Supporting Information

N-Heterocyclic carbene-catalyzed [4+2] cyclization of a,β-unsaturated carboxylic acids bearing γ-H with isatins: An enantioselective synthesis of spirocyclic oxindole–dihydropyranones

Ling Zhu, Chenxia Yu, Tuanjie Li, Yuhong Wang, Yinan Lu, Wenjing Wang and Changsheng Yao*

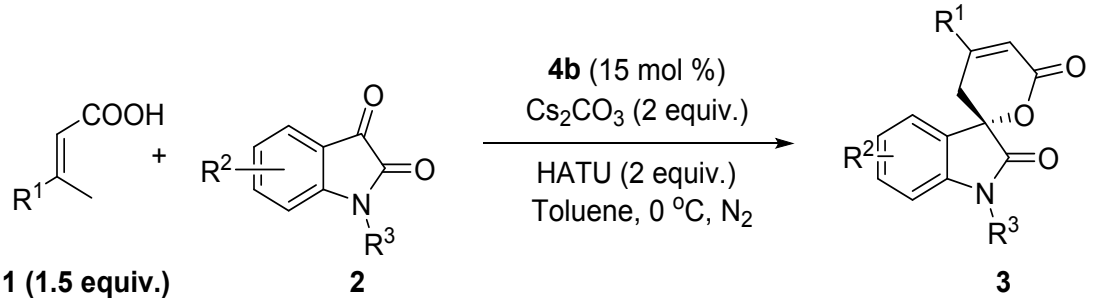
1. General methods

Common reagents and materials were purchased from commercial sources and purified by recrystallization or distillation. Melting points were determined in open capillaries and were uncorrected. IR spectra were taken on a FT-IR-Tensor 27 spectrometer in KBr pellets and reported in cm^{-1}. ^1H NMR spectra were measured on a Bruker DPX 400 MHz spectrometer in $CDCl_3$ (100 MHz, ^{13}C NMR) with chemical shift (δ) given in ppm relative to TMS as internal standard. High-resolution mass spectra (HRMS) were obtained on a microTOF-QⅡ HRMS/MS instrument (Bruker) with the technique of electrospray ionization.

2. Abstract

An NHC-catalyzed asymmetric [4+2] annulation of isatins and a,β-unsaturated carboxylic acids bearing γ-H gave spirocyclic oxindole–dihydropyranones successfully via in situ activation strategy. This protocol featured easy availability of raw materials, good yields and excellent enantioselevities (up to 99% ee).

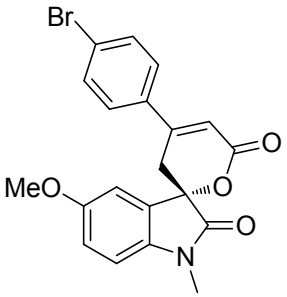
3. Experimental section



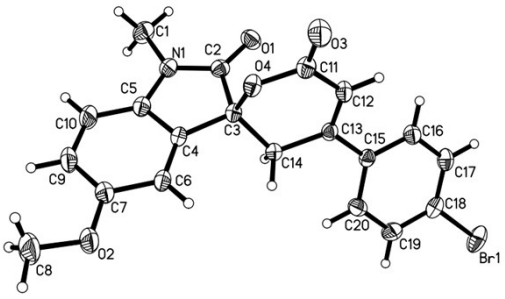
1 (1.5 equiv.) **2** **3**

An oven-dried 10-mL Schlenk tube equipped with a magnetic stir bar was charged with triazolium salt **4b** (12.6 mg, 0.03 mmol), Cs_2CO_3 (130 mg, 0.4 mmol), α,β-unsaturated carboxylic acid **1** (0.3 mmol), isatin **2** (0.2 mmol) and HATU (228 mg, 0.6 mmol). This tube was closed with a septum, evacuated, and refilled with nitrogen. To this mixture was added freshly distilled toluene (2 mL) with a syringe. Then the mixture was stirred at 0 °C until completion (monitored by TLC). After removal of the solvent under reduced pressure, the resulting crude residue was purified by column chromatography (silicagel, mixtures of petroleum ether/ethyl acetate, 3:1, v/v) to afford the desired product **3**.

4. X-ray structure of 3a

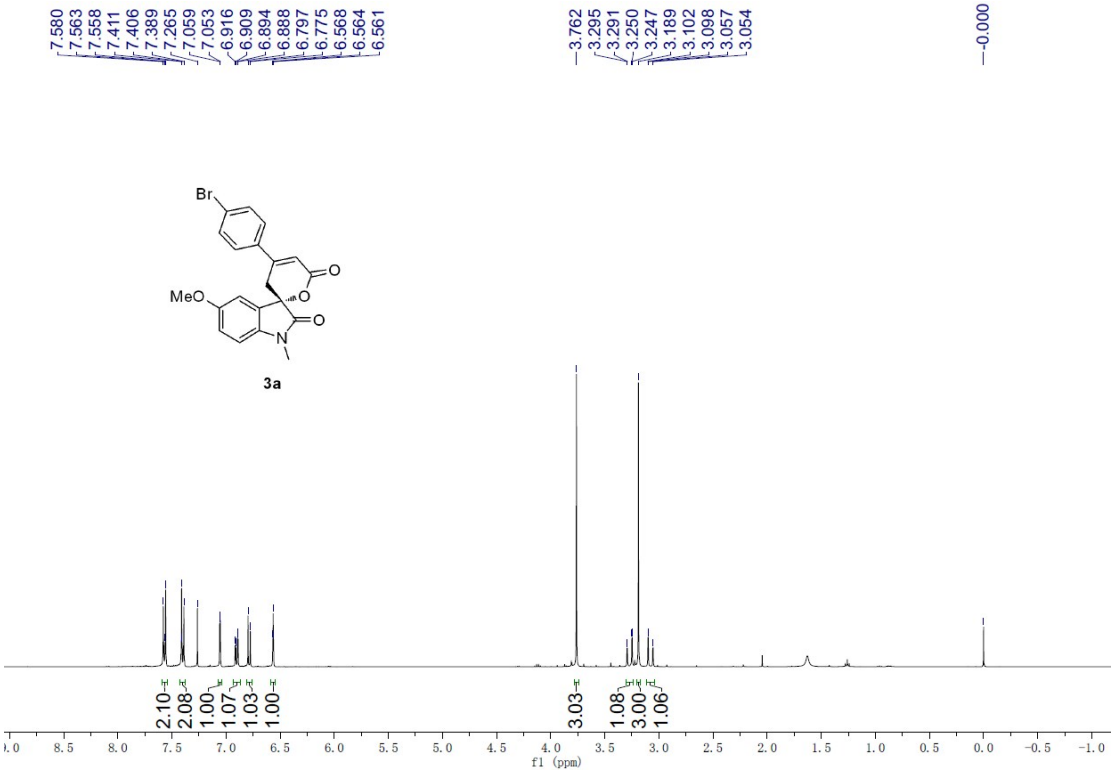


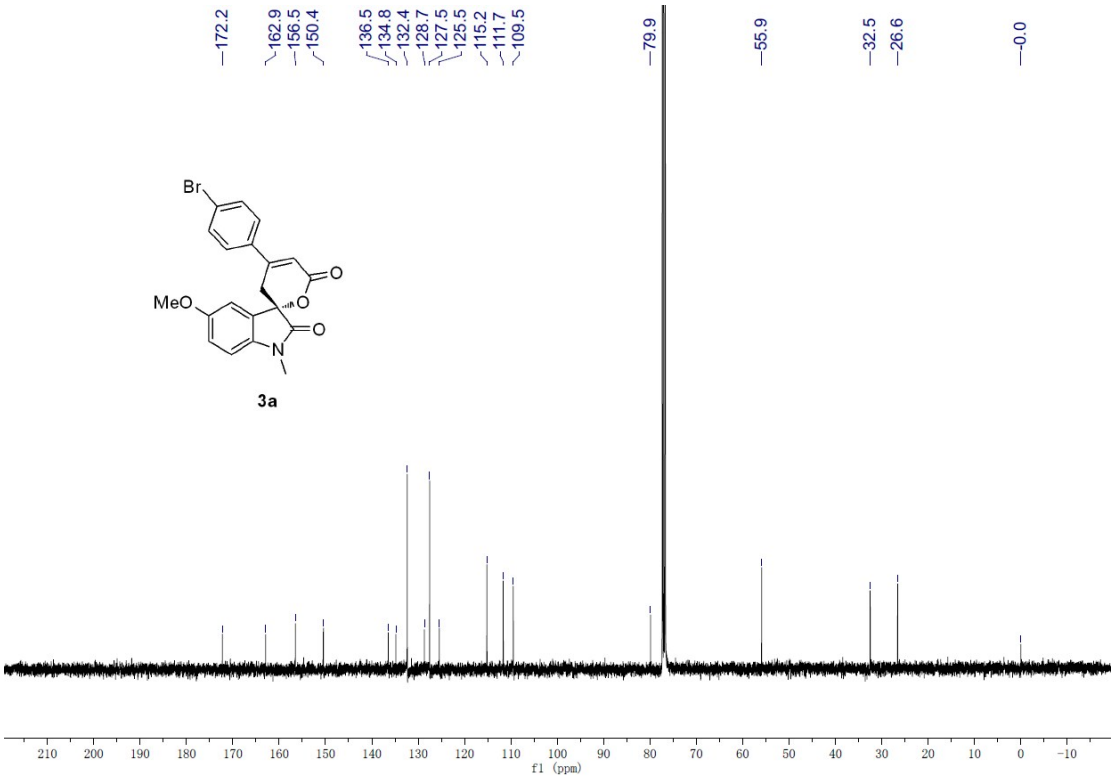
3a

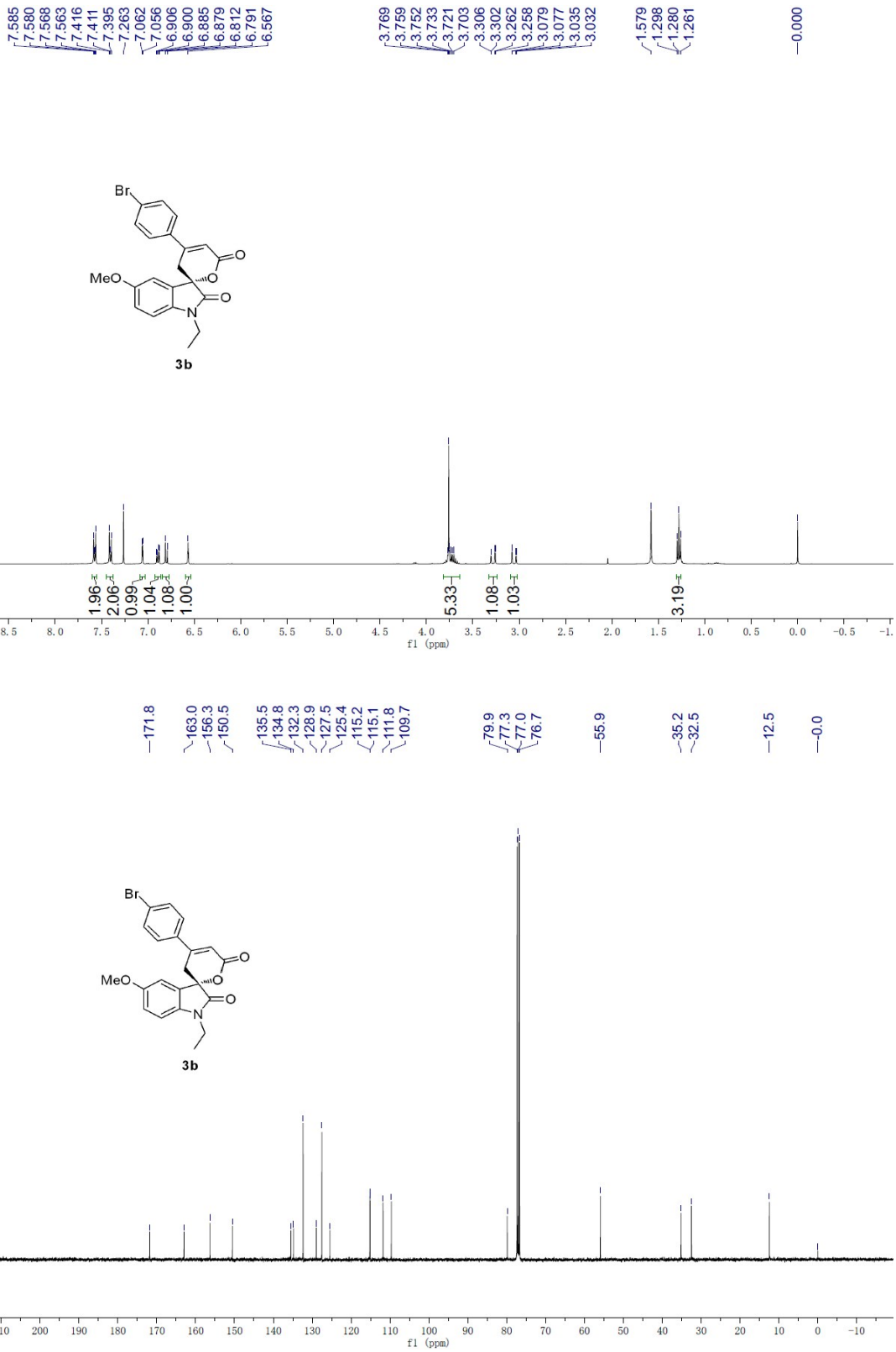


The crystal of compound **3a** was prepared from the solution in petroleum ether/ethyl acetate (M.P.: 207-208 ^{o}C). Crystallographic data (excluding structure factors) for the structures in this paper have been deposited with the Cambridge Crystallographic Data Centre as supplementary publication no. CCDC 1046964. Copies of the data can be obtained, free of charge, on application to CCDC, 12 Union Road, CambridgeCB21EZ, UK (fax: +44 1223 336033 or email: deposit@ccdc.cam.ac.uk).

5. NMR Spectures



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O
O
N
3b
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1.04
1.08
1.00
5.33
1.08
1.03
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156.3
150.5
135.5
134.8
132.3
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127.5
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115.2
115.1
111.8
109.7
79.9
77.3
77.0
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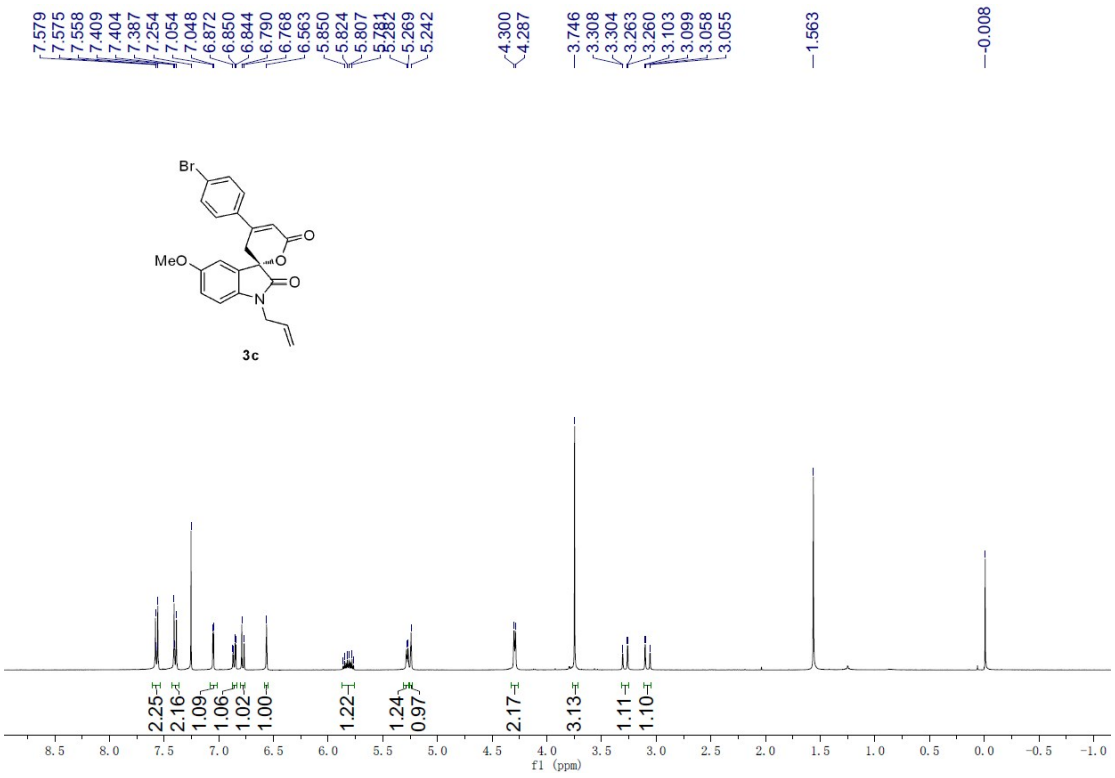
O
O
N
3b
f1 (ppm)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O
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N
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2.16
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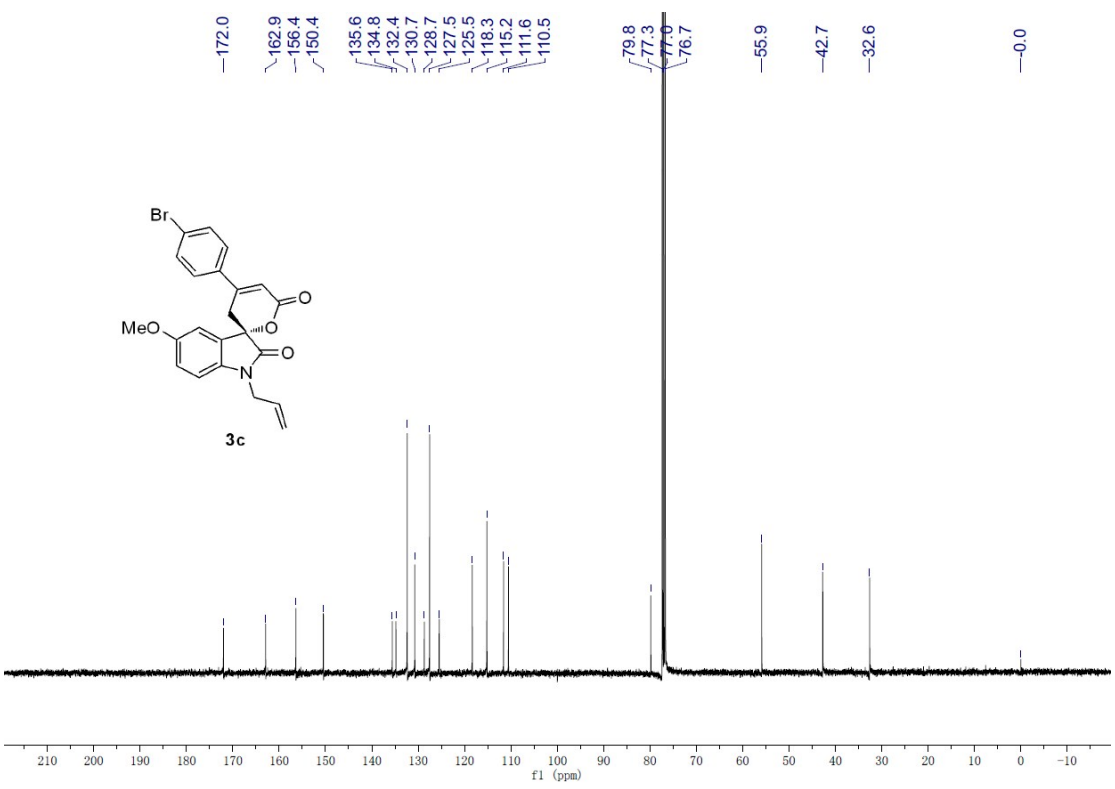
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110.5
79.8
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Br
MeO
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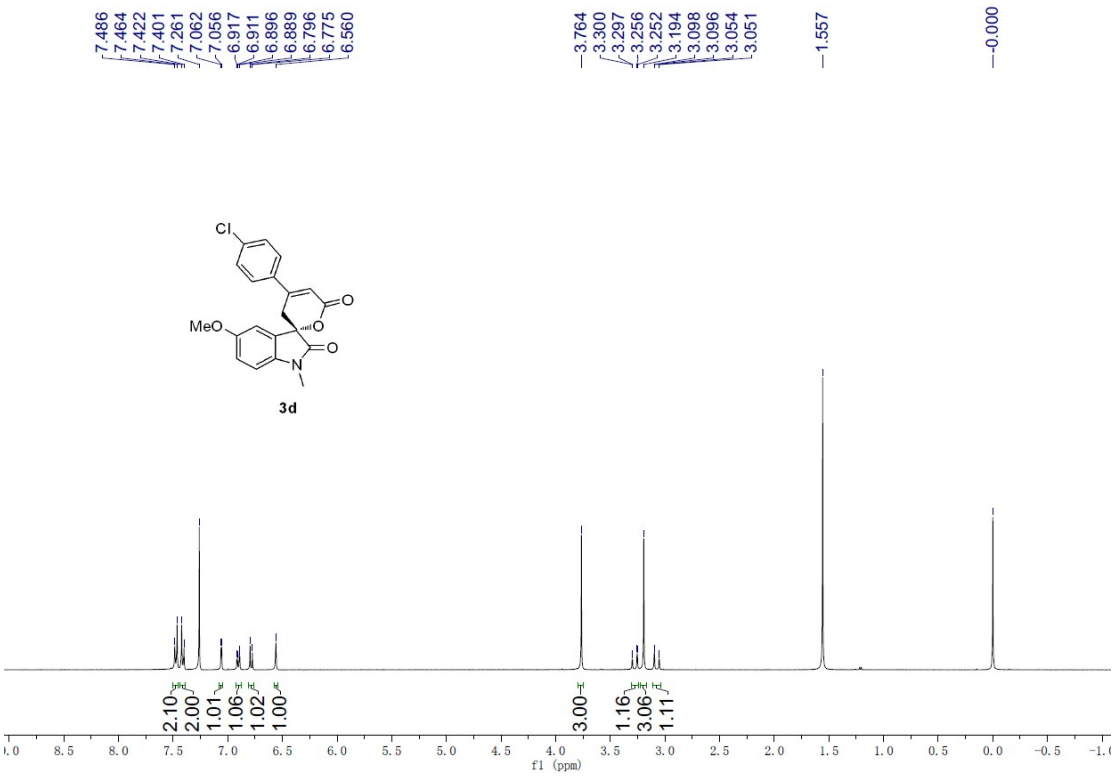
O
O
N
3c
f1 (ppm)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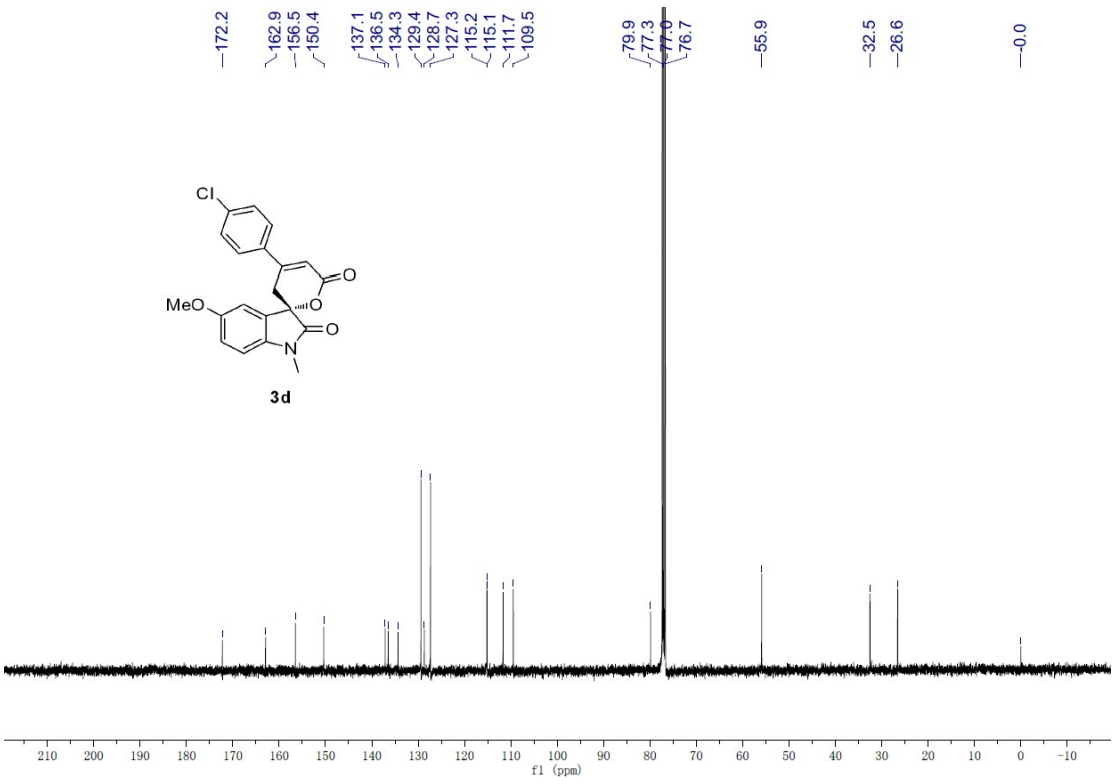
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109.5
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Cl
O
O
MeO
O
N
3d
f1 (ppm)


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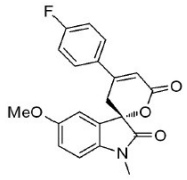
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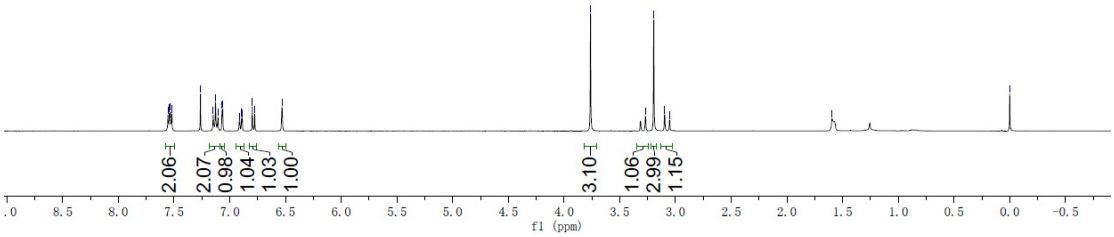
3e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F
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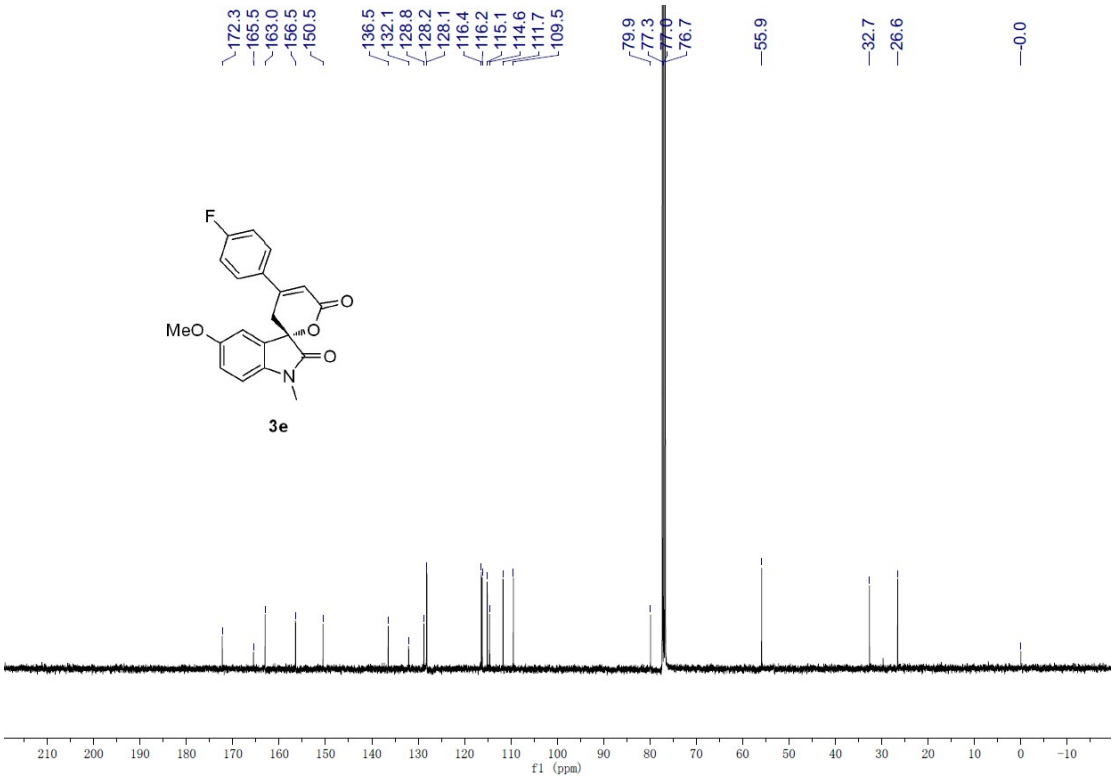
O
MeO
O
N

3e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109.5
79.9
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f1 (ppm)


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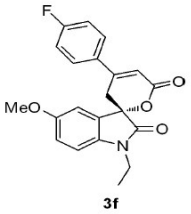
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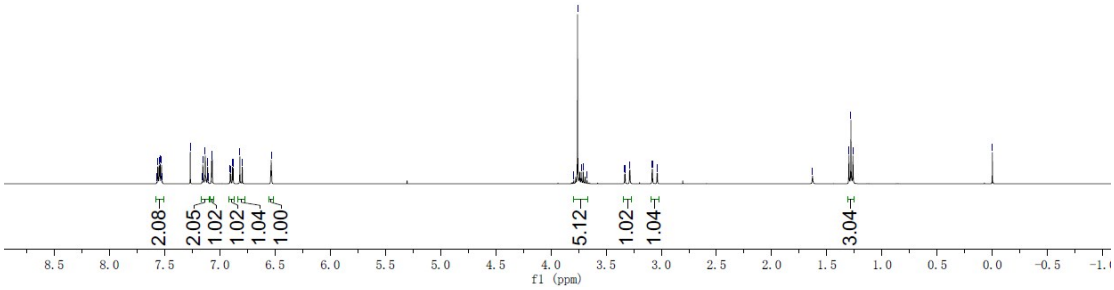
3f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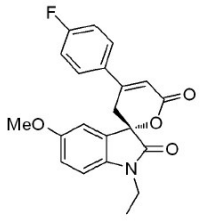
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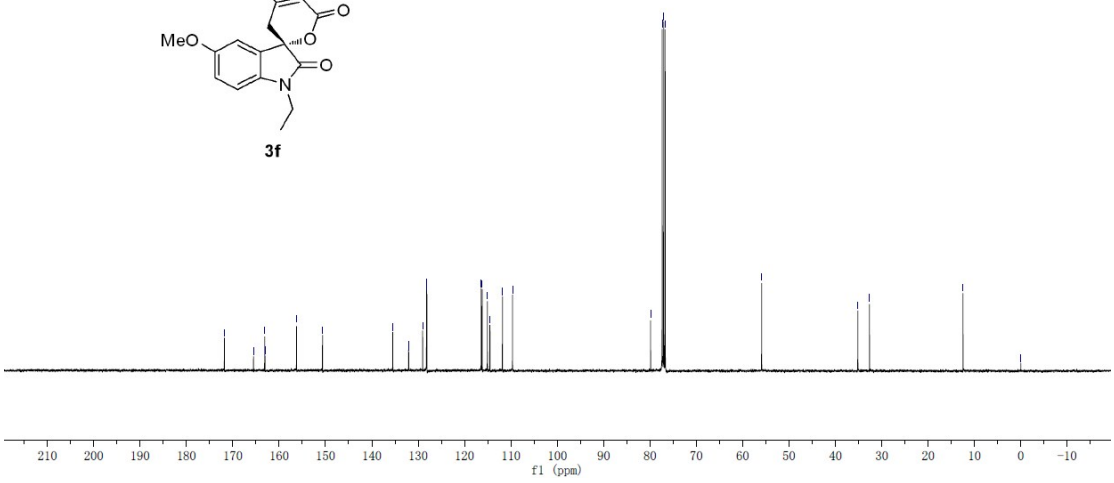
3f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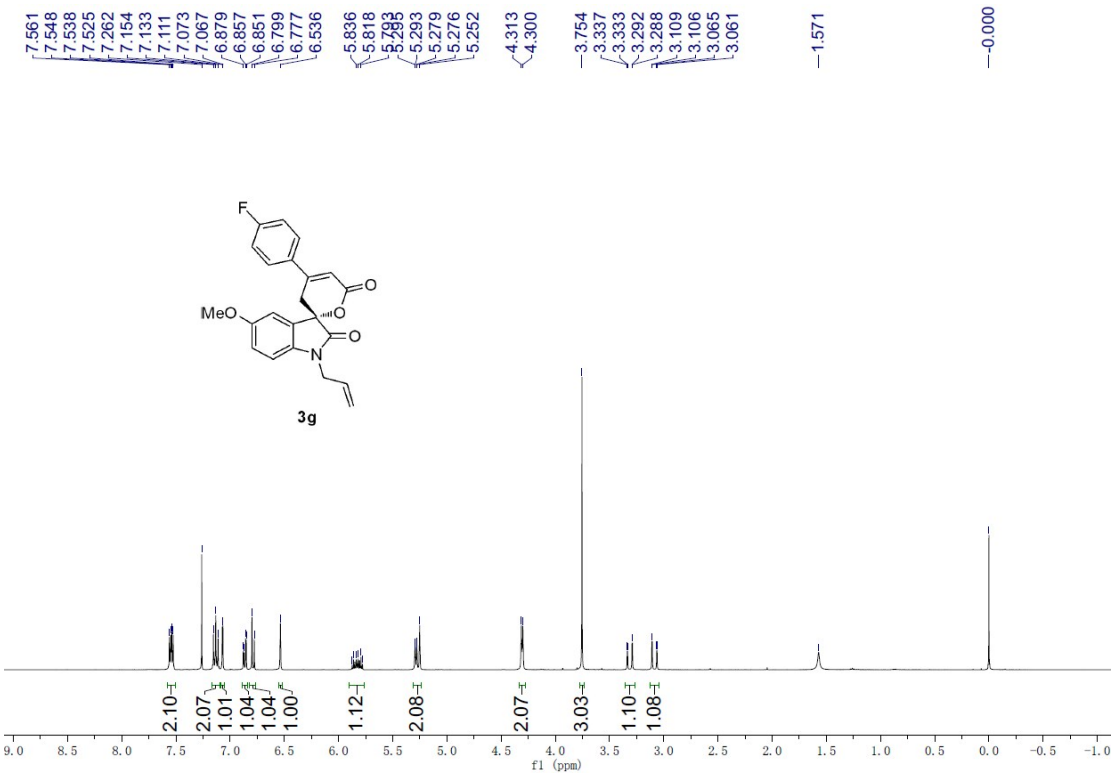
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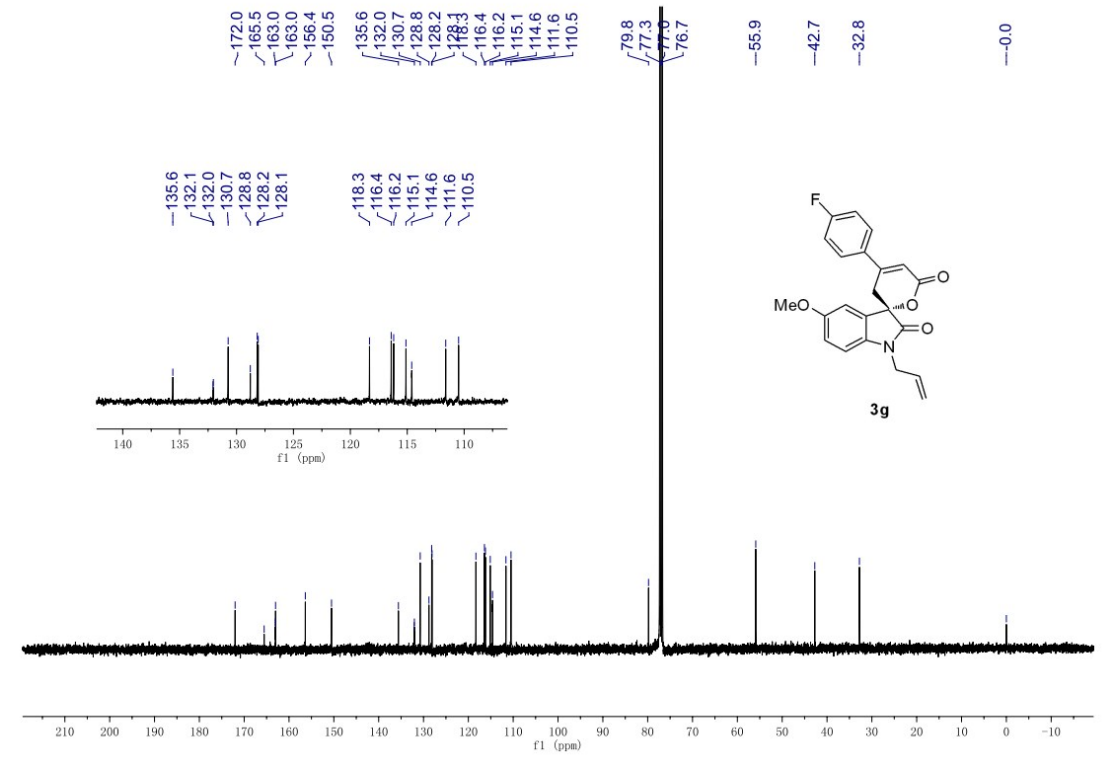
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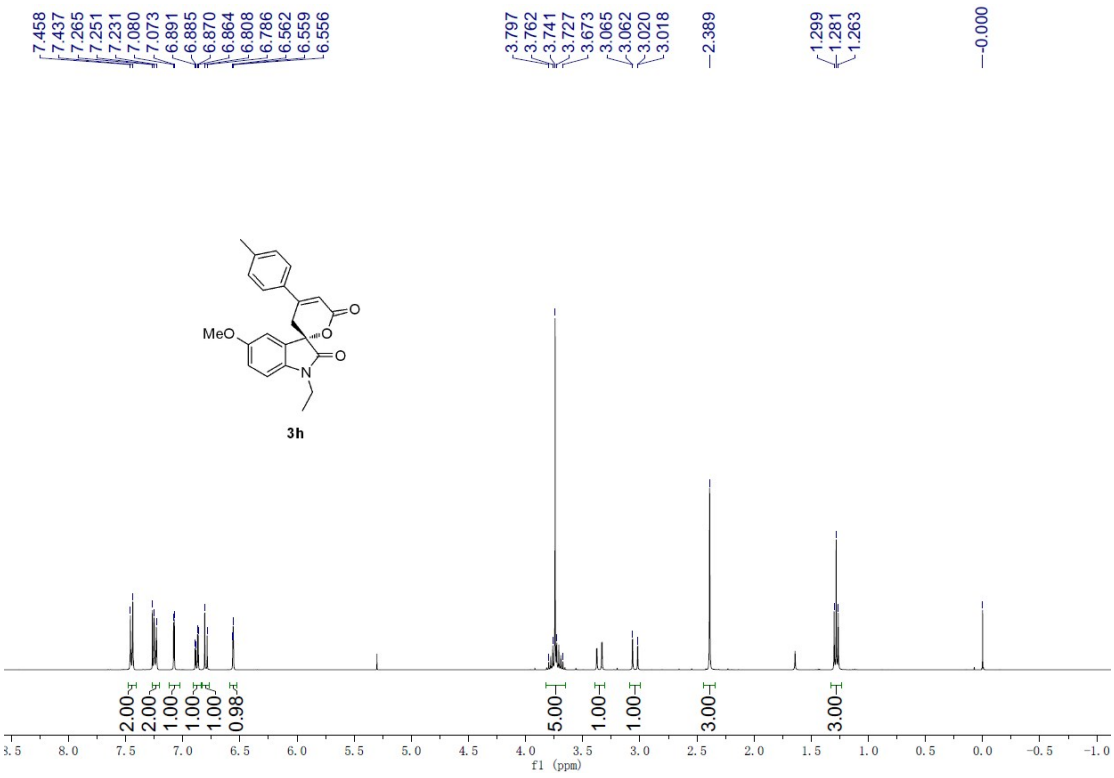
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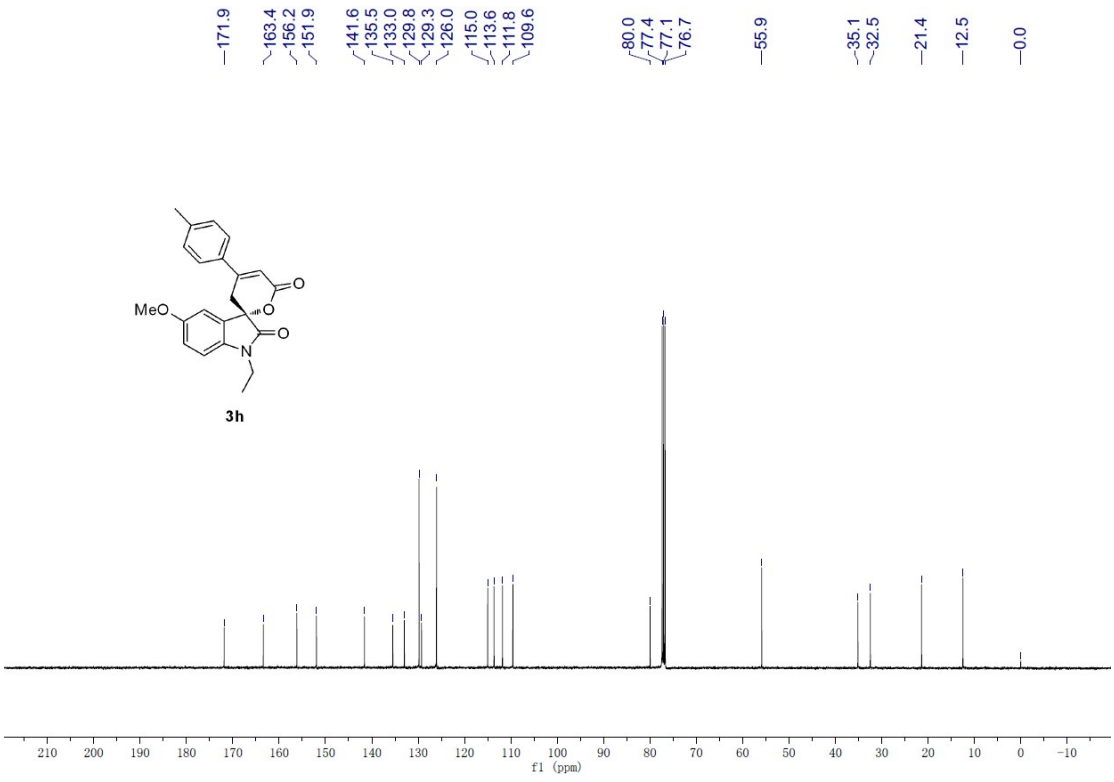
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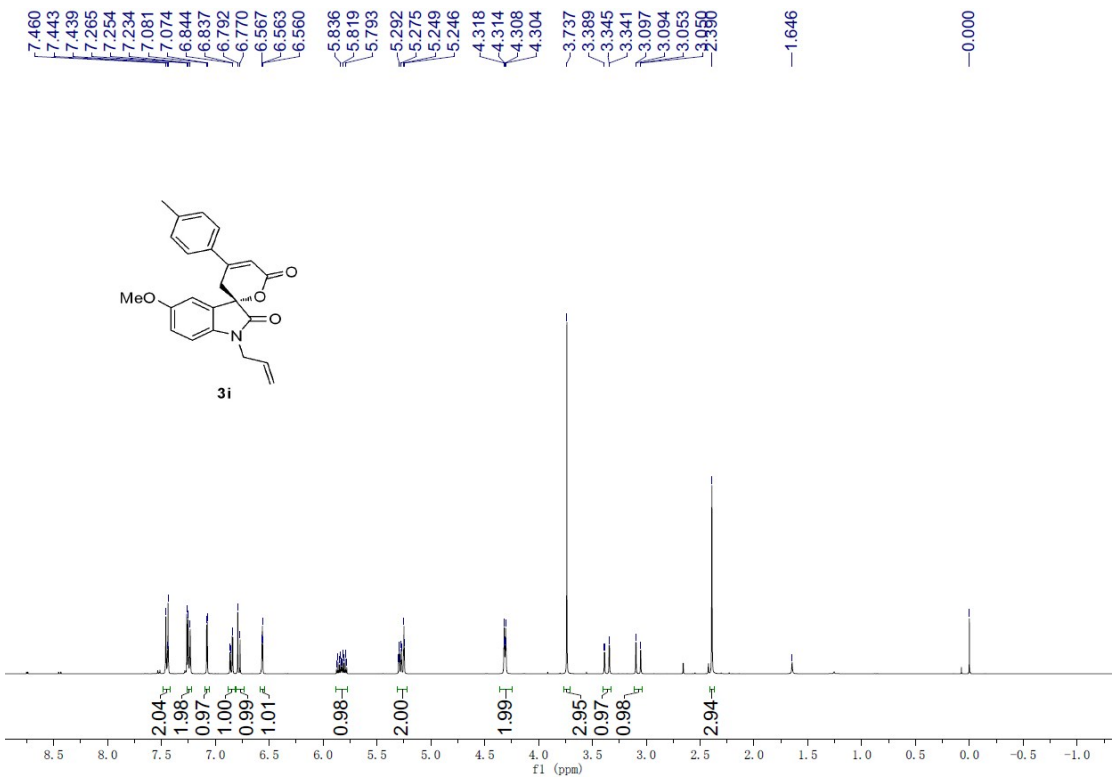
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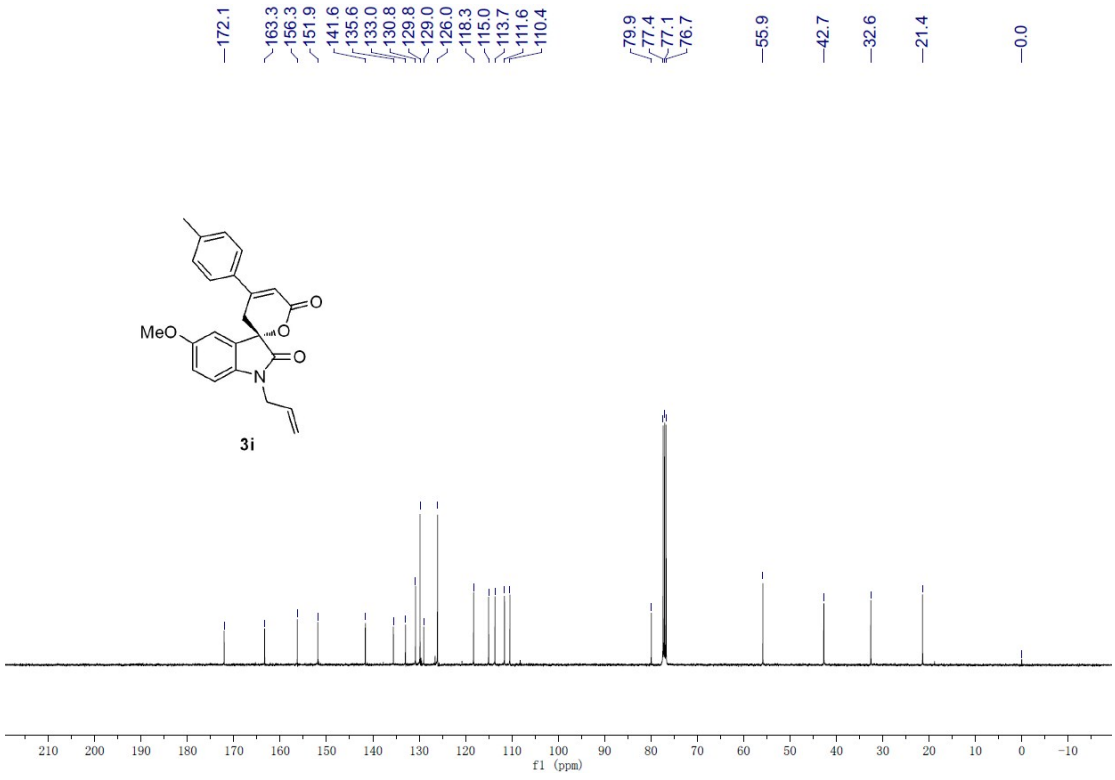
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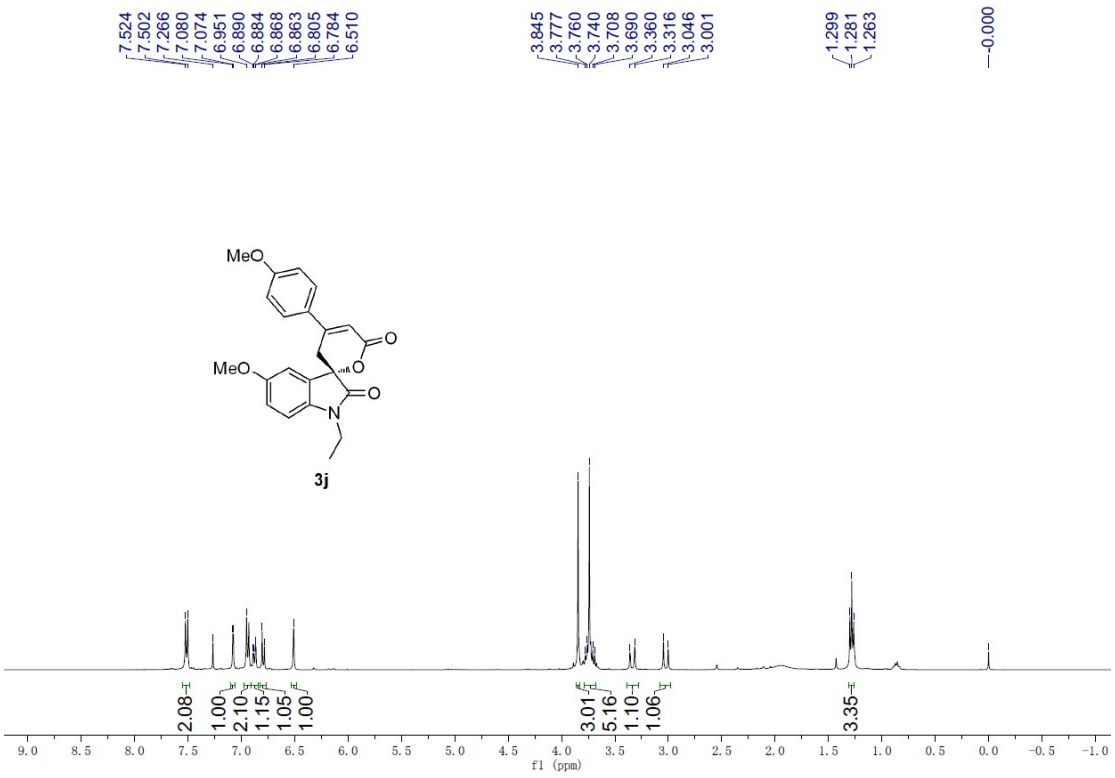
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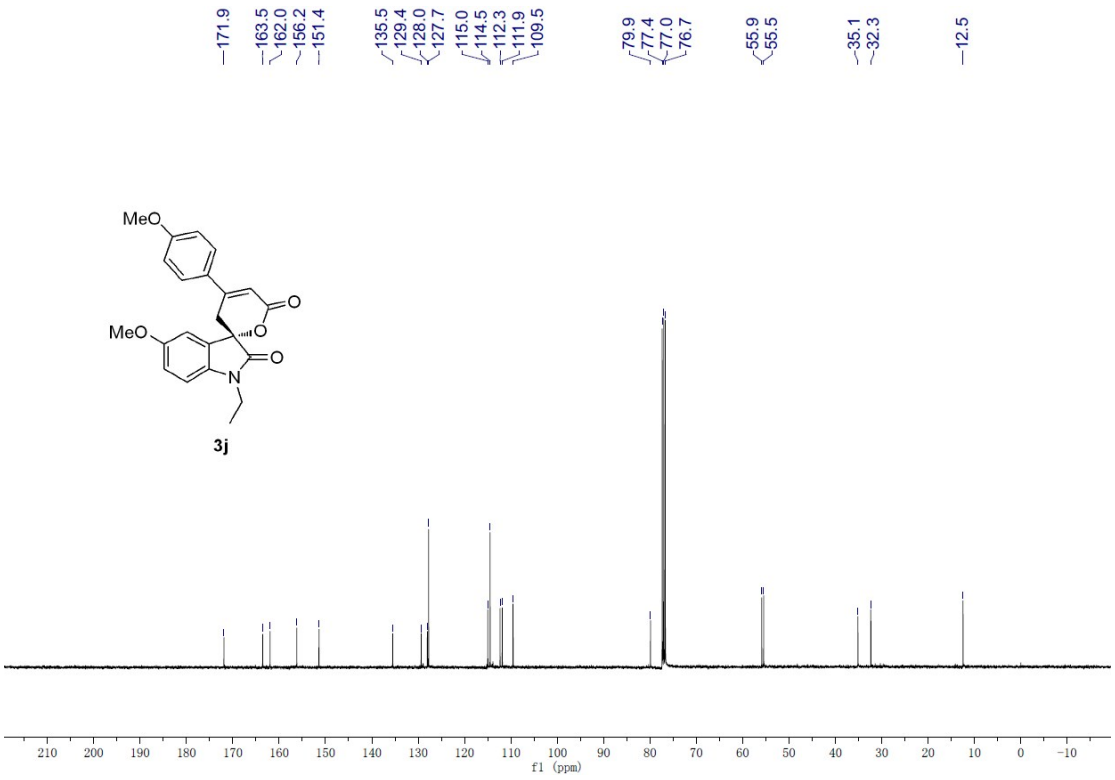
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77.0
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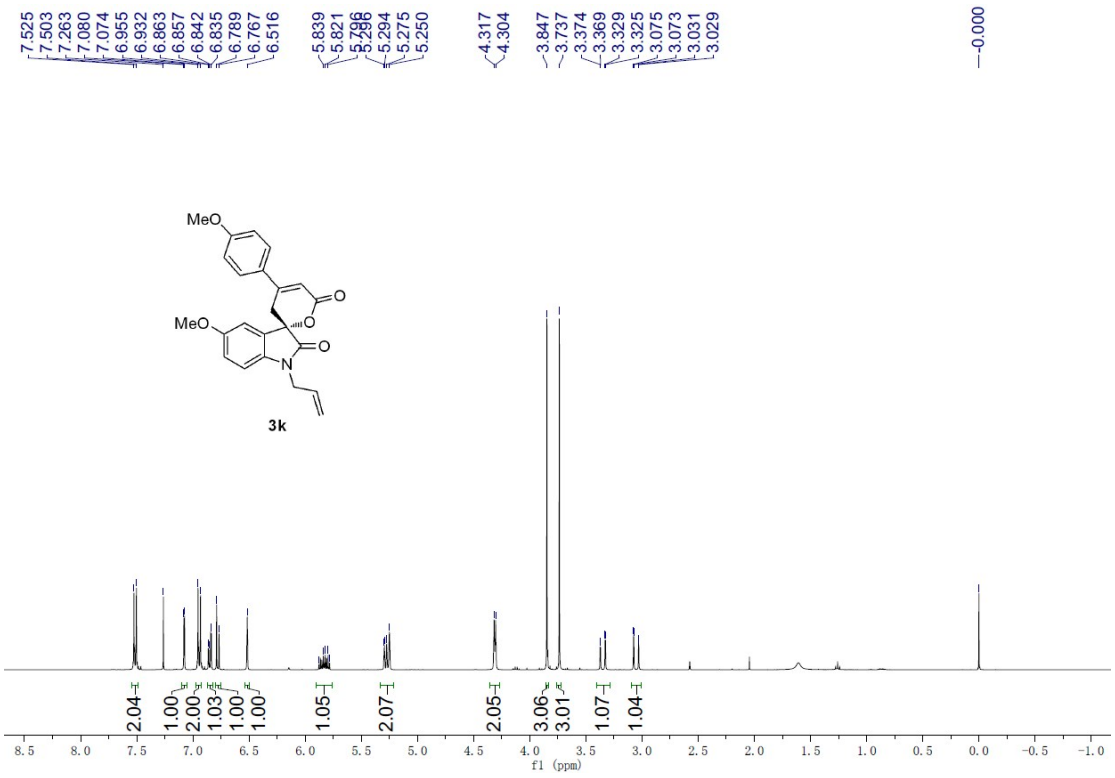
f1 (ppm)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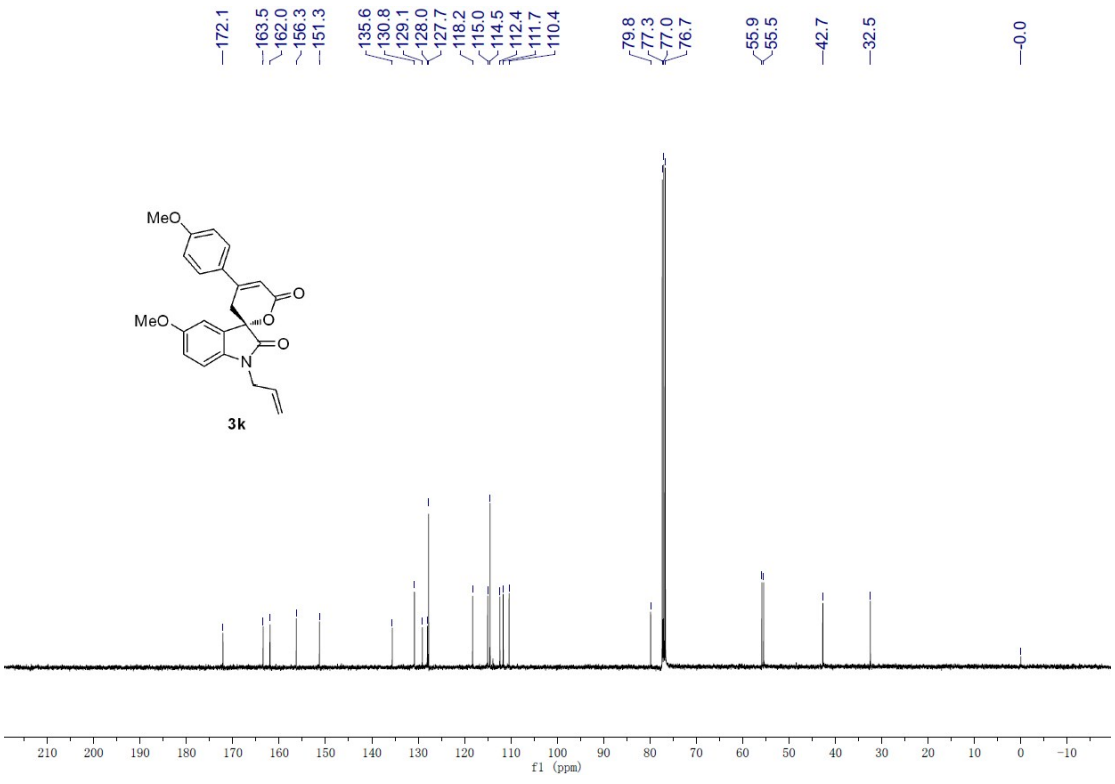
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114.5
112.4
111.7
110.4
79.8
77.3
77.0
76.7
55.9
55.5
42.7
32.5
0.0
MeO
MeO
O
O
O
N
3k
f1 (ppm)


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7.570
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7.424
7.330
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7.261
7.254
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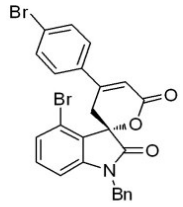
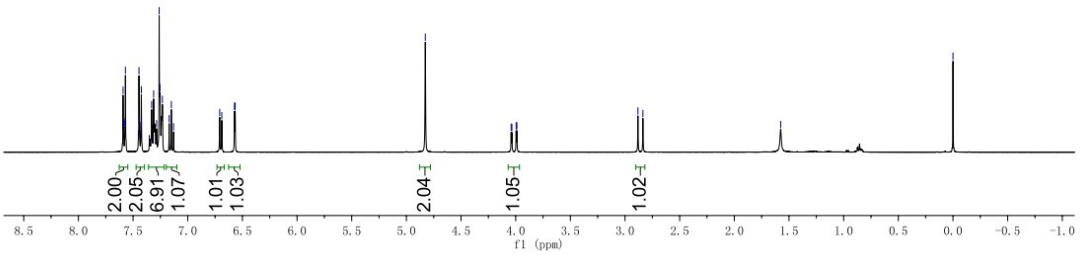
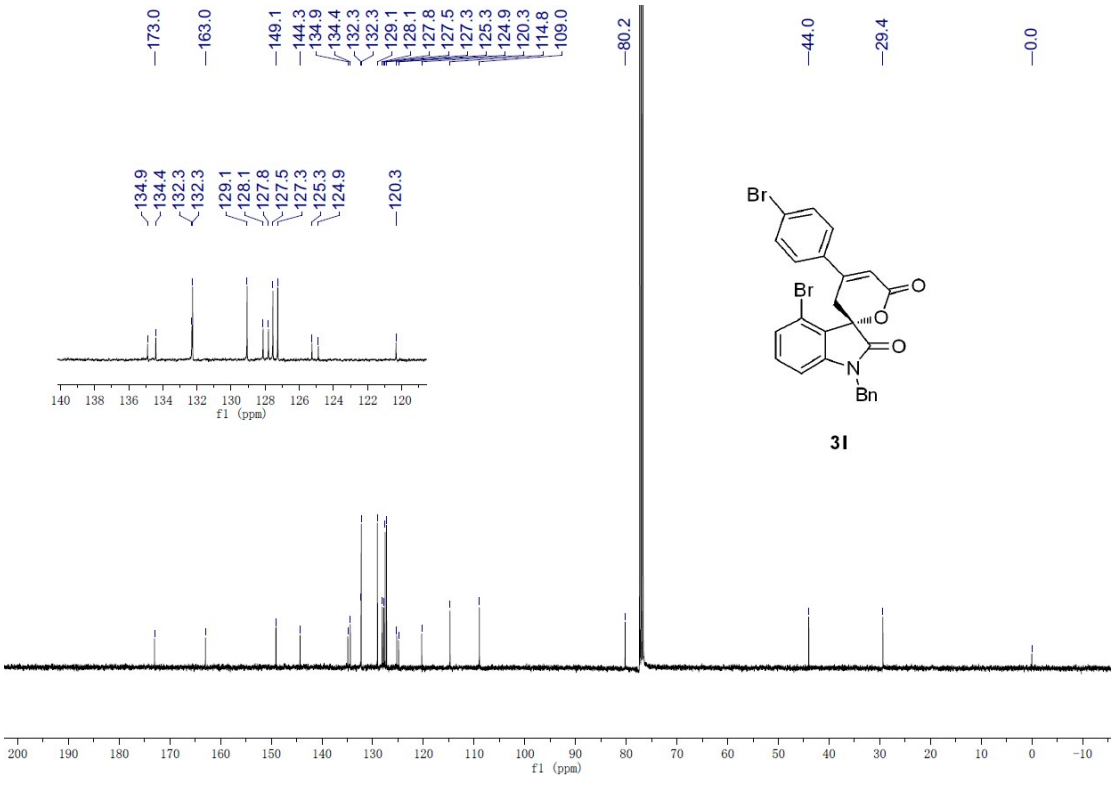
4.035
3.996
3.989
2.882
2.836
1.576
0.000


Br
Br
O
O
O
N
Bn

3l

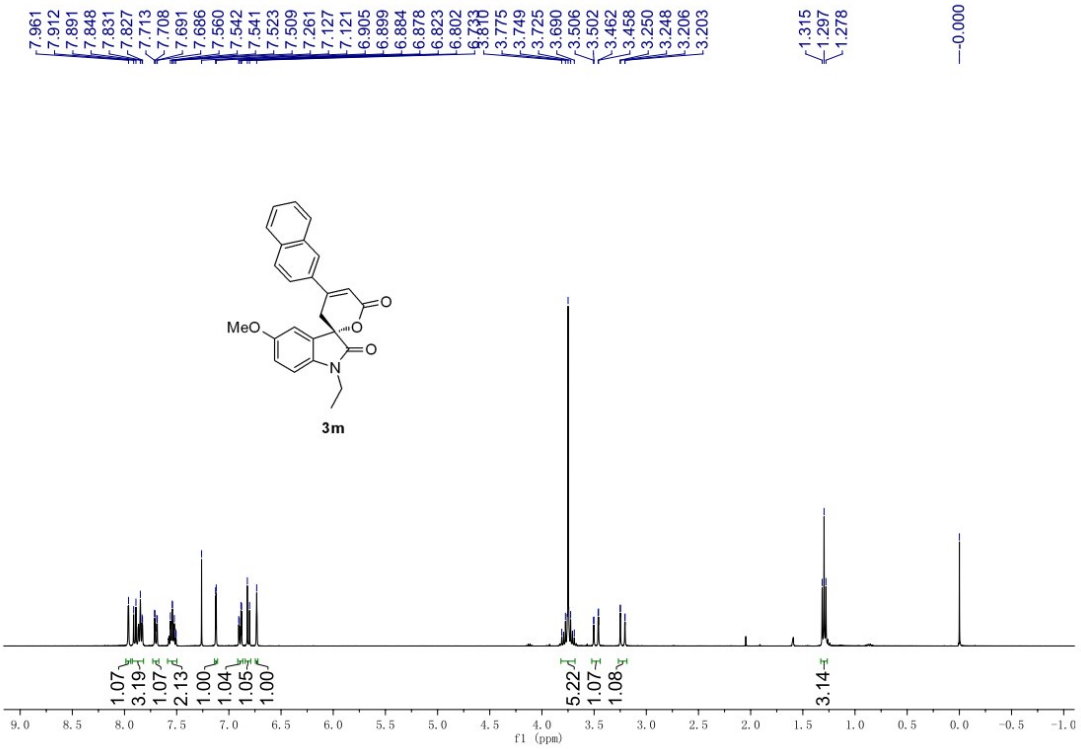

2.00
2.05
6.91
1.07
1.01
1.03
2.04
1.05
1.02
f1 (ppm)

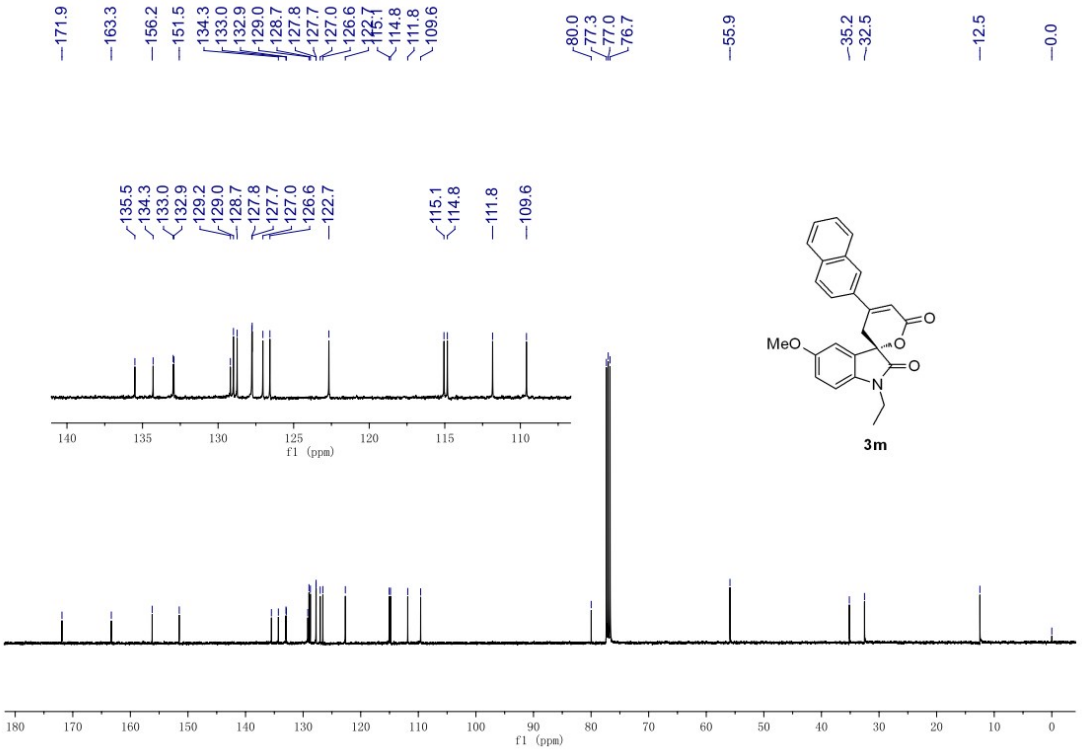

173.0
163.0
149.1
144.3
134.9
134.4
132.3
132.3
129.1
128.1
127.8
127.5
127.3
125.3
124.9
120.3
114.8
109.0
80.2
44.0
29.4
0.0
f1 (ppm)

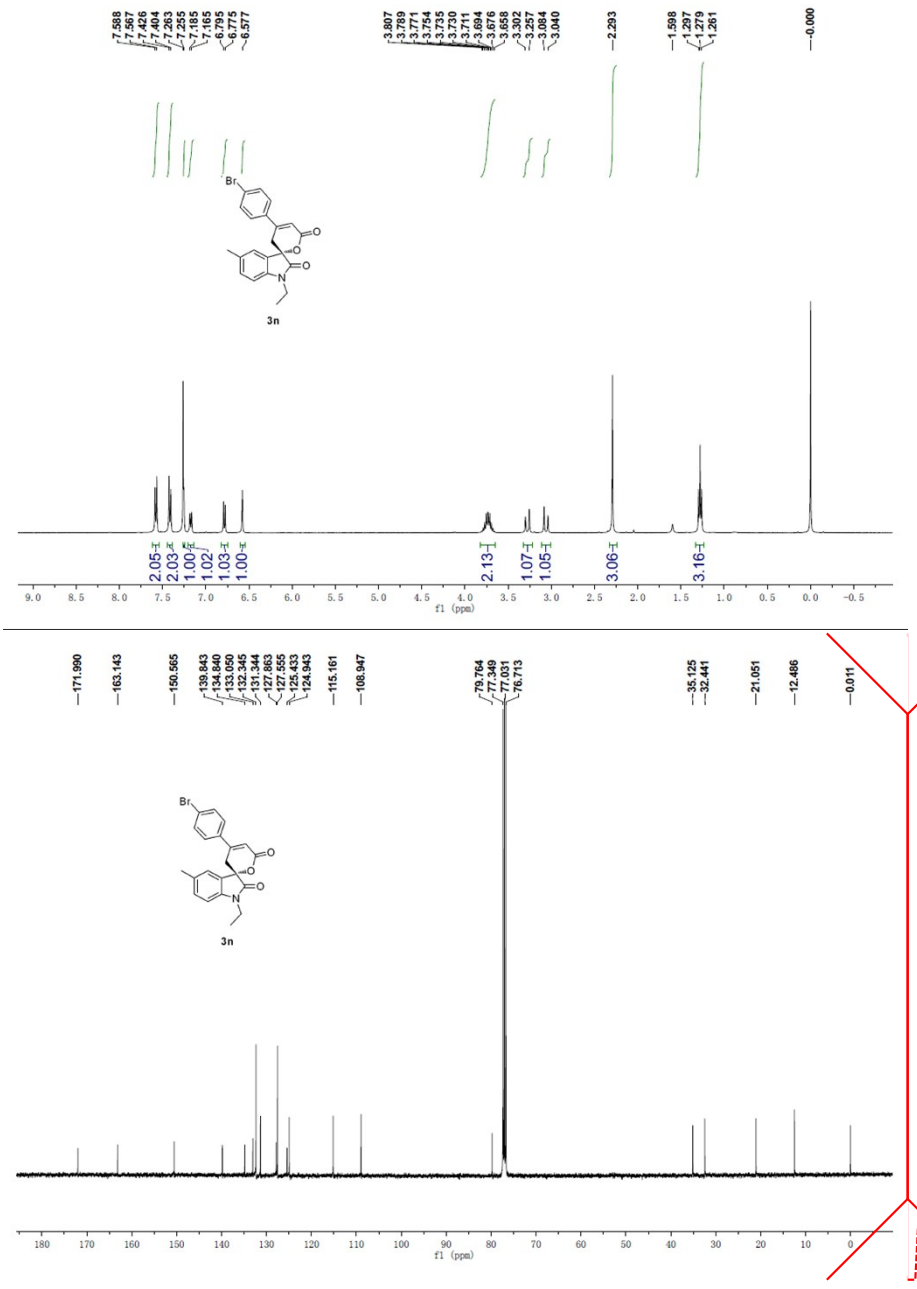
134.9
134.4
132.3
132.3
129.1
128.1
127.8
127.5
127.3
125.3
124.9
120.3
f1 (ppm)

Br
Br
O
O
O
N
Bn

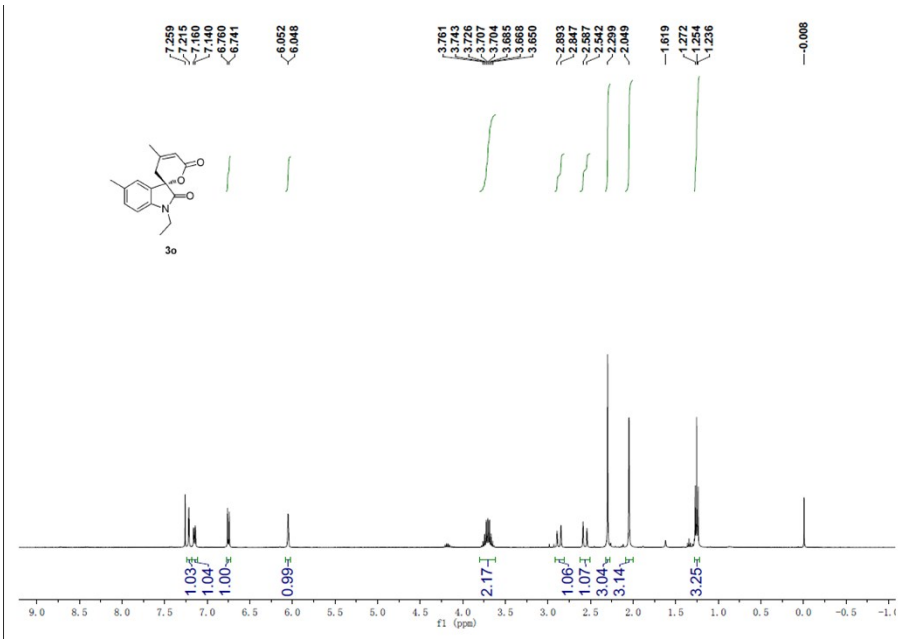
3l

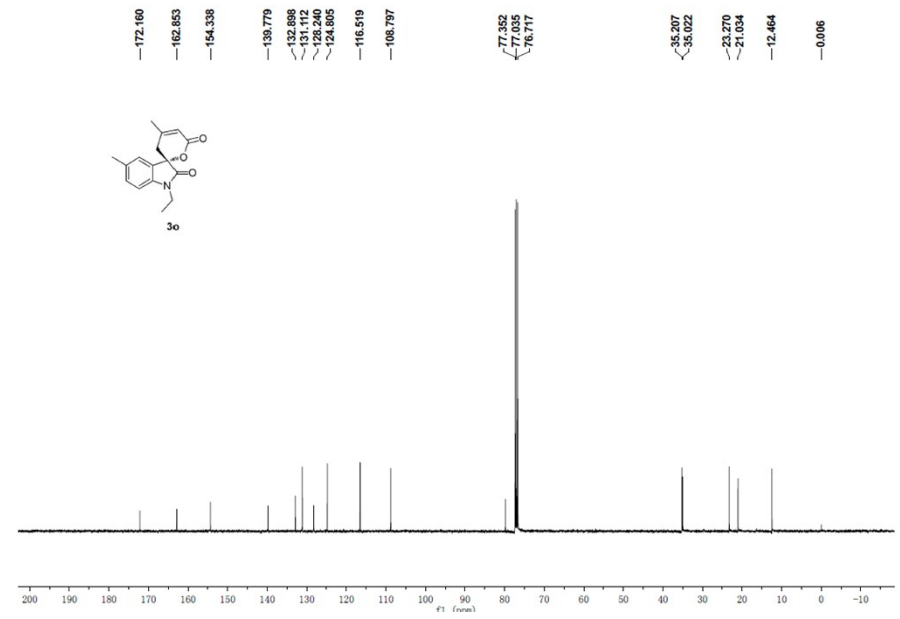

7.961
7.912
7.891
7.848
7.831
7.827
7.713
7.708
7.691
7.686
7.560
7.542
7.541
7.523
7.509
7.261
7.127
7.121
6.905
6.899
6.884
6.878
6.823
6.802
3.775
3.749
3.725
3.690
3.506
3.502
3.462
3.458
3.250
3.248
3.206
3.203
1.315
1.297
1.278
0.000
MeO
O
O
O
N
3m
1.07
3.19
1.07
2.13
1.00
1.04
1.05
1.00
5.22
1.07
1.08
3.14
f1 (ppm)


171.9
163.3
156.2
151.5
134.3
133.0
132.9
129.0
128.7
127.8
127.7
127.0
126.6
122.7
115.1
114.8
111.8
109.6
80.0
77.3
77.0
76.7
55.9
35.2
32.5
12.5
0.0
MeO
O
O
O
N
3m
f1 (ppm)



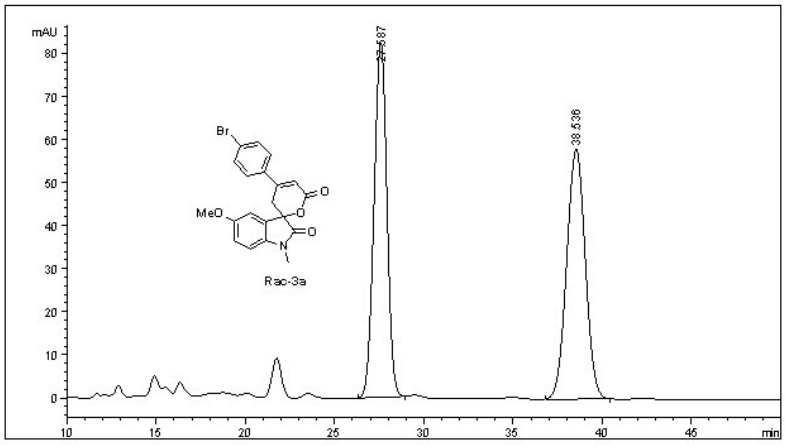
Comment [D]: 新增化合物 3n



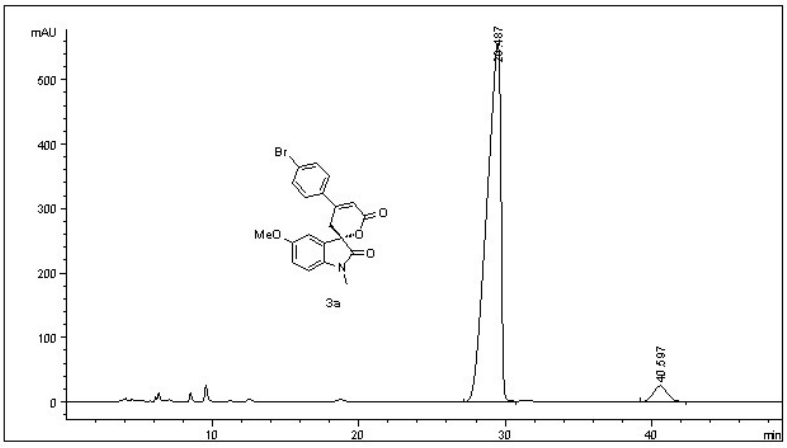


Comment [D]: 新增化合物 3o

6. HPLC Spectures

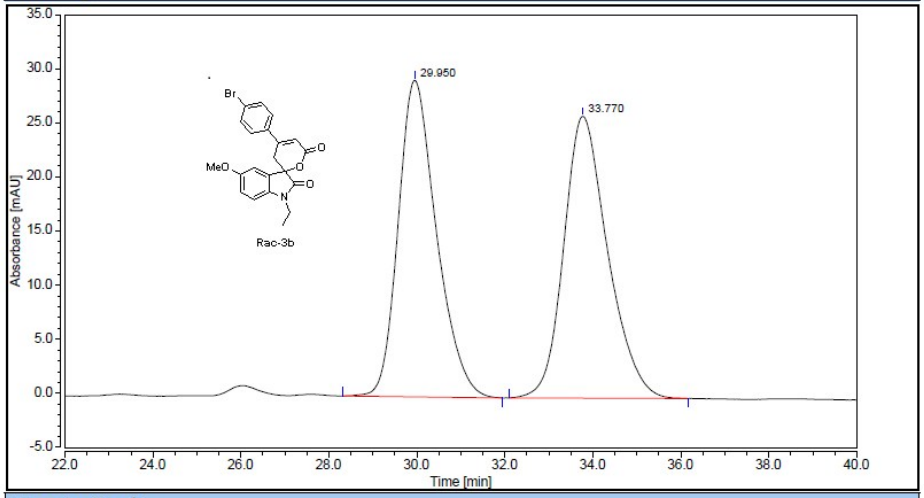



```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 C, Sig=254,8 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]      [min]    [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  27.587 BB    0.7812 4128.06299   82.30220  49.5387
   2  38.536 BB    1.1140 4204.93848   57.98717  50.4613

Totals :                  8333.00146  140.28937

==================================================================
                      *** End of Report ***
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 B, Sig=254,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]      [min]    [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  29.487 BV    0.9737 3.69045e4   556.48242  95.7478
   2  40.597 BB    1.0262 1638.94983   24.69736   4.2522

Totals :                  3.85434e4   581.17978

==================================================================
                      *** End of Report ***
```

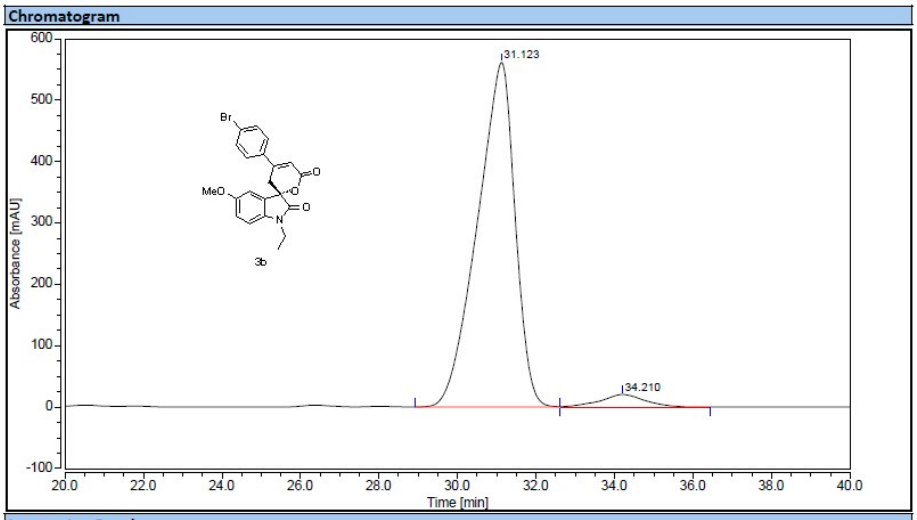
Chromatogram



Integration Results

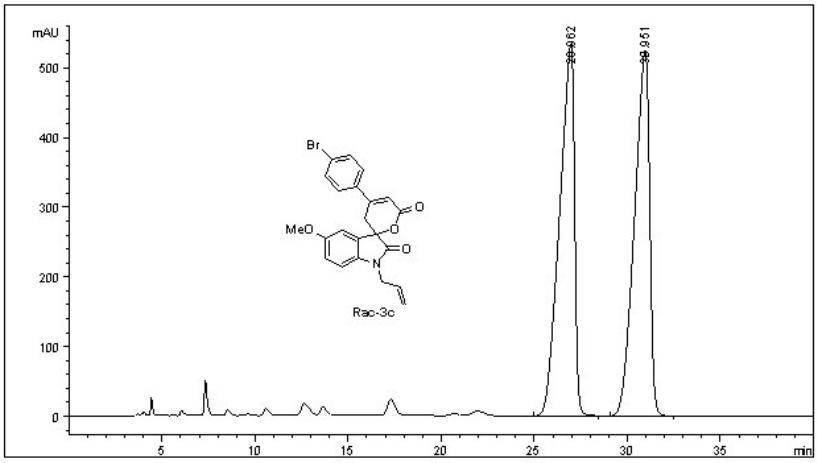
No.	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1	29.950	29.500	29.258	49.48	52.91	n.a.
2	33.770	30.126	26.043	50.52	47.09	n.a.
Total:		**59.627**	**55.301**	**100.00**	**100.00**	

Chromatogram

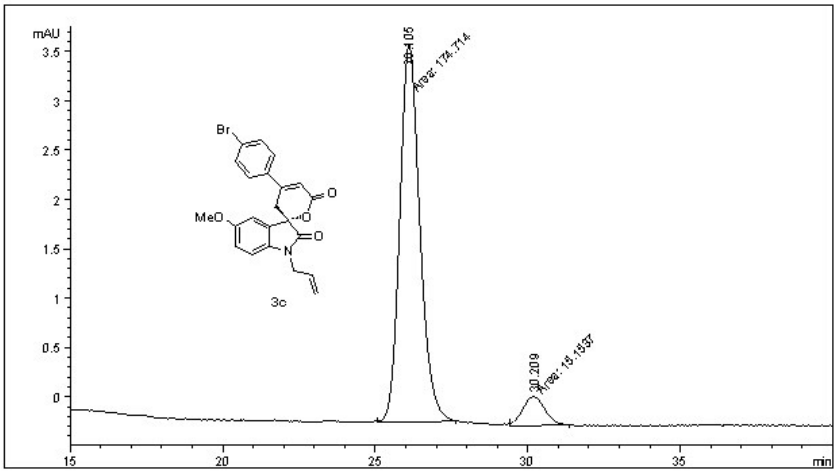


Integration Results

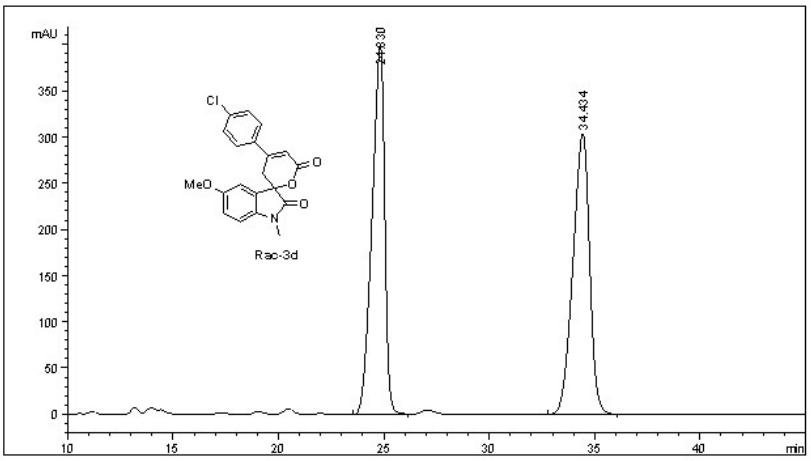
No.	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1	31.123	624.414	561.012	95.84	96.49	n.a.
2	34.210	27.129	20.421	4.16	3.51	n.a.
Total:		**651.543**	**581.433**	**100.00**	**100.00**	



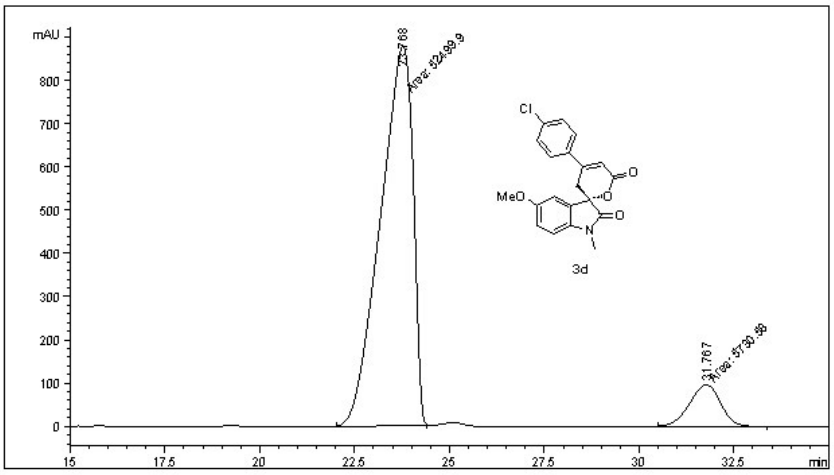

```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 B, Sig=254,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  26.962 BB    0.8284 2.96685e4   533.86200  50.0135
   2  30.951 BB    0.8625 2.96524e4   523.80133  49.9865

Totals :                  5.93209e4  1057.66333

=====================================================================
                        *** End of Report ***
```



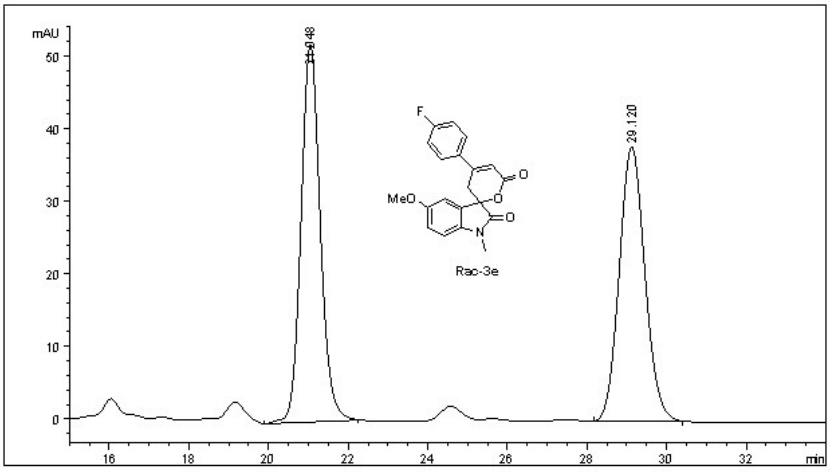

```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 B, Sig=254,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  26.105 MM    0.7624  174.71397    3.81949  92.0188
   2  30.209 MM    0.8540   15.15374 2.95725e-1   7.9812

Totals :                  189.86772    4.11521

=====================================================================
                        *** End of Report ***
```



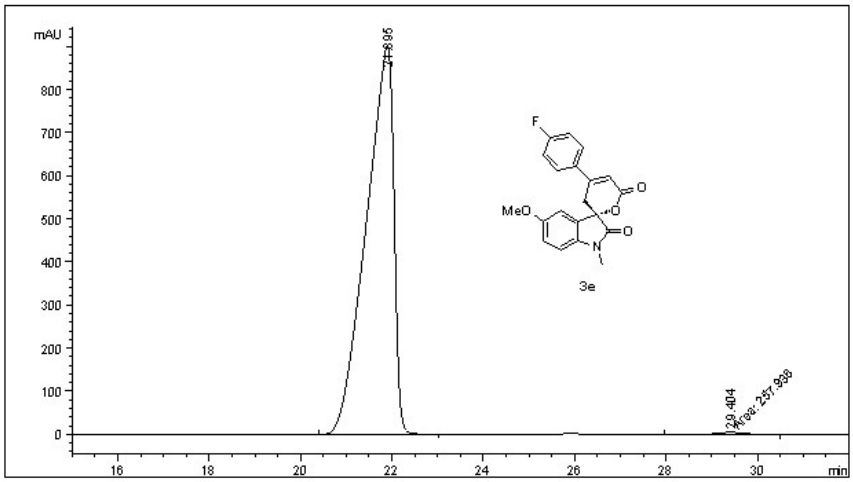

```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 B, Sig=254,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  24.830 BB    0.6353 1.66245e4   399.61536  49.9328
   2  34.434 BB    0.8462 1.66692e4   303.78613  50.0672

Totals :                  3.32936e4   703.40149

=====================================================================
                        *** End of Report ***
```



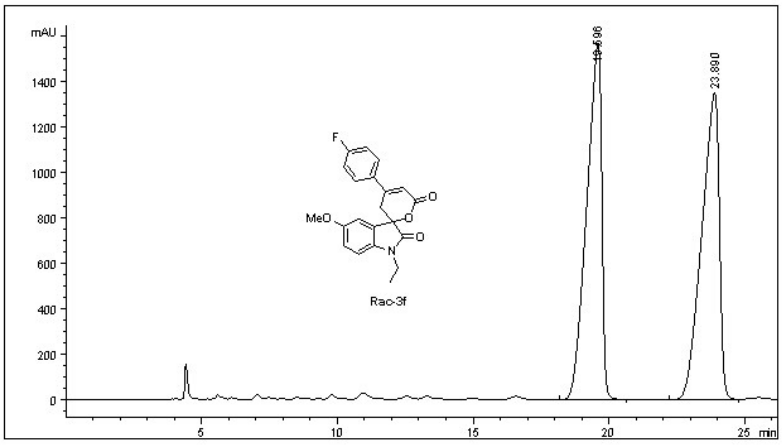

```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 B, Sig=254,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  23.768 MM    0.9969 5.24999e4   877.75183  90.1588
   2  31.767 MM    0.9754 5730.57520   97.92017   9.8412

Totals :                  5.82305e4   975.67200

=====================================================================
                        *** End of Report ***
```



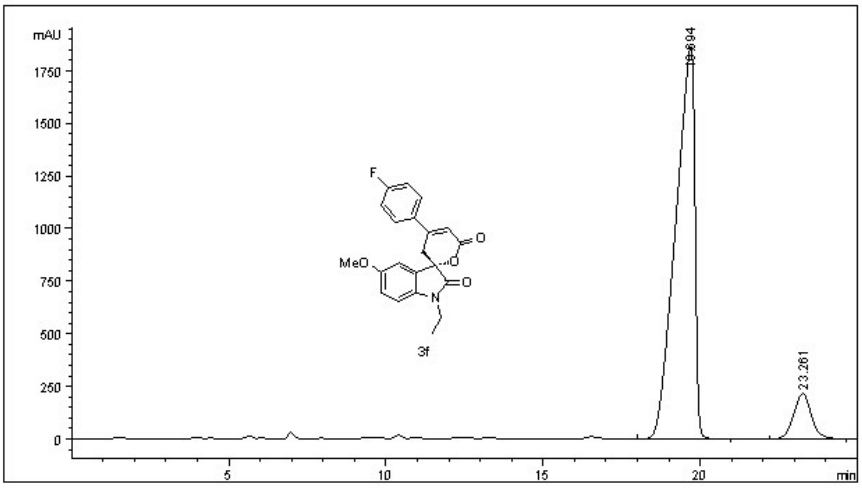

```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 B, Sig=254,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]    [mAU*s]    [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  21.048 VB    0.5161 1748.11902   52.01600  50.7963
   2  29.120 BB    0.6899 1693.31055   37.85235  49.2037

Totals :                  3441.42957   89.86835

======================================================================
                        *** End of Report ***
```



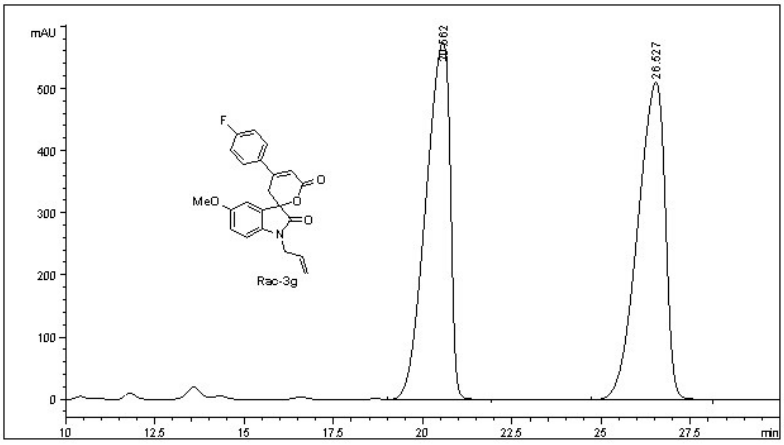

```
======================================================================
                        Area Percent Report
======================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 B, Sig=254,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]    [mAU*s]    [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  21.895 BB    0.6214 3.77943e4   900.97162  99.3222
   2  29.404 MM    0.7785  257.93561    5.52185   0.6778

Totals :                  3.80523e4   906.49347

======================================================================
                        *** End of Report ***
```



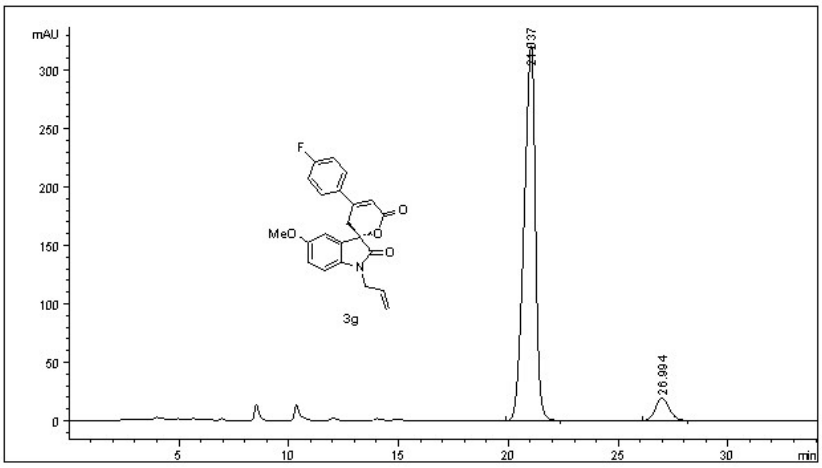

```
=====================================================================
                      Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 B, Sig=254,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  19.596 BB    0.5832 6.03765e4  1568.22717  49.9238
   2  23.890 VV    0.6897 6.05610e4  1349.05664  50.0762

Totals :                  1.20938e5  2917.28381


=====================================================================
                      *** End of Report ***
```



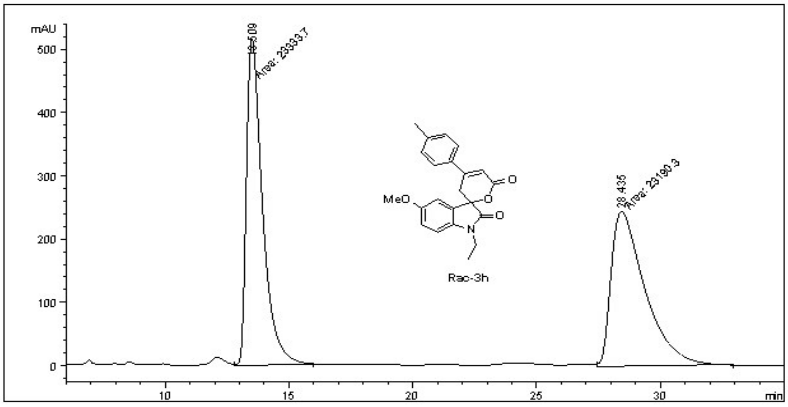

```
=====================================================================
                      Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 B, Sig=254,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  19.694 BB    0.6592 7.88383e4  1864.83313  90.3110
   2  23.261 BV    0.5959 8458.11621  216.46432   9.6890

Totals :                  8.72964e4  2081.29745


=====================================================================
                      *** End of Report ***
```



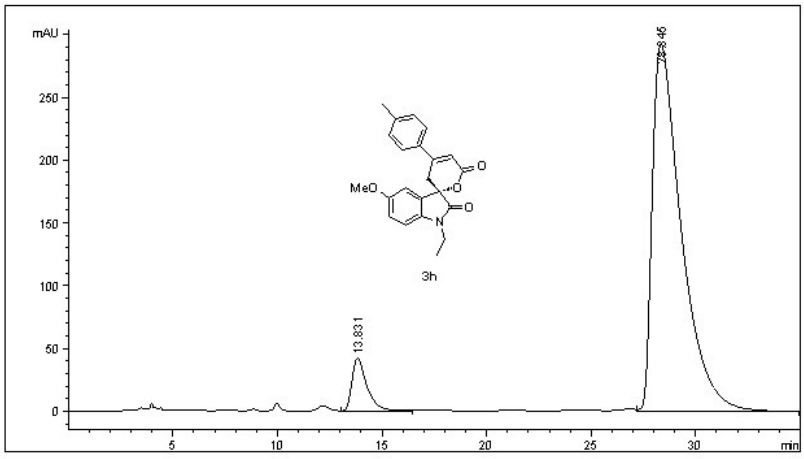

```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 B, Sig=254,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  20.562 VB    0.7524 2.72063e4   574.63806  49.9459
   2  26.527 BB    0.8510 2.72652e4   510.56363  50.0541

Totals :                  5.44714e4  1085.20169


=====================================================================
                        *** End of Report ***
```



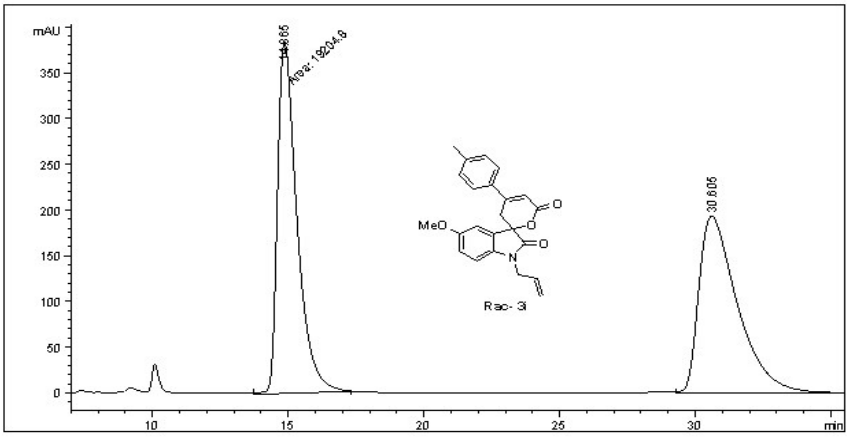

```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 B, Sig=254,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  21.037 BB    0.5444 1.15011e4   320.72775  93.1653
   2  26.994 BB    0.6665  843.73578   19.05745   6.8347

Totals :                  1.23448e4   339.78520


=====================================================================
                        *** End of Report ***
```



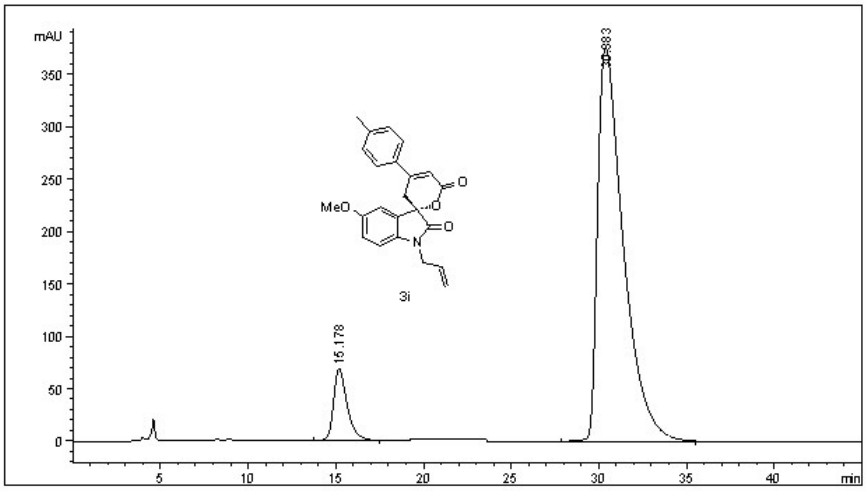

```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 B, Sig=254,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|-------|
   1  13.509 MM    0.7533 2.33337e4   516.22260  50.1541
   2  28.435 MM    1.5816 2.31903e4   244.38194  49.8459

Totals :                  4.65240e4   760.60454

=====================================================================
                        *** End of Report ***
```



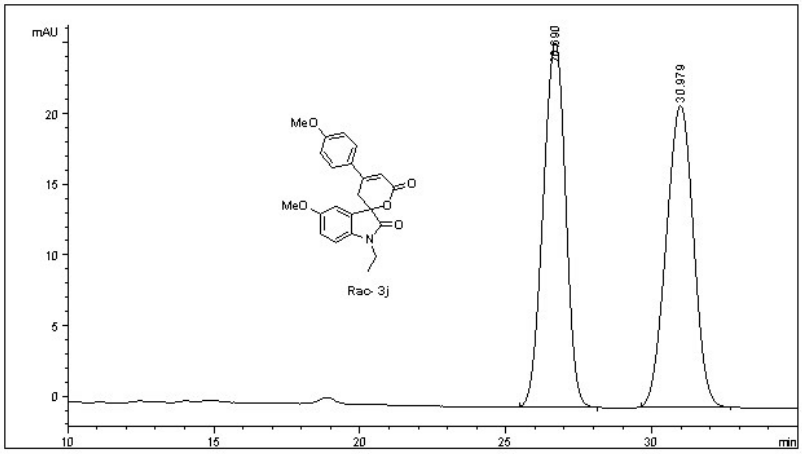

```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 B, Sig=254,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|-------|
   1  13.831 VV    0.7563 2173.01929   42.51846   7.1279
   2  28.345 VB    1.4326 2.83131e4   292.68225  92.8721

Totals :                  3.04861e4   335.20071

=====================================================================
                        *** End of Report ***
```



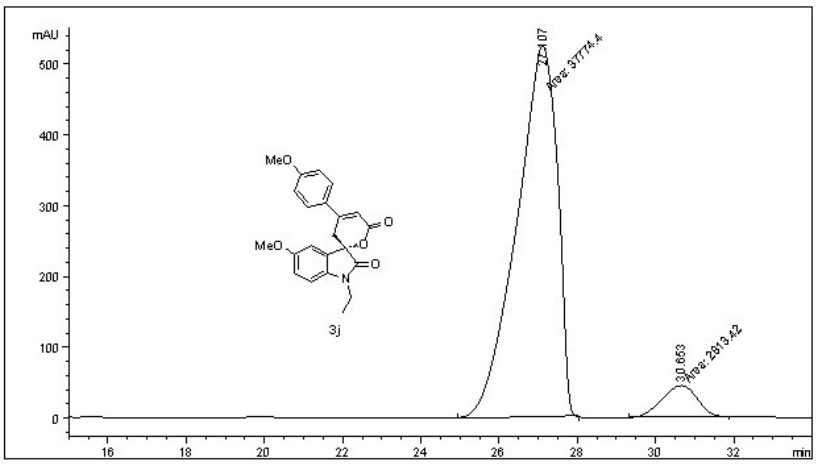

```
================================================================================
                            Area Percent Report
================================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 B, Sig=254,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]    [mAU*s]     [mAU]      %
----|-------|----|-------|----------|----------|--------|
   1  14.865 MM    0.8315 1.92048e4   384.91962  50.0780
   2  30.605 VBA   1.4895 1.91449e4   193.64267  49.9220

Totals :                  3.83497e4   578.56229

================================================================================
                            *** End of Report ***
```



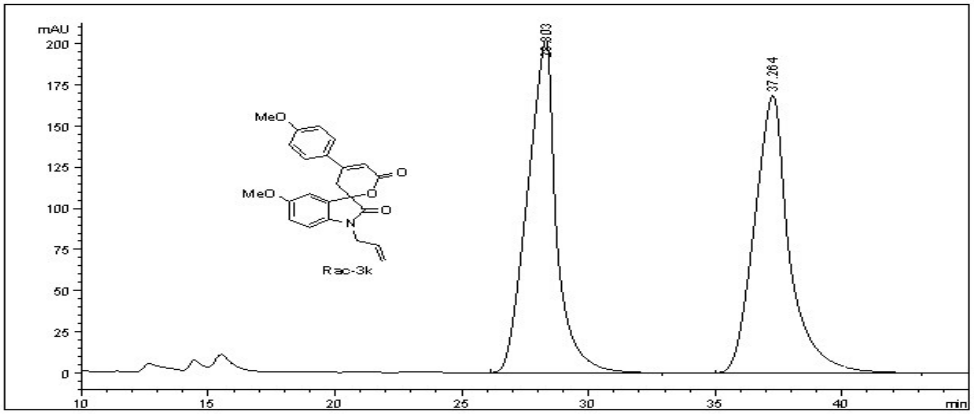

```
================================================================================
                            Area Percent Report
================================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 B, Sig=254,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]    [mAU*s]     [mAU]      %
----|-------|----|-------|----------|----------|--------|
   1  15.178 VB    0.8163 3769.61206   69.11324   8.9597
   2  30.383 BB    1.4859 3.83032e4   376.17947  91.0403

Totals :                  4.20728e4   445.29271

================================================================================
                            *** End of Report ***
```



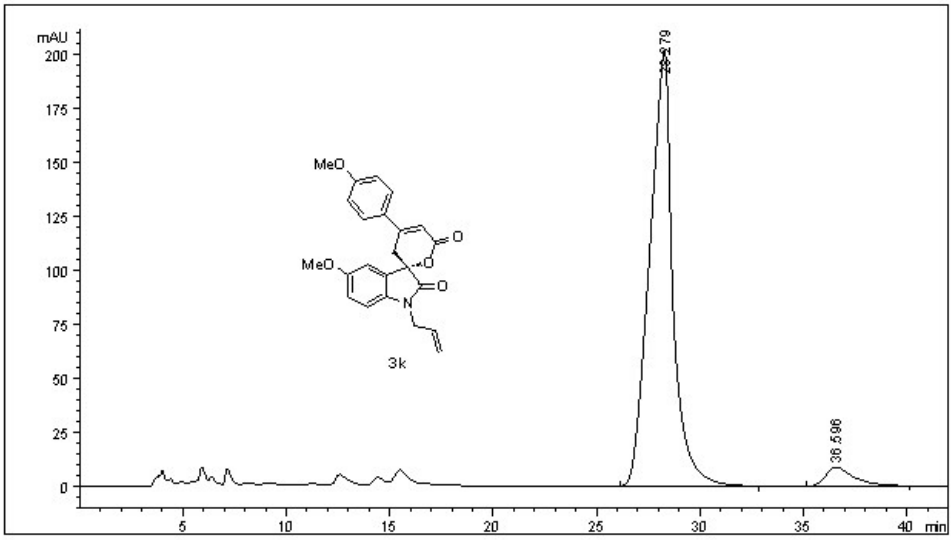

```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 C, Sig=254,8 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|------|----|-------|----------|----------|--------|
   1  26.690 BB    0.8448 1380.28467   25.77466  49.9018
   2  30.979 BB    0.9802 1385.71448   21.32373  50.0982

Totals :                  2765.99915   47.09839

=====================================================================
                        *** End of Report ***
```



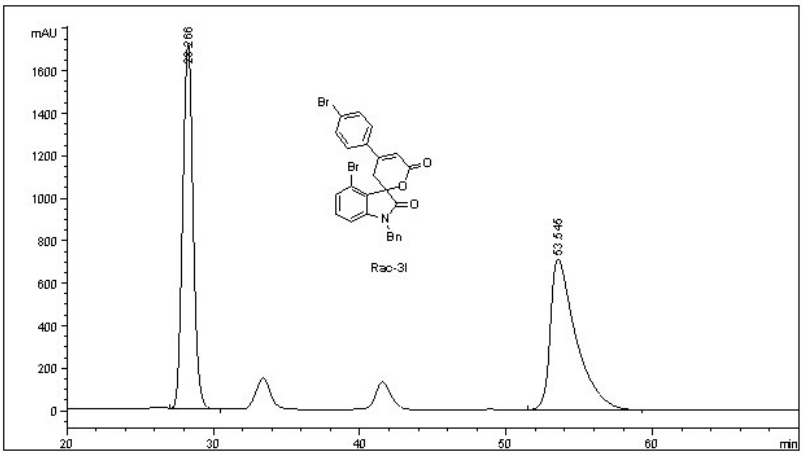

```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 C, Sig=254,8 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|------|----|-------|----------|----------|--------|
   1  27.107 MM    1.2025 3.77744e4   523.54712  93.0683
   2  30.653 MM    1.0544 2813.41675   44.47123   6.9317

Totals :                  4.05878e4   568.01835

=====================================================================
                        *** End of Report ***
```



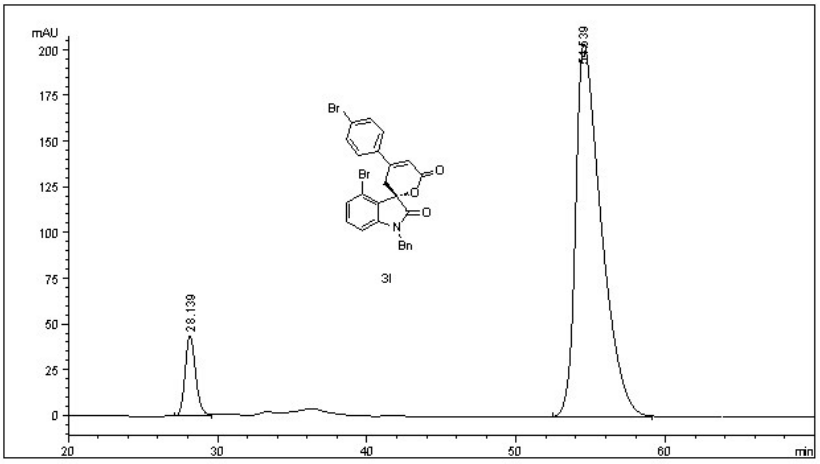

```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 B, Sig=254,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  28.303 BB    1.1845 1.61094e4   202.40913  49.9908
   2  37.264 BB    1.4119 1.61153e4   168.48386  50.0092

Totals :                  3.22246e4   370.89299

==================================================================
                      *** End of Report ***
```



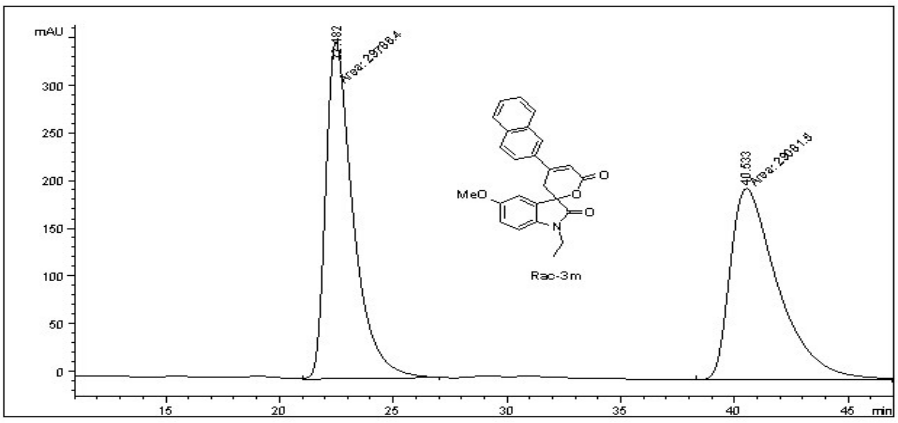

```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 B, Sig=254,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  28.279 BB    1.1466 1.58190e4   201.78352  94.8655
   2  36.596 BB    1.4181  856.19135    8.77700   5.1345

Totals :                  1.66751e4   210.56052

==================================================================
                      *** End of Report ***
```



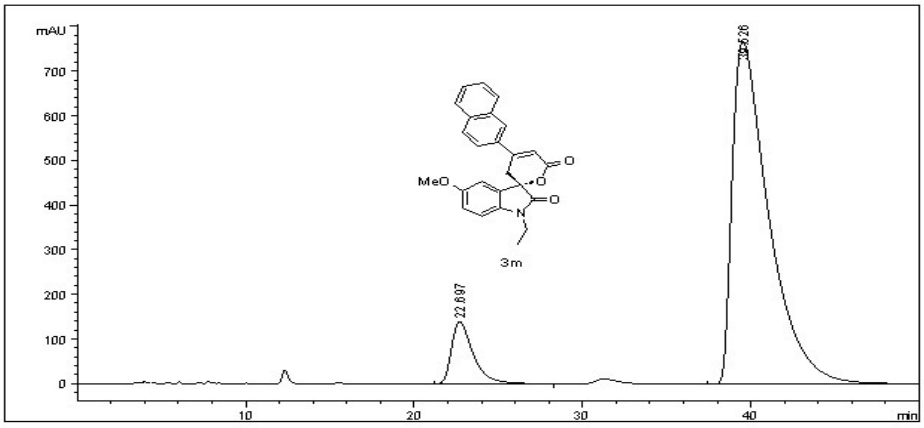

```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 B, Sig=254,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  28.266 VB    0.7769 8.52484e4  1718.11914  49.8320
   2  53.545 BB    1.6828 8.58232e4   708.73456  50.1680

Totals :                  1.71072e5  2426.85370

=====================================================================
                        *** End of Report ***
```




```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 B, Sig=254,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  28.139 BB    0.7528 2125.80151   43.75694   8.0333
   2  54.539 BB    1.7072 2.43365e4   203.79347  91.9667

Totals :                  2.64623e4   247.55042

=====================================================================
                        *** End of Report ***
```



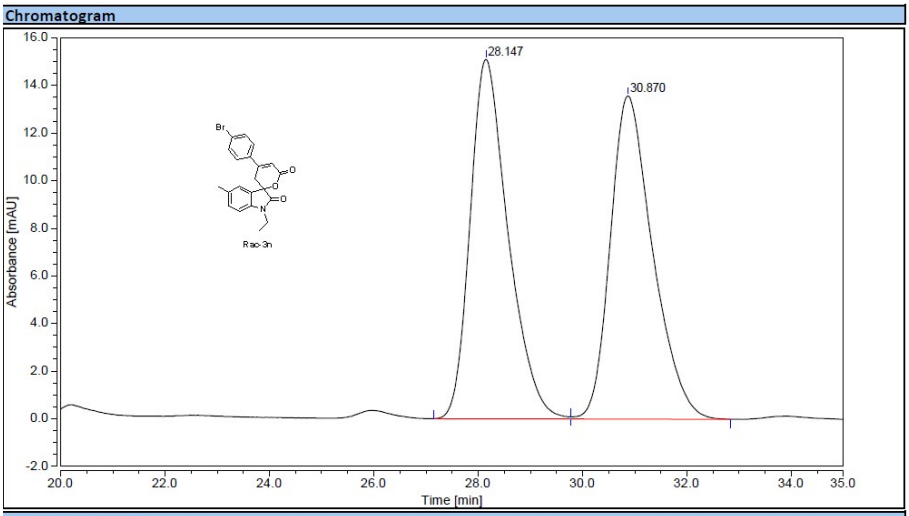

```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 B, Sig=254,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]      [min]   [mAU*s]      [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  22.482 MM    1.4042 2.97864e4   353.55222  50.5987
   2  40.533 MM    2.4251 2.90815e4   199.86505  49.4013

Totals :                  5.88680e4   553.41727

=====================================================================
                        *** End of Report ***
```




```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: MWD1 B, Sig=254,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]      [min]   [mAU*s]      [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  22.697 BB    1.3626 1.26716e4   139.65680   9.8353
   2  39.526 BBA   2.2446 1.16167e5   768.04095  90.1647

Totals :                  1.28838e5   907.69775

=====================================================================
                        *** End of Report ***
```

Comment [D]: 新增化合物 3n

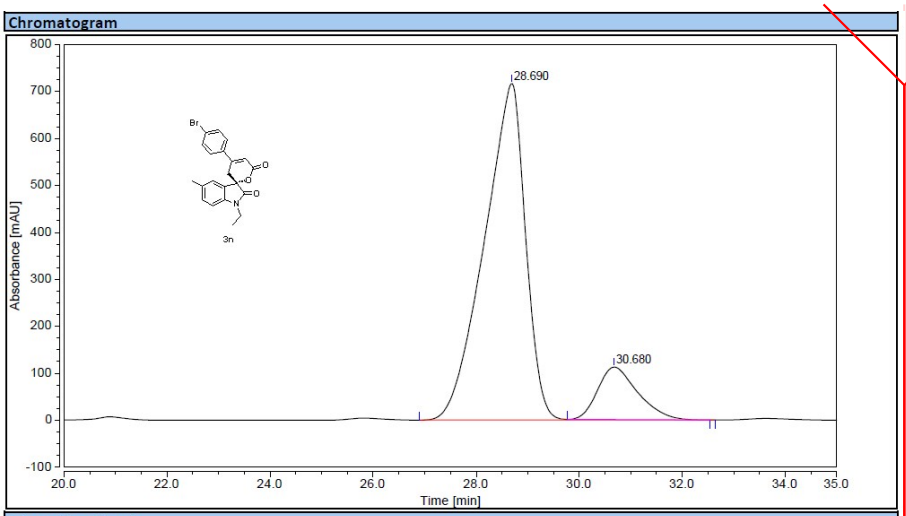
Chromatogram



Integration Results

No.	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1	28.147	12.748	15.104	49.96	52.65	n.a.
2	30.870	12.768	13.583	50.04	47.35	n.a.
Total:		**25.516**	**28.687**	**100.00**	**100.00**	

Chromatogram

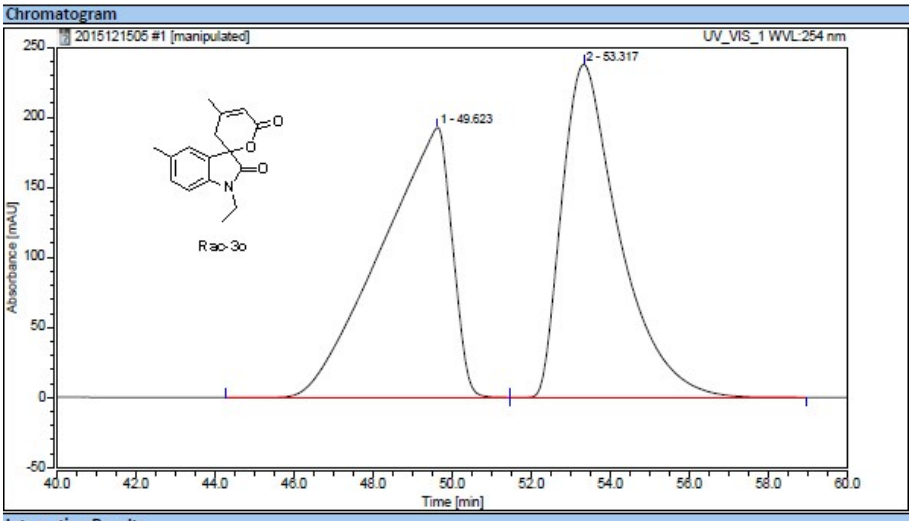


Integration Results

No.	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1	28.690	663.247	716.804	86.86	86.52	n.a.
2	30.680	100.372	111.666	13.14	13.48	n.a.
Total:		**763.619**	**828.469**	**100.00**	**100.00**	

Comment [D]: 新增化合物 3o

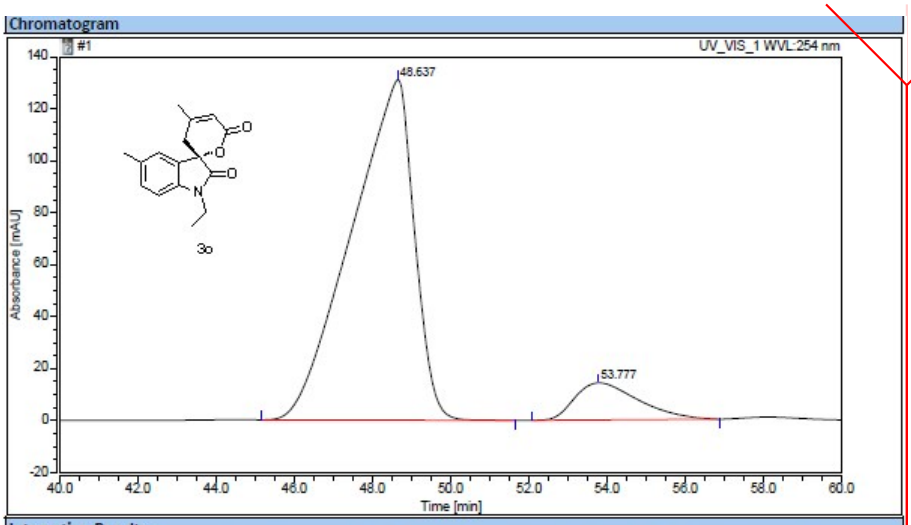
Chromatogram



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		49.623	400.506	192.585	50.06	44.77	n.a.
2		53.317	399.472	237.553	49.94	55.23	n.a.
Total:			**799.978**	**430.138**	**100.00**	**100.00**	

Chromatogram



Integration Results

No.	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1	48.637	244.386	131.059	90.14	90.19	n.a.
2	53.777	26.727	14.251	9.86	9.81	n.a.
Total:		**271.113**	**145.310**	**100.00**	**100.00**	