

## Supporting Information

# Decarboxylative aldol reaction of $\alpha,\alpha$ -difluoro- $\beta$ -ketocarboxylate salt: a facile method for generation of difluoroenolate

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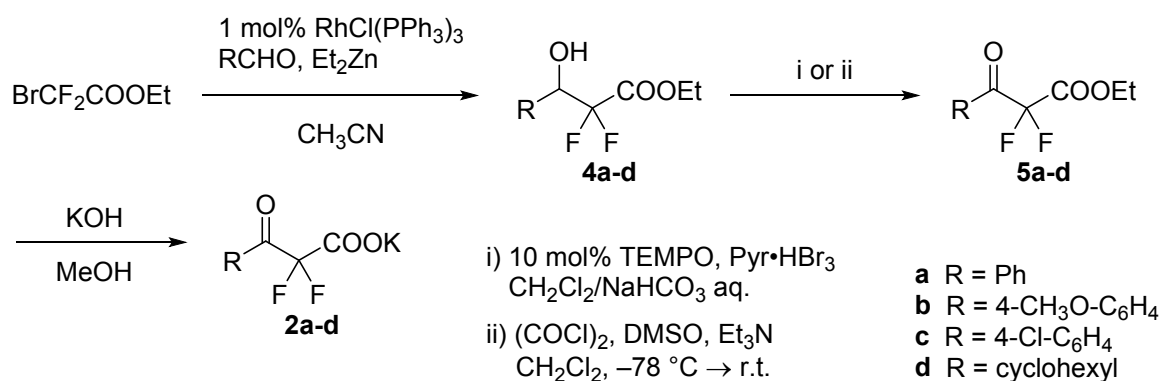
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### General information

NMR spectra were obtained from a solution in CDCl<sub>3</sub> using 400 MHz for <sup>1</sup>H, 100 MHz for <sup>13</sup>C, 376 MHz for <sup>19</sup>F. Chemical shifts of <sup>1</sup>H and <sup>13</sup>C NMR are reported in ppm from tetramethylsilane (TMS) as an internal standard. Chemical shifts of <sup>19</sup>F NMR are reported in ppm from CFC1<sub>3</sub> as an internal standard. All data are reported as follows: chemical shifts, multiplicity (s = singlet, bs = broad singlet, d = doublet, t = triplet, q = quartet, dd = double doublet, ddd = double double doublet, m = multiplet), coupling constants (Hz), and relative integration value. HRMS experiments were measured on a double-focusing mass spectrometer with an ionization mode of EI or negative FAB using nitrobenzyl alcohol (NBA) as a matrix. Melting points were measured uncorrected.

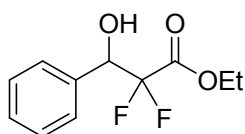
All experiments were carried out under argon atmosphere in flame-dried glassware using standard inert techniques for introducing reagents and solvents unless otherwise noted. Tetrahydrofuran (THF) was purchased from Kanto Chemical Co. Inc. as "Dehydrated". All commercially available materials were used as received without further purification. Toluene, 1,4-dioxane and *tert*-butyl methyl ether was distilled over sodium benzophenone ketyl just before use. CH<sub>3</sub>CN and DMF was distilled over CaH<sub>2</sub> just before use.

### Preparation of potassium $\alpha,\alpha$ -difluoro- $\beta$ -ketopropanoate (**2**)



### Reformatsky adduct **4**

Ethyl bromodifluoroacetate (15 mmol) and the corresponding aldehydes (10 mmol) were added to a solution of RhCl(PPh<sub>3</sub>)<sub>3</sub> (1 mol%) in CH<sub>3</sub>CN (80 mL) at 0 °C, and stirred for 0.5 hr. 1.0 M Et<sub>2</sub>Zn in hexane (15 mmol) was slowly added to the solution via dropfunnel, and then the whole mixture was stirred at room temperature. The reaction was quenched by aqueous 10% HCl and the mixture was extracted with AcOEt, and then the extract was washed with brine and dried with MgSO<sub>4</sub>. The solvent was removed *in vacuo* and the residue was purified by column chromatography on silica gel to give the corresponding Reformatsky adduct **4**.

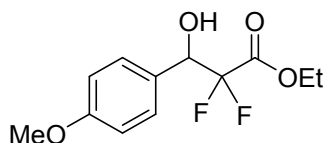


### Ethyl 2,2-difluoro-3-hydroxy-3-phenylpropanoate (**4a**)<sup>1</sup>

The titled product (**4a**) was obtained as a colorless liquid in 95% yield (2.2 g), after column chromatography on silica gel (AcOEt/hexane = 1:4).

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  7.55-7.36 (m, 5H), 5.14 (ddd, *J* = 15.4, 7.8, 5.4 Hz, 1H), 4.28 (q, *J* = 7.0 Hz, 2H), 2.96 (d, *J* = 5.4 Hz, 1H), 1.27 (t, *J* = 7.0 Hz, 3H); <sup>13</sup>C NMR (CDCl<sub>3</sub>, 100 MHz)  $\delta$  163.6 (t, *J* = 31.8 Hz), 134.4, 129.3,

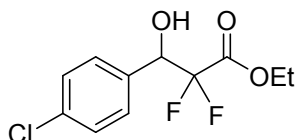
128.4, 127.7, 113.7 (dd,  $J = 259.4, 254.1$  Hz), 73.7 (dd,  $J = 27.7, 24.3$  Hz), 63.2, 13.8;  $^{19}\text{F}$  NMR (376 MHz,  $\text{CDCl}_3$ )  $\delta$  -113.8 (dd,  $J_{\text{FF}} = 262, J_{\text{HF}} = 7.8$  Hz, 1F), -120.2 (dd,  $J_{\text{FF}} = 262, J_{\text{HF}} = 15.4$  Hz, 1F).



#### Ethyl 2,2-difluoro-3-hydroxy-3-(4-methoxyphenyl)propanoate (**4b**)<sup>1</sup>

The reaction was carried out using 3 mmol scale of 4-methoxybenzaldehyde. The titled product (**4b**) was obtained as a colorless liquid in 96% yield (749.8 mg), after column chromatography on silica gel (AcOEt/hexane = 1:4).

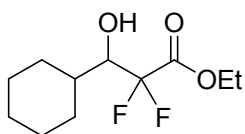
$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  7.36 (d,  $J = 8.6$  Hz, 2H), 6.91 (d,  $J = 8.6$  Hz, 2H), 5.11 (ddd,  $J = 15.3, 8.2, 5.2$  Hz, 1H), 4.31 (q,  $J = 7.0$  Hz, 2H), 3.82 (s, 1H), 2.60 (d,  $J = 5.2$  Hz, 1H), 1.30 (t,  $J = 7.0$  Hz, 3H);  $^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 100 MHz)  $\delta$  163.6 (t,  $J = 31.3$  Hz), 160.3, 129.0, 126.4, 113.9, 113.7 (dd,  $J = 262.9, 254.0$  Hz), 73.5 (dd,  $J = 27.1, 24.3$  Hz), 63.1, 55.3, 13.9;  $^{19}\text{F}$  NMR (376 MHz,  $\text{CDCl}_3$ )  $\delta$  -114.2 (dd,  $J_{\text{FF}} = 261, J_{\text{HF}} = 8.2$  Hz, 1F), -120.3 (dd,  $J_{\text{FF}} = 261, J_{\text{HF}} = 15.3$  Hz, 1F).



#### Ethyl 3-(4-chlorophenyl)-2,2-difluoro-3-hydroxypropanoate (**4c**)<sup>2</sup>

The reaction was carried out using 4 mmol scale of 4-chlorobenzaldehyde. The titled product (**4c**) was obtained as a colorless solid in 93% yield (882.9 mg), after column chromatography on silica gel (AcOEt/hexane = 1:4).

Mp: 34.0-35.5°C (from  $\text{Et}_2\text{O}-\text{C}_6$ );  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  7.40-7.35 (m, 4H), 5.15 (dd,  $J = 15.3, 7.5$  Hz, 1H), 4.32 (q,  $J = 7.2$  Hz, 2H), 2.42 (bs, 1H), 1.31 (t,  $J = 7.2$  Hz, 3H);  $^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 100 MHz)  $\delta$  163.4 (t,  $J = 31.7$  Hz), 135.2, 132.8, 129.0, 128.6, 113.5 (dd,  $J = 259.9, 254.6$  Hz), 73.2 (dd,  $J = 27.9, 24.6$  Hz), 63.2, 13.8;  $^{19}\text{F}$  NMR (376 MHz,  $\text{CDCl}_3$ )  $\delta$  -113.1 (dd,  $J_{\text{FF}} = 264, J_{\text{HF}} = 7.5$  Hz, 1F), -120.5 (dd,  $J_{\text{FF}} = 264, J_{\text{HF}} = 15.3$  Hz, 1F).



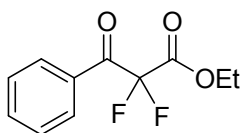
#### Ethyl 3-cyclohexyl-2,2-difluoro-3-hydroxypropanoate (**4d**)<sup>2</sup>

The reaction was carried out using 8 mmol scale of cyclohexanecarboxyaldehyde. The titled product (**4d**) was obtained as a colorless liquid in 81% yield (1.53 g), after column chromatography on silica gel (AcOEt/hexane = 1:4).

$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  4.35 (q,  $J = 7.2$  Hz, 2H), 3.84-3.80 (m, 1H), 2.07-2.06 (m, 1H), 1.93-1.91 (m, 1H), 1.79-1.66 (m, 5H), 1.36 (t,  $J = 7.2$  Hz, 3H), 1.30-1.10 (m, 5H);  $^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 100 MHz)  $\delta$  163.9 (t,  $J = 32.0$  Hz), 115.4 (t,  $J = 256.5$  Hz), 75.2 (t,  $J = 25.0$  Hz), 63.0, 38.2, 29.6, 27.3, 26.1, 26.0, 25.8, 13.9;  $^{19}\text{F}$  NMR (376 MHz,  $\text{CDCl}_3$ )  $\delta$  -111.5 (dd,  $J_{\text{FF}} = 263, J_{\text{HF}} = 7.9$  Hz, 1F), -120.0 (dd,  $J_{\text{FF}} = 263, J_{\text{HF}} = 17.8$  Hz, 1F). HRMS (EI)  $m/z$  calcd for  $\text{C}_{11}\text{H}_{18}\text{F}_2\text{O}_3$  [ $\text{M}$ ]<sup>+</sup> 236.1224, found 236.1229.

#### Oxidation of Reformatsky adduct 4

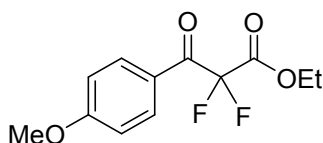
2,2,6,6-Tetramethylpiperidine 1-oxyl (TEMPO, 10 mol%) was added to a solution of Reformatsky adduct **4** (8.8 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (53 mL) at room temperature, then aqueous NaHCO<sub>3</sub> (5%, 123 mL) was added at same temperature. Finally, pyridine hydrobromide perbromide (13.2 mmol) was added to the mixture and the whole mixture was stirred vigorously for 2 hr. The reaction was quenched by aqueous 5% Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> and the mixture was extracted with AcOEt, and then the extract was washed with brine and dried with MgSO<sub>4</sub>. The solvent was removed *in vacuo* and the residue was purified by column chromatography on silica gel to give the corresponding Ethyl 2,2-difluoro-3-oxo-3-arylpropanoate **5**.



#### Ethyl 2,2-difluoro-3-oxo-3-phenylpropanoate (**5a**)<sup>1</sup>

The titled product (**5a**) was obtained as a colorless liquid in 84% yield (1.7 g), after column chromatography on silica gel (AcOEt/hexane = 1:19).

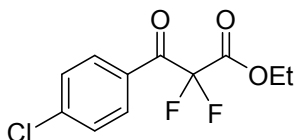
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 8.09-8.07 (m, 2H), 7.70-7.66 (m, 1H), 7.55-7.51 (m, 2H), 4.39 (q, *J* = 7.2 Hz, 2H), 1.32 (t, *J* = 7.2 Hz, 3H); <sup>13</sup>C NMR (CDCl<sub>3</sub>, 100 MHz) δ 185.5 (t, *J* = 27.5 Hz), 161.8 (t, *J* = 30.3 Hz), 135.1, 131.0, 129.9 (m), 128.9, 109.8 (t, *J* = 264.0 Hz), 63.8, 13.8; <sup>19</sup>F NMR (376 MHz, CDCl<sub>3</sub>) δ -44.9 (s, 2F).



#### Ethyl 2,2-difluoro-3-(4-methoxyphenyl)-3-oxopropanoate (**5b**)<sup>1</sup>

The reaction was carried out using 2.9 mmol scale of **4b**. The titled product (**5b**) was obtained as a colorless liquid in 94% yield (706.7 mg), after column chromatography on silica gel (AcOEt/hexane = 1:19).

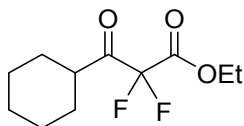
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 8.09-8.07 (d, *J* = 8.5 Hz, 2H), 6.99-6.97 (d, *J* = 8.5 Hz, 2H), 4.38 (q, *J* = 7.1 Hz, 2H), 3.91 (s, 3H), 1.32 (t, *J* = 7.1 Hz, 3H); <sup>13</sup>C NMR (CDCl<sub>3</sub>, 100 MHz) δ 183.8 (t, *J* = 27.5 Hz), 165.1, 162.1 (t, *J* = 30.5 Hz), 132.6 (m), 123.9, 114.3, 110.1 (t, *J* = 264 Hz), 63.7, 55.7, 13.9; <sup>19</sup>F NMR (376 MHz, CDCl<sub>3</sub>) δ -107.1 (s, 2F). HRMS (EI) *m/z* calcd for C<sub>12</sub>H<sub>12</sub>F<sub>2</sub>O<sub>4</sub> [M]<sup>+</sup> 258.0704, found 258.0706



#### Ethyl 3-(4-chlorophenyl)-2,2-difluoro-3-oxopropanoate (**5c**)

The reaction was carried out using 3.0 mmol scale of **4c**. The titled product (**5c**) was obtained as a colorless liquid in 81% yield (642.0 mg), after column chromatography on silica gel (AcOEt/hexane = 1:19).

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 8.03 (d, *J* = 8.7 Hz, 2H), 7.51 (d, *J* = 8.7 Hz, 2H), 4.40 (q, *J* = 7.2 Hz, 2H), 1.33 (t, *J* = 7.2 Hz, 3H); <sup>13</sup>C NMR (CDCl<sub>3</sub>, 100 MHz) δ 184.5 (t, *J* = 27.9 Hz), 161.6 (t, *J* = 30.3 Hz), 142.0, 131.3 (m), 129.4, 129.3, 109.7 (t, *J* = 265 Hz), 63.9, 13.8; <sup>19</sup>F NMR (376 MHz, CDCl<sub>3</sub>) δ -107.2 (s, 2F). HRMS (EI) *m/z* calcd for C<sub>11</sub>H<sub>9</sub>ClF<sub>2</sub>O<sub>3</sub> [M]<sup>+</sup> 262.0208, found 262.0217 (100), 264.0169(35.8).

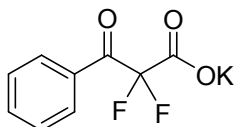


### Ethyl 3-cyclohexyl-2,2-difluoro-3-oxopropanoate (**5d**)<sup>1</sup>

To a dry and argon-flushed reaction vessel, equipped with a magnetic stirrer, were added CH<sub>2</sub>Cl<sub>2</sub> (28 mL) and oxalyl chloride (13 mmol), then the solution was cooled to -78 °C. Dimethyl sulfoxide (26 mmol) was added slowly to the cold solution. After the whole mixture was stirred for 0.5 hr, the solution of **4d** (6.5 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (18 mL) was added slowly to the reaction mixture. Finally, triethylamine (32.5 mmol) was added slowly to the above mixture. The whole mixture was warmed up to room temperature and was stirred at same temperature for 0.5 hr. The reaction was quenched by aqueous saturated NH<sub>4</sub>Cl and the mixture was extracted with AcOEt, and then the extract was washed with brine and dried with MgSO<sub>4</sub>. The solvent was removed *in vacuo* and the residue was purified by column chromatography (AcOEt/C<sub>6</sub> = 1:19) on silica gel to give Ethyl 2,2-difluoro-3-oxo-3-cyclohexylpropionate **5d** as a colorless solid in 98% yield (1.49 g).

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 4.36 (q, *J* = 7.2 Hz, 2H), 2.93-2.87 (m, 1H), 1.69-1.92 (m, 5H), 1.42-1.22 (m, 8H); <sup>13</sup>C NMR (CDCl<sub>3</sub>, 100 MHz) δ 200.2 (t, *J* = 27.0 Hz), 161.6 (t, *J* = 30.8 Hz), 108.6 (t, *J* = 265 Hz), 63.6, 45.3, 28.1, 25.5, 25.3, 13.9; <sup>19</sup>F NMR (376 MHz, CDCl<sub>3</sub>) δ -113.0 (s, 2F). HRMS (EI) *m/z* calcd for C<sub>11</sub>H<sub>16</sub>F<sub>2</sub>O<sub>3</sub> [M]<sup>+</sup> 234.1068, found 234.1072.

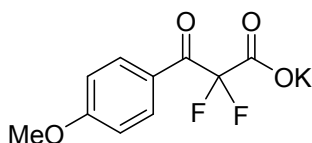
### Saponification of α,α-difluoro-β-keto ester (**5**)



### Potassium 2,2-difluoro-3-oxo-3-phenylpropanoate (**2a**)<sup>1</sup>

The solution of 3-substituted Ethyl 2,2-difluoro-3-oxopropionate **5a** (14.6 mmol) in MeOH (10 mL) was cooled to 0 °C, then pre-cooled solution of KOH in MeOH (14.6 mmol, 4.6 mL) was added slowly via syringe. The whole mixture was stirred at room temperature for 6 hr. The reaction mixture was concentrated *in vacuo*, then the residue was suspended by AcOEt/Et<sub>2</sub>O (= 1:1). The suspension was sonicated for 10 min then the precipitate was corrected by suction filtration. The filtrate was dried under reduce pressure to give potassium 2,2-difluoro-3-oxo-3-arylpropanoate **2a** in 80% yield (2.76 g) without purification.

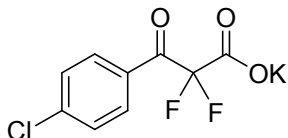
<sup>1</sup>H NMR (400 MHz, DMSO-d<sub>6</sub>) δ 8.02-8.00 (m, 2H), 7.67-7.64 (m, 1H), 7.54-7.50 (m, 2H); <sup>13</sup>C NMR (DMSO-d<sub>6</sub>, 100 MHz) δ 189.6 (t, *J* = 27.5 Hz), 162.4 (m), 133.7, 132.6, 129.1, 128.5, 111.3 (t, *J* = 264 Hz); <sup>19</sup>F NMR (376 MHz, CDCl<sub>3</sub>) δ -105.2 (s, 2F). HRMS (FAB, NBA) *m/z* calcd for C<sub>9</sub>H<sub>5</sub>F<sub>2</sub>O<sub>3</sub> [M-K]<sup>-</sup> 199.0212, found 199.0205.



### Potassium 2,2-difluoro-3-(4-methoxyphenyl)-3-oxopropanoate (**2b**)<sup>1</sup>

The reaction was carried out using 3.3 mmol scale of **5b**. The titled product (**2b**) was obtained as a colorless solid in 89% yield (786.0 mg) without purification.

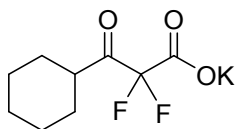
$^1\text{H}$  NMR (400 MHz, DMSO- $d_6$ )  $\delta$  8.00 (d,  $J$  = 8.8 Hz, 2H), 7.04 (d,  $J$  = 8.8 Hz, 2H), 3.84 (s, 3H);  $^{13}\text{C}$  NMR (DMSO- $d_6$ , 100 MHz)  $\delta$  187.9 (t,  $J$  = 27.5 Hz), 163.4, 162.5 (t,  $J$  = 24.1 Hz), 131.5, 125.3, 113.7, 111.3 (t,  $J$  = 262 Hz), 55.5;  $^{19}\text{F}$  NMR (376 MHz,  $\text{CDCl}_3$ )  $\delta$  -104.8 (s, 2F). HRMS (FAB, NBA)  $m/z$  calcd for  $\text{C}_{10}\text{H}_7\text{F}_2\text{O}_4$   $[\text{M}-\text{K}]^-$  229.0318, found 229.0317.



#### Potassium 3-(4-chlorophenyl)-2,2-difluoro-3-oxopropanoate (**2c**)

The reaction was carried out using 2.2 mmol scale of **5c**. The titled product (**2c**) was obtained as a colorless solid in 78% yield (482.5 mg) without purification.

$^1\text{H}$  NMR (400 MHz, DMSO- $d_6$ )  $\delta$  8.00 (d,  $J$  = 8.5 Hz, 2H), 7.62 (d,  $J$  = 8.5 Hz, 2H);  $^{13}\text{C}$  NMR (DMSO- $d_6$ , 100 MHz)  $\delta$  188.7 (t,  $J$  = 28.4 Hz), 162.0 (t,  $J$  = 23.6 Hz), 138.7, 131.2, 130.9, 128.7, 111.1 (t,  $J$  = 263 Hz);  $^{19}\text{F}$  NMR (376 MHz, DMSO- $d_6$ )  $\delta$  -105.4 (s, 2F). HRMS (FAB, NBA)  $m/z$  calcd for  $\text{C}_9\text{H}_4\text{ClF}_2\text{O}_3$   $[\text{M}-\text{K}]^-$  232.9823, found 232.9821.



#### Potassium 3-cyclohexyl-2,2-difluoro-3-oxopropanoate (**2d**)<sup>1</sup>

The reaction was carried out using 6.3 mmol scale of **5d**. The titled product (**2d**) was obtained as a colorless solid in 79% yield (1.24 g) without purification.

$^1\text{H}$  NMR (400 MHz, DMSO- $d_6$ )  $\delta$  2.72-2.67 (m, 1H), 1.77-1.60 (m, 5H), 1.28-1.08 (m, 5H);  $^{13}\text{C}$  NMR (DMSO- $d_6$ , 100 MHz)  $\delta$  203.8 (t,  $J$  = 26.0 Hz), 162.0 (t,  $J$  = 24.5 Hz), 111.1 (t,  $J$  = 265 Hz), 44.7, 28.1, 25.2, 24.9;  $^{19}\text{F}$  NMR (376 MHz, DMSO- $d_6$ )  $\delta$  -111.0 (s, 2F). HRMS (FAB, NBA)  $m/z$  calcd for  $\text{C}_9\text{H}_{11}\text{F}_2\text{O}_3$   $[\text{M}-\text{K}]^-$  205.0682, found 205.0666.

**Table S-1. Screening of counter cation of 2a and the loading of ZnCl<sub>2</sub>/TMEDA.**

Entry	Substrates	X	ZnCl <sub>2</sub> • TMEDA (equiv)	Time (h)	Yield of 6aa <sup>a</sup>
1	<b>2a</b>	K	1.0	5	88
2	<b>9a</b>	Na	1.0	16	83
3	<b>10a</b>	Li	1.0	16	75
4	<b>2a</b>	K	0.5	24	82
5	<b>2a</b>	K	0.1	24	39

a: Isolated yields.

**Table S-2. Screening of solvent.**

Entry	Solvents	Temp. (°C)	Yield of 6aa (%) <sup>a</sup>
1	THF (optimized condition)	80	(98) <sup>b</sup>
2	THF	80	42
3	<i>tert</i> -butyl methyl ether	65	0
4	<i>tert</i> -butyl methyl ether	65	0 <sup>b</sup>
5	1,4-dioxane	115	(80)
6	1,4-dioxane	115	(90) <sup>b</sup>
7	CH <sub>3</sub> CN	95	57
8	CH <sub>3</sub> CN	95	53 <sup>b</sup>
9	CH <sub>3</sub> CN/THF (1:1)	95	72
10	CH <sub>3</sub> CN/THF (1:5)	95	80
11	DMF	165	0
12	DMF	165	0 <sup>b</sup>
13	toluene	110	52
14	toluene	110	48 <sup>b</sup>

a: <sup>19</sup>F NMR yields. Isolated yield was show in parenthesis.

b: H<sub>2</sub>O (1.0 equiv) was added to the corresponding solvent.

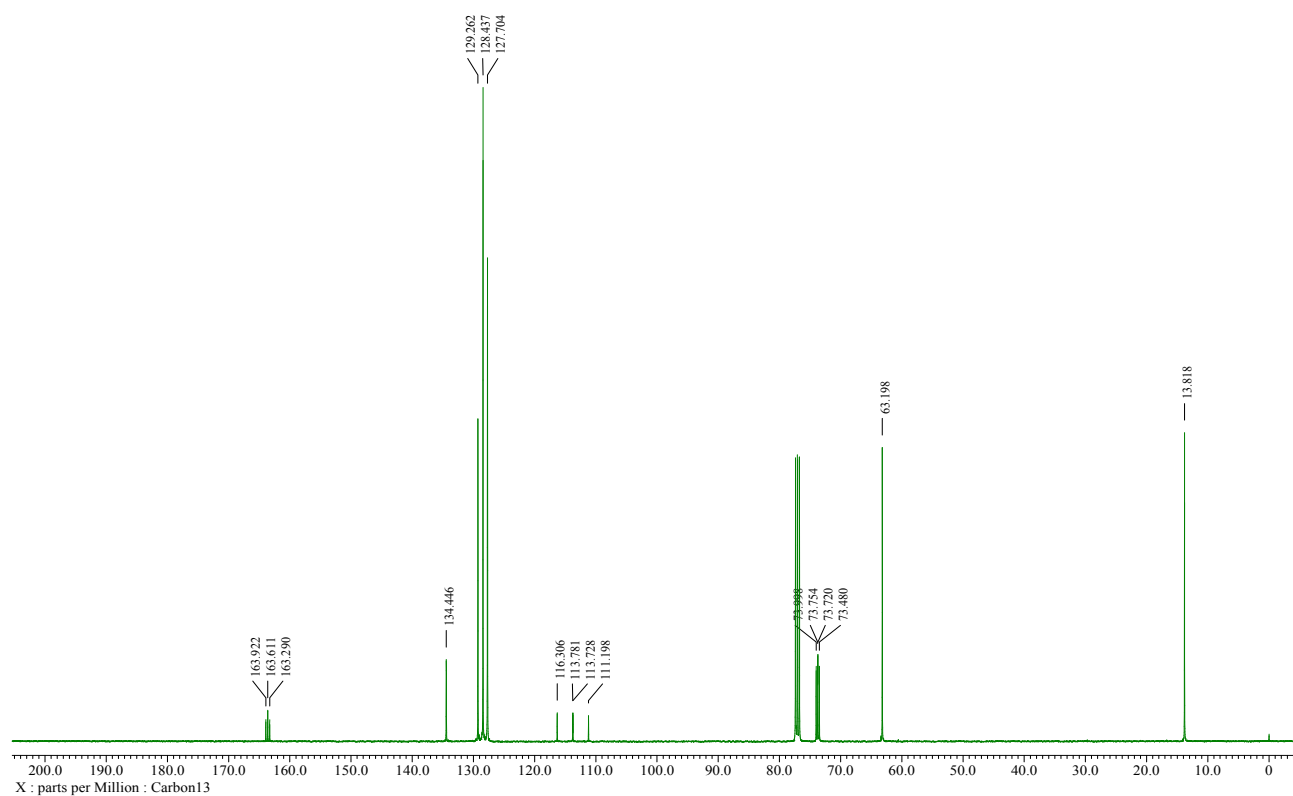
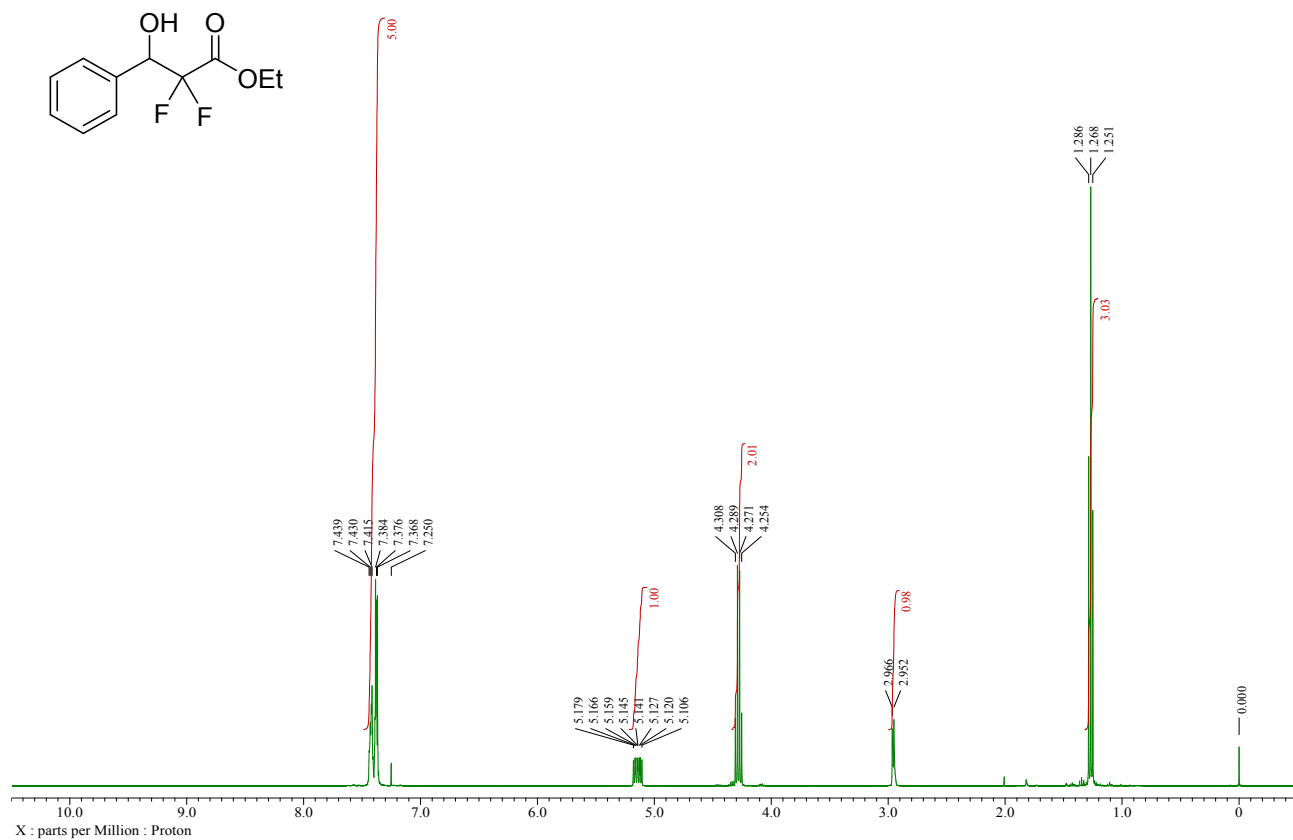
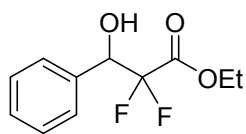
## References

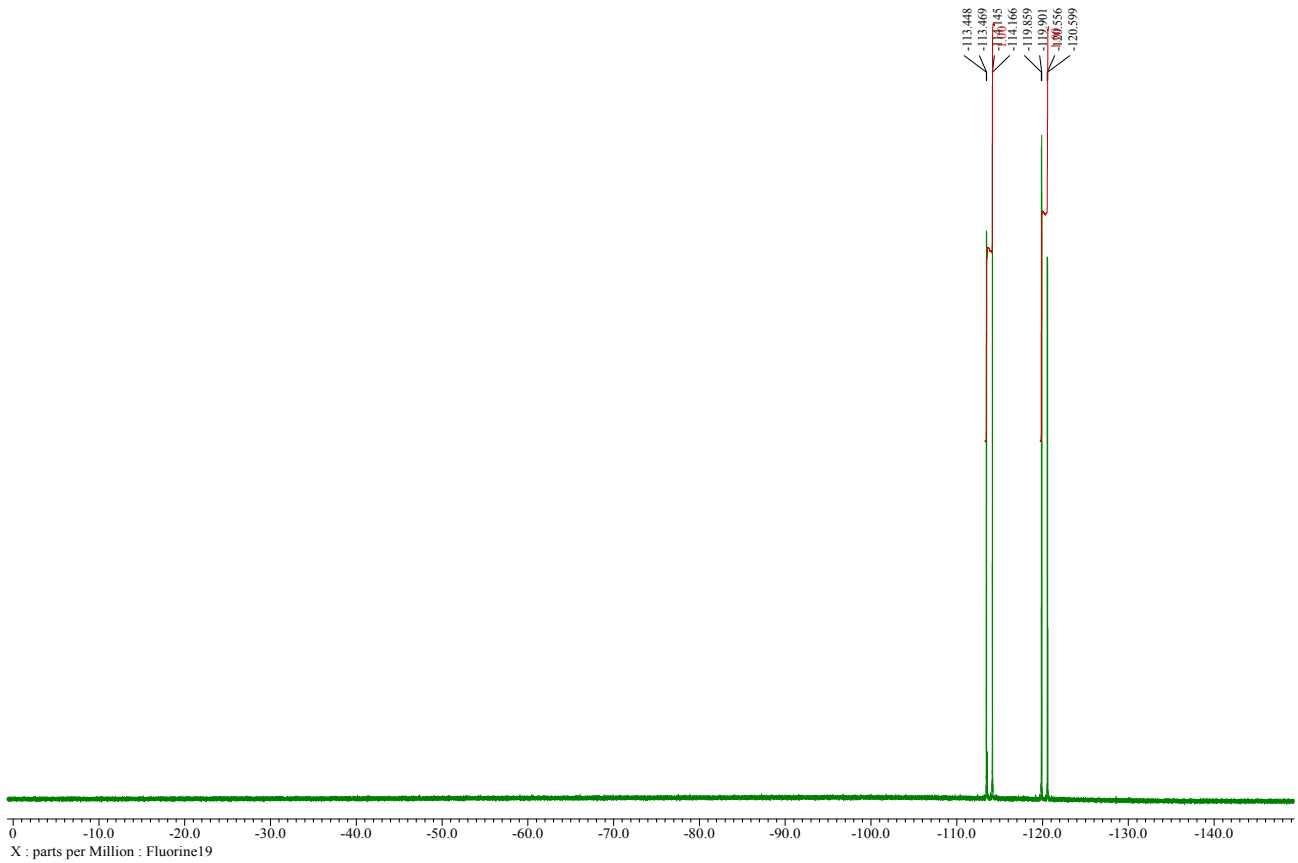
1. M.-H. Yang, D. L. Orsi and R. A. Altman, *Angew. Chem. Int. Ed.* **2015**, *54*, 2361-2365.
2. Y. Wang, F. Xing, C.-Z. Gu, W.-J. Li, L. He, B. Dai and G.-F. Du, *Tetrahedron*, **2017**, *73*, 4501-4507.

NMR Spectra of Compounds ( $^1\text{H}$ ,  $^{13}\text{C}$  and  $^{19}\text{F}$  NMR)

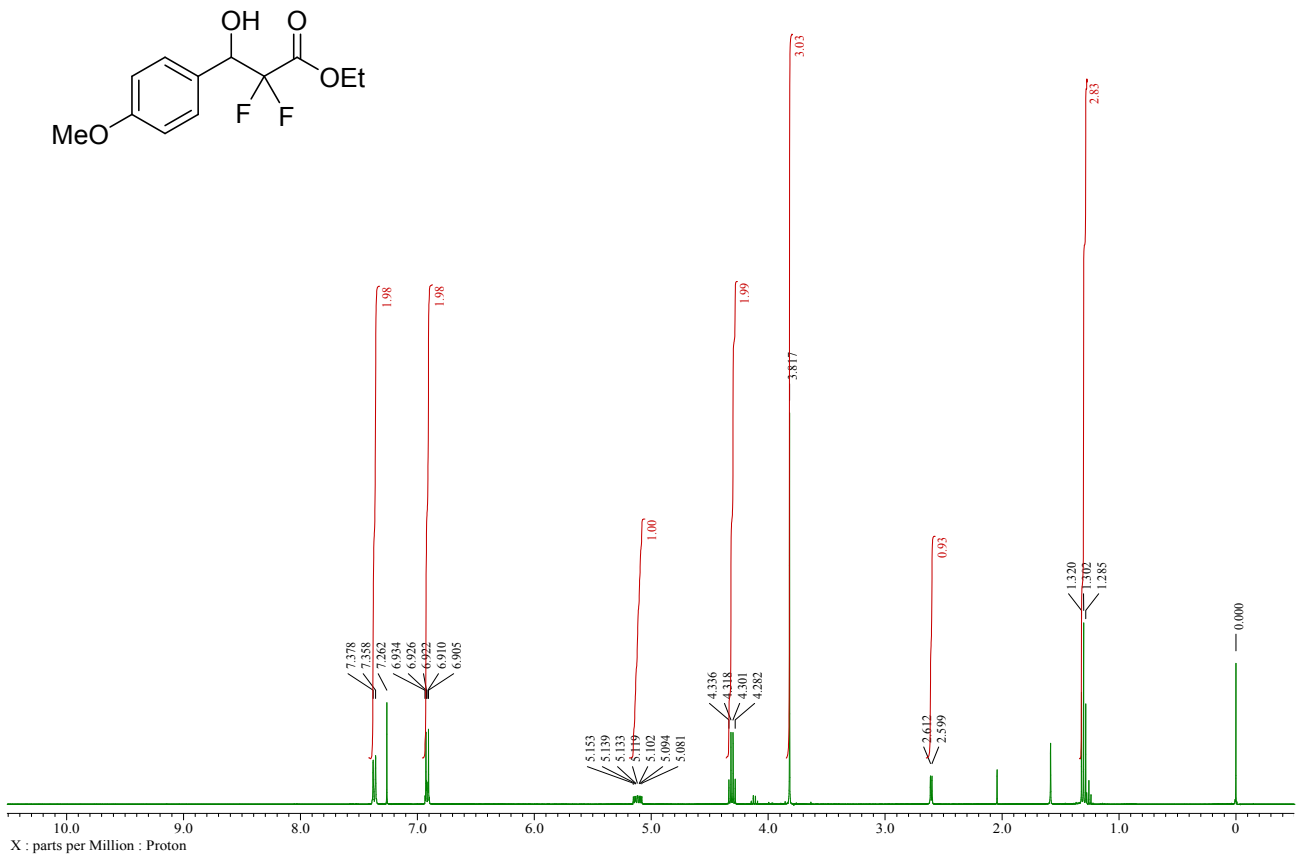


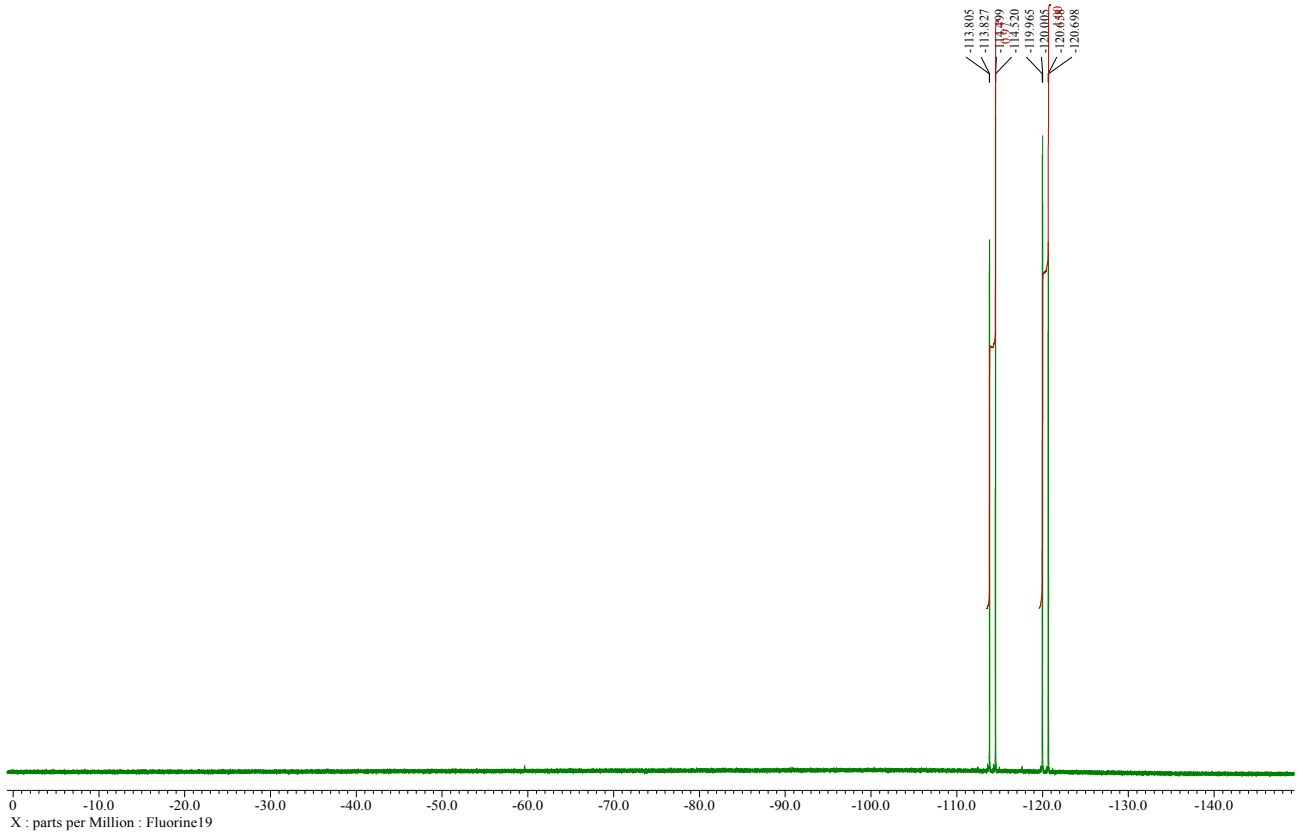
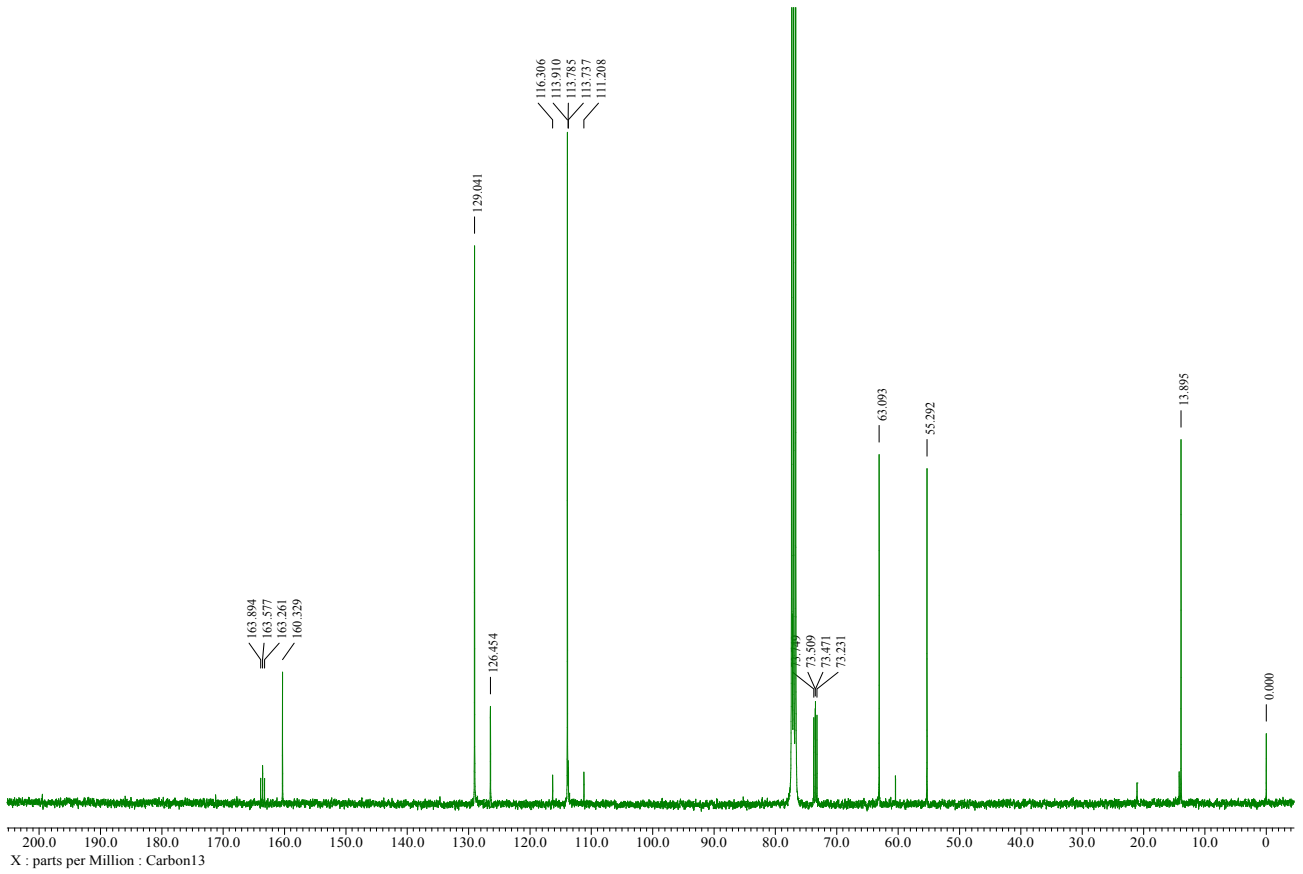
# Ethyl 2,2-difluoro-3-hydroxy-3-phenylpropanoate (4a).



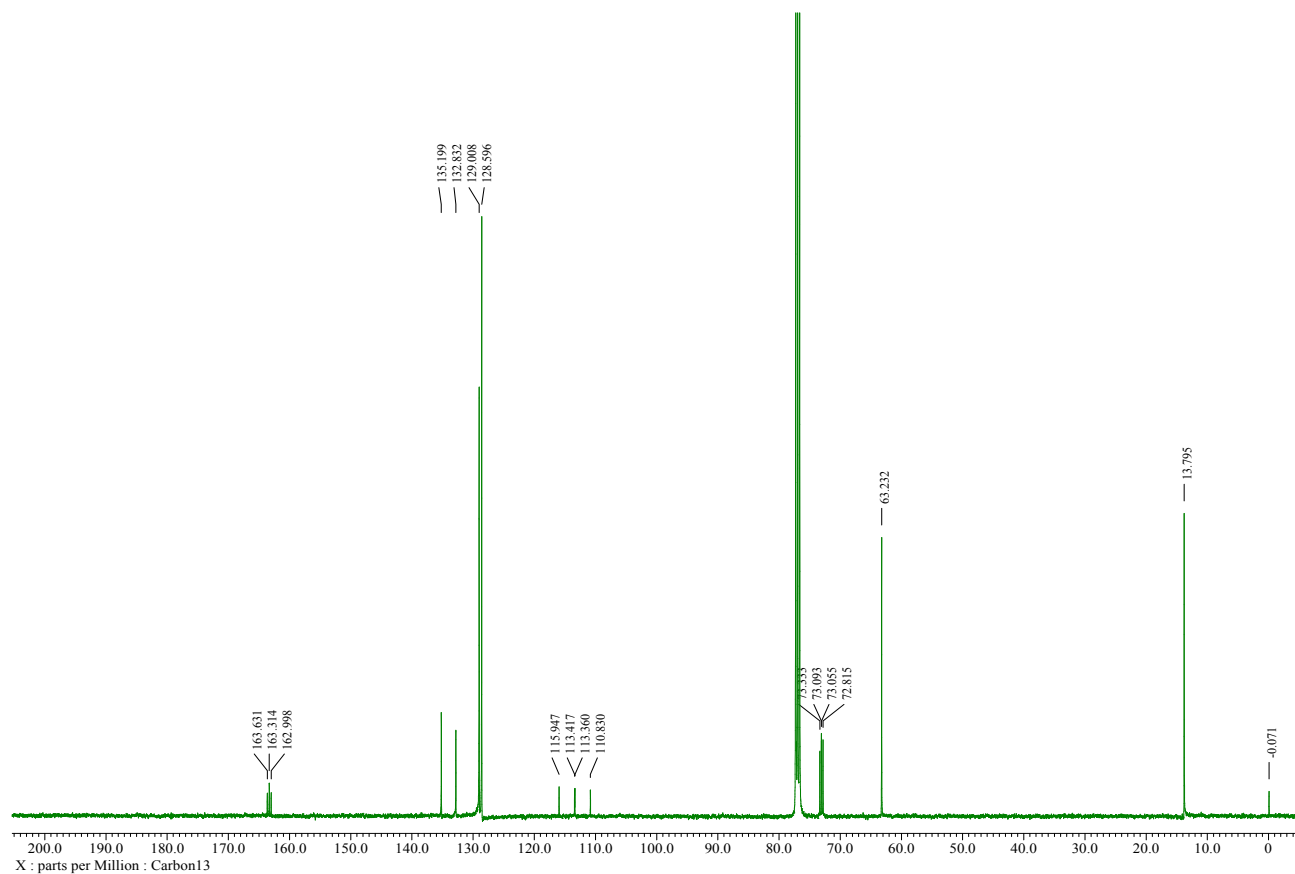
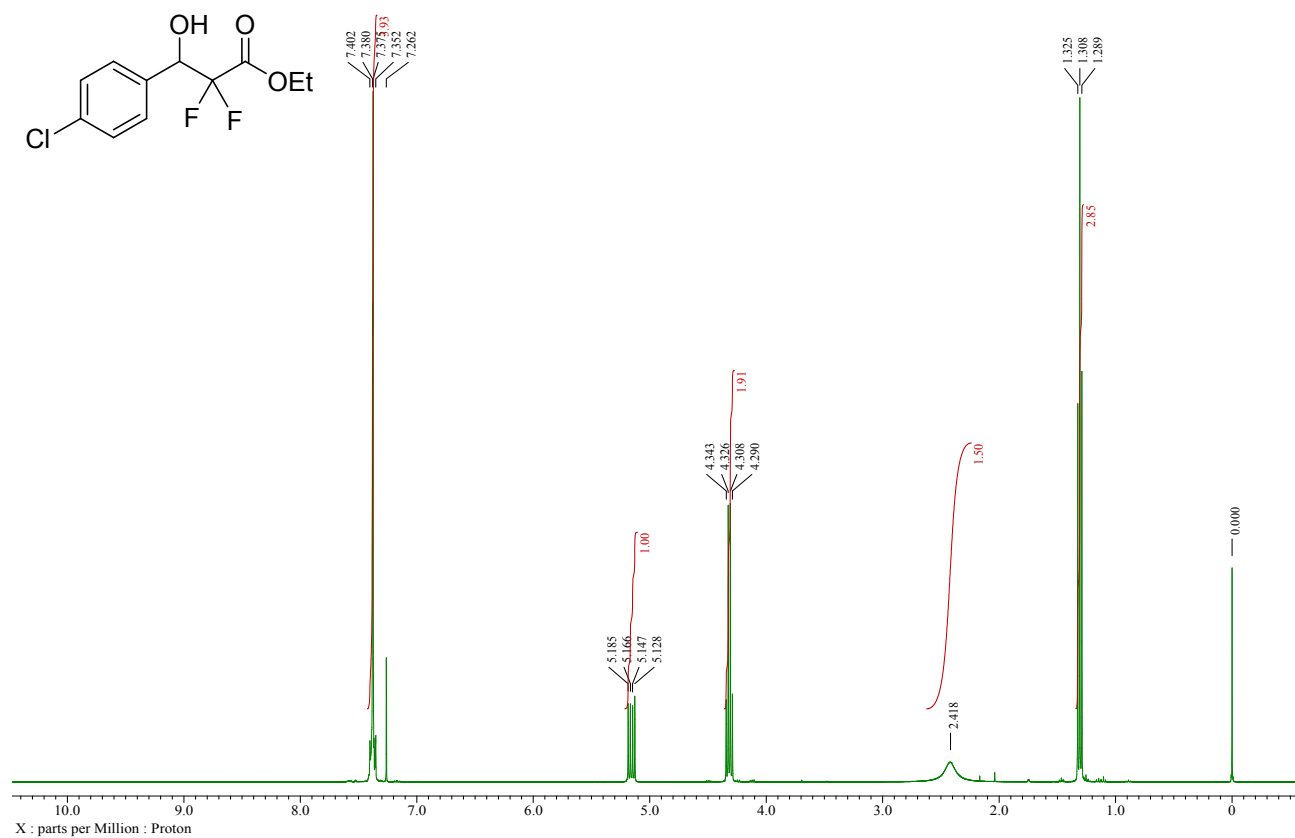


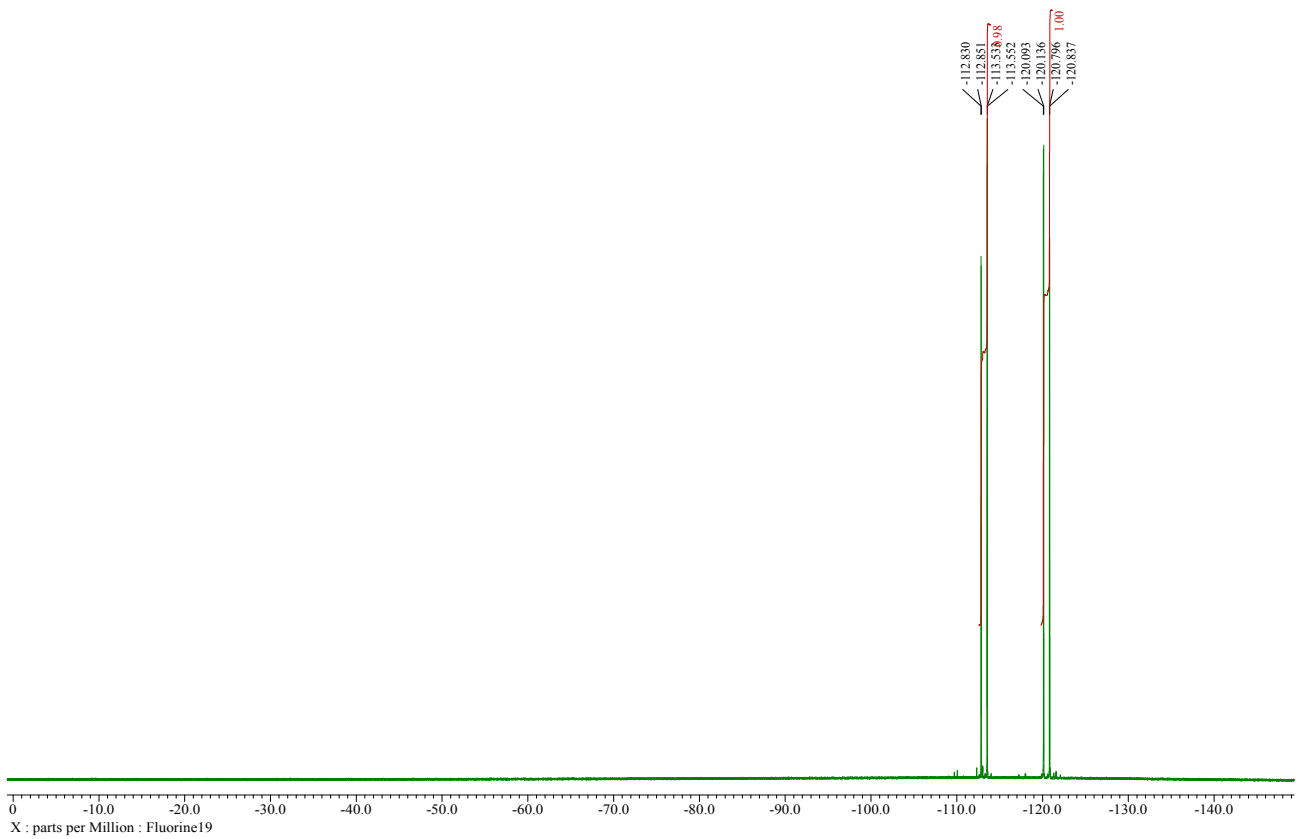
**2,2-Difluoro-3-hydroxy-1-(4-methoxyphenyl)-3-phenylpropan-1-one (4b)**



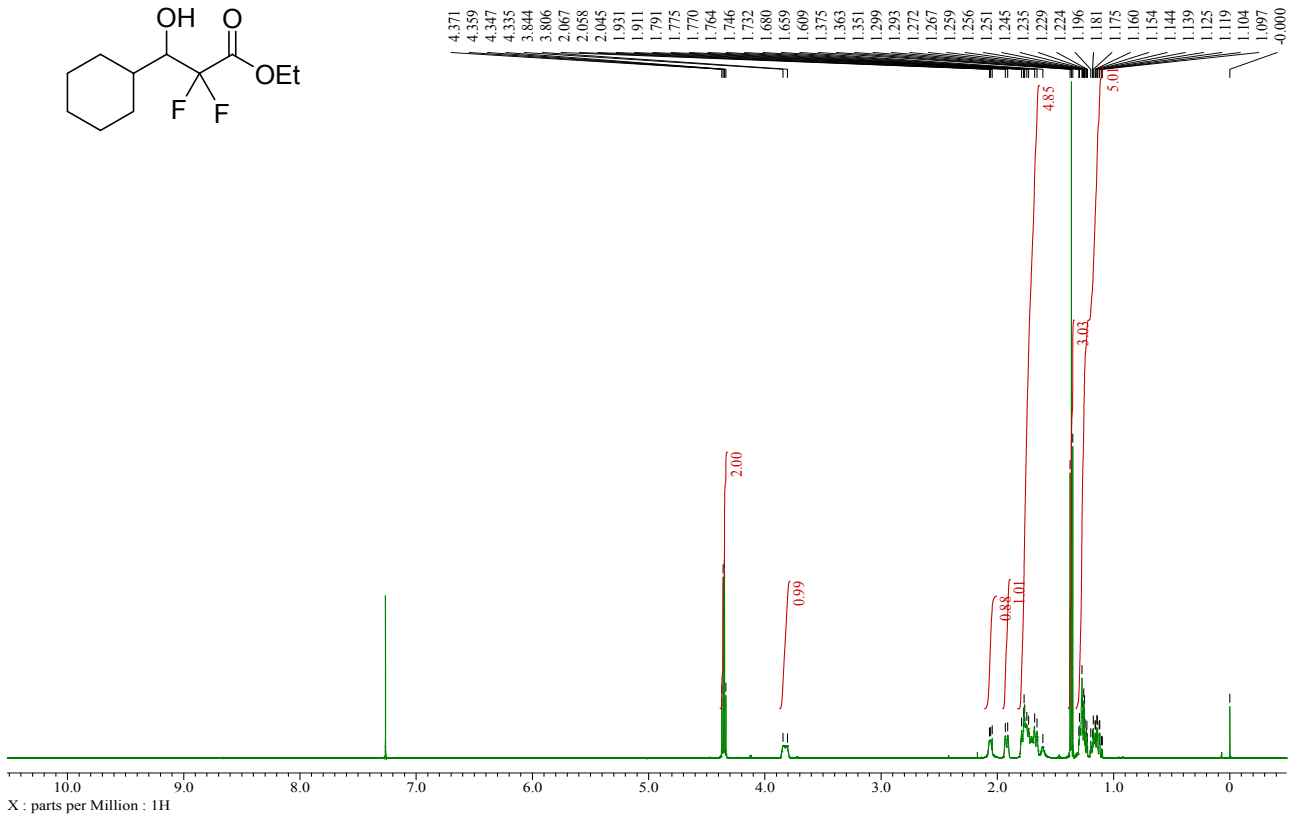
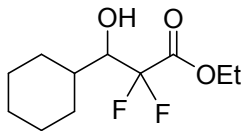


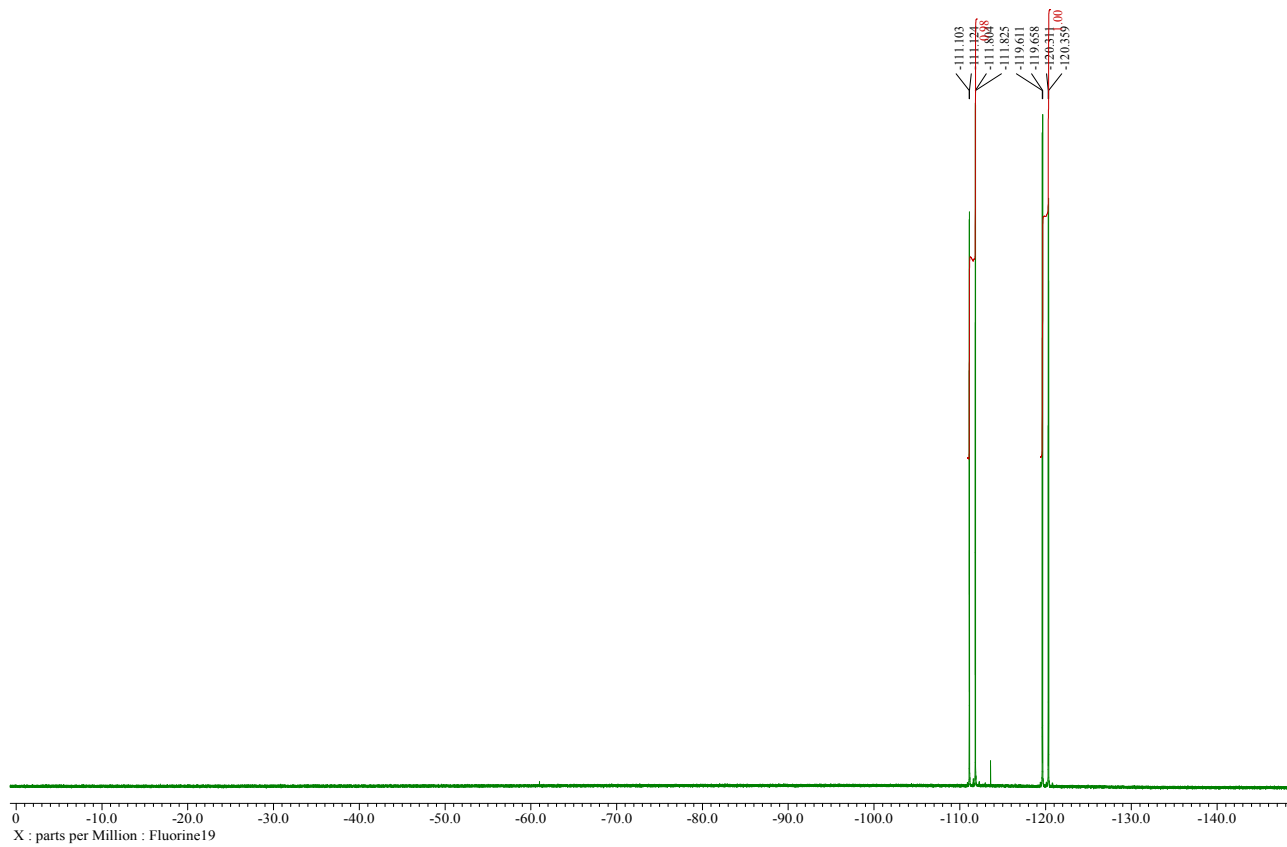
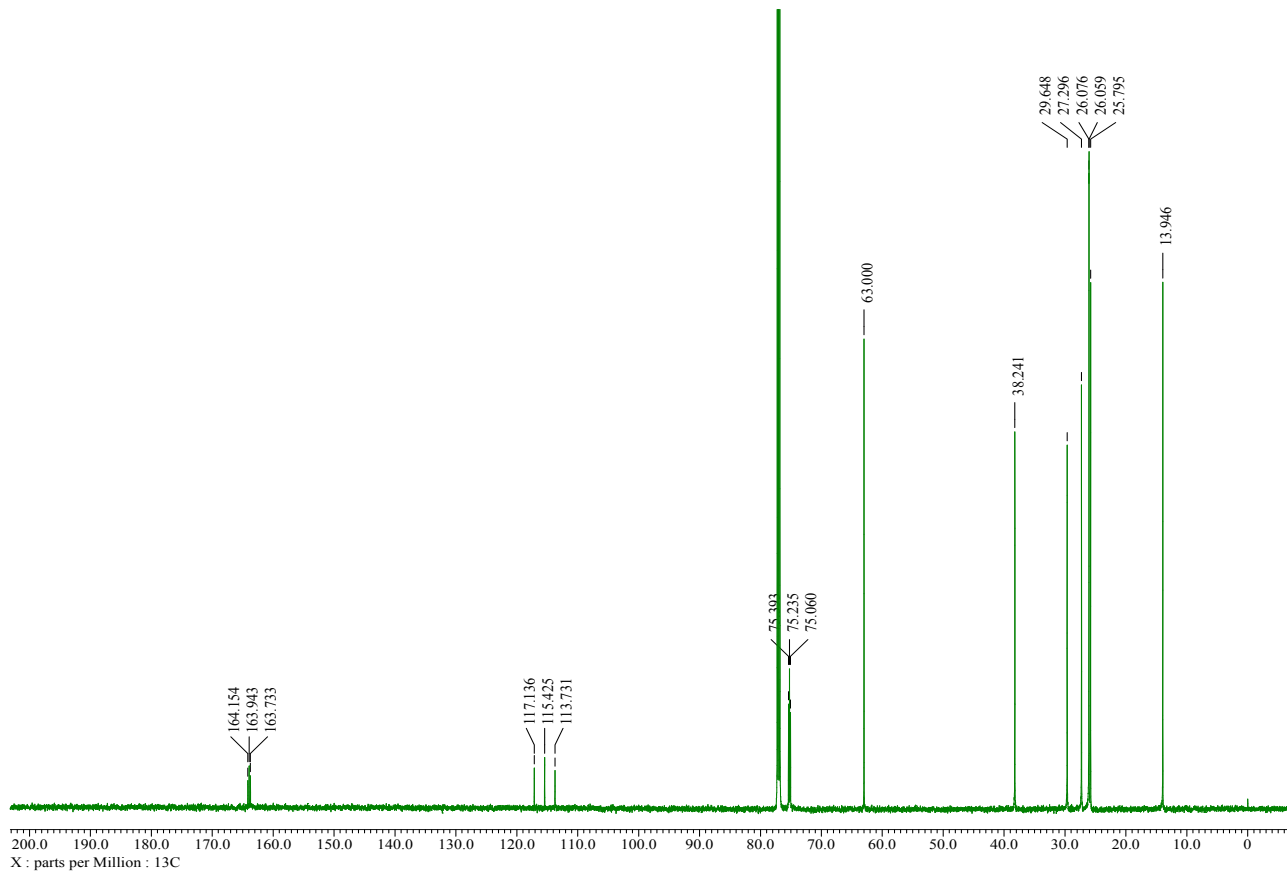
# Ethyl 3-(4-chlorophenyl)-2,2-difluoro-3-hydroxypropanoate (4c)



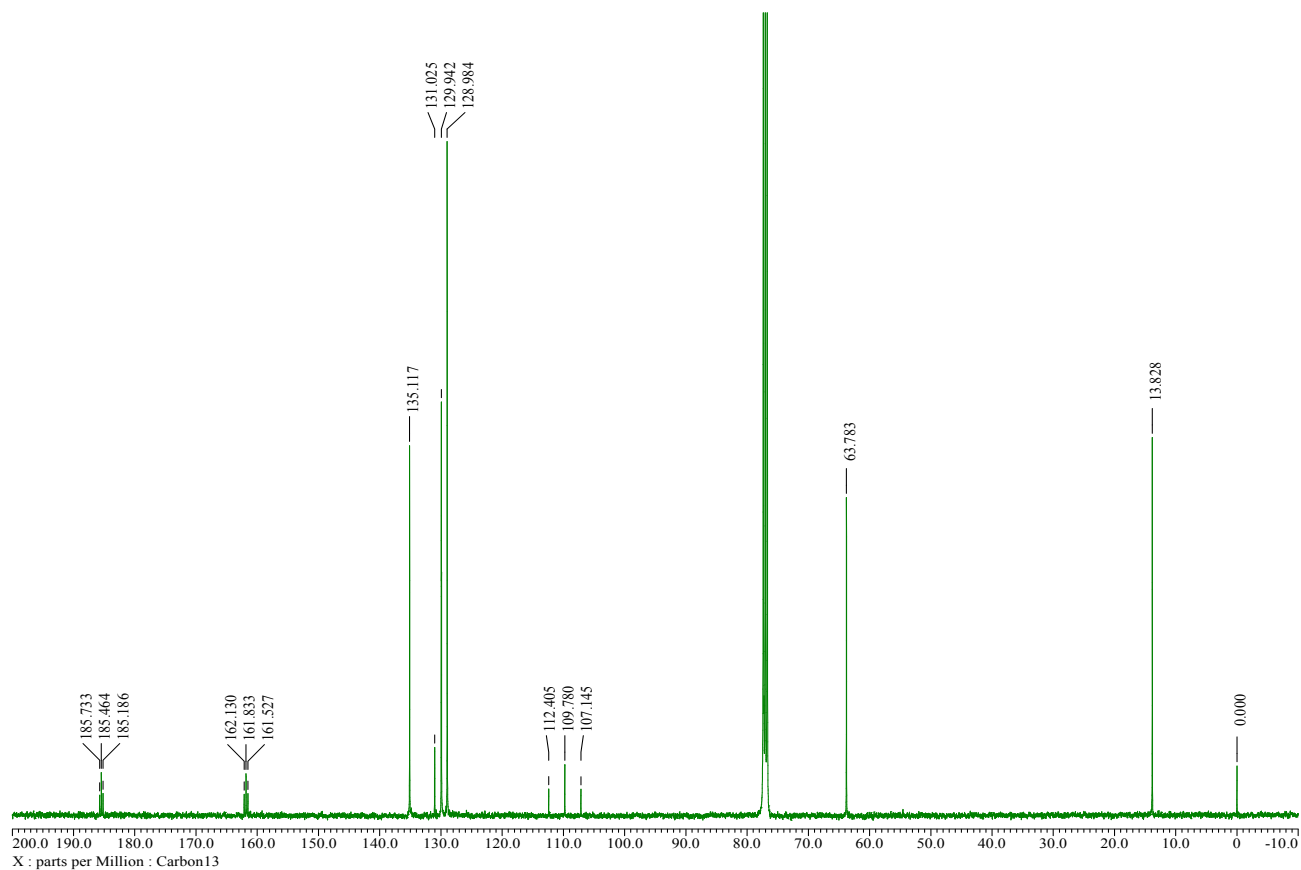
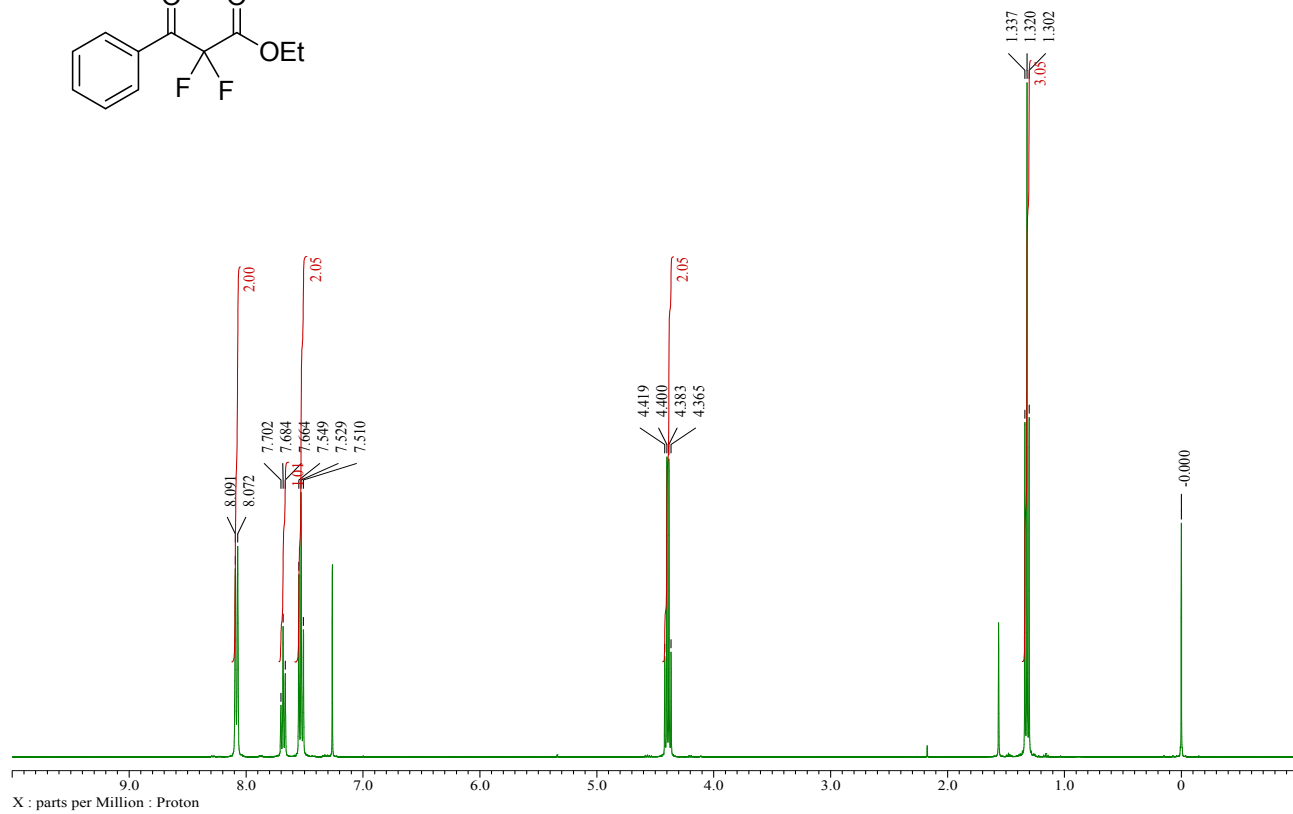
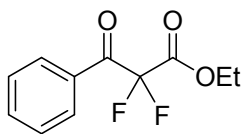


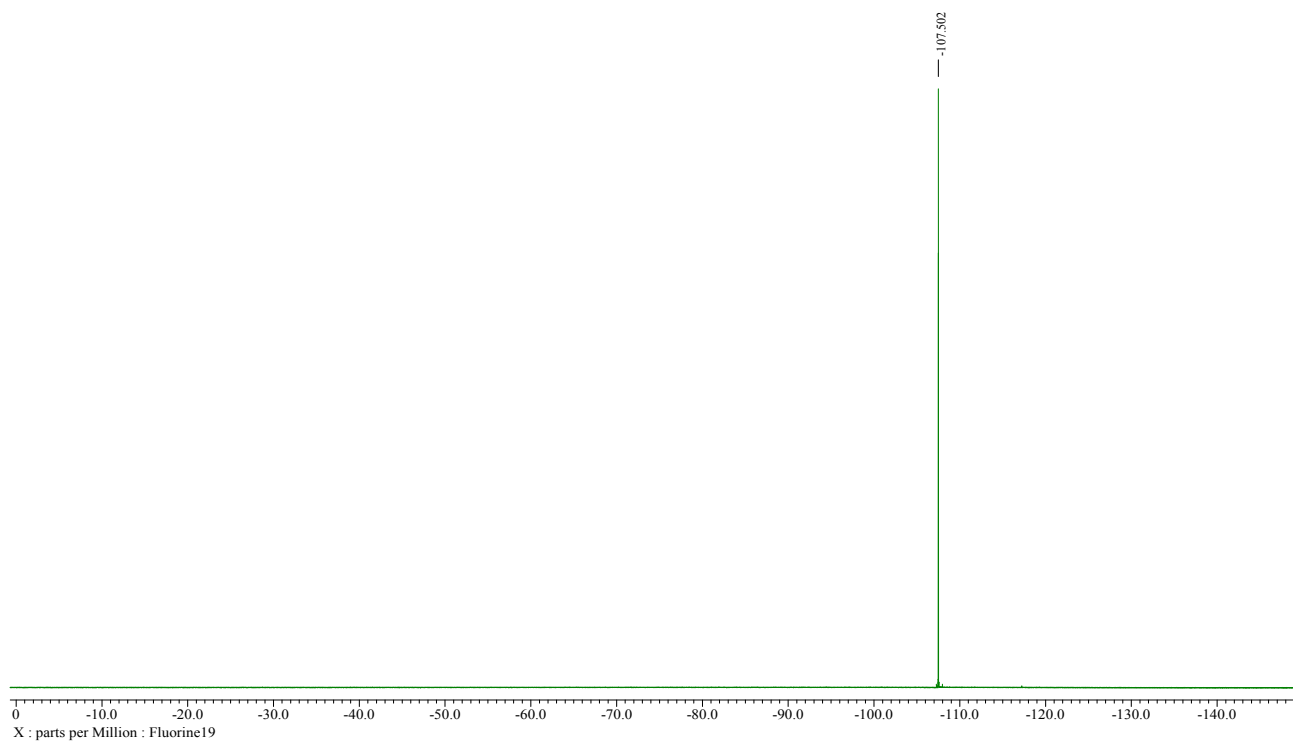
### Ethyl 3-cyclohexyl-2,2-difluoro-3-hydroxypropanoate (4d)



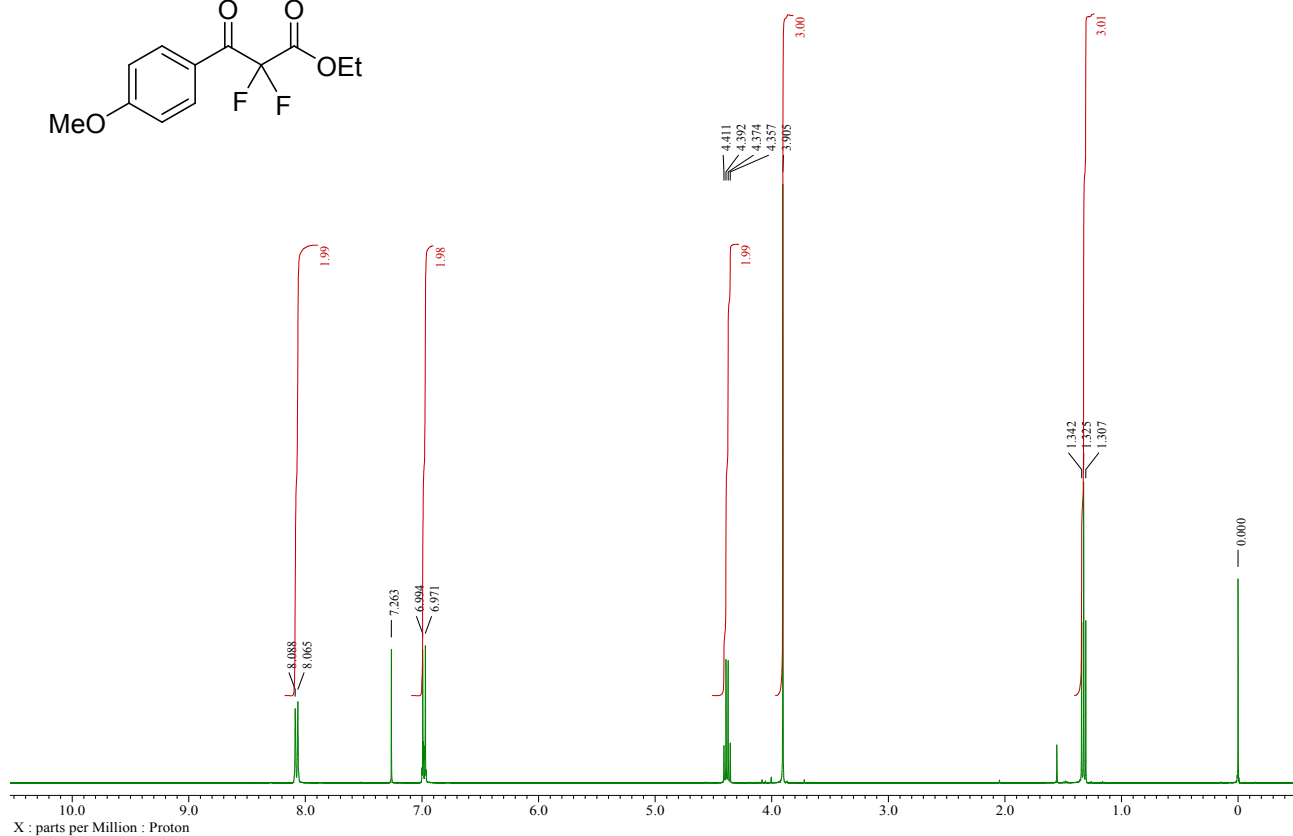
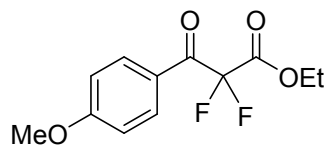


# Ethyl 2,2-difluoro-3-oxo-3-phenylpropanoate (5a)

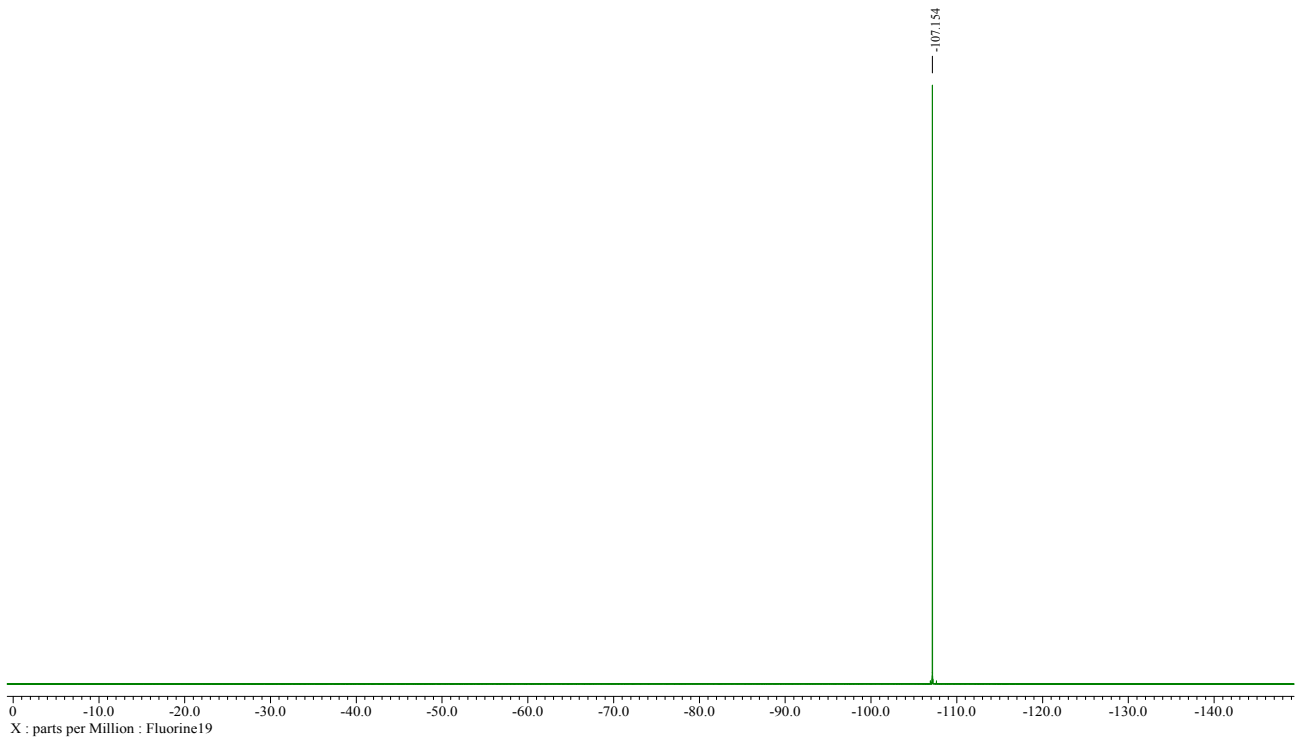
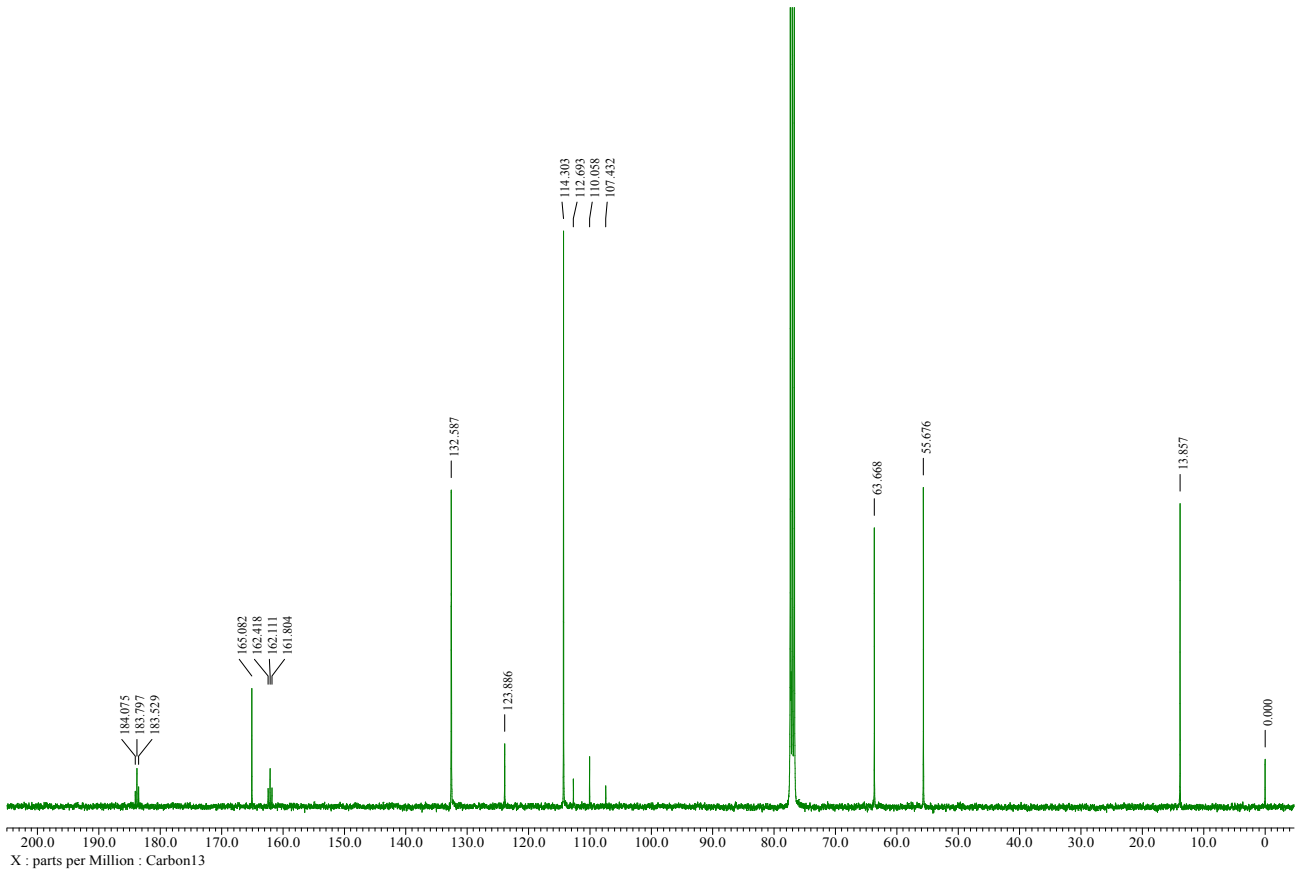




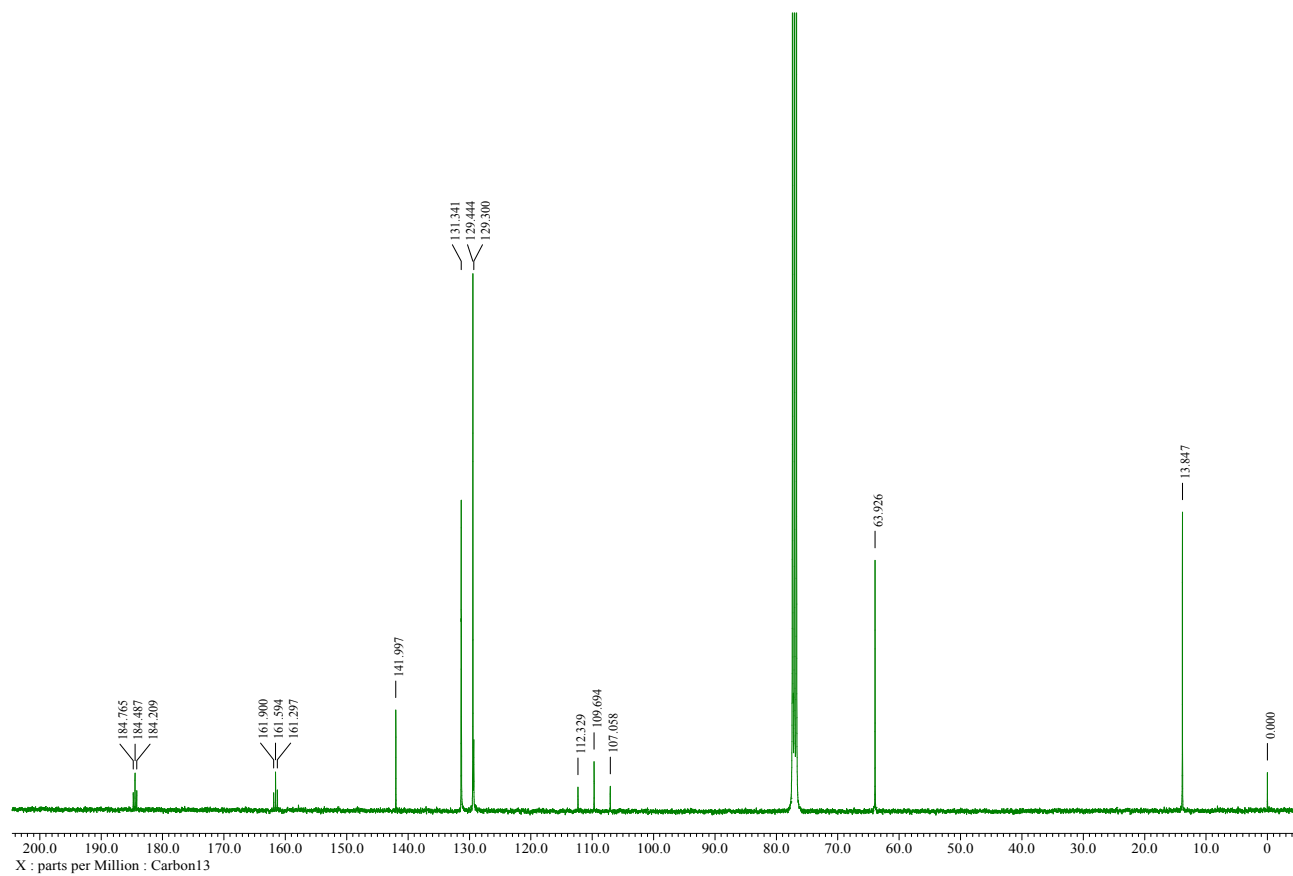
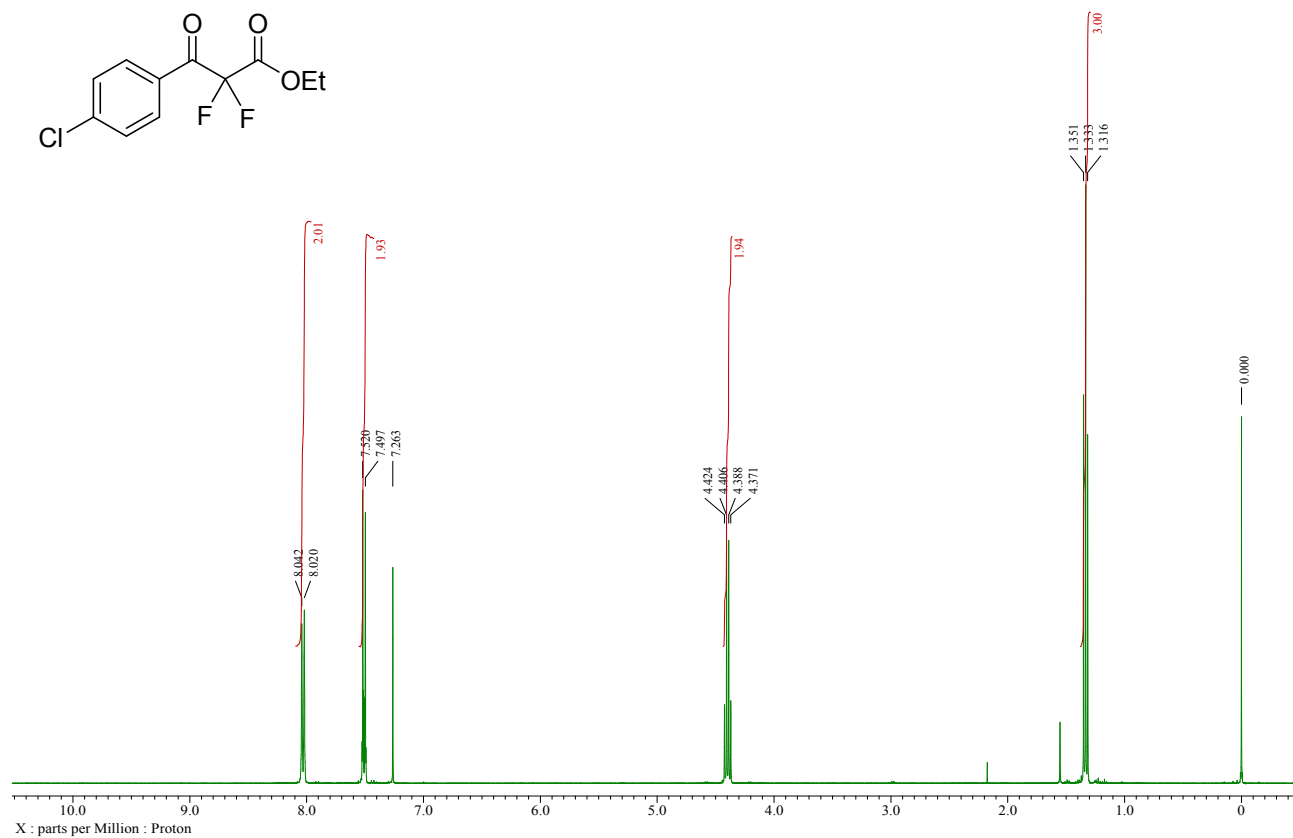
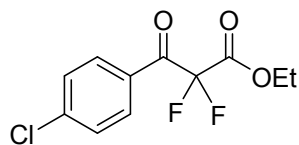
**Ethyl 2,2-difluoro-3-(4-methoxyphenyl)-3-oxopropanoate (5b)**

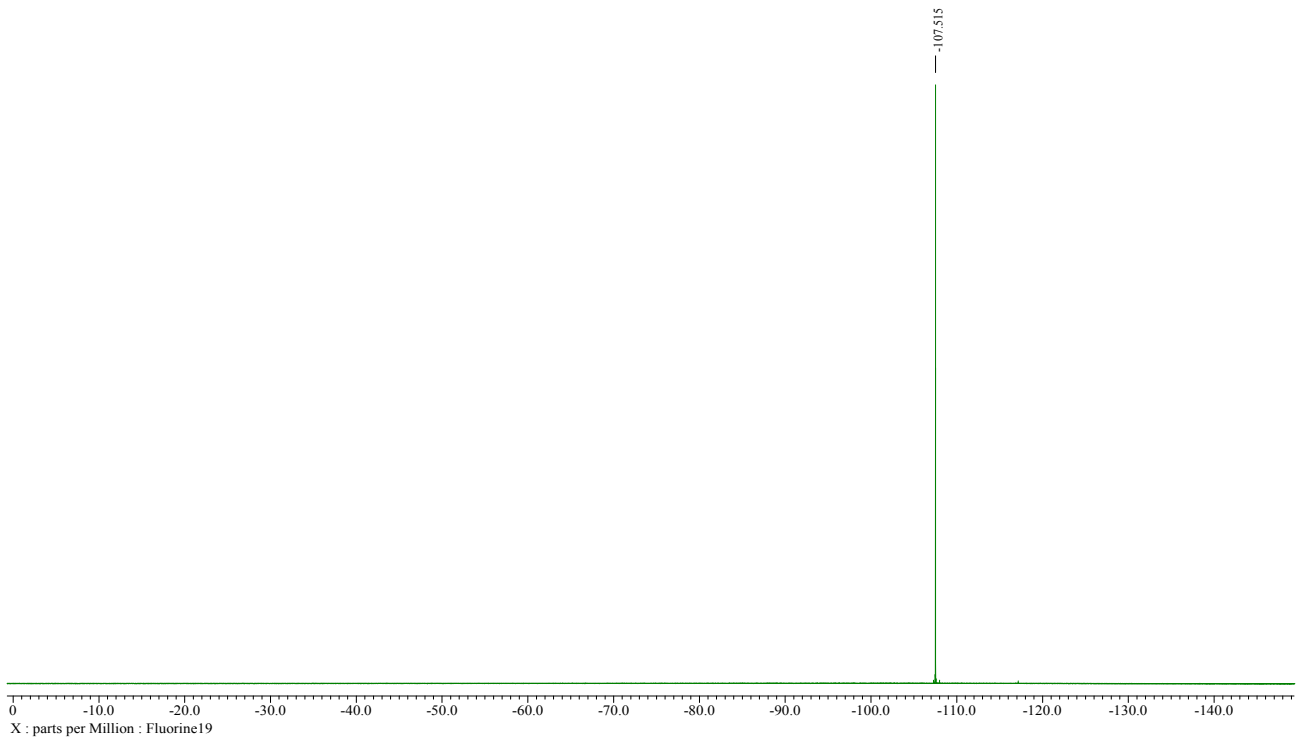




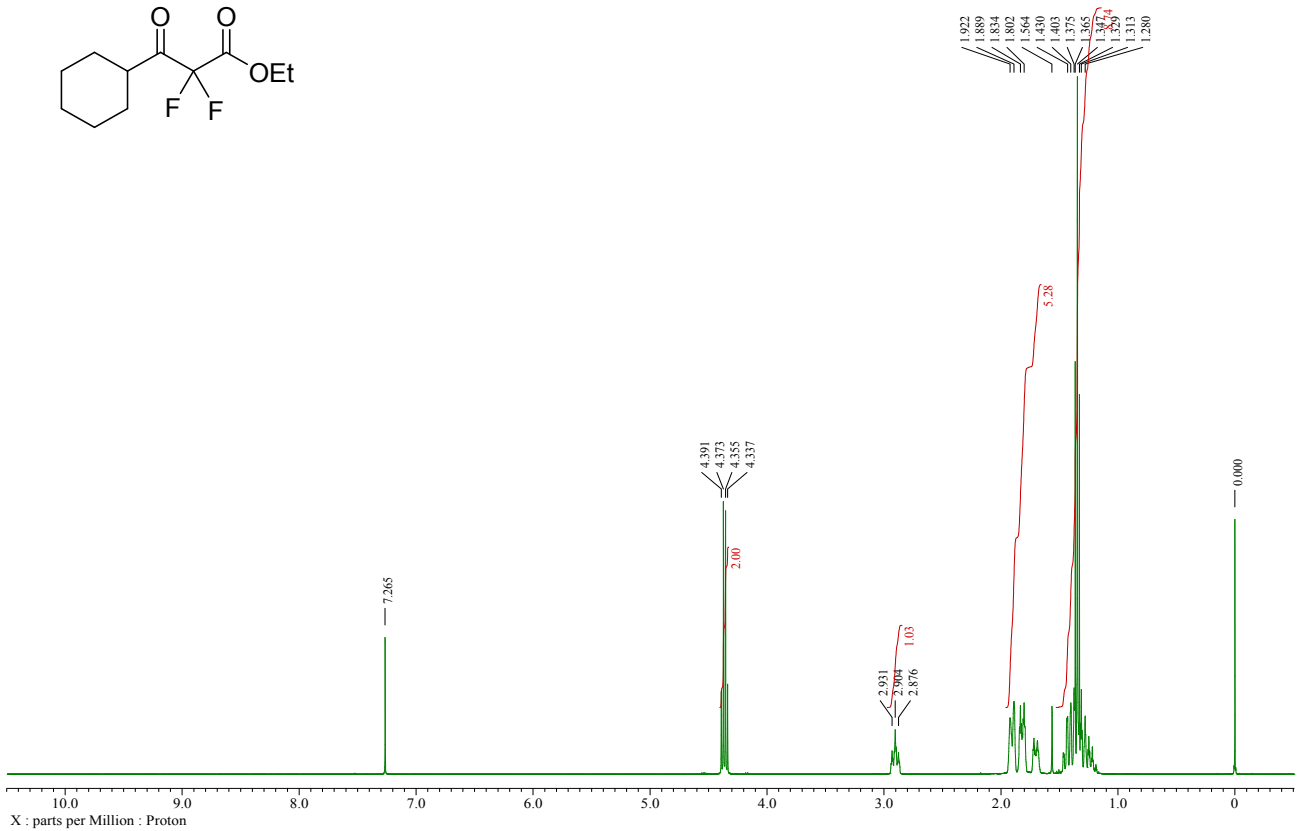
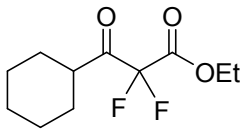


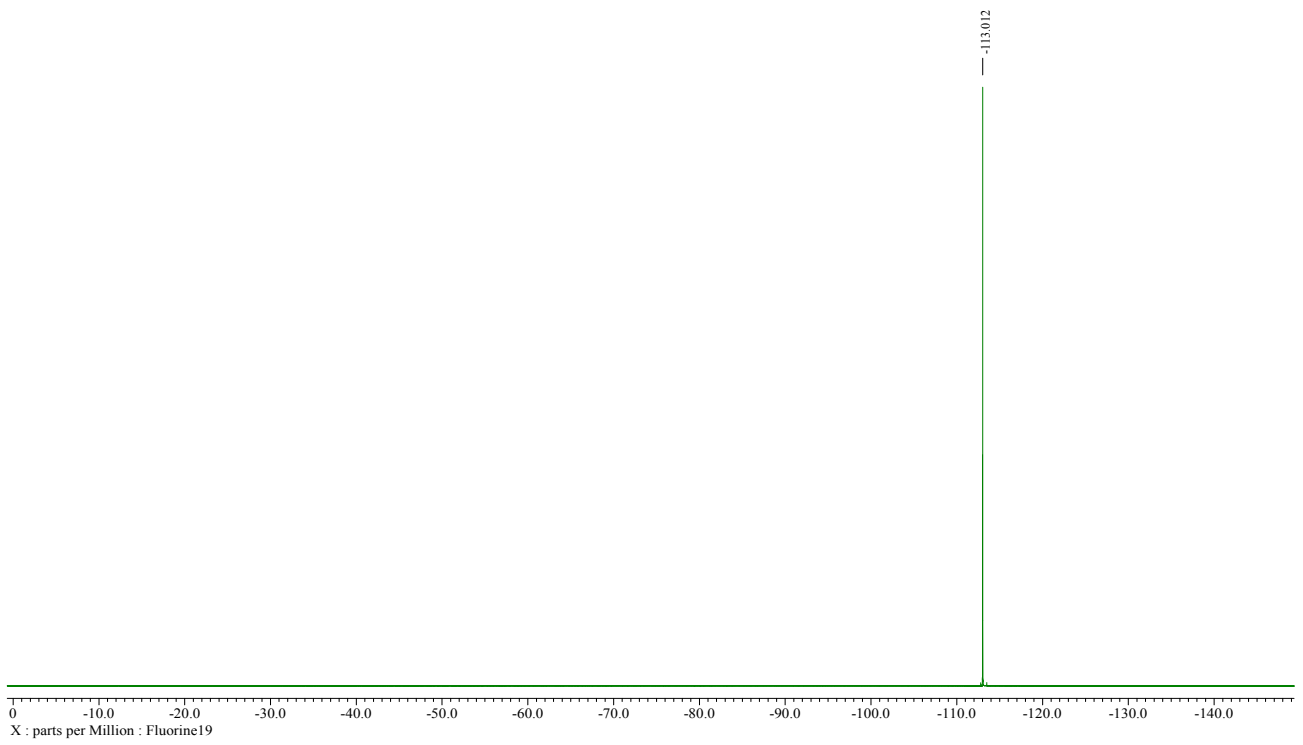
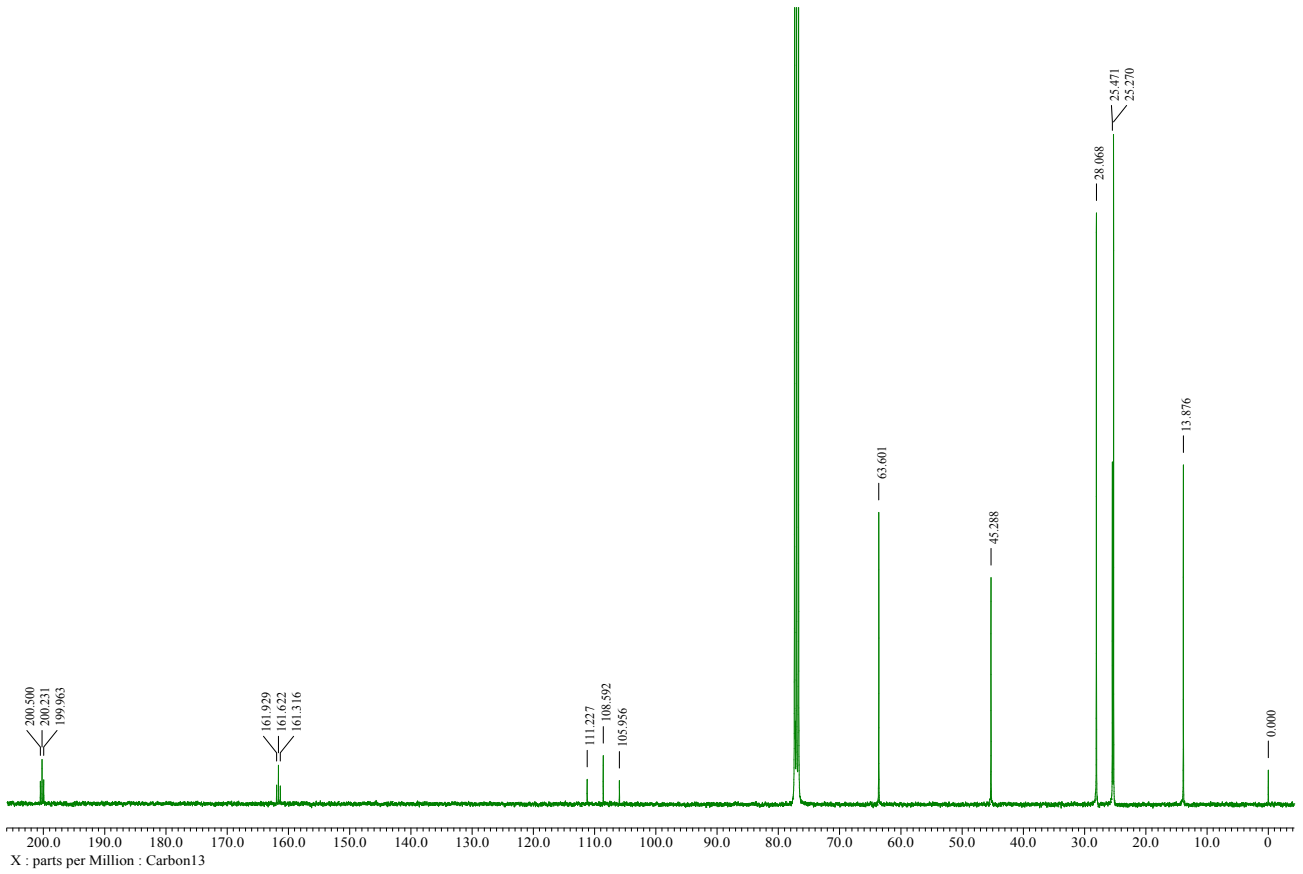
Ethyl 3-(4-chlorophenyl)-2,2-difluoro-3-oxopropanoate (5c).



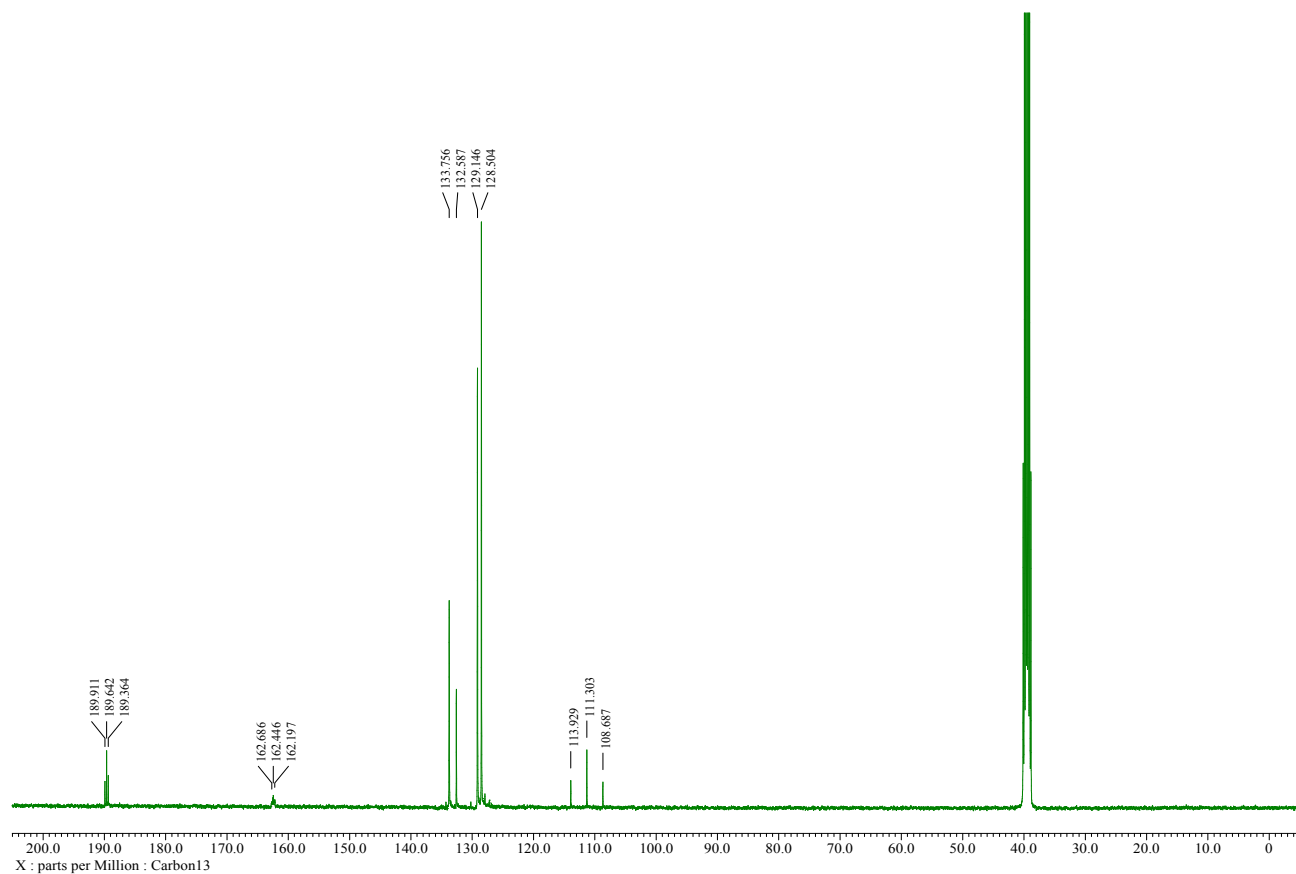
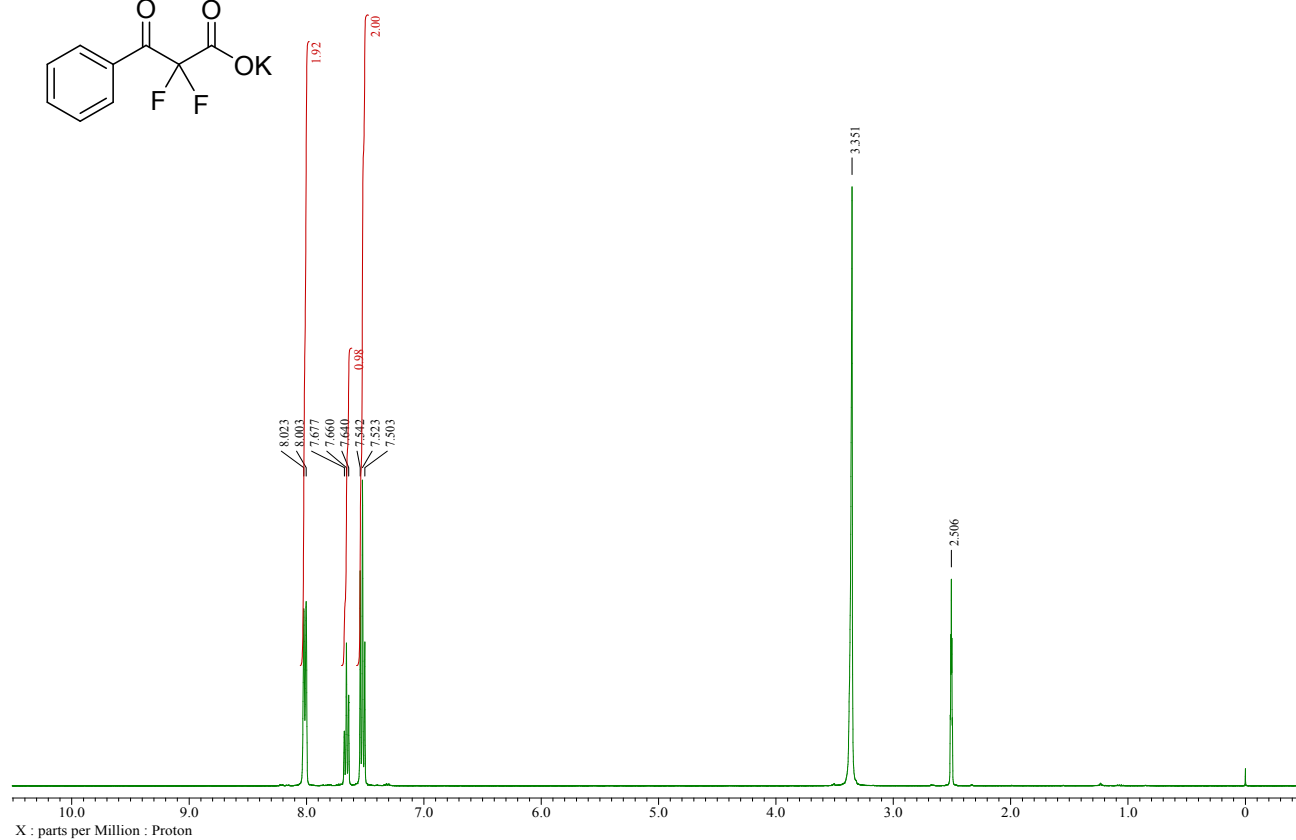
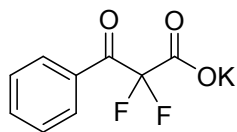


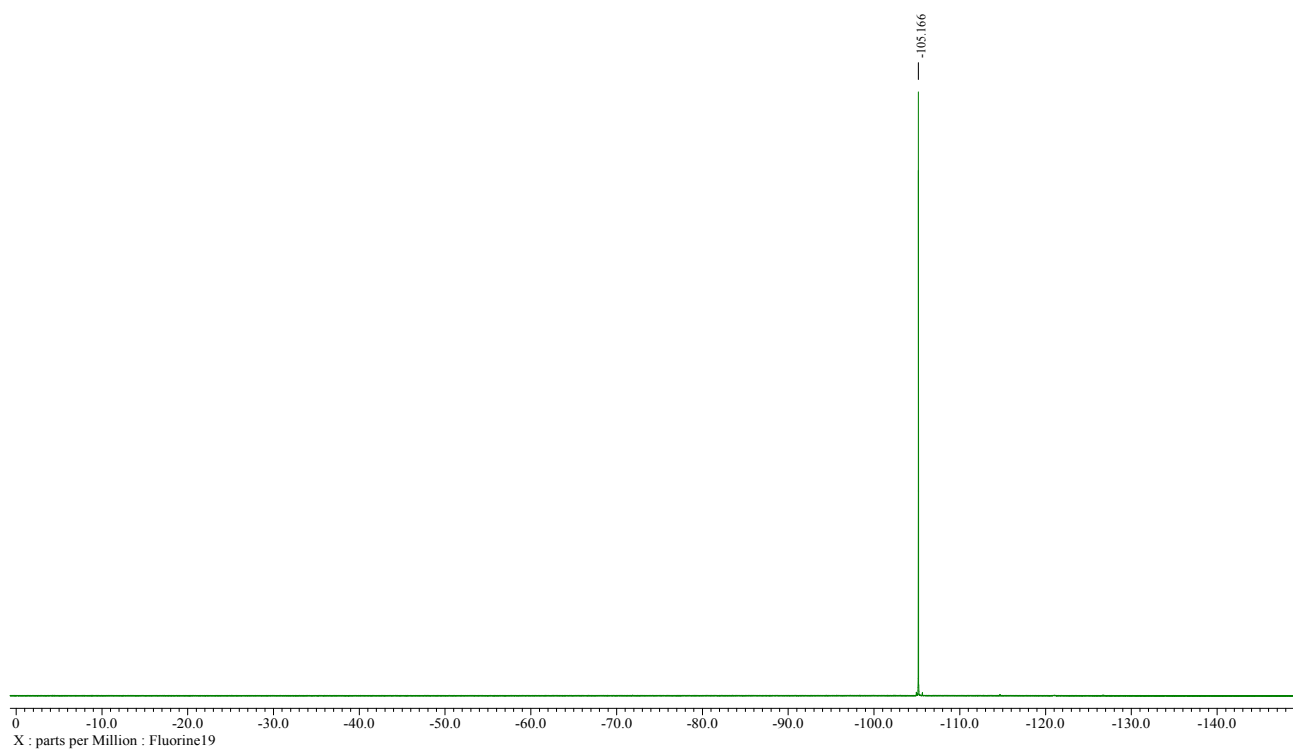
**Ethyl 3-cyclohexyl-2,2-difluoro-3-oxopropanoate (5d)**



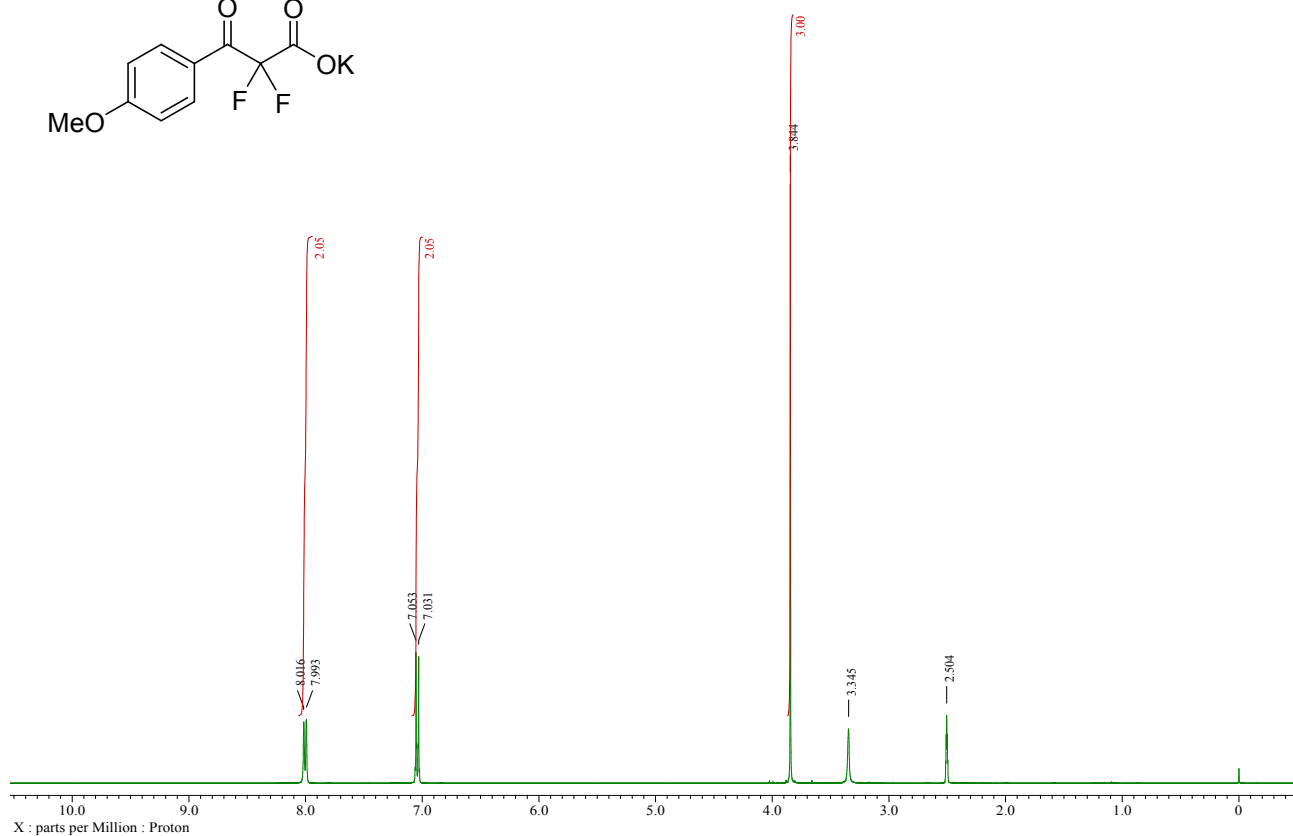
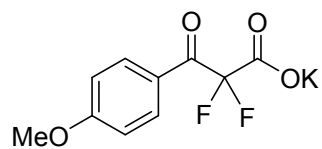


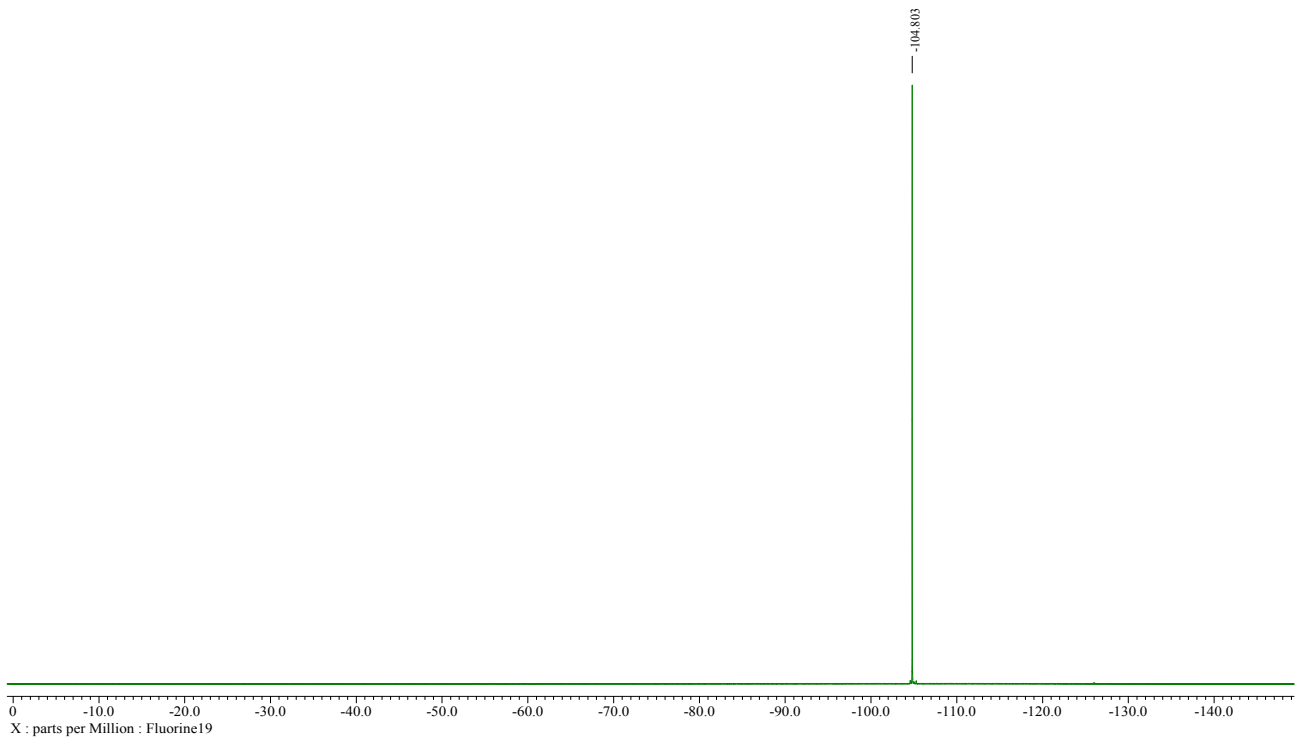
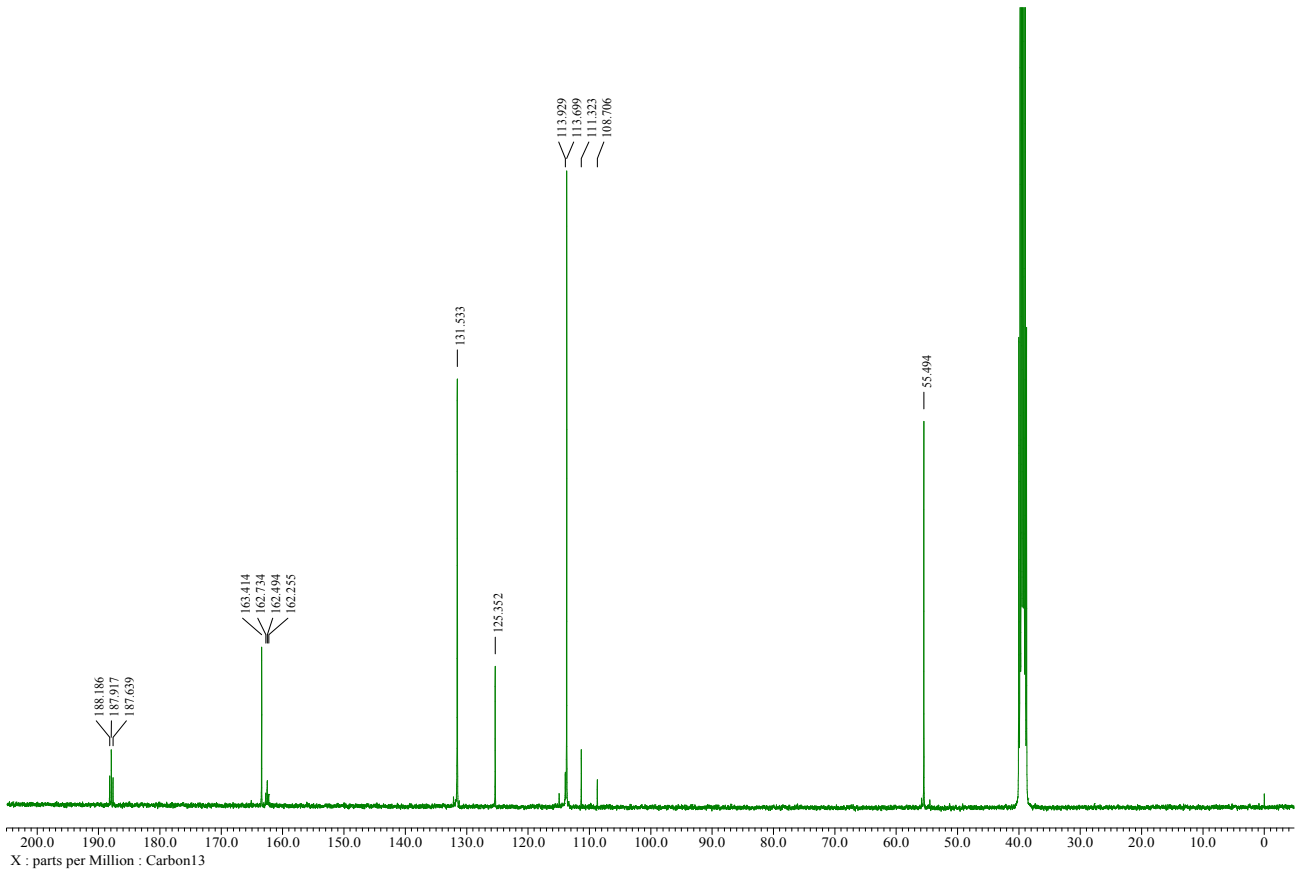
# Potassium 2,2-difluoro-3-oxo-3-phenylpropanoate (2a)



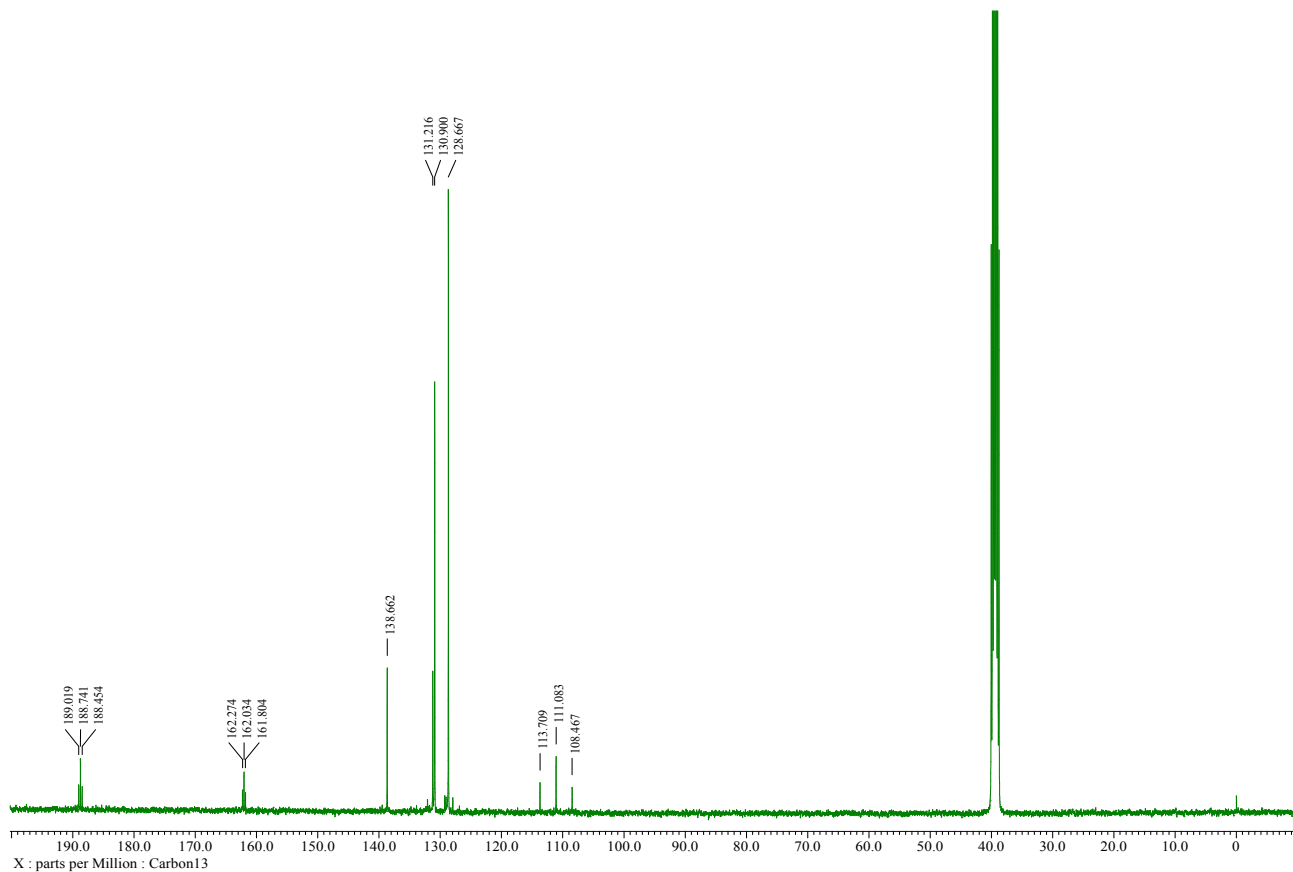
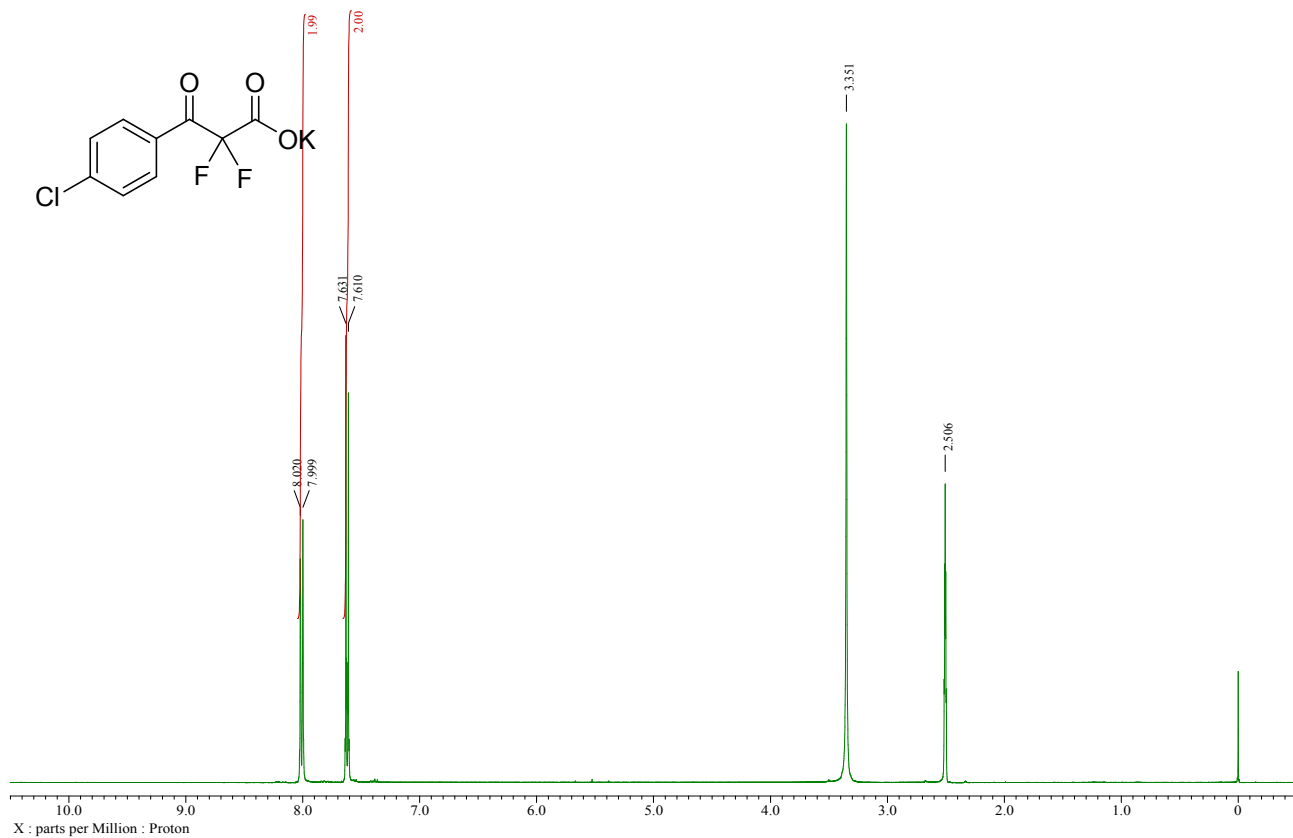
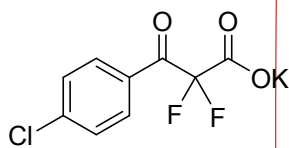


**Potassium 2,2-difluoro-3-(4-methoxyphenyl)-3-oxopropanoate (2b)**

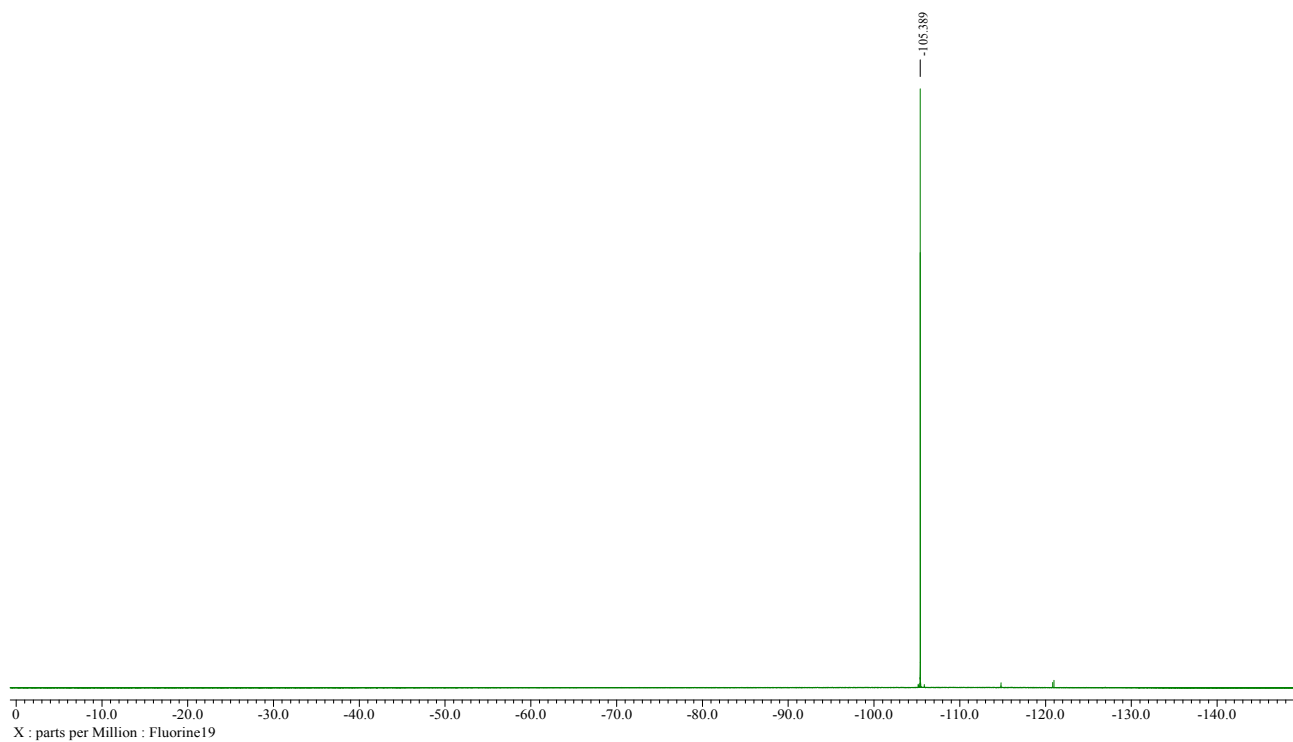




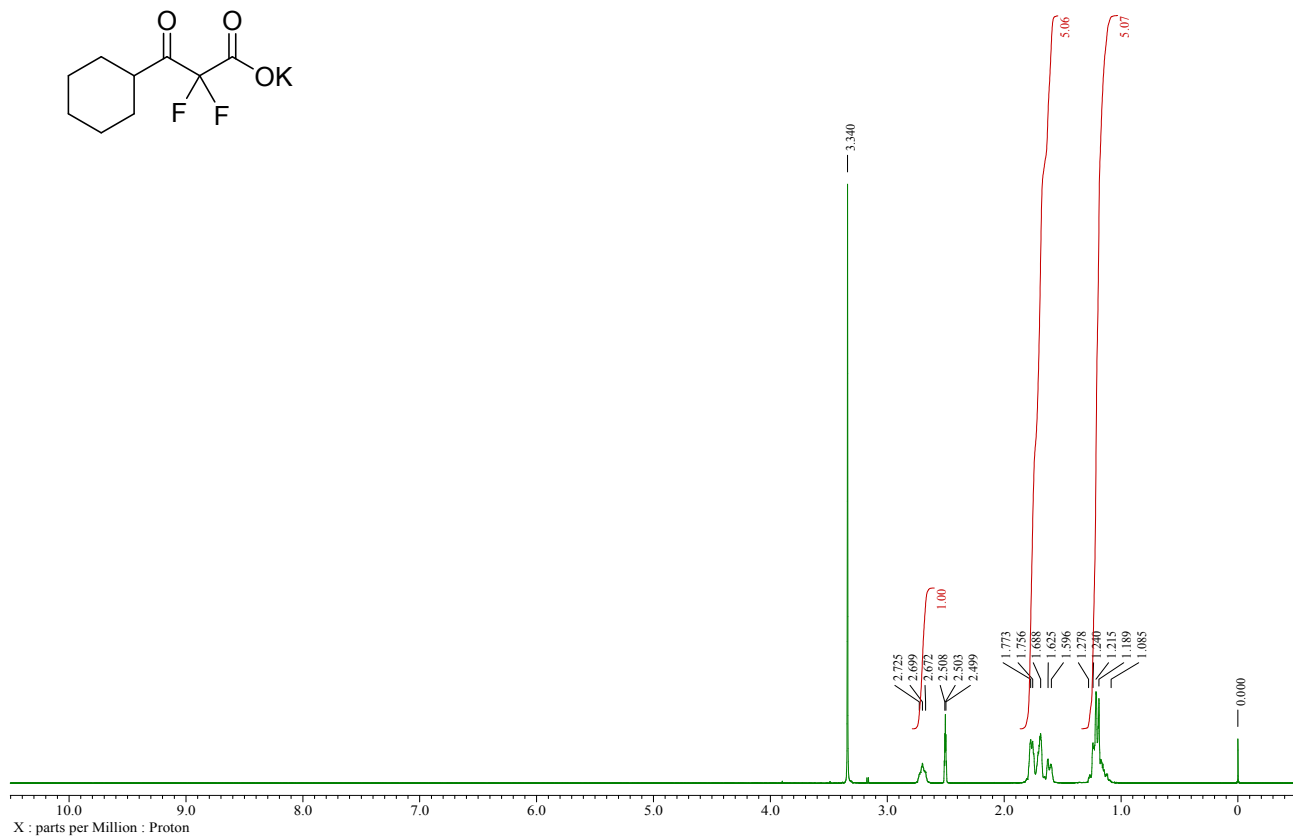
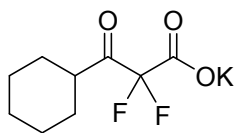
# Potassium 3-(4-chlorophenyl)-2,2-difluoro-3-oxopropanoate (2c)

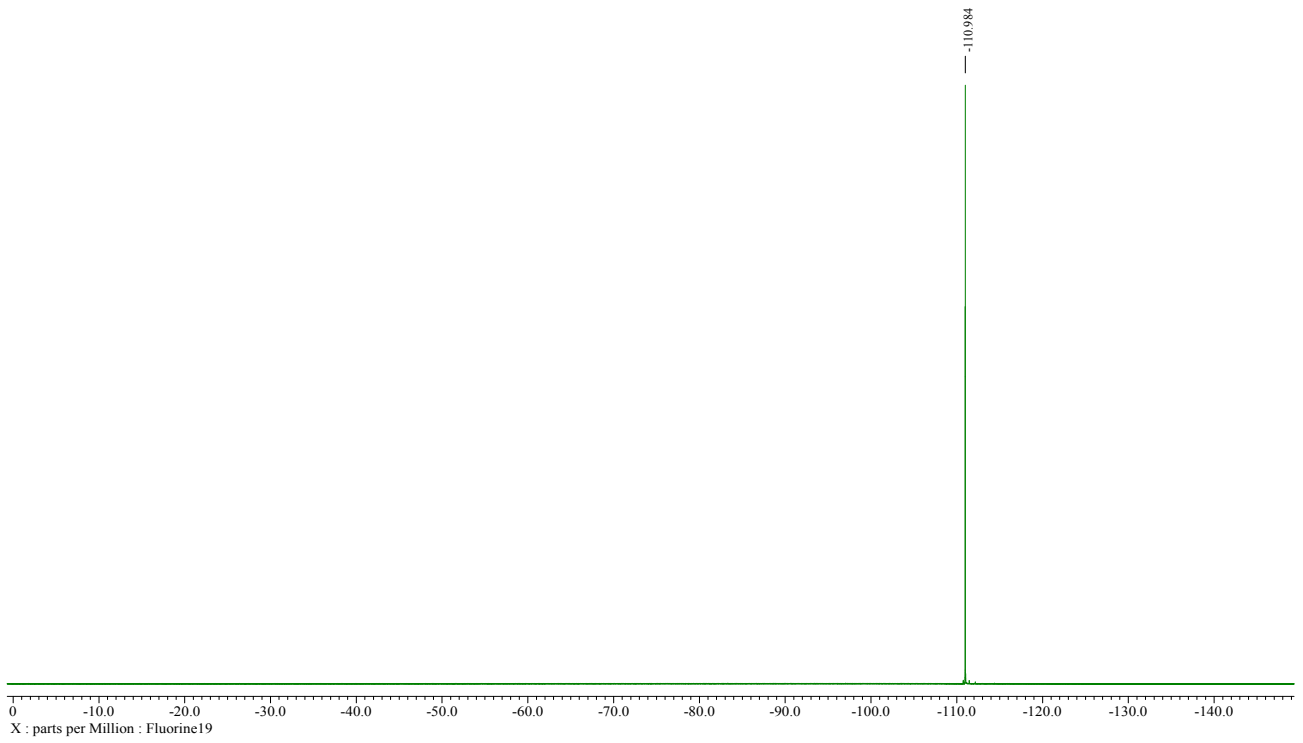
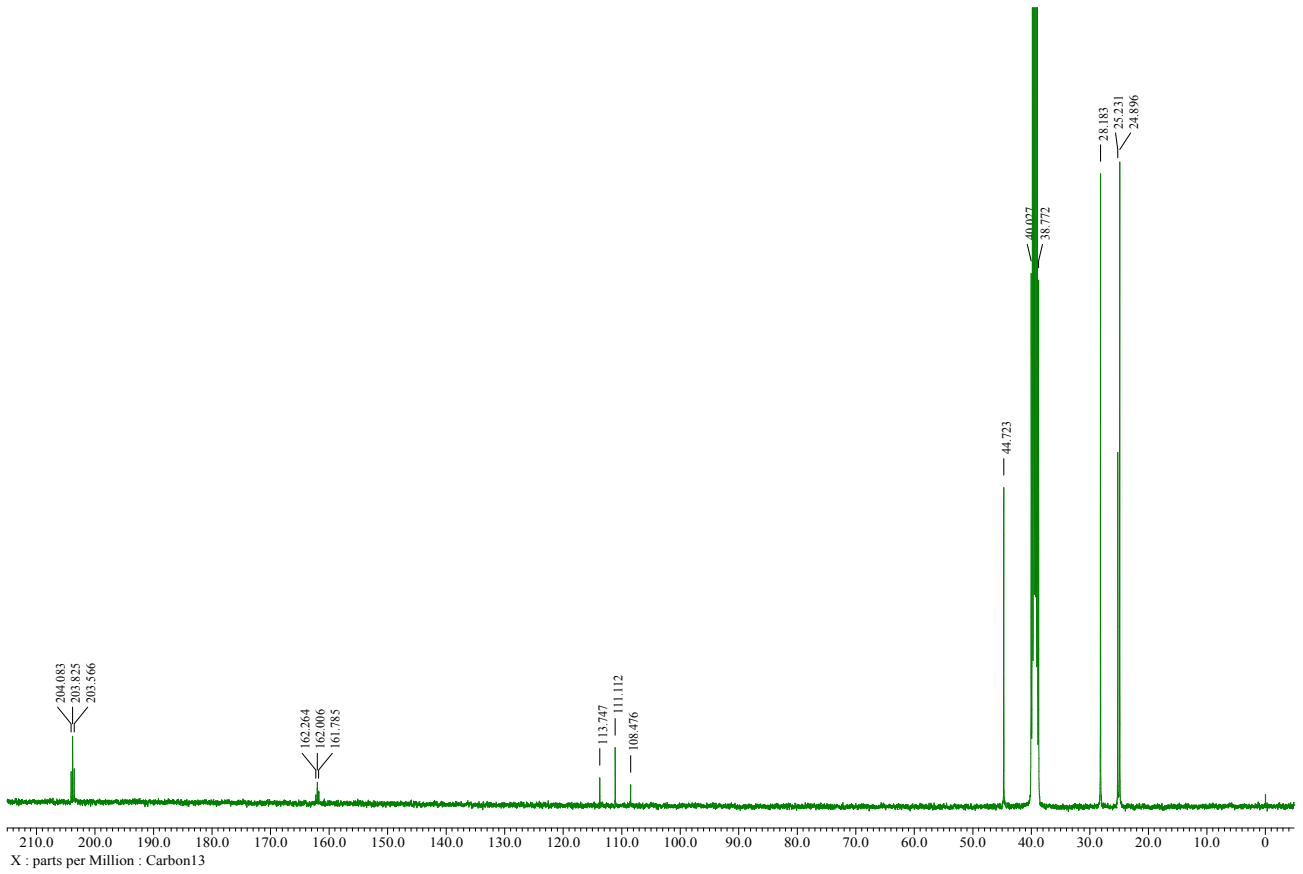




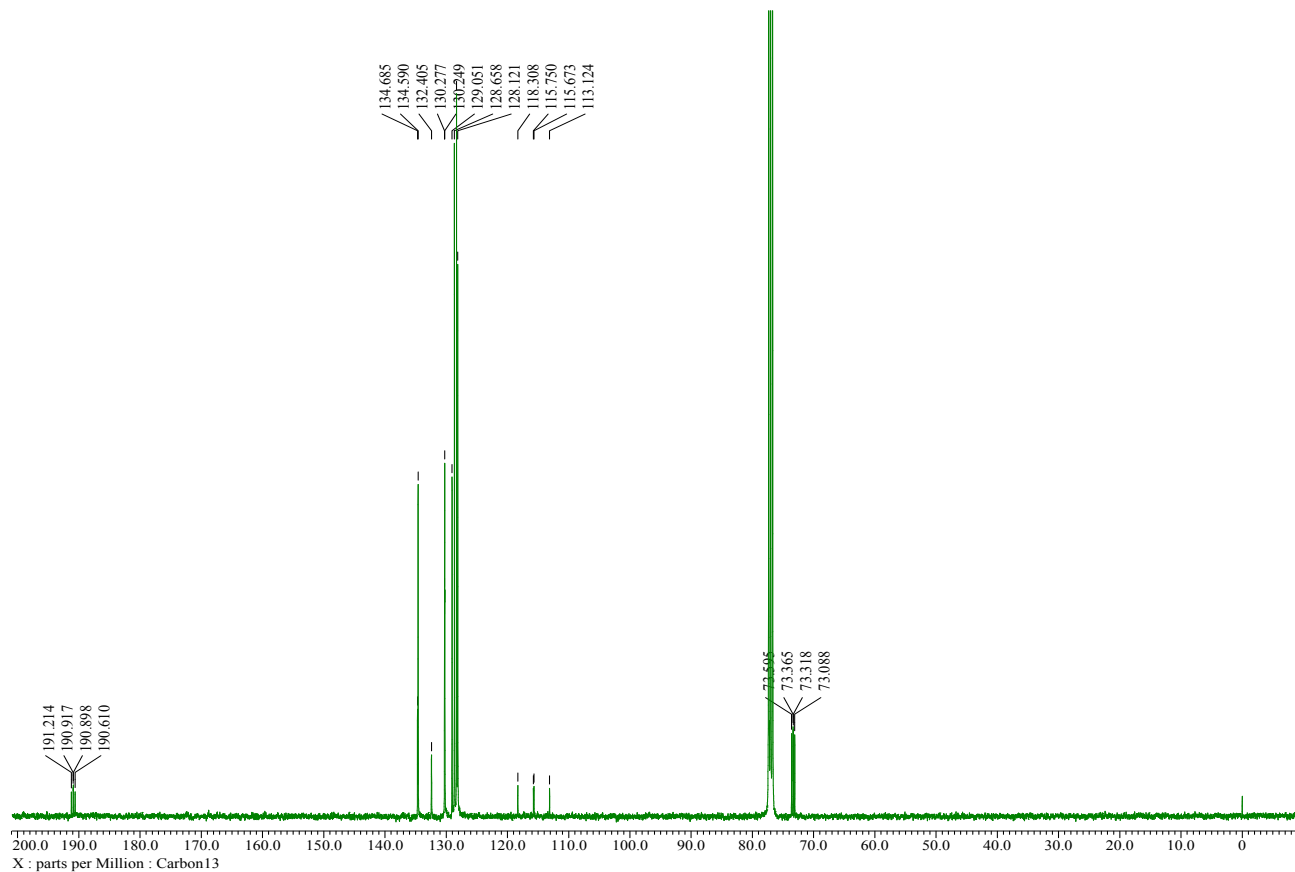
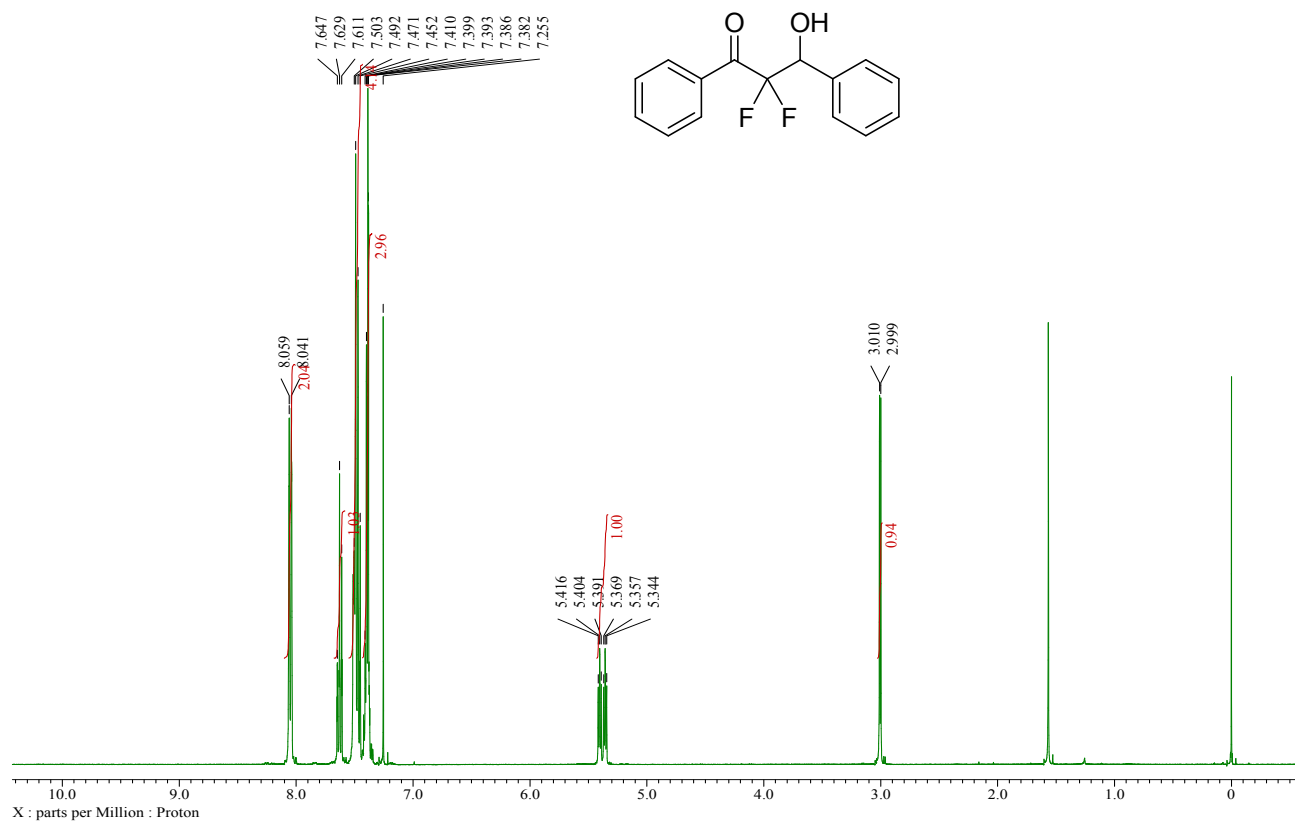


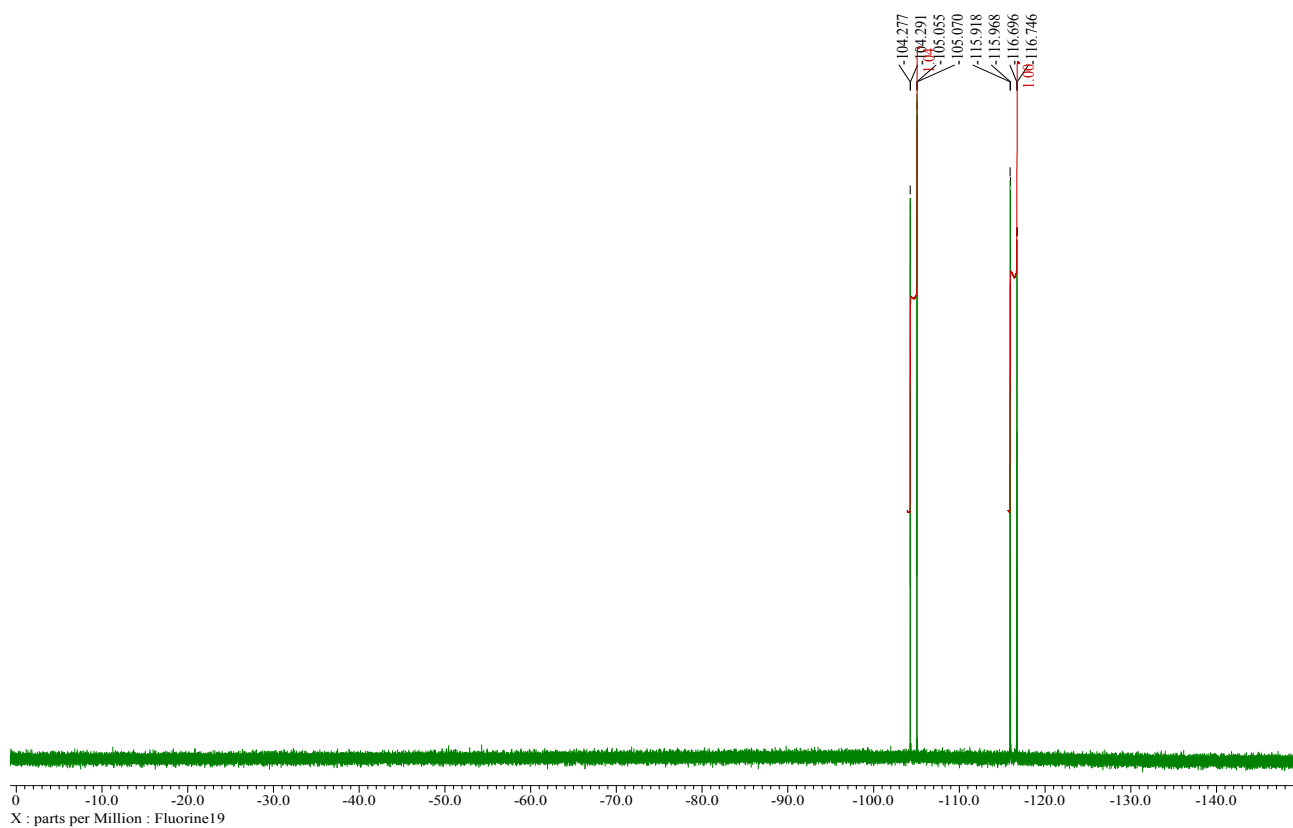
**Potassium 3-cyclohexyl-2,2-difluoro-3-oxopropanoate (2d)**



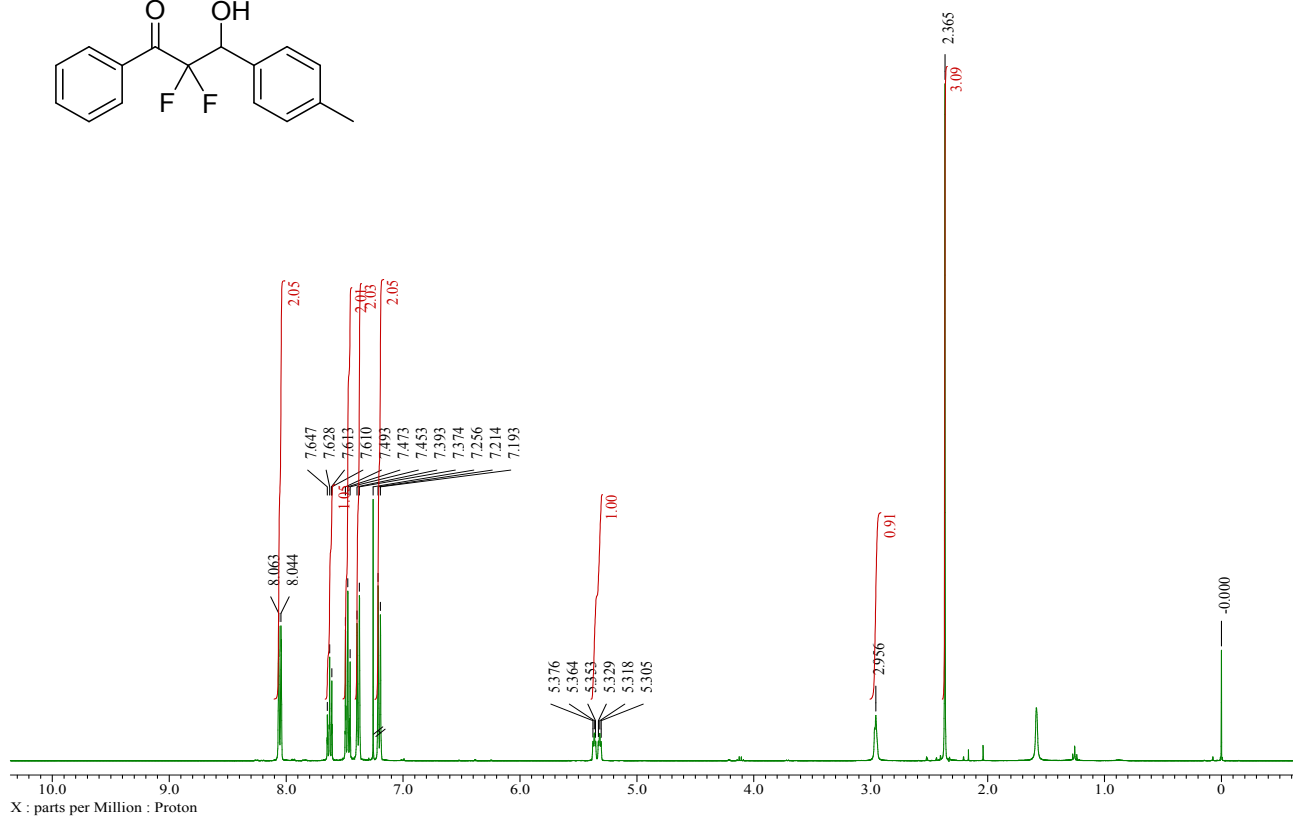
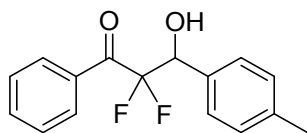


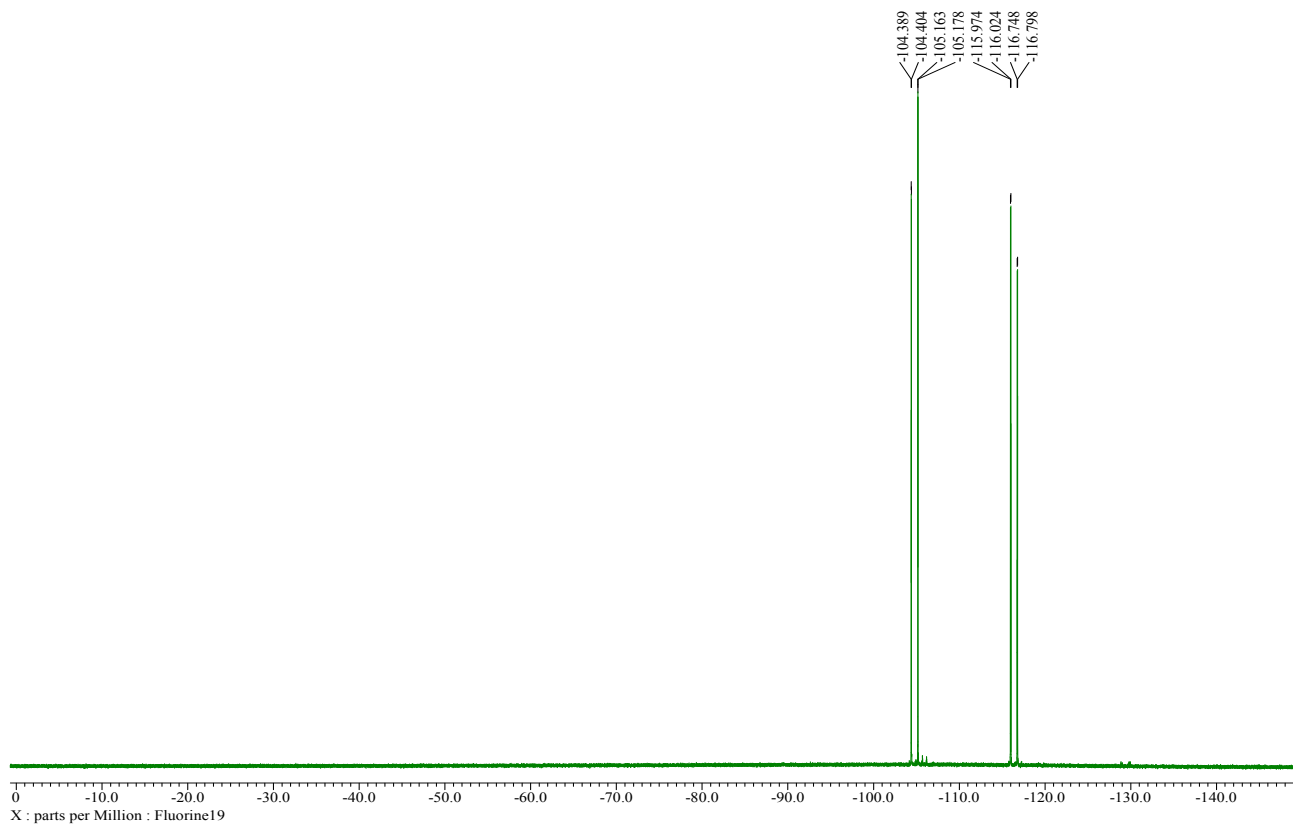
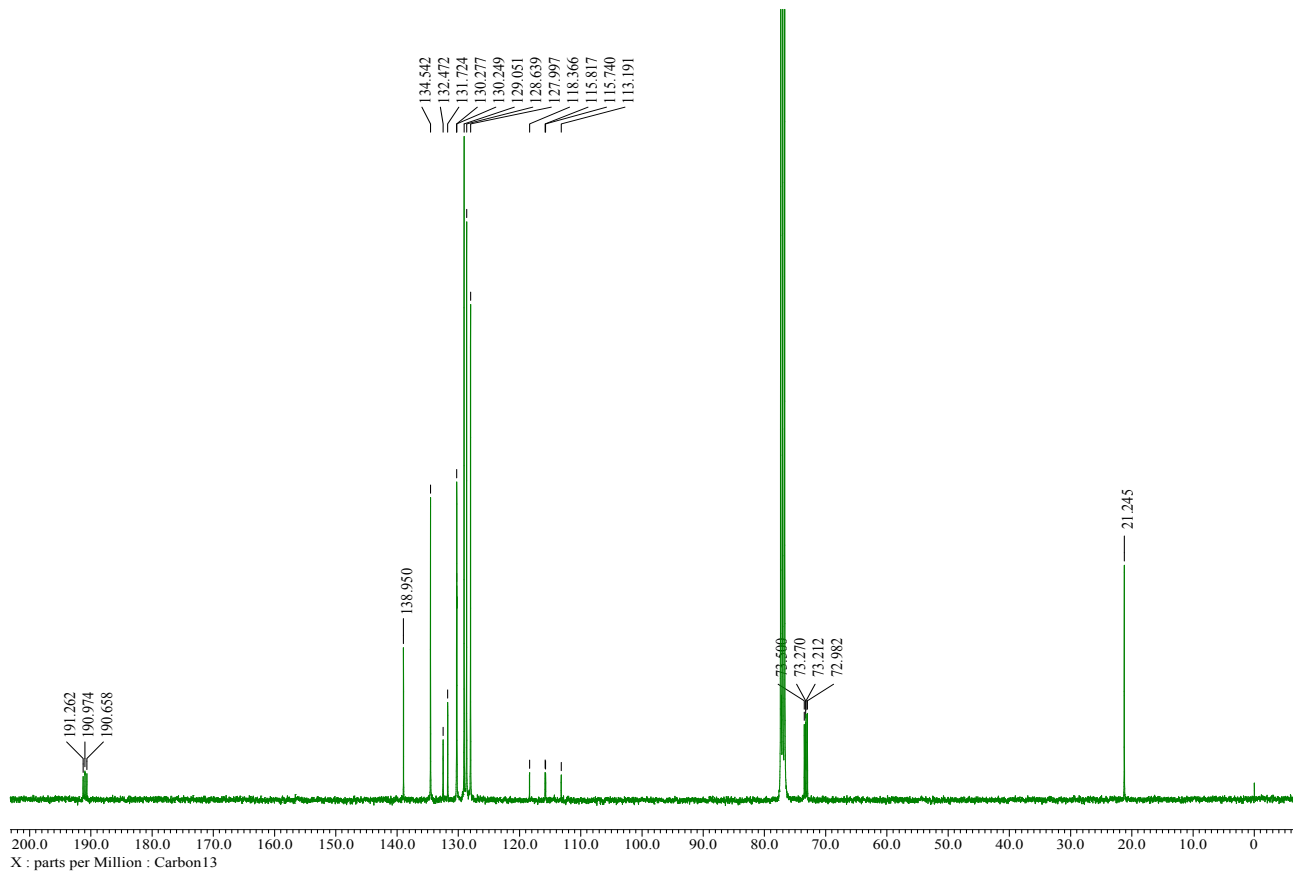
# 2,2-Difluoro-3-hydroxy-1,3-diphenylpropan-1-one (6aa)



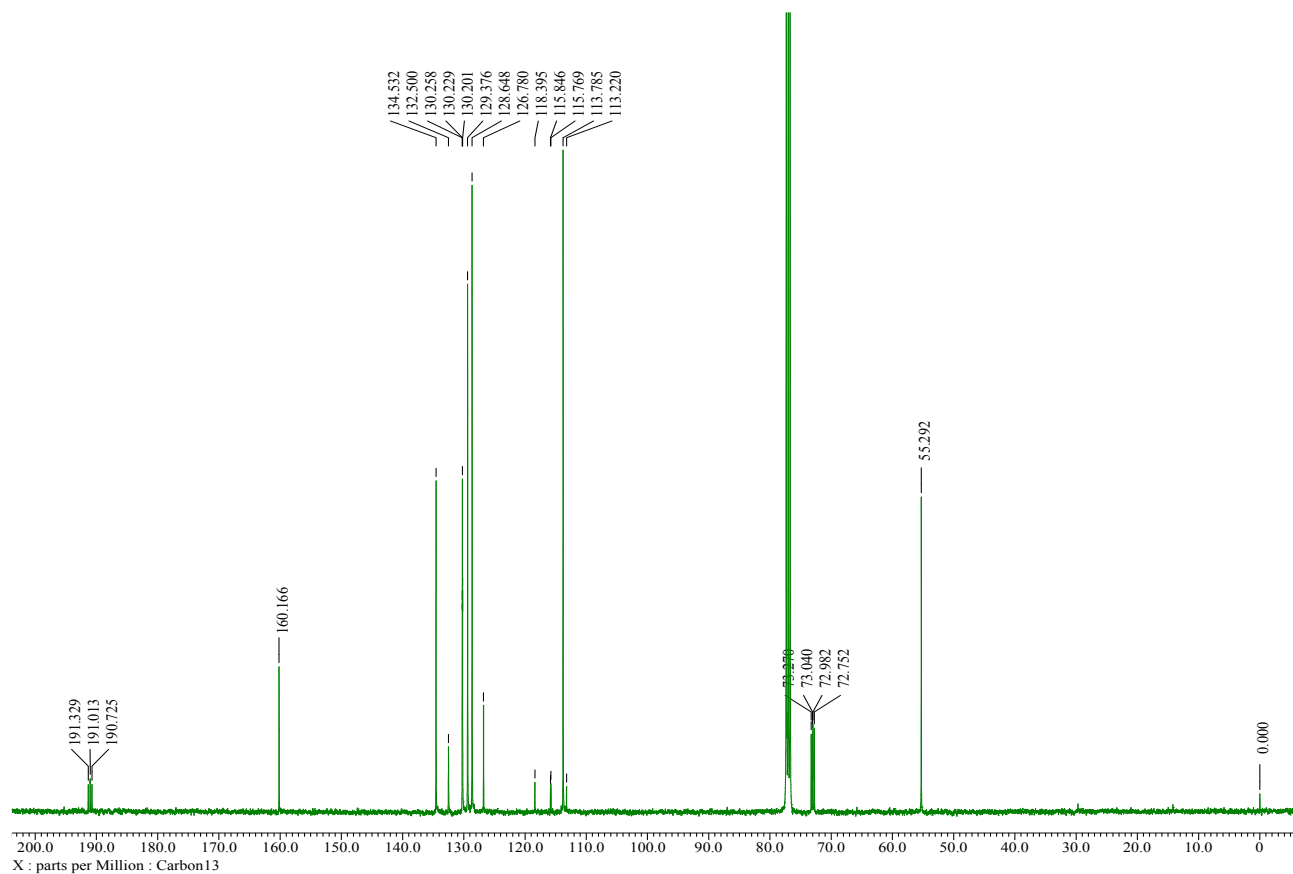
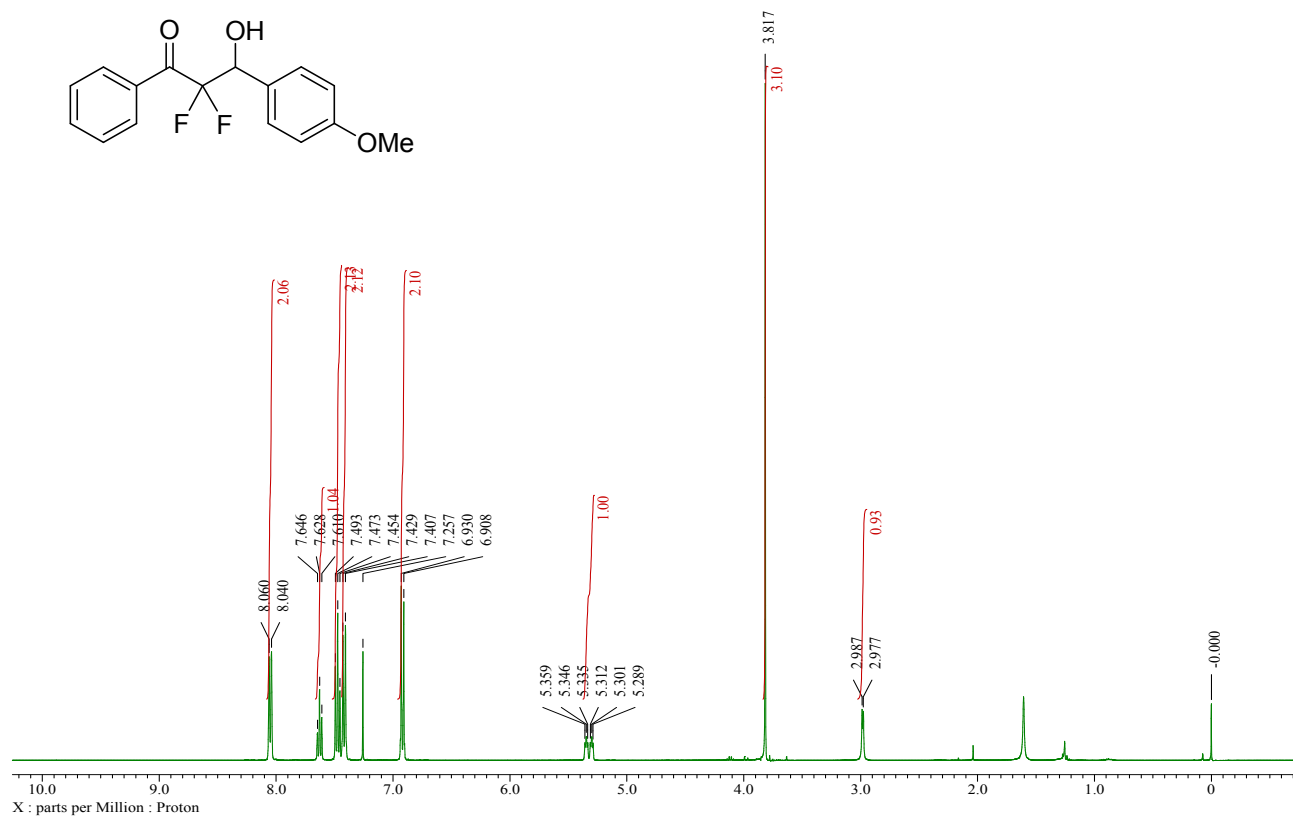
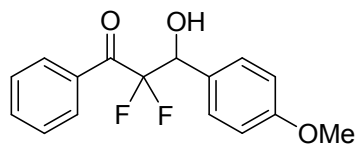


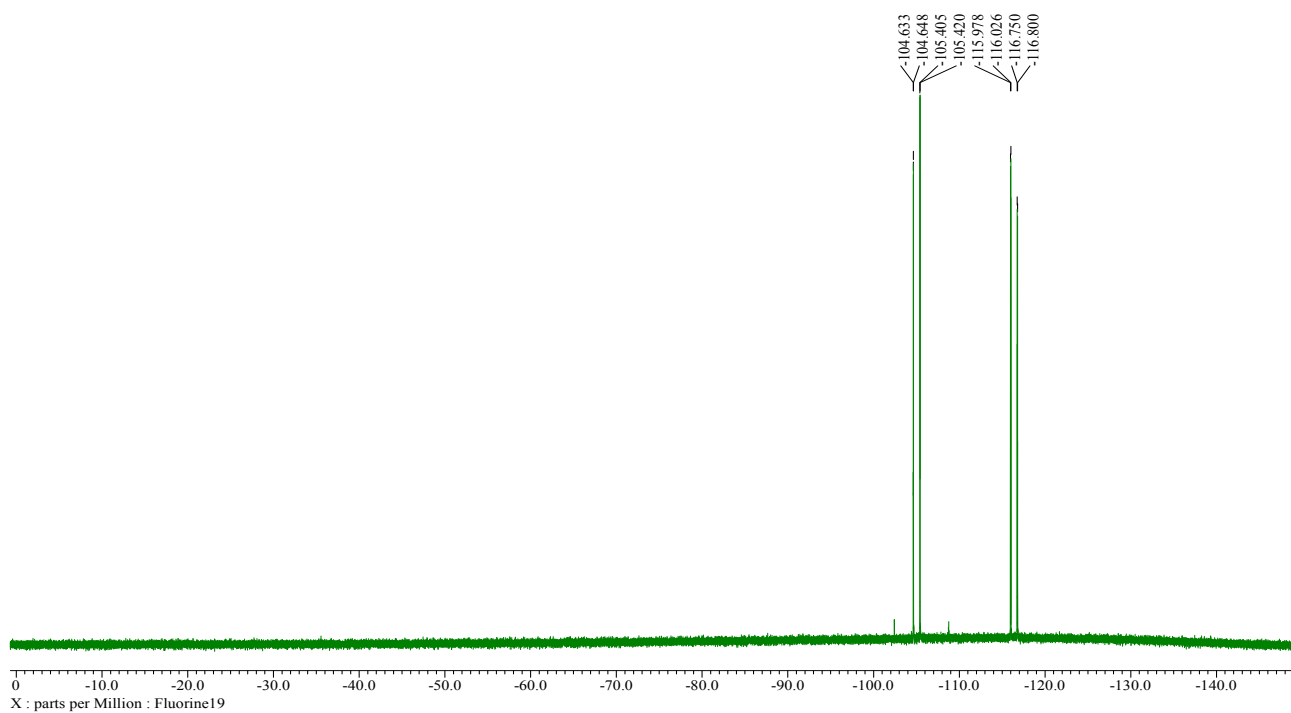
**2,2-Difluoro-3-hydroxy-1-phenyl-3-(p-tolyl)propan-1-one (6ab)**



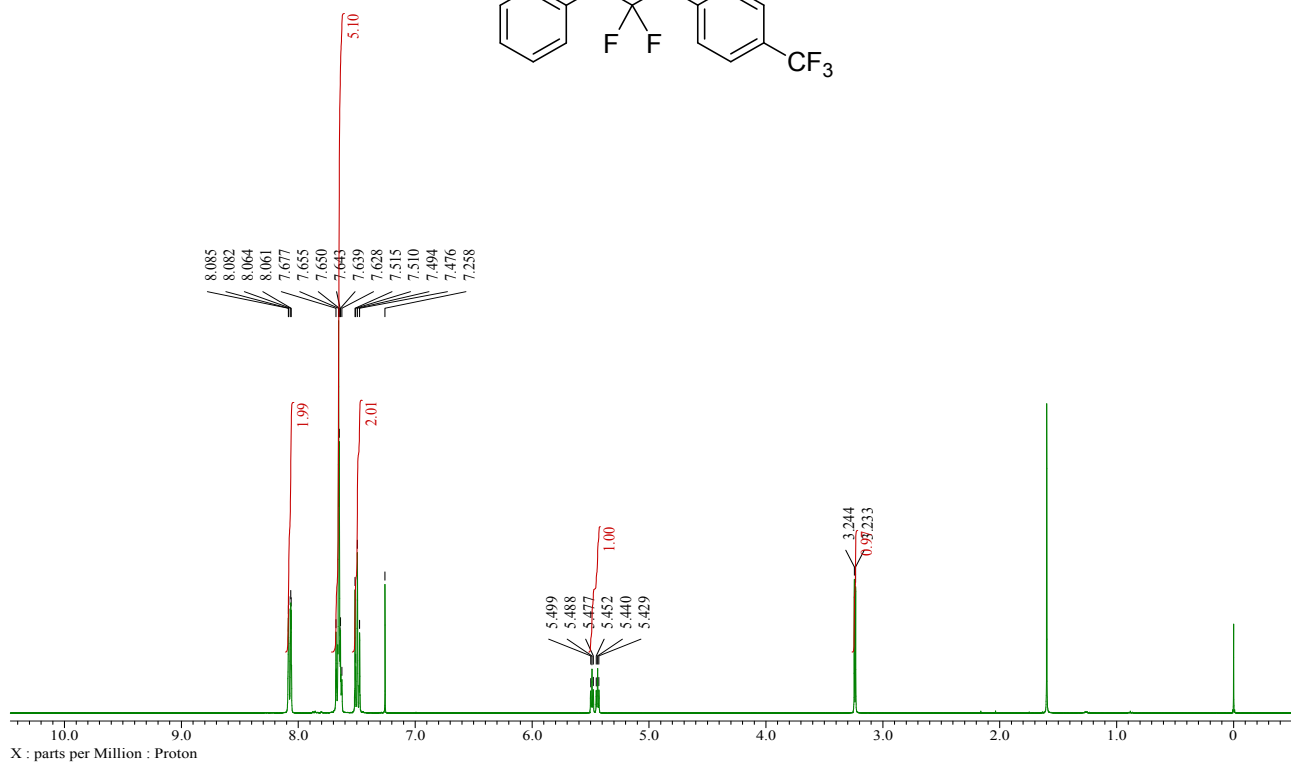
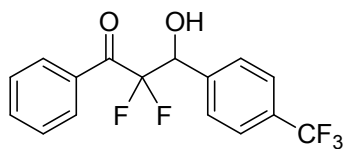


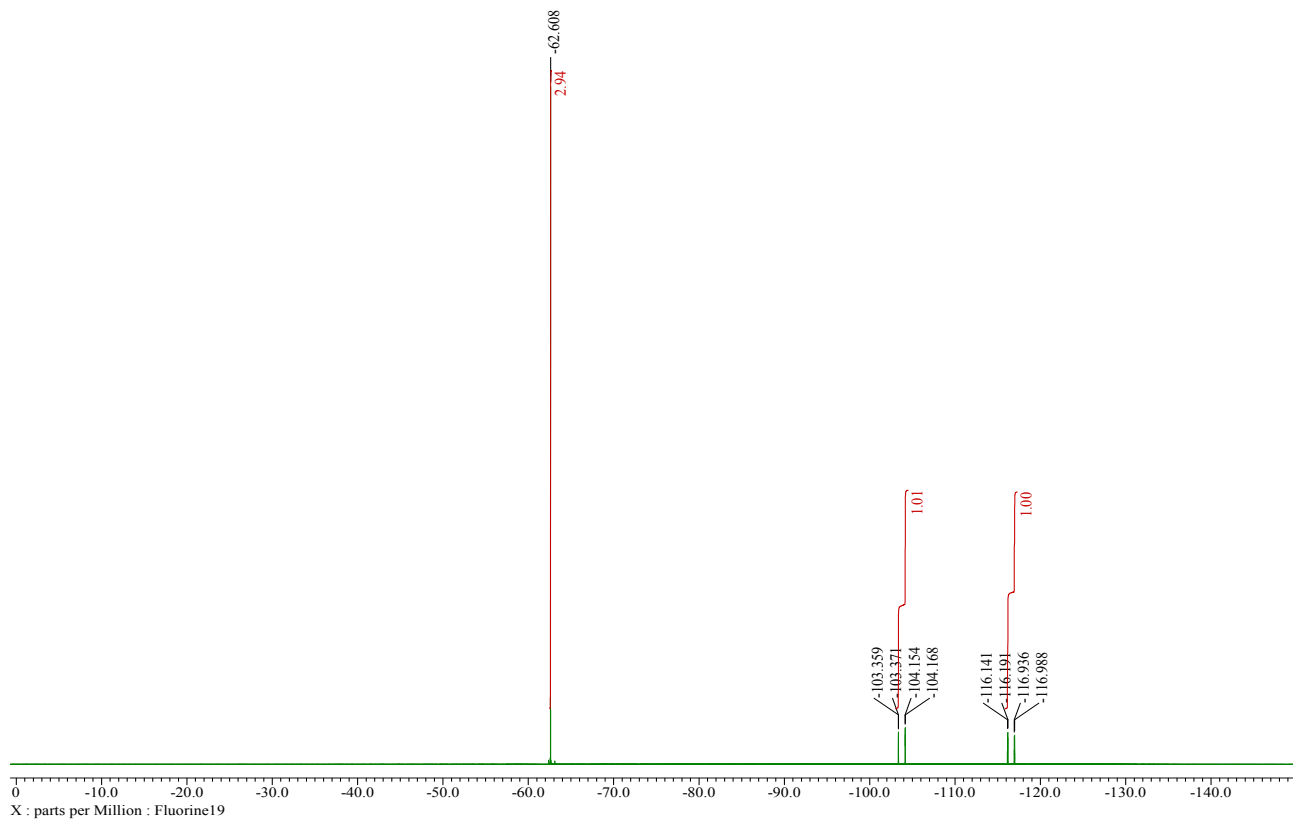
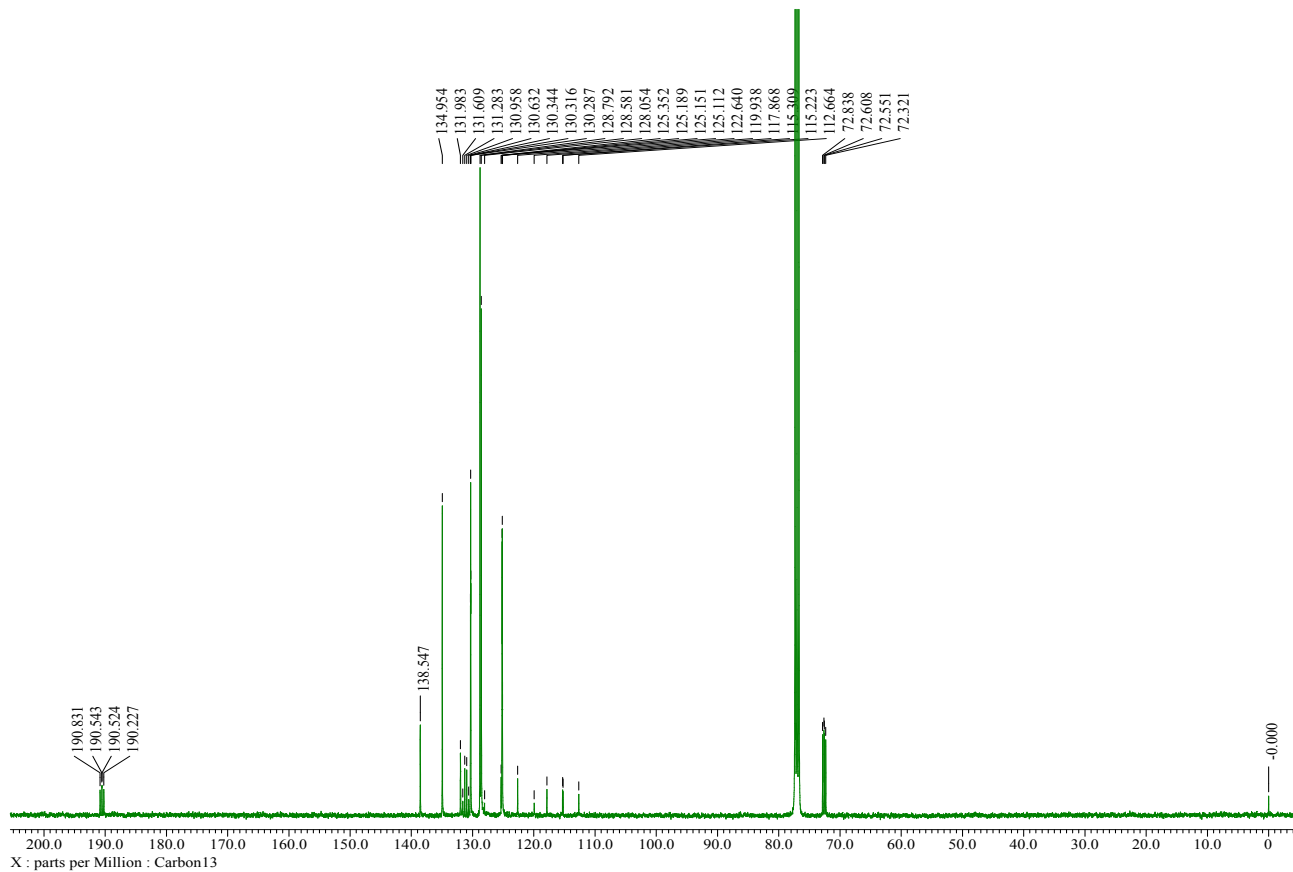
# 2,2-Difluoro-3-hydroxy-3-(4-methoxyphenyl)-1-phenylpropan-1-one (6ac)





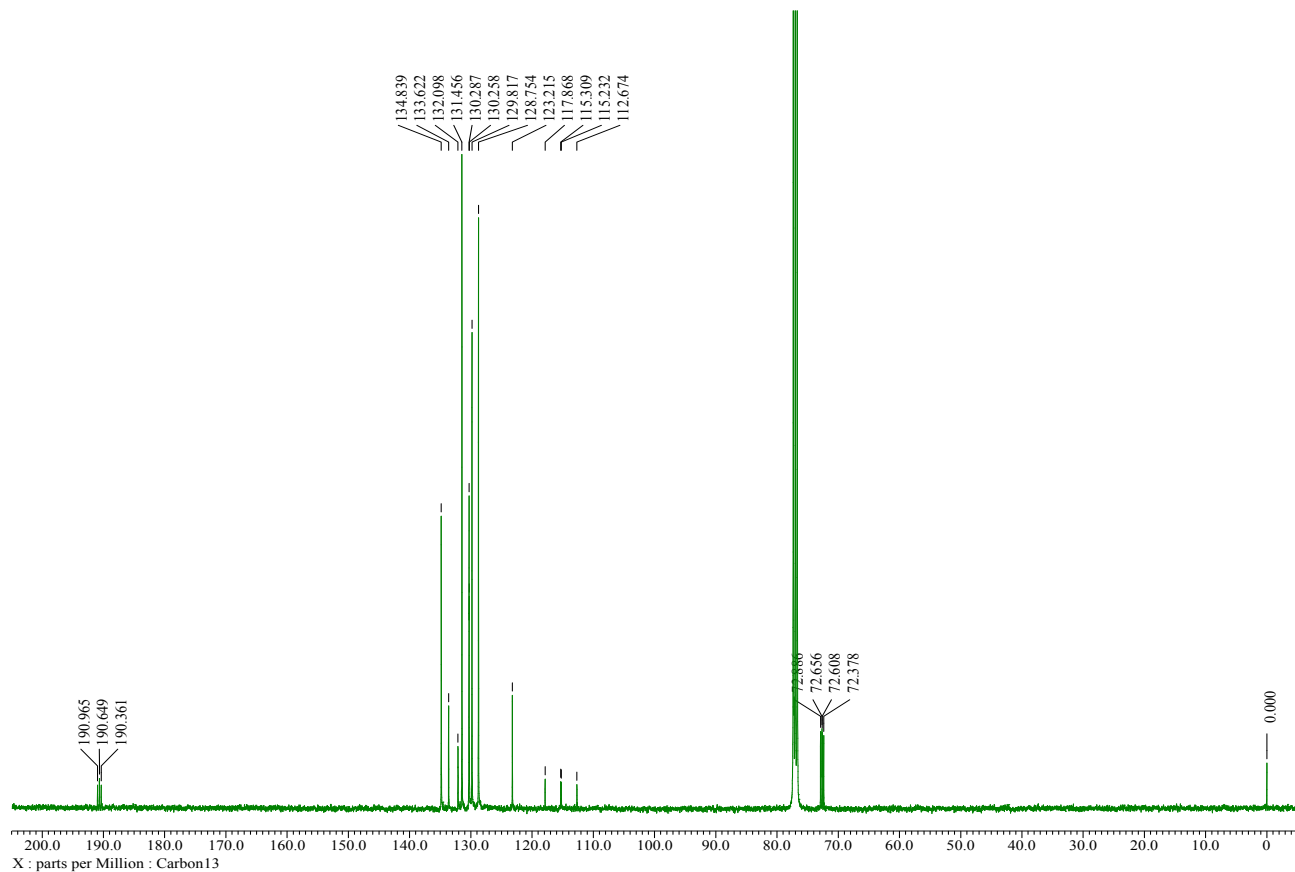
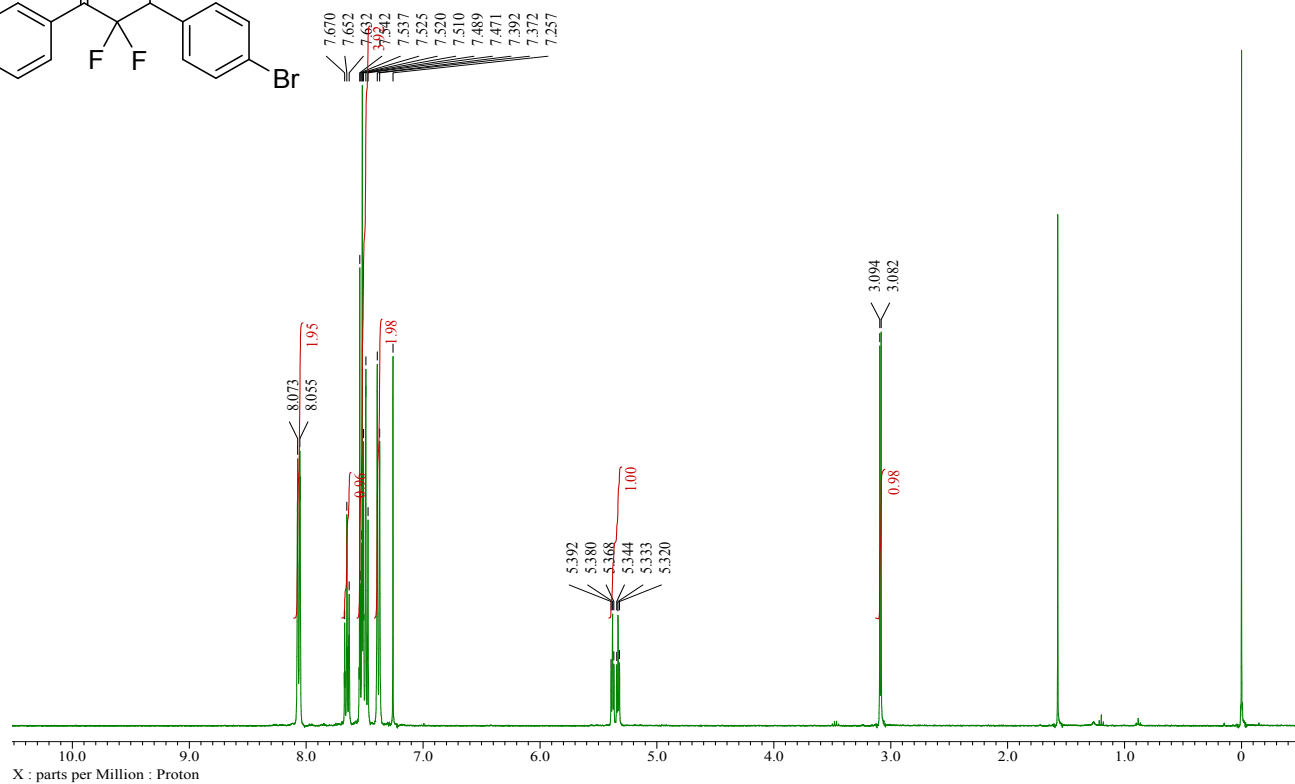
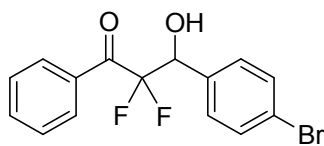
**2,2-Difluoro-3-hydroxy-1-phenyl-3-(4-(trifluoromethyl)phenyl)propan-1-one (6ad)**



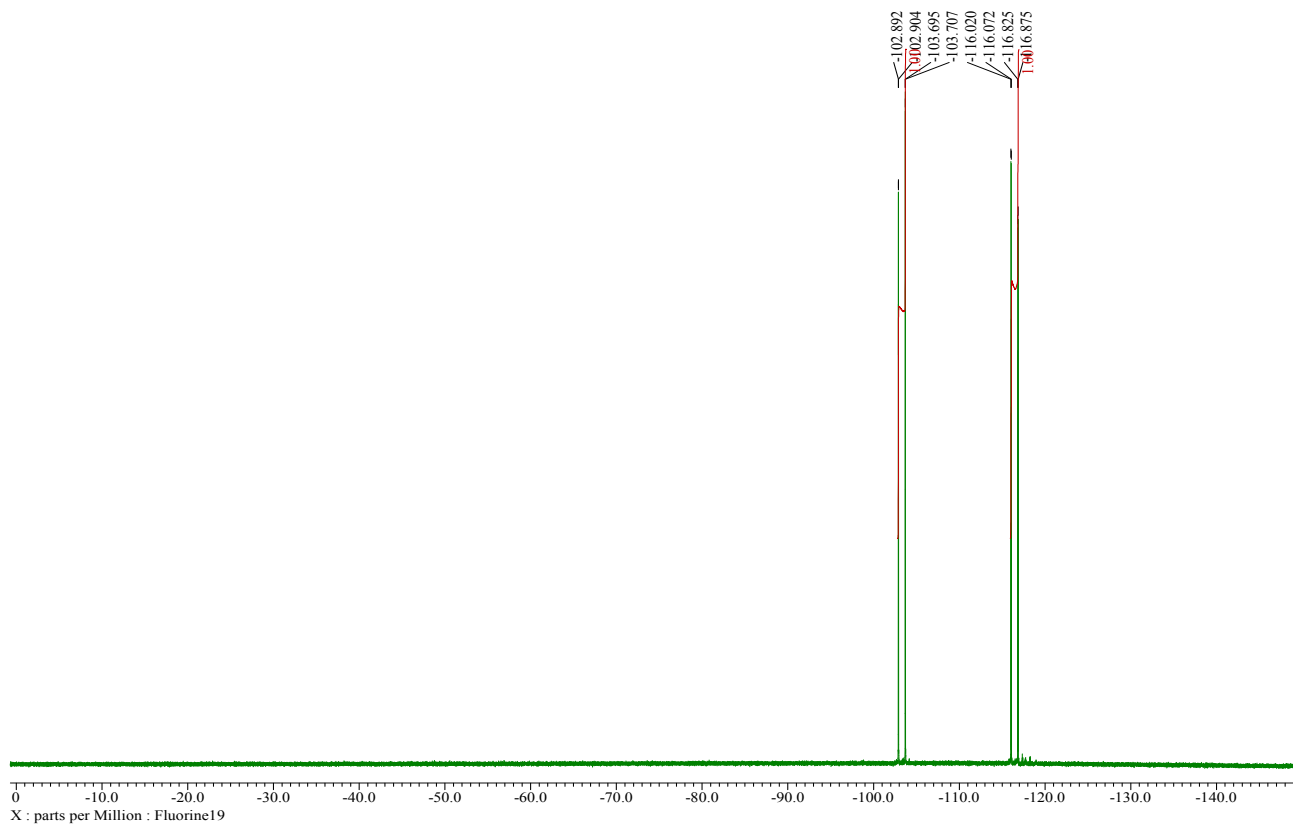
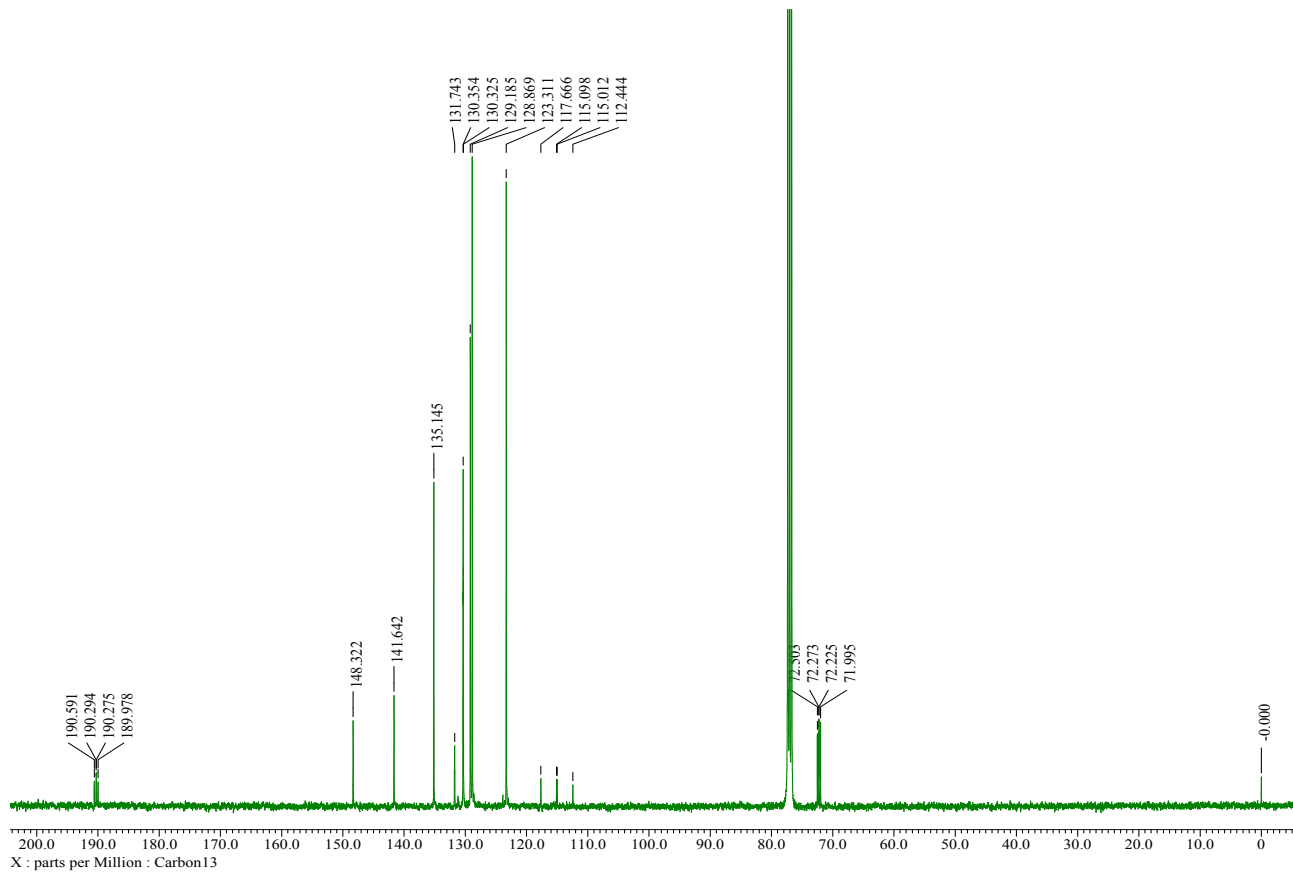




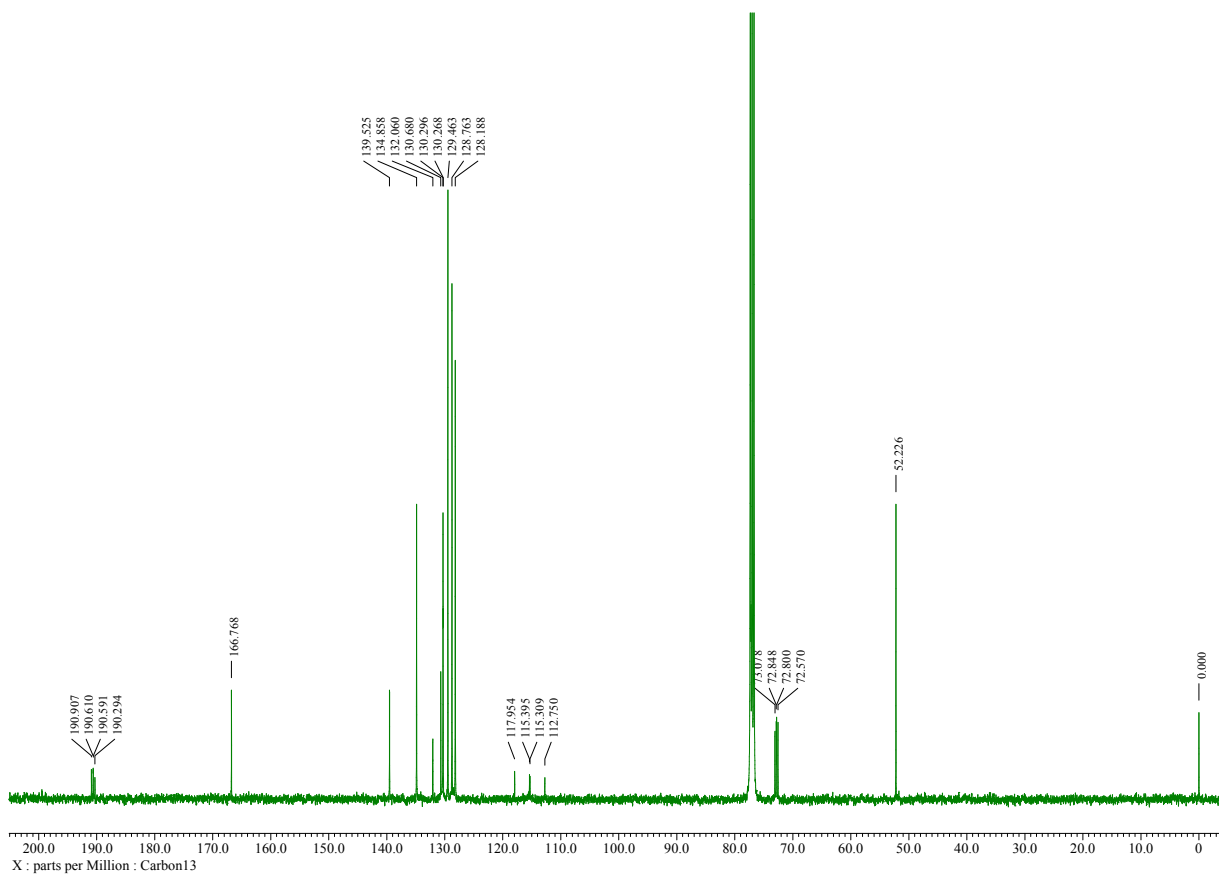
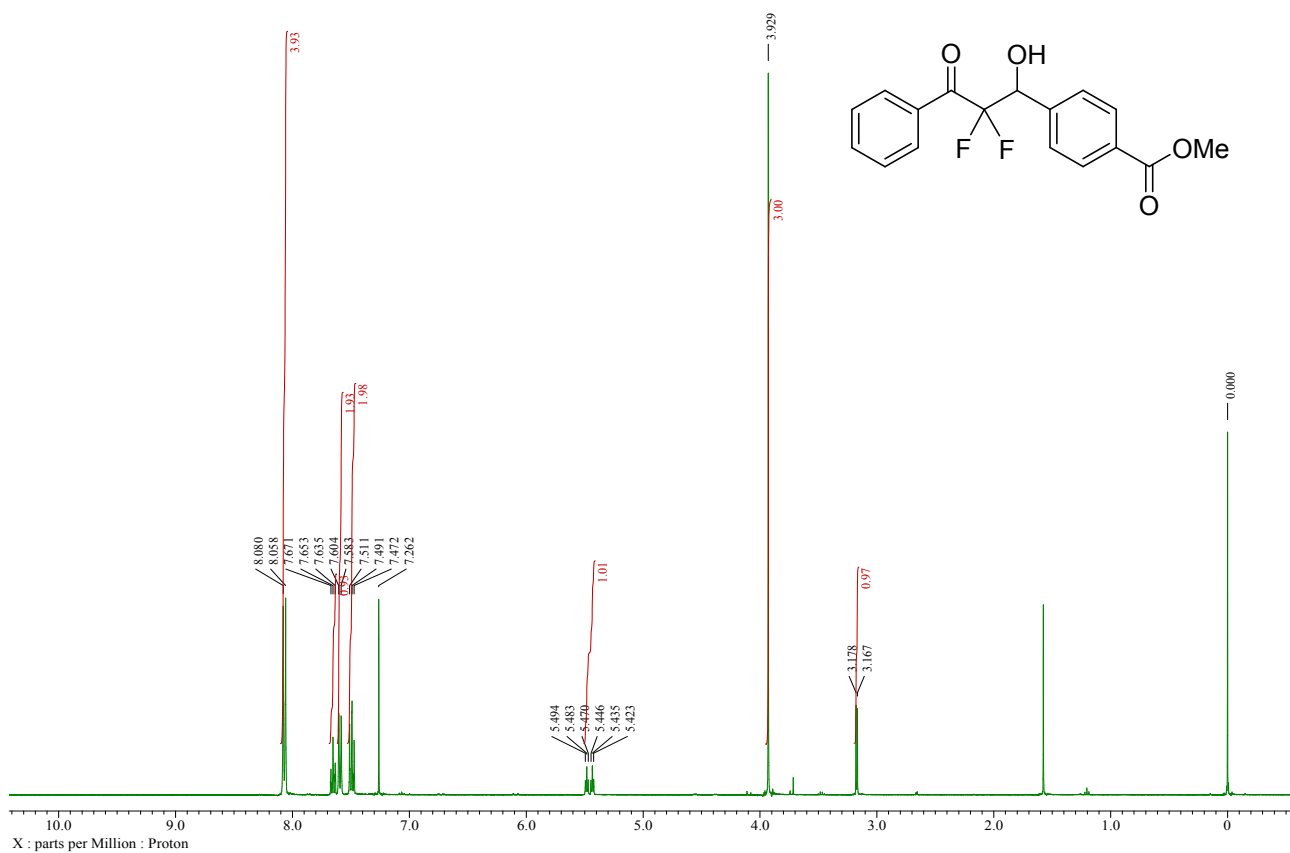
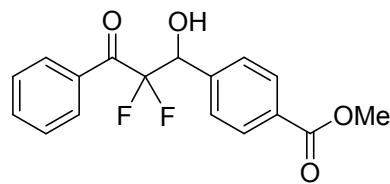
### 3-(4-Bromophenyl)-2,2-difluoro-3-hydroxy-1-phenylpropan-1-one (6ae)

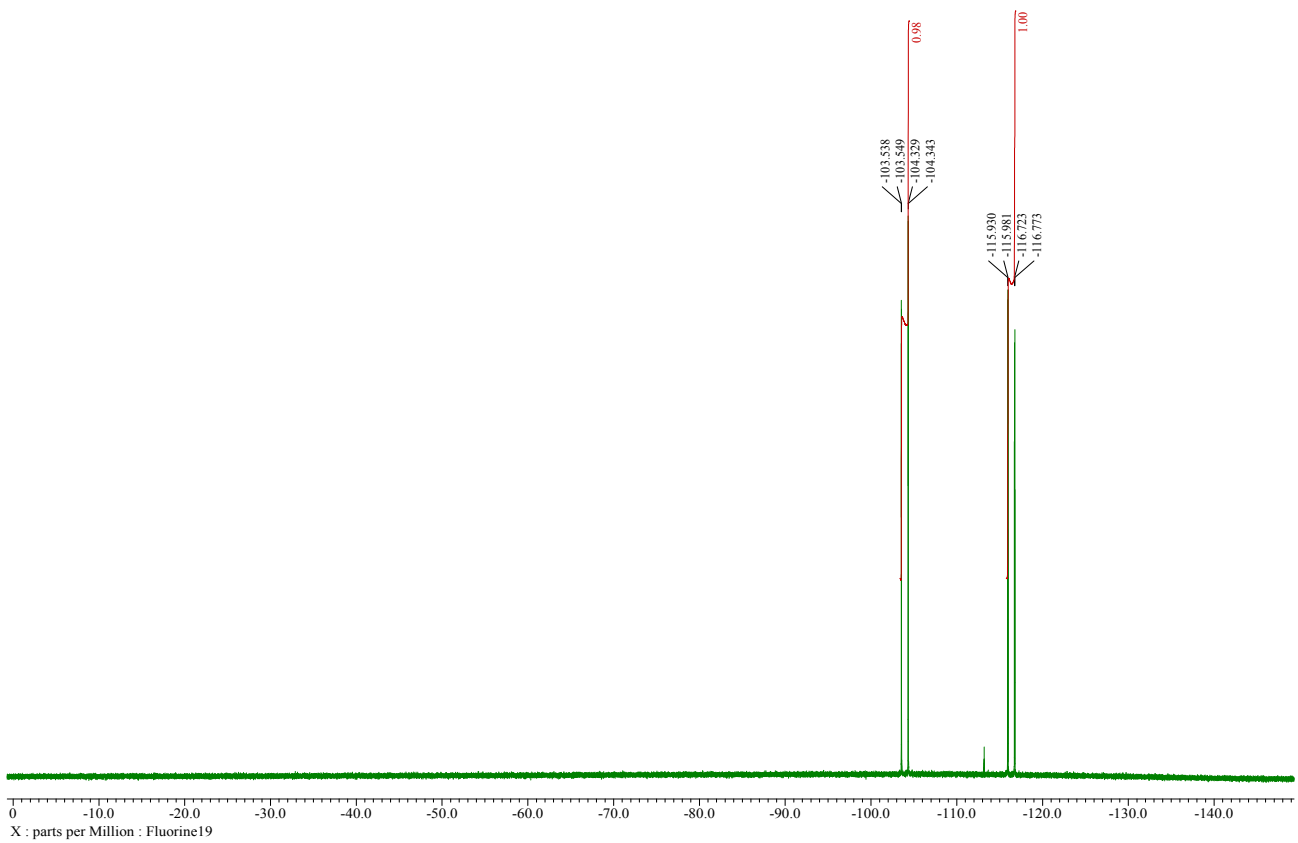




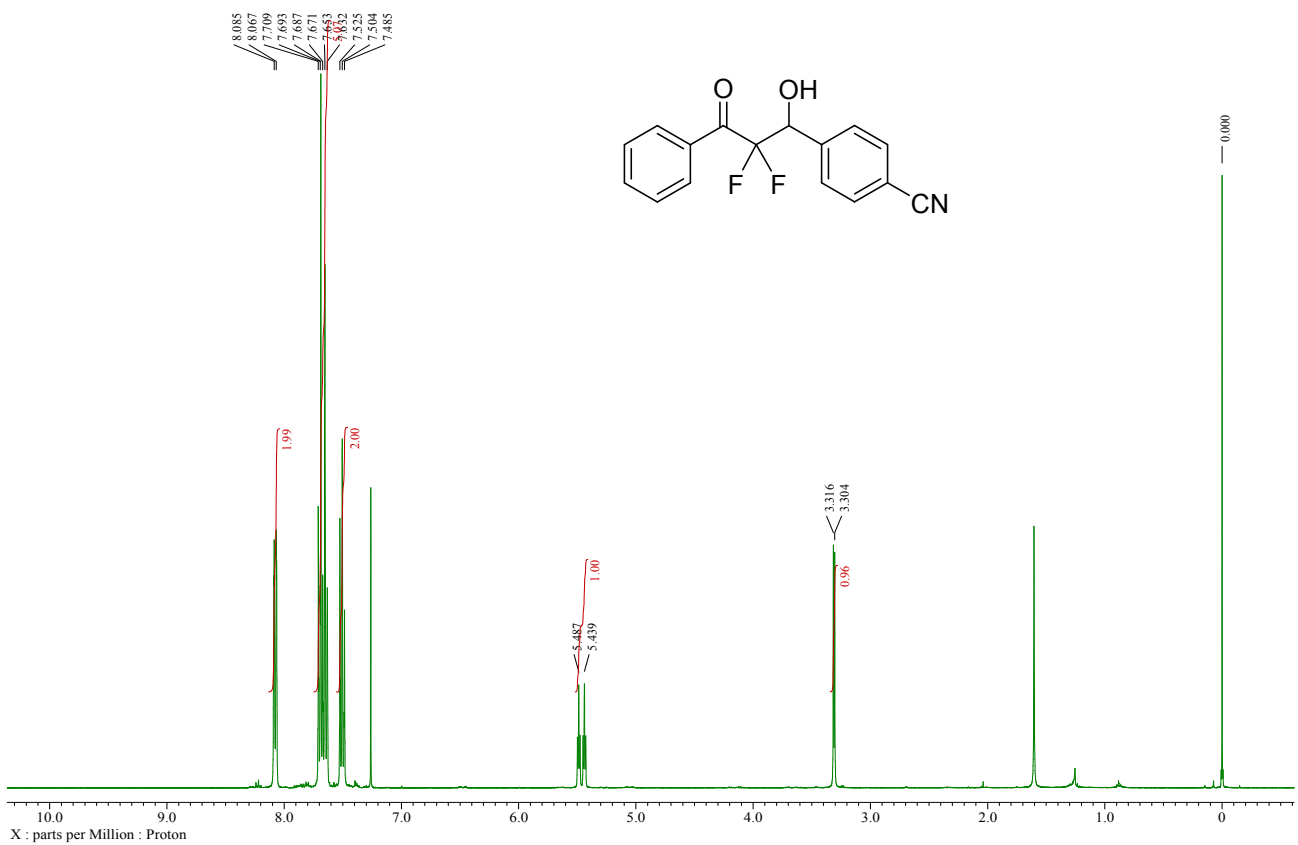


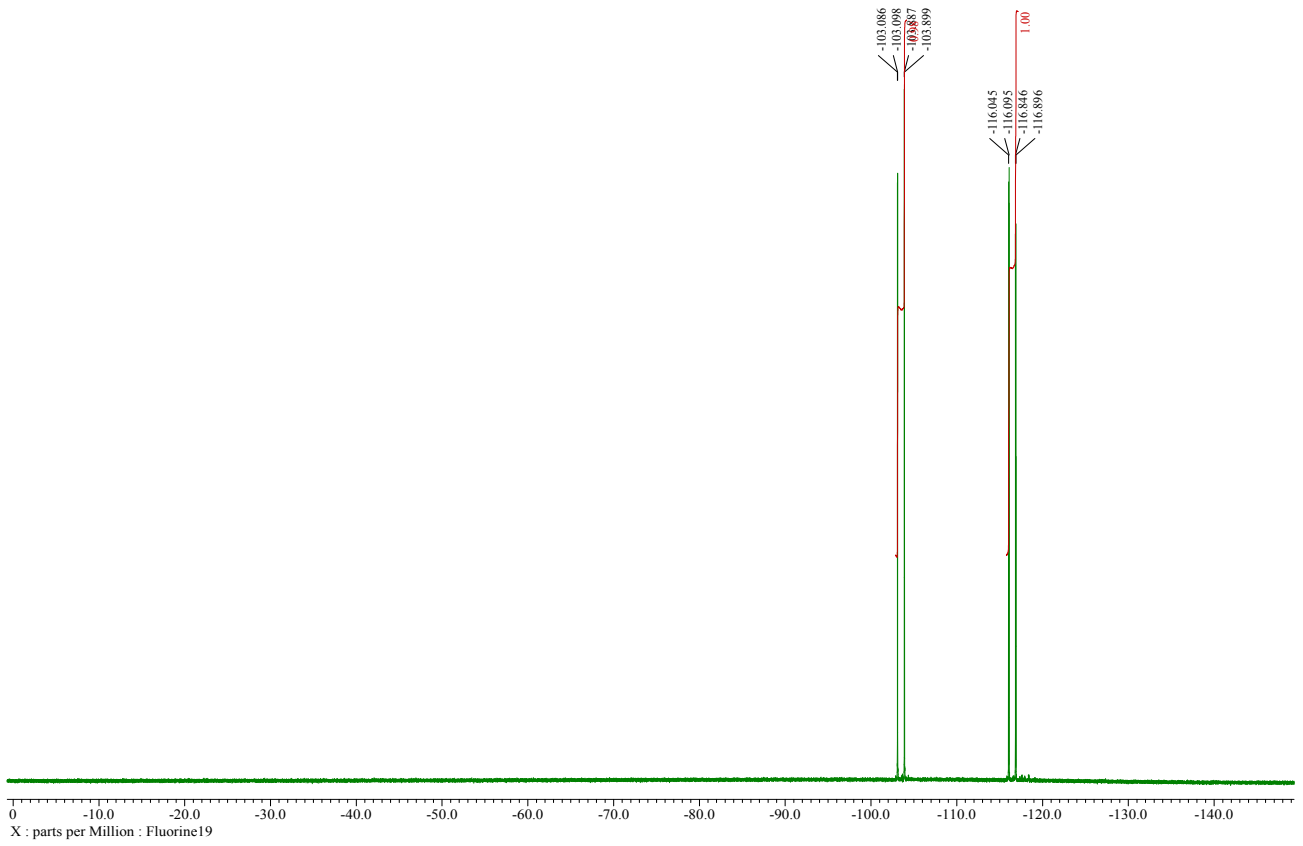
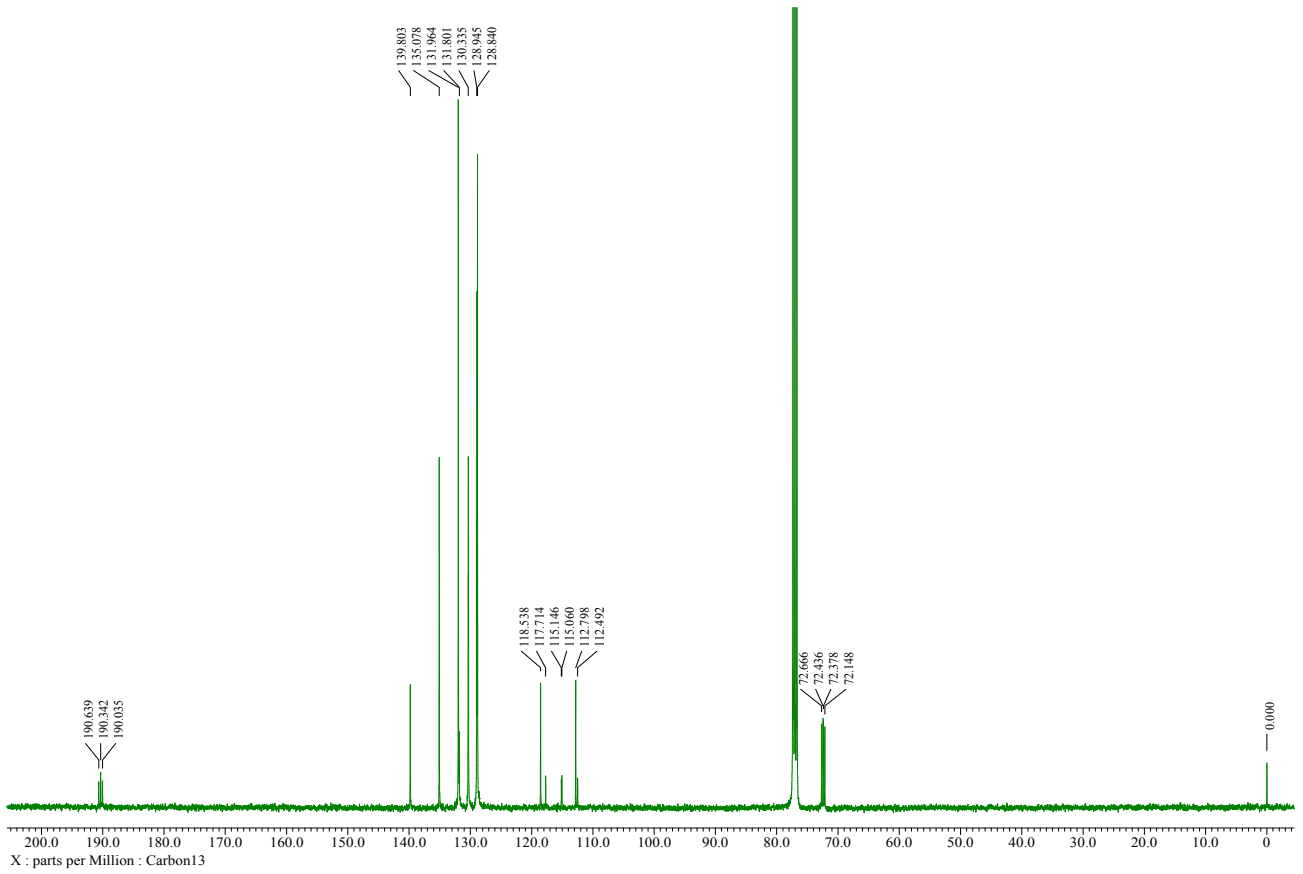
# Methyl 4-(2,2-difluoro-1-hydroxy-3-oxo-3-phenylpropyl)benzoate (6ag)



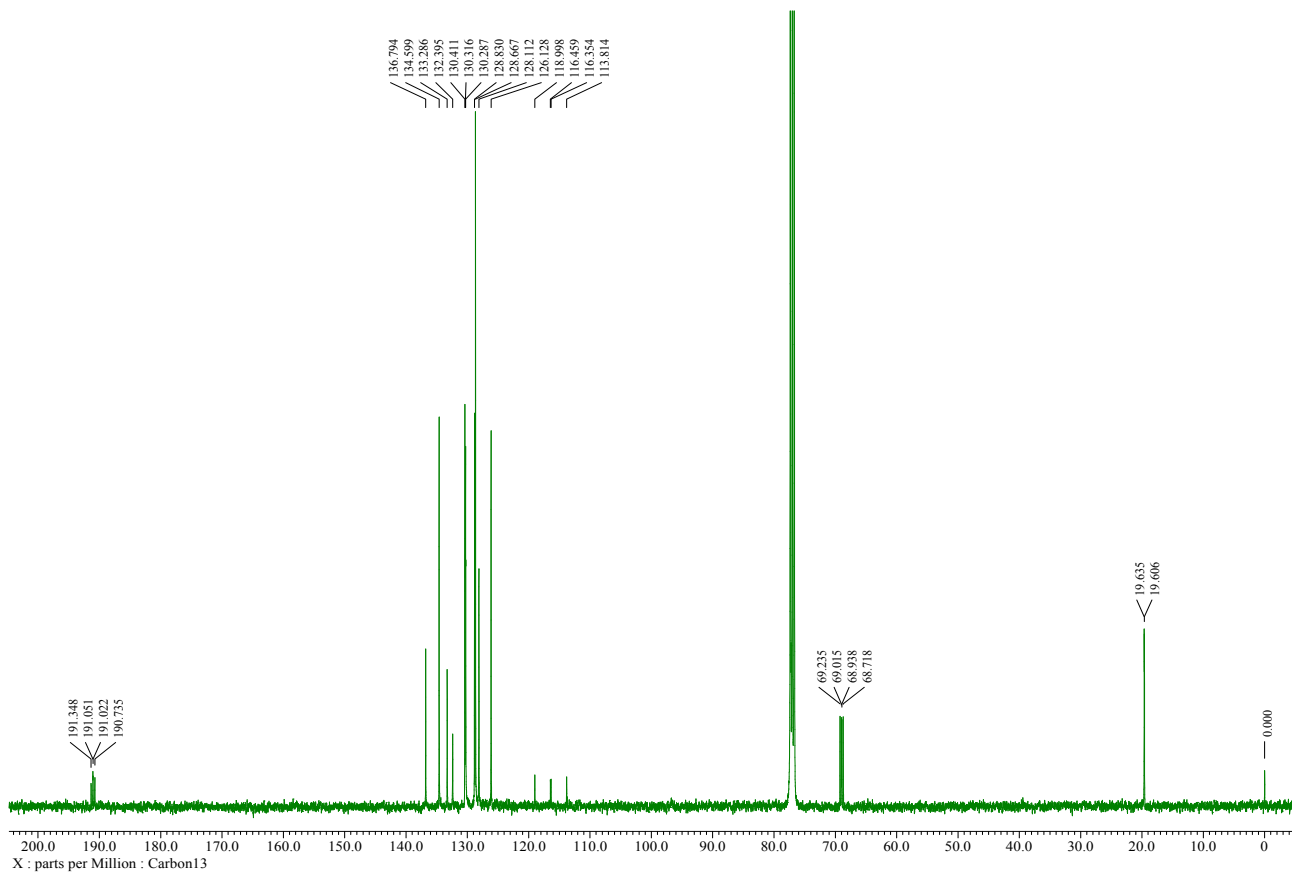
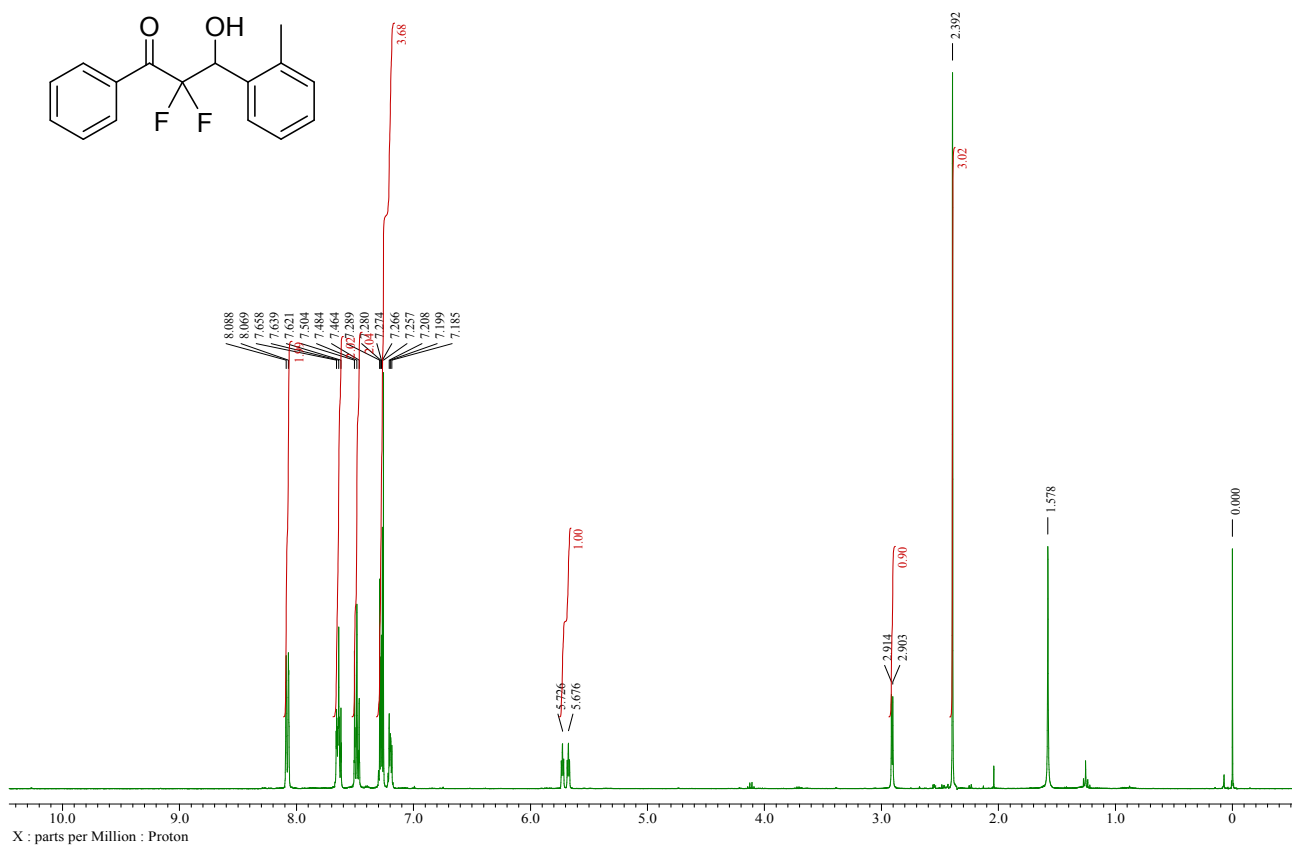
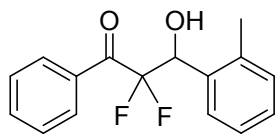


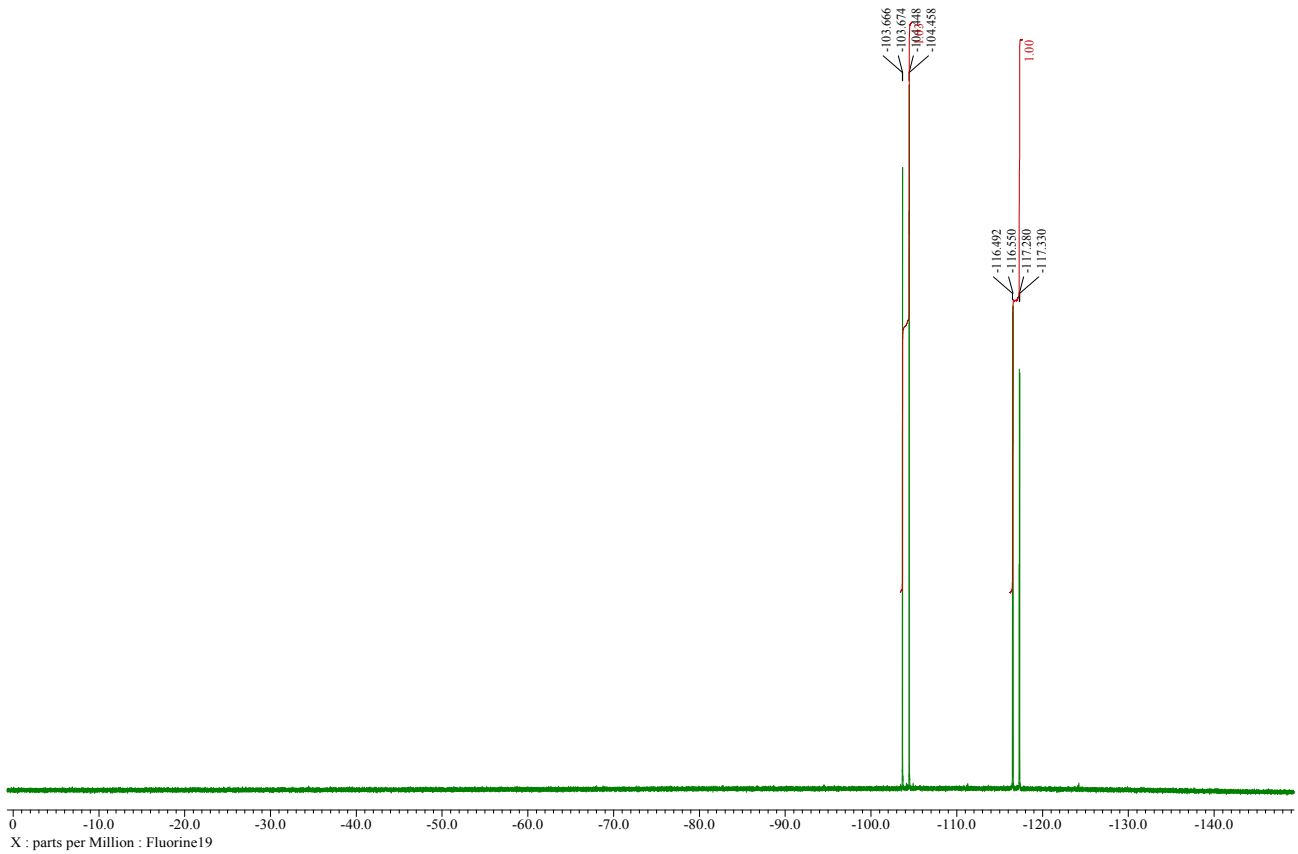
**4-(2,2-Difluoro-1-hydroxy-3-oxo-3-phenylpropyl)benzonitrile (6ah)**



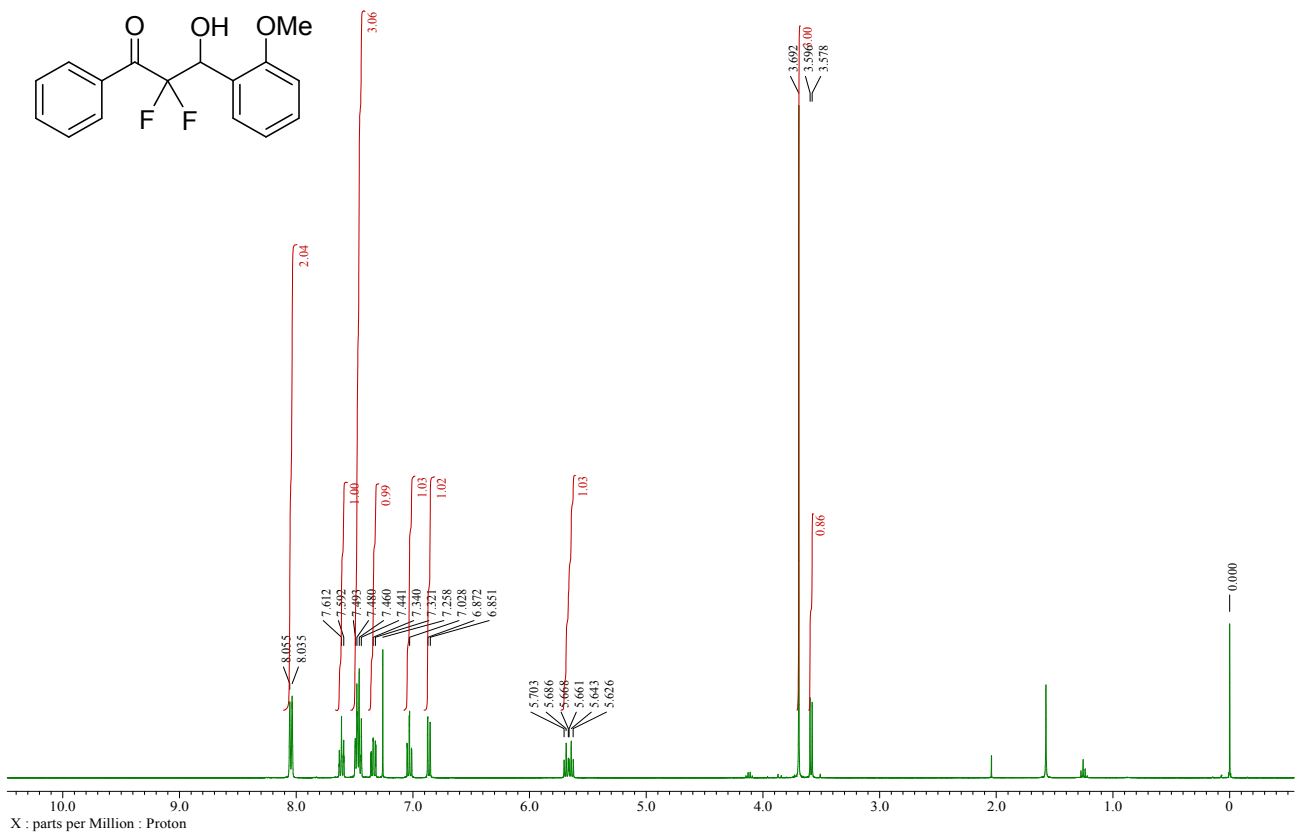


# 2,2-Difluoro-3-hydroxy-1-phenyl-3-(*o*-tolyl)propan-1-one (6ai)

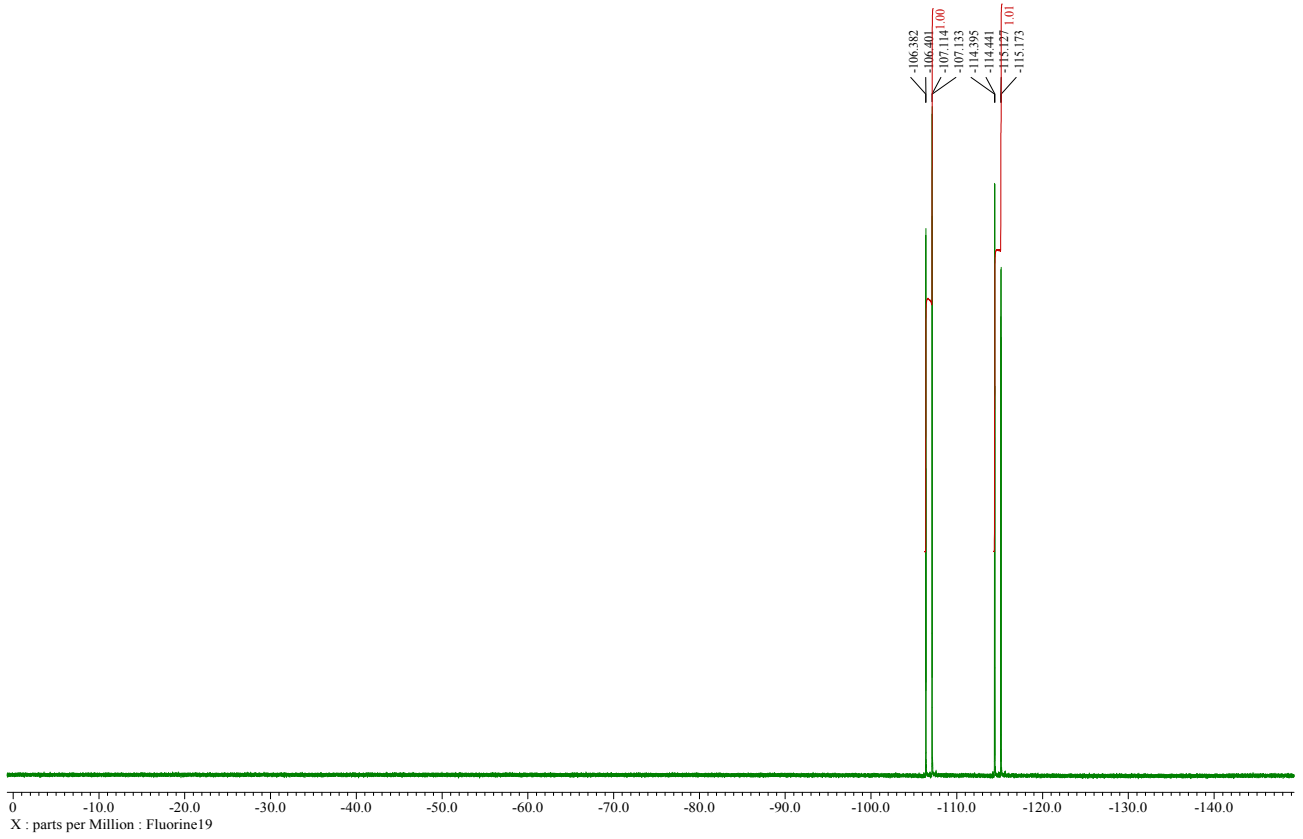
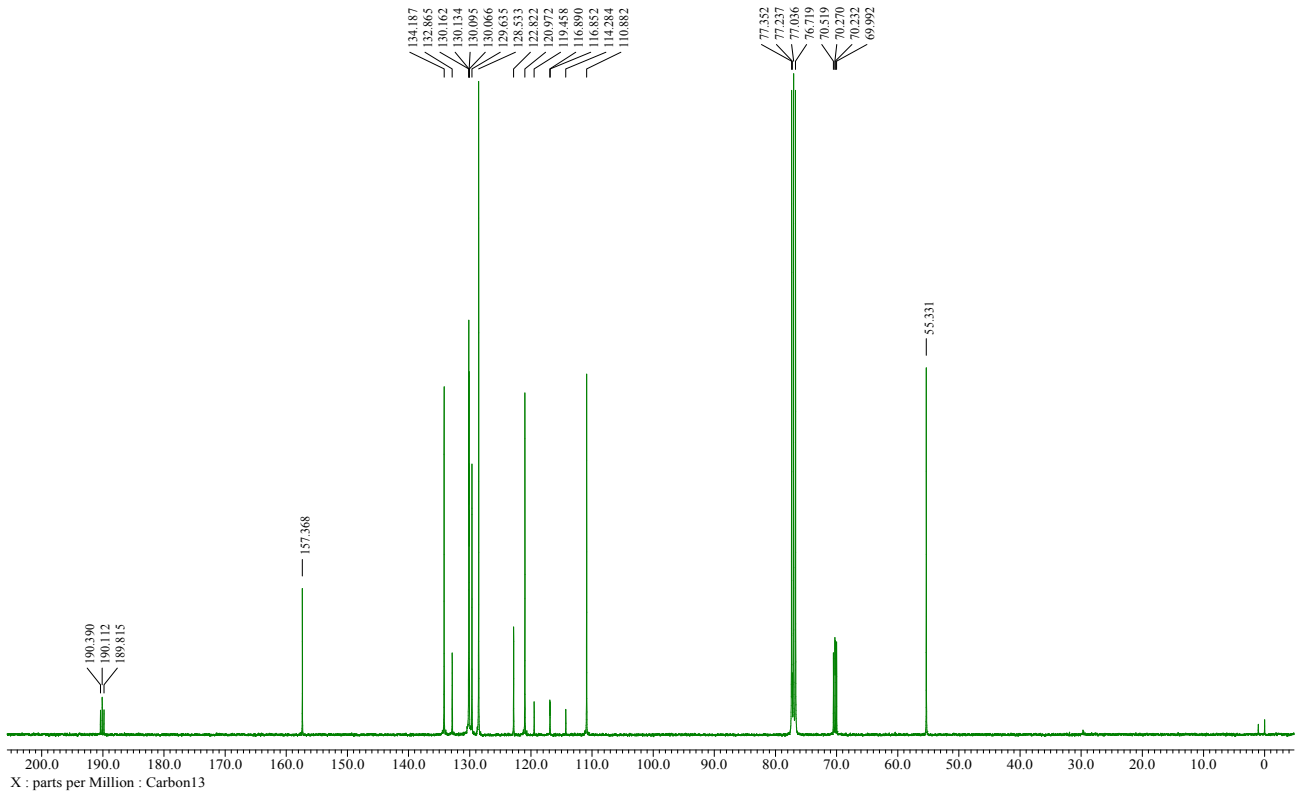




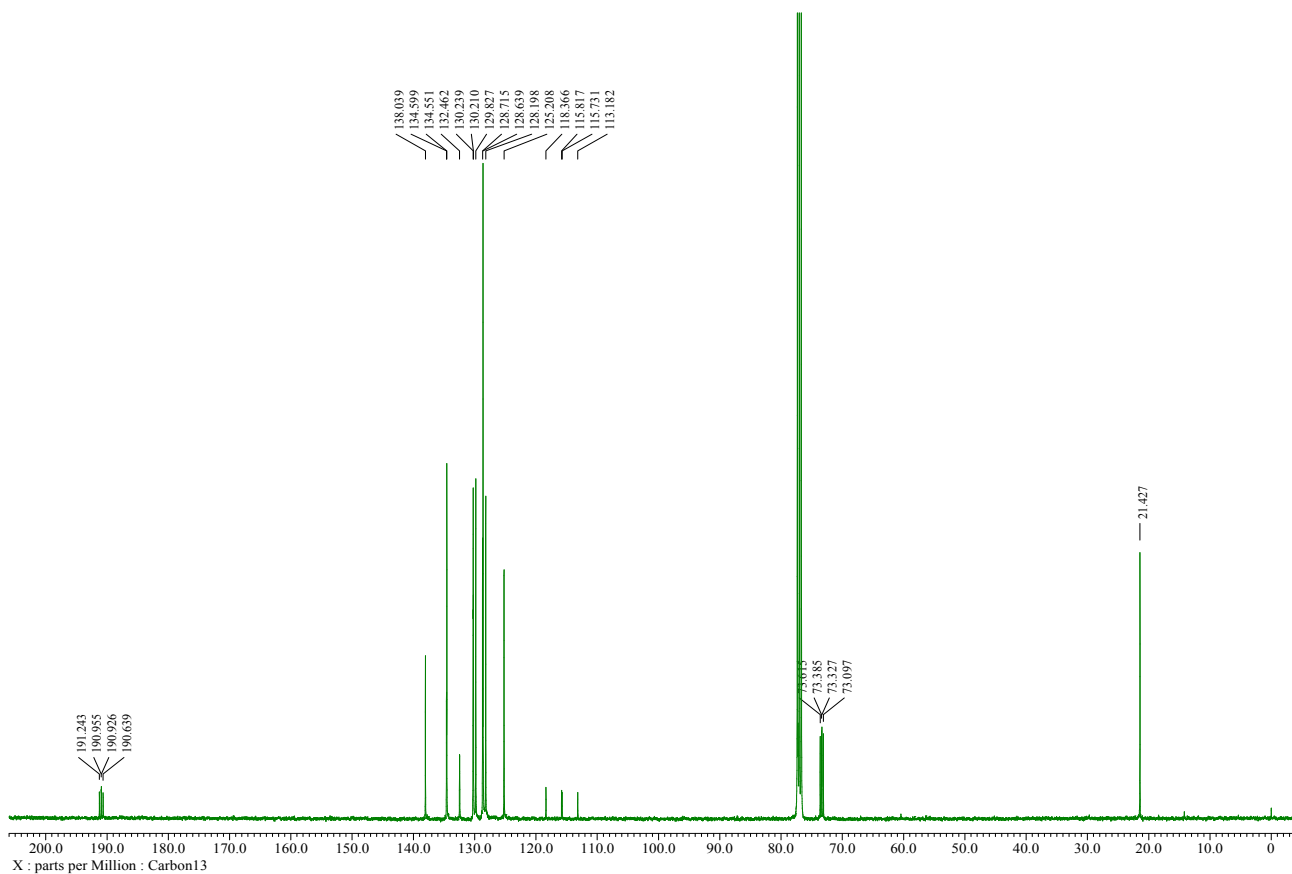
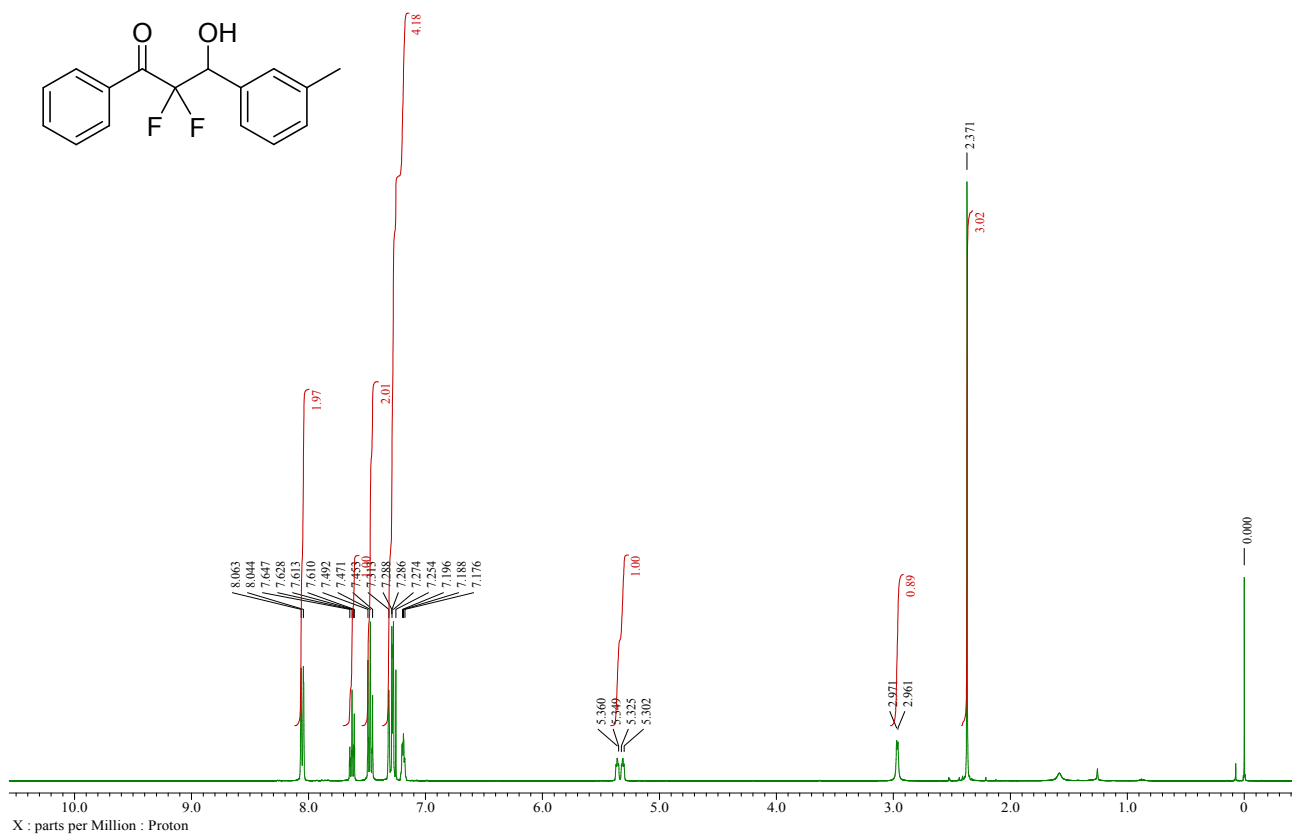
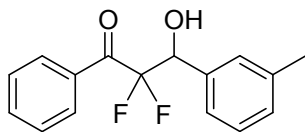
**2,2-Difluoro-3-hydroxy-3-(2-methoxyphenyl)-1-phenylpropan-1-one (6aj)**

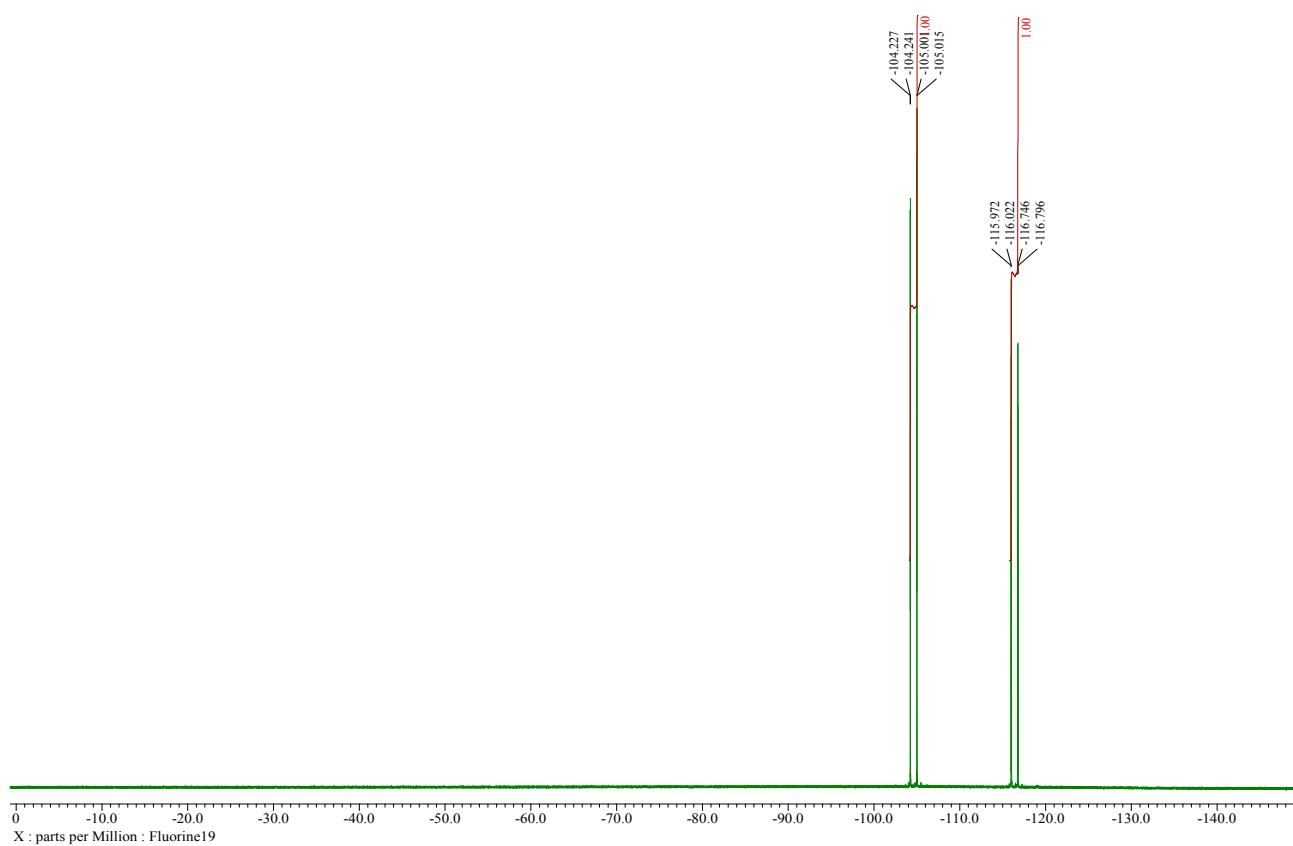




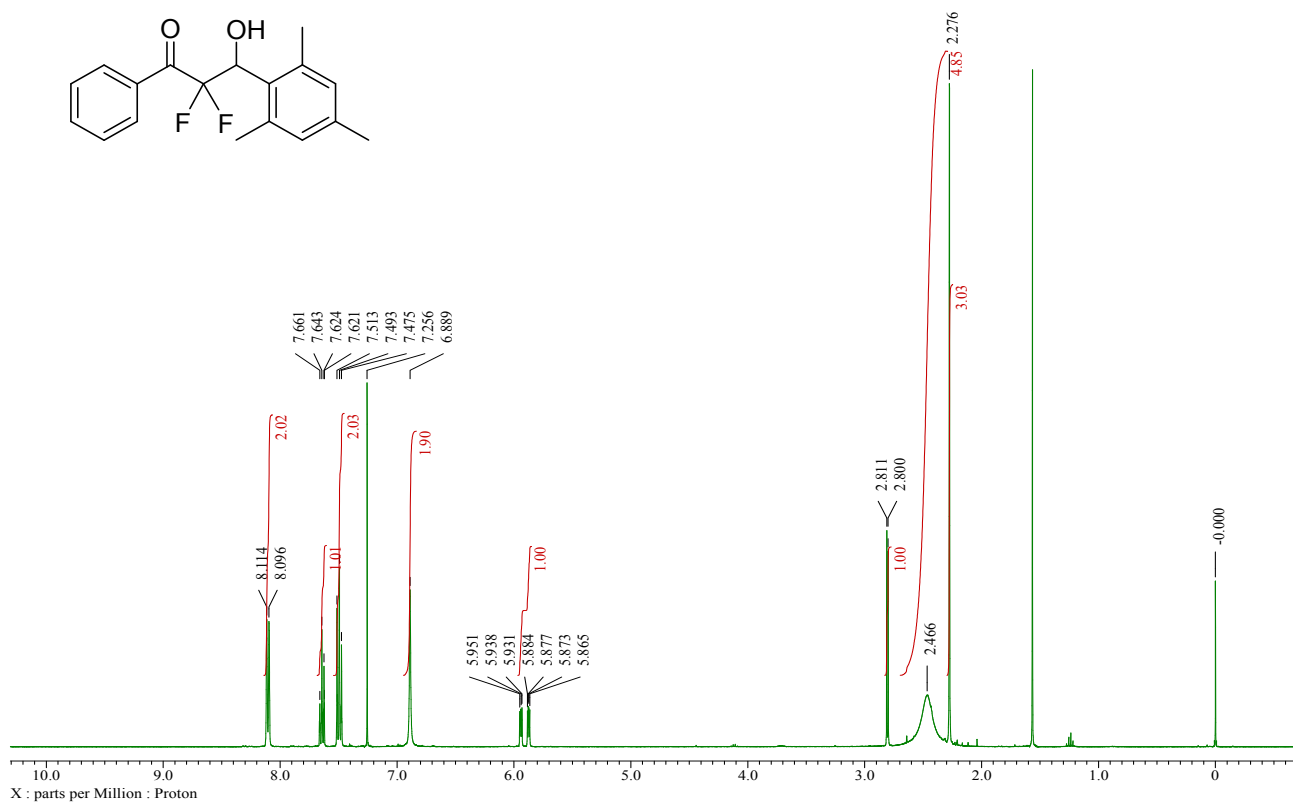
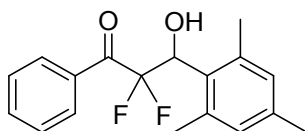


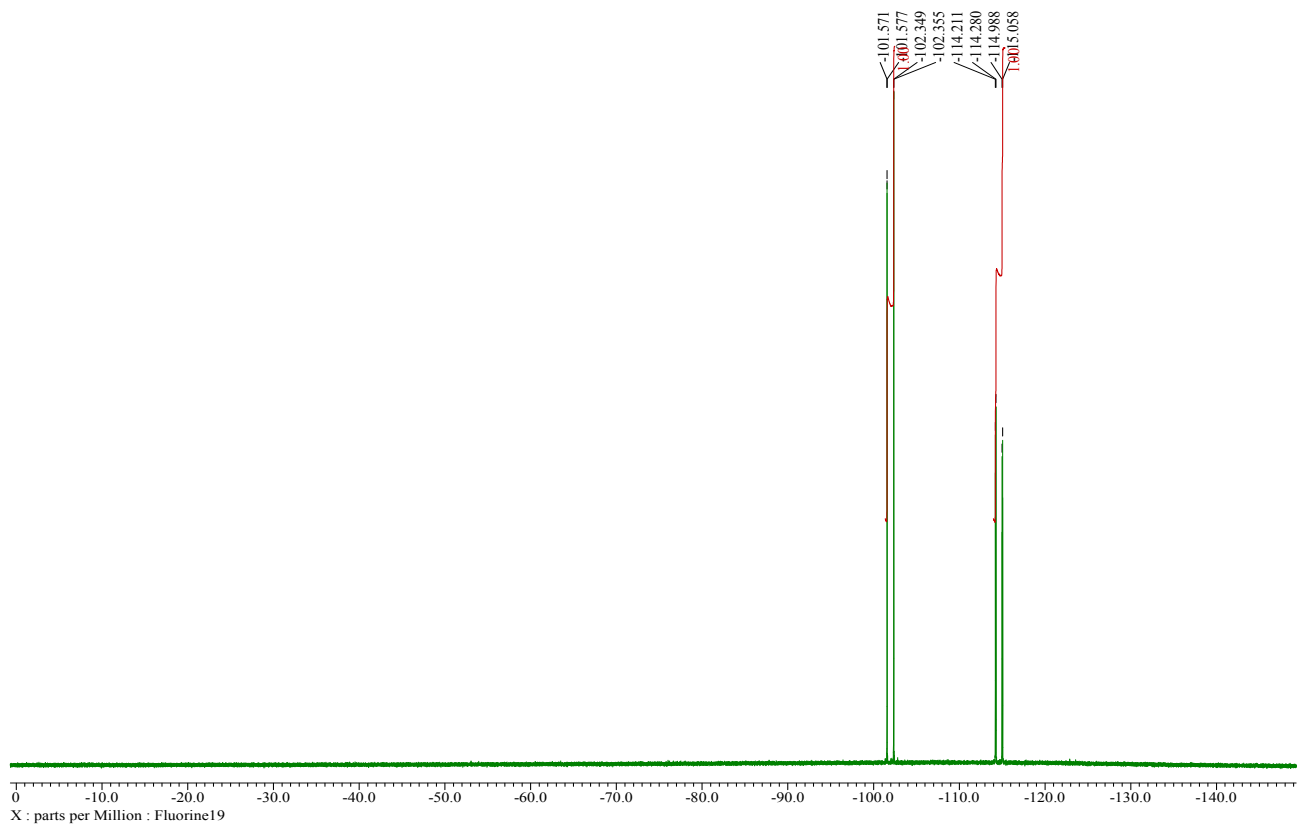
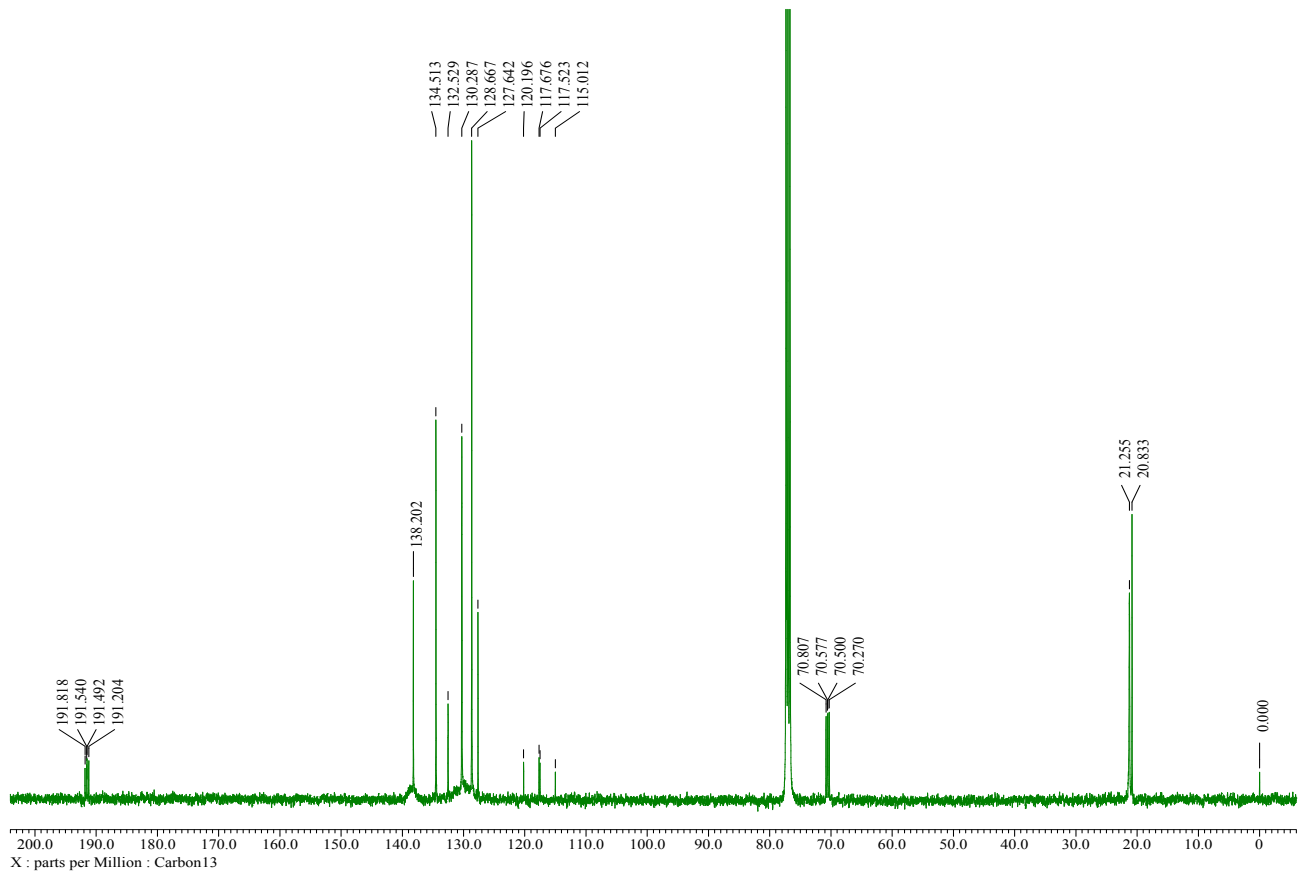
# 2,2-Difluoro-3-hydroxy-1-phenyl-3-(*m*-tolyl)propan-1-one (6ak)



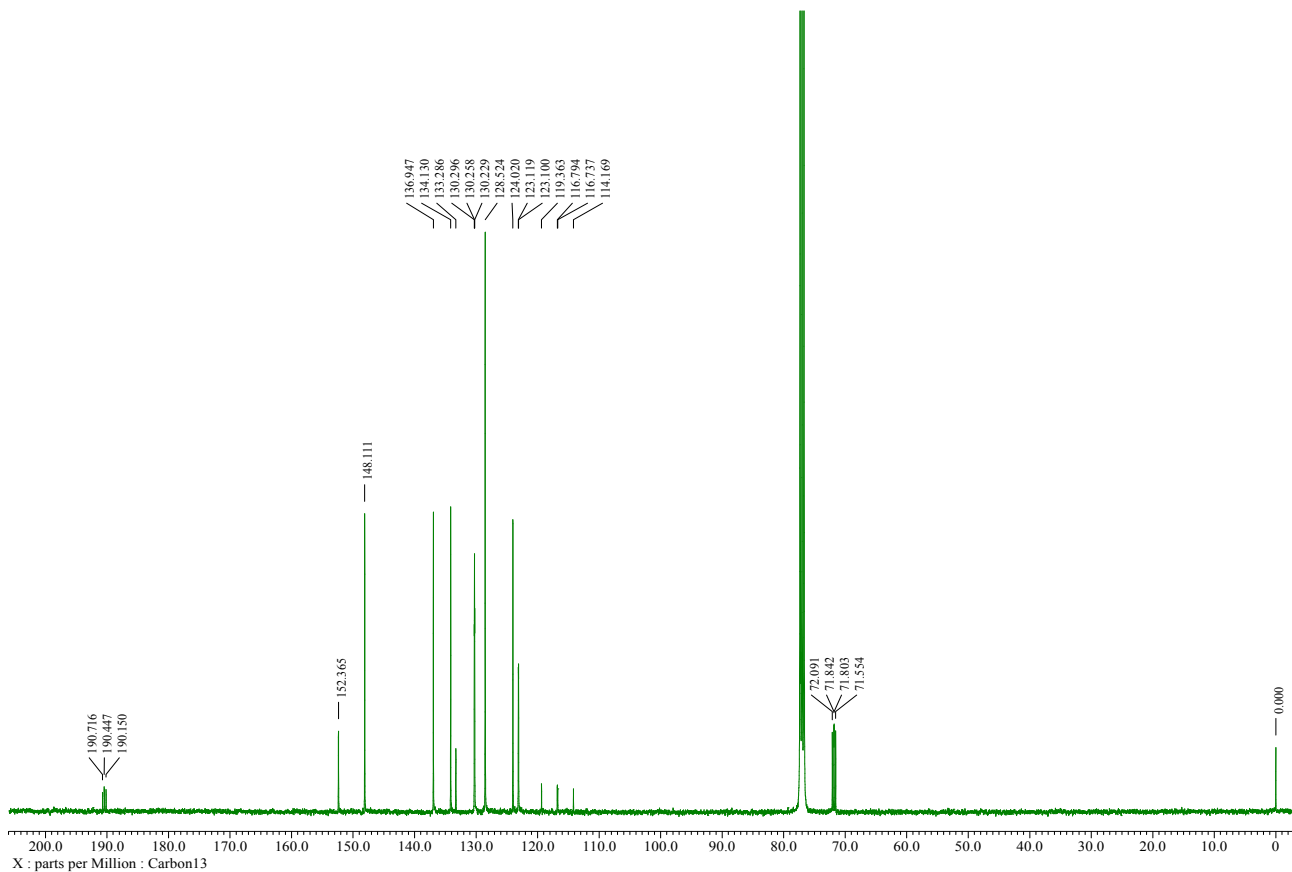
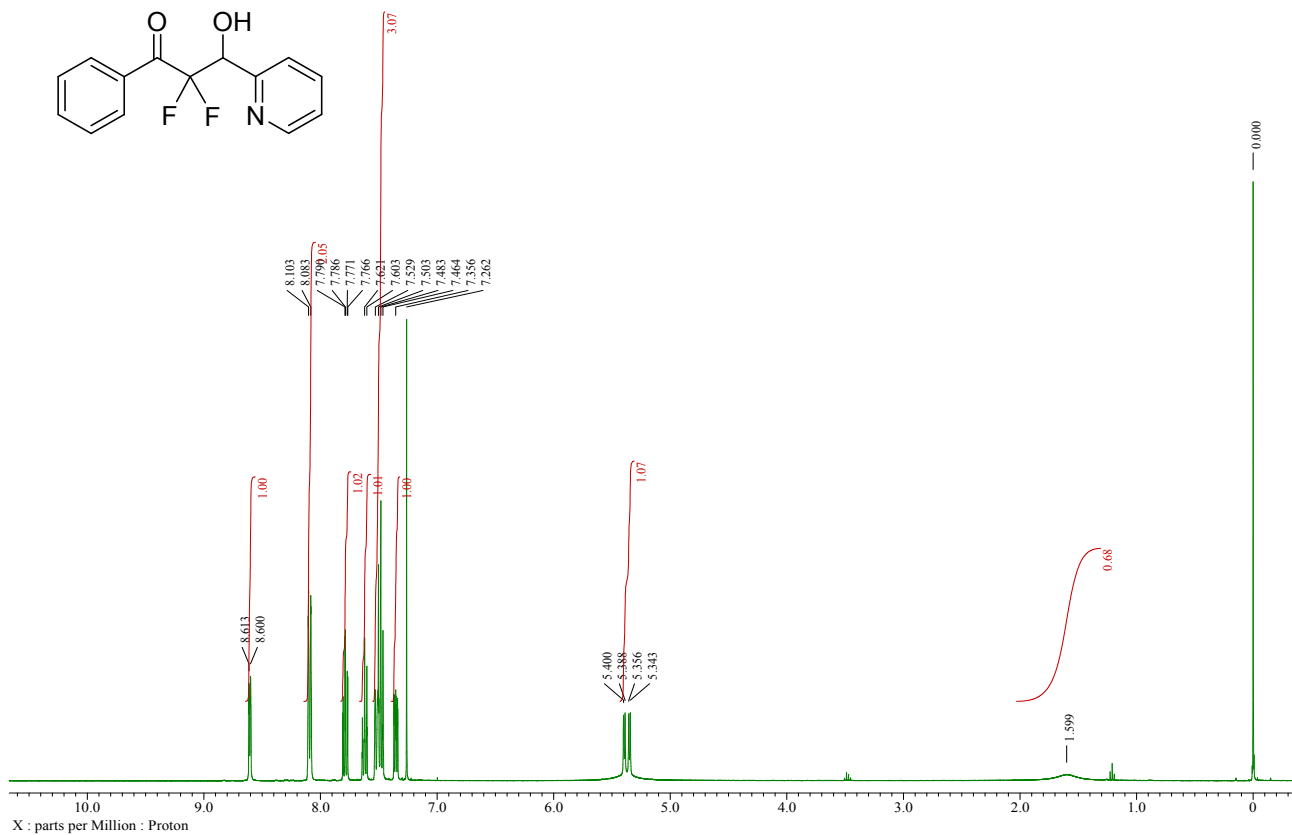
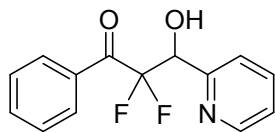


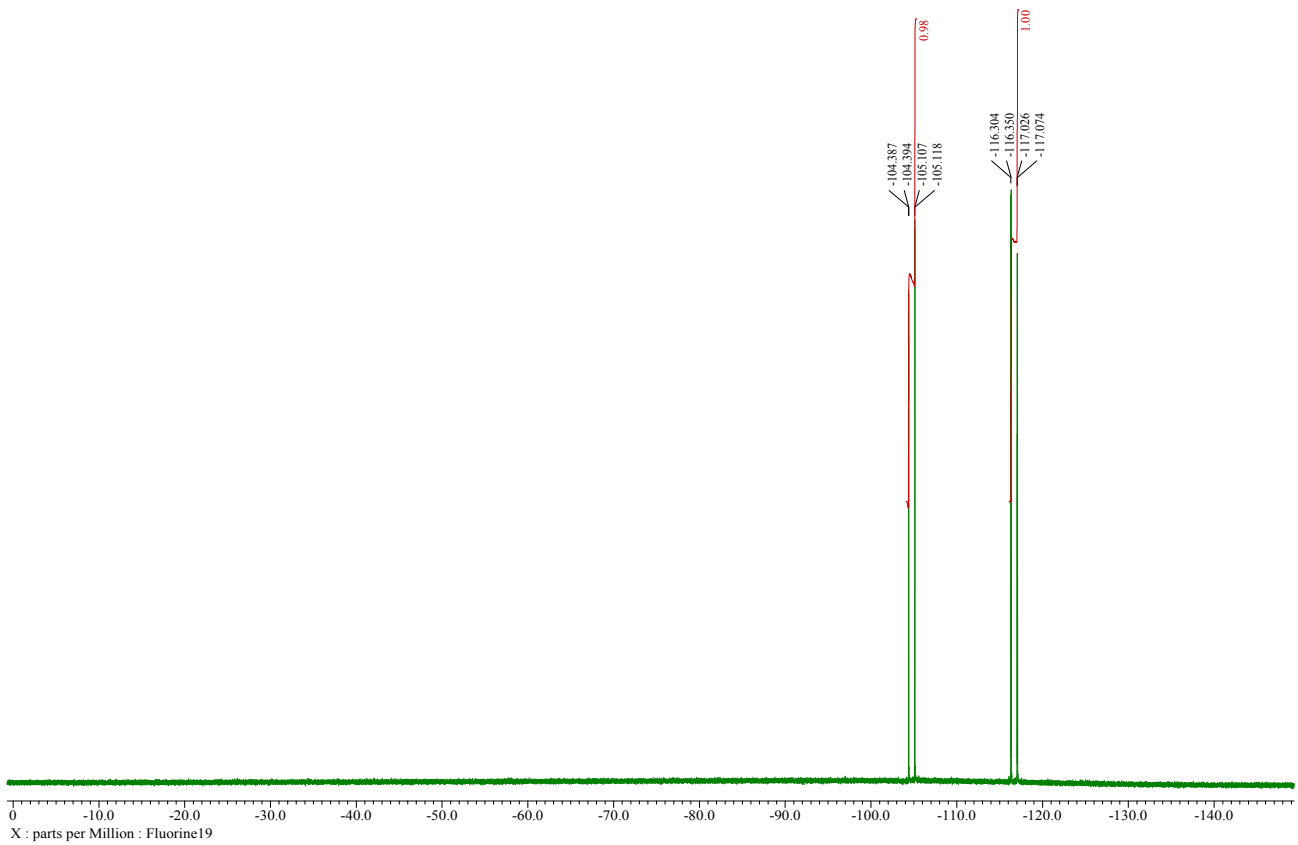
### 2,2-Difluoro-3-hydroxy-3-(2,4,6-trimethylphenyl)-1-phenylpropan-1-one (6a)



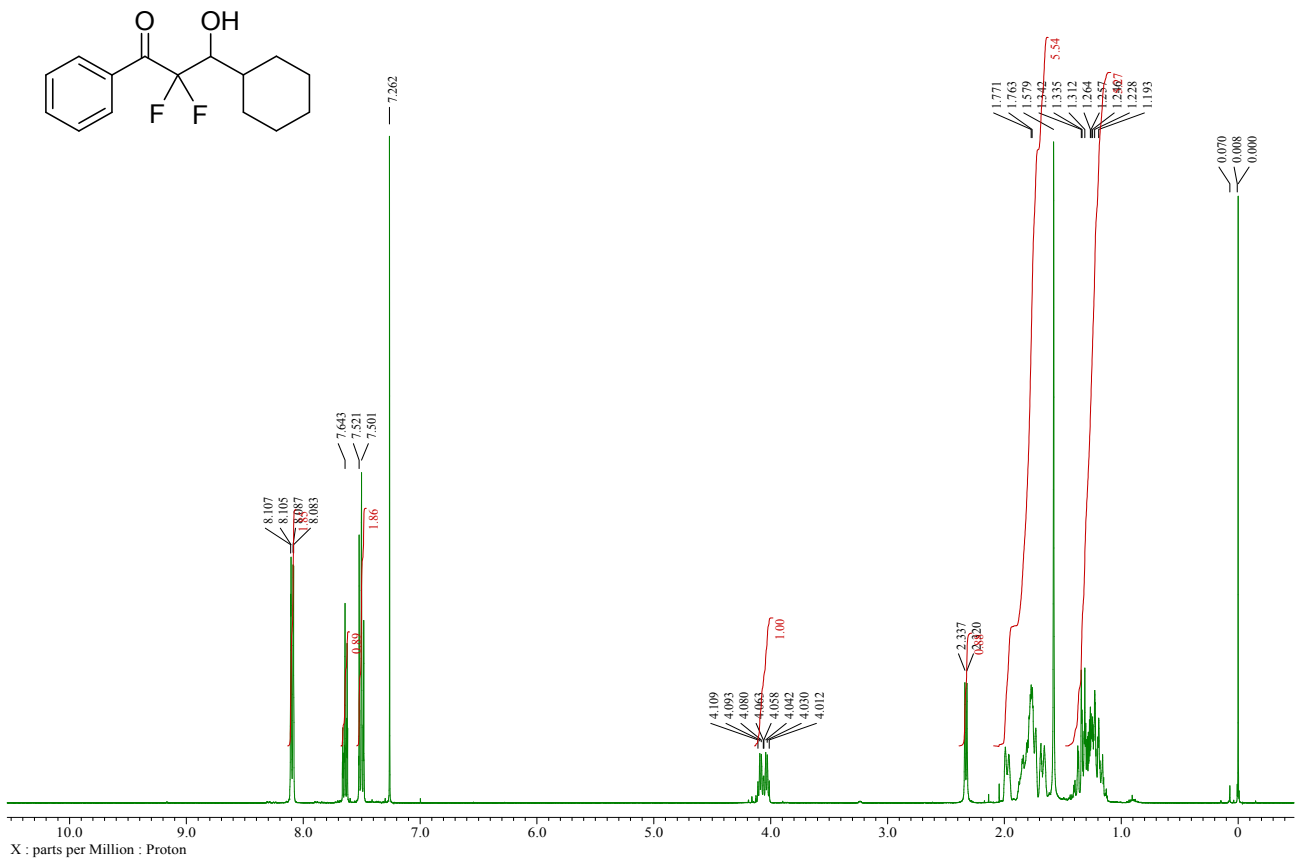


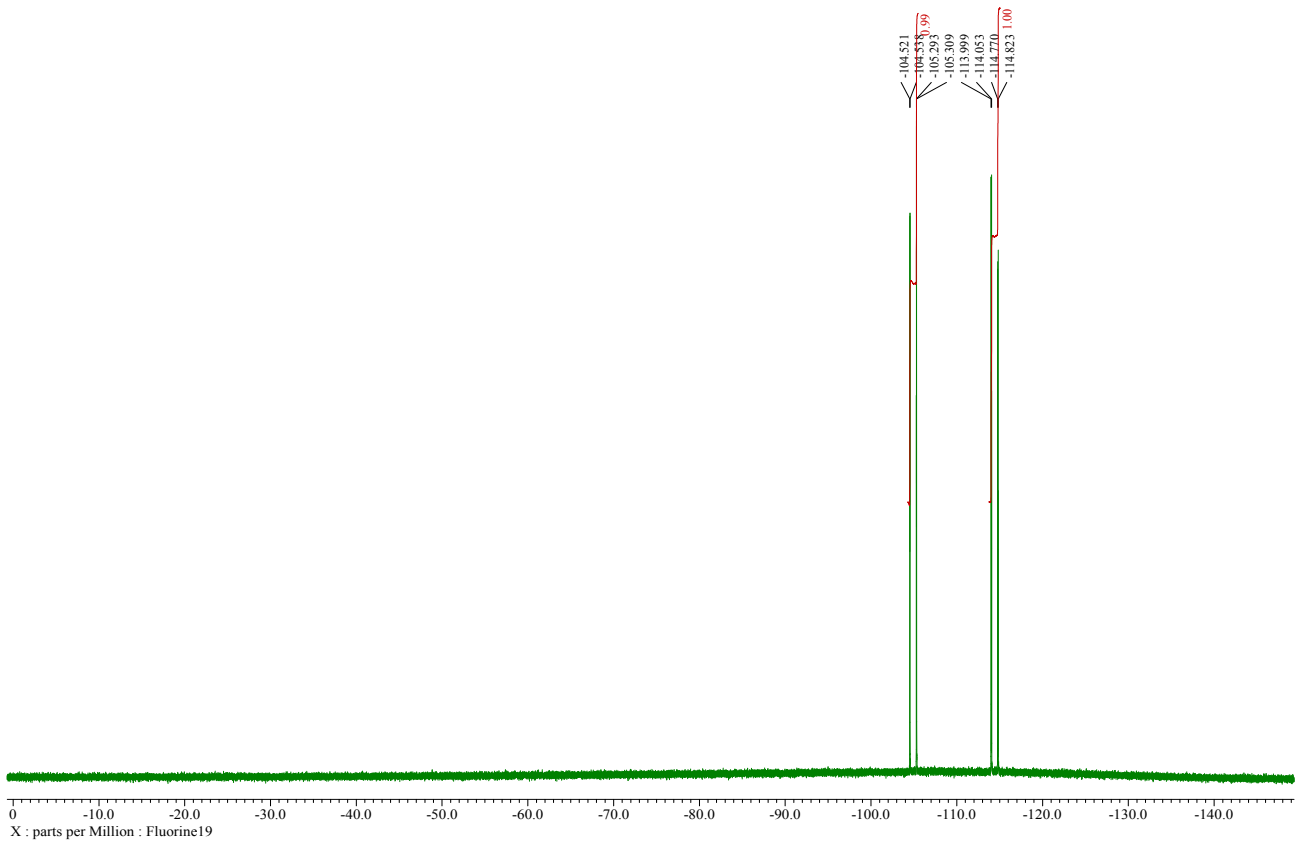
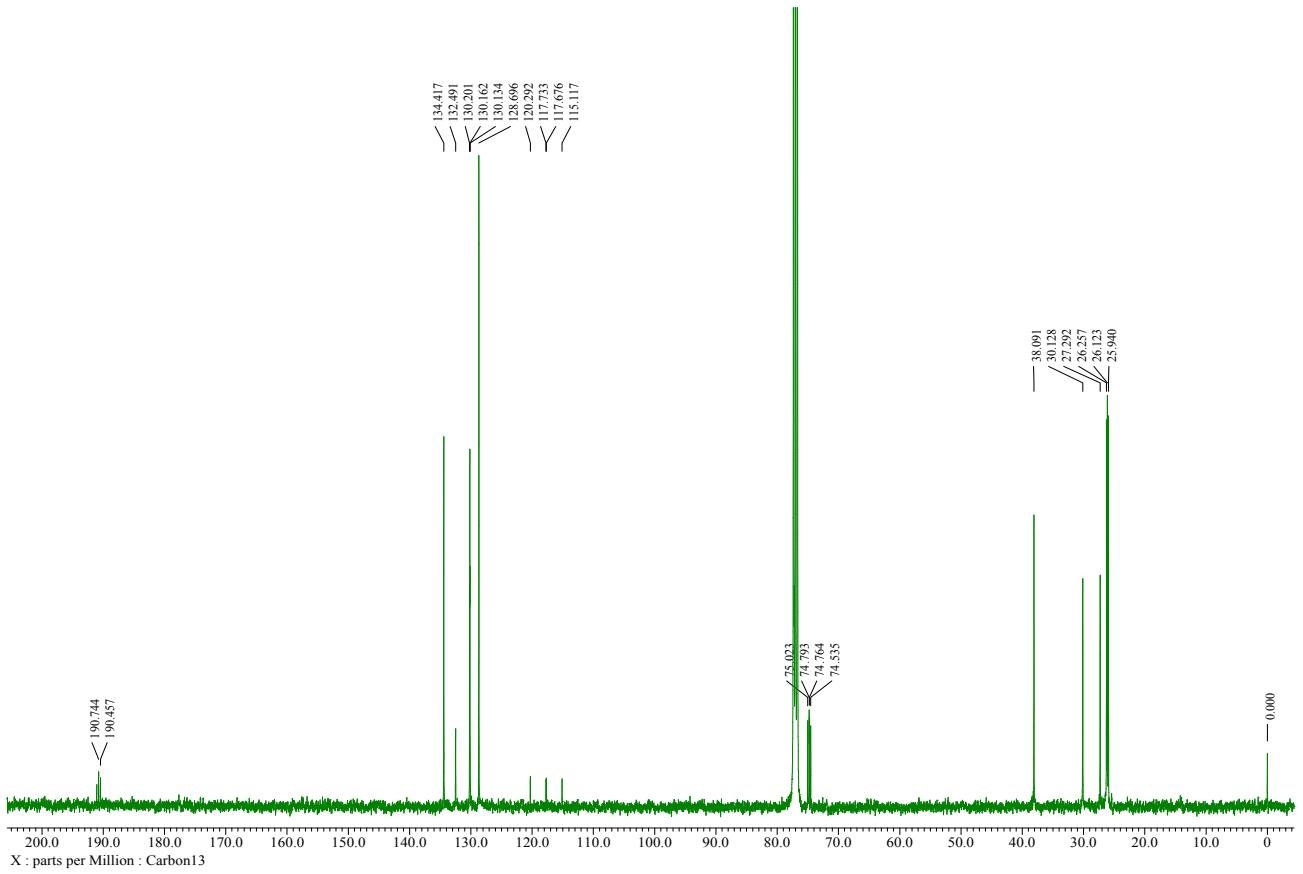
# 2,2-Difluoro-3-hydroxy-1-phenyl-3-(pyridin-2-yl)propan-1-one (6am)



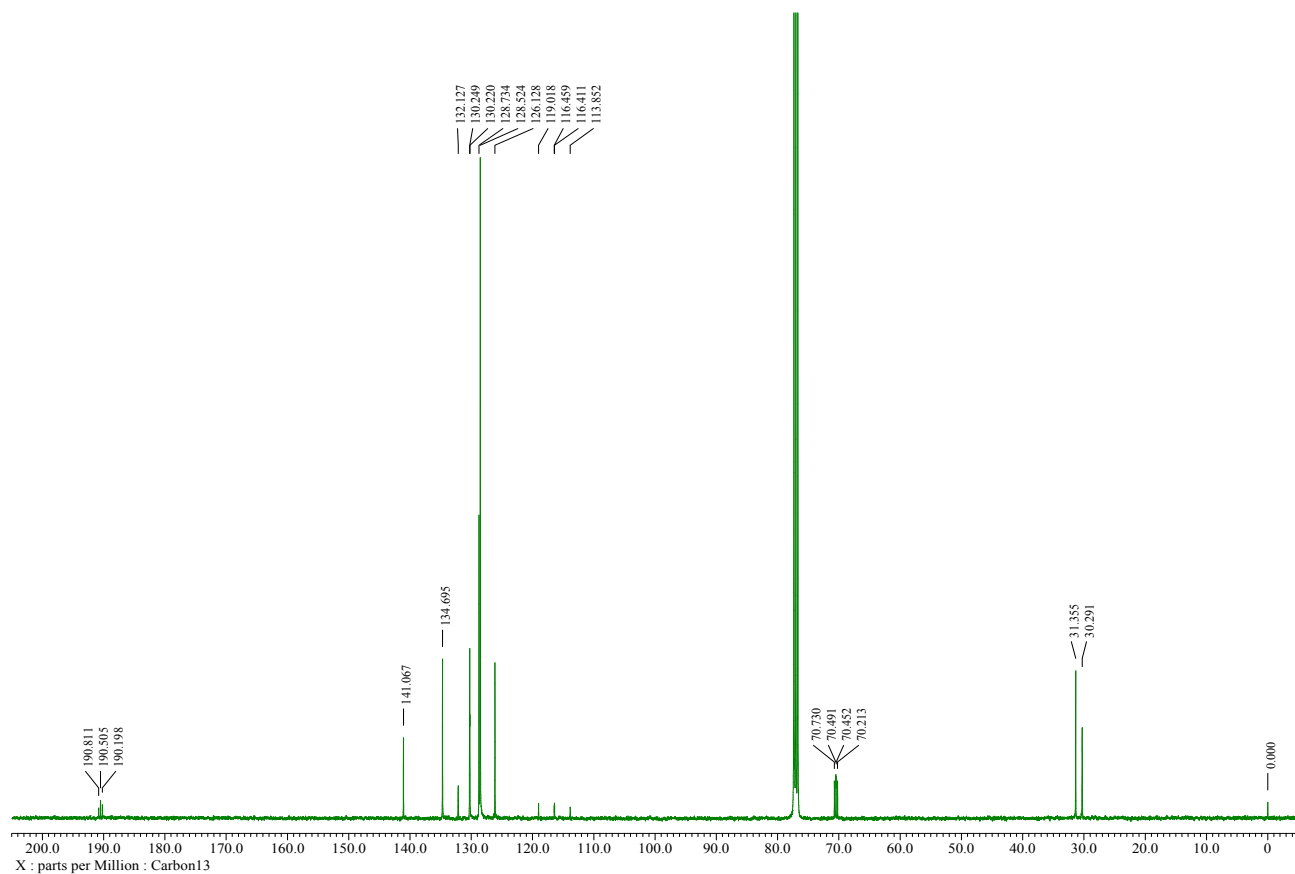
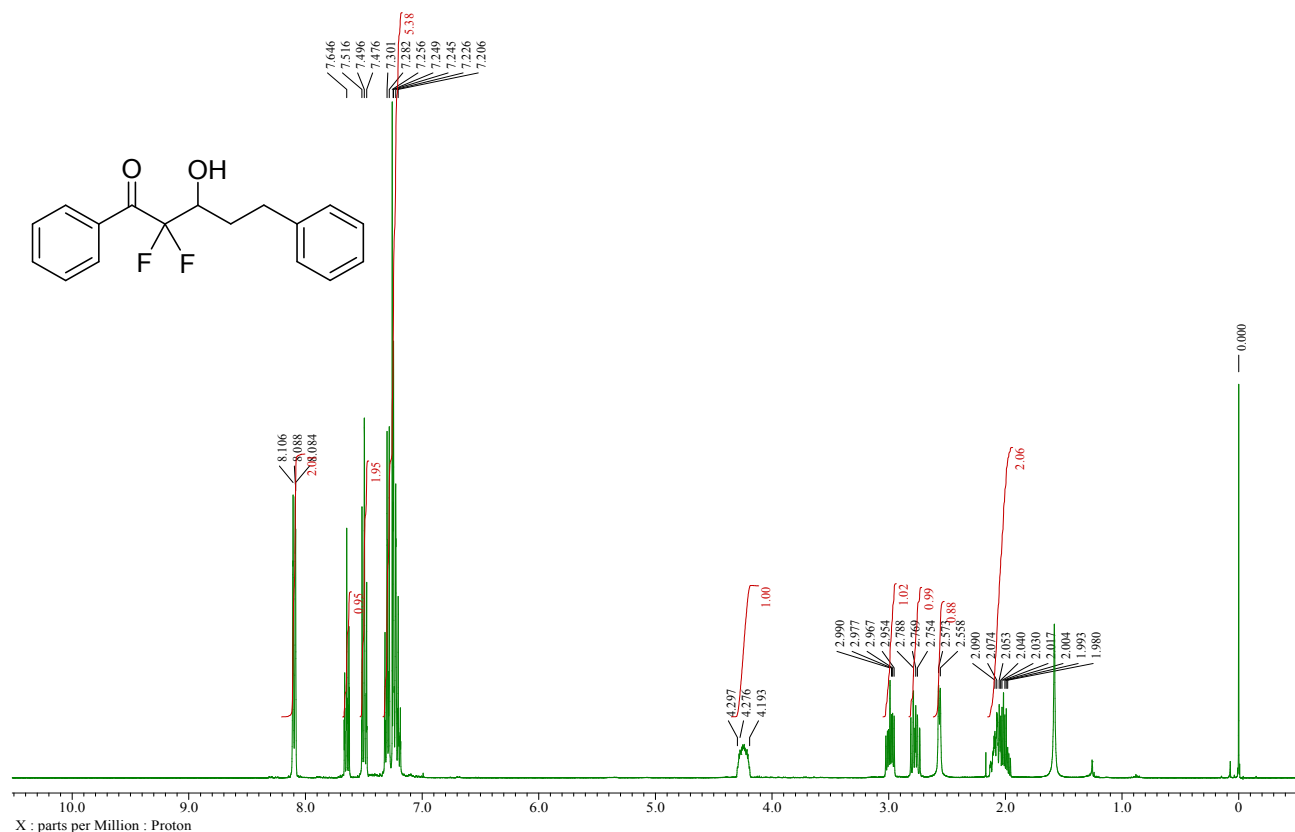


### 3-Cyclohexyl-2,2-difluoro-3-hydroxy-1-phenylpropan-1-one (6an)

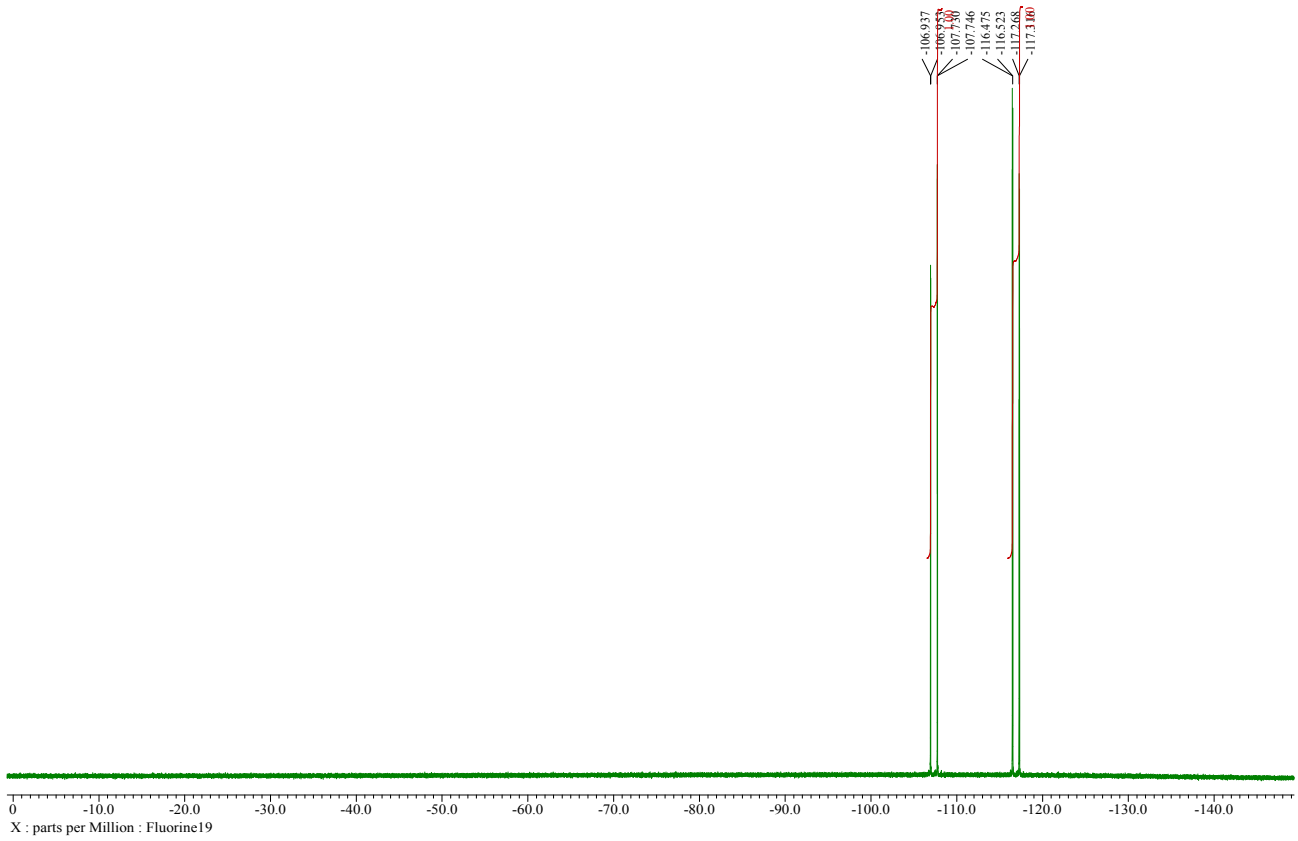




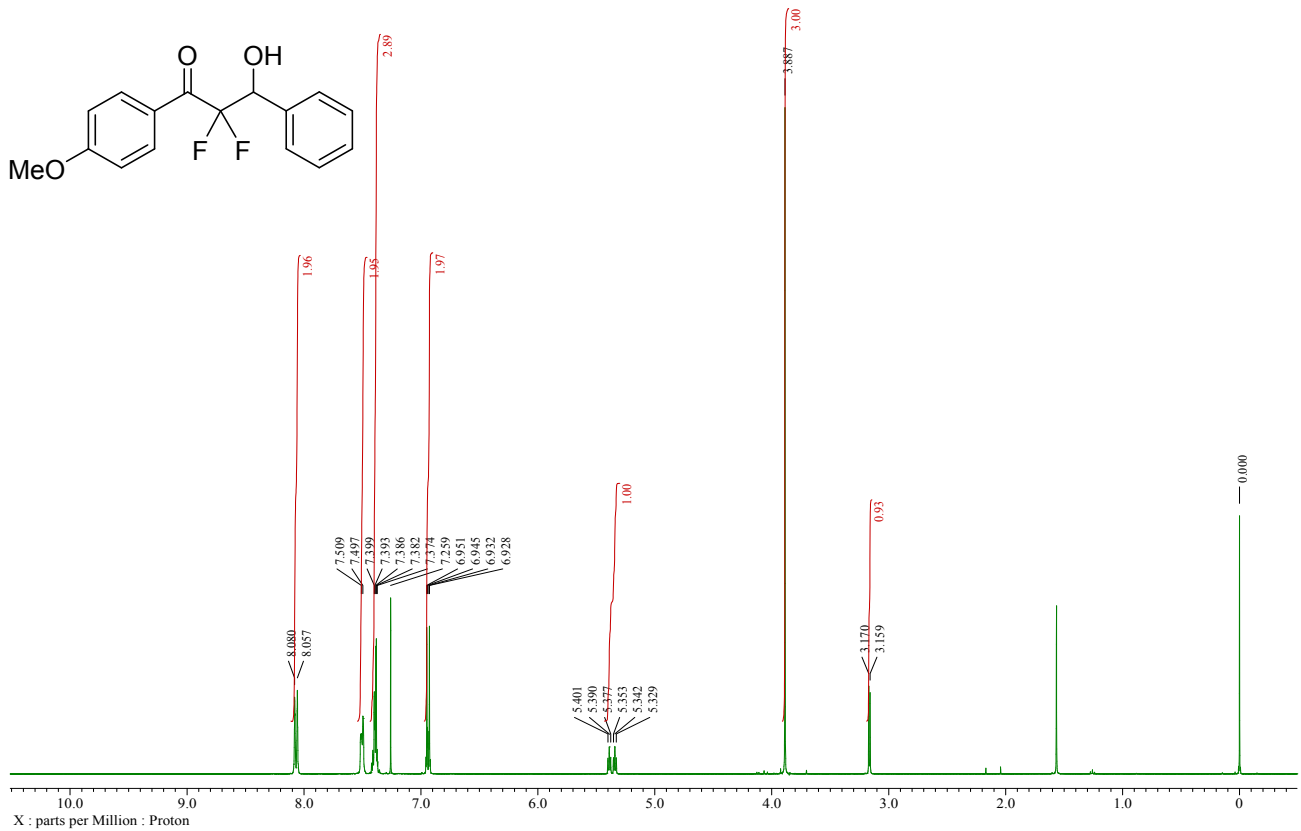
# 2,2-Difluoro-3-hydroxy-1,5-diphenylpentan-1-one (6ao)

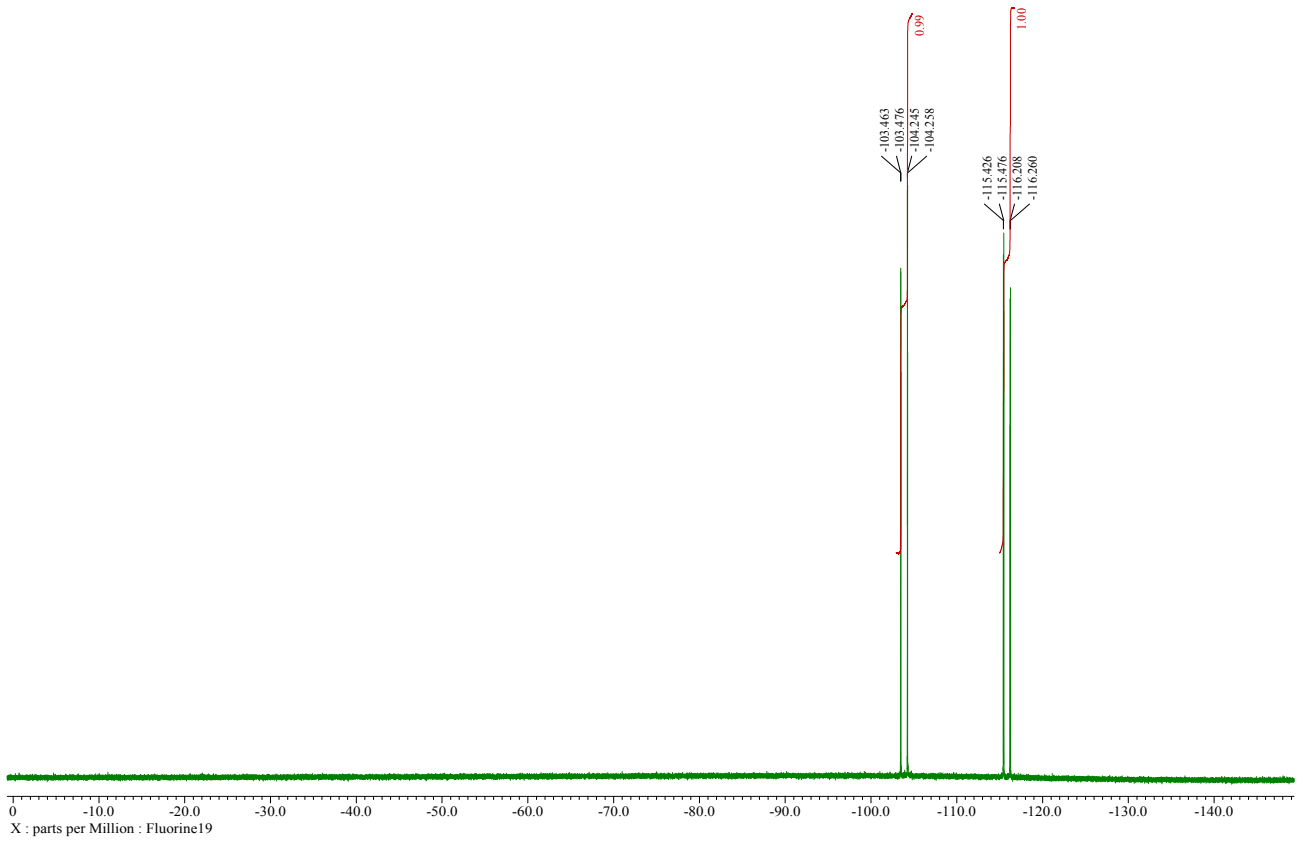
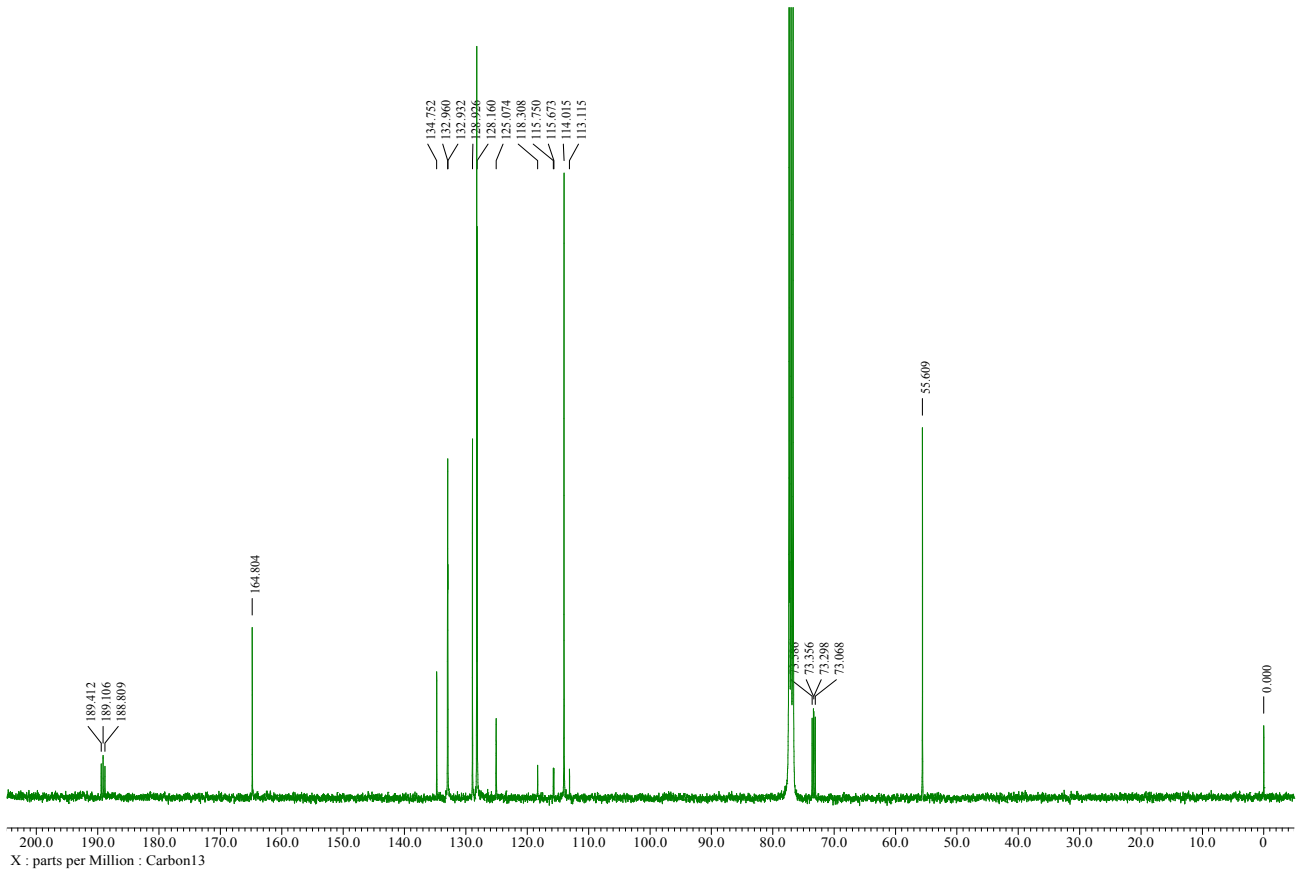




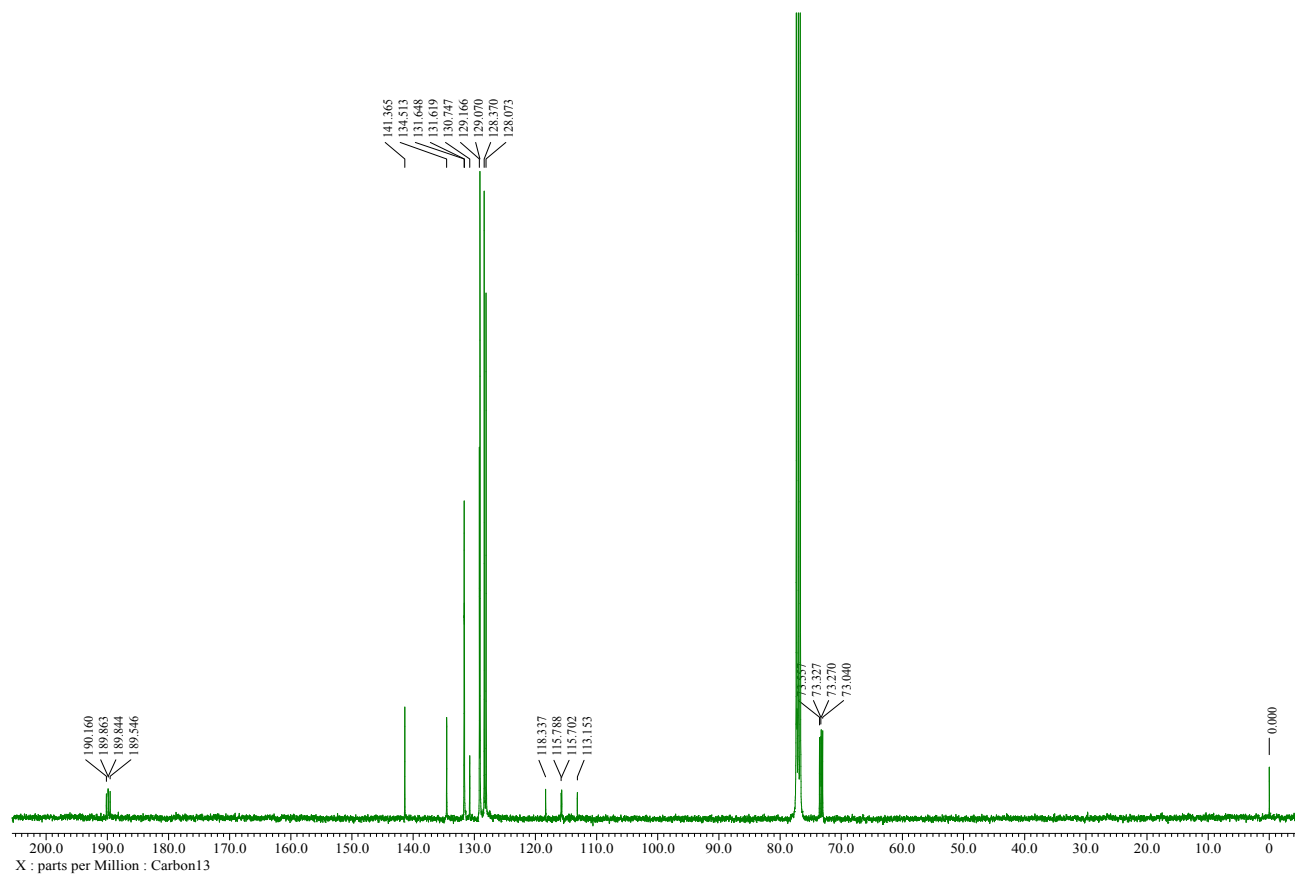
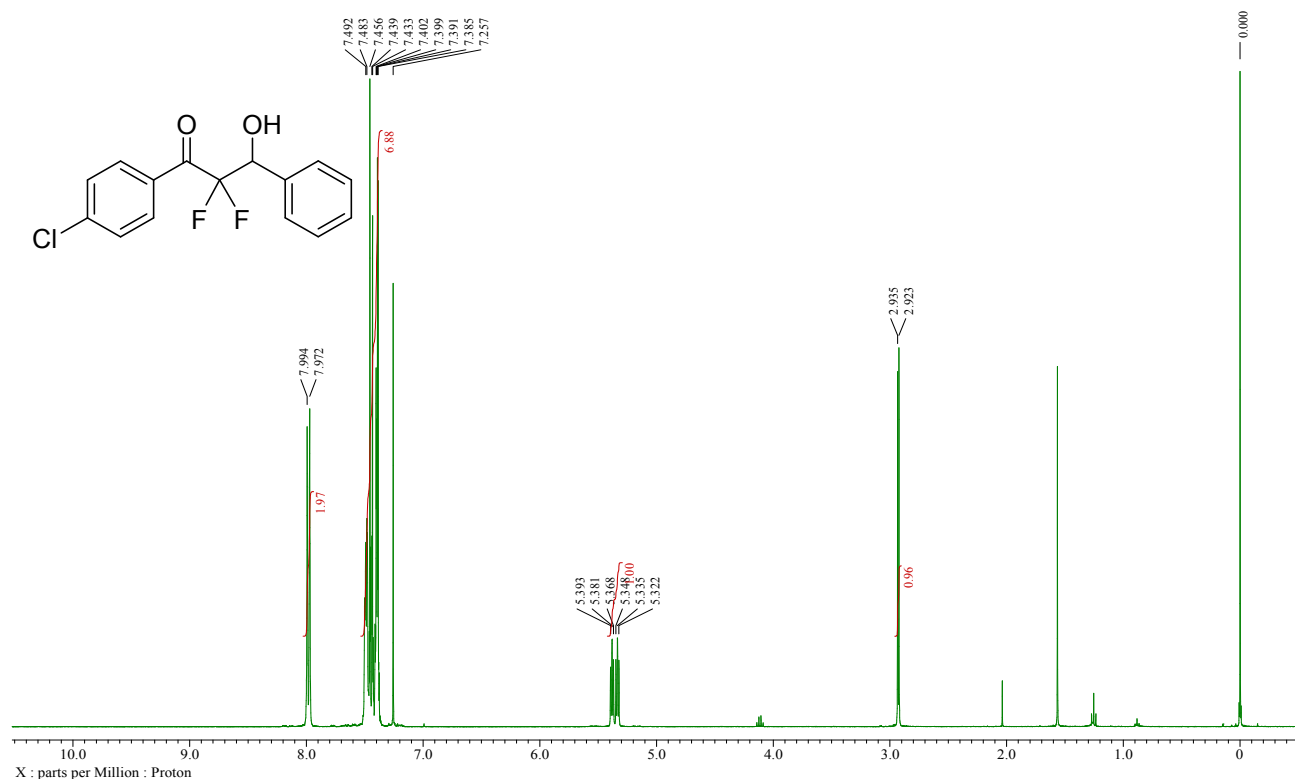


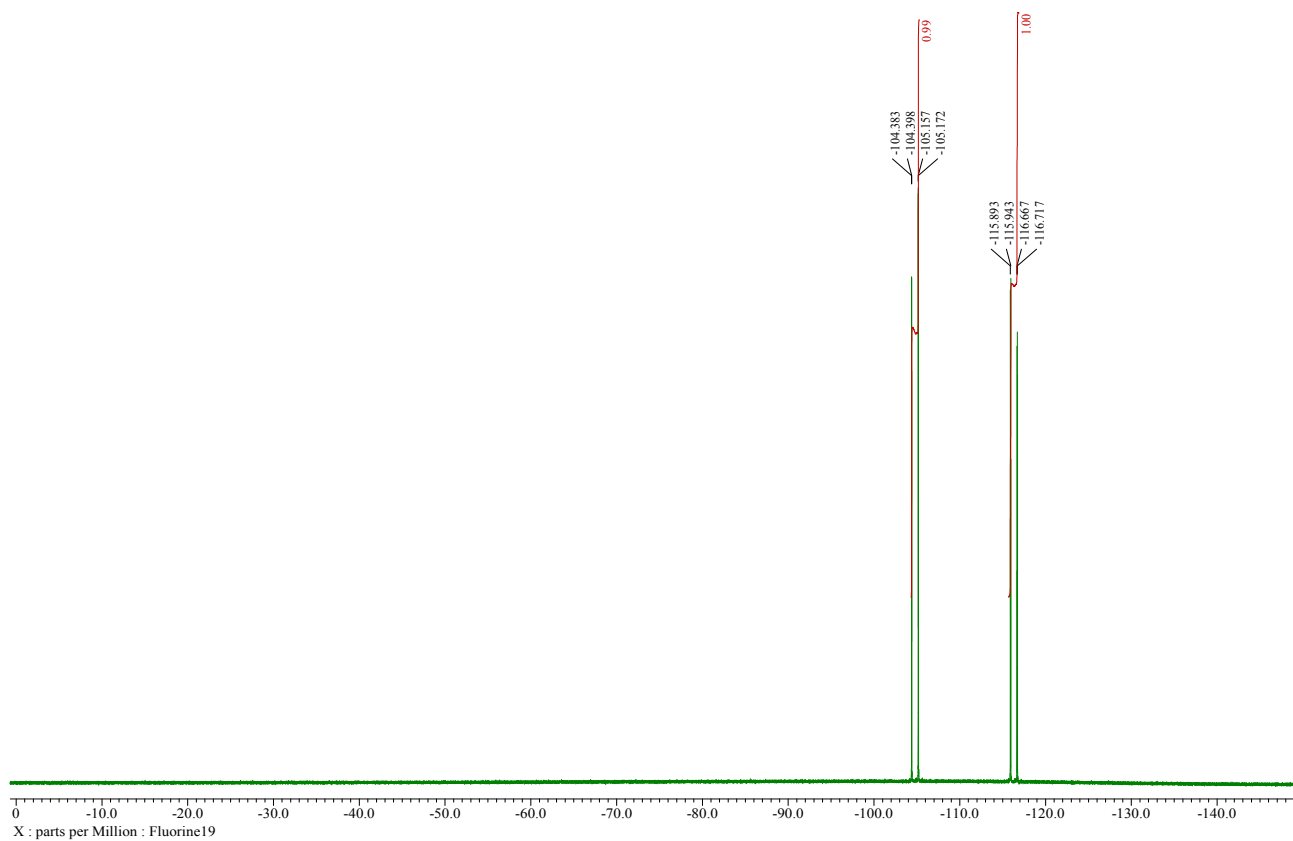
**2,2-Difluoro-3-hydroxy-1-(4-methoxyphenyl)-3-phenylpropan-1-one (6ba)**



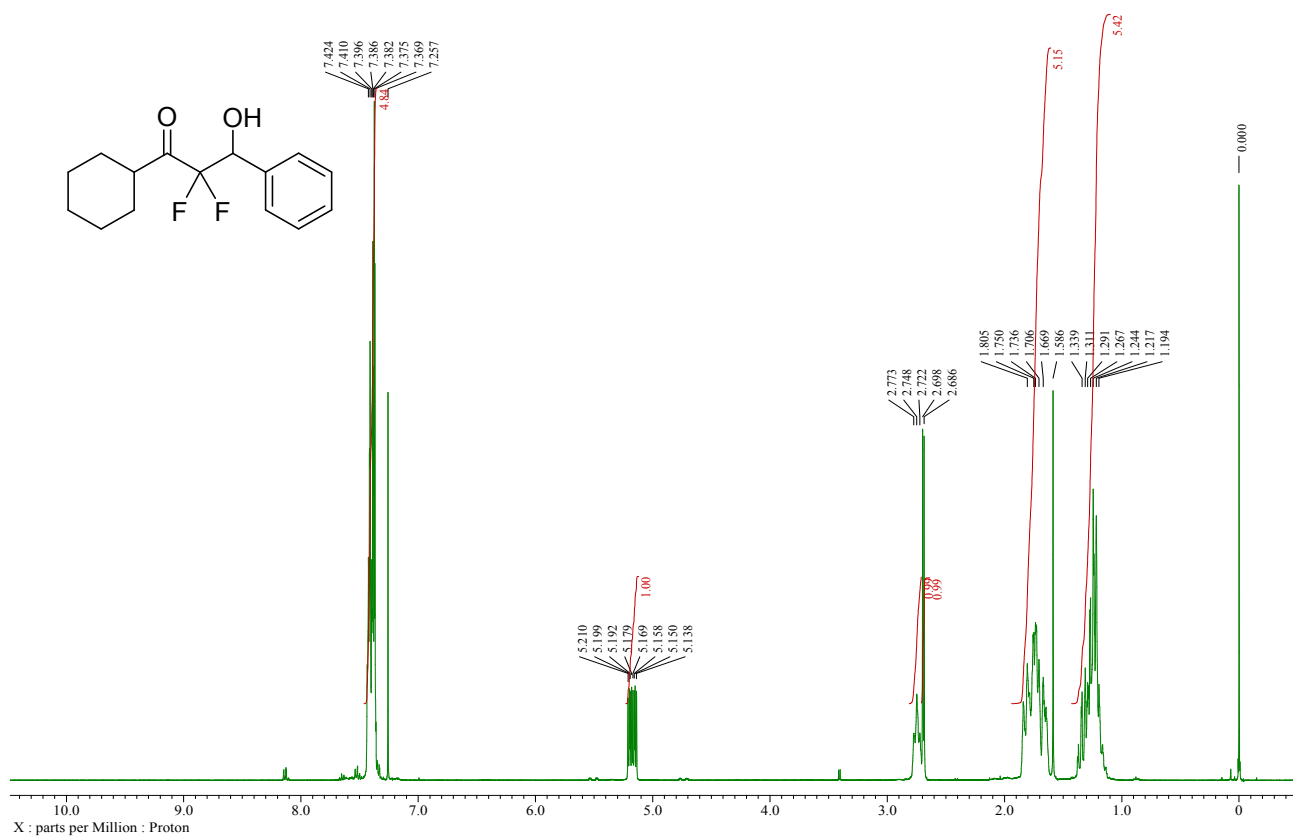


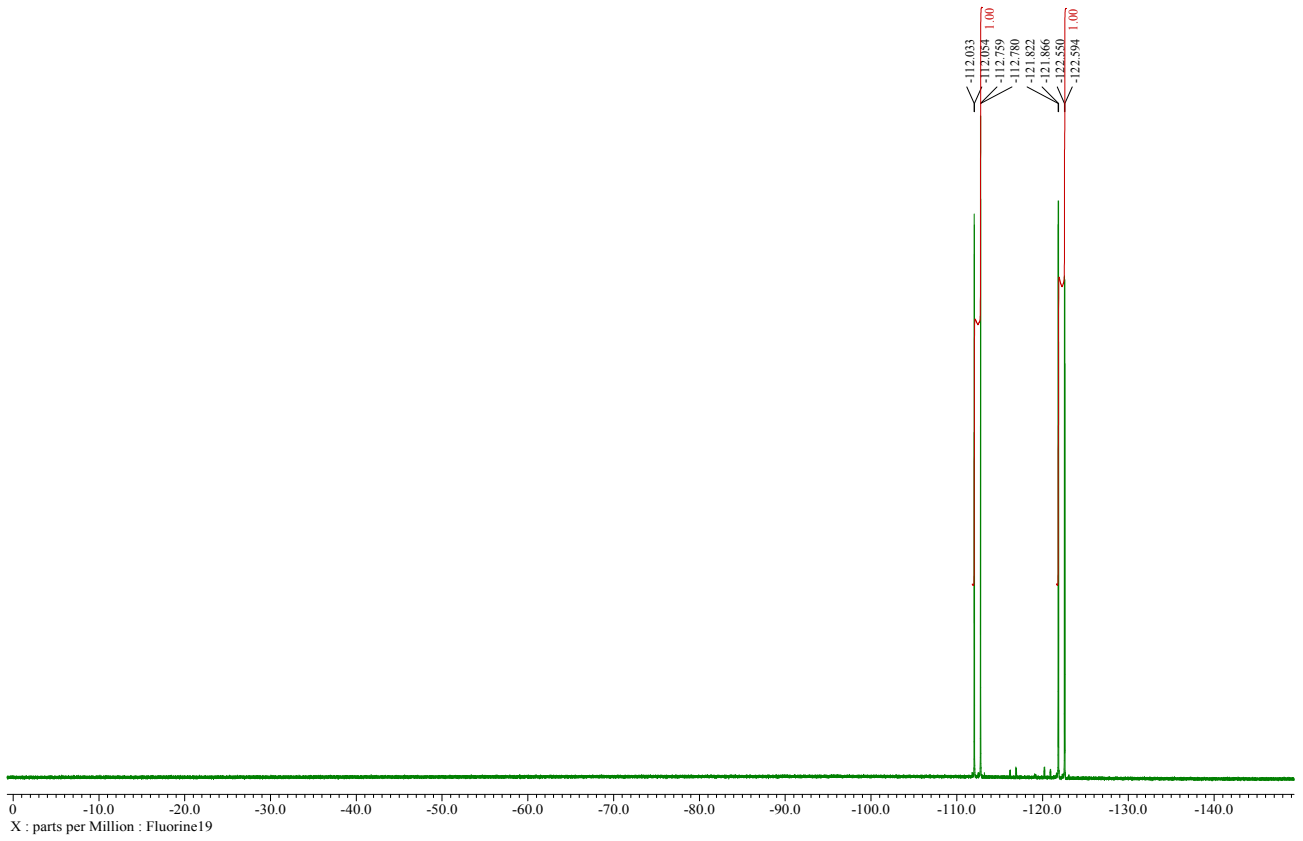
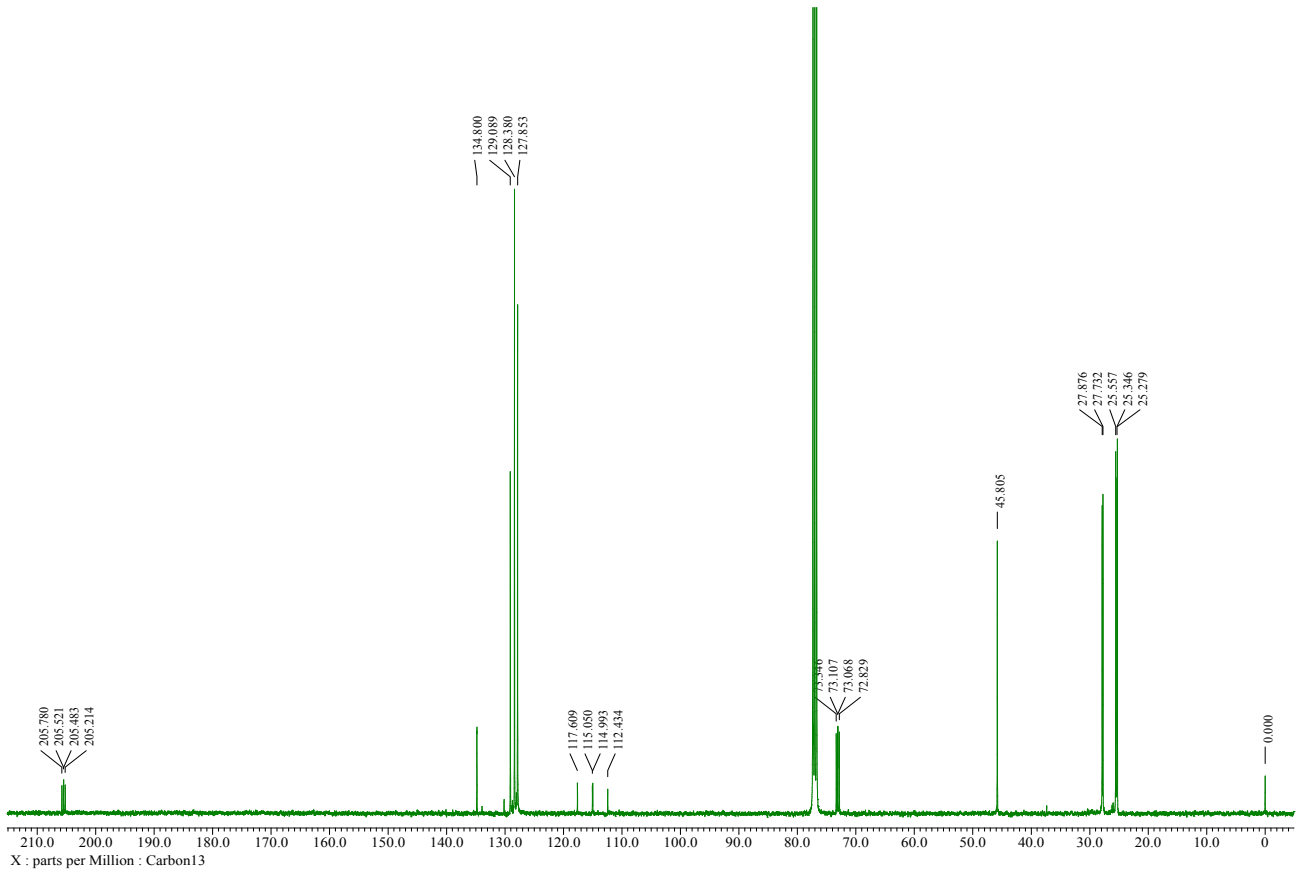
# 1-(4-Chlorophenyl)-2,2-difluoro-3-hydroxy-3-phenylpropan-1-one (6ca)



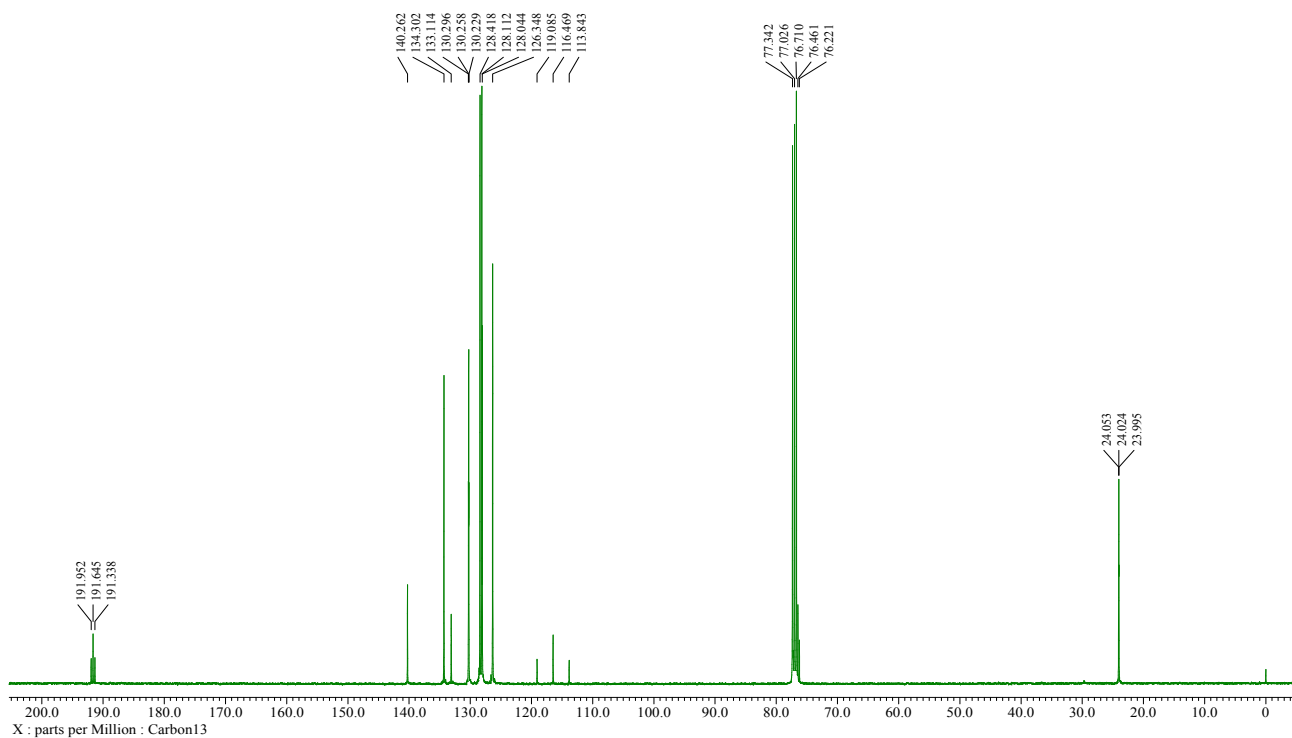
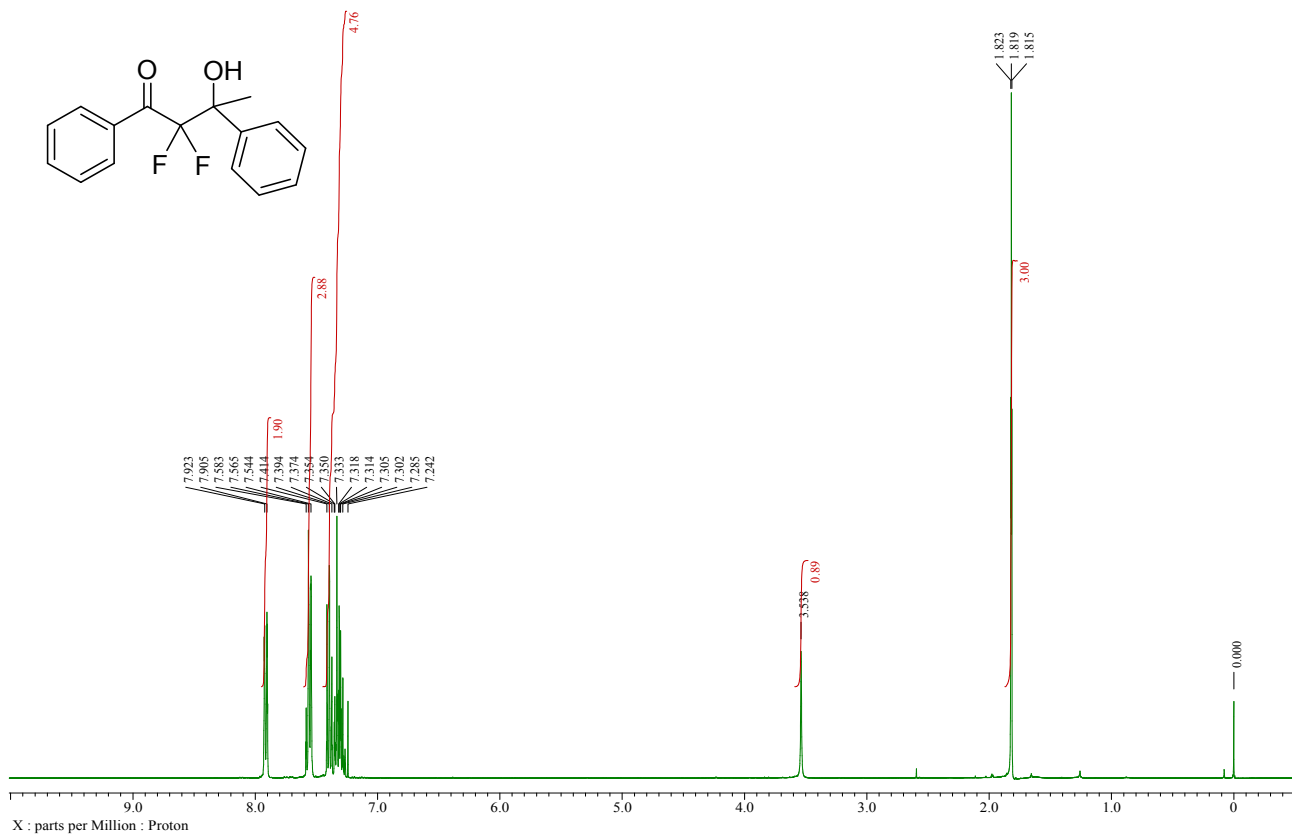
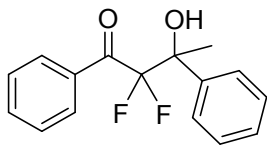


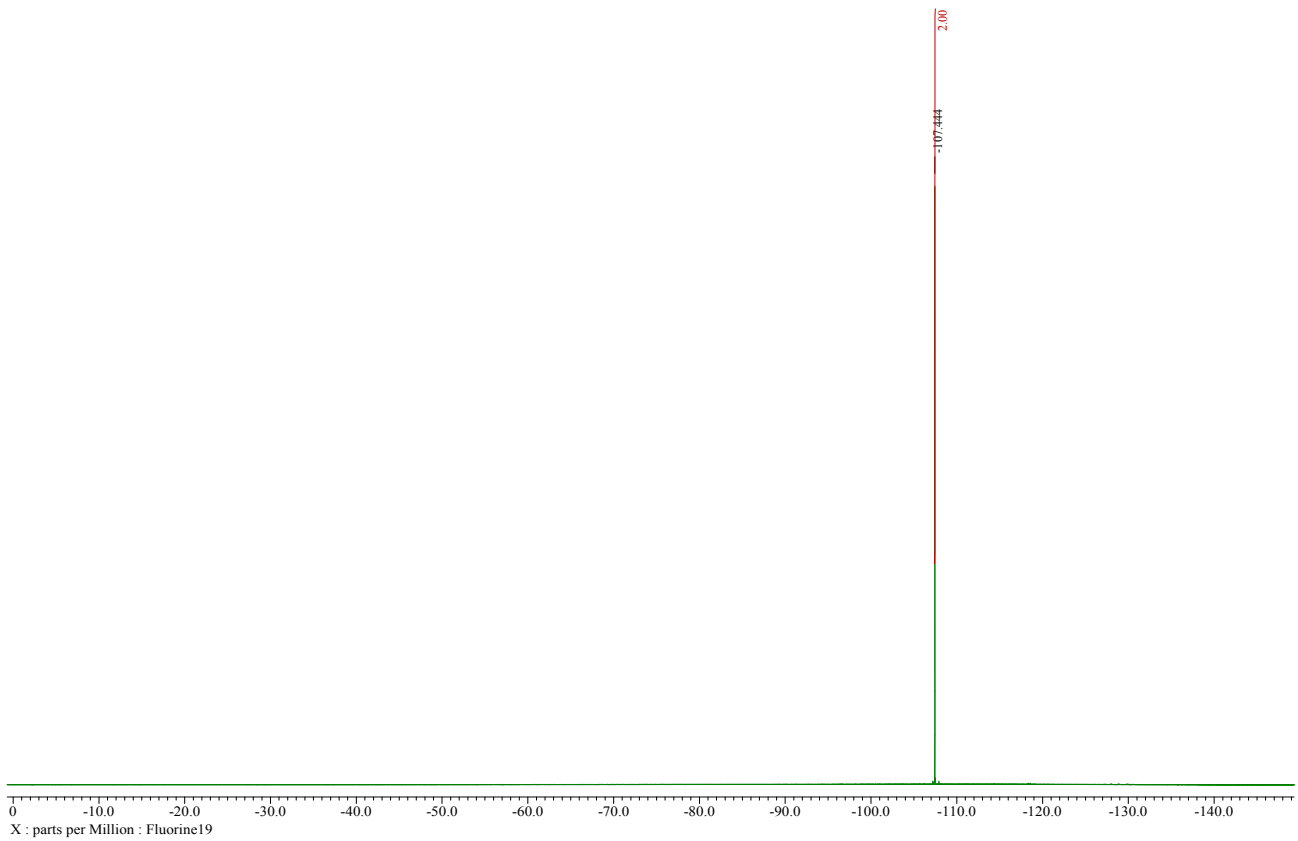
**1-Cyclohexyl-2,2-difluoro-3-hydroxy-3-phenylpropan-1-one (6da)**





# 2,2-Difluoro-3-hydroxy-1,3-diphenylbutan-1-on (6ap)





**2,2-Difluoro-3-hydroxy-3-methyl-1-phenylbutan-1-one (6aq)**

