Electronic Supplementary Material (ESI) for ChemComm.


*Supporting Information*

*for*

# Highly efficient synthesis of functionalized α-oxyketones via Weinreb amides homologation with α-oxygenated organolithiums

*Vittorio Pace,* Irene Murgia, Sophie Westermayer, Thierry Langer and Wolfgang Holzer*

Department of Pharmaceutical Chemistry, Faculty of Life Sciences, University of Vienna

Althanstrasse 14, A-1090 Vienna (Austria)

e-mail: vittorio.pace@univie.ac.at

## 1 Instrumentation and General Analytical Methods

Melting Points were determined on a Reichert-Kofler hot-stage microscope and are uncorrected. Mass spectra were obtained on a Shimadzu QP 1000 instrument (EI, 70 eV) and on a Bruker maXis 4G instrument (ESI-TOF, HRMS). $^{1}H$, $^{19}F$ and $^{13}C$ NMR spectra were recorded on a Bruker Avance III 400 spectrometer (400 MHz for $^{1}H$, 100 MHz for $^{13}C$, 376 MHz for $^{19}F$) at 297 K using a directly detecting broadband observe (BBFO) probe. The centre of the (residual) solvent signal was used as an internal standard which was related to TMS with δ 7.26 ppm ($^{1}H$ in $CDCl_3$), δ 77.00 ppm ($^{13}C$ in $CDCl_3$). For $^{19}F$ NMR spectra absolute referencing via the *Ξ* ratio was used. Spin-spin coupling constants (*J*) are given in Hz.

In nearly all cases, full and unambiguous assignment of all resonances could be performed by combined application of standard NMR techniques, such as APT, HSQC, HMBC, COSY and NOESY experiments.

All the reactions were carried out under inert atmosphere of argon. THF was distilled over Na / benzophenone. Chemicals were purchased from Sigma-Aldrich, Acros, Alfa Aesar and TCI Europe. Solutions were evaporated under reduced pressure with a rotary evaporator.

TLC was carried out on aluminium sheets pre-coated with silica gel 60F254 (Macherey-Nagel, Merck); the spots were visualised under UV light (λ=254 nm) and/or $KMnO_4$ (aq.) was used as revealing system.

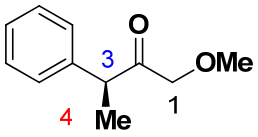
### General Procedure for the addition of $LiCH_2OR$ to Weinreb amides (General Procedure 1)

Lithium metal (7.0 equiv, 25% dispersion in mineral oil) was placed under argon in a Schlenk tube, washed with dry THF for three times and suspended in the same solvent (1.4 M concentration). DTBB (4,4′-di-tert-butylbiphenyl catalyst, 5% mol) was added and the mixture was stirred until the appearance of a dark green colour. To this suspension, cooled down to -78°C, the appropriate α-chloro ether: $ClCH_2OCH_3$, $ClCH_2OCH_2CH_3$, $ClCH_2OPh$, [1] $(CH_3)SiCH_2CH_2OCH_2Cl$, $CH_3CH_2CH_2OCH_2Cl$, (+)-chloromethyl menthyl ether, (-)-chloromethyl menthyl ether (2.0 equiv) was added dropwise and the mixture was stirred for 10 min. Then a 1.0 M solution of the Weinreb amide (1.0 equiv) in dry THF was added and the mixture was stirred at -78°C for the appropriate time and quenched with aqueous $NH_4Cl$. Subsequently, the reaction mixture was allowed to warm to r.t and the resulting organic phase was extracted 3 times whit $Et_2O$, washed with brine, dried over $Na_2SO_4$ and concentrated under reduced pressure. The resulting crude compounds were purified as reported below through flash column chromatography.

**General Procedure for the addition of $LiCH_2OR$ to Weinreb amides (General Procedure 2 - *via cannula*)**

Lithium metal (7.0 equiv, 25% dispersion in mineral oil) was placed under argon in a Schlenk tube, washed with dry THF for three times and suspended in the same solvent (1.4 M concentration). DTBB (4,4′-di-tert-butylbiphenyl catalyst 5% mol) was added and the mixture was stirred until the appearance of a dark green colour. To this suspension, cooled down to -78°C, the appropriate α-chloroether $ClCH_2OCH_3$, $ClCH_2OCH_2CH_3$ was added dropwise and stirred for 10 minutes to allow the formation of the corresponding carbenoid $LiCH_2OCH_3$ or $LiCH_2OCH_2CH_3$. In a separate flask the appropriate Weinreb amide was dissolved in dry THF (1M concentration) and the solution was cooled to -78°C under argon atmosphere. To this cooled solution, the suspension containing the carbenoid was added *via cannula*. The resulting reaction mixture was stirred at -78°C for the required time and quenched at the same temperature with aqueous $NH_4Cl$. Subsequently, the system was allowed to warm to r.t. and the resulting organic phase was extracted 3 times with $Et_2O$, washed with brine, dried over $Na_2SO_4$ and concentrated under reduced pressure. The resulting crude compounds were purified as reported below through flash column chromatography.

**(3*S*)-1-methoxy-3-phenyl-2-butanone (2)**




**2**

By following general procedure 1, starting from (2*S*)-*N*-methoxy-*N*-methyl-2-phenylpropanamide (0.193 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.196 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_3$ (0.161 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **2** was obtained in 95% yield (0.169 g, 0.95 mmol) as a pale oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 9:1).
The corresponding racemic sample has been prepared starting from racemic *N*-methoxy-*N*-methyl-2-phenylpropanamide and spectroscopic data match with those ones reported below.

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 7.32 (m, 2H, Ph H-3,5), 7.25 (m, 1H, Ph H-4), 7.23 (m, 2H, Ph H-2,6), 3.98 (s, 2H, $C\underline{H}_2OCH_3$), 3.89 (q, $^3J$ = 7.0 Hz, 1H, H-3), 3.28 (s, 3H, $OCH_3$), 1.41 (d, $^3J$ = 7.0 Hz, 3H, H-4).

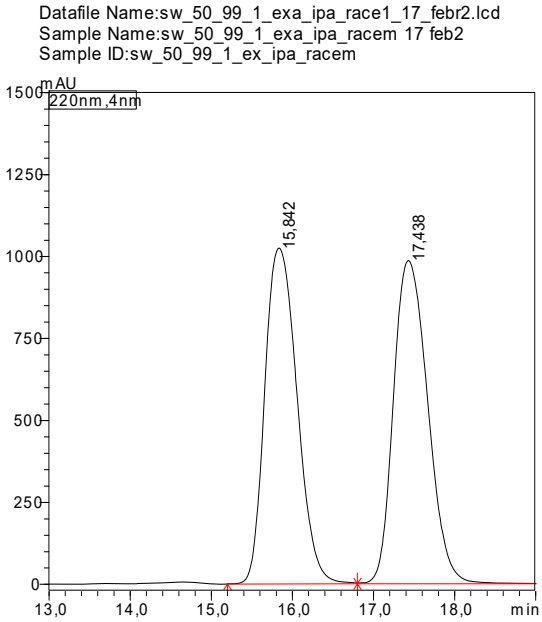
**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 207.8 (C=O), 139.9 (Ph C-1), 128.9 (Ph C-3,5), 127.8 (Ph C-2,6), 127.2 (Ph C-4), 76.1 ($\underline{C}H_2OCH_3$), 59.1 ($OCH_3$), 48.9 (C-3), 17.2 (C-4).

**HRMS** (ESI), *m/z*: calcd. for $C_{11}H_{14}NaO_2^+$ 201.0886 $[M+Na]^+$; found 201.0890.

$[\alpha]_{D}$ = +129 (*c* 0.6, $CHCl_3$).

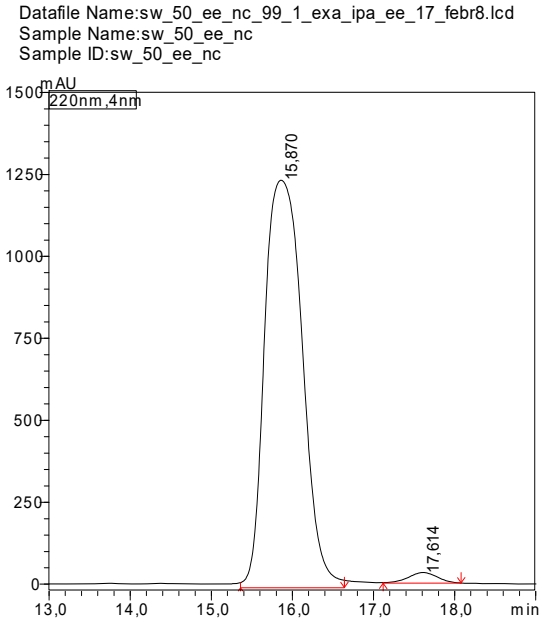
**HPLC analysis:** Chiralpak IA Column, λ 220 nm, eluent: *n*-hexane / *i*-propanol 99/1. Flow: 0.5 mL/min

***Racemate***




| Peaks | Ret.Time | Area | Area% |
|---|---|---|---|
| 1 | 15.842 | 28312270 | 49.387 |
| 2 | 17.438 | 29015280 | 50.613 |
| Total | | 57327550 | 100.000 |

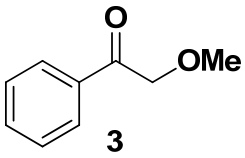
***Enantioenriched***




| Peaks | Ret.Time | Area | Area% |
|---|---|---|---|
| 1 | 15.870 | 38887741 | 98.857 |
| 2 | 17.614 | 449788 | 1.143 |

| | | | |
|---|---|---|---|
| Total | | 39337530 | 100.000 |

**2-methoxy-1-phenylethanone (3)**




**3**

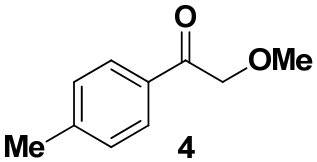
By following general procedure 1, starting from *N*-methoxy-*N*-methylbenzamide (0.163 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.193 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_3$ (0.161 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL). The title compound **3** was obtained in 91% yield (0.137 g, 0.91 mmol) as a yellow oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 8:2).[2]

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 7.92 (m, 2H, Ph H-2,6), 7.58 (m, 1H, Ph H-4), 7.46 (m, 2H, Ph H-3,5), 4.71 (s, 2H, $C\underline{H}_2OCH_3$), 3.50 (s, 3H, $OCH_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 196.1 (C=O), 134.8 (Ph C-1), 133.5 (Ph C-4), 128.7 (Ph C-3,5), 127.8 (Ph C-2,6), 75.2 ($\underline{C}H_2OCH_3$), 59.4 ($OCH_3$).

**HRMS** (ESI), *m/z*: calcd. for $C_9H_{10}NaO_2$ 173.0573 $[M+Na]^+$; found 173.0574.

**2-methoxy-1-(4-methylphenyl)ethanone (4)**[3]




**4**

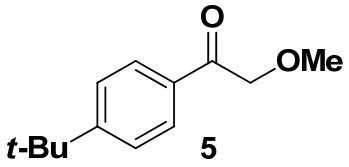
By following general procedure 1, starting from *N*-methoxy-*N*,4-dimethylbenzamide (0.179 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.193 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_3$ (0.161 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **4** was obtained in 93% yield (0.152 g, 0.93 mmol) as a pale yellow oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 8:2).[4]

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 7.84 (m, 2H, Ph H-2,6), 7.27 (m, 2H, Ph H-3,5), 4.69 (s, 2H, $C\underline{H}_2OCH_3$), 3.51 (s, 3H, $OCH_3$), 2.42 (s, 3H, Ph-$C\underline{H}_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 195.8 (C=O), 144.4 (Ph C-4), 132.4 (Ph C-1), 129.4 (Ph C-3,5), 127.9 (Ph C-2,6), 75.2 ($\underline{C}H_2OCH_3$), 59.4 ($OCH_3$), 21.7 (Ph-$\underline{C}H_3$).

**HRMS** (ESI), *m/z*: calcd. for $C_{10}H_{12}O_2Na^+$ 187.0730 $[M+Na]^+$; found 187.0730.

**2-methoxy-1-[4-(2-methyl-2-propanyl)phenyl]ethanone (5)**




5

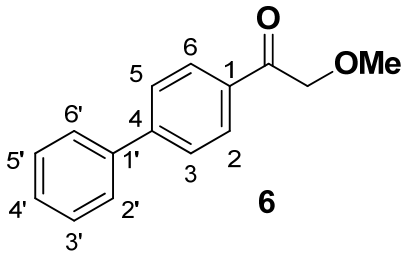
By following general procedure 1, starting from *N*-methoxy-*N*-methyl-4-(2-methyl-2-propanyl)benzamide (0.221 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.193 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_3$ (0.161 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **5** was obtained in 92% yield (0.190 g, 0.92 mmol) as a pale oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 8:2).

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 7.87 (m, 2H, Ph H-2,6), 7.48 (m, 2H, Ph H-3,5), 4.69 (s, 2H, $C\underline{H}_2OCH_3$), 3.50 (s, 3H, $OCH_3$), 1.33 (s, 9H, $C(C\underline{H}_3)_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 195.7 (C=O), 157.3 (Ph C-4), 132.2 (Ph C-1), 127.7 (Ph C-2,6), 125.6 (Ph C-3,5), 75.2 ($\underline{C}H_2OCH_3$), 59.4 $OCH_3$), 35.1 ($\underline{C}(CH_3)_3$), 31.0 ($C(\underline{C}H_3)_3$).

**HRMS** (ESI), *m/z*: calcd. for $C_{13}H_{18}NaO_2^+$ 229.1199 $[M+Na]^+$; found 229.1200.

**1-(4-biphenylyl)-2-methoxyethanone (6)**[5]




6

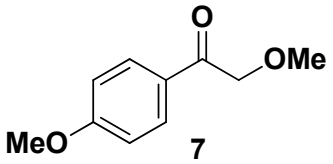
By following general procedure 1, starting from *N*-methoxy-*N*-methyl-4-biphenylcarboxamide (0.241 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.193 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_3$ (0.161 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **6** was obtained in 86% yield (195 g, 0.86 mmol) as a white solid after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 8:2); mp 92-93 °C (lit.,[6] 87-89 °C).

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 8.02 (m, 2H, Ph H-2,6), 7.70 (m, 2H, Ph H-3,5), 7.63 (m, 2H, Ph H-2′,6′), 7.48 (m, 2H, Ph H-3′,5′), 7.41 (m, 1H, Ph H-4′), 4.74 (s, 2H, $C\underline{H}_2OCH_3$), 3.54 (s, 3H, $OCH_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 195.8 (C=O), 146.3 (Ph C-4), 139.7 (Ph C-1'), 133.5 (Ph C-1), 129.0 (Ph C-3′,5′), 128.5 (Ph C-2,6), 128.3 (Ph C-4′), 127.3 (Ph C-3,5), 127.2 (Ph C-2′,6′), 75.4 ($\underline{C}H_2OCH_3$), 59.5 ($OCH_3$).

**HRMS** (ESI), *m/z*: calcd. for $C_{15}H_{14}NaO_2^+$ 249.0886 $[M+Na]^+$; found 249.0888.

**2-methoxy-1-(4-methoxyphenyl)ethanone (7)**




**7**

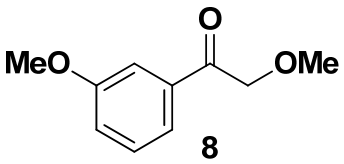
By following general procedure 1, starting from *N*,4-dimethoxy-*N*-methylbenzamide (0.195 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.196 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_3$ (0.161 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **7** was obtained in 84% yield (0.152 g, 0.84 mmol) as a yellow oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 7:3).

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 7.93 (m, 2H, Ph H-2,6), 6.94 (m, 2H, Ph H-3,5), 4.66 (s, 2H, $C\underline{H}_2OCH_3$), 3.87 (s, 3H, Ph-$OC\underline{H}_3$) 3.50 (s, 3H, $CH_2OC\underline{H}_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 194.7 (C=O), 163.8 (Ph C-4), 130.2 (Ph C-2,6), 127.9 (Ph C-1), 113.9 (Ph C-3,5), 75.2 ($\underline{C}H_2OCH_3$), 59.4 ($CH_2O\underline{C}H_3$), 55.5 (Ph-$O\underline{C}H_3$).

**HRMS** (ESI), *m/z*: calcd. For $C_{10}H_{12}NaO_3^+$ 203.0679 $[M+Na]^+$; found 203.0680.

**2-methoxy-1-(3-methoxyphenyl)ethanone (8)**




**8**

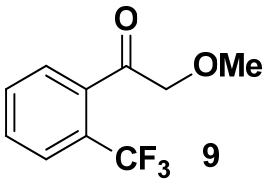
By following general procedure 1, starting from *N*,3-dimethoxy-*N*-methylbenzamide (0.195 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.193 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_3$ (0.161 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **8** was obtained in 89% yield (0.161 g, 0.89 mmol) as a yellow oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 8:2). [7]

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 7.48 (m, 1H, Ph H-6), 7.47 (m, 1H, Ph H-2), 7.36 (m, 1H, Ph H-5), 7.12 (m, 1H, Ph H-4), 4.69 (s, 2H, $C\underline{H}_2OCH_3$), 3.85 (s, 3H, Ph–$OC\underline{H}_3$), 3.50 (s, 3H, $CH_2OC\underline{H}_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 195.9 (C=O), 159.9 (Ph C-3), 136.1 (Ph C-1), 129.7 (Ph C-5), 120.2 (Ph C-6), 120.0 (Ph C-4), 112.1 (Ph C-2), 75.3 ($\underline{C}H_2OCH_3$), 59.4 ($CH_2O\underline{C}H_3$), 55.4 (Ph-$O\underline{C}H_3$).

**HRMS** (ESI), *m/z*: calcd. for $C_{10}H_{12}NaO_3^+$ 203.0679, $[M+Na]^+$; found 203.0680.

**2-methoxy-1-[2-(trifluoromethyl)phenyl]ethanone (9)**




**9**

By following general procedure 1, starting from *N*-methoxy-*N*-methyl-2-(trifluoromethyl)benzamide (0.233 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.193 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_3$ (0.161 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **9** was obtained in 83% yield 0.181 g, 0.83 mmol) as a colourless oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 9:1).

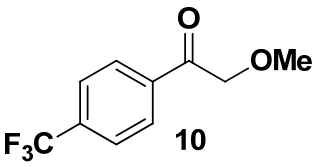
**$^1$H NMR** (400 MHz, $CDCl_3$): δ 7.72 (m, 1H, Ph H-3), 7.62 (m, 1H, Ph H-5), 7.60 (m, 1H, Ph H-4), 7.42 (m, 1H, Ph H-6), 4.44 (s, 2H, $C\underline{H}_2OCH_3$), 3.46 (s, 3H, $OCH_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 201.4 (C=O), 137.2 (q, $^3J_{C,F}$ = 2.0 Hz, Ph C-1), 131.7 (q, $^5J_{C,F}$ = 1.0 Hz, Ph C-5), 130.5 (Ph C-4), 127.5 (q, $^2J_{C,F}$ = 32.5 Hz, Ph C-2), 127.3 (Ph C-6), 126.7 (q, $^3J_{C,F}$ = 4.8 Hz, Ph C-3), 123.5 (q, $^1J_{C,F}$ = 273.6 Hz, $\underline{C}F_3$), 77.1 (q, $J_{C,F}$ = 1.6 Hz, $\underline{C}H_2OCH_3$), 59.3 ($OCH_3$).

**$^{19}$F NMR** (377 MHz, $CDCl_3$) δ: −58.1 (s).

**HRMS** (ESI), *m/z*: calcd. for $C_{10}H_9F_3NaO_2^+$ 241.0447 $[M+Na]^+$; found 241.0449.

**2-methoxy-1-[4-(trifluoromethyl)phenyl]ethanone (10)**




**10**

By following general procedure 1, starting from *N*-methoxy-*N*-methyl-4-(trifluoromethyl)benzamide (0.566 g, 2.0 mmol, 1.0 equiv), DTBB (0.026 g, 5% mol catalyst), lithium 25% in mineral oil (0.386 g, 14.0 mmol, 7.0 equiv) and $ClCH_2OCH_3$ (0.322 g, 0.302 mL, 4.0 mmol, 2.0 equiv) in dry THF (12 mL), compound **10** was obtained in 91% yield (0.200 g, 0.83 mmol) as a white solid after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 9:1); mp 49-51 °C (lit.,[8]48-50 °C).

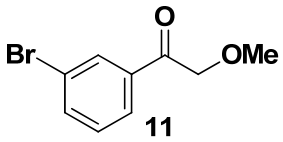
**$^1$H NMR** (400 MHz, $CDCl_3$): δ 8.05 (m, 2H, Ph H-2,6), 7.74 (m, 2H, Ph H-3,5), 4.70 (s, 2H, $C\underline{H}_2OCH_3$), 3.51 (s, 3H, $OCH_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 195.5 (C=O), 137.5 (Ph C-1), 134.8 (q, $^2J_{C,F}$ = 33.2 Hz, Ph C-4), 128.4 (Ph C-2,6), 125.8 (q, $^3J_{C,F}$ = 3.8 Hz, Ph C-3,5), 123.5 (q, $^1J_{C,F}$ = 272.7 Hz, $\underline{C}F_3$), 75.5 ($\underline{C}H_2OCH_3$), 59.5 ($OCH_3$).

**$^{19}$F NMR** (377 MHz, $CDCl_3$) δ: −63.2 (s).

**HRMS** (ESI), *m/z*: calcd. for $C_{10}H_9F_3NaO_2^+$ 241.0447 $[M+Na]^+$; found 241.0450.

**1-(3-bromophenyl)-2-methoxyethanone (11)**




**11**

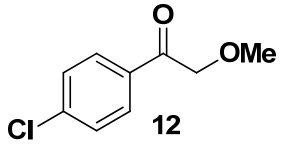
By following general procedure 2, starting from 3-bromo-*N*-methoxy-*N*-methylbenzamide (0.243 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.193 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_3$ (0.104 g, 0.099 mL, 1.3 mmol, 1.3 equiv) in dry THF (6 mL), compound **11** was obtained in 91% yield (0.209 g, 0.91 mmol) as a white solid after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 7:3); mp 44-46 °C.

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 8.07 (m, 1H, Ph H-2), 7.86 (m, 1H, Ph H-6), 7.71 (m, 1H, Ph H-4), 7.36 (m, 1H, Ph H-5), 4.66 (s, 2H, $C\underline{H}_2OCH_3$), 3.50 (s, 3H, $OCH_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 195.0 (C=O), 136.5 (Ph C-1), 136.4 (Ph C-4), 131.0 (Ph C-2), 130.3 (Ph C-5), 126.4 (Ph C-6), 123.1 (Ph C-3), 75.3 ($\underline{C}H_2OCH_3$), 59.5 ($OCH_3$).

**HRMS** (ESI), *m/z*: calcd. for $C_9H_9BrNaO_2^+$ 250.9678 $[M+Na]^+$; found 250.9679.

**1-(4-chlorophenyl)-2-metoxyethanone (12)**




**12**

By following general procedure 2, starting from 4-chloro-*N*-methoxy-*N*-methylbenzamide (0.200 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.196 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_3$ (0.161 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL),

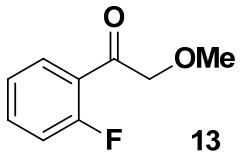
compound **12** was obtained in 88% yield (0.192 g, 0.88 mmol) as a yellow solid after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 8:2); mp 60-61 °C (lit.,[9] 64-65 °C).[10]

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 7.88 (m, 2H, Ph H-2,6), 7.44 (m, 2H, Ph H-3,5), 4.65 (s, 2H, $C\underline{H}_2OCH_3$), 3.49 (s, 3H, $OCH_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 195.1 (C=O), 140.0 (Ph C-4), 133.1 (Ph C-1), 129.4 (Ph C-2,6), 129.0 (Ph C-3,5), 75.3 ($\underline{C}H_2OCH_3$), 59.4 ($OCH_3$).

**HRMS** (ESI), *m/z*: calcd. for $C_9H_{10}ClO_2^+$ 185.0364 $[M+H]^+$; found 185.0365.

**1-(2-fluorophenyl)-2-metoxyethanone (13)**




**13**

By following general procedure 2, starting from 2-fluoro-*N*-methoxy-*N*-methylbenzamide (0.183 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.193 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_3$ (0.161 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **13** was obtained in 94% yield (0.158 g, 0.94 mmol) as an orange liquid after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 9:1).

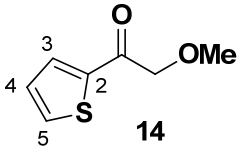
**$^1$H NMR** (400 MHz, $CDCl_3$): δ 7.95 (m, 1H, Ph H-6), 7.53 (m, 1H, Ph H-4), 7.24 (m, 1H, Ph H-5), 7.12 (m, 1H, Ph H-3), 4.61 (d, $J_{H,F}$ = 3.5 Hz, 2H, $C\underline{H}_2OCH_3$), 3.49 (s, 3H, $OCH_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 194.5 (d, $^3J_{C,F}$ = 5.5 Hz, C=O), 162.1 (d, $^1J_{C,F}$ = 254.0 Hz, Ph C-2), 135.1 (d, $^3J_{C,F}$ = 9.0 Hz, Ph C-4), 130.5 (d, $^3J_{C,F}$ = 3.3 Hz, Ph C-6), 124.7 (d, $^4J_{C,F}$ = 3.1 Hz, Ph C-5), 123.0 (d, $^2J_{C,F}$ = 15.2 Hz, Ph C-1), 116.4 (d, $^2J_{C,F}$ = 23.7 Hz, Ph C-3), 78.4 (d, $^4J_{C,F}$ = 11.8 Hz, $\underline{C}H_2OCH_3$), 59.4 ($OCH_3$).

**$^{19}$F NMR** (377 MHz, $CDCl_3$) δ: −107.9 (m).

**HRMS** (ESI), *m/z*: calcd. for $C_9H_{10}FO_2^+$ 169.0659 $[M+H]^+$; found 169.0664.

**2-methoxy-1-(2-thienyl)ethanone (14)**




**14**

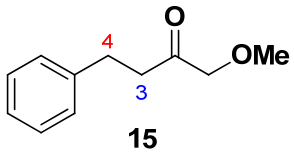
By following general procedure 1, starting from *N*-methoxy-*N*-methyl-2-Thiophenecarboxamide (0.171 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.193 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_3$ (0.161 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **14** was obtained in 90% yield (0.142 g, 0.90 mmol) as a brown oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 8:2).[9]

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 7.86 (dd, $^3J$ = 3.8 Hz and $^4J$ = 1.1 Hz, 1H, Th H-3), 7.68 (dd, $^3J$ = 4.9 Hz and $^4J$ = 1.1 Hz, 1H, Th H-5), 7.15 (dd, $^3J$ = 4.9 Hz and $^3J$ = 3.8 Hz, 1H, Th H4), 4.55 (s, 2H, $C\underline{H}_2OCH_3$), 3.51 (s, 3H, $OCH_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 189.8 (C=O), 141.0 (Th C-2), 134.0 (Th C-5), 132.5 (Th C-3), 128.1 (Th C-4), 75.9 ($\underline{C}H_2OCH_3$), 59.5 ($OCH_3$).

**HRMS** (ESI), *m/z*: calcd. for $C_7H_9O_2S^+$ 157.0318 $[M+H]^+$; found 157.0319.

**1-methoxy-4-phenyl-2-butanone (15)**




**15**

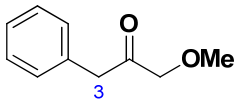
By following general procedure 1, starting from *N*-methoxy-*N*-methyl-3-phenylpropanamide (0.179 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.193 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_3$ (0.161 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **15** was obtained in 95% yield (0.170 g, 0.95 mmol) as a yellow oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 8:2).[11]

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 7.28 (m, 2H, Ph H-3,5), 7.20 (m, 1H, Ph H-4), 7.19 (m, 2H, Ph H-2,6), 3.96 (s, 2H, $C\underline{H}_2OCH_3$), 3.38 (s, 3H, $OCH_3$), 2.93 (m, 2H, H-4), 2.77 (m, 2H, H-3).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 207.8 (C=O), 140.7 (Ph C-1), 128.5 (Ph C-3,5), 128.3 (Ph C-2,6), 126.1 (Ph C-4), 77.7 ($\underline{C}H_2OCH_3$), 59.3 ($OCH_3$), 40.4 (C-3), 29.2 (C-4).

**HRMS** (ESI), *m/z*: calcd. for $C_{11}H_{14}NaO_2^+$ 201.0886 $[M+Na]^+$; found 201.0886.

**1-methoxy-3-phenylacetone (16)**




**16**

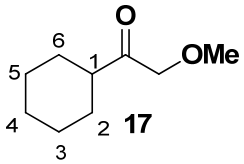
By following general procedure 1, starting from *N*-methoxy-*N*-methyl-2-phenylacetamide (0.179 g, 1.0 mmol, 1.0 equiv), DTBB (0.013g, 5% mol catalyst), lithium 25% in mineral oil (0.196 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_3$ (0.161 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **16** was obtained in 90% yield (0.148 g, 0.90 mmol) as a colourless liquid after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 7:3).[12]

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 7.33 (m, 2H, Ph H-3,5), 7.27 (m, 1H, Ph H-4), 7.22 (m, 2H, Ph H-2,6), 4.06 (s, 2H, $C\underline{H}_2OCH_3$), 3.75 (s, 2H, H-3), 3.39 (s, 3H, $OCH_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 205.8 (C=O), 133.4 (Ph C-1), 129.4 (Ph C-2,6), 128.7 (Ph C-3,5), 127.1 (Ph C-4), 76.9 ($\underline{C}H_2OCH_3$), 59.2 ($OCH_3$), 46.1 (C3).

**HRMS** (ESI), *m/z*: calcd. for $C_{10}H_{12}NaO_2^+$ 187.0730 $[M+Na]^+$; found 187.0730.

**1-cyclohexyl-2-methoxyethanone (17)**




**17**

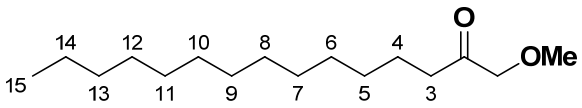
By following general procedure 1, starting from N-methoxy-N-methylcyclohexanecarboxamide (0.171 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.196 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_2CH_3$ (0.189 g, 0.185 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **17** was obtained in 93% yield (0.146 g, 0.93 mmol) as a colourless oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate from 9:1 to 8:2).[13]

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 4.08 (s, 2H, $C\underline{H}_2OCH_3$), 3.40 (s, 3H, $OCH_3$), 2.46 (m, 1H, Cyclohexane H-1), 1.79 (m, 2H, Cyclohexane H-2,6), 1.78 (m, 2H, Cyclohexane H-3,5), 1.66 (m, 1H, Cyclohexane H-4), 1.36 (m, 2H, Cyclohexane H-2´,6´), 1.25 (m, 2H, Cyclohexane H-3´,5´,4´).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 210.9 (C=O), 76.2 ($\underline{C}H_2OCH_3$), 59.2 ($OCH_3$), 47.0 (Cyclohexane C-1), 28.2 (Cyclohexane C-2,6), 25.7 (Cyclohexane C-4), 25.5 (Cyclohexane C-3,5).

**HRMS** (ESI), *m/z*: calcd. for $C_9H_{16}NaO_2^+$ 179.1043 $[M+Na]^+$; found 179.1045.

**1-methoxy-2-pentadecanone (18)**




**18**

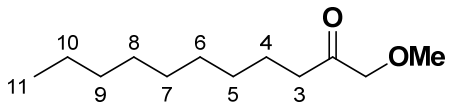
By following general procedure 1, starting from *N*-methoxy-*N*-methyltetradecanamide (0.257 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.196 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_3$ (0.161 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **18** was obtained in 91% yield (0.252 g, 0.91 mmol) as a white solid after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 9:1); mp 29-31°C.

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 3.99 (s, 2H, $C\underline{H}_2OCH_3$), 3.40 (s, 3H, $OCH_3$), 2.41 (t, $^3J$ = 7.5 Hz, 2H, H-3), 1.57 (m, 2H, H-4), 1.20-1.30 (m, 20H, H-5,6,7,8,9,10,11,12,13,14), 0.87 (t, $^3J$ = 7.0 Hz, 3H, H-15).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 208.8 (C=O), 77.6 ($\underline{C}H_2OCH_3$), 59.3 ($OCH_3$), 38.8 (C-3), 31.9 (C-13), 29.6-29.3 (C-6,7,8,9,10,11,12), 29.2 (C-5), 23.3 (C-4), 22.6 (C-14), 14.1 (C-15).

**HRMS** (ESI), *m/z*: calcd. for $C_{16}H_{34}O_2^+$ 257.2475 $[M+H]^+$; found 257.2478.

**1-methoxy-2-undecanone (19)**




**19**

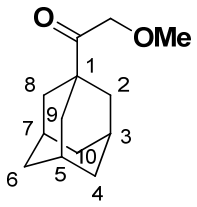
By following general procedure 1, starting from *N*-methoxy-*N*-methyldecanamide (0.215 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.193 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_3$ (0.161 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **19** was obtained in 90% yield (0.181 g, 0.90 mmol) as a yellow oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 9:1). [14]

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 3.99 (s, 2H, $C\underline{H}_2OCH_3$), 3.40 (s, 3H, $OCH_3$), 2.40 (t, $^3J$ = 7.6 Hz, 2H, H-3), 1.57 (m, 2H, H-4), 1.24 (m, 12H, H-5,6,7,8,9,10), 0.86 (t, $^3J$ = 7.0 Hz, 3H, H-11).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 208.7 (C=O), 77.5 ($\underline{C}H_2OCH_3$), 59.2 ($OCH_3$), 38.7 (C-3), 31.8 (C-9), 29.3-29.1 (C-8,7,6,5), 23.3 (C-4), 22.6 (C-10), 14.0 (C-11).

**HRMS** (ESI), *m/z*: calcd. for $C_{12}H_{25}O_2^+$ 201.1849 $[M+H]^+$; found 201.1847.

**1-(adamantan-1-yl)-2-methoxythanone (20)**




**20**

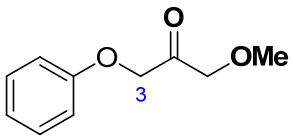
By following general procedure 1, starting from 1-(adamantan-1-yl)-2-[methoxy(methyl)amino] ethanone (0.233 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.196 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_3$ (0.161 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **20** was obtained in 94% yield (0.196 g, 0.94 mmol) as a white solid after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 8:2); mp 48-50°C.

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 4.23 (s, 2H, $C\underline{H}_2OCH_3$), 3.38 (s, 3H, $OCH_3$), 2.01 (m, 3H, Adamantyl H-3,5,7), 1.81 (m, 6H, Adamantyl H-2,8,9), 1.70 (m, 6H, Adamantyl H-4,6,10).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 211.0 (C=O), 73.1 ($\underline{C}H_2OCH_3$), 59.1 ($OCH_3$), 45.0 (Adamantyl C-1), 37.9 (Adamantyl C-2,8,9), 36.4 (Adamantyl C-4,6,10), 27.7 (Adamantyl C-3,5,7).

**HRMS** (ESI), *m/z*: calcd. for $C_{13}H_{20}NaO_2^+$ 231.1356 $[M+Na]^+$; found 231.1357.

**1-methoxy-3-phenoxyacetone (21)**




**21**

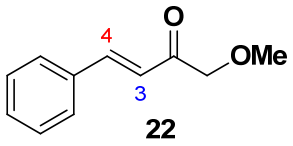
By following general procedure 1, starting from *N*-methoxy-*N*-methyl-2-phenoxyacetamide (0.195 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.193 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_3$ (0.161 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **21** was obtained in 92% yield (0.166 g, 0.92 mmol) as a brown oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 8:2).[15]

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 7.31 (m, 2H, Ph H-3,5), 7.00 (m, 1H, Ph H-4), 6.90 (m, 2H, Ph H-2,6), 4.74 (s, 2H, H-3), 4.33 (s, 2H, $C\underline{H}_2OCH_3$), 3.46 (s, 3H, $OCH_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 204.2 (C=O), 157.6 (Ph C-1), 129.7 (Ph C-3,5), 121.8 (Ph C-4), 114.5 (Ph C-2,6), 76.2 ($\underline{C}H_2OCH_3$), 71.6 (C-3), 59.5 ($OCH_3$).

**HRMS** (ESI), *m/z*: calcd. for $C_{10}H_{13}O_3^+$ 181.0859 $[M+H]^+$; found 181.0860.

**(3*E*)-1-methoxy-4-phenyl-3-buten-2-one (22)**




**22**

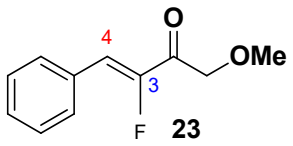
By following general procedure 2, starting from (2*E*)-*N*-methoxy-*N*-methyl-3-phenylacrylamide (0.195 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.196 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_3$ (0.161 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **22** was obtained in 94% yield (0.150 g, 0.94 mmol) as a pale oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 8:2).[16]

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 7.70 (d, $^3J$ = 16.2 Hz, 1H, H-4), 7.57 (m, 2H, Ph H-2,6), 7.39 (m, 3H, Ph H-3,4,5), 6.94 (d, $^3J$ = 16.2 Hz, 1H, H-3), 4.25 (s, 2H, $C\underline{H}_2OCH_3$), 3.47 (s, 3H, $OCH_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 197.1 (C=O), 143.5 (C-4), 134.3 (Ph C-1), 130.7 (Ph C-4), 128.9 (Ph C-3,5), 128.4 (Ph C-2,6), 121.4 (C-3), 77.1 ($\underline{C}H_2OCH_3$), 59.3 ($OCH_3$).

**HRMS** (ESI), *m/z*: calcd. for $C_{11}H_{13}O_2^+$ 177.0910 $[M+H]^+$; found 177.0912.

**(3*Z*)-3-fluoro-1-methoxy-4-phenyl-3-buten-2-one (23)**




**23**

By following general procedure 1, starting from (2*Z*)-2-fluoro-*N*-methoxy-*N*-methyl-3-phenylacryl amide (0.209 g, 1.0 mmol, 1.0 equiv), lithium 25% in mineral oil (0.193 g, 7.0 mmol, 7.0 equiv), DTBB (0.013 g, 5% mol catalyst) and $ClCH_2OCH_2CH_3$ (0.189 g, 0.185 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **23** was obtained in 90% yield (0.175 g, 0.90 mmol) as a yellow oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate from 9:1 to 8:2).

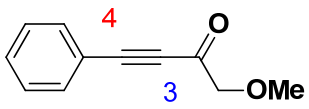
**$^{1}$H NMR** (400 MHz, $CDCl_3$): δ 7.66 (m, 2H, Ph H-2,6), 7.40 (m, 3H, Ph H-3,4,5), 6.91 (d, $^{3}J_{H,F}$ = 37.9 Hz, 1H, H-4), 4.51 (d, $^{4}J_{H,F}$ = 2.0 Hz, 2H, $C\underline{H}_2OCH_3$), 3.50 (s, 3H, $OCH_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 190.8 (d, $^{2}J_{C,F}$ = 32.3 Hz, C=O), 152.9 (d, $^{1}J_{C,F}$ = 271.0 Hz, C-3 ), 130.8 (d, $^{4}J_{C,F}$ = 8.2 Hz, Ph C-2,6), 130.7 ($^{3}J_{C,F}$ = 3.8 Hz, Ph C-1), 130.2 (Ph C-4), 128.9 (Ph C-3,5), 115.9 (d, $^{2}J_{C,F}$ = 3.7 Hz, C-4), 74.7 ($\underline{C}H_2OCH_3$), 59.5 ($OCH_3$).

**$^{19}$F NMR** (377 MHz, CDCl3) δ: −129.9 (d, $^{3}J_{F,H}$ = 37.9 Hz).

**HRMS** (ESI), *m/z*: calcd. for $C_{11}H_{11}FO_2Na^+$ 217.0635 $[M+Na]^+$; found 217.0639.

**1-methoxy-4-phenyl-3-butyn-2-one (24)**



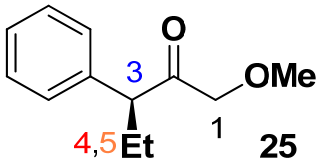

**24**

By following general procedure 1, starting from *N*-methoxy-*N*-methyl-3-phenyl-2-propynamide (0.189 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.193 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_3$ (0.161 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **24** was obtained in 83% yield (0.145 g, 0.83 mmol) as a yellow oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 9:1).[17]

**$^{1}$H NMR** (400 MHz, $CDCl_3$): δ 7.59 (m, 2H, Ph H-2,6), 7.48 (m, 1H, Ph H-4), 7.40 (m, 2H, Ph H-3,5), 4.28 (s, 2H, $C\underline{H}_2OCH_3$), 3.52 (m, 3H, $OCH_3$).
**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 185.0 (C=O), 133.2 (Ph C-2,6), 131.0 (Ph C-4), 128.7 (Ph C-3,5), 119.5 (Ph C-1), 93.6 (C-4), 85.6 (C-3), 78.5 ($\underline{C}H_2OCH_3$), 59.6 ($OCH_3$).

**HRMS** (ESI), *m/z*: calcd. for $C_{11}H_{10}NaO_2^+$ 197.0573 $[M+Na]^+$; found 197.0575.

**(3*S*)-1-methoxy-3-phenyl-2-pentanone (25)**




**25**

By following general procedure 1, starting from (2*S*)-*N*-ethoxy-*N*-methyl-2-phenylbutanamide (0.207 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.196 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_3$ (0.161 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **25** was obtained in 96% yield (0.185 g, 0.96 mmol) as a colourless oil after flash

column chromatography on silica gel (*n*-hexane:ethyl acetate 9:1). The corresponding racemic sample has been prepared starting from racemic *N*-methoxy-*N*-methyl-2-phenylbutanamide and spectroscopic data match with those ones reported below.

**$^{1}$H NMR** (400 MHz, $CDCl_3$): δ 7.31 (m, 2H, Ph H-3,5), 7.24 (m, 1H, Ph H-4), 7.22 (m, 2H, Ph H-2,6), 3.98 (s, 2H, $C\underline{H}_2OCH_3$), 3.64 (t, $^{3}J$ = 7.5 Hz, 1H, H-3), 3.28 (s, 3H, $CH_2OC\underline{H}_3$), 2.07 (m, 1H *diast*, H-4), 1.74 (m, 1H *diast*, H-4), 0.83 (t, $^{3}J$ = 7.4 Hz, 3H, H-5).

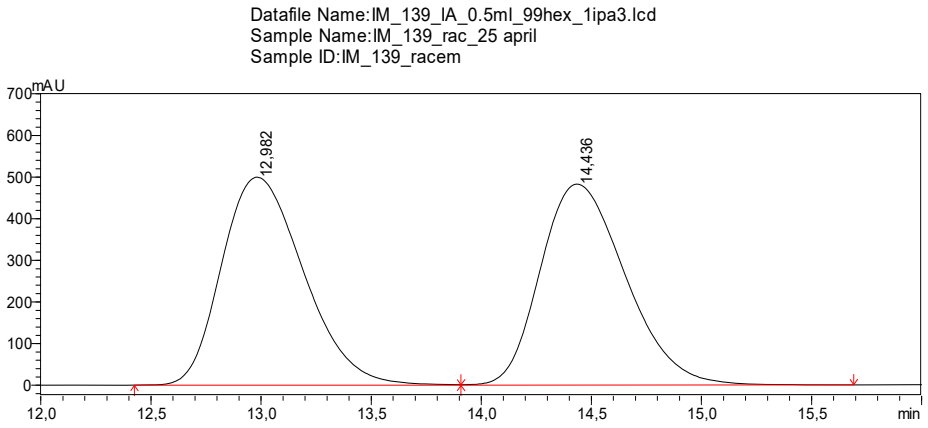
**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 207.6 (C=O), 138.3 (Ph C-1), 128.8 (Ph C-3,5), 128.2 (Ph C-2,6), 127.2 (Ph C-4), 76.6 ($\underline{C}H_2OCH_3$), 59.1 ($OCH_3$), 56.4 (C-3), 25.1 (C-4), 12.0 (C-5).

**HRMS** (ESI), *m/z*: calcd. for $C_{12}H_{16}NaO_2^+$ 215.1043 $[M+Na]^+$; found 215.1046.

$[\alpha]_{D\,=}$ +211 (*c* 0.3, $CHCl_3$).

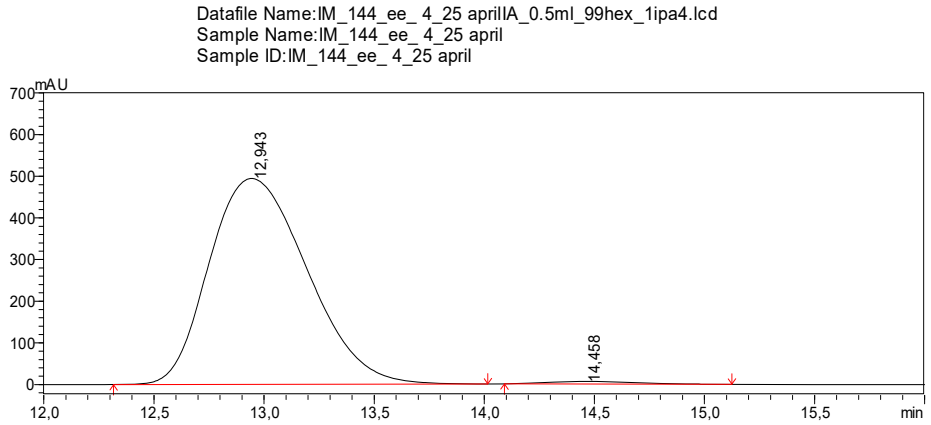
**HPLC analysis:** Chiralpak IA Column, λ 220 nm, eluent: *n*-hexane / *i*-propanol 99/1. Flow: 0.5 mL/min

***Racemate***



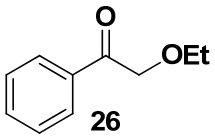

| Peaks | Ret.Time | Area | Area% |
|---|---|---|---|
| 1 | 12.982 | 12937085 | 49.934 |
| 2 | 14.436 | 12971164 | 50.066 |
| Total | | 25908250 | 100.000 |

***Enantioenriched***




| Peaks | Ret.Time | Area | Area% |
|---|---|---|---|
| 1 | 12.943 | 15244949 | 98.875 |
| 2 | 14.458 | 173497 | 1.125 |
| Total | | 15418446 | 100.000 |

**2-ethoxy-1-phenylethanone (26)**




**26**

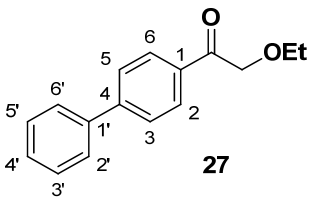
By following general procedure 1, starting from *N*-methoxy-*N*-methylbenzamide (0.163 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.196 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_2CH_3$ (0.189 g, 0.185 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **26** was obtained in 93% yield (0.153 g, 0.93 mmol ) as a yellow oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 8:2). [18]

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 7.93 (m, 2H, Ph H-2,6), 7.57 (m, 1H, Ph H-4), 7.45 (m, 2H, Ph H-3,5), 4.73 (s, 2H, $C\underline{H}_2OCH_2CH_3$), 3.64 (q, $^3J$ = 7.0 Hz, 2H, $CH_2OC\underline{H}_2CH_3$), 1.28 (t, $^3J$ = 7.0 Hz, 3H, $OCH_2C\underline{H}_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 196.5 (C=O), 135.0 (Ph C-1), 133.4 (Ph C-4), 128.6 (Ph C-3,5), 127.9 (Ph C-2,6), 73.5 ($\underline{C}H_2OCH_2CH_3$), 67.2 ($O\underline{C}H_2CH_3$), 15.0 ($OCH_2\underline{C}H_3$).

**HRMS** (ESI), *m/z*: calcd. for $C_{10}H_{12}NaO_2^+$ 187.0730 $[M+Na]^+$; found 187.0727.

**1-(4-biphenylyl)-2-ethoxyethanone (27)**




**27**

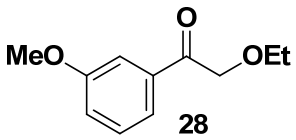
By following general procedure 1, starting from *N*-methoxy-*N*-methyl-4-biphenylcarboxamide (0.241 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.193 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_2CH_3$ (0.189 g, 0.185 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **27** was obtained in 95% yield (0.228 g, 0.95 mmol) as a yellow solid after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 8:2); mp 73-75°C.

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 8.02 (m, 2H, Ph H-2,6), 7.68 (m, 2H, Ph H-3,5), 7.62 (m, 2H, Ph H-2',6'), 7.47 (m, 2H, Ph H-3',5'), 7.40 (m, 1H, Ph H-4'), 4.76 (s, 2H, $C\underline{H}_2OCH_2CH_3$), 3.67 (q, $^3J$ = 7.0 Hz, 2H, $OC\underline{H}_2CH_3$), 1.31 (t, $^3J$ = 7.0 Hz, 3H, $OCH_2C\underline{H}_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 196.1 (C=O), 146.1 (Ph C-4), 139.8 (Ph C-1'), 133.7 (Ph C-1), 128.9 (Ph C-3',5'), 128.5 (Ph C-2,6), 128.2 (Ph C-4'), 127.23 (Ph C-3,5), 127.20 (Ph C-2',6'), 73.6 ($\underline{C}H_2OCH_2CH_3$), 67.2 ($O\underline{C}H_2CH_3$), 15.1 ($OCH_2\underline{C}H_3$).

**HRMS** (ESI), *m/z*: calcd. for $C_{16}H_{16}NaO_2^+$ 263.1043 $[M+Na]^+$; found 263.1043.

**2-ethoxy-1-(3-methoxyphenyl)ethanone (28)**




**28**

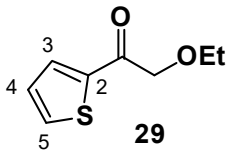
By following general procedure 1, starting from *N*,3-dimethoxy-*N*-methylbenzamide (0.195 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.193 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_2CH_3$ (0.189 g, 0.185 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **28** was obtained in 82% yield (0.197 g, 0.82 mmol) as a pale yellow oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 7:3).

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 7.50 (m, 1H, Ph H-6), 7.48 (m, 1H, Ph H-2), 7.36 (m, 1H, Ph H-5), 7.12 (ddd, $^3J$ = 8.2 Hz, $^4J$ = 2.7 Hz, $^5J$ =1.0 Hz, 1H, Ph H-4), 4.73 (s, 2H, $C\underline{H}_2OCH_3$), 3.85 (s, 3H, Ph–$OC\underline{H}_3$), 3.64 (q, $^3J$ = 7.0 Hz, 2H, $OC\underline{H}_2CH_3$), 1.29 (t, $^3J$ = 7.0 Hz, 3H, $OCH_2C\underline{H}_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 196.3 (C=O), 159.8 (Ph C-3), 136.2 (Ph C-1), 129.6 (Ph C-5), 120.2 (Ph C-6), 119.9 (Ph C-4), 112.2 (Ph C-2), 73.6 ($\underline{C}H_2OCH_2CH_3$), 67.2 ($CO\underline{C}H_2CH_3$), 55.4 (Ph-$O\underline{C}H_3$), 15.1 ($OCH_2\underline{C}H_3$).

**HRMS** (ESI), *m/z*: calcd. for $C_{11}H_{14}NaO_3^+$ 217.0835 $[M+Na]^+$; found 217.0836.

**2-ethoxy-1-(2-thienyl)ethanone (29)**




**29**

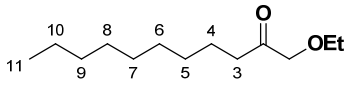
By following general procedure 1, starting from *N*-methoxy-*N*-methyl-2-thiophenecarboxamide (0.171 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.196 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_2CH_3$ (0.189 g, 0.185 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **29** was obtained in 87% yield (0.148 g, 0.87 mmol) as an orange oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 8:2).

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 7.89 (dd, $^3J$ = 3.8 Hz, $^4J$ = 1.1 Hz, 1H, Th H-3), 7.67 (dd, $^3J$ = 4.9 Hz, $^4J$ = 1.1 Hz, 1H, Th H-5), 7.14 (dd, $^3J$ = 4.9 Hz and $^3J$ =3.8 Hz, 1H, Th H-4), 4.56 (s, 2H, $C\underline{H}_2OCH_2CH_3$), 3.65 (q, $^3J$ =7.0 Hz, 2H, $OC\underline{H}_2CH_3$), 1.29 (t, $^3J$ = 7.0 Hz, 3H, $OCH_2C\underline{H}_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 190.3 (C=O), 141.0 (Th C-2), 134.0 (Th C-5), 132.6 (Th C-3), 128.0 (Th C-4), 74.2 ($\underline{C}H_2OCH_2CH_3$), 67.4 ($O\underline{C}H_2CH_3$), 15.1 ($OCH_2\underline{C}H_3$).

**HRMS** (ESI), *m/z*: calcd. for $C_8H_{10}O_2NaS^+$ 193.0294 $[M+Na]^+$; found 193.0295.

**1-ethoxy-2-undecanone (30)**




**30**

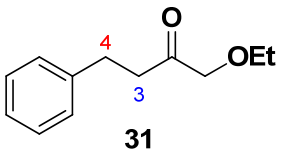
By following general procedure 1, starting from *N*-methoxy-*N*-methyldecanamide (0.215 g, 1.0 mmol, 1.0 equiv), DTBB (0.013g, 5% mol catalyst), lithium 25% in mineral oil (0.193 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_2CH_3$ (0.189 g, 0.185 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **30** was obtained in 88% yield (0.189 g, 0.88 mmol) as a pale oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 9:1).

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 4.02 (s, 2H, $C\underline{H}_2OCH_2CH_3$), 3.53 (q, $^3J$ = 7.0 Hz, 2H, $OC\underline{H}_2CH_3$), 2.43 (t, $^3J$ = 7.5 Hz, 2H, H-3), 1.57 (m, 2H, H-4), 1.31-1.24 (m, 12H, H-5,6,7,8,9,10), 1.24 (t, $^3J$ = 7.0 Hz, 3H, $OCH_2C\underline{H}_3$), 0.86 (t, $^3J$ = 7.0 Hz, 3H, H-11).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 209.3 (C=O), 75.8 ($\underline{C}H_2OCH_2CH_3$), 67.1 ($CO\underline{C}H_2CH_3$), 38.9 (C-3), 31.8 (C-9), 29.4-29.2 (C-6,7,8), 29.2 (C-5), 23.4 (C-4), 22.6 (C-10), 15.0 ($OCH_2\underline{C}H_3$), 14.0 (C-11).

**HRMS** (ESI), *m/z*: calcd. for $C_{13}H_{27}O_2^+$ 215.2006 $[M+H]^+$; found 215.2007.

**1-ethoxy-4-phenyl-2-butanone (31)**




**31**

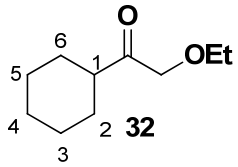
By following general procedure 1, starting from *N*-methoxy-*N*-methyl-3-phenylpropanamide (0.193 g, 1.0 mmol, 1.0 equiv), DTBB (0.013g, 5% mol catalyst), lithium 25% in mineral oil (0.196 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_2CH_3$ (0.122 g, 0.120 mL, 1.3 mmol, 1.3 equiv) in dry THF (6 mL), compound **31** was obtained in 91% yield (0.175 g, 0.91 mmol) as colourless oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate from 9:1 to 8:2).

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 7.28 (m, 2H, Ph H-3,5), 7.20 (m, 3H, Ph H-2,4,6), 4.00 (s, 2H, $C\underline{H}_2OCH_2CH_3$), 3.51 (q, $^3J$ = 7.0 Hz, 2H, $OC\underline{H}_2CH_3$), 2.92 (m, 2H, H-4), 2.79 (m, 2H, H-3), 1.23 (t, $^3J$ = 7.0 Hz, 3H, $OCH_2C\underline{H}_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 208.4 (C=O), 140.9 (Ph C-1), 128.5 (Ph C-3,5), 128.3 (Ph C-2,6), 126.1 (Ph C-4), 76.0 ($\underline{C}H_2OCH_2CH_3$), 67.1 ($O\underline{C}H_2CH_3$), 40.5 (C-3), 29.3 (C-4), 15.0 ($OCH_2\underline{C}H_3$).

**HRMS** (ESI), *m/z*: calcd. for $C_{12}H_{17}O_2^+$ 193.1223 $[M+H]^+$; found 193.1225.

**1-cyclohexyl-2-ethoxyethanone (32)**




**32**

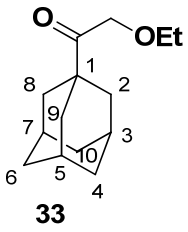
By following general procedure 1, starting from *N*-methoxy-*N*-methylcyclohexanecarboxamide (0.171 g, 1.0 mmol, 1.0 equiv), lithium 25% in mineral oil (0.196 g, 7.0 mmol, 7.0 equiv), DTBB (0.013g, 5% mol catalyst) and $ClCH_2OCH_2CH_3$ (0.189 g, 0.185 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **32** was obtained in 95% yield (0.162 g, 0.95 mmol) as a yellow liquid after flash column chromatography on silica gel (*n*-hexane:ethyl acetate from 9:1 to 8:2). [19]

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 4.12 (s, 2H, $C\underline{H}_2OCH_2CH_3$), 3.53 (q, $^3J$ = 7.0 Hz, 2H, $OC\underline{H}_2CH_3$), 2.48 (m, 1H, Cyclohexane H-1), 1.79 (m, 2H, Cyclohexane H-2,6), 1.77 (m, 2H, Cyclohexane H-3,5), 1.66 (m, 1H, Cyclohexane C-4'), 1.35 (m, 2H, Cyclohexane H-2´,6´), 1.26 (m, 2H, Cyclohexane H-3',5´), 1.24 (t, $^3J$ = 7.0 Hz, 3H, $OCH_2C\underline{H}_3$), 1.23 (m, 1H, Cyclohexane H-4´).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 211.3 (C=O), 74.3 ($\underline{C}H_2OCH_2CH_3$), 67.1 ($O\underline{C}H_2CH_3$), 47.0 (Cyclohexane C-1), 28.2 (Cyclohexane C-2,6), 25.7 (Cyclohexane C-4), 25.6 (Cyclohexane C-3,5), 15.0 ($OCH_2\underline{C}H_3$).

**HRMS** (ESI), *m/z*: calcd. for $C_{10}H_{18}NaO_2^+$ 193.1199 $[M+Na]^+$; found 193.1202.

**1-(adamantan-1-yl)-2-ethoxyethanone (33)**




**33**

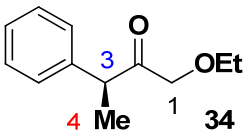
By following general procedure 1, starting from 1-(adamantan-1-yl)-2-[methoxy(methyl)amino]ethanone (0.233 g, 1.0 mmol, 1.0 equiv), DTBB (0.013g, 5% mol catalyst), lithium 25% in mineral oil (0.193 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_2CH_3$ (0.189 g, 0.185 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **33** was obtained in 92% yield (0.205 g, 0.92 mmol) as a white solid after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 8:2).

**$^{1}$H NMR** (400 MHz, $CDCl_3$): δ 4.29 (s, 2H, $C\underline{H}_2OCH_2CH_3$), 3.52 (q, $^3J$ = 7.0 Hz, 2H, $OC\underline{H}_2CH_3$), 2.02 (m, 3H, Adamantyl H-3,5,7), 1.83 (m, 6H, Adamantyl H-2,8,9), 1.71 (m, 6H, Adamantyl H-4,6,10), 1.24 (t, $^3J$ = 7.0 Hz, 3H, $OCH_2C\underline{H}_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 211.3 (C=O), 71.3 ($\underline{C}H_2OCH_2CH_3$), 66.9 ($O\underline{C}H_2CH_3$), 45.1 (Adamantyl C-1), 38.0 (Adamantyl C-2,8,9), 36.4 (Adamantyl C-4,6,10), 27.8 (Adamantyl C-3,5,7), 15.0 ($OCH_2\underline{C}H_3$).

**HRMS** (ESI), *m/z*: calcd. for $C_{14}H_{22}NaO_2^+$ 245.1512 $[M+Na]^+$; found 245.1513.

**(*S*)-1-ethoxy-3-phenyl-2-butanone (34)**




**34**

By following general procedure 1, starting from (*S*)-N-methoxy-*N*-methyl-2-phenylpropanamide (0.193 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.196 g, 7.0 mmol, 7.0 equiv) and $ClCH_2CH_2OCH_3$ (0.161 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF

(6 mL), compound **34** was obtained in 93% yield (0.179 g, 0.93 mmol) as a pale oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 9:1). The corresponding racemic sample has been prepared starting from racemic *N*-methoxy-*N*-methyl-2-phenylpropanamide and spectroscopic data match with those ones reported below.

**$^{1}$H NMR** (400 MHz, $CDCl_3$): δ 7.32 (m, 2H, Ph H-3,5), 7.25 (m, 1H, Ph H-4), 7.23 (m, 2H, Ph H-2,6), 4.02 (d, $^{2}J_{AB}$ = 17.1 Hz, 1H *diast* AB-system, $C\underline{H}_2OCH_2CH_3$), 4.01 (d, $^{2}J_{AB}$ = 17.1 Hz, 1H *diast* AB-system, $C\underline{H}_2OCH_2CH_3$), 3.94 (q, $^{3}J$ = 7.0 Hz, 1H, H-3), 3.43 (dq, $^{2}J$ = 9.2 Hz, $^{3}J$ = 7.0 Hz, 1H *diast*, $OC\underline{H}_2CH_3$), 3.37 (dq, $^{2}J$ = 9.2 Hz, $^{3}J$ = 7.0 Hz, 1H *diast*, $OC\underline{H}_2CH_3$, 1.41 (d, $^{3}J$ = 7.0 Hz, 3H, H-4), 1.17 (t, $^{3}J$ = 7.0 Hz, $OCH_2C\underline{H}_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 208.4 (C=O), 140.0 (Ph C-1), 128.9 (Ph C-3,5), 127.9 (Ph C-2,6), 127.2 (Ph C-4), 74.4 ($\underline{C}H_2OCH_2CH_3$), 67.0 ($O\underline{C}H_2CH_3$), 48.8 (C-3), 17.2 (C-4), 14.9 ($OCH_2\underline{C}H_3$).

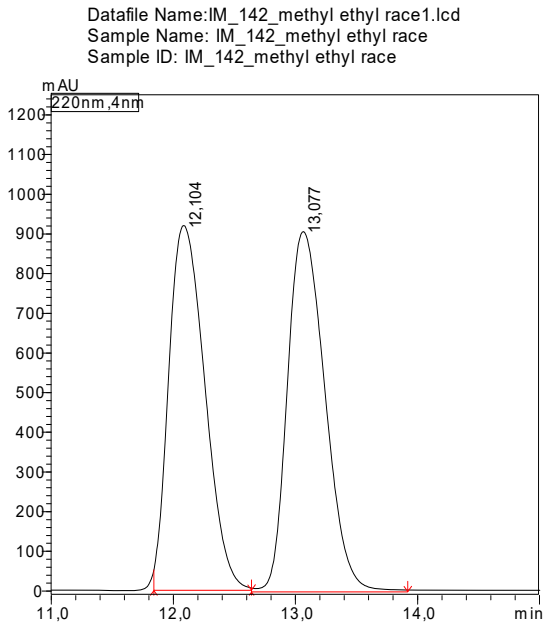
**HRMS** (ESI), *m/z*: calcd. for $C_{12}H_{16}NaO_2^+$ 215.1043 $[M+Na]^+$; found 215.1044.

$[\alpha]_{D\,=}$ +170 (*c* 0.3, $CHCl_3$).

**HPLC analysis:** Chiralpak IA Column, λ 220 nm, eluent: *n*-hexane / *i*-propanol 99/1. Flow:

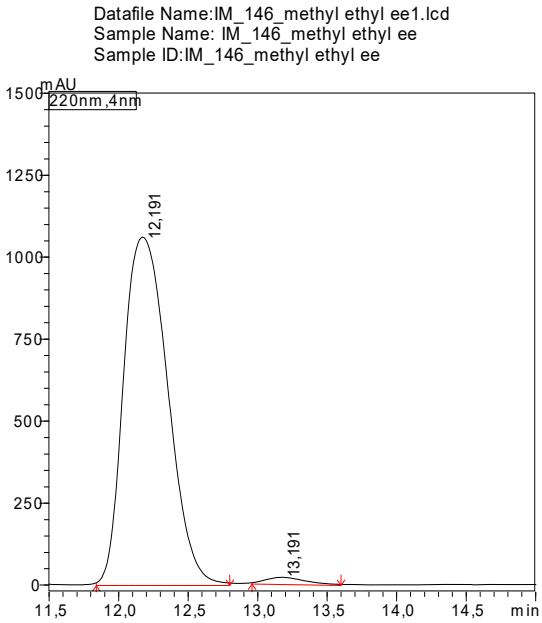
0.5 mL/min

***Racemate***



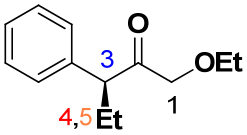

| Peaks | Ret.time | Area | % |
|---|---|---|---|
| 1 | 12.104 | 19214567 | 50.549 |
| 2 | 13.077 | 18796922 | 49.451 |
| Total | | 38011489 | 100.000 |

***Enantioenriched***




| Peak | Ret.time | Area | % |
|---|---|---|---|
| 1 | 12.191 | 23020546 | 99.138 |
| 2 | 13.191 | 200201 | 0.862 |
| Total | | 23220748 | 100.000 |

**(*S*)-1-ethoxy-3-phenyl-2-pentanone (35)**




**35**

By following general procedure 1, starting from (*2S)-N*-methoxy-*N*-methyl-2-phenylbutanamide (0.207 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.196 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_2CH_3$ (0.189 g, 0.185 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **35** was obtained in 98% yield (0.198 g, 0.98 mmol) as a colourless oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 9:1). The corresponding racemic sample has been prepared starting from racemic *N*-methoxy-*N*-methyl-2-phenylbutanamide and spectroscopic data match with those ones reported below.

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 7.31 (m, 2H, Ph H-3,5), 7.24 (m, 1H, Ph H-4), 7.22 (m, 2H, Ph H-2,6), 4.03 (d, $^2J_{AB}$ = 17.2 Hz, 1H *diast* AB-system, $C\underline{H}_2OCH_2CH_3$), 4.00 (d, $^2J_{AB}$ = 17.2 Hz, 1H *diast* AB-system, $C\underline{H}_2OCH_2CH_3$), 3.69 (t, $^3J$ = 7.5 Hz, 1H, H-3), 3.43 (dq, $^2J$ = 9.2 Hz, $^3J$ = 7.0 Hz, 1H *diast*, $OC\underline{H}_2CH_3$), 3.36 (dq, $^2J$ = 9.2 Hz, $^3J$ = 7.0 Hz, 1H *diast*, $OC\underline{H}_2CH_3$), 2.07 (m, 1H *diast*, H-4), 1.74 (m, 1H *diast*, H-4), 1.18 (t, $^3J$ = 7.0 Hz, 3H,$OCH_2C\underline{H}_3$), 0.83 (t, $^3J$ = 7.4 Hz, 3H, H-5).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 208.2 (C=O), 138.4 (Ph C-1), 128.8 (Ph C-3,5), 128.3 (Ph C-2,6), 127.2 (Ph C-4), 74.9 ($\underline{C}H_2OCH_2CH_3$), 67.0 ($O\underline{C}H_2CH_3$), 56.4 (C-3), 25.2 (C-4), 14.9 ($OCH_2\underline{C}H_3$), 12.0 (C-5).

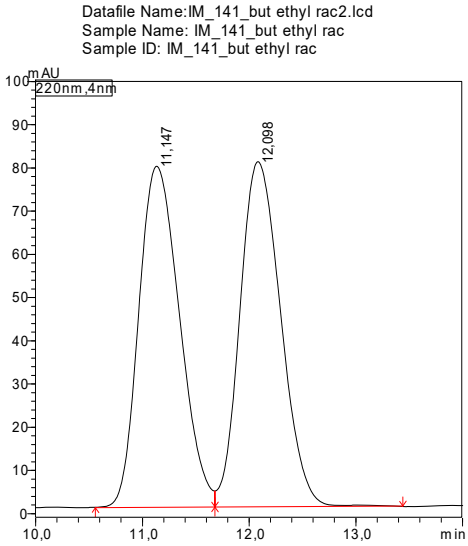
**HRMS** (ESI), *m/z*: calcd. for $C_{13}H_{18}NaO_2^+$ 229.1199 $[M+Na]^+$; found 207.1203.

$[\alpha]_{D\,=}$ +173 (*c* 0.9, $CHCl_3$)

**HPLC analysis:** Chiralpak IA Column, λ 220 nm, eluent: *n*-hexane / *i*-propanol 99/1. Flow:

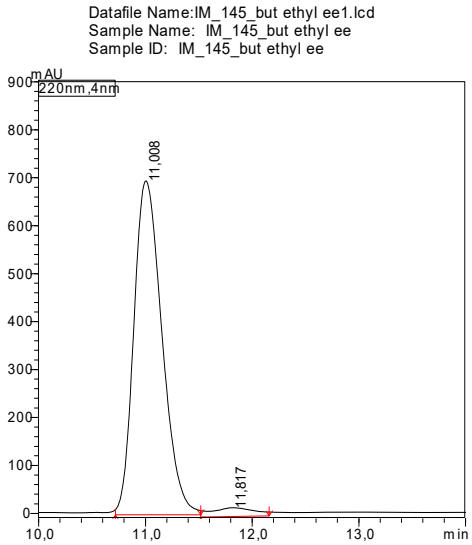
0.5 mL/min

***Racemate***



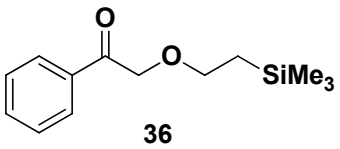

| Peak | Ret.time | Area | % |
|---|---|---|---|
| 1 | 11.147 | 831608 | 49.932 |
| 2 | 12.098 | 836093 | 50.168 |
| Total | | 43452260 | 100.000 |

***Enantioenriched***




| Peak | Ret.time | Area | % |
|---|---|---|---|
| 1 | 11.008 | 12757111 | 99.561 |
| 2 | 11.817 | 56249 | 0.439 |
| Total | | 12813360 | 100.000 |

**1-phenyl-2-[2-(trimethylsilyl)ethoxy]ethanone (36)**




**36**

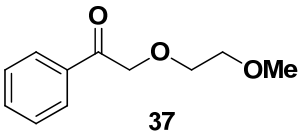
By following general procedure 1, starting from *N*-methoxy-*N*-methylbenzamide (0.163 g, 1.0 mmol, 1.0 equiv), DTBB (0.013g, 5% mol catalyst), lithium 25% in mineral oil (0.196 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_2CH_2SiC(CH_3)_3$ (0.333 g, 0.353 mL, 2.0 mmol, 2.0 equiv) in dry THF (5 mL), compound **36** was obtained in 89% yield (0.210 g, 0.89 mmol) as a yellow liquid after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 9:1).

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 7.93 (m, 2H, Ph H-2,6), 7.55 (m, 1H, Ph H-4), 7.44 (m, 2H, Ph H-3,5), 4.71 (s, 2H, $C\underline{H}_2OCH_2CH_2OSiMe_3$), 3.65 (m, 2H, $CH_2OC\underline{H}_2CH_2OSiMe_3$), 1.03 (m, 2H, $OCH_2C\underline{H}_2OSiMe_3$), 0.00 (s, 9H, $Si(C\underline{H}_3)_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 196.5 (C=O), 135.0 (Ph C-1), 133.3 (Ph C-4), 128.6 (Ph C-3,5), 127.9 (Ph C-2,6), 73.1 ($\underline{C}H_2OCH_2CH_2OSiMe_3$), 69.0 ($O\underline{C}H_2CH_2OSiMe_3$), 18.1 ($OCH_2\underline{C}H_2OSiMe_3$), -1.5 ($Si(\underline{C}H_3)_3$).

**HRMS** (ESI), *m/z*: calcd. for $C_{12}H_{20}NaO_2Si^+$ 259.1125 $[M+Na]^+$; found 259.1126.

**2-(2-methoxyethoxy)-1-phenylethanone (37)**




37

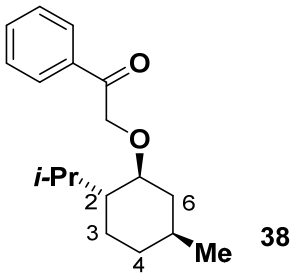
By following general procedure 1, starting from *N*-methoxy-*N*-methylbenzamide (0.163 g, 1.0 mmol, 1.0 equiv), DTBB (0.013 g, 5% mol catalyst), lithium 25% in mineral oil (0.196 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OCH_2CH_2OCH_3$ (0.124 g, 0.125 mL, 2.0 mmol, 2.0 equiv) in dry THF (5 mL), compound **37** was obtained in 94% yield (0.183 g, 0.94 mmol) as a yellow liquid after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 9:1).[20]

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 7.91 (m, 2H, Ph H-2,6), 7.56 (m, 1H, Ph H-4), 7.44 (m, 2H, Ph H-3,5), 4.82 (s, 2H, $C\underline{H}_2OCH_2CH_2OCH_3$), 3.75 (m, 2H, $OC\underline{H}_2CH_2OCH_3$), 3.60 (m, 2H, $OCH_2C\underline{H}_2OCH_3$), 3.36 (s, 3H, $OCH_3$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 196.3 (C=O), 134.8 (Ph C-1), 133.4 (Ph C-4), 128.6 (Ph C-3,5), 127.8 (Ph C-2,6), 74.1 ($\underline{C}H_2OCH_2CH_2OCH_3$), 72.0 ($OCH_2\underline{C}H_2OCH_3$), 70.7 ($O\underline{C}H_2CH_2OCH_3$), 58.9 ($O\underline{C}H_3$).

**HRMS** (ESI), *m/z*: calcd. for $C_{11}H_{14}NaO_3^+$ 217.0835 $[M+Na]^+$; found 217.0835

**2-{[(1*S*, 2*R*, 5*S*)-2-isopropyl-5-methylcyclohexyl]oxy}-1-phenylethanone (38)**




38

By following general procedure 1, starting from N-methoxy-N-methylcyclohexanecarboxamide (0.165 g, 1.0 mmol, 1.0 equiv), lithium 25% in mineral oil (0.196 g, 7.0 mmol, 7.0 equiv), DTBB (0.013 g, 5% mol catalyst) and (+)-chloromethyl menthyl ether (0.412 mL, 2 mmol) in dry THF (6 mL), compound **38** was obtained in 93% yield (0.255 g, 0.93 mmol) as a yellow liquid after flash column chromatography on silica gel (*n*-hexane:ethyl acetate from 9:1 to 8:2).

**$^1$H NMR** (400 MHz, $CDCl_3$): 7.95 (m, 2H, Ph H-2,6), 7.57 (m, 1H, Ph H-4), 7.46 (m, 2H, Ph H-3,5), 4.82 (d, $^2J_{AB}$ = 16.0 Hz, 1H 1H *diast* AB-system, O=CC$\underline{H}_2$O), 4.67 (d, $^2J_{AB}$ = 16.0 Hz, 1H *diast* AB-system, O=CC$\underline{H}_2$O), 3.22 (dt, $^3J$ = 4.2 Hz $^3J$ = 10.5 Hz, 1H, Cyclohexane $H_{1ax}$), 2.27 (dsept, $^3J$ =

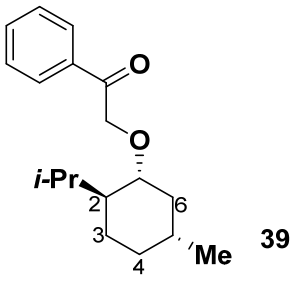
2.7 Hz, $^{3}J$ = 7.0 Hz, 1H, $(CH_3)_2C\underline{H}$), 2.13 (m, 1H, Cyclohexane H-$6_{eq}$), 1.65 (m, 1H, Cyclohexane H-$4_{eq}$), 1.63 (m, 1H, Cyclohexane H-$3_{eq}$), 1.35 (m, 1H, Cyclohexane H-$5_{ax}$), 1.34 (m, 1H, Cyclohexane H-$2_{ax}$), 0.97 (m, 1H, Cyclohexane H-$3_{ax}$), 0.95 (m, 1H, Cyclohexane H-$6_{ax}$), 0.85 (m, 1H, Cyclohexane H-$4_{ax}$), 0.92 (d, $^{3}J$ = 6.6 Hz, 3H, $C\underline{H}_3$-C-5 ), 0.88 (d, $^{3}J$ = 7.0 Hz, 3H, $(C\underline{H}_3)_2CH$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 196.9 (C=O), 135.2 (Ph C-1), 133.3 (Ph C-4), 128.6 (Ph C-3,5), 128.1 (Ph C-2,6´), 80.1 (Cyclohexane C-1), 71.5 (O=C$\underline{C}H_2$O), 48.2 (Cyclohexane C-2), 40.0 (Cyclohexane C-6), 34.4 (Cyclohexane C-4), 31.6 (Cyclohexane C-5), 25.4 $(CH_3)_2\underline{C}H$), 23.2 (Cyclohexane C-3), 22.3 ($\underline{C}H_3$-C-5), 21.0 $(\underline{C}H_3)_2CH$), 16.1 $(\underline{C}H_3)_2CH$).

$[\alpha]_{D\,=}$ +59 (*c* 0.6, $CHCl_3$)

HRMS (ESI), m/z: calcd. for $C_{18}H_{27}O_2$ 275.2011 [M+H]+; found 275.2010

**2-{[(1*R*, 2*S*, 5*R*)-2-isopropyl-5-methylcyclohexy]oxy}-1-phenylethanone (39)**



**39**

By following general procedure 1, starting from *N*-methoxy-*N*-methylbenzamide (0.165 g, 1.0 mmol, 1.0 equiv), lithium 25% in mineral oil (0.196 g, 7.0 mmol, 7.0 equiv), DTBB (0.013 g, 5% mol catalyst) and (-)-chloromethyl menthyl ether (0.412 mL, 2 mmol) in dry THF (6 mL), compound **39** was obtained in 90% yield (0.247 g, 0.90 mmol) as a yellow liquid after flash column chromatography on silica gel (*n*-hexane:ethyl acetate from 9:1 to 8:2).

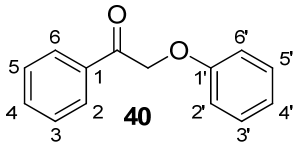
**$^{1}$H NMR** (400 MHz, $CDCl_3$): 7.95 (m, 2H, Ph H-2,6), 7.57 (m, 1H, Ph H-4), 7.46 (m, 2H, Ph H-3,5), 4.82 (d, $^{2}J_{AB}$ = 16.0 Hz, 1H 1H *diast* AB-system, O=CC$\underline{H}_2$O), 4.67 (d, $^{2}J_{AB}$ = 16.0 Hz, 1H *diast* AB-system, O=CC$\underline{H}_2$O), 3.22 (dt, $^{3}J$ = 4.2 Hz $^{3}J$ = 10.5 Hz, 1H, Cyclohexane $H_{1ax}$), 2.27 (dsept, $^{3}J$ = 2.7 Hz, $^{3}J$ = 7.0 Hz, 1H, $(CH_3)_2C\underline{H}$), 2.13 (m, 1H, Cyclohexane H-$6_{eq}$), 1.65 (m, 1H, Cyclohexane H-$4_{eq}$), 1.63 (m, 1H, Cyclohexane H-$3_{eq}$), 1.35 (m, 1H, Cyclohexane H-$5_{ax}$), 1.34 (m, 1H, Cyclohexane H-$2_{ax}$), 0.97 (m, 1H, Cyclohexane H-$3_{ax}$), 0.95 (m, 1H, Cyclohexane H-$6_{ax}$), 0.85 (m, 1H, Cyclohexane H-$4_{ax}$), 0.92 (d, $^{3}J$ = 6.6 Hz, 3H, $C\underline{H}_3$-C-5 ), 0.88 (d, $^{3}J$ = 7.0 Hz, 3H, $(C\underline{H}_3)_2CH$).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 196.9 (C=O), 135.2 (Ph C-1), 133.3 (Ph C-4), 128.6 (Ph C-3,5), 128.1 (Ph C-2,6´), 80.1 (Cyclohexane C-1), 71.5 (O=C<u>C</u>$H_2$O), 48.2 (Cyclohexane C-2), 40.0 (Cyclohexane C-6), 34.4 (Cyclohexane C-4), 31.6 (Cyclohexane C-5), 25.4 $(CH_3)_2$<u>C</u>H), 23.2 (Cyclohexane C-3), 22.3 (<u>C</u>$H_3$-C-5), 21.0 (<u>C</u>$H_3)_2$CH), 16.1 (<u>C</u>$H_3)_2$CH).

$[\alpha]_{D\,=}$ -59 (*c* 0.6, $CHCl_3$)

HRMS (ESI), m/z: calcd. for $C_{18}H_{27}O_2$ 275.2011 [M+H]+; found 275.2010

**2-phenoxy-1-(2-phenyl)ethanone (40)**



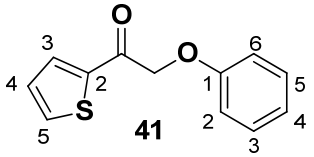

By following general procedure 1, starting from *N*-methoxy-*N*-methylbenzamide (0.163 g, 1.0 mmol, 1.0 equiv), DTBB (0.013g, 5% mol catalyst), lithium 25% in mineral oil (0.196 g, 7.0 mmol, 7.0 equiv) and $ClCH_2OPh$[1] (0.285 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **40** was obtained in 91% yield (0.193 g, 0.91 mmol) as a yellow oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 9:1 8:2).[21] $ClCH_2OPh$ was prepared as previously reported in the literature starting from the commercially available $ClCH_2SCH_3$.[1]

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 8.01 (m, 2H, Ph H-2,6), 7.62 (m, 1H, Ph H-4), 7.50 (m, 2H, Ph H-3,5), 7.29 (m, 2H, Ph H-3',5'), 6.99 (m, 1H, H-4'), 6.95 (m, 2H, Ph H-2',6'), 5.28 (s, 2H, C<u>H</u>$_2$OPh).

**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 194.5 (C=O), 158.0 (Ph C-1'), 134.6 (Ph C-1), 133.8 (Ph C-4), 129.6. (Ph C-3',5'), 128.8 (Ph C-3,5), 128.1 (Ph C-2,6), 121.6 (Ph C-4'), 114.8 (Ph C-2',6'), 70.8 (<u>C</u>$H_2$OPh).

**HRMS** (ESI), *m/z*: calcd. for $C_{14}H_{12}NaO_2^+$ 235.0730 $[M+Na]^+$; found 235.0732.

**2-phenoxy-1-(2-thienyl)ethanone (41)**




By following general procedure 1, starting from *N*-methoxy-*N*-methyl-2-Thiophenecarboxamide (0.171 g, 1.0 mmol, 1.0 equiv), DTBB (0.013g, 5% mol catalyst), lithium 25% in mineral oil (0.193

g, 7.0 mmol, 7.0 equiv) and $ClCH_2OPh$[1] (0.285 g, 0.151 mL, 2.0 mmol, 2.0 equiv) in dry THF (6 mL), compound **41** was obtained in 85% yield (0.185 g, 0.85) as a brown oil after flash column chromatography on silica gel (*n*-hexane:ethyl acetate 8:2).

**$^1$H NMR** (400 MHz, $CDCl_3$): δ 7.98 (dd, $^3J_{H3,H4}$ = 3.8 Hz, $^4J_{H3,H5}$ =1.1 Hz, 1H, Th H-3), 7.71 (dd, $^3J_{H5,H4}$ = 5.0 Hz, $^4J_{H5,H3}$ =1.1 Hz, 1H, Th H-5), 7.30 (m, 2H, Ph H-3,5 ), 7.17 (dd, $^3J_{H4,H3}$ = 3.8 Hz, $^3J_{H4,H5}$ = 5.0 Hz, 1H, Th H-4), 7.00 (m, 1H, Ph H-4), 6.97 (m, 2H, Ph H-2,6), 5.09 (s, 2H, C$\underline{H}_2$OPh).

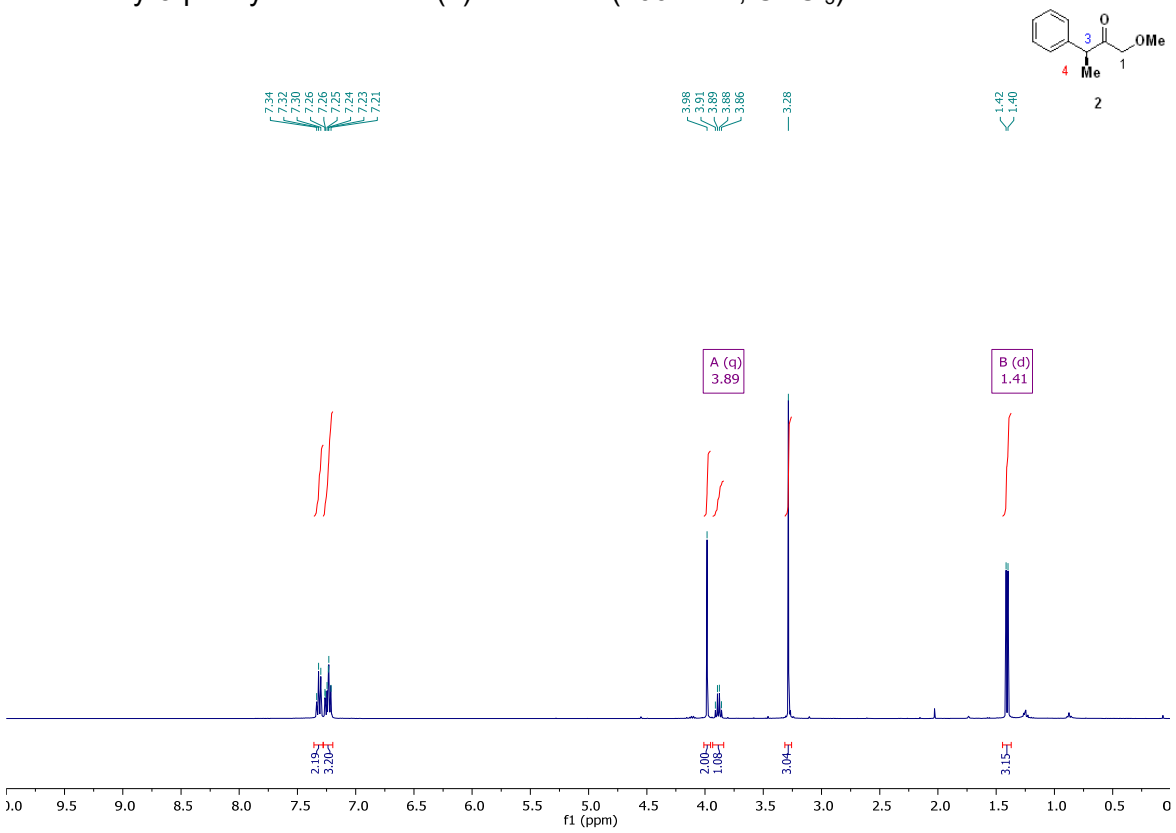
**$^{13}$C NMR** (100 MHz, $CDCl_3$): δ 188.3 (C=O), 157.9 (Ph C-1), 140.6 (Th C-2), 134.6 (Th C-5), 133.2 (Th C-3), 129.7 (Ph C-3,5), 128.2 (Th C-4), 121.8 (Ph C-4), 114.7 (Ph C-2,6), 71.5 ($\underline{C}H_2$OPh).

**HRMS** (ESI), *m/z*: calcd. for $C_7H_{10}NaO_2S^+$ 241.0294 $[M+Na]^+$; found 241.0295.

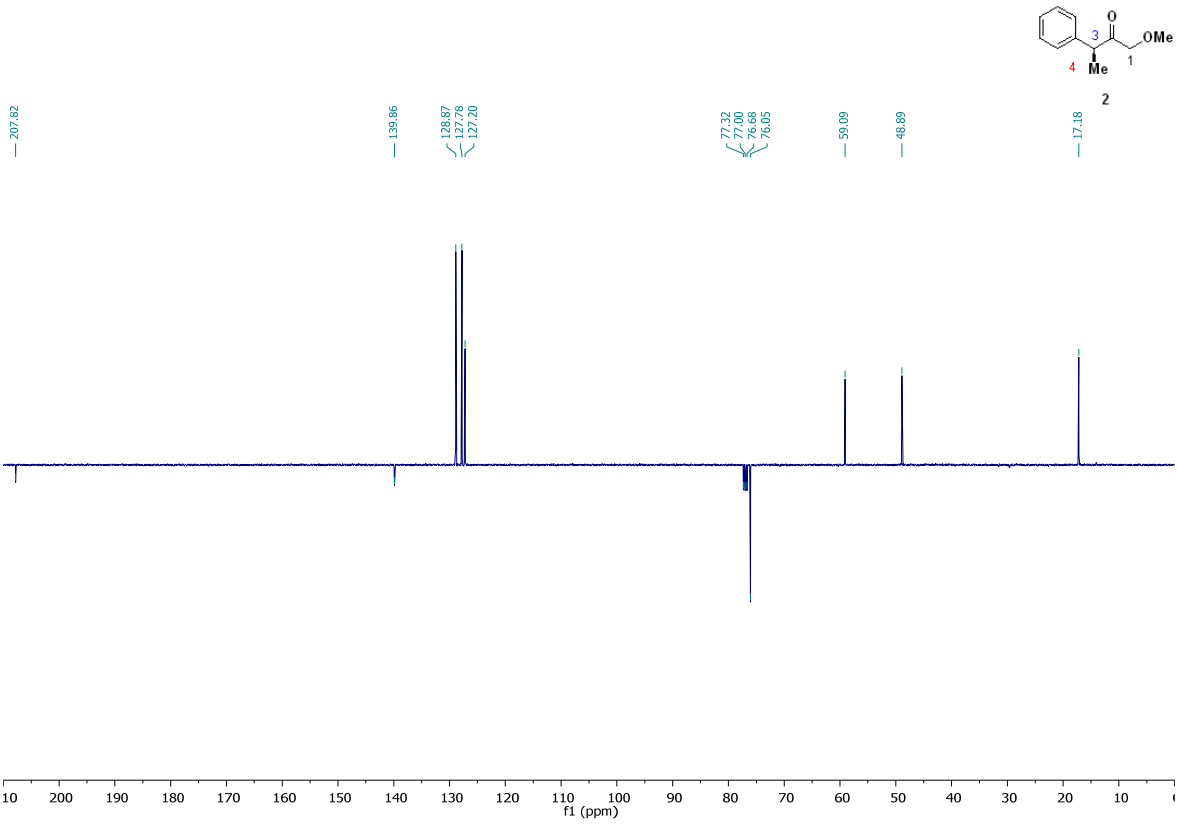
**References**


[1] Iwasaki, T.; Miyata, Y.; Akimoto, R.; Fujii, Y.; Kuniyasu, H.; Kambe, N. *J.Am.Chem.Soc*. **2014,** *136* ,9260-9263.
[2] Moriarty, R.M.; Prakash, O.; Duncan, M.P.; Vaid, R. *J.Org.Chem,* **1987***, 52, 150-153.*
[3]Tamura, K.; Yakura, T.; Shirouchi, Y. *Chem.Pharm.Bull.,* **1985**, *33, 1097-1103.*
[4] Yasumitsu, T,; Takaiuki, K.; Yoshaki, S.; Junicji, H. *Chem.Pharm. Bull.* **1985***, 33***,** 1097-1103.
[5] Yamaji, M.; Cai, X.; Sakamoto, M.; Fujiistuska, M.; Majima, T**.** *J.Phys.Chem.A,* **2008**, *112,* 11306-11311.
[6] Cromwell, Schumacher, F.H.; Adelfang, J.L. *Am. Chem. Soc*. **1961**, *83*, 974-978.
[7] Tamura,Y.; Yakura, T.; Shirouchi, Y.; Haruta, J. *Chem. Pharm. Bull.* **1985***, 33,* 1097-1103.
[8] Cromnwell, N.H.; Schumacher, F.H.; Adelfang, J.L. *Org. Biom. Chem*. **2007**, *5,* 2690-2697
[9] Moriarty, R. M.; Prakash, O.; Duncan,O.; R.K. Vaid *J.Org.Chem,* **1987**, *52*, 150-153
[10]Uemura,M.; Kurono, N.; Sakai, K.; Ohkuma; T.*Adv. Synt. Catalysis***. 2012,** *354*, 2023– 2030.
[11] Duo, Y.; Jacob; S.; Abrahm, W. *Org.Bio.Chem,* **2011**, *9*, 3549-3558.
[12] Inaba, S.; Rieke, R.D. Reuben, D. *J.Org.Chem,* **1985**, *50*, 1373-1381
[13] Yan,X.X.; Liang, C.G.; Zhang, Y.; Hong, W.; Xun Cao, B.; Dai, L.X.; Hou, X.L.; *Angew. Chemie Int. Ed.*, **2005**, *44*, 6544 – 6546
[14] Ochiai, M.; Nishitani, J.; Nishi, Y.; *J.Org.Chem,* **2002**, *67*; 4407-4413.
[15]Jeyakumar, K.; Chand, K. *Synth*, **2008**, *5,* 807-809
[16] Masui, H.; Fuse,S.; Takahashi, T. *Org. Lett.*, **2012**, *14*, 4902–4905
[17] Tanaka,k.; Shoji, T.; Hirano, M.; Eur. J. Org. Chem. **2007**, *16*; 2687-2699.
[18] Wenzl, S.; Deutzmann, R.; Hett, H.; Hochmuth, E.; Sumper, M. *Ang.Chem.Int.Ed.,* **2014**, *53*, 5993 -5997
[19] McNulty, J.; Capretta, A.; Larithcev, V.; Dick, J.; Robertson, A.J. *J.Org.Chem*, **2003**, *68*, 1597-1600.
[20] Amani, J.; Sodgar, E.; Molander, G.A. *Org.Lett.* **2016**,*18*, 732-735.
[21]Ma, Y.; Du, M.; Liu, J.; Xia, F.; Xu, J. *Green Chemistry*, **2015**, *17,* 4968-4973.

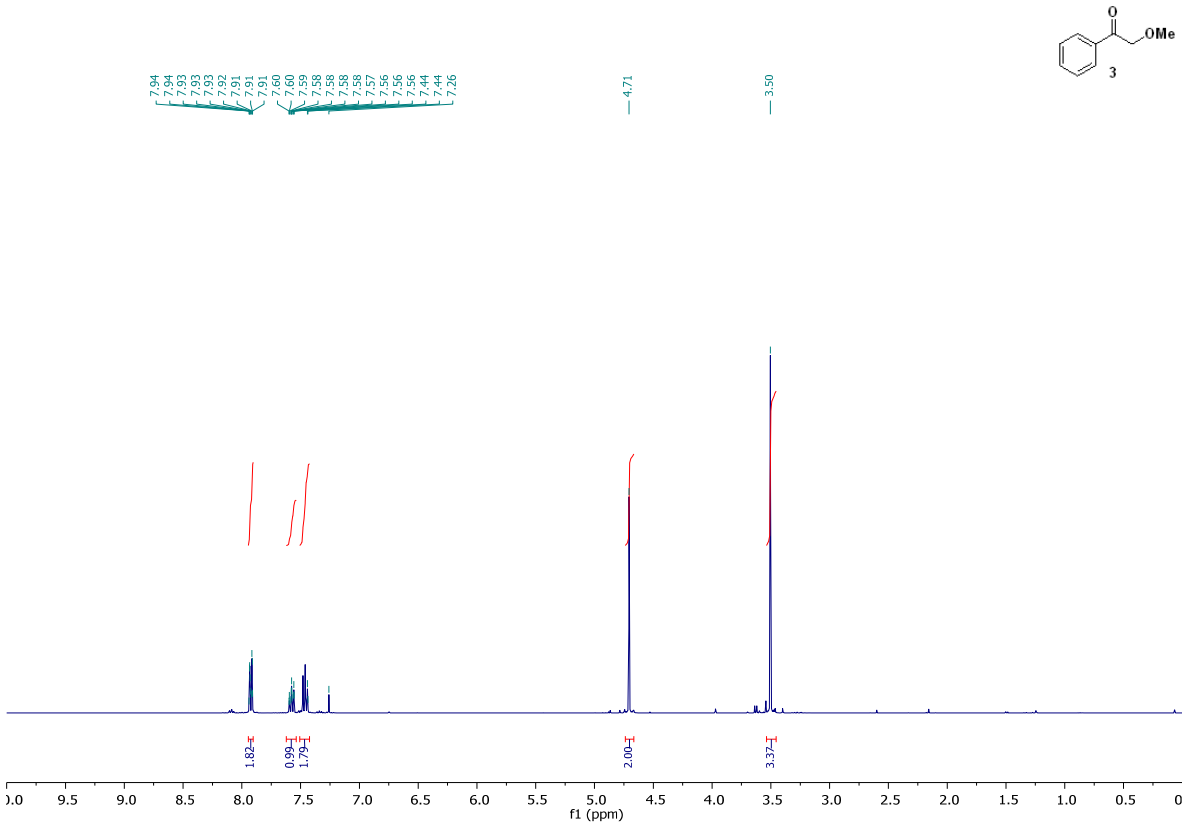
(3*S*)-1-methoxy-3-phenyl-2-butanone (**2**) $^{1}$H NMR (400 MHz, $CDCl_3$)



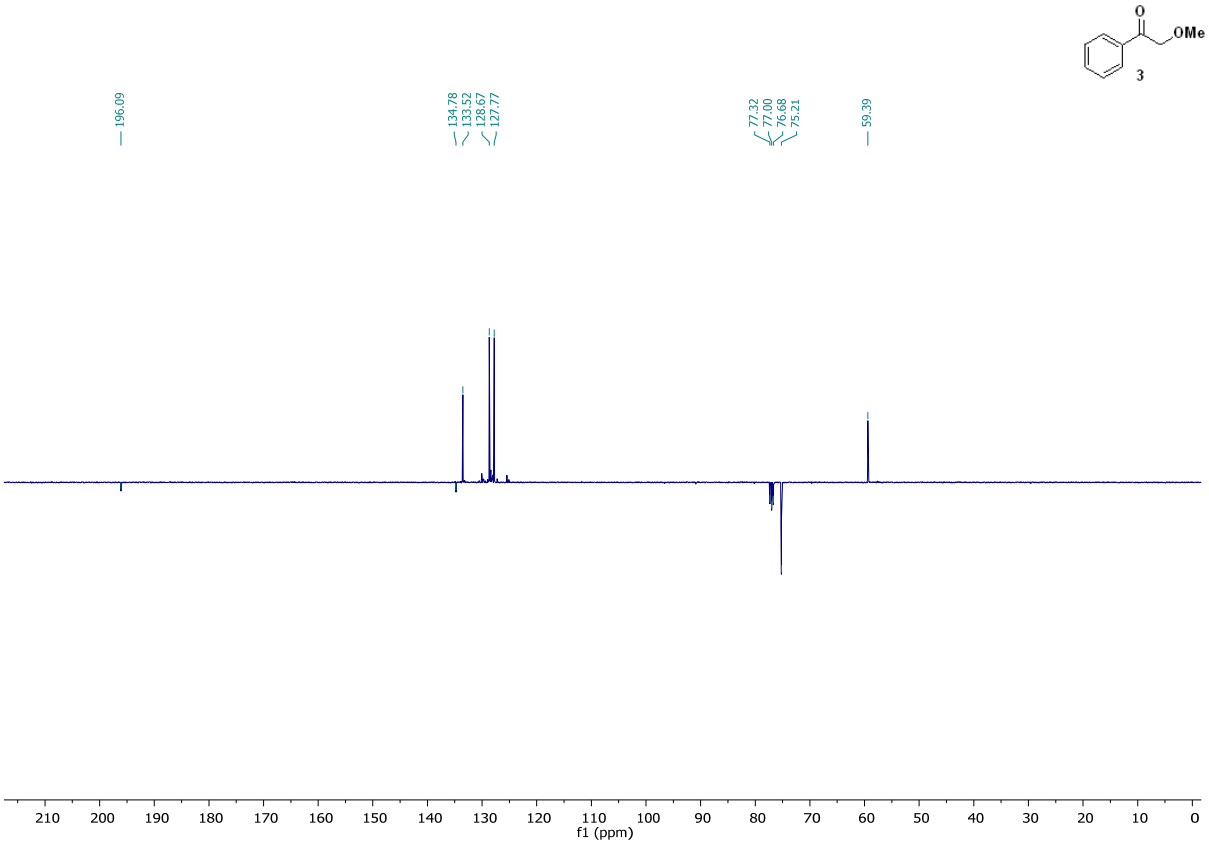

(3*S*)-1-methoxy-3-phenyl-2-butanone (**2**) $^{13}$C NMR (100 MHz, $CDCl_3$)



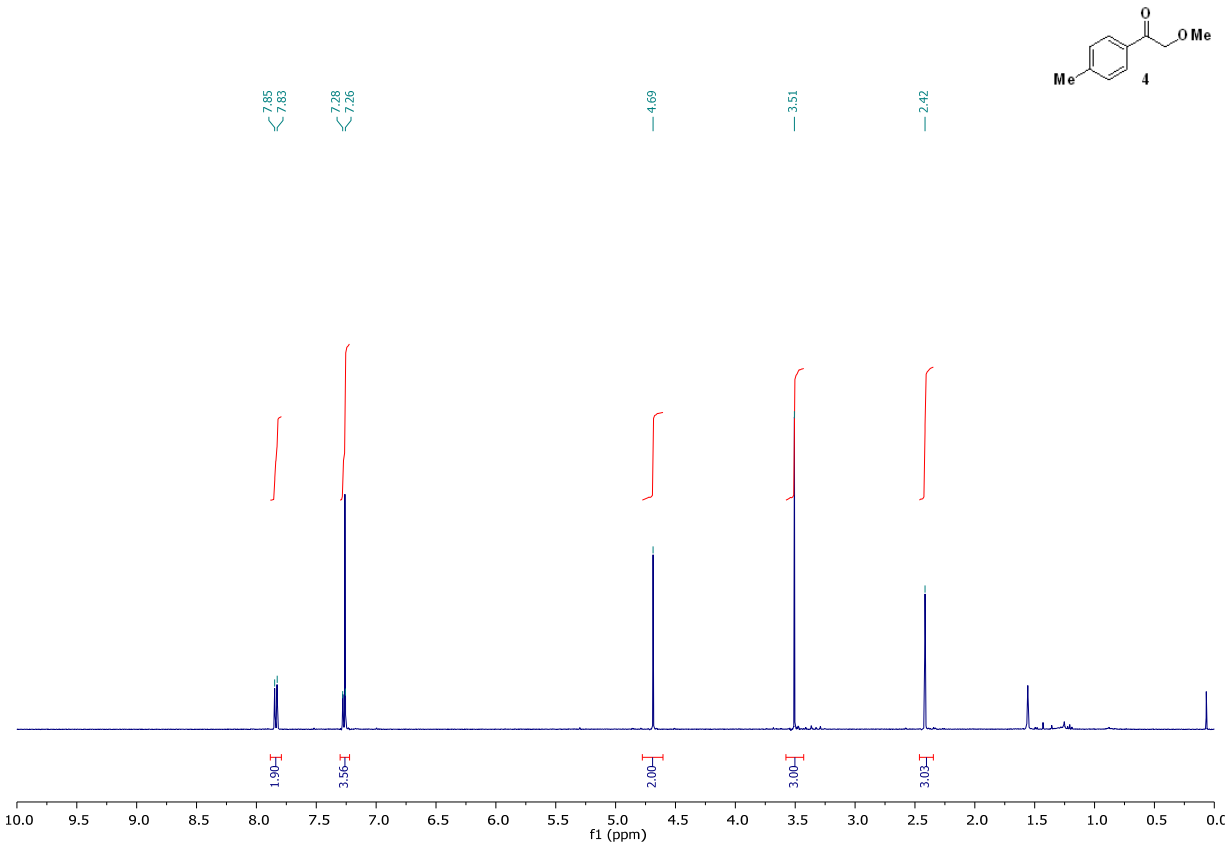
2-methoxy-1-phenylethanone (**3**) $^{1}$H NMR (400 MHz, $CDCl_3$)



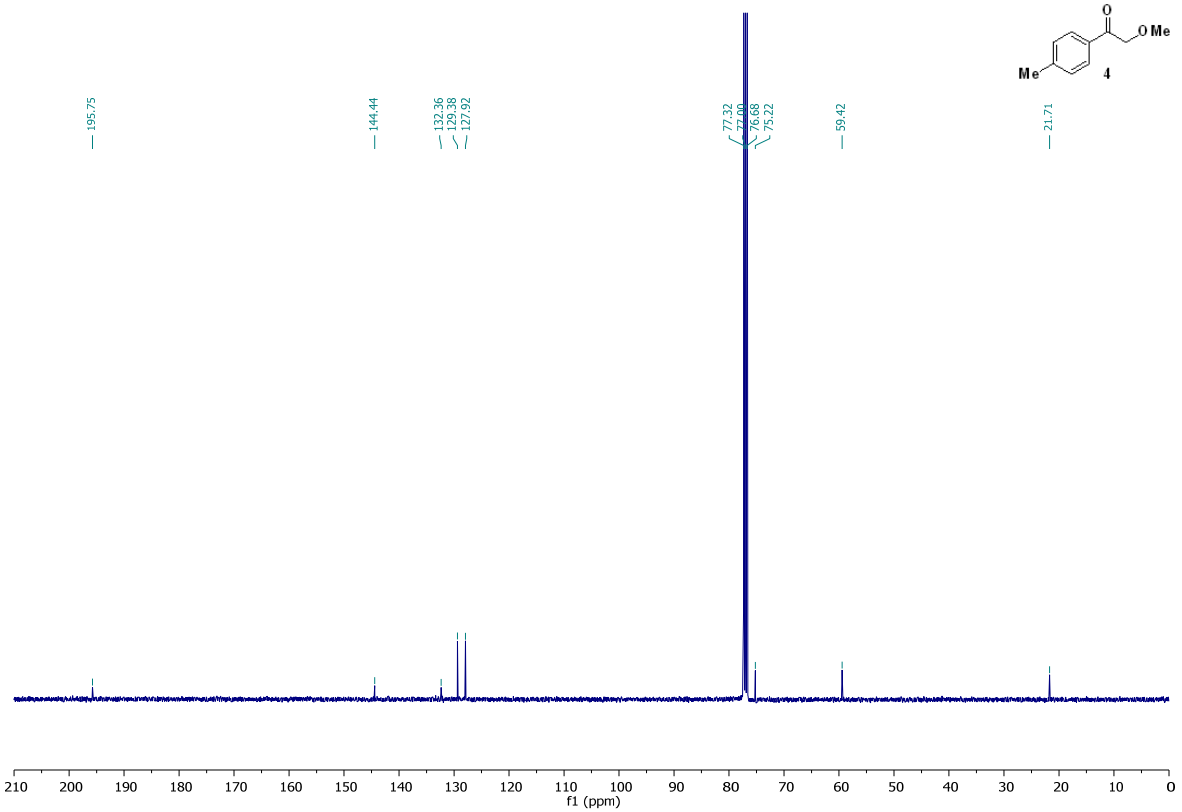

2-methoxy-1-phenylethanone (**3**) $^{13}$C NMR (100 MHz, $CDCl_3$)



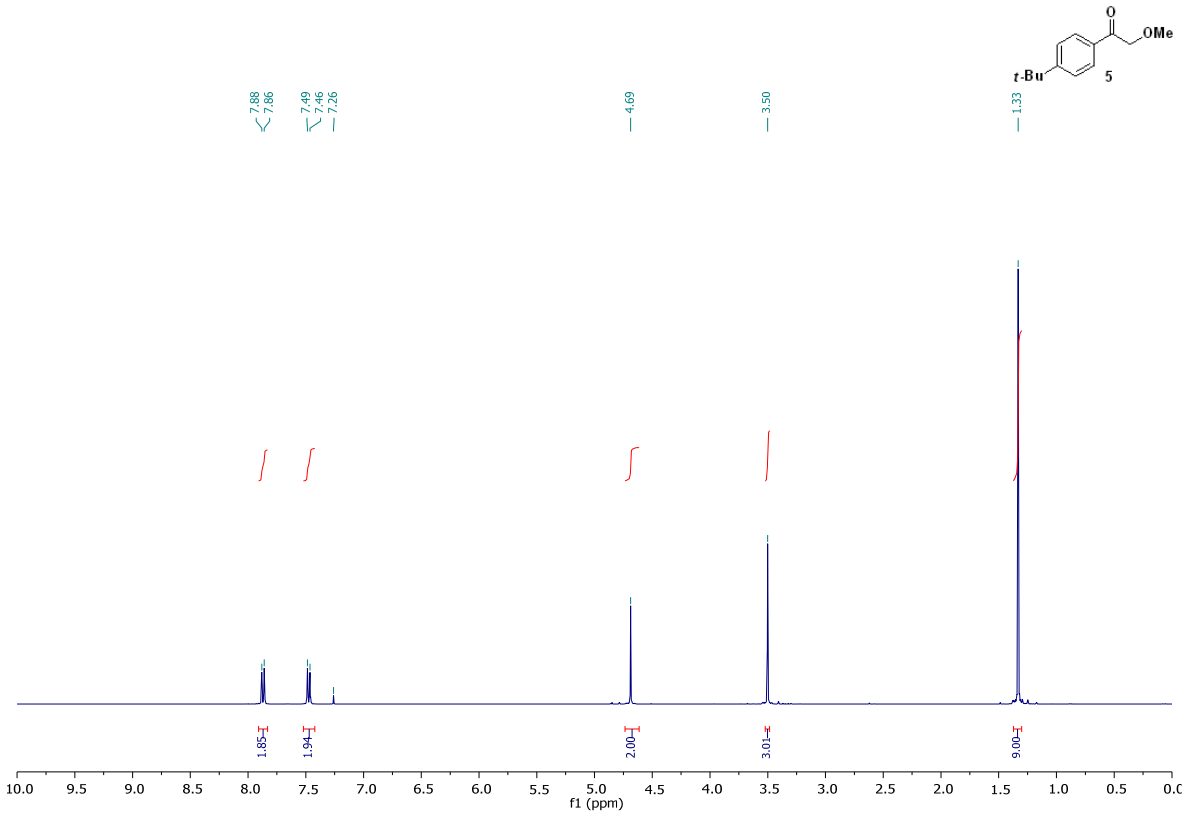
2-methoxy-1-(4-methylphenyl)ethanone (**4**) $^{1}$H NMR (400 MHz, $CDCl_3$)



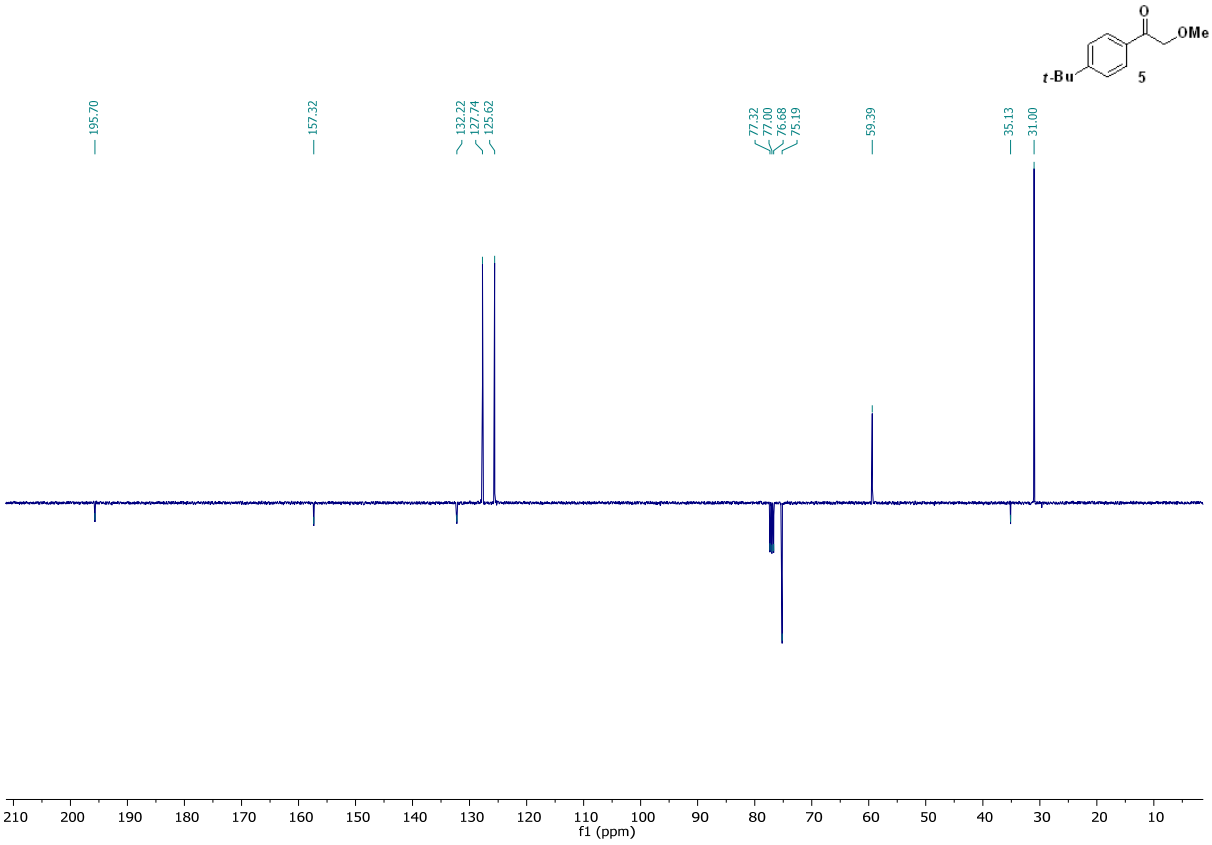

2-methoxy-1-(4-methylphenyl)ethanone (**4**) $^{13}$C NMR (100 MHz, $CDCl_3$)



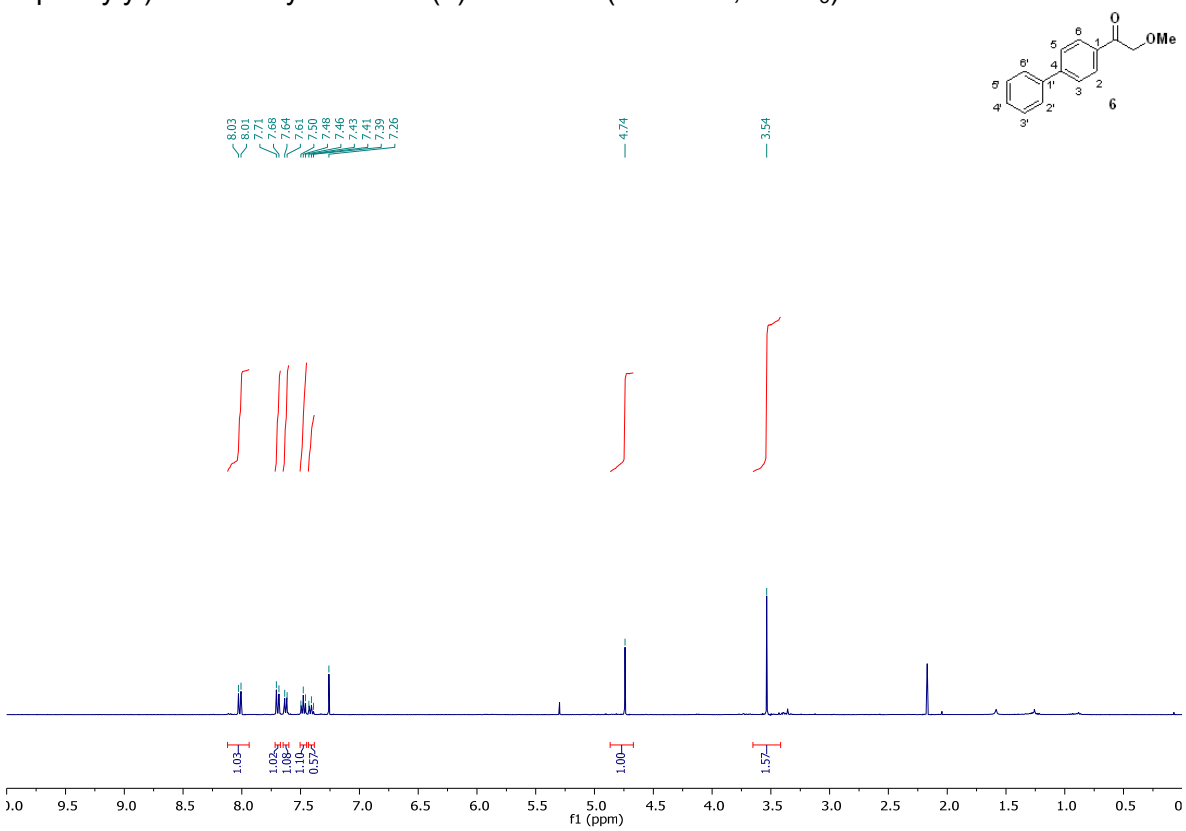
2-methoxy-1-[4-(2-methyl-2-propanyl)phenyl]ethanone (**5**) $^{1}$H NMR (400 MHz, $CDCl_3$)



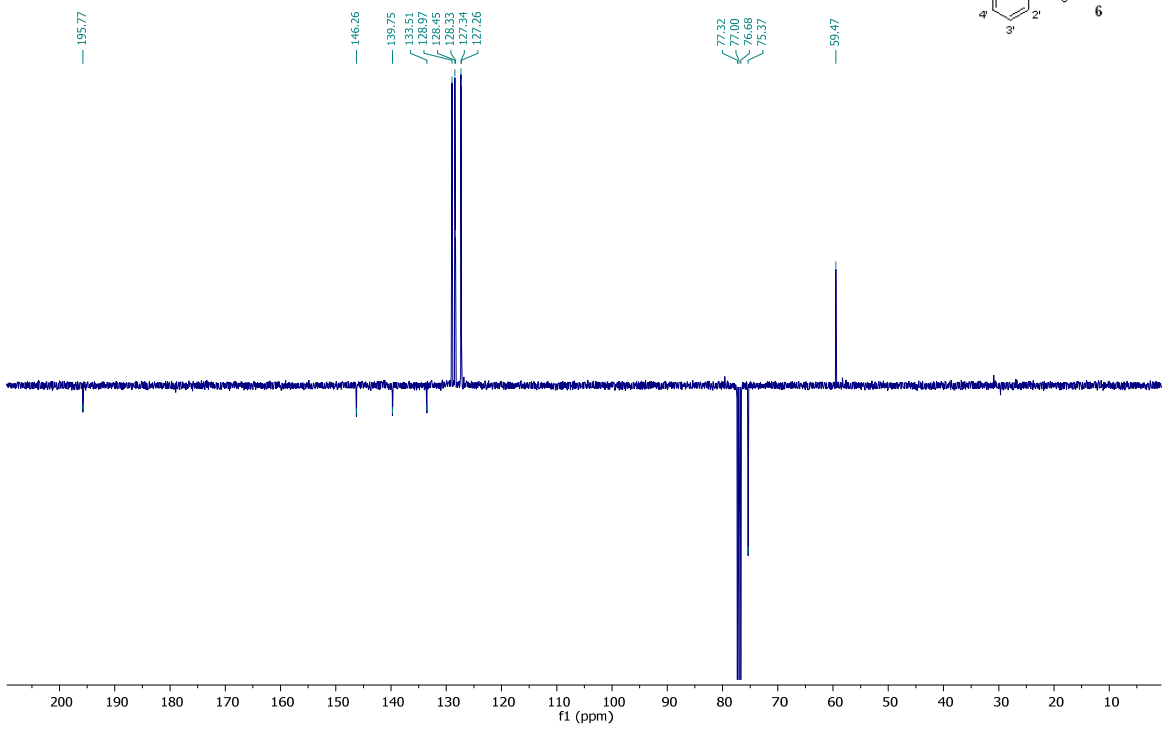

2-methoxy-1-[4-(2-methyl-2-propanyl)phenyl]ethanone (**5**) $^{13}$C NMR (100 MHz, $CDCl_3$)



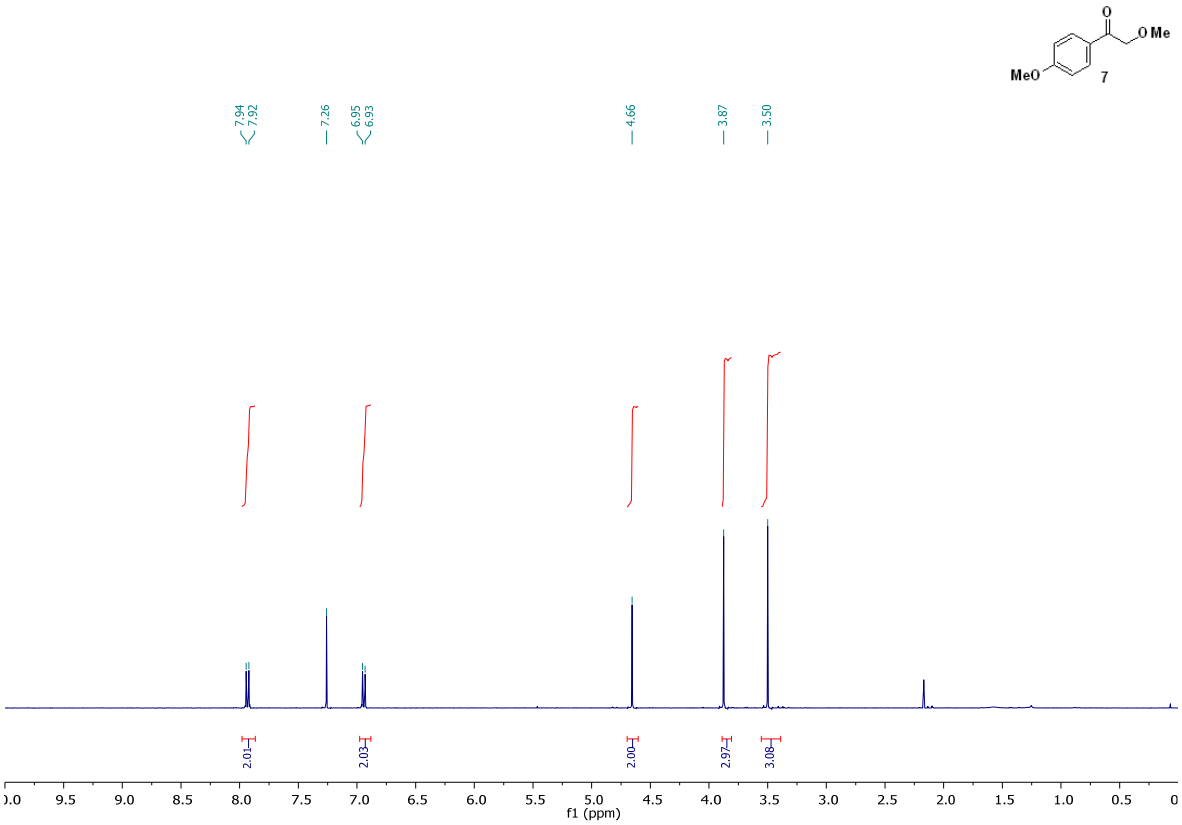
1-(4-biphenylyl)-2-methoxyethanone (**6**) $^{1}$H NMR (400 MHz, $CDCl_3$)



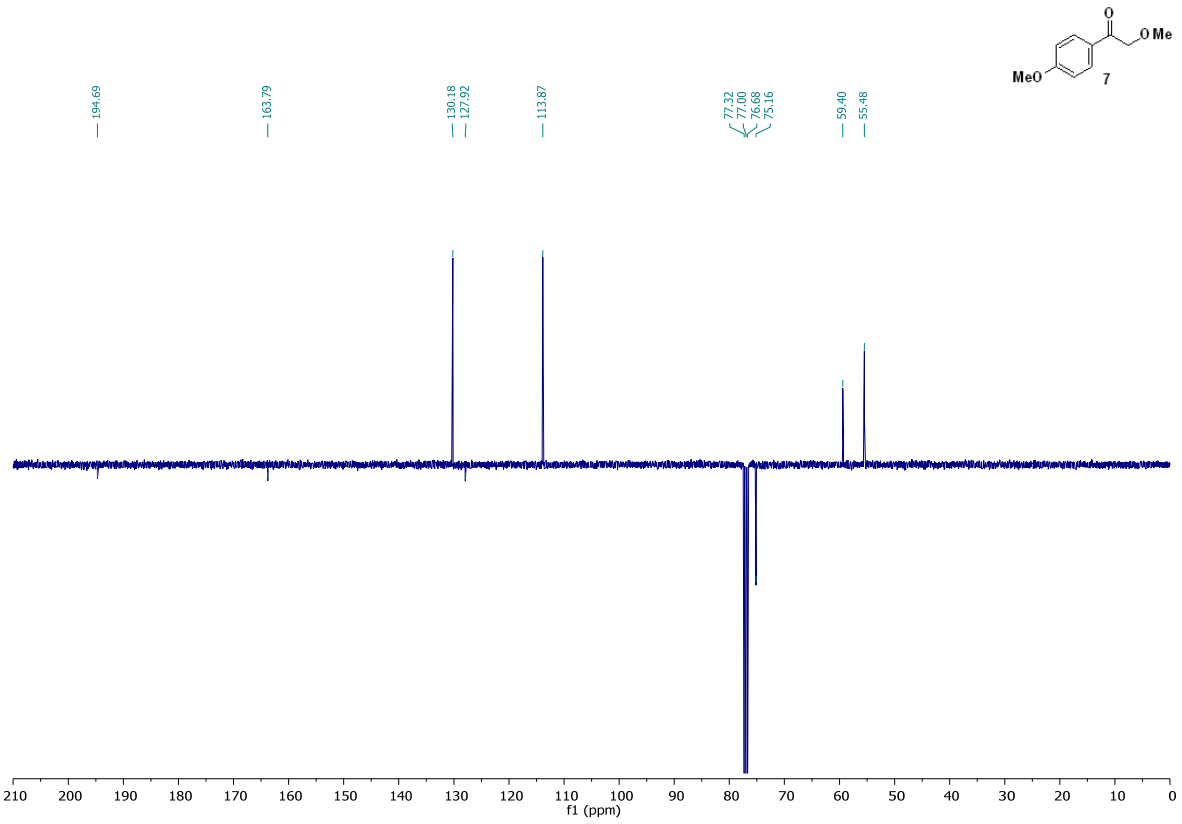

1-(4-biphenylyl)-2-methoxyethanone (**6**) $^{13}$C NMR (100 MHz, $CDCl_3$)



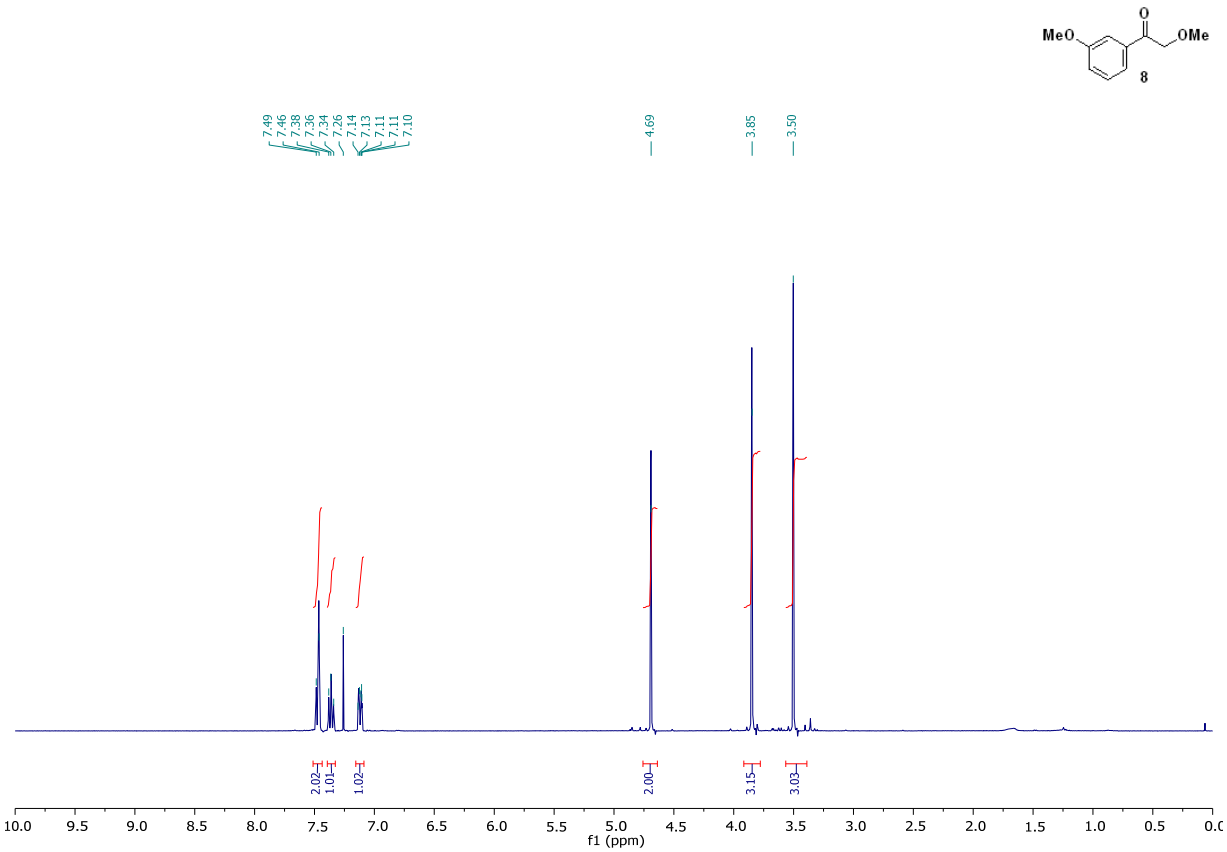
2-methoxy-1-(4-methoxyphenyl)ethanone (**7**) $^{1}$H NMR (400 MHz, $CDCl_3$)



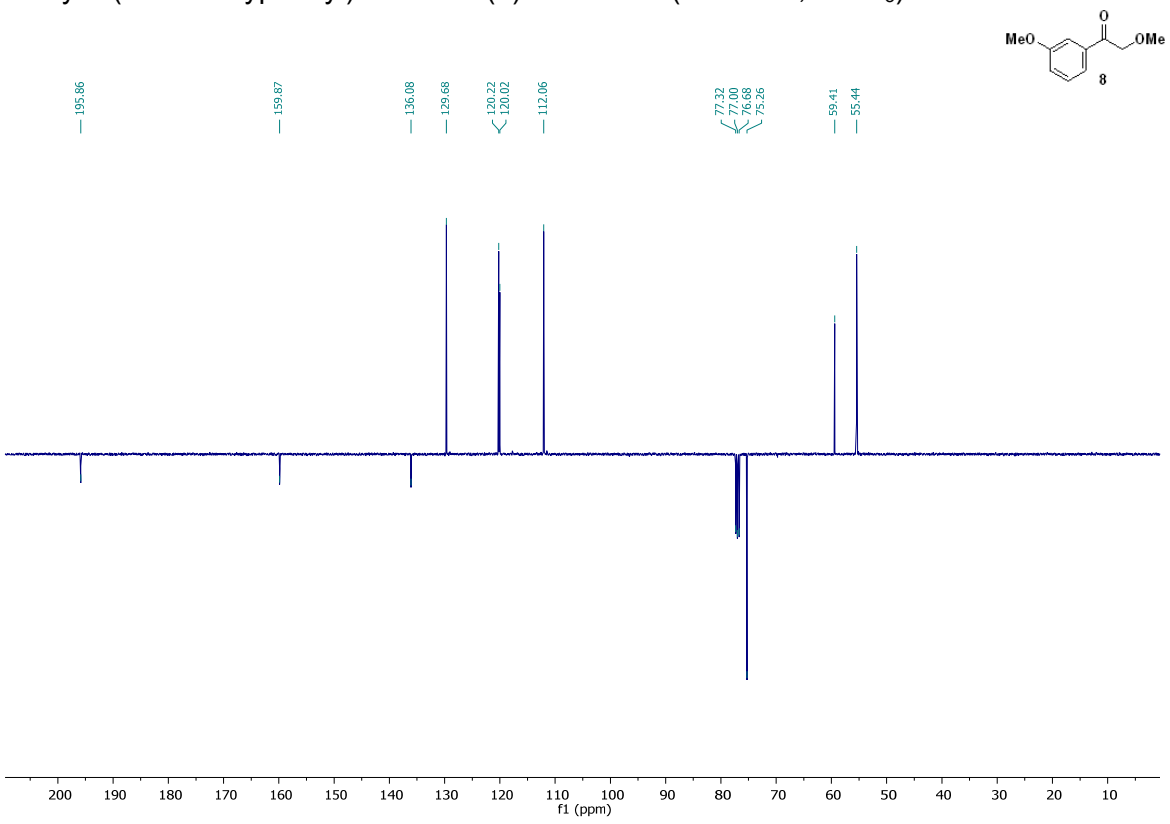

2-methoxy-1-(4-methoxyphenyl)ethanone (**7**) $^{13}$C NMR (100 MHz, $CDCl_3$)



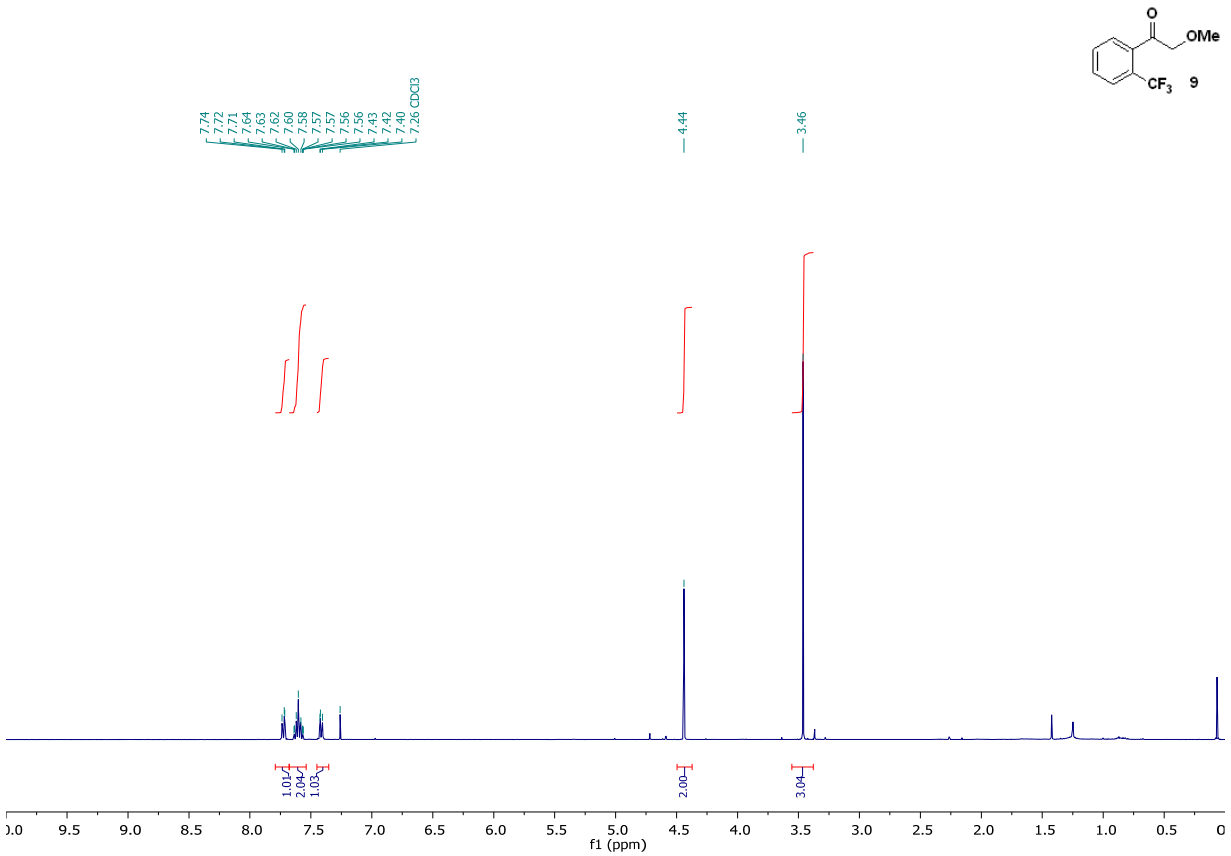
2-methoxy-1-(3-methoxyphenyl)ethanone (**8**) $^{1}$H NMR (400 MHz, $CDCl_3$)



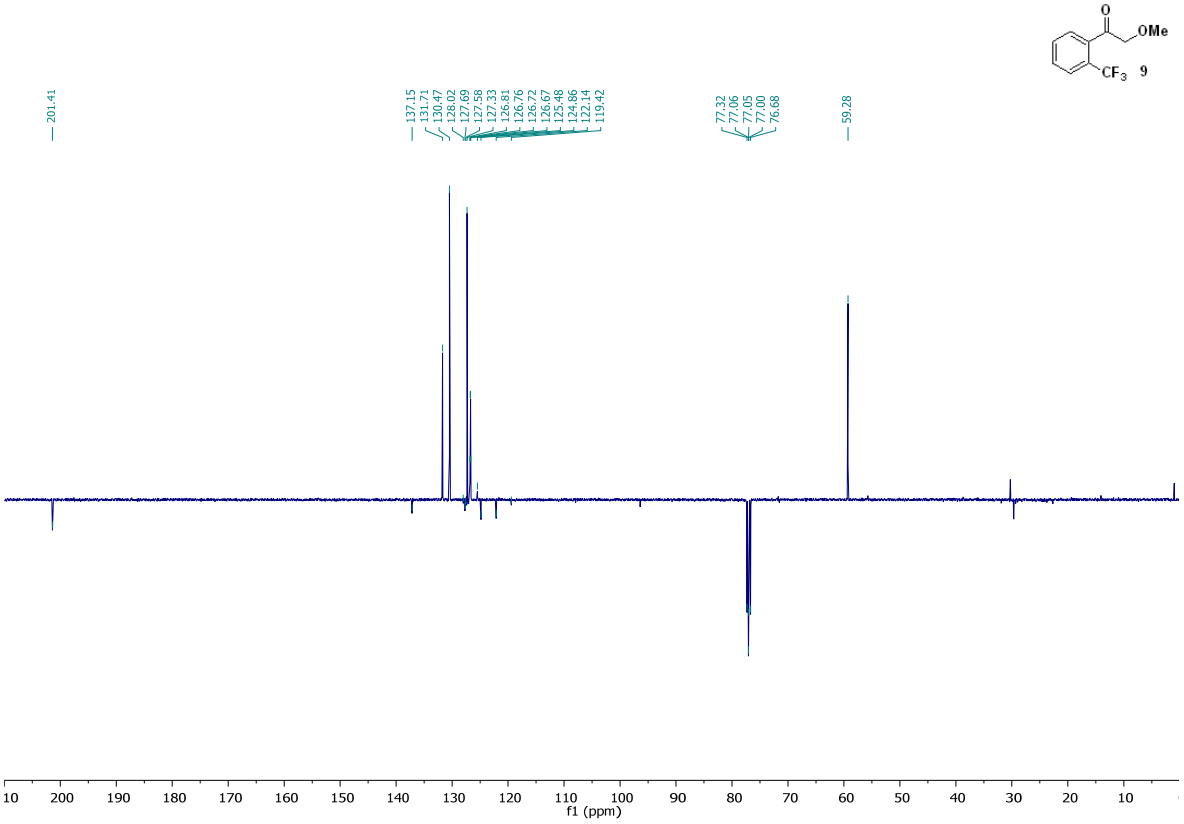

2-methoxy-1-(3-methoxyphenyl)ethanone (**8**) $^{13}$C NMR (100 MHz, $CDCl_3$)



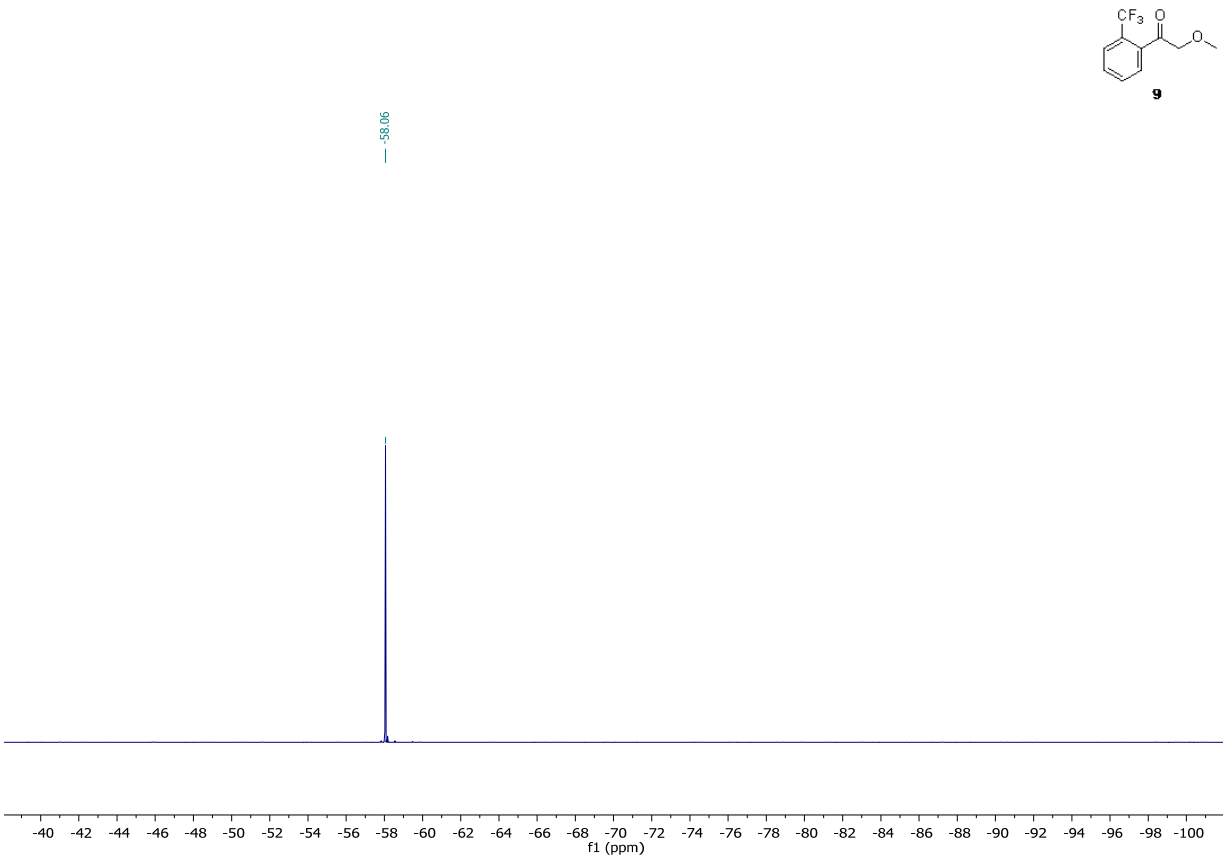
2-methoxy-1-[2-(trifluoromethyl)phenyl]ethanone (**9**) $^{1}$H NMR (400 MHz, $CDCl_3$)



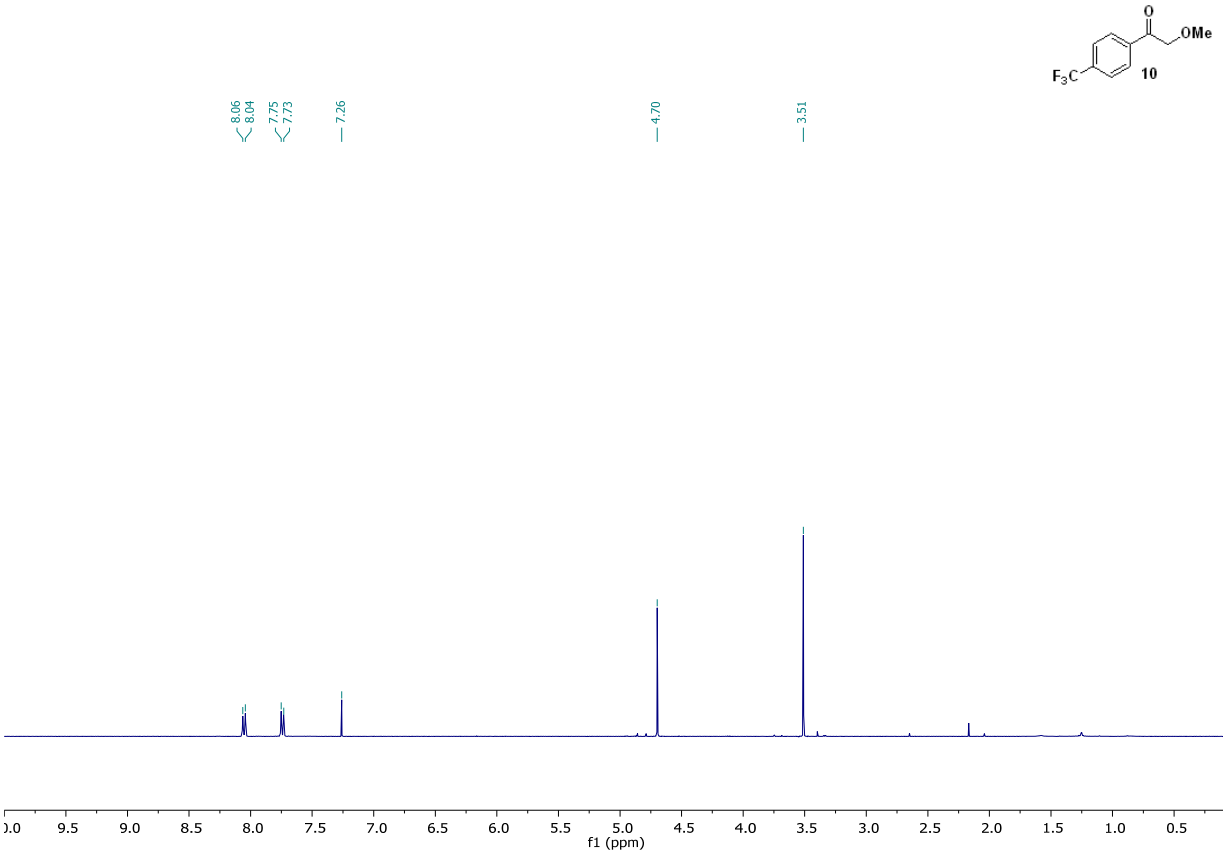

2-methoxy-1-[2-(trifluoromethyl)phenyl]ethanone (**9**) $^{13}$C NMR (100MHz, $CDCl_3$)



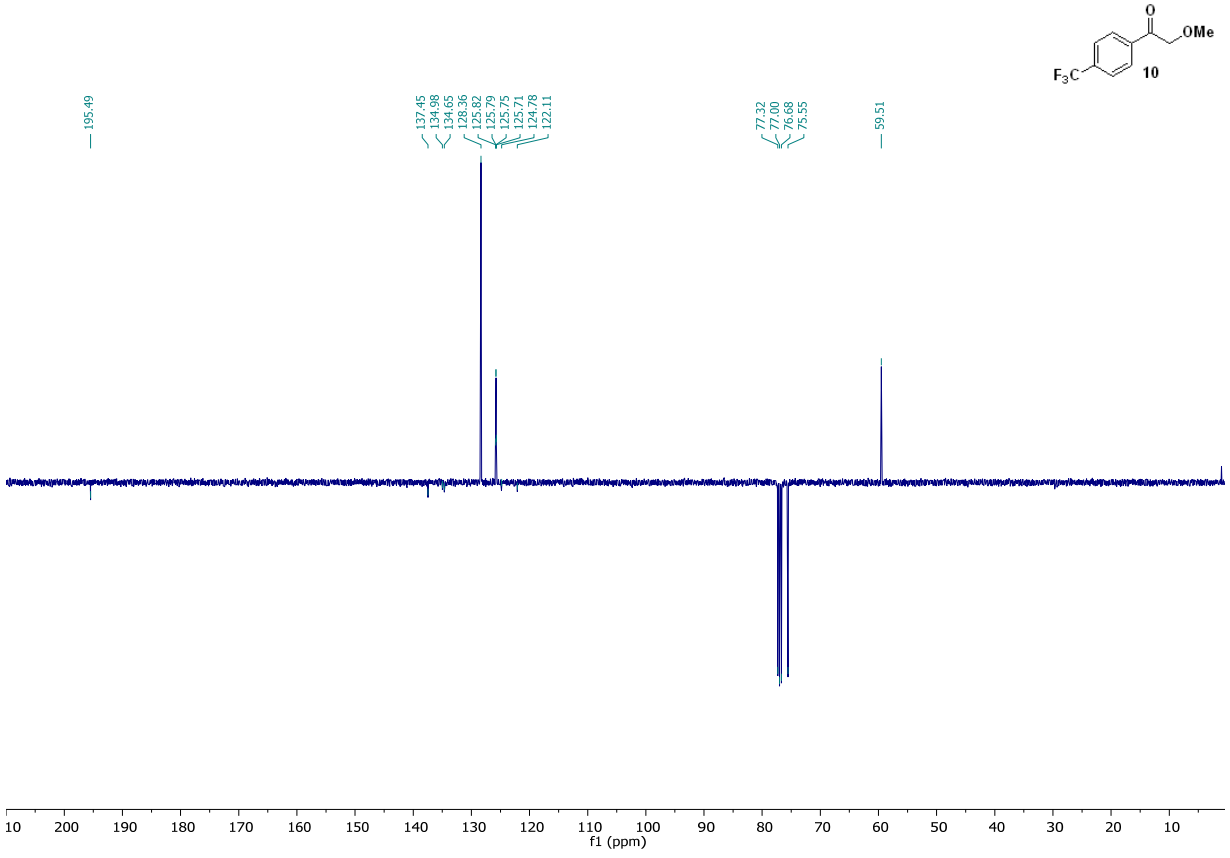
2-methoxy-1-[2-(trifluoromethyl)phenyl]ethanone (**9**) $^{19}F$ NMR (376 MHz, $CDCl_3$)



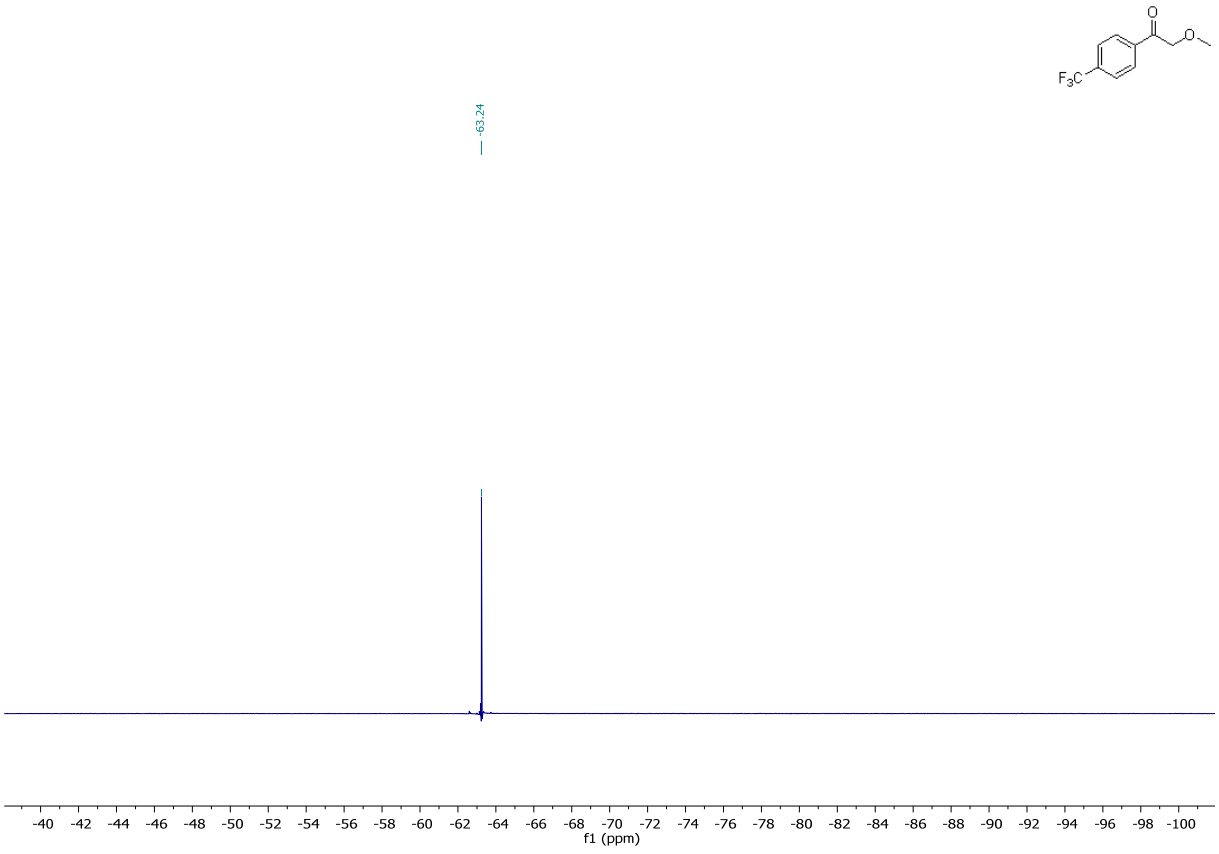
2-methoxy-1-[4-(trifluoromethyl)phenyl]ethanone (**10**) $^{1}H$ NMR (400 MHz, $CDCl_3$)



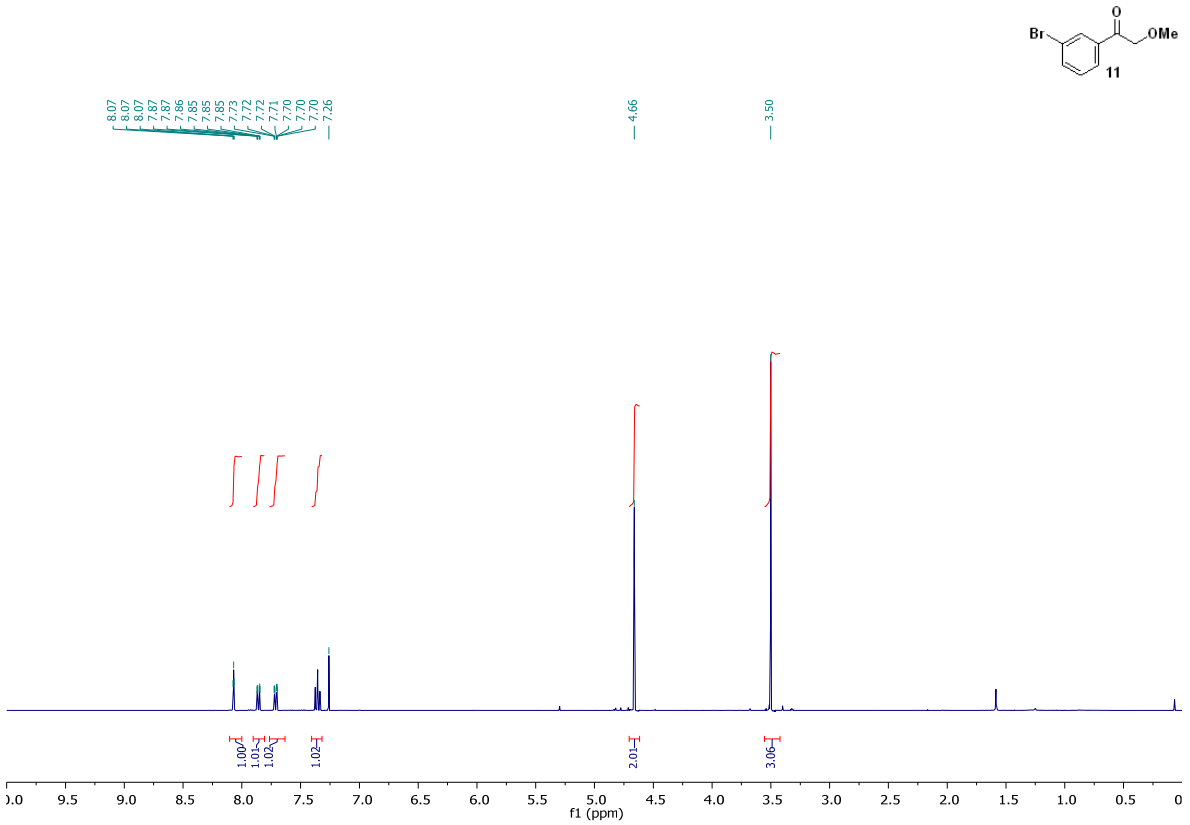

2-methoxy-1-[4-(trifluoromethyl)phenyl]ethanone (**10**) $^{13}C$ NMR (100 MHz, $CDCl_3$)



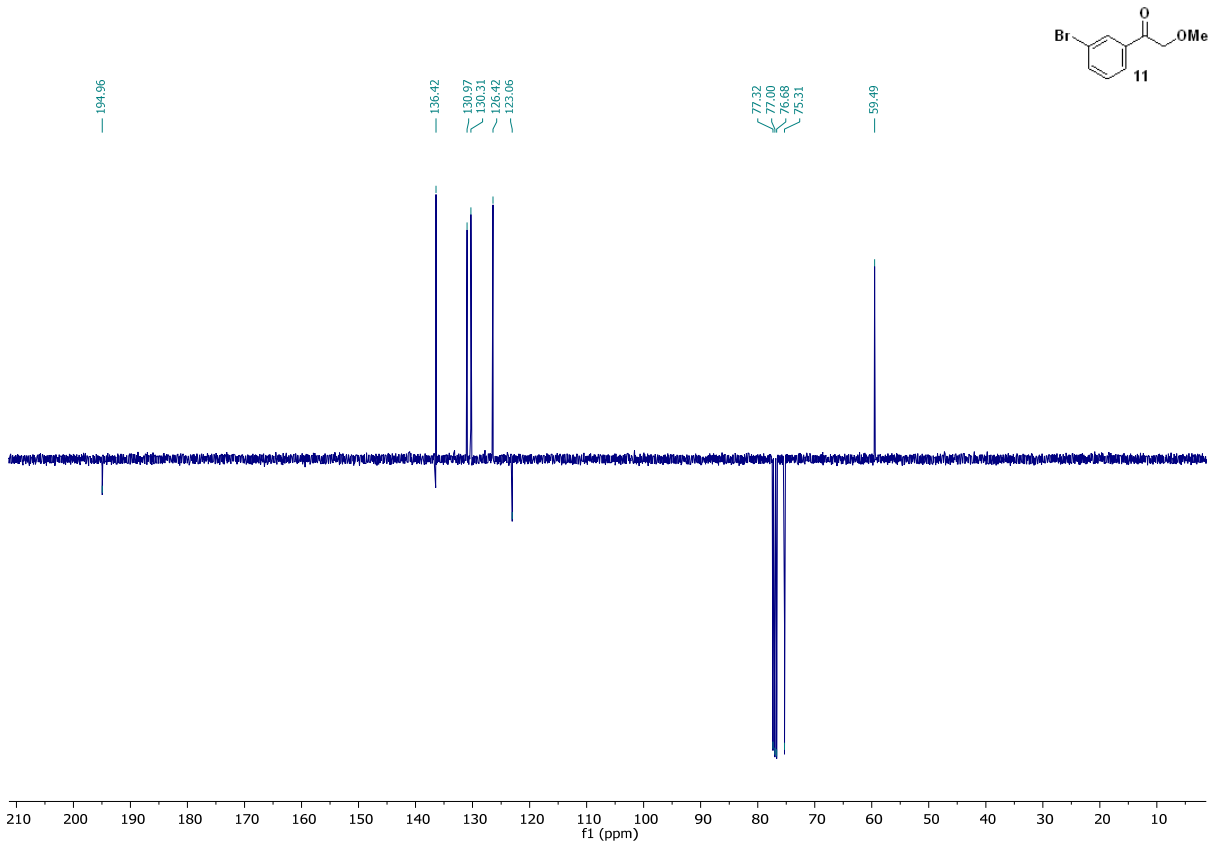
2-methoxy-1-[4-(trifluoromethyl)phenyl]ethanone (**10**) $^{19}F$ NMR (376 MHz, $CDCl_3$)



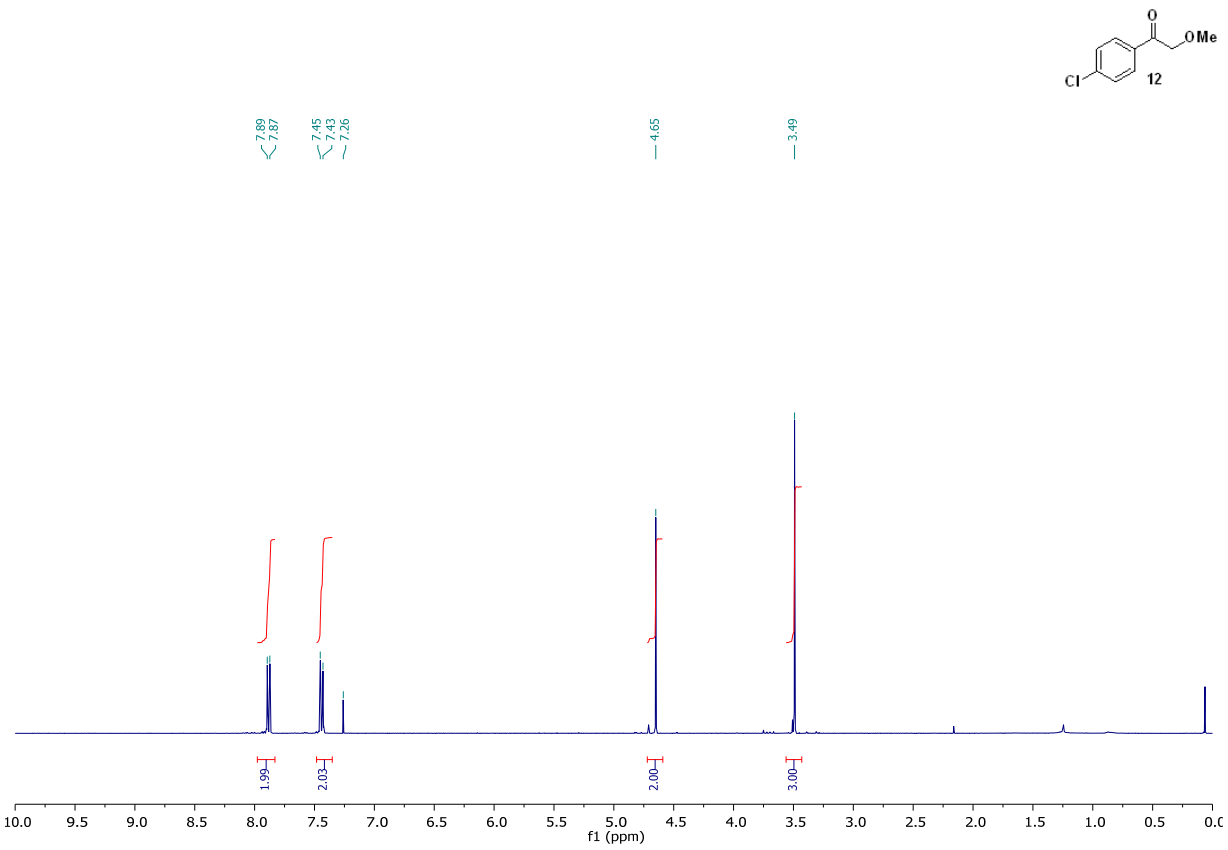
1-(3-bromophenyl)-2-methoxyethanone (**11**) $^{1}H$ NMR (400 MHz, $CDCl_3$)



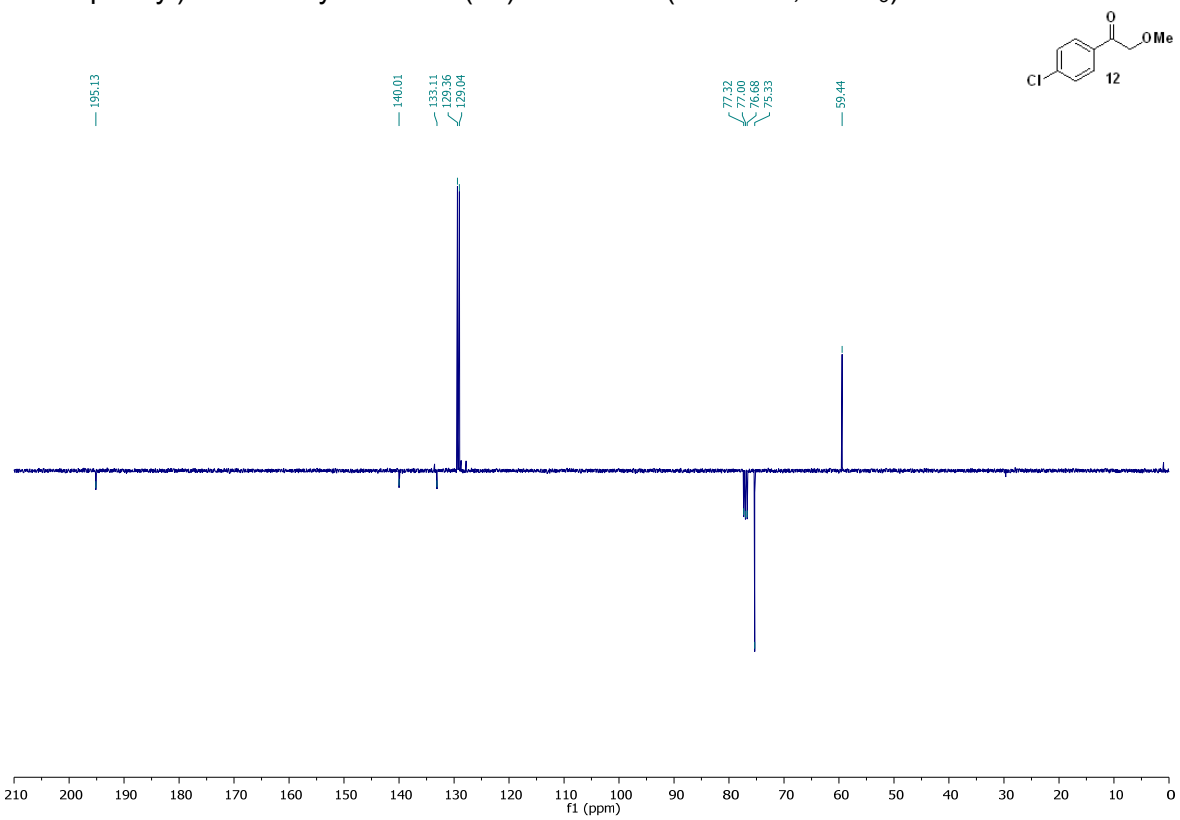

1-(3-bromophenyl)-2-methoxyethanone (**11**) $^{13}C$ NMR (100 MHz, $CDCl_3$)



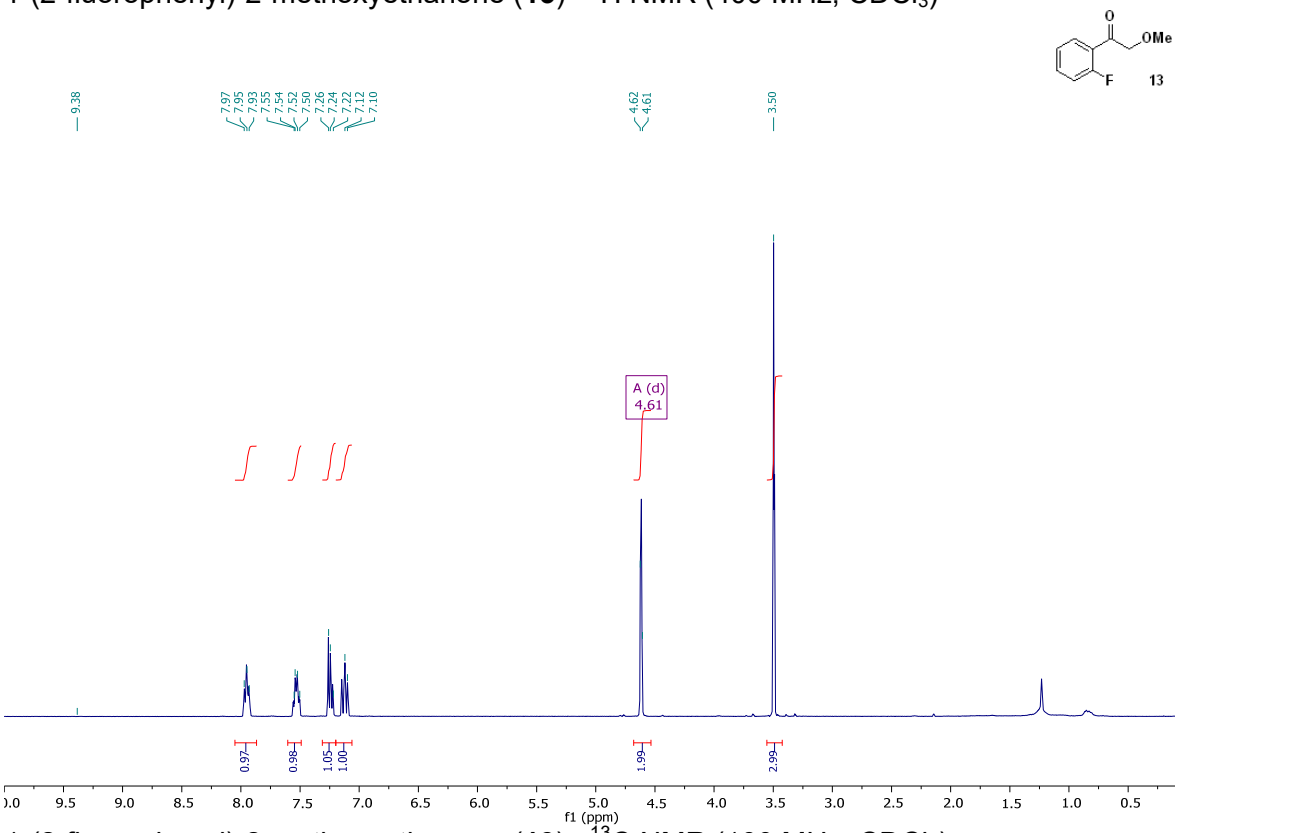
1-(4-chlorophenyl)-2-methoxyethanone (**12**) $^{1}H$ NMR (400 MHz, $CDCl_3$)



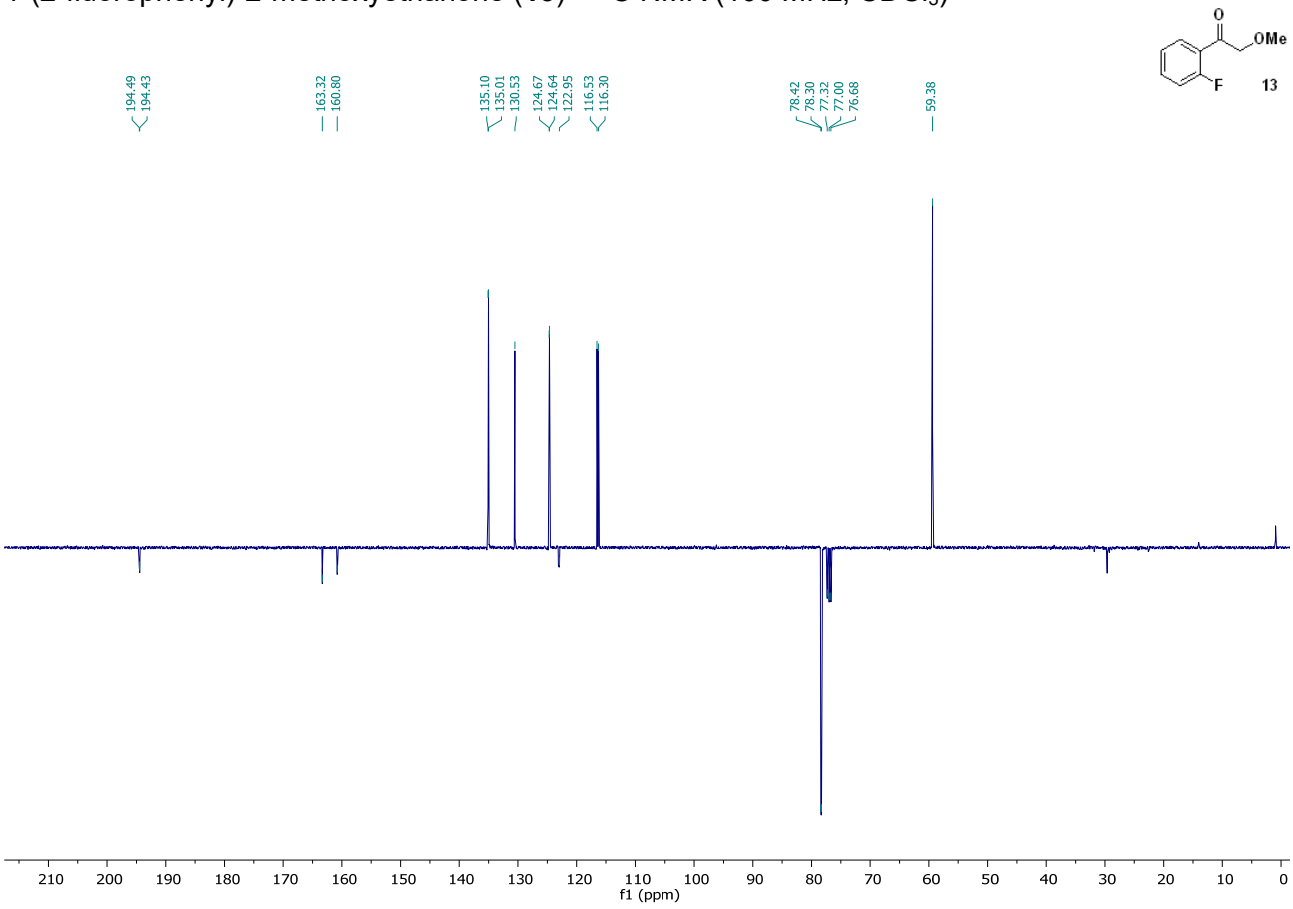

1-(4-chlorophenyl)-2-methoxyethanone (**12**) $^{13}C$ NMR (100 MHz, $CDCl_3$)



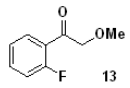
1-(2-fluorophenyl)-2-methoxyethanone (**13**) $^{1}$H NMR (400 MHz, $CDCl_3$)

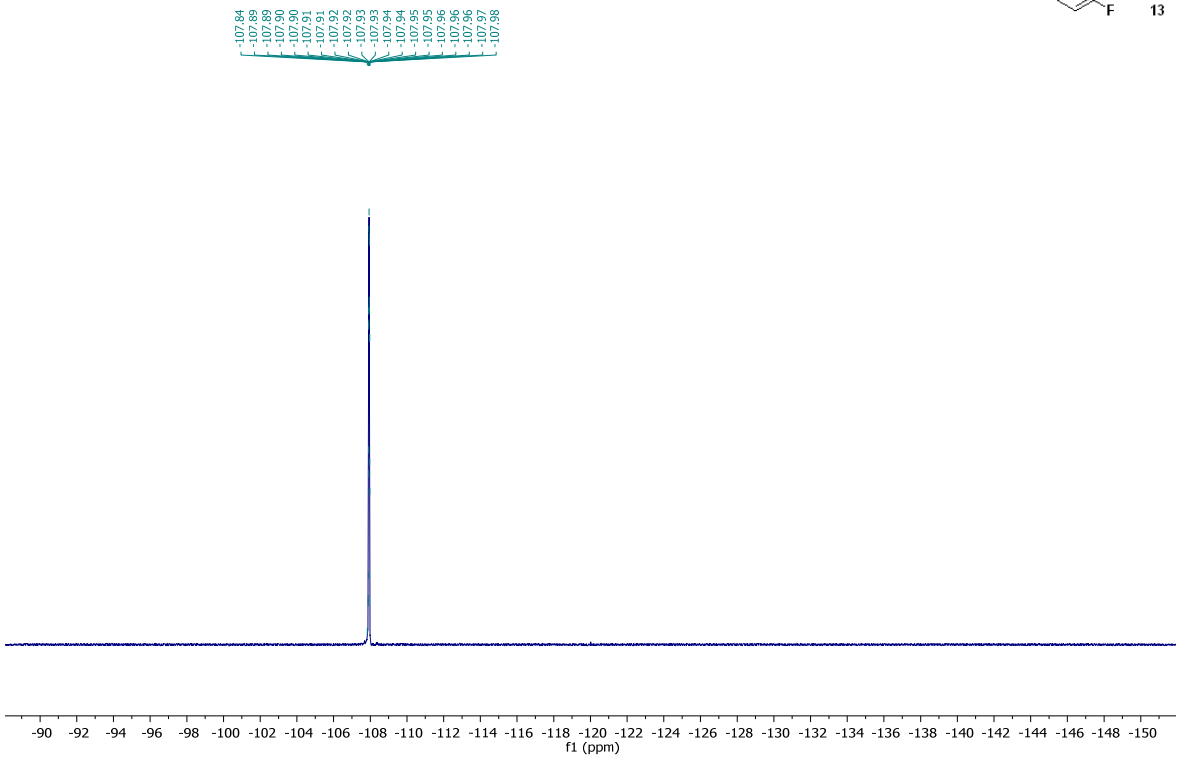



1-(2-fluorophenyl)-2-methoxyethanone (**13**) $^{13}$C NMR (100 MHz, $CDCl_3$)

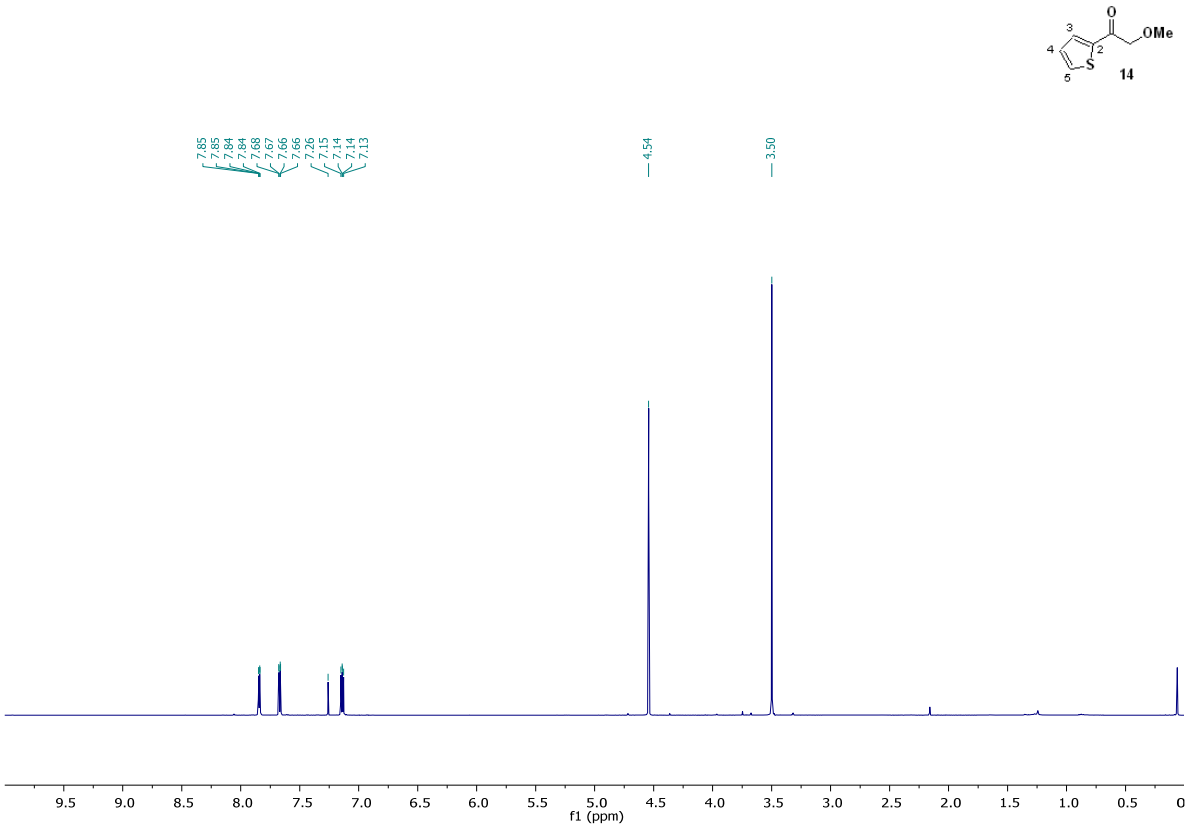


1-(2-fluorophenyl)-2-methoxyethanone (**13**) $^{19}F$ NMR (376 MHz, $CDCl_3$)

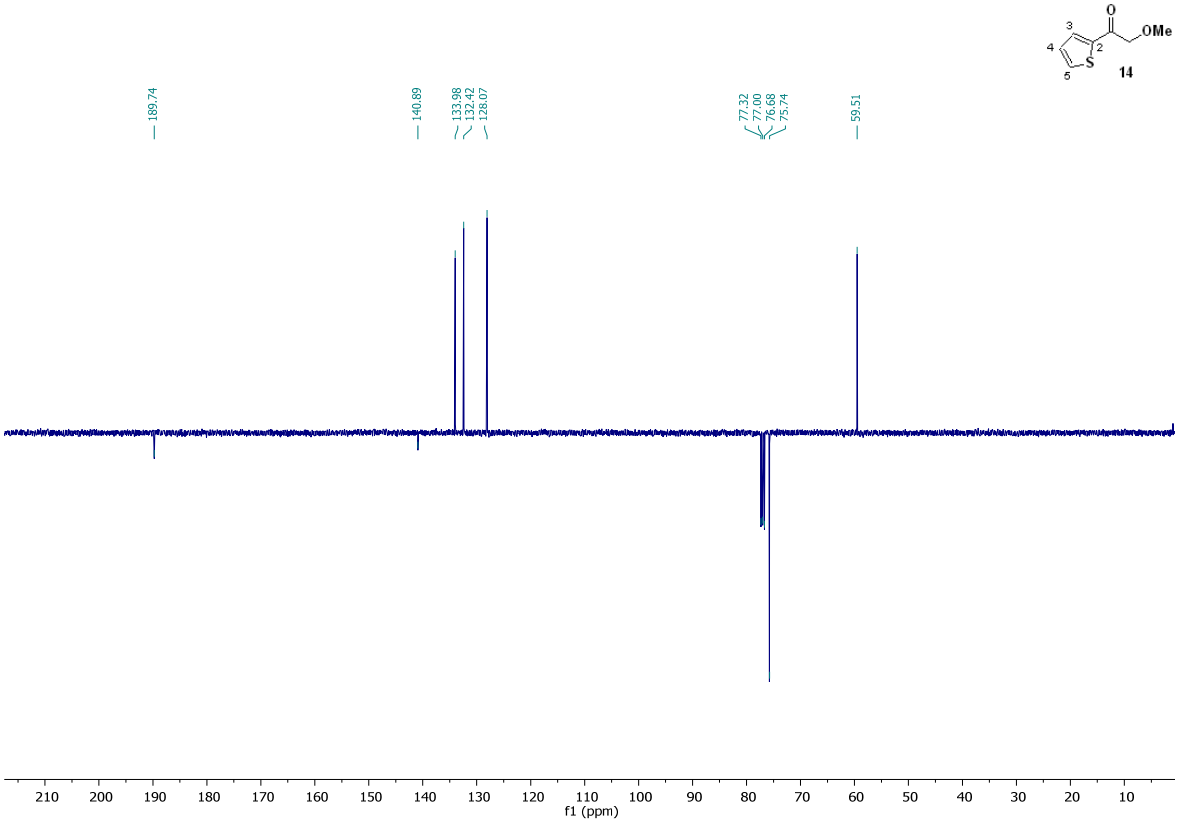


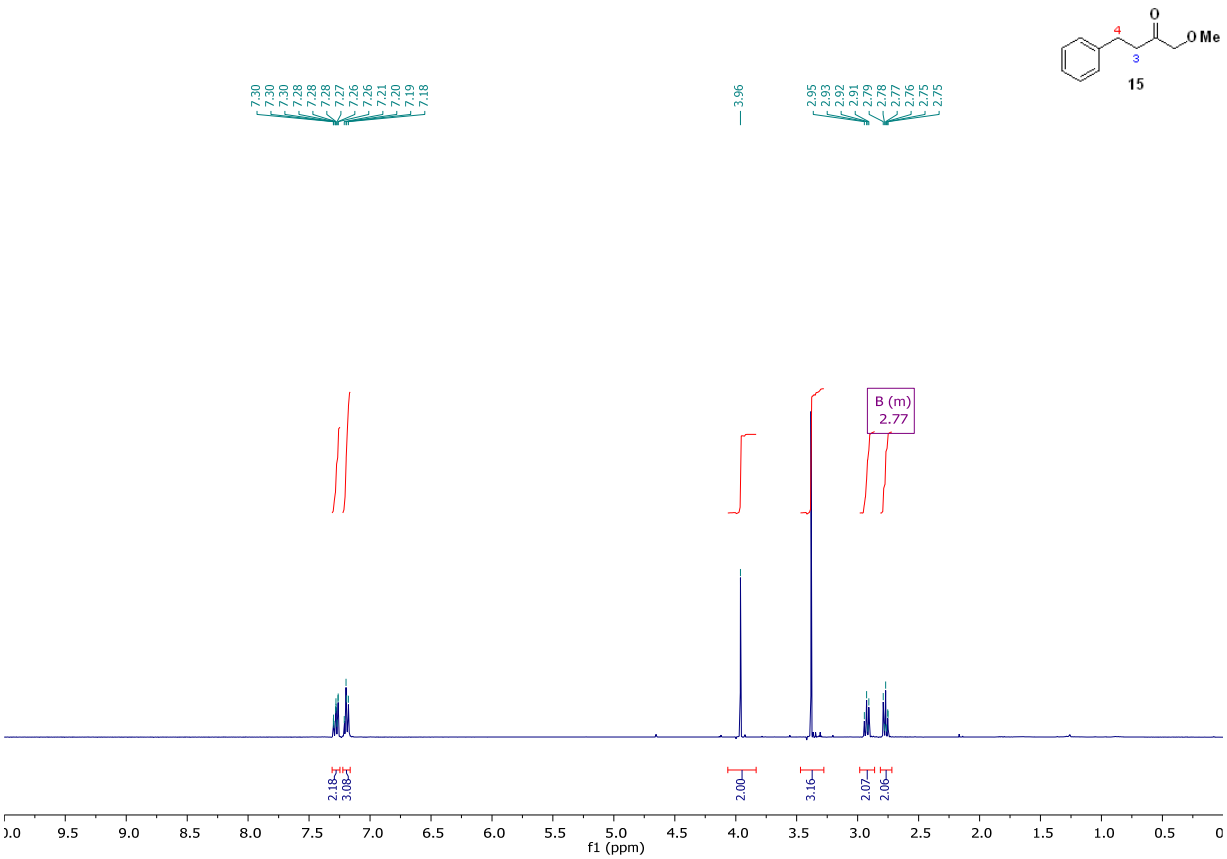
2-methoxy-1-(2-thienyl)ethanone (**14**) $^{1}H$ NMR (400 MHz, $CDCl_3$)



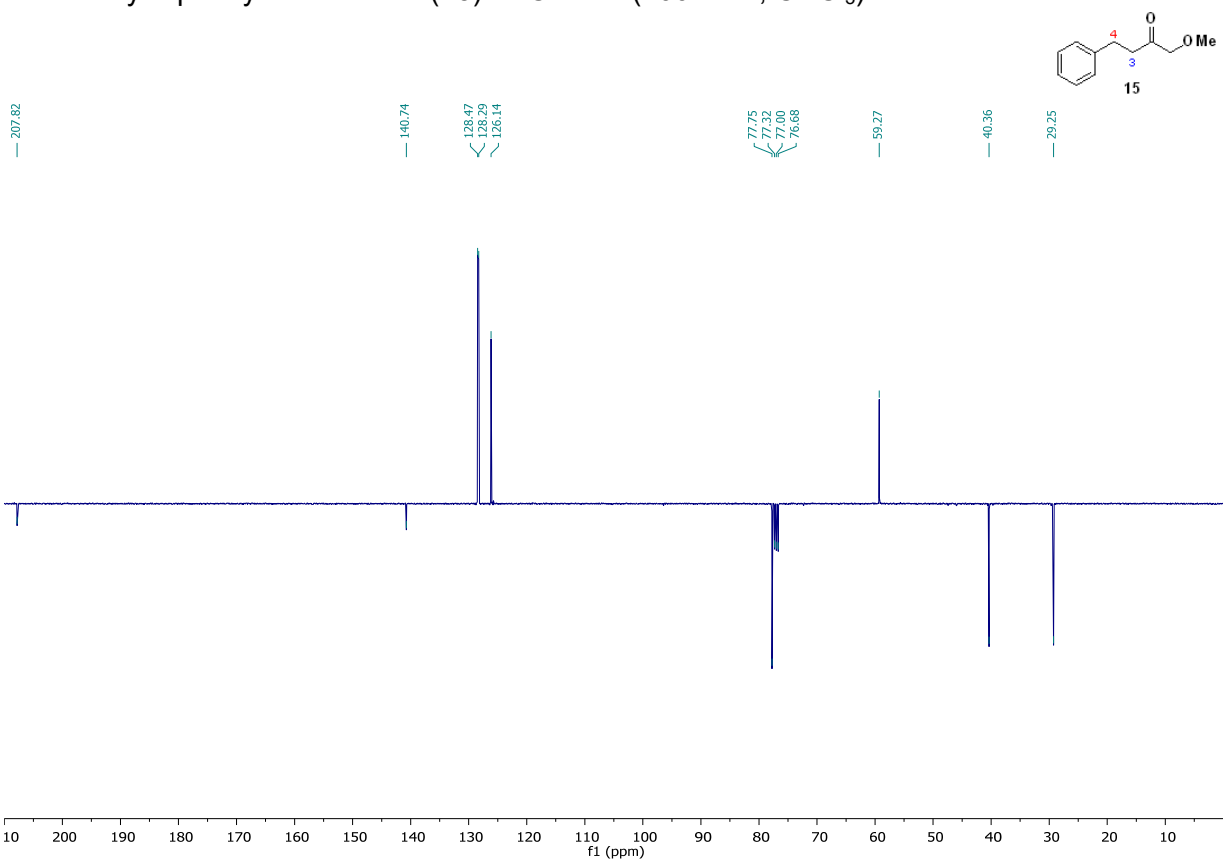

2-methoxy-1-(2-thienyl)ethanone (**14**) $^{13}C$ NMR (100 MHz, $CDCl_3$)



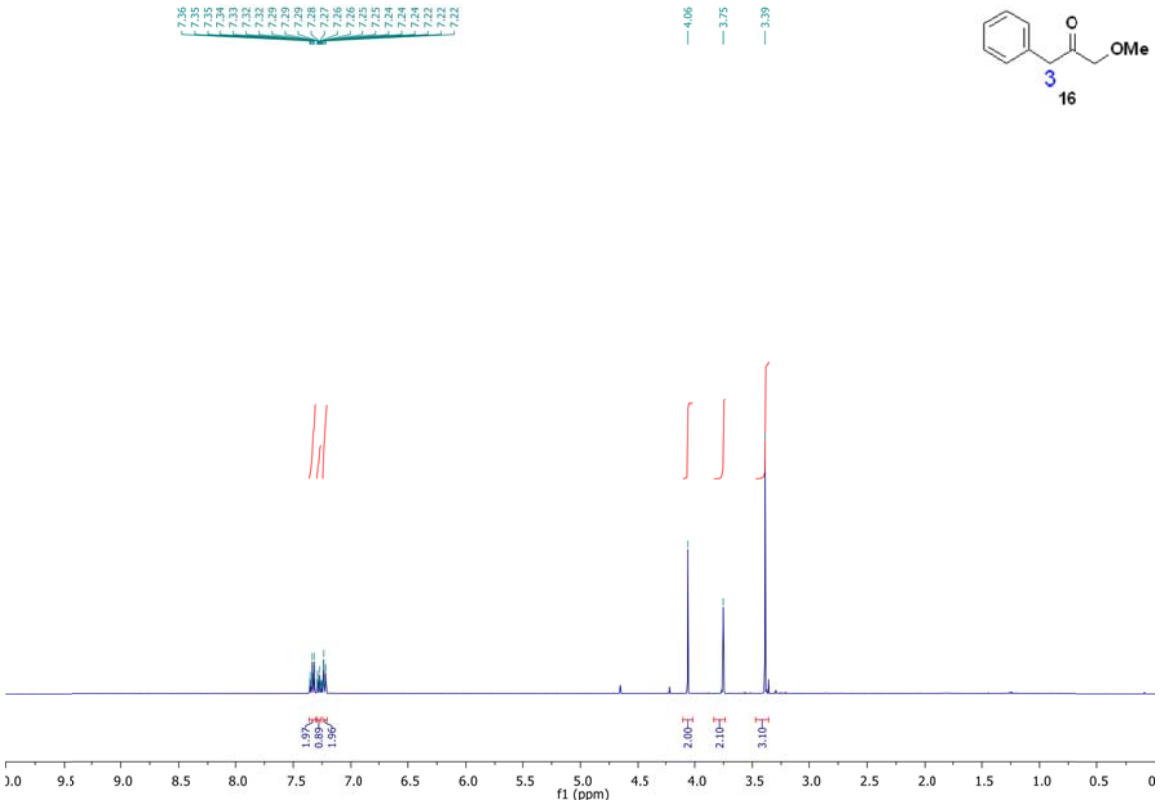
1-methoxy-4-phenyl-2-butanone (**15**) $^{1}$H NMR (400 MHz, $CDCl_3$)



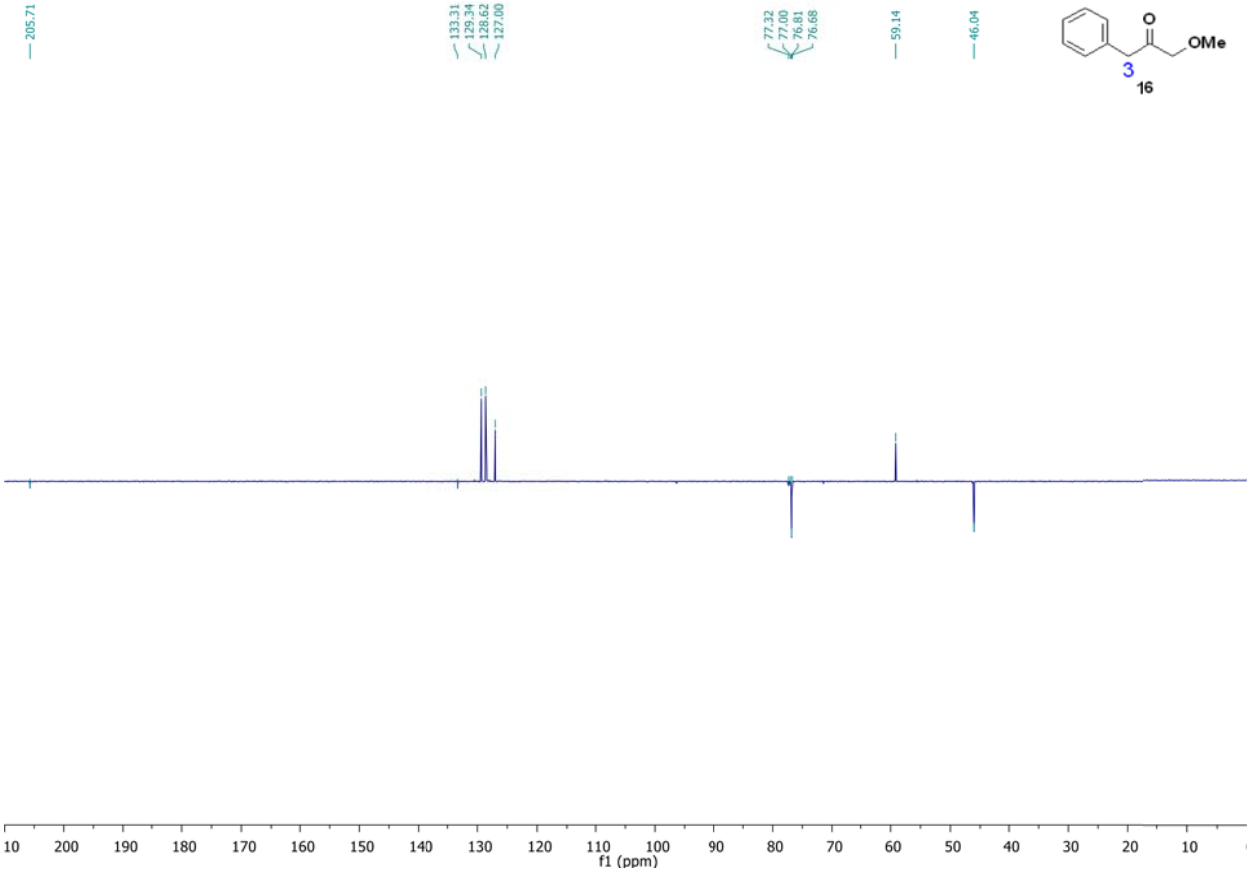

1-methoxy-4-phenyl-2-butanone (**15**) $^{13}$C NMR (100 MHz, $CDCl_3$)



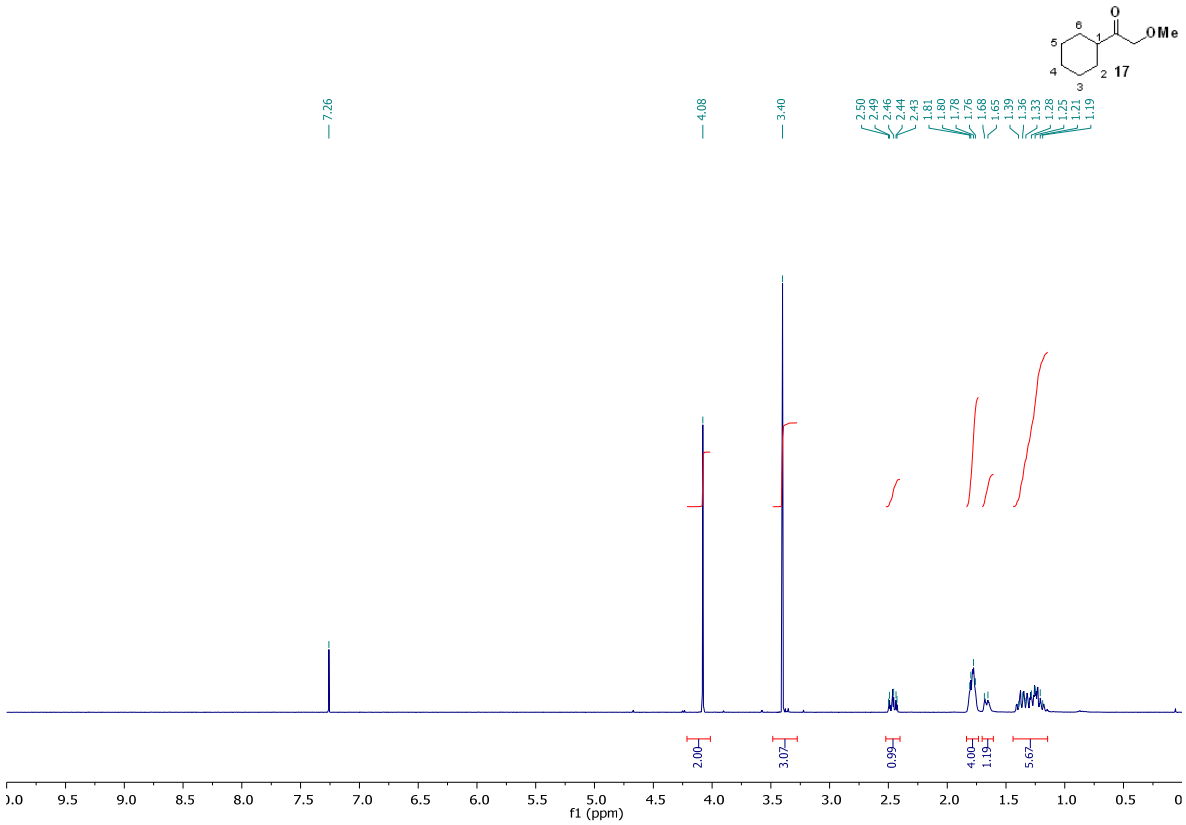
1-methoxy-3-phenylacetone (**16**) $^{1}H$ NMR (400 MHz, $CDCl_3$)



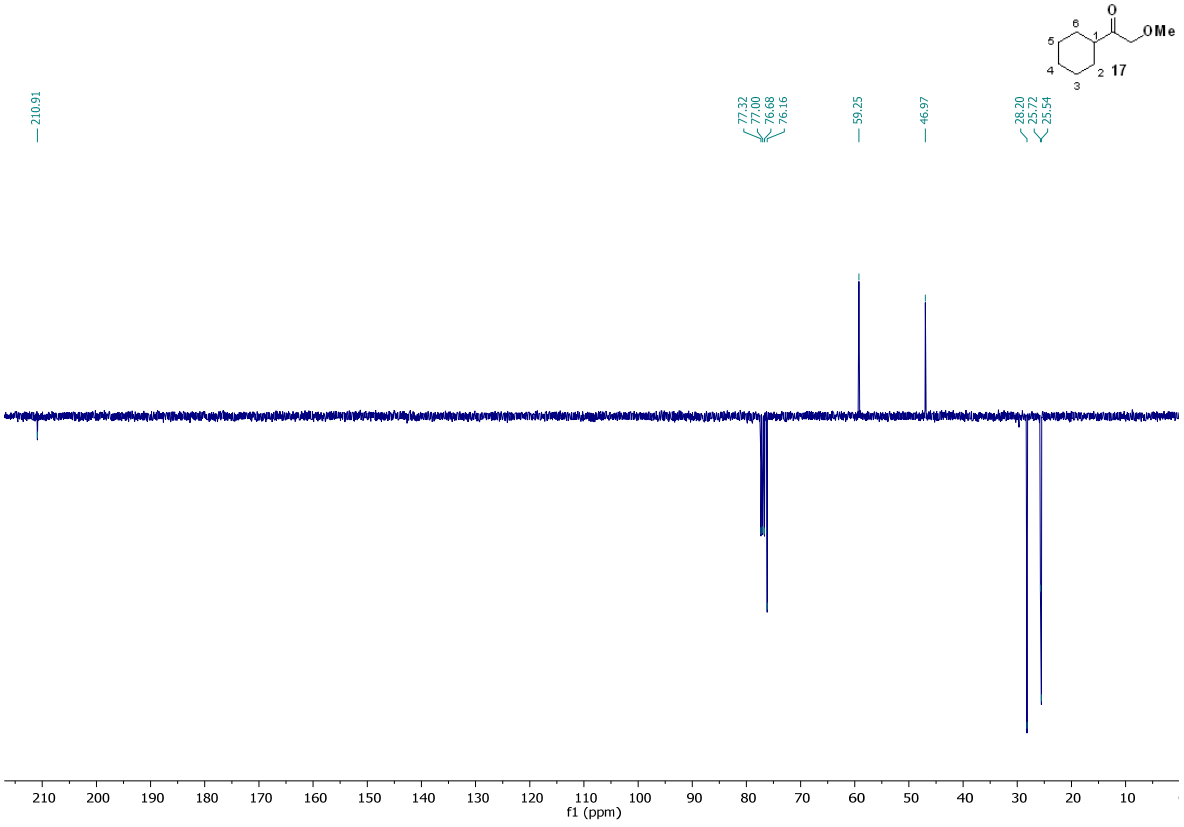

1-methoxy-3-phenylacetone (**16**) $^{13}C$ NMR (100 MHz, $CDCl_3$)



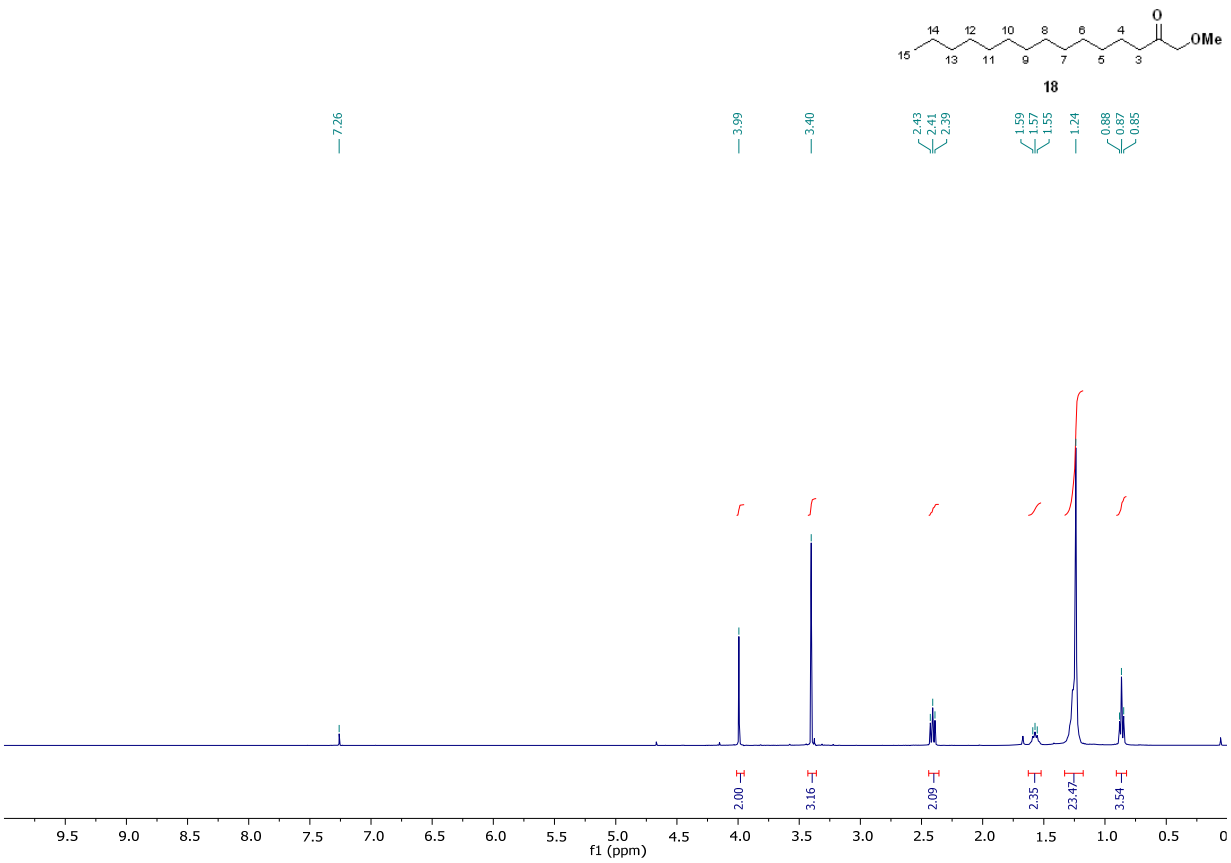
1-cyclohexyl-2-methoxyethanone (**17**) $^{1}$H NMR (400 MHz, $CDCl_3$)



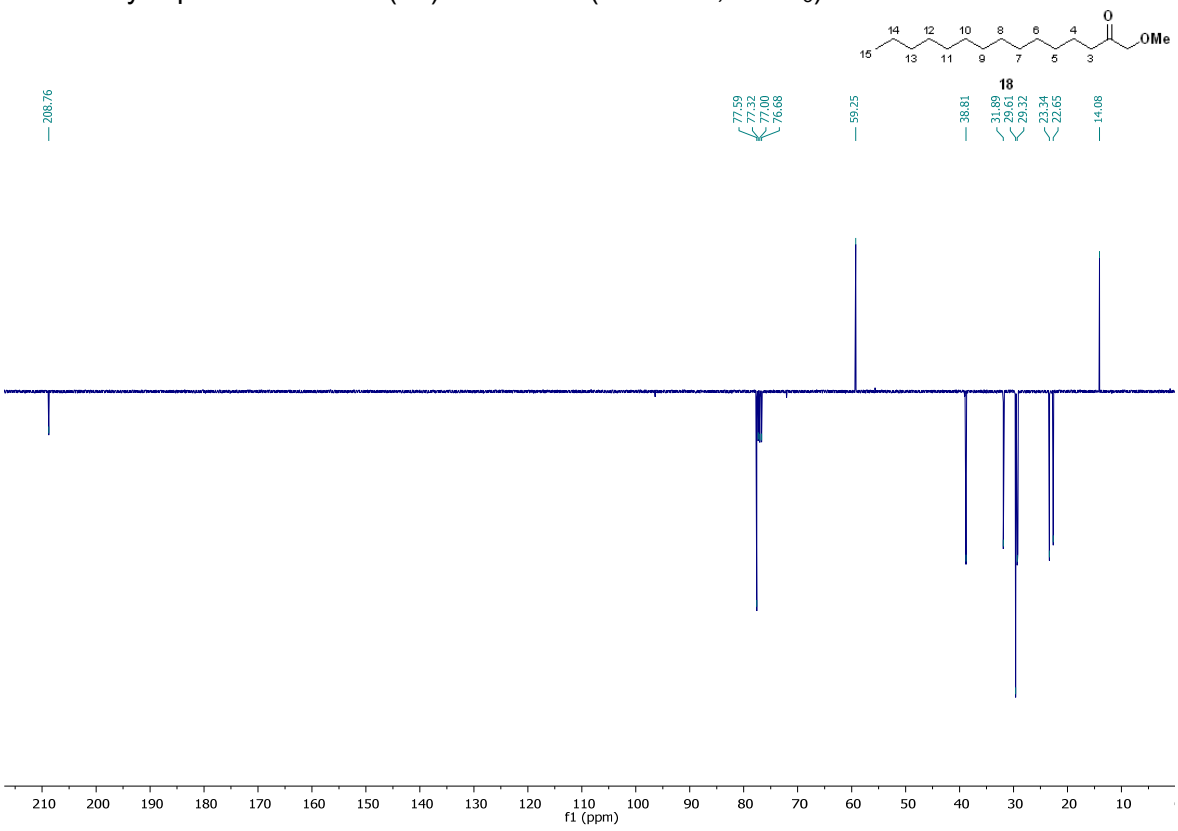

1-cyclohexyl-2-methoxyethanone (**17**) $^{13}$C NMR (100 MHz, $CDCl_3$)



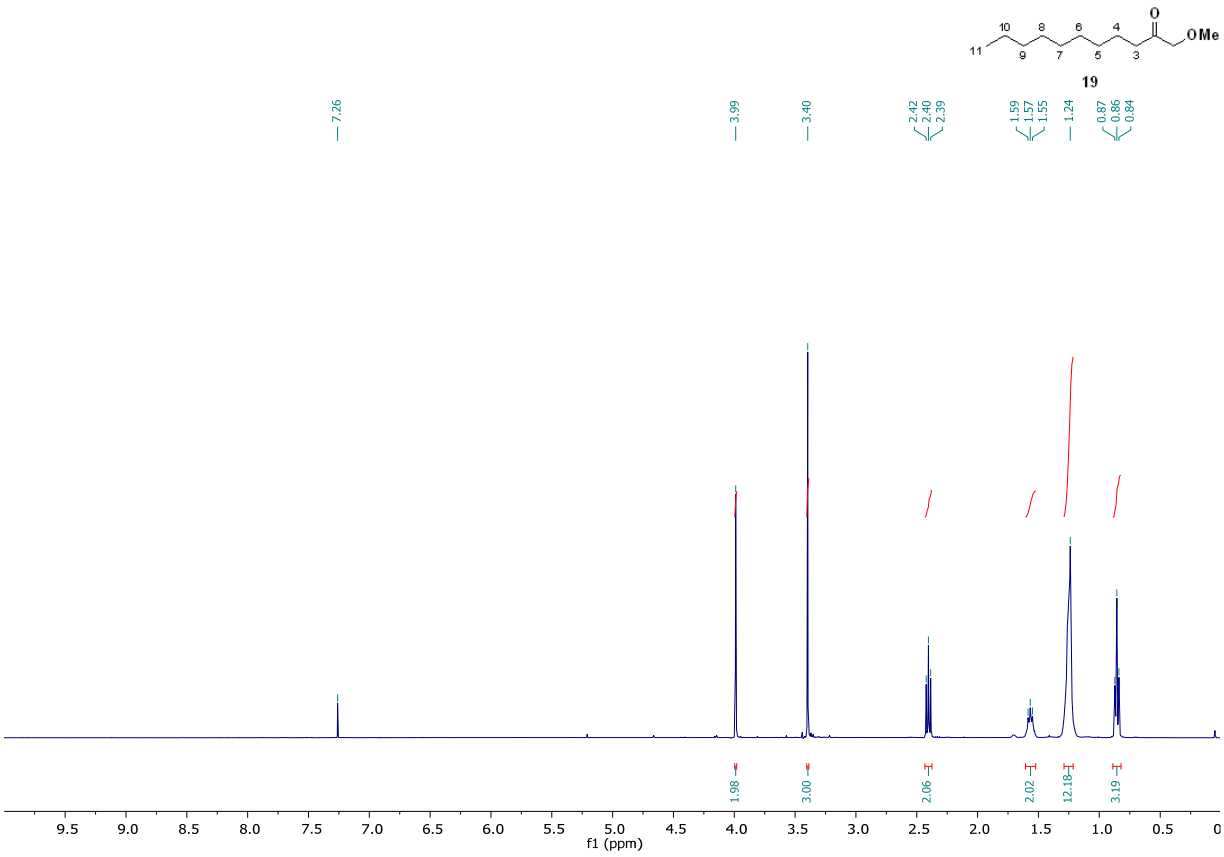
1-methoxy-2-pentadecanone (**18**) $^{1}$H NMR (400 MHz, $CDCl_3$)



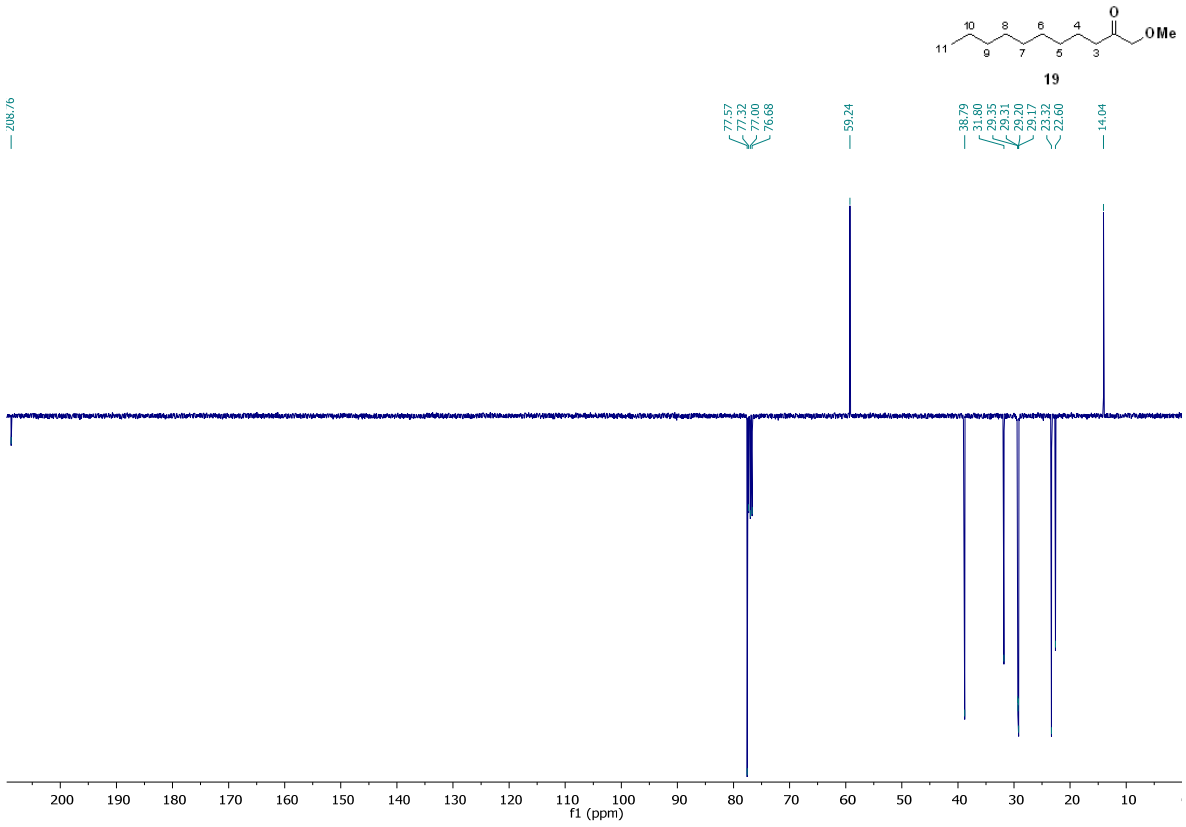

1-methoxy-2-pentadecanone (**18**) $^{13}$C NMR (100 MHz, $CDCl_3$)



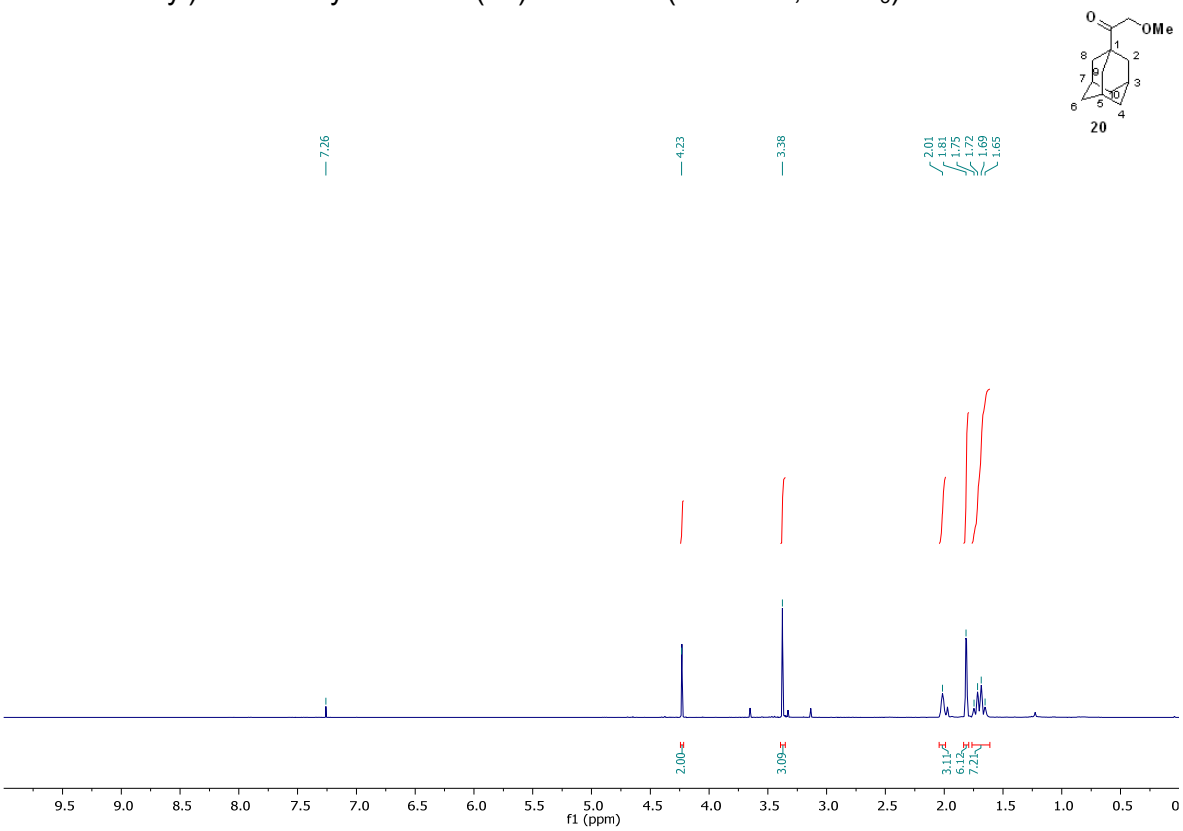
1-methoxy-2-undecanone (**19**) $^{1}$H NMR (400 MHz, $CDCl_3$)



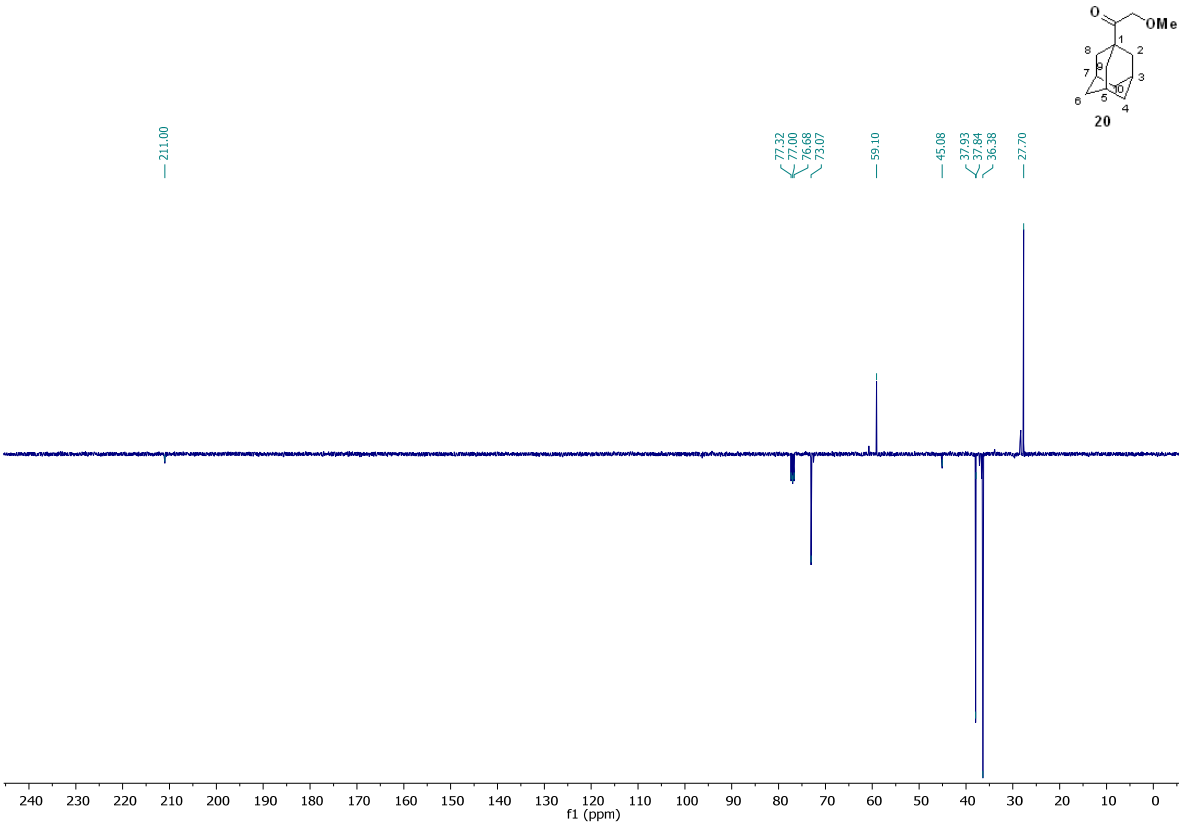

1-methoxy-2-undecanone (**19**) $^{13}$C NMR (100 MHz, $CDCl_3$)



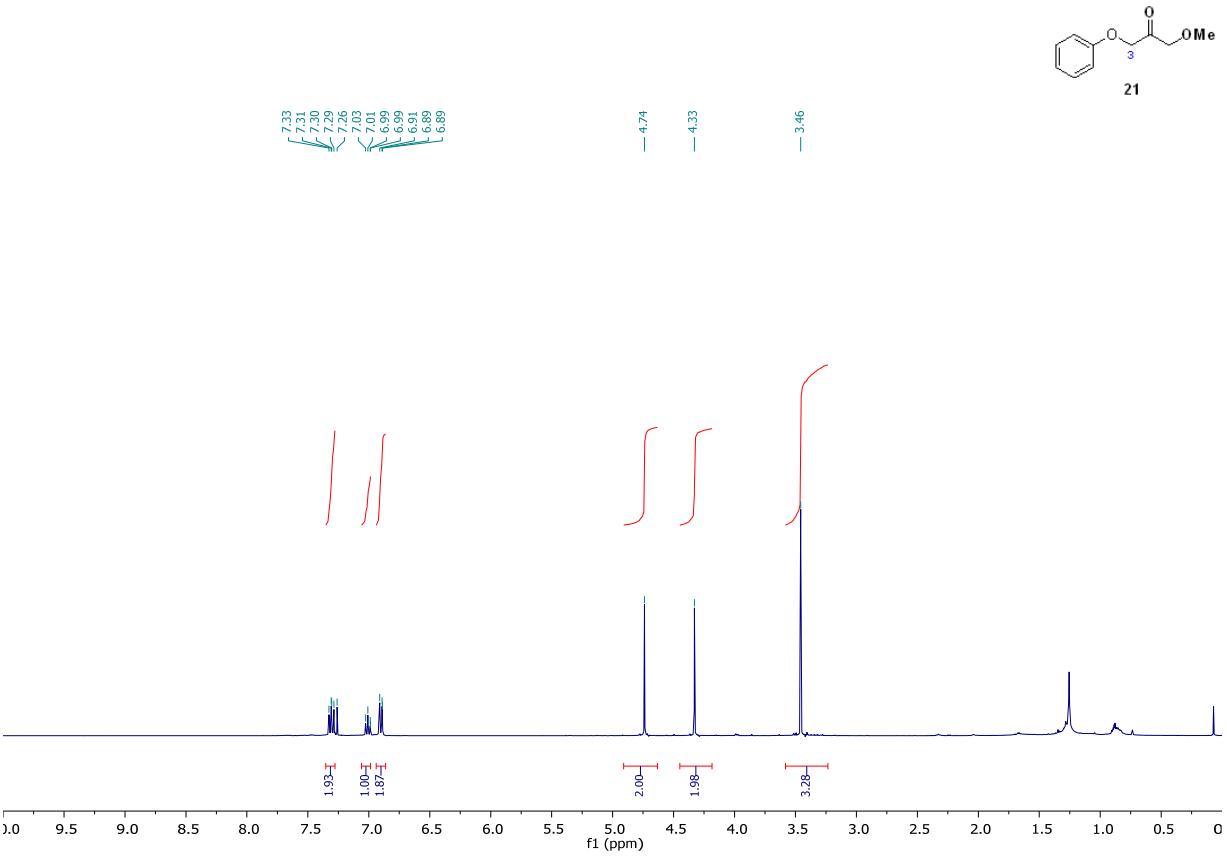
1-(adamantan-1-yl)-2-methoxyethanone (**20**) $^{1}$H NMR (400 MHz, $CDCl_3$)



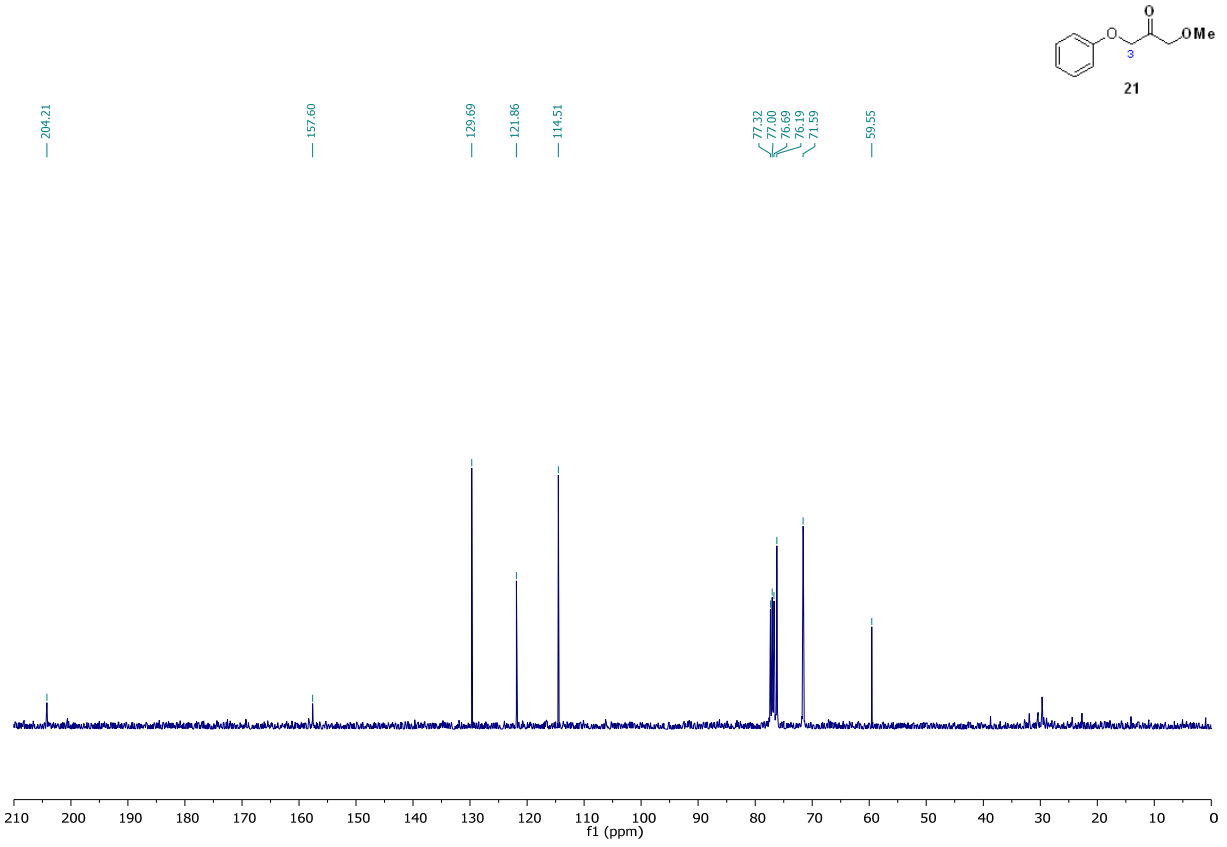

1-(adamantan-1-yl)-2-methoxyethanone (**20**) $^{13}$C NMR (100 MHz, $CDCl_3$)



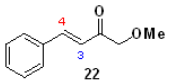
1-methoxy-3-phenoxyacetone (**21**) $^{1}$H NMR (400 MHz, $CDCl_3$)

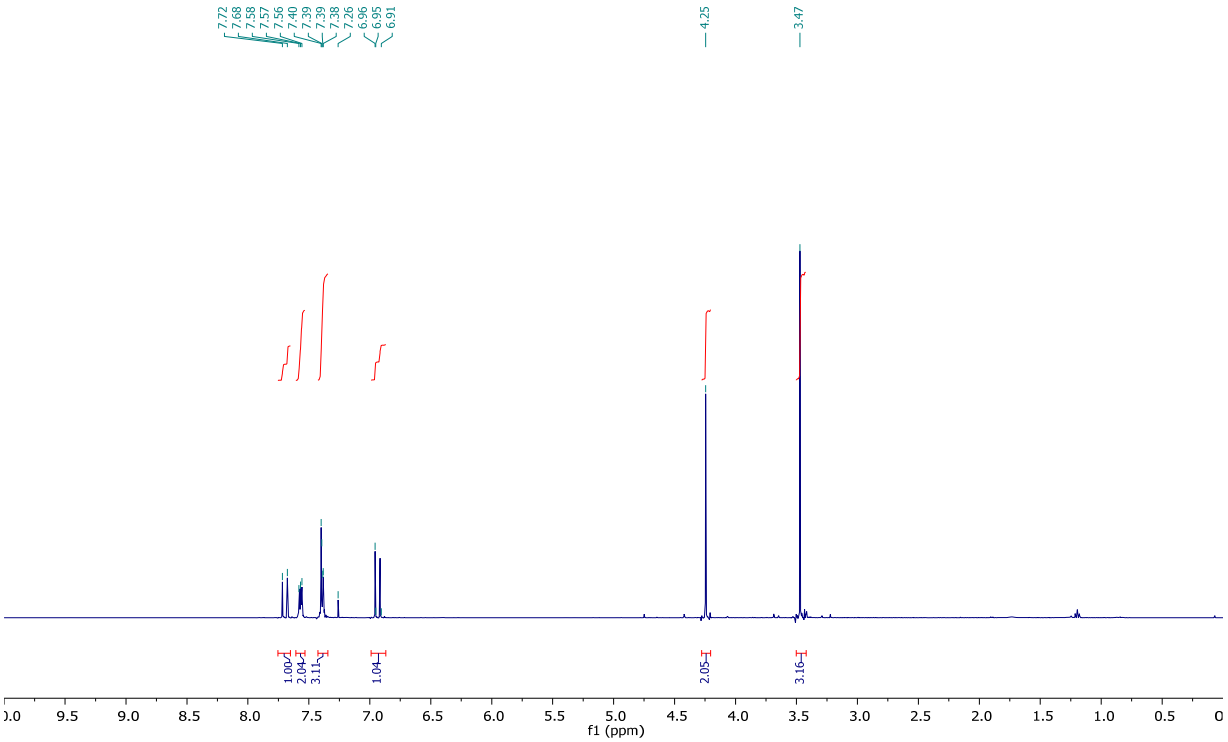



1-methoxy-3-phenoxyacetone (**21**) $^{13}$C NMR (100 MHz, $CDCl_3$)

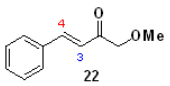


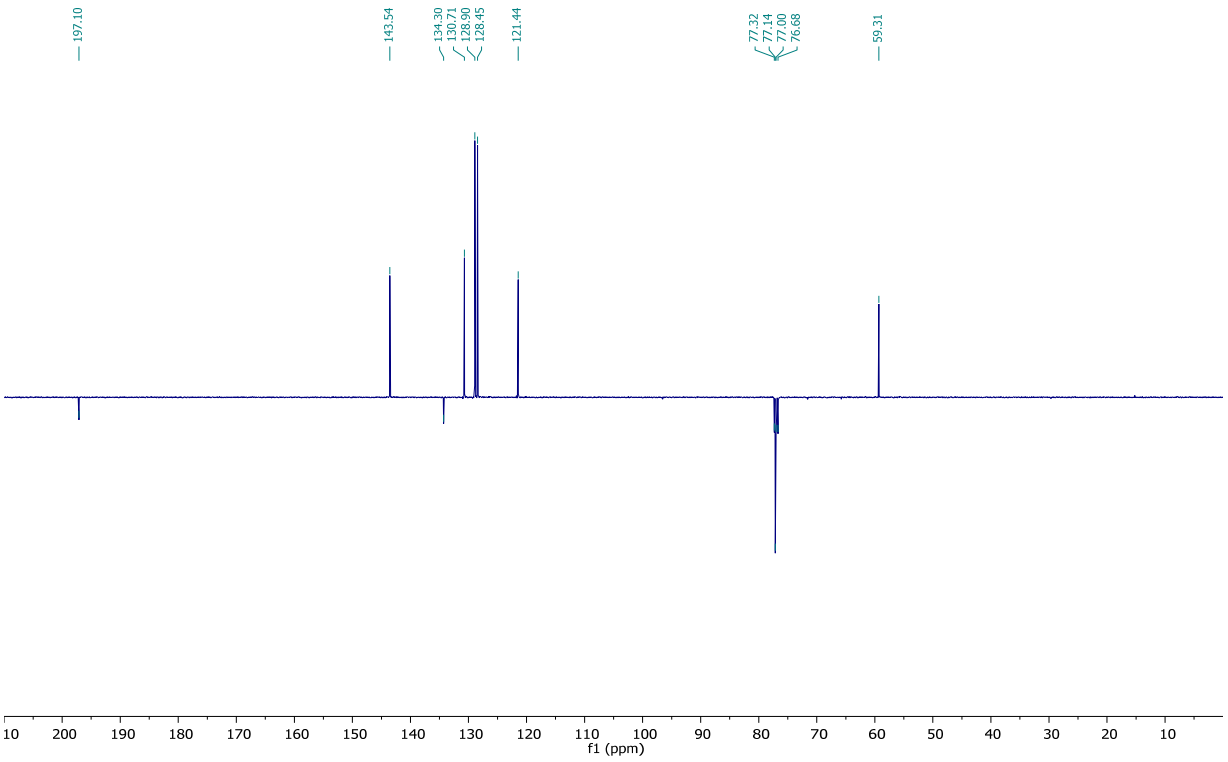
(3*E*)-1-methoxy-4-phenyl-3-buten-2-one (**22**) $^{1}$H NMR (400 MHz, $CDCl_3$)



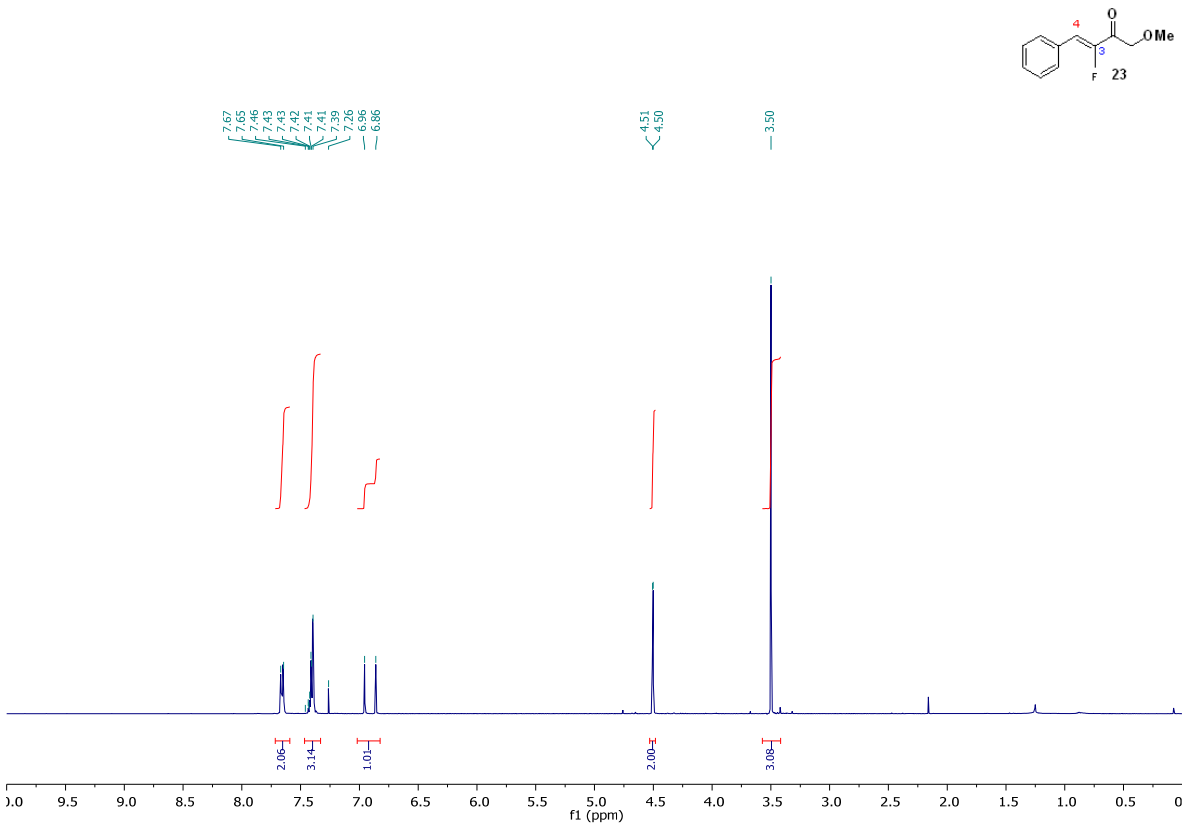




(3*E*)-1-methoxy-4-phenyl-3-buten-2-one (**22**) $^{13}$C NMR (100 MHz, $CDCl_3$)

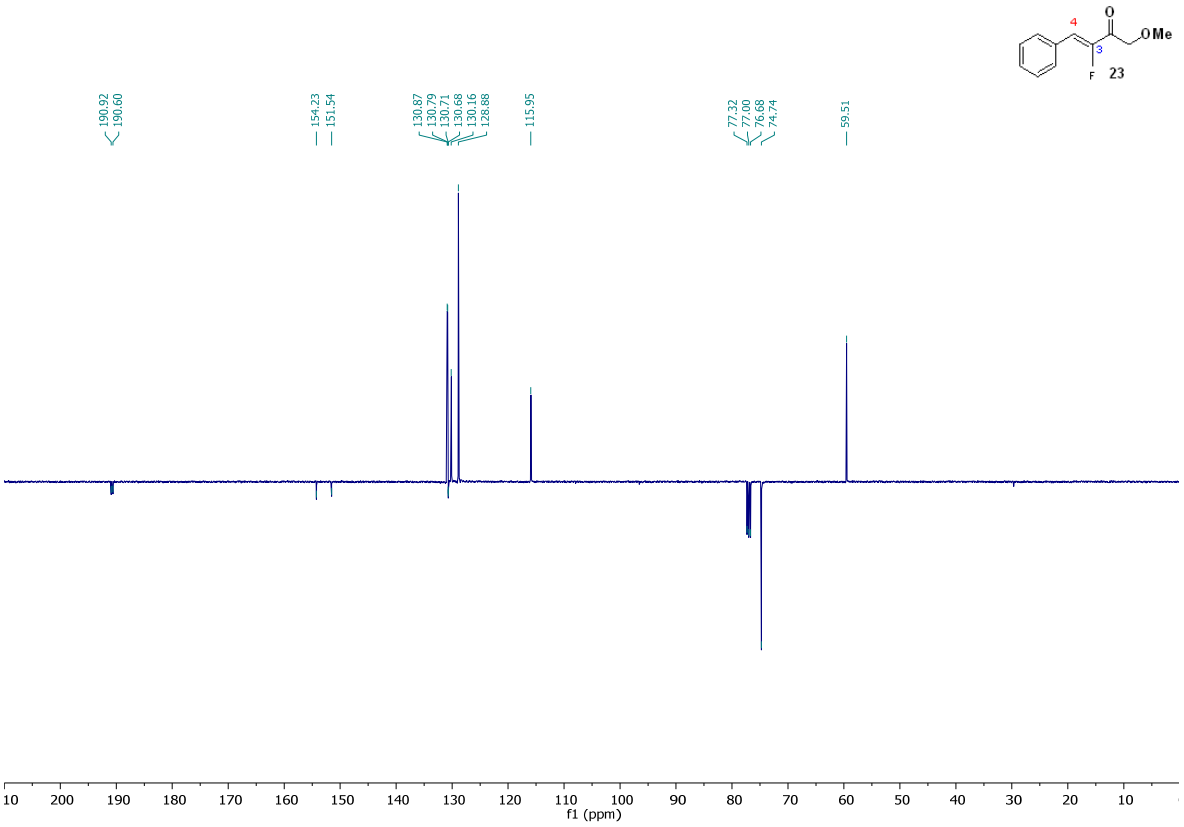


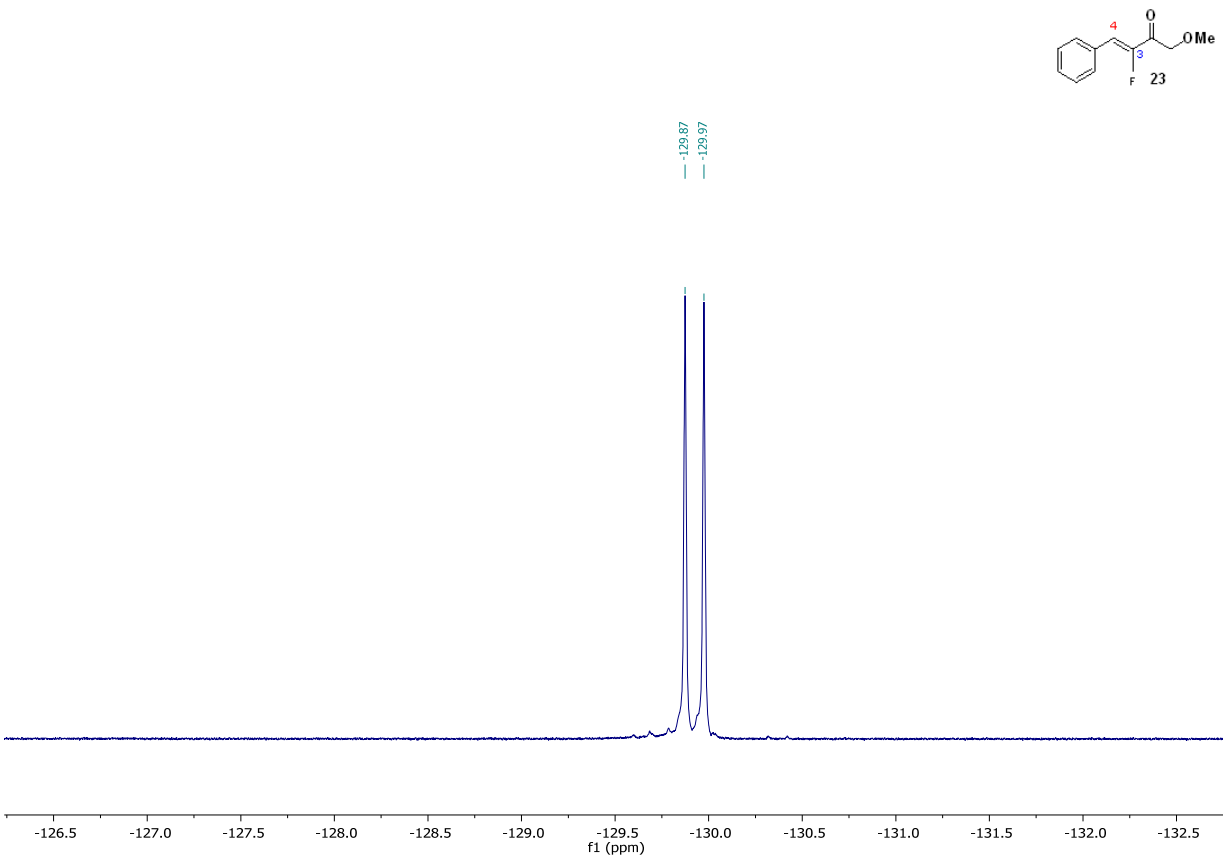
(3*Z*)-3-fluoro-1-methoxy-4-phenyl-3-buten-2-one (**23**) $^{1}$H NMR (400 MHz, $CDCl_3$)



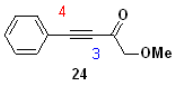

(3*Z*)-3-fluoro-1-methoxy-4-phenyl-3-buten-2-one (**23**) $^{13}$C NMR (100 MHz, $CDCl_3$)



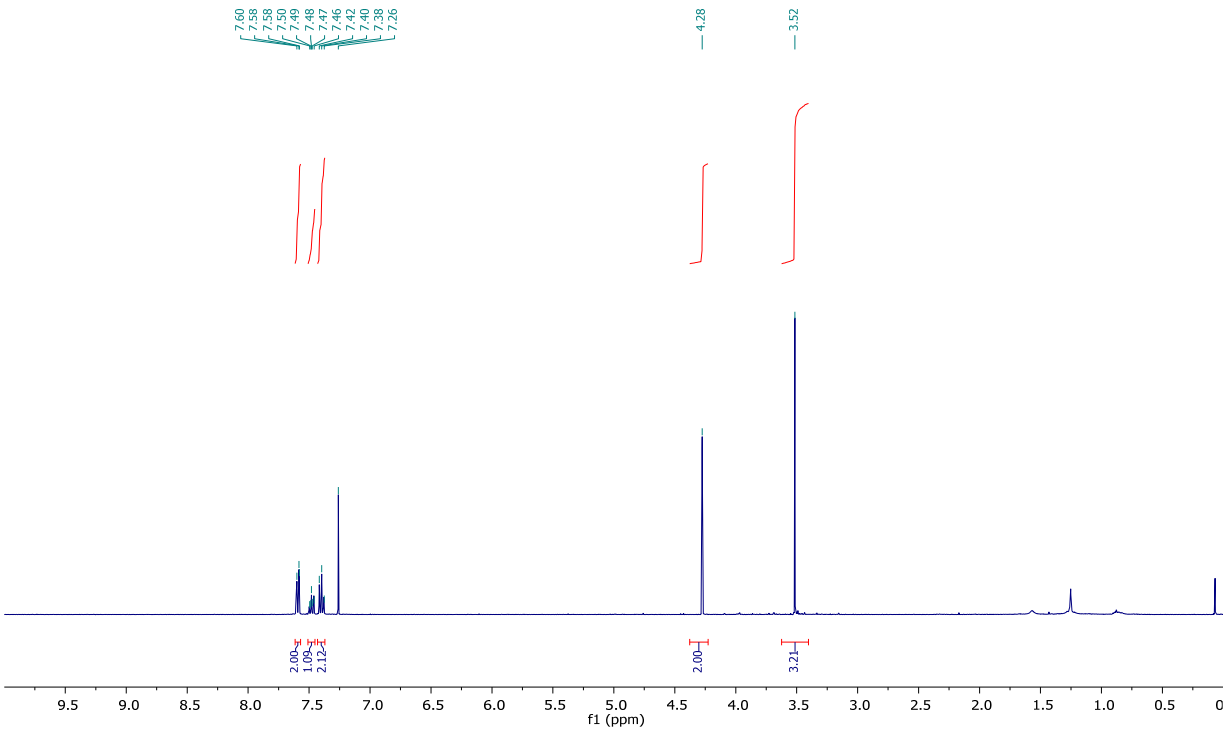
(3*Z*)-3-fluoro-1-methoxy-4-phenyl-3-buten-2-one (**23**) $^{19}$FNMR (376 MHz, $CDCl_3$)



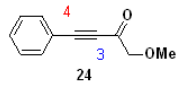
1-methoxy-4-phenyl-3-butyn-2-one (**24**) $^{1}$H NMR (400 MHz, $CDCl_3$)



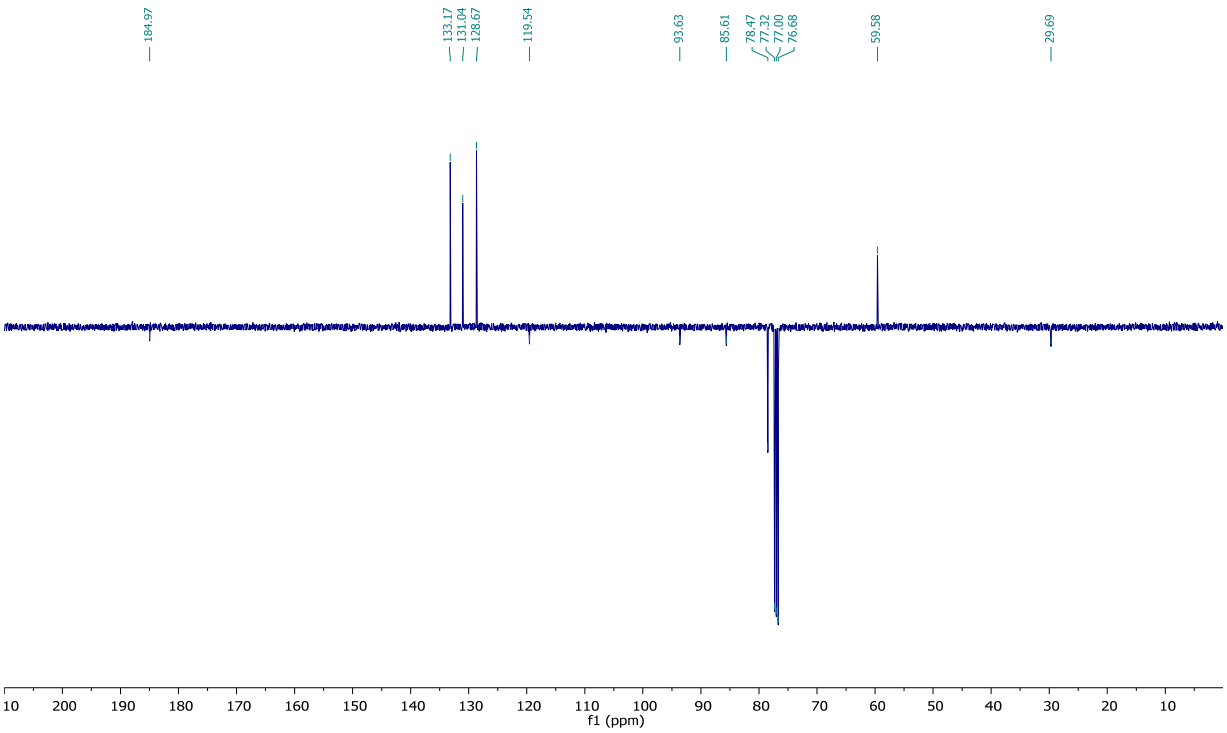

24



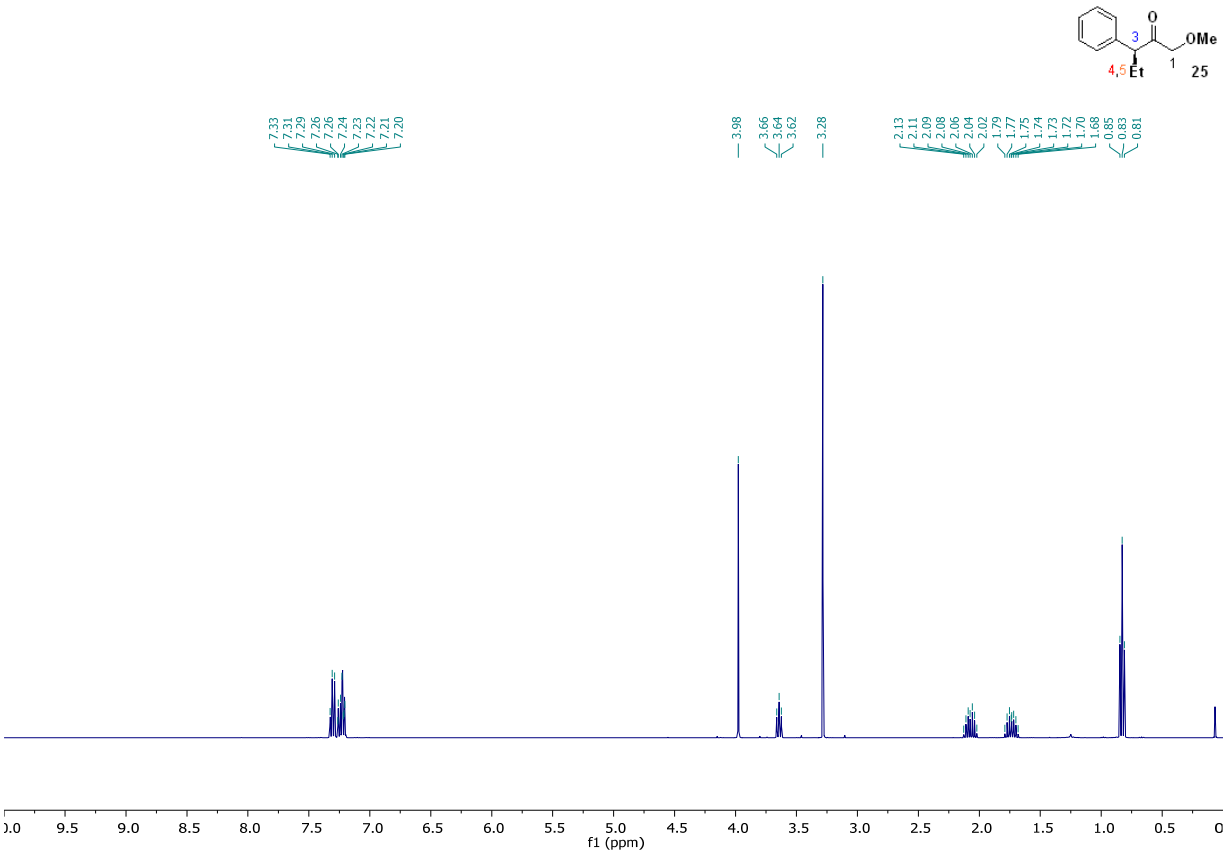

1-methoxy-4-phenyl-3-butyn-2-one (**24**) $^{13}$C NMR (100 MHz, $CDCl_3$)



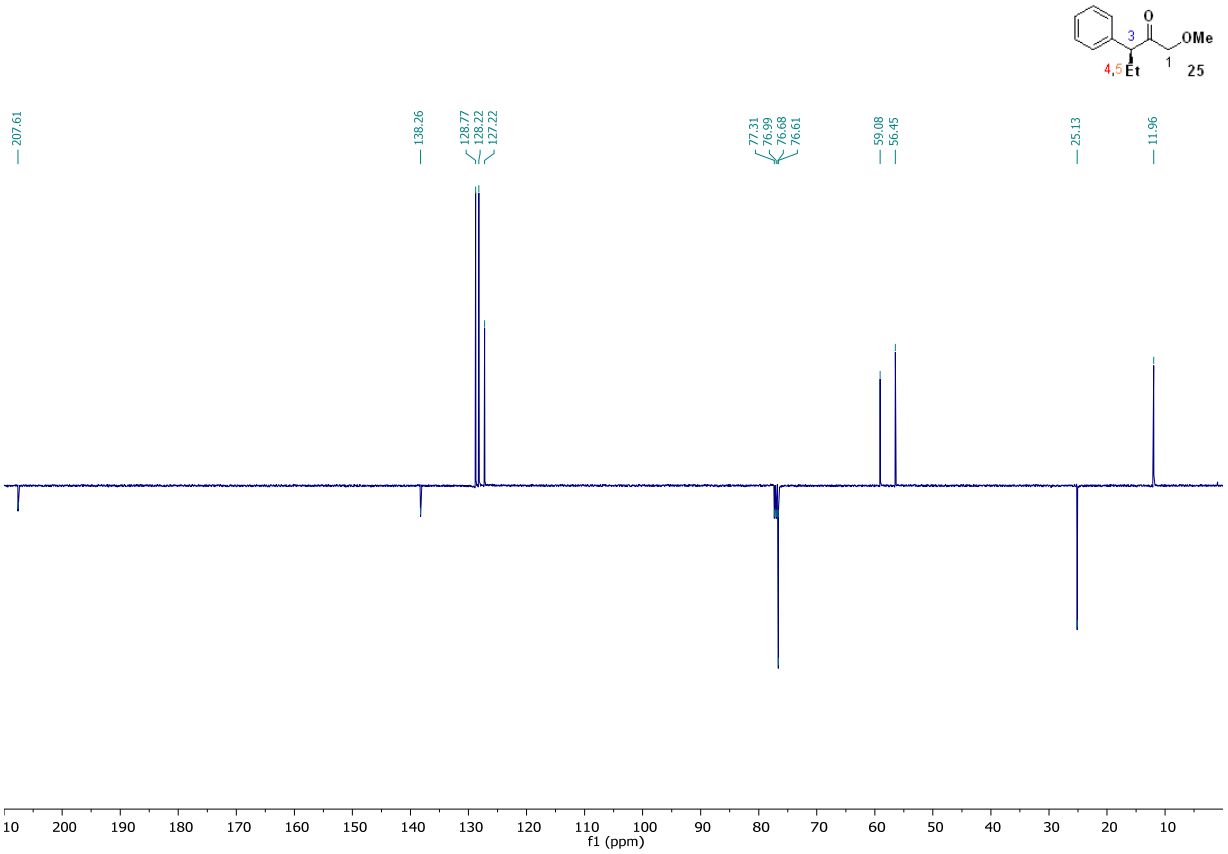

24



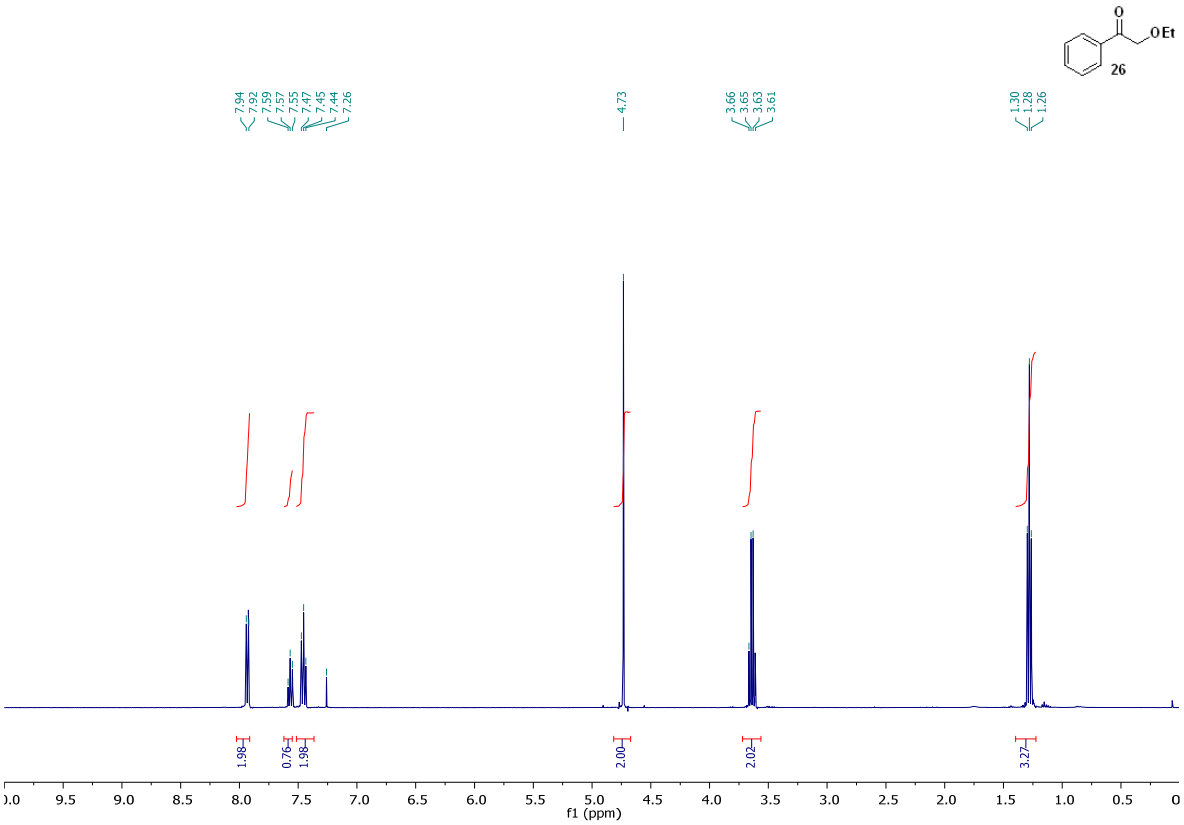
(3*S*)-1-methoxy-3-phenyl-2-pentanone (**25**) $^{1}$H NMR (400 MHz, $CDCl_3$)



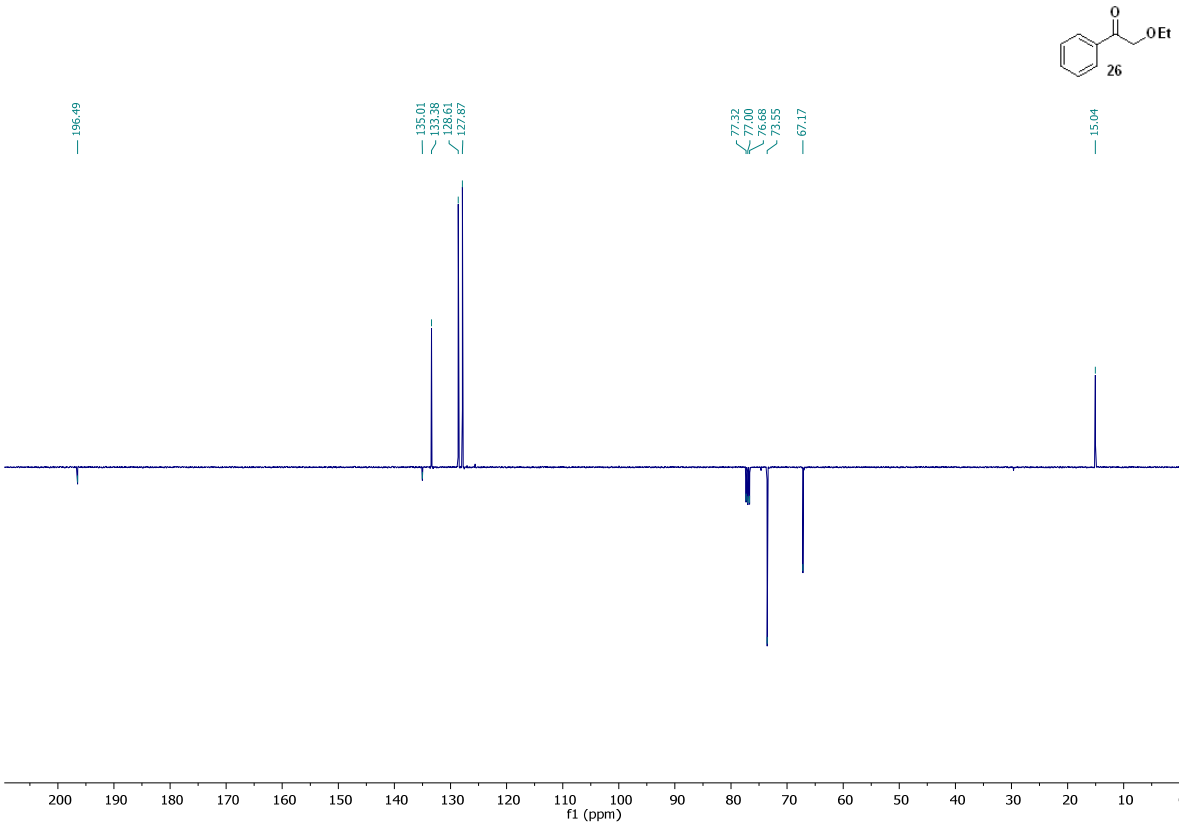

(3*S*)-1-methoxy-3-phenyl-2-pentanone (**25**) $^{13}$C NMR (100 MHz, $CDCl_3$)



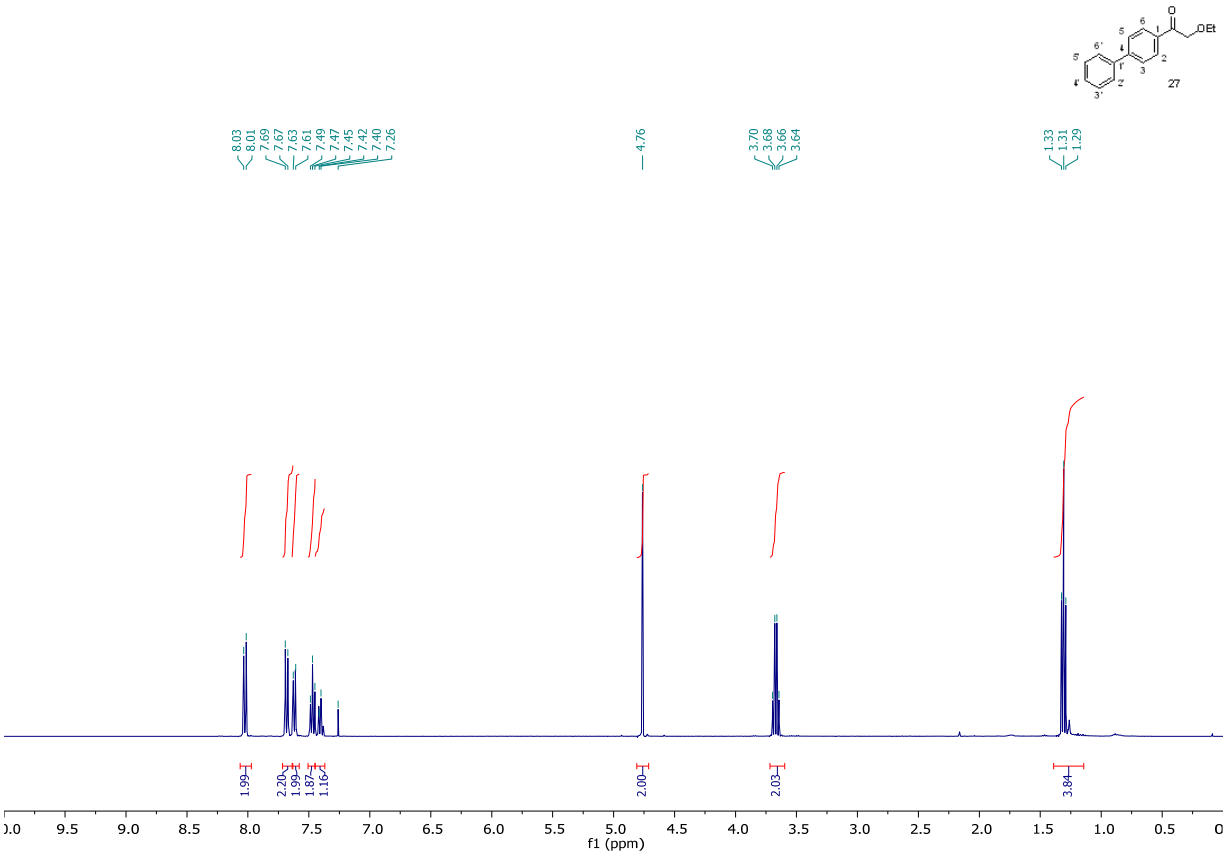
2-ethoxy-1-phenylethanone (**26**) $^{1}H$ NMR (400 MHz, $CDCl_3$)



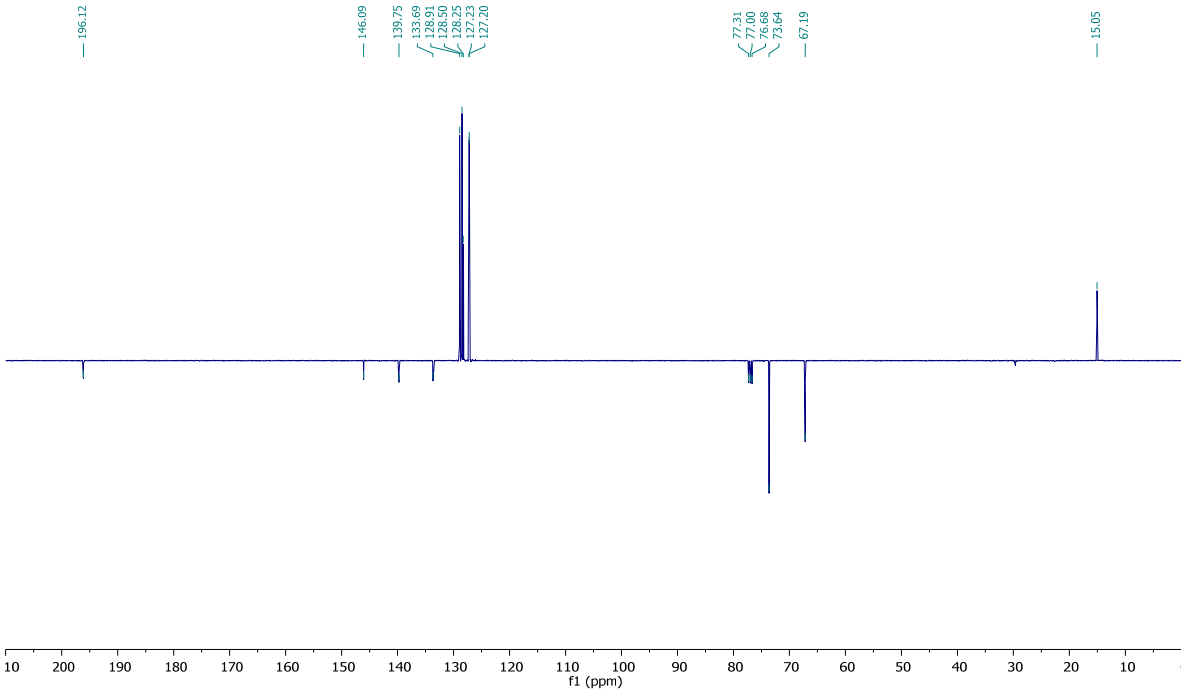

2-ethoxy-1-phenylethanone (**26**) $^{13}C$ NMR (100 MHz, $CDCl_3$)



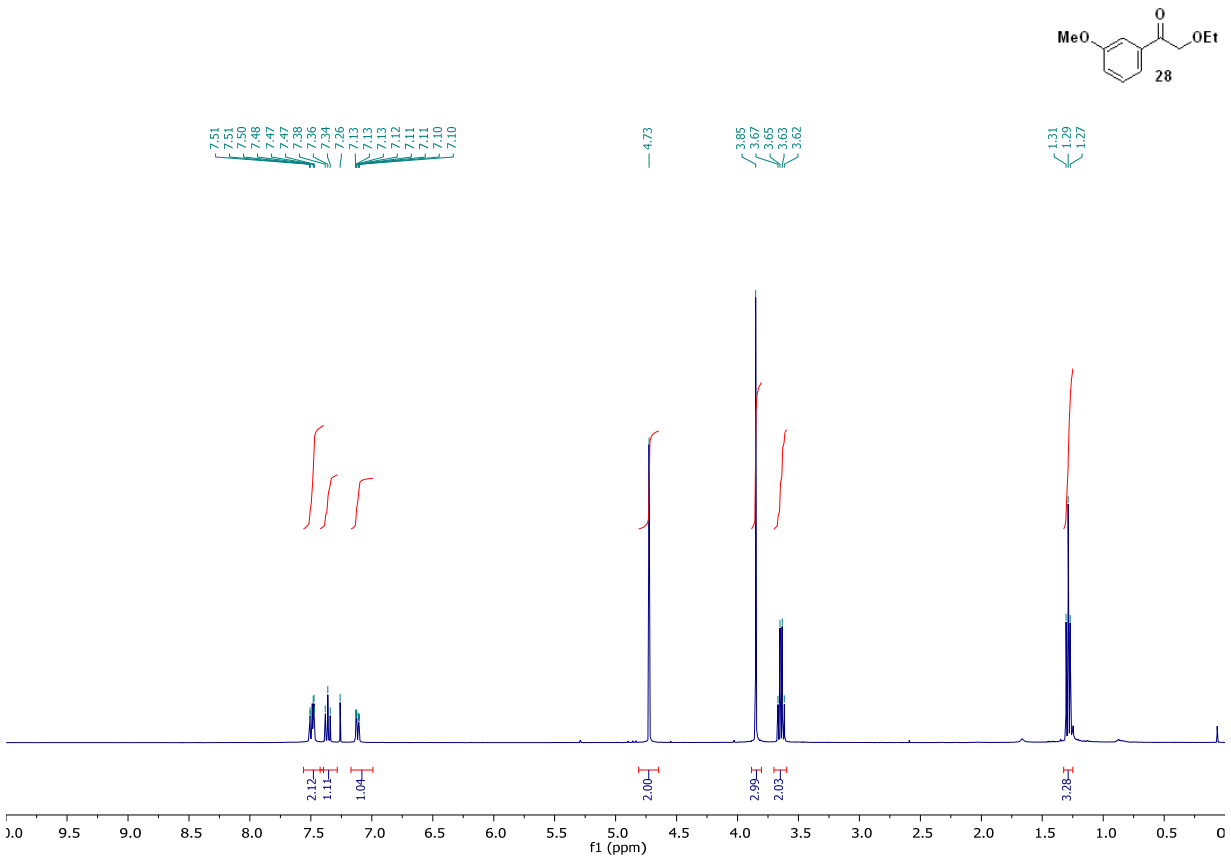
1-(4-biphenylyl)-2-ethoxyethanone (**27**) $^{1}$H NMR (400 MHz, $CDCl_3$)



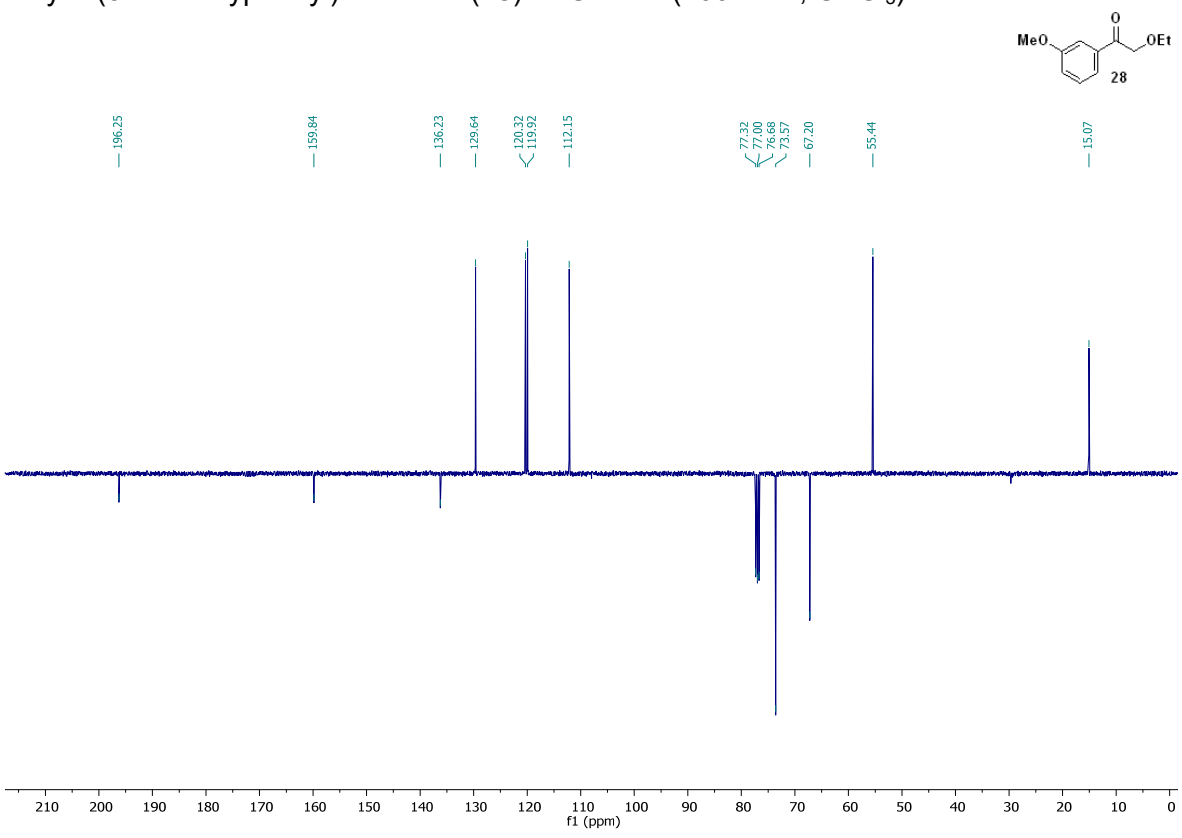

1-(4-biphenylyl)-2-ethoxyethanone (**27**) $^{13}$C NMR (100MHz, $CDCl_3$)



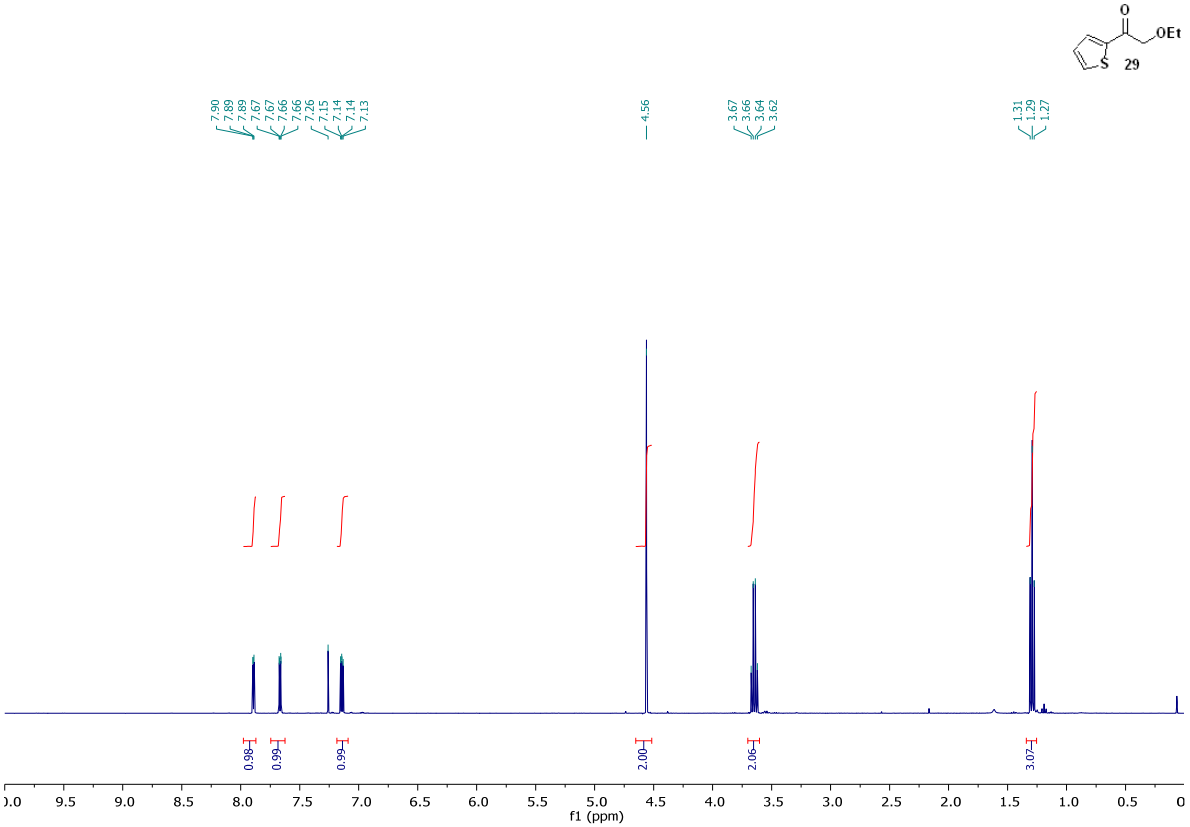
2-ethoxy-1-(3-methoxyphenyl)ethanone (**28**) $^{1}$H NMR (400 MHz, $CDCl_3$)



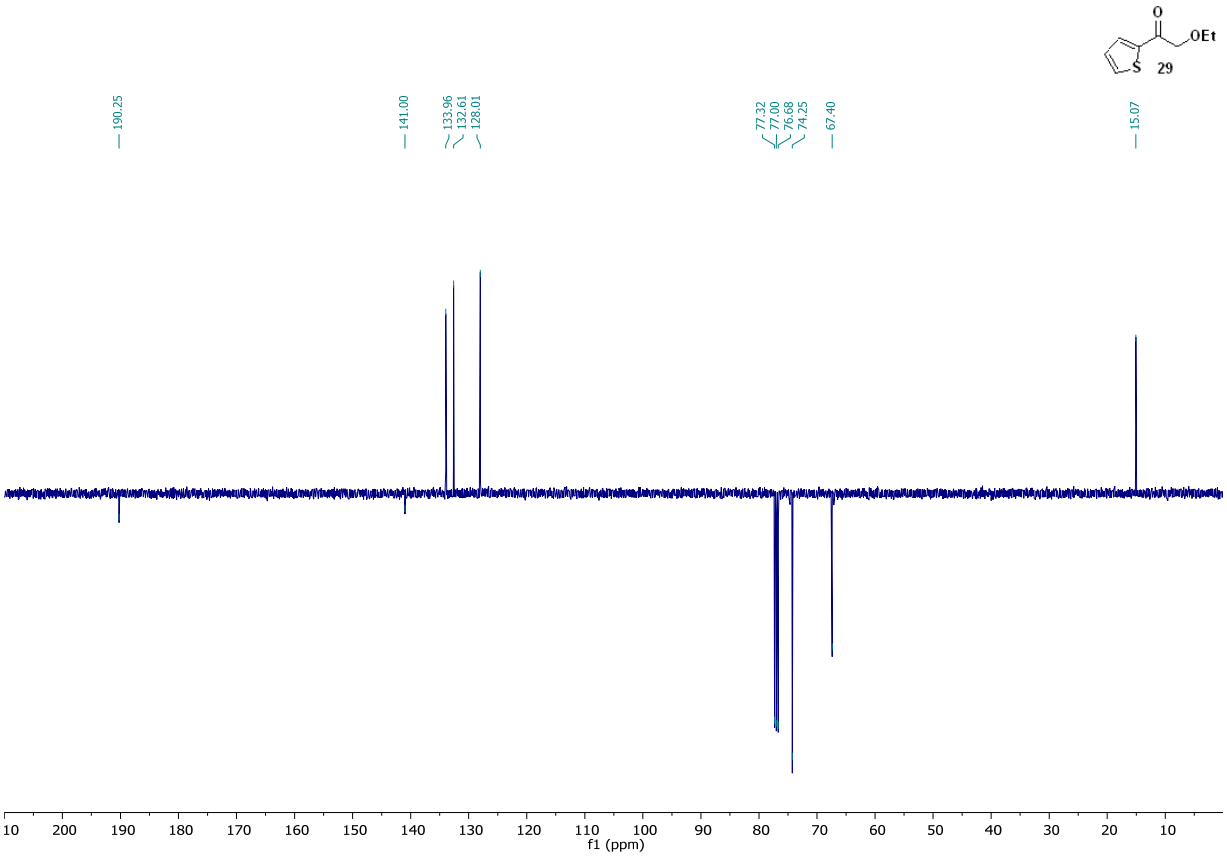

2-ethoxy-1-(3-methoxyphenyl)ethanone (**28**) $^{13}$C NMR (100 MHz, $CDCl_3$)



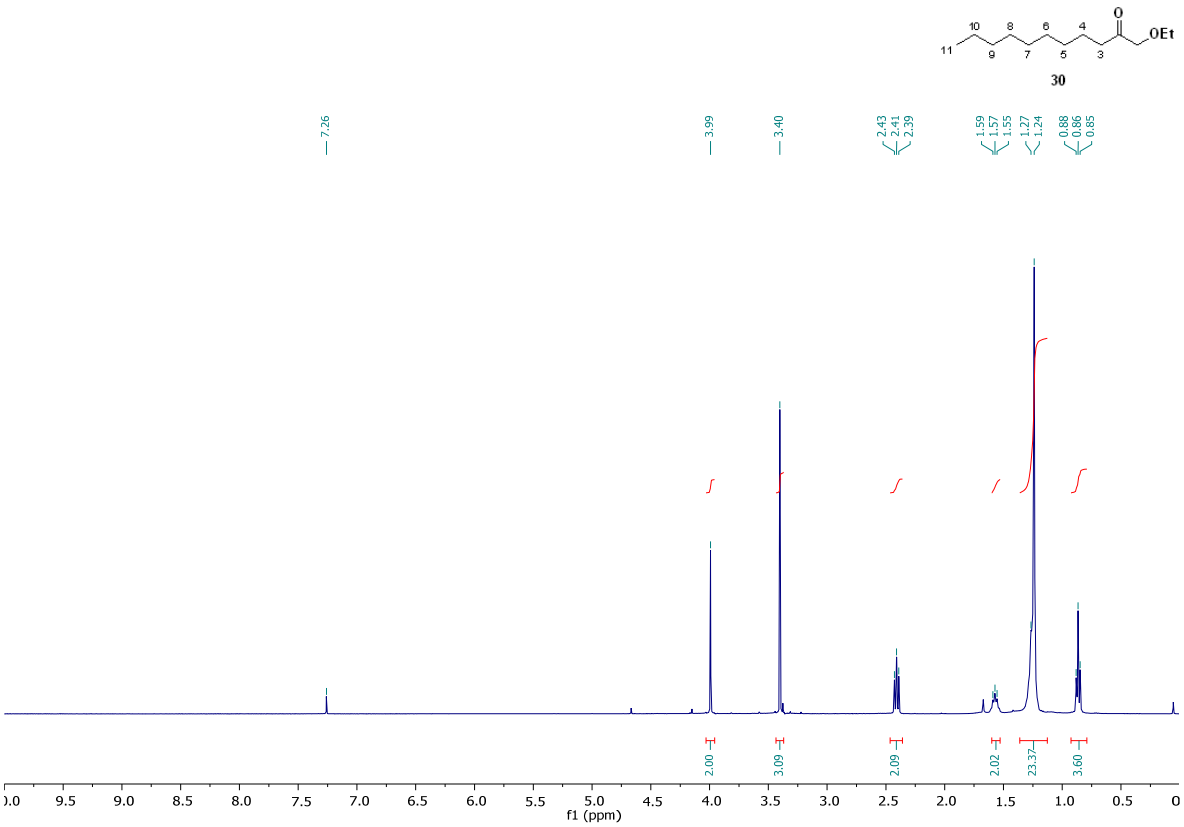
2-ethoxy-1-(2-thienyl)ethanone (**29**) $^{1}$H NMR (400 MHz, $CDCl_3$)



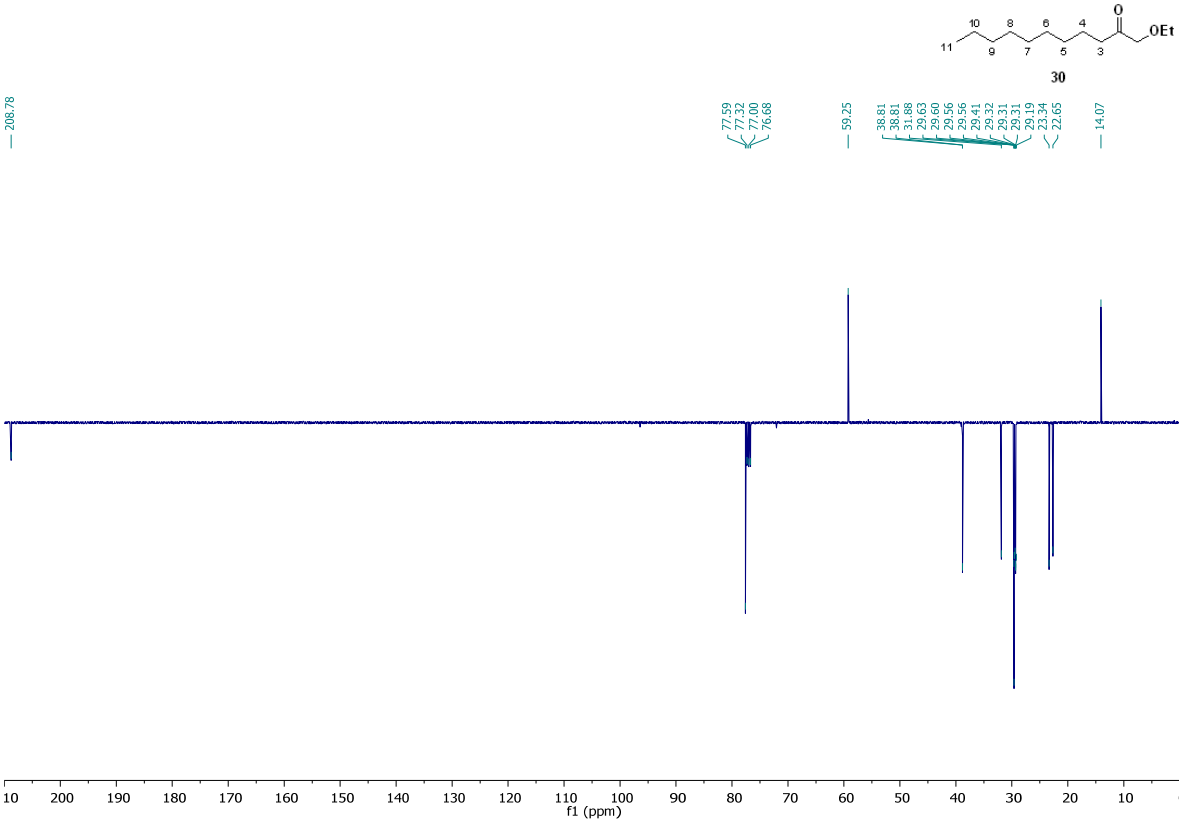

2-ethoxy-1-(2-thienyl)ethanone (**29**) $^{13}$C NMR (100 MHz, $CDCl_3$)



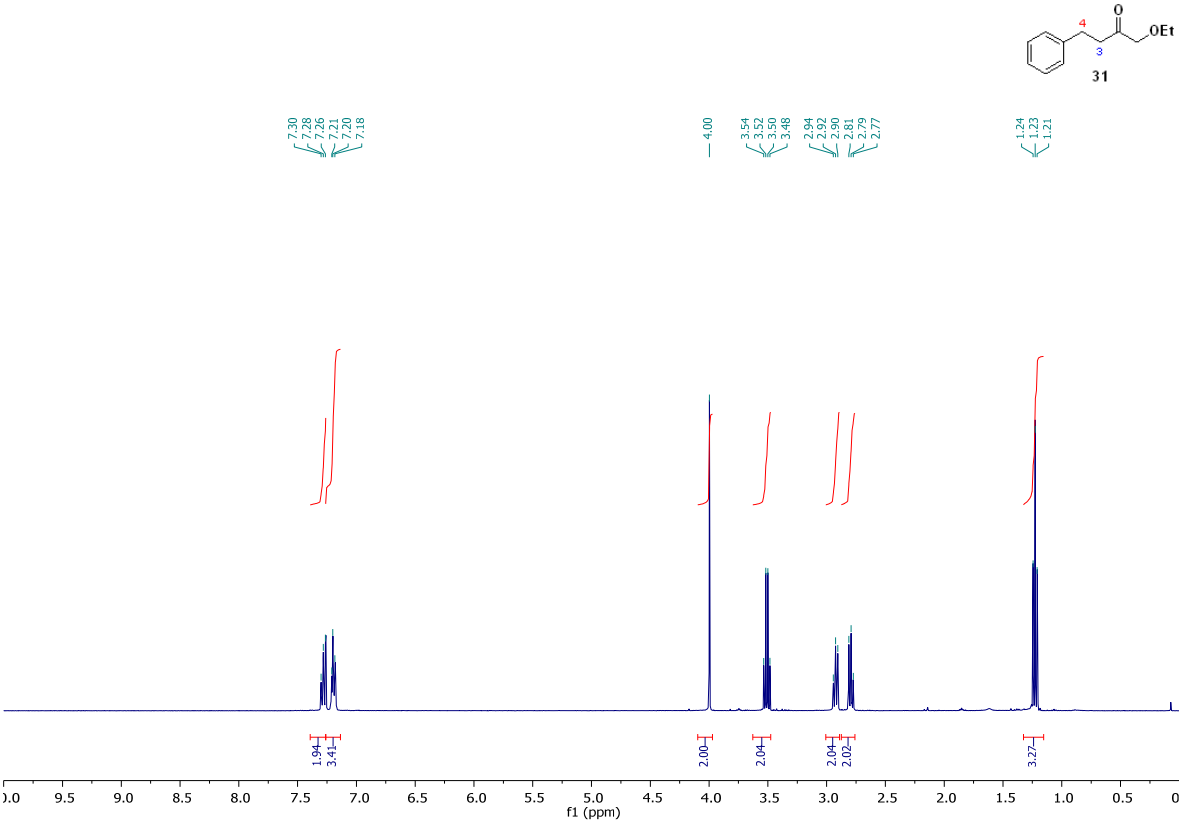
1-methoxy-2-pentadecanone (**30**) $^{1}$H NMR (400 MHz, $CDCl_3$)



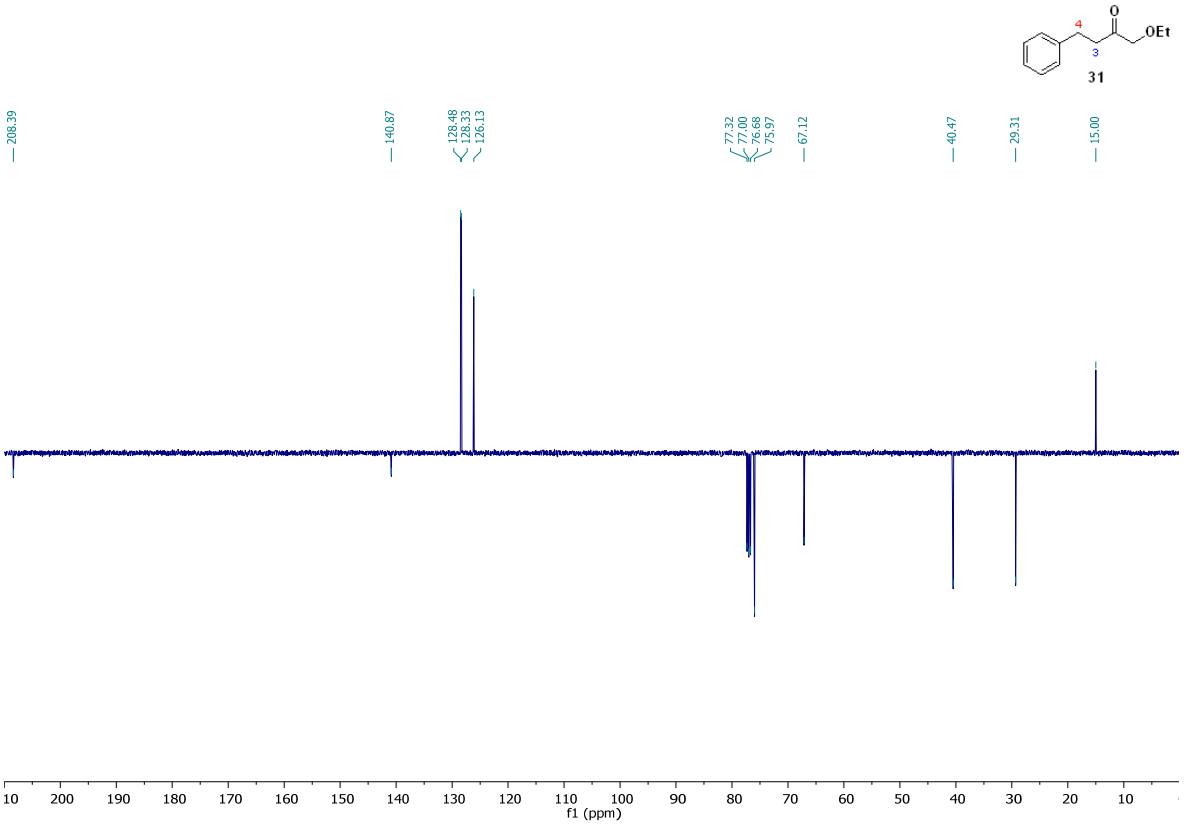

1-methoxy-2-pentadecanone (**30**) $^{13}$C NMR (100 MHz, $CDCl_3$)



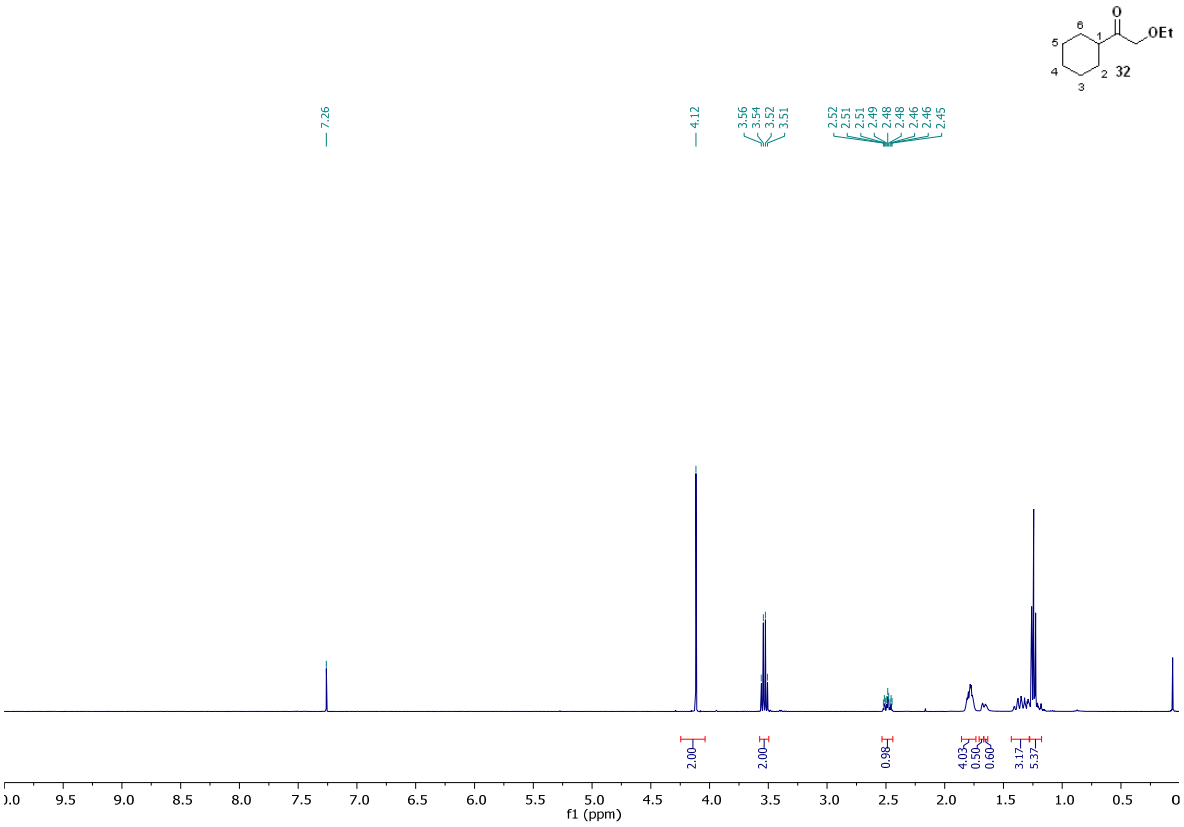
1-ethoxy-4-phenyl-2-butanone (**31**) $^{1}H$ NMR (400 MHz, $CDCl_3$)



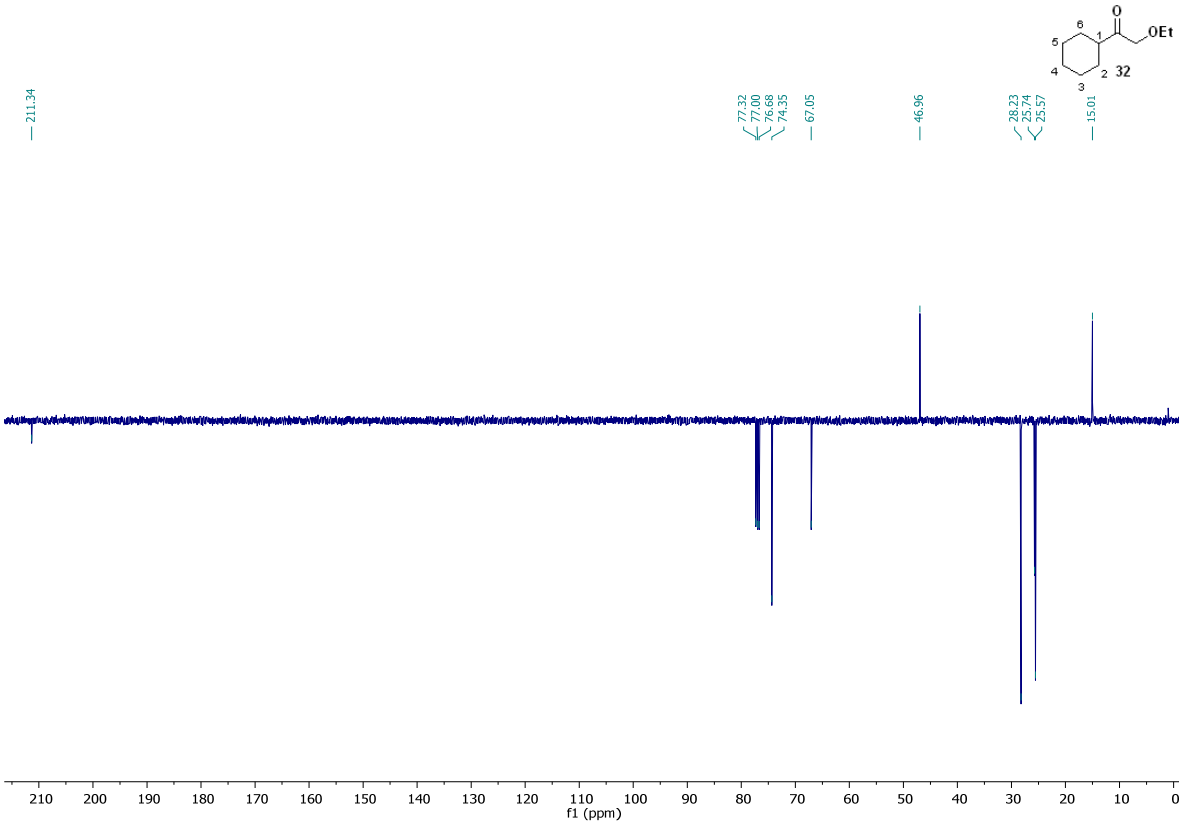

1-ethoxy-4-phenyl-2-butanone (**31**) $^{13}C$ NMR (100 MHz, $CDCl_3$)



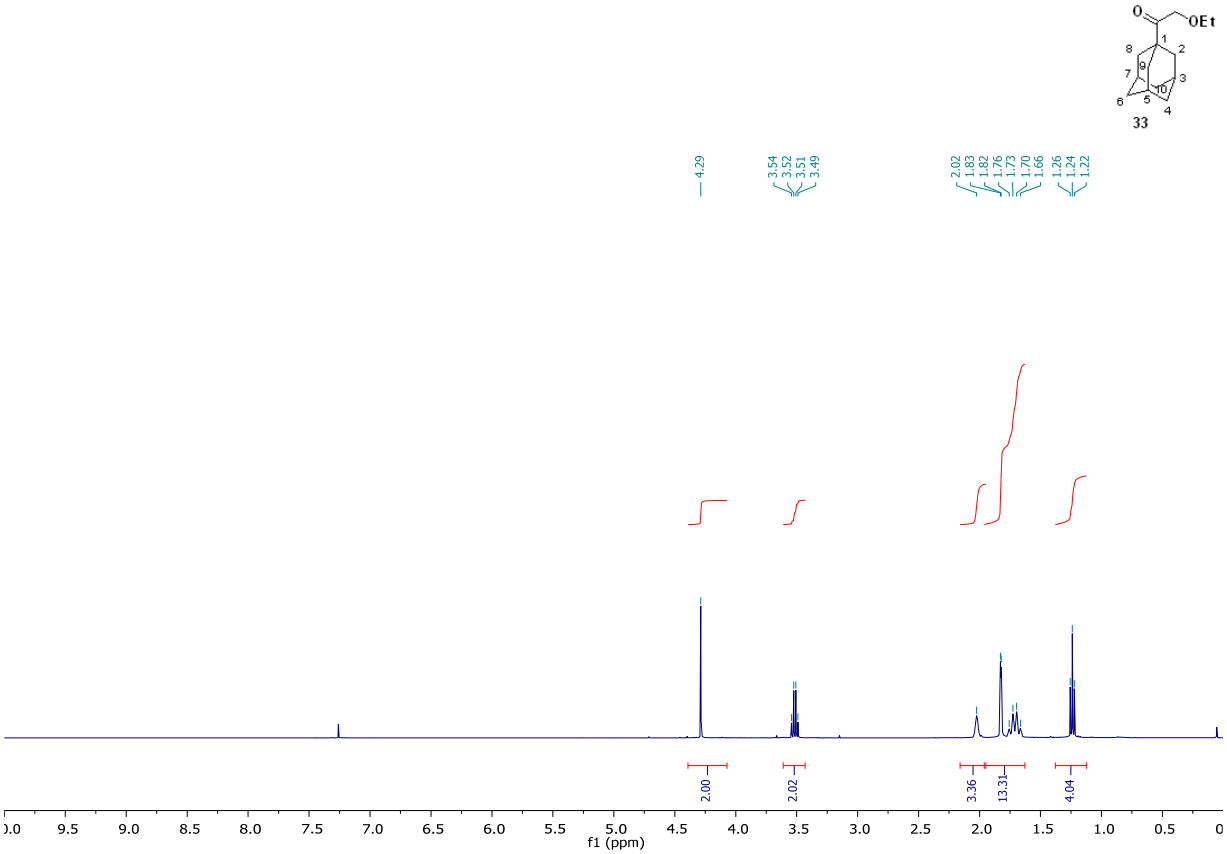
1-cyclohexyl-2-ethoxyethanone (**32**) $^{1}$H NMR (400 MHz, $CDCl_3$)



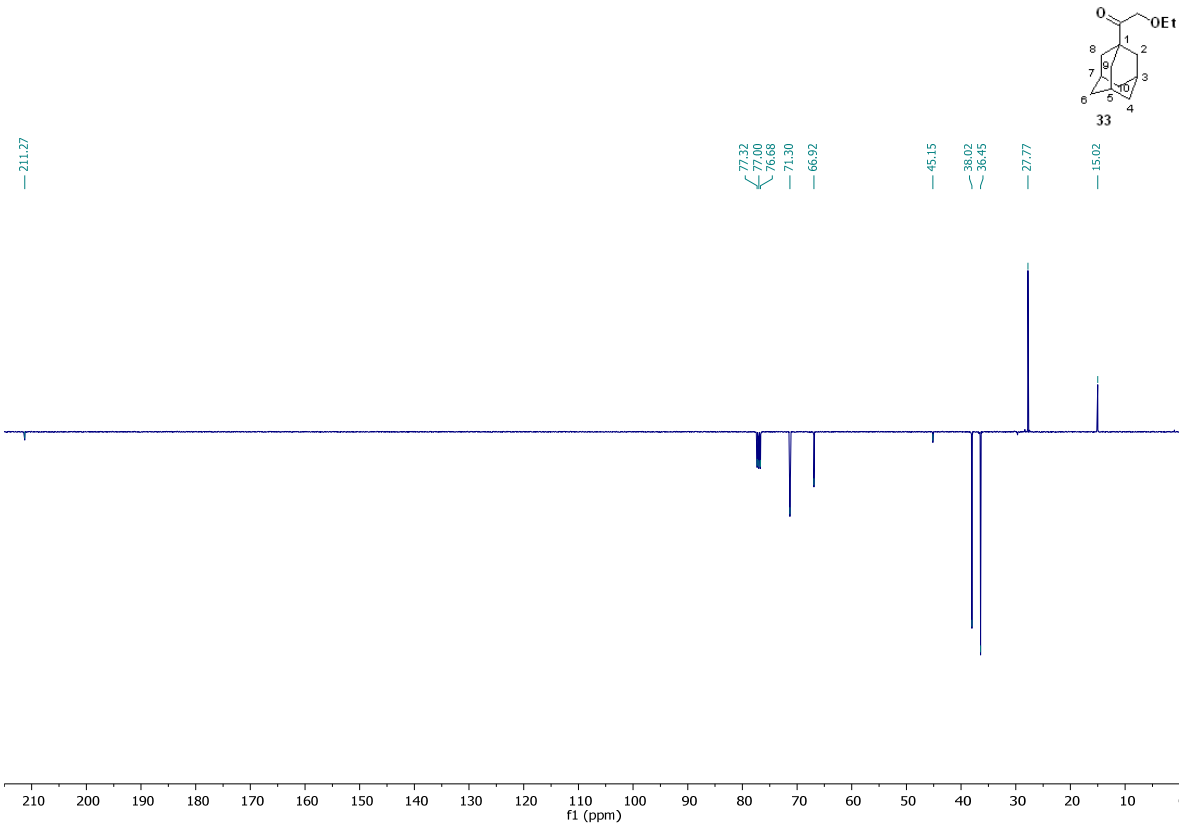

1-cyclohexyl-2-methoxyethanone (**32**) $^{13}$C NMR (100 MHz, $CDCl_3$)



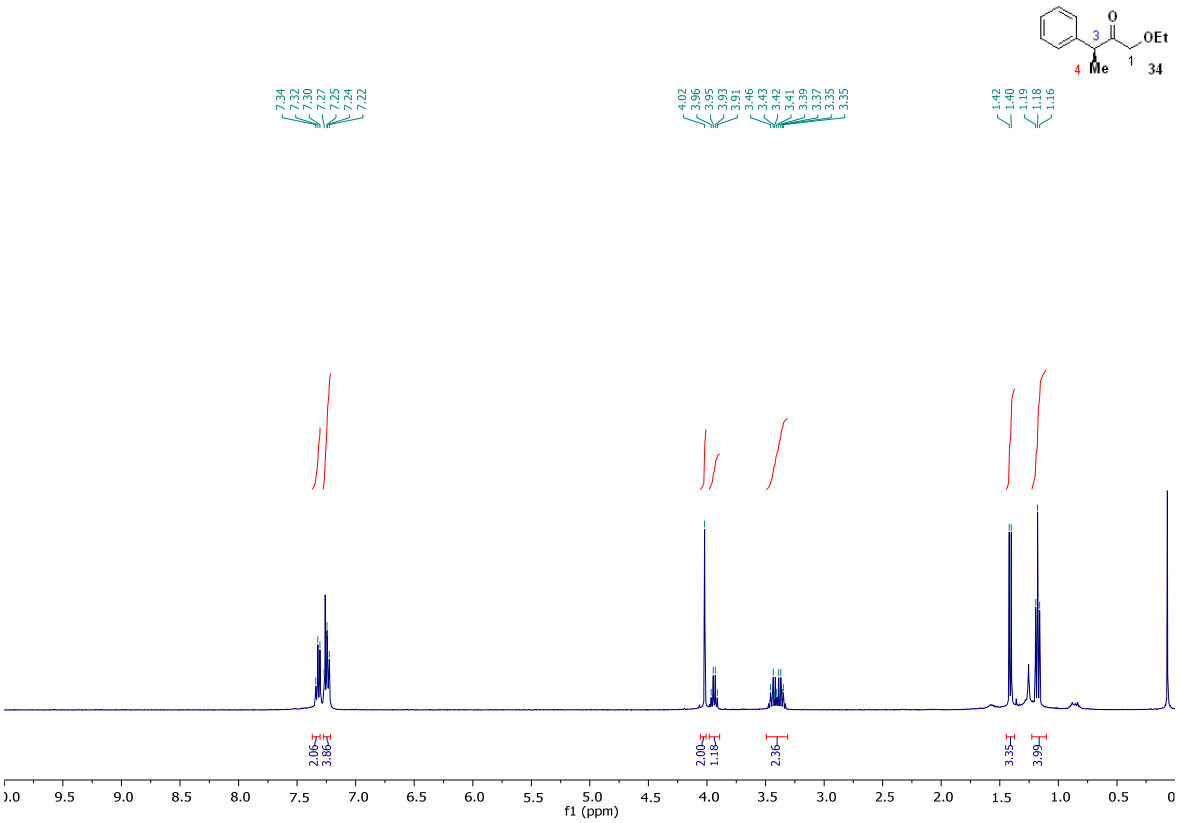
1-(adamantan-1-yl)-2-ethoxyethanone (**33**) $^{1}$H NMR (400 MHz, $CDCl_3$)



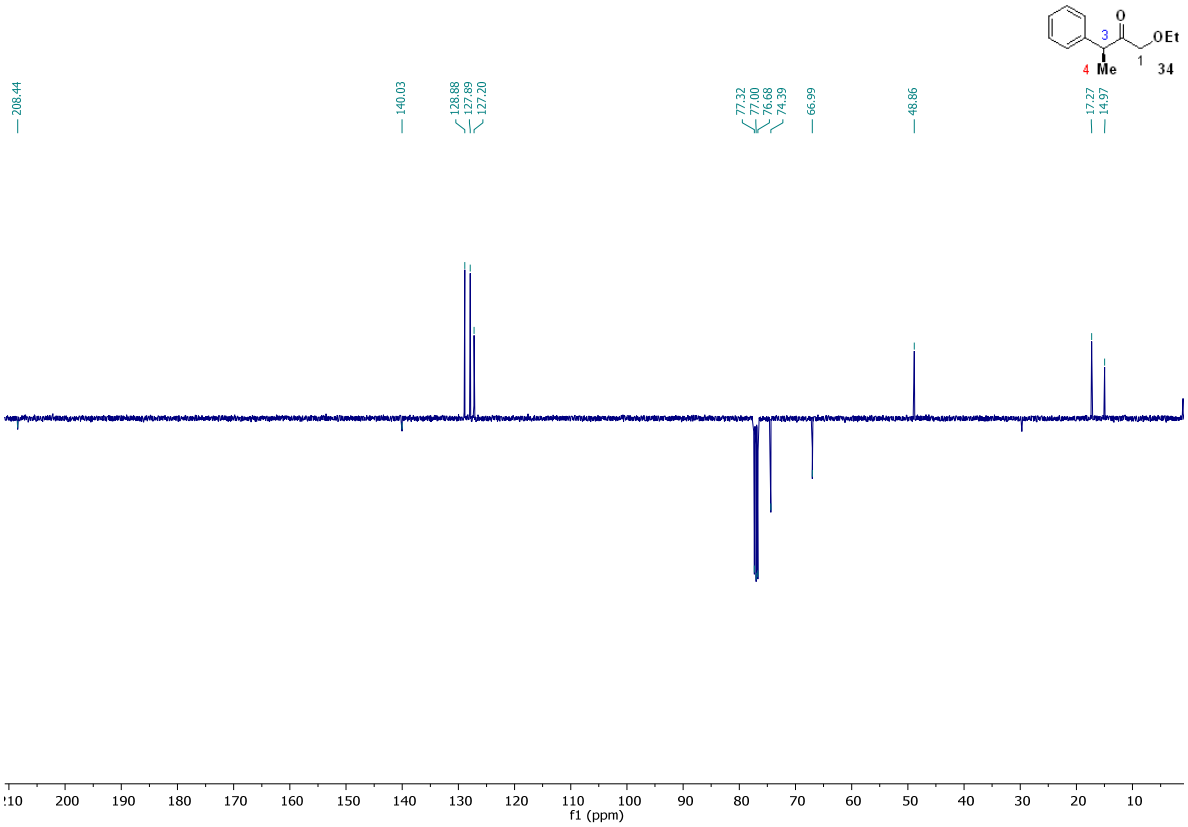

1-(adamantan-1-yl)-2-ethoxyethanone (**33**) $^{13}$C NMR (100 MHz, $CDCl_3$)



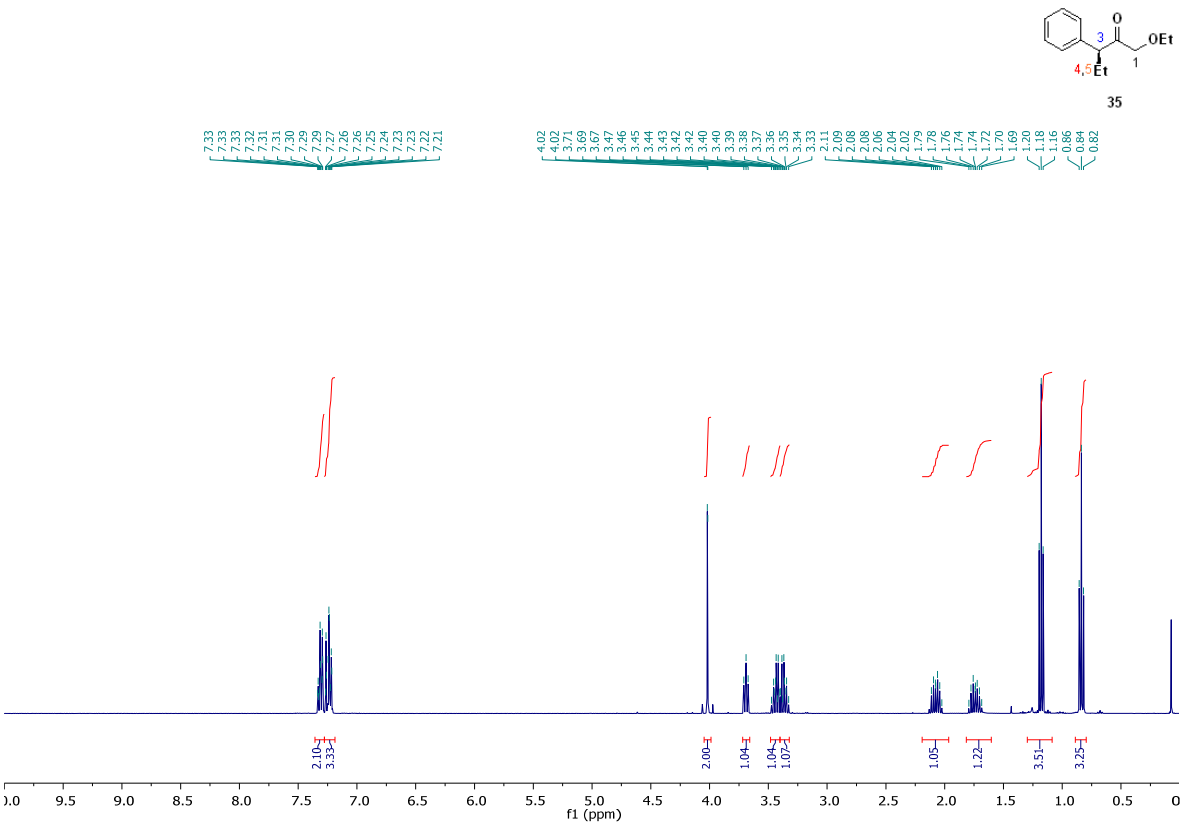
(*S*)-1-ethoxy-3-phenyl-2-butanone (**34**) $^{1}$H NMR (400 MHz, $CDCl_3$)



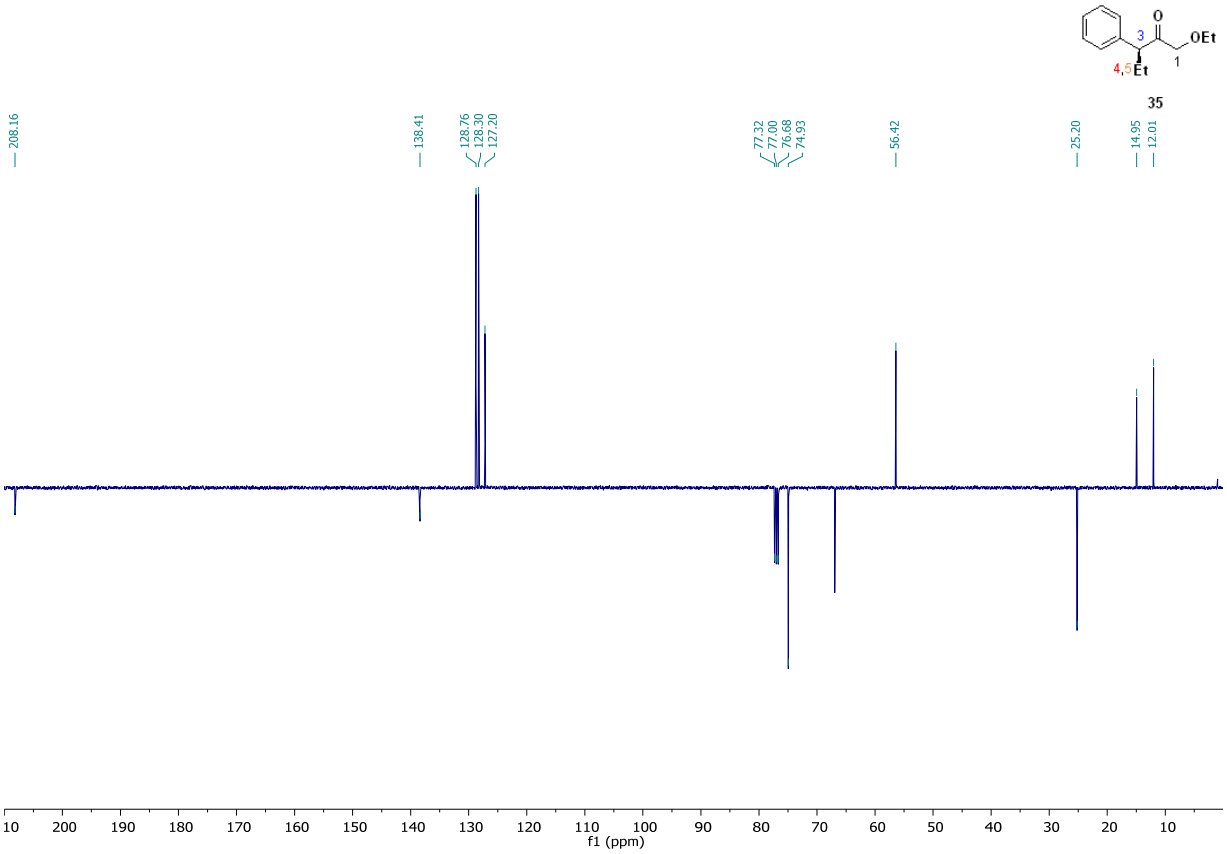

(*S*)-1-ethoxy-3-phenyl-2-butanone (**34**) $^{1}$H NMR (400 MHz, $CDCl_3$)



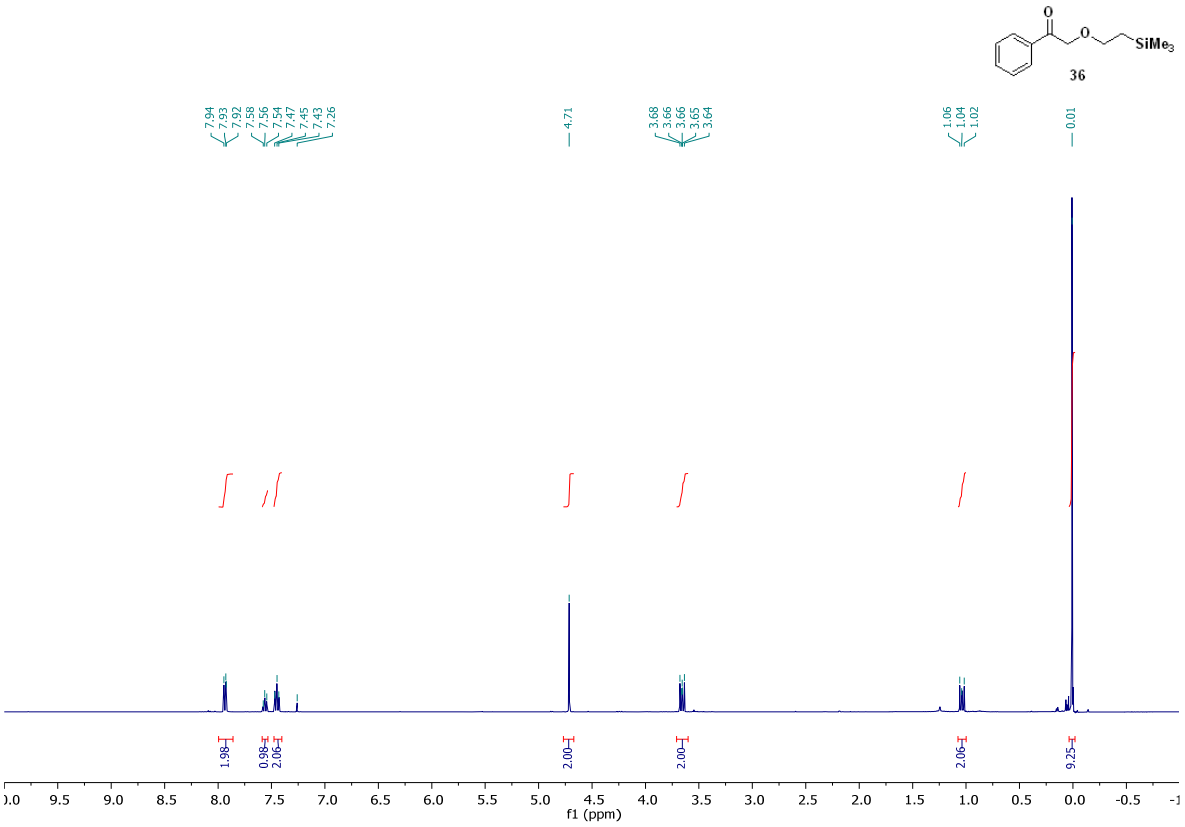
(*S*)-1-ethoxy-3-phenyl-2-pentanone (**35**) $^{1}$H NMR (400 MHz, $CDCl_3$)



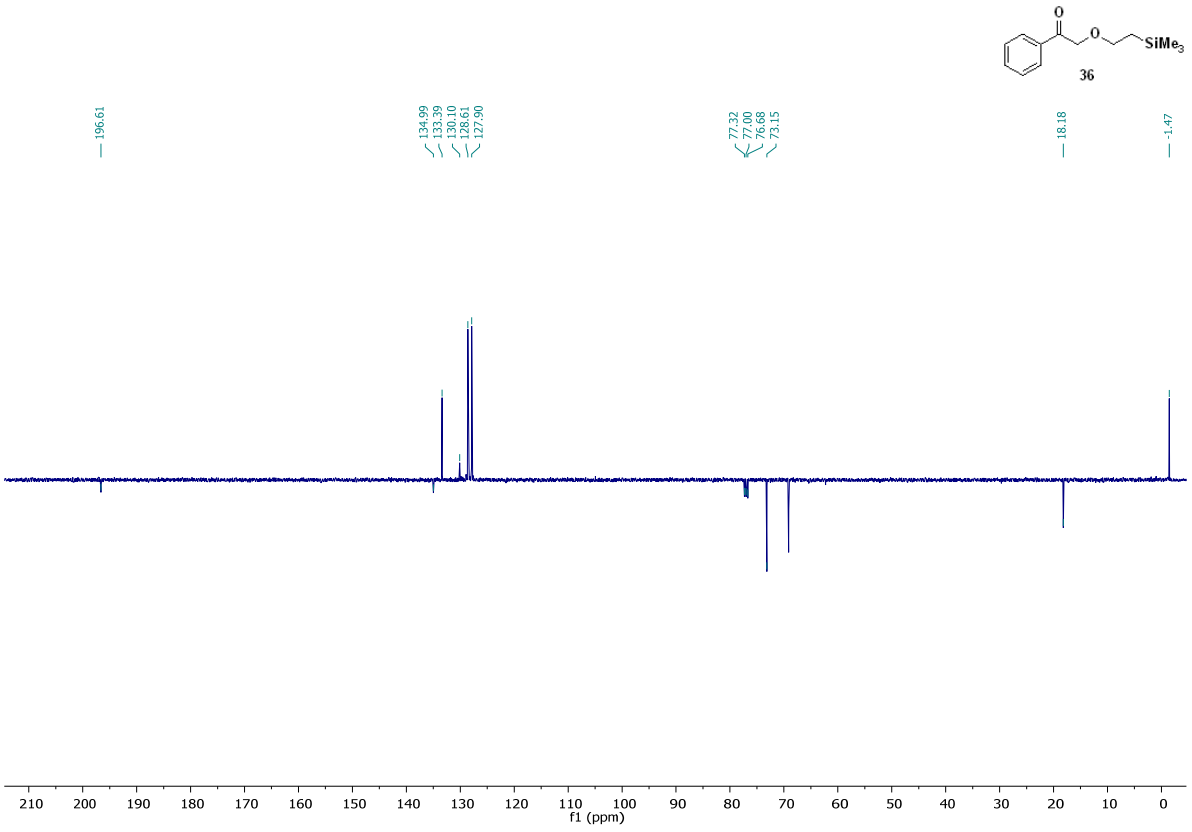

(*S*)-1-ethoxy-3-phenyl-2-pentanone (**35**) $^{13}$C NMR (100 MHz, $CDCl_3$)



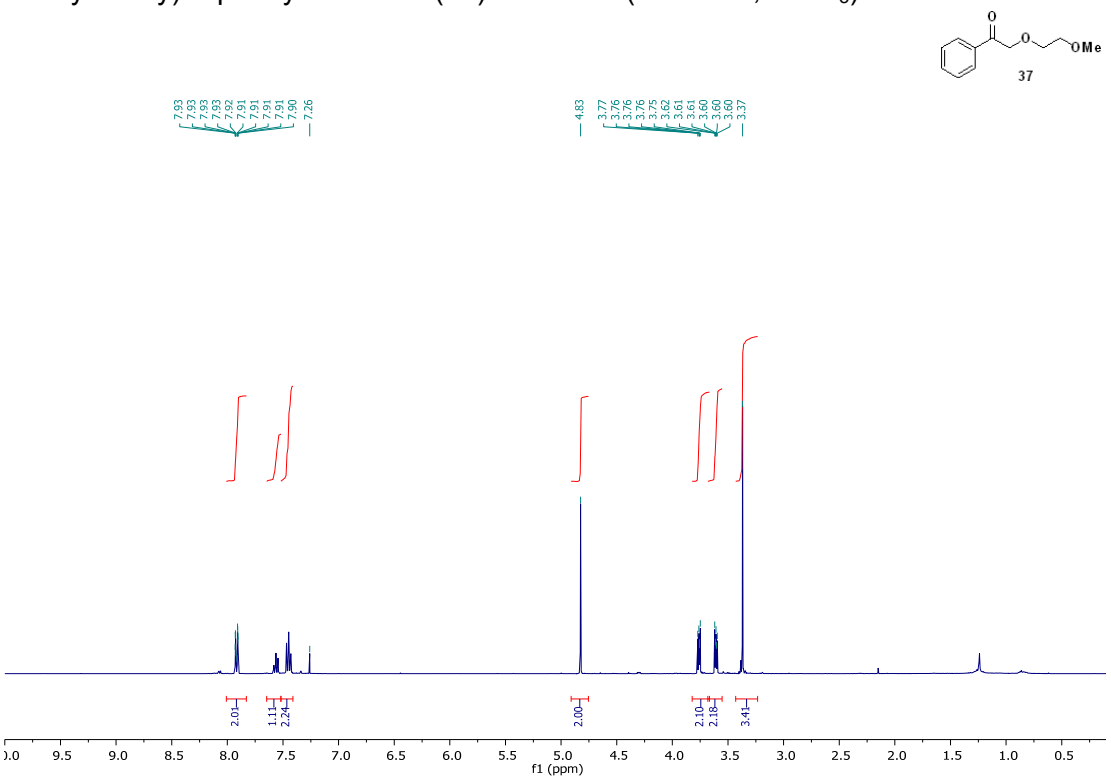
1-phenyl-2-[2-(trimethylsilyl)ethoxy]ethanone (**36**) $^{1}$H NMR (400 MHz, $CDCl_3$)



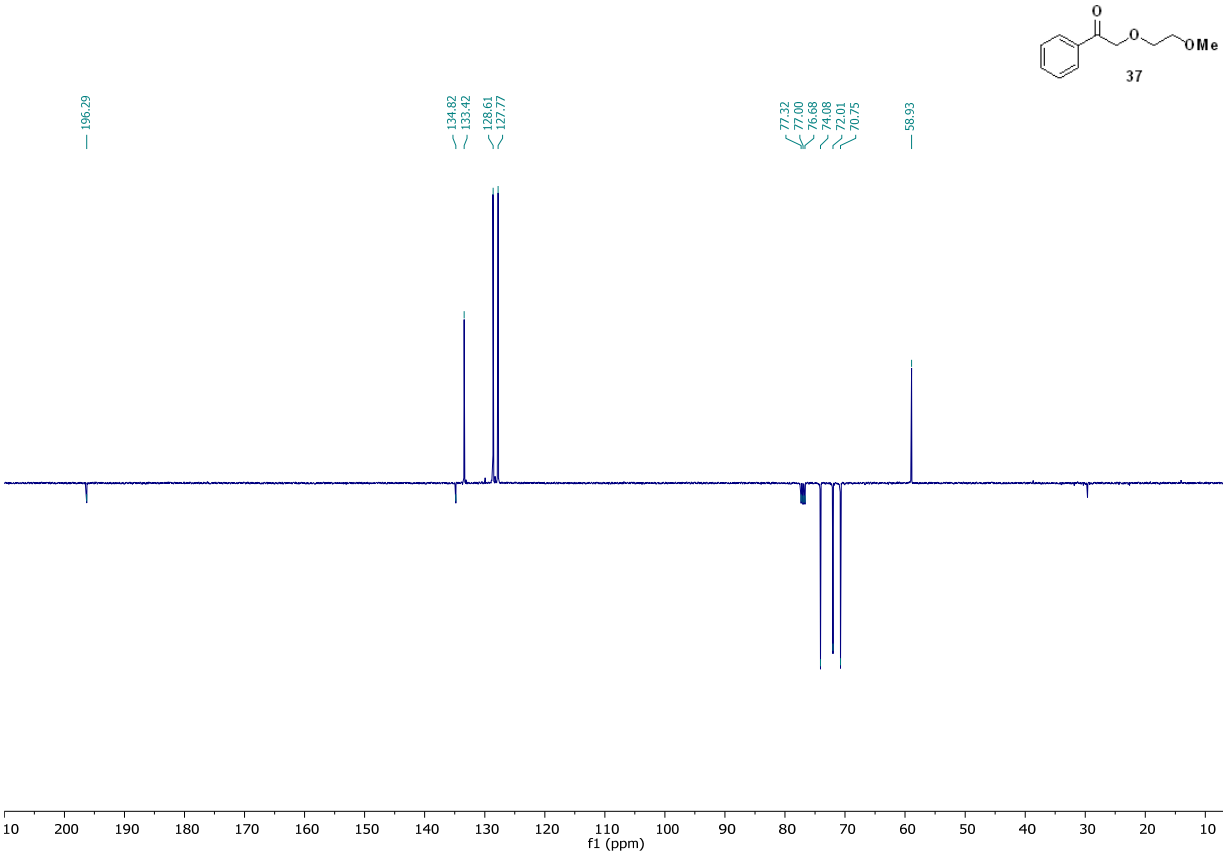

1-phenyl-2-[2-(trimethylsilyl)ethoxy]ethanone (**36**) $^{13}$C NMR (100 MHz, $CDCl_3$)



2-(2-methoxyethoxy)-1-phenylethanone (**37**) $^{1}$H NMR (400 MHz, $CDCl_3$)

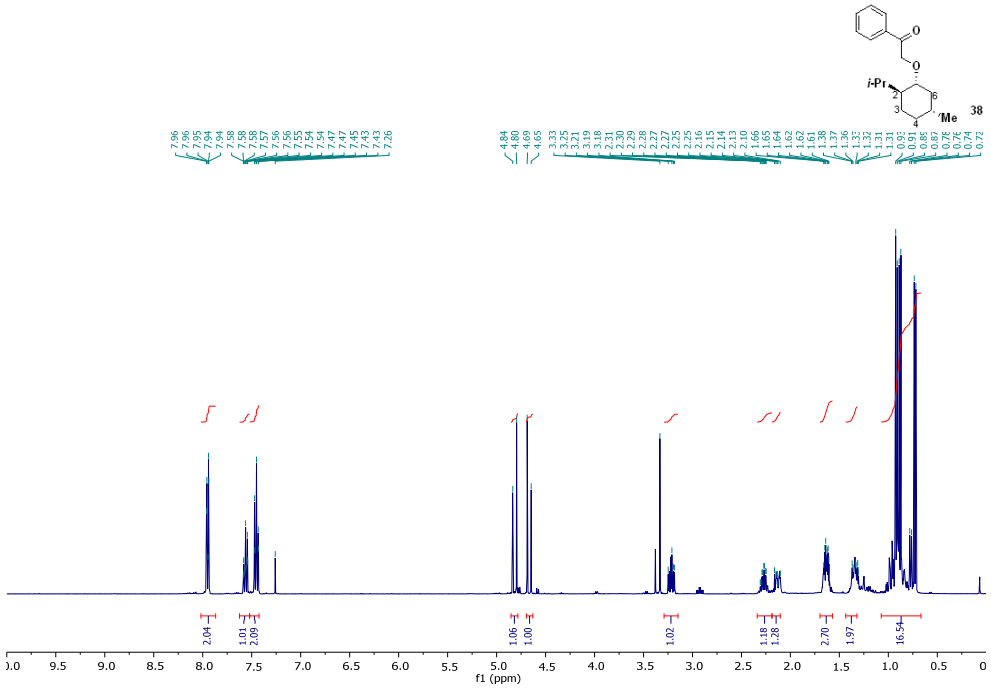



2-(2-methoxyethoxy)-1-phenylethanone (**37**) $^{13}$C NMR (100 MHz, $CDCl_3$)



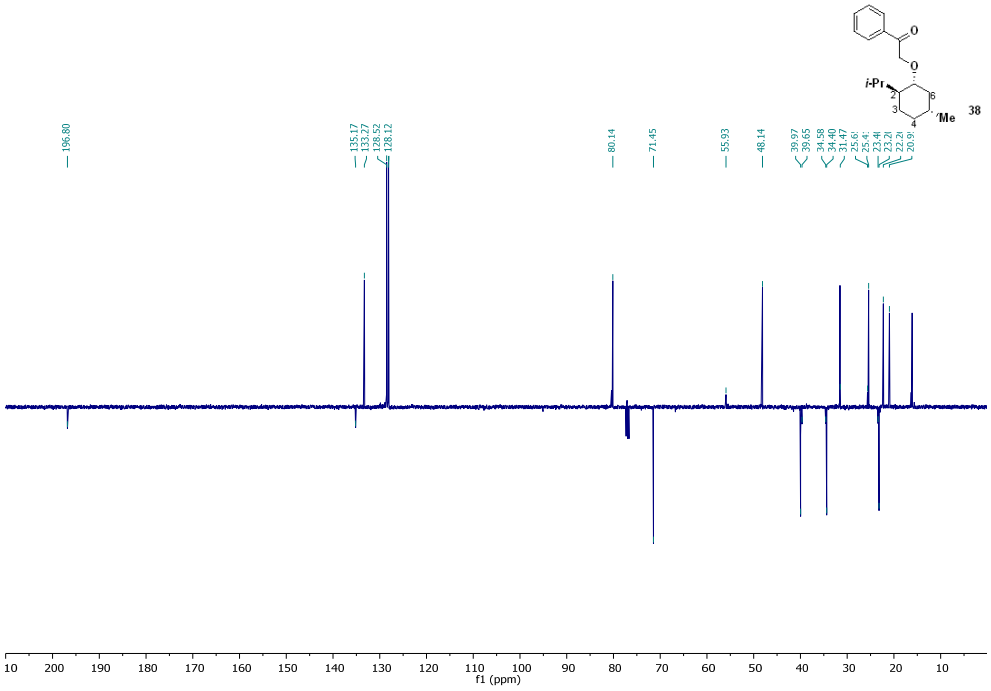
2-{[(1*S*,2*R*,5*S*)-2-isopropyl-5-methylcyclohexyl]oxy}-1-phenylethanone (**38**)

$^{1}$H NMR (400 MHz, $CDCl_3$)



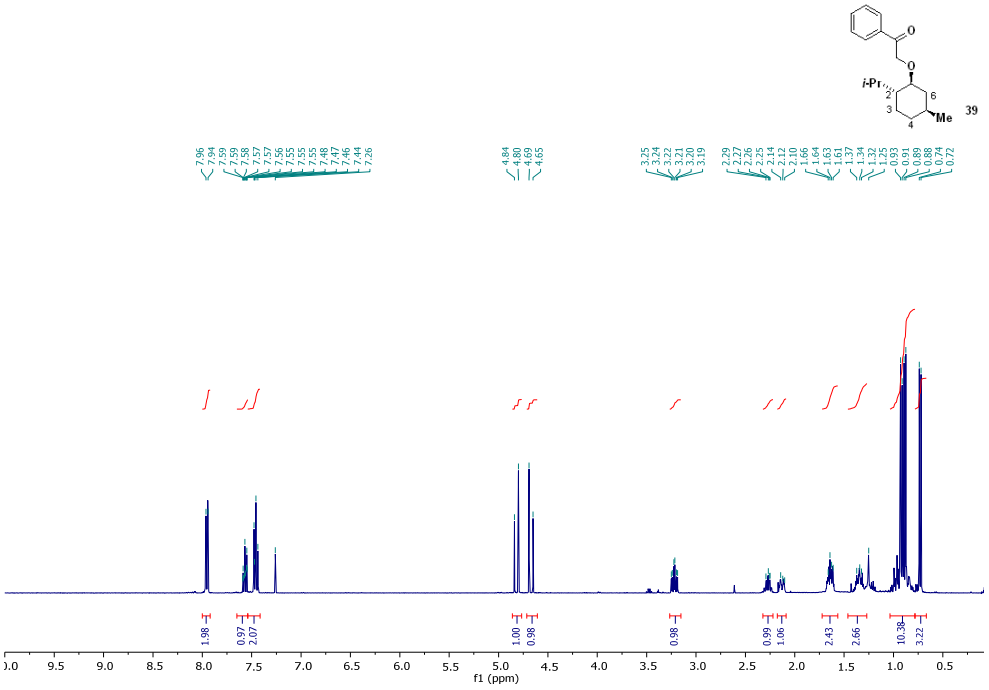

2-{[(1*S*,2*R*,5*S*)-2-isopropyl-5-methylcyclohexyl]oxy}-1-phenylethanone (**38**)

$^{13}$C NMR (100 MHz, $CDCl_3$)



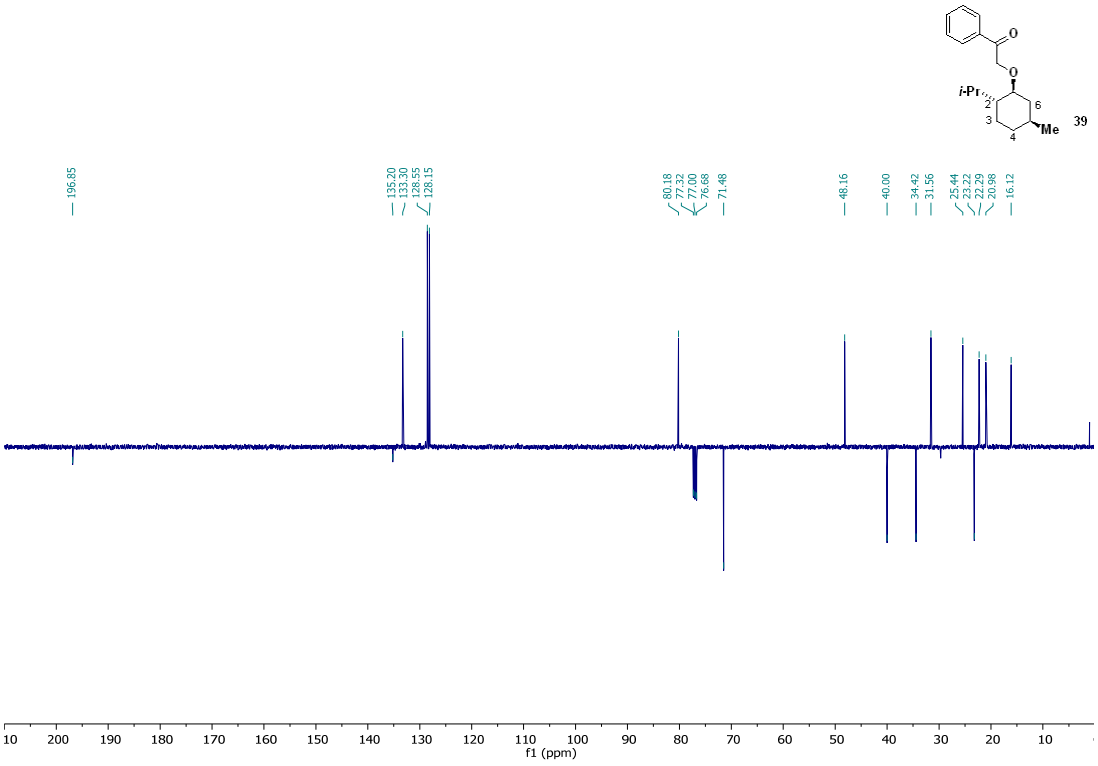
2-{[(1*R*,2*S*,5*R*)-2-isopropyl-5-methylcyclohexyl]oxy}-1-phenylethanone (**39**)

$^{1}$H NMR (400 MHz, $CDCl_3$)

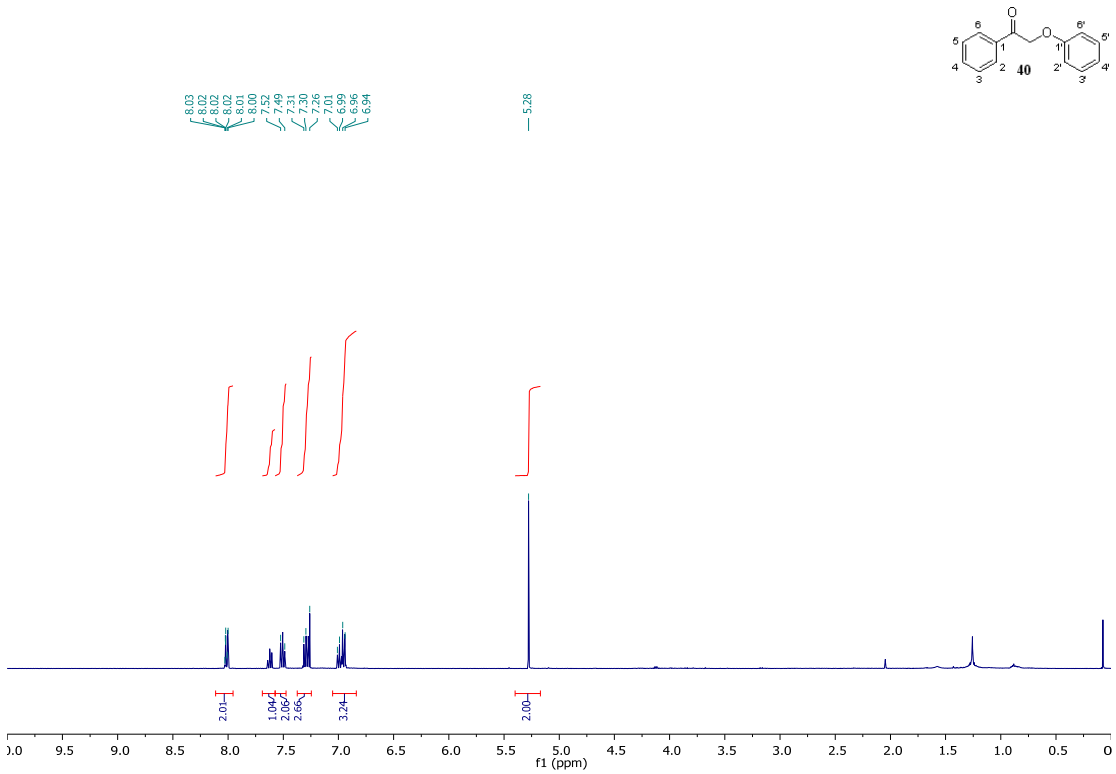



2-{[(1*R*,2*S*,5*R*)-2-isopropyl-5-methylcyclohexyl]oxy}-1-phenylethanone (**39**)

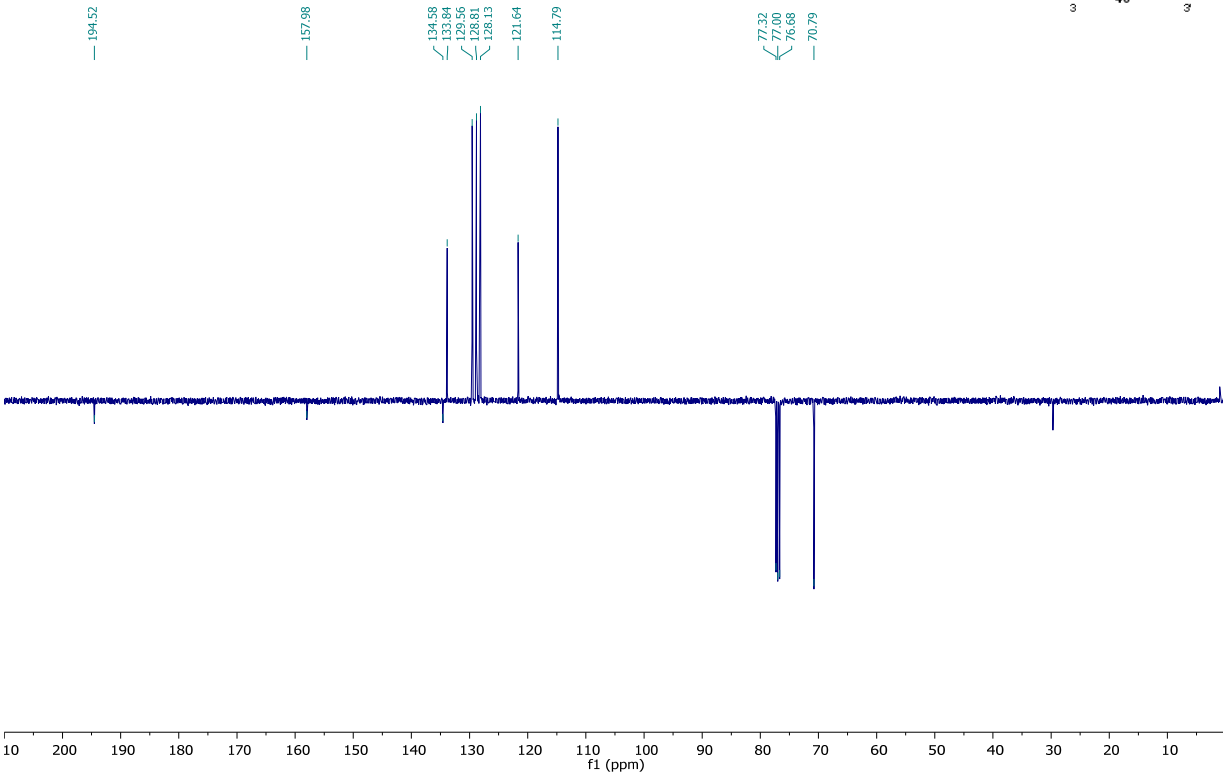
$^{13}$C NMR (100 MHz, $CDCl_3$)



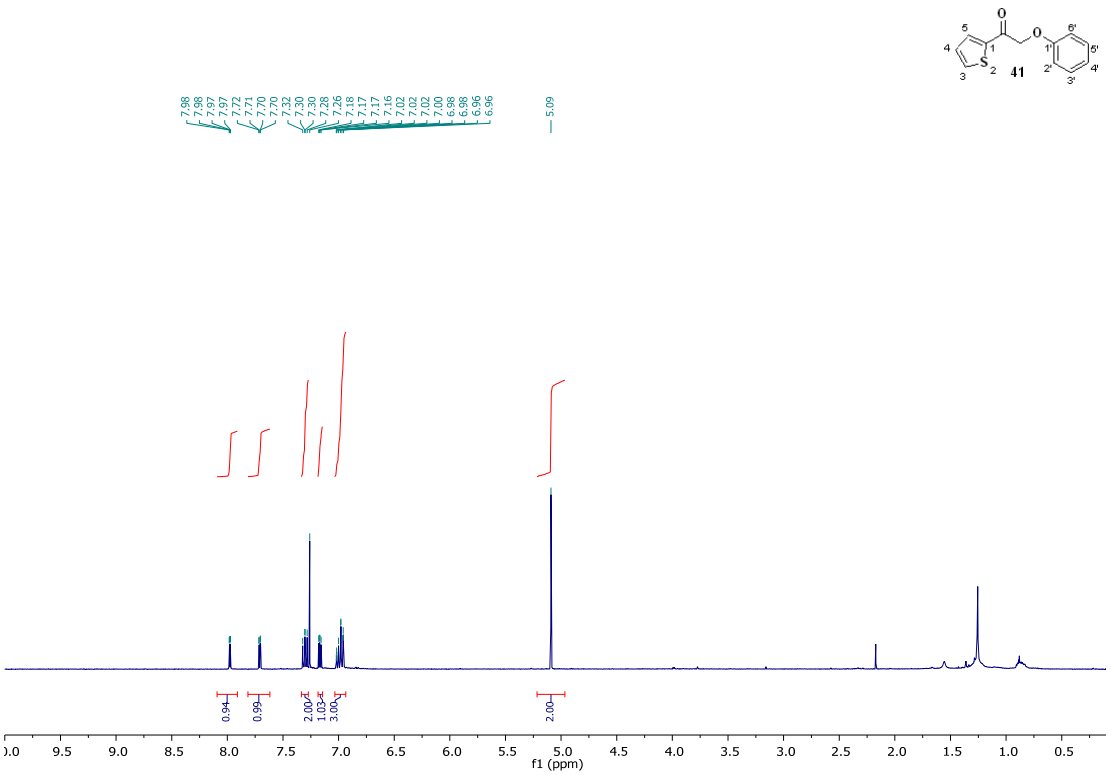
2-phenoxy-1-(2-phenyl)ethanone (**40**) $^{1}$H NMR (400 MHz, $CDCl_3$)




2-phenoxy-1-(2-phenyl)ethanone (**40**) $^{13}$C NMR (100 MHz, $CDCl_3$)



2-phenoxy-1-(2-thienyl)ethanone (**41**) $^{1}$H NMR (400 MHz, $CDCl_3$)




2-phenoxy-1-(2-thienyl)ethanone (**41**) $^{13}$C NMR (100 MHz, $CDCl_3$)