Supporting Information

Asymmetric Fluorination of Indanone-2-carboxylates Using a Polystyrene-supported Diphenylamine-linked Bis(oxazoline) Complex

Biao Wang,[a] Yifeng Wang, [a,*] Yidong Jiang,[a] Mingming Chu,[a] Suosuo Qi,[a] Wanzhen Ju[a] and Danqian Xu[a,*]

State Key Laboratory Breeding Base of Green Chemistry-Synthesis Technology, Key Laboratory of Green Pesticides and Cleaner Production Technology of Zhejiang Province,
Zhejiang University of Technology, Hangzhou 310014, P. R. China
Fax: (+86) 0571 88320066; E-mail: wangyifeng@zjut.edu.cn, chrc@zjut.edu.cn

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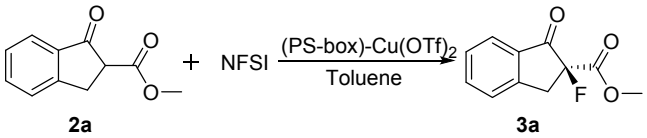
1. Screening of different proportions of $Cu(OTf)_2$/1d in batch condition

Table S1 Catalytic performance of different proportions of $Cu(OTf)_2$/**1d**



2a **3a**

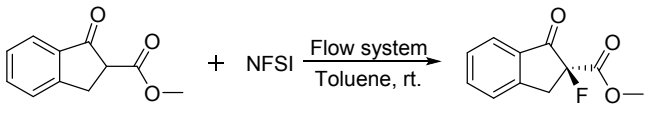
Entry	$Cu(OTf)_2$/**1d**	Yield[%][b]	*ee*[%][c]
1	0.5	95	91
2	0.6	96	92
3	0.7	95	92
4	0.8	96	95
5	0.9	96	94
6	1.0	97	92
7	1.2	94	90
8	1.5	96	88
9[d]	-	76	0
10[d, e]	-	90	0

[a] Typical reaction conditions: to a tube a mixture of PS-box **1d**（0.005mmol, 0.2 mol%）and $Cu(OTf)_2$ with 25.0 mL toluene were added, then **2a** (2.5 mmol, 1.0 equiv.) and NFSI (1.2 equiv.) were added successively. The reaction mixture was shaken for 120 min. [b] Isolated yields. [c] Determined by chiral HPLC. [d] Without PS-box and $Cu(OTf)_2$. [e] The reaction mixture was shaken for 240 min.

Before the screening of solvent and catalyst loading, different proportions $Cu(OTf)_2$/**1d** were also carried out in batch condition. As can be seen in Table S1, the optimum proportion of $Cu(OTf)_2$/**1d** was 0.8, which achieved 97% yield and 96% ee. To be noted, the background reaction occurred obviously without the catalyst.

2. Optimization of flow rate

Table S2 Optimization of the fluorination of 1-indanone-2-carboxylate **2a** catalyzed by **1d** in continuous flow condition [a]



2a **3a**

Entry	Flow rate (μL min^{-1})	Yield[%][b]	*ee*[%][c]
1	10	100	97
2	20	98	96
3	**30**	**99**	**96**
4	40	96	95
5	50	94	94

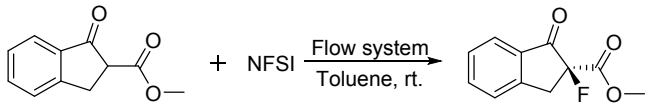
6	60	90	95
7	70	87	93

[a] Typical continuous flow conditions: the reactions were performed with PS-box **1d** (0.068 mmol, 0.12 g) and celite (0.8 g) in a column which was charged with $Cu(OTf)_2$ at room temperature, **2a** (0.2 M, 1.0 equiv.) and NFSI (0.24 M, 1.2 equiv.) were pumped into the column from respective toluene solutions. The same PS-box was used for all the substrates. [b] Isolated yield. [c] Determined by chiral HPLC.

As can be seen in Table S2, the proper flow rate is 30 μL min^{-1}, which achieved 99% yield and 96% ee.

3. Long period experiment in toluene

Table S3 Long period experiment in toluene[a]



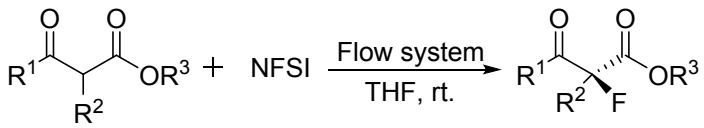
2a **3a**

Time(h)	Yield[%][b]	*ee*[%][c]	Time(h)	Yield[%][b]	*ee*[%][c]
12-12.5	-	-	60-60.5	97	97
24-24.5	97	96	72-72.5	96	96
36-36.5	98	96	84-84.5	97	95
48-48.5	95	95	96-96.5	98	96

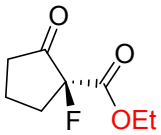
[a] The reactions were performed with PS-box **1d** (0.12 g, 0.068 mmol) and celite (0.8 g) in a column which was charged with $Cu(OTf)_2$ at room temperature, and then **2a** (0.2 M, 1.0 equiv.) and NFSI (0.24 M, 1.2 equiv.) were pumped into the column at 30μL min^{-1} from respective toluene solutions (60 μL min^{-1} total flow rate, 0.1 M concentration of **2a** in the reactor). [b] Isolated yields. [c] Determined by chiral HPLC.

4. Scope of the enantioselective fluorination of aliphatic cyclic and acyclic β-keto esters

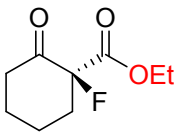
Table S4 Scope of the enantioselective fluorination of aliphatic cyclic and acyclic β-keto esters in continuous flow with immobilized catalyst **1d**[a] and in batch condition with its parent ligand **1f**[b]



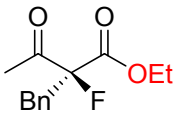
2 **3**



3p
[a]17 yield, rac.
[b]20 yield, rac.



3q
[a]trace, nd
[b]trace, nd



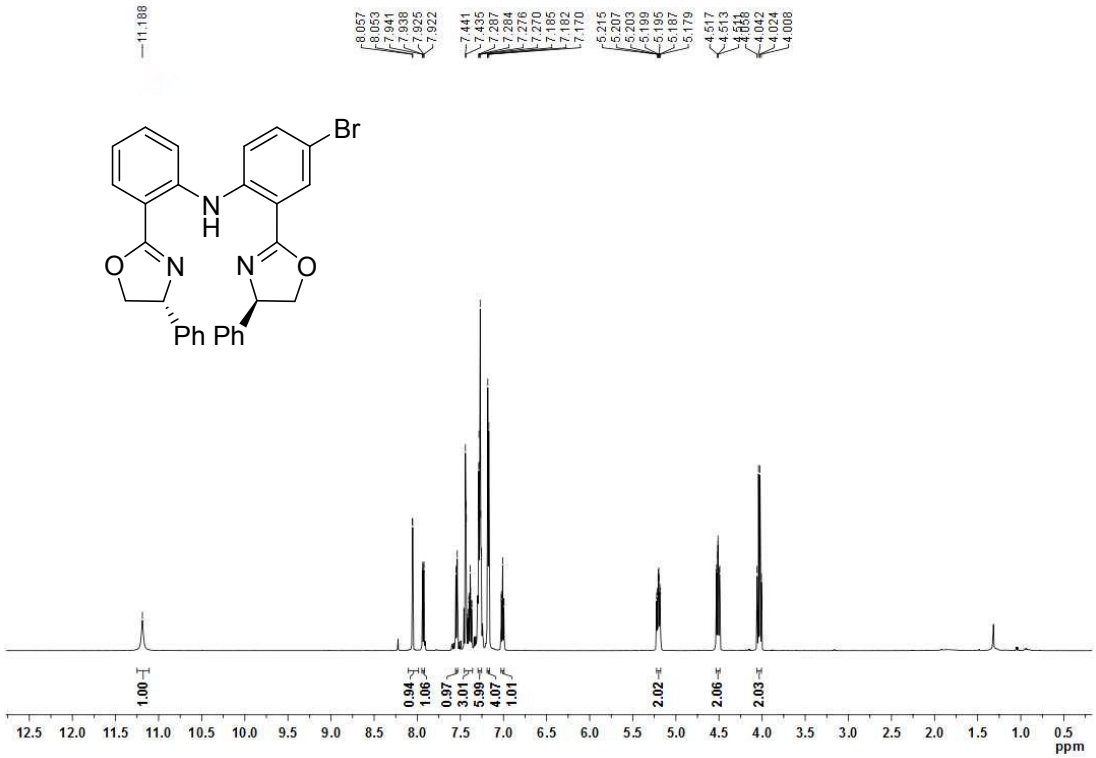
3r
[a]trace, nd
[b]trace, nd

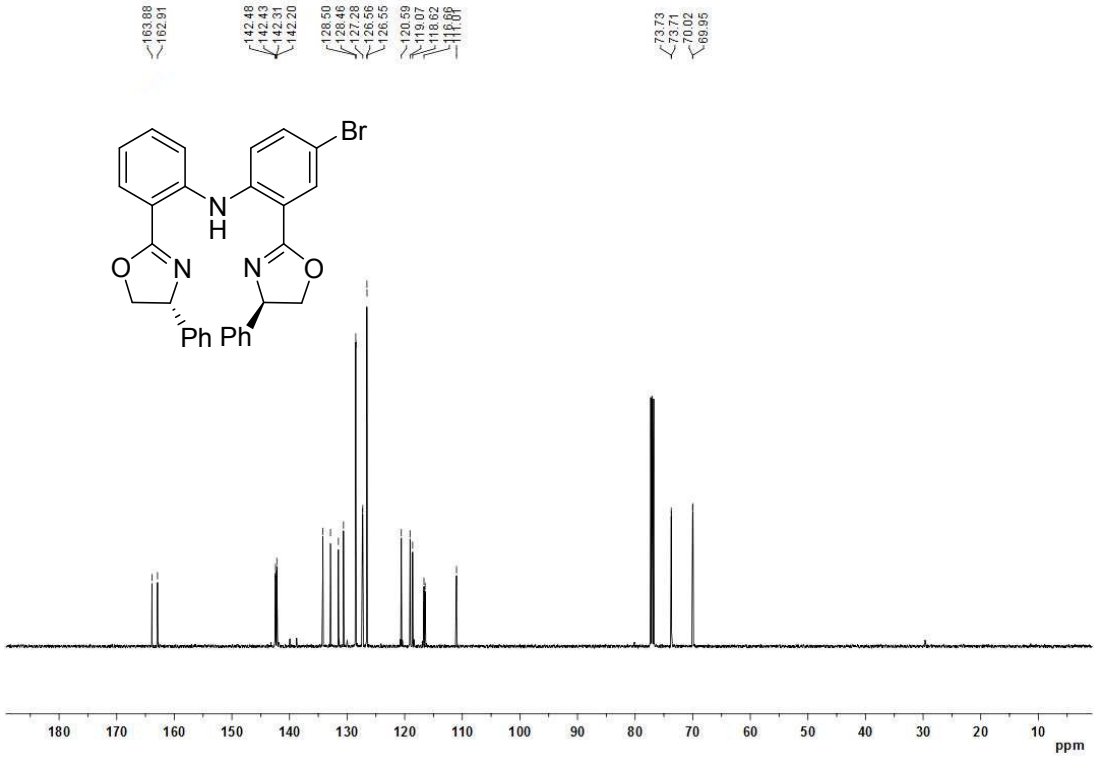
[a] Typical continuous flow conditions: the reactions were performed with PS-box **1d** (0.12 g, 0.068 mmol) and celite (0.8 g) in a column which is charged with $Cu(OTf)_2$ at room temperature, and then **2** (0.2 M, 1.0 equiv.) and NFSI (0.24 M, 1.2 equiv.) were pumped into the column at 30 μL min^{-1} from respective THF solutions (60 μL min^{-1} total flow rate, 0.1 M concentration of **2** in the column). Each substrate carried out for 12 h. The same PS-box was used for all the substrates. Residence time under these conditions was 28 min. [b] Typical batch conditions: to a tube a complex of **1f**-$Cu(OTf)_2$ (0.05 mmol) with 5.0 mL toluene were added, and then **2** (0.5 mmol, 1.0 equiv.) and NFSI (0.6 mmol, 1.2 equiv.) were added into the tube. The reaction mixture was shaken for 12 h.

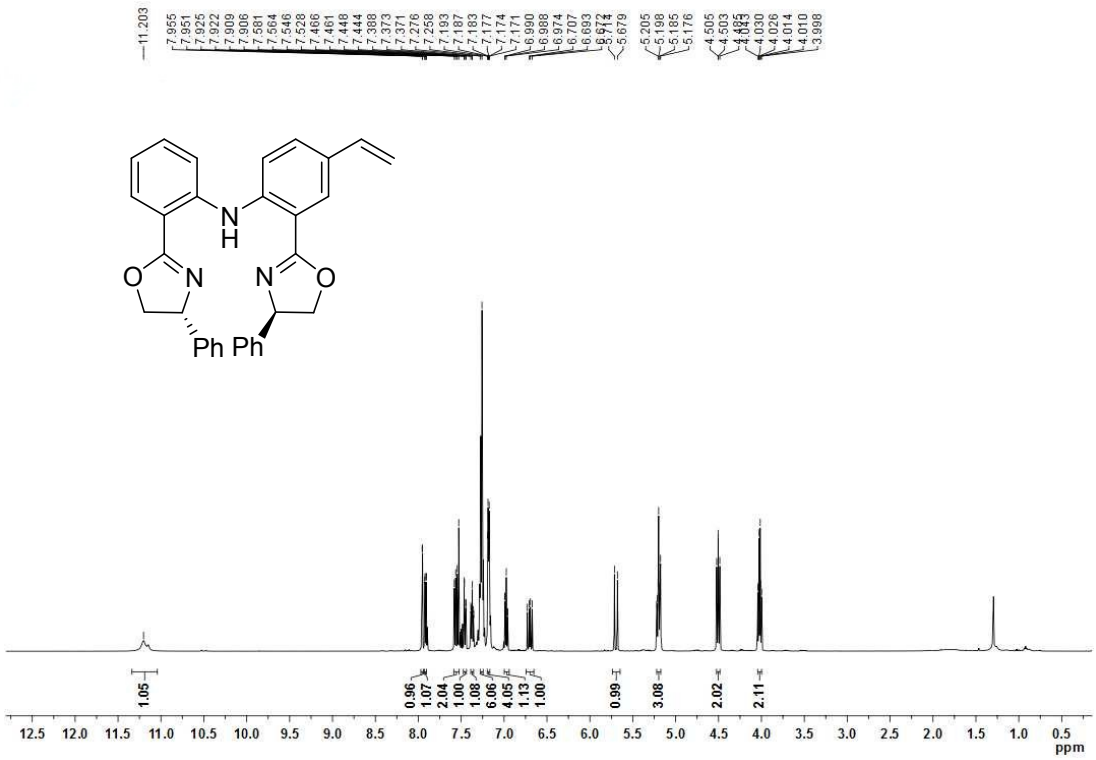
5. Characterization results

The substrates **2a-o** and the corresponding products **3a-o** are known compounds that exhibited ^1H and ^{13}C NMR data in agreement with those reported in the literature.[1-3]. The absolute configuration of the fluorination products was assigned by the chiral HPLC chromatograms with those reported in the literature under the same conditions.[4]

6. NMR spectra



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7.174
7.171
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6.707
6.693
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5.198
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4.505
4.503
4.030
4.026
4.014
4.010
3.998
N
H
O
N
N
O
Ph Ph
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0.96
1.07
2.04
1.00
1.08
6.06
4.05
1.13
1.00
0.99
3.08
2.02
2.11
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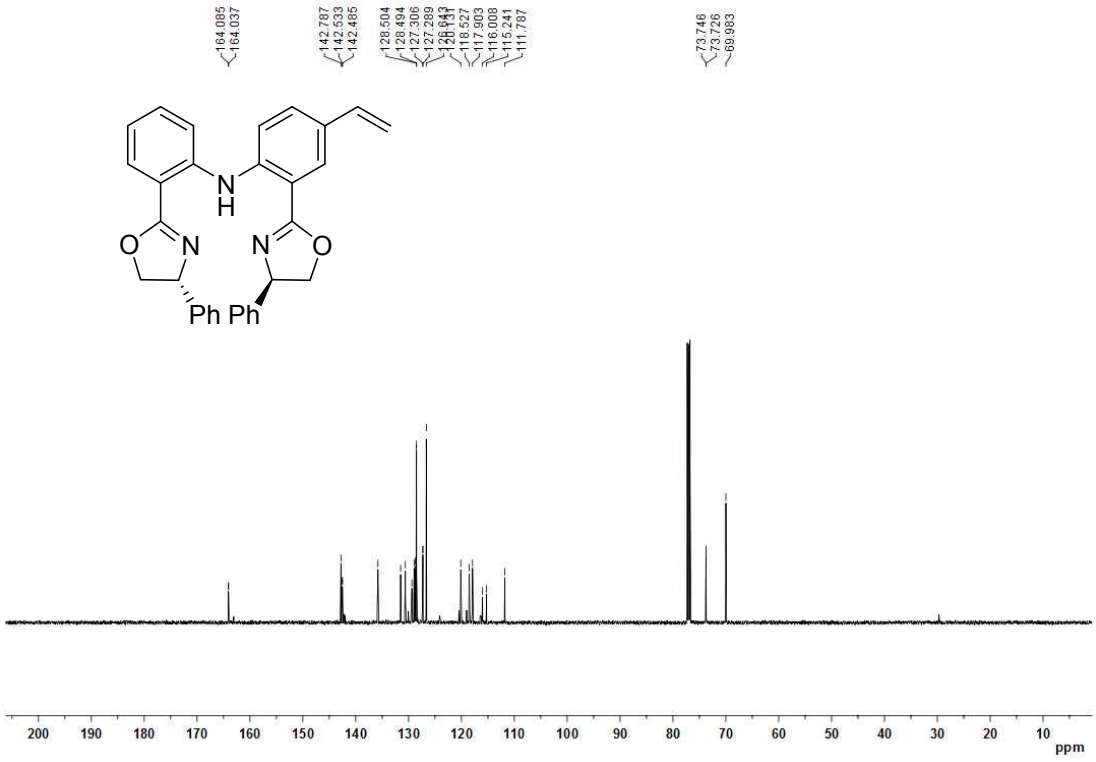
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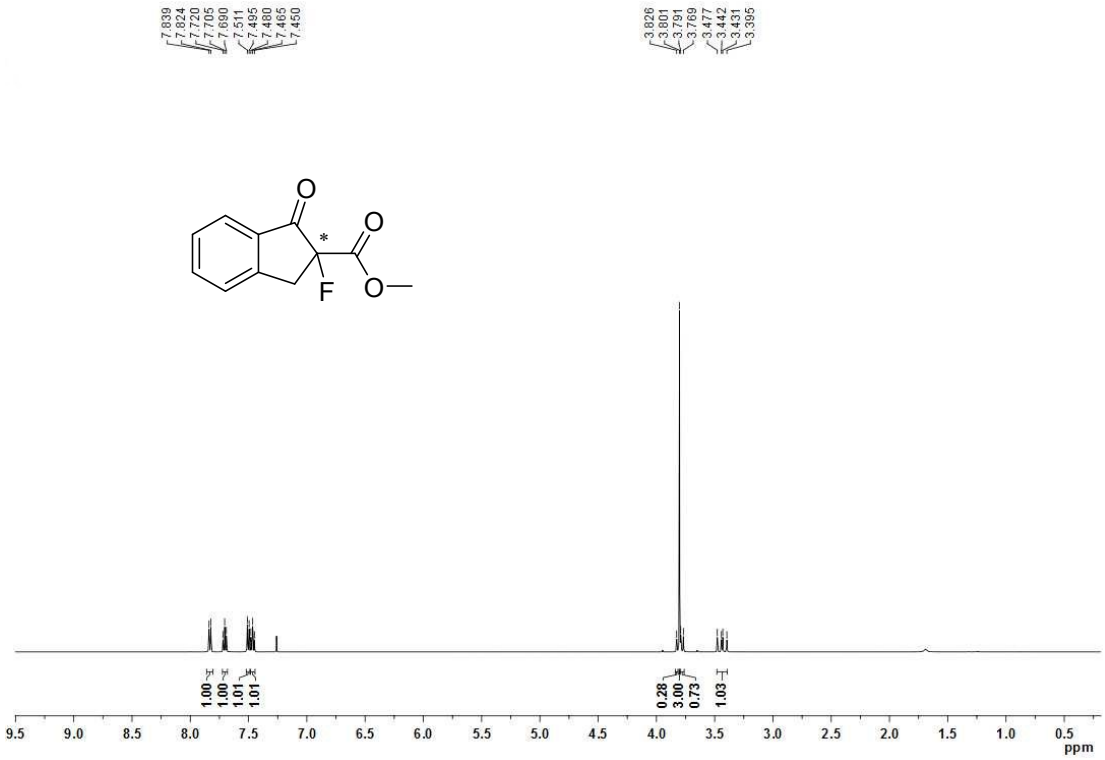
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3.431
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0.73
1.03
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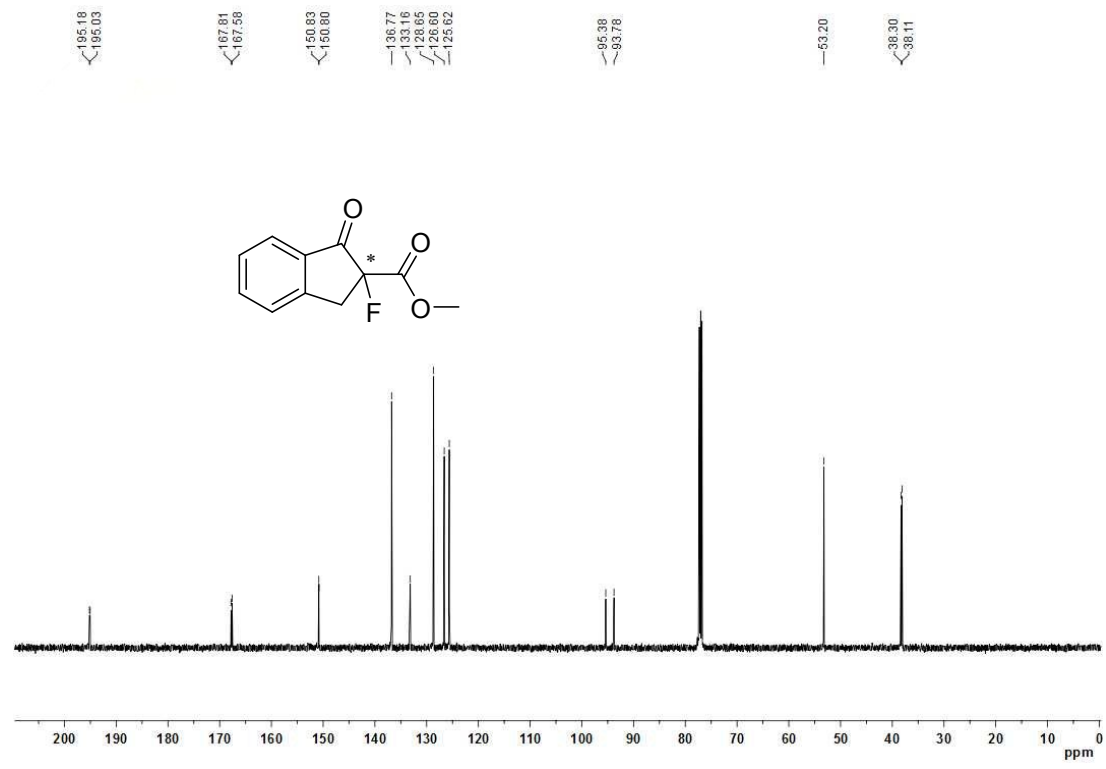
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O—
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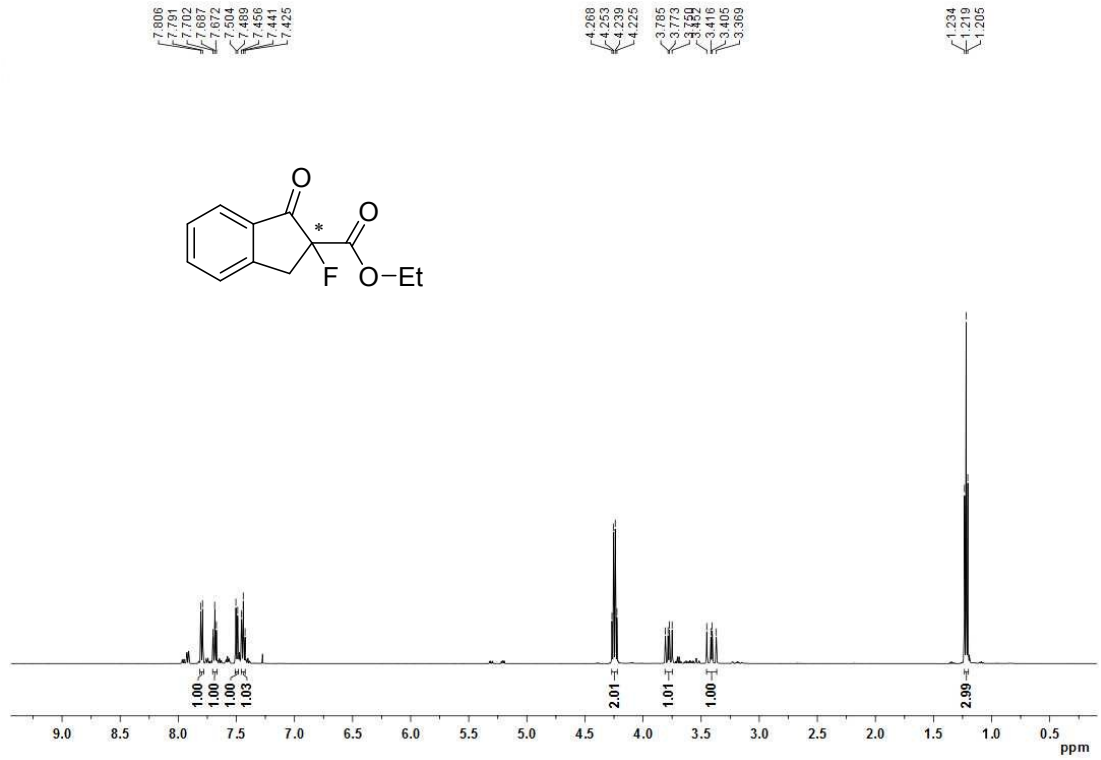
ppm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1.219
1.205
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O
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F
O−Et
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1.00
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1.01
1.00
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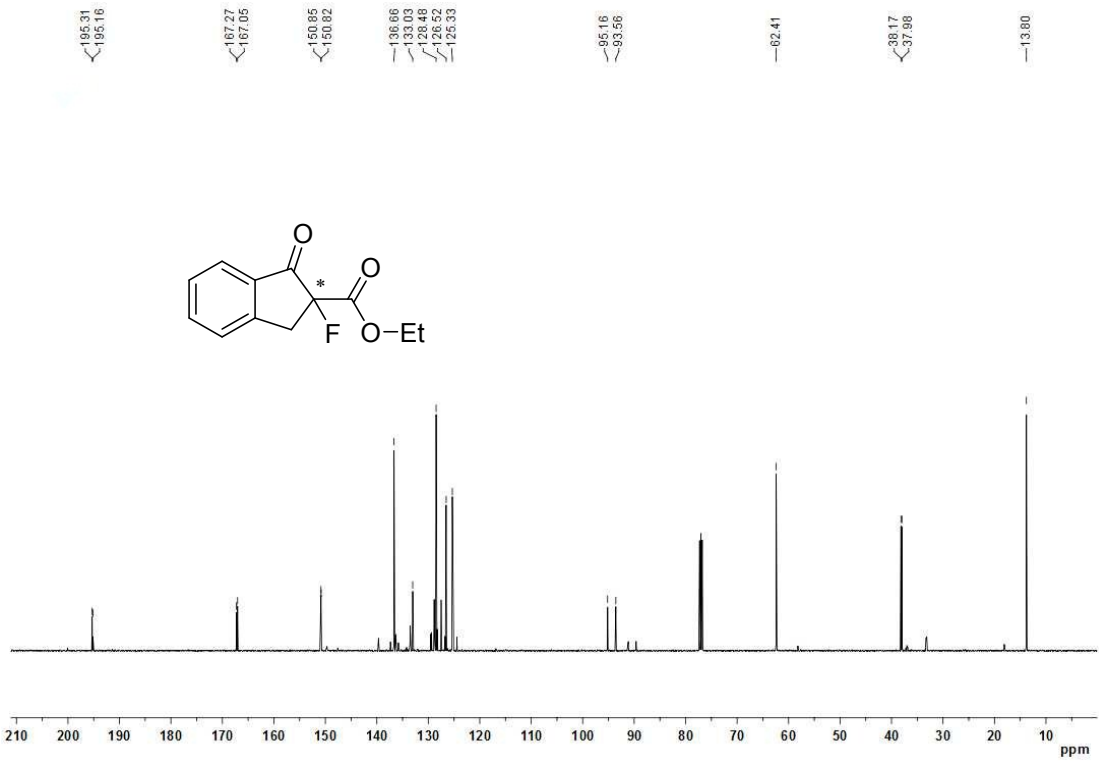
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37.98
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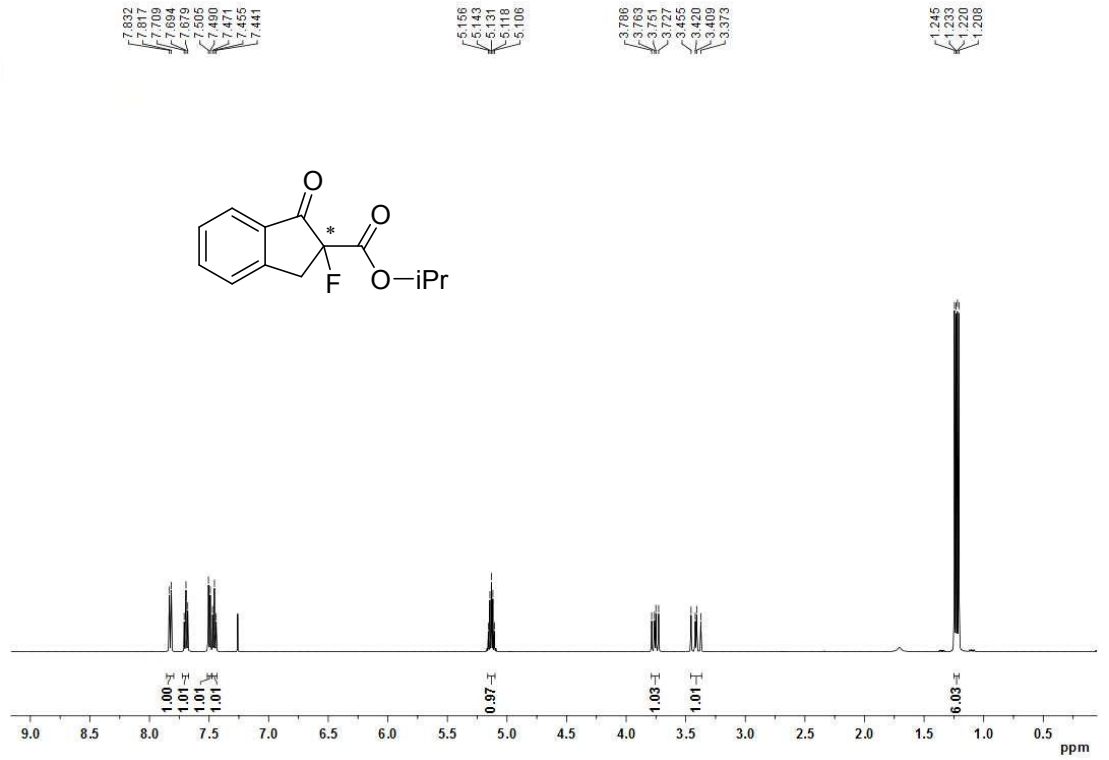
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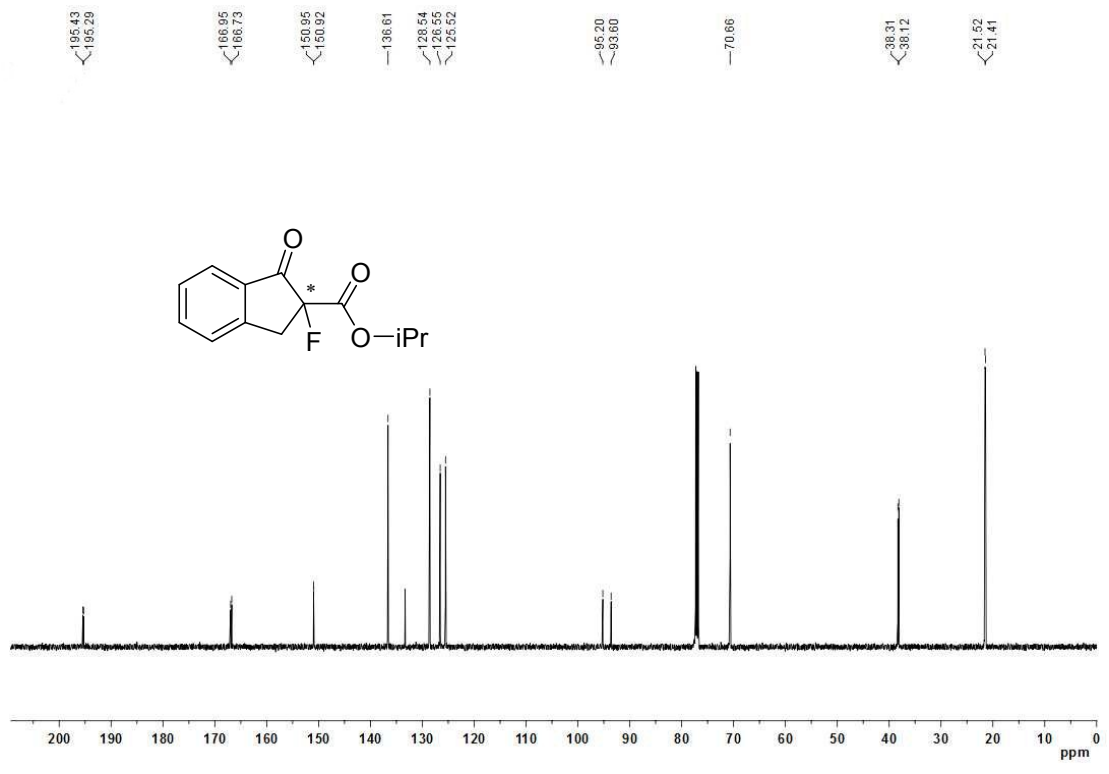
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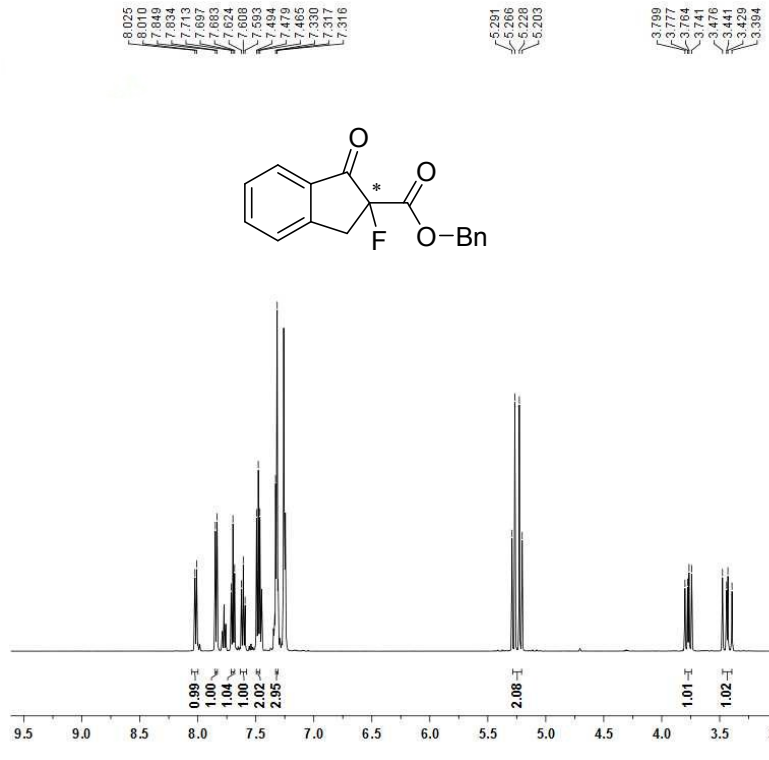
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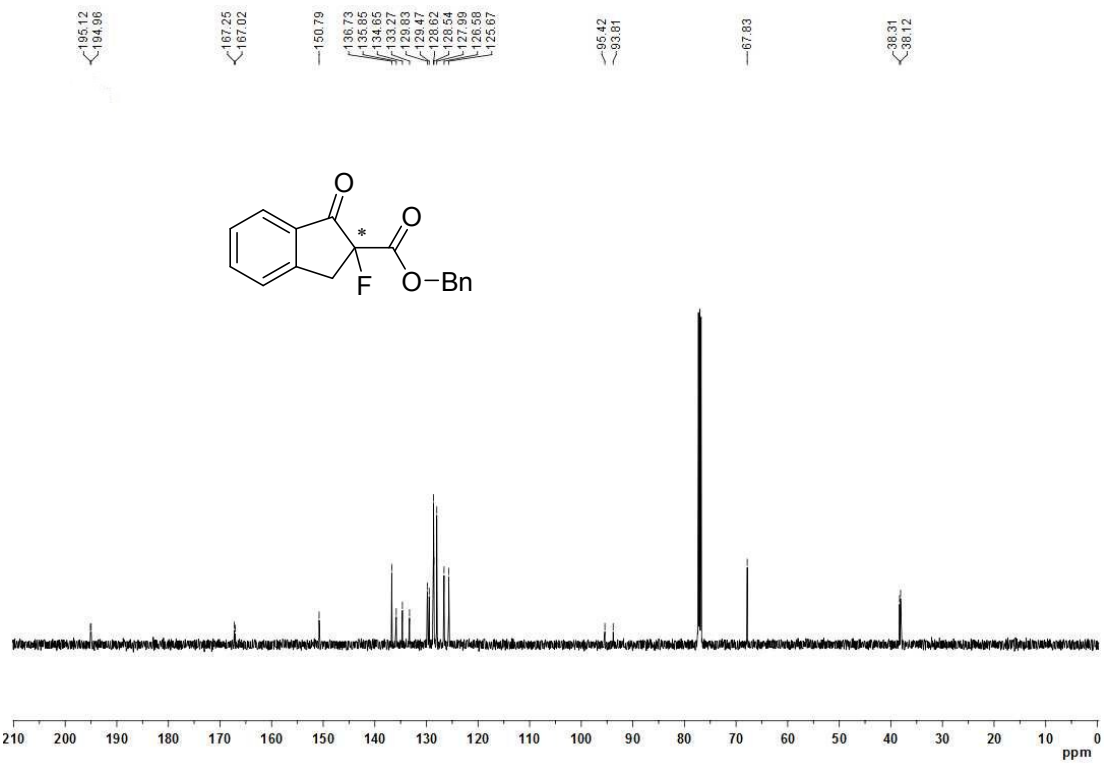
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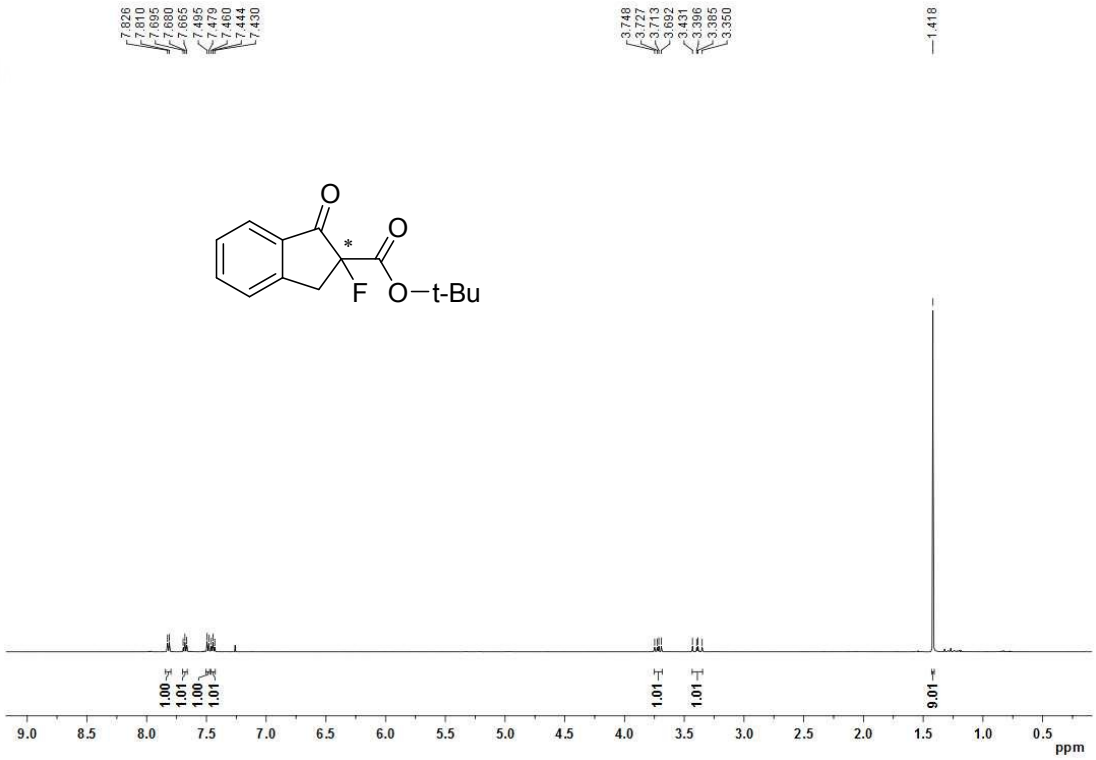
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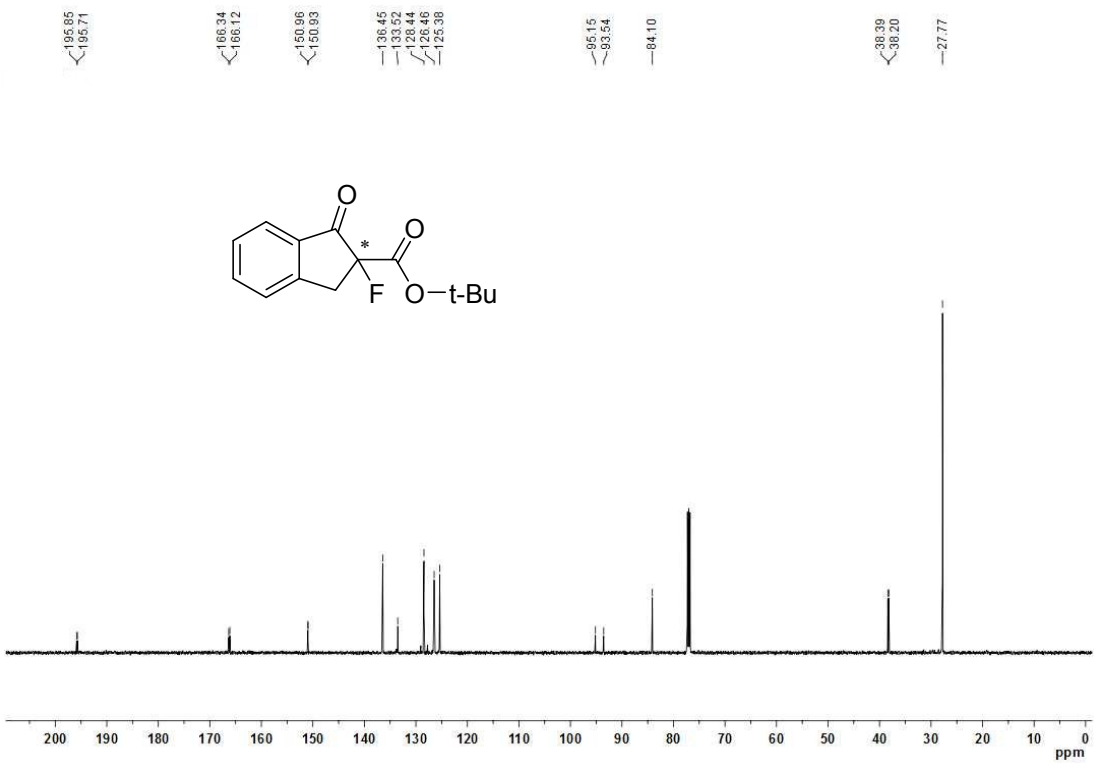
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84.10
38.39
38.20
27.77
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O
*
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O−t-Bu
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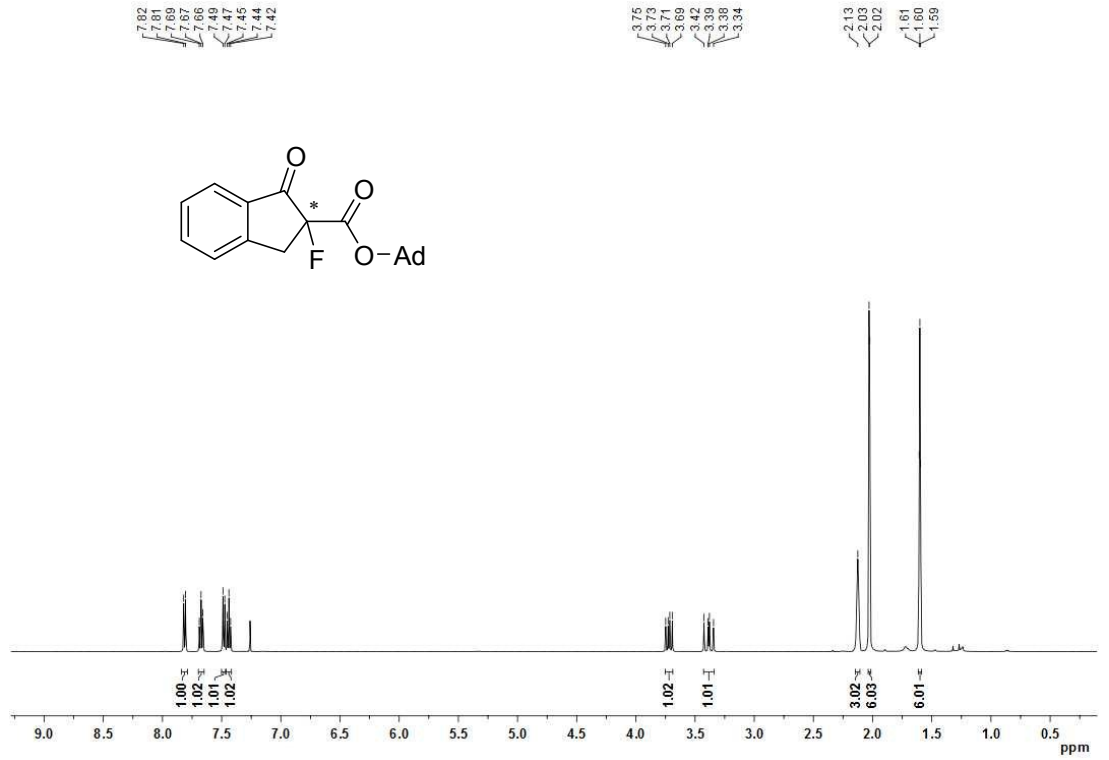
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3.39
3.38
3.34
2.13
2.03
2.02
1.61
1.60
1.59
O
O
*
F
O−Ad
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1.02
1.01
1.02
1.02
1.01
3.02
6.03
6.01
9.0
8.5
8.0
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7.0
6.5
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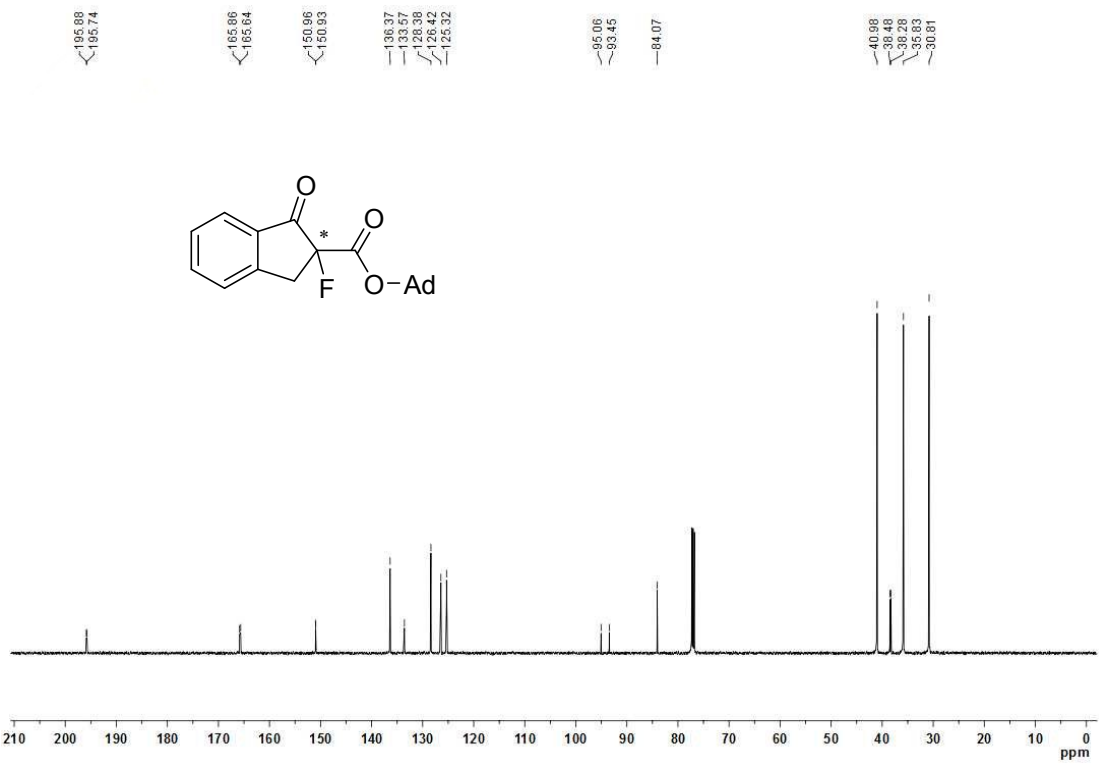
ppm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84.07
40.98
38.48
38.28
35.83
30.81
O
O
*
F
O−Ad
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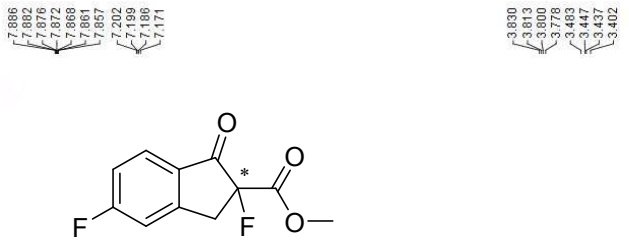
ppm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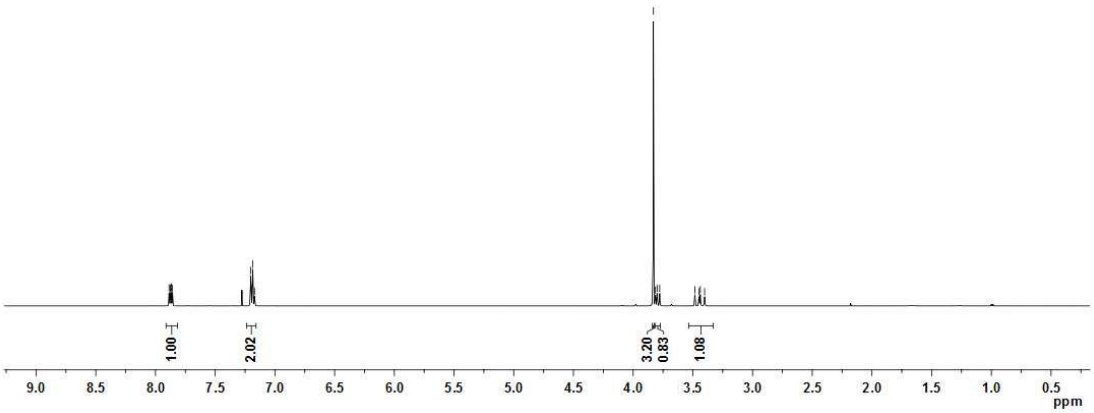
O—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0.83
1.08
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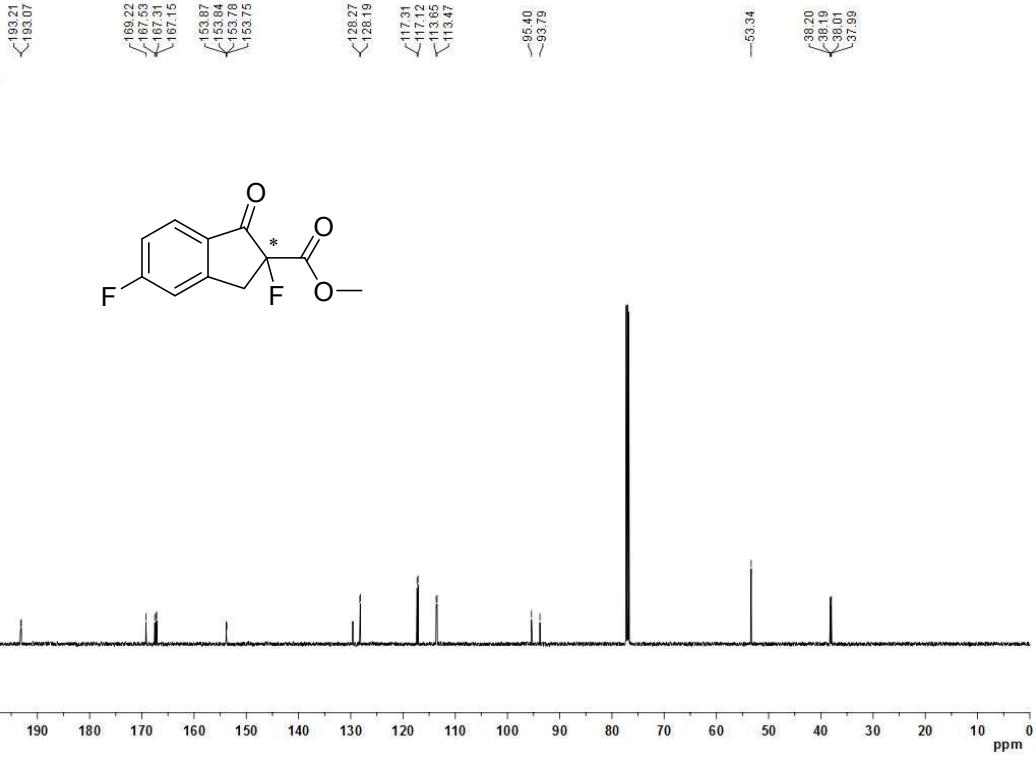
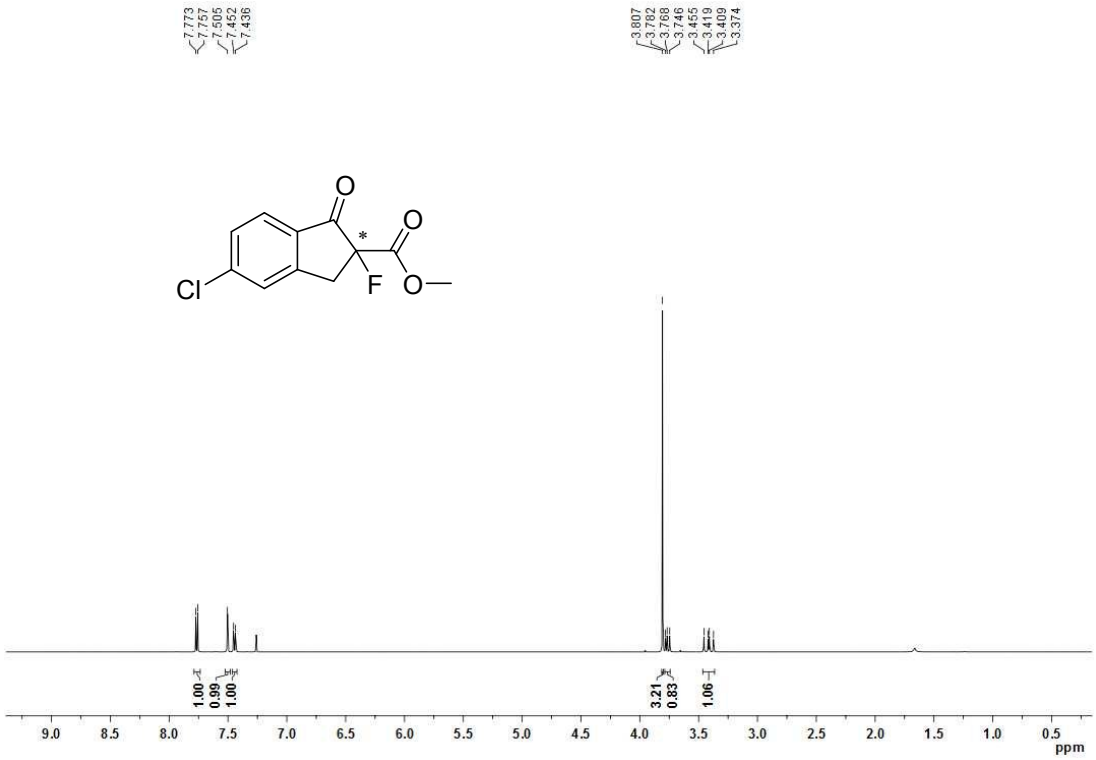
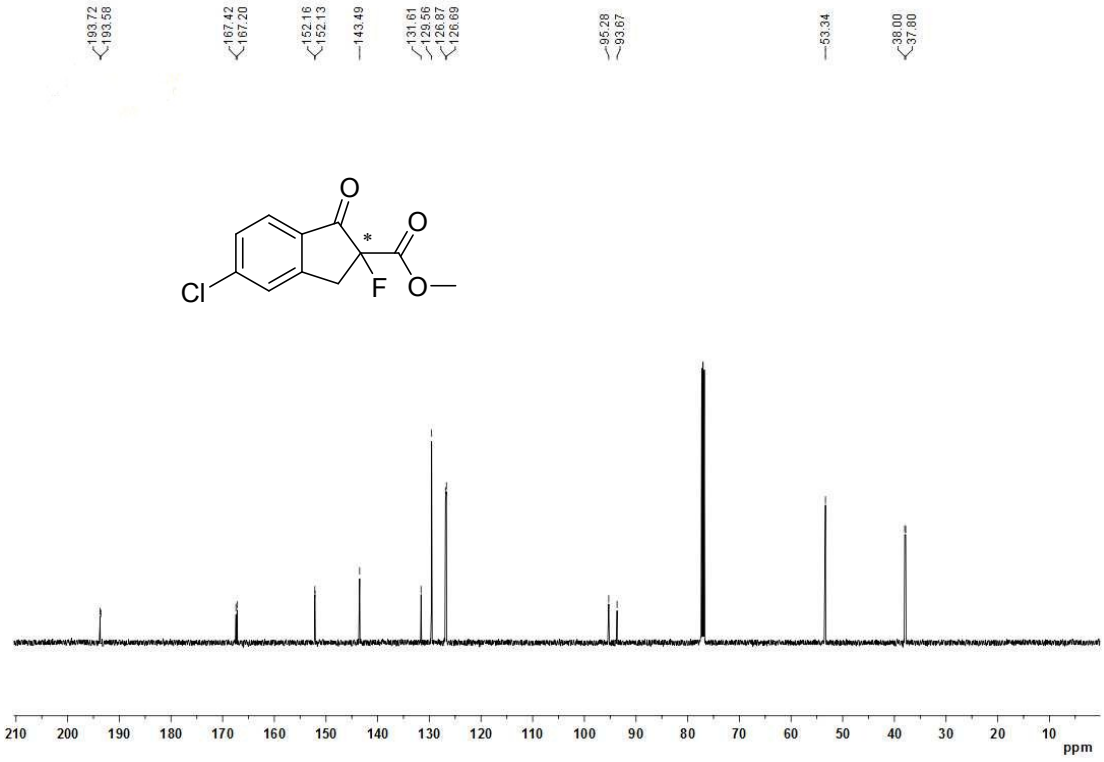
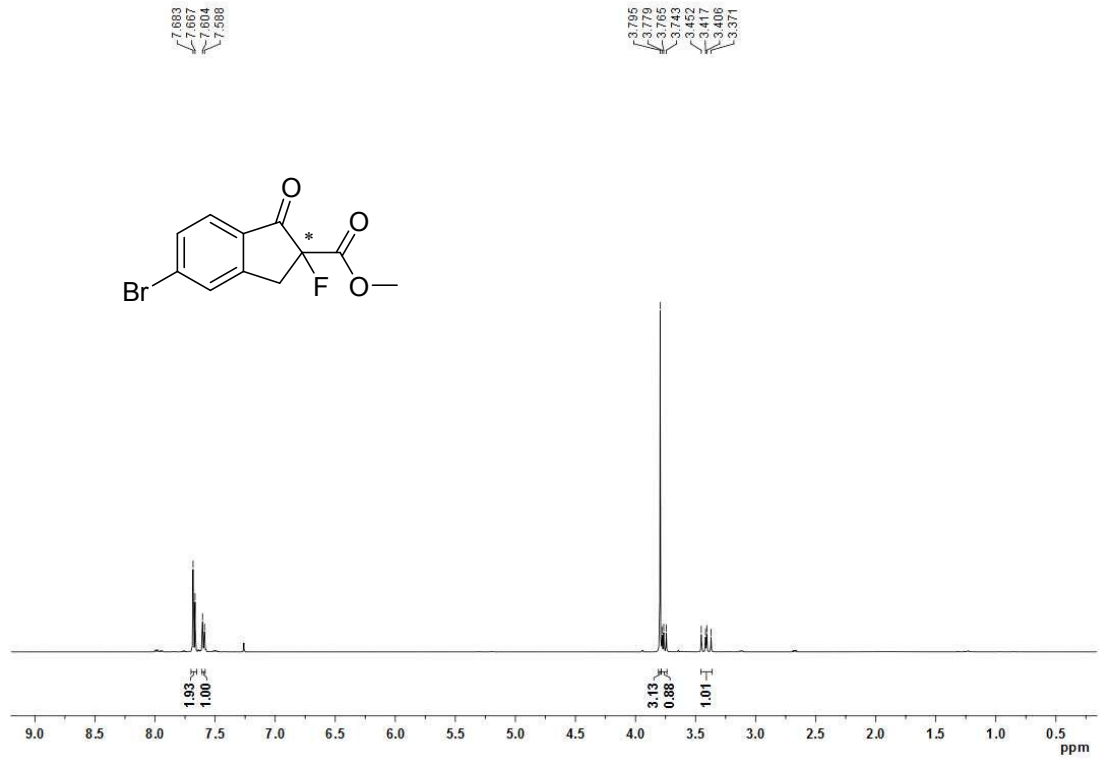
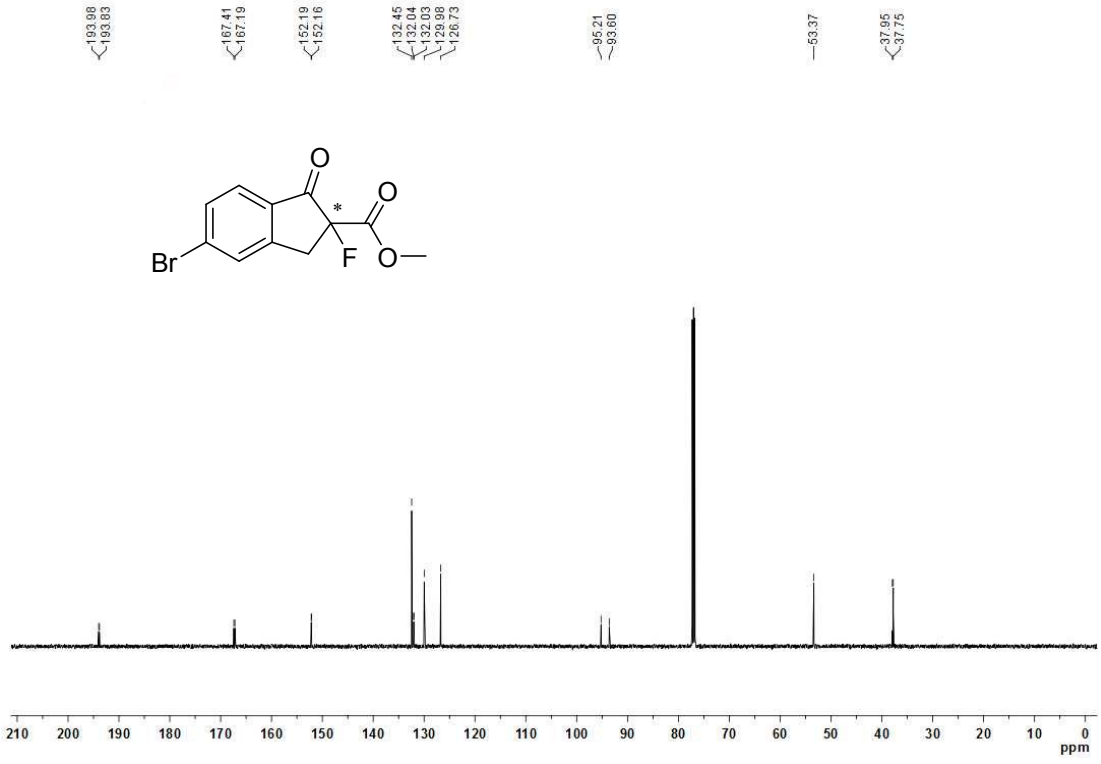
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm

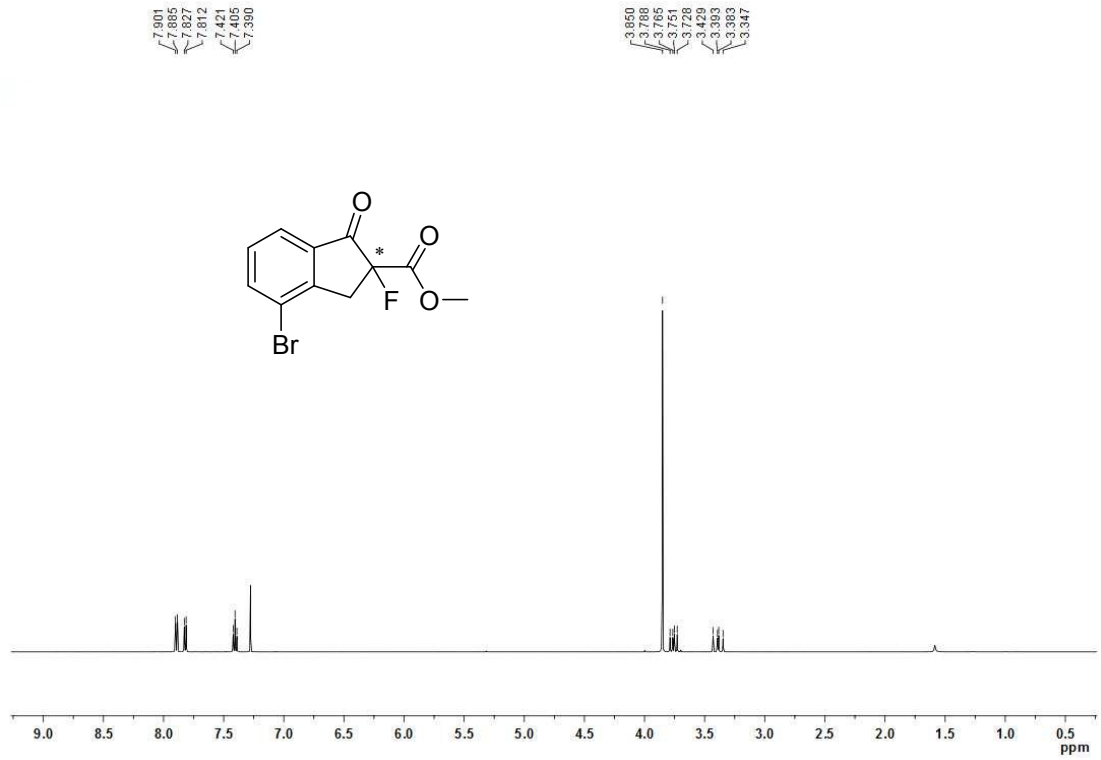

193.21
193.07
169.22
167.53
167.31
167.15
153.87
153.84
153.78
153.75
128.27
128.19
117.31
117.12
113.65
113.47
95.40
93.79
53.34
38.20
38.19
38.01
37.99
O
O
*
F
F
O—
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

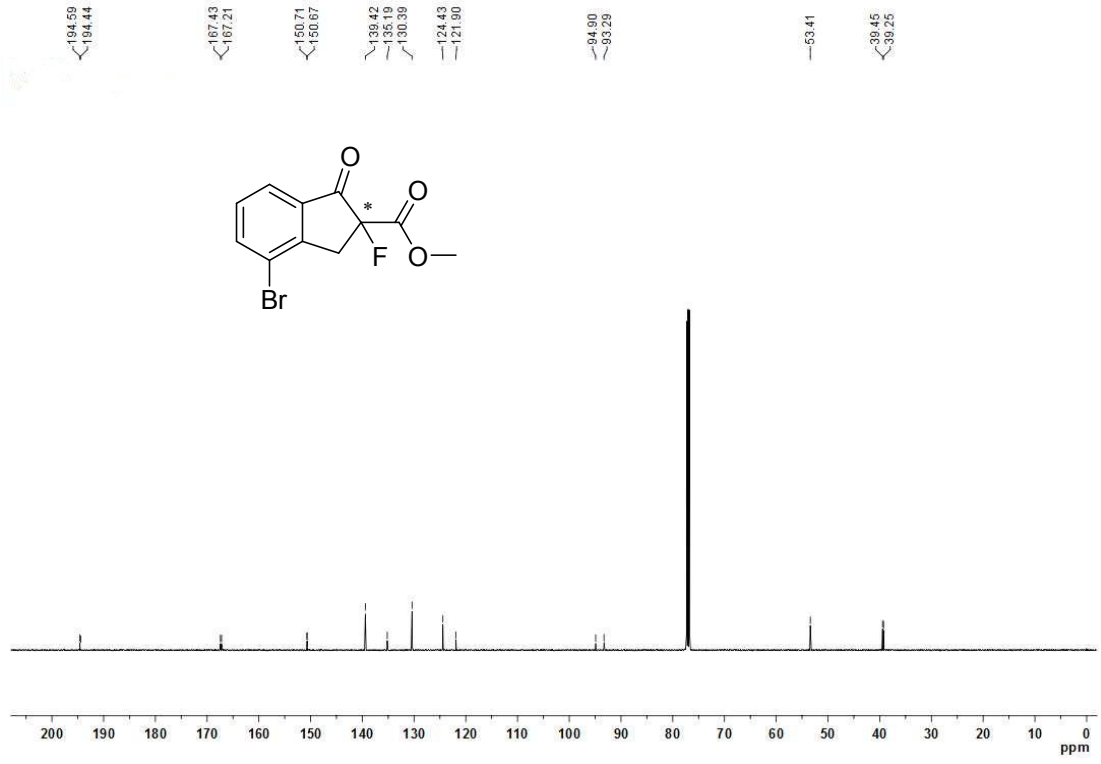

7.773
7.757
7.505
7.452
7.436
3.807
3.782
3.768
3.746
3.455
3.419
3.409
3.374
O
O
*
Cl
F
O
1.00
0.99
1.00
3.21
0.83
1.06
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm

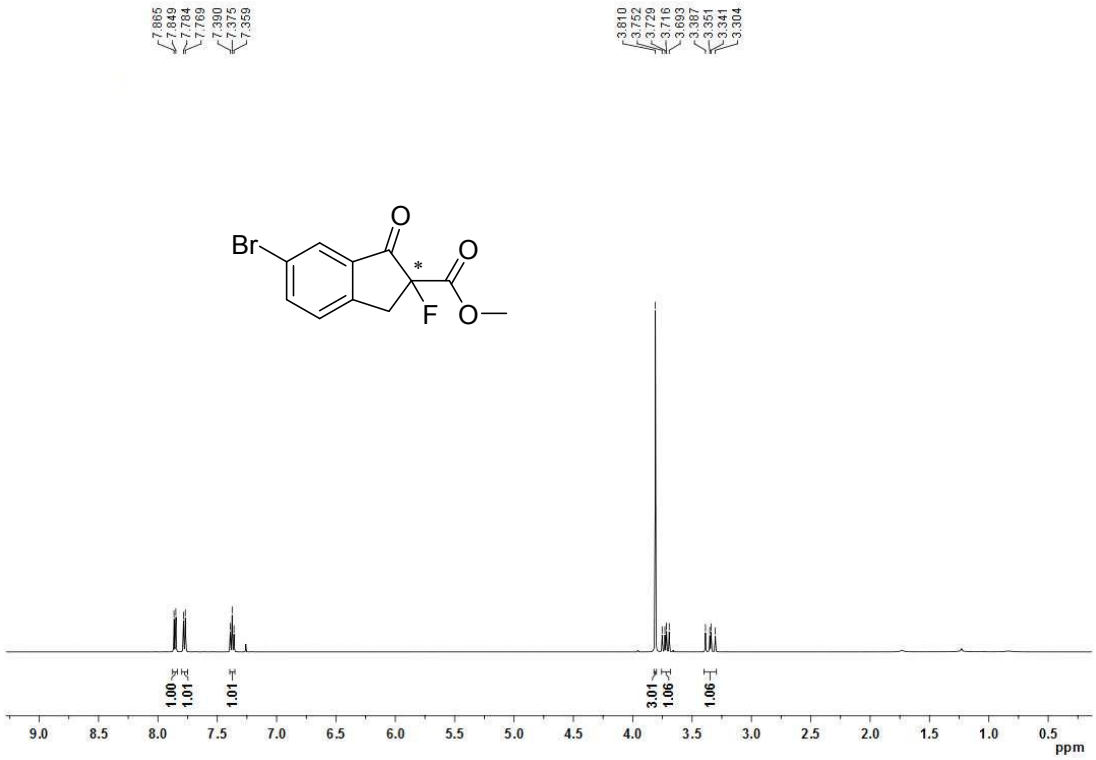

193.72
193.58
167.42
167.20
152.16
152.13
143.49
131.61
129.56
126.87
126.69
95.28
93.67
53.34
38.00
37.80
O
O
*
Cl
F
O
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
ppm

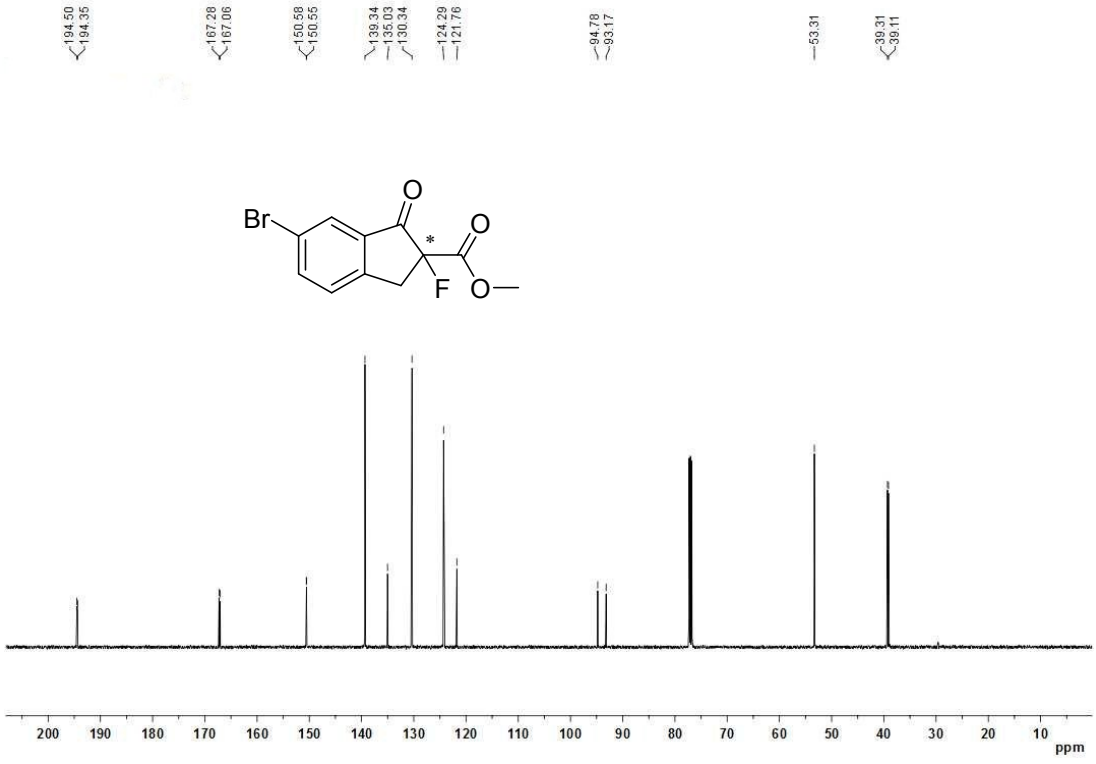

7.683
7.667
7.604
7.588
3.795
3.779
3.765
3.743
3.452
3.417
3.406
3.371
O
O
*
Br
F
O—
1.93
1.00
3.13
0.88
1.01
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm

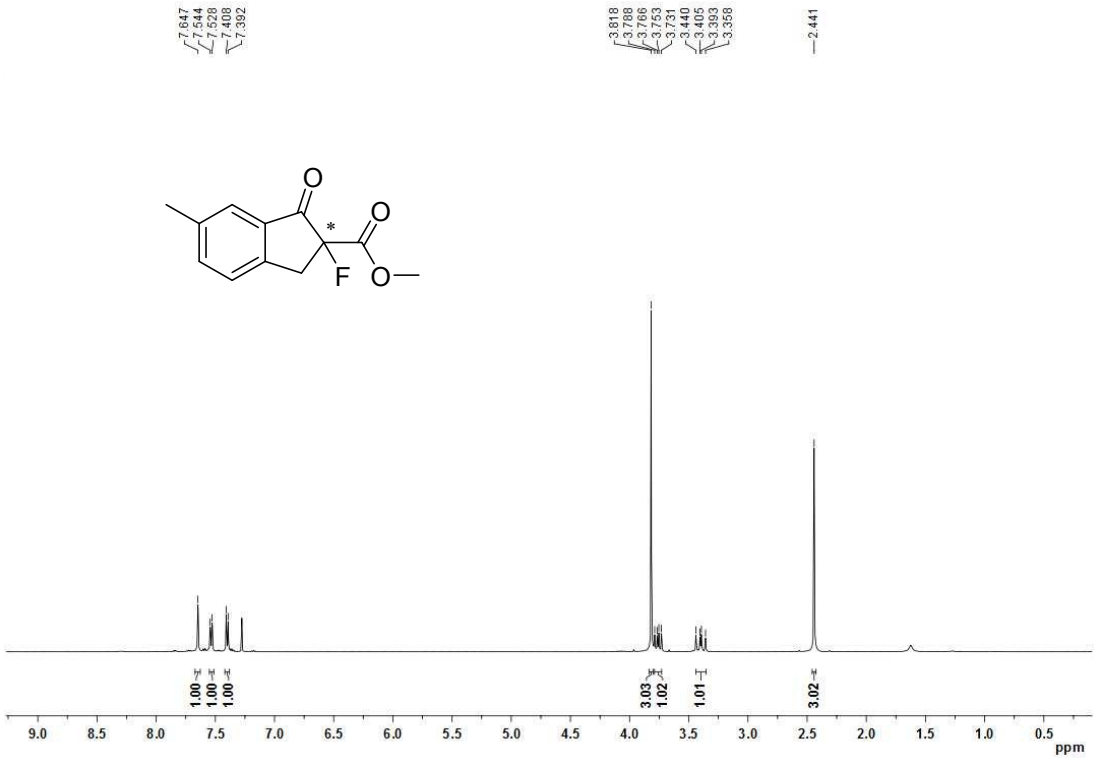

193.98
193.83
167.41
167.19
152.19
152.16
132.45
132.04
132.03
129.98
126.73
95.21
93.60
53.37
37.95
37.75
O
O
*
Br
F
O—
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

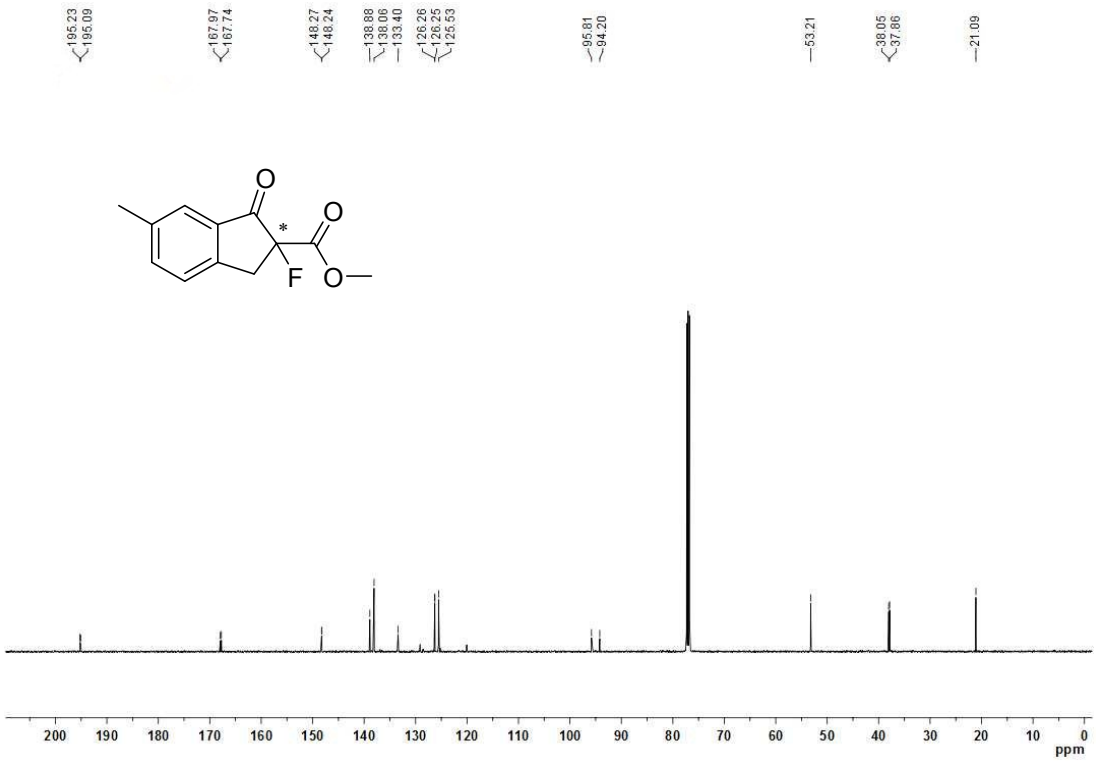

7.901
7.885
7.827
7.812
7.421
7.405
7.390
3.850
3.768
3.765
3.751
3.728
3.429
3.393
3.383
3.347
O
O
*
F
O—
Br
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm

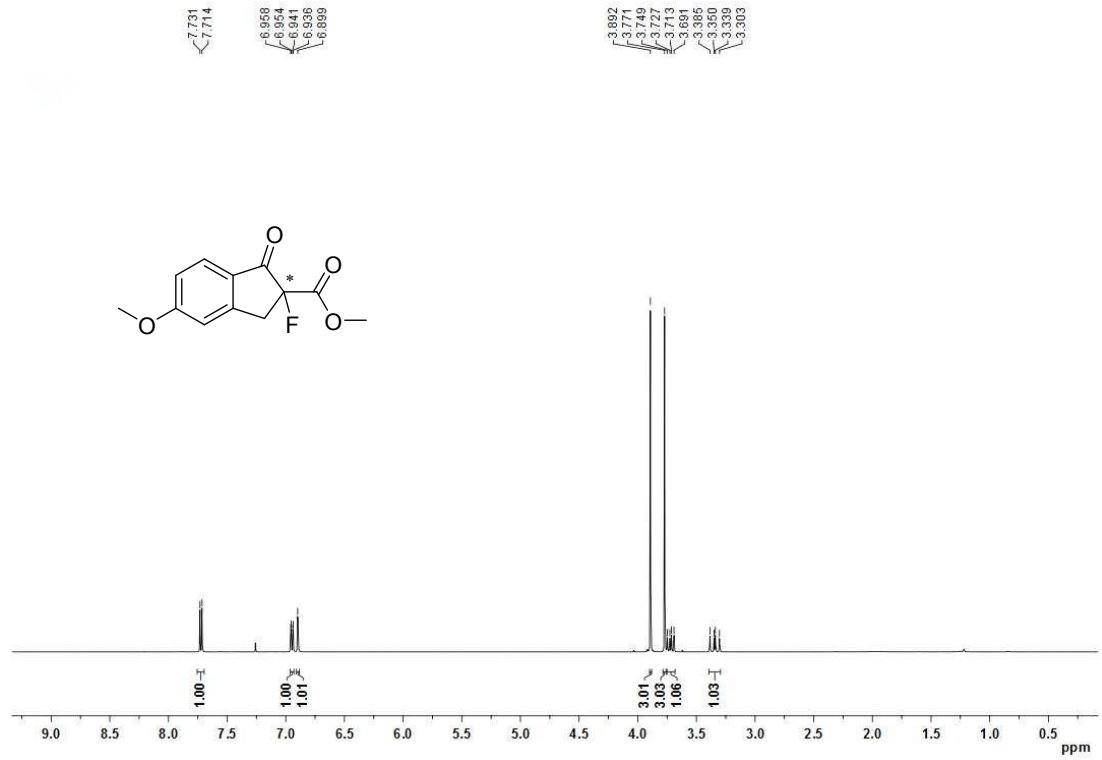

194.59
194.44
167.43
167.21
150.71
150.67
139.42
135.19
130.39
124.43
121.90
94.90
93.29
53.41
39.45
39.25
O
O
*
F
O—
Br
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

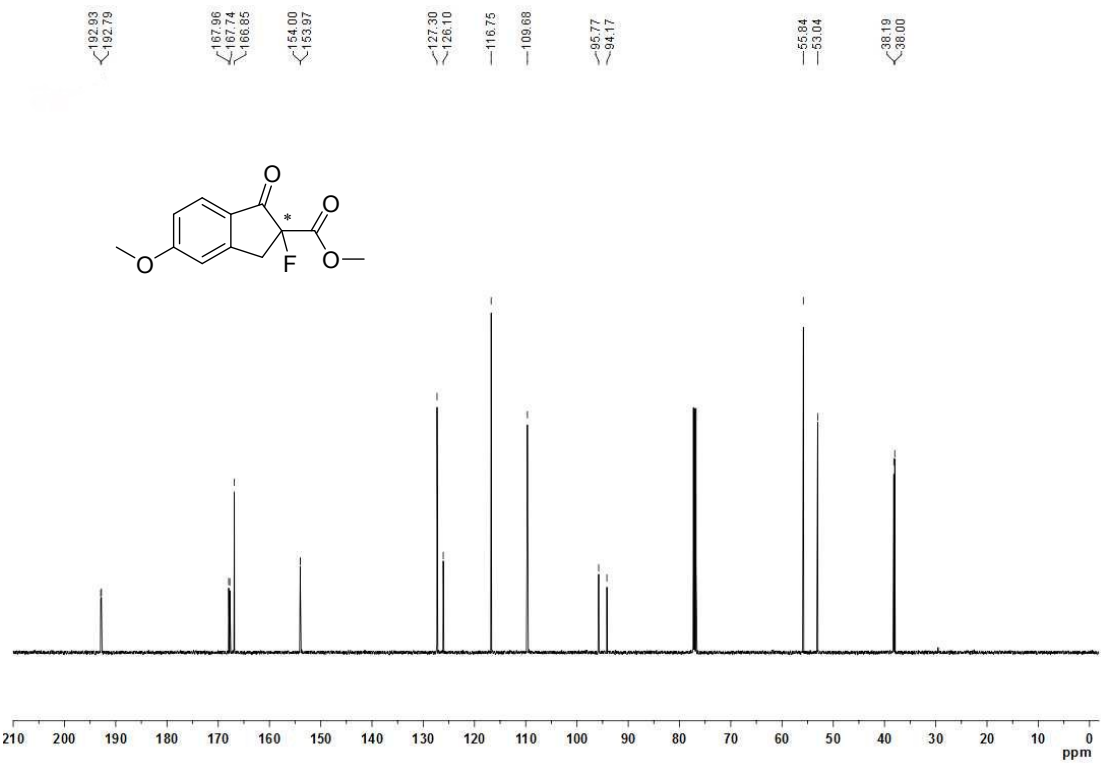

7.865
7.849
7.784
7.769
7.390
7.375
7.359
3.810
3.752
3.729
3.716
3.693
3.367
3.351
3.341
3.304
Br
O
O
*
F
O
1.00
1.01
1.01
3.01
1.06
1.06
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm

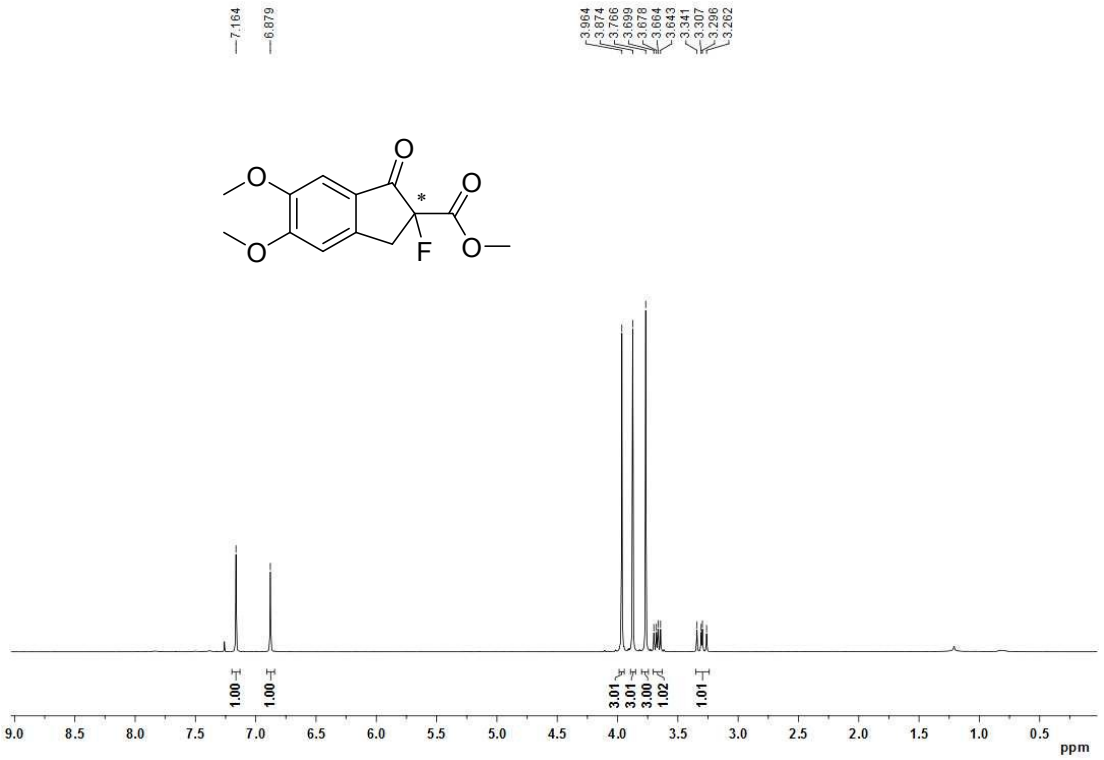

194.50
194.35
167.28
167.06
150.58
150.55
139.34
135.03
130.34
124.29
121.76
94.78
93.17
53.31
39.31
39.11
Br
O
O
*
F
O
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
ppm

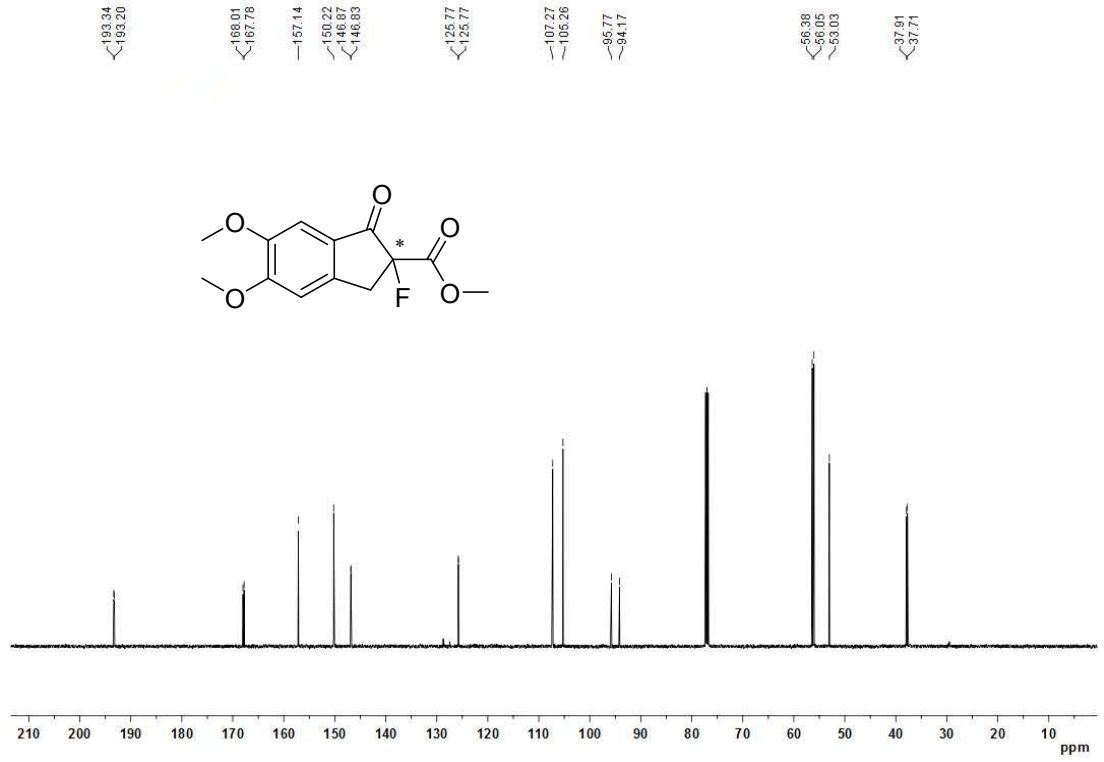

7.647
7.544
7.528
7.408
7.392
3.818
3.788
3.766
3.753
3.731
3.440
3.405
3.393
3.358
2.441
O
O
*
F
O
1.00
1.00
1.00
3.03
1.02
1.01
3.02
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm

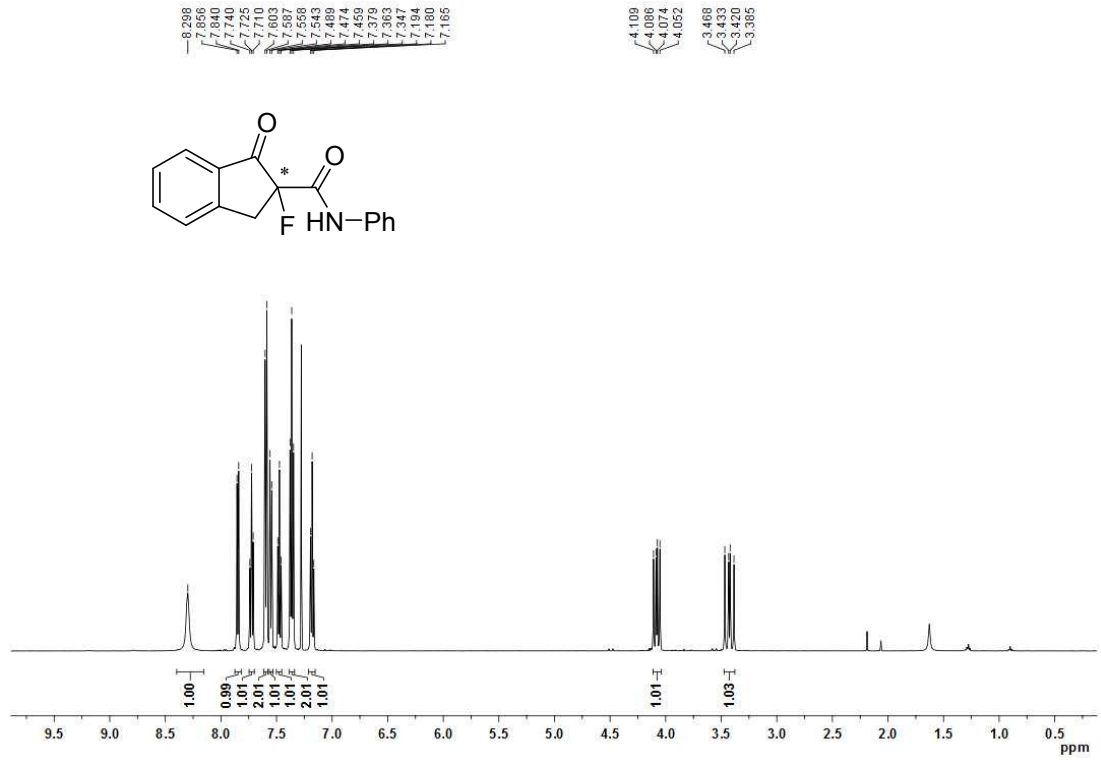

195.23
195.09
167.97
167.74
148.27
148.24
138.88
138.06
133.40
126.26
126.25
125.53
95.81
94.20
53.21
38.05
37.86
21.09
O
O
*
F
O
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

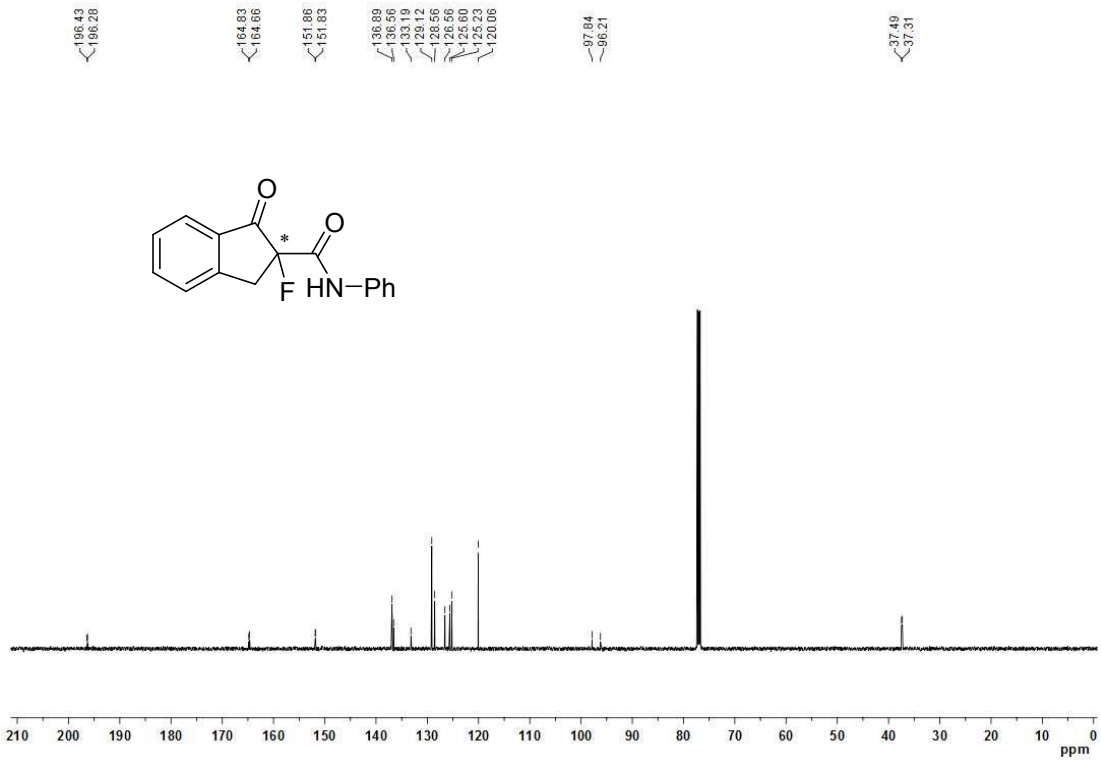

7.731
7.714
6.958
6.954
6.941
6.936
6.899
3.892
3.771
3.749
3.727
3.713
3.691
3.385
3.350
3.339
3.303
O
O
O
F
O
1.00
1.00
1.01
3.01
3.03
1.06
1.03
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm


192.93
192.79
167.96
167.74
166.85
154.00
153.97
127.30
126.10
116.75
109.68
95.77
94.17
55.84
53.04
38.19
38.00
O
O
O
F
O
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

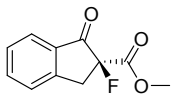

7.164
6.879
3.964
3.874
3.766
3.699
3.678
3.664
3.643
3.341
3.307
3.296
3.262
O
O
O
*
F
O
1.00
1.00
3.01
3.01
3.00
1.02
1.01
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm


193.34
193.20
168.01
167.78
157.14
150.22
146.87
146.83
125.77
125.77
107.27
105.26
95.77
94.17
56.38
56.05
53.03
37.91
37.71
O
O
O
*
F
O
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
ppm


8.298
7.856
7.840
7.740
7.725
7.710
7.603
7.587
7.558
7.543
7.489
7.474
7.459
7.379
7.363
7.347
7.194
7.180
7.165
4.109
4.086
4.074
4.052
3.468
3.433
3.420
3.385
O
O
*
F HN−Ph
1.00
0.99
1.01
2.01
1.01
1.01
2.01
1.01
1.01
1.03
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm

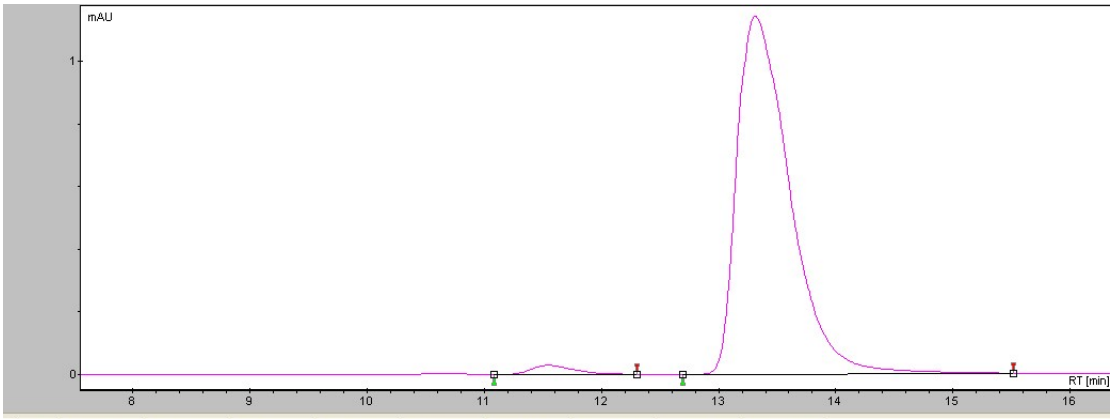

196.43
196.28
164.83
164.66
151.86
151.83
136.89
136.56
133.19
129.12
128.56
126.56
125.60
125.23
120.06
97.84
96.21
37.49
37.31
O
O
*
F HN−Ph
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

7. HPLC traces of the fluorinated product and racemic standards



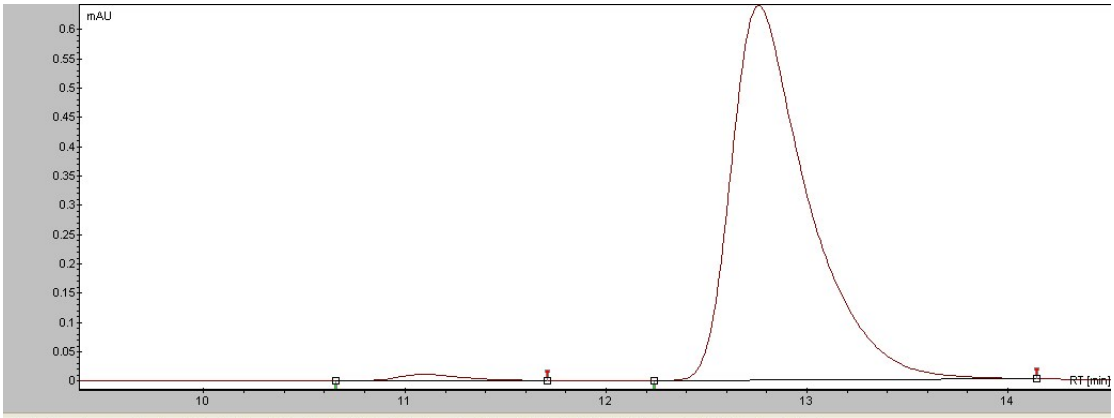
3a

In batch condition



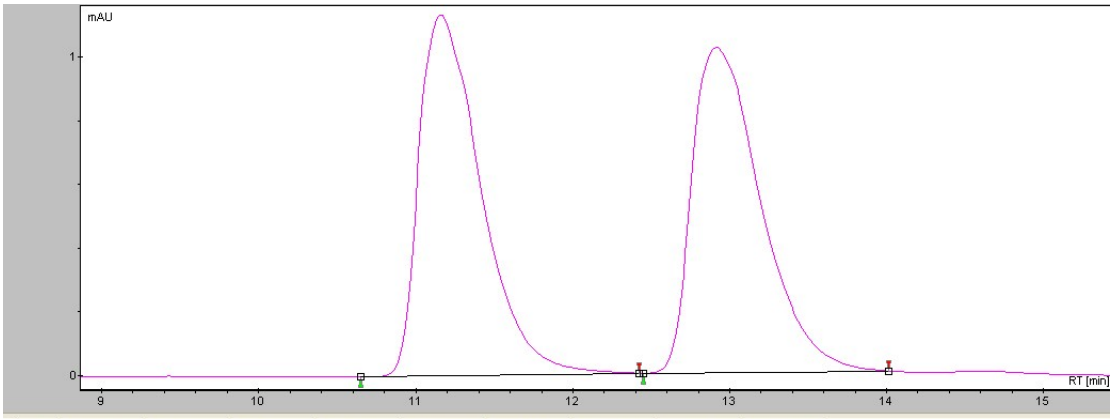
#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	11.083	11.546	12.302	0.000	1.93	0.0	0.0	1.934
2	UNKNOWN	12.694	13.319	15.516	0.000	98.07	1.1	0.6	98.066
Total						100.00	1.2	0.6	100.000

In continuous flow condition

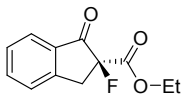


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	10.657	11.093	11.709	0.000	1.37	0.0	0.0	1.366
2	UNKNOWN	12.240	12.760	14.142	0.000	98.63	0.6	0.3	98.634
Total						100.00	0.6	0.3	100.000

Rac

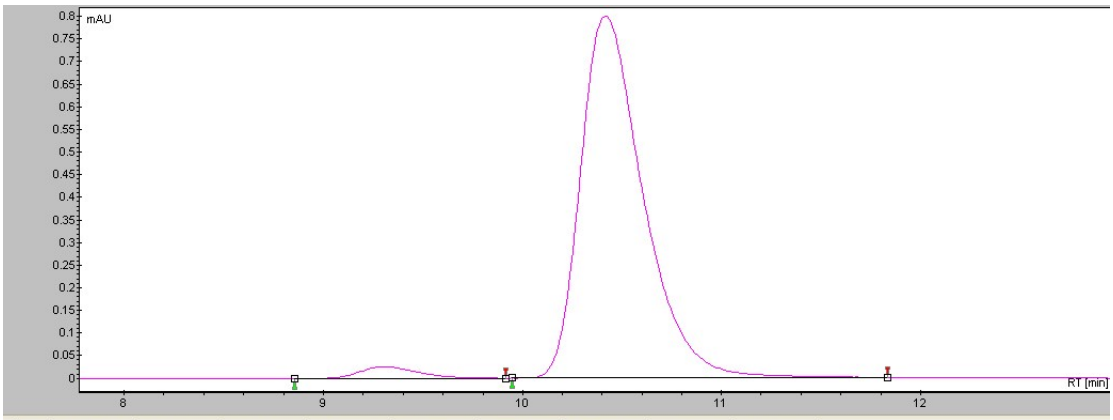


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	10.650	11.160	12.424	0.000	49.98	1.1	0.5	49.976
2	UNKNOWN	12.452	12.920	14.015	0.000	50.02	1.0	0.5	50.024
Total						100.00	2.2	1.0	100.000



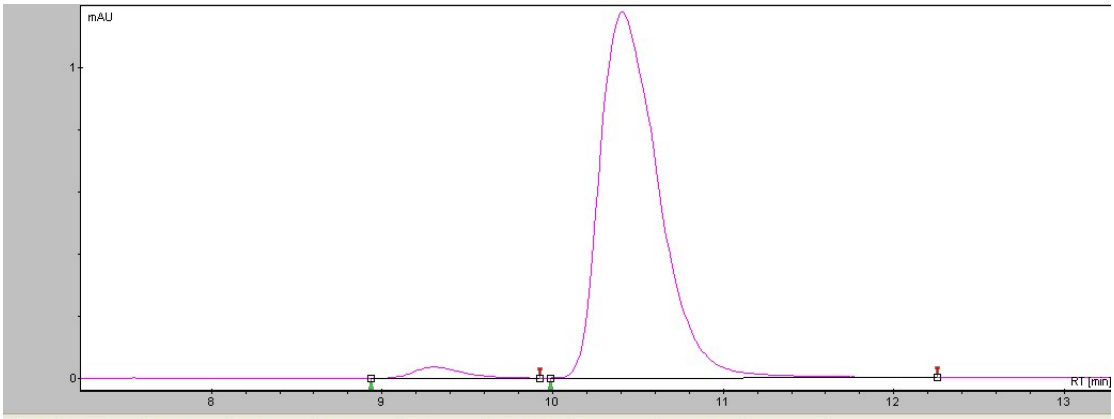
3b

In batch condition



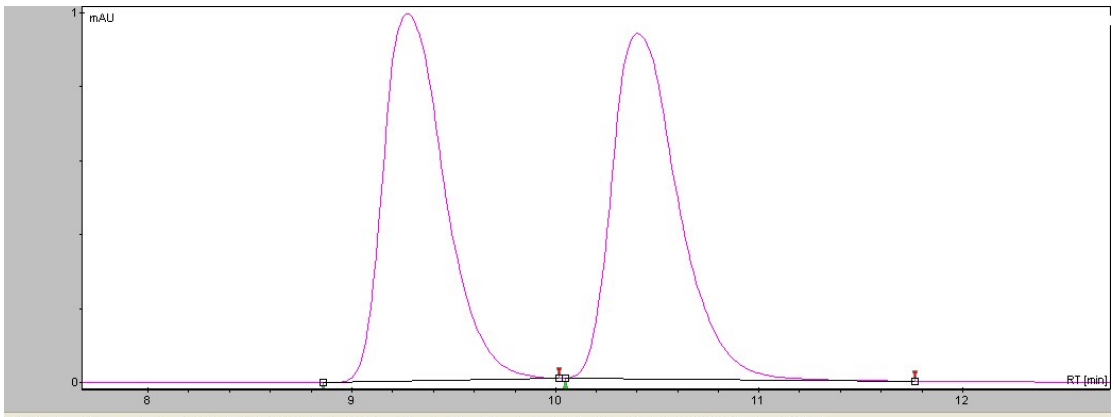
#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	8.855	9.307	9.916	0.000	2.78	0.0	0.0	2.777
2	UNKNOWN	9.948	10.413	11.835	0.000	97.22	0.8	0.3	97.223
Total						100.00	0.8	0.3	100.000

In continuous flow condition

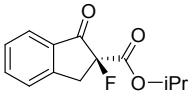


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	8.935	9.307	9.925	0.000	2.41	0.0	0.0	2.407
2	UNKNOWN	9.988	10.400	12.255	0.000	97.59	1.2	0.5	97.593
Total						100.00	1.2	0.5	100.000

rac

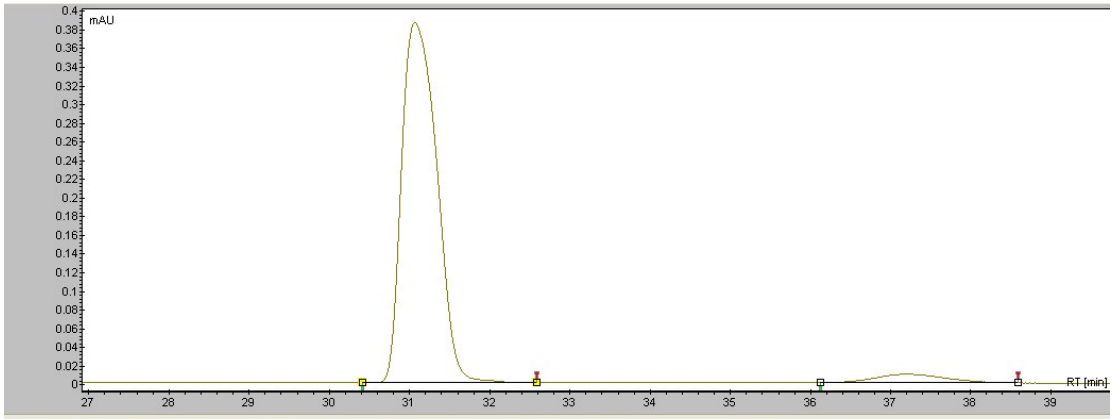


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	8.859	9.280	10.018	0.000	49.54	1.0	0.3	49.544
2	UNKNOWN	10.049	10.400	11.766	0.000	50.46	0.9	0.4	50.456
Total						100.00	1.9	0.7	100.000



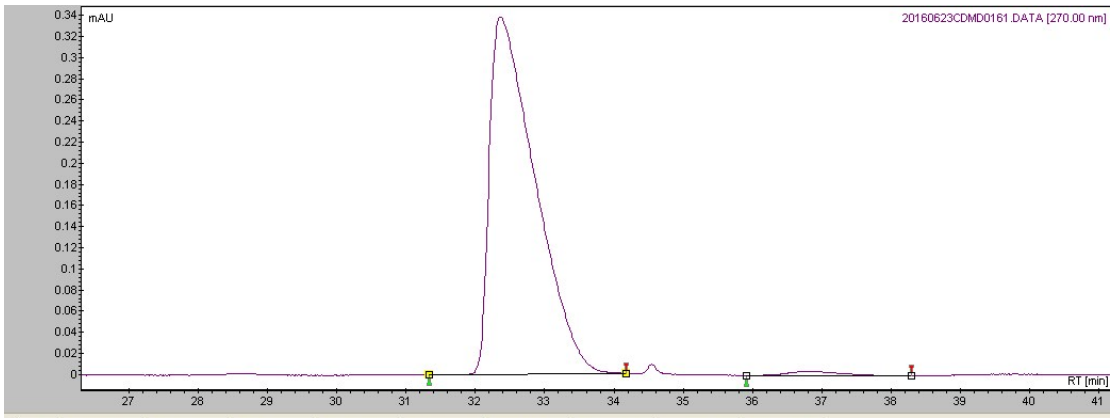
3c

In batch condition



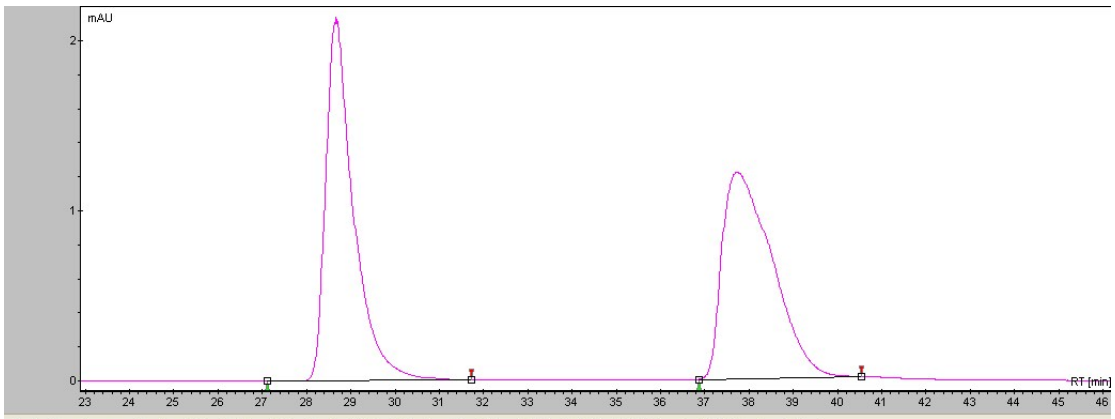
#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	30.420	31.064	32.584	0.000	95.62	0.4	0.2	95.620
2	UNKNOWN	36.126	37.211	38.593	0.000	4.38	0.0	0.0	4.380
Total						100.00	0.4	0.2	100.000

In continuous flow condition

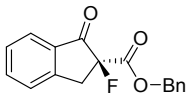


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	31.335	32.358	34.173	0.000	98.60	0.3	0.3	98.602
2	UNKNOWN	35.922	36.824	38.302	0.000	1.40	0.0	0.0	1.398
Total						100.00	0.3	0.3	100.000

rac

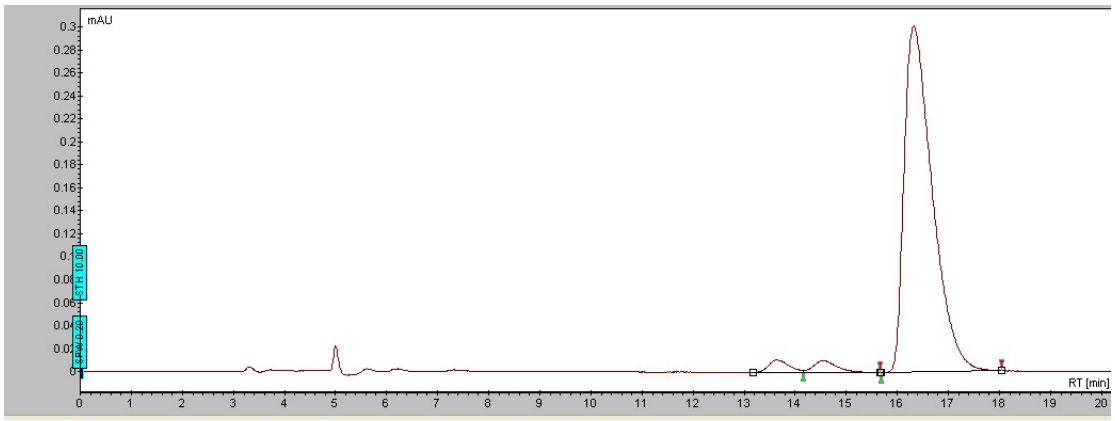


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	27.114	28.665	31.726	0.000	49.29	2.1	1.5	49.294
2	UNKNOWN	36.870	37.731	40.541	0.000	50.71	1.2	1.6	50.706
Total						100.00	3.3	3.1	100.000



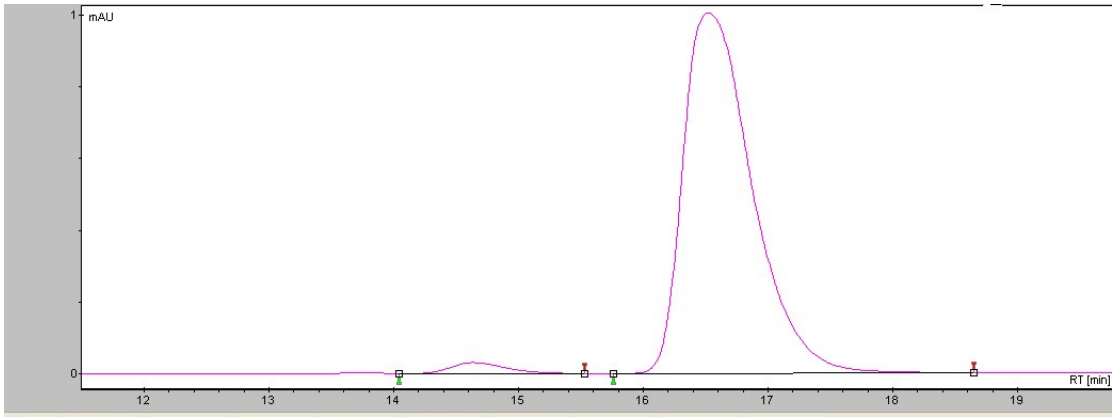
3d

In batch condition



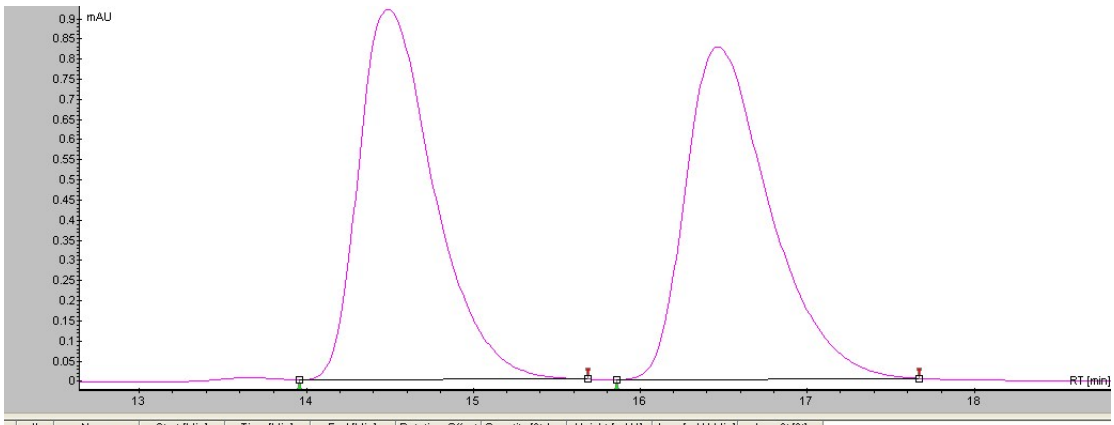
#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	14.159	14.546	15.666	0.000	2.69	0.0	0.0	2.688
2	UNKNOWN	15.692	16.319	18.039	0.000	97.31	0.3	0.2	97.312
Total						100.00	0.3	0.2	100.000

In continuous flow condition

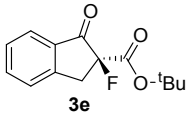


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	14.042	14.639	15.530	0.000	2.29	0.0	0.0	2.290
2	UNKNOWN	15.761	16.532	18.651	0.000	97.71	1.0	0.6	97.710
Total						100.00	1.0	0.7	100.000

rac

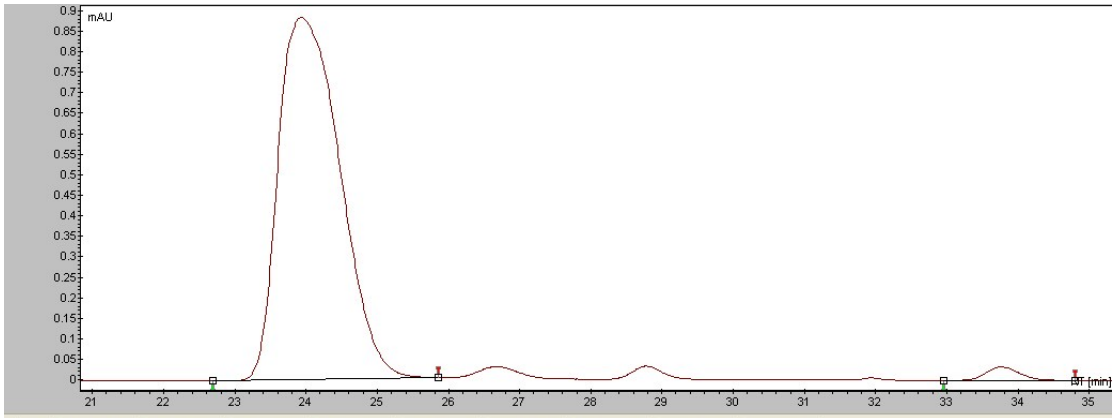


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	13.957	14.492	15.685	0.000	49.81	0.9	0.5	49.809
2	UNKNOWN	15.858	16.465	17.669	0.000	50.19	0.8	0.5	50.191
Total						100.00	1.7	1.0	100.000



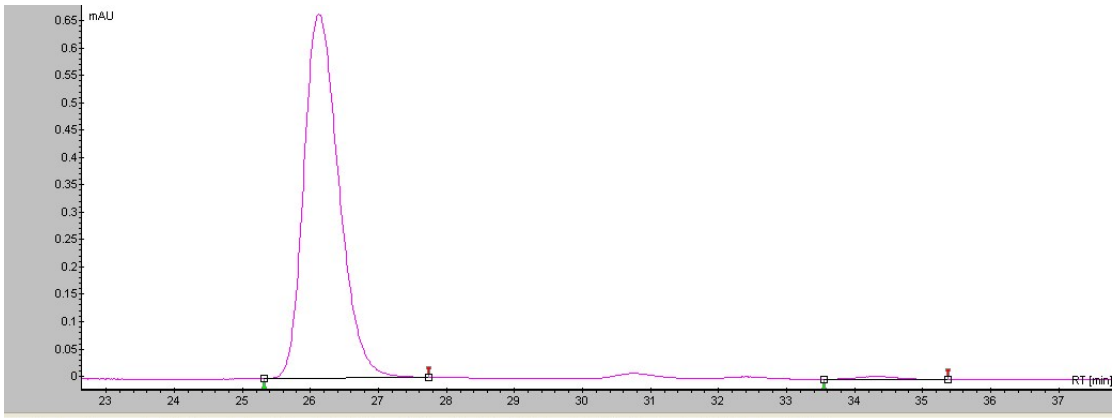
3e

In batch condition



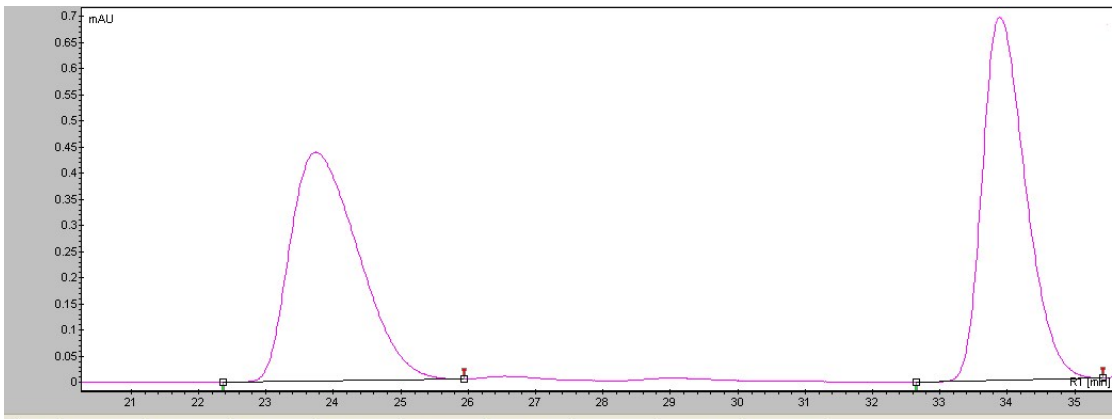
#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	22.691	23.945	25.857	0.000	98.04	0.9	0.9	98.043
2	UNKNOWN	32.955	33.771	34.801	0.000	1.96	0.0	0.0	1.957
Total						100.00	0.9	0.9	100.000

In continuous flow condition

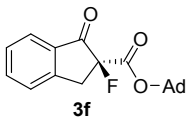


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	25.318	26.118	27.737	0.000	99.16	0.7	0.4	99.163
2	UNKNOWN	33.549	34.318	35.372	0.000	0.84	0.0	0.0	0.837
Total						100.00	0.7	0.4	100.000

rac

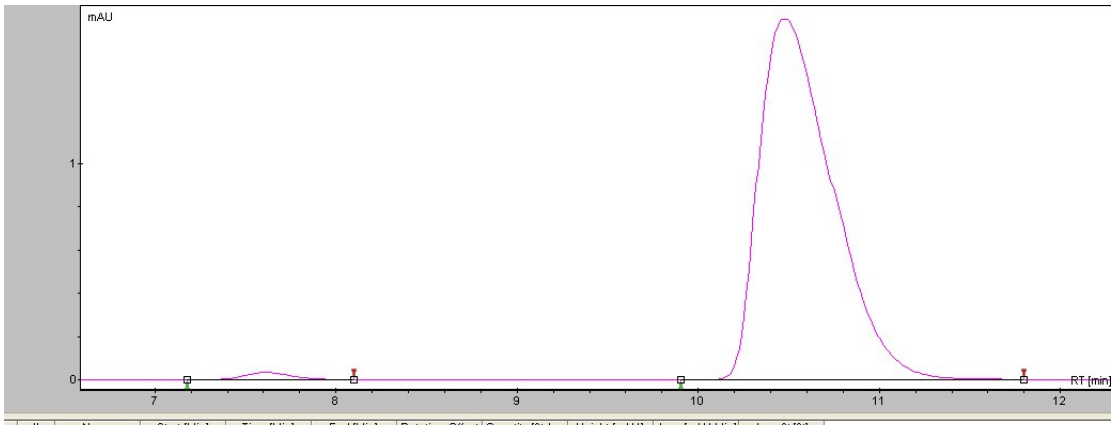


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	22.358	23.745	25.944	0.000	49.86	0.4	0.5	49.861
2	UNKNOWN	32.656	33.891	35.422	0.000	50.14	0.7	0.5	50.139
Total						100.00	1.1	1.0	100.000



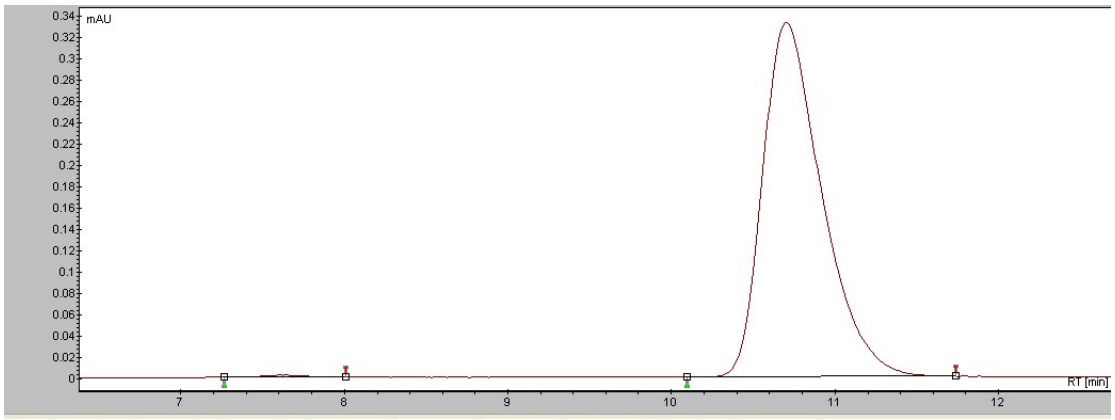
3f

In batch condition



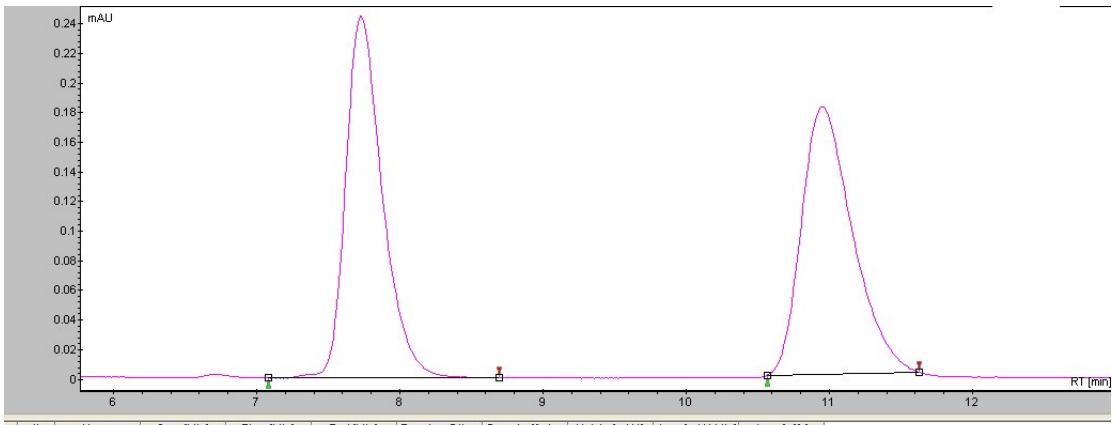
#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	7.178	7.613	8.098	0.000	1.19	0.0	0.0	1.191
2	UNKNOWN	9.904	10.480	11.799	0.000	98.81	1.7	0.8	98.809
Total						100.00	1.7	0.8	100.000

In continuous flow condition

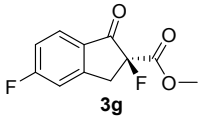


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	7.266	7.640	8.009	0.000	0.35	0.0	0.0	0.349
2	UNKNOWN	10.095	10.707	11.737	0.000	99.65	0.3	0.1	99.651
Total						100.00	0.3	0.1	100.000

rac

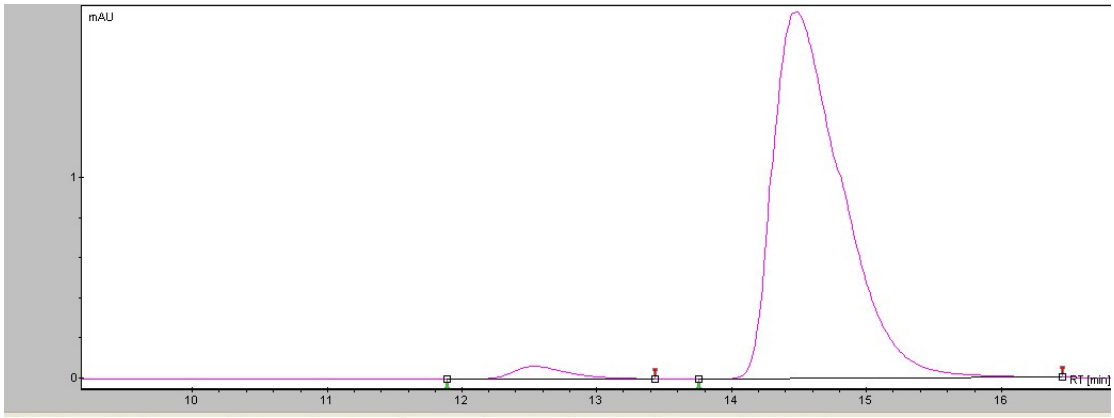


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	7.081	7.733	8.693	0.000	49.23	0.2	0.1	49.232
2	UNKNOWN	10.565	10.947	11.624	0.000	50.77	0.2	0.1	50.768
Total						100.00	0.4	0.1	100.000



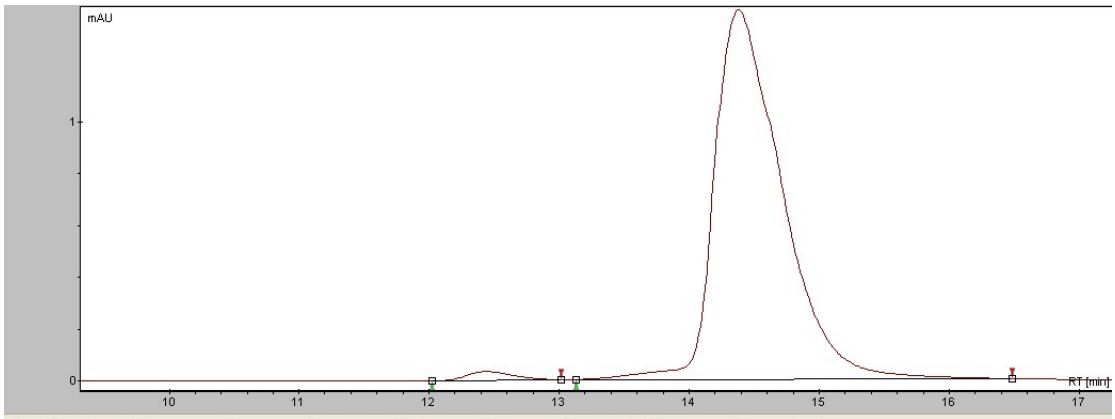
3g

In batch condition



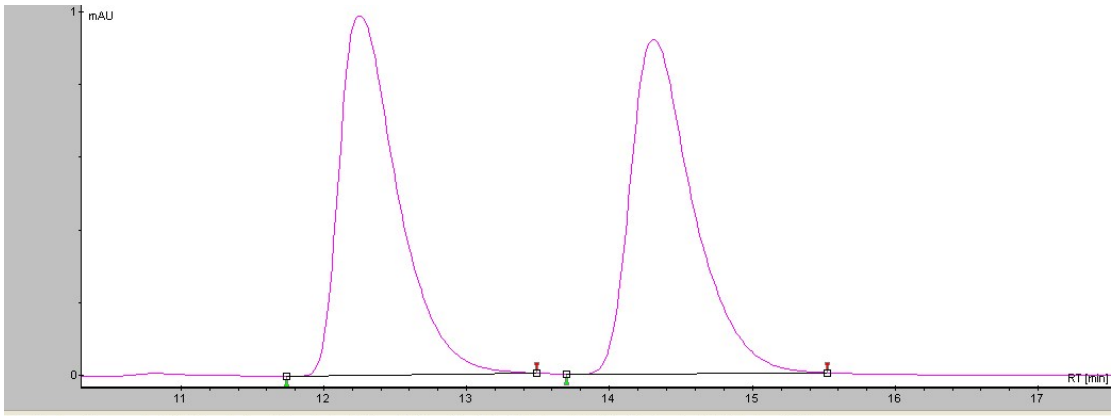
#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	11.889	12.532	13.432	0.000	2.57	0.1	0.0	2.567
2	UNKNOWN	13.756	14.492	16.453	0.000	97.43	1.8	1.1	97.433
Total						100.00	1.9	1.1	100.000

In continuous flow condition

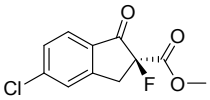


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	12.020	12.439	13.010	0.000	1.56	0.0	0.0	1.557
2	UNKNOWN	13.126	14.372	16.481	0.000	98.44	1.4	0.9	98.443
Total						100.00	1.5	0.9	100.000

rac

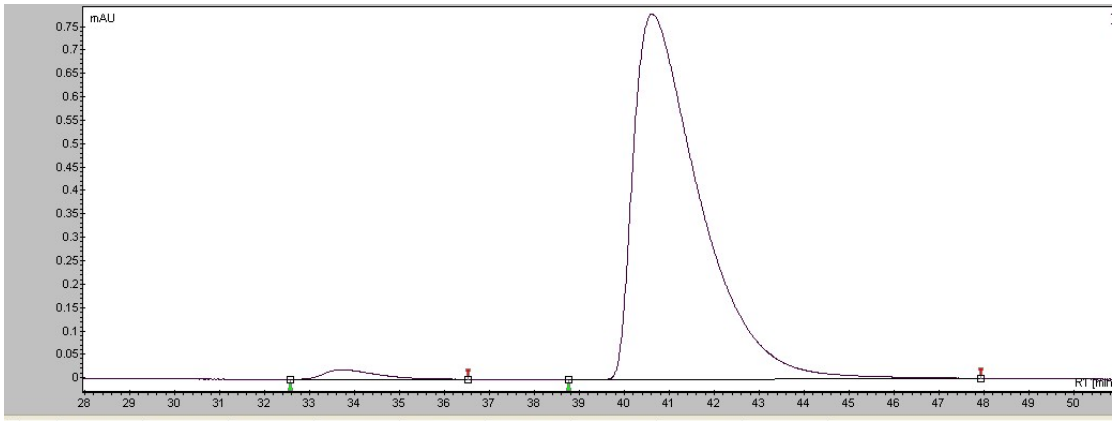


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	11.736	12.239	13.489	0.000	50.02	1.0	0.5	50.023
2	UNKNOWN	13.698	14.306	15.526	0.000	49.98	0.9	0.5	49.977
Total						100.00	1.9	0.9	100.000



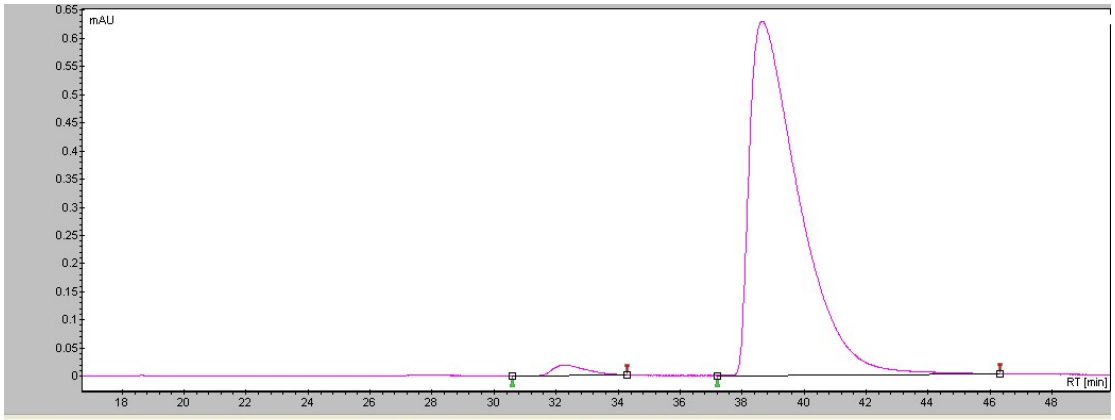
3h

In batch condition



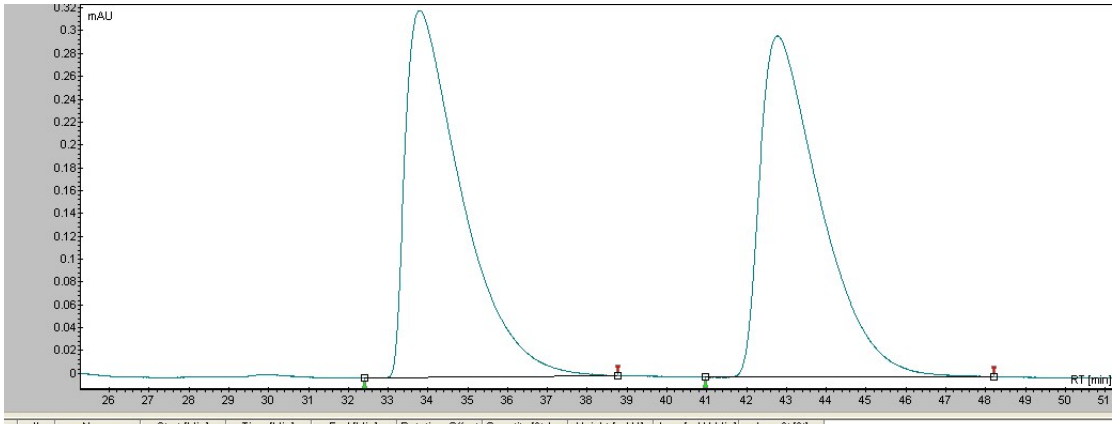
#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	32.577	33.731	36.529	0.000	2.03	0.0	0.0	2.029
2	UNKNOWN	38.766	40.624	47.931	0.000	97.97	0.8	1.3	97.971
Total						100.00	0.8	1.4	100.000

In continuous flow condition

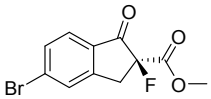


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	30.590	32.278	34.289	0.000	1.93	0.0	0.0	1.932
2	UNKNOWN	37.201	38.651	46.314	0.000	98.07	0.6	1.2	98.068
Total						100.00	0.6	1.2	100.000

rac

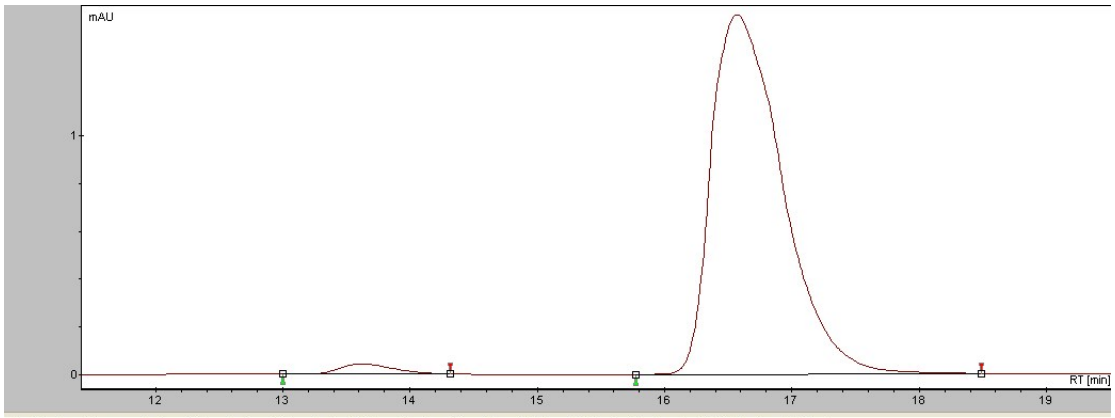


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	32.408	33.798	38.765	0.000	49.98	0.3	0.5	49.980
2	UNKNOWN	40.965	42.770	48.208	0.000	50.02	0.3	0.5	50.020
Total						100.00	0.6	1.0	100.000



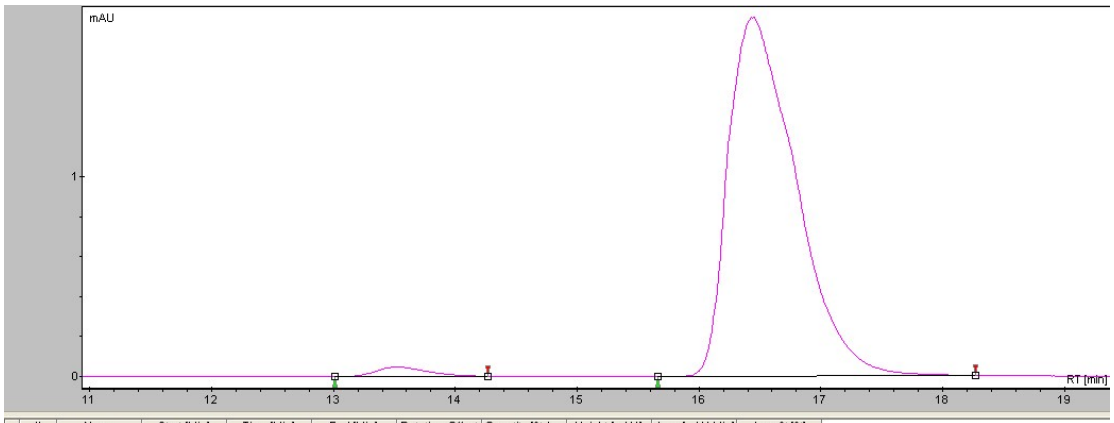
3i

In batch condition



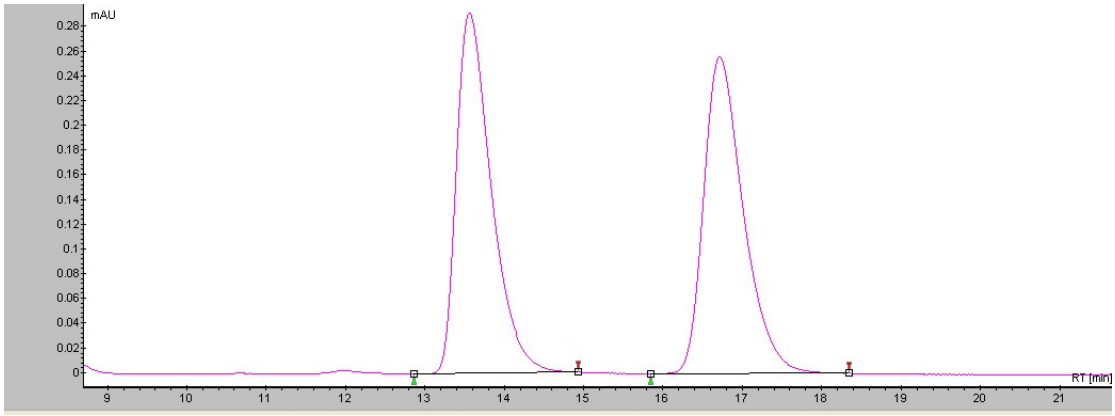
#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	13.001	13.626	14.316	0.000	2.00	0.0	0.0	2.001
2	UNKNOWN	15.774	16.572	18.490	0.000	98.00	1.5	1.0	97.999
Total						100.00	1.5	1.0	100.000

In continuous flow condition

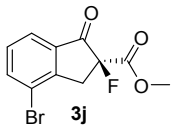


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	13.012	13.519	14.268	0.000	1.95	0.0	0.0	1.946
2	UNKNOWN	15.662	16.425	18.269	0.000	98.05	1.8	1.2	98.054
Total						100.00	1.8	1.2	100.000

rac

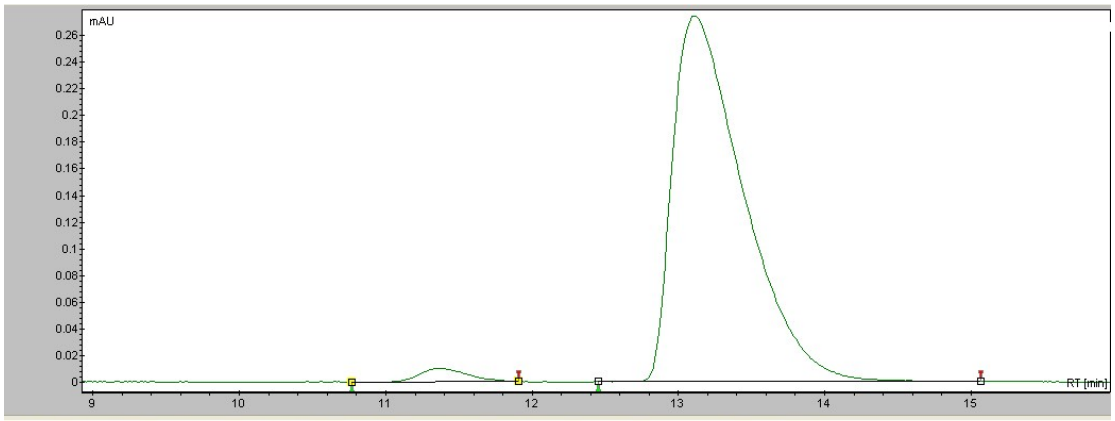


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	12.863	13.559	14.933	0.000	50.06	0.3	0.1	50.060
2	UNKNOWN	15.847	16.719	18.346	0.000	49.94	0.3	0.1	49.940
Total						100.00	0.5	0.3	100.000



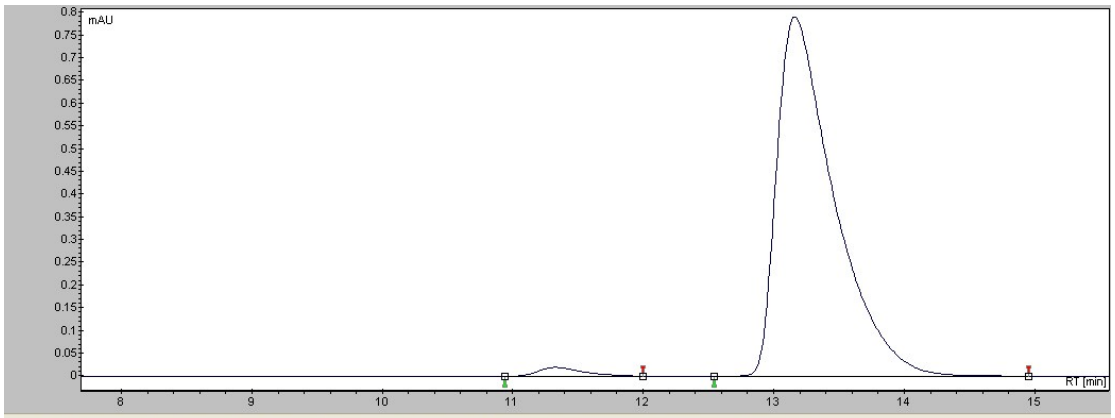
3j

In batch condition



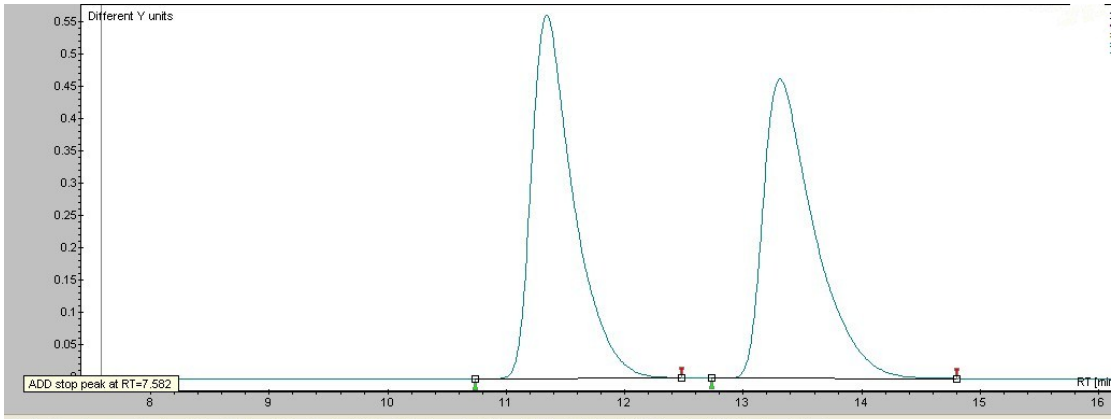
#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	10.768	11.373	11.910	0.000	2.33	0.0	0.0	2.334
2	UNKNOWN	12.455	13.106	15.062	0.000	97.67	0.3	0.2	97.666
Total						100.00	0.3	0.2	100.000

In continuous flow condition

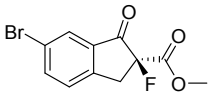


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	10.939	11.333	11.996	0.000	1.92	0.0	0.0	1.918
2	UNKNOWN	12.541	13.160	14.949	0.000	98.08	0.8	0.4	98.082
Total						100.00	0.8	0.4	100.000

rac

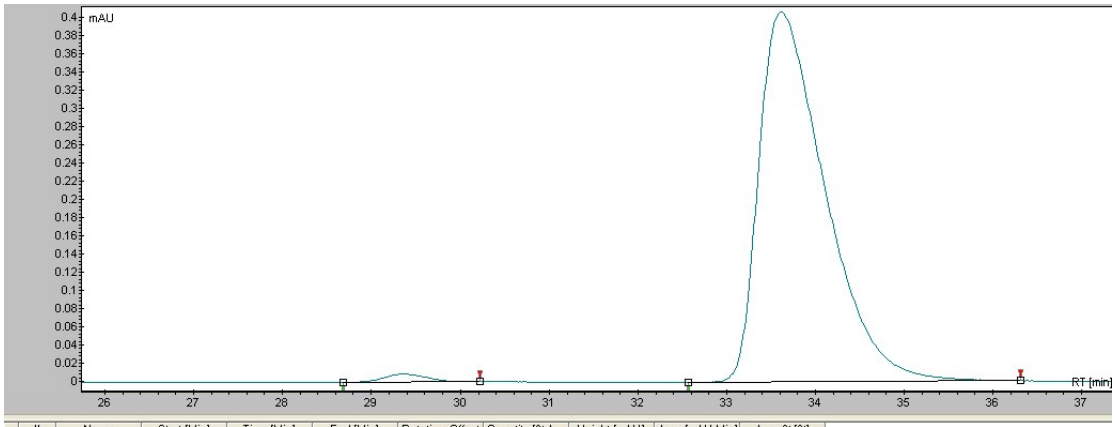


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	10.738	11.333	12.479	0.000	50.07	0.6	0.2	50.073
2	UNKNOWN	12.733	13.306	14.801	0.000	49.93	0.5	0.2	49.927
Total						100.00	1.0	0.5	100.000



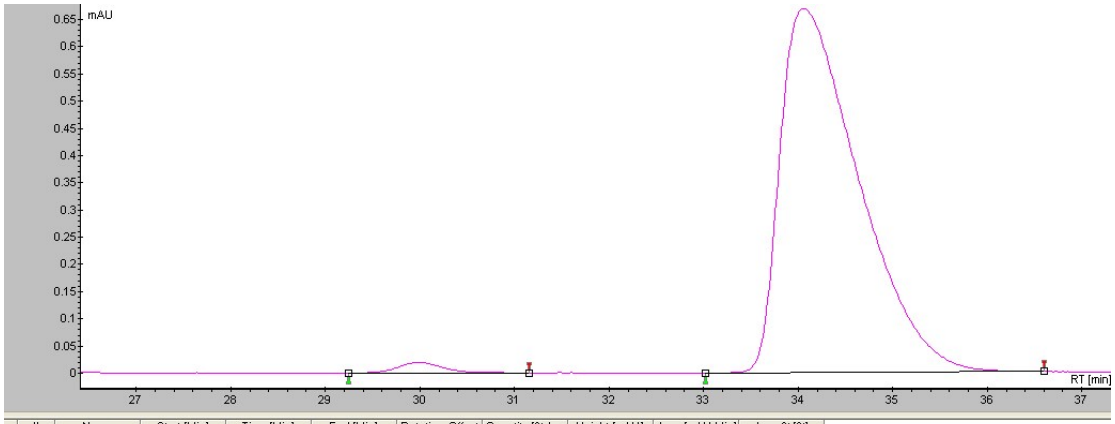
3k

In batch condition



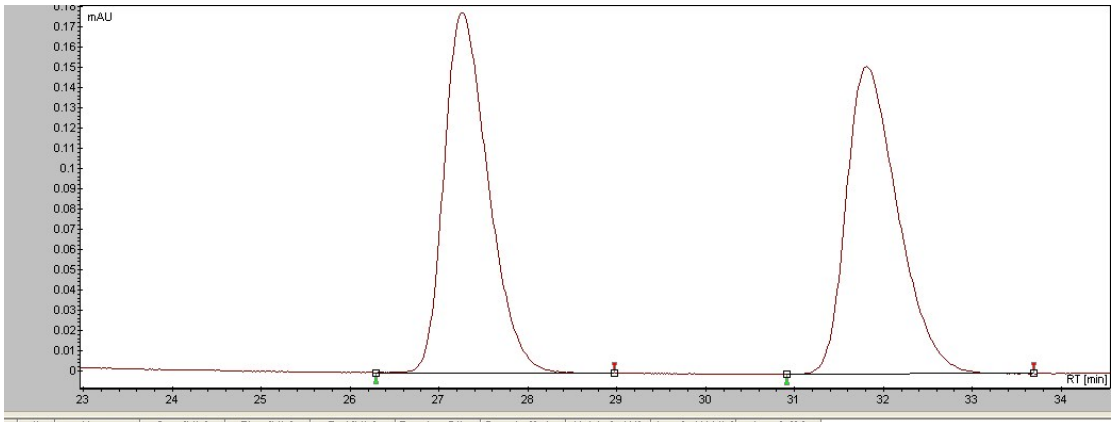
#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	28.682	29.358	30.222	0.000	1.34	0.0	0.0	1.336
2	UNKNOWN	32.567	33.611	36.309	0.000	98.66	0.4	0.3	98.664
Total						100.00	0.4	0.4	100.000

In continuous flow condition

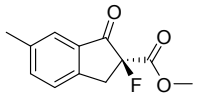


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	29.245	29.984	31.155	0.000	1.56	0.0	0.0	1.561
2	UNKNOWN	33.020	34.051	36.603	0.000	98.44	0.7	0.6	98.439
Total						100.00	0.7	0.7	100.000

rac

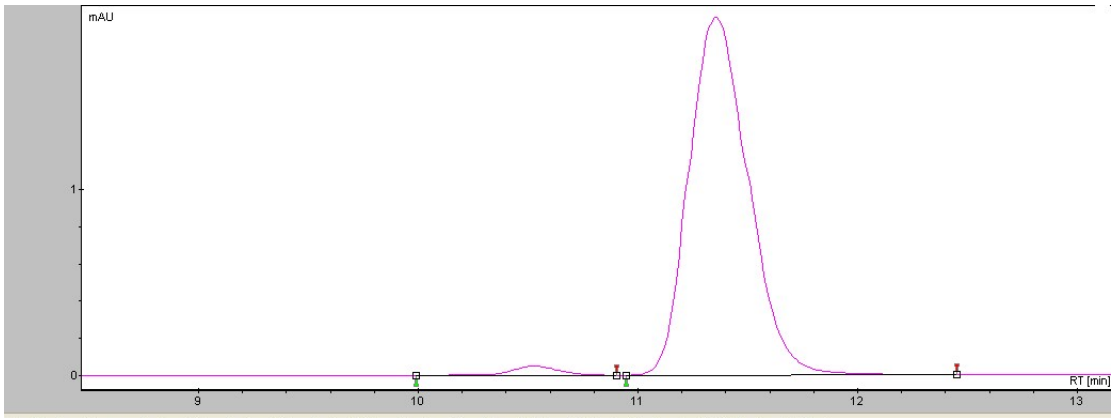


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	26.291	27.251	28.973	0.000	50.06	0.2	0.1	50.055
2	UNKNOWN	30.912	31.811	33.690	0.000	49.94	0.2	0.1	49.945
Total						100.00	0.3	0.2	100.000



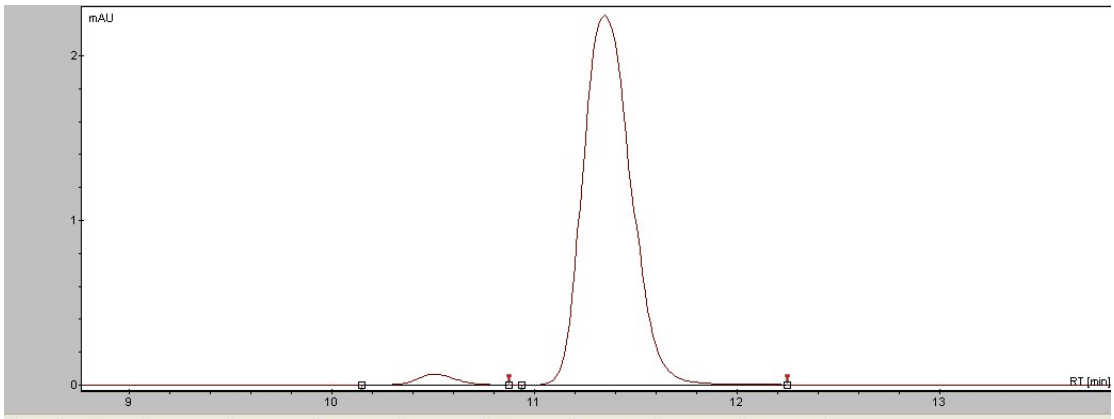
3l

In batch condition



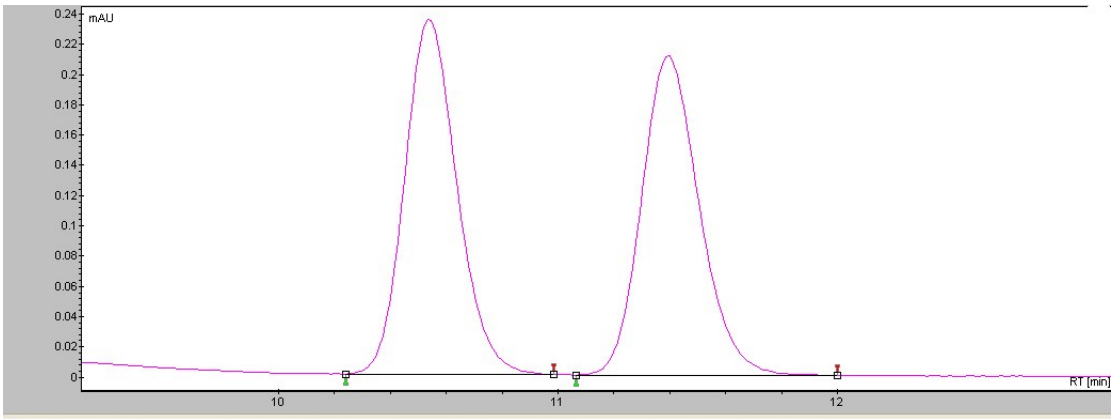
#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	9.990	10.520	10.902	0.000	1.95	0.0	0.0	1.950
2	UNKNOWN	10.946	11.347	12.450	0.000	98.05	1.9	0.6	98.050
Total						100.00	2.0	0.6	100.000

In continuous flow condition

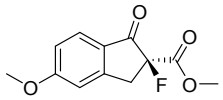


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	10.148	10.506	10.875	0.000	2.26	0.1	0.0	2.262
2	UNKNOWN	10.938	11.346	12.249	0.000	97.74	2.2	0.6	97.738
Total						100.00	2.3	0.6	100.000

rac

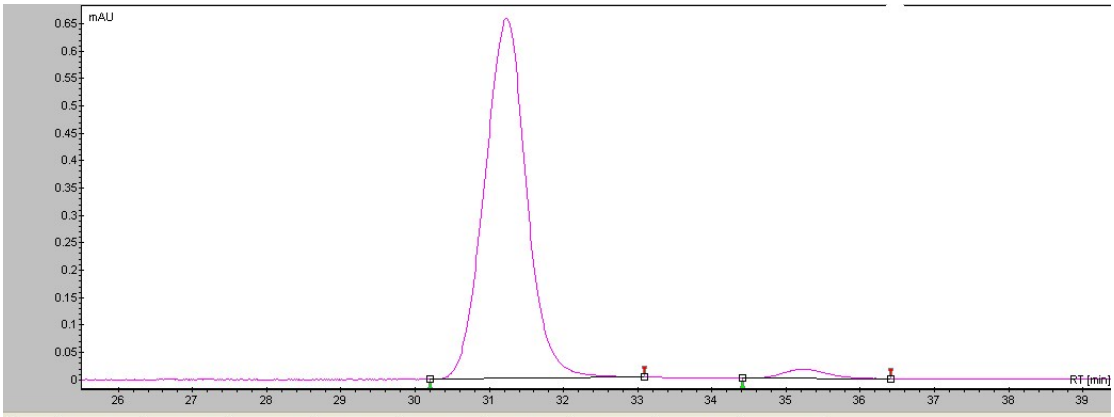


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	10.241	10.533	10.985	0.000	50.19	0.2	0.1	50.193
2	UNKNOWN	11.065	11.400	11.999	0.000	49.81	0.2	0.1	49.807
Total						100.00	0.4	0.1	100.000



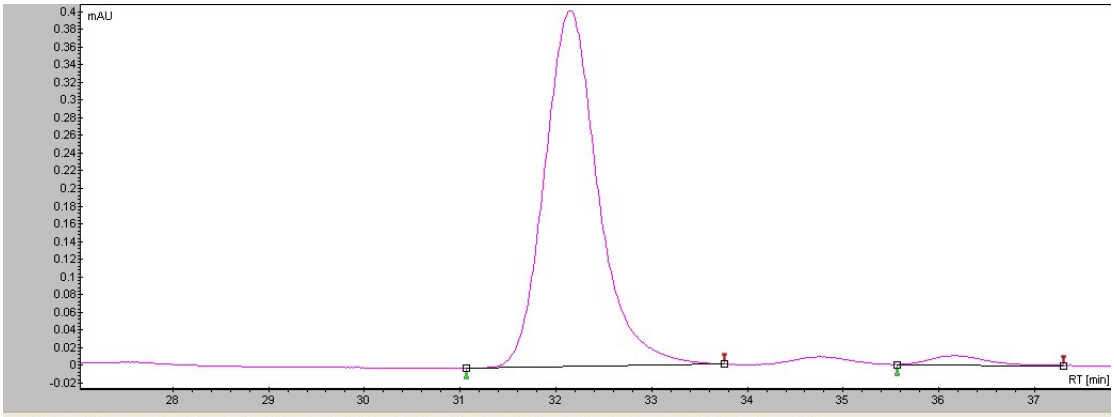
3m

In batch condition



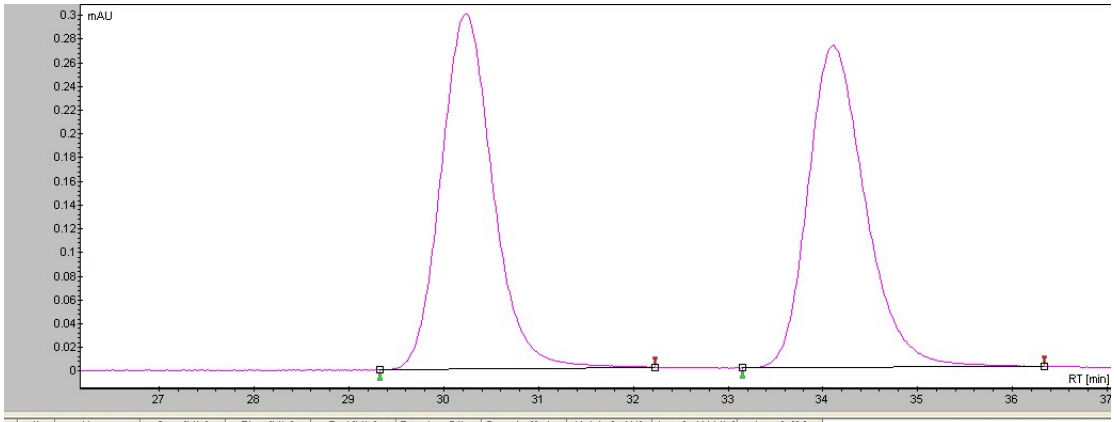
#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	30.202	31.238	33.091	0.000	97.40	0.7	0.4	97.400
2	UNKNOWN	34.413	35.224	36.411	0.000	2.60	0.0	0.0	2.600
Total						100.00	0.7	0.4	100.000

In continuous flow condition

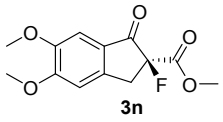


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	31.064	32.144	33.759	0.000	97.45	0.4	0.3	97.450
2	UNKNOWN	35.563	36.157	37.301	0.000	2.55	0.0	0.0	2.550
Total						100.00	0.4	0.3	100.000

rac

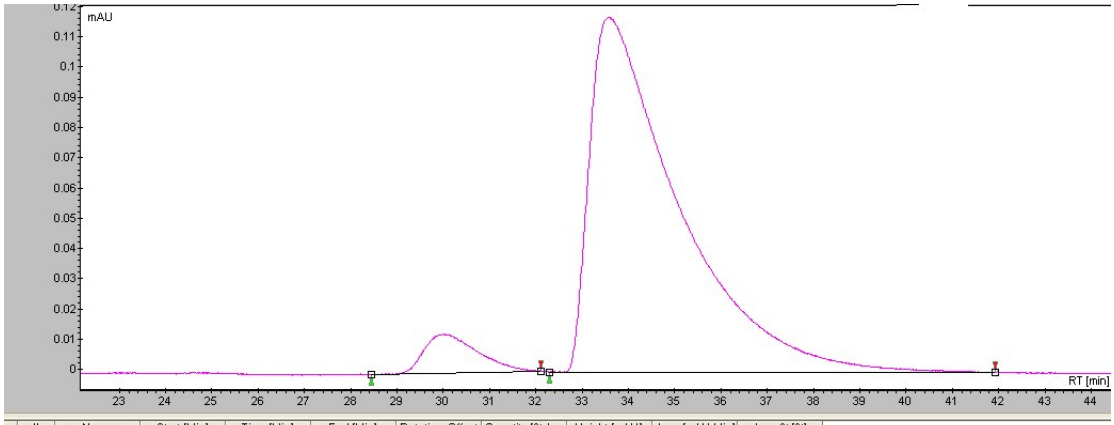


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	29.325	30.224	32.228	0.000	49.98	0.3	0.2	49.978
2	UNKNOWN	33.151	34.104	36.336	0.000	50.02	0.3	0.2	50.022
Total						100.00	0.6	0.4	100.000



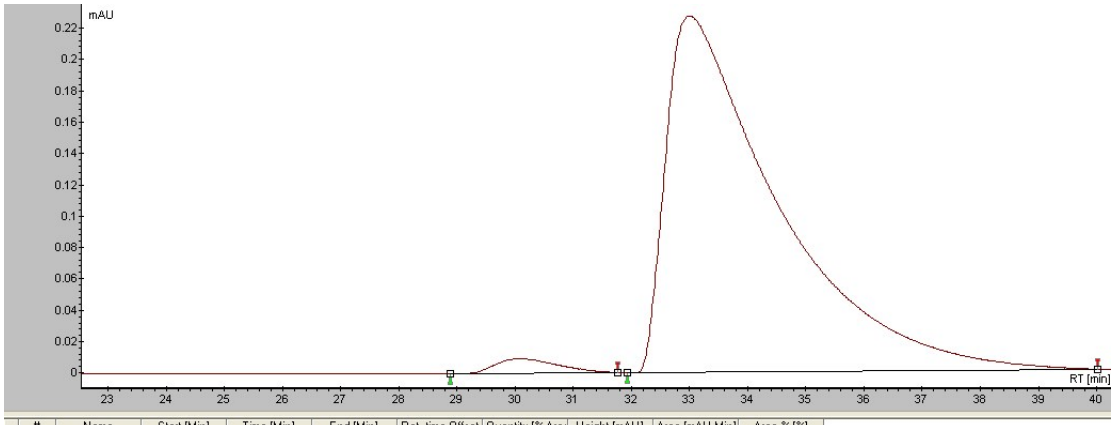
3n

In batch condition



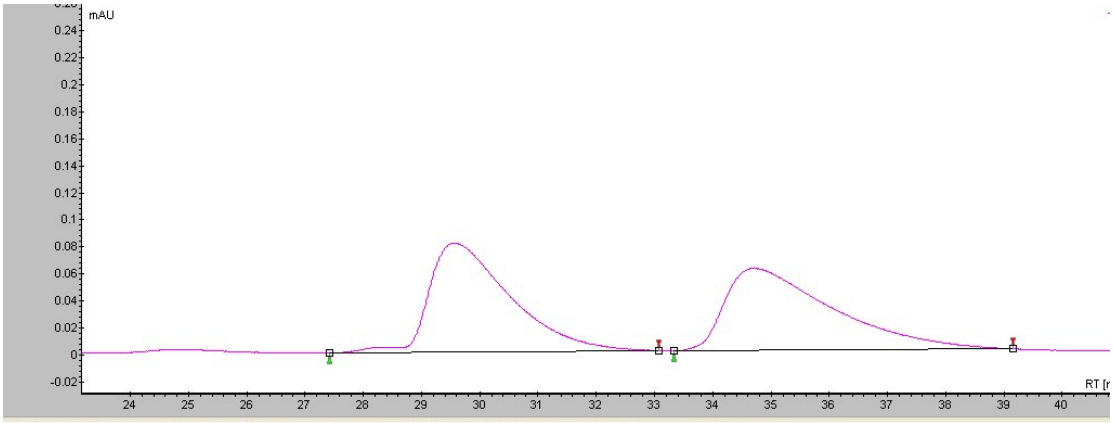
#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	28.447	30.011	32.111	0.000	6.12	0.0	0.0	6.122
2	UNKNOWN	32.295	33.571	41.926	0.000	93.88	0.1	0.3	93.878
Total						100.00	0.1	0.3	100.000

In continuous flow condition

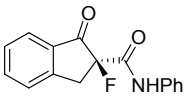


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	28.886	30.051	31.765	0.000	2.22	0.0	0.0	2.222
2	UNKNOWN	31.930	32.998	40.017	0.000	97.78	0.2	0.5	97.778
Total						100.00	0.2	0.5	100.000

rac

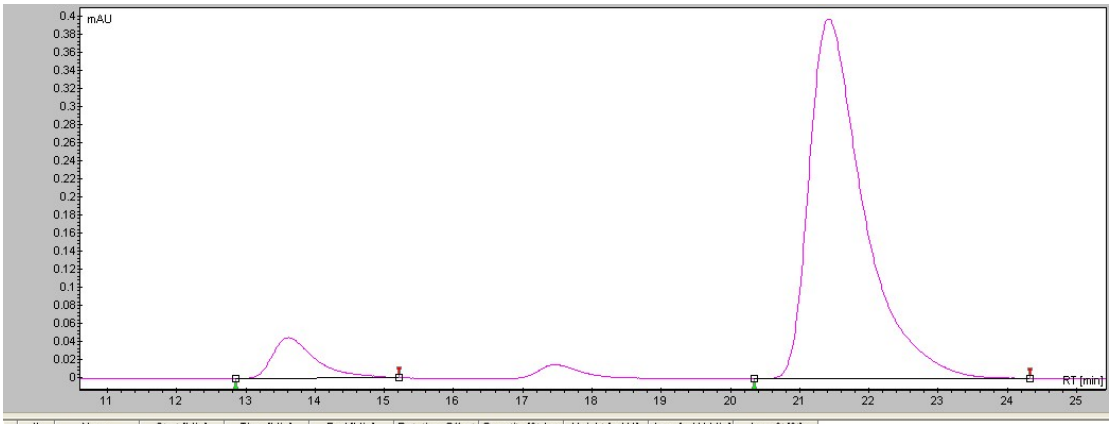


#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	27.421	29.558	33.074	0.000	50.08	0.1	0.1	50.084
2	UNKNOWN	33.334	34.704	39.154	0.000	49.92	0.1	0.1	49.916
Total						100.00	0.1	0.3	100.000



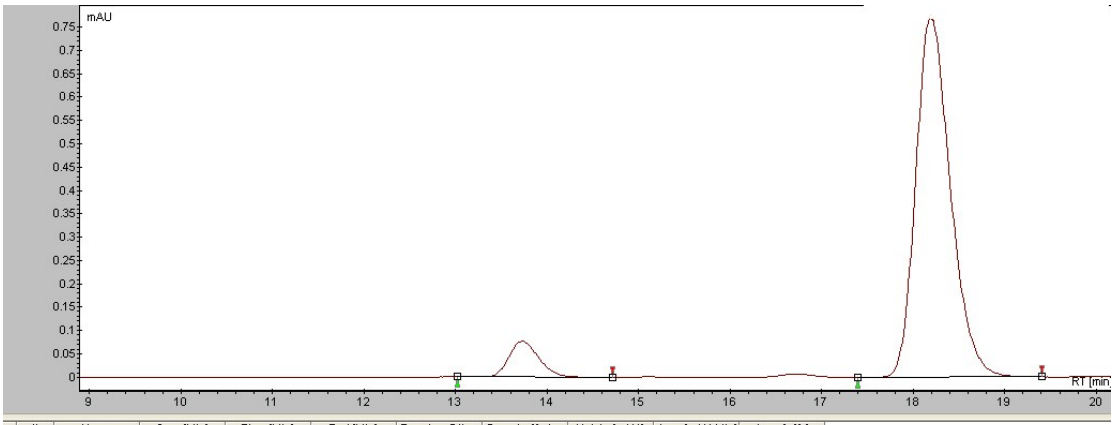
3o

In batch condition



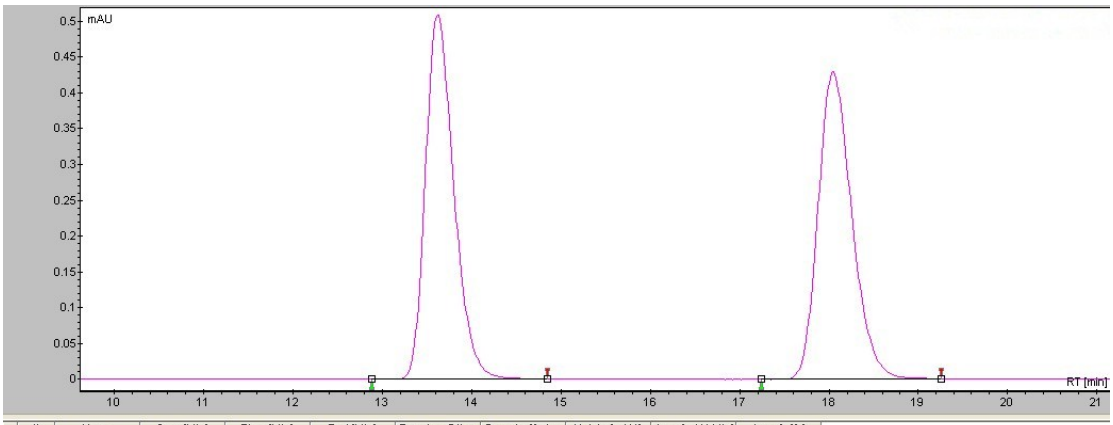
#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	12.853	13.612	15.212	0.000	8.13	0.0	0.0	8.134
2	UNKNOWN	20.343	21.412	24.325	0.000	91.87	0.4	0.4	91.866
Total						100.00	0.4	0.4	100.000

In continuous flow condition



#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	13.025	13.732	14.715	0.000	7.80	0.1	0.0	7.795
2	UNKNOWN	17.395	18.185	19.402	0.000	92.20	0.8	0.3	92.205
Total						100.00	0.9	0.4	100.000

rac



#	Name	Start [Min]	Time [Min]	End [Min]	Ret. time Offset	Quantity [% Area	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	12.880	13.612	14.847	0.000	49.98	0.5	0.2	49.980
2	UNKNOWN	17.243	18.039	19.258	0.000	50.02	0.4	0.2	50.020
Total						100.00	0.9	0.4	100.000

8. References

1. (a) J. Xu, Y. Hu, D. Huang, K.-H. Wang, C. Xu and T. Niu, *Adv. Synth. Catal.*, 2012, **354**, 515-526; (b)Y. Hamashima, K. Yagi, H. Takano, L. Tamás and M. Sodeoka, *J. Am. Chem. Soc.*, 2012, 124, 14530-14531; (c)S. Suzuki, T. Kamo, K. Fukushi, T. Hiramatsu, E. Tokunaga, T. Dohi, Y. Kita and N. Shibata, *Chem. Sci.*, 2014, **5**, 2754-2760; (d)J. Peng and D.-M. Du, *RSC Adv.*, 2014, **4**, 2061-2067.
2. C. De Fusco, S. Meninno, C. Tedesco and A. Lattanzi, *Org. Biomol. Chem.*, 2013, **11**, 896-899.
3. (a) J. Peng, D.-M. Du, *RSC Adv.*, 2014, **4**, 2061-2067; (b) Y.-F. Wang, H.-J. Wang, Y.-D. Jiang, C. Zhang, J.-J. Shao, D.-Q. Xu, *Green Chem.*, 2017, **19**, 1674–1677.
4. (a) Y. Hamashima, K. Yagi, H. Takano, L. Tamas and M. Sodeoka, *J. Am. Chem. Soc.*, 2002, **124**, 14530-14531; (b) X. Wang, Q. Lan, S. Shirakawa and K. Maruoka, *Chem. Commun.*, 2010, **46**, 321-323.