Supporting Information

Ac-*L*-Methionine-Catalyzed, Nitrite-Triggered Cycloaddition Reaction Between Bromide and Alkyne/Alkene: A step-economical reaction for modular synthesis

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Table of Contents

1. General Information

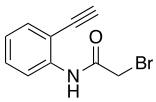
Unless otherwise noted, all reagents and solvents purchased from commercial sources were used without further purification. Reactions were monitored through Thin layer chromatography (TLC). Purifications of reaction products were carried out by chromatography using silica gel (200-300 mesh). Melting points were recorded on a BÜCHI B-540 melting point apparatus. NMR spectra were recorded for ^{1}H NMR at 500 MHz and for ^{13}C NMR at 125 MHz in a solution of either $CDCl_3$ or DMSO-d_6 using tetramethylsilane as the internal standard. HPLC analysis and the HRMS of all compounds were confirmed on a Agilent 1290 HPLC-6224 Time of Flight Mass Spectrometer using PhenomenexLuna 5µ C18, 100 Å, 150 X 4.60 mm 5 micron column at a flow rate of 0.5 mL/min using liner gradients buffer B in A (B: CH_3OH containing 0.1 % formic acid, A: H_2O containing 0.1% formic acid). Mobile phase B was increased linearly from 5% to 95% over 7 min and 95% over the next 2 min, after which the column was equilibrated to 5% for 1 min.

2. General procedure for the synthesis of key intermediate

2.1 Procedure A for the Synthesis of bromide component

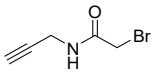
To a solution of amine (1.0 equiv.) and TEA (1.1 equiv.) in DCM (10 mL) at 0 °C, 2-bromoacetyl bromide (1.1 equiv.) in DCM (10 mL) was added dropwise. The reaction mixture was stirred at 0 °C for 2 h. The mixture was poured into 20 mL of water, then extracted with DCM (3 × 15 mL). The organic layer was washed with brine (2 × 15 mL), dried over Na_2SO_4, and concentrated in vacuo. The crude product was purified by flash chromatography to give the desired bromide.

2-bromo-*N*-(2-ethynylphenyl) acetamide



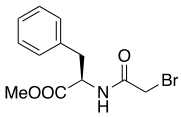
Prepared followed by **Procedure A** using 2-ethynylaniline (5.0 mmol) as the source of amine.
White solid (984 mg, 83%), m.p.= 81.6-82.0 °C
^{1}H NMR (500 MHz, $CDCl_3$) δ 9.09 (s, 1H), 8.38 (dd, *J* = 8.0, 1.5 Hz, 1H), 7.49 (dd, *J* = 7.5, 1.5 Hz, 1H), 7.39 (m, 1H), 7.10 (m, 1H), 4.07 (s, 2H), 3.56 (s, 1H).
HRMS (ESI) calcd for $C_{10}H_9BrNO$ ($[M + H]^+$): m/z 237.9862, found: 237.9867.

2-bromo-*N*-(prop-2-yn-1-yl) acetamide



Prepared followed by **Procedure A** using prop-2-yn-1-amine (5.0 mmol) as the source of amine.
White solid (761 mg, 87%), m.p.= 71.6-72.3 °C
^{1}H NMR (500 MHz, $CDCl_3$) δ 6.76 (s, 1H), 4.08 (dd, *J* = 5.5, 2.5 Hz, 2H), 3.89 (s, 2H), 2.28 (t, *J* = 2.5 Hz, 1H).
HRMS (ESI) calcd for C_5H_7BrNO ($[M + H]^+$): m/z 175.9706, found: 175.9698.

methyl (2-bromoacetyl)-*D*-phenylalaninate



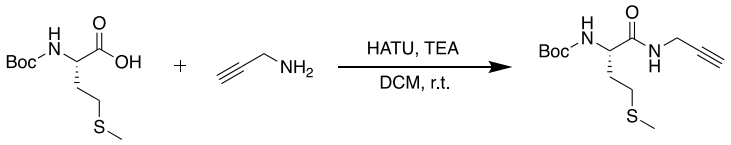
Prepared followed by **Procedure A** using D-phenylalanine methyl ester hydrochloride (5.0 mmol) as the source of amine.

White solid (1.24 g, 83%), m.p.= 86.5-86.9 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.32-7.25 (m, 3H), 7.13-7.11 (m, 2H), 6.89 (d, *J* = 7.5 Hz, 1H), 4.87-4.83 (m, 1H), 3.86-3.80 (m, 2H), 3.74 (s, 3H), 3.19-3.10 (m, 2H).

HRMS (ESI) calcd for $C_{12}H_{14}BrNNaO_3$ ([M + Na]$^+$): m/z 322.0049, found: 322.0041.

2.1.2 Synthesis of *tert*-butyl (*S*)-(4-(methylthio)-1-oxo-1-(prop-2-yn-1-ylamino)butan-2-yl)carbamate:



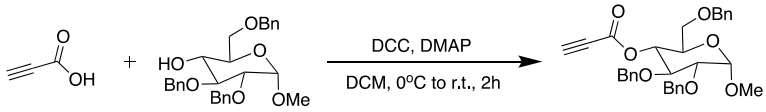
HATU (2.28 g, 6.0 mmol, 1.2 equiv.) and TEA (1.01 g, 10.0 mmol, 2.0 equiv.) were added to a solution of (*tert*-butoxycarbonyl)-*L*-methionine (1.25 g, 5.0 mmol, 1.0 equiv.) in DCM (20 mL). After stirring in an ice bath for 0.5 h, prop-2-yn-1-amine (275 mg, 5.0 mmol, 1.0 equiv.) was added. The mixture was stirred at room temperature overnight. The mixture was diluted with 20 mL water and extracted with DCM (3 × 15 mL). The combined organic layers were washed with 1M HCl (2 × 15 mL) and brine (2 × 15 mL), dried over Na_2SO_4, and concentrated in vacuo. The residue was purified by flash chromatography.

White solid (1.3 g, 91%), m.p.= 105.0-106.1 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 6.74 (s, 1H), 5.26 (d, *J* = 8.5 Hz, 1H), 4.32-4.27 (m, 1H), 4.09-3.99 (m, 2H), 2.60-2.49 (m, 2H), 2.22 (t, *J* = 2.5 Hz, 1H), 2.11-2.05 (m, 4H), 1.96-1.88 (m, 1H), 1.44 (s, 9H).

HRMS (ESI) calcd for $C_{13}H_{22}N_2O_3SNa$ ([M + Na]$^+$): m/z 309.1243, found: 309.1242.

2.1.3 Synthesis of (2*R*,3*R*,4*S*,5*R*,6*S*)-4,5-bis(benzyloxy)-2-((benzyloxy)methyl)-6-methoxytetrahydro-2*H*-pyran-3-yl propiolate:



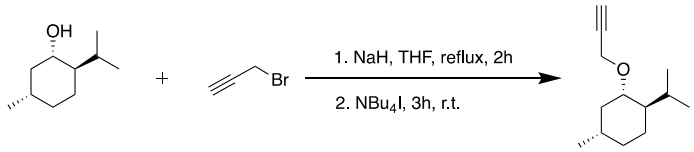
To a solution of (2*R*,3*R*,4*S*,5*R*,6*S*)-4,5-bis(benzyloxy)-2-((benzyloxy)methyl)-6-methoxytetrahydro-2*H*-pyran-3-ol (2.32 g, 5.0 mmol, 1.0 equiv), propiolic acid (350 mg, 5.0 mmol, 1.0 equiv), and DMAP (25 mol%) in DCM (10 mL) was dropwise a solution of DCC (1.24 g, 6.0 mmol, 1.2 equiv) in DCM (10 mL) at 0 °C under nitrogen atmosphere. The reaction then was stirred at room temperature for 2h. After completion of the reaction, the mixture was filtered and the filtrate was concentrated in vacuo. The crude product was purified by flash chromatography.

Colorless liquid. (1.29 g, 50%)

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.36-7.27 (m, 15H), 5.19 (dd, *J* = 10.0, 9.0 Hz, 1H), 4.88 (d, *J* = 11.0 Hz, 1H), 4.79 (d, *J* = 12.0 Hz, 1H), 4.70 (d, *J* = 11.0 Hz, 1H), 4.63 (d, *J* = 12.0 Hz, 1H), 4.60 (d, *J*

= 4.0 Hz, 1H), 4.53 (d, *J* = 12.0 Hz, 1H), 4.48 (d, *J* = 12.0 Hz, 1H), 3.98 (t, *J* = 9.5 Hz, 1H), 3.88-3.85 (m, 1H), 3.60-3.53 (m, 2H), 3.48 (dd, *J* = 11.0, 4.5 Hz, 1H), 3.39 (s, 3H), 2.90 (s, 1H).
HRMS (ESI) calcd for $C_{31}H_{32}O_7Na$ ($[M + Na]^+$): m/z 539.2040, found: 539.2045.

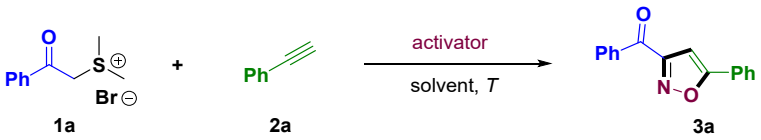
2.1.4 Synthesis of (1*R*,2*S*,4*S*)-1-isopropyl-4-methyl-2-(prop-2-yn-1-yloxy) cyclohexane:

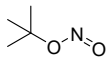
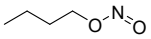
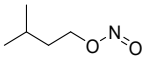


(1*S*,2*R*,5*S*)-2-isopropyl-5-methylcyclohexan-1-ol (780 mg, 5.0 mmol, 1.0 equiv) was dissolved in dry THF (10 mL) under nitrogen atmosphere. NaH (60% dispersion in mineral oil) (240 mg, 6.0 mmol, 1.2 equiv) was added portion wise at 0 °C. The suspension was refluxed for 2h and then cooled at 0 °C. Tetrabutylammonium iodide (37 mg, 0.1 mmol, 0.02 equiv) and propargyl bromide (80 wt.% solution in toluene) (818 mg, 5.5 mmol, 1.1 equiv) were added at 0 °C. The reaction was stirred at room temperature for another 3h. 10 mL cold water was added, extracted with Et_2O (3 × 15 mL). The combined organic layers were dried over Na_2SO_4, concentrated in vacuo, and purified by flash chromatography.
Colorless liquid (165 mg, 17%)
^{1}H NMR (500 MHz, $CDCl_3$) δ 4.24-4.13 (m, 2H), 3.29-3.24 (m, 1H), 2.38 (t, *J* = 2.5 Hz, 1H), 2.27-2.18 (m, 1H), 2.13-2.09 (m, 1H), 1.67-1.59 (m, 2H), 1.41-1.31 (m, 1H), 1.25-1.19 (m, 1H), 1.03-0.95 (m, 1H), 0.92 (d, *J* = 6.5 Hz, 3H), 0.89 (d, *J* = 7.0 Hz, 3H), 0.87-0.80 (m, 2H), 0.79 (d, *J* = 7.0 Hz, 3H).
HRMS (ESI) calcd for $C_{13}H_{23}O$ ($[M + H]^+$): m/z 195.1743, found: 195.1745.

3. Optimization for activators-triggered sulfur ylide-alkyne cycloaddition reaction

Table S1. Optimization for activators-triggered sulfur ylide-alkyne cycloaddition reaction [a]



Entry	Activator	Solvent	T/°C	Yield/%[e]
1[b]		CH_3CN	25	52
2[b]		CH_3CN	25	43
3[b]		CH_3CN	25	48
4	NO_2BF_4	CH_3CN	25	N.D.
5	$NaNO_2$+citric acid (1:1)	CH_3CN	25	29
6	$NaNO_2$+HCOOH (1:1)	CH_3CN	25	58
7[c]	$NaNO_2$+HCOOH (1:1)	CH_3CN	25	60
8[d]	$NaNO_2$+HCOOH (1:1)	CH_3CN	25	63
9	$NaNO_2$+HCOOH (1:1)	CH_3CN-H_2O (10:1)	25	65
10	$NaNO_2$+HCOOH (1:1)	CH_3CN-H_2O (1:1)	25	68
11	$NaNO_2$+HCOOH (1:1)	CH_3CN-H_2O (1:10)	25	72
12	$NaNO_2$+HCOOH (1:1)	H_2O	50	30

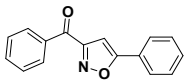
[a.] Reactions were performed in a 0.3 mmol scale, using sulfur ylide **1a** (1.0 equiv), phenylacetylene **2a** (1.0 equiv), and activator (1.0 equiv.) in 0.3 mL of solvent at 25 °C for 12 h to 36 h. [b.] when alkyl nitrite was tested as the activator, 10.0 equivalents were used. [c.] performed in 0.6 mL of solvent. [d.] performed in the 1.0 mL of solvent. [e.] isolated yields.

Alkyl nitrites (*tert*-butyl nitrite, butyl nitrite and isopentyl nitrite), nitronium ion donor (nitronium tetrafluoroborate) and inorganic nitrite (sodium nitrite) were tested. Upon subjecting *tert*-butyl nitrite (1.0 equiv) to the reaction, less than 10% conversion to **3a** was observed *via* LC-MS. Interestingly, the use of 10.0 equivalents led to the formation of **3a** in a good yield of 50%. The tendency was also observed in other alkyl nitrites (Table S1, entries 1-3). The use of a nitronium ion (NO_2BF_4) resulted in a complex reaction mixture with no formation of **3a**. While the nitrite-based nitrosation of sulfur ylide proceeds differently from that of nitrosonium ion. In the case of sodium nitrite, upon adding the biological tolerant acids, such as citric acid and HCOOH were tested. When using combination, $NaNO_2$ and HCOOH showed a promotion in the formation of **3a**. (Table S1, entries 6) Moreover, this transformation still proceeded well upon lowering the concentration of the reaction to 0.5 M and 0.3 M. (Table S1, entries 7-8) Importantly, high conversions to **3a** were obtained in water-CH_3CN co-solvent mixture. Even when the water-CH_3CN proportion reached up to 10:1, the reaction proceeded well to deliver **3a** in 72%. (Table S1, entries 9-11) This finding underlined the potential of the aqueous media for the reaction. But when performed in pure water, the reaction proceeded slowly for most of the reactants floating on the water. Despite raising the reaction temperature to 50 °C would be favor to dissolve these reagents, the reaction became complex with a lower isolated yield.

4. General procedure for preparation of the isoxazoles or isoxazolines

To a solution of corresponding bromides (1.0 equiv.) and Ac-L-Met (0.5 equiv.) in CH_3CN/H_2O (v/v=1:10), $NaNO_2$ (1.0 equiv.), HCOOH (1.0 equiv.), alkenes or alkynes (1.0 equiv.) were successively added. The reaction mixture was stirred at room temperature for 12 h~36 h. Upon completion of the reaction, the mixture was concentrated in vacuo, and the residue was purified by flash column chromatography on silica gel to afford the target products (**3, 5, 6**).

Phenyl (5-phenylisoxazol-3-yl)methanone (3a)



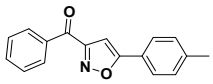
White solid (188 mg, 84%), m.p. 80.2-80.8 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.36-8.34 (m, 2H), 7.87-7.85 (m, 2H), 7.70-7.64 (m, 1H), 7.57-7.49 (m, 5H), 7.06 (s, 1H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 186.0, 170.9, 162.6, 135.9, 134.2, 130.9, 130.8, 129.3, 128.7, 126.9, 126.2, 100.4.

HRMS (ESI) calc for $C_{16}H_{11}NNaO_2$ ([M + Na]$^+$): m/z 272.0682, found: 272.0688.

phenyl(5-(*p*-tolyl)isoxazol-3-yl)methanone (3b)



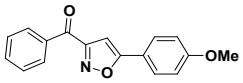
White solid (180 mg, 76%), m.p. 118.6-119.5 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.36-8.34 (m, 2H), 7.75-7.73(m, 2H), 7.68-7.64 (m, 1H), 7.55-7.52 (m, 2H), 7.31 (d, J = 8.0 Hz, 2H), 7.00 (s, 1H), 2.42 (s, 3H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 186.0, 171.1, 162.5, 141.3, 135.9, 134.1, 130.8, 130.0, 128.7, 126.1, 124.1, 99.7, 21.7.

HRMS (ESI) calc for $C_{17}H_{13}NNaO_2$ ([M + Na]$^+$): m/z 286.0838, found: 286.0845.

(5-(4-methoxyphenyl)isoxazol-3-yl)(phenyl)methanone (3c)



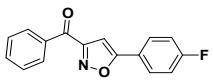
Yellow solid (176 mg, 70%), m.p. 125.6-126.4 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.35-8.33 (m, 2H), 7.80-7.77 (m, 2H), 7.67-7.63 (m, 1H), 7.55-7.52 (m, 2H), 7.02-6.99 (m, 2H), 6.92 (s, 1H), 3.87 (s, 3H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 186.1, 170.9, 162.5, 161.6, 135.9, 134.1, 130.8, 128.7, 127.7, 119.6, 114.7, 98.9, 55.5.

HRMS (ESI) calc for $C_{17}H_{13}NNaO_3$ ([M + Na]$^+$): m/z 302.0788, found: 302.0793.

(5-(4-fluorophenyl)isoxazol-3-yl)(phenyl)methanone (3d)



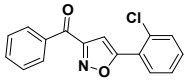
White solid (178 mg, 74%), m.p. 150.1-150.5 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.35-8.33 (m, 2H), 7.87-7.83 (m, 2H), 7.68-7.65 (m, 1H), 7.56-7.53 (m, 2H), 7.23-7.18 (m, 2H), 7.00 (s, 1H).

^{13}C NMR (125 MHz, DMSO-d_6) δ 185.6, 169.4, 163.5(d, J = 248.75 Hz), 162.2, 135.4, 134.4, 130.3, 128.9, 128.6 (d, J = 8.75 Hz), 122.9 (d, J = 3.75 Hz), 116.6 (d, J = 22.50 Hz), 101.0.

HRMS (ESI) calc for $C_{16}H_{10}FNNaO_2$ ([M + Na]$^+$): m/z 290.0588, found: 290.0586.

(5-(2-chlorophenyl)isoxazol-3-yl)(phenyl)methanone (3e)



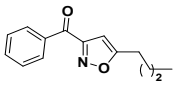
White solid (181 mg, 71%), m.p. 79.5-80.2 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.36-8.34 (m, 2H), 8.02-8.00 (m, 1H), 7.69-7.65 (m, 1H), 7.57-7.53 (m, 3H), 7.47 (s, 1H), 7.45-7.42 (m, 2H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 185.8, 167.3, 162.4, 135.9, 134.2, 132.3, 131.5, 131.2, 130.8, 129.6, 128.8, 127.5, 125.7, 105.2.

HRMS (ESI) calc for $C_{16}H_{10}ClNNaO_2$ ([M + Na]$^+$): m/z 306.0292 and 308.0263, found: 306.0289 and 308.0262.

(5-butylisoxazol-3-yl)(phenyl)methanone (3f)



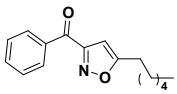
Yellow oil (138 mg, 67%)

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.30-8.28 (m, 2H), 7.64-7.61 (m, 1H), 7.52-7.49 (m, 2H), 6.52 (s, 1H), 2.84 (t, *J* = 7.5 Hz, 2H), 1.77-1.70 (m, 2H), 1.46-1.39 (m, 2H), 0.96 (t, *J* = 7.5 Hz, 3H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 186.2, 174.8, 162.0, 136.0, 134.0, 130.7, 128.6, 101.7, 29.6, 26.4, 22.2, 13.7.

HRMS (ESI) calc for $C_{14}H_{15}NNaO_2$ ([M + Na]$^+$): m/z 252.0995, found: 252.0995.

(5-hexylisoxazol-3-yl)(phenyl)methanone (3g)



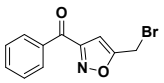
Yellow oil (139 mg, 60%)

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.30-8.28 (m, 2H), 7.65-7.62 (m, 1H), 7.53-7.49 (m, 2H), 6.52 (s, 1H), 2.84 (t, *J* = 7.5 Hz, 2H), 1.78-1.72 (m,2H), 1.43-1.37 (m, 2H), 1.35-1.30 (m, 4H), 0.91-0.88 (m, 3H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 186.3, 174.9, 162.0, 136.0, 134.0, 130.8, 128.7, 101.7, 31.5, 28.8, 27.5, 26.8, 22.6, 14.2.

HRMS (ESI) calc for $C_{16}H_{19}NNaO_2$ ([M + Na]$^+$): m/z 280.1308, found: 280.1311.

(5-(bromomethyl)isoxazol-3-yl)(phenyl)methanone (3h)



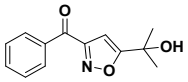
Yellow oil (133 mg, 56%)

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.29-8.27 (m, 2H), 7.66-7.62 (m, 1H), 7.53-7.49 (m, 2H), 6.84 (s, 1H), 4.53 (s, 2H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 185.3, 168.5, 162.2, 135.5, 134.4, 130.8, 128.8, 104.8, 18.1.

HRMS (ESI) calc for $C_{11}H_8BrNNaO_2$ ([M + Na]$^+$): m/z 287.9631 and 289.9610, found: 287.9628 and 289.9609.

(5-(2-hydroxypropan-2-yl)isoxazol-3-yl)(phenyl)methanone (3i)



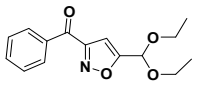
Yellow oil (92 mg, 44%)

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.29-8.26 (m, 2H), 7.66-7.62 (m, 1H), 7.53-7.49 (m, 2H), 6.69 (s, 1H), 1.69 (s, 6H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 186.1, 178.9, 161.8, 135.7, 134.2, 130.8, 128.7, 100.5, 69.3, 29.1.

HRMS (ESI) calc for $C_{13}H_{13}NNaO_3$ ($[M + Na]^+$): m/z 254.0788, found: 254.0778.

(5-(diethoxymethyl)isoxazol-3-yl)(phenyl)methanone (3j)



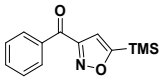
Yellow oil (129 mg, 52%)

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.31-8.28 (m, 2H), 7.66-7.63 (m, 1H), 7.54-7.50 (m, 2H), 6.87 (d, J = 1.0 Hz, 1H), 5.72 (d, J = 1.0 Hz, 1H), 3.71-3.65 (m, 4H), 1.27 (t, J = 7.0 Hz, 6H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 185.7, 170.3, 161.6, 135.8, 134.2, 130.8, 128.7, 104.1, 95.1, 62.1, 15.2.

HRMS (ESI) calc for $C_{15}H_{17}NNaO_4$ ($[M + Na]^+$): m/z 298.1050, found: 298.1044.

phenyl(5-(trimethylsilyl)isoxazol-3-yl)methanone (3k)



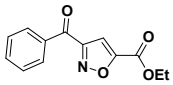
Yellow oil (128 mg, 58%)

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.31-8.29 (m, 2H), 7.63-7.60 (m, 1H), 7.52-7.48 (m, 2H), 6.97 (s, 1H), 0.39 (s, 9H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 188.2, 181.2, 162.2, 138.1, 135.9, 132.6, 130.5, 115.4, -1.9.

HRMS (ESI) calc for $C_{13}H_{15}NNaO_2Si$ ($[M + Na]^+$): m/z 268.0764, found: 268.0768.

ethyl 3-benzoylisoxazole-5-carboxylate (3l)



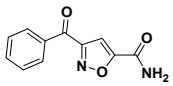
White solid (163 mg, 74%), m.p. 69.9-71.2 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.32-8.30 (m, 2H), 7.69-7.66 (m, 1H), 7.56-7.53 (m, 2H), 7.43 (s, 1H), 4.48 (q, J = 7.0 Hz, 2H), 1.44 (t, J = 7.0 Hz, 3H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 184.7, 162.3, 161.3, 156.4, 135.3, 134.6, 130.9, 128.9, 110.2, 62.8, 14.3.

HRMS (ESI) calc for $C_{13}H_{11}NNaO_4$ ($[M + Na]^+$): m/z 268.0580, found: 268.0587.

3-benzoylisoxazole-5-carboxamide (3m)



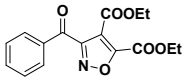
White solid (158 mg, 81%), m.p. 190.9-191.8 °C

^{1}H NMR (500 MHz, DMSO-d_6) δ 8.50 (s, 1H), 8.17-8.13 (m, 3H), 7.79-7.76 (m, 1H), 7.64-7.61(m, 2H), 7.51 (s, 1H).

^{13}C NMR (125 MHz, DMSO-d_6) δ 185.0, 164.4, 161.9, 156.5, 135.1, 134.5, 130.3, 128.9, 106.7.

HRMS (ESI) calc for $C_{11}H_8N_2NaO_3$ ($[M + Na]^+$): m/z 239.0427, found: 239.0419.

diethyl 3-benzoylisoxazole-4,5-dicarboxylate (3n)



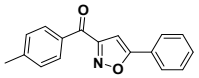
Yellow oil (160 mg, 56%)

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.17-8.15 (m, 2H), 7.70-7.66 (m, 1H), 7.55-7.52 (m, 2H), 4.49 (q, *J* = 7.0 Hz, 2H), 4.36 (q, *J* = 7.0 Hz, 2H), 1.43 (t, *J* = 7.0 Hz, 3H), 1.29 (t, *J* = 7.0 Hz, 3H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 184.1, 160.0, 159.9, 159.4, 155.7, 135.0, 134.9, 130.6, 129.0, 117.8, 63.4, 62.7, 14.1, 13.9.

HRMS (ESI) calc for $C_{16}H_{15}NNaO_6$ ([M + Na]$^+$): m/z 340.0792, found: 340.0791.

(5-phenylisoxazol-3-yl)(p-tolyl)methanone (3o)



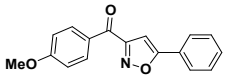
White solid (177 mg, 75%), m.p. 112.3-112.9 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.27-8.25 (m, 2H), 7.86-7.84 (m, 2H), 7.53-7.46 (m, 3H), 7.34 (d, *J* = 8.0 Hz, 2H), 7.04 (s, 1H), 2.46 (s, 3H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 185.5, 170.8, 162.7, 145.3, 133.4, 131.0, 130.8, 129.5, 129.3, 126.9, 126.1, 100.4, 22.0.

HRMS (ESI) calc for $C_{17}H_{13}NNaO_2$ ([M + Na]$^+$): m/z 286.0838, found: 286.0840.

(4-methoxyphenyl)(5-phenylisoxazol-3-yl)methanone (3p)



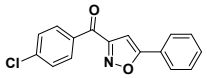
White solid (206 mg, 82%), m.p. 114.7-115.2 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.40-8.37 (m, 2H), 7.85-7.83 (m, 2H), 7.52-7.47 (m, 3H), 7.02-6.99 (m, 3H), 3.90 (s, 3H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 184.1, 170.6, 164.6, 162.8, 133.3, 130.8, 129.2, 128.8, 126.9, 126.1, 114.0, 100.5, 55.7.

HRMS (ESI) calc for $C_{17}H_{13}NNaO_3$ ([M + Na]$^+$): m/z 302.0788, found: 302.0797.

(4-chlorophenyl)(5-phenylisoxazol-3-yl)methanone (3q)



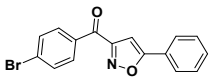
White solid (177 mg, 70%), m.p. 135.1-135.9 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.35-8.32 (m, 2H), 7.86-7.84 (m, 2H), 7.53-7.49 (m, 5H), 7.05 (s, 1H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 184.6, 171.1, 162.4, 140.9, 134.1, 132.3, 131.0, 129.3, 129.1, 126.7, 126.2, 100.3.

HRMS (ESI) calc for $C_{16}H_{10}ClNNaO_2$ ([M + Na]$^+$): m/z 306.0292 and 308.0263, found: 306.0286 and 308.0264.

(4-bromophenyl)(5-phenylisoxazol-3-yl)methanone (3r)



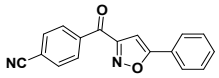
Yellow solid (196 mg, 67%), m.p. 130.1-130.4 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.26-8.24 (m, 2H), 7.86-7.83 (m, 2H), 7.70-7.67 (m, 2H), 7.53-7.49 (m, 3H), 7.05 (s, 1H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 184.8, 171.1, 162.4, 134.5, 132.3, 132.1, 131.0, 129.8, 129.3, 126.7, 126.1, 100.3.

HRMS (ESI) calc for $C_{16}H_{10}BrNNaO_2$ ([M + Na]$^+$): m/z 349.9787 and 351.9767, found: 349.9784 and 351.9767.

4-(5-phenylisoxazole-3-carbonyl)benzonitrile (3s)



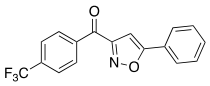
White solid (170 mg, 69%), m.p. 175.5-176.6 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.48-8.45 (m, 2H), 7.86-7.83 (m, 4H), 7.55-7.50 (m, 3H), 7.08 (s, 1H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 184.5, 171.5, 162.1, 138.8, 132.5, 131.2, 131.1, 129.4, 126.5, 126.2, 118.0, 117.2, 100.2.

HRMS (ESI) calc for $C_{17}H_{10}N_2NaO_2$ ([M + Na]$^+$): m/z 297.0634, found: 297.0634.

(5-phenylisoxazol-3-yl)(4-(trifluoromethyl)phenyl)methanone (3t)



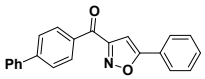
White solid (208 mg, 73%), m.p. 134.2-134.9 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.48-8.46 (m, 2H), 7.87-7.84 (m, 2H), 7.82-7.79 (m, 2H), 7.54-7.50 (m, 3H), 7.08 (s, 1H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 184.9, 171.4, 162.3, 138.6, 135.2 (q, J = 32.5 Hz),131.1, 131.1, 129.4, 126.6, 126.2, 125.7 (q, J = 3.75 Hz), 123.7 (q, J = 270.0 Hz),100.2.

HRMS (ESI) calcd for $C_{17}H_{10}F_3NNaO_2$ ([M + Na]$^+$): m/z 340.0556, found: 340.0557.

[1,1'-biphenyl]-4-yl(5-phenylisoxazol-3-yl)methanone (3u)



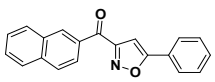
White solid (229 mg, 78%), m.p. 117.6-118.2 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.46-8.44 (m, 2H), 7.88-7.86 (m, 2H), 7.78-7.75 (m, 2H), 7.68-7.66 (m, 2H), 7.54-7.48 (m, 5H), 7.44-7.41 (m, 1H), 7.08 (s, 1H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 185.3, 170.9, 162.7, 146.8, 139.9, 134.6, 131.4, 130.9, 129.3, 129.1, 128.5, 127.5, 127.4, 126.8, 126.1, 100.4.

HRMS (ESI) calc for $C_{22}H_{15}NNaO_2$ ([M + Na]$^+$): m/z 348.0995, found: 348.0995.

naphthalen-2-yl(5-phenylisoxazol-3-yl)methanone (3v)



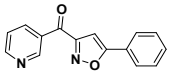
White solid (234 mg, 87%), m.p. 131.4-131.9 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 9.06 (d, J = 2.0 Hz, 1H), 8.30 (dd, J = 8.5, 1.5 Hz, 1H), 8.05 (d, J = 8.0 Hz, 1H), 7.97 (d, J = 8.5 Hz, 1H), 7.92-7.88 (m, 3H), 7.66-7.63 (m, 1H), 7.60-7.57 (m, 1H), 7.55-7.50 (m, 3H), 7.11 (s, 1H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 185.7, 170.9, 162.8, 136.2, 134.1, 133.1, 132.6, 130.9, 130.3, 129.3, 129.2, 128.6, 127.9, 127.0, 126.9, 126.2, 125.3, 100.5.

HRMS (ESI) calc for $C_{20}H_{13}NNaO_2$ ([M + Na]$^+$): m/z 322.0838, found: 322.0844.

(5-phenylisoxazol-3-yl)(pyridin-3-yl)methanone (3w)



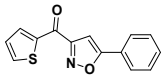
Yellow solid (122 mg, 54%), m.p. 102.1-103.4 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 9.53 (dd, *J* = 2.0, 1.0 Hz, 1H), 8.87 (dd, *J* = 5.0, 1.5 Hz, 1H), 8.67-8.65 (m, 1H), 7.87-7.85 (m, 2H), 7.54-7.48 (m, 4H), 7.09 (s, 1H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 184.7, 171.4, 162.3, 154.1, 151.9, 138.1, 131.5, 131.1, 129.4, 126.6, 126.2, 123.6, 100.0.

HRMS (ESI) calc for $C_{15}H_{10}N_2NaO_2$ ([M + Na]$^+$): m/z 273.0634, found: 273.0629.

(5-phenylisoxazol-3-yl)(thiophen-2-yl)methanone (3x)



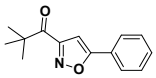
Yellow solid (179 mg, 78%), m.p. 126.2-126.9 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.50 (dd, *J* = 4.0, 1.0 Hz, 1H), 7.85-7.83 (m, 2H), 7.80 (dd, *J* = 5.0, 1.0 Hz, 1H), 7.52-7.47 (m, 3H), 7.23 (dd, *J* = 5.0, 4.0 Hz, 1H), 7.05 (s, 1H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 177.2, 171.1, 162.3, 141.7, 136.8, 136.3, 130.9, 129.3, 128.8, 126.8, 126.1, 99.8.

HRMS (ESI) calc for $C_{14}H_9NNaO_2S$ ([M + Na]$^+$): m/z 278.0246, found: 278.0253.

2,2-dimethyl-1-(5-phenylisoxazol-3-yl)propan-1-one (3y)



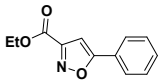
Colorless oil (95 mg, 46%)

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.81-7.78 (m, 2H), 7.49-7.43 (m, 3H), 6.87 (s, 1H), 1.44 (s, 9H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 200.0, 170.2, 161.3, 130.7, 129.2, 126.9, 126.0, 100.1, 44.9, 26.9.

HRMS (ESI) calc for $C_{14}H_{15}NNaO_2$ ([M + Na]$^+$): m/z 252.0995, found: 252.0991.

ethyl 5-phenylisoxazole-3-carboxylate (3z)



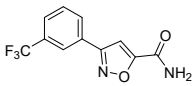
Yellow oil (102 mg, 52%)

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.81-7.79 (m, 2H), 7.50-7.46 (m, 3H), 6.92 (s, 1H), 4.46 (q, *J* = 7.0 Hz, 2H), 1.43 (t, *J* = 7.0 Hz, 3H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 171.8, 160.1, 157.0, 130.9, 129.2, 126.7, 126.0, 100.0, 62.3, 14.3.

HRMS (ESI) calc for $C_{12}H_{11}NNaO_3$ ([M + Na]$^+$): m/z 240.0631, found: 240.0633.

3-(3-(trifluoromethyl)phenyl)isoxazole-5-carboxamide（3za）



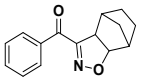
White solid (69 mg, 30 %), m.p. 136.8-137.6 °C

^{1}H NMR (500 MHz, DMSO-d_6) δ 8.42 (s, 1H), 8.05 (s, 1H), 7.79-7.74 (m, 2H), 7.67 (s, 1H), 7.61-7.57 (m, 1H), 7.41-7.37 (m, 1H).

^{13}C NMR (125 MHz, DMSO-d_6) δ 164.8, 163.4, 161.7 (d, *J* = 2.5 Hz),, 161.5, 157.0, 131.5 (d, *J* = 7.5 Hz), 130.1 (d, *J* = 8.75 Hz), 122.9 (d, *J* = 3.75 Hz), 117.5 (d, *J* = 21.25 Hz), 113.6 (d, *J* = 22.5 Hz), 105.1.

HRMS (ESI) calcd for $C_{11}H_7F_3N_2NaO_2$ ([M + Na]$^+$): m/z 279.0352, found: 279.0357.

(3a,4,5,6,7,7a-hexahydro-4,7-methanobenzo[*d*]isoxazol-3-yl)(phenyl)methanone (5a)



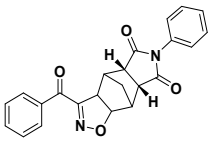
Yellow oil (102 mg, 47%)

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.15-8.13 (m, 2H), 7.59-7.55 (m, 1H), 7.47-7.43 (m, 2H), 4.67-4.65 (m, 1H), 3.53 (dd, *J* = 8.5, 1.5 Hz, 1H), 2.66 (d, *J* = 2.5 Hz, 1H), 2.62 (d, *J* = 2.5 Hz, 1H), 1.59-1.56 (m, 2H), 1.45-1.41 (m, 1H), 1.37-1.33 (m, 1H), 1.26-1.22 (m, 1H), 1.17-1.34 (m, 1H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 186.9, 158.4, 136.5, 133.5, 130.4, 128.4, 89.6, 56.4, 43.2, 39.4, 32.5, 27.4, 22.8.

HRMS (ESI) calcd for $C_{15}H_{15}NNaO_2$ ($[M + Na]^+$): m/z 264.0995, found: 264.0999.

(4a*S*,7a*R*)-3-benzoyl-6-phenyl-3a,4,4a,7a,8,8a-hexahydro-5*H*-4,8-methanoisoxazolo[4,5-*f*]isoindole-5,7(6*H*)-dione (5b)



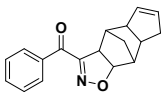
White solid (306 mg, 88%), m.p. 179.8-180.7 °C

^{1}H NMR (500 MHz, DMSO-d_6) δ 8.04-8.01 (m, 2H), 7.70-7.67 (m, 1H), 7.56-7.42 (m, 5H), 7.35-7.32 (m, 2H), 4.80 (d, *J* = 8.0 Hz, 1H), 3.77 (d, *J* = 8.0 Hz, 1H), 3.48-3.43 (m, 2H), 3.11-3.08 (m, 2H), 1.74-1.71 (m, 1H), 1.58 (d, *J* = 11.0 Hz, 1H).

^{13}C NMR (125 MHz, DMSO-d_6) δ 186.1, 176.0, 175.7, 157.5, 136.0, 133.7, 132.1, 129.9, 128.9, 128.6, 128.5, 127.6, 85.1, 52.5, 46.4, 45.1, 44.2, 41.8, 35.6.

HRMS (ESI) calcd for $C_{23}H_{18}N_2NaO_4$ ($[M + H]^+$): m/z 387.1339, found: 387.1334.

(3a,4a,7,7a,8,8a-hexahydro-4*H*-4,8-methanoindeno[5,6-*d*]isoxazol-3-yl)(phenyl)methanone (5c)



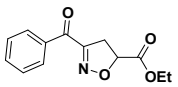
White solid (166 mg, 66%), m.p. 133.0-133.4 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.15-8.12 (m, 2H), 7.59-7.56 (m, 1H), 7.47-7.43 (m, 2H), 5.73-5.60 (m, 2H), 4.68-4.57 (m, 1H), 3.62-3.58 (m, 1H), 3.23-3.18 (m, 1H), 2.81-2.76 (m, 1H), 2.67-2.51 (m, 2H), 2.40-2.24 (m, 2H), 1.55-1.43 (m, 2H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 186.9, 186.8, 159.3, 159.2, 136.6, 136.5, 133.5, 131.9, 131.8, 131.7, 130.8, 130.4, 128.4, 88.1, 85.7, 53.0, 52.2, 50.6, 49.6, 48.0, 46.0, 44.4, 42.7, 41.3, 39.8, 35.5, 34.9, 32.7, 31.7.

HRMS (ESI) calcd for $C_{18}H_{17}NNaO_2$ ($[M + Na]^+$): m/z 302.1151, found: 302.1151.

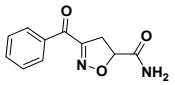
ethyl 3-benzoyl-4,5-dihydroisoxazole-5-carboxylate (5d)



Yellow oil (158 mg, 71%)

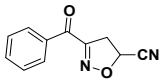
^{1}H NMR (500 MHz, $CDCl_3$) δ 8.22-8.19 (m, 2H), 7.63-7.59 (m, 1H), 7.49-7.45 (m, 2H), 5.18 (dd, *J* = 11.0, 8.0 Hz, 1H), 4.28 (q, *J* = 7.0 Hz, 2H), 3.70-3.59 (m, 2H), 1.33 (t, *J* = 7.0 Hz, 3H).
^{13}C NMR (125 MHz, $CDCl_3$) δ 185.6, 169.3, 157.0, 135.5, 134.0, 130.5, 128.6, 79.1, 62.4, 38.6, 14.2.
HRMS (ESI) calcd for $C_{13}H_{13}NNaO_4$ ($[M + Na]^+$): m/z 270.0737, found: 270.0736.

3-benzoyl-4,5-dihydroisoxazole-5-carboxamide (5e)



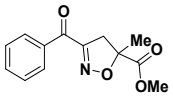
White solid (175 mg, 89%), m.p. 166.1-166.6 °C
^{1}H NMR (500 MHz, $CDCl_3$) δ 8.19-8.16 (m, 2H), 7.65-7.61 (m, 1H), 7.51-7.48 (m, 2H), 6.60 (s, 1H), 5.72 (s, 1H), 5.18 (dd, *J* = 11.0, 7.5 Hz, 1H), 3.77-3.67 (m, 2H).
^{13}C NMR (125 MHz, $CDCl_3$) δ 185.4, 172.5, 157.9, 135.5, 134.2, 130.4, 128.7, 79.8, 39.2.
HRMS (ESI) calcd for $C_{11}H_{10}N_2NaO_3$ ($[M + Na]^+$): m/z 241.0584, found: 241.0589.

3-benzoyl-4,5-dihydroisoxazole-5-carbonitrile (5f)



White solid (137 mg, 76%), m.p. 71.0-71.8 °C
^{1}H NMR (500 MHz, $CDCl_3$) δ 8.22-8.20 (m, 2H), 7.67-7.63 (m, 1H), 7.52-7.49 (m, 2H), 5.38 (dd, *J* = 11.0, 7.5 Hz, 1H), 3.83-3.73 (m, 2H).
^{13}C NMR (125 MHz, $CDCl_3$) δ 184.6, 156.8, 135.0, 134.6, 130.5, 128.8, 116.2, 67.3, 40.9.
HRMS (ESI) calcd for $C_{11}H_9N_2O_2$ ($[M + H]^+$): m/z 201.0659, found: 201.0653.

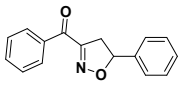
methyl 3-benzoyl-5-methyl-4,5-dihydroisoxazole-5-carboxylate (5g)



Yellow oil (180 mg, 74%)
^{1}H NMR (500 MHz, $CDCl_3$) δ 8.21-8.19 (m, 2H), 7.62-7.58 (m, 1H), 7.49-7.45 (m, 2H), 3.85-3.81 (m, 4H), 3.27 (d, *J* = 18.0 Hz, 1H), 1.72 (s, 3H).
^{13}C NMR (125 MHz, $CDCl_3$) δ 185.9, 171.5, 157.3, 135.6, 133.9, 130.5, 128.6, 87.7, 53.3, 44.4, 23.5.

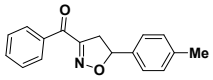
HRMS (ESI) calcd for $C_{13}H_{13}NO_4$ ($[M + Na]^+$): m/z 270.0737, found: 270.0745.

phenyl(5-phenyl-4,5-dihydroisoxazol-3-yl)methanone (5h)



Yellow oil (183 mg, 81%)
^{1}H NMR (500 MHz, $CDCl_3$) δ 8.26-8.24 (m, 2H), 7.64-7.60 (m, 1H), 7.51-7.48 (m, 2H), 7.42-7.36 (m, 5H), 5.79 (dd, *J* = 11.5, 9.0 Hz, 1H), 3.80 (dd, *J* = 17.5, 11.5 Hz, 1H), 3.40 (dd, *J* = 17.5, 9.0 Hz, 1H).
^{13}C NMR (125 MHz, $CDCl_3$) δ 186.4, 157.5, 139.8, 135.9, 133.8, 130.5, 129.1, 128.8, 128.6, 126.1, 84.4, 42.0.
HRMS (ESI) calcd for $C_{16}H_{13}NNaO_2$ ($[M + Na]^+$): m/z 274.0838, found: 274.0844.

phenyl(5-(*p*-tolyl)-4,5-dihydroisoxazol-3-yl)methanone (5i)



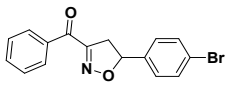
Yellow oil (169 mg, 71%)

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.26-8.24 (m, 2H), 7.63-7.60 (m, 1H), 7.51-7.48 (m, 2H), 7.27-7.20 (m, 4H), 5.75 (dd, *J* = 11.5, 9.0 Hz, 1H), 3.76 (dd, *J* = 17.5, 11.5 Hz, 1H), 3.39 (dd, *J* = 17.5, 9.0 Hz, 1H), 2.37 (s, 3H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 186.5, 157.6, 138.7, 136.8, 136.0, 133.8, 130.5, 129.7, 128.5, 126.1, 84.5, 41.8, 21.3.

HRMS (ESI) calcd for $C_{17}H_{15}NNaO_2$ ($[M + Na]^+$): m/z 288.0995, found: 288.0997.

(5-(4-bromophenyl)-4,5-dihydroisoxazol-3-yl)(phenyl)methanone (5j)



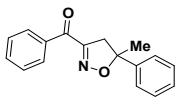
White solid (219 mg, 74%), m.p. 84.5-85.9 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.24-8.22 (m, 2H), 7.64-7.60 (m, 1H), 7.54-7.47 (m, 4H), 7.25-7.23 (m, 2H), 5.74 (dd, *J* = 11.5, 8.5 Hz, 1H), 3.79 (dd, *J* = 17.5, 11.5 Hz, 1H), 3.35 (dd, *J* = 17.5, 8.5 Hz, 1H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 186.2, 157.4, 138.9, 135.7, 133.9, 132.2, 130.5, 128.6, 127.7, 122.8, 83.5, 42.1.

HRMS (ESI) calcd for $C_{16}H_{12}BrNNaO_2$ ($[M + Na]^+$): m/z 351.9944 and 353.9923, found: 351.9942 and 353.9925.

(5-methyl-5-phenyl-4,5-dihydroisoxazol-3-yl)(phenyl)methanone (5k)



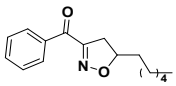
Yellow oil (162 mg, 68%)

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.23-8.21 (m, 2H), 7.62-7.59 (m, 1H), 7.50-7.44 (m, 4H), 7.41-7.38 (m, 2H), 7.33-7.30 (m, 1H), 3.57 (d, *J* = 17.5 Hz, 1H), 3.49 (d, *J* = 17.5 Hz, 1H), 1.82 (s, 3H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 186.7, 157.7, 144.5, 135.9, 133.7, 130.5, 128.8, 128.5, 127.9, 124.7, 90.6, 47.5, 28.4.

HRMS (ESI) calcd for $C_{17}H_{15}NNaO_2$ ($[M + Na]^+$): m/z 288.0995, found: 288.1000.

(5-hexyl-4,5-dihydroisoxazol-3-yl)(phenyl)methanone (5l)



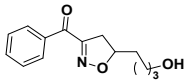
Yellow oil (163 mg, 70%)

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.20-8.18 (m, 2H), 7.60-7.57 (m, 1H), 7.48-7.44 (m, 2H), 4.82-4.76 (m, 1H), 3.39 (dd, *J* = 17.5, 11.0 Hz, 1H), 3.00 (dd, *J* = 17.5, 8.5 Hz, 1H), 1.83-1.76 (m, 1H), 1.67-1.60 (m, 1H), 1.48-1.27 (m, 8H), 0.89 (t, *J* = 7.0 Hz, 3H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 186.7, 157.9, 136.0, 133.6, 130.4, 128.5, 83.7, 38.9, 35.3, 31.8, 29.1, 25.3, 22.7, 14.2.

HRMS (ESI) calcd for $C_{16}H_{21}NNaO_2$ ($[M + Na]^+$): m/z 282.1465, found: 282.1457.

(5-(4-hydroxybutyl)-4,5-dihydroisoxazol-3-yl)(phenyl)methanone (5m)



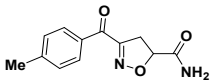
Yellow oil (160 mg, 72%)

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.17-8.14 (m, 2H), 7.58-7.55 (m, 1H), 7.46-7.42 (m, 2H), 4.81-4.74 (m, 1H), 3.63 (t, *J* = 6.5 Hz, 2H), 3.37 (dd, *J* = 17.5, 11.0 Hz, 1H), 2.99 (dd, *J* = 17.5, 8.5 Hz, 1H), 2.21 (s, 1H), 1.82-1.75 (m, 1H), 1.68-1.45 (m, 5H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 186.7, 157.9, 135.8, 133.6, 130.3, 128.4, 83.4, 62.4, 38.8, 34.9, 32.3, 21.6.

HRMS (ESI) calcd for $C_{14}H_{17}NNaO_3$ ([M + Na]$^+$): m/z 270.1101, found: 270.1100.

3-(4-methylbenzoyl)-4,5-dihydroisoxazole-5-carboxamide (5n)



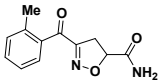
White solid (176 mg, 85%), m.p. 160.6-161.0 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.08-8.06 (m, 2H), 7.28-7.26 (m, 2H), 6.65 (s, 1H), 6.13 (s, 1H), 5.15 (dd, *J* = 11.0, 8.0 Hz, 1H), 3.71-3.68 (m, 2H), 2.42 (s, 3H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 184.9, 172.7, 157.9, 145.4, 132.9, 130.5, 129.4, 79.6, 39.4, 21.9.

HRMS (ESI) calcd for $C_{12}H_{12}N_2NaO_3$ ([M + Na]$^+$): m/z 255.0740, found: 255.0747.

3-(2-methylbenzoyl)-4,5-dihydroisoxazole-5-carboxamide (5o)



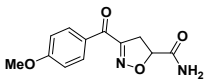
White solid (167 mg, 80%), m.p. 166.9-168.0 °C

^{1}H NMR (500 MHz, DMSO-d_6) δ 7.75 (s, 1H), 7.63 (dd, *J* = 7.5, 1.0 Hz, 1H), 7.50 (s, 1H), 7.48-7.45 (m, 1H), 7.33-7.29 (m, 2H), 5.17 (dd, *J* = 12.0, 7.0 Hz, 1H), 3.58 (dd, *J* = 17.5, 12.0 Hz, 1H), 3.40 (dd, *J* = 17.5, 7.0 Hz, 1H), 2.34 (s, 3H).

^{13}C NMR (125 MHz, DMSO-d_6) δ 189.4, 170.7, 158.5, 136.9, 136.6, 131.5, 131.0, 130.1, 125.3, 81.0, 36.8, 19.8.

HRMS (ESI) calcd for $C_{12}H_{12}N_2NaO_3$ ([M + Na]$^+$): m/z 255.0740, found: 255.0744.

3-(4-methoxybenzoyl)-4,5-dihydroisoxazole-5-carboxamide (5p)



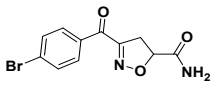
White solid (183 mg, 82%), m.p. 138.7-139.2 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.21-8.18 (m, 2H), 6.96-6.93 (m, 2H), 6.66 (s, 1H), 6.14 (s, 1H), 5.13 (dd, *J* = 10.0, 8.0 Hz, 1H), 3.88 (s, 3H), 3.71-3.68 (m, 2H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 183.5, 172.8, 164.6, 158.0, 132.9, 128.3, 114.0, 79.4, 55.7, 39.6.

HRMS (ESI) calcd for $C_{12}H_{12}N_2NaO_4$ ([M + Na]$^+$): m/z 271.0689, found: 271.0690.

3-(4-bromobenzoyl)-4,5-dihydroisoxazole-5-carboxamide (5q)



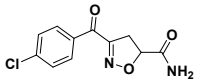
White solid (221 mg, 83%), m.p. 168.8-169.9 °C

^{1}H NMR (500 MHz, DMSO-d_6) δ 8.00-7.97 (m, 2H), 7.80-7.77 (m, 2H), 7.76 (s, 1H), 7.51 (s, 1H), 5.15 (dd, *J* = 12.0, 7.5 Hz, 1H), 3.58 (dd, *J* = 17.5, 12.0 Hz, 1H), 3.42 (dd, *J* = 17.5, 7.5 Hz, 1H).

^{13}C NMR (125 MHz, DMSO-d_6) δ 184.8, 170.7, 157.5, 134.6, 131.8, 131.7, 128.0, 80.4, 37.6.

HRMS (ESI) calcd for $C_{11}H_9BrN_2NaO_3$ ([M + Na]$^+$): m/z 318.9689 and 320.9668, found: 318.9694 and 320.9674.

3-(4-chlorobenzoyl)-4,5-dihydroisoxazole-5-carboxamide (5r)



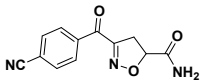
White solid (184 mg, 81%), m.p. 166.2-167.0 °C

^{1}H NMR (500 MHz, DMSO-d_6) δ 8.08-8.05 (m, 2H), 7.76 (s, 1H), 7.65-7.62 (m, 2H), 7.51 (s, 1H), 5.15 (dd, J = 12.0, 7.5 Hz, 1H), 3.59 (dd, J = 17.5, 12.0 Hz, 1H), 3.42 (dd, J = 17.5, 7.5 Hz, 1H).

^{13}C NMR (125 MHz, DMSO-d_6) δ 184.6, 170.7, 157.5, 138.7, 134.2, 131.7, 128.7, 80.3, 37.6.

HRMS (ESI) calcd for $C_{11}H_9ClN_2NaO_3$ ([M + Na]$^+$): m/z 275.0194 and 277.0164, found: 275.0192 and 277.0164.

3-(4-cyanobenzoyl)-4,5-dihydroisoxazole-5-carboxamide (5s)



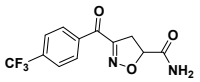
White solid (151 mg, 69%), m.p. 208.1-208.5 °C

^{1}H NMR (500 MHz, DMSO-d_6) δ 8.14 (d, J = 8.0 Hz, 2H), 8.03 (d, J = 8.0 Hz, 2H), 7.77 (s, 1H), 7.52 (s, 1H), 5.18 (dd, J = 12.5, 7.5 Hz, 1H), 3.59 (dd, J = 17.5, 12.5 Hz, 1H), 3.43 (dd, J = 17.5, 7.5 Hz, 1H).

^{13}C NMR (125 MHz, DMSO-d_6) δ 185.0, 170.6, 157.6, 139.1, 132.4, 130.4, 118.1, 115.4, 80.7, 37.2.

HRMS (ESI) calcd for $C_{12}H_9N_3NaO_3$ ([M + Na]$^+$): m/z 266.0536, found: 266.0532.

3-(4-(trifluoromethyl)benzoyl)-4,5-dihydroisoxazole-5-carboxamide (5t)



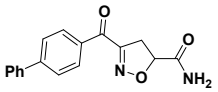
White solid (196 mg, 76%), m.p. 164.0-165.0 °C

^{1}H NMR (500 MHz, DMSO-d_6) δ 8.20 (d, J = 8.0 Hz, 2H), 7.93 (d, J = 8.0 Hz, 2H), 7.77 (s, 1H), 7.53 (s, 1H), 5.18 (dd, J = 12.0, 7.5 Hz, 1H), 3.60 (dd, J = 17.5, 12.0 Hz, 1H), 3.44 (dd, J = 17.5, 7.5 Hz, 1H).

^{13}C NMR (125 MHz, DMSO-d_6) δ 185.1, 170.6, 157.7, 139.1, 132.7 (q, J = 32.5 Hz), 130.7, 125.4 (q, J = 3.8 Hz), 123.8 (q, J =271.3 Hz), 80.7, 37.3.

HRMS (ESI) calcd for $C_{12}H_9F_3N_2NaO_3$ ([M + Na]$^+$): m/z 309.0457, found: 309.0455.

3-([1,1'-biphenyl]-4-carbonyl)-4,5-dihydroisoxazole-5-carboxamide (5u)



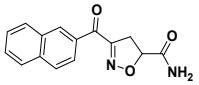
White solid (206 mg, 78%), m.p. 179.7-180.4 °C

^{1}H NMR (500 MHz, DMSO-d_6) δ 8.16 (d, J = 8.0 Hz, 2H), 7.87 (d, J = 8.0 Hz, 2H), 7.79-7.76 (m, 3H), 7.53-7.50 (m, 3H), 7.44 (t, J = 7.5 Hz, 1H), 5.16 (dd, J = 12.0, 7.5 Hz, 1H), 3.63 (dd, J = 17.5, 12.0 Hz, 1H), 3.46 (dd, J = 17.5, 7.5 Hz, 1H).

^{13}C NMR (125 MHz, DMSO-d_6) δ 185.2, 170.8, 157.6, 145.1, 138.7, 134.4, 130.7, 129.2, 128.6, 127.1, 126.7, 80.2, 37.9.

HRMS (ESI) calcd for $C_{17}H_{14}N_2NaO_3$ ([M + Na]$^+$): m/z 317.0897, found: 317.0890.

3-(2-naphthoyl)-4,5-dihydroisoxazole-5-carboxamide (5v)



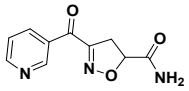
White solid (157 mg, 65%), m.p. 193.6-194.7 °C

^{1}H NMR (500 MHz, DMSO-d_6) δ 8.17-8.15 (m, 2H), 7.88-7.86 (m, 2H), 7.80-7.76 (m, 3H), 7.53-7.50 (m, 3H), 7.46-7.43 (m, 1H), 5.16 (dd, J = 12.0, 7.0 Hz, 1H), 3.62 (dd, J = 17.5, 12.0 Hz, 1H), 3.45 (dd, J = 17.5, 7.0 Hz, 1H).

^{13}C NMR (125 MHz, DMSO-d_6) δ 185.2, 170.8, 157.6, 145.1, 138.7, 134.4, 130.7, 129.2, 128.6, 127.1, 126.7, 80.2, 37.9.

HRMS (ESI) calcd for $C_{15}H_{13}N_2O_3$ ([M + H]$^+$): m/z 269.0921, found: 269.0927.

3-nicotinoyl-4,5-dihydroisoxazole-5-carboxamide (5w)



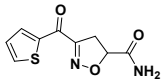
Gray solid (104 mg, 53%), m.p. 147.6-148.5 °C

^{1}H NMR (500 MHz, DMSO-d_6) δ 9.13 (d, J = 1.5 Hz, 1H), 8.82 (dd, J = 5.0, 1.5 Hz, 1H), 8.36-8.33 (m, 1H), 7.78 (s, 1H), 7.60-7.58 (m, 1H), 7.53 (s, 1H), 5.19 (dd, J = 12.0, 7.5 Hz, 1H), 3.59 (dd, J = 17.5, 12.0 Hz, 1H), 3.43 (dd, J = 17.5, 7.5 Hz, 1H).

^{13}C NMR (125 MHz, DMSO-d_6) δ 185.0, 170.7, 157.8, 153.6, 150.5, 137.3, 131.5, 123.6, 80.7, 37.2.

HRMS (ESI) calcd for $C_{10}H_{10}N_3O_3$ ([M + H]$^+$): m/z 220.0717, found: 220.0717.

3-(thiophene-2-carbonyl)-4,5-dihydroisoxazole-5-carboxamide (5x)



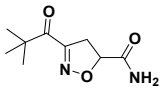
White solid (125 mg, 62%), m.p. 159.2-159.9 °C

^{1}H NMR (500 MHz, DMSO-d_6) δ 8.18 (dd, J = 3.5, 1.0 Hz, 1H), 8.14 (dd, J = 5.0, 1.0 Hz, 1H), 7.78 (s, 1H), 7.51 (s, 1H), 7.29 (dd, J = 5.0, 3.5 Hz, 1H), 5.15 (dd, J = 12.0, 7.0 Hz, 1H), 3.57 (dd, J = 17.5, 12.0 Hz, 1H), 3.39 (dd, J = 17.5, 7.0 Hz, 1H).

^{13}C NMR (125 MHz, DMSO-d_6) δ 176.9, 170.7, 157.3, 140.4, 137.10, 136.0, 128.9, 80.4, 37.3.

HRMS (ESI) calcd for $C_9H_8N_2NaO_3S$ ([M + Na]$^+$): m/z 247.0148, found: 247.0149.

3-pivaloyl-4,5-dihydroisoxazole-5-carboxamide (5y)



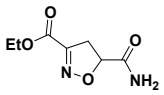
White solid (134 mg, 75%), m.p. 90.4-91.1 °C

^{1}H NMR (500 MHz, DMSO-d_6) δ 7.72 (s, 1H), 7.45 (s, 1H), 5.01 (dd, J = 12.0, 7.5 Hz, 1H), 3.39 (dd, J = 17.5, 12.0 Hz, 1H), 3.22 (dd, J = 17.5, 7.5 Hz, 1H), 1.25 (s, 9H).

^{13}C NMR (125 MHz, DMSO-d_6) δ 199.4, 170.8, 155.3, 79.3, 44.1, 38.0, 26.5.

HRMS (ESI) calcd for $C_9H_{14}N_2NaO_3$ ([M + Na]$^+$): m/z 221.0897, found: 221.0904.

ethyl 5-carbamoyl-4,5-dihydroisoxazole-3-carboxylate (5z)



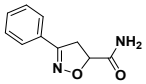
White solid (131 mg, 78%), m.p. 128.0-128.4 °C

^{1}H NMR (500 MHz, DMSO-d_6) δ 7.71 (s, 1H), 7.47 (s, 1H), 5.12 (dd, J = 12.0, 7.0 Hz, 1H), 4.25 (q, J = 7.0 Hz, 2H), 3.45 (dd, J = 17.5, 12.0 Hz, 1H), 3.27 (dd, J = 17.5, 7.0 Hz, 1H), 1.26 (t, J = 7.0 Hz, 3H).

^{13}C NMR (125 MHz, DMSO-d_6) δ 170.7, 159.7, 151.7, 80.7, 61.6, 37.2, 13.9.

HRMS (ESI) calcd for $C_7H_{11}N_2O_4$ ([M + H]$^+$): m/z 187.0713, found: 187.0713.

3-phenyl-4,5-dihydroisoxazole-5-carboxamide (5za)



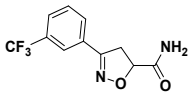
White solid (82 mg, 48%), m.p. 204.8-206.4 °C

^{1}H NMR (500 MHz, DMSO-d_6) δ 7.71-7.69 (m, 2H), 7.65 (s, 1H), 7.48-7.43 (m, 4H), 5.05 (dd, J = 11.5, 7.0 Hz, 1H), 3.67 (dd, J = 17.5, 11.5 Hz, 1H), 3.54 (dd, J = 17.5, 7.0 Hz, 1H).

^{13}C NMR (125 MHz, DMSO-d_6) δ 172.0, 156.4, 130.4, 128.9, 128.7, 126.8, 78.9, 38.5.

HRMS (ESI) calcd for $C_{10}H_{11}N_2O_2$ ([M + H]$^+$): m/z 191.0815, found: 191.0811.

3-(3-(trifluoromethyl)phenyl)-4,5-dihydroisoxazole-5-carboxamide (5zb)



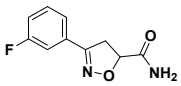
White solid (88 mg, 38%), m.p. 172.6-173.3 °C

^{1}H NMR (500 MHz, DMSO-d_6) δ 8.00 (d, J = 7.5 Hz, 1H), 7.97 (s, 1H), 7.84 (d, J = 7.5 Hz, 1H), 7.71 (t, J = 7.5 Hz, 1H), 7.68 (s, 1H), 7.47 (s, 1H), 5.11 (dd, J = 11.5, 7.0 Hz, 1H), 3.73 (dd, J = 17.5, 11.5 Hz, 1H), 3.62 (dd, J = 17.5, 7.0 Hz, 1H).

^{13}C NMR (125 MHz, DMSO-d_6) δ 171.8, 155.7, 130.8, 130.2, 129.9, 129.7 (q, J = 32.5 Hz), 126.8 (q, J = 3.8 Hz), 123.9 (q, J = 271.3 Hz), 123.1 (q, J = 3.8 Hz), 79.4, 38.1.

HRMS (ESI) calcd for $C_{11}H_9F_3N_2NaO_2$ ([M + Na]$^+$): m/z 281.0508, found: 281.0501.

3-(3-fluorophenyl)-4,5-dihydroisoxazole-5-carboxamide (5zc)



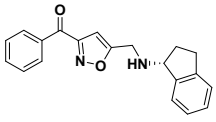
White solid (79 mg, 42%), m.p. 157.8-158.3 °C

^{1}H NMR (500 MHz, DMSO-d_6) δ 7.66 (s, 1H), 7.56-7.49 (m, 3H), 7.45 (s, 1H), 7.34-7.30 (m, 1H), 5.07 (dd, J = 11.5, 7.0 Hz, 1H), 3.66 (dd, J = 17.5, 11.5 Hz, 1H), 3.56 (dd, J = 17.5, 7.0 Hz, 1H).

^{13}C NMR (125 MHz, DMSO-d_6) δ 171.8, 162.2 (d, J = 242.5 Hz), 155.8 (d, J = 2.5 Hz), 131.0 (d, J = 8.75 Hz), 131.0 (d, J = 8.75 Hz), 123.0 (d, J = 2.5 Hz), 117.2 (d, J = 21.25 Hz), 113.4 (d, J = 22.5 Hz), 79.22, 38.29.

HRMS (ESI) calcd for $C_{10}H_{10}FN_2O_2$ ([M + H]$^+$): m/z 209.0721, found: 209.0717.

(*R*)-(5-(((2,3-dihydro-1*H*-inden-1-yl)amino)methyl)isoxazol-3-yl)(phenyl)methanone (6a)



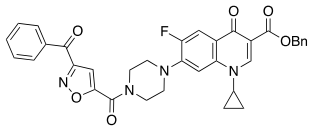
Yellow solid (235 mg, 82%), m.p. 81.8-83.0 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.25-8.22 (m, 2H), 7.66-7.62 (m, 1H), 7.52-7.49 (m, 2H), 7.37-7.32 (m, 2H), 7.25-7.23 (m, 1H), 7.16 (d, *J* = 7.5 Hz, 1H), 6.61-6.58 (m, 1H), 4.89 (d, *J* = 15.5 Hz, 1H), 4.32 (d, *J* = 15.5 Hz, 1H), 3.23-3.17 (m, 1H), 3.09-3.03 (m, 1H), 2.79-2.72 (m, 1H), 2.35-2.27 (m, 1H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 185.4, 166.1, 162.0, 144.0, 138.5, 135.6, 134.2, 130.7, 129.5, 128.7, 127.6, 125.7, 124.7, 104.7, 68.2, 37.0, 30.6, 30.4.

HRMS (ESI) calc for $C_{20}H_{18}N_2NaO_2$ ([M + Na]$^+$): m/z 341.1260, found: 341.1263.

benzyl 7-(4-(3-benzoylisoxazole-5-carbonyl)piperazin-1-yl)-1-cyclopropyl-6-fluoro-4-oxo-1,4-dihydroquinoline-3-carboxylate (6b)



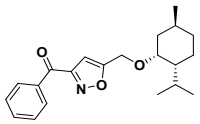
White solid (251 mg, 45 %), m.p. 209.3-210.0 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.52 (s, 1H), 8.31-8.29 (m, 2H), 8.04 (d, *J* = 12.5 Hz, 1H), 7.70-7.67 (m, 1H), 7.57-7.53 (m, 2H), 7.50 (d, *J* = 7.5 Hz, 2H), 7.38-7.34 (m, 2H), 7.32-7.28 (m, 2H), 7.26 (s, 1H), 5.37 (s, 2H), 4.04-3.97 (m, 4H), 3.45-3.35 (m, 5H), 1.31 (q, *J* = 6.5 Hz, 2H), 1.12-1.09 (m, 2H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 184.7, 173.2, 165.4, 164.3, 161.7, 156.5, 153.4 (d, *J* = 247.5 Hz), 148.5, 143.9, 138.0, 136.4, 135.3, 134.6, 130.7, 128.8, 128.6, 128.1, 123.5, 113.4(d, *J* = 22.5 Hz), 109.9, 109.0, 105.6, 66.5, 50.5, 49.7, 46.7, 42.8, 34.8, 8.3.

HRMS (ESI) calcd for $C_{35}H_{30F}N_4O_6$ ([M + H]$^+$): m/z 621.2144, found: 621.2140.

(5-((((1*R*, 2*R*, 5*S*)-2-isopropyl-5-methylcyclohexyl)oxy)methyl)isoxazol-3-yl)(phenyl)methanone (6c)



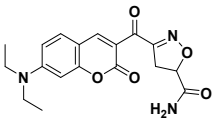
Colorless oil (172 mg, 56 %)

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.30-8.28 (m, 2H), 7.66-7.63 (m, 1H), 7.54-7.50 (m, 2H), 6.77 (d, *J* = 0.8 Hz, 1H), 4.80 (dd, *J* = 13.5, 1.0 Hz, 1H), 4.61 (dd, *J* = 13.5, 1.0 Hz, 1H), 3.26-3.21 (m, 1H), 2.25-2.19 (m, 1H), 2.17-2.13 (m, 1H), 1.69-1.62 (m, 2H), 1.43-1.33 (m, 1H), 1.31-1.25 (m, 1H), 1.00-0.93 (m, 5H), 0.91-0.83 (m, 4H), 0.72 (d, *J* = 6.5 Hz, 3H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 185.9, 171.3, 161.9, 135.9, 134.2, 130.8, 128.7, 103.8, 80.1, 61.1, 48.3, 40.1, 34.5, 31.6, 25.7, 23.4, 22.4, 21.1, 16.3.

HRMS (ESI) calcd for $C_{21}H_{27}NNaO_3$ ([M + Na]$^+$): m/z 364.1883, found: 364.1882.

3-(7-(diethylamino)-2-oxo-2H-chromene-3-carbonyl)-4,5-dihydroisoxazole-5-carboxamide (6d)



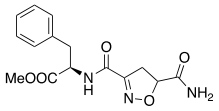
Yellow solid (135 mg, 42%), m.p. 172.9-173.4 °C

^{1}H NMR (500 MHz, DMSO-d_6) δ 8.50 (s, 1H), 7.69 (s, 1H), 7.62 (d, J = 9.0 Hz, 1H), 7.49 (s, 1H), 6.81 (dd, J = 9.0, 2.0 Hz, 1H), 6.58 (d, J = 2.0 Hz, 1H), 5.12 (dd, J = 12.0, 7.5 Hz, 1H), 3.56-3.48 (m, 5H), 3.37 (dd, J = 17.5, 2.5 Hz, 1H), 1.14 (t, J = 7.0 Hz, 6H).

^{13}C NMR (125 MHz, DMSO-d_6) δ 182.6, 170.9, 157.9, 157.9, 157.7, 153.2, 149.0, 132.3, 114.2, 110.3, 107.0, 96.1, 80.2, 44.5, 37.7, 12.3.

HRMS (ESI) calcd for $C_{18}H_{20}N_3O_5$ ([M + H]$^+$): m/z 358.1397, found: 358.1399.

methyl (5-carbamoyl-4,5-dihydroisoxazole-3-carbonyl)-*D*-phenylalaninate (6e)



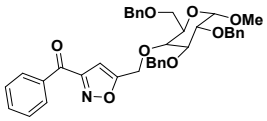
White solid (115 mg, 40%), m.p. 147.0-147.6 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.32-7.23 (m, 3H), 7.14-7.11 (m, 2H), 7.07-7.03 (m, 1H), 6.57 (s, 0.7H), 6.54 (s, 0.3H), 5.95 (s, 0.7H), 5.87 (s, 0.3H), 5.13-5.08 (m, 1H), 4.94-4.88 (m, 1H), 3.74 (s, 0.9H), 3.73 (s, 2.1H), 3.59-3.47 (m, 2H), 3.21-3.10 (m, 2H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 172.4, 172.3, 171.4, 171.3, 158.4, 158.3, 154.1, 154.0, 135.5, 135.4, 129.3, 129.2, 128.9, 127.5, 80.5, 53.4, 53.3, 52.7, 52.6, 38.2, 38.1, 38.0, 37.9.

HRMS (ESI) calcd for $C_{15}H_{18}N_3O_5$ ([M + H]$^+$): m/z 320.1241, found: 320.1245.

(5-((((2R,4S,5R,6S)-4,5-bis(benzyloxy)-2-((benzyloxy)methyl)-6-methoxytetrahydro-2H-pyran-3-yl)oxy)methyl)isoxazol-3-yl)(phenyl)methanone (6f)



Yellow oil (204 mg, 35%)

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.28-8.26 (m, 2H), 7.67-7.63 (m, 1H), 7.54-7.50 (m, 2H), 7.37-7.33 (m, 7H), 7.32-7.28 (m, 7H), 7.25-7.22 (m, 1H), 6.53 (s, 1H), 5.00 (d, J = 11.0 Hz, 1H), 4.89 (d, J = 13.0 Hz, 1H), 4.79 (dd, J = 11.5, 6.5 Hz, 2H), 4.68-4.63 (m, 3H), 4.55 (d, J = 13.0 Hz, 1H), 4.46 (d, J = 12.5 Hz, 1H), 3.97 (t, J = 9.0 Hz, 1H), 3.75 (dd, J = 10.5, 3.0 Hz, 1H), 3.73-3.70 (m, 1H), 3.66 - 3.62 (m, 2H), 3.56 (dd, J = 10.0, 3.5 Hz, 1H), 3.38 (s, 3H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 185.6, 170.0, 161.7, 138.6, 138.1, 137.8, 135.8, 134.1, 130.7, 128.7, 128.6, 128.6, 128.5, 128.3, 128.1, 128.1, 127.9, 127.9, 103.9, 98.3, 81.9, 80.0, 78.0, 75.9, 73.6, 73.5, 69.8, 68.1, 65.0, 55.4.

HRMS (ESI) calc for $C_{39}H_{39}NNaO_8$ ([M + Na]$^+$): m/z 672.2568, found: 672.2567.

4,5-dihydro-6*H*-pyrrolo[3,4-*c*]isoxazol-6-one (6g)

White solid (55 mg, 49%), m.p. 194.3-194.9 °C

^{1}H NMR (500 MHz, DMSO-d_6) δ 9.09 (s, 1H), 8.99 (t, J = 1.0 Hz, 1H), 4.32-4.31 (t, J = 1.0 Hz, 2H).

^{13}C NMR (125 MHz, DMSO-d_6) δ 162.6, 159.9, 153.8, 122.1, 38.1.

HRMS (ESI) calcd for $C_5H_5N_2O_2$ ([M + H]$^+$): m/z 125.0346, found: 125.0347.

5-phenyl-4,5-dihydro-6H-pyrrolo[3,4-c]isoxazol-6-one (6h)

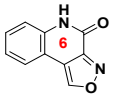
White solid (117 mg, 65%), m.p. 159.4-159.8 °C

^{1}H NMR (500 MHz, DMSO-d_6) δ 9.15 (t, J = 1.0 Hz, 1H), 7.82-7.80 (m, 2H), 7.49-7.45 (m, 2H), 7.28-7.25 (m, 1H), 4.97 (d, J = 1.0 Hz, 2H).

^{13}C NMR (125 MHz, DMSO-d_6) δ 162.4, 157.1, 154.1, 138.9, 129.0, 125.5, 120.5, 118.8, 44.5.

HRMS (ESI) calcd for $C_{11}H_9N_2O_2$ ([M + H]$^+$): m/z 201.0659, found: 201.0660.

isoxazolo[3,4-*c*]quinolin-4(5*H*)-one (6i)



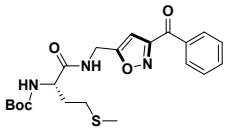
White solid (149 mg, 89%), m.p. >250 °C

^{1}H NMR (500 MHz, DMSO-d_6) δ 11.73 (s, 1H), 10.03 (s, 1H), 7.95 (d, J = 7.5 Hz, 1H), 7.43-7.40 (m, 1H), 7.31 (d, J = 7.5 Hz, 1H), 7.24-7.21 (m, 1H).

^{13}C NMR (125 MHz, DMSO-d_6) δ 157.2, 154.4, 151.6, 136.2, 129.2, 125.2, 123.0, 117.7, 116.4, 112.2.

HRMS (ESI) calcd for $C_{10}H_7N_2O_2$ ([M + H]$^+$): m/z 187.0502, found: 187.0505.

***tert*-butyl(1-(((3-benzoylisoxazol-5-yl)methyl)amino)-4-(methylthio)-1-oxobutan-2-yl)carbamate (6j)**



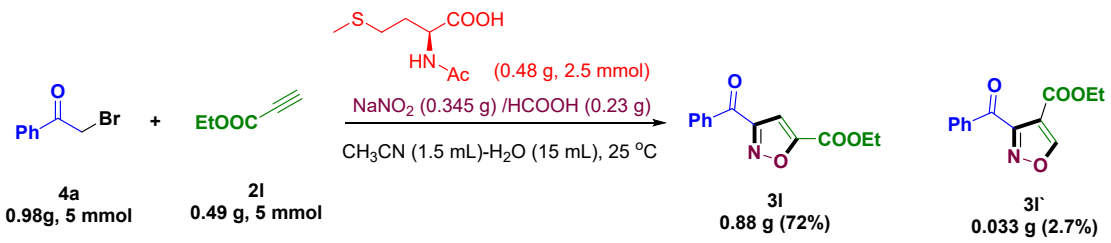
White solid (140 mg, 36%), m.p. 132.9-134.3 °C

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.26-8.24 (m, 2H), 7.65-7.62 (m, 1H), 7.53-7.49 (m, 2H), 7.23 (s, 1H), 6.70 (s, 1H), 5.26 (d, J = 7.5 Hz, 1H), 4.71-4.61 (m, 2H), 4.37-4.32 (m, 1H), 2.61-2.51 (m, 2H), 2.16-2.09 (m, 4H), 1.98-1.91 (m, 1H), 1.43 (s, 9H).

^{13}C NMR (125 MHz, $CDCl_3$) δ 185.6, 172.1, 169.9, 162.0, 156.0, 135.7, 134.2, 130.7, 128.7, 103.1, 80.8, 53.5, 35.4, 31.2, 30.4, 28.4, 15.5.

HRMS (ESI) calcd for $C_{21}H_{27}N_3NaO_5S$ ([M + Na]$^+$): m/z 456.1564, found: 456.1554.

5. 5.0 mmol-scale synthesis of isoxazoles (3l)



4a
0.98g, 5 mmol

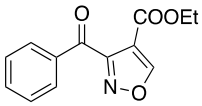
2l
0.49 g, 5 mmol

3l
0.88 g (72%)

3l`
0.033 g (2.7%)

In a 25 mL RBF, 2-bromo-1-phenylethan-1-one (0.98 g, 5.0 mmol) and Ac-*L*-methionine (0.48 g, 2.5 mmol, 0.5 equiv.) in CH_3CN/H_2O (1.5 mL/15.0 mL) were charged. To the above solution, $NaNO_2$ (0.345 g, 5.0 mmol), HCOOH (0.23 g, 5.0 mmol), ethyl propiolate (0.49 g, 5.0 mmol) were successively added. The reaction mixture was stirred at room temperature for 12 h. Upon completion of the reaction *via* TLC (PET: EtOAc = 15:1), the mixture was concentrated in vacuo, and the residue was purified by flash column chromatography on silica gel to afford the product (**3l**) as a white solid (0.88 g, 72%) and regio-isomer (**3l`**) as a yellow oil (33 mg, 2.7%).

ethyl 3-benzoylisoxazole-4-carboxylate (3l`)



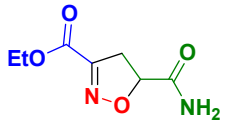
Yellow oil (33 mg, 2.7%)

^{1}H NMR (500 MHz, $CDCl_3$) δ 9.03 (s, 1H), 7.95-7.92 (m, 2H), 7.67-7.64 (m, 1H), 7.53-7.49 (m, 2H), 4.19 (q, J = 7.0 Hz, 2H), 1.13 (t, J = 7.0 Hz, 3H).

HRMS (ESI) calc for $C_{13}H_{11}NNaO_4$ ($[M + Na]^+$): m/z 268.0580, found: 268.0581.

6. X-ray Crystallography Data of 5z (CCDC No. 2241047)

Single crystals of compound **5z** were measured on a Rigaku RAXIS-RAPID single-crystal diffractometer. Single crystals of **5z** were obtained by dissolving **5z** in MeOH to afford single crystals with an ellipsoid contour probability level of 50%.



5z

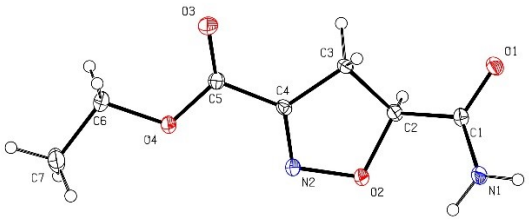
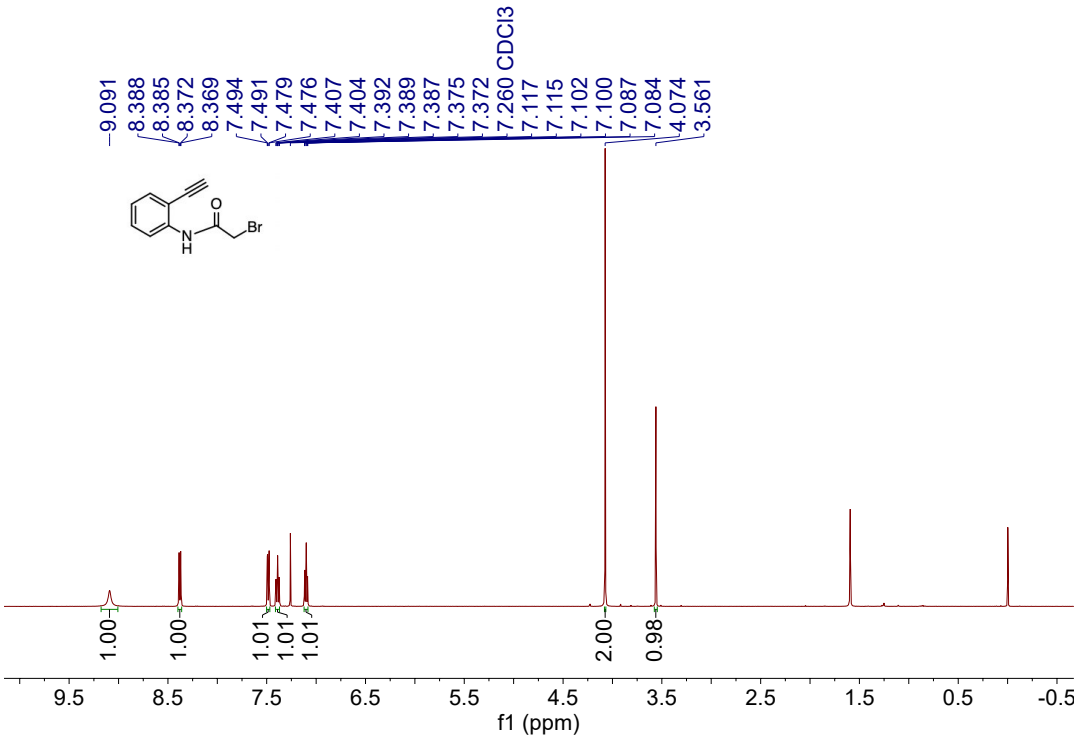


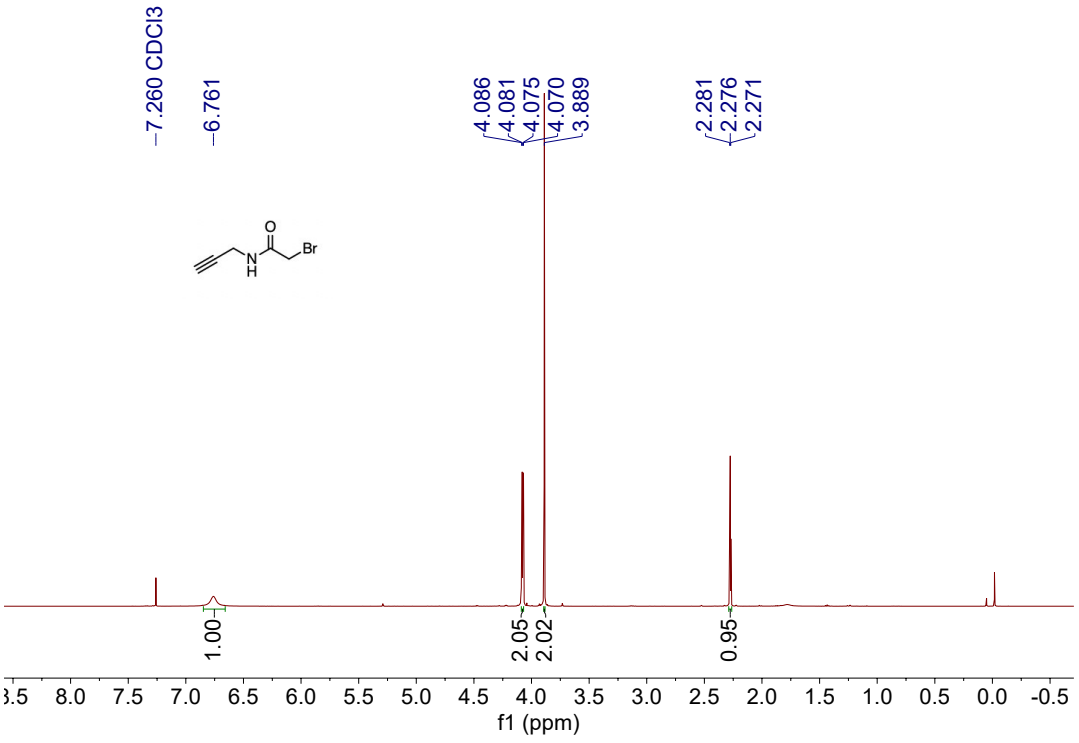
Table S2. X-ray crystallography data of **5z**

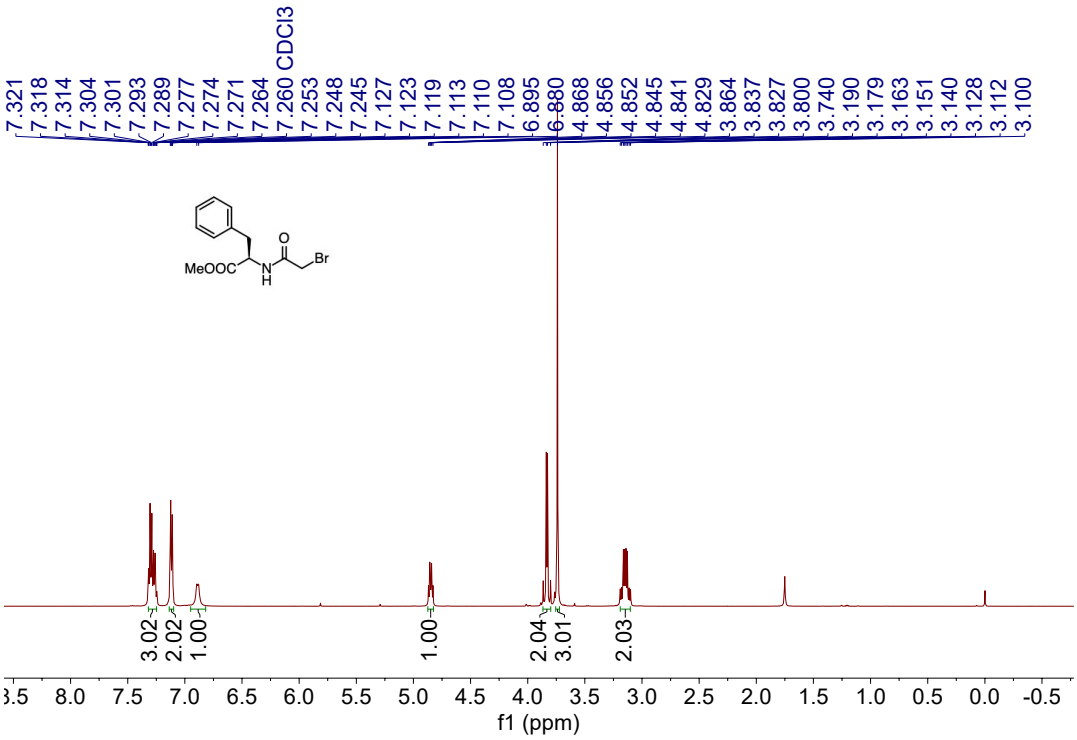
Formula moiety	$C_7H_{10}N_2O_4$
Formula sum	$C_7H_{10}N_2O_4$
Formula weight	186.17
Temperature	170 K
Crystal system	Monoclinic
Space group	P 1 21 1
Unit cell dimensions	a=7.300(2) Å b=5.2776(15) Å c=11.714(3) Å alpha= 90 deg. beta= 107.493（14）deg. gamma= 90 deg.
Volume	430.4（2）$Å^3$
Z	2
Calculated density	1.436 g/cm^3
Absorption coefficient	0.119 mm^{-1}
F(000)	196.0
Crystal size	0.36 × 0.23 × 0.2 mm
Theta range for data collection	2.94 to 27.19 deg.
Reflections collected / unique	1688 / 1719 [R_{int} = 0.0237, R_{sigma} = 0.0242]
Data / restrains / parameters	1719/1/119

Goodness-of-fit on F^2	1.075
Final R indexes [I>=2sigma (I)	R_1 = 0.0237, wR_2 = 0.0613
Final R indexes [all data]	R_1 = 0.0242, wR_2 = 0.0619

7. NMR spectrum of key intermediates



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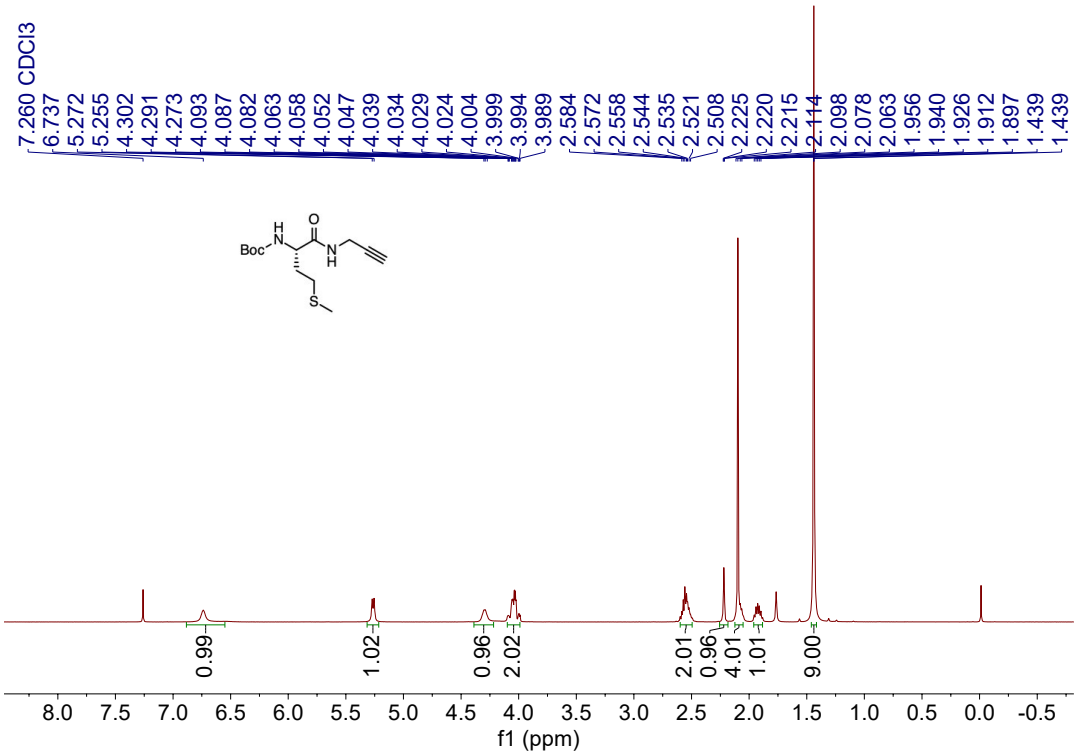
7.314
7.304
7.301
7.293
7.289
7.277
7.274
7.271
7.264
7.260 CDCl3
7.253
7.248
7.245
7.127
7.123
7.119
7.113
7.110
7.108
6.895
6.880
4.868
4.856
4.852
4.845
4.841
4.829
3.864
3.837
3.827
3.800
3.740
3.190
3.179
3.163
3.151
3.140
3.128
3.112
3.100
MeOOC
O
N
H
Br
3.02
2.02
1.00
1.00
2.04
3.01
2.03
f1 (ppm)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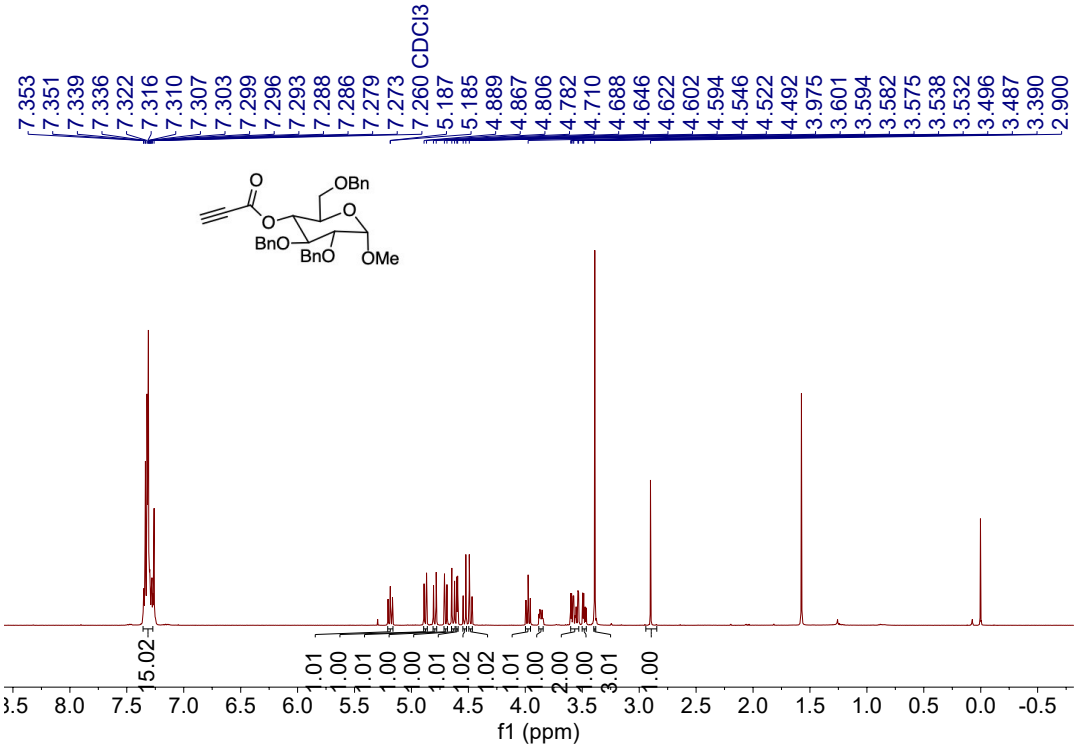
5.272
5.255
4.302
4.291
4.273
4.093
4.087
4.082
4.063
4.058
4.052
4.047
4.039
4.034
4.029
4.024
4.004
3.999
3.994
3.989
2.584
2.572
2.558
2.544
2.535
2.521
2.508
2.225
2.220
2.215
2.114
2.098
2.078
2.063
1.956
1.940
1.926
1.912
1.897
1.439
1.439
Boc
H
N
O
N
H
S
0.99
1.02
0.96
2.02
2.01
0.96
4.01
1.01
9.00
f1 (ppm)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7.351
7.339
7.336
7.322
7.316
7.310
7.307
7.303
7.299
7.296
7.293
7.288
7.286
7.279
7.273
7.260 CDCl3
5.187
5.185
4.889
4.867
4.806
4.782
4.710
4.688
4.646
4.622
4.602
4.594
4.546
4.522
4.492
3.975
3.601
3.594
3.582
3.575
3.538
3.532
3.496
3.487
3.390
2.900
O
OBn
O
O
BnO
BnO
OMe
15.02
1.01
1.00
1.01
1.00
1.00
1.01
1.02
1.02
1.01
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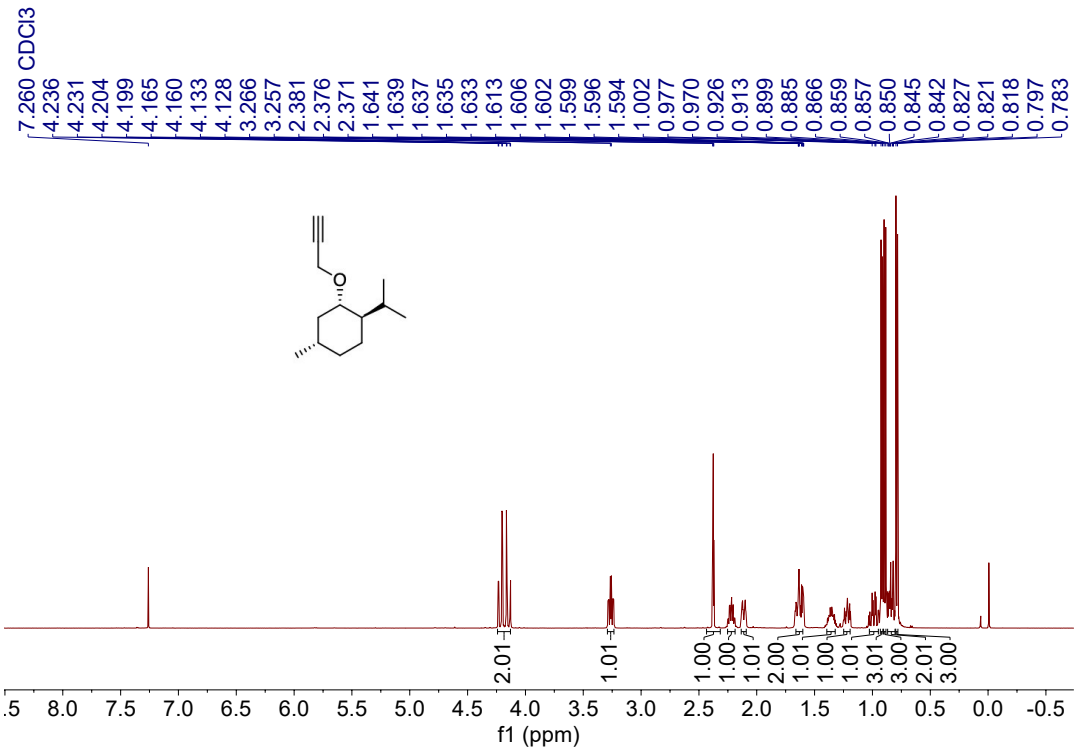
2.00
1.00
3.01
1.00
f1 (ppm)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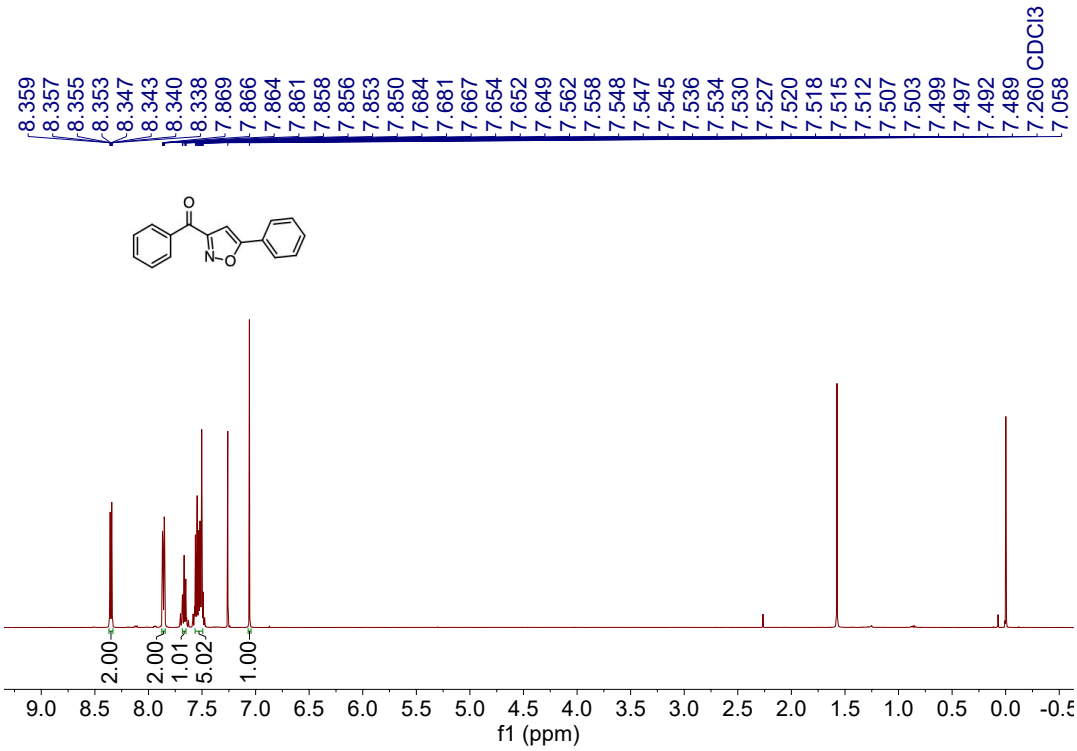
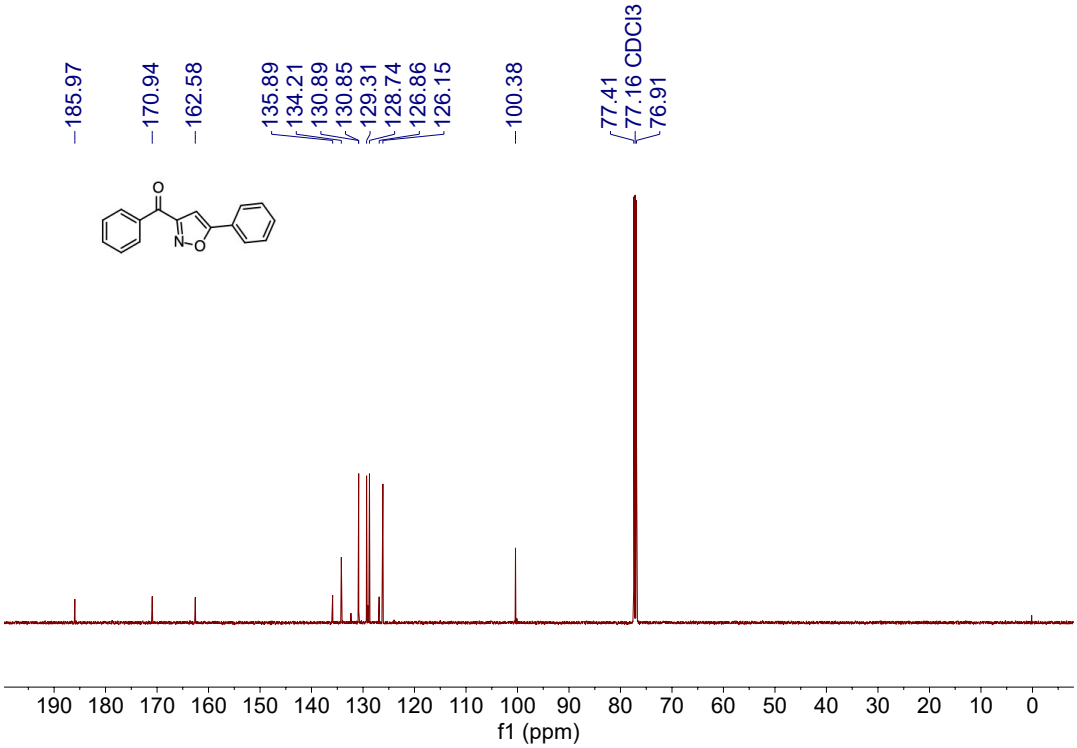
4.231
4.204
4.199
4.165
4.160
4.133
4.128
3.266
3.257
2.381
2.376
2.371
1.641
1.639
1.637
1.635
1.633
1.613
1.606
1.602
1.599
1.596
1.594
1.002
0.977
0.970
0.926
0.913
0.899
0.885
0.866
0.859
0.857
0.850
0.845
0.842
0.827
0.821
0.818
0.797
0.783
O
2.01
1.01
1.00
1.00
1.01
2.00
1.01
1.00
1.01
3.01
3.00
2.01
3.00
f1 (ppm)

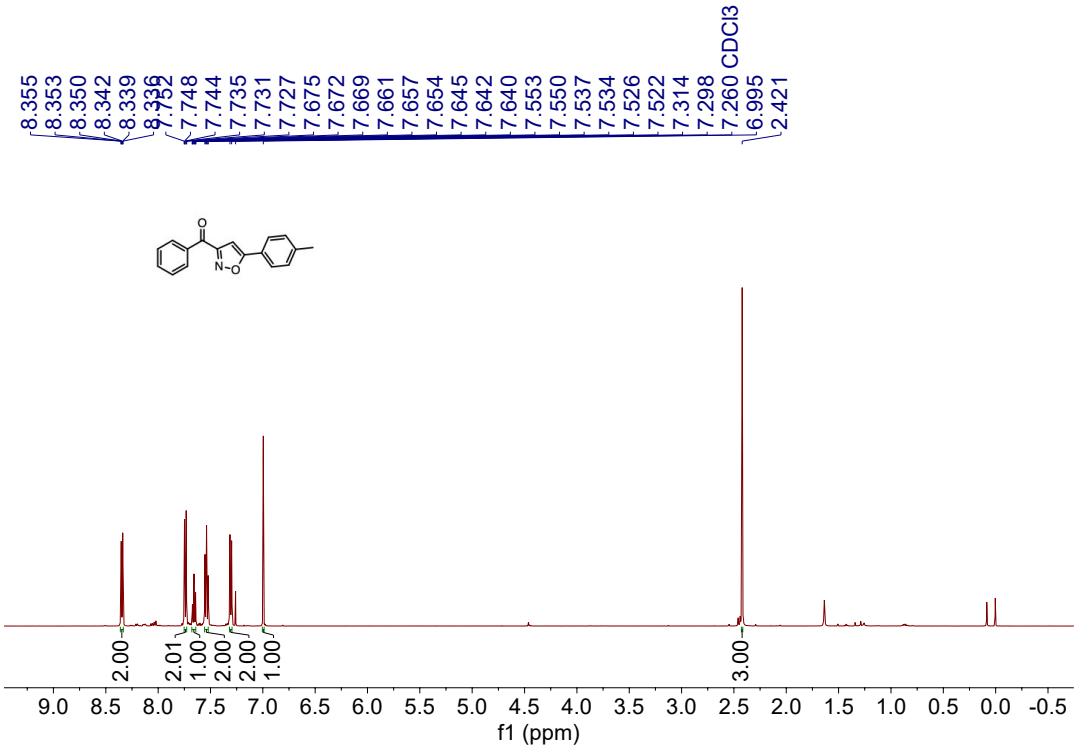
7. NMR spectrum of final products

3a





3b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8.342
8.339
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7.744
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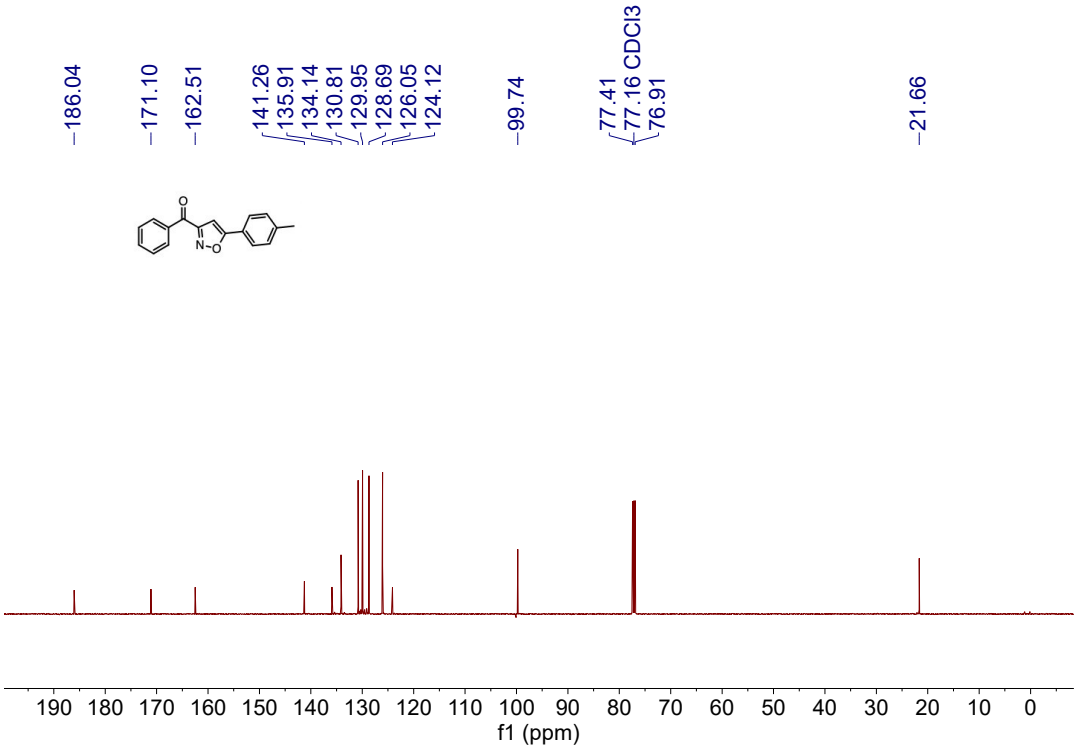
7.731
7.727
7.675
7.672
7.669
7.661
7.657
7.654
7.645
7.642
7.640
7.553
7.550
7.537
7.534
7.526
7.522
7.314
7.298
7.260 CDCl3
6.995
2.421
2.00
2.01
1.00
2.00
2.00
1.00
3.00
f1 (ppm)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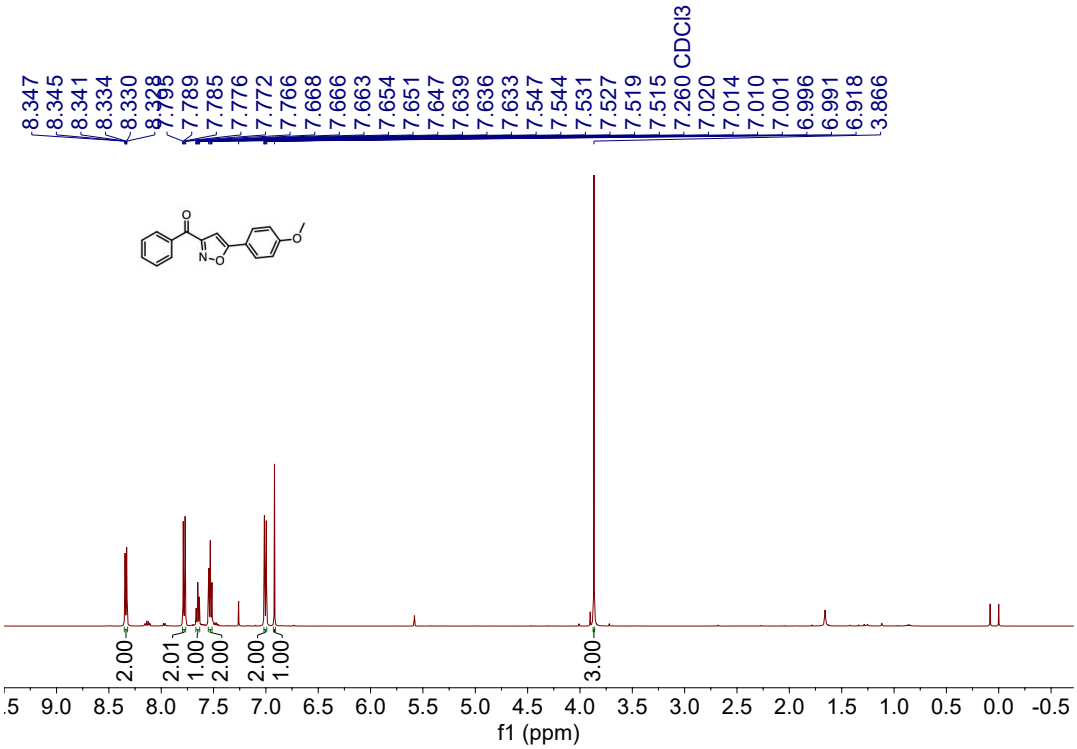
171.10
162.51
141.26
135.91
134.14
130.81
129.95
128.69
126.05
124.12
99.74
77.41
77.16 CDCl3
76.91
21.66
f1 (ppm)

3c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8.330
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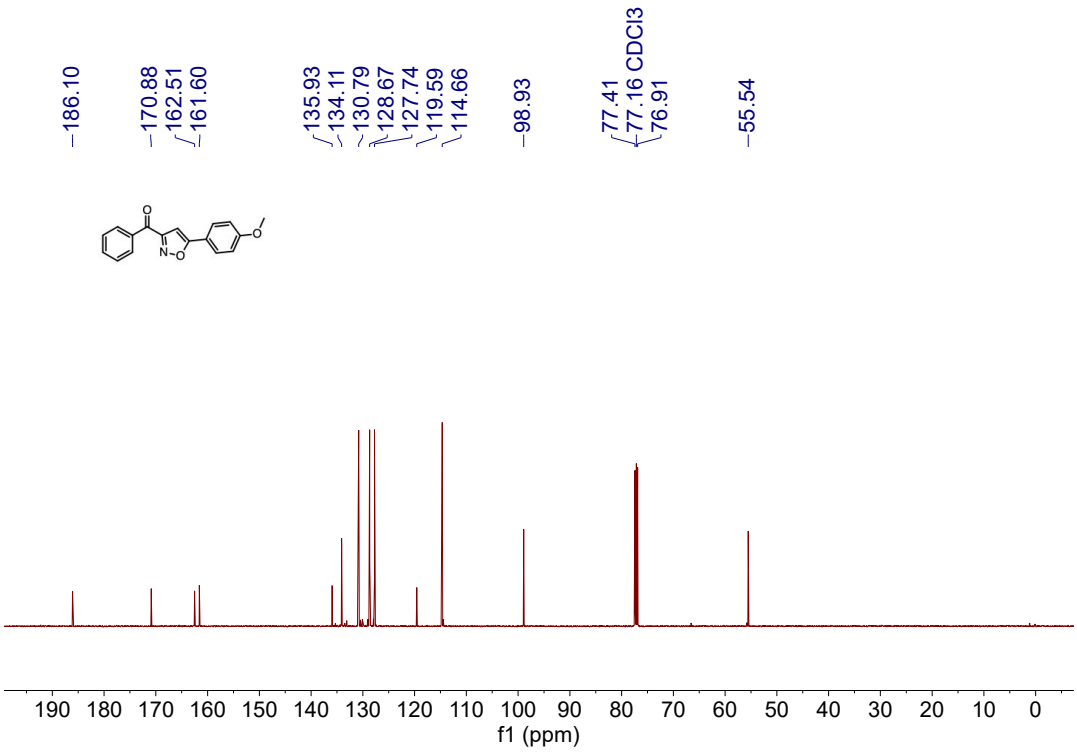
7.785
7.776
7.772
7.766
7.668
7.666
7.663
7.654
7.651
7.647
7.639
7.636
7.633
7.547
7.544
7.531
7.527
7.519
7.515
7.260 CDCl3
7.020
7.014
7.010
7.001
6.996
6.991
6.918
3.866
2.00
2.01
1.00
2.00
2.00
1.00
3.00
f1 (ppm)


186.10
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161.60
135.93
134.11
130.79
128.67
127.74
119.59
114.66
98.93
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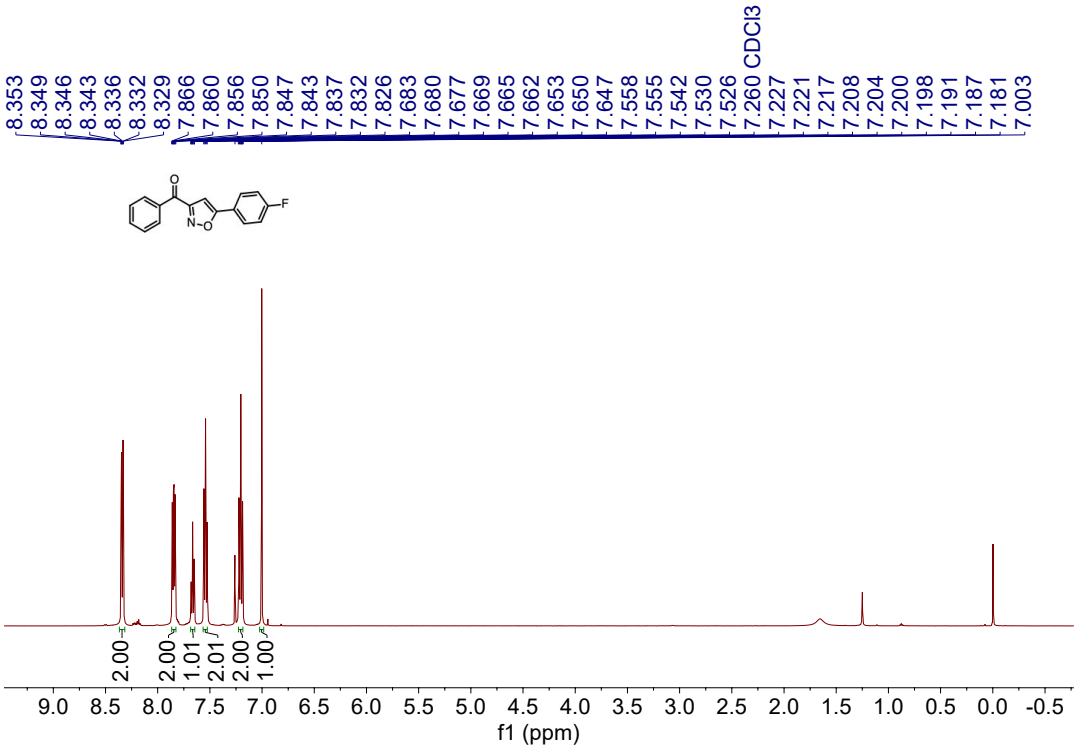
77.16 CDCl3
76.91
55.54
f1 (ppm)

3d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7.850
7.847
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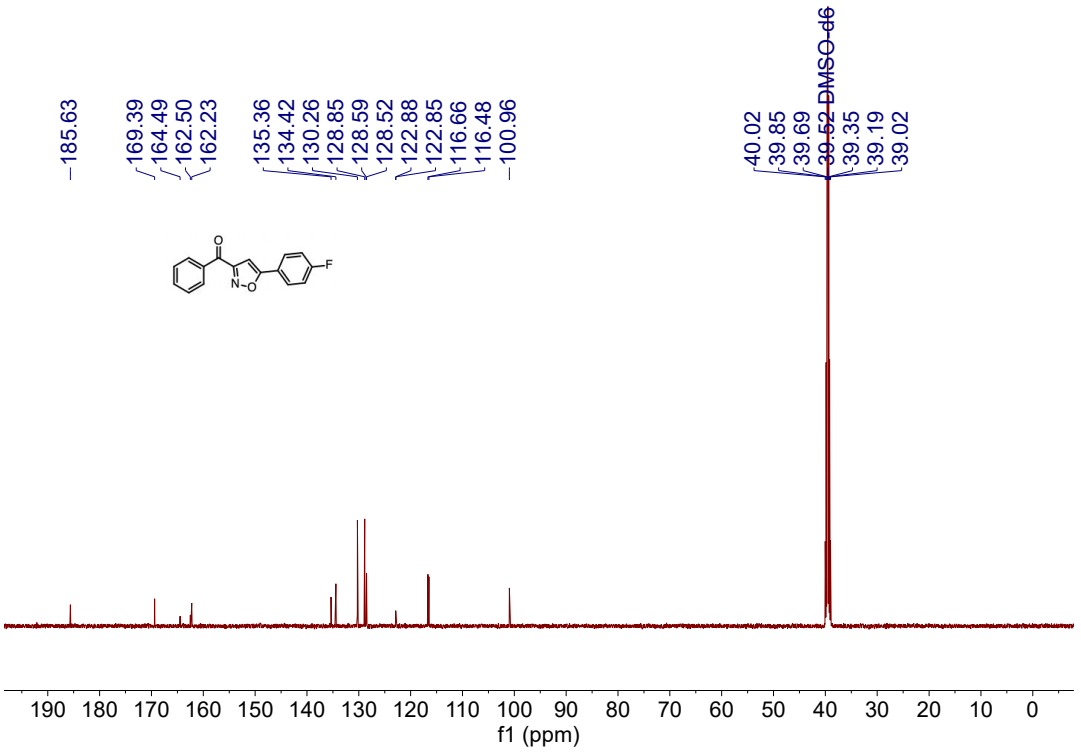
7.837
7.832
7.826
7.683
7.680
7.677
7.669
7.665
7.662
7.653
7.650
7.647
7.558
7.555
7.542
7.530
7.526
7.260 CDCl3
7.227
7.221
7.217
7.208
7.204
7.200
7.198
7.191
7.187
7.181
7.003
O
N
O
F
2.00
2.00
1.01
2.01
2.00
1.00
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)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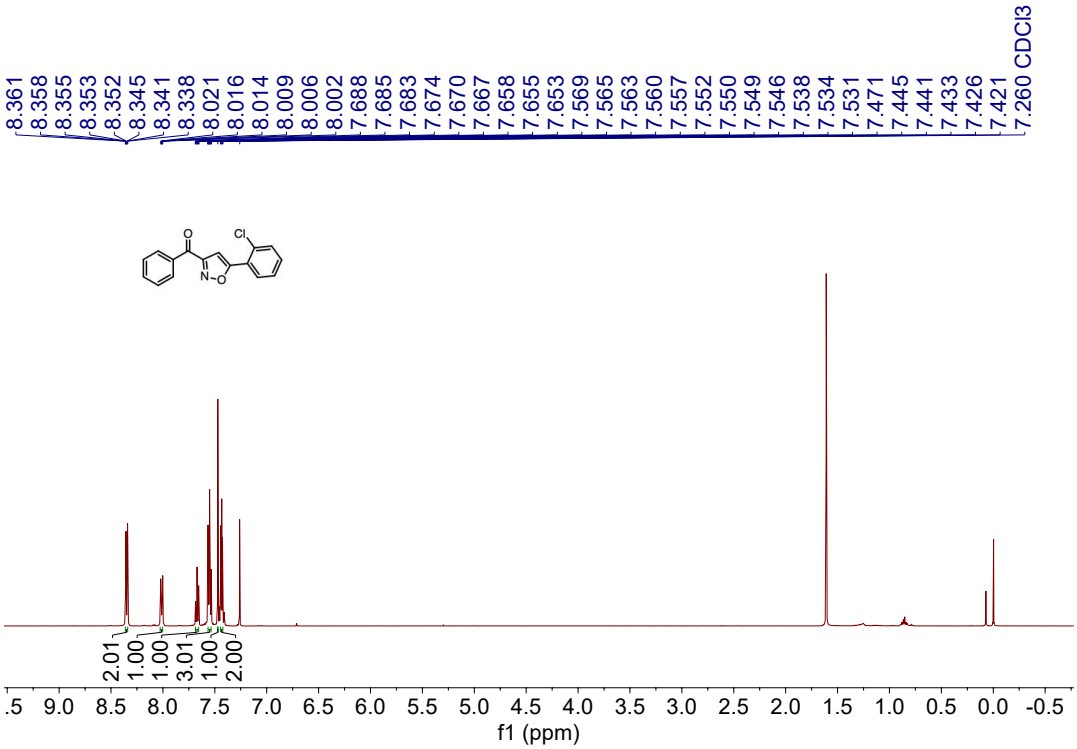
164.49
162.50
162.23
135.36
134.42
130.26
128.85
128.59
128.52
122.88
122.85
116.66
116.48
100.96
40.02
39.85
39.69
39.52 DMSO-d6
39.35
39.19
39.02
O
N
O
F
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

3e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8.352
8.345
8.341
8.338
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8.016
8.014
8.009
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7.683
7.674
7.670
7.667
7.658
7.655
7.653
7.569
7.565
7.563
7.560
7.557
7.552
7.550
7.549
7.546
7.538
7.534
7.531
7.471
7.445
7.441
7.433
7.426
7.421
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N
O
Cl
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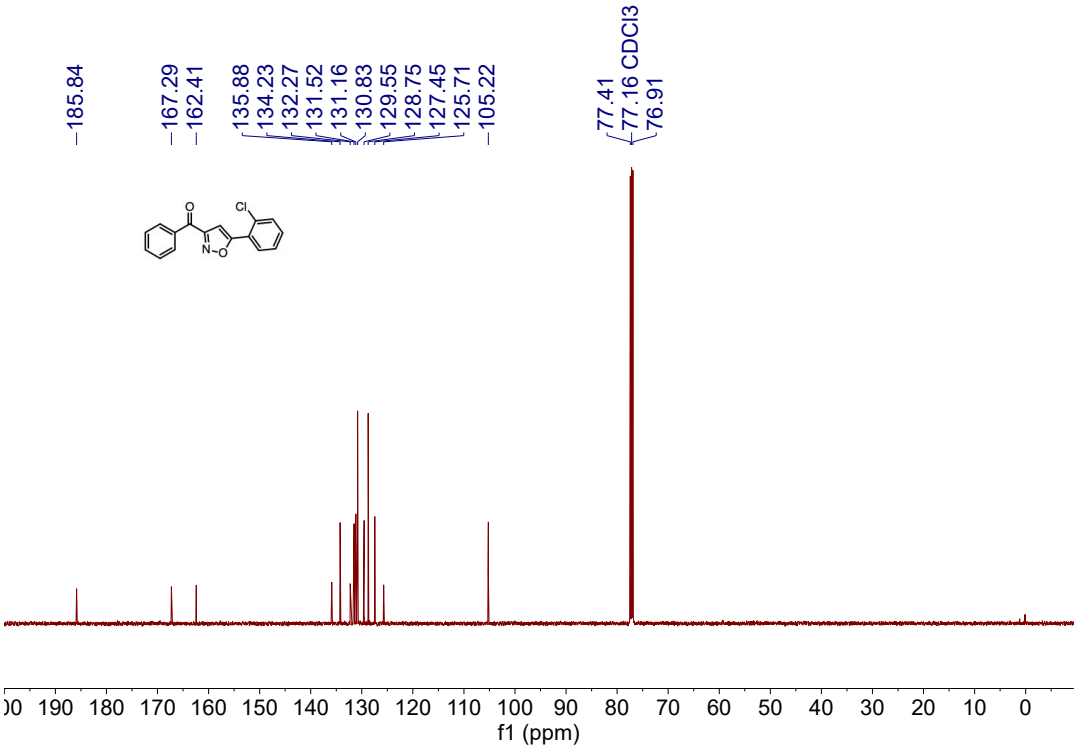
1.00
3.01
1.00
2.00
f1 (ppm)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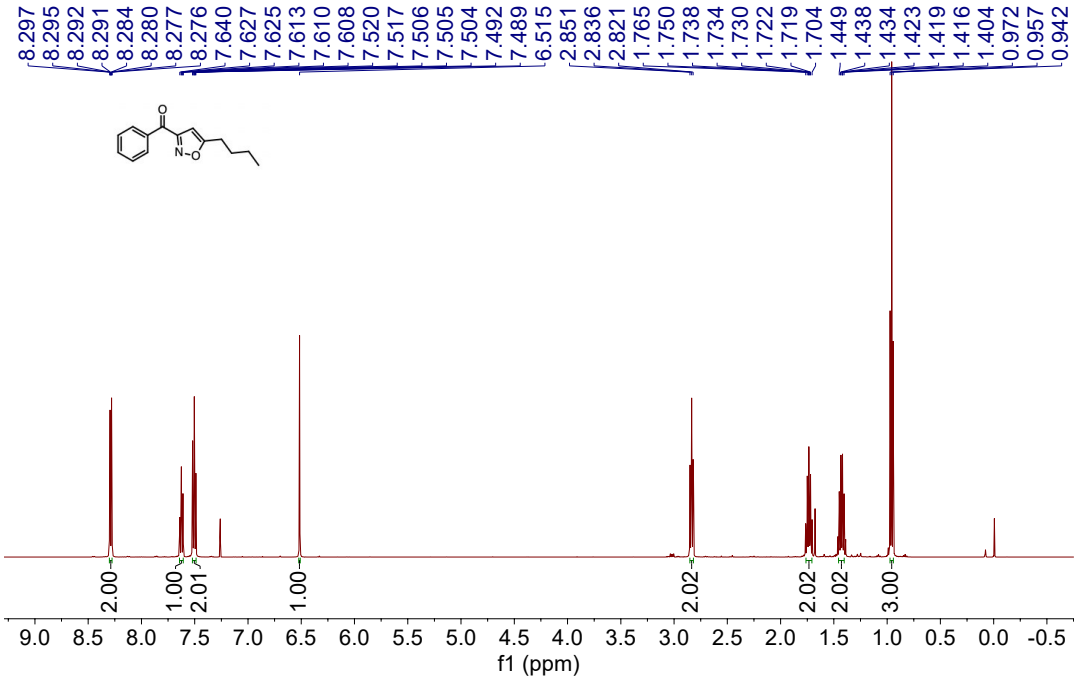
167.29
162.41
135.88
134.23
132.27
131.52
131.16
130.83
129.55
128.75
127.45
125.71
105.22
77.41
77.16 CDCl3
76.91
O
N
O
Cl
f1 (ppm)

3f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7.625
7.613
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7.608
7.520
7.517
7.506
7.505
7.504
7.492
7.489
6.515
2.851
2.836
2.821
1.765
1.750
1.738
1.734
1.730
1.722
1.719
1.704
1.449
1.438
1.434
1.423
1.419
1.416
1.404
0.972
0.957
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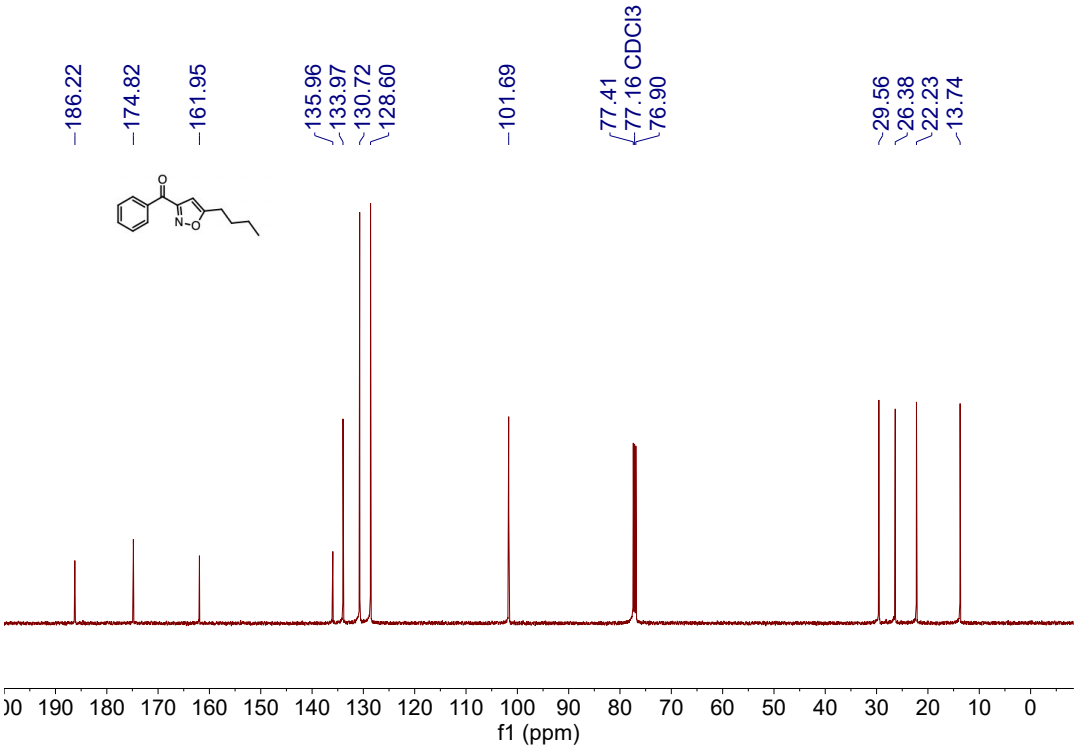
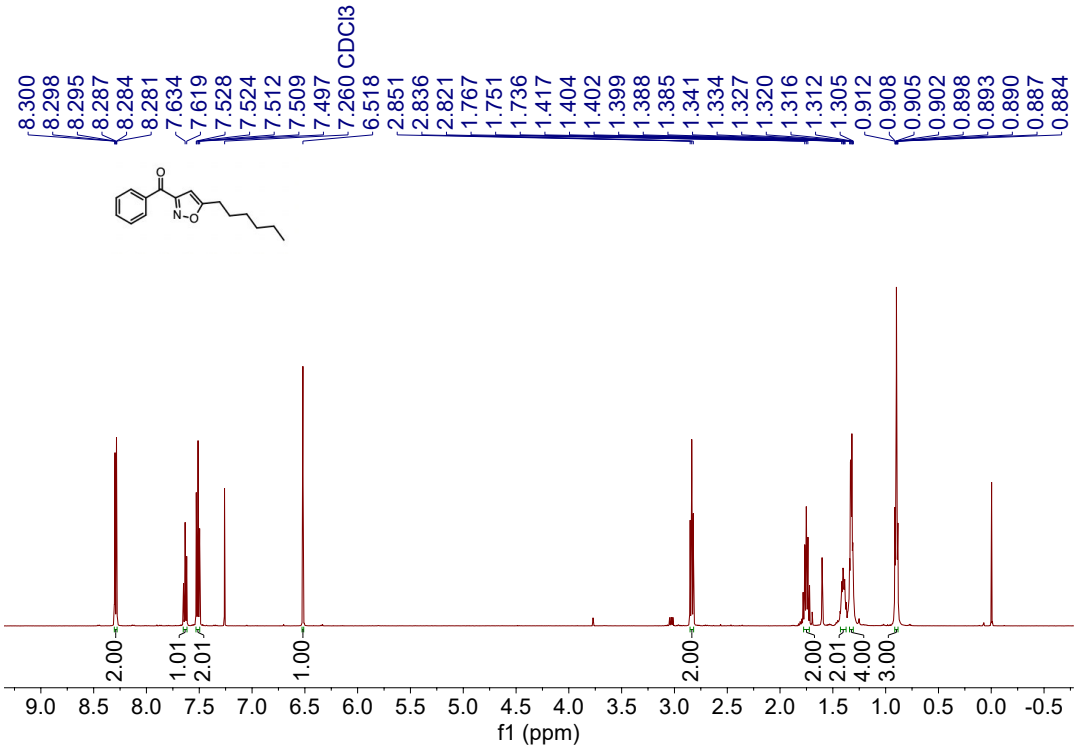
1.00
2.01
1.00
2.02
2.02
2.02
3.00
f1 (ppm)


186.22
174.82
161.95
135.96
133.97
130.72
128.60
101.69
77.41
77.16 CDCl3
76.90
29.56
26.38
22.23
13.74
f1 (ppm)

3g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8.298
8.295
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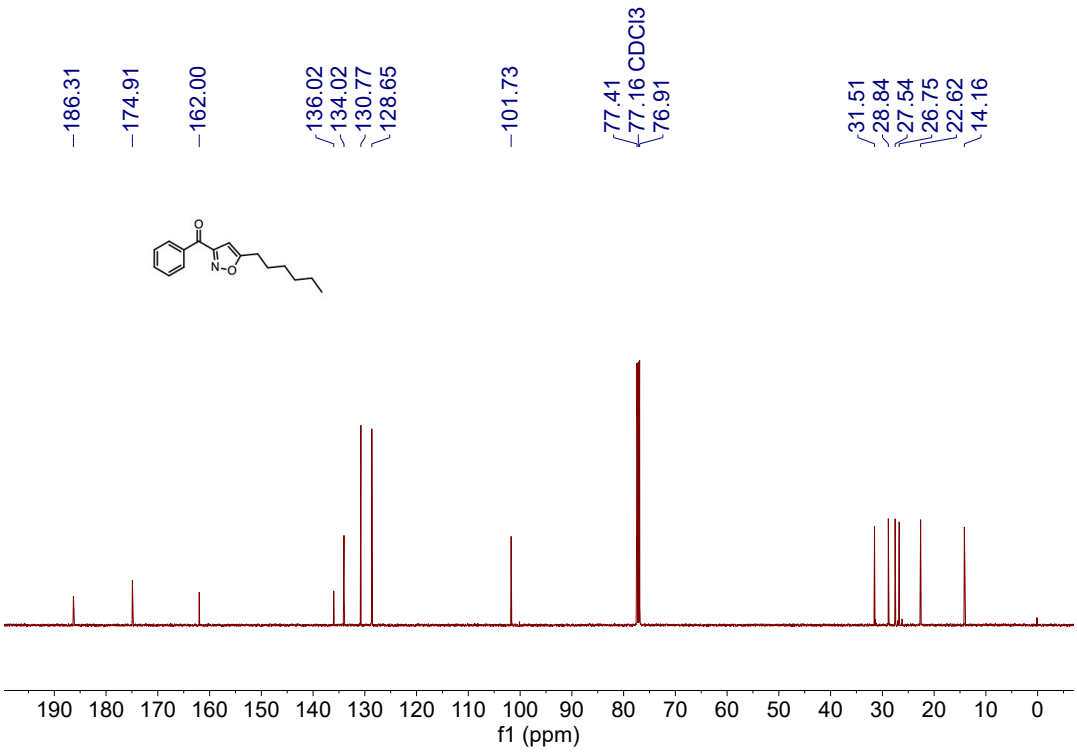
8.284
8.281
7.634
7.619
7.528
7.524
7.512
7.509
7.497
7.260 CDCl3
6.518
2.851
2.836
2.821
1.767
1.751
1.736
1.417
1.404
1.402
1.399
1.388
1.385
1.341
1.334
1.327
1.320
1.316
1.312
1.305
0.912
0.908
0.905
0.902
0.898
0.893
0.890
0.887
0.884
2.00
1.01
2.01
1.00
2.00
2.00
2.01
4.00
3.00
9.0 8.5 8.0 7.5 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)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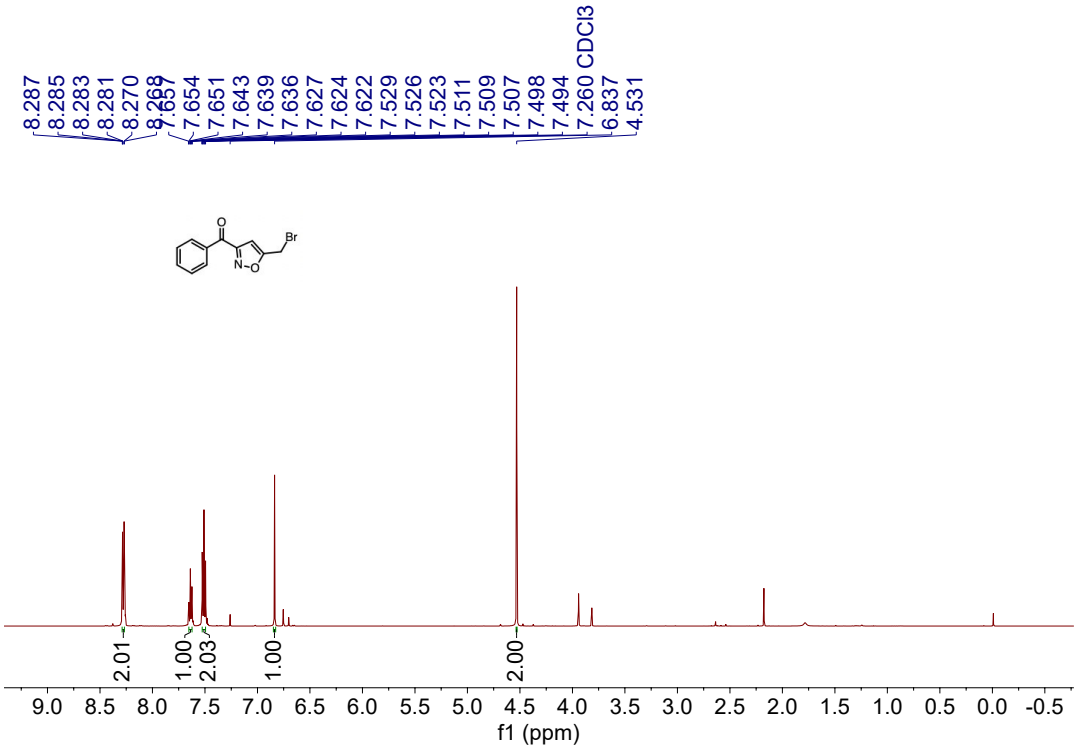
174.91
162.00
136.02
134.02
130.77
128.65
101.73
77.41
77.16 CDCl3
76.91
31.51
28.84
27.54
26.75
22.62
14.16
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

3h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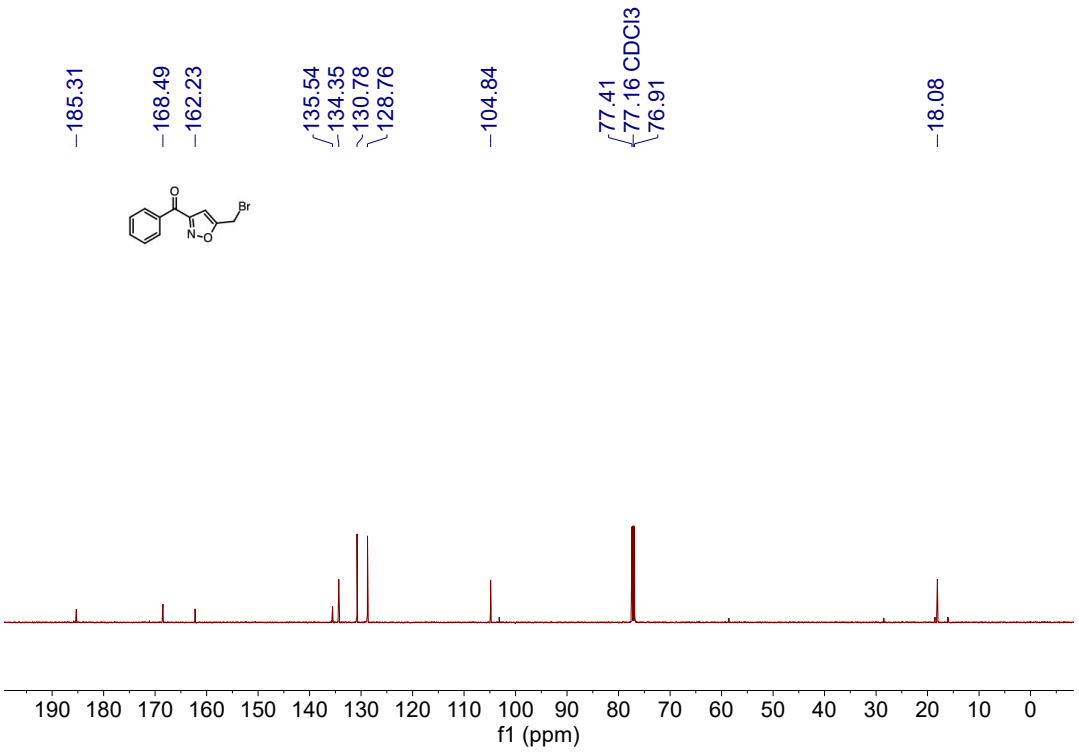
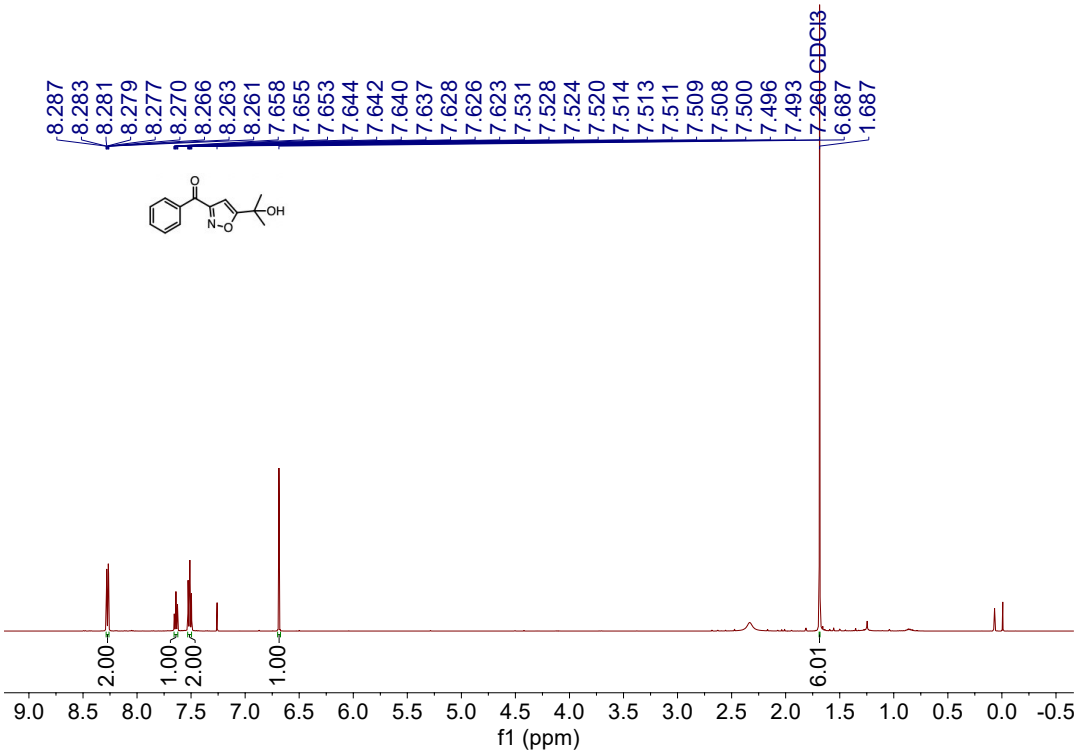
8.285
8.283
8.281
8.270
8.268
7.657
7.654
7.651
7.643
7.639
7.636
7.627
7.624
7.622
7.529
7.526
7.523
7.511
7.509
7.507
7.498
7.494
7.260 CDCl3
6.837
4.531
O
N
O
Br
2.01
1.00
2.03
1.00
2.00
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)


185.31
168.49
162.23
135.54
134.35
130.78
128.76
104.84
77.41
77.16 CDCl3
76.91
18.08
O
N
O
Br
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

3i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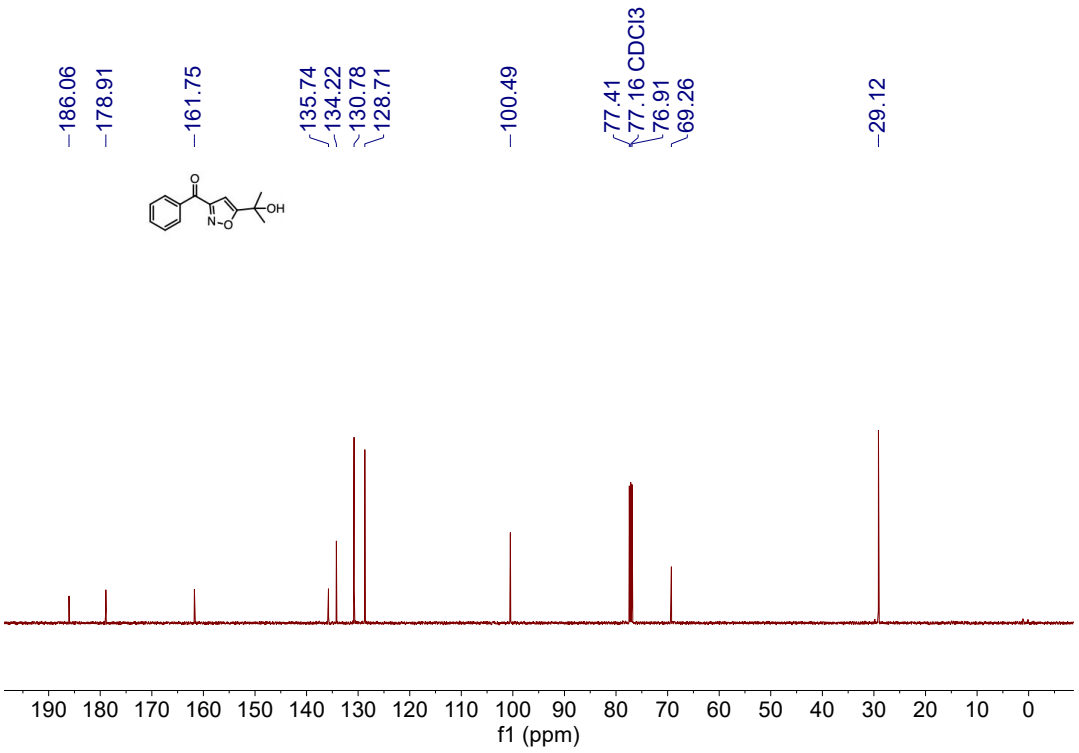
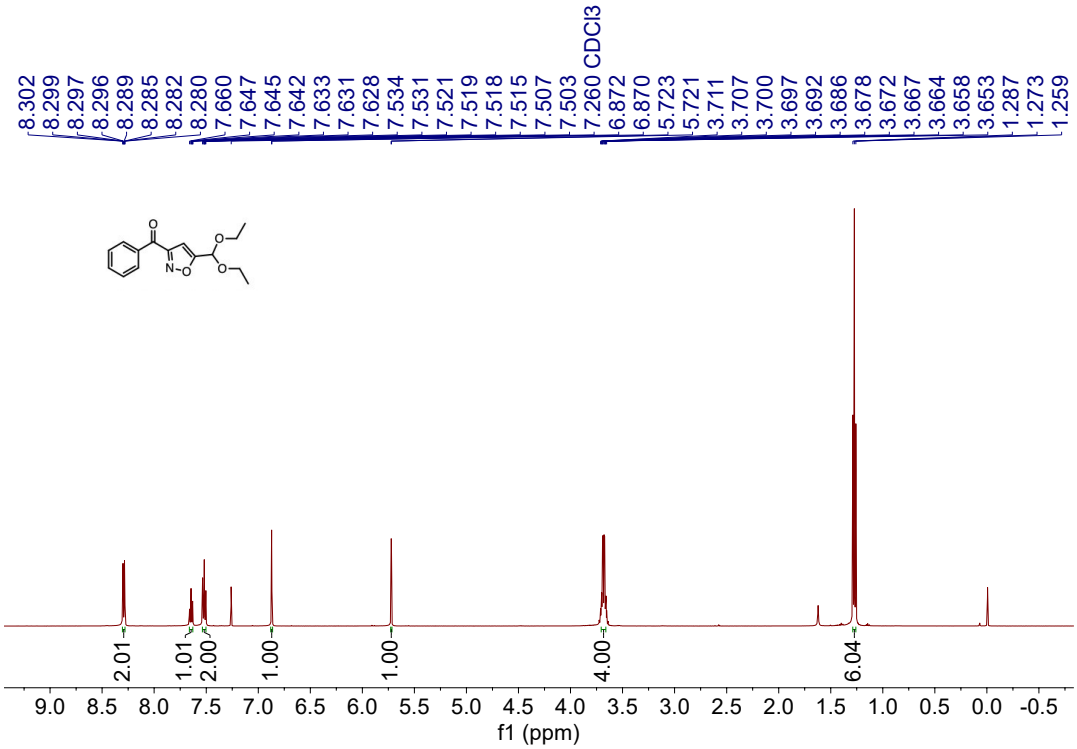
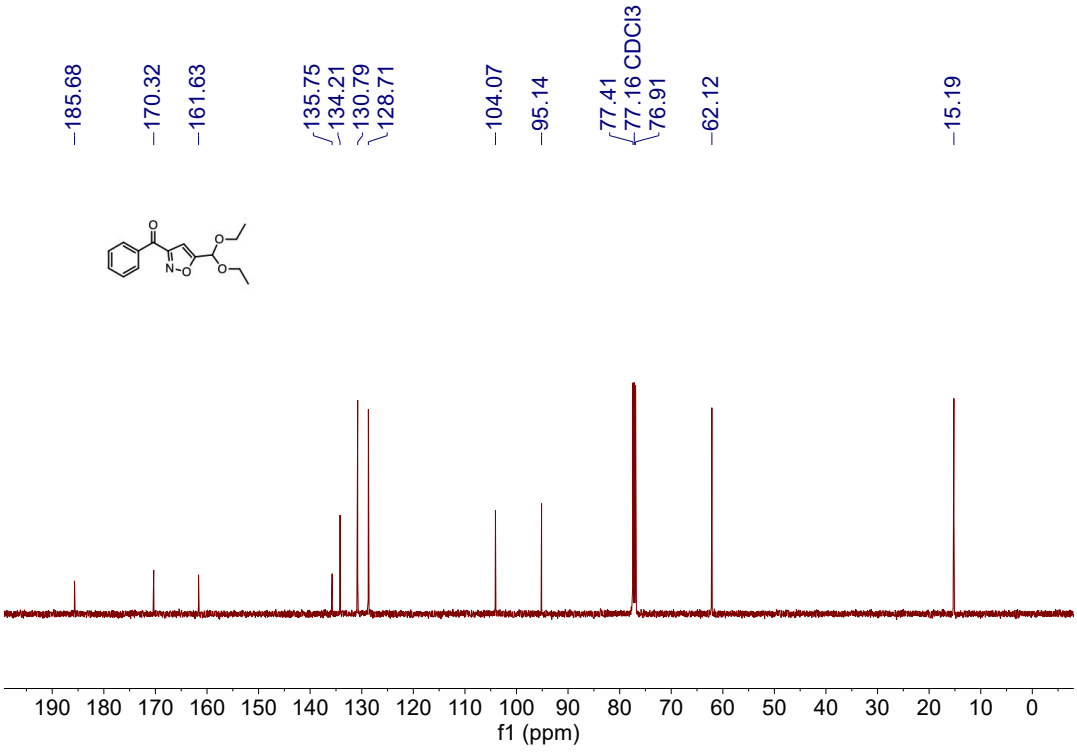
8.283
8.281
8.279
8.277
8.270
8.266
8.263
8.261
7.658
7.655
7.653
7.644
7.642
7.640
7.637
7.628
7.626
7.623
7.531
7.528
7.524
7.520
7.514
7.513
7.511
7.509
7.508
7.500
7.496
7.493
7.260 CDCl3
6.687
1.687
O
N
O
OH
2.00
1.00
2.00
1.00
6.01
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)


186.06
178.91
161.75
135.74
134.22
130.78
128.71
100.49
77.41
77.16 CDCl3
76.91
69.26
29.12
O
N
O
OH
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

3j


8.302
8.299
8.297
8.296
8.289
8.285
8.282
8.280
7.660
7.647
7.645
7.642
7.633
7.631
7.628
7.534
7.531
7.521
7.519
7.518
7.515
7.507
7.503
7.260 CDCl3
6.872
6.870
5.723
5.721
3.711
3.707
3.700
3.697
3.692
3.686
3.678
3.672
3.667
3.664
3.658
3.653
1.287
1.273
1.259
2.01
1.01
2.00
1.00
1.00
4.00
6.04
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)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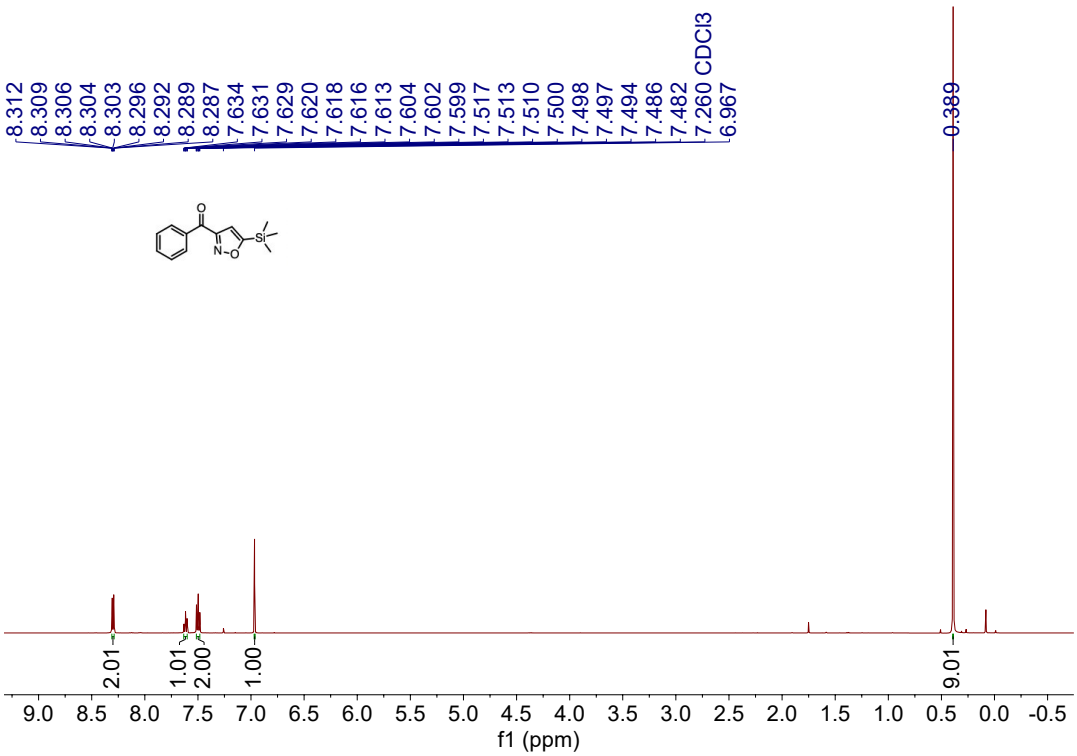
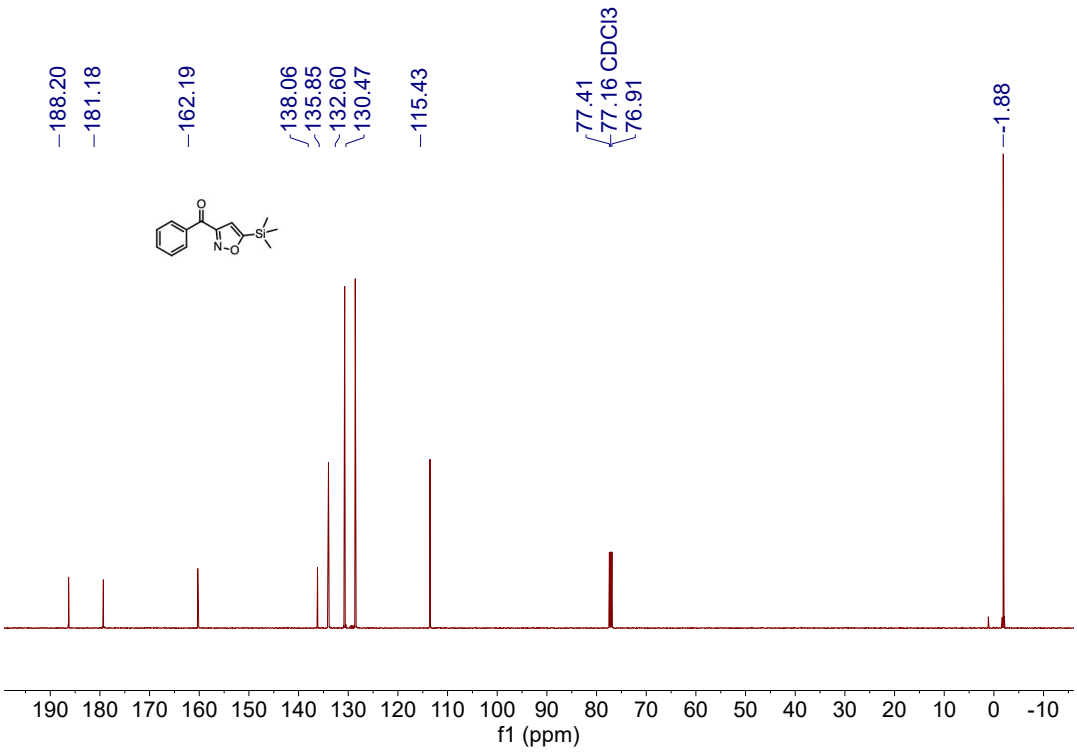
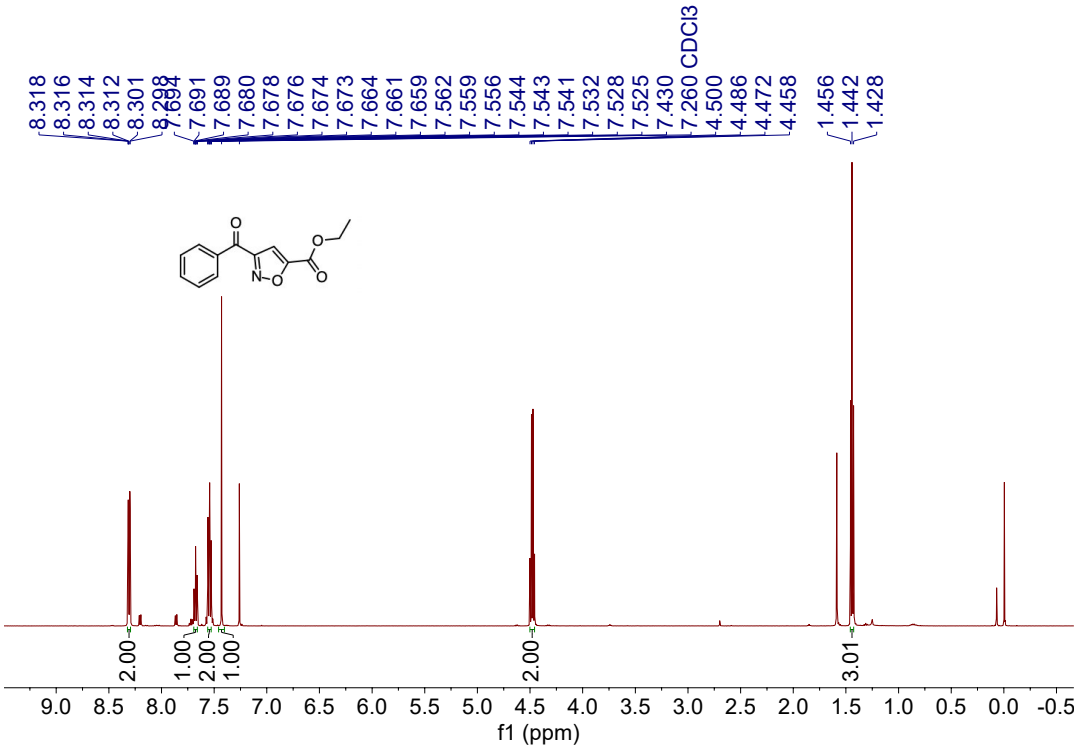
170.32
161.63
135.75
134.21
130.79
128.71
104.07
95.14
77.41
77.16 CDCl3
76.91
62.12
15.19
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

3k


8.312
8.309
8.306
8.304
8.303
8.296
8.292
8.289
8.287
7.634
7.631
7.629
7.620
7.618
7.616
7.613
7.604
7.602
7.599
7.517
7.513
7.510
7.500
7.498
7.497
7.494
7.486
7.482
7.260 CDCl3
6.967
0.389
2.01
1.01
2.00
1.00
9.01
f1 (ppm)


188.20
181.18
162.19
138.06
135.85
132.60
130.47
115.43
77.41
77.16 CDCl3
76.91
-1.88
f1 (ppm)

3l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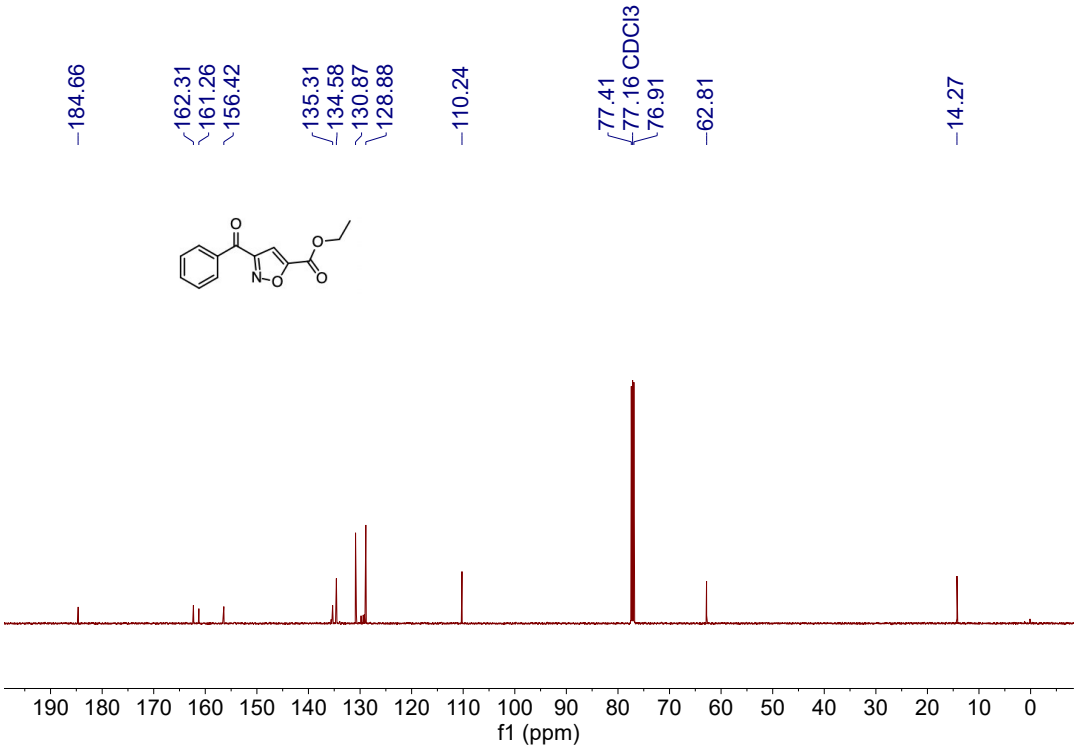
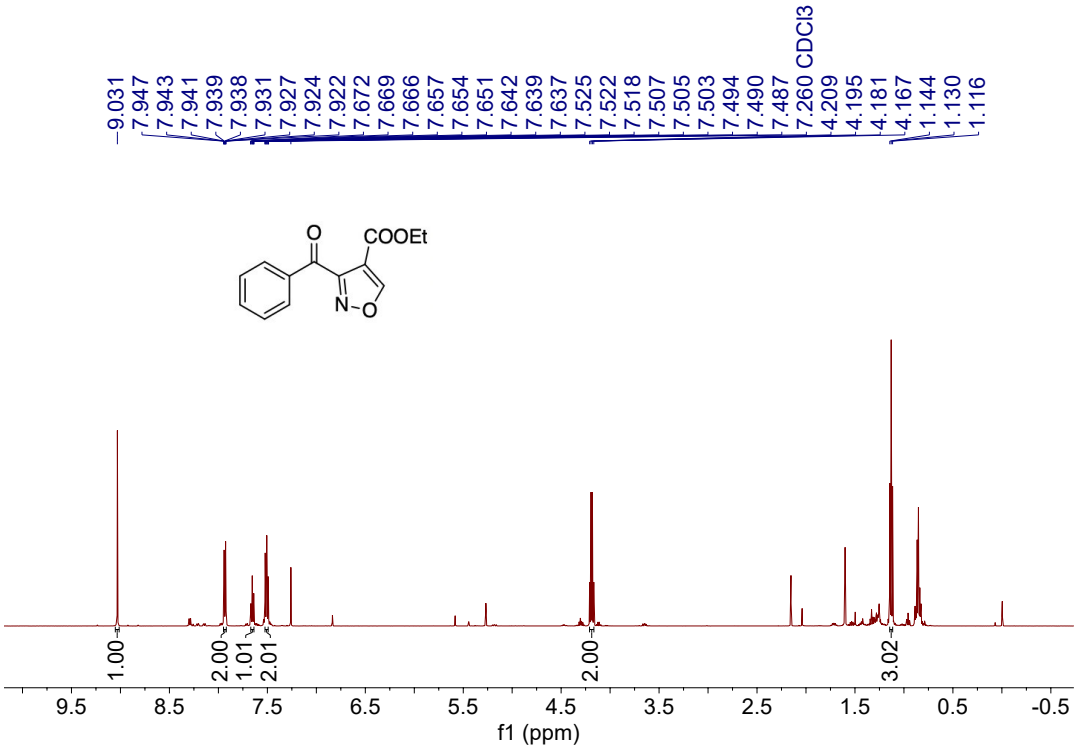
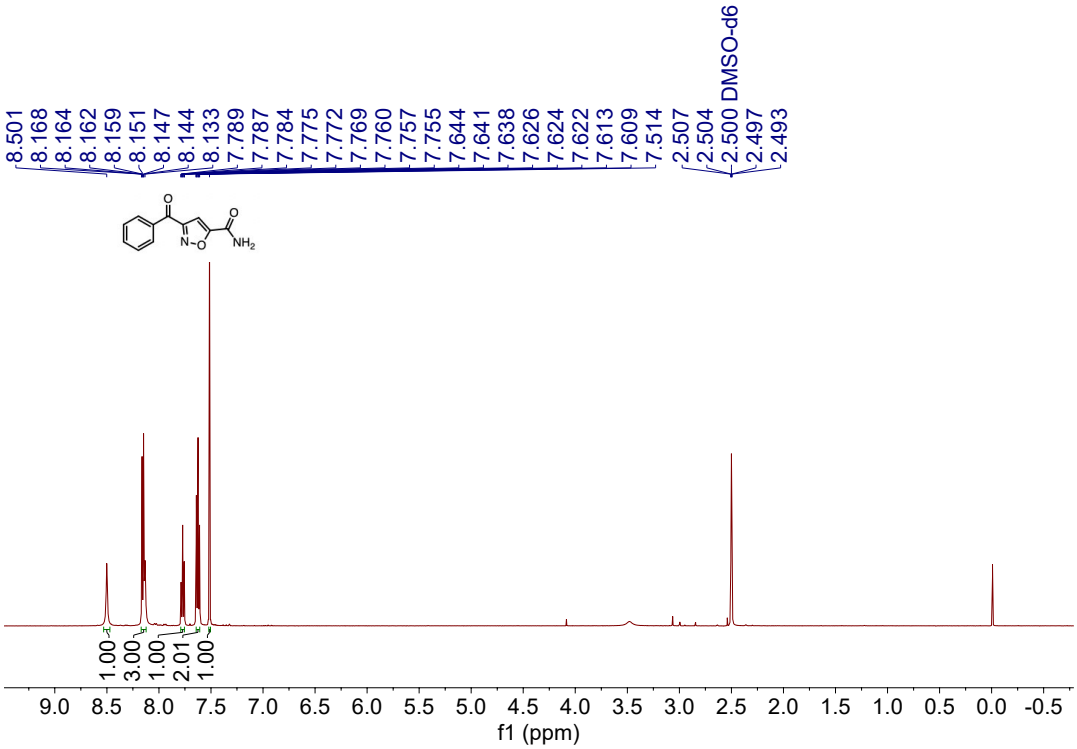
8.316
8.314
8.312
8.301
7.691
7.689
7.680
7.678
7.676
7.674
7.673
7.664
7.661
7.659
7.562
7.559
7.556
7.544
7.543
7.541
7.532
7.528
7.525
7.430
7.260 CDCl3
4.500
4.486
4.472
4.458
1.456
1.442
1.428
2.00
1.00
2.00
1.00
2.00
3.01
f1 (ppm)

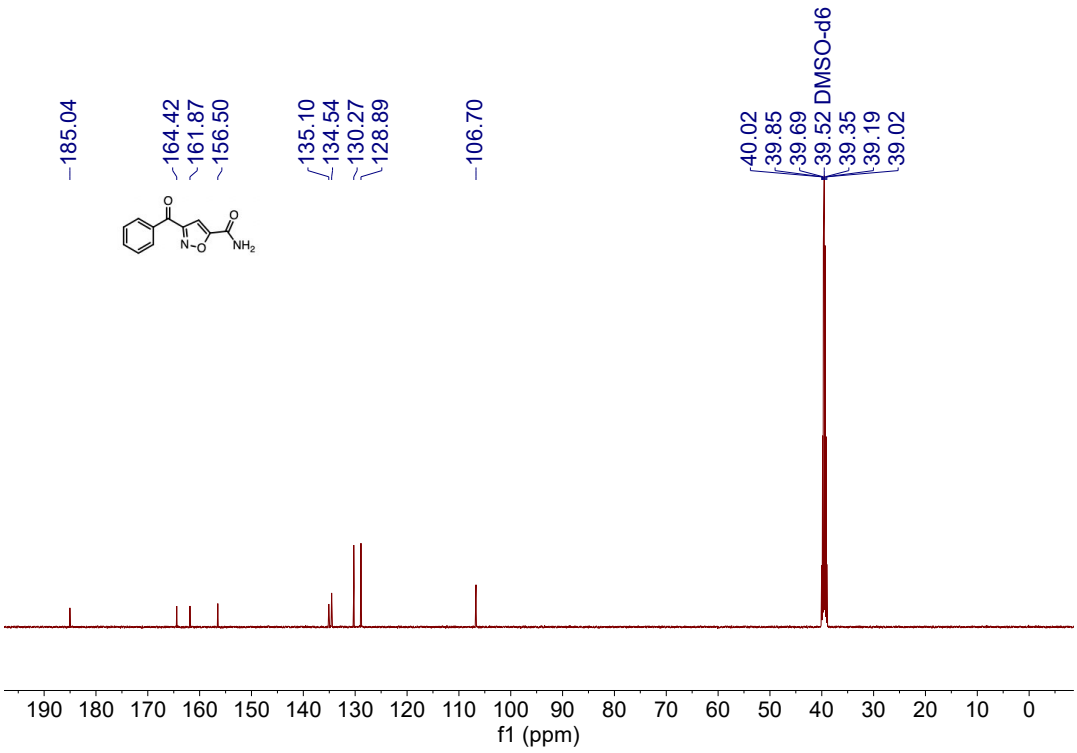

184.66
162.31
161.26
156.42
135.31
134.58
130.87
128.88
110.24
77.41
77.16 CDCl3
76.91
62.81
14.27
f1 (ppm)

3l`

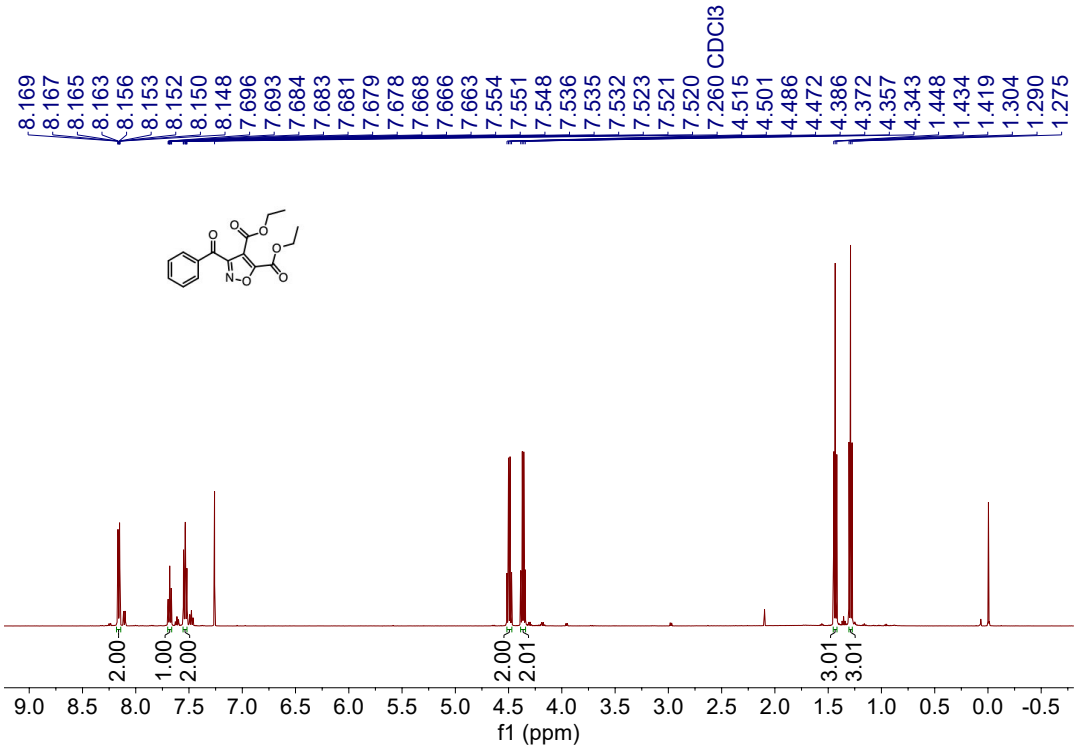

9.031
7.947
7.943
7.941
7.939
7.938
7.931
7.927
7.924
7.922
7.672
7.669
7.666
7.657
7.654
7.651
7.642
7.639
7.637
7.525
7.522
7.518
7.507
7.505
7.503
7.494
7.490
7.487
7.260 CDCl3
4.209
4.195
4.181
4.167
1.144
1.130
1.116
O
COOEt
N
O
1.00
2.00
1.01
2.01
2.00
3.02
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)

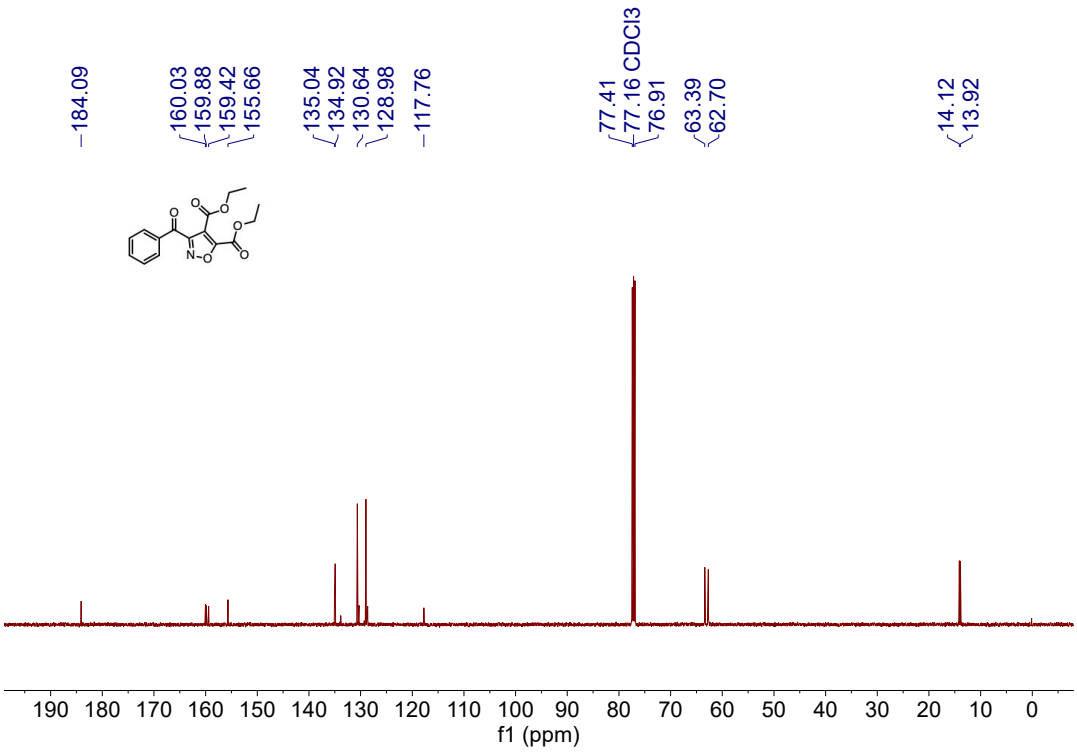
3m


8.501
8.168
8.164
8.162
8.159
8.151
8.147
8.144
8.133
7.789
7.787
7.784
7.775
7.772
7.769
7.760
7.757
7.755
7.644
7.641
7.638
7.626
7.624
7.622
7.613
7.609
7.514
2.507
2.504
2.500 DMSO-d6
2.497
2.493
1.00
3.00
1.00
2.01
1.00
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)

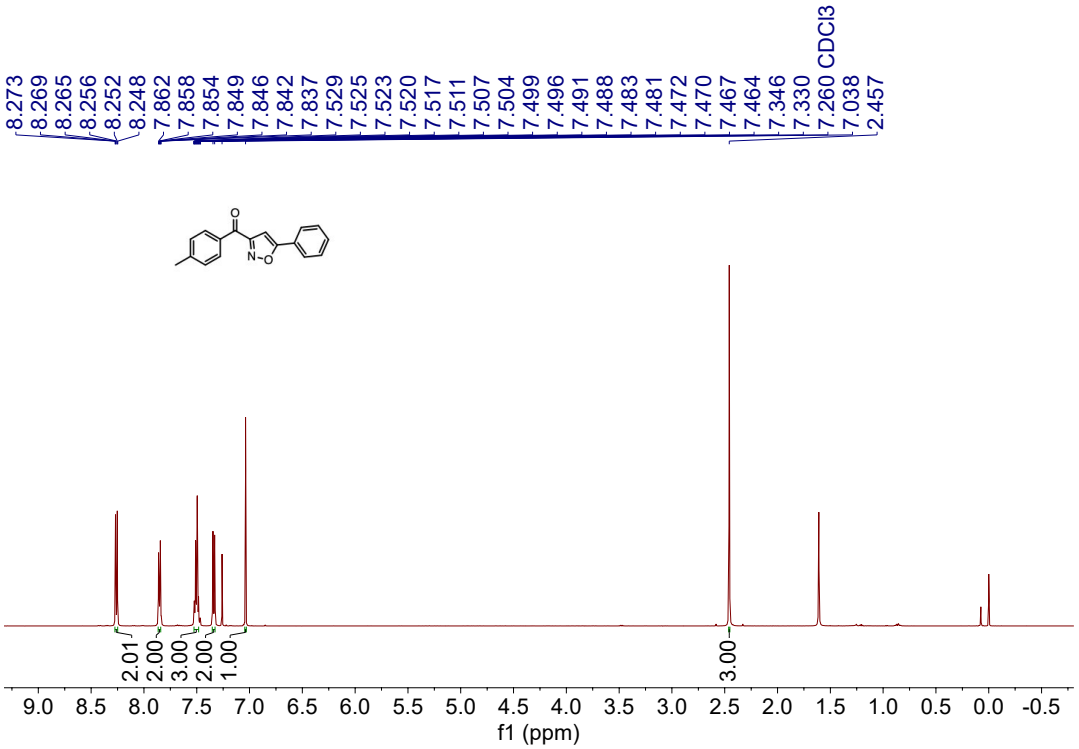

185.04
164.42
161.87
156.50
135.10
134.54
130.27
128.89
106.70
40.02
39.85
39.69
39.52 DMSO-d6
39.35
39.19
39.02
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

3n


8.169
8.167
8.165
8.163
8.156
8.153
8.152
8.150
8.148
7.696
7.693
7.684
7.683
7.681
7.679
7.678
7.668
7.666
7.663
7.554
7.551
7.548
7.536
7.535
7.532
7.523
7.521
7.520
7.260 CDCl3
4.515
4.501
4.486
4.472
4.386
4.372
4.357
4.343
1.448
1.434
1.419
1.304
1.290
1.275
2.00
1.00
2.00
2.00
2.01
3.01
3.01
f1 (ppm)


184.09
160.03
159.88
159.42
155.66
135.04
134.92
130.64
128.98
117.76
77.41
77.16 CDCl3
76.91
63.39
62.70
14.12
13.92
f1 (ppm)

3o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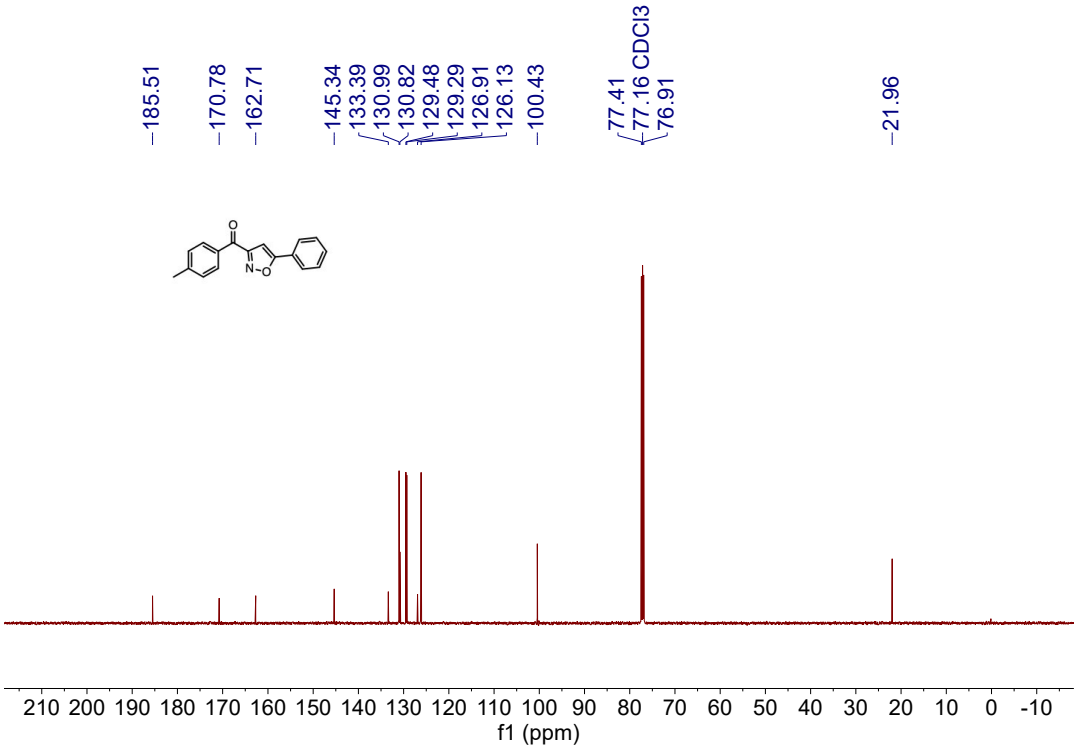
8.269
8.265
8.256
8.252
8.248
7.862
7.858
7.854
7.849
7.846
7.842
7.837
7.529
7.525
7.523
7.520
7.517
7.511
7.507
7.504
7.499
7.496
7.491
7.488
7.483
7.481
7.472
7.470
7.467
7.464
7.346
7.330
7.260 CDCl3
7.038
2.457
2.01
2.00
3.00
2.00
1.00
3.00
f1 (ppm)


185.51
170.78
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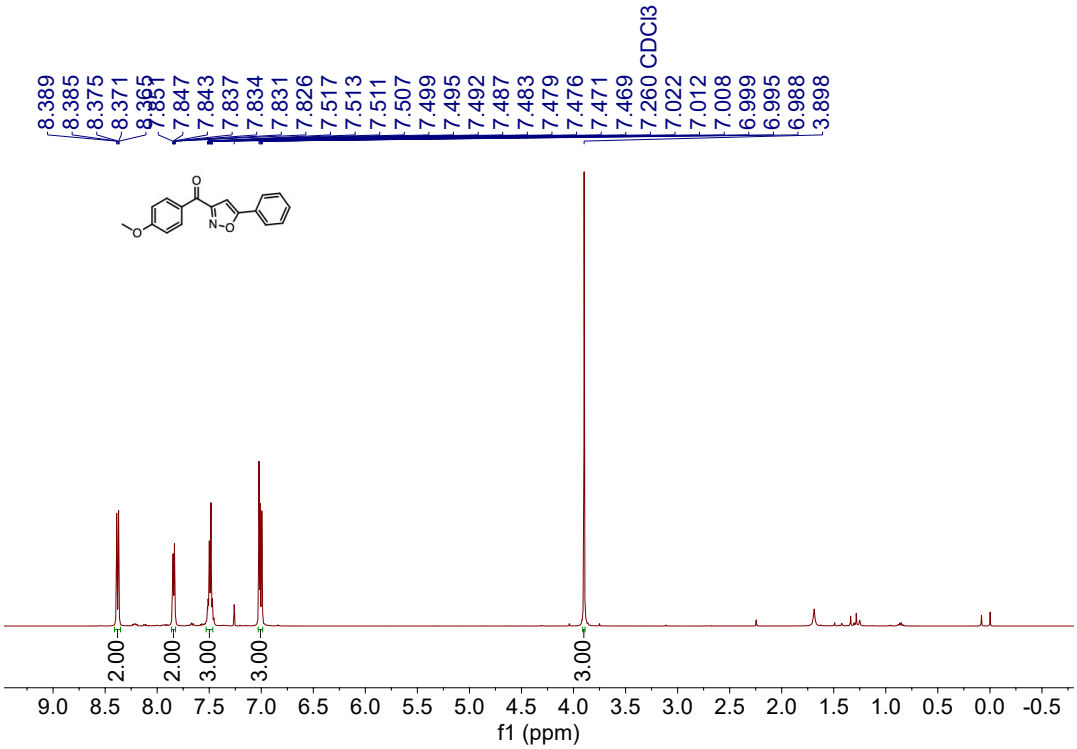
133.39
130.99
130.82
129.48
129.29
126.91
126.13
100.43
77.41
77.16 CDCl3
76.91
21.96
f1 (ppm)

3p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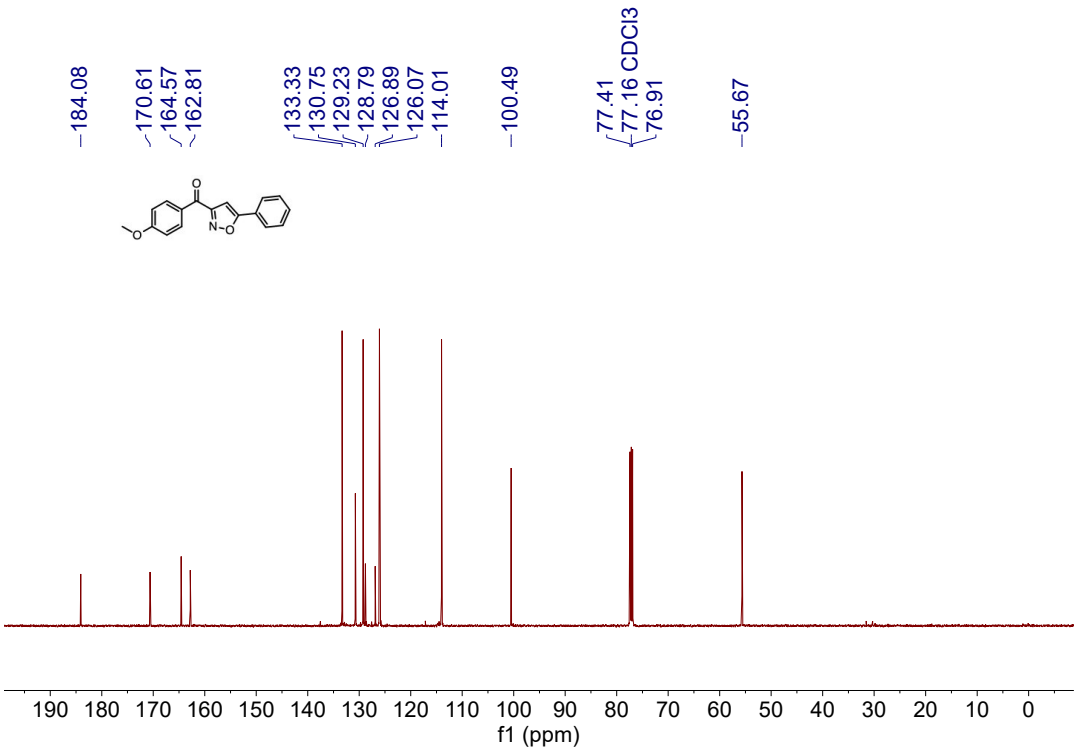
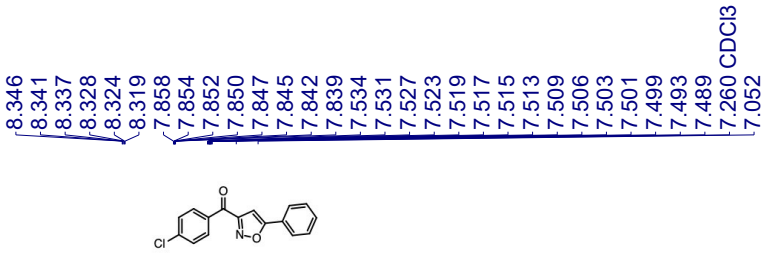
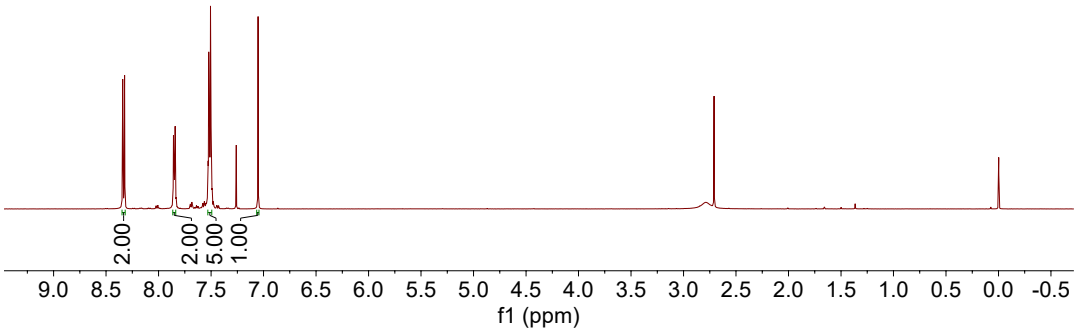
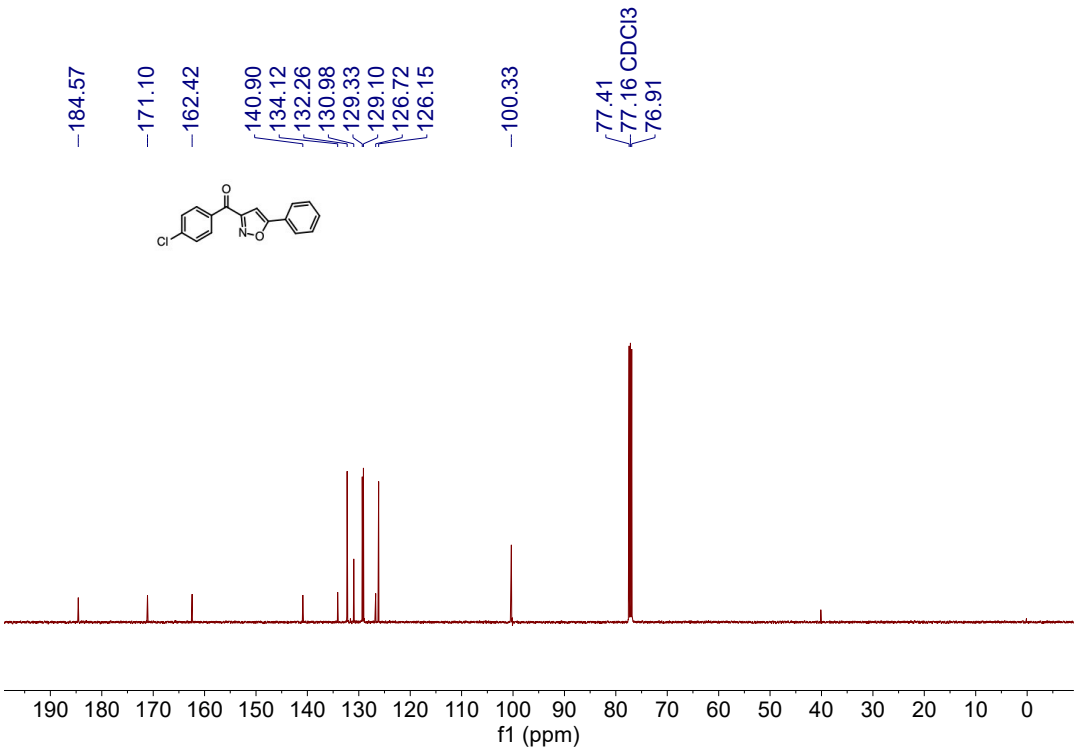
8.385
8.375
8.371
7.847
7.843
7.837
7.834
7.831
7.826
7.517
7.513
7.511
7.507
7.499
7.495
7.492
7.487
7.483
7.479
7.476
7.471
7.469
7.260 CDCl3
7.022
7.012
7.008
6.999
6.995
6.988
3.898
2.00
2.00
3.00
3.00
3.00
f1 (ppm)


184.08
170.61
164.57
162.81
133.33
130.75
129.23
128.79
126.89
126.07
114.01
100.49
77.41
77.16 CDCl3
76.91
55.67
f1 (ppm)

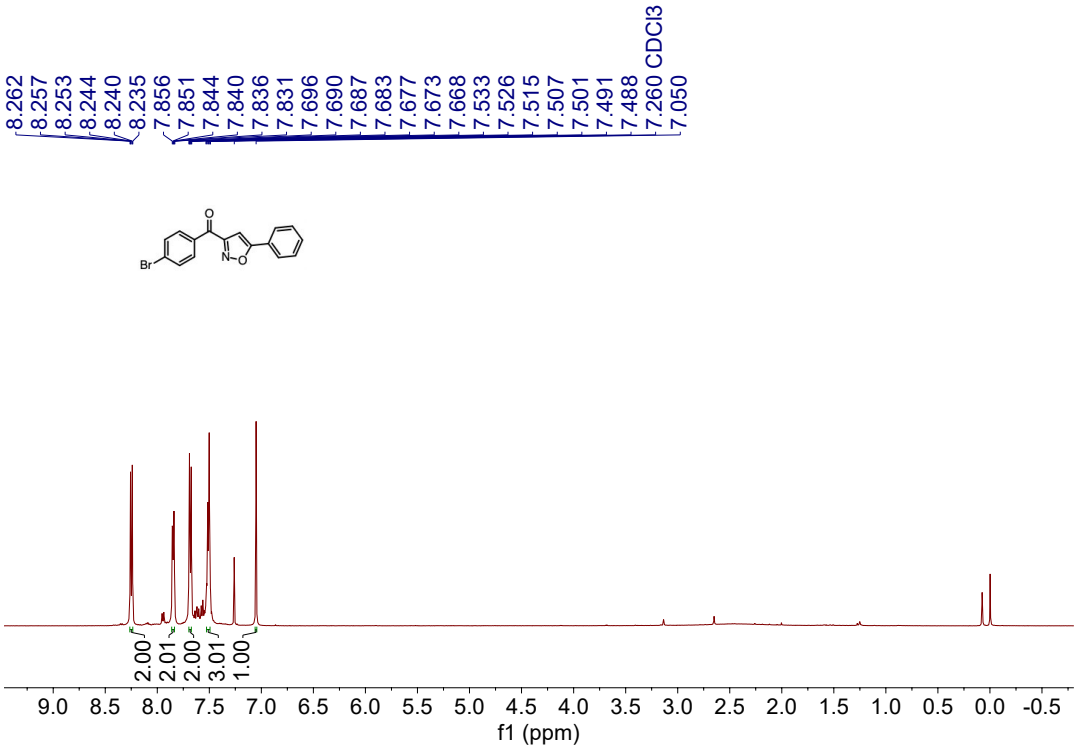
3q


8.346
8.341
8.337
8.328
8.324
8.319
7.858
7.854
7.852
7.850
7.847
7.845
7.842
7.839
7.534
7.531
7.527
7.523
7.519
7.517
7.515
7.513
7.509
7.506
7.503
7.501
7.499
7.493
7.489
7.260 CDCl3
7.052
O
N
O
Cl


2.00
2.00
5.00
1.00
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)


184.57
171.10
162.42
140.90
134.12
132.26
130.98
129.33
129.10
126.72
126.15
100.33
77.41
77.16 CDCl3
76.91
O
N
O
Cl
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

3r


8.262
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8.240
8.235
7.856
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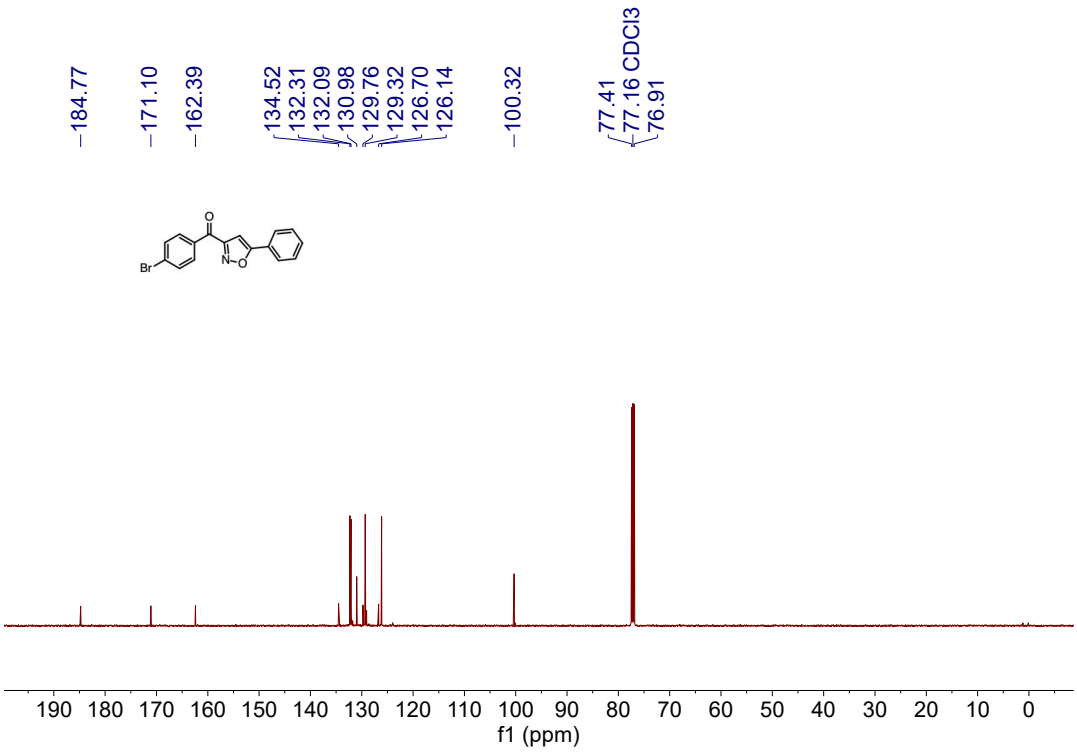
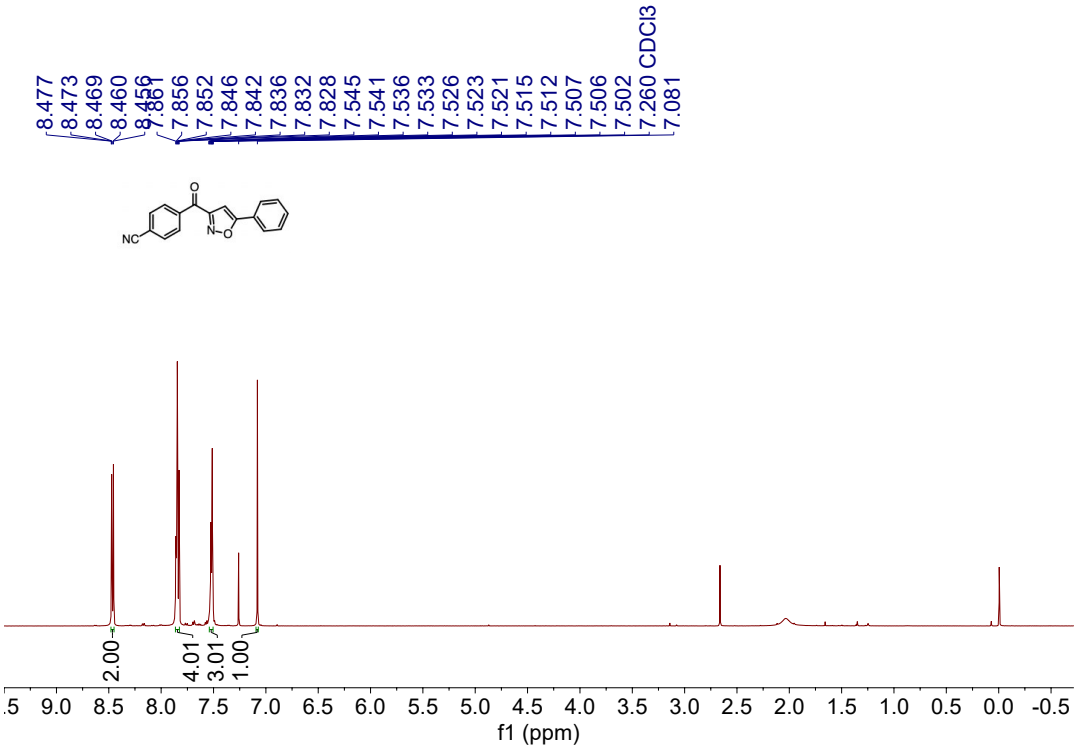
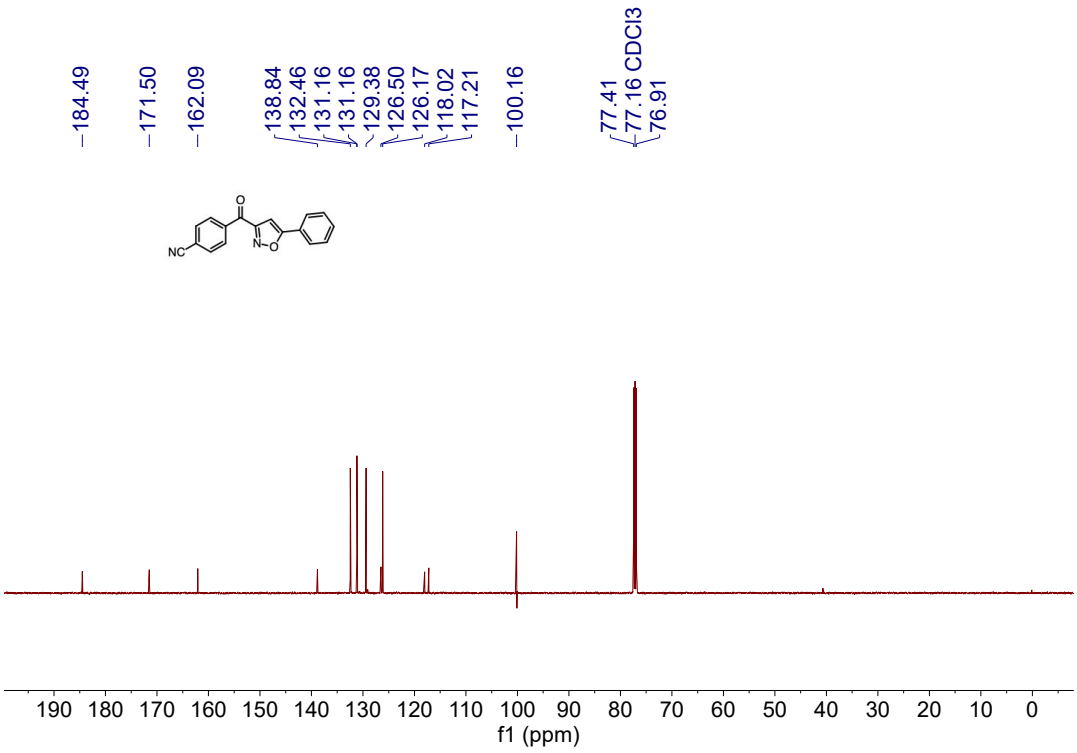
7.844
7.840
7.836
7.831
7.696
7.690
7.687
7.683
7.677
7.673
7.668
7.533
7.526
7.515
7.507
7.501
7.491
7.488
7.260 CDCl3
7.050
Br
O
N
O
2.00
2.01
2.00
3.01
1.00
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)

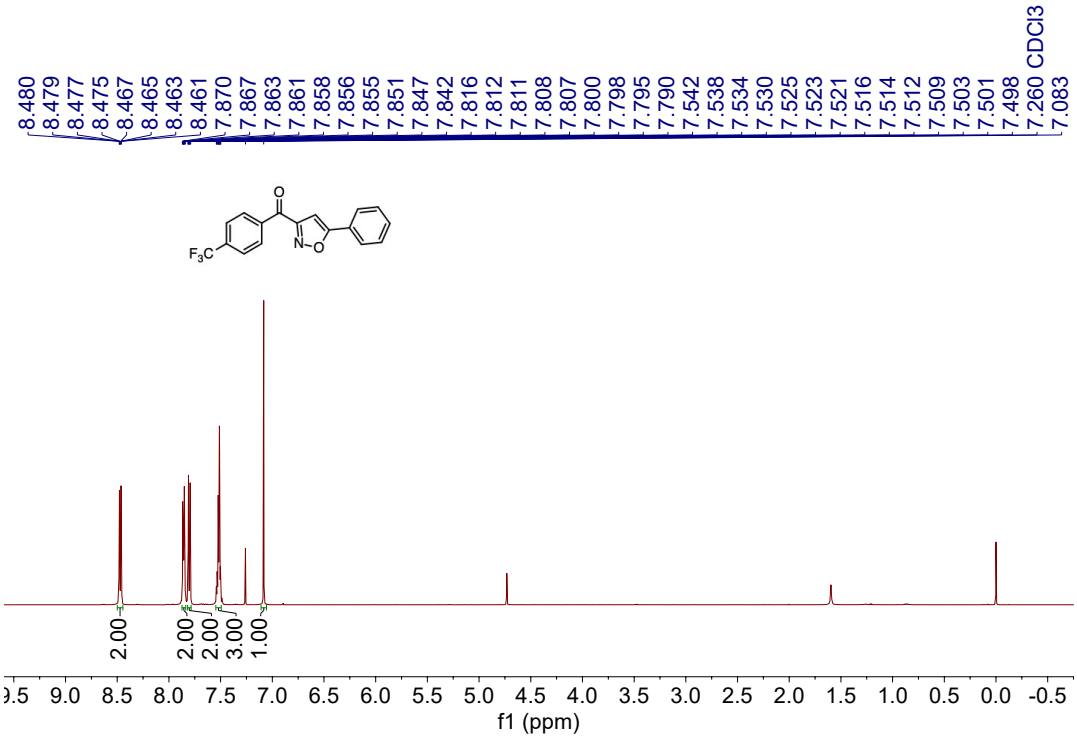

184.77
171.10
162.39
134.52
132.31
132.09
130.98
129.76
129.32
126.70
126.14
100.32
77.41
77.16 CDCl3
76.91
Br
O
N
O
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

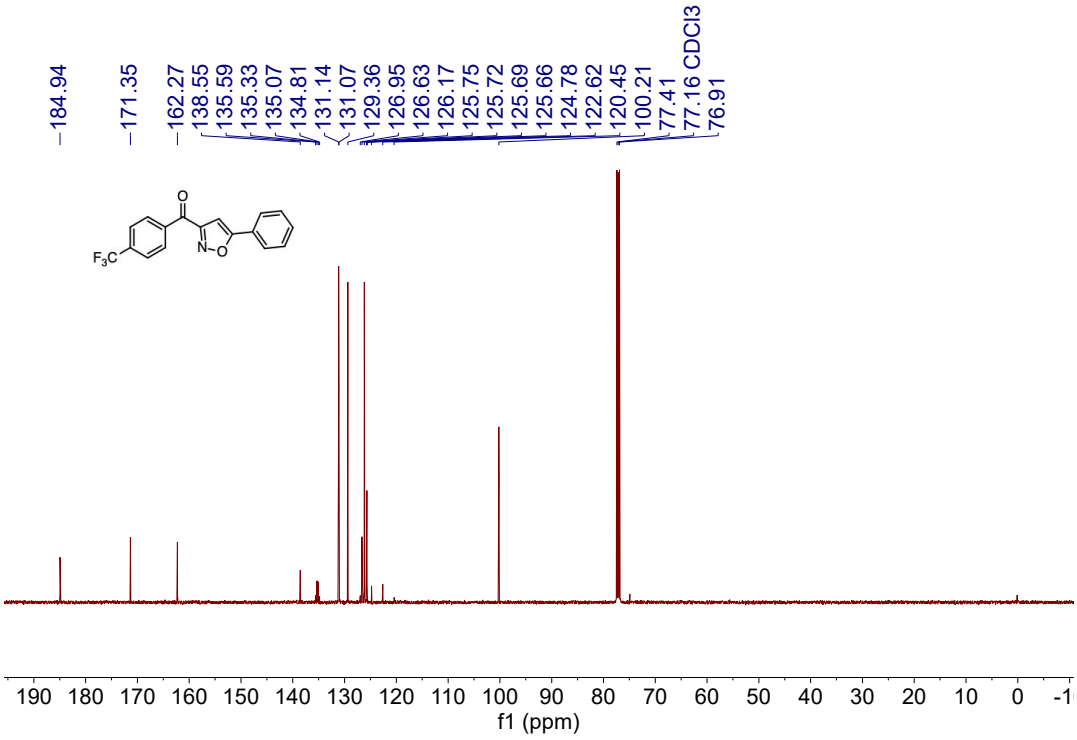
3s


8.477
8.473
8.469
8.460
7.856
7.852
7.846
7.842
7.836
7.832
7.828
7.545
7.541
7.536
7.533
7.526
7.523
7.521
7.515
7.512
7.507
7.506
7.502
7.260 CDCl3
7.081
2.00
4.01
3.01
1.00
f1 (ppm)

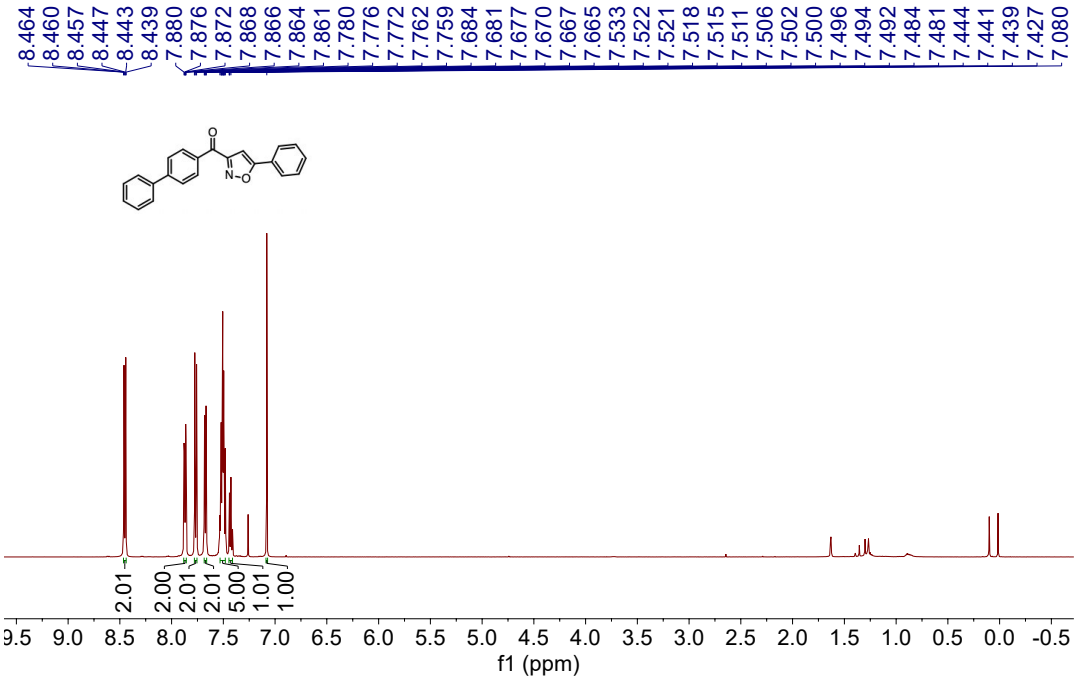

184.49
171.50
162.09
138.84
132.46
131.16
131.16
129.38
126.50
126.17
118.02
117.21
100.16
77.41
77.16 CDCl3
76.91
f1 (ppm)

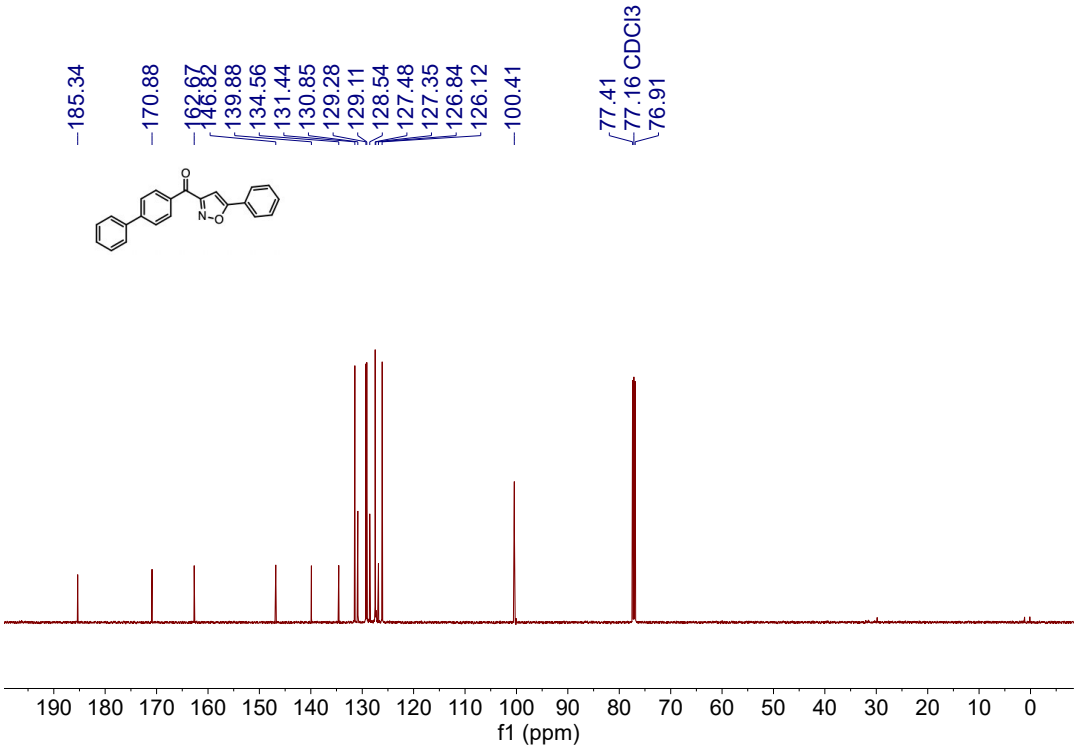
3t


8.480
8.479
8.477
8.475
8.467
8.465
8.463
8.461
7.870
7.867
7.863
7.861
7.858
7.856
7.855
7.851
7.847
7.842
7.816
7.812
7.811
7.808
7.807
7.800
7.798
7.795
7.790
7.542
7.538
7.534
7.530
7.525
7.523
7.521
7.516
7.514
7.512
7.509
7.503
7.501
7.498
7.260 CDCl3
7.083
O
N
O
F3C
2.00
2.00
2.00
3.00
1.00
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)

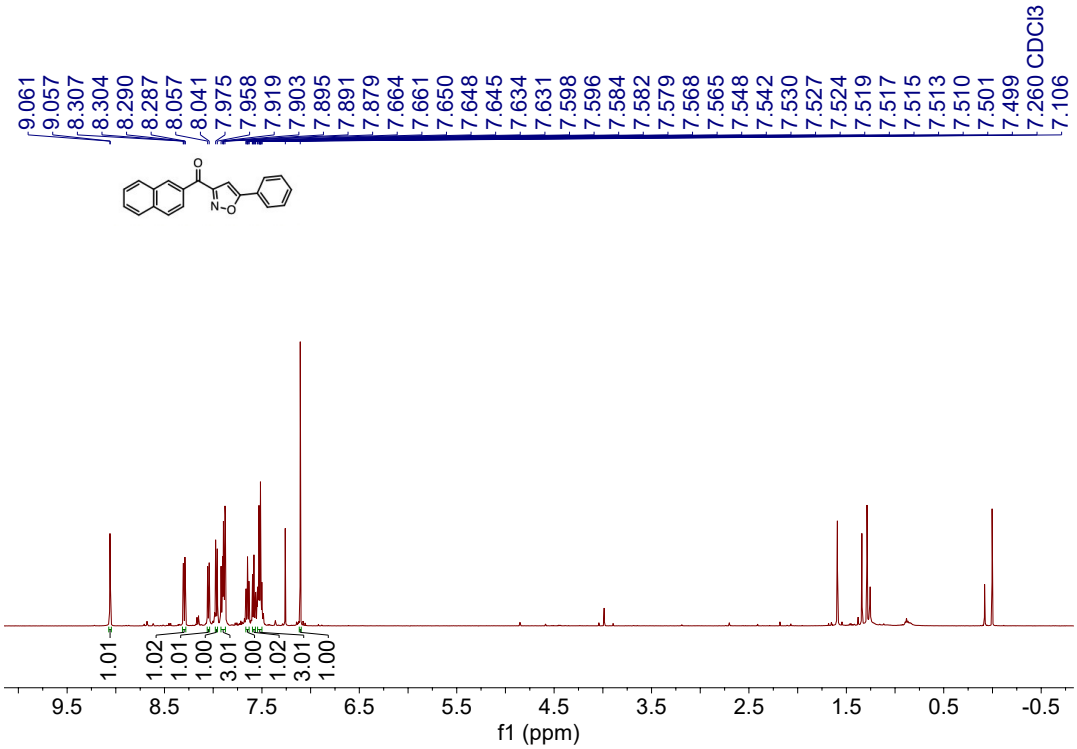

184.94
171.35
162.27
138.55
135.59
135.33
135.07
134.81
131.14
131.07
129.36
126.95
126.63
126.17
125.75
125.72
125.69
125.66
124.78
122.62
120.45
100.21
77.41
77.16 CDCl3
76.91
O
N
O
F3C
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -1
f1 (ppm)

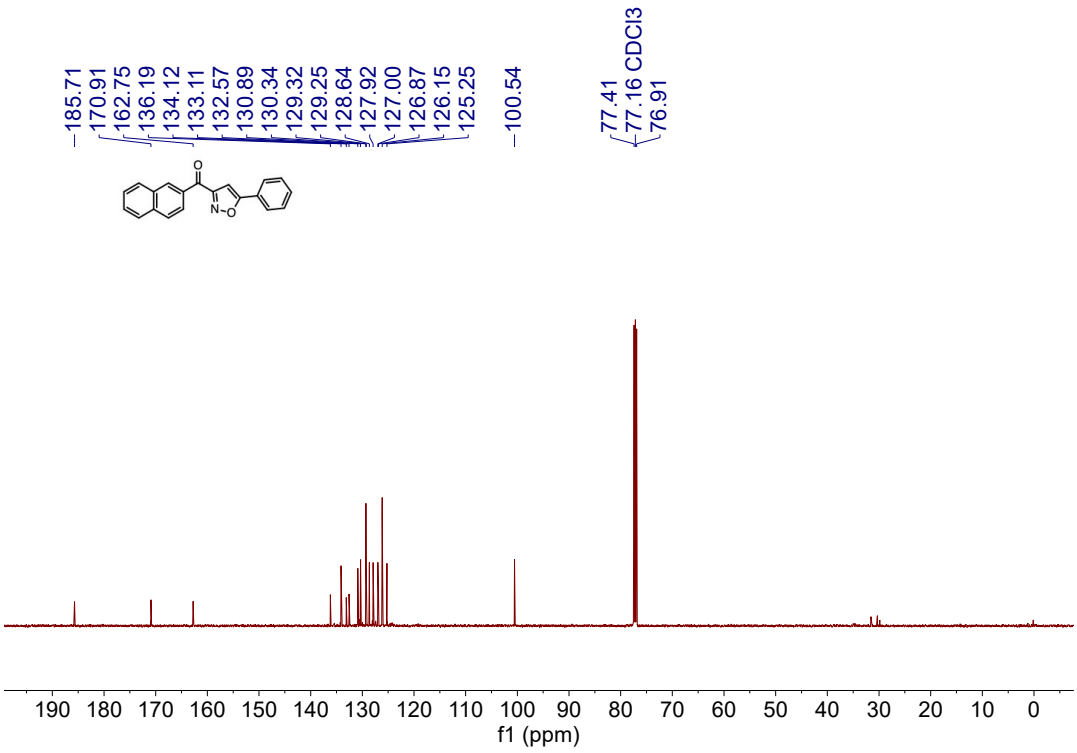
3u


8.464
8.460
8.457
8.447
8.443
8.439
7.880
7.876
7.872
7.868
7.866
7.864
7.861
7.780
7.776
7.772
7.762
7.759
7.684
7.681
7.677
7.670
7.667
7.665
7.533
7.522
7.521
7.518
7.515
7.511
7.506
7.502
7.500
7.496
7.494
7.492
7.484
7.481
7.444
7.441
7.439
7.427
7.080
2.01
2.00
2.01
2.01
5.00
1.01
1.00
f1 (ppm)

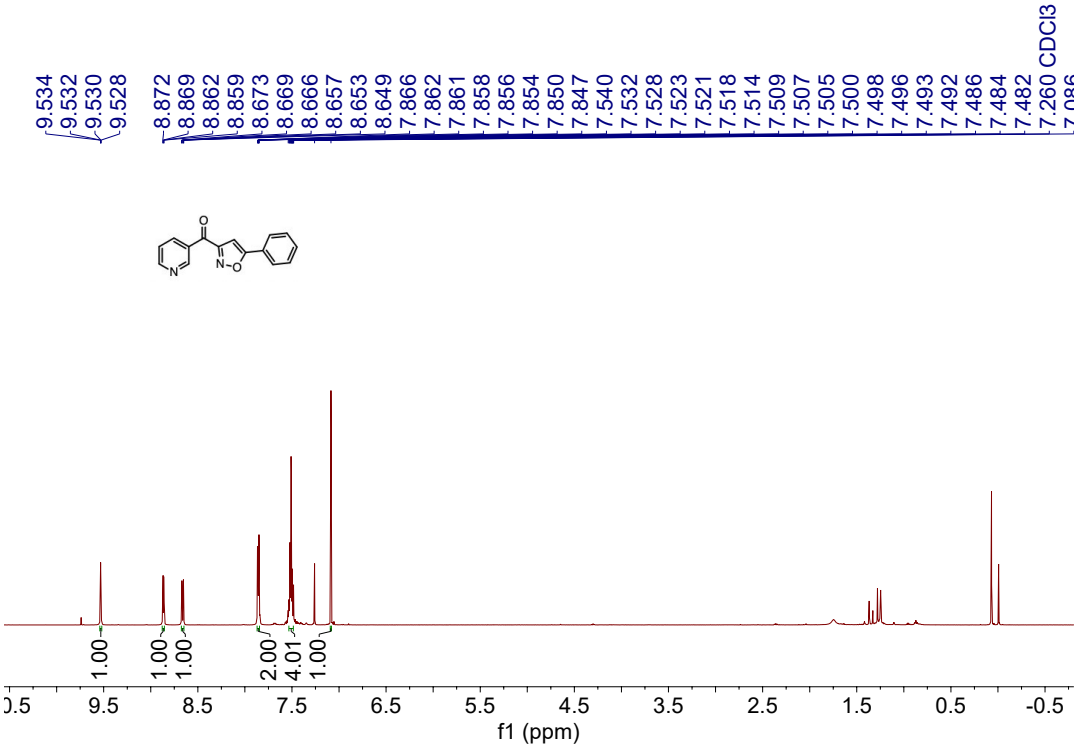

185.34
170.88
162.67
146.82
139.88
134.56
131.44
130.85
129.28
129.11
128.54
127.48
127.35
126.84
126.12
100.41
77.41
77.16 CDCl3
76.91
f1 (ppm)

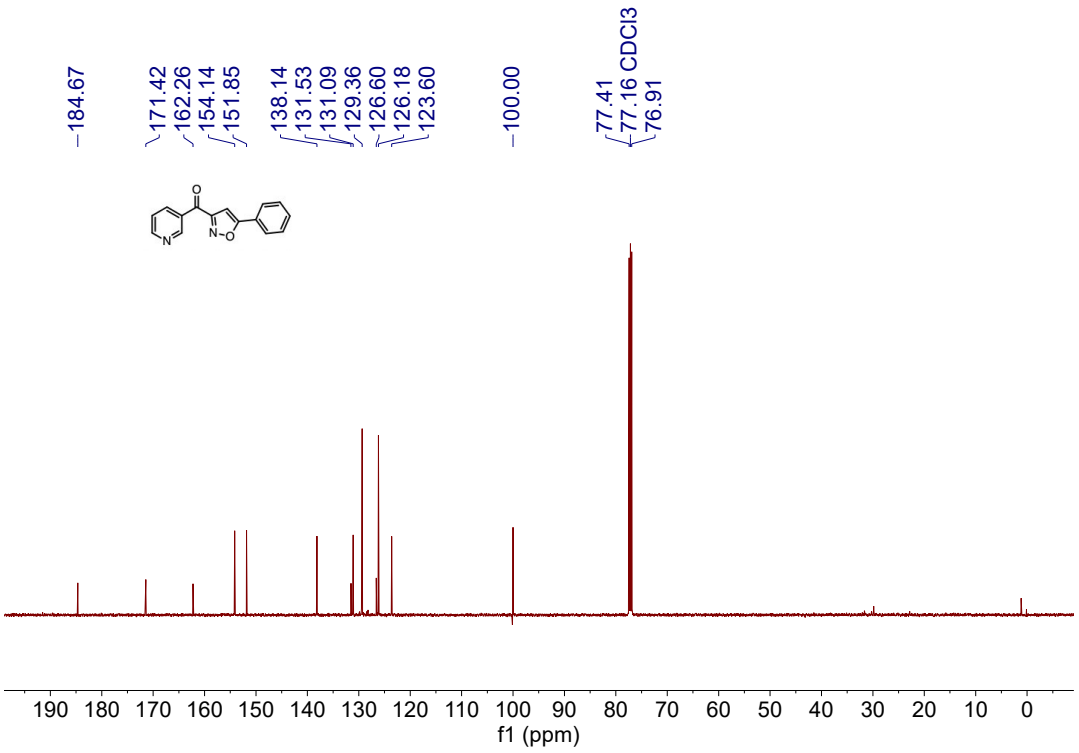
3v


9.061
9.057
8.307
8.304
8.290
8.287
8.057
8.041
7.975
7.958
7.919
7.903
7.895
7.891
7.879
7.664
7.661
7.650
7.648
7.645
7.634
7.631
7.598
7.596
7.584
7.582
7.579
7.568
7.565
7.548
7.542
7.530
7.527
7.524
7.519
7.517
7.515
7.513
7.510
7.501
7.499
7.260 CDCl3
7.106
1.01
1.02
1.01
1.00
3.01
1.00
1.02
3.01
1.00
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)

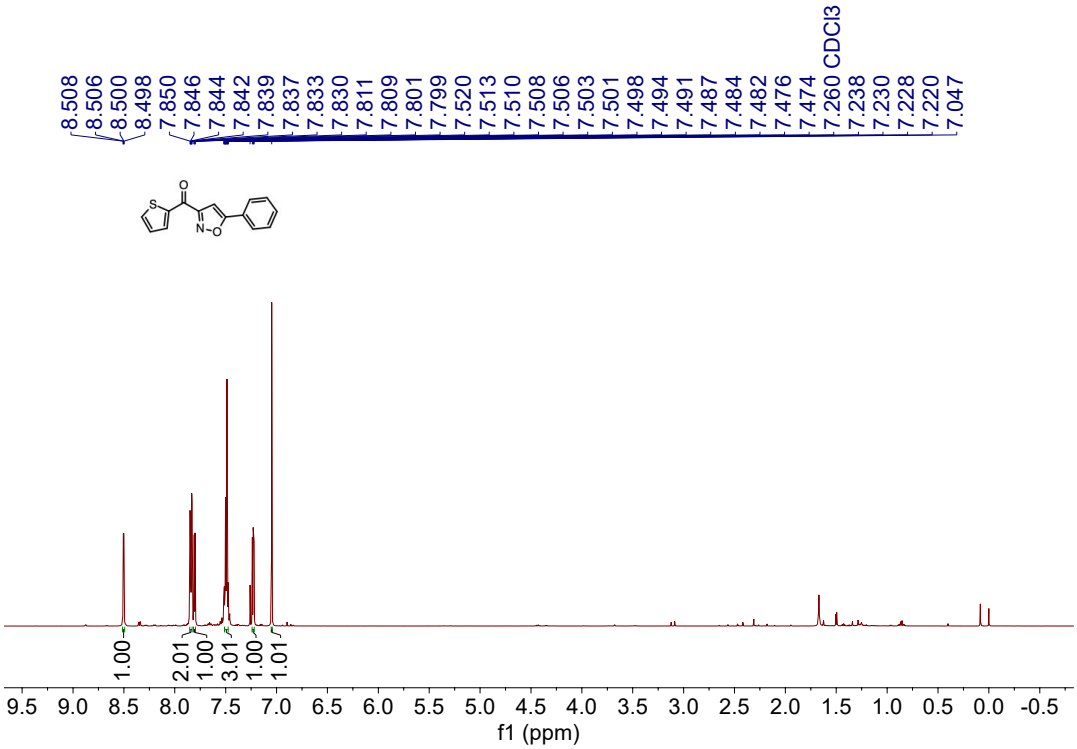

185.71
170.91
162.75
136.19
134.12
133.11
132.57
130.89
130.34
129.32
129.25
128.64
127.92
127.00
126.87
126.15
125.25
100.54
77.41
77.16 CDCl3
76.91
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

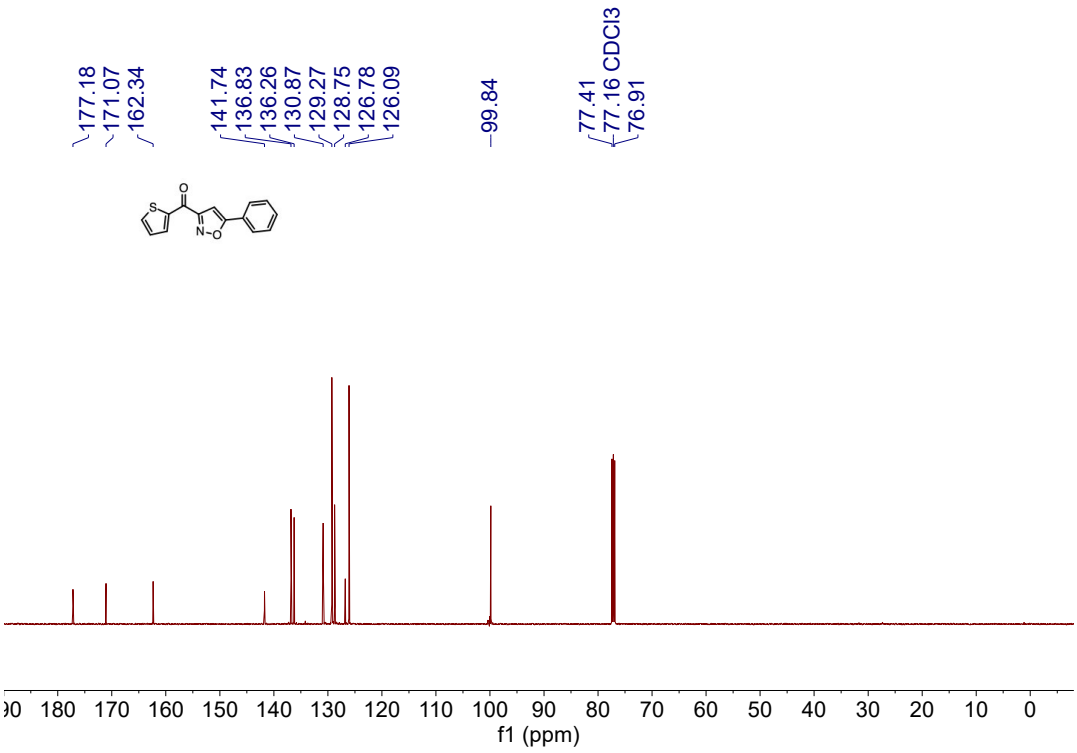
3w


9.534
9.532
9.530
9.528
8.872
8.869
8.862
8.859
8.673
8.669
8.666
8.657
8.653
8.649
7.866
7.862
7.861
7.858
7.856
7.854
7.850
7.847
7.540
7.532
7.528
7.523
7.521
7.518
7.514
7.509
7.507
7.505
7.500
7.498
7.496
7.493
7.492
7.486
7.484
7.482
7.260 CDCl3
1.00
1.00
1.00
2.00
4.01
1.00
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)

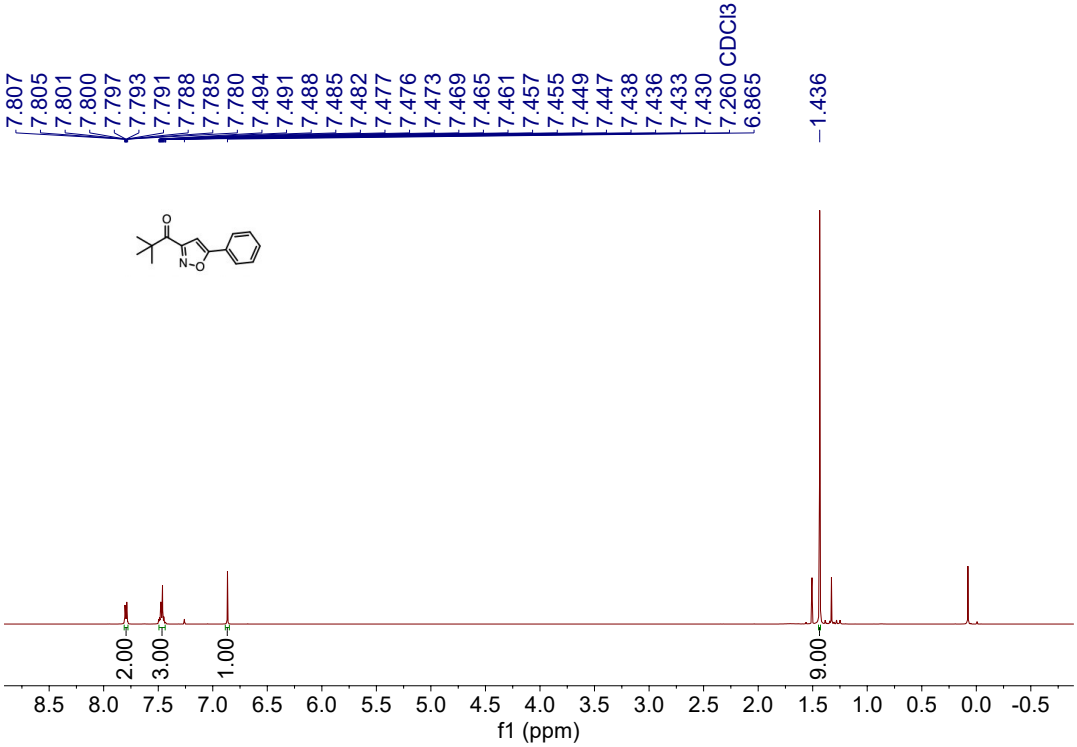

184.67
171.42
162.26
154.14
151.85
138.14
131.53
131.09
129.36
126.60
126.18
123.60
100.00
77.41
77.16 CDCl3
76.91
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

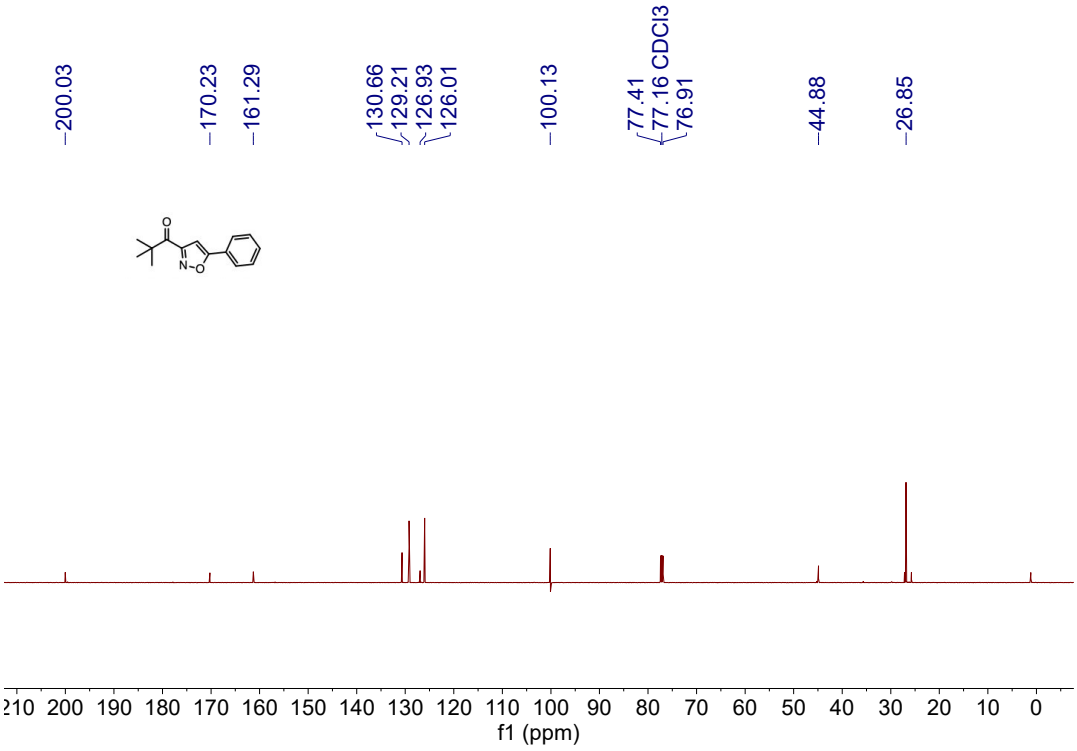
3x


8.508
8.506
8.500
8.498
7.850
7.846
7.844
7.842
7.839
7.837
7.833
7.830
7.811
7.809
7.801
7.799
7.520
7.513
7.510
7.508
7.506
7.503
7.501
7.498
7.494
7.491
7.487
7.484
7.482
7.476
7.474
7.260 CDCl3
7.238
7.230
7.228
7.220
7.047
1.00
2.01
1.00
3.01
1.00
1.01
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)

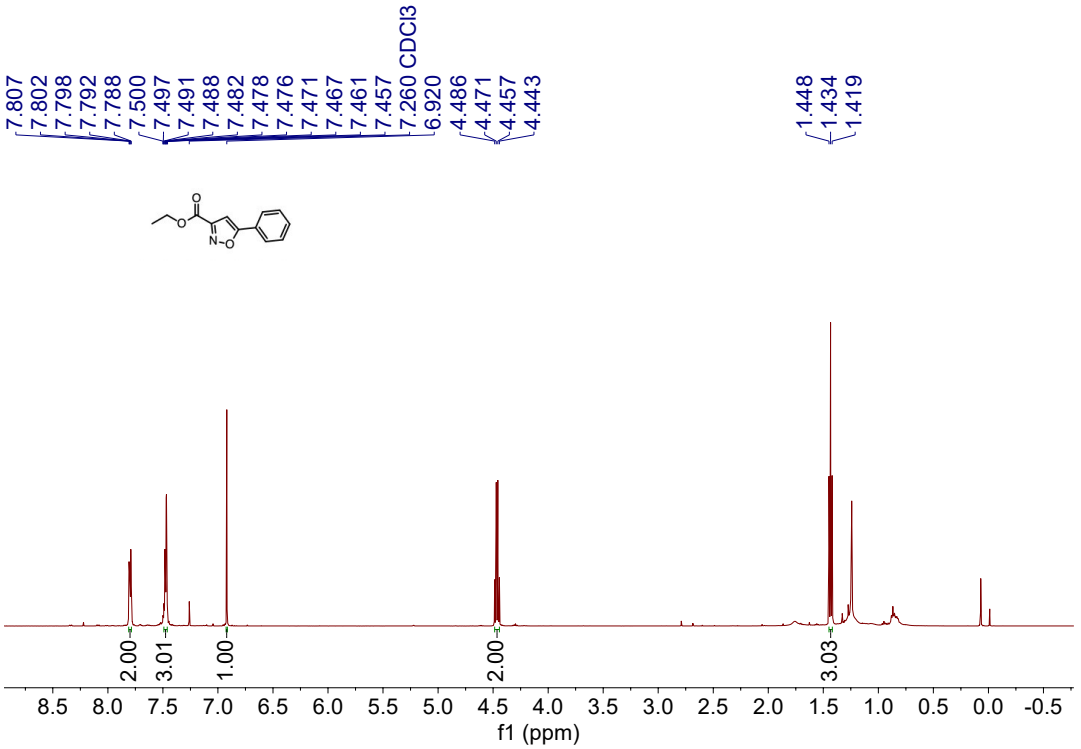

177.18
171.07
162.34
141.74
136.83
136.26
130.87
129.27
128.75
126.78
126.09
99.84
77.41
77.16 CDCl3
76.91
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

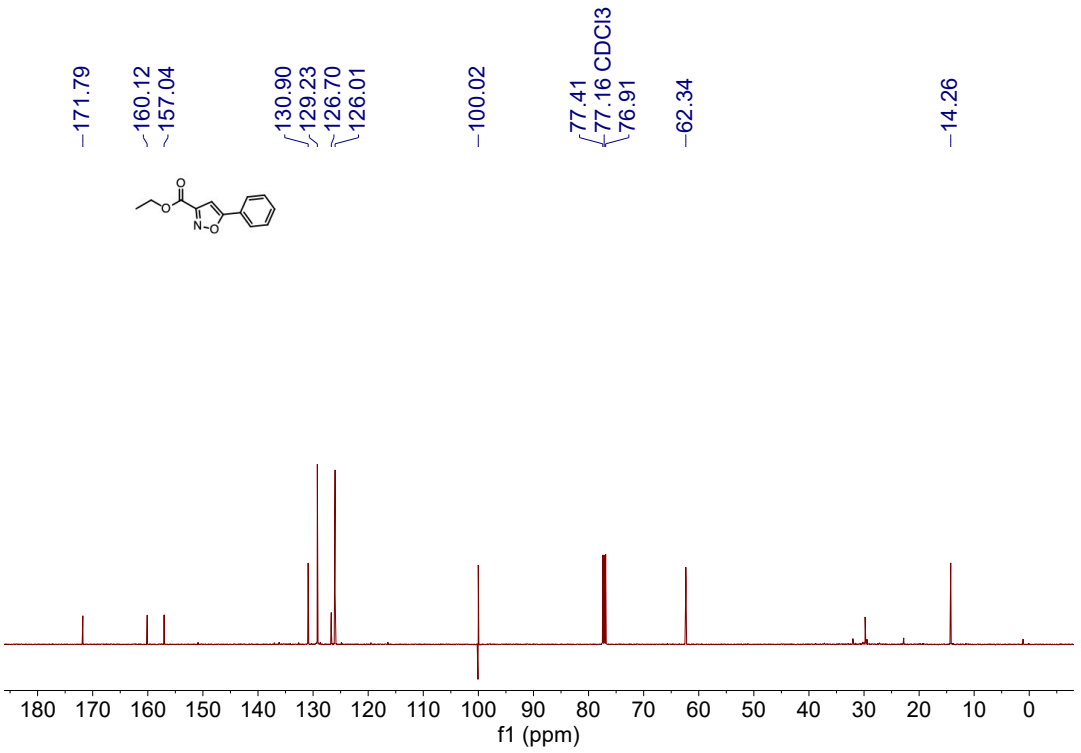
3y


7.807
7.805
7.801
7.800
7.797
7.793
7.791
7.788
7.785
7.780
7.494
7.491
7.488
7.485
7.482
7.477
7.476
7.473
7.469
7.465
7.461
7.457
7.455
7.449
7.447
7.438
7.436
7.433
7.430
7.260 CDCl3
6.865
1.436
2.00
3.00
1.00
9.00
f1 (ppm)

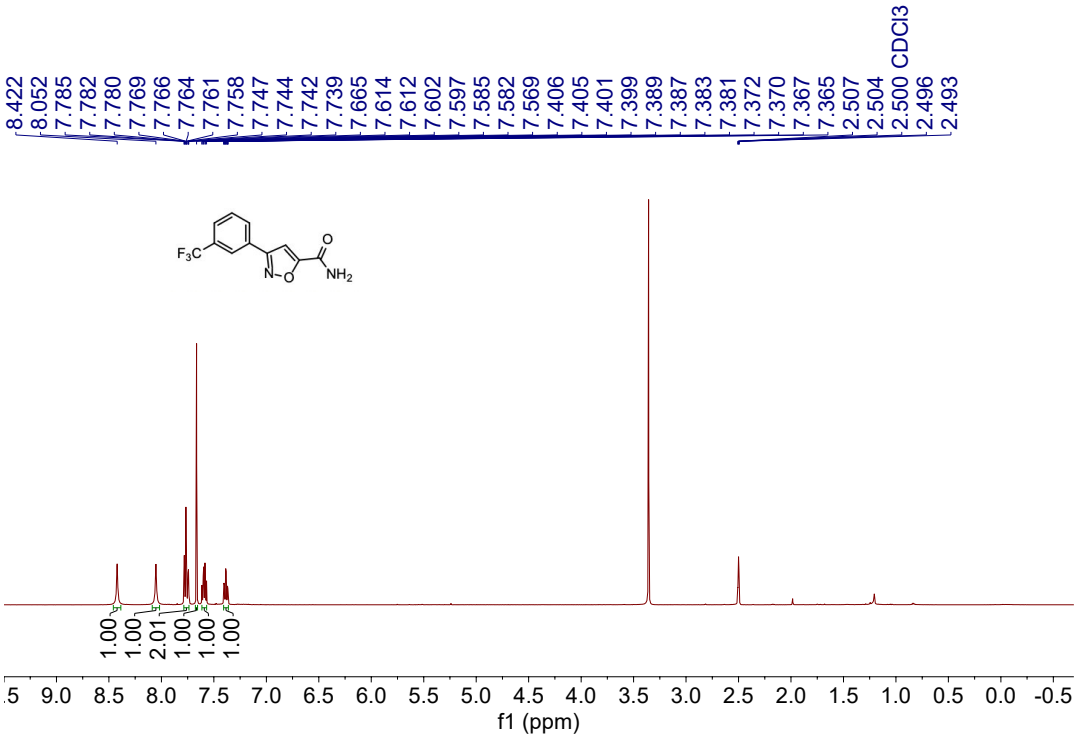

200.03
170.23
161.29
130.66
129.21
126.93
126.01
100.13
77.41
77.16 CDCl3
76.91
44.88
26.85
f1 (ppm)

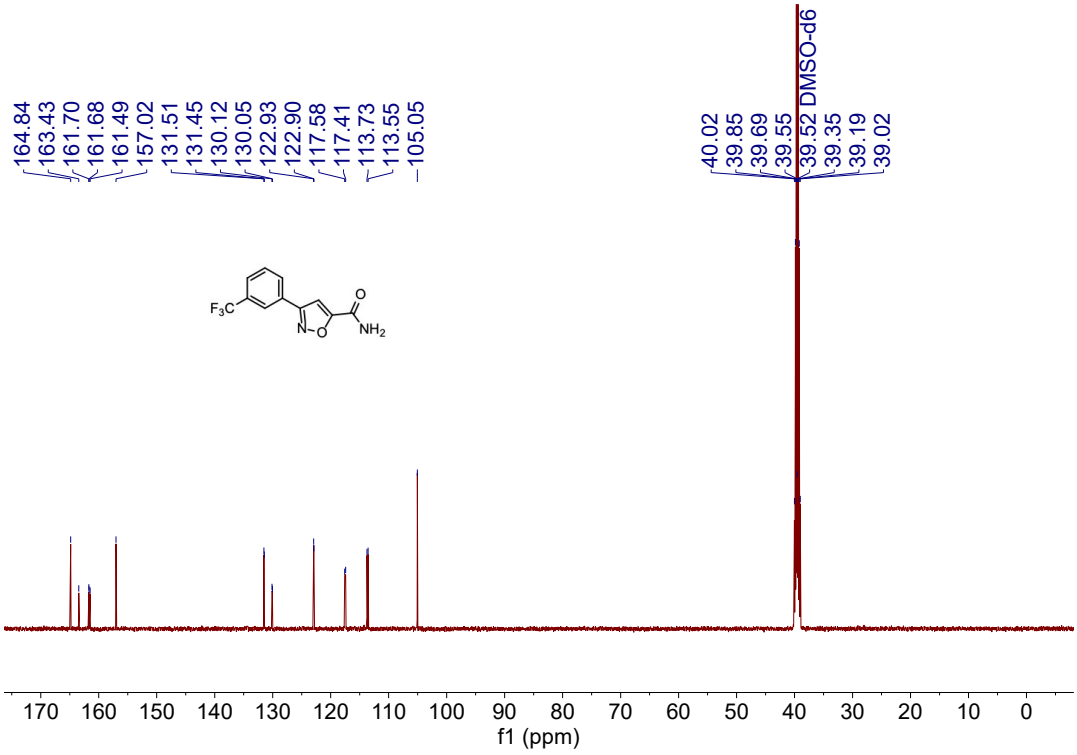
3z


7.807
7.802
7.798
7.792
7.788
7.500
7.497
7.491
7.488
7.482
7.478
7.476
7.471
7.467
7.461
7.457
7.260 CDCl3
6.920
4.486
4.471
4.457
4.443
1.448
1.434
1.419
2.00
3.01
1.00
2.00
3.03
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)

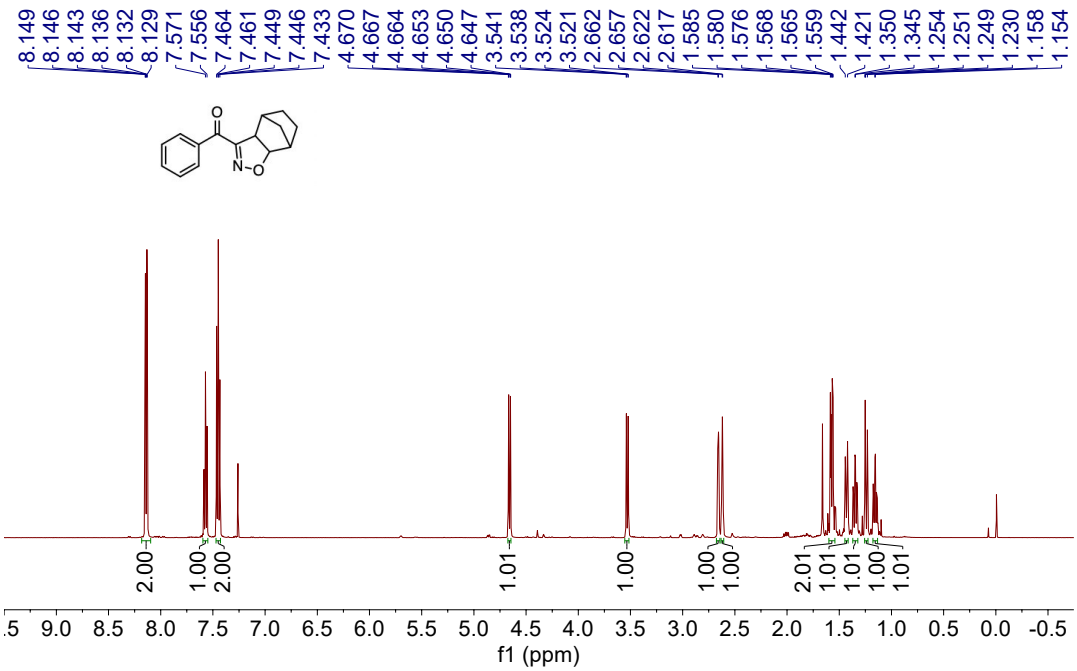

171.79
160.12
157.04
130.90
129.23
126.70
126.01
100.02
77.41
77.16 CDCl3
76.91
62.34
14.26
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

3za


8.422
8.052
7.785
7.782
7.780
7.769
7.766
7.764
7.761
7.758
7.747
7.744
7.742
7.739
7.665
7.614
7.612
7.602
7.597
7.585
7.582
7.569
7.406
7.405
7.401
7.399
7.389
7.387
7.383
7.381
7.372
7.370
7.367
7.365
2.507
2.504
2.500 CDCl3
2.496
2.493
F3C
O
N
O
NH2
1.00
1.00
2.01
1.00
1.00
1.00
f1 (ppm)


164.84
163.43
161.70
161.68
161.49
157.02
131.51
131.45
130.12
130.05
122.93
122.90
117.58
117.41
113.73
113.55
105.05
40.02
39.85
39.69
39.55
39.52 DMSO-d6
39.35
39.19
39.02
F3C
O
N
O
NH2
f1 (ppm)

5a


8.149
8.146
8.143
8.136
8.132
8.129
7.571
7.556
7.464
7.461
7.449
7.446
7.433
4.670
4.667
4.664
4.653
4.650
4.647
3.541
3.538
3.524
3.521
2.662
2.657
2.622
2.617
1.585
1.580
1.576
1.568
1.565
1.559
1.442
1.421
1.350
1.345
1.254
1.251
1.249
1.230
1.158
1.154
O
N
O
2.00
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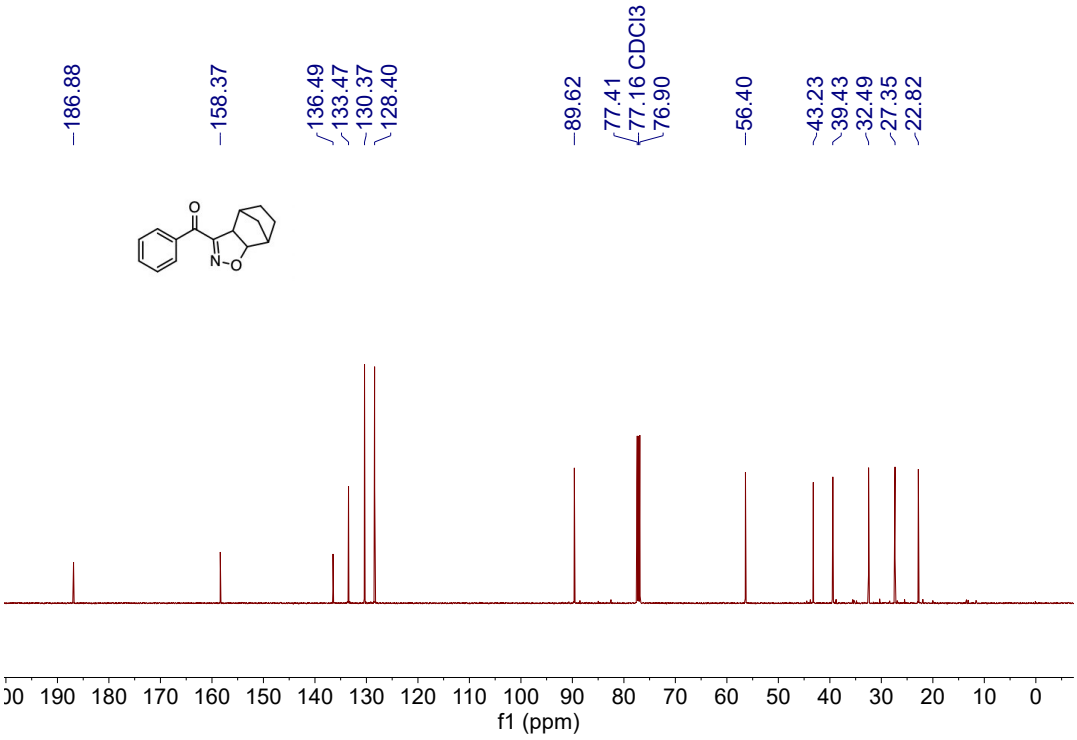
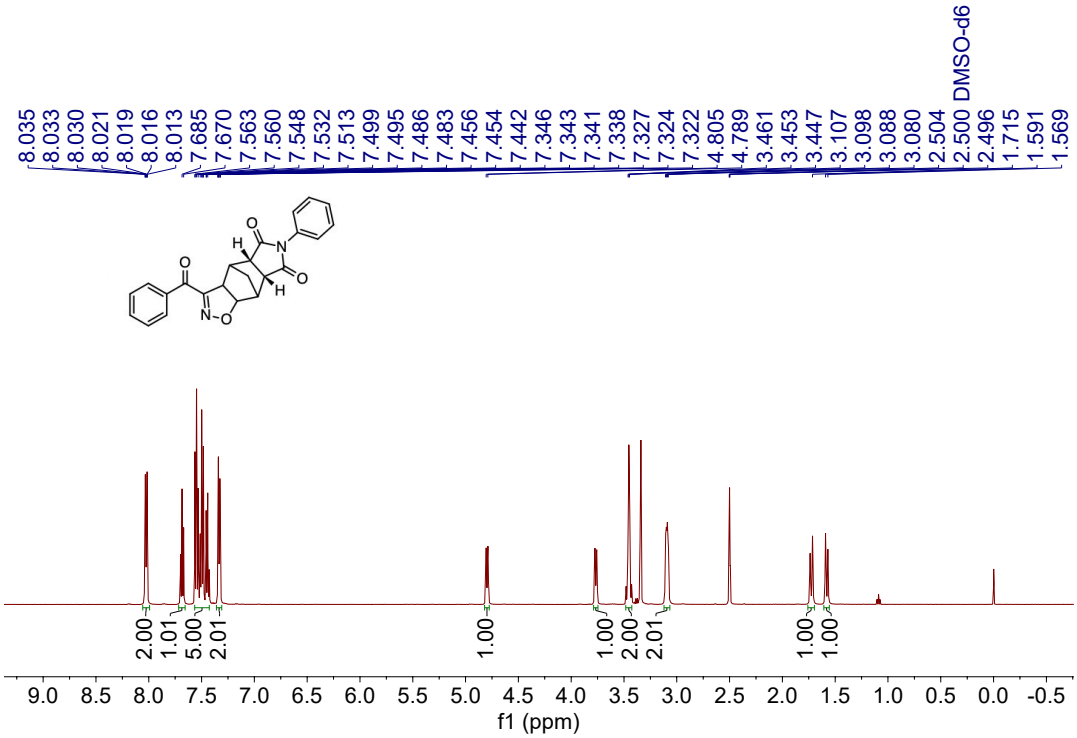
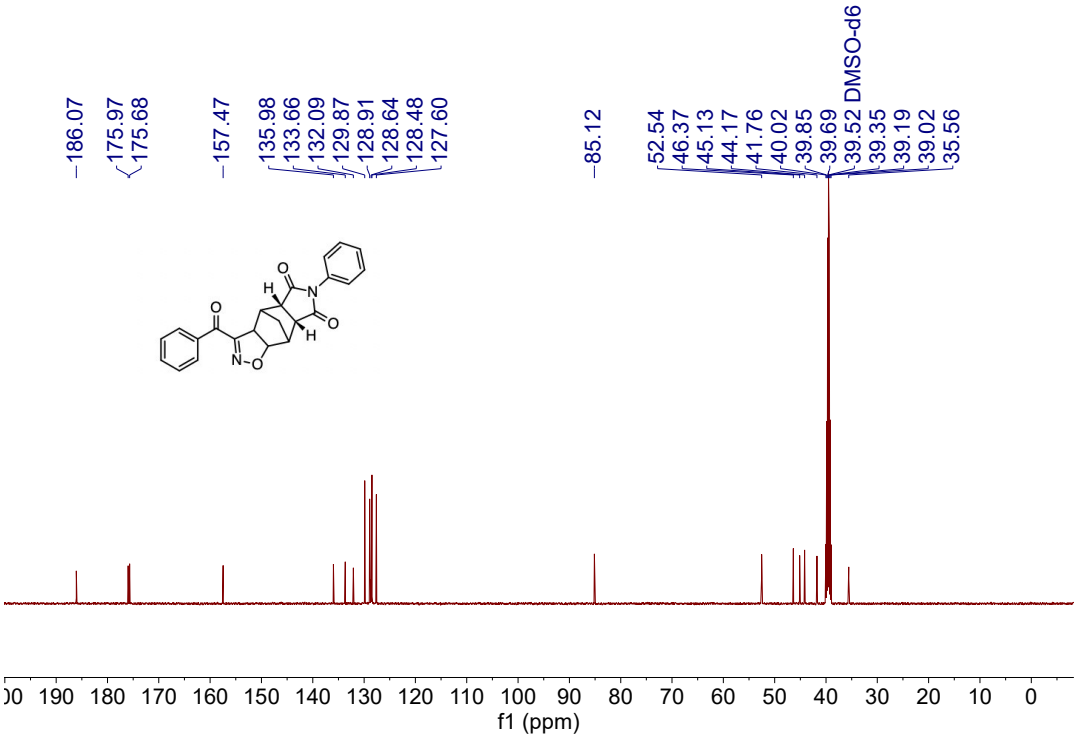
1.01
1.01
1.00
1.01
f1 (ppm)

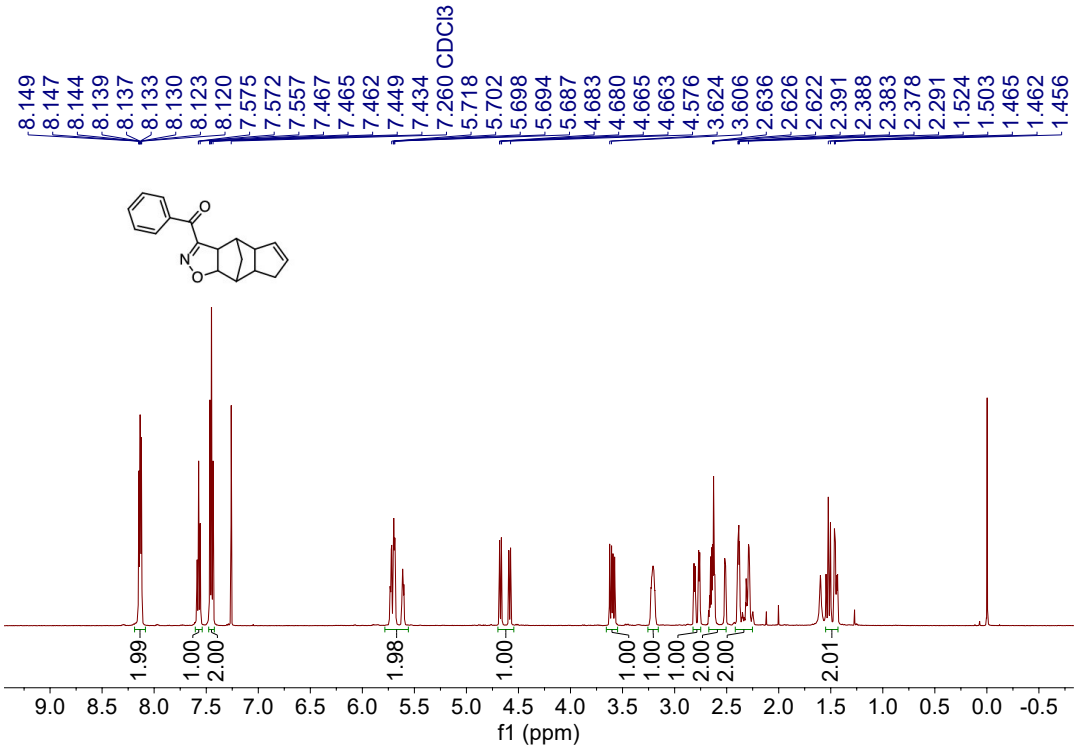

186.88
158.37
136.49
133.47
130.37
128.40
89.62
77.41
77.16 CDCl3
76.90
56.40
43.23
39.43
32.49
27.35
22.82
O
N
O
f1 (ppm)

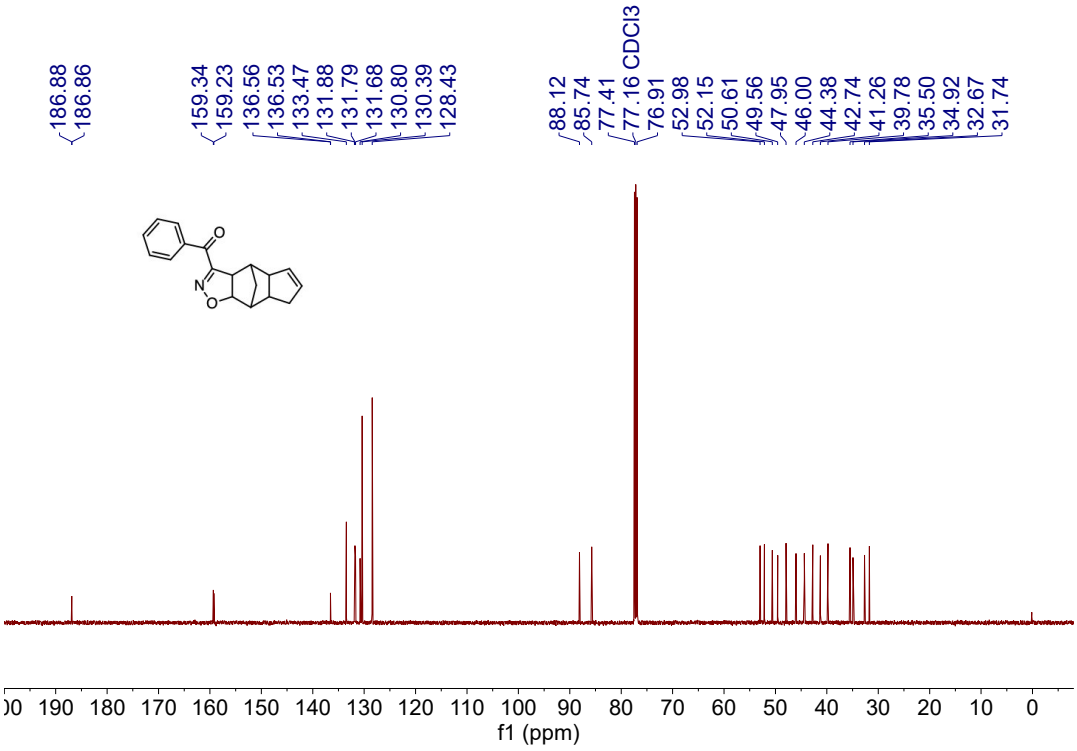
5b


8.035
8.033
8.030
8.021
8.019
8.016
8.013
7.685
7.670
7.563
7.560
7.548
7.532
7.513
7.499
7.495
7.486
7.483
7.456
7.454
7.442
7.346
7.343
7.341
7.338
7.327
7.324
7.322
4.805
4.789
3.461
3.453
3.447
3.107
3.098
3.088
3.080
2.504
2.500 DMSO-d6
2.496
1.715
1.591
1.569
2.00
1.01
5.00
2.01
1.00
1.00
2.00
2.01
1.00
1.00
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)

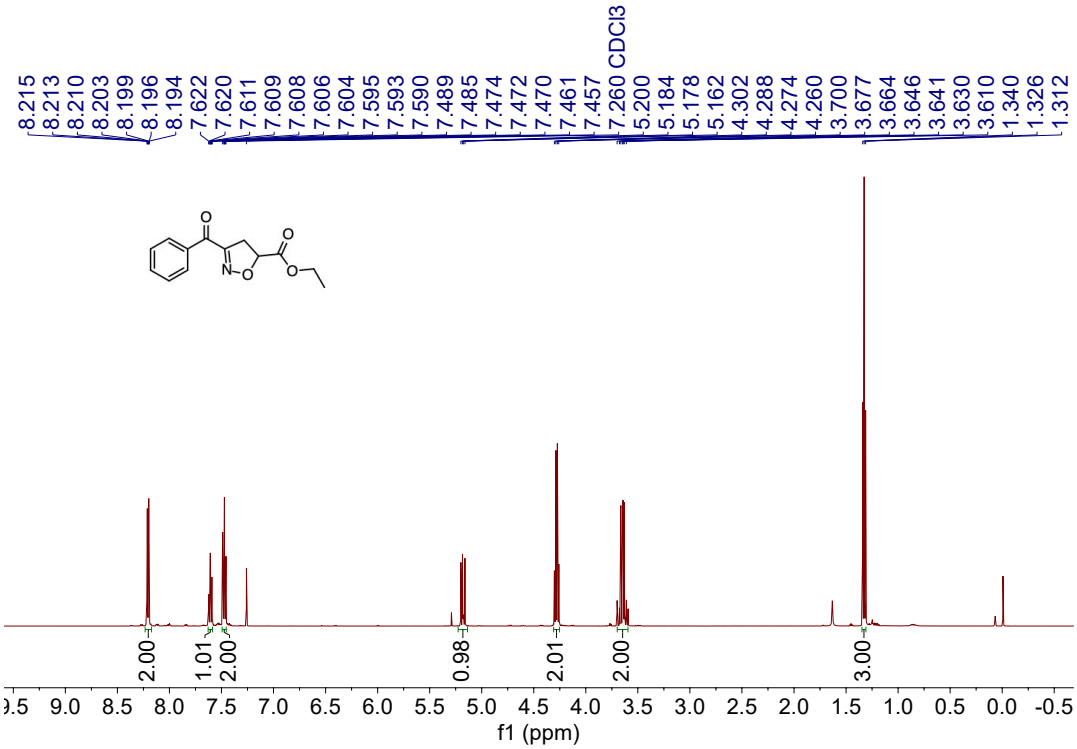

186.07
175.97
175.68
157.47
135.98
133.66
132.09
129.87
128.91
128.64
128.48
127.60
85.12
52.54
46.37
45.13
44.17
41.76
40.02
39.85
39.69
39.52 DMSO-d6
39.35
39.19
39.02
35.56
00 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

5c


8.149
8.147
8.144
8.139
8.137
8.133
8.130
8.123
8.120
7.575
7.572
7.557
7.467
7.465
7.462
7.449
7.434
7.260 CDCl3
5.718
5.702
5.698
5.694
5.687
4.683
4.680
4.665
4.663
4.576
3.624
3.606
2.636
2.626
2.622
2.391
2.388
2.383
2.378
2.291
1.524
1.503
1.465
1.462
1.456
O
N
O
1.99
1.00
2.00
1.98
1.00
1.00
1.00
2.00
2.00
2.01
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)


186.88
186.86
159.34
159.23
136.56
136.53
133.47
131.88
131.79
131.68
130.80
130.39
128.43
88.12
85.74
77.41
77.16 CDCl3
76.91
52.98
52.15
50.61
49.56
47.95
46.00
44.38
42.74
41.26
39.78
35.50
34.92
32.67
31.74
O
N
O
00 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

5d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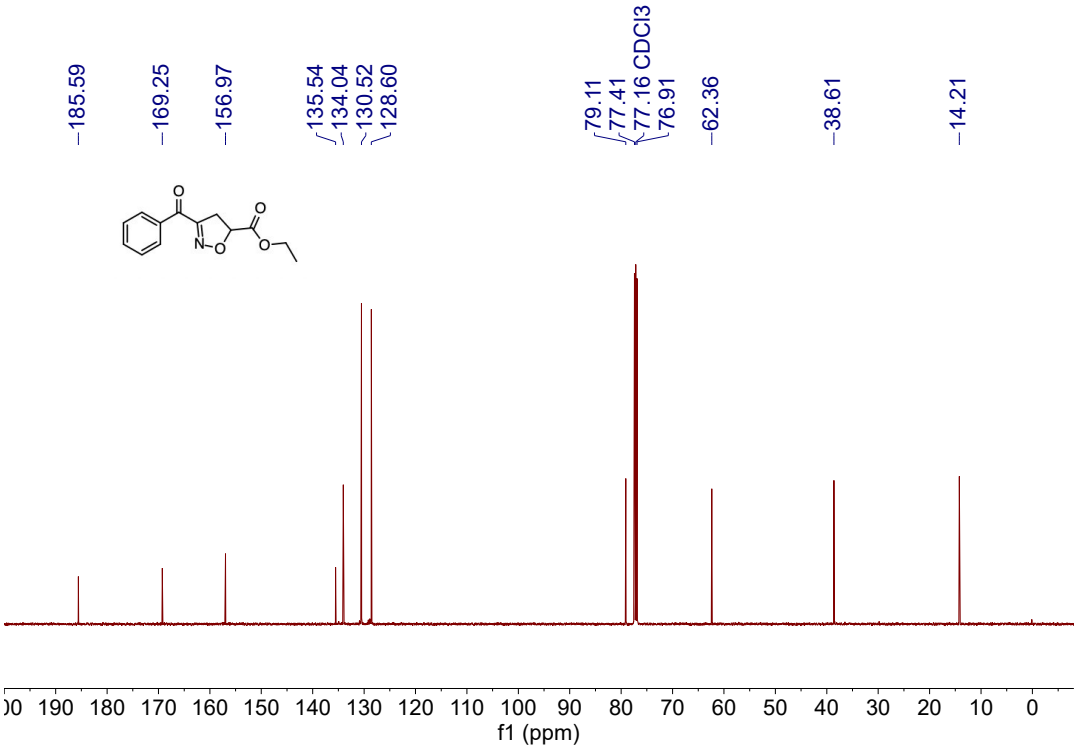
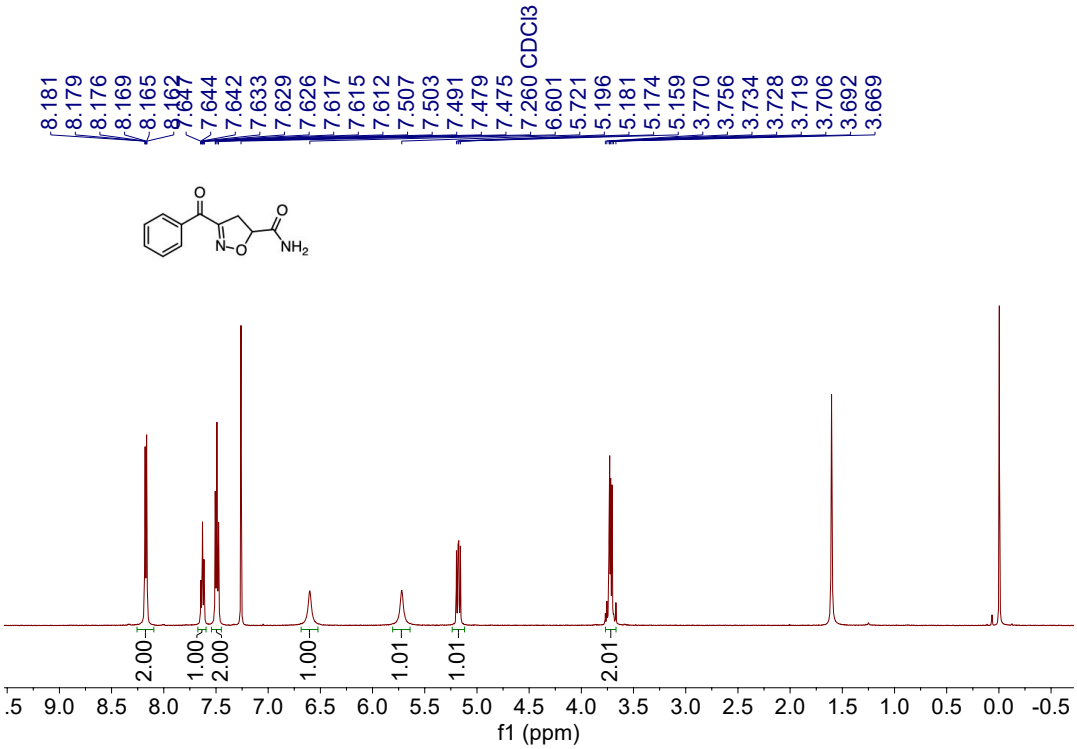
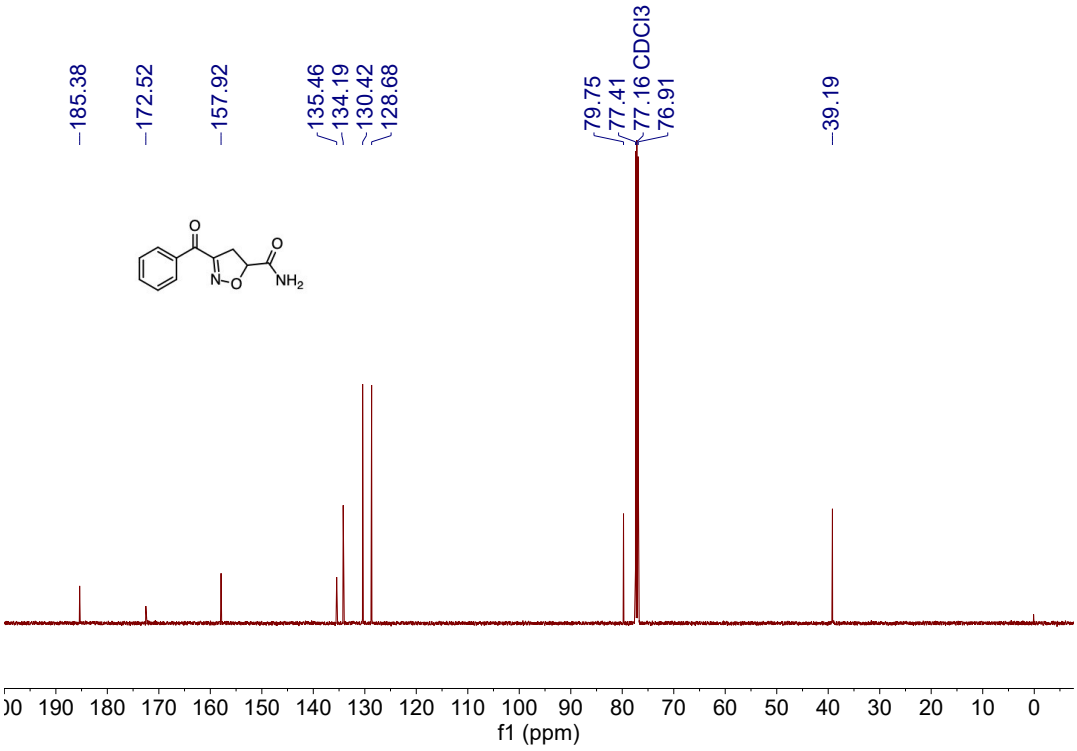
8.213
8.210
8.203
8.199
8.196
8.194
7.622
7.620
7.611
7.609
7.608
7.606
7.604
7.595
7.593
7.590
7.489
7.485
7.474
7.472
7.470
7.461
7.457
7.260 CDCl3
5.200
5.184
5.178
5.162
4.302
4.288
4.274
4.260
3.700
3.677
3.664
3.646
3.641
3.630
3.610
1.340
1.326
1.312
2.00
1.01
2.00
0.98
2.01
2.00
3.00
f1 (ppm)

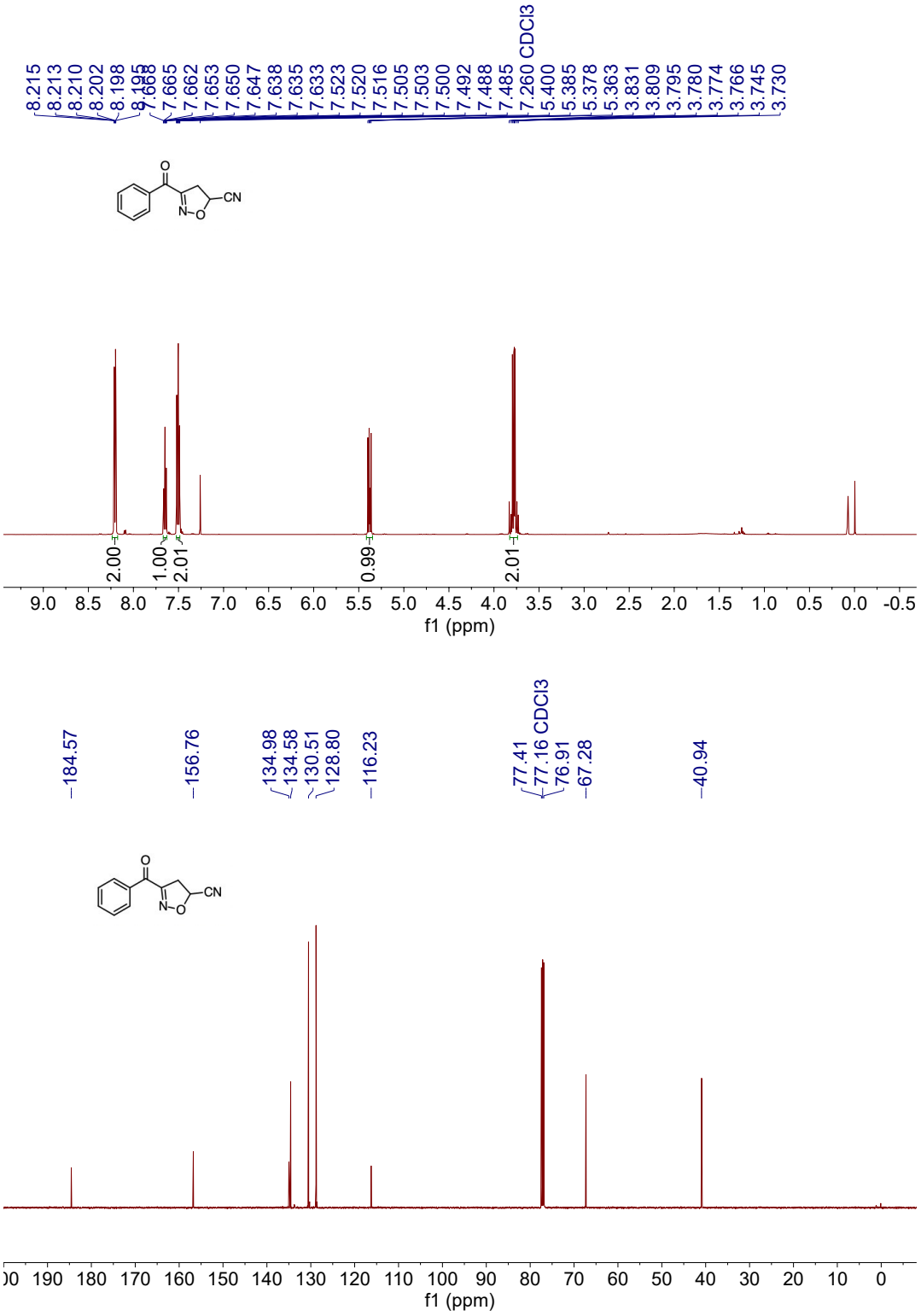

185.59
169.25
156.97
135.54
134.04
130.52
128.60
79.11
77.41
77.16 CDCl3
76.91
62.36
38.61
14.21
f1 (ppm)

5e

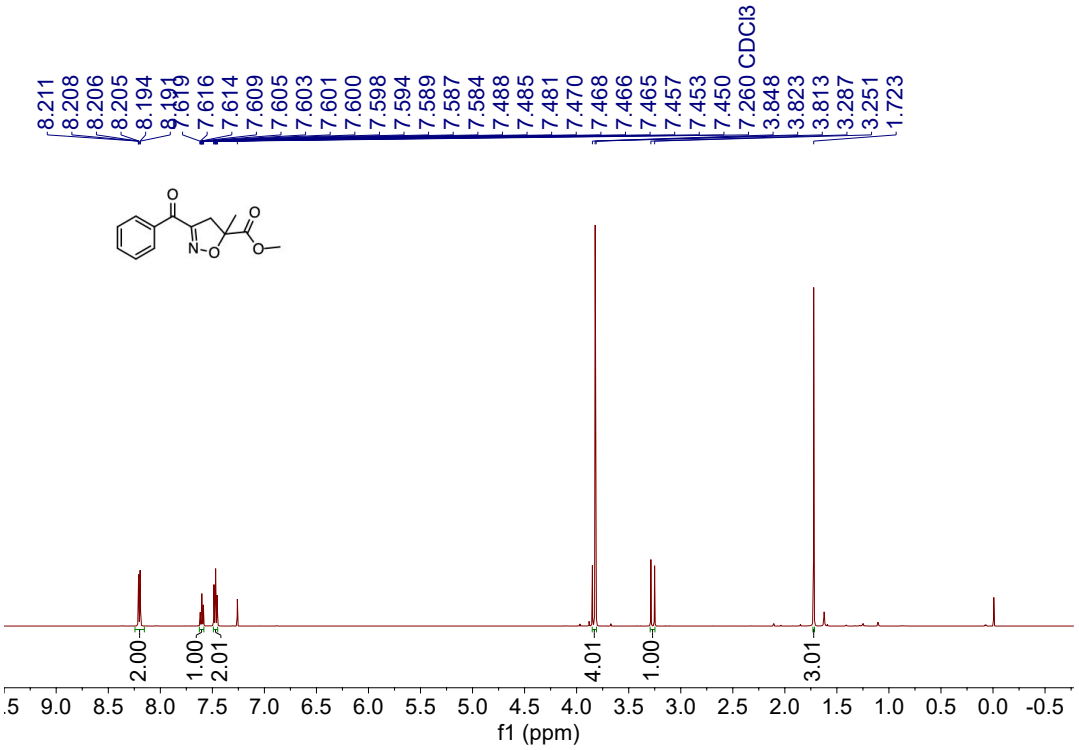

8.181
8.179
8.176
8.169
8.165
7.644
7.642
7.633
7.629
7.626
7.617
7.615
7.612
7.507
7.503
7.491
7.479
7.475
7.260 CDCl3
6.601
5.721
5.196
5.181
5.174
5.159
3.770
3.756
3.734
3.728
3.719
3.706
3.692
3.669
O
O
N
O
NH2
2.00
1.00
2.00
1.00
1.01
1.01
2.01
f1 (ppm)

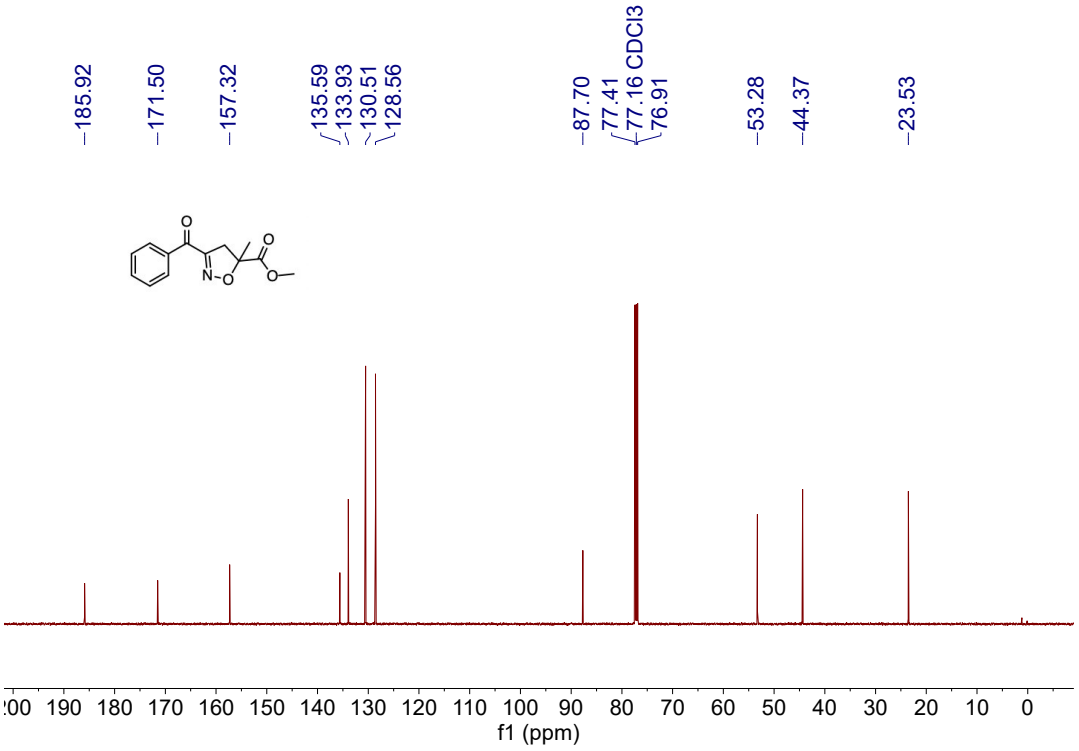

185.38
172.52
157.92
135.46
134.19
130.42
128.68
79.75
77.41
77.16 CDCl3
76.91
39.19
O
O
N
O
NH2
f1 (ppm)

5f

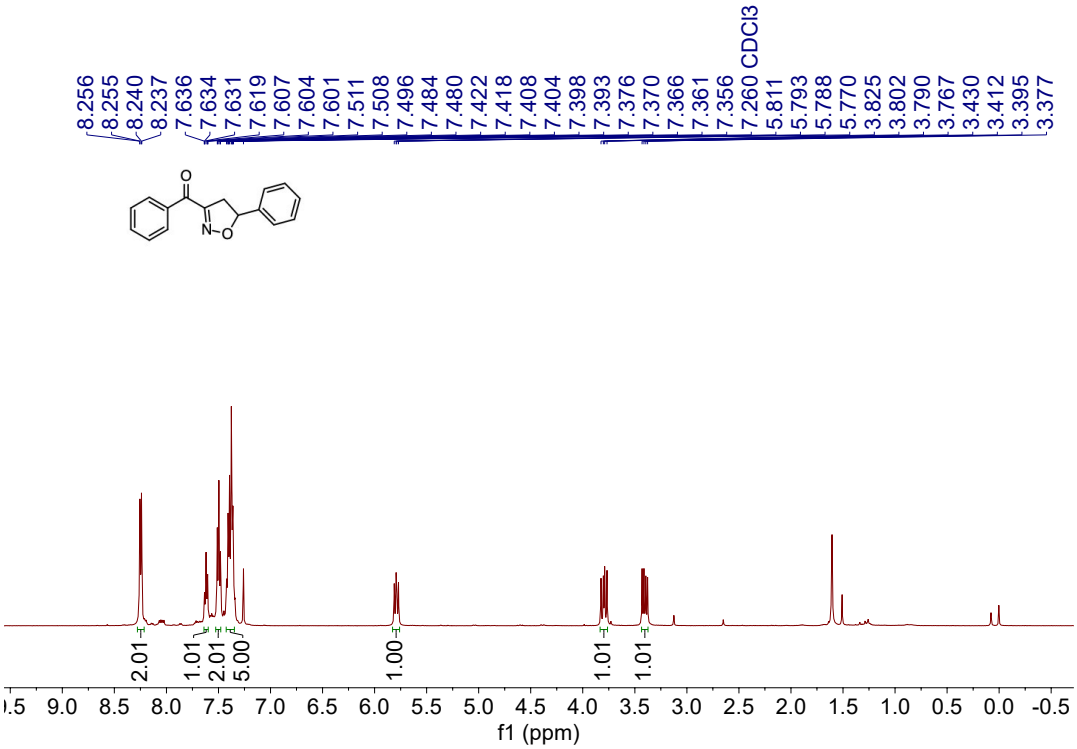

8.215
8.213
8.210
8.202
8.198
7.665
7.662
7.653
7.650
7.647
7.638
7.635
7.633
7.523
7.520
7.516
7.505
7.503
7.500
7.492
7.488
7.485
7.260 CDCl3
5.400
5.385
5.378
5.363
3.831
3.809
3.795
3.780
3.774
3.766
3.745
3.730
O
N
O
CN
2.00
1.00
2.01
0.99
2.01
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)
184.57
156.76
134.98
134.58
130.51
128.80
116.23
77.41
77.16 CDCl3
76.91
67.28
40.94
O
N
O
CN
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

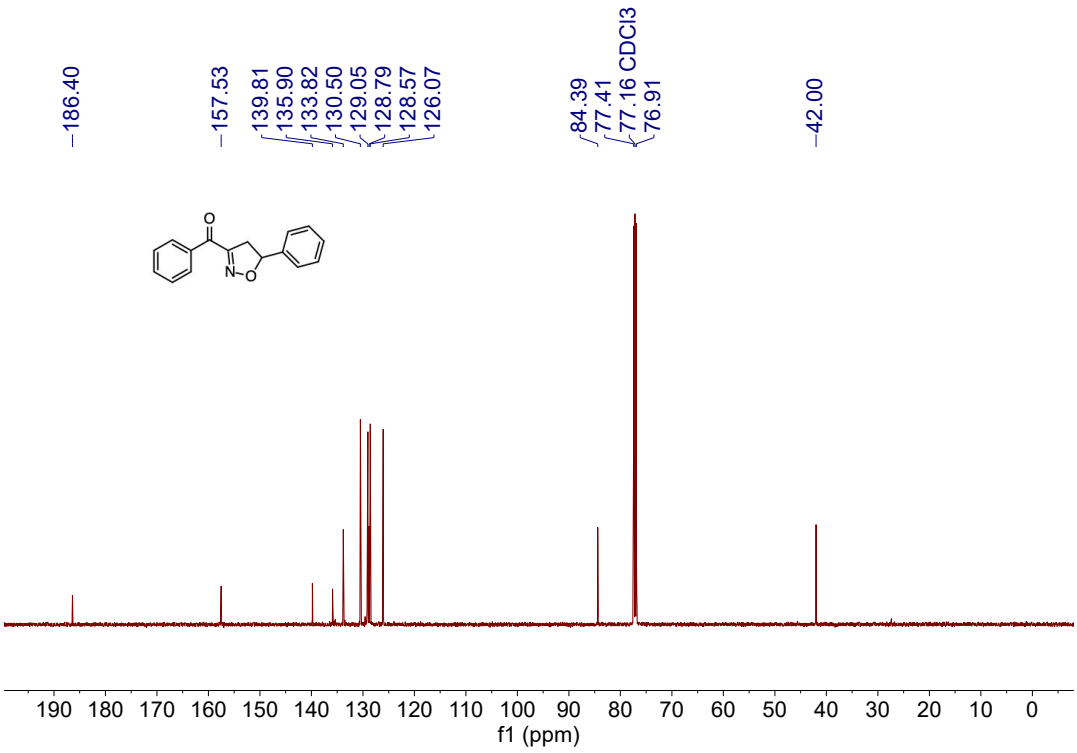
5g


8.211
8.208
8.206
8.205
8.194
8.191
8.179
7.616
7.614
7.609
7.605
7.603
7.601
7.600
7.598
7.594
7.589
7.587
7.584
7.488
7.485
7.481
7.470
7.468
7.466
7.465
7.457
7.453
7.450
7.260 CDCl3
3.848
3.823
3.813
3.287
3.251
1.723
2.00
1.00
2.01
4.01
1.00
3.01
f1 (ppm)

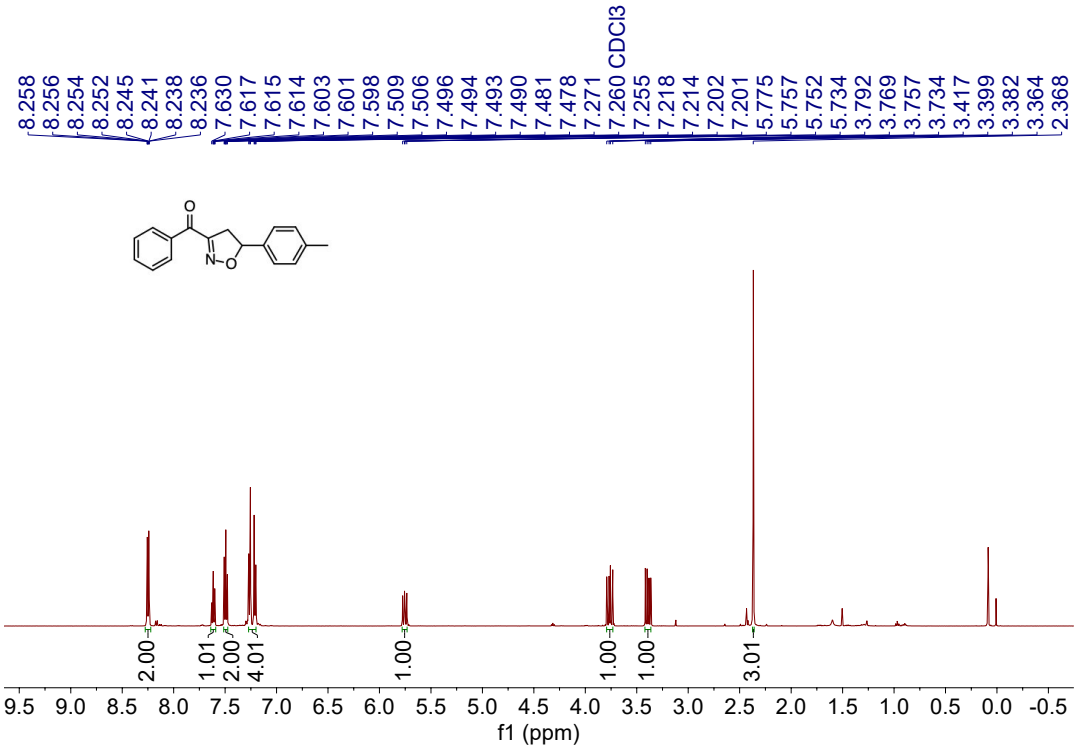

185.92
171.50
157.32
135.59
133.93
130.51
128.56
87.70
77.41
77.16 CDCl3
76.91
53.28
44.37
23.53
f1 (ppm)

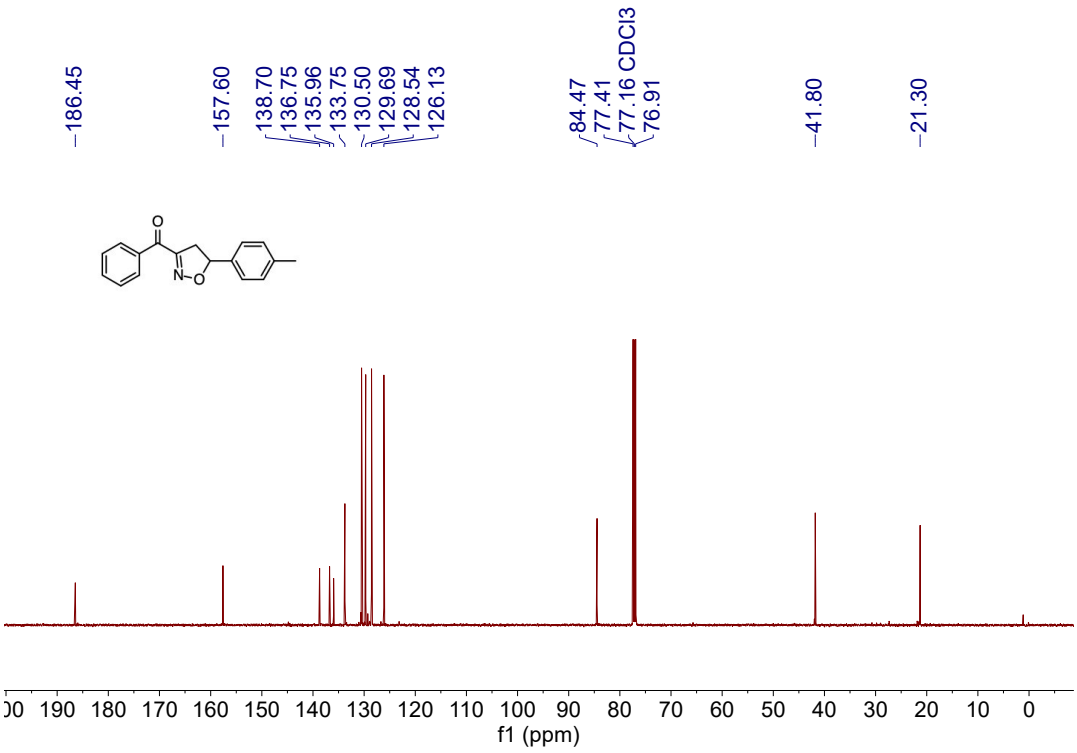
5h


8.256
8.255
8.240
8.237
7.636
7.634
7.631
7.619
7.607
7.604
7.601
7.511
7.508
7.496
7.484
7.480
7.422
7.418
7.408
7.404
7.398
7.393
7.376
7.370
7.366
7.361
7.356
7.260 CDCl3
5.811
5.793
5.788
5.770
3.825
3.802
3.790
3.767
3.430
3.412
3.395
3.377
O
N
O
2.01
1.01
2.01
5.00
1.00
1.01
1.01
f1 (ppm)

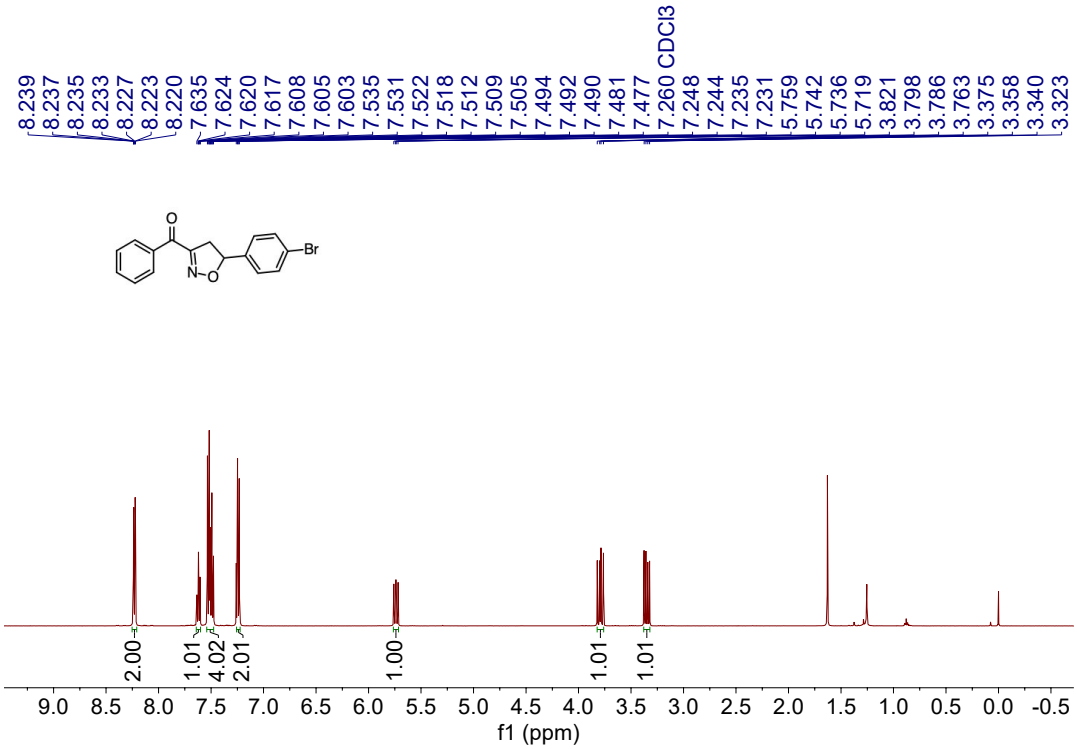

186.40
157.53
139.81
135.90
133.82
130.50
129.05
128.79
128.57
126.07
84.39
77.41
77.16 CDCl3
76.91
42.00
O
N
O
f1 (ppm)

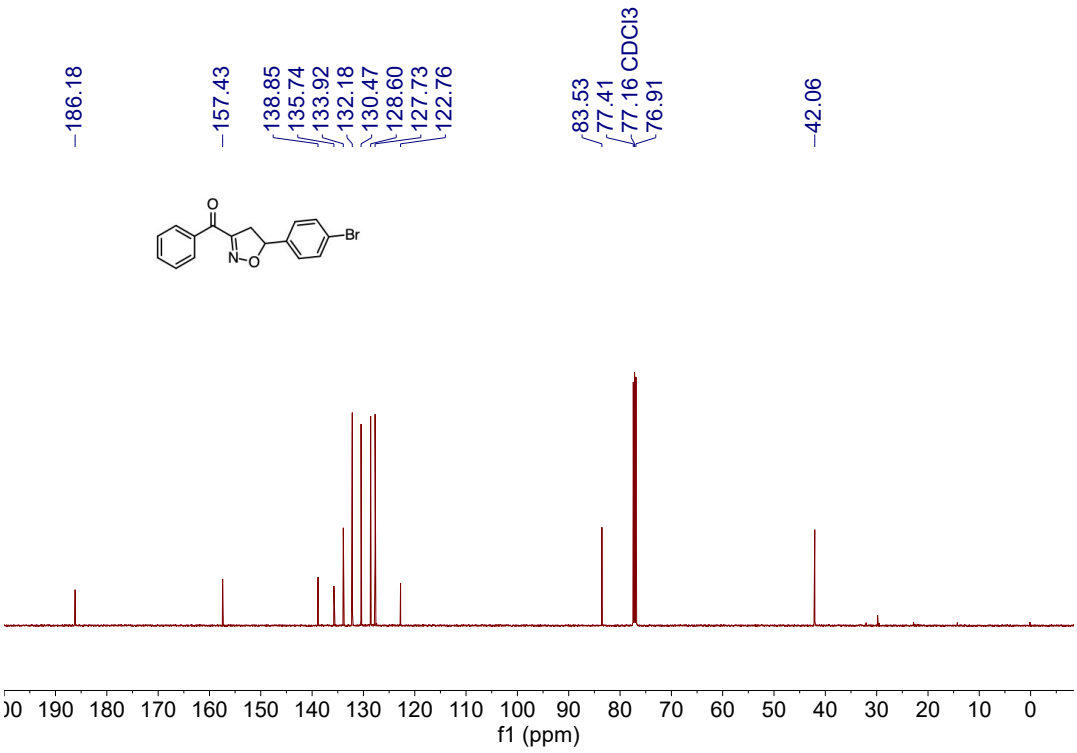
5i


8.258
8.256
8.254
8.252
8.245
8.241
8.238
8.236
7.630
7.617
7.615
7.614
7.603
7.601
7.598
7.509
7.506
7.496
7.494
7.493
7.490
7.481
7.478
7.271
7.260 CDCl3
7.255
7.218
7.214
7.202
7.201
5.775
5.757
5.752
5.734
3.792
3.769
3.757
3.734
3.417
3.399
3.382
3.364
2.368
O
N
O
2.00
1.01
2.00
4.01
1.00
1.00
1.00
3.01
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)

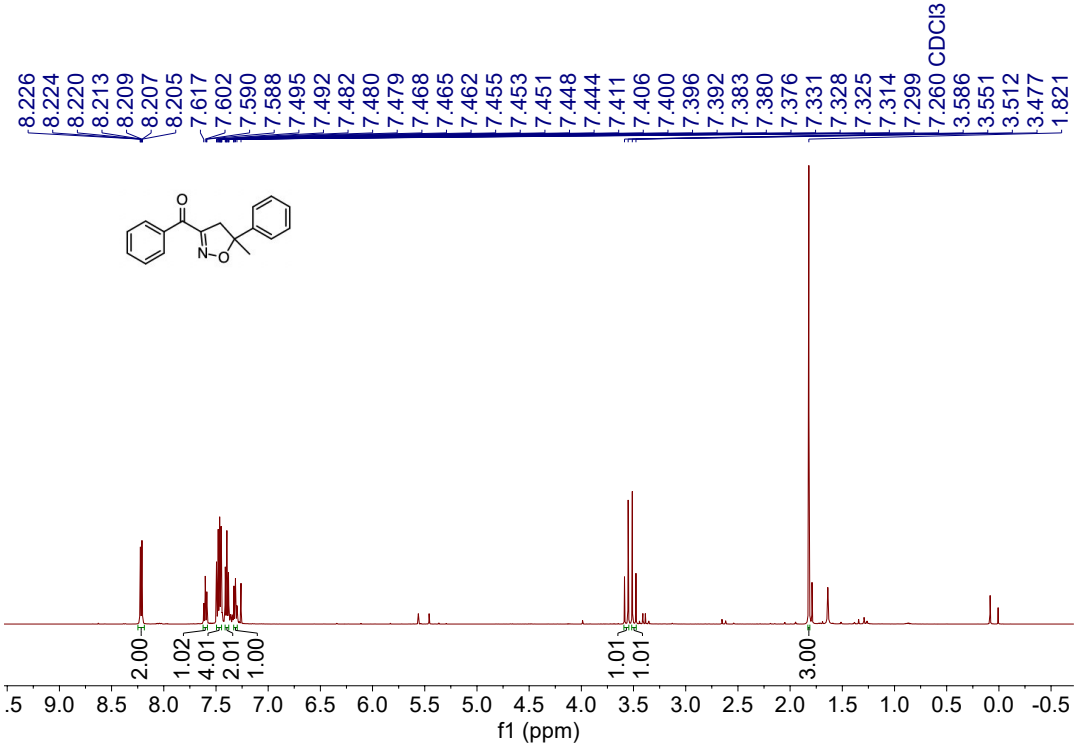

186.45
157.60
138.70
136.75
135.96
133.75
130.50
129.69
128.54
126.13
84.47
77.41
77.16 CDCl3
76.91
41.80
21.30
O
N
O
00 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

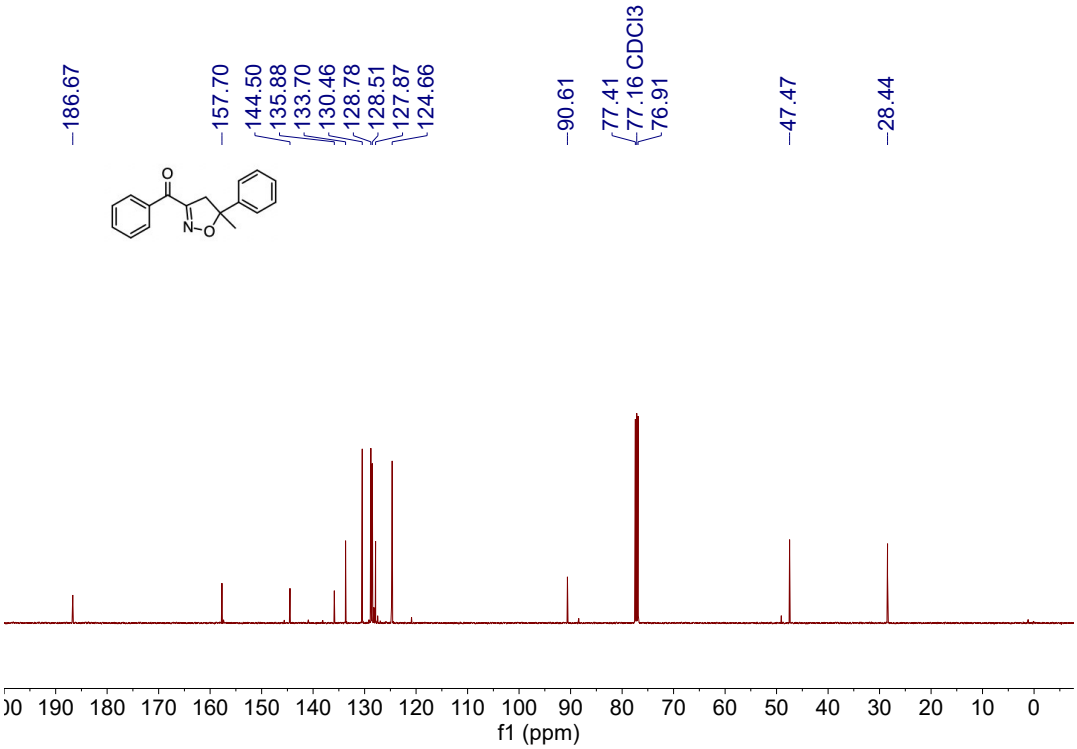
5j


8.239
8.237
8.235
8.233
8.227
8.223
8.220
7.635
7.624
7.620
7.617
7.608
7.605
7.603
7.535
7.531
7.522
7.518
7.512
7.509
7.505
7.494
7.492
7.490
7.481
7.477
7.260 CDCl3
7.248
7.244
7.235
7.231
5.759
5.742
5.736
5.719
3.821
3.798
3.786
3.763
3.375
3.358
3.340
3.323
O
N
O
Br
2.00
1.01
4.02
2.01
1.00
1.01
1.01
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)

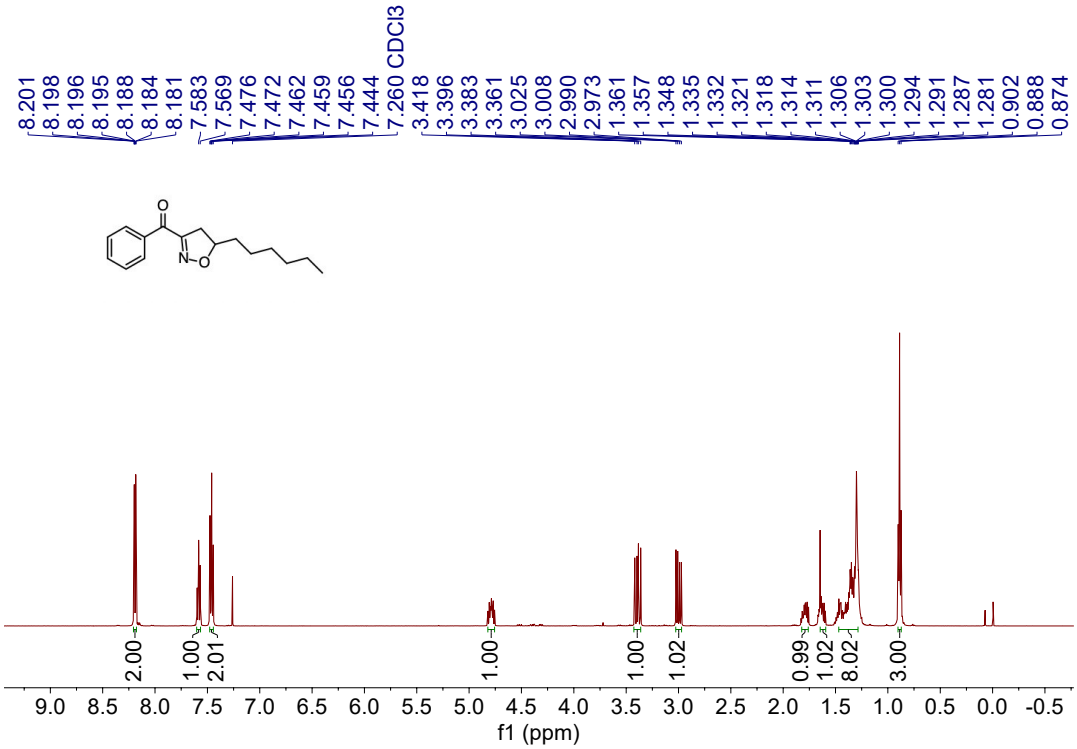

186.18
157.43
138.85
135.74
133.92
132.18
130.47
128.60
127.73
122.76
83.53
77.41
77.16 CDCl3
76.91
42.06
O
N
O
Br
00 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

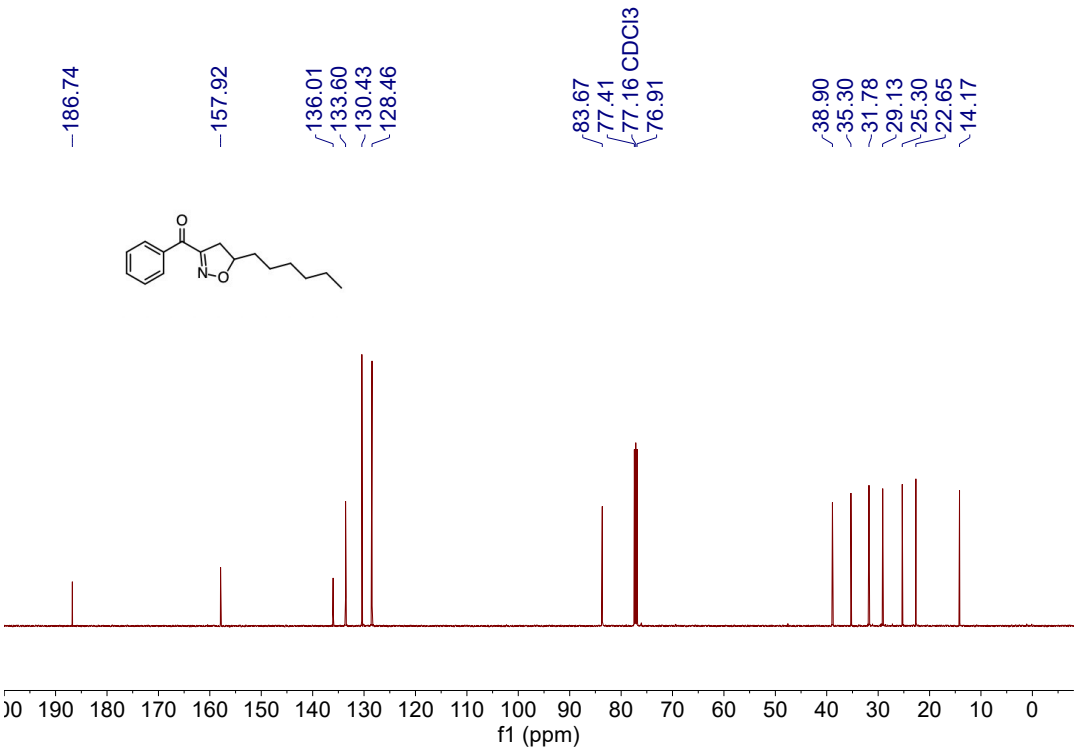
5k


8.226
8.224
8.220
8.213
8.209
8.207
8.205
7.617
7.602
7.590
7.588
7.495
7.492
7.482
7.480
7.479
7.468
7.465
7.462
7.455
7.453
7.451
7.448
7.444
7.411
7.406
7.400
7.396
7.392
7.383
7.380
7.376
7.331
7.328
7.325
7.314
7.299
7.260 CDCl3
3.586
3.551
3.512
3.477
1.821
2.00
1.02
4.01
2.01
1.00
1.01
1.01
3.00
f1 (ppm)

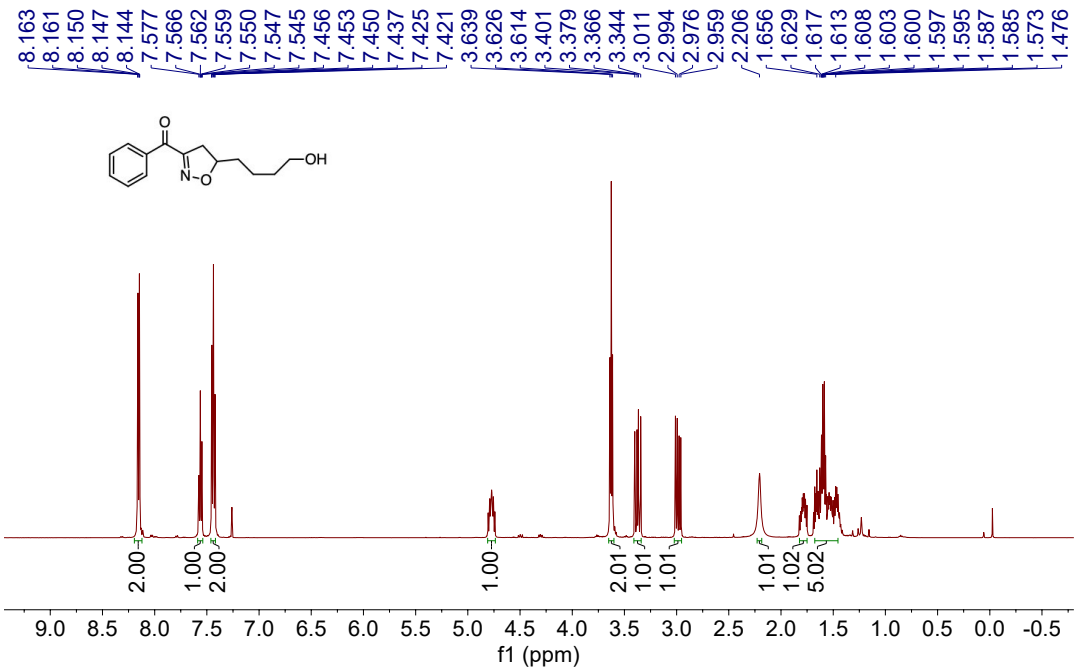

186.67
157.70
144.50
135.88
133.70
130.46
128.78
128.51
127.87
124.66
90.61
77.41
77.16 CDCl3
76.91
47.47
28.44
f1 (ppm)

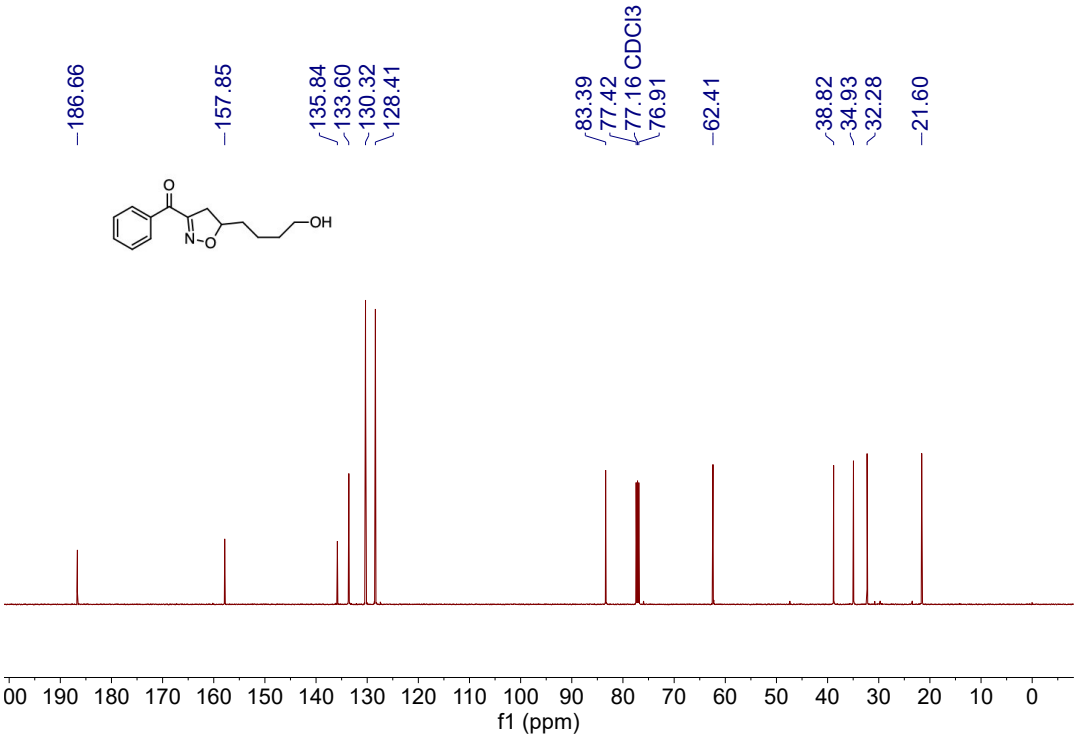
5l


8.201
8.198
8.196
8.195
8.188
8.184
8.181
7.583
7.569
7.476
7.472
7.462
7.459
7.456
7.444
7.260 CDCl3
3.418
3.396
3.383
3.361
3.025
3.008
2.990
2.973
1.361
1.357
1.348
1.335
1.332
1.321
1.318
1.314
1.311
1.306
1.303
1.300
1.294
1.291
1.287
1.281
0.902
0.888
0.874
O
N
O
2.00
1.00
2.01
1.00
1.00
1.02
0.99
1.02
8.02
3.00
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)

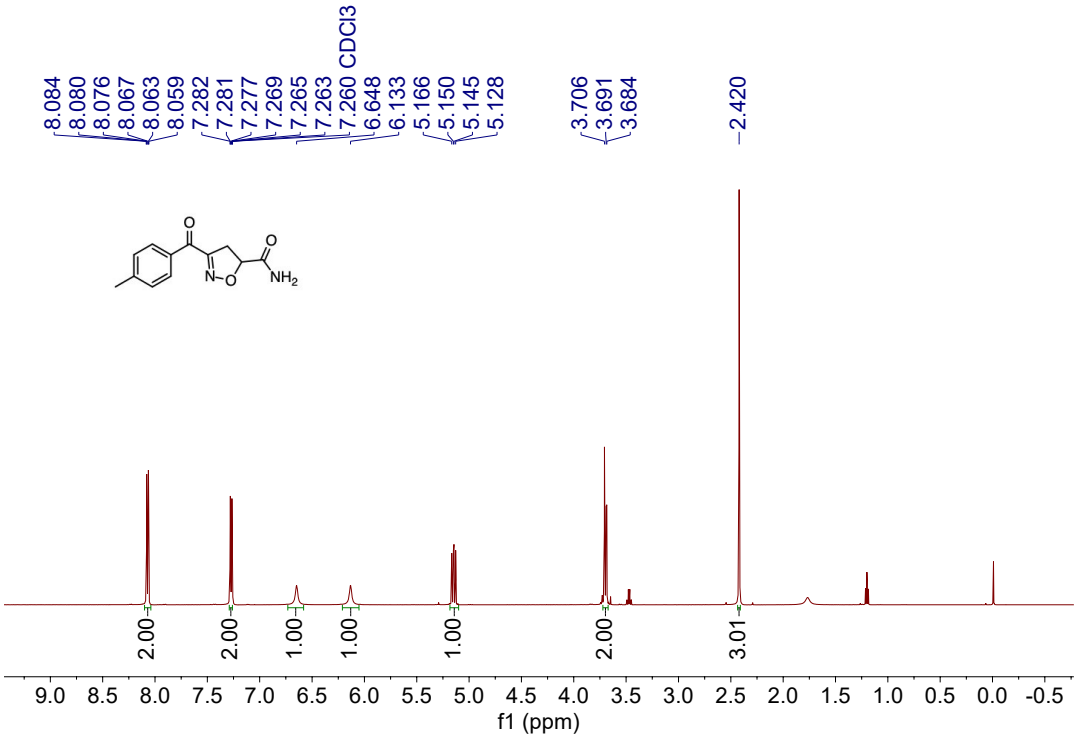

186.74
157.92
136.01
133.60
130.43
128.46
83.67
77.41
77.16 CDCl3
76.91
38.90
35.30
31.78
29.13
25.30
22.65
14.17
O
N
O
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

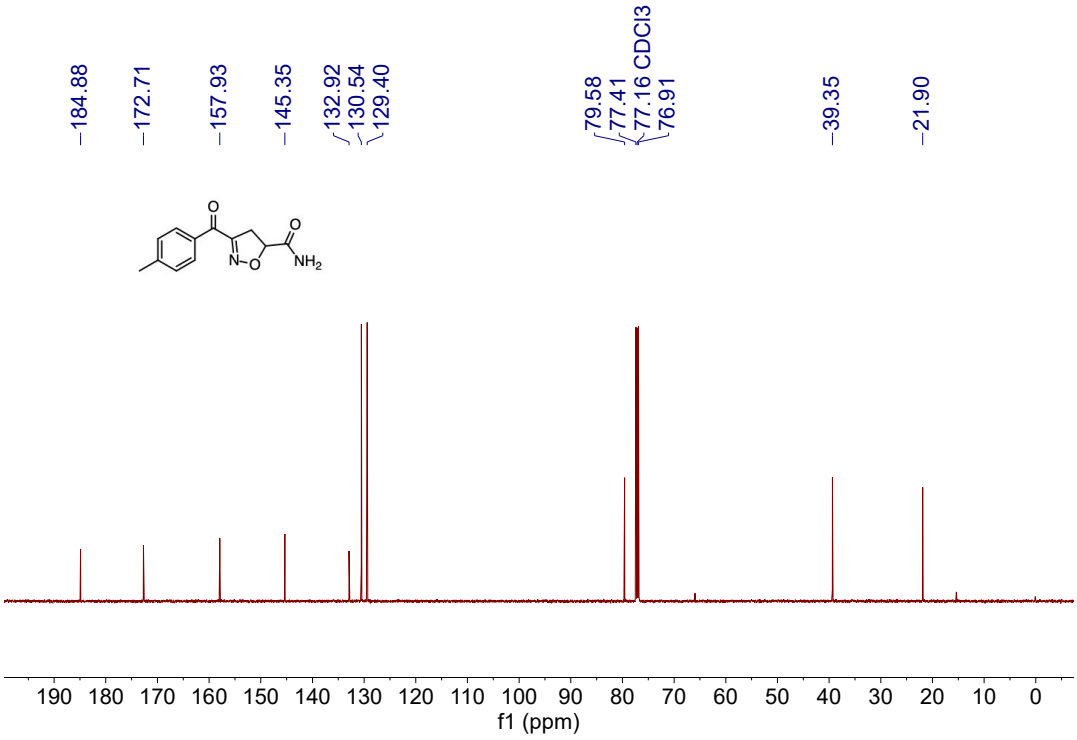
5m


8.163
8.161
8.150
8.147
8.144
7.577
7.566
7.562
7.559
7.550
7.547
7.545
7.456
7.453
7.450
7.437
7.425
7.421
3.639
3.626
3.614
3.401
3.379
3.366
3.344
3.011
2.994
2.976
2.959
2.206
1.656
1.629
1.617
1.613
1.608
1.603
1.600
1.597
1.595
1.587
1.585
1.573
1.476
O
N
O
OH
2.00
1.00
2.00
1.00
2.01
1.01
1.01
1.01
1.02
5.02
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)

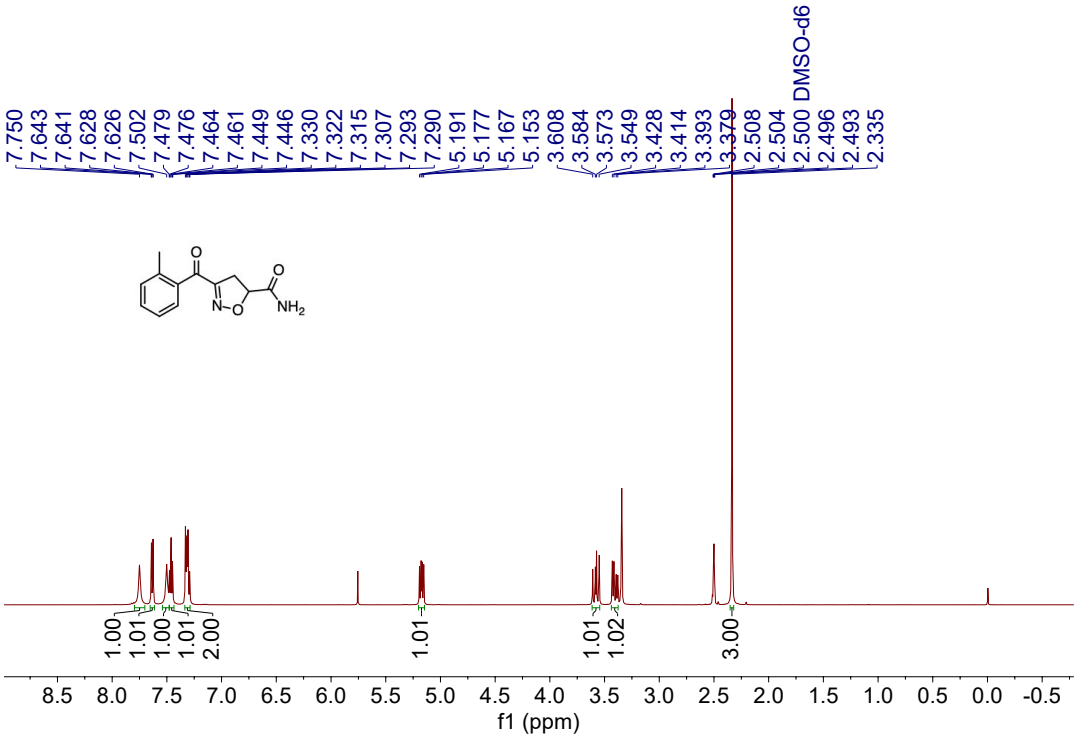

186.66
157.85
135.84
133.60
130.32
128.41
83.39
77.42
77.16 CDCl3
76.91
62.41
38.82
34.93
32.28
21.60
O
N
O
OH
00 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

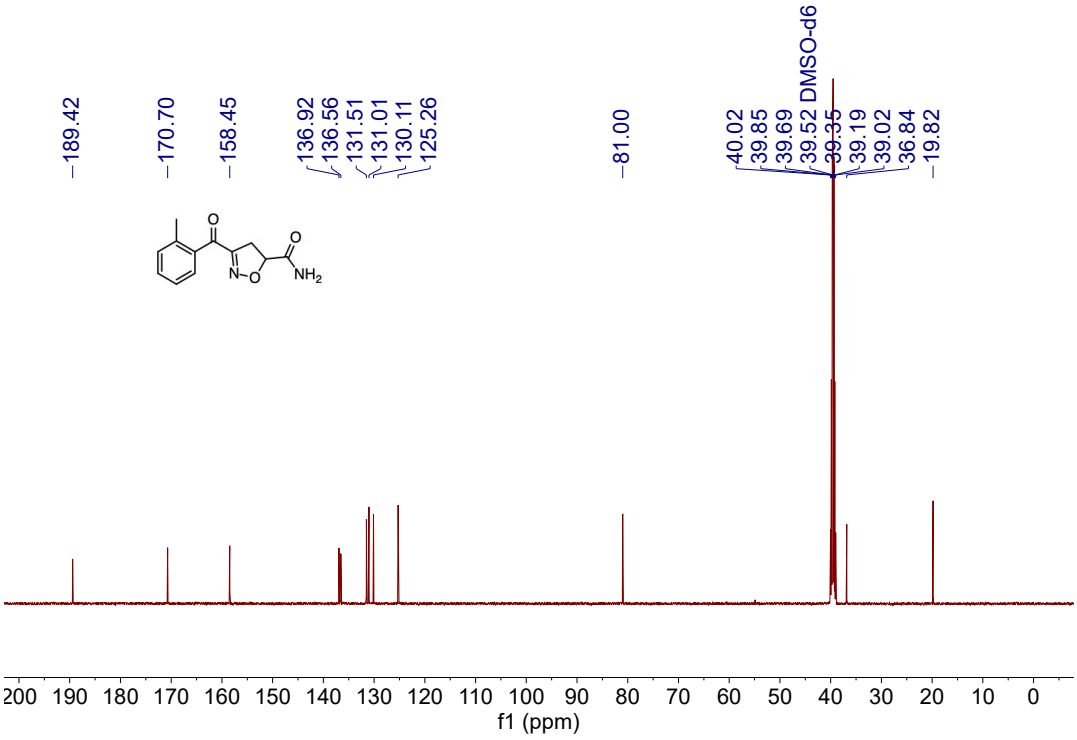
5n


8.084
8.080
8.076
8.067
8.063
8.059
7.282
7.281
7.277
7.269
7.265
7.263
7.260 CDCl3
6.648
6.133
5.166
5.150
5.145
5.128
3.706
3.691
3.684
2.420
O
O
N
O
NH2
2.00
2.00
1.00
1.00
1.00
2.00
3.01
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)

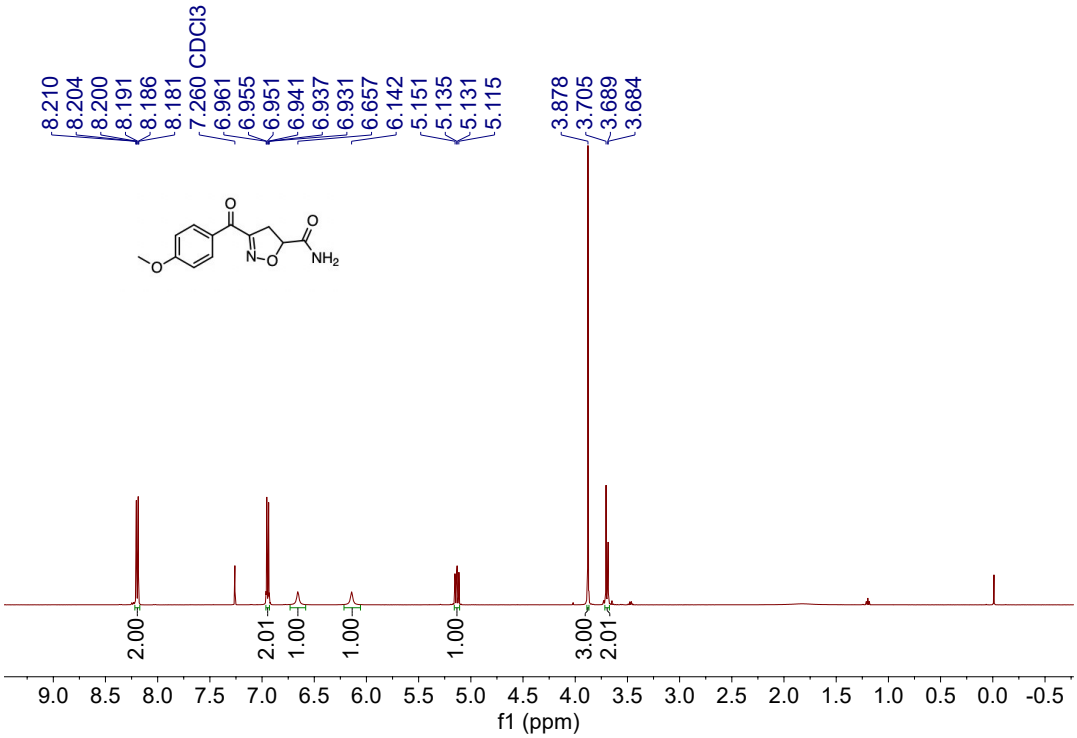

184.88
172.71
157.93
145.35
132.92
130.54
129.40
79.58
77.41
77.16 CDCl3
76.91
39.35
21.90
O
O
N
O
NH2
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

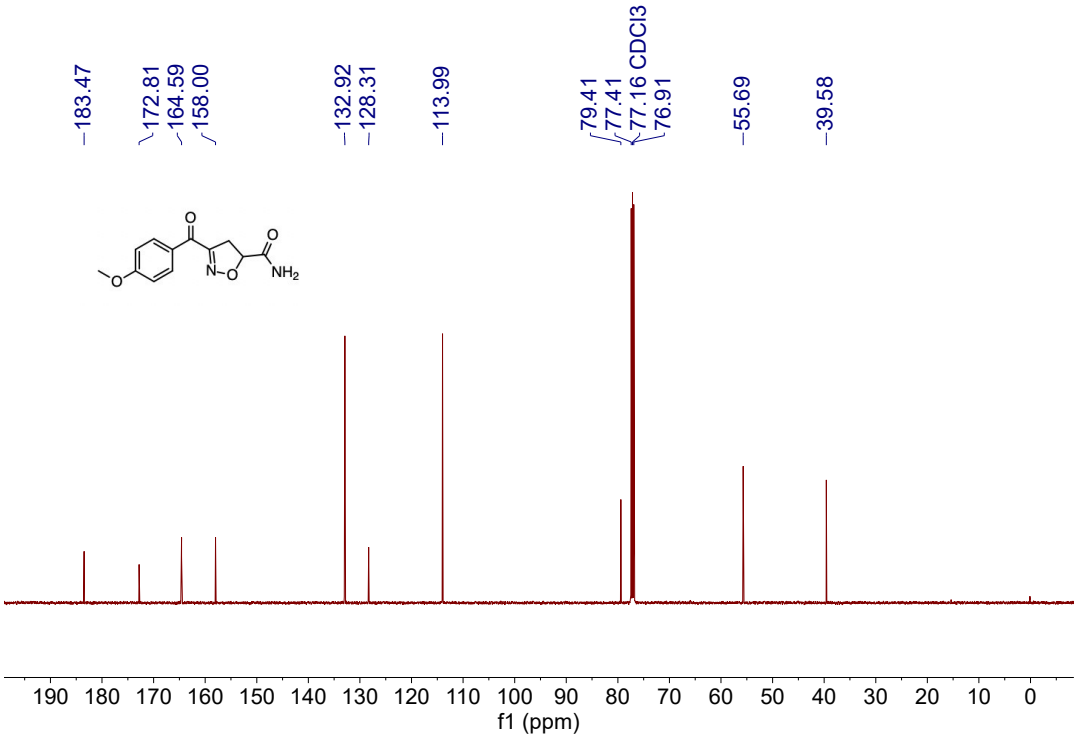
5o


7.750
7.643
7.641
7.628
7.626
7.502
7.479
7.476
7.464
7.461
7.449
7.446
7.330
7.322
7.315
7.307
7.293
7.290
5.191
5.177
5.167
5.153
3.608
3.584
3.573
3.549
3.428
3.414
3.393
3.379
2.508
2.504
2.500 DMSO-d6
2.496
2.493
2.335
O
O
N
O
NH2
1.00
1.01
1.00
1.01
2.00
1.01
1.01
1.02
3.00
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)

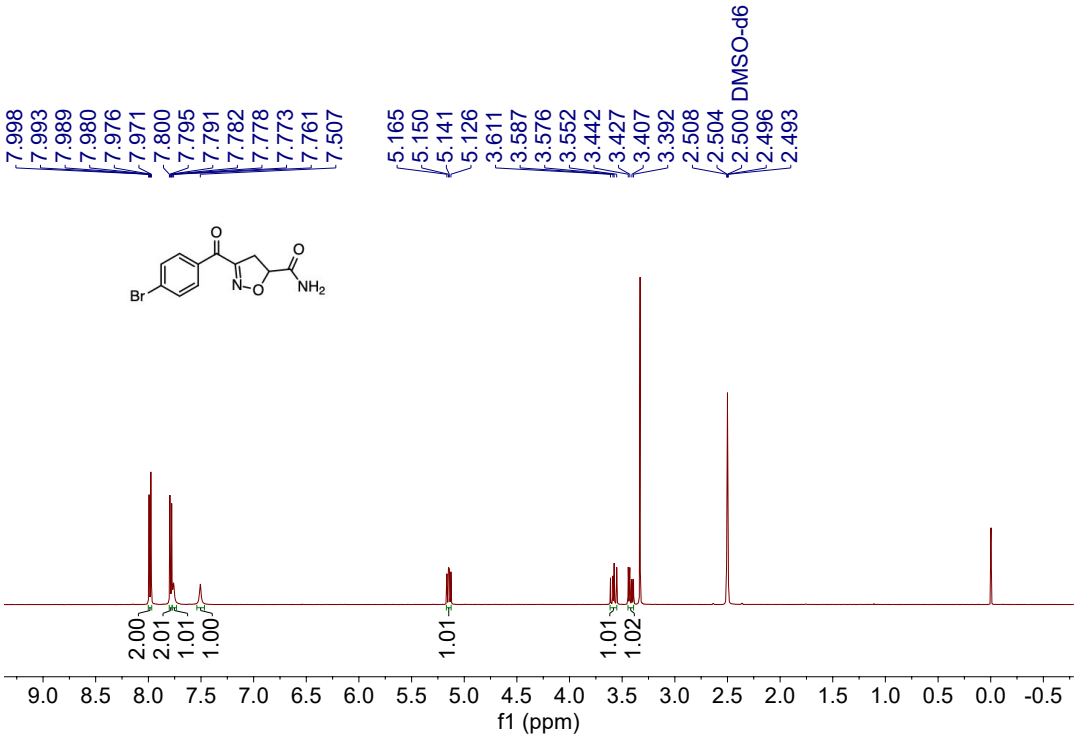

189.42
170.70
158.45
136.92
136.56
131.51
131.01
130.11
125.26
81.00
40.02
39.85
39.69
39.52 DMSO-d6
39.35
39.19
39.02
36.84
19.82
O
O
N
O
NH2
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

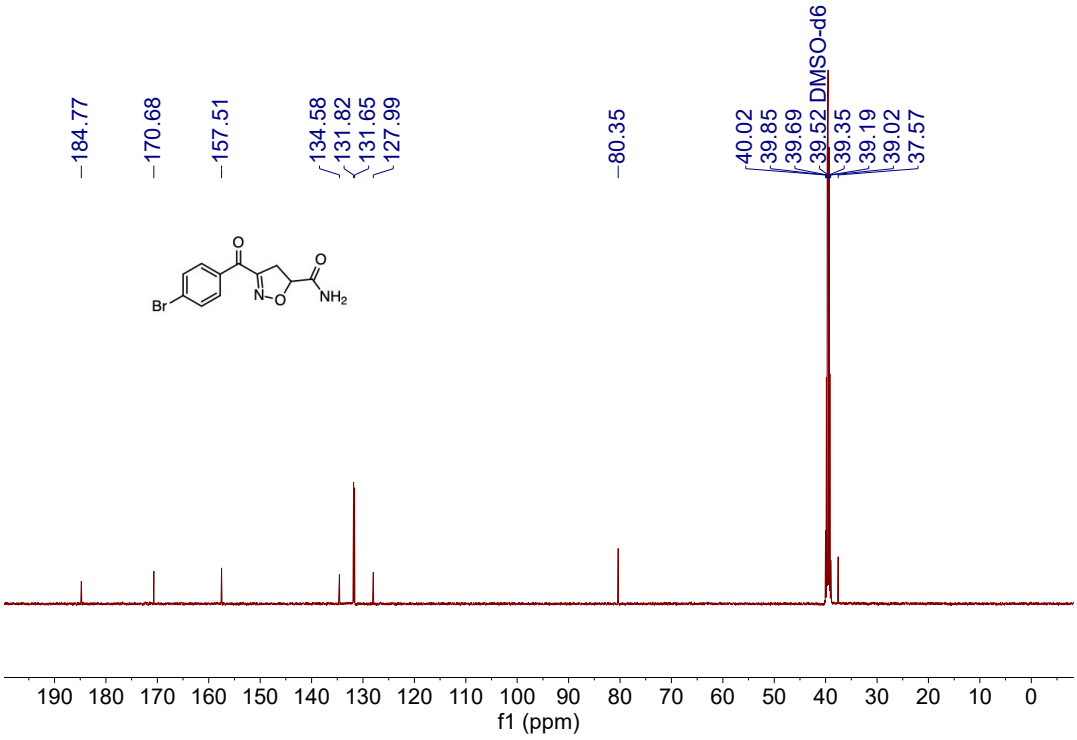
5p


8.210
8.204
8.200
8.191
8.186
8.181
7.260 CDCl3
6.961
6.955
6.951
6.941
6.937
6.931
6.657
6.142
5.151
5.135
5.131
5.115
3.878
3.705
3.689
3.684
O
O
N
O
NH2
O
2.00
2.01
1.00
1.00
1.00
3.00
2.01
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)

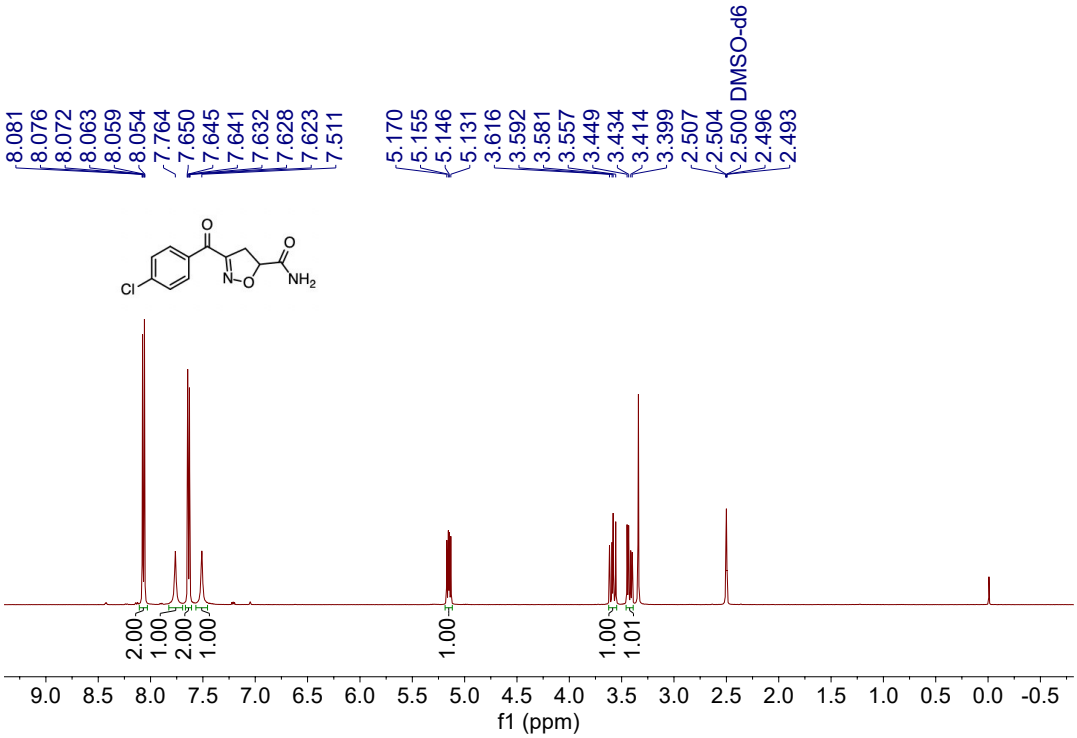

183.47
172.81
164.59
158.00
132.92
128.31
113.99
79.41
77.41
77.16 CDCl3
76.91
55.69
39.58
O
O
N
O
NH2
O
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

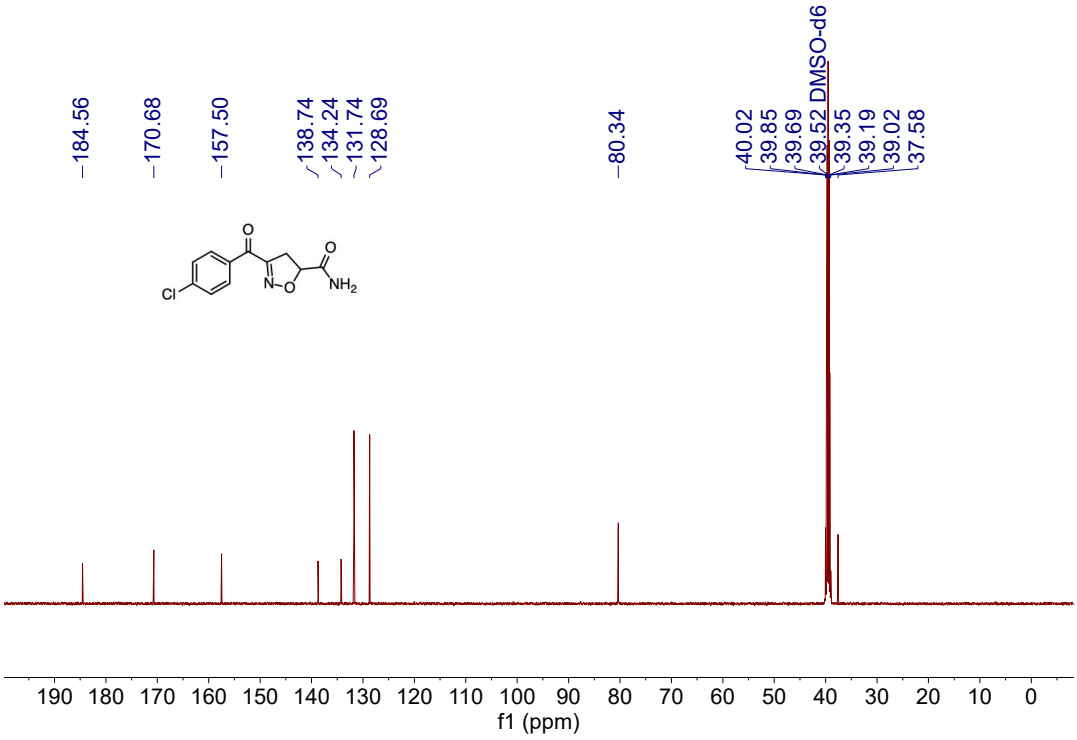
5q


7.998
7.993
7.989
7.980
7.976
7.971
7.800
7.795
7.791
7.782
7.778
7.773
7.761
7.507
5.165
5.150
5.141
5.126
3.611
3.587
3.576
3.552
3.442
3.427
3.407
3.392
2.508
2.504
2.500 DMSO-d6
2.496
2.493
Br
O
N
O
O
NH2
2.00
2.01
1.01
1.00
1.01
1.01
1.02
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)

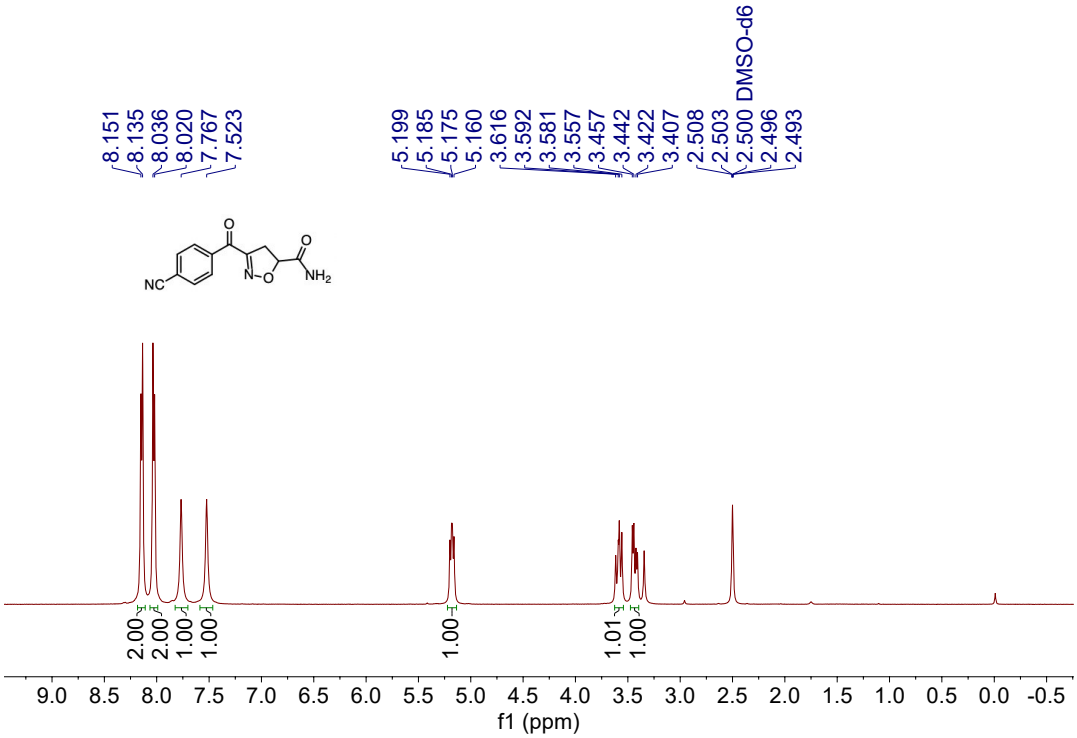

184.77
170.68
157.51
134.58
131.82
131.65
127.99
80.35
40.02
39.85
39.69
39.52 DMSO-d6
39.35
39.19
39.02
37.57
Br
O
N
O
O
NH2
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

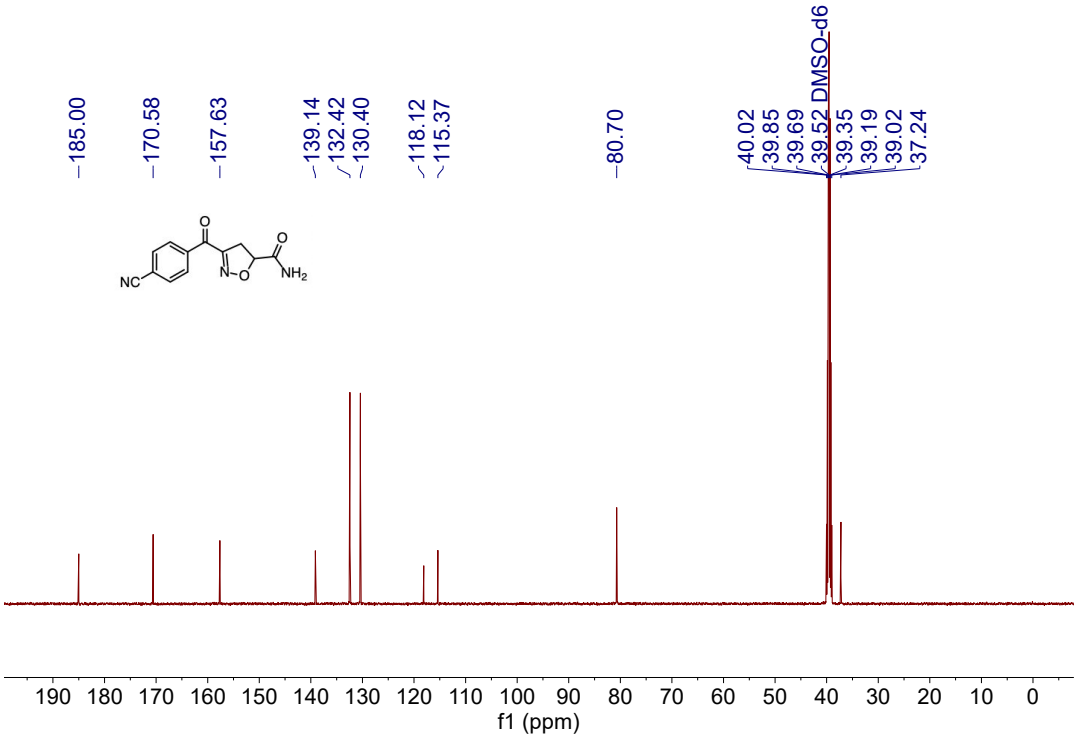
5r


8.081
8.076
8.072
8.063
8.059
8.054
7.764
7.650
7.645
7.641
7.632
7.628
7.623
7.511
5.170
5.155
5.146
5.131
3.616
3.592
3.581
3.557
3.449
3.434
3.414
3.399
2.507
2.504
2.500 DMSO-d6
2.496
2.493
Cl
O
N
O
O
NH2
2.00
1.00
2.00
1.00
1.00
1.00
1.01
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)

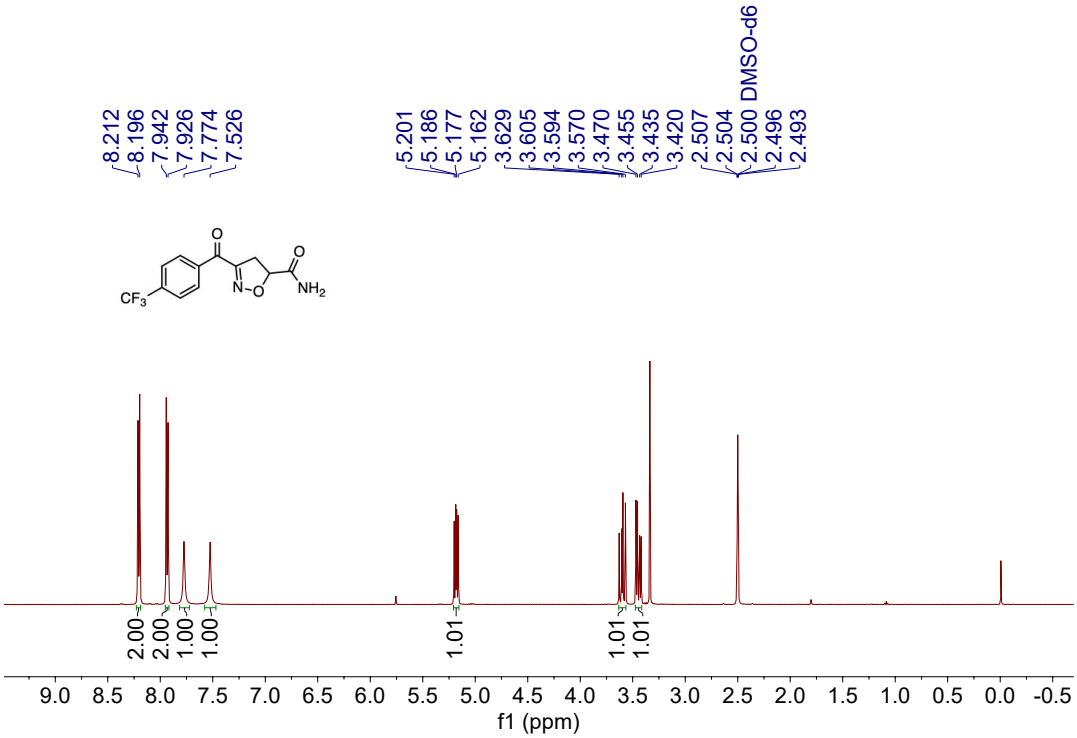

184.56
170.68
157.50
138.74
134.24
131.74
128.69
80.34
40.02
39.85
39.69
39.52 DMSO-d6
39.35
39.19
39.02
37.58
Cl
O
N
O
O
NH2
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

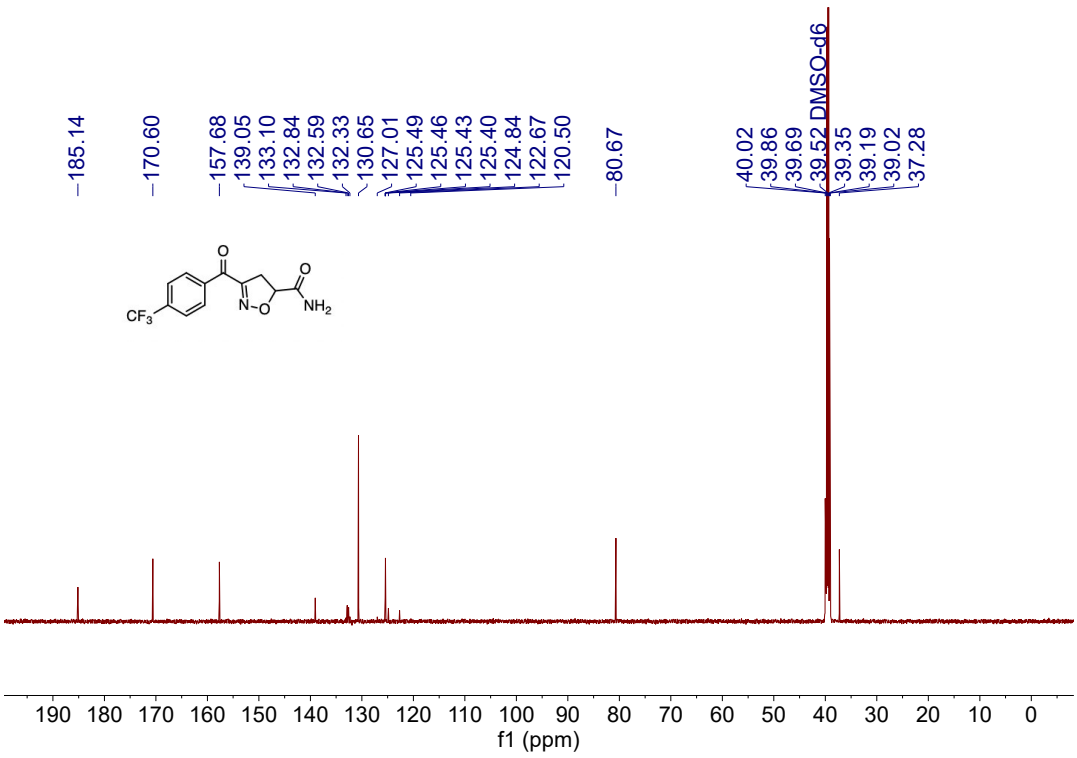
5s


8.151
8.135
8.036
8.020
7.767
7.523
5.199
5.185
5.175
5.160
3.616
3.592
3.581
3.557
3.457
3.442
3.422
3.407
2.508
2.503
2.500 DMSO-d6
2.496
2.493
NC
O
N
O
O
NH2
2.00
2.00
1.00
1.00
1.00
1.01
1.00
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)

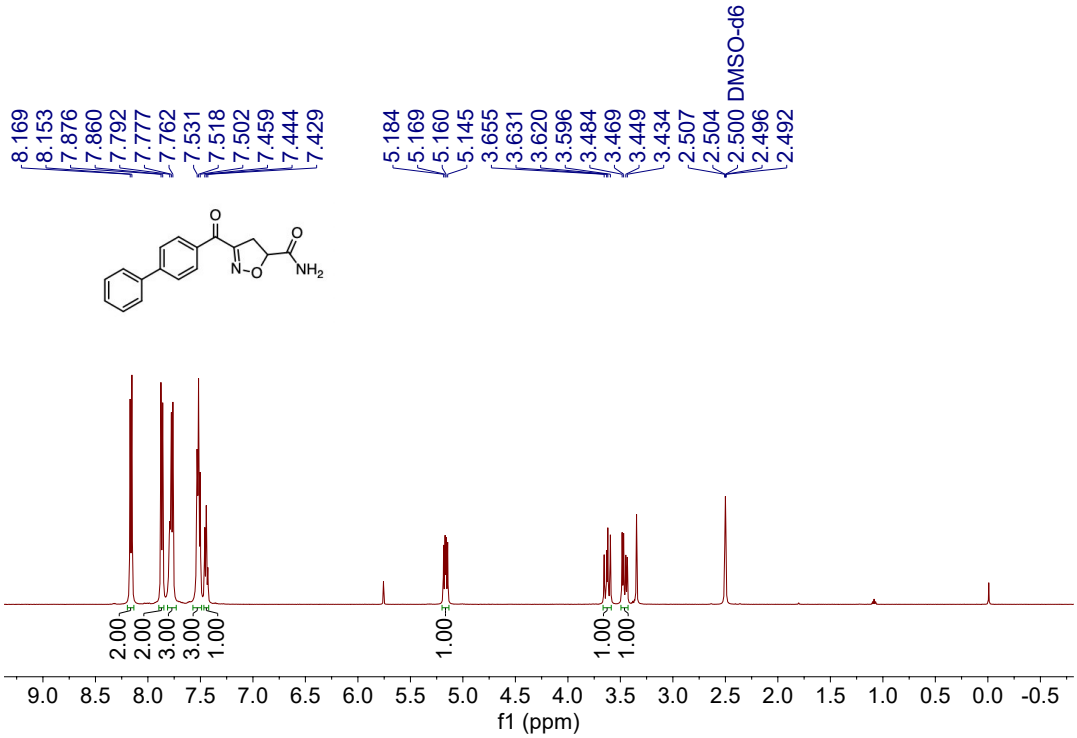

185.00
170.58
157.63
139.14
132.42
130.40
118.12
115.37
80.70
40.02
39.85
39.69
39.52 DMSO-d6
39.35
39.19
39.02
37.24
NC
O
N
O
O
NH2
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

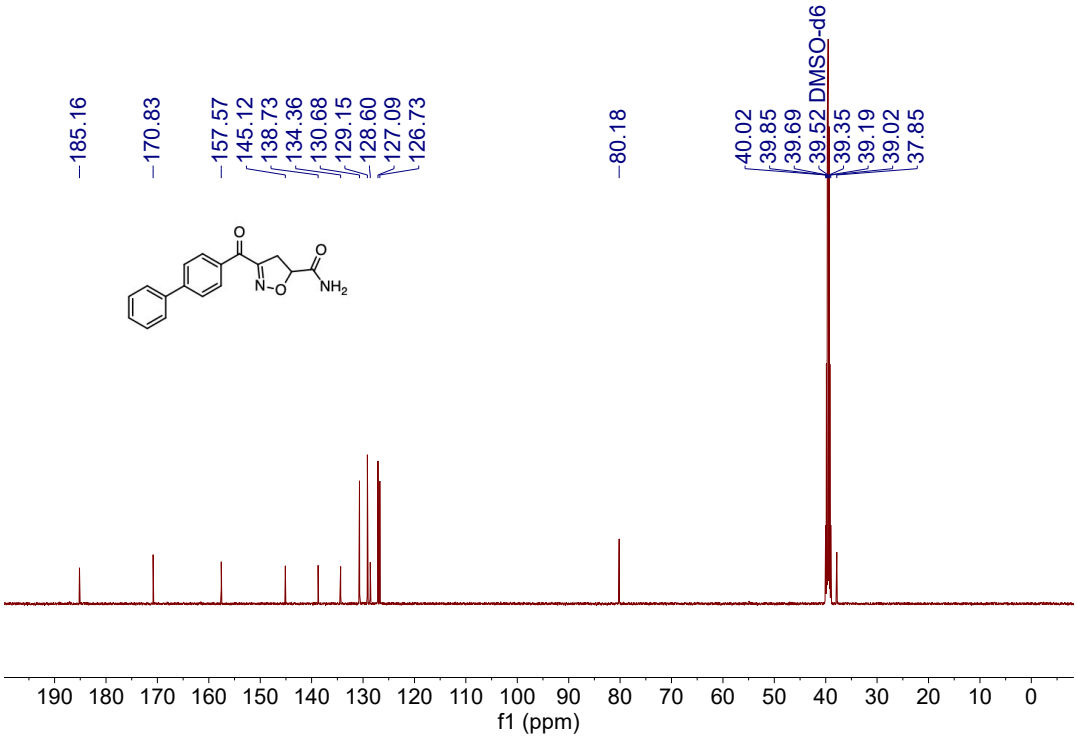
5t


8.212
8.196
7.942
7.926
7.774
7.526
5.201
5.186
5.177
5.162
3.629
3.605
3.594
3.570
3.470
3.455
3.435
3.420
2.507
2.504
2.500 DMSO-d6
2.496
2.493
O
O
N
O
NH2
CF3
2.00
2.00
1.00
1.00
1.01
1.01
1.01
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)

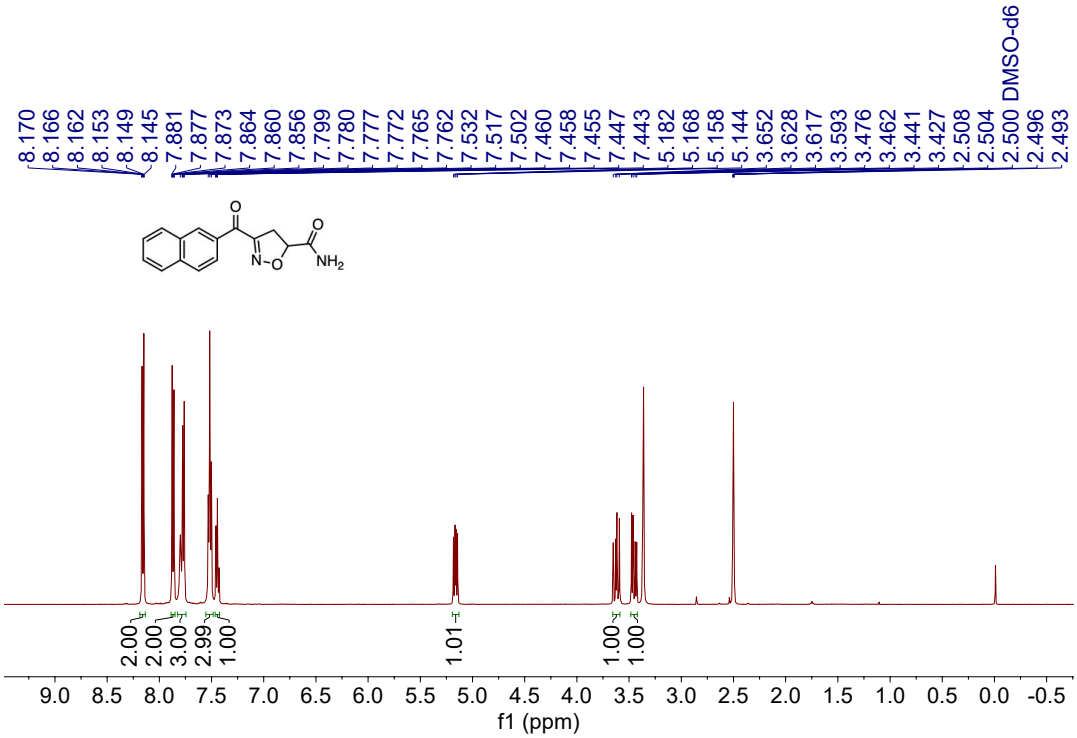

185.14
170.60
157.68
139.05
133.10
132.84
132.59
132.33
130.65
127.01
125.49
125.46
125.43
125.40
124.84
122.67
120.50
80.67
40.02
39.86
39.69
39.52 DMSO-d6
39.35
39.19
39.02
37.28
O
O
N
O
NH2
CF3
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

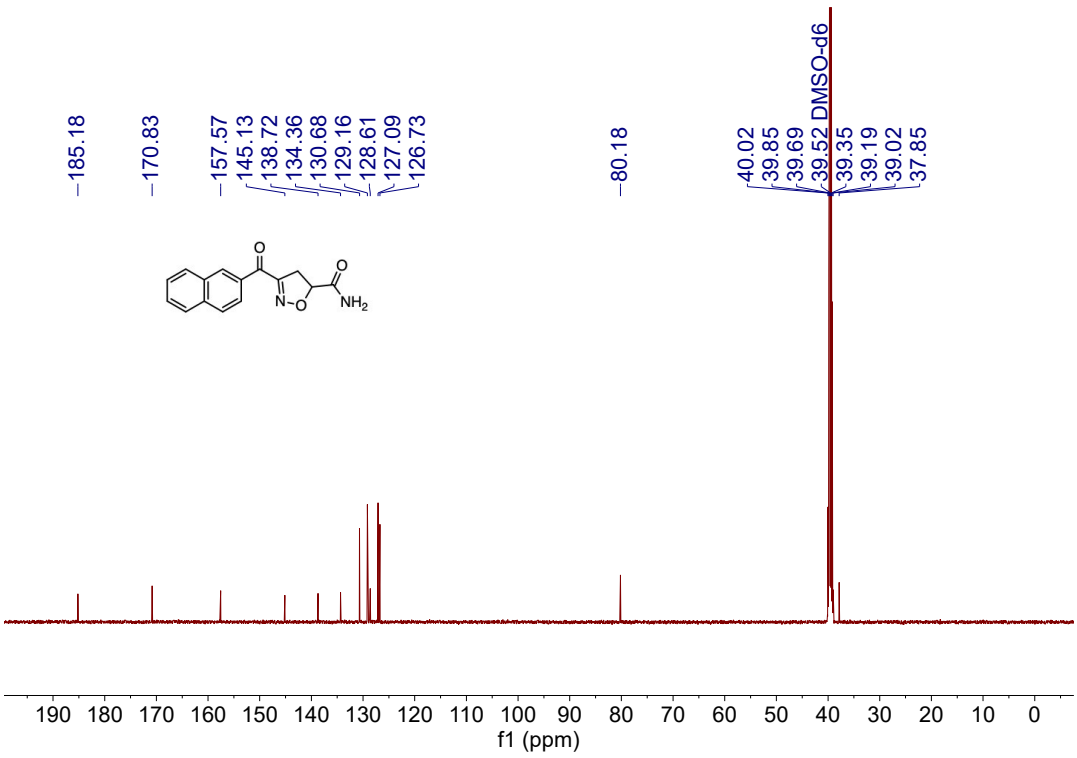
5u


8.169
8.153
7.876
7.860
7.792
7.777
7.762
7.531
7.518
7.502
7.459
7.444
7.429
5.184
5.169
5.160
5.145
3.655
3.631
3.620
3.596
3.484
3.469
3.449
3.434
2.507
2.504
2.500 DMSO-d6
2.496
2.492
O
N
O
O
NH2
2.00
2.00
3.00
3.00
1.00
1.00
1.00
1.00
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)

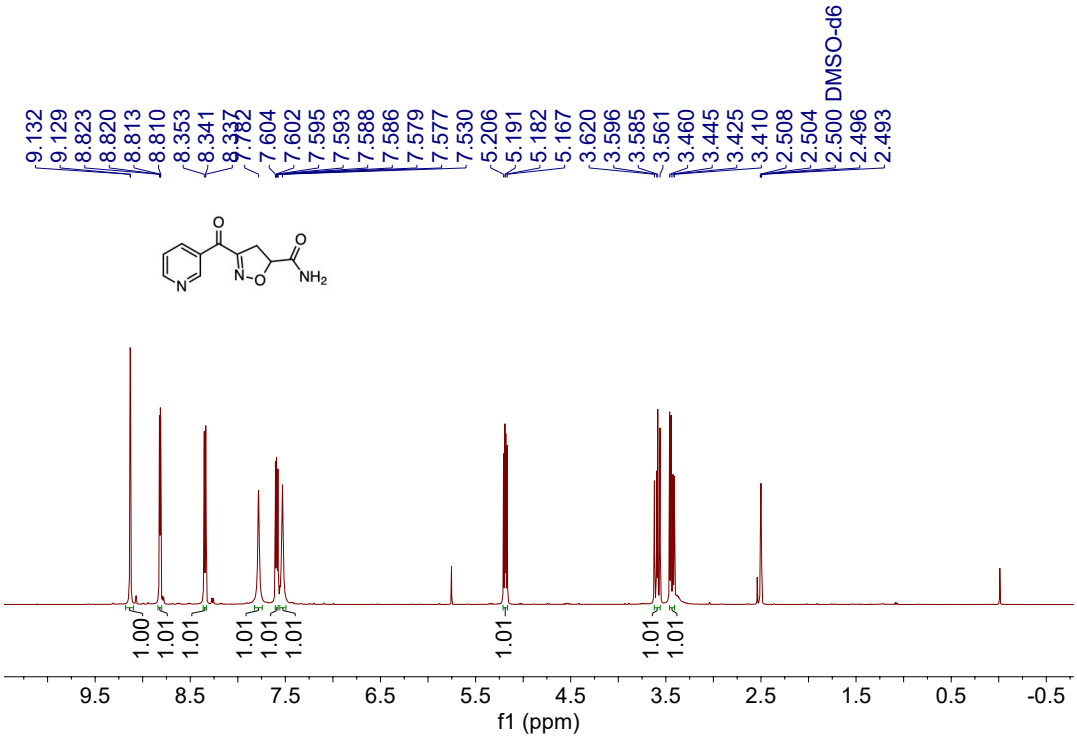

185.16
170.83
157.57
145.12
138.73
134.36
130.68
129.15
128.60
127.09
126.73
80.18
40.02
39.85
39.69
39.52 DMSO-d6
39.35
39.19
39.02
37.85
O
N
O
O
NH2
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

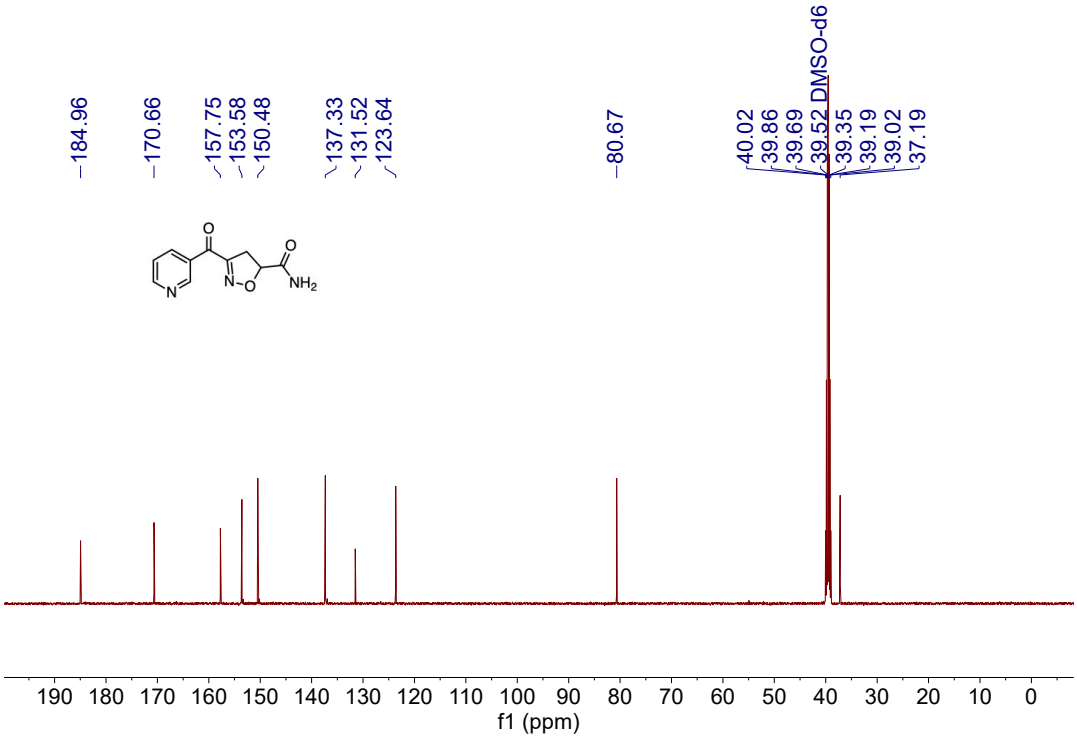
5v


8.170
8.166
8.162
8.153
8.149
8.145
7.881
7.877
7.873
7.864
7.860
7.856
7.799
7.780
7.777
7.772
7.765
7.762
7.532
7.517
7.502
7.460
7.458
7.455
7.447
7.443
5.182
5.168
5.158
5.144
3.652
3.628
3.617
3.593
3.476
3.462
3.441
3.427
2.508
2.504
2.500 DMSO-d6
2.496
2.493
O
O
N
O
NH2
2.00
2.00
3.00
2.99
1.00
1.01
1.00
1.00
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)

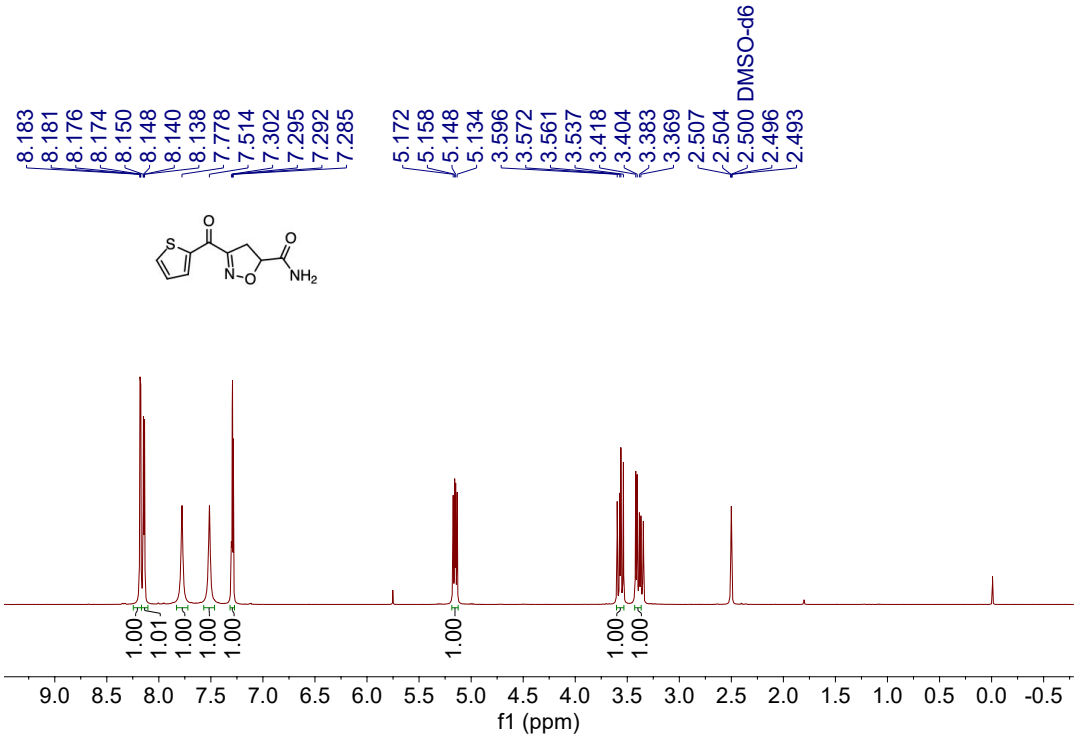

185.18
170.83
157.57
145.13
138.72
134.36
130.68
129.16
128.61
127.09
126.73
80.18
40.02
39.85
39.69
39.52 DMSO-d6
39.35
39.19
39.02
37.85
O
O
N
O
NH2
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

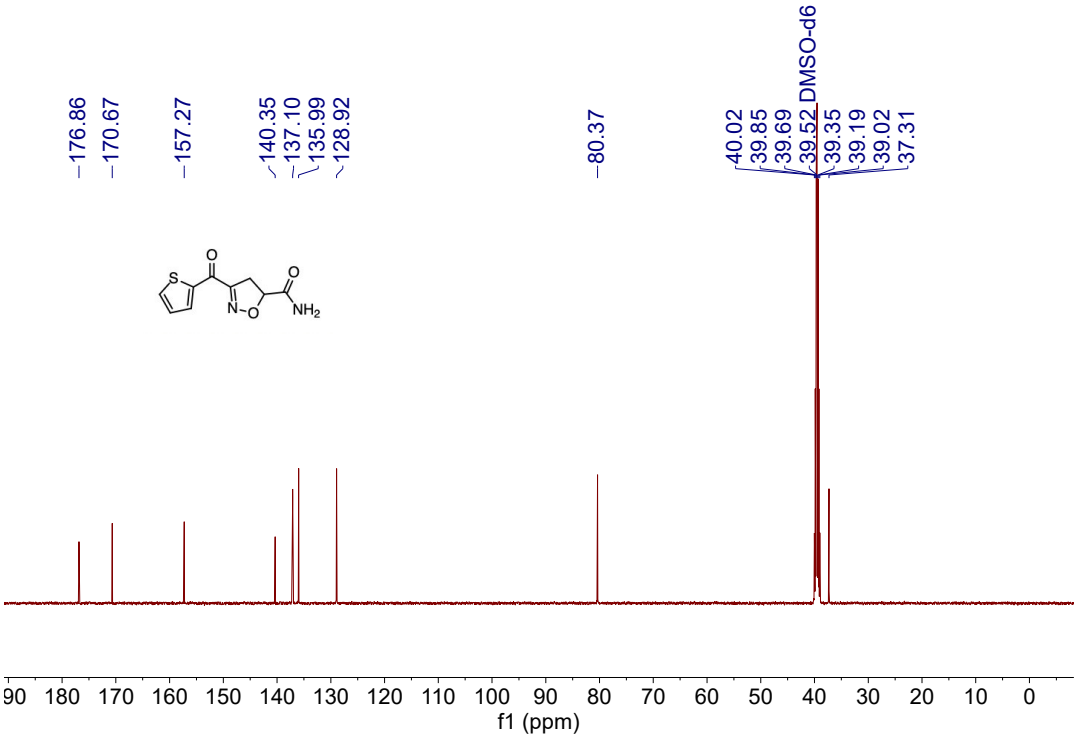
5w


9.132
9.129
8.823
8.820
8.813
8.810
8.353
8.341
7.782
7.604
7.602
7.595
7.593
7.588
7.586
7.579
7.577
7.530
5.206
5.191
5.182
5.167
3.620
3.596
3.585
3.561
3.460
3.445
3.425
3.410
2.508
2.504
2.500 DMSO-d6
2.496
2.493
O
N
N-O
O
NH2
1.00
1.01
1.01
1.01
1.01
1.01
1.01
1.01
1.01
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)

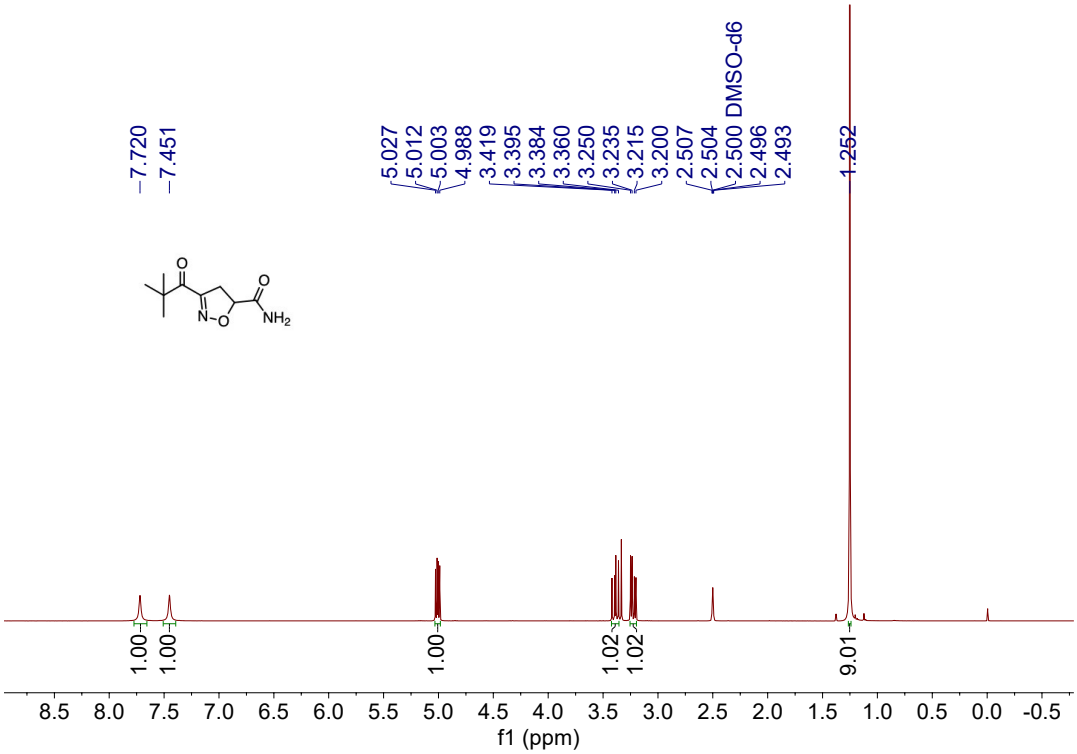

184.96
170.66
157.75
153.58
150.48
137.33
131.52
123.64
80.67
40.02
39.86
39.69
39.52 DMSO-d6
39.35
39.19
39.02
37.19
O
N
N-O
O
NH2
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

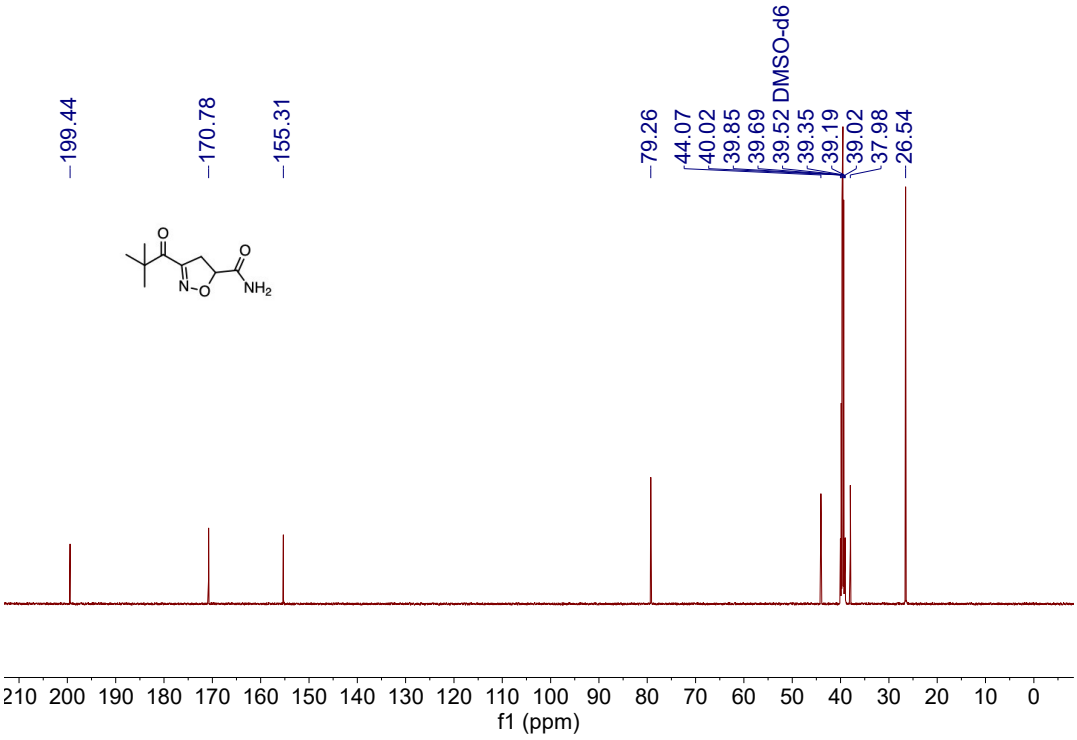
5x


8.183
8.181
8.176
8.174
8.150
8.148
8.140
8.138
7.778
7.514
7.302
7.295
7.292
7.285
5.172
5.158
5.148
5.134
3.596
3.572
3.561
3.537
3.418
3.404
3.383
3.369
2.507
2.504
2.500 DMSO-d6
2.496
2.493
O
S
N
O
O
NH2
1.00
1.01
1.00
1.00
1.00
1.00
1.00
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)

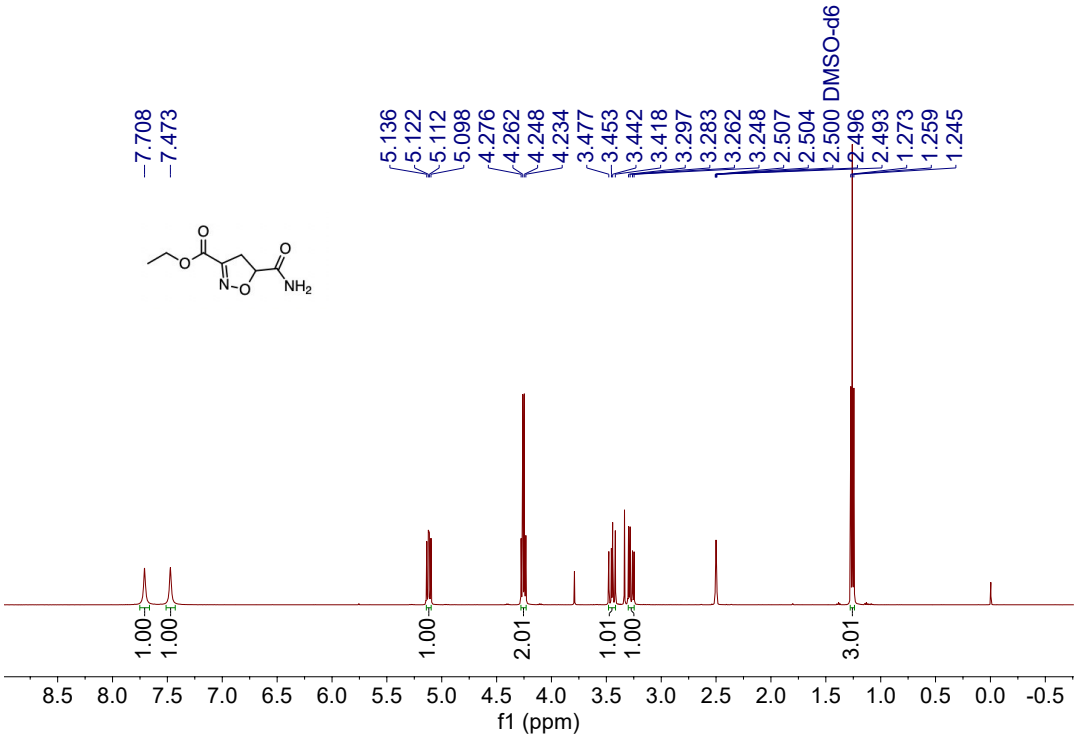

176.86
170.67
157.27
140.35
137.10
135.99
128.92
80.37
40.02
39.85
39.69
39.52 DMSO-d6
39.35
39.19
39.02
37.31
O
S
N
O
O
NH2
90 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

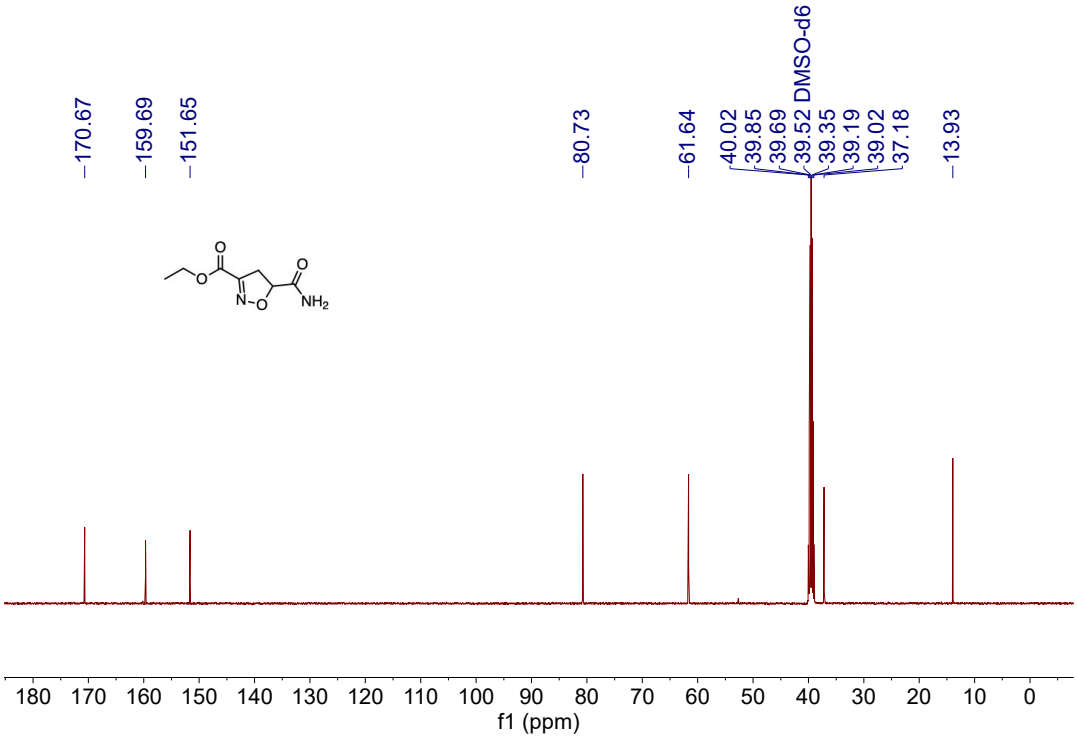
5y


7.720
7.451
5.027
5.012
5.003
4.988
3.419
3.395
3.384
3.360
3.250
3.235
3.215
3.200
2.507
2.504
2.500 DMSO-d6
2.496
2.493
1.252
1.00
1.00
1.00
1.02
1.02
9.01
f1 (ppm)

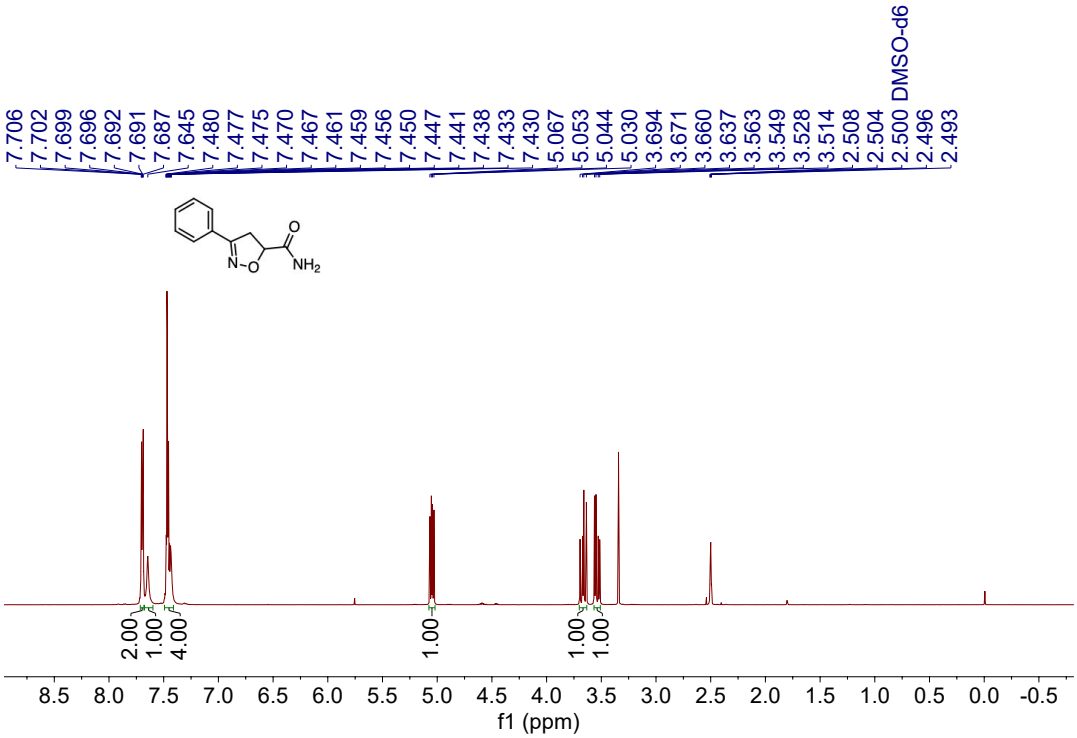

199.44
170.78
155.31
79.26
44.07
40.02
39.85
39.69
39.52 DMSO-d6
39.35
39.19
39.02
37.98
26.54
f1 (ppm)

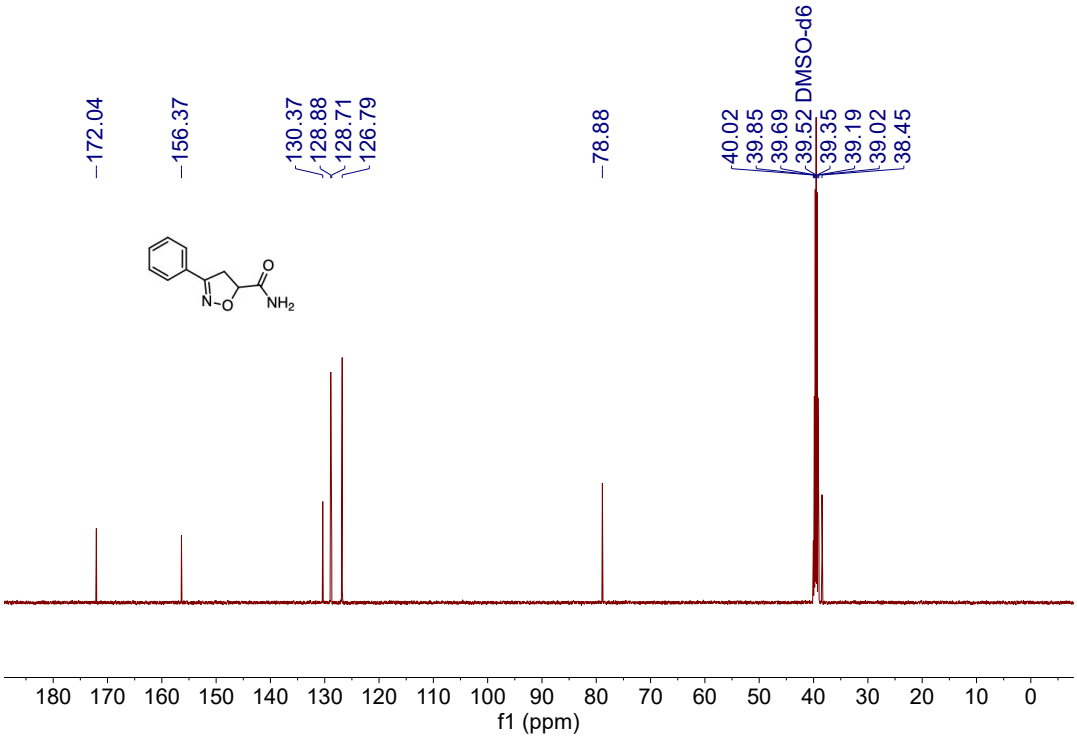
5z


7.708
7.473
5.136
5.122
5.112
5.098
4.276
4.262
4.248
4.234
3.477
3.453
3.442
3.418
3.297
3.283
3.262
3.248
2.507
2.504
2.500 DMSO-d6
2.496
2.493
1.273
1.259
1.245
O
O
O
N
O
NH2
1.00
1.00
1.00
2.01
1.01
1.00
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 -0.5
f1 (ppm)

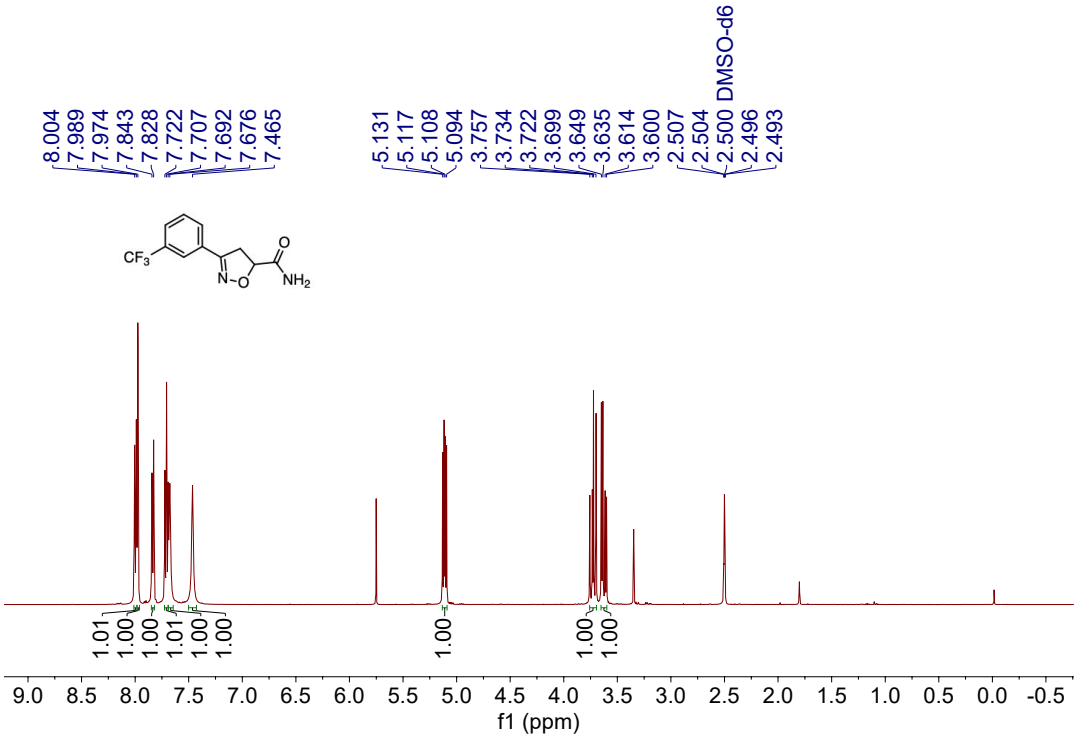

170.67
159.69
151.65
80.73
61.64
40.02
39.85
39.69
39.52 DMSO-d6
39.35
39.19
39.02
37.18
13.93
O
O
O
N
O
NH2
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

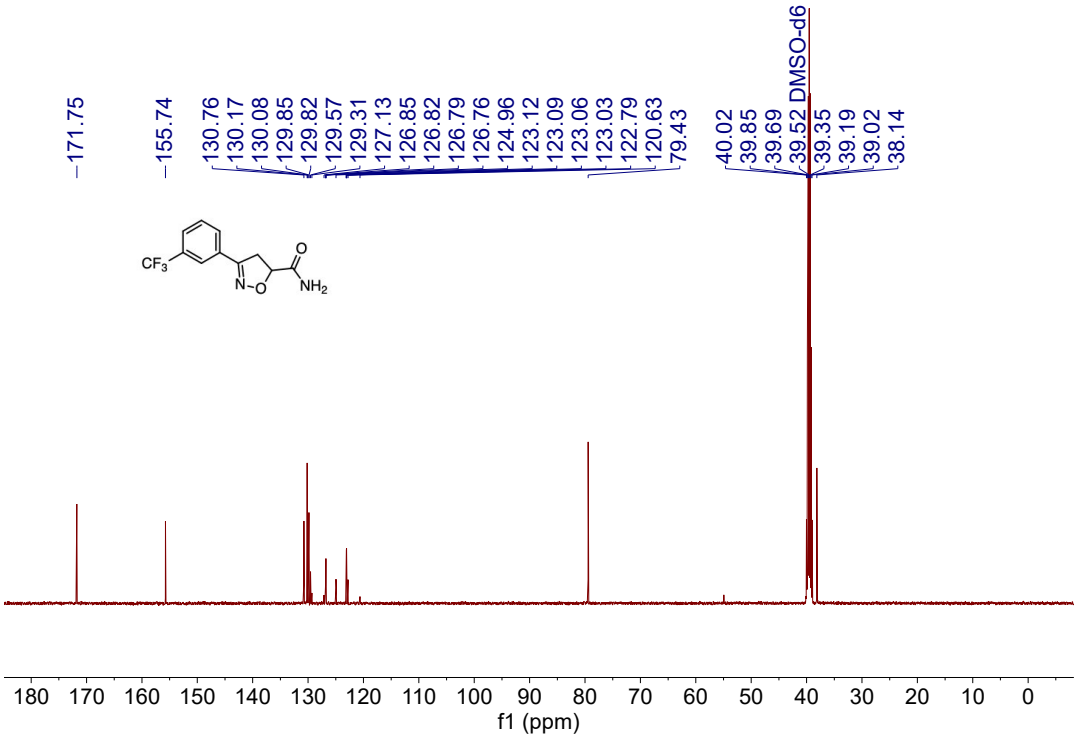
5za


7.706
7.702
7.699
7.696
7.692
7.691
7.687
7.645
7.480
7.477
7.475
7.470
7.467
7.461
7.459
7.456
7.450
7.447
7.441
7.438
7.433
7.430
5.067
5.053
5.044
5.030
3.694
3.671
3.660
3.637
3.563
3.549
3.528
3.514
2.508
2.504
DMSO-d6
2.496
2.493
O
N
O
NH2
2.00
1.00
4.00
1.00
1.00
1.00
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)


172.04
156.37
130.37
128.88
128.71
126.79
78.88
40.02
39.85
39.69
39.52
DMSO-d6
39.35
39.19
39.02
38.45
O
N
O
NH2
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

5zb


8.004
7.989
7.974
7.843
7.828
7.722
7.707
7.692
7.676
7.465
5.131
5.117
5.108
5.094
3.757
3.734
3.722
3.699
3.649
3.635
3.614
3.600
2.507
2.504
2.500 DMSO-d6
2.496
2.493
CF3
O
N
O
NH2
1.01
1.00
1.00
1.01
1.00
1.00
1.00
1.00
1.00
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)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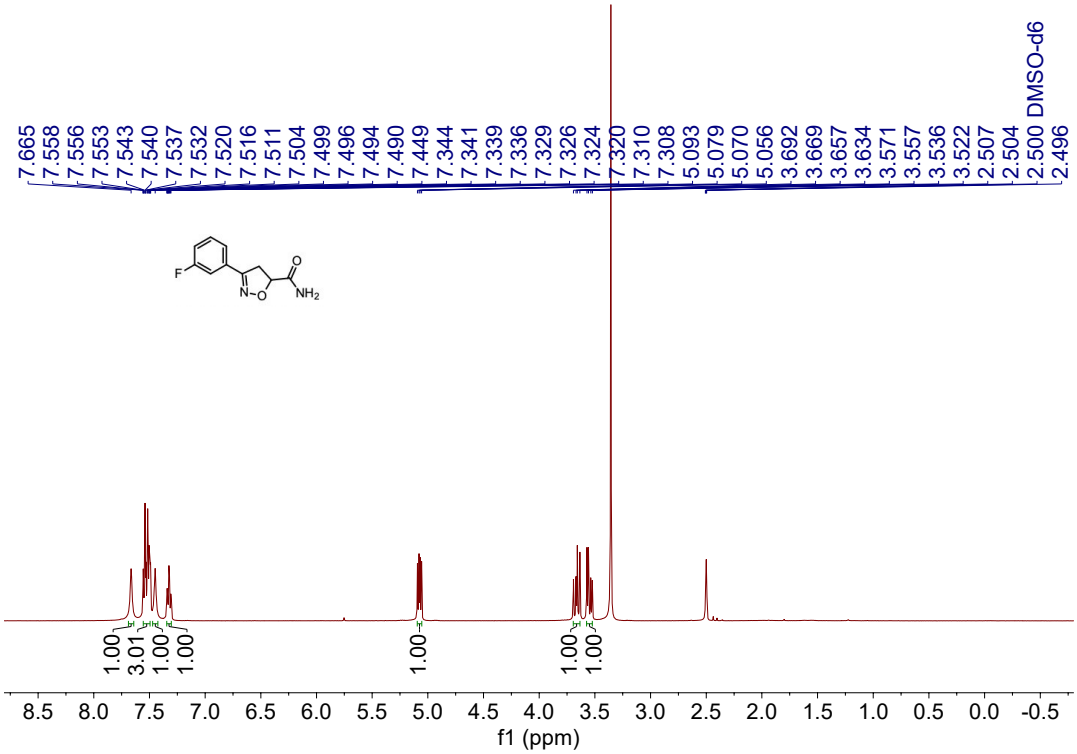
155.74
130.76
130.17
130.08
129.85
129.82
129.57
129.31
127.13
126.85
126.82
126.79
126.76
124.96
123.12
123.09
123.06
123.03
122.79
120.63
79.43
40.02
39.85
39.69
39.52 DMSO-d6
39.35
39.19
39.02
38.14
CF3
O
N
O
NH2
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

5zc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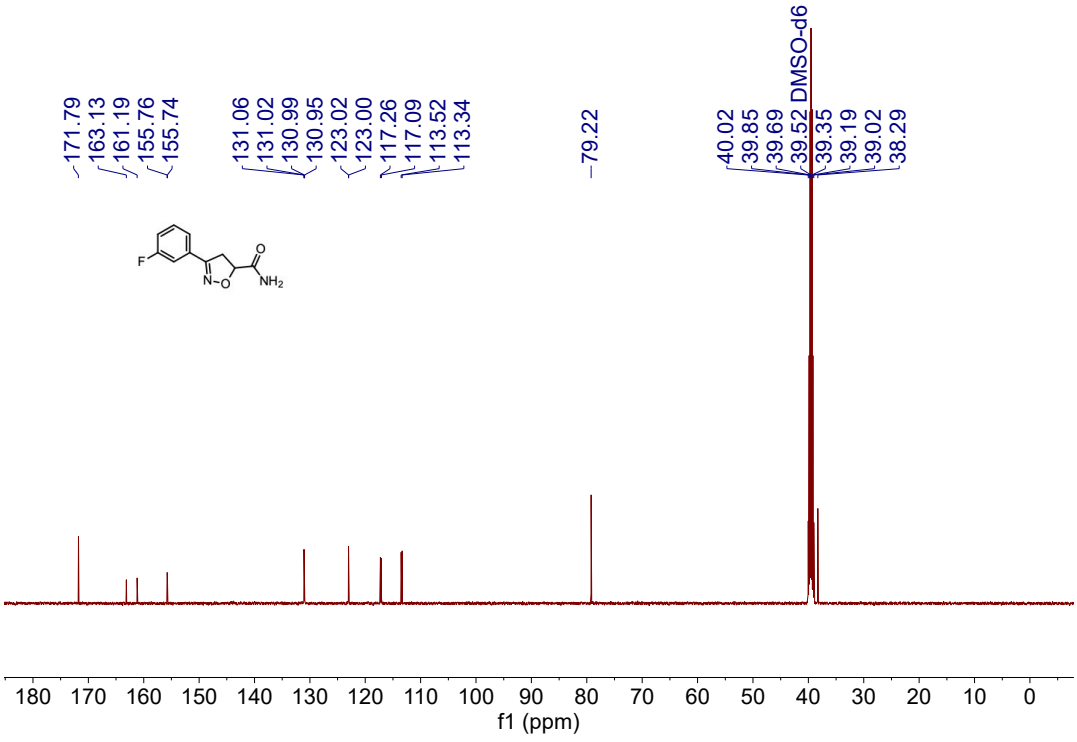
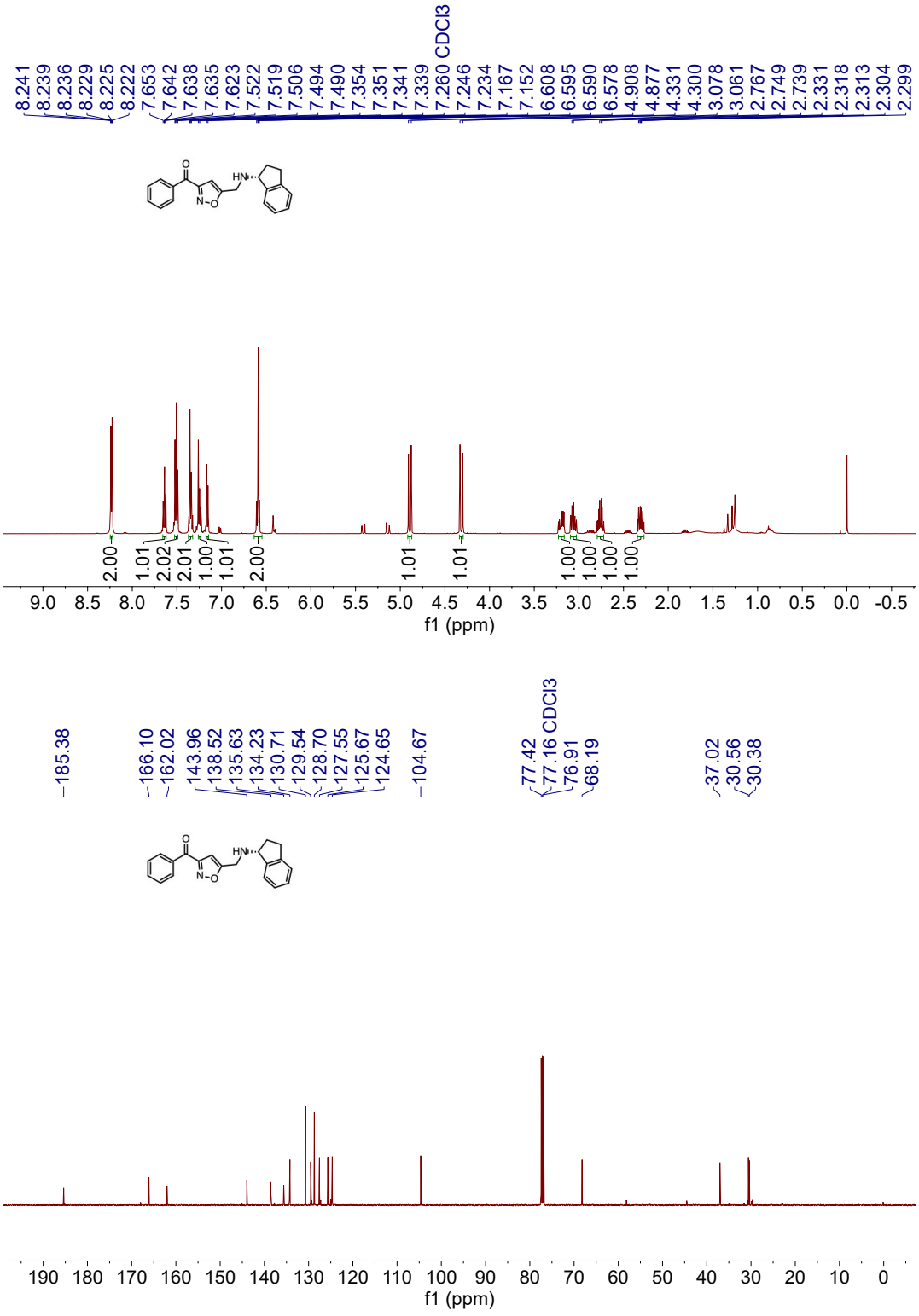
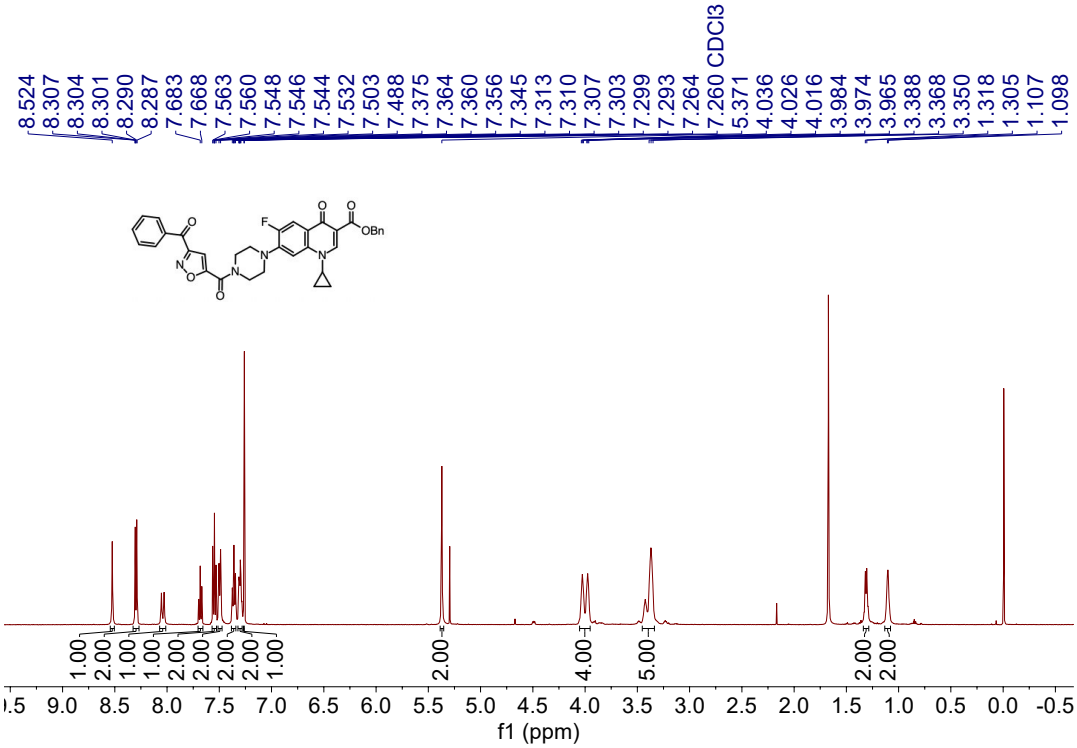
7.558
7.556
7.553
7.543
7.540
7.537
7.532
7.520
7.516
7.511
7.504
7.499
7.496
7.494
7.490
7.449
7.344
7.341
7.339
7.336
7.329
7.326
7.324
7.320
7.310
7.308
5.093
5.079
5.070
5.056
3.692
3.669
3.657
3.634
3.571
3.557
3.536
3.522
2.507
2.504
2.500 DMSO-d6
2.496
F
O
N
O
NH2
1.00
3.01
1.00
1.00
1.00
1.00
1.00
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)

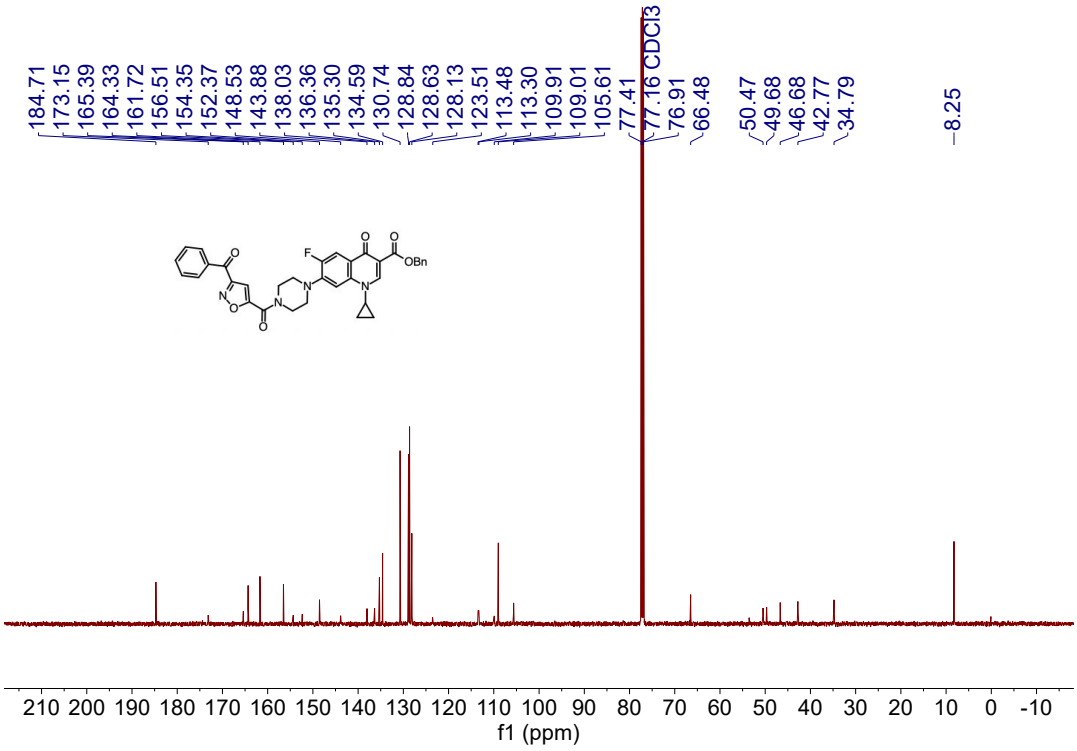

171.79
163.13
161.19
155.76
155.74
131.06
131.02
130.99
130.95
123.02
123.00
117.26
117.09
113.52
113.34
79.22
40.02
39.85
39.69
39.52 DMSO-d6
39.35
39.19
39.02
38.29
F
O
N
O
NH2
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

6a

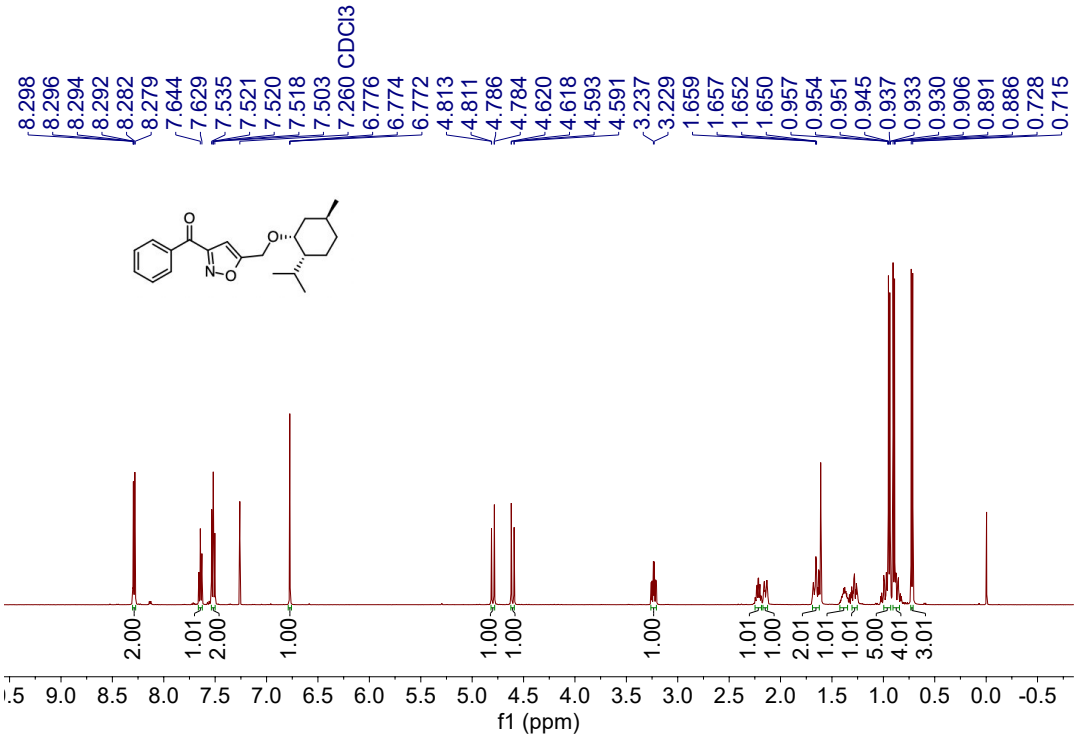

8.241
8.239
8.236
8.229
8.225
8.222
7.653
7.642
7.638
7.635
7.623
7.522
7.519
7.506
7.494
7.490
7.354
7.351
7.341
7.339
7.260 CDCl3
7.246
7.234
7.167
7.152
6.608
6.595
6.590
6.578
4.908
4.877
4.331
4.300
3.078
3.061
2.767
2.749
2.739
2.331
2.318
2.313
2.304
2.299
2.00
1.01
2.02
2.01
1.00
1.01
2.00
1.01
1.01
1.00
1.00
1.00
1.00
f1 (ppm)
185.38
166.10
162.02
143.96
138.52
135.63
134.23
130.71
129.54
128.70
127.55
125.67
124.65
104.67
77.42
77.16 CDCl3
76.91
68.19
37.02
30.56
30.38
f1 (ppm)

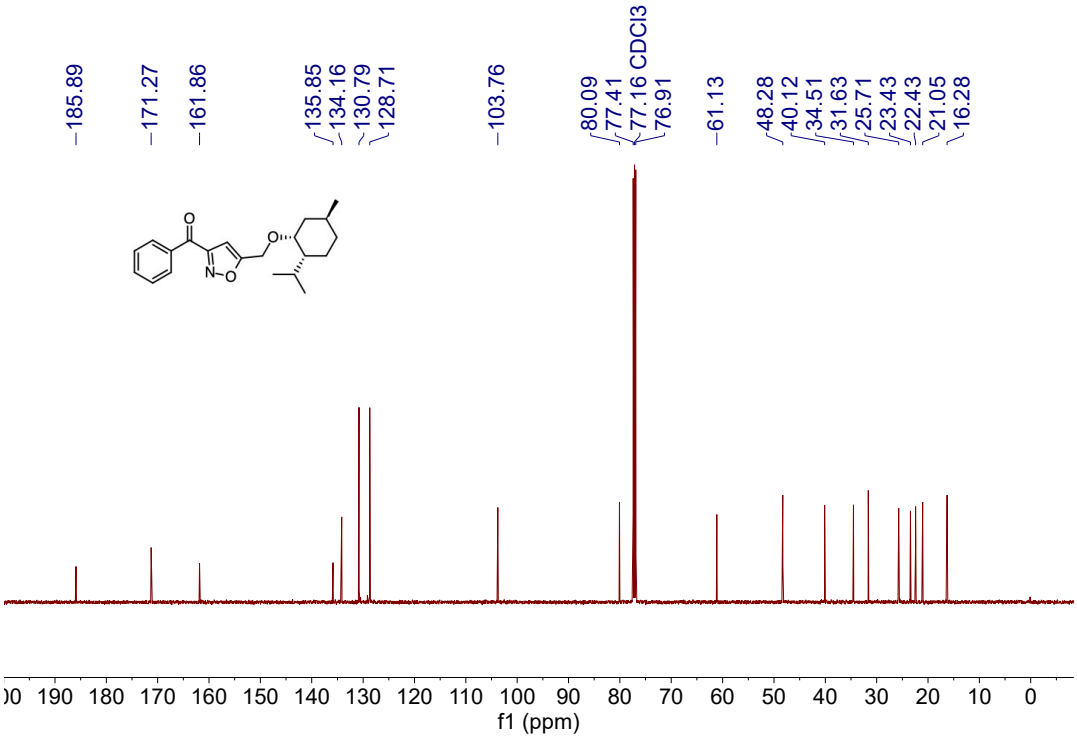
6b


8.524
8.307
8.304
8.301
8.290
8.287
7.683
7.668
7.563
7.560
7.548
7.546
7.544
7.532
7.503
7.488
7.375
7.364
7.360
7.356
7.345
7.313
7.310
7.307
7.303
7.299
7.293
7.264
7.260 CDCl3
5.371
4.036
4.026
4.016
3.984
3.974
3.965
3.388
3.368
3.350
1.318
1.305
1.107
1.098
F
O
OBn
N
O
1.00
2.00
1.00
1.00
2.00
2.00
2.00
1.00
2.00
4.00
5.00
2.00
2.00
f1 (ppm)

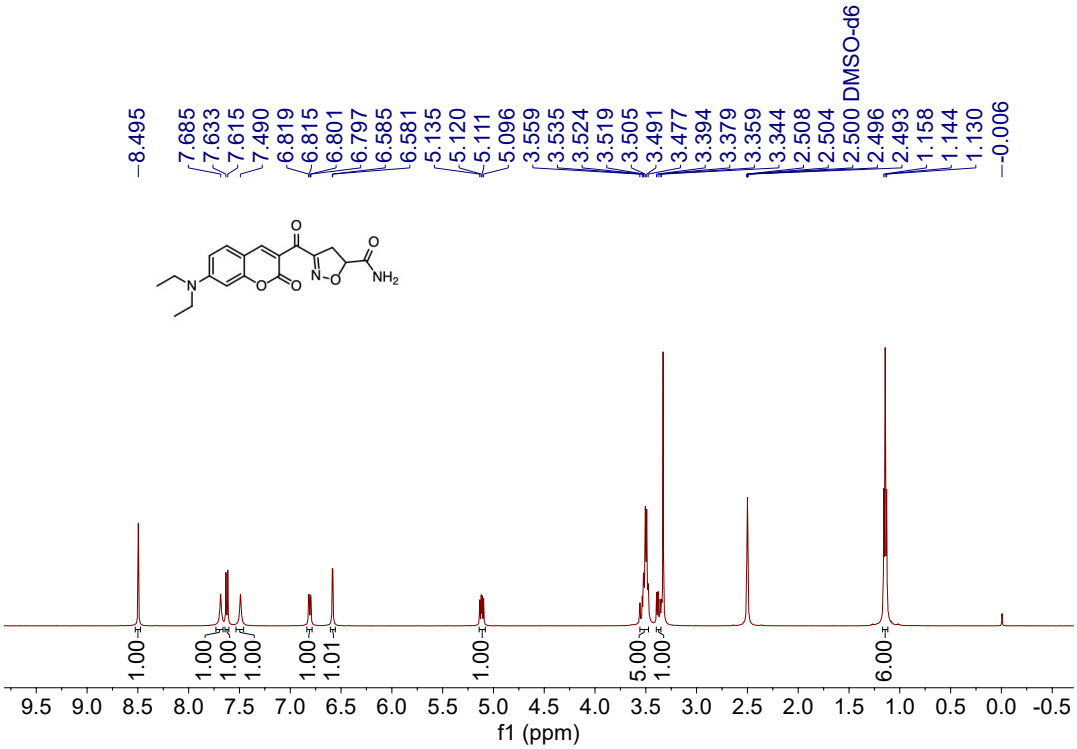

184.71
173.15
165.39
164.33
161.72
156.51
154.35
152.37
148.53
143.88
138.03
136.36
135.30
134.59
130.74
128.84
128.63
128.13
123.51
113.48
113.30
109.91
109.01
105.61
77.41
77.16 CDCl3
76.91
66.48
50.47
49.68
46.68
42.77
34.79
8.25
F
O
OBn
N
O
f1 (ppm)

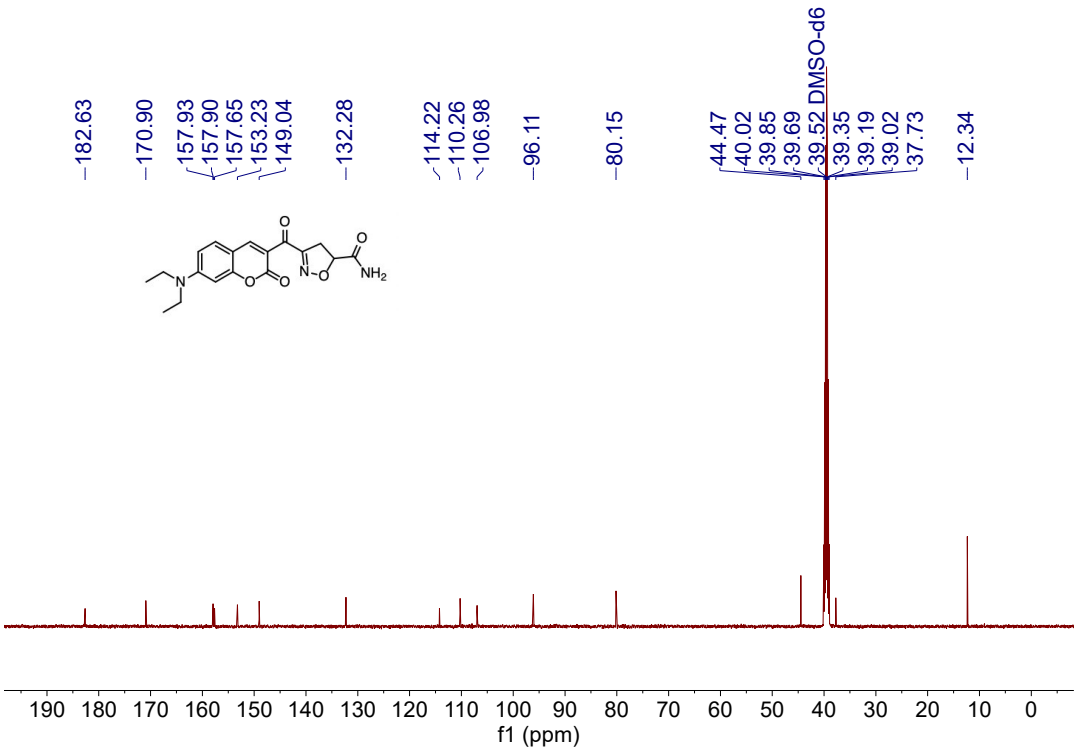
6c


8.298
8.296
8.294
8.292
8.282
8.279
7.644
7.629
7.535
7.521
7.520
7.518
7.503
7.260 CDCl3
6.776
6.774
6.772
4.813
4.811
4.786
4.784
4.620
4.618
4.593
4.591
3.237
3.229
1.659
1.657
1.652
1.650
0.957
0.954
0.951
0.945
0.937
0.933
0.930
0.906
0.891
0.886
0.728
0.715
2.00
1.01
2.00
1.00
1.00
1.00
1.00
1.01
1.00
2.01
1.01
1.01
5.00
4.01
3.01
f1 (ppm)

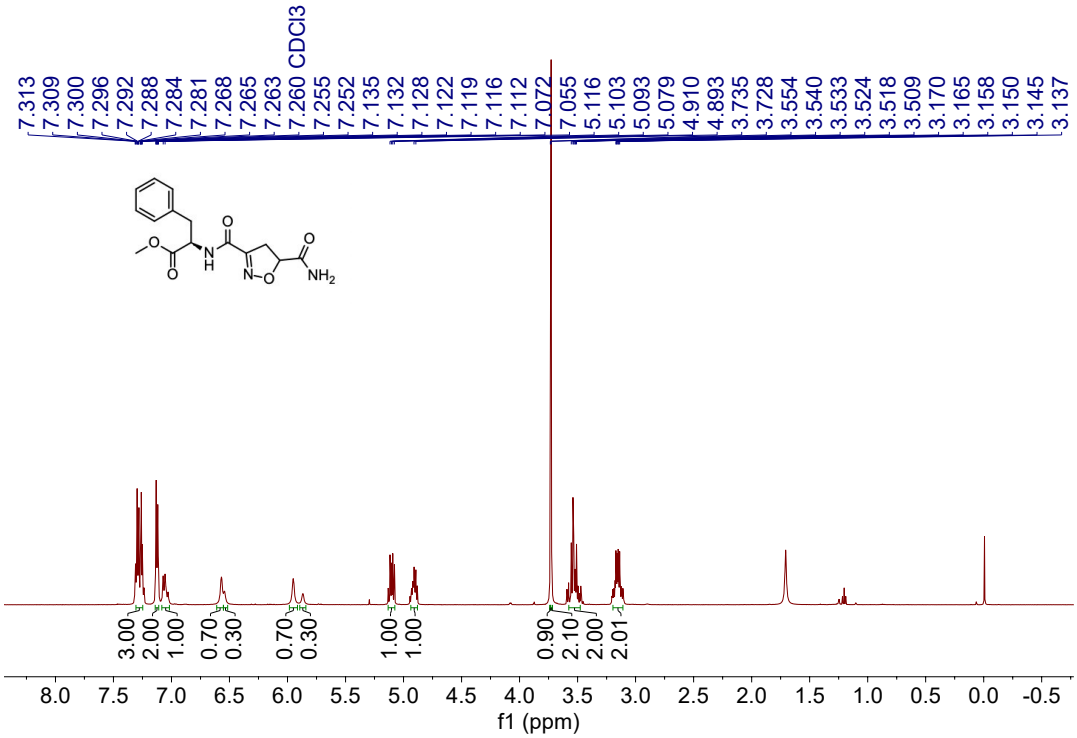

185.89
171.27
161.86
135.85
134.16
130.79
128.71
103.76
80.09
77.41
77.16 CDCl3
76.91
61.13
48.28
40.12
34.51
31.63
25.71
23.43
22.43
21.05
16.28
f1 (ppm)

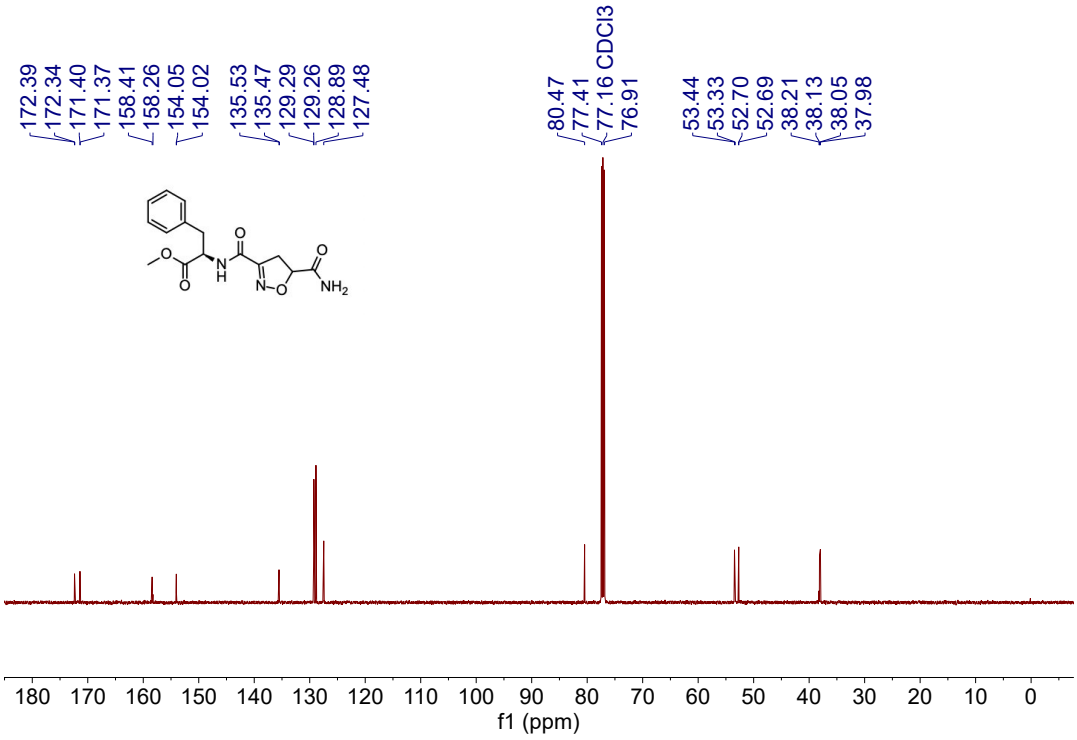
6d


8.495
7.685
7.633
7.615
7.490
6.819
6.815
6.801
6.797
6.585
6.581
5.135
5.120
5.111
5.096
3.559
3.535
3.524
3.519
3.505
3.491
3.477
3.394
3.379
3.359
3.344
2.508
2.504
2.500 DMSO-d6
2.496
2.493
1.158
1.144
1.130
0.006
1.00
1.00
1.00
1.00
1.01
1.00
5.00
1.00
6.00
f1 (ppm)

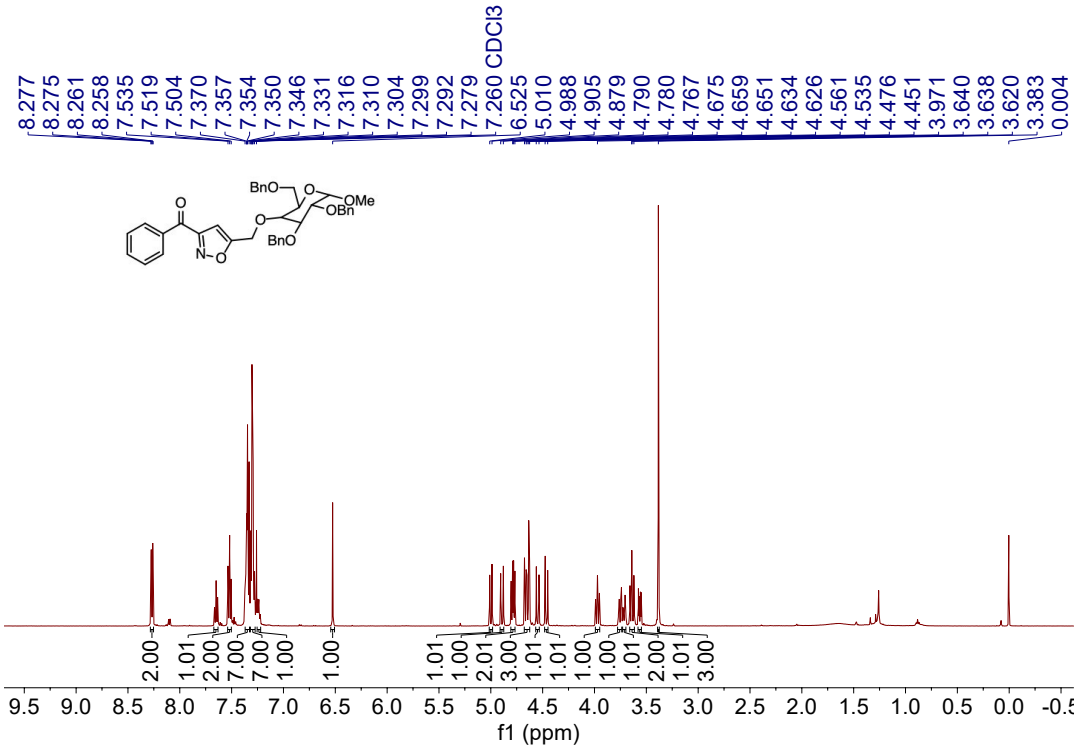

182.63
170.90
157.93
157.90
157.65
153.23
149.04
132.28
114.22
110.26
106.98
96.11
80.15
44.47
40.02
39.85
39.69
39.52 DMSO-d6
39.35
39.19
39.02
37.73
12.34
f1 (ppm)

6e

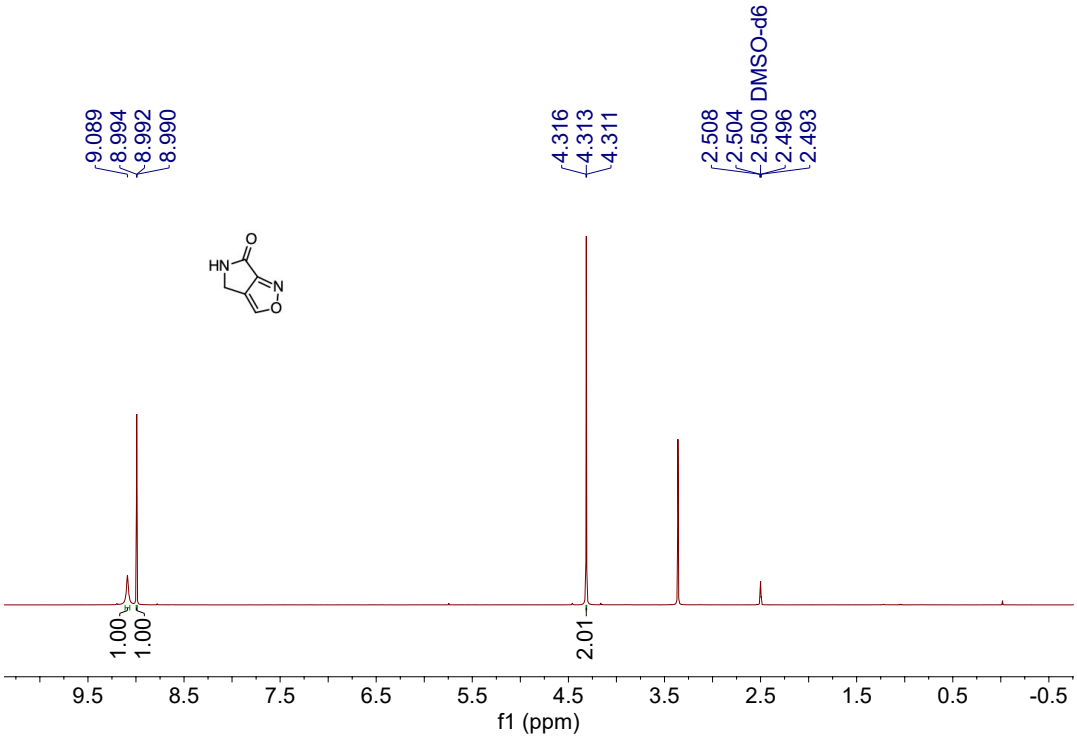

7.313
7.309
7.300
7.296
7.292
7.288
7.284
7.281
7.268
7.265
7.263
7.260 CDCl3
7.255
7.252
7.135
7.132
7.128
7.122
7.119
7.116
7.112
7.072
7.055
5.116
5.103
5.093
5.079
4.910
4.893
3.735
3.728
3.554
3.540
3.533
3.524
3.518
3.509
3.170
3.165
3.158
3.150
3.145
3.137
3.00
2.00
1.00
0.70
0.30
0.70
0.30
1.00
1.00
0.90
2.10
2.00
2.01
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)

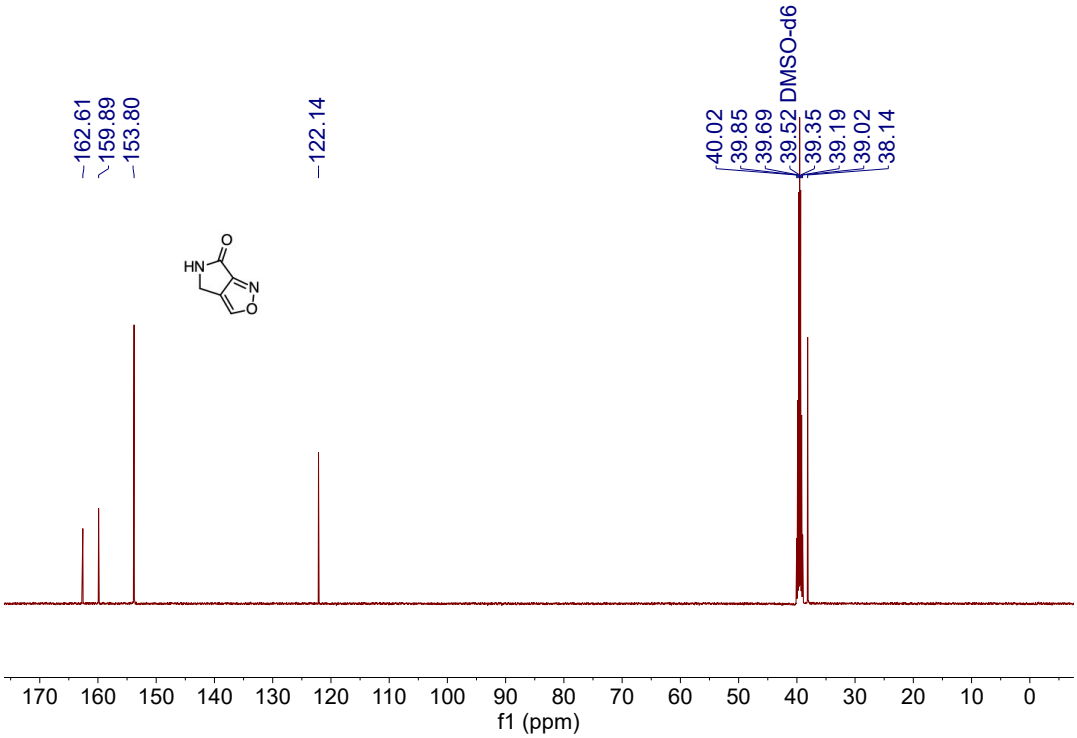

172.39
172.34
171.40
171.37
158.41
158.26
154.05
154.02
135.53
135.47
129.29
129.26
128.89
127.48
80.47
77.41
77.16 CDCl3
76.91
53.44
53.33
52.70
52.69
38.21
38.13
38.05
37.98
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

6f

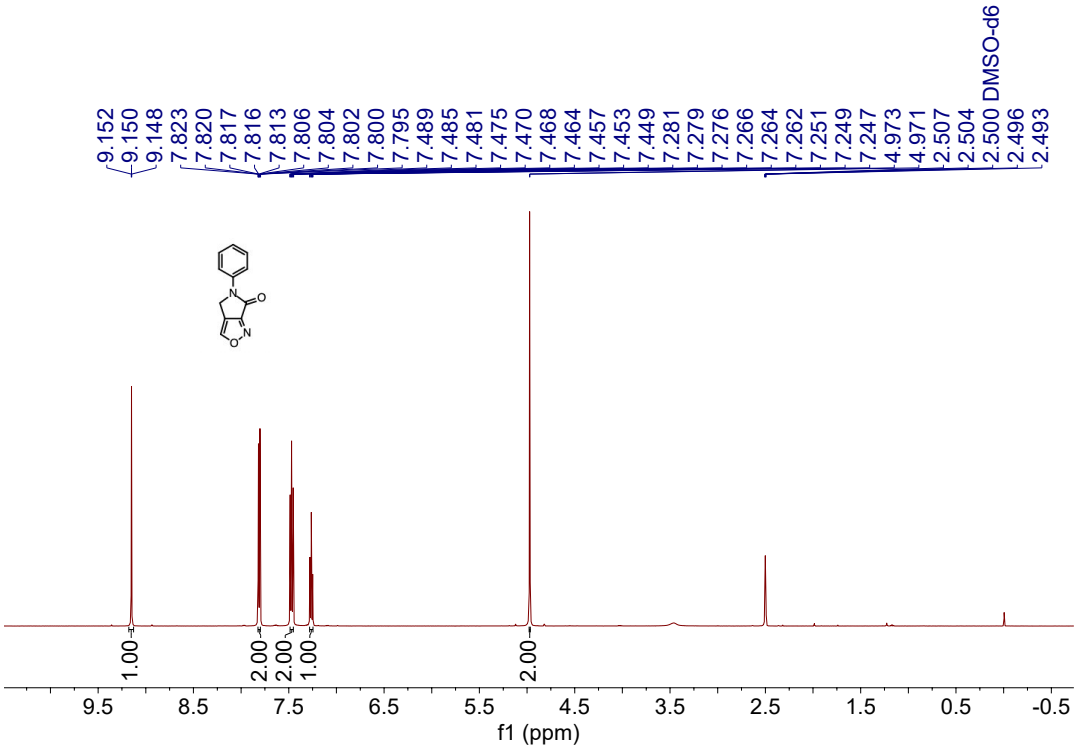

8.277
8.275
8.261
8.258
7.535
7.519
7.504
7.370
7.357
7.354
7.350
7.346
7.331
7.316
7.310
7.304
7.299
7.292
7.279
7.260 CDCl3
6.525
5.010
4.988
4.905
4.879
4.790
4.780
4.767
4.675
4.659
4.651
4.634
4.626
4.561
4.535
4.476
4.451
3.971
3.640
3.638
3.620
3.383
0.004
BnO
O
OMe
OBn
O
BnO
O
N
O
2.00
1.01
2.00
7.00
7.00
1.00
1.00
1.01
1.00
2.01
3.00
1.01
1.01
1.00
1.00
1.01
2.00
1.01
3.00
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
f1 (ppm)

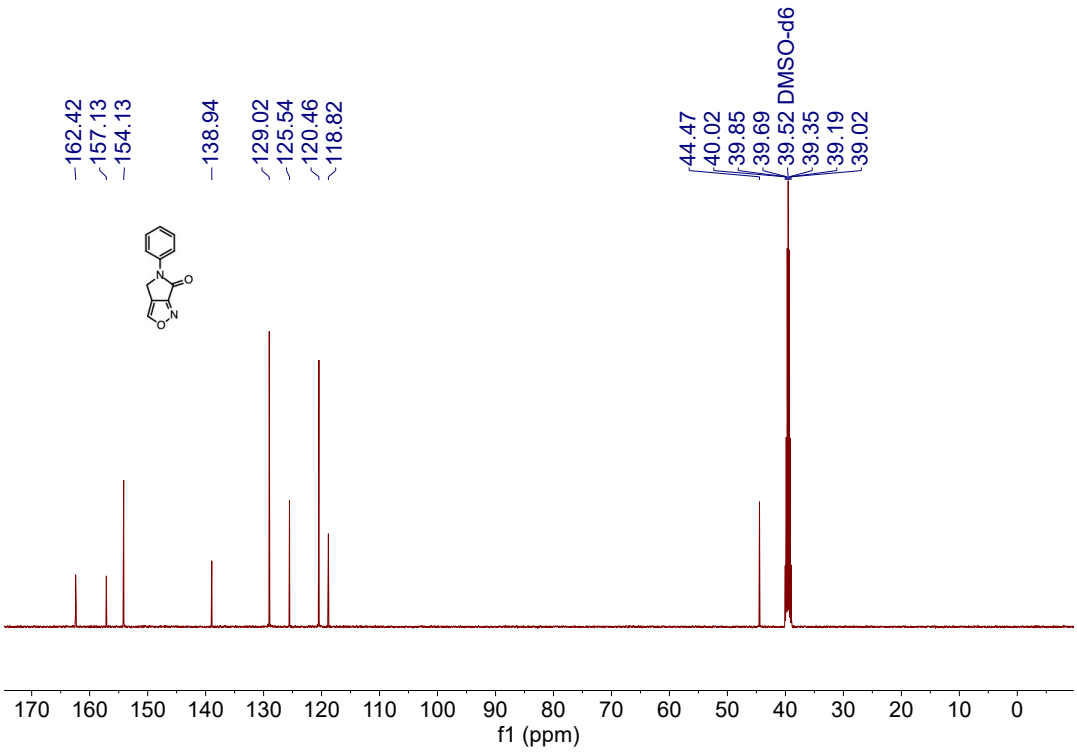
6g


9.089
8.994
8.992
8.990
4.316
4.313
4.311
2.508
2.504
2.500 DMSO-d6
2.496
2.493
1.00
1.00
2.01
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)

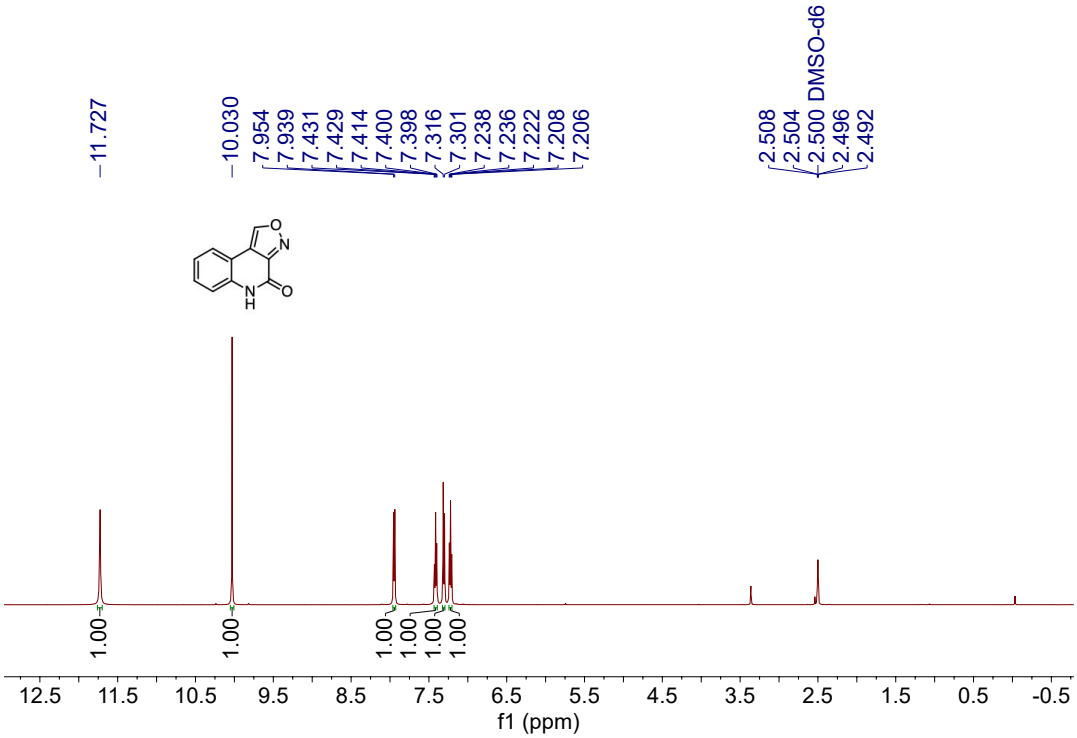

162.61
159.89
153.80
122.14
40.02
39.85
39.69
39.52 DMSO-d6
39.35
39.19
39.02
38.14
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

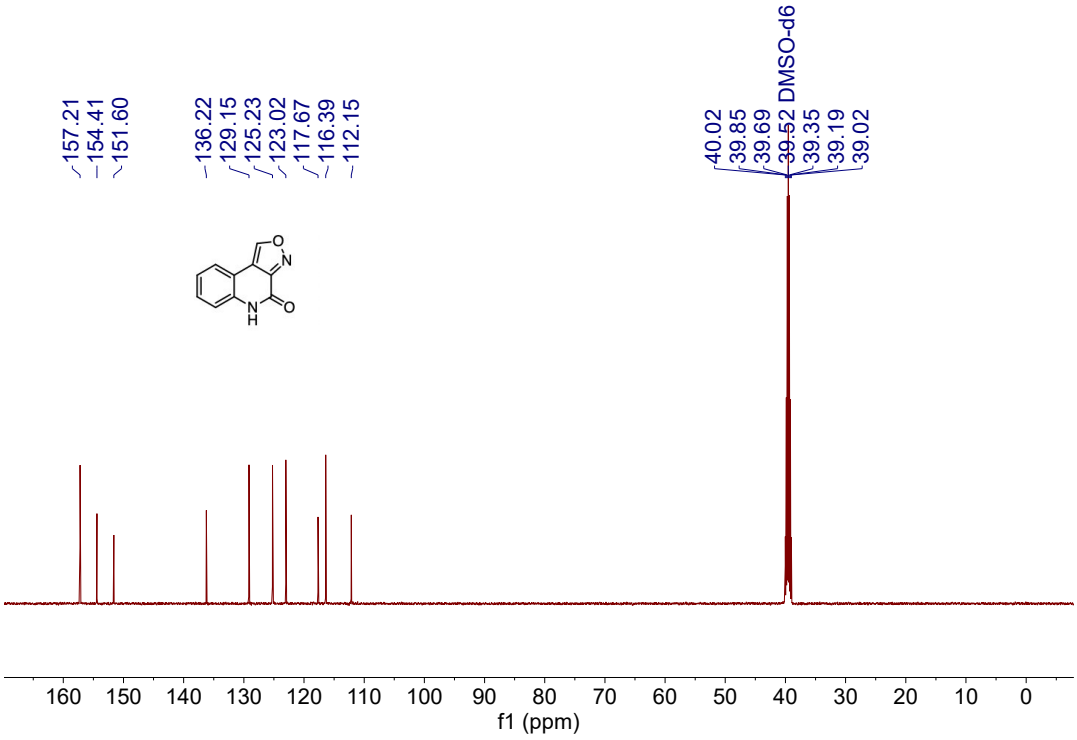
6h


9.152
9.150
9.148
7.823
7.820
7.817
7.816
7.813
7.806
7.804
7.802
7.800
7.795
7.489
7.485
7.481
7.475
7.470
7.468
7.464
7.457
7.453
7.449
7.281
7.279
7.276
7.266
7.264
7.262
7.251
7.249
7.247
4.973
4.971
2.507
2.504
2.500 DMSO-d6
2.496
2.493
1.00
2.00
2.00
1.00
2.00
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)

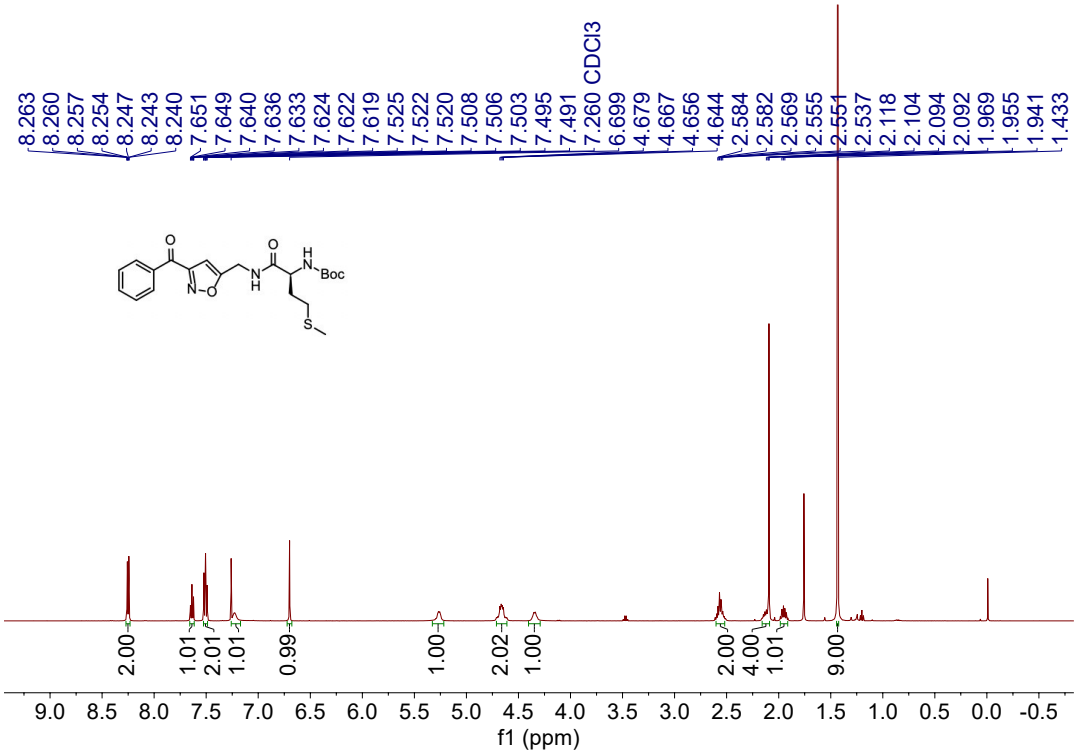

162.42
157.13
154.13
138.94
129.02
125.54
120.46
118.82
44.47
40.02
39.85
39.69
39.52 DMSO-d6
39.35
39.19
39.02
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

6i


11.727
10.030
7.954
7.939
7.431
7.429
7.414
7.400
7.398
7.316
7.301
7.238
7.236
7.222
7.208
7.206
2.508
2.504
2.500 DMSO-d6
2.496
2.492
1.00
1.00
1.00
1.00
1.00
1.00
12.5 11.5 10.5 9.5 8.5 7.5 6.5 5.5 4.5 3.5 2.5 1.5 0.5 -0.5
f1 (ppm)


157.21
154.41
151.60
136.22
129.15
125.23
123.02
117.67
116.39
112.15
40.02
39.85
39.69
39.52 DMSO-d6
39.35
39.19
39.02
160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

6j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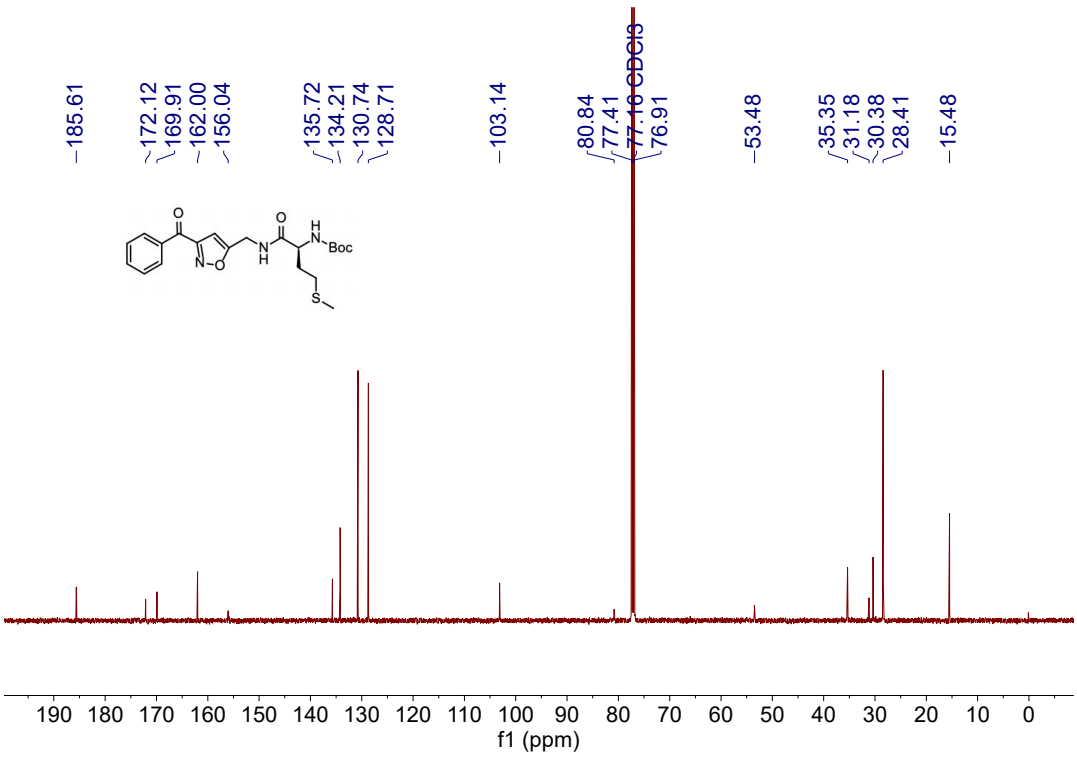
8.257
8.254
8.247
8.243
8.240
7.651
7.649
7.640
7.636
7.633
7.624
7.622
7.619
7.525
7.522
7.520
7.508
7.506
7.503
7.495
7.491
CDCl3
7.260
6.699
4.679
4.667
4.656
4.644
2.584
2.582
2.569
2.555
2.551
2.537
2.118
2.104
2.094
2.092
1.969
1.955
1.941
1.433
Boc
2.00
1.01
2.01
1.01
0.99
1.00
2.02
1.00
2.00
4.00
1.01
9.00
f1 (ppm)


185.61
172.12
169.91
162.00
156.04
135.72
134.21
130.74
128.71
103.14
80.84
77.41
77.16 CDCl3
76.91
53.48
35.35
31.18
30.38
28.41
15.48
Boc
f1 (ppm)