Electronic Supplementary Material (ESI) for Organic Chemistry Frontiers.

Supporting Information

Photocatalytic Dehydrogenated Oxidation/Amination of 2-Alkyl Benzamides under Transition-Metal-Free Conditions

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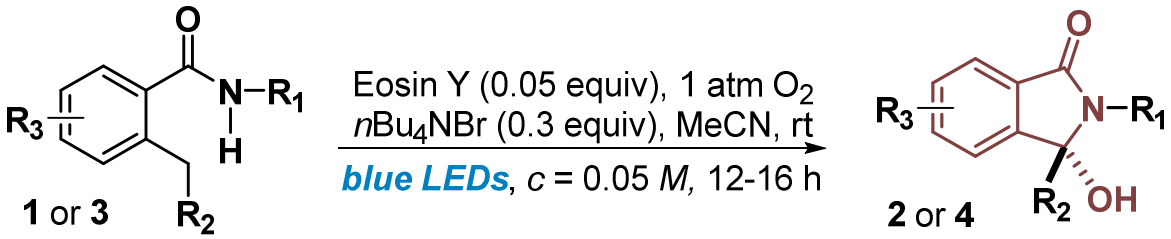
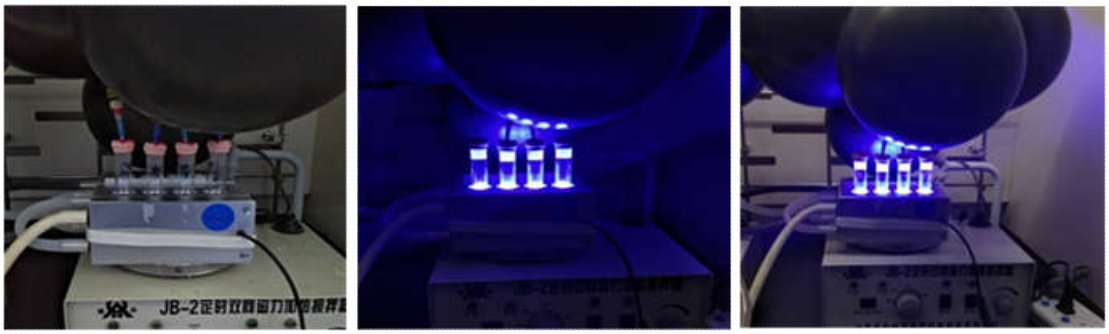
Materials and methods

All the chemicals were purchased commercially, and used without further purification. Thin-layer chromatography (TLC) was conducted with 0.25 mm Tsingdao silica gel plates (60F-254) and visualized by exposure to UV light (254 nm) or stained with potassium permanganate. Flash column chromatography was performed using Tsingdao silica gel (60, particle size 0.040–0.063 mm). Reagents were purchased at the highest commercial quality and used without further purification, unless otherwise stated. ^{1}H NMR spectra were recorded on JEOL spectrometers (at 400 MHz) and were reported relative to deuterated solvent signals. Data for ^{1}H NMR spectra were reported as follows: chemical shift (δ ppm), multiplicity, coupling constant (Hz) and integration. ^{13}C NMR spectrawere recorded on JEOL Spectrometers (at 100 MHz). Data for ^{13}C NMR spectra were reported in terms of chemical shift. Mass spectrometric data were obtained using Bruker Apex IV RTMS. The following abbreviations were used to explain the multiplicities: s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet, br = broad.

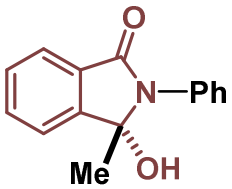
General procedure for isoindolinone synthesis



A flame-dried reaction tube was equipped with magnetic stir bar and charged with 2-ethyl-*N*-phenylbenzamide **1** or **3** (0.13 mmol, 1.0 equiv), Eosin Y (0.0067 mmol, 0.05 equiv), nBu$_4$NBr (0.04 mmol, 0.3 equiv) and MeCN (3.0 mL). The reaction mixture was irradiated by blue LEDs (12 W, wavelength 450 nm) under a balloon oxygen atmosphere at room temperature until the starting material disappeared from the TLC. After that, the reaction mixture was directly concentrated under reduced pressure and the crude residue was purified by silica gel column chromatography using hexane/EtOAc (v/v = 2/1) to afford the desired pure product **2** or **4** in 53-92% yields.

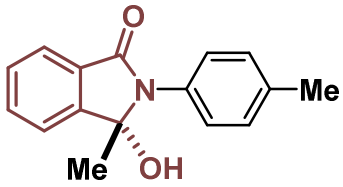


^{1}H, ^{13}C and ^{19}F spectra data of compounds 2a-2s, 4a-4y



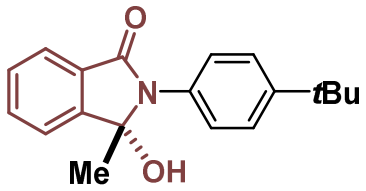
2a

3-hydroxy-3-methyl-2-phenylisoindolin-1-one (2a): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.61-7.59 (m, 3H), 7.49-7.47 (m, 2H), 7.44-7.41 (m, 1H), 7.39-7.36 (m, 1H), 7.33-7.29 (m, 1H), 3.68 (s, 1H), 1.61 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.7, 147.9, 135.4, 132.9, 130.1, 129.8, 129.2, 129.0, 127.2, 123.8, 121.8, 90.5, 24.4. These data are consistent with literature values, see: Kanako Nozawa-Kumada, Yuta Matsuzawa, Kanako Ono, Masanori Shigeno and Yoshinori Kondo. *Chem. Commun.* **2021**, *57*, 8604. (White solid, 29.3 mg, 92% isolated yield)



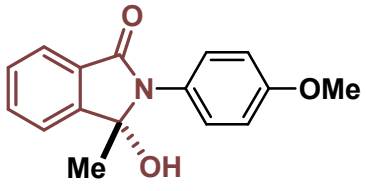
2b

3-hydroxy-3-methyl-2-(p-tolyl)isoindolin-1-one (2b): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.69-7.67 (d, J = 7.6 Hz, 1H), 7.62-7.60 (m, 2H), 7.47-7.43 (m, 1H), 7.37-7.34 (d, J = 8.8 Hz, 2H), 7.21-7.19 (d, J = 8.4 Hz, 2H), 3.27 (s, 1H), 2.39 (s, 3H), 1.62 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.6, 147.8, 137.3, 132.9, 132.6, 130.3, 129.8, 129.7, 127.3, 123.9, 121.8, 90.3, 24.5, 21.2; HRMS calculated for $C_{19}H_{16}NO_2$ ($M + H^+$): 254.1182, found: 254.1176. (Yellow solid, 22.2 mg, 70% isolated yield)



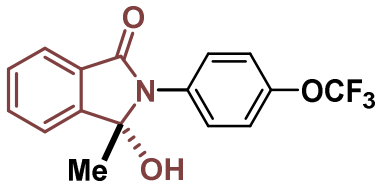
2c

2-(4-(tert-butyl)phenyl)-3-hydroxy-3-methylisoindolin-1-one (2c): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.57-7.56 (d, *J* =4.4 Hz, 2H), 7.53-7.51 (d, *J* = 7.6 Hz, 1H), 7.39-7.36 (m, 5H),3.90 (s, 1H), 1.59 (s, 3H), 1.35 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.8, 150.1, 148.0, 132.8, 132.5, 130.2, 129.6, 126.8, 126.0, 123.7, 121.7, 90.4, 34.7, 31.5, 24.5; HRMS calculated for $C_{19}H_{22}NO_2$ (M + H^+): 296.1651, found: 296.1645. (White solid, 28.6 mg, 91% isolated yield)



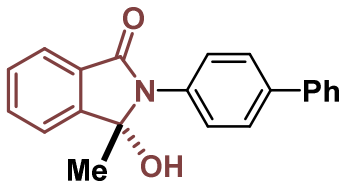
2d

4-hydroxy-2-(4-methoxyphenyl)-3-methylisoindolin-1-one (2d): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58-7.57 (d, *J* = 3.6 Hz, 2H), 7.49-7.47 (d, *J* = 8.0 Hz, 1H), 7.39-7.36 (m, 1H), 7.33-7.31 (d, *J* = 8.8 Hz, 2H), 6.88-6.86 (d, J = 9.6 Hz, 2H), 3.82 (s, 3H), 1.57 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.8, 158.7, 147.9, 132.7, 130.2, 129.7, 128.8, 127.8, 123.6, 121.8, 114.3, 90.3, 55.5, 24.5; HRMS calculated for $C_{16}H_{16}NO_3$ (M + H^+): 270.1130, found: 270.1125. (White solid, 27.5 mg, 87% isolated yield)



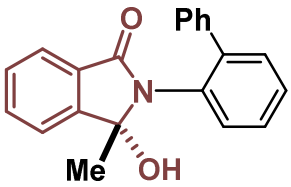
2e

3-hydroxy-3-methyl-2-(4-(trifluoromethoxy)phenyl)isoindolin-1-one (2e): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.62-7.60 (m, 2H), 7.59-7.55 (m, 2H), 7.50-7.48 (d, *J* = 7.2 Hz, 1H), 7.40-7.36 (m, 1H), 7.20-7.18 (m, 2H), 3.94 (s, 1H), 1.60 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.8, 147.8, 147.6, 134.1, 133.2, 129.9, 129.6, 127.9, 127.7, 123.8, 121.9, 121.8, 121.4, 90.8, 24.3; ^{19}F NMR (376 MHz, $CDCl_3$) δ -57.8; HRMS calculated for $C_{16}H_{13}F_3NO_3$ ($M + H^+$): 324.0848, found: 324.0842. (White solid, 27.6 mg, 88% isolated yield)



2f

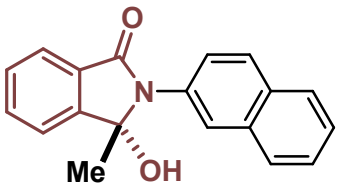
2-([1,1'-biphenyl]-4-yl)-3-hydroxy-3-methylisoindolin-1-one (2f): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.63-7.61 (m, 2H), 7.59-7.58 (m, 1H), 7.57-7.54 (m, 4H), 7.53-7.51 (m, 2H), 7.43-7.38 (m, 3H), 7.37-7.35 (m, 1H), 3.84 (s, 1H), 1.65 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.8, 148.0, 140.5, 139.8, 134.7, 133.0, 130.0, 129.8, 128.9, 127.8, 127.6, 127.4, 127.1, 127.0, 123.7, 121.8, 90.7, 24.4; HRMS calculated for $C_{21}H_{17}NO_2Na$ ($M + Na^+$): 338.1157, found: 338.1152. (Yellow oil, 23.5 mg, 75% isolated yield)



2g

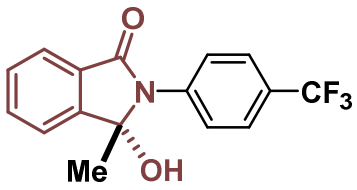
2-([1,1'-biphenyl]-2-yl)-3-hydroxy-3-methylisoindolin-1-one (2g): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.67-7.63 (m, 3H), 7.62-7.60 (m, 4H), 7.58-7.56 (m, 2H), 7.48-7.41 (m, 3H), 7.38-7.34 (m, 1H), 1.68 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.6, 152.5, 150.4, 147.9, 140.6, 140.0, 134.7, 133.0, 130.2, 130.0, 128.9, 127.7, 127.5, 127.2, 127.1, 123.9,

121.8, 90.6, 24.4; HRMS calculated for $C_{21}H_{17}NO_2Na$ (M + Na^+): 338.1157, found: 338.1152. (Yellow oil, 24.2 mg, 77% isolated yield)



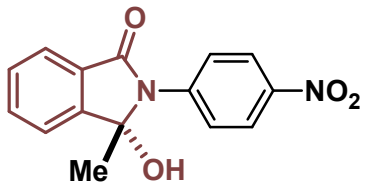
2h

3-hydroxy-3-methyl-2-(naphthalen-2-yl)isoindolin-1-one (2h): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.91-7.90 (d, *J* = 2.0 Hz, 1H), 7.76-7.73 (d, *J* = 8.4 Hz, 1H), 7.65-7.63 (d, *J* = 8.8 Hz, 1H), 7.60-7.51 (m, 4H), 7.46-7.40 (m, 2H), 7.37-7.30 (m, 2H), 4.34 (s, 1H), 1.57 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.0, 148.1, 133.4, 133.0, 132.2, 130.0, 129.7, 128.5, 128.2, 127.5, 126.1, 126.0, 125.0, 124.9, 123.6, 121.8, 90.9, 24.4; HRMS calculated for $C_{19}H_{15}NO_2Na$ (M + Na^+): 312.1000, found: 312.0095. (White solid, 24.9 mg, 79% isolated yield)



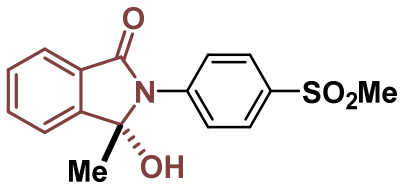
2i

3-hydroxy-3-methyl-2-(4-(trifluoromethyl)phenyl)isoindolin-1-one (2i): ^{1}H NMR (400 MHz, *d*6-DMSO) δ 7.89-7.87 (d, *J* = 8.4 Hz, 2H), 7.82-7.80 (d, *J* = 8.8 Hz, 2H), 7.76-7.74 (d, *J* = 7.6 Hz, 1H), 7.71-7.70 (d, *J* = 3.6 Hz, 2H), 7.58-7.54 (m, 1H), 7.01 (s, 1H), 1.56 (s, 3H); ^{13}C NMR (100 MHz, *d*6-DMSO) δ 166.1, 149.3, 140.8, 133.8, 130.1, 130.0, 127.1, 126.9, 126.3, 126.2, 123.6, 122.8, 90.8, 25.1; ^{19}F NMR (376 MHz, *d*6-DMSO) δ -60.7; HRMS calculated for $C_{16}H_{12}F_3NO_2Na$ (M + Na^+): 330.0718, found: 330.0712. (White solid, 28.0 mg, 89% isolated yield)



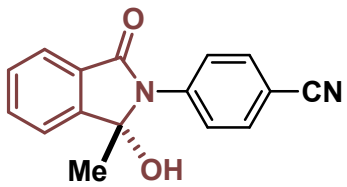
2j

3-hydroxy-3-methyl-2-(4-nitrophenyl)isoindolin-1-one (2j): ^{1}H NMR (400 MHz, *d*6-DMSO) δ 8.33-8.29 (m, 2H), 8.07-8.03 (m, 2H), 7.78-7.76 (d, *J* = 7.2 Hz, 1H), 7.74-7.71 (m, 2H), 7.60-7.56 (m, 1H), 1.61 (s, 3H); ^{13}C NMR (100 MHz, *d*6-DMSO) δ 166.2, 149.3, 144.8, 143.6, 134.1, 130.2, 129.7, 125.5, 124.8, 123.8, 122.8, 91.3, 25.0; HRMS calculated for $C_{15}H_{11}N_2O_4$ (M - H^+): 283.0719, found: 283.0724. (Yellow solid, 26.2 mg, 83% isolated yield)



2k

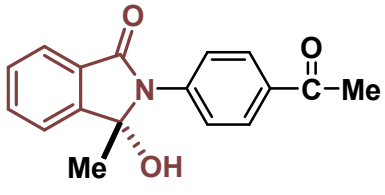
3-hydroxy-3-methyl-2-(4-(methylsulfonyl)phenyl)isoindolin-1-one (2k): ^{1}H NMR (400 MHz, *d*6-DMSO) δ 8.00-7.93 (m, 4H), 7.77-7.75 (d, *J* = 8.0 Hz, 1H), 7.72-7.71 (d, *J* = 3.6 Hz, 1H), 7.59-7.55 (m, 1H), 7.06 (s, 1H), 3.23 (s, 3H), 1.58 (s, 3H); ^{13}C NMR (100 MHz, *d*6-DMSO) δ 166.1, 149.3, 141.8, 138.3, 133.9, 130.1, 130.0, 128.2, 126.4, 123.6, 122.8, 91.0, 44.1, 25.1; HRMS calculated for $C_{16}H_{15}NO_4SNa$ (M + Na^+): 340.0619, found: 340.0614. (White solid, 27.3 mg, 87% isolated yield)



2l

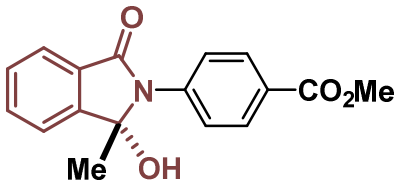
4-(1-hydroxy-1-methyl-3-oxoisoindolin-2-yl)benzonitrile (2l): ^{1}H NMR (400 MHz,

$CDCl_3$) δ 7.94-7.89 (m, 4H), 7.77-7.75 (d, J = 7.2 Hz, 1H), 7.72-7.71 (m, 2H), 7.59-7.55 (m, 1H), 1.58 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.1, 149.3, 141.6, 134.0, 133.4, 130.1, 129.9, 126.2, 123.7, 122.8, 119.3, 108.6, 91.1, 25.1; HRMS calculated for $C_{16}H_{12}N_2O_2Na$ ($M + Na^+$): 287.0796, found: 287.0791. (White solid, 24.7 mg, 78% isolated yield)



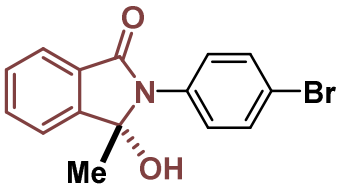
2m

2-(4-acetylphenyl)-3-hydroxy-3-methylisoindolin-1-one (2m): ^1H NMR (400 MHz, $CDCl_3$) δ 7.85-7.82 (m, 2H), 7.73-7.70 (m, 2H), 7.61-7.60 (m, 2H), 7.39-7.37 (d, J = 7.6 Hz, 1H), 7.35-7.31 (m, 1H), 4.59 (s, 1H), 2.58 (s, 3H), 1.62 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.6, 166.8, 148.0, 140.4, 134.5, 133.4, 129.8, 129.3, 129.0, 124.8, 123.7, 121.7, 91.4, 26.6, 24.2; HRMS calculated for $C_{17}H_{15}NO_3Na$ ($M + Na^+$): 304.0950, found: 304.0944. (White solid, 25.6 mg, 81% isolated yield)



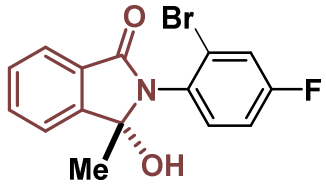
2n

methyl 4-(1-hydroxy-1-methyl-3-oxoisoindolin-2-yl)benzoate (2n): ^1H NMR (400 MHz, $CDCl_3$) δ 8.01-7.99 (m, 2H), 7.75-7.73 (m, 2H), 7.64-7.58 (m, 3H), 7.44-7.40 (m, 1H), 3.93 (s, 3H), 1.65 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.7, 166.6, 147.9, 140.3, 133.4, 130.3, 130.0, 129.5, 127.8, 124.9, 124.0, 121.7, 91.2, 52.3, 24.2; HRMS calculated for $C_{17}H_{15}NO_4Na$ ($M + Na^+$): 320.0899, found: 320.0893. (Yellow solid, 25.2 mg, 80% isolated yield)



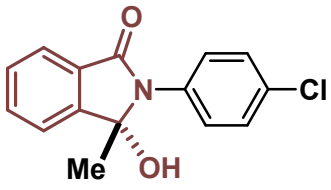
2o

2-(4-bromophenyl)-3-hydroxy-3-methylisoindolin-1-one (2o): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.61-7.57 (m, 2H), 7.45-7.34 (m, 6H), 4.13 (s, 1H), 1.57 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.6, 147.9, 134.6, 133.2, 132.0, 129.8, 129.5, 127.7, 123.7, 121.7, 120.5,90.8, 24.2; HRMS calculated for $C_{15}H_{12}BrNO_2Na$ (M + Na^+): 339.9949, found: 339.9944. (White solid, 27.6 mg, 88% isolated yield)



2p

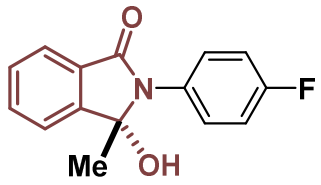
2-(2-bromo-4-fluorophenyl)-3-hydroxy-3-methylisoindolin-1-one (2p): ^{1}H NMR (400 MHz, *d*6-DMSO) δ 7.76-7.67 (m, 4H), 7.57-7.51 (m, 2H), 7.41-7.36 (m, 1H), 6.79 (s, 1H), 1.49 (s, 3H); ^{13}C NMR (100 MHz, *d*6-DMSO) δ 165.2, 160.5, 149.7, 133.9, 133.5, 131.7, 131.6, 130.2, 130.0, 125.7, 125.6, 123.6, 122.9, 120.9, 120.6, 116.0, 115.8, 90.1, 24.4; ^{19}F NMR (376 MHz, *d*6-DMSO) δ -110.9; HRMS calculated for $C_{15}H_{11}BrFNO_2Na$ (M + Na^+): 357.9855, found: 357.9849. (Yellow solid, 28.2 mg, 90% isolated yield)



2q

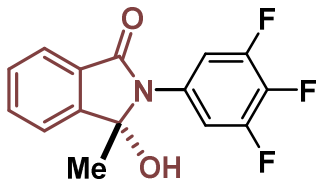
2-(4-chlorophenyl)-3-hydroxy-3-methylisoindolin-1-one (2q): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.63-7.58 (m, 2H), 7.46-7.43 (m, 2H), 7.41-7.39 (d, *J* = 7.2 Hz, 1H), 7.37-7.33

(m, 1H), 7.31-7.26 (m, 2H), 4.07 (s, 1H), 1.58 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.7, 147.9, 134.0, 133.2, 132.5, 129.8, 129.6, 129.0, 127.5, 123.7, 121.7, 90.8, 24.2; HRMS calculated for $C_{15}H_{12}ClNO_2Na$ (M + Na^+): 296.0454, found: 296.0499. (White solid, 25.6 mg, 81% isolated yield)



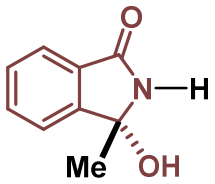
2r

2-(4-fluorophenyl)-3-hydroxy-3-methylisoindolin-1-one (2r): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.61-7.59 (m, 2H), 7.46-7.41 (m, 3H), 7.39-7.35 (m, 1H), 7.06-7.02 (t, *J* = 8.8 Hz, 2H), 1.57 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.7, 160.3, 147.8, 133.0, 131.2, 129.8, 128.8, 128.7, 123.7, 121.8, 115.9, 115.7, 90.5, 24.3; ^{19}F NMR (376 MHz, $CDCl_3$) δ -114.5; HRMS calculated for $C_{15}H_{12}FNO_2Na$ (M + Na^+): 280.0750, found: 280.0744. (White solid, 28.9 mg, 91% isolated yield)



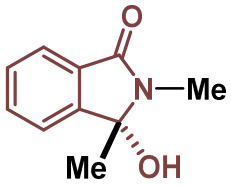
2s

3-hydroxy-3-methyl-2-(3,4,5-trifluorophenyl)isoindolin-1-one (2s): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65-7.58 (m, 2H), 7.34-7.26 (m, 4H), 4.42 (s, 1H), 1.61 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.6, 147.7, 133.7, 129.9, 128.8, 123.7, 121.8, 109.9, 109.8, 109.7, 109.6, 91.4, 24.0; ^{19}F NMR (376 MHz, $CDCl_3$) δ -133.7, -162.5; HRMS calculated for $C_{15}H_{10}F_3NO_2Na$ (M + Na^+): 316.0561, found: 316.0556. (White solid, 28.0 mg, 89% isolated yield)



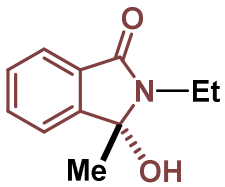
4a

3-hydroxy-3-methylisoindolin-1-one (4a): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.60-7.53 (m, 3H), 7.42-7.38 (m, 1H), 7.09 (s, 1H), 3.79 (s, 1H), 1.78 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 169.1, 149.4, 133.0, 130.0, 129.6, 123.6, 121.8, 86.1, 25.9; HRMS calculated for $C_9H_9NO_2Na$ (M + Na^+): 186.0531, found: 186.0526. (White solid, 23.3 mg, 71% isolated yield)



4b

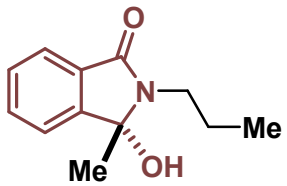
3-hydroxy-2,3-dimethylisoindolin-1-one (4b): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.59-7.51 (m, 3H), 7.41-7.37 (m, 1H), 2.82 (s, 3H), 1.64 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.9, 148.2, 132.3, 130.4, 129.5, 123.2, 121.7, 88.3, 23.4, 23.2; HRMS calculated for $C_{10}H_{11}NO_2Na$ (M + Na^+): 200.0687, found: 200.0682. (White solid, 17.3 mg, 53% isolated yield)



4c

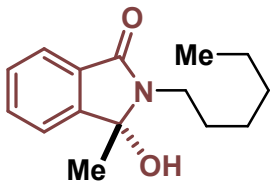
2-ethyl-3-hydroxy-3-methylisoindolin-1-one (4c): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58-7.54 (m, 3H), 7.44-7.39 (m, 1H), 3.49-3.40 (m, 1H), 3.32-3.21 (m, 1H), 1.69 (s, 1H),

1.24-1.21 (t, J = 6.8 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.9, 148.2, 132.3, 130.6, 129.5, 123.2, 121.6, 88.9, 33.2, 24.4, 14.8; HRMS calculated for $C_{11}H_{13}NO_2Na$ (M + Na^+): 214.0844, found: 214.0839. (White solid, 17.5 mg, 54% isolated yield)



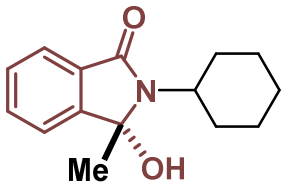
4d

3-hydroxy-3-methyl-2-propylisoindolin-1-one (4d): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.62-7.60 (m, 1H), 7.56-7.54 (m, 2H), 7.44-7.40 (m, 1H), 3.41-3.34 (m, 1H), 3.20-3.13 (m, 1H), 1.75-1.71 (m, 1H), 1.70 (s, 3H), 1.67-1.59 (m, 1H), 0.95-0.91 (t, J = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.1, 148.1, 132.3, 130.6, 129.5, 123.3, 121.6, 88.9, 40.4, 24.4, 22.6, 11.8; HRMS calculated for $C_{12}H_{15}NO_2Na$ (M + Na^+): 228.1000, found: 228.0995. (White solid, 16.7 mg, 52% isolated yield)



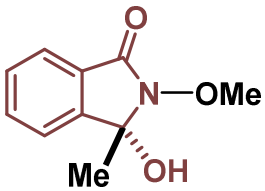
4e

2-hexyl-3-hydroxy-3-methylisoindolin-1-one (4e): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.61-7.58 (m, 1H), 7.55-7.54 (m, 2H), 7.43-7.39 (m, 1H), 3.40-3.33 (m, 1H), 3.17-3.10 (m, 1H), 1.69 (s, 1H), 1.60-1.56 (m, 1H), 1.34-1.24 (m, 7H), 0.90-0.87 (m, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.0, 148.2, 132.3, 130.6, 129.5, 123.2, 121.6, 88.9, 38.8, 31.6, 29.3, 27.1, 24.4, 22.7, 14.1; HRMS calculated for $C_{15}H_{21}NO_2Na$ (M + Na^+): 270.1470, found: 270.1465. (White solid, 18.1 mg, 57% isolated yield)



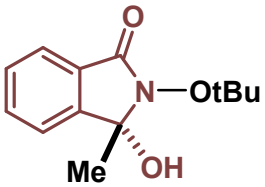
4f

2-cyclohexyl-3-hydroxy-3-methylisoindolin-1-one (4f): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.63-7.61 (d, *J* = 7.2 Hz, 1H), 7.51-7.48 (m, 2H), 7.44-7.40 (m, 1H), 3.47-3.41 (m, 1H), 2.86 (s, 1H), 2.40-2.31 (m, 2H), 1.87-1.82 (m, 2H), 1.70-1.66 (m, 6H), 1.37-1.27 (m, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.3, 147.6, 132.0, 131.7, 129.5, 123.1, 121.4, 89.3, 52.2, 30.7, 30.3, 26.5, 25.3, 24.4; HRMS calculated for $C_{15}H_{19}NO_2Na$ (M + Na^+): 268.1313, found: 268.1308. (White solid, 24.5 mg, 77% isolated yield)



4g

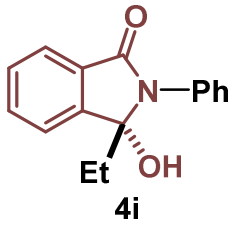
3-hydroxy-2-methoxy-3-methylisoindolin-1-one (4g): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.71-7.69 (d, *J* = 8.0 Hz, 1H), 7.63-7.59 (m, 1H), 7.54-7.52 (d, *J* = 7.2 Hz, 1H), 7.49-7.45 (m, 1H), 4.06 (s, 3H), 1.76 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.9, 145.6, 133.2, 129.9, 128.0, 123.7, 121.8, 88.8, 66.0, 23.4; HRMS calculated for $C_{10}H_{11}NO_3Na$ (M + Na^+): 216.0637, found: 216.0631. (Yellow oil, 22.6 mg, 70% isolated yield)



4h

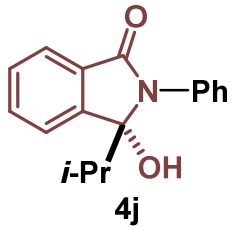
2-(tert-butoxy)-3-hydroxy-3-methylisoindolin-1-one (4h): ^{1}H NMR (400 MHz, $CDCl_3$) δ 1.77-7.50 (d, *J* = 7.6 Hz, 1H), 7.65-7.61 (m, 1H), 7.58-7.56 (d, *J* = 8.0 Hz, 1H), 7.52-7.48 (m, 1H), 1.69 (s, 3H), 1.43 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.4,

146.8, 133.4, 129.9, 128.1, 1232.8, 122.1, 89.2, 82.9, 28.1, 24.1; HRMS calculated for $C_{13}H_{17}NO_3Na$ ($M + Na^+$): 258.1106, found: 258.1101. (Yellow oil, 23.6 mg, 74% isolated yield)



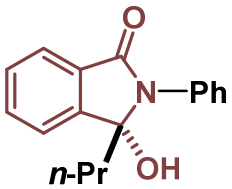
4i

3-ethyl-3-hydroxy-2-phenylisoindolin-1-one (4i): ^1H NMR (400 MHz, $CDCl_3$) δ 7.63-7.53 (m, 5H), 7.44-7.40 (t, J = 8.0 Hz, 1H), 7.38-7.34 (m, 2H), 7.29-7.26 (m, 1H), 2.14-1.96 (m, 2H), 0.49-0.45 (t, J = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.2, 146.1, 135.6, 132.9, 131.1, 129.8, 128.9, 126.9, 126.3, 123.8, 121.8, 94.0, 28.9, 7.9. These data are consistent with literature values, see: K. Nozawa-Kumada, Y. Matsuzawa, K. Ono, M. Shigeno and Y. Kondo. *Chem. Commun.* **2021**, *57*, 8604. (White solid, 27.0 mg, 85% isolated yield)



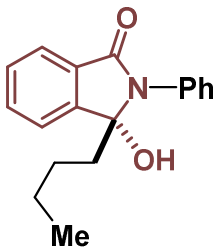
4j

3-hydroxy-3-isopropyl-2-phenylisoindolin-1-one (4j): ^1H NMR (400 MHz, $CDCl_3$) δ 7.64-7.61 (m,1H), 7.59-7.55 (m, 4H), 7.45-7.41 (m, 1H), 7.37-7.33 (m, 2H), 7.30-7.25 (m, 1H), 2.28-2.21 (m, 1H), 1.22-1.20 (d, J = 4.8 Hz, 3H), 0.48-0.46 (d, J = 6.8 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.0, 145.0, 135.9, 132.4, 131.7, 129.7, 128.9, 126.9, 126.8, 123.8, 123.1, 95.9, 34.0, 17.2, 16.7; HRMS calculated for $C_{17}H_{17}NO_2Na$ ($M + Na^+$): 290.1157, found: 290.1152. (White solid, 25.6 mg, 81% isolated yield)



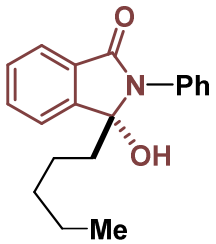
4k

3-hydroxy-2-phenyl-3-propylisoindolin-1-one (4k): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.59-7.46 (m, 5H), 7.34-7.24 (m, 4H), 4.06 (s, 1H), 2.03-1.85 (m, 2H), 1.01-0.93 (m, 1H), 0.72-0.62 (m, 4H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.1, 146.6, 135.5, 132.8, 130.8, 129.6, 128.9, 126.8, 126.4, 123.7, 121.9, 93.4, 38.1, 16.8, 13.8. These data are consistent with literature values, see: K. Nozawa-Kumada, Y. Matsuzawa, K. Ono, M. Shigeno and Y. Kondo. *Chem. Commun.* **2021**, *57*, 8604. (White solid, 26.9 mg, 85% isolated yield)



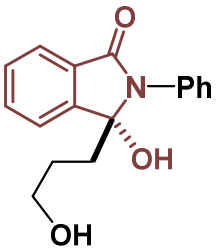
4l

3-butyl-3-hydroxy-2-phenylisoindolin-1-one (4l): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.63-7.59 (m, 2H), 7.55-7.53 (m, 3H), 7.44-7.40 (m, 1H), 7.38-7.34 (m, 2H), 7.30-7.26 (m, 1H), 2.09-1.90 (m, 2H), 1.08-0.88 (m, 3H), 0.71-0.61 (m, 4H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.1, 146.5, 135.5, 132.9, 131.0, 129.8, 128.9, 126.9, 126.5, 123.8, 121.8, 93.4, 35.5, 25.5, 22.3, 13.7; HRMS calculated for $C_{18}H_{19}NO_2Na$ ($M + Na^+$): 304.1313, found: 304.1308. (Yellow oil, 24.6 mg, 78% isolated yield)



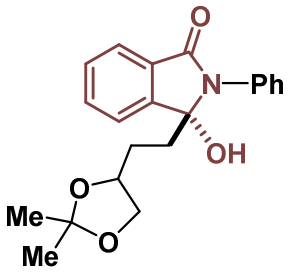
4m

3-hydroxy-3-pentyl-2-phenylisoindolin-1-one (4m): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.67-7.65 (m, 1H), 7.63-7.59 (m, 1H), 7.57-7.54 (m, 3H), 7.46-7.42 (m, 1H), 7.39-7.35 (m, 2H), 7.31-7.27 (m, 1H), 2.09-1.90 (m, 2H), 1.07-0.94 (m, 5H), 0.72-0.64 (m, 4H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.0, 146.4, 135.6, 132.9, 131.0, 129.8, 128.9, 126.9, 126.5, 123.9, 121.8, 93.4, 35.8, 31.3, 23.0, 22.2, 13.8; HRMS calculated for $C_{19}H_{21}NO_2Na$ ($M + Na^+$): 296.1651, found: 296.1645. (Yellow oil, 27.4 mg, 87% isolated yield)



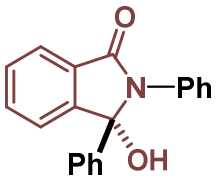
4n

3-hydroxy-3-(3-hydroxypropyl)-2-phenylisoindolin-1-one (4n): ^{1}H NMR (400 MHz, *d*6-DMSO) δ 7.76-7.70 (m, 2H), 7.65-7.63 (d, J = 7.2 Hz, 1H), 7.60-7.56 (m, 3H), 7.48-7.44 (m, 2H), 7.35-7.31 (m, 1H), 6.92 (s, 1H), 3.13-3.12 (d, J = 4.4 Hz, 2H), 2.09-2.01 (m, 1H), 1.85-1.78 (m, 1H), 1.15-1.07 (m, 1H), 0.83-0.74 (m, 1H); ^{13}C NMR (100 MHz, *d*6-DMSO) δ 166.4, 147.9, 136.6, 133.3, 131.4, 129.9, 129.2, 127.4, 127.1, 123.3, 122.9, 93.0, 60.7, 33.4, 27.4; HRMS calculated for $C_{17}H_{17}NO_3Na$ ($M + Na^+$): 306.1106, found: 306.1101. (Yellow solid, 24.6 mg, 74% isolated yield)



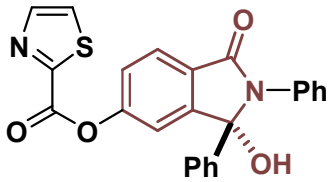
4o

3-(2-(2,2-dimethyl-1,3-dioxolan-4-yl)ethyl)-3-hydroxy-2-phenylisoindolin-1-one (4o): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.66-7.63 (m, 1H), 7.61-7.57 (m, 2H), 7.55-7.52 (m, 2H), 7.47-7.43 (m, 1H), 7.39-7.35 (m, 2H), 7.33-7.29 (m, 1H), 3.82-3.78 (m, 1H), 3.54-3.51 (m, 1H), 3.21-3.17 (t, *J* = 9.2 Hz, 1H), 2.40-2.34 (m, 1H), 2.20-2.15 (m, 1H), 1.25 (s, 3H), 1.12 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.7, 146.4, 135.7, 132.8, 130.1, 129.0, 127.4, 123.9, 122.4, 108.9, 91.6, 71.9, 69.9, 40.7, 26.7, 25.6; HRMS calculated for $C_{21}H_{23}NO_4Na$ ($M + Na^+$): 354.1705, found: 354.1700. (Yellow oil, 21.2 mg, 65% isolated yield)



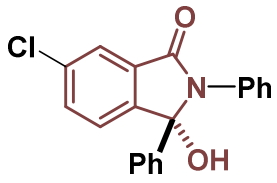
4p

3-hydroxy-2,3-diphenylisoindolin-1-one (4p): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.72-7.70 (d, *J* = 3.2 Hz, 1H), 7.53-7.49 (m, 1H), 7.43-7.41 (m, 3H), 7.38-7.34 (m, 4H), 7.31-7.29 (d, *J* = 8.0 Hz, 1H), 7.25-7.20 (m, 3H), 7.19-7.17(m, 1H), 7.12-7.08 (m, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.6, 148.7, 138.7, 135.9, 133.3, 129.9, 129.8, 128.6, 128.5, 128.4, 126.3, 126.2, 125.5, 123.9, 122.8, 93.1. These data are consistent with literature values, see: D.-M. Yan, Q.-Q. Zhao, L. Rao, J.-R. Chen and W.-J. Xiao. *Chem. Eur. J.* **2018**, *24*, 16895. (White solid, 24.5 mg, 78% isolated yield)



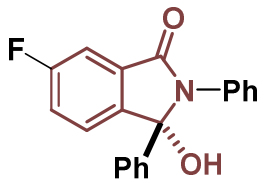
4q

3-hydroxy-1-oxo-2,3-diphenylisoindolin-5-yl thiazole-2-carboxylate (4q): ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.83-8.82 (d, *J* = 2.0 Hz, 1H), 8.37-8.36 (d, *J* = 1.6 Hz, 1H), 7.71-7.69 (d, *J* = 8.0 Hz, 1H), 7.45-7.42 (m, 2H), 7.40-7.36 (m, 2H), 7.34-7.33 (m, 1H), 7.30-7.27 (m, 1H), 7.25-7.21 (m, 3H), 7.18-7.15 (m, 2H), 7.11-7.09 (m, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.7, 159.0, 155.3, 155.2, 150.6, 146.4, 138.4, 135.8, 131.6, 129.5, 128.6, 128.5, 128.4, 127.7, 126.4, 126.3, 126.2, 126.1, 125.6, 125.2, 123.7, 116.6, 92.7; HRMS calculated for $C_{24}H_{16}N_2O_4SNa$ ($M + Na^+$): 451.0728, found: 457.0723. (Yellow solid, 26.7 mg, 86% isolated yield)



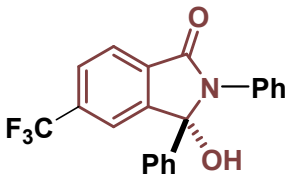
4r

6-chloro-3-hydroxy-2,3-diphenylisoindolin-1-one (4r): ^{1}H NMR (400 MHz, *d*6-DMSO) δ 7.82-7.81 (d, *J* = 1.6 Hz, 1H), 7.64-7.62 (dd, J_1= 2.0 Hz, J_2 = 1.6 Hz, 1H), 7.45-7.43 (m, 2H), 7.34-7.32 (m, 2H), 7.27-7.24 (m, 3H), 1.22-7.18 (m, 3H), 7.13-7.09 (m, 1H); ^{13}C NMR (100 MHz, *d*6-DMSO) δ 165.5, 148.6, 139.8, 136.7, 134.7, 133.7, 132.3, 129.0, 128.9, 128.6, 126.5, 126.4, 126.0, 125.4, 123.3, 92.6. These data are consistent with literature values, see: K. Nozawa-Kumada, Y. Matsuzawa, K. Ono, M. Shigeno and Y. Kondo. *Chem. Commun.* **2021**, *57*, 8604. (White solid, 24.1 mg, 77% isolated yield)



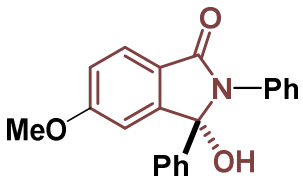
4s

6-fluoro-3-hydroxy-2,3-diphenylisoindolin-1-one (4s): ^{1}H NMR (400 MHz, *d*6-DMSO) δ 7.89-7.87 (d, *J* = 8.4 Hz, 3H), 7.82-7.80 (d, *J* = 8.8 Hz, 2H), 7.76-7.74 (d, *J* = 7.2 Hz, 1H), 7.71-7.70 (d, *J* = 3.6 Hz, 2H), 7.58-7.54 (m, 1H), 7.01 (s, 1H), 1.56 (s, 3H); ^{13}C NMR (100 MHz, *d*6-DMSO) δ 166.1, 149.3, 140.8, 133.8, 130.1, 130.0, 127.1, 126.9, 126.4, 126.3, 123.6, 122.8, 90.8, 25.1; ^{19}F NMR (376 MHz, *d*6-DMSO) δ -113.1. These data are consistent with literature values, see: K. Nozawa-Kumada, Y. Matsuzawa, K. Ono, M. Shigeno and Y. Kondo. *Chem. Commun.* **2021**, *57*, 8604. (White solid, 25.4 mg, 81% isolated yield)



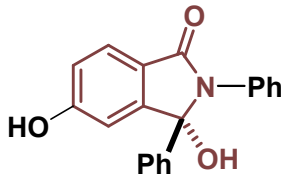
4t

3-hydroxy-2,3-diphenyl-5-(trifluoromethyl)isoindolin-1-one (4t): ^{1}H NMR (400 MHz, *d*6-DMSO) δ 8.09-8.07 (d, *J* = 8.0 Hz, 1H), 7.98-7.96 (dd, J_1= 0.8 Hz, J_2 = 1.2 Hz, 1H), 7.90 (s, 1H), 7.57 (s, 1H), 7.51-7.48 (m, 2H), 7.42-7.39 (m, 2H), 7.31-7.23 (m, 5H), 7.19-7.15 (m, 1H); ^{13}C NMR (100 MHz, *d*6-DMSO) δ 165.4, 150.7, 139.4, 136.5, 134.1, 129.1, 129.0, 128.8, 127.4, 127.3, 126.7, 126.6, 126.1, 125.0, 120.1, 92.7; ^{19}F NMR (376 MHz, *d*6-DMSO) δ -60.9. These data are consistent with literature values, see: K. Nozawa-Kumada, Y. Matsuzawa, K. Ono, M. Shigeno and Y. Kondo. *Chem. Commun.* **2021**, *57*, 8604. (White solid, 23.7 mg, 76% isolated yield)



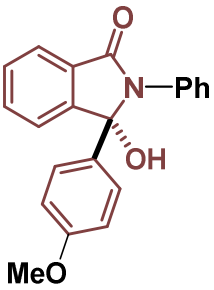
4u

3-hydroxy-5-methoxy-2,3-diphenylisoindolin-1-one (4u): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.48-7.46 (d, *J* = 8.4 Hz, 1H), 7.41-7.39 (d, *J* = 8.0 Hz, 2H), 7.36-7.34 (d, *J* = 2.4 Hz, 2H), 7.23-7.20 (m, 3H), 7.14-7.10 (m, 2H), 7.06-7.03 (m, 1H), 6.77-6.72 (m, 2H), 4.86 (s, 1H), 3.75 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.7, 164.1, 151.3, 138.9, 136.2, 128.4, 128.3, 126.2, 125.7, 125.3, 125.0, 122.0, 116.3, 107.2, 92.8, 55.8. These data are consistent with literature values, see: K. Nozawa-Kumada, Y. Matsuzawa, K. Ono, M. Shigeno and Y. Kondo. *Chem. Commun.* **2021**, *57*, 8604. (White solid, 23.5 mg, 75% isolated yield)



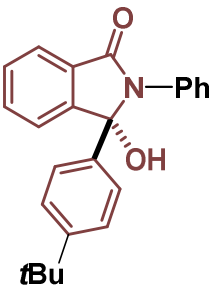
4v

3,5-dihydroxy-2,3-diphenylisoindolin-1-one (4v): ^{1}H NMR (400 MHz, *d*6-DMSO) δ 10.3 (s, 1H), 7.66-7.64 (dd, *J* = 8.4 Hz, 1H), 7.58 (s, 1H), 7.52-7.50 (m, 2H), 7.35-7.33 (m, 2H), 7.29-7.20 (m, 5H), 7.10-7.06 (m, 1H), 6.91-6.89 (dd, J_1 = 6.4 Hz, J_2 = 2.0 Hz, 1H), 6.56-6.55 (d, *J* = 2.4 Hz, 1H); ^{13}C NMR (100 MHz, *d*6-DMSO) δ 166.9, 162.6, 152.6, 141.0, 137.5, 128.9, 128.7, 128.3, 126.3, 125.7, 125.5, 125.4, 121.0, 117.3, 109.4, 92.1; ^{19}F NMR (376 MHz, $CDCl_3$) δ -60.9; HRMS calculated for $C_{20}H_{15}NO_3Na$ ($M + Na^+$): 340.0950, found: 340.0944. (White solid, 24.5 mg, 78% isolated yield)



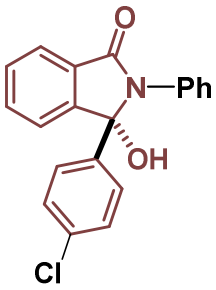
4w

3-hydroxy-3-(4-methoxyphenyl)-2-phenylisoindolin-1-one (4w): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.66-7.64 (d, J = 7.6 Hz, 1H), 7.52-7.48 (m, 1H), 7.42-7.40 (m, 2H), 7.38-7.34 (m, 1H), 7.30-7.25 (m, 3H), 7.21-7.17 (m, 2H), 7.13-7.09 (m, 1H), 6.76-6.72 (m, 2H), 4.21 (s, 1H), 3.72 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.5, 159.5, 148.9, 135.9, 133.3, 130.7, 129.8, 129.7, 128.6, 127.5, 126.2, 125.6, 123.8, 122.7, 113.8, 93.1, 55.2. These data are consistent with literature values, see: K. Nozawa-Kumada, Y. Matsuzawa, K. Ono, M. Shigeno and Y. Kondo. *Chem. Commun.* **2021**, *57*, 8604. (White solid, 26.6 mg, 85% isolated yield)



4x

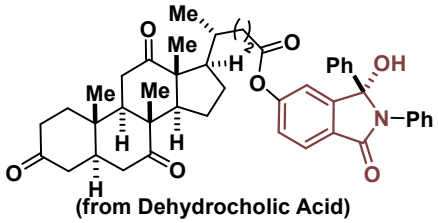
3-(4-(tert-butyl)phenyl)-3-hydroxy-2-phenylisoindolin-1-one (4x): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.72-7.67 (m, 1H), 7.51-7.49 (m, 1H), 7.45-7.43 (m, 2H), 7.38-7.34 (m, 1H), 7.31-7.29 (m, 2H), 7.27-7.24 (m, 2H), 7.22-7.17 (m, 3H), 7.13-7.11 (m, 1H), 1.23 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.6, 151.3, 148.9, 136.0, 135.6, 133.2, 129.8, 129.6, 128.6, 126.1, 125.8, 125.5, 125.4, 123.8, 122.8, 93.2, 34.6, 31.3, 31.1. These data are consistent with literature values, see: J. M. Dennis, C. M. Calyore, J. S. Sjoholm, J. P. Lutz, J. J. Gair and J. B. Johnson. *Synlett*, **2013**, *24*, 2567. (White solid, 25.0 mg, 80% isolated yield)



4y

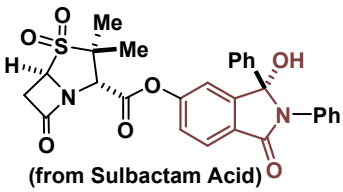
3-(4-chlorophenyl)-3-hydroxy-2-phenylisoindolin-1-one (4y): ^{1}H NMR (400 MHz, *d*6-DMSO) δ 7.81-7.80 (d, *J* = 6.8 Hz, 1H), 7.74 (s, 1H), 7.62-7.53 (m, 2H),7.45-7.42 (m, 2H), 7.34-7.23 (m, 7H), 7.13-7.09 (m, 1H); ^{13}C NMR (100 MHz, *d*6-DMSO) δ 166.8, 149.6, 139.6, 136.8, 133.9, 133.1, 130.3, 130.1, 128.9, 128.6, 126.5, 126.1, 123.7, 123.4, 120.8, 92.3. These data are consistent with literature values, see: K. Nozawa-Kumada, Y. Matsuzawa, K. Ono, M. Shigeno and Y. Kondo. *Chem. Commun.* **2021**, *57*, 8604. (White solid, 26.3 mg, 84% isolated yield)

Late-stage diversification of substances derived from natural products and drugs



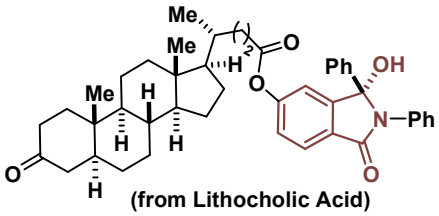
(from Dehydrocholic Acid)

5: 81%



(from Sulbactam Acid)

6: 63%



(from Lithocholic Acid)

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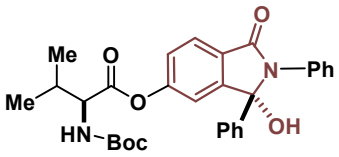
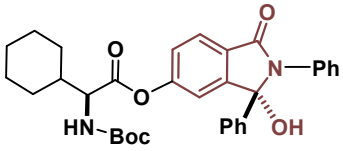


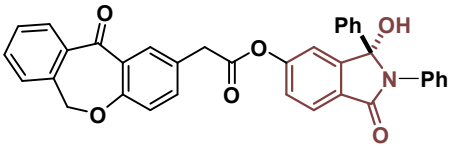
(from L-Valine)

8: 87%



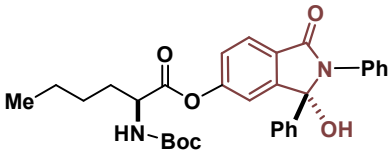
(from L-Cyclohexylglycine)

9: 85%



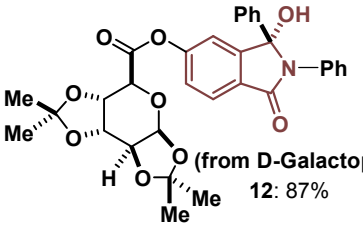
(from Isoxepac)

10: 88%



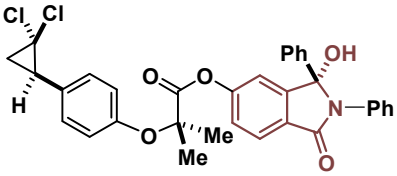
(from L-Norleucine)

11: 86%



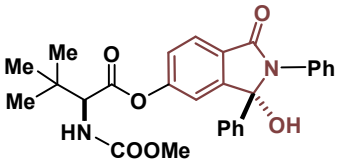
(from D-Galactopyranose)

12: 87%



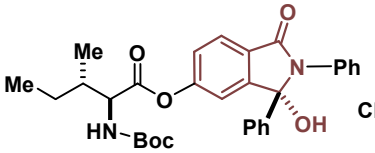
(from Ciprofibrate)

13: 90%



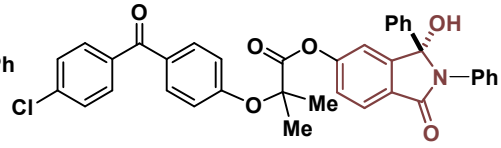
(from L-*tert*-Leucine)

14: 86%



(from L-Isoleucine)

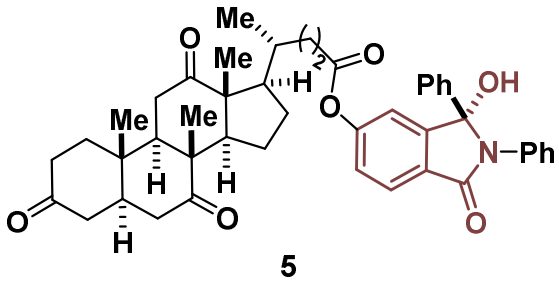
15: 87%



(from Fenofibric Acid)

16: 91%

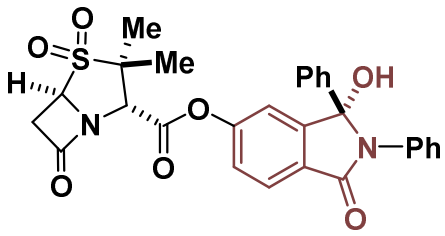
^{1}H and ^{13}C spectra data of compounds 5-16



5

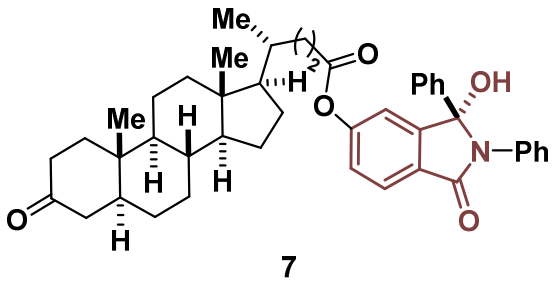
3-hydroxy-1-oxo-2,3-diphenylisoindolin-5-yl 4-(8,10,13-trimethyl-3,7,12-trioxohexadecahydro-1*H*-cyclopenta[*a*]phenanthren-17-yl)pentanoate (5): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.83-7.77 (m, 1H), 7.46-7.42 (m, 2H), 7.39-7.37 (m, 2H), 7.25-7.16

(m, 6H), 7.14-7.09 (m, 1H), 7.04-7.01 (m, 1H), 5.04-4.89 (d, J = 58.5 Hz, 1H), 2.92-2.77 (m, 2H), 2.63-2.54 (m, 1H),2.48-2.42 (m, 1H), 2.33-2.26 (m, 2H), 2.20-2.10 (m, 3H), 2.04-1.96 (m, 2H),1.90-1.76 (m, 3H), 1.63-1.43 (m, 3H), 1.38-1.37 (d, J = 6.8 Hz, 3H), 1.31-1.20 (m, 3H), 1.06-1.04 (d, J = 9.2 Hz, 3H), 0.87-0.81 (m, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 212.4, 209.6, 208.9, 172.2, 166.6, 154.7, 150.6, 138.5, 135.9, 128.6, 128.5, 128.4, 127.4, 126.4, 126.2, 125.8, 125.5, 125.2, 123.4, 116.5, 92.5, 57.0, 51.8, 49.0, 46.9, 45.6, 45.0, 42.8, 38.7, 36.4, 36.1, 35.3, 31.5, 30.3, 27.8, 25.2, 21.9, 18.7, 11.8; HRMS calculated for $C_{45}H_{50}NO_7$ (M + H^+): 716.3587, found: 716.3582. (White solid, 24.2 mg, 81% isolated yield)



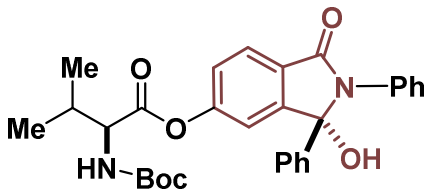
6

3-hydroxy-1-oxo-2,3-diphenylisoindolin-5-yl 3,3-dimethyl-7-oxo-4-thia-1-azabicyclo [3.2.0]heptane-2-carboxylate 4,4-dioxide (6): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.80-7.78 (d, J = 8.4 Hz, 1H), 7.42-7.35 (m, 4H), 7.27-7.25 (m, 4H), 7.22-7.13 (m, 3H), 7.07-7.04 (m, 1H), 4.67-4.65 (m, 1H), 4.60-4.58 (d, J = 8.8 Hz, 1H), 4.37-4.35 (m, 1H), 3.51-3.48 (m, 2H), 1.69 (s, 3H), 1.55-1.54 (d, J = 4.0 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.4, 170.7, 166.2, 150.7, 137.9, 131.0, 128.9, 128.8, 128.7, 126.6, 126.2, 125.7, 125.6, 123.2, 122.9, 116.1, 115.9, 92.6, 63.3, 62.9, 61.2, 23.1, 20.6, 18.8; HRMS calculated for $C_{28}H_{24}N_2O_7Na$ (M + Na^+): 555.1202, found: 555.1196. (Yellow solid, 19.4 mg, 63% isolated yield)



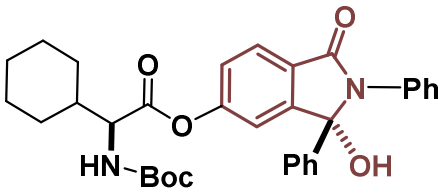
7

3-hydroxy-1-oxo-2,3-diphenylisoindolin-5-yl 4-(10,13-dimethyl-3-oxohexadecahydro-1*H*-cyclopenta[*a*]phenanthren-17-yl)pentanoate (7): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.79-7.77 (d, *J* = 8.0 Hz, 1H), 7.40-7.36 (m, 4H), 7.25-7.18 (m, 5H), 7.15-7.10 (m, 2H), 7.02-7.01 (d, *J* = 2.0 Hz, 1H), 4.53 (s, 1H), 2.72-2.65 (t, *J* = 13.6 Hz, 1H), 2.60-2.53 (m, 1H), 2.45-2.28 (m, 2H), 2.17-2.13 (m, 1H), 2.06-1.99 (m, 3H), 1.91-1.79 (m, 4H), 1.63-1.57 (m, 1H), 1.52-1.34 (m, 9H), 1.27-1.21 (m, 2H), 1.16-1.06 (m, 4H), 1.02 (s, 3H), 0.98-0.96 (d, *J* = 6.4 Hz, 3H), 0.69-0.68 (d, *J* = 2.0 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 213.7, 172.4, 166.6, 154.7, 150.3, 138.4, 135.8, 128.7, 128.6, 128.5, 127.4, 126.5, 126.2, 125.7, 125.3, 123.6, 116.4, 92.5, 56.5, 56.0, 44.4, 42.9, 42.4, 40.8, 40.1, 37.3, 37.1, 35.6, 35.4, 35.0, 31.4, 30.9, 28.3, 26.7, 25.9, 24.2, 22.7, 21.3, 18.4, 12.2; HRMS calculated for $C_{44}H_{51}NO_5Na$ (M + Na^+): 696.3665, found: 696.3659. (Yellow solid, 24.5 mg, 80% isolated yield)



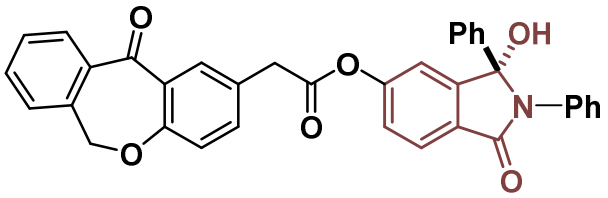
8

3-hydroxy-1-oxo-2,3-diphenylisoindolin-5-yl (*tert*-butoxycarbonyl)-*L*-valinate (8): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.77-7.72 (t, *J* = 8.0 Hz, 1H), 7.41-7.35 (m, 4H), 7.25-7.22 (m, 3H), 7.21-7.16 (m, 2H), 7.14-7.09 (m, 2H), 7.04-7.00 (m, 1H), 5.03-5.01 (d, *J* = 8.8 Hz, 1H), 4.49 (s, 1H), 4.41-4.37 (m, 1H), 2.29-2.26 (m, 1H), 1.45 (s, 3H), 1.43 (s, 6H), 1.06-1.04 (m, 3H), 1.00-0.97 (m, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.9, 169.0, 166.5, 155.7, 154.3, 150.4, 138.2, 135.7, 128.7, 128.6, 127.8, 126.5, 126.2, 125.7, 125.6, 125.4, 123.5, 123.4, 116.3, 116.2, 92.6, 80.4, 58.9, 31.2, 28.4, 19.2, 17.8; HRMS calculated for $C_{30}H_{32}N_2O_6Na$ (M + Na^+): 539.2158, found: 539.2153. (White solid, 26.8 mg, 87% isolated yield)



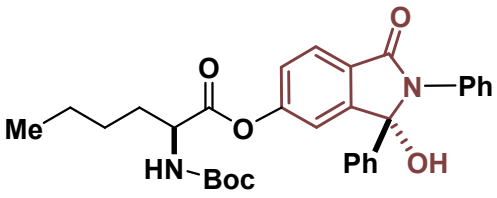
9

3-hydroxy-1-oxo-2,3-diphenylisoindolin-5-yl 2-((*tert*-butoxycarbonyl)amino)-2-cyclohexylacetate (9): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.74-7.69 (m, 1H), 7.39-7.34 (m, 4H), 7.23-7.22 (m, 3H), 7.20-7.10 (m, 4H), 7.04-7.00 (dd, J_1 = 8.8 Hz, J_2 = 1.6 Hz, 1H), 5.03-5.01 (d, J = 8.8 Hz, 1H), 4.74-4.58 (m, 1H), 4.40-4.34 (m, 1H), 1.88-1.68 (m, 6H), 1.46-1.42 (d, J = 9.0 Hz, 9H), 1.31-1.09 (m, 5H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 176.5, 170.9, 166.6, 155.7, 154.4, 150.4, 138.3, 135.7, 128.6, 128.5, 127.7, 127.6, 126.5, 126.4, 125.7, 125.6, 125.3, 123.4, 116.3, 116.2, 92.6, 80.3, 58.7, 40.8, 40.7, 29.6, 28.4, 26.0; HRMS calculated for $C_{33}H_{36}N_2O_6Na$ ($M + Na^+$): 579.2471, found: 579.2466. (Yellow oil, 26.2 mg, 85% isolated yield)



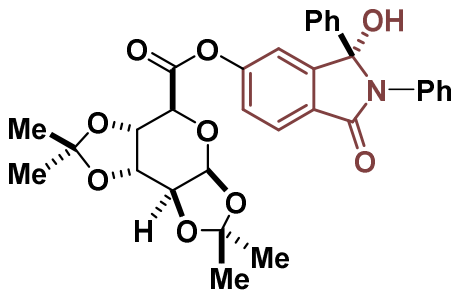
10

3-hydroxy-1-oxo-2,3-diphenylisoindolin-5-yl 2-(11-oxo-6,11-dihydrodibenzo[*b*,*e*]oxepin-2-yl)acetate (10): ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.16-8.15 (d, J = 2.0 Hz, 1H), 7.89-7.86 (m, 1H), 7.73-7.71 (d, J = 8.4 Hz, 1H), 7.59-7.55 (m, 1H), 7.49-7.43 (m, 2H), 7.37-7.33 (m, 5H), 7.24-7.15 (m, 5H), 7.13-7.10 (m, 2H), 7.06-7.04 (d, J = 8.4 Hz, 1H), 7.02-7.01 (d, J = 1.6 Hz, 1H), 5.19 (s, 2H), 3.85 (s, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 190.9, 169.7, 166.6, 160.9, 154.5, 150.3, 140.4, 138.3, 136.4, 135.7, 135.6, 133.0, 132.8, 129.6, 129.4, 128.6, 128.5, 128.4, 127.9, 127.6, 126.6, 126.4, 126.2, 125.7, 125.3, 125.2, 123.5, 121.5, 116.4, 92.6, 73.7, 40.2; HRMS calculated for $C_{36}H_{25}NO_6Na$ ($M + Na^+$): 590.1580, found: 590.1574. (White solid, 27.1 mg, 88% isolated yield)



11

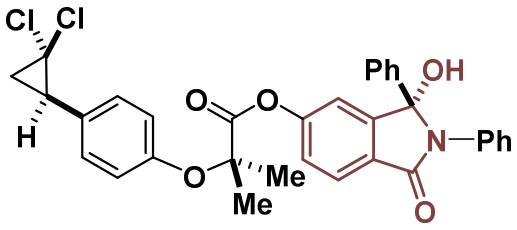
3-hydroxy-1-oxo-2,3-diphenylisoindolin-5-yl 2-((*tert*-butoxycarbonyl)amino) hexanoate (11): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.78-7.69 (m, 2H), 7.41-7.31 (m, 4H), 7.25-7.19 (m, 4H), 7.18-7.09 (m, 3H), 7.04-7.01 (dd, J_1 = 8.0 Hz, J_2 = 2.0 Hz, 1H), 4.99-4.97 (d, J = 8.0 Hz, 1H), 4.47-4.24 (m, 1H), 1.96-1.88 (m, 1H), 1.76-1.68 (m, 1H), 1.44-1.43 (d, J = 5.6 Hz, 9H), 1.41-1.33 (m, 4H), 0.94-0.90 (m, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 176.8, 171.8, 166.5, 154.4, 150.4, 130.3, 129.1, 128.7, 128.6, 127.6, 127.5, 126.5, 126.2, 125.7, 125.6, 125.4, 123.5, 116.2, 92.6, 80.4, 53.8, 32.1, 28.4, 27.6, 22.3, 13.9; HRMS calculated for $C_{31}H_{34}N_2O_6Na$ ($M + Na^+$): 553.2315, found: 553.2309. (Yellow solid, 26.5 mg, 86% isolated yield)



12

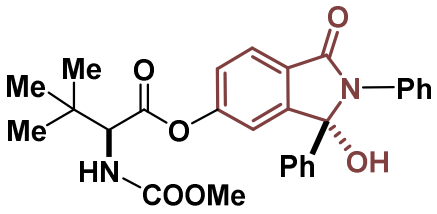
3-hydroxy-1-oxo-2,3-diphenylisoindolin-5-yl 2,2,7,7-tetramethyltetrahydro-5*H*-bis ([1,3]dioxolo)[4,5-b:4',5'-d]pyran-5-carboxylate (12): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.76-7.72 (t, J = 7.6 Hz, 1H), 7.43-7.39 (m, 2H), 7.37-7.34 (m, 3H), 7.25-7.16 (m, 5H), 7.13-7.08 (m, 2H), 5.69-5.68 (d, J = 5.2 Hz, 1H), 4.73-4.62 (m, 3H), 4.44-4.42 (m, 1H), 1.57-1.55 (d, J = 6.4 Hz, 3H), 1.49-1.44 (d, J = 18.0 Hz, 3H), 1.36-1.34 (m, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 176.4, 166.7, 154.3, 138.3, 128.7, 128.5, 127.7, 126.4, 126.2, 125.7, 125.6, 125.4, 123.8, 123.7, 116.5, 110.6, 109.4, 96.6, 92.6, 72.3, 70.9, 70.2, 68.9,

26.1, 26.0, 24.9, 24.8; HRMS calculated for $C_{32}H_{31}NO_9Na$ (M + Na^+): 596.1897, found: 596.1893. (Yellow oil, 26.7 mg, 87% isolated yield)



13

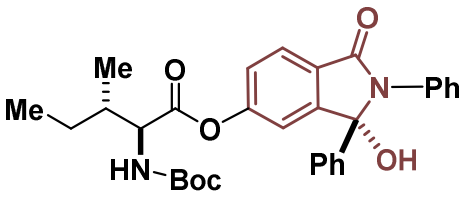
3-hydroxy-1-oxo-2,3-diphenylisoindolin-5-yl 2-(4-(2,2-dichlorocyclopropyl)phenoxy) -2-methylpropanoate (13): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.68-7.65(d, *J* = 2.4 Hz, 1H), 7.37-7.31 (m, 4H), 7.25-7.22 (m, 3H), 7.18-7.09 (m, 5H), 6.92-6.86 (m, 3H), 2.86-2.81 (m, 1H), 1.98-1.93 (m, 1H), 1.80-1.75 (m, 1H), 1.71 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 172.7, 166.6, 154.7, 154.4, 150.4, 138.2, 135.6, 130.0, 128.9, 128.6, 128.5, 127.7, 126.5, 126.2, 125.7, 125.6, 125.3, 123.4, 118.8, 116.2, 92.6, 79.3, 60.9, 34.8, 25.9, 25.7, 25.3; HRMS calculated for $C_{33}H_{27}Cl_2NO_5Na$ (M + Na^+): 610.1164, found: 610.1159. (Yellow oil, 27.7 mg, 90% isolated yield)



14

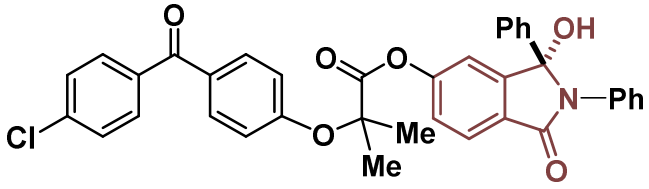
3-hydroxy-1-oxo-2,3-diphenylisoindolin-5-yl 2-((methoxycarbonyl)amino)-3,3-dimethylbutanoate (14): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.72-7.63 (m, 1H), 7.37-7.31 (m, 4H), 7.25-7.21 (m, 3H), 7.18-7.13 (m, 2H), 7.12-7.07 (m, 2H), 7.03-7.00 (m, 1H), 5.34-5.32 (d, *J* = 7.2 Hz, 1H), 4.91 (s, 1H), 4.33-4.31 (d, *J* = 8.8 Hz, 1H), 3.69 (s, 3H), 1.08-1.07 (d, *J* = 3.6 Hz, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.2, 166.7, 166.6, 156.9, 154.1, 150.5, 138.2, 137.6, 135.6, 130.3, 128.6, 128.5, 127.8, 127.7, 126.5, 126.4, 126.3, 126.2, 125.8, 125.7, 125.3, 123.5, 123.4, 116.4, 116.2, 92.7, 62.4, 52.7, 342.9, 26.7;

HRMS calculated for $C_{28}H_{28}N_2O_6Na$ ($M + Na^+$): 511.1845, found: 511.1840. (White solid, 26.6 mg, 86% isolated yield)



15

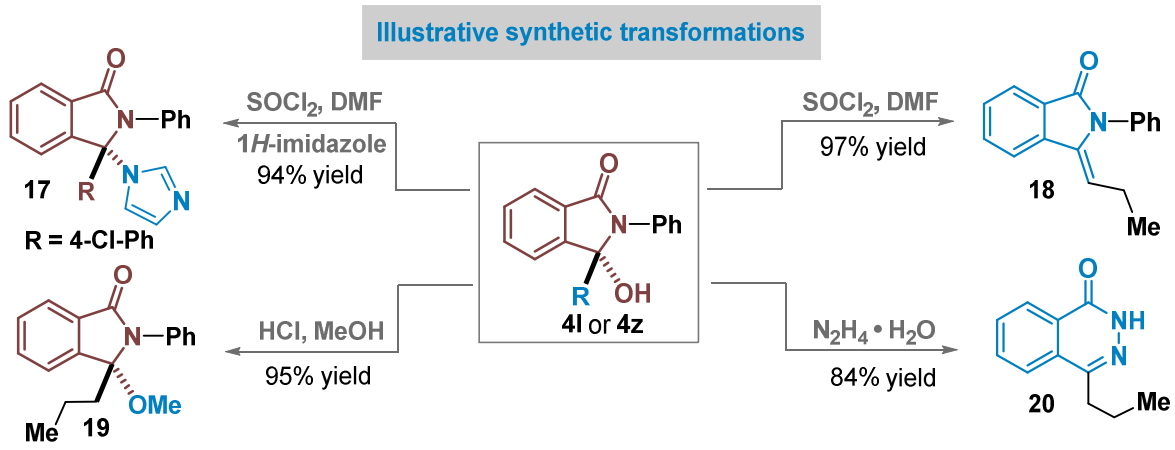
3-hydroxy-1-oxo-2,3-diphenylisoindolin-5-yl (*tert*-butoxycarbonyl)-*L*-isoleucinate (15): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.73-7.68 (m, 1H), 7.40-7.34 (m, 4H), 7.25-7.21 (m, 3H), 7.19-7.10 (m, 4H), 7.03-7.00 (dd, J_1 = 10.4 Hz, J_2 = 2.0 Hz, 1H), 5.04-5.02 (d, J = 8.8 Hz, 1H), 4.43-4.40 (m, 1H), 1.97 (s, 1H), 1.55-1.47 (m, 1H), 1.45-1.43 (d, J = 7.2 Hz, 9H), 1.30-1.22 (m, 1H), 1.03-1.00 (m, 3H), 0.99-0.94 (m, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 176.4, 170.9, 166.6, 154.4, 150.4, 138.2, 135.7, 135.6, 128.6, 128.5, 127.7, 127.6, 126.5, 126.4, 126.2, 125.7, 125.6, 125.3, 123.5, 116.3, 116.2, 92.6, 80.4, 58.3, 38.0, 28.4, 25.3, 15.8, 11.7; HRMS calculated for $C_{31}H_{34}N_2O_6Na$ ($M + Na^+$): 553.2315, found: 553.2309. (Yellow oil, 26.8 mg, 87% isolated yield)



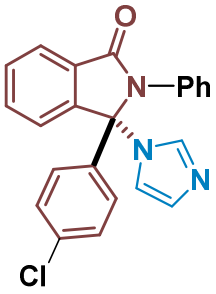
16

3-hydroxy-1-oxo-2,3-diphenylisoindolin-5-yl 2-(4-(4-chlorobenzoyl)phenoxy)-2-methylpropanoate (16): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.76-7.68 (m, 5H), 7.47-7.44 (m, 2H), 7.37-7.31 (m, 4H), 7.24-7.15 (m, 5H), 7.12-7.04 (m, 2H), 6.95-6.91 (m, 3H), 4.51 (s, 1H), 1.78 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 194.3, 172.3, 166.4, 159.3, 154.3, 150.5, 138.7, 138.1, 136.2, 135.6, 132.3, 131.3, 131.0, 128.8, 128.7, 128.6, 128.5, 127.9, 126.5, 126.2, 125.7, 125.4, 123.3, 117.5, 116.0, 92.6, 79.5.25.6, 25.3; HRMS calculated for $C_{37}H_{28}ClNO_6Na$ ($M + Na^+$): 640.1503, found: 610.1497. (Colourless oil, 27.9 mg, 91% isolated yield)

Illustrative synthetic transformations

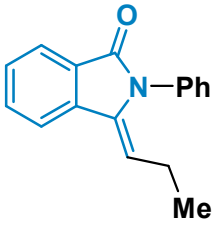


^{1}H and ^{13}C spectra data of compounds 17-20



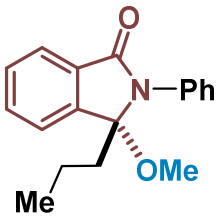
17

3-(4-chlorophenyl)-3-(1*H*-imidazol-1-yl)-2-phenylisoindolin-1-one (17): ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.05-8.03 (m, 1H), 7.65-7.63 (m, 2H), 7.40-7.34 (m, 5H), 7.32-7.26 (m, 4H), 7.01 (s, 1H), 6.87-6.85 (m, 2H), 6.63 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.8, 145.7, 137.5, 136.0, 135.4, 134.6, 133.8, 132.8, 130.8, 130.2, 129.6, 129.5, 129.3, 129.0, 128.7, 125.2, 123.5, 119.1, 83.9; HRMS calculated for $C_{23}H_{16}ClN_3ONa$ ($M + Na^+$): 408.0880, found: 408.0874. (Yellow oil, 32.4 mg, 94% isolated yield)



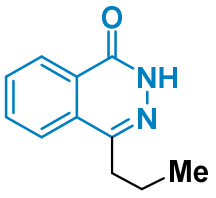
18

2-phenyl-3-propylideneisoindolin-1-one (18): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.79-7.97 (d, *J* = 8.0 Hz, 1H), 7.91-7.89 (d, *J* = 7.6 Hz, 1H), 7.67-7.63 (m, 1H), 7.56-7.49 (m, 3H), 7.45-7.40 (m, 1H), 7.35-7.32 (m, 2H), 5.33-5.29 (t, *J* = 8.0 Hz, 1H), 2.69-2.61 (m, 2H), 1.16-1.13 (t, *J* = 7.6 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.1, 136.7, 135.5, 135.0, 132.2, 130.2, 129.5, 129.0, 128.9, 128.2, 123.9, 123.4, 115.7, 20.8, 14.5; HRMS calculated for $C_{17}H_{16}NONa$ ($M + H^+$): 250.1232, found: 250.1226. (Yellow oil, 27.2 mg, 97% isolated yield)



19

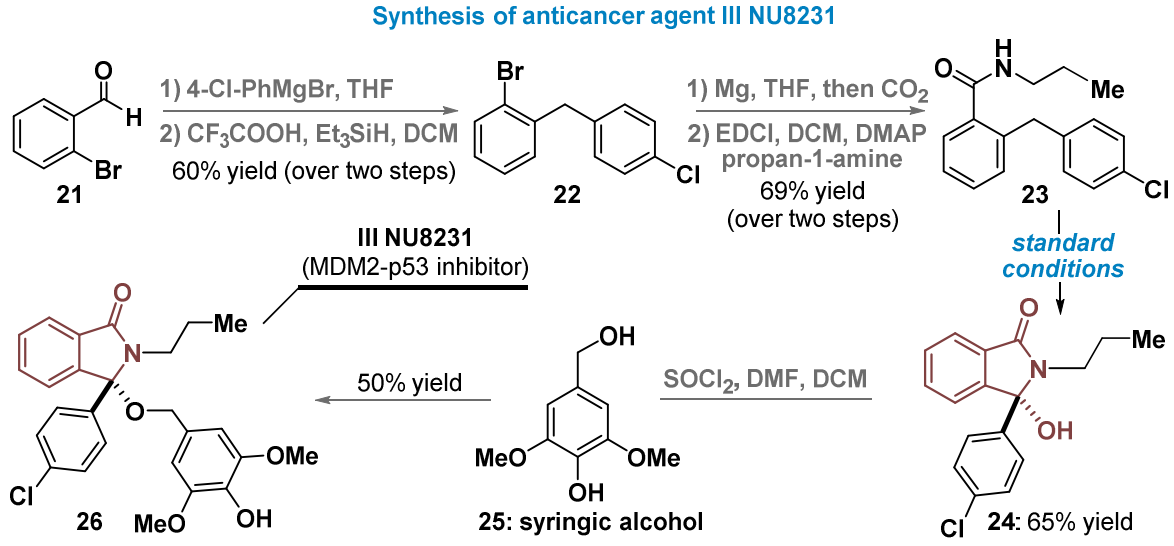
3-methoxy-2-phenyl-3-propylisoindolin-1-one (19): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.94-7.92 (d, *J* = 8.0 Hz, 1H), 7.68-7.64 (m, 1H), 7.62-7.59 (m, 2H), 7.58-7.54 (m, 1H), 7.50-7.43 (m, 3H), 7.31-7.26 (m, 1H), 3.01 (s, 3H), 2.05-1.98 (m, 2H), 1.06-0.96 (m, 1H), 0.78-0.69 (m, 1H), 0.66-0.63 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.4, 143.1, 136.1, 132.9, 132.6, 129.9, 129.1, 126.5, 125.1, 124.0, 122.1, 97.7, 50.2, 38.0, 16.6, 13.8; HRMS calculated for $C_{18}H_{19}NO_2Na$ ($M + Na^+$): 304.1313, found: 304.1308. (White solid, 29.9 mg, 95% isolated yield)



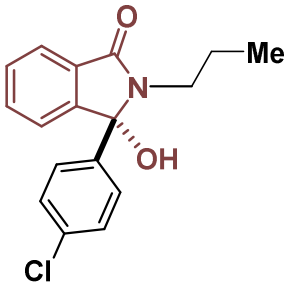
20

4-propylphthalazin-1(2*H*)-one (20): ^{1}H NMR (400 MHz, $CDCl_3$) δ 10.42 (s, 1H), 8.49-8.47 (d, *J* = 7.6 Hz, 1H), 7.85-7.83 (m, 2H), 7.80-7.76 (m, 1H), 2.95-2.91 (t, *J* = 7.2 Hz, 2H), 1.87-1.77 (m, 2H), 1.08-1.04 (t, *J* = 7.6 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 160.5, 147.8, 133.5, 131.3, 130.0, 128.2, 127.1, 124.8, 34.2, 21.3, 14.1; HRMS calculated for $C_{11}H_{13}N_2O$ ($M + H^+$): 189.1028, found: 189.1022. (Yellow oil, 16.9 mg, 84% isolated yield)

Synthesis of anticancer agent III NU8231

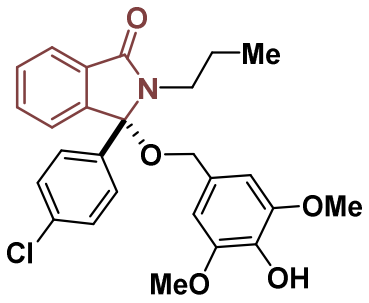


^{1}H and ^{13}C spectra data of compounds 24 and 26



24

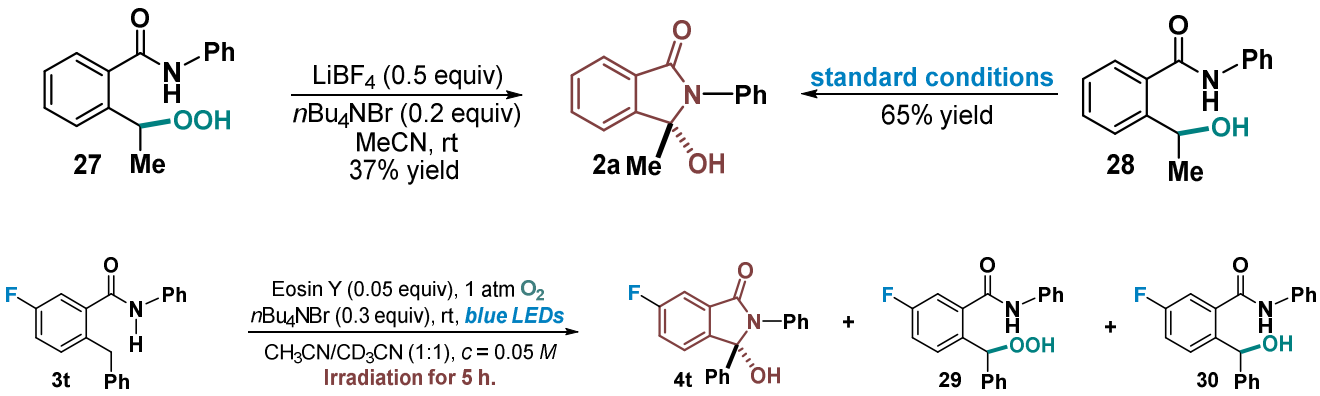
3-(4-chlorophenyl)-3-hydroxy-2-propylisoindolin-1-one (24): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.73-7.71 (d, *J* = 7.2 Hz, 1H), 7.59-7.50 (m, 2H), 7.42-7.40 (d, *J* = 7.6 Hz, 1H), 7.34-7.32 (d, *J* = 8.2 Hz, 1H), 7.26-7.24 (d, *J* = 7.2 Hz, 1H), 7.19-7.18 (m, 1H), 3.35 (s, 1H), 3.34-3.28 (m, 1H), 2.91-2.84 (m, 1H),1.48-1.38 (m, 1H),0.78-0.75 (t, *J* = 8.0 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.1, 149.7, 140.0, 133.2, 133.0, 131.1, 129.9, 129.0, 128.4, 123.2, 123.0, 90.6, 41.2, 22.2, 12.1. These data are consistent with literature values, see: R. K. Dempster and F. A. Luzzio. *Tetrahedron Lett.* **2011**, *52*, 4992.(White solid, 20.4 mg, 65% isolated yield)



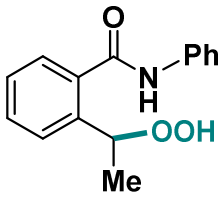
26

3-(4-chlorophenyl)-3-((4-hydroxy-3,5-dimethoxybenzyl)oxy)-2-propylisoindolin-1-on e (26): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.92-7.90 (dd, J_1 = 5.2 Hz, J_2 = 1.2 Hz, 1H), 7.53-7.46 (m, 2H), 7.36-7.28 (m, 4H), 7.12-7.11 (dd, J_1 = 5.2 Hz, J_2 = 1.2 Hz, 1H), 6.46 (s, 2H), 4.17-4.14 (d, J = 7.6 Hz, 1H), 3.93-3.90 (d, J = 7.6 Hz, 1H), 3.87 (s, 6H), 3.34-3.07 (m, 2H), 1.57-1.34 (m, 2H), 0.83-0.80 (t, J = 7.6 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.4, 147.0, 145.3, 137.7, 134.6, 134.4, 132.6, 132.0, 130.0, 128.7, 128.5, 128.0, 123.6, 123.3, 104.5, 94.9, 65.4, 56.4, 41.6, 21.7, 11.9. These data are consistent with literature values, see: I. R. Hardcastle, S. U. Ahmed and H. Atkins. *J. Med. Chem.* **2006**, *49*, 6209. (White solid, 23.3 mg, 50% isolated yield)

Experiments on reaction mechanism

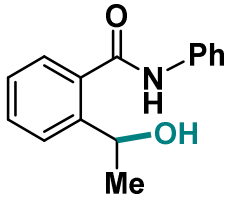


^{1}H, ^{13}C and ^{19}F spectra data of compounds 27-30



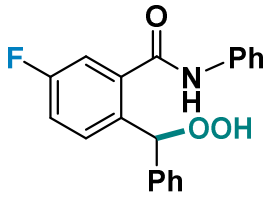
27

2-(1-hydroperoxyethyl)-*N*-phenylbenzamide (27): ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.12 (s, 1H), 8.24 (s, 1H), 7.60-7.58 (d, *J* = 8.0 Hz, 2H), 7.52-7.45 (m, 3H), 7.34-7.31 (m, 3H), 7.16-7.13 (t, *J* = 7.6 Hz, 1H), 5.46-5.41 (m, 1H), 1.47-1.46 (d, *J* = 6.4 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.1, 139.1, 137.8, 136.3, 130.8, 129.2, 128.4, 127.8, 127.1, 124.9, 120.2, 80.5, 29.9; HRMS calculated for $C_{15}H_{15}NO_3$ (M + Na^+): 280.0950, found: 280.0944. (White solid, 15.1 mg, 44% isolated yield)



28

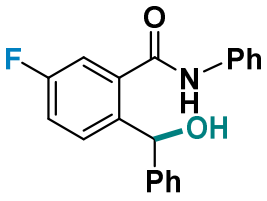
2-(1-hydroxyethyl)-*N*-phenylbenzamide (28): ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.26 (s, 1H),7.64-7.61 (t, *J* = 7.2 Hz, 3H), 7.57-7.48 (m, 2H), 7.40-7.36 (t, *J* = 8.4 Hz, 3H), 7.20-7.16 (t, *J* = 7.6 Hz, 1H), 5.11-5.06 (m, 1H), 3.92 (s, 1H), 1.60-1.59 (d, *J* = 6.4 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.4, 143.4, 137.8, 131.4, 129.3, 128.0, 127.9, 127.0, 125.8, 125.0, 120.3, 68.0, 22.1; HRMS calculated for $C_{15}H_{15}NO_2$ (M + Na^+): 264.1000, found: 264.0995. (White solid, 15.4 mg, 82% isolated yield)



29

5-fluoro-2-(hydroperoxy(phenyl)methyl)-*N*-phenylbenzamide (29): ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.06 (s, 1H), 7.60-7.58 (d, *J* = 8.0 Hz, 2H), 7.41-7.34 (m, 8H), 7.31-7.28 (m, 1H), 7.19-7.10 (m, 2H), 6.50 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.2, 139.1,

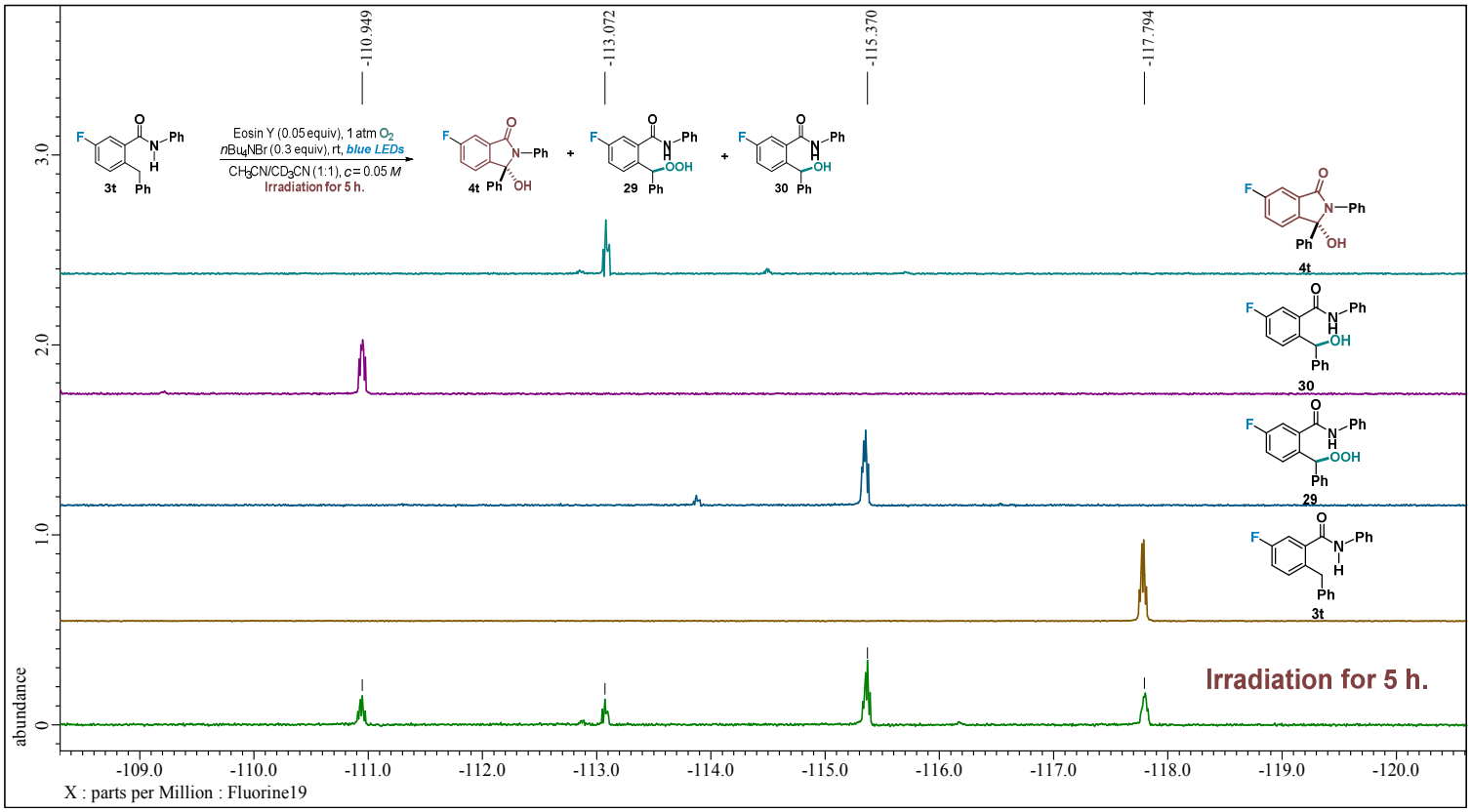
137.9, 137.5, 131.5, 131.4, 129.2, 129.0, 128.8, 128.7, 128.6, 127.4, 126.8, 126.1, 125.1, 120.3, 117.7, 117.5, 115.8, 115.6, 85.8; ^{19}F NMR (376 MHz, $CDCl_3$) δ -115.4; HRMS calculated for $C_{20}H_{16}FNO_3$ ($M + Na^+$): 360.1012, found: 360.1006. (White solid, 13.3 mg, 40% isolated yield)



30

5-fluoro-2-(hydroxy(phenyl)methyl)-*N*-phenylbenzamide (30): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.94 (s, 1H), 7.42-7.38 (m, 2H), 7.36-7.27 (m, 8H), 7.25-7.18 (m, 2H), 7.17-7.10 (m, 1H), 6.06 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.1, 142.0, 138.7, 137.1, 131.9, 131.8, 129.2, 128.8, 128.6, 128.3, 127.5, 126.5, 126.1, 125.3, 124.8, 124.7, 120.6, 117.9, 117.7, 115.3, 115.1, 73.6; ^{19}F NMR (376 MHz, $CDCl_3$) δ -110.9; HRMS calculated for $C_{20}H_{16}FNO_2$ ($M + Na^+$): 344.1063, found: 344.1057. (White solid, 15.2 mg, 80% isolated yield)

Reaction progress of **3t** monitored by *in situ* ^{19}F-NMR



UV-Vis absorption experiments

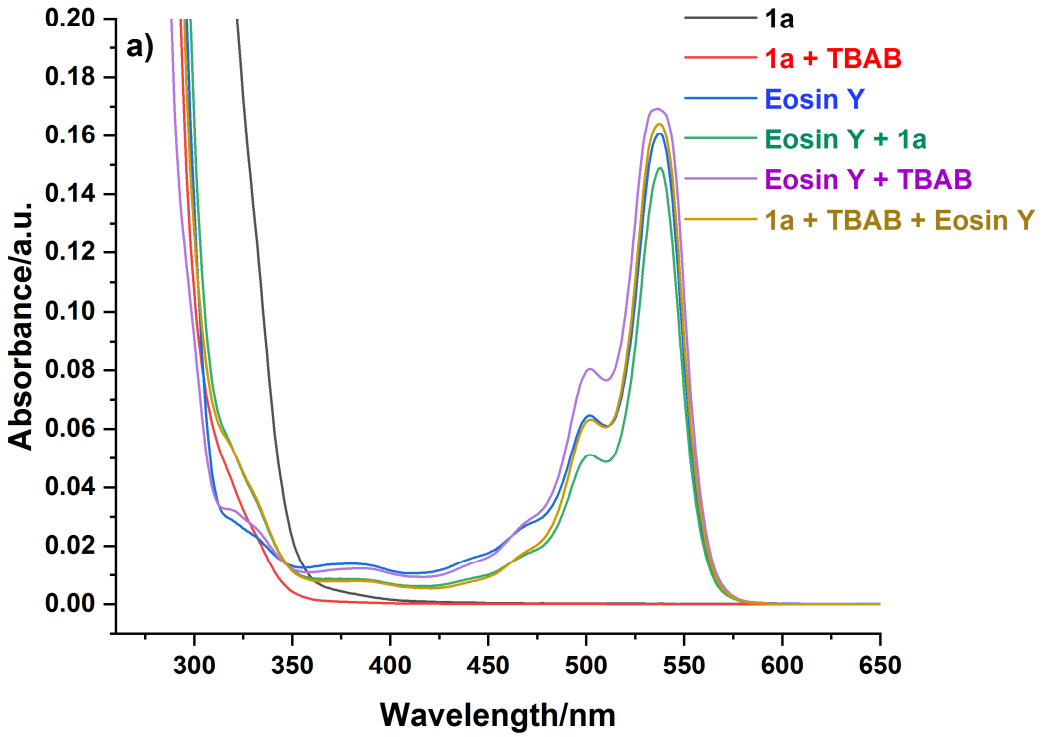


Figure 1. UV−Vis absorption spectra of the individual reaction components and the reaction mixtures

Fluorescence quenching experiments

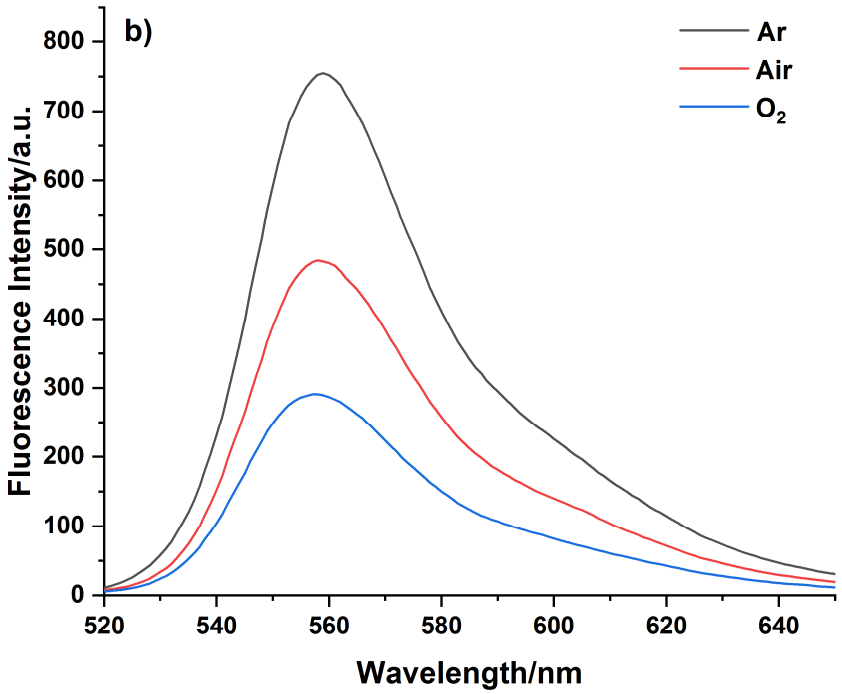


Figure 2. Fluorescence spectra of Eosin Y with different concentrations of O_2

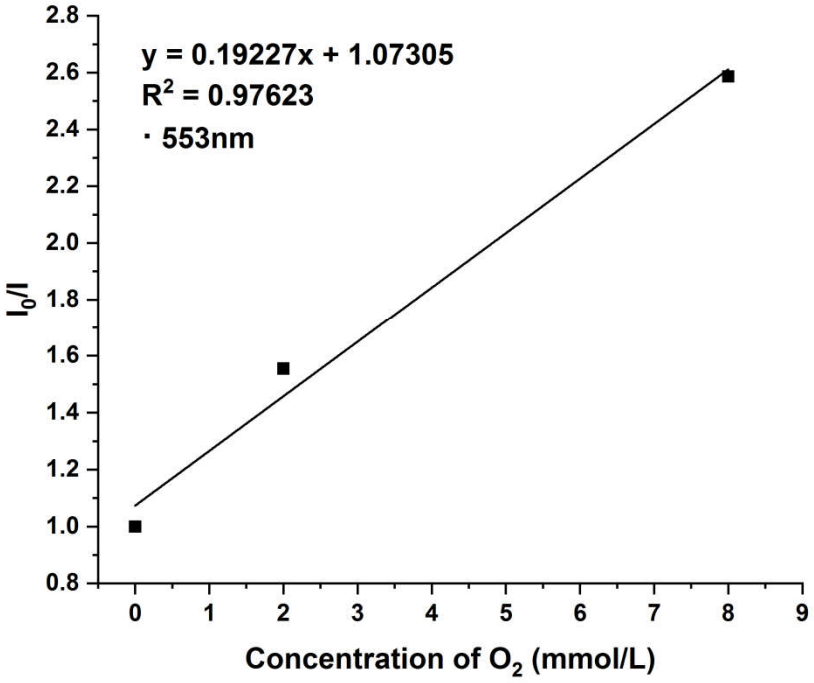


Figure 3. Stern Volmer plots of O_2

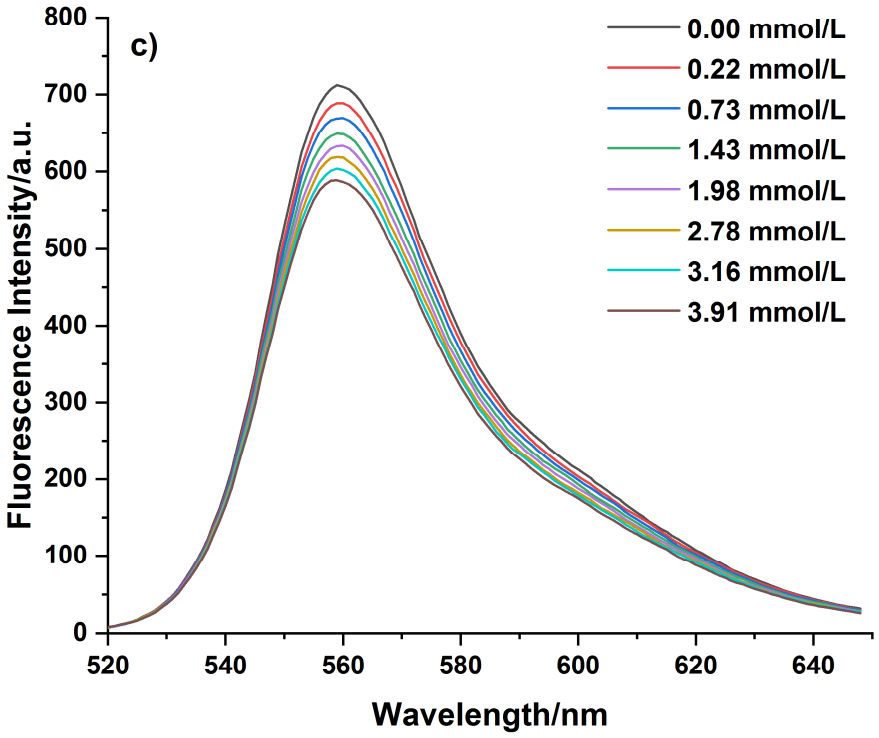


Figure 4. Fluorescence spectra of Eosin Y with different concentrations of **1a**

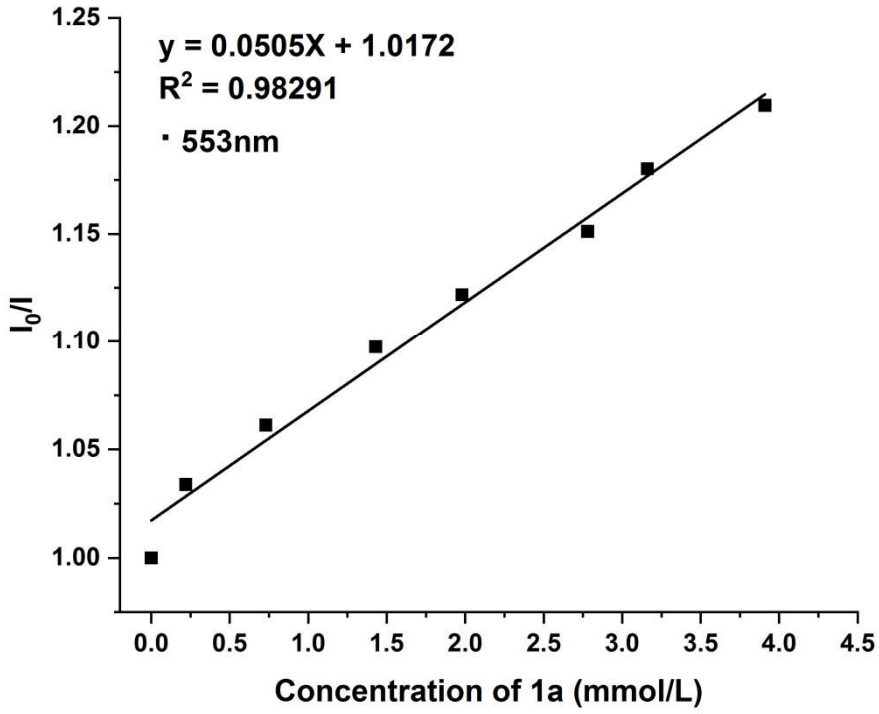


Figure 5. Stern Volmer plots of the substrate **1a**

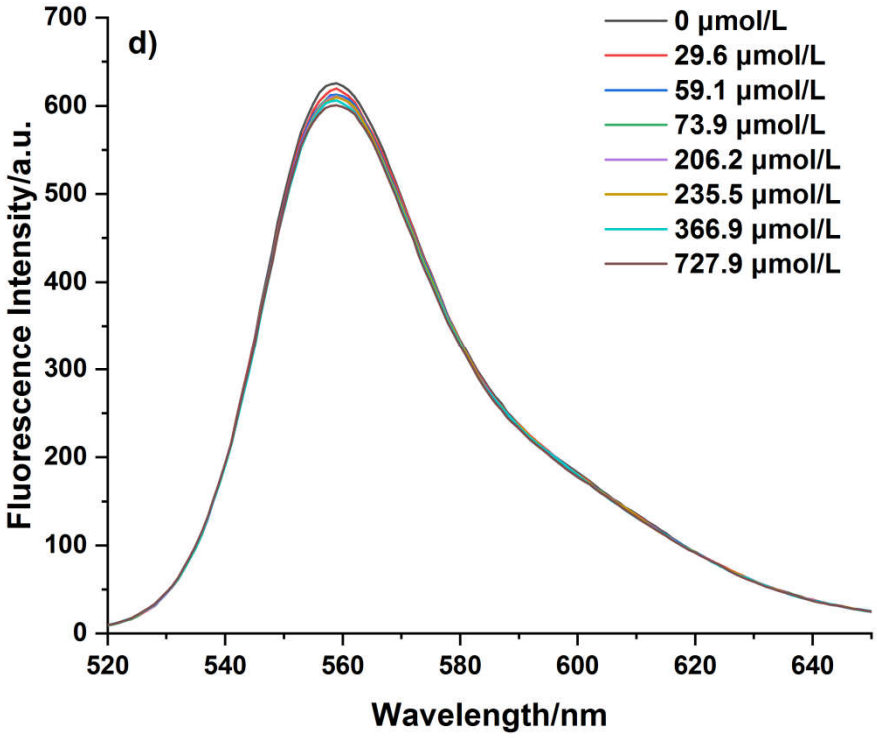


Figure 6. Fluorescence spectra of Eosin Y with different concentrations of nBu$_4$NBr

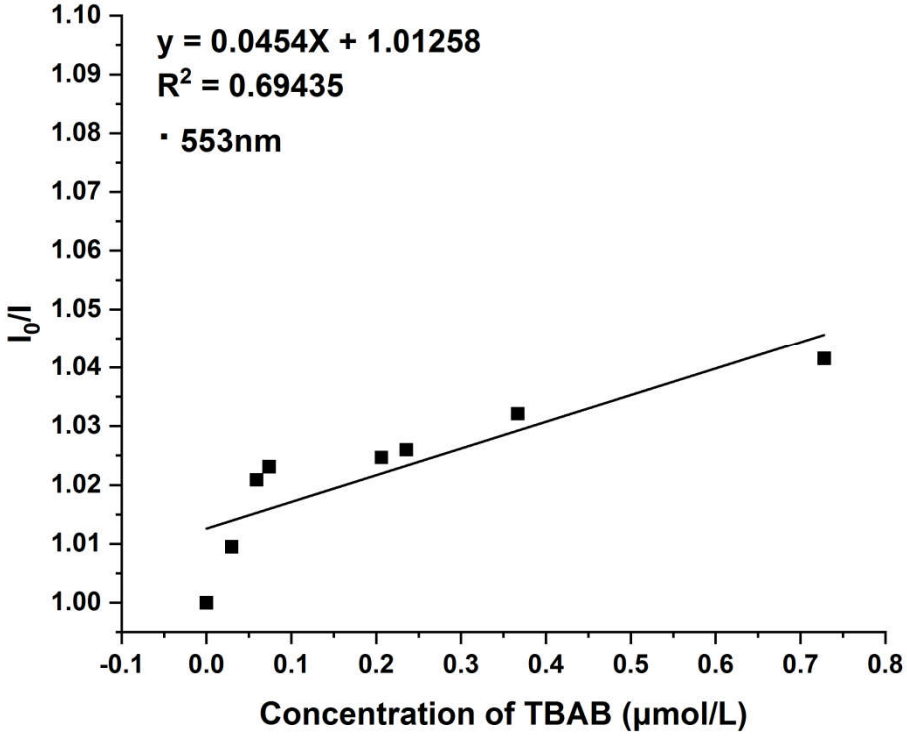


Figure 7. Stern Volmer plots of the TBAB

CV curve of the substrate 1a

Cyclic voltammetry (CV) was performed using an Epsilon electrochemical workstation (a BASi three-electrode cell system): glassy carbon electrode as the working electrode, Pt wire as the counter electrode, Ag/AgCl (KCl, 3 *M*) electrode as the reference electrode, and ferrocenium/ferrocene (Fc^+/Fc) as the internal standard. Scan rate: 100 mV s^{-1} (in the range -0.7 to +2.3 V). nBu$_4$NPF$_6$ (0.1 M MeCN) was used as the supporting electrolyte.

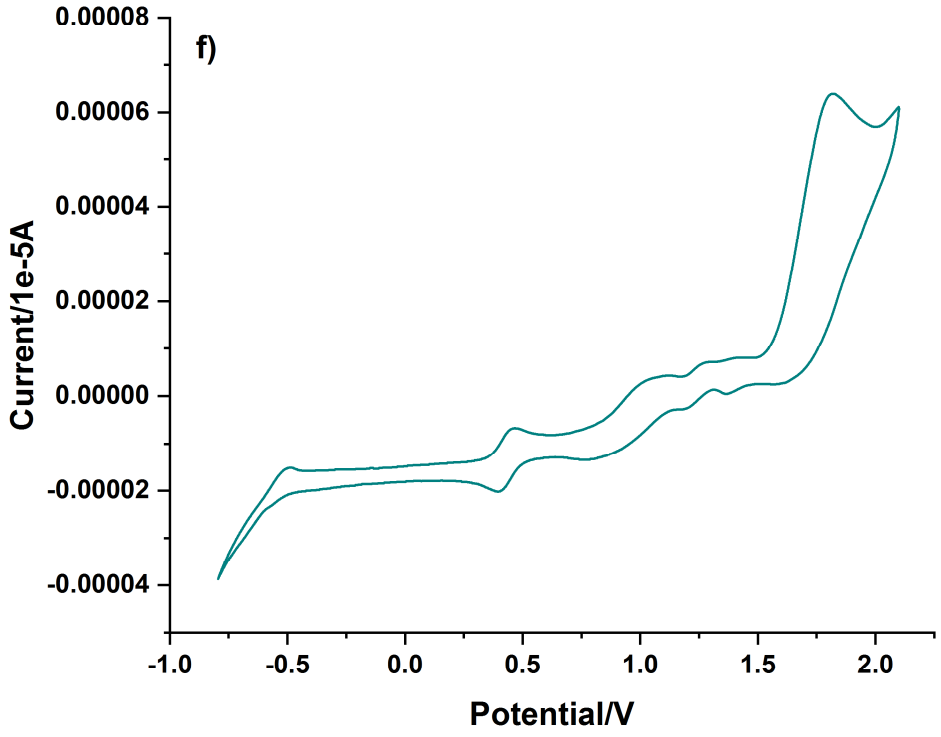


Figure 8. Cyclic voltammetry of the substrate **1a**

EPR experiments

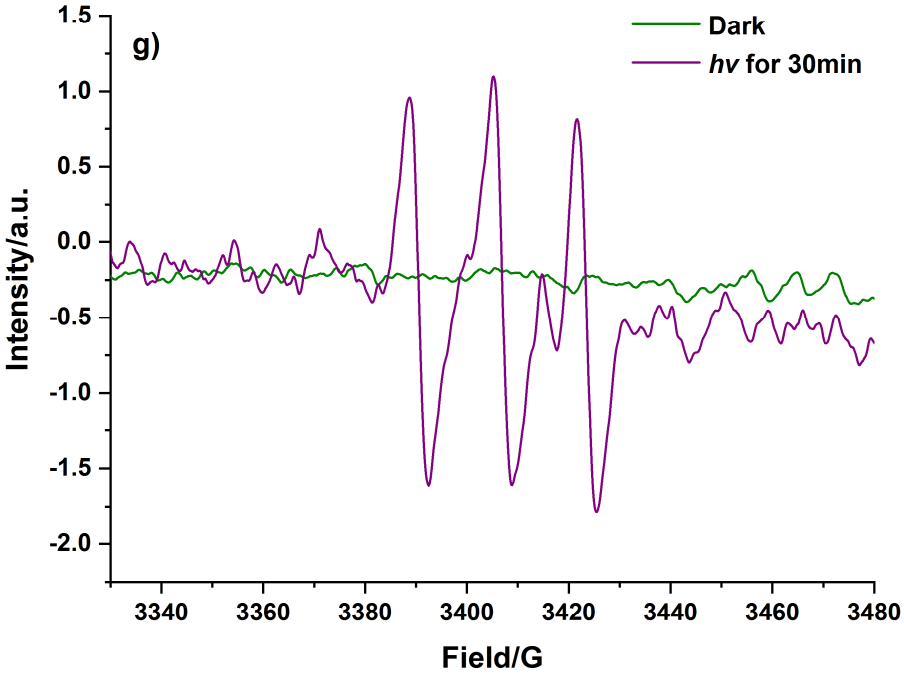


Figure 9. EPR experiments on reaction of **1a** by adding TEMP

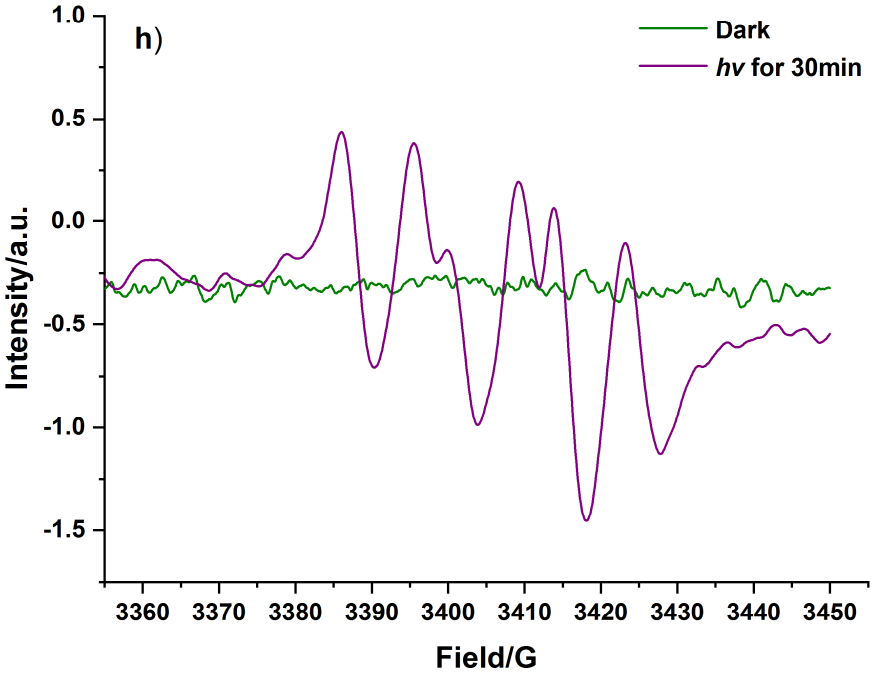
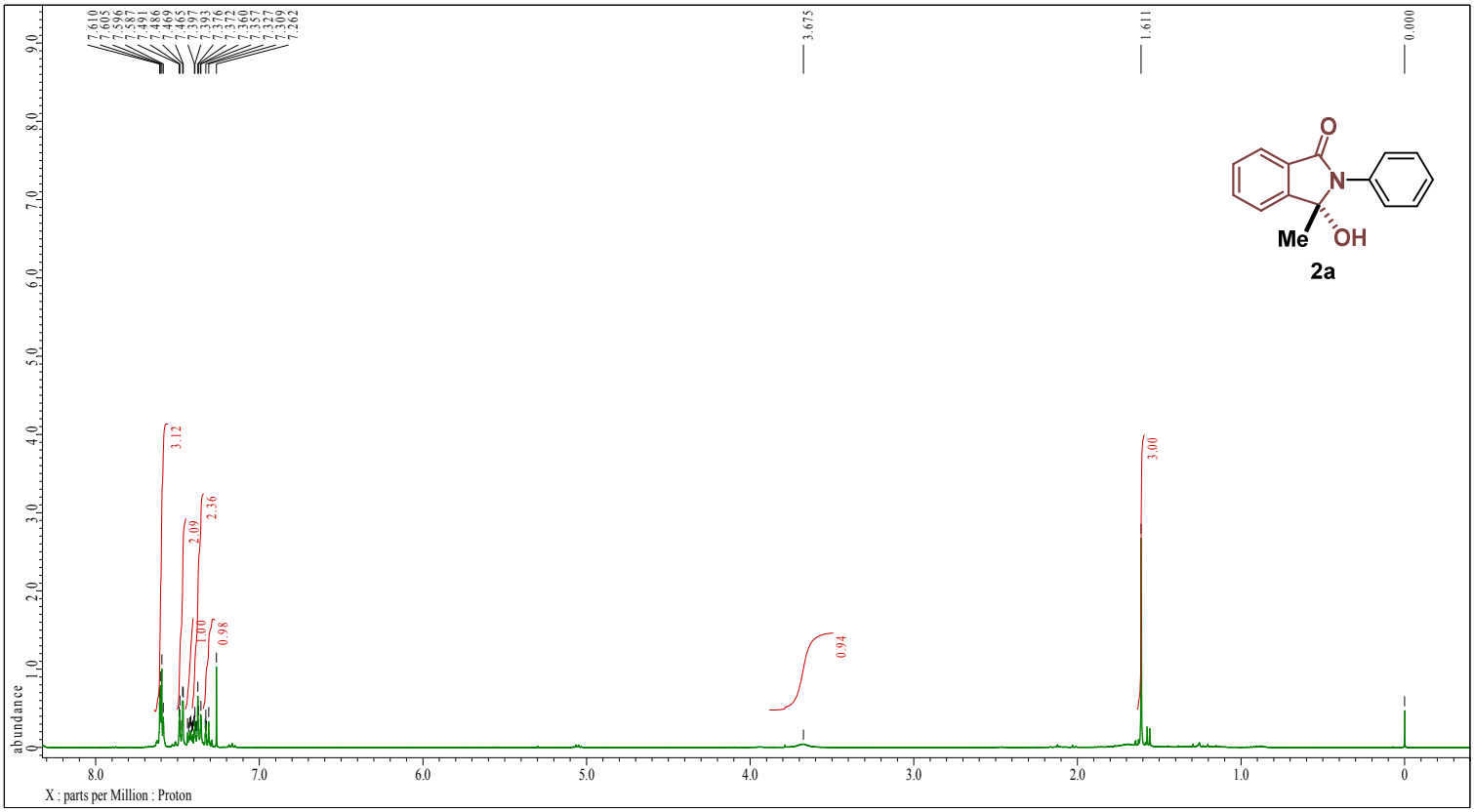
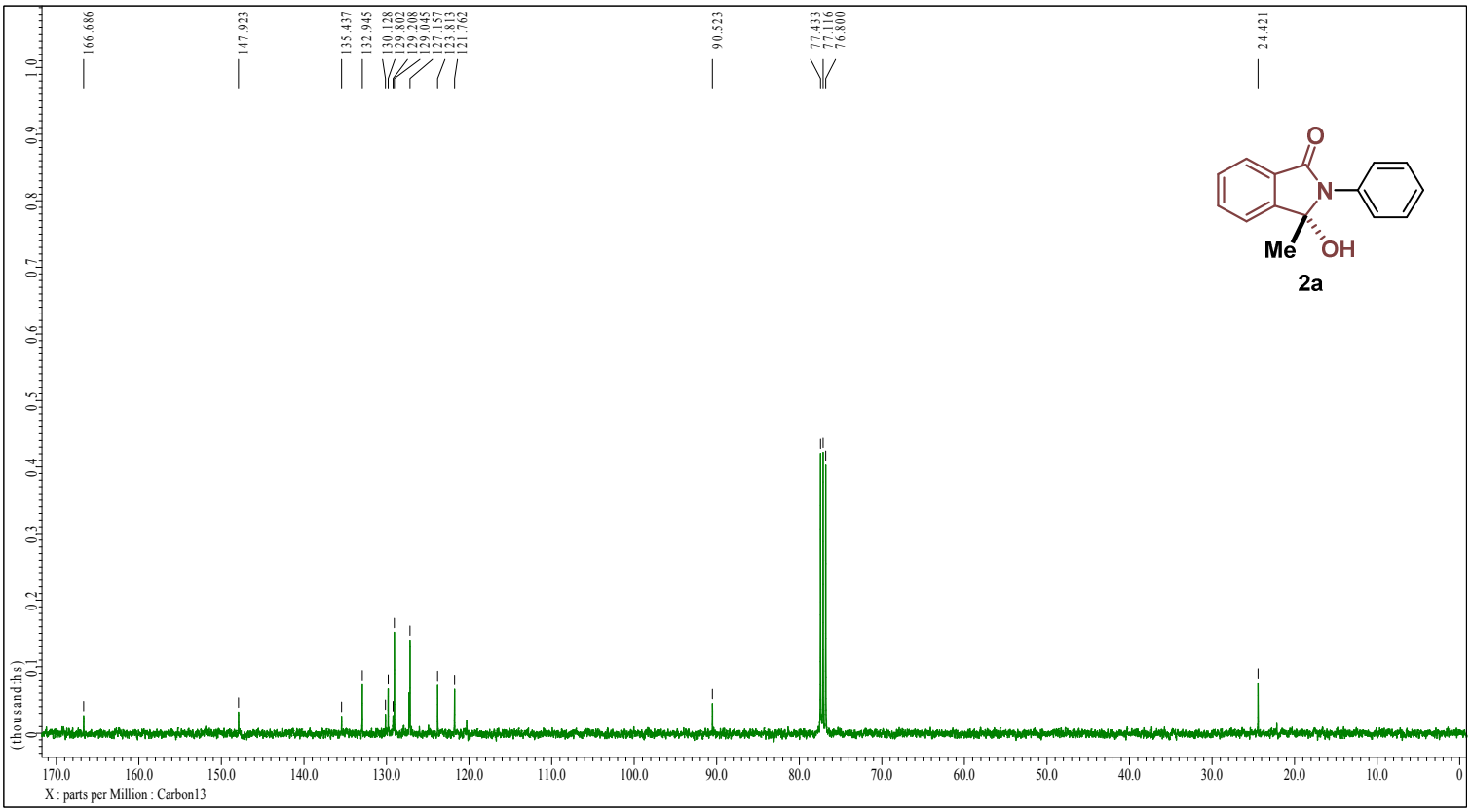
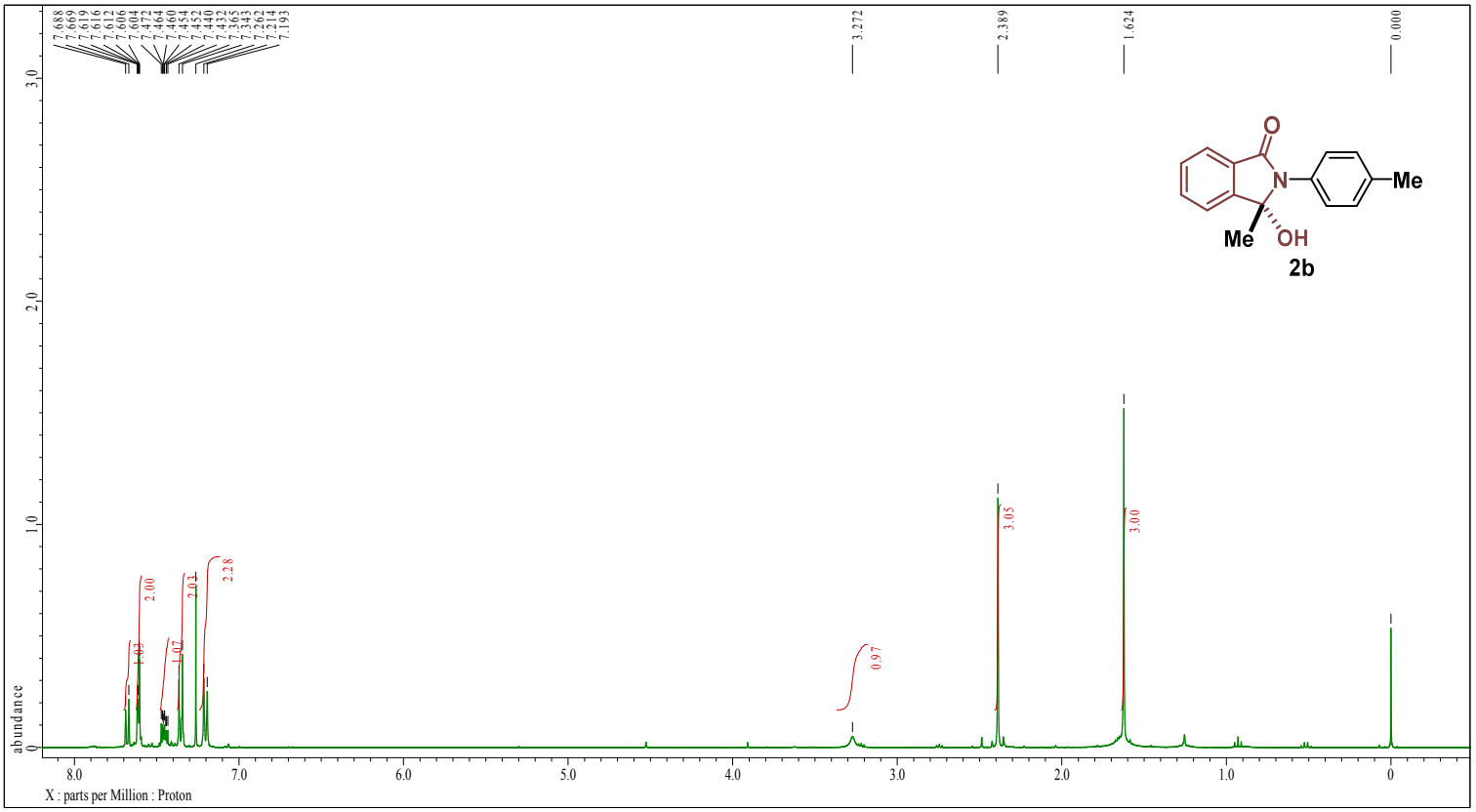


Figure 10. EPR experiments on reaction of **1a** by adding DMPO

Copies of ^{1}H NMR, ^{13}C NMR and ^{19}F NMR spectra



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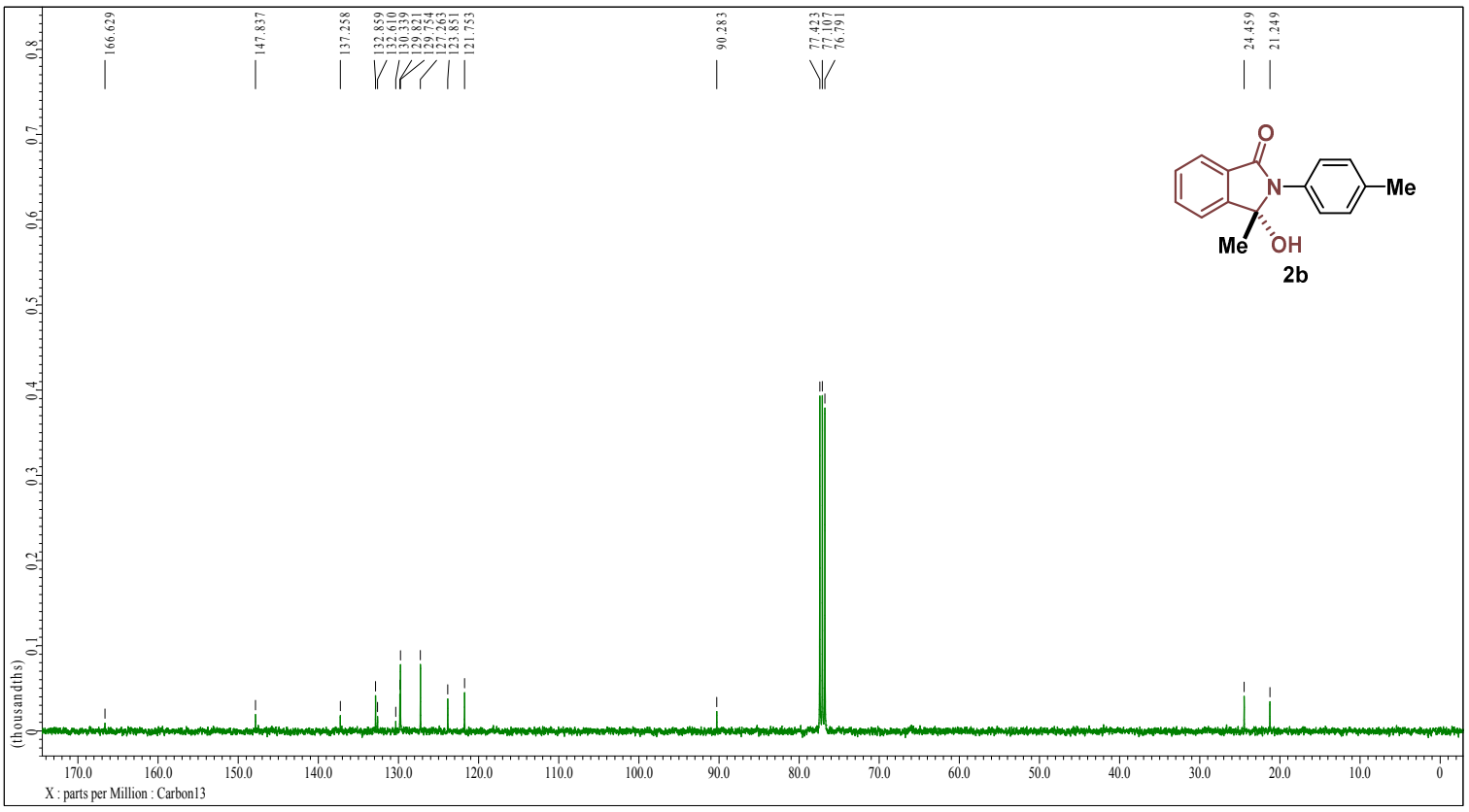
7.616
7.612
7.606
7.604
7.472
7.464
7.460
7.454
7.452
7.440
7.432
7.365
7.343
7.262
7.214
7.193
3.272
2.389
1.624
0.000
O
N
Me
Me
OH
2b
2.00
1.03
1.07
2.03
2.28
0.97
3.05
3.00
abundance
X : parts per Million : Proton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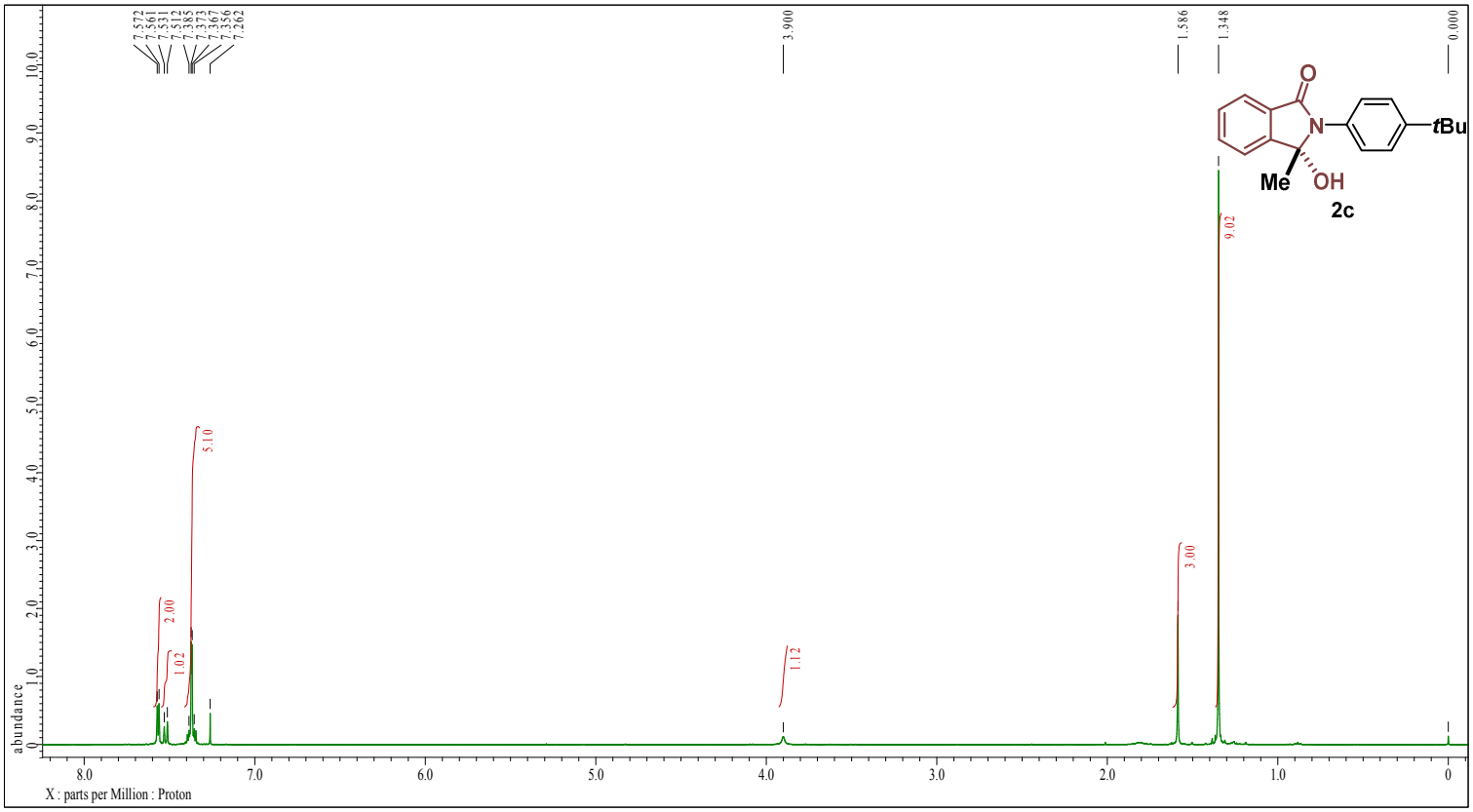
132.859
132.610
130.339
129.821
129.754
127.263
123.851
121.753
90.283
77.423
77.107
76.791
24.459
21.249
O
N
Me
Me
OH
2b
(thousandths)
X : parts per Million : Carbon13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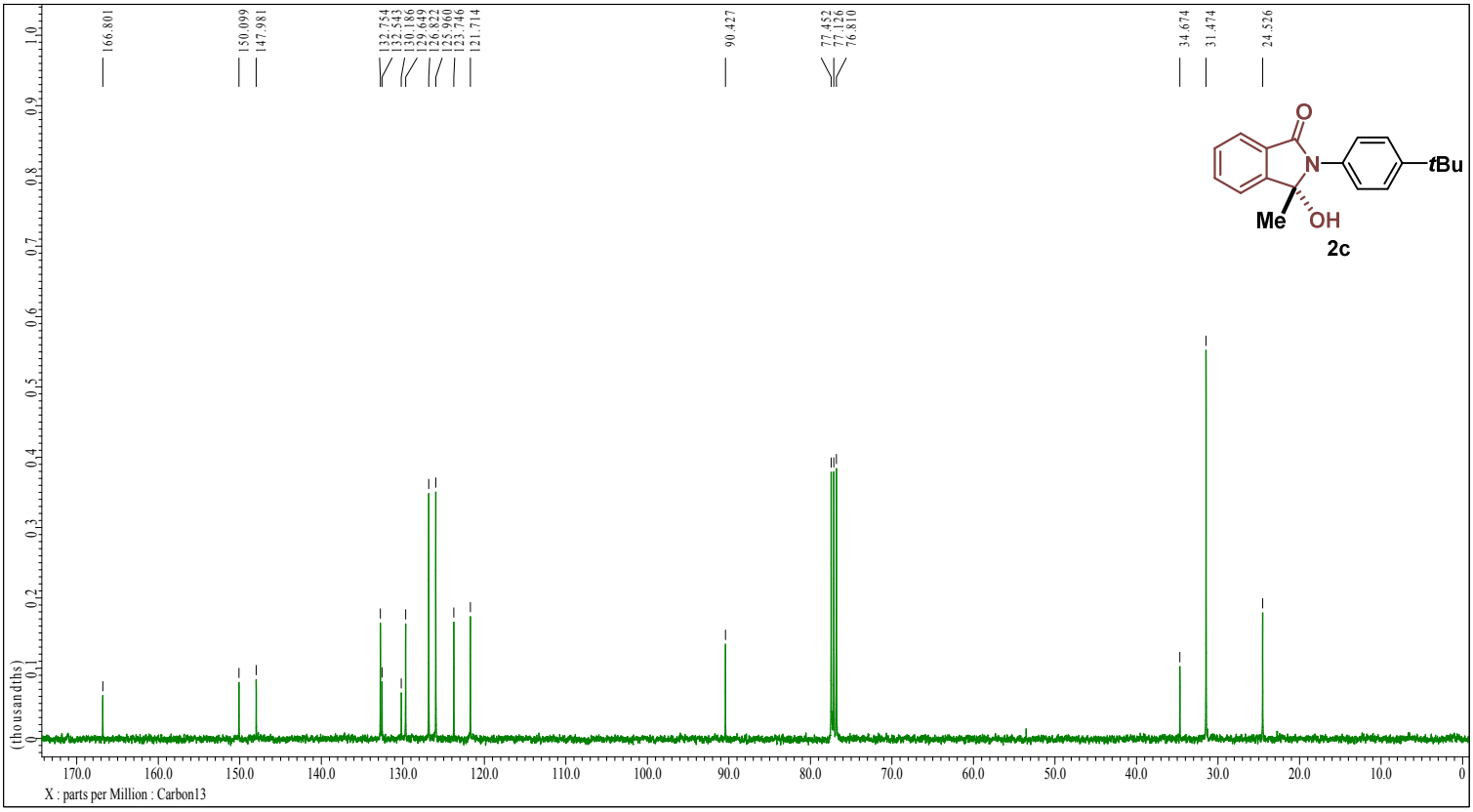
7.551
7.512
7.385
7.373
7.367
7.356
7.262
3.900
1.586
1.348
0.000
5.10
2.00
1.02
1.12
3.00
9.02
abundance
X : parts per Million : Proton
O
N
tBu
Me
OH
2c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132.543
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126.822
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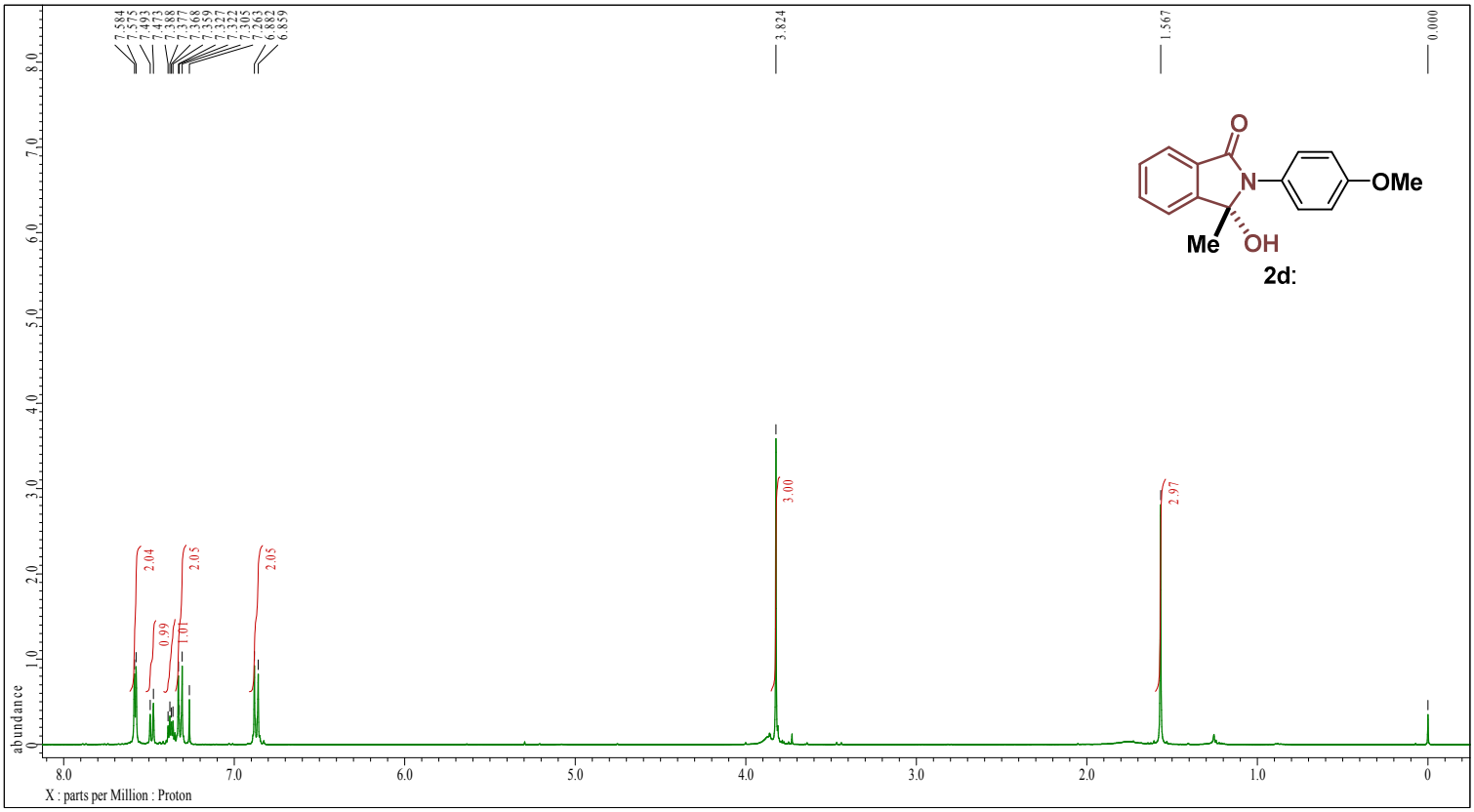
90.427
77.452
77.126
76.810
34.674
31.474
24.526
(thousandths)
X : parts per Million : Carbon13
O
N
tBu
Me
OH
2c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7.368
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6.859
3.824
1.567
0.000
O
N
OMe
Me
OH
2d:
2.04
0.99
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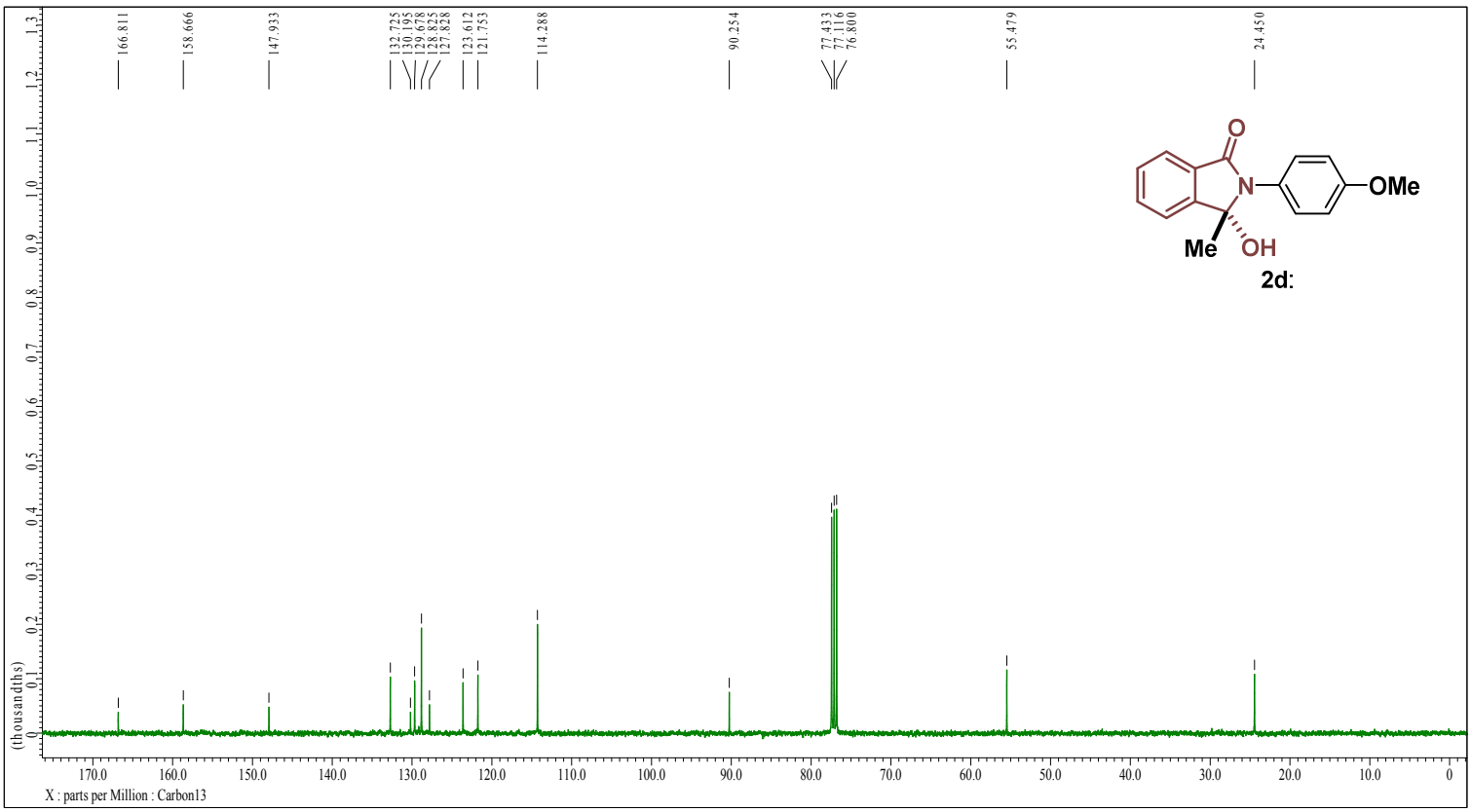
2.05
2.05
3.00
2.97
abundance
X : parts per Million : Proton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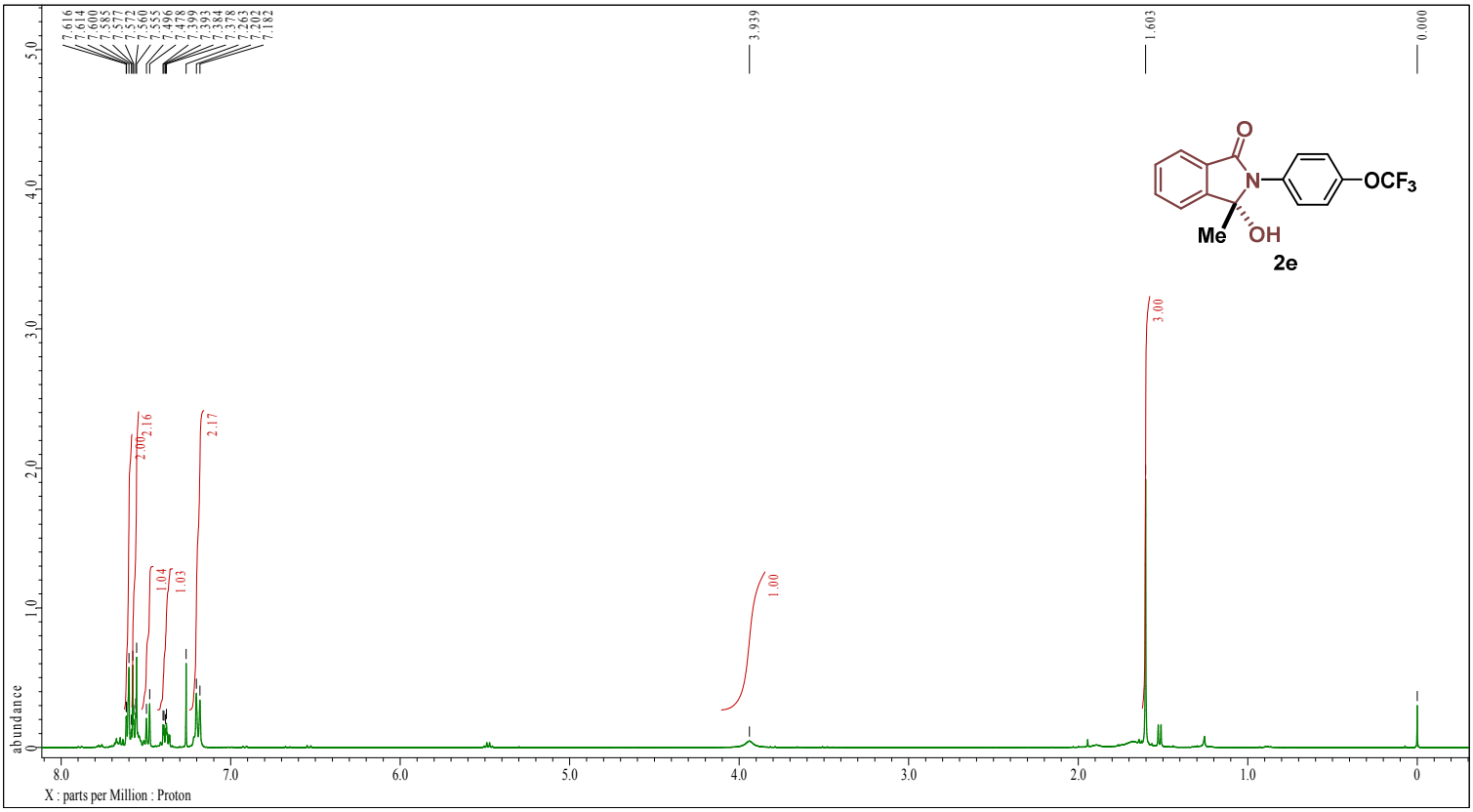
55.479
24.450
O
N
OMe
Me
OH
2d:
(thousandths)
X : parts per Million : Carbon13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7.478
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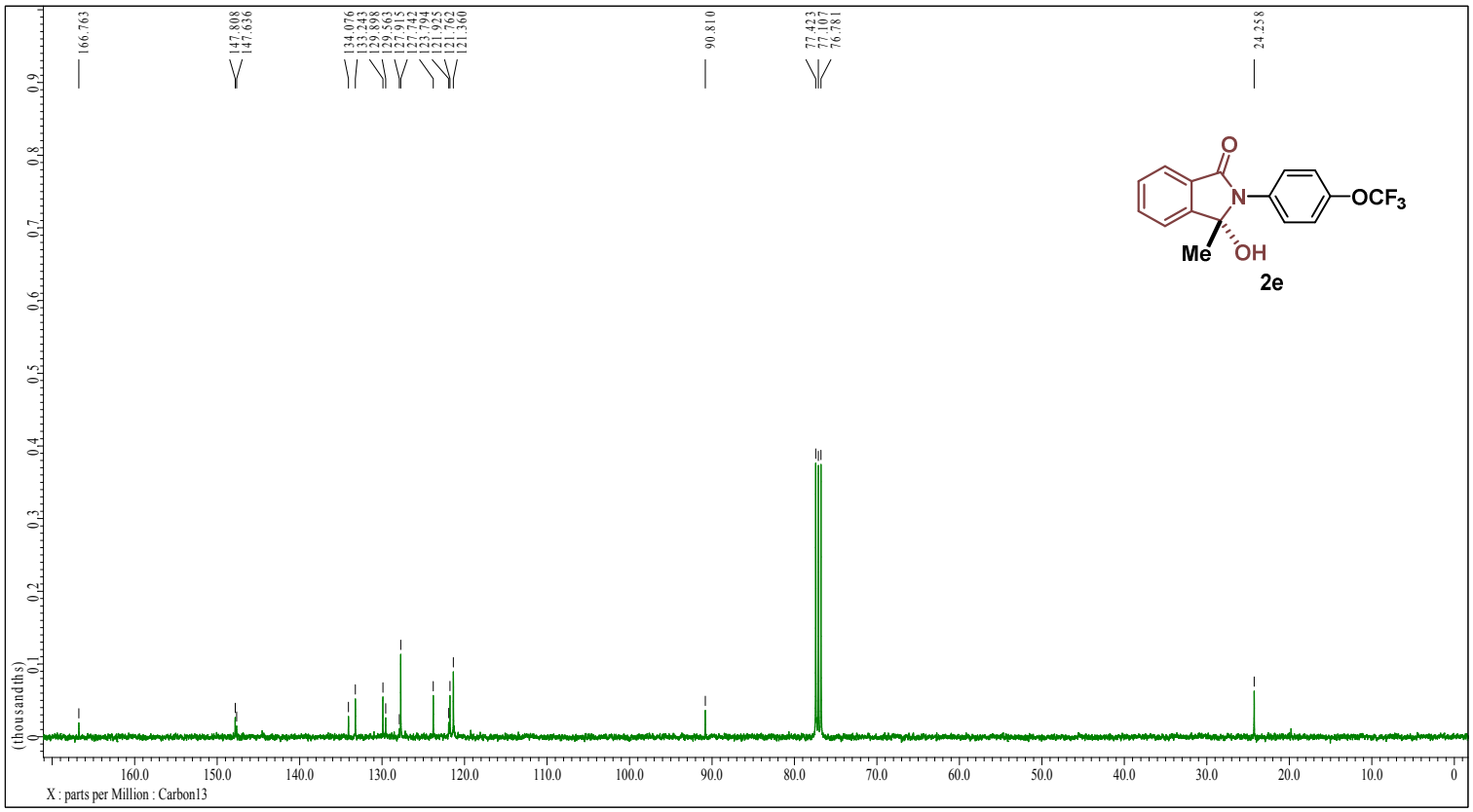
7.384
7.378
7.263
7.202
7.182
3.939
1.603
0.000
O
N
OCF3
Me
OH
2e
3.00
2.00
2.16
2.17
1.04
1.03
1.00
abundance
X : parts per Million : Proton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121.360
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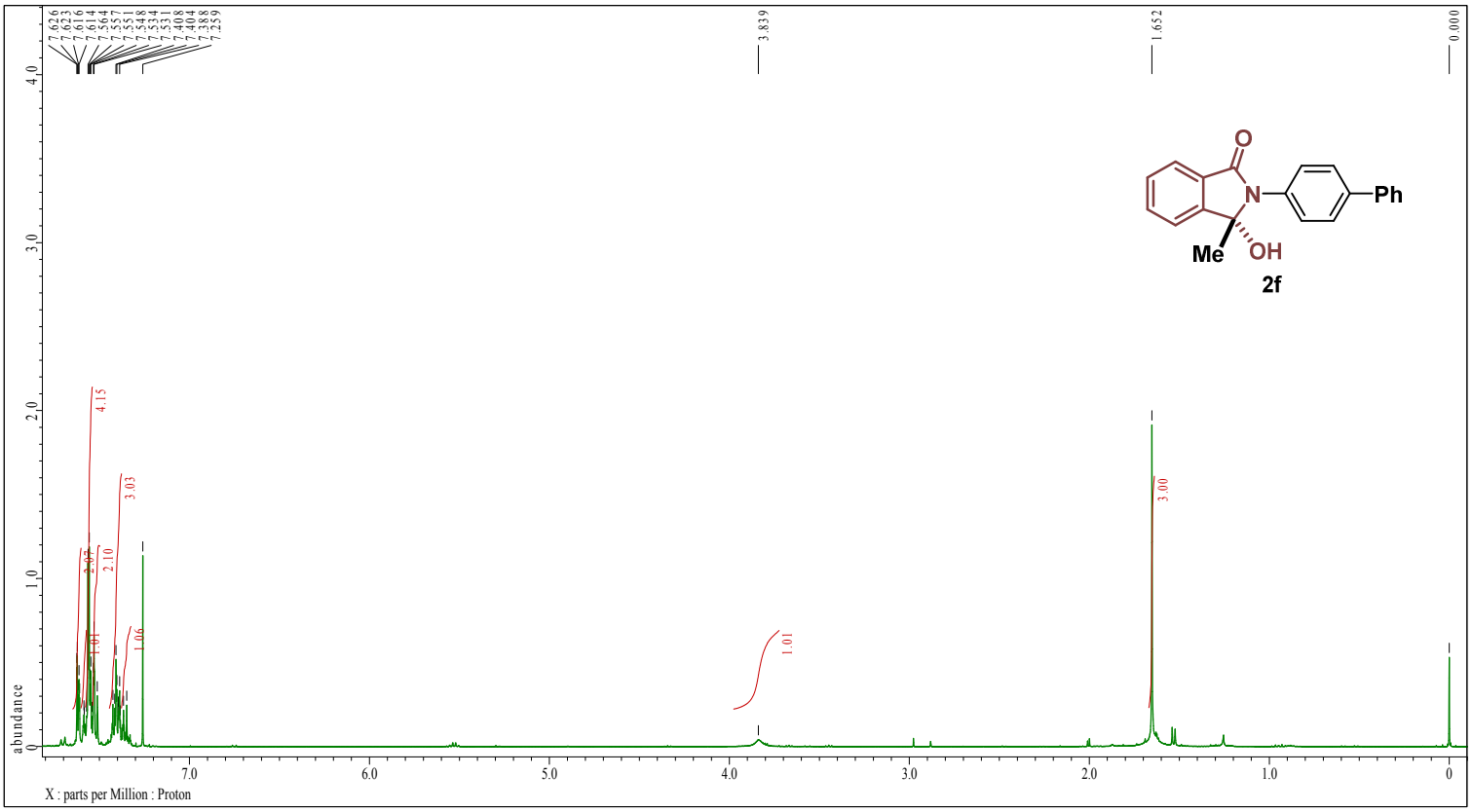
76.781
24.258
O
N
OCF3
Me
OH
2e
(thousandths)
X : parts per Million : Carbon13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7.548
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7.531
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7.404
7.388
7.259
3.839
1.652
0.000
O
N
Ph
Me
OH
2f
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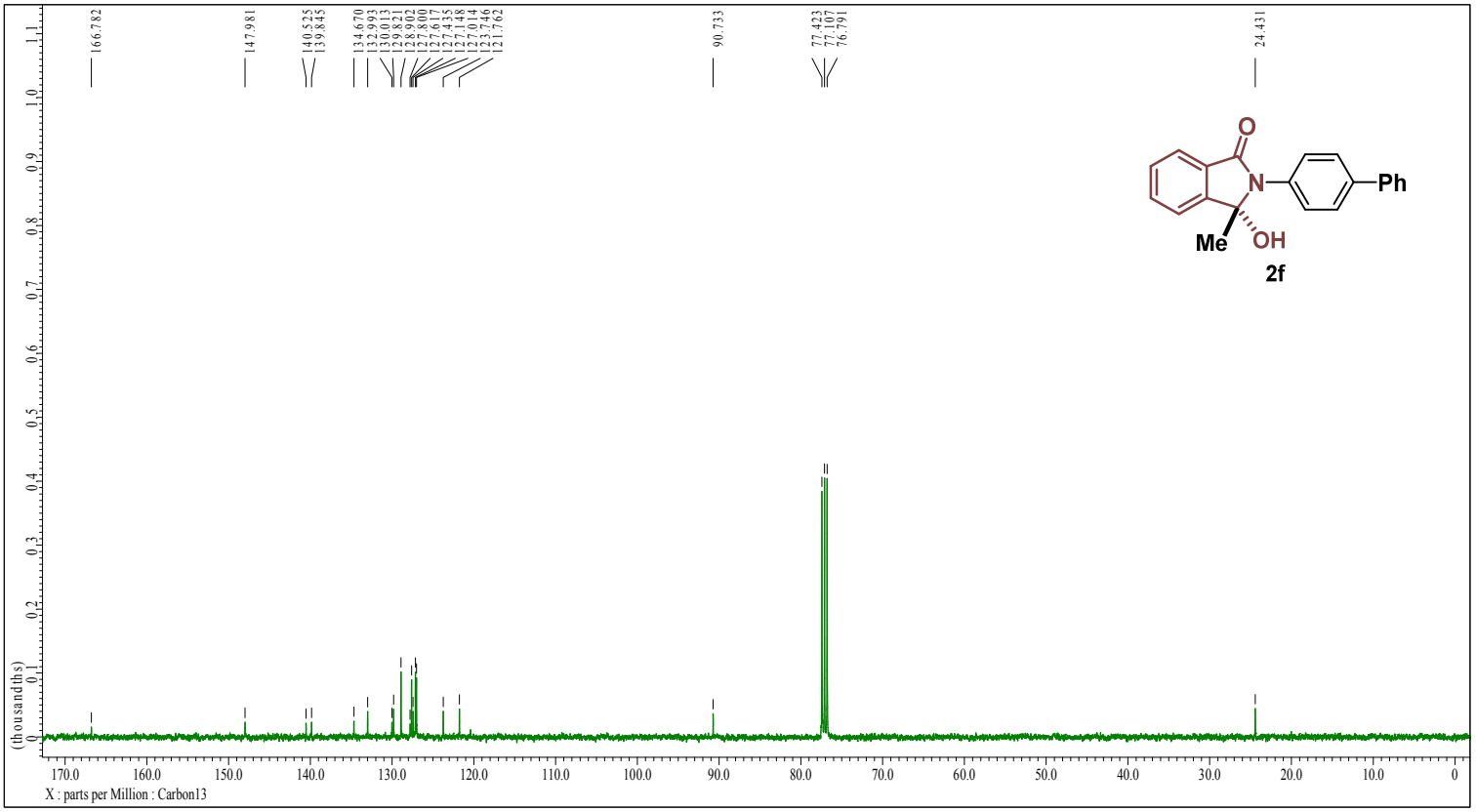
3.03
2.10
2.07
1.01
1.06
1.01
3.00
abundance
X : parts per Million : Proton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123.746
121.762
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76.791
24.431
O
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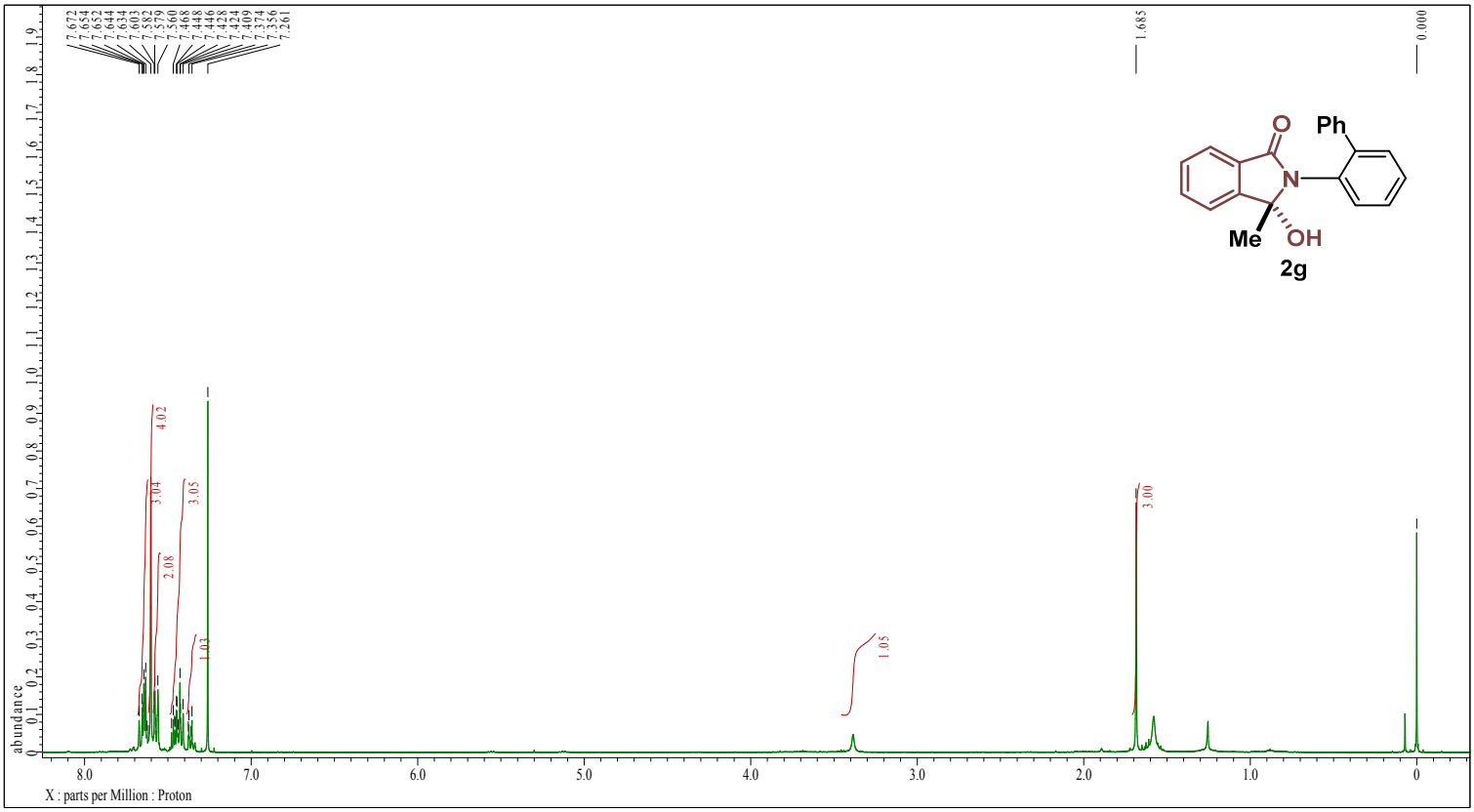
Ph
Me
OH
2f
(thousandths)
X : parts per Million : Carbon13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7.428
7.421
7.409
7.374
7.356
7.261
1.685
0.000
4.02
3.04
3.05
2.08
1.03
1.05
3.00
abundance
X : parts per Million : Proton
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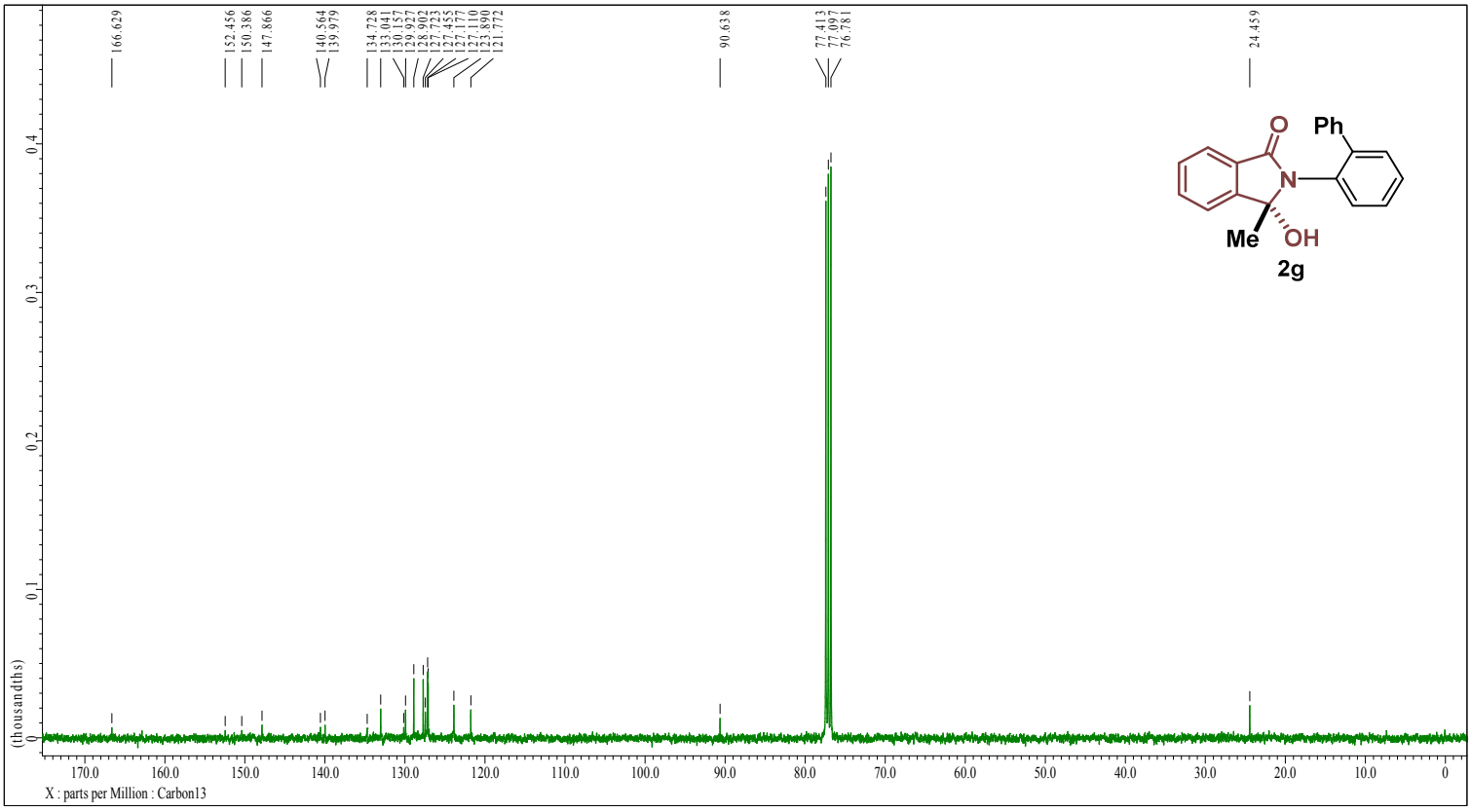
Ph
N
Me
OH
2g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127.177
127.110
123.890
121.772
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24.459
(thousandths)
X : parts per Million : Carbon13
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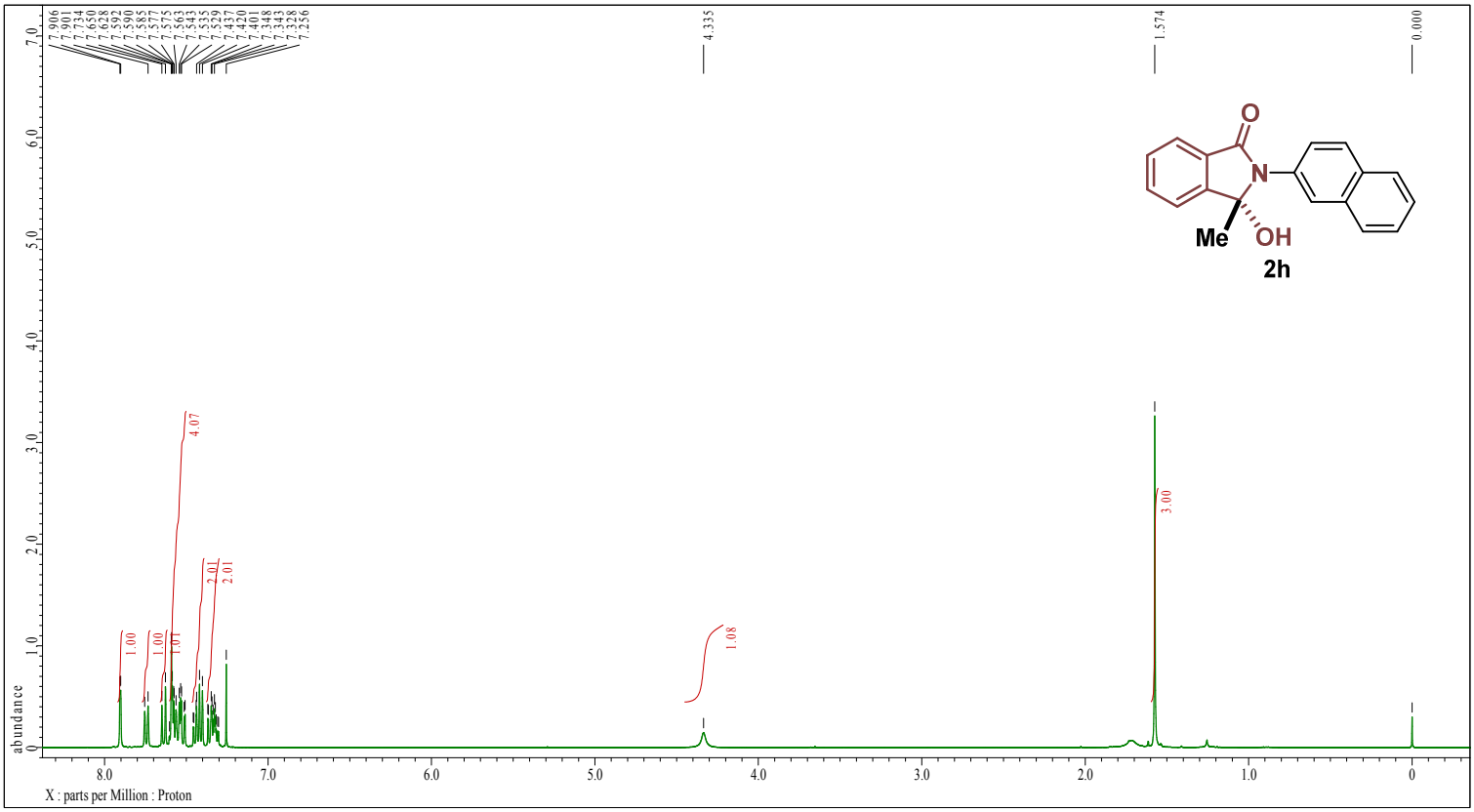
Ph
N
Me
OH
2g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O
N
Me
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2.01
1.00
1.00
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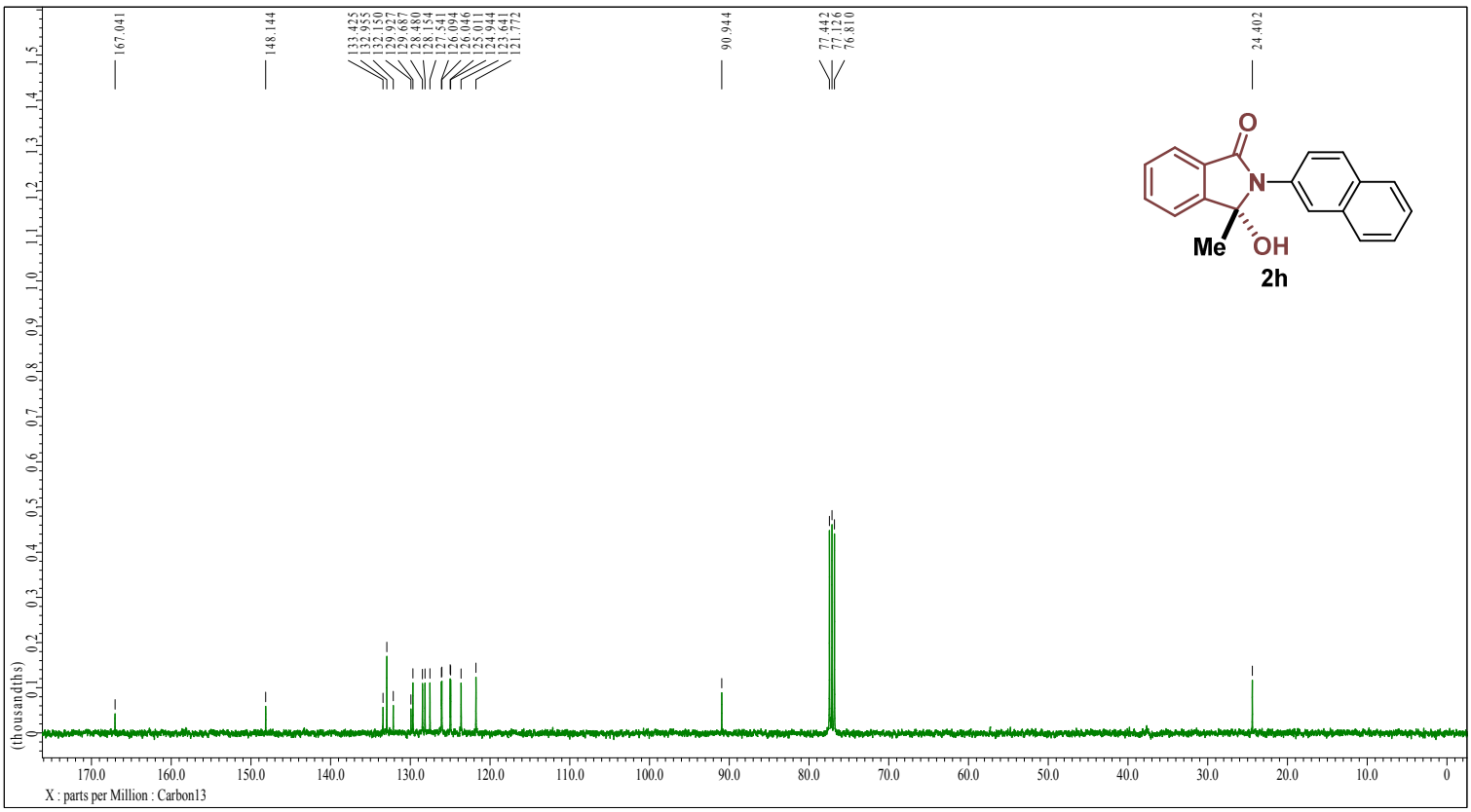
1.08
3.00
abundance
X : parts per Million : Proton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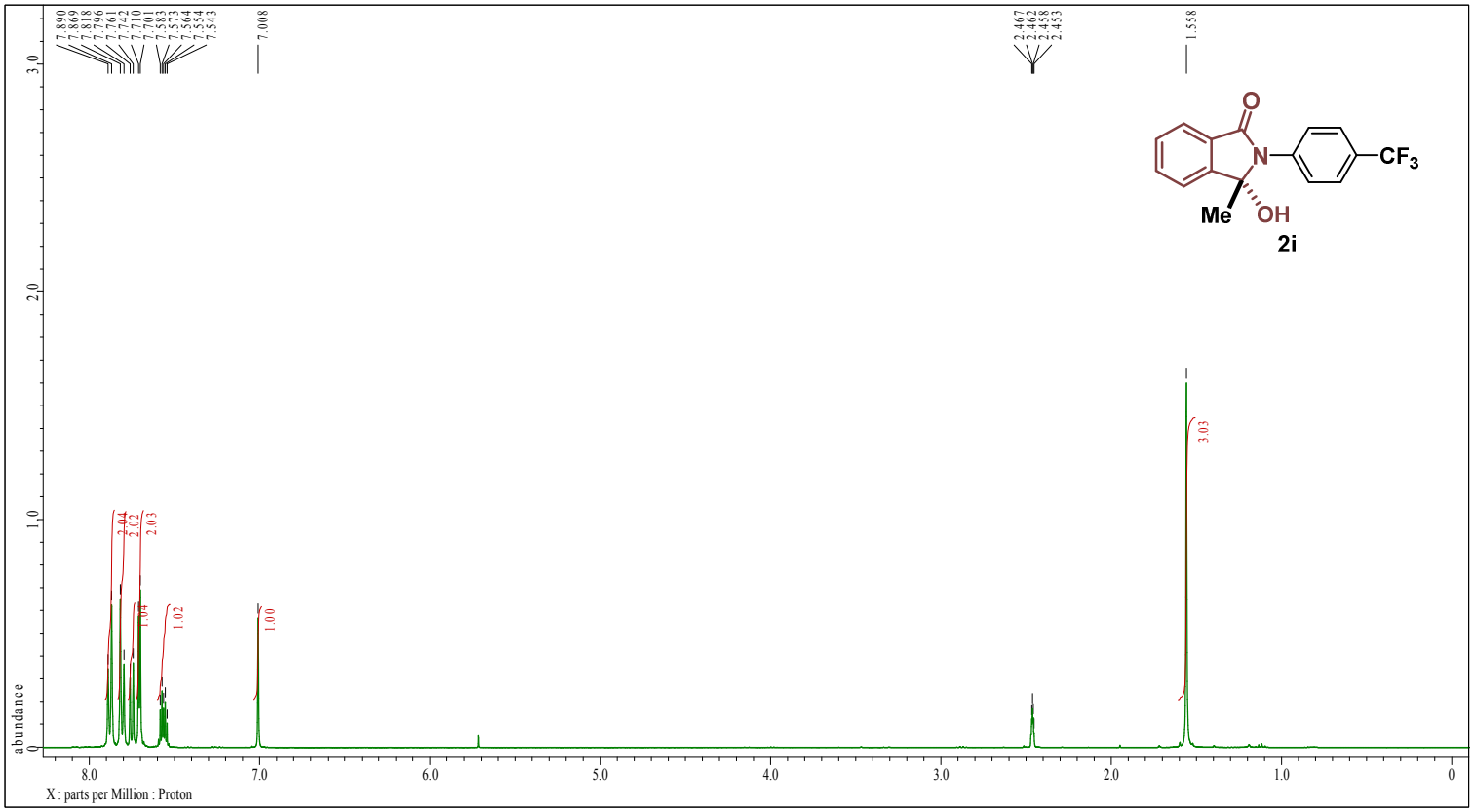
N
Me
OH
2h
(thousandths)
X : parts per Million : Carbon13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2.458
2.453
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CF3
Me
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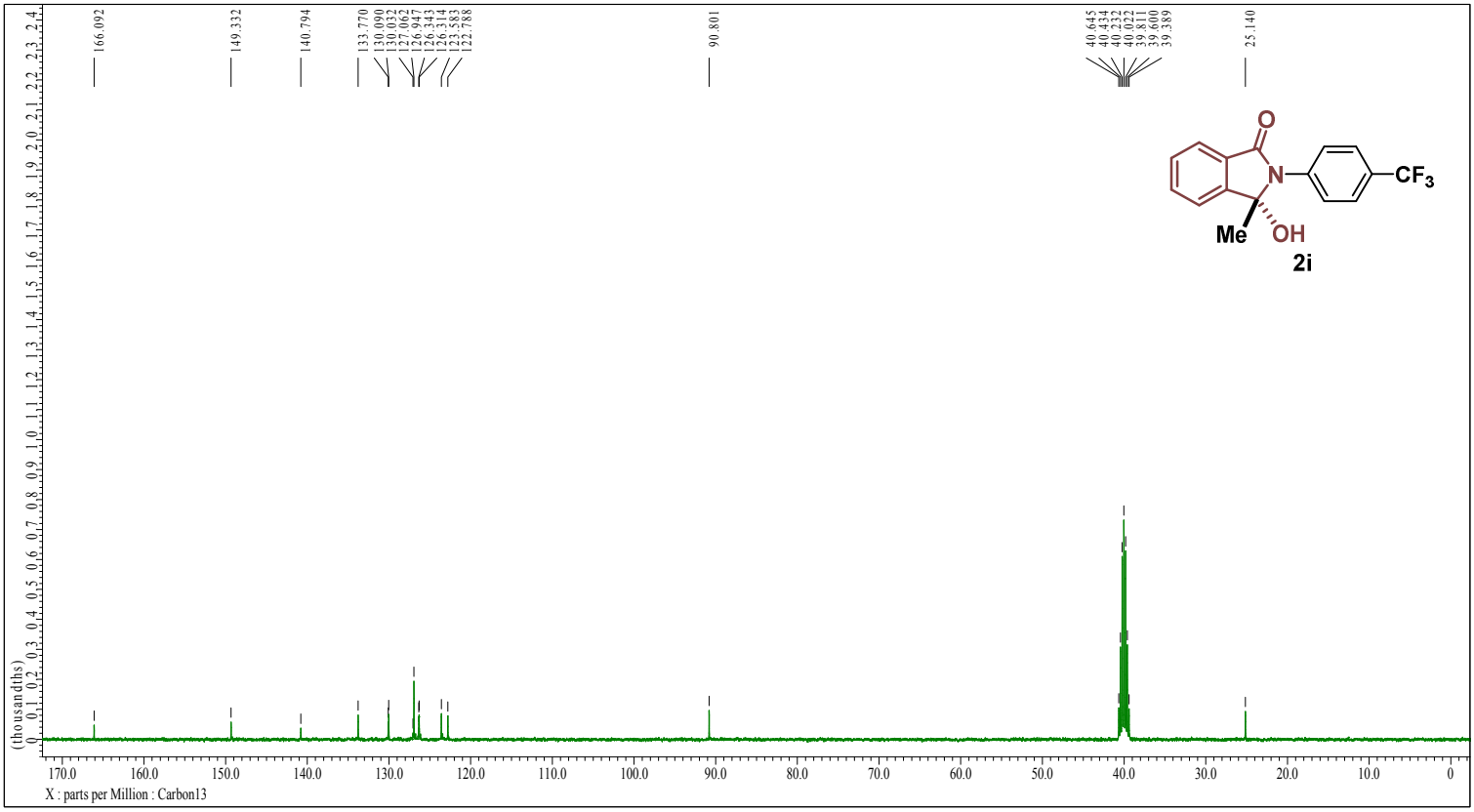
abundance
X : parts per Million : Proton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90.801
40.645
40.434
40.232
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O
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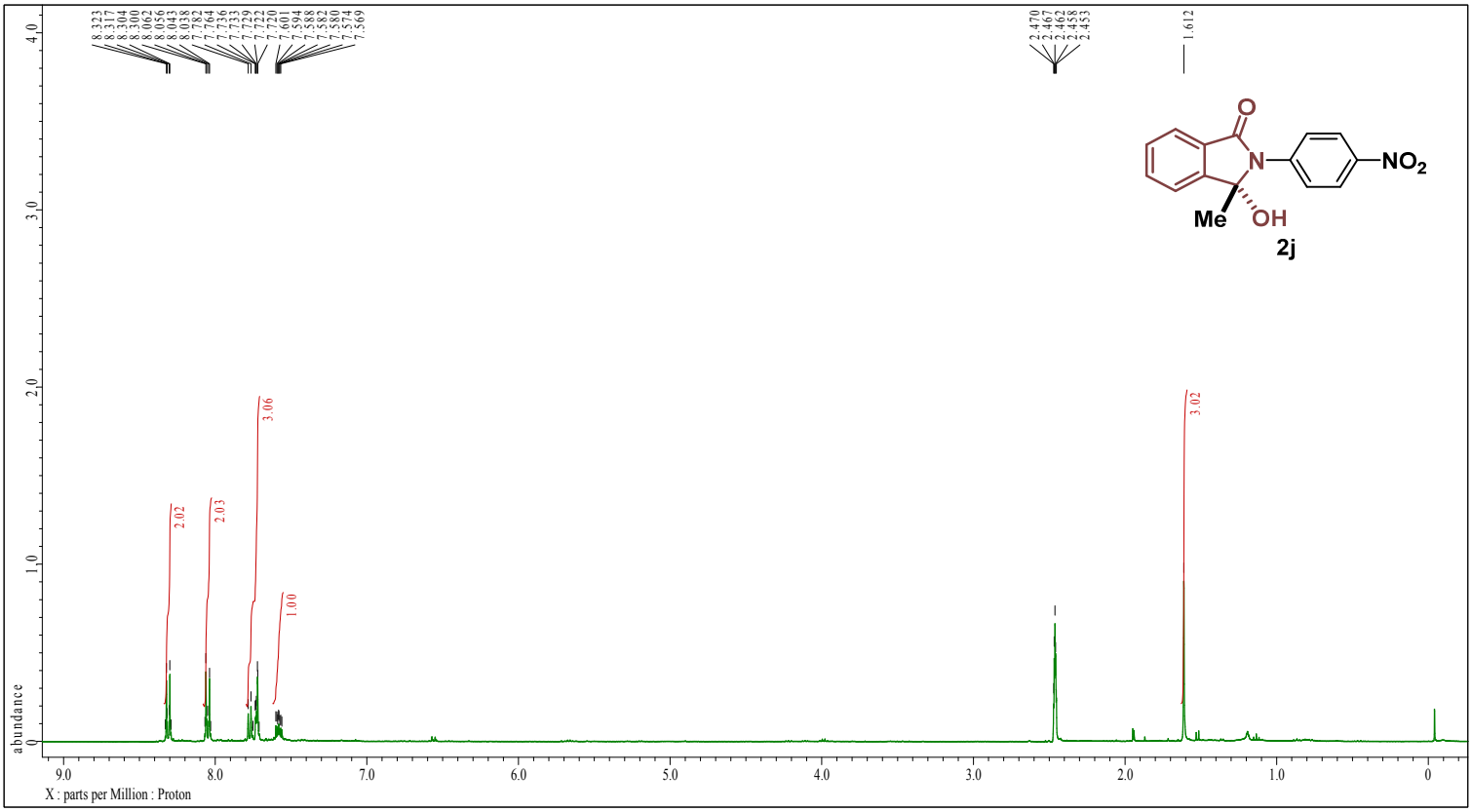
CF3
Me
OH
2i
(thousandths)
X : parts per Million : Carbon13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7.582
7.580
7.574
7.569
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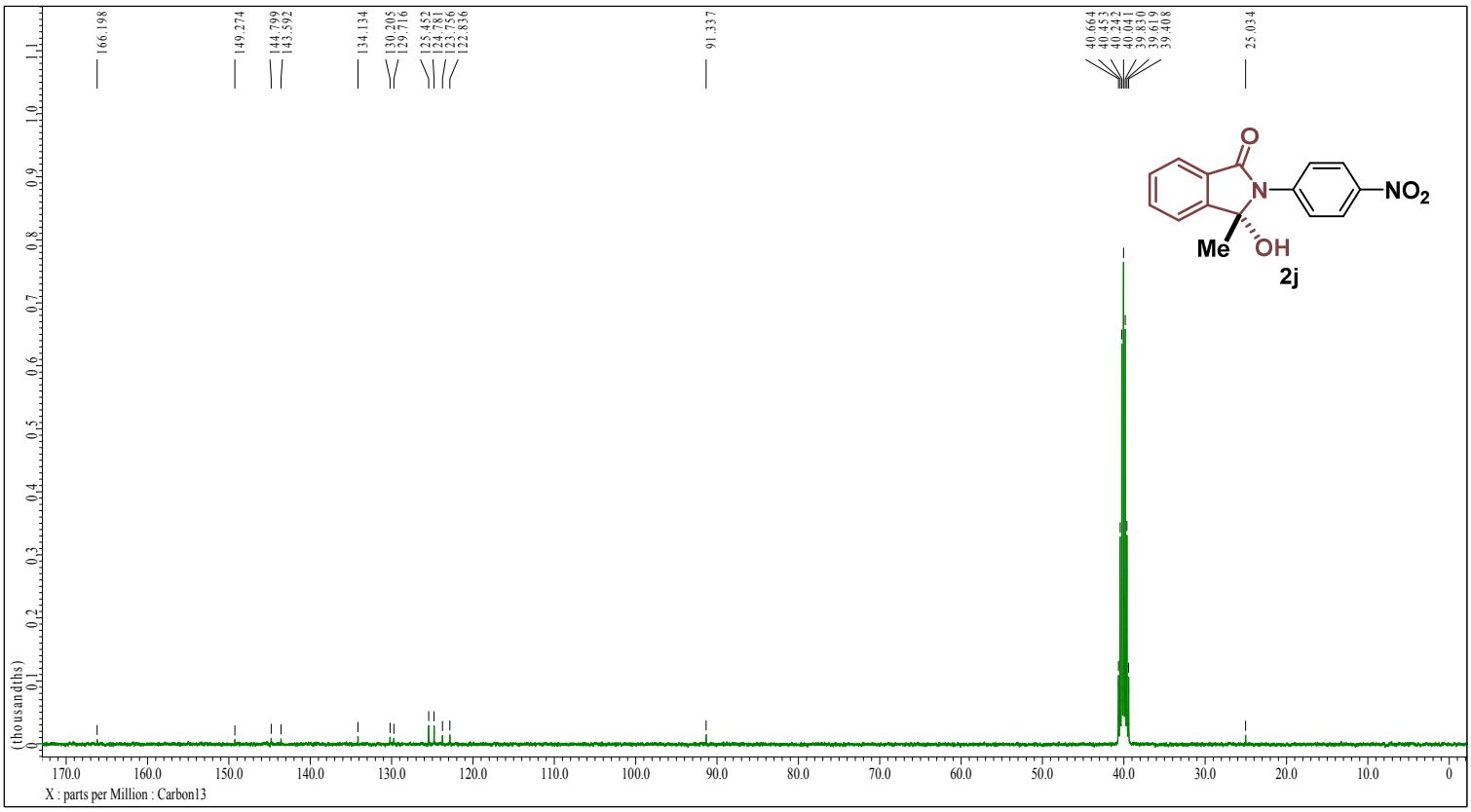
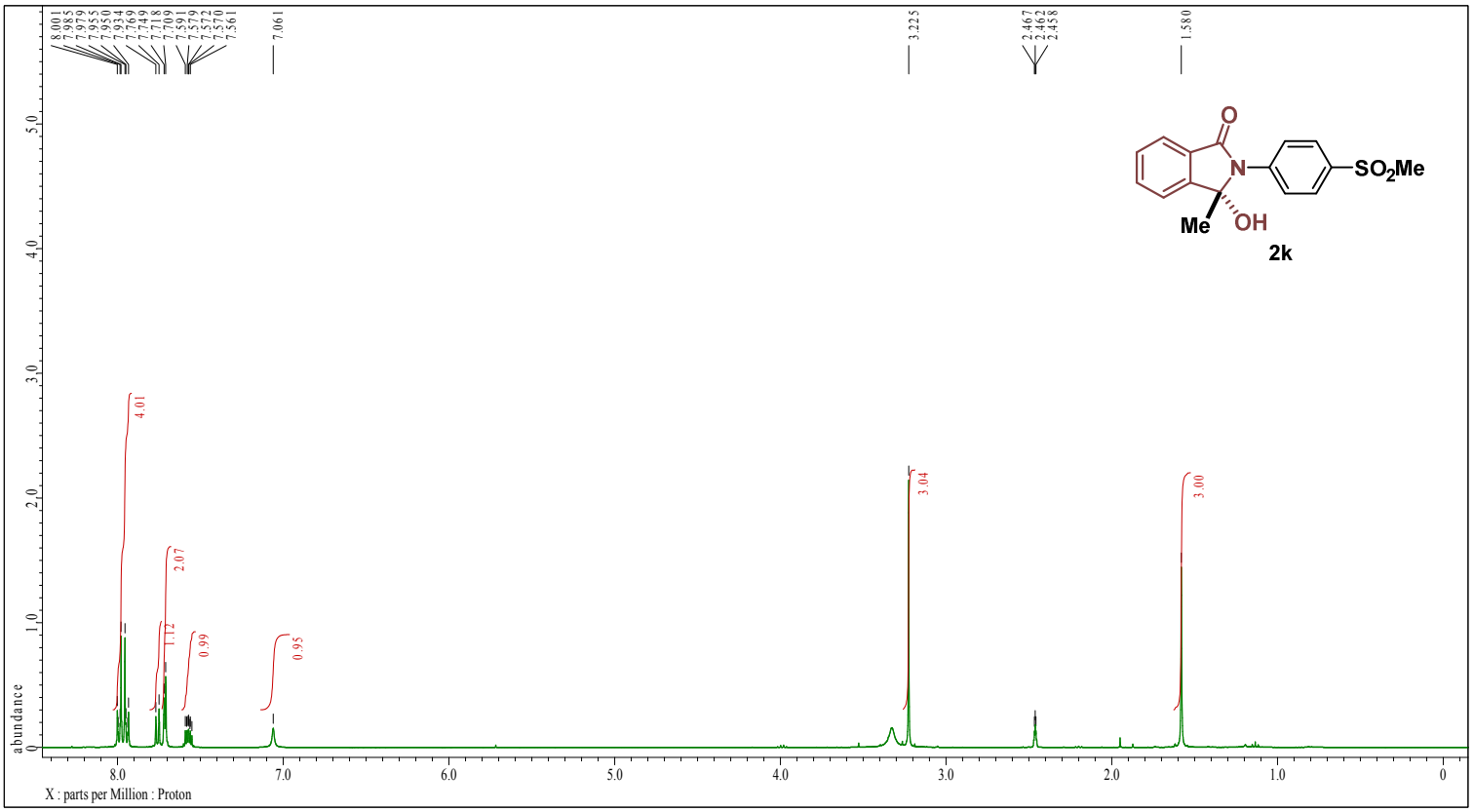
2.467
2.462
2.458
2.453
1.612
O
N
NO2
Me
OH
2j
3.06
3.02
2.02
2.03
1.00
abundance
X : parts per Million : Proton


166.198
149.274
144.799
143.592
134.134
130.205
129.716
125.452
124.781
123.756
122.836
91.337
40.664
40.453
40.242
40.041
39.830
39.619
39.408
25.034
O
N
NO2
Me
OH
2j
(thousandths)
X : parts per Million : Carbon13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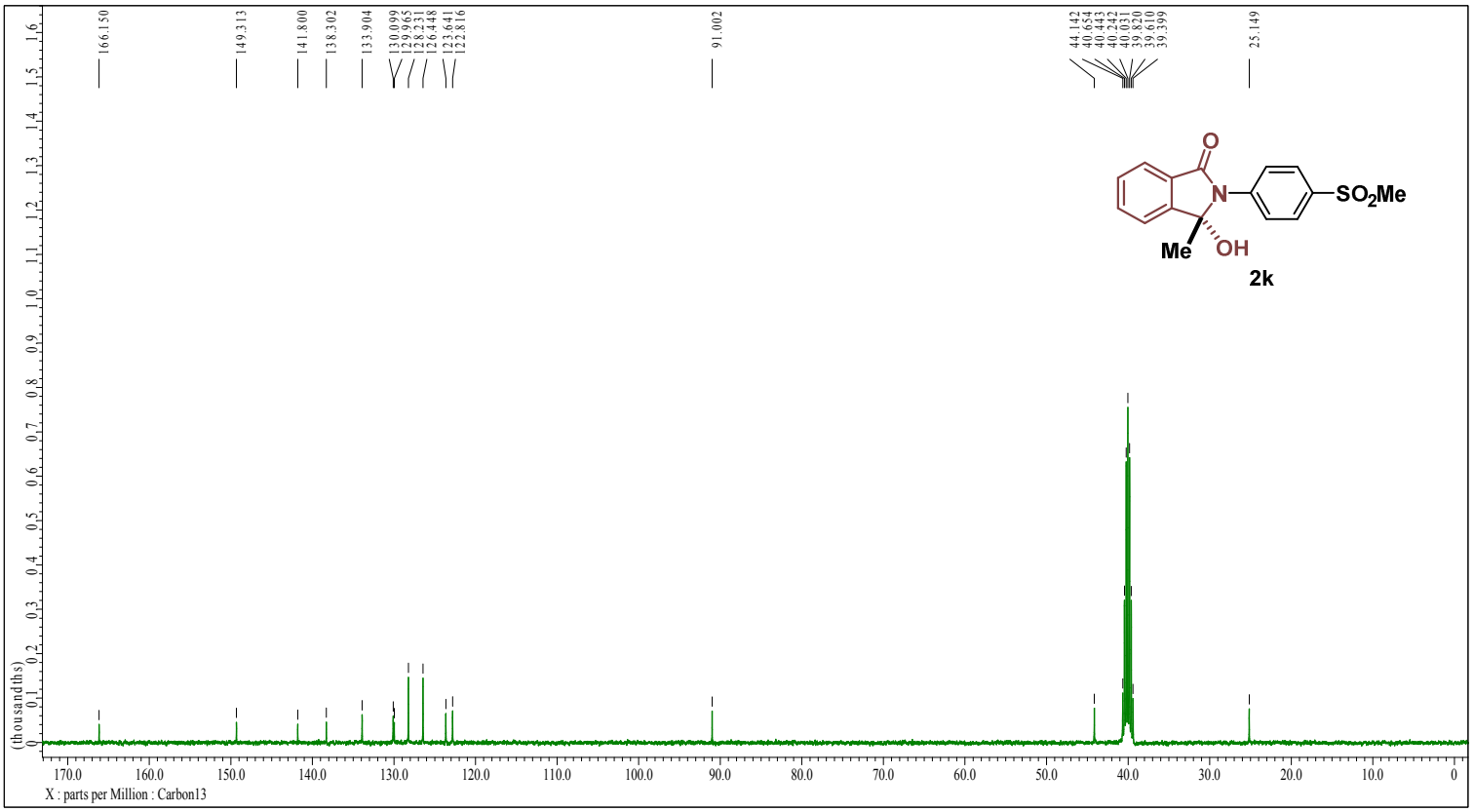
7.985
7.979
7.955
7.950
7.934
7.769
7.749
7.718
7.709
7.591
7.572
7.570
7.561
7.061
3.225
2.467
2.452
2.438
1.580
4.01
2.07
1.12
0.99
0.95
3.04
3.00
abundance
X : parts per Million : Proton
O
N
SO2Me
Me
OH
2k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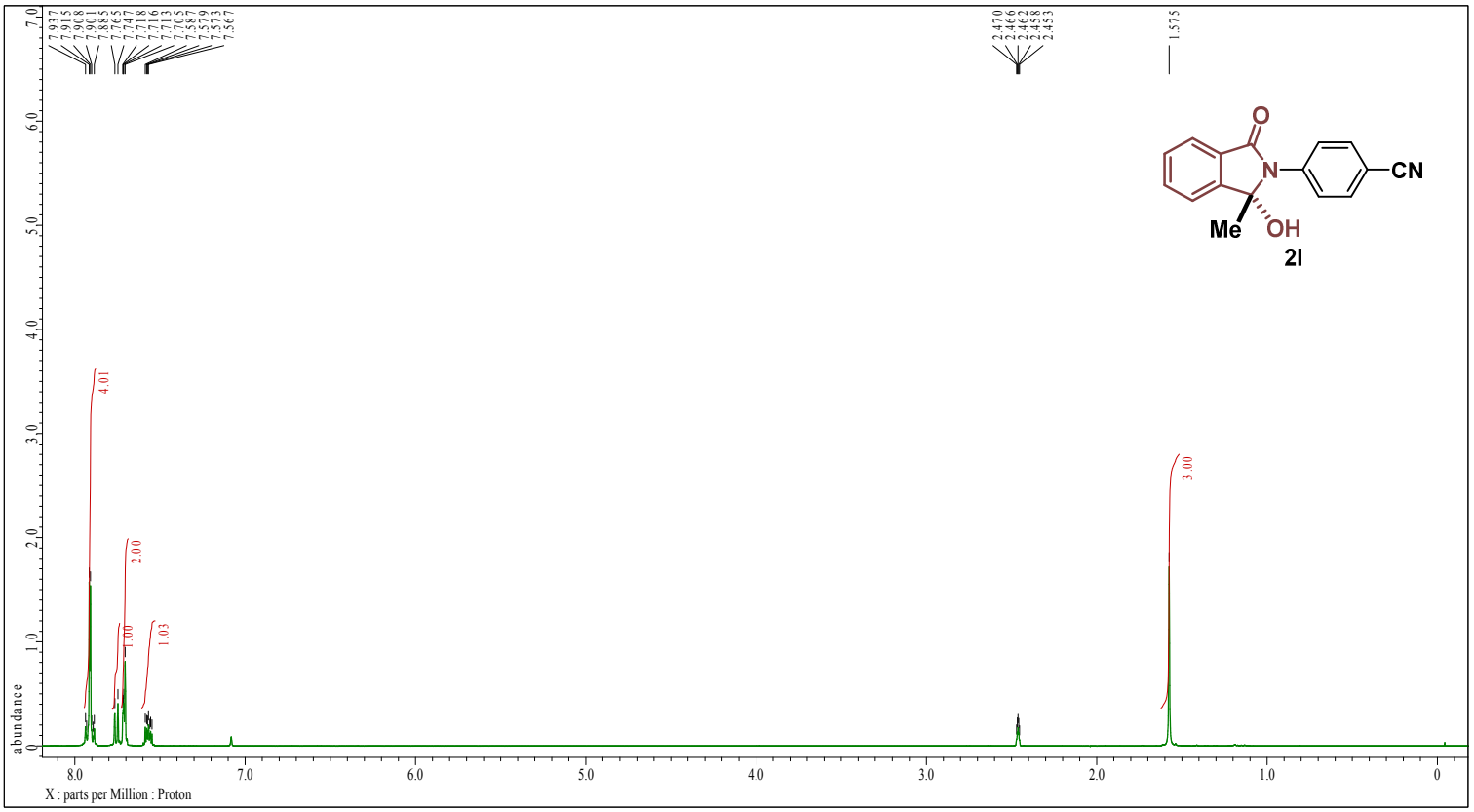
149.313
141.800
138.302
133.904
130.099
129.965
128.231
126.448
123.641
122.816
91.002
44.142
40.654
40.443
40.242
40.031
39.820
39.610
39.399
25.149
(thousandths)
X : parts per Million : Carbon13
O
N
SO2Me
Me
OH
2k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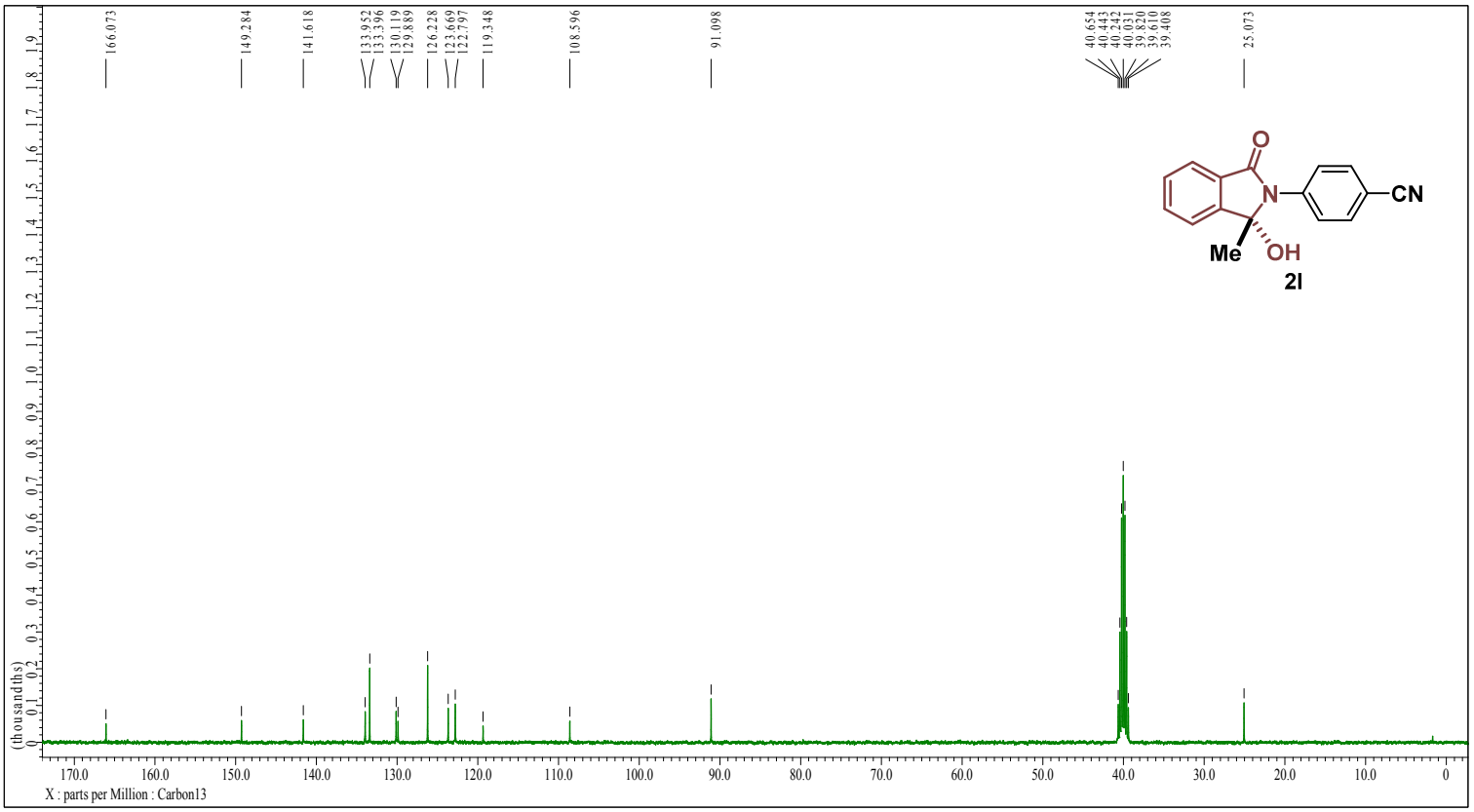
7.908
7.901
7.885
7.765
7.747
7.718
7.716
7.713
7.705
7.587
7.579
7.573
7.567
2.470
2.466
2.462
2.458
2.453
1.575
O
N
CN
Me
OH
2l
4.01
2.00
1.00
1.03
3.00
abundance
X : parts per Million : Proton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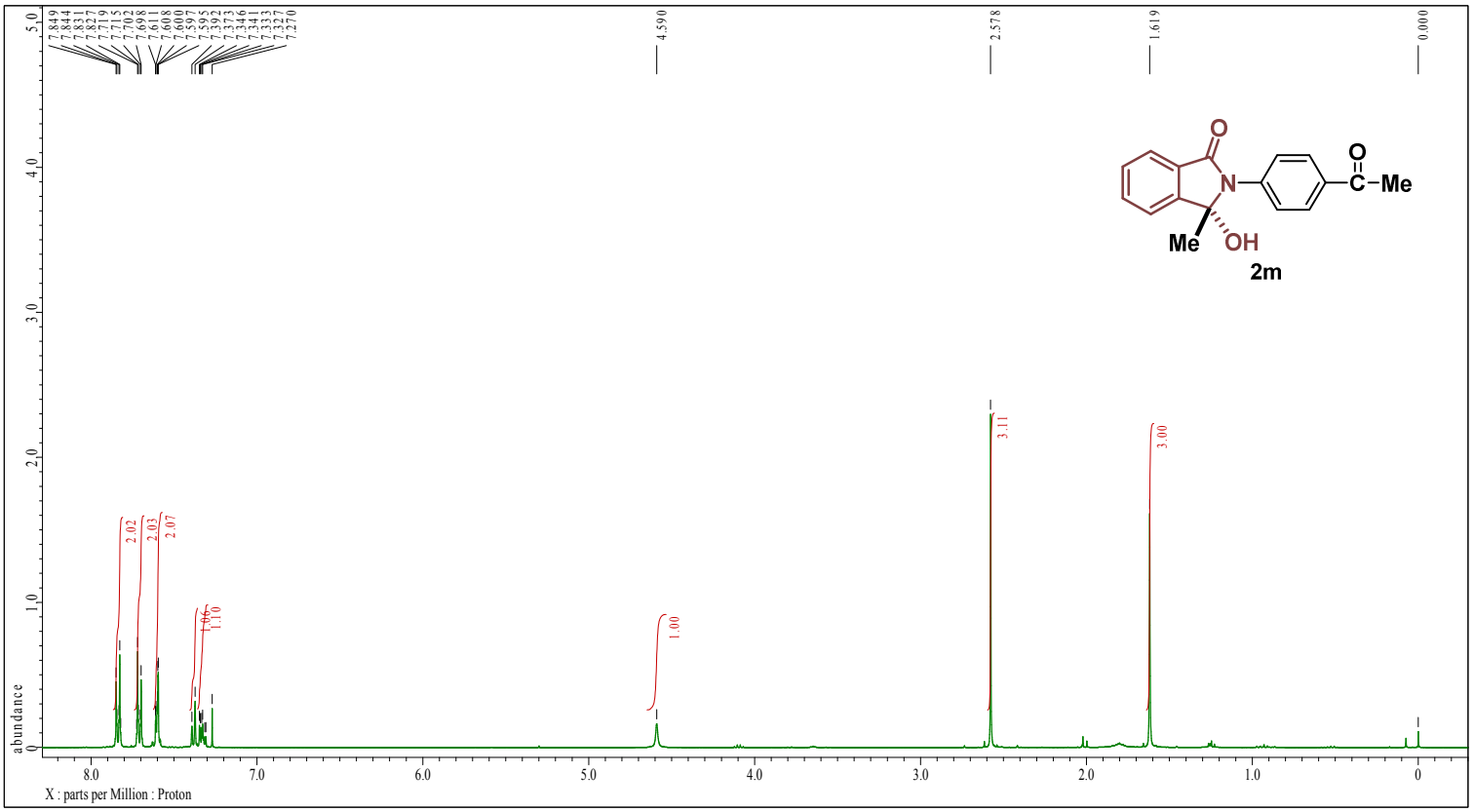
149.284
141.618
133.952
133.396
130.119
129.889
126.228
123.669
122.797
119.348
108.596
91.098
40.654
40.443
40.242
40.031
39.820
39.610
39.408
25.073
O
N
CN
Me
OH
2l
(thousandths)
X : parts per Million : Carbon13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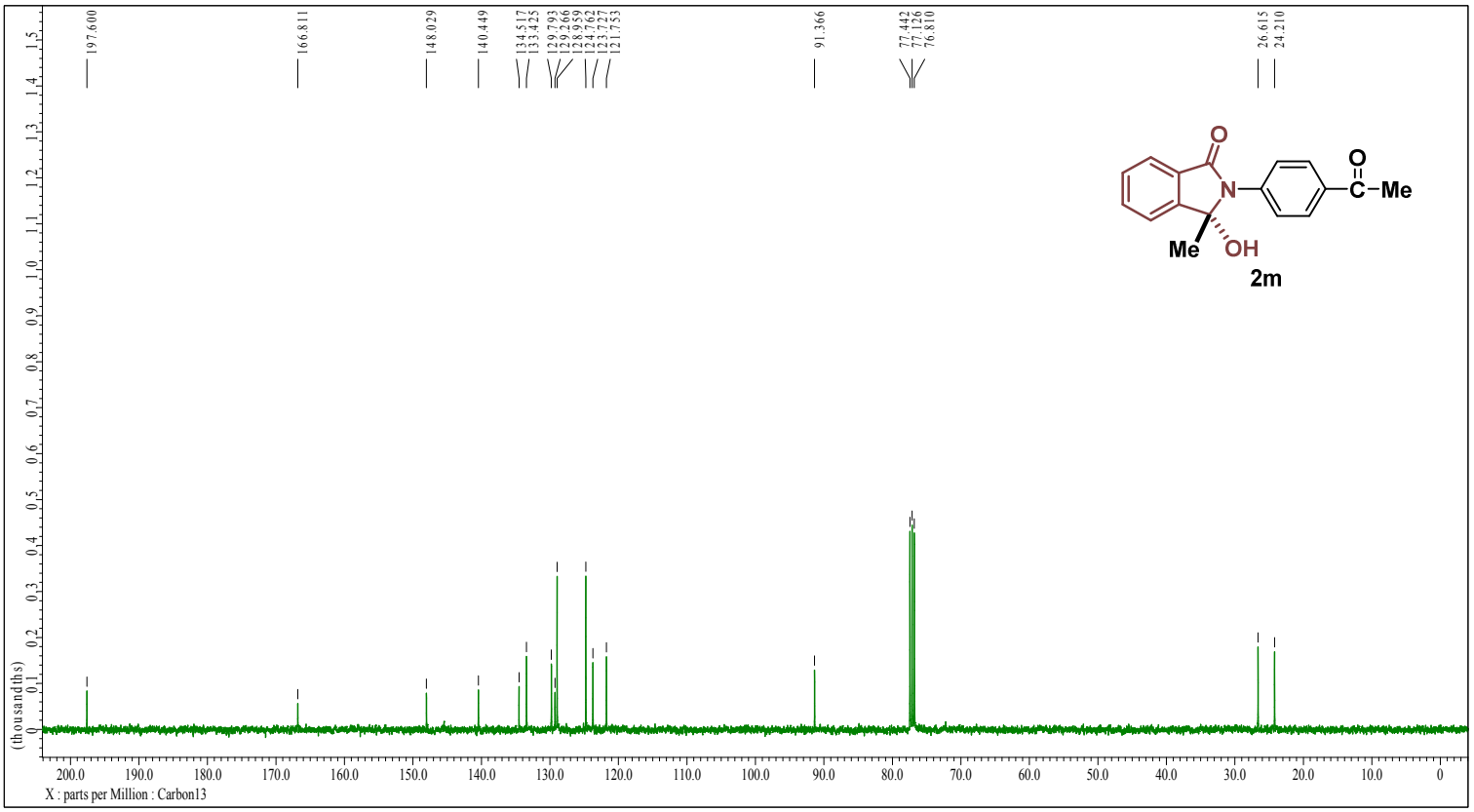
7.831
7.827
7.719
7.715
7.702
7.698
7.611
7.608
7.600
7.597
7.595
7.392
7.373
7.346
7.341
7.333
7.327
7.270
4.590
2.578
1.619
0.000
O
N
O
C–Me
Me
OH
2m
2.02
2.03
2.07
1.06
1.10
1.00
3.11
3.00
abundance
X : parts per Million : Proton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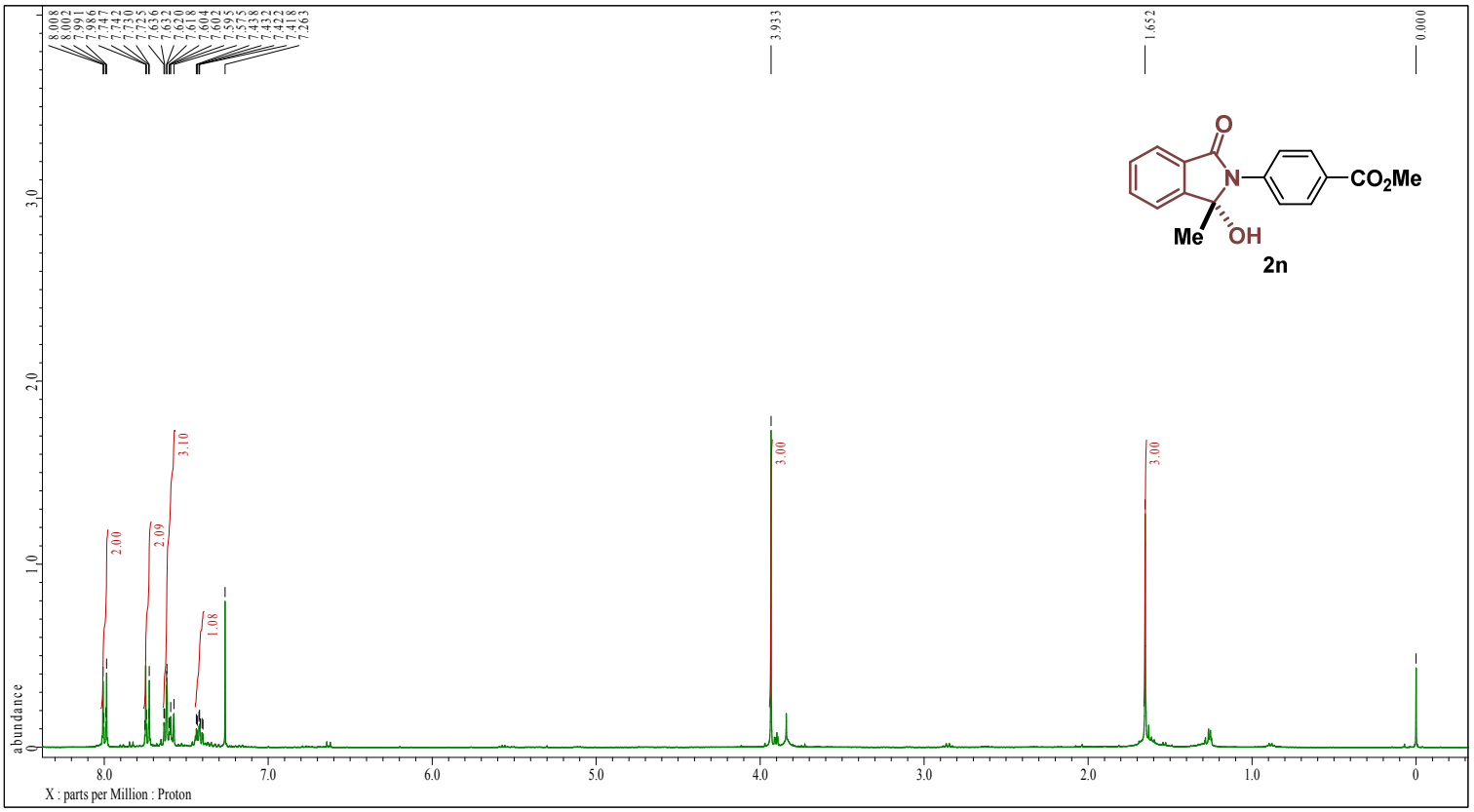
166.811
148.029
140.449
134.517
133.425
129.793
129.366
128.959
124.762
123.727
121.753
91.366
77.442
77.126
76.810
26.615
24.210
O
N
O
C–Me
Me
OH
2m
(thousandths)
X : parts per Million : Carbon13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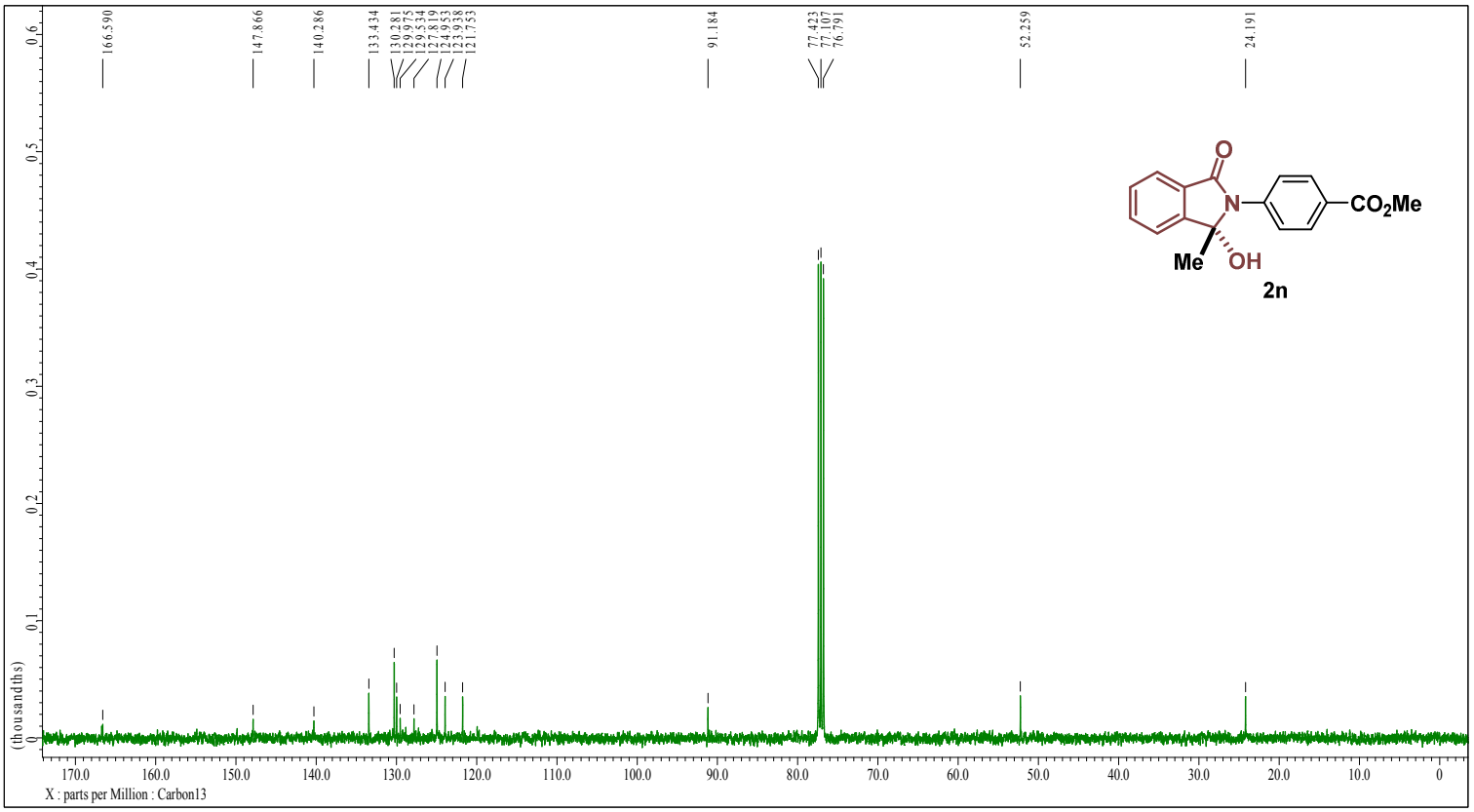
8.002
7.991
7.986
7.747
7.742
7.730
7.725
7.636
7.632
7.620
7.618
7.604
7.602
7.595
7.575
7.438
7.432
7.422
7.418
7.263
3.933
1.652
0.000
O
N
CO2Me
Me
OH
2n
2.00
2.09
3.10
1.08
3.00
3.00
abundance
X : parts per Million : Proton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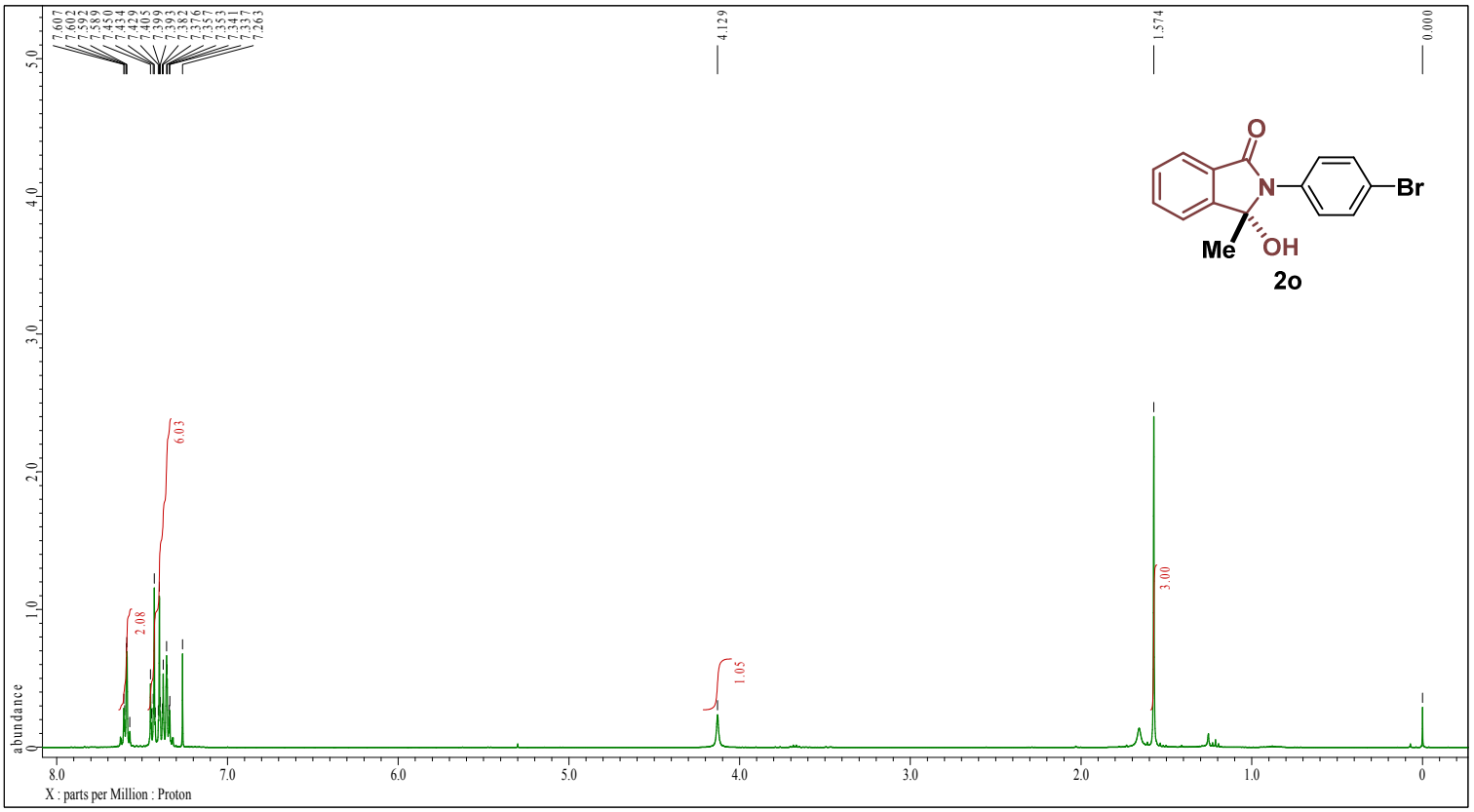
147.866
140.286
133.434
130.281
129.975
129.534
127.819
124.953
123.938
121.753
91.184
77.423
77.107
76.791
52.259
24.191
O
N
CO2Me
Me
OH
2n
(thousandths)
X : parts per Million : Carbon13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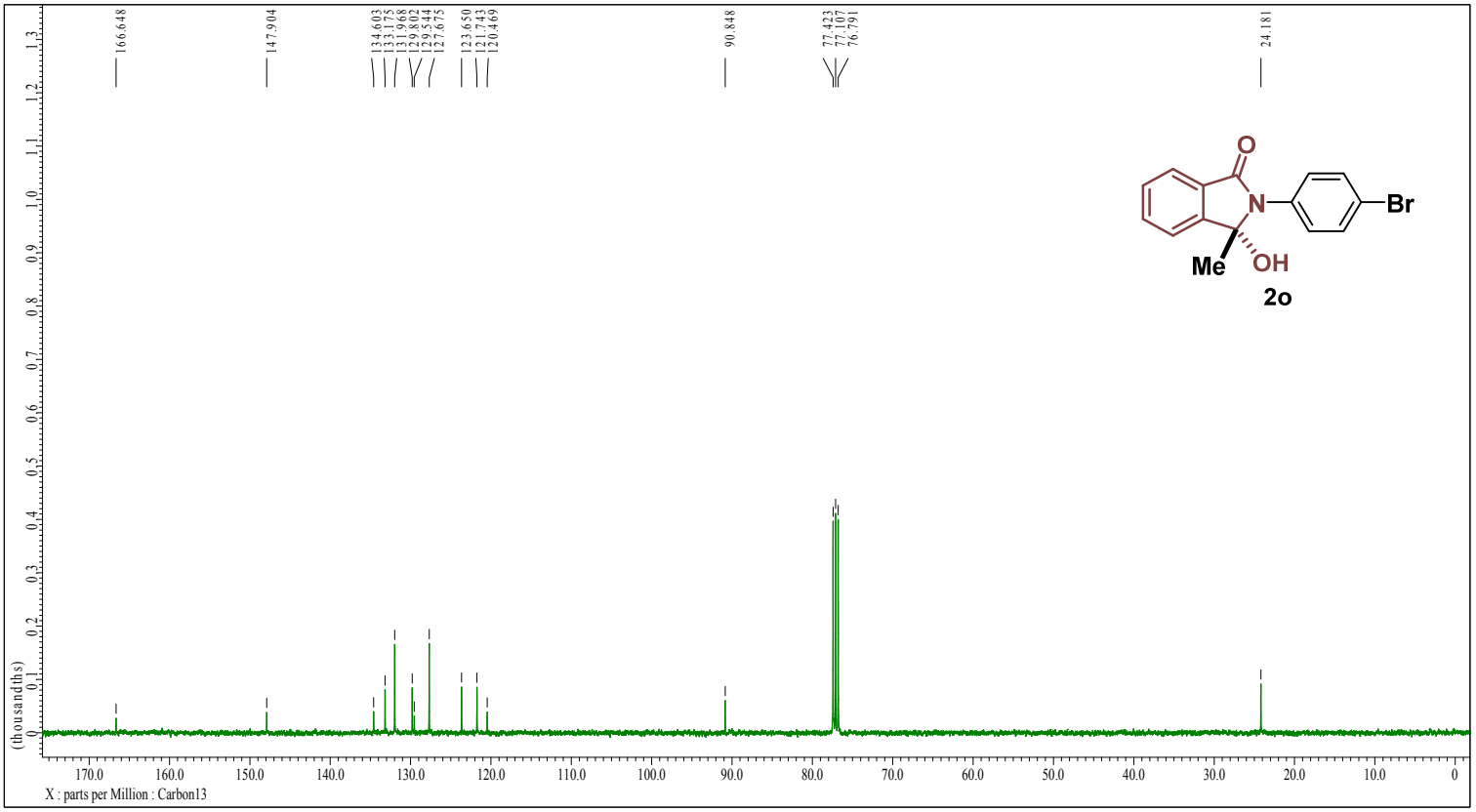
7.602
7.592
7.589
7.450
7.434
7.429
7.405
7.399
7.393
7.362
7.357
7.353
7.341
7.337
7.263
4.129
1.574
0.000
O
N
Br
Me
OH
2o
6.03
2.08
1.05
3.00
abundance
X : parts per Million : Proton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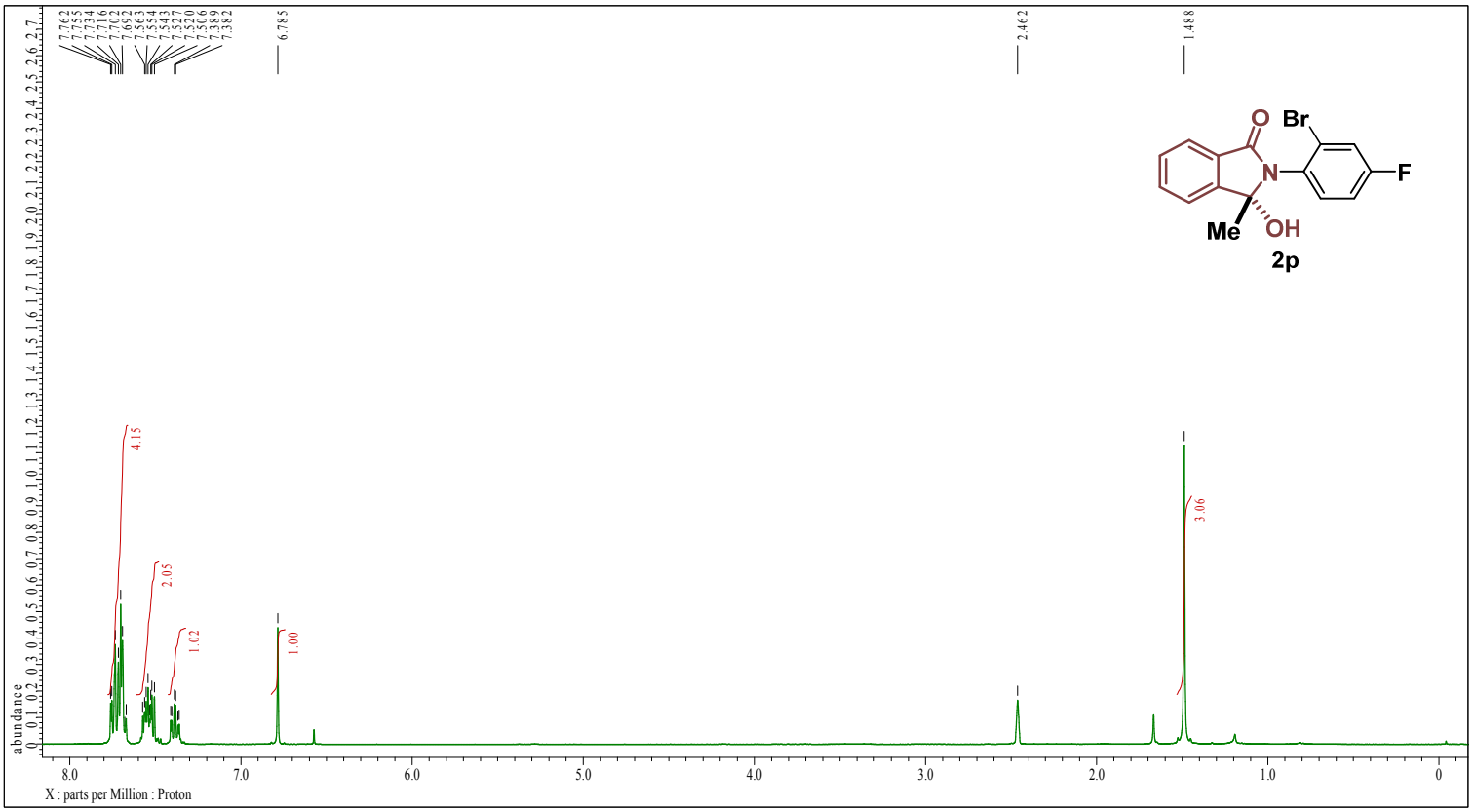
133.175
131.968
129.802
129.644
127.675
123.650
121.743
120.469
90.848
77.423
77.107
76.791
24.181
O
N
Br
Me
OH
2o
(thousandths)
X : parts per Million : Carbon13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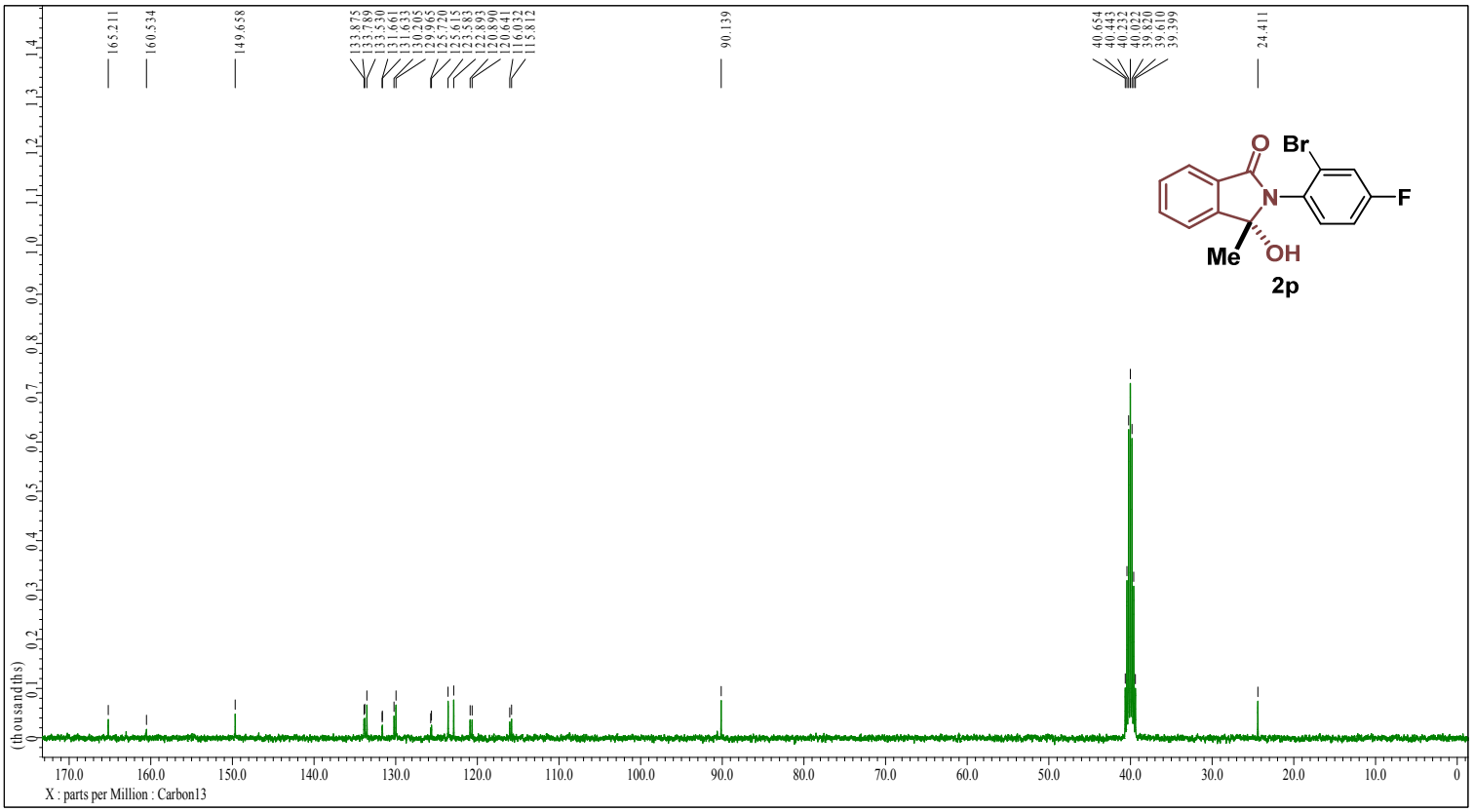
7.755
7.734
7.716
7.702
7.692
7.553
7.543
7.527
7.520
7.506
7.389
7.382
6.785
2.462
1.488
4.15
2.05
1.02
1.00
3.06
abundance
X : parts per Million : Proton
O
Br
N
F
Me
OH
2p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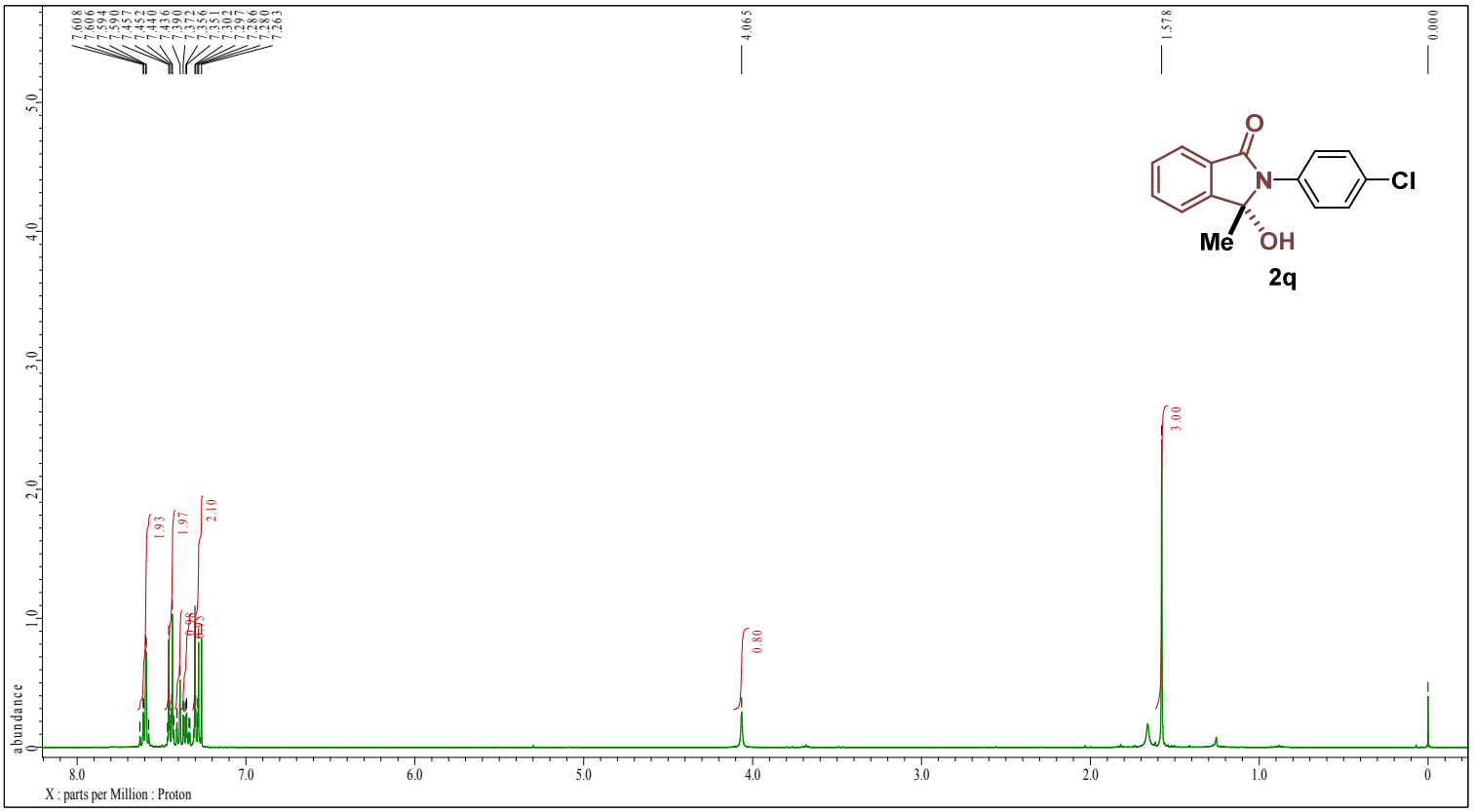
160.534
149.658
133.875
133.789
133.530
131.661
131.633
130.205
129.965
125.720
125.615
123.583
122.890
120.641
116.032
115.812
90.139
40.654
40.443
40.232
40.022
39.822
39.610
39.399
24.411
(thousandths)
X : parts per Million : Carbon13
O
Br
N
F
Me
OH
2p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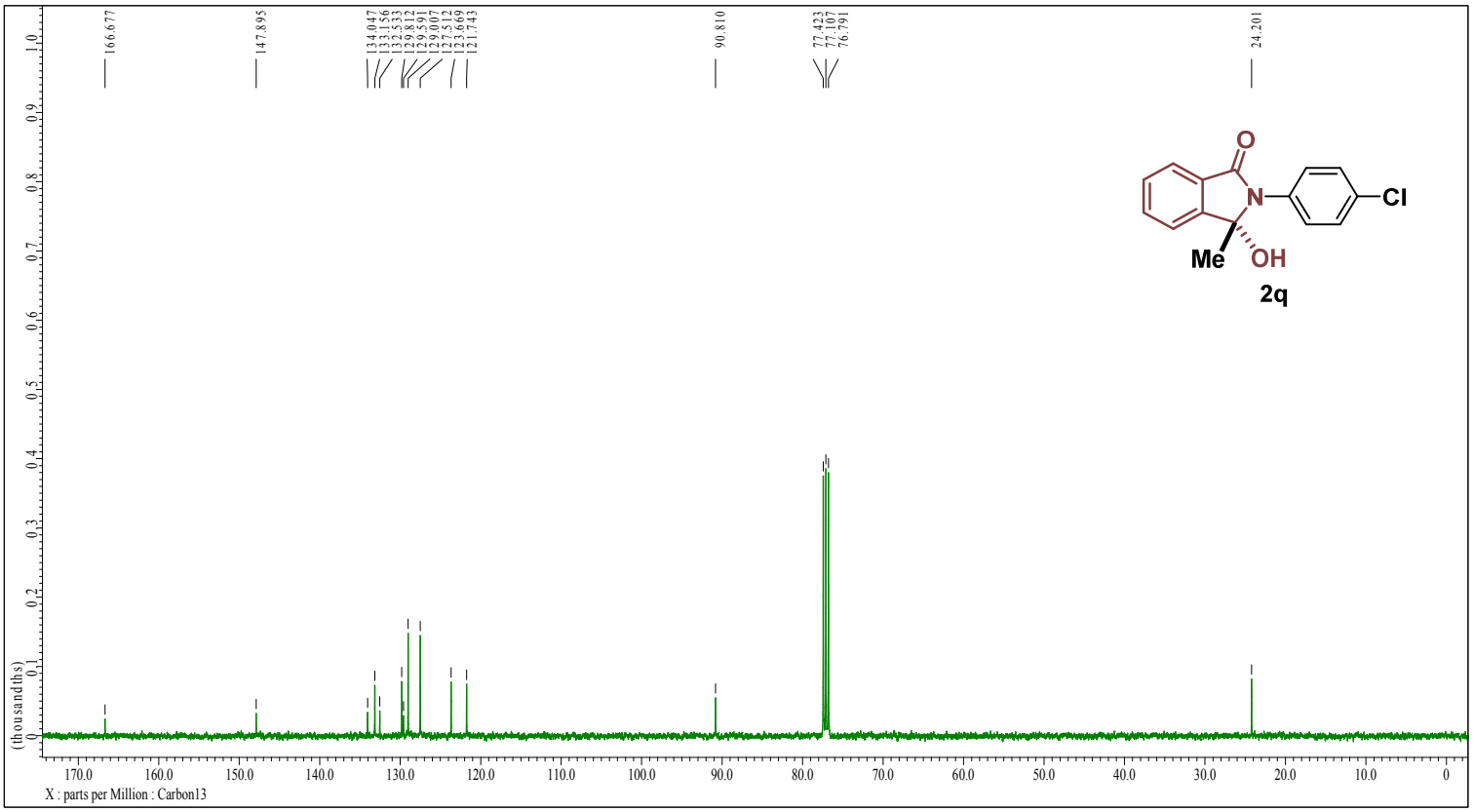
7.606
7.594
7.590
7.457
7.432
7.440
7.436
7.390
7.372
7.356
7.351
7.302
7.297
7.286
7.280
7.263
4.065
1.578
0.000
1.93
1.97
2.10
0.80
3.00
abundance
X : parts per Million : Proton
O
N
Cl
Me
OH
2q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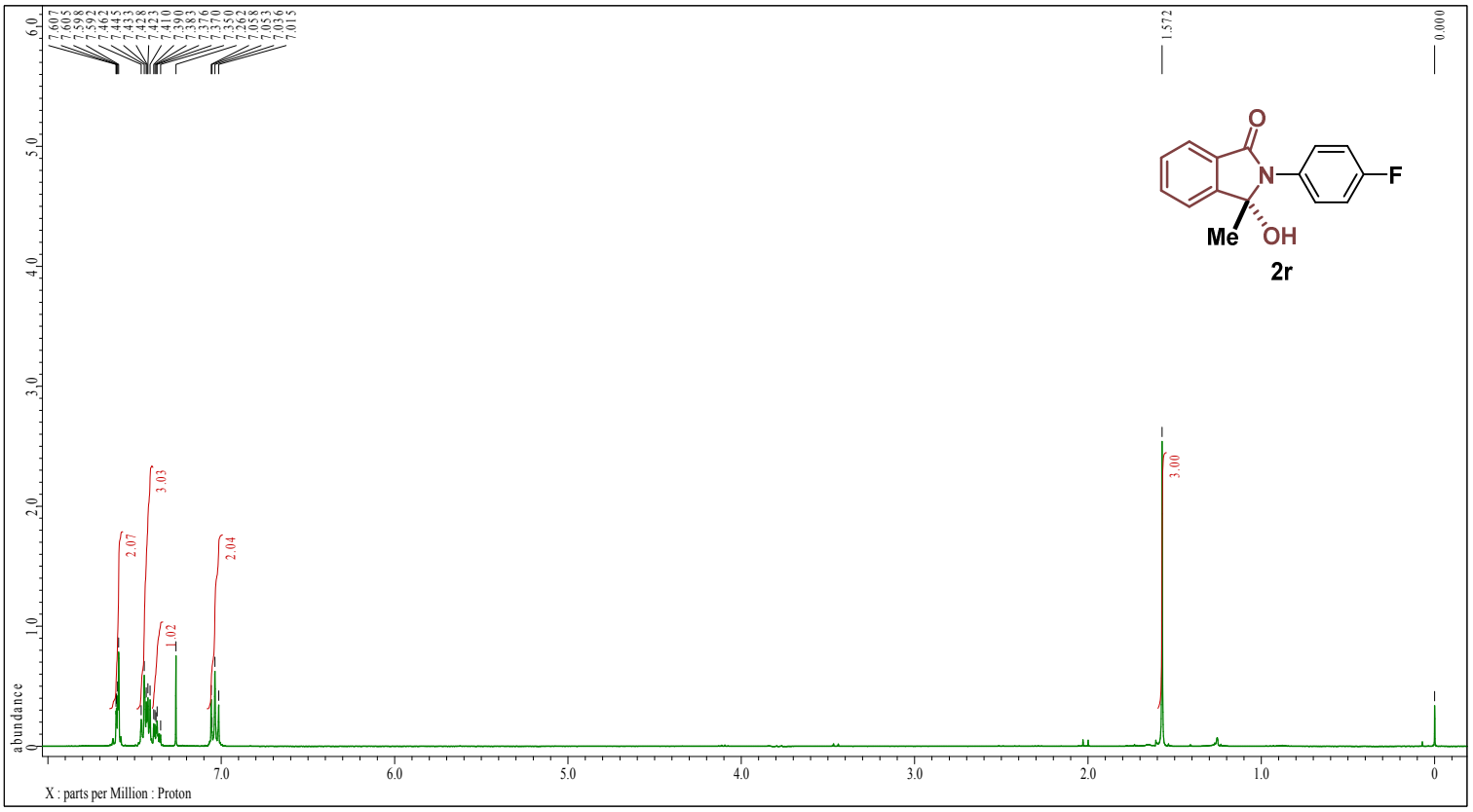
134.047
133.536
132.535
129.812
129.591
129.007
127.512
123.669
121.743
90.810
77.423
77.107
76.791
24.201
(thousandths)
X : parts per Million : Carbon13
O
N
Cl
Me
OH
2q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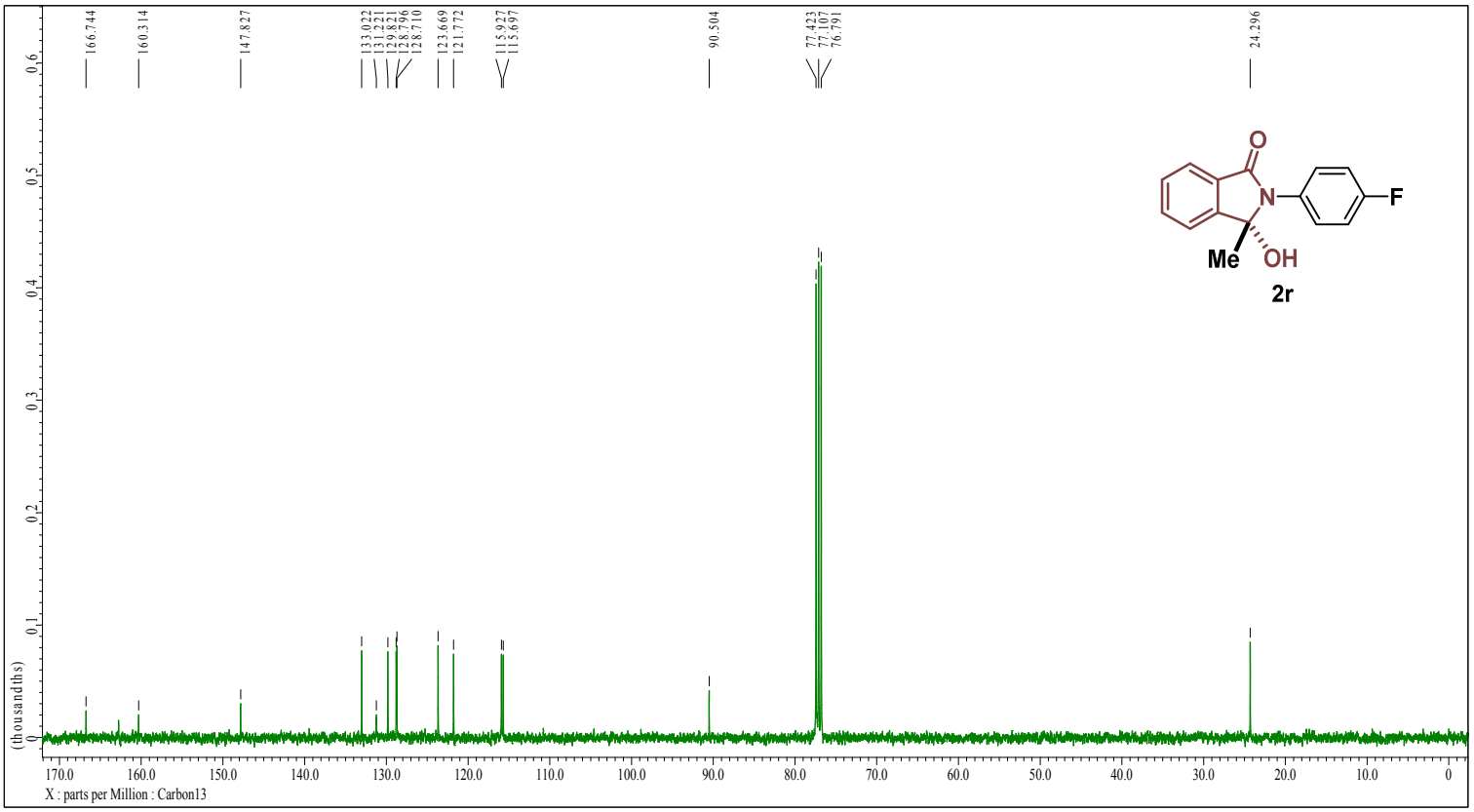
7.605
7.598
7.592
7.462
7.445
7.433
7.428
7.423
7.410
7.400
7.383
7.376
7.370
7.350
7.262
7.058
7.053
7.036
7.015
1.572
0.000
O
N
F
Me
OH
2r
3.03
2.07
2.04
1.02
3.00
abundance
X : parts per Million : Proton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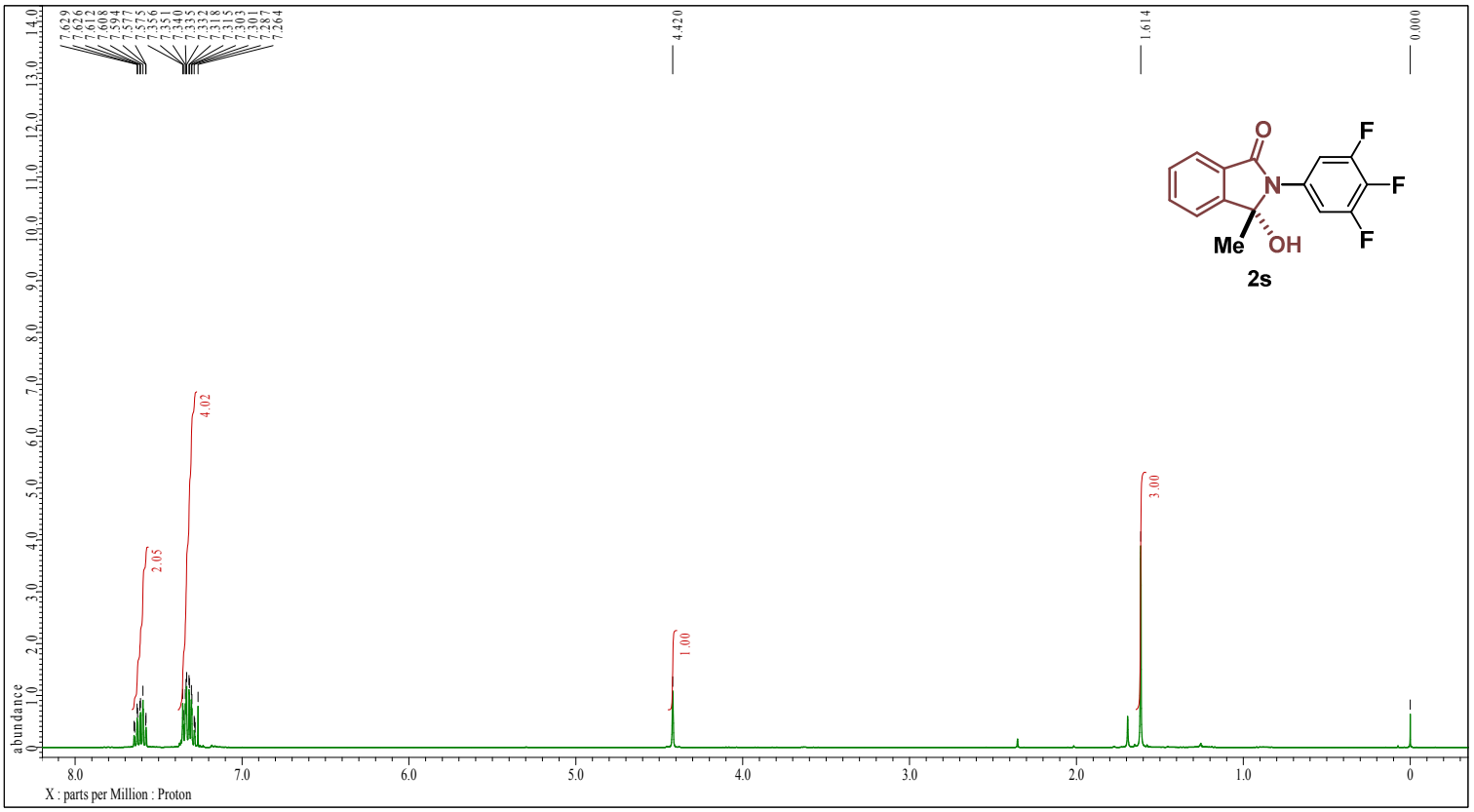
129.821
128.796
128.710
123.669
121.772
115.927
115.697
90.504
77.423
77.107
76.791
24.296
O
N
F
Me
OH
2r
(thousandths)
X : parts per Million : Carbon13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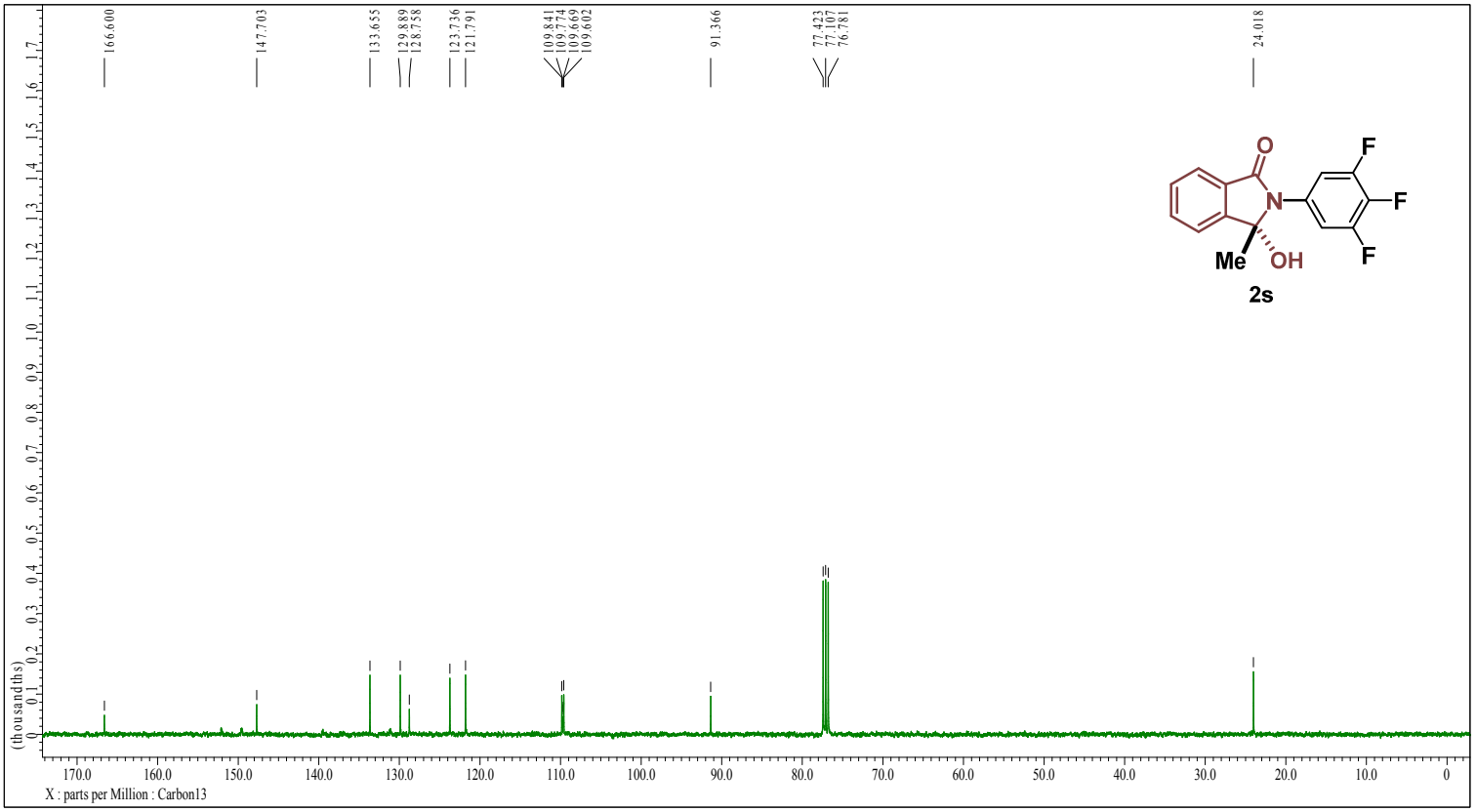
7.626
7.612
7.608
7.594
7.577
7.575
7.356
7.351
7.340
7.335
7.332
7.318
7.315
7.303
7.301
7.287
7.264
4.420
1.614
0.000
O
N
F
F
F
Me
OH
2s
4.02
3.00
2.05
1.00
abundance
X : parts per Million : Proton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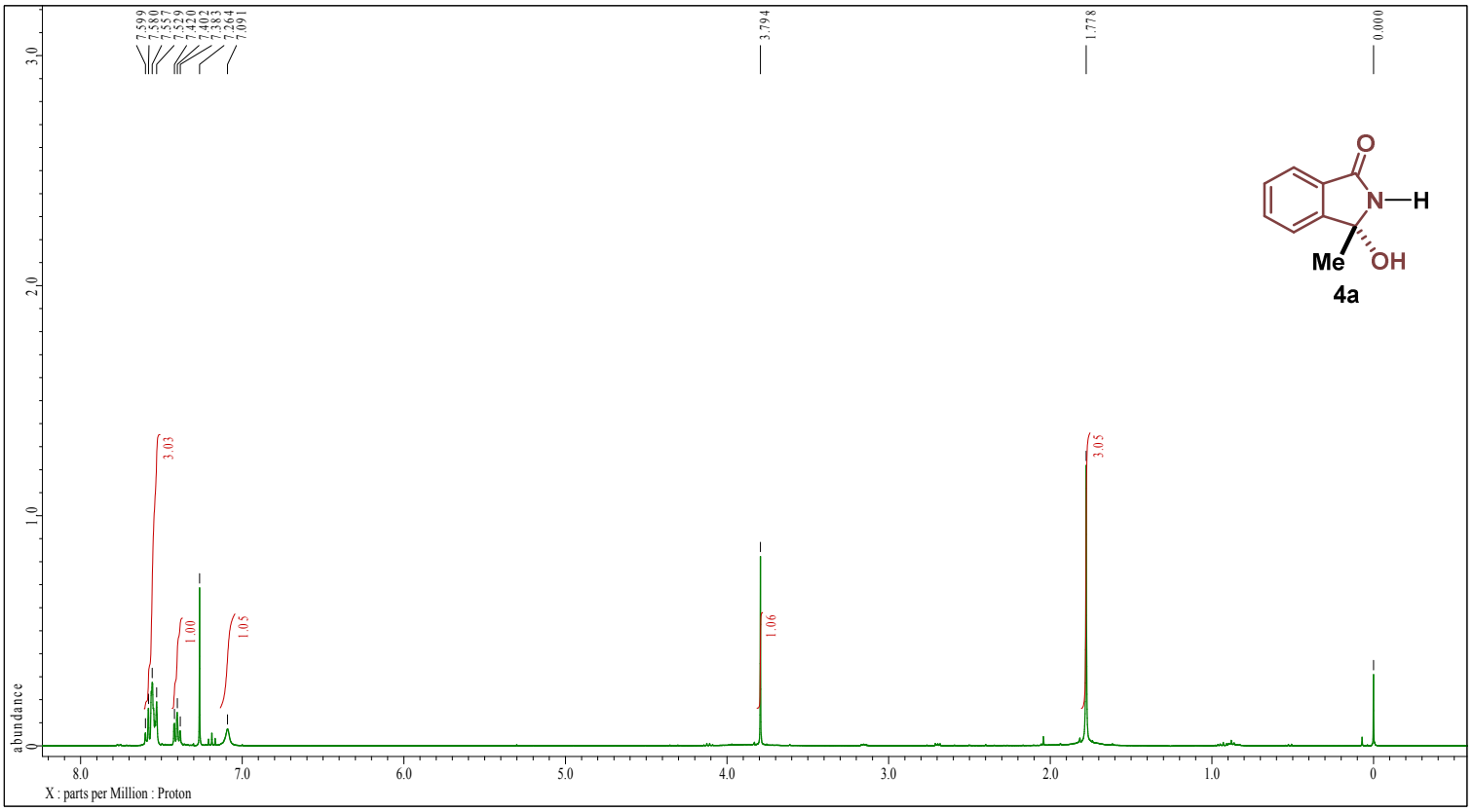
147.703
133.655
129.889
128.758
123.736
121.791
109.841
109.774
109.669
109.602
91.366
77.423
77.107
76.781
24.018
O
N
F
F
F
Me
OH
2s
(thousandths)
X : parts per Million : Carbon13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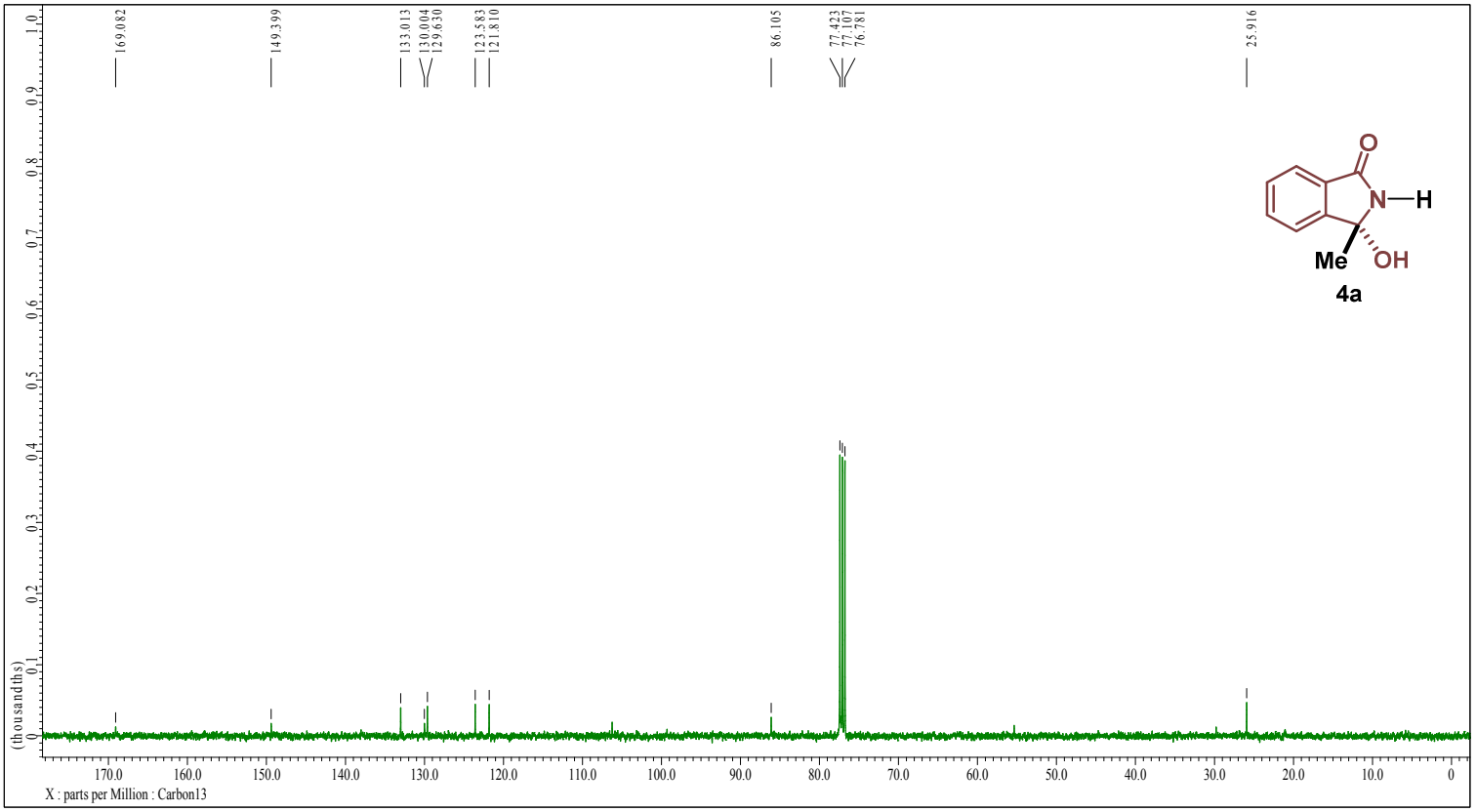
7.590
7.557
7.539
7.420
7.402
7.383
7.264
7.091
3.794
1.778
0.000
3.03
1.00
1.05
1.06
3.05
abundance
X : parts per Million : Proton
O
N—H
Me
OH
4a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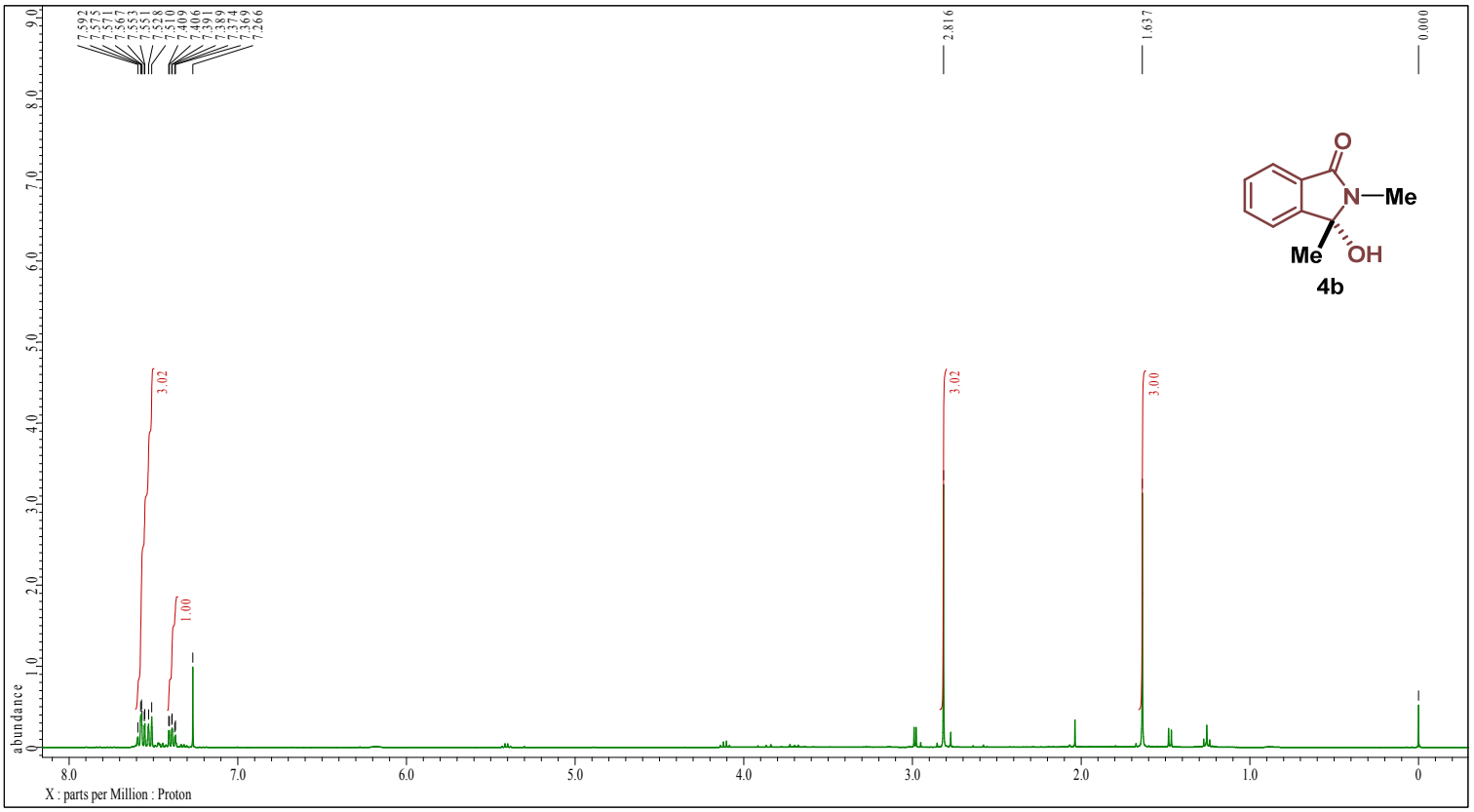
149.399
133.013
130.004
129.630
123.583
121.810
86.105
77.423
77.107
76.781
25.916
(thousandths)
X : parts per Million : Carbon13
O
N—H
Me
OH
4a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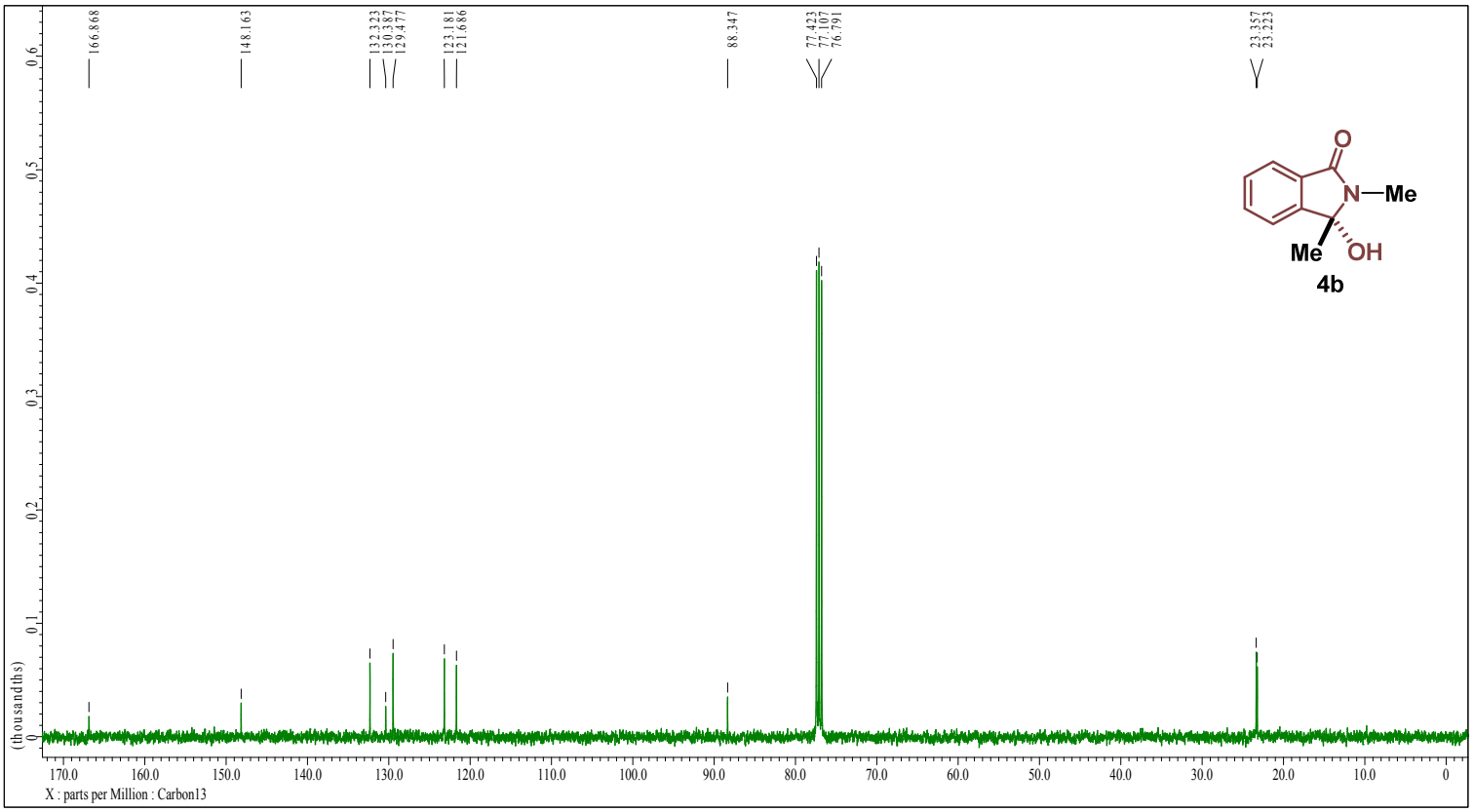
7.571
7.567
7.553
7.551
7.528
7.510
7.409
7.406
7.391
7.389
7.374
7.369
7.266
2.816
1.637
0.000
3.02
1.00
3.02
3.00
abundance
X : parts per Million : Proton
O
N—Me
Me
OH
4b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130.387
129.477
123.181
121.686
88.347
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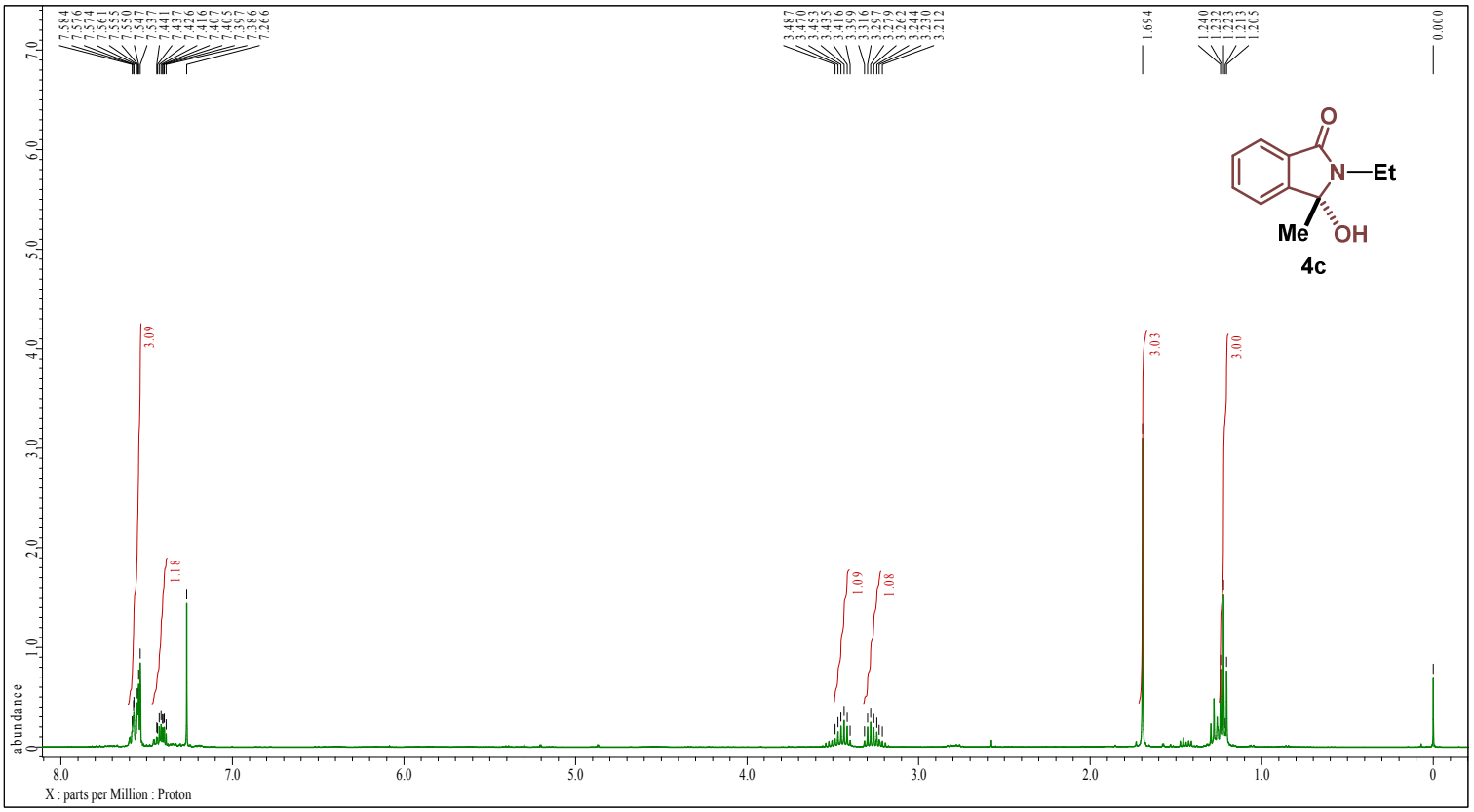
77.107
76.791
23.357
23.223
(thousandths)
X : parts per Million : Carbon13
O
N—Me
Me
OH
4b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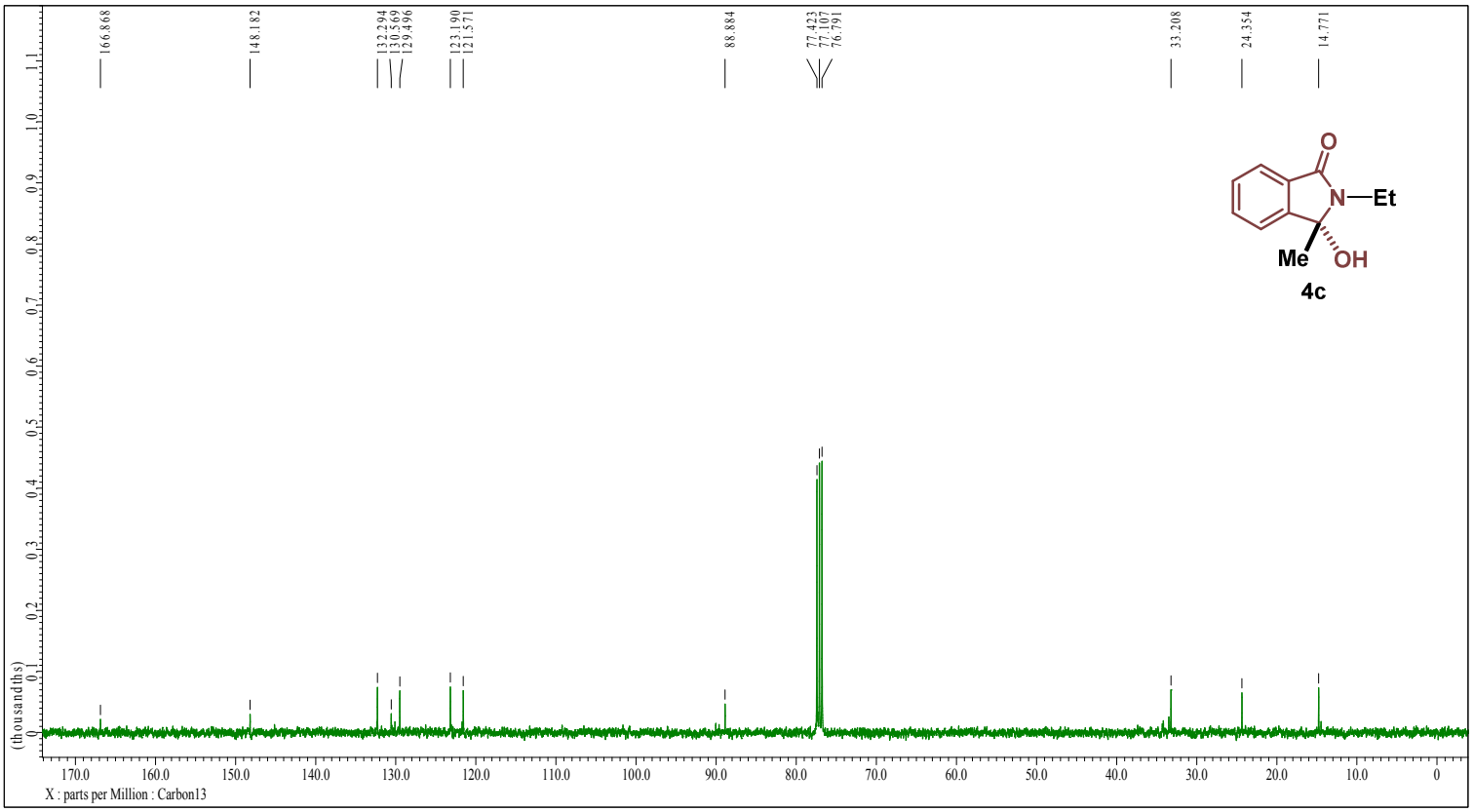
7.555
7.550
7.537
7.441
7.437
7.426
7.416
7.407
7.405
7.397
7.386
7.266
3.487
3.470
3.453
3.435
3.416
3.399
3.306
3.279
3.262
3.244
3.230
3.212
1.694
1.240
1.232
1.223
1.213
1.205
0.000
3.09
1.18
1.09
1.08
3.03
3.00
abundance
X : parts per Million : Proton
O
N—Et
Me
OH
4c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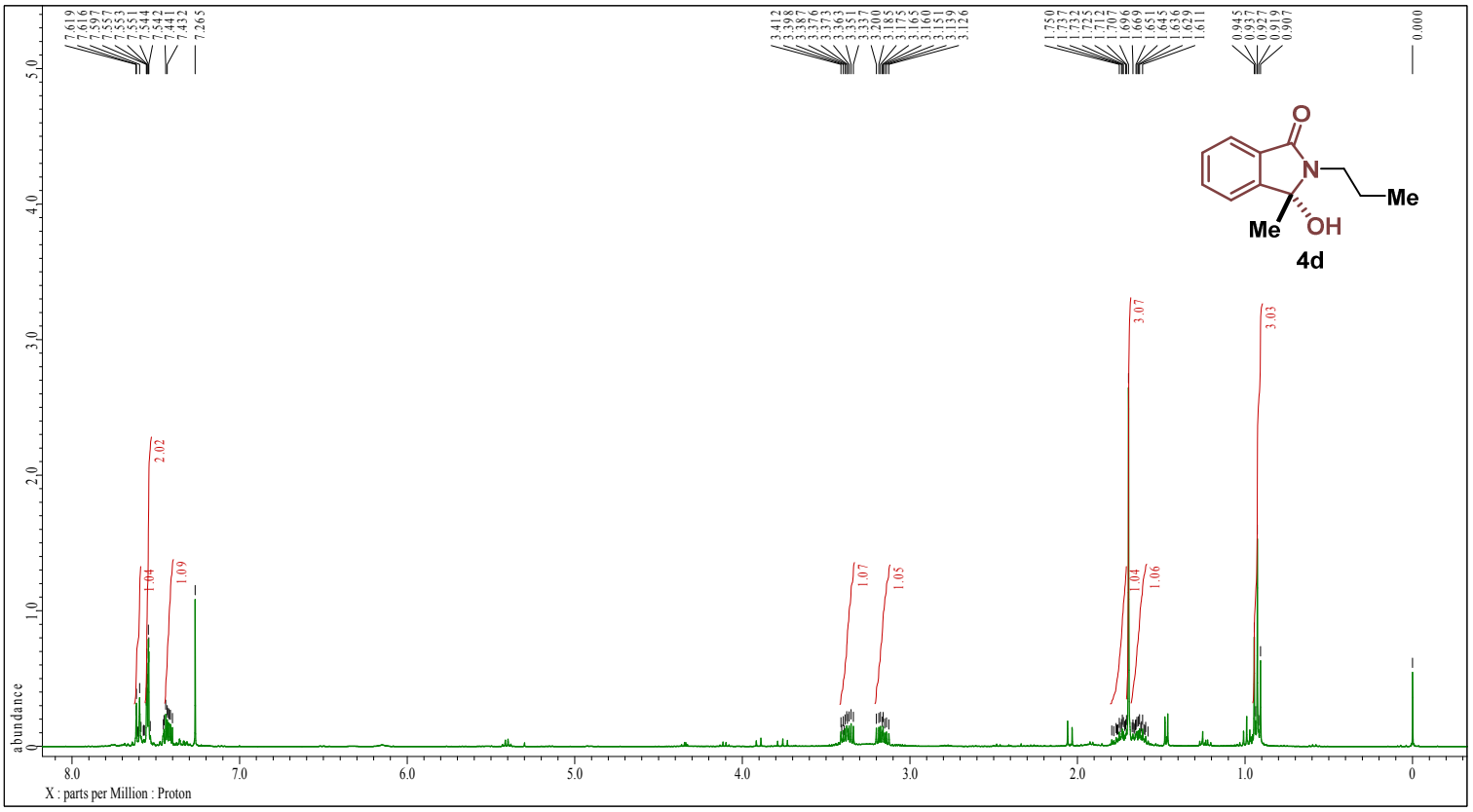
129.496
123.190
121.571
88.884
77.423
77.107
76.791
33.208
24.354
14.771
(thousandths)
X : parts per Million : Carbon13
O
N—Et
Me
OH
4c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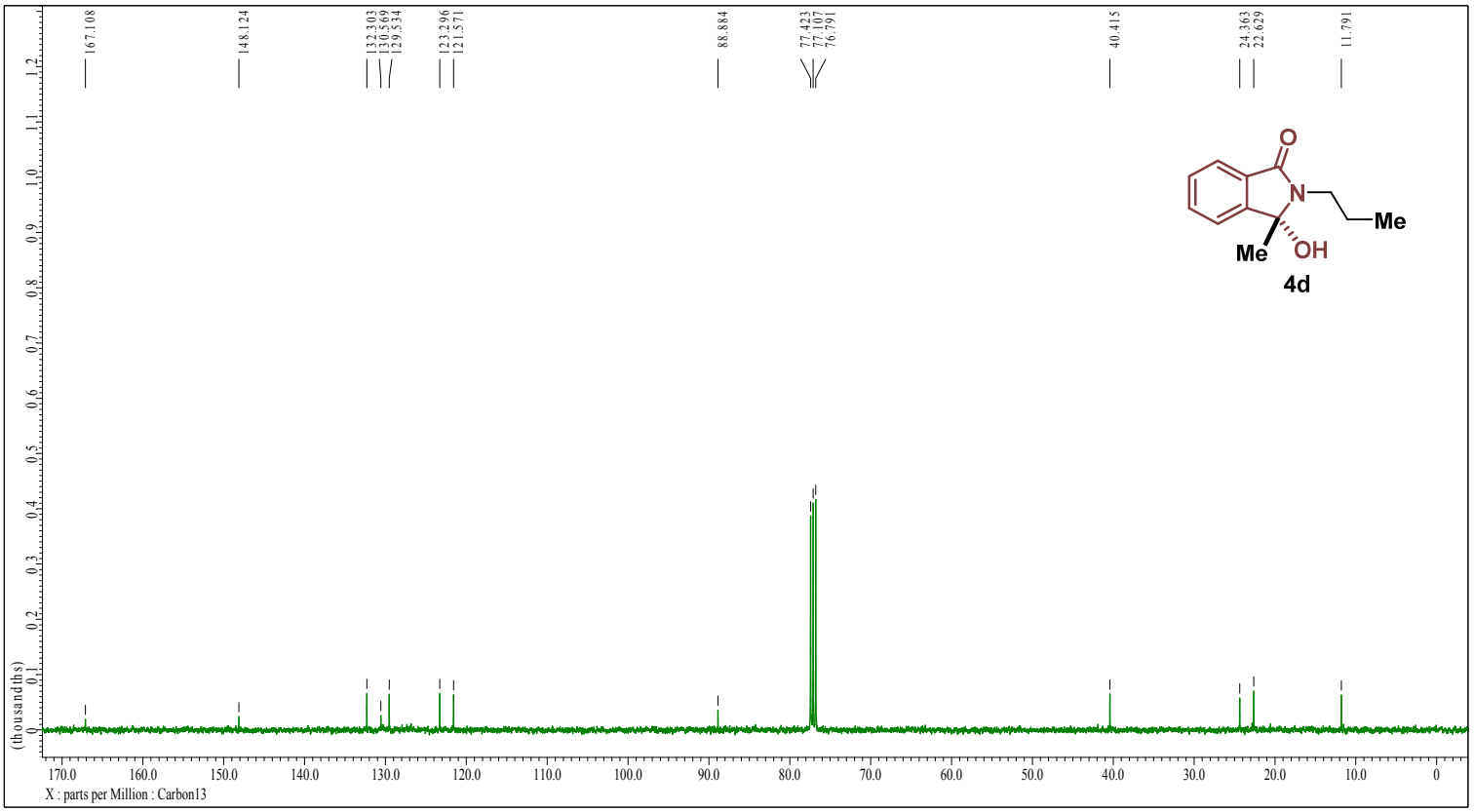
7.553
7.551
7.544
7.542
7.441
7.432
7.265
3.412
3.398
3.387
3.376
3.373
3.363
3.351
3.337
3.200
3.175
3.165
3.160
3.151
3.139
3.126
1.750
1.737
1.732
1.725
1.712
1.707
1.696
1.669
1.651
1.645
1.636
1.629
1.611
0.945
0.937
0.927
0.919
0.907
0.000
O
N
Me
Me
OH
4d
2.02
1.04
1.09
1.07
1.05
3.07
1.04
1.06
3.03
abundance
X : parts per Million : Proton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130.569
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123.296
121.571
88.884
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77.107
76.791
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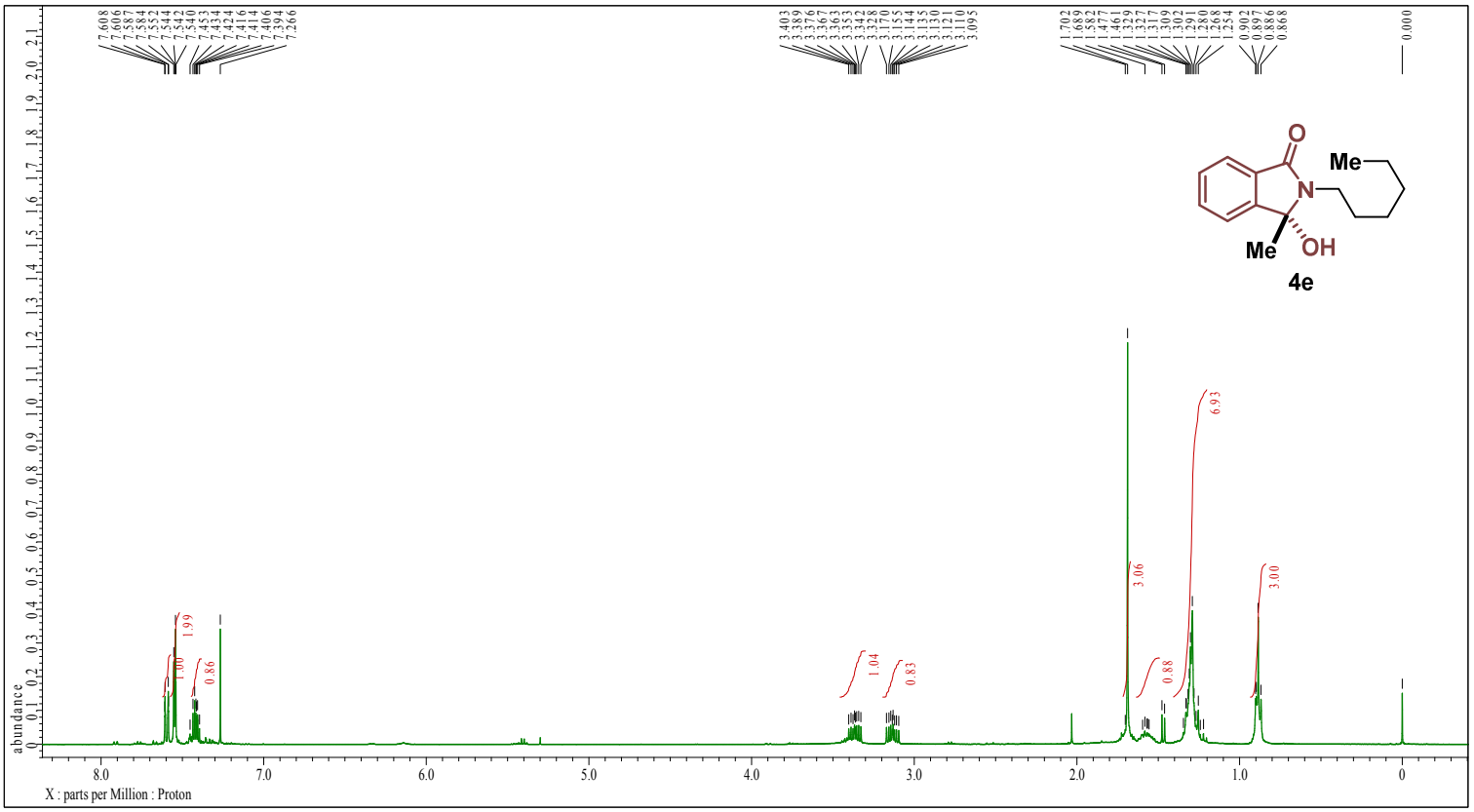
24.363
22.629
11.791
O
N
Me
Me
OH
4d
(thousandths)
X : parts per Million : Carbon13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7.540
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7.434
7.424
7.416
7.414
7.406
7.394
7.266
3.403
3.389
3.376
3.367
3.353
3.342
3.328
3.170
3.155
3.144
3.135
3.130
3.121
3.110
3.095
1.702
1.689
1.582
1.477
1.461
1.329
1.327
1.317
1.309
1.302
1.281
1.268
1.254
0.902
0.897
0.886
0.868
0.000
Me
N
O
Me
OH
4e
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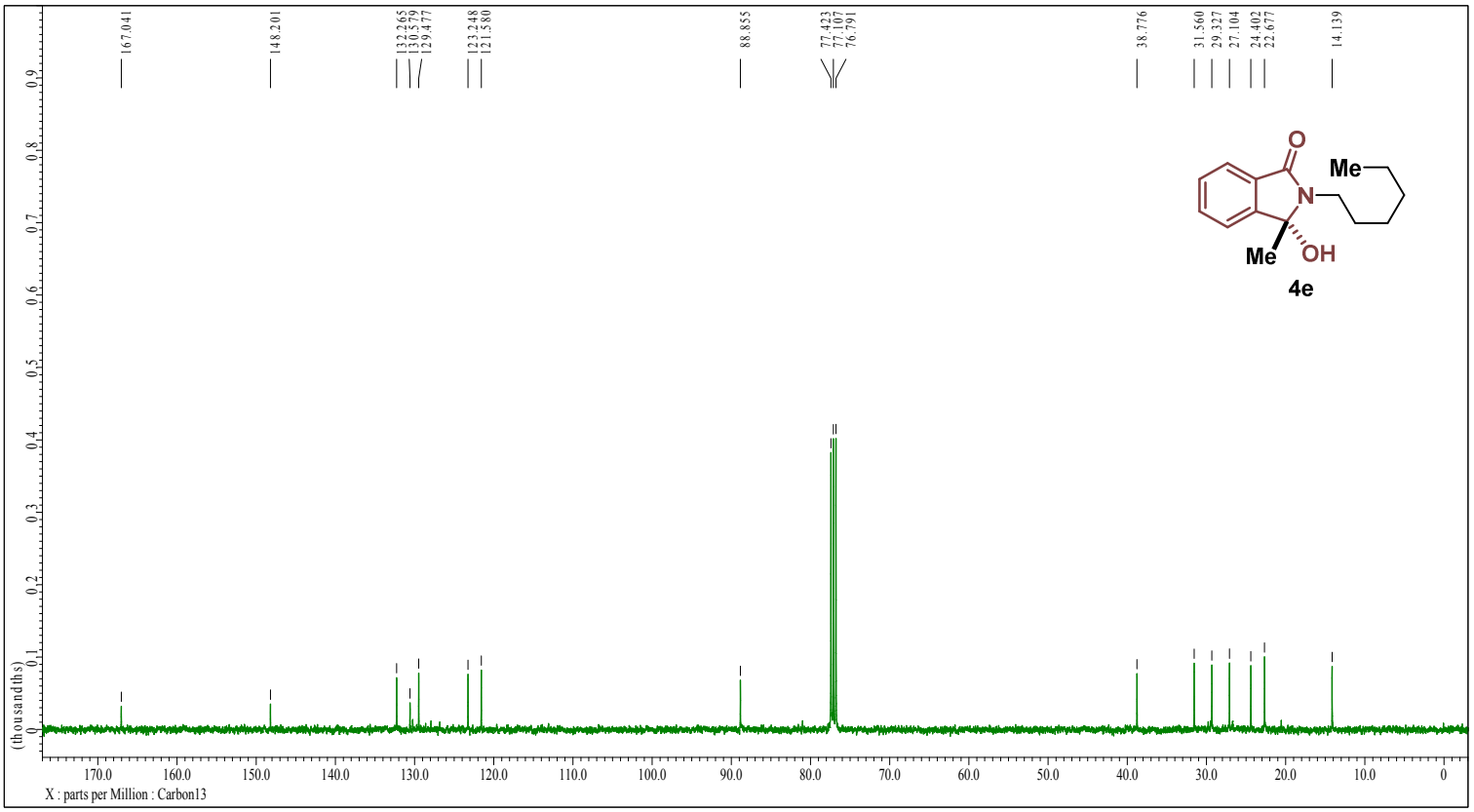
0.86
1.04
0.83
3.06
0.88
6.93
3.00
abundance
X : parts per Million : Proton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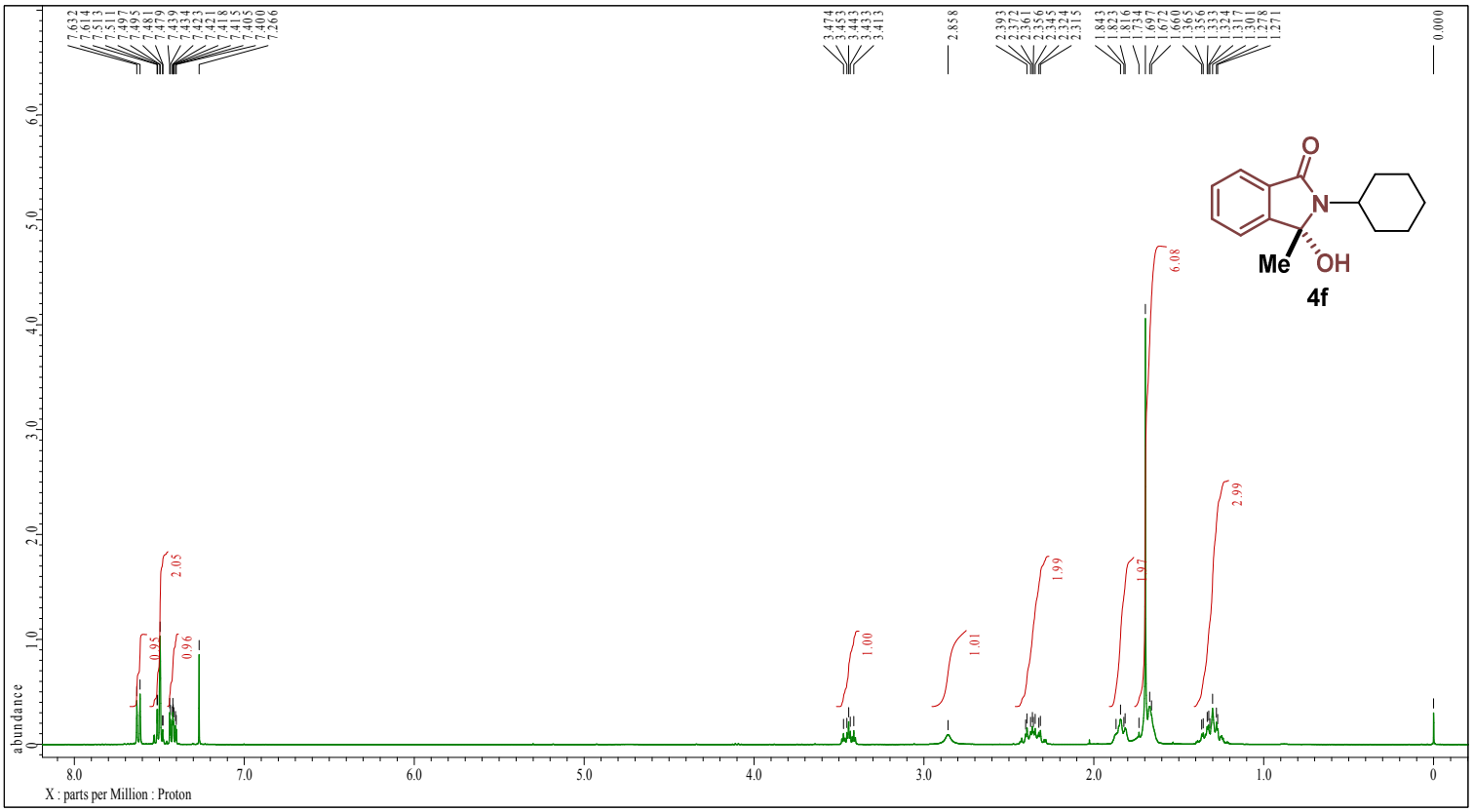
148.201
132.265
130.579
129.477
123.248
121.580
88.855
77.423
77.107
76.791
38.776
31.560
29.327
27.104
24.402
22.677
14.139
Me
N
O
Me
OH
4e
(thousandths)
X : parts per Million : Carbon13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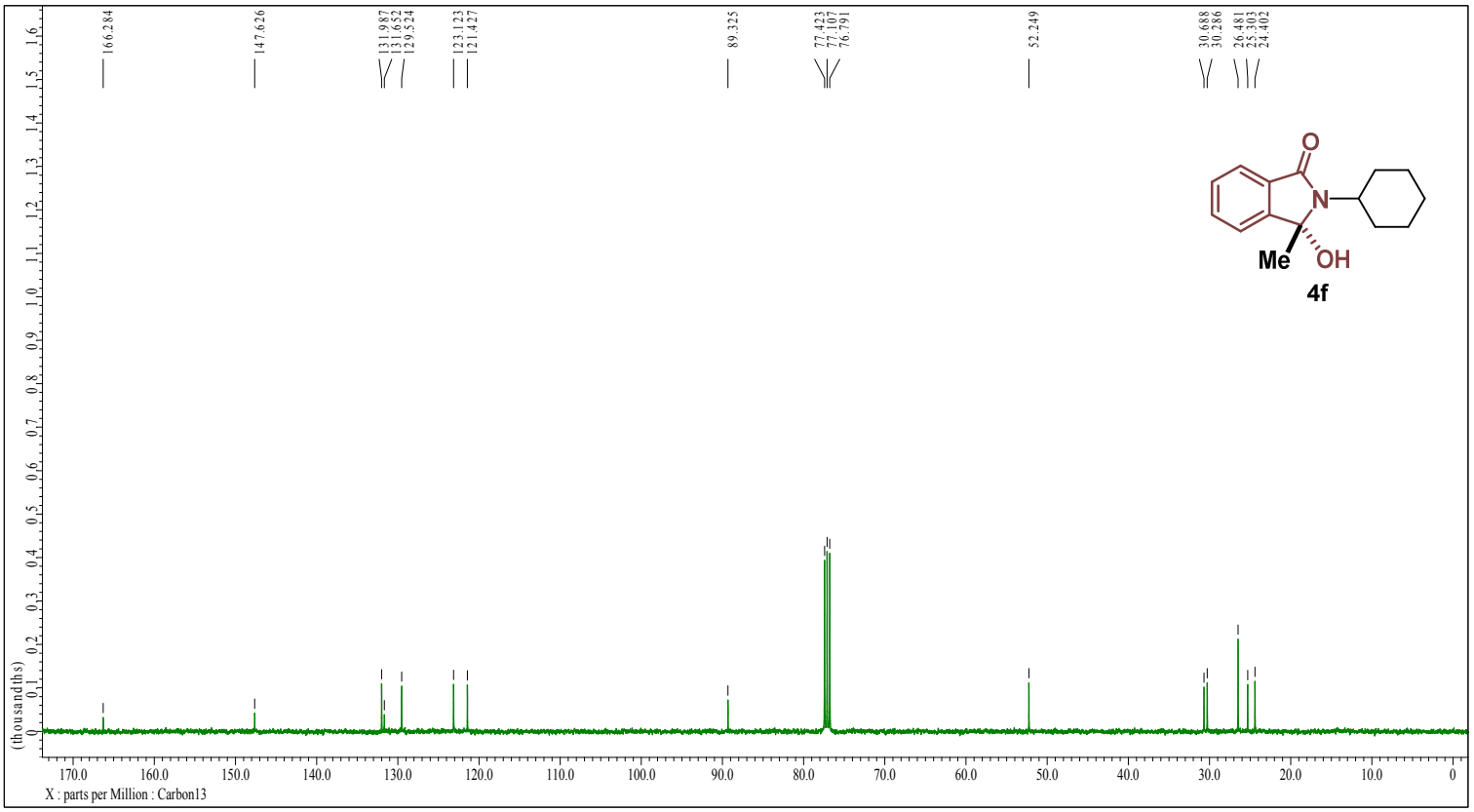
7.614
7.511
7.497
7.495
7.481
7.479
7.439
7.434
7.423
7.421
7.418
7.415
7.405
7.400
7.266
3.474
3.453
3.443
3.433
3.413
2.858
2.393
2.372
2.361
2.356
2.345
2.324
2.315
1.843
1.823
1.816
1.734
1.672
1.660
1.365
1.356
1.333
1.324
1.317
1.301
1.278
1.271
0.000
O
N
Me
OH
4f
6.08
2.99
2.05
1.99
1.97
1.00
1.01
0.95
0.96
abundance
X : parts per Million : Proton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129.524
123.123
121.427
89.325
77.423
77.107
76.791
52.249
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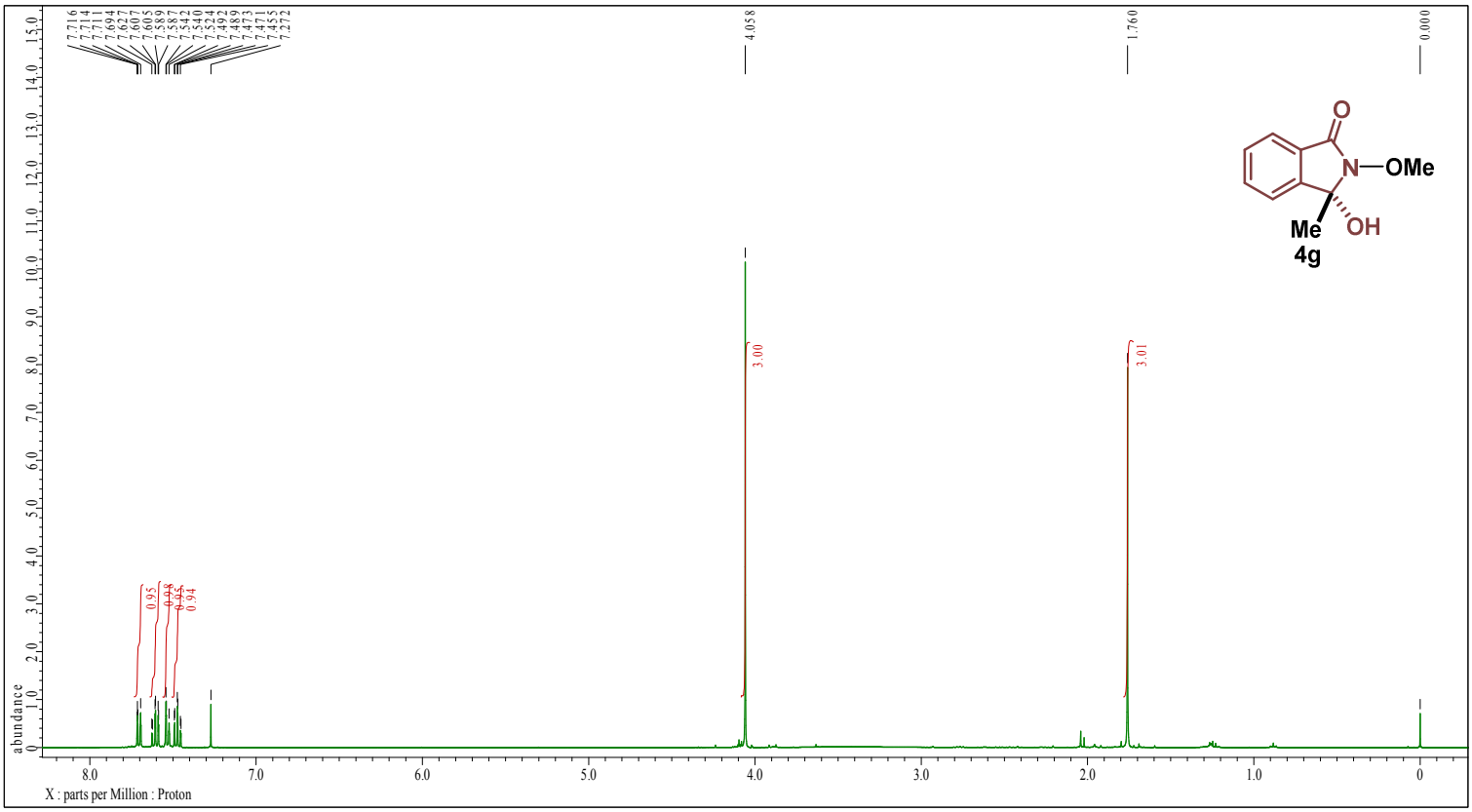
30.286
26.481
25.303
24.402
O
N
Me
OH
4f
(thousandths)
X : parts per Million : Carbon13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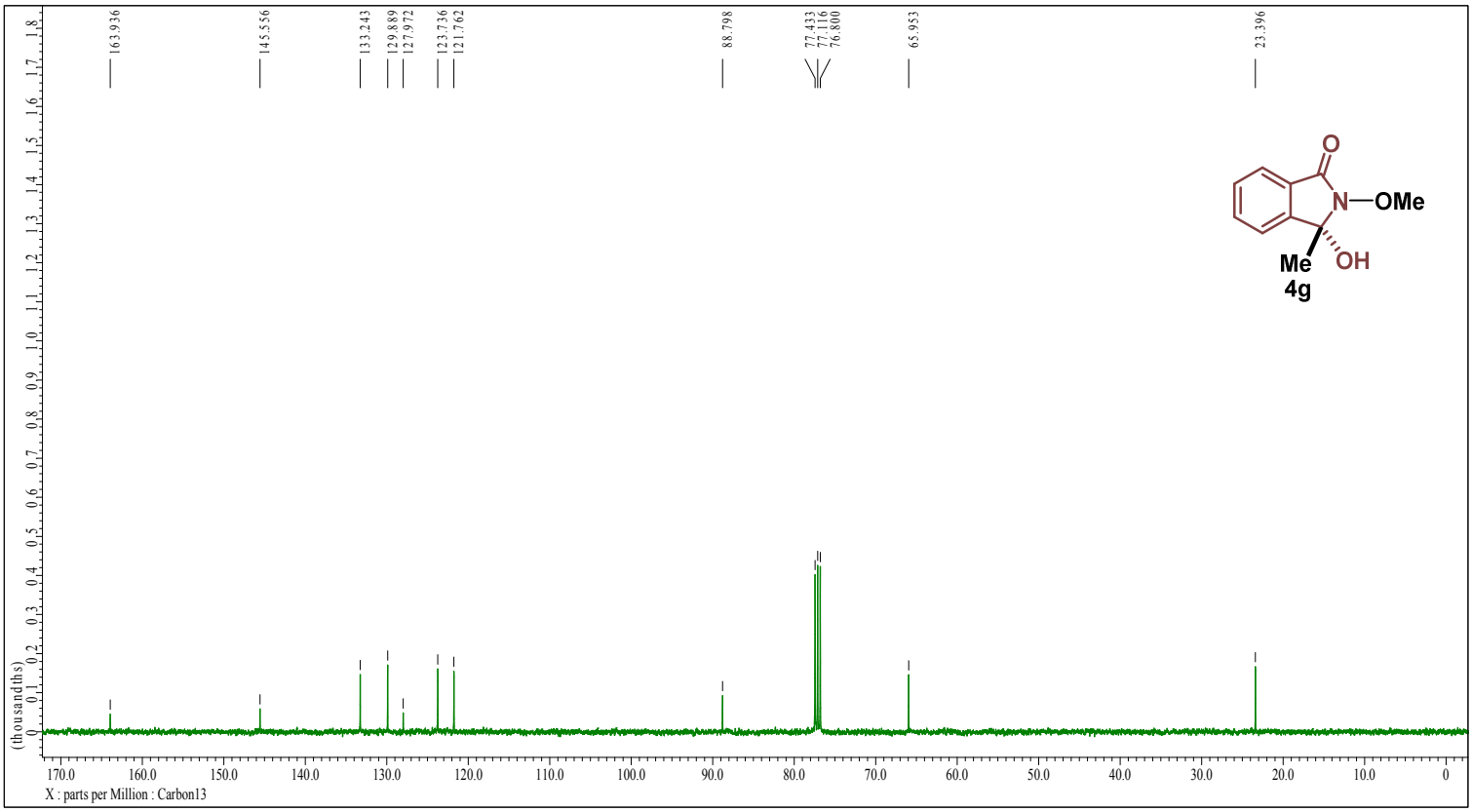
7.711
7.694
7.627
7.607
7.605
7.589
7.587
7.542
7.540
7.534
7.492
7.489
7.473
7.471
7.455
7.272
4.058
1.760
0.000
O
N—OMe
Me
OH
4g
3.00
3.01
0.95
0.94
abundance
X : parts per Million : Proton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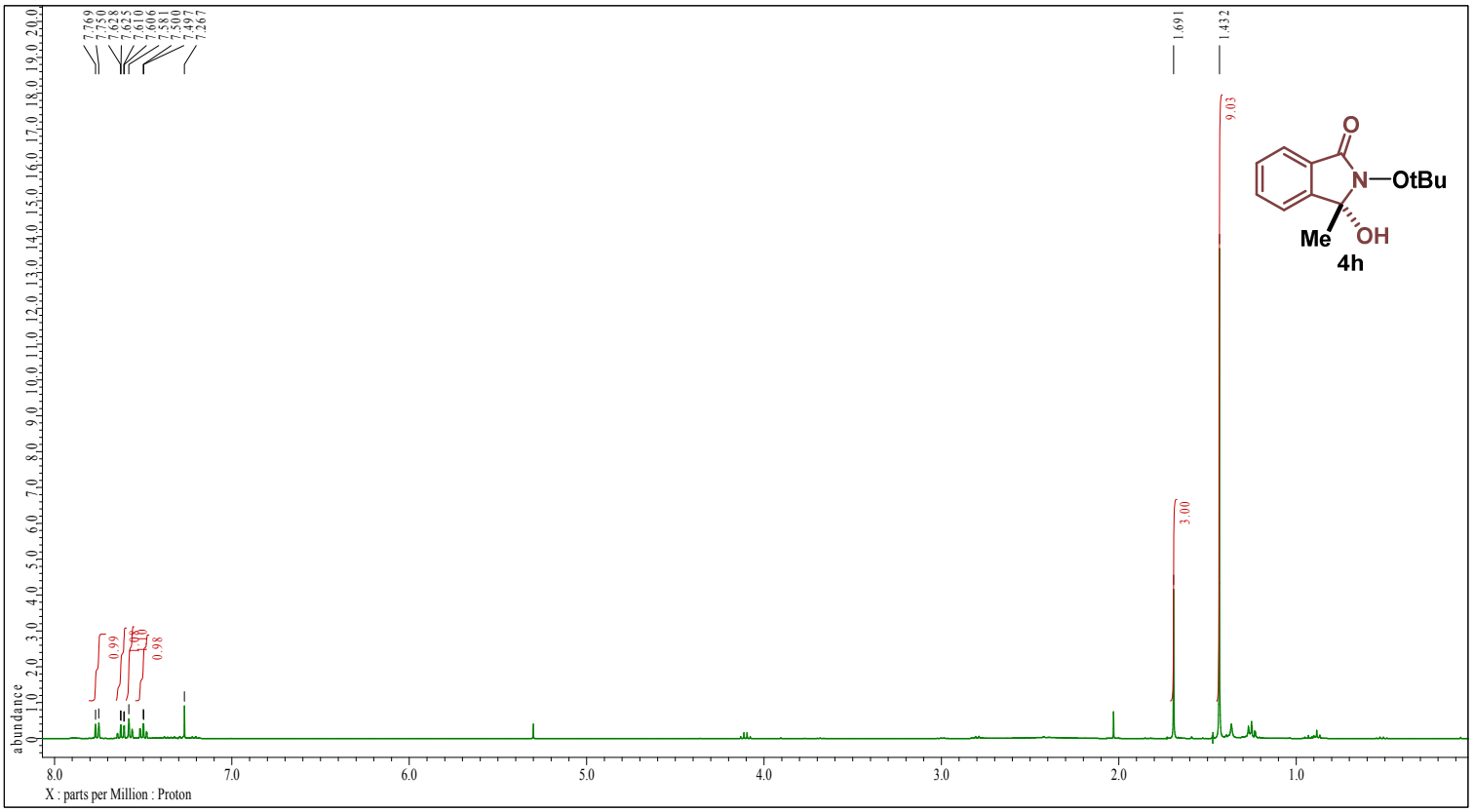
145.556
133.243
129.889
127.972
123.736
121.762
88.798
77.433
77.116
76.800
65.953
23.396
O
N—OMe
Me
OH
4g
(thousandths)
X : parts per Million : Carbon13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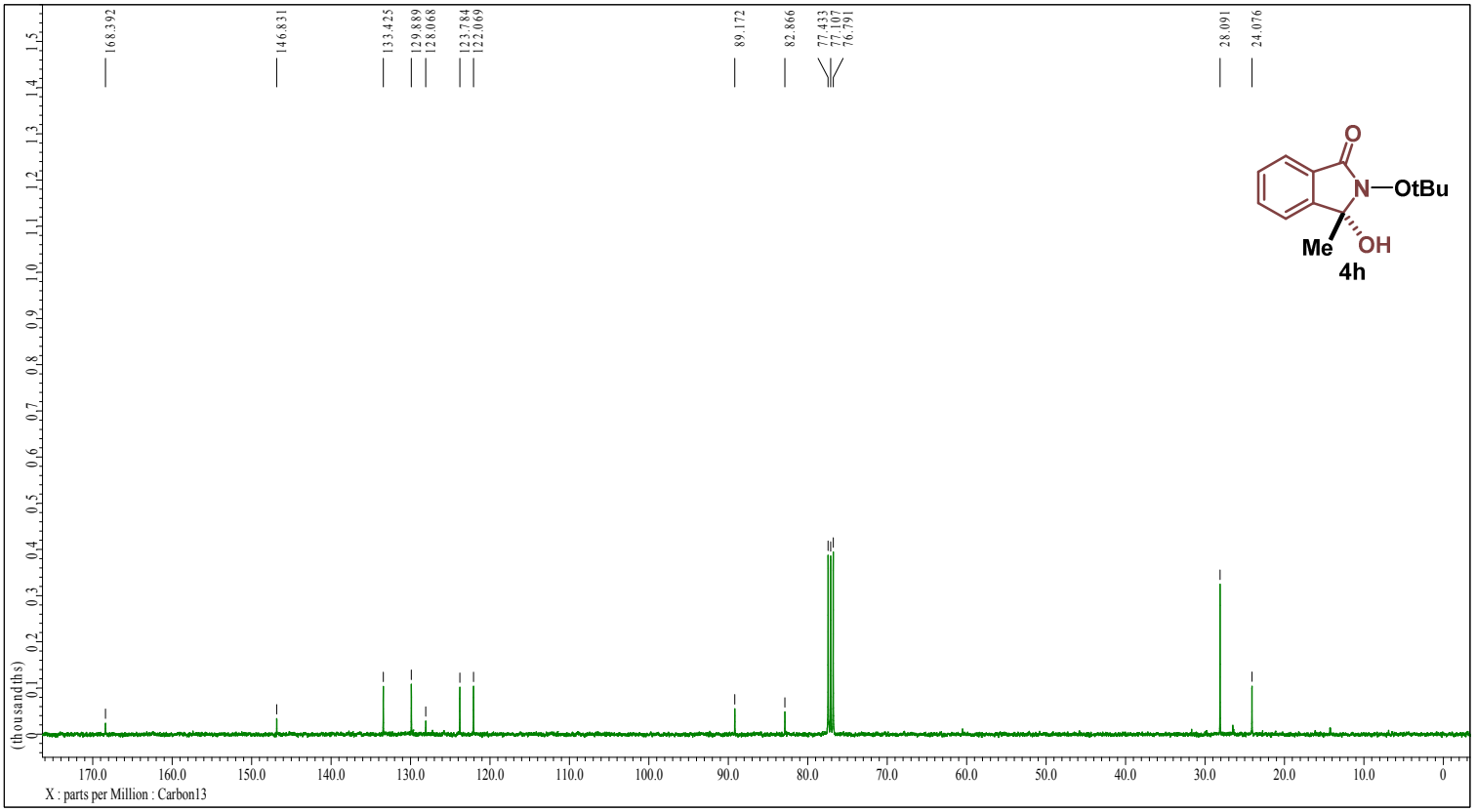
7.750
7.628
7.625
7.610
7.606
7.581
7.500
7.497
7.267
1.691
1.432
9.03
3.00
0.99
1.08
1.00
0.98
O
N—OtBu
Me
OH
4h
abundance
X : parts per Million : Proton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146.831
133.425
129.889
128.068
123.784
122.069
89.172
82.866
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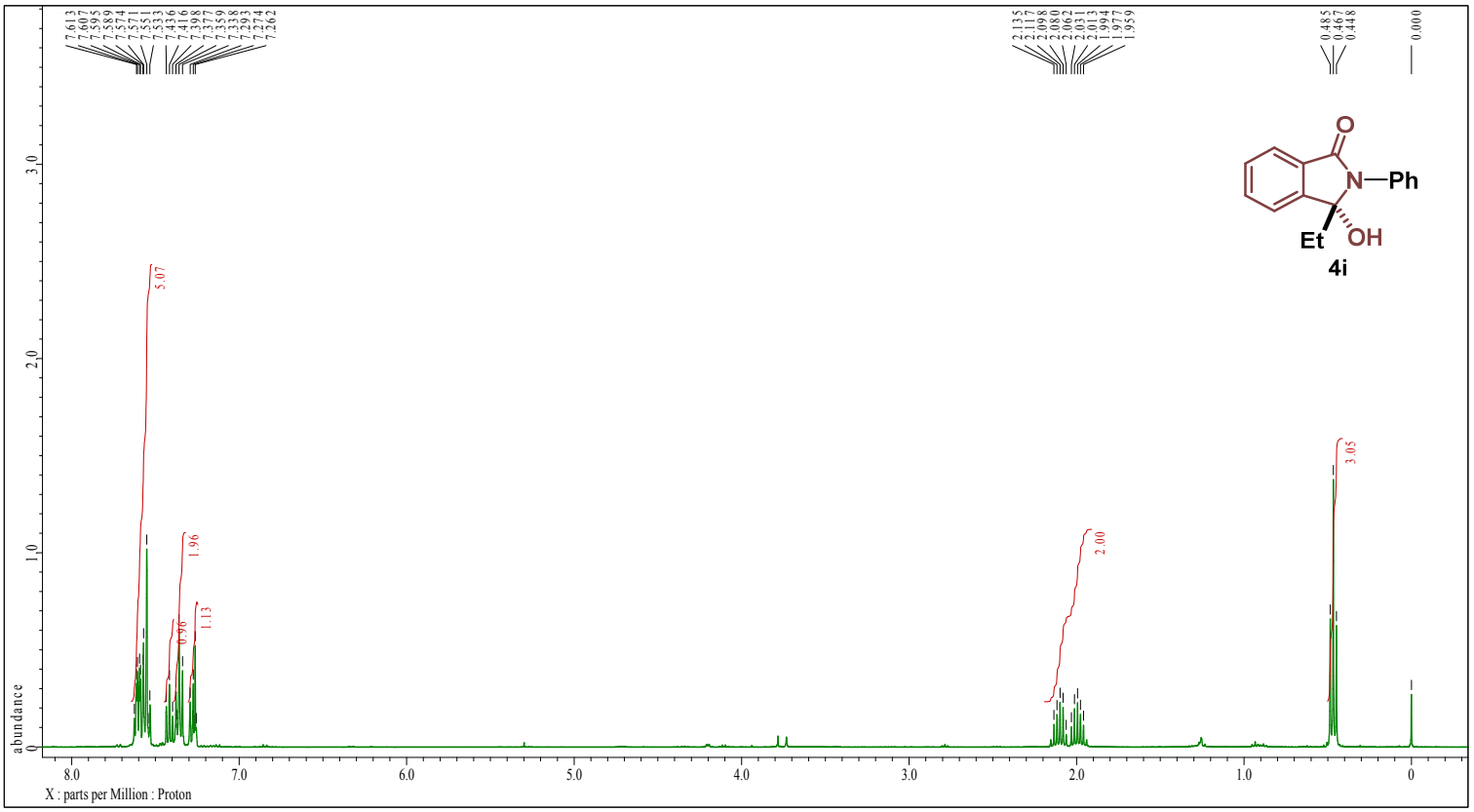
77.107
76.791
28.091
24.076
O
N—OtBu
Me
OH
4h
(thousandths)
X : parts per Million : Carbon13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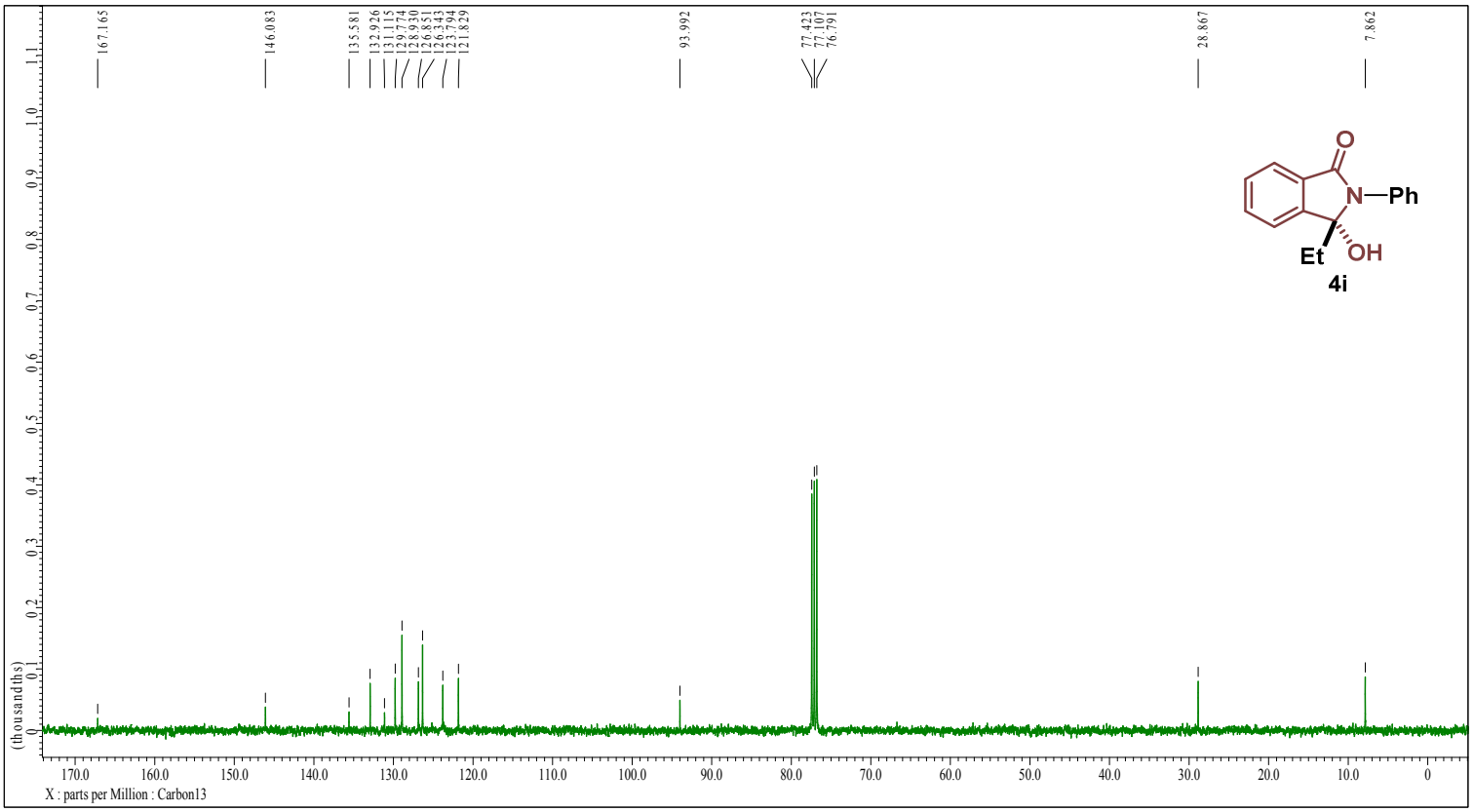
7.607
7.595
7.589
7.574
7.571
7.551
7.533
7.436
7.416
7.398
7.377
7.359
7.338
7.293
7.274
7.262
2.135
2.117
2.098
2.080
2.052
2.031
2.013
1.994
1.977
1.959
0.485
0.467
0.448
0.000
5.07
1.96
0.96
1.13
2.00
3.05
O
N—Ph
Et
OH
4i
abundance
X : parts per Million : Proton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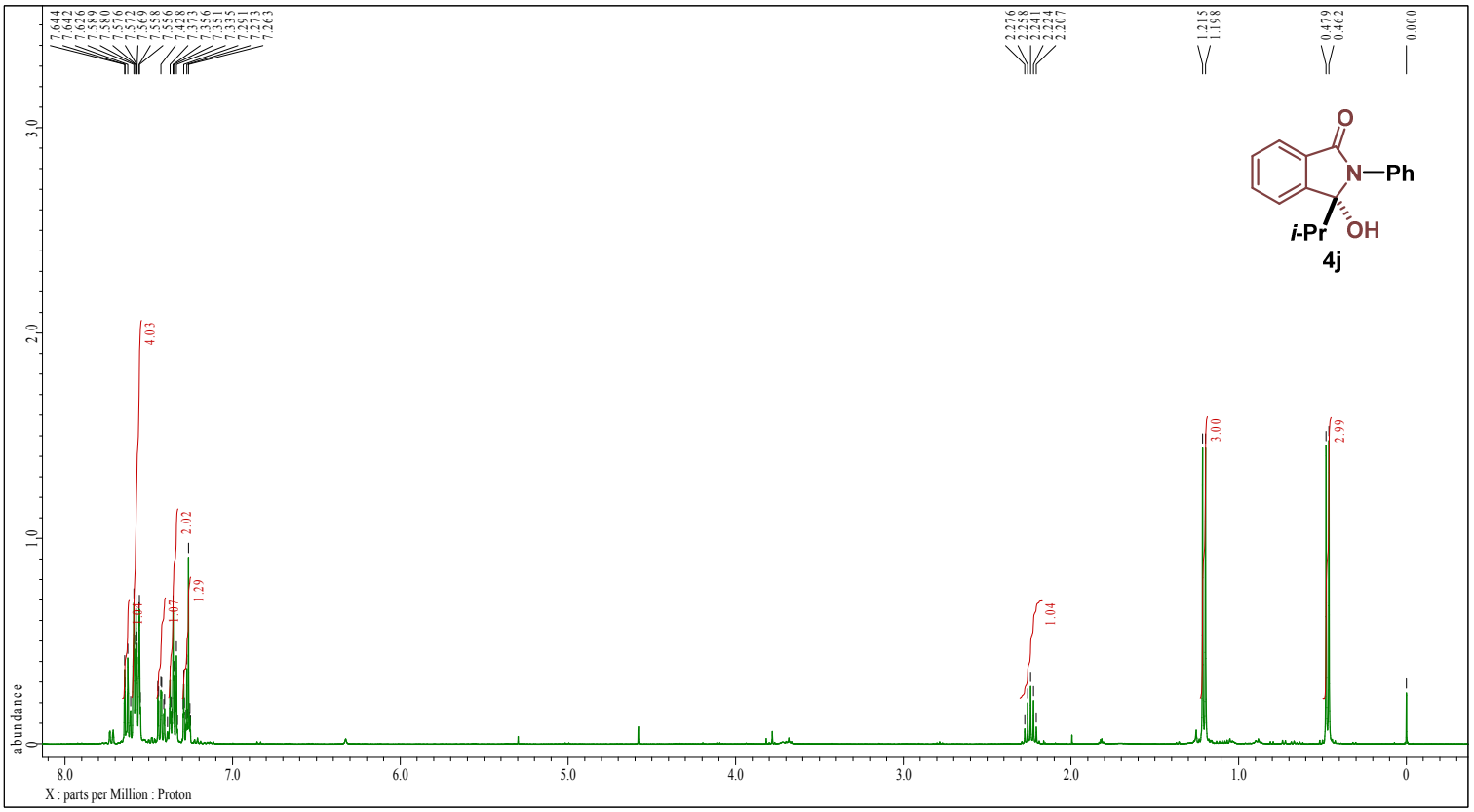
146.083
135.581
132.926
131.115
129.774
128.930
126.851
126.453
123.794
121.829
93.992
77.423
77.107
76.791
28.867
7.862
O
N—Ph
Et
OH
4i
(thousandths)
X : parts per Million : Carbon13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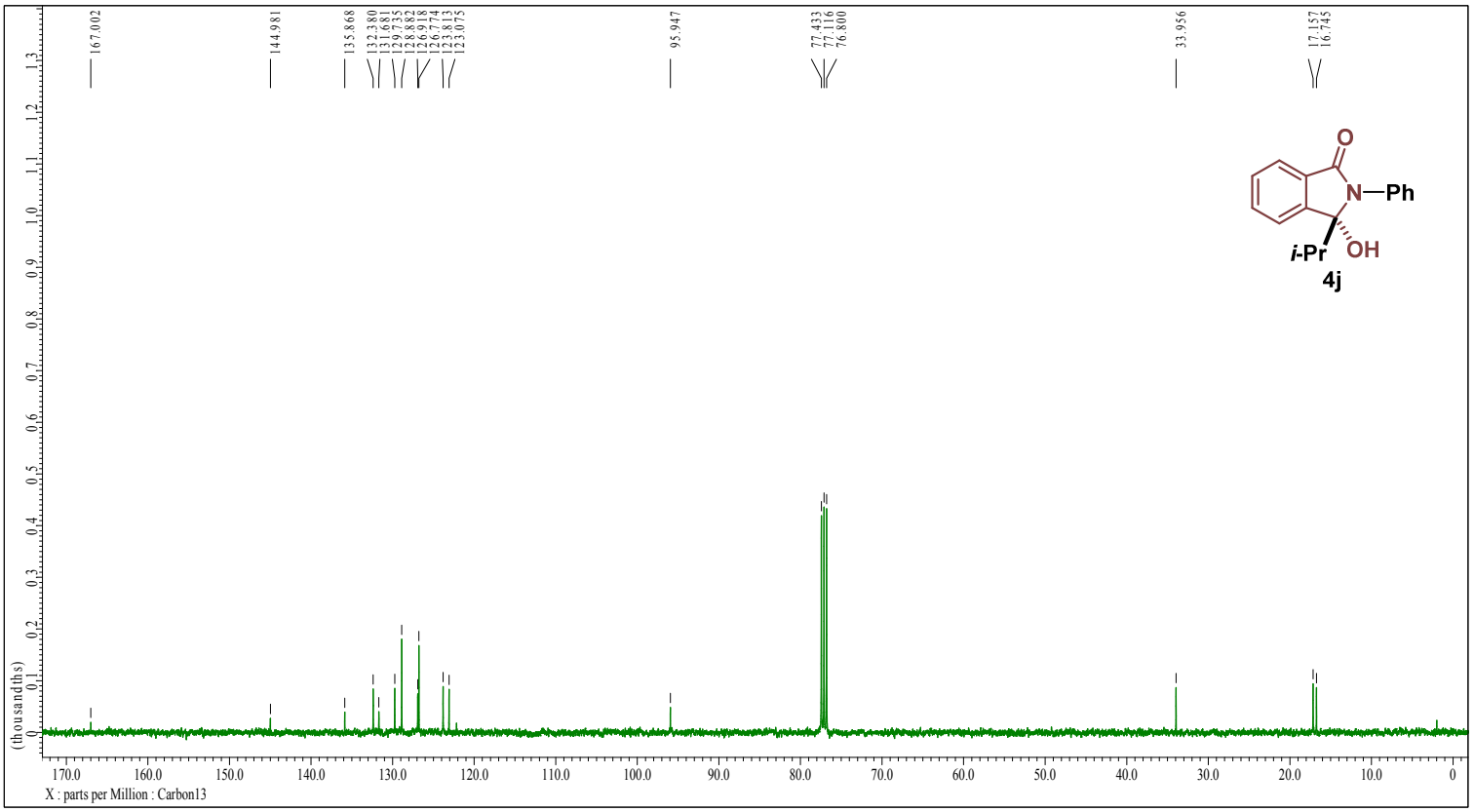
7.626
7.589
7.580
7.576
7.572
7.569
7.558
7.556
7.478
7.473
7.356
7.351
7.335
7.291
7.273
7.263
2.276
2.258
2.241
2.224
2.207
1.215
1.198
0.479
0.462
0.000
4.03
2.02
1.29
1.07
0.92
1.04
3.00
2.99
O
N—Ph
i-Pr
OH
4j
abundance
X : parts per Million : Proton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144.981
135.868
132.380
131.841
129.735
128.882
126.918
126.774
123.813
123.075
95.947
77.433
77.116
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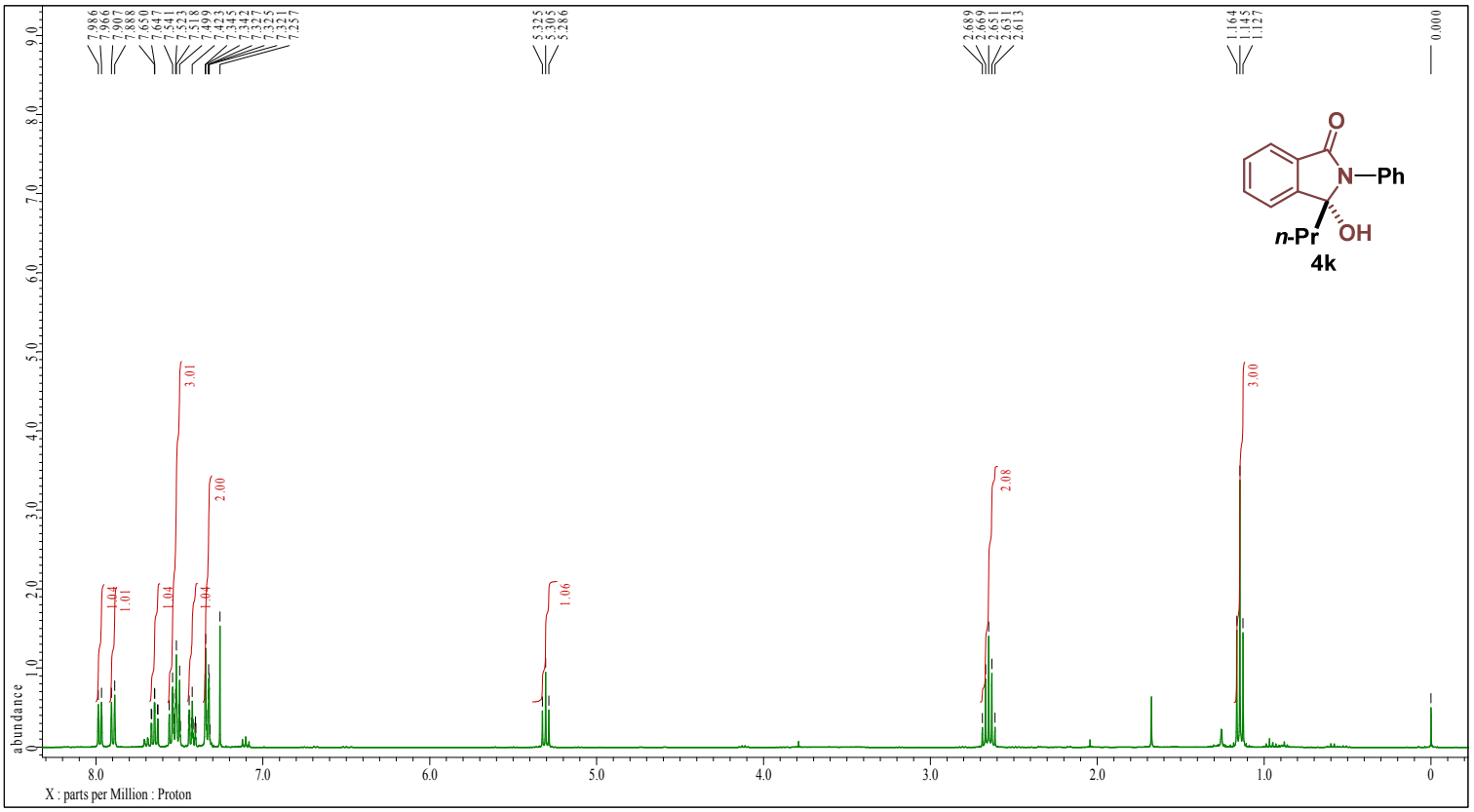
33.956
17.157
16.745
O
N—Ph
i-Pr
OH
4j
(thousandths)
X : parts per Million : Carbon13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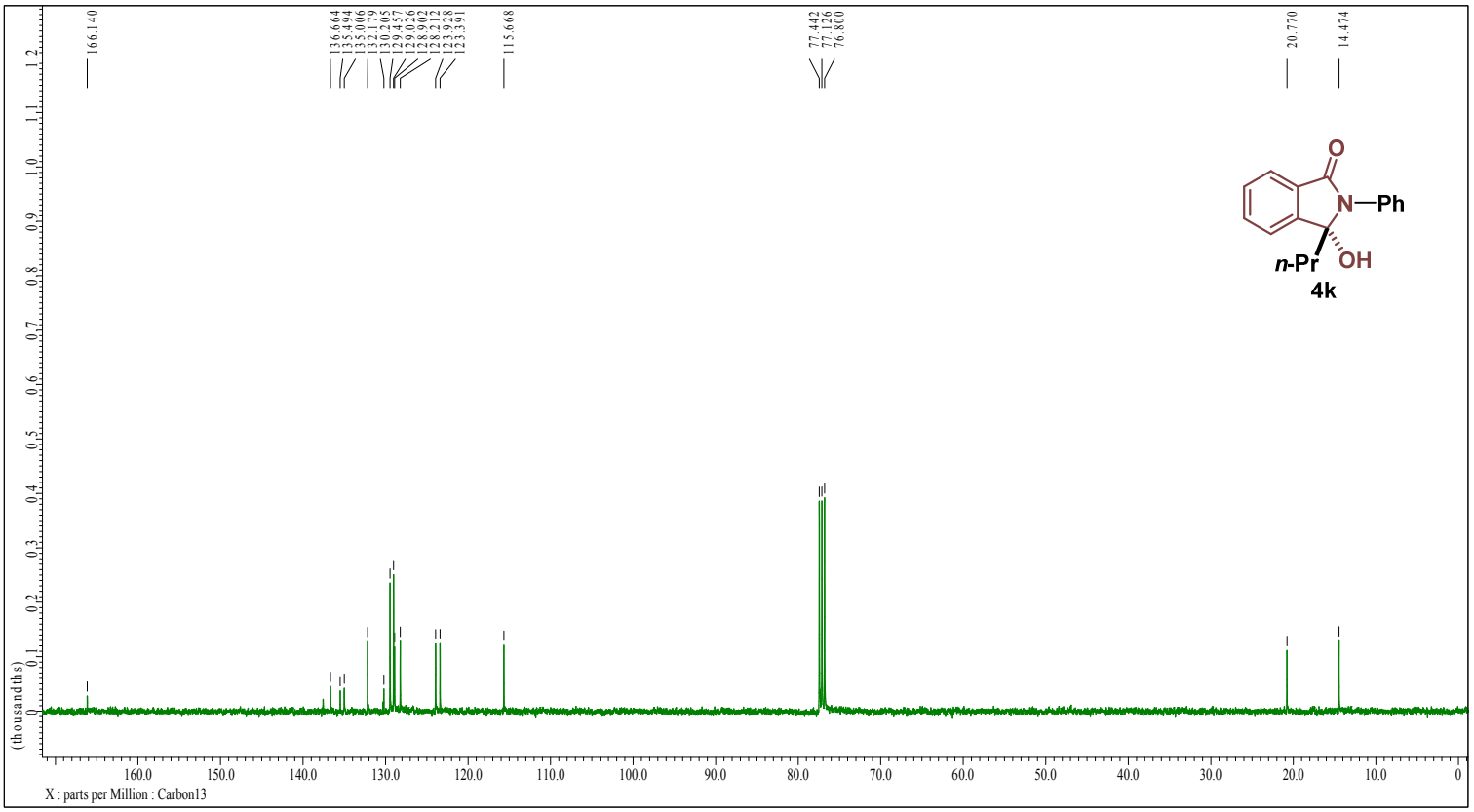
7.966
7.907
7.888
7.650
7.647
7.541
7.523
7.518
7.499
7.423
7.345
7.342
7.327
7.325
7.321
7.257
5.325
5.305
5.286
2.689
2.669
2.651
2.631
2.613
1.164
1.145
1.127
0.000
O
N—Ph
n-Pr
OH
4k
3.01
2.00
1.04
1.01
1.04
1.04
1.06
2.08
3.00
abundance
X : parts per Million : Proton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135.006
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130.455
129.026
128.902
128.212
123.928
123.391
115.668
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20.770
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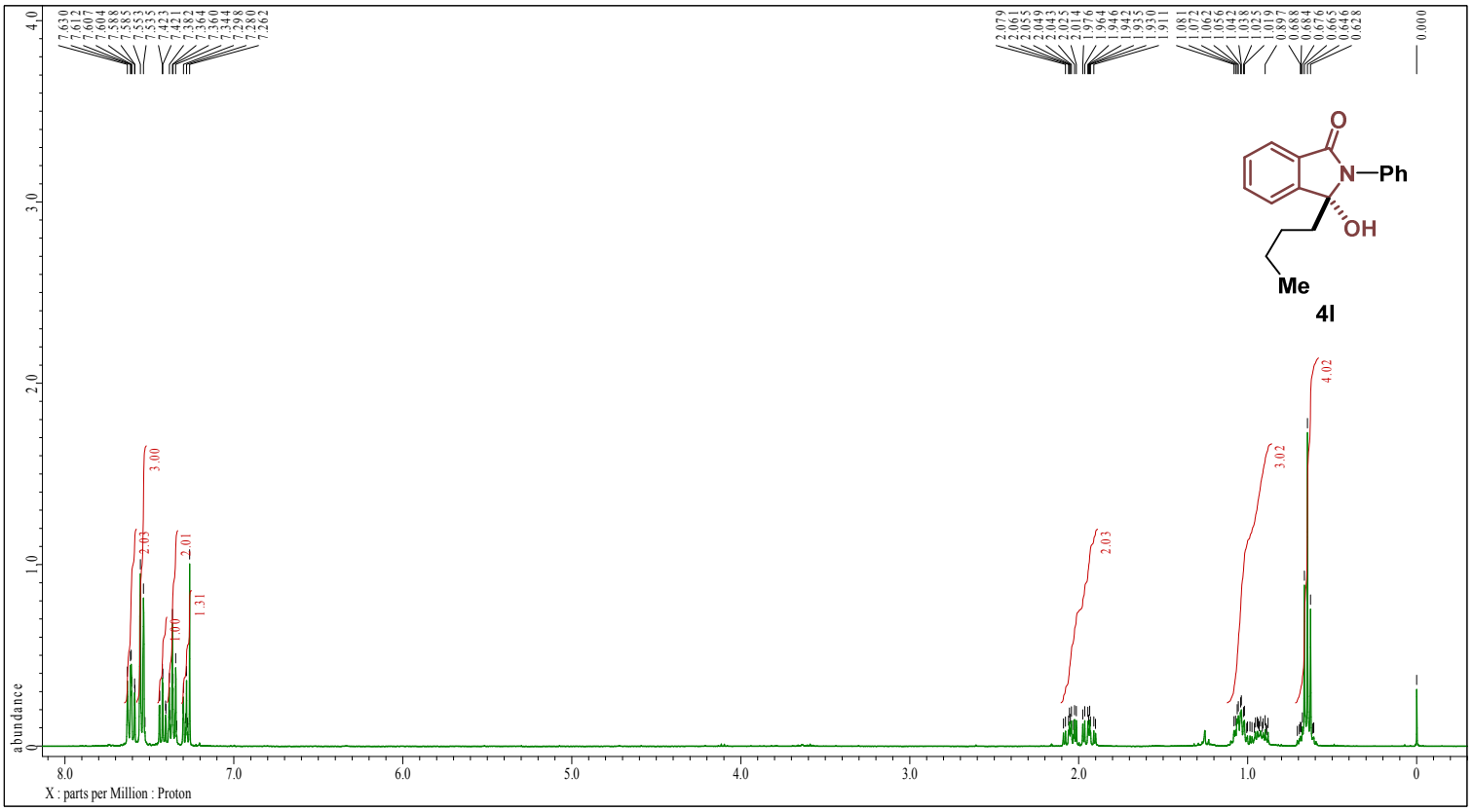
N—Ph
n-Pr
OH
4k
(thousandths)
X : parts per Million : Carbon13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7.607
7.604
7.588
7.555
7.535
7.423
7.421
7.382
7.364
7.360
7.344
7.298
7.280
7.262
2.079
2.061
2.045
2.043
2.025
2.014
1.976
1.964
1.946
1.942
1.935
1.930
1.911
1.081
1.072
1.062
1.056
1.042
1.028
1.025
1.019
0.897
0.688
0.684
0.676
0.665
0.646
0.628
0.000
O
N—Ph
OH
Me
4l
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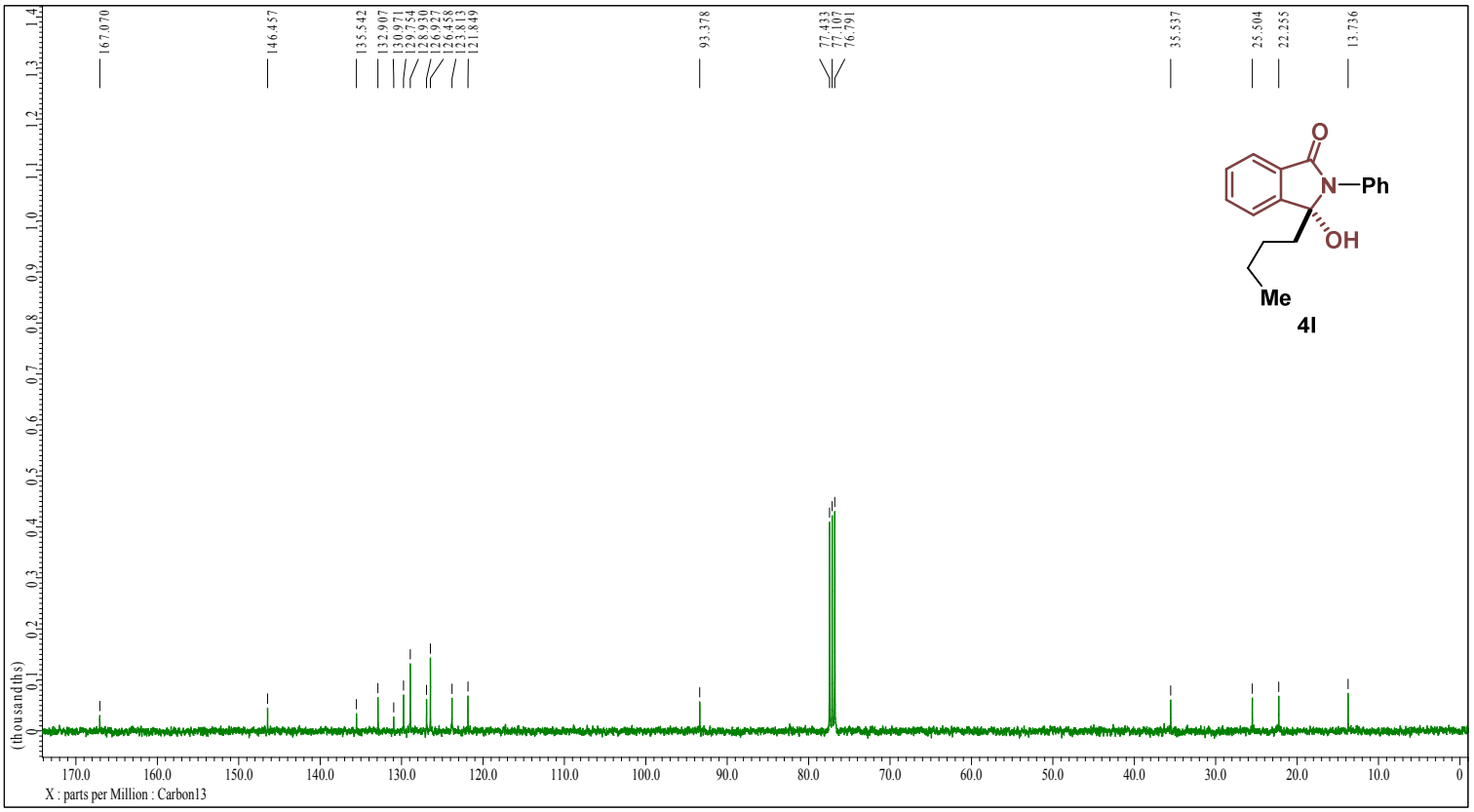
2.03
2.01
1.00
1.31
2.03
3.02
4.02
abundance
X : parts per Million : Proton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132.907
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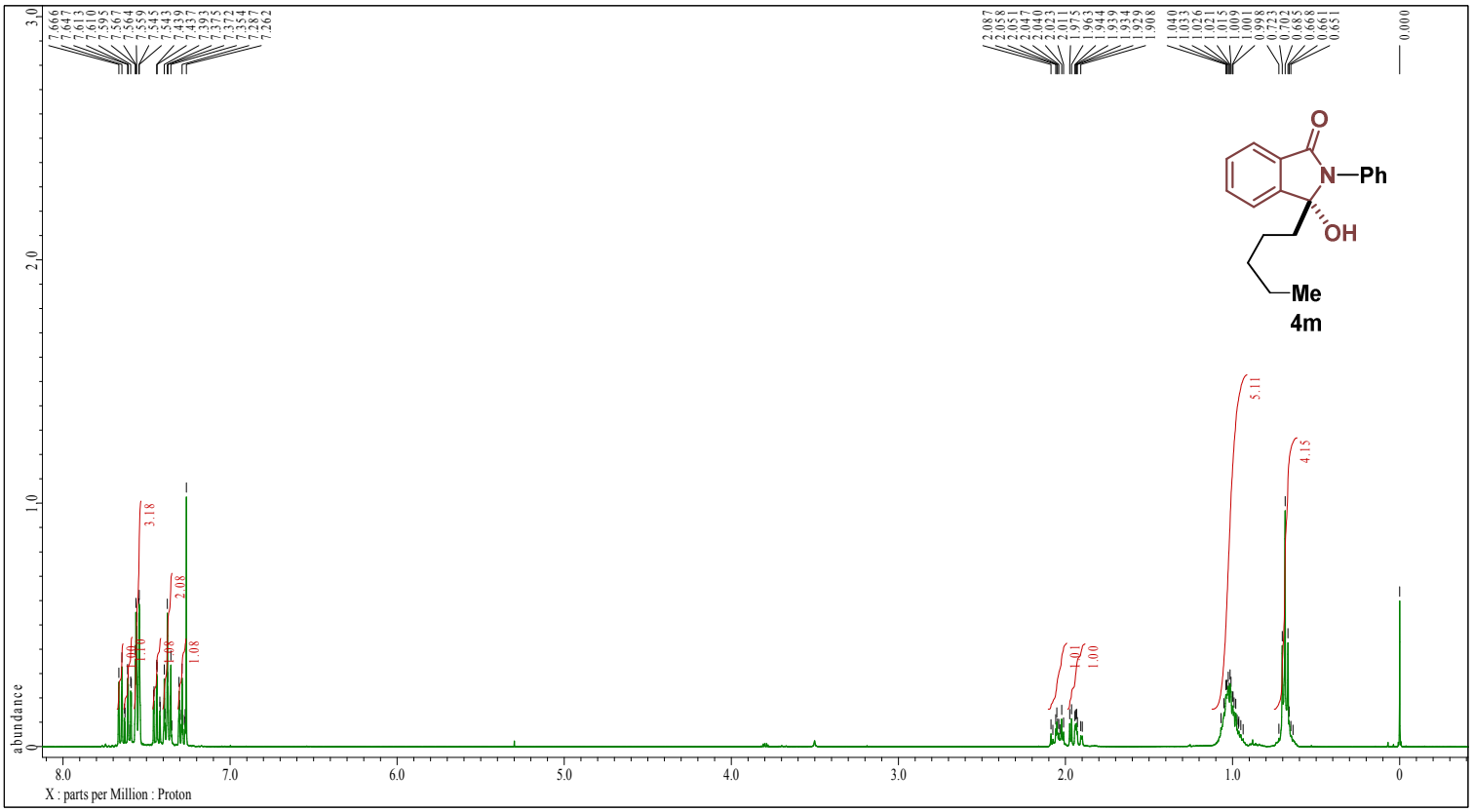
129.754
128.930
126.927
126.458
123.813
121.849
93.378
77.433
77.107
76.791
35.537
25.504
22.255
13.736
O
N—Ph
OH
Me
4l
(thousandths)
X : parts per Million : Carbon13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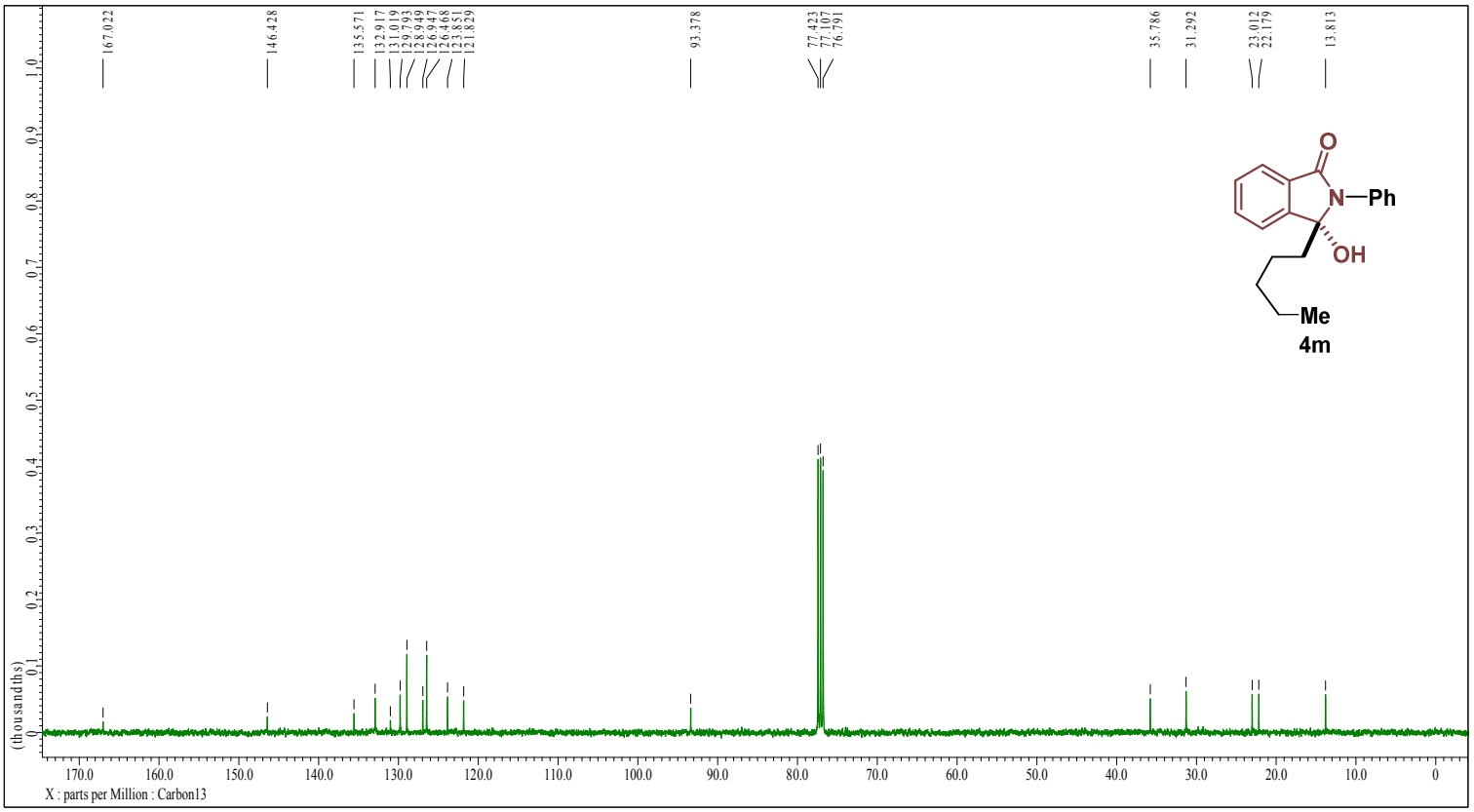
7.647
7.613
7.610
7.595
7.567
7.564
7.559
7.545
7.543
7.439
7.437
7.393
7.375
7.372
7.354
7.287
7.262
2.087
2.058
2.051
2.047
2.040
2.023
2.011
1.975
1.963
1.944
1.939
1.934
1.929
1.908
1.040
1.033
1.026
1.021
1.015
1.009
1.001
0.998
0.973
0.763
0.685
0.668
0.661
0.651
0.000
O
N—Ph
OH
Me
4m
5.11
4.15
3.18
2.08
1.08
1.01
1.00
abundance
X : parts per Million : Proton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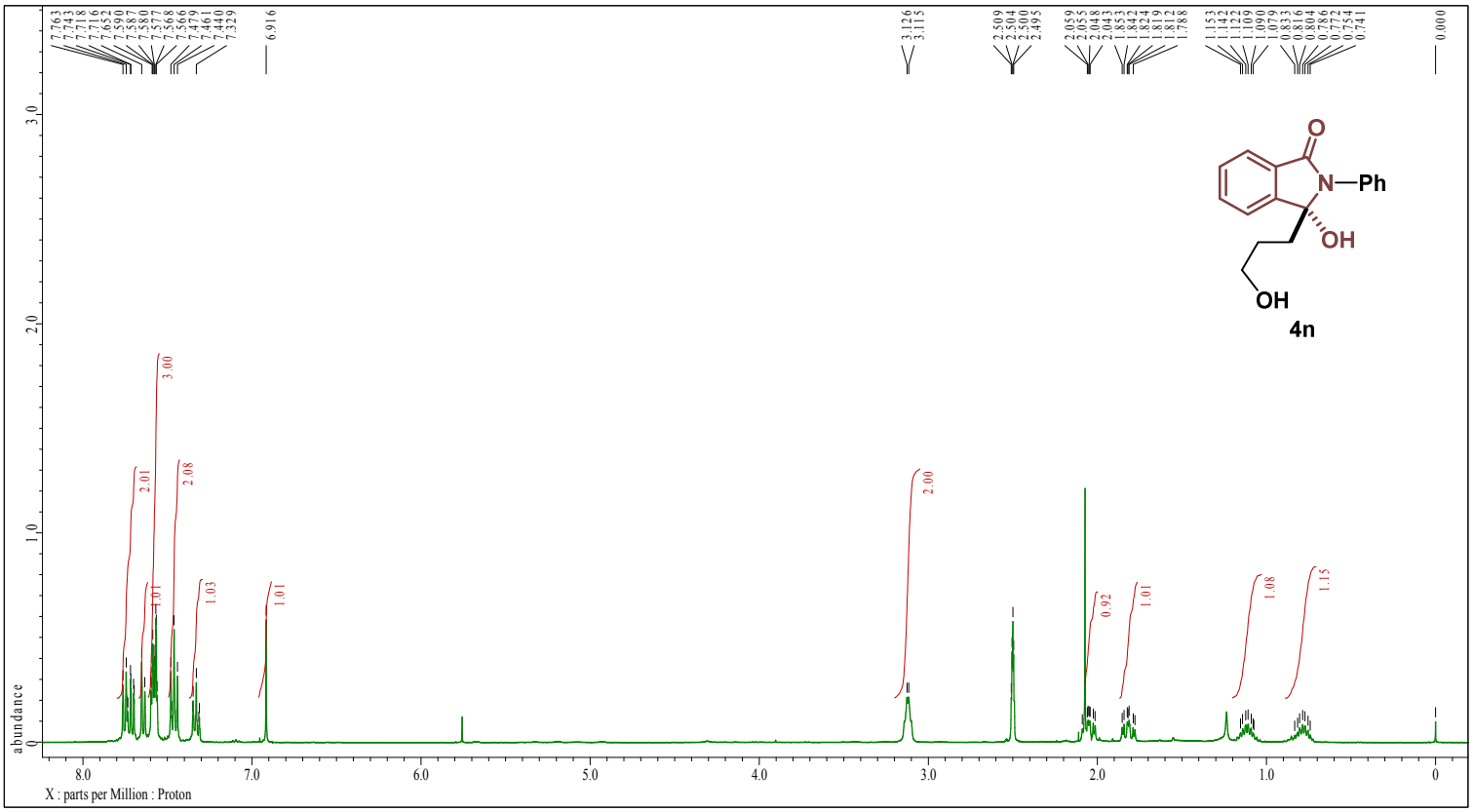
128.949
126.947
126.468
123.851
121.829
93.378
77.423
77.107
76.791
35.786
31.292
23.012
22.179
13.813
O
N—Ph
OH
Me
4m
(thousandths)
X : parts per Million : Carbon13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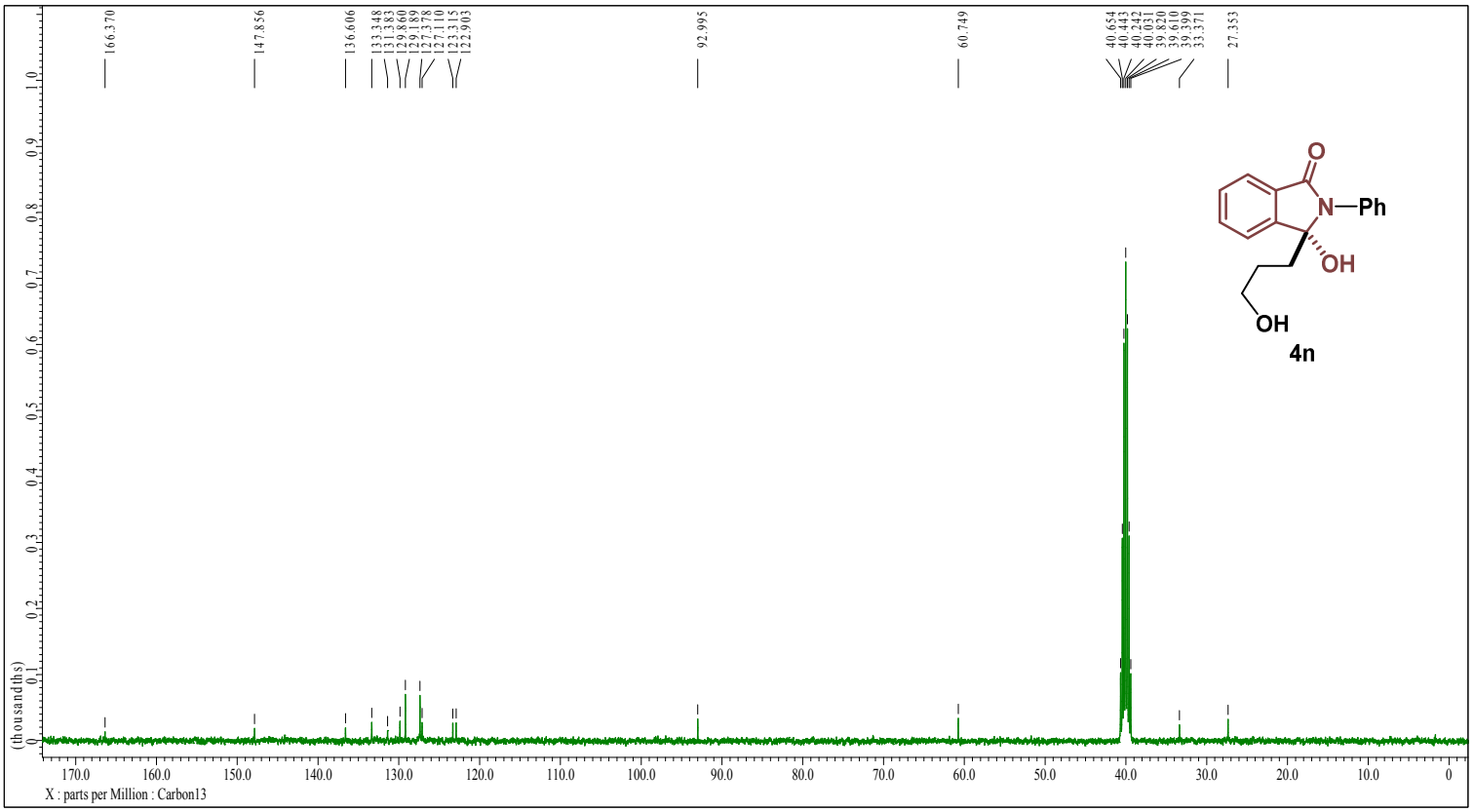
7.587
7.580
7.577
7.568
7.566
7.499
7.461
7.440
7.329
6.916
3.126
3.115
2.509
2.504
2.500
2.495
2.059
2.055
2.048
2.043
1.853
1.842
1.824
1.819
1.812
1.788
1.153
1.142
1.122
1.109
1.090
1.079
1.073
0.813
0.804
0.786
0.772
0.754
0.741
0.000
3.00
2.01
2.08
1.01
1.03
1.01
2.00
0.92
1.01
1.08
1.15
abundance
X : parts per Million : Proton
O
N—Ph
OH
OH
4n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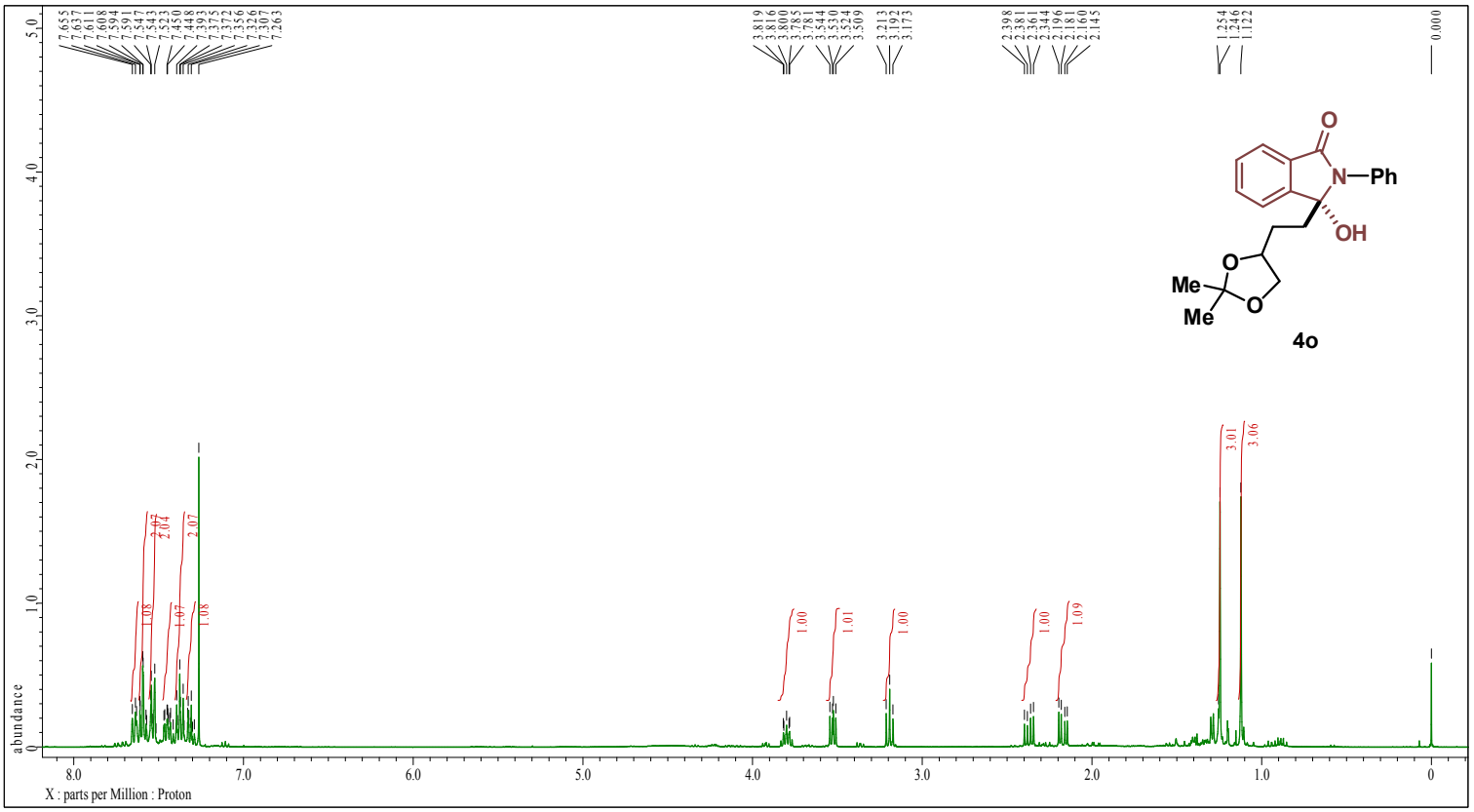
129.189
127.378
127.110
123.115
122.903
92.995
60.749
40.654
40.443
40.232
40.021
39.820
39.610
39.399
33.371
27.353
(thousandths)
X : parts per Million : Carbon13
O
N—Ph
OH
OH
4n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7.543
7.523
7.450
7.448
7.393
7.375
7.372
7.356
7.326
7.307
7.263
3.819
3.816
3.800
3.785
3.781
3.744
3.530
3.524
3.509
3.213
3.192
3.173
2.398
2.381
2.361
2.344
2.196
2.181
2.160
2.145
1.254
1.246
1.122
0.000
O
N—Ph
OH
O
Me
Me
O
4o
1.08
2.07
2.04
1.07
2.07
1.08
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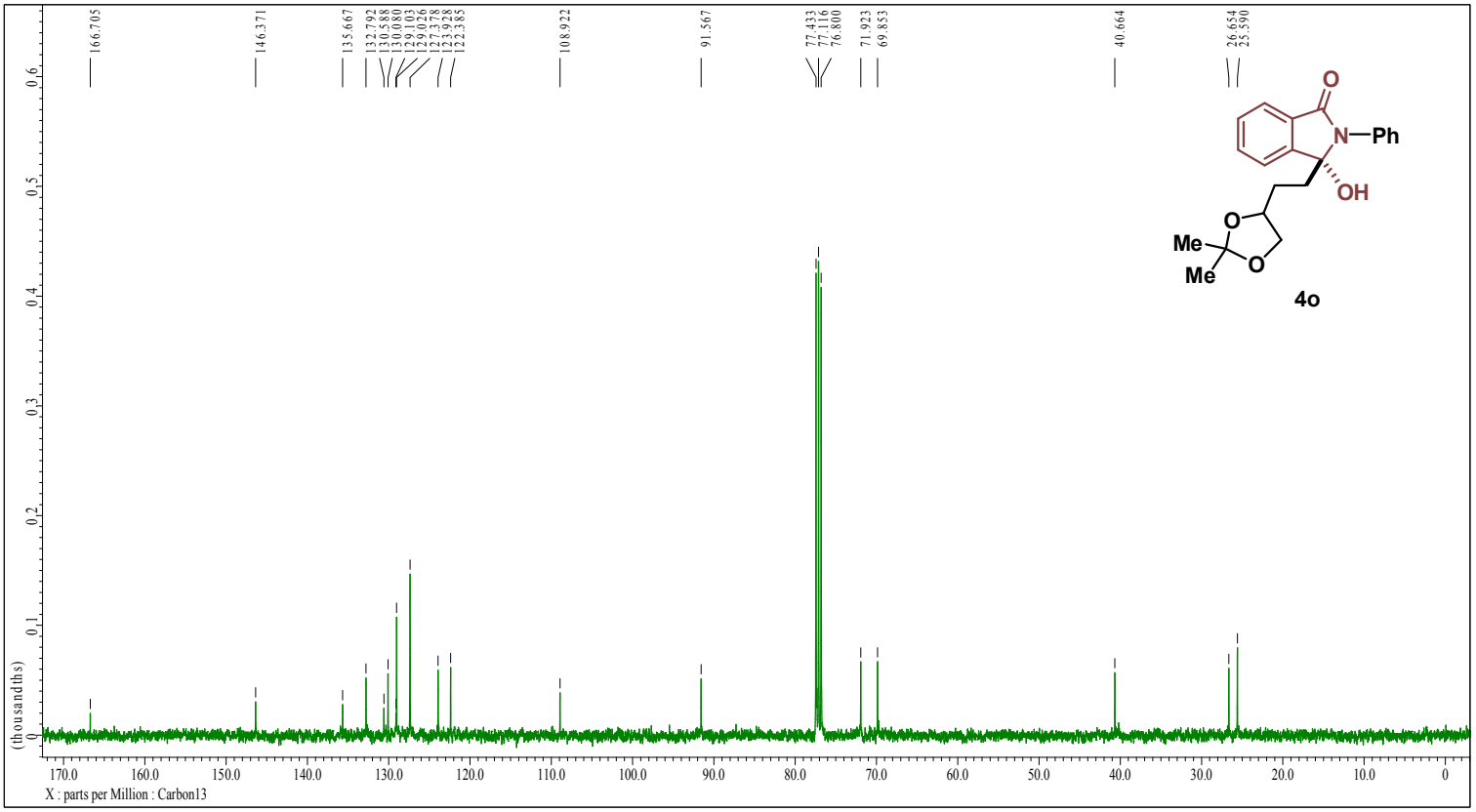
1.01
1.00
1.00
1.09
3.01
3.06
abundance
X : parts per Million : Proton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132.792
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130.080
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129.026
127.378
123.928
122.385
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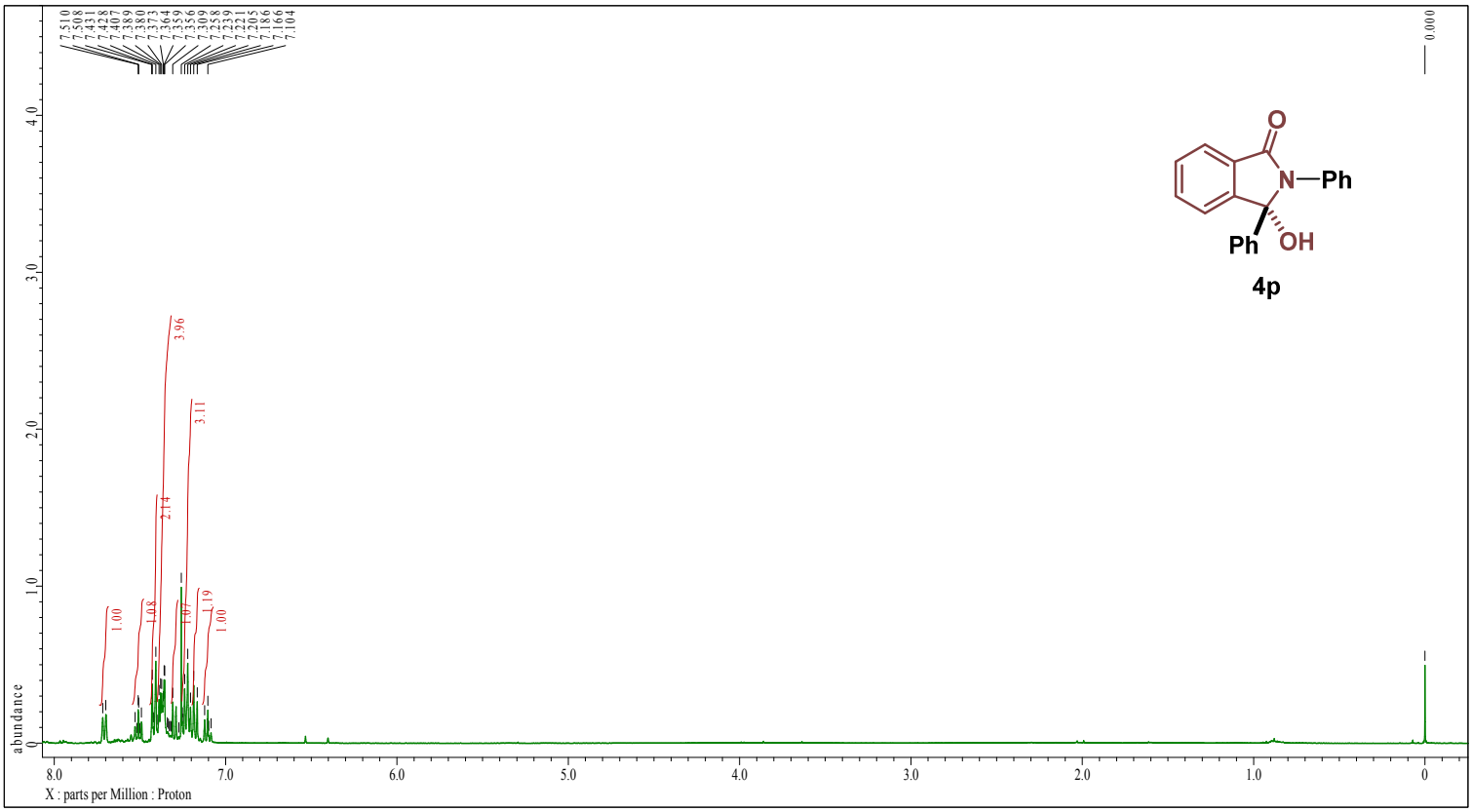
91.567
77.433
77.116
76.800
71.923
69.853
40.664
26.654
25.590
O
N—Ph
OH
O
Me
Me
O
4o
(thousandths)
X : parts per Million : Carbon13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7.431
7.428
7.407
7.389
7.380
7.373
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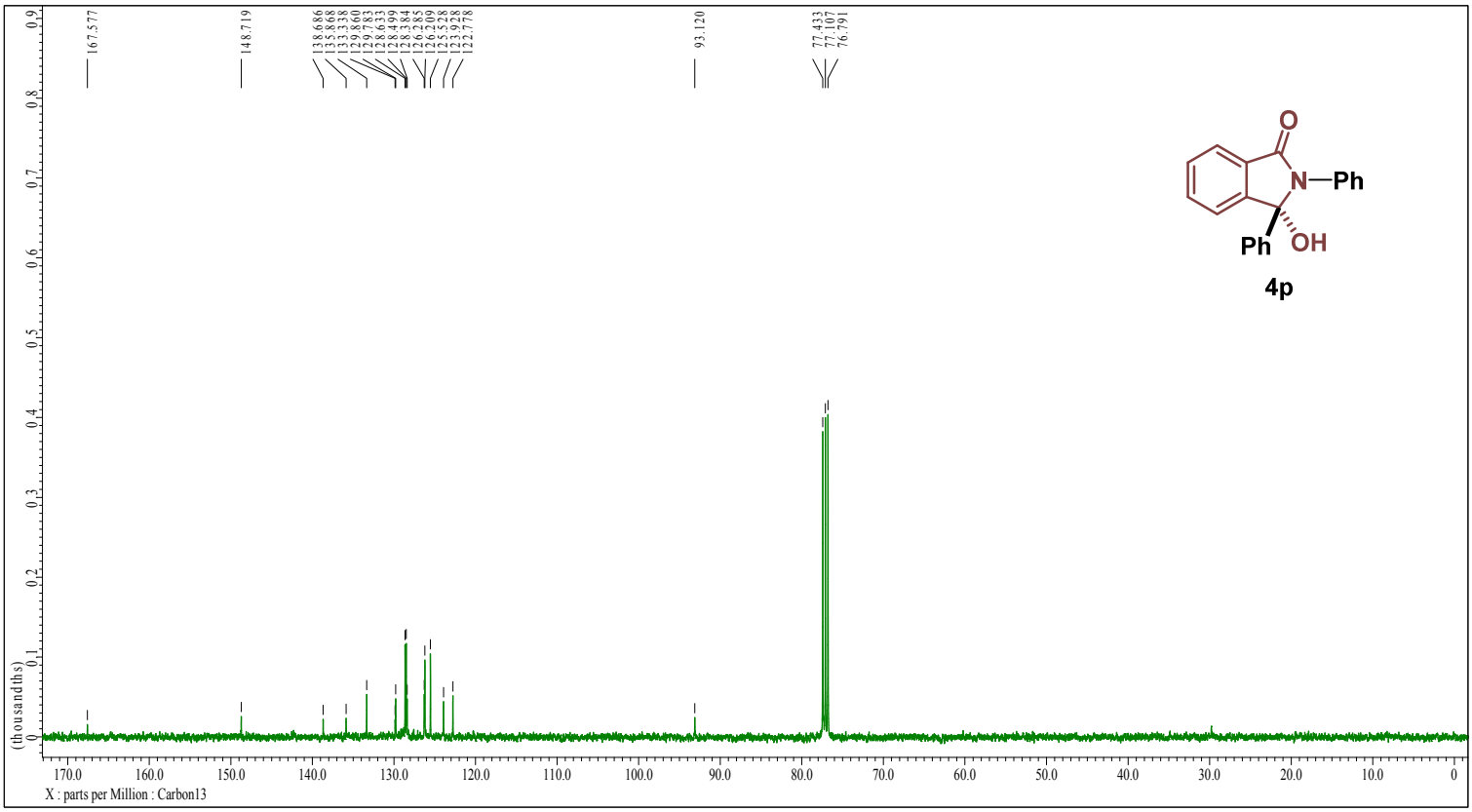
7.359
7.356
7.309
7.258
7.239
7.221
7.205
7.186
7.166
7.104
0.000
3.96
3.11
2.14
1.19
1.08
1.07
1.00
1.00
abundance
X : parts per Million : Proton
O
N—Ph
Ph
OH
4p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129.860
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128.633
128.499
128.384
126.285
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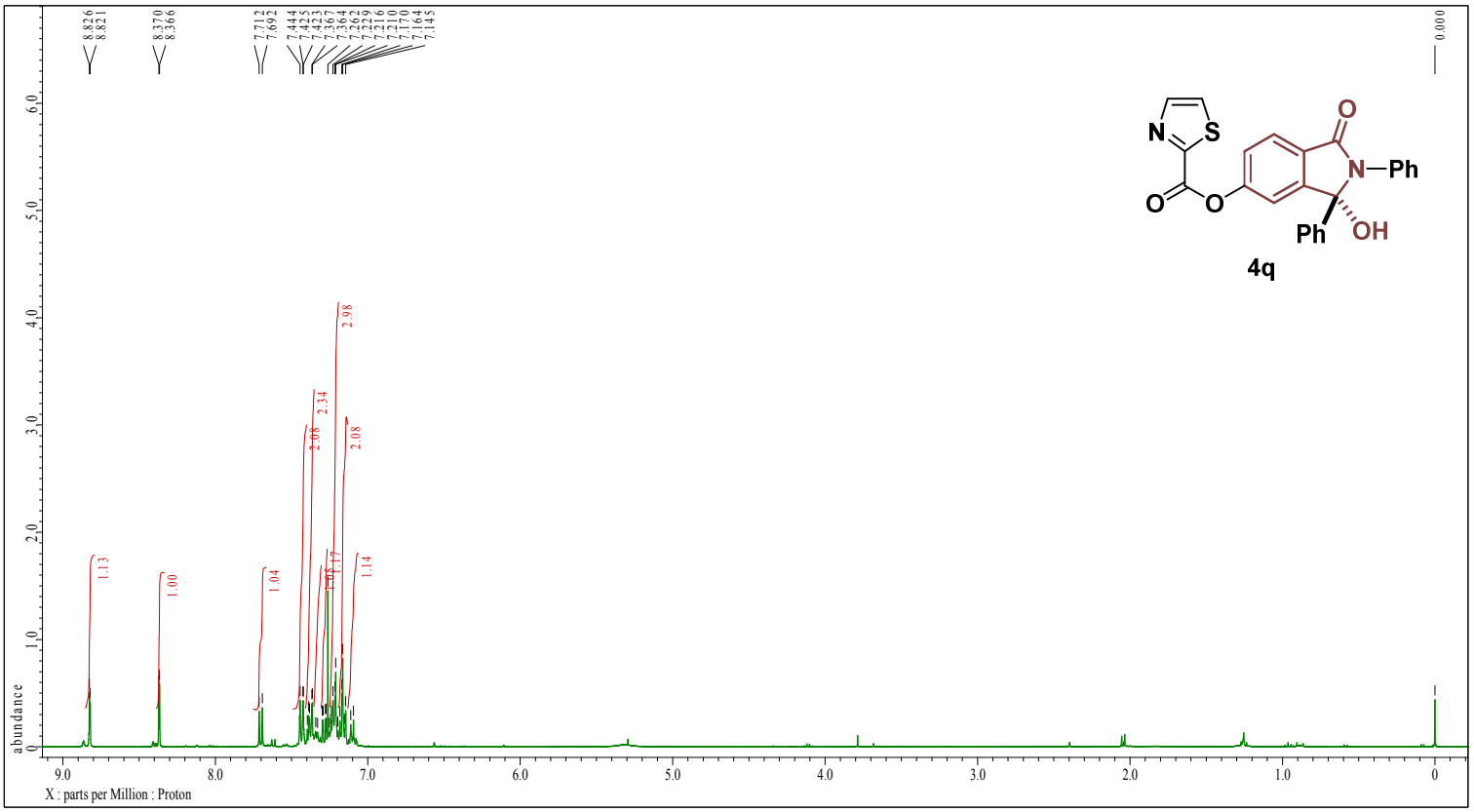
125.528
123.928
122.778
93.120
77.433
77.107
76.791
(thousandths)
X : parts per Million : Carbon13
O
N—Ph
Ph
OH
4p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8.366
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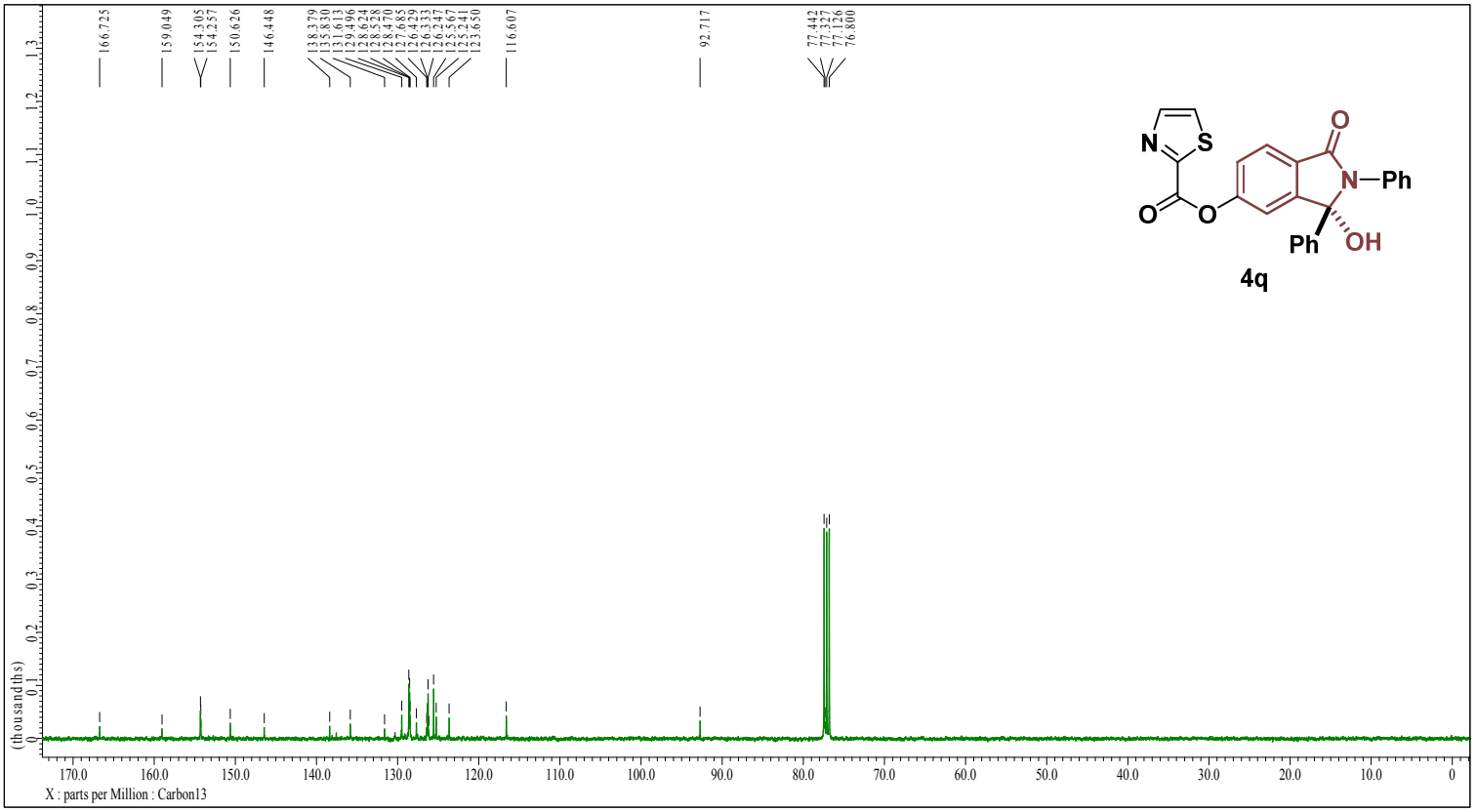
7.444
7.425
7.423
7.367
7.364
7.262
7.229
7.216
7.210
7.170
7.164
7.145
0.000
1.13
1.00
1.04
2.08
2.34
2.98
2.08
1.17
1.14
abundance
X : parts per Million : Proton
4q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154.257
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146.448
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135.830
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129.496
128.624
128.528
128.470
127.685
126.439
126.243
125.567
125.241
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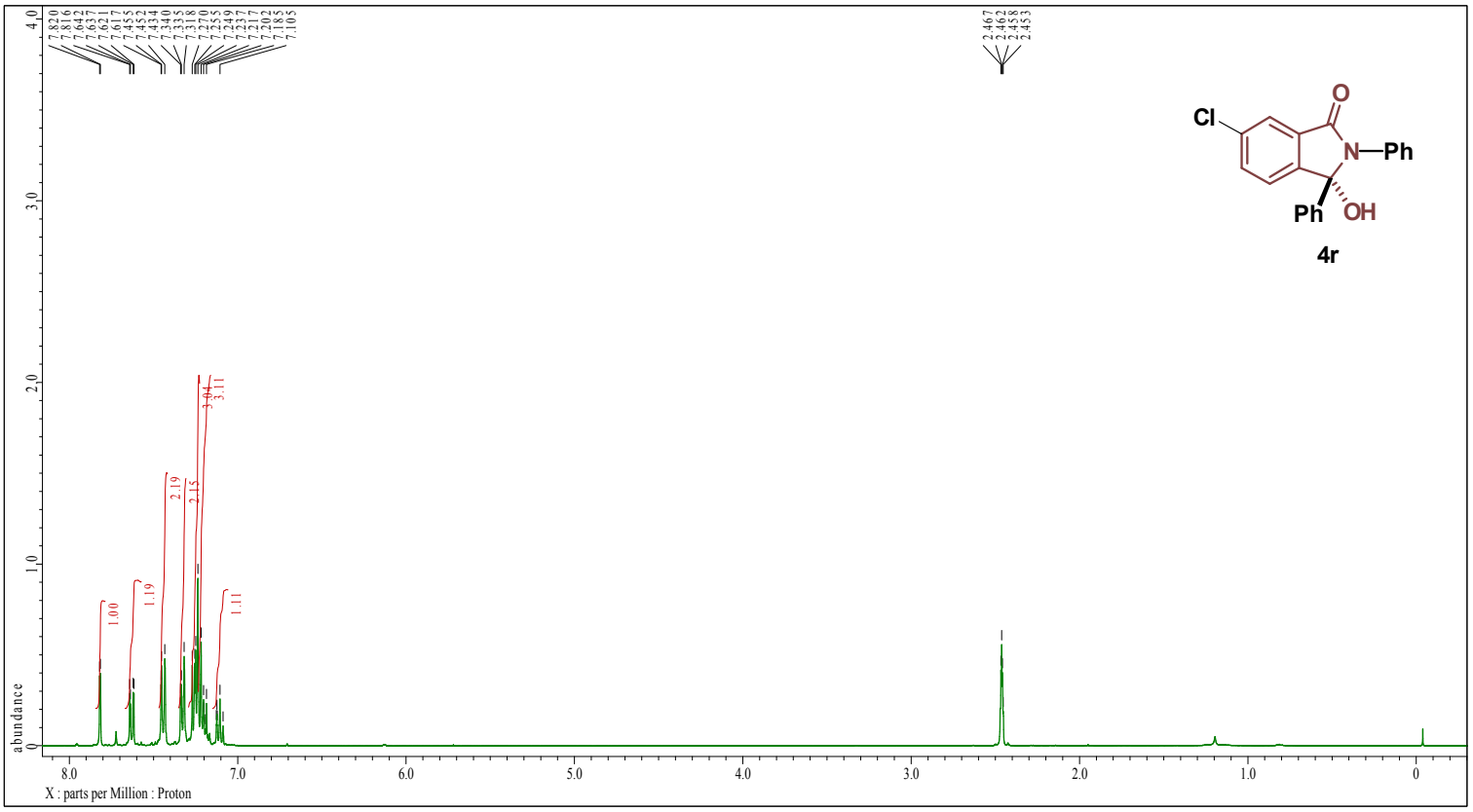
116.607
92.717
77.442
77.327
77.126
76.800
(thousandths)
X : parts per Million : Carbon13
4q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7.637
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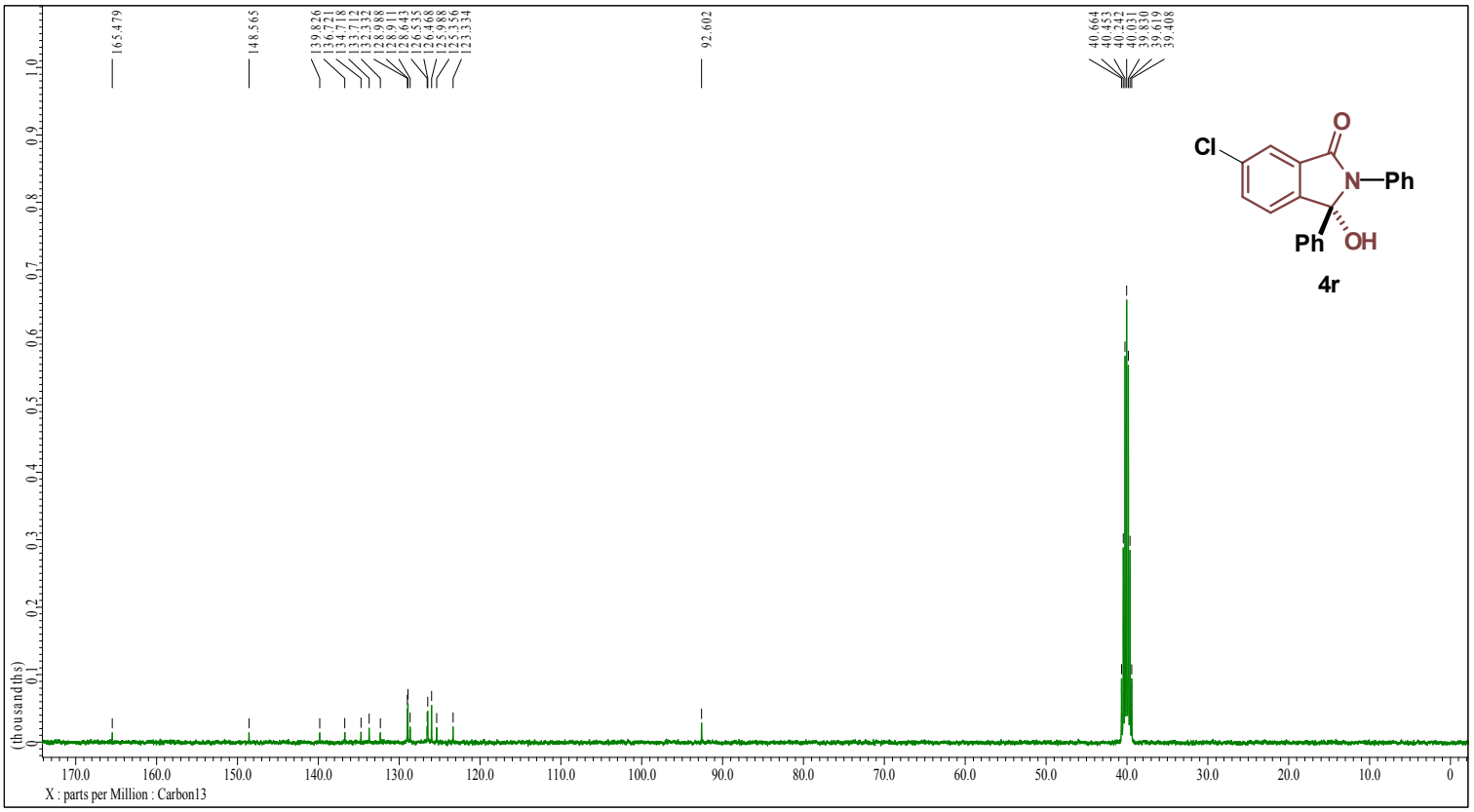
7.617
7.455
7.452
7.434
7.430
7.335
7.318
7.270
7.255
7.249
7.237
7.217
7.202
7.185
7.105
2.467
2.463
2.458
2.453
3.04
3.11
2.19
2.15
1.00
1.19
1.11
abundance
X : parts per Million : Proton
Cl
O
N—Ph
Ph
OH
4r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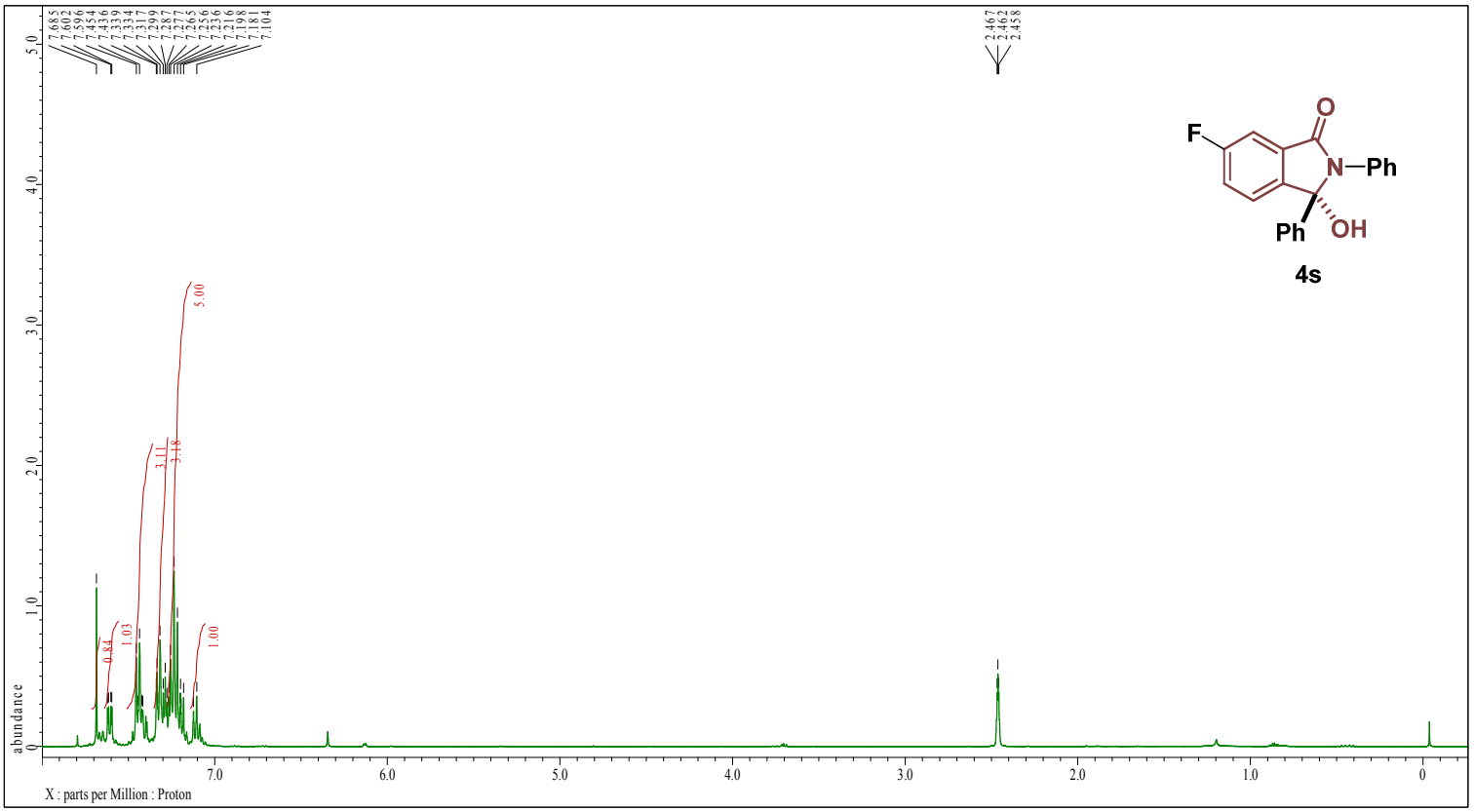
136.721
134.718
133.712
132.332
128.988
128.911
128.643
126.535
126.468
125.988
125.356
123.334
92.602
40.664
40.453
40.242
40.031
39.830
39.619
39.408
(thousandths)
X : parts per Million : Carbon13
Cl
O
N—Ph
Ph
OH
4r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7.454
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7.334
7.317
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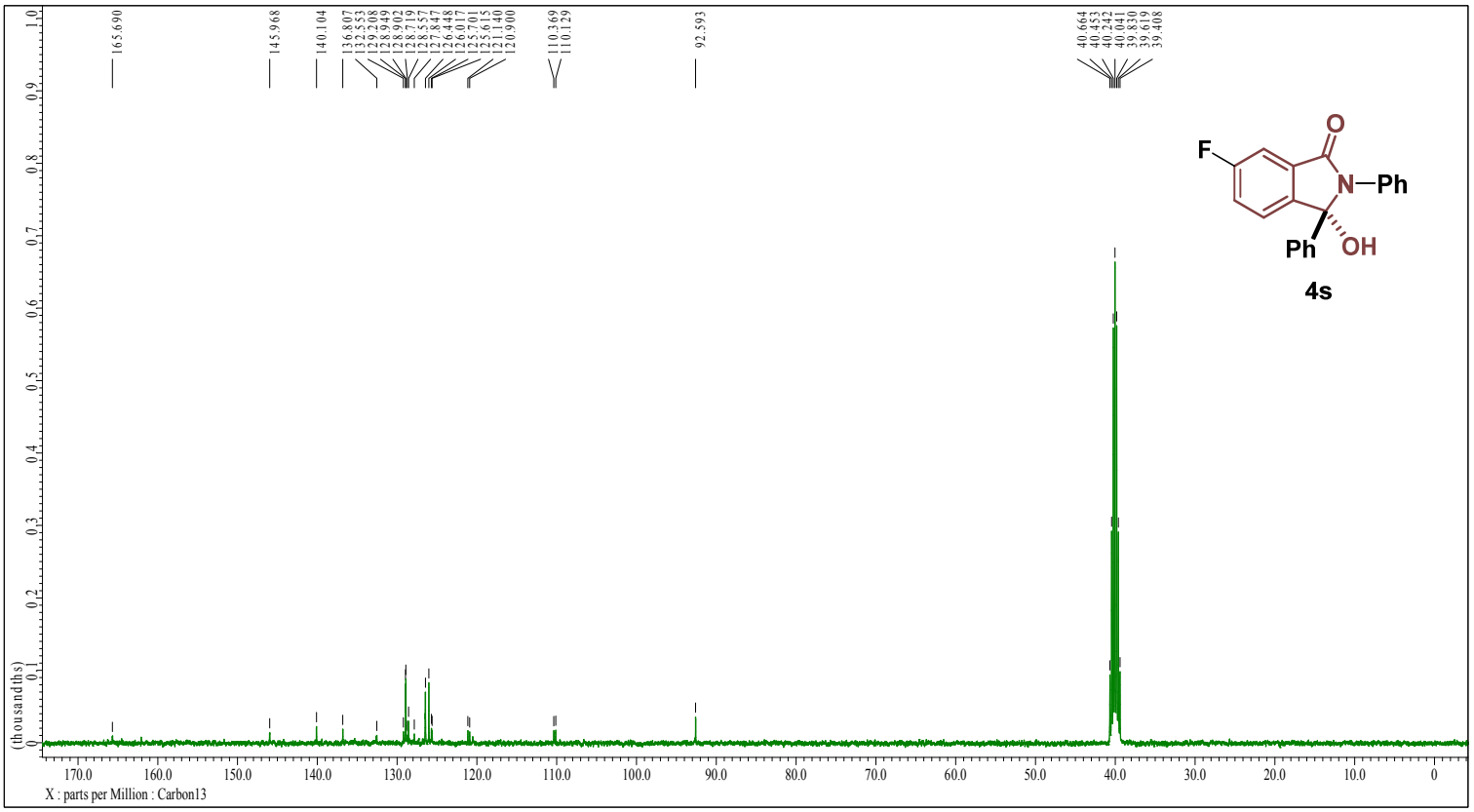
7.297
7.277
7.265
7.256
7.236
7.216
7.198
7.181
7.104
2.467
2.462
2.458
5.00
3.11
3.18
0.84
1.03
1.00
abundance
X : parts per Million : Proton
F
O
N—Ph
Ph
OH
4s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128.910
128.710
128.557
127.847
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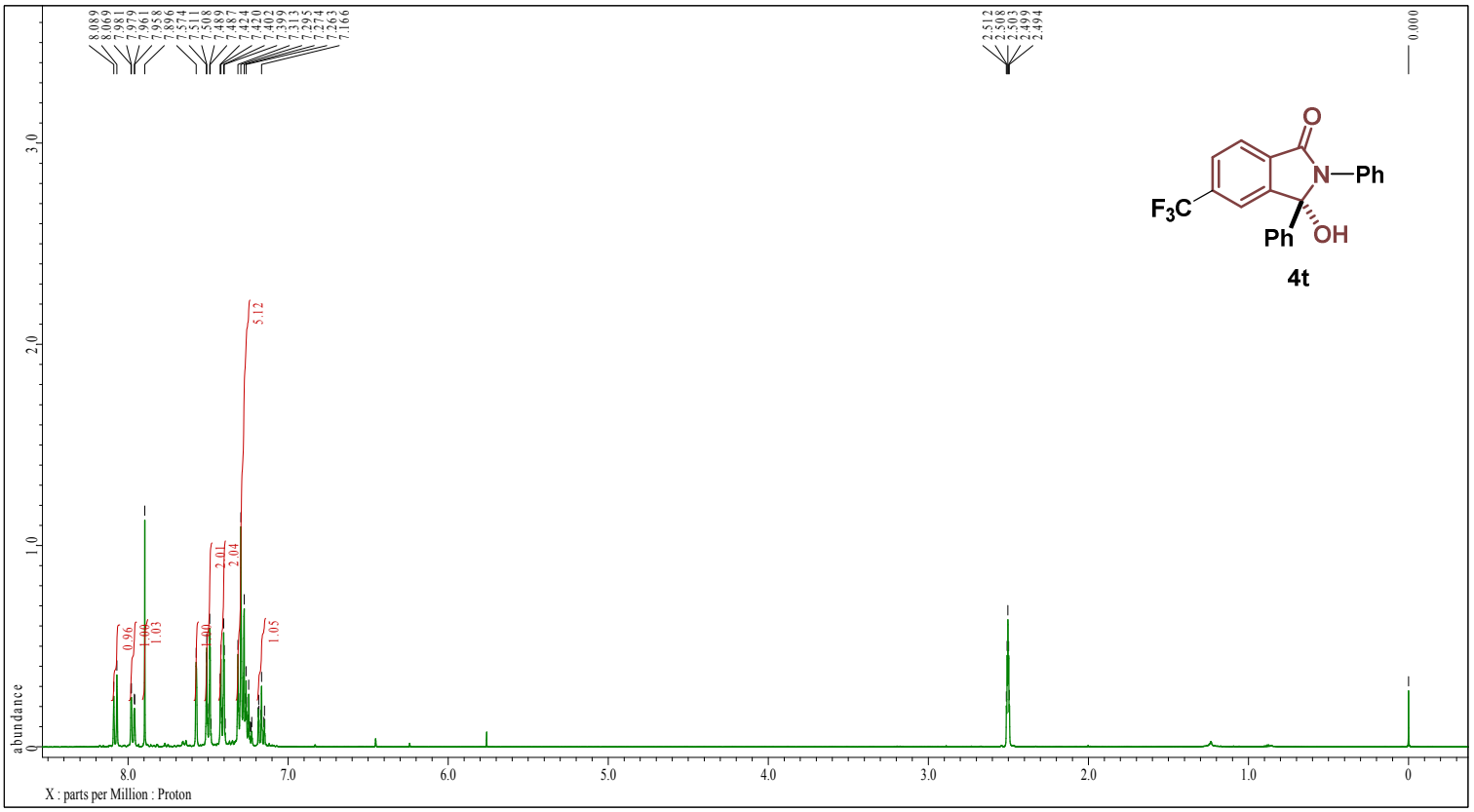
125.701
125.615
121.140
120.900
110.369
110.129
92.593
40.664
40.453
40.243
40.041
39.830
39.619
39.408
(thousandths)
X : parts per Million : Carbon13
F
O
N—Ph
Ph
OH
4s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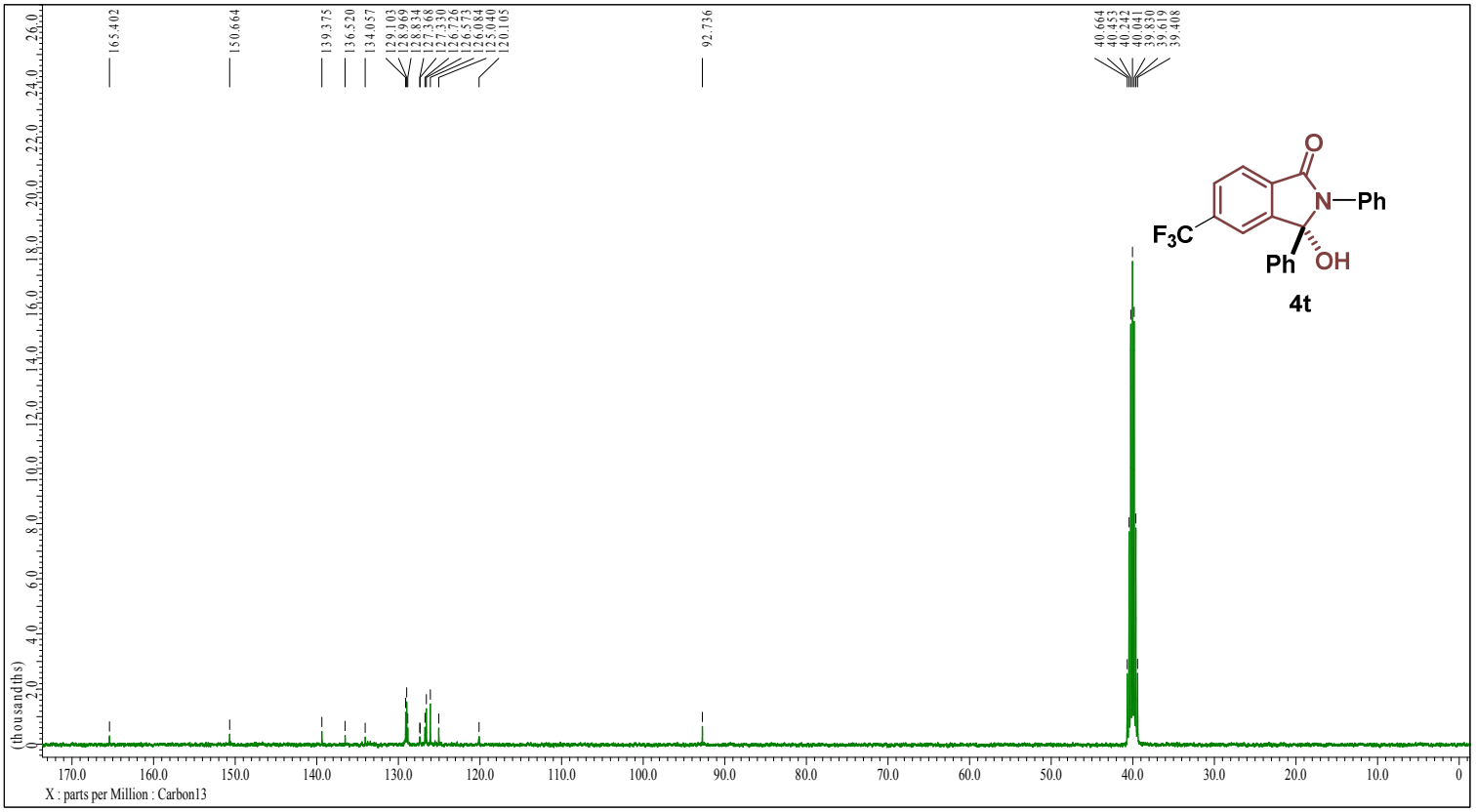
7.958
7.896
7.574
7.511
7.508
7.489
7.487
7.424
7.420
7.402
7.399
7.313
7.295
7.274
7.263
7.166
2.512
2.508
2.503
2.499
2.494
0.000
5.12
2.01
2.04
0.96
1.00
1.08
1.03
1.05
abundance
X : parts per Million : Proton
O
N—Ph
F3C
Ph
OH
4t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139.375
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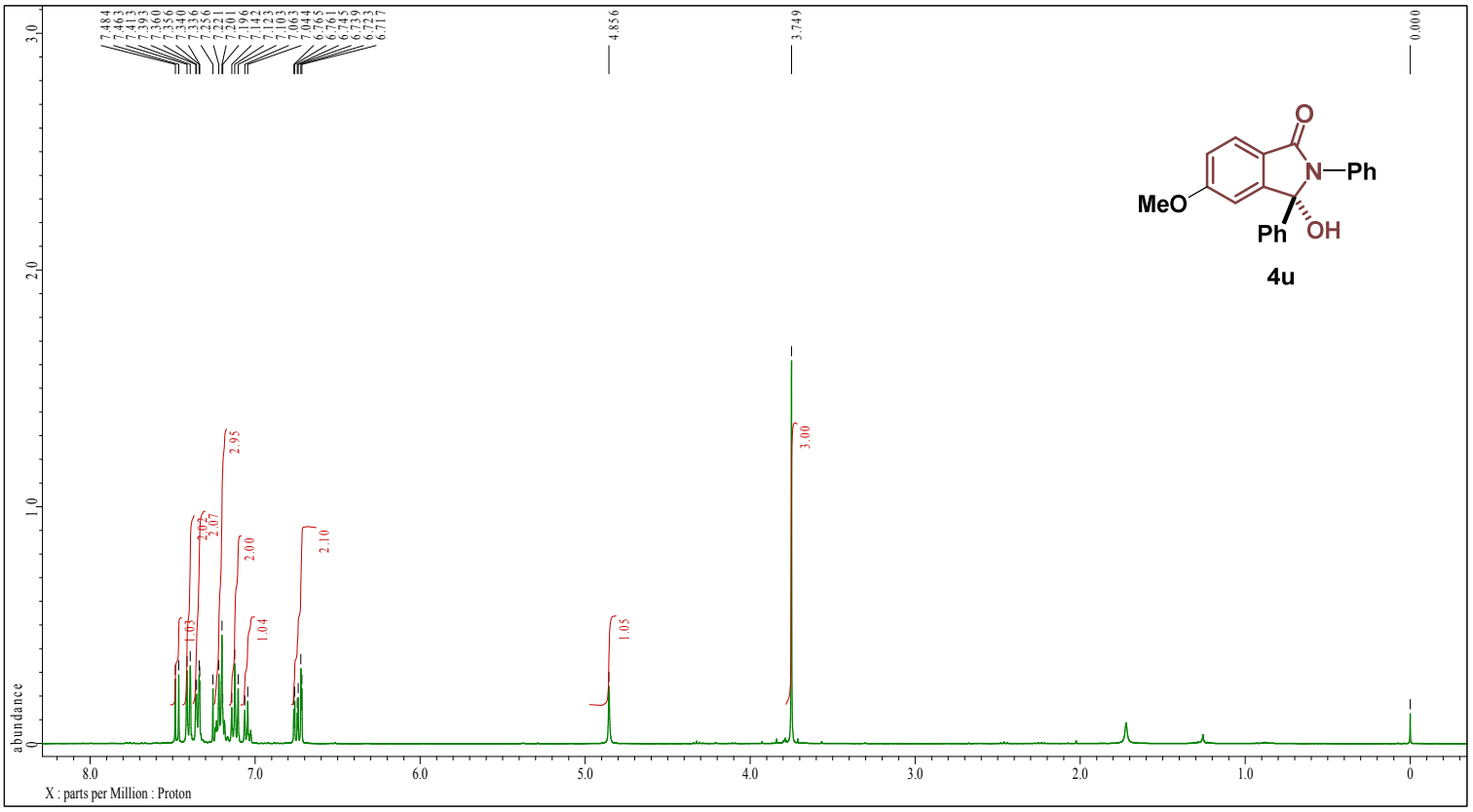
134.057
129.103
128.969
128.834
127.368
127.330
126.576
126.084
125.040
120.105
92.736
40.664
40.453
40.242
40.031
39.831
39.619
39.408
(thousandths)
X : parts per Million : Carbon13
O
N—Ph
F3C
Ph
OH
4t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7.413
7.393
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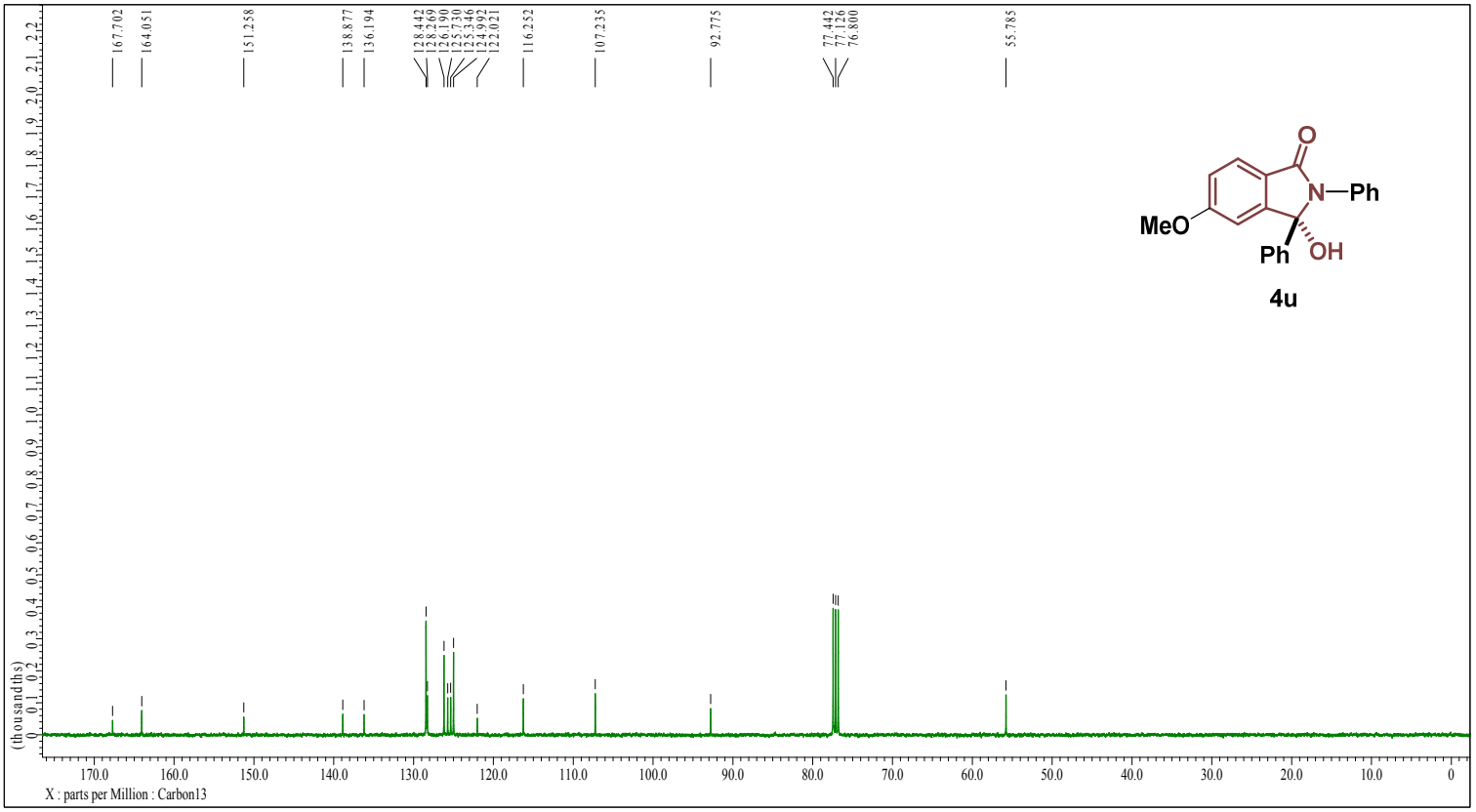
7.356
7.340
7.336
7.256
7.221
7.201
7.196
7.142
7.123
7.103
7.063
7.044
6.765
6.761
6.745
6.739
6.723
6.717
4.856
3.749
0.000
2.95
2.02
2.07
2.00
2.10
1.03
1.04
1.05
3.00
abundance
X : parts per Million : Proton
MeO
Ph
N—Ph
OH
O
4u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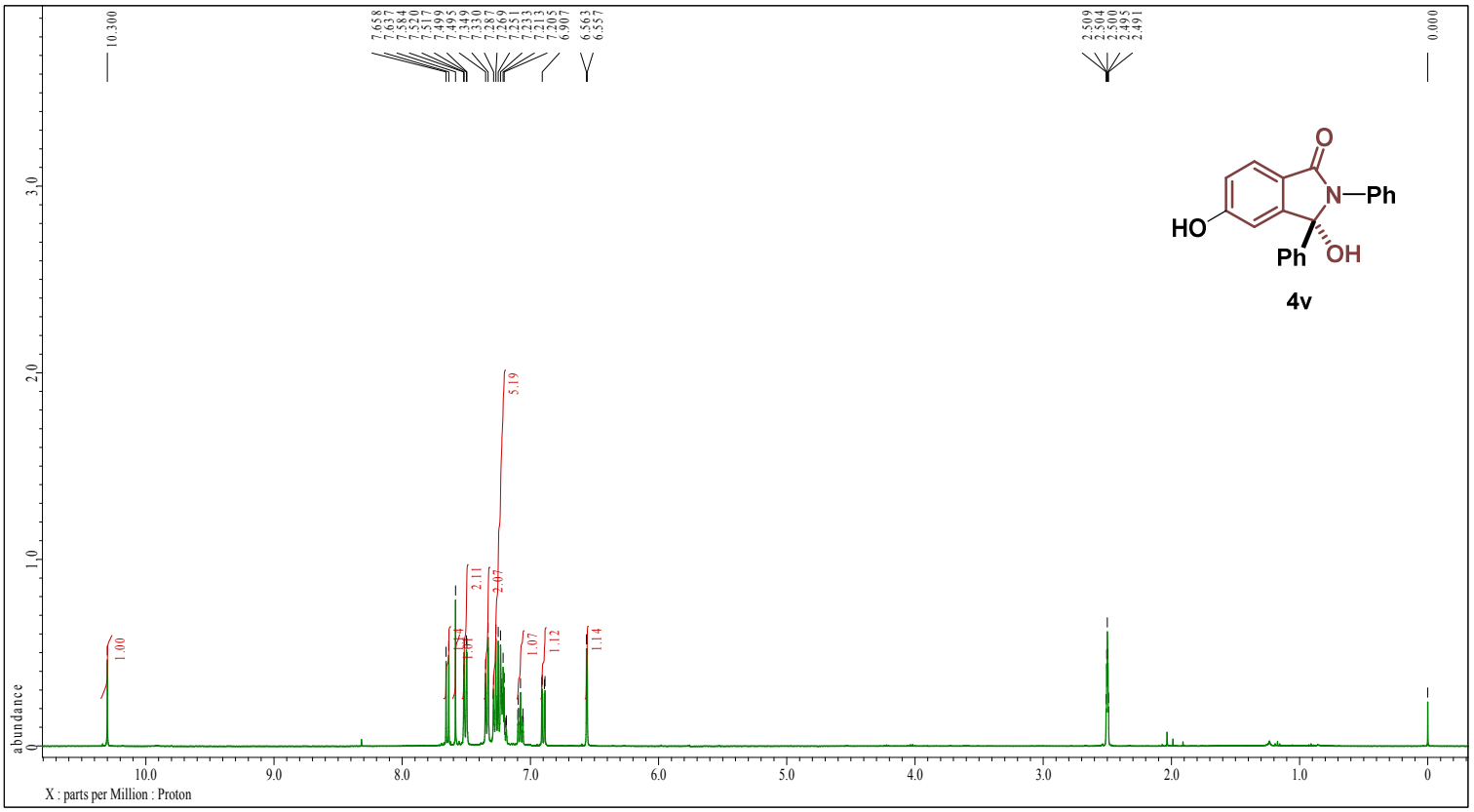
151.258
138.877
136.194
128.442
128.269
126.190
125.730
125.346
114.992
112.021
116.252
107.235
92.775
77.442
77.126
76.800
55.785
(thousandths)
X : parts per Million : Carbon13
MeO
Ph
N—Ph
OH
O
4u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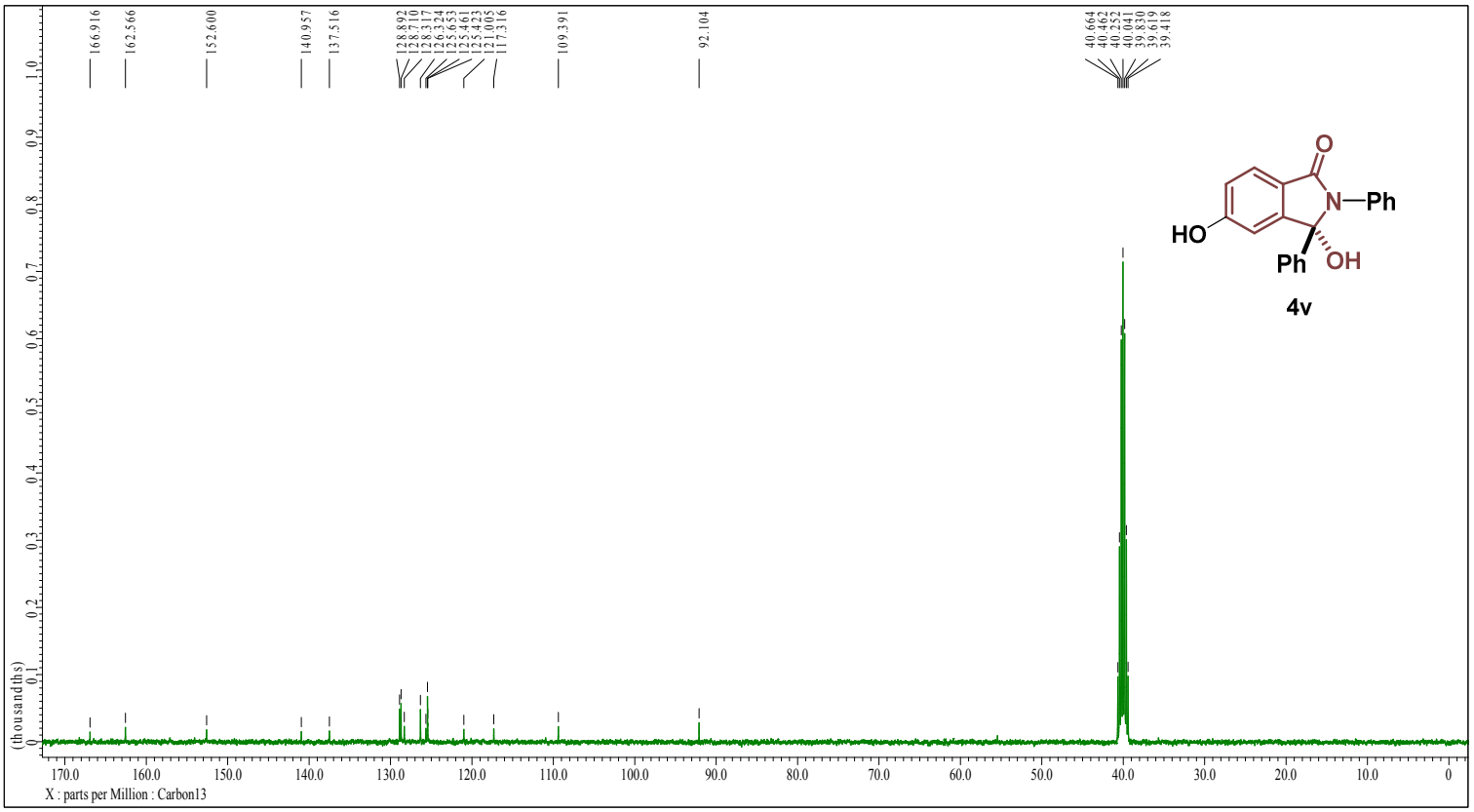
7.637
7.584
7.520
7.517
7.509
7.495
7.349
7.330
7.287
7.269
7.251
7.233
7.213
7.205
6.907
6.563
6.557
2.509
2.504
2.500
2.495
2.491
0.000
O
N—Ph
HO
Ph
OH
4v
5.19
2.11
2.07
1.00
1.07
1.07
1.12
1.14
abundance
X : parts per Million : Proton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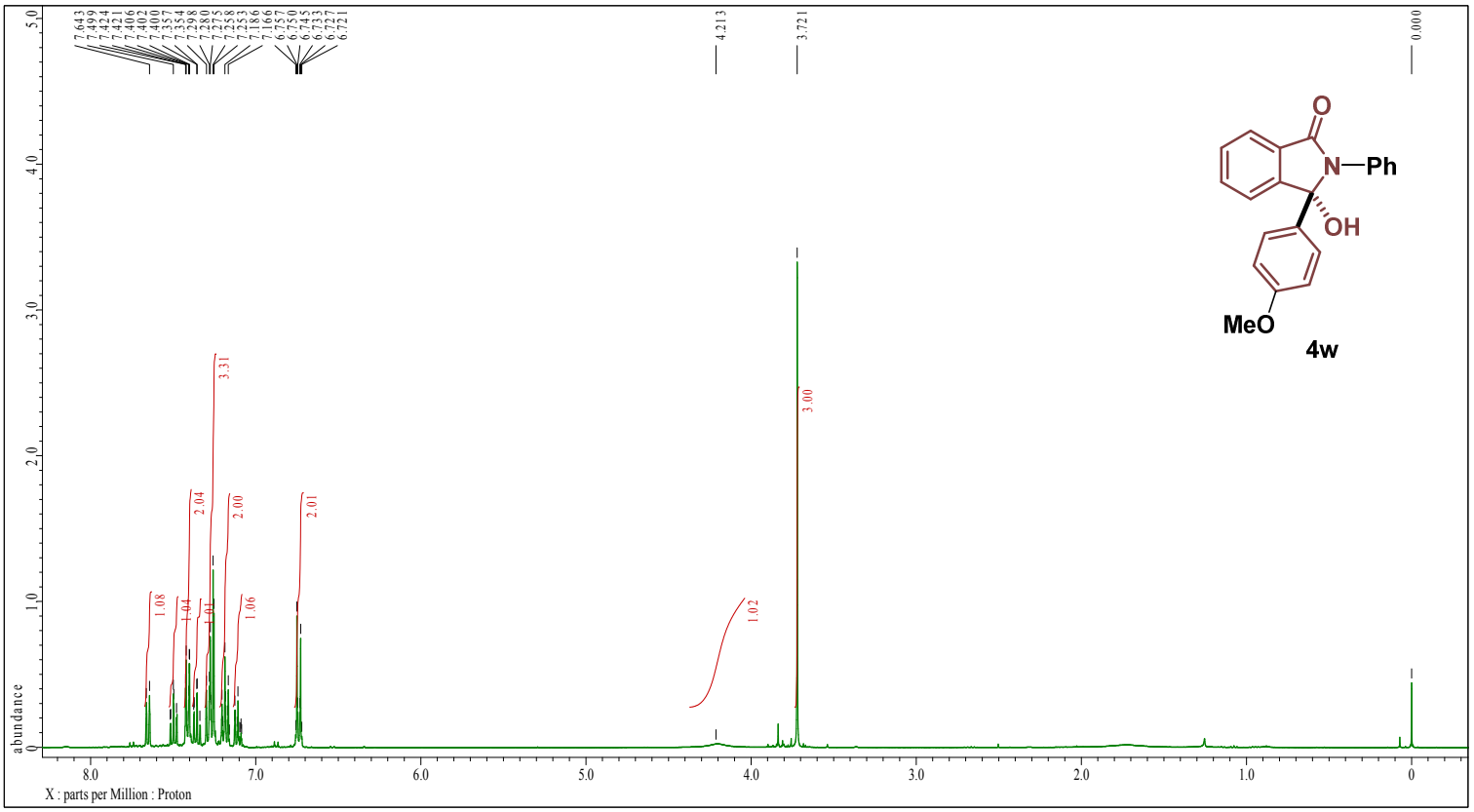
162.566
152.600
140.957
137.516
128.892
128.710
128.317
128.134
125.653
125.461
125.423
121.005
117.316
109.391
92.104
40.664
40.462
40.252
40.041
39.830
39.619
39.418
O
N—Ph
HO
Ph
OH
4v
(thousandths)
X : parts per Million : Carbon13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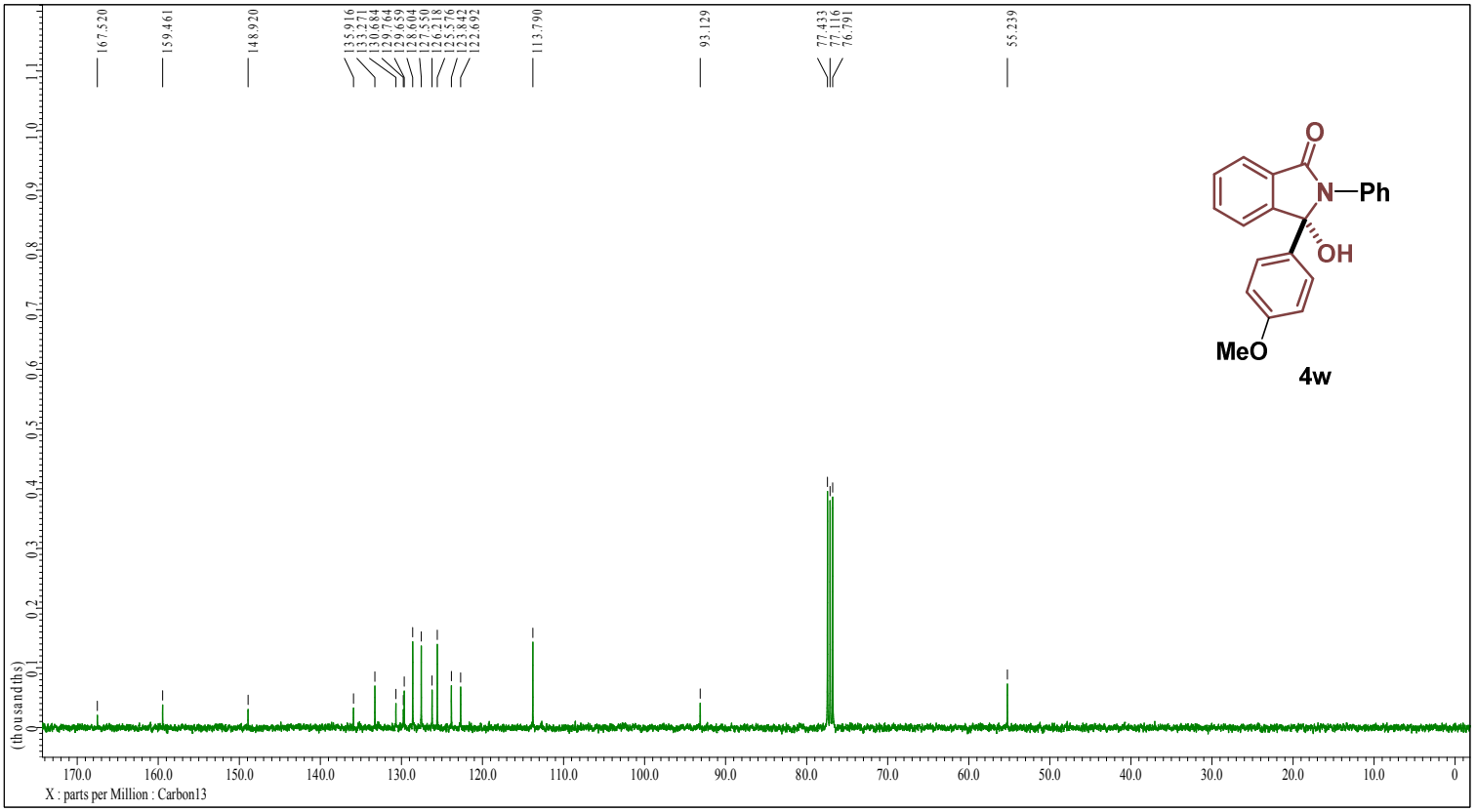
7.421
7.406
7.402
7.400
7.357
7.354
7.298
7.280
7.275
7.258
7.253
7.186
7.166
6.757
6.750
6.745
6.733
6.727
6.721
4.213
3.721
0.000
3.31
2.04
2.00
2.01
1.08
1.04
1.01
1.06
1.02
3.00
O
N—Ph
OH
MeO
4w
abundance
X : parts per Million : Proton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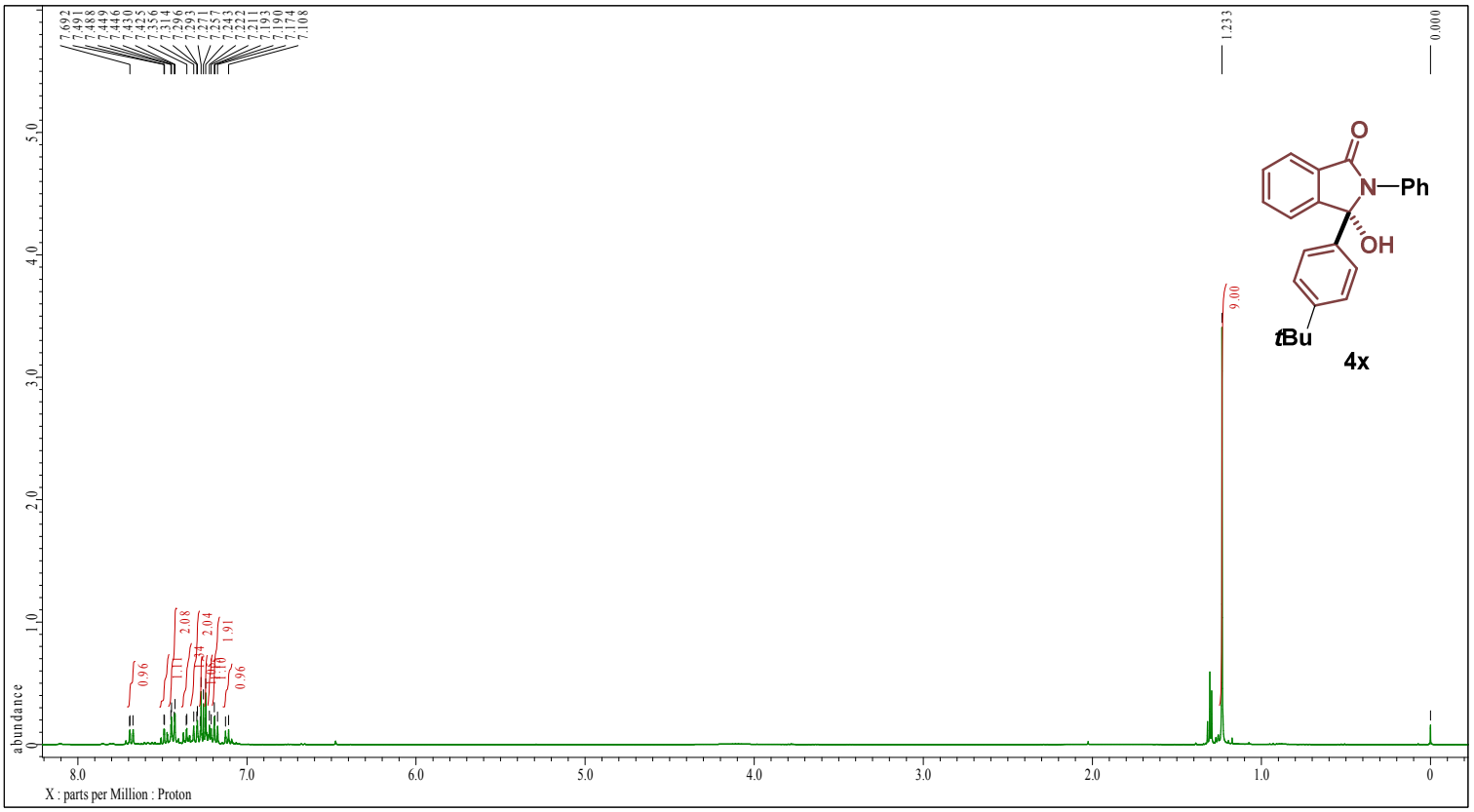
133.271
130.684
129.764
128.659
128.604
127.550
126.218
125.576
123.842
122.692
113.790
93.129
77.433
77.116
76.791
55.239
O
N—Ph
OH
MeO
4w
(thousandths)
X : parts per Million : Carbon13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7.488
7.449
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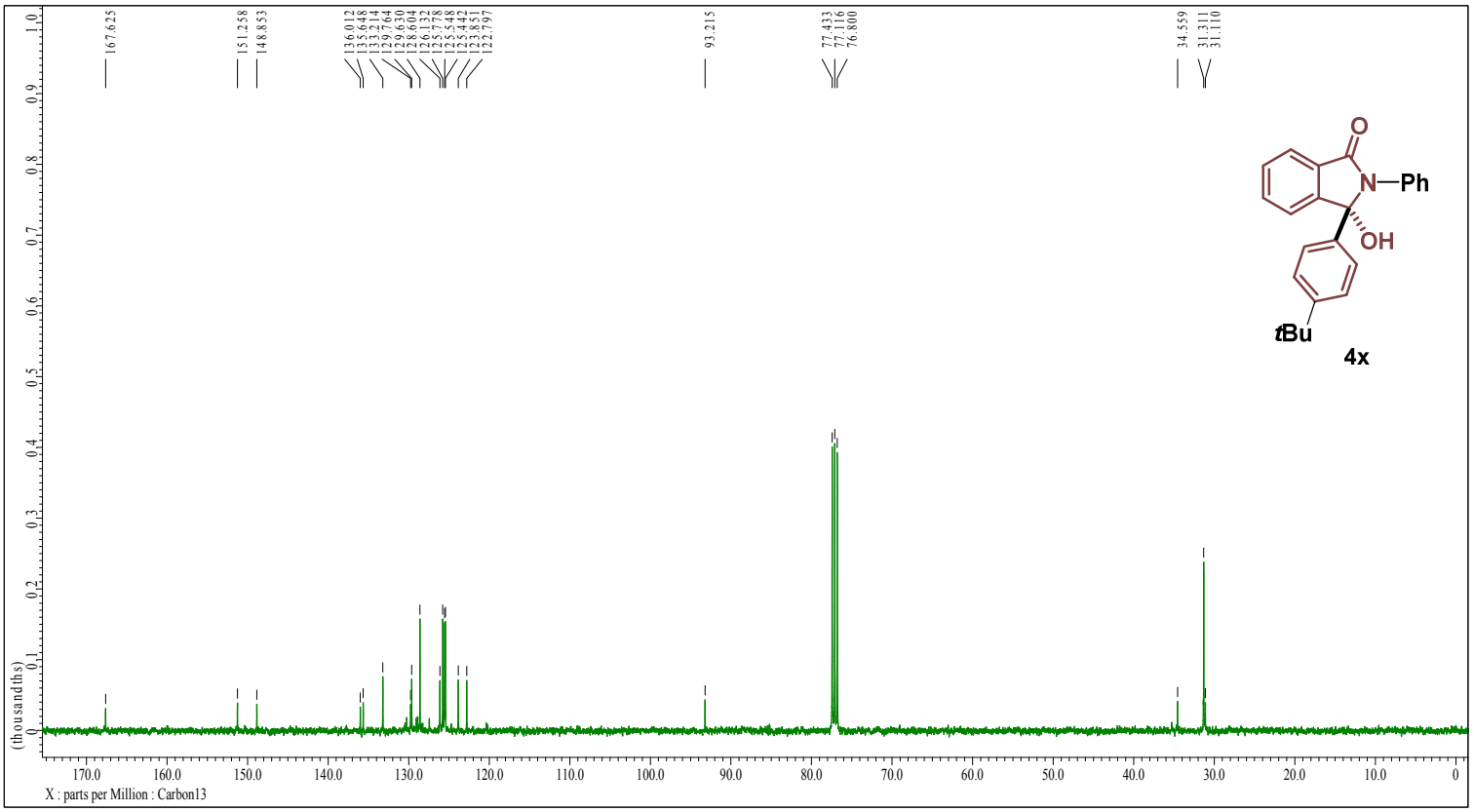
7.430
7.425
7.316
7.314
7.296
7.293
7.271
7.257
7.243
7.222
7.211
7.193
7.190
7.174
7.108
1.233
0.000
9.00
2.08
2.04
1.91
0.96
0.96
O
N—Ph
OH
tBu
4x
abundance
X : parts per Million : Proton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129.764
129.630
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126.173
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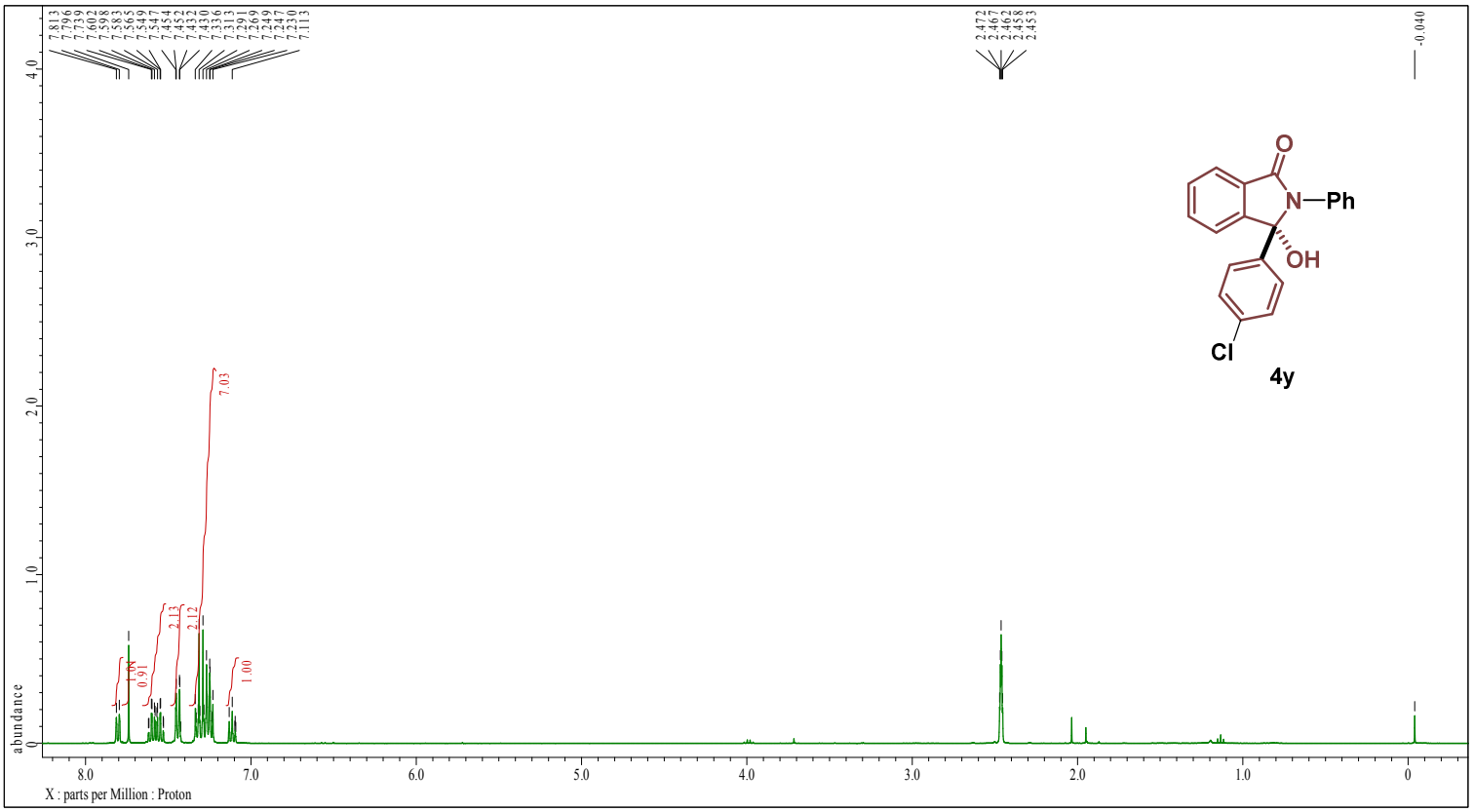
125.548
125.442
123.851
122.797
93.215
77.433
77.116
76.800
34.559
31.311
31.110
O
N—Ph
OH
tBu
4x
(thousandths)
X : parts per Million : Carbon13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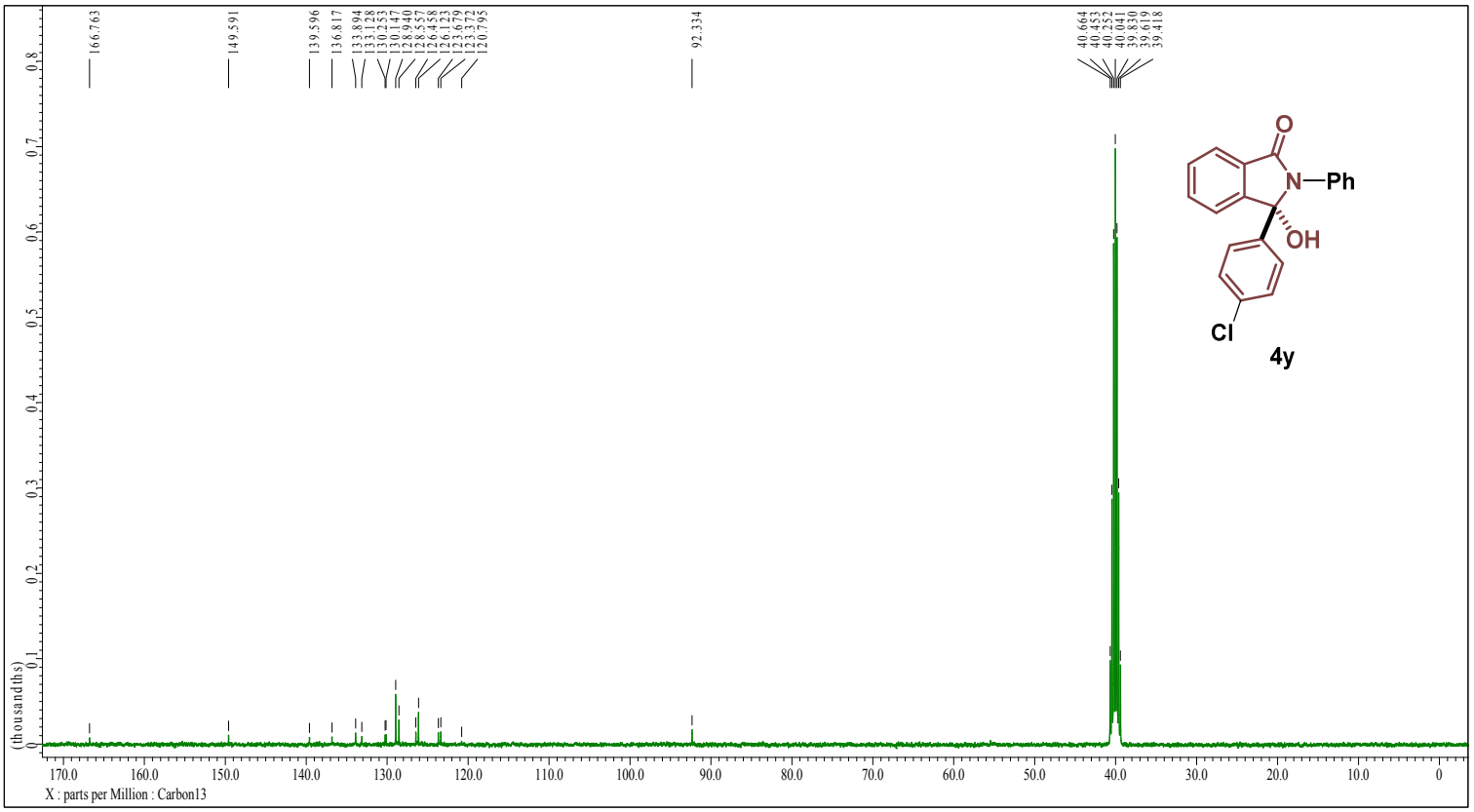
7.602
7.598
7.583
7.565
7.549
7.547
7.454
7.452
7.432
7.430
7.336
7.313
7.291
7.269
7.249
7.247
7.230
7.113
2.472
2.467
2.462
2.458
2.453
-0.040
7.03
2.13
2.12
1.00
1.06
0.91
abundance
X : parts per Million : Proton
O
N—Ph
OH
Cl
4y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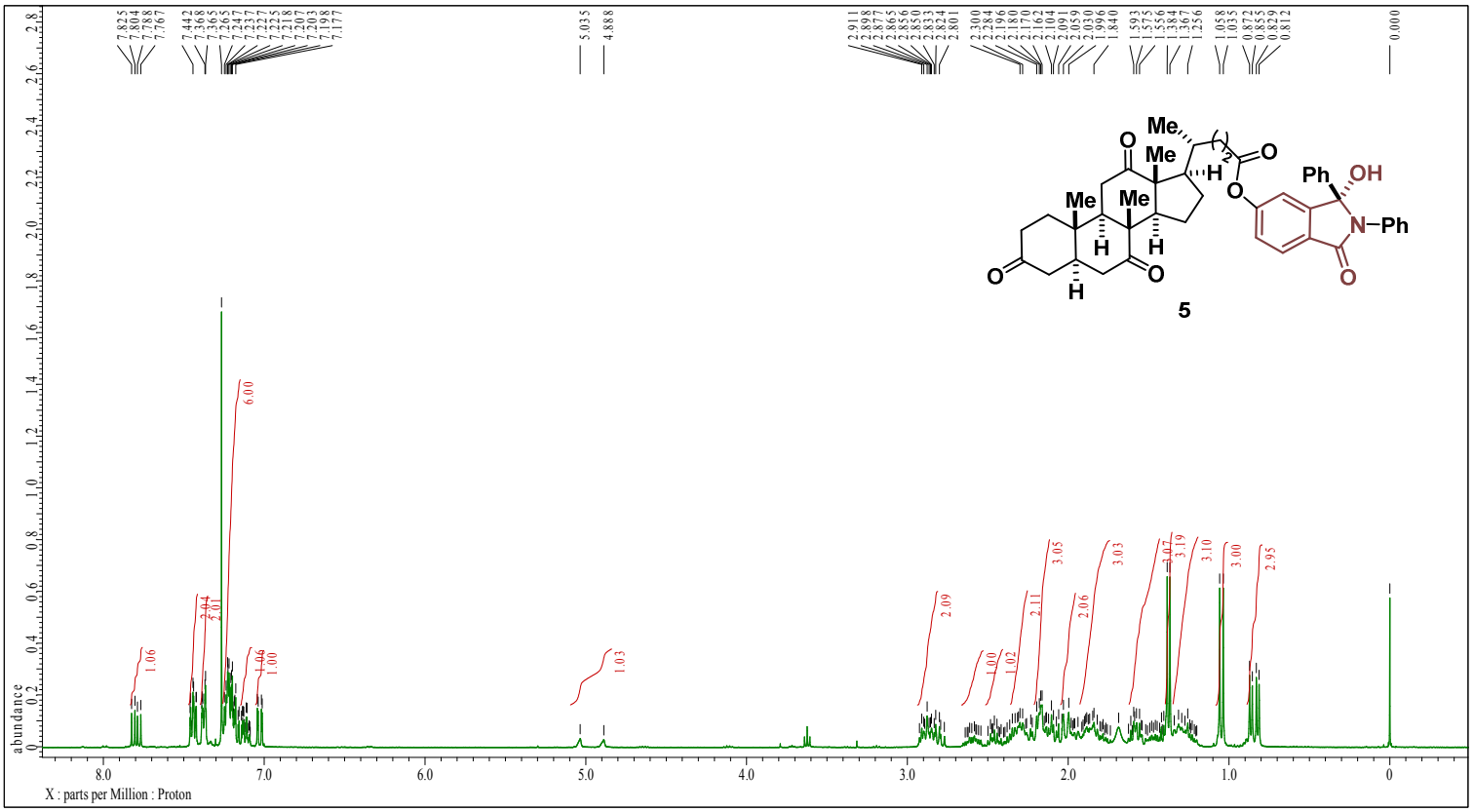
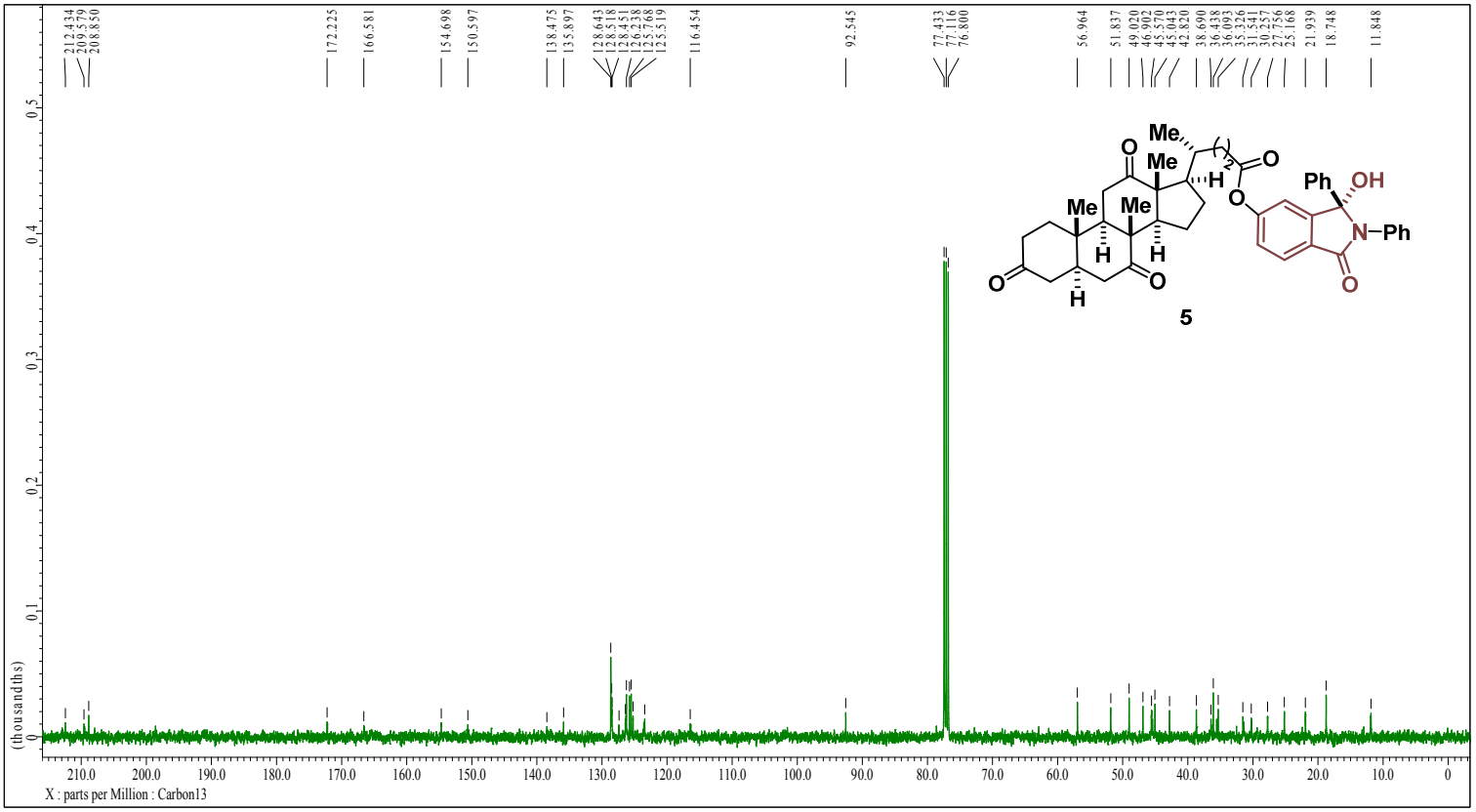
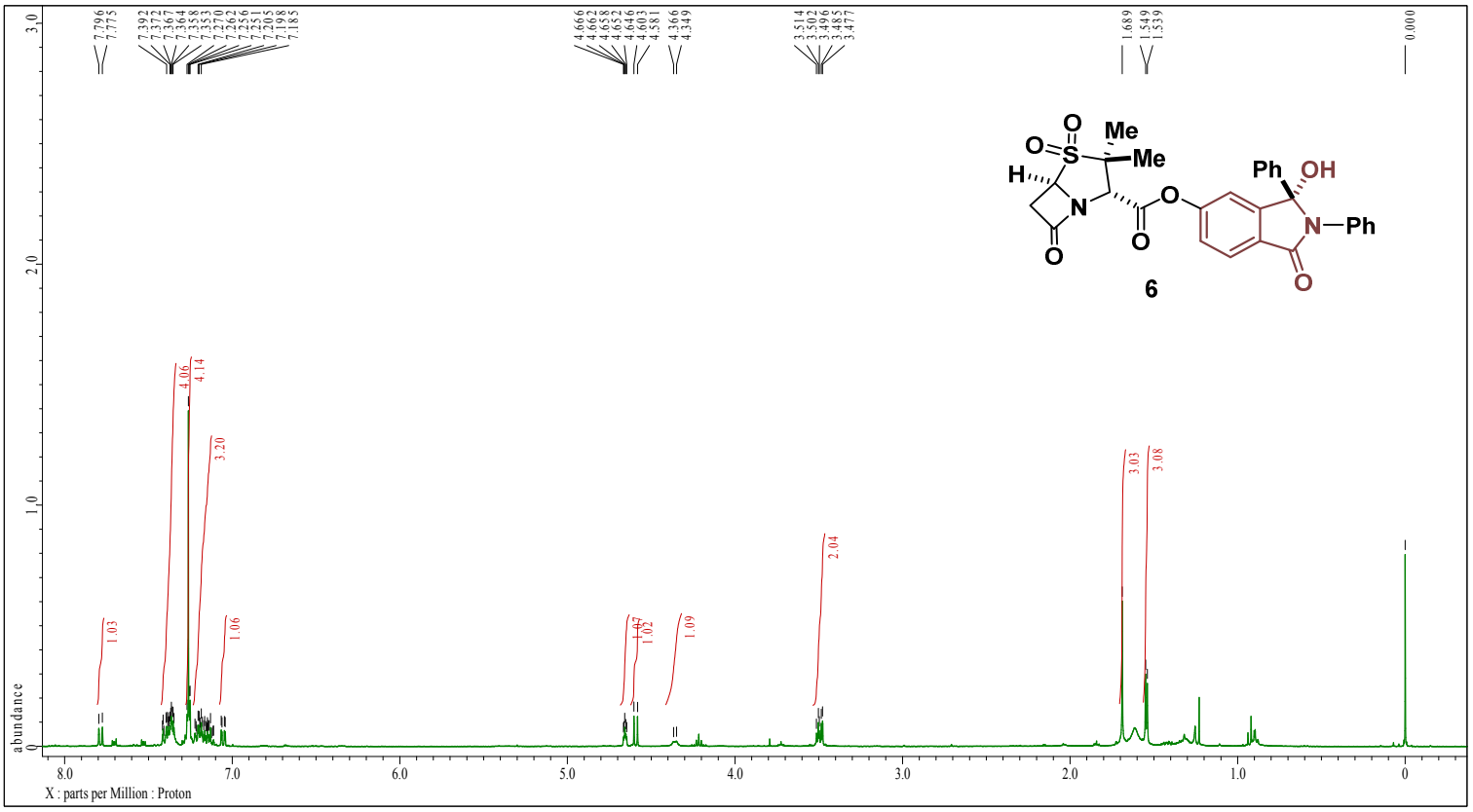
136.817
133.894
133.128
130.253
130.147
128.940
128.557
126.458
126.123
123.679
123.372
120.795
92.334
40.664
40.453
40.251
40.041
39.830
39.619
39.418
(thousandths)
X : parts per Million : Carbon13
O
N—Ph
OH
Cl
4y


X : parts per Million : Proton
abundance
5


X : parts per Million : Carbon13
(thousandths)
5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7.358
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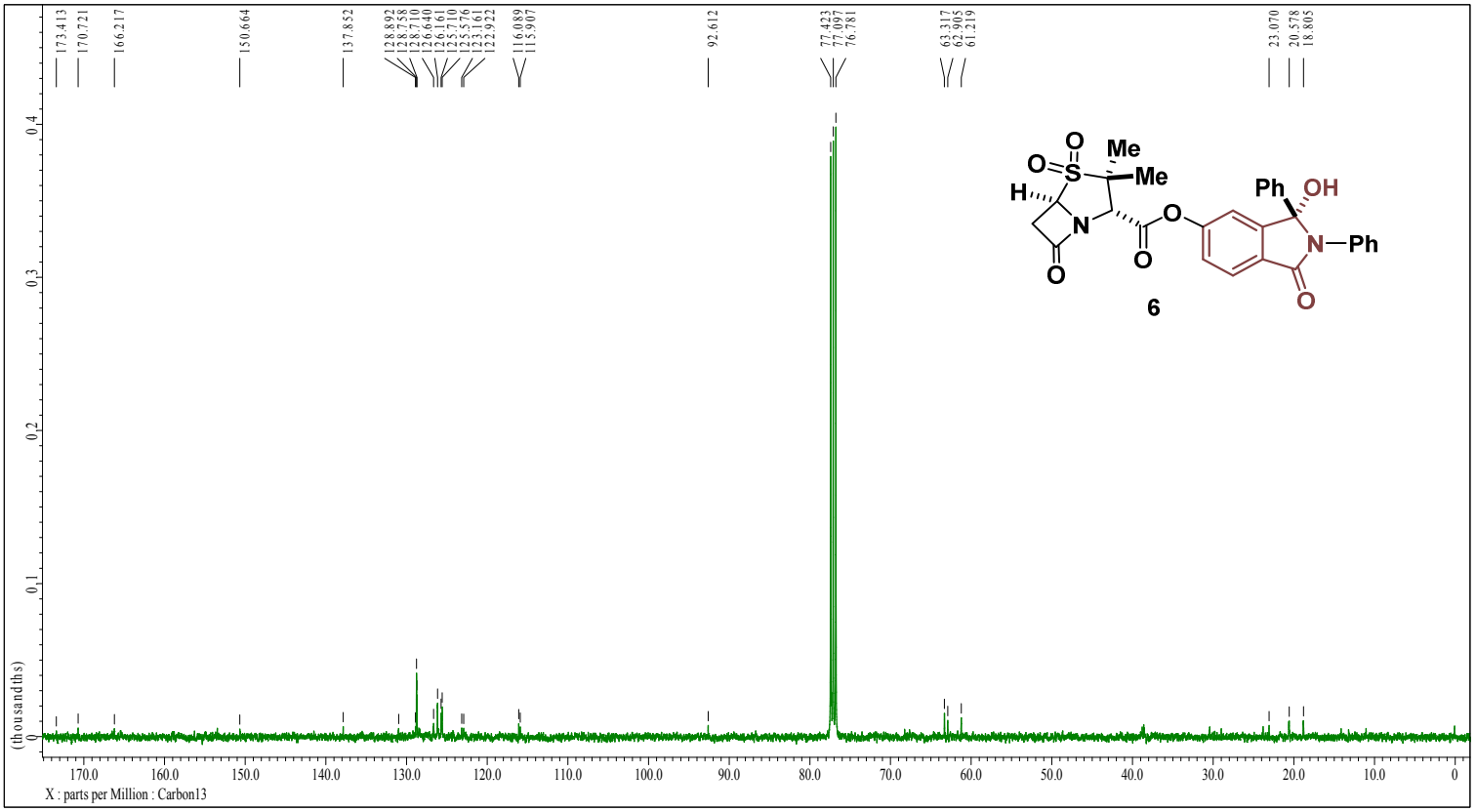
7.262
7.256
7.251
7.205
7.198
7.185
4.666
4.662
4.658
4.654
4.646
4.603
4.581
4.366
4.349
3.514
3.502
3.496
3.485
3.477
1.689
1.549
1.539
0.000
Me
Me
O
S
H
N
O
O
O
O
Ph
OH
N
Ph
O
6
4.06
4.14
3.20
1.03
1.06
1.07
1.02
1.09
2.04
3.03
3.08
abundance
X : parts per Million : Proton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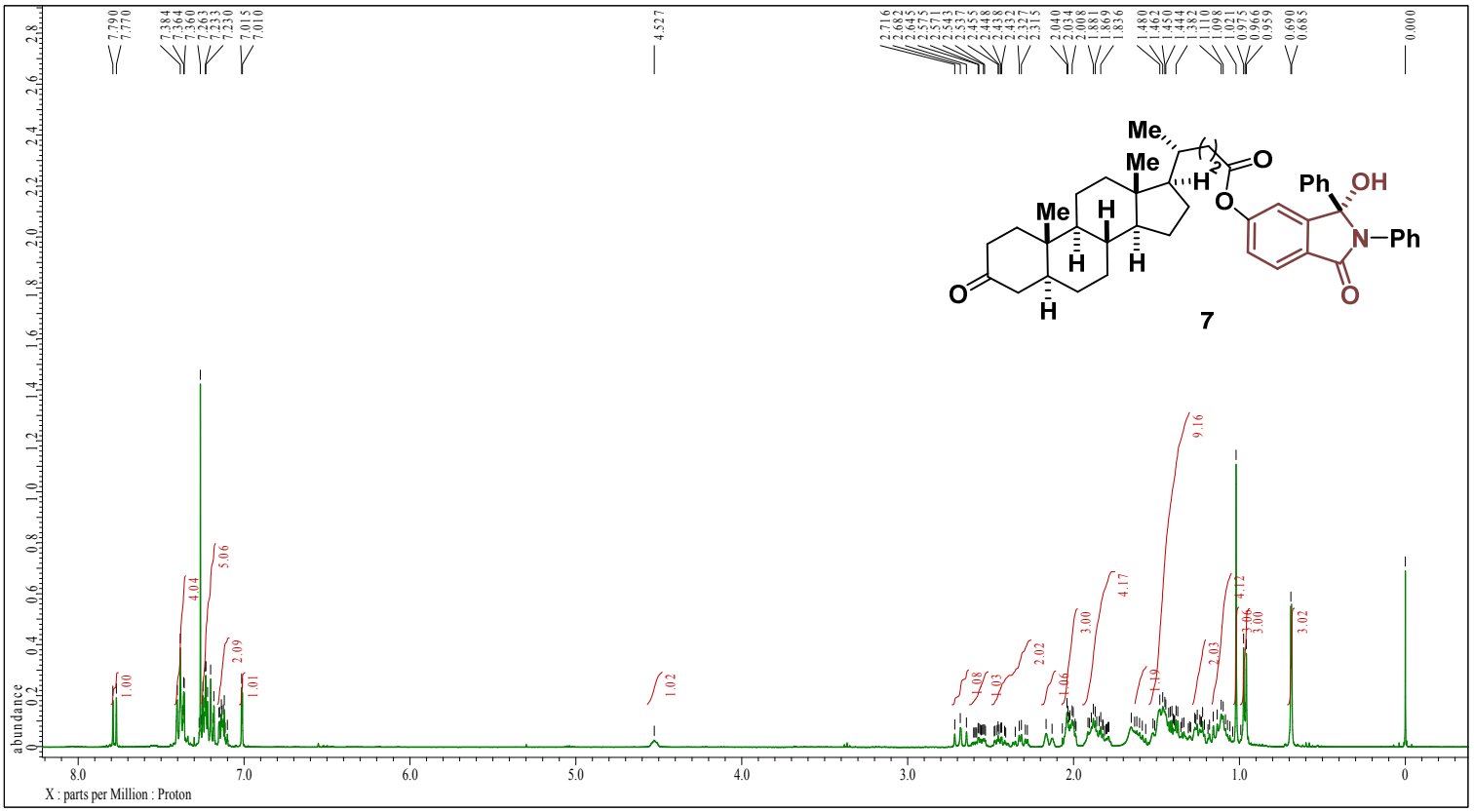
126.161
125.710
125.576
123.161
122.922
116.089
115.907
92.612
77.423
77.097
76.781
63.317
62.905
61.219
23.070
20.578
18.805
Me
Me
O
S
H
N
O
O
O
O
Ph
OH
N
Ph
O
6
(thousandths)
X : parts per Million : Carbon13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2.682
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2.575
2.571
2.543
2.537
2.455
2.448
2.438
2.432
2.327
2.315
2.040
2.034
2.008
1.881
1.869
1.836
1.480
1.462
1.450
1.444
1.362
1.110
1.108
1.021
0.975
0.966
0.959
0.690
0.685
0.000
Me
Me
H
O
Ph
OH
Me
H
N—Ph
H
H
O
O
H
7
1.00
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1.01
1.02
1.08
1.03
2.02
1.06
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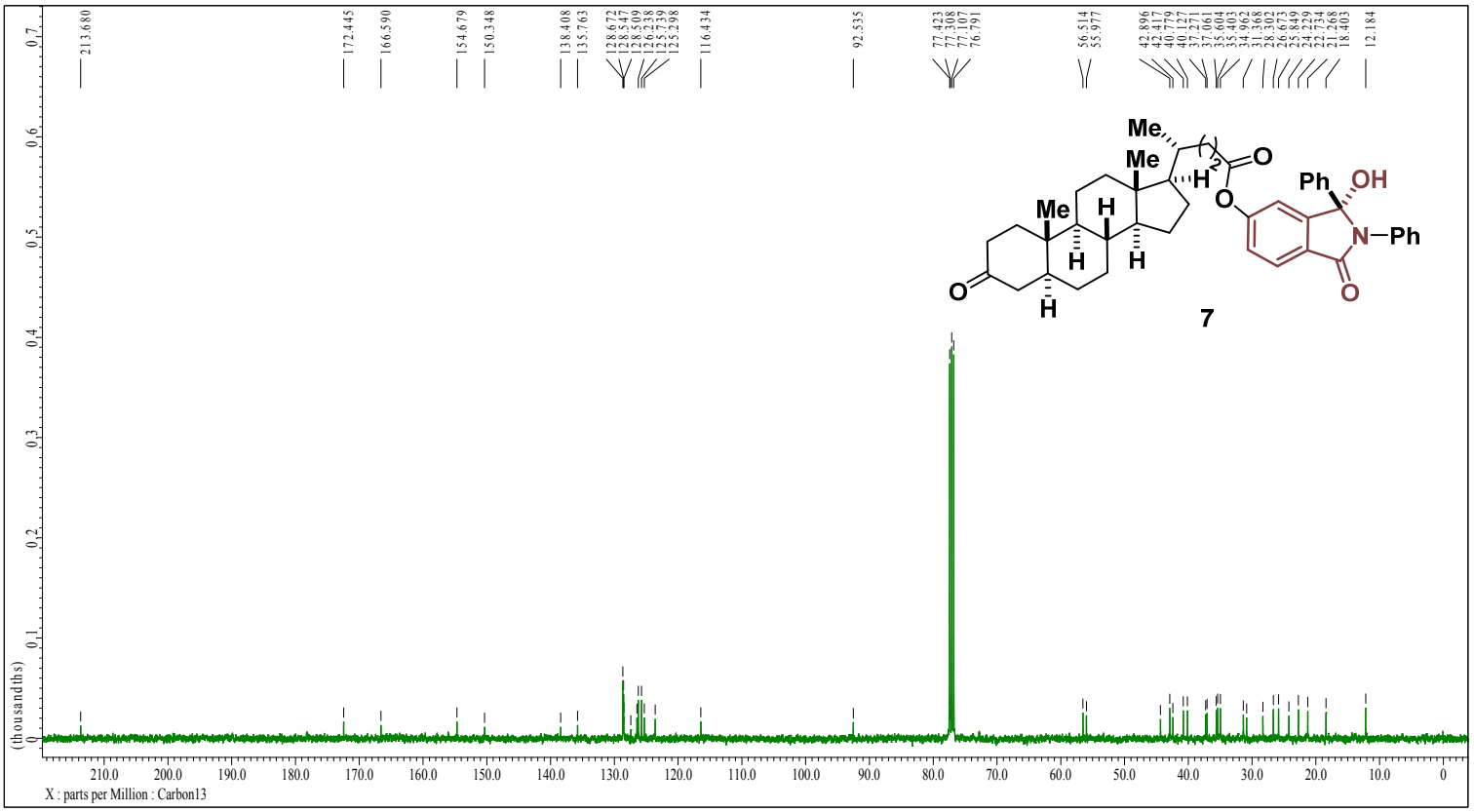
9.16
2.03
4.12
3.06
3.00
3.02
abundance
X : parts per Million : Proton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154.679
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135.763
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128.509
126.238
125.739
125.298
116.434
92.535
77.423
77.308
77.107
76.791
56.514
55.977
42.896
42.417
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40.127
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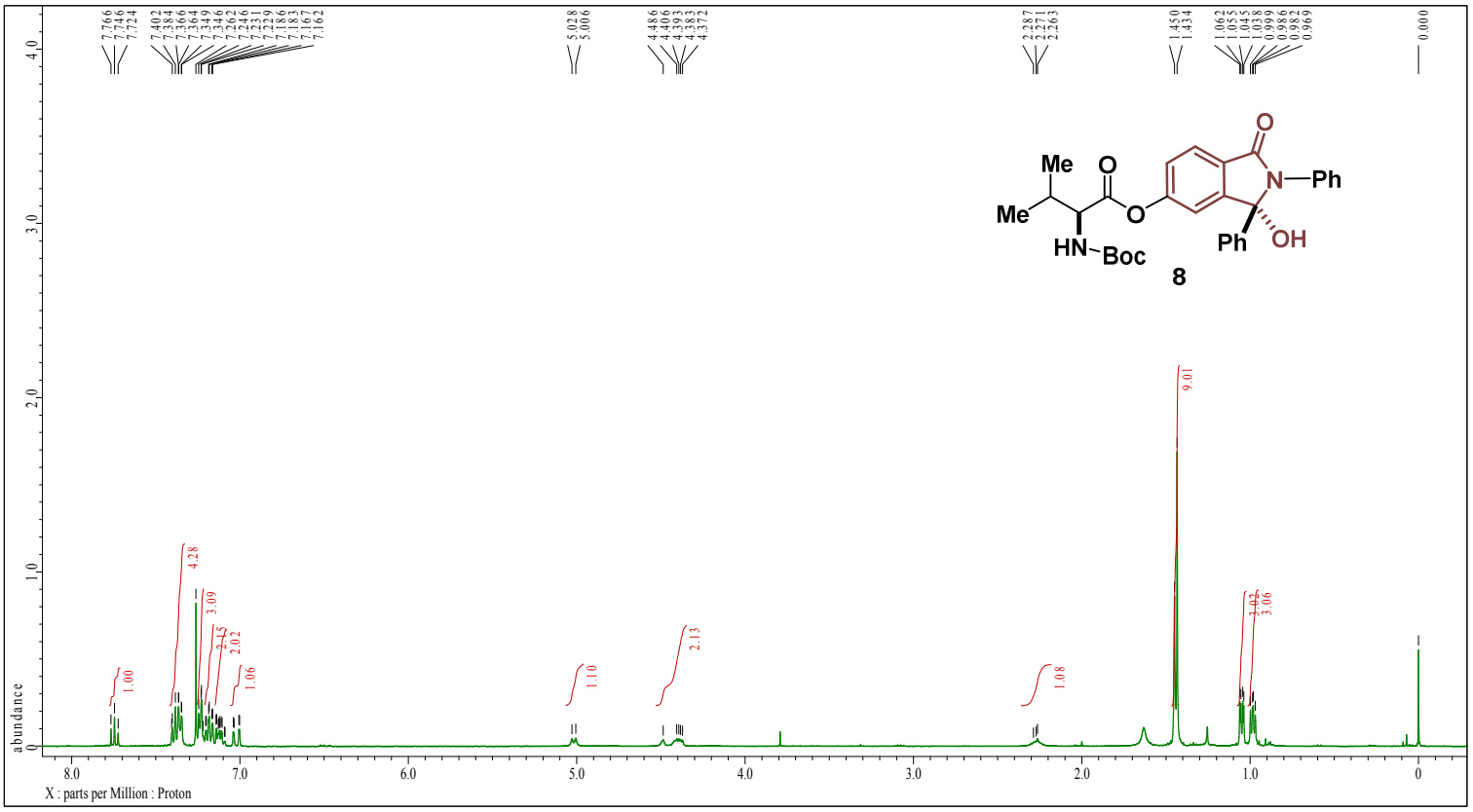
37.061
35.604
35.403
34.368
31.366
28.302
26.673
25.849
24.229
22.734
21.268
18.403
12.184
Me
Me
H
O
Ph
OH
Me
H
O
N—Ph
H
H
O
O
H
7
(thousandths)
X : parts per Million : Carbon13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7.346
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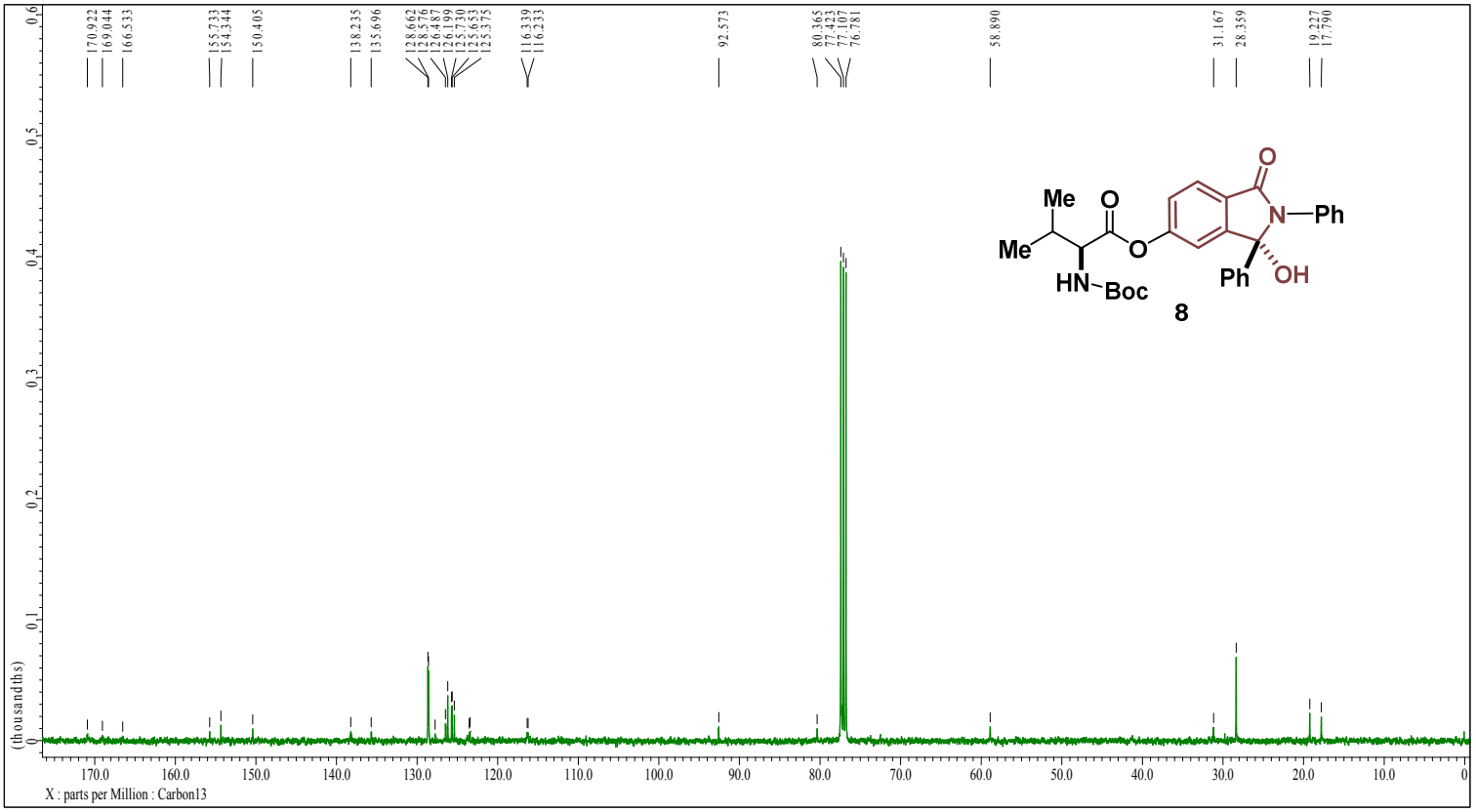
7.231
7.229
7.186
7.183
7.167
7.162
5.028
5.006
4.486
4.406
4.393
4.383
4.372
2.287
2.271
2.263
1.450
1.434
1.062
1.055
1.045
1.038
0.999
0.986
0.982
0.969
0.000
Me
O
N—Ph
Me
O
HN—Boc
Ph
OH
8
4.28
3.09
2.15
2.02
1.06
1.00
1.10
2.13
1.08
9.01
3.02
3.06
abundance
X : parts per Million : Proton


170.922
169.044
166.533
155.733
154.344
150.405
138.235
135.696
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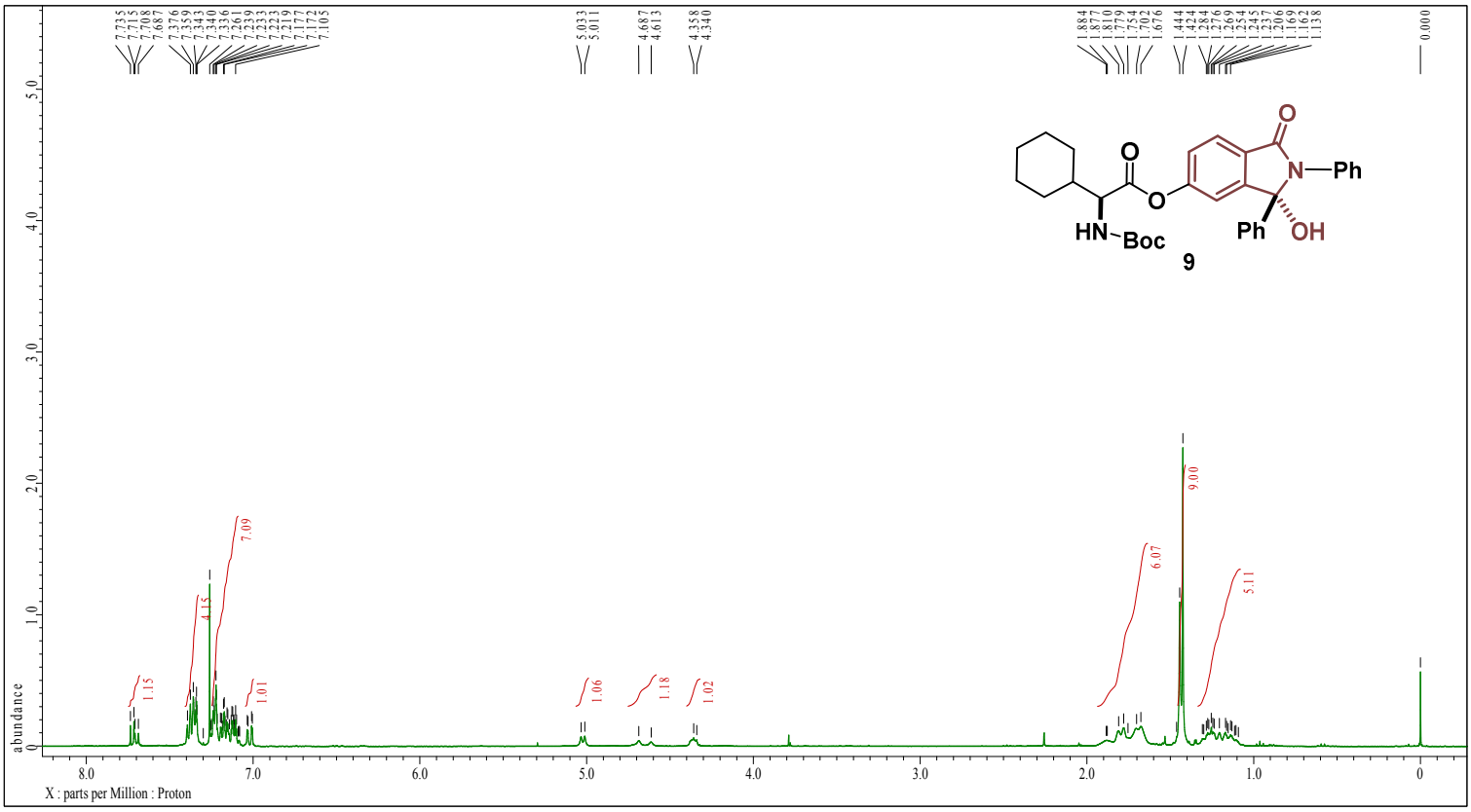
128.576
126.487
126.199
125.730
125.653
125.375
116.339
116.233
92.573
80.365
77.423
77.107
76.781
58.890
31.167
28.359
19.227
17.790
Me
O
N—Ph
Me
O
HN—Boc
Ph
OH
8
(thousandths)
X : parts per Million : Carbon13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7.343
7.340
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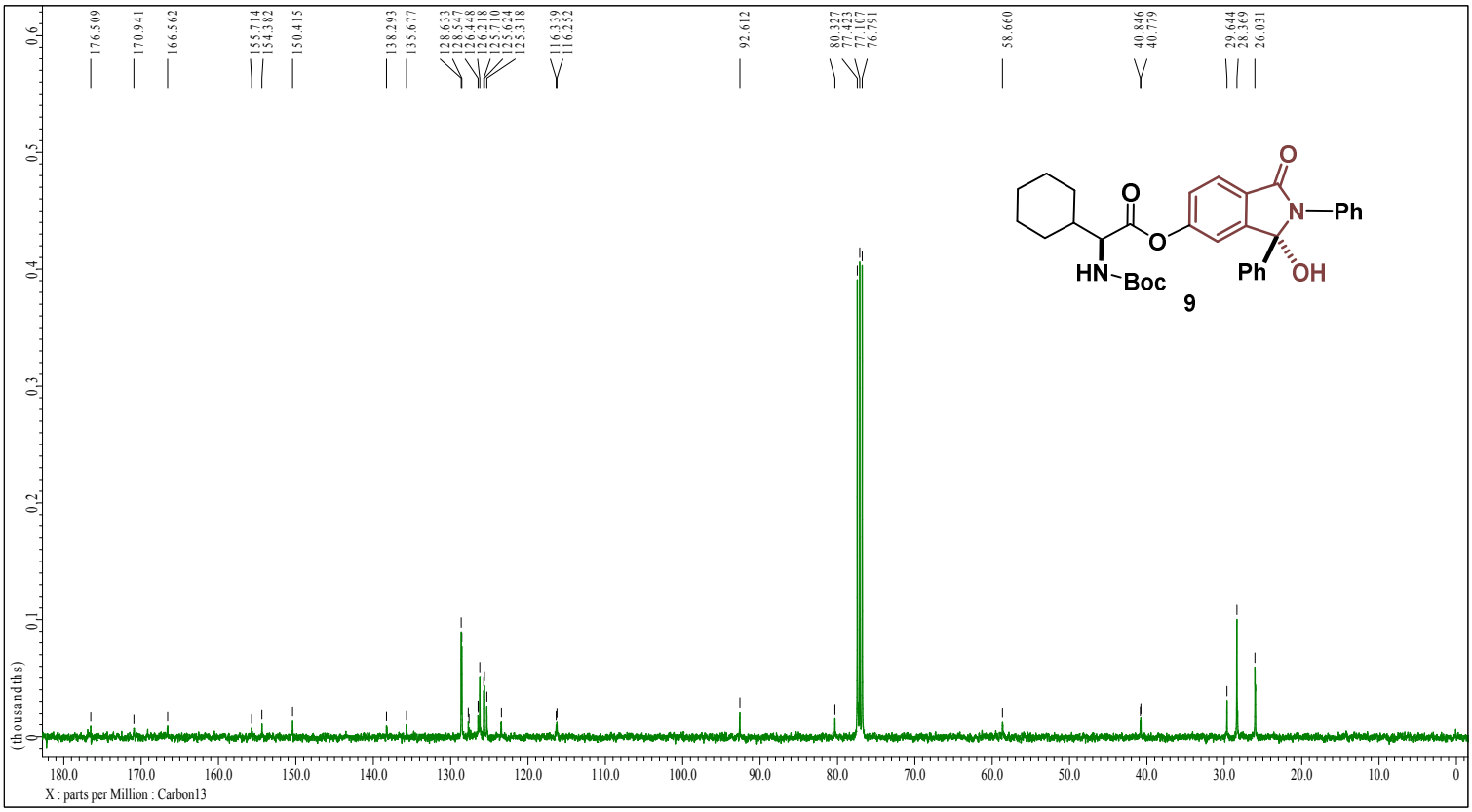
7.261
7.239
7.233
7.223
7.219
7.177
7.172
7.105
5.033
5.011
4.687
4.613
4.358
4.340
1.884
1.877
1.870
1.779
1.754
1.702
1.676
1.444
1.424
1.284
1.266
1.254
1.245
1.237
1.206
1.169
1.162
1.138
0.000
O
O
N—Ph
O
HN—Boc
Ph
OH
9
7.09
4.15
1.15
1.01
1.06
1.18
1.02
6.07
9.00
5.11
abundance
X : parts per Million : Proton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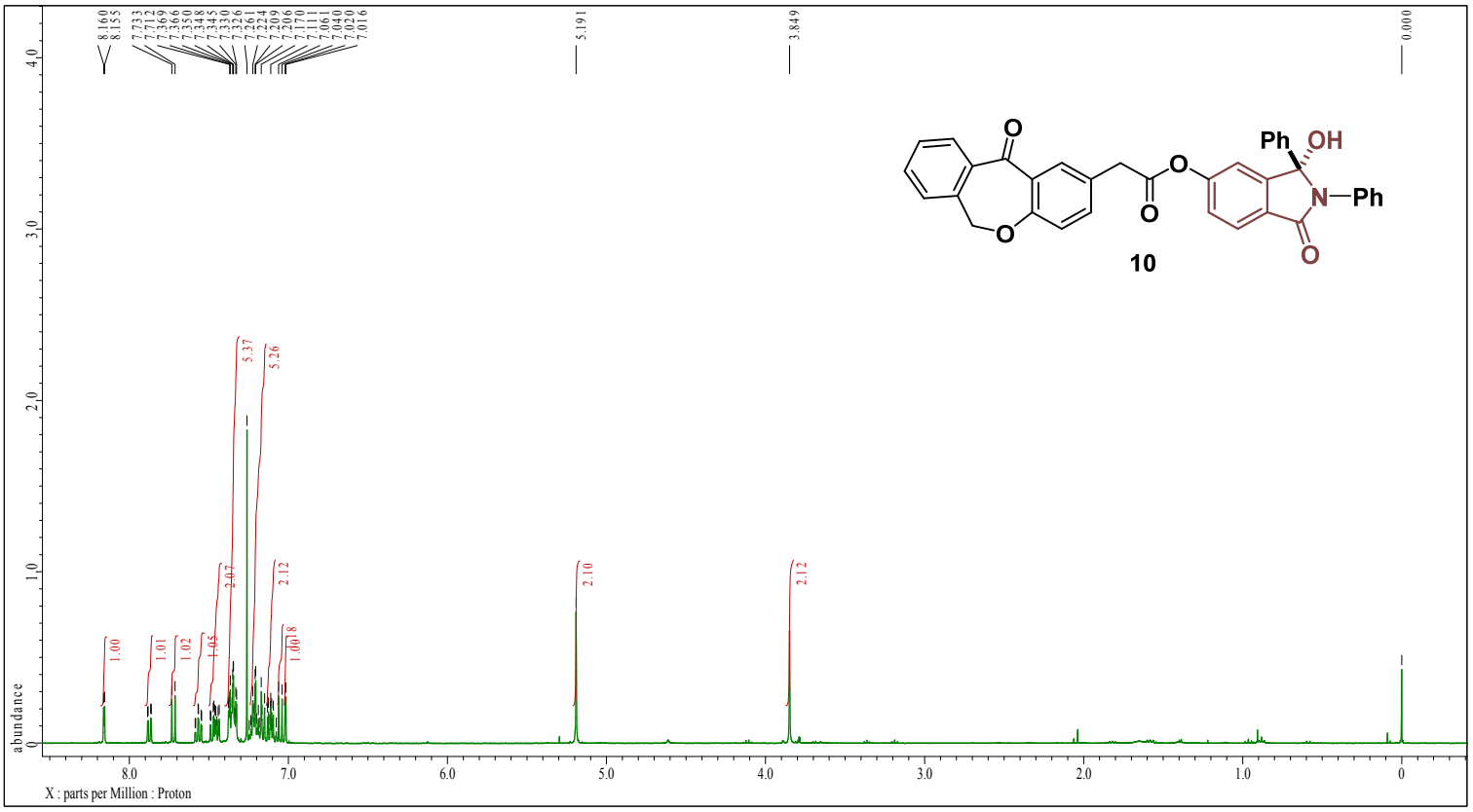
125.710
125.514
125.318
116.339
116.252
92.612
80.327
77.423
77.107
76.791
58.660
40.846
40.779
29.644
28.369
26.031
O
O
N—Ph
O
HN—Boc
Ph
OH
9
(thousandths)
X : parts per Million : Carbon13


8.160
8.155
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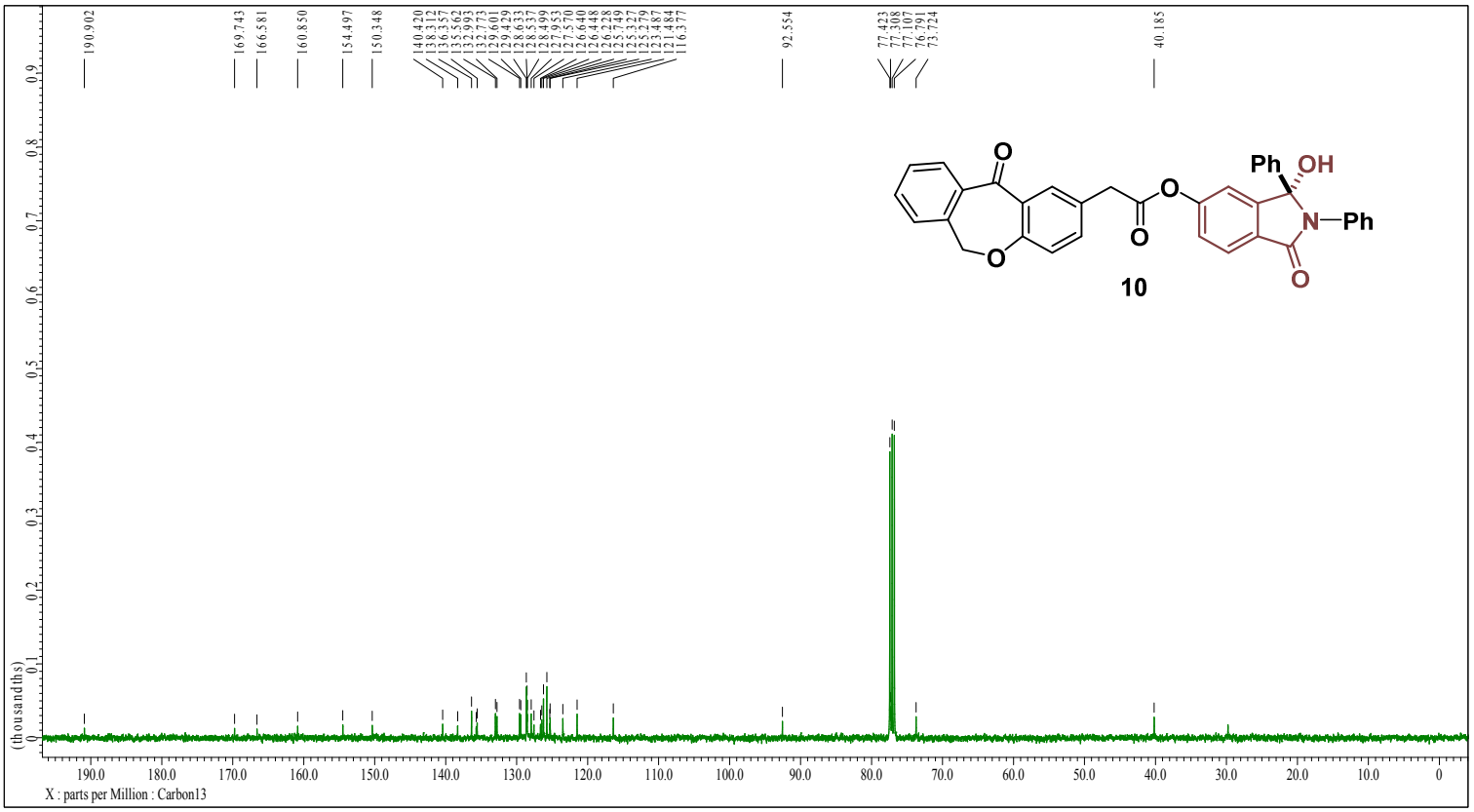
7.224
7.209
7.206
7.170
7.111
7.061
7.040
7.020
7.016
5.191
3.849
0.000
5.37
5.26
2.07
2.12
2.10
2.12
1.00
1.01
1.02
1.05
1.0018
abundance
X : parts per Million : Proton
Ph
OH
N—Ph
O
10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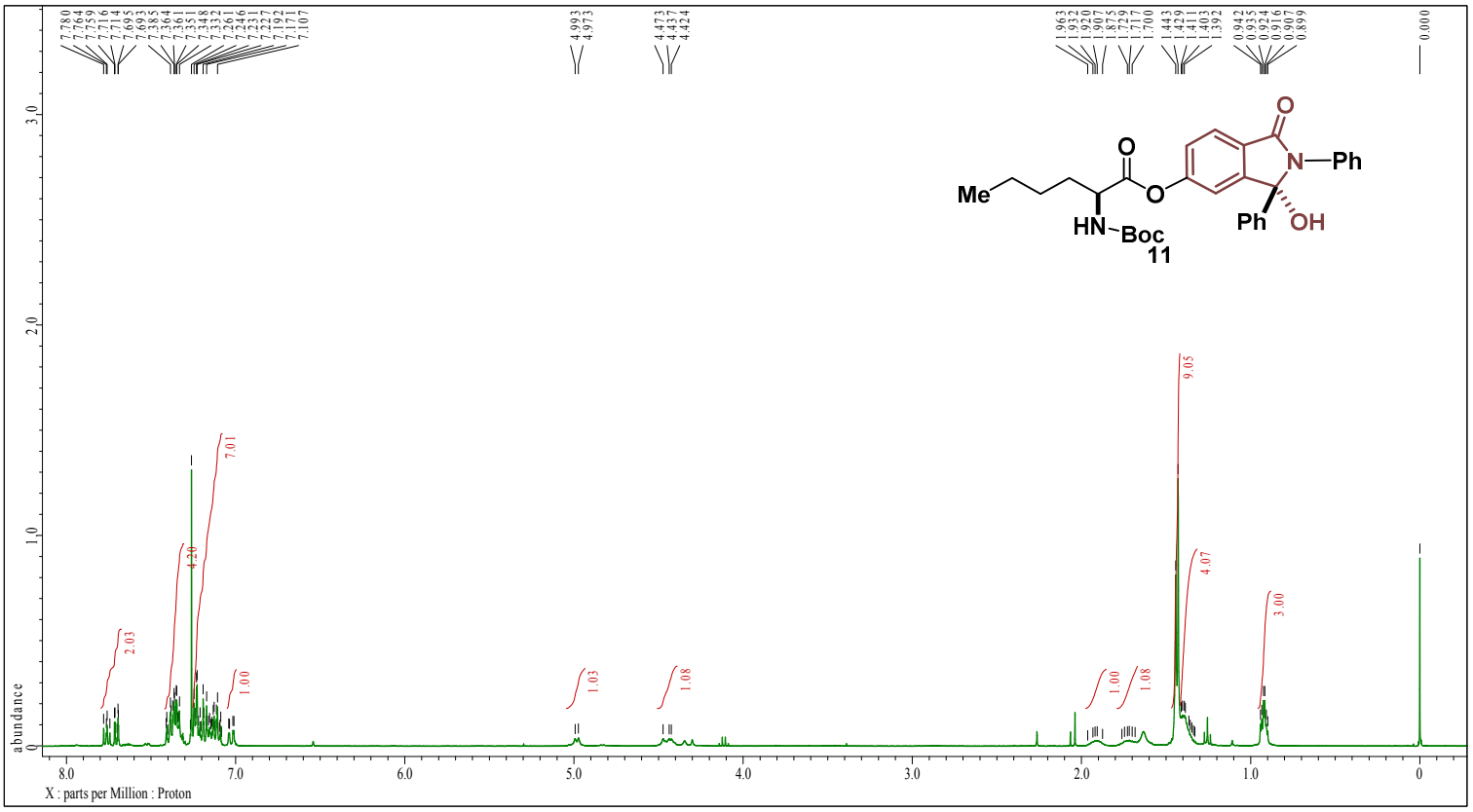
166.581
160.850
154.497
150.348
140.420
138.312
136.357
135.662
132.993
132.673
132.601
129.429
128.633
128.537
128.499
127.953
127.570
126.640
126.448
126.228
125.749
125.527
125.279
123.487
121.484
116.377
92.554
77.423
77.308
77.107
76.791
73.724
40.185
(thousandths)
X : parts per Million : Carbon13
Ph
OH
N—Ph
O
10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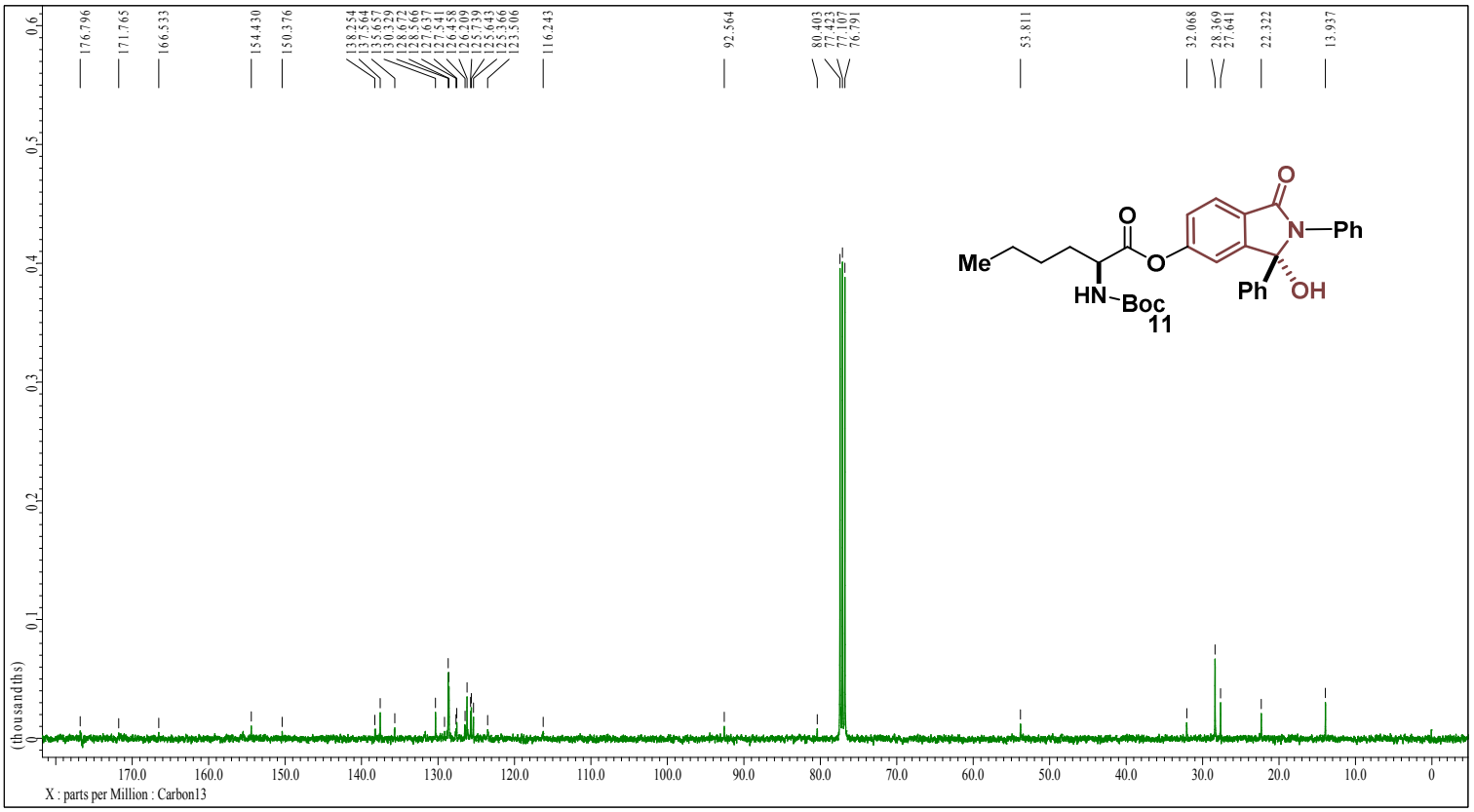
7.716
7.714
7.695
7.693
7.385
7.384
7.361
7.351
7.348
7.332
7.261
7.246
7.231
7.227
7.192
7.171
7.107
4.993
4.973
4.473
4.437
4.424
1.963
1.932
1.920
1.907
1.875
1.729
1.717
1.700
1.443
1.429
1.411
1.403
1.392
0.942
0.935
0.924
0.916
0.907
0.899
0.000
Me
HN
Boc
11
O
N
Ph
Ph
OH
2.03
4.20
7.01
1.00
1.03
1.08
1.00
1.08
9.05
4.07
3.00
abundance
X : parts per Million : Proton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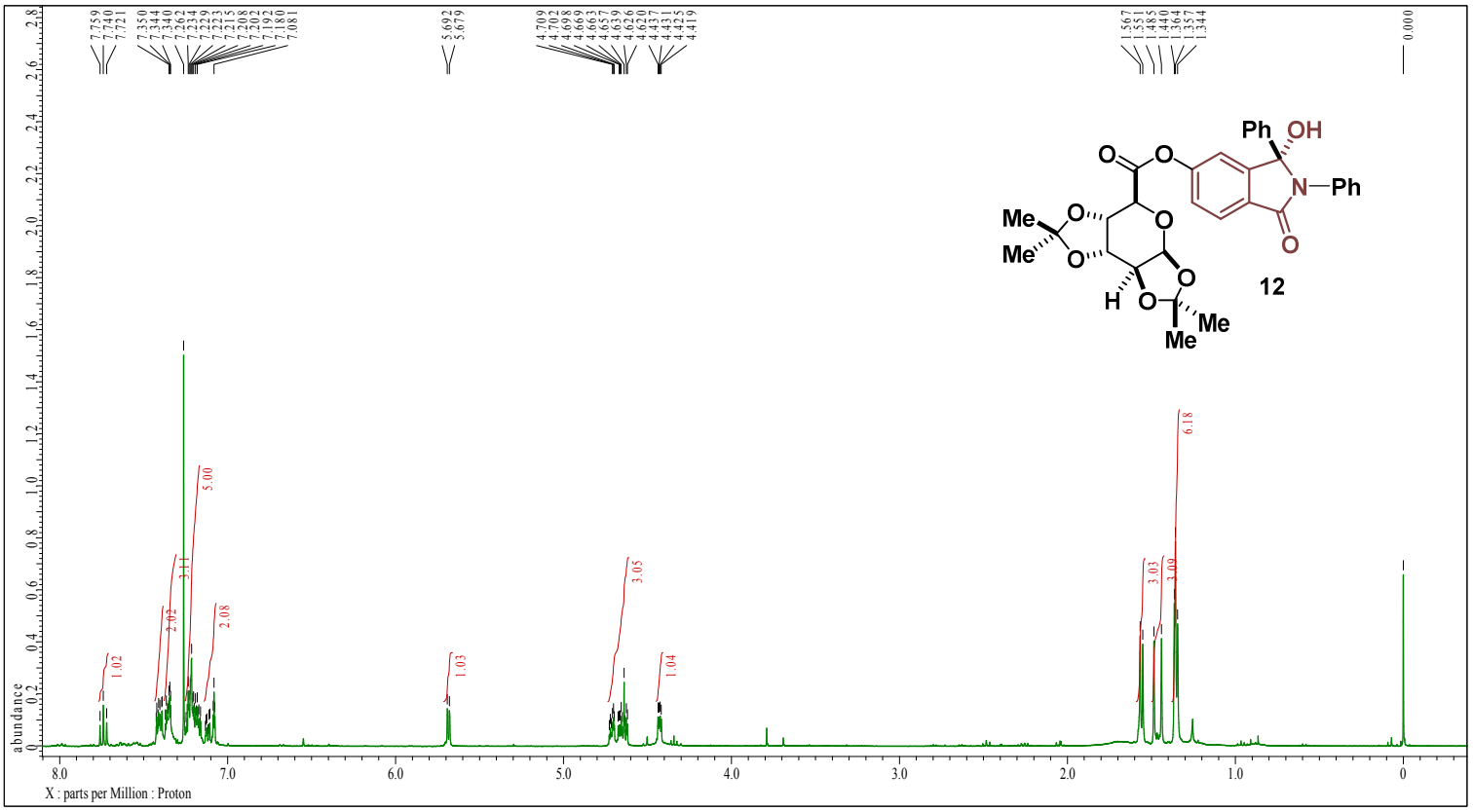
171.765
166.533
154.430
150.376
138.254
137.564
135.657
130.329
128.672
128.566
127.637
127.441
126.458
126.209
125.739
125.643
125.366
123.506
116.243
92.564
80.403
77.423
77.107
76.791
53.811
32.068
28.369
27.641
22.322
13.937
Me
HN
Boc
11
O
N
Ph
Ph
OH
(thousandths)
X : parts per Million : Carbon13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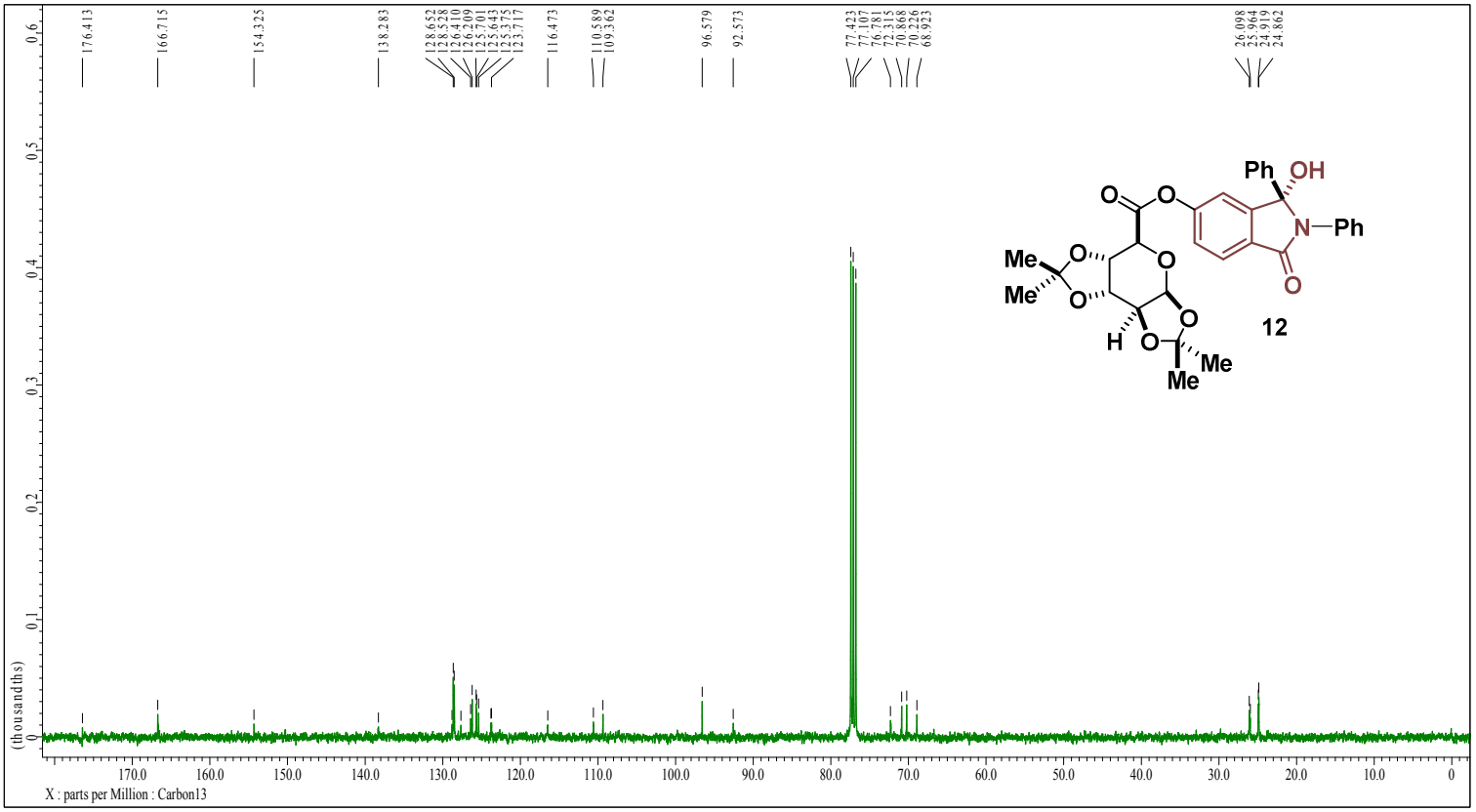
7.740
7.721
7.350
7.344
7.340
7.294
7.244
7.229
7.223
7.215
7.208
7.202
7.192
7.180
7.081
5.692
5.679
4.709
4.702
4.698
4.669
4.663
4.637
4.629
4.626
4.620
4.437
4.431
4.425
4.419
1.567
1.551
1.485
1.440
1.364
1.347
1.344
0.000
Ph
OH
N—Ph
O
Me
Me
H
Me
Me
12
1.02
2.02
3.11
5.00
2.08
1.03
3.05
1.04
3.03
3.09
6.18
abundance
X : parts per Million : Proton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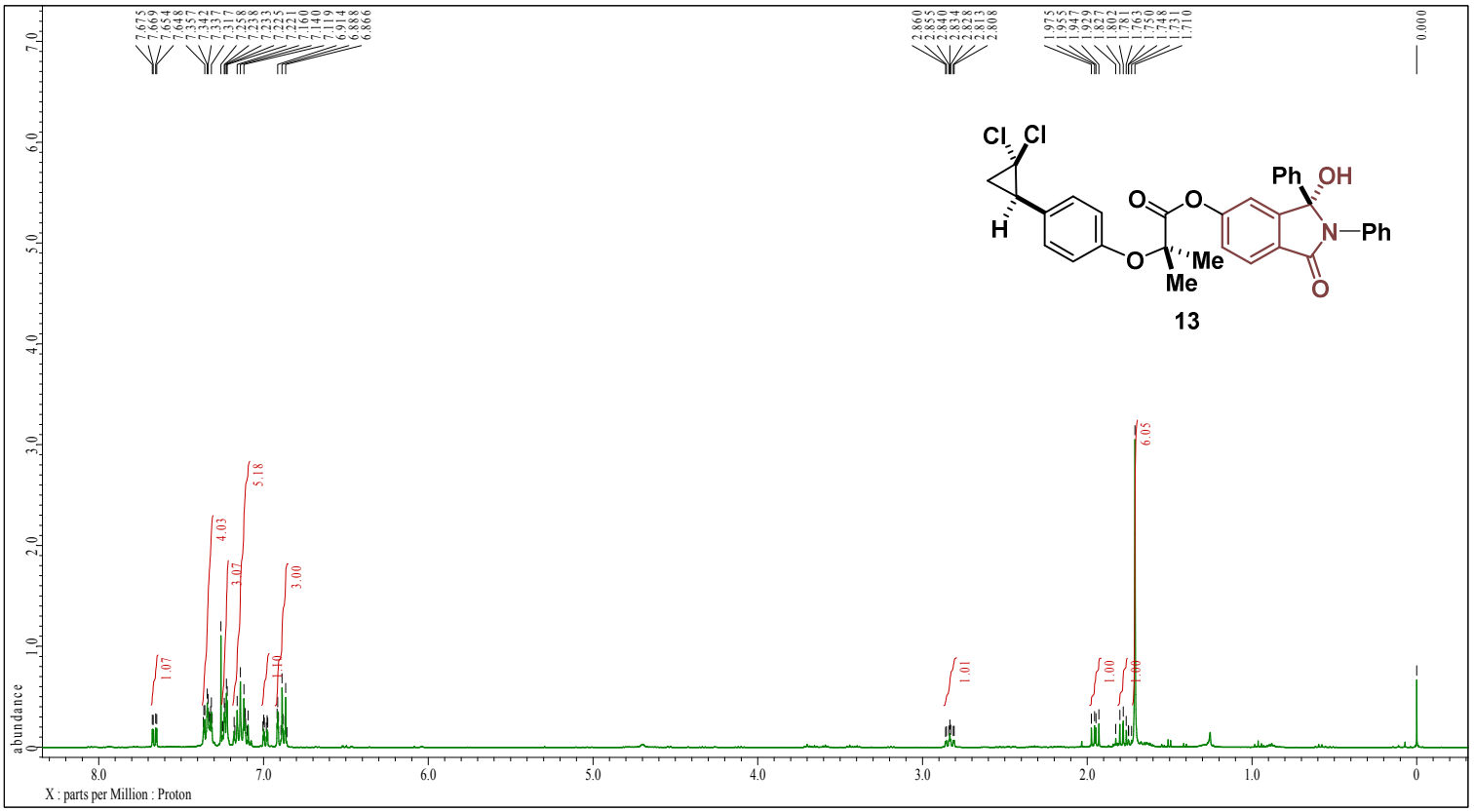
166.715
154.325
138.283
128.652
128.528
126.410
126.209
125.701
125.643
125.375
123.717
116.473
110.589
109.362
96.579
92.573
77.423
77.107
76.781
72.315
70.868
70.226
68.923
26.098
25.964
24.919
24.862
Ph
OH
N—Ph
O
Me
Me
H
Me
Me
12
(thousandths)
X : parts per Million : Carbon13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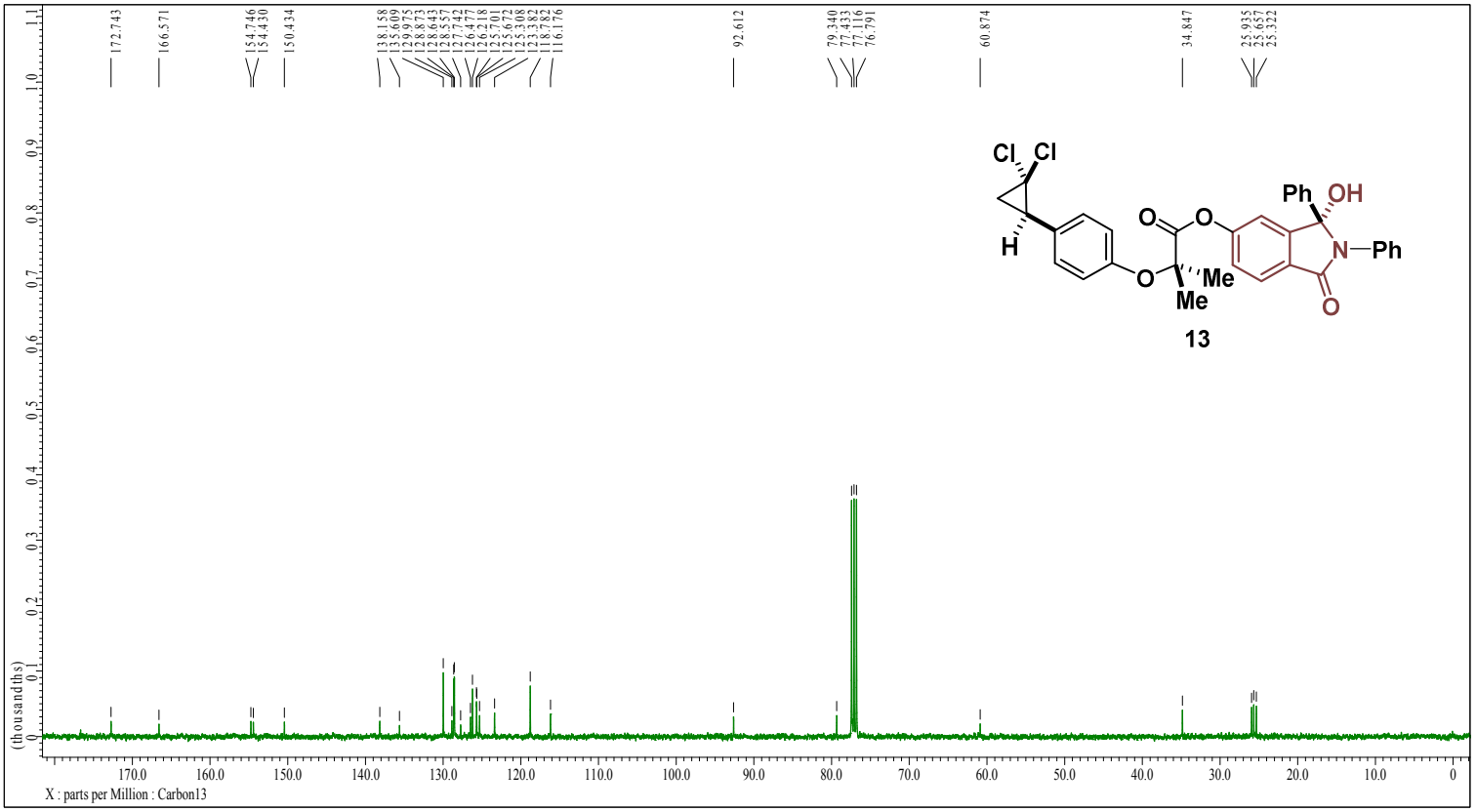
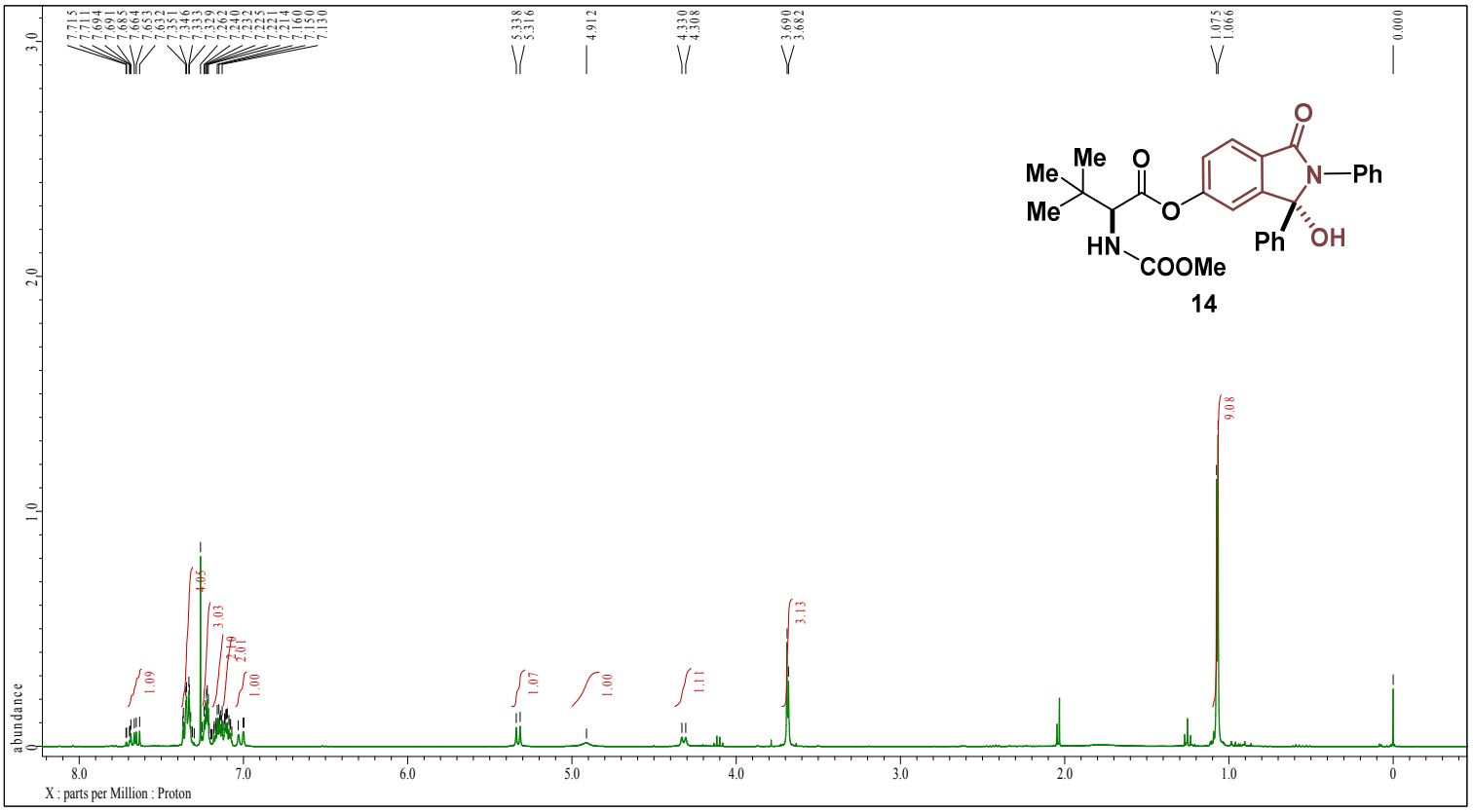
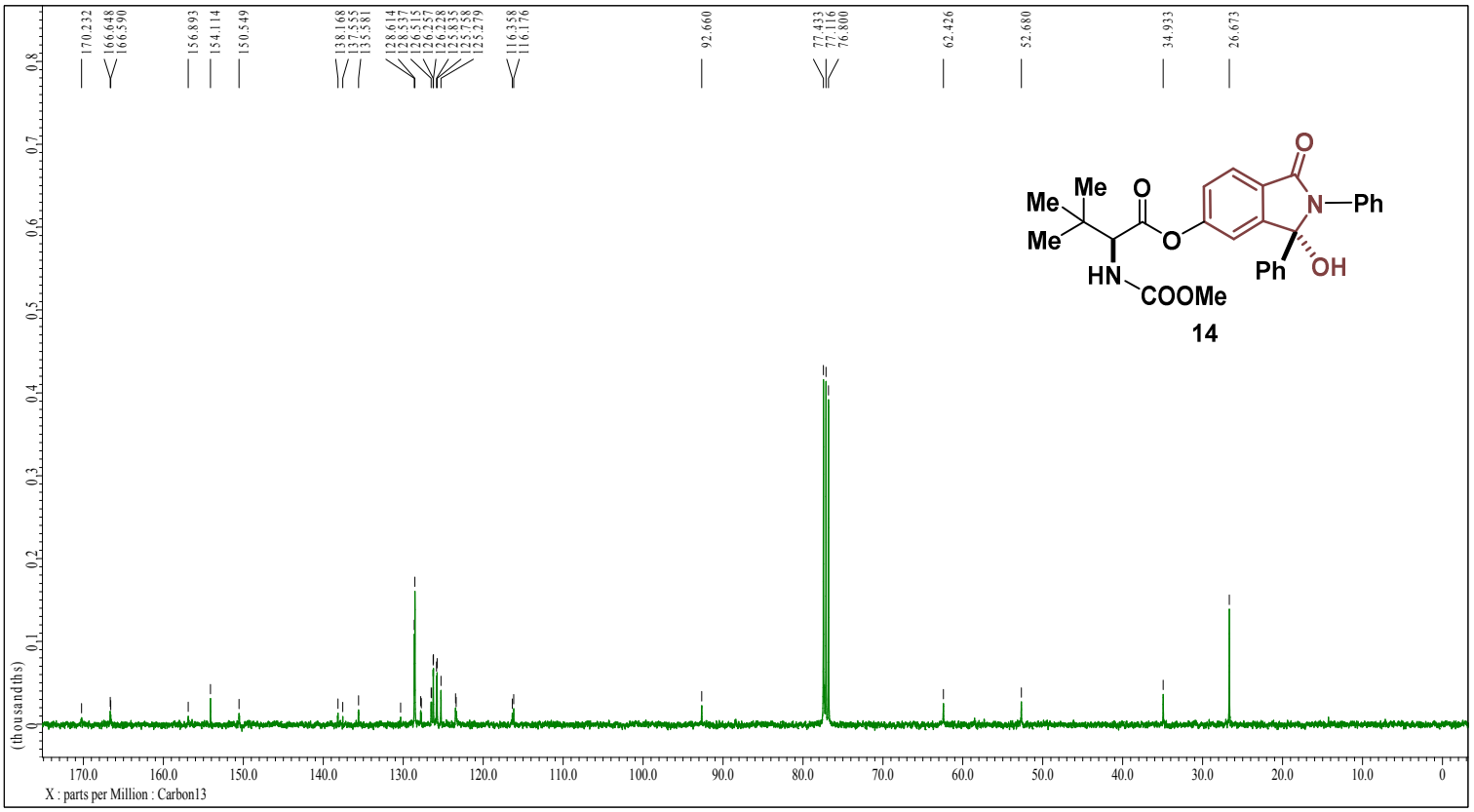
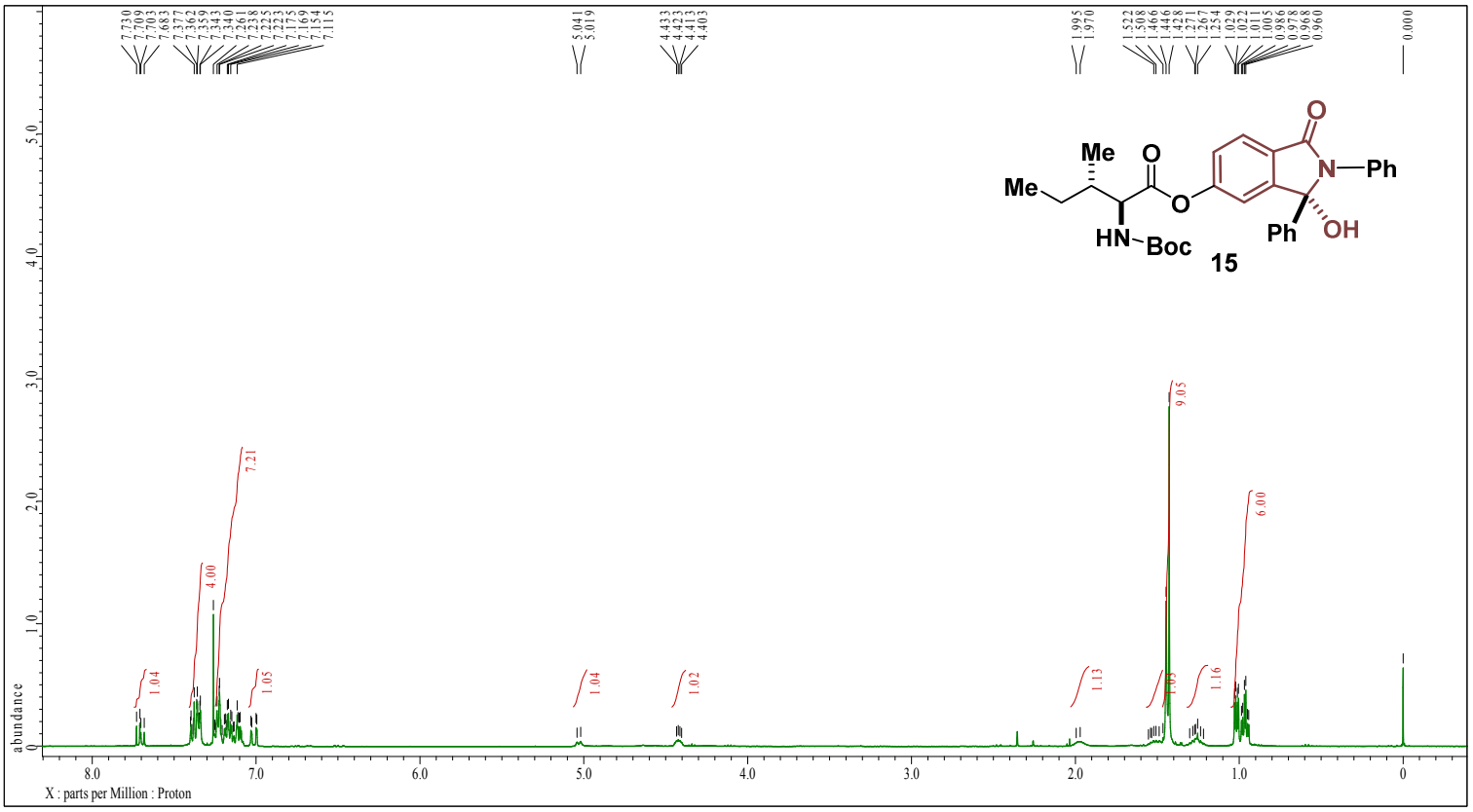
7.669
7.644
7.638
7.357
7.342
7.337
7.317
7.258
7.238
7.233
7.225
7.221
7.160
7.140
7.119
6.914
6.888
6.866
2.860
2.855
2.840
2.834
2.828
2.813
2.808
1.975
1.955
1.947
1.929
1.827
1.802
1.781
1.763
1.748
1.731
1.710
0.000
Cl Cl
H
O
O
O
Ph OH
N—Ph
Me
Me
O
13
1.07
4.03
3.07
5.18
1.14
3.00
1.01
1.00
1.00
6.05
abundance
X : parts per Million : Proton


172.743
166.571
154.746
154.430
150.434
138.158
135.609
129.975
128.873
128.643
128.557
127.742
126.477
126.218
125.671
125.308
123.382
118.782
116.176
92.612
79.340
77.433
77.116
76.791
60.874
34.847
25.935
25.657
25.322
Cl Cl
H
O
O
O
Ph OH
N—Ph
Me
Me
O
13
(thousandths)
X : parts per Million : Carbon13


7.715
7.711
7.704
7.691
7.685
7.664
7.653
7.632
7.351
7.346
7.333
7.329
7.262
7.240
7.234
7.225
7.221
7.214
7.160
7.150
7.130
5.338
5.316
4.912
4.330
4.308
3.690
3.682
1.075
1.066
0.000
Me
Me
Me
O
O
N
Ph
Ph
OH
HN
COOMe
14
9.08
4.05
3.03
2.19
2.01
1.09
1.00
1.07
1.00
1.11
3.13
abundance
X : parts per Million : Proton


170.232
166.648
166.590
156.893
154.114
150.549
138.168
137.555
135.581
128.614
128.537
126.515
126.257
126.238
125.958
125.758
125.279
116.358
116.176
92.660
77.433
77.116
76.800
62.426
52.680
34.933
26.673
Me
Me
Me
O
O
N
Ph
Ph
OH
HN
COOMe
14
(thousandths)
X : parts per Million : Carbon13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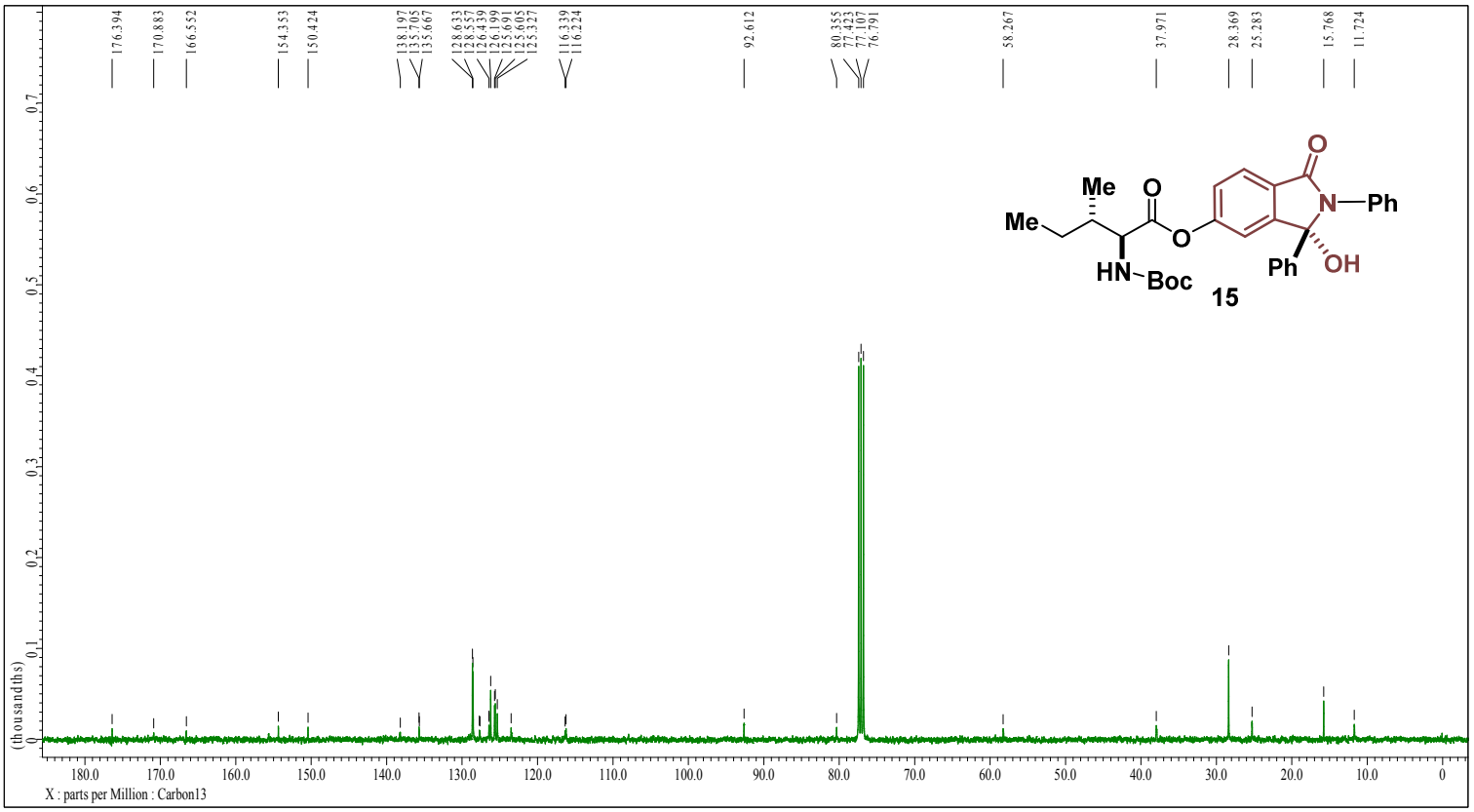
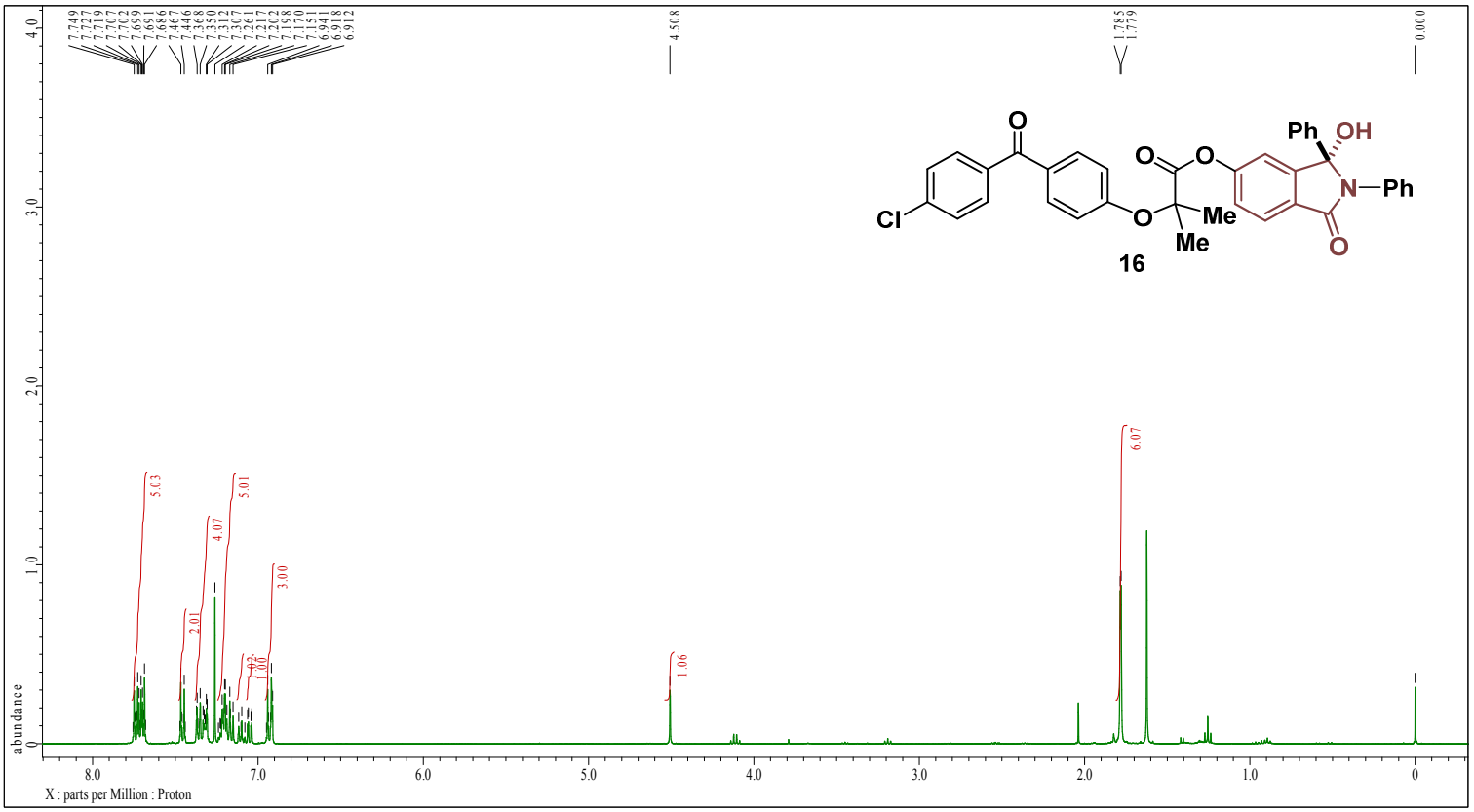
7.709
7.703
7.683
7.377
7.362
7.359
7.343
7.340
7.261
7.238
7.225
7.223
7.175
7.169
7.144
7.115
5.041
5.019
4.433
4.423
4.413
4.403
1.995
1.970
1.522
1.508
1.466
1.446
1.428
1.271
1.267
1.254
1.029
1.022
1.011
1.005
0.986
0.978
0.968
0.960
0.000
Me
O
N—Ph
Me
O
HN—Boc
Ph
OH
15
9.05
7.21
6.00
4.00
1.04
1.05
1.04
1.02
1.13
1.00
1.16
abundance
X : parts per Million : Proton


176.394
170.883
166.552
154.353
150.424
138.197
135.705
135.667
128.633
128.557
126.439
126.199
125.691
125.605
125.327
116.339
116.224
92.612
80.355
77.422
77.107
76.791
58.267
37.971
28.369
25.283
15.768
11.724
Me
O
N—Ph
Me
O
HN—Boc
Ph
OH
15
(thousandths)
X : parts per Million : Carbon13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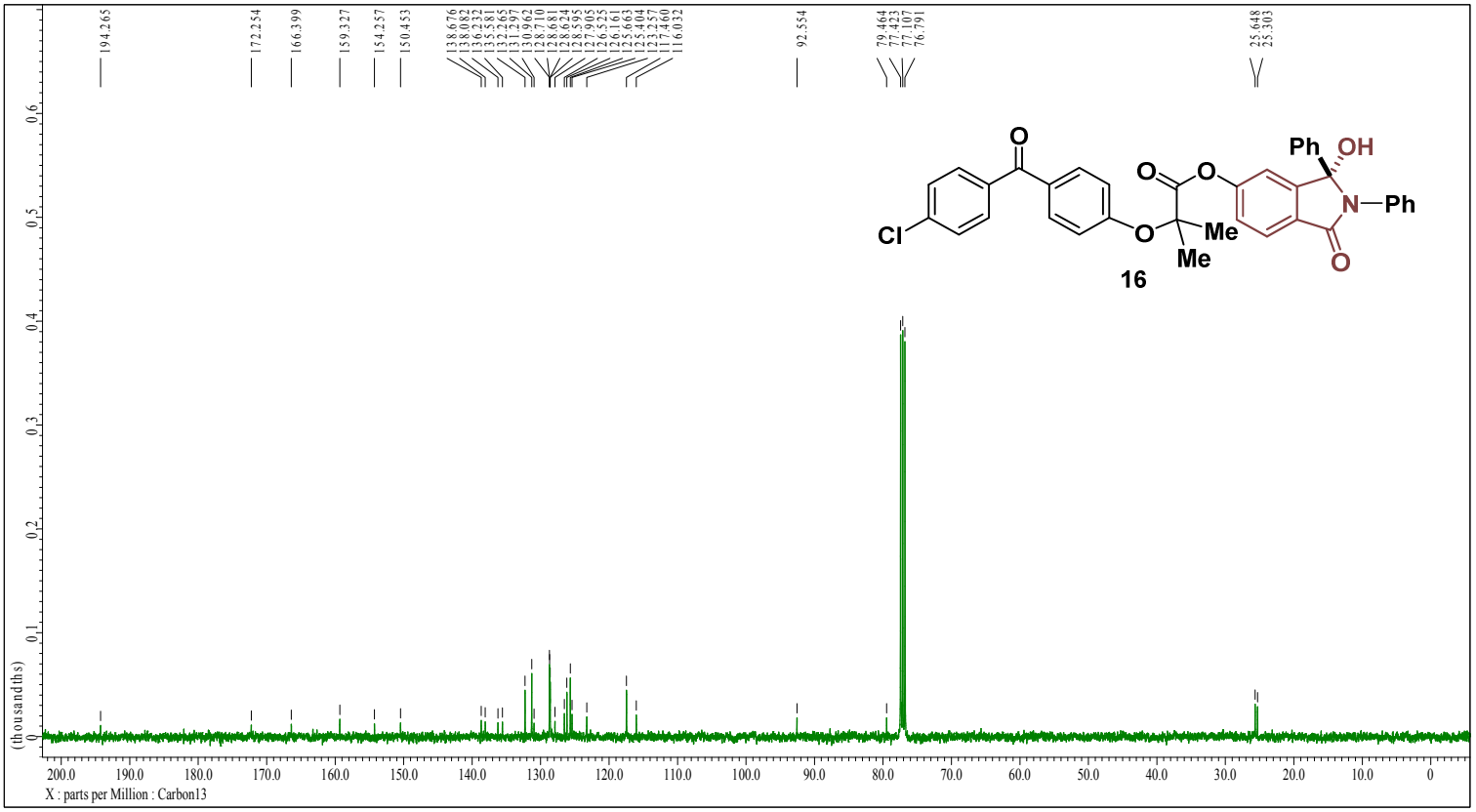
7.727
7.719
7.707
7.702
7.699
7.691
7.686
7.467
7.446
7.368
7.350
7.312
7.307
7.211
7.202
7.198
7.170
7.151
6.941
6.918
6.912
4.508
1.785
1.779
0.000
Cl
O
O
O
O
Me
Me
Ph
OH
N
Ph
O
16
5.03
5.01
4.07
2.01
3.00
1.06
6.07
abundance
X : parts per Million : Proton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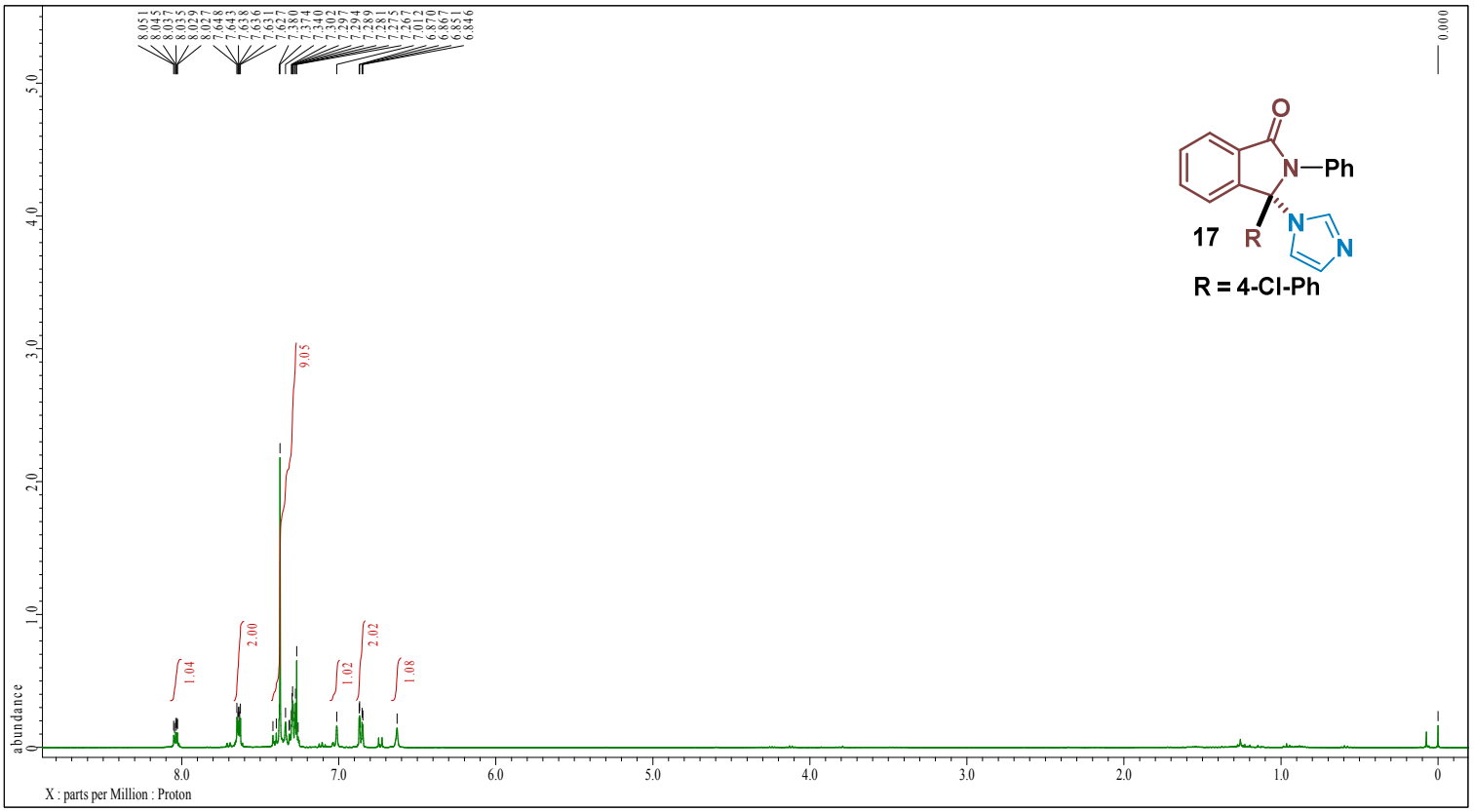
172.254
166.399
159.327
154.257
150.453
138.676
138.082
136.232
135.581
132.265
131.297
130.962
128.710
128.681
128.624
128.595
126.525
126.161
125.663
125.404
123.257
117.460
116.032
92.554
79.464
77.423
77.107
76.791
25.648
25.303
Cl
O
O
O
O
Me
Me
Ph
OH
N
Ph
O
16
(thousandths)
X : parts per Million : Carbon13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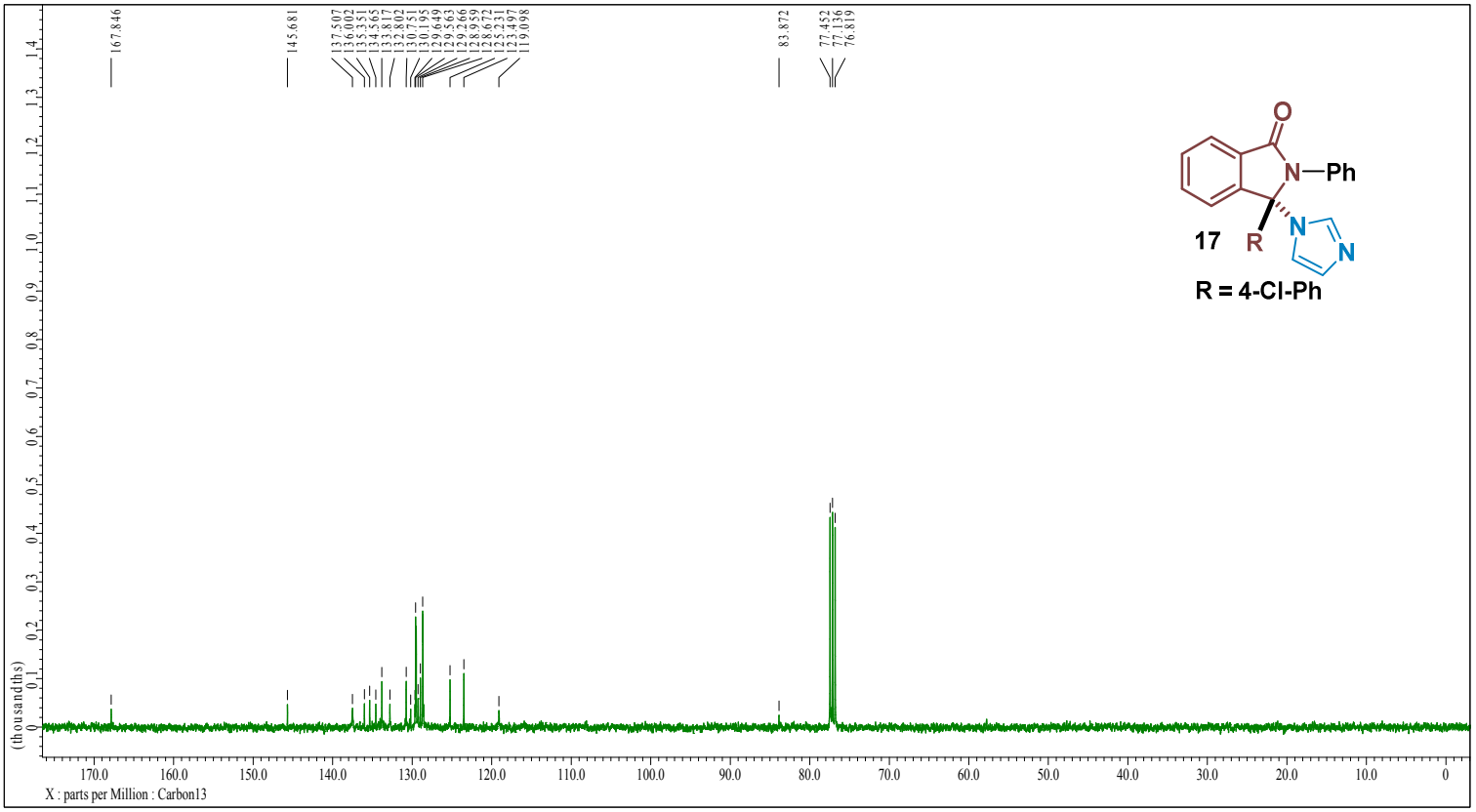
8.045
8.037
8.035
8.029
8.027
7.648
7.643
7.638
7.636
7.631
7.627
7.380
7.374
7.340
7.302
7.297
7.294
7.289
7.281
7.275
7.267
7.012
6.870
6.867
6.851
6.846
0.000
O
N—Ph
17
R
N
N
R = 4-Cl-Ph
9.05
2.00
2.02
1.04
1.02
1.08
abundance
X : parts per Million : Proton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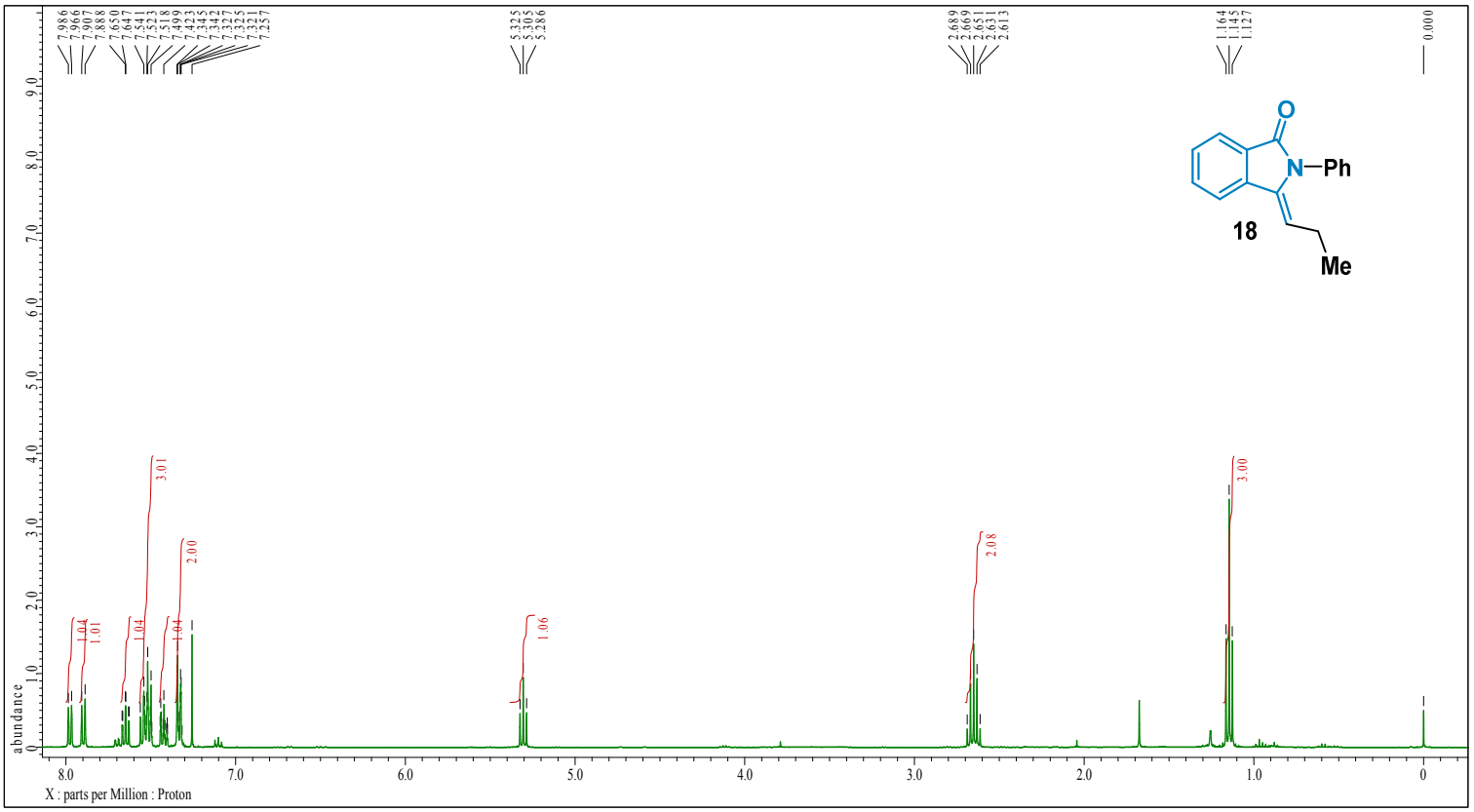
137.507
136.002
135.351
134.565
133.817
133.602
132.751
130.195
129.649
129.563
129.266
128.959
128.672
125.231
123.497
119.098
83.872
77.452
77.136
76.819
O
N—Ph
17
R
N
N
R = 4-Cl-Ph
(thousandths)
X : parts per Million : Carbon13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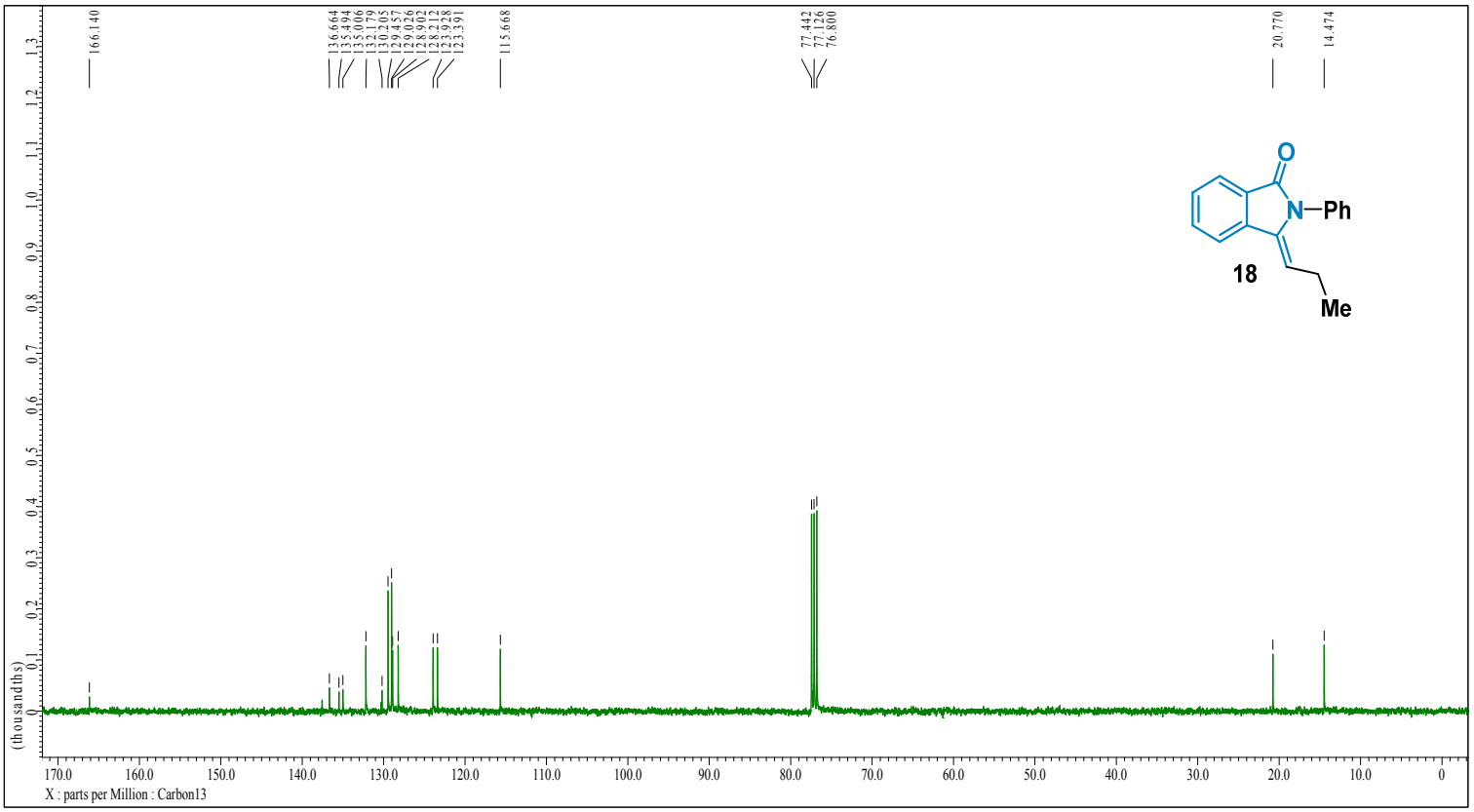
7.966
7.907
7.898
7.650
7.647
7.541
7.533
7.518
7.409
7.423
7.345
7.342
7.327
7.325
7.321
7.257
5.325
5.305
5.286
2.689
2.669
2.651
2.631
2.613
1.164
1.145
1.127
0.000
O
N—Ph
18
Me
3.01
2.00
1.04
1.01
1.04
1.04
1.06
2.08
3.00
abundance
X : parts per Million : Proton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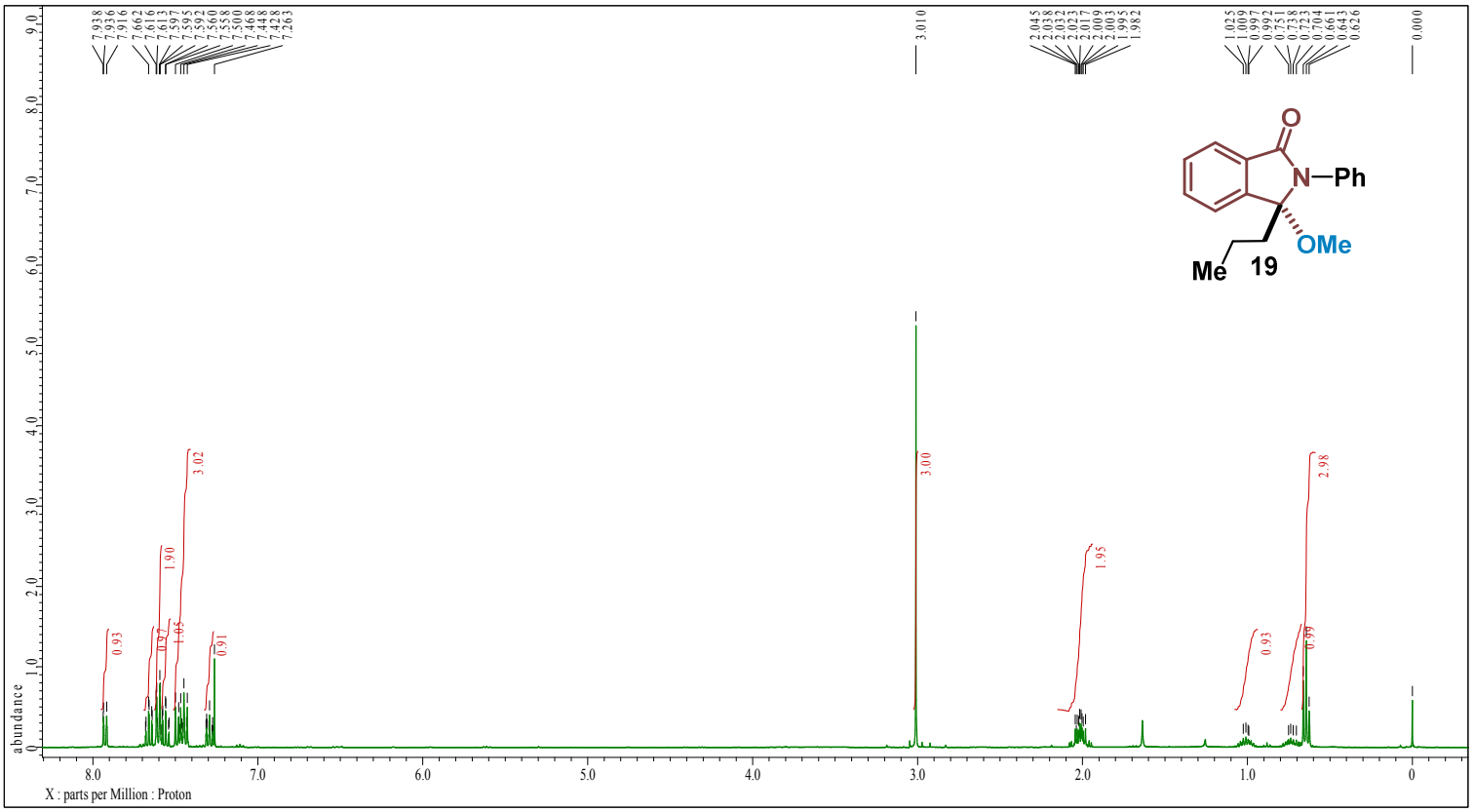
136.664
135.494
135.006
130.779
130.205
129.457
129.026
128.902
128.212
123.928
123.391
115.668
77.442
77.126
76.800
20.770
14.474
O
N—Ph
18
Me
(thousandths)
X : parts per Million : Carbon13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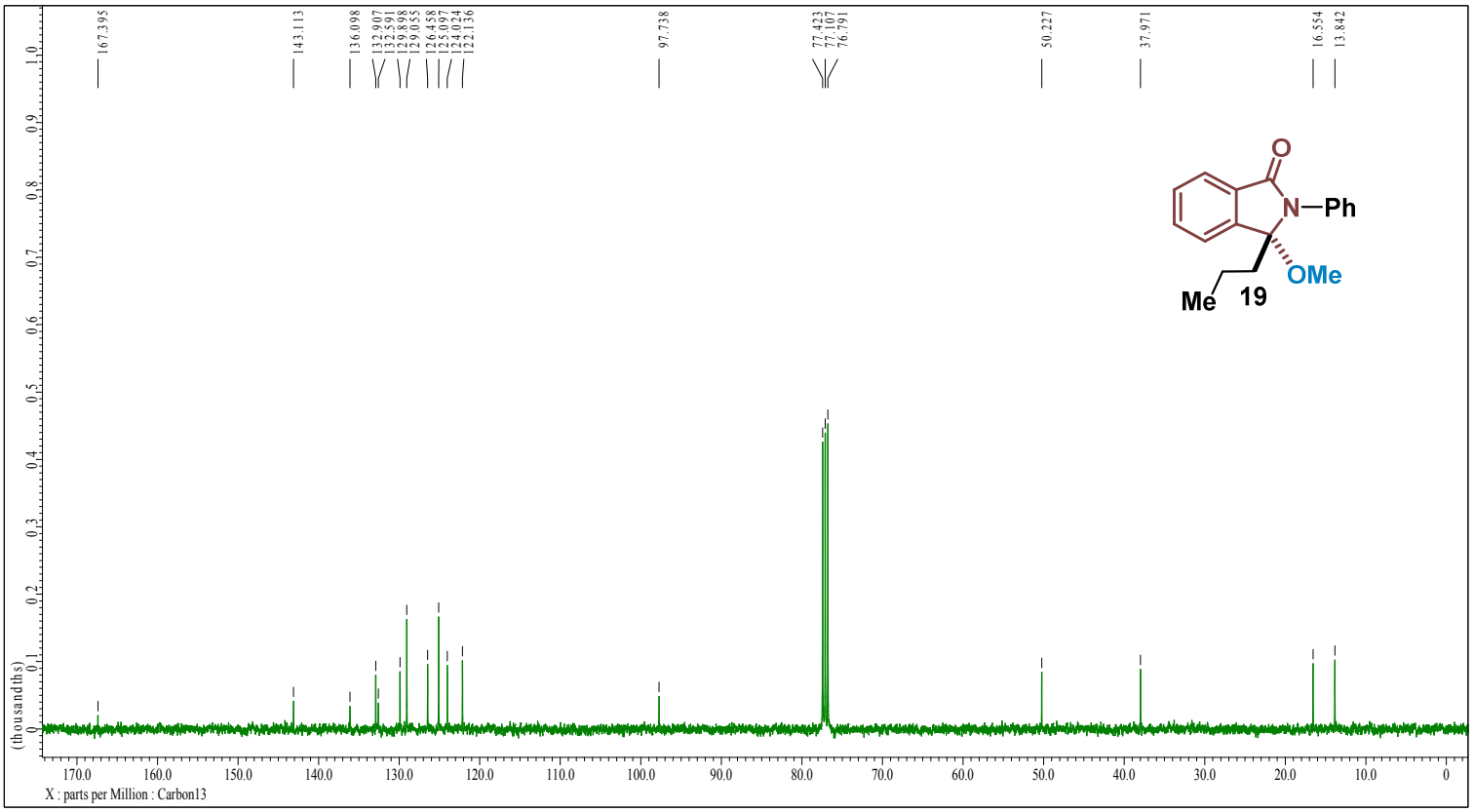
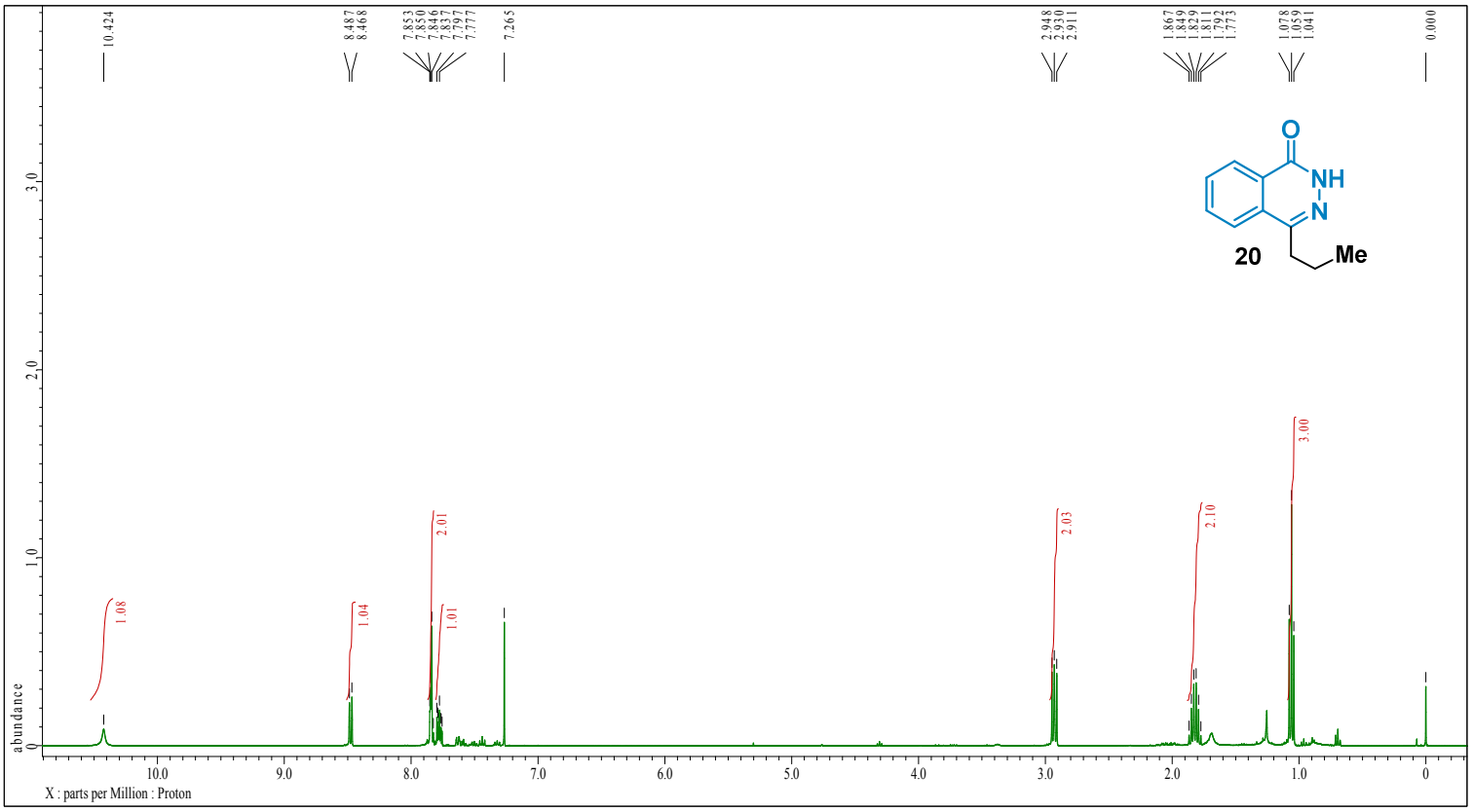
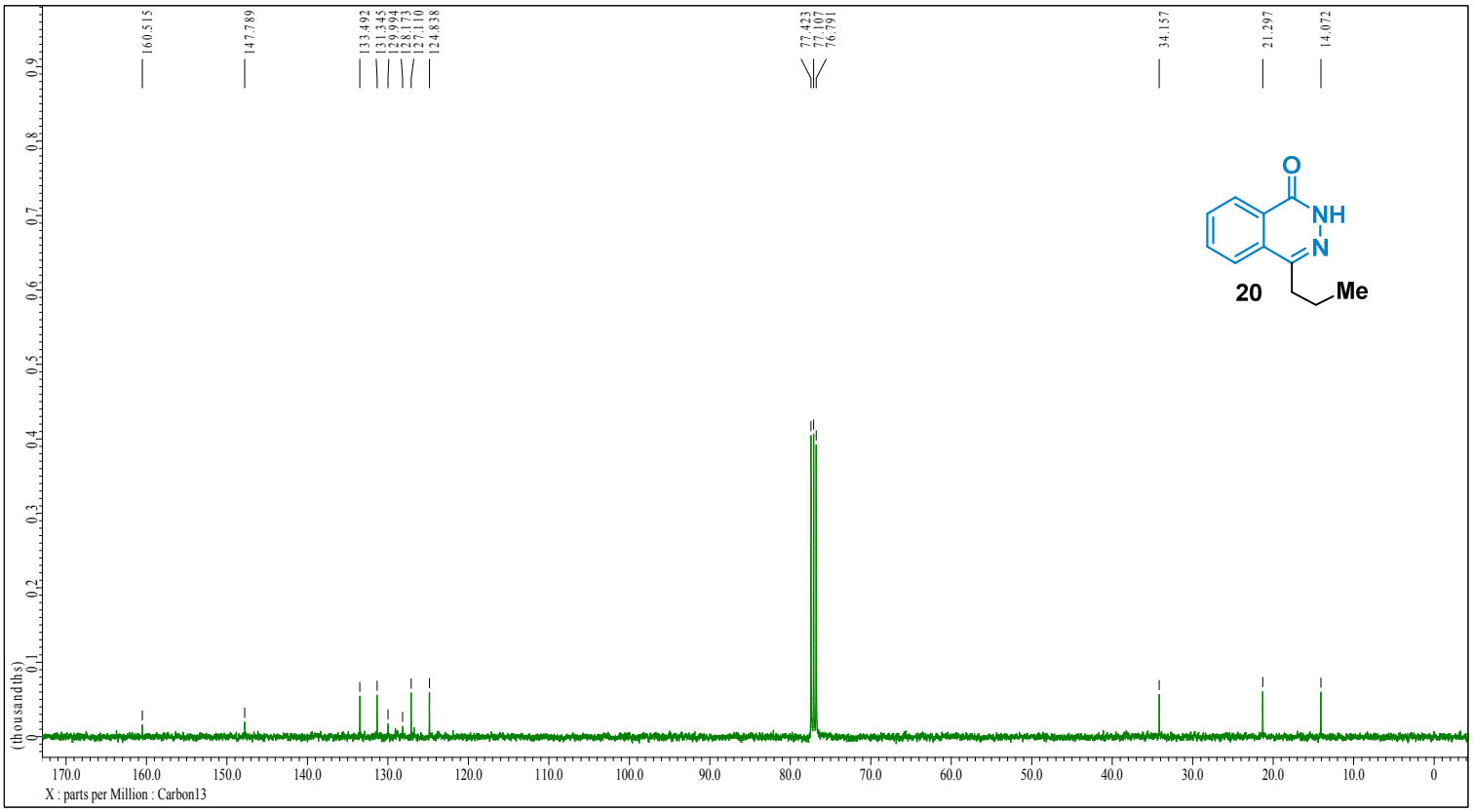
7.936
7.916
7.662
7.616
7.613
7.597
7.595
7.592
7.560
7.558
7.500
7.468
7.448
7.438
7.263
3.010
2.045
2.038
2.032
2.023
2.017
2.009
2.003
1.995
1.982
1.025
1.009
0.997
0.992
0.751
0.738
0.723
0.704
0.661
0.643
0.626
0.000
O
N—Ph
OMe
Me
19
0.93
1.90
0.97
1.05
3.02
0.91
3.00
1.95
0.93
0.99
2.98
abundance
X : parts per Million : Proton


167.395
143.113
136.098
132.907
132.591
129.898
129.055
126.458
125.097
124.024
122.136
97.738
77.423
77.107
76.791
50.227
37.971
16.554
13.842
O
N—Ph
OMe
Me
19
(thousandths)
X : parts per Million : Carbon13


10.424
8.487
8.468
7.853
7.850
7.846
7.837
7.797
7.777
7.265
2.948
2.930
2.911
1.867
1.849
1.829
1.811
1.792
1.773
1.078
1.059
1.041
0.000
1.08
1.04
2.01
1.01
2.03
2.10
3.00
abundance
X : parts per Million : Proton
O
NH
N
20
Me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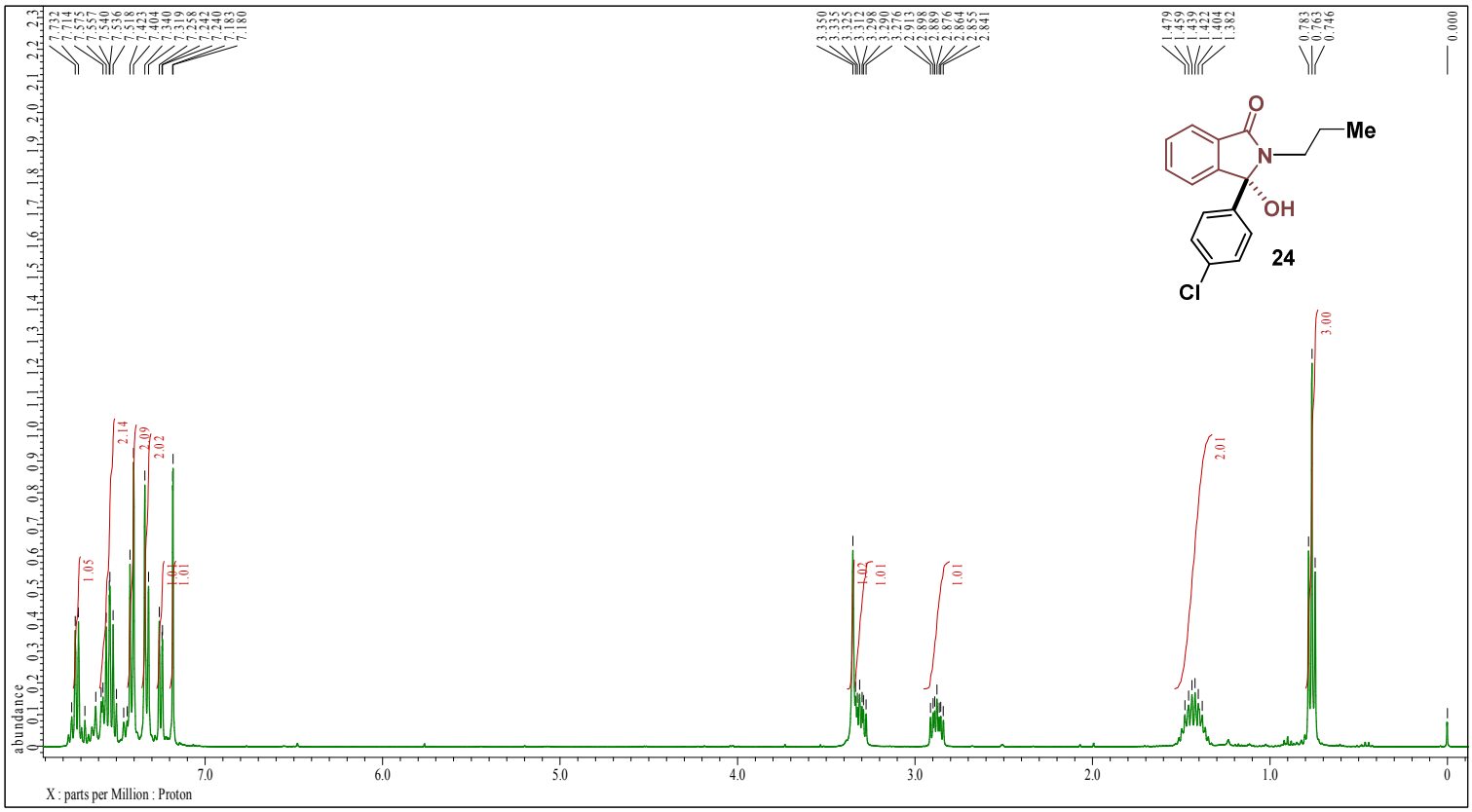
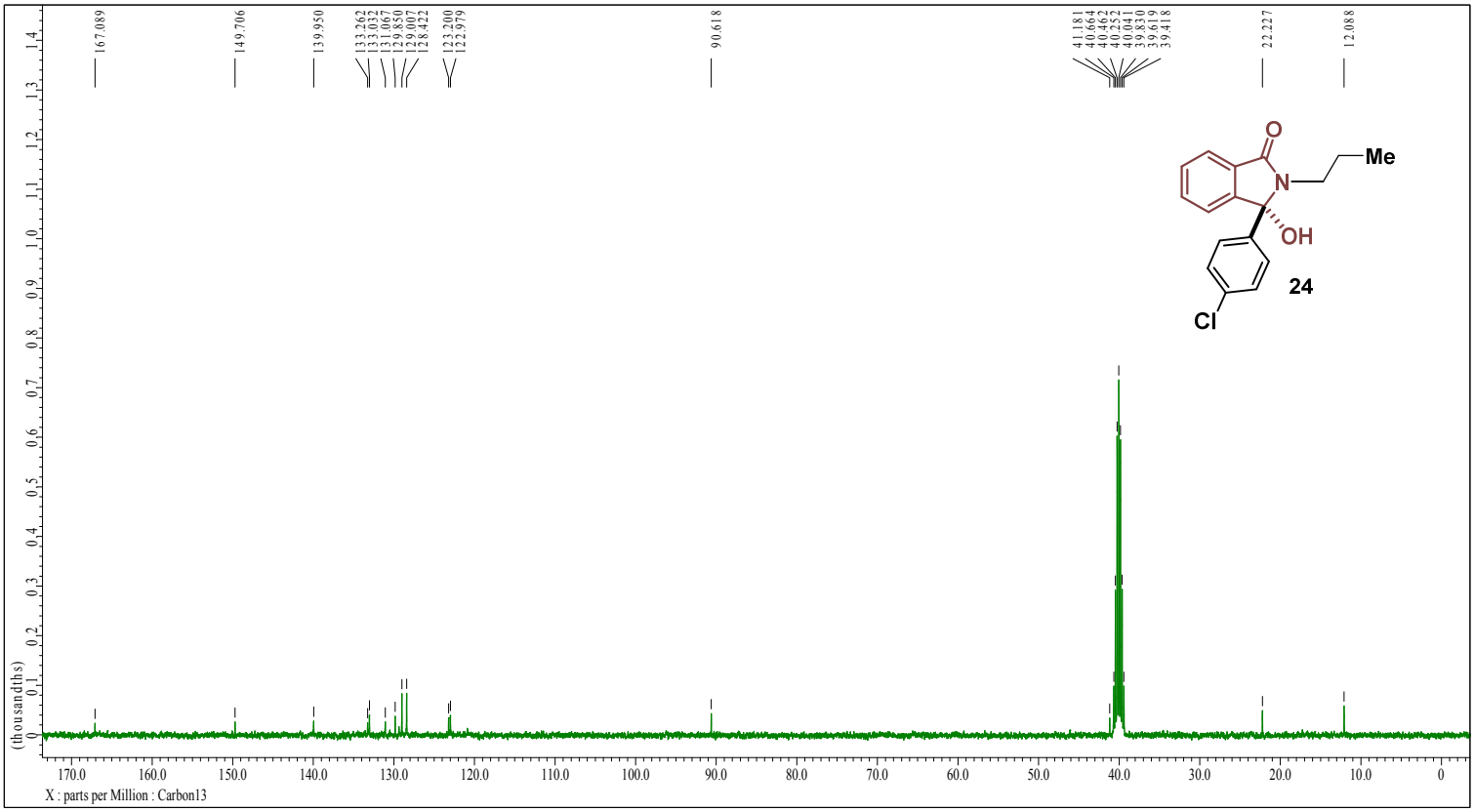
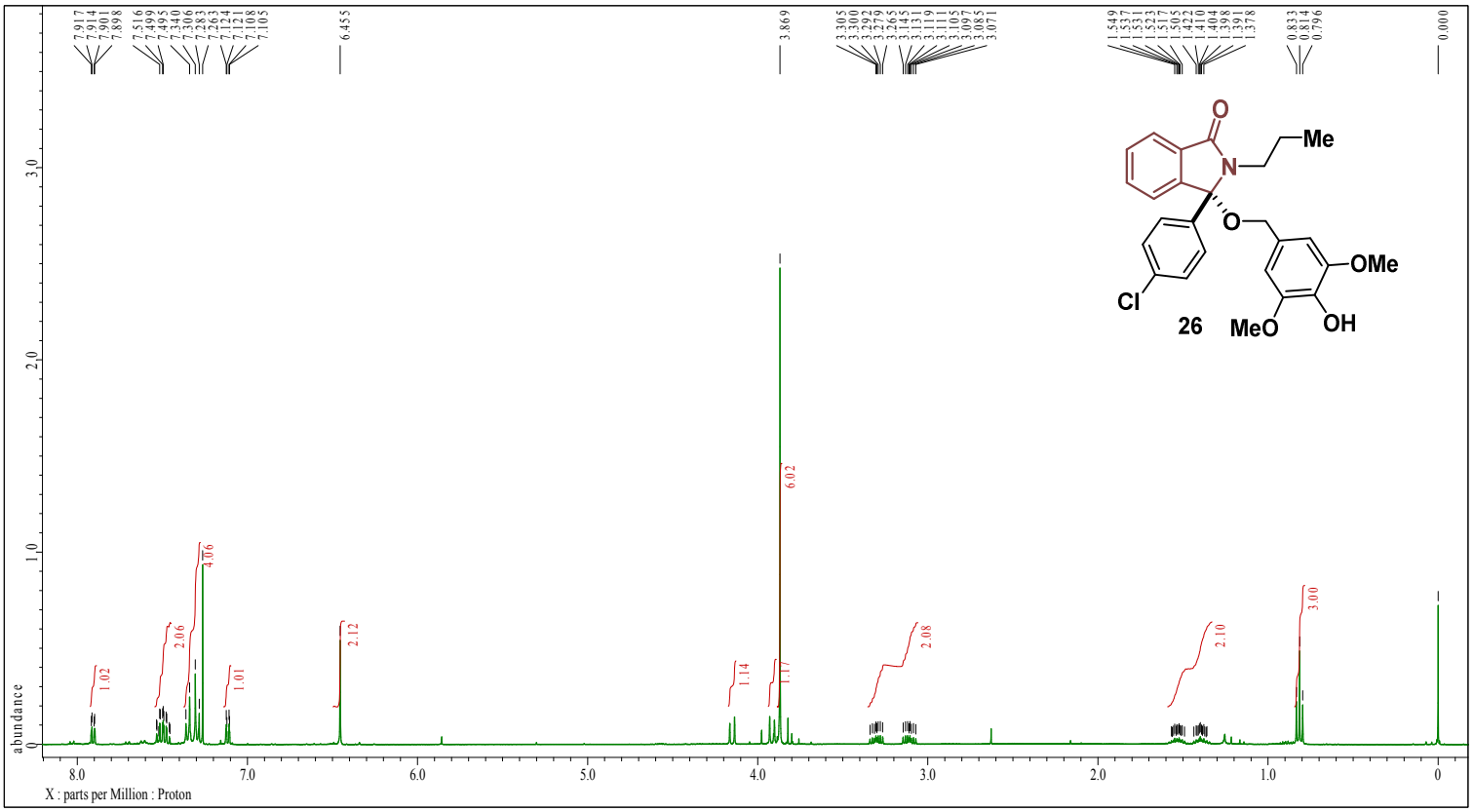
147.789
133.492
131.345
129.994
128.173
127.110
124.838
77.423
77.107
76.791
34.157
21.297
14.072
(thousandths)
X : parts per Million : Carbon13
O
NH
N
20
Me


abundance
X : parts per Million : Proton
O
N
Me
OH
Cl
24


(thousandths)
X : parts per Million : Carbon13
O
N
Me
OH
Cl
24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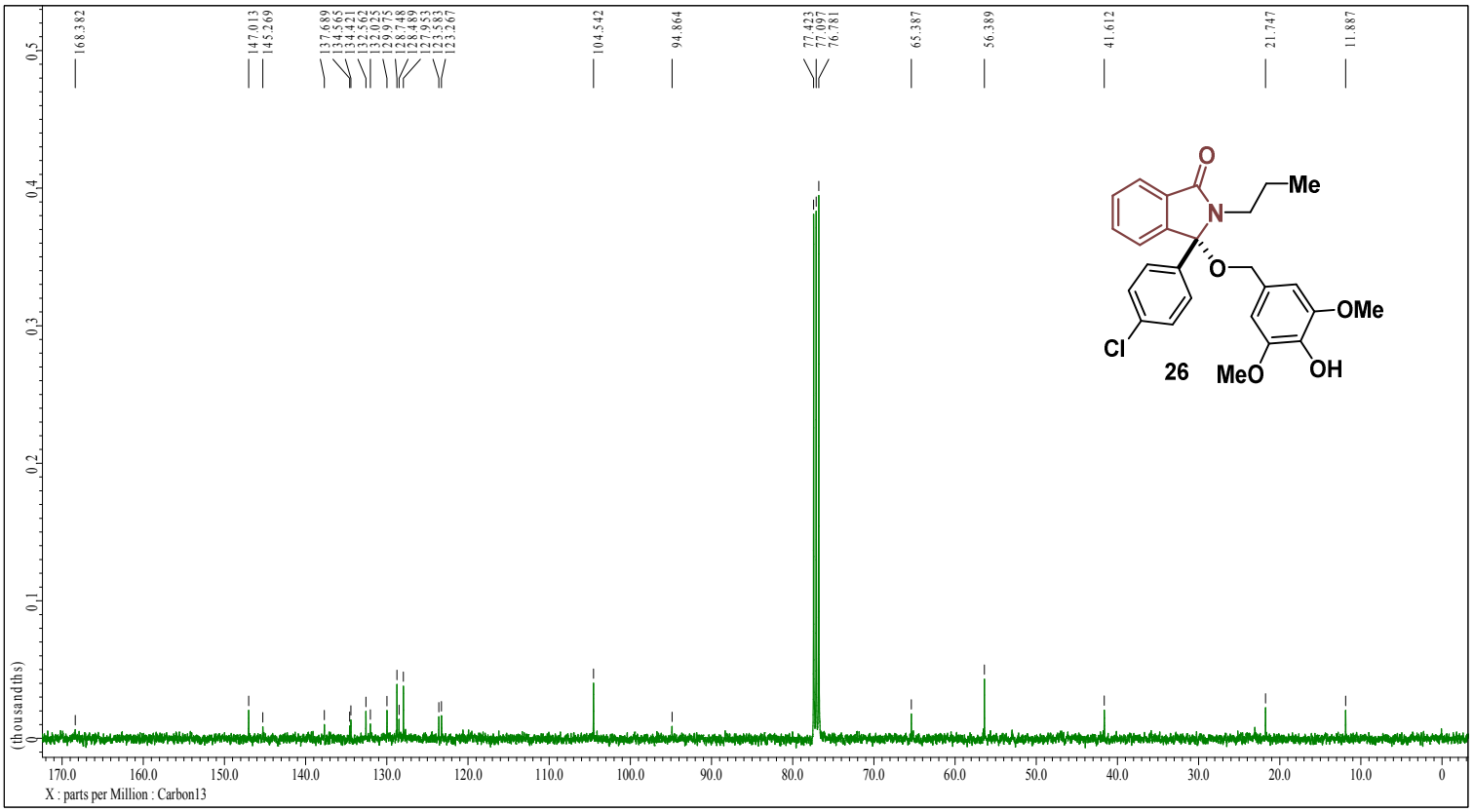
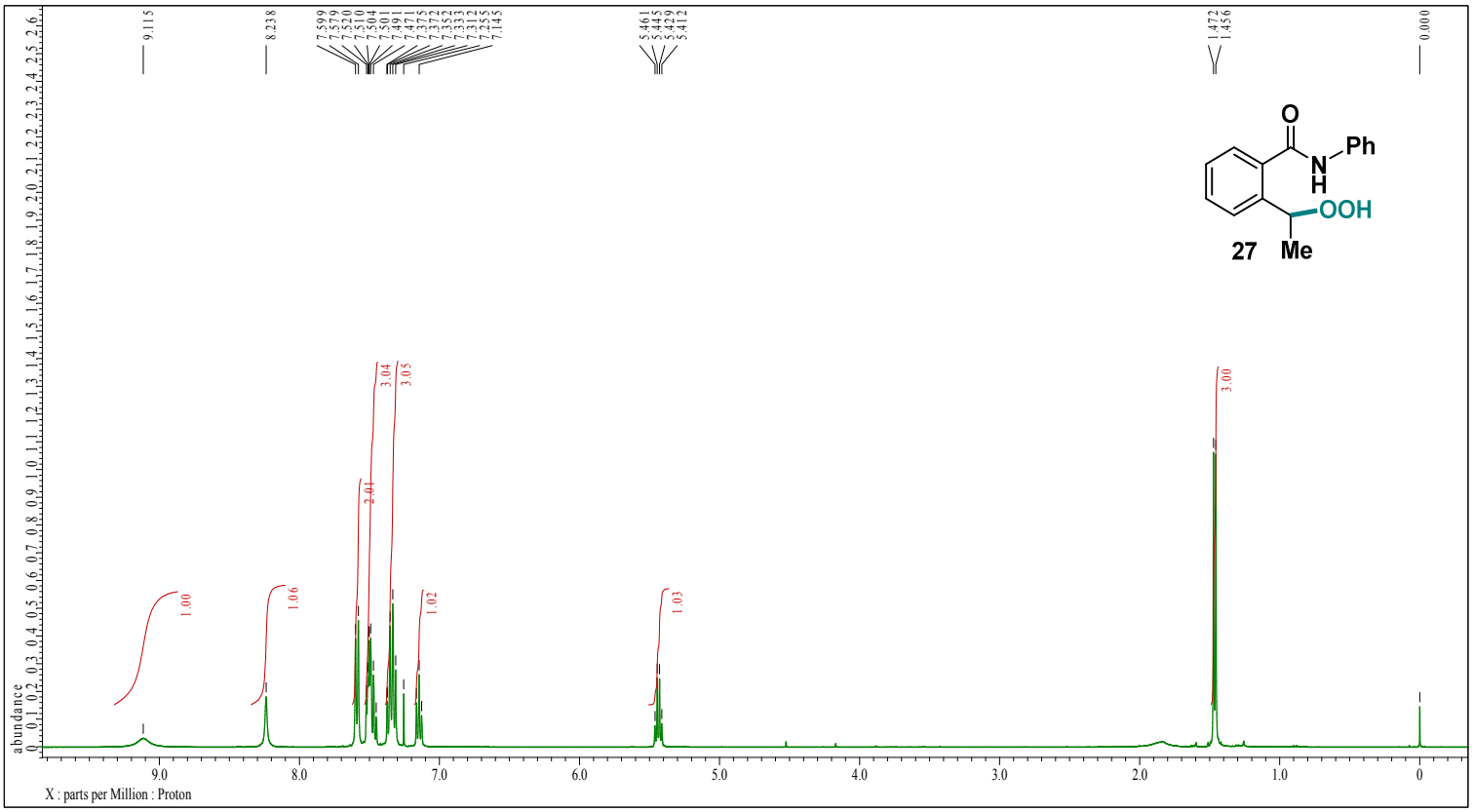
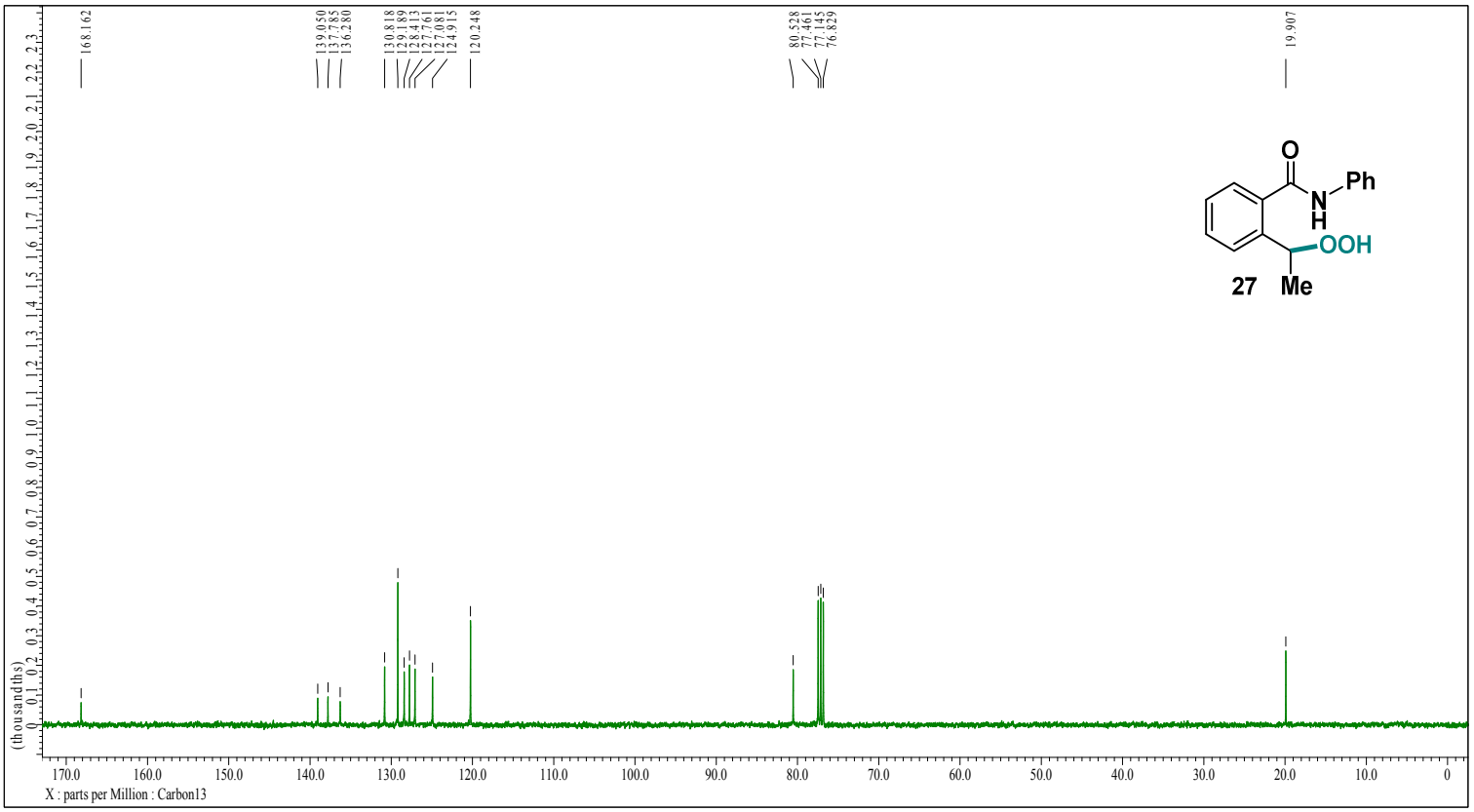
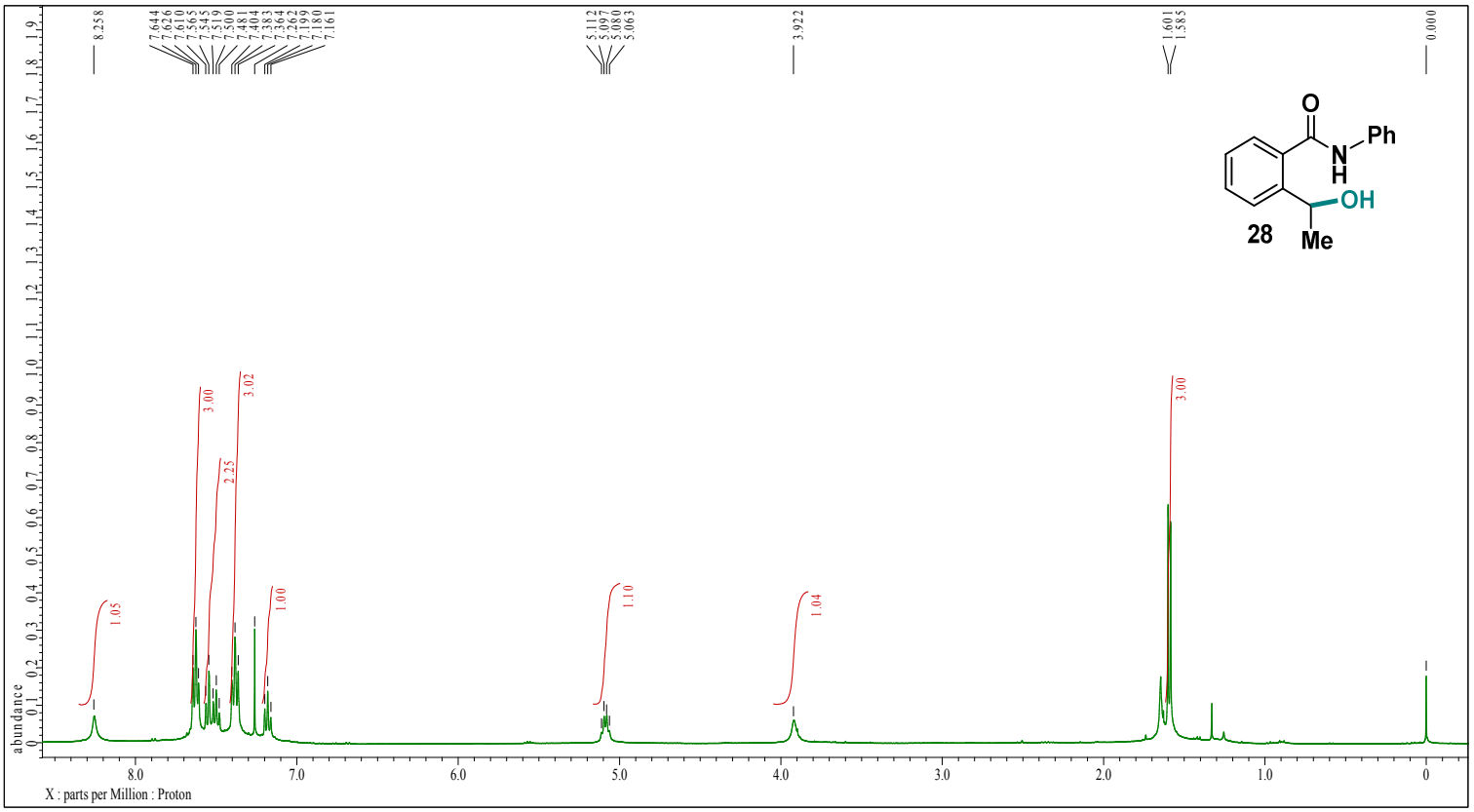
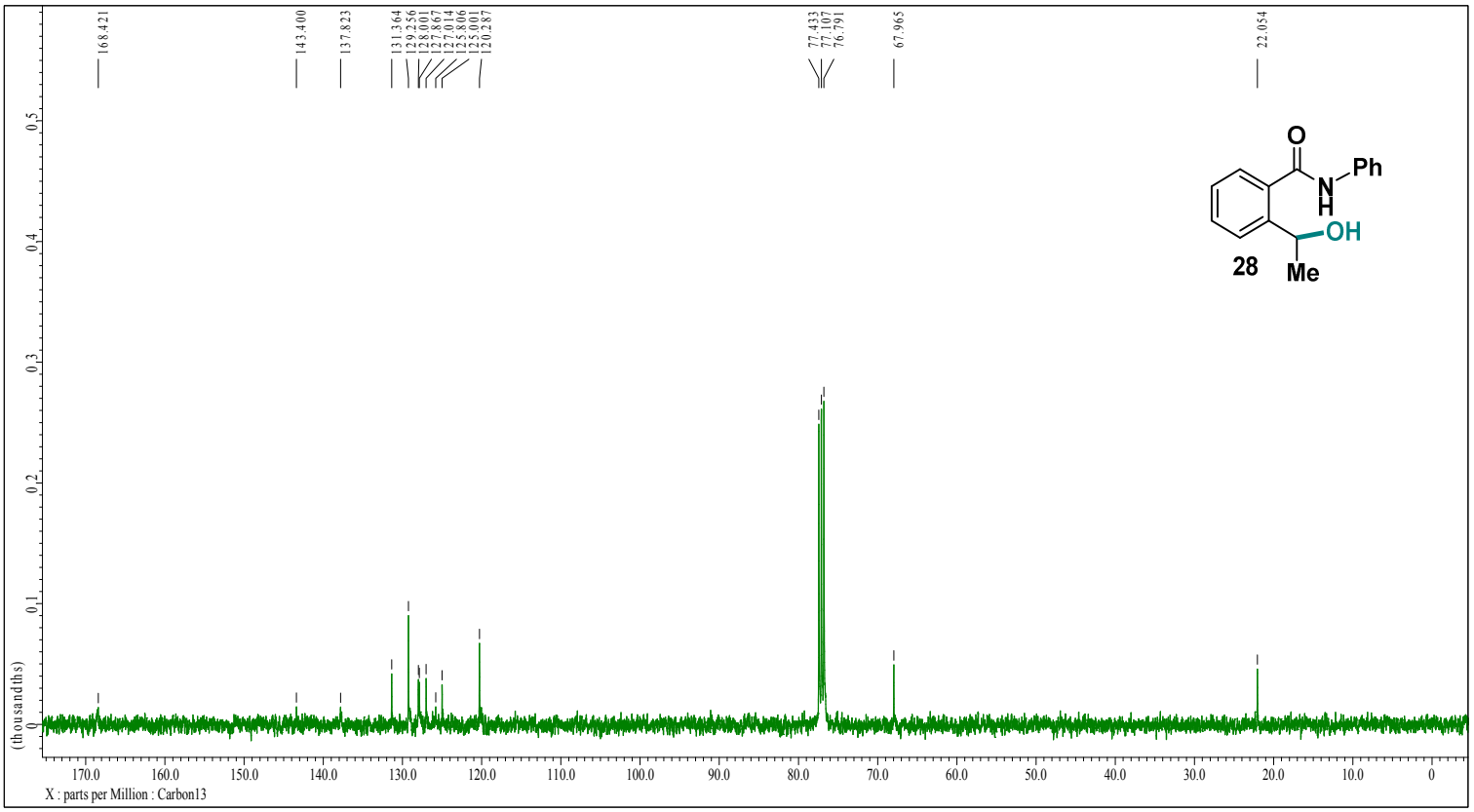
7.914
7.901
7.898
7.516
7.499
7.495
7.340
7.306
7.283
7.263
7.124
7.121
7.108
7.105
6.455
3.869
3.305
3.300
3.292
3.279
3.265
3.145
3.141
3.119
3.111
3.105
3.097
3.085
3.071
1.549
1.537
1.531
1.523
1.517
1.505
1.422
1.410
1.404
1.398
1.391
1.378
0.833
0.814
0.796
0.000
Me
N
O
O
OMe
Cl
26
MeO
OH
abundance
1.02
2.06
4.06
1.01
2.12
1.14
1.17
6.02
2.08
2.10
3.00
X : parts per Million : Proton

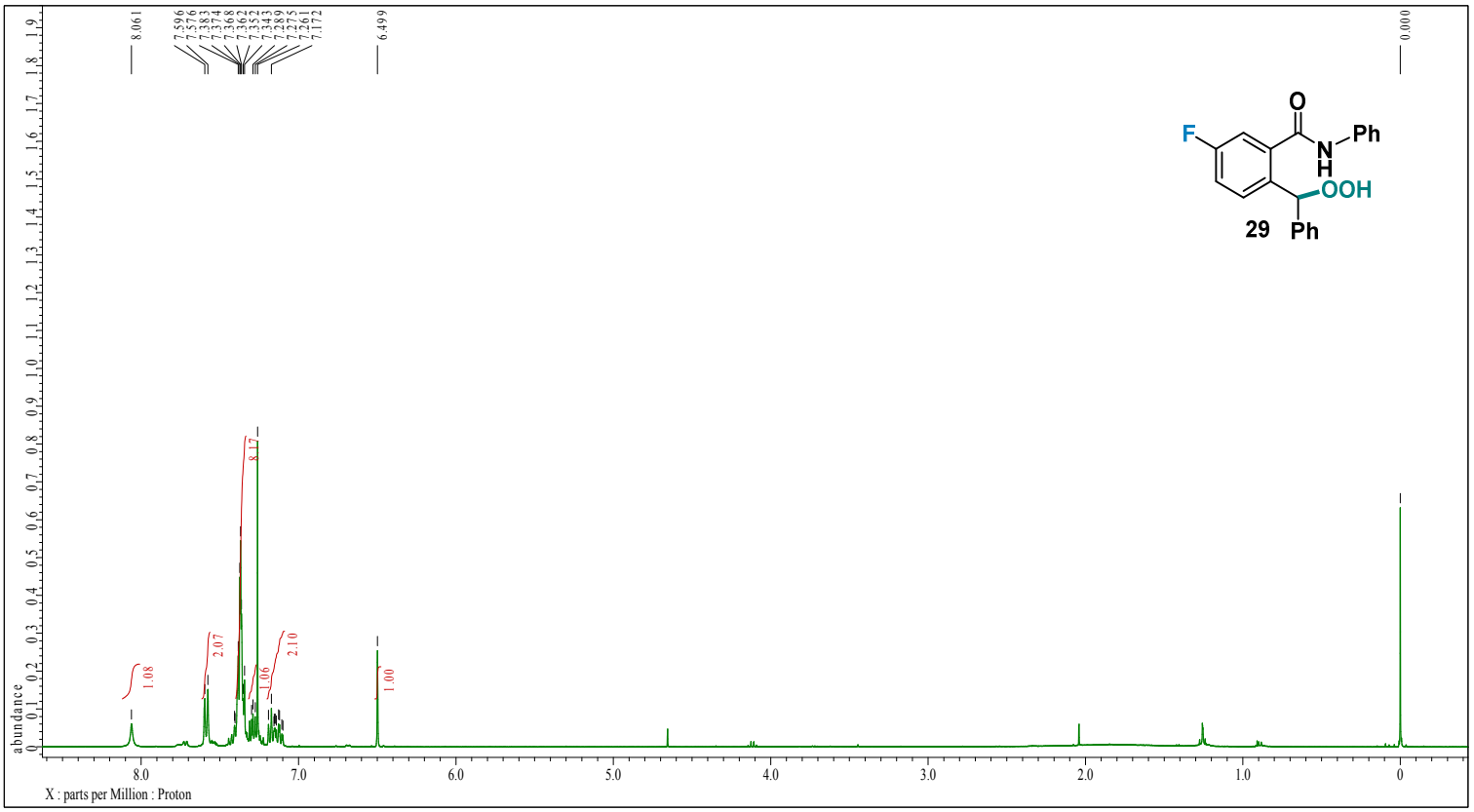

168.382
147.013
145.269
137.689
134.565
134.421
132.562
132.025
129.975
128.748
128.489
125.853
123.583
123.267
104.542
94.864
77.423
77.097
76.781
65.387
56.389
41.612
21.747
11.887
Me
N
O
O
OMe
Cl
26
MeO
OH
(thousandths)
X : parts per Million : Carbon13

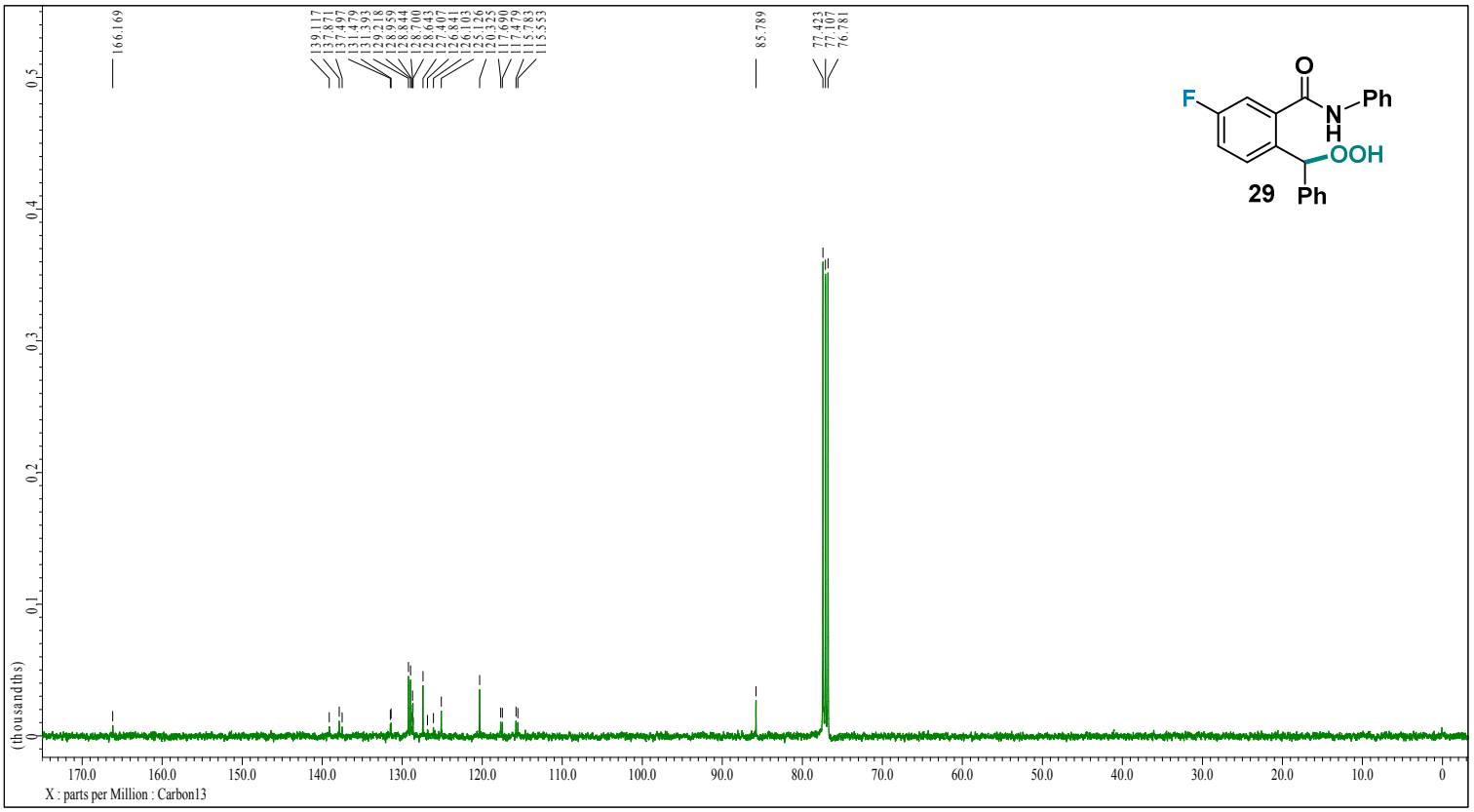

9.115
8.238
7.599
7.579
7.520
7.510
7.504
7.491
7.471
7.375
7.372
7.352
7.333
7.312
7.255
7.145
5.461
5.445
5.429
5.412
1.472
1.456
0.000
O
Ph
N
H
OOH
27 Me
1.00
1.06
2.01
3.04
3.05
1.02
1.03
3.00
abundance
X : parts per Million : Proton

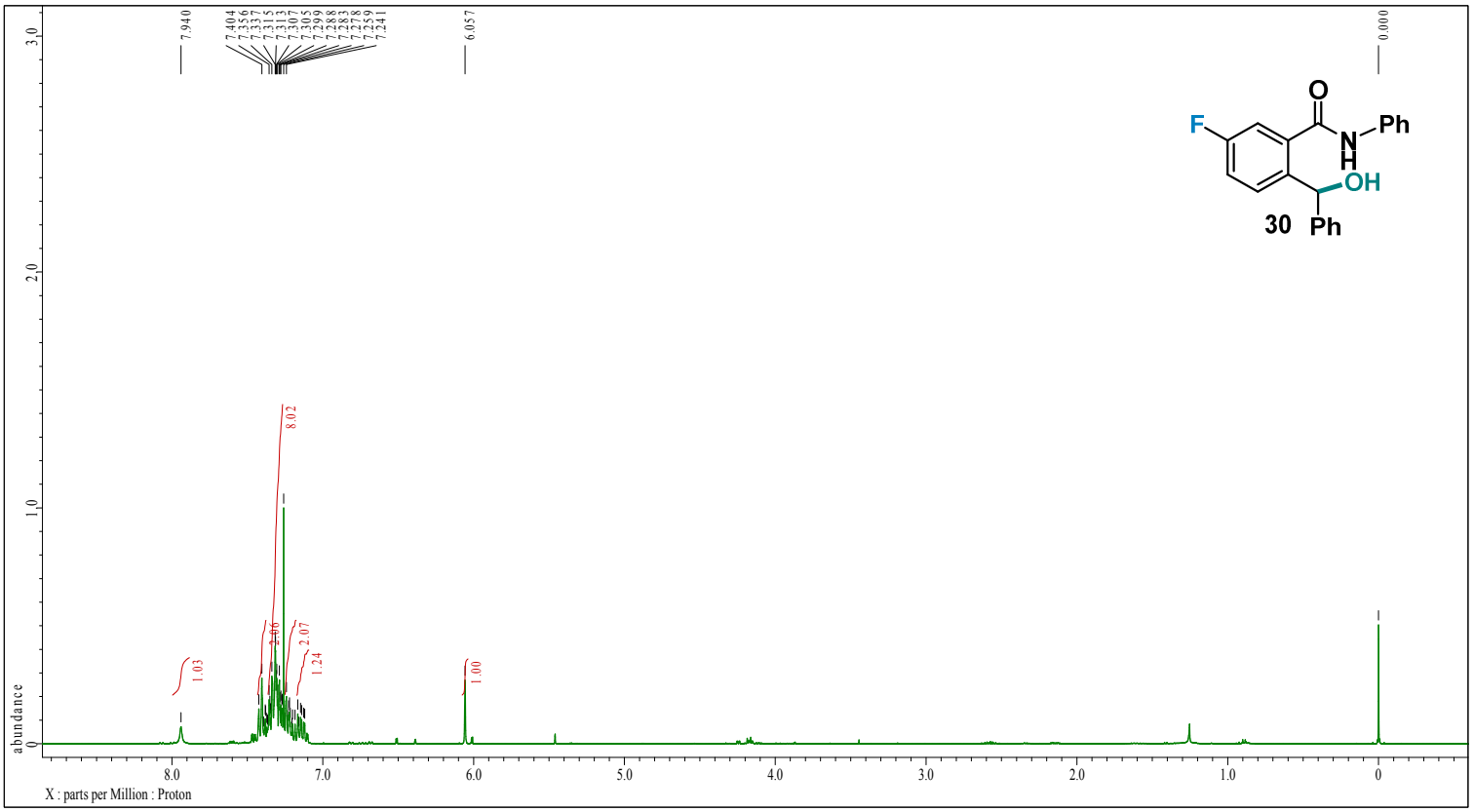

168.162
139.050
137.785
136.280
130.818
129.189
128.413
127.761
127.081
124.915
120.248
80.528
77.461
77.145
76.829
19.907
O
Ph
N
H
OOH
27 Me
(thousandths)
X : parts per Million : Carbon13

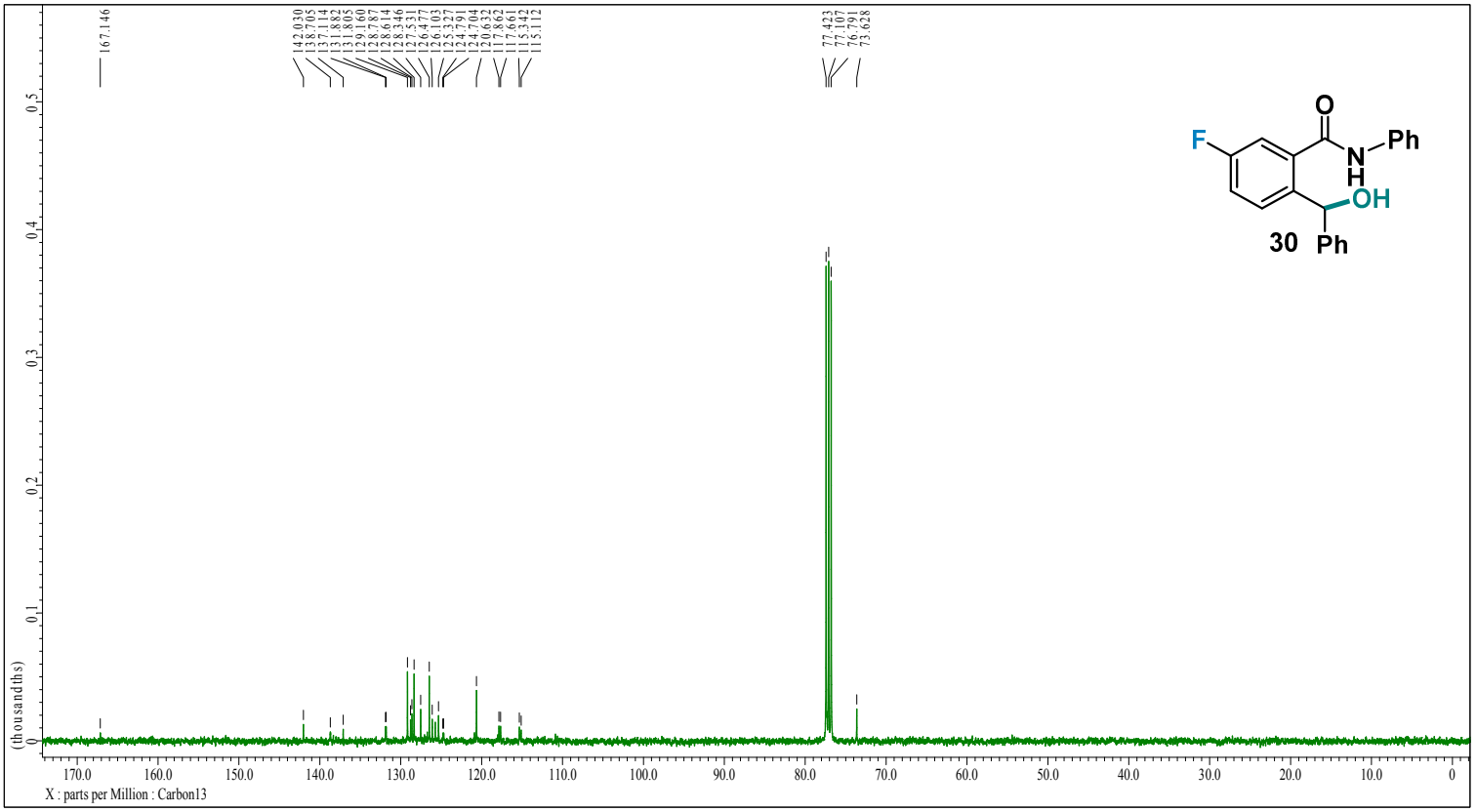

8.258
7.644
7.626
7.610
7.565
7.545
7.519
7.500
7.481
7.404
7.383
7.364
7.262
7.199
7.180
7.161
5.112
5.097
5.080
5.063
3.922
1.601
1.585
0.000
O
Ph
N
H
OH
28
Me
1.05
3.00
2.25
3.02
1.00
1.10
1.04
3.00
abundance
X : parts per Million : Proton

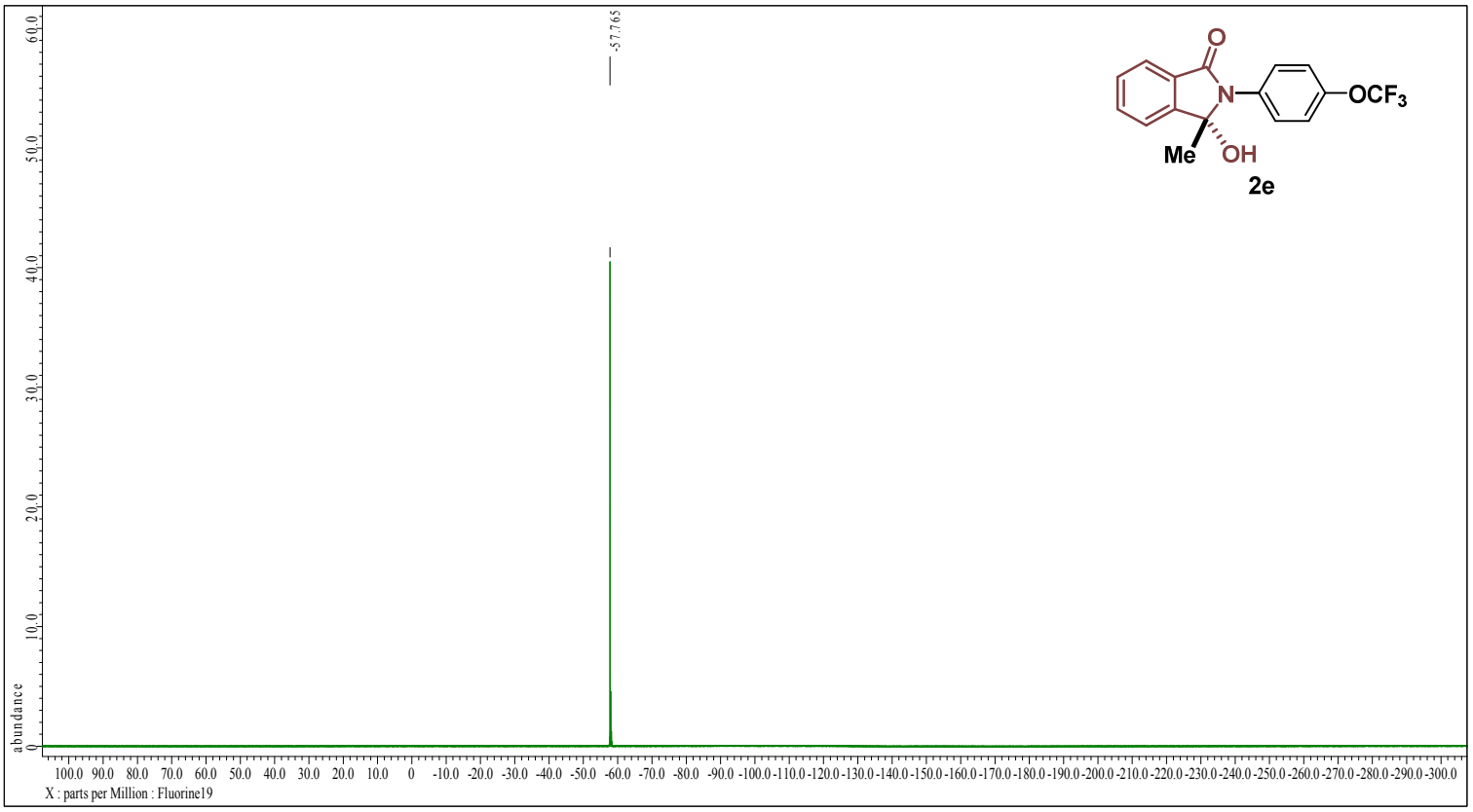

168.421
143.400
137.823
131.364
129.256
128.001
127.867
127.014
125.806
125.001
120.287
77.433
77.107
76.791
67.965
22.054
O
Ph
N
H
OH
28
Me
(thousandths)
X : parts per Million : Carbon13

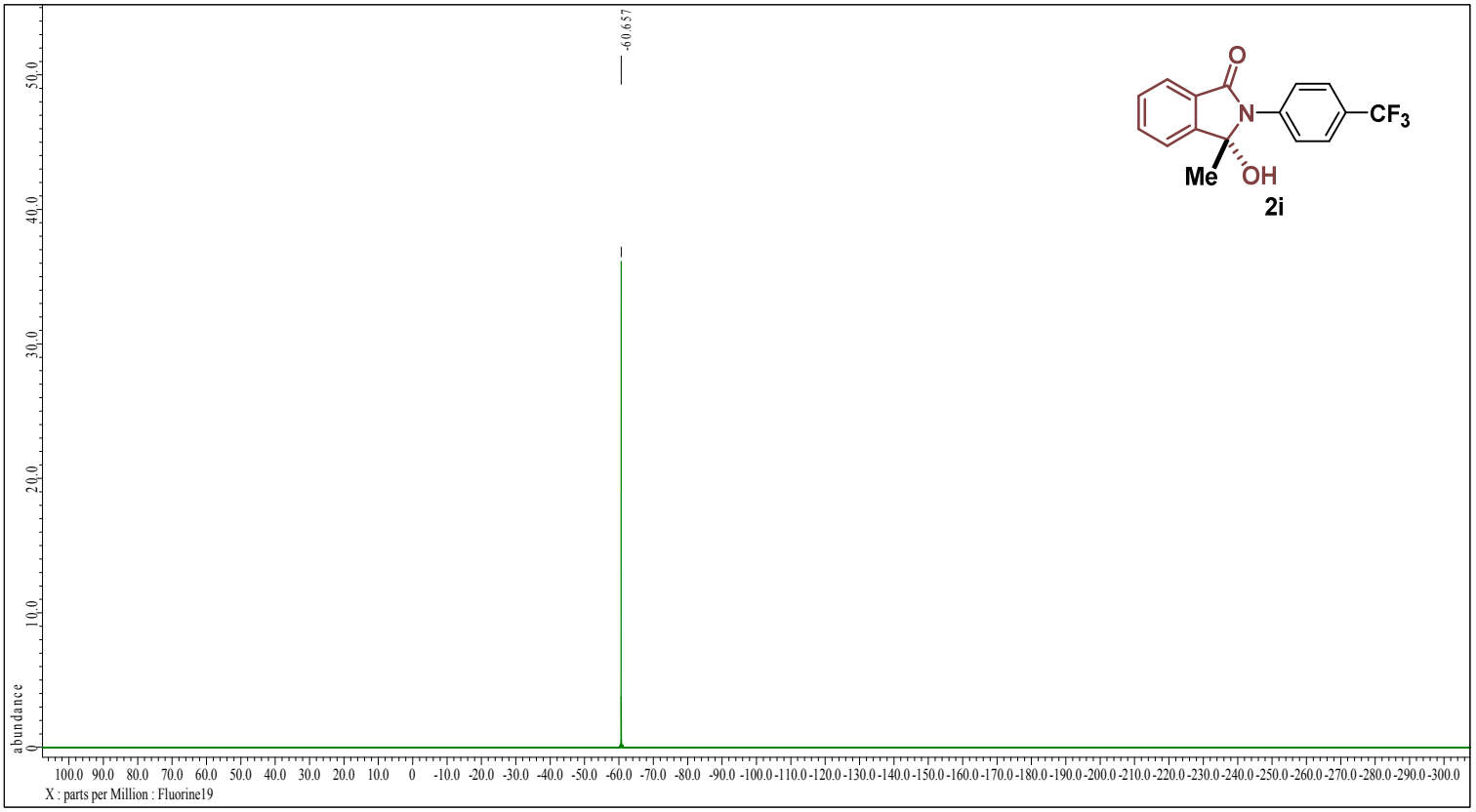

8.061
7.596
7.576
7.383
7.374
7.368
7.362
7.352
7.343
7.289
7.275
7.261
7.172
6.499
0.000
F
O
N
H
Ph
OOH
29
Ph
8.17
2.07
2.10
1.08
1.06
1.00
abundance
X : parts per Million : Proton

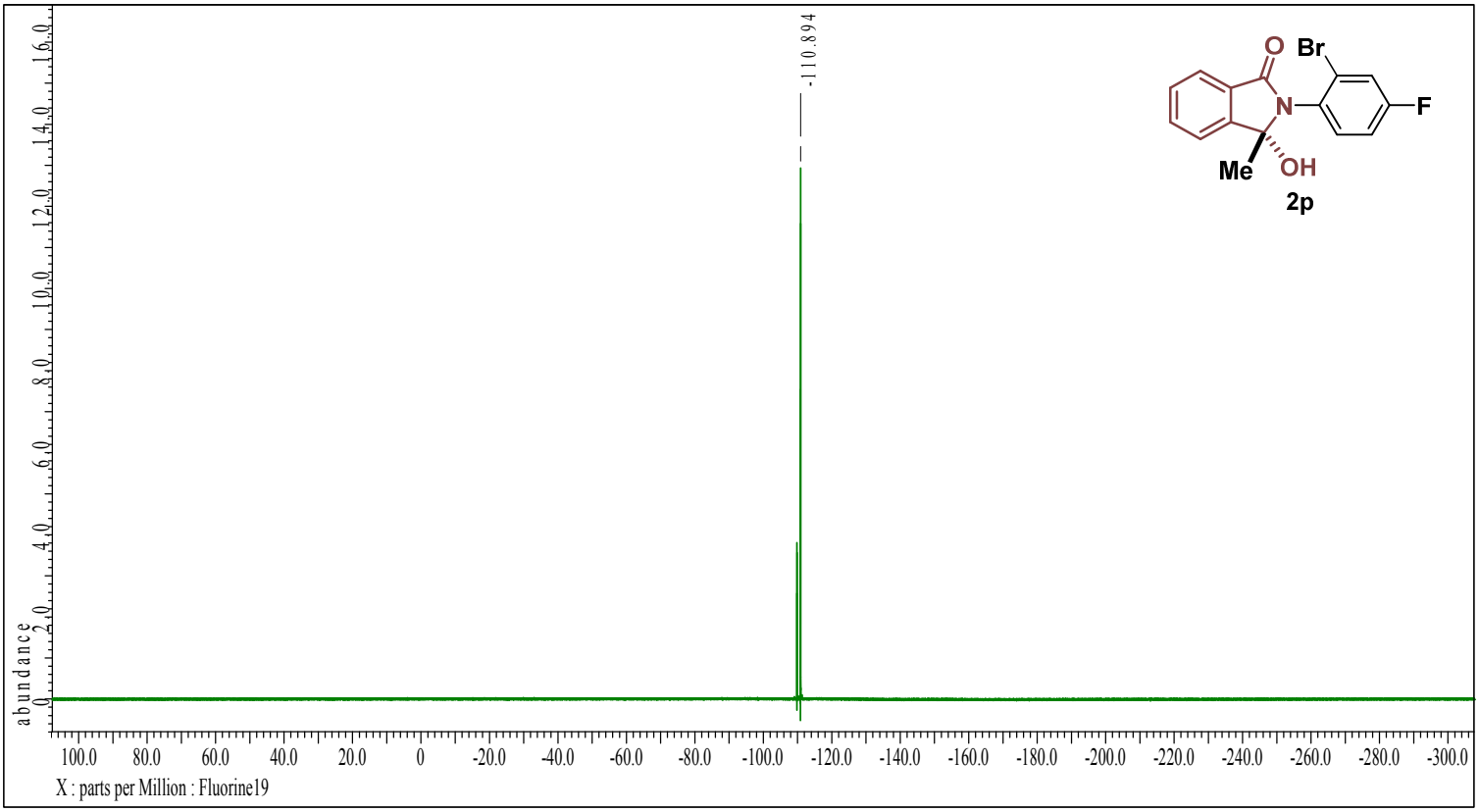

166.169
139.117
137.871
137.497
131.479
131.393
129.218
128.959
128.844
128.700
128.643
127.407
126.641
125.126
120.325
117.690
117.479
115.783
115.553
85.789
77.423
77.107
76.781
F
O
N
H
Ph
OOH
29
Ph
(thousandths)
X : parts per Million : Carbon13

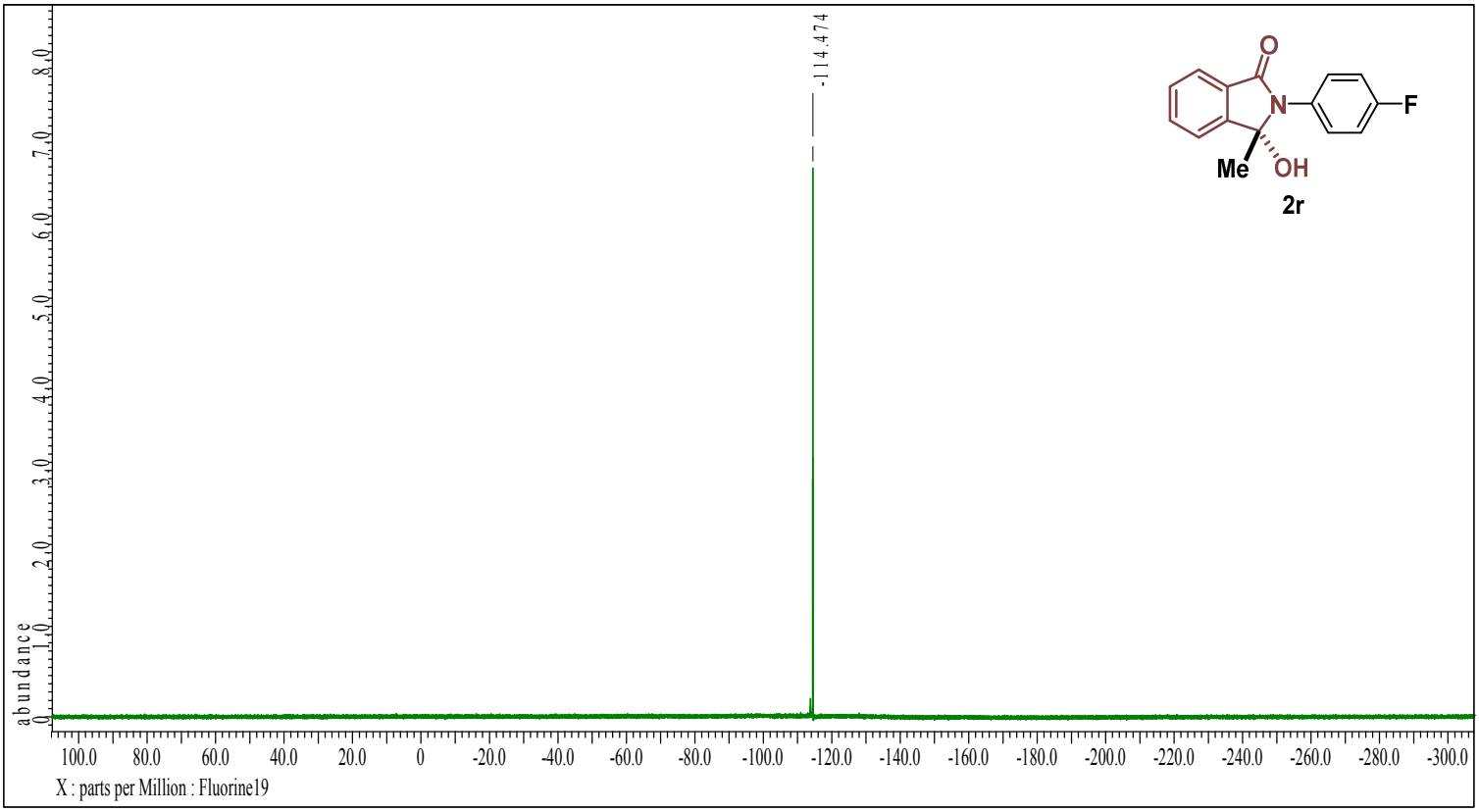

7.940
7.404
7.356
7.337
7.315
7.313
7.307
7.305
7.299
7.288
7.283
7.278
7.259
7.241
6.057
0.000
F
O
N
H
Ph
OH
30
Ph
8.02
1.03
2.05
2.07
1.24
1.00
abundance
X : parts per Million : Proton

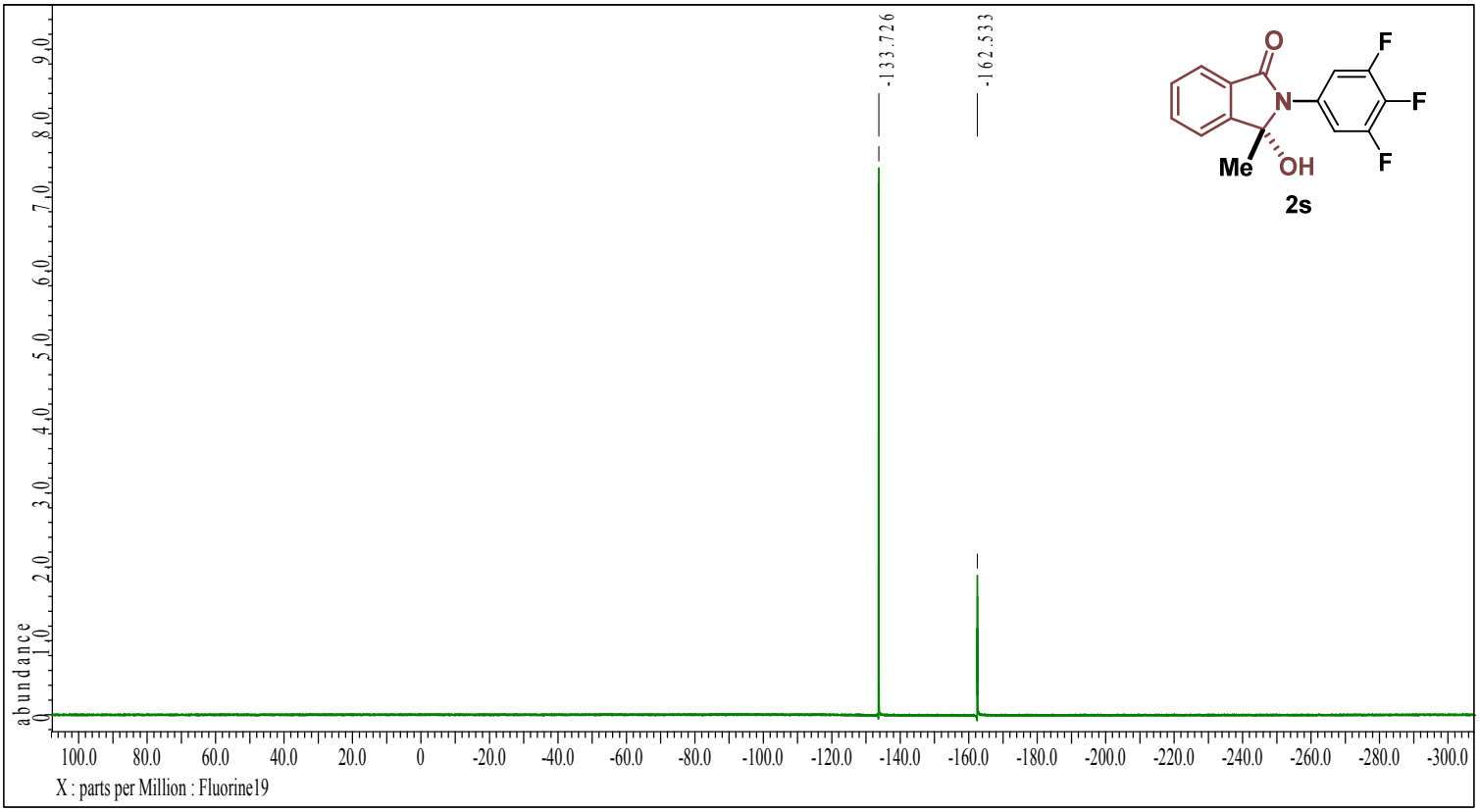

167.146
142.030
138.705
137.114
131.882
131.805
129.160
128.787
128.614
128.446
127.531
126.477
126.103
125.327
124.791
124.704
120.632
117.862
117.661
115.342
115.112
77.423
77.107
76.791
73.628
F
O
N
H
Ph
OH
30
Ph
(thousandths)
X : parts per Million : Carbon13

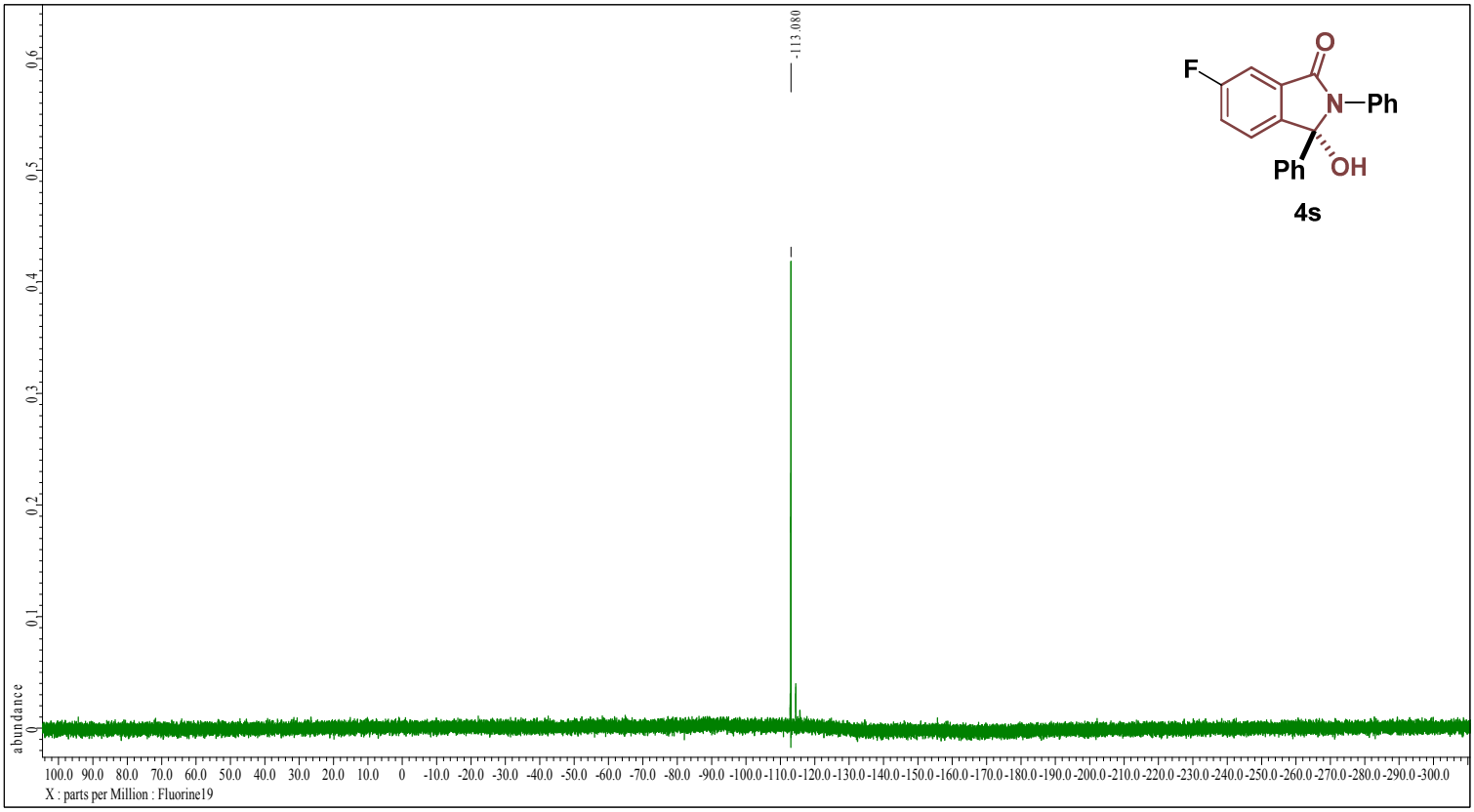

-57.765
O
N
OCF3
Me
OH
2e
abundance
X : parts per Million : Fluorine19

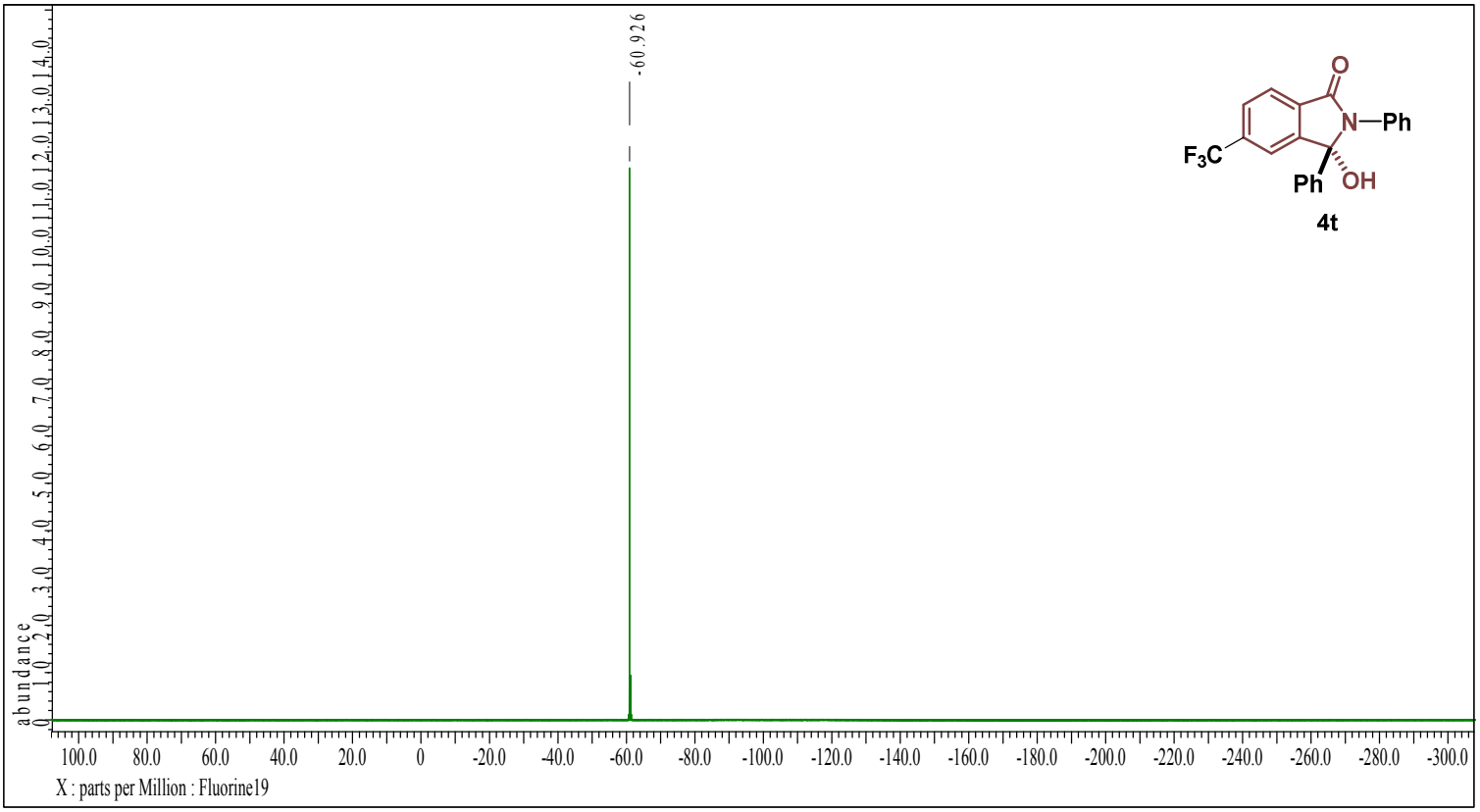

-60.657
O
N
CF3
Me
OH
2i
abundance
X : parts per Million : Fluorine19

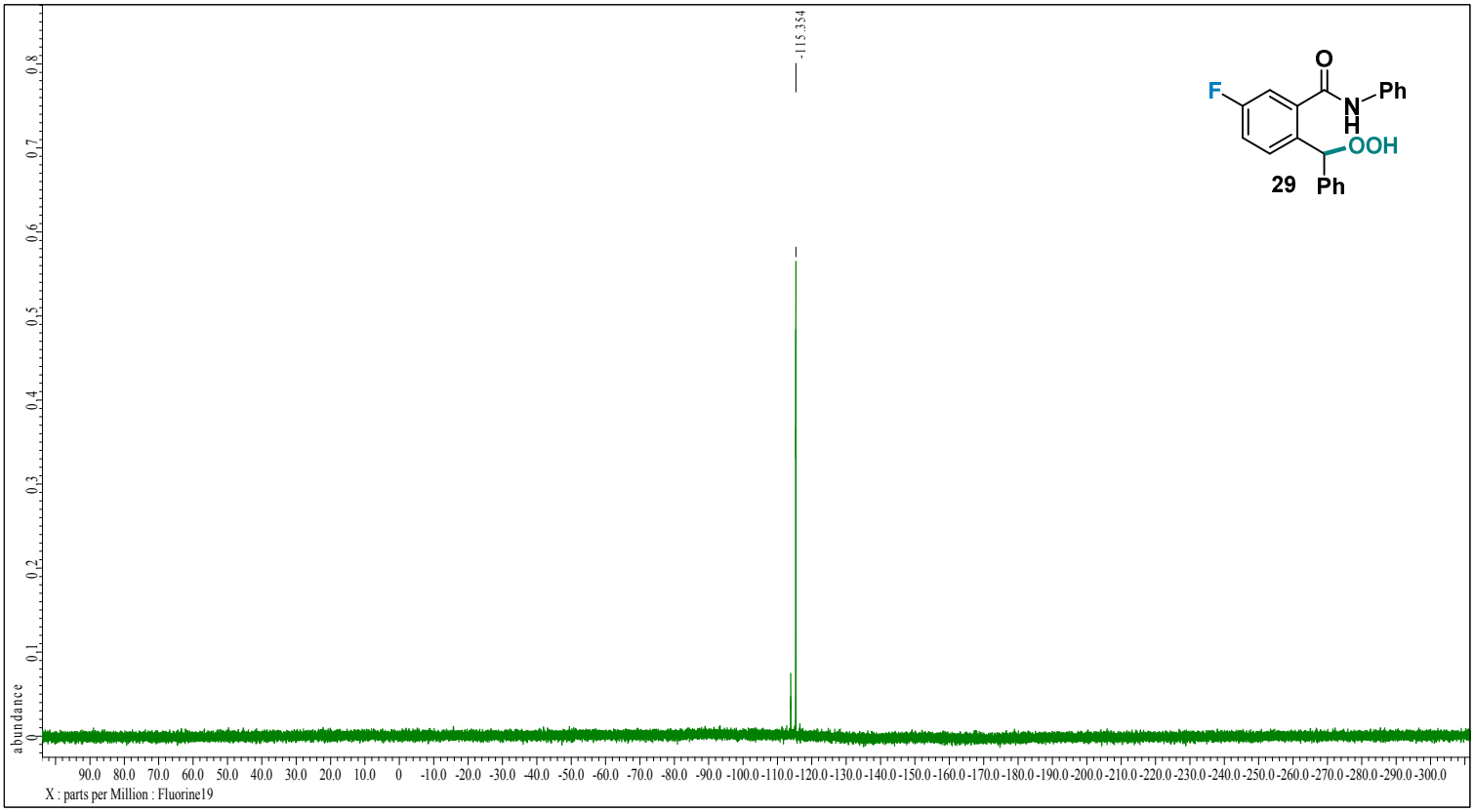

-110.894
O
Br
N
F
Me
OH
2p
abundance
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0
100.0 80.0 60.0 40.0 20.0 0 -20.0 -40.0 -60.0 -80.0 -100.0 -120.0 -140.0 -160.0 -180.0 -200.0 -220.0 -240.0 -260.0 -280.0 -300.0
X : parts per Million : Fluorine19

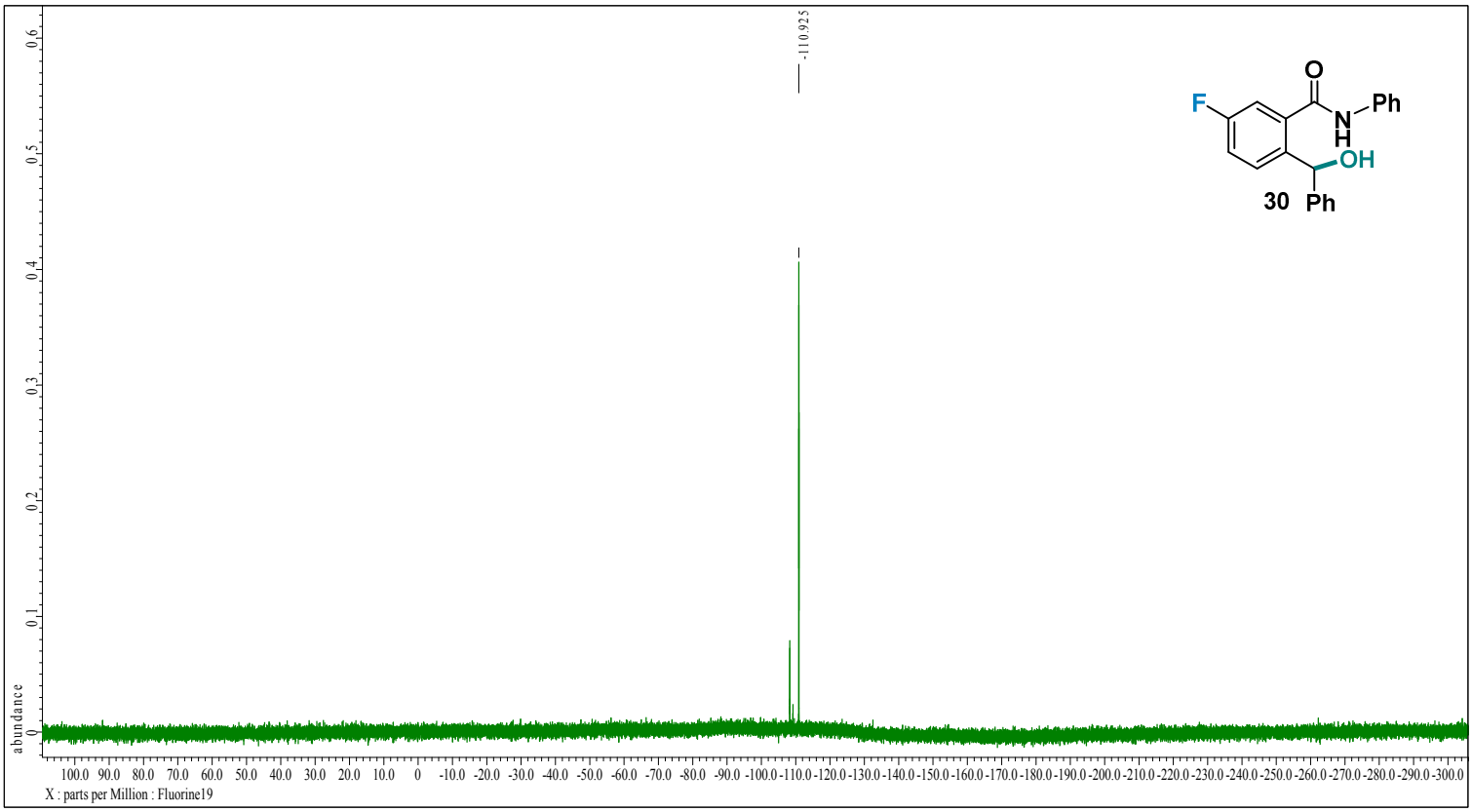

-114.474
O
N
F
Me
OH
2r
abundance
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0
100.0 80.0 60.0 40.0 20.0 0 -20.0 -40.0 -60.0 -80.0 -100.0 -120.0 -140.0 -160.0 -180.0 -200.0 -220.0 -240.0 -260.0 -280.0 -300.0
X : parts per Million : Fluorine19


-133.726
-162.533
O
N
F
F
F
Me
OH
2s
abundance
X : parts per Million : Fluorine19


-113.080
O
F
N—Ph
Ph
OH
4s
abundance
X : parts per Million : Fluorine19


-60.926
abundance
X : parts per Million : Fluorine19
O
N—Ph
F3C
Ph
OH
4t


-115.354
abundance
X : parts per Million : Fluorine19
O
F
N
H
Ph
OOH
29
Ph


-110.925
F
O
N
H
Ph
OH
30
Ph
abundance
0.6
0.5
0.4
0.3
0.2
0.1
0
100.0 90.0 80.0 70.0 60.0 50.0 40.0 30.0 20.0 10.0 0 -10.0 -20.0 -30.0 -40.0 -50.0 -60.0 -70.0 -80.0 -90.0 -100.0 -110.0 -120.0 -130.0 -140.0 -150.0 -160.0 -170.0 -180.0 -190.0 -200.0 -210.0 -220.0 -230.0 -240.0 -250.0 -260.0 -270.0 -280.0 -290.0 -300.0
X : parts per Million : Fluorine19