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Supporting Information

Visible Light-Enabled Alkylation of Enol Acetates with Alkylboronic Acids for the Synthesis of α-Alkyl Ketones

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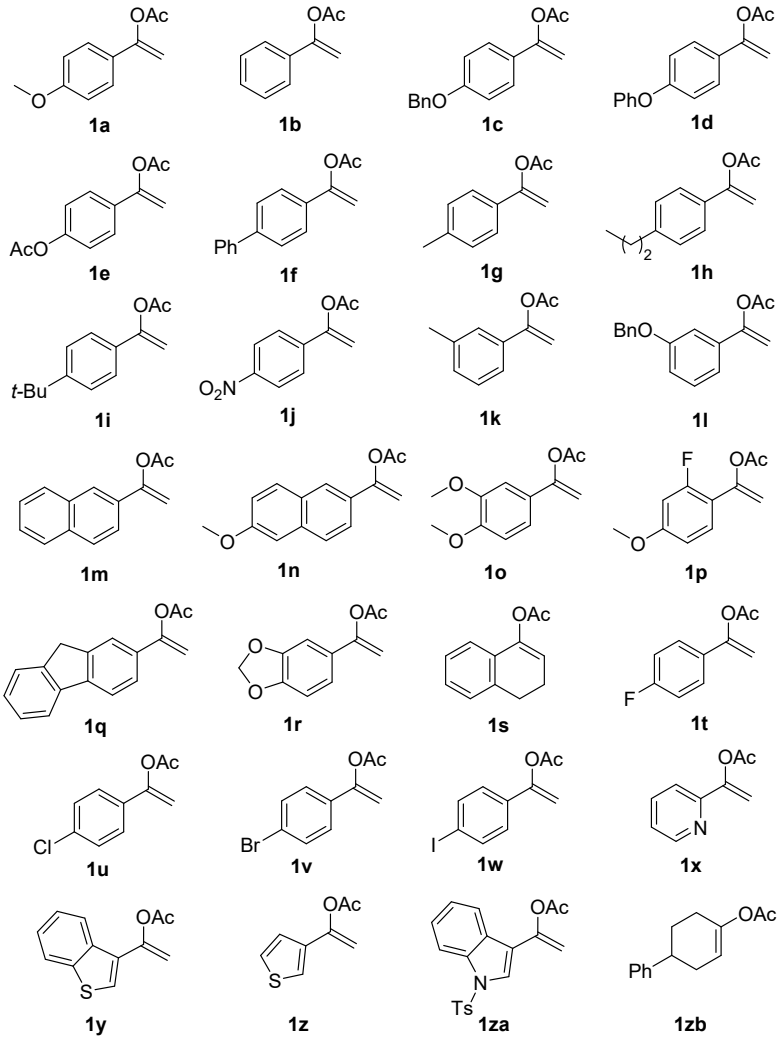
1. General Information

Unless otherwise noted, materials were purchased from commercial suppliers and used without further purification. All reactions were carried out in sealed tubes filled with argon atmosphere. All reactions were monitored by TLC (thin layer chromatography) and visualized using UV light. The products were purified by column chromatography using 200-300 mesh silica. The elution solvent used for column chromatography was PE (petroleum ether, boiling point range 60 -90 °C), EA (ethyl acetate) and DCM (dichloromethane). The wavelength of the blue LEDs used in the experiment was 450 - 470 nm. ^{1}H NMR spectra were recorded on 400 or 600 MHz spectrophotometers. Chemical shifts (δ) were reported in ppm from the resonance of tetramethyl silane as the internal standard (TMS: 0.00 ppm). Data were reported as follows: chemical shift, multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet), coupling constants (Hz) and integration. ^{13}C NMR spectra were recorded on 100 with complete proton decoupling spectrophotometers. ^{19}F NMR spectra were observed in the ^{1}H-decoupled mode. High-resolution mass spectra (HRMS) were obtained from Shimadzu LCMS-IT-TOF mass spectrometer and DIONEX UltiMate 3000 & Bruker Compact TOF mass spectrometer.

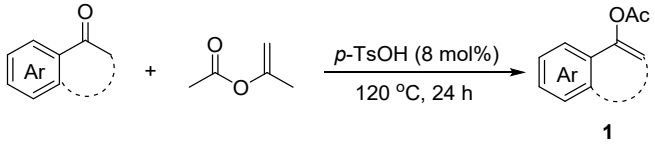
2. General Procedure for the Synthesis of Substrates

2.1 General Procedure for the Synthesis of Enol Acetates [1-6]



Scheme S1: List of all enol acetates used in this study

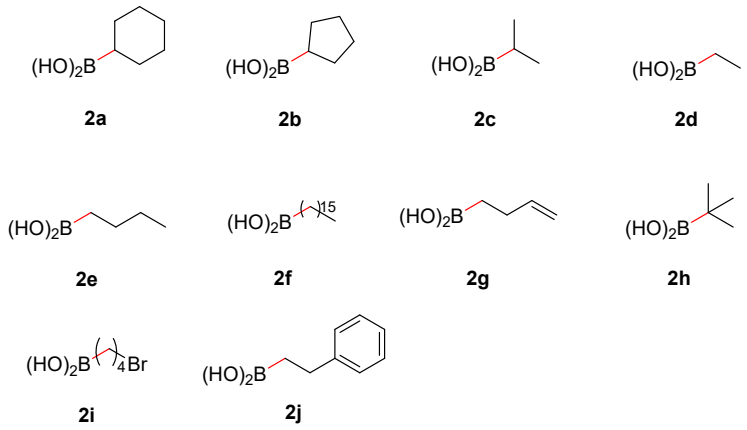
2.1.1 Synthesis of Enol Acetates 1a – 1zb



Scheme S2: Synthesis of enol acetates

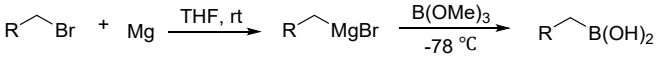
A 100 mL round-bottom flask equipped with a magnetic stir bar and a reflux condenser was charged with ketone (50 mmol, 1.0 equiv), isopropenyl acetate (250 mmol, 5.0 equiv) and *p*-TsOH (4 mmol, 0.08 equiv). The reaction mixture was heated to 120 °C in aluminum dry block heater. After 24 hours the reaction mixture was allowed to cool to room temperature and the remaining isopropenyl acetate was subsequently evaporated under reduced pressure. The residue was redissolved in ethyl acetate (100 mL), washed with H_2O (3×50 mL) and dried over Na_2SO_4. The solvent was evaporated in vacuo to give a dark red oil. The pure product was obtained by distillation under reduced pressure or by purification on SiO_2 column chromatography (DCM/PE= 3/1-1/1). All enol acetates were synthesized and purified according to the above procedure and in agreement with reference.[1-6]

2.2 General Procedure for the Synthesis of Alkylboronic Acids [7-13]



Scheme S3: List of all alkylboronic acids used in this study

2.2.1 Synthesis of alkylboronic acids 2b - 2h



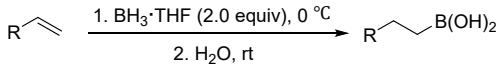
Scheme S4: Synthesis of alkylboronic acids **2b - 2h**

Magnesium flakes (0.27 g, 11 mmol, 1.1 equiv) were added to a dry flask under argon atmosphere. Dry tetrahydrofuran was added to cover the magnesium flakes and 1,2-dibromoethane was added to initiate the reaction. The corresponding alkyl halogenates (10 mmol, 1.0 equiv) in dry tetrahydrofuran (10 mL) were added dropwise to the magnesium for more than half an hour, keeping the solution slightly boiling during the drop. The reaction mixture was heated to reflux for 1 hour and then stirred at room

temperature for 17 hours. At the end of the reaction, the solution of the format reagent was nearly gray black.

Trimethyl borate (1.45 mL, 12 mmol, 1.2 equiv.) was added to tetrahydrofuran (10 mL) at -78 °C. The corresponding R-MgBr in tetrahydrofuran were added dropwise to the solvent for more than half an hour. The temperature was kept below -55 °C during the whole process. The flask was removed and stirred at room temperature for 2 h. Then, HCl (10 wt.%, 10 mL) was added dropwise to quench the reaction. The solvent was extracted with Et_2O (2×10 mL) and dried over $MgSO_4$. The solvent was removed in vacuum to give the duct as a white solid.

2.2.2 Synthesis of alkylboronic acids 2i - 2j

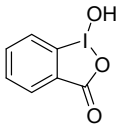


Scheme S5: Synthesis of alkylboronic acids **2i - 2j**

To a solution of alkene (10 mmol, 1.0 equiv) in tetrahydrofuran (2 mL) was added dropwise a solution of BH_3•THF (20 mL, 20 mmol, 2.0 equiv, 1.0 M solution in THF) at 0 °C. The mixture was stirred for 2 h at room temperature and H_2O (2 mL) was added carefully. After stirring for additional 3 h at room temperature, the reaction mixture was concentrated under reduced pressure. The residue was dissolved in EtOAc (30 mL), washed with saturated aqueous $NaHCO_3$ solution (20 mL) and brine (20 mL). The organic layer was dried over Na_2SO_4 and filtrated. The filtrate was concentrated under reduced pressure to approximately 5 mL. Petroleum ether was then added under stirring. The resultant precipitate was collected by filtration, washed with petroleum ether and dried under high vacuum to afford the desired alkylboronic acid as a white solid.

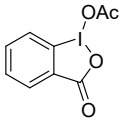
2.3 General Procedure for the Synthesis of BI-OAc [14-16]

Synthesis of 1-hydroxy-1,2-benziodoxol-3(1*H*)-one (BI-OH):



1-Hydroxy-1,2-benziodoxol-3(1*H*)-one was prepared according to the previous literature. A 100 mL round-bottom flask was charged with a magnetic stir bar, 2-iodobenzoic acid (3.20 g, 13 mmol, 1.0 equiv) and aqueous acetic acid (30% v/v, 25 mL). Then, $NaIO_4$ (3.20 g, 15 mmol, 1.15 equiv) was added to the solution at room temperature (25 °C), and the reaction mixture was heated to 120 °C. After 4 hours, the solution was cooled to room temperature (25 °C) and quenched with water (90 mL). The precipitate was filtered, washed with water (10 mL) three times and cold acetone (10 mL) three times sequentially, and dried in vacuo to give 1-hydroxy-1,2-benziodoxol-3(1*H*)-one (3.10 g, 90% yield) as a colorless crystal.

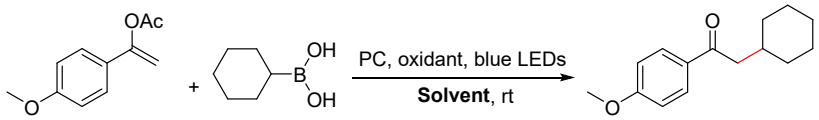
Synthesis of 1-(acetyloxy)-1,2-benziodoxol-3(1*H*)-one (BI-OAc):



1-(Acetyloxy)-1,2-benziodoxol-3(1*H*)-one was prepared according to the previous literature. To a 50 mL round-bottom flask charged with a magnetic stir bar and 1-hydroxy-1,2-benziodoxol-3(1*H*)-one (3.0 g, 11 mmol). Acetic anhydride (11 mL) was added at room temperature (25 °C). The cloudy solution was heated to 135 °C and stirred until the solution becomes clear. The reaction mixture was cooled to -20 °C and stayed overnight. The grown crystal were filtered, washed with pentane three times, and dried in vacuo to afford 1-(acetyloxy)-1,2-benziodoxol-3(1*H*)-one (2.90 g, 86% yield) as a colorless crystal.

3. Optimization Studies

Table S1. Optimization of solvent [a]

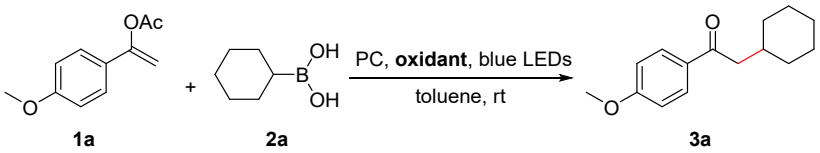


1a **2a** **3a**

Entry	Oxidant	PC	Solvent	Yield(%)[b]
1	BI-OAc	$Ru(bpy)_3Cl_2·6H_2O$	THF	35
2	BI-OAc	$Ru(bpy)_3Cl_2·6H_2O$	CH_2Cl_2	48
3	BI-OAc	$Ru(bpy)_3Cl_2·6H_2O$	DMF	62
4	BI-OAc	$Ru(bpy)_3Cl_2·6H_2O$	DMSO	Trace
5	BI-OAc	$Ru(bpy)_3Cl_2·6H_2O$	NMP	36
6	**BI-OAc**	**$Ru(bpy)_3Cl_2·6H_2O$**	**toluene**	**76**
7	BI-OAc	$Ru(bpy)_3Cl_2·6H_2O$	CH_3CN	33
8	BI-OAc	$Ru(bpy)_3Cl_2·6H_2O$	Acetone	59
9	BI-OAc	$Ru(bpy)_3Cl_2·6H_2O$	Benzene	56
10	BI-OAc	$Ru(bpy)_3Cl_2·6H_2O$	1,4-dioxane	69
11	BI-OAc	$Ru(bpy)_3Cl_2·6H_2O$	EtOAc	53
12	BI-OAc	$Ru(bpy)_3Cl_2·6H_2O$	DMAC	59
13	BI-OAc	$Ru(bpy)_3Cl_2·6H_2O$	Chlorobenzene	Trace
14	BI-OAc	$Ru(bpy)_3Cl_2·6H_2O$	$CHCl_3$	Trace
15	BI-OAc	$Ru(bpy)_3Cl_2·6H_2O$	H_2O	28
16	BI-OAc	$Ru(bpy)_3Cl_2·6H_2O$	Benzotrifluoride	49
17	BI-OAc	$Ru(bpy)_3Cl_2·6H_2O$	HFIP	Trace

[a] Reaction condition: **1a** (0.2 mmol, 1.0 equiv), **2a** (0.4 mmol, 2.0 equiv), oxidant (0.3 mmol, 1.5 equiv), PC (0.006 mmol, 3 mol%), solvent (2 mL), argon atmosphere, 15 W blue LEDs, 36 h. [b] Isolated yield. NMP = *N*-Methyl-2-pyrrolidone. HFIP = 1,1,1,3,3,3-Hexafluoro-2-propanol.

Table S2. Optimization of oxidant [a]

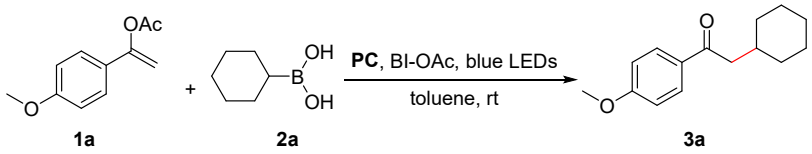


1a **2a** **3a**

Entry	Oxidant	PC	Yield(%)[b]
1	**BI-OAc**	**$Ru(bpy)_3Cl_2·6H_2O$**	**76**
2	PIDA	$Ru(bpy)_3Cl_2·6H_2O$	Trace
3	PIFA	$Ru(bpy)_3Cl_2·6H_2O$	NR
4	IB-X	$Ru(bpy)_3Cl_2·6H_2O$	58
5	$K_2S_2O_8$	$Ru(bpy)_3Cl_2·6H_2O$	60
6	BI-OH	$Ru(bpy)_3Cl_2·6H_2O$	70
7	*m*-CPBA	$Ru(bpy)_3Cl_2·6H_2O$	NR
8	DPO	$Ru(bpy)_3Cl_2·6H_2O$	NR
9	BPO	$Ru(bpy)_3Cl_2·6H_2O$	Trace
10[c]	BI-OAc	$Ru(bpy)_3Cl_2·6H_2O$	Trace

[a] Reaction condition: **1a** (0.2 mmol, 1.0 equiv), **2a** (0.4 mmol, 2.0 equiv), oxidant (0.3 mmol, 1.5 equiv), PC (0.006 mmol, 3 mol%), toluene (2 mL), argon atmosphere, 15 W blue LEDs, 36 h. [b] Isolated yield. [c] Air atmosphere. BI-OAc = 1-(Acetyloxy)-1,2-benziodoxol-3(1*H*)-one. PIDA = (Diacetoxyiodo)-benzene. PIFA = [Bis(trifluoroacetoxy)iodo]benzene. IB-X = 2-Iodoxybenzoic acid. BI-OH = 1-Hydroxy-1,2-benziodoxol-3(1*H*)-one. *m*-CPBA = 3-Chloroperoxybenzoicacid. DPO = 2,5-Diphenyloxazole. BPO = Dibenzoyl peroxide.

Table S3. Optimization of PC [a]

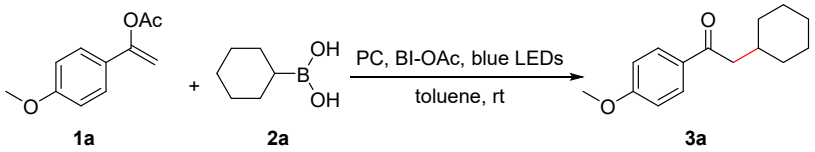


1a **2a** **3a**

Entry	PC	Solvent	Yield(%)[b]
1	$Ir(ppy)_3$	toluene	61
2	$Ru(bpy)_3Cl_2$	toluene	64
3	Eosin Y	toluene	30
4	Eosin B	toluene	23
5	$Ru(bpy)_3(PF_6)_2$	toluene	Trace
6	Acid Red 91	toluene	38
7	Solvent Red 43	toluene	38
8	Fluorescein	toluene	36
9	Methylene blue	toluene	39
10	Rhodamine B	toluene	Trace
11	4-CzIPN	toluene	33
12	**$Ru(bpy)_3Cl_2·6H_2O$**	**toluene**	**76**

[a] Reaction condition: **1a** (0.2 mmol, 1.0 equiv), **2a** (0.4 mmol, 2.0 equiv), BI-OAc (0.3 mmol, 1.5 equiv), PC (0.006 mmol, 3 mol%), toluene (2 mL), argon atmosphere, 15 W blue LEDs, 36 h. [b] Isolated yield.

Table S4. Optimization of amount of substrates and reaction times [a]

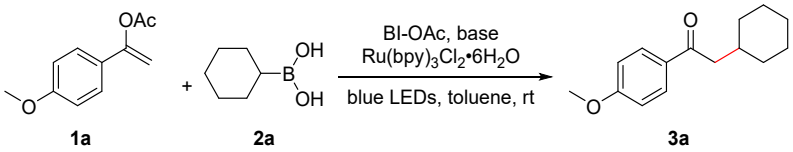


1a **2a** **3a**

Entry	**2a**/mmol	Oxidant/mmol	PC/mol%	Toluene/mL	Time/h	Yield(%)[b]
1	0.4	0.3	3	2	36	76
2	0.2	0.3	3	2	36	50
3	0.3	0.3	3	2	36	68
4	0.5	0.3	3	2	36	79
5	0.6	0.3	3	2	36	76
6	0.7	0.3	3	2	36	70
7	0.5	0.3	3	2	12	76
8	**0.5**	**0.3**	**3**	**2**	**24**	**86**
9	0.5	0.3	3	1	24	75
10	0.5	0.3	3	1.5	24	82
11	0.5	0.3	3	2.5	24	74
12	0.5	0.3	3	3	24	64
13	0.5	0.3	1	2	24	76
14	0.5	0.3	2	2	24	77
15	0.5	0.3	5	2	24	80
16	0.5	0.2	3	2	24	63
17	0.5	0.4	3	2	24	80
18	0.5	0.5	3	2	24	75
19	0.5	0.6	3	2	24	73

[a] Reaction condition: **1a** (0.2 mmol, 1.0 equiv), **2a**, oxidant = BI-OAc, PC = $Ru(bpy)_3Cl_2 \cdot 6H_2O$, toluene, argon atmosphere, 15 W blue LEDs. [b] Isolated yield.

Table S5. Control experiments and the effect of additive base [a]

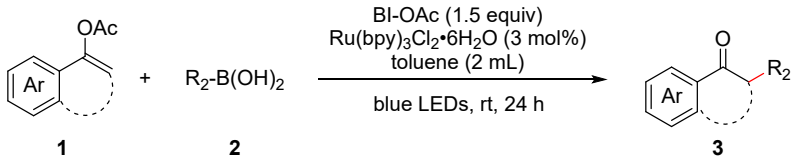


1a **2a** **3a**

Entry	Oxidant/mmol	PC/mol%	Base	Yield(%)[b]
1	/	3	/	NR
2	0.3	/	/	NR
3	0.3	3	K_3PO_4	39
4	0.3	3	NaOAc	63
5	0.3	3	$KHCO_3$	44
6	0.3	3	Na_2CO_3	44
7	0.3	3	DBU	41
8	0.3	3	DMAP	64

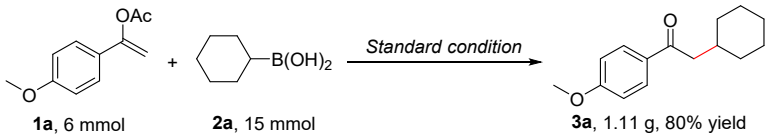
[a] Reaction condition: **1a** (0.2 mmol, 1.0 equiv), **2a** (0.5 mmol, 2.0 equiv), BI-OAc (0.3 mmol, 1.5 equiv), $Ru(bpy)_3Cl_2 \cdot 6H_2O$ (0.006 mmol, 3 mol%), base (0.2 mmol, 1.0 equiv), toluene (2 mL), argon atmosphere, 15 W blue LEDs, 24 h. [b] Isolated yield. DBU = 1,8-Diazabicyclo[5.4.0]undec-7-ene. DMAP = 4-Dimethylaminopyridine.

4. General Procedure for the Synthesis of *α*-Alkyl Ketones



A 10 mL Schlenk tube was charged with **1a** (38.4 mg, 0.2 mmol), **2a** (64.0 mg, 0.5 mmol), BI-OAc (92.0 mg, 0.3 mmol), $Ru(bpy)_3Cl_2·6H_2O$ (3.9 mg, 3 mol%), toluene (2 mL) and a magnetic stir bar under argon atmosphere. The Schlenk tube was sealed by a plastic screw-cap with a Teflon sealed. The reaction solution was continuously irradiated using blue LEDs with a wavelength of 450 - 470 nm. Turn on the magnetic stirrer at the same time. After irradiation at room temperature for 24 hours, the blue LEDs was removed. The crude product was purified by silica gel chromatography (PE/EA =30/1~10/1) to afford the corresponding products **3**.

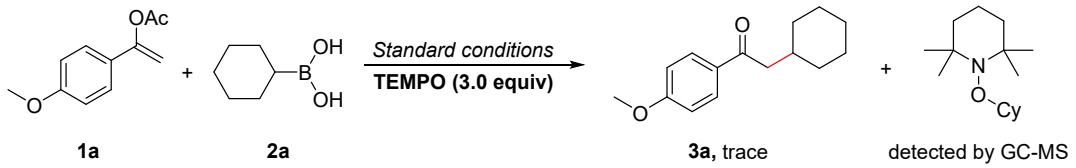
5. Gram-Scale Reaction



A 250 mL round-bottom flask was charged with **1a** (1.15 g, 6 mmol), **2a** (1.92 g, 15 mmol), BI-OAc (2.76 g, 9 mmol), $Ru(bpy)_3Cl_2·6H_2O$ (117.0 mg, 0.18 mmol), toluene (60 mL) and a magnetic stir bar under argon atmosphere. The flask was sealed by a rubber plug. The reaction solution was continuously irradiated using blue LEDs with a wavelength of 450 - 470 nm. Turn on the magnetic stirrer at the same time. After irradiation at room temperature for 24 hours, the blue LEDs was removed. The crude product was purified by silica gel chromatography (PE/EA = 30/1) to afford the target product **3a** (1.11 g, 80%).

6. Mechanism Studies

6.1 TEMPO Trapping Experiment

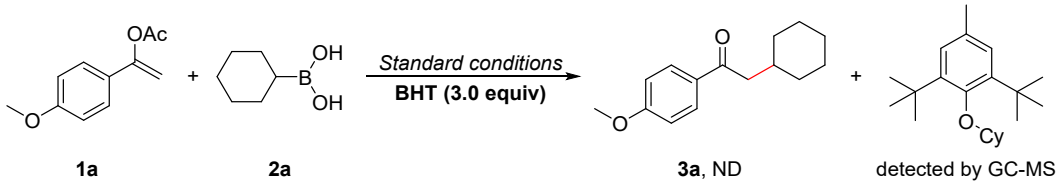


A 10 mL Schlenk tube was charged with **1a** (38.4 mg, 0.2 mmol), **2a** (64.0 mg, 0.5 mmol), BI-OAc (92.0 mg, 0.3 mmol), $Ru(bpy)_3Cl_2·6H_2O$ (3.9 mg, 3 mol%), toluene (2 mL), **TEMPO** (3.0 equiv) and a magnetic stir bar under argon atmosphere. The Schlenk tube was sealed by a plastic screw-cap with a Teflon sealed. The reaction solution was continuously irradiated using blue LEDs with a wavelength of 450 - 470 nm. Turn on the magnetic stirrer at the same time. After irradiation at room temperature for

24 hours, the blue LEDs was removed. The reaction mixture was concentrated in vacuo and separated by column chromatography (PE/EA = 30/1).

*The reaction was almost completely inhibited and **1a** (34.9 mg, recovery rate = 91%) was recovered as a white solid. The molecular ion peak of the cyclohexyl radical captured by TEMPO was found.*

6.2 BHT Trapping Experiment

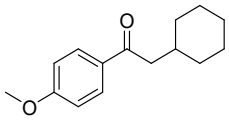


1a **2a** **3a**, ND detected by GC-MS

A 10 mL Schlenk tube was charged with **1a** (38.4 mg, 0.2 mmol), **2a** (64.0 mg, 0.5 mmol), BI-OAc (92.0 mg, 0.3 mmol), $Ru(bpy)_3Cl_2·6H_2O$ (3.9 mg, 3 mol%), toluene (2 mL), **BHT** (3.0 equiv) and a magnetic stir bar under argon atmosphere. The Schlenk tube was sealed by a plastic screw-cap with a Teflon sealed. The reaction solution was continuously irradiated using blue LEDs with a wavelength of 450 - 470 nm. Turn on the magnetic stirrer at the same time. After irradiation at room temperature for 24 hours, the blue LEDs was removed. After treatment, the reaction solution was sent to GC-MS for detection.

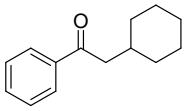
*No product **3a** was detected, and the molecular ion peak of the cyclohexyl radical captured by BHT was found.*

7. Characterization of the Products



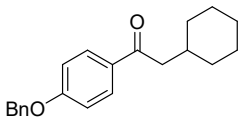
2-Cyclohexyl-1-(4-methoxyphenyl) ethan-1-one (3a)[17]:

The general procedure using 1-(4-methoxyphenyl)vinyl acetate (38.4 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3a** as yellow oil (39.9 mg, 86% yield); R_f = 0.3 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.93 (d, *J* = 8.7 Hz, 2H), 6.92 (d, *J* = 8.7 Hz, 2H), 3.86 (s, 3H), 2.76 (d, *J* = 6.8 Hz, 2H), 2.08 - 1.97 (m, 1H), 1.83 - 1.68 (m, 4H), 1.40 - 0.92 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 199.0, 163.3, 130.6, 130.4, 113.6, 55.4, 45.9, 34.8, 33.5, 26.2, 26.2.



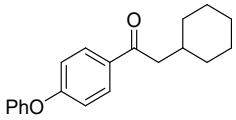
2-Cyclohexyl-1-phenylethan-1-one (3b)[17]:

The general procedure using 1-phenylvinyl acetate (32.4 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3b** as yellow oil (29.9 mg, 74% yield); R_f = 0.3 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.95 (d, *J* = 7.3 Hz, 2H), 7.55 (t, *J* = 7.3 Hz, 1H), 7.45 (t, *J* = 7.7 Hz, 2H), 2.82 (d, *J* = 6.8 Hz, 2H), 2.04 - 1.92 (m, 1H), 1.81 - 1.67 (m, 4H), 1.37 - 0.93 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 200.3, 137.5, 132.9, 128.5, 128.2, 46.2, 34.6, 33.5, 26.3, 26.2.



1-(4-(Benzyloxy)phenyl)-2-cyclohexylethan-1-one (3c)[18]:

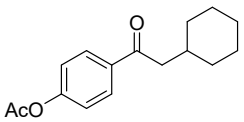
The general procedure using 1-(4-(benzyloxy)phenyl)vinyl acetate (53.6 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3c** as white solid (53.6 mg, 87% yield); R_f = 0.3 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.93 (d, *J* = 8.9 Hz, 2H), 7.48 - 7.30 (m, 5H), 7.00 (d, *J* = 8.9 Hz, 2H), 5.13 (s, 2H), 2.77 (d, *J* = 6.8 Hz, 2H), 2.02 - 1.89 (m, 1H), 1.80 - 1.67 (m, 4H), 1.40 - 0.86 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 199.0, 162.5, 136.2, 130.8, 130.5, 128.7, 128.3, 127.5, 114.5, 70.1, 46.0, 34.8, 33.5, 26.3, 26.2.



2-Cyclohexyl-1-(4-phenoxyphenyl)ethan-1-one (3d):

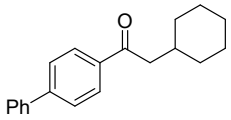
The general procedure using 1-(4-phenoxyphenyl)vinyl acetate (50.8 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3d** as yellow oil (45.3 mg, 77% yield); R_f = 0.3 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.93 (d, *J* = 8.8 Hz, 2H), 7.40 (t, *J* = 8.0 Hz, 2H), 7.20 (t, *J* = 7.6 Hz, 1H), 7.07 (d, *J* = 7.6 Hz, 2H), 7.00 (d, *J* = 8.8 Hz, 2H), 2.78 (d, *J* = 6.8 Hz, 2H), 2.02 - 1.90 (m, 1H), 1.80 - 1.67 (m, 4H), 1.35 - 0.96 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$,

ppm): δ 199.0, 161.8, 155.5, 132.2, 130.4, 130.1, 124.6, 120.2, 117.3, 46.1, 34.8, 33.5, 26.3, 26.2. **HRMS** (ESI) Calcd for $C_{20}H_{23}O_2$ $[M + H]^+$ 295.1693, found 295.1695.



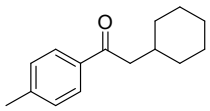
4-(2-Cyclohexylacetyl)phenyl acetate (3e):

The general procedure using 1-(4-acetoxyphenyl)vinyl acetate (44.0 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3e** as yellow oil (34.9 mg, 67% yield); R_f = 0.2 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.98 (d, *J* = 8.7 Hz, 2H), 7.18 (d, *J* = 8.7 Hz, 2H), 2.80 (d, *J* = 6.8 Hz, 2H), 2.33 (s, 3H), 2.02 - 1.91 (m, 1H) ,1.79 - 1.67 (m, 4H), 1.33 - 0.96 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 199.0, 169.0, 154.1, 135.0, 129.8, 121.7, 46.2, 34.5, 33.4, 26.2, 26.1, 21.2. **HRMS** (ESI) Calcd for $C_{16}H_{21}O_3$ $[M + H]^+$ 261.1485, found 261.1489.



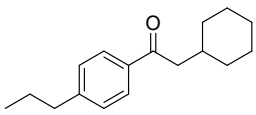
1-([1,1'-Biphenyl]-4-yl)-2-cyclohexylethan-1-one (3f)[17]:

The general procedure using 1-([1,1'-biphenyl]-4-yl)vinyl acetate (47.6 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3f** as white soild (41.1 mg, 74% yield); R_f = 0.2 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 8.03 (d, *J* = 8.3 Hz, 2H), 7.68 (d, *J* = 8.3 Hz, 2H), 7.63 (d, *J* = 7.4 Hz, 2H), 7.48 (t, *J* = 7.5 Hz, 2H), 7.40 (t, *J* = 7.3 Hz, 1H), 2.86 (d, *J* = 6.8 Hz, 2H), 2.06 - 1.96 (m, 1H), 1.82 - 1.69 (m, 4H), 1.37 - 0.98 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 199.9, 145.5, 140.0, 136.2, 129.0, 128.8, 128.2, 127.3, 127.2, 46.3, 34.7, 33.5, 26.3, 26.2.



2-Cyclohexyl-1-(*p*-tolyl)ethan-1-one (3g)[17]:

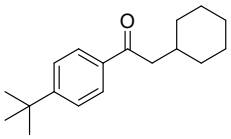
The general procedure using 1-(*p*-tolyl)vinyl acetate (35.2 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3g** as yellow oil (33.7 mg, 78% yield); R_f = 0.3 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.78 (d, *J* = 8.2 Hz, 2H), 7.18 (d, *J* = 8.2 Hz, 2H), 2.72 (d, *J* = 6.8 Hz, 2H), 2.33 (s, 3H), 1.92 - 1.84 (m, 1H), 1.72 - 1.59 (m, 4H), 1.30 - 0.88 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 200.0, 143.6, 135.0, 129.2, 128.3, 46.2, 34.7, 33.5, 26.3, 26.2, 21.6.



2-Cyclohexyl-1-(4-propylphenyl)ethan-1-one (3h):

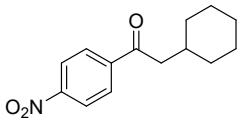
The general procedure using 1-(4-propylphenyl)vinyl acetate (40.8 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3h** as yellow oil (41.0 mg, 84% yield); R_f = 0.3 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.89 (d, *J* = 8.3 Hz, 2H), 7.28 (d, *J* = 8.2 Hz, 2H), 2.82 (d, *J* = 6.8 Hz, 2H), 2.66 (t, *J* = 7.6 Hz, 2H), 2.04 - 1.95 (m, 1H), 1.83 - 1.68 (m, 6H), 1.38 - 0.95 (m, 9H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 200.1, 148.3, 135.2, 128.6, 128.3, 46.2,

38.0, 34.7, 33.5, 26.3, 26.2, 24.3, 13.8. **HRMS** (ESI) Calcd for $C_{17}H_{25}O$ $[M + H]^+$ 245.1900, found 245.1901.



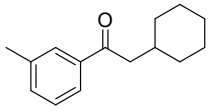
1-(4-(*tert*-Butyl)phenyl)-2-cyclohexylethan-1-one (3i)[17]:

The general procedure using 1-(4-(*tert*-butyl)phenyl)vinyl acetate (43.6 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3i** as yellow oil (32.5 mg, 63% yield); R_f = 0.3 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.89 (d, *J* = 8.5 Hz, 2H), 7.47 (d, *J* = 8.5 Hz, 2H), 2.80 (d, *J* = 6.8 Hz, 2H), 2.02 - 1.92 (m, 1H), 1.77 - 1.67 (m, 4H), 1.34 (s, 9H), 1.25 - 0.95 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 200.2, 156.5, 135.0, 128.1, 125.5, 46.2, 35.1, 34.7, 33.5, 31.1, 26.3, 26.2.



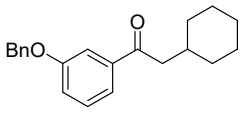
2-Cyclohexyl-1-(4-nitrophenyl)ethan-1-one (3j):

The general procedure using 1-(4-nitrophenyl)vinyl acetate (41.4 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3j** as yellow oil (14.8 mg, 30% yield); R_f = 0.1 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 8.31 (d, *J* = 8.8 Hz, 2H), 8.09 (d, *J* = 8.8 Hz, 2H), 2.87 (d, *J* = 6.8 Hz, 2H), 2.04 - 1.92 (m, 1H), 1.80 - 1.69 (m, 4H), 1.29 - 1.01 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 194.7, 143.0, 131.9, 127.1, 126.2, 47.7, 34.7, 33.5, 26.3, 26.2. **GC-MS** (EI): m/z (%) = 104 (50), 150 (60), 165 (100), 230 (40), 247 (10).



2-Cyclohexyl-1-(*m*-tolyl)ethan-1-one (3k)[19]:

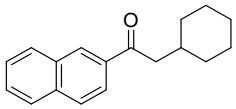
The general procedure using 1-(*m*-tolyl)vinyl acetate (35.2 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3k** as yellow oil (28.0 mg, 65% yield); R_f = 0.3 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.74 (d, *J* = 8.8 Hz, 2H), 7.38 - 7.31 (m, 2H), 2.81 (d, *J* = 6.8 Hz, 2H), 2.41 (s, 3H), 2.02 - 1.91 (m, 1H), 1.80 - 1.68 (m, 4H), 1.35 - 0.93 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 200.6, 138.3, 137.5, 133.6, 128.6, 128.4, 125.4, 46.3, 34.6, 33.5, 26.3, 26.2, 21.4.



1-(3-(Benzyloxy)phenyl)-2-cyclohexylethan-1-one (3l):

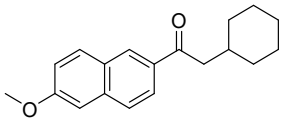
The general procedure using 1-(3-(benzyloxy)phenyl)vinyl acetate (53.6 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3l** as white solid (27.1 mg, 44% yield); R_f = 0.2 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.59 - 7.52 (m, 2H), 7.48 - 7.32

(m, 6H), 7.17 (d, *J* = 8.1 Hz, 1H), 5.12 (s, 2H), 2.79 (d, *J* = 6.8 Hz, 2H), 2.00 - 1.90 (m, 1H), 1.79 - 1.67 (m, 4H), 1.32 - 0.97 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 200.1, 159.0, 138.9, 136.6, 129.6, 128.7, 128.2, 127.6, 121.1, 120.0, 113.6, 70.2, 46.4, 34.6, 33.4, 26.3, 26.2. **HRMS** (ESI) Calcd for $C_{21}H_{25}O_2$ $[M + H]^+$ 309.1849, found 309.1847.



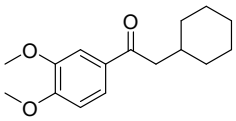
2-Cyclohexyl-1-(naphthalen-2-yl)ethan-1-one (3m)[18]:

The general procedure using 1-(naphthalen-2-yl)vinyl acetate (42.4 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3m** as white solid (39.8 mg, 79% yield); R_f = 0.2 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 8.45 (s, 1H), 8.03 (d, *J* = 8.5 Hz, 1H), 7.97 (d, *J* = 8.0 Hz, 1H), 7.88 (t, *J* = 7.4 Hz, 2H), 7.62 - 7.52 (m, 2H), 2.95 (d, *J* = 6.8 Hz, 2H), 2.10 - 1.98 (m, 1H), 1.84 - 1.69 (m, 4H), 1.41 - 0.94 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 200.4, 135.5, 134.8, 132.6, 129.8, 129.6, 128.4, 128.3, 127.8, 126.7, 124.1, 46.3, 34.8, 33.5, 26.3, 26.2.



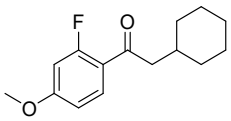
2-Cyclohexyl-1-(6-methoxynaphthalen-2-yl)ethan-1-one (3n):

The general procedure using 1-(6-methoxynaphthalen-2-yl)vinyl acetate (48.4 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3n** as white solid (33.8 mg, 60% yield); R_f = 0.2 (PE/EA = 30/1). m.p. 67 - 69 °C. **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 8.38 (s, 1H), 8.00 (d, *J* = 8.6 Hz, 1H), 7.86 (d, *J* =8.9 Hz, 1H), 7.77 (d, *J* = 8.7 Hz, 1H), 7.20 (d, *J* = 8.9 Hz, 1H), 7.16 (s, 1H), 3.95 (s, 3H), 2.92 (d, *J* = 6.8 Hz, 2H), 2.08 - 1.98 (m, 1H), 1.84 - 1.68 (m, 4H), 1.42 - 0.97 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 200.1, 159.7, 137.2, 133.0, 131.1, 129.6, 127.9, 127.1, 124.8, 119.7, 105.7, 55.4, 46.1, 34.9, 33.5, 26.3, 26.2. **HRMS** (ESI) Calcd for $C_{19}H_{23}O_2$ $[M + H]^+$ 283.1693, found 283.1696.



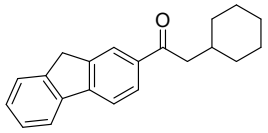
2-Cyclohexyl-1-(3,4-dimethoxyphenyl)ethan-1-one (3o):

The general procedure using 1-(3,4-dimethoxyphenyl)vinyl acetate (44.4 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3o** as yellow oil (46.1 mg, 88% yield); R_f = 0.2 (PE/EA = 20/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.57 (d, *J* = 8.7 Hz, 1H), 7.53 (s, 1H), 6.88 (d, *J* = 8.3 Hz, 1H), 3.95 (s, 3H), 3.94 (s, 3H), 2.77 (d, *J* = 6.9 Hz, 2H), 2.00 - 1.91 (m, 1H), 1.77 - 1.67 (m, 4H), 1.33 - 0.96 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 199.0, 153.1, 149.0, 130.8, 122.9, 110.2, 109.9, 56.1, 56.0, 45.8, 35.0, 33.5, 26.3, 26.2. **HRMS** (ESI) Calcd for $C_{16}H_{22}O_3$ $[M + H]^+$ 263.1642, found 263.1646.



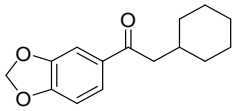
2-cyclohexyl-1-(2-fluoro-4-methoxyphenyl)ethan-1-one (3p):

The general procedure using 1-(2-fluoro-4-methoxyphenyl)vinyl acetate (42.0 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3p** as yellow oil (39.0 mg, 78% yield); R_f = 0.3 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.84 (t, *J* = 8.8 Hz, 1H), 6.74 (dd, *J* = 8.8, 2.4 Hz, 1H), 6.60 (dd, *J* = 13.1, 2.4 Hz, 1H), 3.86 (s, 3H), 2.79 (dd, *J* = 6.8, 3.0 Hz, 2H), 1.95 - 1.92 (m, 1H), 1.75 - 1.66 (m, 4H), 1.29 - 0.95 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 197.2 (d, *J* = 4.6 Hz), 164.6 (d, *J* = 7.0 Hz), 163.4 (d, *J* = 253.2 Hz), 132.2 (d, *J* = 4.7 Hz), 119.0 (d, *J* = 13.3 Hz), 110.7 (d, *J* = 2.5 Hz), 101.7 (d, *J* = 28.0 Hz), 55.9, 50.9 (d, *J* = 6.8 Hz), 34.2, 33.4, 26.3, 26.2. **^{19}F NMR** (376.5 MHz, $CDCl_3$): -106.0. **HRMS** (ESI) Calcd for $C_{15}H_{20}FO_2$ $[M + H]^+$ 251.1442, found 251.1443.



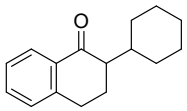
2-Cyclohexyl-1-(9*H*-fluoren-2-yl)ethan-1-one (3q):

The general procedure using 1-(9*H*-fluoren-2-yl)vinyl acetate (50.0 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3q** as yellow oil (31.3 mg, 54% yield); R_f = 0.3 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 8.14 (s, 1H), 8.00 (d, *J* = 8.0 Hz, 1H), 7.84 (t, *J* = 6.6 Hz, 2H), 7.59 (d, *J* = 7.4 Hz, 1H), 7.44 - 7.34 (m, 2H), 3.96 (s, 2H), 2.88 (d, *J* = 6.8 Hz, 2H), 2.06 - 1.96 (m, 1H), 1.83 - 1.68 (m, 4H), 1.44 - 0.85 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 200.2, 146.2, 144.5, 143.3, 140.6, 136.0, 128.0, 127.6, 127.1, 125.3, 124.8, 120.9, 120.0, 46.4, 36.9, 34.8, 33.5, 26.3, 26.2. **HRMS** (ESI) Calcd for $C_{21}H_{23}O$ $[M + H]^+$ 291.1743, found 291.1743.



1-(Benzo[*d*][1,3]dioxol-5-yl)-2-cyclohexylethan-1-one (3r)[20]:

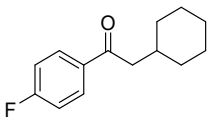
The general procedure using 1-(benzo[*d*][1,3]dioxol-5-yl)vinyl acetate (41.2 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3r** as yellow oil (24.1 mg, 49% yield); R_f = 0.3 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.54 (d, *J* = 8.1 Hz, 1H), 7.42 (s, 1H), 6.84 (d, *J* = 8.2 Hz, 1H), 6.03 (s, 2H), 2.73 (d, *J* = 6.8 Hz, 2H), 2.00 - 1.88 (m, 1H), 1.79 - 1.67 (m, 4H), 1.31 - 0.96 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 198.4, 151.6, 148.1, 132.4, 124.4, 108.0, 107.8, 101.8, 46.0, 34.9, 33.5, 26.3, 26.2.



2-Cyclohexyl-3,4-dihydronaphthalen-1(2*H*)-one (3s)[21]:

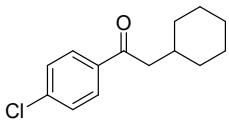
The general procedure using 3,4-dihydronaphthalen-1-yl acetate (37.6 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3s** as yellow oil (19.2 mg, 42% yield); R_f = 0.3 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 8.01 (dd, *J* = 7.8, 1.2 Hz, 1H), 7.45 (dt, *J* = 7.5, 1.4 Hz, 1H), 7.32 - 7.21 (m, 2H), 3.02 (td, *J* = 16.8, 5.3 Hz, 1H), 2.96 - 2.87 (m, 1H), 2.35 - 2.28 (m, 1H), 2.18 - 2.10 (m, 2H), 2.03 - 1.97 (m, 1H), 1.74 - 1.63 (m, 4H), 1.30 - 1.00 (m, 6H).

^{13}C NMR (100 MHz, $CDCl_3$, ppm): δ 200.0, 144.0, 133.0, 128.6, 127.5, 126.5, 53.3, 36.2, 31.2, 29.2, 28.4, 26.7, 26.5, 26.4, 24.3.



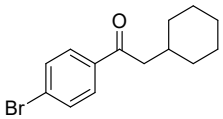
2-cyclohexyl-1-(4-fluorophenyl)ethan-1-one (3t):

The general procedure using 1-(4-fluorophenyl)vinyl acetate (36.0 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3t** as yellow oil (20.7 mg, 47% yield); R_f = 0.3 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 8.00 - 7.95 (m, 2H), 7.16 - 7.09 (m, 2H), 2.79 (d, *J* = 6.8 Hz, 2H), 2.00 - 1.90 (m, 1H), 1.79 - 1.68 (m, 4H), 1.27 - 0.98 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 198.8, 165.6 (d, *J* = 253.2 Hz), 133.9 (d, *J* = 2.8 Hz), 130.8 (d, *J* = 9.3 Hz), 115.6 (d, *J* = 21.7 Hz), 46.2, 34.6, 33.5, 26.3, 26.2. **^{19}F NMR** (376.5 MHz, $CDCl_3$): -105.8. **HRMS** (ESI) Calcd for $C_{14}H_{18}FO$ $[M + H]^+$ 221.1336, found 221.1339.



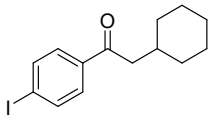
1-(4-Chlorophenyl)-2-cyclohexylethan-1-one (3u)[18]:

The general procedure using 1-(4-chlorophenyl)vinyl acetate (39.2 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3u** as yellow oil (24.5 mg, 52% yield); R_f = 0.3 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.88 (d, *J* = 8.6 Hz, 2H), 7.42 (d, *J* = 8.6 Hz, 2H), 2.78 (d, *J* = 6.8 Hz, 2H), 2.00 - 1.90 (m, 1H), 1.78 - 1.67 (m, 4H), 1.35 - 0.94 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 199.0, 139.3, 135.8, 129.6, 128.9, 46.2, 34.6, 33.4, 26.2, 26.1.



1-(4-Bromophenyl)-2-cyclohexylethan-1-one (3v)[19]:

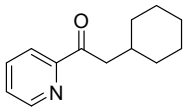
The general procedure using 1-(4-bromophenyl)vinyl acetate (48.0 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3v** as yellow oil (29.8 mg, 53% yield); R_f = 0.3 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.81 (d, *J* = 8.6 Hz, 2H), 7.59 (d, *J* = 8.6 Hz, 2H), 2.78 (d, *J* = 6.8 Hz, 2H), 1.99 - 1.90 (m, 1H), 1.74 - 1.64 (m, 4H), 1.26 - 0.94 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 199.3, 136.2, 131.9, 129.7, 128.0, 46.2, 34.6, 33.4, 26.2, 26.1.



2-Cyclohexyl-1-(4-iodophenyl)ethan-1-one (3w):

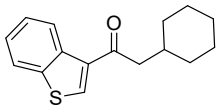
The general procedure using 1-(4-iodophenyl)vinyl acetate (57.6 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3w** as yellow oil (33.4 mg, 51% yield); R_f = 0.3 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.81 (d, *J* = 8.6 Hz, 2H), 7.65 (d, *J* = 8.6 Hz, 2H), 2.77 (d, *J* = 6.8 Hz, 2H), 1.99 - 1.89 (m, 1H), 1.77 - 1.66 (m, 4H), 1.32 - 0.95 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 199.6, 137.9, 136.7, 129.6, 100.8, 46.1, 34.6, 33.4, 26.2, 26.1. **HRMS** (ESI)

Calcd for $C_{14}H_{17}INaO$ $[M + Na]^+$ 351.0216, found 351.0221.



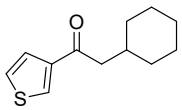
2-Cyclohexyl-1-(pyridin-2-yl)ethan-1-one (3x)[22]:

The general procedure using 1-(pyridin-2-yl)vinyl acetate (32.6 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3x** as yellow oil (21.1 mg, 52% yield); R_f = 0.2 (PE/EA = 20/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 8.67 (d, *J* = 4.5 Hz, 1H), 8.03 (d, *J* = 7.9 Hz, 1H), 7.82 (t, *J* = 7.6 Hz, 1H), 7.45 (t, *J* = 6.1 Hz, 1H), 3.09 (d, *J* = 6.8 Hz, 2H), 2.05 - 1.95 (m, 1H), 1.80 - 1.66 (m, 4H), 1.33 - 0.99 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 201.7, 153.8, 148.8, 136.9, 126.9, 121.8, 45.0, 34.1, 33.4, 26.3, 26.2.



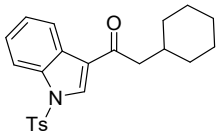
1-(Benzo[*b*]thiophen-3-yl)-2-cyclohexylethan-1-one (3y):

The general procedure using 1-(benzo[*b*]thiophen-3-yl)vinyl acetate (43.6 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3y** as yellow solid (31.0 mg, 60% yield); R_f = 0.3 (PE/EA = 30/1). m.p. 63 - 65 °C. **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.94 (s, 1H), 7.88 (t, *J* = 8.8 Hz, 2H), 7.46 (t, *J* = 7.5 Hz, 1H), 7.40 (t, *J* = 7.5 Hz, 1H), 2.86 (d, *J* = 6.9 Hz, 2H), 2.07 - 1.96 (m, 1H), 1.83 - 1.68 (m, 4H), 1.39 - 0.92 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 194.9, 144.6, 142.6, 139.2, 129.0, 127.3, 125.9, 125.0, 123.0, 47.0, 35.3, 33.5, 26.2, 26.1. **HRMS** (ESI) Calcd for $C_{16}H_{19}OS$ $[M + H]^+$ 259.1151, found 259.1157.



2-Cyclohexyl-1-(thiophen-3-yl)ethan-1-one (3z):

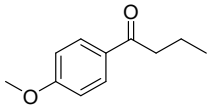
The general procedure using 1-(thiophen-3-yl)vinyl acetate (33.6 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3z** as yellow oil (22.0 mg, 53% yield); R_f = 0.2 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 8.02 (d, *J* = 2.9 Hz, 1H), 7.54 (d, *J* = 5.1 Hz, 1H), 7.32 - 7.28 (m, 1H), 2.72 (d, *J* = 6.9 Hz, 2H), 2.02 - 1.90 (m, 1H), 1.79 - 1.67 (m, 4H), 1.34 - 0.95 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 194.7, 143.0, 131.9, 127.1, 126.2, 47.7, 34.7, 33.5, 26.3, 26.2. **HRMS** (ESI) Calcd for $C_{12}H_{17}OS$ $[M + H]^+$ 209.0995, found 209.0998.



2-Cyclohexyl-1-(1-tosyl-1*H*-indol-3-yl)ethan-1-one (3za):

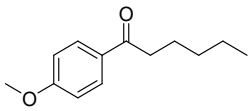
The general procedure using 1-(1-tosyl-1*H*-indol-3-yl)vinyl acetate (71.0 mg, 0.2 mmol) and cyclohexylboronic acid (64.0 mg, 0.5 mmol) afforded the title compound **3za** as yellow solid (55.3 mg, 70% yield); R_f = 0.3 (PE/EA = 30/1). m.p. 86 - 88 °C. **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 8.35 (d, *J* =

6.9 Hz, 1H), 8.20 (s, 1H), 7.91(d, *J* = 7.0 Hz, 1H), 7.83 (d, *J* = 8.4 Hz, 2H), 7.39 - 7.31 (m, 2H), 7.28 (d, *J* = 8.3 Hz, 2H), 2.74 (d, *J* = 6.9 Hz, 2H), 2.37 (s, 3H), 2.05 - 1.94 (m, 1H), 1.81 - 1.69 (m, 4H), 1.32 - 1.01 (m, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 196.3, 145.9, 134.9, 134.5, 131.8, 130.2, 127.7, 127.1, 125.7, 124.8, 123.2, 122.0, 113.1, 47.9, 35.0, 33.5, 26.2, 26.1, 21.7. **HRMS** (ESI) Calcd for $C_{23}H_{26}NO_3S$ $[M + H]^+$ 396.1628, found 396.1628.



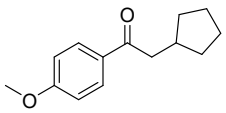
1-(4-Methoxyphenyl)butan-1-one (3zc)[23]:

The general procedure using 1-(4-methoxyphenyl)vinyl acetate (38.4 mg, 0.2 mmol) and ethylboronic acid (37.0 mg, 0.5 mmol) afforded the title compound **3zc** as yellow oil (28.8 mg, 81% yield); R_f = 0.3 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.94 (d, *J* = 8.8 Hz, 2H), 6.92 (d, *J* = 8.8 Hz, 2H), 3.86 (s, 3H), 2.89 (t, *J* = 7.4 Hz, 2H), 1.80 - 1.70 (m, 2H), 0.99 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 199.2, 163.4, 130.4, 130.3, 113.8, 55.6, 40.3, 18.1, 14.1.



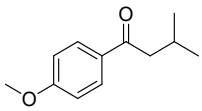
1-(4-Methoxyphenyl)hexan-1-one (3zd)[24]:

The general procedure using 1-(4-methoxyphenyl)vinyl acetate (38.4 mg, 0.2 mmol) and butylboronic acid (51.0 mg, 0.5 mmol) afforded the title compound **3zd** as yellow oil (35.8 mg, 87% yield); R_f = 0.3 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.94 (d, *J* = 8.8 Hz, 2H), 6.92 (d, *J* = 8.8 Hz, 2H), 3.86 (s, 3H), 2.90 (t, *J* = 7.5 Hz, 2H), 1.77 - 1.67 (m, 2H), 1.40 - 1.30 (m, 4H), 0.90 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 199.3, 163.3, 130.3, 130.2, 113.7, 55.4, 38.3, 31.6, 24.3, 22.6, 14.0.



2-Cyclopentyl-1-(4-methoxyphenyl)ethan-1-one (3ze)[25]:

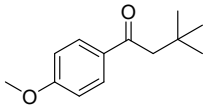
The general procedure using 1-(4-methoxyphenyl)vinyl acetate (38.4 mg, 0.2 mmol) and cyclopentylboronic acid (57.0 mg, 0.5 mmol) afforded the title compound **3ze** as yellow oil (30.5 mg, 70% yield); R_f = 0.3 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.93 (d, *J* = 8.9 Hz, 2H), 6.92 (d, *J* = 8.9 Hz, 2H), 3.86 (s, 3H), 2.92 (d, *J* = 7.2 Hz, 2H), 2.42 - 2.30 (m, 1H), 1.90 - 1.82 (m, 2H), 1.68 - 1.51 (m, 4H), 1.22 - 1.13 (m, 2H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 199.1, 163.3, 130.40, 130.38, 113.7, 55.4, 44.5, 36.3, 32.8, 25.0.



1-(4-Methoxyphenyl)-3-methylbutan-1-one (3zf)[24]:

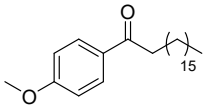
The general procedure using 1-(4-methoxyphenyl)vinyl acetate (38.4 mg, 0.2 mmol) and isopropylboronic acid (44.0 mg, 0.5 mmol) afforded the title compound **3zf** as yellow oil (27.6 mg, 72%

yield); R_f = 0.2 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.93 (d, *J* = 8.8 Hz, 2H), 6.92 (d, *J* = 8.7 Hz, 2H), 3.86 (s, 3H), 2.77 (d, *J* = 6.9 Hz, 2H), 2.32 - 2.21 (m, 1H), 0.98 (d, *J* = 6.7 Hz, 6H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 198.9, 163.3, 130.5, 130.4, 113.7, 55.5, 47.2, 25.4, 22.8.



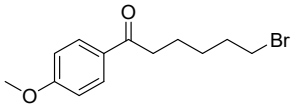
1-(4-Methoxyphenyl)-3,3-dimethylbutan-1-one (3zg)[25]:

The general procedure using 1-(4-methoxyphenyl)vinyl acetate (38.4 mg, 0.2 mmol) and *tert*-butylboronic acid (51.0 mg, 0.5 mmol) afforded the title compound **3zg** as yellow oil (28.9 mg, 70% yield); R_f = 0.2 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.93 (d, *J* = 8.9 Hz, 2H), 6.92 (d, *J* = 8.9 Hz, 2H), 3.86 (s, 3H), 2.80 (s, 2H), 1.05 (s, 9H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 199.0, 163.2, 131.7, 130.6, 113.6, 55.4, 49.7, 31.5, 30.2.



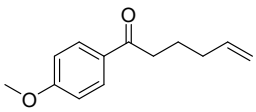
1-(4-Methoxyphenyl)octadecan-1-one (3zh)[26]:

The general procedure using 1-(4-methoxyphenyl)vinyl acetate (38.4 mg, 0.2 mmol) and hexadecylboronic acid (135.1 mg, 0.5 mmol) afforded the title compound **3zh** as white solid (29.9 mg, 40% yield); R_f = 0.2 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.94 (d, *J* = 8.9 Hz, 2H), 6.93 (d, *J* = 8.9 Hz, 2H), 3.87 (s, 3H), 2.90 (t, *J* = 7.5 Hz, 2H), 1.75 - 1.68 (m, 2H), 1.30 - 1.23 (m, 28H), 0.88 (t, *J* = 6.8 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 199.3, 163.3, 130.3, 130.2, 113.7, 55.4, 38.3, 31.9, 29.7, 29.7, 29.6, 29.5, 29.5, 29.5, 29.4, 24.7, 22.7, 14.1. (some peaks overlap).



6-Bromo-1-(4-methoxyphenyl)hexan-1-one (3zi)[27]:

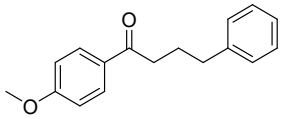
The general procedure using 1-(4-methoxyphenyl)vinyl acetate (38.4 mg, 0.2 mmol) and (4-bromobutyl)boronic acid (90.0 mg, 0.5 mmol) afforded the title compound **3zi** as yellow oil (50.7 mg, 89% yield); R_f = 0.2 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.93 (d, *J* = 8.7 Hz, 2H), 6.93 (d, *J* = 8.7 Hz, 2H), 3.86 (s, 3H), 3.42 (t, *J* = 6.7 Hz, 2H), 2.93 (t, *J* = 7.2 Hz 2H), 1.95 - 1.87 (m, 2H), 1.79 - 1.72 (m, 2H), 1.56 - 1.49 (m, 2H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 198.6, 163.4, 130.3, 130.1, 113.7, 55.5, 37.9, 33.7, 32.7, 27.9, 23.6.



1-(4-Methoxyphenyl)hex-5-en-1-one (3zj)[25]:

The general procedure using 1-(4-methoxyphenyl)vinyl acetate (38.4 mg, 0.2 mmol) and but-3-en-1-ylboronic acid (50.0 mg, 0.5 mmol) afforded the title compound **3zj** as yellow oil (28.5 mg, 70% yield); R_f = 0.2 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.93 (d, *J* = 8.8 Hz, 2H), 6.92 (d, *J* = 8.8 Hz, 2H), 5.91 - 5.75 (m, 1H), 5.08 - 4.95 (m, 2H), 3.86 (s, 3H), 2.91 (t, *J* = 7.4 Hz, 2H), 2.20 - 2.11 (m,

2H), 1.88 - 1.78 (m, 2H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 198.9, 163.4, 138.1, 130.3, 130.2, 115.2, 113.7, 55.4, 37.4, 33.3, 23.6.



1-(4-Methoxyphenyl)-4-phenylbutan-1-one (3zk)[25]:

The general procedure using 1-(4-methoxyphenyl)vinyl acetate (38.4 mg, 0.2 mmol) and phenethylboronic acid (75.0 mg, 0.5 mmol) afforded the title compound **3zk** as yellow oil (36.0 mg, 71% yield); R_f = 0.2 (PE/EA = 30/1). **^{1}H NMR** (400 MHz, $CDCl_3$, ppm): δ 7.91 (d, *J* = 8.9 Hz, 2H), 7.31 - 7.18 (m, 5H), 6.92 (d, *J* = 8.8 Hz, 2H), 3.87 (s, 3H), 2.93 (t, *J* = 7.4 Hz, 2H), 2.72 (t, *J* = 7.6 Hz, 2H), 2.11 - 2.04 (m, 2H). **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 198.8, 163.4, 141.8, 130.3, 130.1, 128.6, 128.4, 125.9, 113.7, 55.5, 37.4, 35.3, 26.0.

8. References

(1) D. Gärtner, A. L. Stein, S. Grupe, J. Arp and A. JacobivonWangelin, Iron-Catalyzed Cross-Coupling of Alkenyl Acetates. *Angew. Chem. Int. Ed.*, 2015, **54**, 10545 - 10549.

(2) J.-Y. Yu, R. Shimizu and R. Kuwano, Selective Cine Substitution of 1-Arylethenyl Acetates with Arylboron Reagents and a Diene/Rhodium Catalyst. *Angew. Chem. Int. Ed.*, 2010, **49**, 6396 - 6399.

(3) C.-X. Song, G.-X. Cai, T. R. Farrell, Z.-P. Jiang, H. Li, L.-B. Gan and Z.-J. Shi, Direct Functionalization of Benzylic C–Hs with Vinyl Acetates via Fe-Catalysis. *Chem. Commun.*, 2009, 6002 - 6004.

(4) I. Geibel, A. Dierks, T. Müller and J. Christoffers, Formation of *δ*-Lactones with *Anti* -Baeyer-Villiger Regiochemistry: Investigations into the Mechanism of the Cerium-Catalyzed Aerobic Coupling of *β*-Oxoesters with Enol Acetates. *Chem. Eur. J.*, 2017, **23**, 7245 - 7254.

(5) Y. Lu, Y. Li, R. Zhang, K. Jin and C. Duan, Highly Efficient Cu(I)-Catalyzed Trifluoromethylation of Aryl(Heteroaryl) Enol Acetates with CF_3 Radicals Derived from CF_3SO_2Na and TBHP at Room Temperature. *J. Fluorine Chem.*, 2014, **161**, 128 - 133.

(6) M. Noji, T. Ohno, K. Fuji, N. Futaba, H. Tajima and K. Ishii, Secondary Benzylation Using Benzyl Alcohols Catalyzed by Lanthanoid, Scandium, and Hafnium Triflate. *J. Org. Chem.*, 2003, **68**, 9340 - 9347.

(7) C. Ren, S. Xu, J. Xu, H. Chen and H. Zeng, Planar Macrocyclic Fluoropentamers as Supramolecular Organogelators. *Org. Lett.*, 2011, **13**, 3840 - 3843.

(8) G. A. Molander and M. Ribagorda, Expanding Organoboron Chemistry: Epoxidation of Potassium Organotrifluoroborates. *J. Am. Chem. Soc.*, 2003, **125**, 11148 - 11149.

(9) V. R. L. J. Bloemendal, D. Sondag, H. Elferink, T. J. Boltje, J. C. M. van Hest and F. P. J. T. Rutjes, A Revised Modular Approach to (–)-Trans-Δ^8-THC and Derivatives Through Late-Stage Suzuki-Miyaura Cross-Coupling Reactions. *Eur. J. Org. Chem.*, 2019, **2019**, 2289 - 2296.

(10) J. E. Richards and D. Philp, A Reactive Nitrone-Based Organogel That Self-Assembles from Its Constituents in Chloroform. *Chem. Commun.*, 2016, **52**, 4995 - 4998.

(11) C. Ren, F. Zhou, B. Qin, R. Ye, S. Shen, H. Su and H. Zeng, Crystallographic Realization of the Mathematically Predicted Densest All-Pentagon Packing Lattice by C_5-Symmetric "Sticky" Fluoropentamers. *Angew. Chem. Int. Ed.*, 2011, **50**, 10612 - 10615.

(12) G.-X. Li, C. A. Morales-Rivera, Y. Wang, F. Gao, G. He, P. Liu and G. Chen, Photoredox-Mediated Minisci C-H Alkylation of *N*-Heteroarenes Using Boronic Acids and Hypervalent Iodine. *Chem. Sci.*, 2016, **7**, 6407 - 6412.

(13) H. Huang, G. Zhang, L. Gong, S. Zhang and Y. Chen, Visible-Light-Induced Chemoselective Deboronative Alkynylation under Biomolecule-Compatible Conditions. *J. Am. Chem. Soc.*, 2014, **136**, 2280 - 2283.

(14) A. T. Parsons, T. D. Senecal and S. L. Buchwald, Iron(II)-Catalyzed Trifluoromethylation of Potassium Vinyltrifluoroborates. *Angew. Chem. Int. Ed.*, 2012, **51**, 2947 - 2950.

(15) J. Sun, X. Zhen, H. Ge, G. Zhang, X. An and Y. Du, Synthesis of Trifluoromethylated 2*H*-Azirines through Togni Reagent-Mediated Trifluoromethylation Followed by PhIO-Mediated Azirination. *Beilstein J. Org. Chem.*, 2018, **14**, 1452 - 1458.

(16) S.-E. Suh, S.-J. Chen, M. Mandal, I. A. Guzei, C. J. Cramer and S. S. Stahl, Site-Selective Copper-Catalyzed Azidation of Benzylic C-H Bonds. *J. Am. Chem. Soc.*, 2020, **142**, 11388 - 11393.

(17) D. Bhattacharyya, B. K. Sarmah, S. Nandi, H. K. Srivastava and A. Das, Selective Catalytic

Synthesis of *α*-Alkylated Ketones and *β*-Disubstituted Ketones via Acceptorless Dehydrogenative Cross-Coupling of Alcohols, *Org. Lett.*, 2021, **23**, 869 - 875.

(18) S. Thiyagarajan and C. Gunanathan, Catalytic Cross-Coupling of Secondary Alcohols, *J. Am. Chem. Soc.*, 2019, **141**, 3822 - 3827.

(19) J. Ji, P. Liu and P. Sun, Peroxide Promoted Tunable Decarboxylative Alkylation of Cinnamic Acids to form Alkenes or Ketones under Metal-Free Conditions, *Chem. Commun.*, 2015, **51**, 7546 - 7549.

(20) W. G. Shuler, R. A. Swyka, T. T. Schempp, B. J. Spinello and M. J. Krische, Vinyl Triflate-Aldehyde Reductive Coupling-Redox Isomerization Mediated by Formate: Rhodium-Catalyzed Ketone Synthesis in the Absence of Stoichiometric Metals, *Chem. - Eur. J.*, 2019, **25**, 12517 - 12520.

(21) C. F. Malosh and J. M. Ready, Catalytic Cross-Coupling of Alkylzinc Halides with *α*-Chloroketones, *J. Am. Chem. Soc.*, 2004, **126**, 10240 - 10241.

(22) W. Sun, L. Wang, C. Xia and C. Liu, Dual Functionalization of *α*-Monoboryl Carbanions through Deoxygenative Enolization with Carboxylic Acids, *Angew. Chem. Int. Ed.*, 2018, **130**, 5599 - 5603.

(23) U. K. Sharma, N. Sharma, R. Kumar, R. Kumar and A. K. Sinha, Biocatalytic Promiscuity of Lipase in Chemoselective Oxidation of Aryl Alcohols/Acetates: A Unique Synergism of CAL-B and [hmim]Br for the Metal-Free H_2O_2 Activation, *Org. Lett.*, 2009, **11**, 4846 - 4848.

(24) J. Ruan, O. Saidi, J. A. Iggo and J. Xiao, Direct Acylation of Aryl Bromides with Aldehydes by Palladium Catalysis, *J. Am. Chem. Soc.*, 2008, **130**, 10510 - 10511.

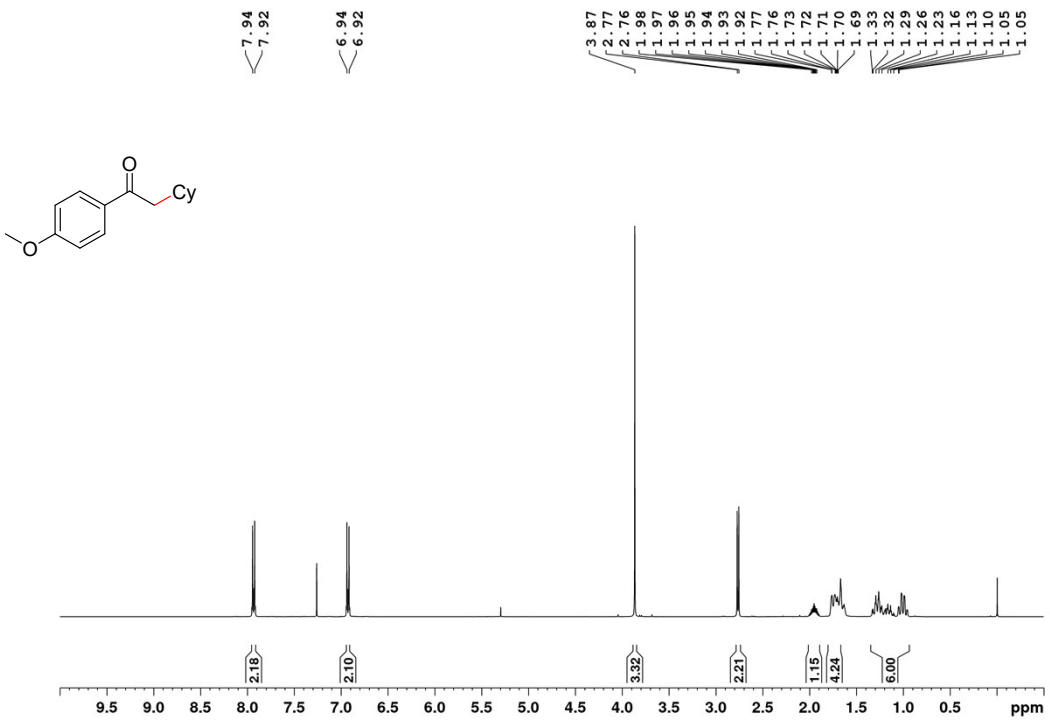
(25) Y. Nie, Z. Wang, Z. Feng, B. Dong, Y. Bai, Y. Leng and J. Wu, Na_2EosinY Catalyzed Alkylation of Enol Acetatesby Radical Decarboxylation of *N*-Hydroxyphthalimide Esters, *Asian J. Org. Chem.*, 2021, **10**, 1675-1678.

(26) R. Sharma, A. Mondal, A. Samanta, N. Biswas, B. Das and D. Srimani, Well-Defined Ni−SNS Complex Catalysed Borrowing Hydrogenative *α*-Alkylation of Ketones and Dehydrogenative Synthesis of Quinolines, *Adv. Synth.Catal.*, 2022, **364**, 2429 - 2437.

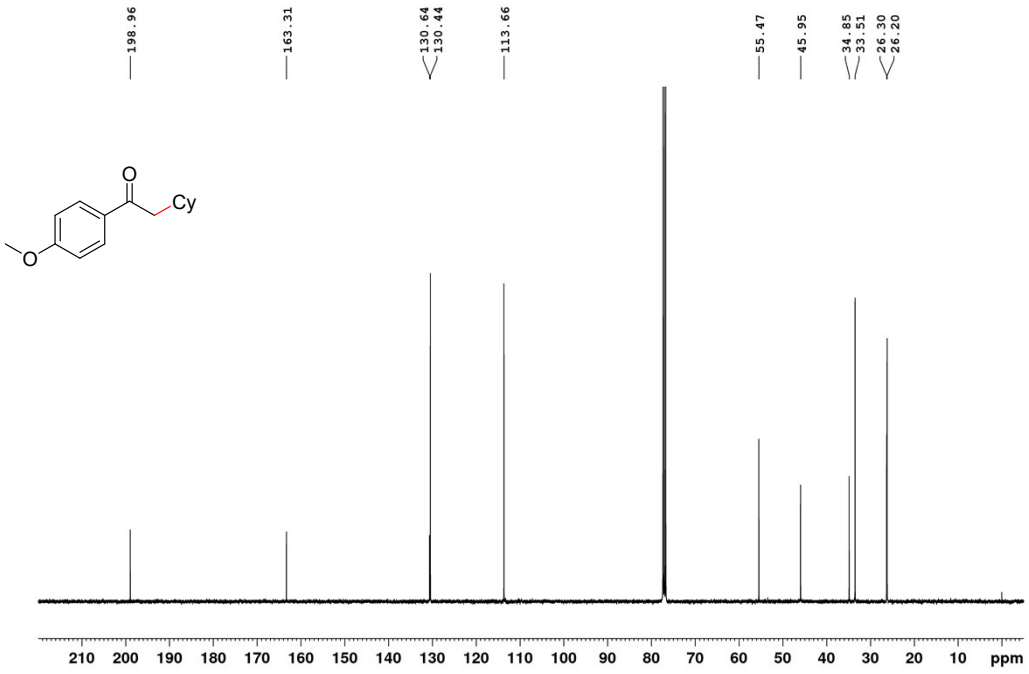
(27) M. D. Hareram, A. El Gehani, J. Harnedy, A. C. Seastram, A. C. Jones, M. Burns, T. Wirth, D. L. Browne and L. C. Morrill, Electrochemical Deconstructive Functionalization of Cycloalkanols via Alkoxy Radicals Enabled by Proton-Coupled Electron Transfer, *Org. Lett.*, 2022, **24**, 3890 - 3895.

9. ^{1}H NMR, ^{13}C NMR and ^{19}F NMR Spectra

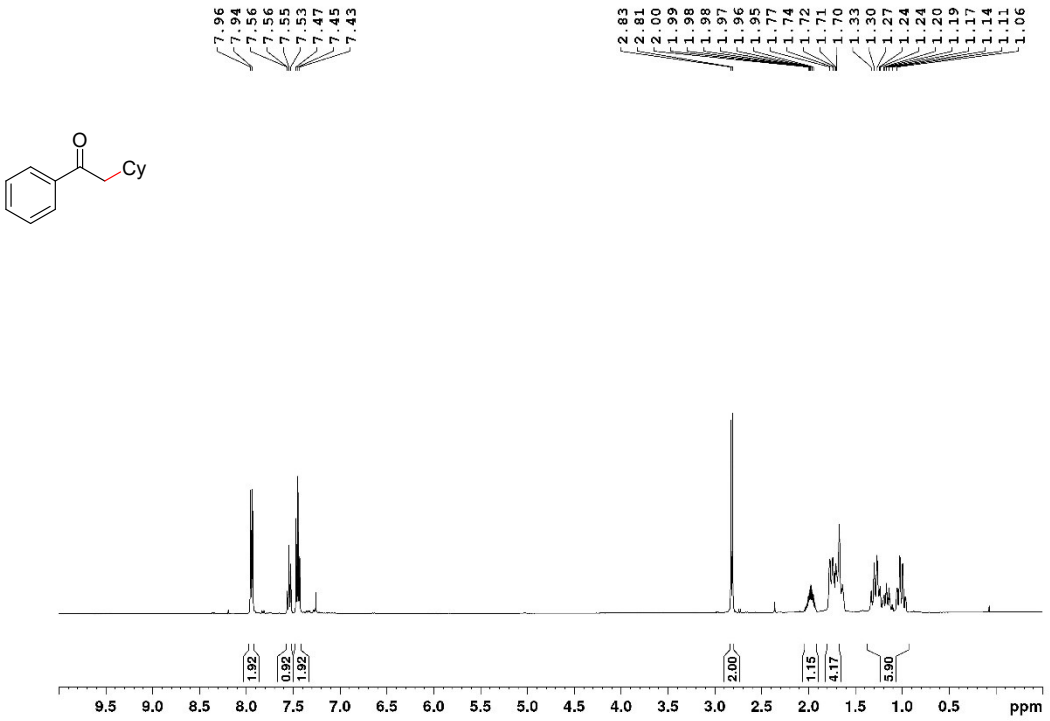
2-Cyclohexyl-1-(4-methoxyphenyl) ethan-1-one (3a): ^{1}H NMR (400 MHz, $CDCl_3$)



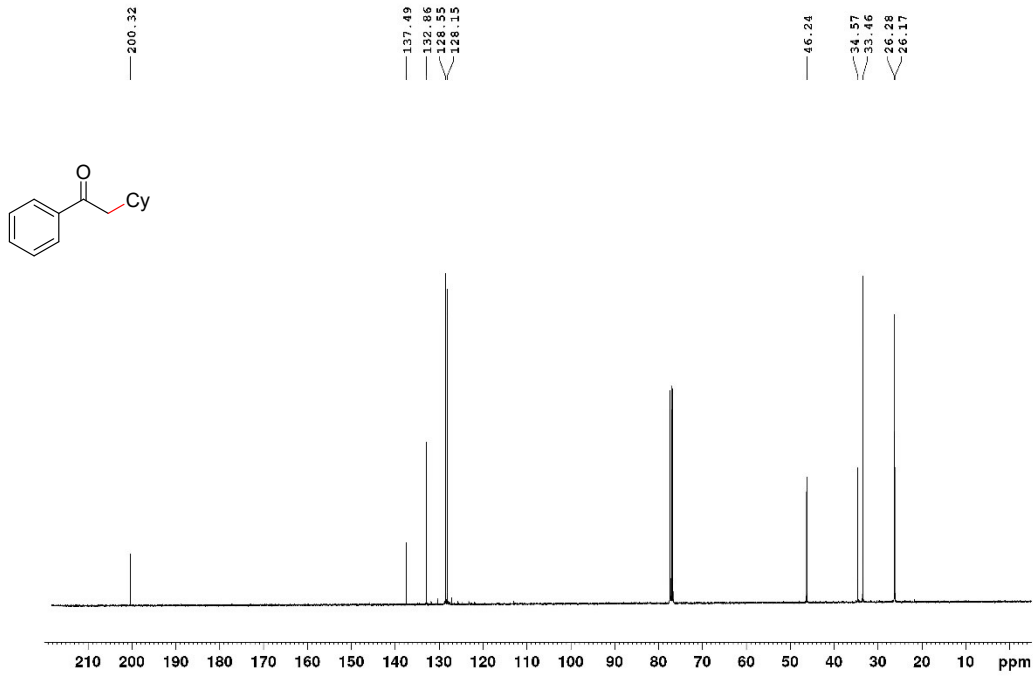
2-Cyclohexyl-1-(4-methoxyphenyl) ethan-1-one (3a): ^{13}C NMR (100 MHz, $CDCl_3$)



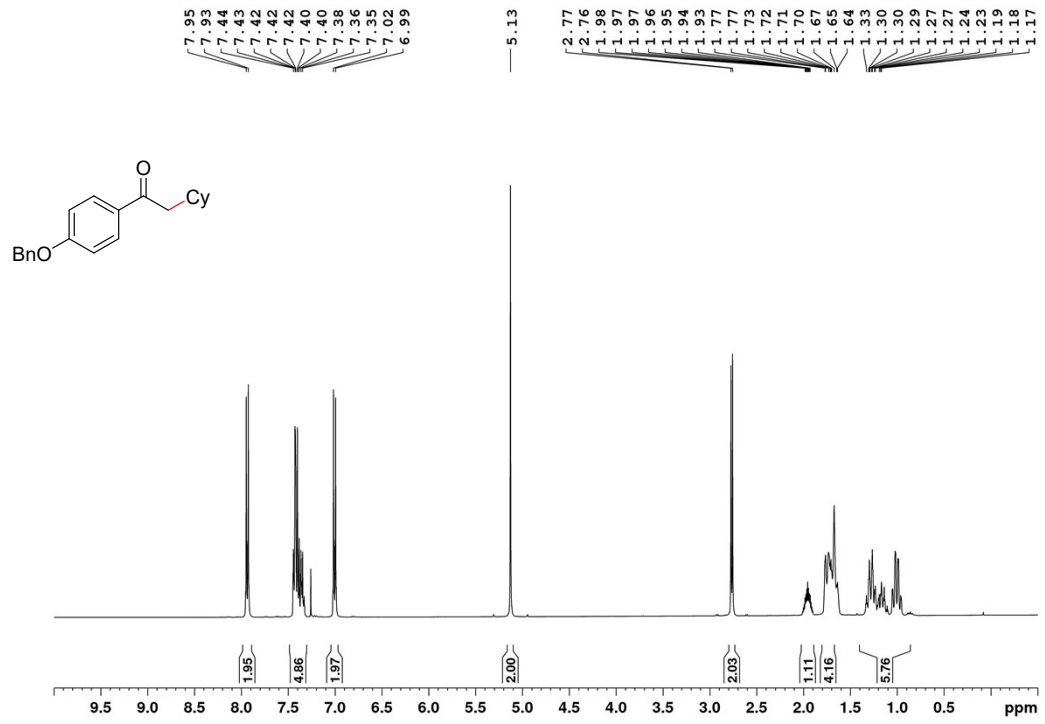
2-Cyclohexyl-1-phenylethan-1-one (3b): ^{1}H NMR (400 MHz, $CDCl_3$)



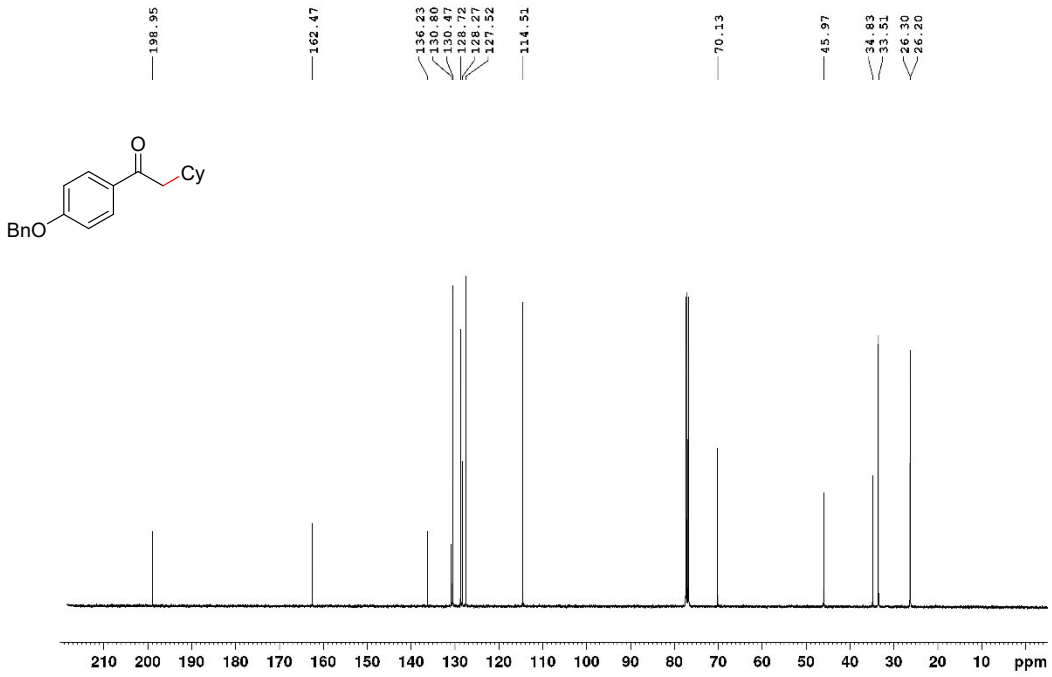
2-Cyclohexyl-1-phenylethan-1-one (3b): ^{13}C NMR (100 MHz, $CDCl_3$)



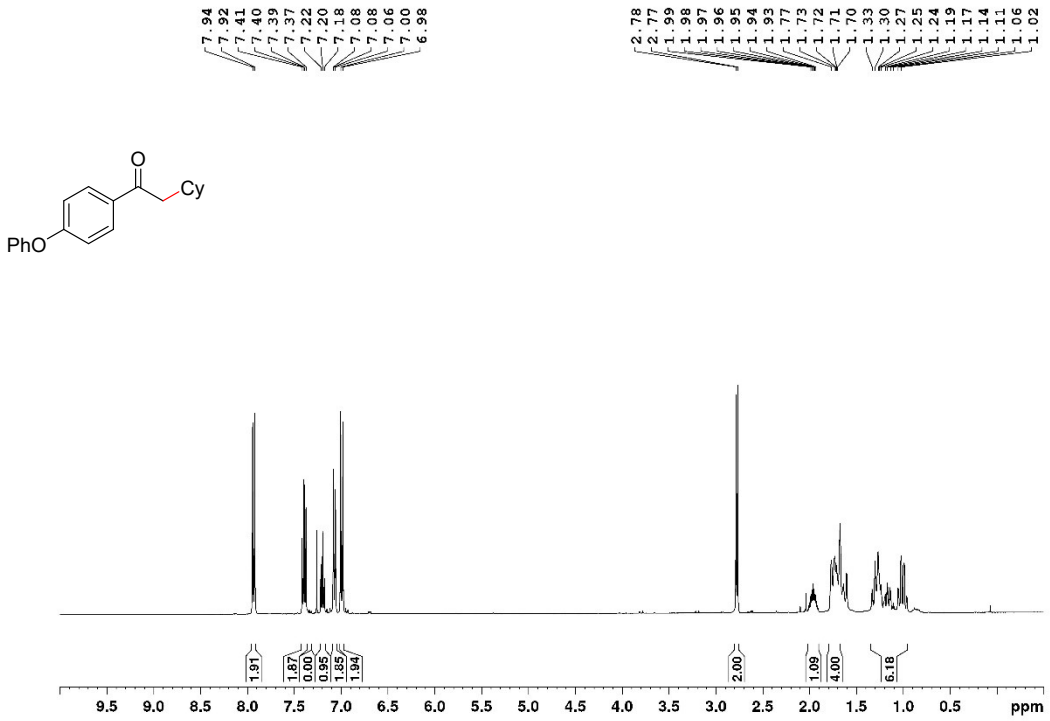
1-(4-(Benzyloxy)phenyl)-2-cyclohexylethan-1-one (3c): ^{1}H NMR (400 MHz, $CDCl_3$)



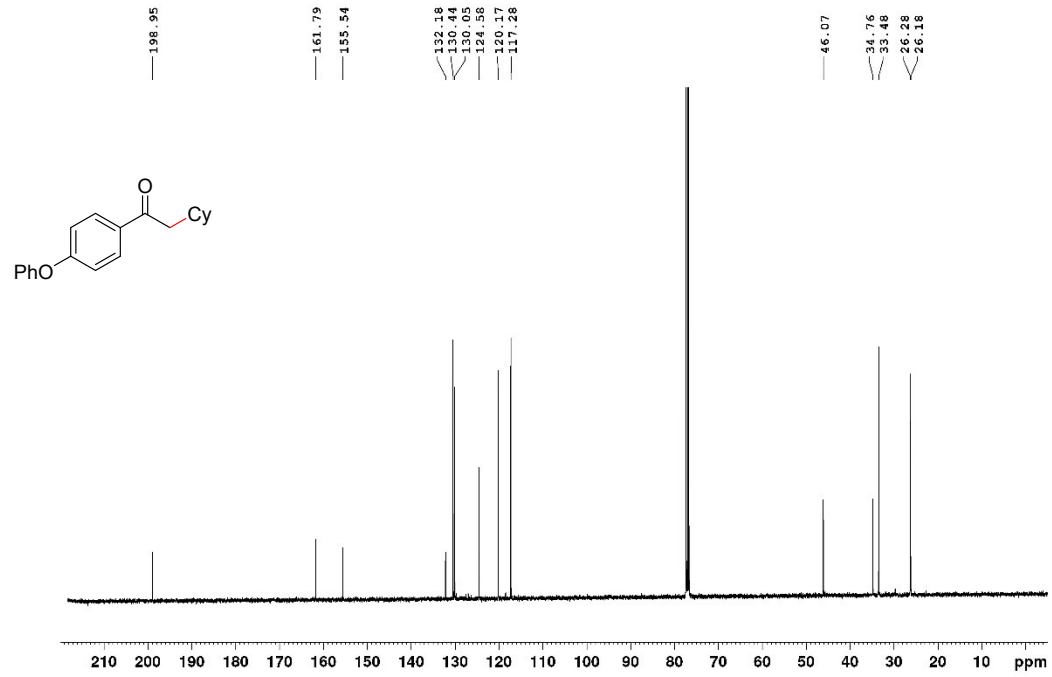
1-(4-(Benzyloxy)phenyl)-2-cyclohexylethan-1-one (3c): ^{13}C NMR (100 MHz, $CDCl_3$)



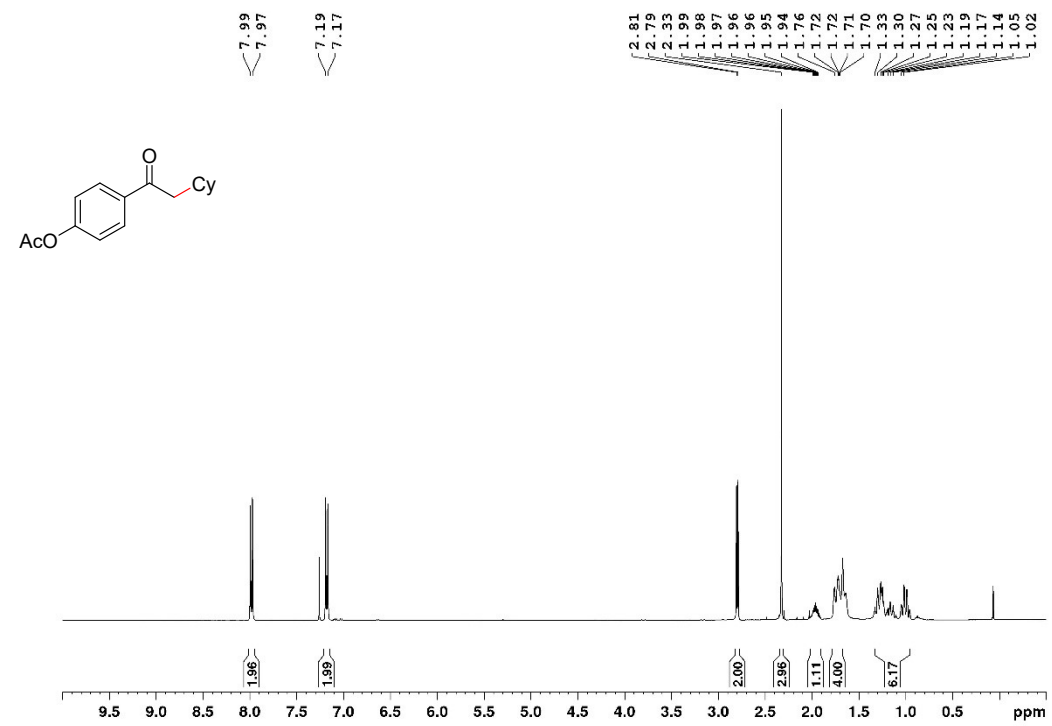
2-Cyclohexyl-1-(4-phenoxyphenyl)ethan-1-one (3d): ^{1}H NMR (400 MHz, $CDCl_3$)



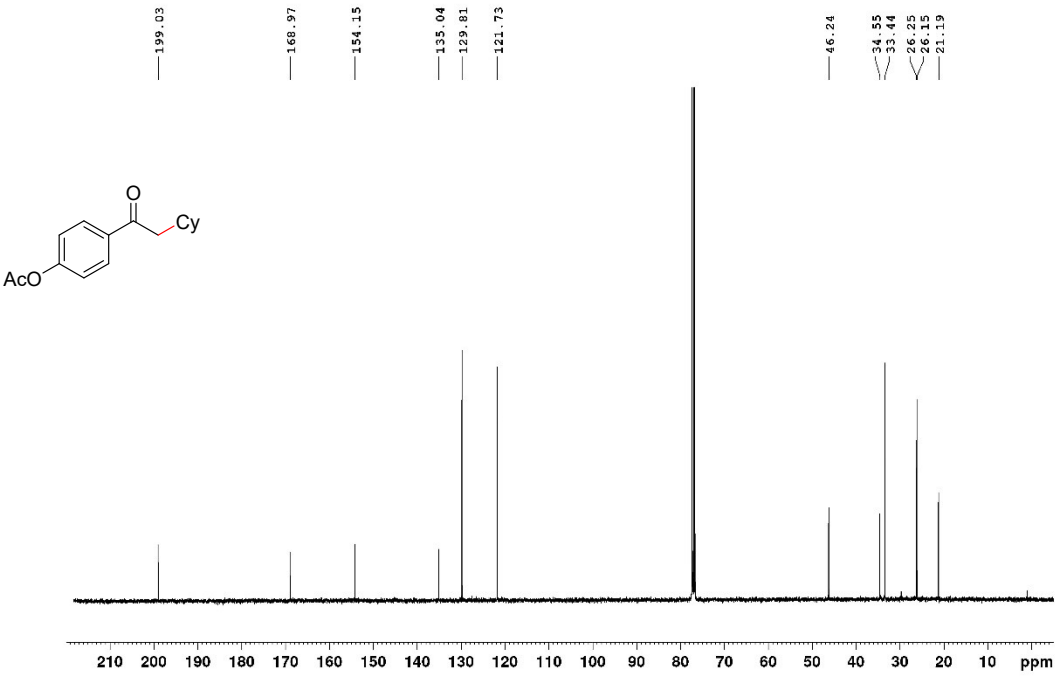
2-Cyclohexyl-1-(4-phenoxyphenyl)ethan-1-one (3d): ^{13}C NMR (100 MHz, $CDCl_3$)



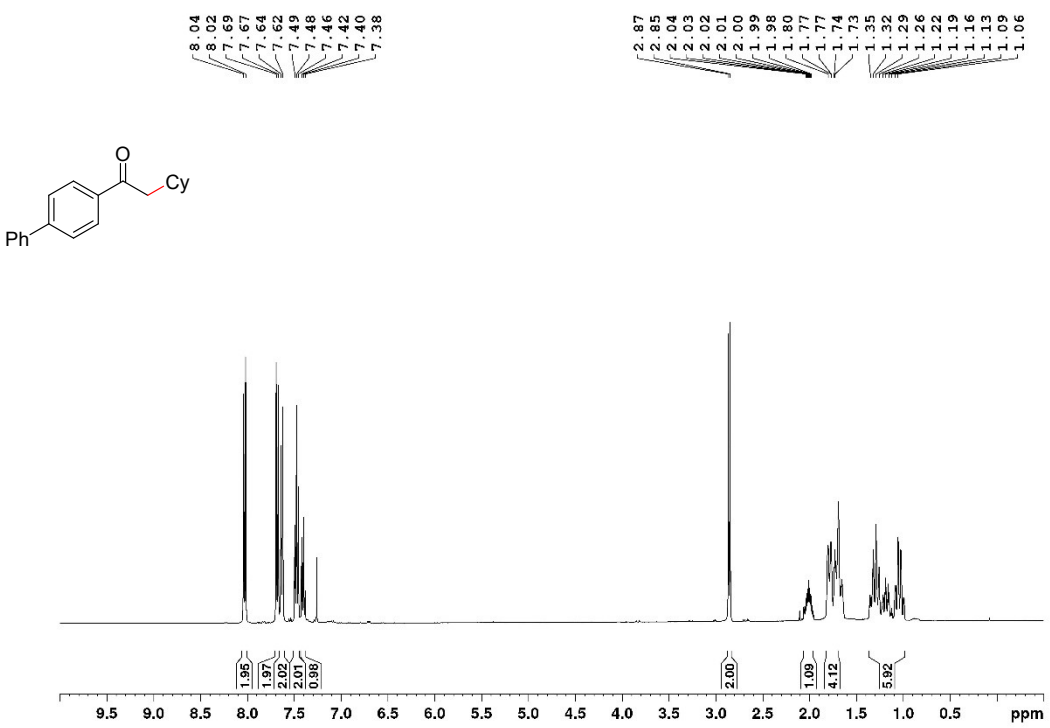
4-(2-Cyclohexylacetyl)phenyl acetate (3e): ^{1}H NMR (400 MHz, $CDCl_3$)



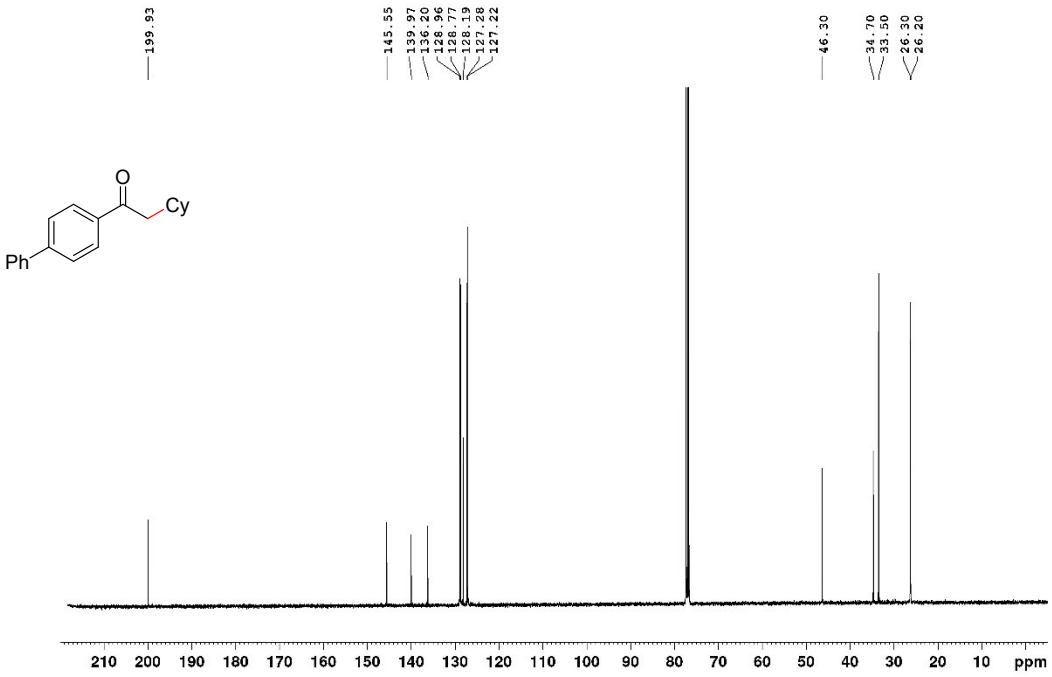
4-(2-Cyclohexylacetyl)phenyl acetate (3e): ^{13}C NMR (100 MHz, $CDCl_3$)



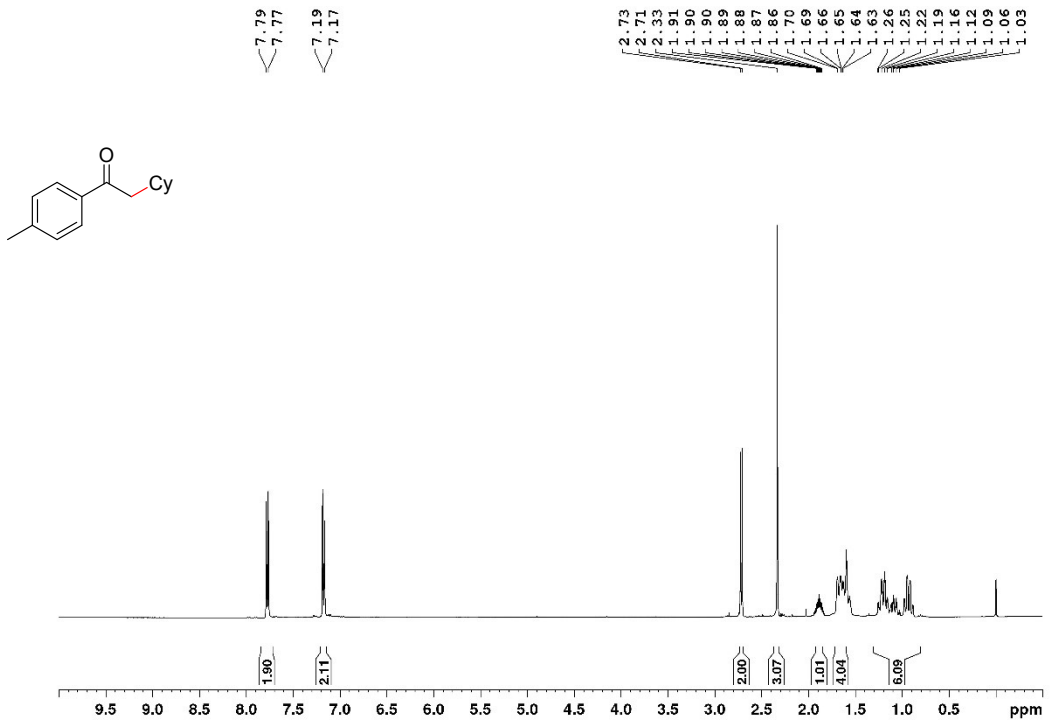
1-([1,1'-Biphenyl]-4-yl)-2-cyclohexylethan-1-one (3f): ^{1}H NMR (400 MHz, $CDCl_3$)



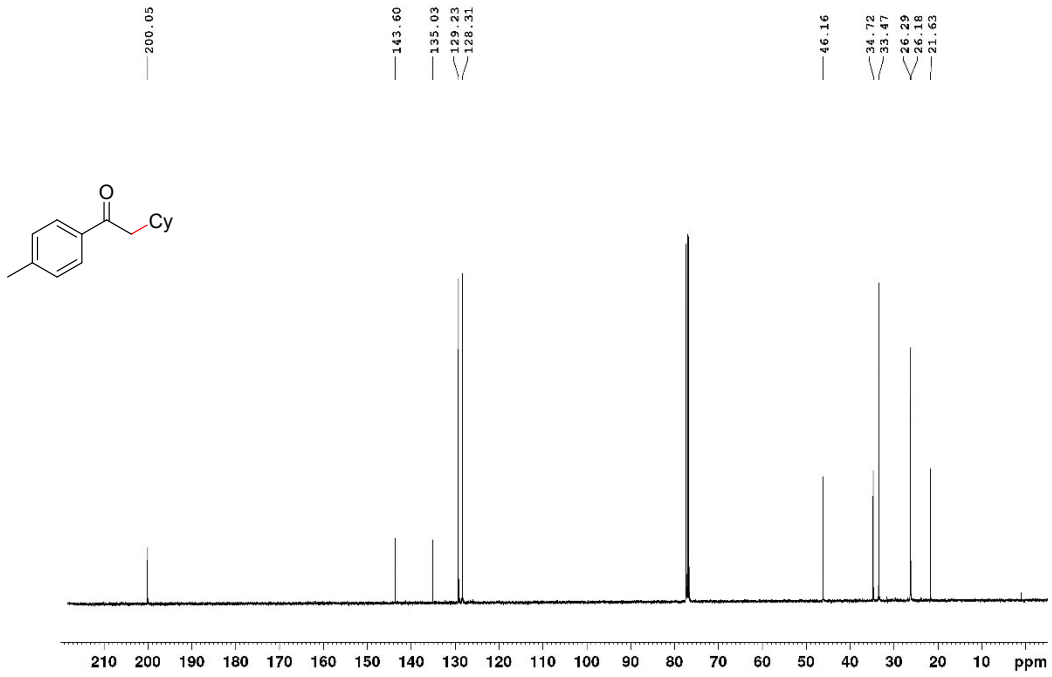
1-([1,1'-Biphenyl]-4-yl)-2-cyclohexylethan-1-one (3f): ^{13}C NMR (100 MHz, $CDCl_3$)



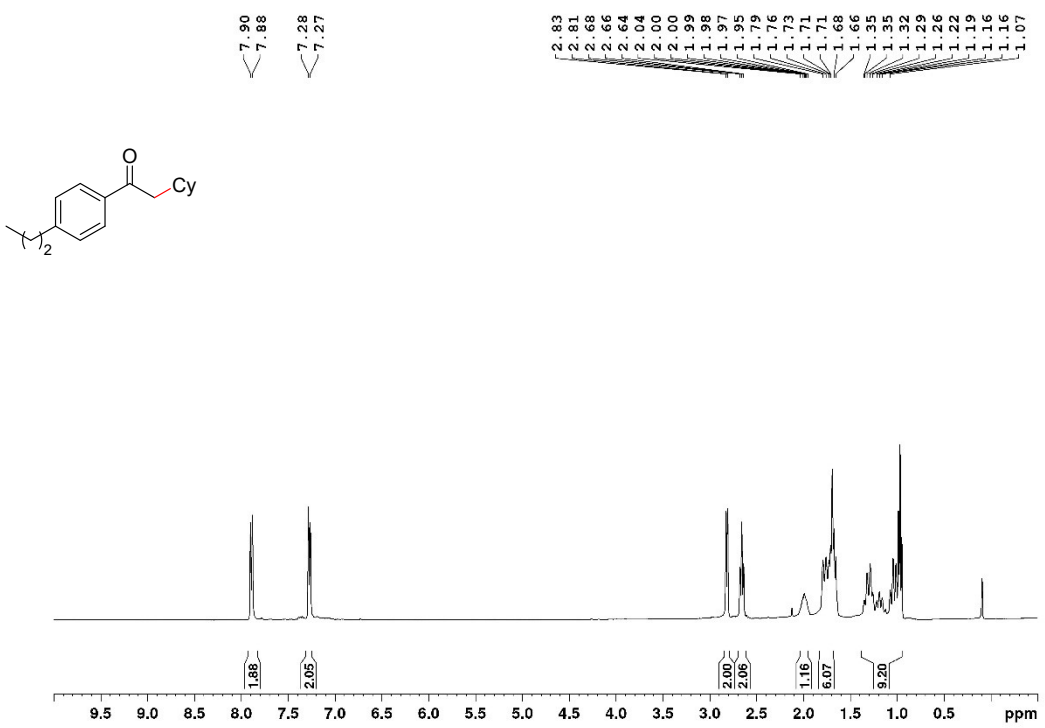
2-Cyclohexyl-1-(*p*-tolyl)ethan-1-one (3g): ^{1}H NMR (400 MHz, $CDCl_3$)



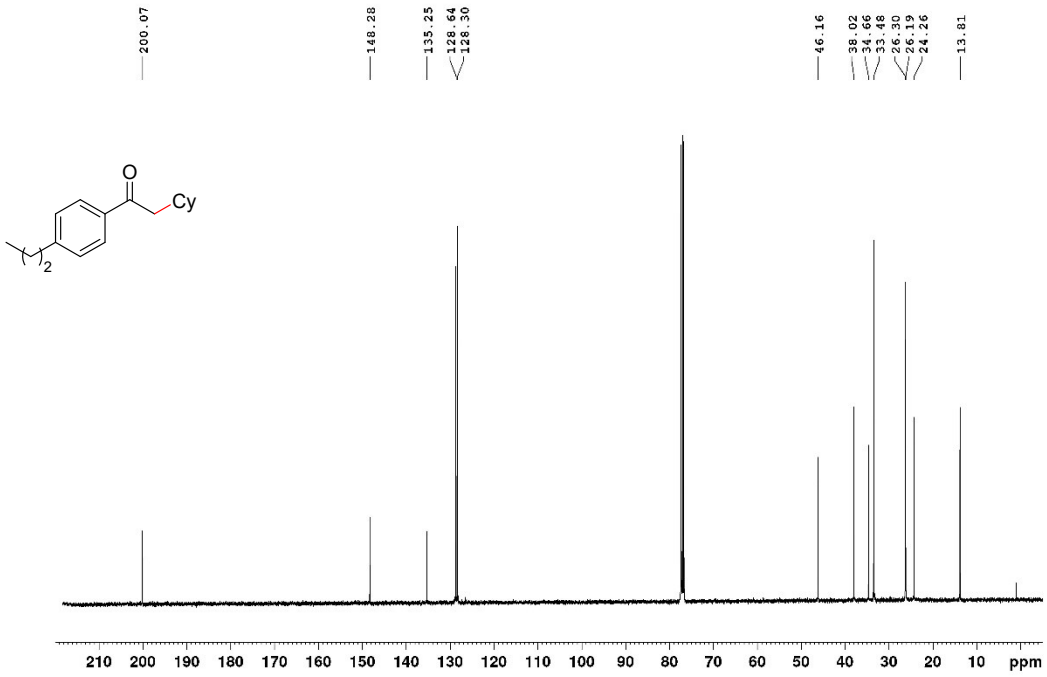
2-Cyclohexyl-1-(*p*-tolyl)ethan-1-one (3g): ^{13}C NMR (100 MHz, $CDCl_3$)



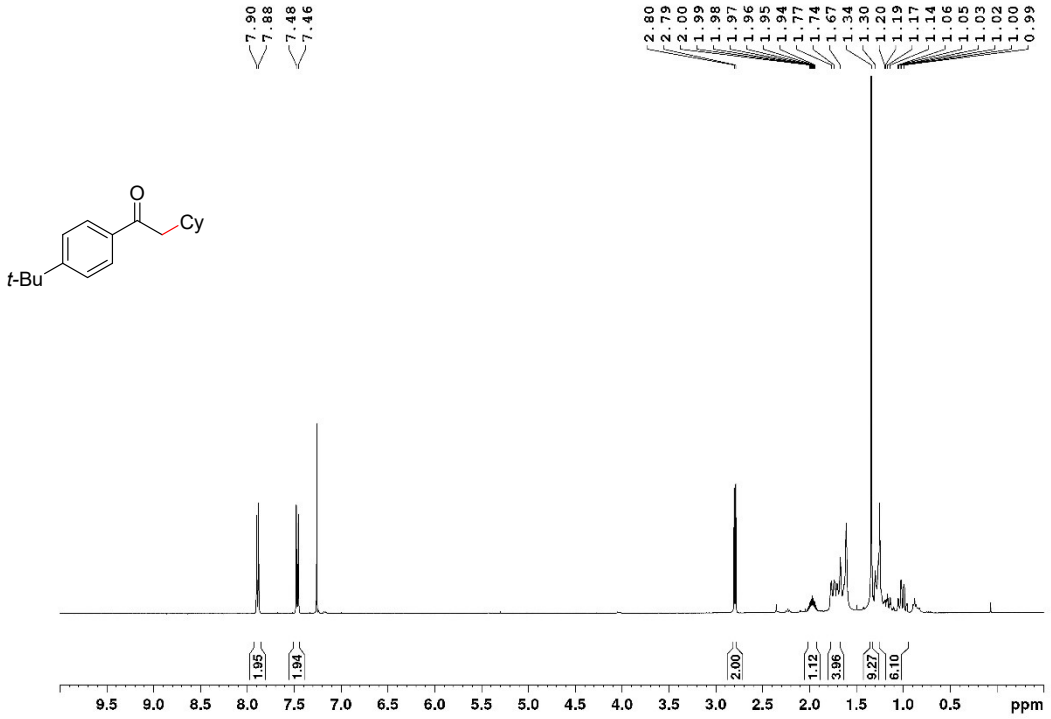
2-Cyclohexyl-1-(4-propylphenyl)ethan-1-one (3h): ^{1}H NMR (400 MHz, $CDCl_3$)



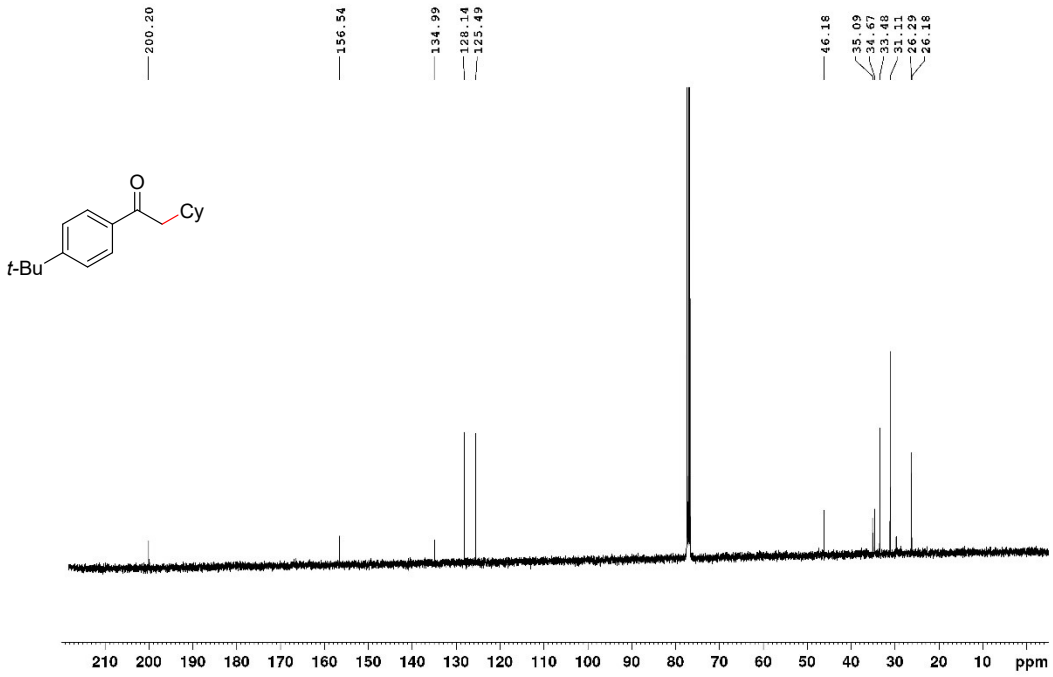
2-Cyclohexyl-1-(4-propylphenyl)ethan-1-one (3h): ^{13}C NMR (100 MHz, $CDCl_3$)



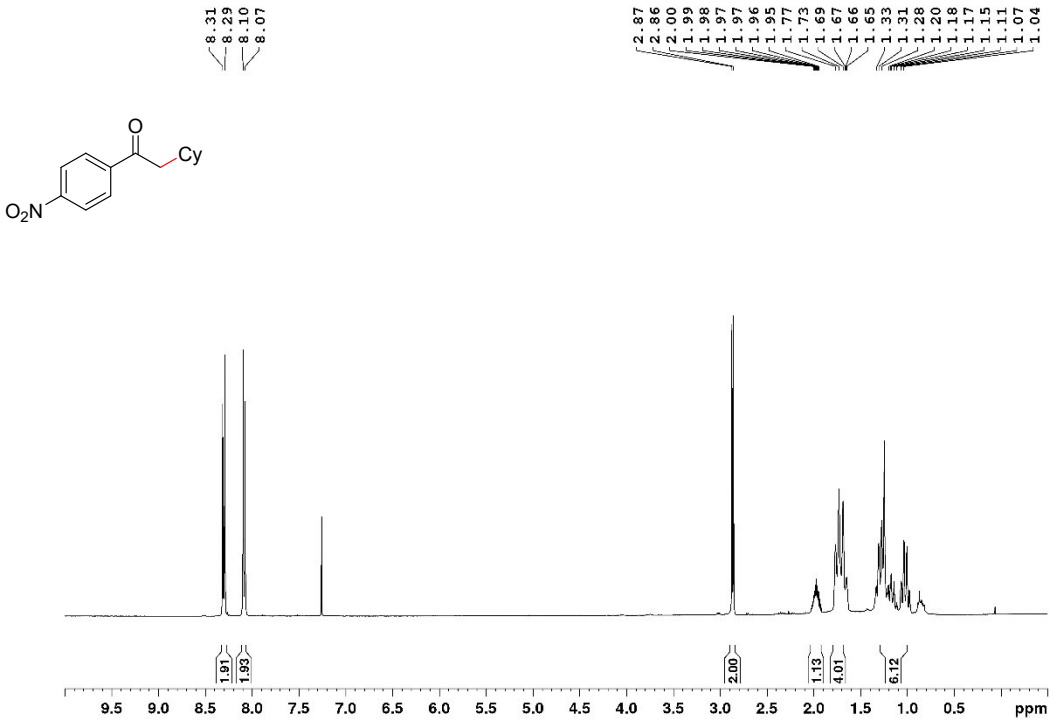
1-(4-(*tert*-Butyl)phenyl)-2-cyclohexylethan-1-one (3i): ^{1}H NMR (400 MHz, $CDCl_3$)



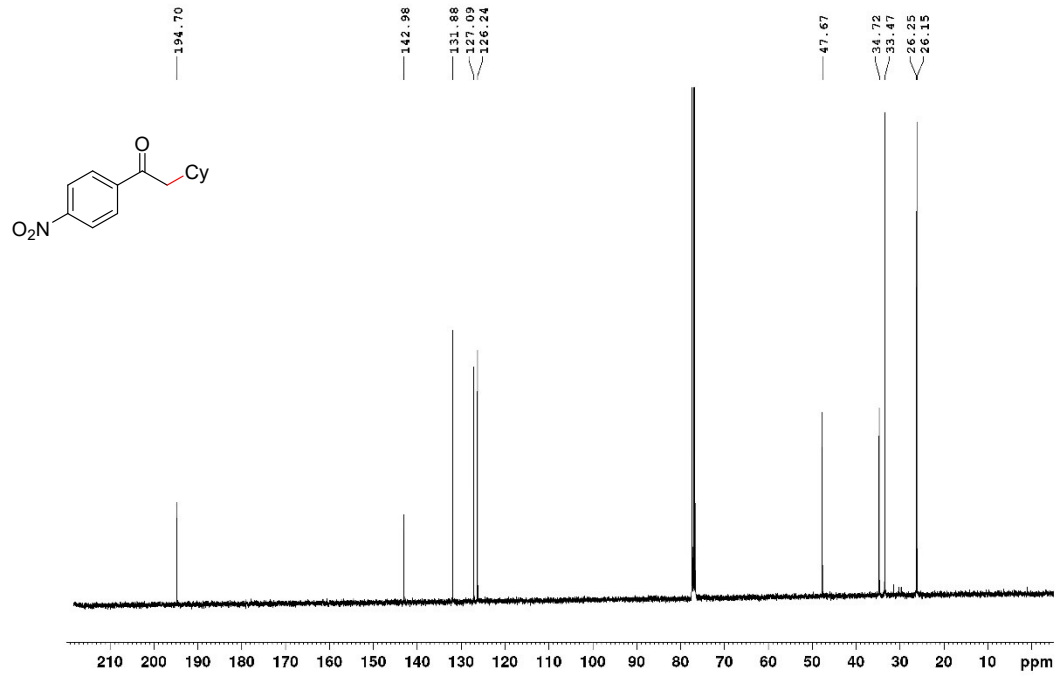
1-(4-(*tert*-Butyl)phenyl)-2-cyclohexylethan-1-one (3i): ^{13}C NMR (100 MHz, $CDCl_3$)



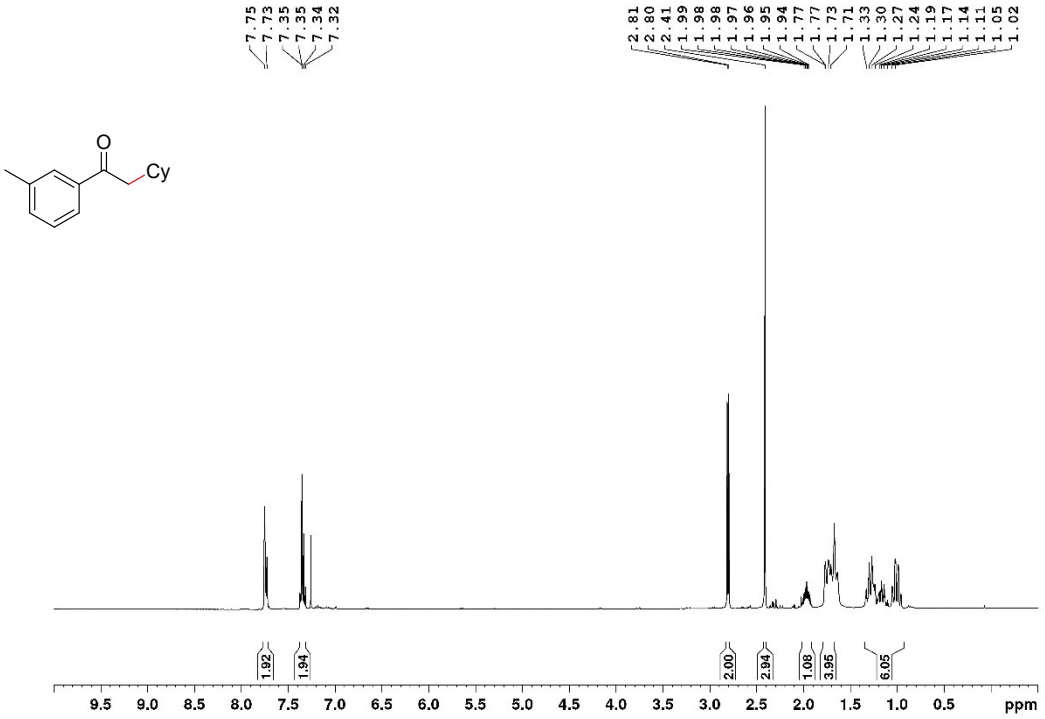
2-Cyclohexyl-1-(4-nitrophenyl)ethan-1-one (3j): ^{1}H NMR (400 MHz, $CDCl_3$)



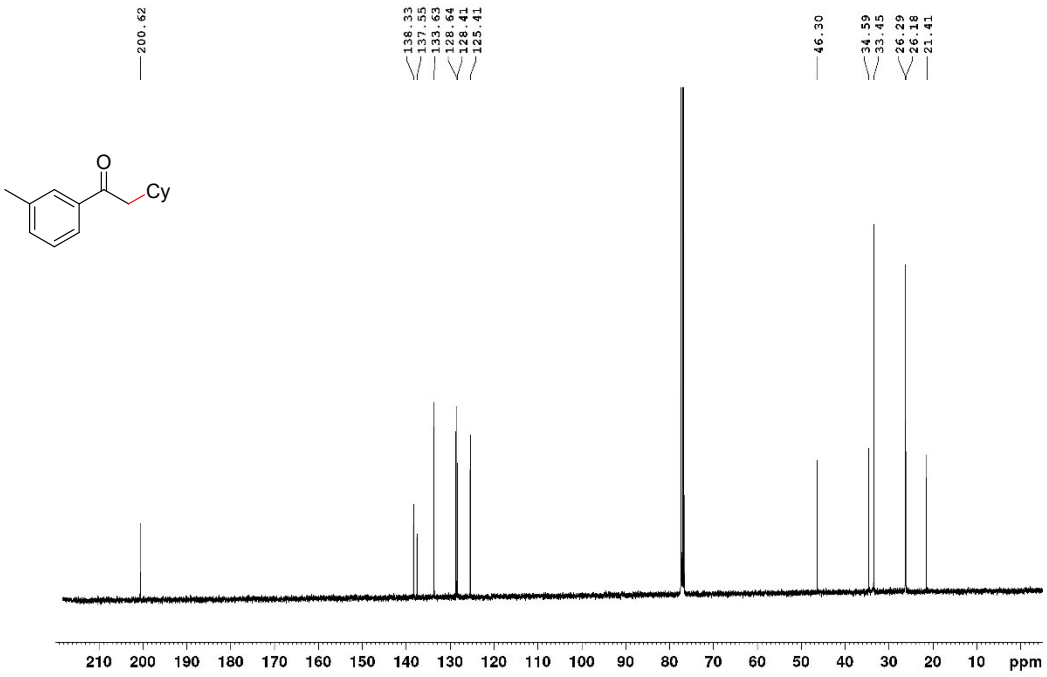
2-Cyclohexyl-1-(4-nitrophenyl)ethan-1-one (3j): ^{13}C NMR (100 MHz, $CDCl_3$)



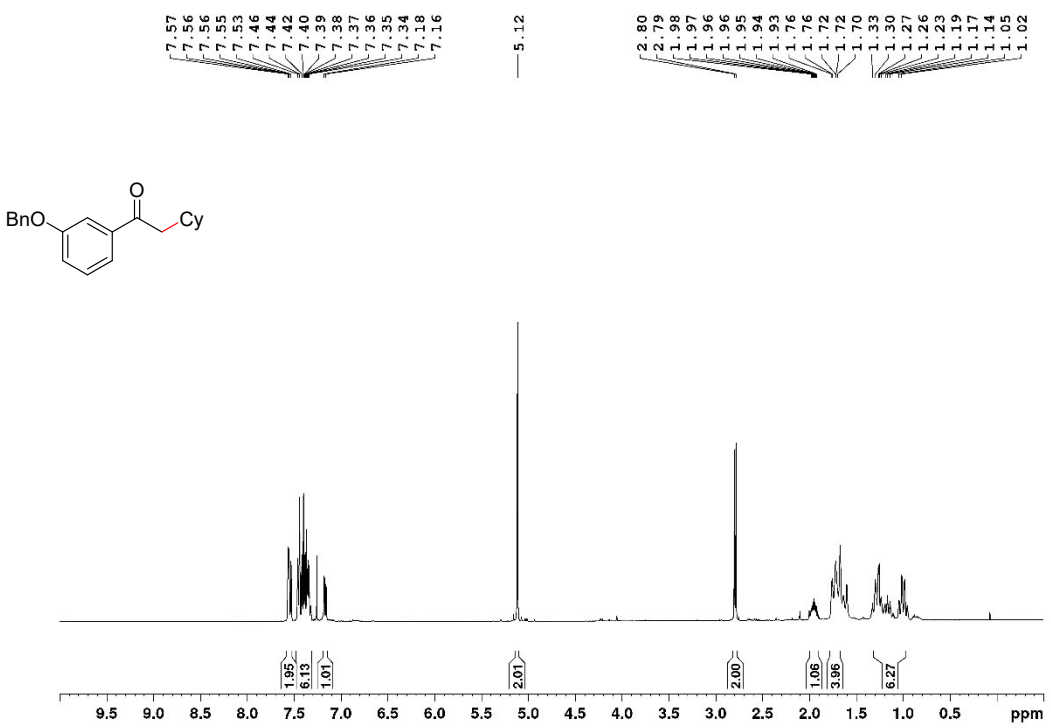
2-Cyclohexyl-1-(*m*-tolyl)ethan-1-one (3k): ^{1}H NMR (400 MHz, $CDCl_3$)



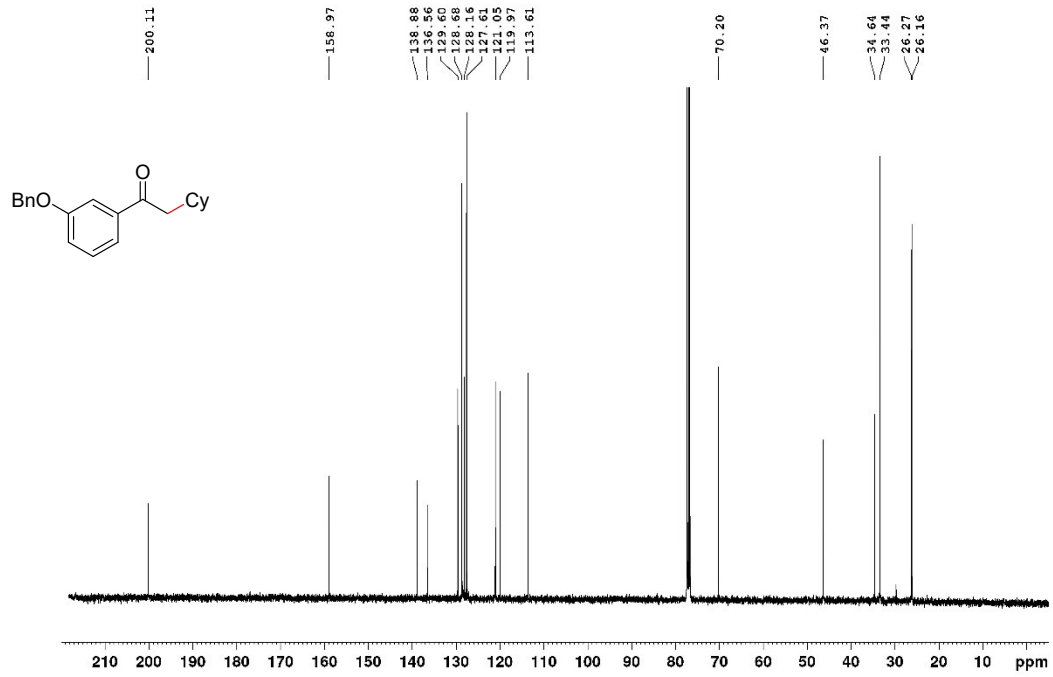
2-Cyclohexyl-1-(*m*-tolyl)ethan-1-one (3k): ^{13}C NMR (100 MHz, $CDCl_3$)



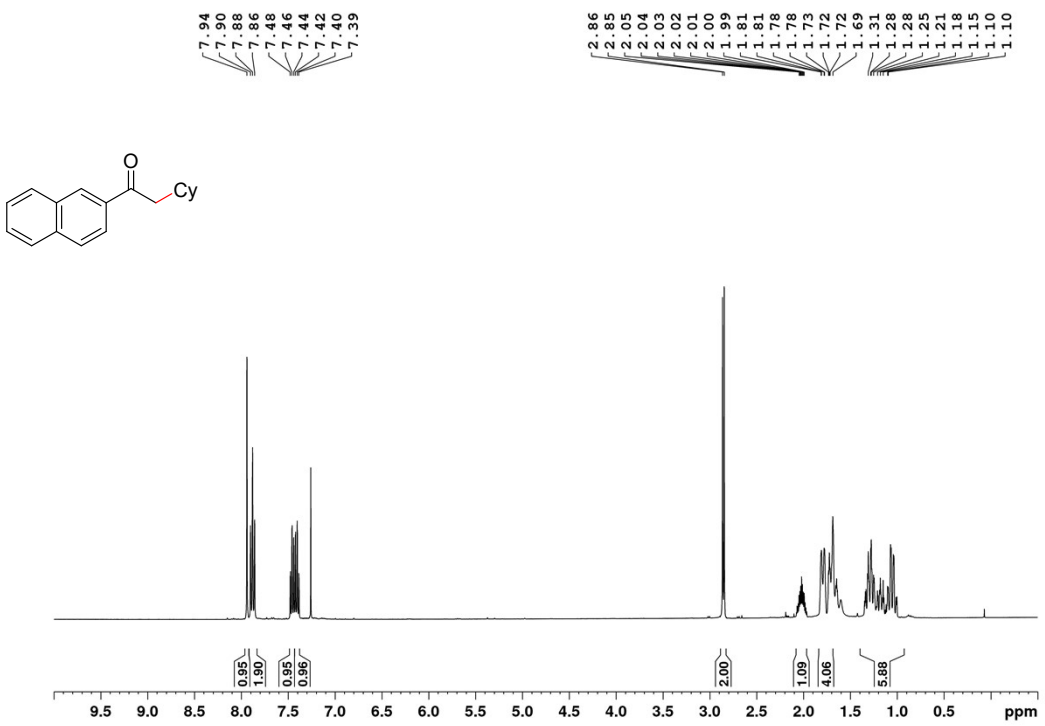
1-(3-(Benzyloxy)phenyl)-2-cyclohexylethan-1-one (3l): ^{1}H NMR (400 MHz, $CDCl_3$)



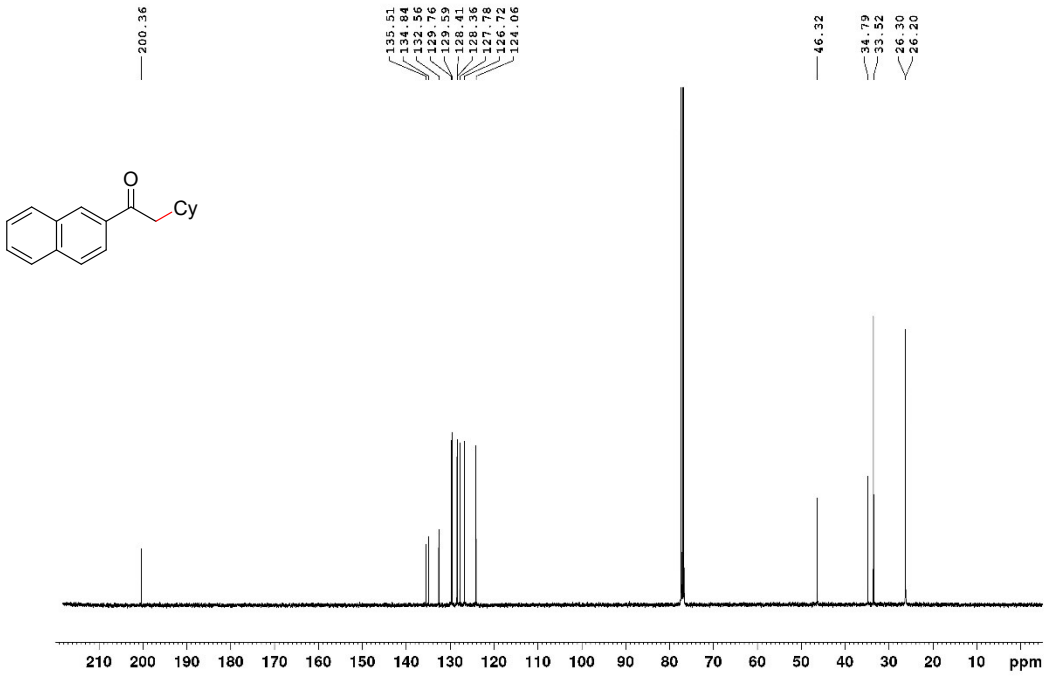
1-(3-(Benzyloxy)phenyl)-2-cyclohexylethan-1-one (3l): ^{13}C NMR (100 MHz, $CDCl_3$)



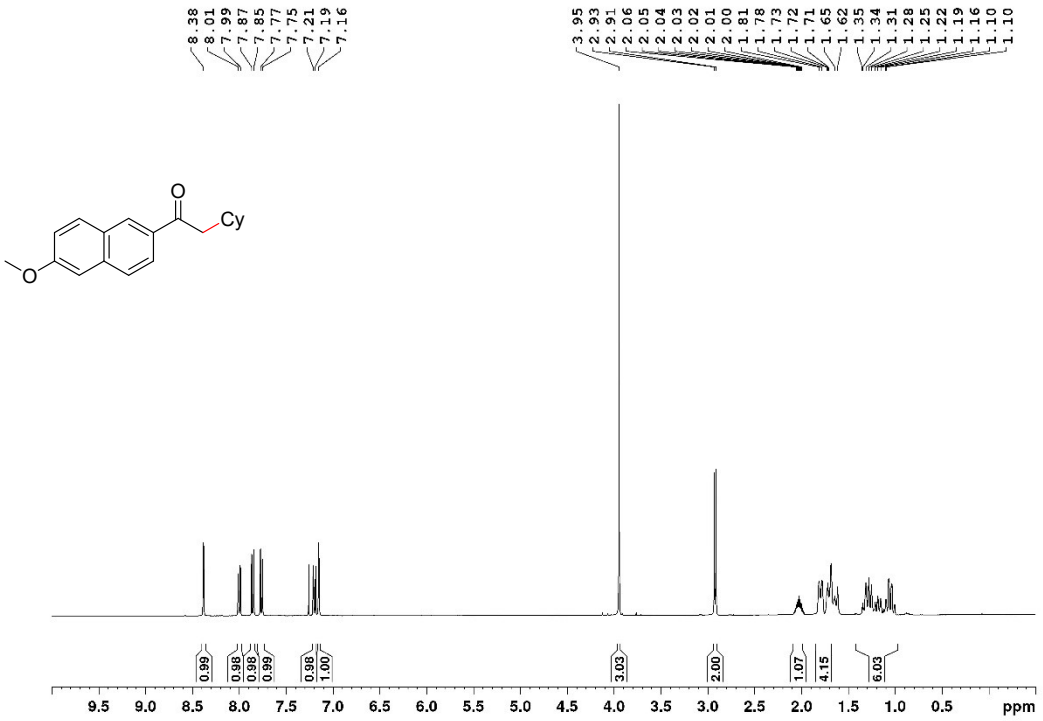
2-Cyclohexyl-1-(naphthalen-2-yl)ethan-1-one (3m): ^{1}H NMR (400 MHz, $CDCl_3$)



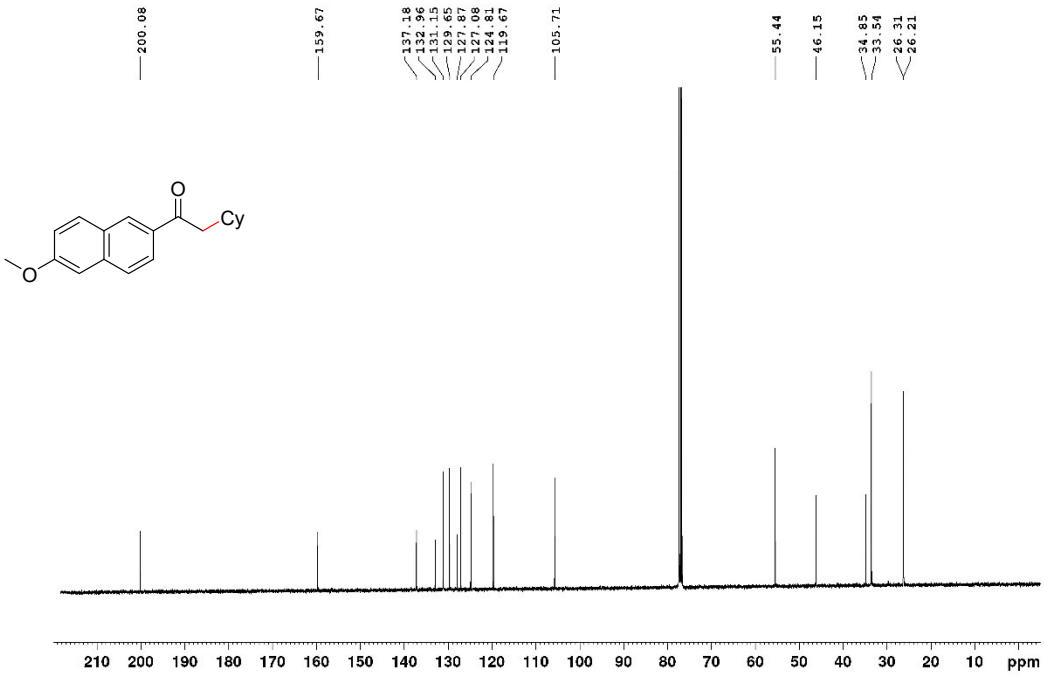
2-Cyclohexyl-1-(naphthalen-2-yl)ethan-1-one (3m): ^{13}C NMR (100 MHz, $CDCl_3$)



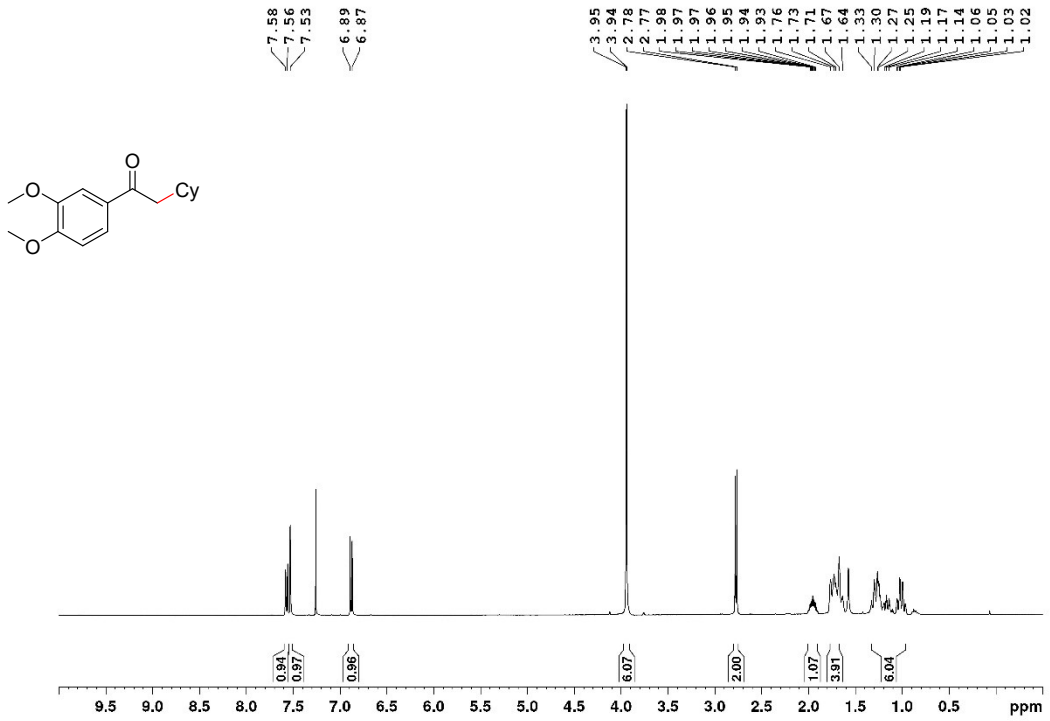
2-Cyclohexyl-1-(6-methoxynaphthalen-2-yl)ethan-1-one (3n): ^{1}H NMR (400 MHz, $CDCl_3$)



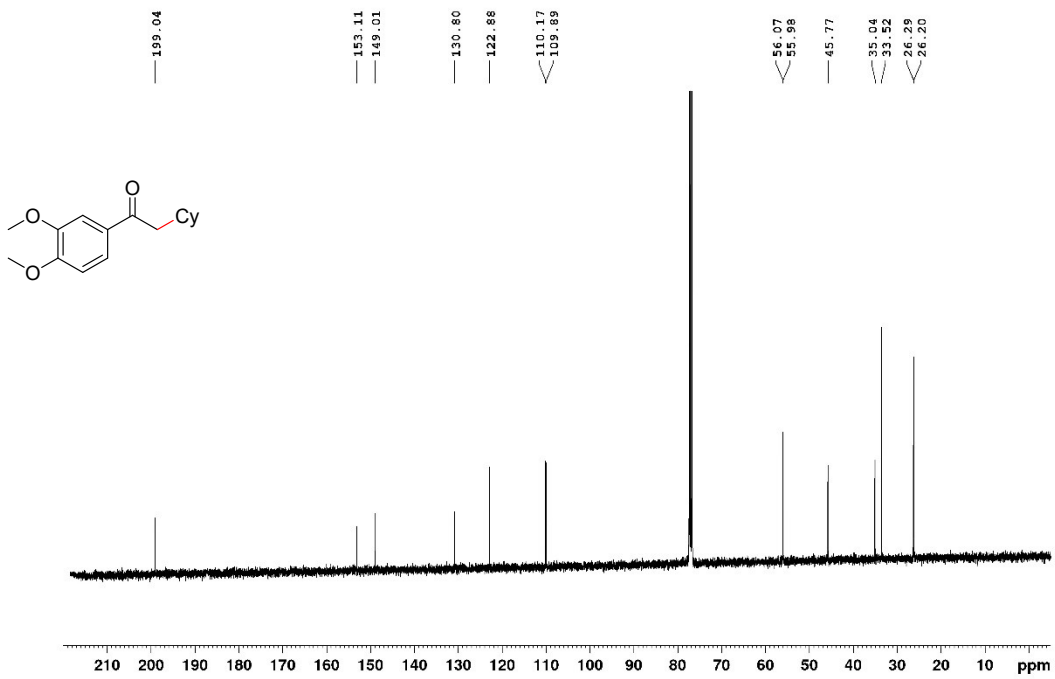
2-Cyclohexyl-1-(6-methoxynaphthalen-2-yl)ethan-1-one (3n): ^{13}C NMR (100 MHz, $CDCl_3$)



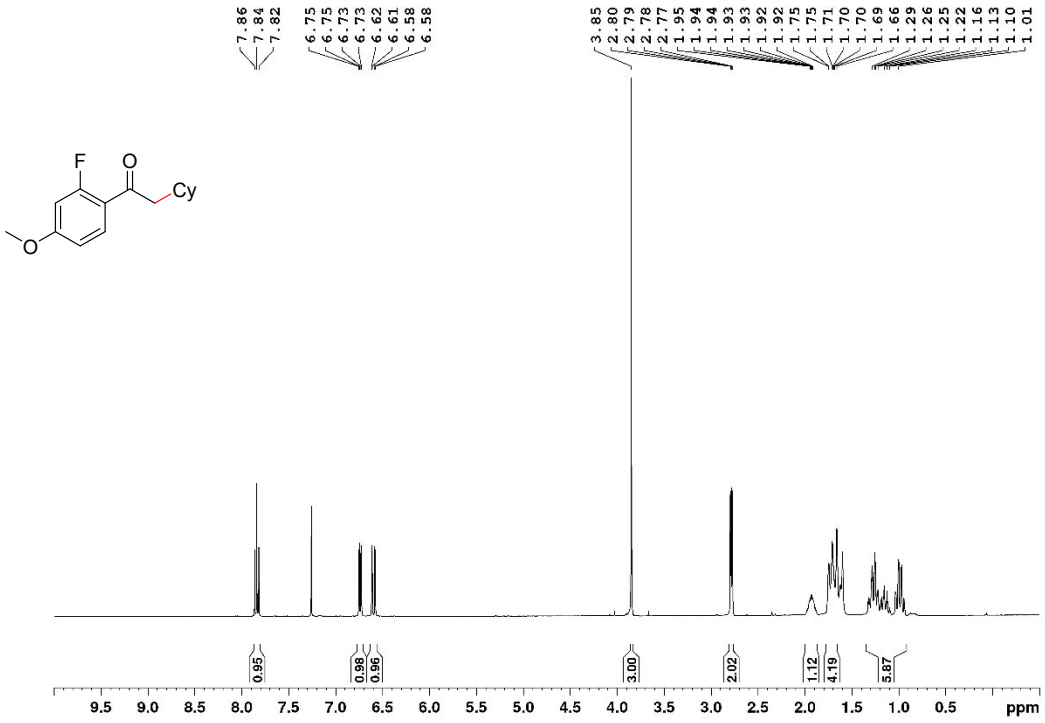
2-Cyclohexyl-1-(3,4-dimethoxyphenyl)ethan-1-one (3o): ^{1}H NMR (400 MHz, $CDCl_3$)



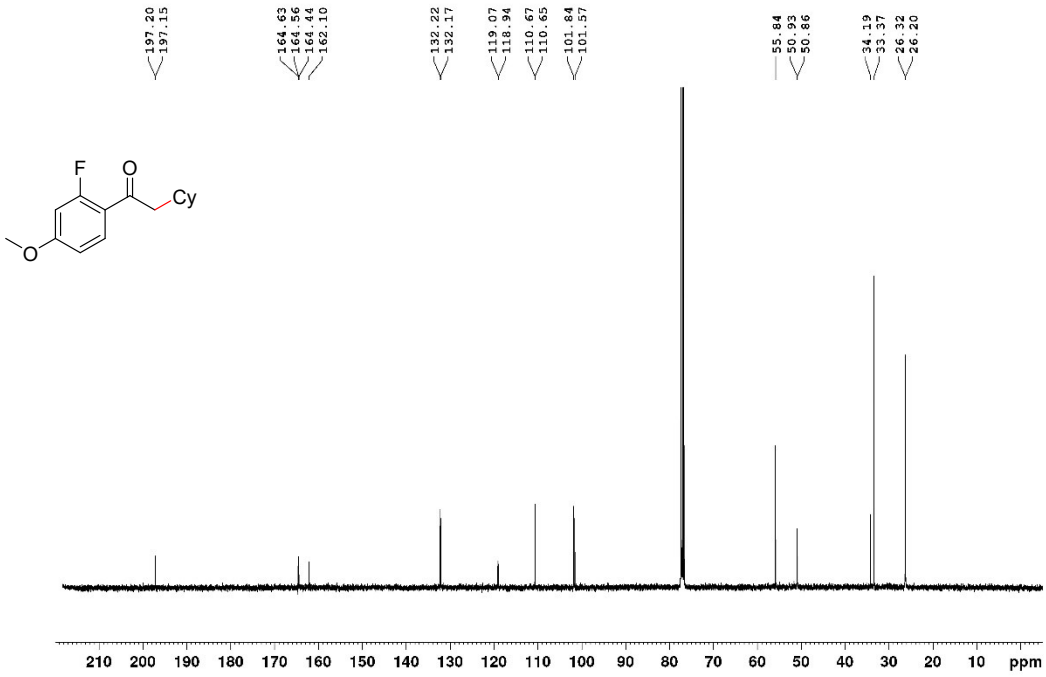
2-Cyclohexyl-1-(3,4-dimethoxyphenyl)ethan-1-one (3o): ^{13}C NMR (100 MHz, $CDCl_3$)



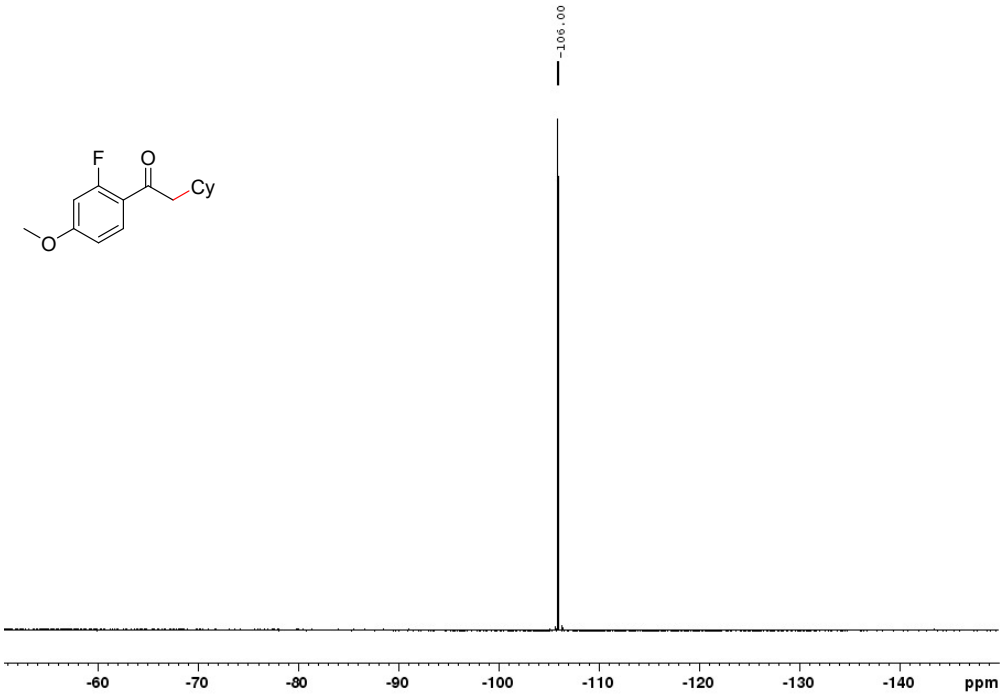
2-Cyclohexyl-1-(2-fluoro-4-methoxyphenyl)ethan-1-one (3p): ^{1}H NMR (400 MHz, $CDCl_3$)



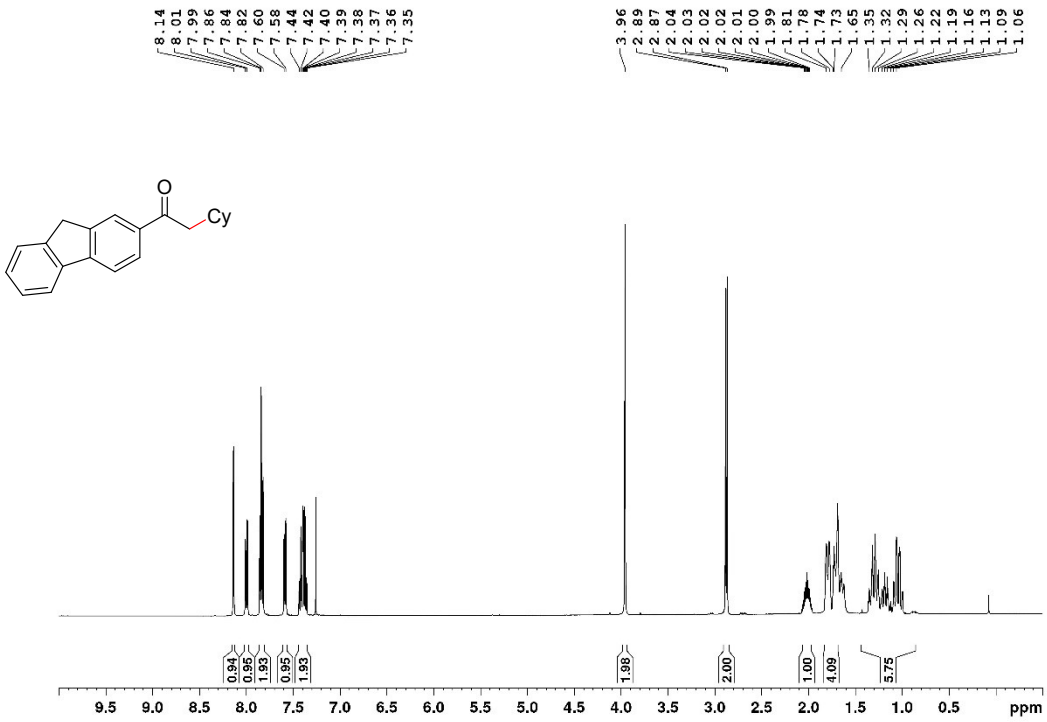
2-Cyclohexyl-1-(2-fluoro-4-methoxyphenyl)ethan-1-one (3p): ^{13}C NMR (100 MHz, $CDCl_3$)



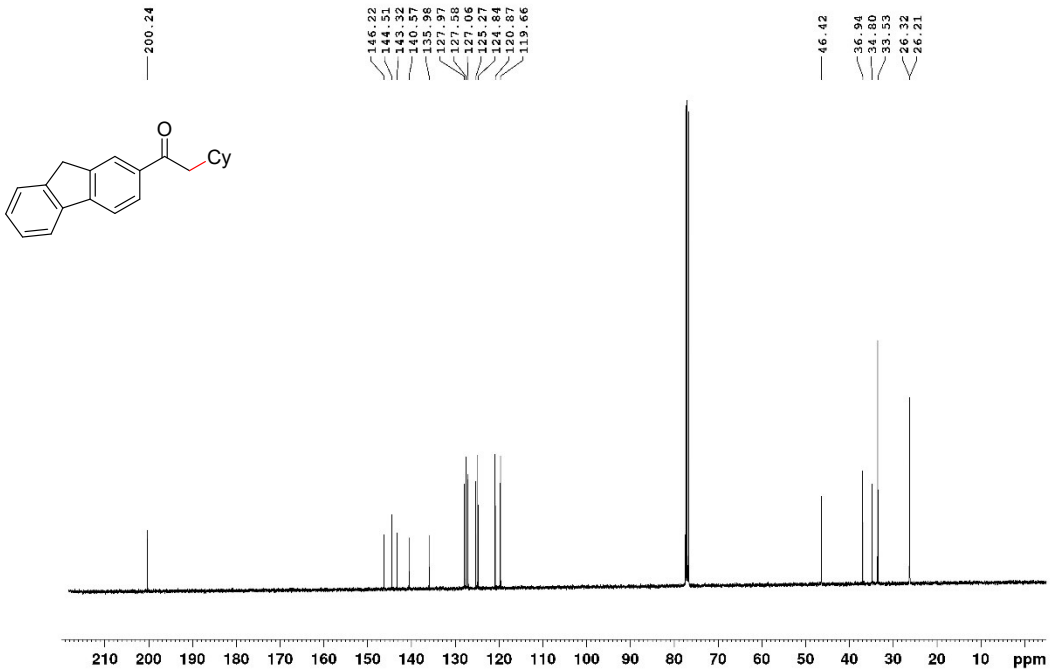
2-Cyclohexyl-1-(2-fluoro-4-methoxyphenyl)ethan-1-one (3p): ^{19}F NMR (376.5 MHz, $CDCl_3$)



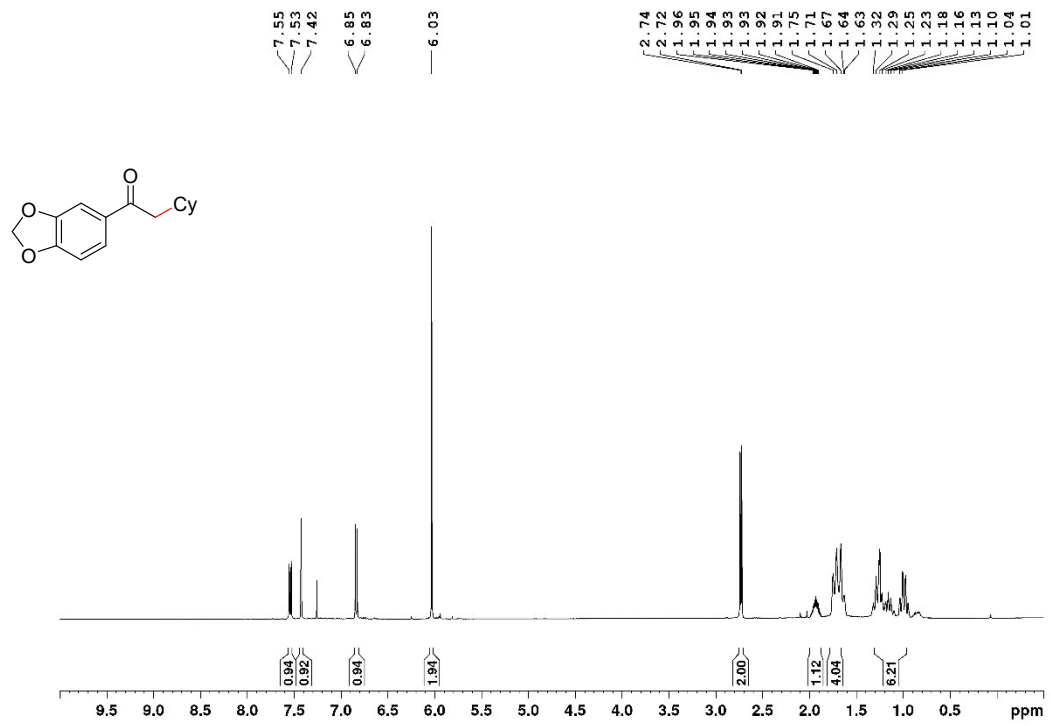
2-Cyclohexyl-1-(9*H*-fluoren-2-yl)ethan-1-one (3q): ^{1}H NMR (400 MHz, $CDCl_3$)



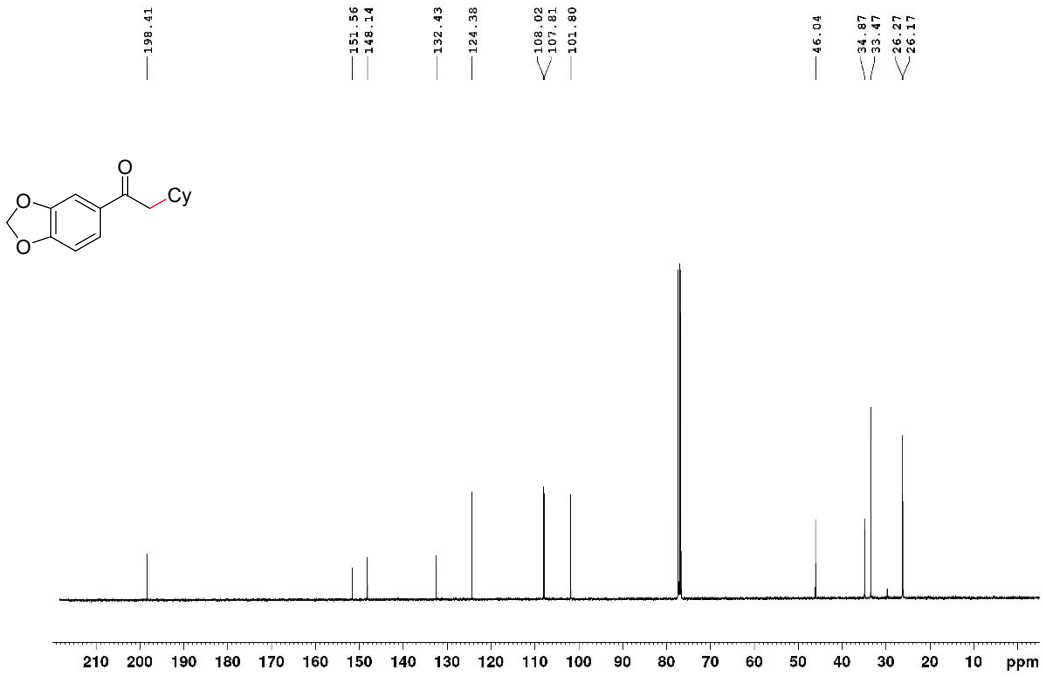
2-Cyclohexyl-1-(9*H*-fluoren-2-yl)ethan-1-one (3q): ^{13}C NMR (100 MHz, $CDCl_3$)



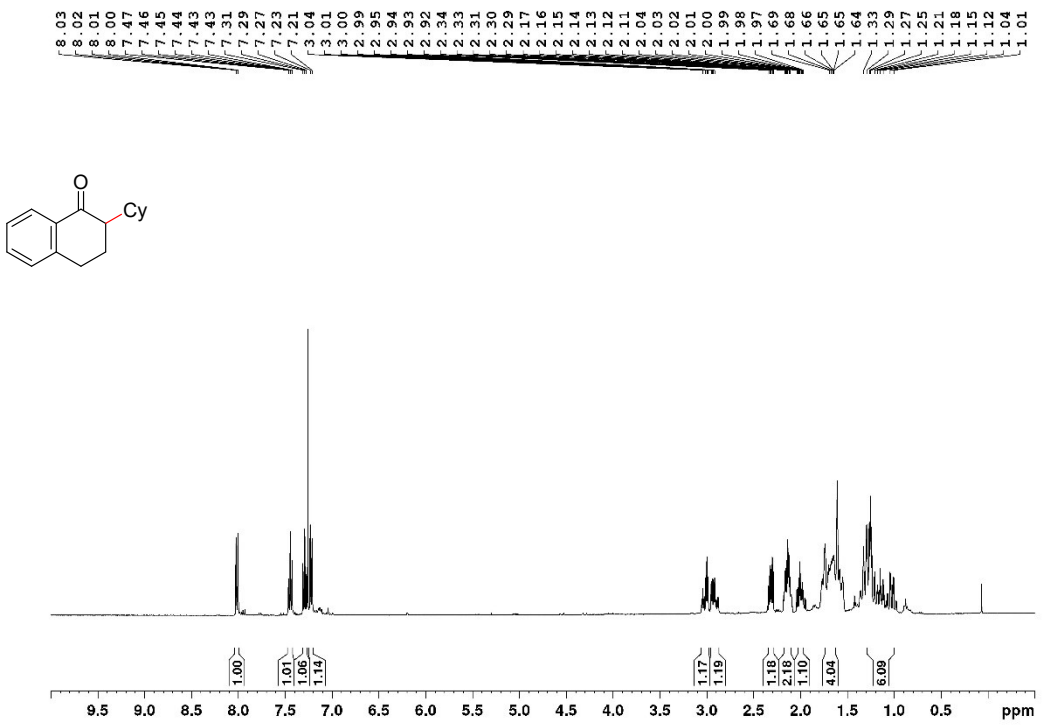
1-(Benzo[*d*][1,3]dioxol-5-yl)-2-cyclohexylethan-1-one (3r): ^{1}H NMR (400 MHz, $CDCl_3$)



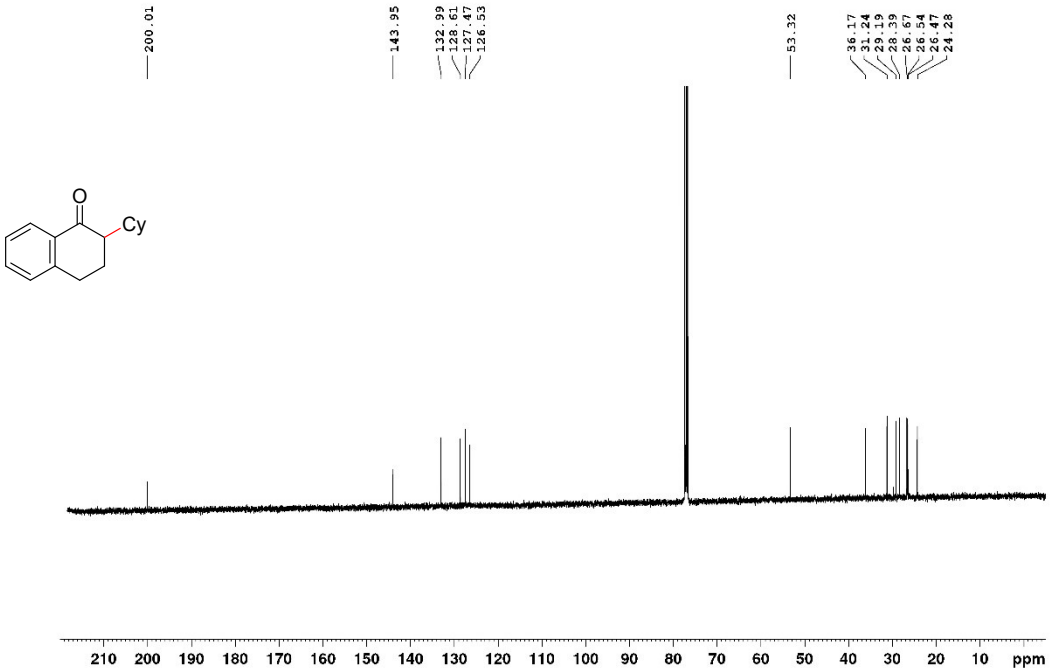
1-(Benzo[*d*][1,3]dioxol-5-yl)-2-cyclohexylethan-1-one (3r): ^{13}C NMR (100 MHz, $CDCl_3$)



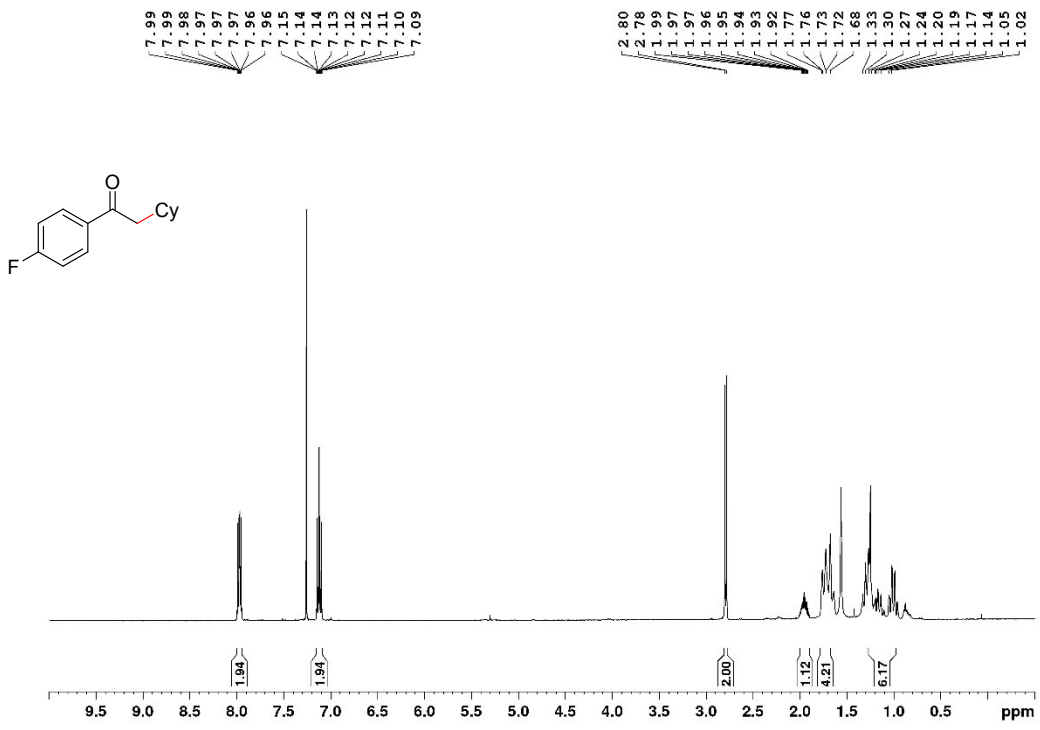
2-Cyclohexyl-1-(1,2,3,4-tetrahydronaphthalen-2-yl)ethan-1-one (3s): ^{1}H NMR (400 MHz, $CDCl_3$)



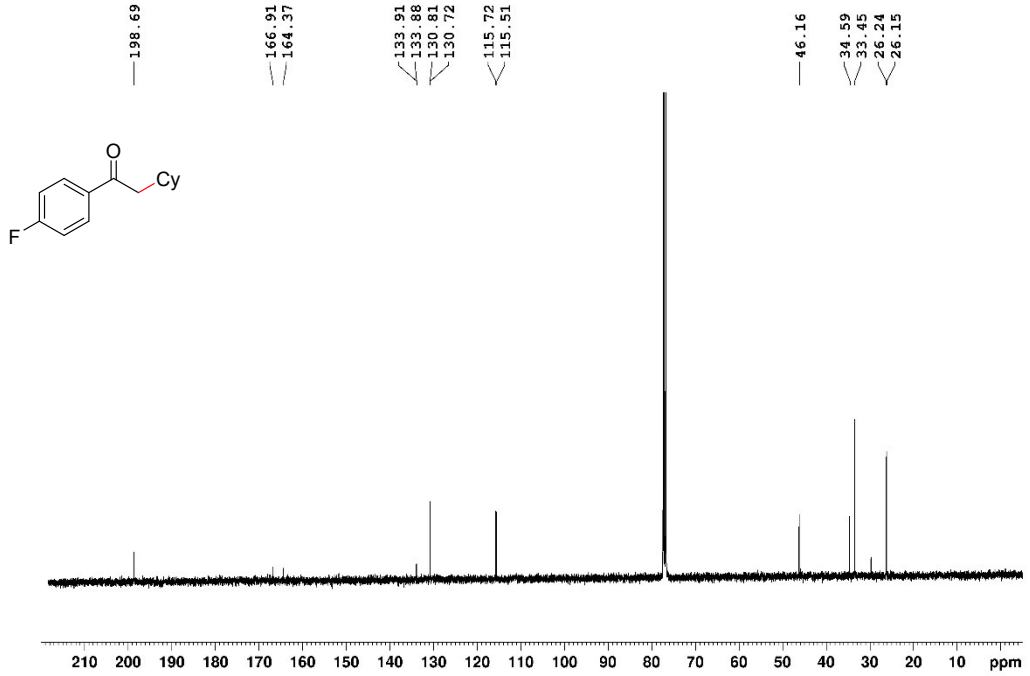
2-Cyclohexyl-1-(1,2,3,4-tetrahydronaphthalen-2-yl)ethan-1-one (3s): ^{13}C NMR (100 MHz, $CDCl_3$)



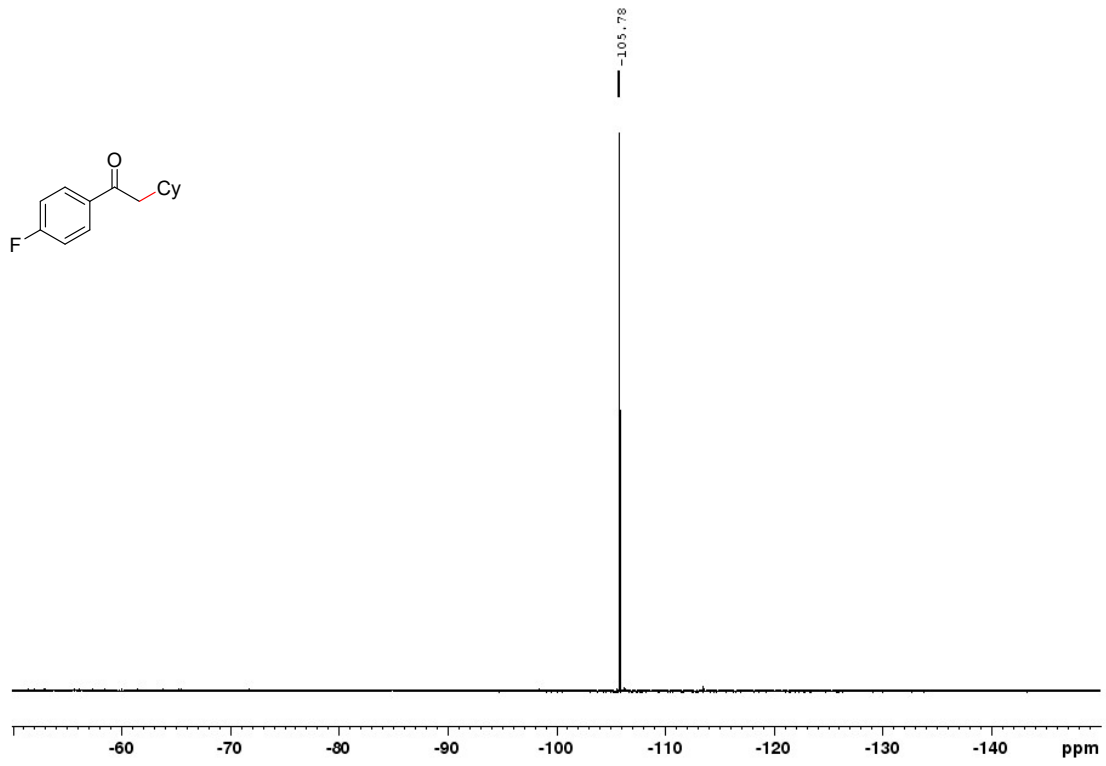
2-Cyclohexyl-1-(4-fluorophenyl)ethan-1-one (3t): ^{1}H NMR (400 MHz, $CDCl_3$)



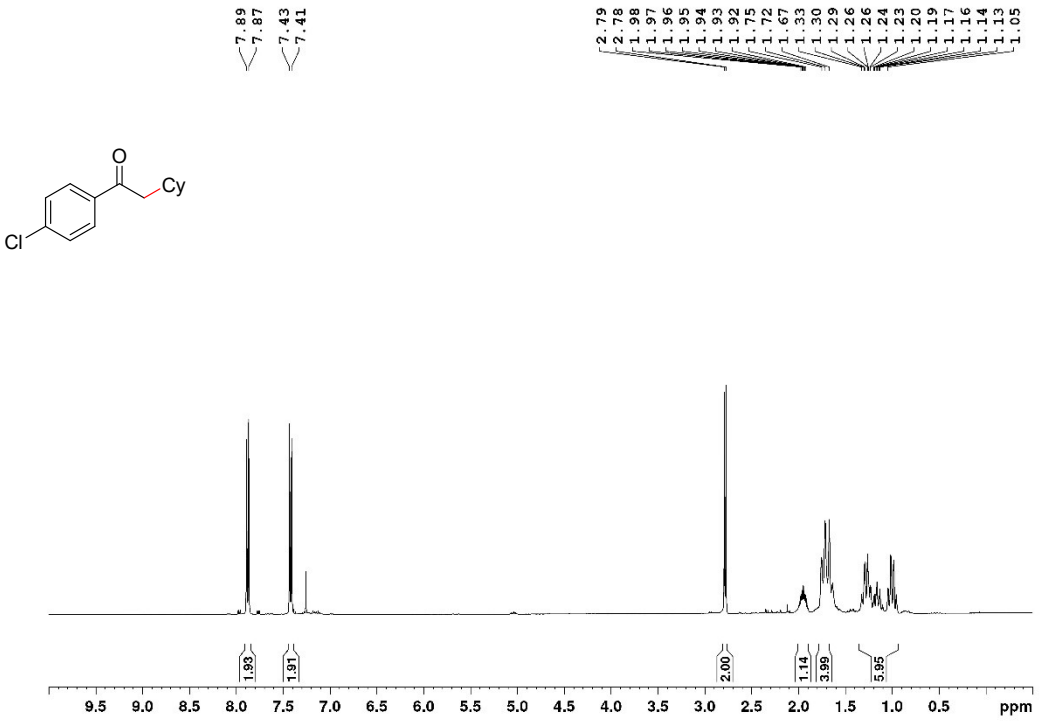
2-Cyclohexyl-1-(4-fluorophenyl)ethan-1-one (3t): ^{13}C NMR (100 MHz, $CDCl_3$)



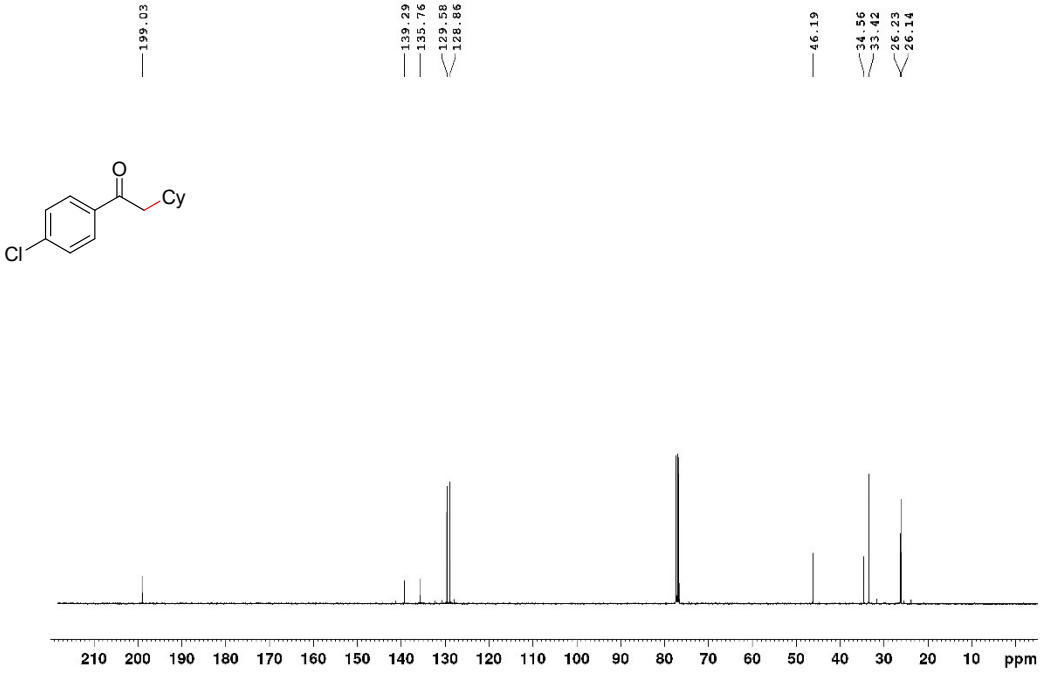
2-Cyclohexyl-1-(4-fluorophenyl)ethan-1-one (3t): ^{19}F NMR (376.5 MHz, $CDCl_3$)



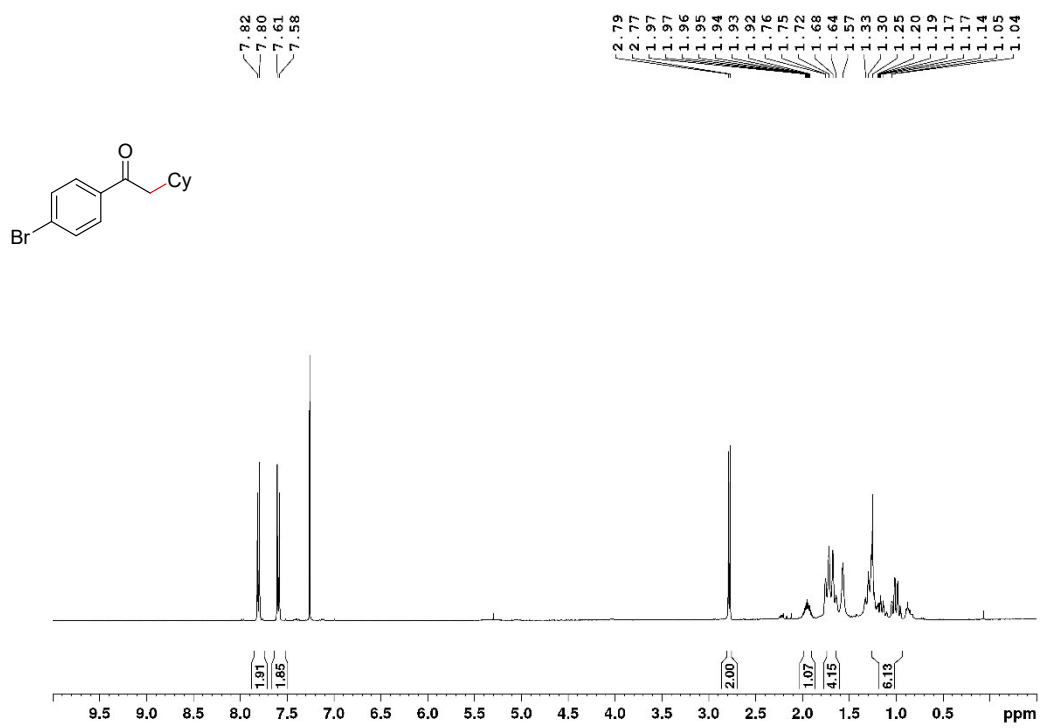
1-(4-Chlorophenyl)-2-cyclohexylethan-1-one (3u): ^{1}H NMR (400 MHz, $CDCl_3$)



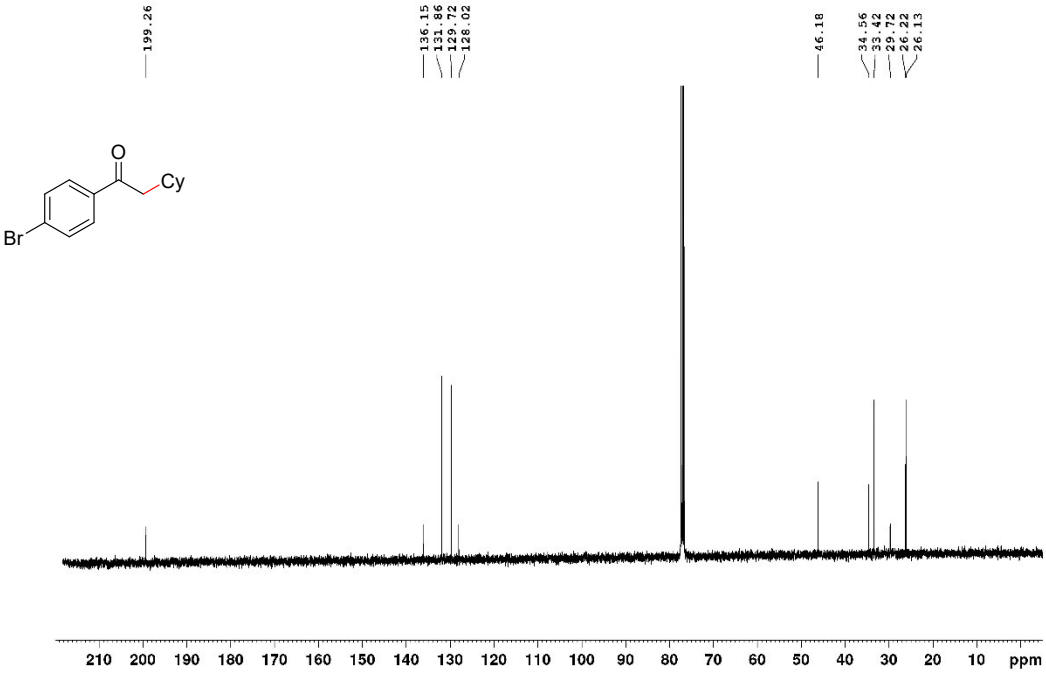
1-(4-Chlorophenyl)-2-cyclohexylethan-1-one (3u): ^{13}C NMR (100 MHz, $CDCl_3$)



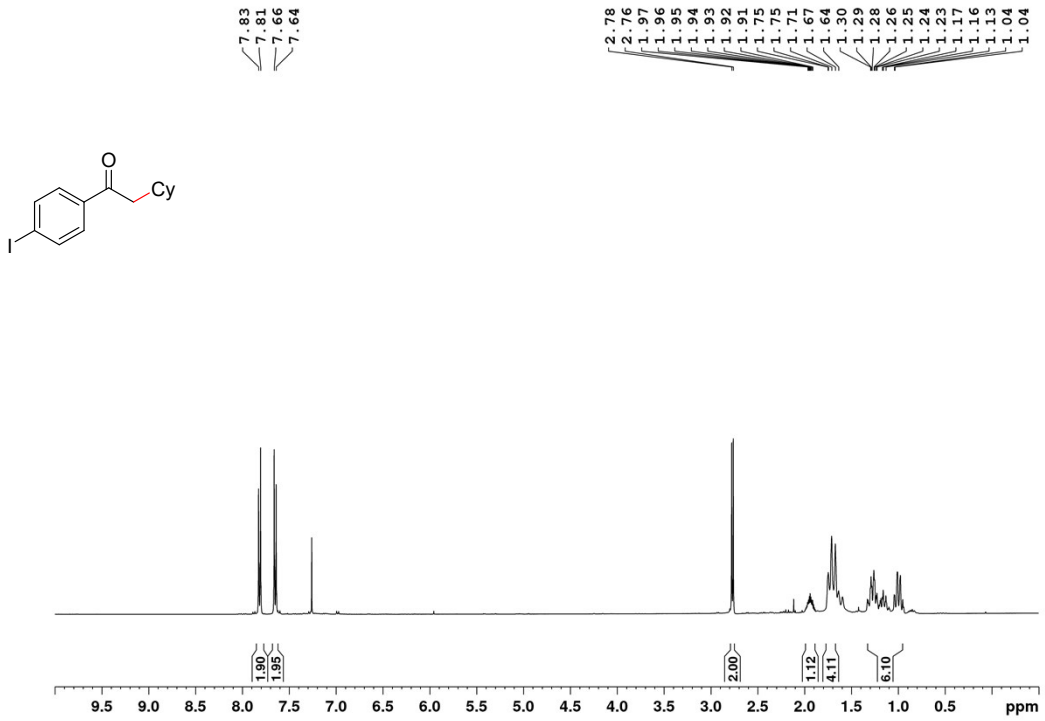
1-(4-Bromophenyl)-2-cyclohexylethan-1-one (3v): ^{1}H NMR (400 MHz, $CDCl_3$)



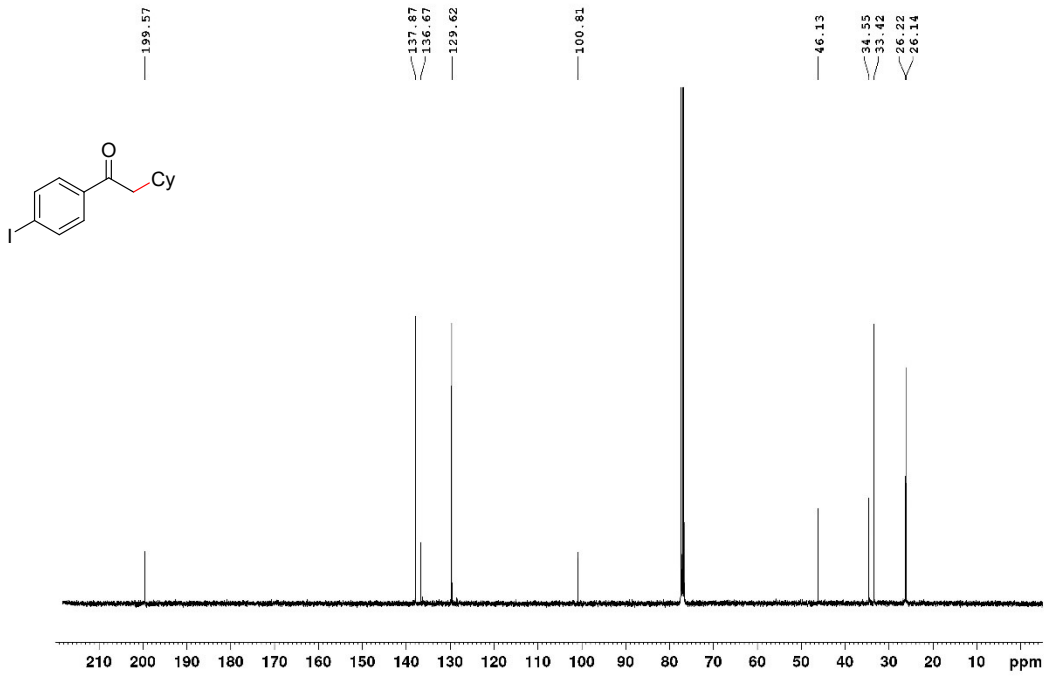
1-(4-Bromophenyl)-2-cyclohexylethan-1-one (3v): ^{13}C NMR (100 MHz, $CDCl_3$)



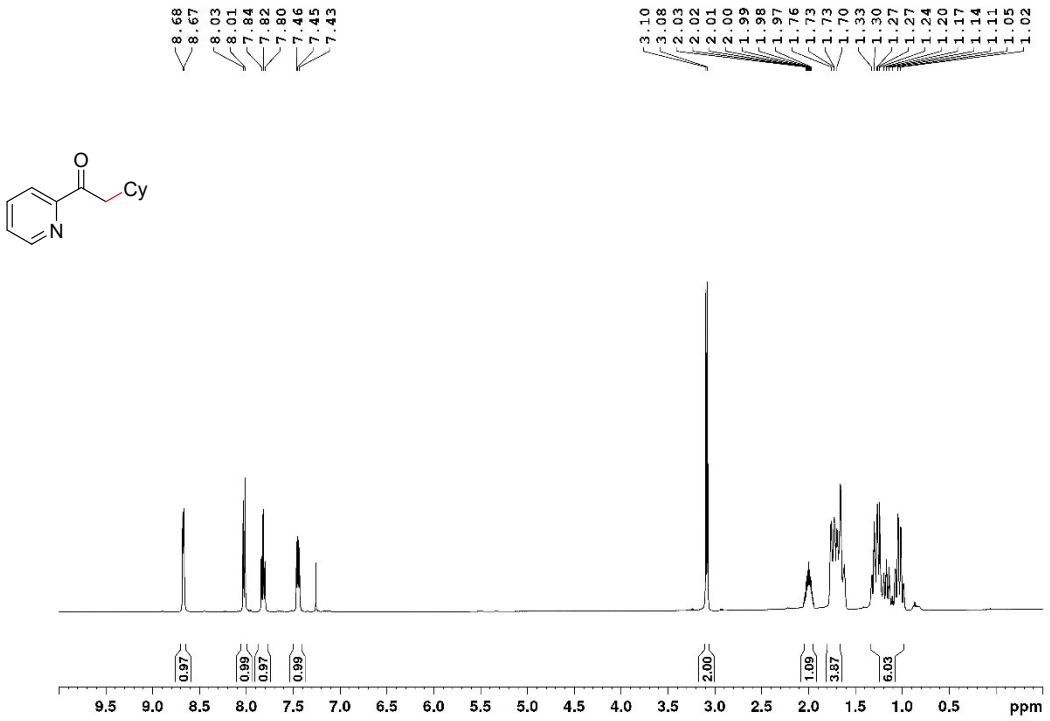
2-Cyclohexyl-1-(4-iodophenyl)ethan-1-one (3w): ^{1}H NMR (400 MHz, $CDCl_3$)



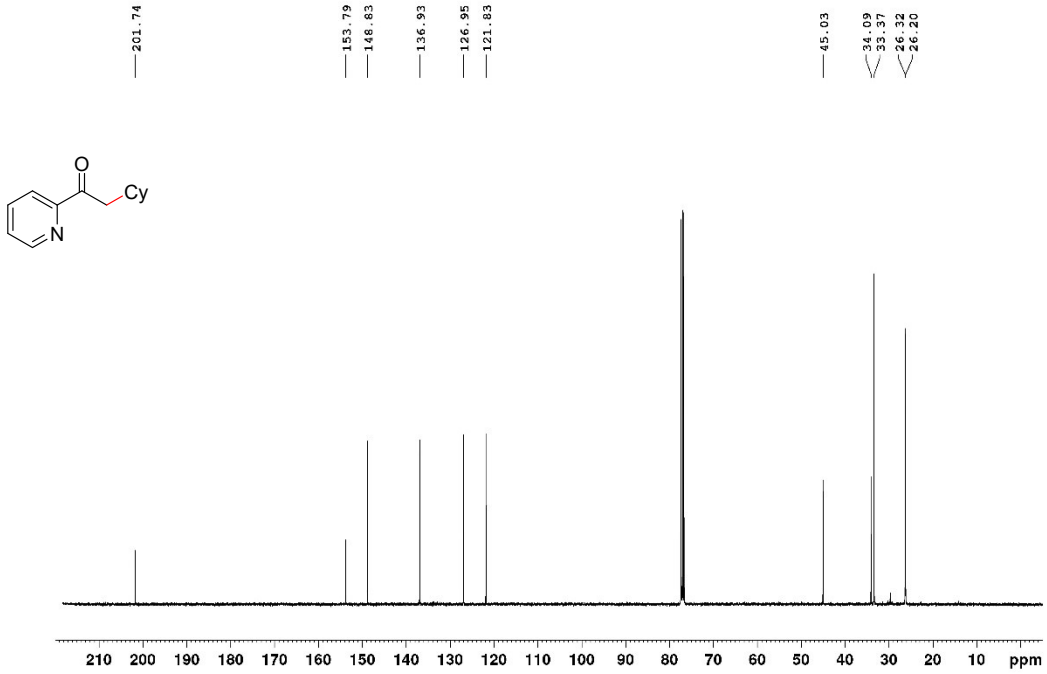
2-Cyclohexyl-1-(4-iodophenyl)ethan-1-one (3w): ^{13}C NMR (100 MHz, $CDCl_3$)



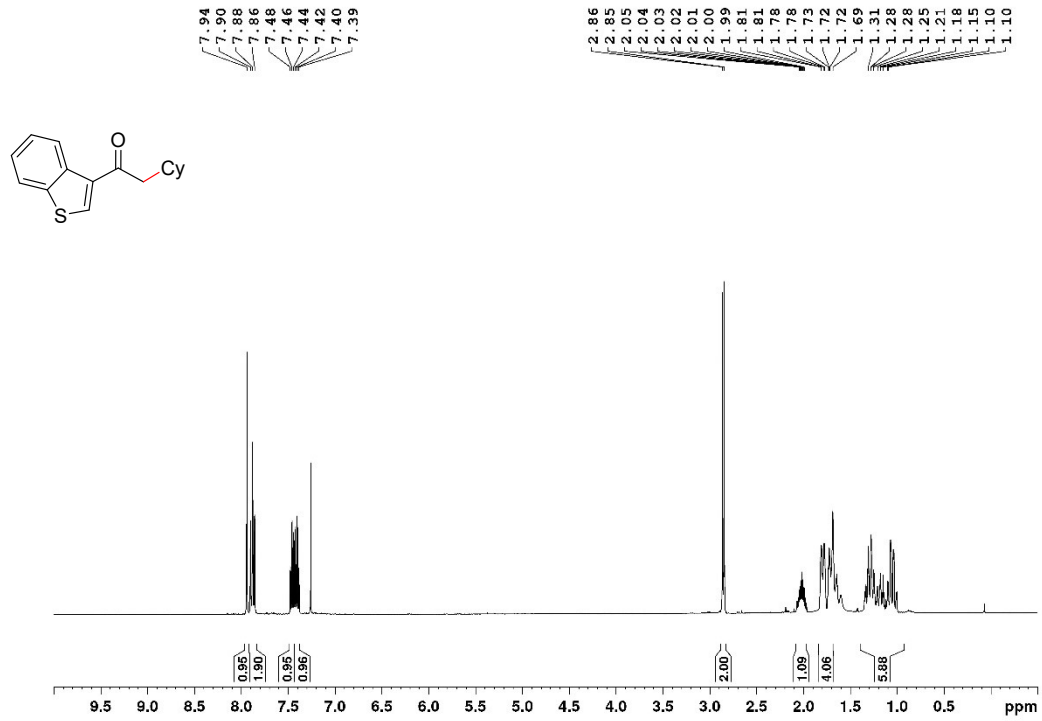
2-Cyclohexyl-1-(pyridin-2-yl)ethan-1-one (3x): ^{1}H NMR (400 MHz, $CDCl_3$)



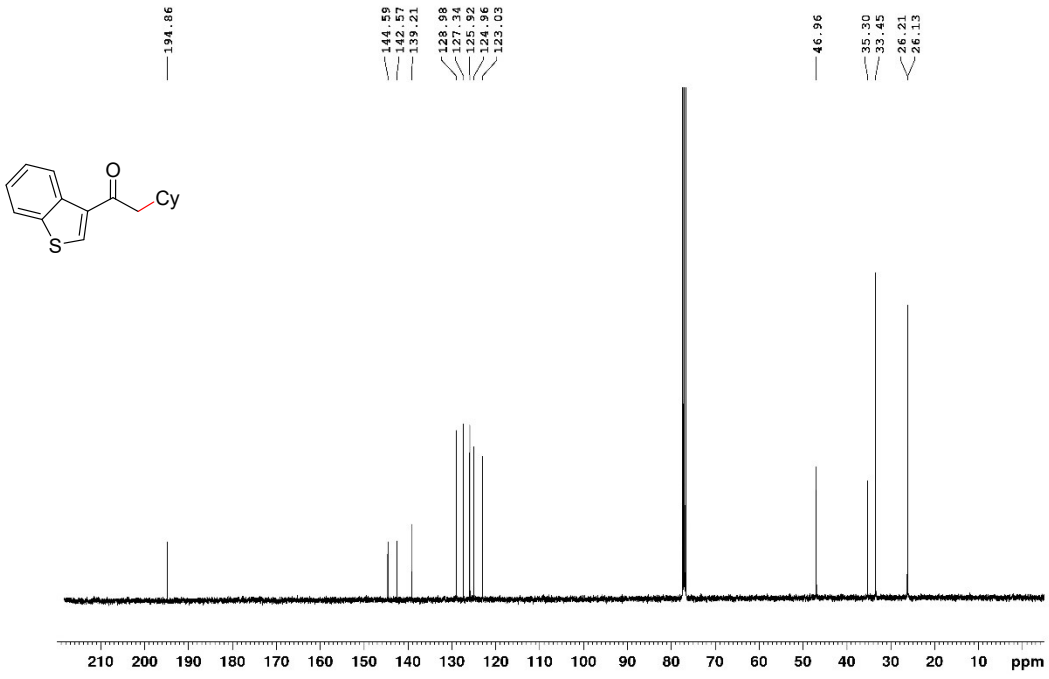
2-Cyclohexyl-1-(pyridin-2-yl)ethan-1-one (3x): ^{13}C NMR (100 MHz, $CDCl_3$)



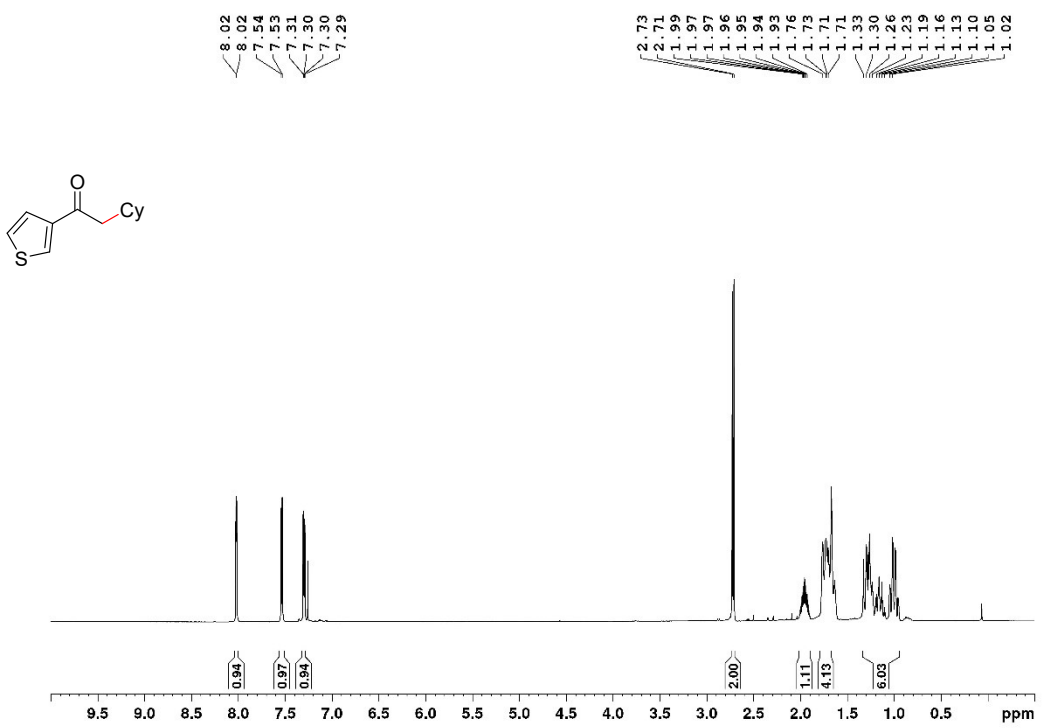
1-(Benzo[*b*]thiophen-3-yl)-2-cyclohexylethan-1-one (3y): ^{1}H NMR (400 MHz, $CDCl_3$)



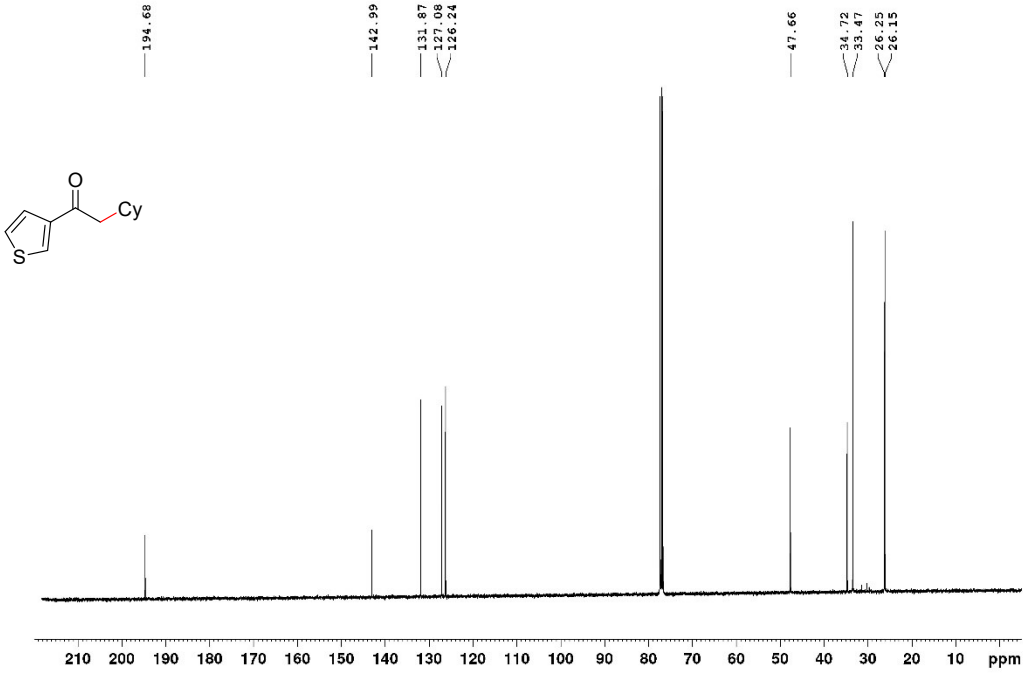
1-(Benzo[*b*]thiophen-3-yl)-2-cyclohexylethan-1-one (3y): ^{13}C NMR (100 MHz, $CDCl_3$)



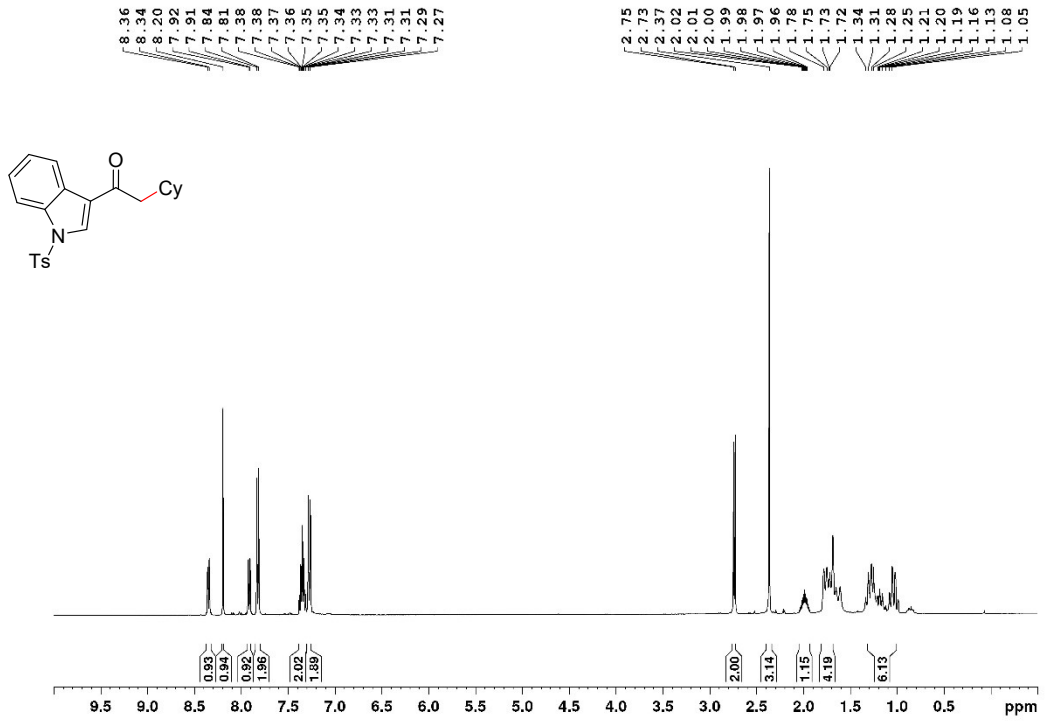
2-Cyclohexyl-1-(thiophen-3-yl)ethan-1-one (3z): ^{1}H NMR (400 MHz, $CDCl_3$)



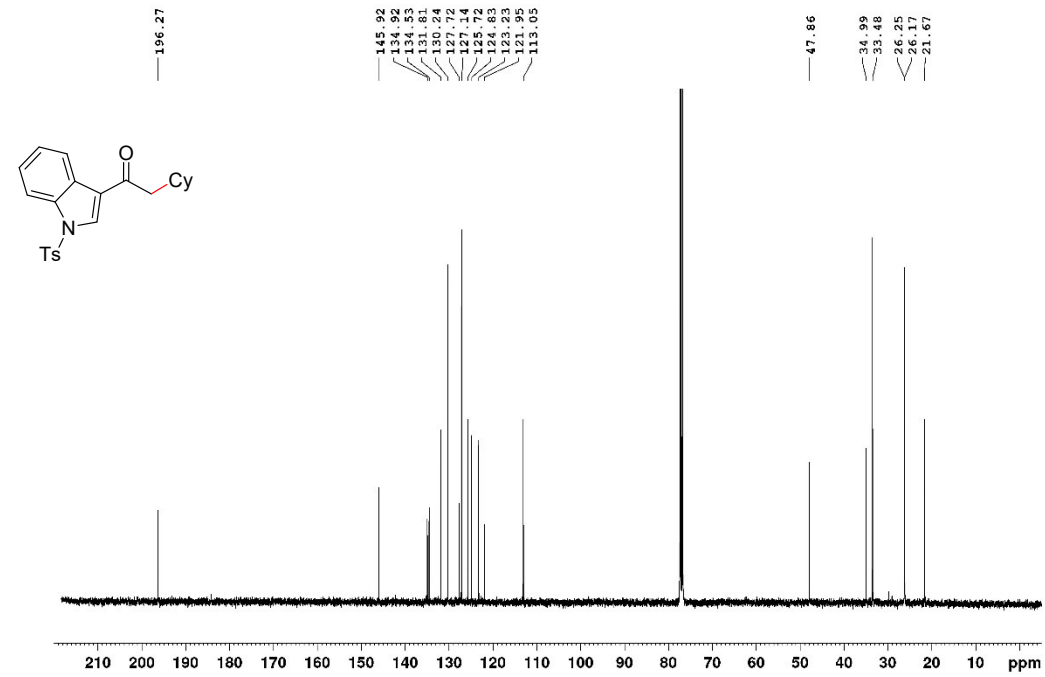
2-Cyclohexyl-1-(thiophen-3-yl)ethan-1-one (3z): ^{13}C NMR (100 MHz, $CDCl_3$)



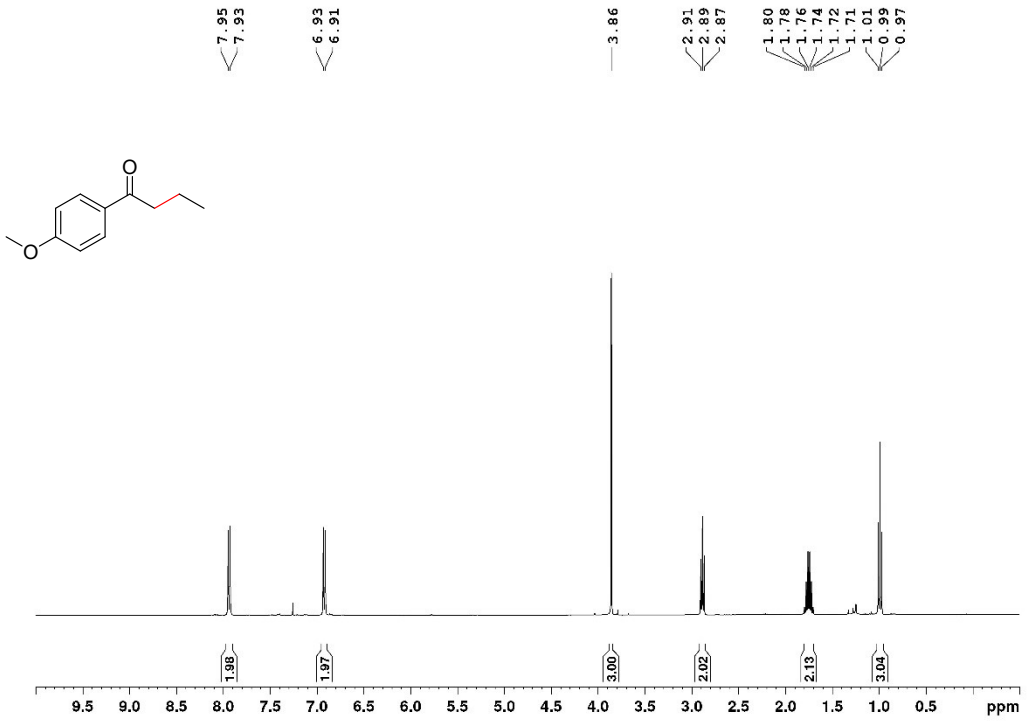
2-Cyclohexyl-1-(1-tosyl-1*H*-indol-3-yl)ethan-1-one (3za): ^{1}H NMR (400 MHz, $CDCl_3$)



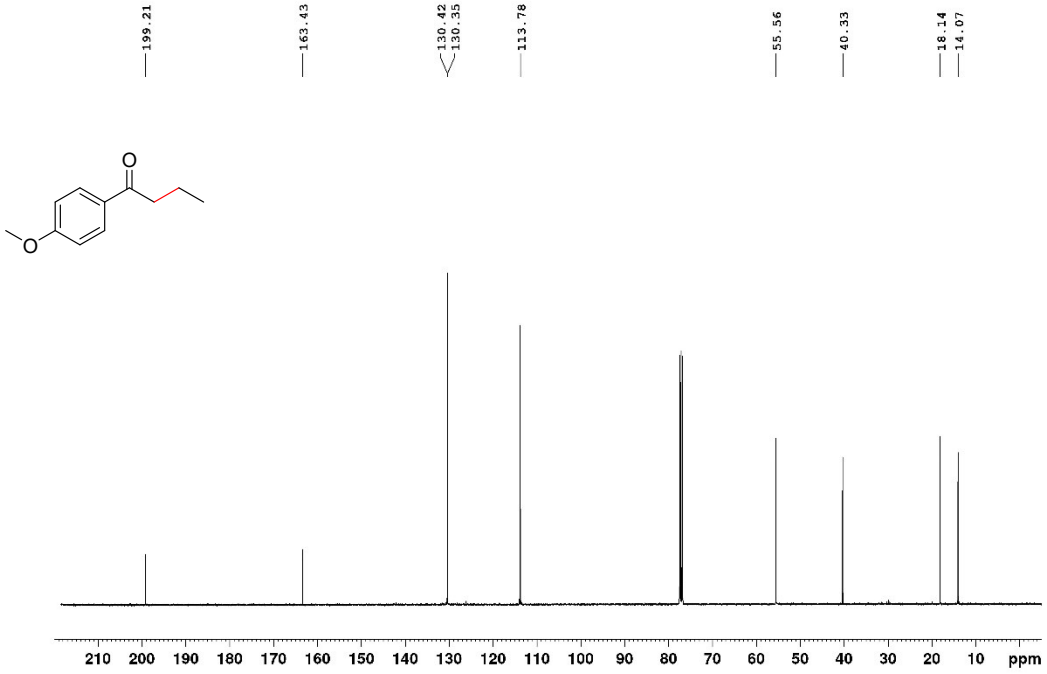
2-Cyclohexyl-1-(1-tosyl-1*H*-indol-3-yl)ethan-1-one (3za): ^{13}C NMR (100 MHz, $CDCl_3$)



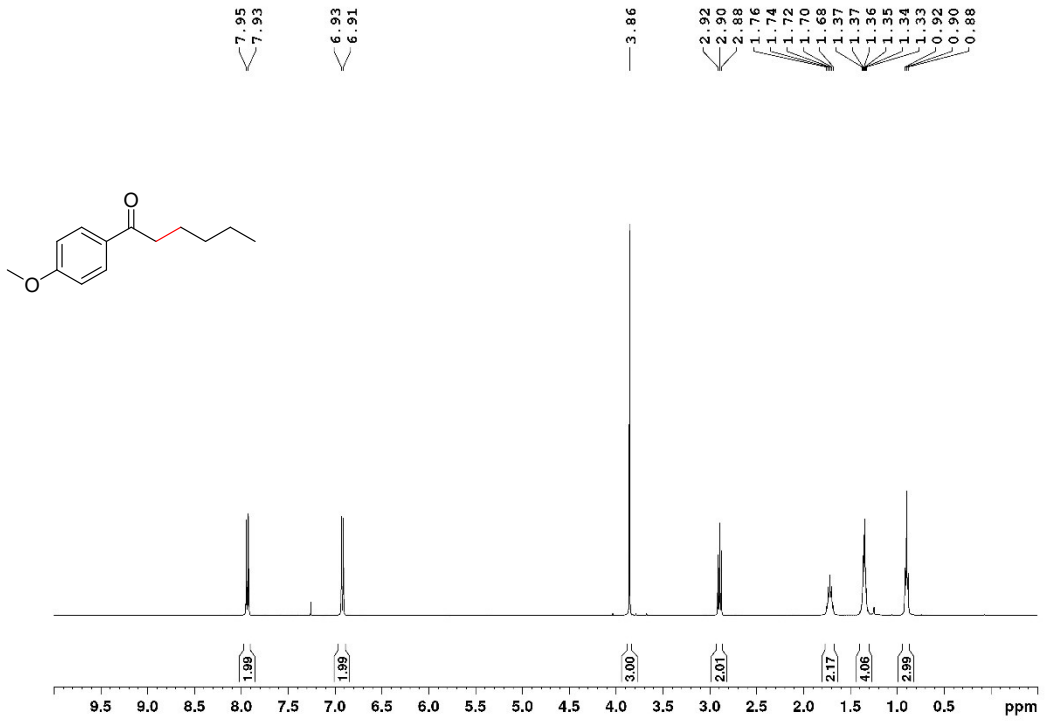
1-(4-Methoxyphenyl)butan-1-one (3zc): ^{1}H NMR (400 MHz, $CDCl_3$)



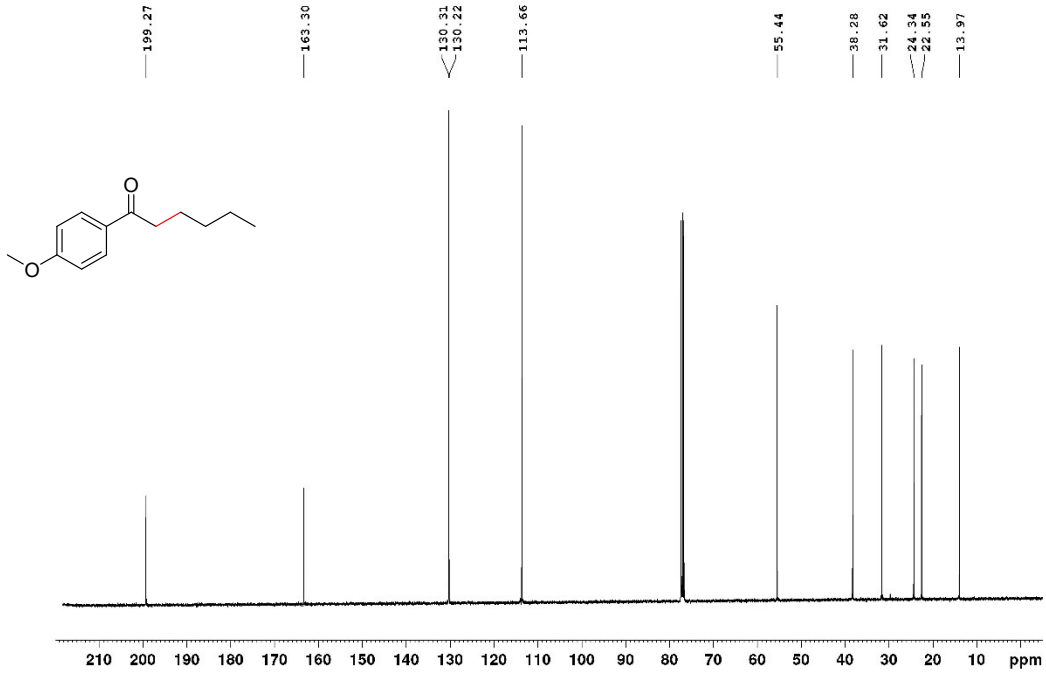
1-(4-Methoxyphenyl)butan-1-one (3zc): ^{13}C NMR (100 MHz, $CDCl_3$)



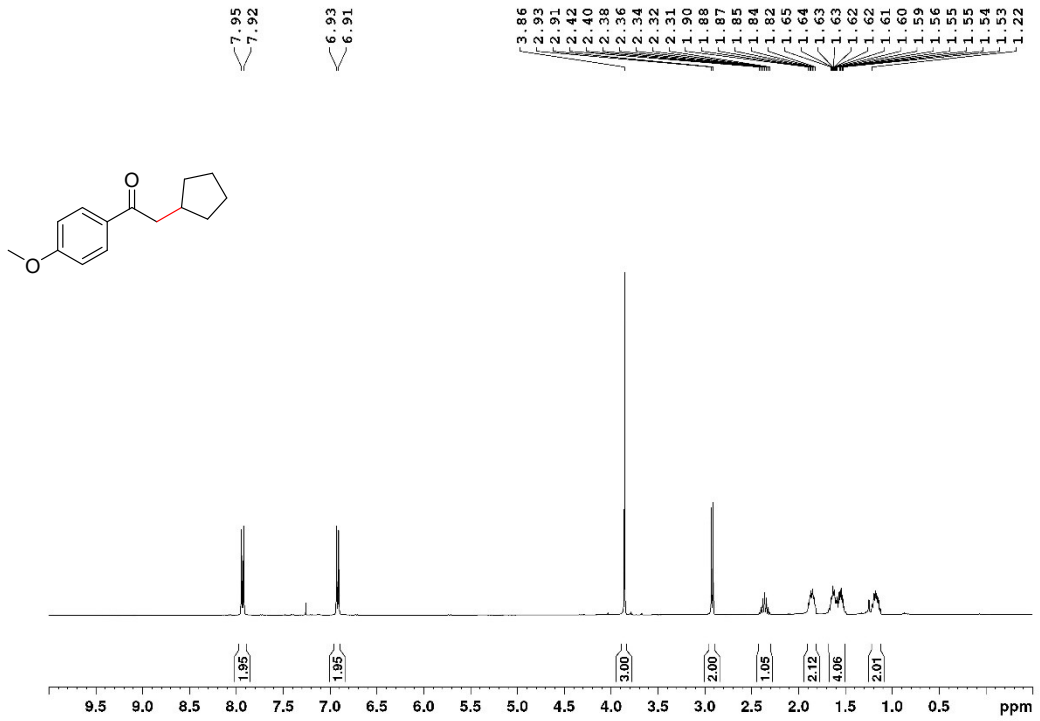
1-(4-Methoxyphenyl)hexan-1-one (3zd): ^{1}H NMR (400 MHz, $CDCl_3$)



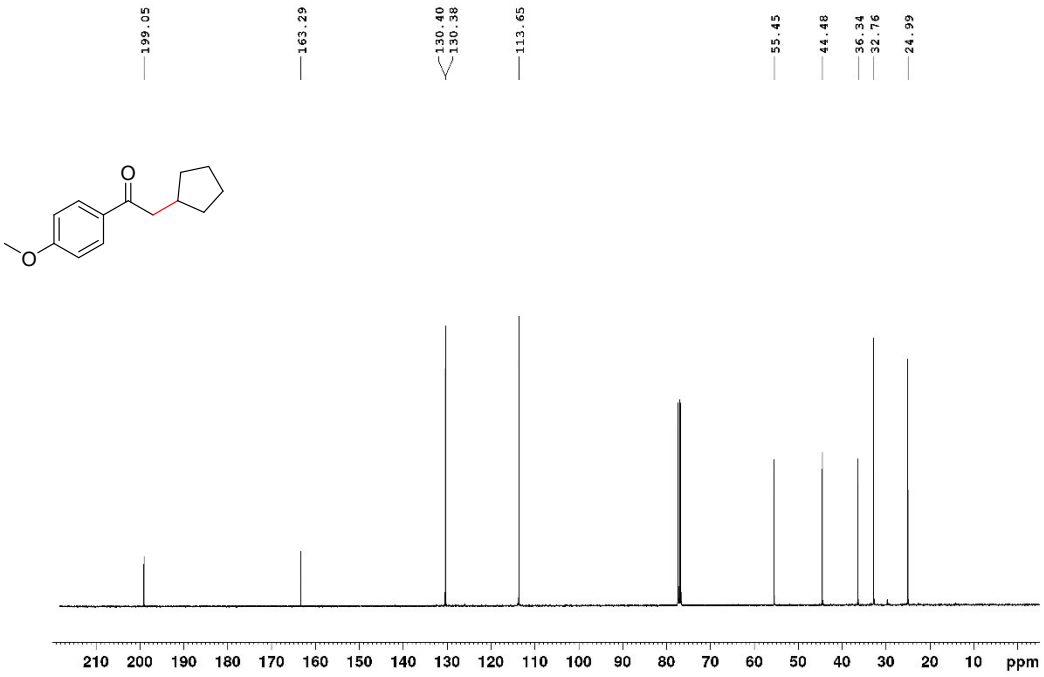
1-(4-Methoxyphenyl)hexan-1-one (3zd): ^{13}C NMR (100 MHz, $CDCl_3$)



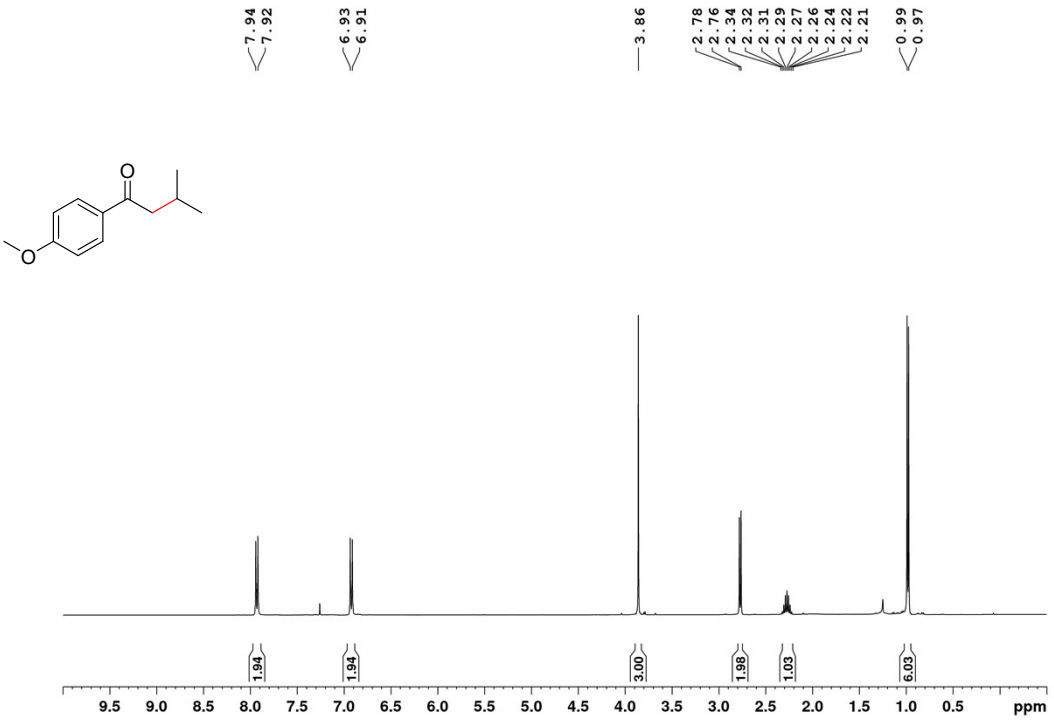
2-Cyclopentyl-1-(4-methoxyphenyl)ethan-1-one (3ze): ^{1}H NMR (400 MHz, $CDCl_3$)



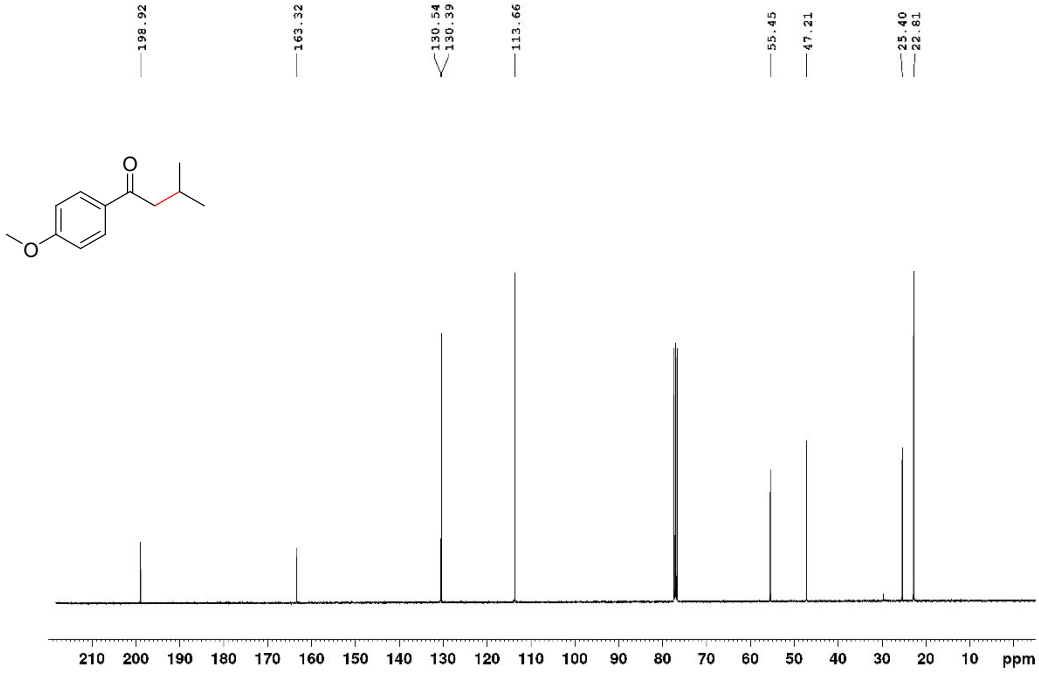
2-Cyclopentyl-1-(4-methoxyphenyl)ethan-1-one (3ze): ^{13}C NMR (100 MHz, $CDCl_3$)



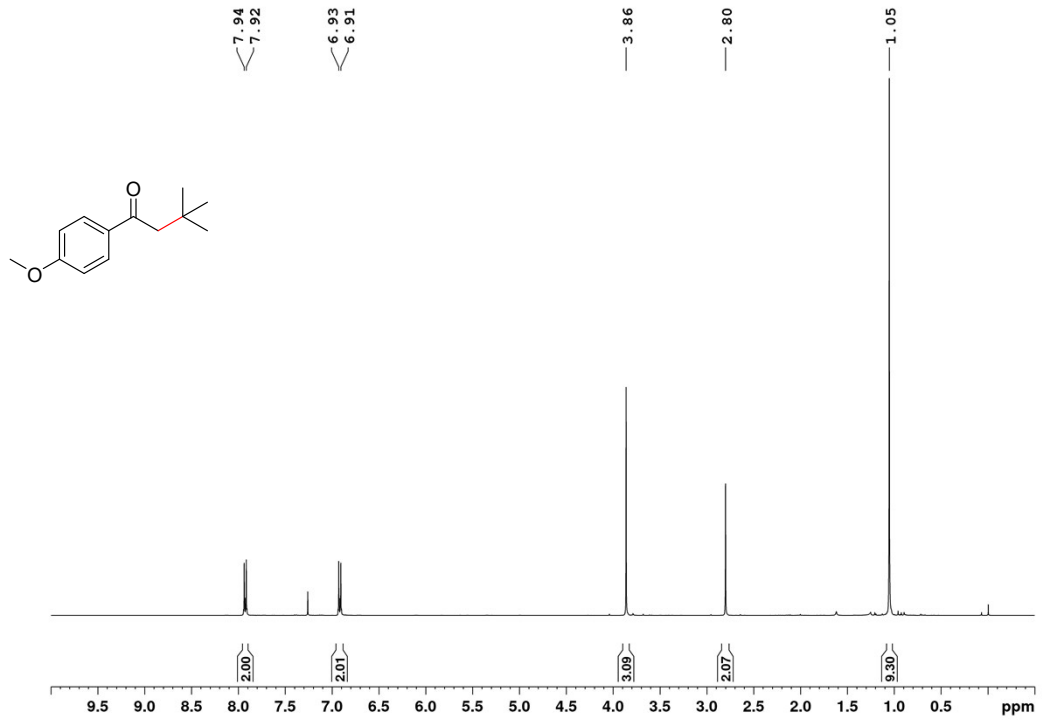
1-(4-Methoxyphenyl)-3-methylbutan-1-one (3zf): ^{1}H NMR (400 MHz, $CDCl_3$)



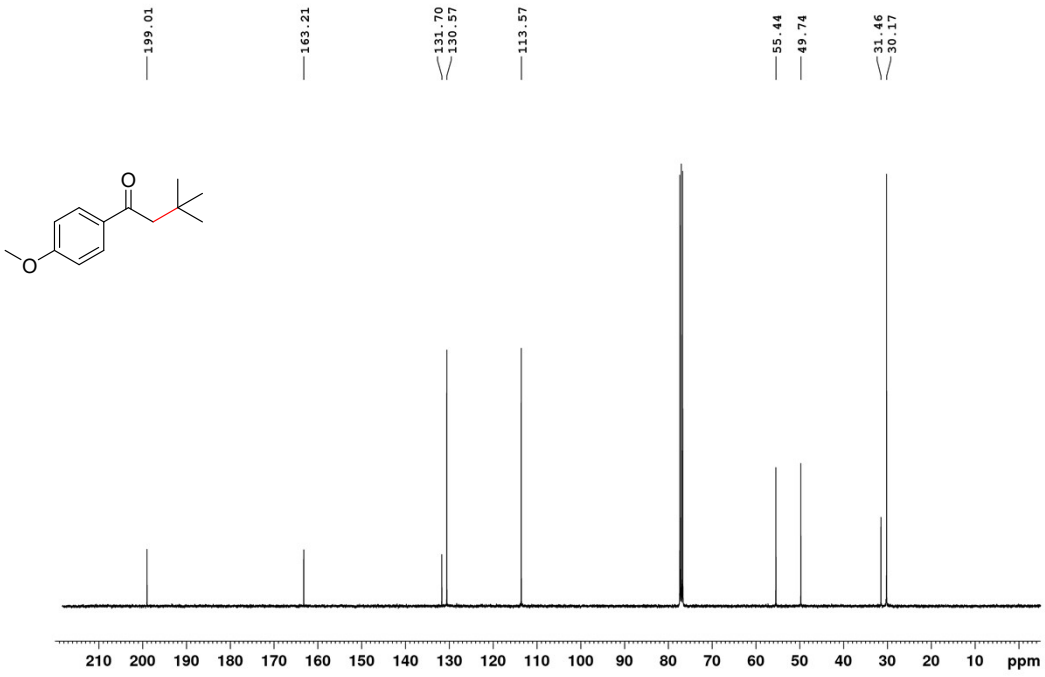
1-(4-Methoxyphenyl)-3-methylbutan-1-one (3zf): ^{13}C NMR (100 MHz, $CDCl_3$)



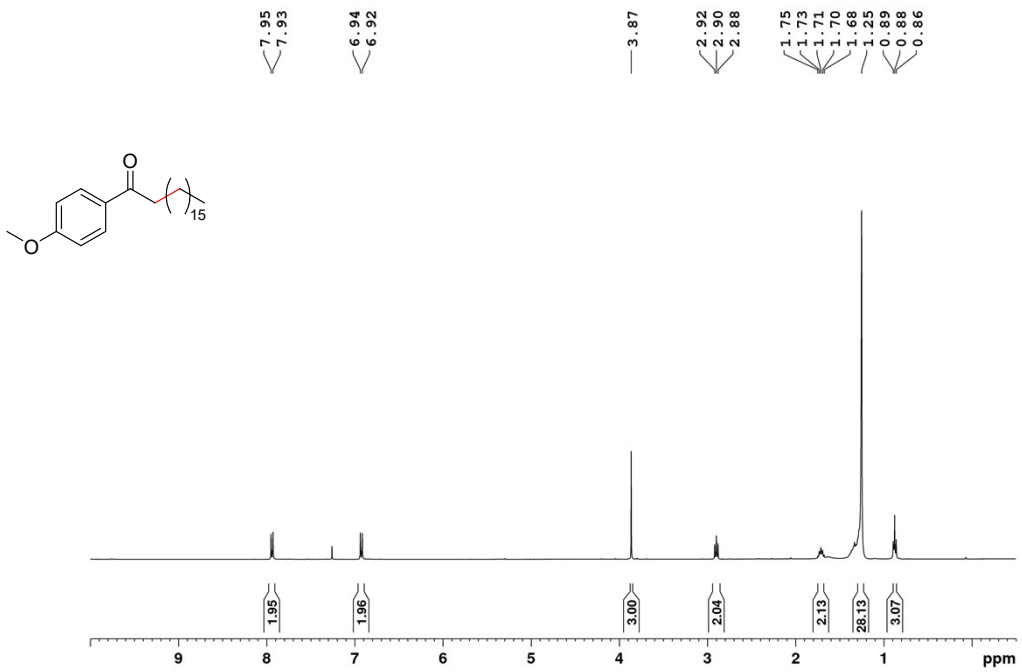
1-(4-Methoxyphenyl)-3,3-dimethylbutan-1-one (3zg): ^{1}H NMR (400 MHz, $CDCl_3$)



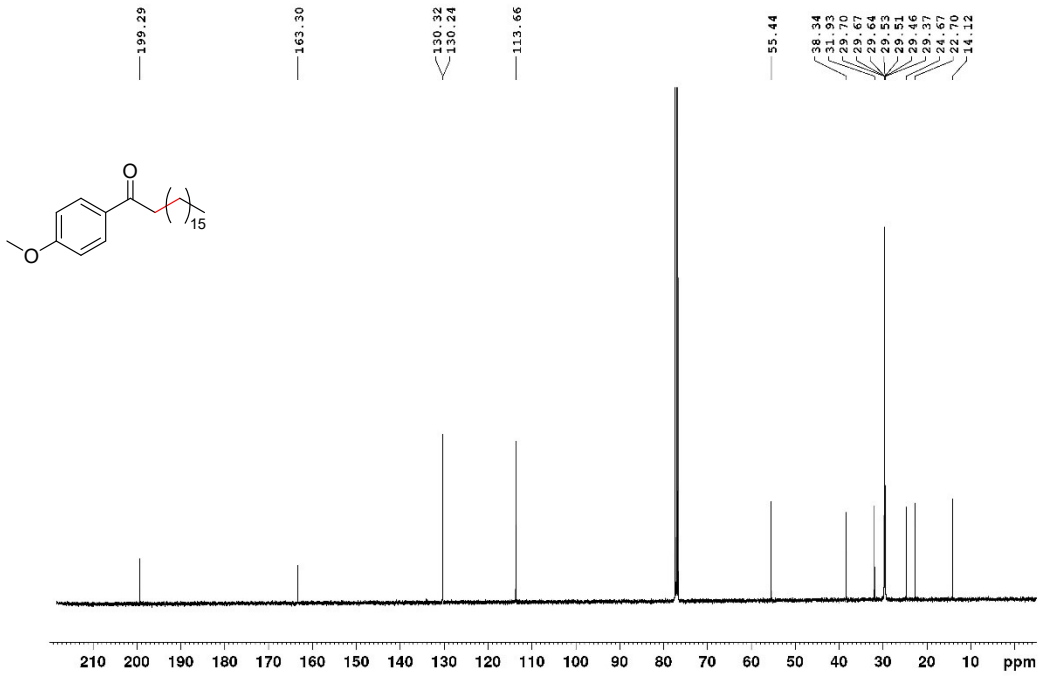
1-(4-Methoxyphenyl)-3,3-dimethylbutan-1-one (3zg): ^{13}C NMR (100 MHz, $CDCl_3$)



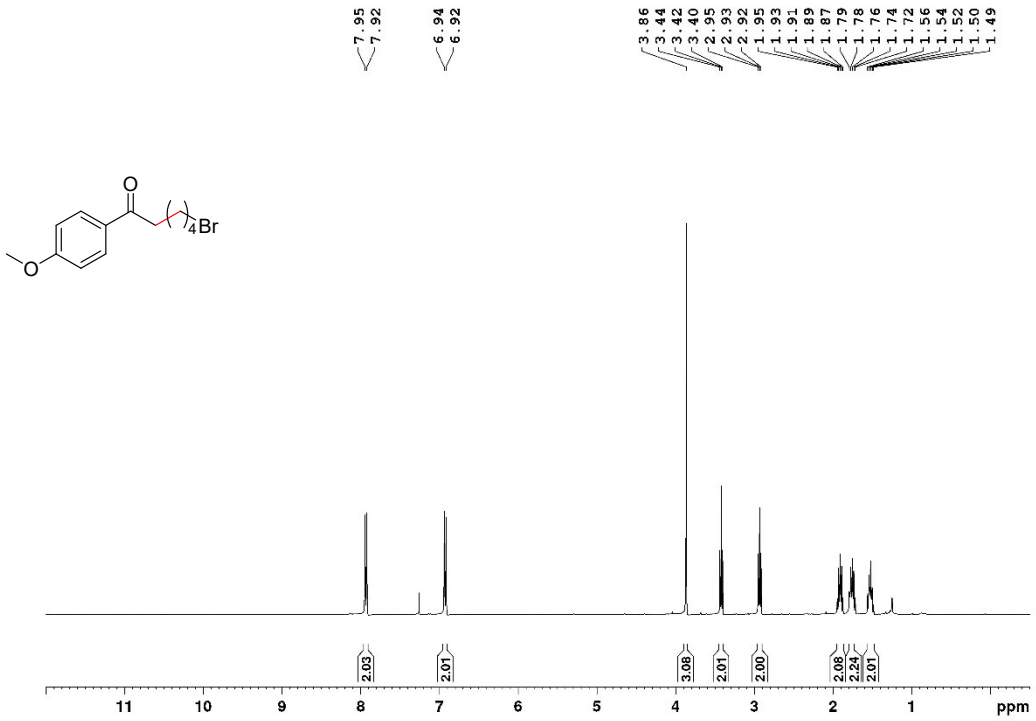
1-(4-Methoxyphenyl)octadecan-1-one (3zh): ^{1}H NMR (400 MHz, $CDCl_3$)



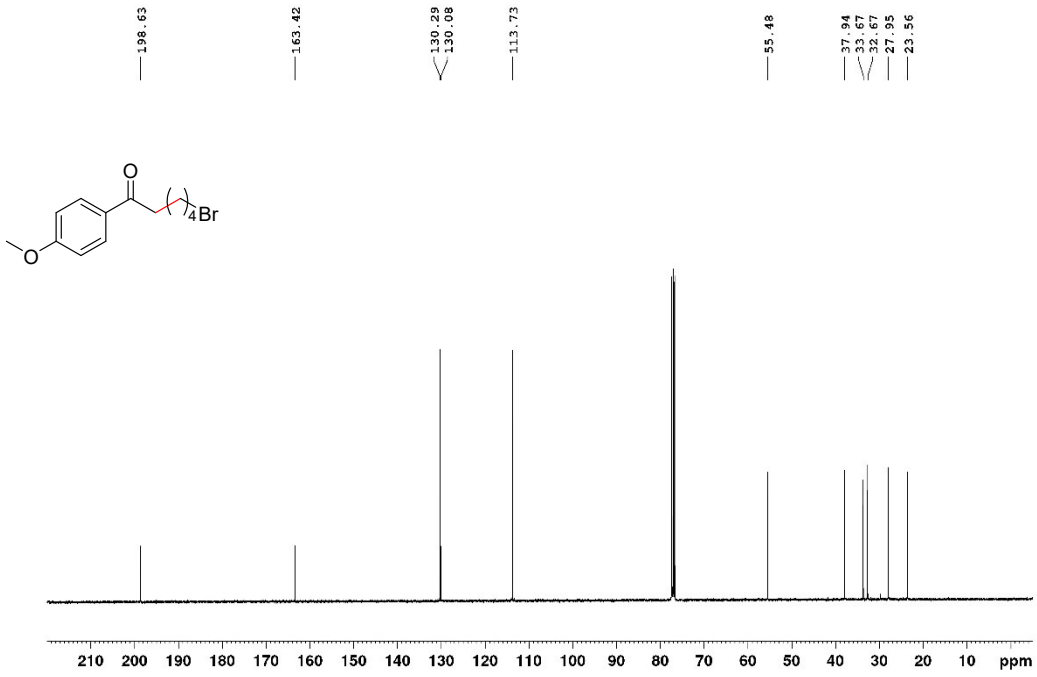
1-(4-Methoxyphenyl)octadecan-1-one (3zh): ^{13}C NMR (100 MHz, $CDCl_3$)



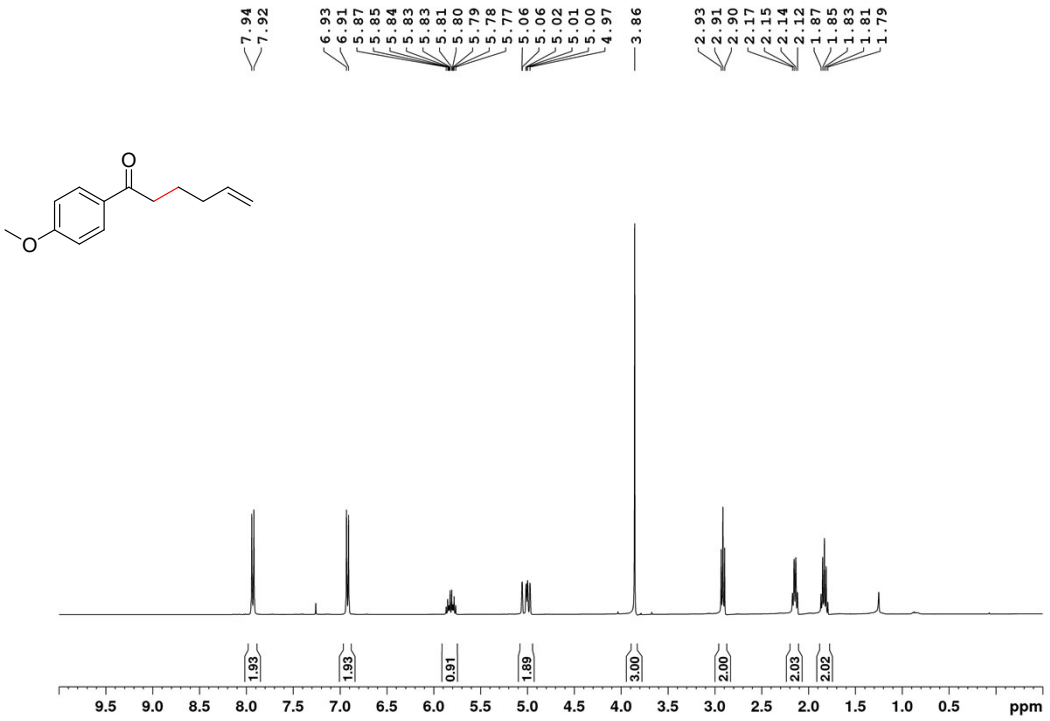
6-Bromo-1-(4-methoxyphenyl)hexan-1-one (3zi): ^{1}H NMR (400 MHz, $CDCl_3$)



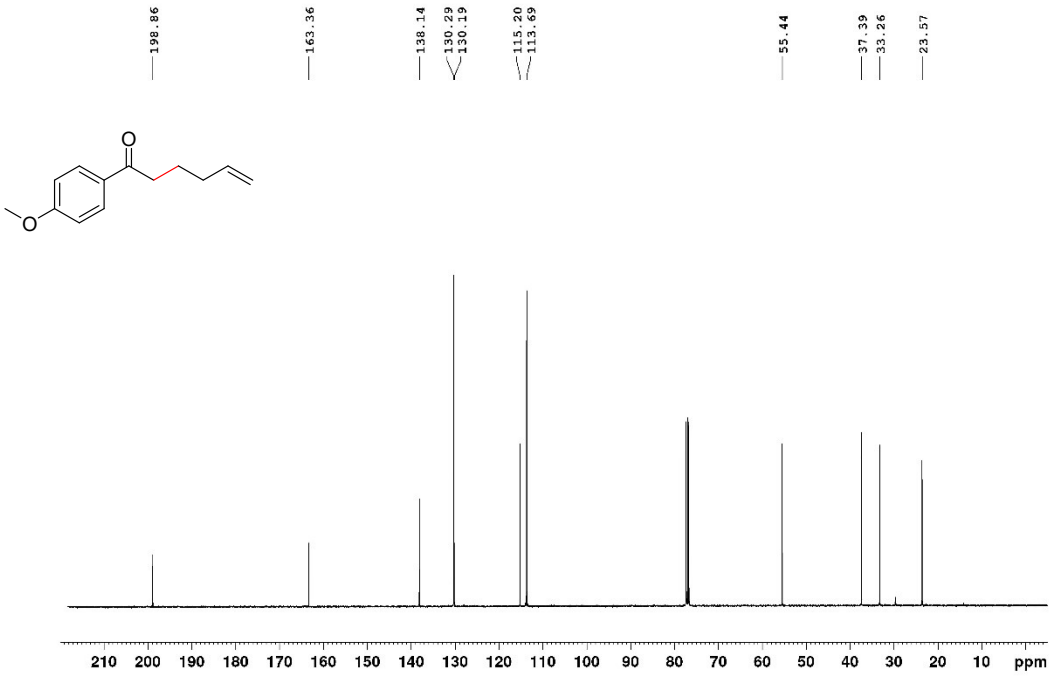
6-Bromo-1-(4-methoxyphenyl)hexan-1-one (3zi): ^{13}C NMR (100 MHz, $CDCl_3$)



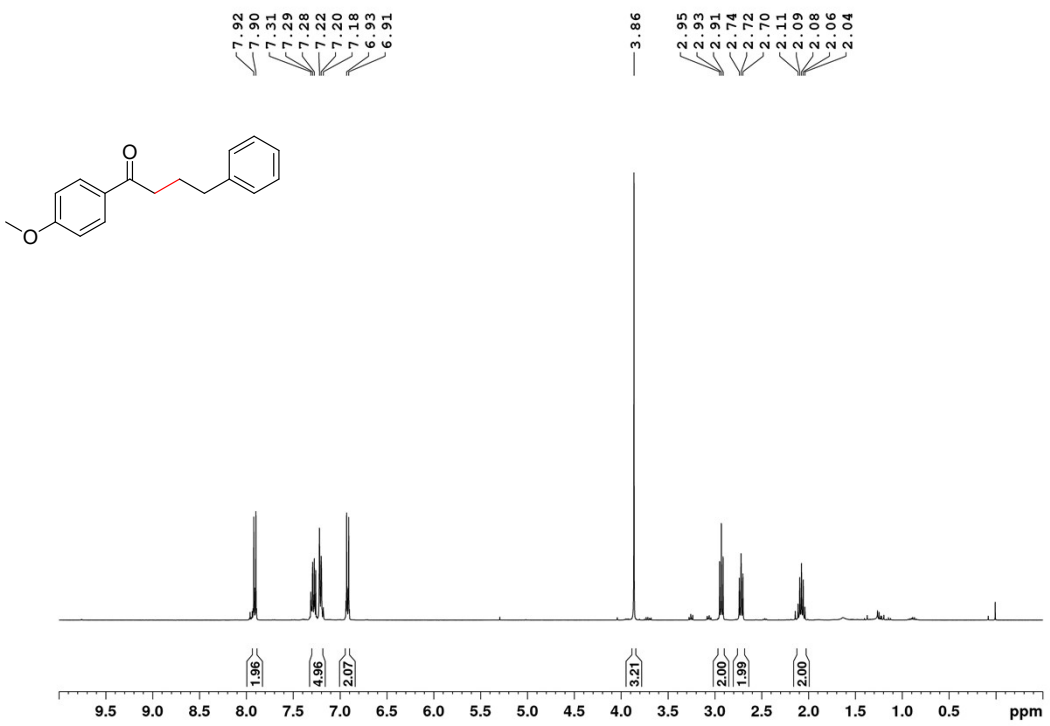
1-(4-Methoxyphenyl)hex-5-en-1-one (3zj): ^{1}H NMR (400 MHz, $CDCl_3$)



1-(4-Methoxyphenyl)hex-5-en-1-one (3zj): ^{13}C NMR (100 MHz, $CDCl_3$)



1-(4-Methoxyphenyl)-4-phenylbutan-1-one (3zk): ^{1}H NMR (400 MHz, $CDCl_3$)



1-(4-Methoxyphenyl)-4-phenylbutan-1-one (3zk): ^{13}C NMR (100 MHz, $CDCl_3$)