- Electronic Supplementary Information -

for

Brønsted acid-catalyzed annulation reaction of hydroxamic acids: synthesis of cyclopentane-fused isoxazolidines and their benzilic amide rearrangement

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General procedure:

All non-aqueous reactions were carried out under an atmosphere of nitrogen in flame-dried glassware and were stirred using a magnetic stir plate. All reactions were carried out using commercial grade solvent unless otherwise noted. CH_3CN, DCE, and CH_2Cl_2 were dried over calcium hydride. Dry THF was prepared by distilling over sodium ketyl.

All reactions were monitored by thin layer chromatography (TLC) on WhatmanPartisil® K6F TLC plates (silica gel 60 Å, 0.25 mm thickness) and visualized using a UV lamp (366 or 254 nm) or by use of one of the following visualization reagents: PMA: 10 g phosphomolybdic acid/ 100 mL ethanol; $KMnO_4$: 0.75 g potassium permanganate, 5 g K_2CO_3, / 100 mL water. Products were isolated by column chromatography (Merck silica gel 100-200μm). Yields refer to chromatographically and spectroscopically homogenous materials unless noted otherwise. ^{13}C and ^{1}H NMR spectra were recorded on a Bruker 400 or Bruker 500 MHz spectrometers. Chemical shift values (δ) are reported in ppm and calibrated to the residual solvent peak $CDCl_3$ δ = 7.2600 ppm for ^{1}H, δ = 77.16 for ^{13}C, DMSO-d_6 δ = 2.500 ppm for ^{1}H, δ = 39.500 ppm for ^{13}C; or calibrated to tetramethylsilane (δ = 0.00 ppm). All NMR spectra were recorded at ambient temperature (290 K) unless otherwise noted. ^{1}H NMR spectra are reported as follows: chemical shift (multiplicity, coupling constant, integration). The following abbreviations are used to indicate multiplicities: s, singlet; d, doublet; t, triplet; q, quartet; quint, quintet; sext, sextet; sept, septet; m, multiplet; dd, doublet of doublet; dt, doublet of triplet; dq, doublet of quartet; td, triplet of doublet; tt, triplet of triplet; dq, doublet of quartet; br, broad; app, apparent. Mass spectra were recorded by electrospray ionization (ESI) method on a Q-TOF Micro with lock spray source. The crystal data were collected and integrated using a BrukerAxs kappa apex2 CCD diffractometer, with graphite monochromated Mo-Kα radiation.

The ω-formyl enone **1** was synthesized by following literature procedures (*Adv. Synth. Catal.* 2019, ***361***, 208; *Org. Lett.* 2005, ***7***, 18).

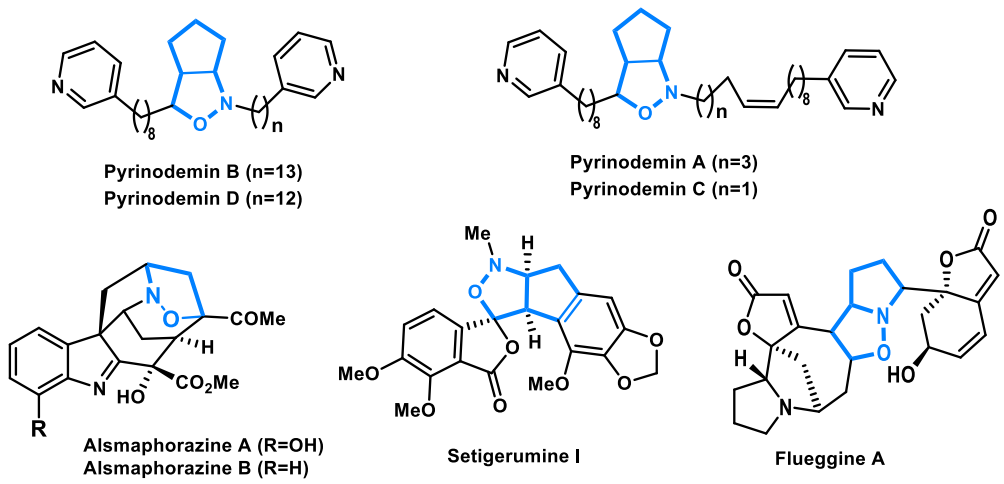
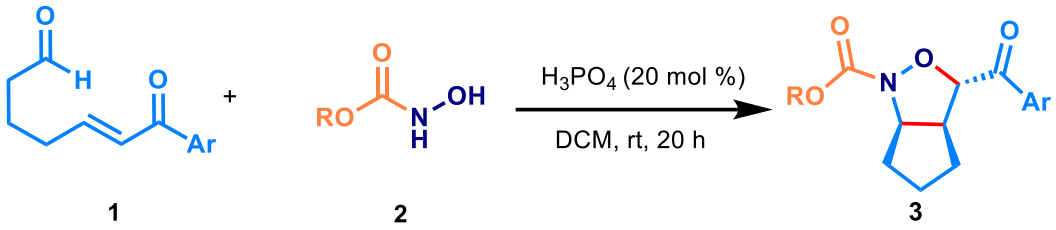
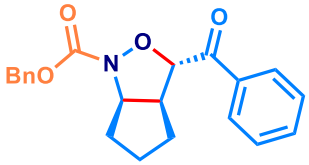
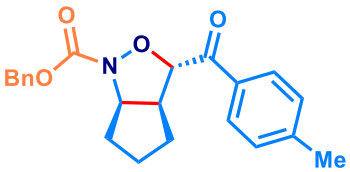
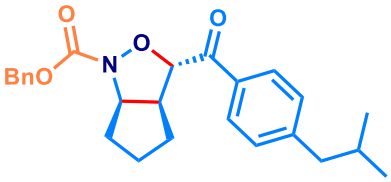
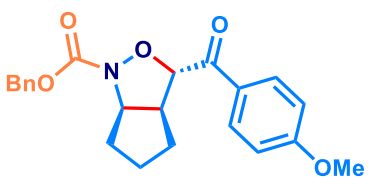


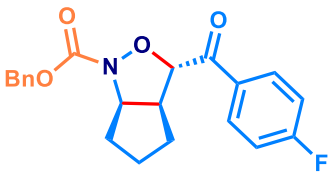
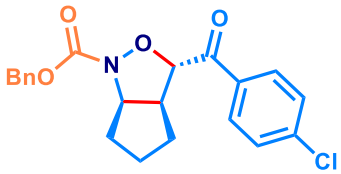
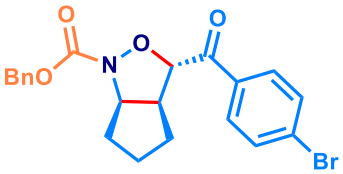
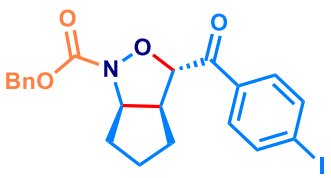
Figure 1: Examples of natural products with cyclopentane fused isoxazolidine framework.

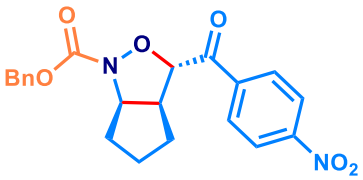
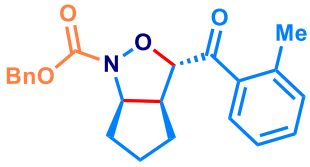
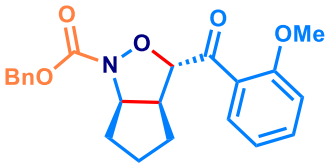
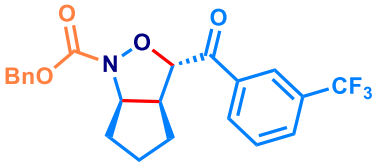
General procedure for synthesis of cyclopentane fused isoxazolidines 3

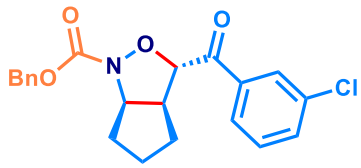
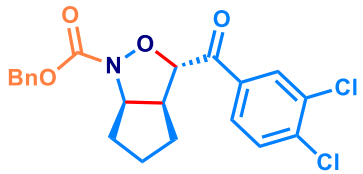
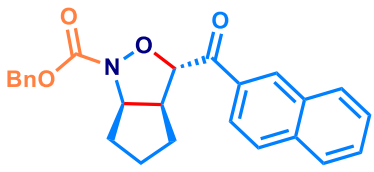
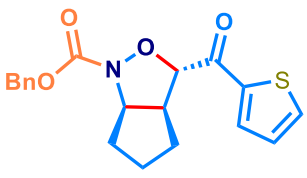


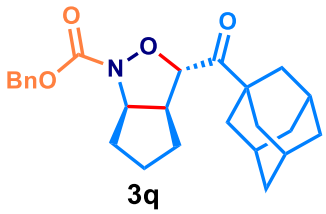
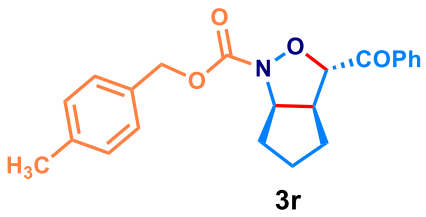
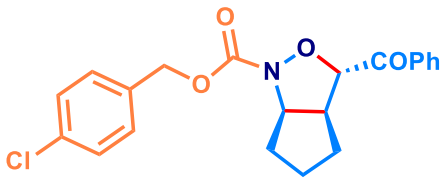
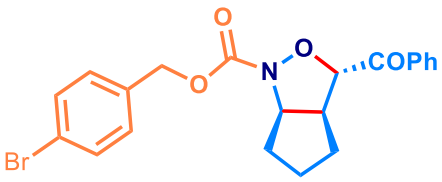
A 16x100 mm oven dried reaction tube equipped with a magnetic stir was charged with *ω*-formyl enones **1** (0.20 mmol, 1.0 equiv), hydroxamic acids **2** (0.20 mmol, 1.0 equiv), and H_3PO_4 (20 mol %). The reaction tube was capped with a rubber septum, evacuated, and backfilled with nitrogen gas. Then, anhydrous CH_2Cl_2 (1.5 mL) was added via syringe. The reaction mixture was allowed to stir for 20 h at room temperature. After completion of the reaction (TLC monitored), volatiles were removed under reduced pressure and the crude product was purified by silica gel column chromatography to provide pure products **3**.

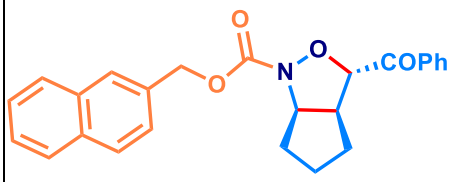
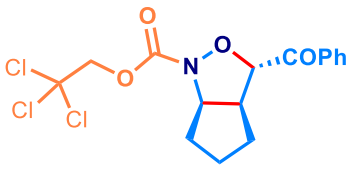
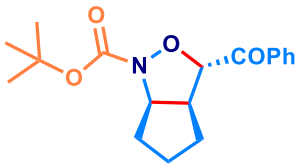
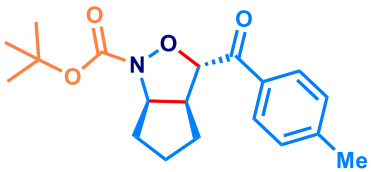
 **3a**	Compound **3a**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 86% (64 mg). **^{1}H NMR (500 MHz, $CDCl_3$)** δ 7.97 – 7.94 (m, 2H), 7.57 – 7.54 (m, 1H), 7.44 –7.41 (m, 2H), 7.23 – 7.19 (m, 3H), 7.10 – 7.09 (m, 2H), 5.11 (d, *J* = 1.6 Hz, 1H), 5.07 – 5.04 (m, 1H), 4.96 – 4.92 (m, 1H) 4.81–4.78 (m, 1H), 3.49 – 3.45 (m, 1H), 1.95 – 1.89 (m, 3H), 1.84 – 1.75 (m, 2H), 1.68 – 1.64 (m, 1H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 195.2, 157.0, 135.6, 134.9, 133.6, 128.9, 128.7, 128.3, 128.0, 127.9, 86.3, 67.7, 65.1, 47.9, 34.1, 32.0, 25.6. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{21}H_{21}NO_4Na^+$ 374.1363; Found 374.1354.
 **3b**	Compound **3b**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 83% (61 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.86 (d, *J* = 7.9 Hz, 2H), 7.25 – 7.19 (m, 5H), 7.11 – 7.09 (m, 2H), 5.09 – 4.92 (m, 3H), 4.81 – 4.77 (m, 1H), 3.50 – 3.45 (m, 1H), 2.40 (s, 3H), 1.98 – 1.87 (m, 3H), 1.84 – 1.75 (m, 2H), 1.69 – 1.62 (m, 1H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 194.9, 157.1, 144.6, 135.8, 132.5, 129.5, 129.1, 128.3, 128.0, 127.9, 86.4, 67.8, 65.2, 48.0, 34.2, 32.1, 25.7, 21.8. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{22}H_{23}NO_4Na^+$ 388.1519; Found 388.1526.
 **3c**	Compound **3c**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 80% (65 mg). **^{1}H NMR (500 MHz, $CDCl_3$)** δ 7.88 (d, *J* = 8.3 Hz, 2H), 7.24 – 7.20 (m, 5H), 7.15 – 7.13 (m, 2H), 5.10 – 4.95 (m, 3H), 4.81 – 4.77 (m, 1H), 3.48 – 3.44 (m, 1H), 2.53 (d, *J* = 7.2 Hz, 2H), 1.96 – 1.87 (m, 4H), 1.85 – 1.76 (m, 2H), 1.68 – 1.64 (m, 1H, merged with water) , 0.91 (d, *J* = 6.6 Hz, 6H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 195.0, 157.1, 148.3, 135.9, 132.9, 129.5, 129.0, 128.4, 128.1, 128.0, 86.3, 67.8, 65.2, 48.2, 45.6, 34.2, 32.1, 30.2, 25.7, 22.5. **HRMS** (ESI/TOF-Q) m/z: $[M+H]^+$ Calculated for $C_{25}H_{30}NO_4^+$ 408.2169; Found 408.2180.
 **3d**	Compound **3d**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 79% (60 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.94 (d, *J* = 7.7 Hz, 2H), 7.23 –7.22 (m, 3H), 7.11 (bs, 2H), 6.89 (d, *J* = 7.7 Hz, 2H), 5.07– 4.93 (m, 3H), 4.80 – 4.76 (m, 1H), 3.86 (s, 3H), 3.51 – 3.46 (m, 1H), 1.99 – 1.89 (m, 3H), 1.84 – 1.75 (m, 2H), 1.70 –1.67 (m, 1H, merged with water). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 193.8, 164.0, 157.1, 135.8, 131.4, 128.3, 128.05, 127.96, 125.8, 114.0, 86.3, 67.8, 65.2, 55.6, 48.0, 34.2, 32.1, 25.7. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{22}H_{23}NO_5Na^+$ 404.1468; Found 404.1473.

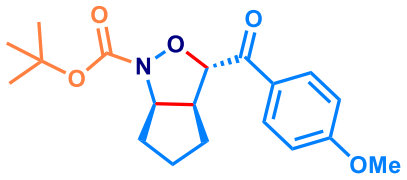
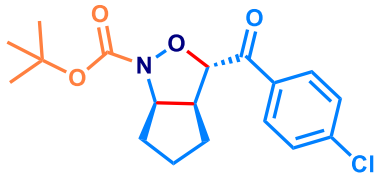
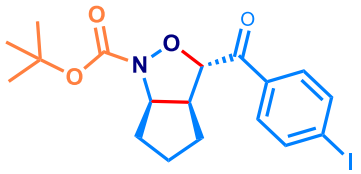
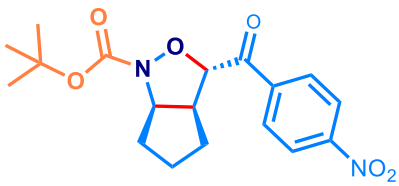
 **3e**	Compound **3e**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 85% (63 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.98 (dd, *J* = 8.5, 5.5 Hz, 2H), 7.26 – 7.23 (m, 3H), 7.09 – 7.04 (m, 4H), 5.03 – 4.91 (m, 3H), 4.81 – 4.77 (m, 1H), 3.56 – 3.51 (m, 1H), 2.00 – 1.90 (m, 3H), 1.83 – 1.74 (m, 2H), 1.69-1.65 (m, 1H).**^{13}C NMR (101 MHz, $CDCl_3$)** δ 193.7, 166.0 (d, $^{1}J_{C-F}$ = 255.8Hz), 157.1, 135.5, 131.8 (d, $^{3}J_{C-F}$ = 9.5 Hz) 131.5 (d, $^{4}J_{C-F}$ = 3.1 Hz), 128.4, 128.1 (2×C), 115.8 (d, $^{2}J_{C-F}$ = 21.9 Hz), 86.6, 67.9, 65.3, 47.5, 34.1, 32.0, 25.7. **^{19}F NMR (471 MHz, $CDCl_3$)** δ -104.05. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{21}H_{20}FNO_4Na^+$ 392.1269; Found 392.1276.
 **3f**	Compound **3f**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 72% (56 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.88 (d, *J* = 8.2 Hz, 2H), 7.35 (d, *J* = 8.1 Hz, 2H), 7.25 – 7.21 (m, 3H), 7.06 (d, *J* = 6.8 Hz, 2H), 5.02 – 4.89 (m, 3H), 4.79 – 4.77 (m, 1H), 3.56 – 3.51 (m, 1H), 1.97 – 1.86 (m, 3H), 1.84 – 1.74 (m, 2H), 1.70 – 1.64 (m, 1H, merged with water). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 194.1, 157.1, 140.2, 135.4, 133.4, 130.5, 129.1, 128.4, 128.2, 128.1, 86.7, 68.0, 65.4, 47.4, 34.2, 32.1, 25.8. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{21}H_{20}ClNO_4Na^+$ 408.0973; Found 408.0970.
 **3g**	Compound **3g**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 76% (65 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.80 (d, *J* = 8.1 Hz, 2H), 7.52 (d, *J* = 8.1 Hz, 2H), 7.25 – 7.22 (m, 3H), 7.06 (d, *J* = 6.8 Hz, 2H), 5.01– 4.89 (m, 3H), 4.82 – 4.77 (m, 1H), 3.57 – 3.52 (m, 1H), 1.97 – 1.84 (m, 3H), 1.80 –1.73 (m, 2H), 1.69 –1.65 (m, 1H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 194.3, 157.1, 135.4, 133.8, 132.1, 130.6, 129.0, 128.5, 128.19, 128.16, 86.7, 68.0, 65.4, 47.4, 34.2, 32.1, 25.8. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{21}H_{20}BrNO_4Na^+$ 452.0468; Found 452.0452.
 **3h**	Compound **3h**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 71% (67 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.75 (d, *J* = 8.3 Hz, 2H), 7.64 (d, *J* = 8.3 Hz, 2H), 7.28 – 7.22 (m, 3H), 7.05 (d, *J* = 6.8 Hz, 2H), 5.00 – 4.88 (m, 3H), 4.81– 4.77 (m, 1H), 3.56 – 3.51 (m, 1H), 1.97– 1.88 (m, 3H), 1.84 – 1.75 (m, 2H), 1.73 – 1.67 (m, 1H).**^{13}C NMR (101 MHz, $CDCl_3$)** δ 194.6, 157.1, 138.0, 135.4, 134.3, 130.4, 128.5, 128.2, 128.1, 102.0, 86.6, 68.0, 65.4, 47.3, 34.2, 32.0, 25.8. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{21}H_{20}INO_4Na^+$ 500.0329; Found 500.0341.

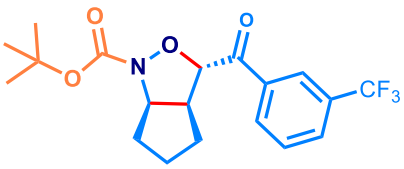
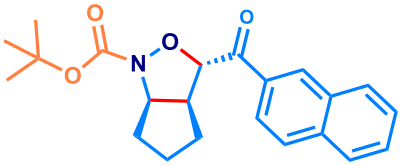
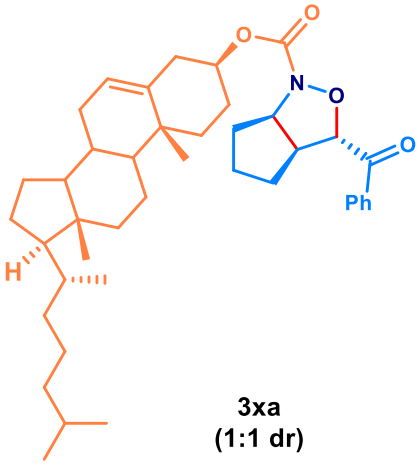
 **3i**	Compound **3i**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 63% (54 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.13 (d, *J* = 8.3 Hz, 2H), 8.06 (d, *J* = 8.5 Hz, 2H), 7.22 –7.17 (m, 3H), 7.02 (d, *J* = 7.0 Hz, 2H), 5.02 (s, 1H), 4.94 – 4.79 (m, 3H), 3.66 – 3.61 (m, 1H), 2.00 – 1.90 (m, 3H), 1.81–1.76 (m, 2H), 1.71 – 1.66 (m, 1H).**^{13}C NMR (126 MHz, $CDCl_3$)** δ 193.8, 157.1, 150.3, 139.5, 135.1, 130.1, 128.4, 128.3, 128.1, 123.7, 87.3, 68.1, 65.7, 46.8, 34.1, 32.0, 25.8. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{21}H_{20}N_2O_6Na^+$ 419.1214; Found 419.1214.
 **3j**	Compound **3j**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 80% (58 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.79 (d, *J* = 7.5 Hz, 1H), 7.40 (t, *J* = 7.3 Hz, 1H), 7.28 – 7.25 (m, 5H), 7.24 – 7.21 (m, 2H), 5.14 – 5.01 (m, 3H), 4.81 – 4.79 (m, 1H), 3.43– 4.39 (m, 1H), 2.45 (s, 3H), 1.94 – 1.92 (m, 3H), 1.86 – 1.76 (m, 2H), 1.71 – 1.67 (m, 1H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 195.3, 157.0, 136.9, 135.1, 133.7, 133.6, 130.2, 129.1, 129.0, 128.7, 128.3, 125.9, 86.4, 66.1, 65.2, 48.0, 34.2, 32.1, 25.7, 18.8. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{22}H_{23}NO_4Na^+$ 388.1519; Found 388.1498.
 **3k**	Compound **3k**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 62% (47 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.70 (d, *J* = 7.6 Hz, 1H), 7.50 – 7.46 (m, 1H), 7.37 – 7.28 (m, 5H), 7.01 – 6.94 (m, 2H), 5.25 – 5.13 (m, 3H), 4.65 – 4.61 (m, 1H), 3.91 (s, 3H), 3.28 – 3.23 (m, 1H), 2.01 – 1.92 (m, 2H), 1.84 – 1.78 (m, 3H), 1.70 – 1.64 (m, 1H, merged with water). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 198.4, 159.0, 136.4, 134.7 (2×C), 131.4, 128.5, 128.2, 128.0, 125.4, 121.2, 111.6, 89.5, 67.7, 63.6, 55.8, 49.8, 34.5, 32.7, 25.5. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{22}H_{23}NO_5Na^+$ 404.1468; Found 404.1484.
 **3l**	Compound **3l**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 65% (55 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.21 (s, 1H), 8.13 (d, *J* = 8.0 Hz, 1H), 7.76 (d, *J* = 7.8 Hz, 1H), 7.51 (t, *J* = 7.8 Hz, 1H), 7.23 – 7.18 (m, 3H), 7.05 (d, *J* = 6.7 Hz, 2H), 5.05 (s, 1H), 5.00 (d, *J* = 12.2 Hz, 1H), 4.88 (d, *J* = 12.2 Hz, 1H), 4.84 – 4.79 (m, 1H), 3.60 – 3.55 (m, 1H), 1.98 – 1.89 (m, 3H), 1.84 –1.76 (m, 2H), 1.70 –1.66 (m, 1H).**^{13}C NMR (126 MHz, $CDCl_3$)** δ 194.0, 157.1, 135.7, 135.4, 132.3, 131.3 (q, $^{2}J_{C\text{-}F}$ = 33.0 Hz), 129.9 (q, $^{3}J_{C\text{-}F}$ = 3.6 Hz), 129.4, 128.4, 128.2, 128.1, 125.9 (q, $^{3}J_{C\text{-}F}$ = 3.7 Hz), 123.7 (q, $^{1}J_{C\text{-}F}$ = 272 Hz) 86.8, 68.0, 65.5, 47.3, 34.2, 32.0, 25.8. **^{19}F NMR (471 MHz, $CDCl_3$)** δ -62.8. **HRMS** (ESI/TOF-Q) m/z: $[M+H]^+$ Calculated for $C_{22}H_{21}F_3NO_4^+$ 420.1417; Found 420.1436.

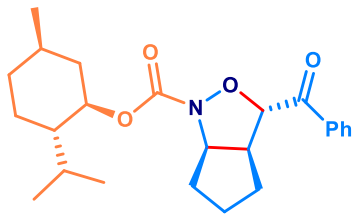
 **3m**	Compound **3m**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 78% (60 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.92 (s, 1H), 7.84 (d, *J* = 7.8 Hz, 1H), 7.50 (d, *J* = 8.0 Hz, 1H), 7.34 (t, *J* = 7.9Hz, 1H), 7.28 – 7.22 (m, 3H), 7.11 – 7.09 (m, 2H), 5.04 – 4.92 (m, 3H), 4.84 – 4.79 (m, 1H), 3.55 –3.50 (m, 1H), 1.98 – 1.89 (m, 3H), 1.84 – 1.75 (m, 2H), 1.70 –1.65 (m, 1H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 193.9, 157.1, 136.5, 135.4, 134.9, 133.5, 130.0, 128.9, 128.3, 128.1, 128.0, 127.1, 86.5, 67.9, 65.4, 47.4, 34.1, 32.0, 25.7. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{21}H_{20}ClNO_4Na^+$ 408.0973; Found 408.0981.
 **3n**	Compound **3n**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 73% (61 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.99 (s, 1H), 7.75 (d, *J* = 8.3 Hz, 1H), 7.40 (d, *J* = 8.4 Hz, 1H), 7.26 – 7.20 (m, 3H), 7.05 (d, *J* = 7.1 Hz, 2H), 4.97–4.87 (m, 3H), 4.82 – 4.77 (m, 1H), 3.59 – 3.52 (m, 1H), 1.99 – 1.84 (m, 3H), 1.82 – 1.71 (m, 2H), 1.68 –1.64 (m, 1H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 193.0, 157.2, 138.2, 135.1, 134.6, 133.3, 131.0, 130.7, 128.4, 128.24, 128.16, 128.1, 86.9, 68.1, 65.6, 47.0, 34.2, 32.0, 25.8. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{21}H_{19}Cl_2NO_4Na^+$ 442.0583; Found 442.0593.
 **3o**	Compound **3o**: Sticky liquid; eluent (5% ethyl acetate in Hexane) **Yield**: 70% (56 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.54 (s, 1H), 7.98 – 7.93 (m, 2H), 7.87 – 7.83 (m, 2H), 7.64 –7.53 (m, 2H), 7.13 –6.93 (m, 5H), 5.27 (s, 1H), 5.02 – 4.87 (m, 3H), 3.60 – 3.55 (m, 1H), 2.00 – 1.94 (m, 3H), 1.87–1.81 (m, 2H), 1.71 – 1.67 (m, 1H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 195.2, 157.2, 135.9, 135.5, 132.6, 132.4, 131.3, 130.0, 128.9, 128.7, 128.2, 127.95 (2×C), 127.91, 127.0, 124.3, 86.6, 67.9, 65.4, 47.9, 34.3, 32.1, 25.8. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{25}H_{23}NO_4Na^+$ 424.1519; Found 424.1535.
 **3p**	Compound **3p**: Sticky liquid; eluent (5% Ethyl acetate in hexane) **Yield**: 74% (53 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.91 (d, *J* = 3.8 Hz, 1H), 7.65 (d, *J* = 5.0 Hz, 1H), 7.28 – 7.26 (m, 3H), 7.21– 7.19 (m, 2H), 7.11 – 7.09 (m, 1H, merged with water), 5.13 – 5.02 (m, 2H), 4.89 (s, 1H), 4.76 – 4.71 (m, 1H), 3.52 – 3.47 (m, 1H), 1.96 – 1.85 (m, 3H), 1.84 – 1.75 (m, 2H), 1.70 – 1.63 (m, 1H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 188.9, 156.7, 141.7, 137.4, 135.8, 135.0, 134.0, 128.6, 128.5, 128.1, 87.2, 67.9, 64.9, 48.6, 34.1, 32.0, 25.6. **HRMS** (ESI/TOF-Q) m/z: $[M+H]^+$ Calculated for $C_{19}H_{20}SNO_4^+$ 358.1108; Found 358.1109.

 **3q**	Compound **3q**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 77% (63 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.35 – 7.28 (m, 5H), 5.08 (d, *J* = 2.3 Hz, 2H), 4.79 – 4.76 (m, 1H), 4.62 (s, 1H), 3.05 – 3.00 (m, 1H), 1.95 (bs, 3H), 1.83 – 1.77 (m, 6H), 1.69 – 1.66 (m, 8H), 1.59 –1.55 (m, 4H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 209.7, 157.1, 135.9, 128.33, 128.27, 128.1, 82.7, 67.7, 65.3, 48.5, 45.8, 37.3, 36.3, 34.1, 31.9, 27.6, 25.6. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{25}H_{31}NO_4Na^+$ 432.2145; Found 432.2154.
 **3r**	Compound **3r**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 75% (55 mg).**^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.96 (d, *J* = 7.9 Hz, 2H), 7.57 (t, *J* = 7.3 Hz, 1H), 7.44 (t, *J* = 7.4 Hz, 2H), 7.04 – 6.99 (m, 4H), 5.10 (s, 1H), 5.04 – 5.01 (m, 1H), 4.91– 4.88 (m, 1H) ,4.80 – 4.76 (m, 1H), 3.50 – 3.45 (m, 1H), 2.31 (s, 3H), 1.99 – 1.86 (m, 3H), 1.83–1.76 (m, 2H), 1.68 –1.62 (m, 1H, merged with water). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 195.3, 157.2, 137.8, 135.1, 133.6, 132.7, 129.1 (2×C), 128.8, 128.3, 86.4, 67.8, 65.2, 48.0, 34.2, 32.1, 25.7, 21.3. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{12}H_{23}NO_4Na^+$ 388.1519; Found 388.1526.
 **3s**	Compound **3s**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 72% (56 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.93 (d, *J* = 7.5 Hz, 2H), 7.58 (t, *J* = 7.4 Hz, 1H), 7.43 (t, *J* = 7.7 Hz, 2H), 7.16 (d, *J* = 8.3 Hz, 2H), 7.01 (d, *J* = 8.2 Hz, 2H), 5.12 (s, 1H), 4.95 (q, *J* = 12.4 Hz, 2H), 4.82 – 4.77 (m, 1H), 3.50 – 3.45 (m, 1H), 1.97 – 1.88 (m, 3H), 1.85 – 1.75 (m, 2H), 1.70 –1.65 (m, 1H, merged with water). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 195.2, 157.0, 135.0, 134.2, 133.9, 133.7, 129.5, 129.0, 128.8, 128.6, 86.4, 67.0, 65.2, 48.0, 34.2, 32.1, 25.8. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{21}H_{20}ClNO_4Na^+$ 408.0973; Found 408.0970.
 **3t**	Compound **3t**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 70% (60 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.93 (d, *J* = 7.7 Hz, 2H), 7.59 – 7.56 (m, 1H), 7.45 – 7.41 (m, 2H), 7.32 (d, *J* = 8.2 Hz, 2H), 6.94 (d, *J* = 8.0 Hz, 2H), 5.12 (s, 1H), 4.97 – 4.89 (m, 2H), 4.80 – 4.77 (m, 1H), 3.50 – 3.44 (m, 1H), 1.97 – 1.89 (m, 3H), 1.85 – 1.75 (m, 2H), 1.70 – 1.65 (m, 1H, merged with water). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 195.2, 157.0, 135.0, 134.7, 133.7, 131.5, 129.8, 129.0, 128.8, 122.1, 86.4, 67.0, 65.2, 48.0, 34.2, 32.1, 25.8. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{21}H_{20}BrNO_4Na^+$ 452.0468; Found 452.0450.

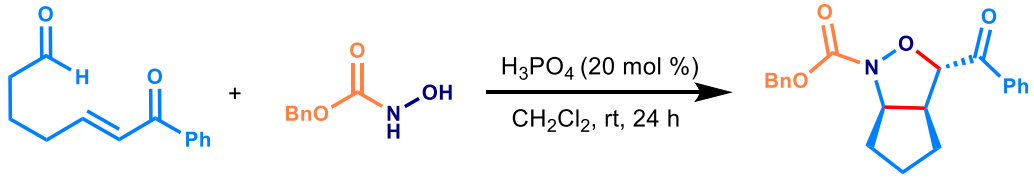
 **3u**	Compound **3u**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 72% (58 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.95 – 7.90 (m, 2H), 7.87 – 7.83 (m, 2H), 7.78 – 7.76 (m, 1H), 7.52 – 7.45 (m, 3H), 7.38 – 7.31 (m, 4H), 5.57 (d, *J* = 12.4 Hz, 1H), 5.37 (d, *J* = 12.4 Hz, 1H), 5.10 (s, 1H), 4.82 – 4.78 (m,1H), 3.50 – 3.45 (m, 1H), 1.95 – 1.87 (m, 3H) 1.82 – 1.75 (m, 2H), 1.66 – 1.62 (m, 1H, merged with water). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 195.4, 157.1, 134.9, 133.6 (2×C), 131.6, 131.2, 129.1, 128.9, 128.7, 128.6, 127.2, 126.5, 125.9, 125.3, 123.7, 86.4, 66.0, 65.2, 48.0, 34.2, 32.1, 25.7. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{25}H_{23}NO_4Na^+$ 424.1519; Found 424.1519.
 **3v**	Compound **3v**: Sticky liquid; eluent (5% ethyl acetate in Hexane) **Yield**: 76% (60mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.00 (d, *J* = 7.7 Hz, 2H), 7.58 (t, *J* = 7.3 Hz, 1H), 7.47 (t, *J* = 7.5 Hz, 2H), 5.18 (s, 1H), 4.80 – 4.76 (m, 1H), 4.71 (d, *J* = 11.8 Hz, 1H), 4.57 – 4.54 (m, 1H), 3.53 – 3.48 (m, 1H), 2.03 – 1.90 (m, 3H), 1.88 – 1.80 (m, 2H), 1.74 – 1.65 (m, 1H, merged with water). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 195.1, 154.4, 134.8, 133.9, 129.1, 128.9, 94.9, 86.3, 75.2, 65.1, 48.2, 34.1, 32.0, 25.7. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{16}H_{16}Cl_3NO_4Na^+$ 414.0037; Found 414.0034.
 **3w**	Compound **3w**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield:** 73% (46 mg). **^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.07 – 8.05 (m, 2H), 7.59 – 7.56 (m, 1H), 7.49 – 7.46 (m, 2H), 5.04 (s, 1H), 4.81 – 4.77 (m, 1H), 3.57 – 3.53 (m, 1H), 1.96 – 1.88 (m, 2H), 1.85 – 1.71 (m, 3H), 1.67 – 1.59 (m, 1H), 1.13 (s, 9H). **^{13}C NMR (126 MHz, CDCl3)** δ 194.7, 156.8, 135.4, 133.6, 129.3, 128.7, 86.7, 81.8, 65.3, 46.8, 34.3, 32.1, 27.6, 25.9. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{18}H_{23}NO_4Na^+$ 340.1519; Found 340.1517.
 **3wa**	Compound **3wa**: Sticky liquid; eluent (5% ethyl acetate in Hexane) **Yield**: 76% (50 mg). **^{1}H NMR (400 MHz, $CDCl_3$** δ 7.96 – 7.95 (m, 2H), 7.28 – 7.26 (m, 2H), 5.03 (s, 1H), 4.79 – 4.77 (m, 1H), 3.53 – 3.51 (m, 1H), 2.41 (s, 3H), 2.00 – 1.90 (m, 2H), 1.83 – 1.70 (m, 3H), 1.63 –1.15 (m, 1H), 1.15 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 194.4, 156.8, 144.4, 132.9, 129.4, 129.3, 86.6, 81.7, 65.2, 46.9, 34.3, 32.1, 27.6, 25.9, 21.8. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{19}H_{25}NO_4Na^+$ 354.1676; Found 354.1688

 **3wb**	Compound **3wb**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 75% (52 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.04 (d, *J* = 8.4 Hz, 2H), 6.95 (d, *J* = 8.4 Hz, 2H), 5.01 (s, 1H), 4.80 – 4.76 (m, 1H), 3.87 (s, 3H), 3.57 – 3.51 (m, 1H), 1.94 –1.86 (m, 2H), 1.84 – 1.70 (m, 4H), 1.17 (s, 9H).**^{13}C NMR (101 MHz, $CDCl_3$)** δ 193.3, 163.9, 156.9, 131.7, 128.6, 113.9, 86.6, 81.7, 65.3, 55.7, 46.9, 34.3, 32.1, 27.7, 25.9. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{19}H_{25}NO_5Na^+$ 370.1625; Found 370.1632.
 **3wc**	Compound **3wc**: Sticky liquid; eluent (5% Ethyl acetate/ Hexane) **Yield:** 71% (50mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.02 (d, *J* = 8.6 Hz, 2H), 7.46 (d, *J* = 8.6 Hz, 2H), 4.97 (s, 1H), 4.80 – 4.75 (m, 1H), 3.59 – 3.54 (m, 1H), 1.96 – 1.78 (m, 4H), 1.71 – 1.60 (m, 2H), 1.16 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 193.7, 156.7, 140.1, 133.9, 130.8, 129.0, 86.8, 82.0, 65.4, 46.7, 34.3, 32.1, 27.7, 25.9. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{18}H_{22}ClNO_4Na^+$ 374.1130; Found 374.1132.
 **3wd**	Compound **3wd**: Sticky liquid; eluent (5% Ethyl acetate/ Hexane) **Yield:** 69% (61 mg) .**^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.85 (d, *J* = 8.4 Hz, 2H), 7.78 (d, *J* = 8.3 Hz, 2H), 4.96 (s, 1H), 4.79 – 4.75 (m, 1H), 3.58 – 3.53 (m, 1H), 1.97– 1.89 (m, 2H), 1.84 – 1.69 (m, 3H), 1.52 – 1.47 (m, 1H), 1.16 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 194.2, 156.7, 138.1, 134.8, 130.7, 101.7, 86.8, 82.0, 65.4, 46.7, 34.3, 32.1, 27.7, 25.9. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{18}H_{22}INO_4Na^+$ 466.0486; Found 466.0496.
 **3we**	Compound **3we**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 66% (51 mg).**^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.33 (d, *J* = 8.0 Hz, 2H), 8.25 (d, *J* = 8.0 Hz, 2H), 5.00 (s, 1H), 4.80 – 4.76 (m, 1H), 3.64 – 3.59 (m, 1H), 2.01 – 1.91 (m, 2H), 1.86 – 1.72 (m, 3H), 1.68 – 1.64 (m, 1H), 1.16 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 193.5, 156.6, 150.5, 140.1, 130.4, 123.9, 87.2, 82.3, 65.7, 46.5, 34.2, 32.1, 27.8, 25.9. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{18}H_{22}N_2O_6Na^+$ 385.1370; Found 385.1380.

 **3wf**	Compound **3wf**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 62% (51 mg) .**^{1}H NMR (500 MHz, $CDCl_3$)** δ 8.34 (s, 1H), 8.27 (d, *J* = 7.9 Hz, 1H), 7.84 (d, *J* = 7.8 Hz, 1H), 7.64 (t, *J* = 7.8 Hz, 1H), 5.02 (s,1H), 4.81– 4.78 (m, 1H), 3.63 – 3.59 (m, 1H), 1.99 – 1.91 (m, 2H), 1.85 – 1.78 (m, 2H), 1.77–1.72 (m, 1H), 1.66-1.62 (m, 1H), 1.12 (s, 9H). **^{13}C NMR (126 MHz, $CDCl_3$)** δ 193.6, 156.7, 136.1, 132.6, 131.4 (q, $^{2}J_{C-F}$ = 33.1 Hz), 129.9 (q, $^{3}J_{C-F}$ = 3.6 Hz), 129.4, 126.3 (q, $^{3}J_{C-F}$ = 3.7 Hz), 123.77 (q, $^{1}J_{C-F}$ = 272.7 Hz), 87.0, 82.1, 65.5, 46.6, 34.3, 32.1, 27.6, 25.9. **^{19}F NMR (471 MHz, $CDCl_3$)** δ -62.85. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{19}H_{22}F_3NO_4Na^+$ 408.1393; Found 408.1404.
 **3wg**	Compound **3wg**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 74% (57 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.65 (s, 1H), 8.08 (d, *J* = 8.6 Hz, 1H), 7.99 (d, *J* = 8.2 Hz, 1H), 7.89 (dd, *J* = 13.8, 8.4 Hz, 2H), 7.63 – 7.54 (m, 2H), 5.21 (s, 1H), 4.87 – 4.82 (m, 1H), 3.66 – 3.59 (m, 1H), 2.00 – 1.77 (m, 5H), 1.52 – 1.39 (m, 1H), 1.08 (s, 9H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 194.8, 156.9, 135.8, 132.7, 132.6, 131.5, 129.9, 128.9, 128.6, 127.9, 127.0, 124.5, 86.8, 81.8, 65.4, 47.0, 34.4, 32.2, 27.6, 26.0. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{22}H_{25}NO_4Na^+$ 390.1676; Found 390.1690.
 **3xa** **(1:1 dr)**	Compound **3xa**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 78% (94 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.05 (d, *J* = 7.4 Hz, 2H), 7.58 (t, *J* = 7.0 Hz, 1H), 7.48 (t, *J* = 7.3 Hz, 2H), 5.26 (d, *J* = 18.6 Hz, 1H), 5.07 (s, 1H), 4.79 (s, 1H), 4.32 (s, 1H), 3.54 (s, 1H), 1.94 – 1.69 (m, 12H), 1.53 – 1.22 (m, 12H), 1.11 – 0.96 (m, 8H), 0.90 – 0.80 (m, 14H), 0.64 (s, 3H).**^{13}C NMR (101 MHz, $CDCl_3$)** 195.1, 195.0 (C*), 157.1, 139.8, 139.7 (C*), 135.2, 133.7, 133.6 (C*), 129.3, 128.7, 122.55, 122.50 (C*), 86.90, 86.87 (C*), 76.2, 65.3, 56.7, 56.2, 50.0, 47.35, 47.30 (C*), 42.4, 39.8, 39.6 (C*), 37.9, 37.3, 36.9, 36.8 (C*), 36.6, 36.5 (C*), 36.3, 35.9, 34.3, 32.1, 32.0, 31.9 (C*), 28.3, 28.1, 27.6, 27.0, 25.9, 24.4, 23.9, 22.9, 22.7, 21.1, 19.3, 18.8, 11.9. [C* = signal from another diastereomer]; **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{41}H_{59}NO_4Na^+$ 652.4336; Found 652.4334.

 **3xb** **(1:1 dr)**	Compound **3xb**: Sticky liquid; eluent (5% ethyl acetate in hexane) **Yield**: 84% (67 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.05 (d, *J* = 7.9 Hz, 2H), 7.58 (t, *J* = 7.2 Hz, 1H), 7.47 (t, *J* = 7.5 Hz, 2H), 5.05 (s, 1H), 4.77 (bs, 1H), 4.42 – 4.38 (m, 1H), 3.59 – 3.56 (m, 1H), 1.97 – 1.74 (m, 7H), 1.69 – 1.65 (m, 2H), 1.52 (t, *J* = 11.2 Hz, 2H), 0.93 – 0.86 (m, 2H), 0.79 (t, *J* = 6.1 Hz, 6H), 0.72 (d, *J* = 6.9 Hz, 3H), 0.63 – 0.57 (m, 1H), 0.44 – 0.35 (m, 1H) **^{13}C NMR (101 MHz, $CDCl_3$)** δ 194.9 , 157.6, 135.4, 133.6, 129.5, 128.6, 86.9, 76.6, 65.6, 47.2, 47.0, 40.0, 34.4, 34.3, 32.2, 31.3, 26.2, 25.9, 23.4, 22.1, 20.8, 16.4. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{24}H_{33}NO_4Na^+$ 422.2302; Found 422.2298.

Gram scale synthesis of compound 3a:



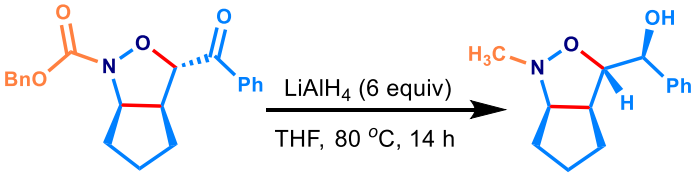
1a
1.1 g (5.5 mmol)

2a
0.92 g (5.5 mmol)

3a
77%, 1.48 g,
(single diastereomer)

A 100 mL oven dried round bottom flask equipped with a magnetic stir was charged with formyl enone **1a** (1.1 g, 5.5 mmol, 1.0 equiv), benzylhydroxycarbamate **2a** (0.92 g, 5.5 mmol, 1.0 equiv), and H_3PO_4 (0.57 mL, 20 mol %) under N_2 atmosphere. Then, anhydrous DCM (18 mL) was added via syringe. The reaction mixture was allowed to stir for 24 h at room temperature. After completion of the reaction (TLC monitored), volatiles were removed under reduced pressure and the crude product was purified by silica gel column chromatography to provide pure product **3a** (1.48 g, 77%).

Synthesis of compound 4a:

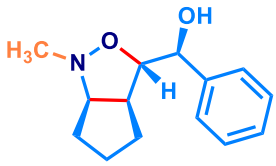


3a (0.28 mmol)

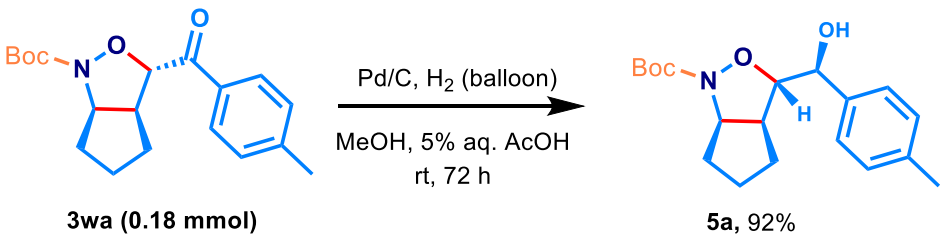
4a, 87%
(single diastereomer)

To an oven dried 16 mL sealed pressure tube equipped with a magnetic stir, was charged with the product **3a** (100 mg, 0.28 mmol, 1.0 equiv). The tube was capped with a rubber septum,

evacuated and backfilled with nitrogen gas. Then, 4 mL of anhydrous THF was added and the reaction temperature cooled down to 0 °C. Next, $LiAlH_4$ (60.5 mg, 1.68 mmol, 6 equiv) was added under N_2. While addition, effervescence evolved and waited till it ceases at 0°C and next the reaction mixture allowed to stir for 10 minutes at rt and the rubber septum was replaced with a cap under inert atmosphere. The reaction mixture was then heated to 80 °C for 14 h. After completion of the reaction, the reaction mixture was cooled down to rt and slowly quenched with ice-cold water and 15% NaOH (2 mL) was added. The resulting suspension was brought to room temperature and then filtered. The filtrate was washed with DCM (3 X 6 mL). Then organic layer was washed with Brine (6 mL) and dried under Na_2SO_4. The volatiles were evaporated under vacuum. Crude material was purified via column chromatography using 30% ethyl acetate in hexane to get pure **4a** as oil (57 mg, 87 % yield).

 **4a**	Compound **4a**: Oil; eluent (30% ethyl acetate in hexane) **Yield**: 87% (57 mg).**^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.32 – 7.18 (m, 5H), 4.56 (d, *J* = 7.1 Hz, 1H), 3.64 (t, *J* = 7.2 Hz, 1H), 2.97 (s, 1H), 2.60 (s, 1H), 2.64 (s, 3H) , 1.66 – 1.51 (m, 2H), 1.42 – 1.26 (m, 2H), 1.09 – 0.82 (m, 2H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ 128.5 (2×C), 128.2, 127.2, 88.3, 76.6, 51.1, 44.5, 31.1, 29.9, 24.6. **HRMS** (ESI/TOF-Q) m/z: $[M+H]^+$ Calculated for $C_{14}H_{20}NO_2^+$ 234.1489; Found 234.1486.

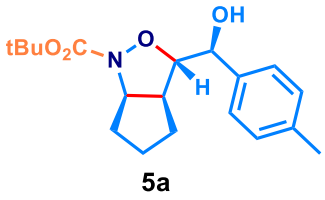
Synthesis of compound 5a:



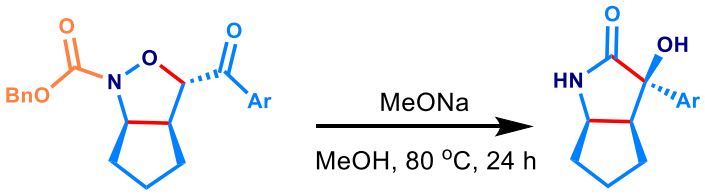
3wa (0.18 mmol) **5a**, 92%

To an oven dried 25 mL round bottom flask, the product **3wa** (60 mg, 0.18 mmol, 1.0 equiv) was dissolved in 2 mL MeOH. Next, 15 mg 5% Pd/C in 1 mL of 5% aqueous AcOH was added. The round bottom flask was exposed to hydrogen gas by a hydrogen bladder and stirred at room temperature for 72 h. After completion, reaction mixture was filtered through a short celite pad and the solid was washed with dichloromethane. The filtrate was diluted with 2.5 mL of water, the aqueous layer was then extracted with dichloromethane (3 X 3 mL) and the

organic layer was dried over Na_2SO_4. After concentration under reduced pressure, the crude material was purified via column chromatography using 5% ethyl acetate in hexane to get **5a** as oil (55 mg, 92 % yield).

 **5a**	Compound, **5a**: Sticky liquid; eluent (30% ethyl acetate in hexane) **Yield**: 92% (55 mg). **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.27 (d, *J* = 7.8 Hz, 2H), 7.18 (d, *J* = 8.0 Hz, 2H), 4.69 – 4.65 (m, 1H), 4.07 (d, *J* = 9.6 Hz, 1H), 3.92 (d, *J* = 9.6 Hz, 1H), 2.68 – 2.63 (m, 1H), 2.36 (s, 3H), 1.87 – 1.82 (m, 2H), 1.76 – 1.60 (m, 2H), 1.57 (s, 9H), 1.53 – 1.39 (m, 2H, merged with water).**^{13}C NMR (101 MHz, $CDCl_3$)** δ 157.7, 138.3, 135.3, 129.5, 127.7, 93.4, 82.9, 73.2, 64.7, 48.2, 34.7, 32.5, 28.2, 25.6, 21.3. **HRMS** (ESI/TOF-Q) m/z: $[M+H]^+$ Calculated for $C_{19}H_{28}NO_4^+$ 334.2013; Found 334.2016.

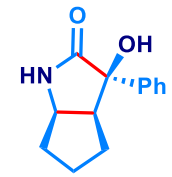
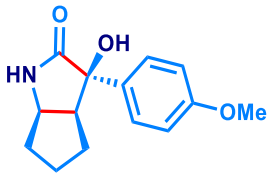
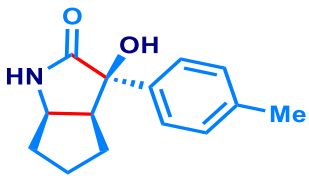
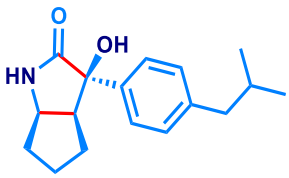
General procedure for synthesis of compound 6:

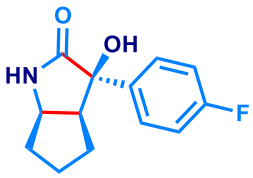
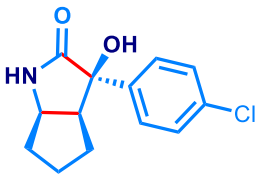
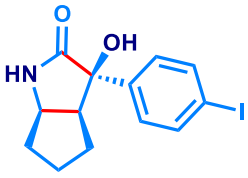
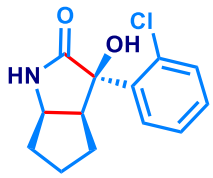


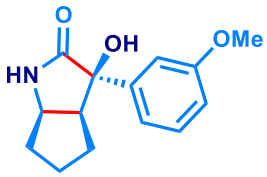
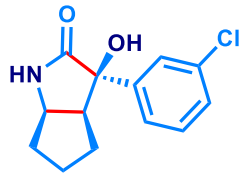
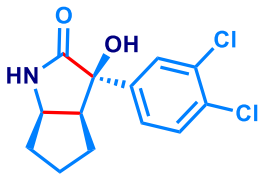
3 **6**

single diastereomer

A 16 mL oven dried sealed pressure tube equipped with a magnetic stir was charged with product **3** (0.2 mmol, 1.0 equiv). The reaction tube was capped with a rubber septum, evacuated, and backfilled with nitrogen gas. Then, 5 mL of freshly prepared sodium methoxide (25% solution) in anhydrous methanol was added and the rubber septum was replaced with a reaction tube cap under inert atmosphere. Then the mixture was heated at 80 °C for 24 h. Next, the reaction mixture was cooled down to room temperature and slowly neutralized with aqueous HCl. The resulting suspension was washed with EtOAc (3 X 6 mL). Organic layer was washed with brine (6 mL) and dried under Na_2SO_4. The volatiles were evaporated in vacuum. The crude material was purified via silica gel column chromatography using (35-45% ethyl acetate: hexane) to get pure compound **6** as white solid.

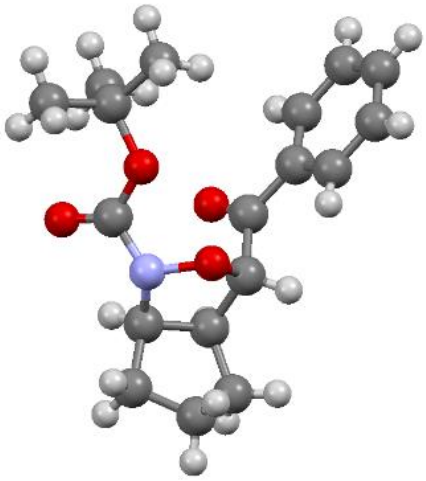
 **6a**	Compound, **6a**: White solid; eluent (40% ethyl acetate in Hexane) **Yield**: 94% (57 mg).**^{1}H NMR (400 MHz, DMSO-*d*$_6$)** δ 7.89 (s, 1H), 7.42 – 7.30 (m, 4H), 7.23 (t, *J* = 7.1 Hz, 1H), 5.74 (s, 1H), 3.96 (s, 1H), 2.72 – 2.69 (m, 1H), 2.10 – 2.06 (m, 1H), 1.65 – 1.44 (m, 5H). **^{13}C NMR (101 MHz, DMSO-*d*$_6$)** δ 176.3, 146.1, 128.0, 126.9, 124.8, 78.2, 55.6, 51.6, 33.8, 26.0, 24.0. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{13}H_{15}NO_2Na^+$ 240.0995; Found 240.0998.
 **6d**	Compound, **6b**: White solid; eluent (40% ethyl acetate in Hexane) **Yield**: 88% (41 mg). **^{1}H NMR (400 MHz, DMSO-*d*$_6$)** δ 7.86 (s, 1H), 7.29 (d, *J* = 7.5 Hz, 2H), 7.12 (d, *J* = 7.6 Hz, 2H), 5.68 (s, 1H), 3.93 (s, 1H), 2.69 – 2.67 (m, 1H), 2.27 (s, 3H), 2.09 – 2.05 (m, 1H), 1.64 – 1.45 (m, 5H). **^{13}C NMR (101 MHz, DMSO-*d*$_6$)** δ 176.4, 143.1, 135.8, 128.5, 124.8, 78.0, 55.5, 51.5, 33.8, 25.9, 23.9, 20.6. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{14}H_{17}NO_2Na^+$ 254.1151; Found 254.1171.
 **6b**	Compound, **6c**: White solid; eluent (40% ethyl acetate in Hexane) **Yield**: 93% (51 mg). **^{1}H NMR (400 MHz, DMSO-*d*$_6$)** δ 7.88 (s, 1H), 7.32 (d, *J* = 7.8 Hz, 2H), 7.10 (d, *J* = 7.7 Hz, 2H), 5.69 (s, 1H), 3.96 – 3.93 (m, 1H), 2.71 – 2.67 (m, 1H), 2.42 (d, *J* = 7.0 Hz, 2H), 2.10 – 2.06 (m, 1H), 1.85 – 1.75 (m, 1H), 1.65 – 1.46 (m, 5H), 0.85 (d, *J* = 6.5 Hz, 6H). **^{13}C NMR (101 MHz, DMSO-*d*$_6$)** δ 176.4, 143.4, 139.6, 128.5, 124.6, 78.0, 55.5, 51.5, 44.2, 33.8, 29.7, 25.9, 23.9, 22.2 (2×C). **HRMS** (ESI/TOF-Q) m/z: $[M+H]^+$ Calculated for $C_{17}H_{24}NO_2^+$ 274.1802; Found 274.1800.
 **6c**	Compound, **6d**: White solid; eluent (40% ethyl acetate in Hexane) **Yield**: 87% (43 mg). **^{1}H NMR (400 MHz, DMSO-*d*$_6$)** δ 7.83 (s, 1H), 7.33 (d, *J* = 7.2 Hz, 2H), 6.88 (d, *J* = 7.5 Hz, 2H), 5.66 (s, 1H), 3.91 (bs, 1H), 3.73 (s, 3H), 2.71 – 2.68 (m, 1H), 2.07 – 2.04 (m, 1H), 1.64 – 1.46 (m, 5H). **^{13}C NMR (101 MHz, DMSO-*d*$_6$)** δ 176.4, 158.2, 138.0, 126.1, 113.3, 77.8, 55.4, 55.1, 51.4, 33.7, 25.9, 23.9. **HRMS** (ESI/TOF-Q) m/z: $[M+H]^+$ Calculated for $C_{14}H_{18}NO_3^+$ 248.1281; Found 248.1280.

 **6e**	Compound, **6e**: White solid; eluent (40% ethyl acetate in Hexane) **Yield**: 95% (43 mg). **^{1}H NMR (400 MHz, DMSO-*d*$_6$)** δ 7.93 (s, 1H), 7.46 – 7.42 (m, 2H), 7.14 (t, *J* = 8.7 Hz, 2H), 5.87 (s, 1H), 3.96 (s, 1H), 2.71 – 2.68 (m, 1H), 2.09 – 2.05 (m, 1H), 1.64 – 1.46 (m, 5H). **^{13}C NMR (101 MHz, DMSO-*d*$_6$)** δ 176.1, 161.2 (d, $^{1}J_{C-F}$ = 242.7 Hz), 142.2 (d, $^{4}J_{C-F}$ = 2.8 Hz), 126.9 (d, $^{3}J_{C-F}$ = 8.1 Hz), 114.7 (d, $^{2}J_{C-F}$ = 21.1 Hz), 77.8, 55.5, 51.4, 33.8, 25.9, 23.9. **^{19}F NMR (471 MHz, DMSO-*d*$_6$)** δ -115.8. **HRMS** (ESI/TOF-Q) m/z: $[M+H]^+$ Calculated for $C_{13}H_{15}FNO_2^+$ 236.1081; Found 236.1080.
 **6f**	Compound, **6f**: White solid; eluent (40% ethyl acetate in Hexane) **Yield**: 89% (45 mg). **^{1}H NMR (400 MHz, DMSO-*d*$_6$)** δ 7.96 (s, 1H), 7.40 (q, *J* = 8.2 Hz, 4H), 5.93 (s, 1H), 3.97 (bs, 1H), 2.70 – 2.67 (m, 1H), 2.09 – 2.05 (m, 1H), 1.66 – 1.46 (m, 5H). **^{13}C NMR (101 MHz, DMSO-*d*$_6$)** δ 176.3, 145.5, 131.9, 128.4, 127.3, 78.3, 55.9, 51.7, 34.2, 26.4, 24.3. **HRMS** (ESI/TOF-Q) m/z: $[M+H]^+$ Calculated for $C_{13}H_{15}ClNO_2^+$ 252.0786; Found 252.0785.
 **6g**	Compound, **6g**: White solid; eluent (40% ethyl acetate in Hexane) **Yield**: 87% (57 mg). **^{1}H NMR (400 MHz, DMSO-*d*$_6$)** δ 7.96 (s, 1H), 7.68 (d, *J* = 8.1 Hz, 2H), 7.22 (d, *J* = 8.1 Hz, 2H), 5.90 (s, 1H), 3.95 (bs, 1H), 2.68 – 2.63 (m, 1H), 2.08 – 2.04 (m, 1H), 1.63 – 1.43 (m, 5H). **^{13}C NMR (101 MHz, DMSO-*d*$_6$)** δ 175.8, 146.0, 136.7, 127.3, 92.8, 77.9, 55.5, 51.2, 33.8, 25.9, 23.9. **HRMS** (ESI/TOF-Q) m/z: $[M+H]^+$ Calculated for $C_{13}H_{15}INO_2^+$ 344.0142; Found 344.0141.
 **6h**	Compound, **6h**: White solid; eluent (40% ethyl acetate in Hexane) **Yield**: 91% (47 mg). **^{1}H NMR (400 MHz, DMSO-*d*$_6$)** δ 7.89 (s, 1H), 7.42 (s, 1H), 7.34 – 7.30 (m, 2H), 7.25 –7.21 (m, 1H), 5.75 (s, 1H), 3.97 – 3.95 (m, 1H), 2.72 – 2.67 (m, 1H), 2.11– 2.05 (m, 1H), 1.66 – 1.44 (m, 5H). **^{13}C NMR (101 MHz, DMSO-*d*$_6$)** δ 176.4, 146.1, 128.1(2C), 127.0, 124.9(2C), 78.3, 55.7, 51.6, 33.9, 26.0, 24.0. **HRMS** (ESI/TOF-Q) m/z: $[M+H]^+$ Calculated for $C_{13}H_{15}ClNO_2^+$ 252.0786; Found 252.0784.

 **6i**	Compound, **6i**: White solid; eluent (40% ethyl acetate in Hexane) **Yield**: 89% (44 mg). **^{1}H NMR (400 MHz, DMSO-*d*$_6$)** δ 7.91 (s, 1H), 7.24 (t, *J* = 7.9 Hz, 1H), 6.99 (s, 1H), 6.94 (d, *J* = 7.7 Hz, 1H), 6.81 (d, *J* = 8.1 Hz, 1H), 5.76 (s, 1H), 3.96 (s, 1H), 3.74 (s, 3H), 2.70 – 2.68 (m, 1H), 2.09 – 2.05 (m, 1H), 1.64 – 1.45 (m, 5H). **^{13}C NMR (101 MHz, DMSO-*d*$_6$)** δ 176.2, 159.1, 147.8, 129.1, 116.9, 112.0, 110.8, 78.1, 55.6, 55.0, 51.5, 33.8, 26.0, 23.9. **HRMS** (ESI/TOF-Q) m/z: $[M+Na]^+$ Calculated for $C_{14}H_{18}NO_3^+$ 248.1281; Found 248.1280.
 **6j**	Compound, **6j**: White solid; eluent (40% ethyl acetate in Hexane) **Yield**: 87% (44 mg). **^{1}H NMR (400 MHz, DMSO-*d*$_6$)** δ 7.98 (s, 1H), 7.45 (s, 1H), 7.39 – 7.29 (m, 3H), 5.98 (s, 1H), 4.01 – 3.98 (m, 1H), 2.73 – 2.68 (m, 1H), 2.10 – 2.04 (m, 1H), 1.66 –1.62 (m, 2H), 1.57 – 1.48 (m, 3H). **^{13}C NMR (101 MHz, DMSO-*d*$_6$)** δ 175.6, 148.6, 132.9, 130.0, 126.8, 124.9, 123.4, 77.9, 55.6, 51.1, 33.8, 25.9, 23.9. **HRMS** (ESI/TOF-Q) m/z: $[M+H]^+$ Calculated for $C_{13}H_{15}ClNO_2^+$ 252.0786; Found 252.0782.
 **6k**	Compound, **6k**: White solid; eluent (40% ethyl acetate in Hexane) **Yield**: 94% (54 mg). **^{1}H NMR (400 MHz, DMSO-*d*$_6$)** δ 8.03 (s, 1H), 7.60 – 7.58 (m, 2H), 7.35 (d, *J* = 8.4 Hz, 1H), 6.11 (s, 1H), 4.00 (bs, 1H), 2.73 – 2.71 (m, 1H), 2.07 – 2.05 (m, 1H), 1.64 – 1.63 (m, 2H), 1.54 – 1.46 (m, 3H). **^{13}C NMR (101 MHz, DMSO-*d*$_6$)** δ 175.3, 147.2, 130.8, 130.4, 129.5, 127.1, 125.3, 77.7, 55.6, 50.9, 33.8, 26.0, 23.9. **HRMS** (ESI/TOF-Q) m/z: $[M+H]^+$ Calculated for $C_{13}H_{14}Cl_2NO_2^+$ 286.0396; Found 286.0395.

Crystallographic experimental data

Crystal Data for 3w:



Crystallization: Crystals of compound **3w** were obtained through slow evaporation technique at room temperature from the solution in $CDCl_3$. Crystal structure of compound **3w** has the **CCDC number: 2243707 (**Ellipsoid Probability 50%).

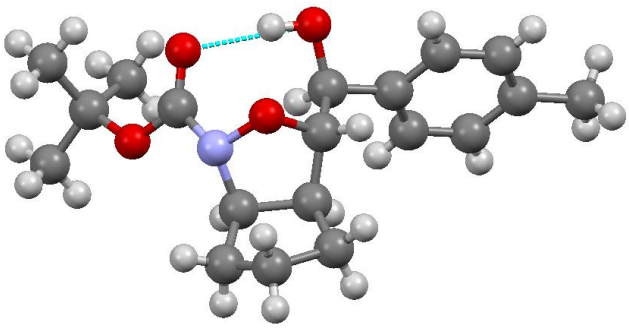
Crystal data and structure refinement for **3w**.

Identification code	3w	
Empirical formula	$C_{13}\ H_{27}\ N\ O_4$	
Formula weight	317.388	
Temperature	296.15 K	
Wavelength	0.71073 Å	
Crystal system	Orthorhombic	
Space group	$Pna2_1$	
Unit cell dimensions	a = 12.2934 (5) Å	α= 90°.
	b = 14.3475 (5) Å	β= 90°.
	c = 9.7444(4) Å	γ = 90°.
Volume	1718.71(12) Å3	

Z	4
Density (calculated)	1.227 g/m3
Absorption coefficient	0.086 mm-1
F(000)	680.5
Crystal size	0.25 x 0.22 x 0.1 mm3
Theta range for data collection/°	4.36 to 49.98.
Index ranges	-14≤ h≤ 14, -17 ≤ k ≤15, -11≤ l≤ 11
Reflections collected	11670
Independent reflections	3028 [R_{int} = 0.0231, R_{sigma}= 0.0230]
Data / restraints / parameters	3028 / 1 / 94
Goodness-of-fit on F2	1.697
Final R indices [I>2sigma(I)]	R1 = 0.1131, wR2 = 0.3572
R indices (all data)	R1 = 0.1239, wR2 = 0.3789
Extinction coefficient	n/a
Largest diff. peak and hole	0.62/-0.42 e.Å-3

Crystal Data for 5a:

Crystals of compound **5a** were obtained through slow evaporation technique at room temperature from the solution in $CDCl_3$. Crystal structure of compound **5a** has the **CCDC number: 2245191 (**Ellipsoid Probability 50%).

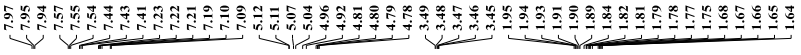


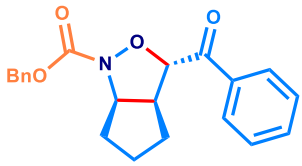
Crystal data and structure refinement for **5a**

Identification code	5a	
Empirical formula	C_{19} H_{27} N O_4	
Formula weight	333.41	
Temperature	298(2) K	
Wavelength	1.54178 Å	
Crystal system, space group	Monoclinic, C 2/c	
Unit cell dimensions	a = 26.239(5) Å	α = 90 deg.
	b = 14.599(3) Å	β = 112.952(8) deg.
	c = 10.4681(18) Å	γ= 90 deg.
Volume	3692.3(11) $Å^3$	
Z	8	
Calculated density	1.200 Mg/m^3	
Absorption coefficient	0.675 mm^{-1}	
F (000)	1440	
Crystal size	0.206 x 0.198 x 0.112 mm	
Theta range for data collection	3.537 to 68.245 deg.	
Limiting indices	-31<=h<=31, -17<=k<=17, -12<=l<=12	
Reflections collected / unique	50618 / 3387 [R(int) = 0.0495]	
Completeness to theta = 67.679	100.0 %	
Absorption correction	Semi-empirical from equivalents	
Max. and min. transmission	0.7531 and 0.6279	
Refinement method	Full-matrix least-squares on F^2	
Data / restraints / parameters	3387 / 52 / 235	
Goodness-of-fit on F^2	1.078	

Final R indices [I>2sigma(I)]	R1 = 0.0453, wR2 = 0.1286
R indices (all data)	R1 = 0.0557, wR2 = 0.1419
Extinction coefficient	0.00084(12)
Largest diff. peak and hole	0.243 and -0.241 $e.A^{-3}$

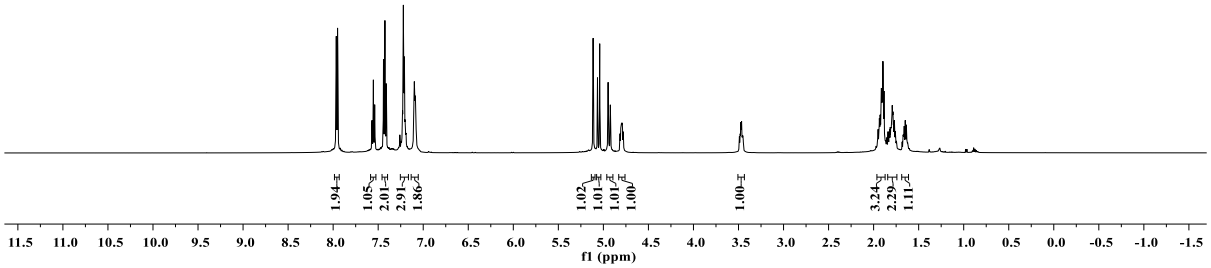
NMR SPECTRA OF SYNTHESISED COMPOUNDS

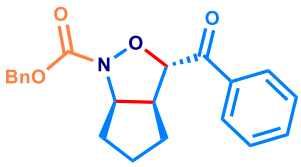




3a

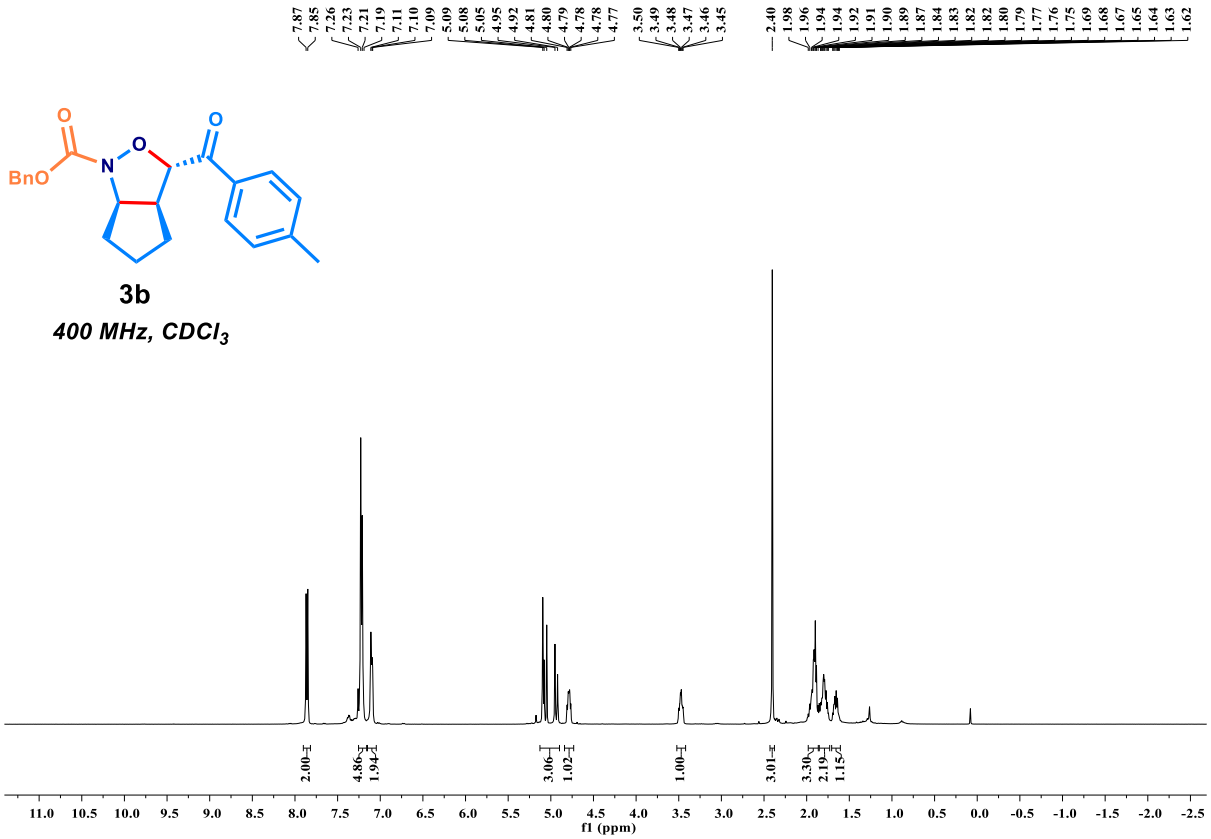
500 MHz, $CDCl_3$

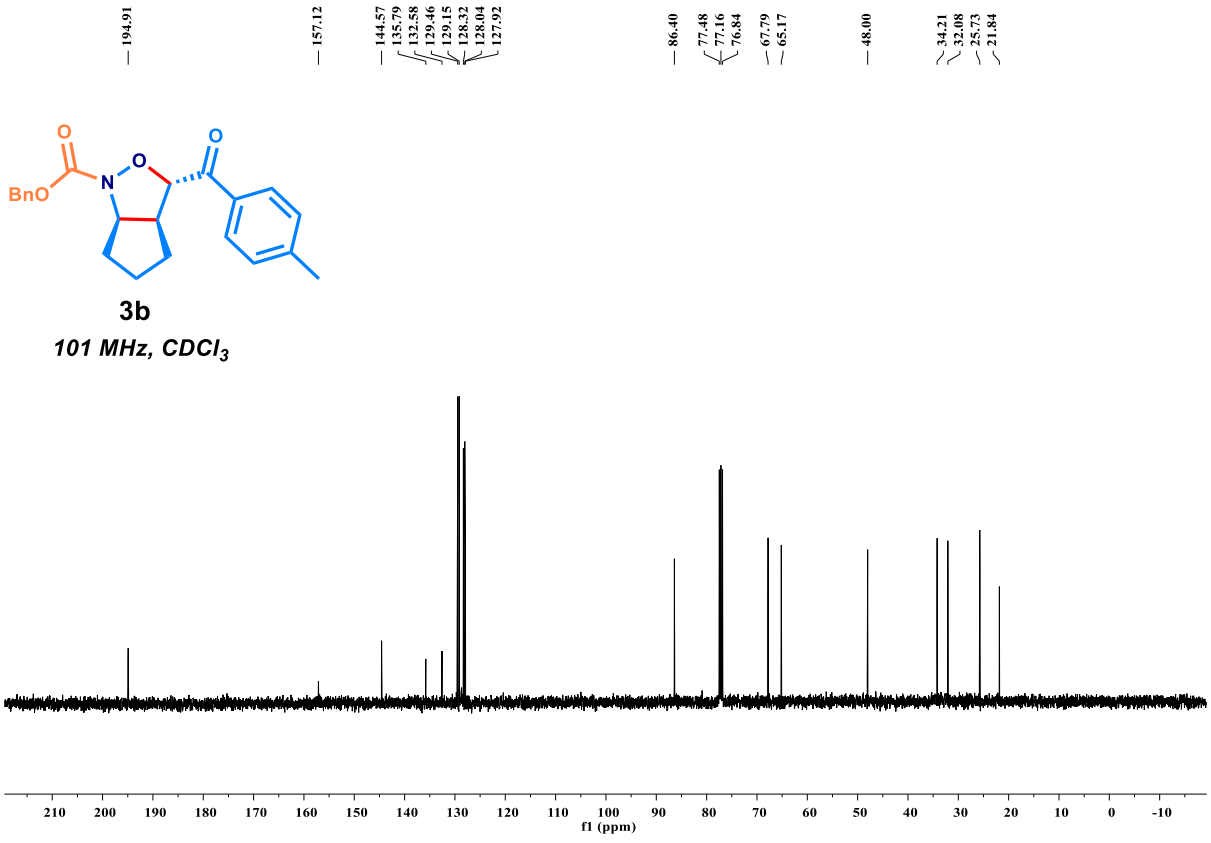


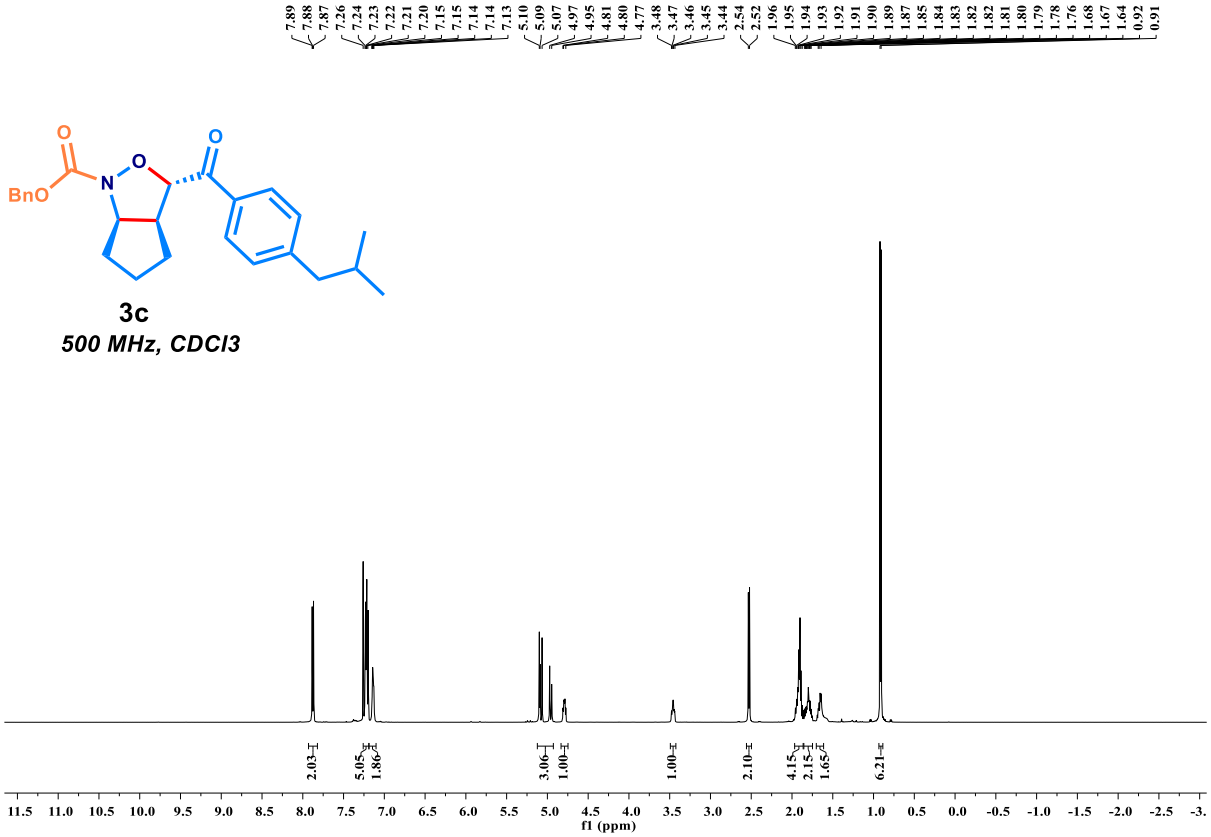


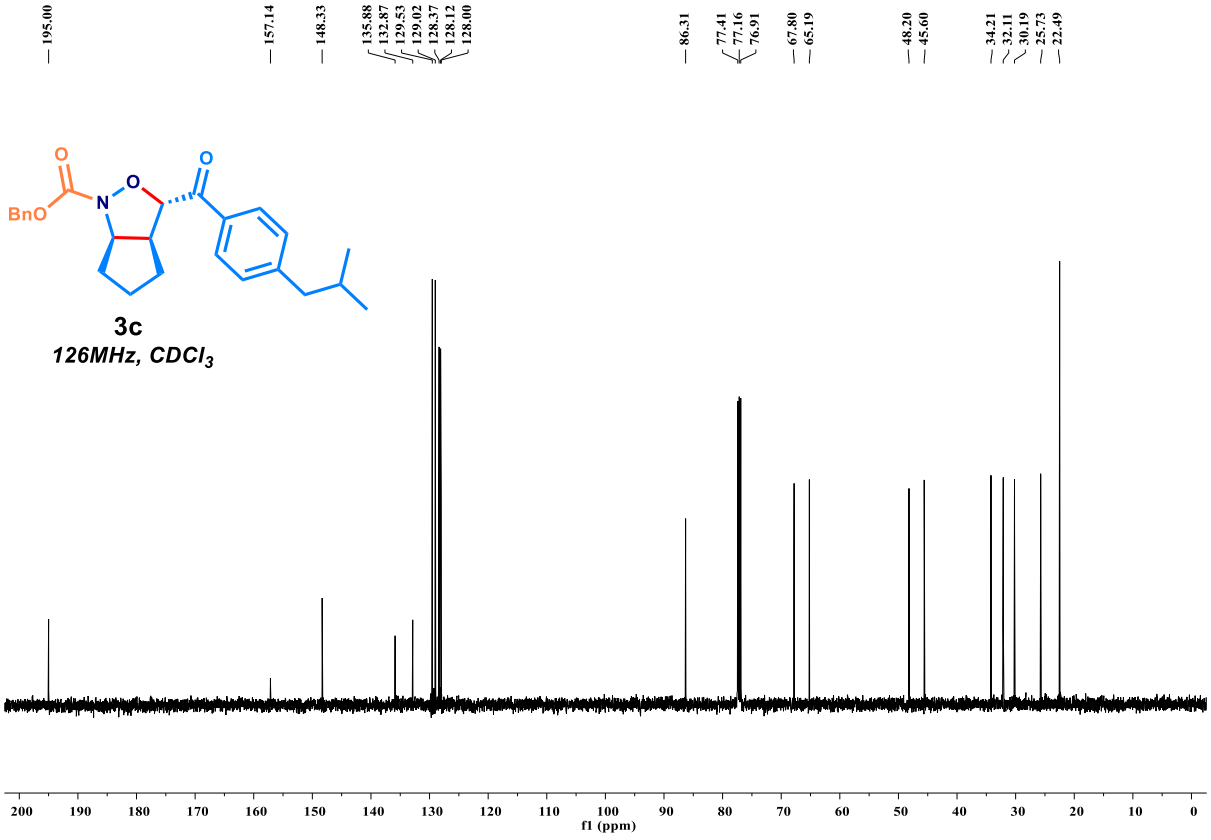
3a

126 MHz, $CDCl_3$


7.87
7.85
7.26
7.23
7.21
7.19
7.11
7.10
7.09
5.09
5.08
5.05
4.95
4.92
4.81
4.80
4.79
4.78
4.78
4.77
3.50
3.49
3.48
3.47
3.46
3.45
2.40
1.98
1.96
1.94
1.94
1.92
1.91
1.90
1.89
1.87
1.84
1.83
1.82
1.82
1.80
1.79
1.77
1.76
1.75
1.69
1.68
1.67
1.65
1.64
1.63
1.62
BnO
O
N
O
O
3b
400 MHz, CDCl3
2.00
4.86
1.94
3.06
1.02
1.00
3.01
3.30
2.19
1.15
11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1.0 -1.5 -2.0 -2.5
f1 (ppm)


194.91
157.12
144.57
135.79
132.58
129.46
129.15
128.32
128.04
127.92
86.40
77.48
77.16
76.84
67.79
65.17
48.00
34.21
32.08
25.73
21.84
BnO
O
N
O
O
3b
101 MHz, CDCl3
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


7.89
7.88
7.87
7.26
7.24
7.23
7.22
7.21
7.20
7.15
7.15
7.14
7.14
7.13
5.10
5.09
5.07
4.97
4.95
4.81
4.80
4.77
3.48
3.47
3.46
3.45
3.44
2.54
2.52
1.96
1.95
1.94
1.93
1.92
1.91
1.90
1.89
1.87
1.85
1.84
1.83
1.82
1.81
1.80
1.79
1.78
1.76
1.68
1.67
1.64
0.92
0.91
O
O
N
O
BnO
3c
500 MHz, CDCl3
2.03
5.05
1.86
3.06
1.00
1.00
2.10
4.15
2.15
1.65
6.21
11.5 11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1.0 -1.5 -2.0 -2.5 -3.
f1 (ppm)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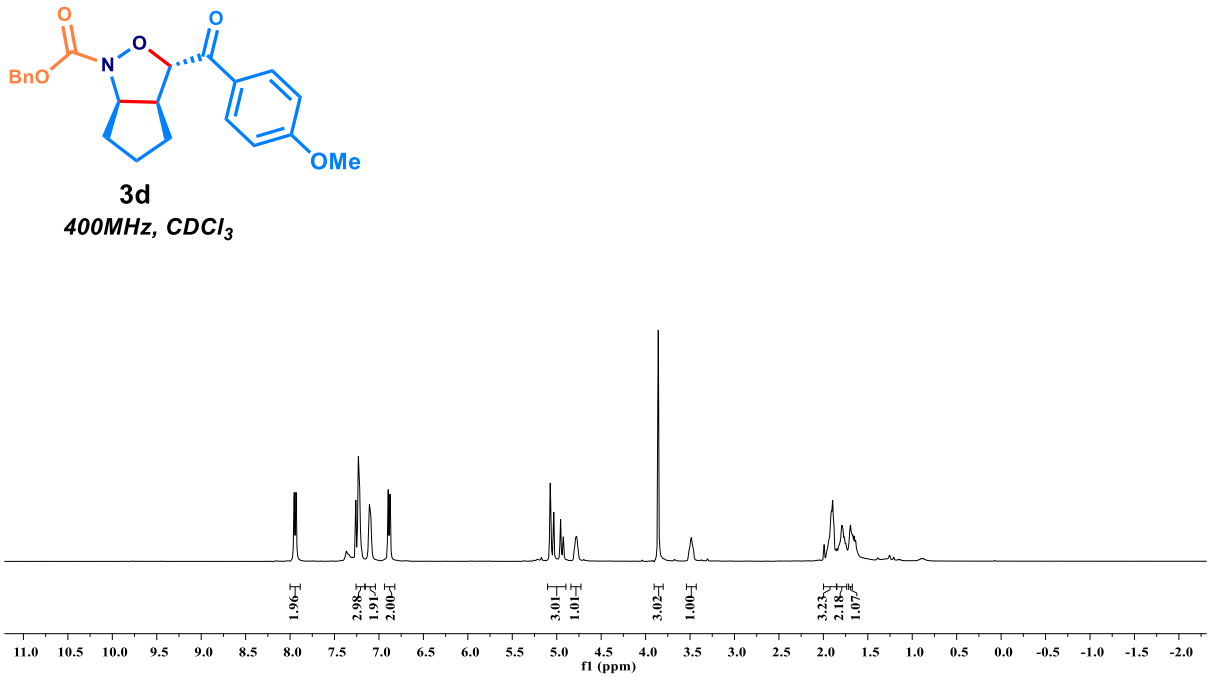
157.14
148.33
135.88
132.87
129.53
129.02
128.37
128.12
128.00
86.31
77.41
77.16
76.91
67.80
65.19
48.20
45.60
34.21
32.11
30.19
25.73
22.49
O
O
N
O
BnO
3c
126MHz, CDCl3
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)


7.95
7.93
7.26
7.23
7.22
7.11
6.90
6.88
5.07
5.06
5.04
5.03
4.96
4.93
4.80
4.79
4.77
4.76
3.86
3.51
3.49
3.46
1.99
1.93
1.91
1.89
1.84
1.81
1.79
1.77
1.75
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1.67
BnO
O
N
O
O
OMe
3d
400MHz, CDCl3
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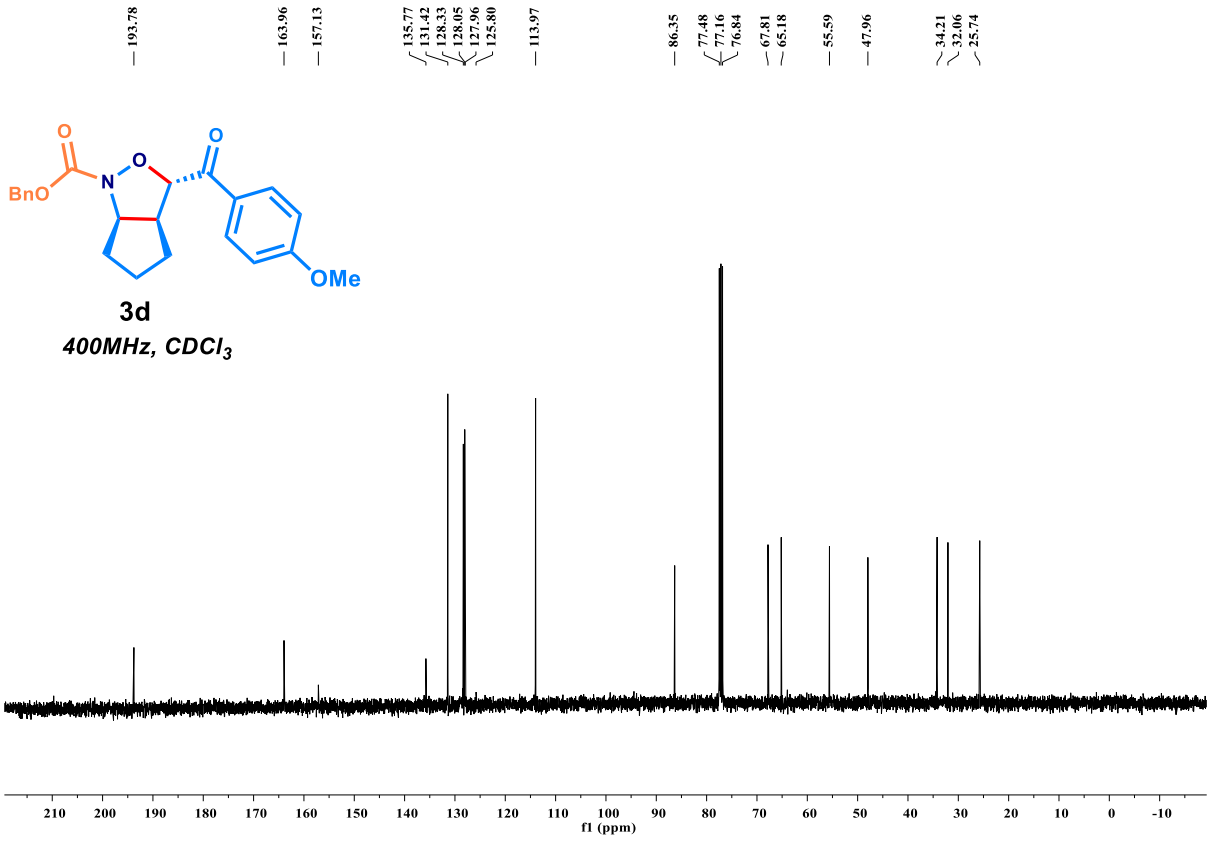
1.00
3.23
2.18
1.07
f1 (ppm)


193.78
163.96
157.13
135.77
131.42
128.33
128.05
127.96
125.80
113.97
86.35
77.48
77.16
76.84
67.81
65.18
55.59
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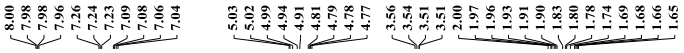
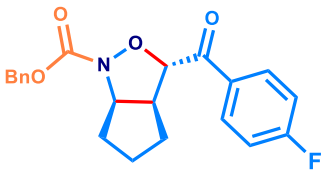
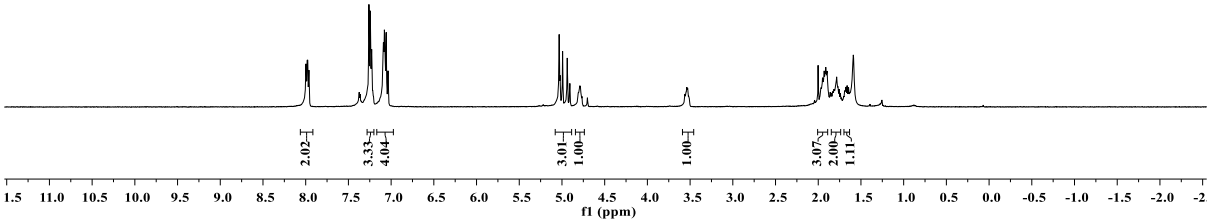
O
O
OMe
3d
400MHz, CDCl3
f1 (ppm)

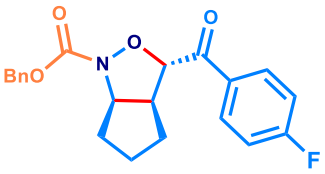




3e

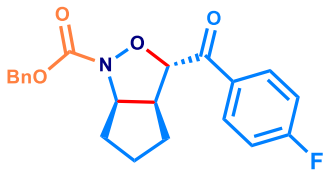
400 MHz, $CDCl_3$





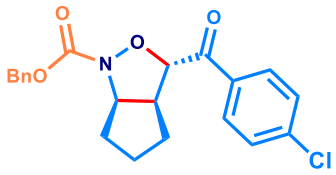
3e

101 MHz, $CDCl_3$



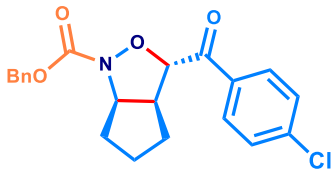
3e

471 MHz, $CDCl_3$



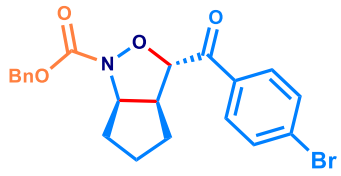
3f

400 MHz, $CDCl_3$



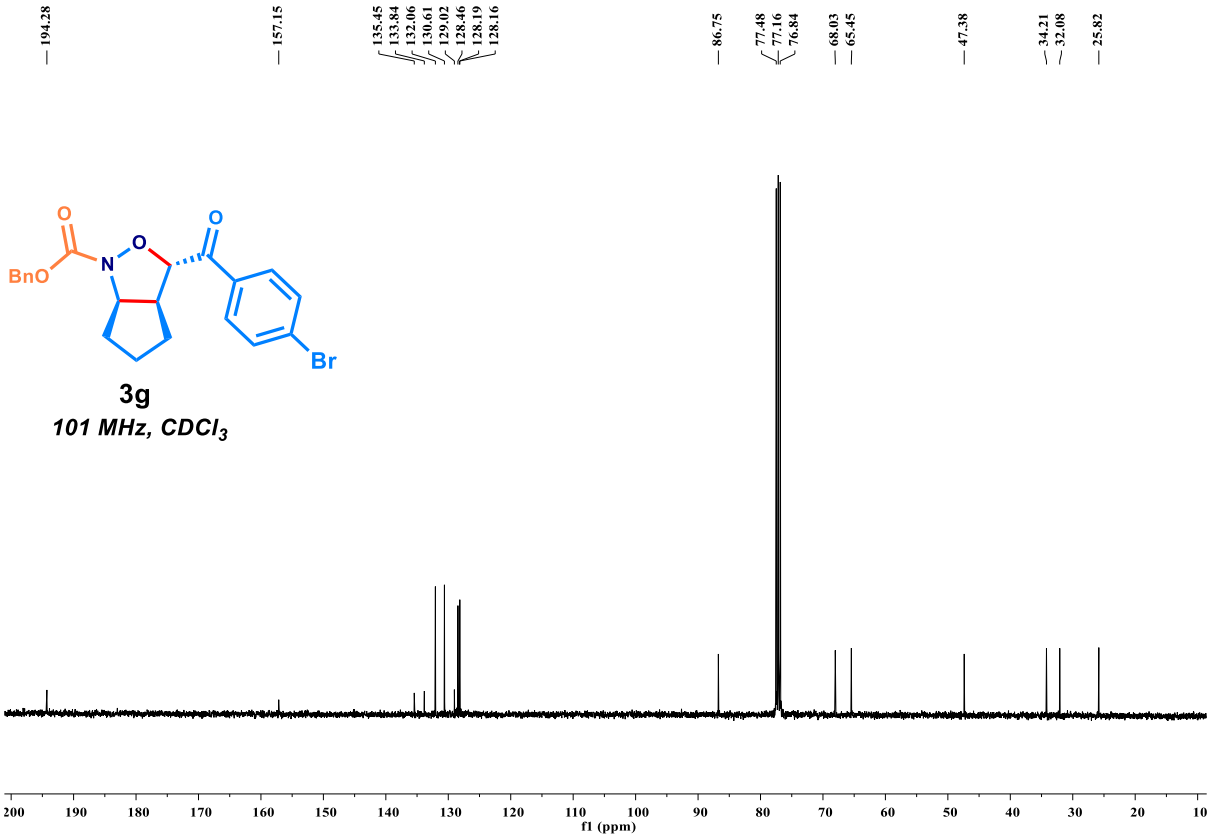
3f

101MHz, $CDCl_3$



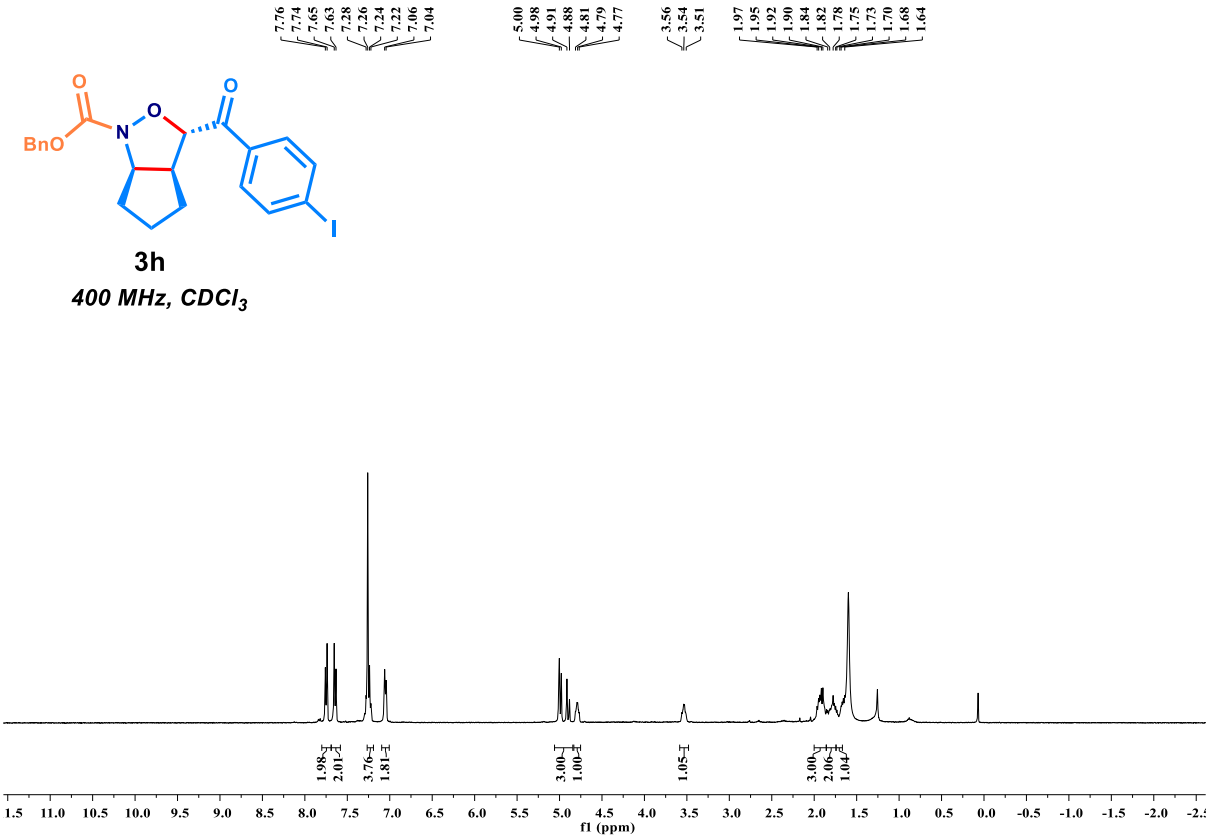
3g

400 MHz, $CDCl_3$



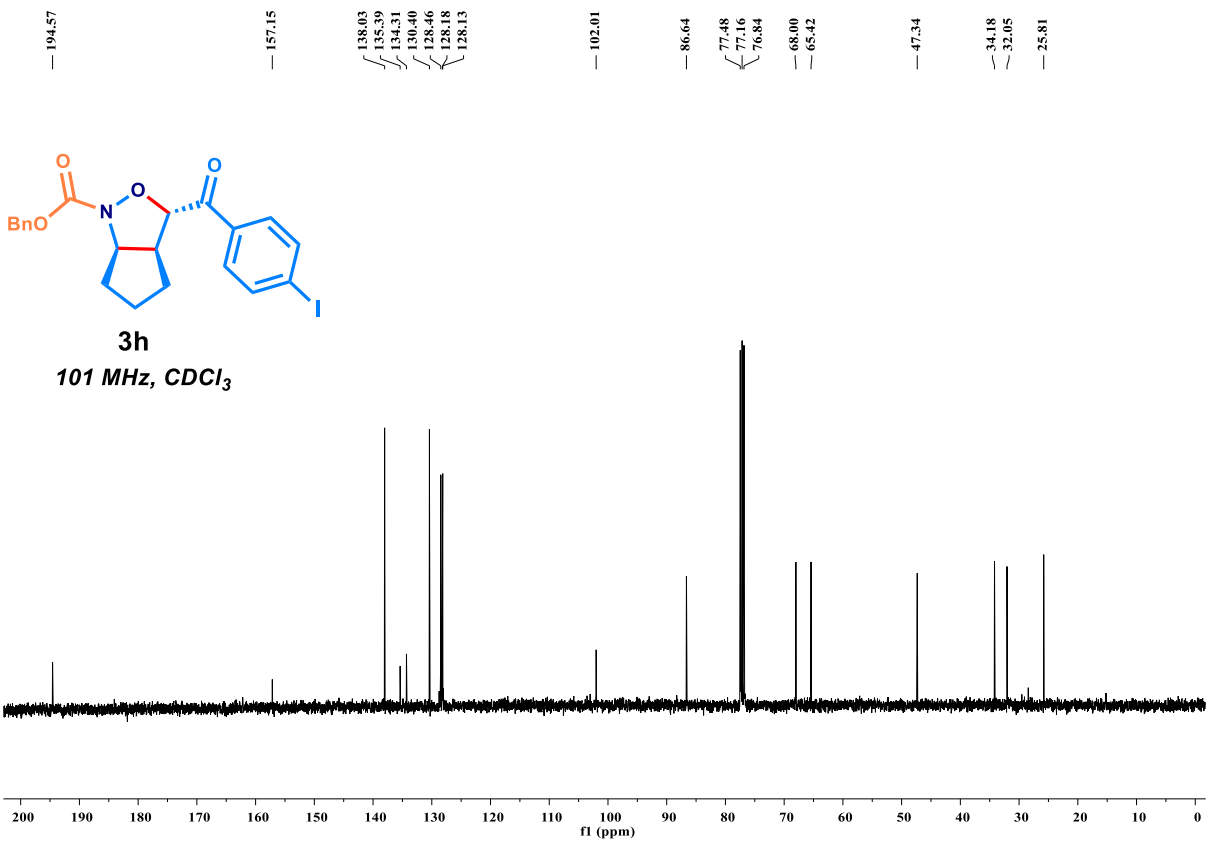
3g

101 MHz, $CDCl_3$



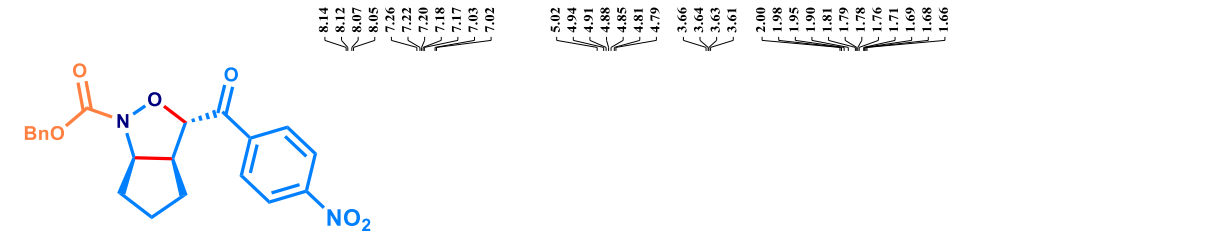
3h

400 MHz, $CDCl_3$



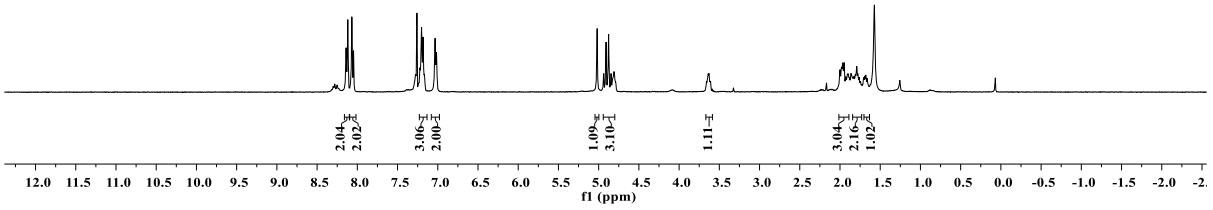
3h

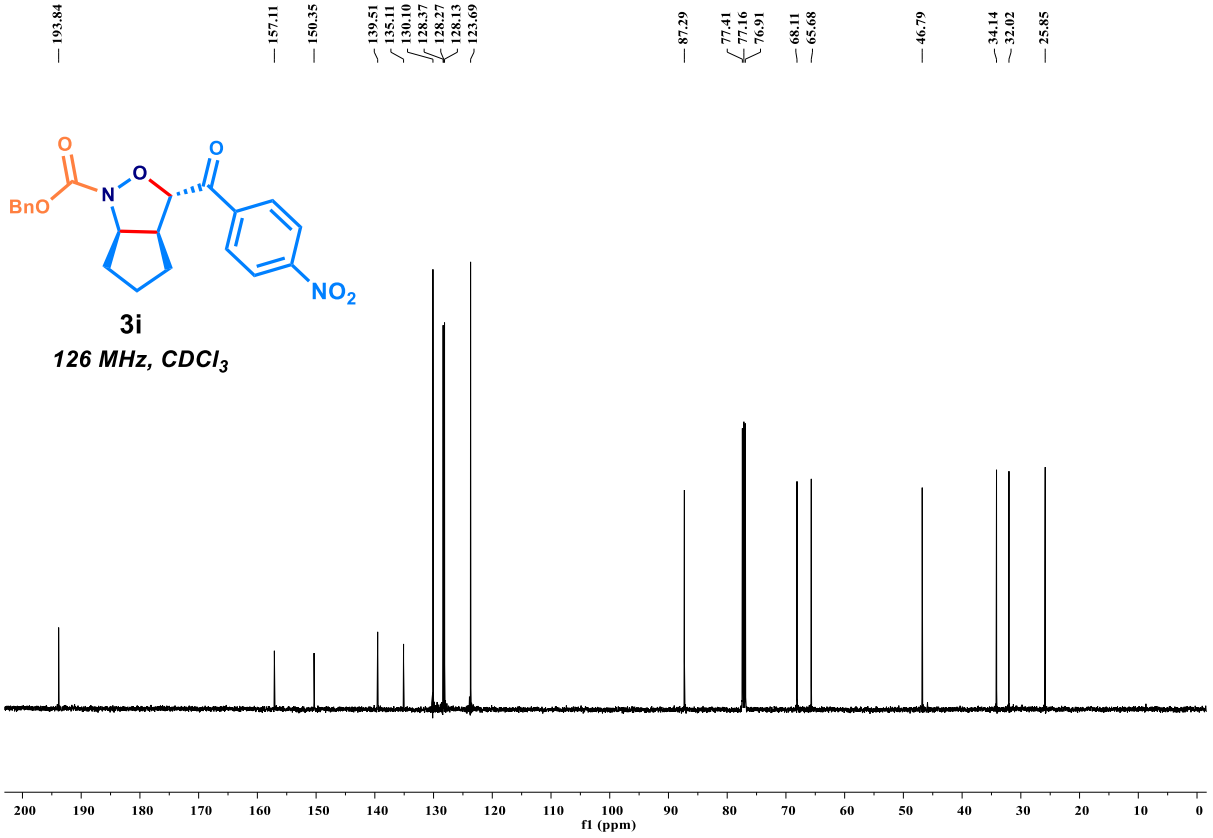
101 MHz, $CDCl_3$



3i

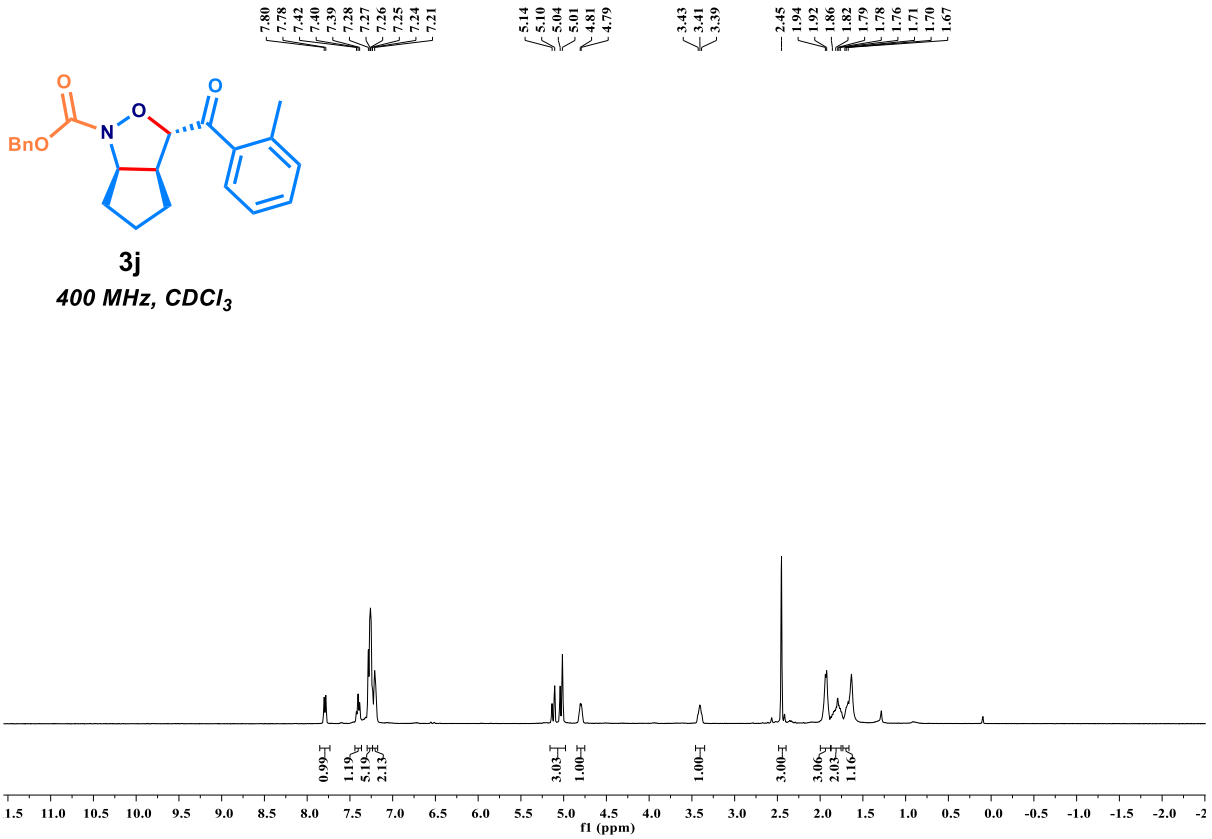
400 MHz, $CDCl_3$





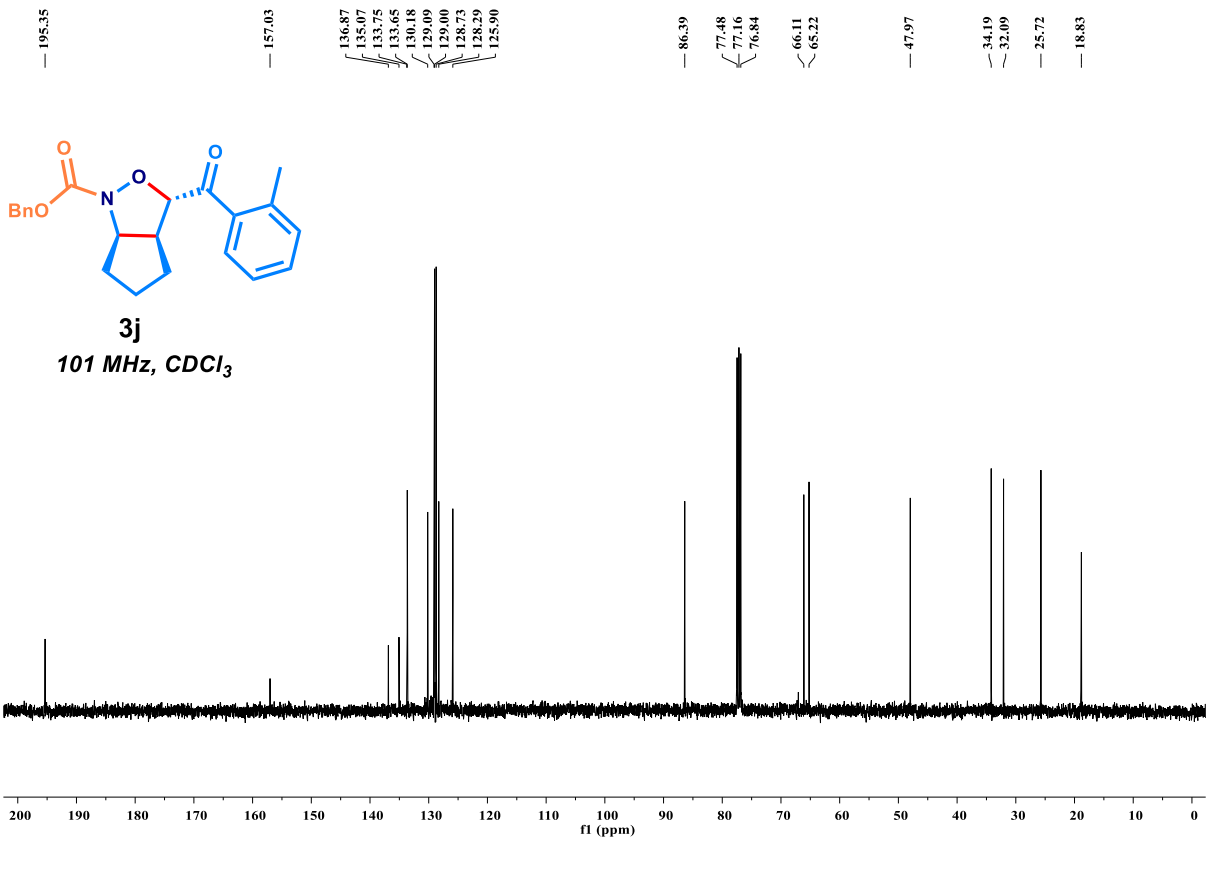
3i

126 MHz, $CDCl_3$



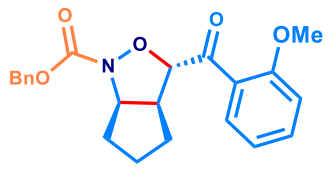
3j

400 MHz, $CDCl_3$



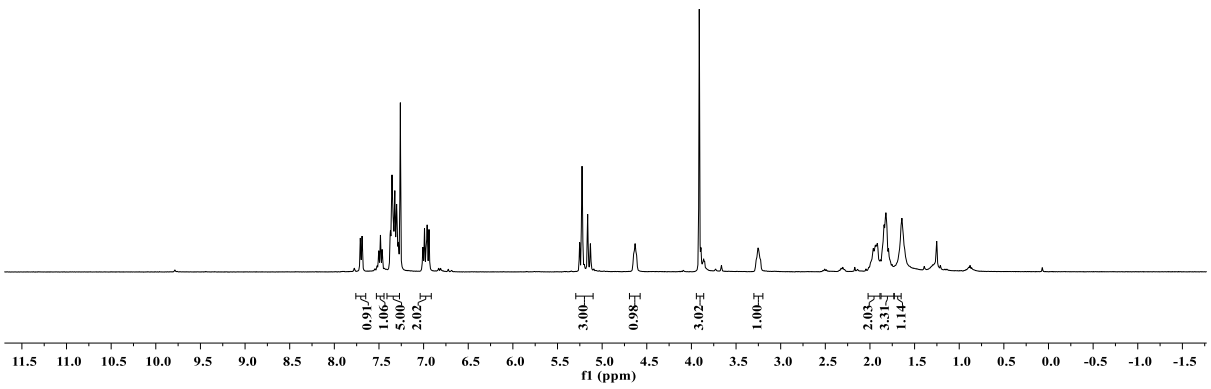
3j

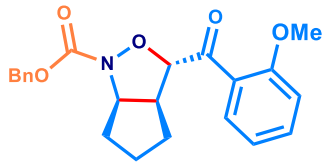
101 MHz, $CDCl_3$



3k

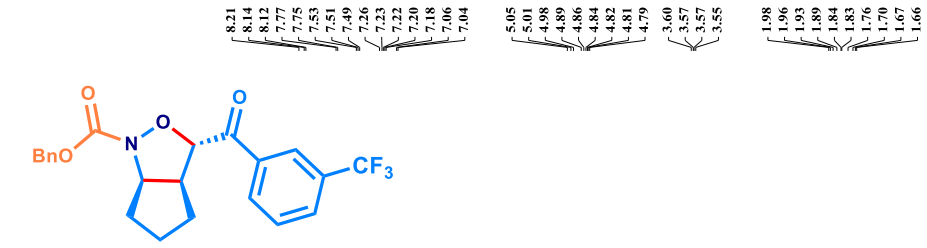
400 MHz, $CDCl_3$





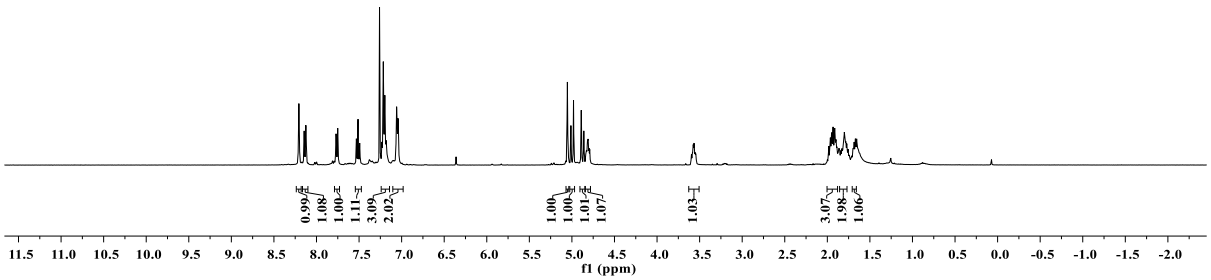
3k

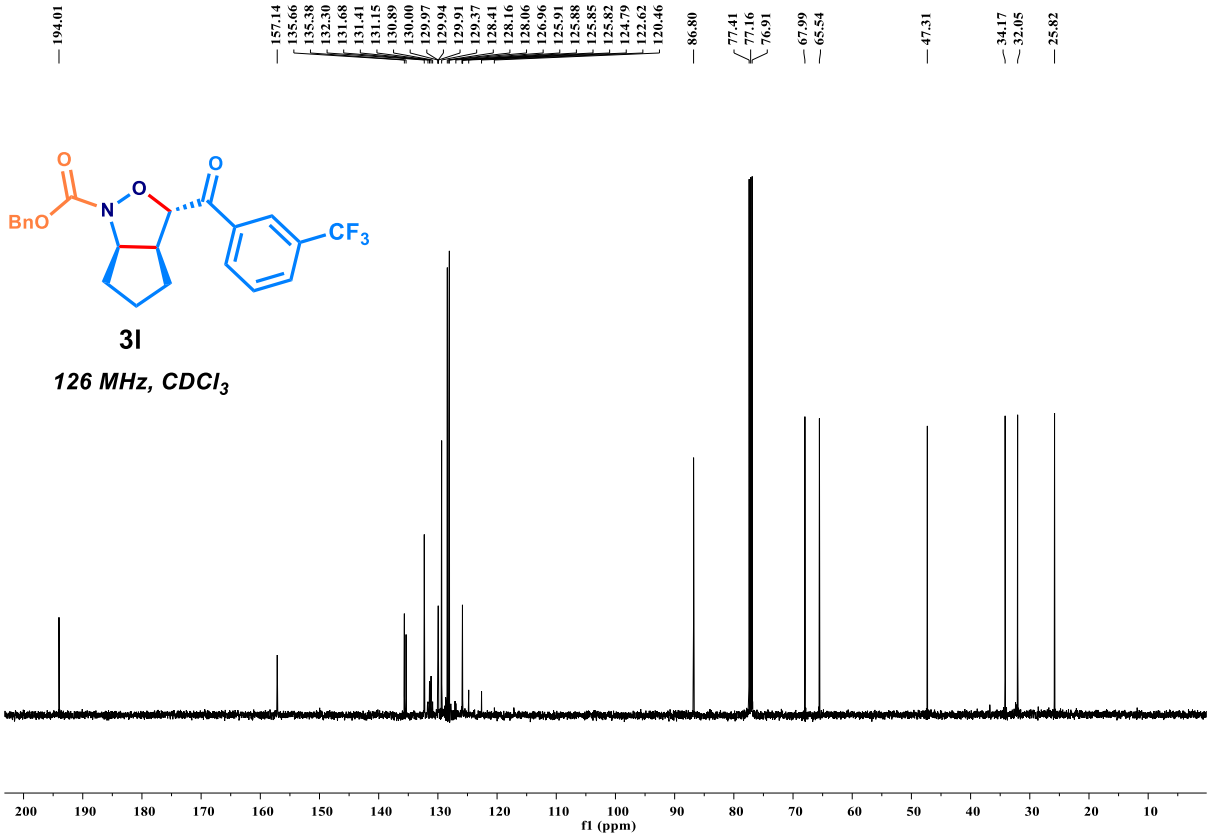
101 MHz, $CDCl_3$



3l

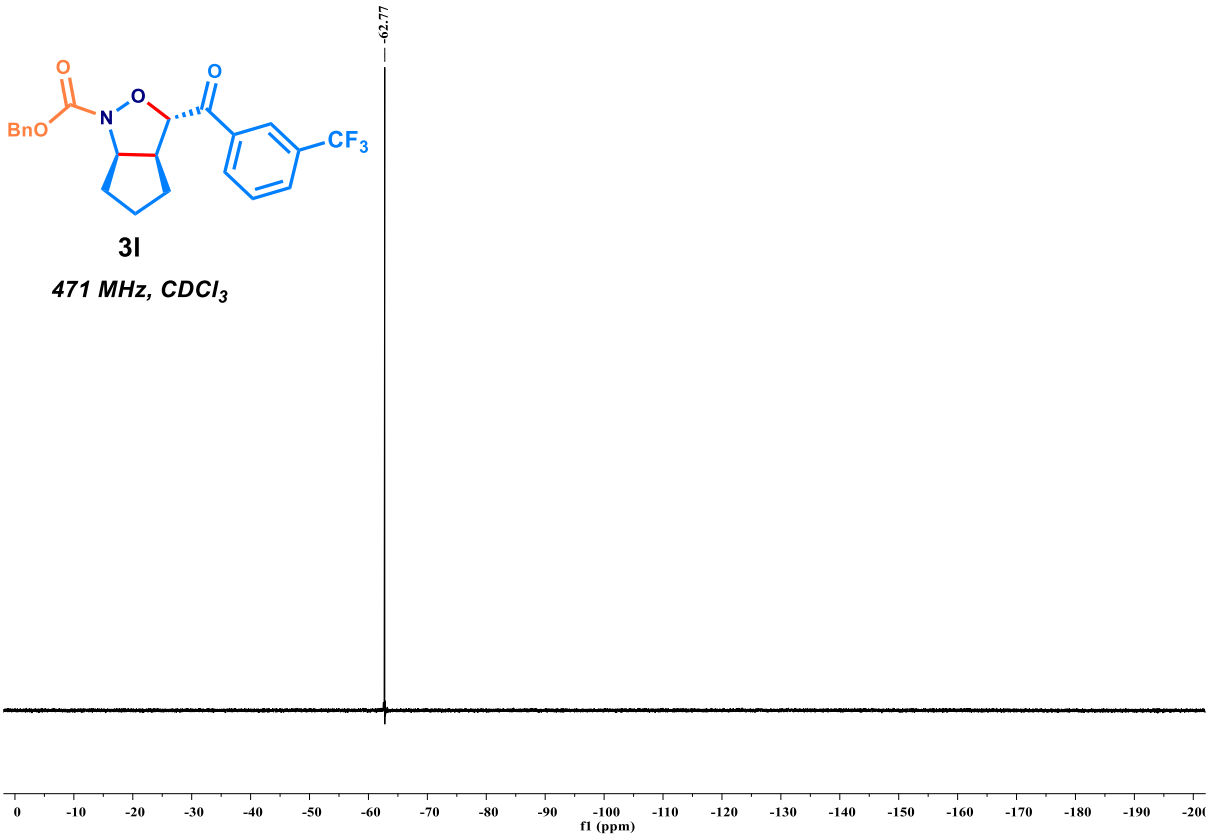
400 MHz, $CDCl_3$





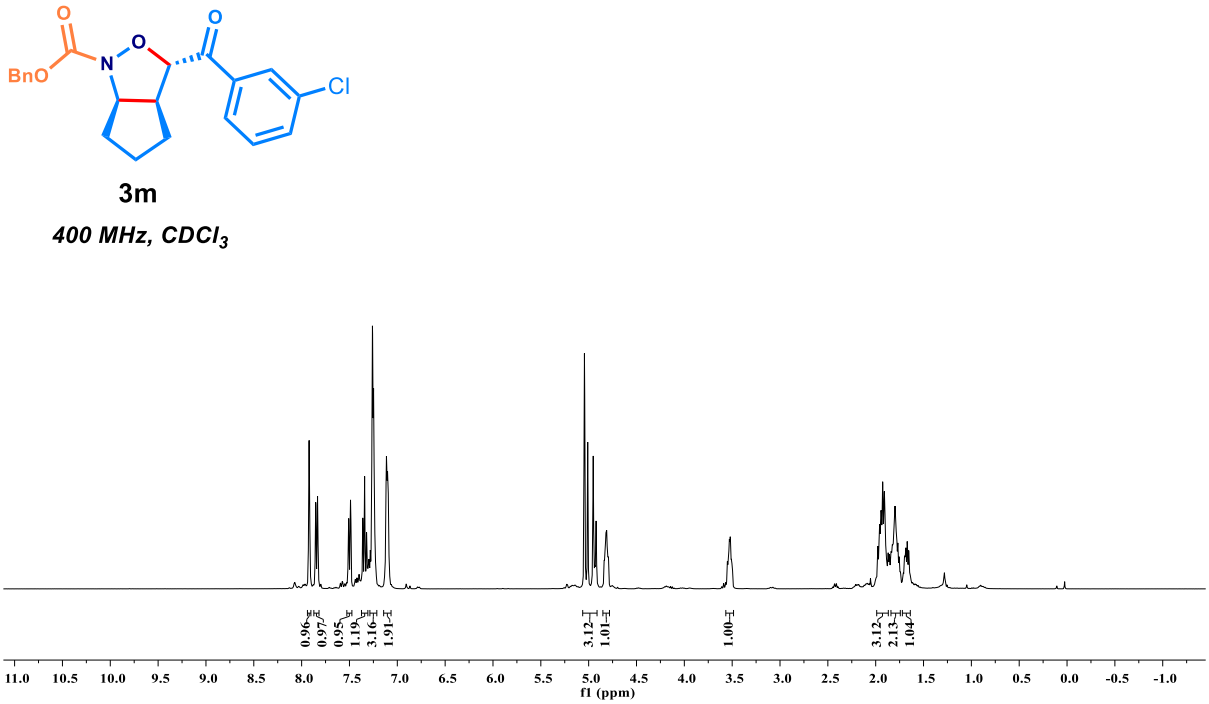
3l

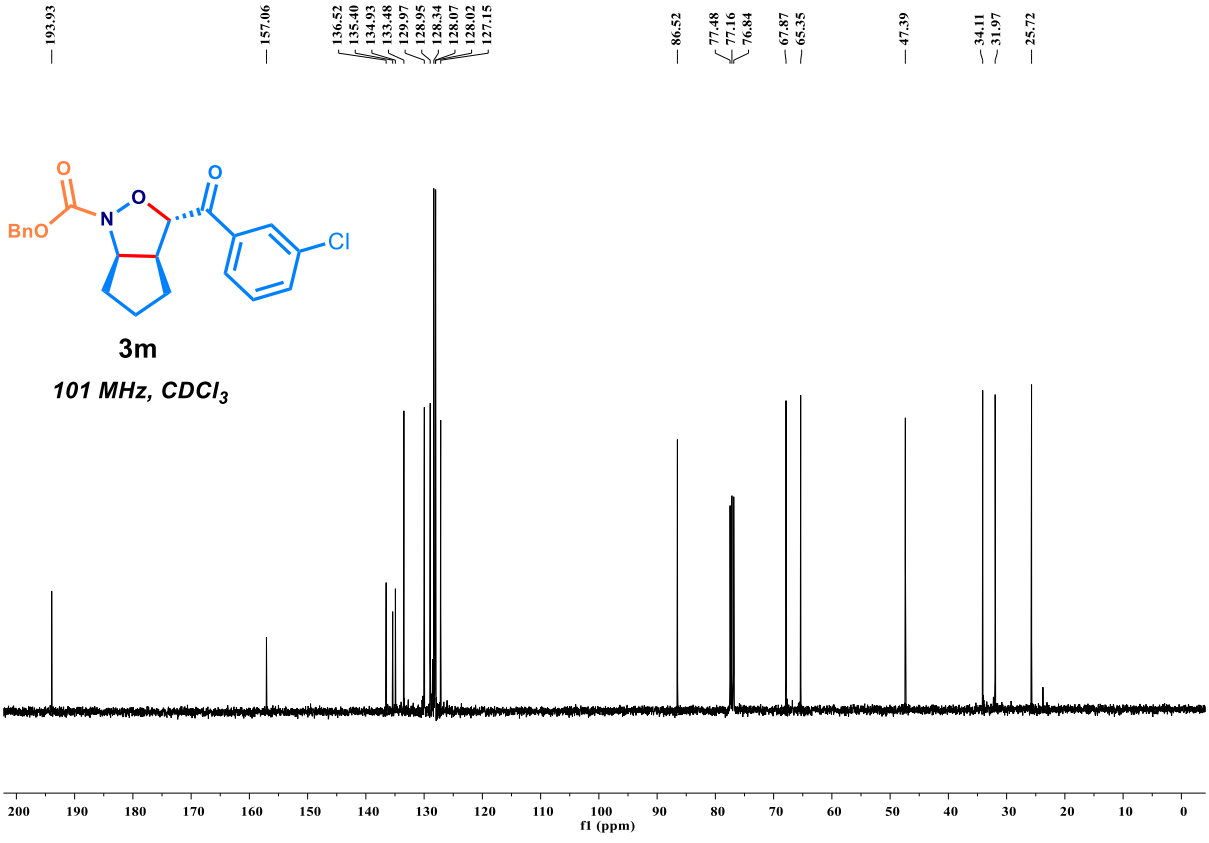
126 MHz, $CDCl_3$

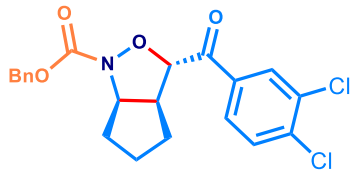


3l

471 MHz, $CDCl_3$

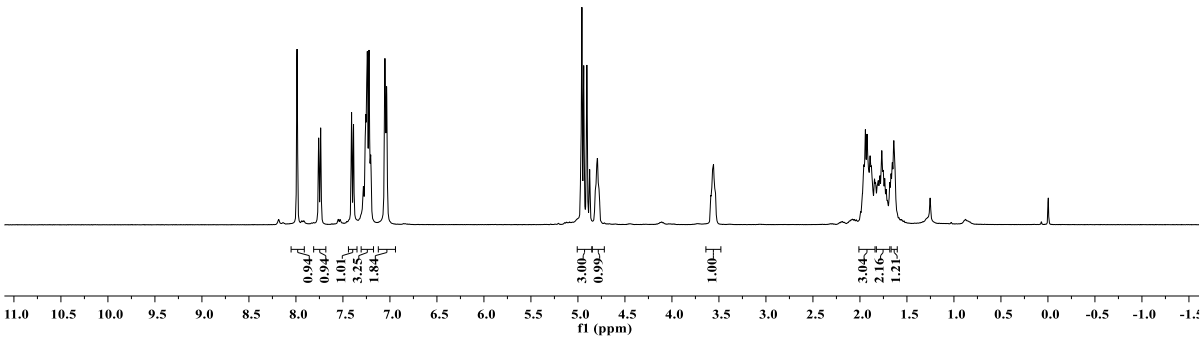

7.92
7.85
7.83
7.51
7.49
7.36
7.34
7.32
7.28
7.26
7.25
7.24
7.22
7.11
7.10
7.09
5.04
5.01
4.95
4.94
4.92
4.84
4.83
4.82
4.81
4.80
4.79
3.55
3.54
3.53
3.52
3.51
3.50
1.98
1.96
1.95
1.94
1.93
1.91
1.89
1.84
1.83
1.80
1.78
1.77
1.75
1.70
1.68
1.67
1.65
BnO
O
N
O
O
Cl
3m
400 MHz, CDCl3
0.96
0.97
0.95
1.19
3.16
1.91
3.12
1.01
1.00
3.12
2.13
1.04
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
f1 (ppm)

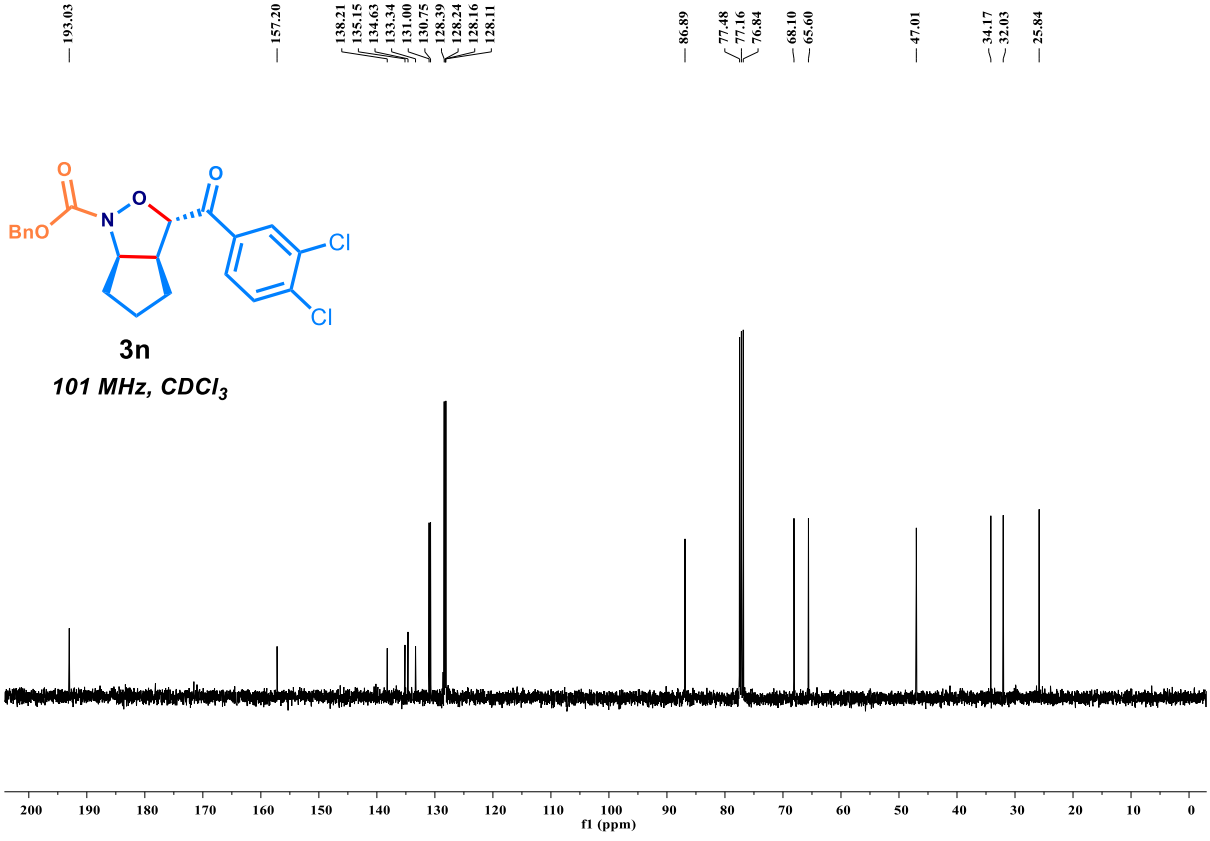

193.93
157.06
136.52
135.40
134.93
133.48
129.97
128.95
128.34
128.07
128.02
127.15
86.52
77.48
77.16
76.84
67.87
65.35
47.39
34.11
31.97
25.72
BnO
O
N
O
O
Cl
3m
101 MHz, CDCl3
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)



3n

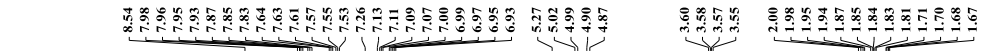
400 MHz, $CDCl_3$

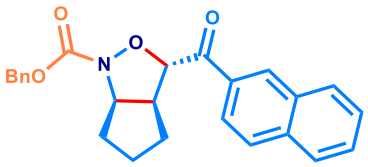




3n

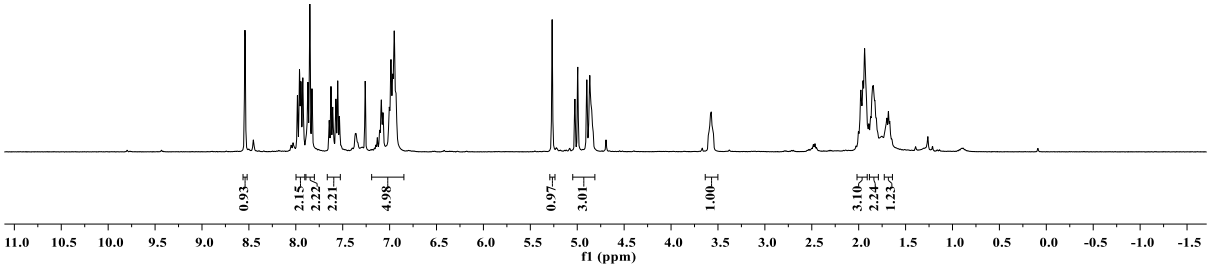
101 MHz, $CDCl_3$

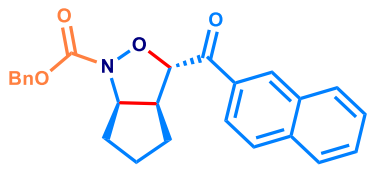




3o

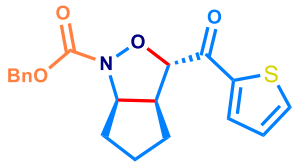
400 MHz,CDCl$_3$





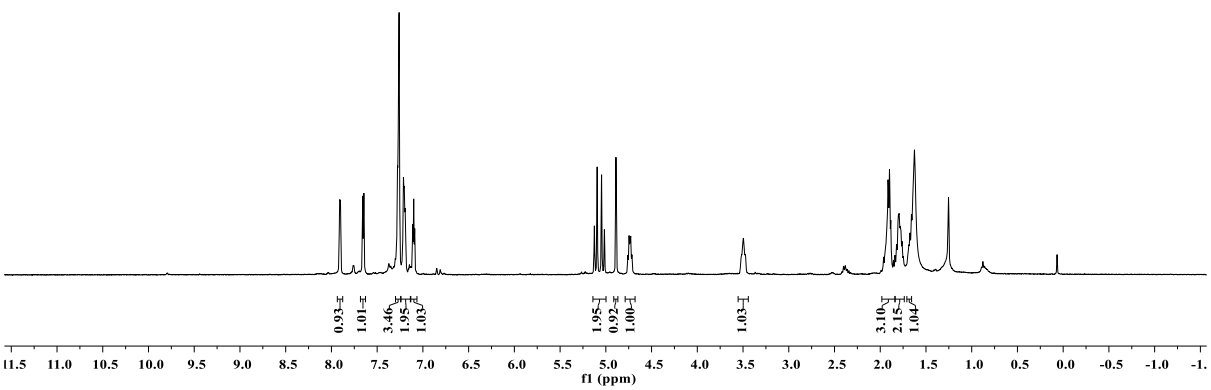
3o

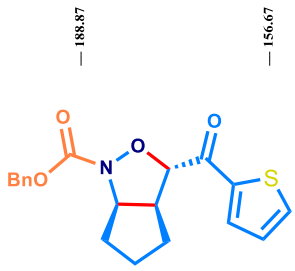
126 MHz, CDCl$_3$



3p

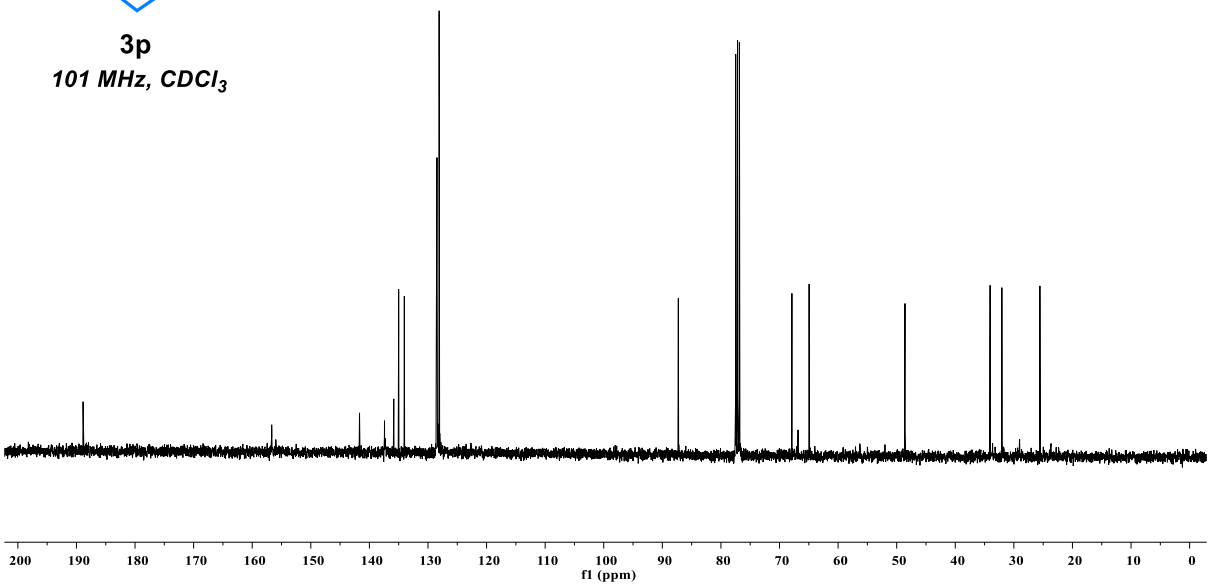
400 MHz, $CDCl_3$

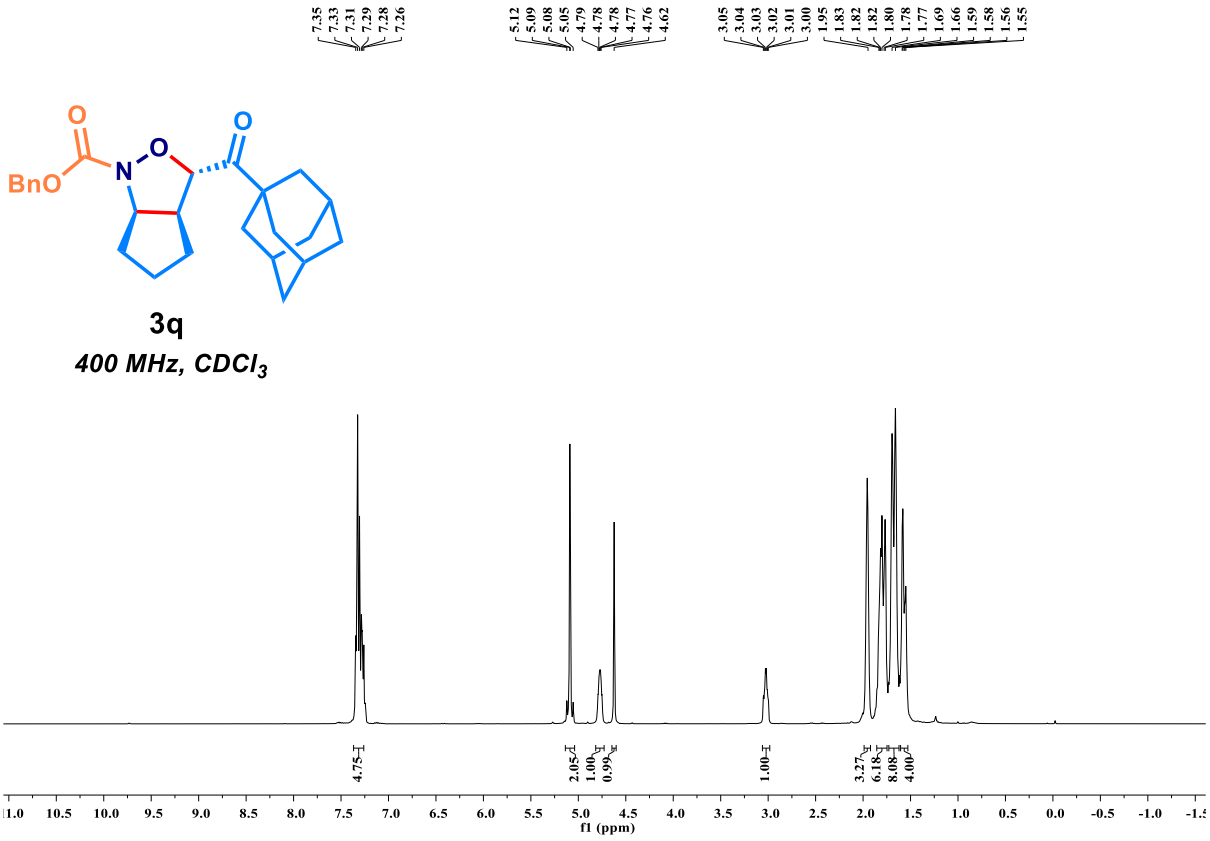


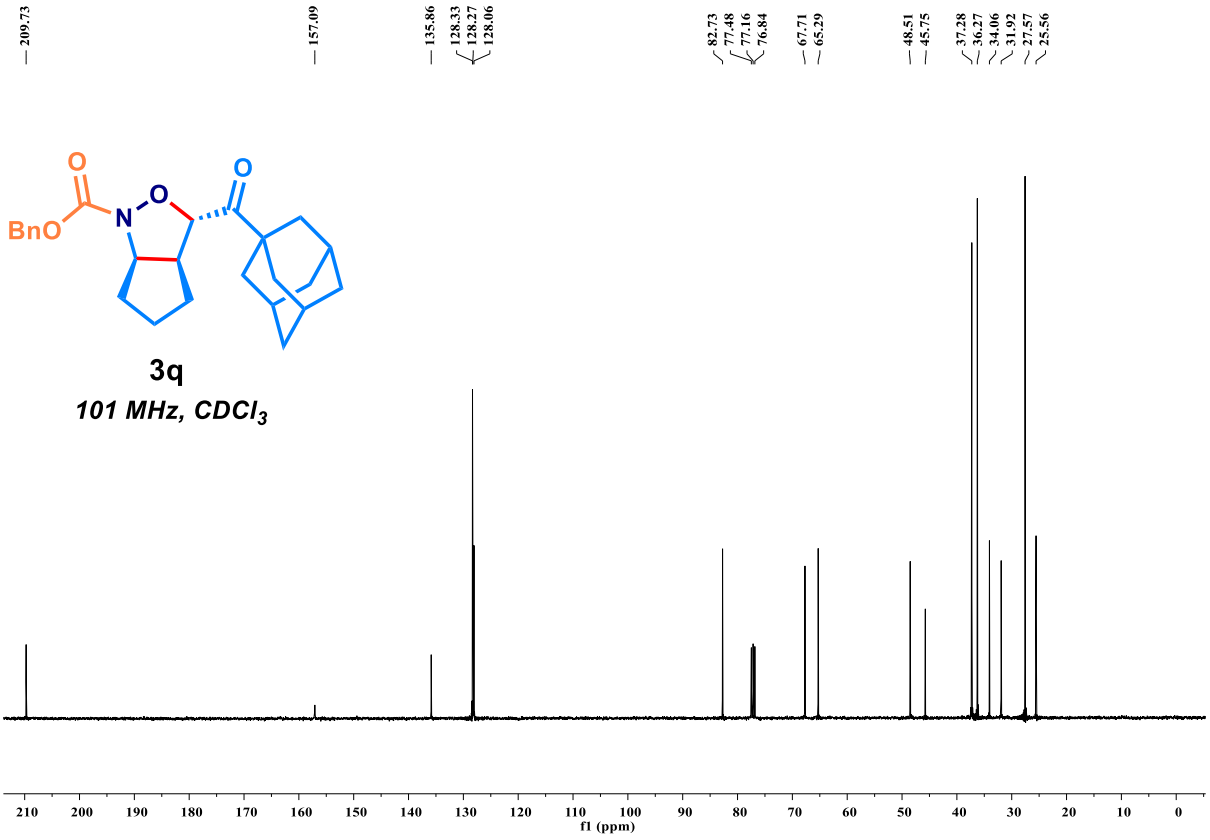


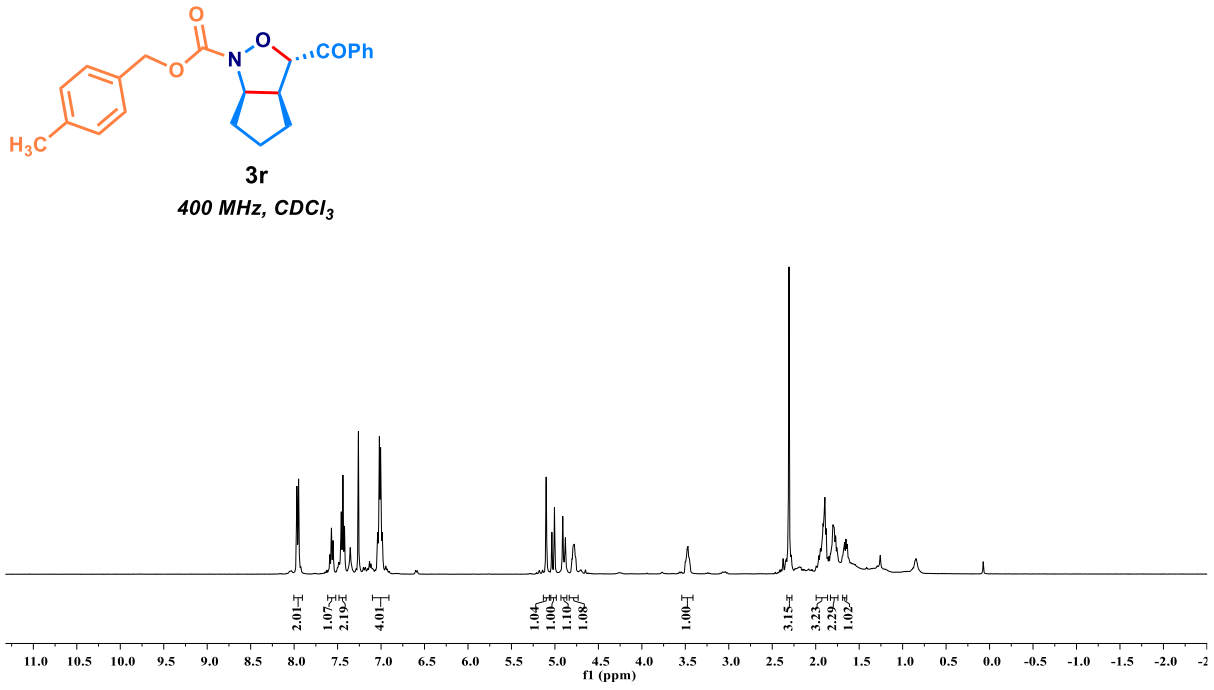
3p

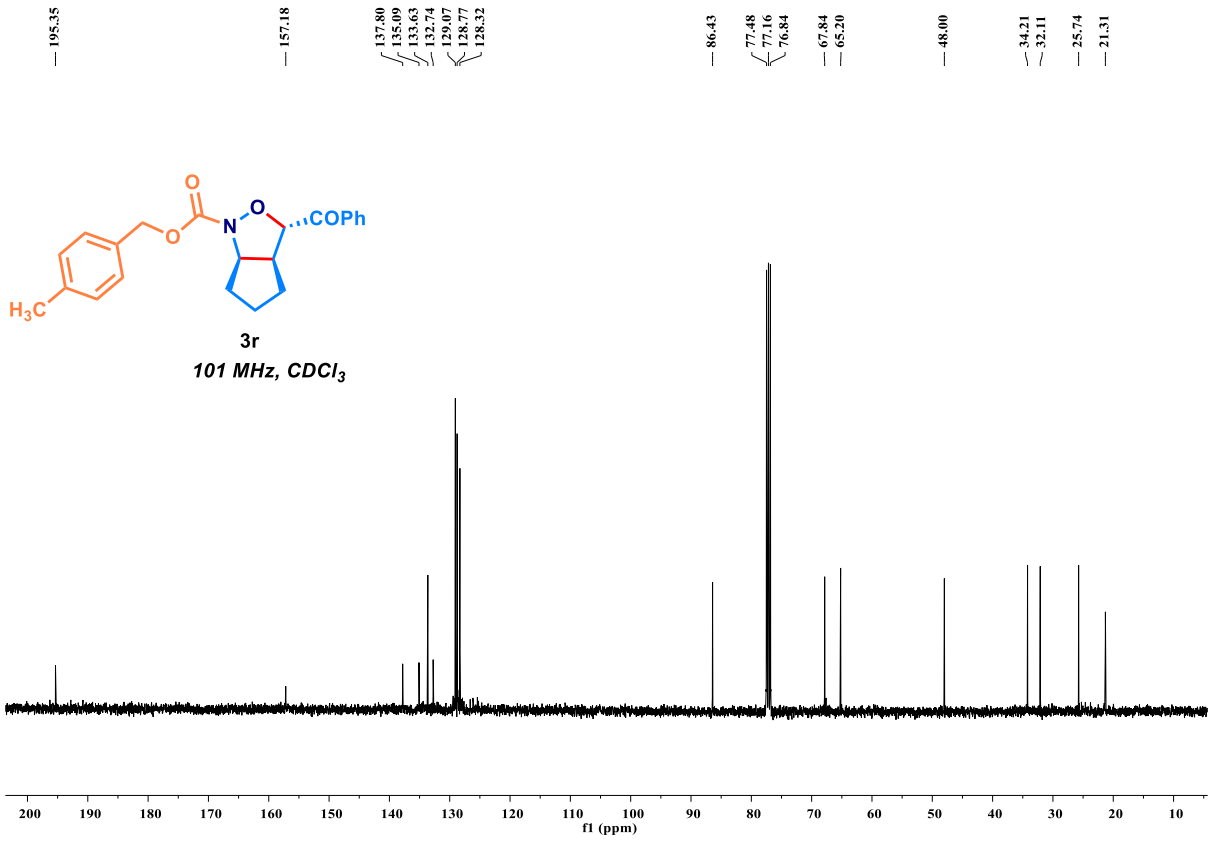
101 MHz, $CDCl_3$

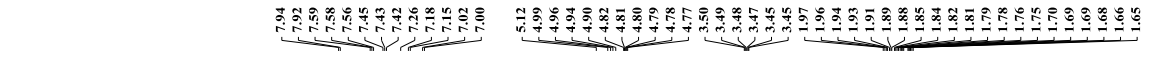


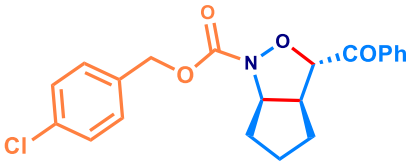

7.35
7.33
7.31
7.29
7.28
7.26
5.12
5.09
5.08
5.05
4.79
4.78
4.78
4.77
4.76
4.62
3.05
3.04
3.03
3.02
3.01
3.00
1.95
1.83
1.82
1.82
1.80
1.78
1.77
1.69
1.66
1.59
1.58
1.56
1.55
O
BnO
N
O
O
3q
400 MHz, CDCl3
4.75
2.05
1.00
0.99
1.00
3.27
6.18
8.08
4.00
f1 (ppm)


209.73
157.09
135.86
128.33
128.27
128.06
82.73
77.48
77.16
76.84
67.71
65.29
48.51
45.75
37.28
36.27
34.06
31.92
27.57
25.56
O
BnO
N
O
O
3q
101 MHz, CDCl3
f1 (ppm)


7.97
7.95
7.59
7.57
7.55
7.46
7.44
7.42
7.26
7.04
7.02
7.01
6.99
5.10
5.04
5.01
4.91
4.88
4.80
4.78
4.78
4.76
3.50
3.48
3.47
3.45
2.31
1.99
1.97
1.95
1.92
1.89
1.88
1.86
1.83
1.79
1.77
1.76
1.68
1.67
1.65
1.64
1.62
O
O
N
O
COPh
H3C
3r
400 MHz, CDCl3
2.01
1.07
2.19
4.01
1.04
1.00
1.10
1.08
1.00
3.15
3.23
2.29
1.02
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
f1 (ppm)

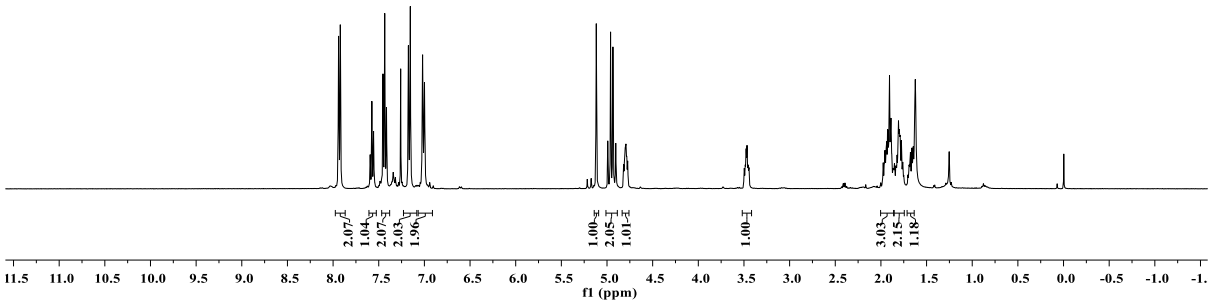

195.35
157.18
137.80
135.09
133.63
132.74
129.07
128.77
128.32
86.43
77.48
77.16
76.84
67.84
65.20
48.00
34.21
32.11
25.74
21.31
O
O
N
O
COPh
H3C
3r
101 MHz, CDCl3
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

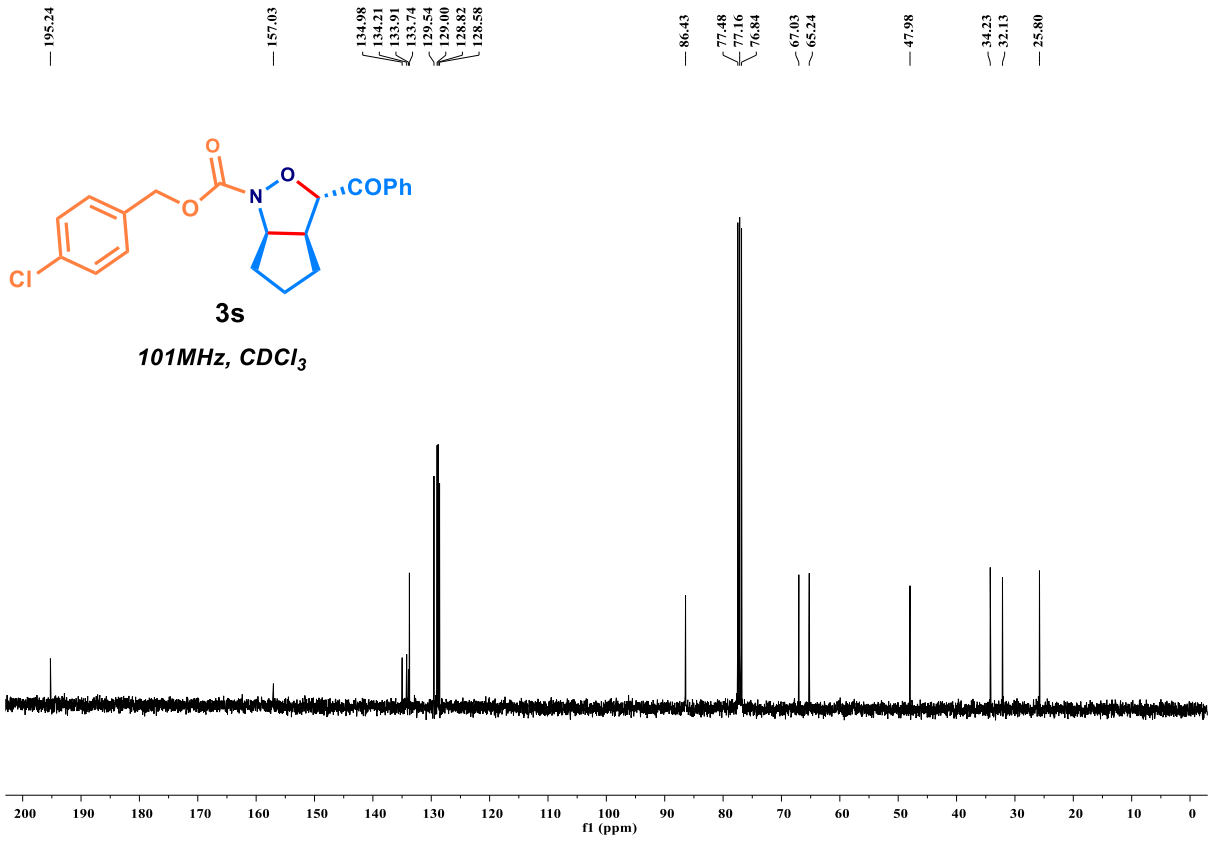




3s

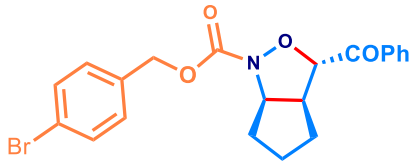
400 MHz, $CDCl_3$





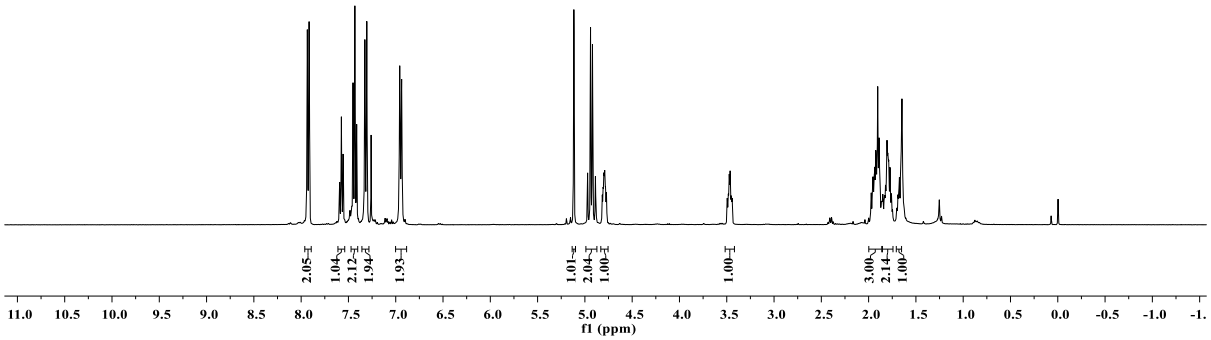
3s

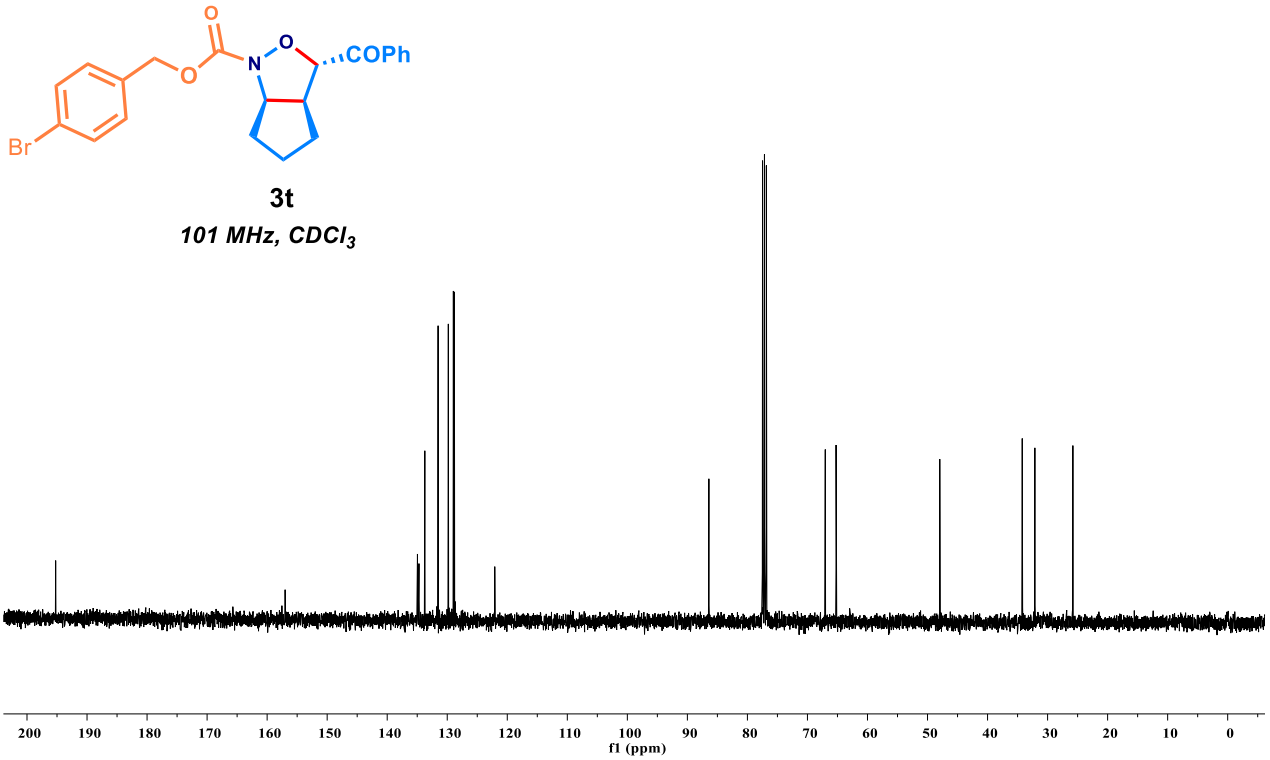
101MHz, $CDCl_3$



3t

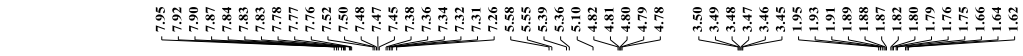
400 MHz, $CDCl_3$

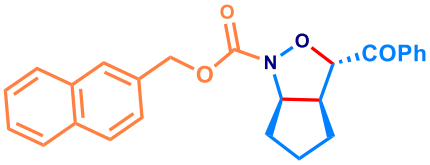




3t

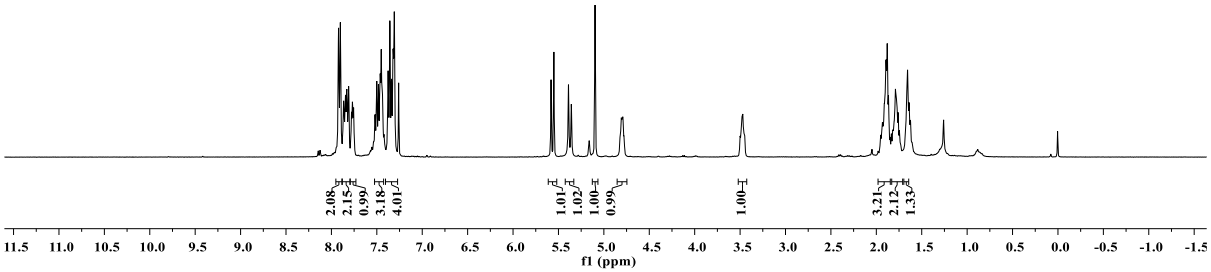
101 MHz, $CDCl_3$

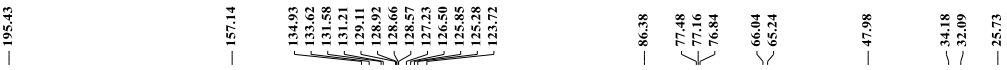


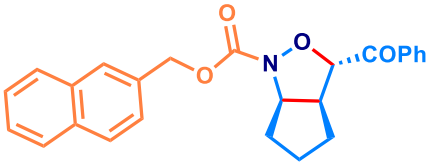


3u

400 MHz, $CDCl_3$

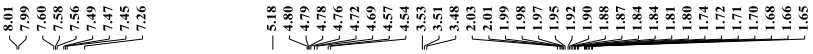


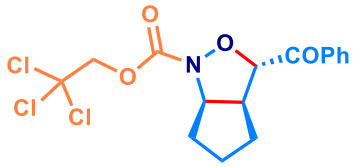




3u

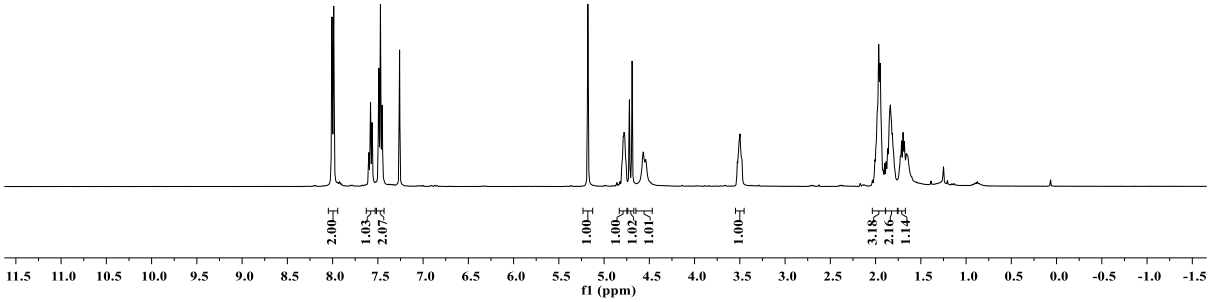
101 MHz, $CDCl_3$

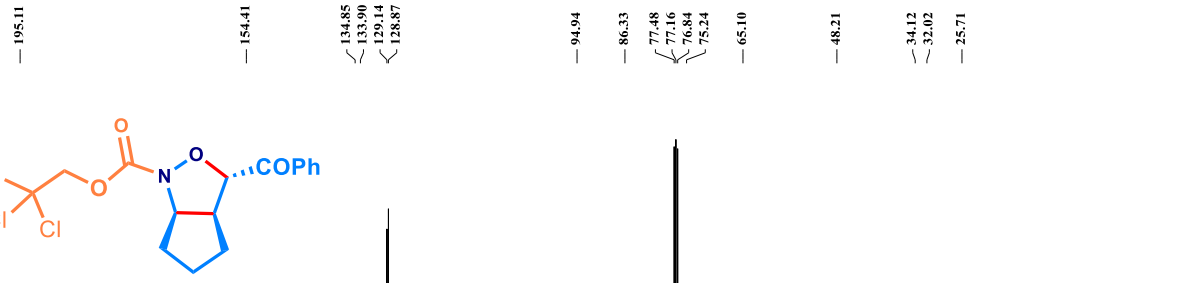




3v

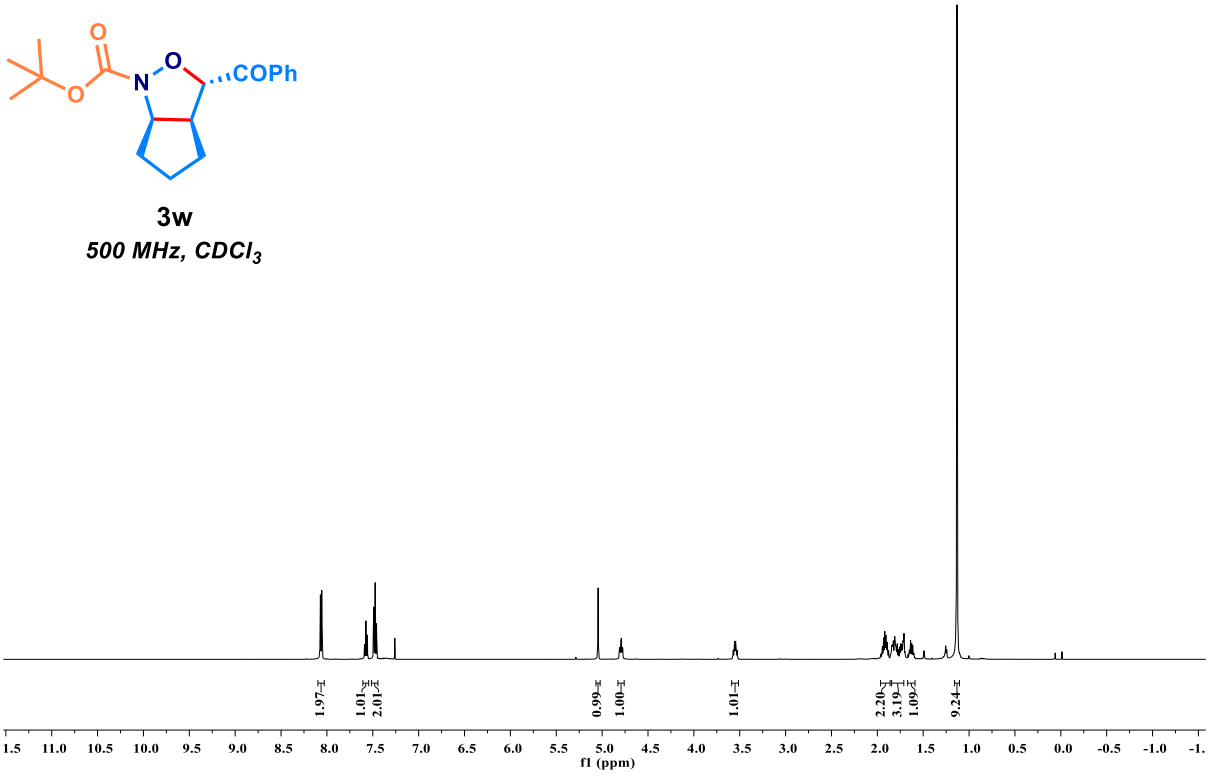
400 MHz, $CDCl_3$





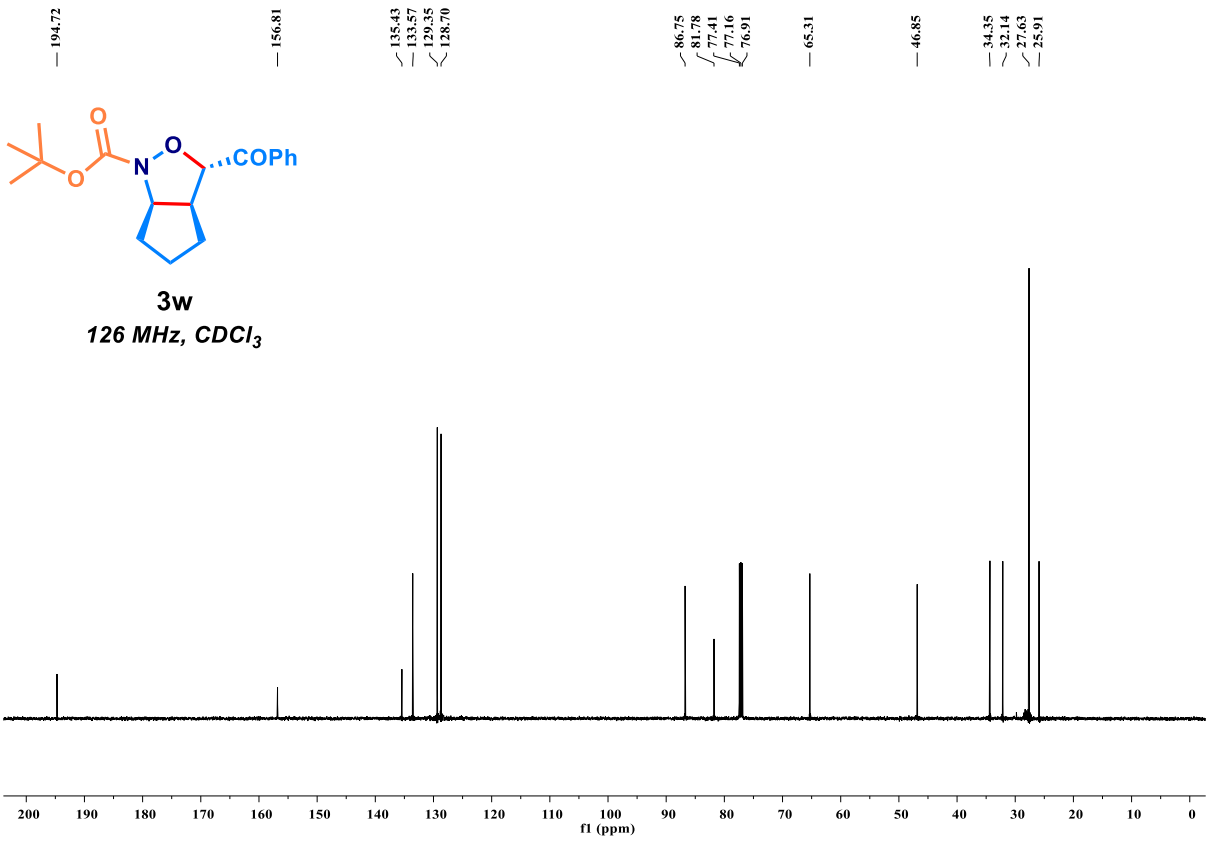
3v

126 MHz, $CDCl_3$



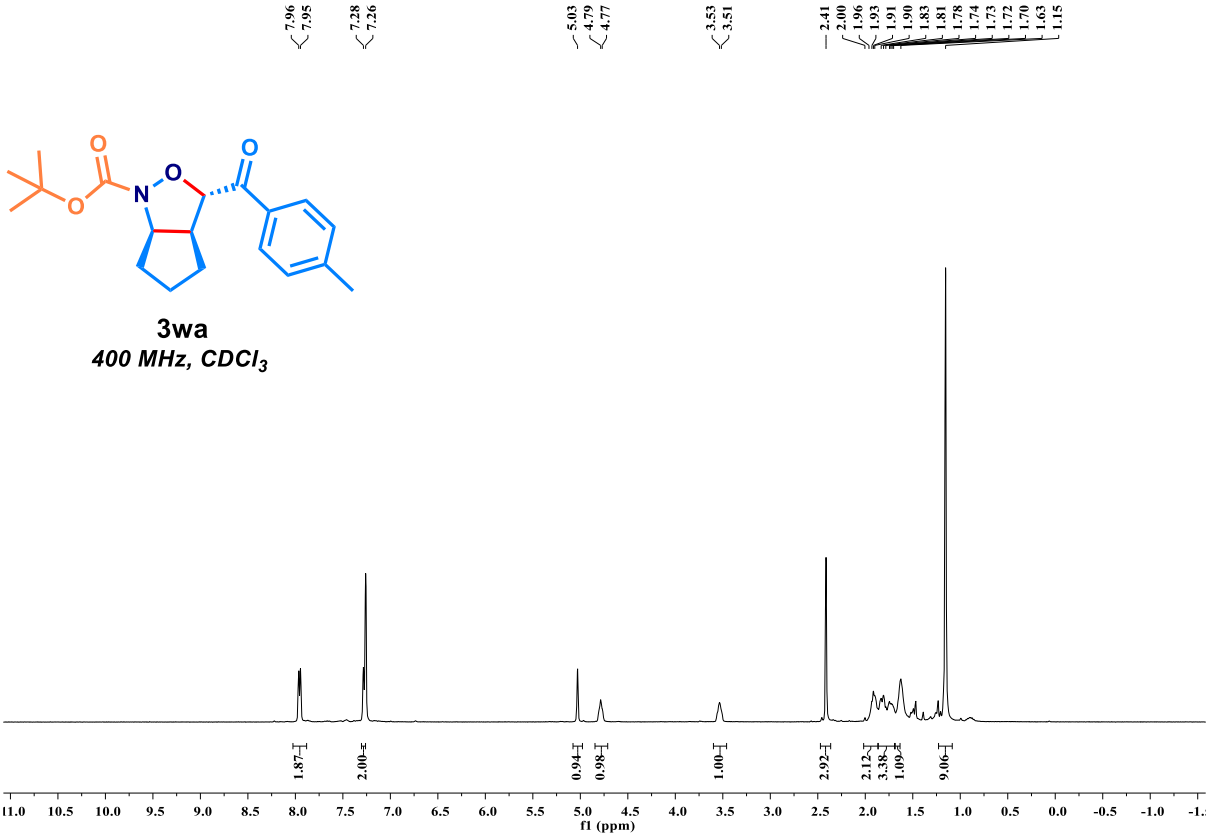
3w

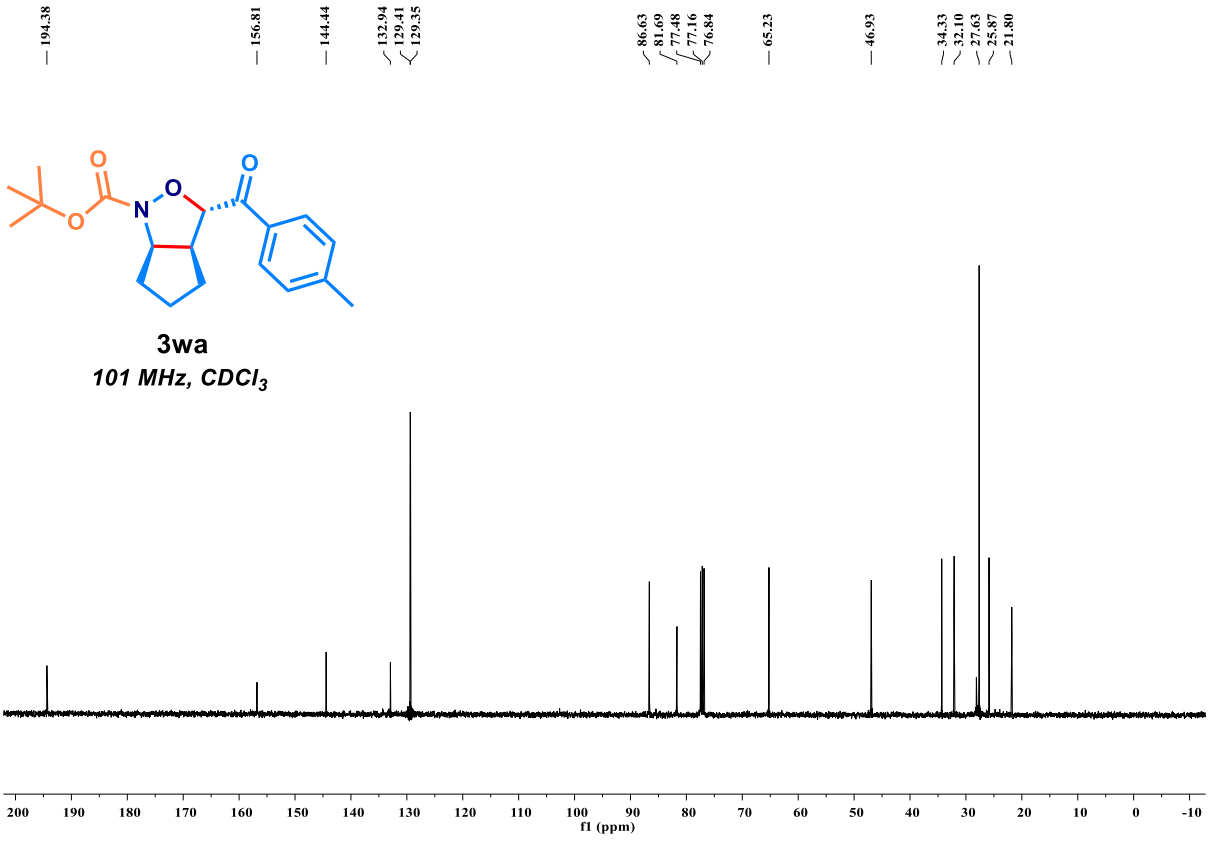
500 MHz, $CDCl_3$

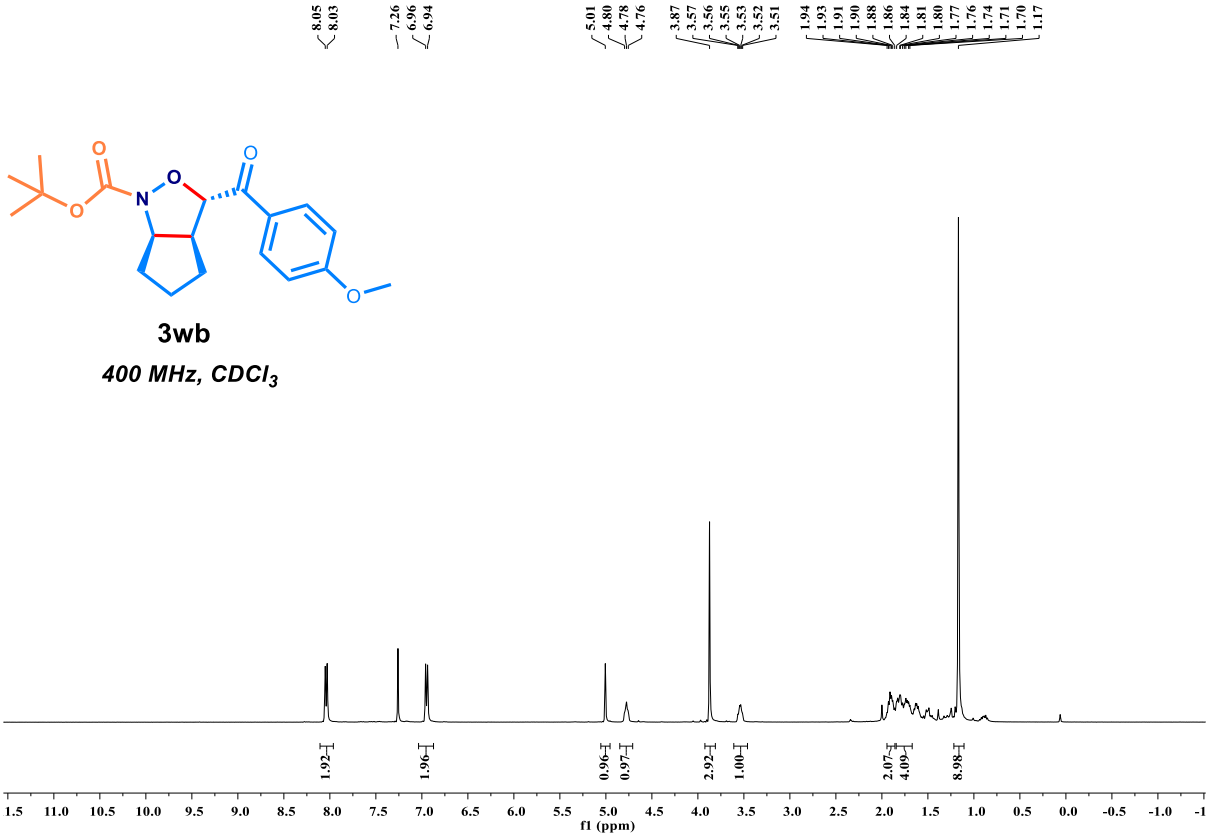


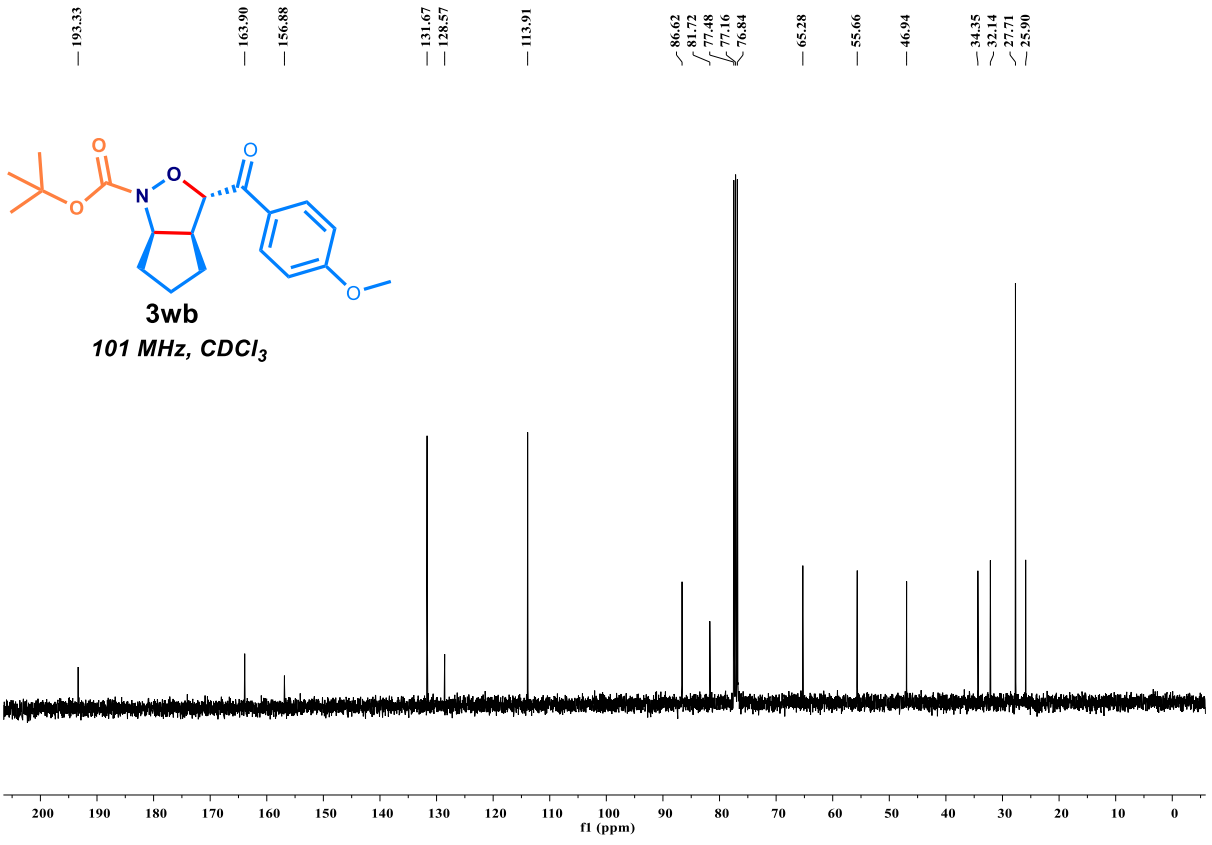
3w

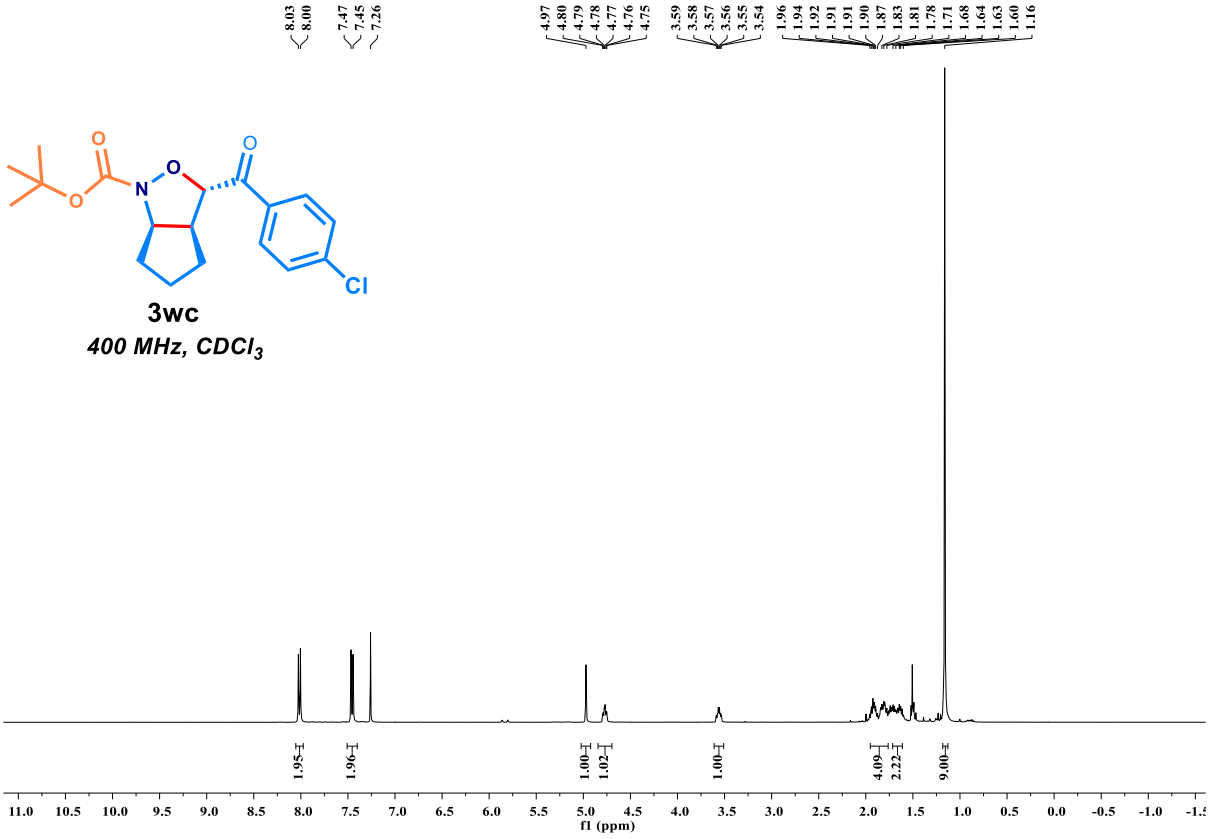
126 MHz, $CDCl_3$


7.96
7.95
7.28
7.26
5.03
4.79
4.77
3.53
3.51
2.41
2.00
1.96
1.93
1.91
1.90
1.83
1.81
1.78
1.74
1.73
1.72
1.70
1.63
1.15
3wa
400 MHz, CDCl3
1.87
2.00
0.94
0.98
1.00
2.92
2.12
3.38
1.09
9.06
f1 (ppm)


194.38
156.81
144.44
132.94
129.41
129.35
86.63
81.69
77.48
77.16
76.84
65.23
46.93
34.33
32.10
27.63
25.87
21.80
3wa
101 MHz, CDCl3
f1 (ppm)

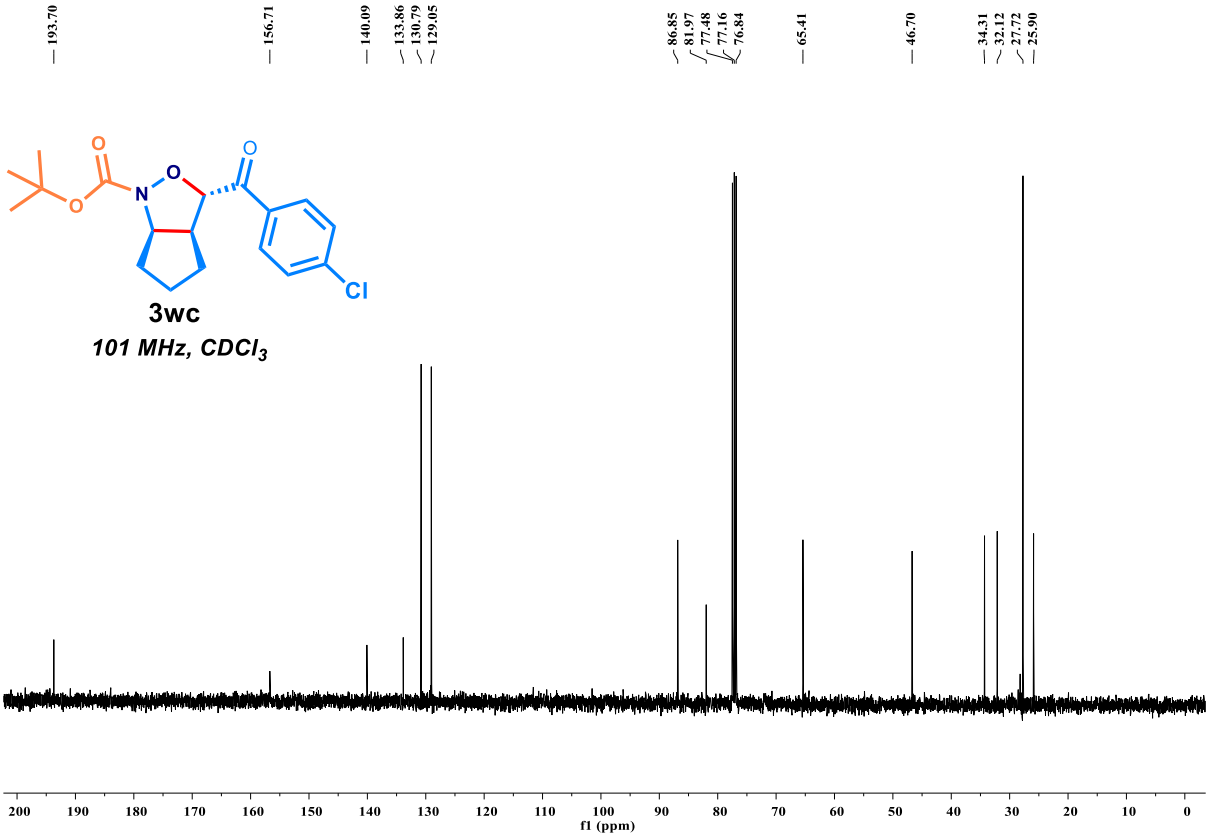

8.05
8.03
7.26
6.96
6.94
5.01
4.80
4.78
4.76
3.87
3.57
3.56
3.55
3.53
3.52
3.51
1.94
1.93
1.91
1.90
1.88
1.86
1.84
1.81
1.80
1.77
1.76
1.74
1.71
1.70
1.17
O
O
N
O
O
O
3wb
400 MHz, CDCl3
1.92
1.96
0.96
0.97
2.92
1.00
2.07
4.09
8.98
f1 (ppm)


193.33
163.90
156.88
131.67
128.57
113.91
86.62
81.72
77.48
77.16
76.84
65.28
55.66
46.94
34.35
32.14
27.71
25.90
O
O
N
O
O
O
3wb
101 MHz, CDCl3
f1 (ppm)



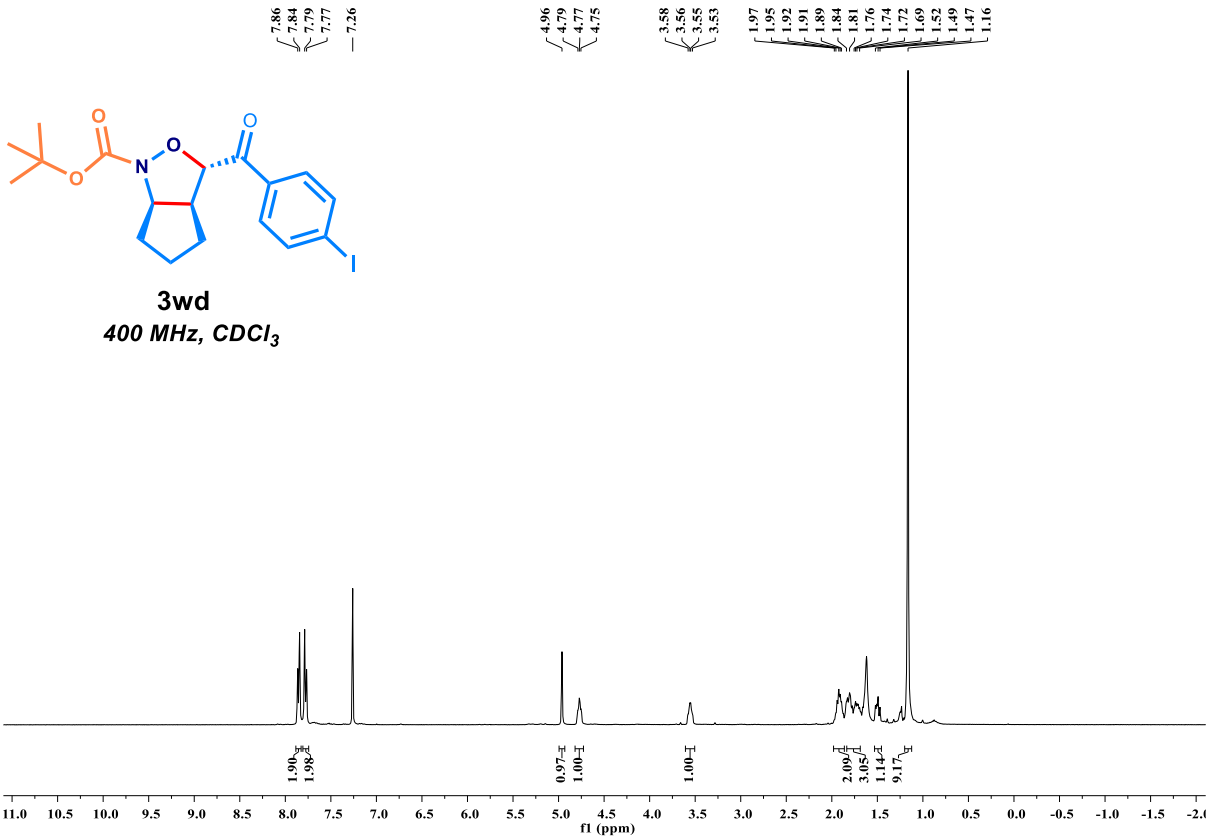
3wc

400 MHz, $CDCl_3$



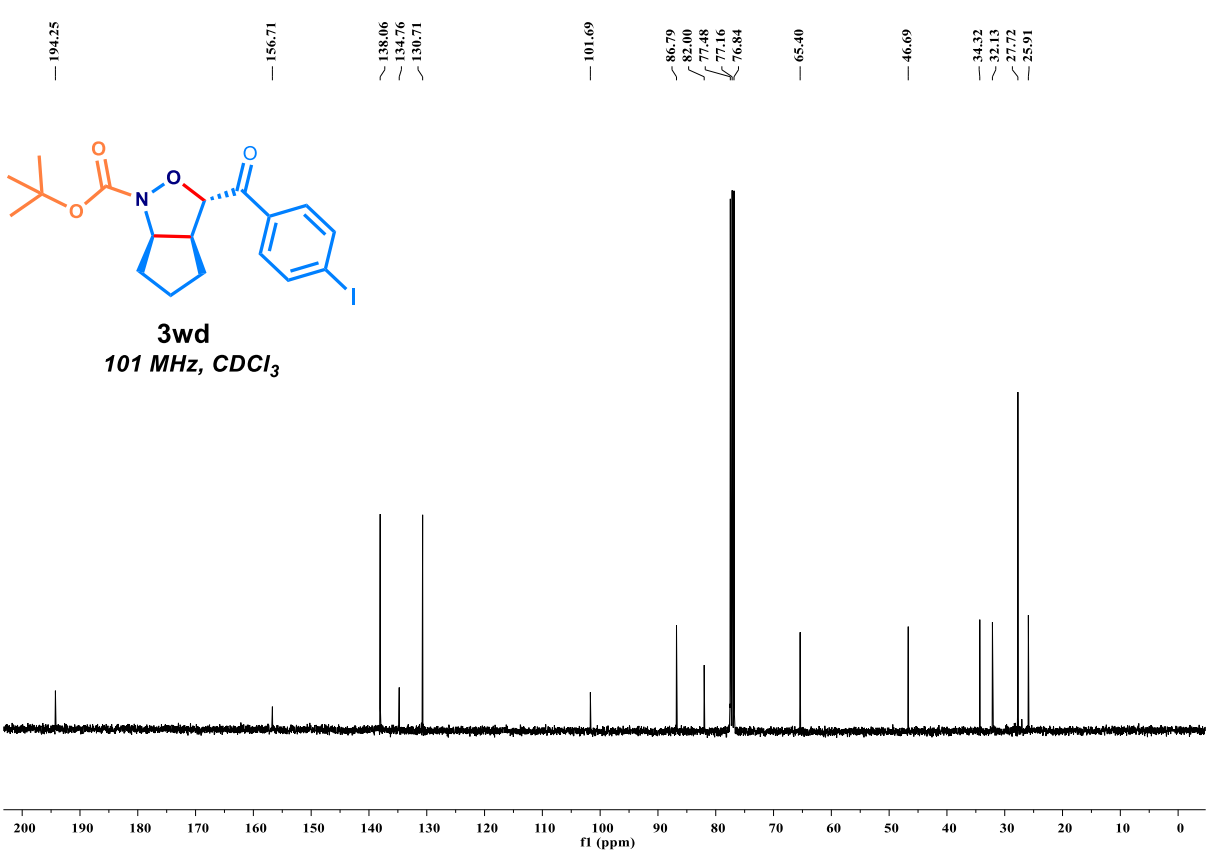
3wc

101 MHz, $CDCl_3$



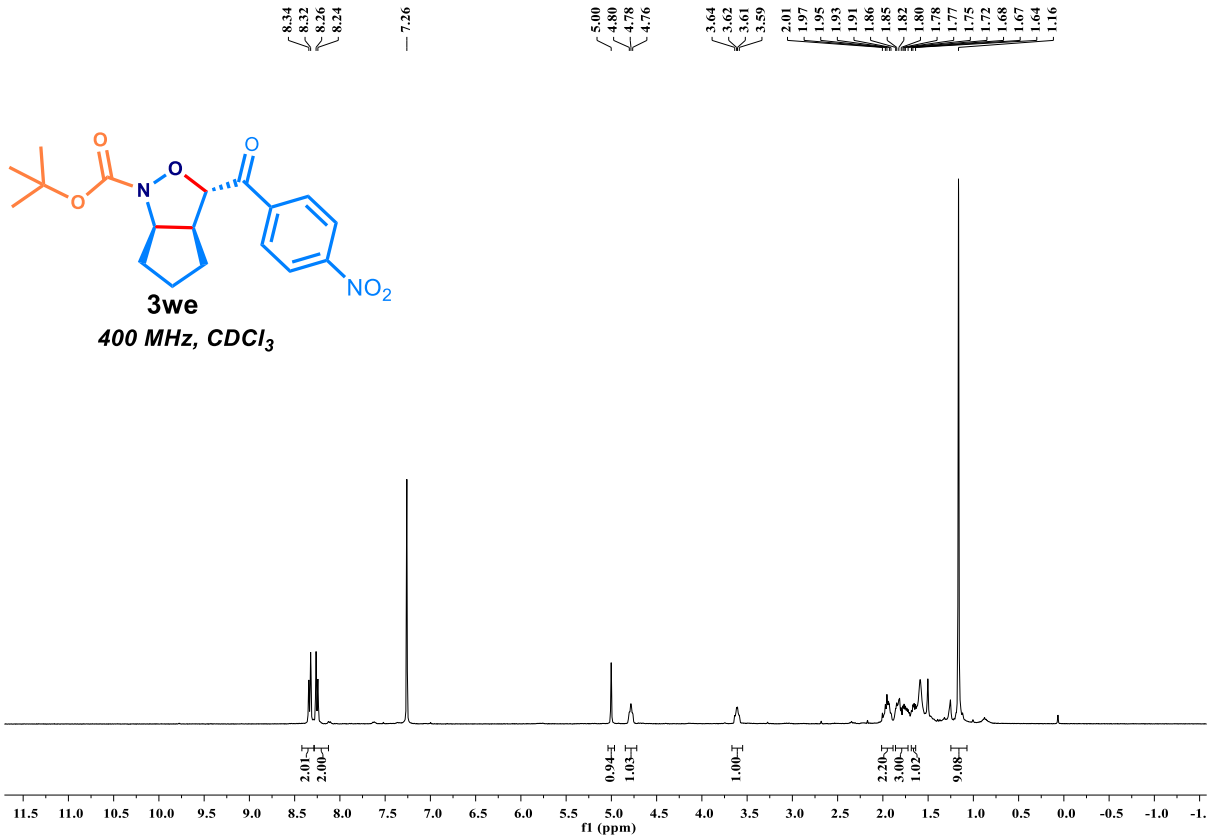
3wd

400 MHz, $CDCl_3$



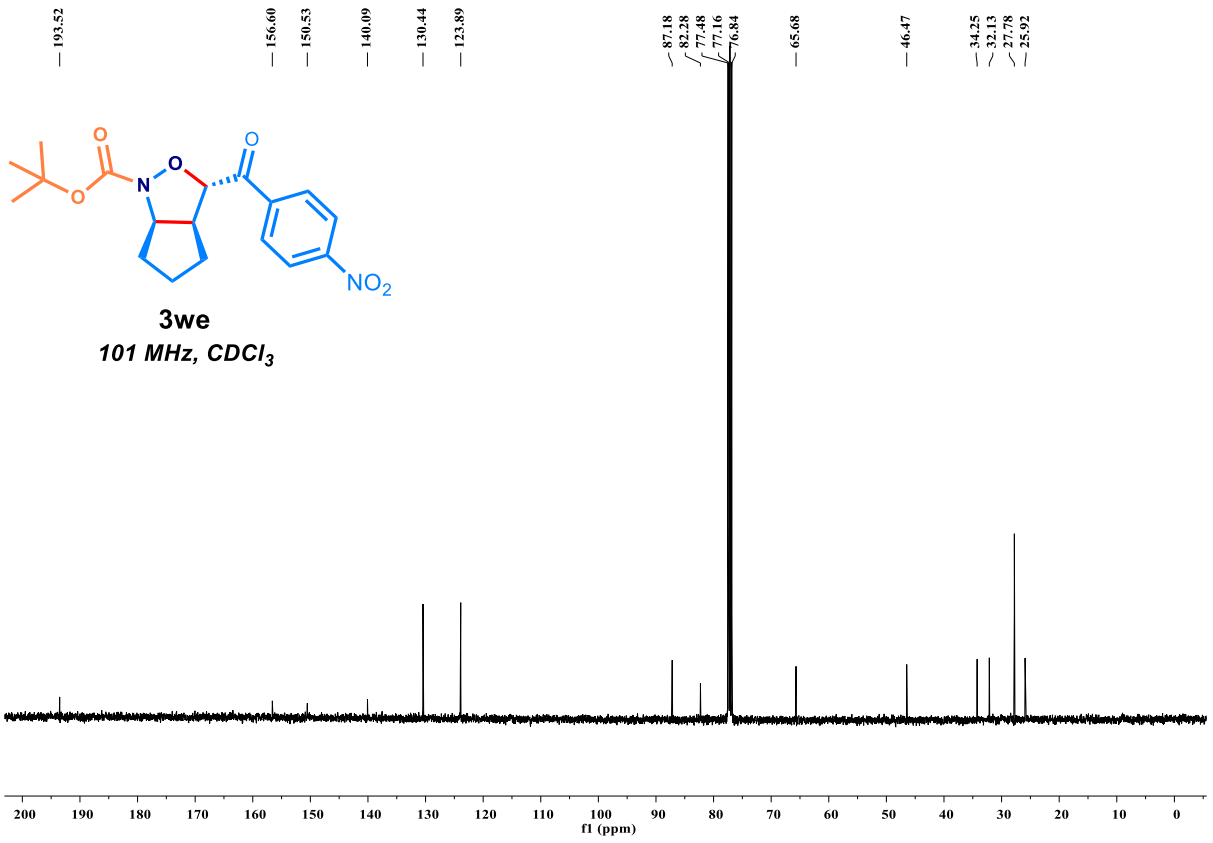
3wd

101 MHz, $CDCl_3$



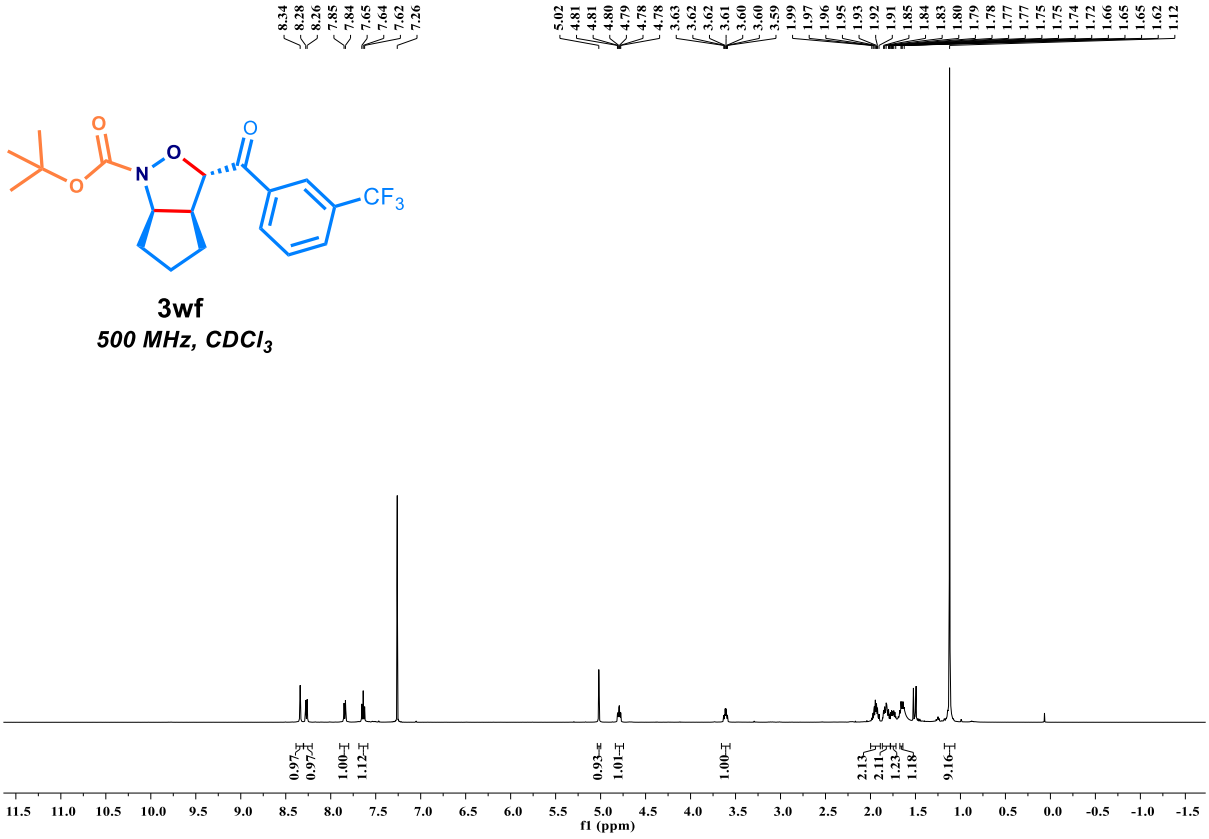
3we

400 MHz, $CDCl_3$



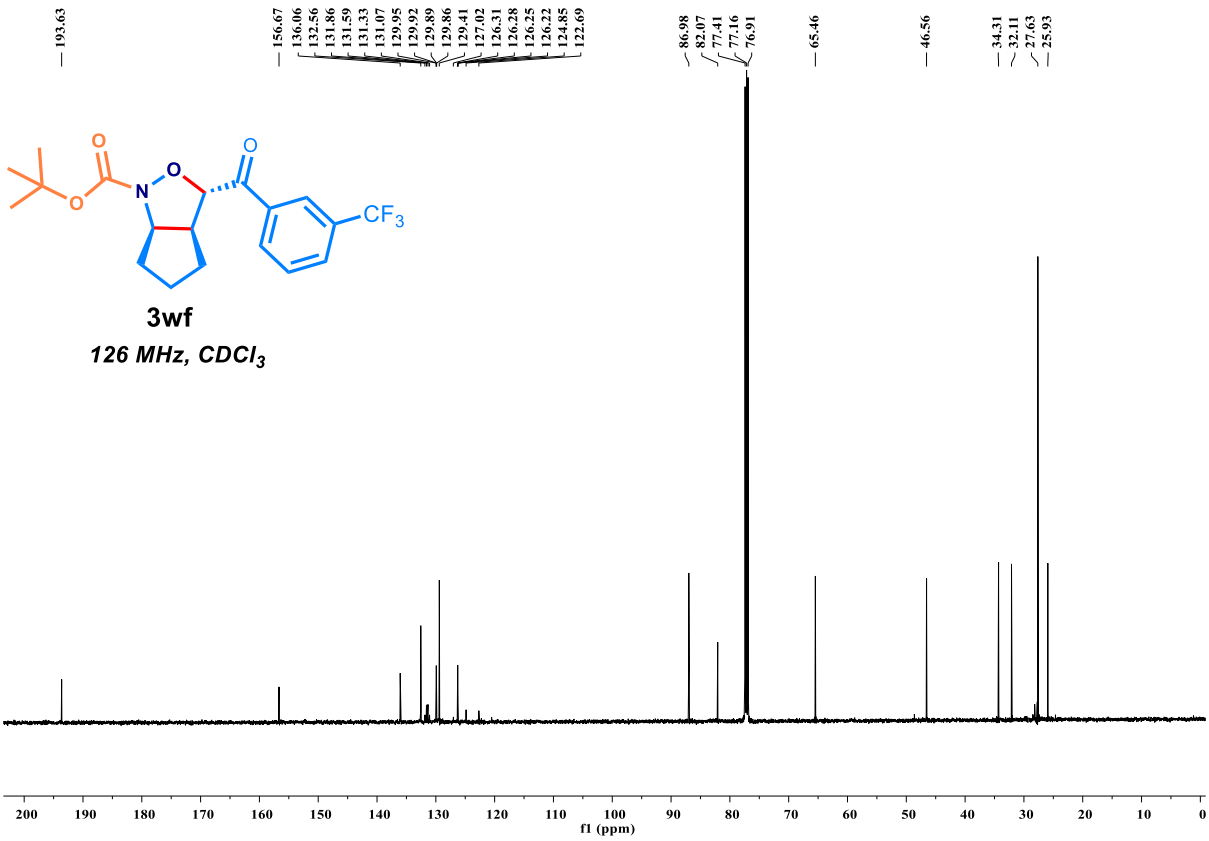
3we

101 MHz, $CDCl_3$



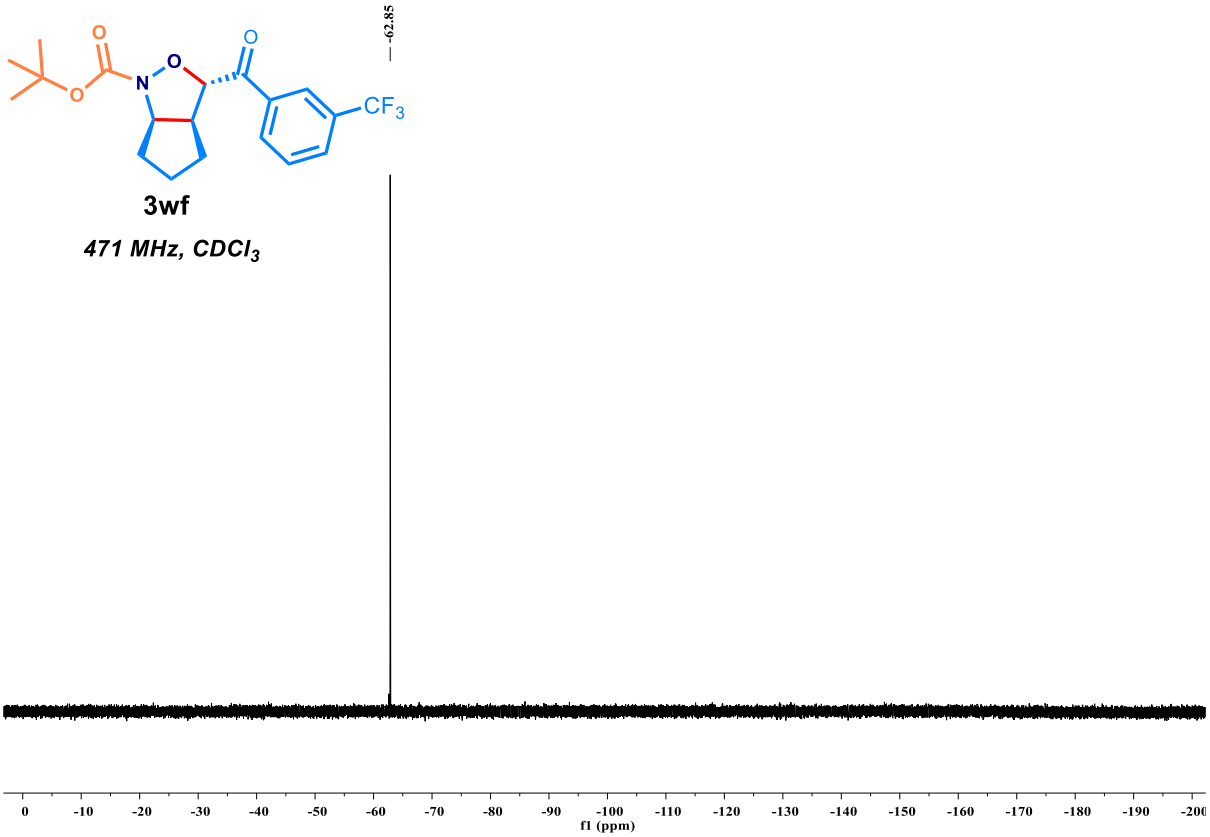
3wf

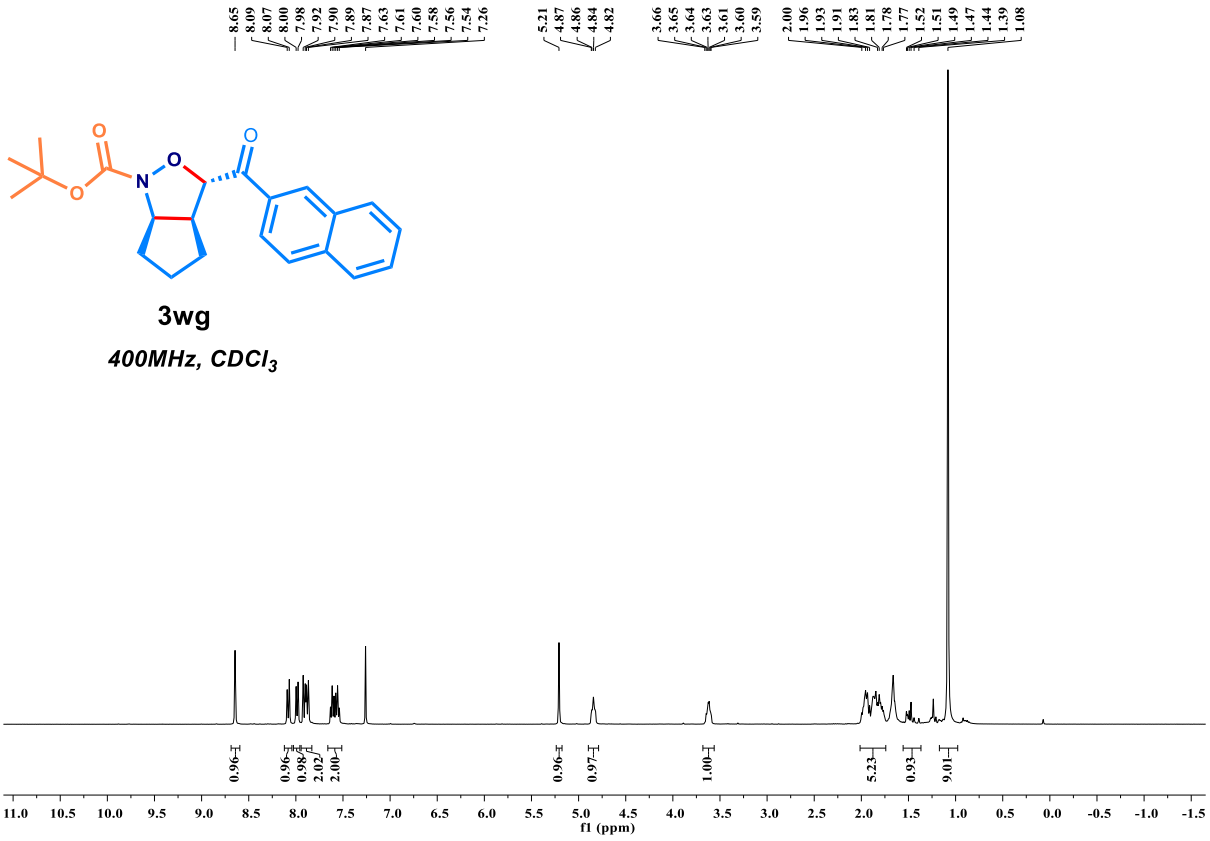
500 MHz, $CDCl_3$



3wf

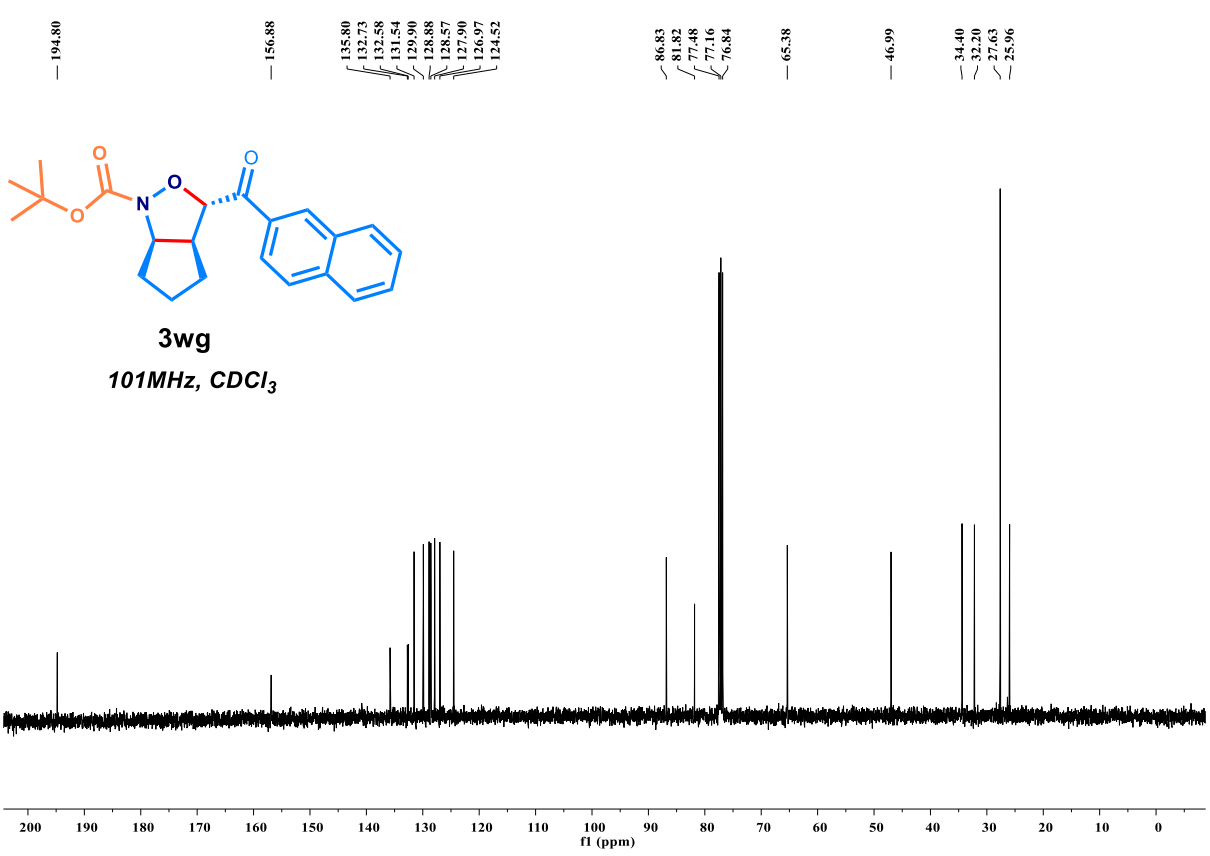
126 MHz, $CDCl_3$


-62.85
CF3
3wf
471 MHz, CDCl3
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
f1 (ppm)



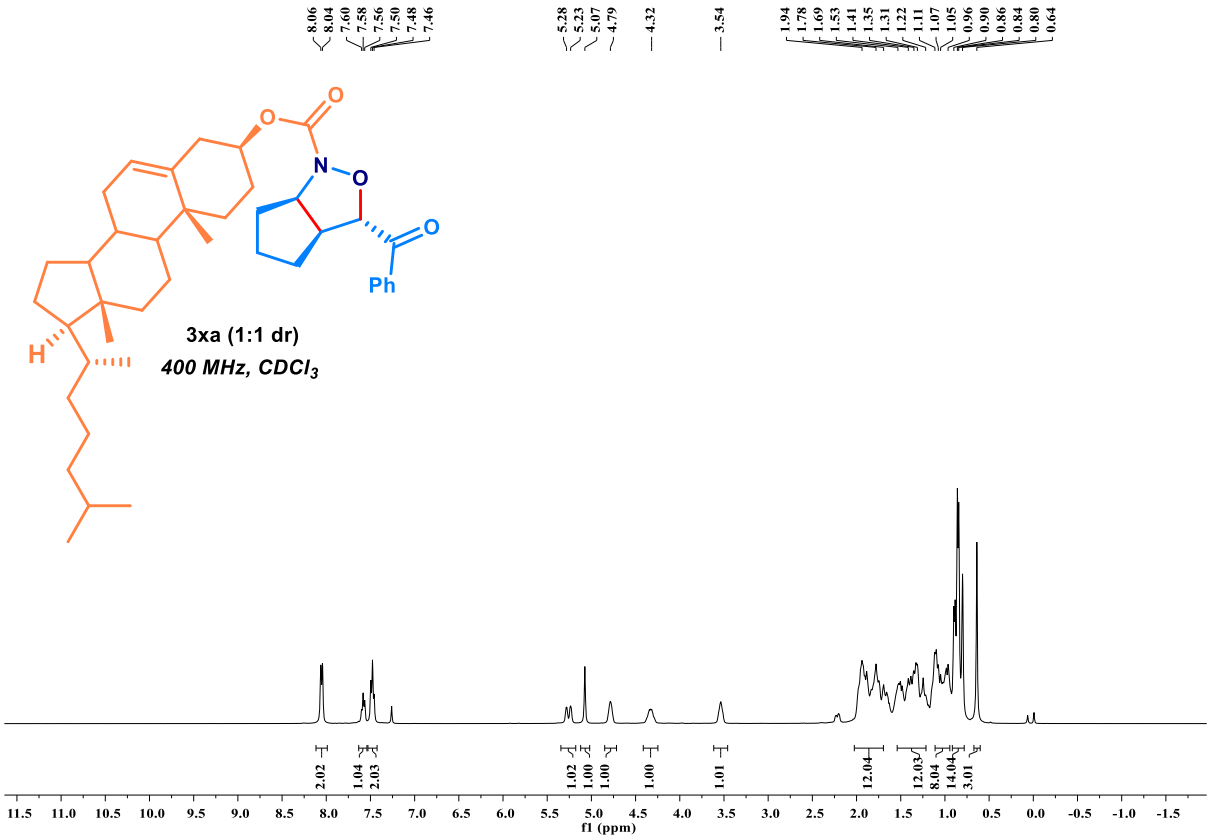
3wg

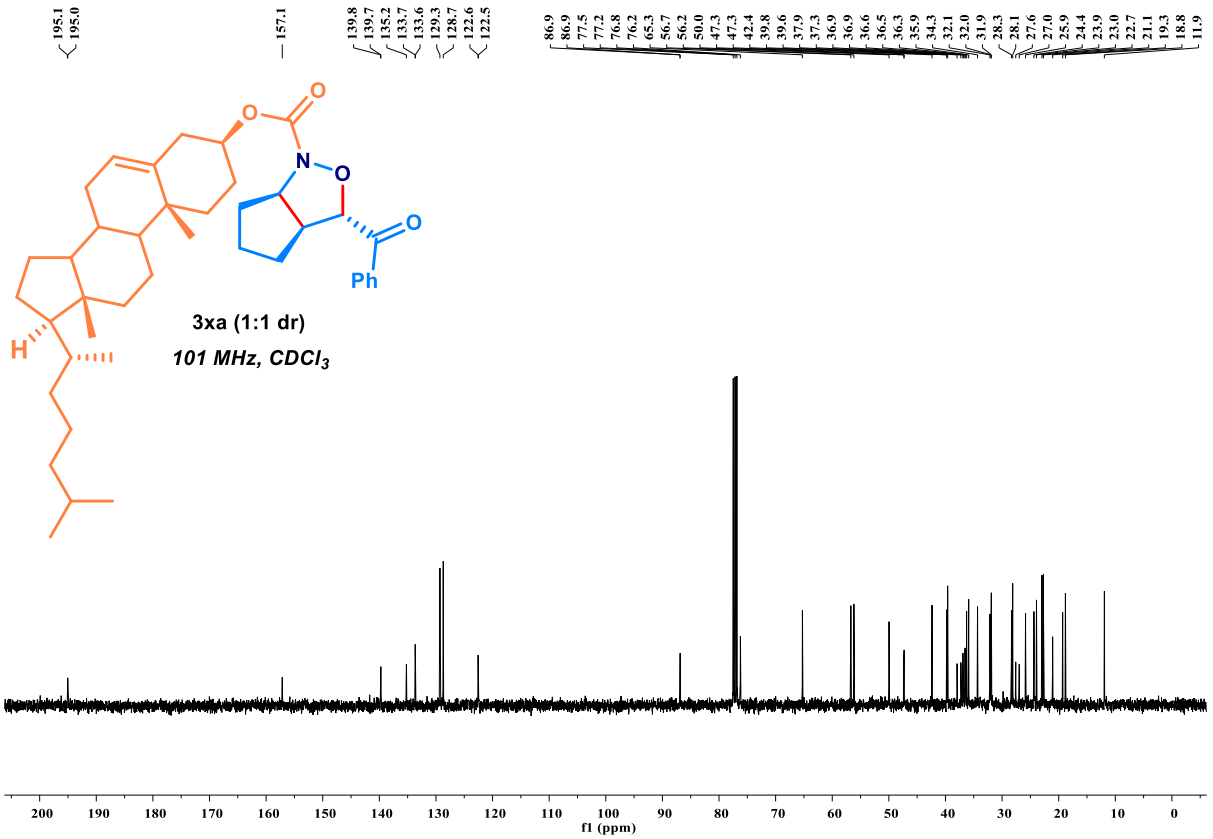
400MHz, $CDCl_3$

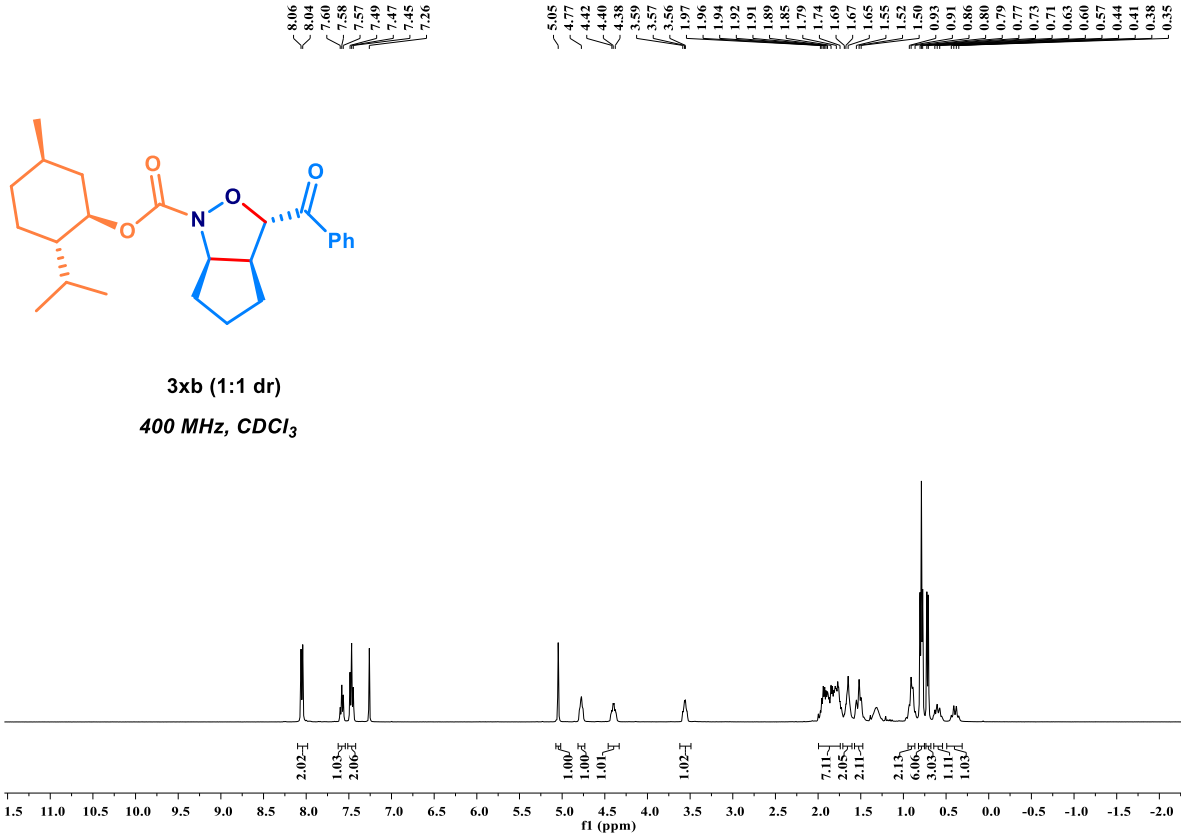


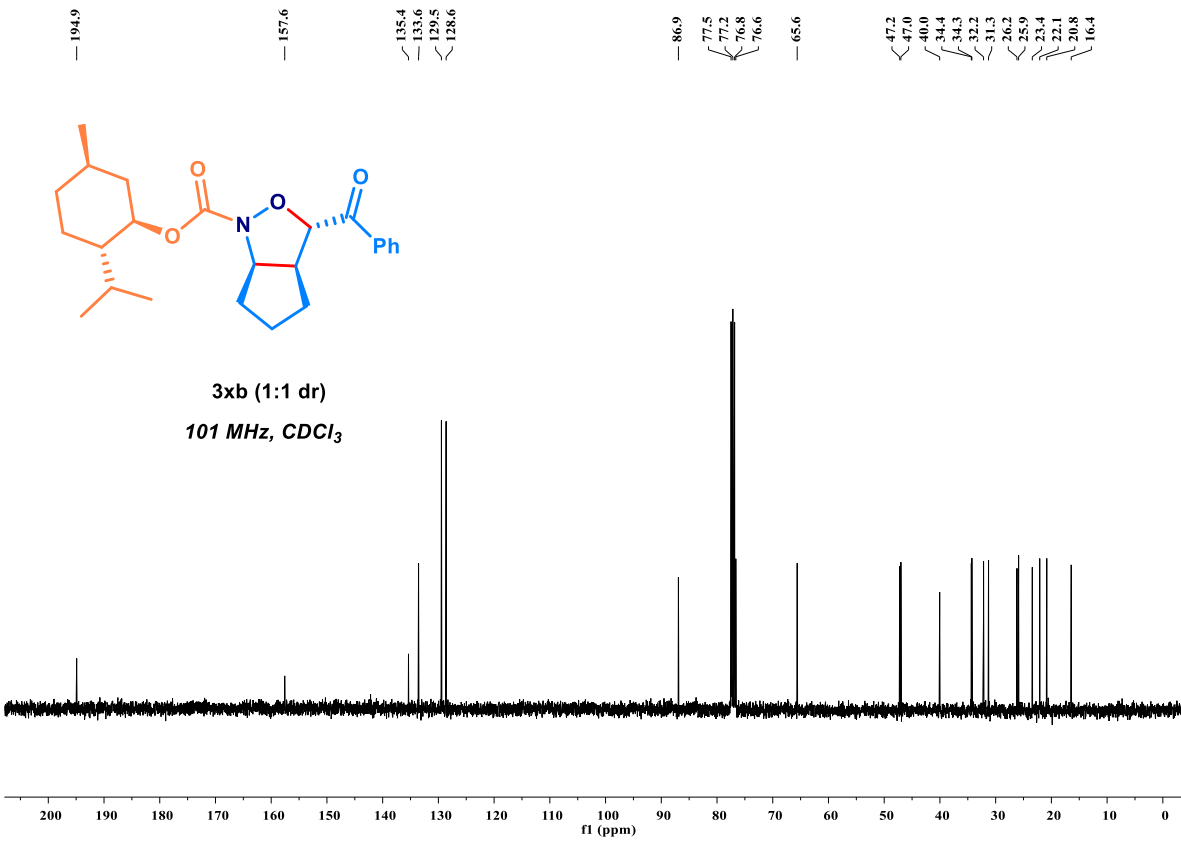
3wg

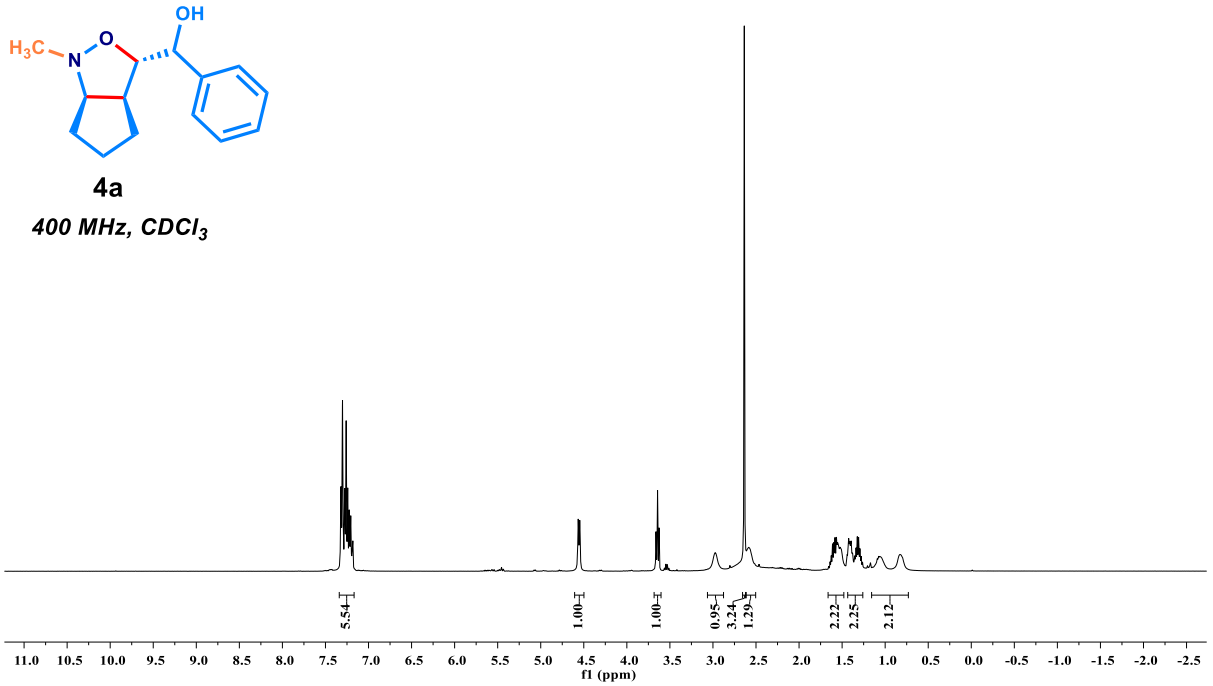
101MHz, $CDCl_3$

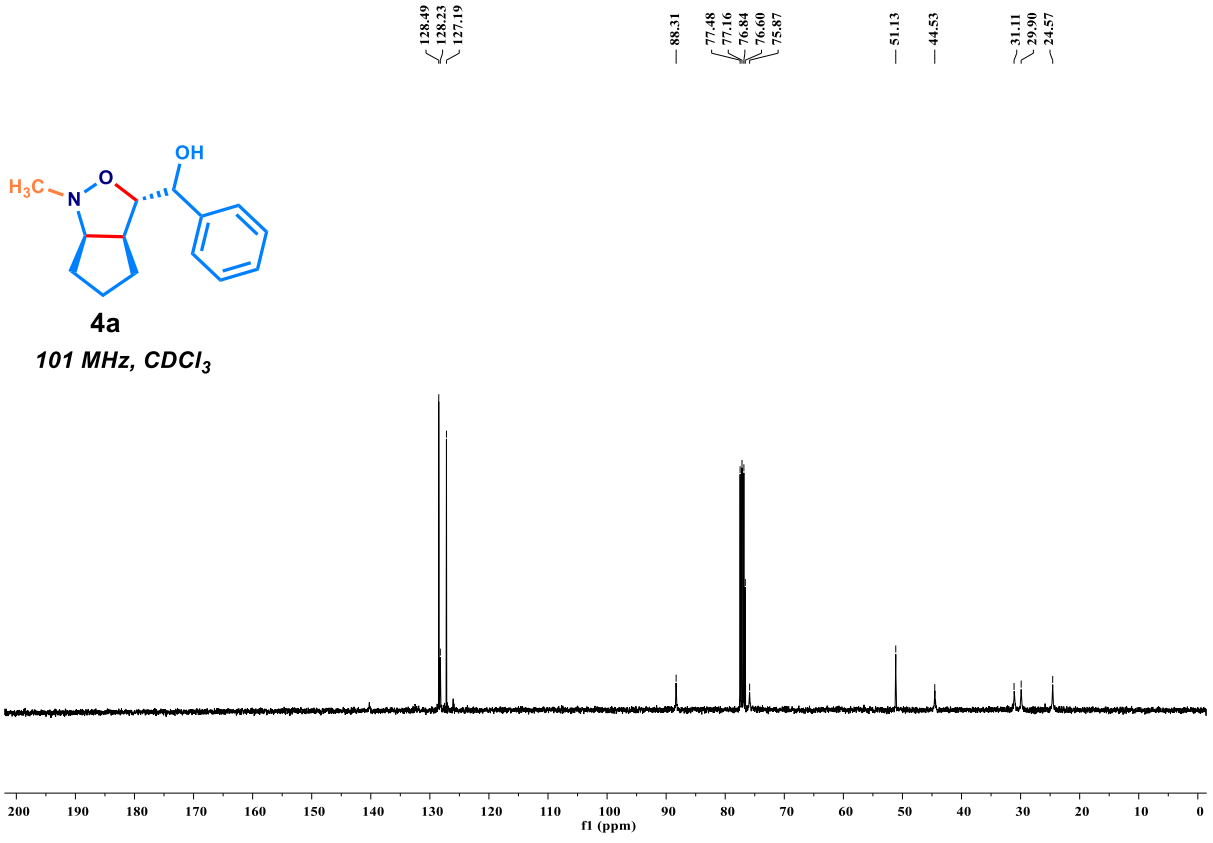

3xa (1:1 dr)
400 MHz, CDCl3
f1 (ppm)

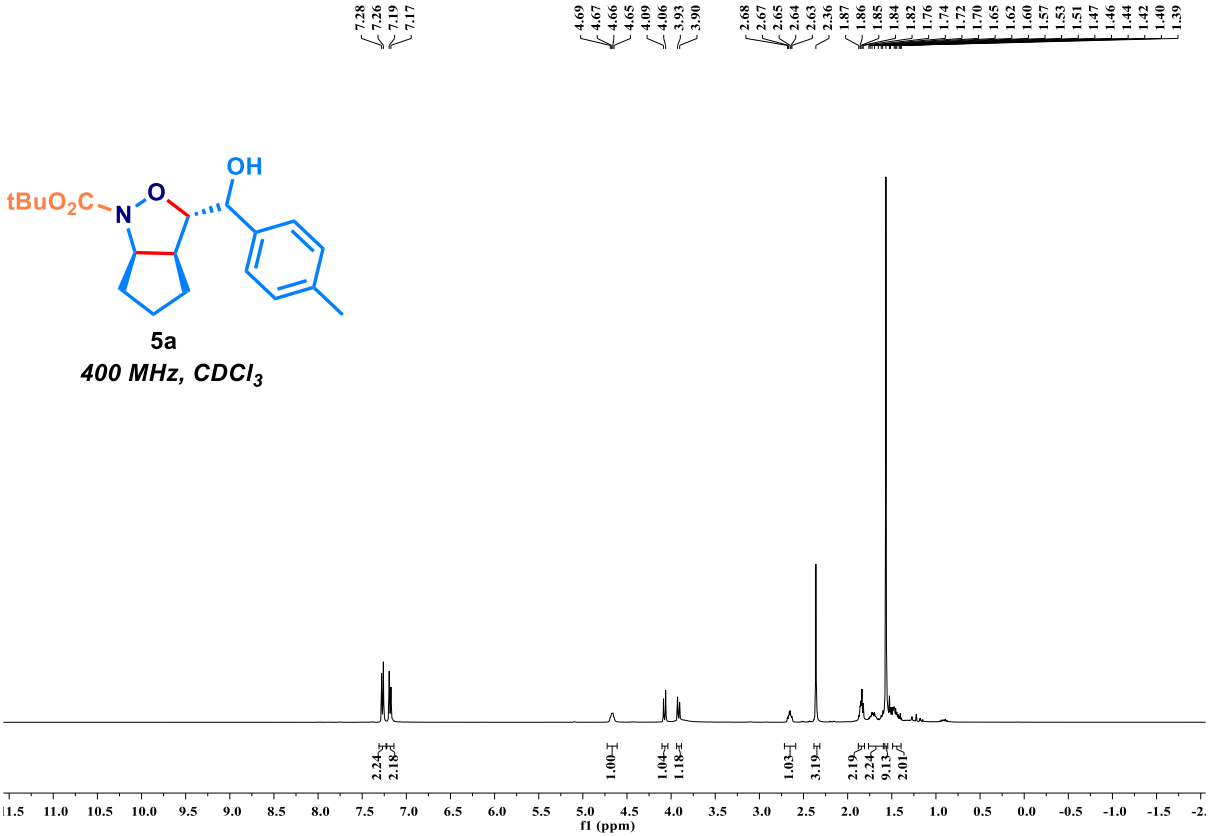

3xa (1:1 dr)
101 MHz, CDCl3
f1 (ppm)

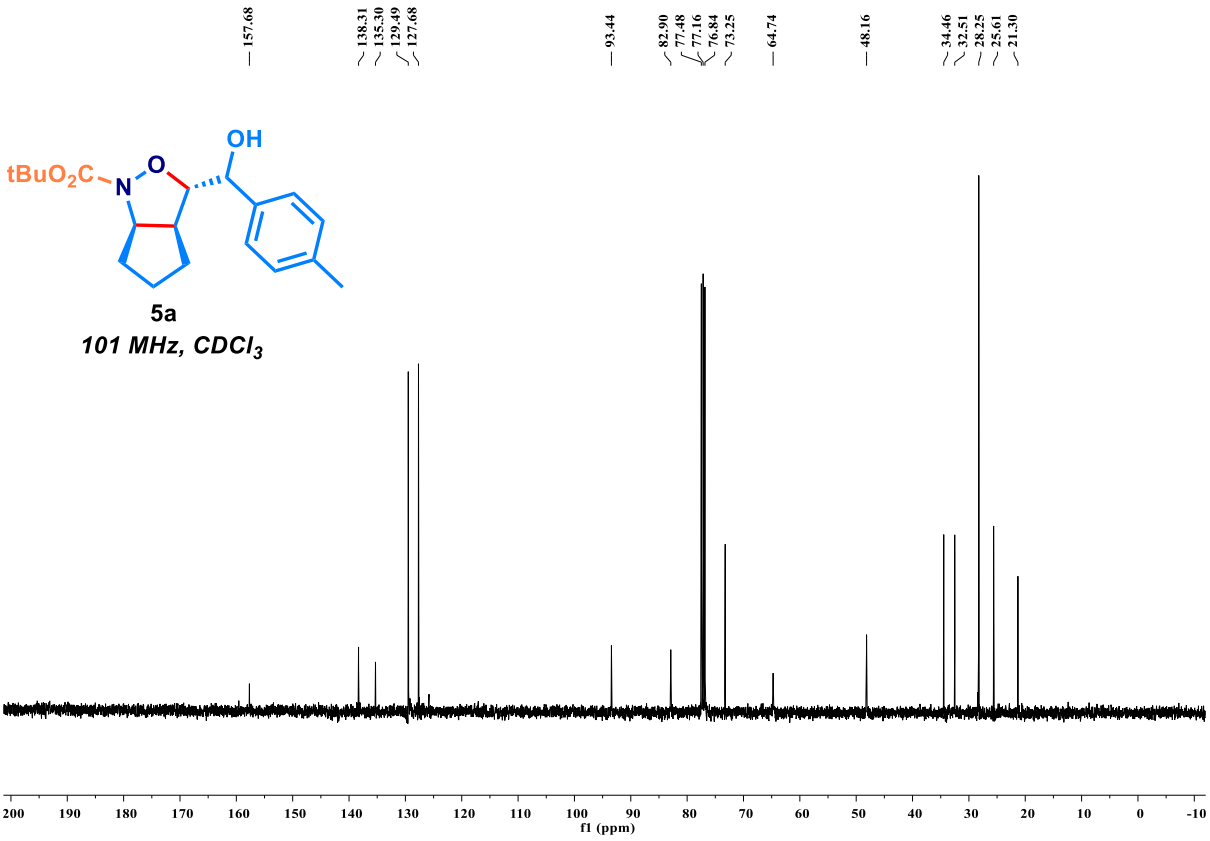

8.06
8.04
7.60
7.58
7.57
7.49
7.47
7.45
7.26
5.05
4.77
4.42
4.40
4.38
3.59
3.57
3.56
1.97
1.96
1.94
1.92
1.91
1.89
1.85
1.79
1.74
1.69
1.67
1.65
1.55
1.52
1.50
0.93
0.91
0.86
0.80
0.79
0.77
0.73
0.71
0.63
0.60
0.57
0.44
0.41
0.38
0.35
O
O
N
O
O
Ph
3xb (1:1 dr)
400 MHz, CDCl3
2.02
1.03
2.06
1.00
1.00
1.01
1.02
7.11
2.05
2.11
2.13
6.06
3.03
1.11
1.03
f1 (ppm)

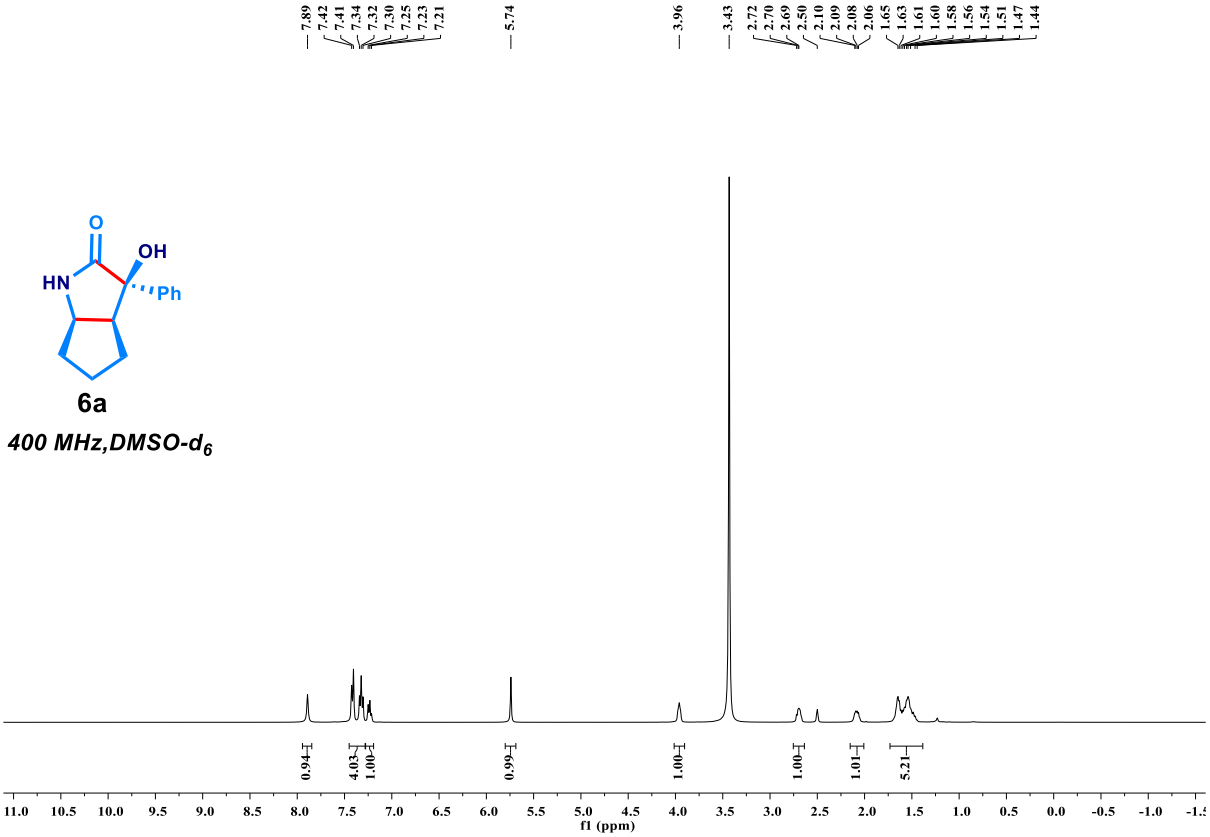

194.9
157.6
135.4
133.6
129.5
128.6
86.9
77.5
77.2
76.8
76.6
65.6
47.2
47.0
40.0
34.4
34.3
32.2
31.3
26.2
25.9
23.4
22.1
20.8
16.4
O
O
N
O
O
Ph
3xb (1:1 dr)
101 MHz, CDCl3
f1 (ppm)


7.32
7.30
7.28
7.26
7.24
7.22
7.21
7.18
4.56
4.55
3.66
3.64
3.63
2.97
2.64
2.60
1.66
1.64
1.63
1.61
1.60
1.58
1.57
1.55
1.51
1.42
1.41
1.39
1.38
1.38
1.35
1.34
1.32
1.31
1.29
1.28
1.26
1.09
1.06
0.83
0.82
OH
H3C
N
O
4a
400 MHz, CDCl3
5.54
1.00
1.00
0.95
3.24
1.29
2.22
2.25
2.12
11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1.0 -1.5 -2.0 -2.5
f1 (ppm)


128.49
128.23
127.19
88.31
77.48
77.16
76.84
76.60
75.87
51.13
44.53
31.11
29.90
24.57
OH
H3C
N
O
4a
101 MHz, CDCl3
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

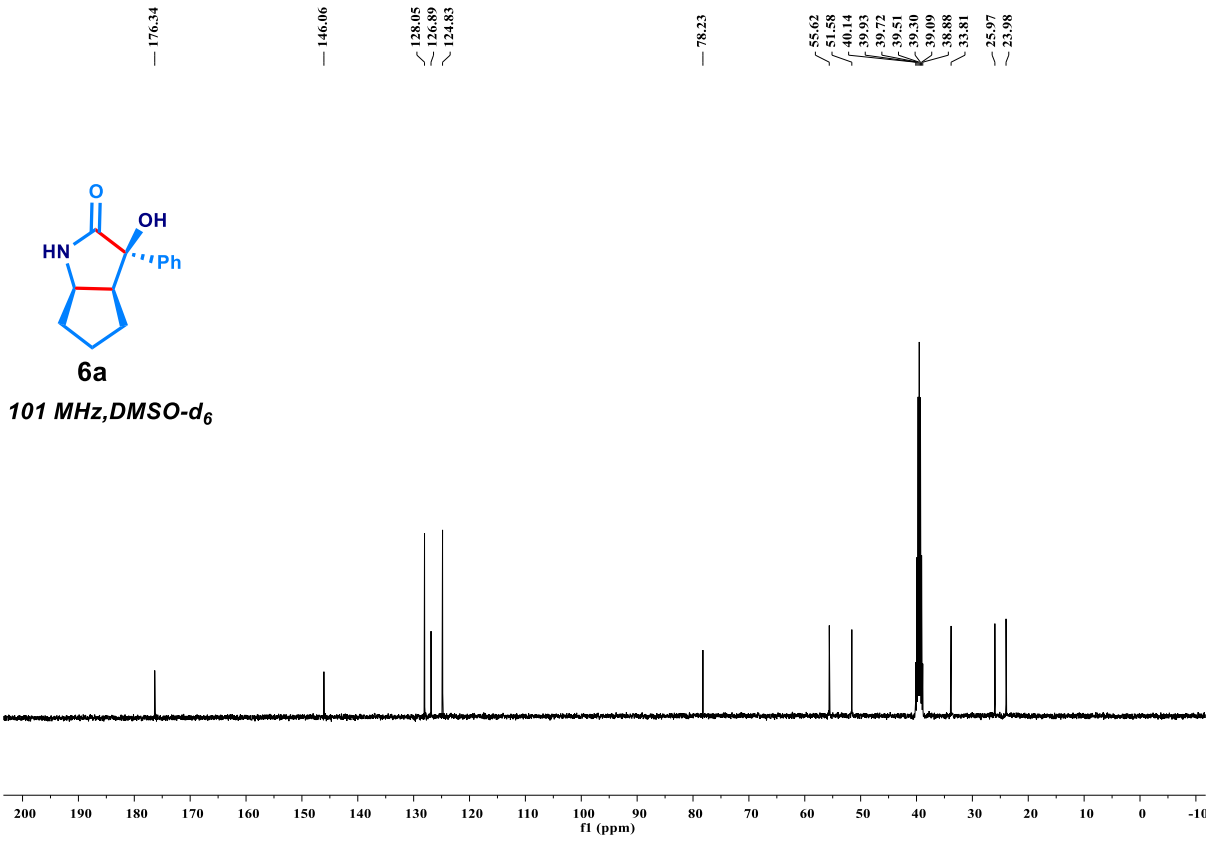

7.28
7.26
7.19
7.17
4.69
4.67
4.66
4.65
4.09
4.06
3.93
3.90
2.68
2.67
2.65
2.64
2.63
2.36
1.87
1.86
1.85
1.84
1.82
1.76
1.74
1.72
1.70
1.65
1.62
1.60
1.57
1.53
1.51
1.47
1.46
1.44
1.42
1.40
1.39
tBuO2C
N
O
OH
5a
400 MHz, CDCl3
2.24
2.18
1.00
1.04
1.18
1.03
3.19
2.19
2.24
9.13
2.01
f1 (ppm)


157.68
138.31
135.30
129.49
127.68
93.44
82.90
77.48
77.16
76.84
73.25
64.74
48.16
34.46
32.51
28.25
25.61
21.30
tBuO2C
N
O
OH
5a
101 MHz, CDCl3
f1 (ppm)



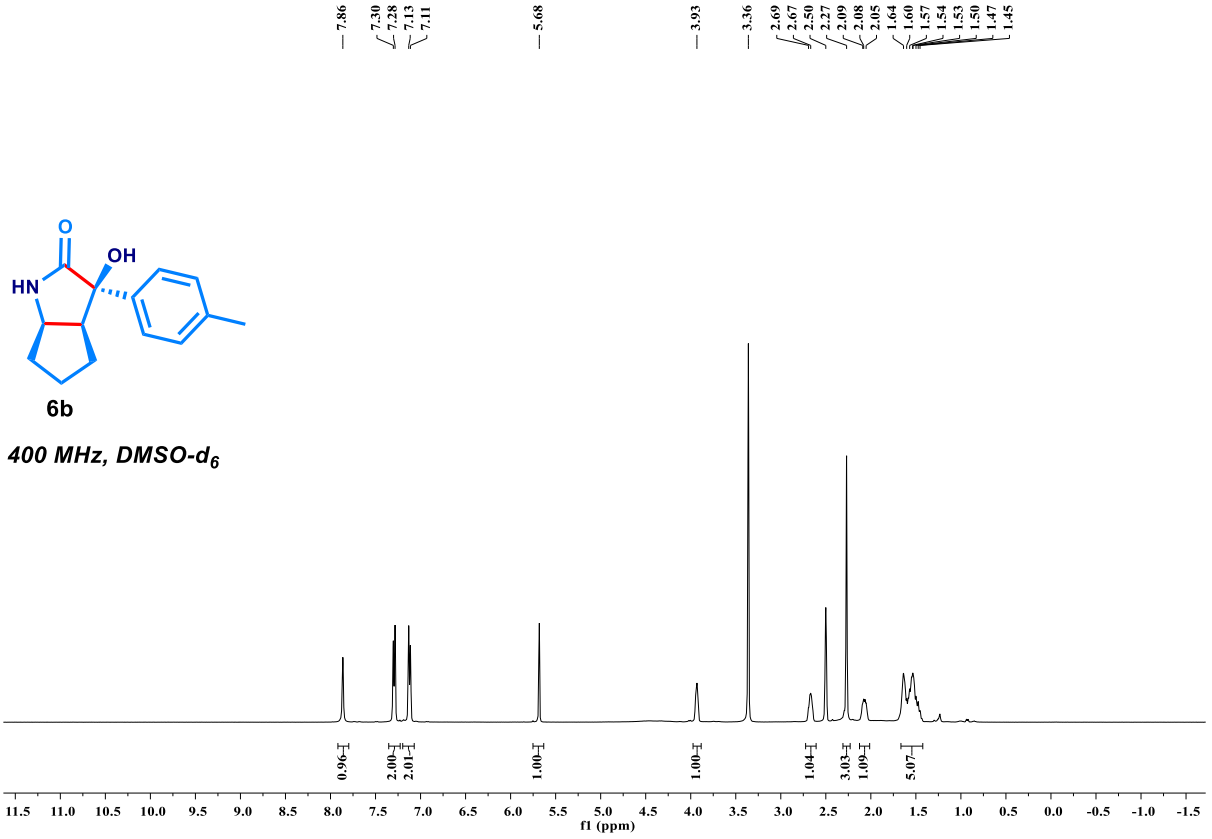
6a

400 MHz,DMSO-d_6



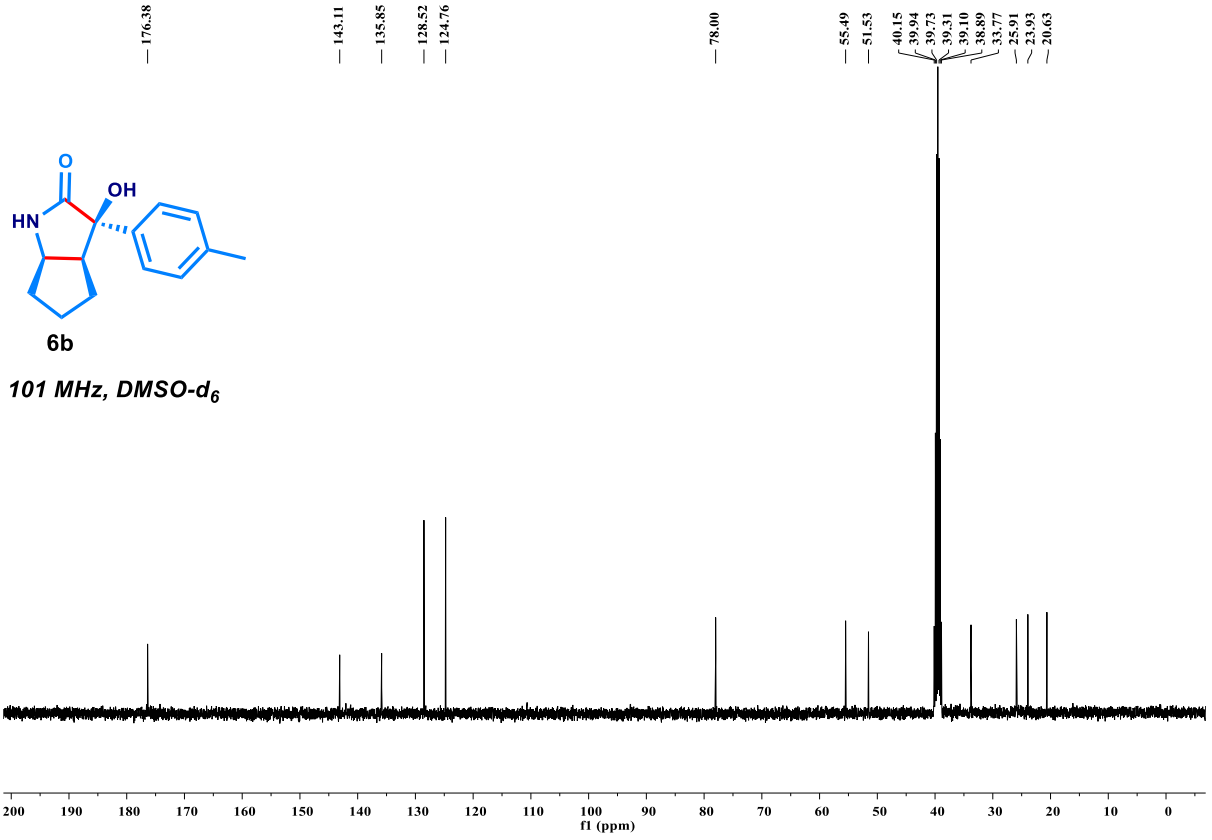
6a

101 MHz,DMSO-d_6



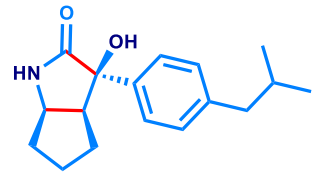
6b

400 MHz, DMSO-d_6



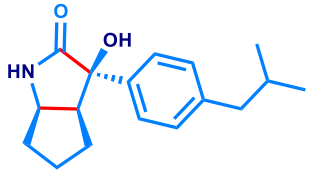
6b

101 MHz, DMSO-d_6



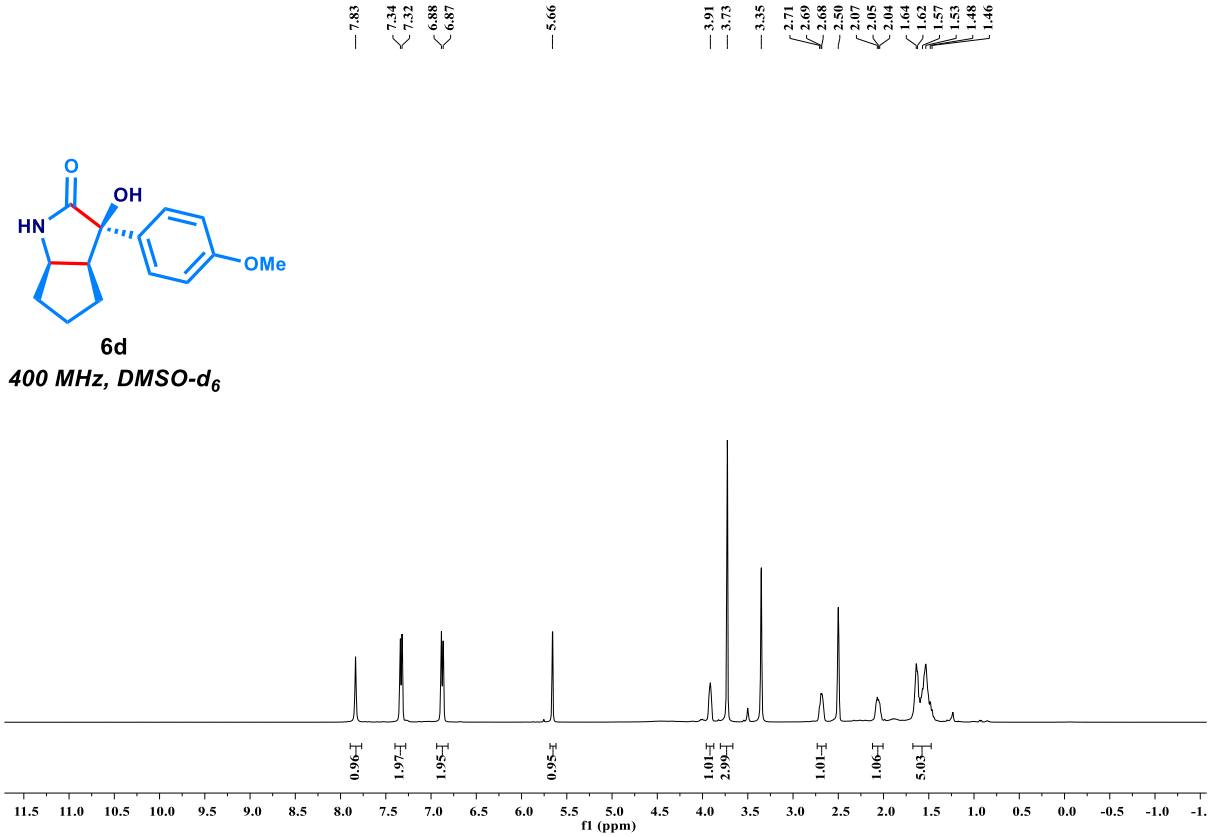
6c

400 MHz, DMSO-d_6



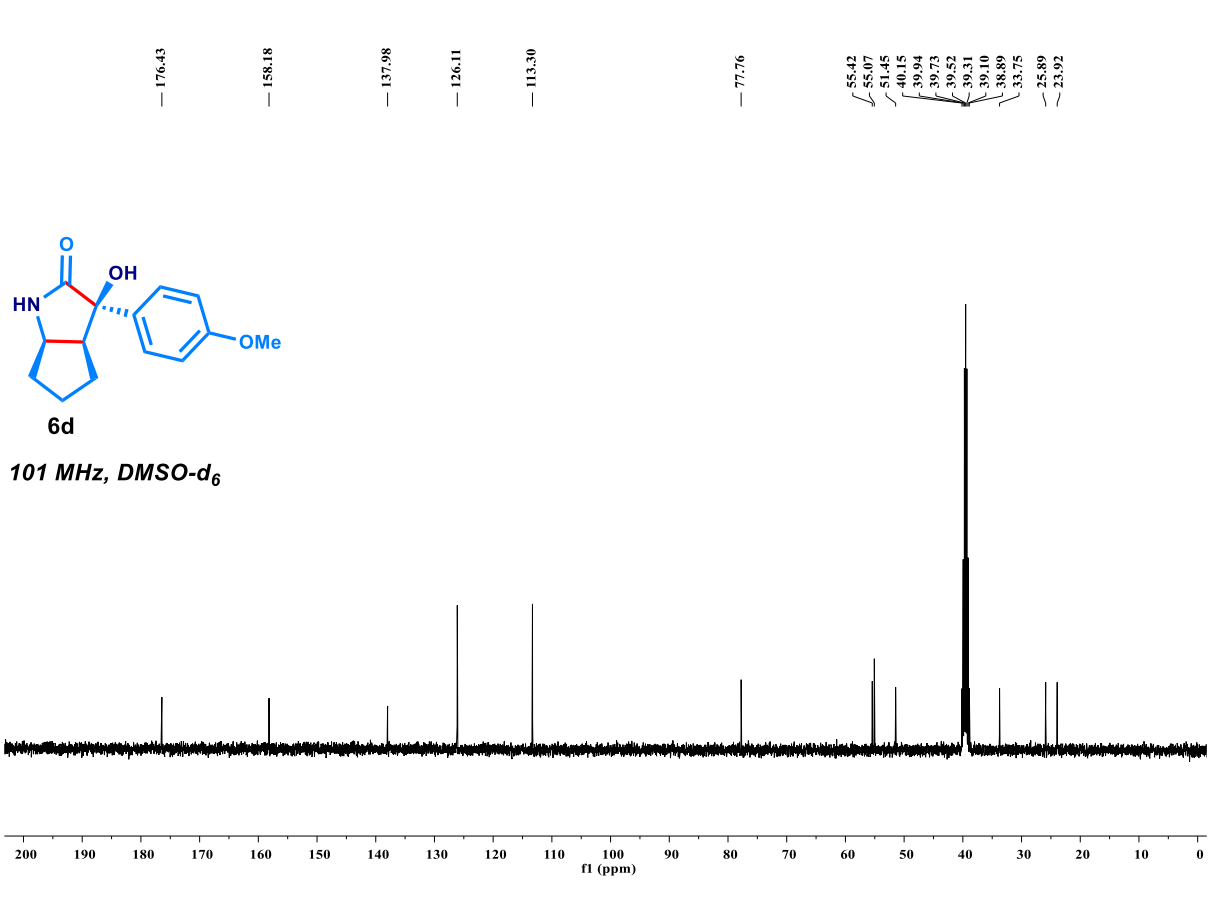
6c

100 MHz, DMSO-d_6



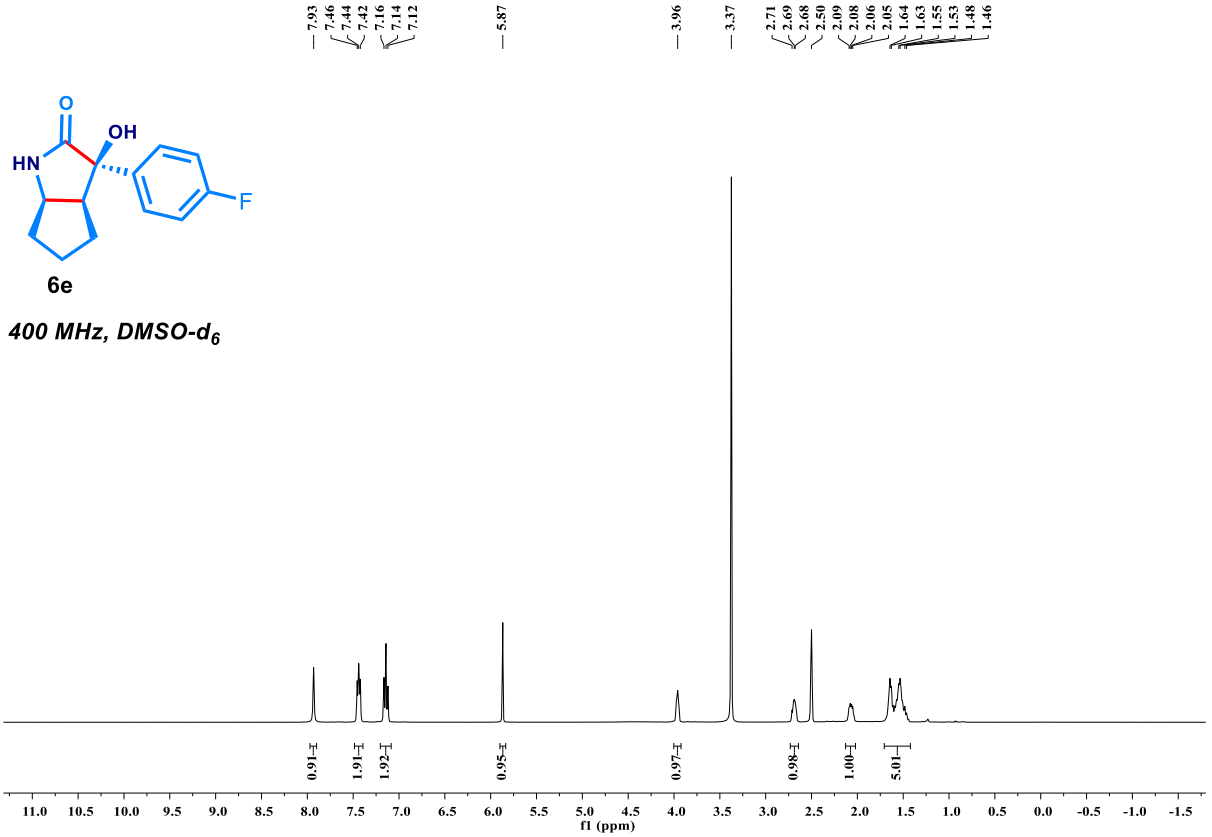
6d

400 MHz, DMSO-d_6



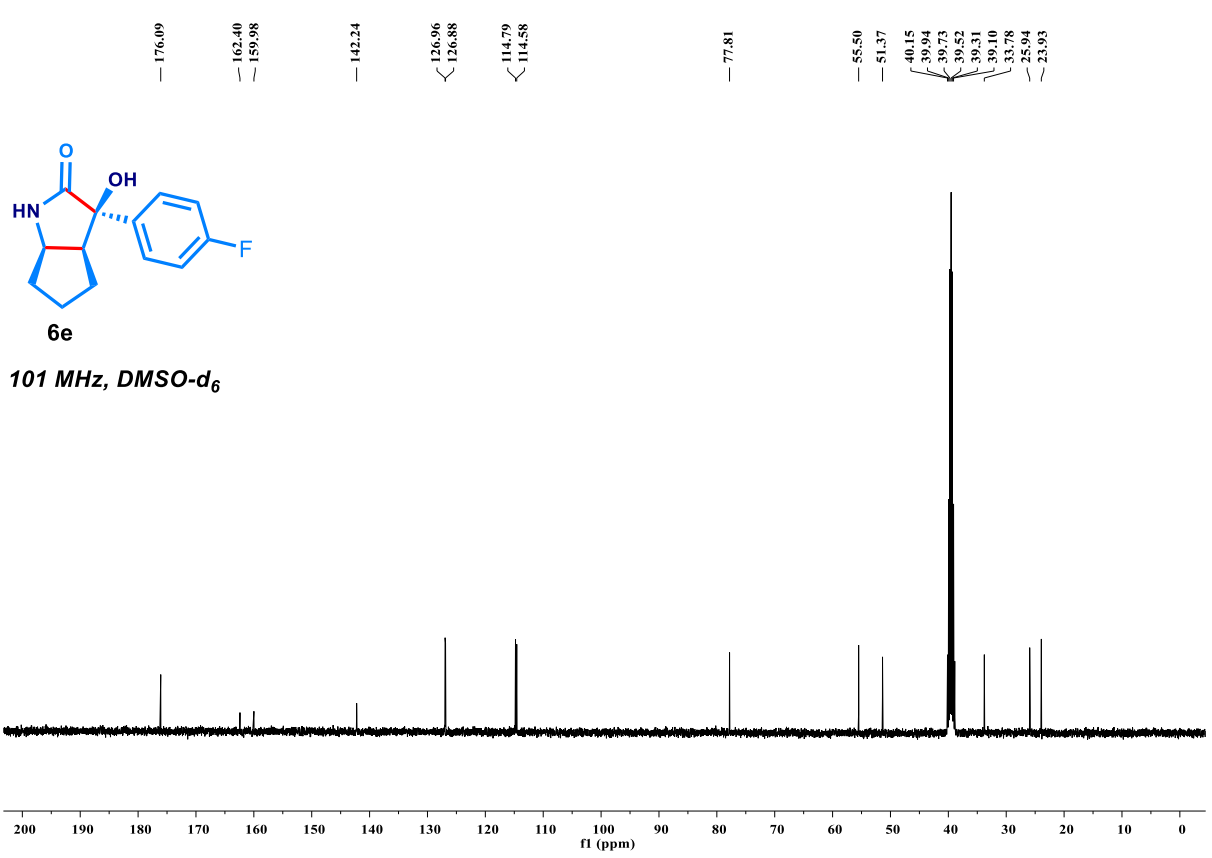
6d

101 MHz, DMSO-d_6



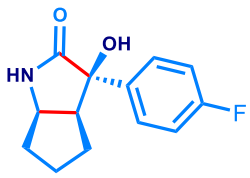
6e

400 MHz, DMSO-d_6



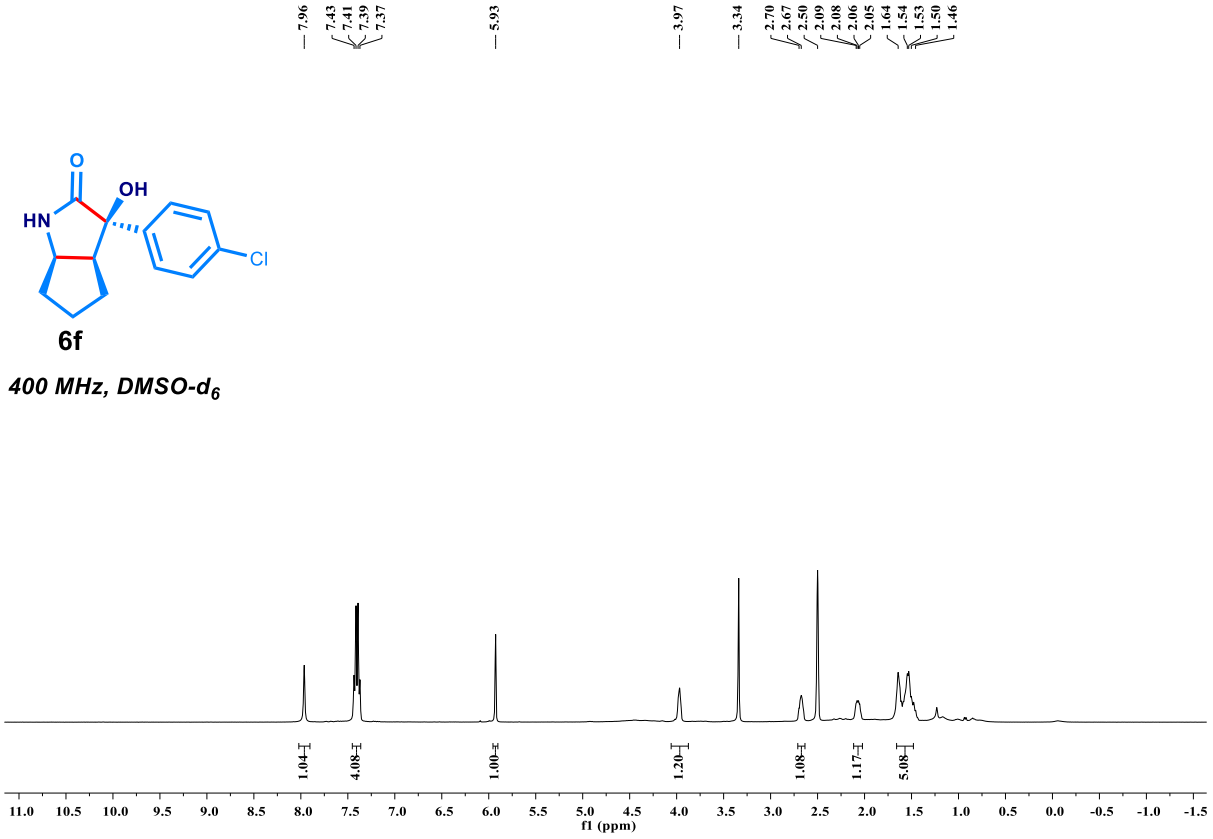
6e

101 MHz, DMSO-d_6



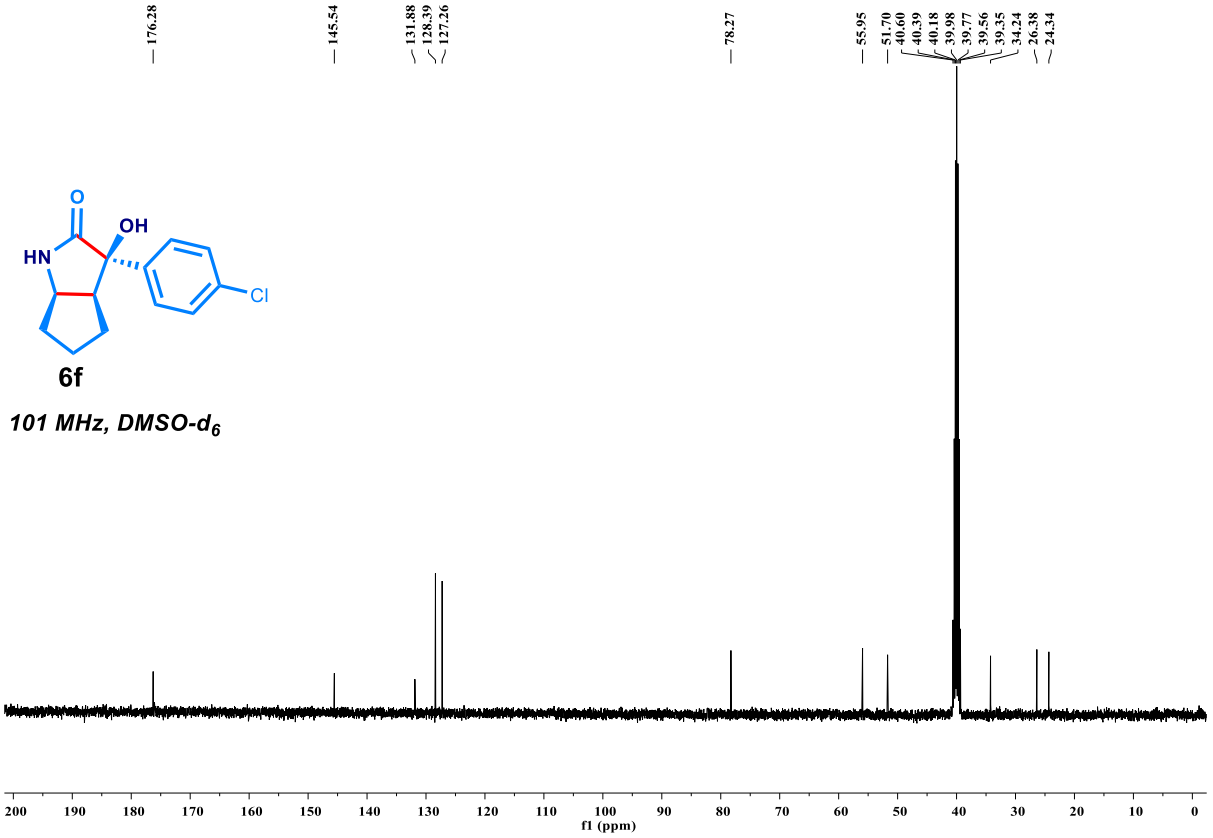
6e

471 MHz, DMSO-d_6



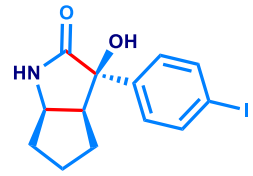
6f

400 MHz, DMSO-d_6



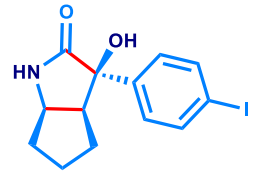
6f

101 MHz, DMSO-d_6



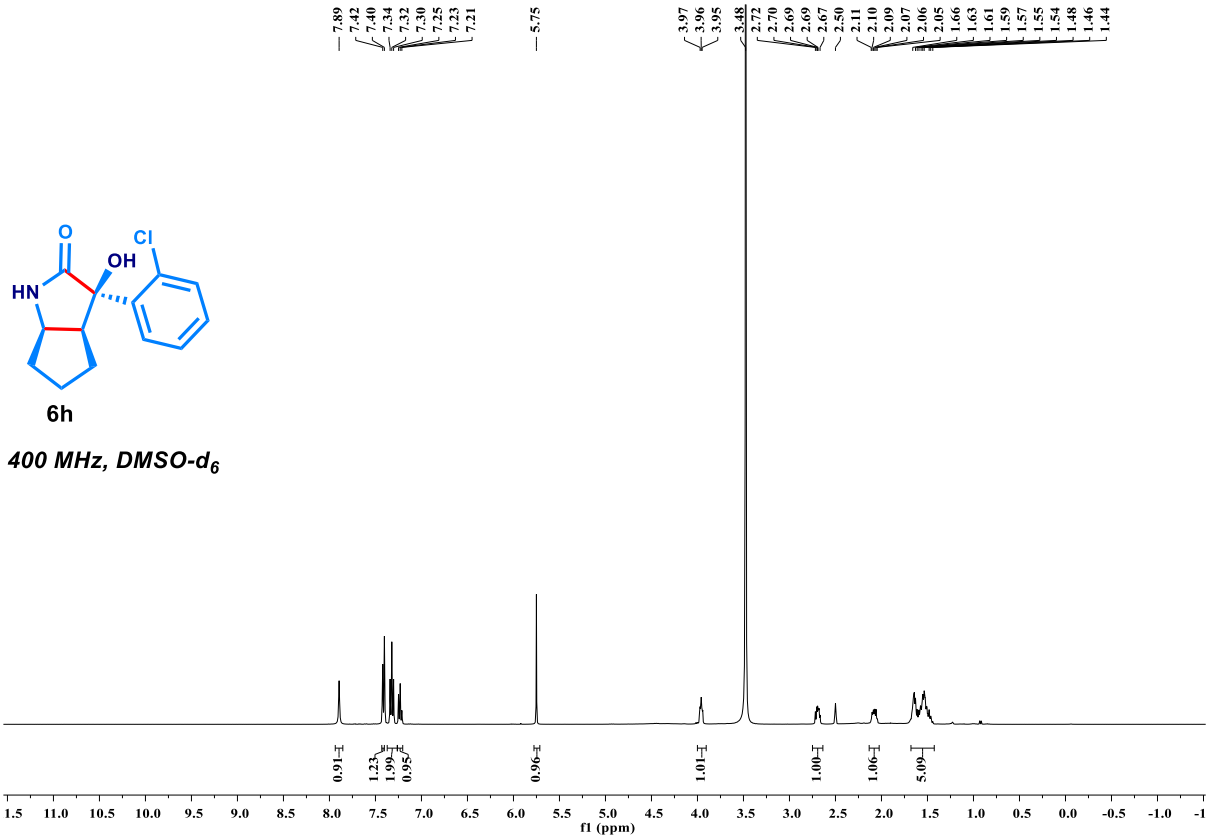
6g

400 MHz, DMSO-d_6



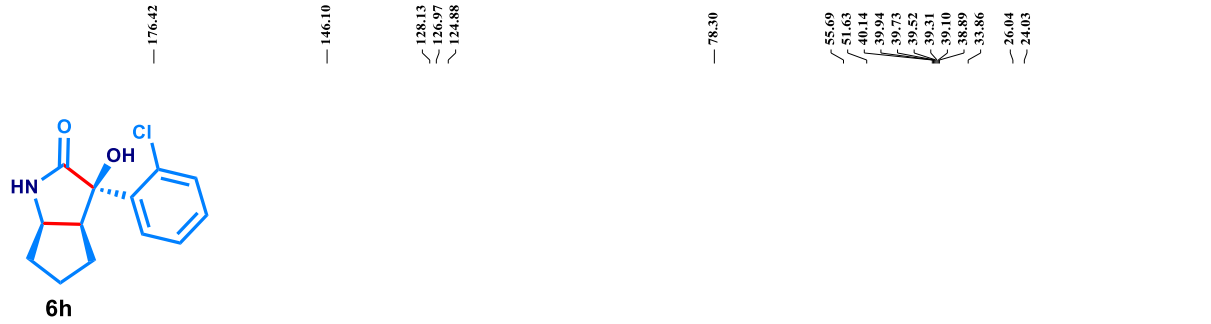
6g

101 MHz, DMSO-d_6



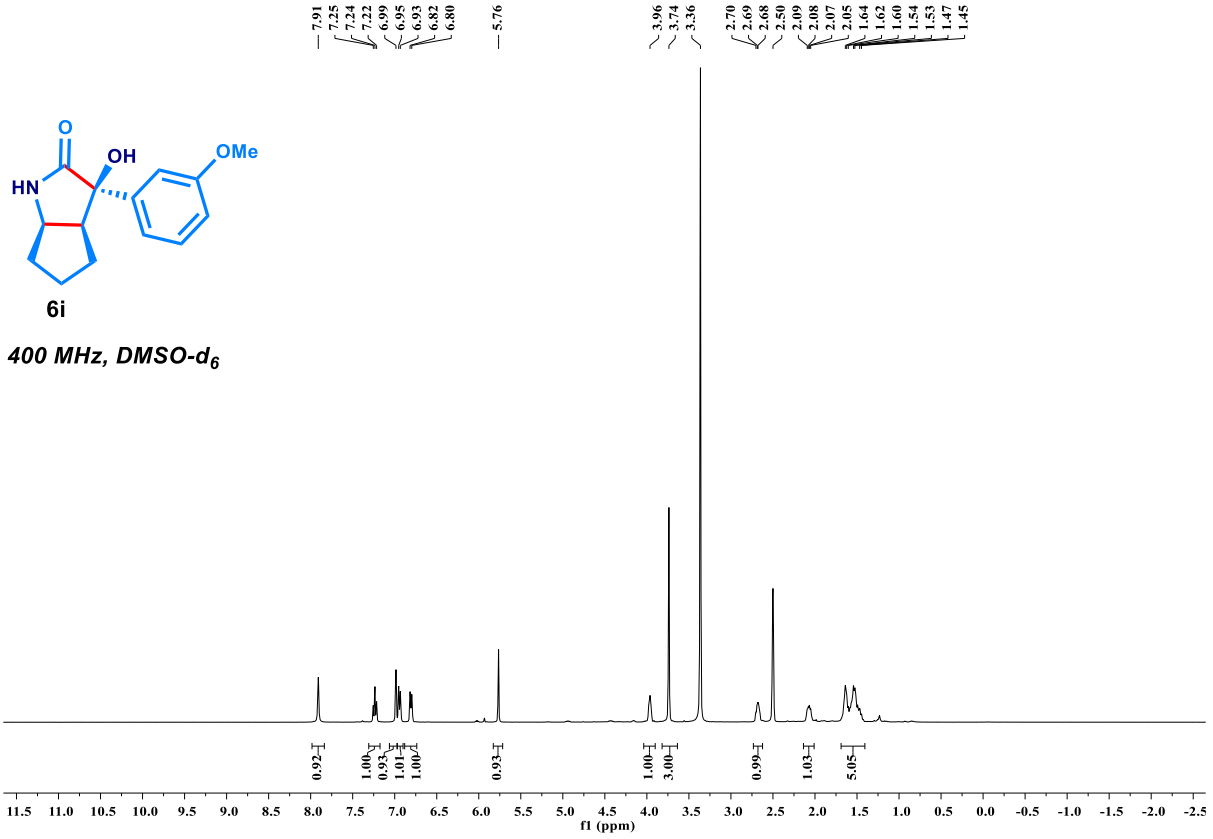
6h

400 MHz, DMSO-d_6



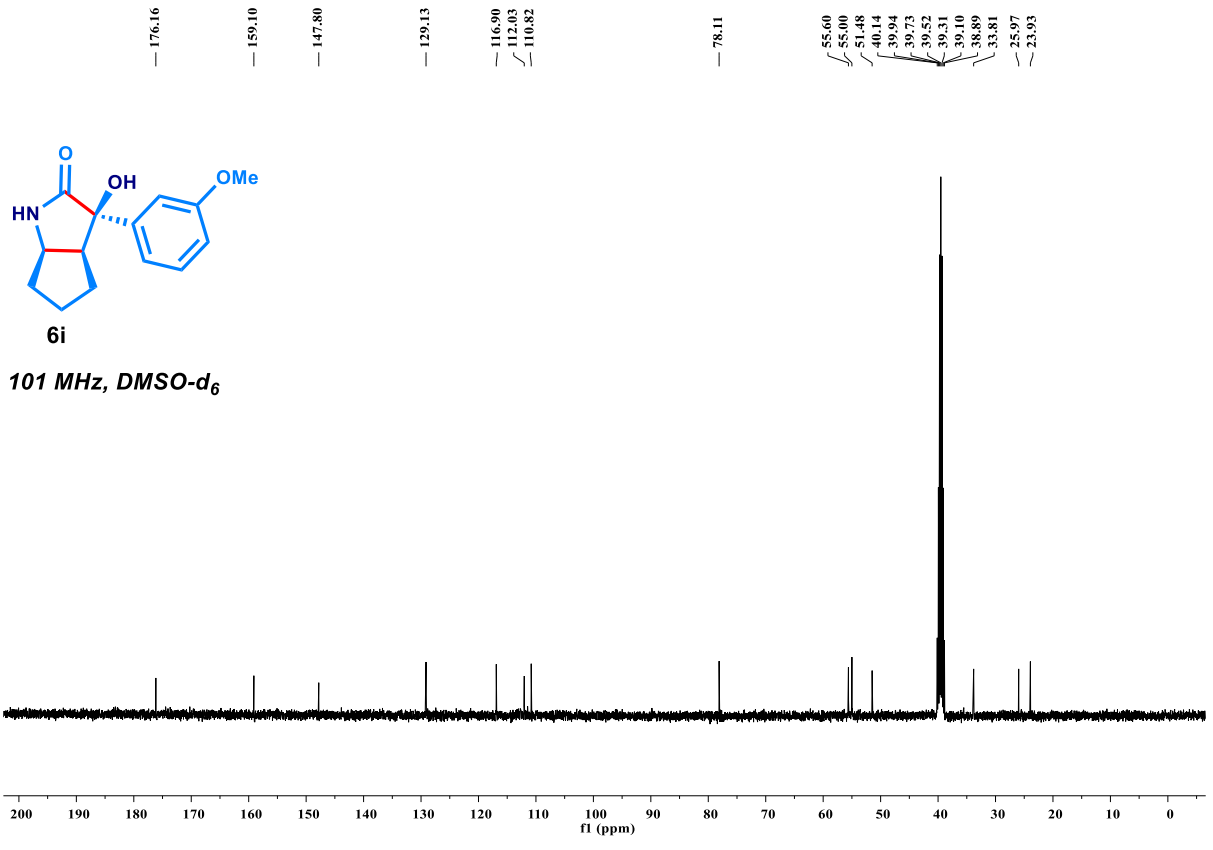
6h

101 MHz, DMSO-d_6



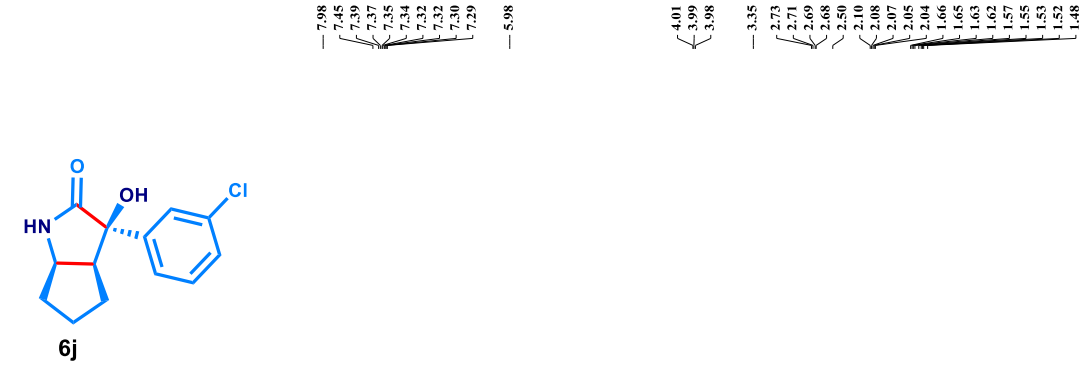
6i

400 MHz, DMSO-d_6



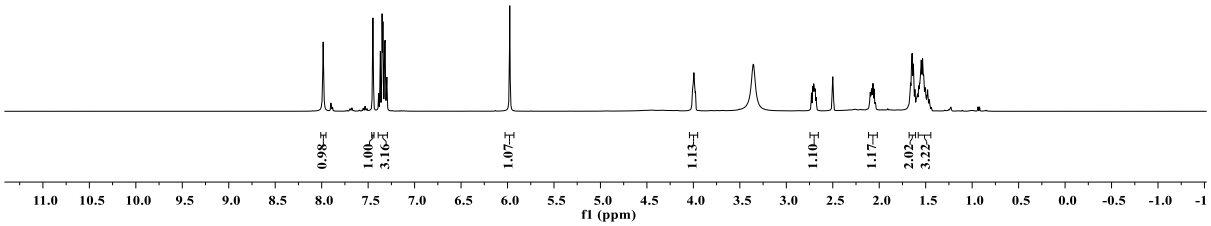
6i

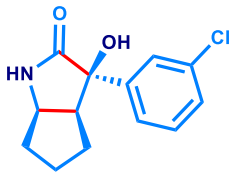
101 MHz, DMSO-d_6



6j

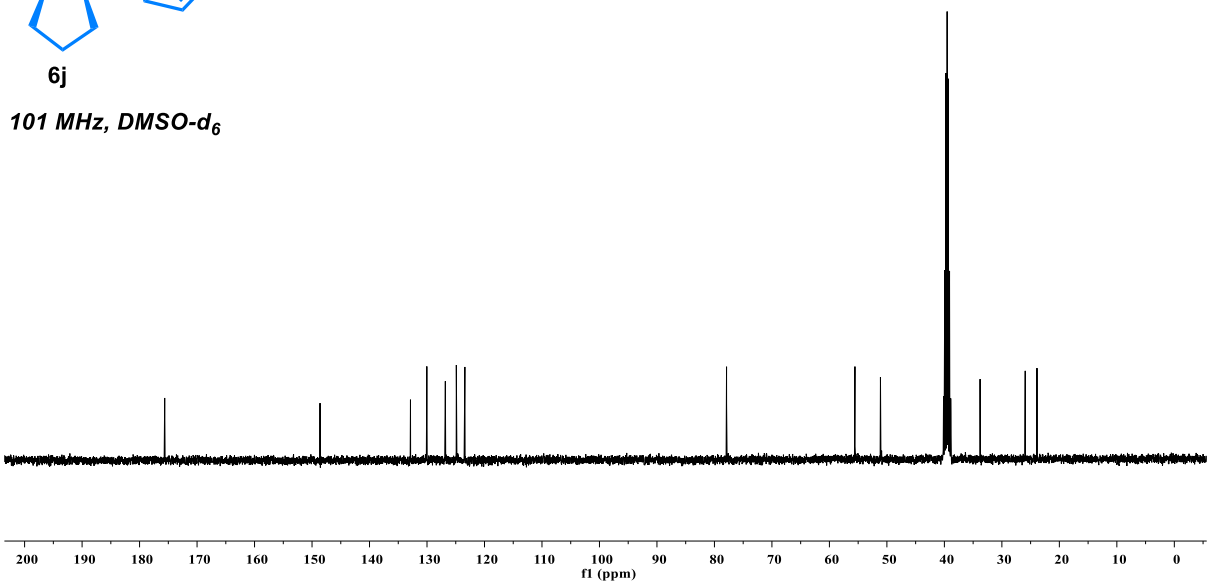
400 MHz, DMSO-d_6

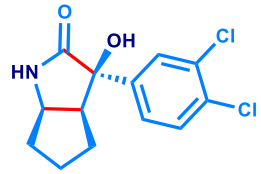




6j

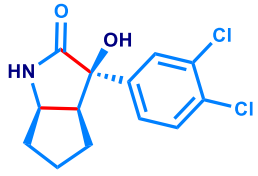
101 MHz, DMSO-d_6





6k

400 MHz, DMSO-d_6



6k

101 MHz, DMSO-d_6