ν_{max} (KBr, film, cm^{-1}): 3053, 2926, 2870, 1705, 1609, 1471, 1372, 1023, 801, 755. HRMS (ESI): calcd for $C_{37}H_{47}N_2O_3^+$ $[M+H]^+$: 567.35812, found: 567.35730.

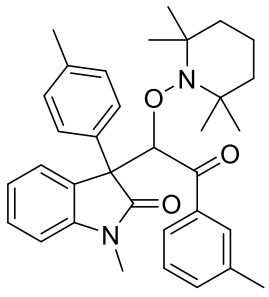
3-(2-(4-bromophenyl)-2-oxo-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-1-methyl-3-(p-tolyl)indolin-2-one (3p)



3p

Pale yellow mixture. 51% yield. mp 151-153 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.37 (d, *J* = 7.4 Hz, 1H), 7.81 (d, *J* = 8.3 Hz, 2H), 7.55 (t, *J* = 7.7 Hz, 2H), 7.36 (dd, *J* = 13.2, 5.9 Hz, 1H), 7.22 (d, *J* = 7.8 Hz, 3H), 6.87 (t, *J* = 8.0 Hz, 3H), 6.37 (s, 1H), 3.21 (s, 3H), 3.01 (s, 1H), 2.31 (s, 1H), 2.17 (s, 3H), 1.45 (s, 3H), 1.39 (s, 3H), 1.15 (d, *J* = 10.6 Hz, 3H), 0.87 (s, 3H), 0.60 (s, 3H), 0.49 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 200.2, 177.4, 144.7, 139.3, 137.3, 133.5, 131.7, 131.0, 130.7, 130.2, 129.1, 128.9, 128.7, 128.2, 127.80, 127.7, 127.5, 122.3, 108.4, 107.9, 85.5, 83.2, 61.9, 60.2, 60.1, 58.9, 41.1, 40.2, 33.5, 33.4, 26.7, 21.0, 19.9, 17.0. IR ν_{max} (KBr, film, cm^{-1}): 3054, 3003, 2929, 1713, 1609, 1471, 1372, 1071, 820, 754. HRMS (ESI): calcd for $C_{33}H_{38}BrN_2O_3^+$ $[M+H]^+$: 589.20603, found: 589.20538.

1-methyl-3-(2-oxo-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)-2-(m-tolyl)ethyl)-3-(p-tolyl)indolin-2-one （major 3q）

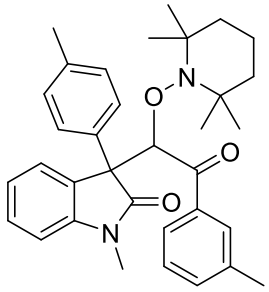


3q
major

Pale yellow solid. 43% yield. mp 149-151 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.41 (d, *J* = 7.5 Hz, 1H), 7.74 (s, 2H), 7.35 (t, *J* = 7.6 Hz, 1H), 7.30 (d, *J* = 1.6 Hz, 1H), 7.26-7.16 (m, 4H), 6.93-6.80 (m, 3H), 6.43 (s, 1H), 3.21 (s, 3H), 2.37 (s, 3H), 2.16 (s, 3H), 1.45-1.34 (m, 3H), 1.21-1.09 (m, 3H), 0.88 (s, 3H), 0.63 (s, 3H), 0.49 (s, 3H); 13C NMR (101 MHz, CDCl3) δ 201.0, 177.3, 144.5, 140.4, 137.5, 136.8, 133.4, 132.9, 130.1, 129.4, 128.7, 127.82, 127.75, 127.3, 126.0, 122.0, 107.5, 83.0, 61.5 , 59.9, 59.8, 40.9, 40.0, 33.2, 33.0, 26.4 , 21.2, 20.7, 19.6, 16.7. IR $_{vmax}$ (KBr, film, cm-

[1]): 3052, 3004, 2928, 1713, 1609, 1471, 1371, 1025, 803, 753. HRMS (ESI): calcd for $C_{34}H_{41}N_2O_3^+$ $[M+H]^+$: 525.31117, found: 525.31085.

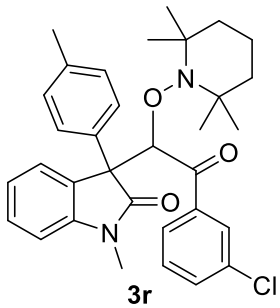
1-methyl-3-(2-oxo-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)-2-(m-tolyl)ethyl)-3-(p-tolyl)indolin-2-one （minor 3q）



3q
minor

Pale yellow solid. 12% yield. mp 49- 51 °C; 1H NMR (400 MHz, CDCl3) δ 8.02 (d, J = 7.1 Hz, 1H), 7.86 (d, J = 4.8 Hz, 2H), 7.81 (d, J = 8.3 Hz, 2H), 7.41-7.34 (m, 1H), 7.34-7.29 (m, 2H), 7.23 (d, J = 7.6 Hz, 1H), 7.13 (d, J = 8.1 Hz, 2H), 6.83 (d, J = 7.7 Hz, 1H), 6.13 (s, 1H), 3.02 (s, 3H), 2.40 (s, 3H), 2.31 (s, 3H), 1.26 (s, 4H), 1.14 (s, 5H), 0.86 (s, 6H), 0.62 (s, 3H); 13C NMR (101 MHz, CDCl3) δ 201.4, 176.4, 143.9, 139.8, 137.8, 137.5, 134.1, 133.4, 130.1, 129.7, 128.9, 128.8, 128.14, 128.08, 126.8, 121.8, 108.3, 85.8, 61.7, 60.2, 58.9, 41.3, 40.6, 33.4, 26.5, 21.6, 21.1, 17.1;IR ν_{max} (KBr, film, cm^{-1}): 2923, 1705, 1609, 1472, 1260, 1024, 802. HRMS (ESI): calcd for $C_{34}H_{41}N_2O_3^+$ $[M+H]^+$:. 525.31117, found: 525.31097.

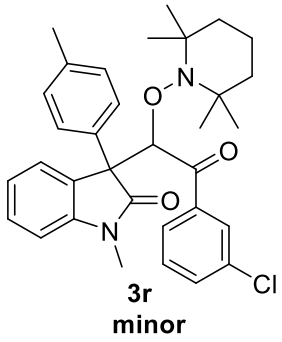
3-(2-(3-chlorophenyl)-2-oxo-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-1-methyl-3-(p-tolyl)indolin-2-one (major 3r)



3r
major

Pale yellow solid. 60% yield. mp154-156 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.36 (d, *J* = 7.5 Hz, 1H), 7.97 (s, 1H), 7.75 (d, *J* = 7.7 Hz, 1H), 7.46 (d, *J* = 8.0 Hz, 1H), 7.35 (dt, *J* = 12.0, 7.8 Hz, 2H), 7.22 (t, *J* = 7.1 Hz, 3H), 6.88 (d, *J* = 7.9 Hz, 3H), 6.35 (s, 1H), 3.21 (s, 3H), 2.18 (s, 3H), 1.53-1.36 (m, 6H), 1.24-1.08 (m, 3H), 0.88 (s, 3H), 0.62 (s, 3H), 0.51 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 200.3, 177.3, 144.7, 142.1, 137.4, 134.5, 133.4, 132.3, 130.2, 129.6, 129.3, 129.2, 128.3, 127.7, 127.5, 127.0, 122.4, 107.9, 83.6, 61.9, 60.2, 60.0, 41.1, 40.3, 33.5, 33.2, 26.7, 21.0, 20.0, 19.9, 17.0. IR ν_{max} (KBr, film, cm^{-1}): 3053, 3004, 2930, 1713, 1609, 1471, 1367, 1210, 754. HRMS (ESI): calcd for $C_{33}H_{38}ClN_2O_3^+$ $[M+H]^+$: 567.35571, found: 567.35675

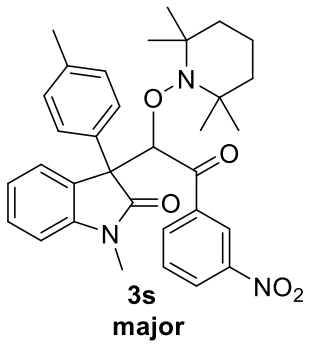
3-(2-(3-chlorophenyl)-2-oxo-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-1-methyl-3-(p-tolyl)indolin-2-one (minor 3r)



3r
minor

Pale yellow solid. 17% yield. mp 158-160 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.10 (s, 1H), 8.01 (d, *J* = 7.4 Hz, 1H), 7.92 (d, *J* = 7.8 Hz, 1H), 7.78 (d, *J* = 8.3 Hz, 2H), 7.49 (d, *J* = 8.0 Hz, 1H), 7.39 (td, *J* = 7.7, 3.2 Hz, 2H), 7.22 (d, *J* = 7.5 Hz, 1H), 7.13 (d, *J* = 8.1 Hz, 2H), 6.85 (d, *J* = 7.7 Hz, 1H), 6.06 (s, 1H), 3.04 (s, 3H), 2.31 (s, 3H), 1.34-1.22 (m, 4H), 1.16 (d, *J* = 8.6 Hz, 5H), 0.87 (t, *J* = 5.8 Hz, 6H), 0.60 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 200.5, 176.4, 143.8, 141.2, 137.7, 134.5, 133.7, 132.6, 129.8, 129.7, 129.4, 128.9, 128.8, 128.2, 127.5, 122.0, 108.4, 61.9, 60.3, 41.2, 40.5, 33.4, 32.7, 26.5, 21.6, 21.1, 20.6, 17.0. IR_{vmax} (KBr, film, cm-1): 3053, 2962, 2869, 1705, 1608, 1471, 1260, 1023, 797. HRMS (ESI): calcd for $C_{33}H_{38}ClN_2O_3^+$ $[M+H]^+$: 567.35571, found: 567.35706.

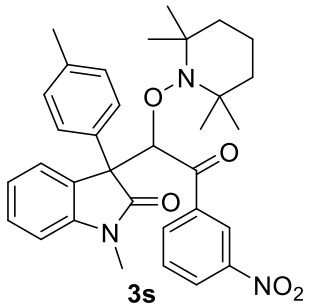
1-methyl-3-(2-(3-nitrophenyl)-2-oxo-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-3-(p-tolyl)indolin-2-one (major 3s)



3s
major

Yellow solid. 41% yield. mp 82- 84 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.34 (d, *J* = 7.4 Hz, 1H), 7.90 (td, *J* = 7.6, 1.6 Hz, 1H), 7.46-7.39 (m, 1H), 7.38-7.31 (m, 3H), 7.21 (dd, *J* = 7.6, 6.8 Hz, 1H), 7.14 (dd, *J* = 11.1, 4.1 Hz, 1H), 7.01 (dd, *J* = 10.6, 8.7 Hz, 1H), 6.88 (dd, *J* = 11.0, 8.0 Hz, 3H), 6.41 (s, 1H), 3.20 (s, 3H), 2.18 (s, 3H), 1.37 (d, *J* = 12.3 Hz, 6H), 1.23 -1.10 (m, 3H), 0.87 (s, 3H), 0.74 (s, 3H), 0.52 (s, 3H); 13C NMR (101 MHz, CDCl3) δ 199.21, 199.17, 177.3, 144.7, 137.4, 133.8, 133.7, 132.8, 131.3, 130.2, 129.1, 128.2, 127.8, 127.6, 123.74, 123.70, 122.2, 116.8, 116.6, 107.8, 85.6, 85.6, 77.4, 61.8, 60.2, 60.0, 41.2, 40.4, 33.7, 33.5, 26.7, 21.0, 19.9, 17.0. IR_{vmax} (KBr, film, cm^{-1}): 3005, 3004, 2932, 1709, 1611, 1532, 1472, 1131,754. HRMS (ESI): calcd for $C_{33}H_{38}N_3O_5^+$ $[M+H]^+$: 556.28060, found: 556.28009.

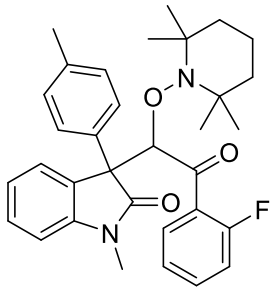
1-methyl-3-(2-(3-nitrophenyl)-2-oxo-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-3-(p-tolyl)indolin-2-one (minor 3s)



3s
minor

Pale yellow solid. 11% yield. mp 163-164 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.24 (s, 1H), 8.39 (dd, *J* = 8.1, 1.2 Hz, 1H), 8.24 (d, *J* = 7.8 Hz, 1H), 8.03 (d, *J* = 7.3 Hz, 1H), 7.76 (d, *J* = 8.3 Hz, 2H), 7.63 (s, 1H), 7.41 (td, *J* = 7.7, 1.0 Hz, 1H), 7.24 (s, 1H), 7.14 (d, *J* = 8.1 Hz, 2H), 6.87 (d, *J* = 7.7 Hz, 1H), 6.08 (s, 1H), 3.06 (s, 3H), 2.32 (s, 3H), 1.17 (s, 9H), 0.90 (d, *J* = 8.3 Hz, 6H), 0.57 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 200.5, 176.7, 148.2, 143.8, 140.9, 137.9, 134.7, 133.3, 129.6, 129.3, 129.0, 128.7, 128.6, 128.3, 126.9, 125.2, 122.1, 108.5, 86.5, 62.2, 60.4, 59.0, 41.0, 40.6, 33.3, 32.4, 26.6, 21.6, 21.1, 20.8, 17.0. IR_{vmax} (KBr, film, cm^{-1}): 2928, 1703, 1612, 1531, 1472, 1290, 1099, 797. HRMS (ESI): calcd for $C_{33}H_{38}N_3O_5^+$ $[M+H]^+$: 556.28060, found: 556.28107.

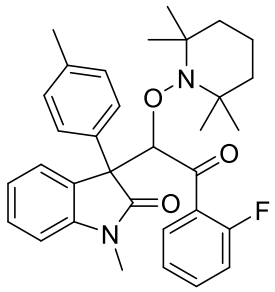
3-(2-(2-fluorophenyl)-2-oxo-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-1-methyl-3-(p-tolyl)indolin-2-one (major 3t)



3t
major

Yellow solid. 28% yield. mp159-161 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.34 (d, *J* = 7.4 Hz, 1H), 7.90 (td, *J* = 7.6, 1.6 Hz, 1H), 7.42 (ddd, J = 8.2, 4.9, 1.7 Hz, 1H), 7.40-7.30 (m, 3H), 7.25-7.18 (m, 1H), 7.14 (dd, *J* = 11.1, 4.1 Hz, 1H), 7.01 (dd, *J* = 10.6, 8.7 Hz, 1H), 6.88 (dd, J = 11.0, 8.0 Hz, 3H), 6.41 (s, 1H), 3.20 (s, 3H), 2.18 (s, 3H), 1.37 (d, *J* = 12.3 Hz, 6H), 1.24-1.10 (m, 3H), 0.87 (s, 3H), 0.74 (s, 3H), 0.52 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 199.21, 199.17, 177.3, 162.0, 159.4, 144.7, 137.4, 133.8, 133.7, 132.8, 131.3, 130.2, 129.1, 128.2, 127.8, 127.6, 123.7, 123.7, 122.2, 116.8, 116.6, 107.8, 85.59, 85.55, 77.4, 61.8, 60.2, 60.0, 41.2, 40.4, 33.7, 33.5, 26.7, 21.0, 19.9, 17.0. IR_{vmax} (KBr, film, cm^{-1}): 3004, 2930, 1713, 1609, 1472, 1271, 1025, 754, HRMS (ESI): calcd for $C_{33}H_{38}FN_2O_3^+$ $[M+H]^+$: 529.28610, found: 529.29583.

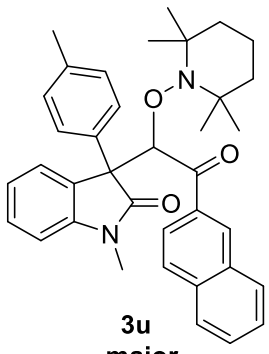
3-(2-(2-fluorophenyl)-2-oxo-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-1-methyl-3-(p-tolyl)indolin-2-one (minor 3t)



3t
minor

Brown solid. 8% yield. mp 131-133 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.04 -7.96 (m, 2H), 7.79 (d, *J* = 8.3 Hz, 2H), 7.52-7.43 (m, 1H), 7.38 (td, *J* = 7.7, 1.1 Hz, 1H), 7.21 (td, *J* = 8.6, 0.9 Hz, 2H), 7.11 (t, *J* = 8.4 Hz, 3H), 6.84 (d, *J* = 7.7 Hz, 1H), 6.17 (s, 1H), 3.03 (s, 3H), 2.31 (s, 3H), 1.27 (dd, *J* = 25.4, 12.2 Hz, 4H), 1.16 (d, *J* = 11.0 Hz, 5H), 0.83 (d, *J* = 4.8 Hz, 6H), 0.74 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 199.38, 199.35, 176.4, 162.3, 159.4, 143.9, 137.5 , 133.9 , 133.8, 131.3, 129.0, 128.9, 128.7, 128.6, 128.3, 123.81, 123.77, 121.9, 117.1, 116.9, 108.4, 88.0, 87.9, 61.77, 60.27, 59.14, 41.27, 40.71, 33.89, 33.08, 26.44, 21.4, 21.1, 20.4, 17.1.IR$_{vmax}$ (KBr, film, cm^{-1}): 3053, 2928, 1705, 1609, 1471, 1023, 755. HRMS (ESI): calcd for $C_{33}H_{38}FN_2O_3^+$ $[M+H]^+$: 529.28610, found: 529.28564.

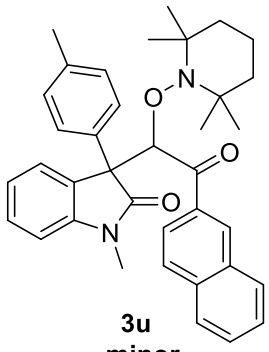
1-methyl-3-(2-(naphthalen-2-yl)-2-oxo-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-3-(p-tolyl)indolin-2-one (major 3u)



3u
major

Brown solid. 39% yield. mp 81-83 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.76 (s, 1H), 8.47 (d, *J* = 7.4 Hz, 1H), 7.98 (d, *J* = 7.6 Hz, 1H), 7.90-7.76 (m, 3H), 7.65-7.53 (m, 2H), 7.37 (td, *J* = 7.6, 0.9 Hz, 1H), 7.24 (dd, *J* = 10.2, 5.3 Hz, 3H), 6.90 (d, *J* = 7.7 Hz, 1H), 6.84 (d, *J* = 8.1 Hz, 2H), 6.62 (s, 1H), 3.23 (s, 3H), 2.13 (s, 3H), 1.59 (s, 3H), 1.51-1.32 (m, 3H), 1.11 (t, *J* = 18.1 Hz, 3H), 0.91 (s, 3H), 0.62 (s, 3H), 0.50 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 200.7, 177.7, 144.8, 137.9, 137.2, 135.4, 133.9, 132.5, 131.5, 130.4, 129.9, 129.1, 128.5, 128.2, 128.1, 127.9, 127.5, 126.7, 124.8, 122.4, 107.8, 83.3, 61.8, 60.3, 60.2, 41.2, 40.2, 33.4, 26.7, 21.0, 20.0, 19.9, 17.0. IR$_{vmax}$ (KBr, film, cm^{-1}): 3055, 3003, 2928, 1713, 1609, 1471, 1025, 748. HRMS (ESI): calcd for $C_{37}H_{41}N_2O_3^+$ $[M+H]^+$: 561.31117, found: 561.31049.

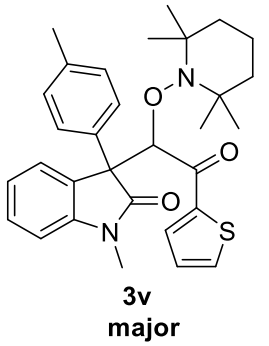
1-methyl-3-(2-(naphthalen-2-yl)-2-oxo-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)ethyl)-3-(p-tolyl)indolin-2-one (minor 3u)



3u
minor

Yellow solid. 12% yield. mp 115-117 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.76 (s, 1H), 8.06 (d, *J* = 7.3 Hz, 1H), 7.99 (d, *J* = 8.6 Hz, 2H), 7.90-7.79 (m, 4H), 7.65-7.47 (m, 2H), 7.39 (d, *J* = 7.7 Hz, 1H), 7.23 (d, *J* = 7.5 Hz, 1H), 7.15 (d, *J* = 8.1 Hz, 2H), 6.86 (d, *J* = 7.7 Hz, 1H), 6.30 (s, 1H), 3.03 (s, 3H), 2.33 (s, 3H), 1.27 (d, *J* = 16.5 Hz, 5H), 1.15 (s, 4H), 0.94 (s, 3H), 0.89 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 201.1, 176.5, 143.9, 137.6, 137.0, 135.5, 134.0, 132.6, 131.9, 130.1, 129.7, 128.91, 128.86, 128.8, 128.4, 128.1, 127.8, 126.5, 125.1, 121.9, 108.3, 85.8, 61.8, 60.2, 59.0, 41.3, 40.5, 33.4, 32.9, 26.5, 21.6, 21.1, 20.6, 17.1. IRνmax (KBr, film, cm^{-1}): 3055, 2926, 1703, 1627, 1471, 1023, 807. HRMS (ESI): calcd for $C_{37}H_{41}N_2O_3^+$ $[M+H]^+$: 561.31117, found: 561.31042.

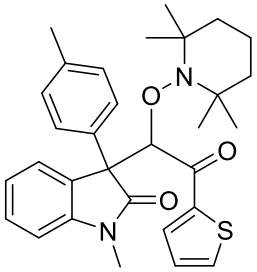
1-methyl-3-(2-oxo-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)-2-(thiophen-2-yl)ethyl)-3-(p-tolyl)indolin-2-one (major 3v)



3v
major

Yellow solid. 44% yield. mp 158-160 °C; ^{1}H NMR (400 MHz, CDCl3) δ 8.40 (d, *J* = 7.4 Hz, 1H), 7.96 (d, *J* = 3.2 Hz, 1H), 7.66-7.57 (m, 1H), 7.35 (td, *J* = 7.7, 0.9 Hz, 1H), 7.28 (d, *J* = 8.3 Hz, 2H), 7.21 (t, *J* = 7.6 Hz, 1H), 7.15-7.08 (m, 1H), 6.89 (t, *J* = 7.8 Hz, 3H), 6.28 (s, 1H), 3.21 (s, 3H), 2.17 (s, 3H), 1.50 (s, 3H), 1.36 (d, *J* = 12.1 Hz, 3H), 1.20-1.03 (m, 3H), 0.87 (s, 3H), 0.65 (s, 3H), 0.46 (s, 3H); 13C NMR (101 MHz, CDCl3) δ 191.9, 177.5, 148.1, 144.8, 137.2, 134.6, 133.8, 133.5, 130.4, 129.1, 128.1, 128.1, 127.9, 127.4, 122.4, 107.8, 84.5, 77.4, 61.7, 60.1, 60.0, 41.1, 40.2, 33.5, 33.2, 26.7, 21.3, 19.9, 19.9, 17.0. IR_{vmax} (KBr, film, cm^{-1}): 3055, 3003, 1713,1609, 1471, 1371, 738. HRMS (ESI): calcd for $C_{31}H_{37}N_2O_3S^+$ $[M+H]^+$: 517.25194, found: 517.25153.

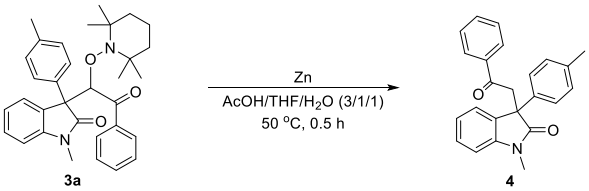
1-methyl-3-(2-oxo-1-((2,2,6,6-tetramethylpiperidin-1-yl)oxy)-2-(thiophen-2-yl)ethyl)-3-(p-tolyl)indolin-2-one (minor 3v)



3v
minor

Brown solid. 8% yield. mp 83-85 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.00 (d, *J* = 7.4 Hz, 1H), 7.93 (d, *J* = 3.0 Hz, 1H), 7.81 (d, *J* = 8.3 Hz, 2H), 7.62 (d, *J* = 4.9 Hz, 1H), 7.36 (d, *J* = 7.7 Hz, 1H), 7.21 (d, *J* = 6.9 Hz, 1H), 7.17 -7.08 (m, 3H), 6.83 (d, *J* = 7.7 Hz, 1H), 5.91 (s, 1H), 3.03 (s, 3H), 2.32 (s, 3H), 1.40 -1.20 (m, 4H), 1.14 (s, 5H), 0.86 (d, *J* = 10.3 Hz, 6H), 0.65 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 192.6, 176.3, 147.0, 143.9, 137.6, 134.5, 134.0, 128.9, 128.7, 128.1, 128.1, 121.8, 108.3, 87.5, 77.4, 61.7, 60.1, 58.6, 41.2, 40.5, 33.2, 32.9, 26.5, 21.6, 21.1, 20.6, 17.1. IR $_{vmax}$ (KBr, film, cm^{-1}): 3053, 2962, 1705, 1611, 1471, 1372, 1260, 808. HRMS (ESI): calcd for $C_{31}H_{37}N_2O_3S^+$ $[M+H]^+$: 517.25194, found: 517.25153.

3.3 Chemical transformation of alkoxyamine 3a[3]



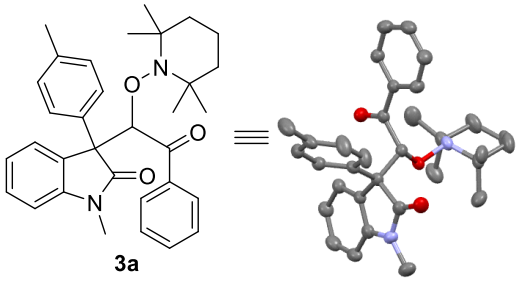
To a solution of 11 (0.16 mmol) in acetic acid (0.6 mL), water (0.3mL), and THF (0.2mL) was added Zn powder (40 mmol), which was previously activated. The suspension was allowed to react for 0.5 h at 50 °C, then the mixture was filtered through a pad of silica gel. The filtrate was directly subjected to flash column chromatography on silica gel to afford the desired product **4**.

1-methyl-3-(2-oxo-2-phenylethyl)-3-(p-tolyl)indolin-2-one (4) [4]

Pale yellow solid. 62% yield. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.98-7.71 (m, 2H), 7.50 (d, *J* = 7.4 Hz, 1H), 7.39 (t, *J* = 7.7 Hz, 2H), 7.31 (dd, *J* = 11.0, 4.6 Hz, 3H), 7.27-7.22 (m, 1H), 7.11 (d, *J* = 8.1 Hz, 2H), 7.03 (td, *J* = 7.6, 0.7 Hz, 1H), 6.93 (d, *J* = 7.8 Hz, 1H), 4.11 (q, *J* = 18.0 Hz, 2H), 3.28 (s, 3H), 2.30 (s, 3H); 13C NMR (101 MHz, CDCl3) δ 196.0, 178.9, 144.9, 137.5, 136.7, 136.5, 133.3, 131.9, 129.5, 128.7, 128.5, 128.1, 126.8, 124.2, 122.3, 108.5, 52.9, 47.1, 26.9, 21.1.

4. X-ray cr ystallographic data

X-ray crystallography of compound 3a



”

Table 1. Crystal data and structure refinement for sa5171.

Identification code	sa5171
Empirical formula	C33 H39 N2 O3
Formula weight	511.66
Temperature	173.15 K
Wavelength	0.71073 Å
Crystal system	Monoclinic
Space group	P 1 21/n 1
Unit cell dimensions	a = 9.683(3) Å α= 90°.
	b = 21.363(6) Å β= 109.097(3)°.
	c = 14.386(4) Å γ = 90°.
Volume	2812.1(14) Å3
Z	4
Density (calculated)	1.209 Mg/m3
Absorption coefficient	0.077 mm-1
F(000)	1100
Crystal size	0.43 x 0.37 x 0.32 mm3
Theta range for data collection	2.240 to 27.476°.
Index ranges	-12<=h<=12, -27<=k<=27, -18<=l<=18
Reflections collected	18942
Independent reflections	6381 [R(int) = 0.0461]
Completeness to theta = 25.242°	99.7 %
Absorption correction	Semi-empirical from equivalents
Max. and min. transmission	1.0000 and 0.76001

Refinement method Full-matrix least-squares on F2

Data / restraints / parameters 6381 / 0 / 349

Goodness-of-fit on F2 1.178

Final R indices [I>2sigma(I)] R1 = 0.0748, wR2 = 0.1671

R indices (all data) R1 = 0.0826, wR2 = 0.1726

Extinction coefficient n/a

Largest diff. peak and hole 0.221 and -0.726 e.Å-3

Table 2. Atomic coordinates (x 104) and equivalent isotropic displacement parameters (Å2x 103) for sa5171. U(eq) is defined as one third of the trace of the orthogonalized Uij tensor.

	x	y	z	U(eq)
O1	2336(2)	5200(1)	5635(1)	42(1)
O2	6375(2)	5352(1)	9031(1)	39(1)
O3	4700(2)	6150(1)	7328(1)	29(1)
N1	1096(2)	5631(1)	6596(1)	34(1)
N2	5807(2)	6508(1)	7065(1)	32(1)
C1	1418(2)	5794(1)	7591(2)	32(1)
C2	528(2)	6107(1)	8014(2)	38(1)
C3	1101(3)	6247(1)	9013(2)	42(1)
C4	2506(3)	6070(1)	9558(2)	39(1)
C5	3379(2)	5738(1)	9122(2)	34(1)
C6	2824(2)	5595(1)	8132(1)	28(1)
C7	3457(2)	5232(1)	7449(1)	28(1)
C8	2253(2)	5344(1)	6438(2)	33(1)
C9	-218(3)	5823(1)	5810(2)	44(1)
C10	3597(2)	4525(1)	7658(1)	29(1)
C11	3589(2)	4278(1)	8547(1)	32(1)
C12	3787(2)	3640(1)	8734(2)	37(1)
C13	4002(2)	3230(1)	8050(2)	40(1)

C14	3979(3)	3477(1)	7155(2)	54(1)
C15	3786(3)	4114(1)	6960(2)	46(1)
C16	4268(3)	2543(1)	8278(2)	56(1)
C17	4898(2)	5486(1)	7348(1)	28(1)
C18	6266(2)	5256(1)	8176(1)	29(1)
C19	7446(2)	4913(1)	7931(1)	30(1)
C20	8697(2)	4752(1)	8708(2)	36(1)
C21	9827(3)	4430(1)	8539(2)	43(1)
C22	9730(3)	4257(1)	7593(2)	41(1)
C23	8506(3)	4412(1)	6814(2)	43(1)
C24	7367(2)	4737(1)	6980(2)	38(1)
C25	6213(3)	7022(1)	7816(2)	41(1)
C26	7227(3)	7476(1)	7521(2)	53(1)
C27	6594(4)	7716(1)	6478(2)	59(1)
C28	6229(3)	7160(1)	5787(2)	53(1)
C29	5162(3)	6689(1)	6000(2)	39(1)
C30	7087(3)	6719(1)	8794(2)	53(1)
C31	4919(3)	7378(1)	7964(2)	54(1)
C32	3601(3)	6952(1)	5703(2)	52(1)
C33	5133(3)	6110(1)	5367(2)	44(1)

Table 3. Bond lengths [Å] and angles [°] for sa5171.

O1-C8	1.224(2)
O2-C18	1.217(2)
O3-N2	1.464(2)
O3-C17	1.430(2)
N1-C1	1.407(3)
N1-C8	1.359(3)
N1-C9	1.457(3)

N2-H2 1.0000

N2-C25 1.500(3)

N2-C29 1.504(3)

C1-C2 1.379(3)

C1-C6 1.395(3)

C2-H2A 0.9500

C2-C3 1.393(3)

C3-H3 0.9500

C3-C4 1.382(3)

C4-H4 0.9500

C4-C5 1.400(3)

C5-H5 0.9500

C5-C6 1.383(3)

C6-C7 1.529(3)

C7-C8 1.556(3)

C7-C10 1.539(3)

C7-C17 1.547(3)

C9-H9A 0.9800

C9-H9B 0.9800

C9-H9C 0.9800

C10-C11 1.386(3)

C10-C15 1.389(3)

C11-H11 0.9500

C11-C12 1.391(3)

C12-H12 0.9500

C12-C13 1.383(3)

C13-C14 1.384(3)

C13-C16 1.508(3)

C14-H14 0.9500

C14-C15 1.390(3)

C15-H15	0.9500
C16-H16A	0.9800
C16-H16B	0.9800
C16-H16C	0.9800
C17-H17	1.0000
C17-C18	1.544(3)
C18-C19	1.493(3)
C19-C20	1.396(3)
C19-C24	1.397(3)
C20-H20	0.9500
C20-C21	1.380(3)
C21-H21	0.9500
C21-C22	1.384(3)
C22-H22	0.9500
C22-C23	1.379(3)
C23-H23	0.9500
C23-C24	1.389(3)
C24-H24	0.9500
C25-C26	1.534(3)
C25-C30	1.528(4)
C25-C31	1.540(3)
C26-H26A	0.9900
C26-H26B	0.9900
C26-C27	1.513(4)
C27-H27A	0.9900
C27-H27B	0.9900
C27-C28	1.516(4)
C28-H28A	0.9900
C28-H28B	0.9900
C28-C29	1.542(3)

C29-C32	1.536(3)
C29-C33	1.530(3)
C30-H30A	0.9800
C30-H30B	0.9800
C30-H30C	0.9800
C31-H31A	0.9800
C31-H31B	0.9800
C31-H31C	0.9800
C32-H32A	0.9800
C32-H32B	0.9800
C32-H32C	0.9800
C33-H33A	0.9800
C33-H33B	0.9800
C33-H33C	0.9800

C17-O3-N2	114.74(14)
C1-N1-C9	124.53(18)
C8-N1-C1	111.17(17)
C8-N1-C9	123.75(18)
O3-N2-H2	109.0
O3-N2-C25	103.74(14)
O3-N2-C29	107.58(16)
C25-N2-H2	109.0
C25-N2-C29	117.99(17)
C29-N2-H2	109.0
C2-C1-N1	127.3(2)
C2-C1-C6	122.6(2)
C6-C1-N1	110.05(17)
C1-C2-H2A	121.2
C1-C2-C3	117.6(2)

C3-C2-H2A	121.2
C2-C3-H3	119.6
C4-C3-C2	120.8(2)
C4-C3-H3	119.6
C3-C4-H4	119.6
C3-C4-C5	120.8(2)
C5-C4-H4	119.6
C4-C5-H5	120.5
C6-C5-C4	119.0(2)
C6-C5-H5	120.5
C1-C6-C7	108.65(17)
C5-C6-C1	119.14(18)
C5-C6-C7	132.20(19)
C6-C7-C8	100.78(16)
C6-C7-C10	113.62(15)
C6-C7-C17	116.45(16)
C10-C7-C8	108.95(15)
C10-C7-C17	109.81(16)
C17-C7-C8	106.38(15)
O1-C8-N1	125.66(19)
O1-C8-C7	125.66(19)
N1-C8-C7	108.67(16)
N1-C9-H9A	109.5
N1-C9-H9B	109.5
N1-C9-H9C	109.5
H9A-C9-H9B	109.5
H9A-C9-H9C	109.5
H9B-C9-H9C	109.5
C11-C10-C7	121.85(17)
C11-C10-C15	117.96(19)

C15-C10-C7 120.15(18)

C10-C11-H11 119.7

C10-C11-C12 120.62(19)

C12-C11-H11 119.7

C11-C12-H12 119.1

C13-C12-C11 121.8(2)

C13-C12-H12 119.1

C12-C13-C14 117.4(2)

C12-C13-C16 121.1(2)

C14-C13-C16 121.6(2)

C13-C14-H14 119.3

C13-C14-C15 121.4(2)

C15-C14-H14 119.3

C10-C15-C14 120.9(2)

C10-C15-H15 119.6

C14-C15-H15 119.6

C13-C16-H16A 109.5

C13-C16-H16B 109.5

C13-C16-H16C 109.5

H16A-C16-H16B 109.5

H16A-C16-H16C 109.5

H16B-C16-H16C 109.5

O3-C17-C7 103.36(15)

O3-C17-H17 108.8

O3-C17-C18 114.05(16)

C7-C17-H17 108.8

C18-C17-C7 112.86(15)

C18-C17-H17 108.8

O2-C18-C17 119.65(18)

O2-C18-C19 120.09(18)

C19-C18-C17 120.26(16)

C20-C19-C18 117.54(18)

C20-C19-C24 118.24(19)

C24-C19-C18 124.22(18)

C19-C20-H20 119.6

C21-C20-C19 120.9(2)

C21-C20-H20 119.6

C20-C21-H21 119.9

C20-C21-C22 120.2(2)

C22-C21-H21 119.9

C21-C22-H22 120.0

C23-C22-C21 120.0(2)

C23-C22-H22 120.0

C22-C23-H23 120.0

C22-C23-C24 120.0(2)

C24-C23-H23 120.0

C19-C24-H24 119.6

C23-C24-C19 120.7(2)

C23-C24-H24 119.6

N2-C25-C26 107.69(17)

N2-C25-C30 106.79(18)

N2-C25-C31 115.4(2)

C26-C25-C31 110.5(2)

C30-C25-C26 108.1(2)

C30-C25-C31 108.2(2)

C25-C26-H26A 108.9

C25-C26-H26B 108.9

H26A-C26-H26B 107.7

C27-C26-C25 113.6(2)

C27-C26-H26A 108.9

C27-C26-H26B 108.9

C26-C27-H27A 110.0

C26-C27-H27B 110.0

C26-C27-C28 108.4(2)

H27A-C27-H27B 108.4

C28-C27-H27A 110.0

C28-C27-H27B 110.0

C27-C28-H28A 108.7

C27-C28-H28B 108.7

C27-C28-C29 114.16(19)

H28A-C28-H28B 107.6

C29-C28-H28A 108.7

C29-C28-H28B 108.7

N2-C29-C28 106.7(2)

N2-C29-C32 114.84(18)

N2-C29-C33 108.59(17)

C32-C29-C28 111.7(2)

C33-C29-C28 106.98(18)

C33-C29-C32 107.8(2)

C25-C30-H30A 109.5

C25-C30-H30B 109.5

C25-C30-H30C 109.5

H30A-C30-H30B 109.5

H30A-C30-H30C 109.5

H30B-C30-H30C 109.5

C25-C31-H31A 109.5

C25-C31-H31B 109.5

C25-C31-H31C 109.5

H31A-C31-H31B 109.5

H31A-C31-H31C 109.5

H31B-C31-H31C	109.5
C29-C32-H32A	109.5
C29-C32-H32B	109.5
C29-C32-H32C	109.5
H32A-C32-H32B	109.5
H32A-C32-H32C	109.5
H32B-C32-H32C	109.5
C29-C33-H33A	109.5
C29-C33-H33B	109.5
C29-C33-H33C	109.5
H33A-C33-H33B	109.5
H33A-C33-H33C	109.5
H33B-C33-H33C	109.5

Symmetry transformations used to generate equivalent atoms:

Table 4. Anisotropic displacement parameters (Å2x 103) for sa5171. The anisotropic displacement factor exponent takes the form: -22[h2 a*2U11 + ... + 2 h k a* b* U12]

	U11	U22	U33	U23	U13	U12
O1	42(1)	52(1)	29(1)	-6(1)	8(1)	-4(1)
O2	38(1)	50(1)	28(1)	0(1)	11(1)	5(1)
O3	31(1)	27(1)	35(1)	2(1)	16(1)	-1(1)
N1	29(1)	35(1)	34(1)	2(1)	5(1)	0(1)
N2	35(1)	30(1)	37(1)	3(1)	19(1)	-1(1)
C1	34(1)	26(1)	37(1)	1(1)	14(1)	-4(1)
C2	34(1)	30(1)	52(1)	3(1)	17(1)	3(1)
C3	44(1)	38(1)	53(1)	-4(1)	27(1)	3(1)
C4	43(1)	39(1)	39(1)	-7(1)	18(1)	-1(1)

C5 37(1) 34(1) 32(1) -1(1)14(1) -1(1)

C6 30(1) 25(1) 32(1) 0(1) 13(1) -2(1)

C7 29(1) 29(1) 26(1) -3(1)10(1) -3(1)

C8 32(1) 31(1) 33(1) -1(1)9(1) -6(1)

C9 35(1) 42(1) 45(1) 1(1) 0(1) 1(1)

C10 28(1) 28(1) 33(1) -3(1)12(1) -2(1)

C11 32(1) 32(1) 32(1) -2(1)10(1) 0(1)

C12 37(1) 35(1) 40(1) 6(1) 14(1) 0(1)

C13 36(1) 32(1) 61(1) 0(1) 27(1) -1(1)

C14 83(2) 32(1) 64(2) -9(1)49(2) -2(1)

C15 69(2) 36(1) 44(1) -3(1)35(1) -4(1)

C16 62(2) 33(1) 88(2) 4(1) 45(2) 4(1)

C17 30(1) 29(1) 26(1) 0(1) 11(1) 1(1)

C18 29(1) 30(1) 29(1) 0(1) 11(1) -4(1)

C19 30(1) 28(1) 32(1) 3(1) 11(1) -2(1)

C20 34(1) 40(1) 34(1) 2(1) 9(1) 1(1)

C21 33(1) 47(1) 46(1) 4(1) 8(1) 5(1)

C22 35(1) 38(1) 54(1) 1(1) 18(1) 4(1)

C23 44(1) 48(1) 42(1) -1(1)19(1) 7(1)

C24 34(1) 44(1) 33(1) 1(1) 9(1) 7(1)

C25 47(1) 35(1) 47(1) -6(1)25(1) -9(1)

C26 63(2) 38(1) 70(2) -8(1)38(1) -16(1)

C27 81(2) 36(1) 80(2) 8(1) 52(2) -6(1)

C28 75(2) 40(1) 58(2) 10(1) 44(1) 1(1)

C29 51(1) 36(1) 38(1) 8(1) 23(1) 5(1)

C30 63(2) 53(2) 43(1) -13(1) 16(1) -20(1)

C31 69(2) 41(1) 69(2) -14(1) 45(2) -5(1)

C32 59(2) 50(1) 49(1) 14(1) 17(1) 17(1)

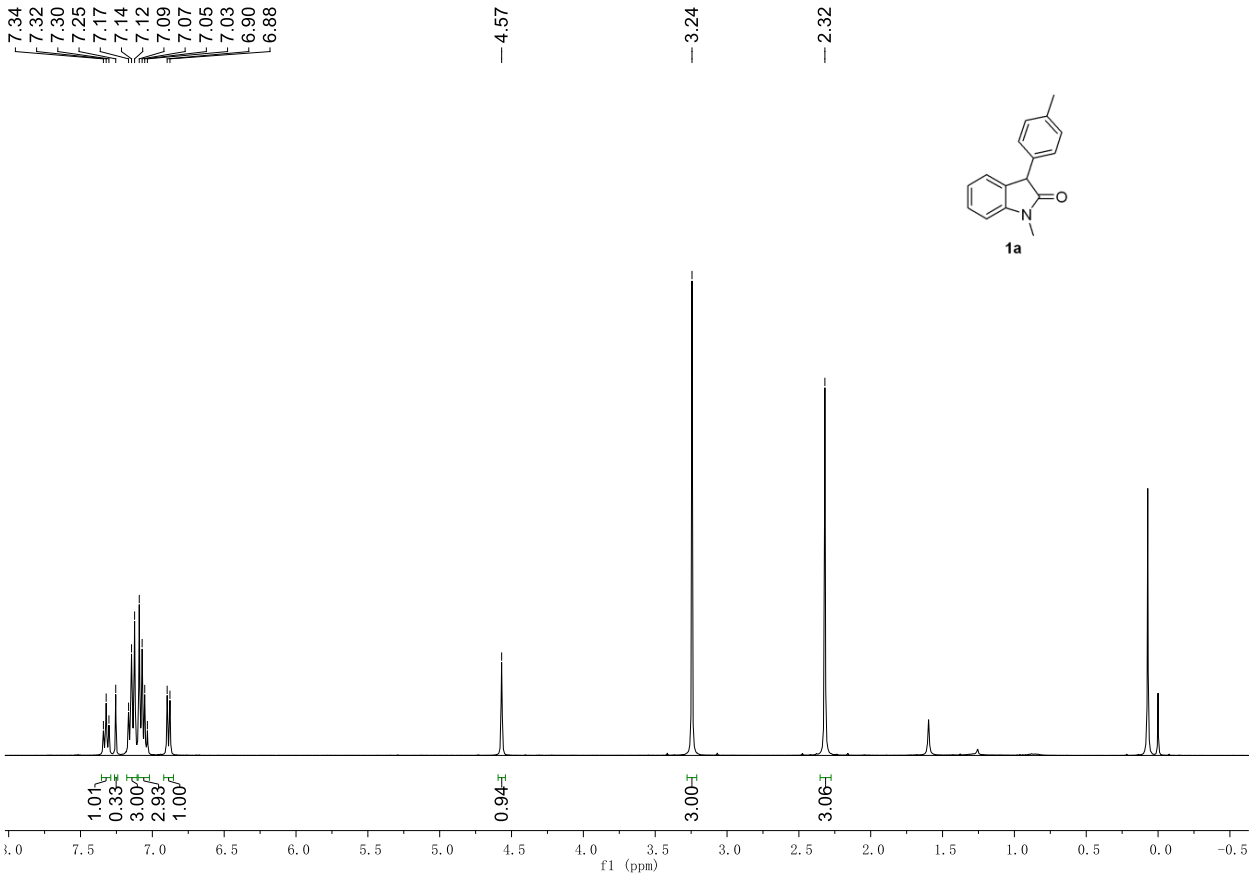
C33 61(2) 46(1) 32(1) 4(1) 23(1) 3(1)

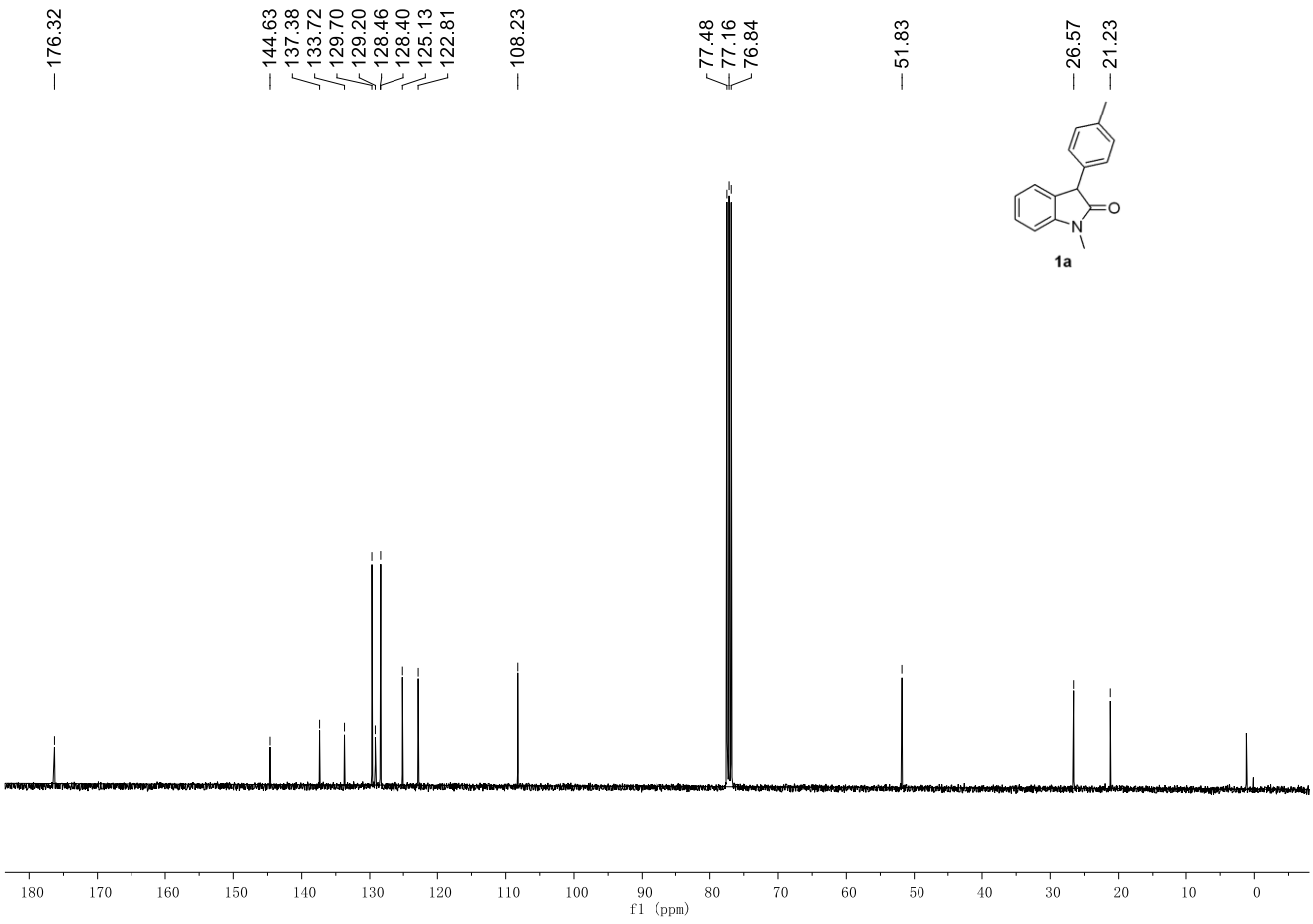
Table 5. Hydrogen coordinates (x 104) and isotropic displacement parameters (Å2x 10 3) for sa5171.

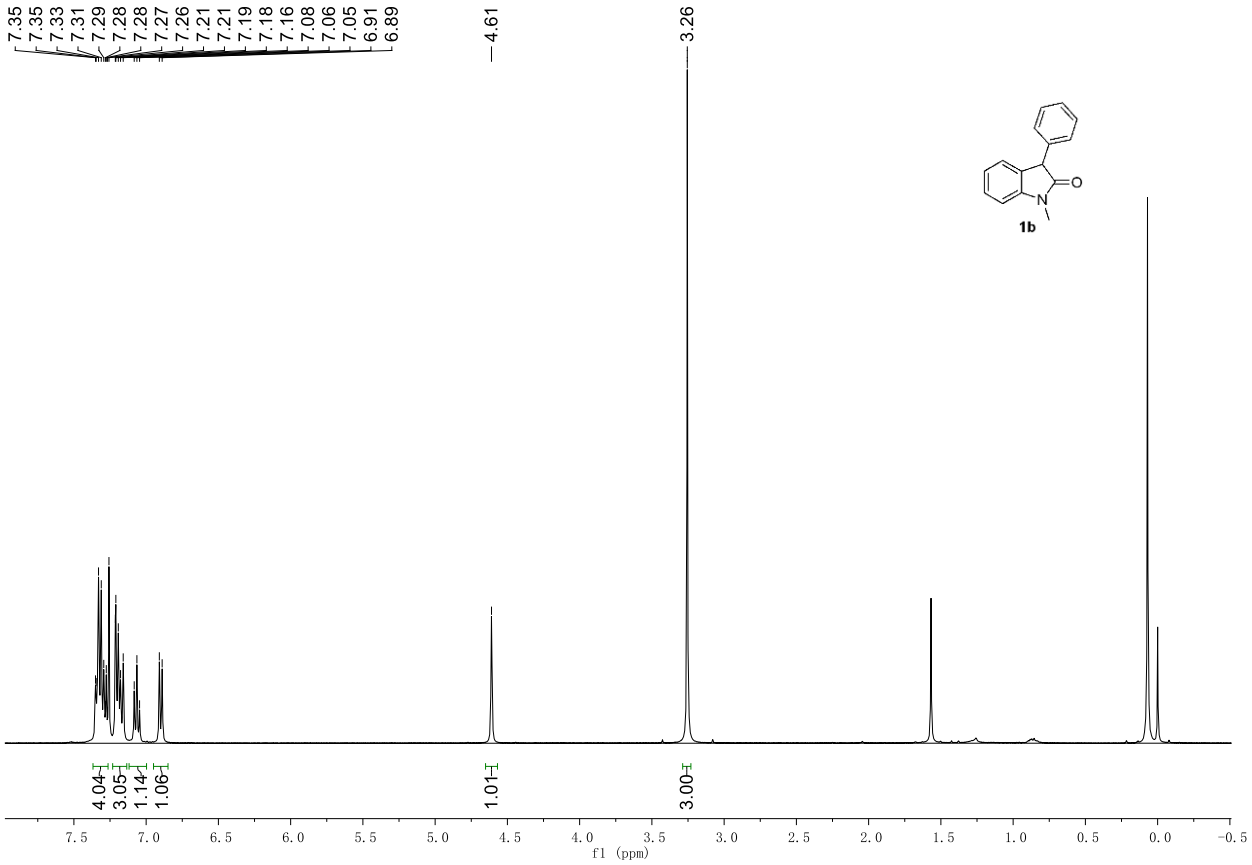
	x	y	z	U(eq)
H2	6680	6236	7149	38
H2A	-442	6222	7637	46
H3	519	6467	9323	51
H4	2883	6175	10236	47
H5	4340	5612	9502	41
H9A	-1079	5646	5929	66
H9B	-173	5670	5178	66
H9C	-286	6280	5794	66
H11	3448	4547	9034	38
H12	3775	3481	9348	44
H14	4099	3205	6664	64
H15	3783	4271	6342	55
H16A	5306	2449	8410	84
H16B	3678	2295	7715	84
H16C	3995	2438	8858	84
H17	4968	5349	6701	33
H20	8771	4865	9361	43
H21	10675	4327	9075	52
H22	10507	4032	7480	50
H23	8441	4295	6164	52
H24	6526	4842	6440	45
H26A	7443	7837	7979	63
H26B	8163	7261	7595	63
H27A	7312	7990	6319	71

H27B	5701	7964	6406	71
H28A	7146	6938	5832	63
H28B	5796	7315	5105	63
H30A	6430	6471	9041	80
H30B	7550	7046	9272	80
H30C	7842	6447	8696	80
H31A	4445	7635	7383	81
H31B	5275	7648	8545	81
H31C	4212	7078	8060	81
H32A	3018	6699	6007	79
H32B	3157	6937	4986	79
H32C	3632	7386	5928	79
H33A	6082	5898	5605	67
H33B	4933	6238	4681	67
H33C	4366	5824	5410	67

5. NMR spectra



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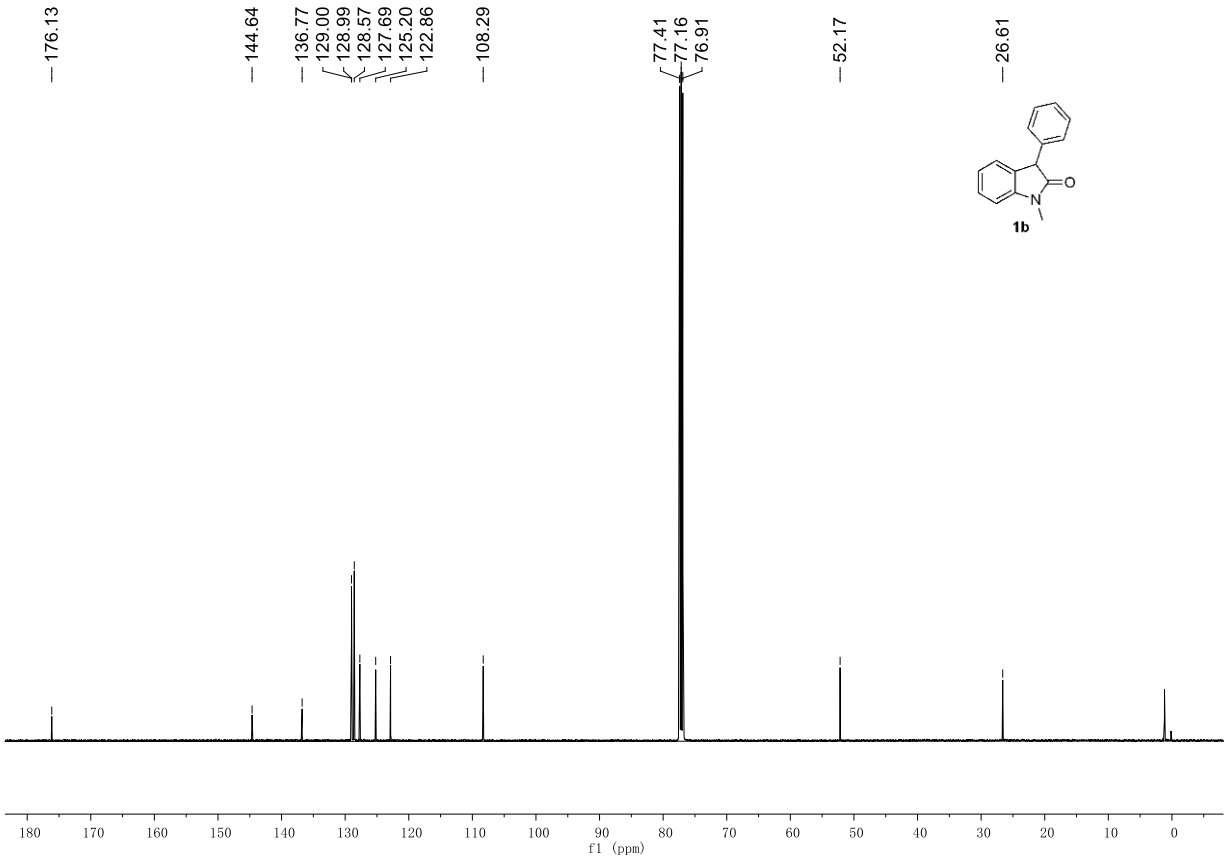
7.18
7.16
7.08
7.06
7.05
6.91
6.89
4.61
3.26
1b
4.04
3.05
1.14
1.06
1.01
3.00
f1 (ppm)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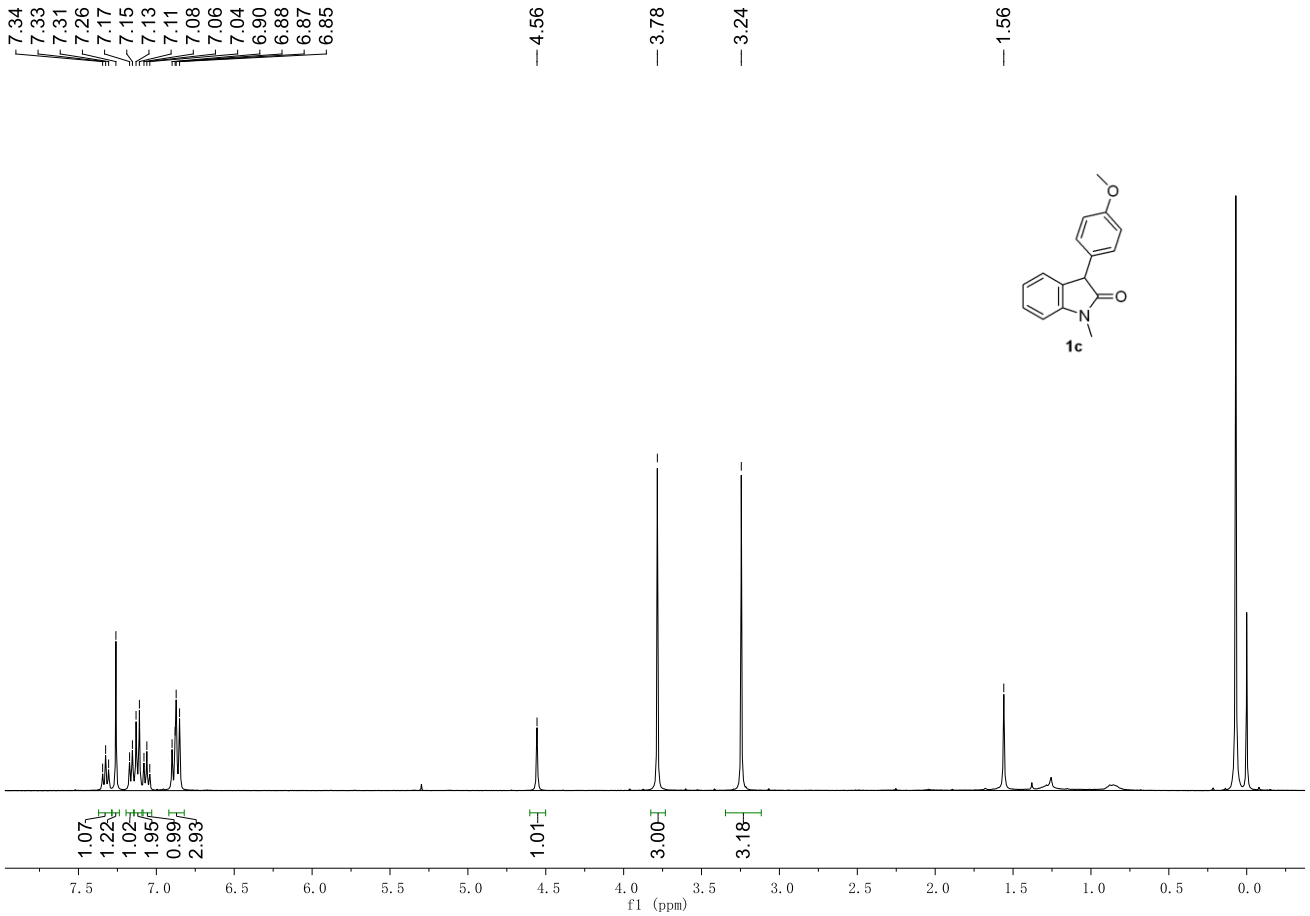
76.91
52.17
26.61
1b
f1 (ppm)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6.88
6.87
6.85
4.56
3.78
3.24
1.56
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1.22
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1.95
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2.93
1.01
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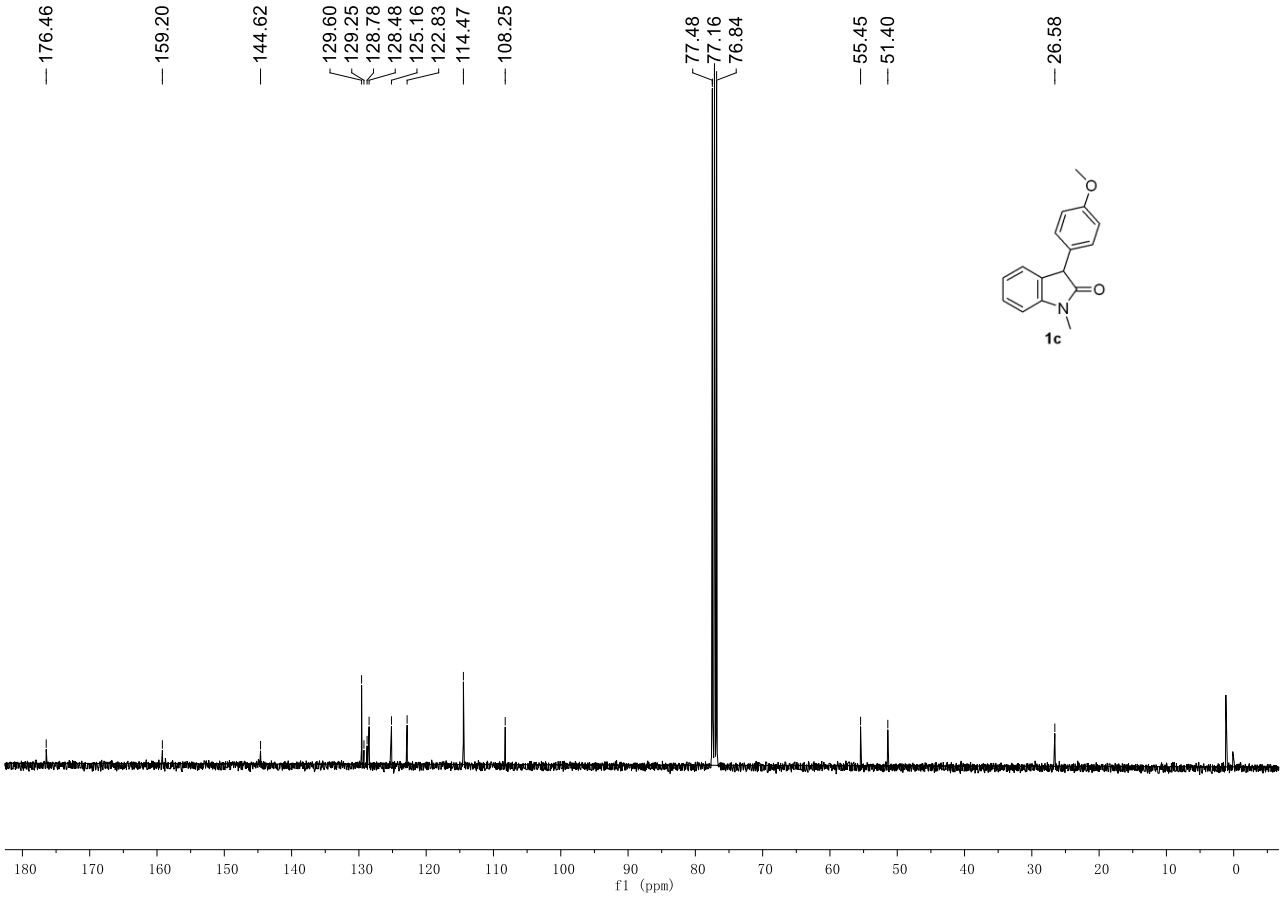
3.18
f1 (ppm)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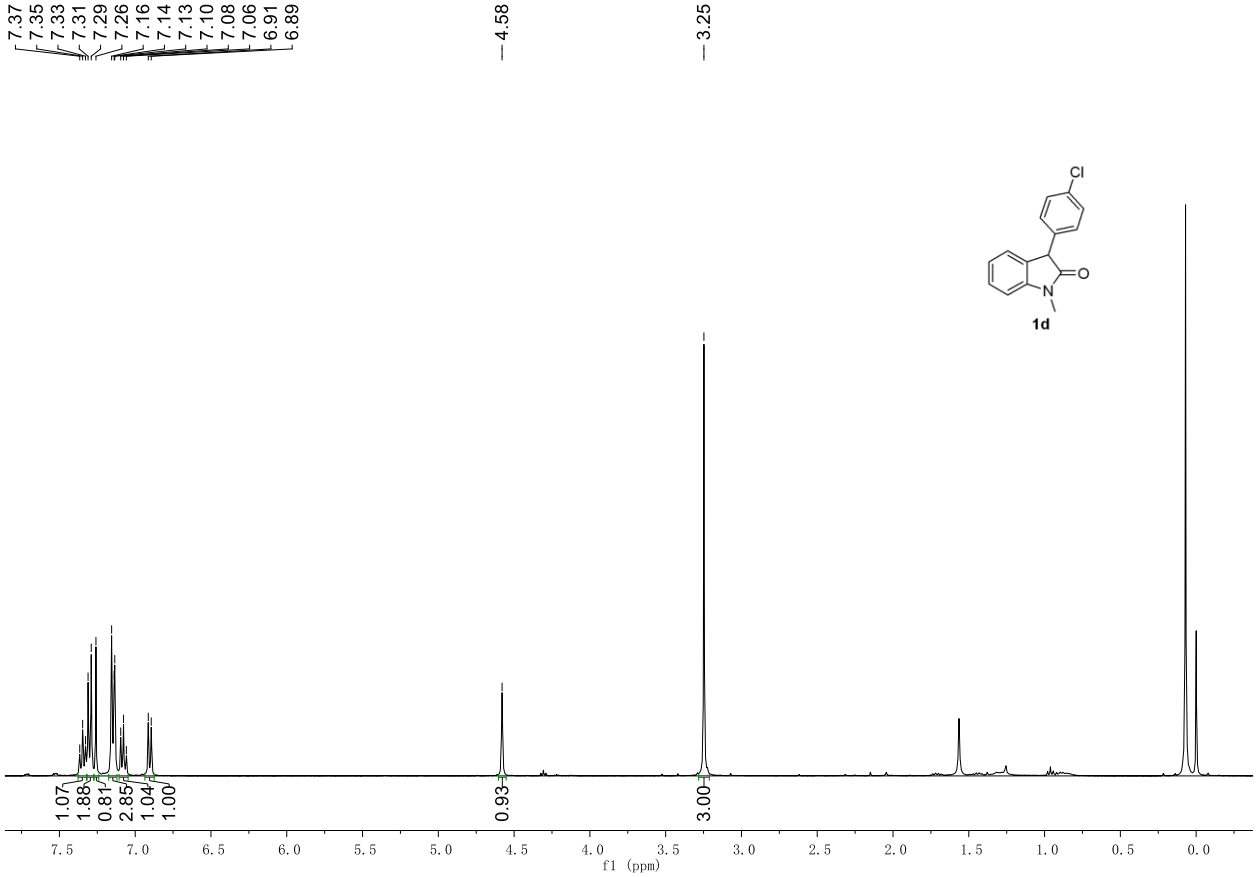
1c
f1 (ppm)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4.58
3.25
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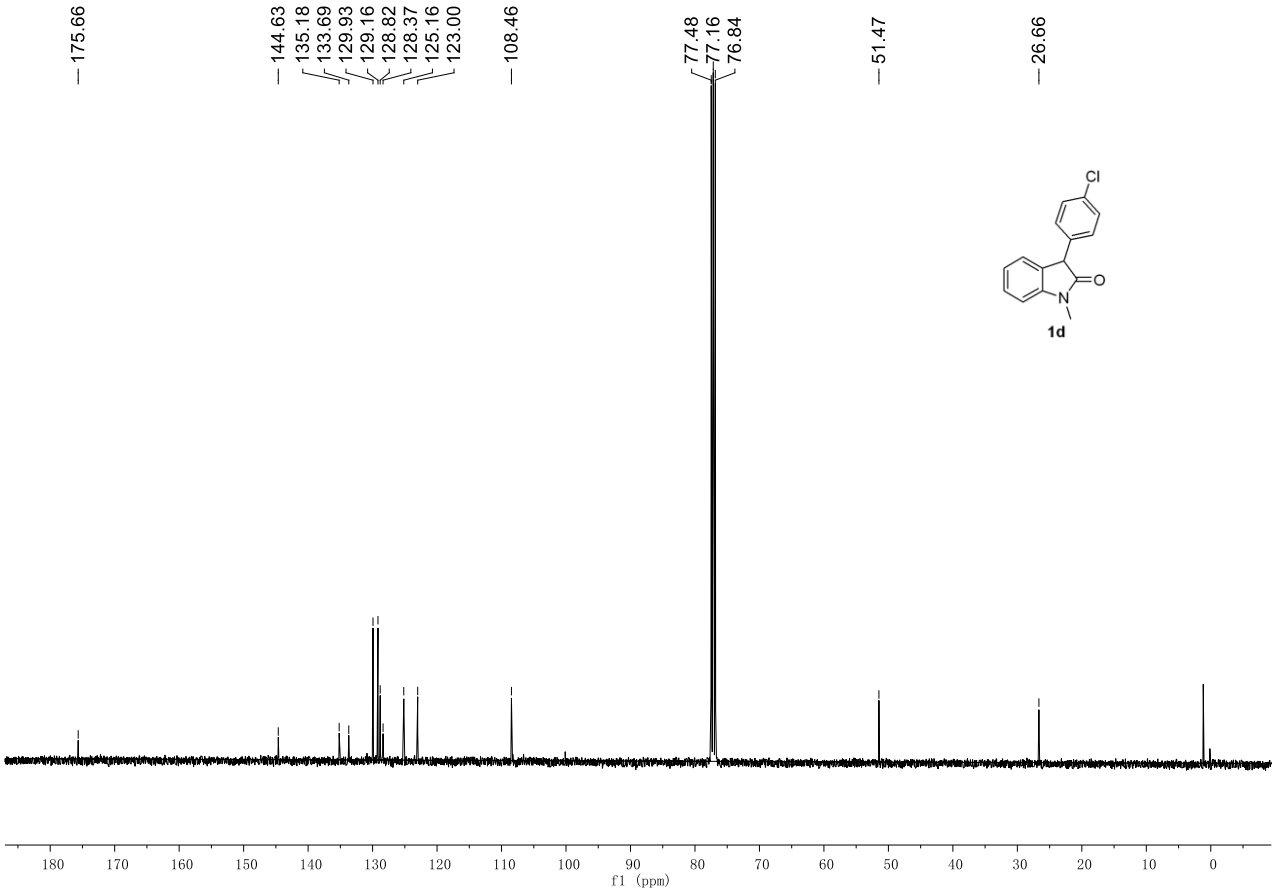
3.00
f1 (ppm)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26.66
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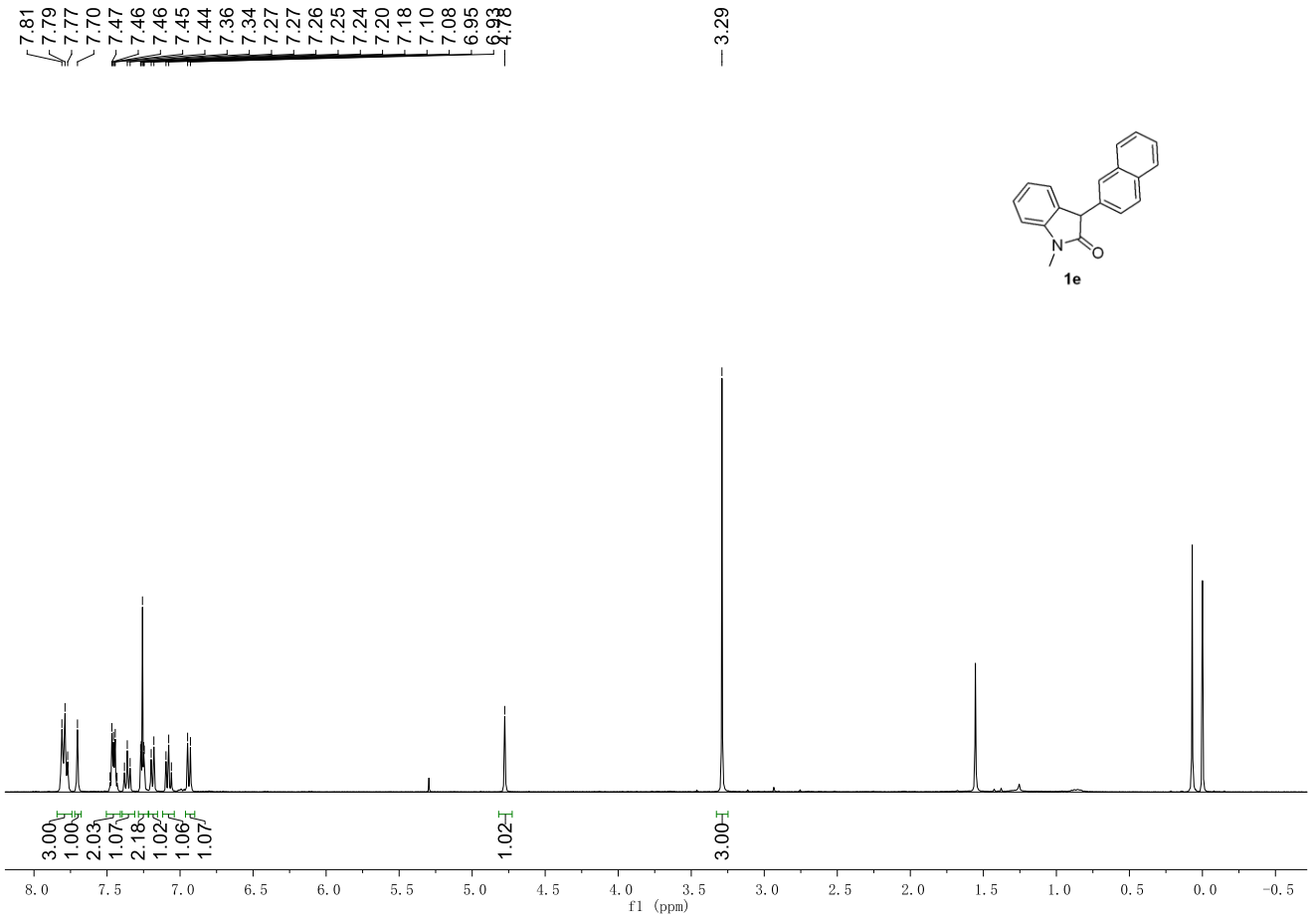
O
N
1d
f1 (ppm)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7.24
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7.10
7.08
6.95
6.93
4.78
3.29
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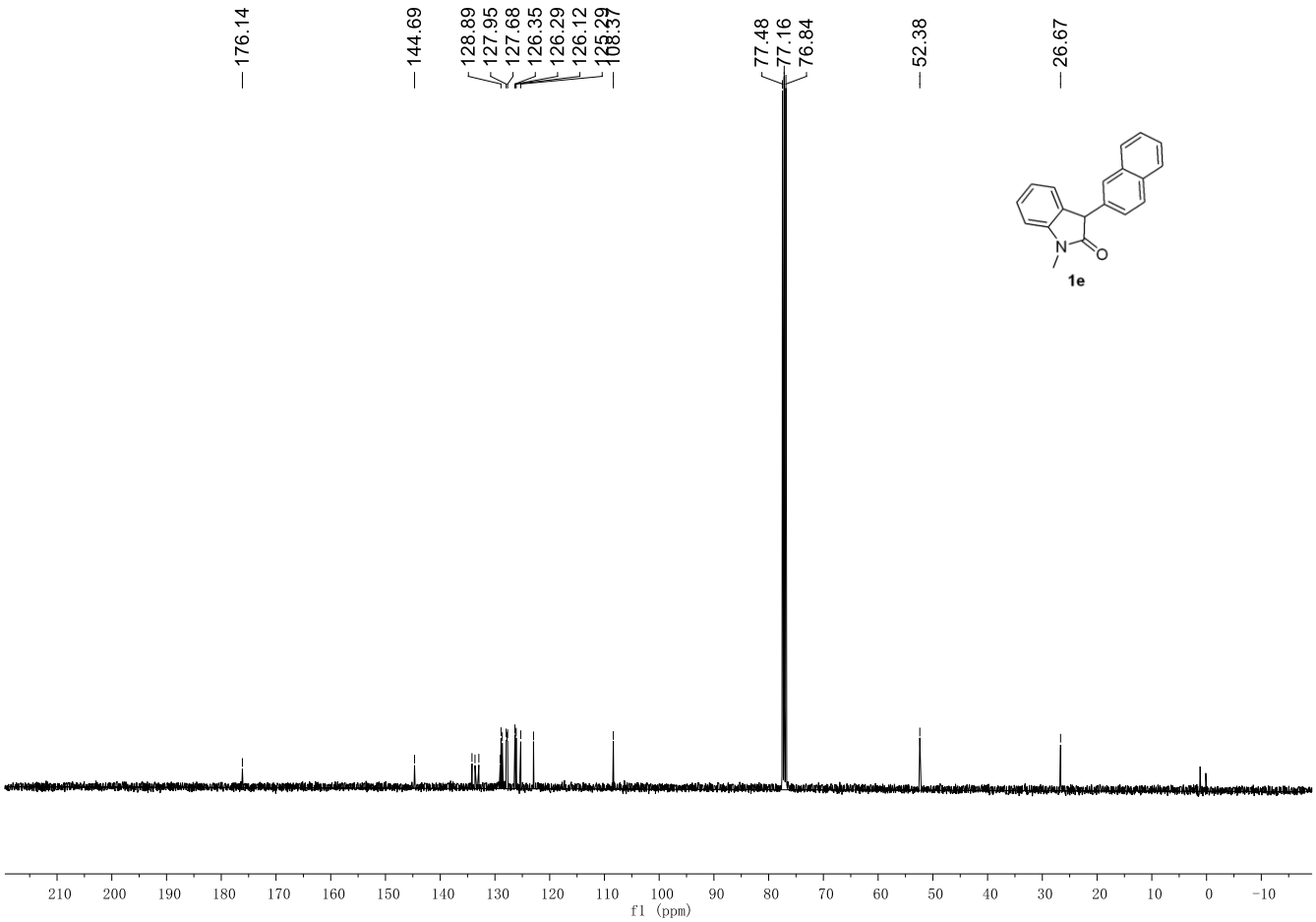
3.00
f1 (ppm)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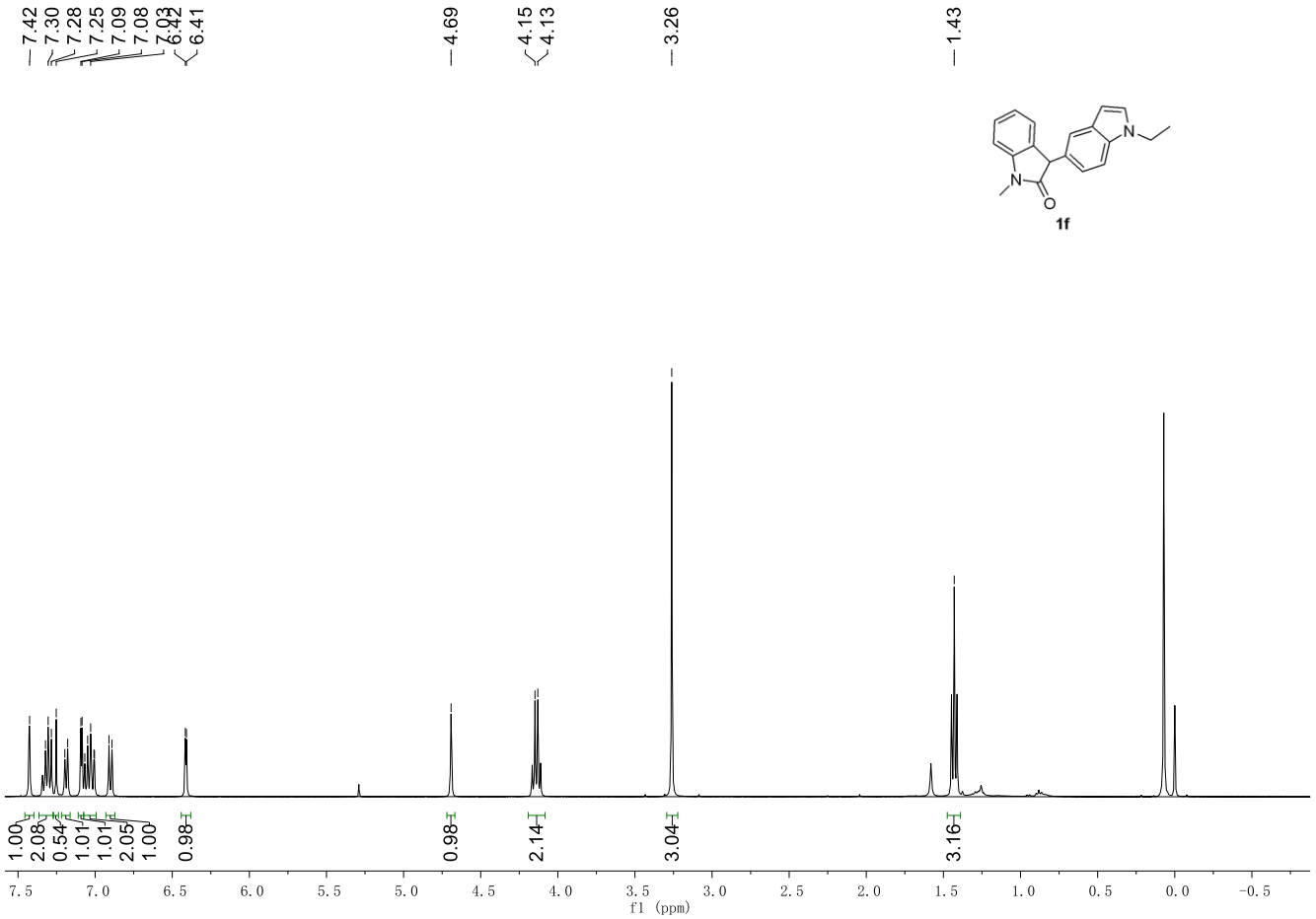
1e
f1 (ppm)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1f
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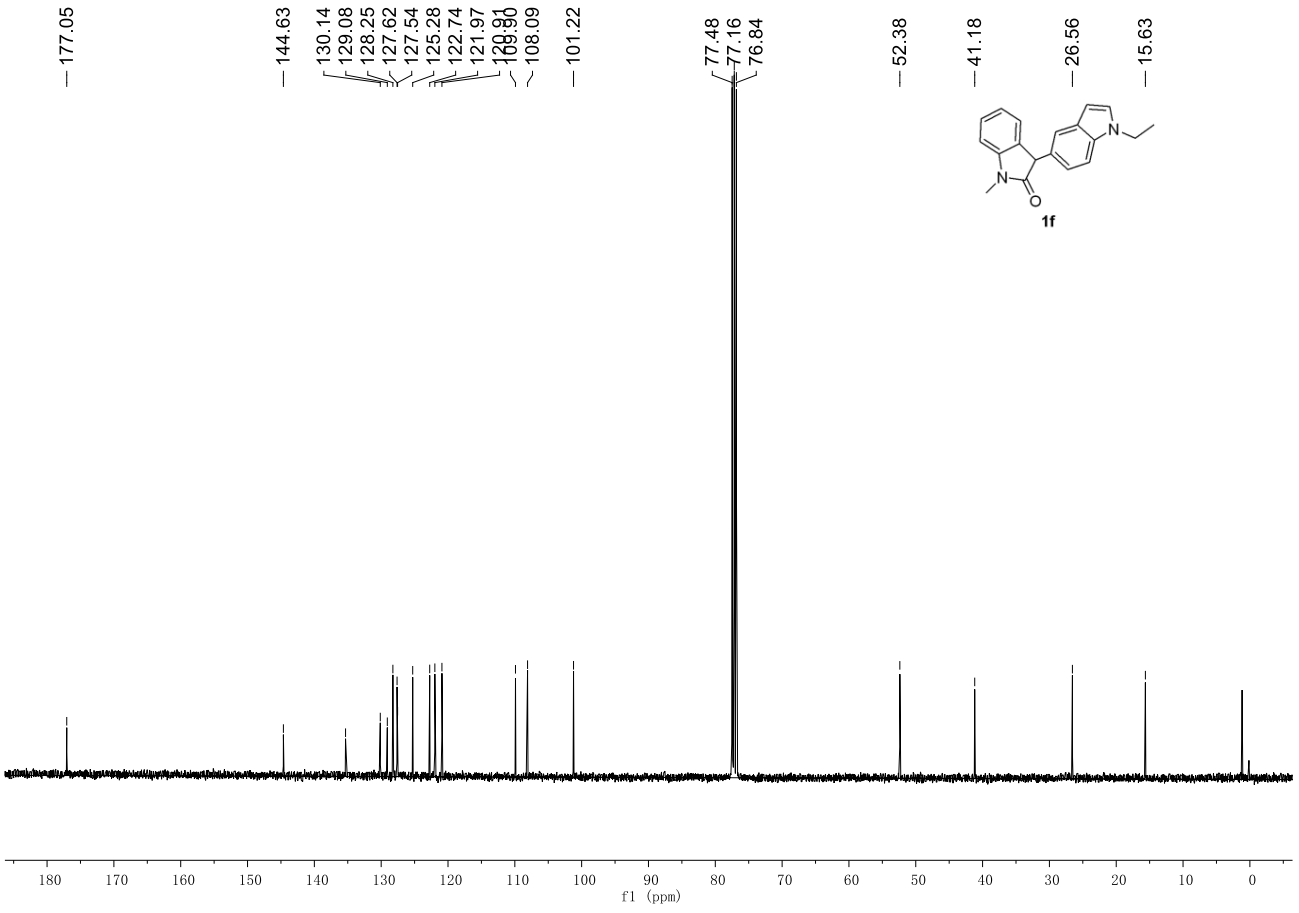
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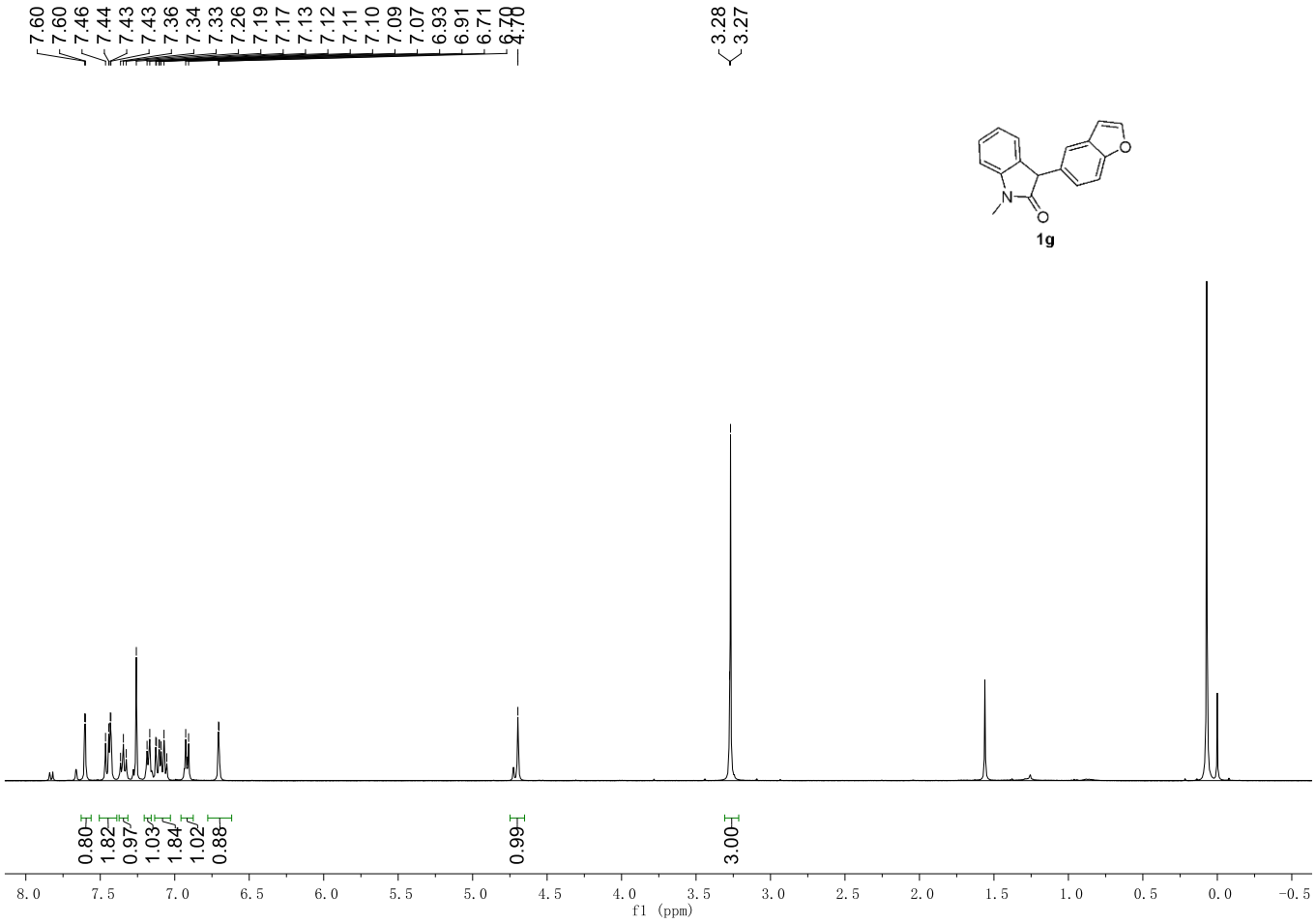
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6.91
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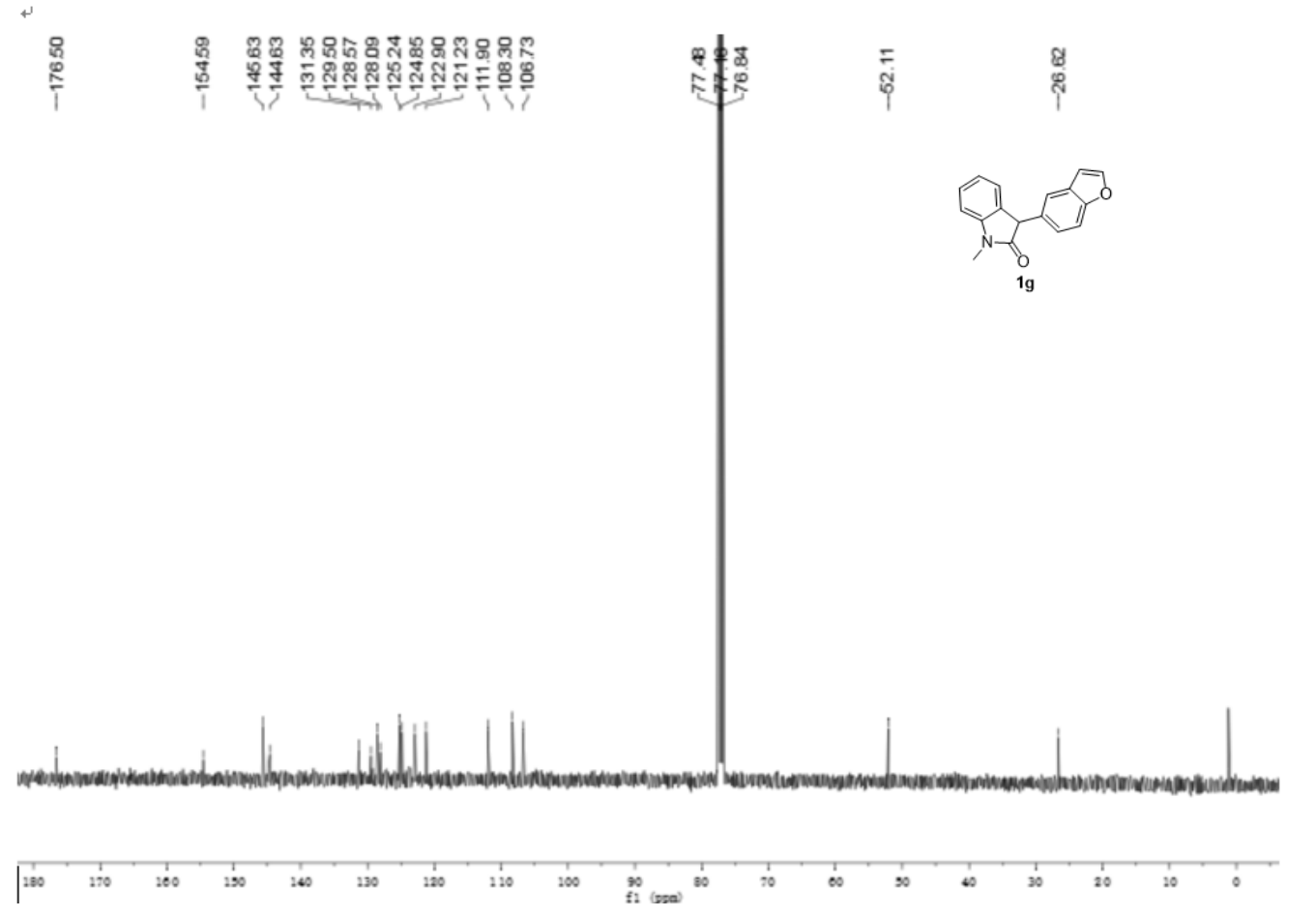
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52.11
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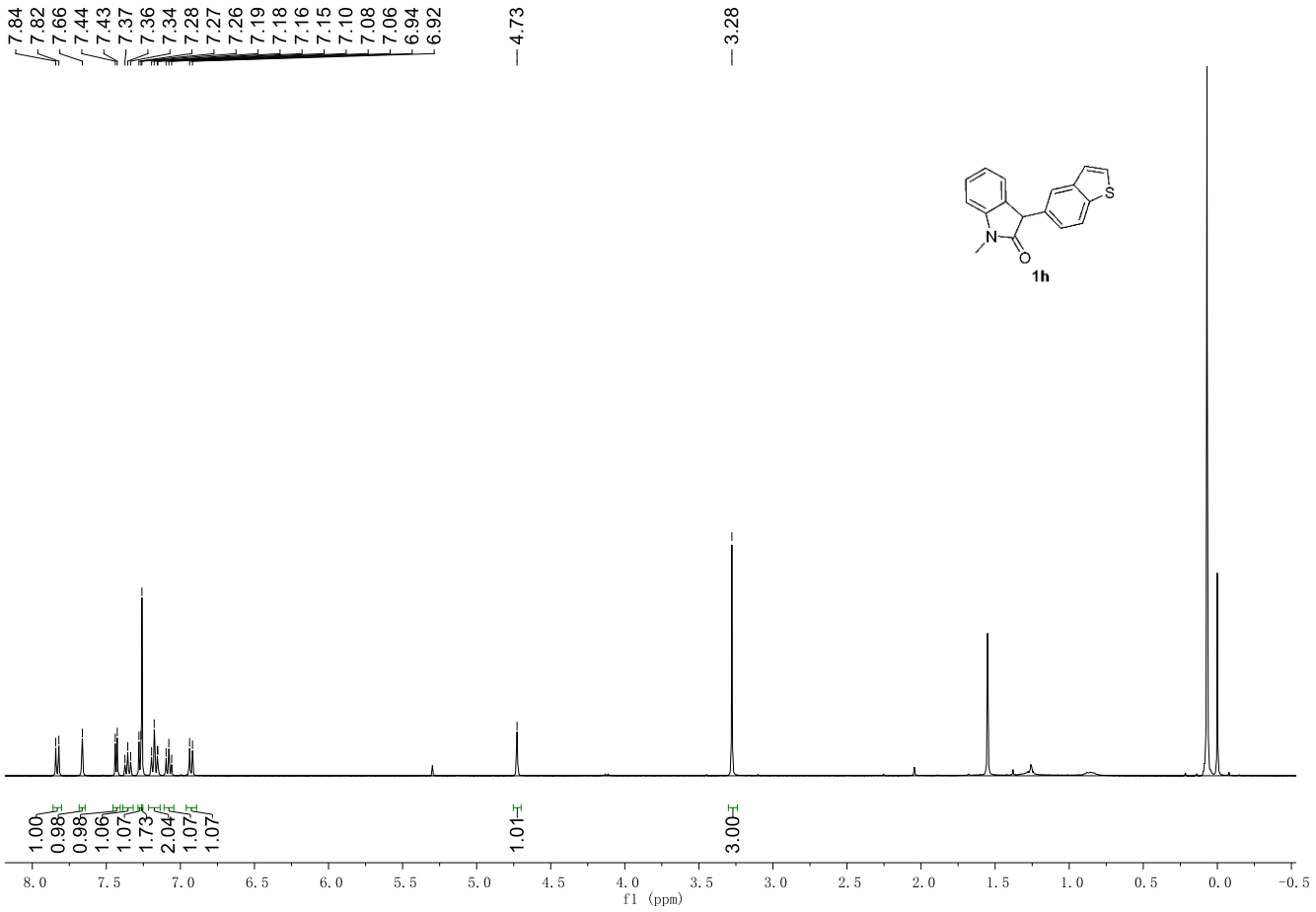
1g
f1 (ppm)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7.16
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7.10
7.08
7.06
6.94
6.92
4.73
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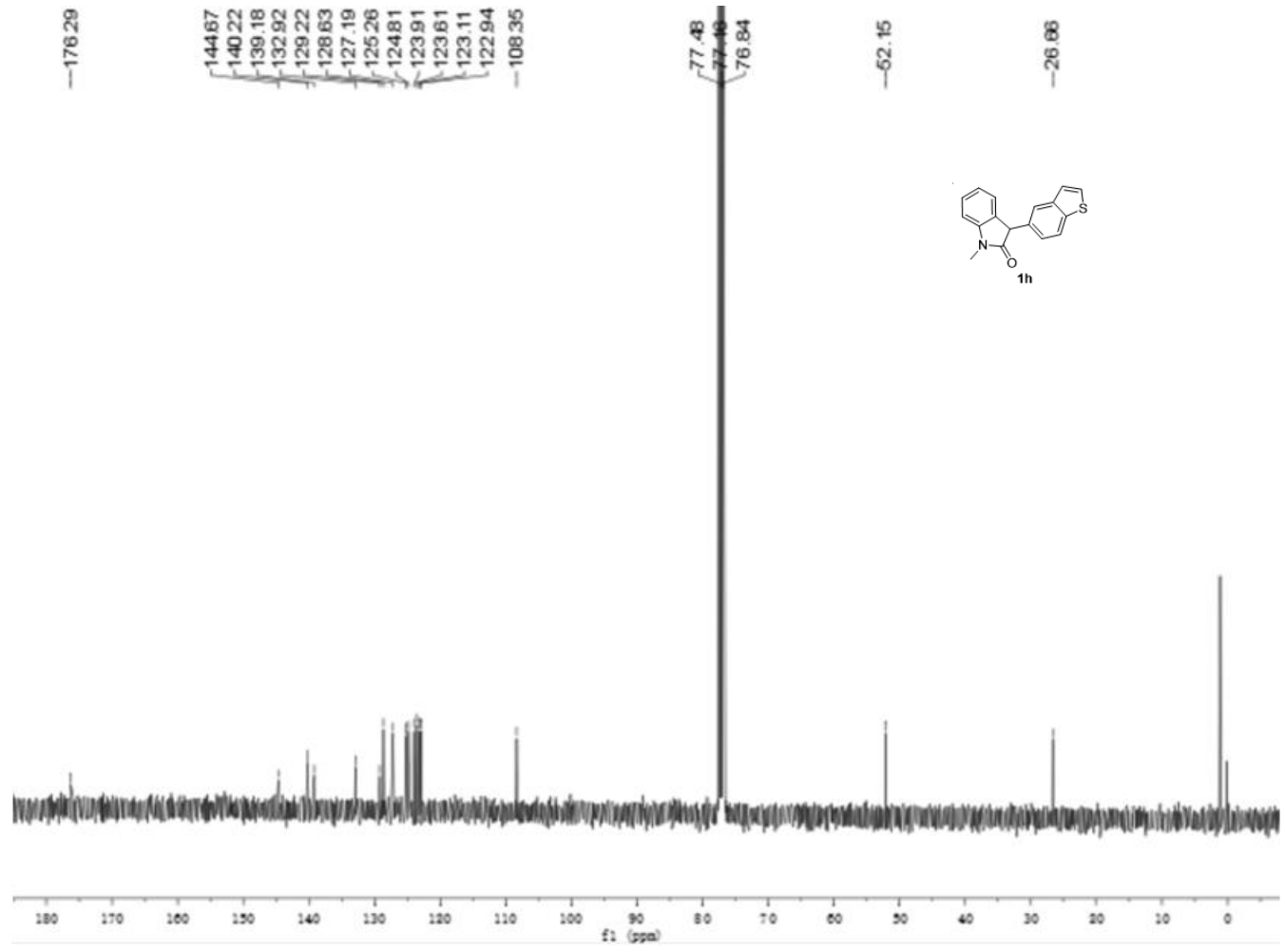
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76.84
52.15
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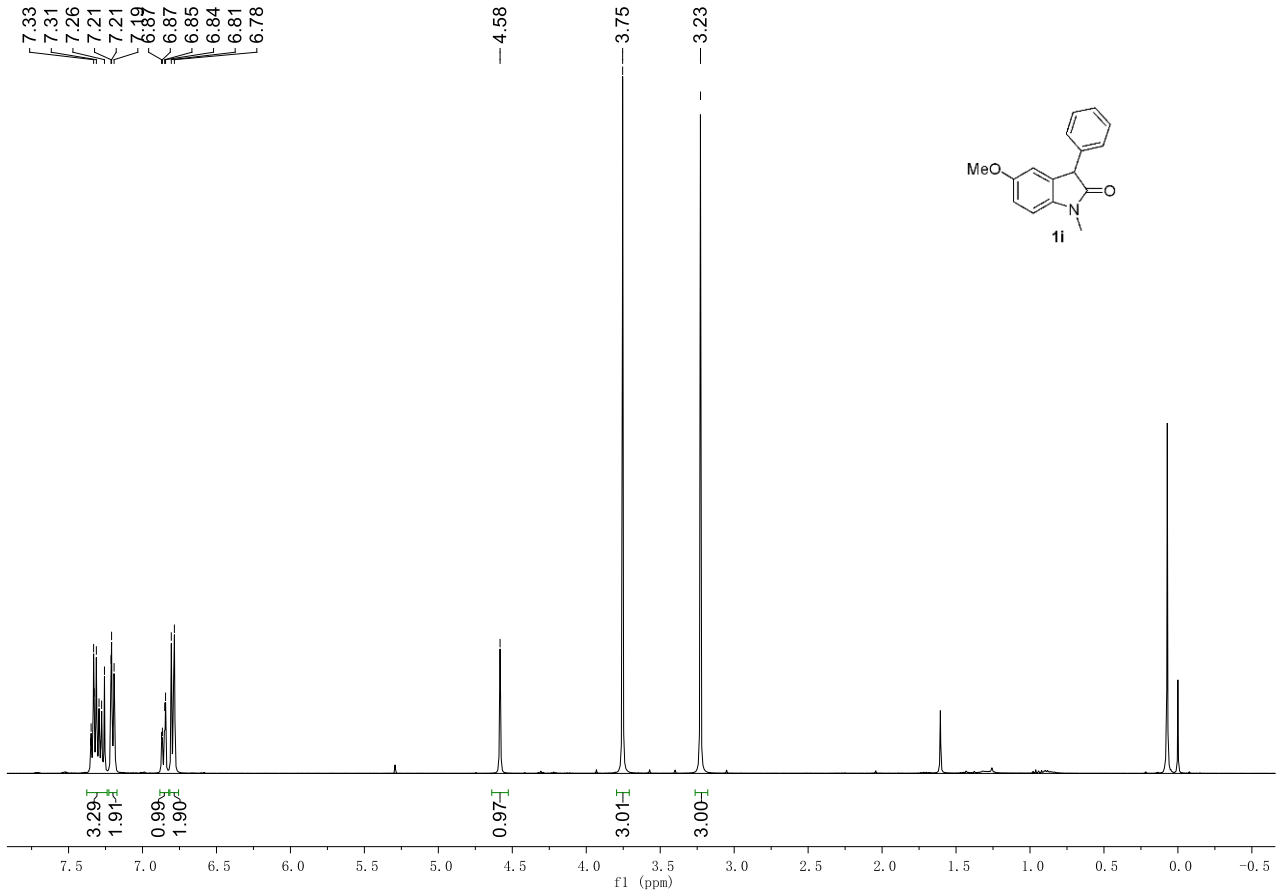
1h
f1 (ppm)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0.97
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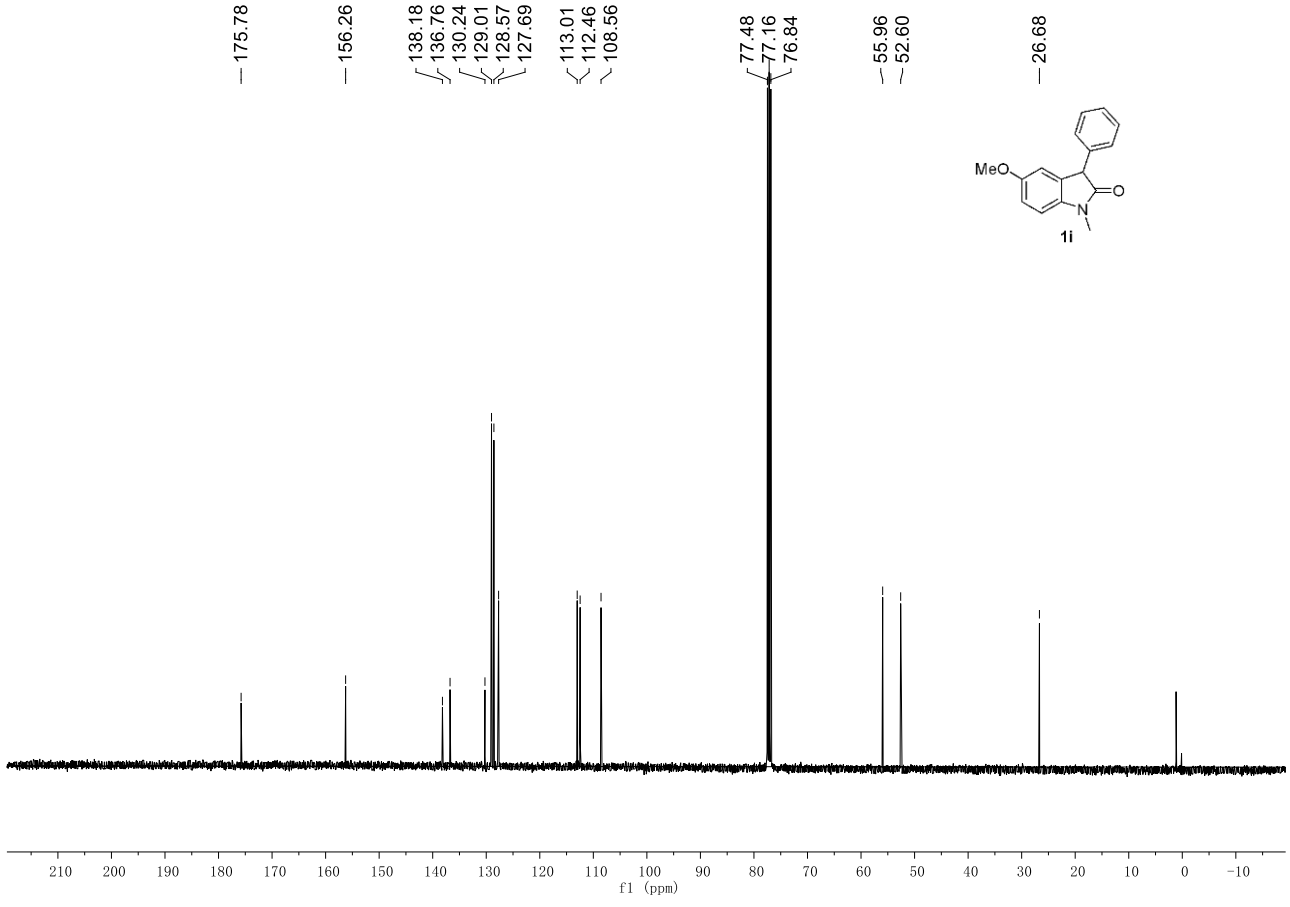
3.00
f1 (ppm)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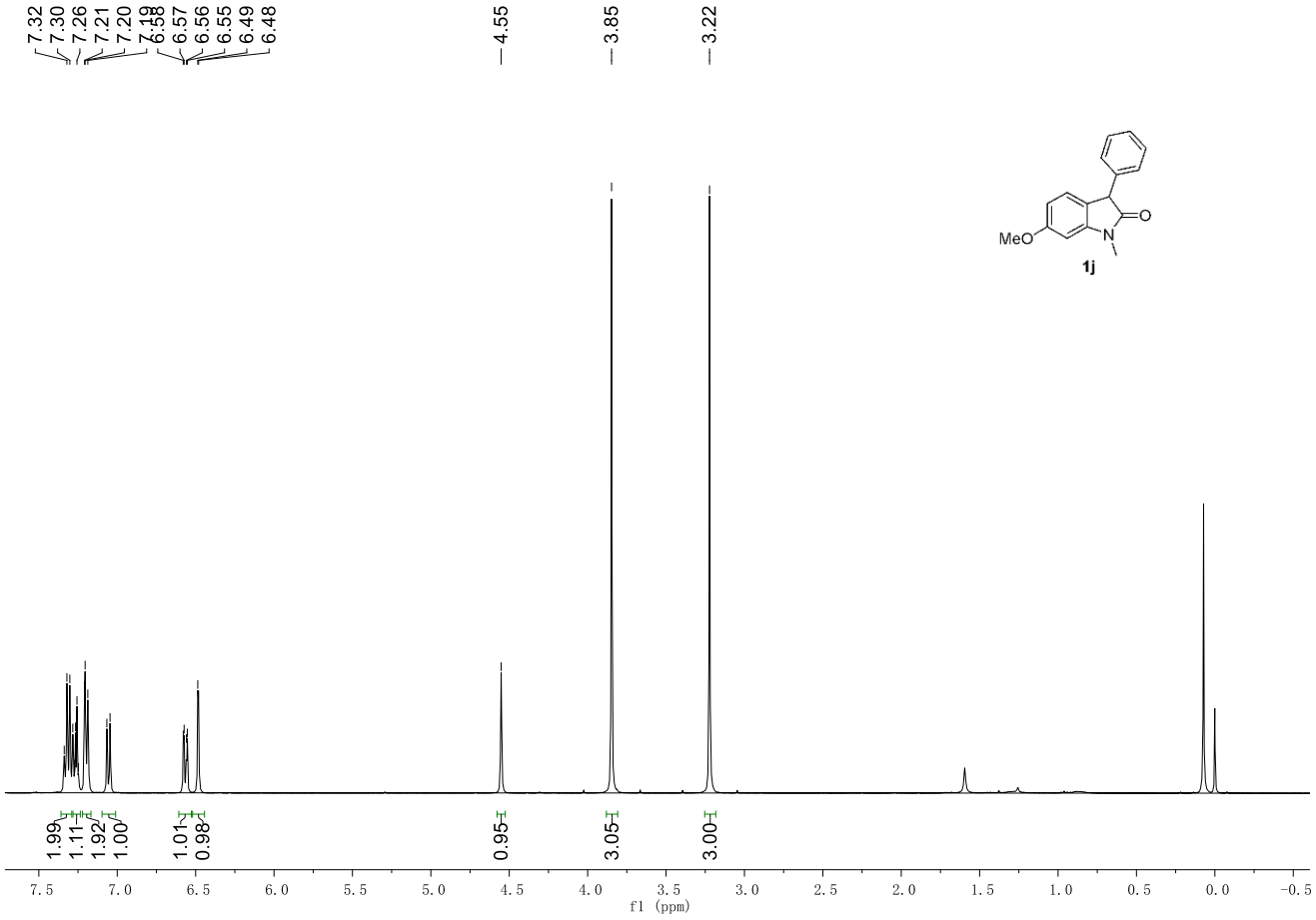
1i
f1 (ppm)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3.85
3.22
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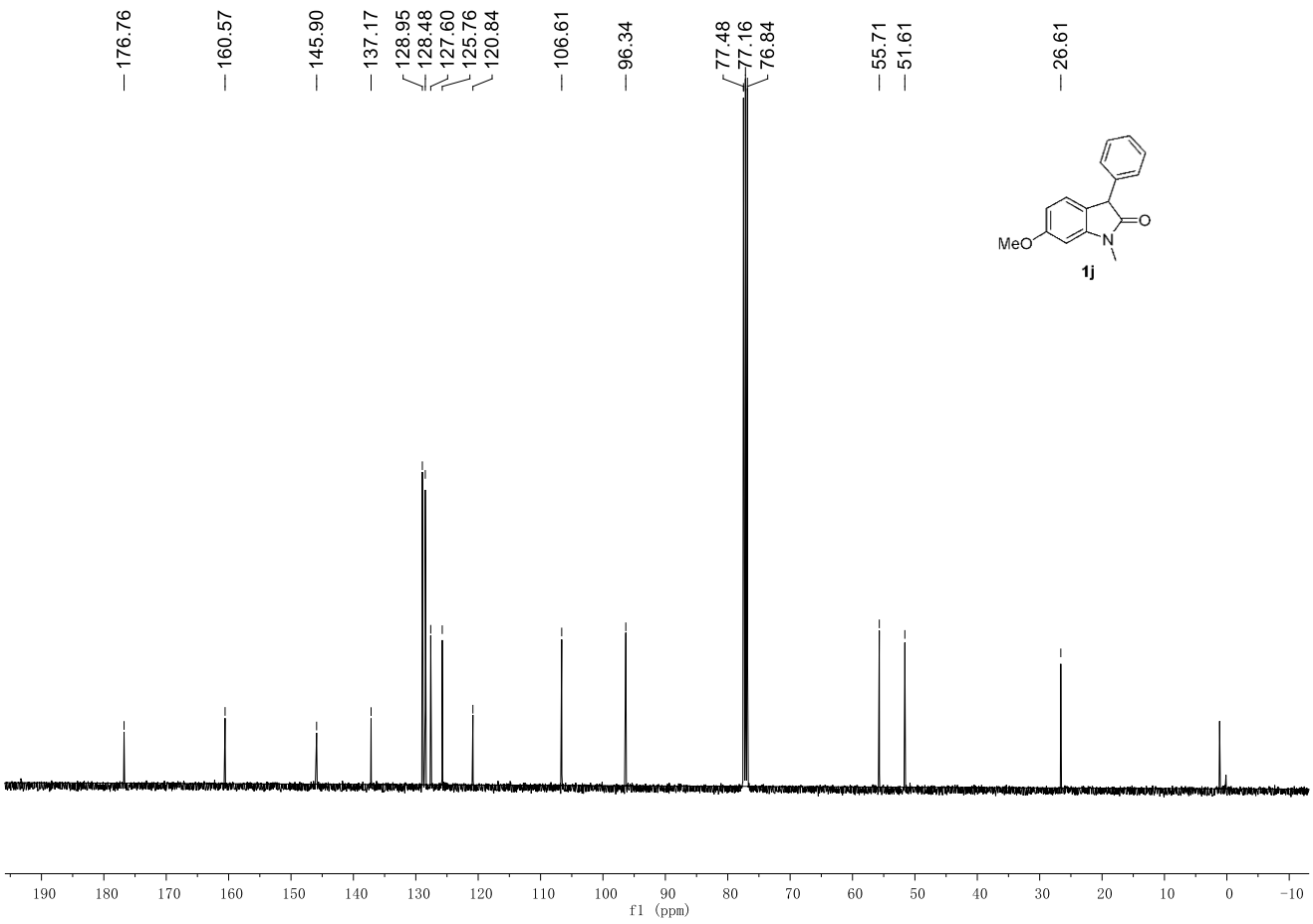
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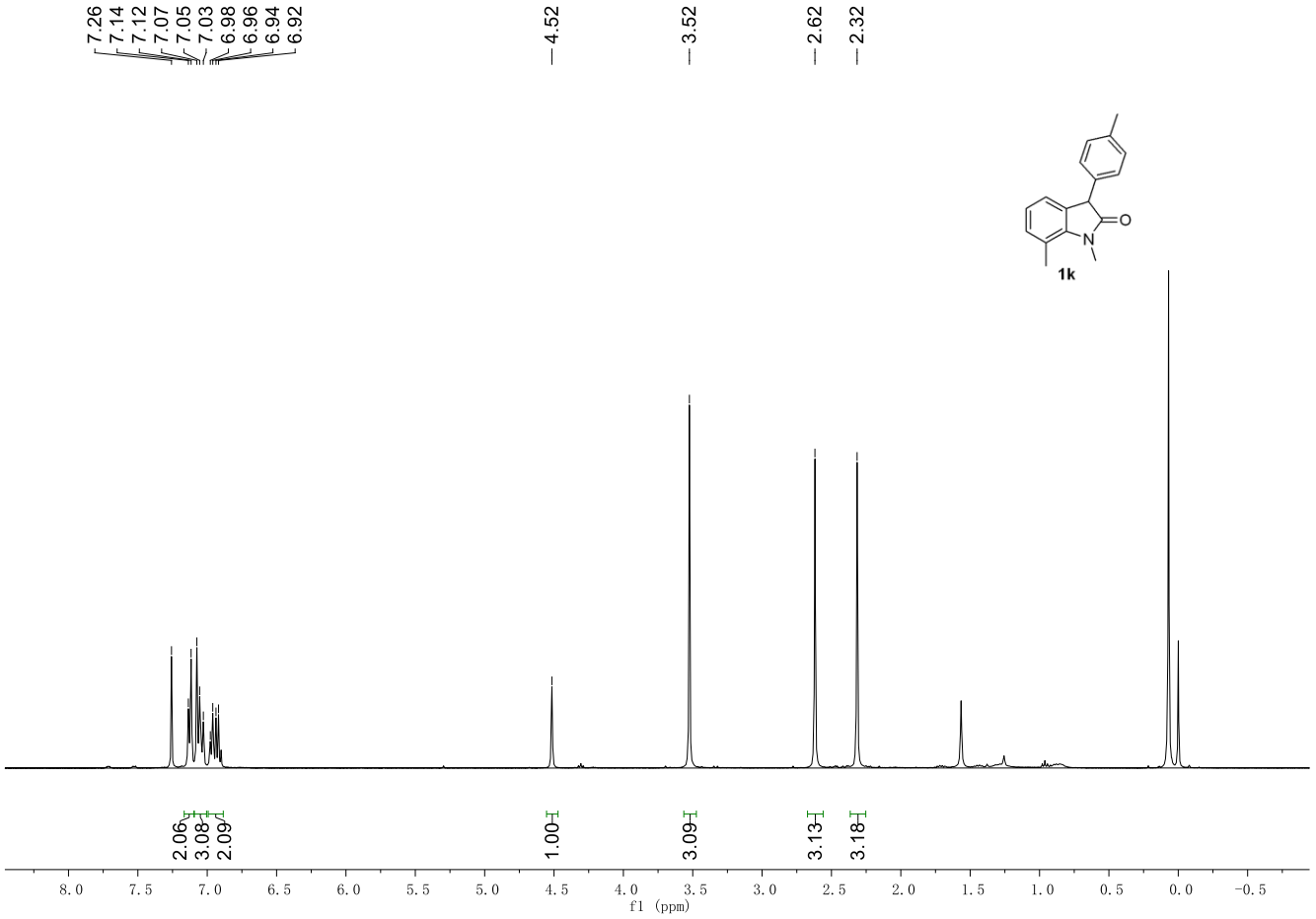
MeO
1j
f1 (ppm)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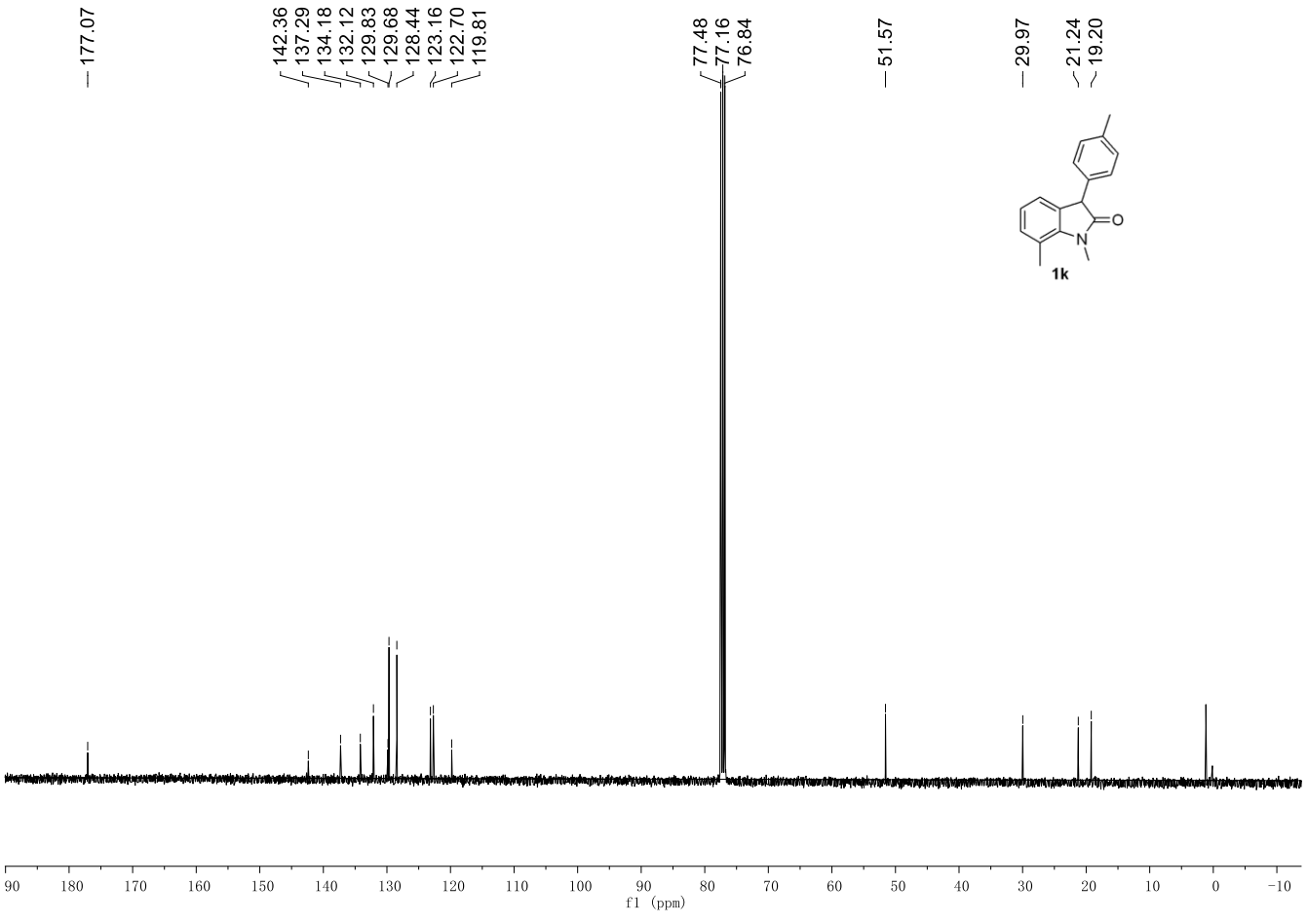
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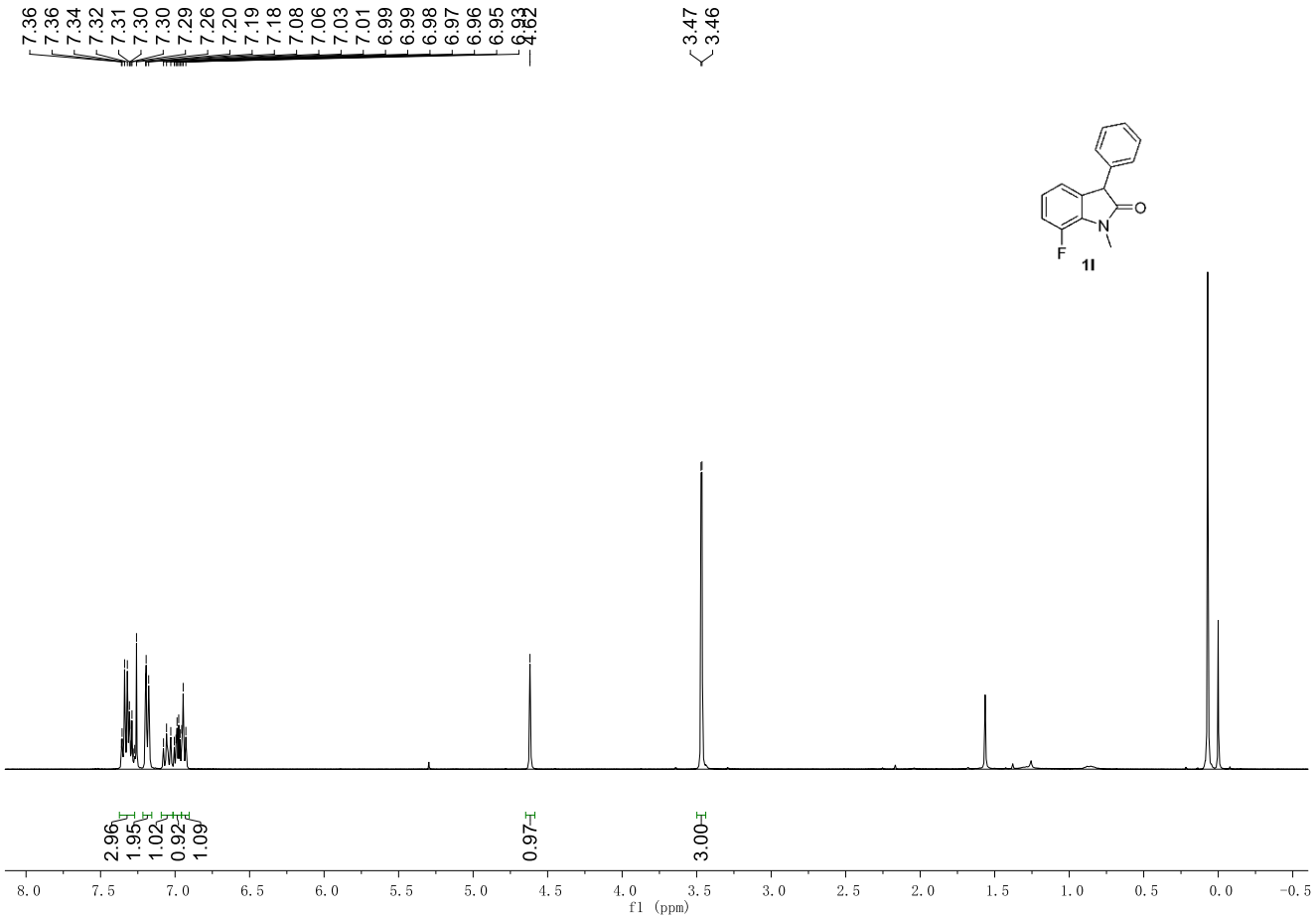
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6.99
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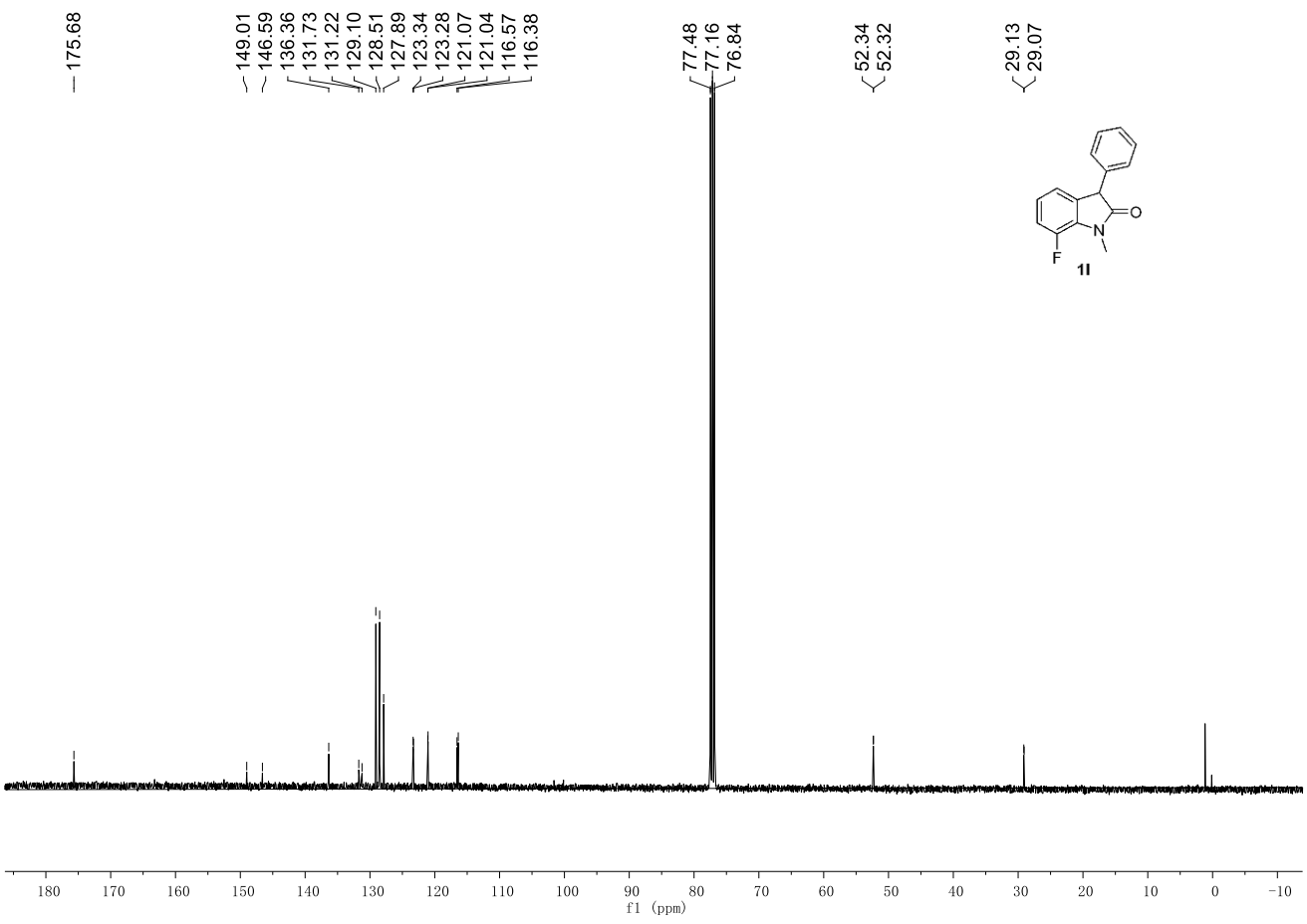
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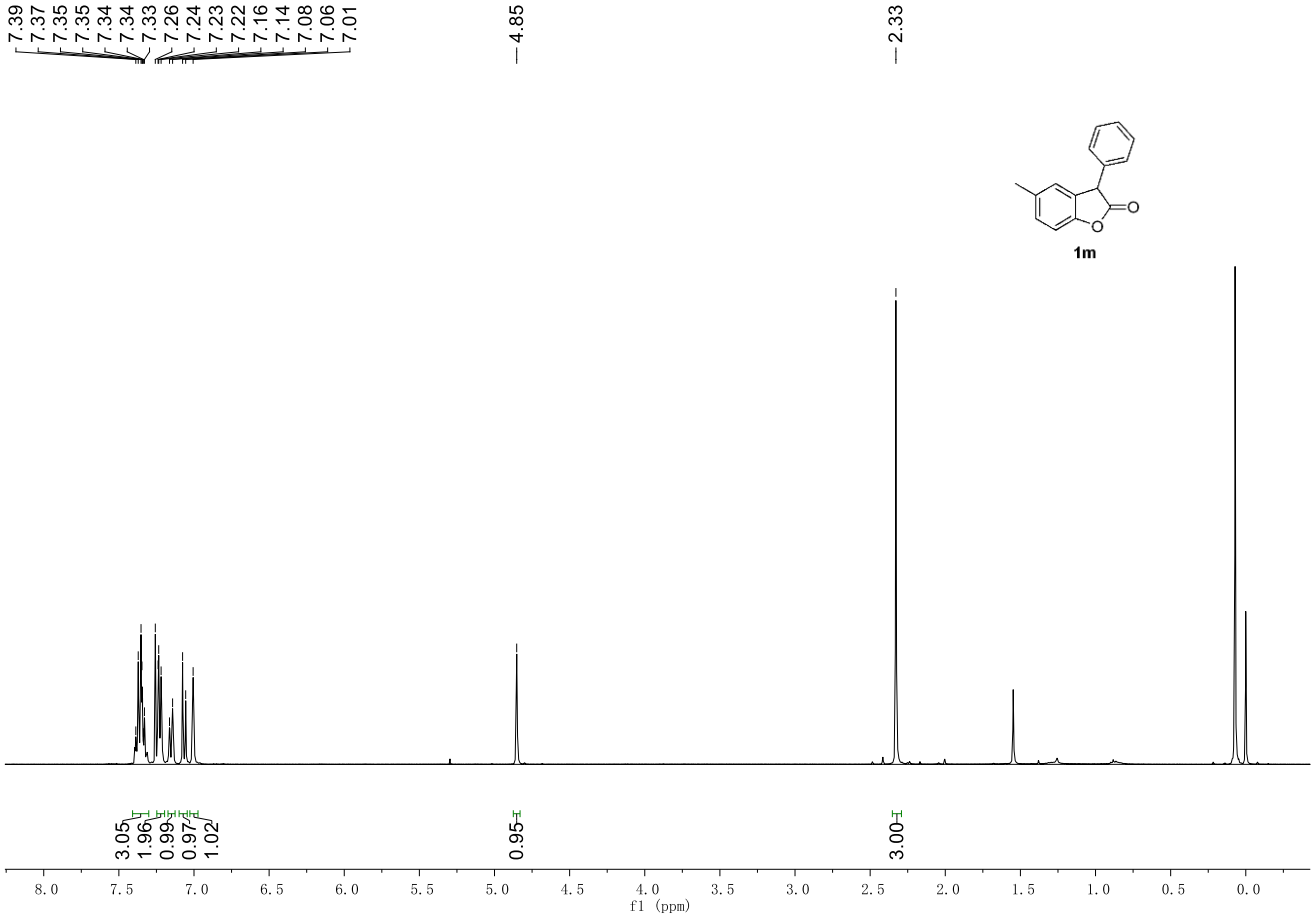
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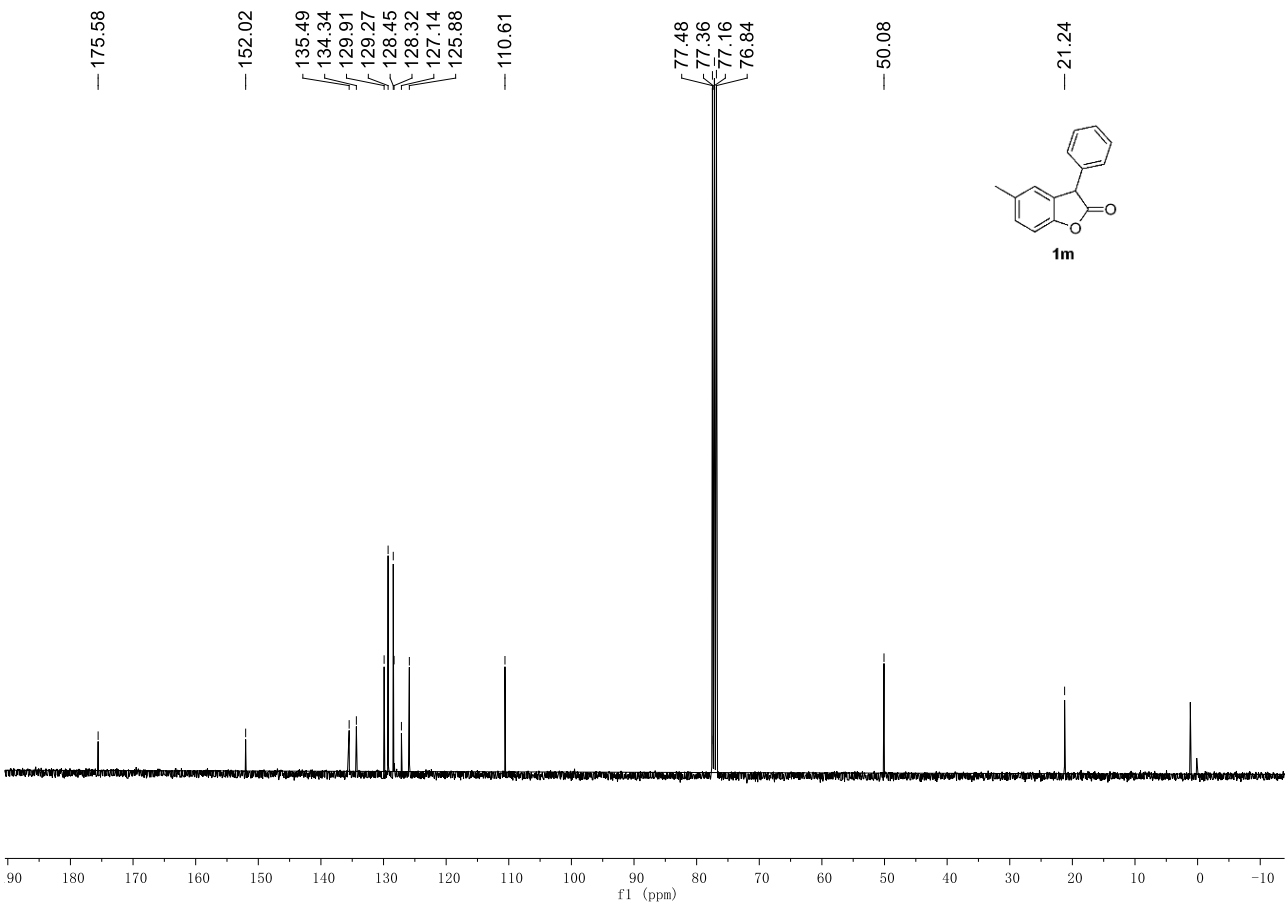
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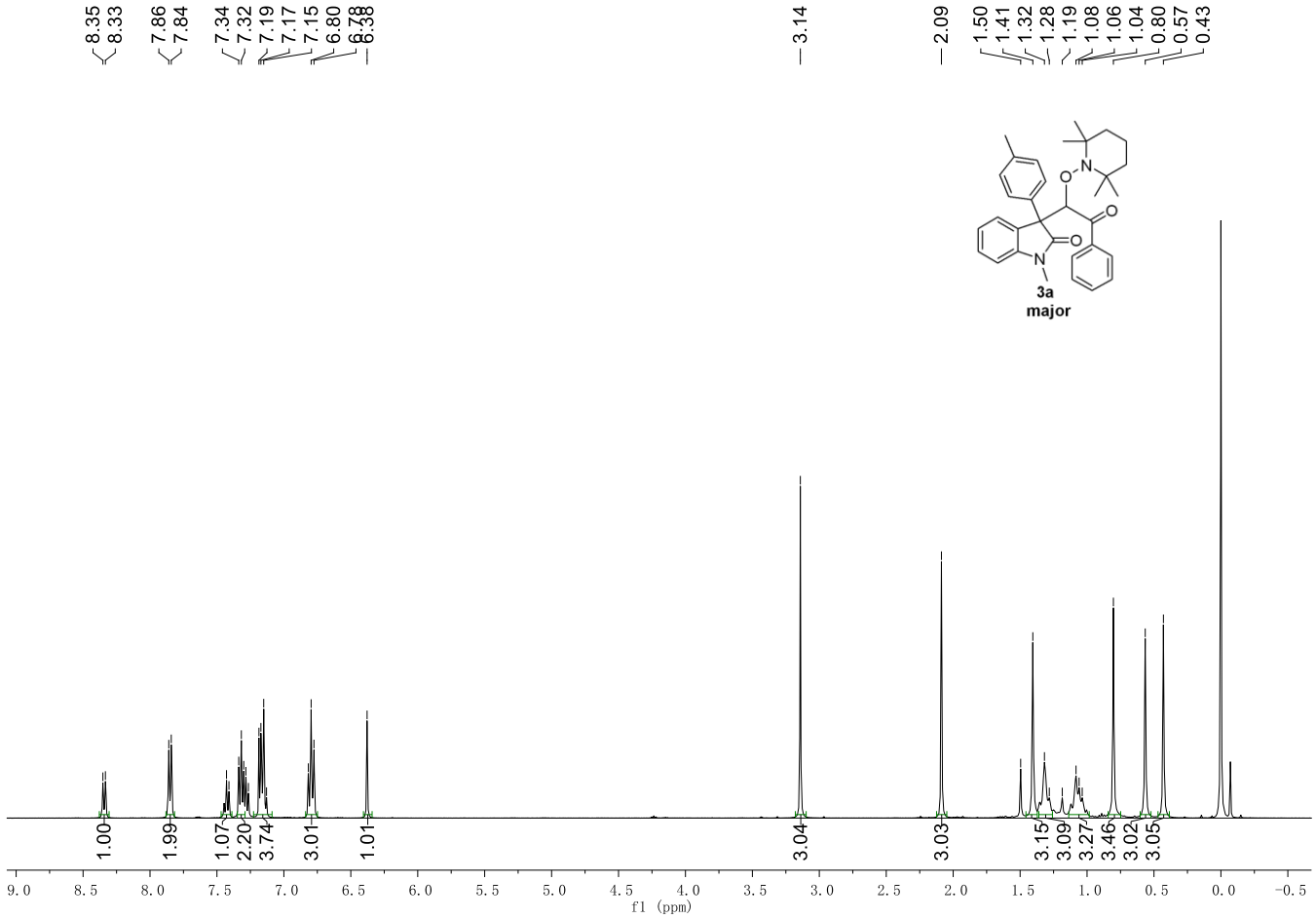
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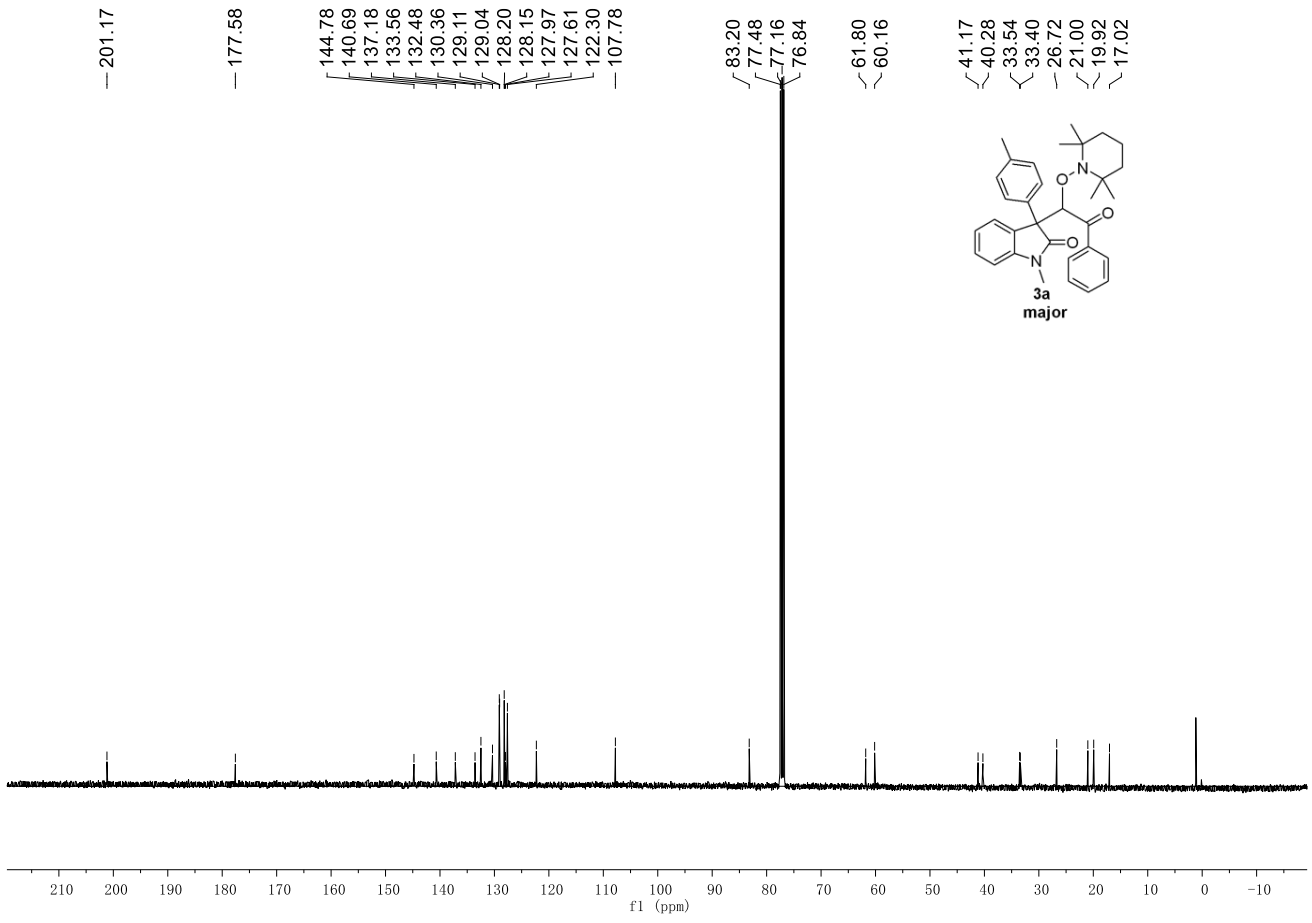
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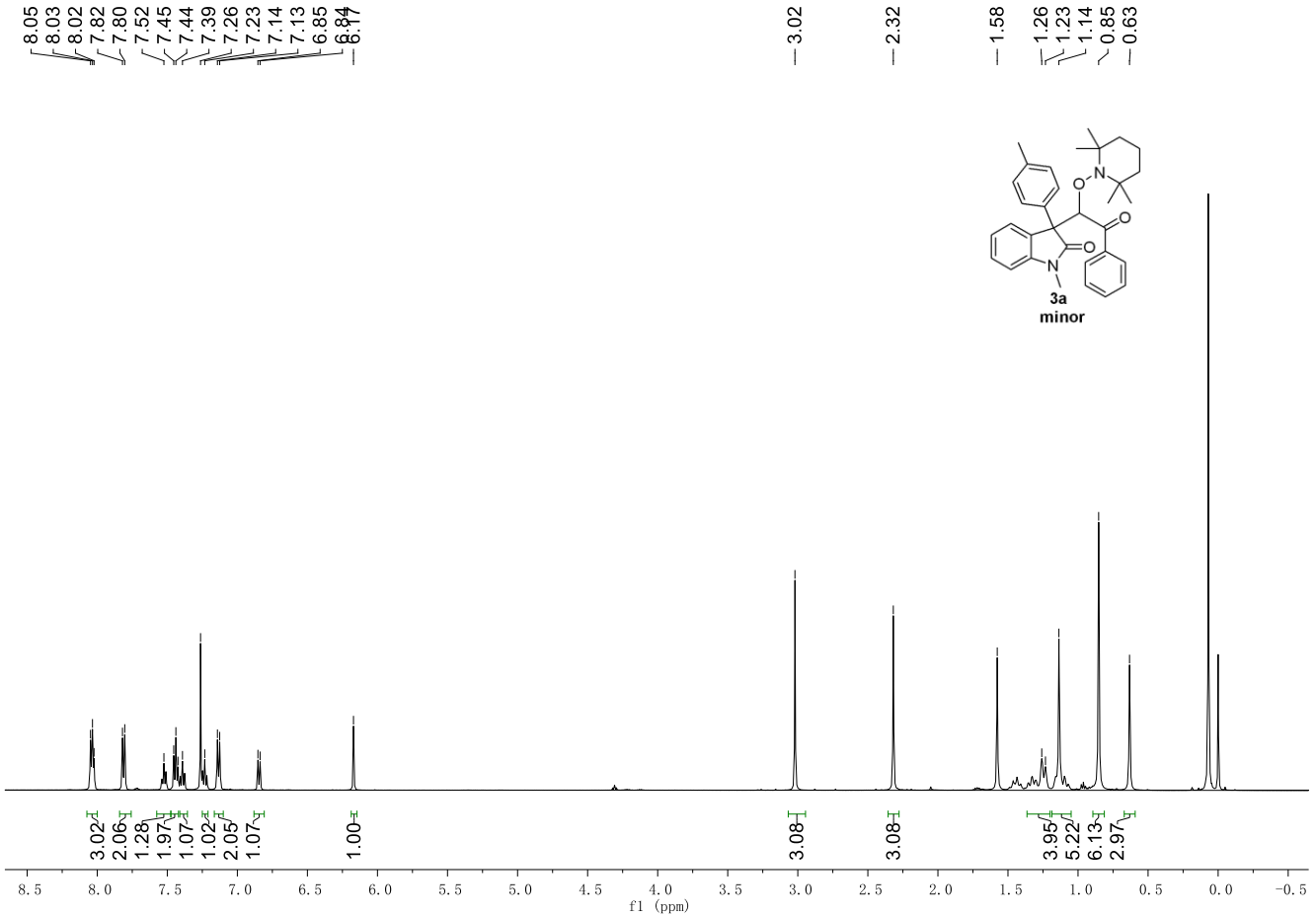
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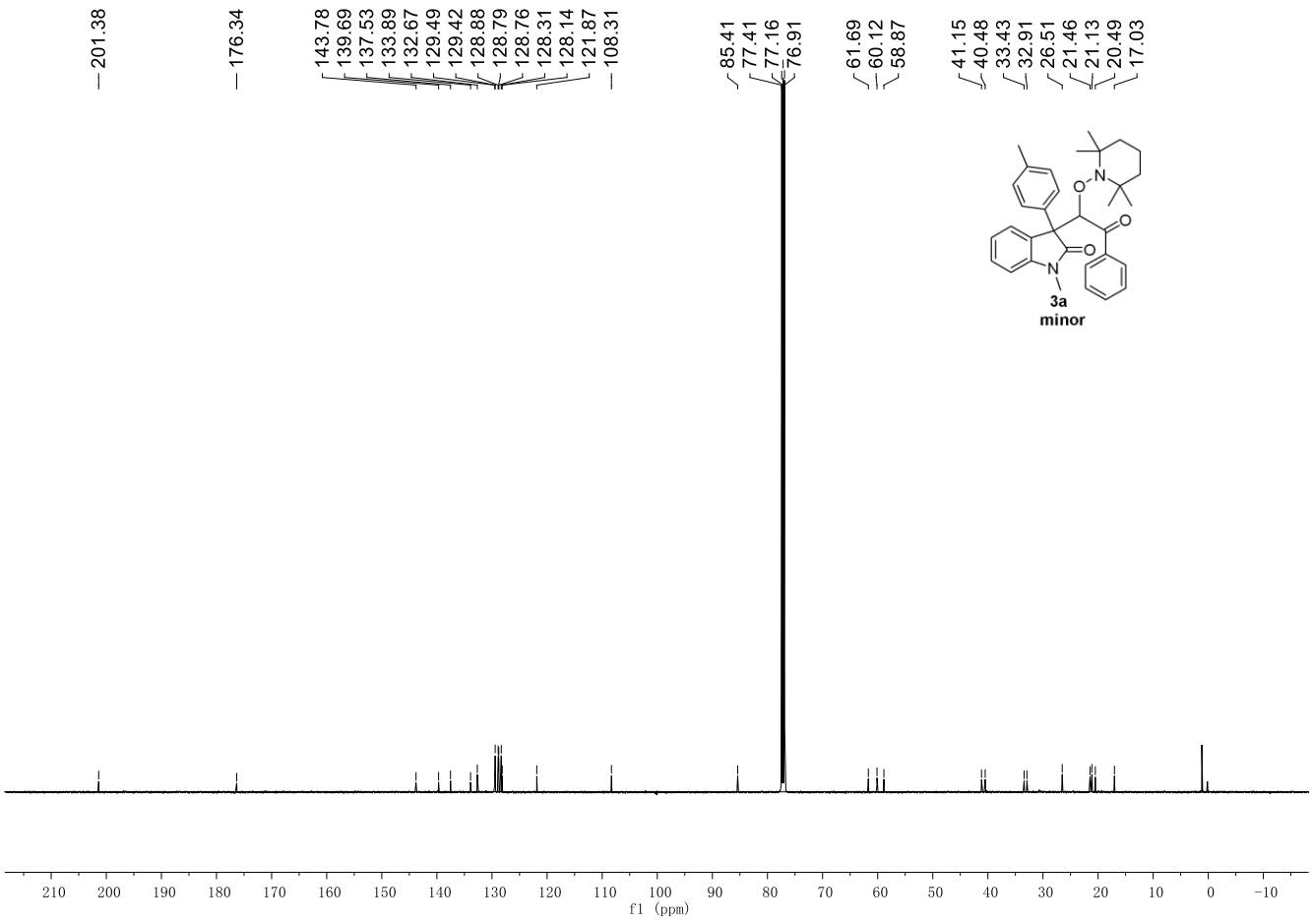
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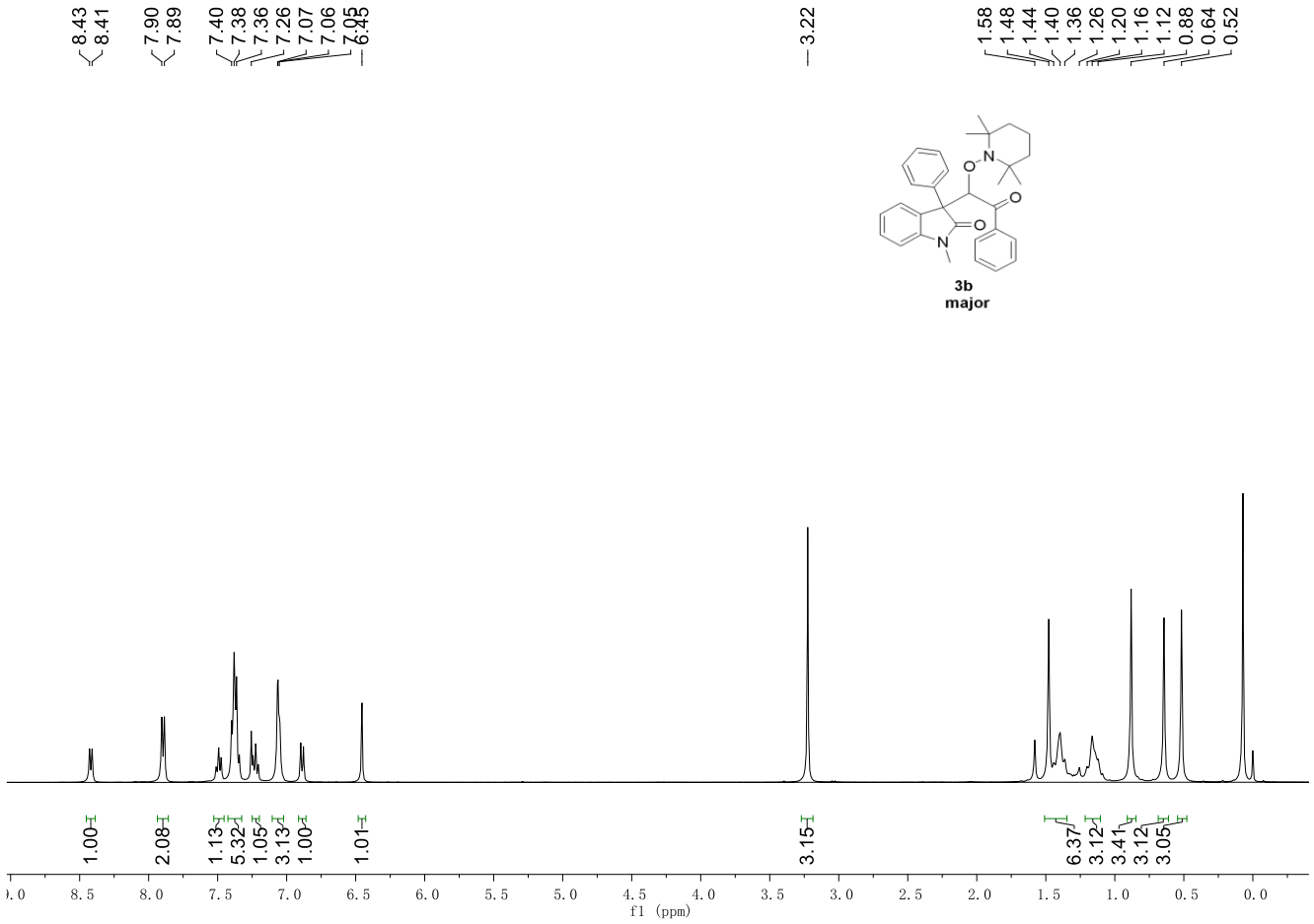
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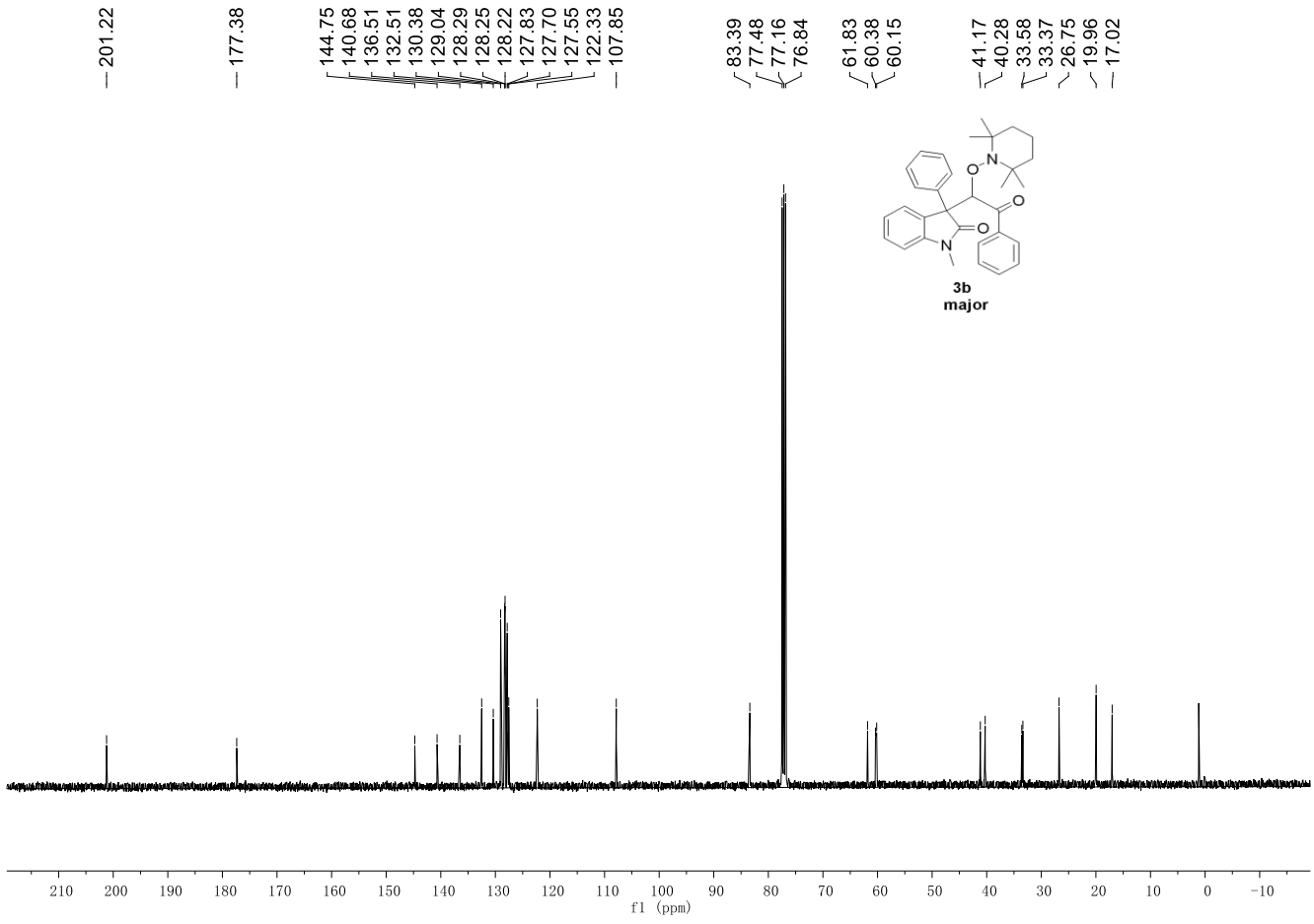
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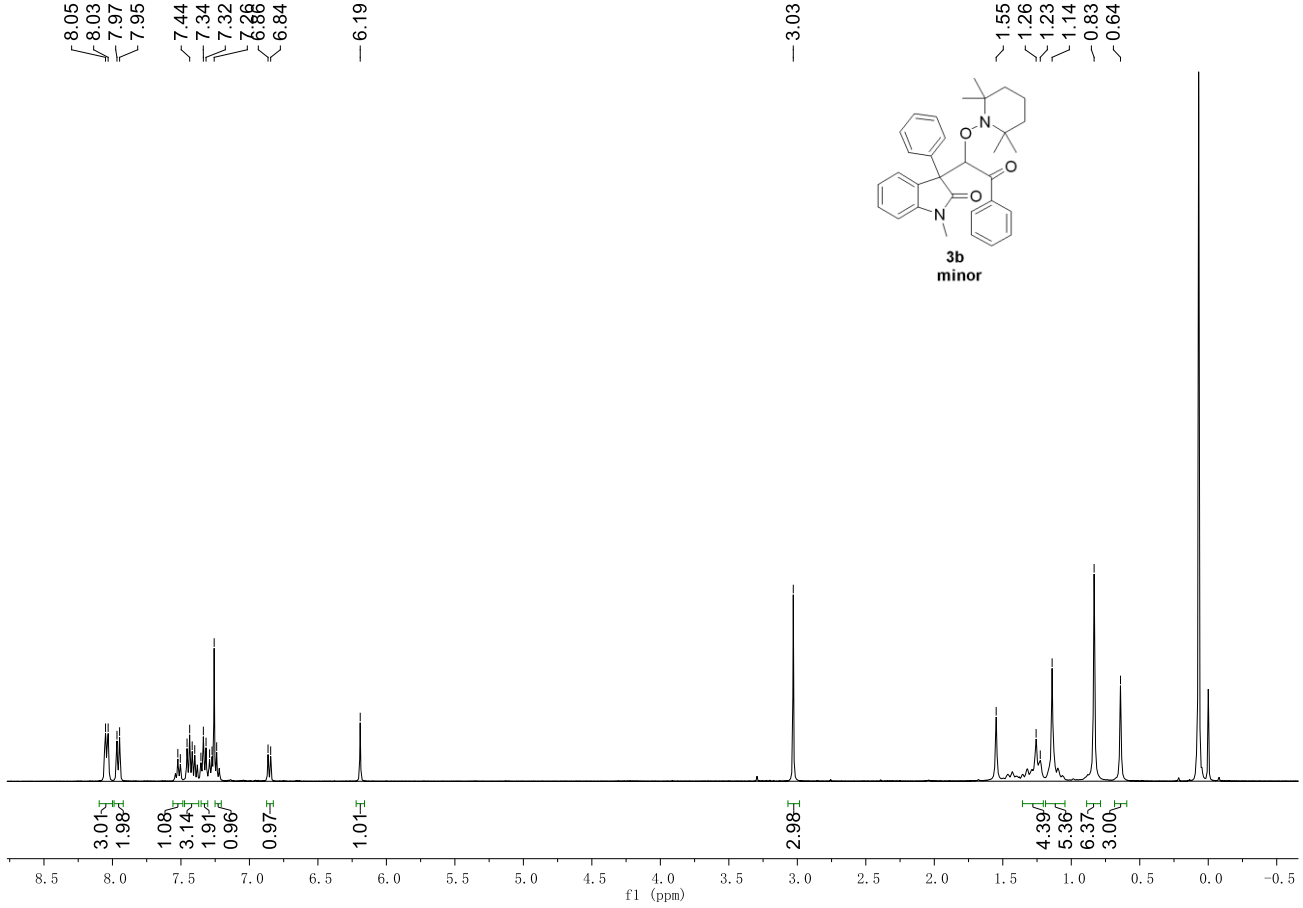
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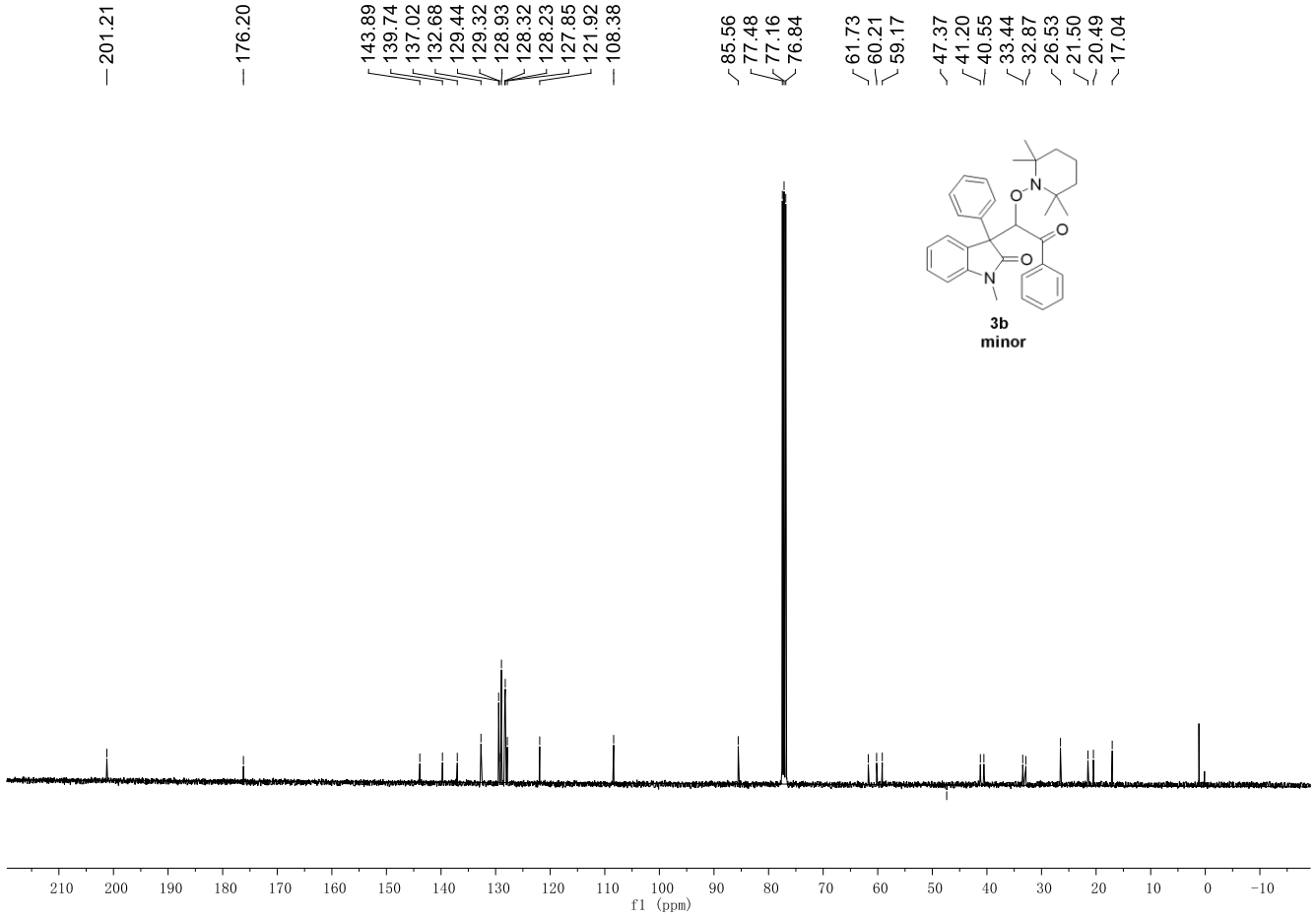
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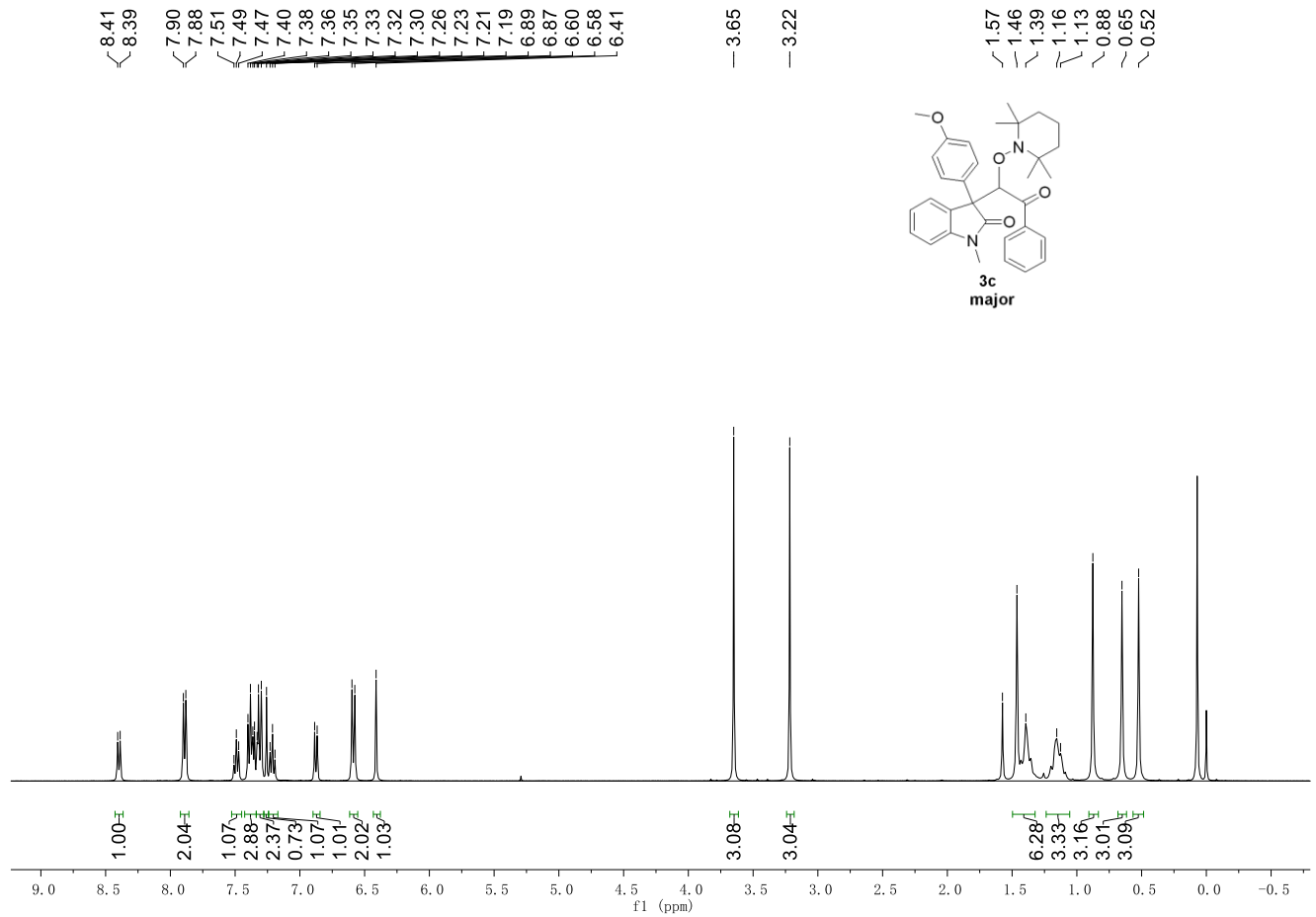
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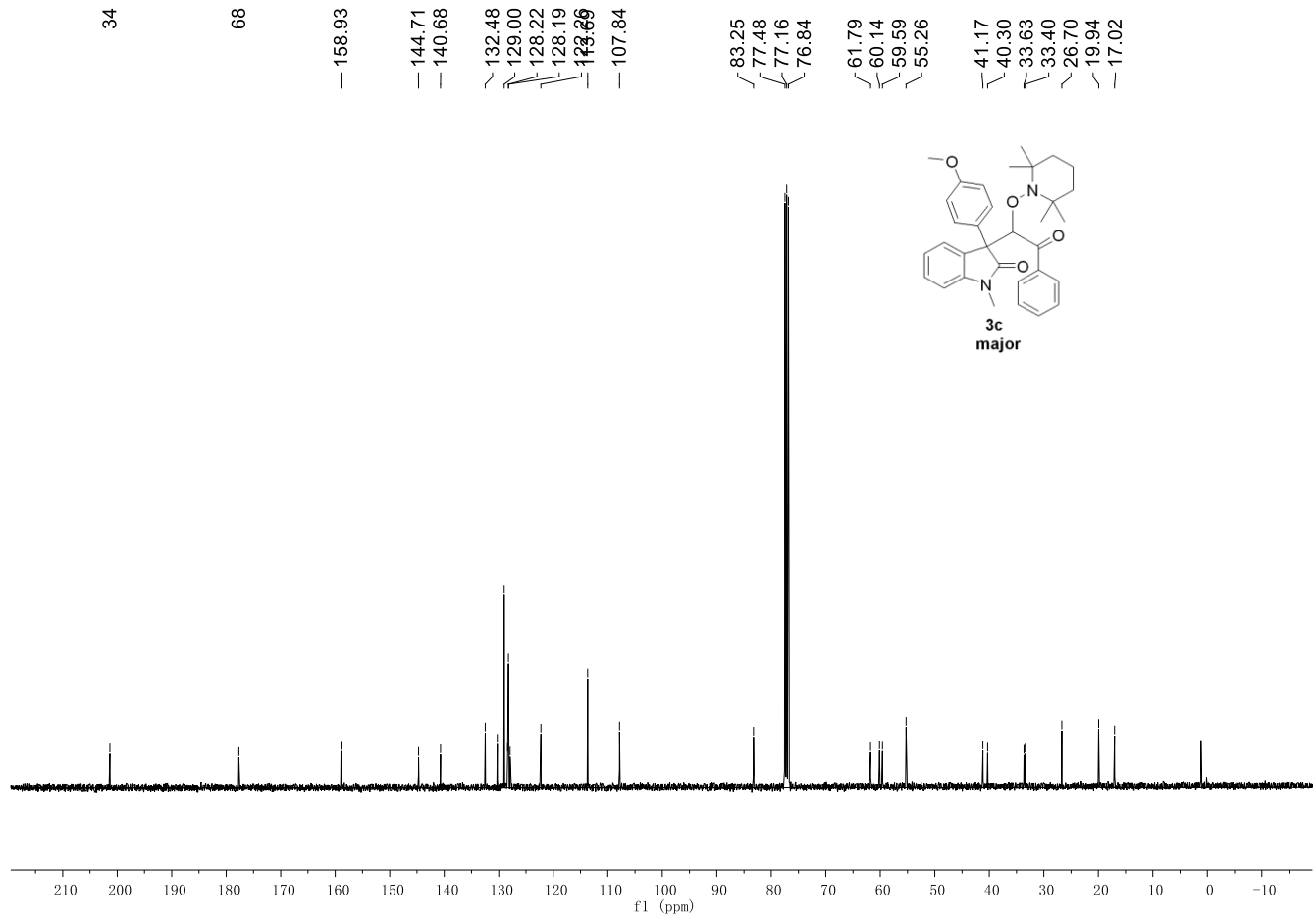
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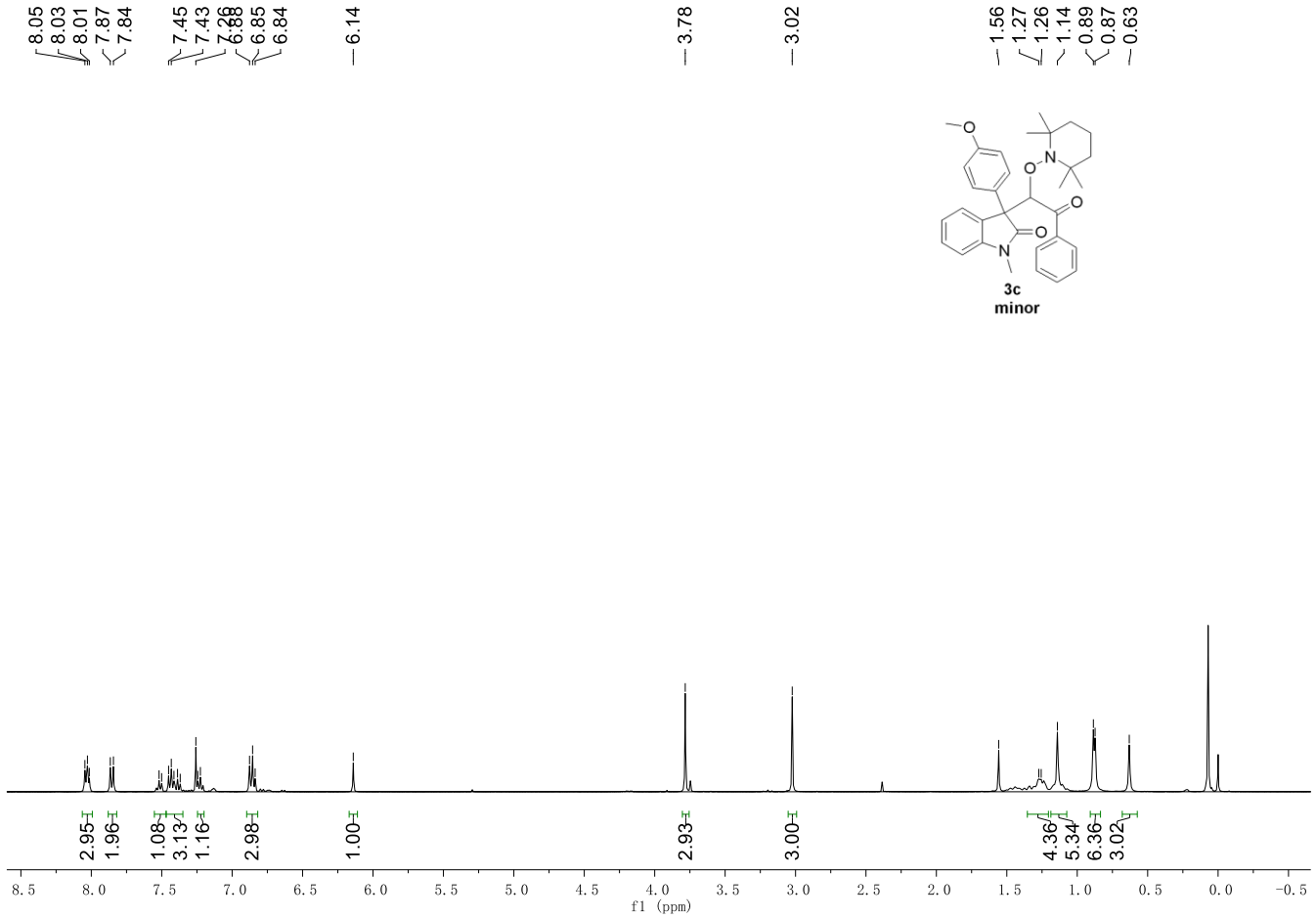
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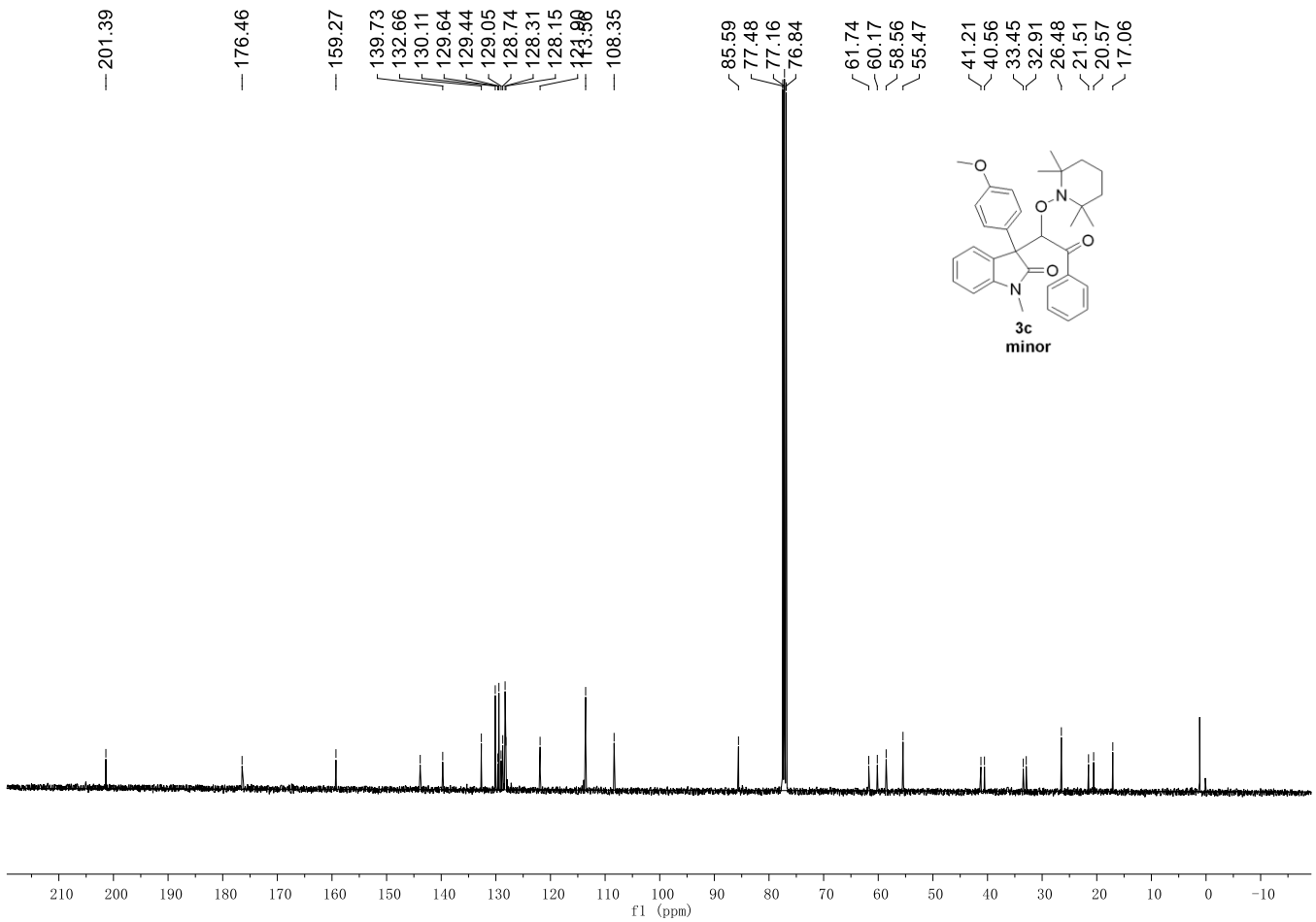
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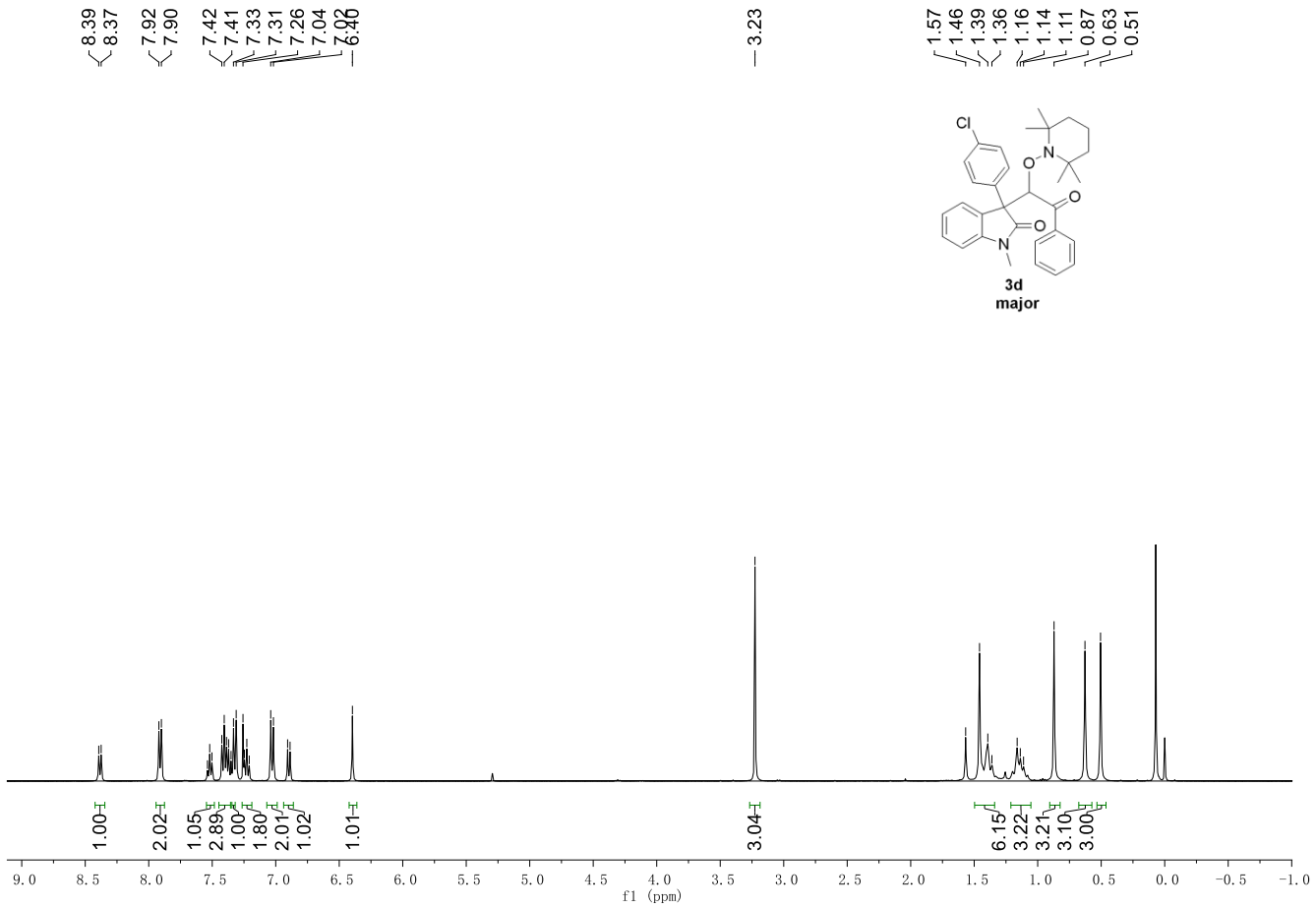
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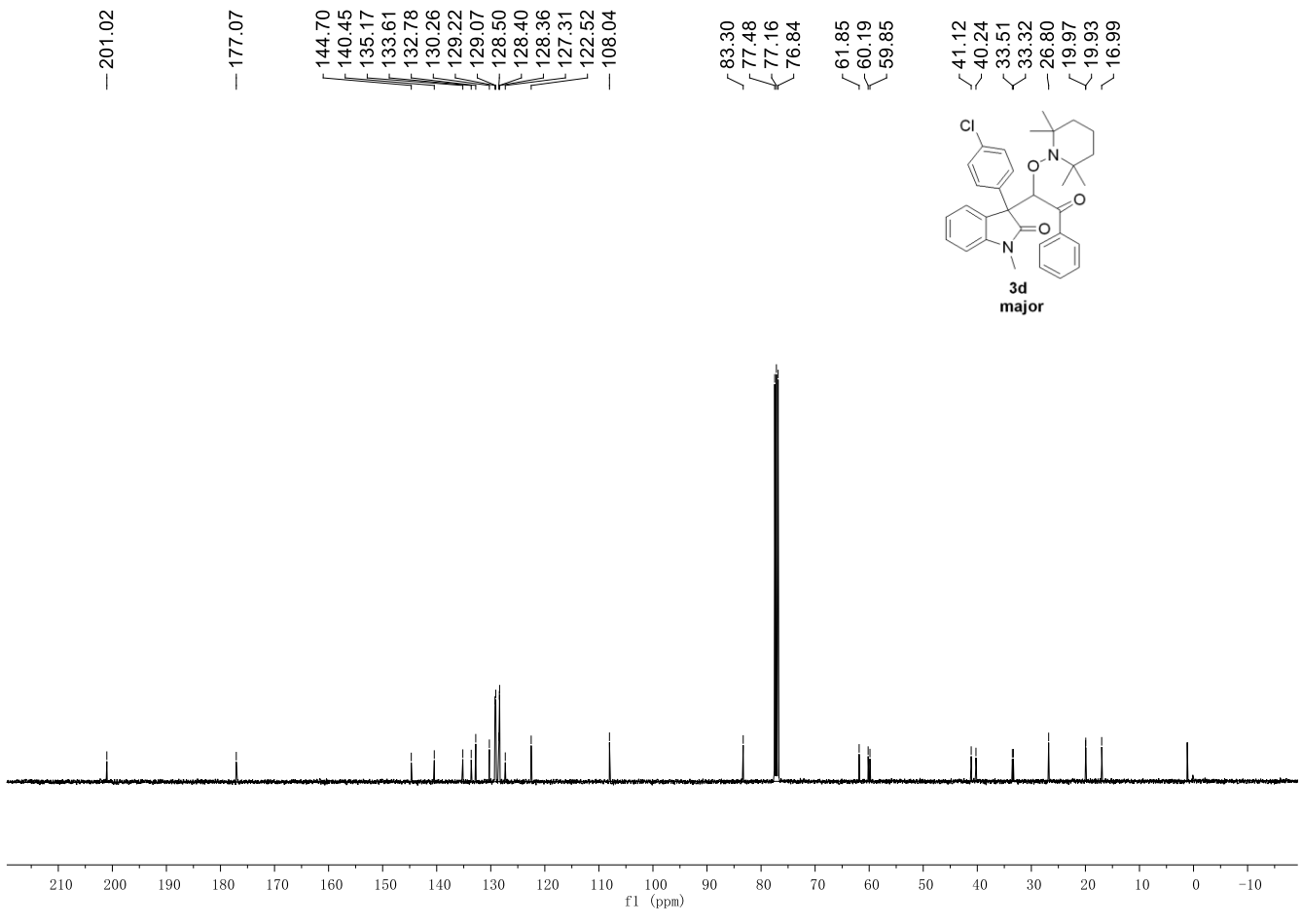
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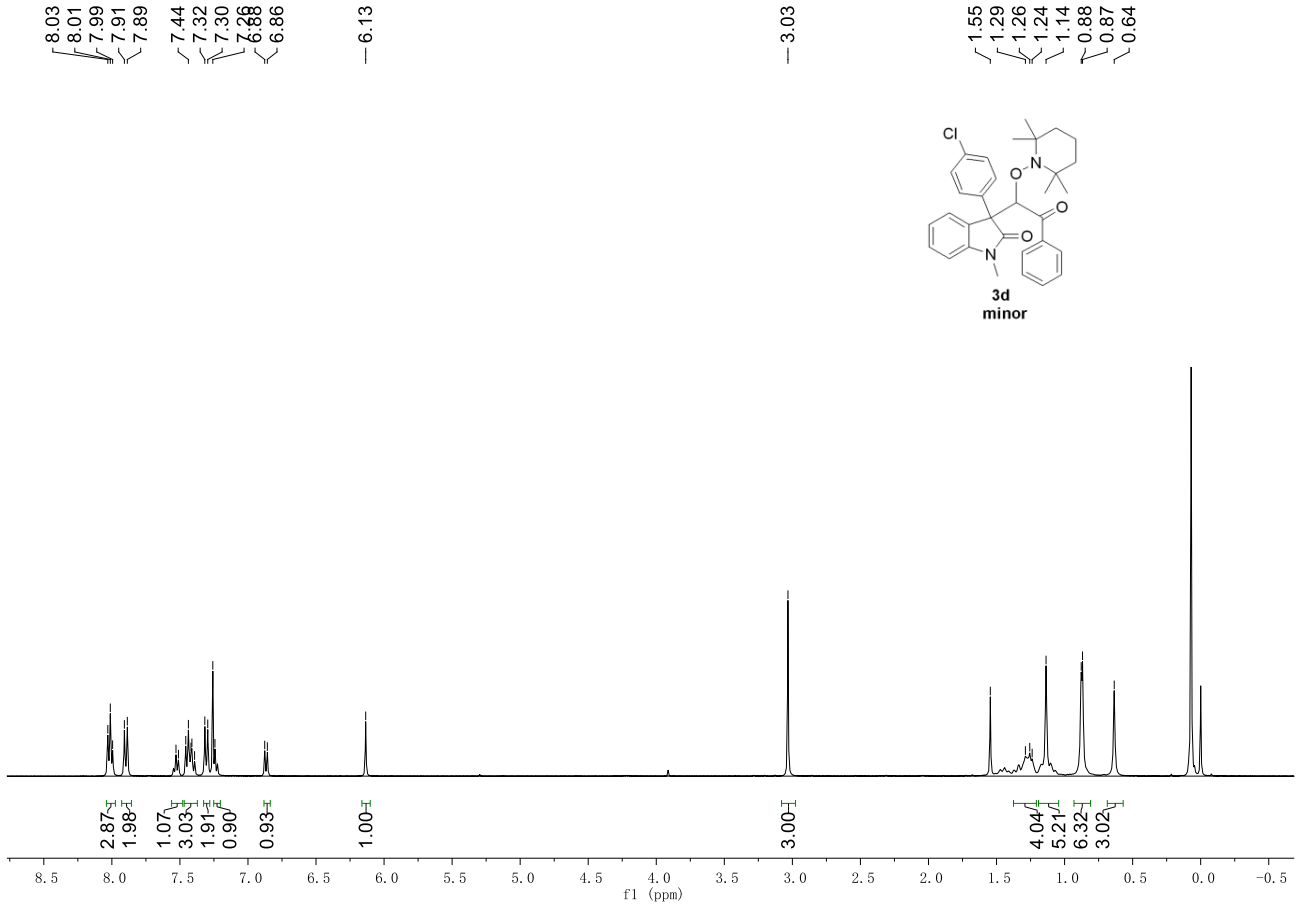
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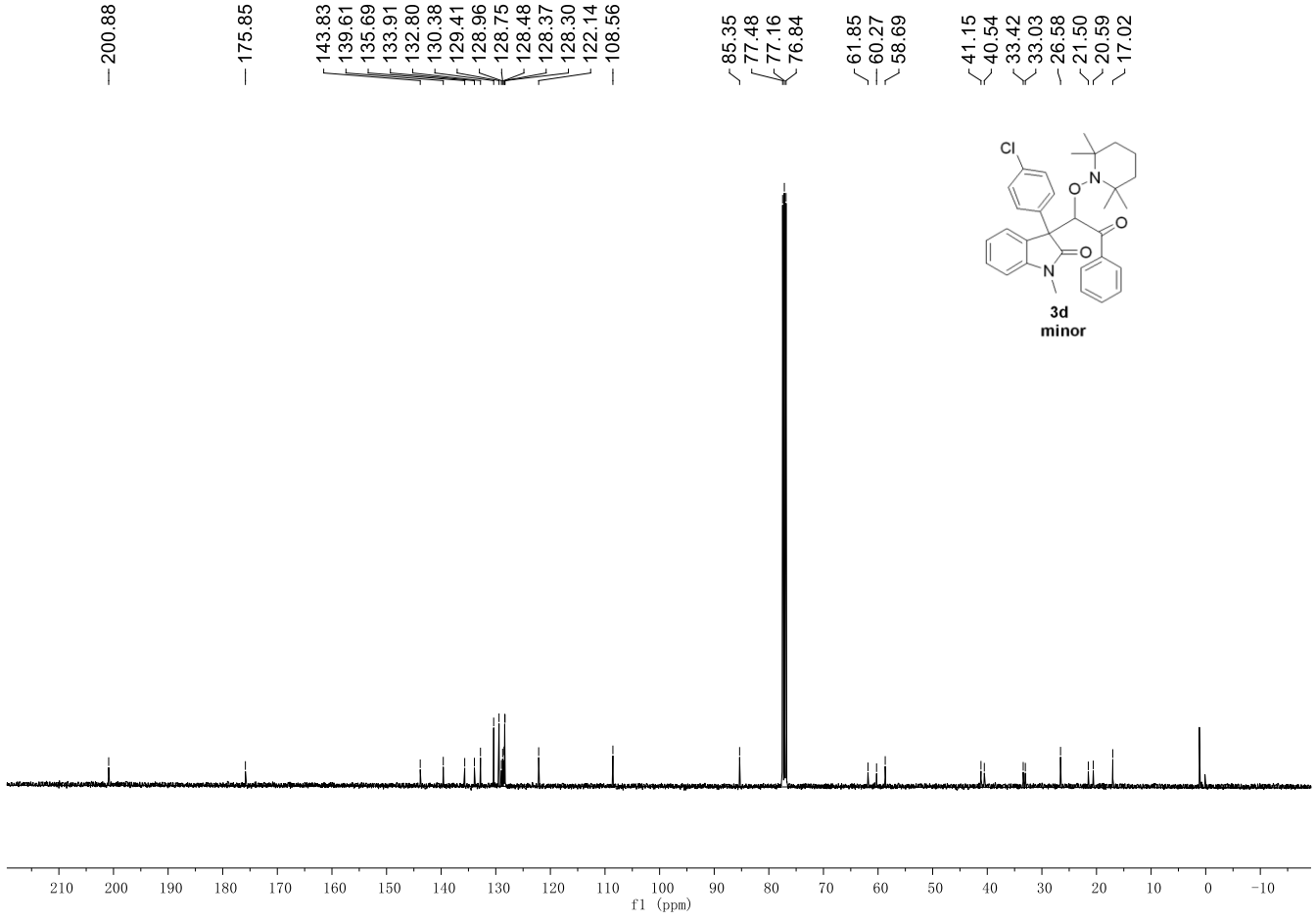
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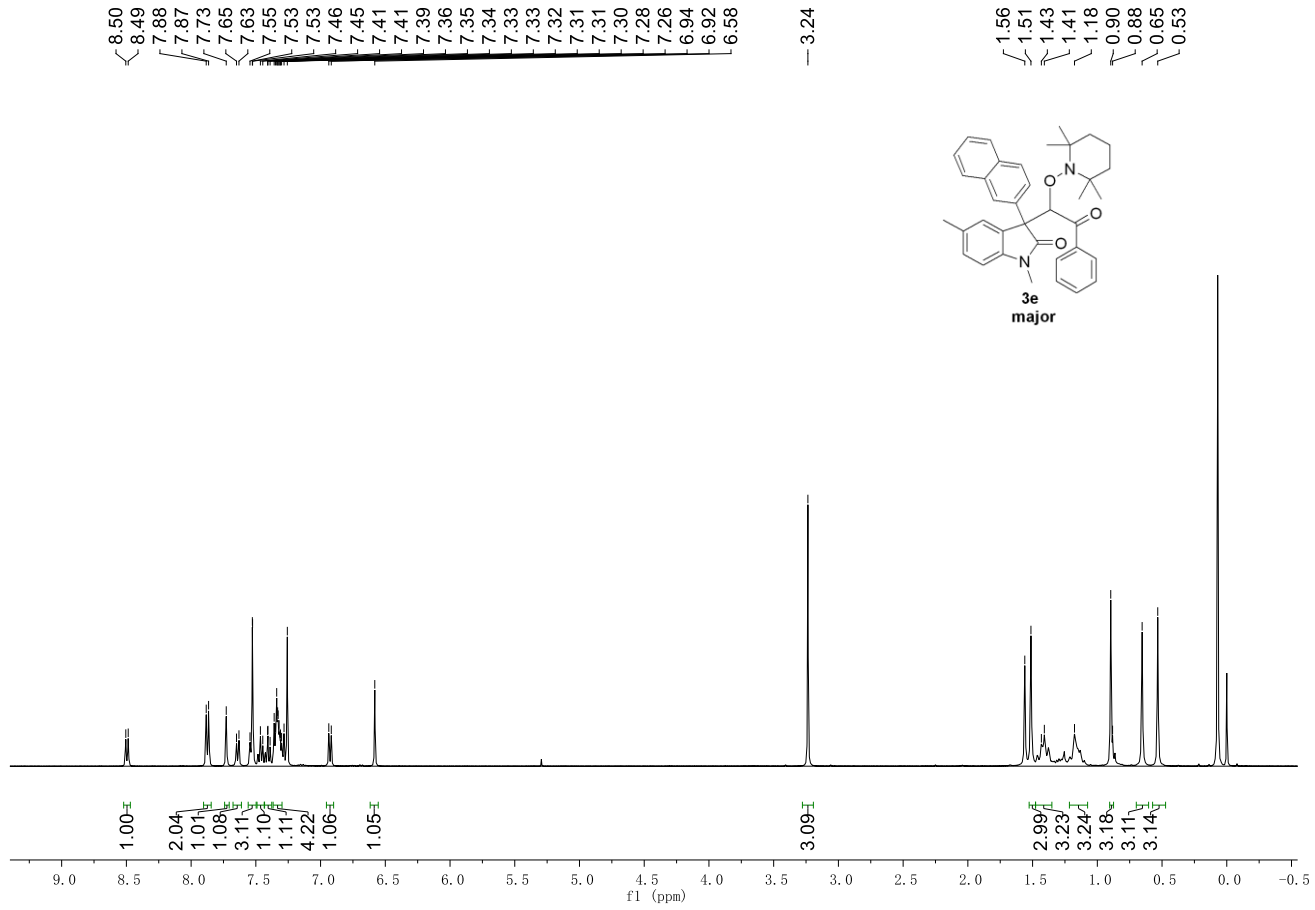
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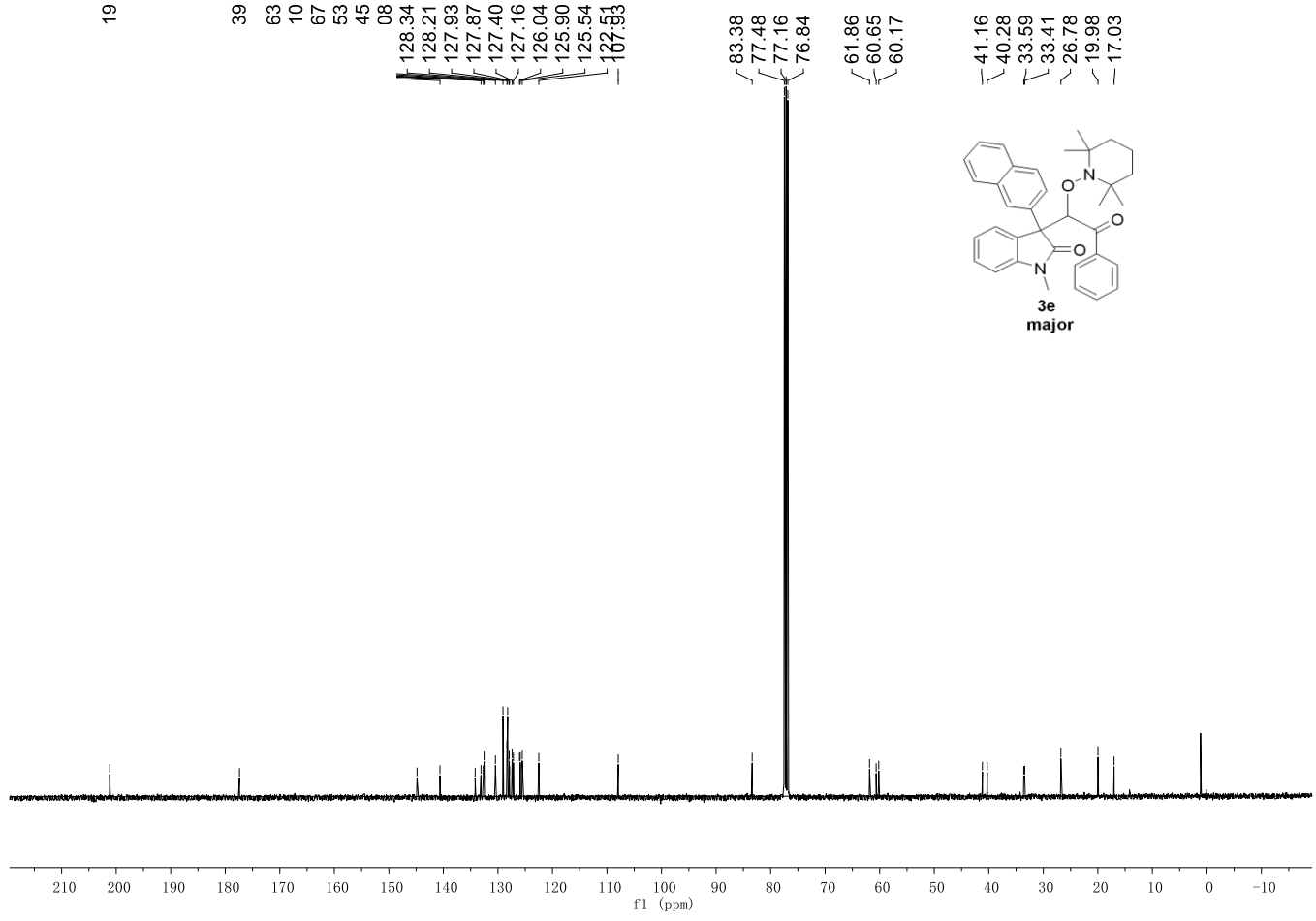
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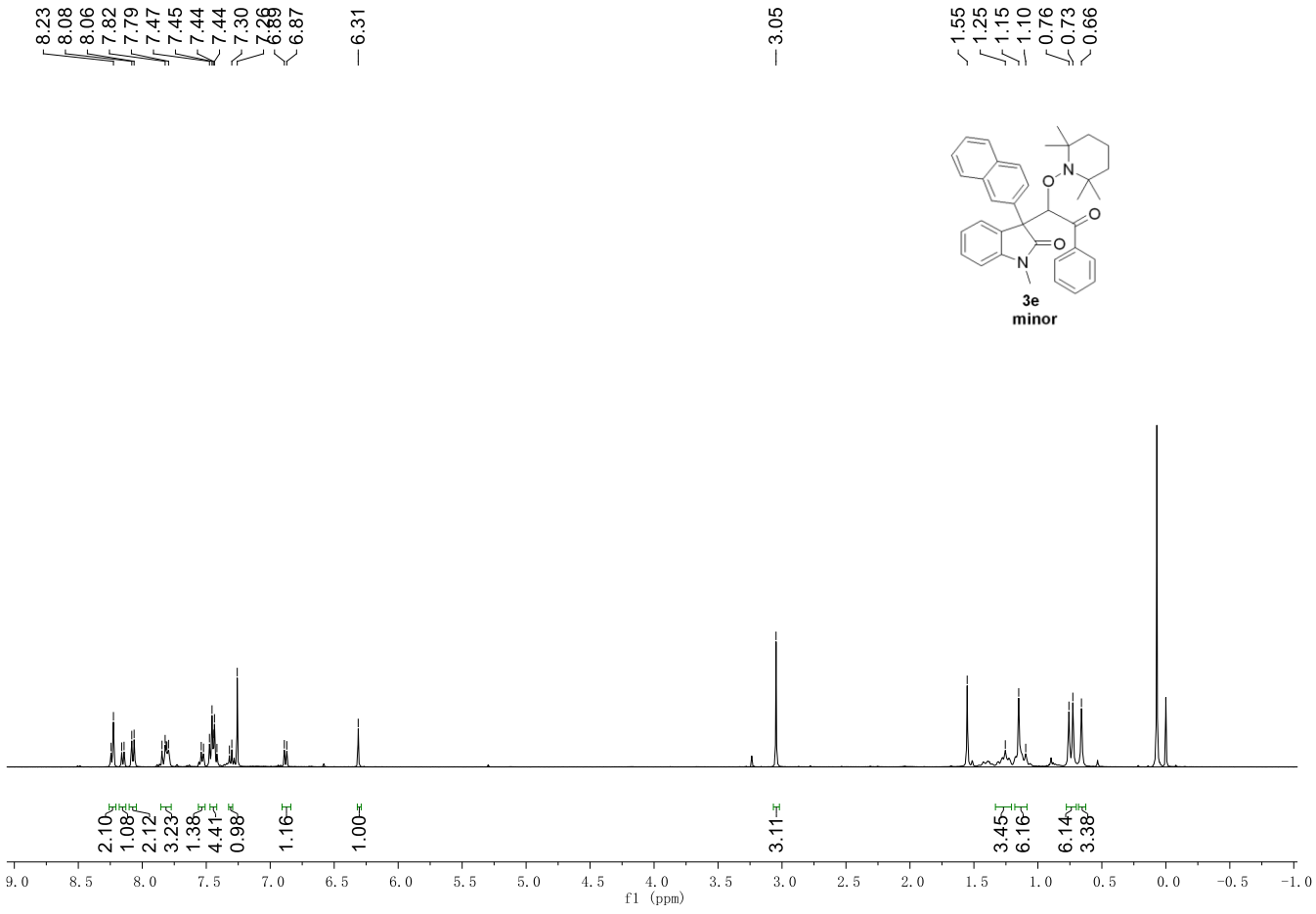
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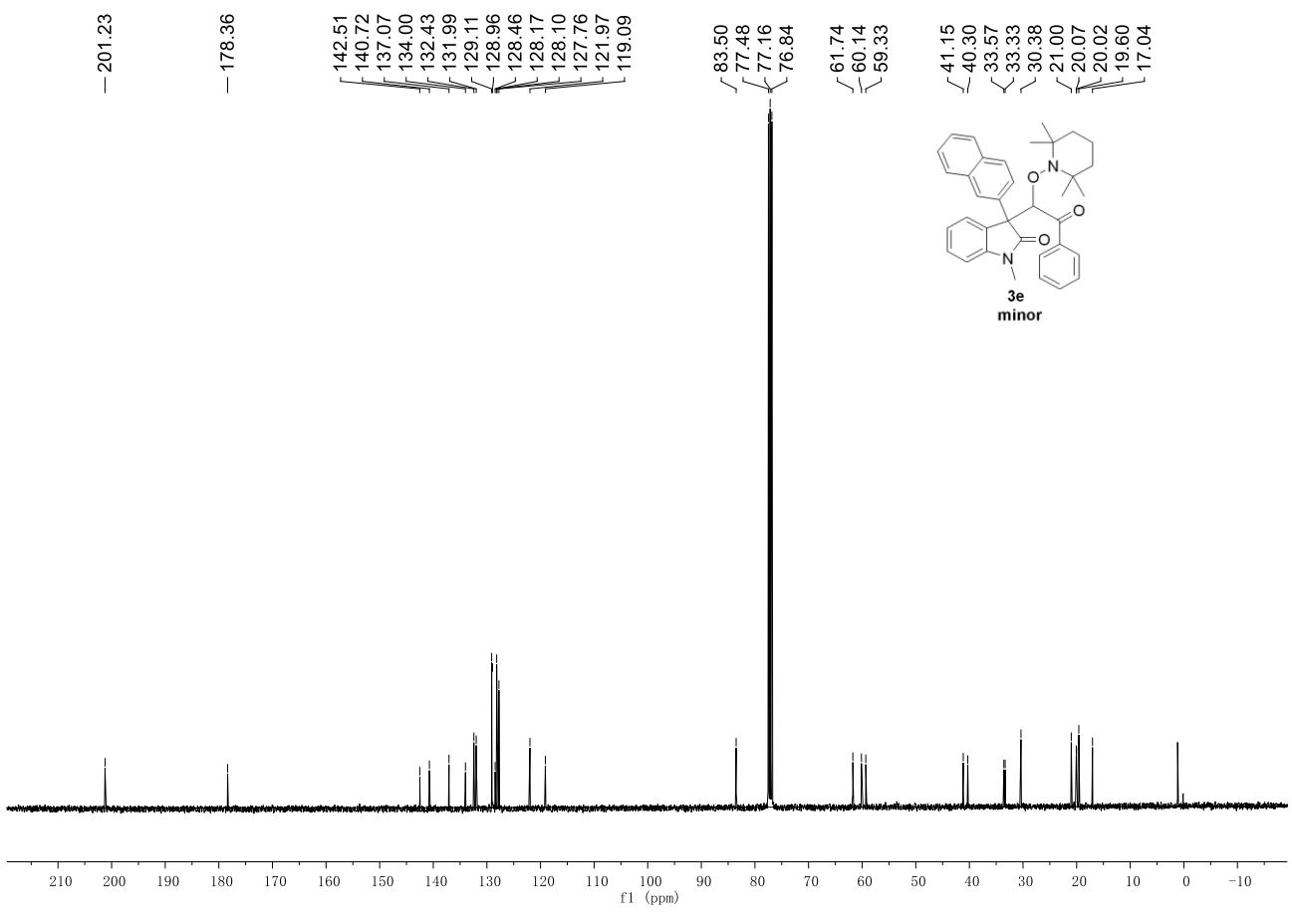
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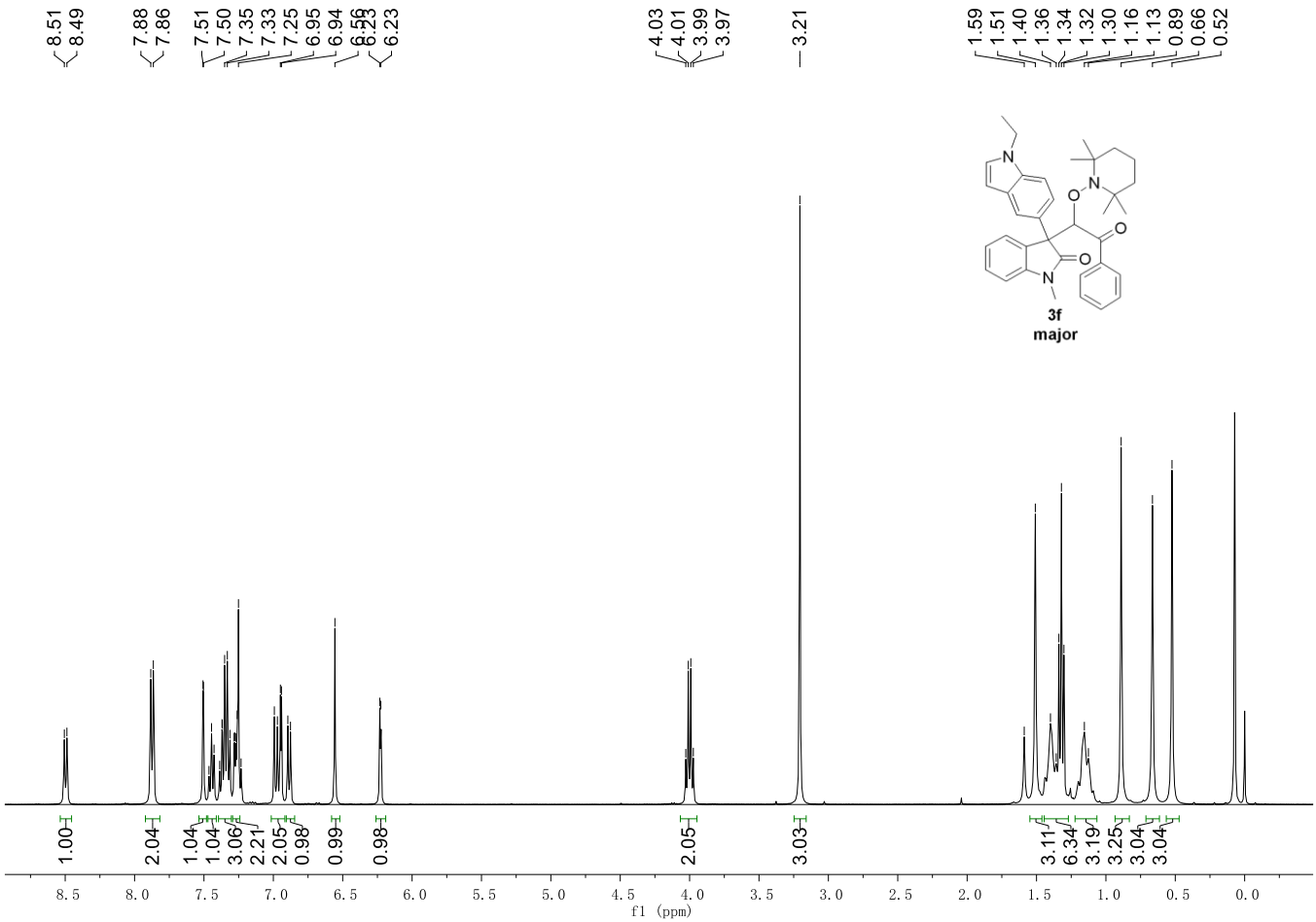
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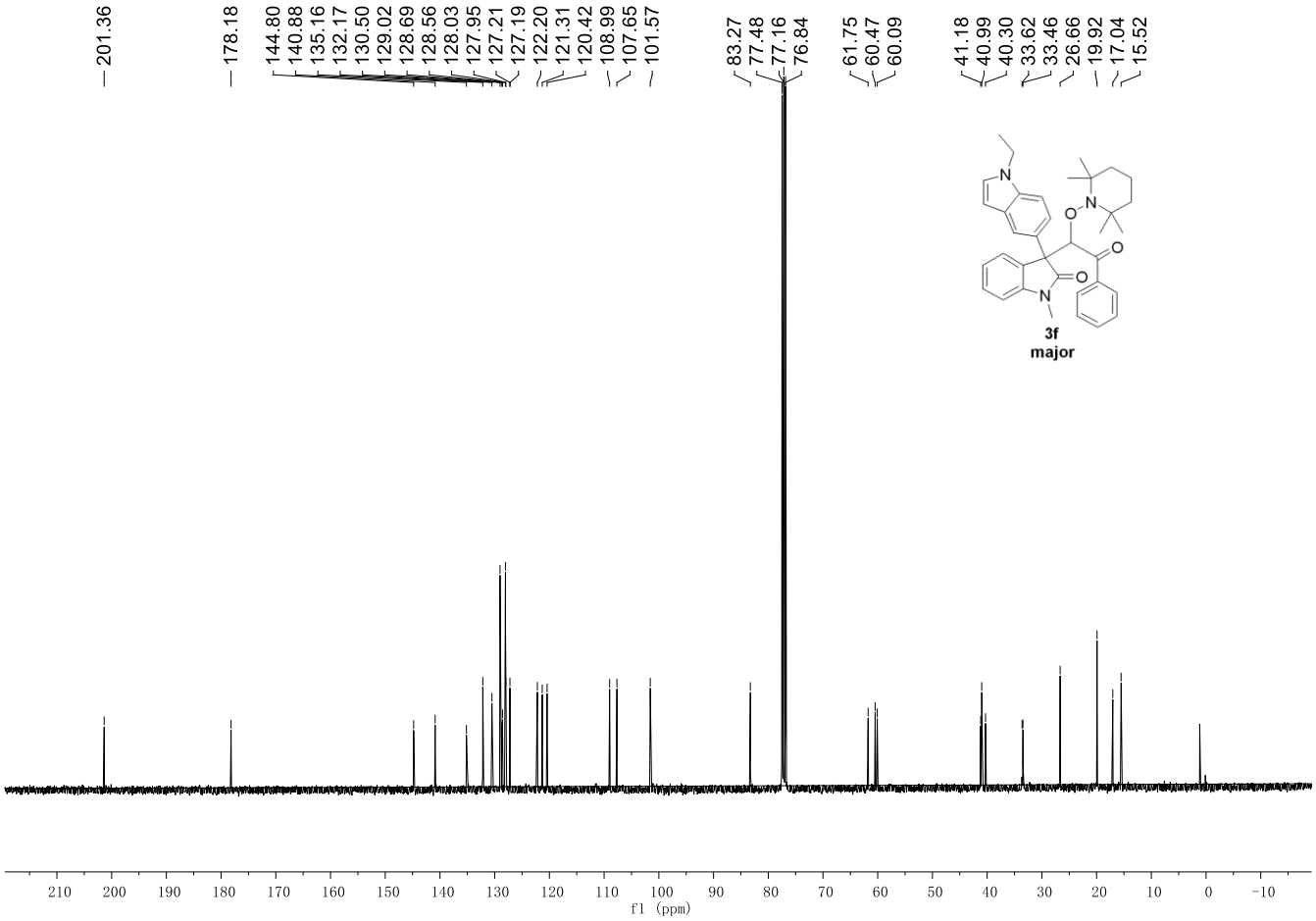
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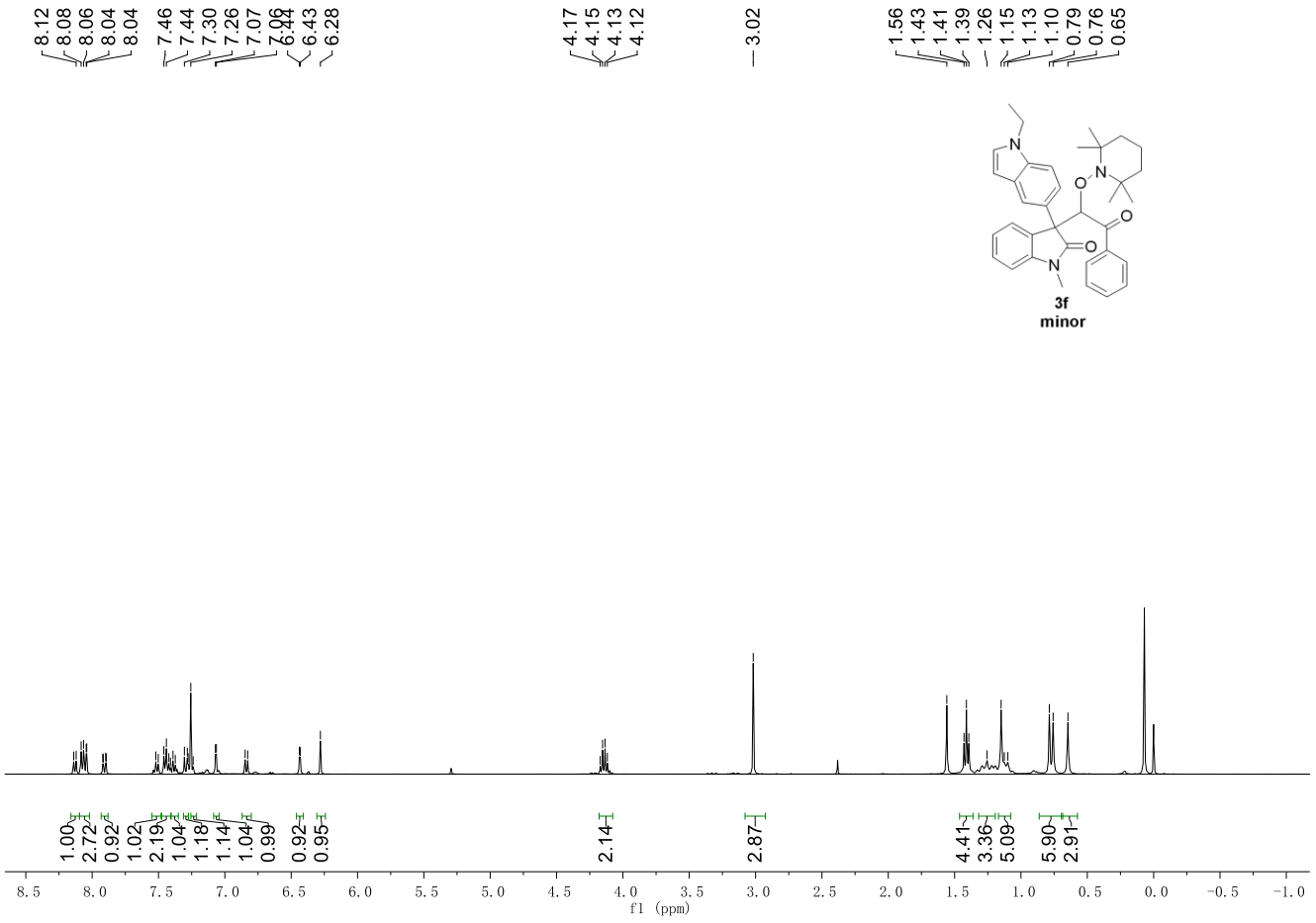
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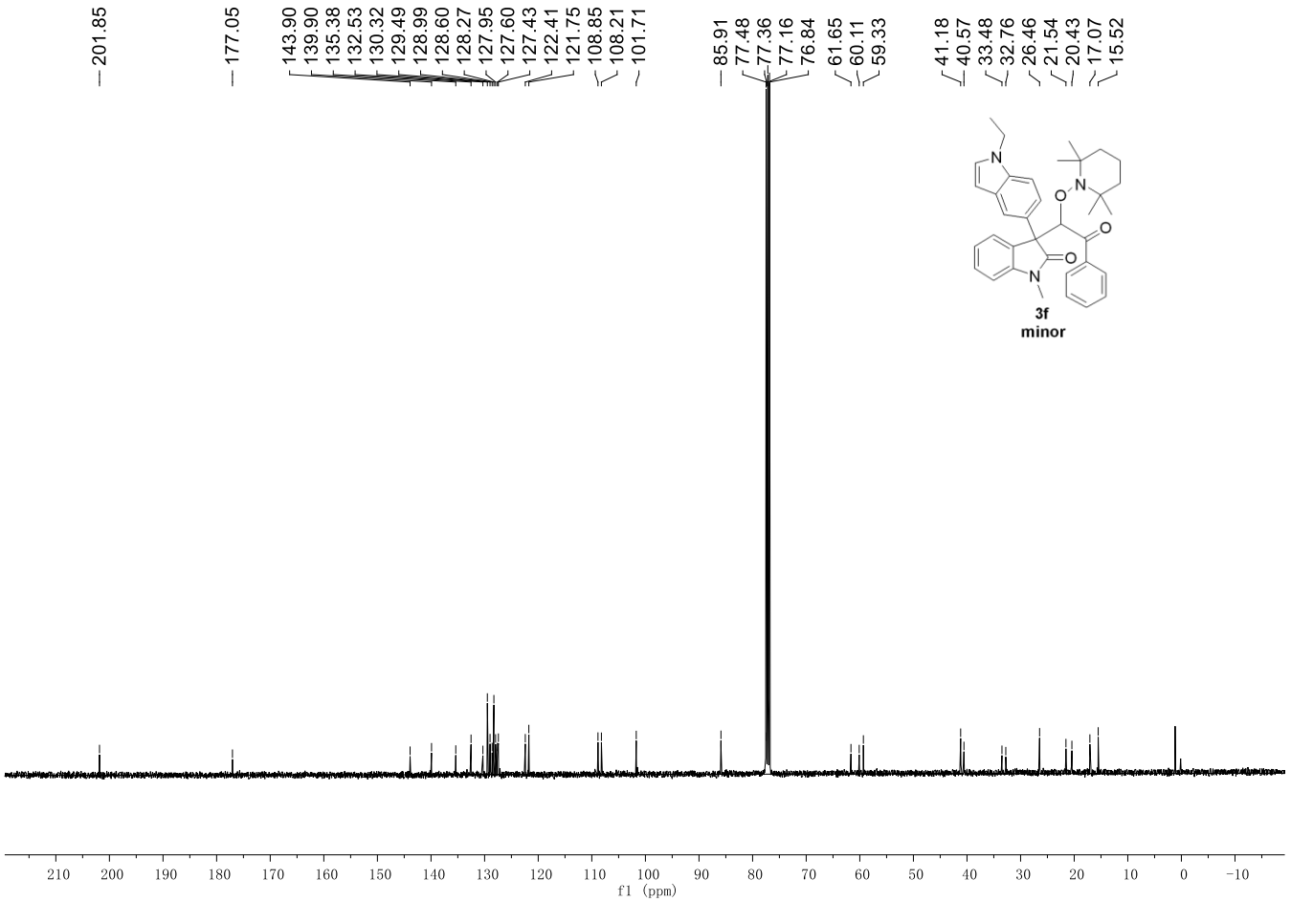
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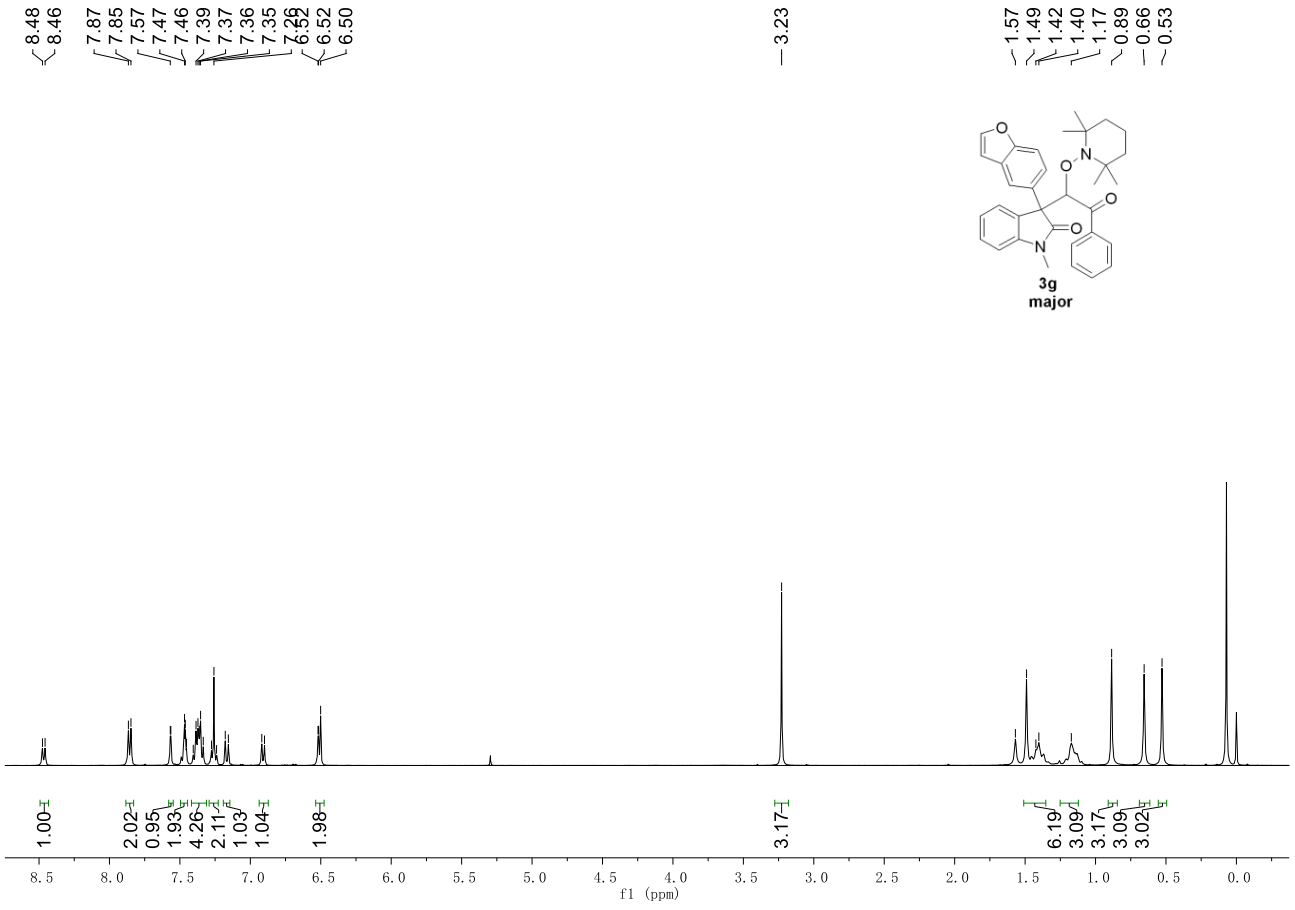
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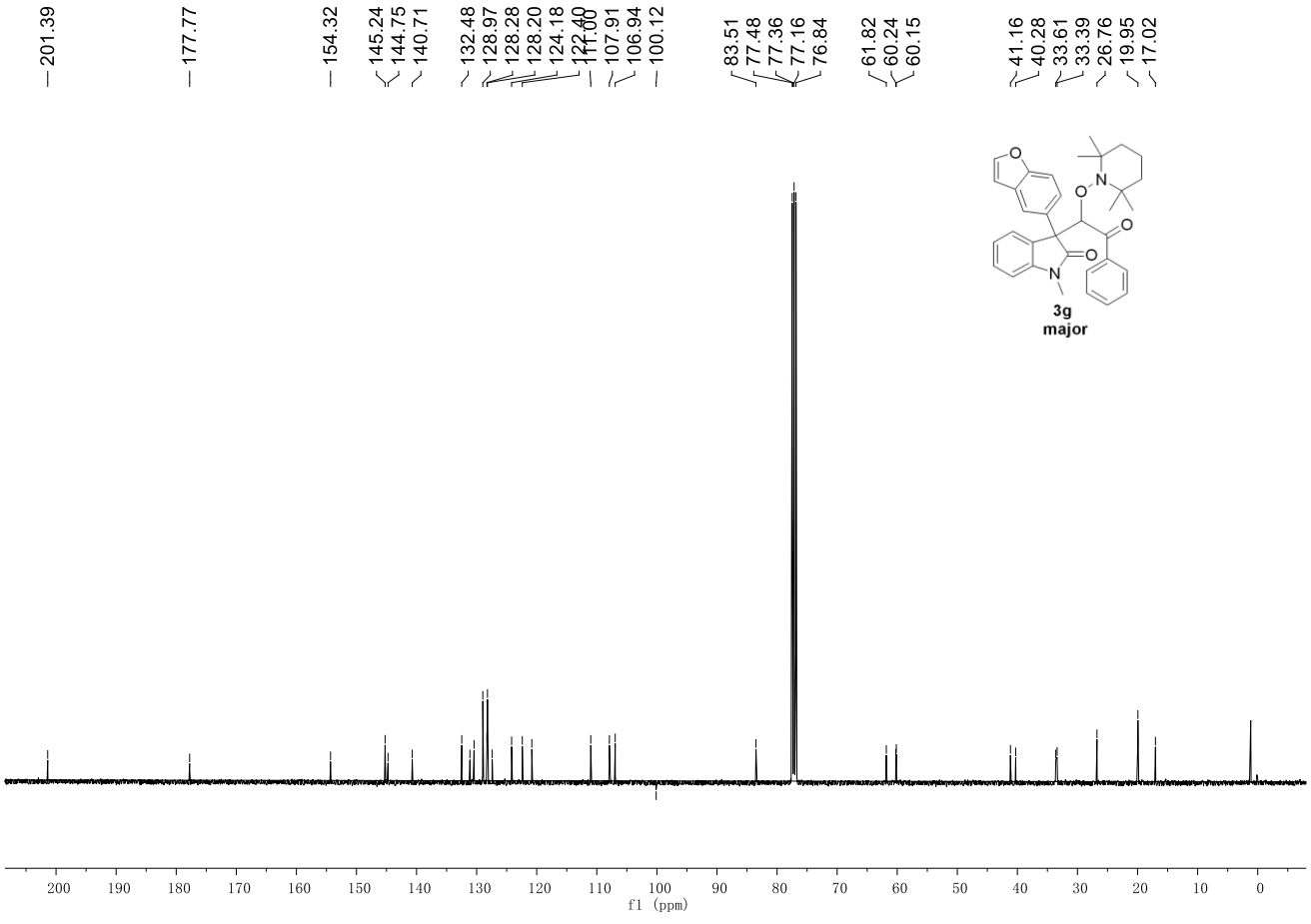
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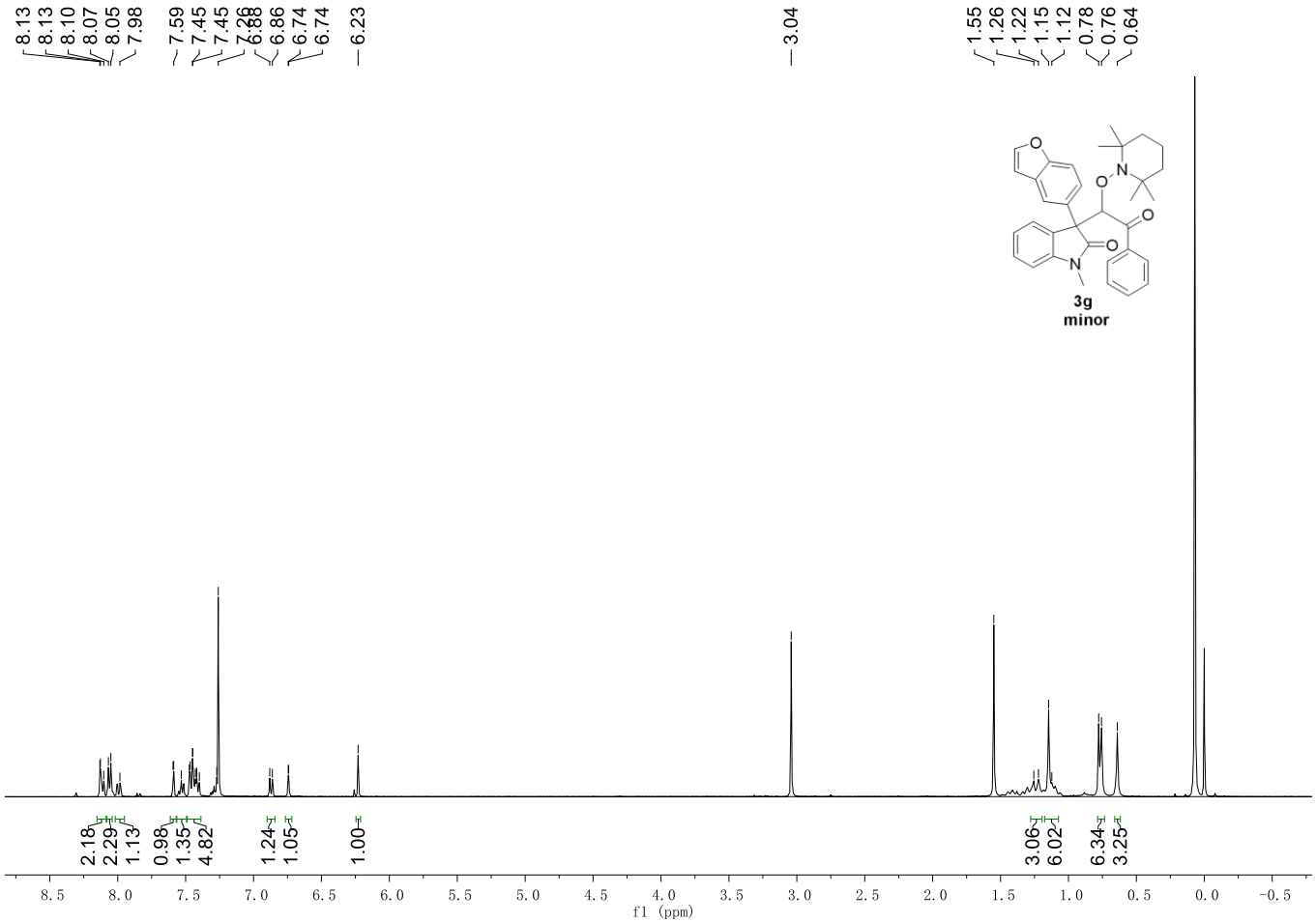
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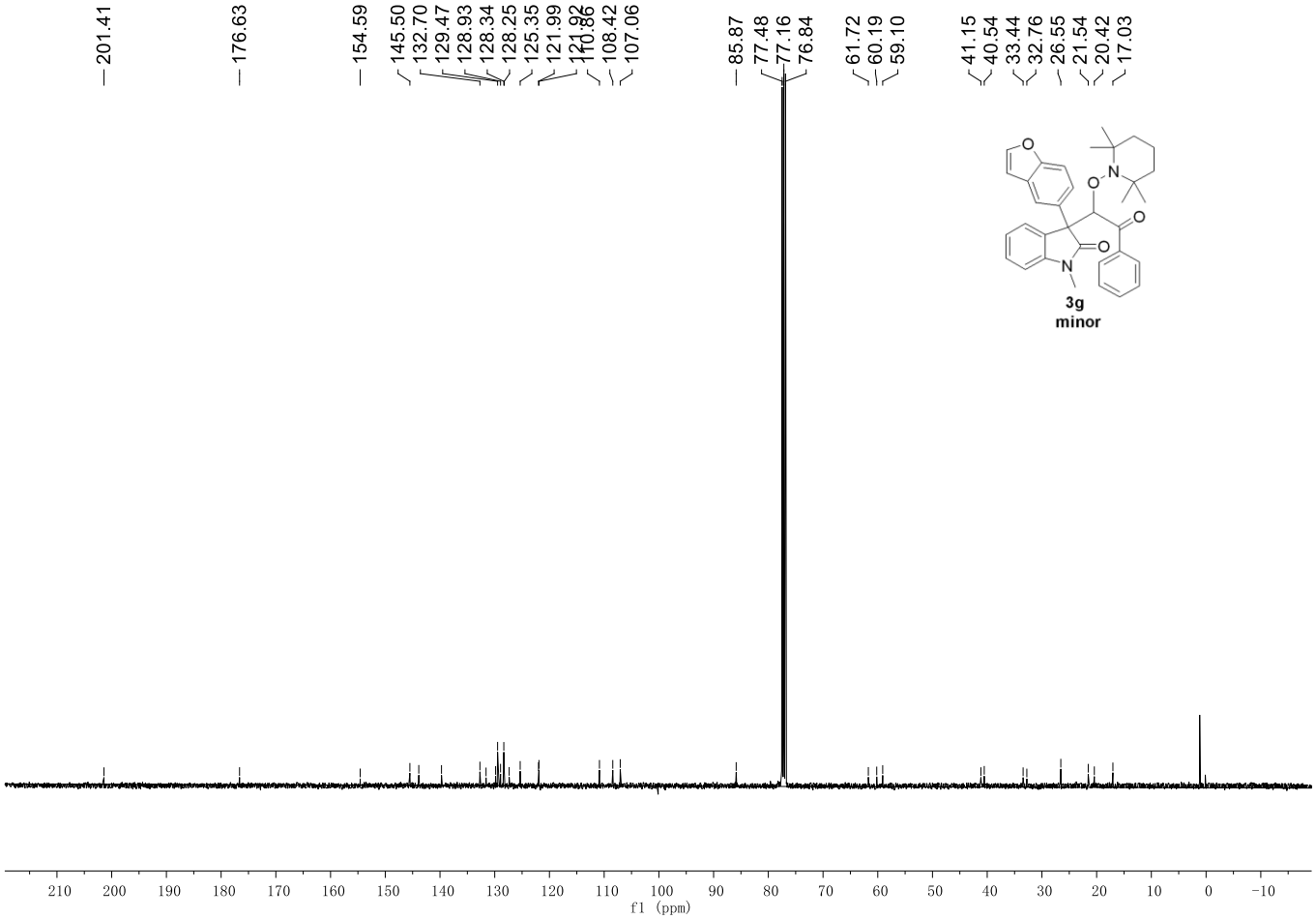
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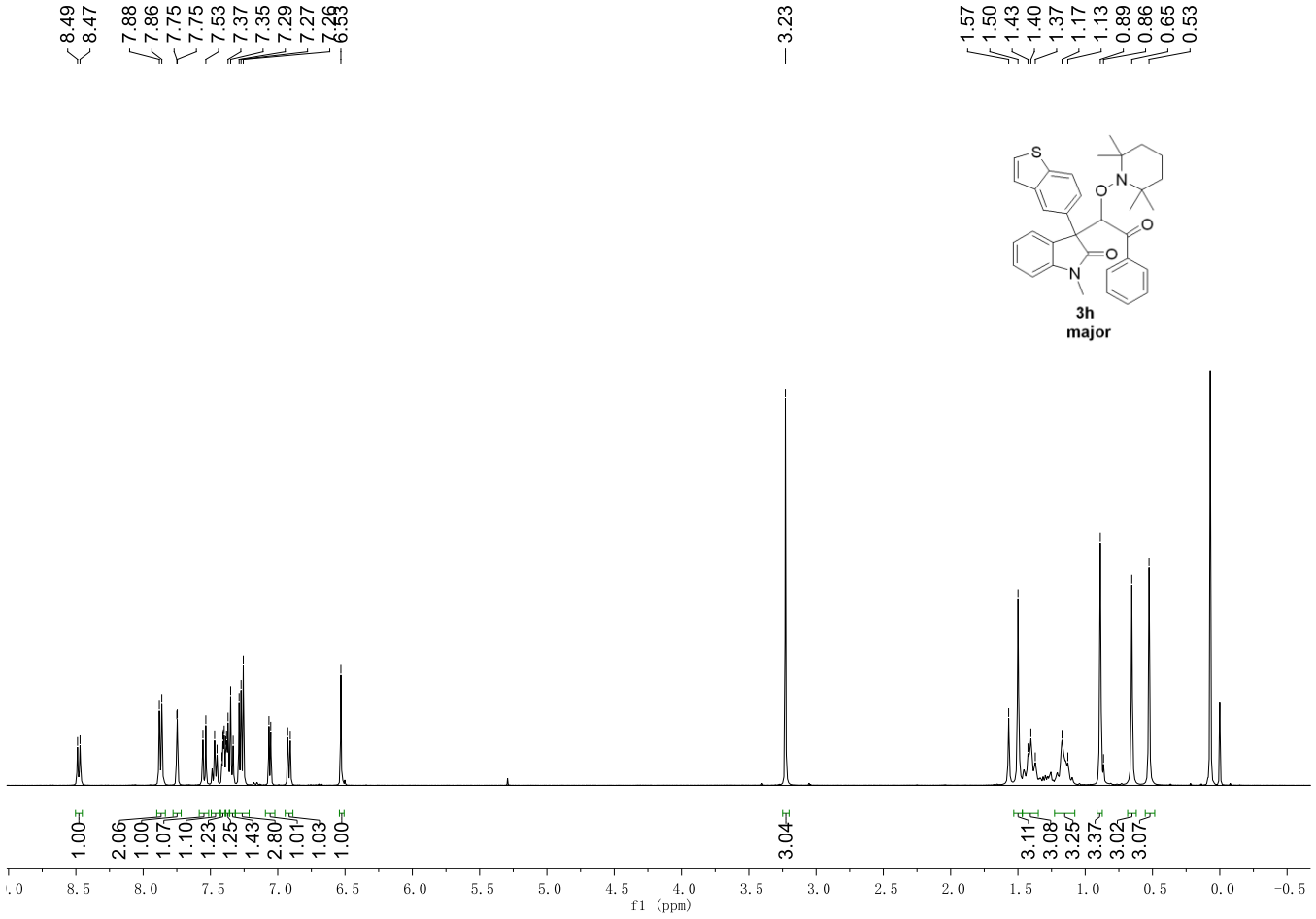
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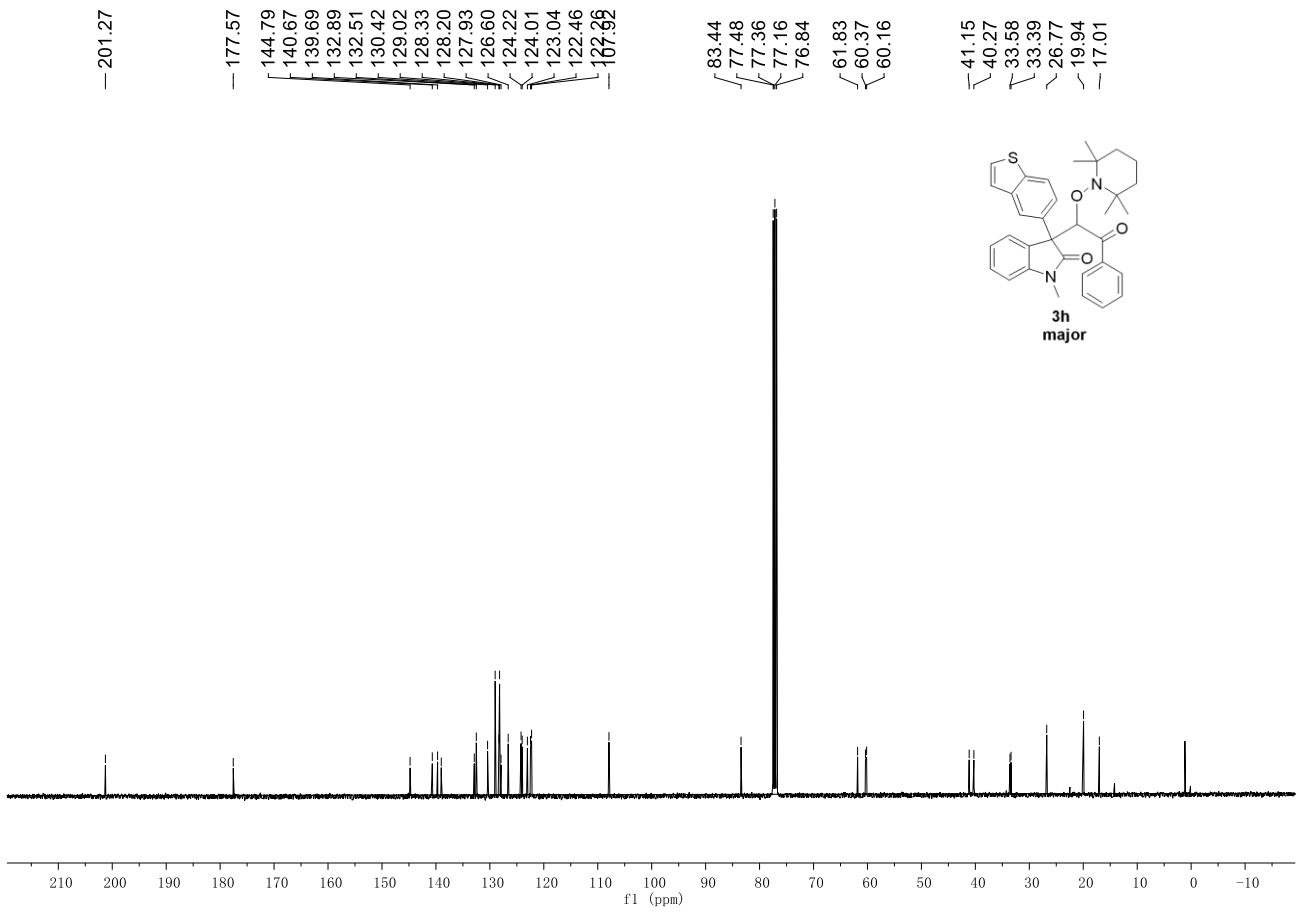
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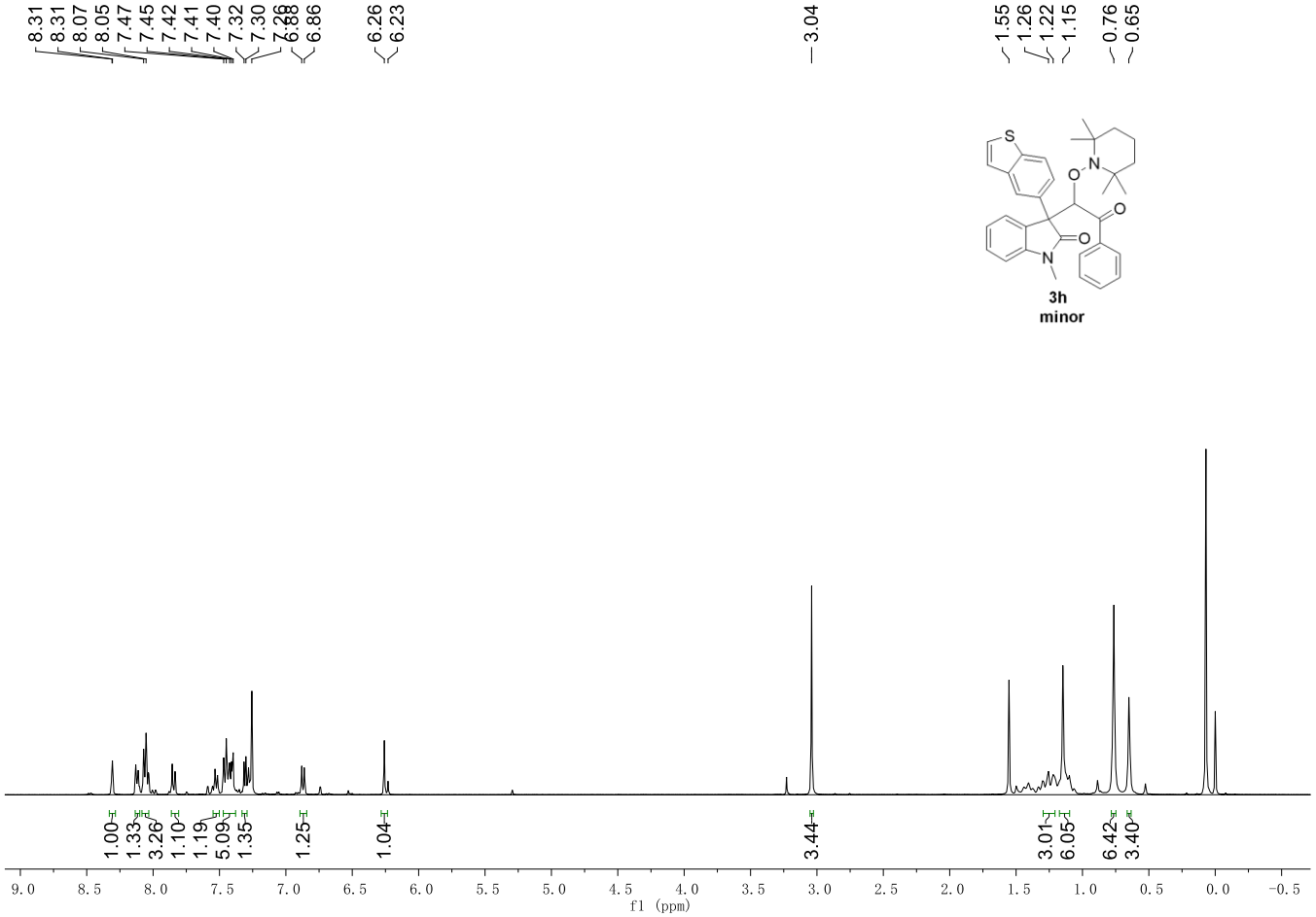
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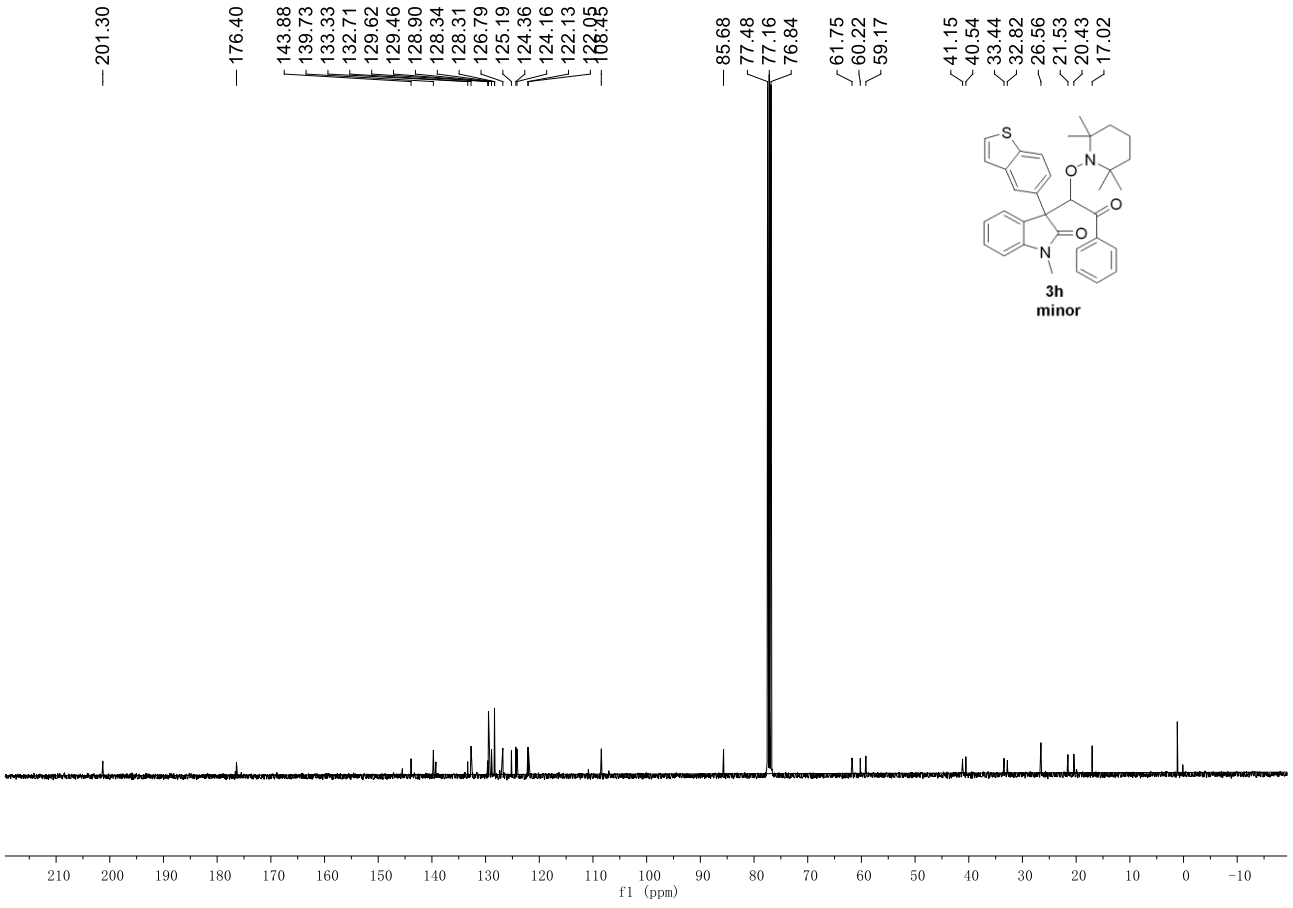
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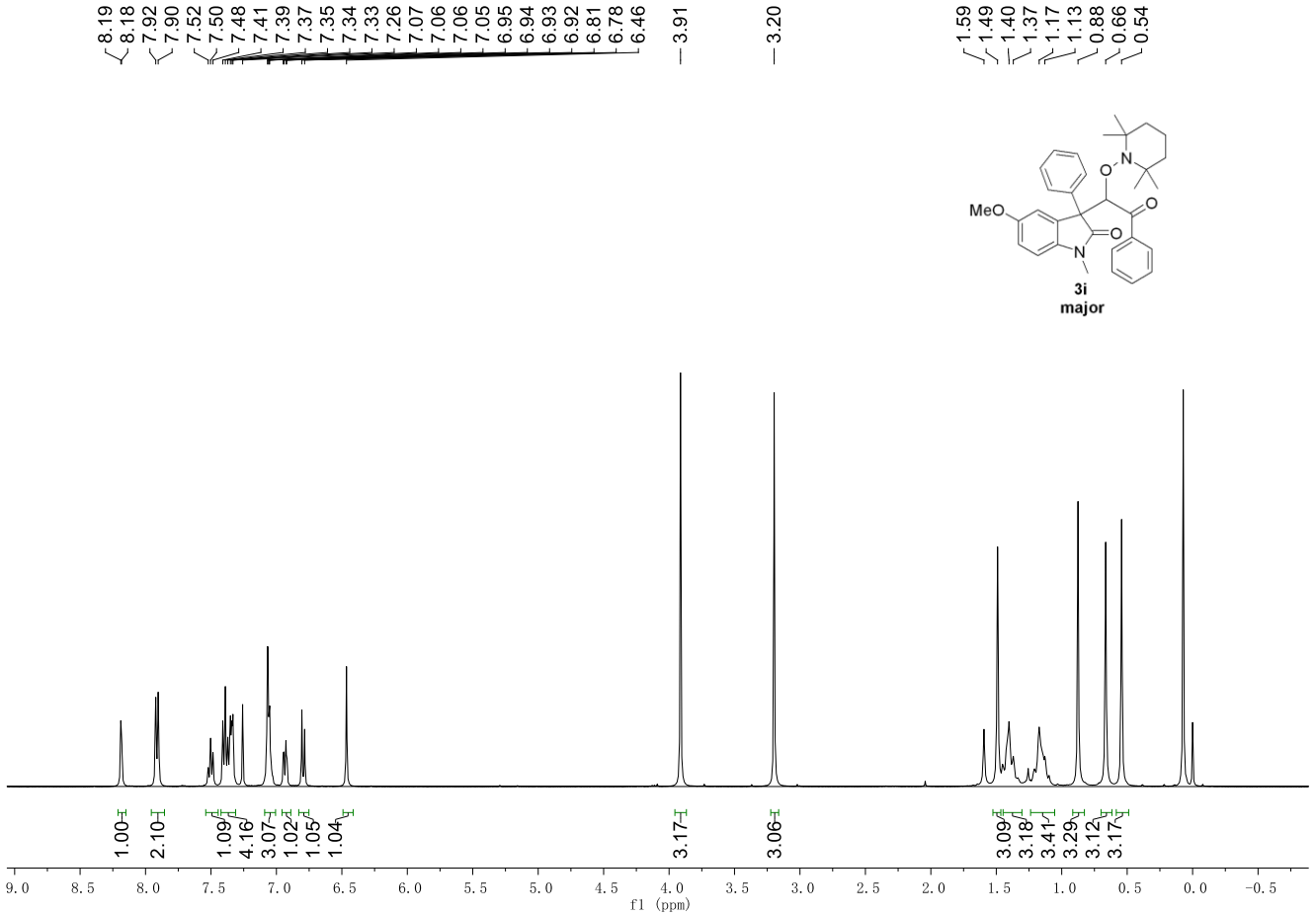
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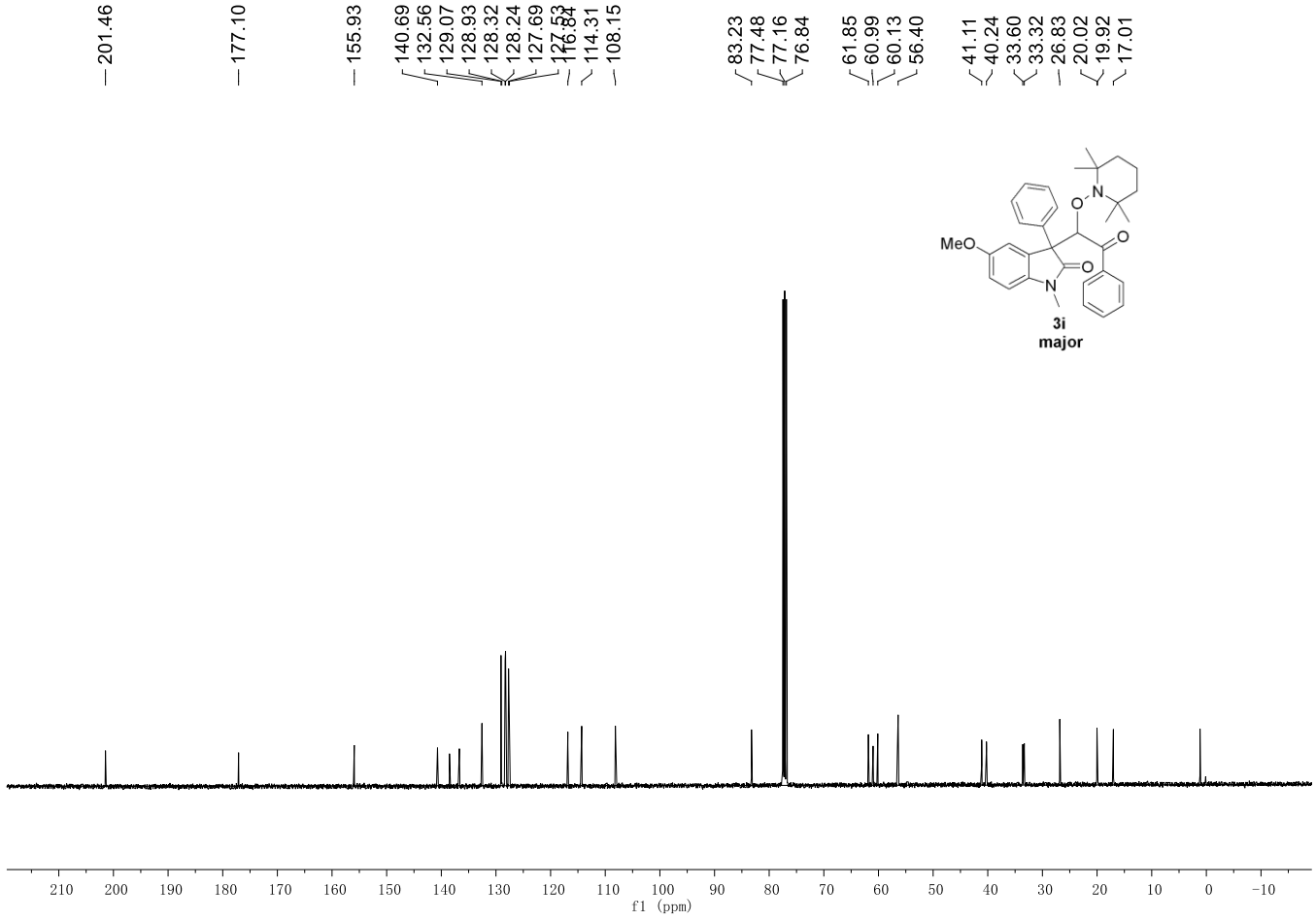
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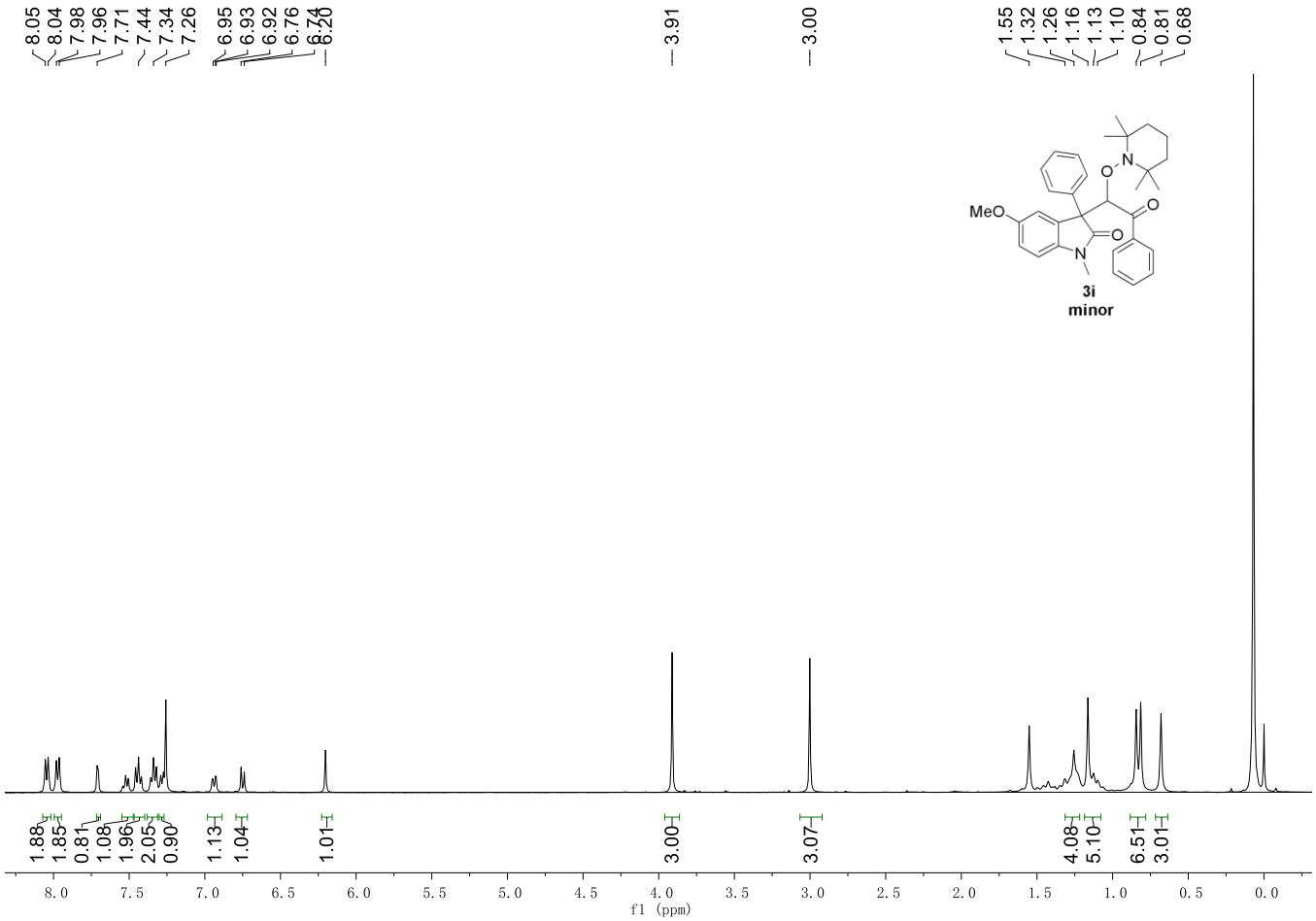
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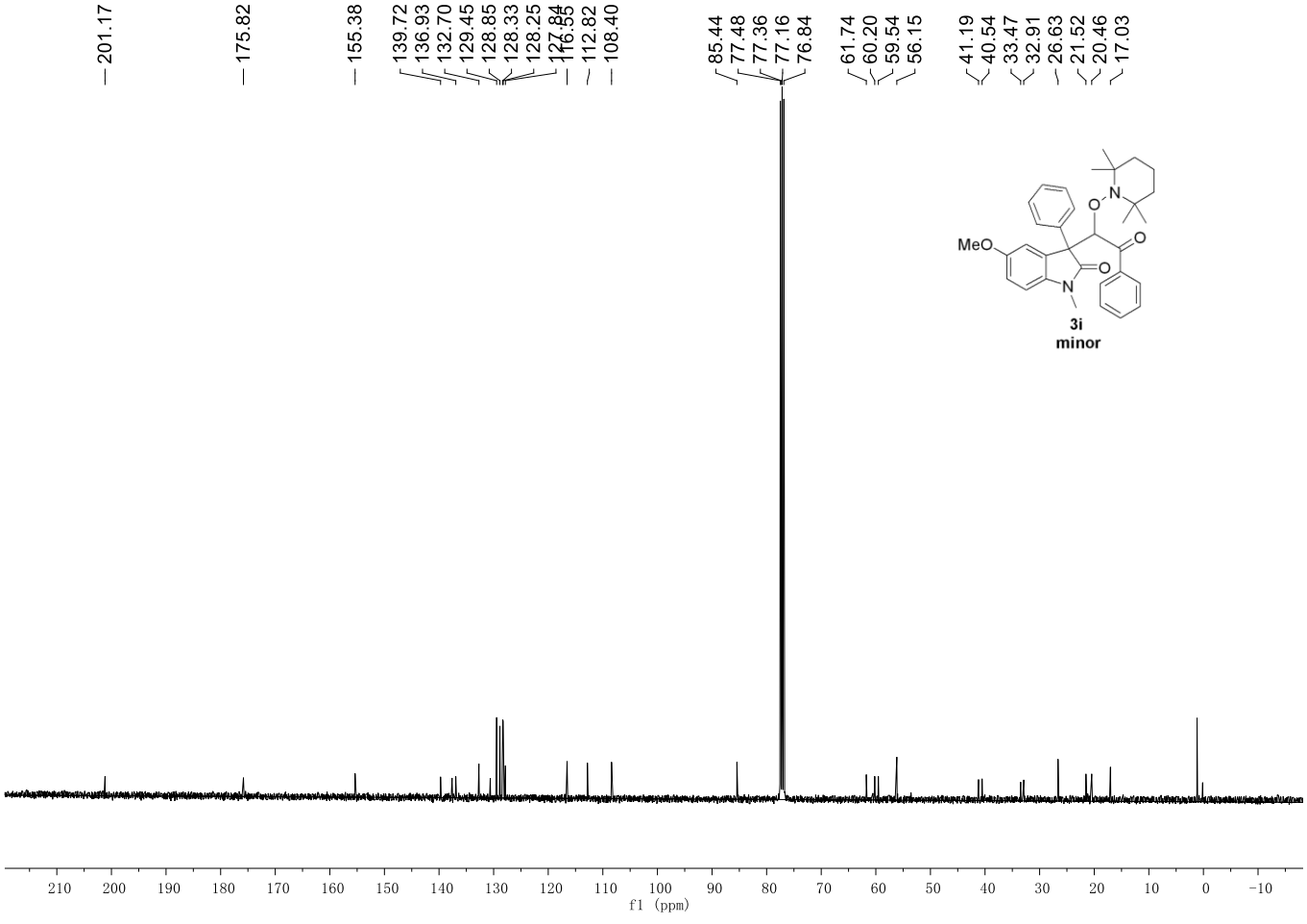
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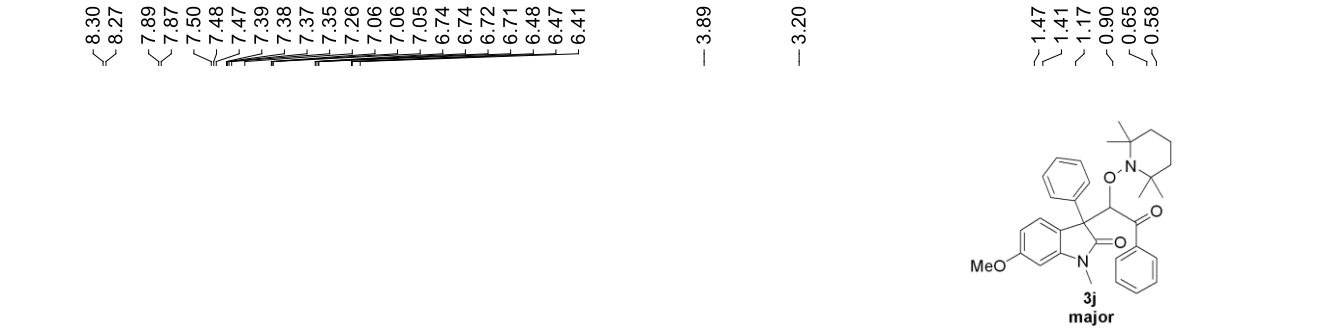
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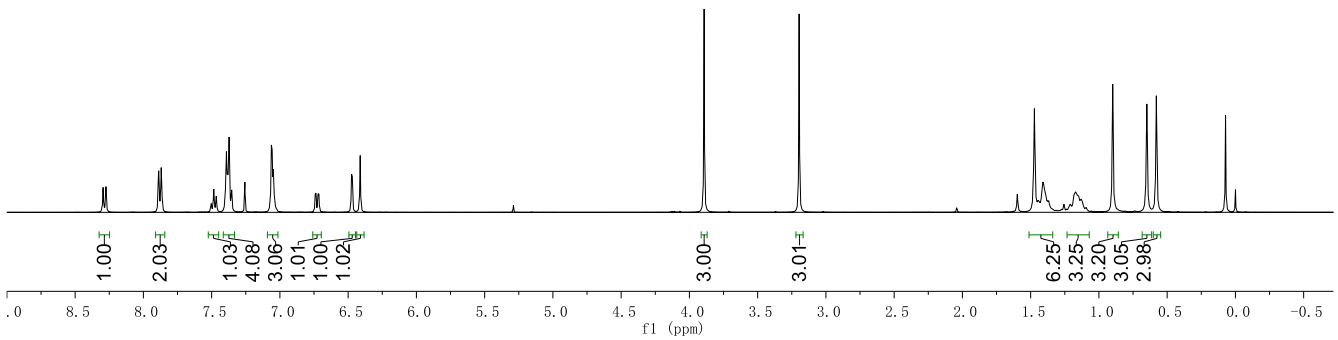
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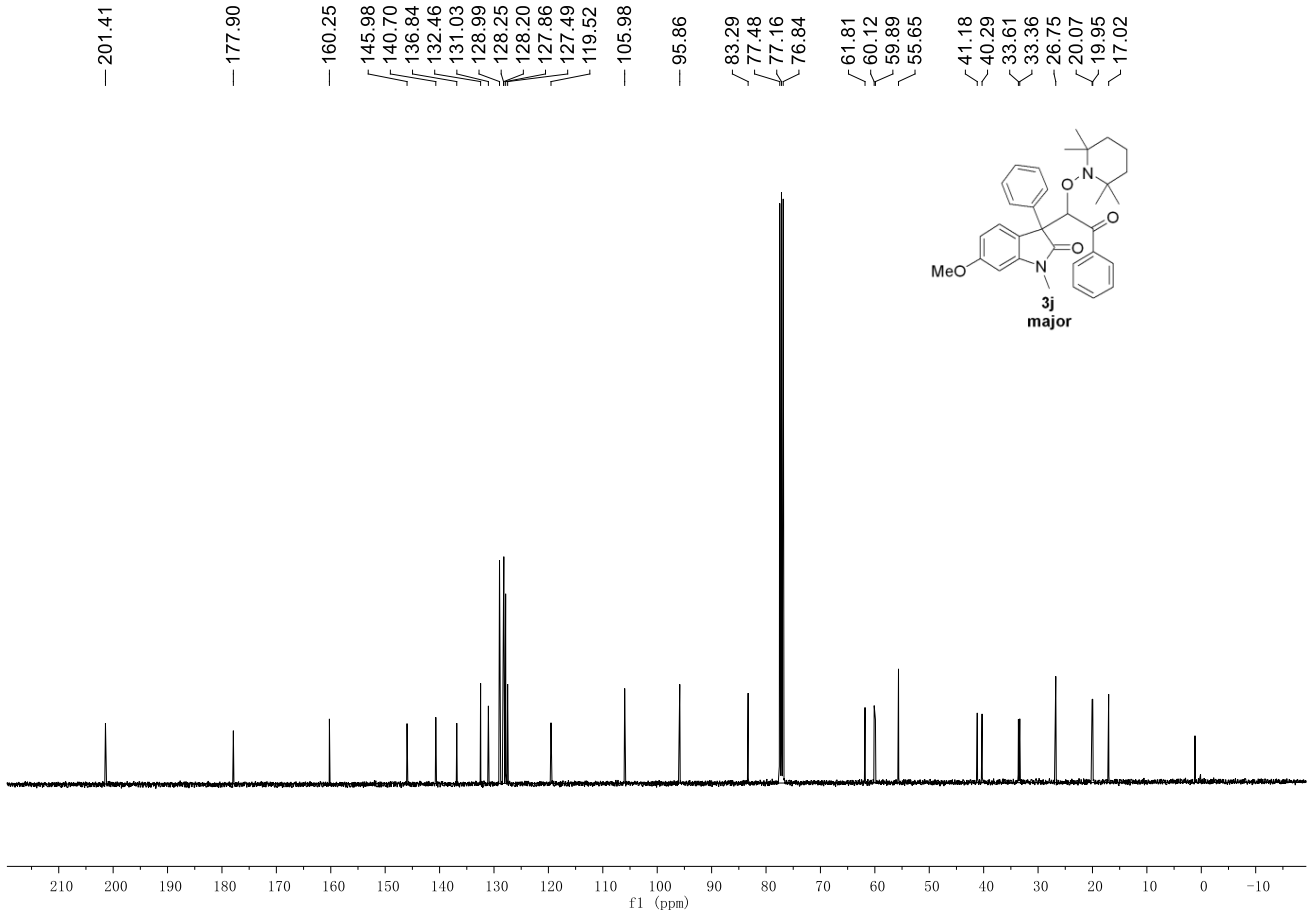
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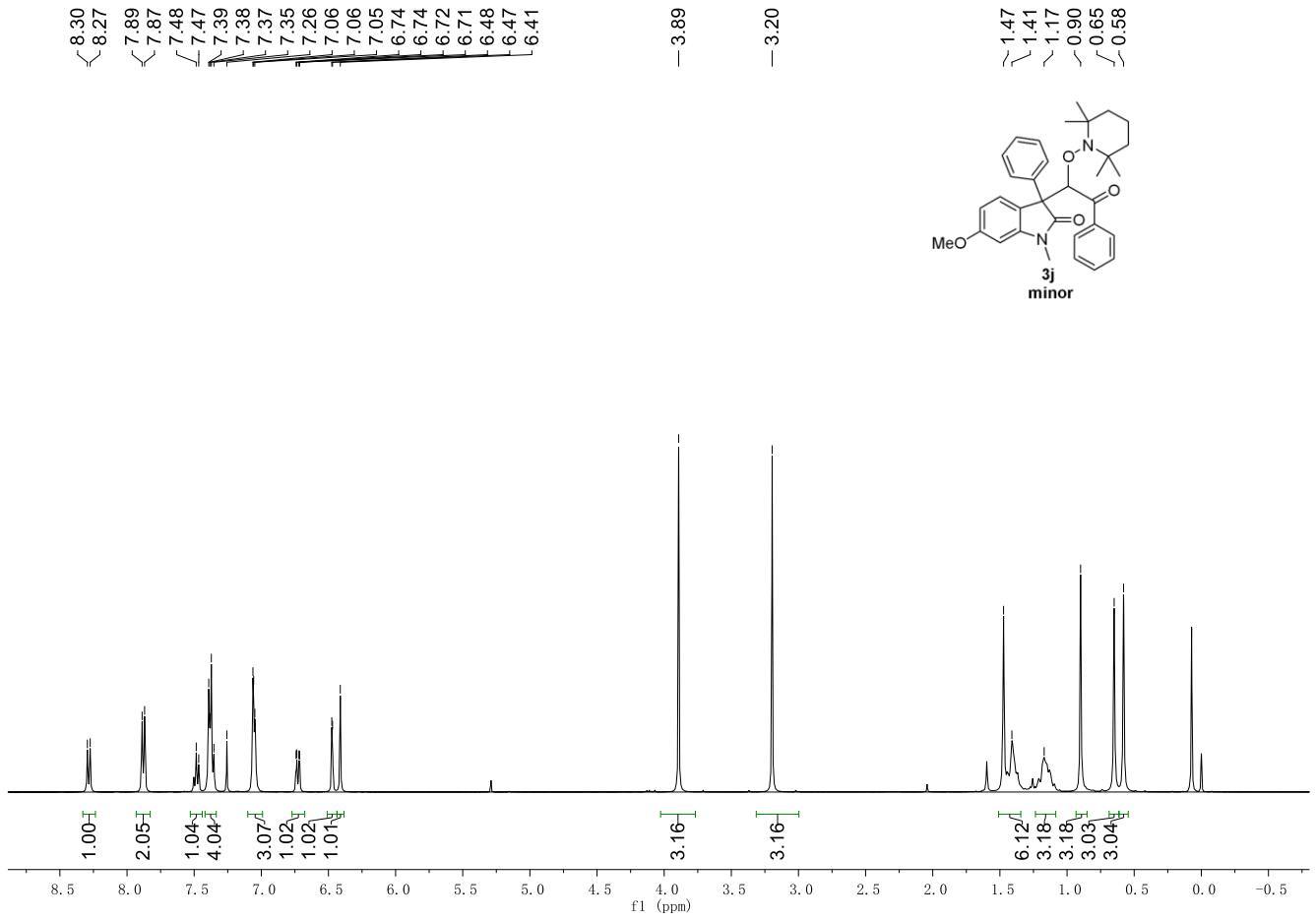
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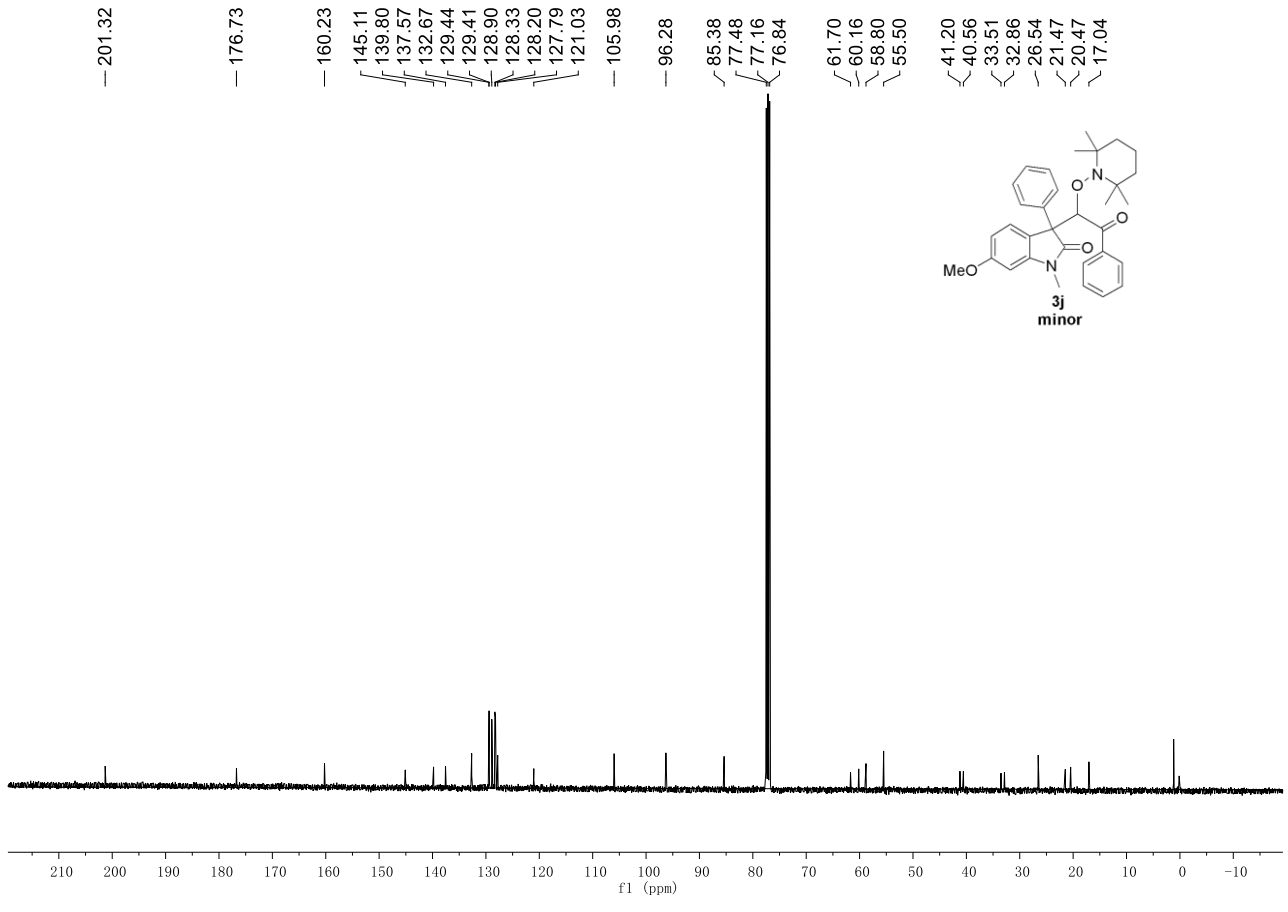
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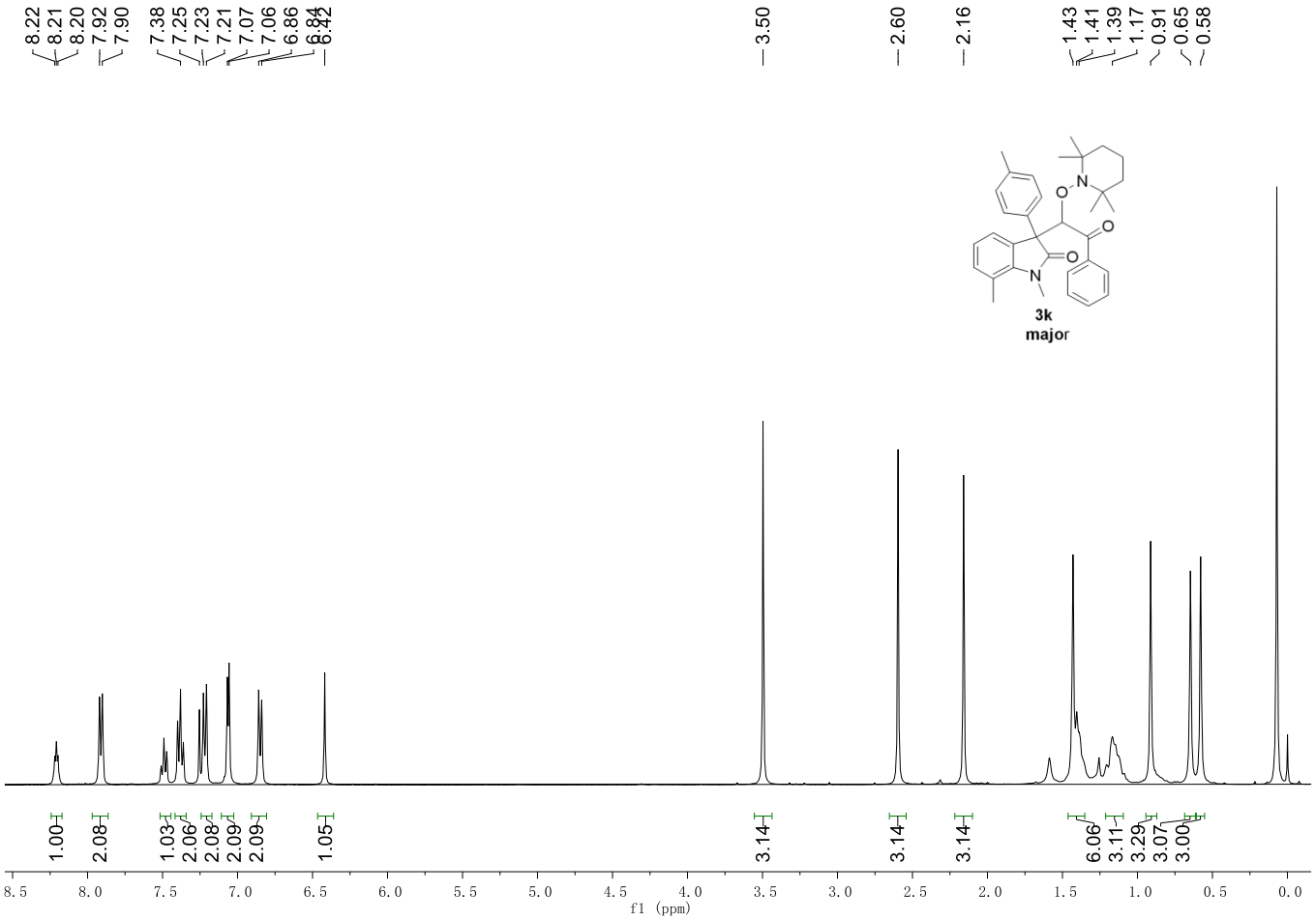
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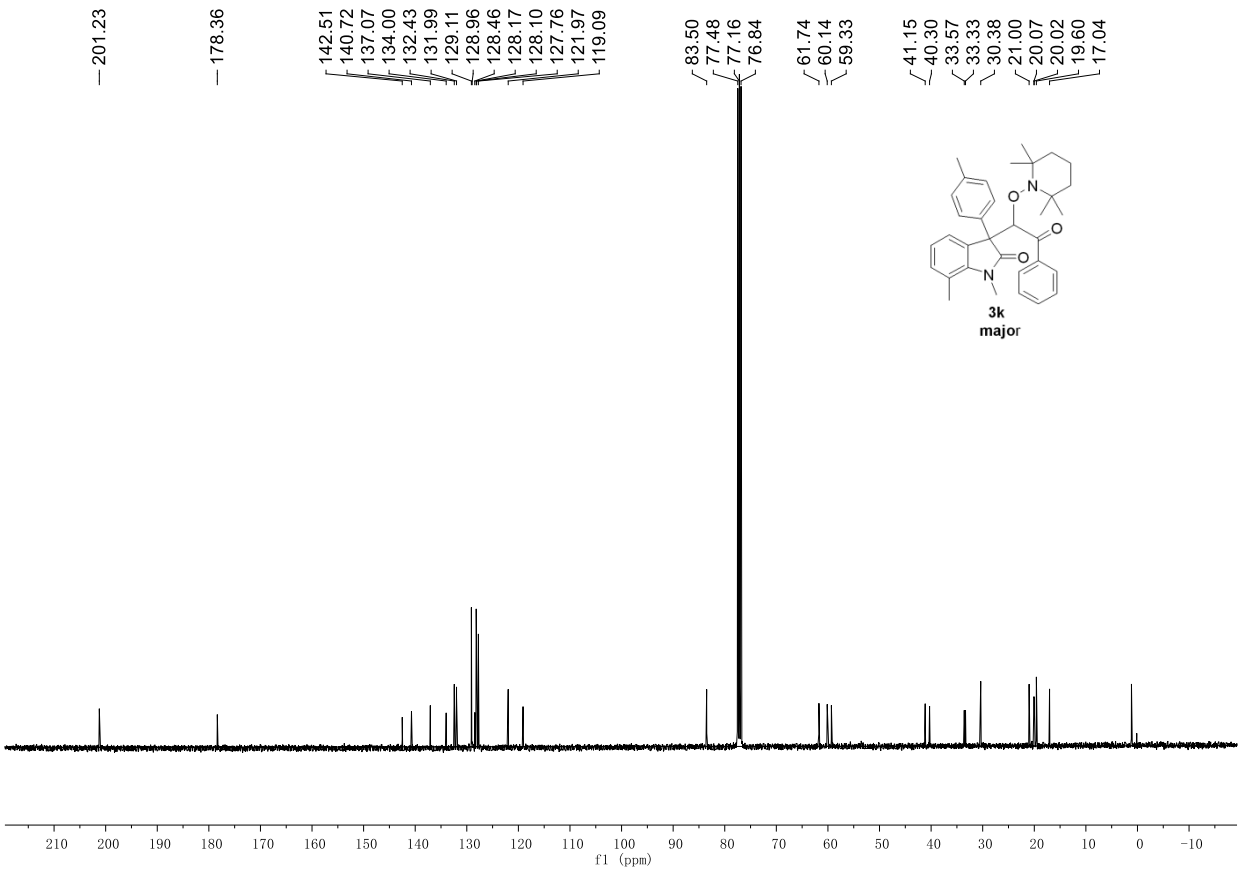
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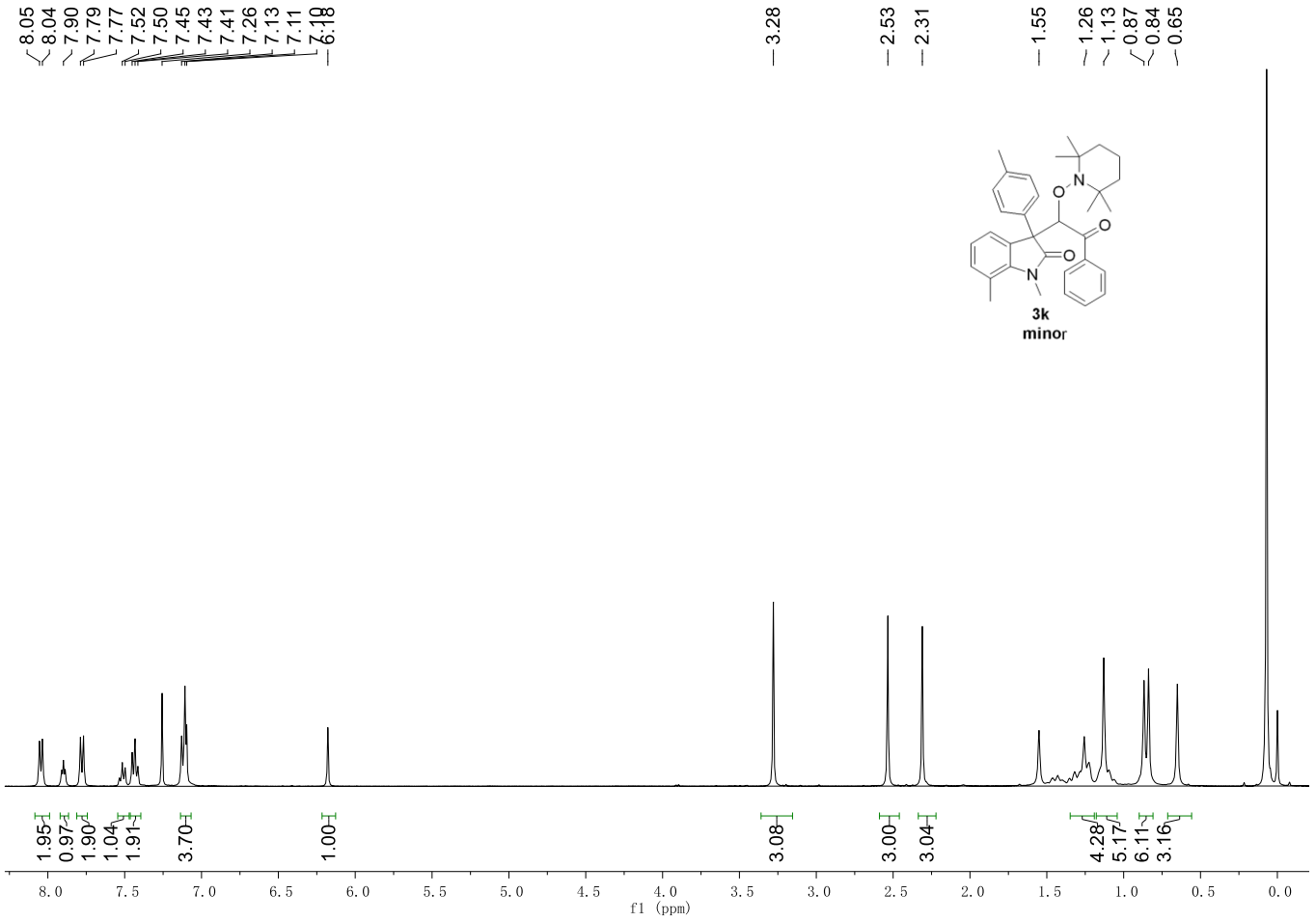
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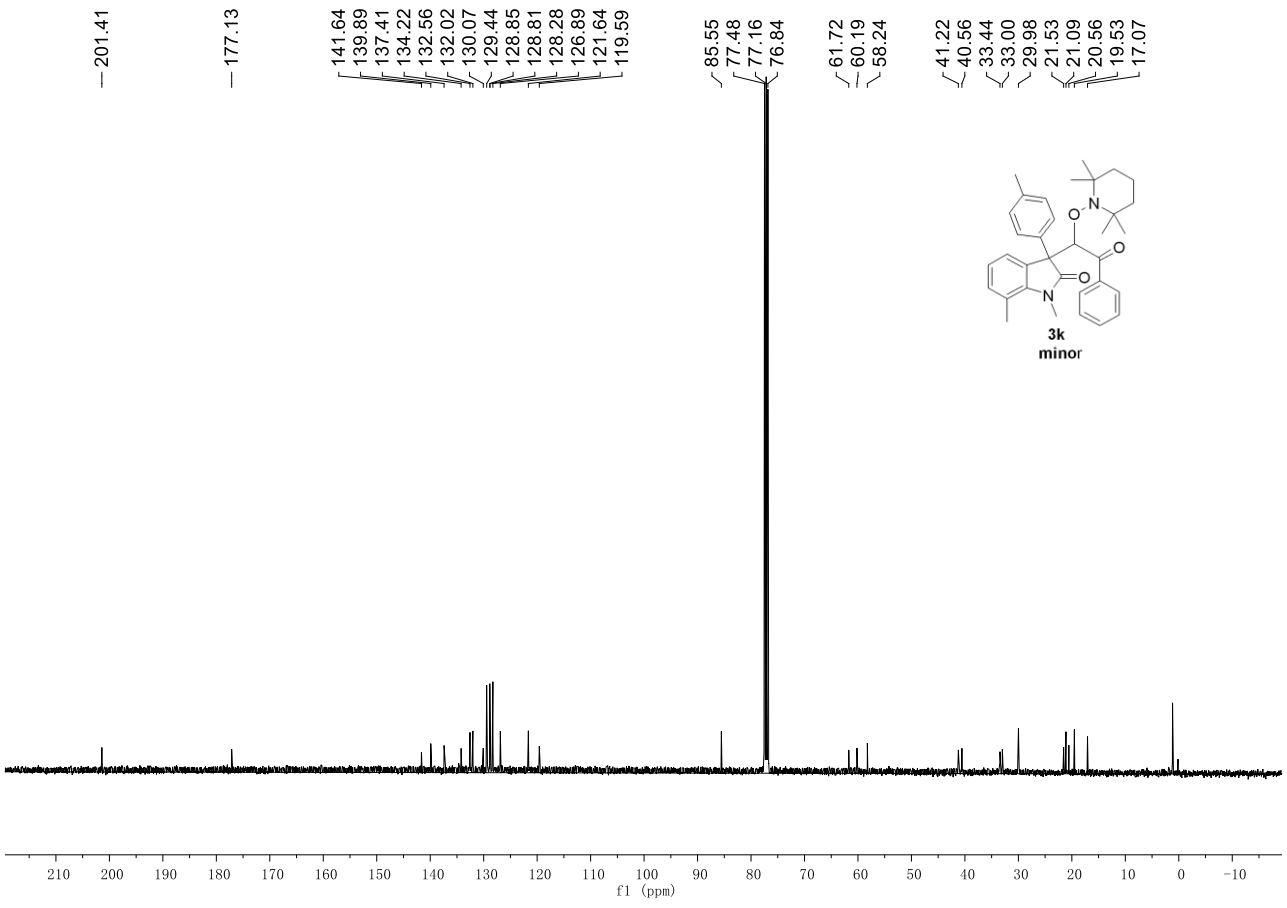
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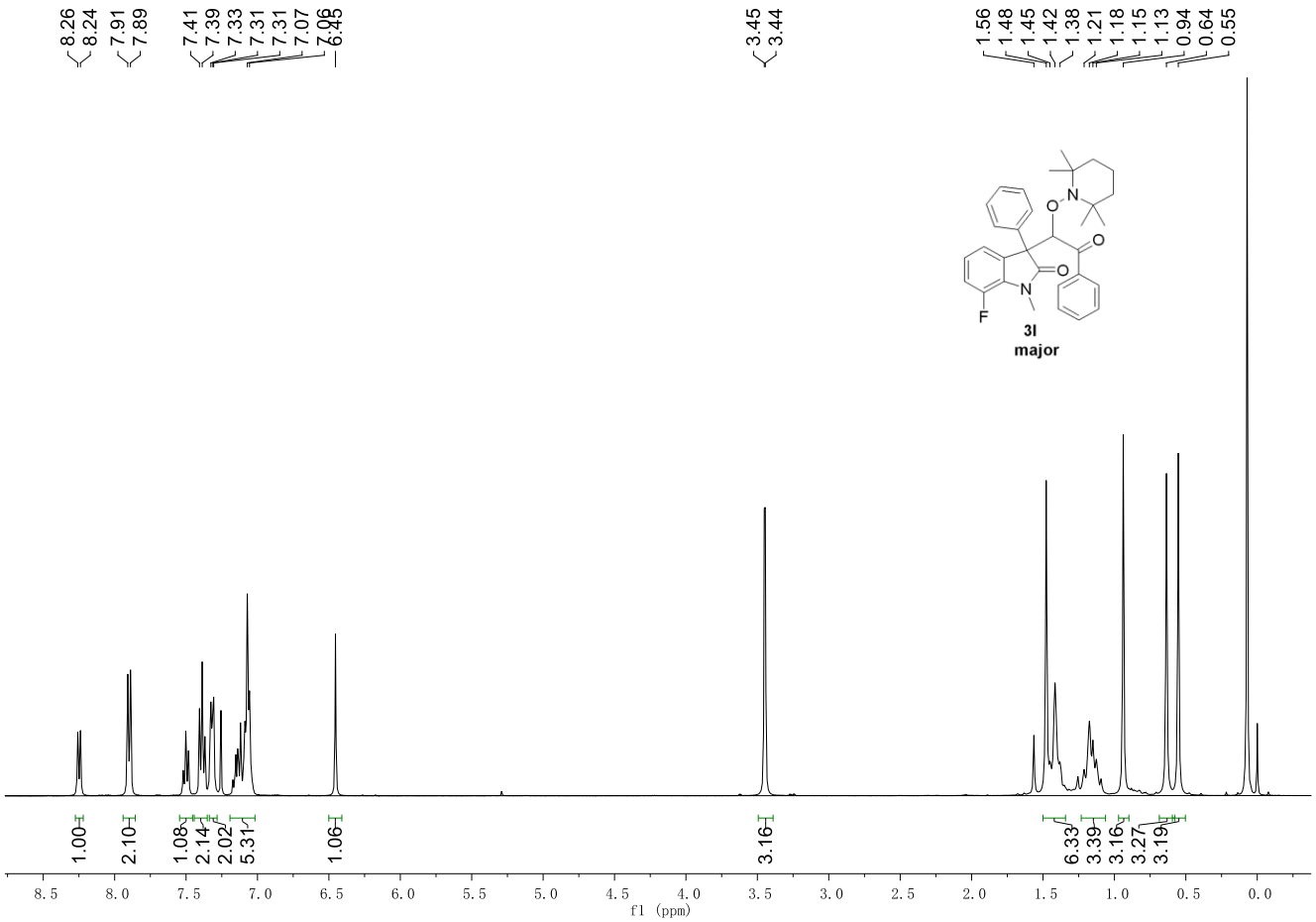
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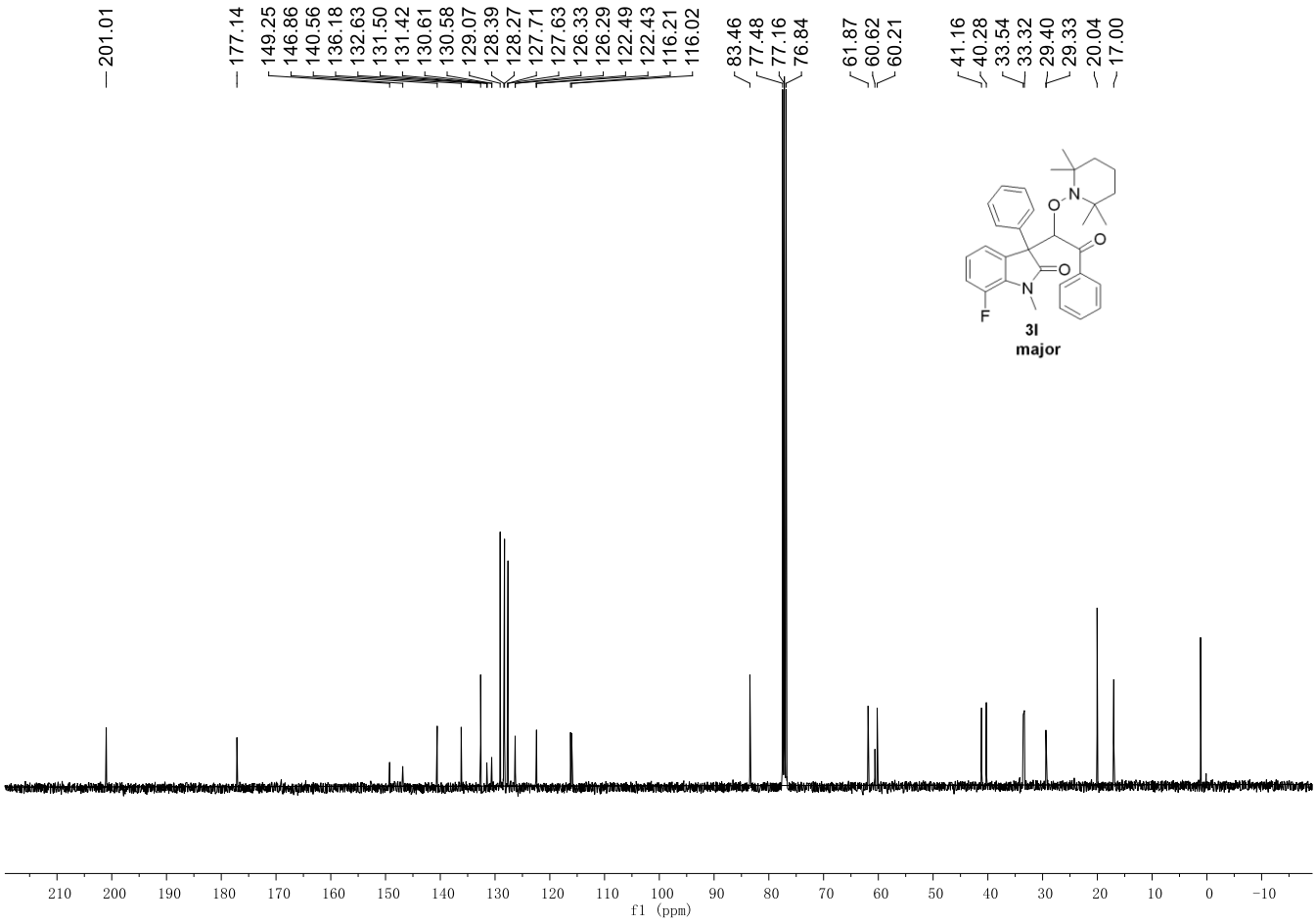
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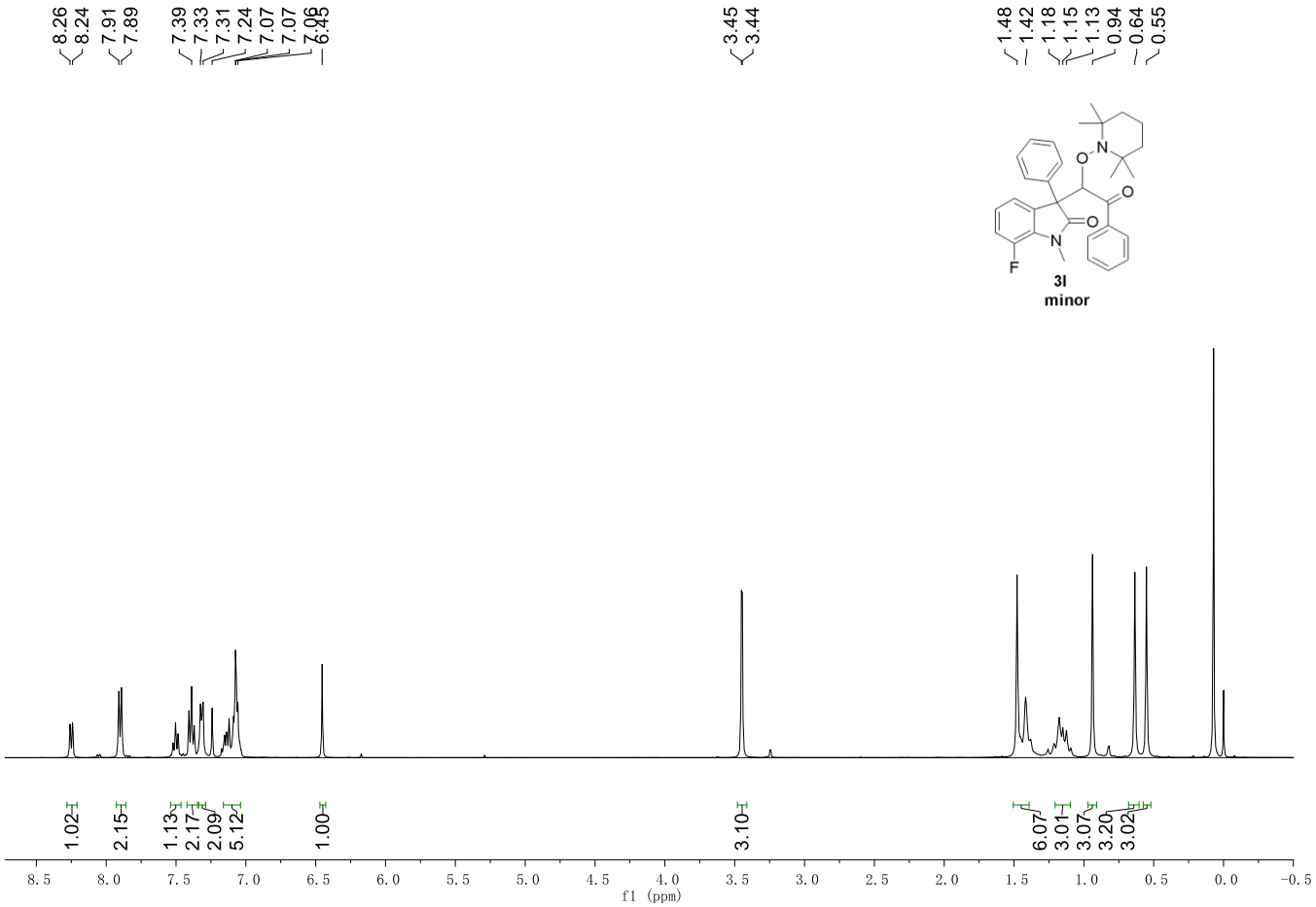
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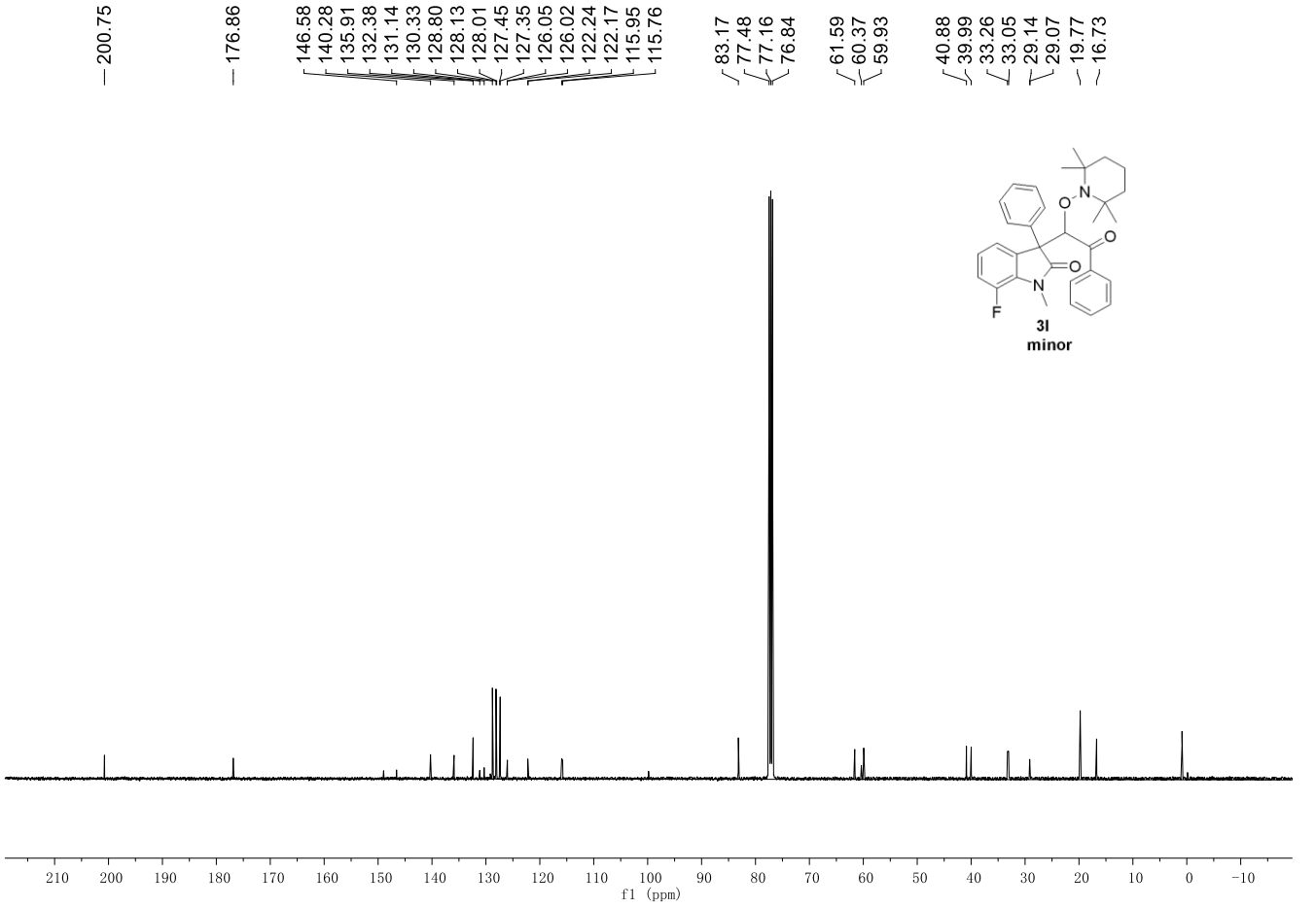
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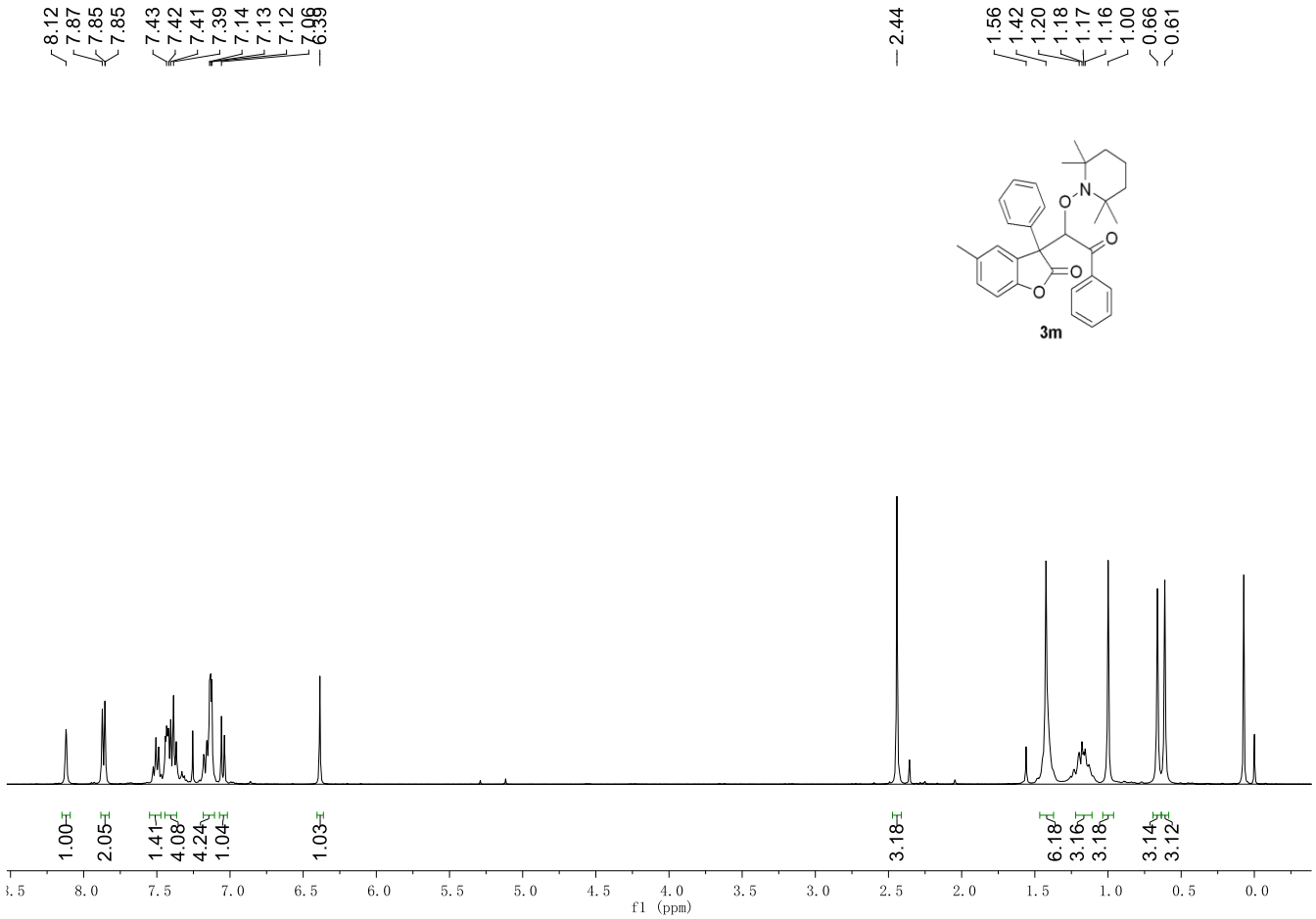
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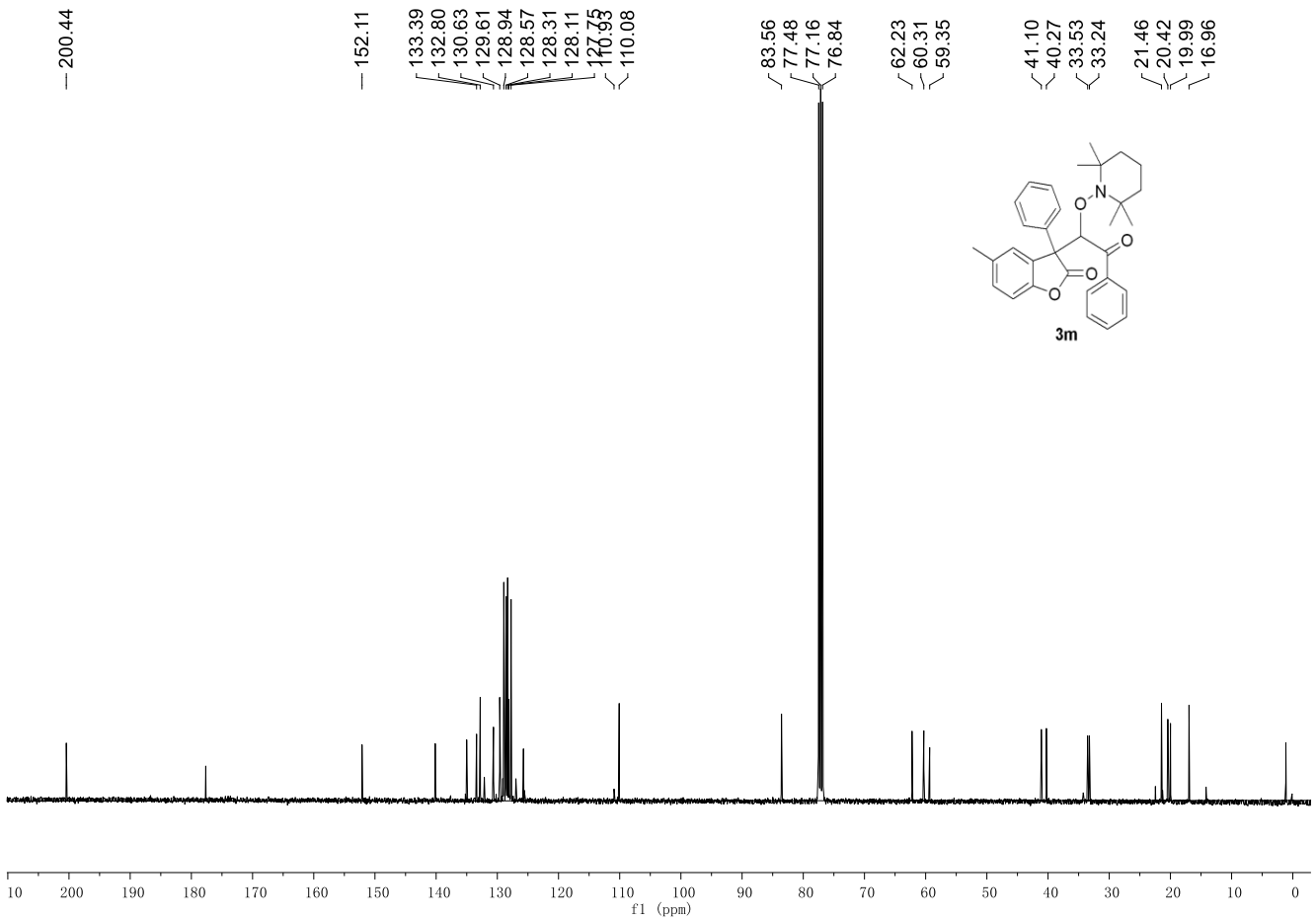
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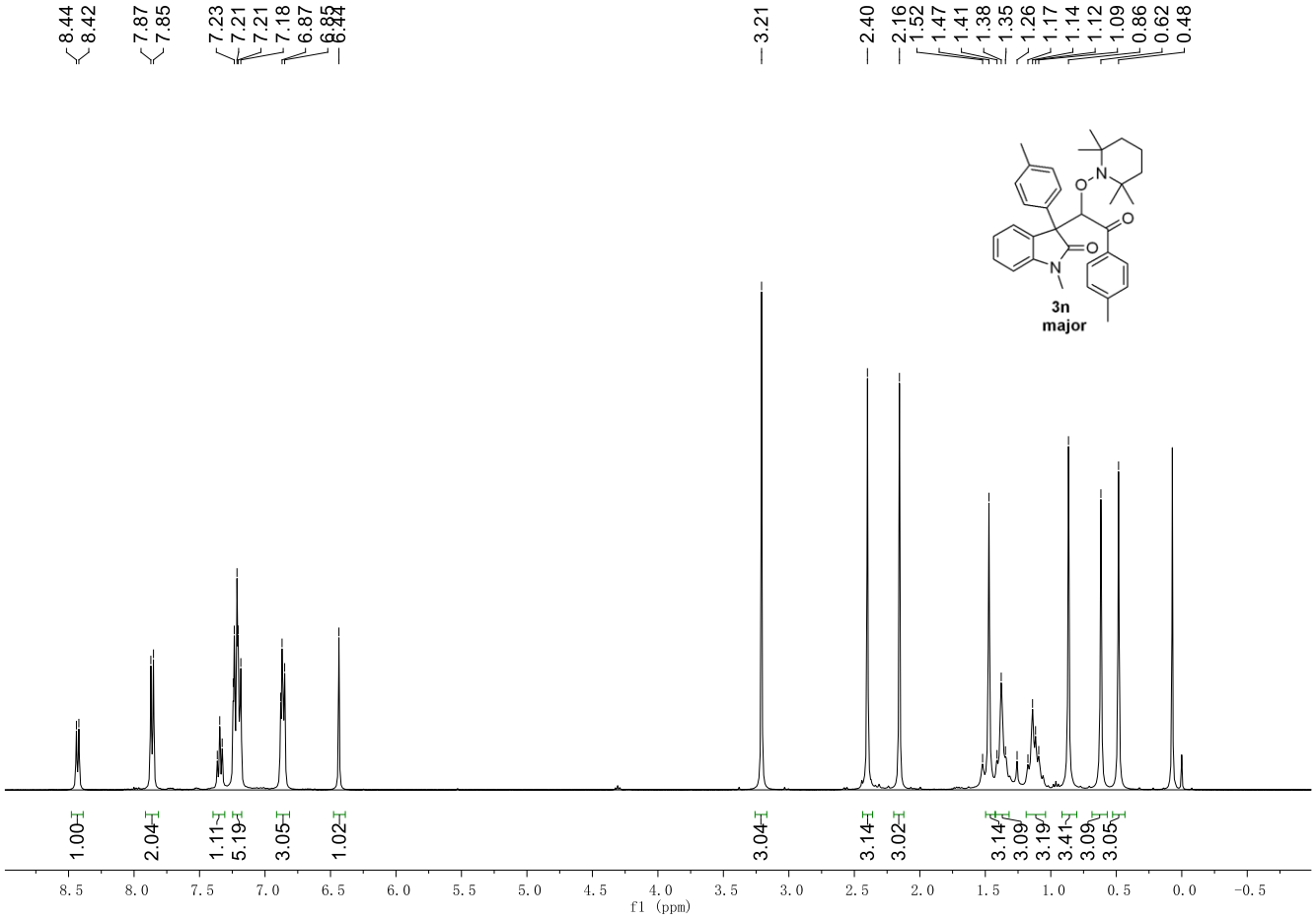
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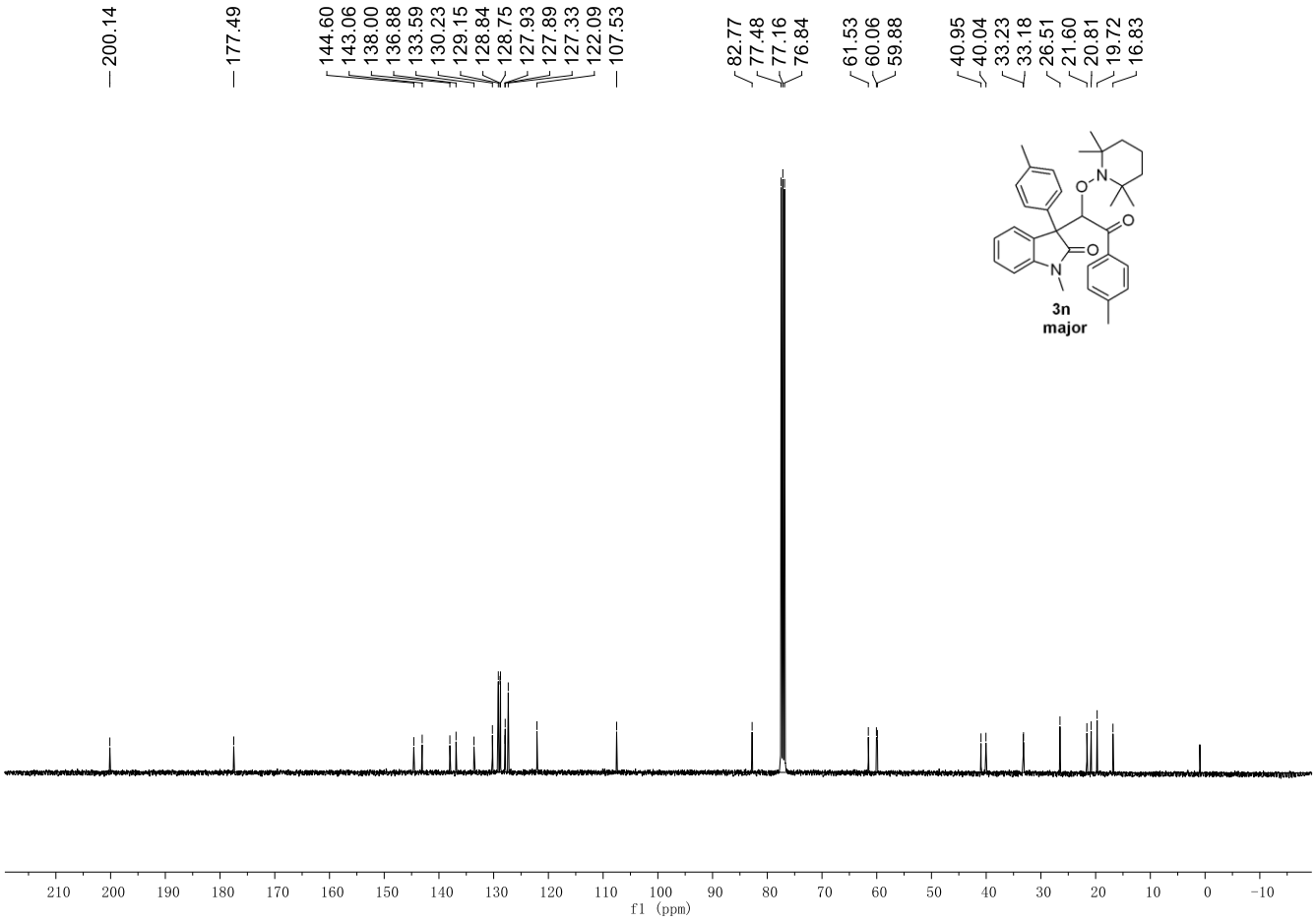
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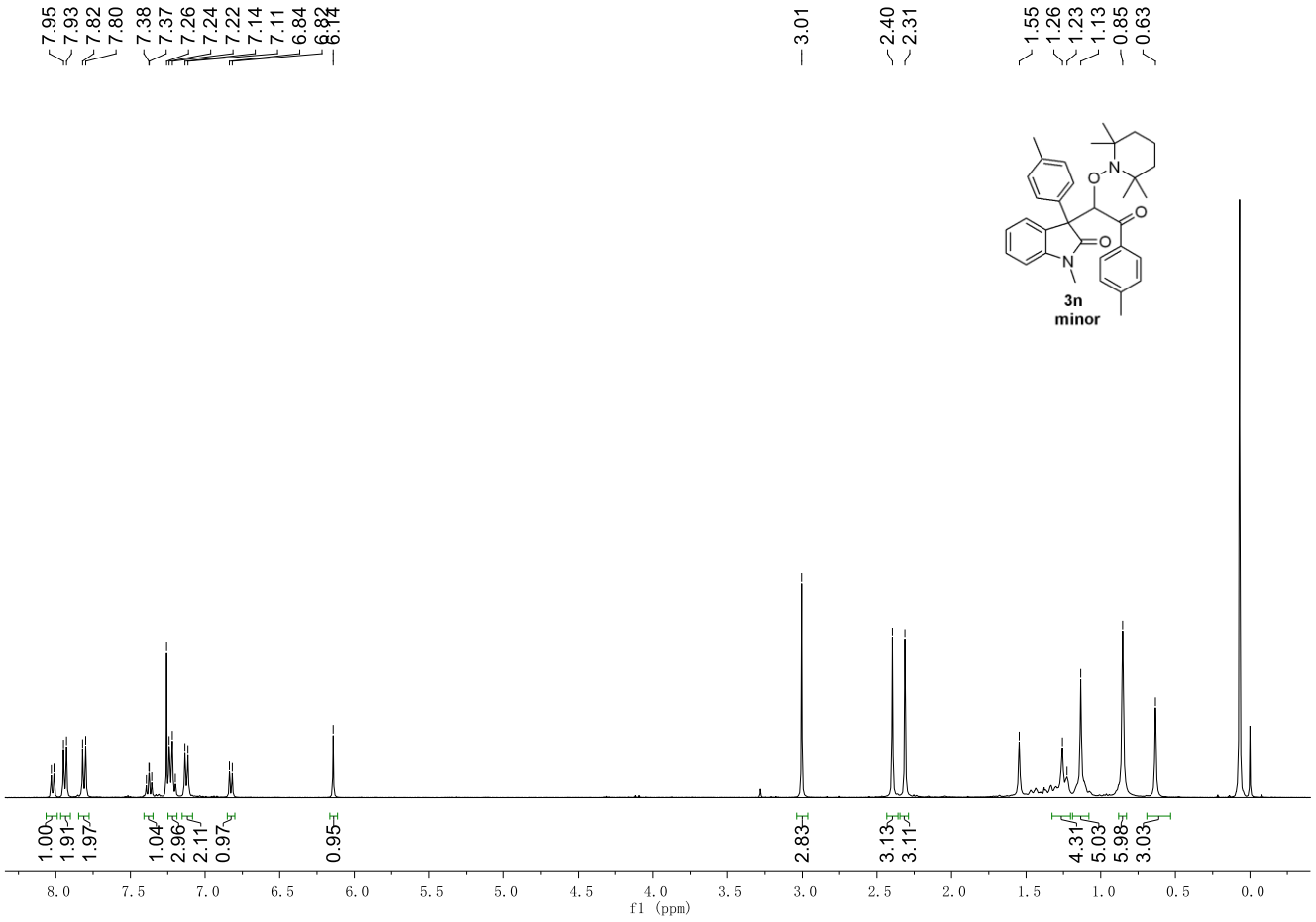
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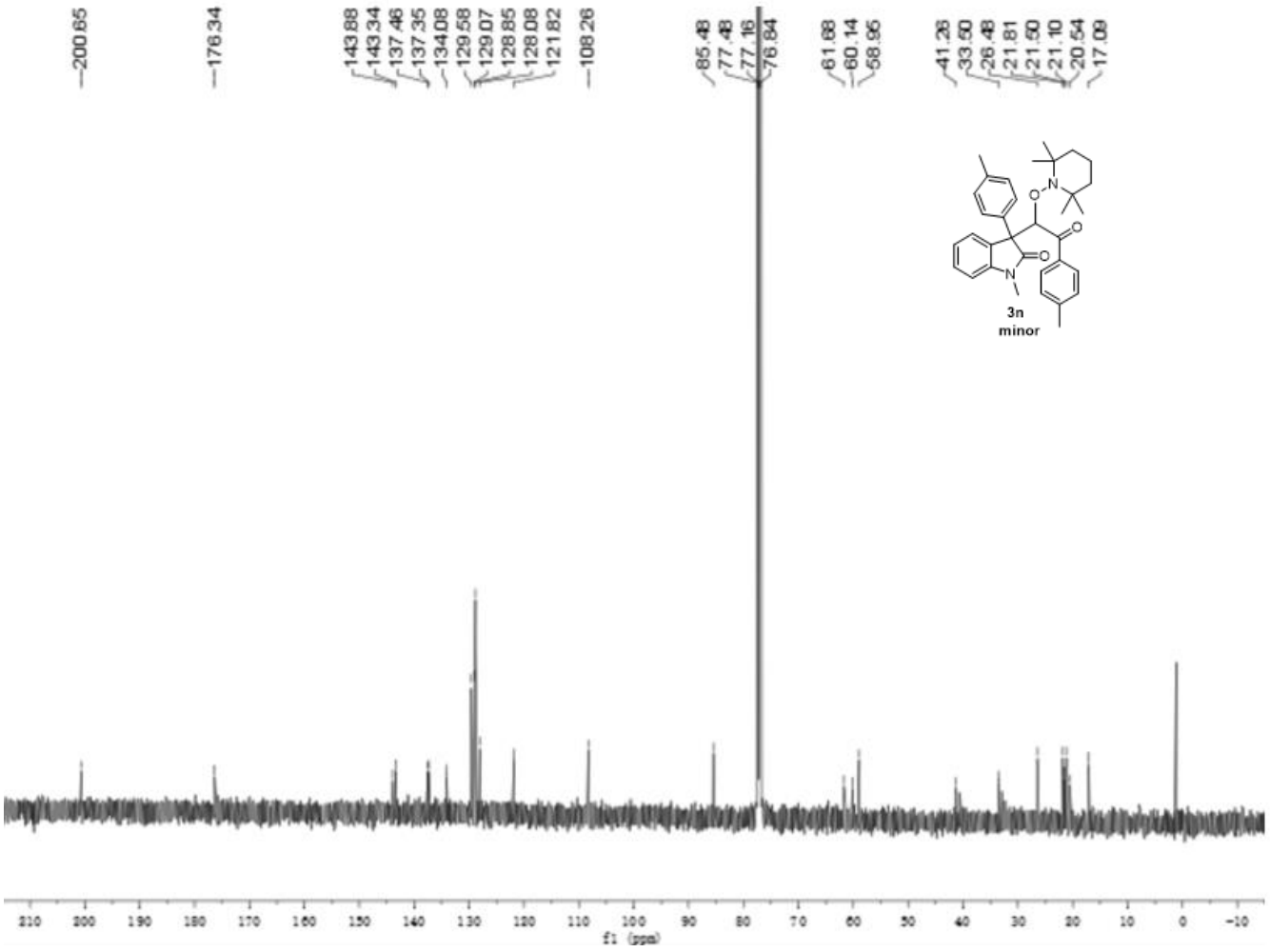
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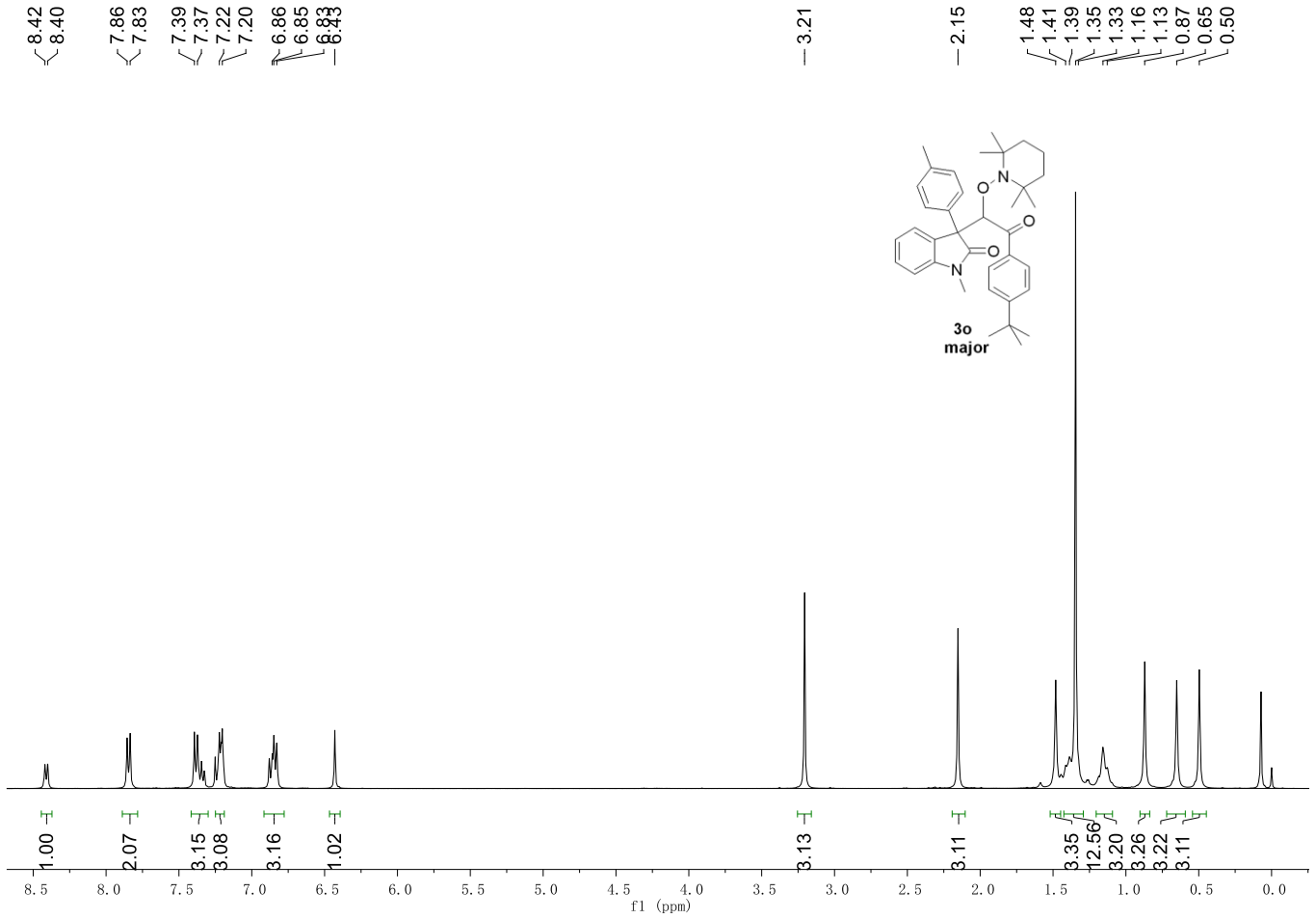
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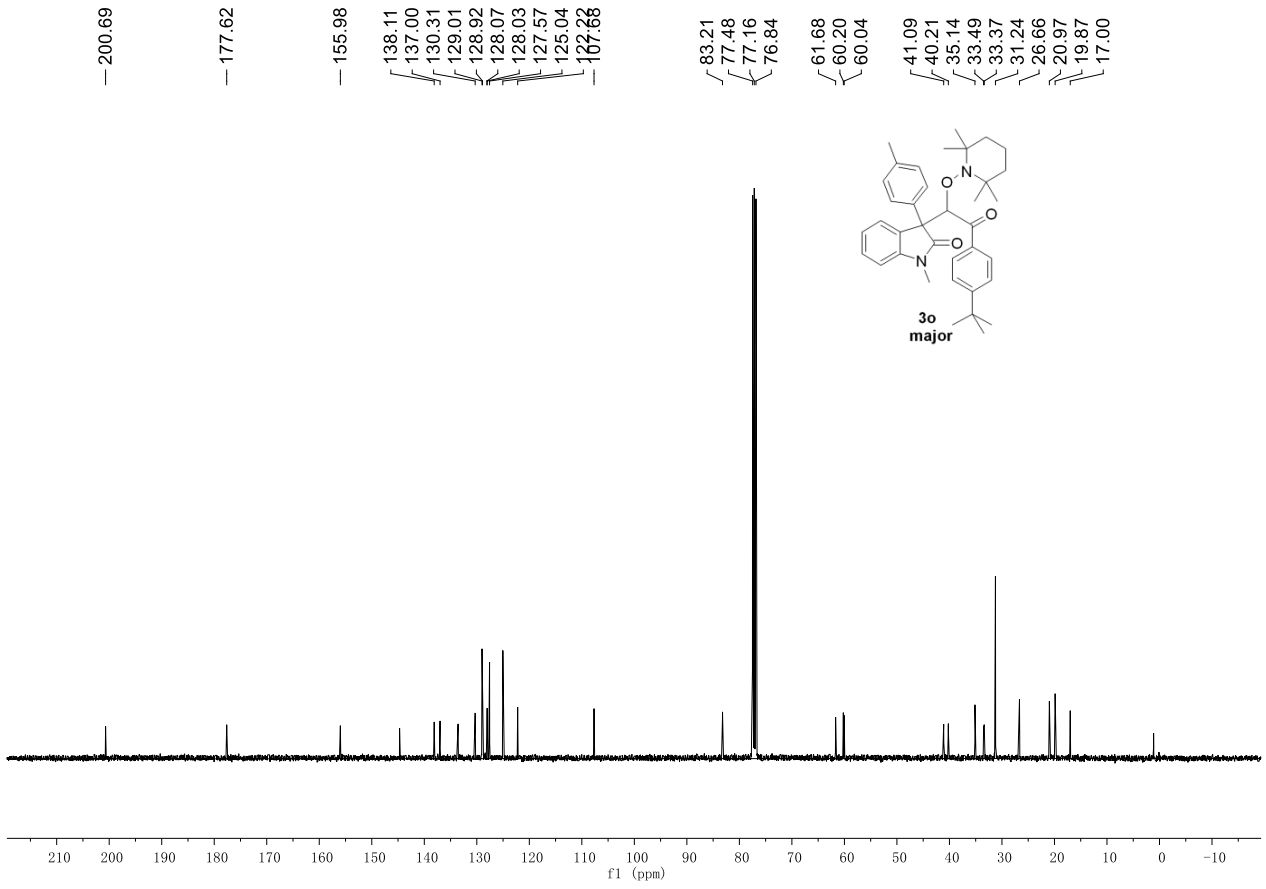
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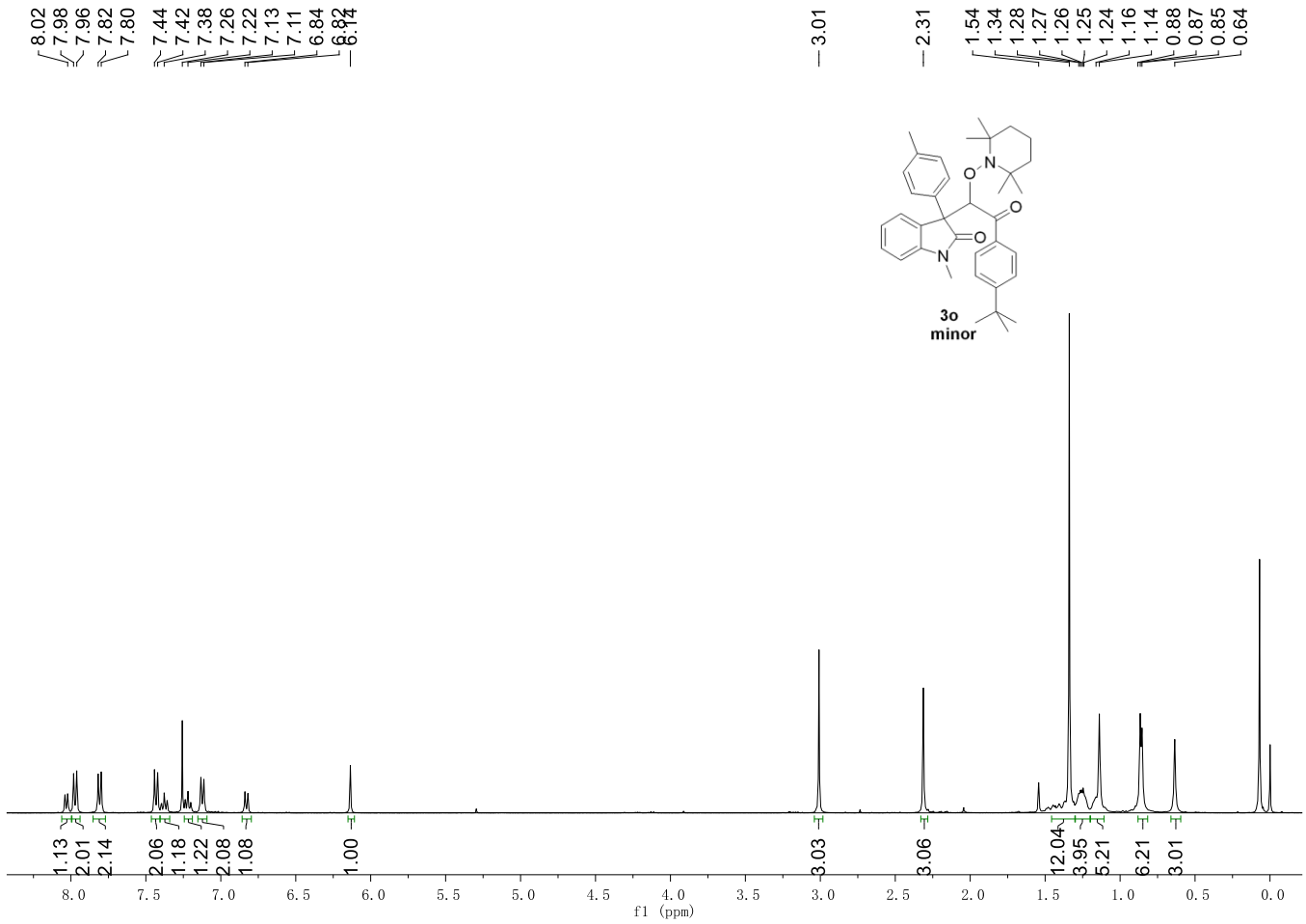
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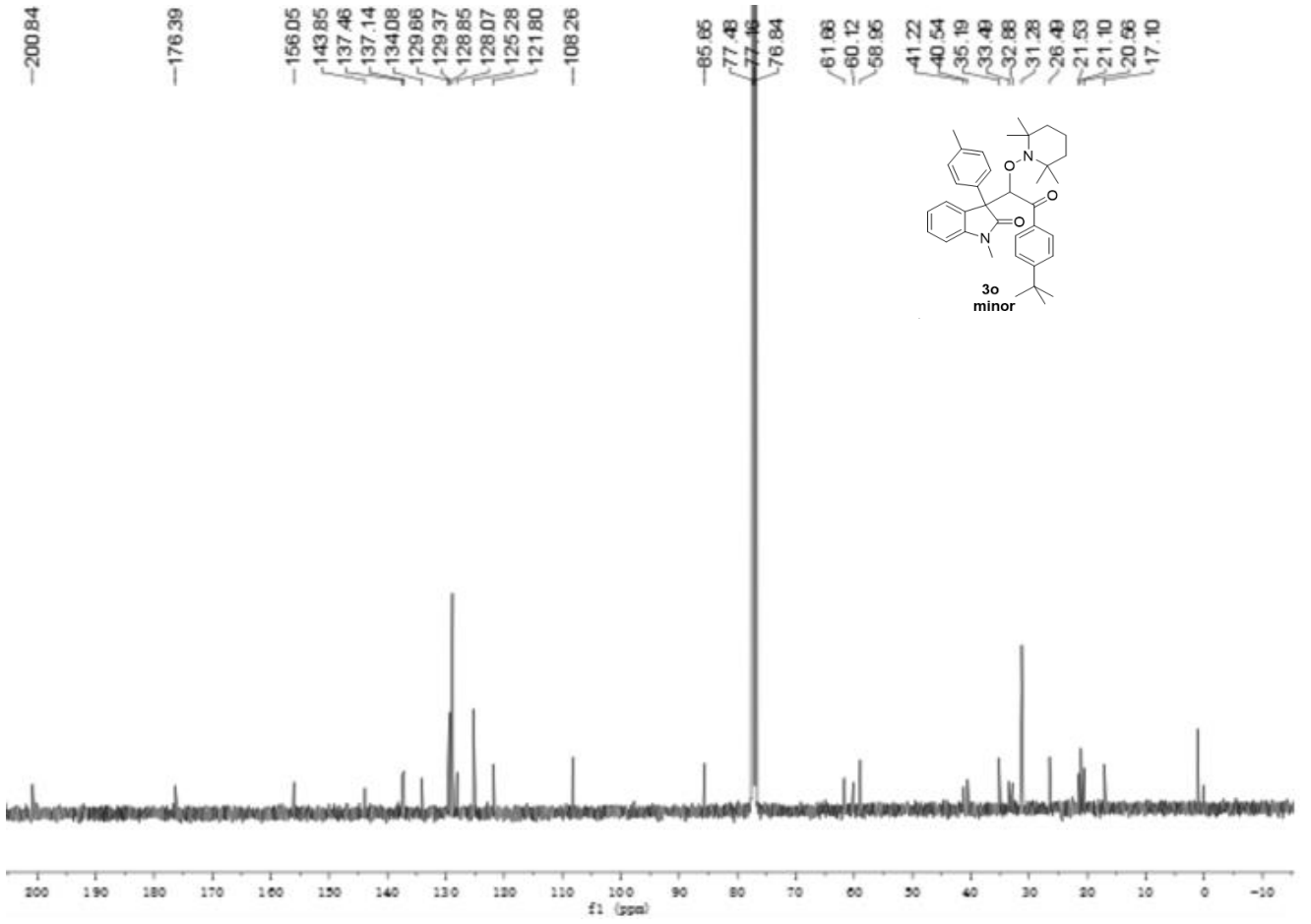
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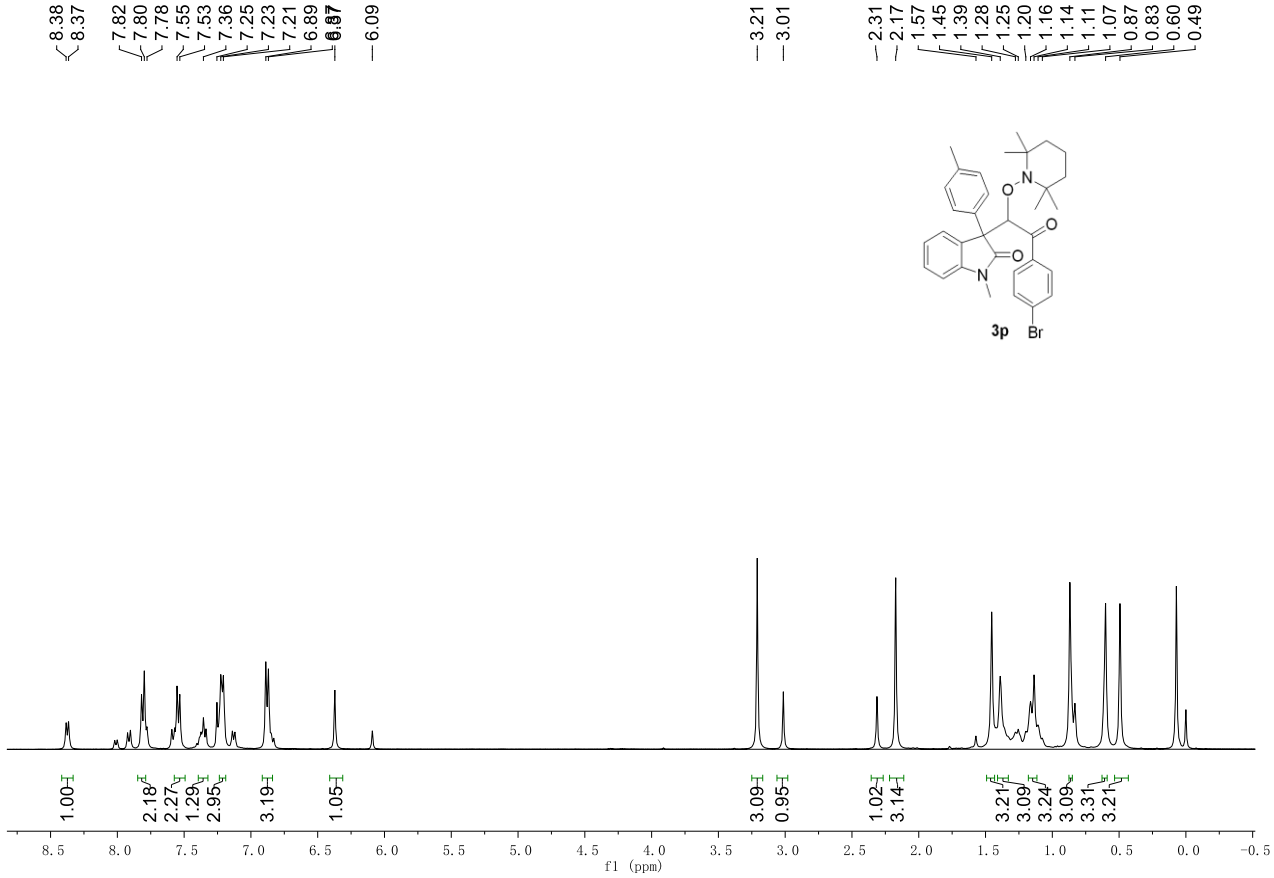
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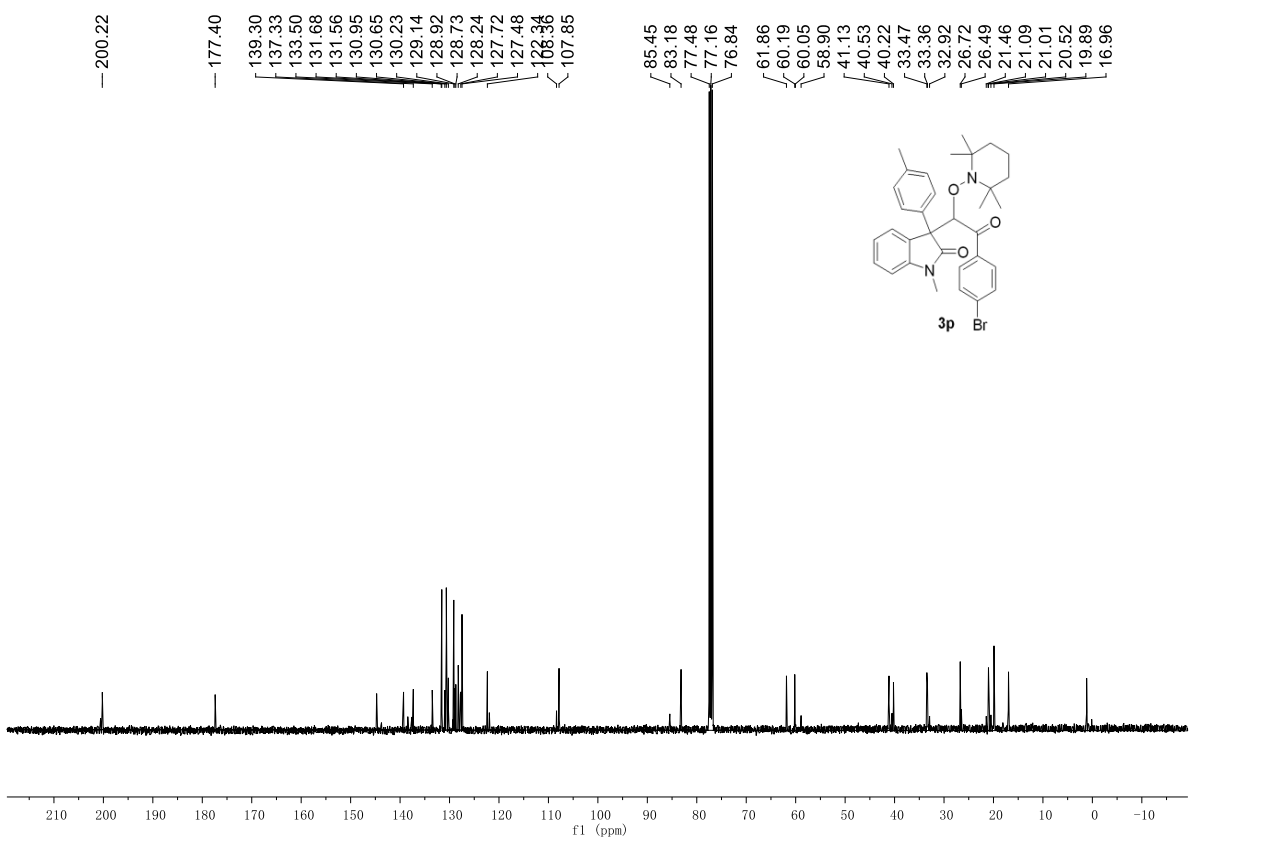
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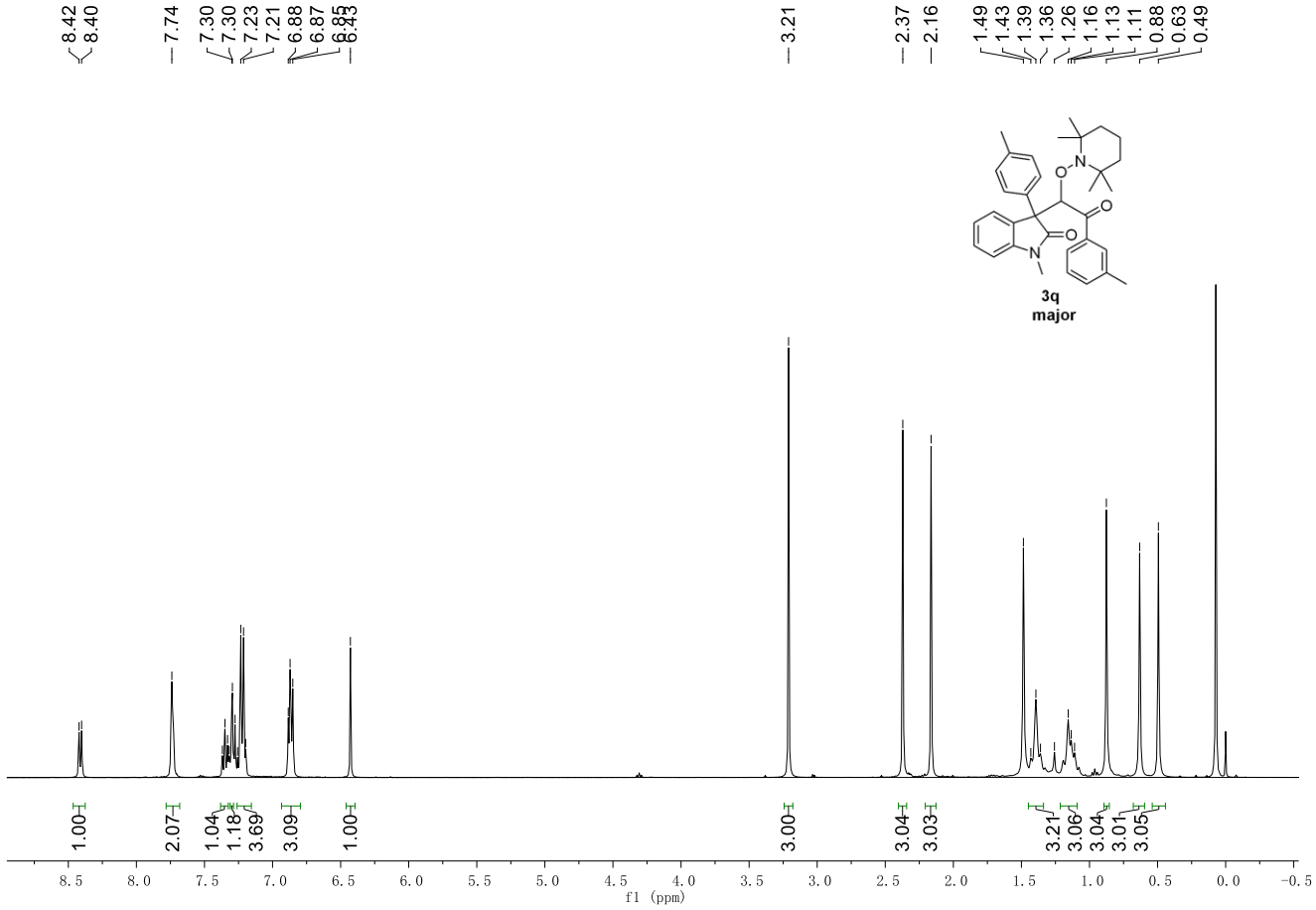
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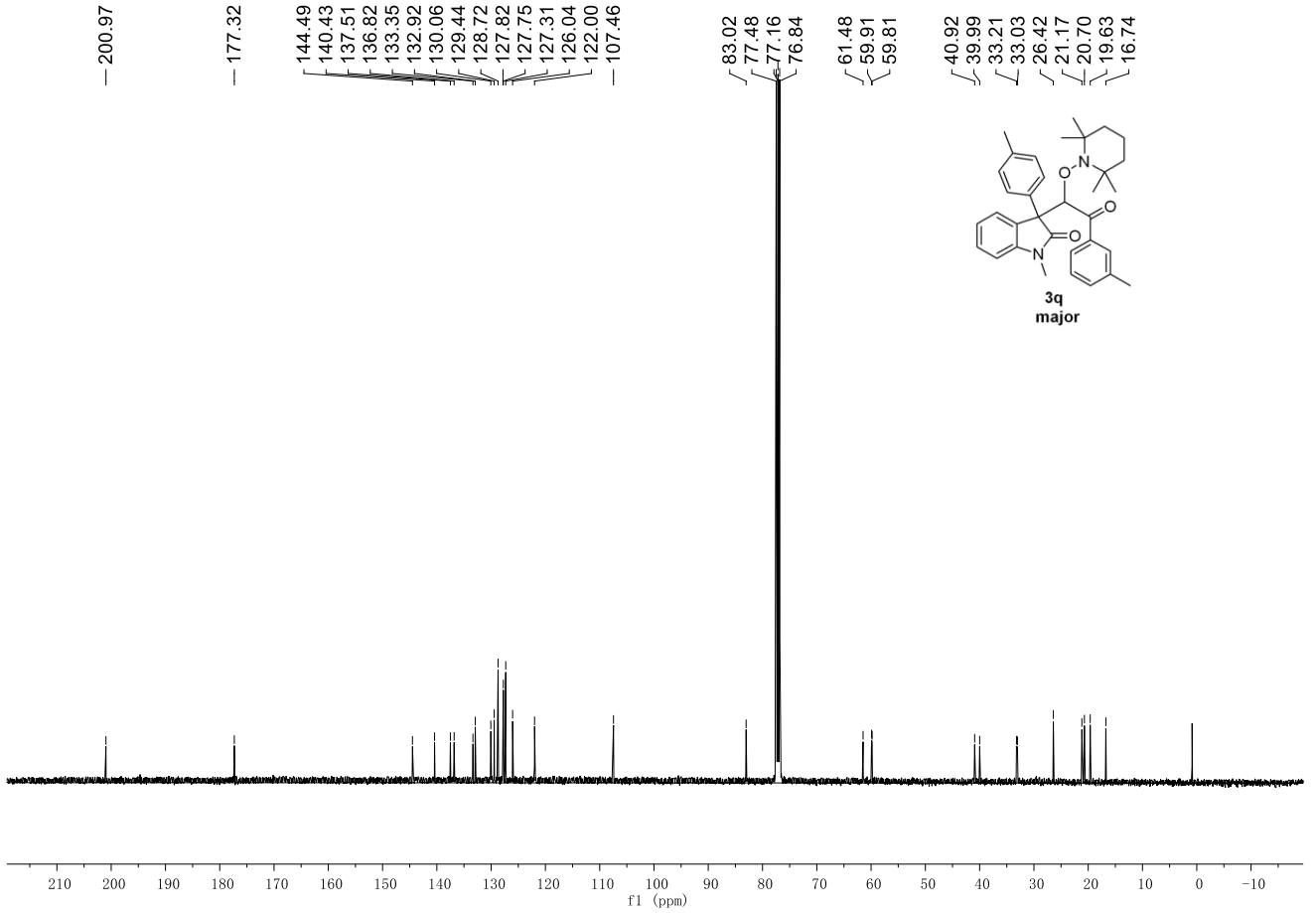
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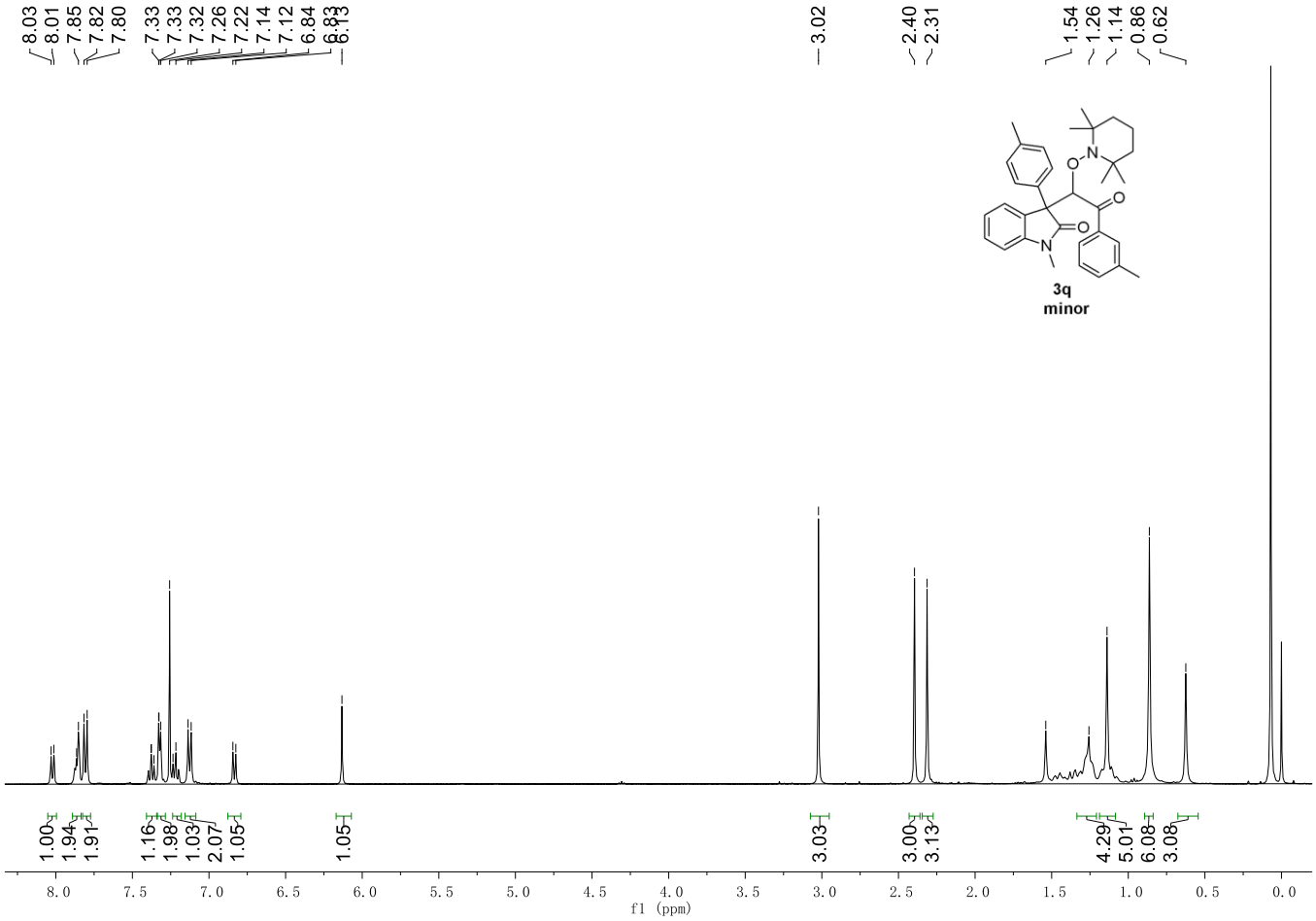
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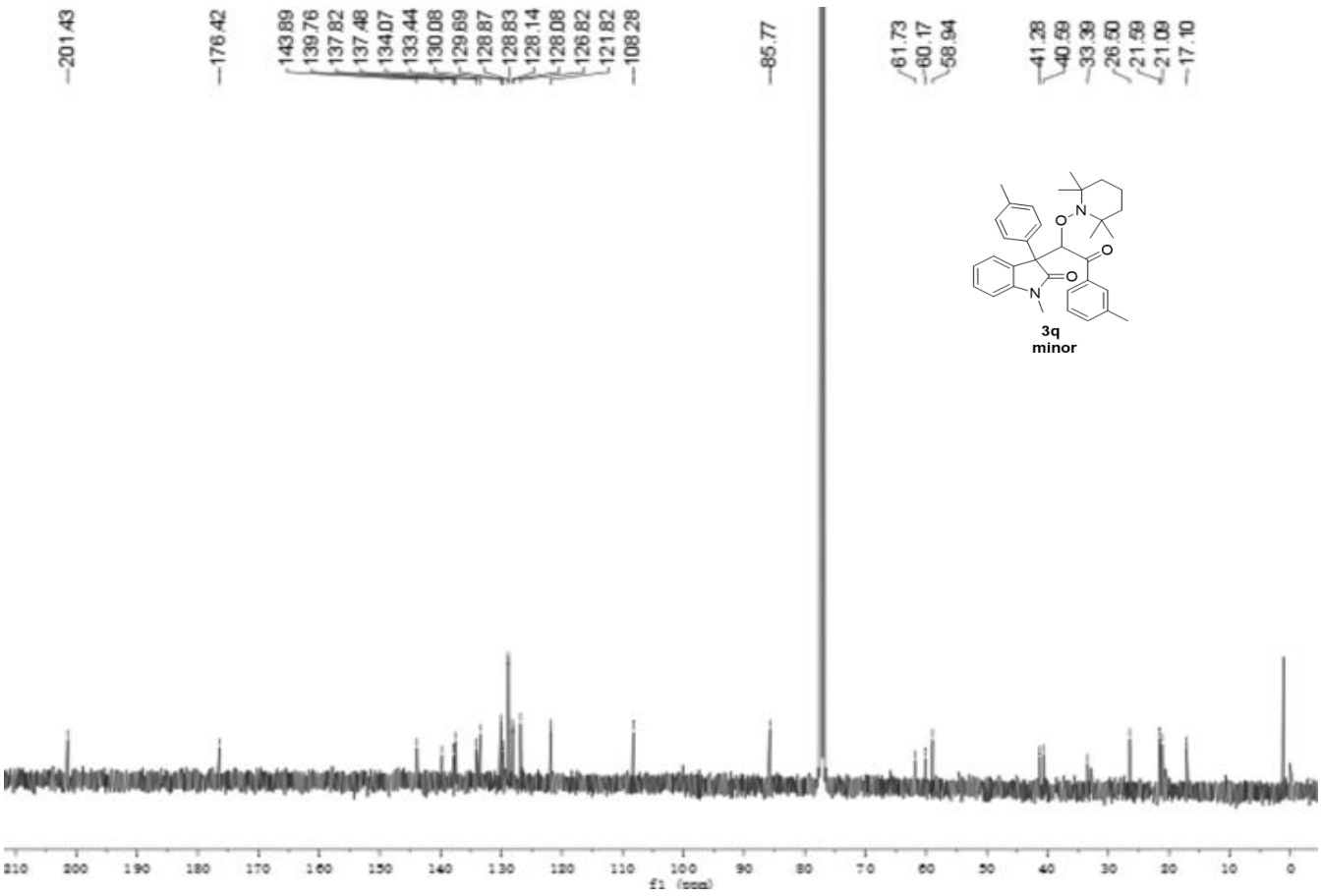
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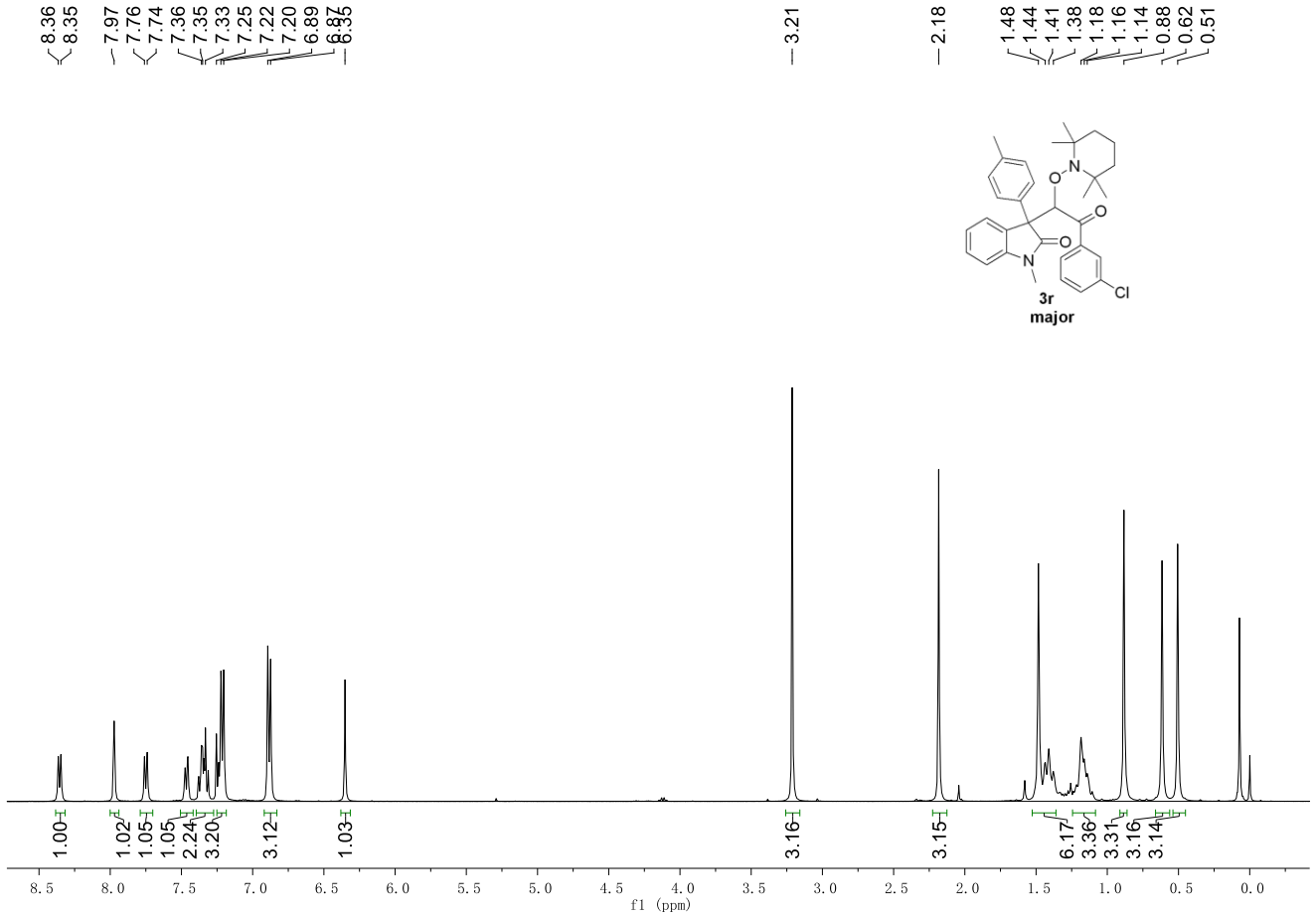
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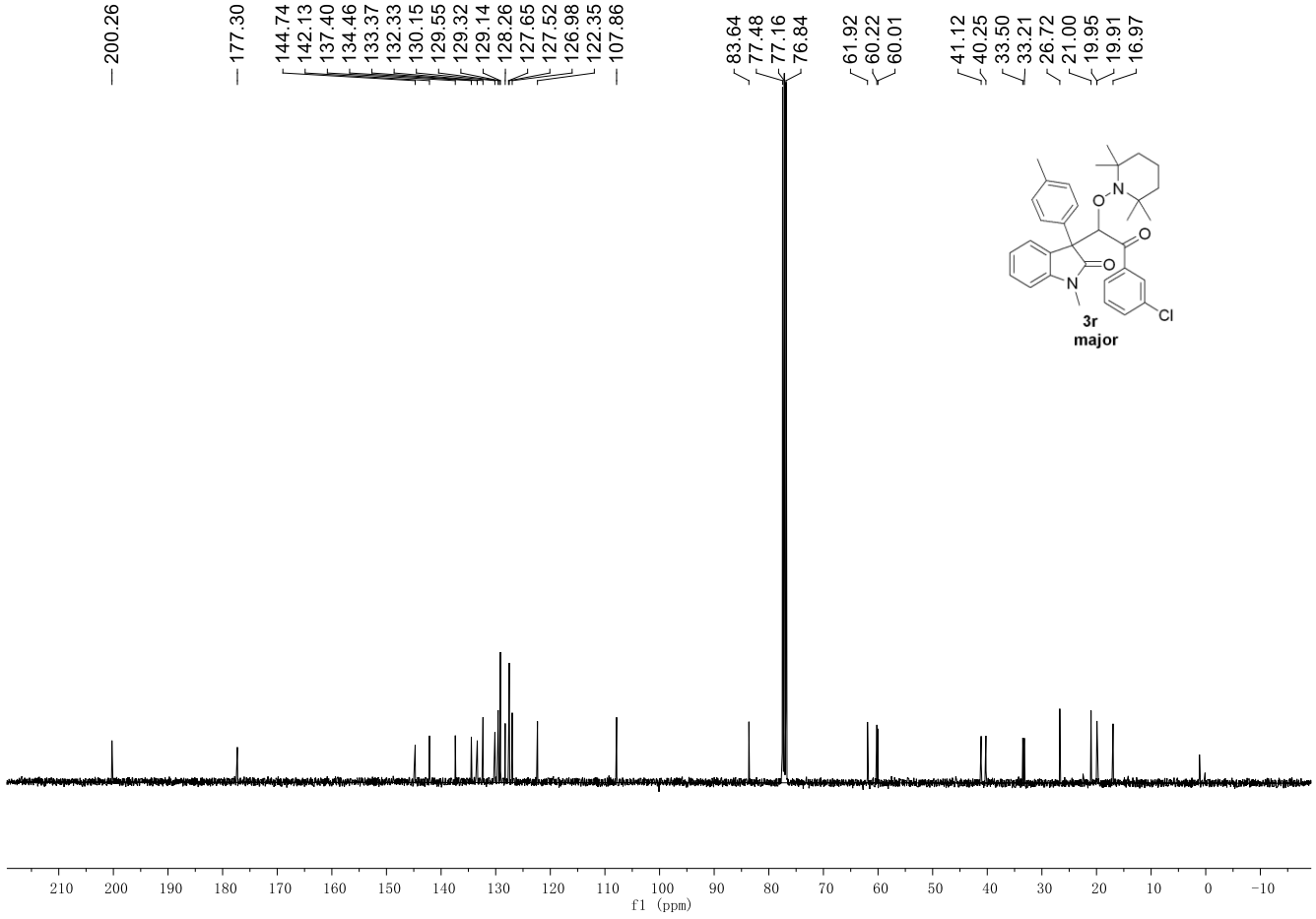
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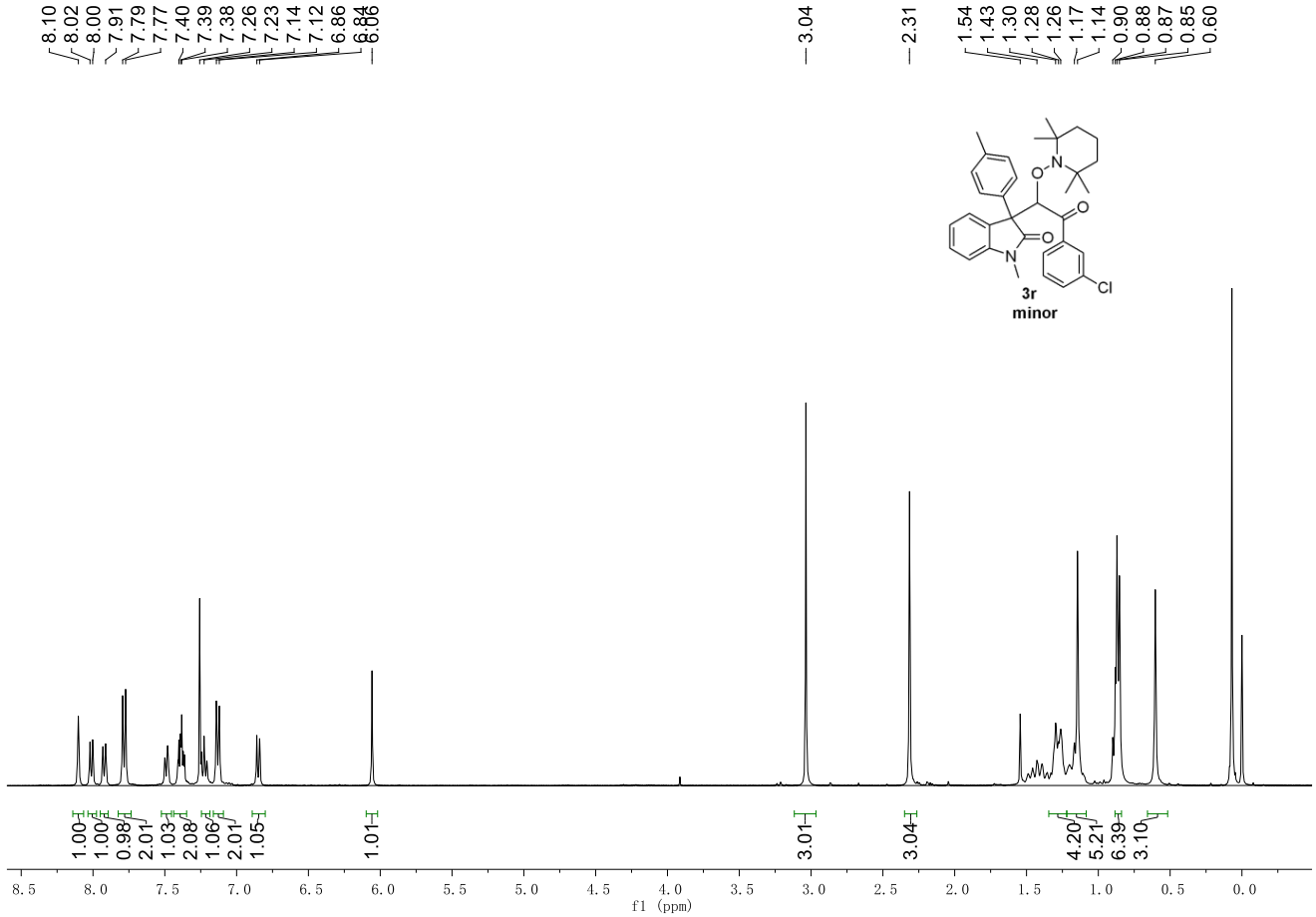
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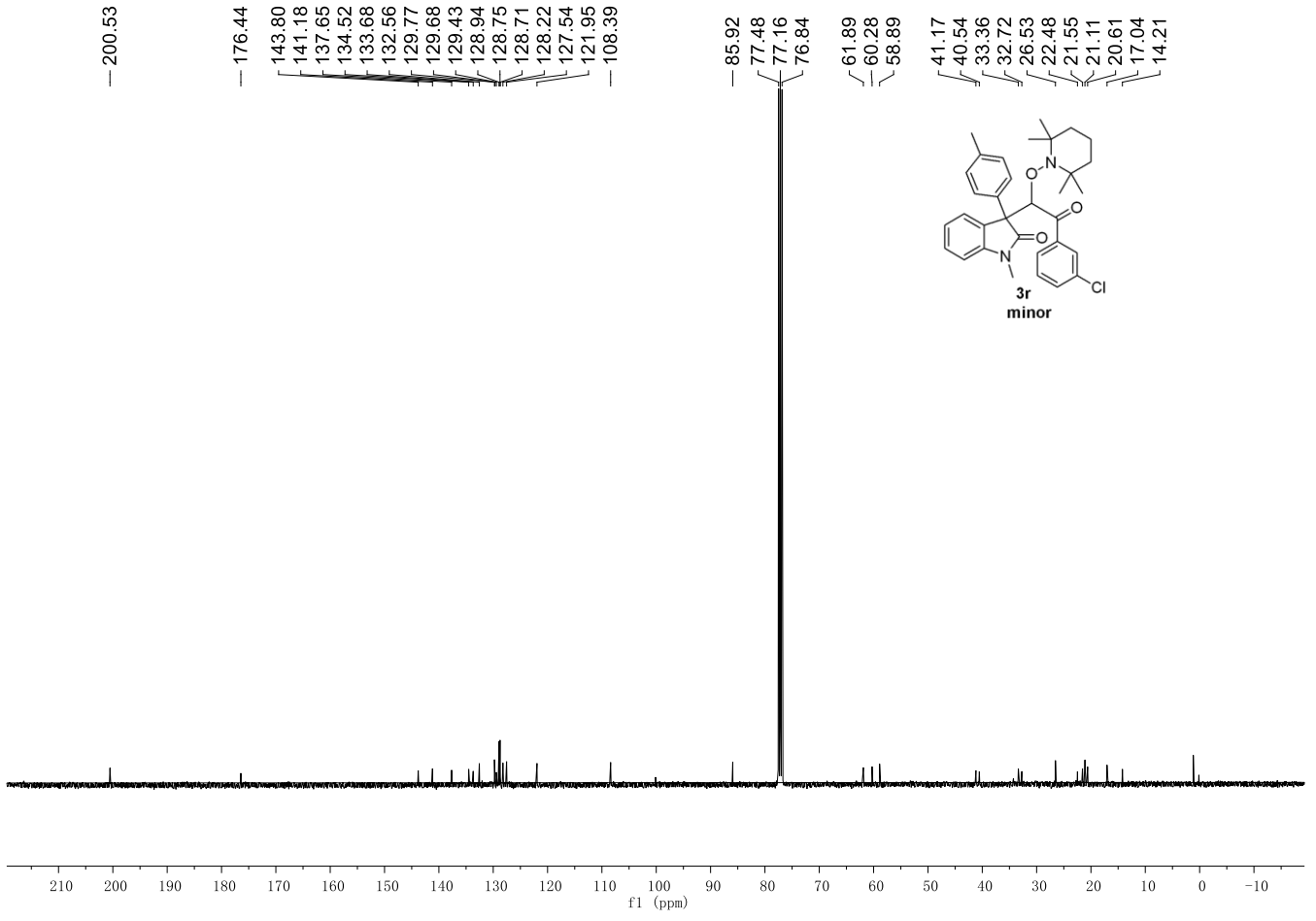
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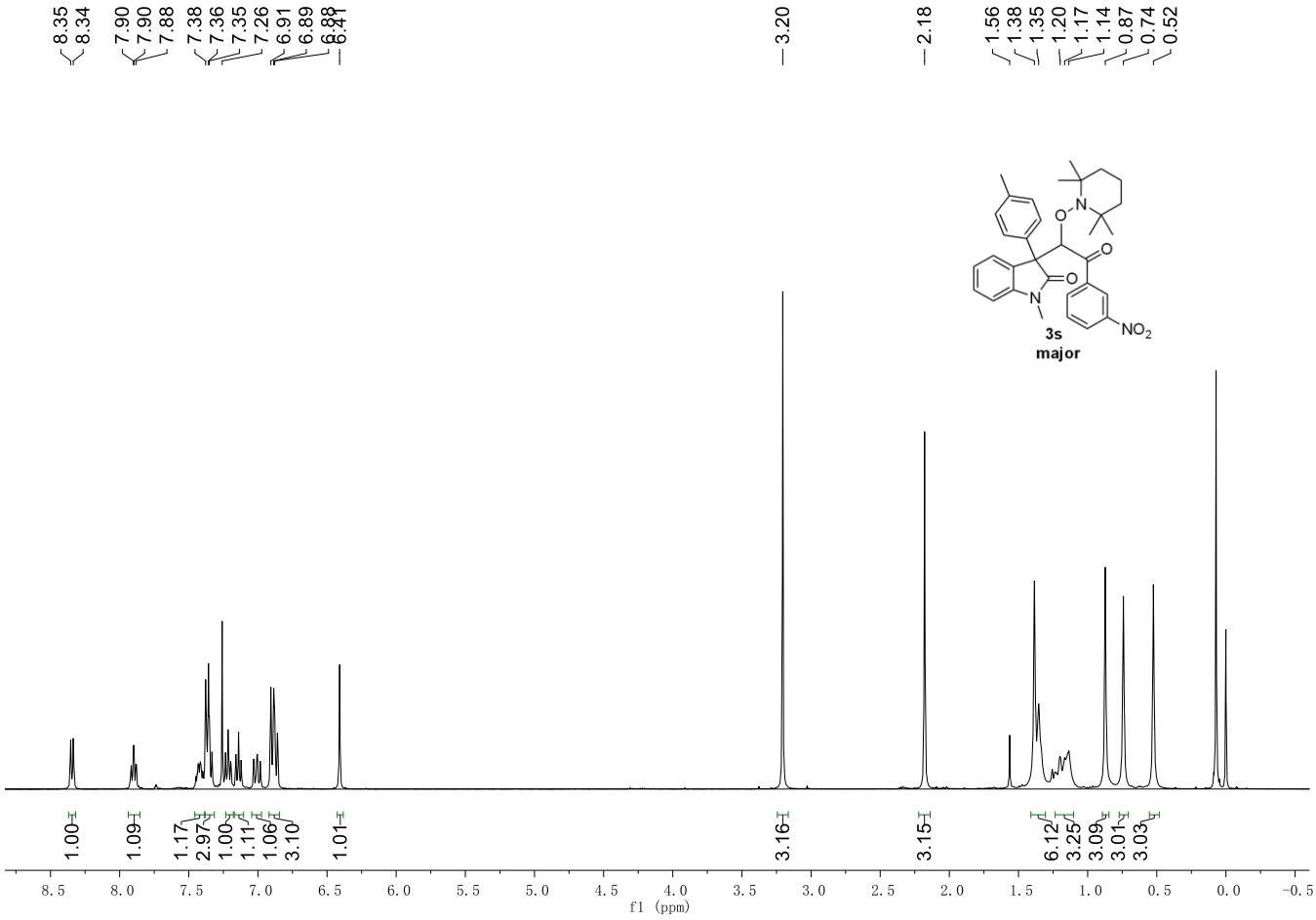
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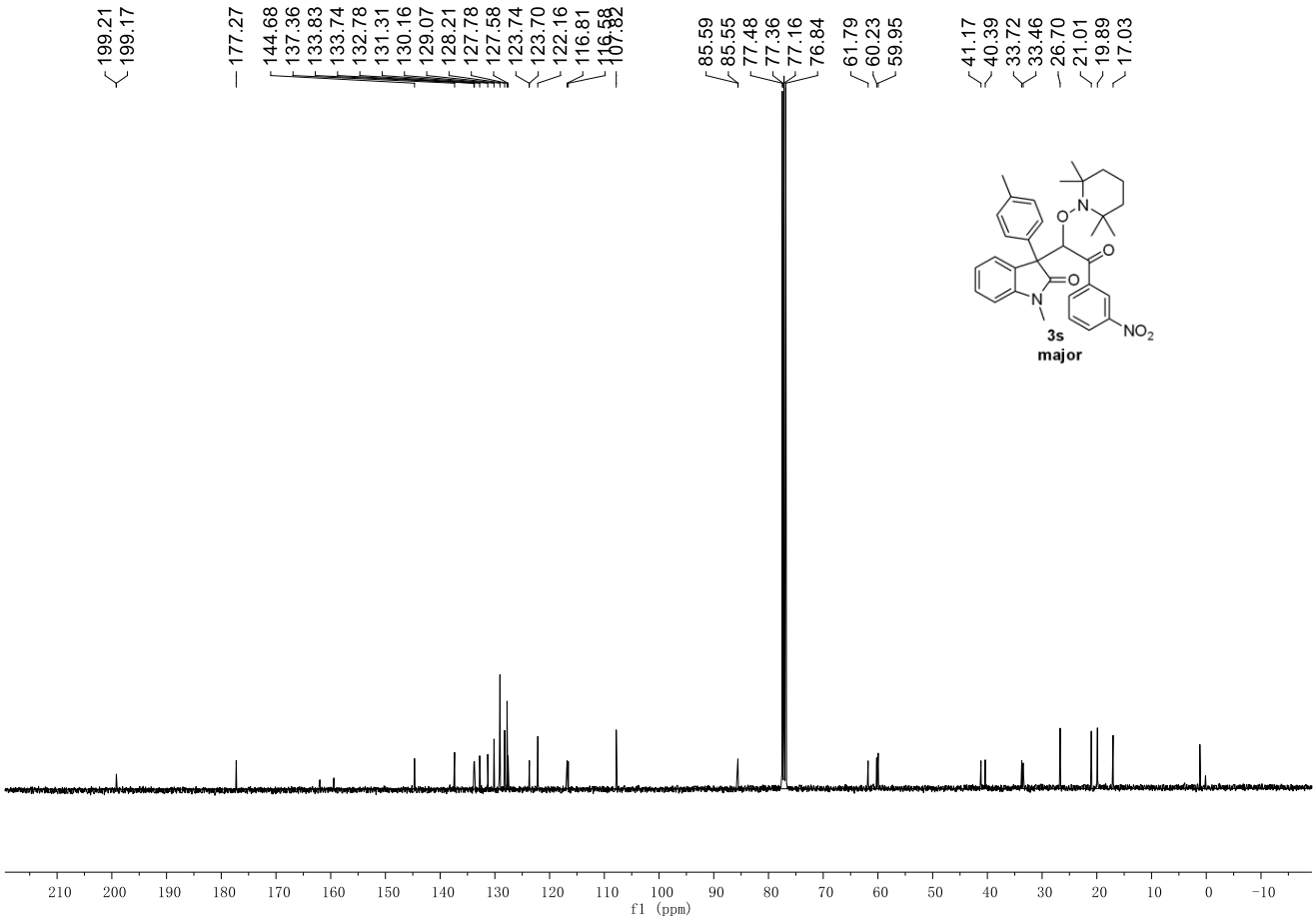
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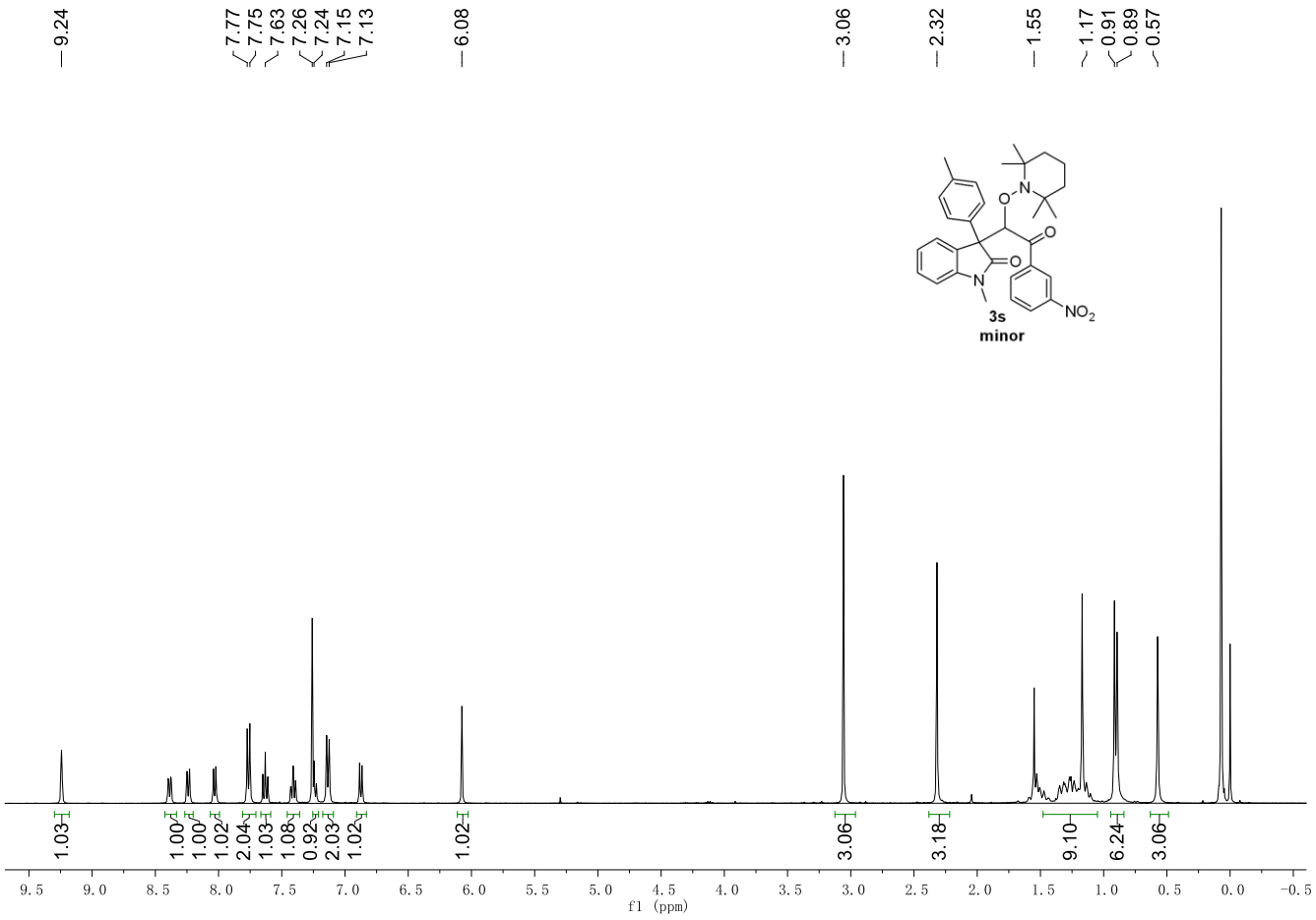
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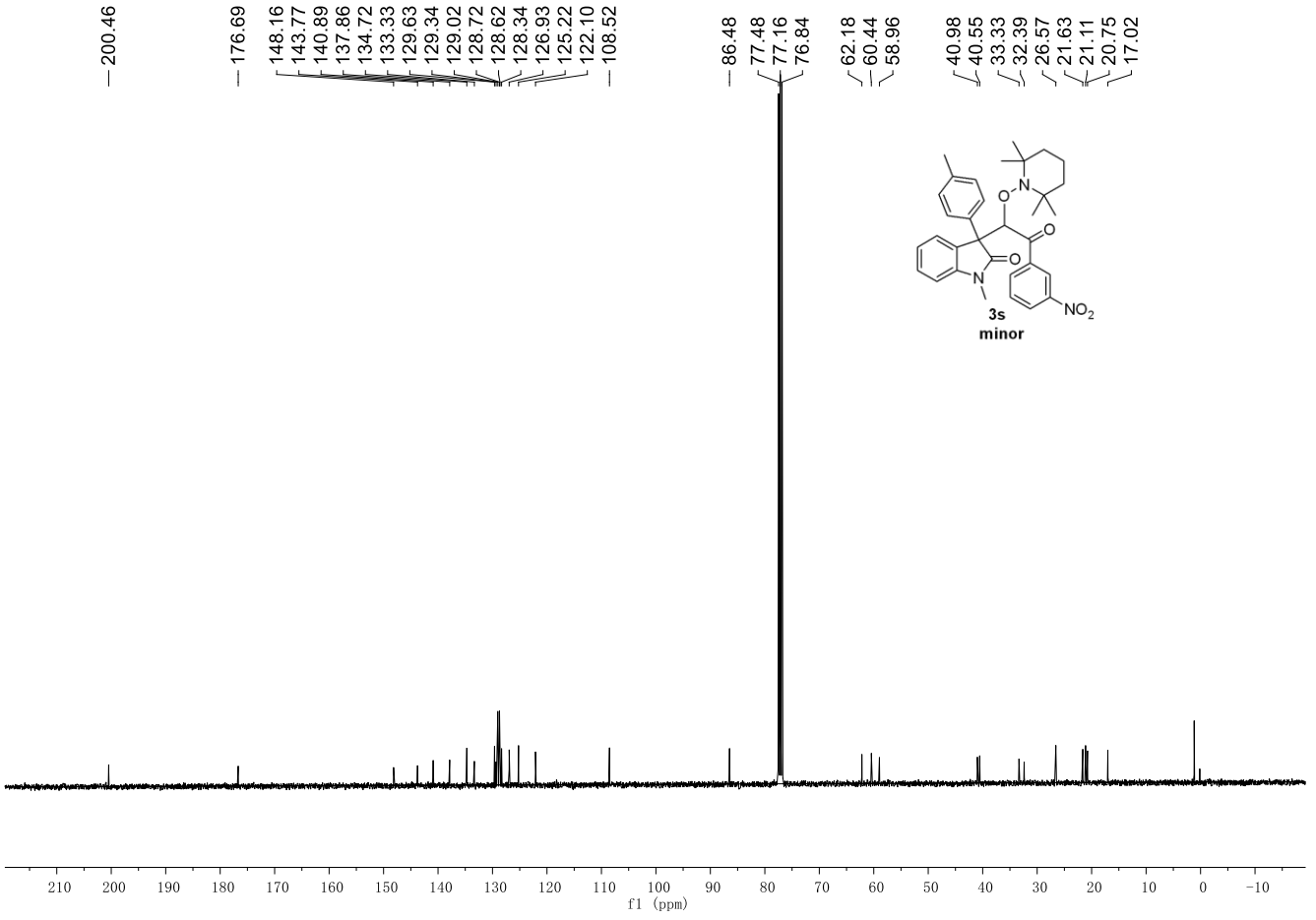
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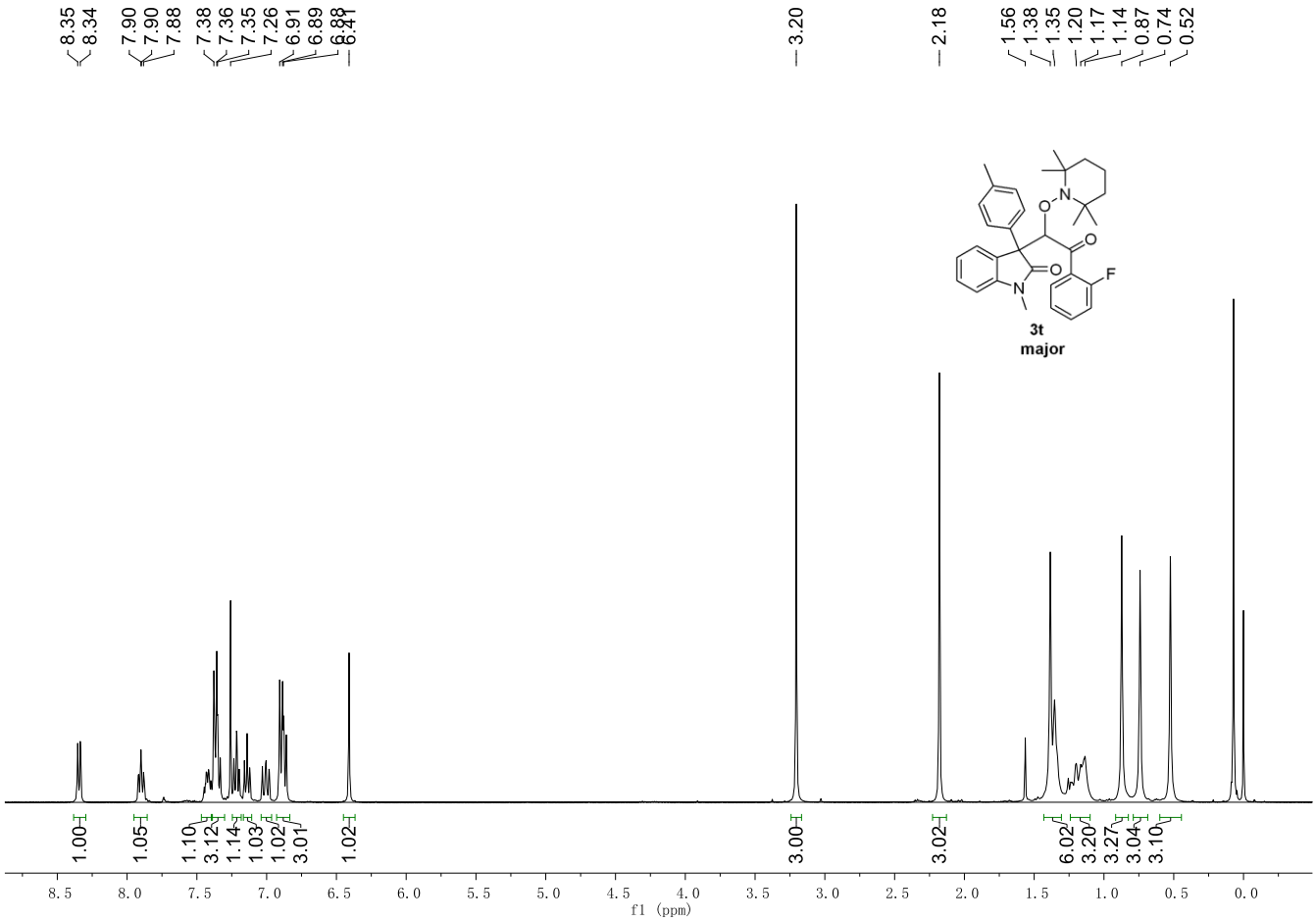
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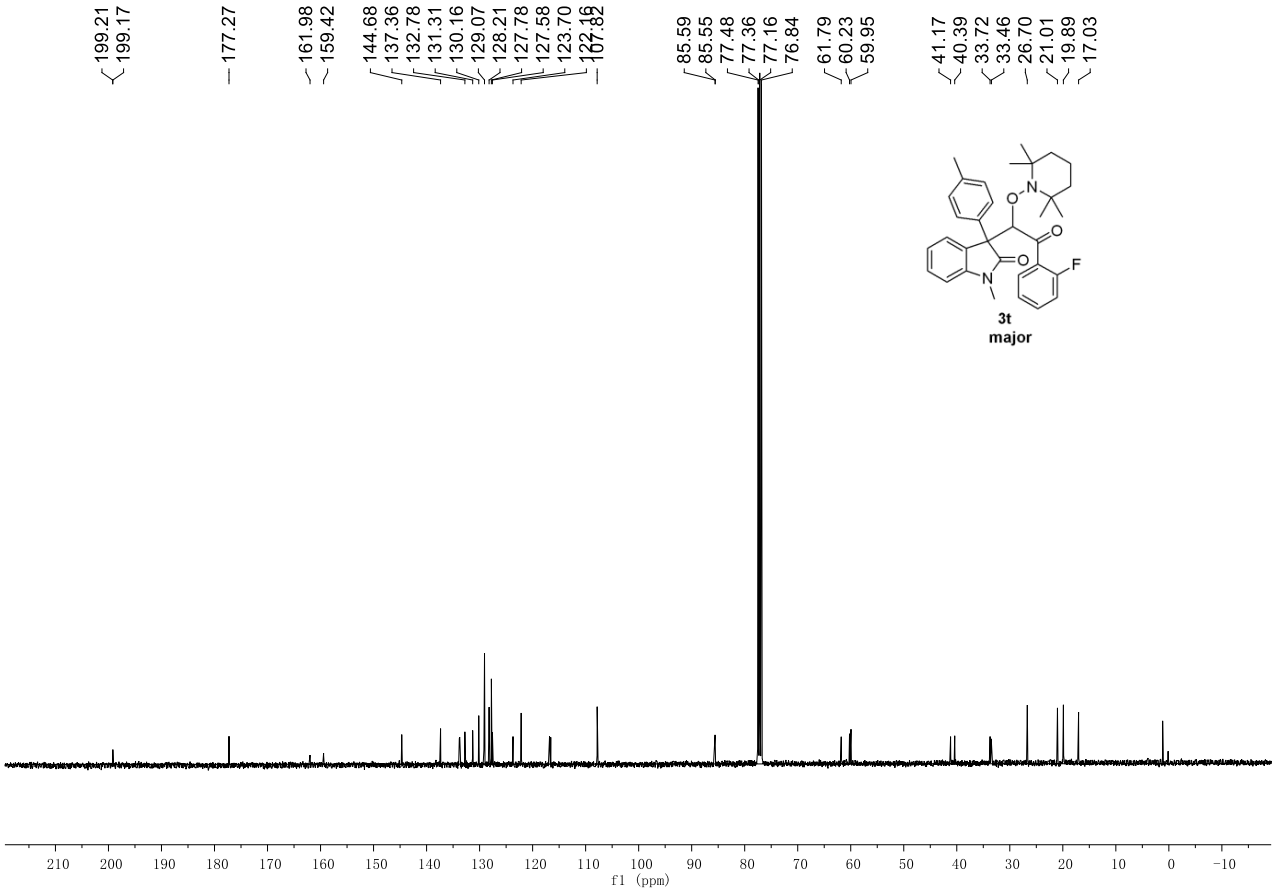
3t
major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123.70
122.16
107.82
85.59
85.55
77.48
77.36
77.16
76.84
61.79
60.23
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3t
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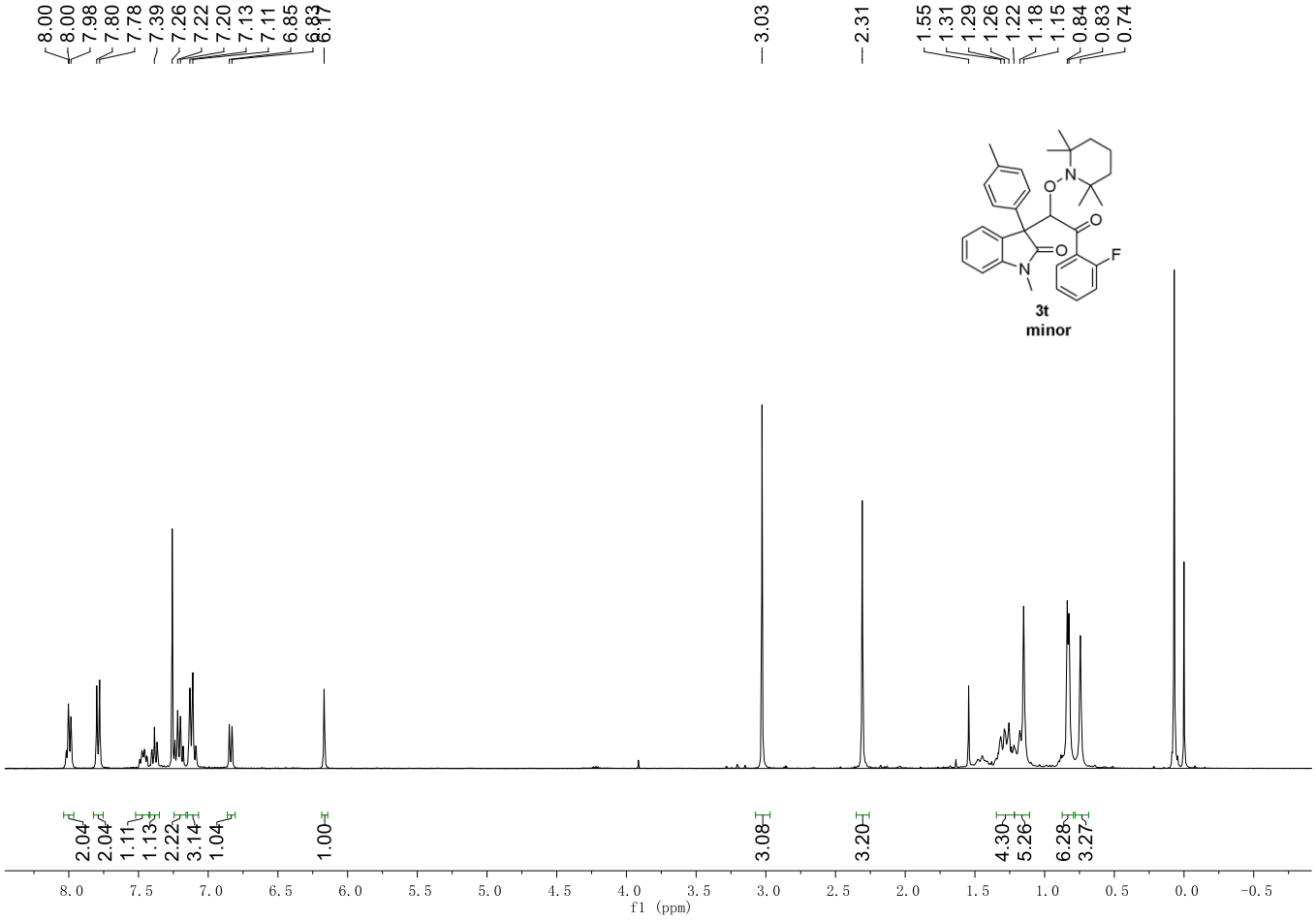
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6.17
3.03
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1.31
1.29
1.26
1.22
1.18
1.15
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3t
minor
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2.04
1.11
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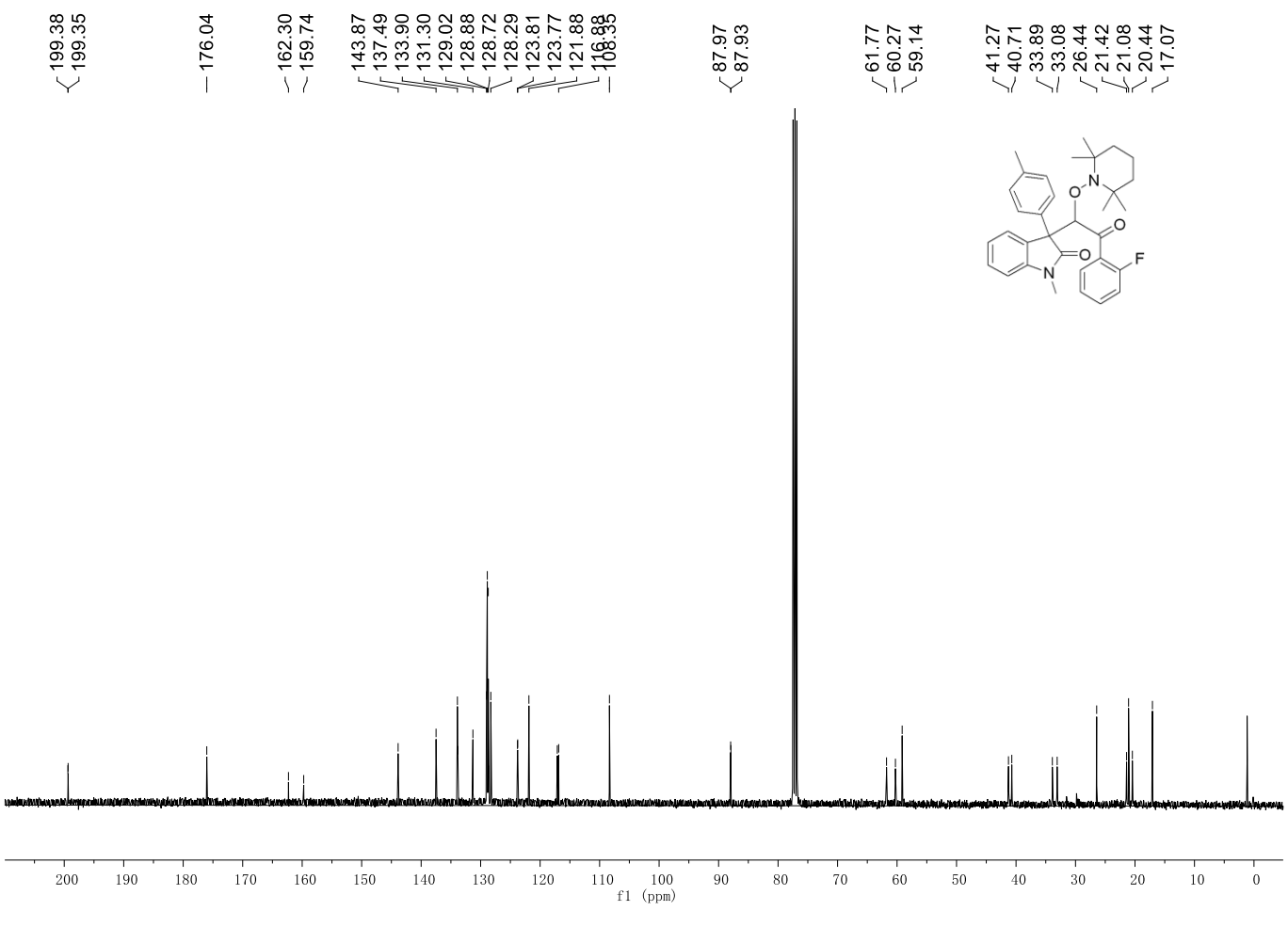
f1 (ppm)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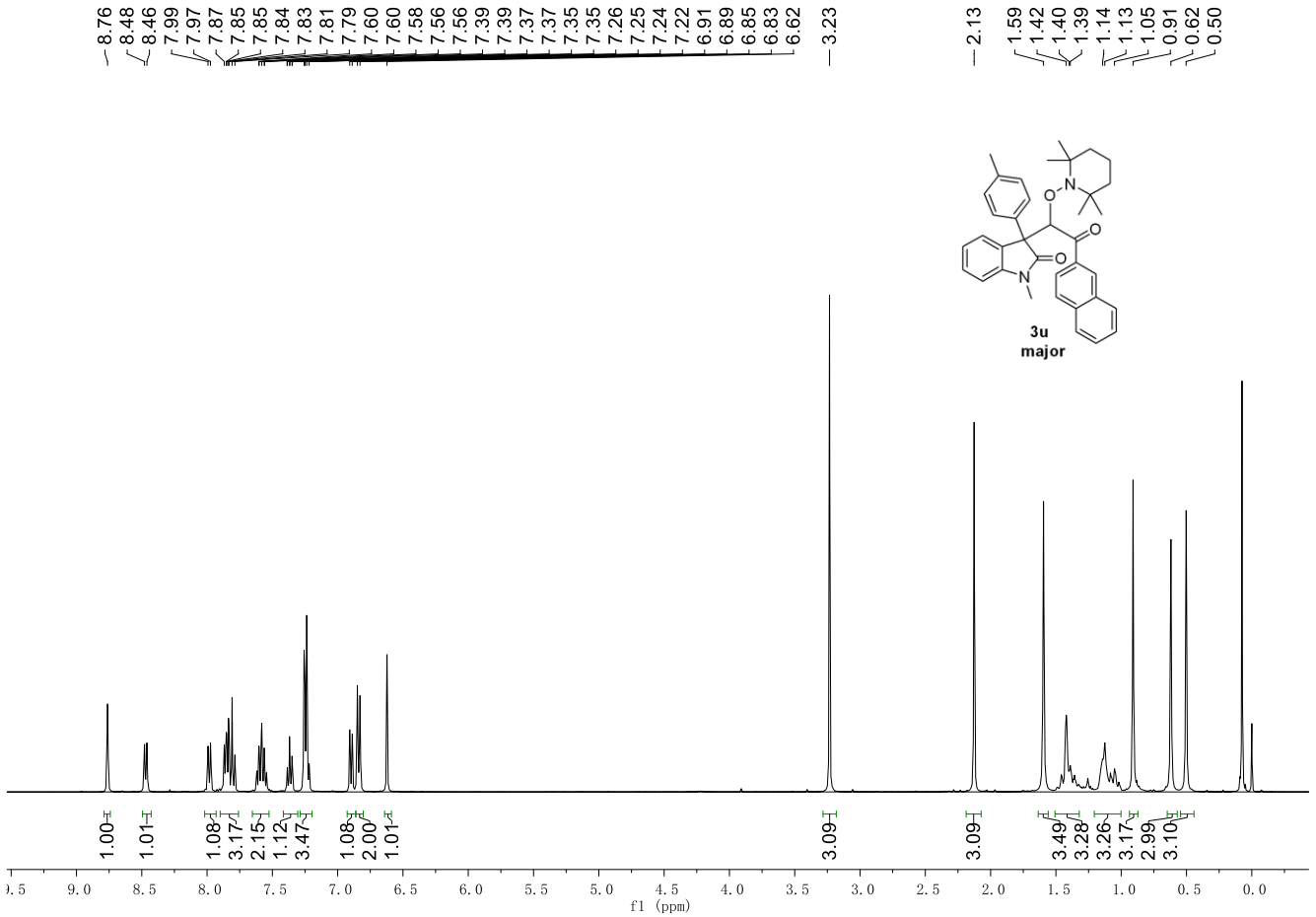
17.07
f1 (ppm)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7.56
7.56
7.39
7.37
7.37
7.35
7.35
7.26
7.25
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6.89
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6.83
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1.42
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1.13
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major
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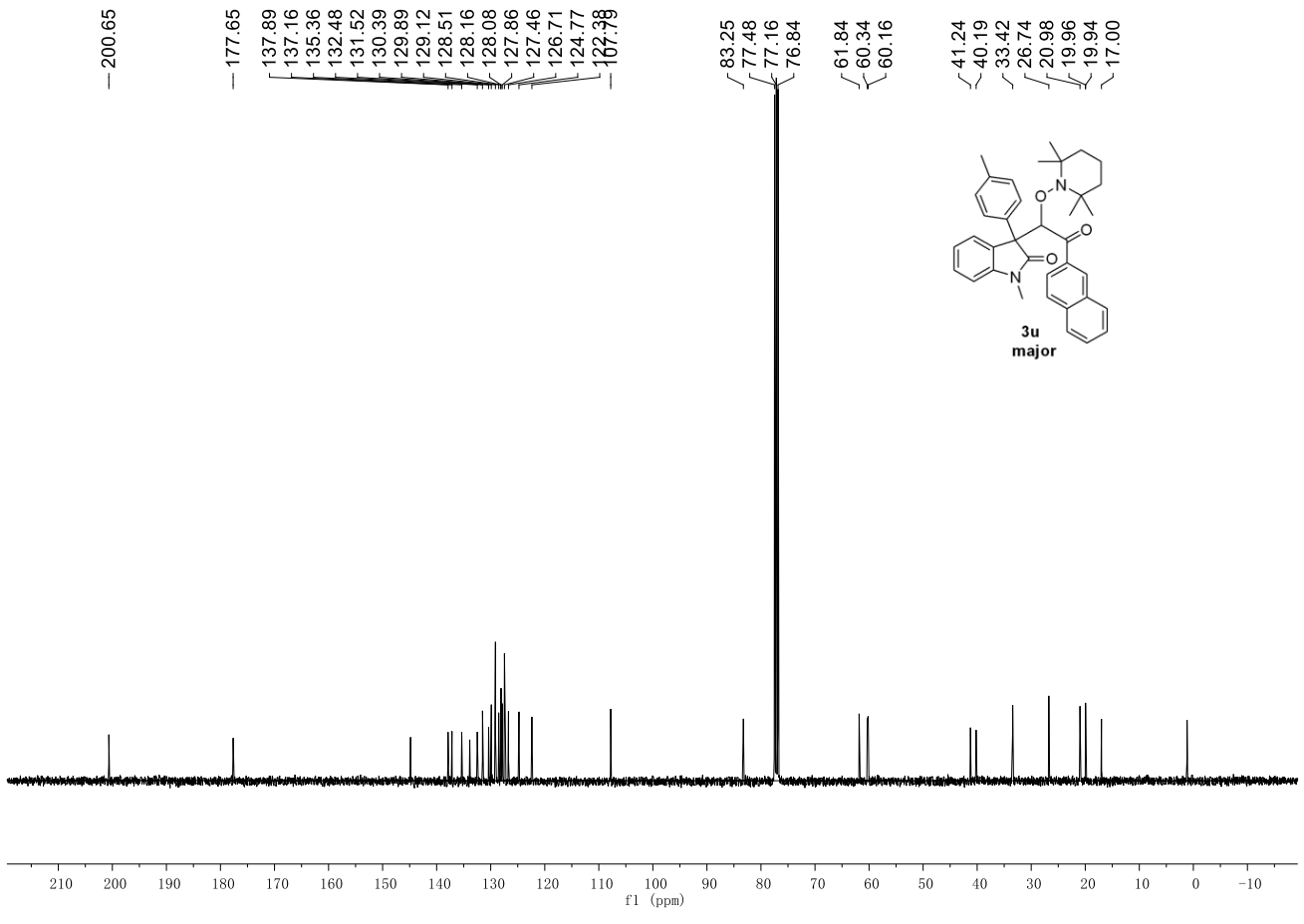
3.10
f1 (ppm)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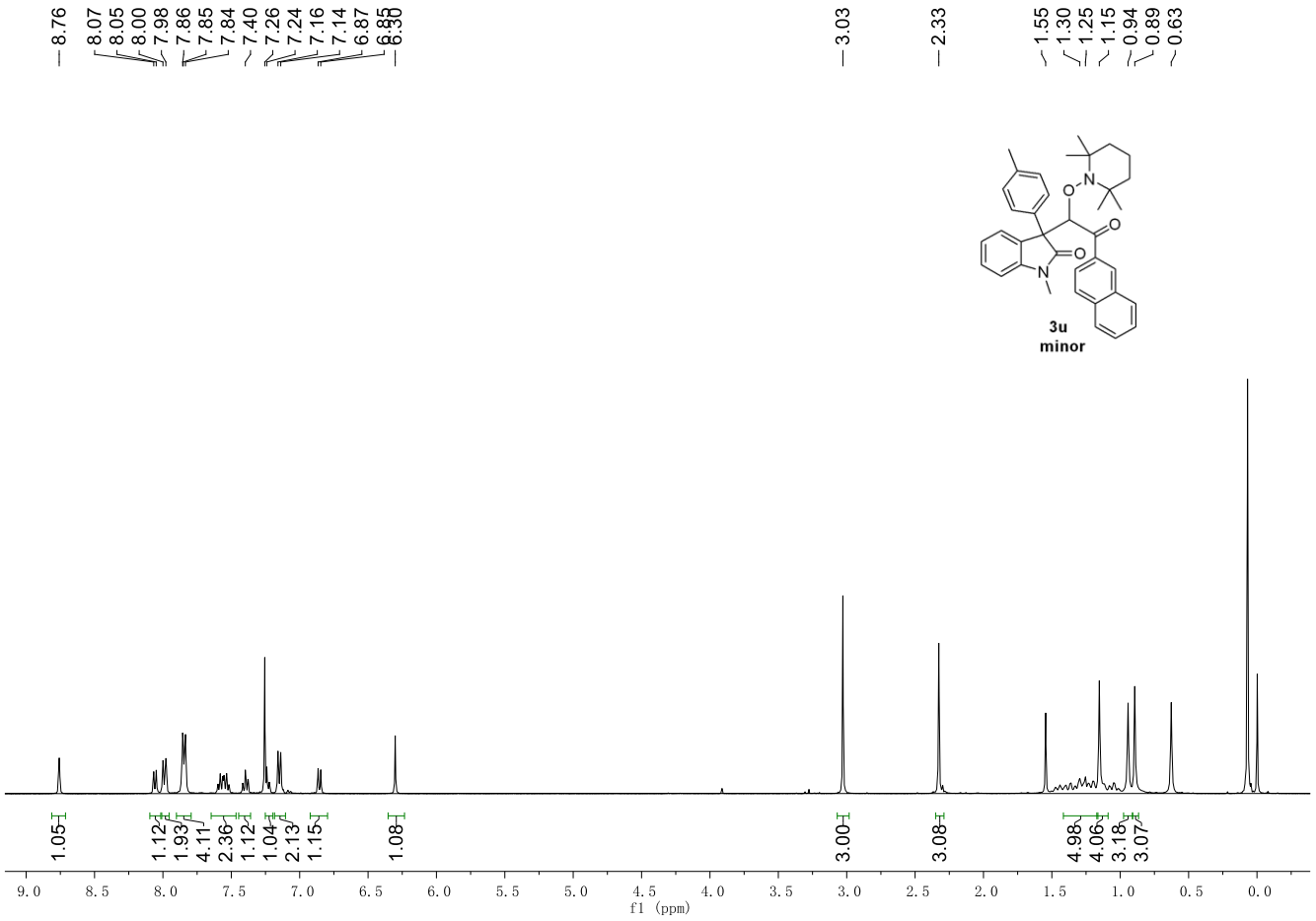
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7.14
6.87
6.85
6.30
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2.33
1.55
1.30
1.25
1.15
0.94
0.89
0.63
3u
minor
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1.12
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4.11
2.36
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1.08
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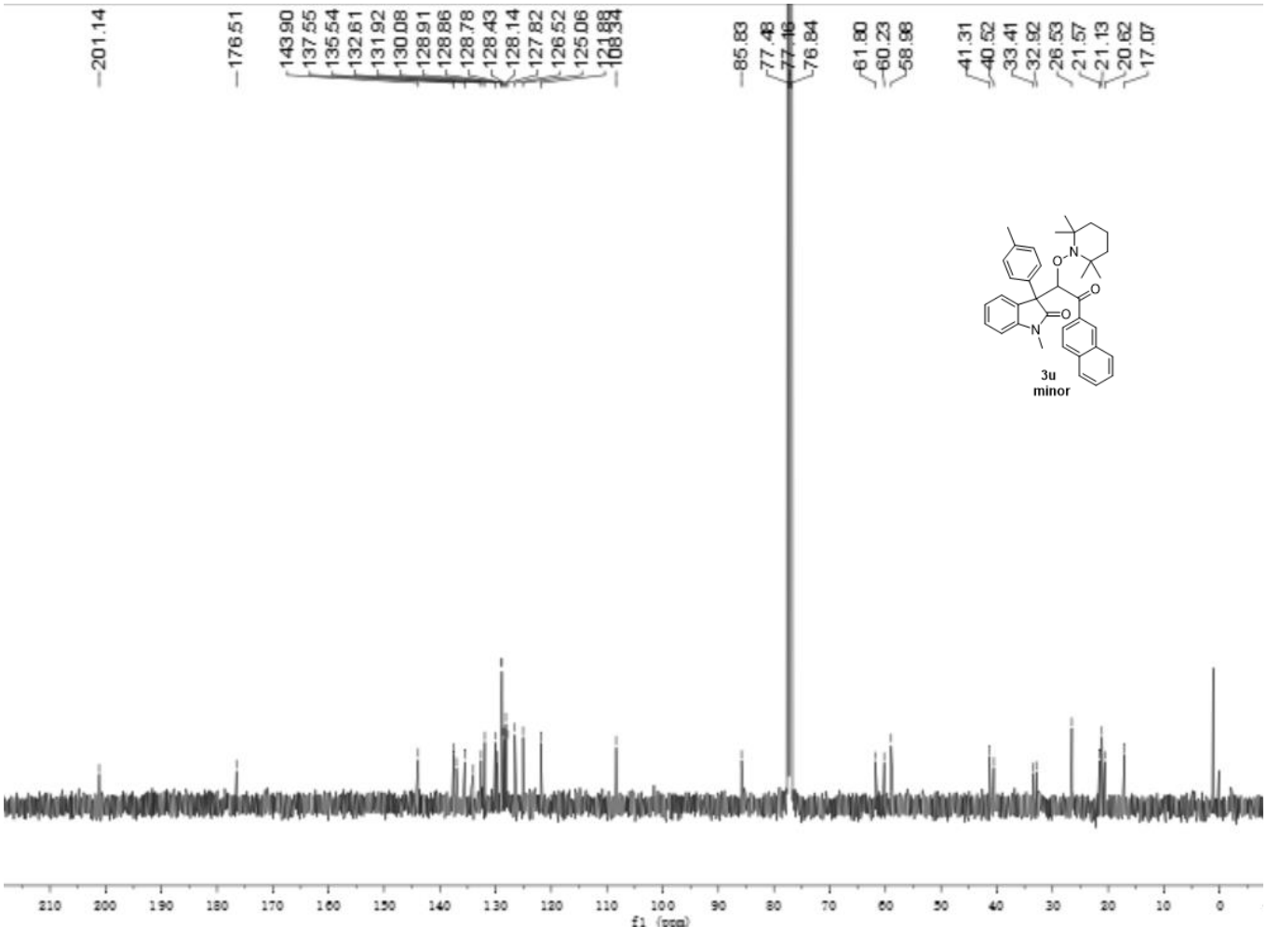
3.07
f1 (ppm)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77.16
76.84
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60.23
58.98
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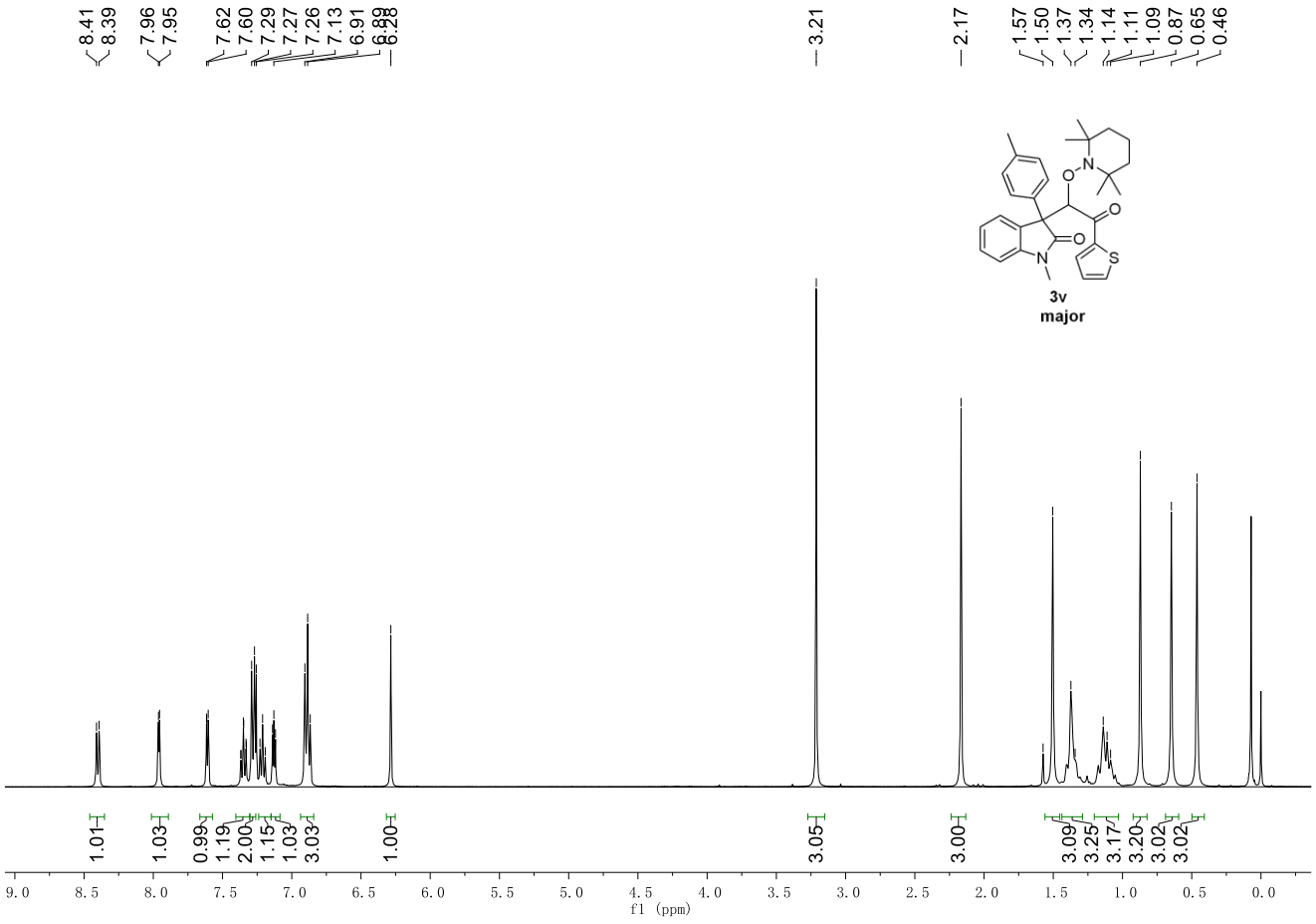
f1 (ppm)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major
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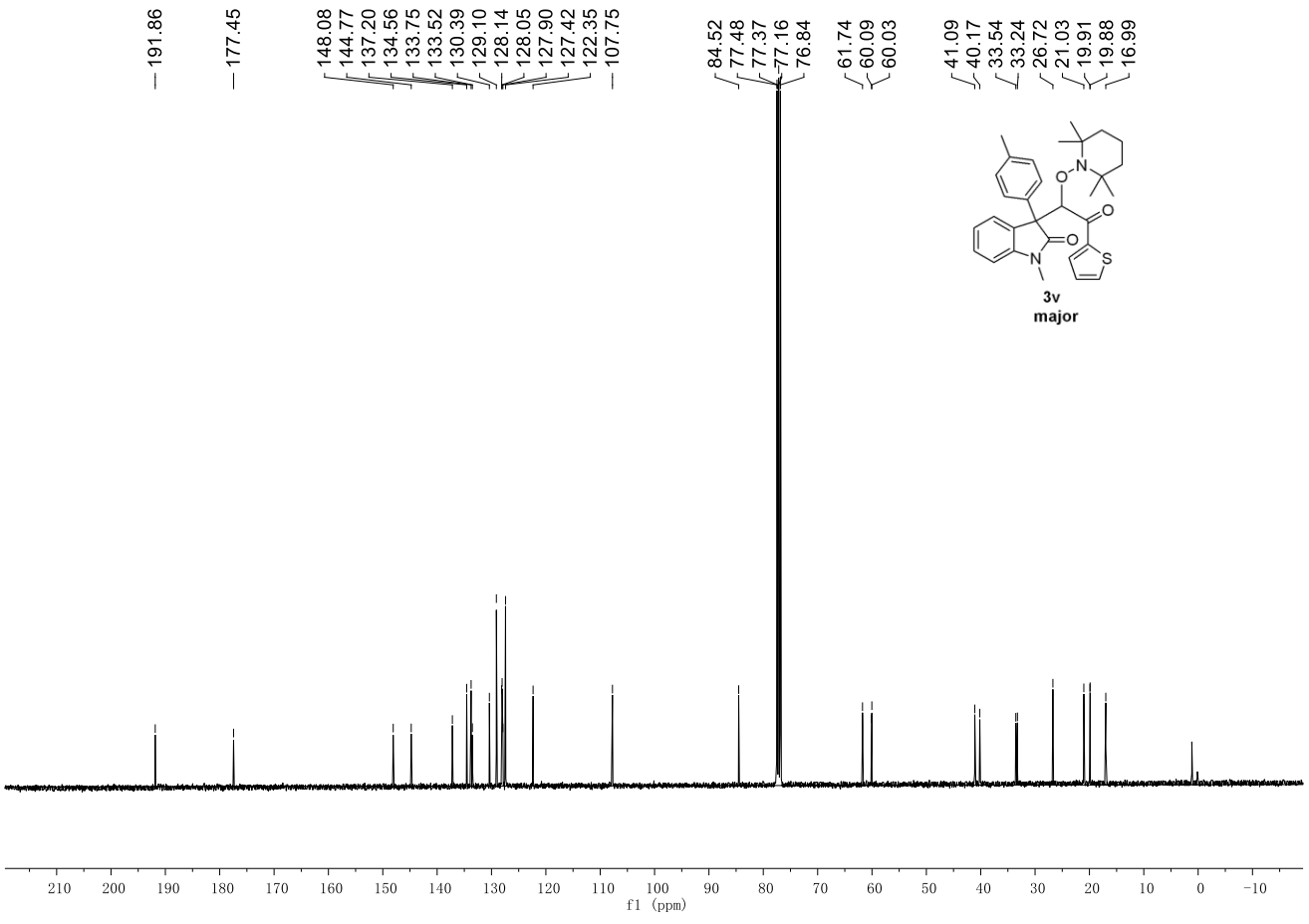
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major
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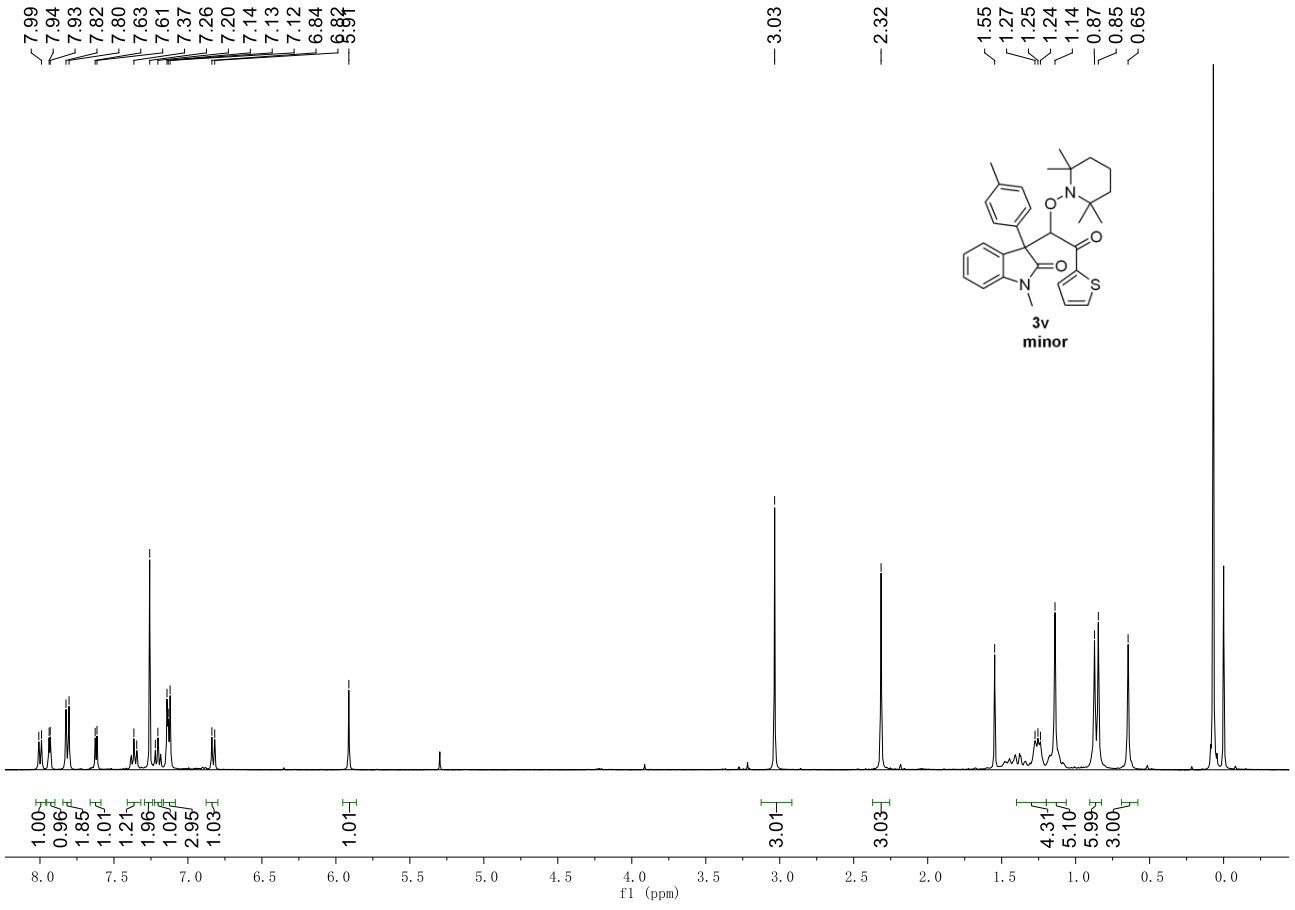
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3.03
2.32
1.55
1.27
1.25
1.24
1.14
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0.96
1.85
1.01
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1.96
1.02
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3.01
3.03
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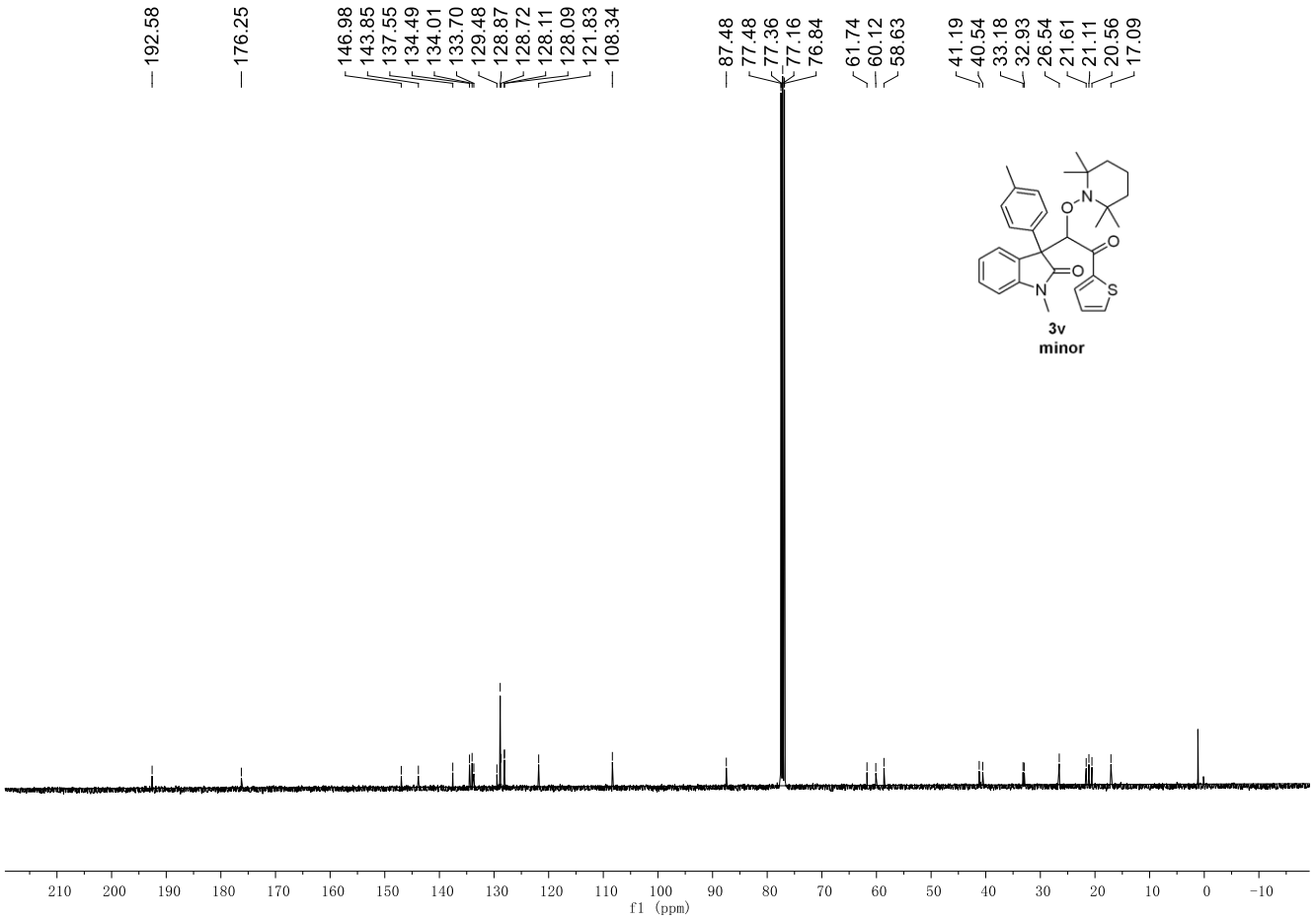
3v
minor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f1 (ppm)
3v
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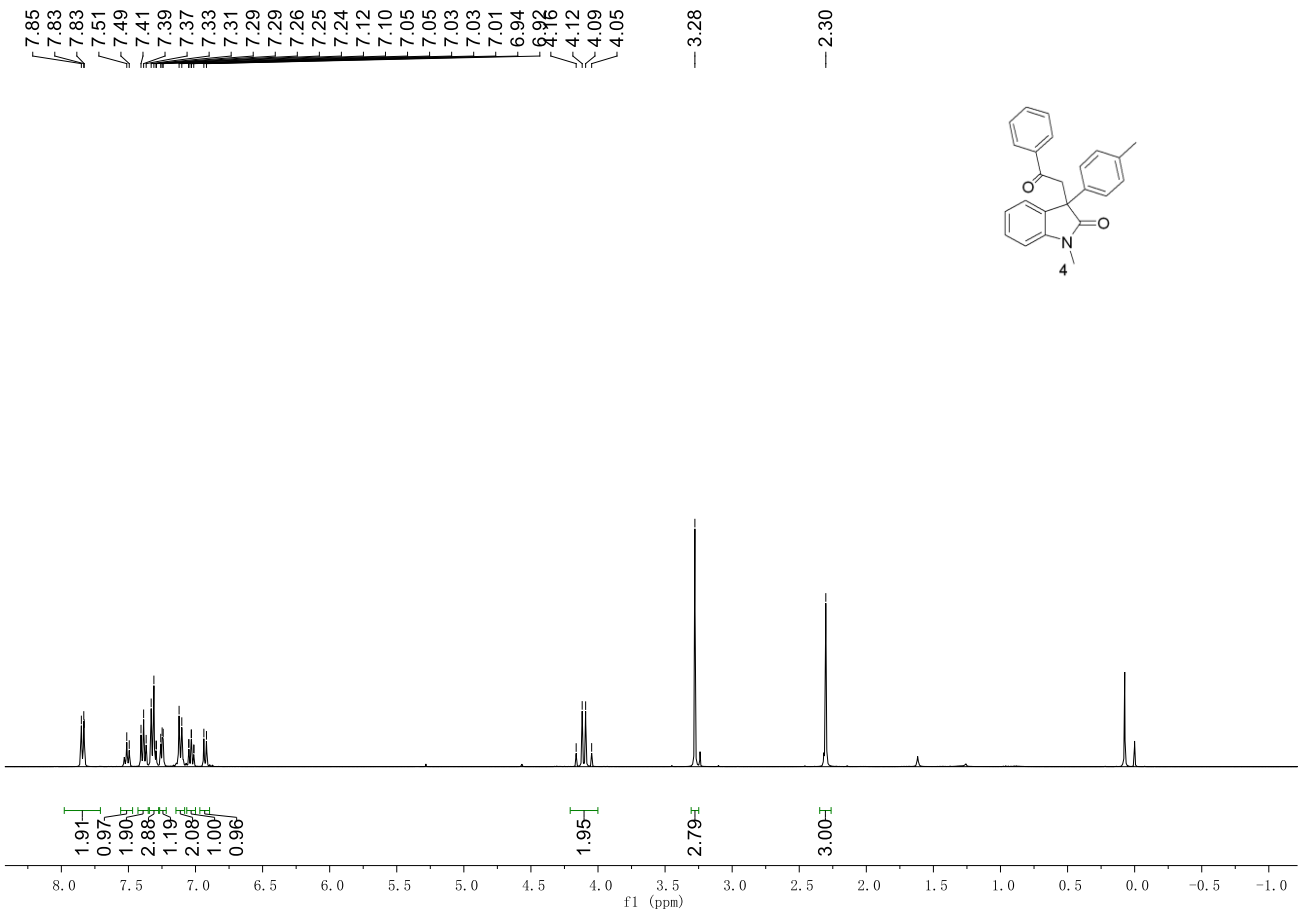
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4.16
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3.28
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O
O
N
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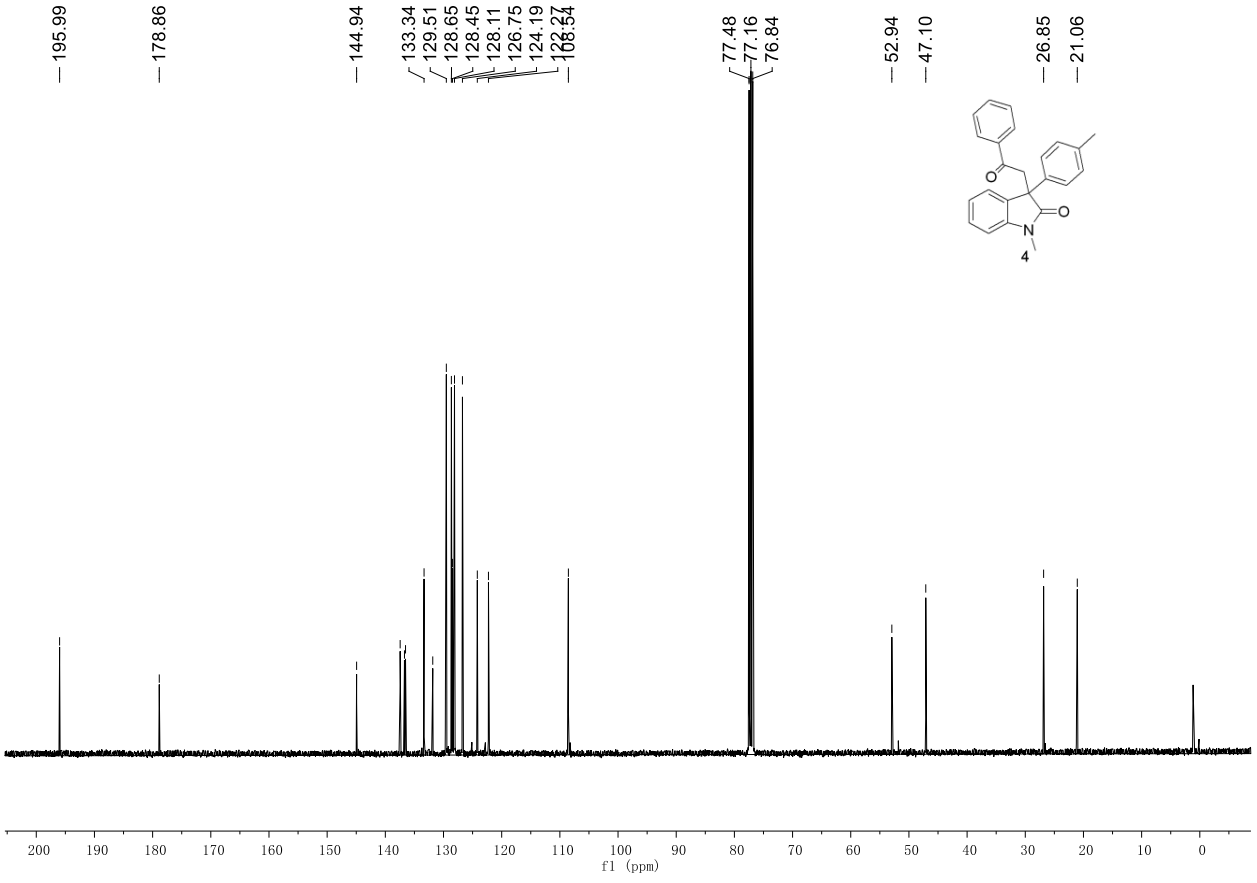
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52.94
47.10
26.85
21.06
O
O
N
4
f1 (ppm)

6. References

1. (a) Durbin, M. J.; Willis, M. C. *Org. Lett.* 2008, **10**, 1413. (b)Trost, B. M.; Xie, J.; Sieber, J. D. *J. Am. Chem. Soc.* 2011, **133**, 20611.
2. Dhotare, B. B.; Choudhary, M. K.; Nayak, S. K. *Synth. Commun*. 2016, **46**, 1772.
3. Urbano, O. N.; Delfino, C. A.; Leticia, Q. H. H.; F, S. P. *J. Org. Chem*. 2016, **81**, 8625.
4. (a) Liu, J. J.; Huang, H. Y.; Cheng, L.; Liu, Q.; Wang, D.; Liu, L. *Org. Biomol. Chem.* 2018, **16**, 899. (b) Huang, H. Y.; Cheng, L.; Liu, J. J.; Wang, D.; Liu, L.; Li, C. J. *J. Org. Chem.* 2017, **82**, 2656.