Electronic Supplementary Information for

Cu-catalysed oxidative amidation of cinnamic acids/arylacetic acids with 2° amines: an efficient synthesis of α-ketoamides

Anup Kumar Sharma, Anjali Jaiswal and Krishna Nand Singh*

Department of Chemistry (Center of Advanced Study), Institute of Science, Banaras Hindu University, Varanasi-221005, India.

E-mail: knsinghbhu@yahoo.co.in; knsingh@bhu.ac.in;

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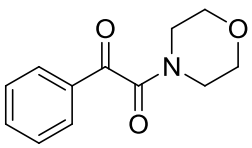
I. General Information: All the reagents were purchased from Sigma-Aldrich, Alfa Aesar, and E. Merck, and were used as received. The reactions were monitored by thin layer chromatography (TLC) using Merck Kieselgel 60GF 254 plates (thickness 0.25 mm). Visualization of TLC was performed using UV light; products purification was done using Merck silica gel (100-200 mess) column chromatography. NMR spectra were recorded with a 500 MHz spectrometer (JNM-ECZ500R/S1) for ^{1}H NMR, and 125 MHz for ^{13}C NMR spectroscopy using $CDCl_3$ solution. Chemical shifts are given in δ ppm and are measured relative to tetramethylsilane (TMS) as internal standard. Mass spectra was recorded on Waters Q-TOF Premier-HAB213 (ESI-MS).

II. General procedure for the synthesis of α-ketoamides (3): A mixture of cinnamic acid **1** (1.0 mmol), amine **2** (2.0 mmol) and $Cu(OAc)_2$(40 mol %) in *p*-xylene (1mL) was stirred under open air at 110 ºC for 24 h. After the completion of reaction (as indicated by TLC), the mixture was quenched with aqueous $NaHCO_3$ saturated solution (5 mL) and extracted with diethyl ether (3 × 5 mL). The combined organic phase was dried over anhydrous sodium sulfate, concentrated under reduced pressure, and then purified by silica gel column chromatography using a mixture of EtOAc-Hexane (1:4) to give the pure product **3**.

III. Spectral data of the products:

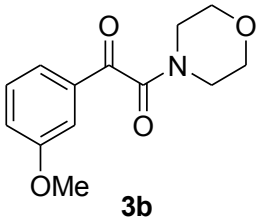
1-Morpholino-2-phenylethane-1,2-dione (3a):[1]



3a

Reddish brown viscous liquid (64%, 140 mg); **^{1}H NMR (500 MHz, $CDCl_3$):** δ = 3.37 (t, *J* = 4.5 Hz, 2H), 3.64 (t, *J* = 5.0, 2H), 3.77-3.81 (m, 4H), 7.50-7.53 (m, 2H), 7.64 (t, *J* = 7.0 Hz, 1H), 7.95 (d, *J* = 7.5 Hz, 2H); **^{13}C NMR (125 MHz, $CDCl_3$):** δ = 41.7, 46.4, 66.8, 66.9, 129.2, 129.8, 133.2, 135.1, 165.6, 191.3.

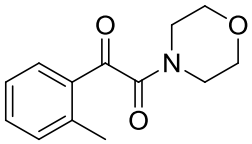
1-(3-Methoxyphenyl)-2-morpholinoethane-1,2-dione (3b):[1]



3b

Reddish brown viscous liquid (66%, 164 mg); **^{1}H NMR (500 MHz, $CDCl_3$):** δ = 3.36 (t, *J* = 4.5 Hz, 2H), 3.64 (t, *J* = 5.0 Hz, 2H), 3.78 (br. s, 4H), 3.86 (s, 3H), 7.19 (t, *J* = 7.0 Hz, 1H), 7.40-7.43 (m, 1H), 7.49 (d, *J* = 7.5 Hz, 2H); **^{13}C NMR (125 MHz, $CDCl_3$):** δ = 41.7, 46.4, 55.7, 66.8, 66.9, 112.9, 122.0, 122.9, 130.2, 134.4, 160.3, 165.5, 191.2.

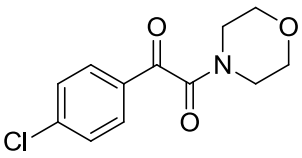
1-Morpholino-2-(o-tolyl)ethane-1,2-dione (3c):[1]



3c

Reddish brown viscous liquid (61%, 142 mg); **^{1}H NMR (500 MHz, $CDCl_3$):** δ = 2.59 (s, 3H), 3.32 (t, *J* = 4.5 Hz, 2H), 3.59 (t, *J* = 4.5 Hz, 2H), 3.71 (br. d, *J* = 5.0 Hz, 4H), 7.24-7.27 (m, 2H), 7.41 (t, *J* = 7.5 Hz, 1H), 7.64 (d, *J* = 7.5 Hz, 1H); **^{13}C NMR (125 MHz, $CDCl_3$):** δ = 21.9, 41.7, 46.4, 66.7, 66.8, 126.3, 131.6, 132.8, 132.8, 134.0, 141.8, 166.3, 193.2.

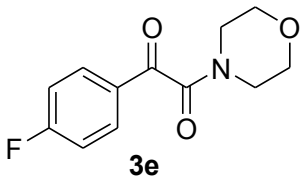
1-(4-Chlorophenyl)- 2-morpholinoethane-1,2-dione (3d):[1]



3d

Reddish brown viscous liquid (62%, 156 mg); **^{1}H NMR (500 MHz, $CDCl_3$):** δ = 3.36 (t, *J* = 4.5 Hz, 2H), 3.64 (t, *J* = 4.5 Hz, 2H), 3.78 (br. s, 4H), 7.48 (d, *J* = 8.5 Hz, 2H), 7.89 (d, *J* = 8.5 Hz, 2H); **^{13}C NMR (125 MHz, $CDCl_3$):** δ = 41.8, 46.4, 66.7, 66.8, 129.6, 131.1, 131.5, 141.7, 165.0, 189.8.

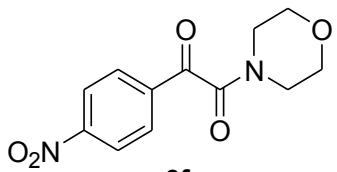
1-(4-Fluorophenyl)-2-morpholinoethane-1,2-dione (3e):[1]



3e

Reddish brown viscous liquid (61%, 144 mg); **^{1}H NMR (500 MHz, $CDCl_3$):** δ = 3.31(t, *J* = 4.5 Hz, 2H), 3.58 (t, *J* = 5.0 Hz, 2H), 3.72 (br. s, 4H), 7.11 (t, *J* = 8.5 Hz, 2H), 7.92 (m, 2H); **^{13}C NMR (125 MHz, $CDCl_3$):** δ = 41.8, 46.4, 66.7, 66.8, 116.5, 116.6, 129.7, 129.9, 129.9, 132.6, 132.7, 165.2, 165.9, 167.9, 189.5; **^{19}F NMR (470 MHz, $CDCl_3$)**: δ = -101.0 (s, 1F).

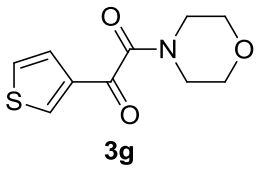
1-Morpholino-2-(4-nitrophenyl)ethane-1,2-dione (3f):[1]



3f

Reddish brown viscous liquid (51%, 134 mg); **^{1}H NMR (500 MHz, $CDCl_3$):** δ = 3.41 (t, *J* = 4.5 Hz, 2H), 3.68 (t, *J* = 4.5 Hz, 2H), 3.81 (br. s, 4H), 8.14 (d, *J* = 8.5 Hz, 2H), 8.34 (d, *J* = 8.5 Hz, 2H); **^{13}C NMR (125 MHz, $CDCl_3$):** δ = 42.1, 46.5, 66.7, 66.8, 124.3, 130.9, 137.6, 151.3, 164.1, 188.8.

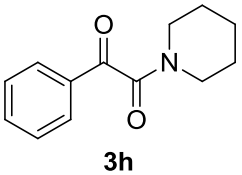
1-Morpholino-2-(thiophen-3-yl)ethane-1,2-dione (3g):[2]



3g

Reddish brown viscous liquid (63%, 141 mg); **^{1}H NMR (500 MHz, $CDCl_3$):** δ = 3.43 (t, *J* = 5.0 Hz, 2H), 3.65-3.67 (m, 2H), 3.73-3.77 (m, 4H), 7.36-7.38 (m, 1H), 7.58 (d, *J* = 5.0 Hz, 1H), 8.24 (d, *J* = 2.5 Hz, 1H); **^{13}C NMR (125 MHz, $CDCl_3$):** δ = 41.9, 46.4, 66.7, 66.9, 127.0, 127.4, 136.8, 138.6, 165.2, 184.4.

1-Phenyl-2-(piperidin-1-yl)ethane-1,2-dione (3h):[1]

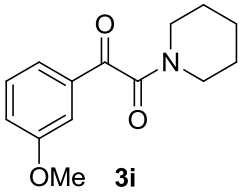


3h

Reddish brown viscous liquid (71%, 154 mg); **^{1}H NMR (500 MHz, $CDCl_3$):** δ = 1.54 (br. s, 2H), 1.68 (quin, *J* = 2.5 Hz, 4H), 3.27 (t, *J* = 5.5 Hz, 2H), 3.70 (br. s, 2H), 7.48 (t, *J* = 8.0 Hz, 2H), 7.61 (t, *J* = 7.5 Hz, 1H), 7.93 (d, *J* = 7.5 Hz, 2H); **^{13}C**

NMR (125 MHz, $CDCl_3$): δ = 24.5, 25.5, 26.3, 42.2, 47.1, 129.1, 129.6, 133.3, 134.7, 165.5, 192.0.

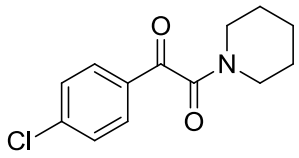
1-(3-Methoxyphenyl)-2-(piperidin-1-yl)ethane-1,2-dione (3i):[3]



3i

Reddish brown viscous liquid (74%, 182 mg); **^{1}H NMR (500 MHz, $CDCl_3$):** δ = 1.47 (br. s, 2H), 1.62 (br. s, 4H), 3.19 (t, *J* = 5.5 Hz, 2H), 3.62 (br. s, 2H), 3.79 (s, 3H), 7.10-7.11 (m, 1H), 7.32 (t, *J* = 8.0 Hz, 1H), 7.42 (s, 2H); **^{13}C NMR (125 MHz, $CDCl_3$):** δ = 24.5, 25.5, 26.3, 42.2, 47.1, 55.6, 112.7, 121.7, 122.8, 130.1, 134.7, 160.2, 165.5, 191.9.

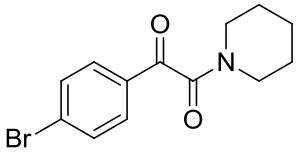
1-(4-Chlorophenyl)-2-(piperidin-1-yl)ethane-1,2-dione (3j):[4]



3j

Reddish brown viscous liquid (63%, 158 mg); **^{1}H NMR (500 MHz, $CDCl_3$):** δ = 1.54 (br. s, 2H), 1.68 (br. s, 4H), 3.26 (t, *J* = 5.5 Hz, 2H), 3.68 (br. s, 2H), 7.46 (d, *J* = 8.5 Hz, 2H), 7.87 (d, *J* = 8.5 Hz, 2H); **^{13}C NMR (125 MHz, $CDCl_3$):** δ = 24.4, 25.5, 26.3, 42.3, 47.1, 129.6, 131.0, 131.8, 141.3, 165.0, 190.6.

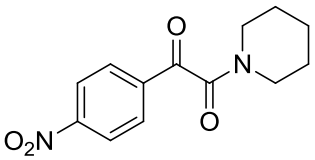
1-(4-Bromophenyl)-2-(piperidin-1-yl)ethane-1,2-dione (3k):[3]



3k

Reddish brown viscous liquid (62%, 182 mg); **^{1}H NMR (500 MHz, $CDCl_3$):** δ = 1.54 (br. s, 2H), 1.68 (br. s, 4H), 3.25 (t, *J* = 5.0 Hz, 2H), 3.68 (br. s, 2H), 7.64 (d, *J* = 8.0 Hz, 2H), 7.79 (d, *J* = 8.5 Hz, 2H); **^{13}C NMR (125 MHz, $CDCl_3$):** δ = 24.4, 25.5, 26.3, 42.3, 47.1, 130.2, 131.0, 132.1, 132.5, 165.0, 190.8.

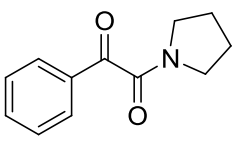
1-(4-Nitrophenyl)-2-(piperidin-1-yl)ethane-1,2-dione (3l):[3]



3l

Reddish brown viscous liquid (54%, 141 mg); **^{1}H NMR (500 MHz, $CDCl_3$):** δ = 1.51-1.55 (m, 2H), 1.67-1.70 (m, 4H), 3.26 (t, *J* = 6.6 Hz, 2H), 3.66 (t, *J* = 4.5 Hz, 2H), 8.08-8.10 (m, 2H), 8.29 (d, *J* = 9.0 Hz, 2H); **^{13}C NMR (125 MHz, $CDCl_3$):** δ = 24.3, 25.4, 26.3, 42.4, 47.1, 124.1, 130.6, 137.7, 151.0, 164.1, 189.5.

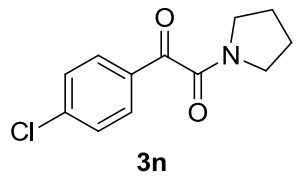
1-Phenyl-2-(pyrrolidin-1-yl)ethane-1,2-dione (3m):[3]



3m

Reddish brown viscous liquid (69%, 140 mg); **^{1}H NMR (500 MHz, $CDCl_3$):** δ = 1.93-1.98 (m, 4H), 3.41 (t, *J* = 6.5 Hz, 2H), 3.64 (t, *J* = 6.5 Hz, 2H), 7.48 (t, *J* = 8.0 Hz, 2H), 7.62 (t, *J* = 7.5 Hz, 1H), 7.98 (d, *J* = 7.5 Hz, 2H); **^{13}C NMR (125 MHz, $CDCl_3$):** δ = 24.1, 26.0, 45.4, 46.8, 129.0, 130.0, 133.0, 134.7, 165.0, 191.7.

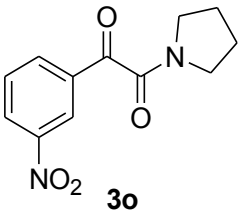
1-(4-Chlorophenyl)-2-(pyrrolidin-1-yl)ethane-1,2-dione (3n):[5]



3n

Reddish brown viscous liquid (63%, 149 mg); **^{1}H NMR (500 MHz, $CDCl_3$):** δ = 1.93-1.97 (m, 4H), 3.42 (t, *J* = 6.0 Hz, 2H), 3.63 (t, *J* = 6.5 Hz, 2H), 7.46 (d, *J* = 8.5 Hz, 2H), 7.94 (d, *J* = 8.5 Hz, 2H); **^{13}C NMR (125 MHz, $CDCl_3$):** δ = 24.1, 26.0, 45.5, 46.9, 129.4, 131.4, 131.5, 141.3, 164.4, 190.2.

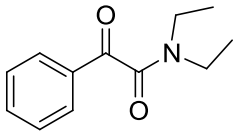
1-(3-Nitrophenyl)-2-(pyrrolidin-1-yl)ethane-1,2-dione (3o):[6]



3o

Reddish brown viscous liquid (53%, 131 mg); **^{1}H NMR (500 MHz, $CDCl_3$):** δ = 1.99 (br. s, 4H), 3.50 (t, *J* = 6.0 Hz, 2H), 3.67 (t, *J* = 6.5 Hz, 2H), 7.69 (t, *J* = 8.0 Hz, 1H), 8.37 (d, *J* = 8.0 Hz, 1H), 8.46 (d, *J* = 8.0 Hz, 1H), 8.85 (s, 1H); **^{13}C NMR (125 MHz, $CDCl_3$):** δ = 24.0, 26.1, 45.8, 47.1, 125.0, 128.6, 130.2, 134.8, 135.6, 148.7, 163.1, 188.5.

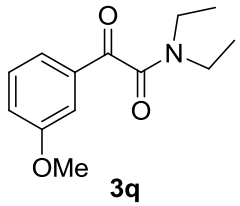
***N*,*N*-Diethyl-2-oxo-2-phenylacetamide (3p):**[1]



3p

Reddish brown viscous liquid (52%, 106 mg); **^{1}H NMR (500 MHz, $CDCl_3$):** δ = 1.14 (t, *J* = 7.0 Hz, 3H), 1.27 (t, *J* = 7.0 Hz, 3H), 3.22 (q, *J* = 7.0 Hz, 2H), 3.54 (q, *J* = 7.5 Hz, 2H), 7.49-7.52 (m, 2H), 7.61 (t, *J* = 7.5 Hz, 1H), 7.93 (d, *J* = 8.0 Hz, 2H); **^{13}C NMR (125 MHz, $CDCl_3$):** δ = 12.9, 14.2, 38.9, 42.2, 129.0, 129.7, 133.4, 134.6, 166.8, 191.7.

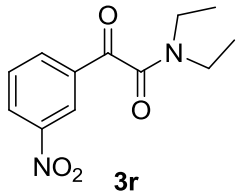
***N*,*N*-Diethyl-2-(3-methoxyphenyl)-2-oxoacetamide (3q):**[7]



3q

Reddish brown viscous liquid (57%, 133 mg); **^{1}H NMR (500 MHz, $CDCl_3$):** δ = 0.86 (t, *J* = 7.0 Hz, 3H), 1.14 (t, *J* = 7.0 Hz, 3H), 3.21 (q, *J* = 7.0 Hz, 2H), 3.53 (q, *J* = 7.0 Hz, 2H), 3.85 (s, 3H), 7.16-7.18 (m, 1H), 7.38-7.41 (m, 1H), 7.46 (d, *J* = 7.5 Hz, 2H); **^{13}C NMR (125 MHz, $CDCl_3$):** δ = 12.9, 14.2, 38.9, 42.2, 55.6, 112.8, 121.7, 122.9, 130.1, 134.7, 160.1, 166.8, 191.6.

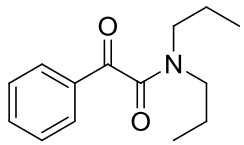
***N*,*N*-Diethyl-2-(3-nitrophenyl)-2-oxoacetamide (3r):**[8]



3r

Reddish brown viscous liquid (47%, 117 mg); **^{1}H NMR (500 MHz, $CDCl_3$):** δ = 1.18 (t, *J* = 7.0 Hz, 3H), 1.29 (t, *J* = 7.0 Hz, 3H), 3.26 (q, *J* = 6.5 Hz, 2H), 3.57 (q, *J* = 7.0 Hz, 2H), 7.70 (t, *J* = 8.0 Hz, 1H), 8.27 (d, *J* = 7.5 Hz, 1H), 8.46 (d,, *J* = 8.5 Hz, 1H), 8.77 (s, 1H); **^{13}C NMR (125 MHz, $CDCl_3$):** δ = 12.9, 14.4, 39.4, 42.4, 124.5, 128.6, 130.3, 134.9, 135.2, 148.7, 165.4, 188.7.

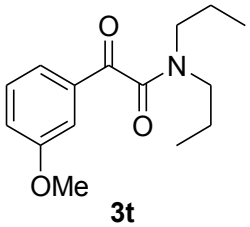
2-Oxo-2-phenyl-*N*,*N*-dipropylacetamide (3s):[1]



3s

Reddish brown viscous liquid (47%, 109 mg); **^{1}H NMR (500 MHz, $CDCl_3$):** δ = 0.77 (t, *J* = 7.5 Hz, 3H), 0.98 (t, *J* = 7.5 Hz, 3H), 1.54 (sext, *J* = 7.5 Hz, 2H), 1.68 (sext, *J* = 7.5 Hz, 2H), 3.11 (t, *J* = 7.5 Hz, 2H), 3.45 (t, *J* = 8.0 Hz, 2H), 7.48-7.51 (m, 2H), 7.61-7.64 (m, 1H), 7.93-7.94 (m, 2H); **^{13}C NMR (125 MHz, $CDCl_3$):** δ = 11.1, 11.5, 20.7, 21.9, 46.0, 49.4, 129.0, 129.7, 133.5, 134.6, 167.3, 191.6.

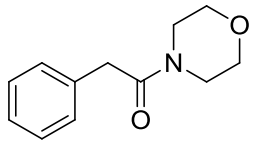
2-(3-Methoxyphenyl)-2-oxo-*N*,*N*-dipropylacetamide (3t):



3t

Reddish brown viscous liquid (46%, 121 mg); **^{1}H NMR (500 MHz, $CDCl_3$):** δ = 0.76 (t, *J* = 7.5 Hz, 3H), 0.97 (t, *J* = 7.5 Hz, 3H), 1.53 (sext, *J* = 7.5 Hz, 2H), 1.66 (sext, *J* = 7.5 Hz, 2H), 3.08 (t, *J* = 7.5 Hz, 2H), 3.43 (t, *J* = 7.5 Hz, 2H), 3.84 (s, 3H), 7.14-7.16 (m, 1H), 7.36-7.39 (m, 1H), 7.45-7.47 (m, 2H); **^{13}C NMR (125 MHz, $CDCl_3$):** δ = 11.1, 11.5, 20.7, 21.9, 45.9, 49.4, 55.6, 112.8, 121.6, 122.8, 130.1, 134.8, 160.1, 167.3, 191.5. **HRMS (ESI+):** $(M+H)^+$ calcd. For $C_{15}H_{22}NO_3$ 264.1600; found 264.1600.

1-Morpholino-2-phenylethanone (C):[9]



C

Brown yellow solid (76%, 155 mg); **^{1}H NMR (500 MHz, $CDCl_3$):** δ =3.34 (s, 2H), 3.37 (s, 2H), 3.55 (s, 4H), 3.64 (s, 2H), 7.14-7.18 (m, 3H), 7.22-7.25 (m, 2H); **^{13}C NMR (125 MHz, $CDCl_3$):** δ = 40.8, 42.2, 46.5, 66.5, 66.8, 126.9, 128.5, 128.8, 134.8, 169.6.

References:

1) F. Liu, Y. Liu, Y. Chen, Z. Sun and B. Wang, *Chemistry Select,* 2017, **2**, 4638.
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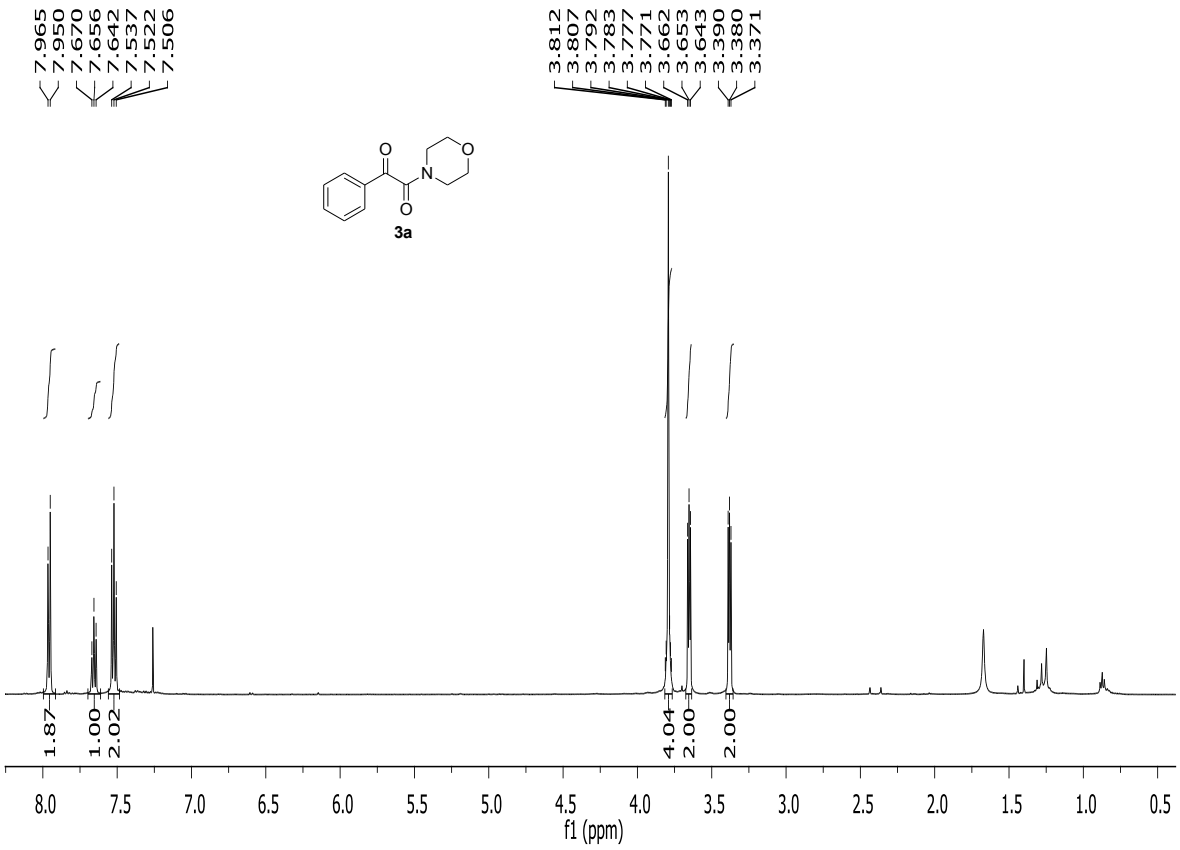
5) N. S. Thirukovela, R. Balaboina, R. Vadde and C. S. Vasam, *Tetrahedron Letters,* 2018, **59**,3749.
6) N. Mupparapu, N. Battini , S. Battula, S. Khan, R. A. Vishwakarma and Q. N. Ahmed, *Chem. Eur. J.,* 2015, **21**, 2954.
7) C. Zhang, J. Liu and C. Xi, *Org. Biomol. Chem.,* 2014, **12**, 9702.
8) Y. Lei, S. Xiao, G. Li, Y. Gu, H. Wu and K. Shi, *Appl Organometal Chem.,* 2017, **31**, e3637.
9) D. G. Pintori and M. F. Greaney, *Org. Lett.,* 2011, **13**, 5713.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7.506
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3.777
3.771
3.662
3.653
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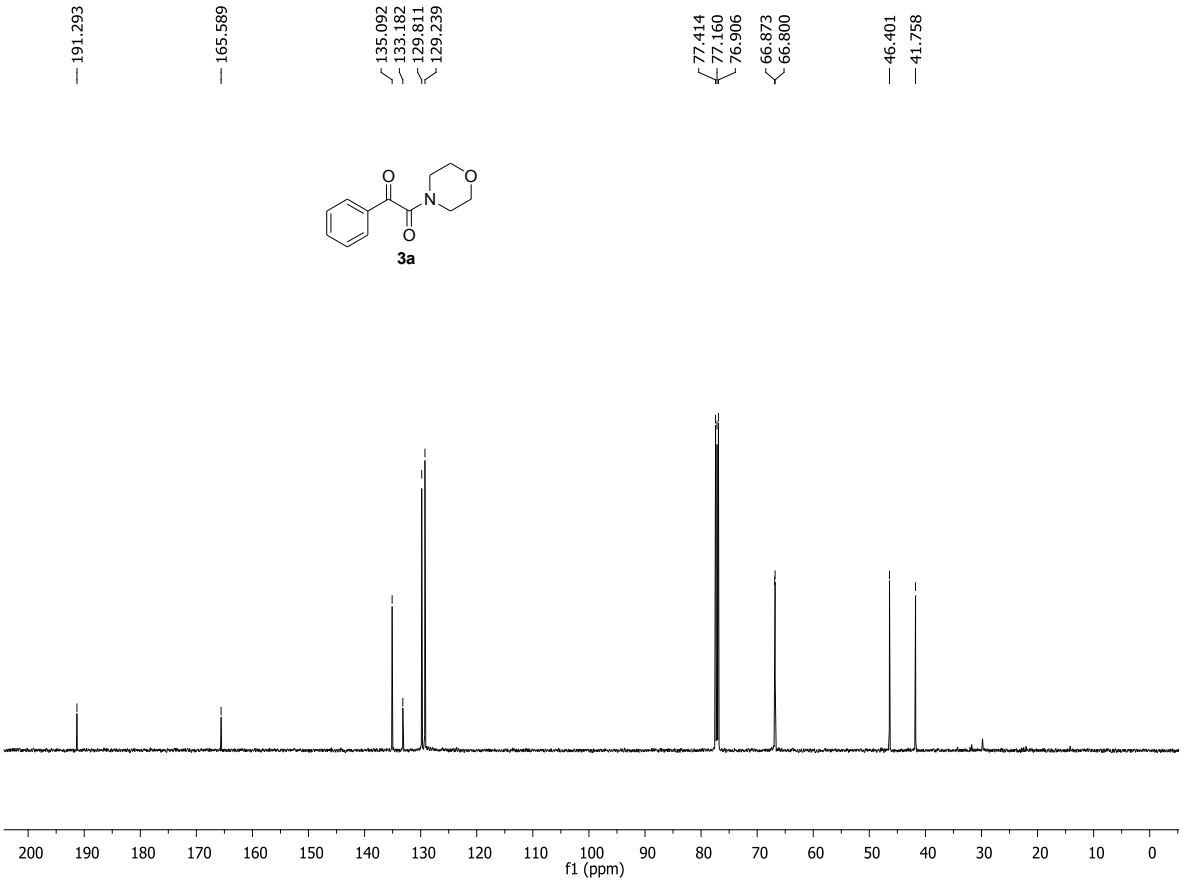
3.371
3a
1.87
1.00
2.02
4.04
2.00
2.00
f1 (ppm)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135.092
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77.160
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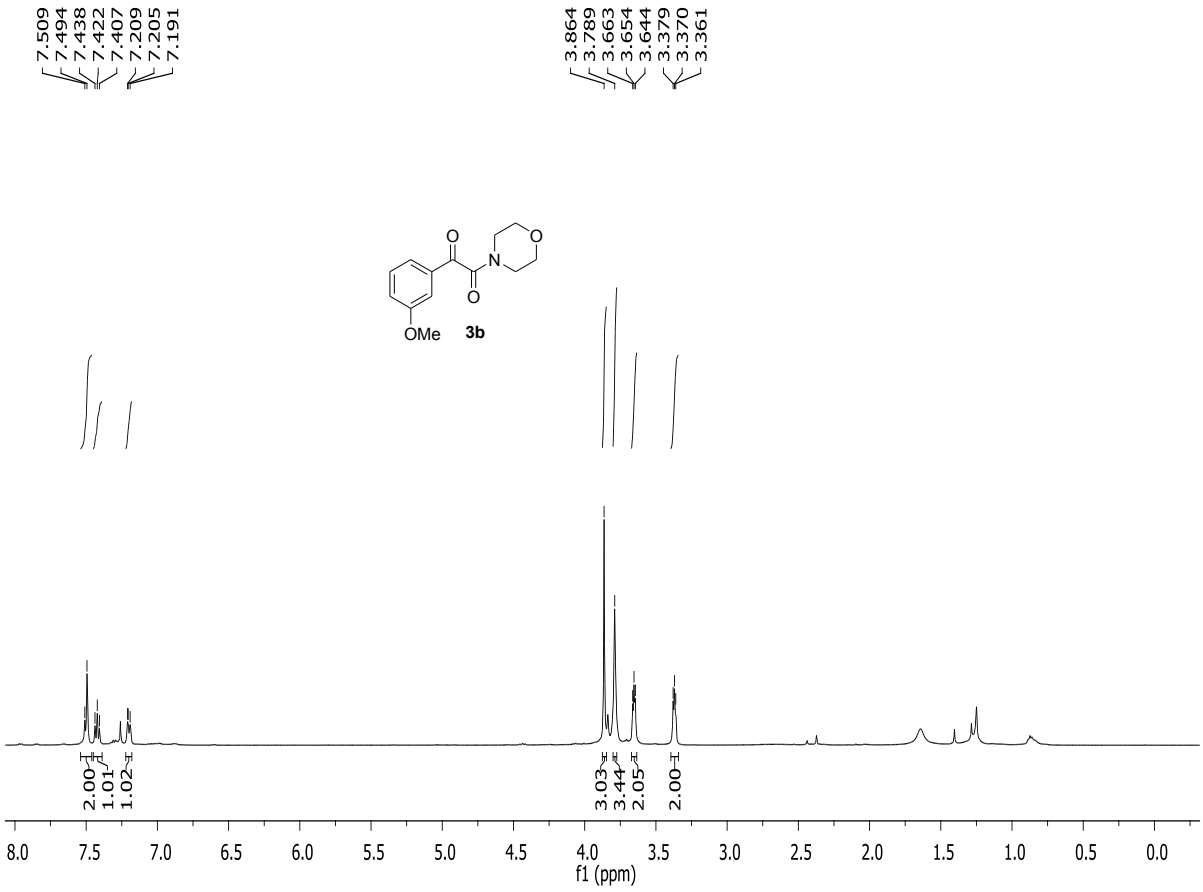
41.758
3a
f1 (ppm)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3.644
3.379
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OMe
3b
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1.01
1.02
3.03
3.44
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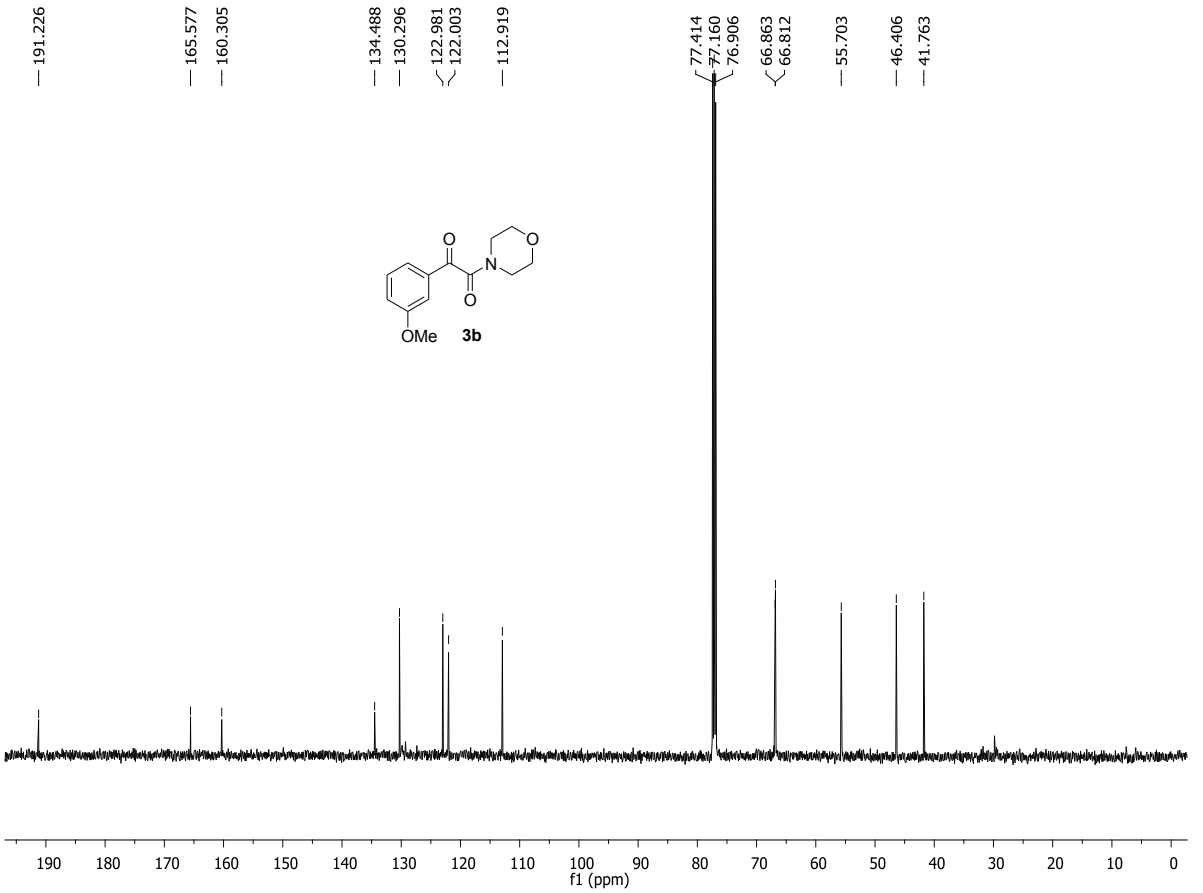
2.00
f1 (ppm)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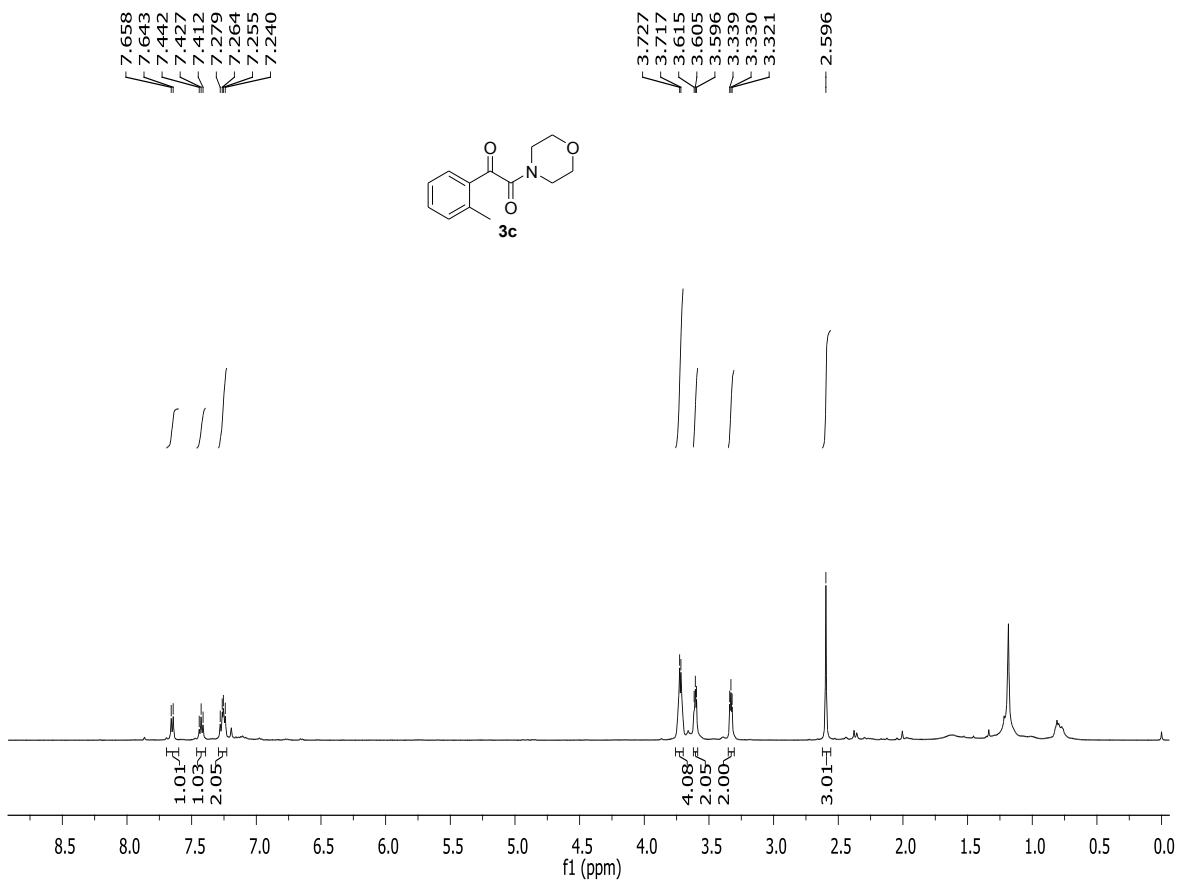
3b
f1 (ppm)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7.255
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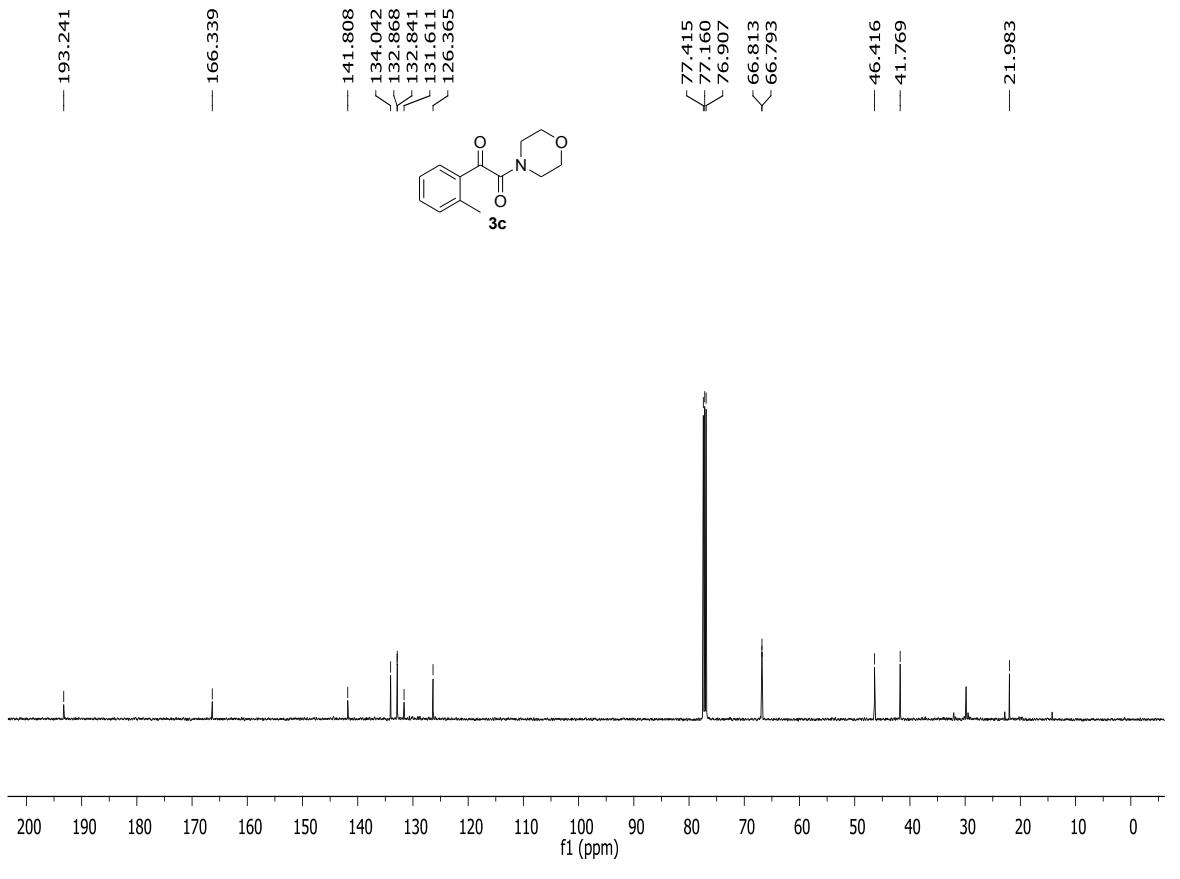
3.727
3.717
3.615
3.605
3.596
3.339
3.330
3.321
2.596
3c
1.01
1.03
2.05
4.08
2.05
2.00
3.01
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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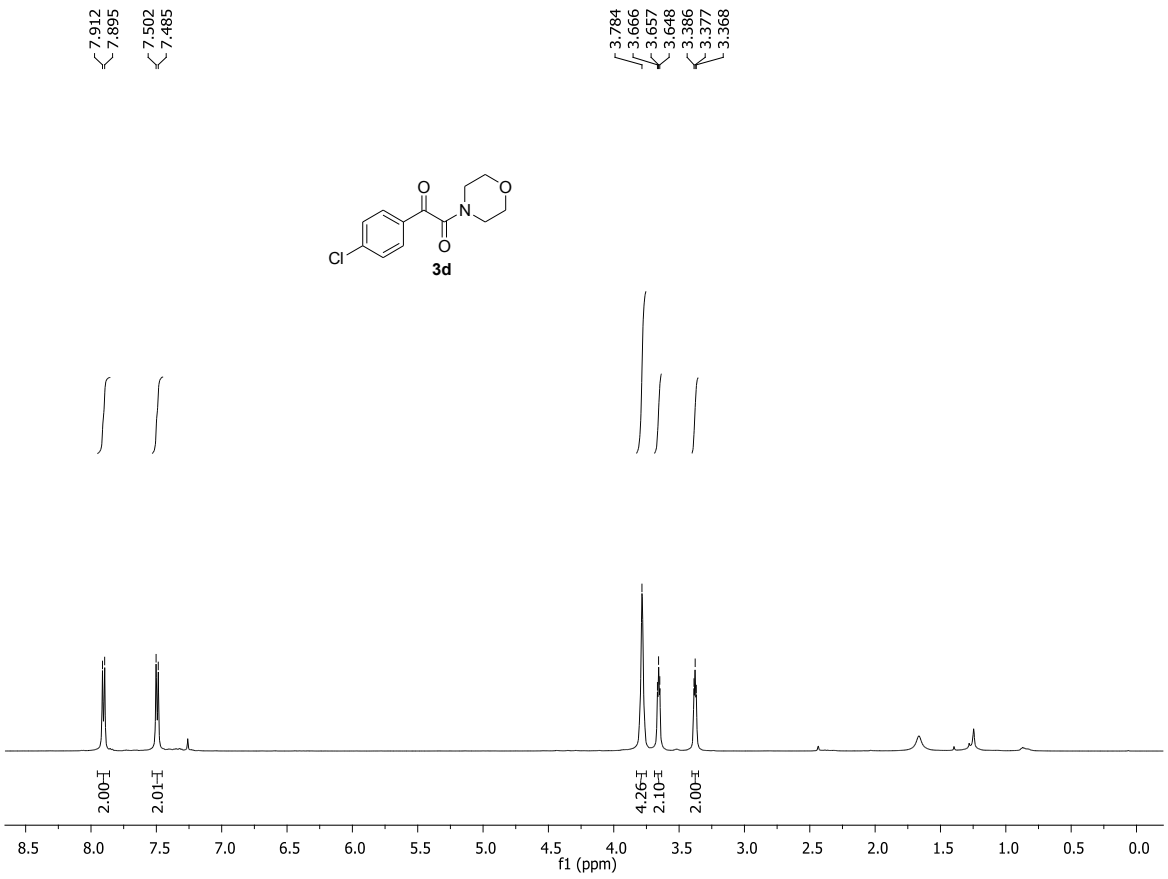
f1 (ppm)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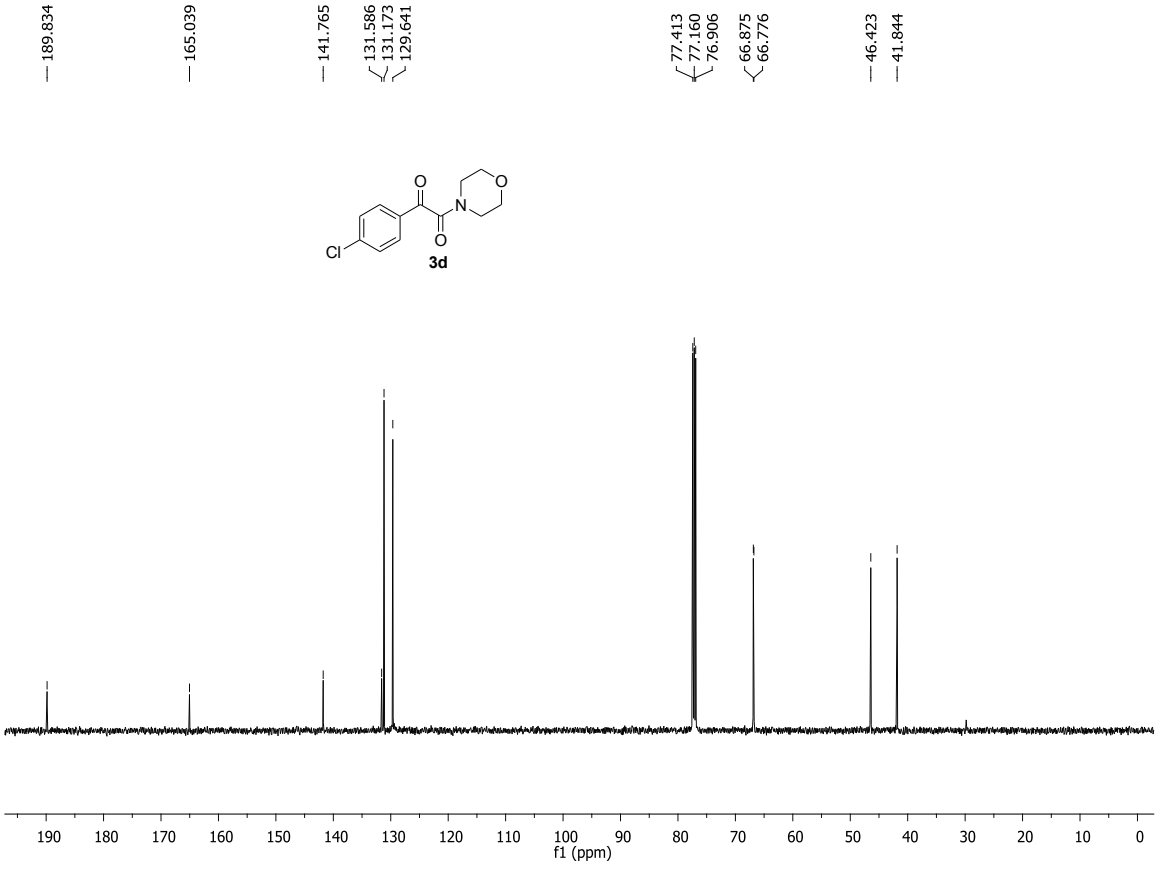
f1 (ppm)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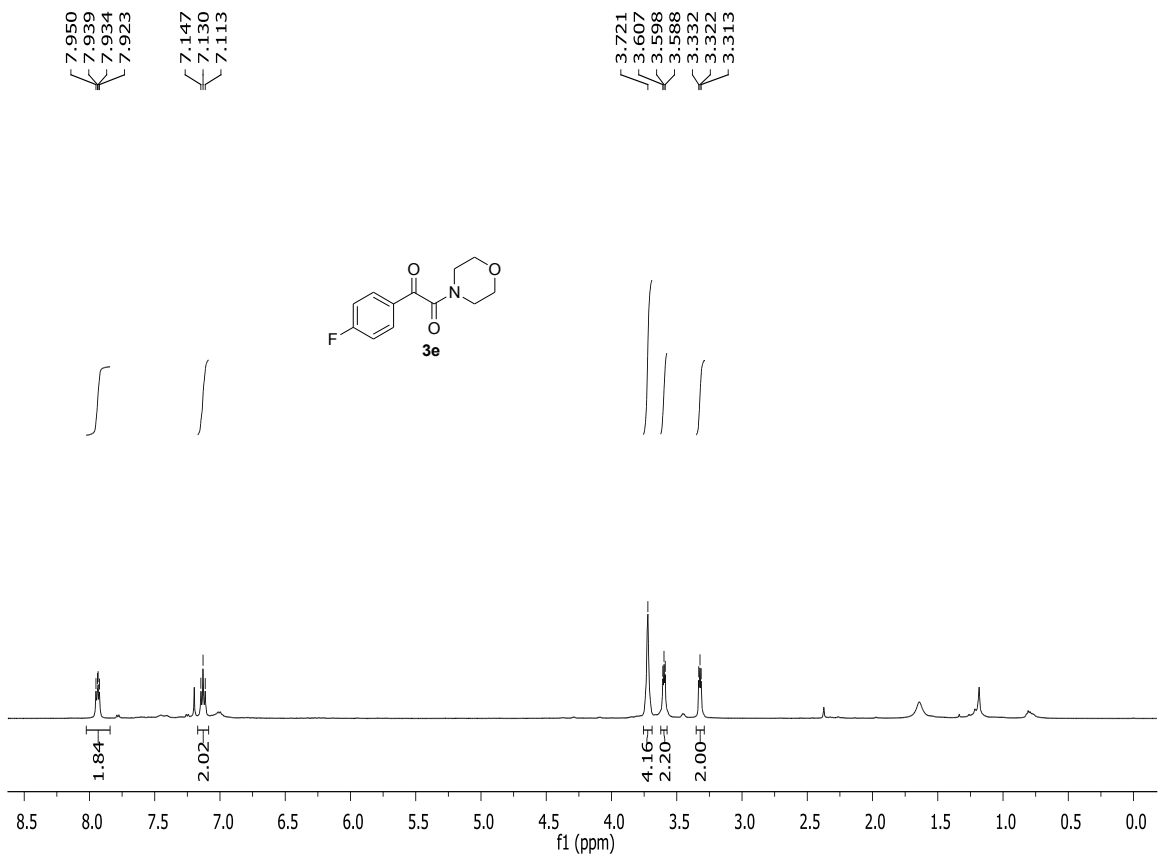
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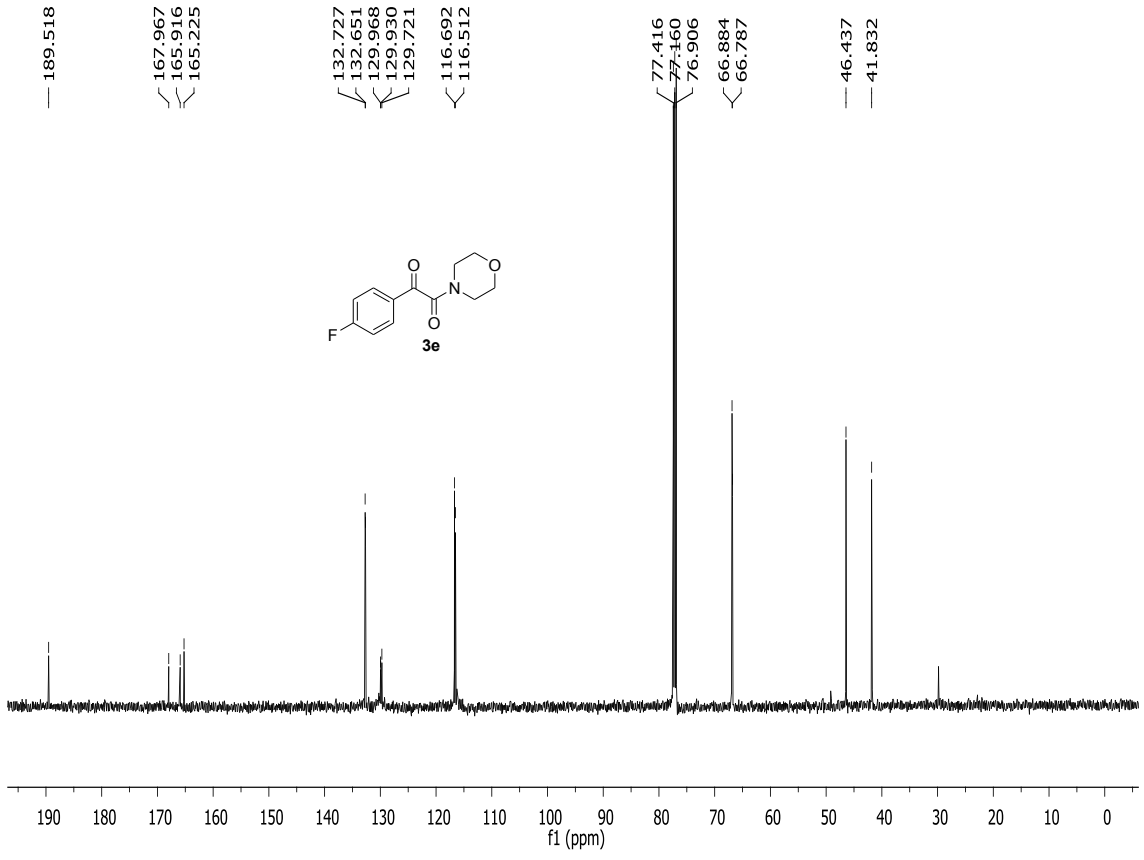
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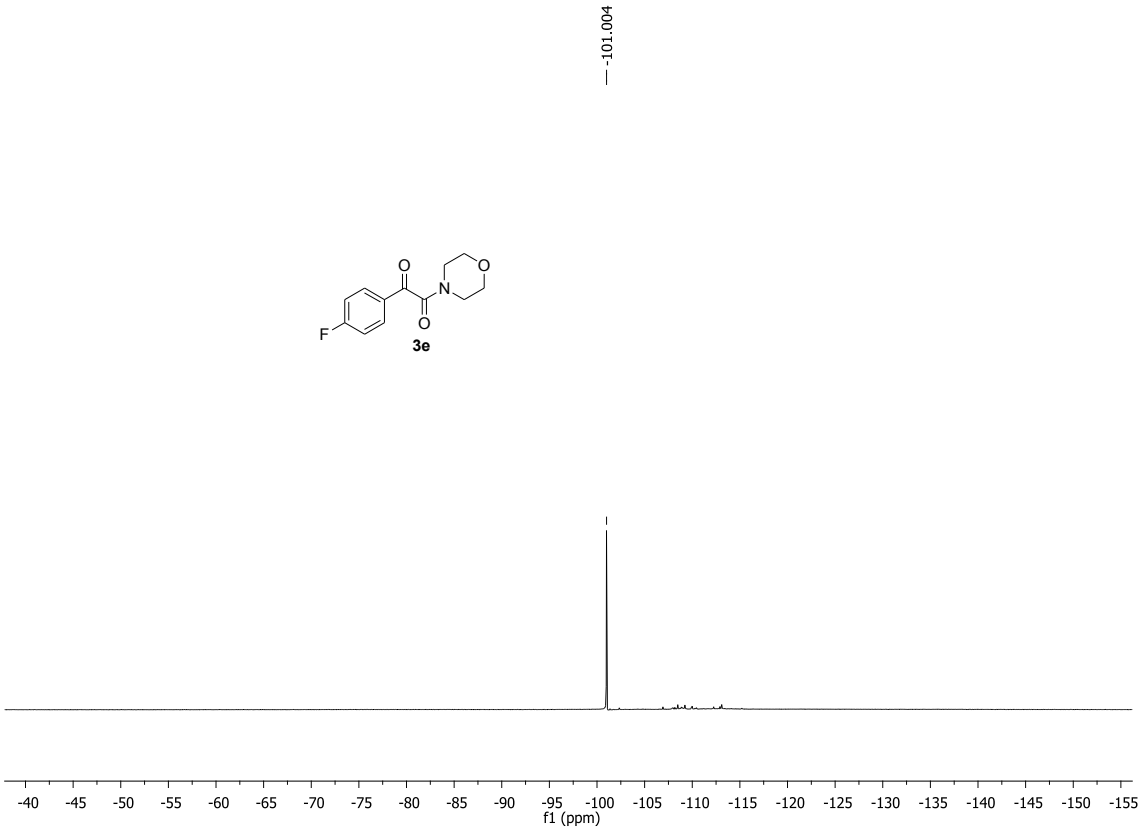
f1 (ppm)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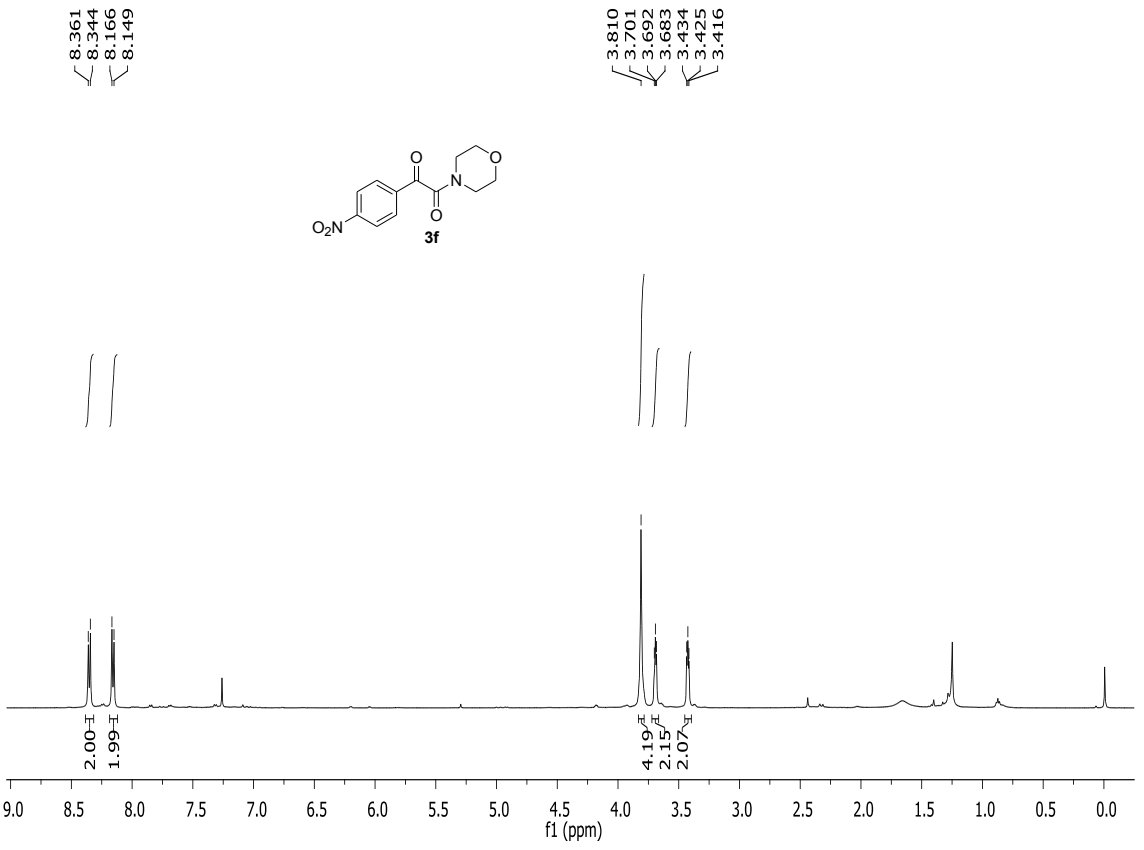
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4.19
2.15
2.07
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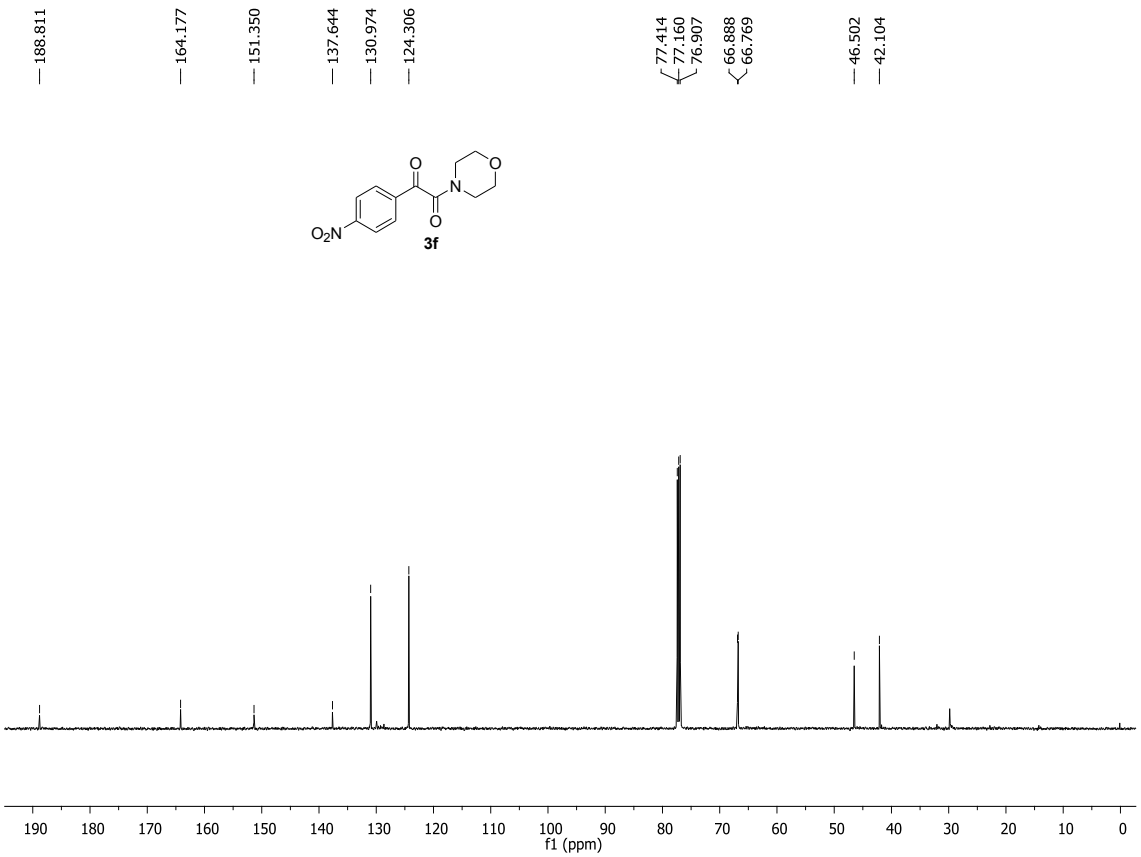
f1 (ppm)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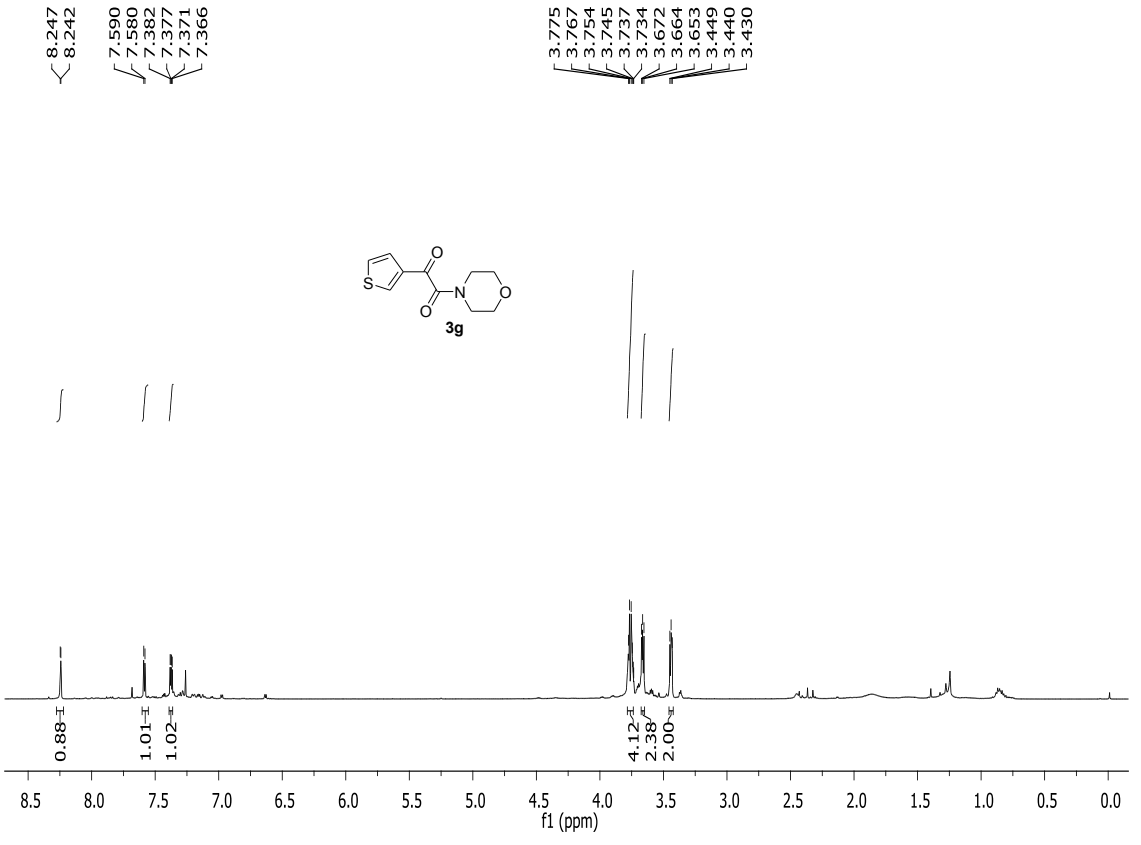
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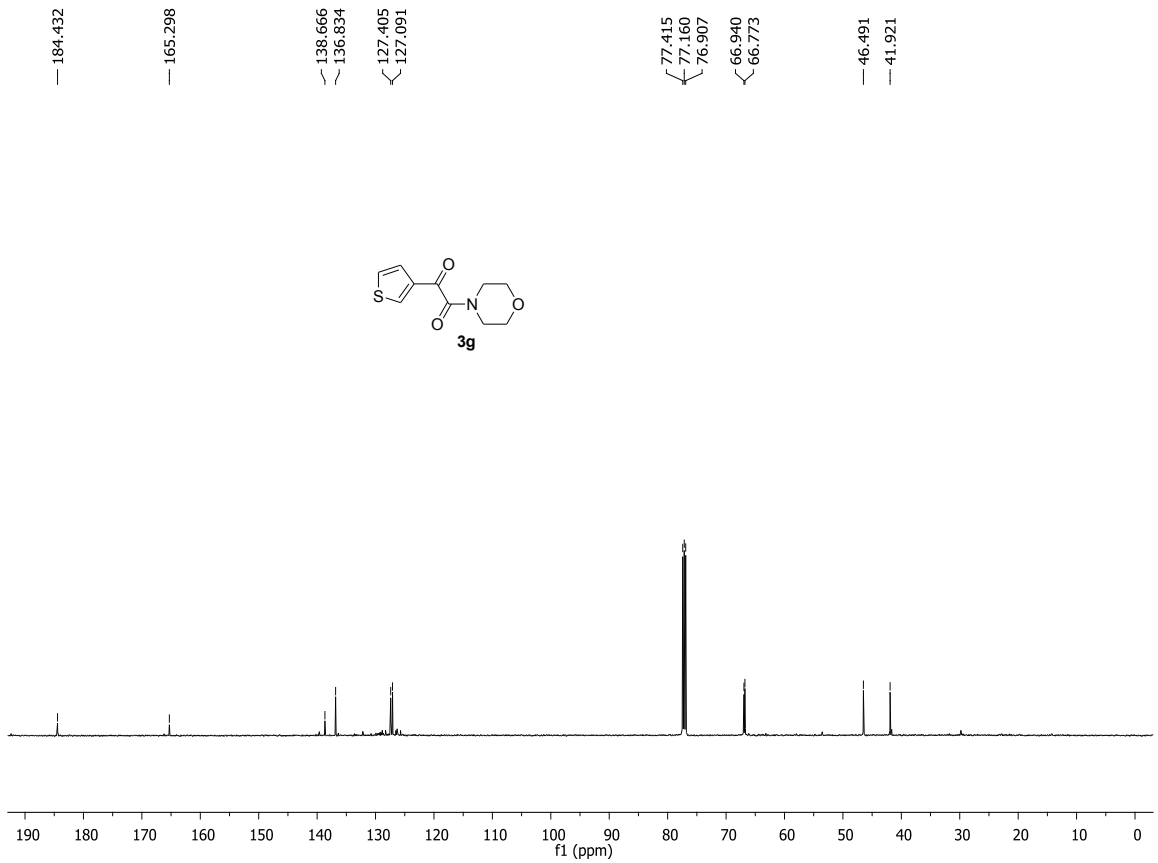
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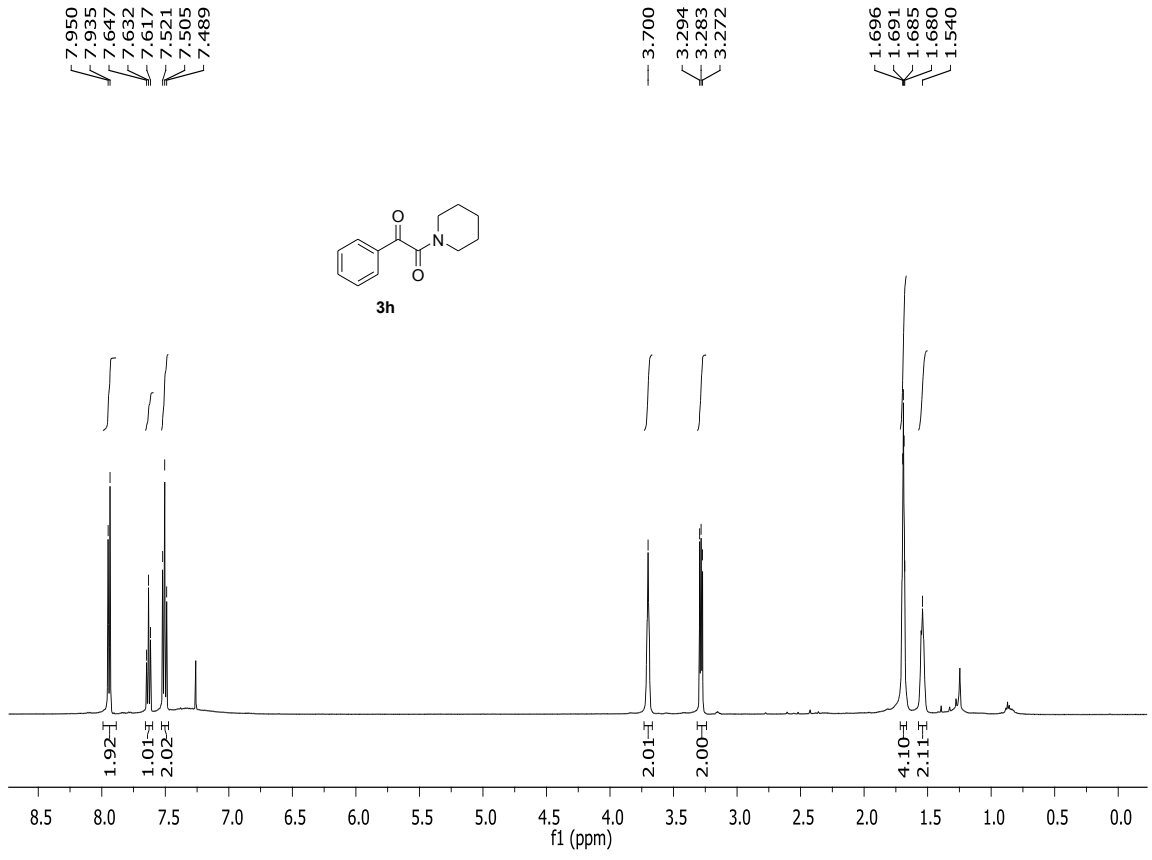
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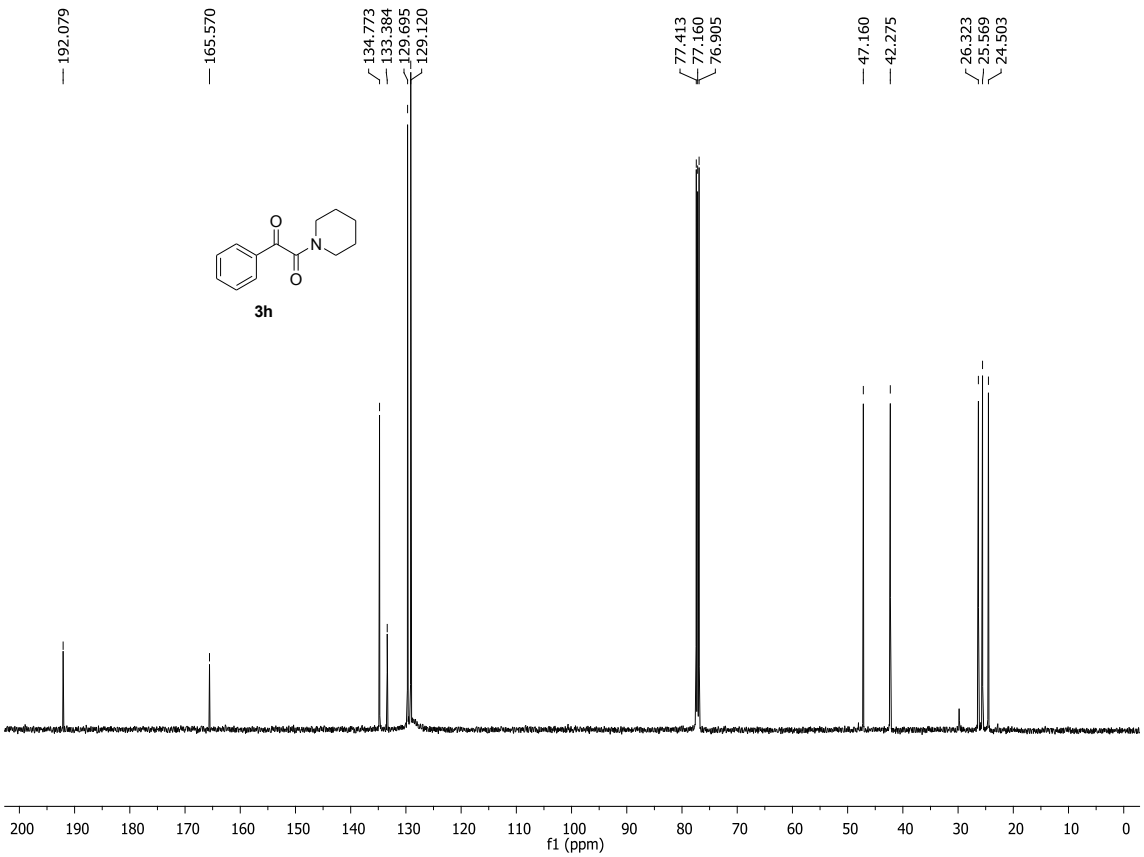
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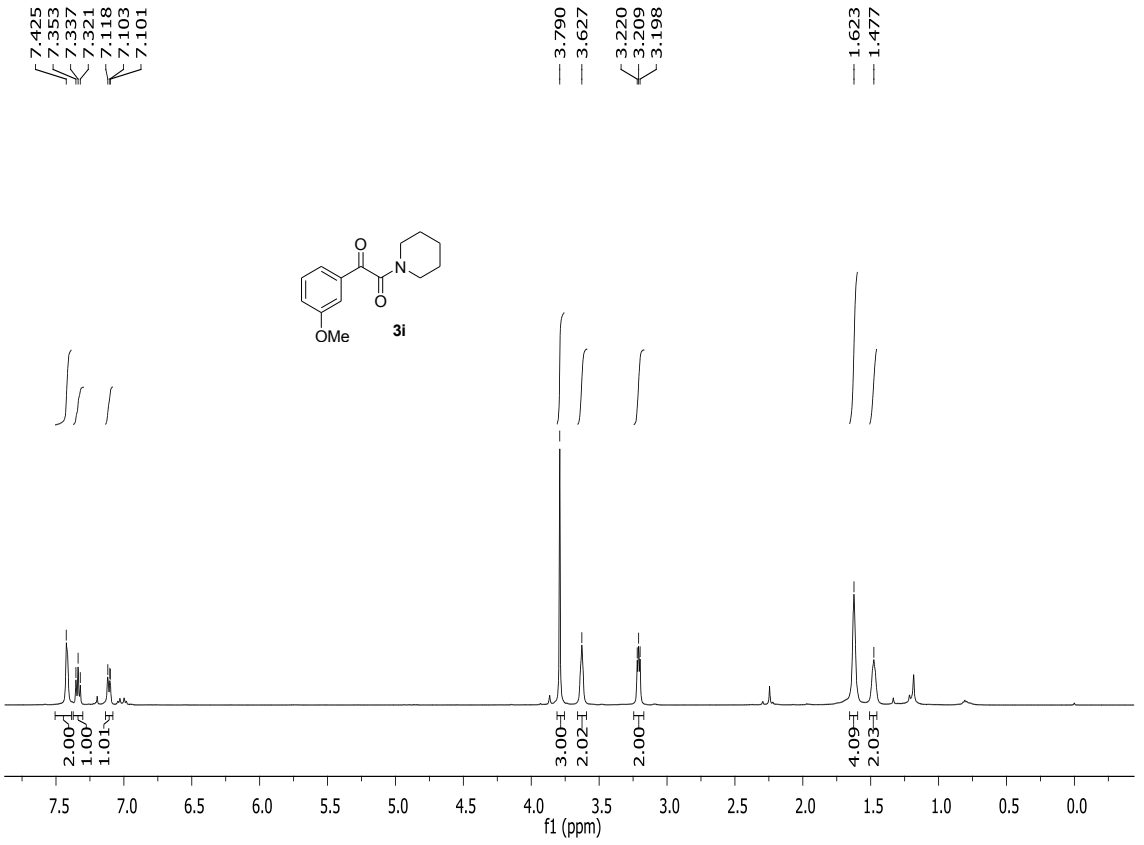
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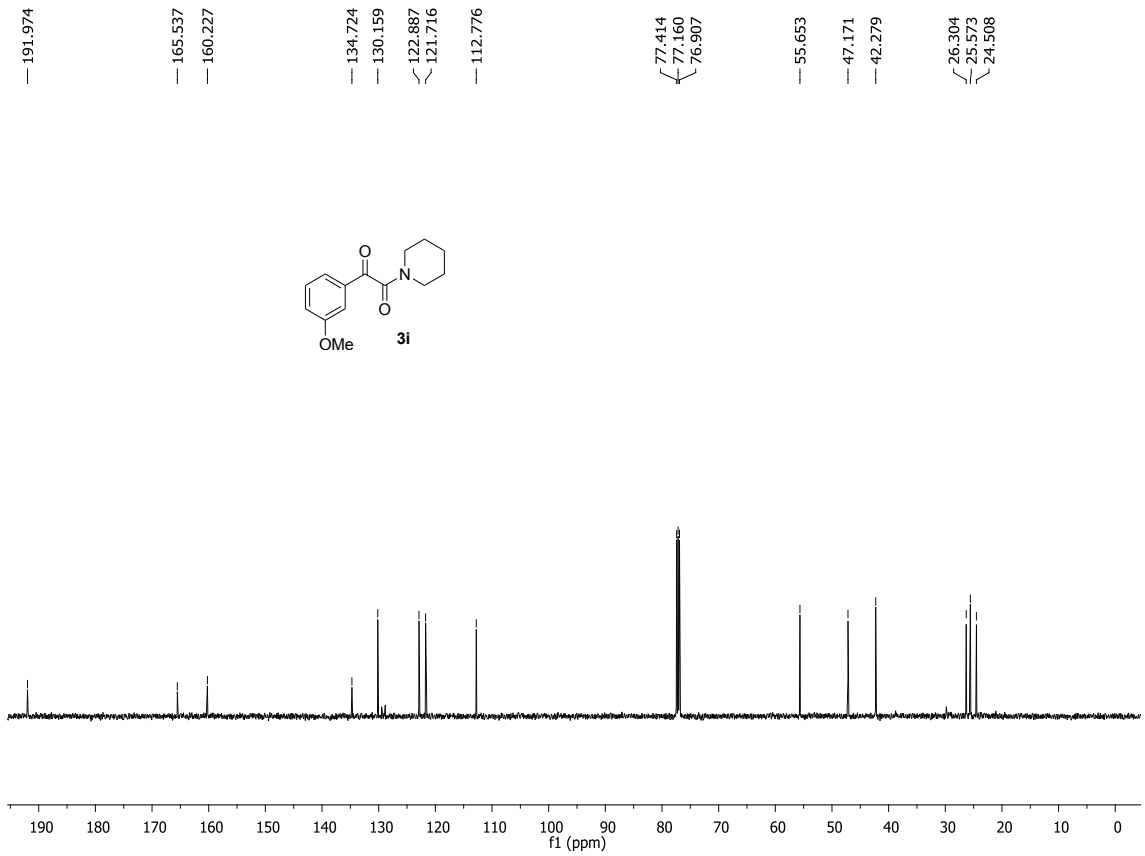
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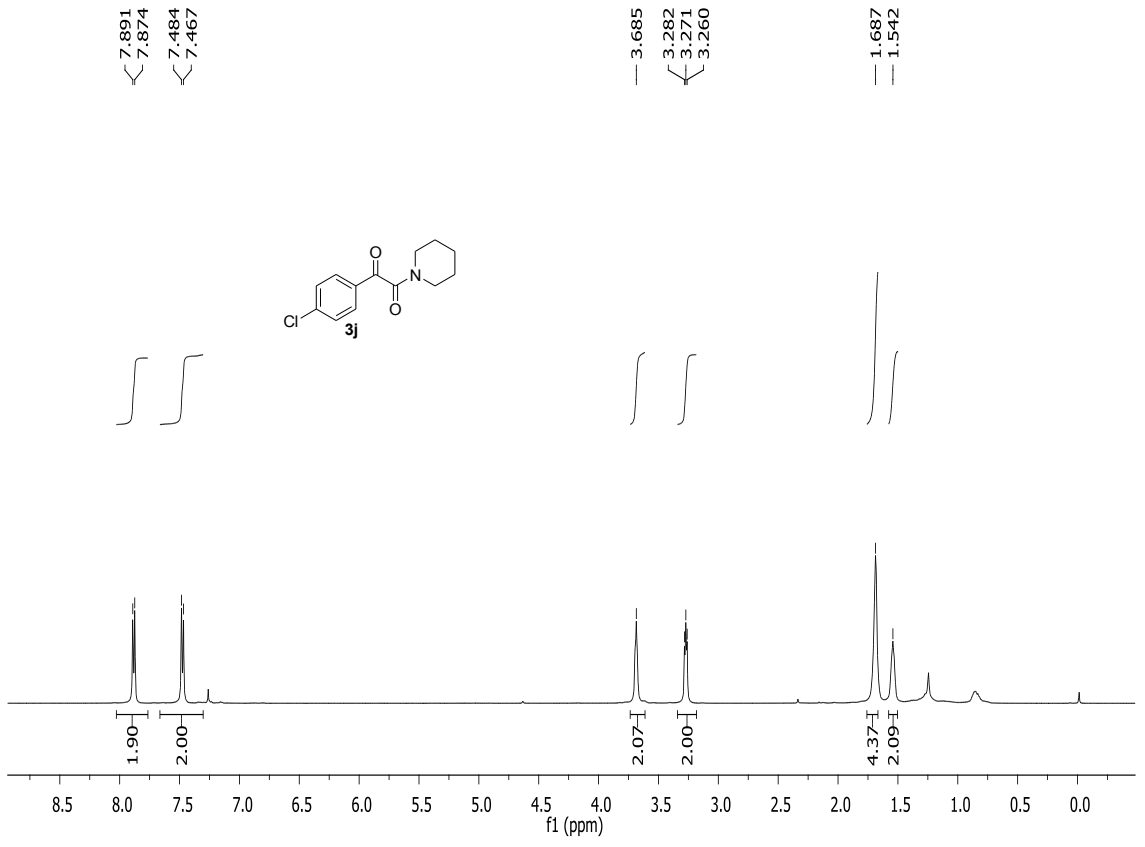
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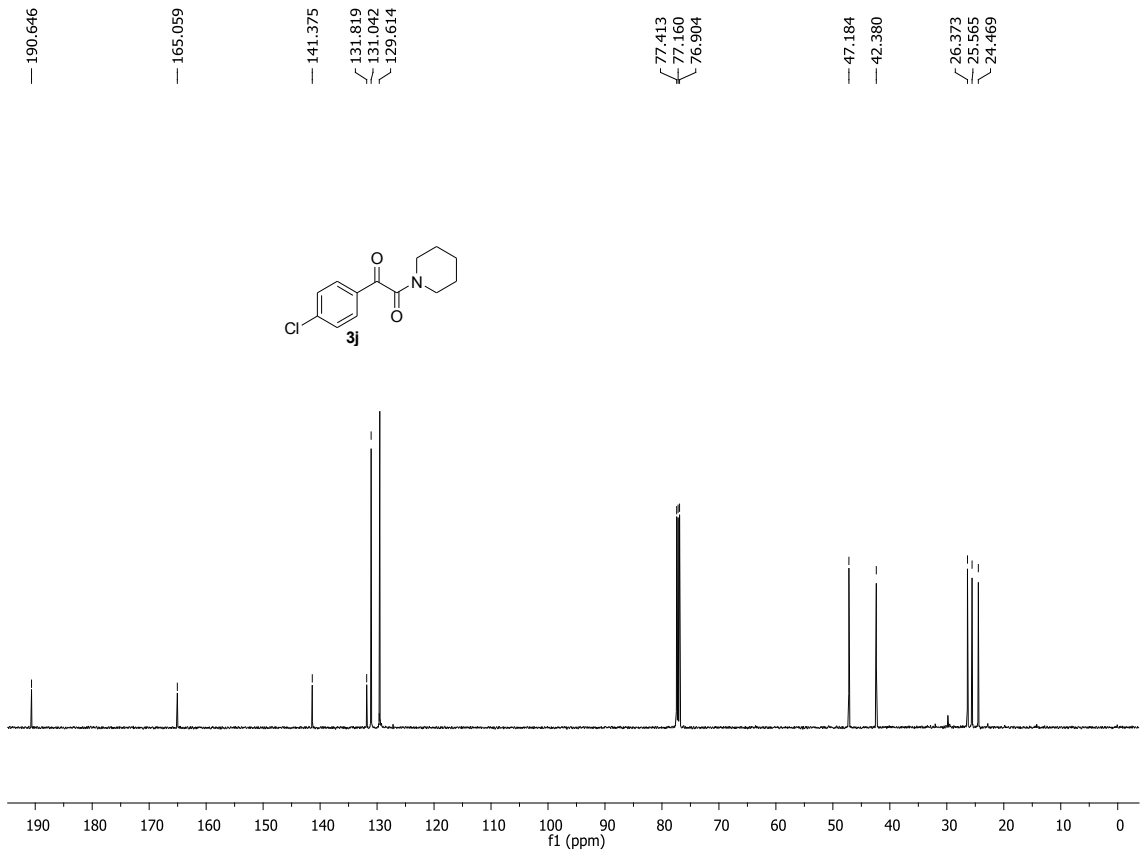
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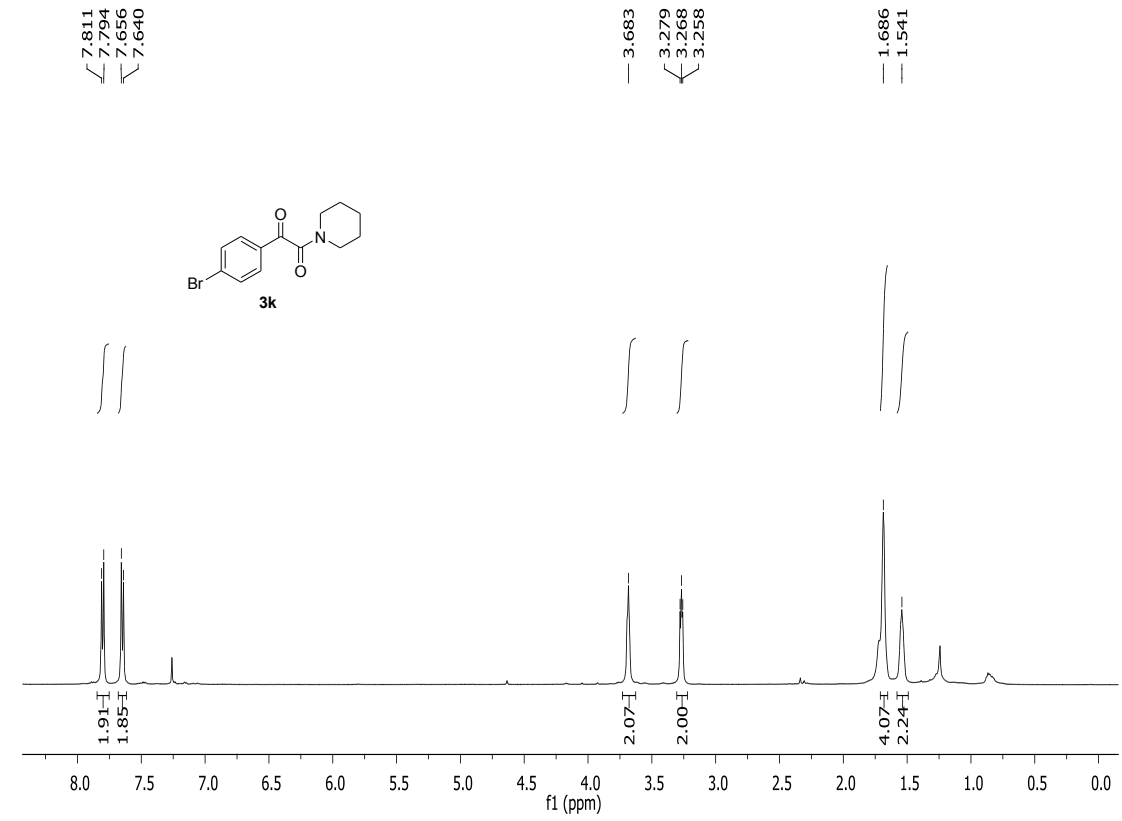
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4.07
2.24
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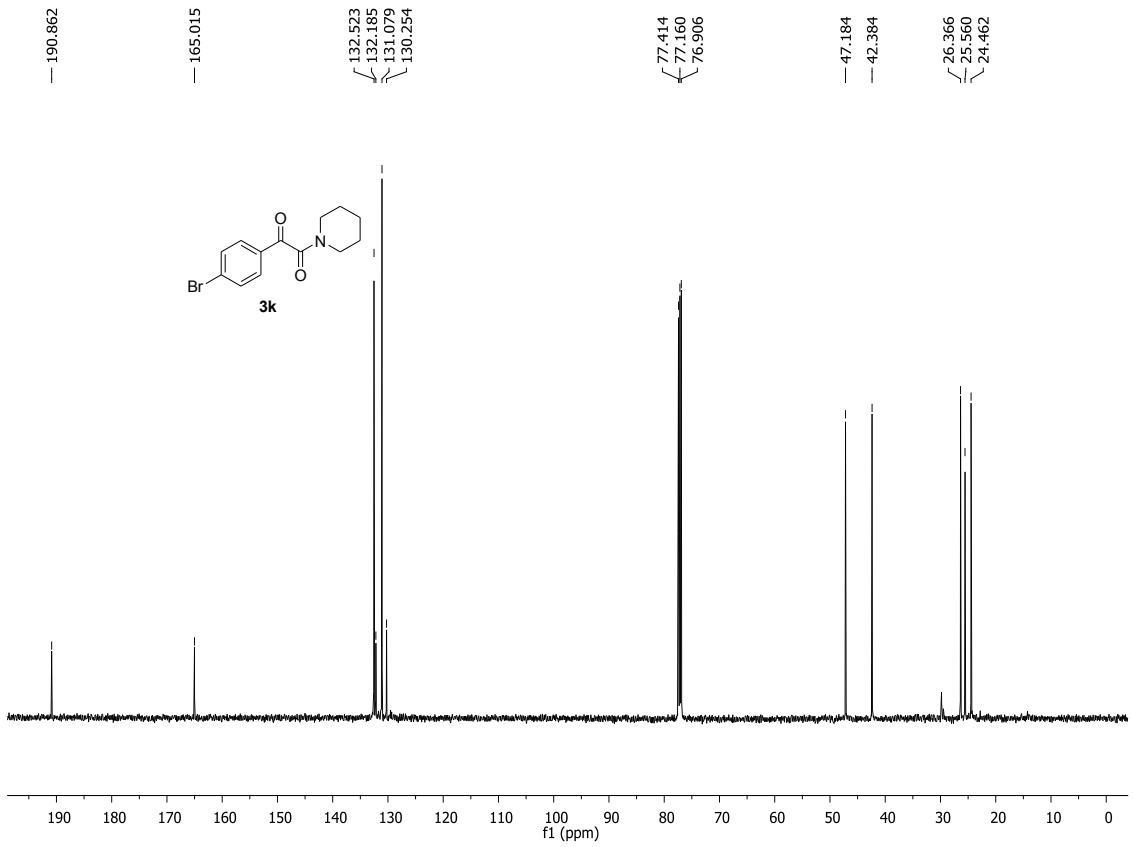
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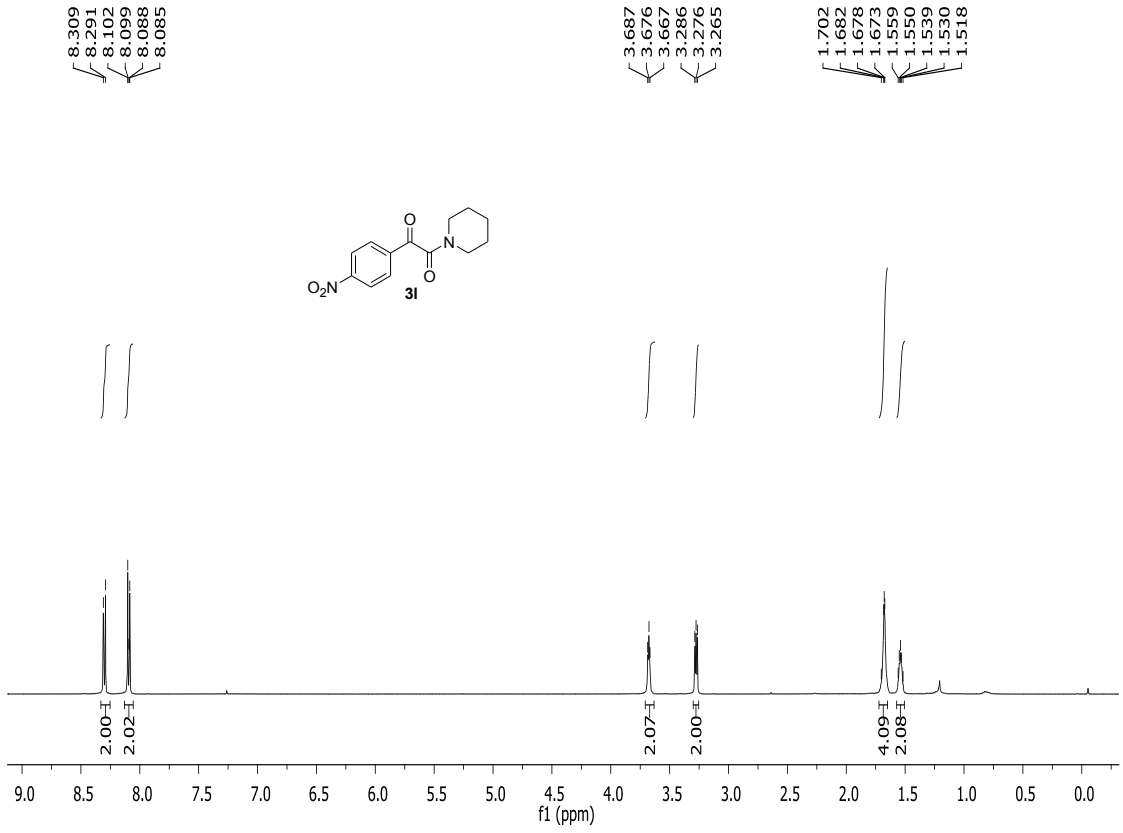
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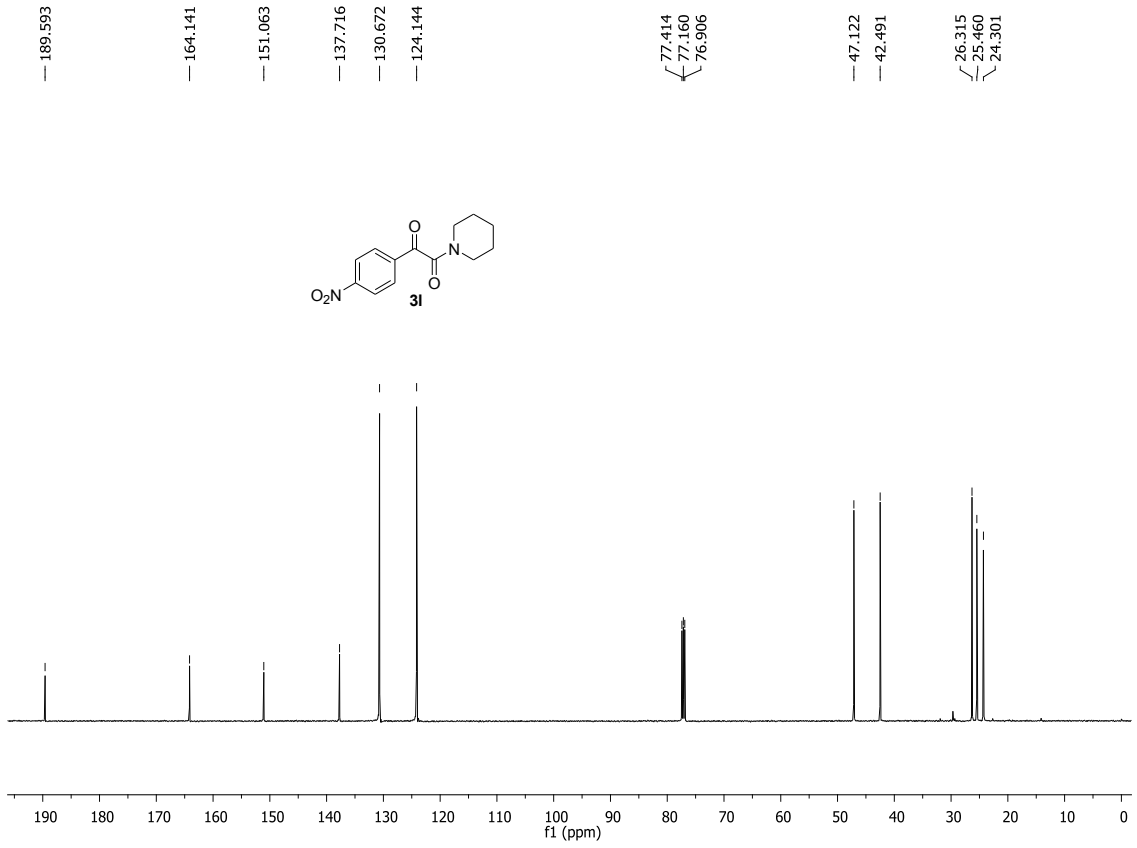
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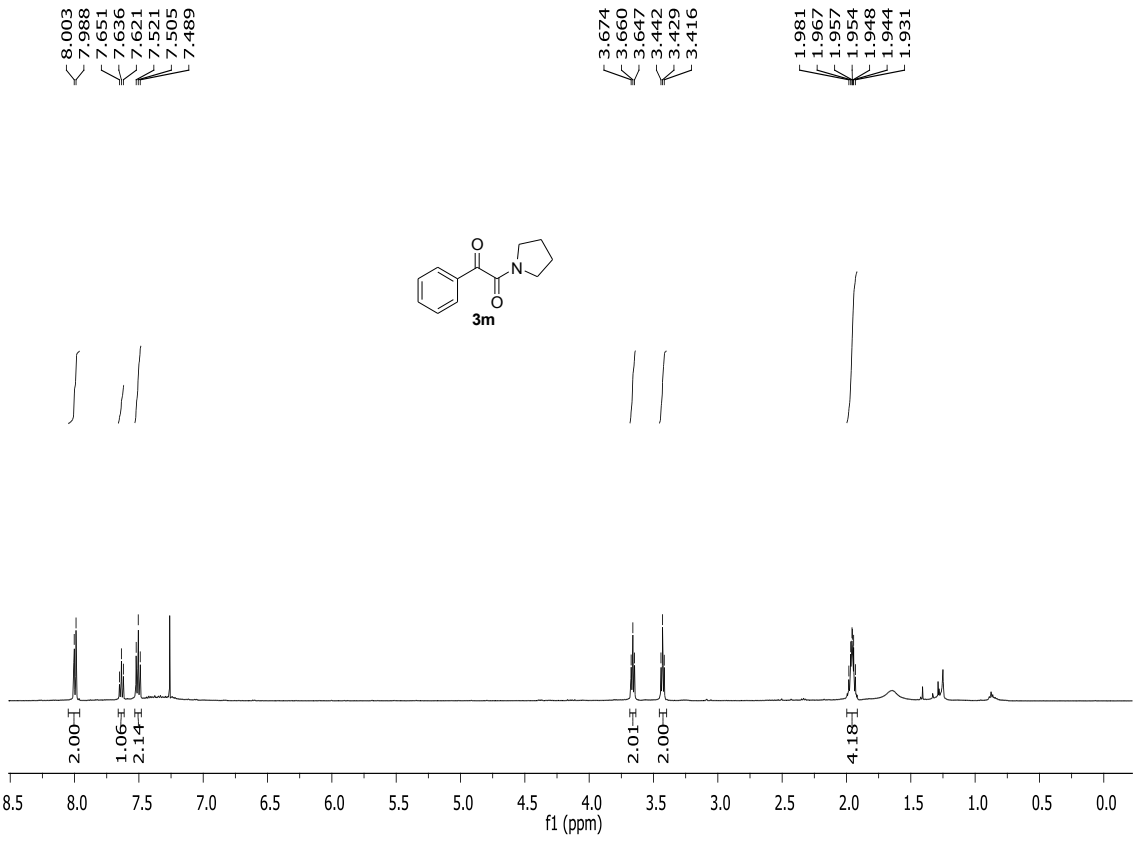
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2.00
4.18
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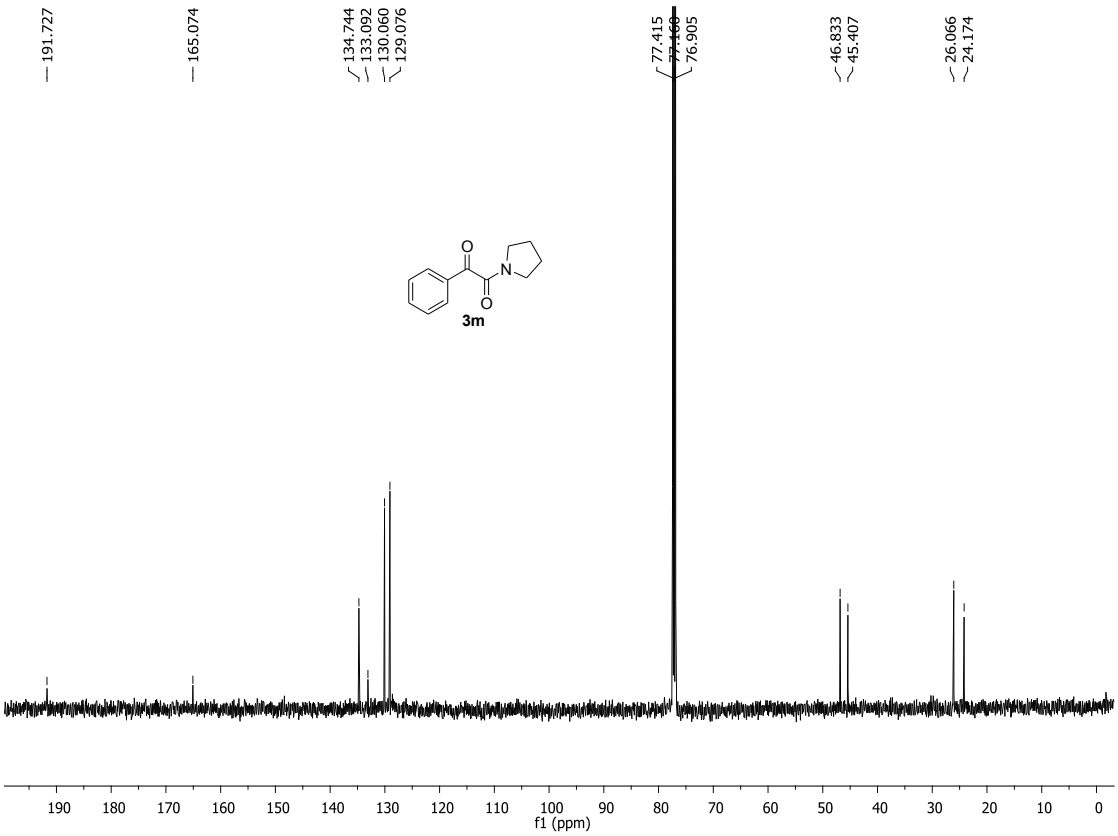
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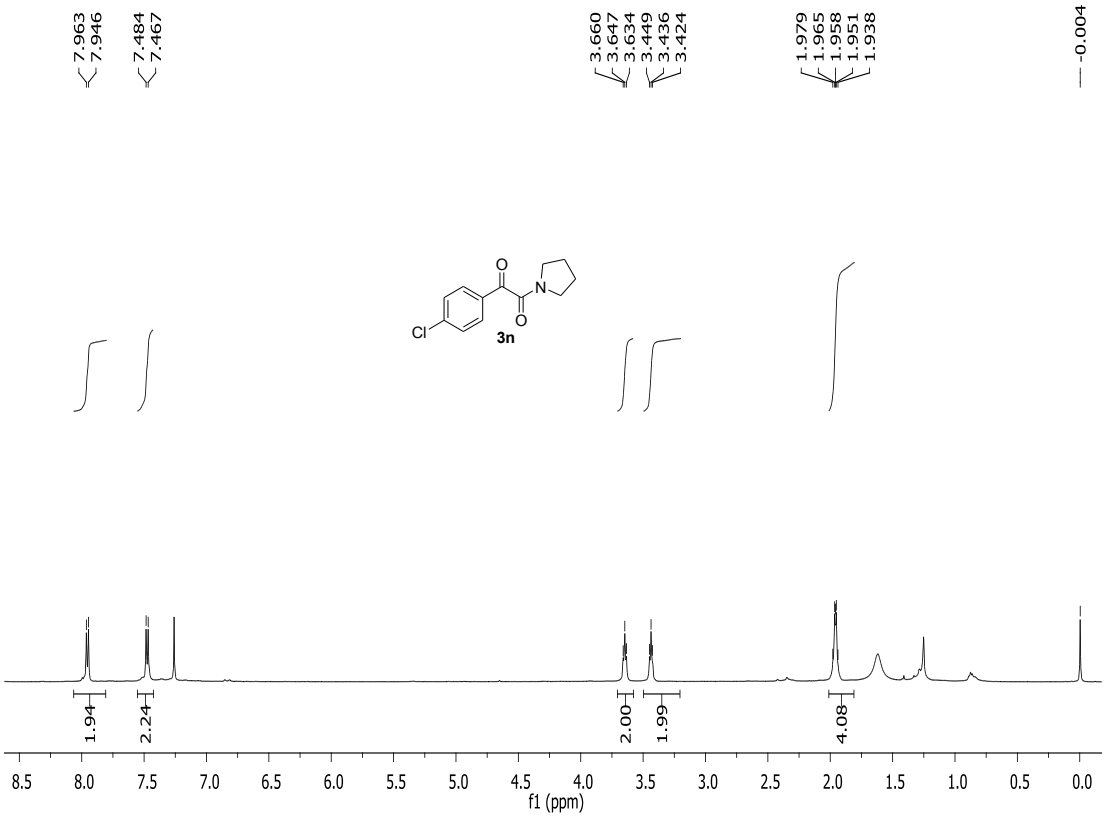
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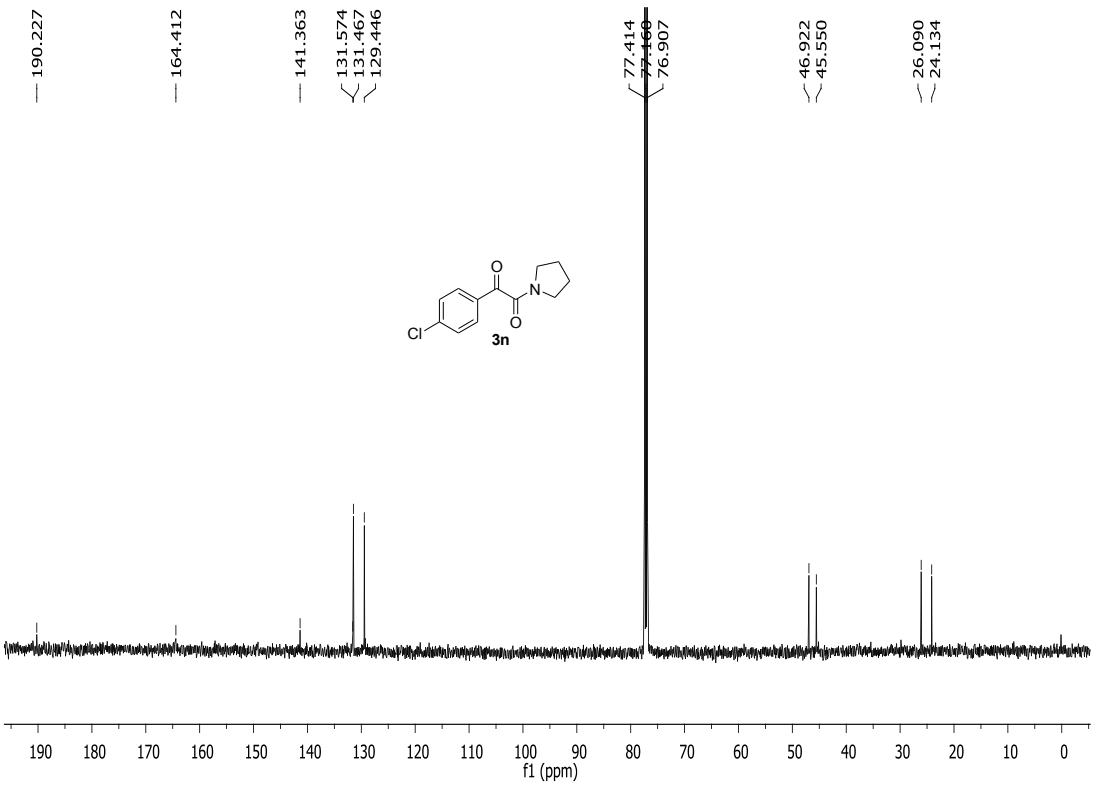
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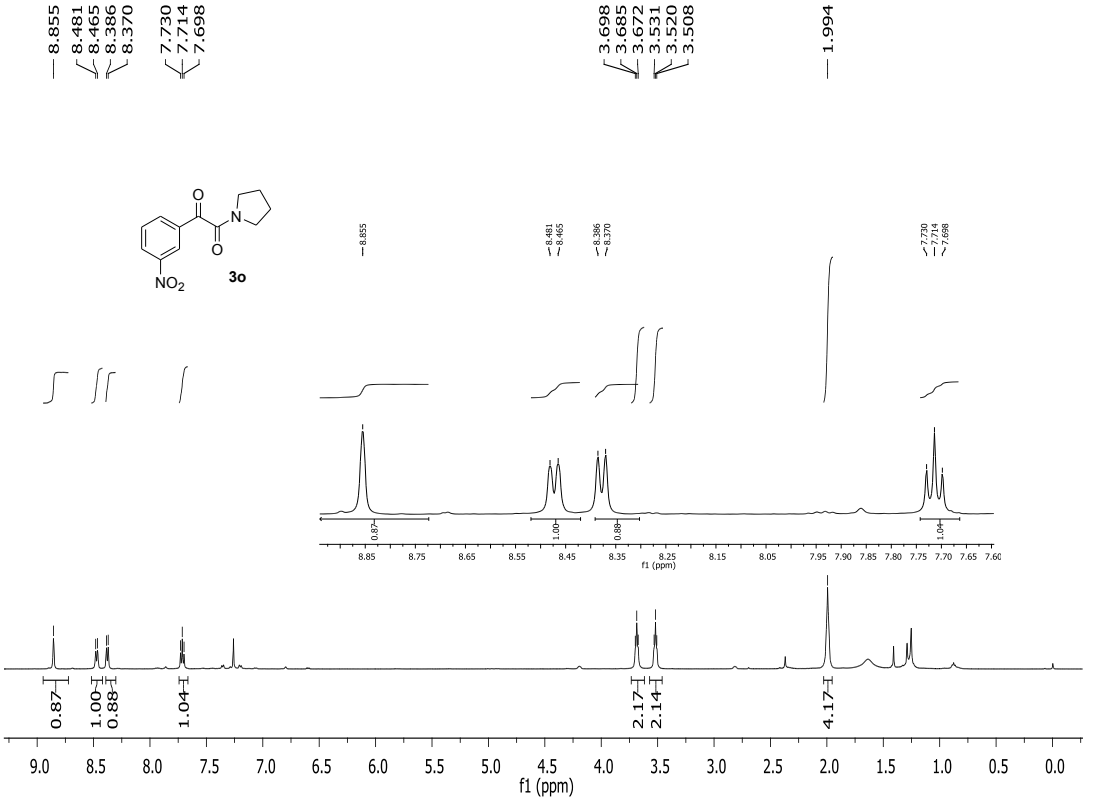
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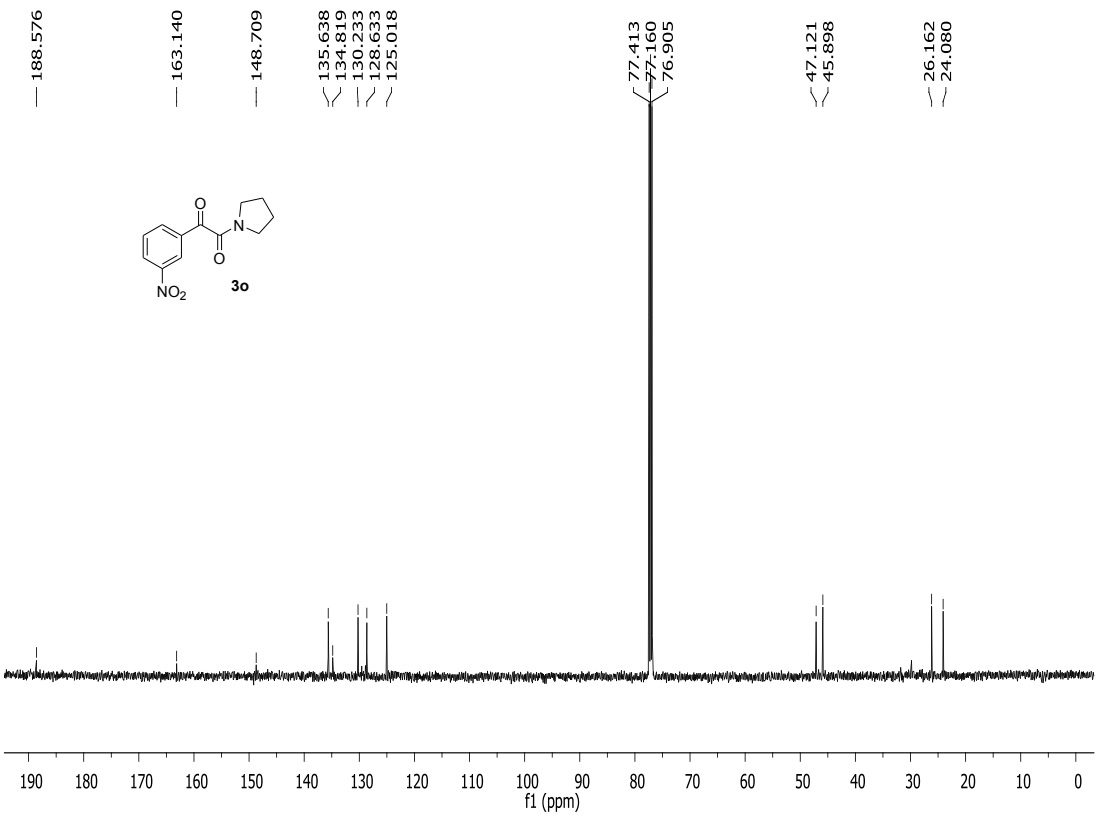
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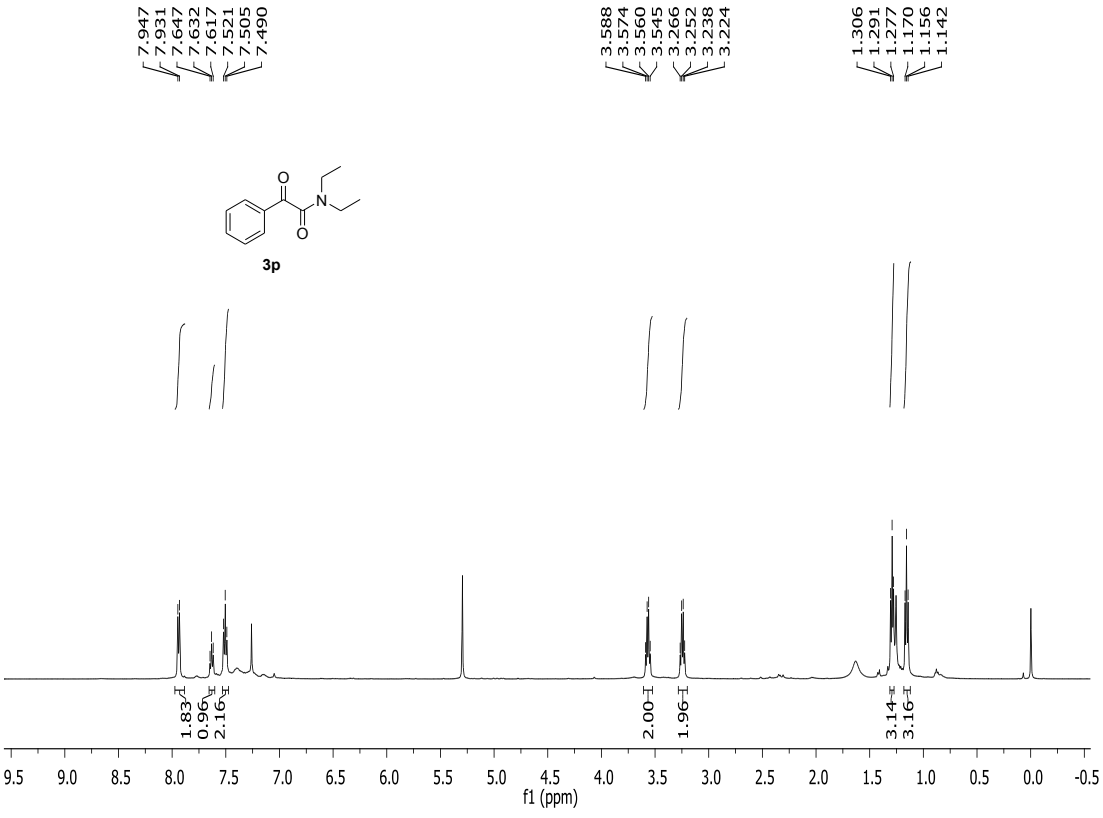
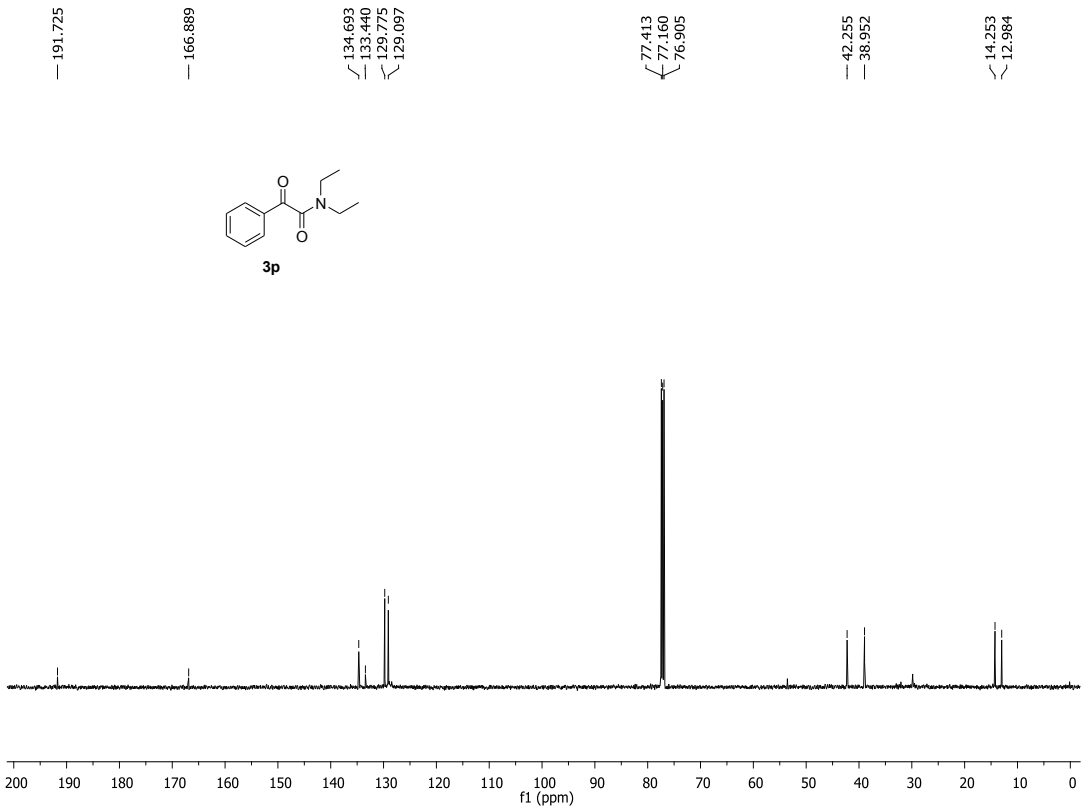
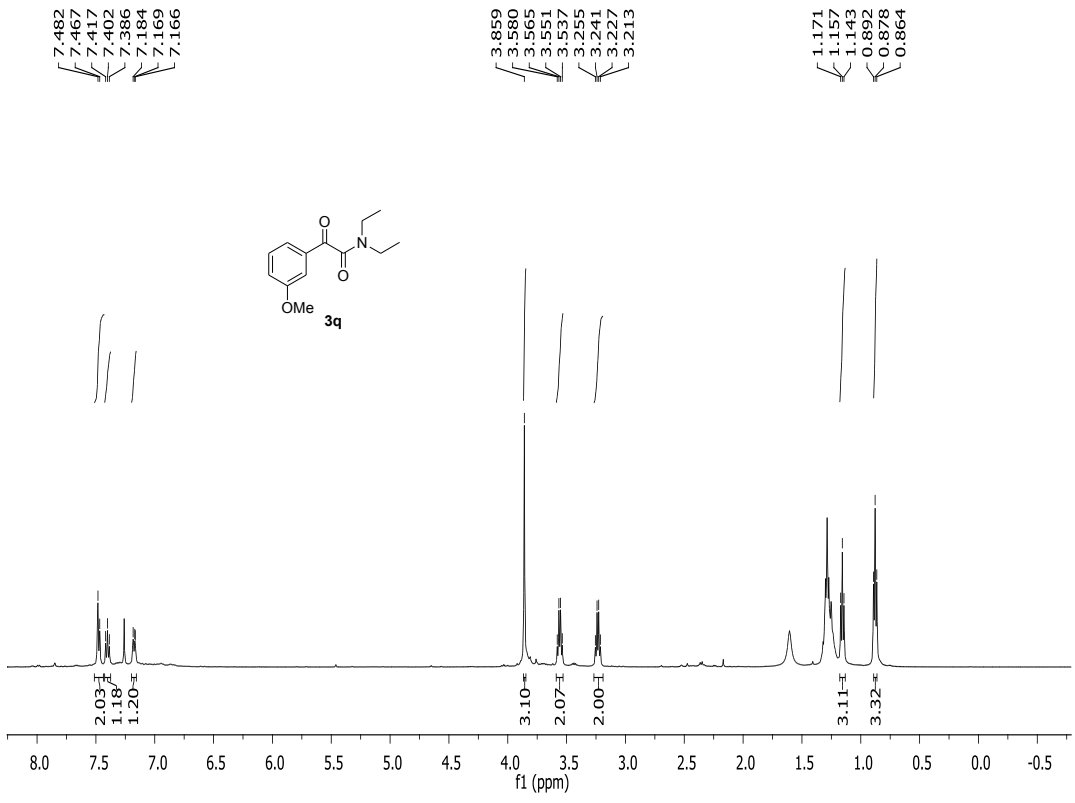
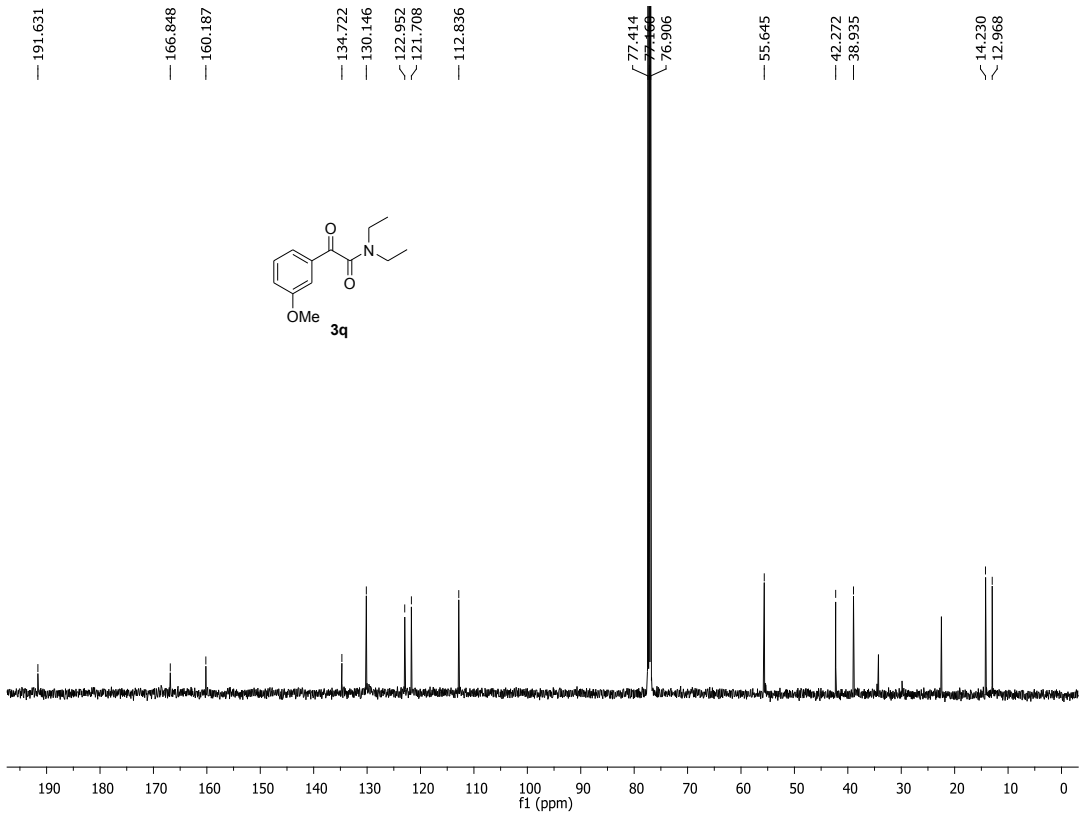
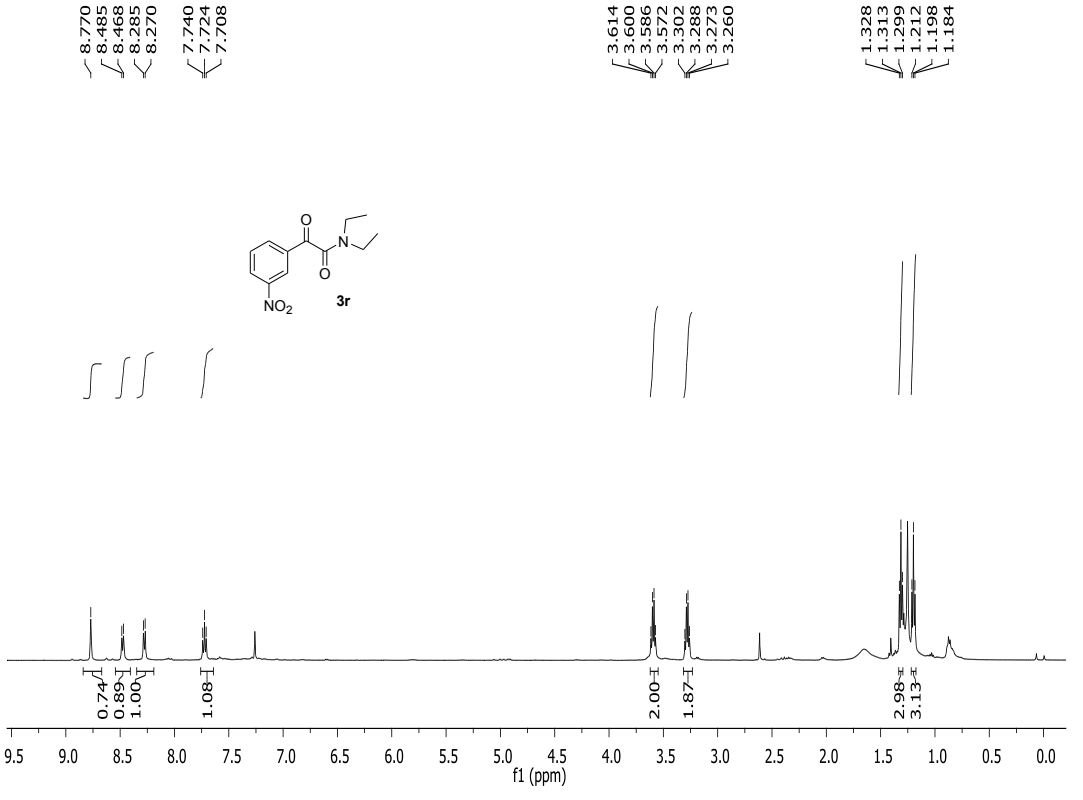
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

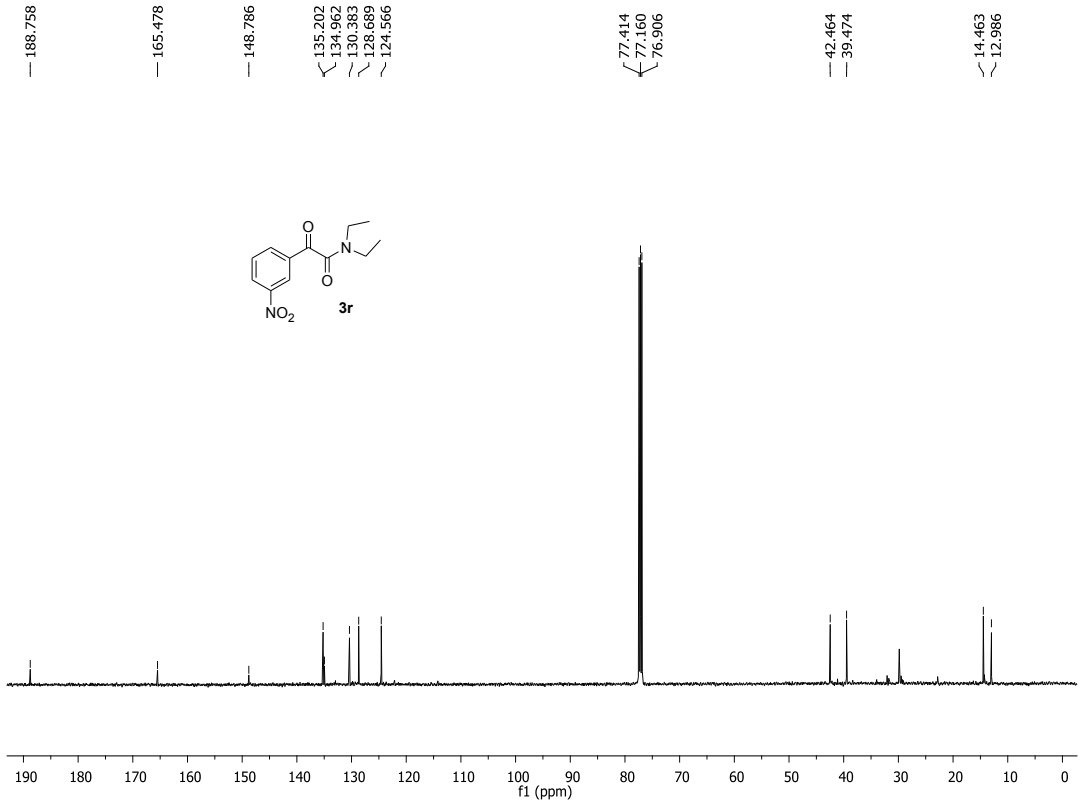

7.947
7.931
7.647
7.632
7.617
7.521
7.505
7.490
3.588
3.574
3.560
3.545
3.266
3.252
3.238
3.224
1.306
1.291
1.277
1.170
1.156
1.142
O
N
O
3p
1.83
0.96
2.16
2.00
1.96
3.14
3.16
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)

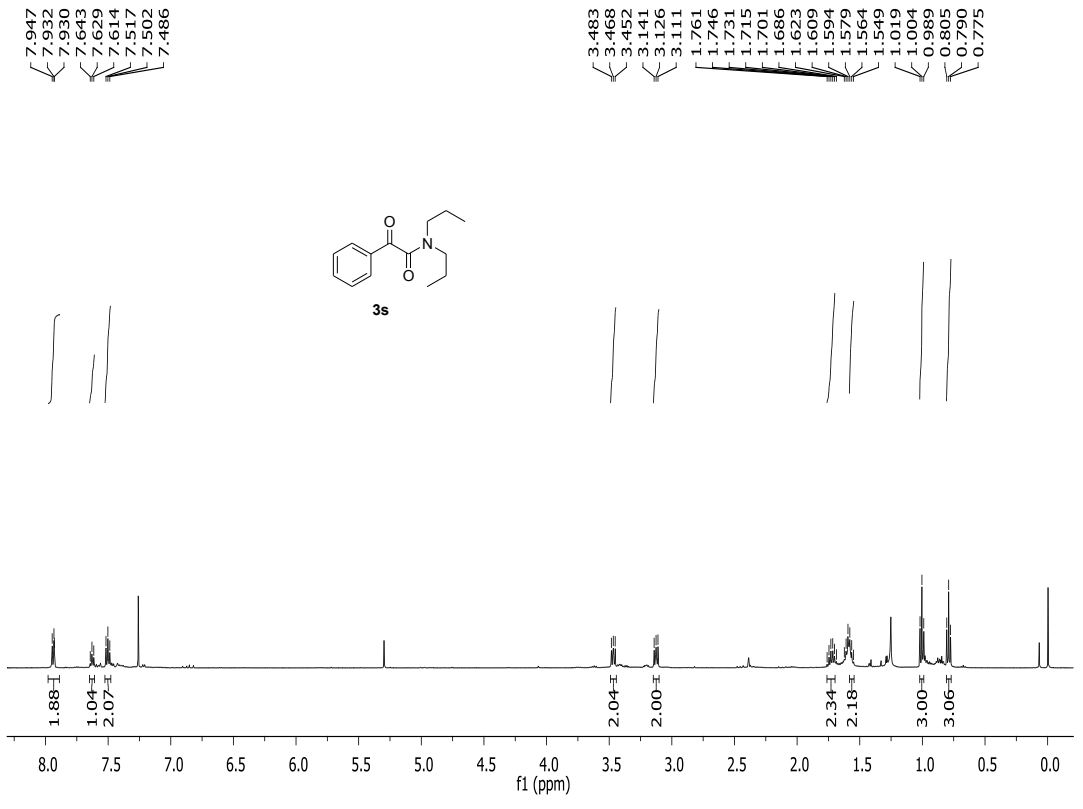

191.725
166.889
134.693
133.440
129.775
129.097
77.413
77.160
76.905
42.255
38.952
14.253
12.984
3p
f1 (ppm)

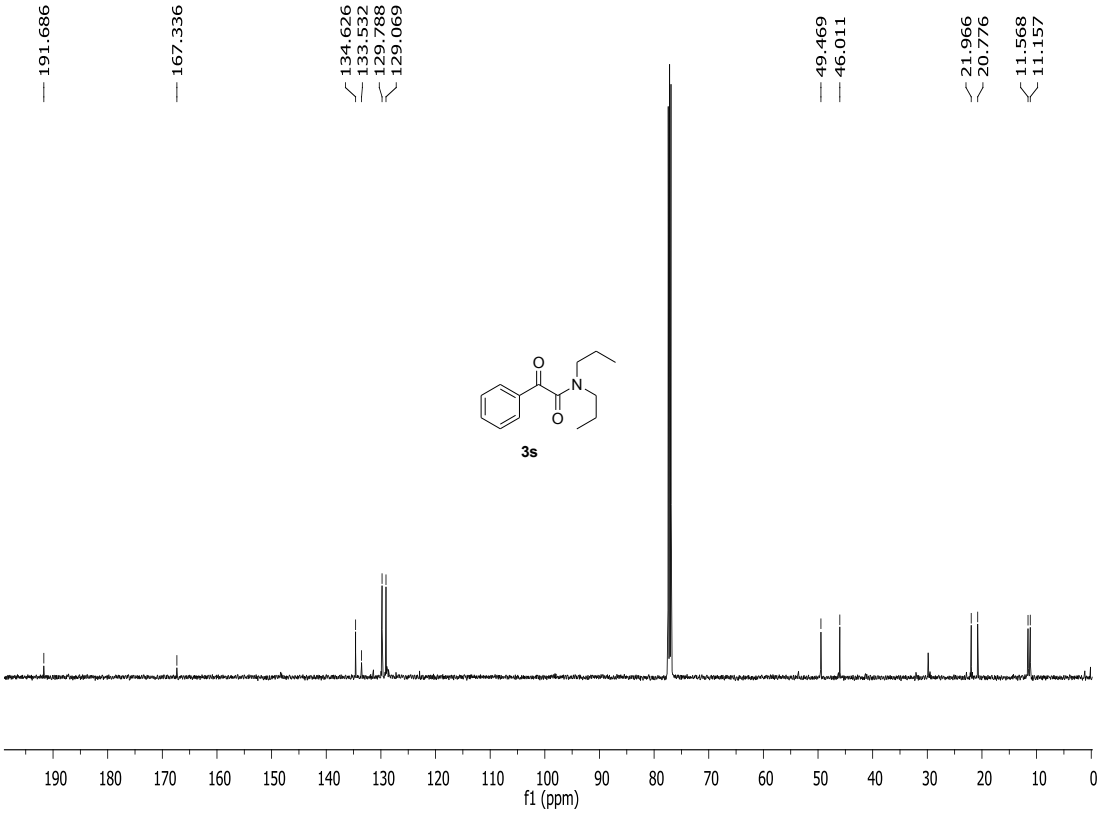

7.482
7.467
7.417
7.402
7.386
7.184
7.169
7.166
3.859
3.580
3.565
3.551
3.537
3.255
3.241
3.227
3.213
1.171
1.157
1.143
0.892
0.878
0.864
OMe
3q
2.03
1.18
1.20
3.10
2.07
2.00
3.11
3.32
f1 (ppm)


191.631
166.848
160.187
134.722
130.146
122.952
121.708
112.836
77.414
77.166
76.906
55.645
42.272
38.935
14.230
12.968
OMe
3q
f1 (ppm)

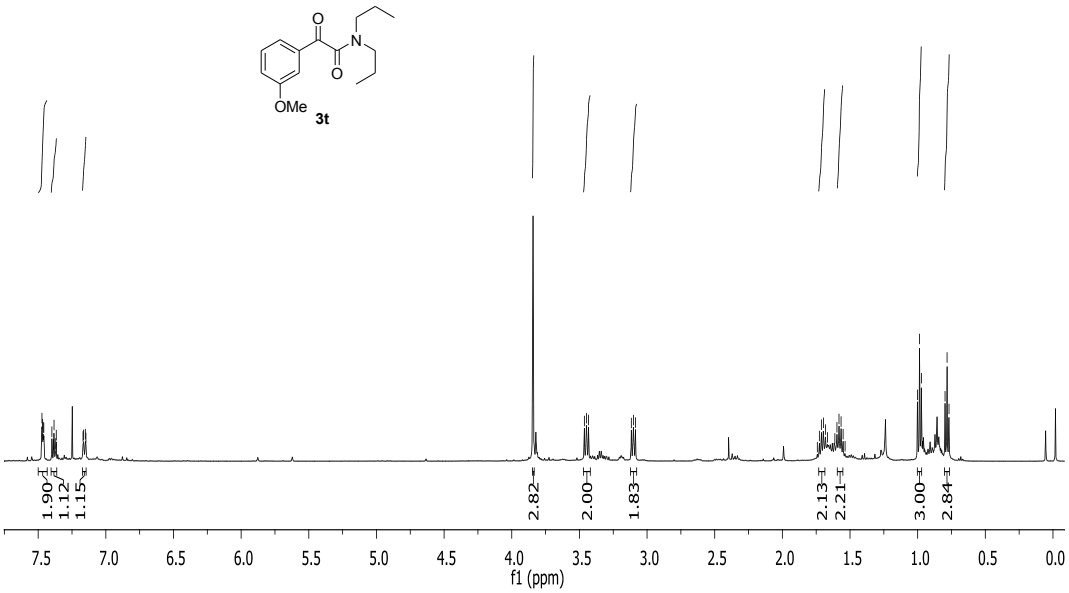

8.770
8.485
8.468
8.285
8.270
7.740
7.724
7.708
3.614
3.600
3.586
3.572
3.302
3.288
3.273
3.260
1.328
1.313
1.299
1.212
1.198
1.184
NO2
3r
0.74
0.89
1.00
1.08
2.00
1.87
2.98
3.13
f1 (ppm)

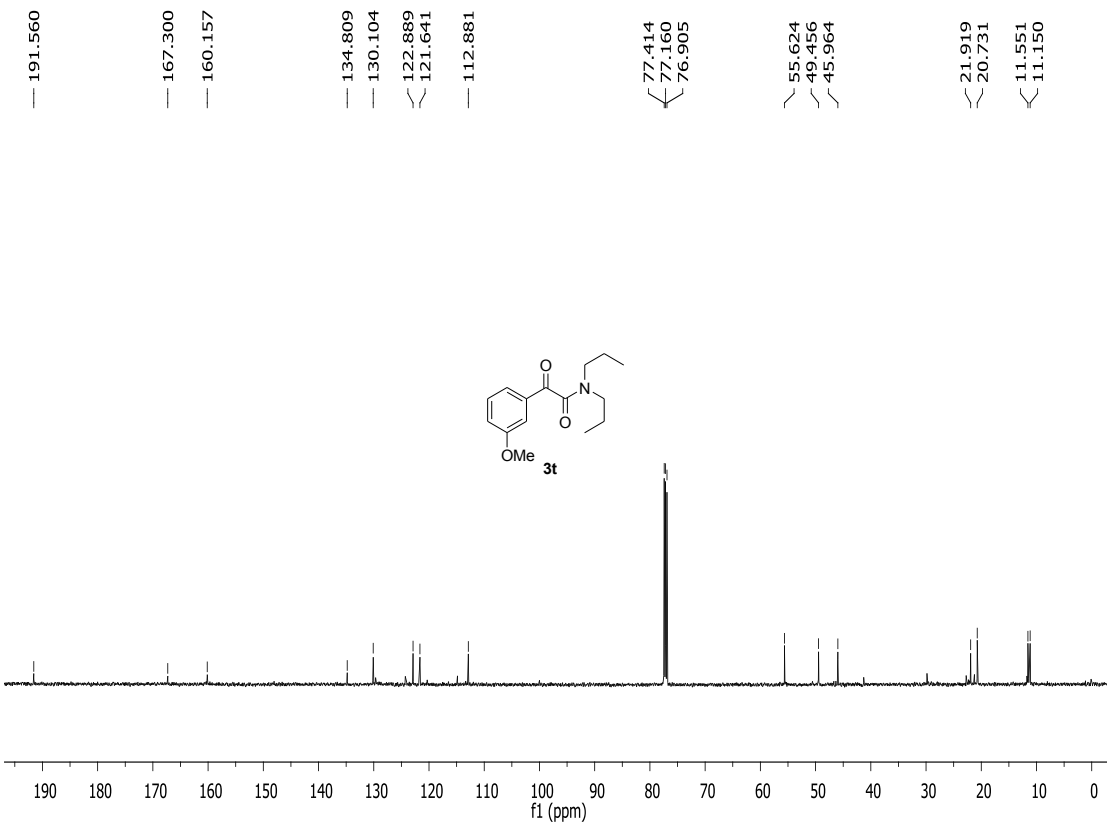

188.758
165.478
148.786
135.202
134.962
130.383
128.689
124.566
77.414
77.160
76.906
42.464
39.474
14.463
12.986
3r
f1 (ppm)

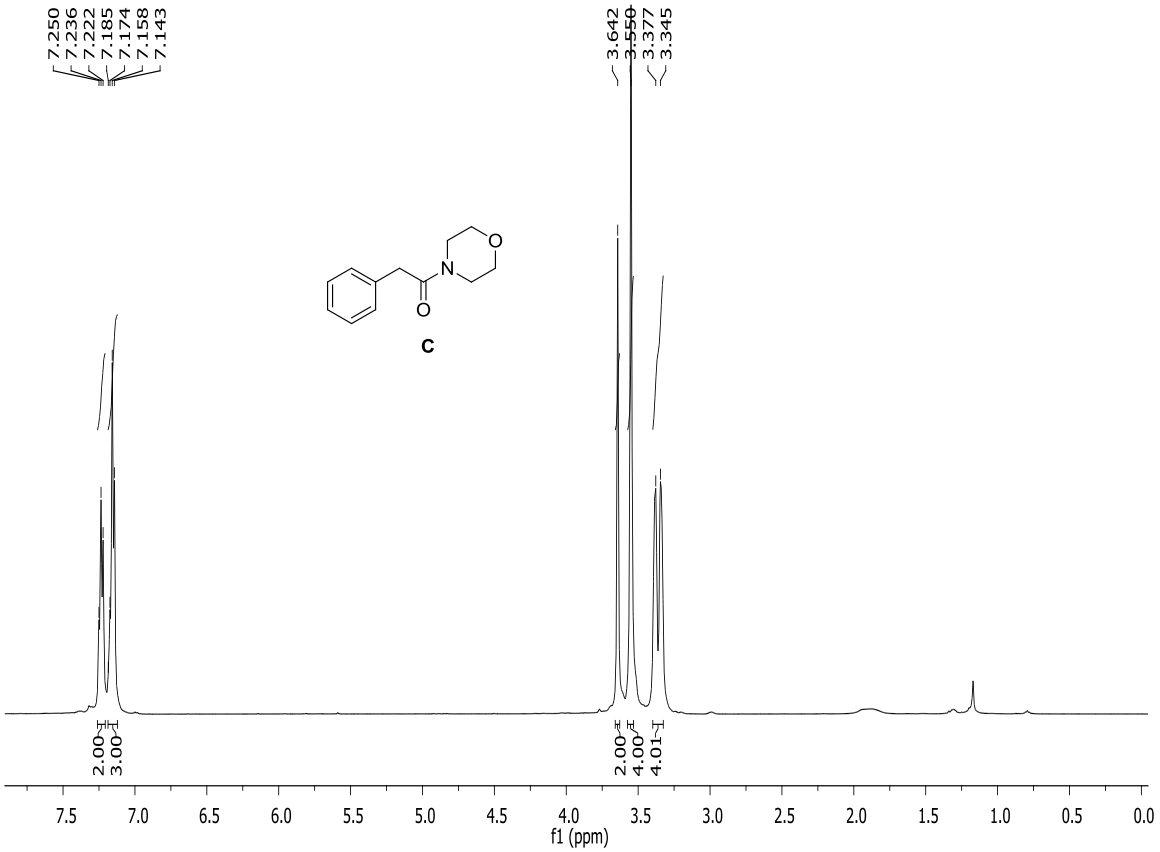

7.947
7.932
7.930
7.643
7.629
7.614
7.517
7.502
7.486
3.483
3.468
3.452
3.141
3.126
3.111
1.761
1.746
1.731
1.715
1.701
1.686
1.623
1.609
1.594
1.579
1.564
1.549
1.019
1.004
0.989
0.805
0.790
0.775
3s
1.88
1.04
2.07
2.04
2.00
2.34
2.18
3.00
3.06
f1 (ppm)

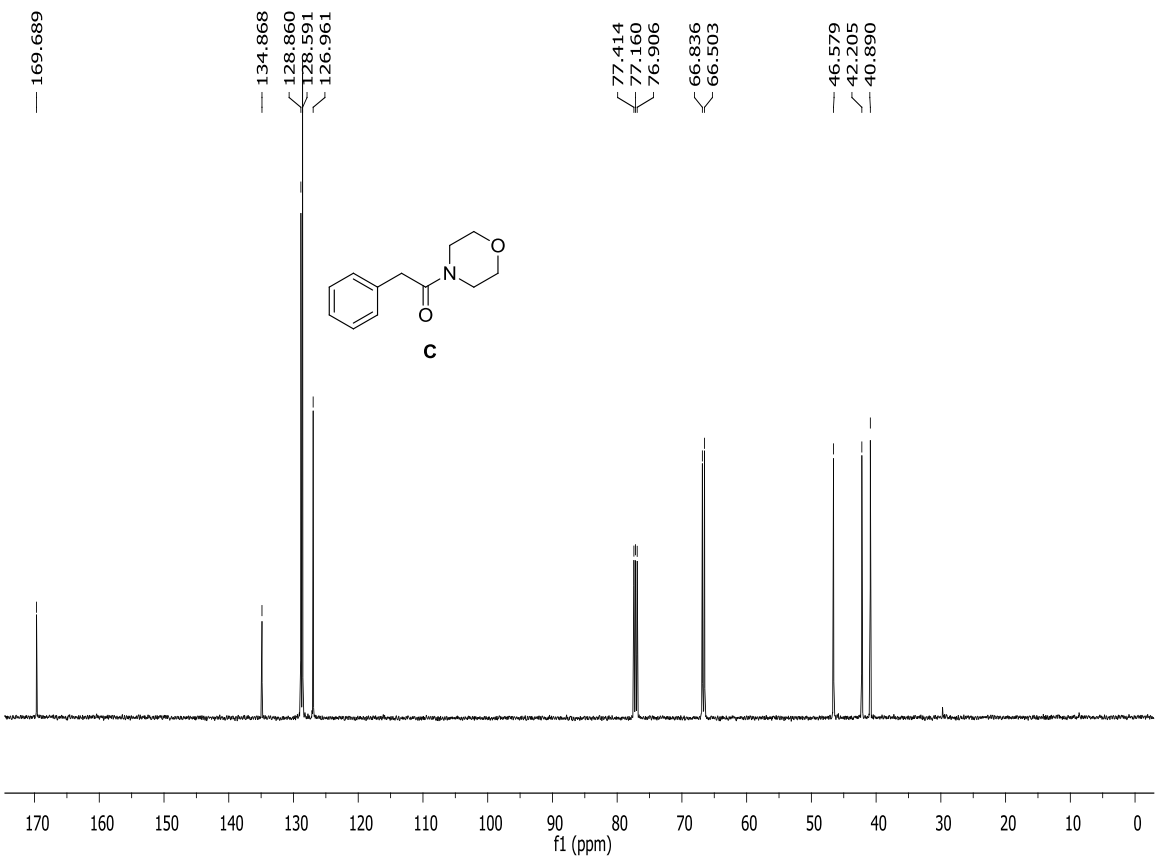

191.686
167.336
134.626
133.532
129.788
129.069
49.469
46.011
21.966
20.776
11.568
11.157
3s
f1 (ppm)


7.472
7.468
7.463
7.459
7.399
7.386
7.383
7.370
7.366
7.169
7.164
7.151
7.147
3.463
3.448
3.433
3.116
3.101
3.086
1.742
1.726
1.712
1.697
1.682
1.667
1.612
1.597
1.581
1.566
1.551
1.536
1.002
0.987
0.972
0.798
0.783
0.768


OMe
3t
1.90
1.12
1.15
2.82
2.00
1.83
2.13
2.21
3.00
2.84
f1 (ppm)


191.560
167.300
160.157
134.809
130.104
122.889
121.641
112.881
77.414
77.160
76.905
55.624
49.456
45.964
21.919
20.731
11.551
11.150
OMe
3t
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)


7.250
7.236
7.222
7.185
7.174
7.158
7.143
3.642
3.550
3.377
3.345
C
2.00
3.00
2.00
4.00
4.01
7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)


169.689
134.868
128.860
128.591
126.961
77.414
77.160
76.906
66.836
66.503
46.579
42.205
40.890
O
N
O
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

c