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N-(Acyloxy)phthalimides as tertiary alkyl radical precursors in the visible light photocatalyzed tandem radical cyclization of *N*-arylacrylamides to 3,3-dialkyl substituted oxindoles

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***General*:**

Column chromatography silica gel (200-300 mesh) and TCL plate were purchased from Qingdao Meijin Chemical Inc(Qingdao; China); HRMS data were obtained in the ESI mode on a Agilent 6530 Q-TOF/MS system; ^{1}H NMR and ^{13}C NMR spectra were recorded on Bruker 400 MHz spectrometer and chemical shifts were given in δ with TMS as an internal reference.

Representative experimental procedure for visible light promoted tandem radical cyclization of N-arylacrylamides

A solution of *N*-arylacrylamides **1** (0.4 mmol), 3.0 eq of *N*-(acyloxy)phthalimides **2**, $Ru(bpy)_3Cl_2.6H_2O$ (2 mol%) and 3.0 eq of *i*-Pr_2NEt in MeCN (4 mL) was irradiated with 25W compact fluorescent lamp for 24 h at room temperature. After the reaction was completed, the resulting mixture was poured into water (50 mL) and then extracted with EtOAc (20 mL×3). The combined organic solution was then washed with water (20 mL×3). The organic layers were washed with brine and dried over $MgSO_4$. The solvent were removed via vacuo and theresidue was purified by flash column chromatography (SiO_2) with petroleum ether/acetone (30:1) to give target compounds **3** and **4**.

[1]H NMR analysis of the mixture of 3n and 3o

According to NMR analysis, the tandem cyclization of *meta*-methyl substituted *N*-arylacrylamide with *N*-(pivaloyloxy)phthalimide (**2a**) give **3n** and **3o** as a mixture in ratio of 2:1.

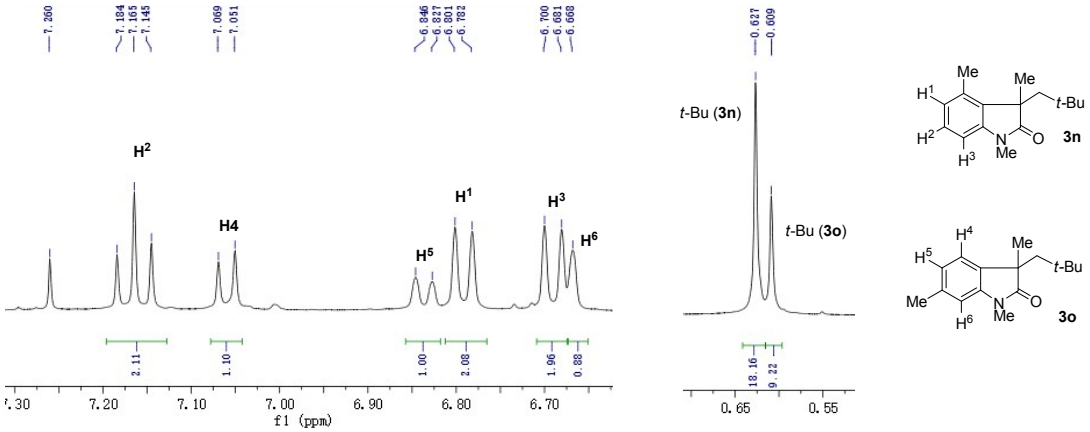


Figure 1s Part of [1]H NMR spectra of the mixture of **3n** and **3o** (solvent: $CDCl_3$)

HPLC-Q-TOF and ^{1}H NMR analysis of the mixture of 3p and 3q

According to HPLC-Q-TOF and NMR analysis, the tandem cyclization of *meta*-chloro substituted *N*-arylacrylamide with *N*-(pivaloyloxy)phthalimide (**2a**) give **3q** and **3q** as a mixture in ratio of about 13:1.

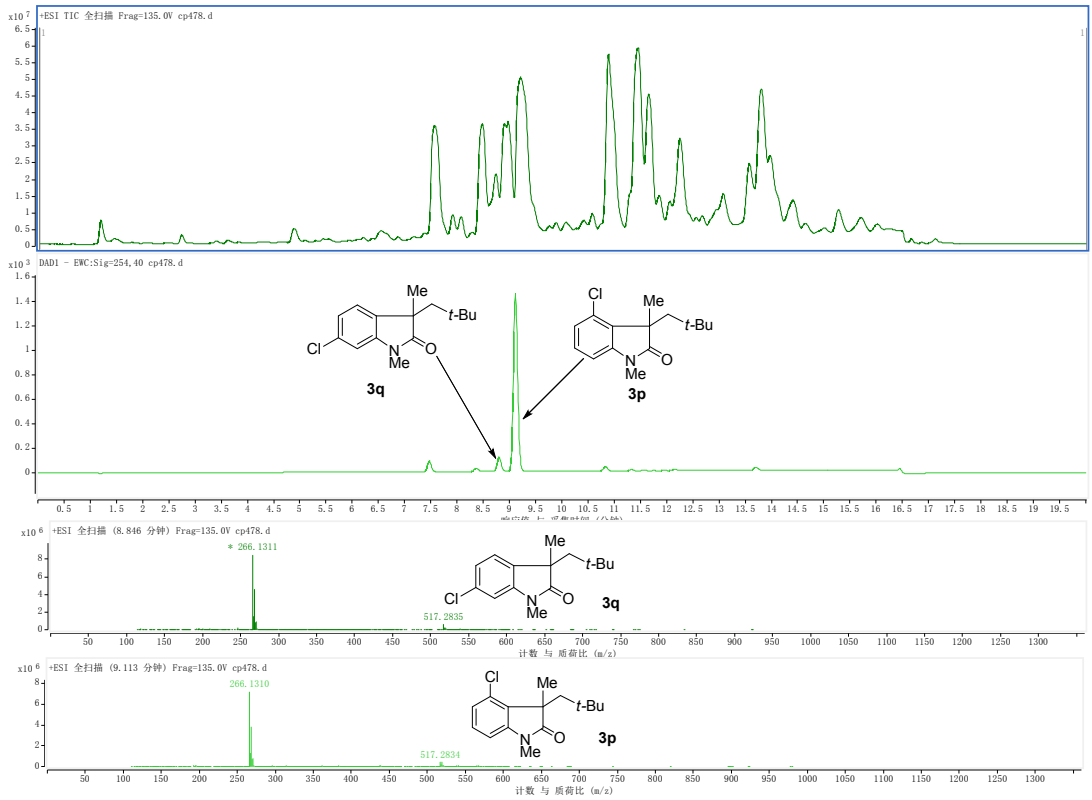


Figure 2s HPLC-Q-Tof analysis of the mixture of **3p** and **3q**

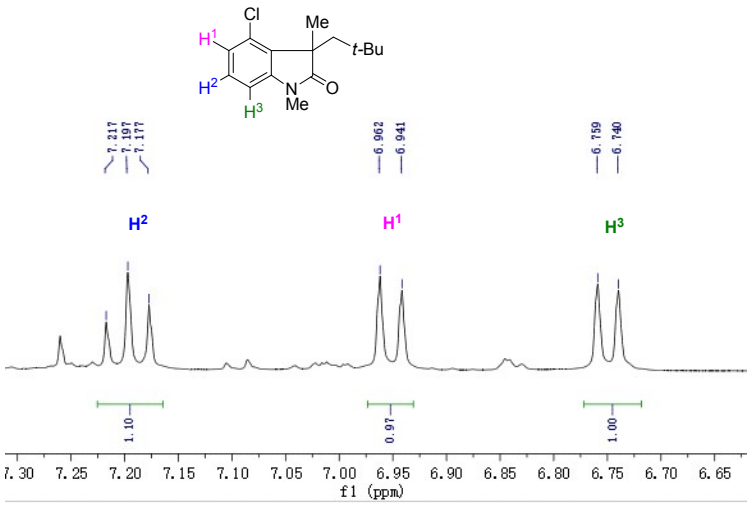
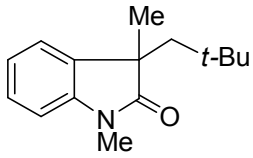


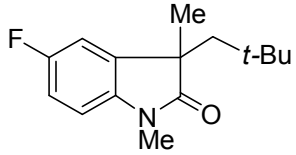
Figure 3s Low field part of ^{1}H NMR spectra of the mixture of **3p** and **3q** (solvent: $CDCl_3$)

Characterization data of compounds 3 and 4



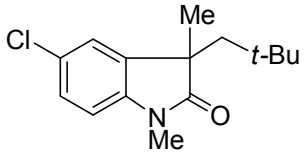
1,3-dimethyl-3-neopentylindolin-2-one (3a) :

Obtained as colorless oil, ^{1}H NMR (400MHz, $CDCl_3$): δ 7.29-7.19 (m, 2H), 7.03 (t, J = 8.8 Hz, 1H), 6.85 (d, J = 7.6 Hz, 1H), 3.22 (s, 3H), 2.16 (d, J = 14.4 Hz, 1H), 1.86 (d, J = 14.4 Hz, 1H) 1.30 (s, 3H), 0.62 (s, 9H). ^{13}C NMR (100MHz, $CDCl_3$): δ 181.2, 142.9, 134.7, 127.6, 123.9, 122.1, 108.1, 50.9, 47.5, 31.8, 30.9(×3), 28.3, 27.1. HRMS (ESI$^+$): calcd 232.1696 for $C_{15}H_{22}NO^+$ $[M+H]^+$; found, 232.1707.



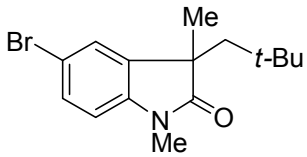
5-fluoro-1,3-dimethyl-3-neopentylindolin-2-one (3b):

Obtained as white wax, ^{1}H NMR (400MHz, $CDCl_3$): δ 6.96-6.91 (m, 2H), 6.75-6.72 (m, 1H), 3.18 (s, 3H), 2.14 (d, J = 14.4 Hz, 1H), 1.80 (d, J = 14.4 Hz, 1H), 1.26 (s, 3H), 0.60 (s, 9H). ^{13}C NMR (100MHz, $CDCl_3$): δ 180.4, 158.9 (d, $^{1}J_{F\text{-}C}$ = 238 Hz), 138.6, 135.8 (d, $^{3}J_{F\text{-}C}$ = 8.0 Hz), 113.5 (d, $^{2}J_{F\text{-}C}$ = 23.4 Hz), 111.6 (d, $^{2}J_{F\text{-}C}$ = 24.2 Hz), 108.2 (d, $^{3}J_{F\text{-}C}$ = 8.1 Hz), 50.6, 47.7, 31.6, 30.6(×3), 28.0, 26.1. HRMS (ESI$^+$): calcd 250.1602 for $C_{15}H_{21}FNO^+$ $[M+H]^+$; found, 250.1608.



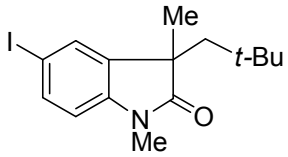
5-chloro-1,3-dimethyl-3-neopentylindolin-2-one (3c):

Obtained as white wax, ^{1}H NMR (400MHz, $CDCl_3$): δ 7.18 (dd, J = 8.4, 2.0 Hz, 1H), 7.12 (d, J = 2.0 Hz, 1H), 6.72 (d, J = 8.0 Hz, 1H), 3.15 (s, 3H), 2.11 (d, J = 14.4 Hz, 1H), 1.78 (d, J = 14.4 Hz, 1H), 1.23 (s, 3H), 0.57 (s, 9H). ^{13}C NMR (100MHz, $CDCl_3$): δ 180.4, 141.5(×2), 136.1, 127.5, 124.3, 109.0, 50.8, 47.7, 31.8, 30.9(×3), 28.2, 26.4. HRMS (ESI$^+$): calcd 266.1306 for $C_{15}H_{21}ClNO^+$ $[M+H]^+$; found, 266.1310.



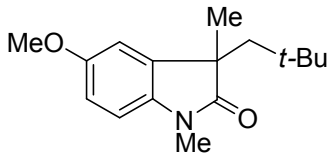
5-bromo-1,3-dimethyl-3-neopentylindolin-2-one (3d):

Obtained as white wax, ^{1}H NMR (400MHz, $CDCl_3$): δ 7.34-7.32 (m, 1H), 7.27-7.26 (m, 1H), 6.68 (dd, J = 8.0, 2.4 Hz, 1H), 3.15 (s, 3H), 2.10 (d, J = 14.4 Hz, 1H), 1.78 (d, J = 14.4 Hz, 1H), 1.24 (s, 3H), 0.58 (s, 9H) . ^{13}C NMR (100MHz, $CDCl_3$): δ 180.4, 142.0, 136.5, 130.4, 127.1, 114.8, 109.5, 50.9, 47.7, 31.8, 30.9(×3), 28.2, 26.4. HRMS (ESI$^+$): calcd 310.0801 for $C_{15}H_{21}BrNO^+$ $[M+H]^+$; found, 310.0798.



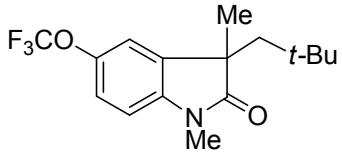
5-iodo-1,3-dimethyl-3-neopentylindolin-2-one (3e):

Obtained as white wax, ^{1}H NMR (400MHz, $CDCl_3$): δ 7.53 (dd, *J* = 8.0, 1.6 Hz, 1H), 7.44 (s, 1H), 6.60 (d, *J* = 8.4 Hz), 3.15 (s, 3H), 2.09 (d, *J* = 14.4 Hz, 1H), 1.78 (d, *J*= 14.4 Hz, 1H), 1.24 (s, 3H), 0.58 (s, 9H). ^{13}C NMR (100MHz, $CDCl_3$): δ 180.1, 142.6, 136.9, 136.4, 132.7, 110.2, 84.6, 50.8, 47.5, 31.8, 30.9(×3), 28.2, 26.3. HRMS (ESI$^+$): calcd 358.0662 for $C_{15}H_{21}INO^+$ $[M+H]^+$; found, 358.0656.



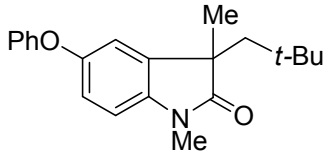
5-methoxy-1,3-dimethyl-3-neopentylindolin-2-one (3f):

Obtained as colorless oil, ^{1}H NMR (400MHz, $CDCl_3$): δ 6.81-6.72 (m, 3H), 3.78 (s, 3H), 3.18 (s, 3H), 2.14 (d, *J* = 14.4 Hz, 1H), 1.71 (d, *J* = 14.4 Hz, 1H), 1.27 (s, 3H), 0.61 (s, 9H). ^{13}C NMR (100MHz, $CDCl_3$): δ 180.8, 155.8, 136.7, 135.8, 111.9, 111.7, 108.3, 56.0, 50.9, 48.0, 31.9, 30.9(×3), 28.4, 26.4. HRMS (ESI$^+$): calcd 262.1802 for $C_{16}H_{24}NO_2^+$ $[M+H]^+$; found, 262.1794.



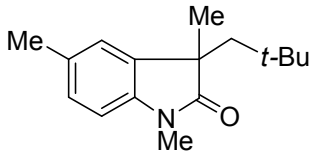
1,3-dimethyl-3-neopentyl-5-(trifluoromethoxy)indolin-2-one (3g):

Obtained as colorless oil, ^{1}H NMR (400MHz, $CDCl_3$): δ 7.12 (d, *J* = 8.4 Hz, H), 7.08 (s, 1H), 6.82 (d, *J* = 8.4 Hz, 1H), 3.24 (s, 3H), 2.16 (d, *J* = 14.4 Hz, 1H), 1.84 (d, *J* = 14.4 Hz, 1H), 1.29 (s, 3H), 0.60 (s, 9H). ^{13}C NMR (100MHz, $CDCl_3$): δ 180.9, 144.6, 141.7, 136.0, 120.8 (q, $^{1}J_{F\text{-}C}$ = 254.5 Hz), 120.9, 118.1, 108.5, 51.0, 47.9, 31.9, 30.9(×3), 28.2, 26.5. HRMS (ESI$^+$): calcd 316.1519 for $C_{16}H_{21}F_3NO_2^+$ $[M+H]^+$; found, 316.1518.



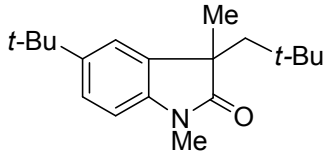
1,3-dimethyl-3-neopentyl-5-phenoxyindolin-2-one (3h):

Obtained as white wax, ^{1}H NMR (400MHz, $CDCl_3$): δ 7.26 (dt, *J* = 7.6, 2.0 Hz, 2H), 7.03 (t, *J* = 8.8 Hz, 1H), 6.97-6.92 (m, 3H), 6.90 (s, 1H), 6.80 (d, *J* = 8.0 Hz, 1H), 3.21 (s, 3H), 2.14 (d, *J* = 14.4 Hz, 1H), 1.78 (d, *J* = 14.4 Hz, 1H), 1.27 (s, 3H), 0.64 (s, 9H). ^{13}C NMR (100MHz, $CDCl_3$): δ 180.8, 158.6, 152.1, 139.0, 136.0, 129.7 (×2), 122.6, 119.0, 117.6 (×2), 116.6, 108.7, 50.8, 47.8, 31.8, 30.9(×3), 28.3, 26.4. HRMS (ESI$^+$): calcd 324.1958 for $C_{21}H_{26}NO_2^+$ $[M+H]^+$; found, 324.1951.



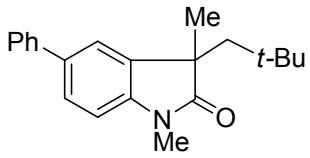
1,3,5-trimethyl-3-neopentylindolin-2-one (3i):

Obtained as colorless oil, ^{1}H NMR (400MHz, $CDCl_3$): δ 7.40 (d, *J* = 7.6 Hz, 1H), 7.00 (s, 1H), 6.72 (d, *J* = 8.0 Hz, 1H), 3.18 (s, 3H), 2.32 (s, 3H), 2.13 (d, *J* = 14.4 Hz, 1H), 1.82 (d, *J* = 14.4 Hz, 1H), 1.27 (s, 3H), 0.60 (s, 9H). ^{13}C NMR (100MHz, $CDCl_3$): δ 181.2, 140.6, 1344, 131.5, 127.8, 124.8, 107.8, 50.9, 47.6, 31.9, 30.9(×3), 28.4, 26.4, 21.2. HRMS (ESI$^+$): calcd 246.1852 for $C_{16}H_{24}NO^+$ $[M+H]^+$; found, 246.1858.



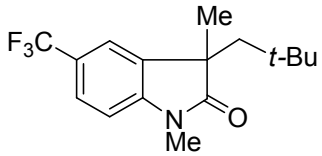
5-(tert-butyl)-1,3-dimethyl-3-neopentylindolin-2-one (3J):

Obtained as colorless oil, ^{1}H NMR (400MHz, $CDCl_3$): δ 7.27 (dd, *J* = 8.0, 2.0 Hz, 1H), 7.24 (d, *J* = 2.0 Hz, 1H), 6.77 (d, *J* = 8.0 Hz, 1H), 3.20 (s, 3H), 2.16 (d, *J* = 14.4 Hz, 1H), 1.86 (d, *J* = 14.4 Hz, 1H), 1.32 (s, 9H), 1.30 (s, 3H), 0.60 (s, 9H). ^{13}C NMR (100MHz, $CDCl_3$): δ 181.4, 145.2, 140.6, 133.8, 123.9, 121.5, 107.4, 50.9, 47.6, 34.6, 31.8, 31.6(×3), 30.9(×3), 28.4, 26.3. HRMS (ESI$^+$): calcd 288.2322 for $C_{19}H_{30}NO^+$ $[M+H]^+$; found, 288.2319.



1,3-dimethyl-3-neopentyl-5-phenylindolin-2-one (3k):

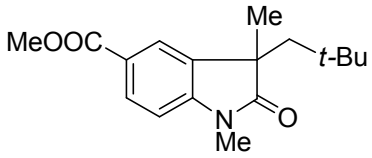
Obtained as white wax, ^{1}H NMR (400MHz, $CDCl_3$): δ 7.60 (d, *J* = 8.0 Hz, 2H), 7.49 (d, *J* = 8.0 Hz, 1H), 7.45-7.41 (m, 3H), 7.32 (t, *J* = 8.8 Hz, 1H), 6.91 (d, *J* = 8.0 Hz, 1H), 3.51 (s, 3H), 2.21 (d, *J* = 14.4 Hz, 1H), 1.93 (d, *J* = 14.4, 1H), 1.35 (s, 3H), 0.67 (s, 9H). ^{13}C NMR (100MHz, $CDCl_3$): δ 181.1, 142.4, 141.2, 135.5, 134.8, 128.8(×2), 126.9, 126.8(×2), 126.5, 122.9, 108.3, 50.9, 47.6, 31.9, 30.9(×3), 28.4, 26.4. HRMS (ESI$^+$): calcd 308.2009 for $C_{21}H_{26}NO^+$ $[M+H]^+$; found, 308.2005.



1,3-dimethyl-3-neopentyl-5-(trifluoromethyl)indolin-2-one (3l):

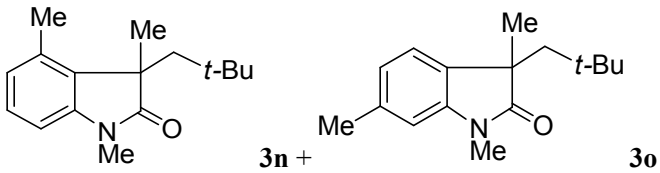
Obtained as colorless oil, ^{1}H NMR (400MHz, $CDCl_3$): δ 7.53 (d, *J* = 8.0 Hz, 1H), 7.40 (s, 1H), 6.90 (d, *J* = 8.0 Hz, 1H), 3.22 (s, 3H), 2.16 (d, *J* = 14.4 Hz, 1H), 1.86 (d, *J* = 14.4 Hz, 1H), 1.29 (s, 3H), 0.57 (s, 9H). ^{13}C NMR (100MHz, $CDCl_3$): δ 180.8, 145.6, 134.7, 125.1 (q, $^{3}J_{F\text{-}C}$ = 3.9 Hz), 124.7 (q, $^{1}J_{F\text{-}C}$ = 278 Hz),

124.1 (q, $^{2}J_{F\text{-}C}$ = 32.5 Hz), 120.6 (q, $^{3}J_{F\text{-}C}$ = 3.4 Hz), 107.6, 50.6, 47.2, 31.5, 30.6(×3), 27.9, 26.4. HRMS (ESI^{+}): calcd 300.1570 for $C_{16}H_{21}F_3NO^{+}$ [M+H]$^{+}$; found, 300.1584.

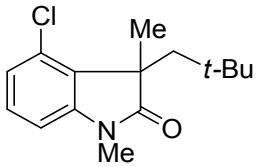


methyl 1,3-dimethyl-3-neopentyl-2-oxoindoline-5-carboxylate (3m):

Obtained as colorless oil, ^{1}H NMR (400MHz, $CDCl_3$): δ 7.95 (dd, *J* = 8.0, 2.0 Hz, 1H), 7.81 (d, *J* = 2.0 Hz, 1H), 6.83 (d, *J* = 8.0 Hz, 1H), 3.84 (s, 3H), 3.19 (s, 3H), 2.19 (d, *J* = 14.4 Hz, 1H), 1.85 (d, *J* = 14.4 Hz, 1H), 1.24 (s, 3H), 0.53 (s, 9H). ^{13}C NMR (100MHz, $CDCl_3$): δ 181.2, 167.0, 147.0, 134.3, 130.4, 125.0, 124.0, 107.6, 52.0, 50.8, 47.2, 31.8, 30.8(×3), 28.1, 26.4. HRMS (ESI^{+}): calcd 290.1751 for $C_{17}H_{24}NO_3^{+}$ [M+H]$^{+}$; found, 290.1760.



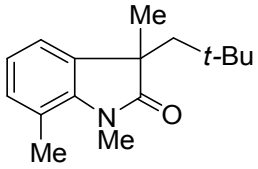
1,3,4-trimethyl-3-neopentylindolin-2-one (3n) and **1,3,6-trimethyl-3-neopentylindolin-2-one (3o)** were obtained as colorless oil mixture. ^{1}H NMR (400MHz, $CDCl_3$): δ 7.17 (t, *J* = 7.6 Hz, 1H) (**3n**), 7.06 (d, *J* = 7.6 Hz, 1H) (**3o**), 6.84 (d, *J* = 7.6 Hz, 1H) (**3o**), 6.79 (d, *J* = 7.6 Hz, 1H) (**3o**), 6.69 (d, *J* = 7.6 Hz, 1H) (**3n**), 6.67 (s, 1H) (**3o**), 3.91 (s, NMe, overlapped), 2.39 (s, 3H) (**3o**), 2.38 (s, 3H) (**3n**), 2.13 (d, *J* = 14.4 Hz, 1H) (**3o**), 2.08 (d, *J* = 2.0 Hz, 2H) (**3n**), 1.82 (d, *J* = 14.4 Hz, 1H) (**3o**), 1.36 (s, 3H) (**3o**), 1.26 (s, 3H) (**3n**), 0.63 (s, 9H) (**3n**), 0.61 (s, 9H) (**3o**). ^{13}C NMR (100MHz, $CDCl_3$): δ 181.9(**3o**), 181.5(**3n**), 143.6, 143.4, 138.0, 135.4, 131.7, 127.9, 125.4, 124.1, 123.0, 109.4, 106.2, 51.2, 49.6, 48.7, 32.2, 31.3, 30.5 (overlapped), 28.8, 26.8, 26.6, 25.7, 22.2(**3o**), 19.2(**3n**). HRMS (ESI^{+}): calcd 246.1852 for $C_{16}H_{24}NO^{+}$ [M+H]$^{+}$; found, 246.1859.



4-chloro-1,3-dimethyl-3-neopentylindolin-2-one (3p):

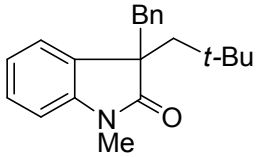
Obtained as colorless oil, ^{1}H NMR (400MHz, $CDCl_3$): δ 7.20 (t, *J* = 8.0 Hz, 1H), 6.95 (d, *J* = 8.0 Hz, 1H), 6.75 (d, *J* = 8.0 Hz, 1H), 3.20 (s, 3H), 2.36 (d, *J* = 14.4 Hz, 1H), 2.20 (d, *J* = 14.4 Hz, 1H), 1.43 (s, 3H), 0.65 (s, 9H). ^{13}C NMR (100MHz, $CDCl_3$): δ 108.2, 144.5, 131.3, 130.4, 128.6, 123.4, 106.3, 48.6, 48.0, 31.5, 29.8(×3), 26.3, 24.2. HRMS (ESI^{+}): calcd 266.1306 for $C_{15}H_{21}ClNO^{+}$ [M+H]$^{+}$; found,

266.1310.



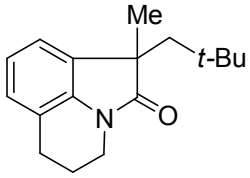
1,3,7-trimethyl-3-neopentylindolin-2-one (3r):

Obtained as colorless oil, ^{1}H NMR (400MHz, $CDCl_3$): δ 7.01 (d, *J* = 7.2 Hz, 1H), 6.97 (d, *J* = 7.2 Hz, 1H), 6.90 (t, *J* = 7.2 Hz, 1H), 3.50 (s, 3H), 2.59 (s, 3H), 2.13 (d, *J* = 14.4 Hz, 1H), 1.82 (d, *J* = 14.4 Hz, 1H), 1.27 (s, 3H), 0.61 (s 9H). ^{13}C NMR (100MHz, $CDCl_3$): δ 182.0, 140.8, 135.0, 131.4, 122.0(×2), 119.7, 51.2, 46.9, 31.9, 30.9(×3), 29.7, 28.8. HRMS (ESI$^+$): calcd 246.1852 for $C_{16}H_{24}NO^+$ $[M+H]^+$; found, 246.1862.



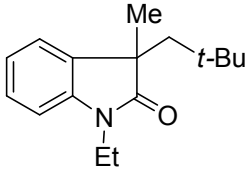
3-benzyl-1-methyl-3-neopentylindolin-2-one (3u):

Obtained as colorless oil, ^{1}H NMR (400MHz, $CDCl_3$): δ 7.21 (d, *J* = 7.2 Hz, 1H), 7.15 (td, *J* = 7.6, 1.2 Hz, 1H), 7.03-6.95 (m, 4H), 6.72 (dd, *J* = 7.2, 1.6 Hz, 2H), 6.53 (d, *J* = 8.0 Hz, 1H), 3.05 (d, *J* = 12.4 Hz, 1H), 2.92 (d, *J* = 12.4 Hz, 1H), 2.89 (s, 3H), 2.30 (d, *J* = 14.4 Hz, 1H), 2.00 (d,*J* = 14.4 Hz, 1H), 0.66 (s, 9H). ^{13}C NMR (100MHz, $CDCl_3$): δ 179.4, 143.6, 135.3, 131.3, 130.0(×2), 127.8, 127.3(×2), 126.5, 125.1, 1215, 107.8, 53.8, 49.6, 47.7, 32.0, 31.3(×3), 25.9. HRMS (ESI$^+$): calcd 308.2009 for $C_{21}H_{26}NO^+$ $[M+H]^+$; found, 308.2015.



1-methyl-1-neopentyl-5,6-dihydro-1H-pyrrolo[3,2,1-iJ]quinolin-2(4H)-one (3v):

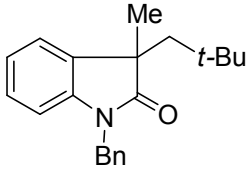
Obtained as colorless oil, ^{1}H NMR (400MHz, $CDCl_3$): δ 7.02 (d, *J* = 7.6 Hz, 1H), 7.00 (d, *J* = 7.6 Hz, 1H), 6.91 (t, *J* = 7.6 Hz, 1H), 3.71 (q, *J* = 4.8 Hz, 2H), 2.79 (q, *J* = 5.6 Hz, 2H), 2.14 (d, *J* = 14.4 Hz, 1H), 2.02-1.99 (m, 2H), 1.84 (d, *J* = 14.4 Hz, 1H), 1.30 (s, 3H), 0.64 (s, 9H). ^{13}C NMR (100MHz, $CDCl_3$): δ 180.1, 138.8, 132.9, 126.4, 122.0, 121.6, 120.2, 50.8, 48.9, 39.1, 31.9, 31.0(×3), 28.2, 24.9, 21.4. HRMS (ESI$^+$): calcd 258.1852 for $C_{17}H_{24}NO^+$ $[M+H]^+$; found, 258.1849.



1- ethyl-3-methyl-3-neopentylindolin-2-one (3y):

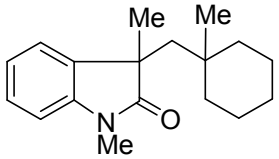
Obtained as colorless oil, ^{1}H NMR (400MHz, $CDCl_3$): δ 7.23 (dd, *J* = 7.6, 0.8 Hz, 1H), 7.20 (d, *J* = 7.2 Hz, 1H), 7.01 (dt, *J* = 7.6, 0.8 Hz,

1H), 6.86 (d, *J* = 7.6 Hz, 1H), 3.89-3.66 (m, 2H), 2.16 (d, *J* = 14.4 Hz, 1H), 1.86 (d, *J* =14.4 Hz, 1H), 1.28 (s, 3H), 1.26 (q, *J* = 7.2 Hz, 3H), 0.63(s, 9H). ^{13}C NMR (100MHz, $CDCl_3$): δ 180.7, 142.1, 134.6, 1276, 124.2, 121.8, 108.3, 50.7, 47.6, 34.7, 32.0, 31.0, 28.8, 12.4. HRMS (ESI^+): calcd 246.1852 for $C_{16}H_{24}NO^+$ $[M+H]^+$; found, 246.1849.



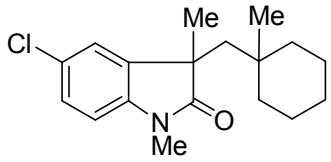
1-benzyl-3-methyl-3-neopentylindolin-2-one (3z)

Obtained as colorless oil, ^{1}H NMR (400MHz, $CDCl_3$): δ 7.32-7.20 (m, 7H), 7.00 (d, *J* = 7.6 Hz, 1H), 6.78 (d, *J* = 8.0 Hz, 1H), 5.06 (d, *J*= 15.6 Hz, 1H), 4.08 (d, *J* = 15.6 Hz, 1H), 2.22 (d, *J* = 14.4 Hz, 1H), 1.91 (d, *J* = 14.4 Hz, 1H), 1.35 (s, 3H), 0.65 (s, 9H). ^{13}C NMR (100MHz, $CDCl_3$): δ 181.2, 142.2, 136.2, 134.3, 128.8 (×2), 127.7 (×2), 127.6, 127.5, 124.1, 122.1, 1092, 50.6, 47.6, 44.0, 32.0, 31.0, 29.2. HRMS (ESI^+): calcd 308.2009 for $C_{21}H_{26}NO^+$ $[M+H]^+$; found, 308.2013.



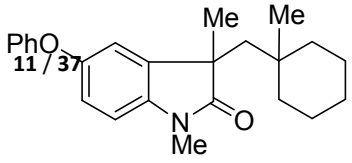
1,3-dimethyl-3-((1-methylcyclohexyl)methyl)indolin-2-one (4a):

Obtained as colorless oil, ^{1}H NMR (400MHz, $CDCl_3$): δ 7.28-7.21(m, 2H), 7.03 (t, *J* = 7.2 Hz, 1H), 6.85 (d, *J* = 7.2 Hz, 1H), 3.22 (s, 3H), 2.12 (d, *J* = 14.4 Hz, 1H), 1.93 (d, *J* = 14.4 Hz, 1H), 1.30 (s, 3H), 1.34-0.90 (m, 10H), 0.51 (s, 3H). ^{13}C NMR (100MHz, $CDCl_3$): δ 181.3, 142.8, 134.6, 127.6, 123.9, 122.0, 108.1, 50.7, 47.2, 39.3, 39.1, 34.3, 28.7, 26.3 (×2), 24.3, 22.0, 21.9. HRMS (ESI^+): calcd 272.2009 for $C_{18}H_{26}NO^+$ $[M+H]^+$; found, 272.2010.



5-chloro-1,3-dimethyl-3-((1-methylcyclohexyl)methyl)indolin-2-one (4b):

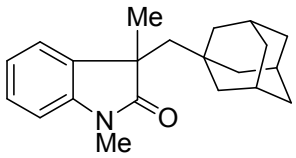
Obtained as white wax, ^{1}H NMR (400MHz, $CDCl_3$): δ 7.31 (d, *J* = 8.0 Hz, 1H), 7.26 (s, 1H), 6.84 (dd, *J* = 8.0, 2.0 Hz, 1H), 3.28 (brs, 3H), 2.20 (brd, *J* = 14.4 Hz, 1H), 1.95 (brd, *J* = 14.4 Hz, 1H), 1.46-0.98 (m, 10H), 1.36 (brs, 3H), 0.59 (brs, 3H) . ^{13}C NMR (100MHz, $CDCl_3$): δ 180.4, 141.1, 136.2, 127.2(×2), 124.0, 108.7, 50.5, 47.1, 39.1, 38.7, 34.0, 28.3, 26.2, 26.0, 24.1, 21.7, 21.6. HRMS (ESI^+): calcd 306.1619 for $C_{18}H_{25}ClNO^+$ $[M+H]^+$; found, 306.1621.



1,3-dimethyl-3-((1-methylcyclohexyl)methyl)-5-

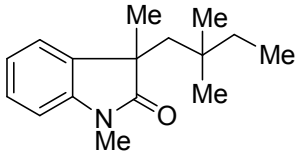
phenoxyindolin-2-one (4c):

Obtained as colorless oil, ^{1}H NMR (400MHz, $CDCl_3$): δ 7.29 (t, *J* = 8.0 Hz, 2H), 7.04 (t, *J* = 7.6 Hz, 1H), 7.00-6.90 (m, 4H), 6.80 (d, *J* = 8.0 Hz, 1H), 3.22 (s, 3H), 2.10 (d, *J* = 14.4 Hz, 1H), 1.83 (d, *J* = 14.4 Hz, 1H), 1.28 (s, 3H), 1.38-0.92 (m, 10H), 0.56 (s, 3H). ^{13}C NMR (100MHz, $CDCl_3$): δ 180.8, 158.4, 151.7, 138.6, 136.1, 129.4(×2), 122.3, 118.9, 117.3(×2), 116.4, 108.4 50.6, 47.3, 39.1, 38.9, 34.1, 28.4, 26.2, 26.0, 23.9, 21.7(×2). HRMS (ESI^+): calcd 364.2271 for $C_{24}H_{30}NO_2^+$ $[M+H]^+$; found, 364.2271.



3-((3r,5r,7r)-adamantan-1-ylmethyl)-1,3-dimethylindolin-2-one (4d):

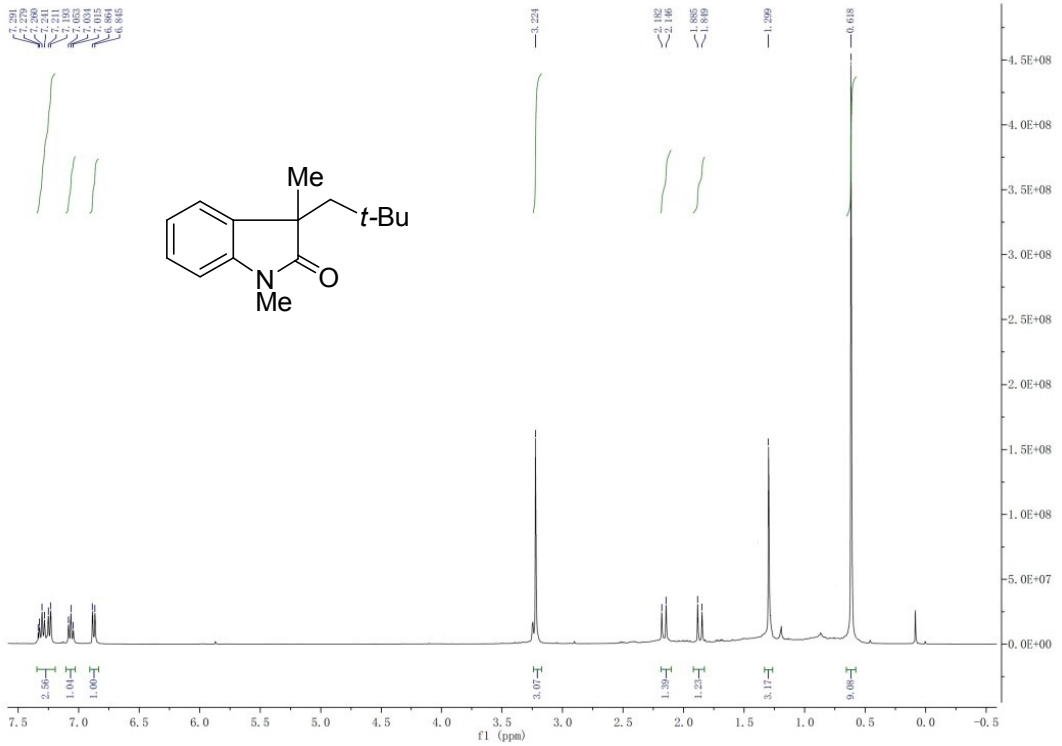
Obtained as white wax, ^{1}H NMR (400MHz, $CDCl_3$): δ 7.24 (t, *J* = 7.6, 0.8 Hz, 1H), 7.18 (d, *J* = 7.6 Hz, 1H), 7.01 (t, *J* = 7.6 Hz, 1H), 6.83 (d, *J* = 8.0 Hz, 1H), 3.22 (s, 3H), 1.99 (d, *J* = 14.4 Hz, 1H), 1.73 (d, *J* = 14.4 Hz, 1H), 1.70 (brs, 3H), 1.50 (brd, *J* = 12.0 Hz, 3H), 1.37 (brd, *J* = 12.0Hz, 3H), 1.26 (s, 3H), 1.20-1.13 (m, 6H). ^{13}C NMR (100MHz, $CDCl_3$): δ 181.3, 142.8, 134.8, 127.6 123.7, 122.1, 108.1, 52.2, 46.8, 43.5(×3), 36.8(×3), 34.0, 28.7, 28.7(×3), 26.3. HRMS (ESI^+): calcd 310.2165 for $C_{21}H_{28}NO^+$ $[M+H]^+$; found, 310.2163.

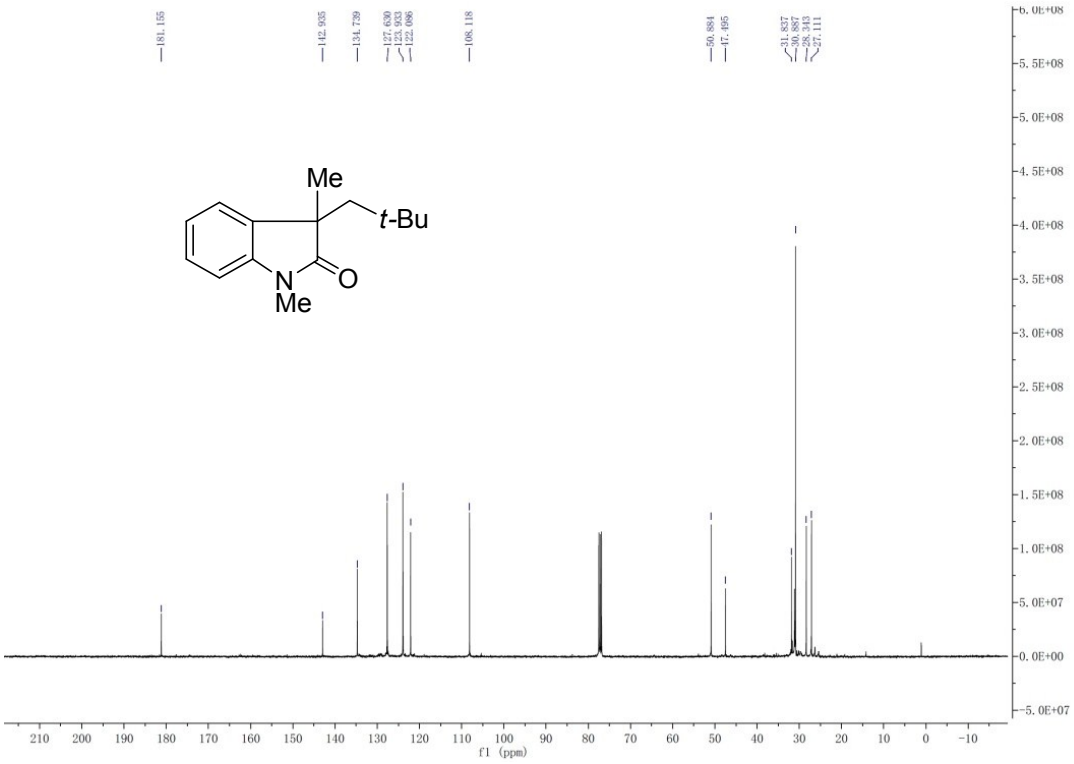


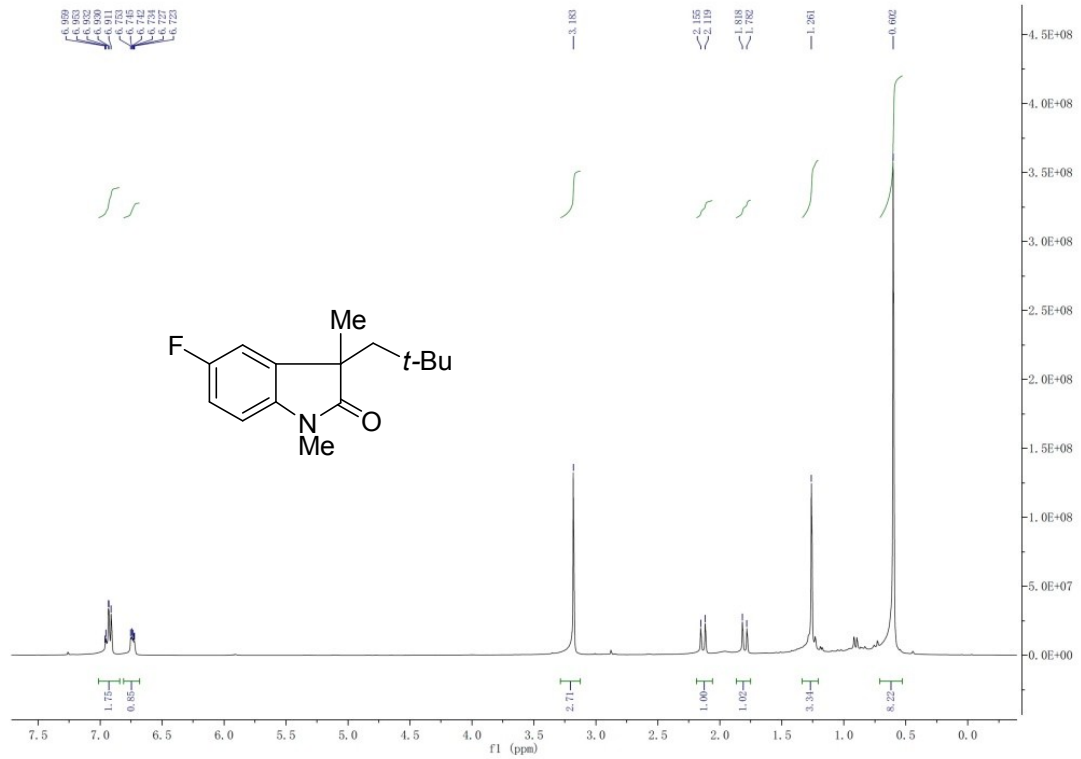
3-(2,2-dimethylbutyl)-1,3-dimethylindolin-2-one (4e):

Obtained as colorless oil, ^{1}H NMR (400MHz, $CDCl_3$): δ 7.26 (t, *J* = 7.6 Hz, 1H), 7.20 (d, *J* = 7.2 Hz, 1H), 7.03 (t, *J* = 7.6 Hz, 1H), 6.84 (d, *J* = 7.6 Hz, 1H), 3.22 (s, 3H), 2.12 (d, *J* = 14.4 Hz,), 1.87 (d, *J* = 14.4 Hz, 1H), 1.29 (s, 3H), 0.73 (q, *J* = 7.2 Hz, 2H), 0.57 (s,3H), 0.48 (s, 3H). ^{13}C NMR (100MHz, $CDCl_3$): δ 181.3, 143.0, 134.6, 127.7, 123.9, 122.1, 108.2, 48.7, 47.4, 36.4, 34.3, 27.7, 27.0, 26.4, 8.5. HRMS (ESI^+): calcd 246.1852 for $C_{16}H_{24}NO^+$ $[M+H]^+$; found, 246.1846.

^{1}H NMR and ^{13}C NMR spectra of compounds 3 and 4



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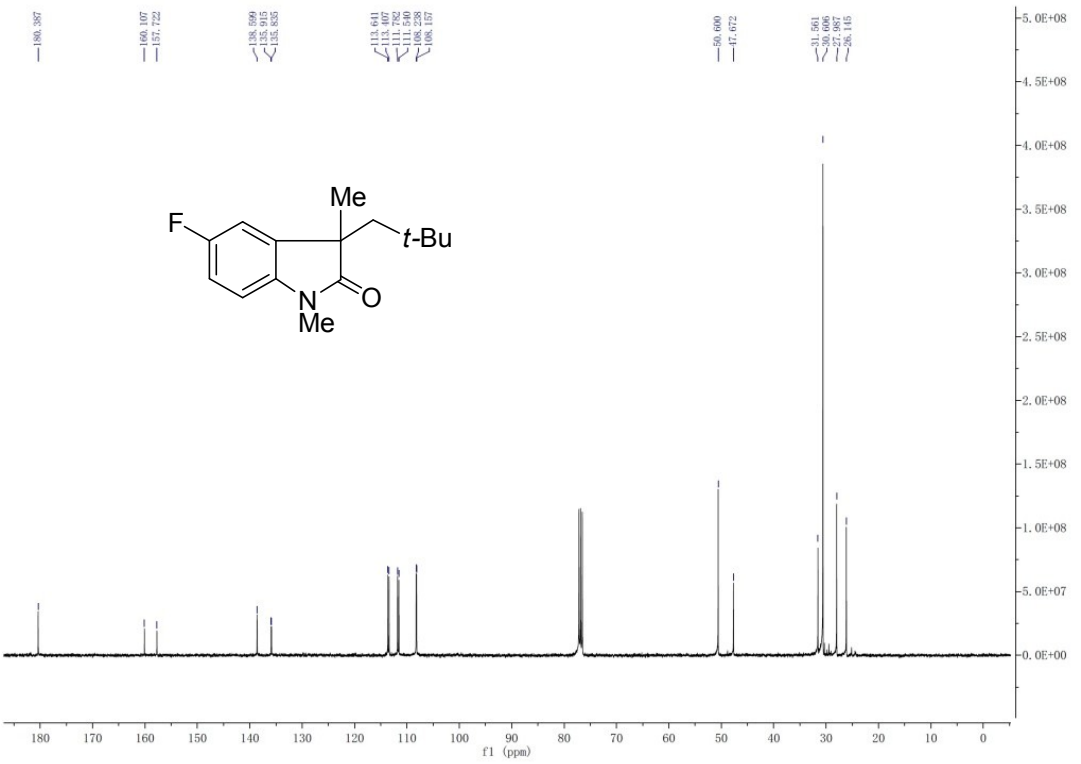
N
O
Me
f1 (ppm)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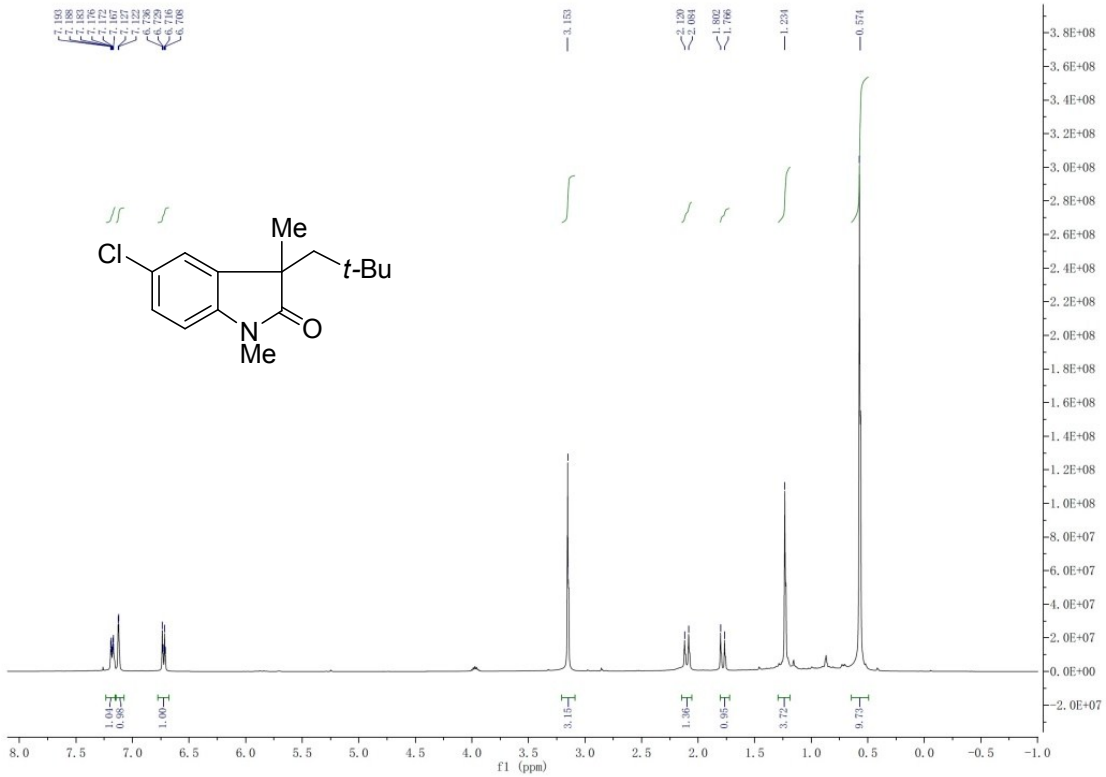
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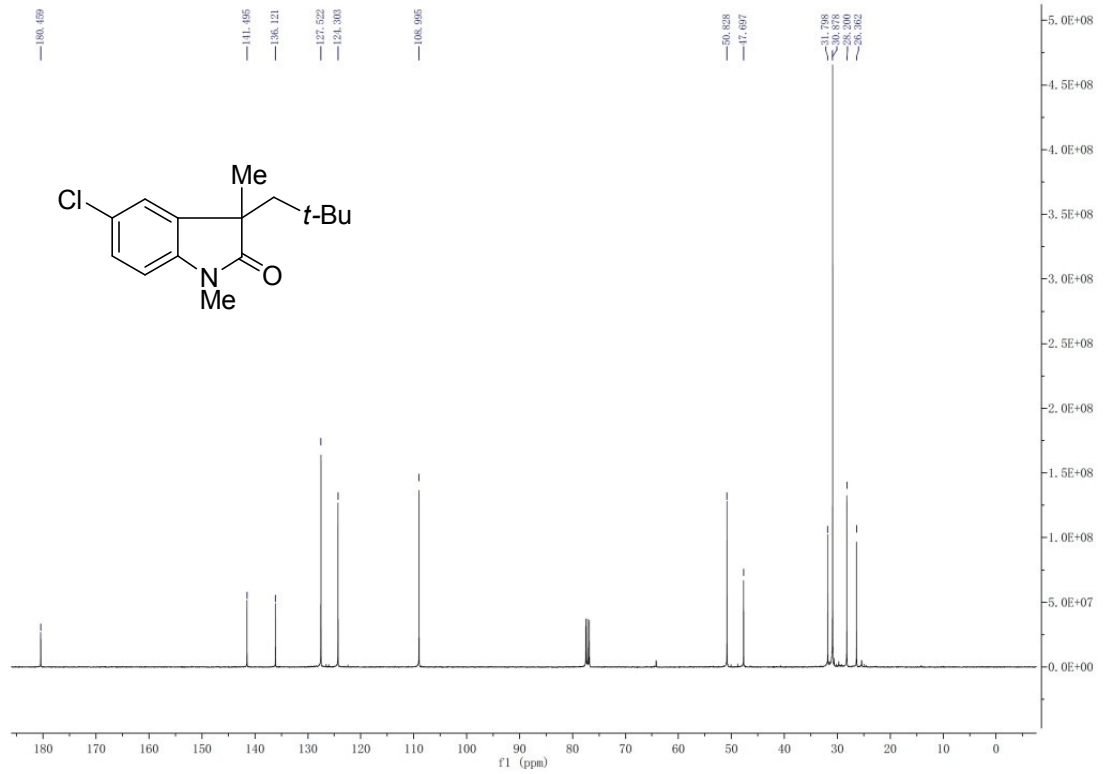
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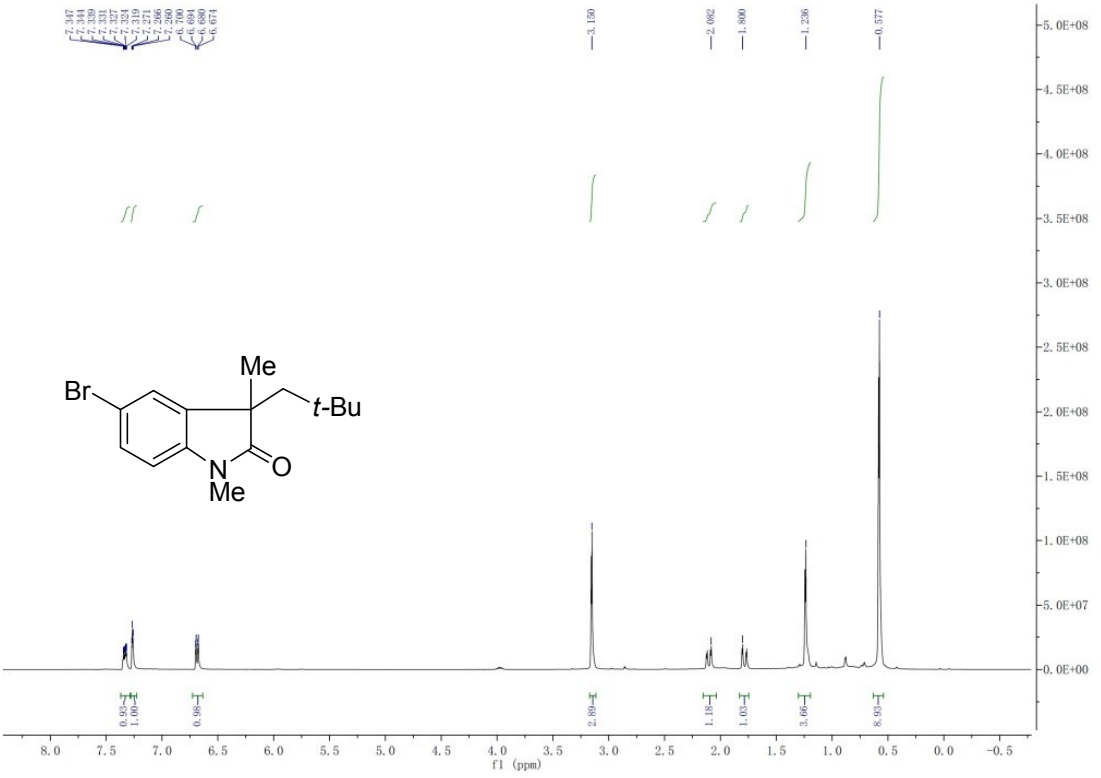
f1 (ppm)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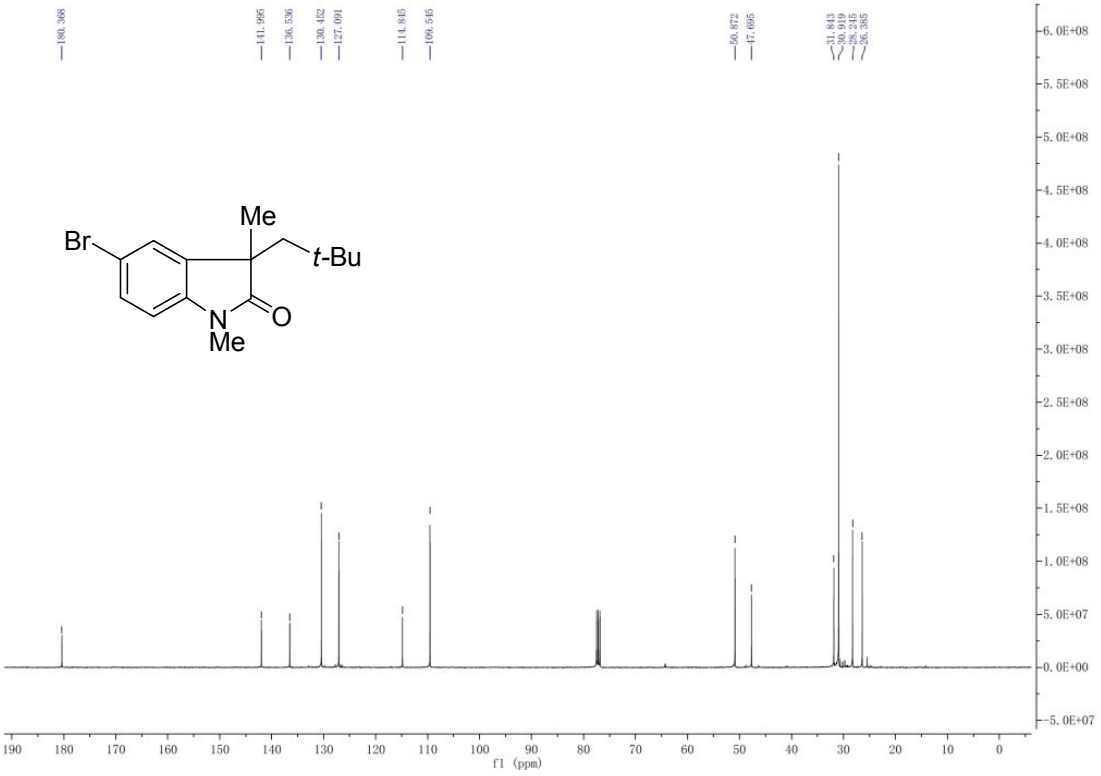
f1 (ppm)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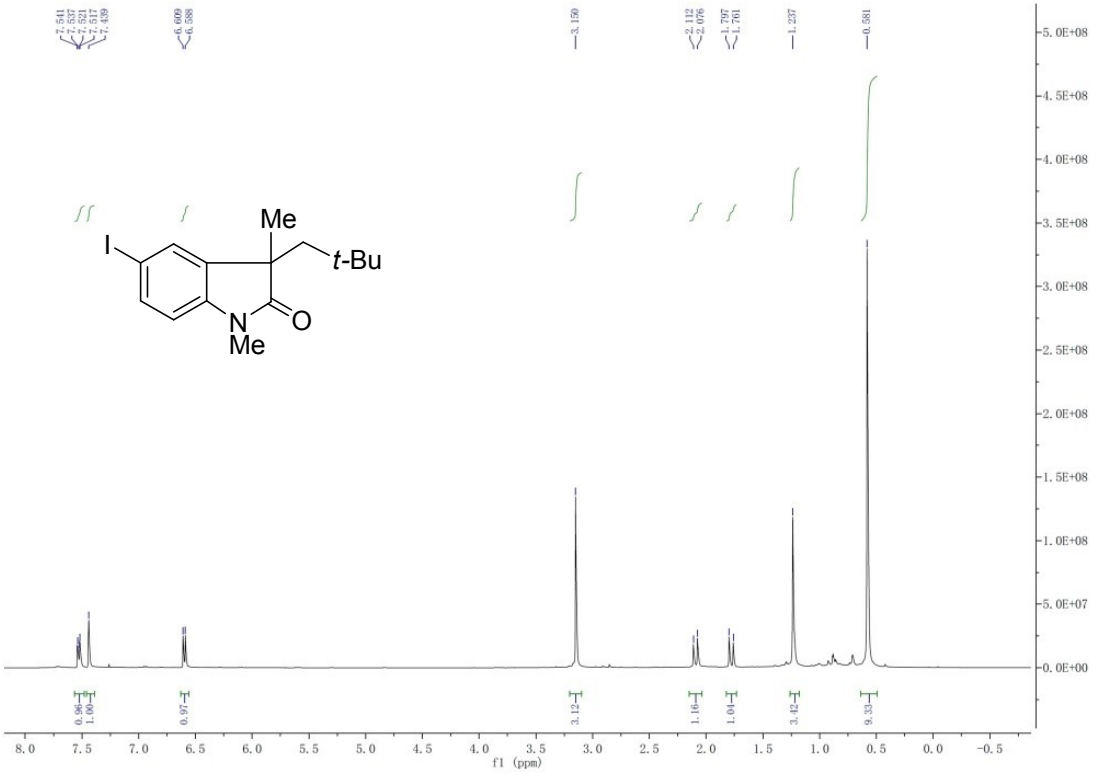
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I
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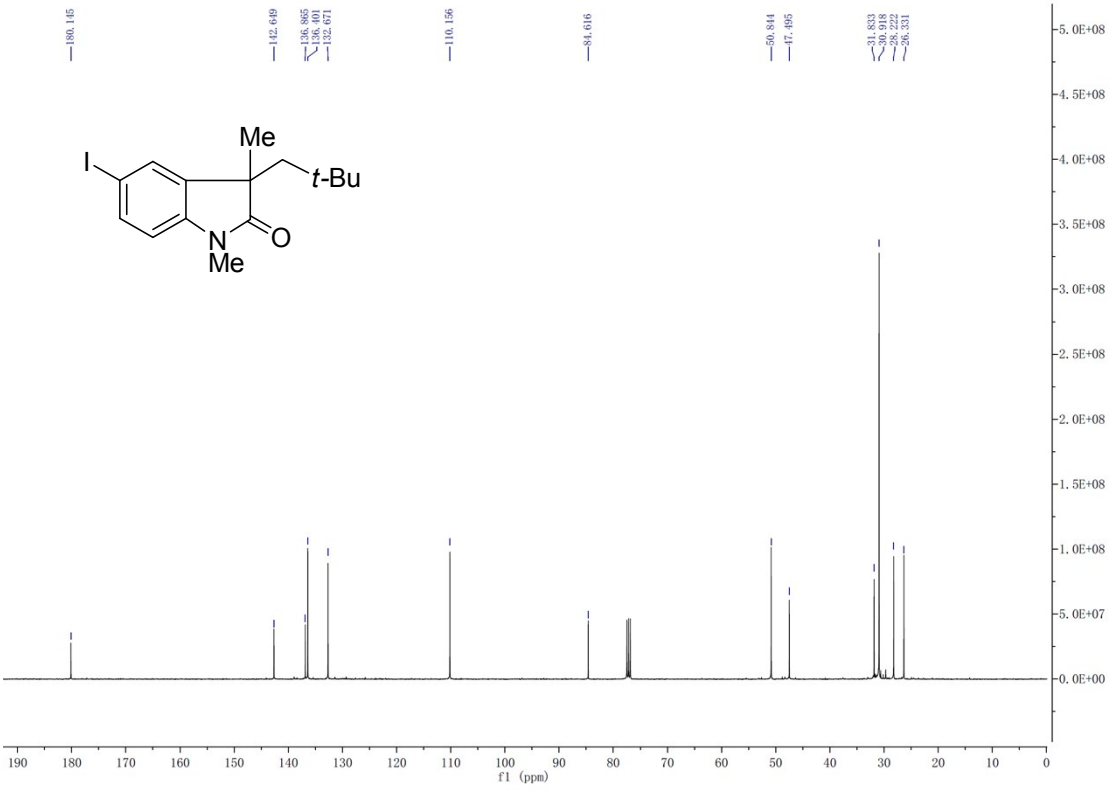
f1 (ppm)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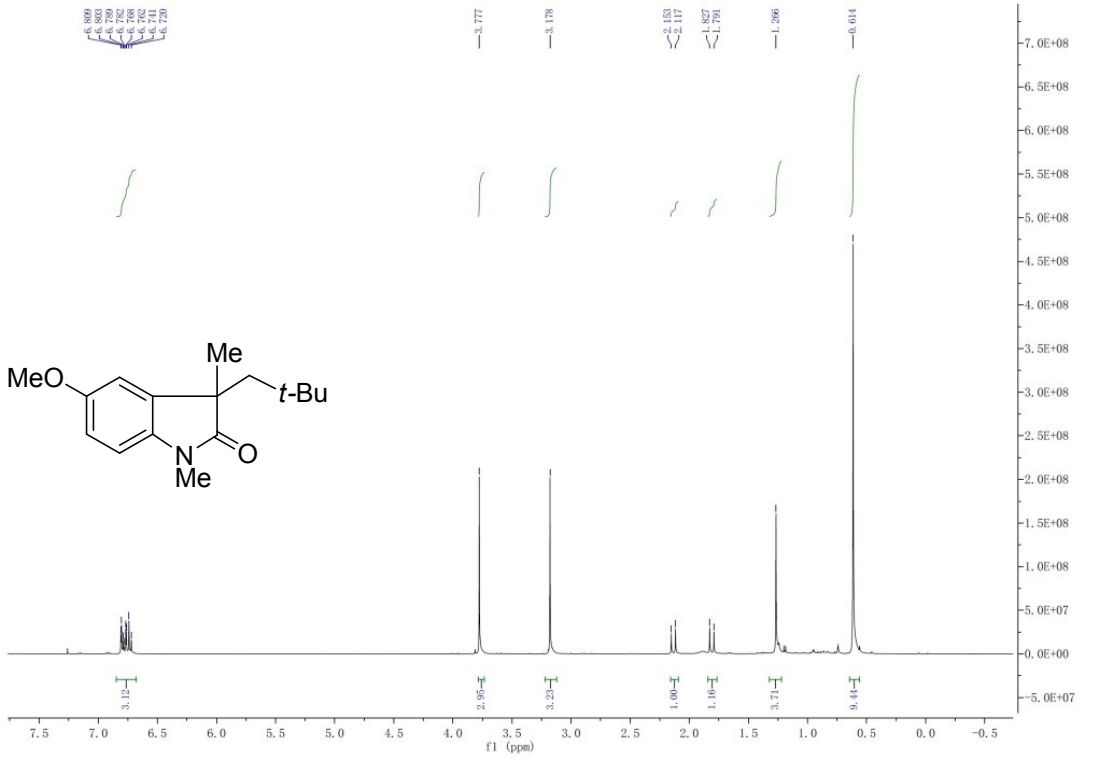
f1 (ppm)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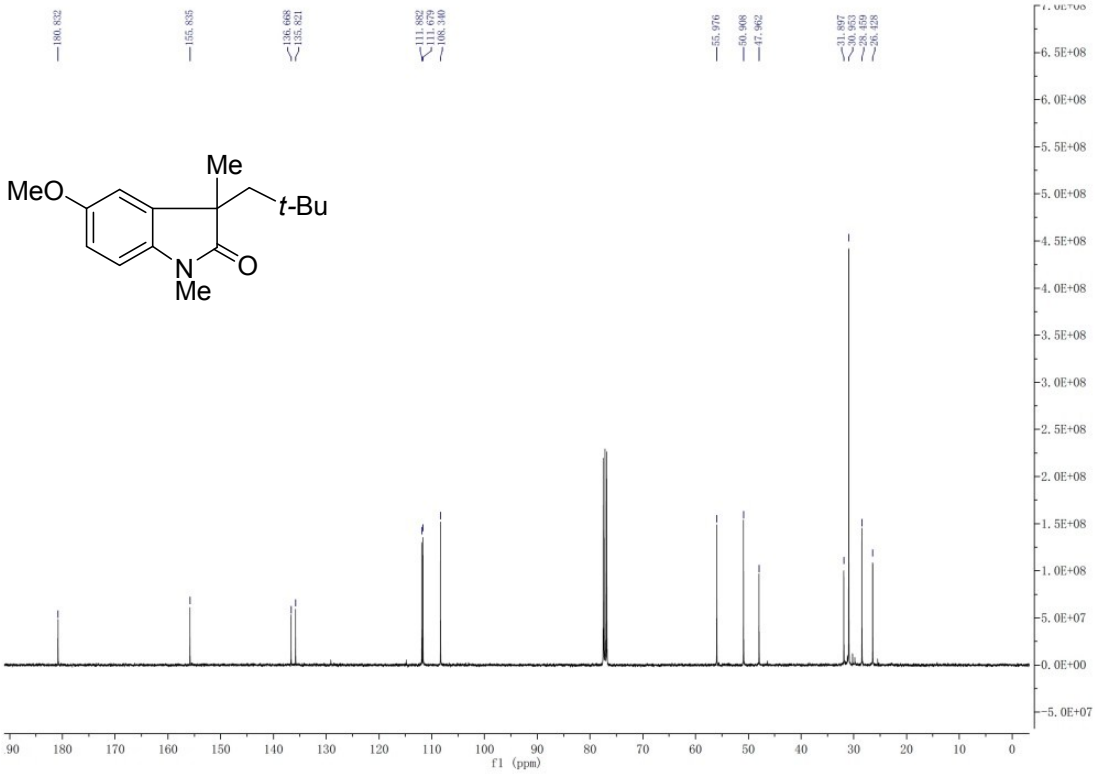
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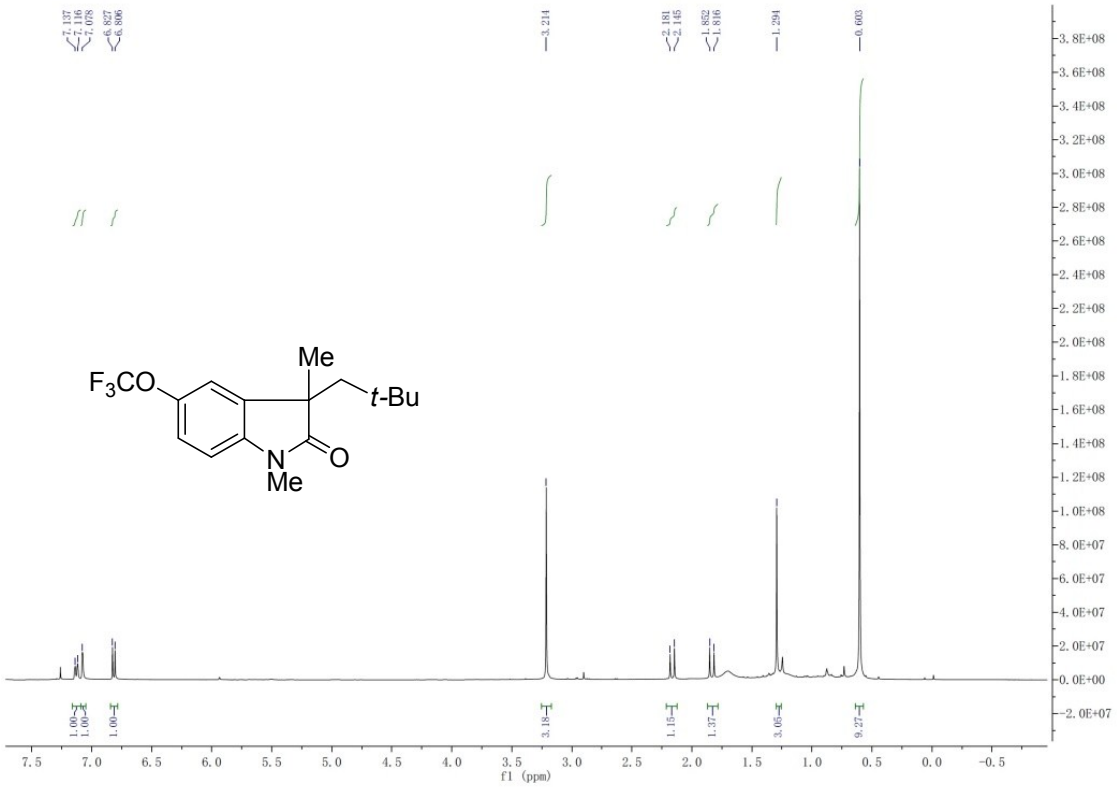
f1 (ppm)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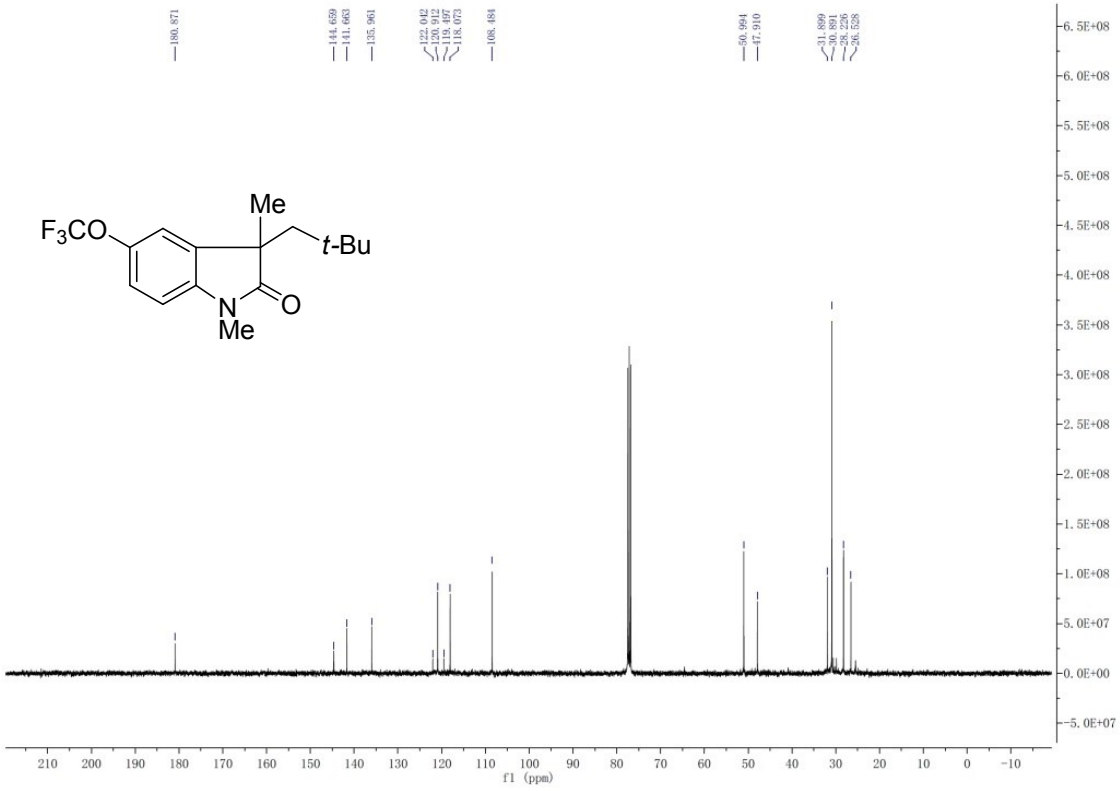
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t-Bu
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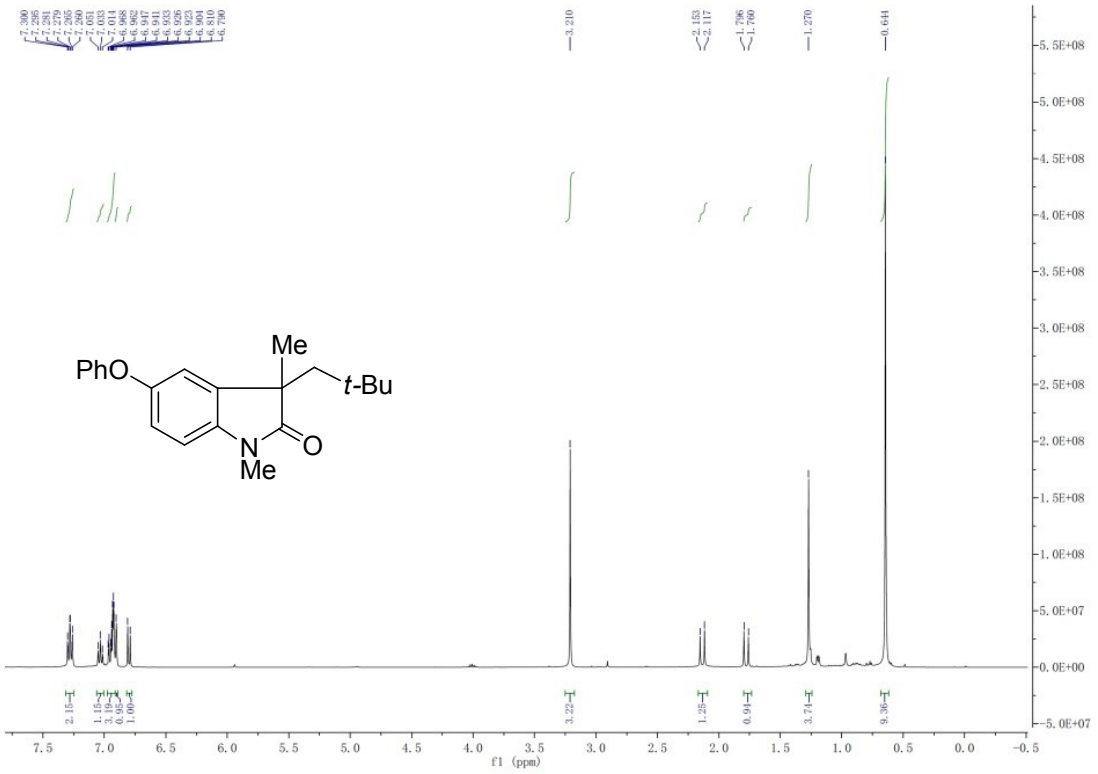
f1 (ppm)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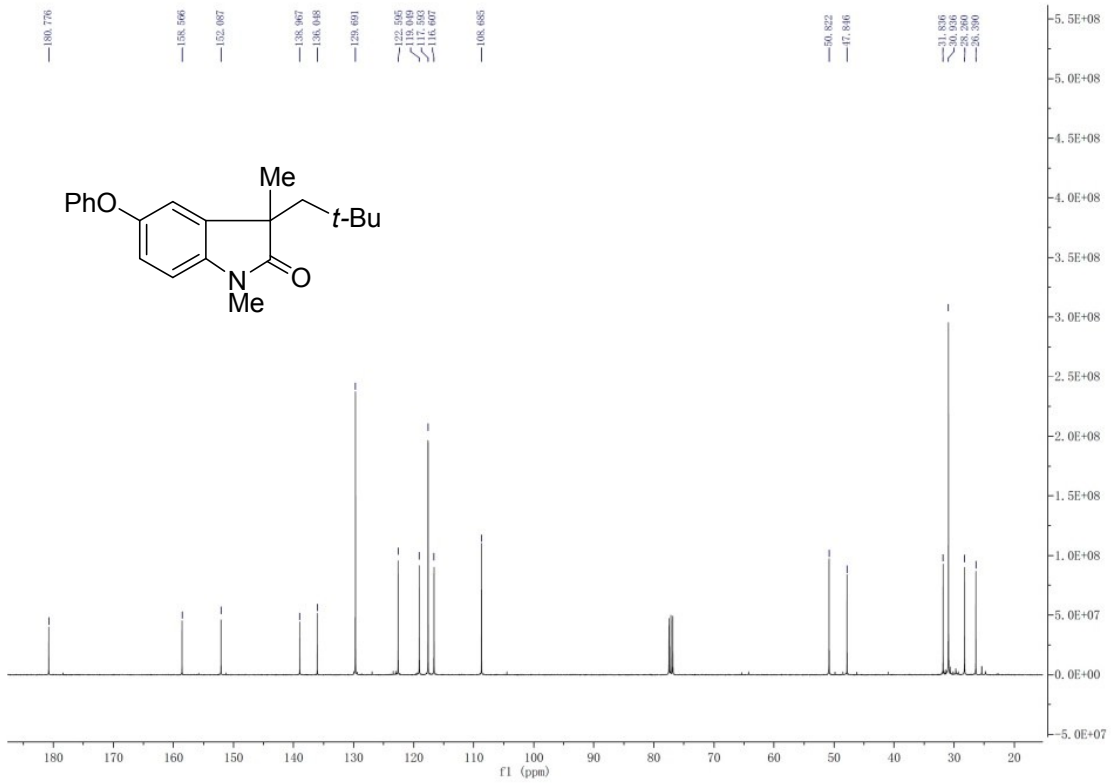
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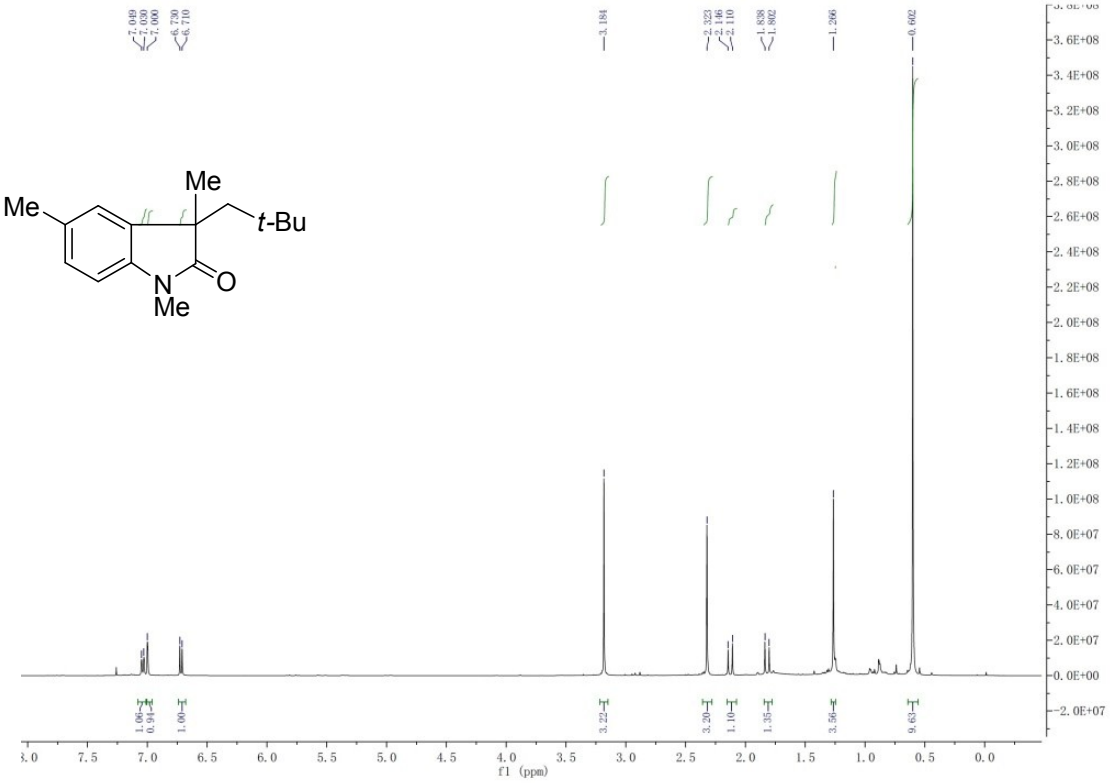
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0.94
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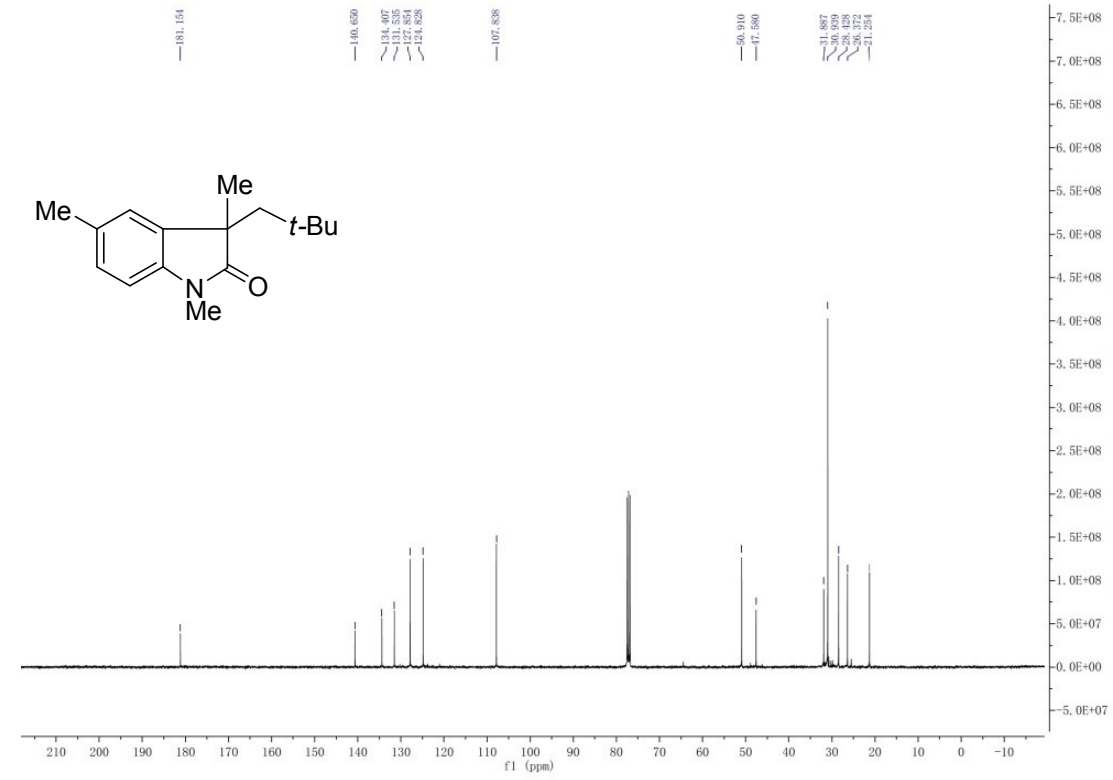
f1 (ppm)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47.580
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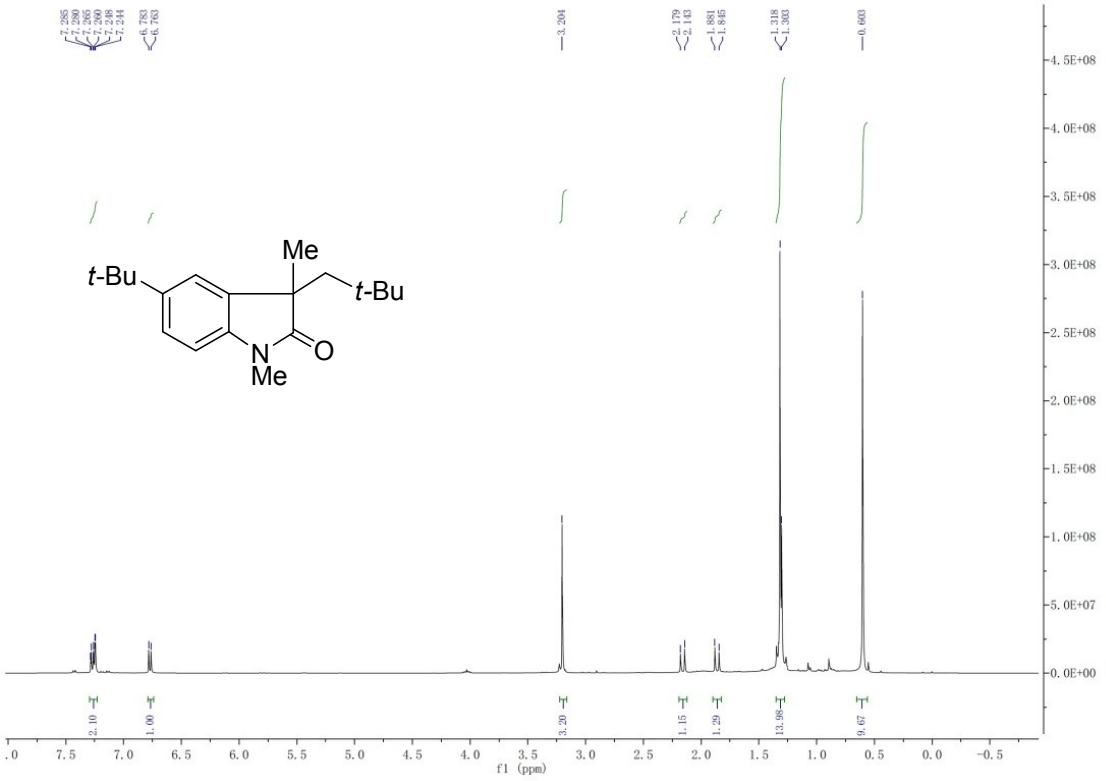
28.198
26.372
21.254
f1 (ppm)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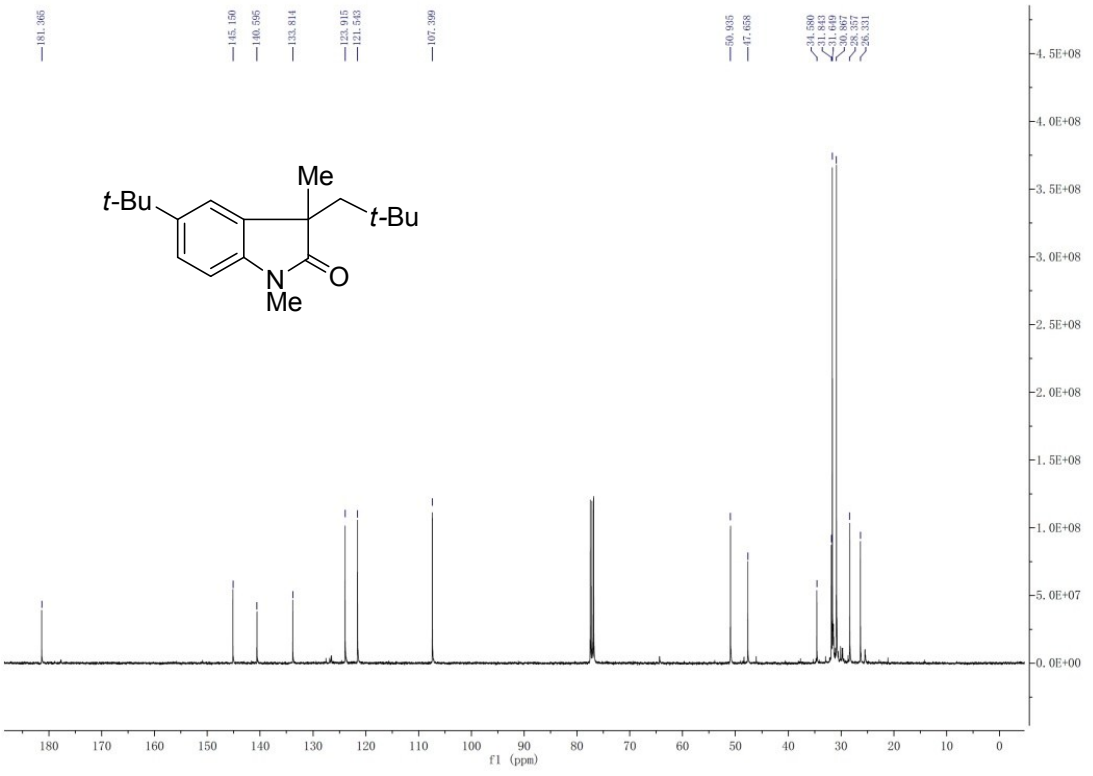
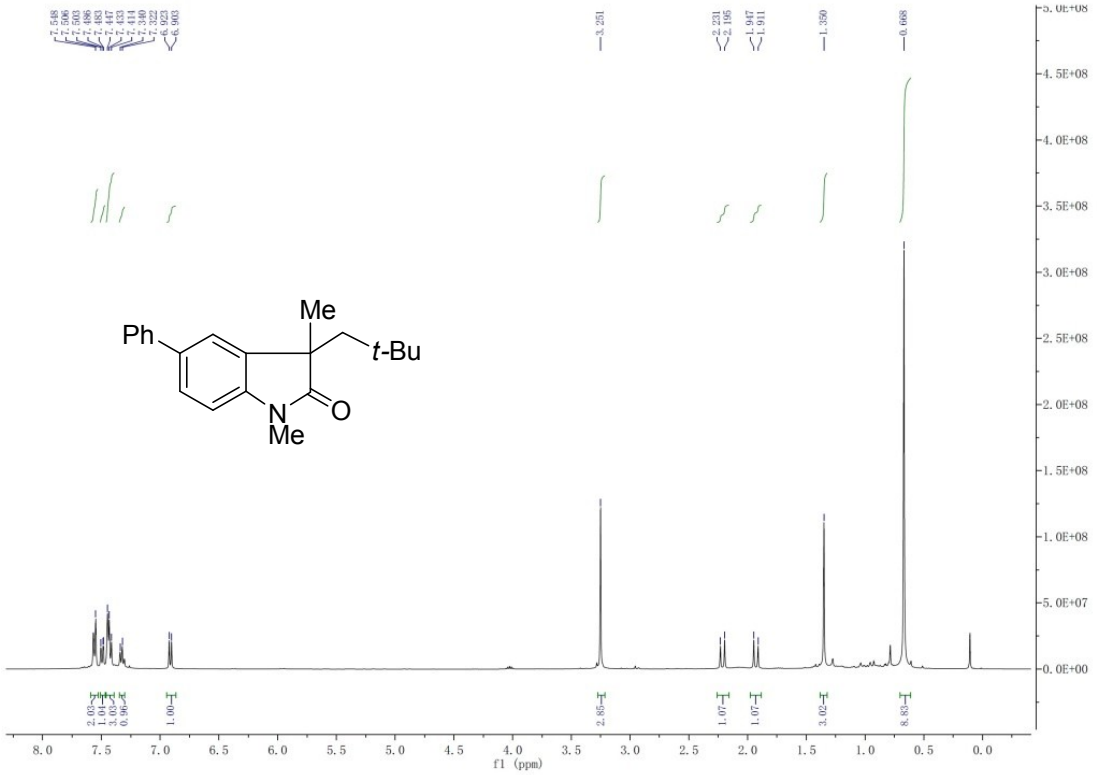
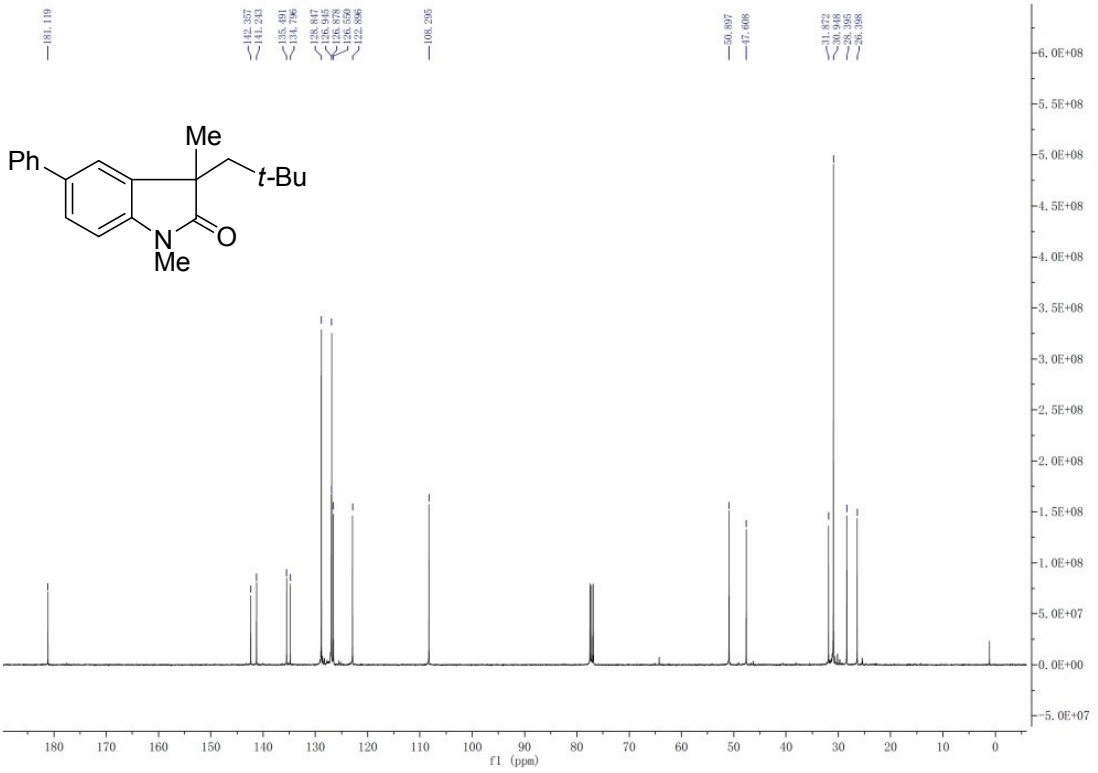
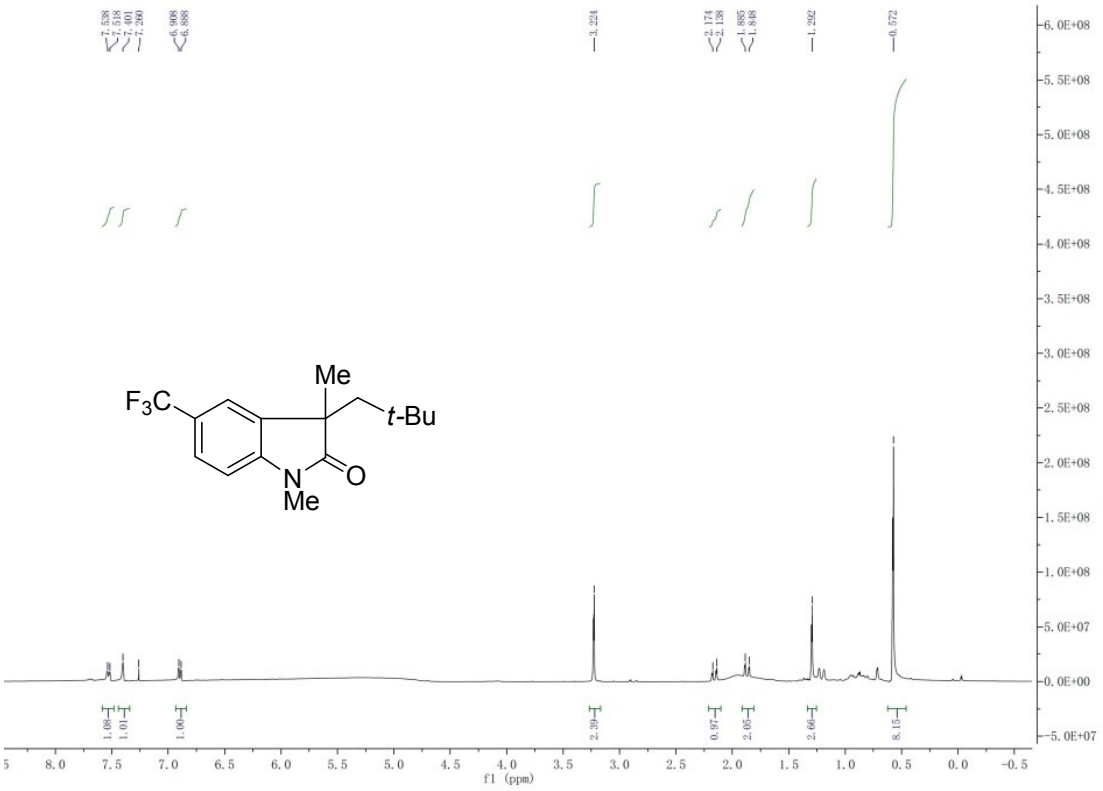
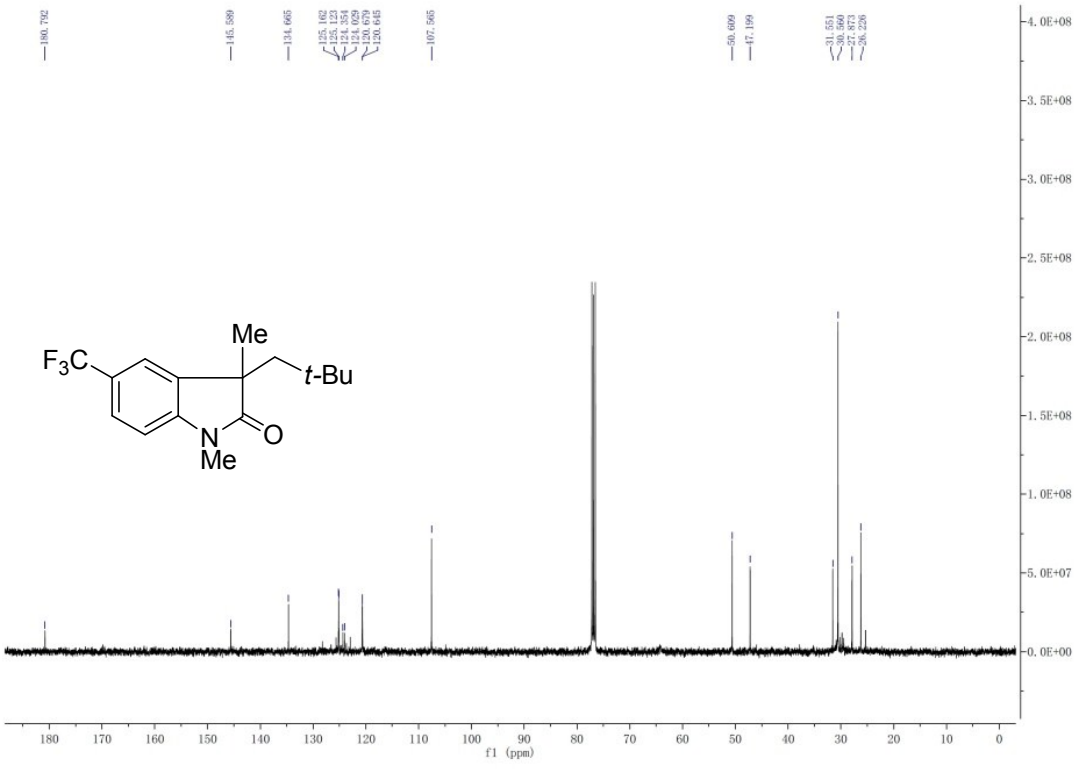
7.290
7.265
7.260
7.248
7.244
6.783
6.763
3.204
2.179
2.143
1.881
1.845
1.318
1.303
0.603
t-Bu
Me
t-Bu
N
Me
O
2.10
1.00
3.20
1.15
1.29
13.98
9.67
f1 (ppm)

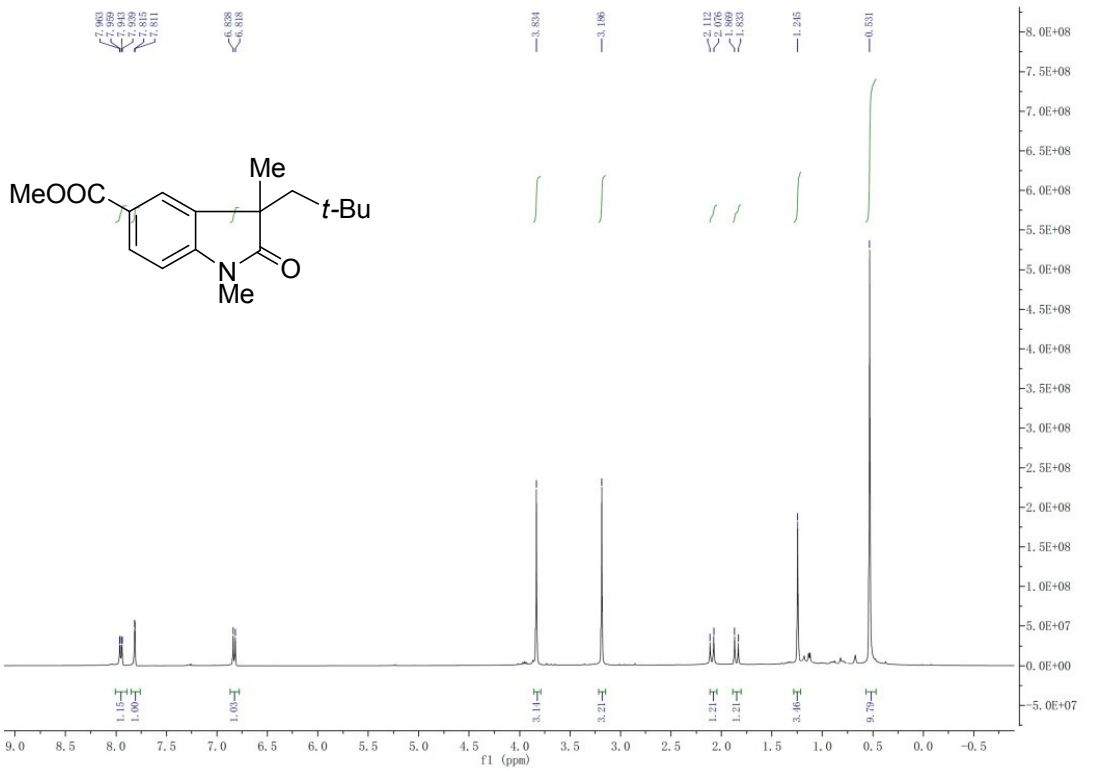

181.366
145.150
140.566
133.814
123.915
121.543
107.399
50.935
47.658
34.590
31.843
31.649
30.867
28.357
26.351
t-Bu
Me
t-Bu
N
Me
O
f1 (ppm)

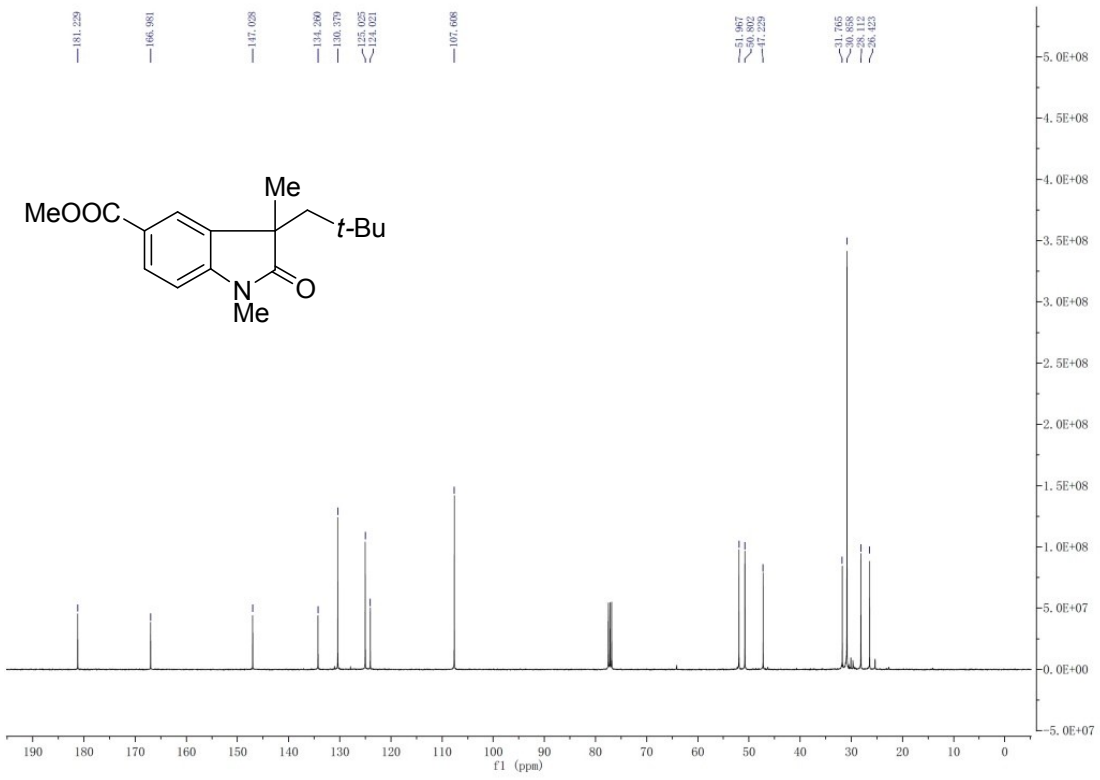

Ph
Me
t-Bu
N
Me
O
f1 (ppm)

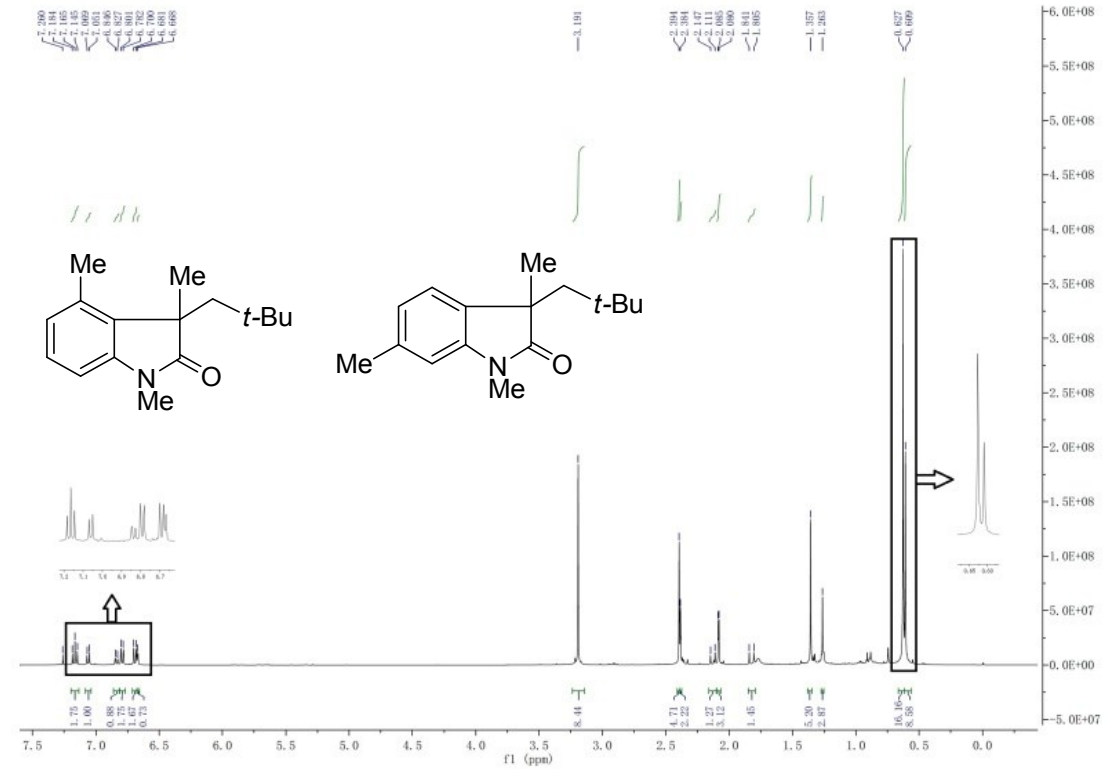

Ph
Me
t-Bu
N
Me
O
f1 (ppm)

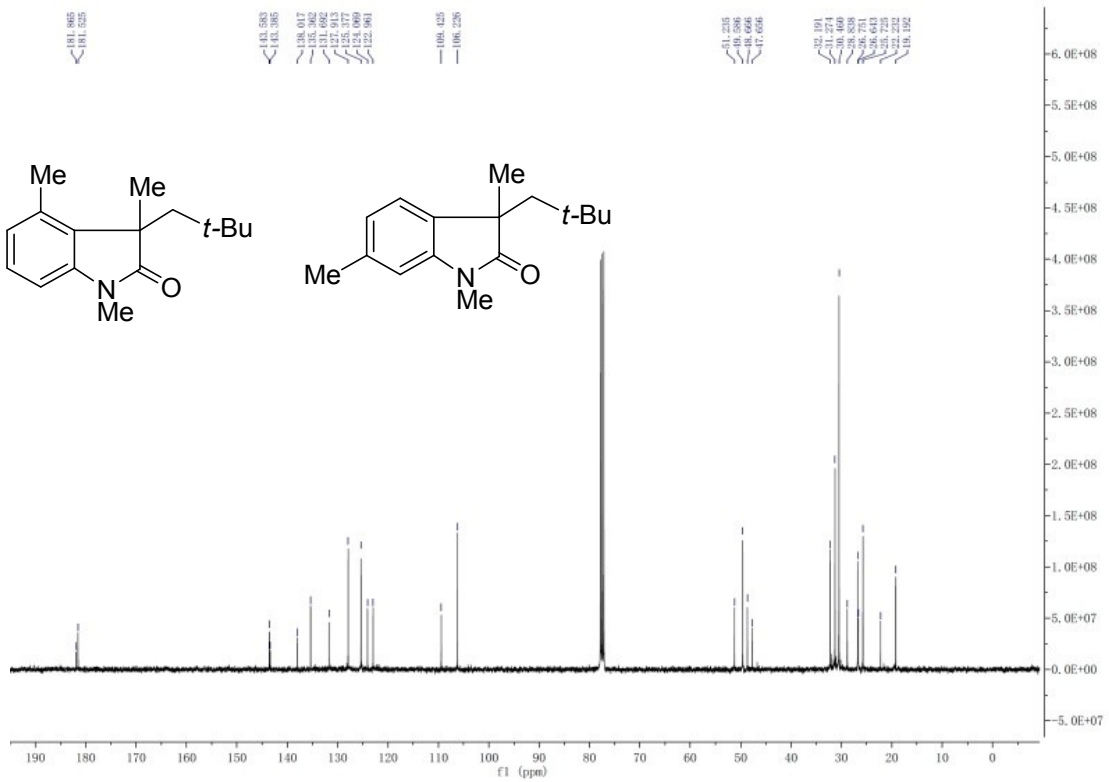

Me
F3C
t-Bu
N
O
Me
f1 (ppm)

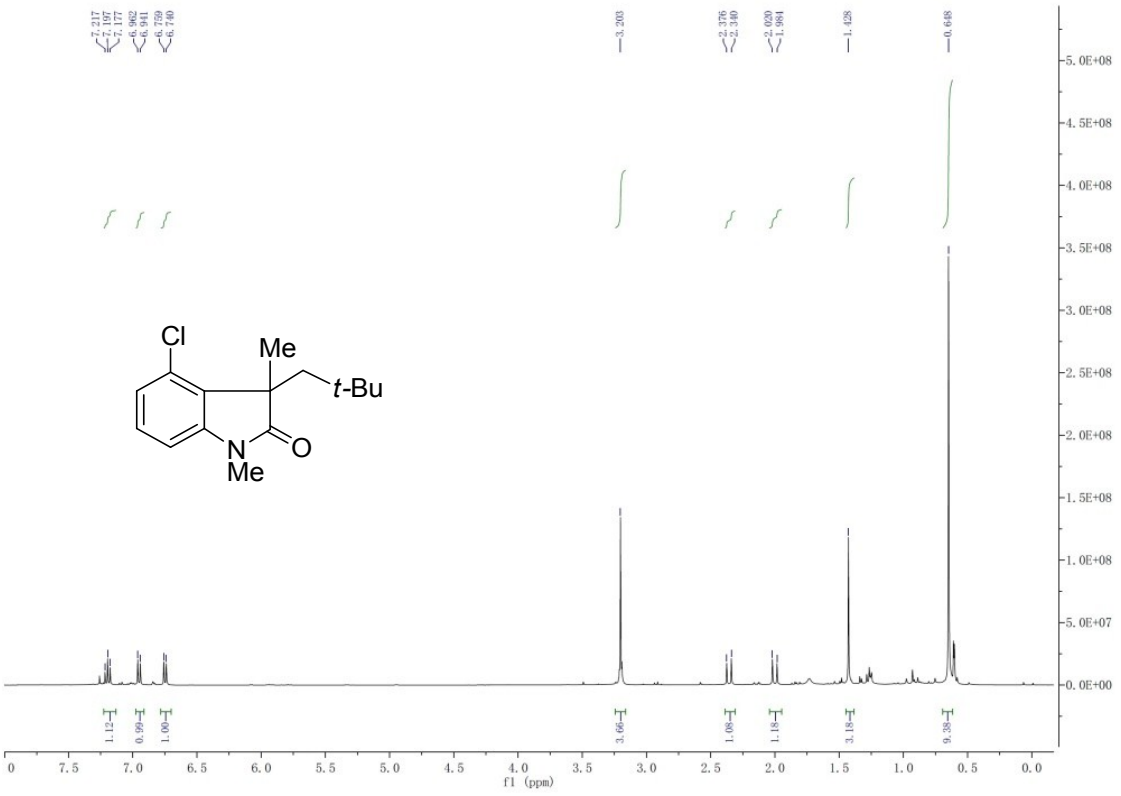

Me
F3C
t-Bu
N
O
Me
f1 (ppm)

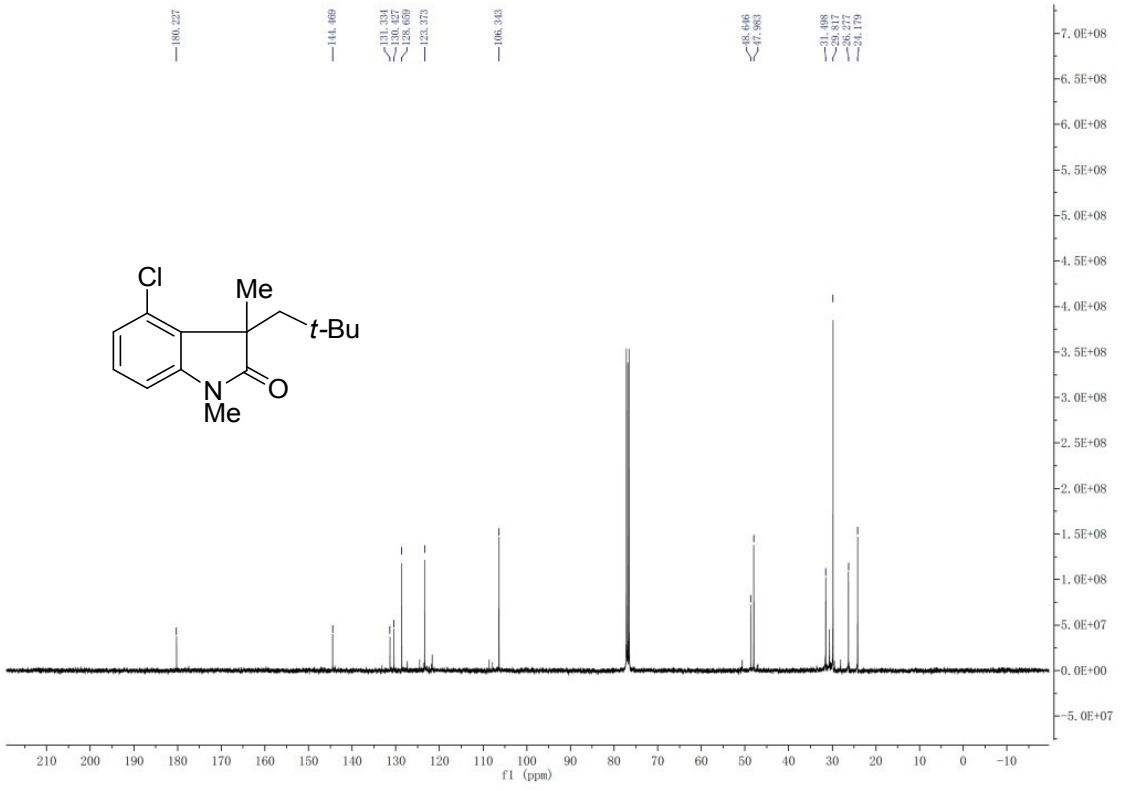

MeOOC
Me
t-Bu
N
Me
O
f1 (ppm)

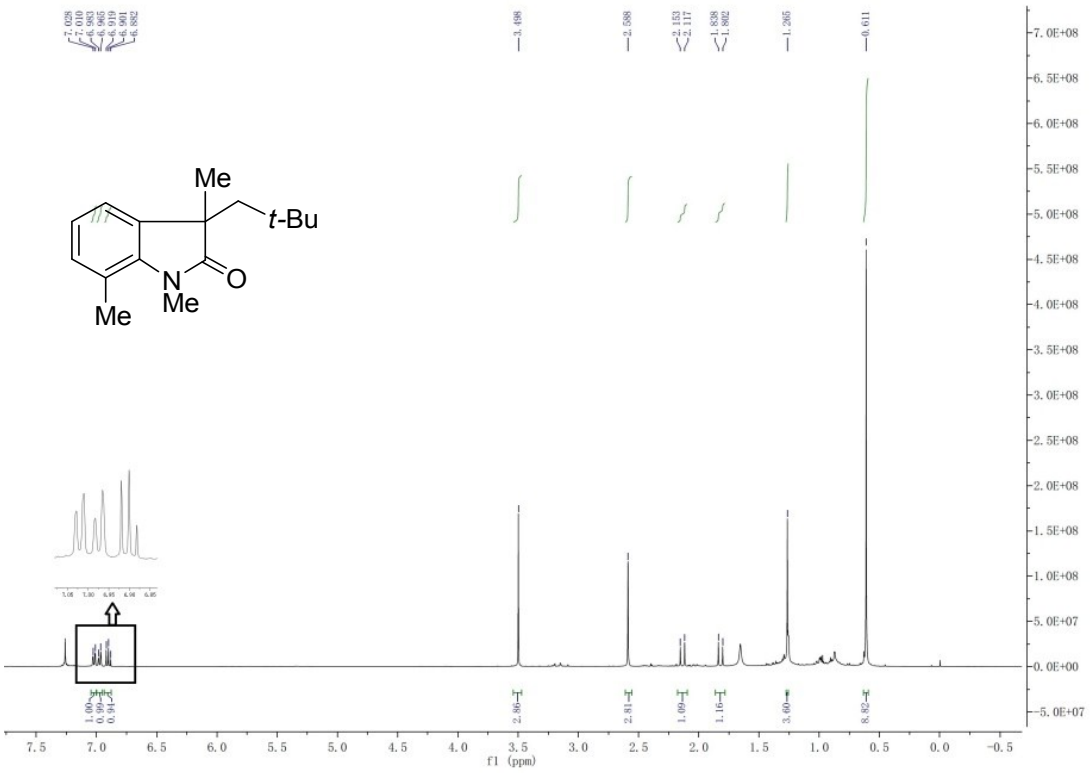

MeOOC
Me
t-Bu
N
Me
O
f1 (ppm)

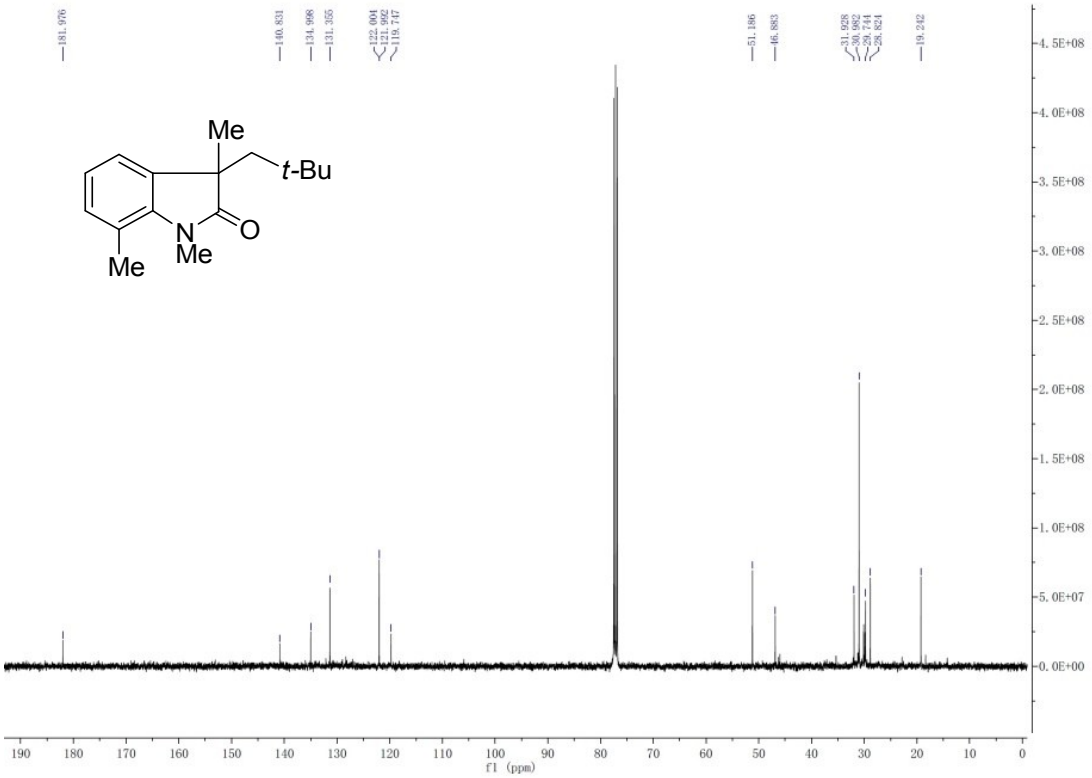

Me
Me
t-Bu
N
O
Me
Me
Me
t-Bu
N
O
Me
f1 (ppm)

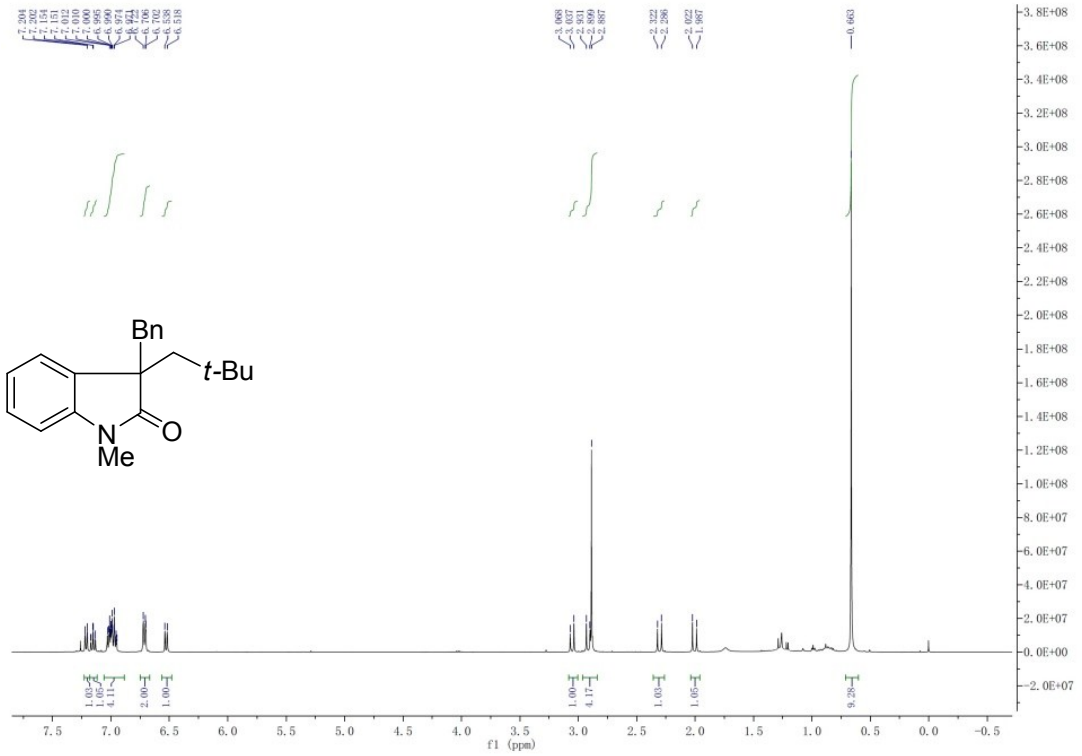

Me
Me
t-Bu
N
O
Me
Me
Me
t-Bu
N
O
Me
f1 (ppm)


7.217
7.197
7.177
6.962
6.941
6.759
6.740
3.203
2.376
2.340
2.020
1.984
1.428
0.648
Cl
Me
t-Bu
N
Me
O
1.12
0.99
1.00
3.66
1.08
1.18
3.18
9.38
f1 (ppm)


180.227
144.469
131.334
130.427
128.659
123.373
106.343
68.646
47.983
31.498
29.817
26.277
24.179
Cl
Me
t-Bu
N
Me
O
f1 (ppm)


Me
t-Bu
N
O
Me
Me
f1 (ppm)


Me
t-Bu
N
O
Me
Me
f1 (ppm)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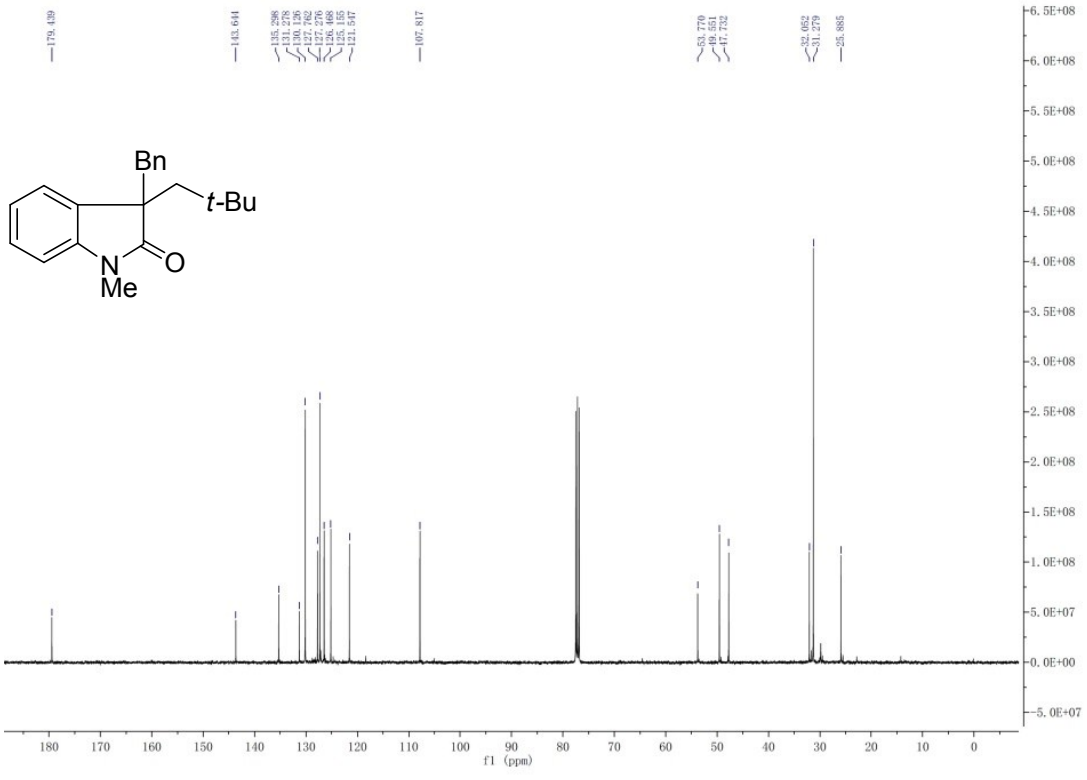
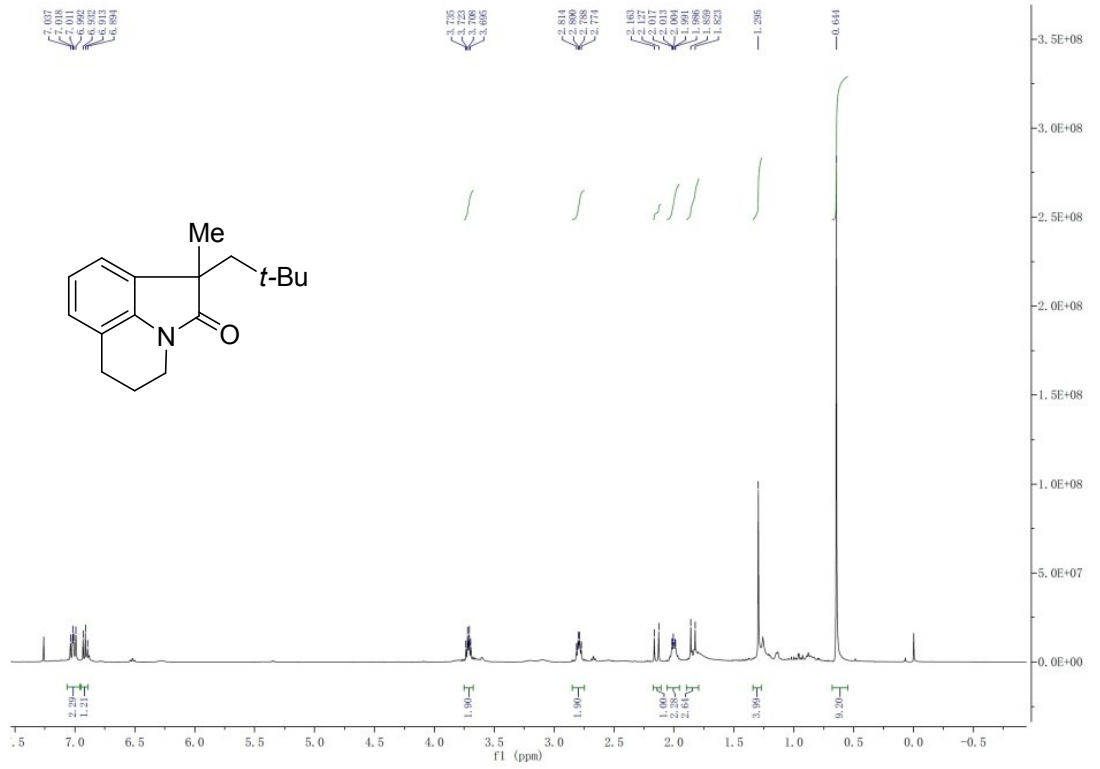
t-Bu
N
Me
O
f1 (ppm)


Bn
t-Bu
N
Me
O
f1 (ppm)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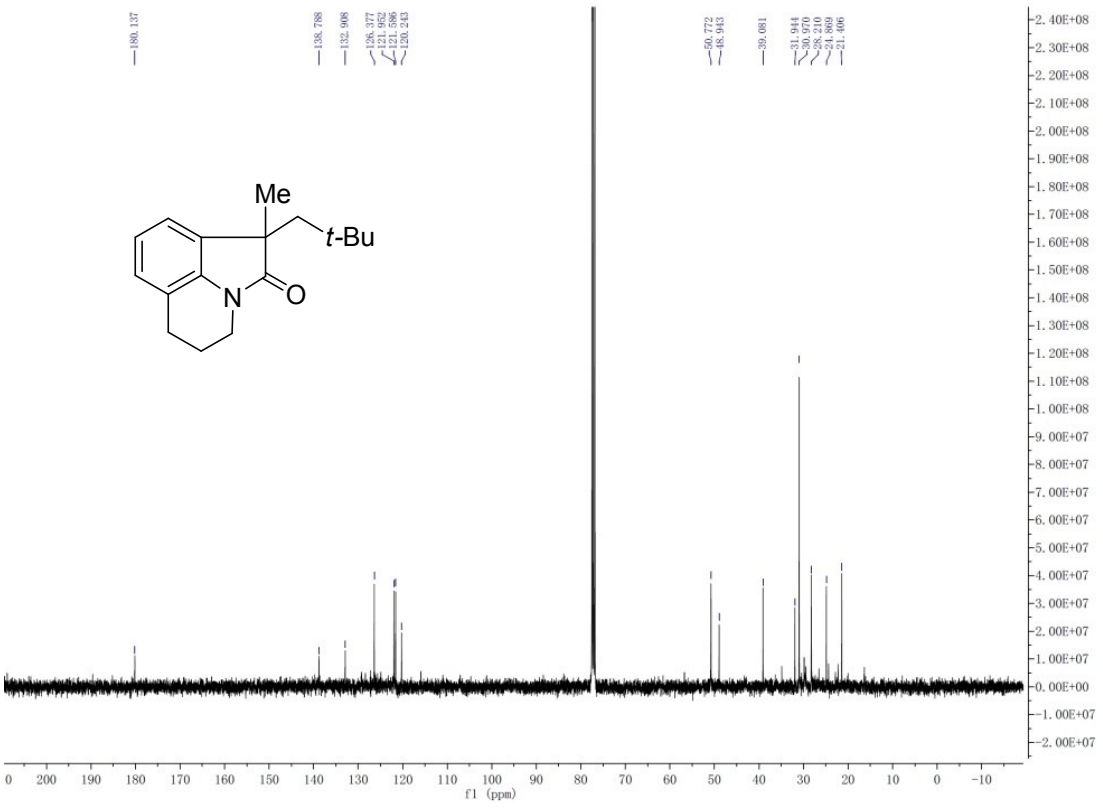
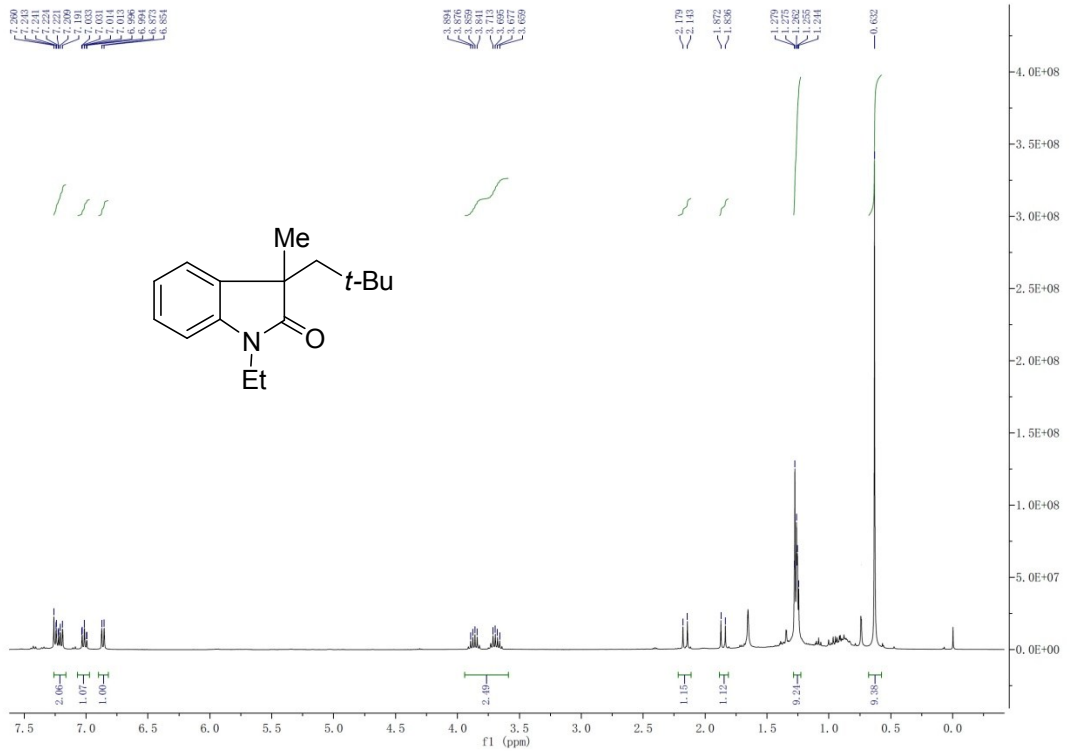
t-Bu
N
O
f1 (ppm)


Me
t-Bu
N
O
f1 (ppm)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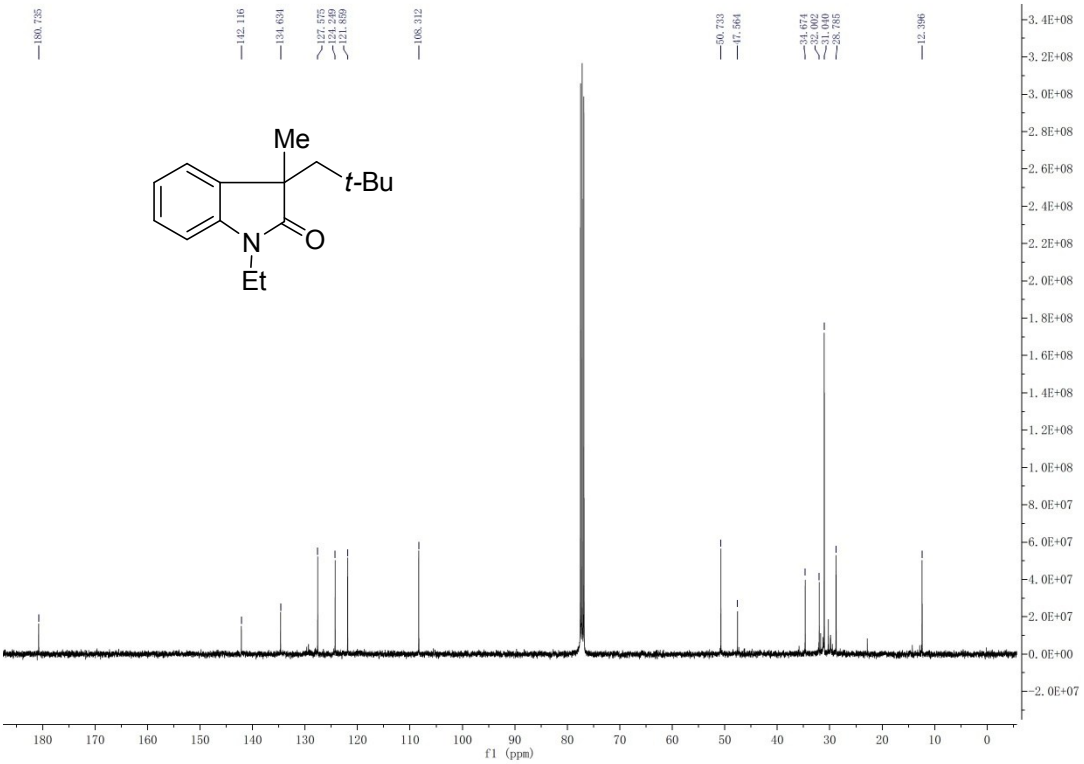
N
O
Et
f1 (ppm)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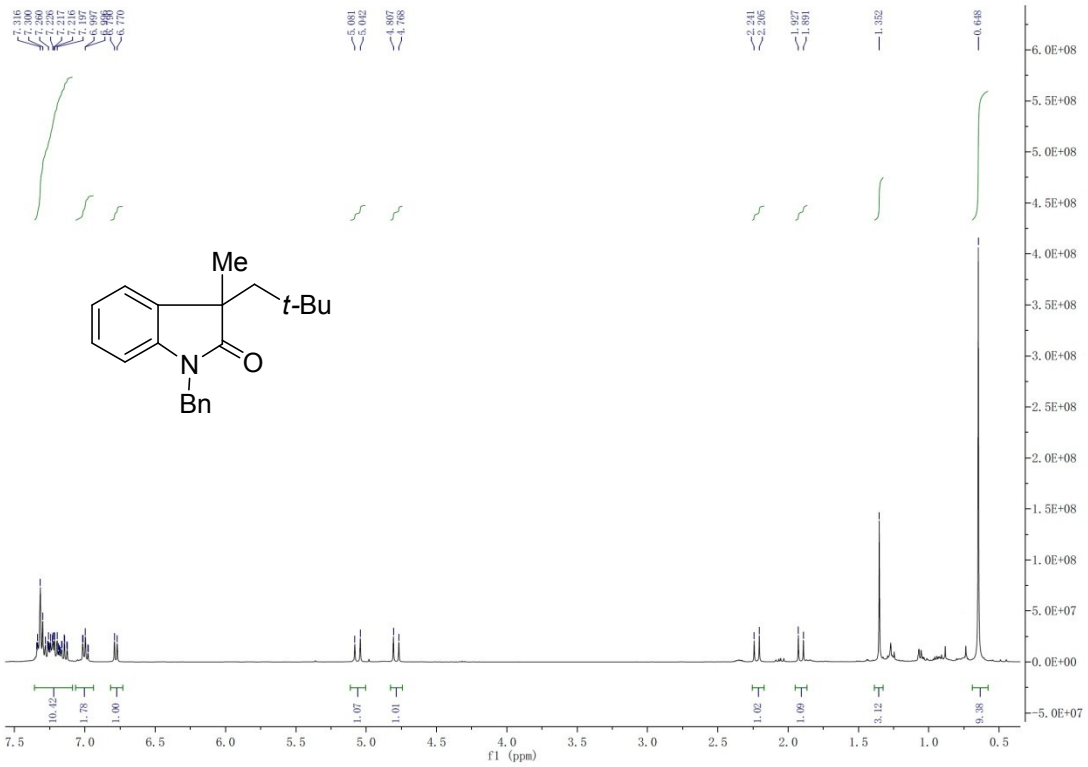
t-Bu
N
O
Et
f1 (ppm)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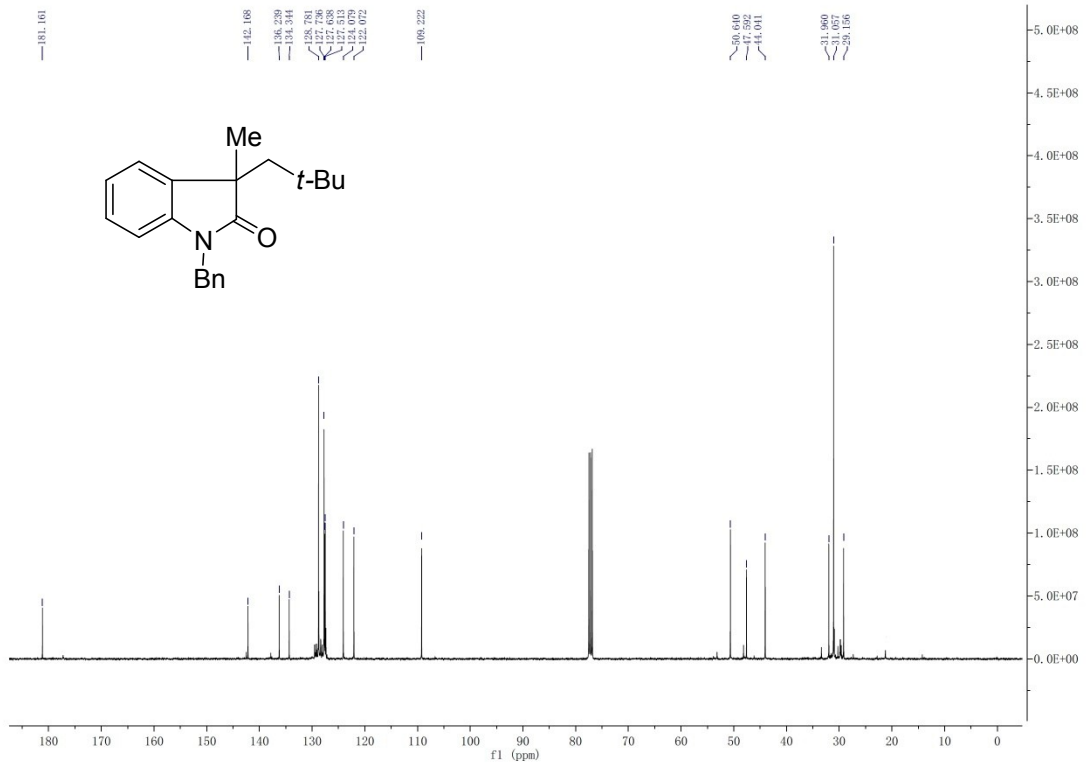
N
O
Bn
f1 (ppm)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t-Bu
N
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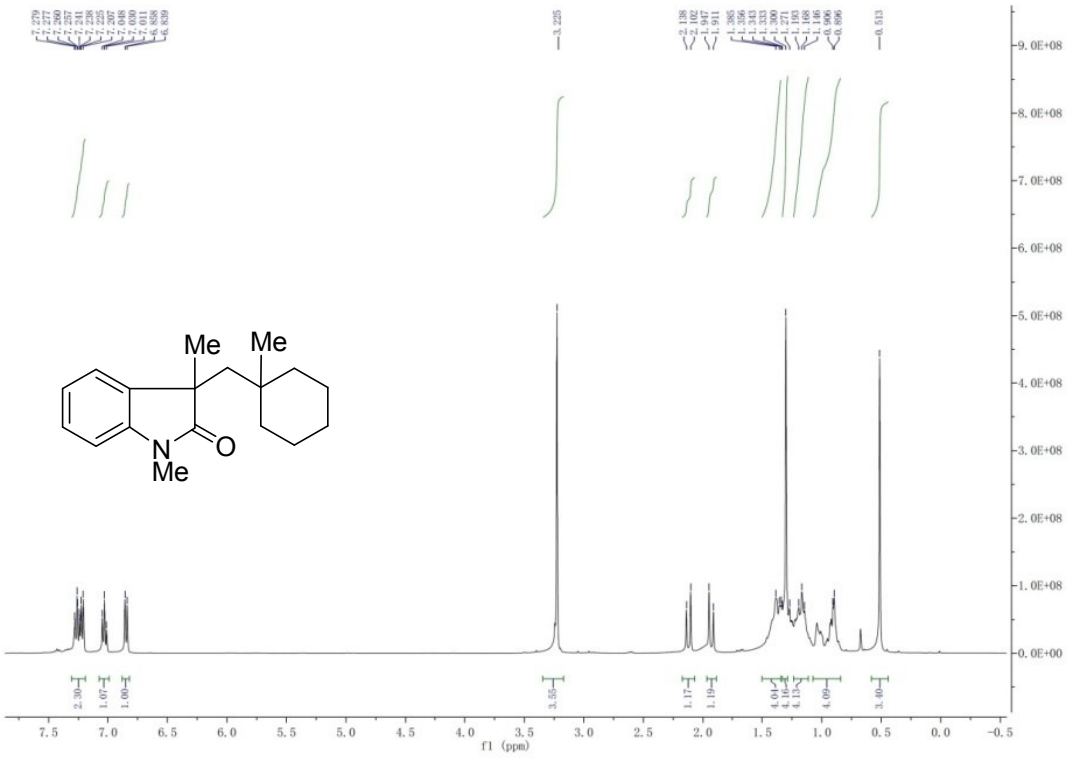
Bn
f1 (ppm)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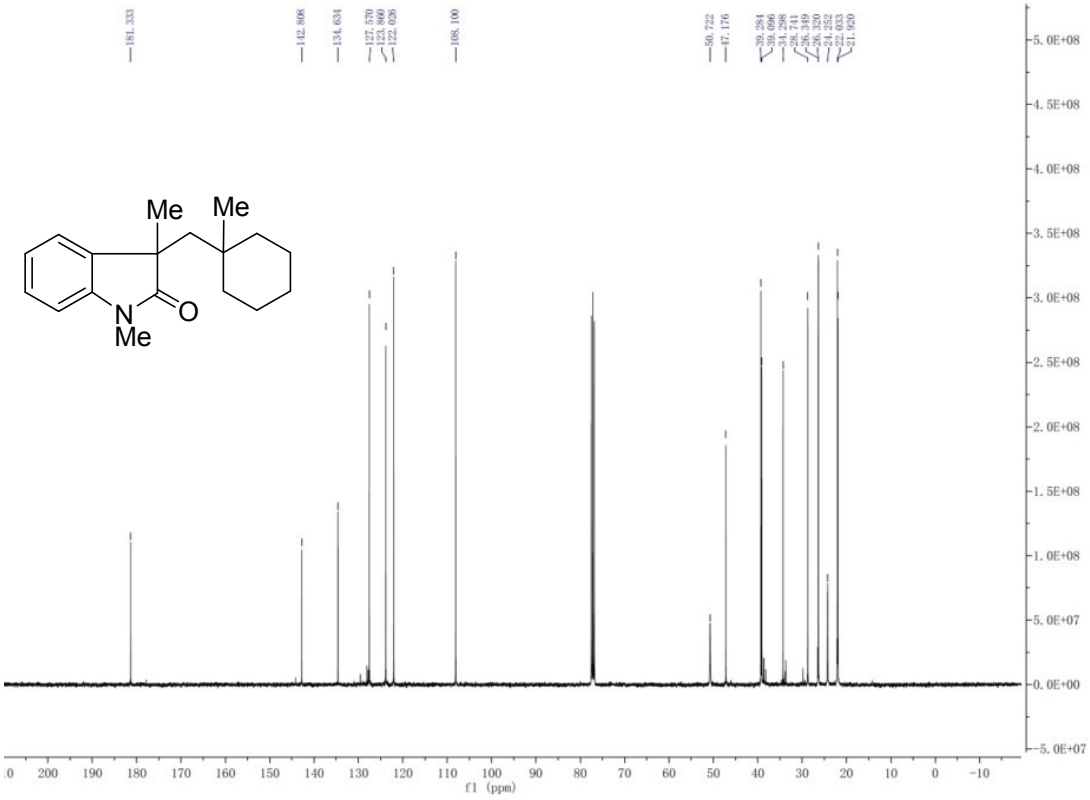
Me
N
Me
O
f1 (ppm)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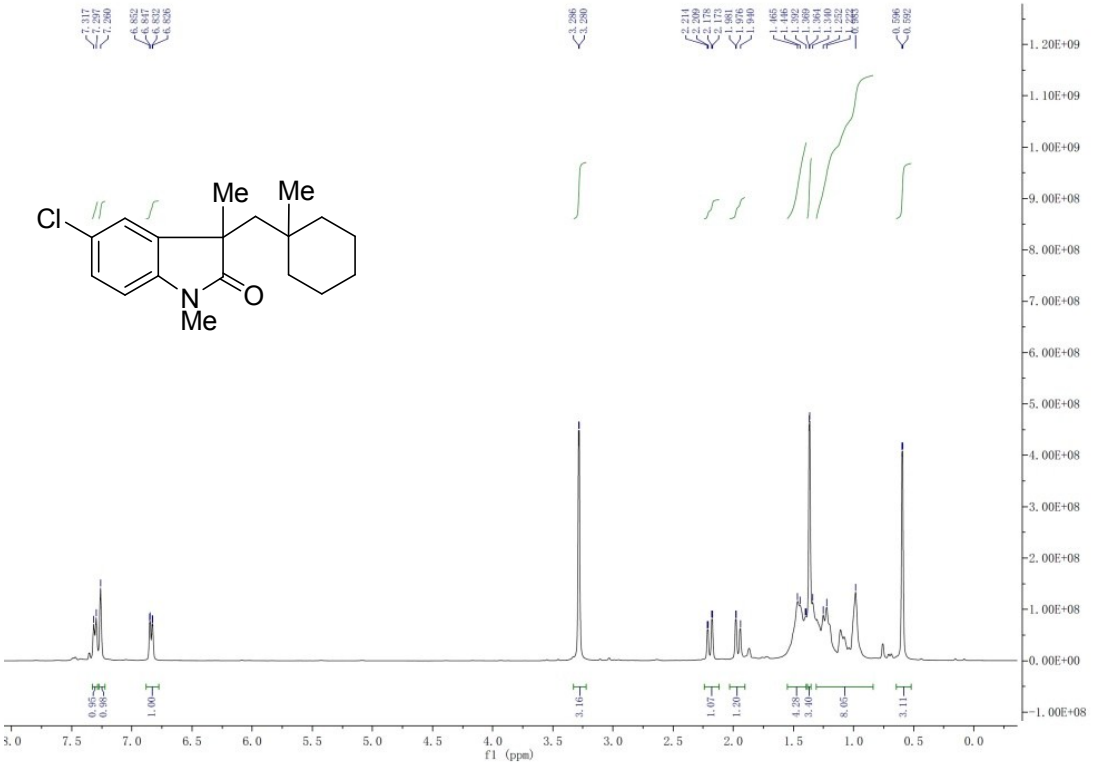
Me
N
Me
O
f1 (ppm)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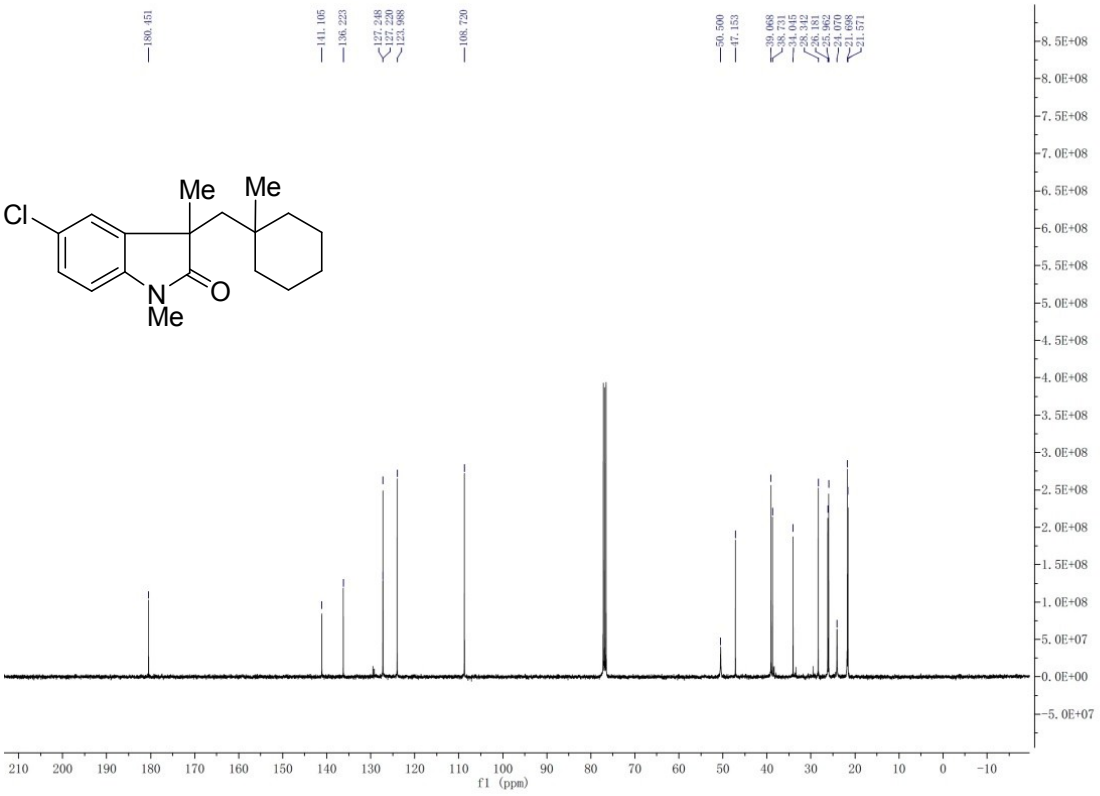
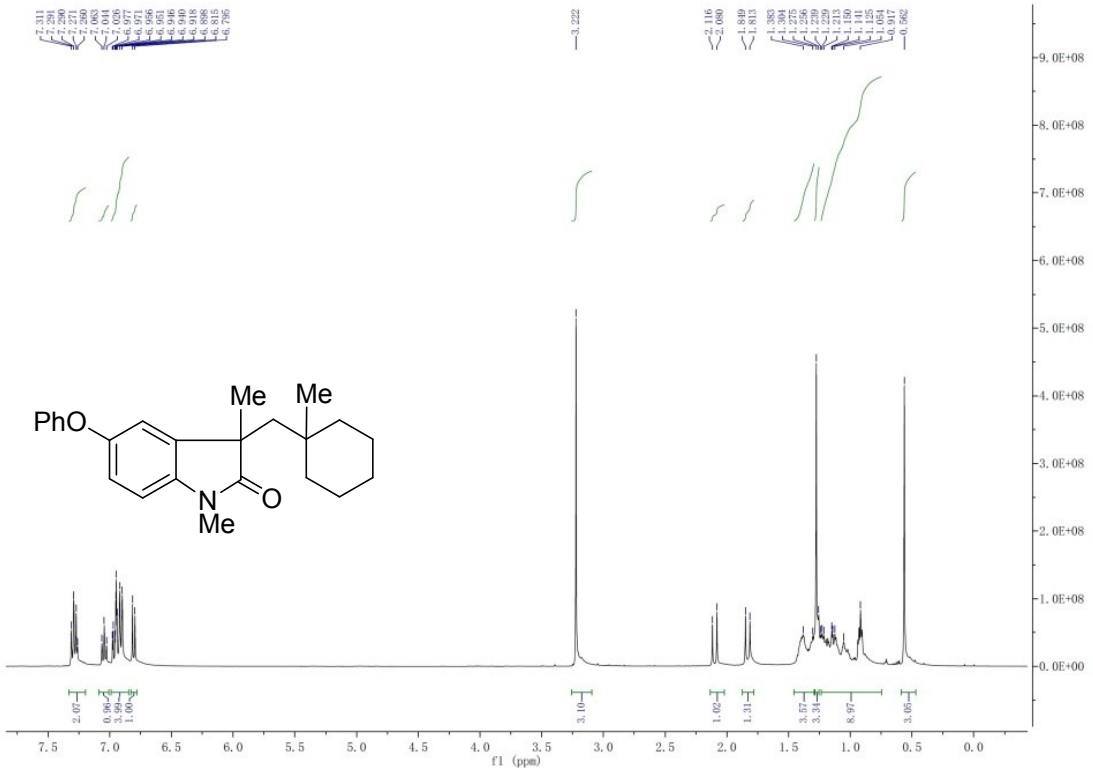
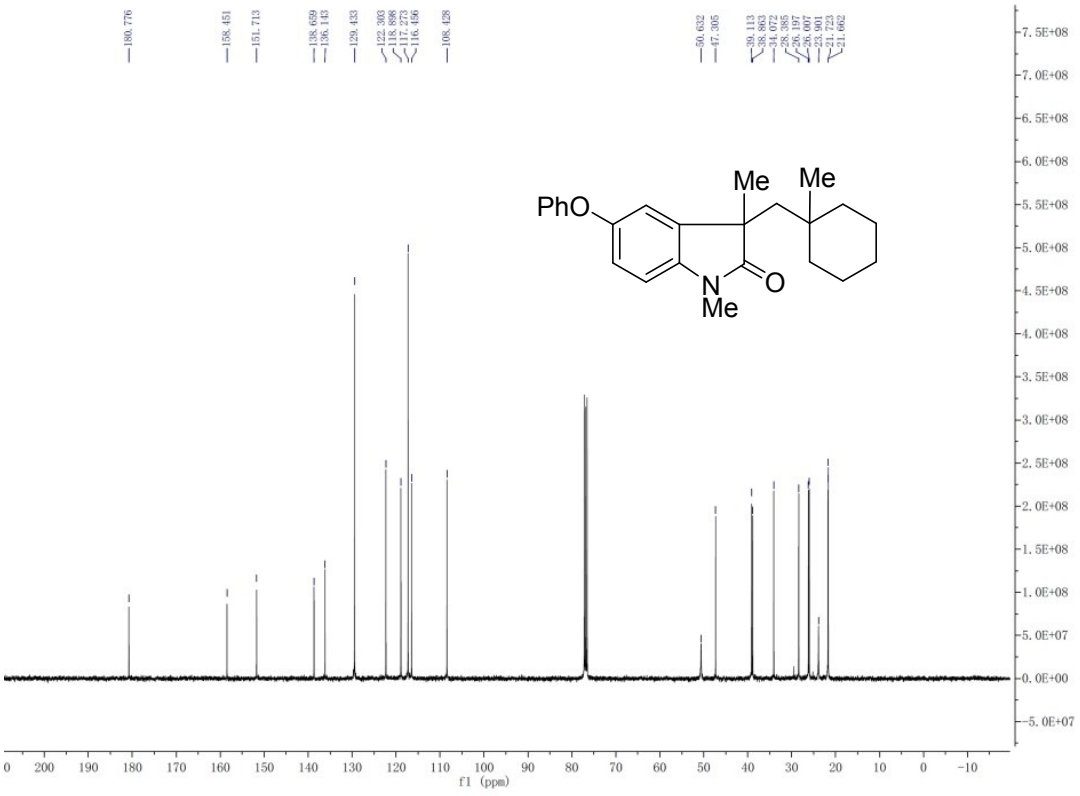
Me
Me
N
Me
O
f1 (ppm)


Cl
Me
Me
N
Me
O
f1 (ppm)


PhO
Me
Me
N
O
Me
f1 (ppm)


PhO
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Me
N
O
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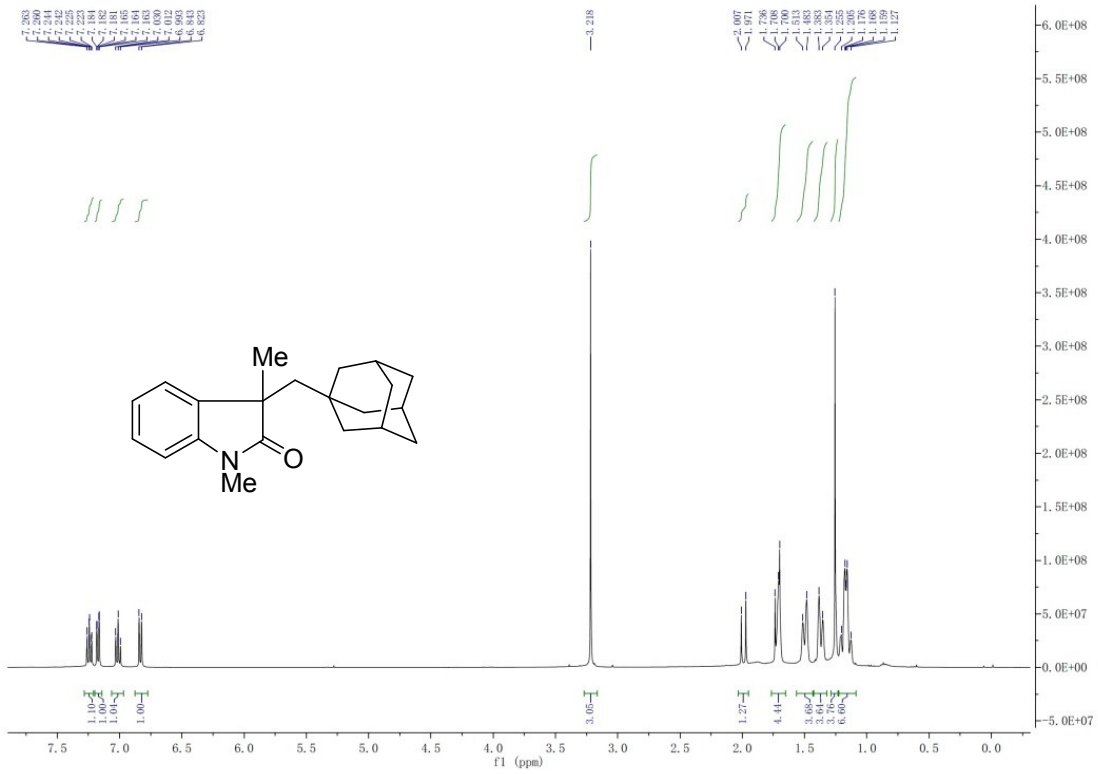
f1 (ppm)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O
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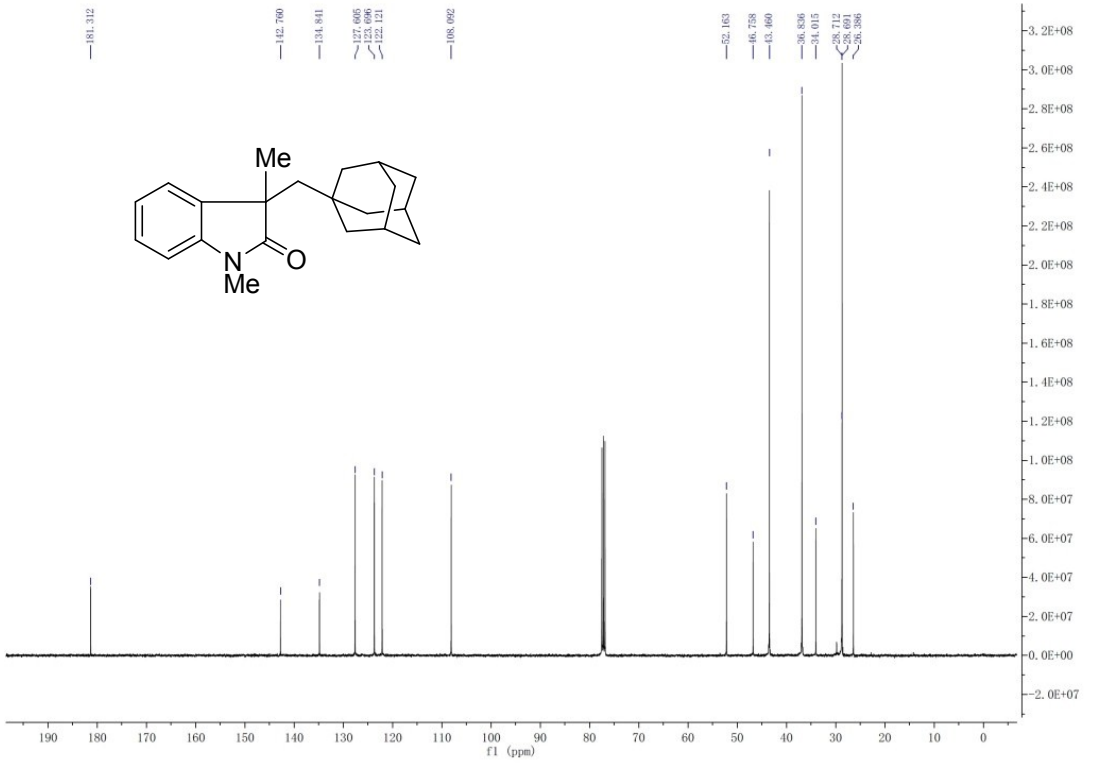
f1 (ppm)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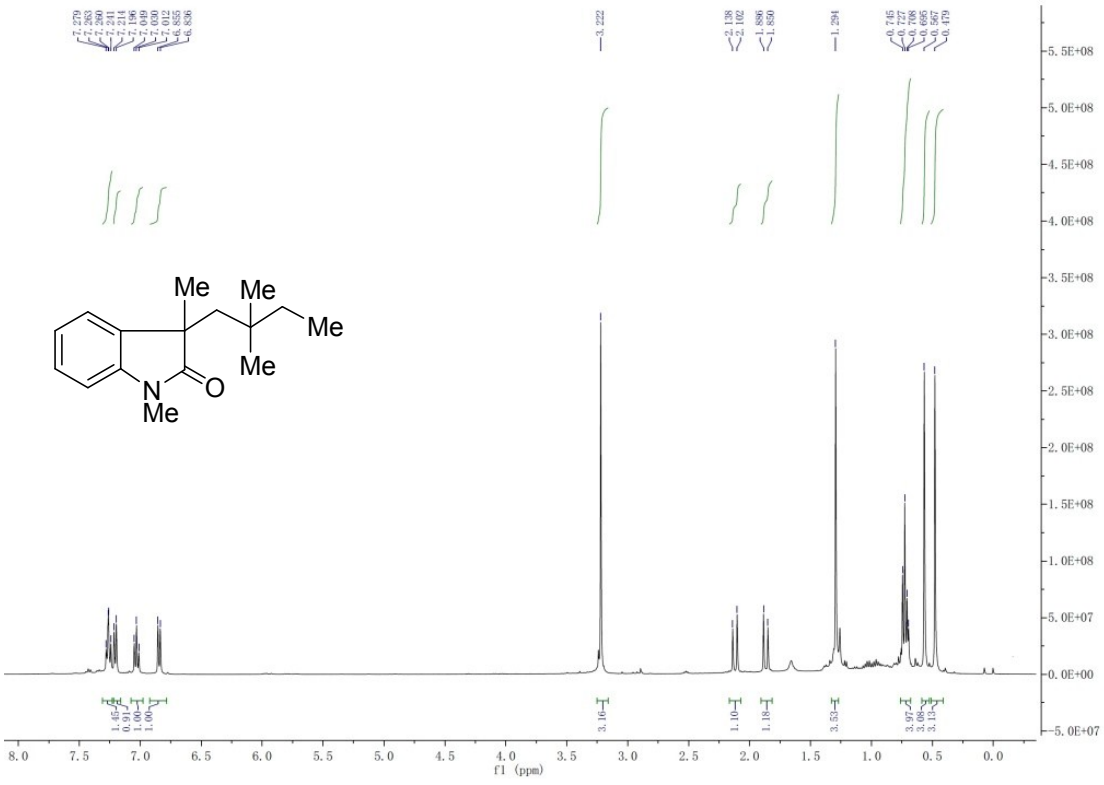
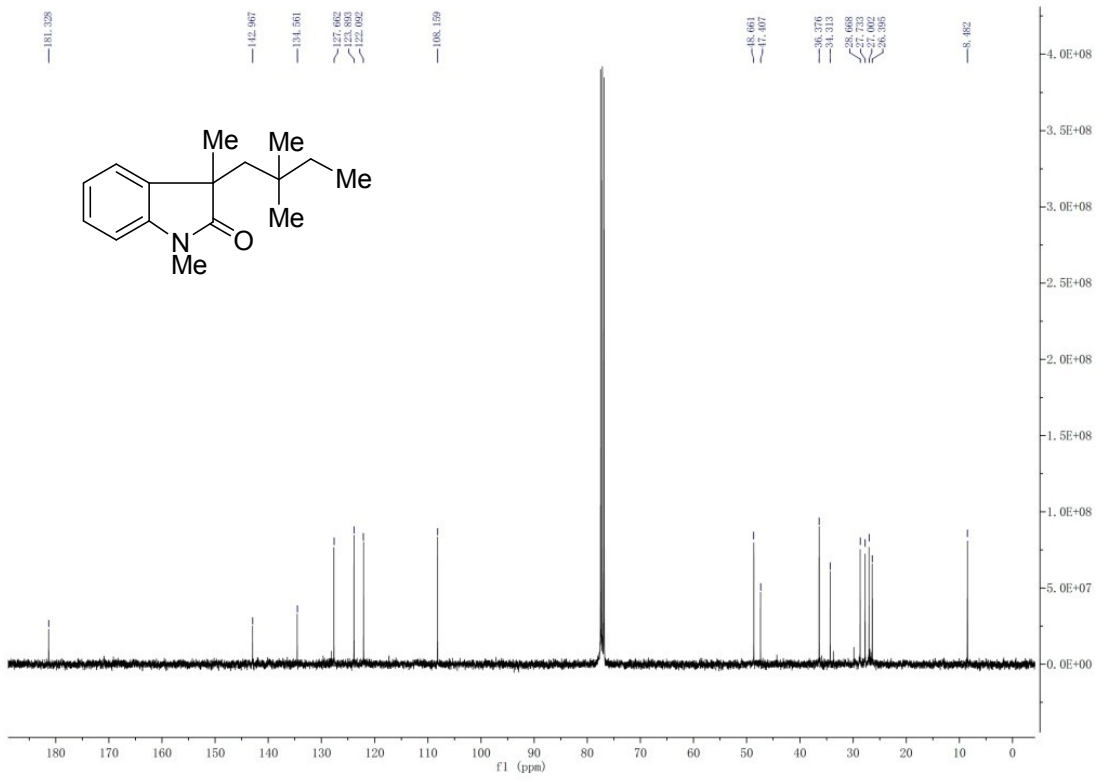
O
Me
f1 (ppm)


Me
Me
Me
Me
N
O
Me
f1 (ppm)


Me
Me
Me
Me
N
O
Me
f1 (ppm)