Electronic Supplementary Information

Experimental Section

Materials

Polyacrylonitrile (PAN, Mw = 80,000) was purchased from Kunshan Hongyu Plastic Co., Ltd. (Kunshan China); N, N-dimethylformamide (DMF, A.R.) was supplied from Tianjin Fengchuan Chemical Reagent Science and Technology Co., Ltd. (Tianjin China); β-cyclodextrin (β-CD) and Copper nitrate hydrate ($Cu(NO_3)_2 \cdot 3H_2O$, A.R.) were purchased from Sinopharm Chemical Reagent Co., Ltd. (China). All the other chemicals used in the experiment were purchased in analytical purity and were used without any purification.

Preparation of β-CDs/PAN composite nanofibers by electrospining

In a typical procedure, the PAN (poly (acrylonitrile)) powders were dissolved in DMF solvent to make solutions with a concentration of 10 wt. %, followed by vigorous stirring to a homogeneous and clear polymer solution at room temperature. Subsequently, a controlled amount of β-CD was added to the resulted PAN/DMF polymer solution when its concentration was 4 wt. % and stirred at 24 h to obtain β-CDs/PAN/DMF solutions for electrospinning. During electrospinning, the applied voltage was held constant at 15 kV, and the distance between the polymer solution and the aluminum foil collection screen was kept at 18 cm. The dry fibers were collected as a fiber mat on the aluminum foil and stored at room temperature.

Preparation of β-CDs/PAN composite nanofibers containing copper nanoparticles

Adsorption of copper ions on the surface of the β-CDs/PAN composite nanofibers was achieved by immersing the β-CDs/PAN composite nanofibers into the copper precursor solution at room temperature. Copper nitrate hydrate, which is often

used in the preparation of copper nanoparticles, has been shown the advantage. The complexation of hydroxyls in the β-CDs with Cu ions can lead to coordination of Cu ions on the fiber surface. Cu ions were adsorbed on the electrospun β-CDs/PAN composite nanofibers peeled from the aluminum foil by dipping them in a 0.2 M copper nitrate solution. After soaking for 24 h in the blue copper nitrate solution, the white β-CDs/PAN composite fibers changed from white to light blue consistent with the adsorption of Cu ions on the fibers. The fibers were thoroughly rinsed with deionized water and ethanol to remove excess metal ions which were not anchored. Subsequently, the fibers were dried at room temperature. The Cu ions loaded fibers were then reduced after dipping into a 0.05 M NaBH4 aqueous solution (ice-salt bath,-2°C). After reduction, the fiber color changed from light blue to dark brown, which indicating the conversion from the copper ion to copper metal.

Preparation of CuNPs/CNFs composite nanofibers

The CuNPs/CNFs composite nanofibers were obtained as follows: (i) the as-prepared composite nanofibers pre-oxidized treatment, temperature-programmed heating with a heating rate of 5 °C min-1 from room temperature to 250 °C and kept for 2 h, (ii) temperature-programmed heating with a ramping rate of 3 °C min-1 to 600°C under N2 atmosphere and kept for 2 h, (iii) cooling down to room temperature. The whole process was in a tubular electrical furnace.

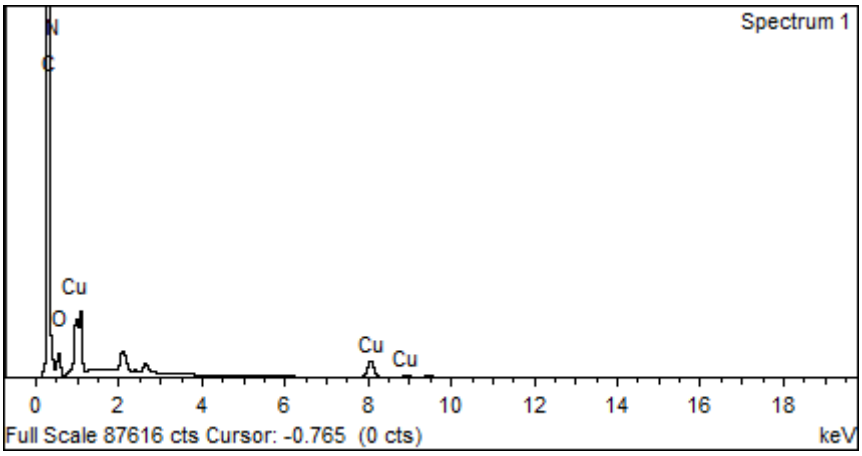


Fig.1-1 EDS signature of the CuNPs/CNFs catalyst

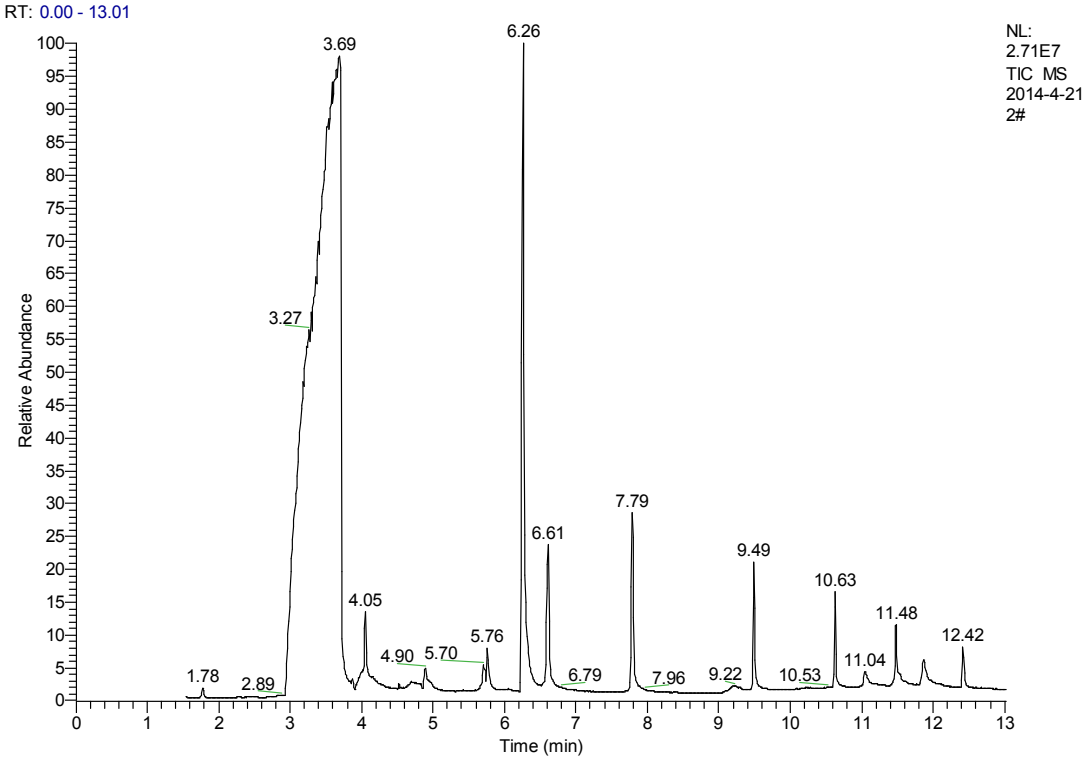
Element	Weight%	Atomic%
C K	61.09	69.01
N K	20.66	20.01
O K	11.17	9.48
Cu K	7.07	1.51
Totals	100.00	

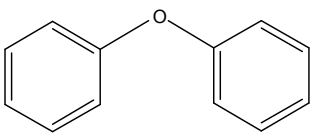
Tab.1-1 Element table

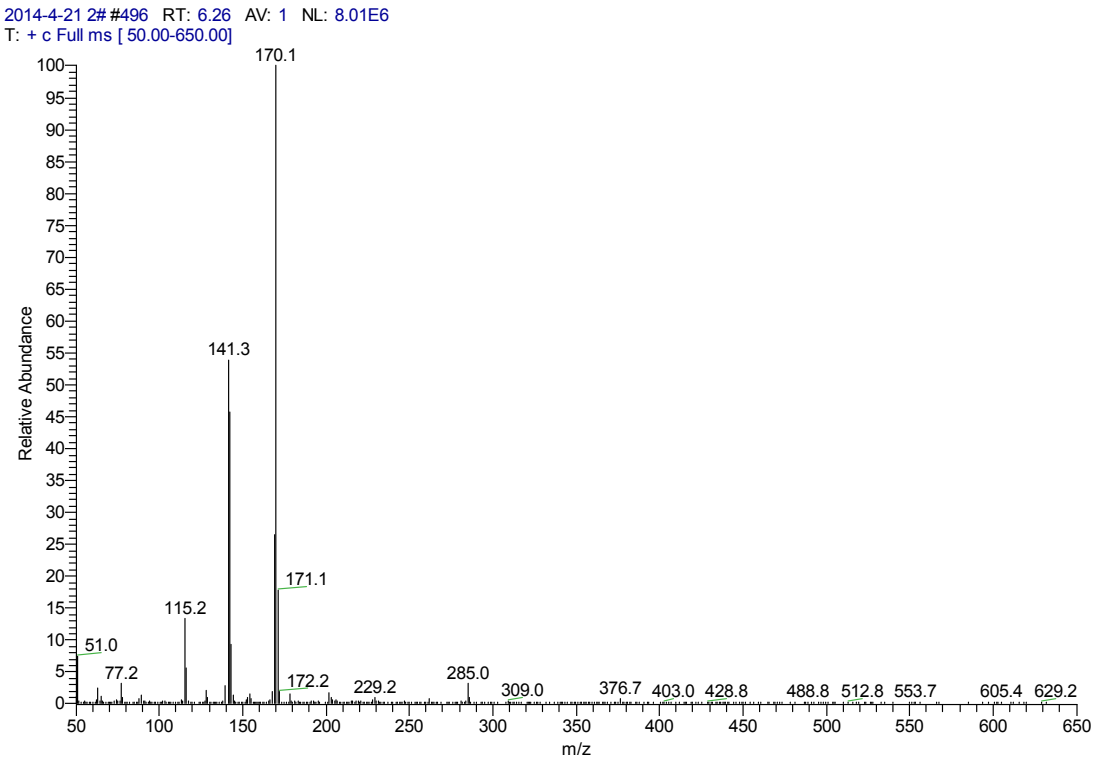
Fig.1-1 showed the energy dispersive spectrum of the CuNPs/CNFs catalyst, and Tab.1-1 showed the element content of the CuNPs/CNFs catalyst. It indicated that the atomic percentage of copper is 1.51%, at the same time, the atomic percentage of copper provided by XPS data is 1.49%. Hence, the loading of copper in catalyst is about 1.5%.

GC-MS Table 2

Entry 1







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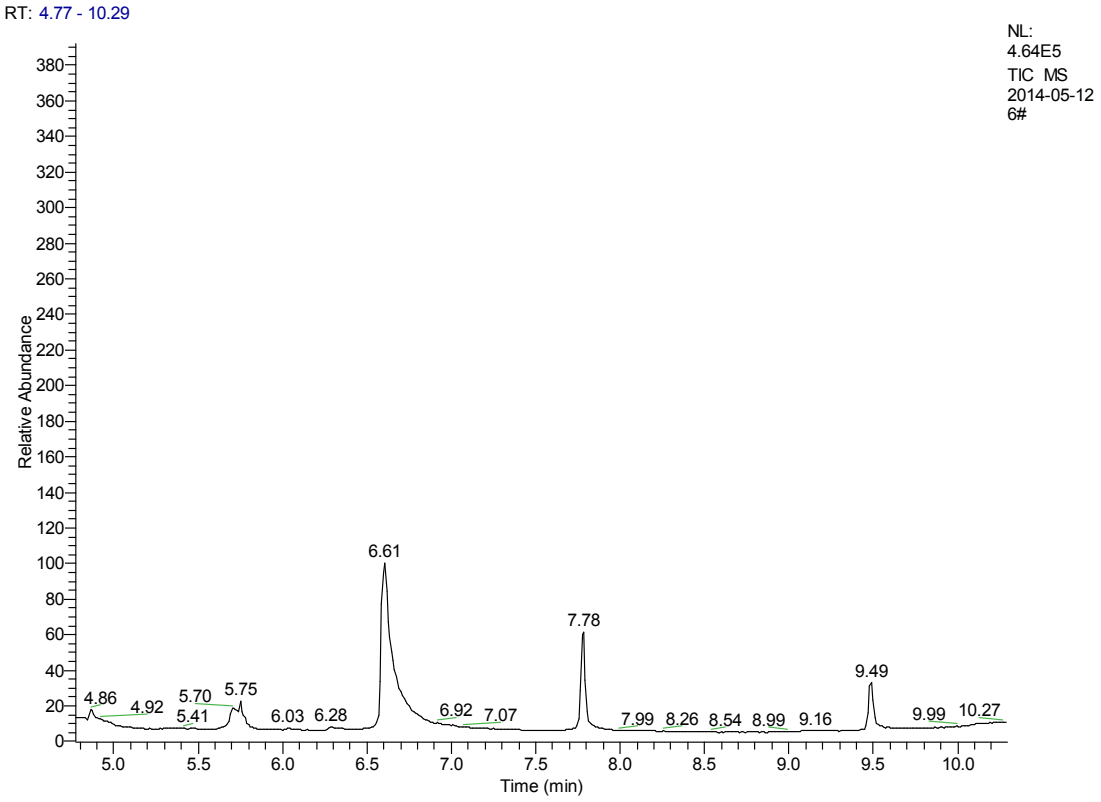
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NL:
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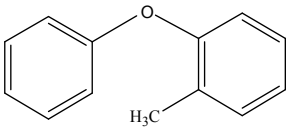
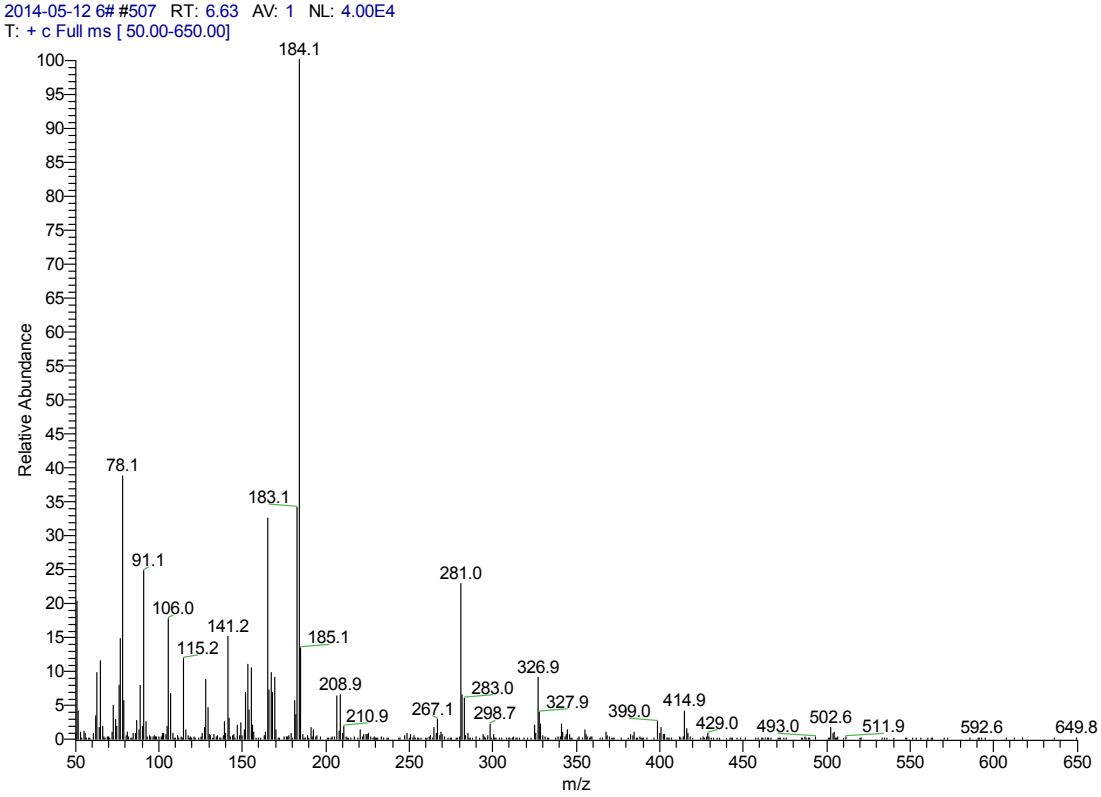
TIC MS
2014-05-12
6#
Relative Abundance
Time (min)
4.86
4.92
5.41
5.70
5.75
6.03
6.28
6.61
6.92
7.07
7.78
7.99
8.26
8.54
8.99
9.16
9.49
9.99
10.27


O
H3C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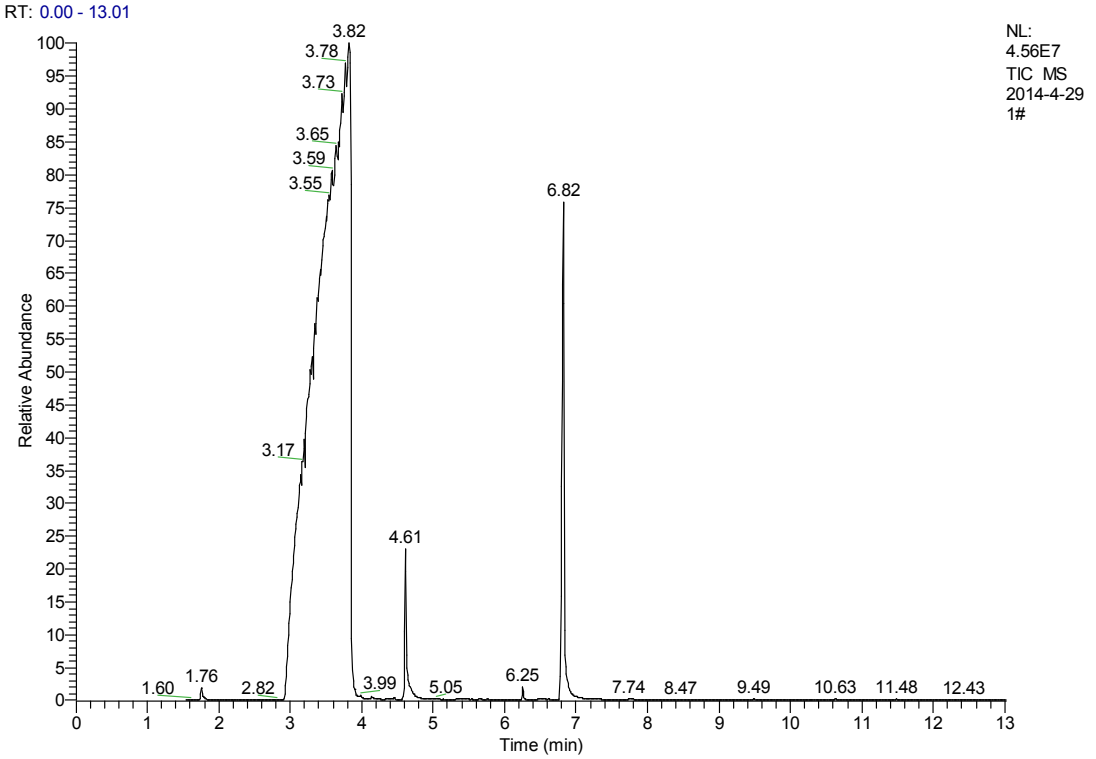
T: + c Full ms [50.00-650.00]
Relative Abundance
m/z
184.1
78.1
183.1
91.1
281.0
106.0
141.2
115.2
185.1
326.9
208.9
283.0
210.9
267.1
298.7
327.9
399.0
414.9
429.0
493.0
502.6
511.9
592.6
649.8

Entry 3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NL:
4.56E7
TIC MS
2014-4-29
1#
Relative Abundance
Time (min)
3.82
3.78
3.73
3.65
3.59
3.55
6.82
3.17
4.61
1.60
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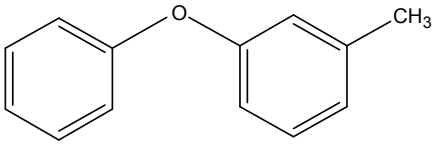
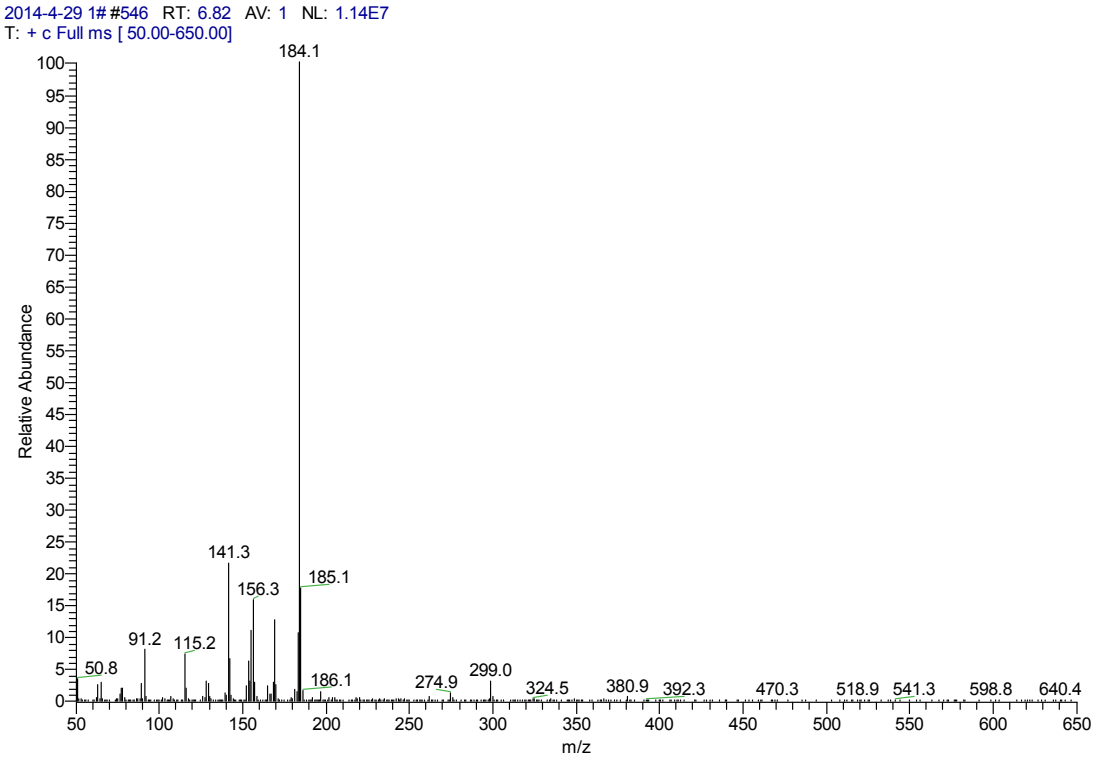
10.63
11.48
12.43


O
CH3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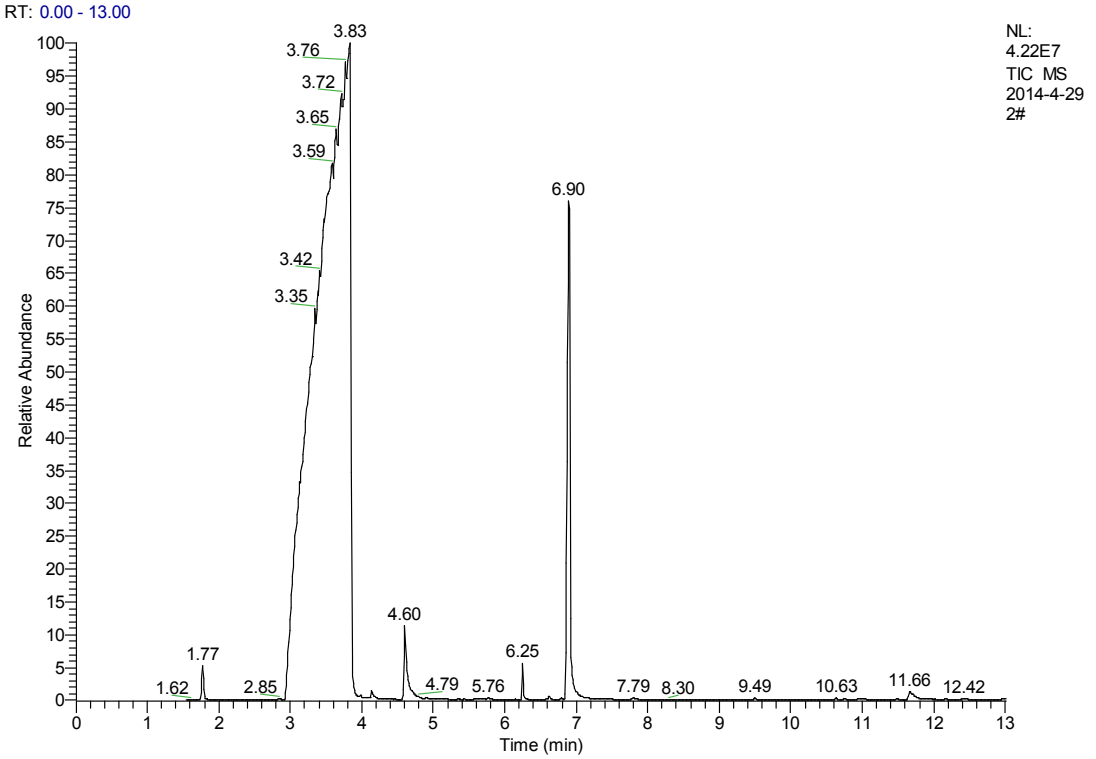
Relative Abundance
m/z
184.1
141.3
156.3
185.1
91.2
115.2
50.8
186.1
274.9
299.0
324.5
380.9
392.3
470.3
518.9
541.3
598.8
640.4

Entry 4


RT: 0.00 - 13.00
NL:
4.22E7
TIC MS
2014-4-29
2#
Relative Abundance
Time (min)
3.83
3.76
3.72
3.65
3.59
6.90
3.42
3.35
4.60
1.77
6.25
1.62
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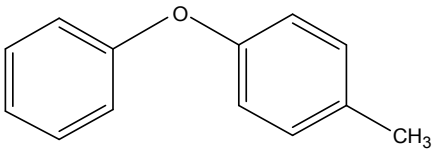
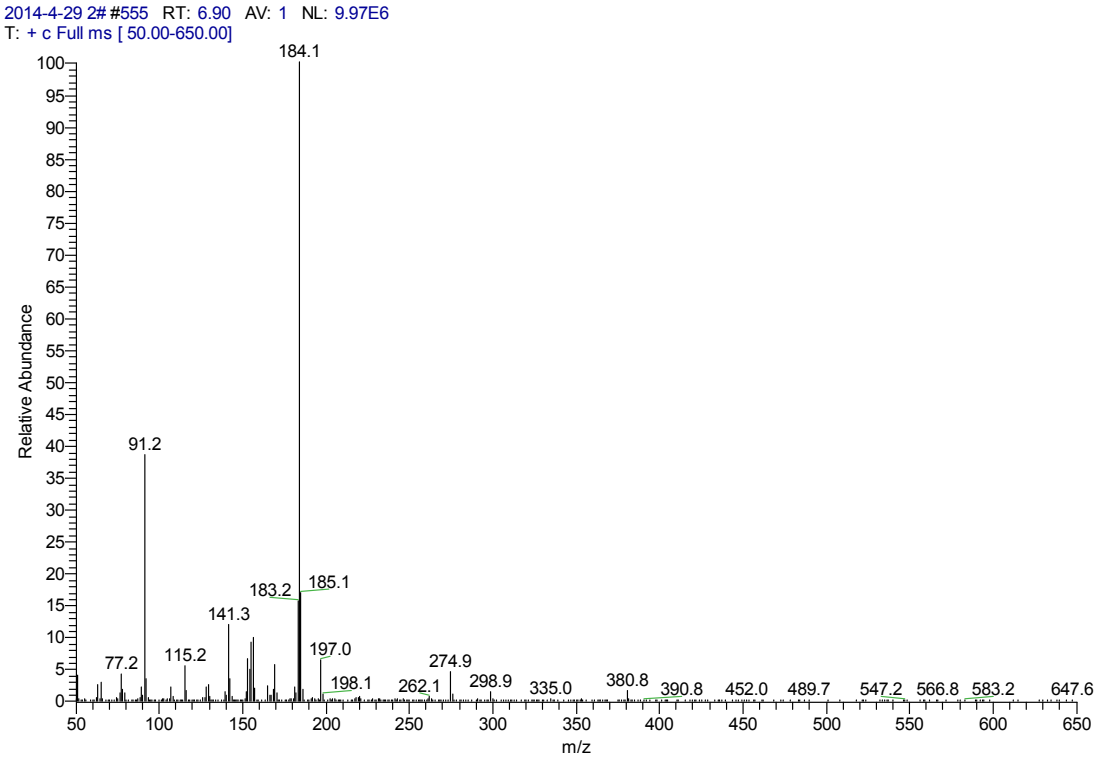
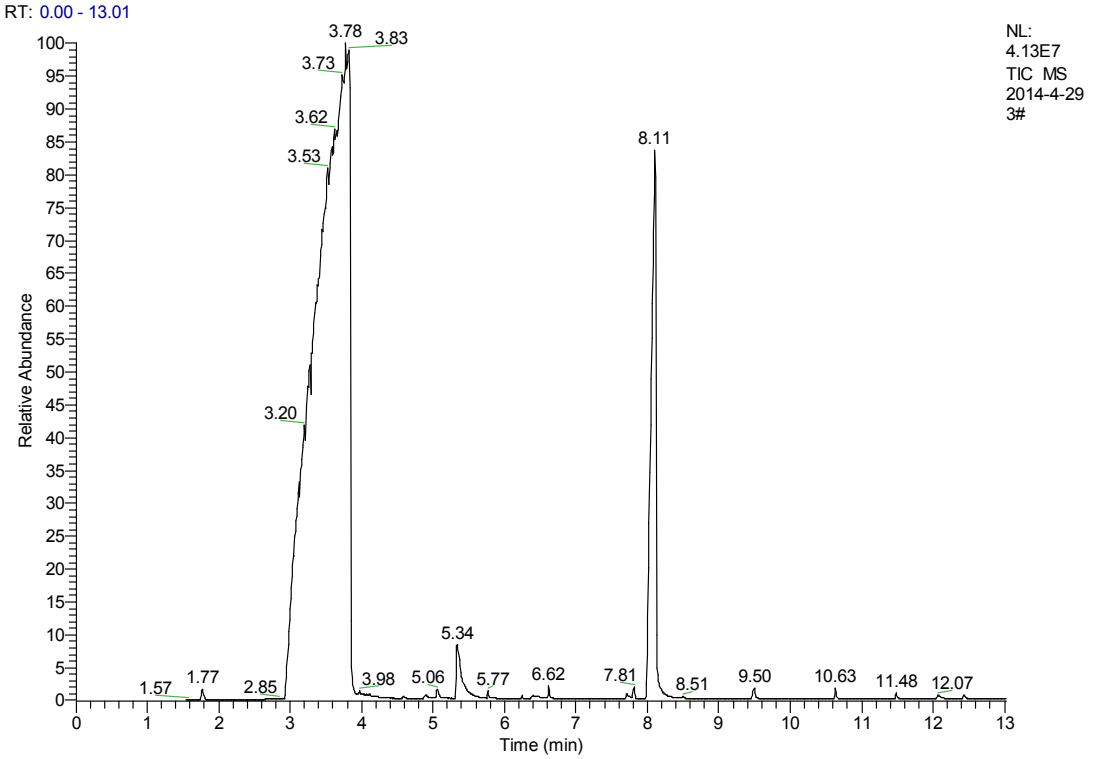
9.49
10.63
11.66
12.42


O
CH3


2014-4-29 2# #555 RT: 6.90 AV: 1 NL: 9.97E6
T: + c Full ms [50.00-650.00]
Relative Abundance
m/z
184.1
91.2
183.2
185.1
141.3
197.0
77.2
115.2
274.9
198.1
262.1
298.9
335.0
380.8
390.8
452.0
489.7
547.2
566.8
583.2
647.6

Entry 5


RT: 0.00 - 13.01
NL:
4.13E7
TIC MS
2014-4-29
3#
Relative Abundance
Time (min)
3.78
3.83
3.73
3.62
3.53
8.11
3.20
5.34
1.57
1.77
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3.98
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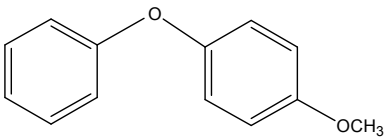
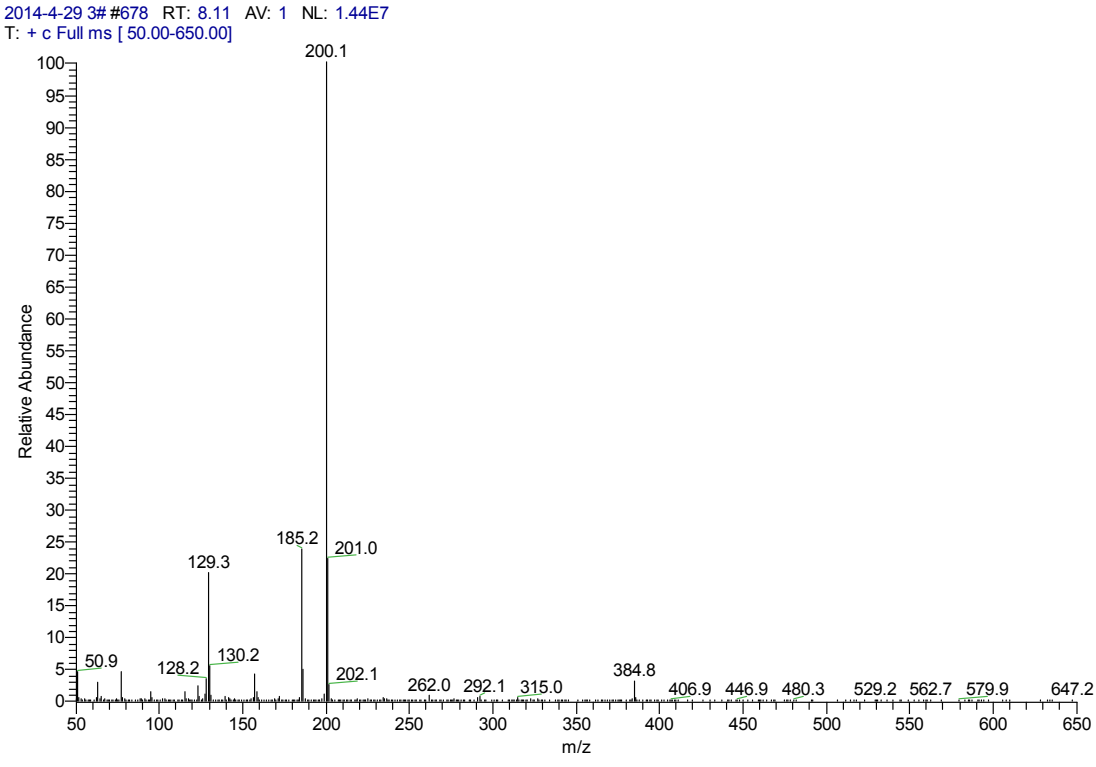
5.77
6.62
7.81
8.51
9.50
10.63
11.48
12.07


O
OCH3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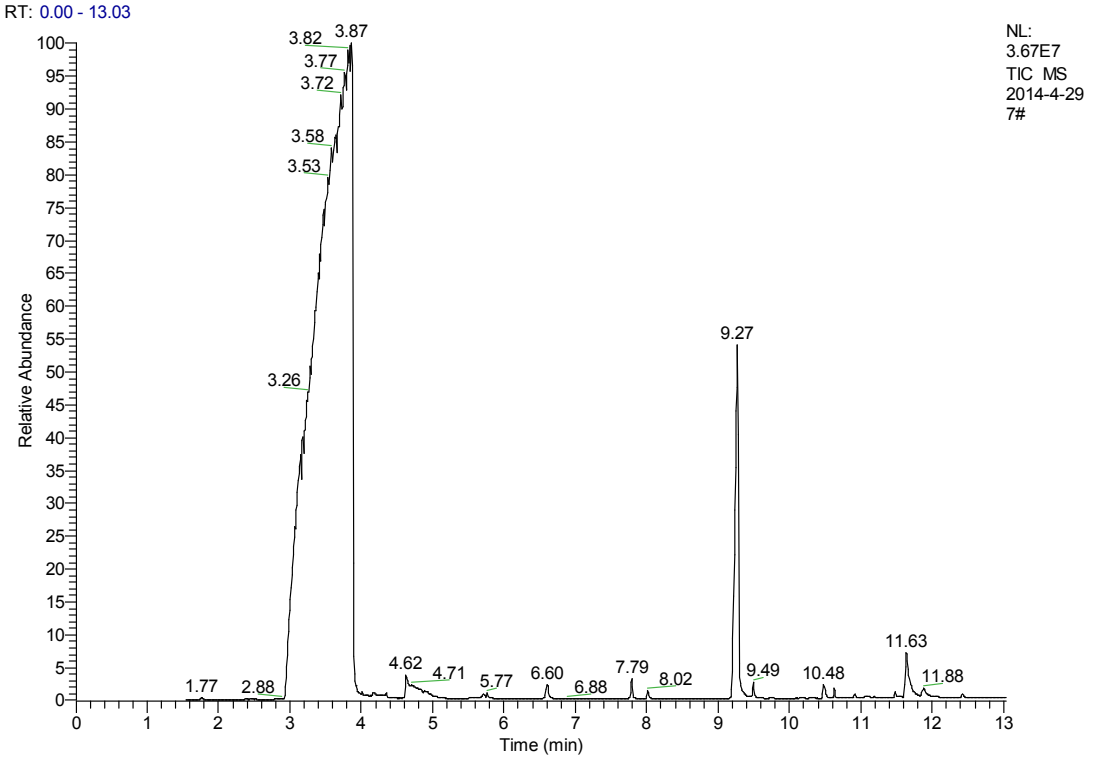
T: + c Full ms [50.00-650.00]
Relative Abundance
m/z
200.1
185.2
201.0
129.3
130.2
50.9
128.2
202.1
262.0
292.1
315.0
384.8
406.9
446.9
480.3
529.2
562.7
579.9
647.2

Entry 6


RT: 0.00 - 13.03
NL:
3.67E7
TIC MS
2014-4-29
7#
Relative Abundance
Time (min)
3.82
3.87
3.77
3.72
3.58
3.53
3.26
9.27
1.77
2.88
4.62
4.71
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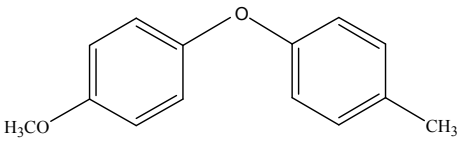
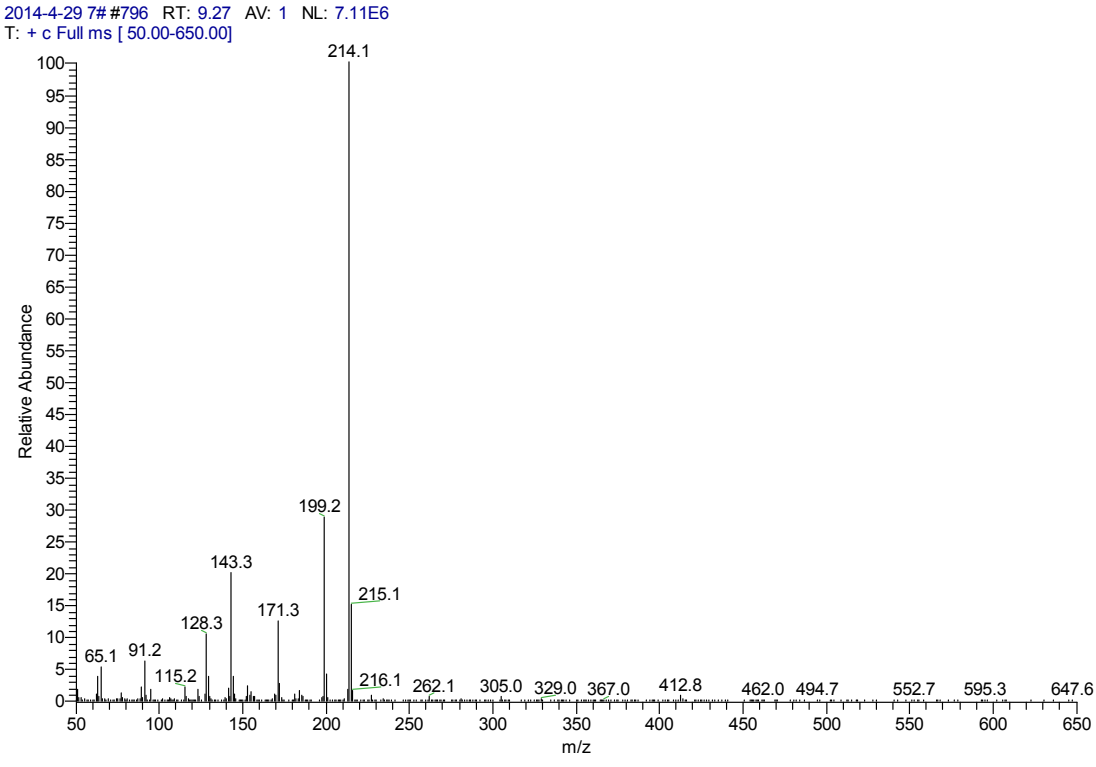
7.79
8.02
9.49
10.48
11.63
11.88


O
H3CO
CH3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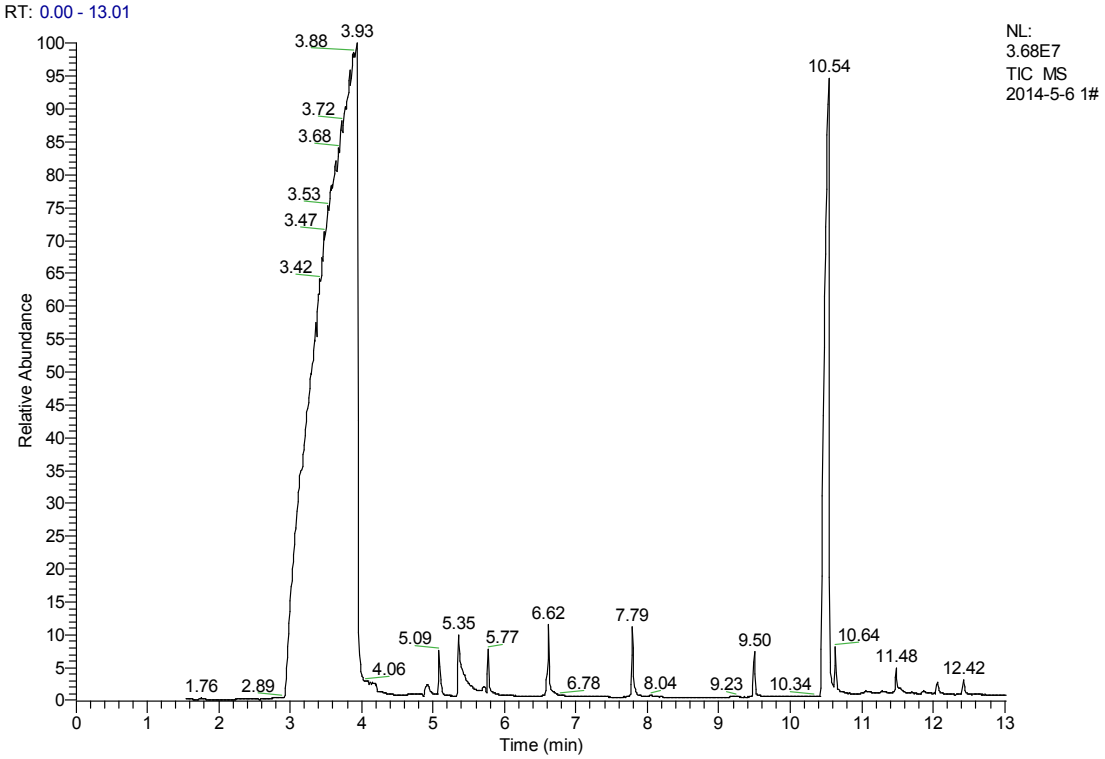
T: + c Full ms [50.00-650.00]
Relative Abundance
m/z
214.1
199.2
143.3
215.1
171.3
128.3
65.1
91.2
115.2
216.1
262.1
305.0
329.0
367.0
412.8
462.0
494.7
552.7
595.3
647.6

Entry 7


RT: 0.00 - 13.01
NL:
3.68E7
TIC MS
2014-5-6 1#
Relative Abundance
Time (min)
3.88
3.93
3.72
3.68
3.53
3.47
3.42
10.54
1.76
2.89
4.06
5.09
5.35
5.77
6.62
6.78
7.79
8.04
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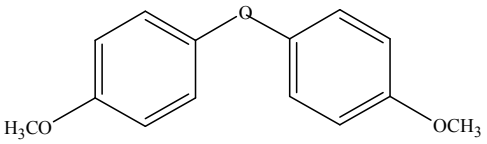
9.50
10.34
10.64
11.48
12.42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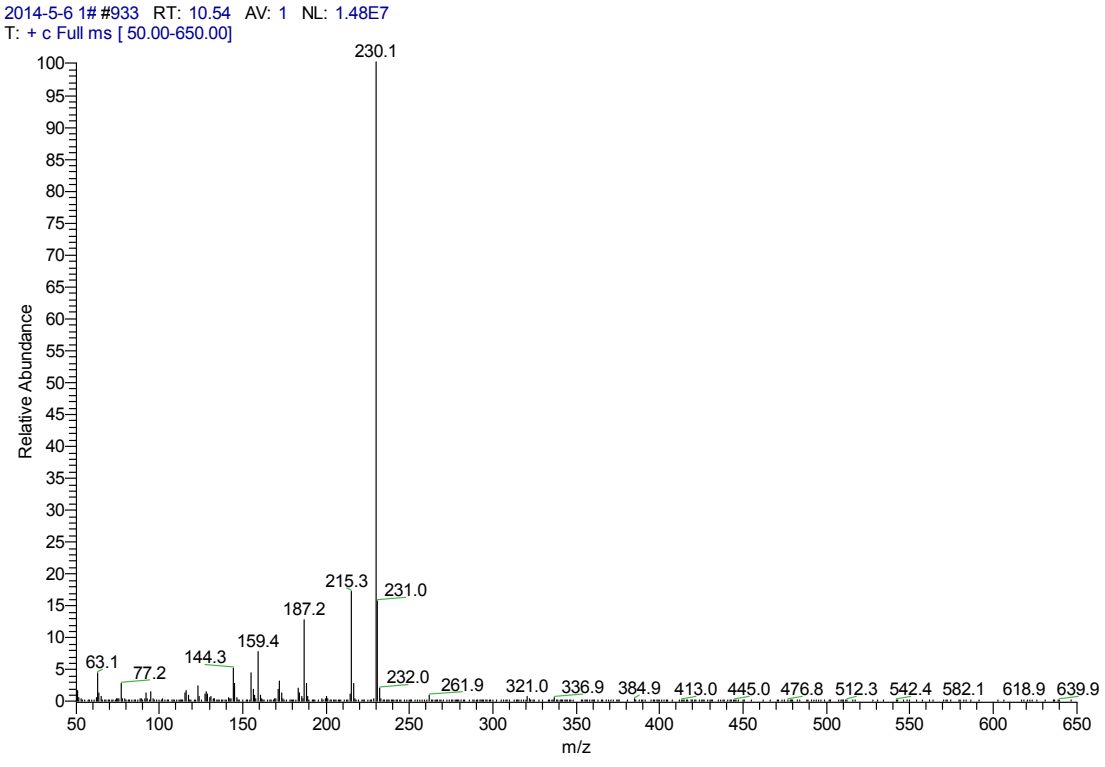
H3CO
OCH3


2014-5-6 1# #933 RT: 10.54 AV: 1 NL: 1.48E7
T: + c Full ms [50.00-650.00]
Relative Abundance
m/z
230.1
215.3
231.0
187.2
159.4
144.3
63.1
77.2
232.0
261.9
321.0
336.9
384.9
413.0
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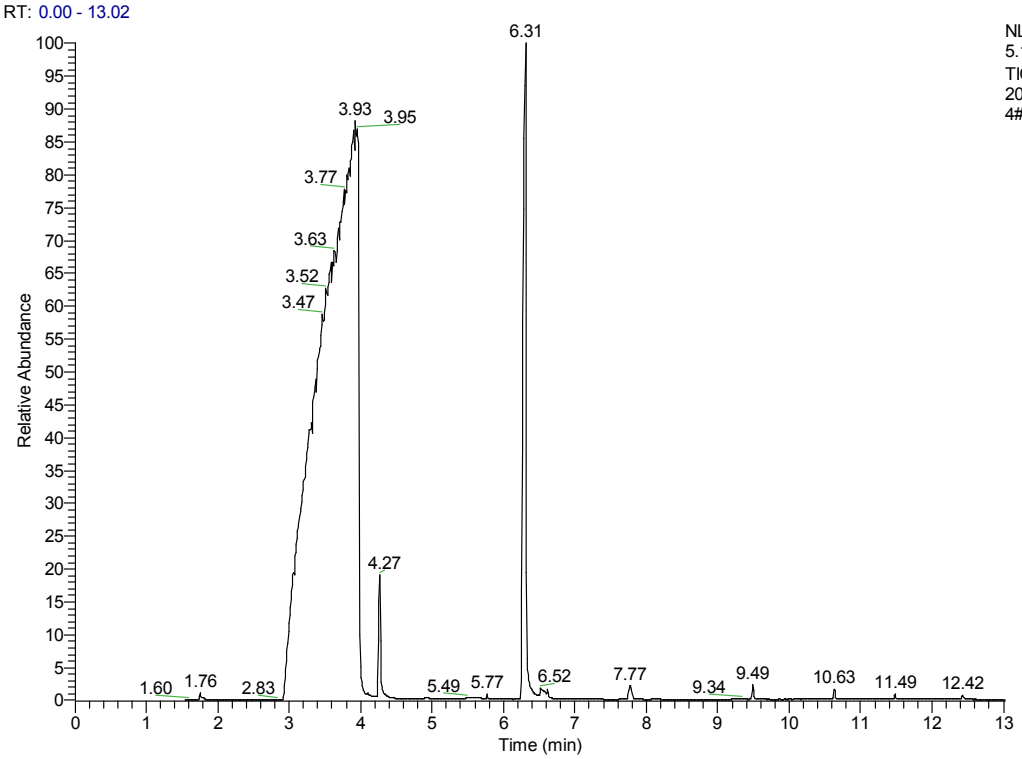
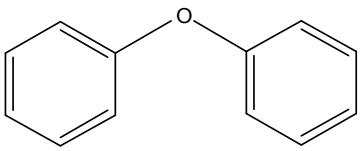
476.8
512.3
542.4
582.1
618.9
639.9

Entry 8





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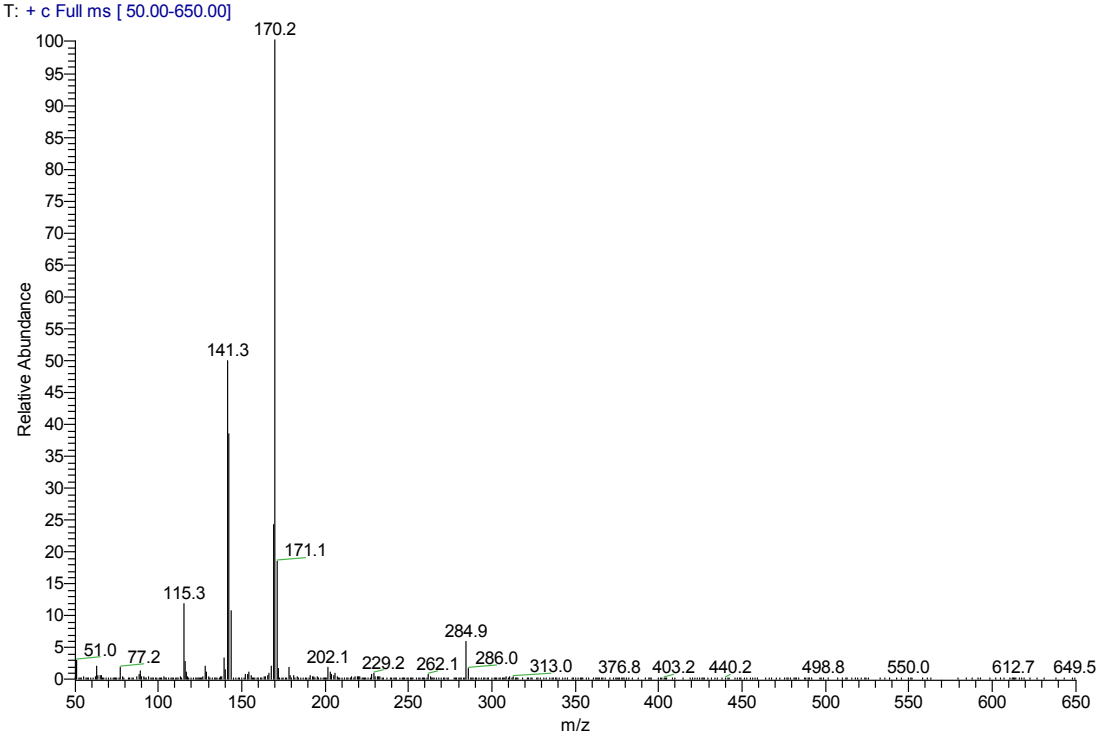

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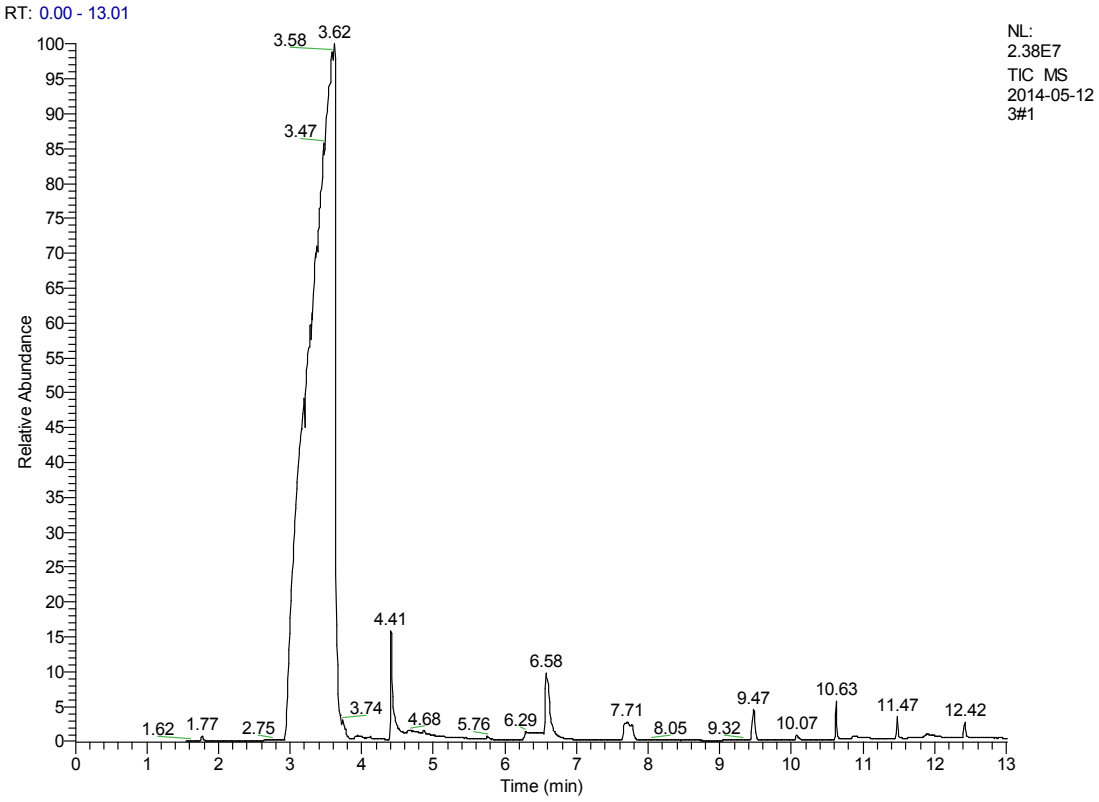
RT: 0.00 - 13.01
NL:
2.38E7
TIC MS
2014-05-12
3#1
Relative Abundance
Time (min)
3.58
3.62
3.47
4.41
6.58
1.62
1.77
2.75
3.74
4.68
5.76
6.29
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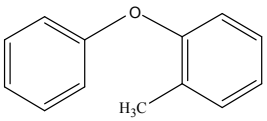
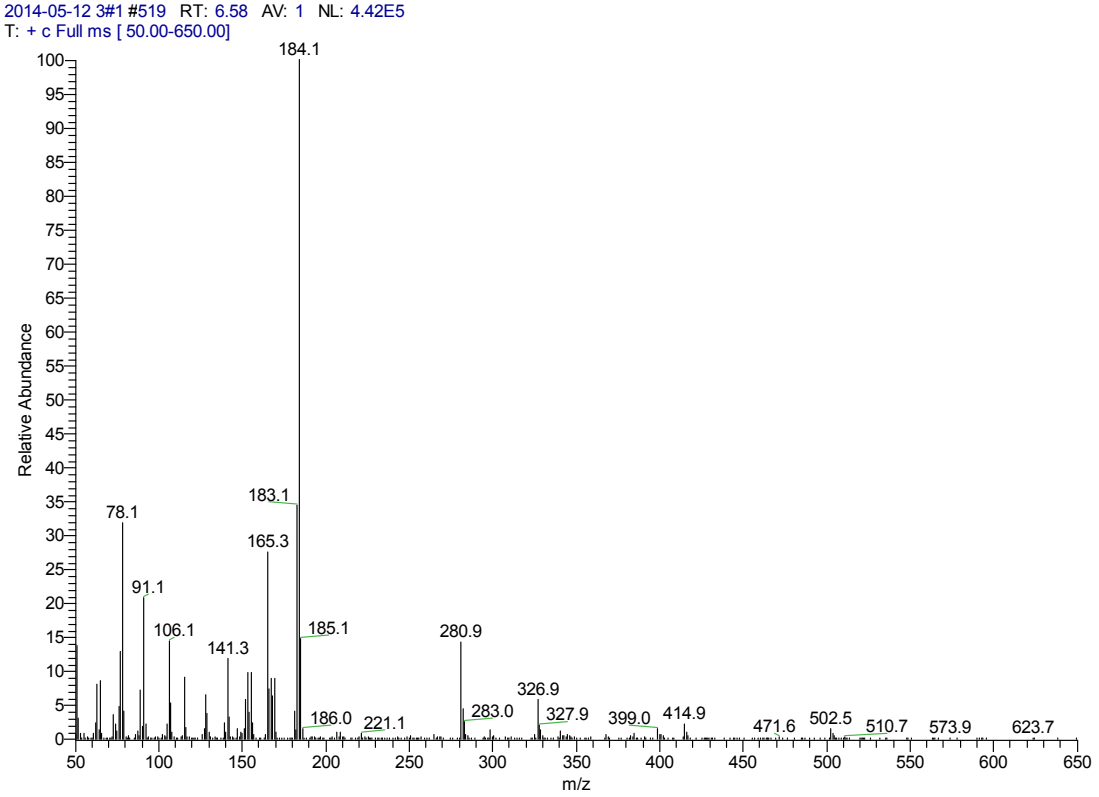
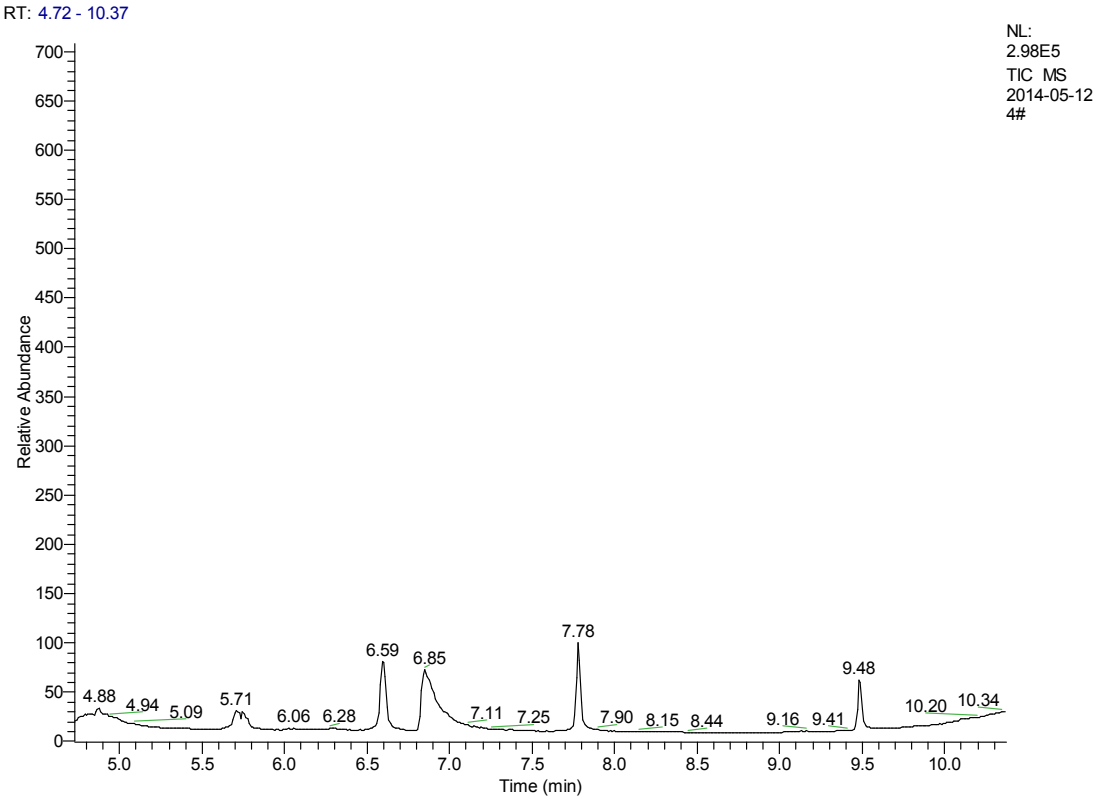
9.32
9.47
10.07
10.63
11.47
12.42


O
H3C


2014-05-12 3#1 #519 RT: 6.58 AV: 1 NL: 4.42E5
T: + c Full ms [50.00-650.00]
Relative Abundance
m/z
184.1
183.1
78.1
165.3
91.1
106.1
141.3
185.1
280.9
326.9
186.0
221.1
283.0
327.9
399.0
414.9
471.6
502.5
510.7
573.9
623.7

Entry 10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NL:
2.98E5
TIC MS
2014-05-12
4#
Relative Abundance
Time (min)
4.88
4.94
5.09
5.71
6.06
6.28
6.59
6.85
7.11
7.25
7.78
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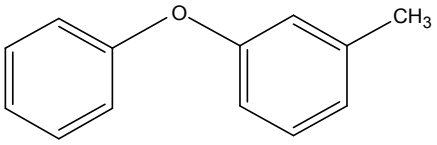
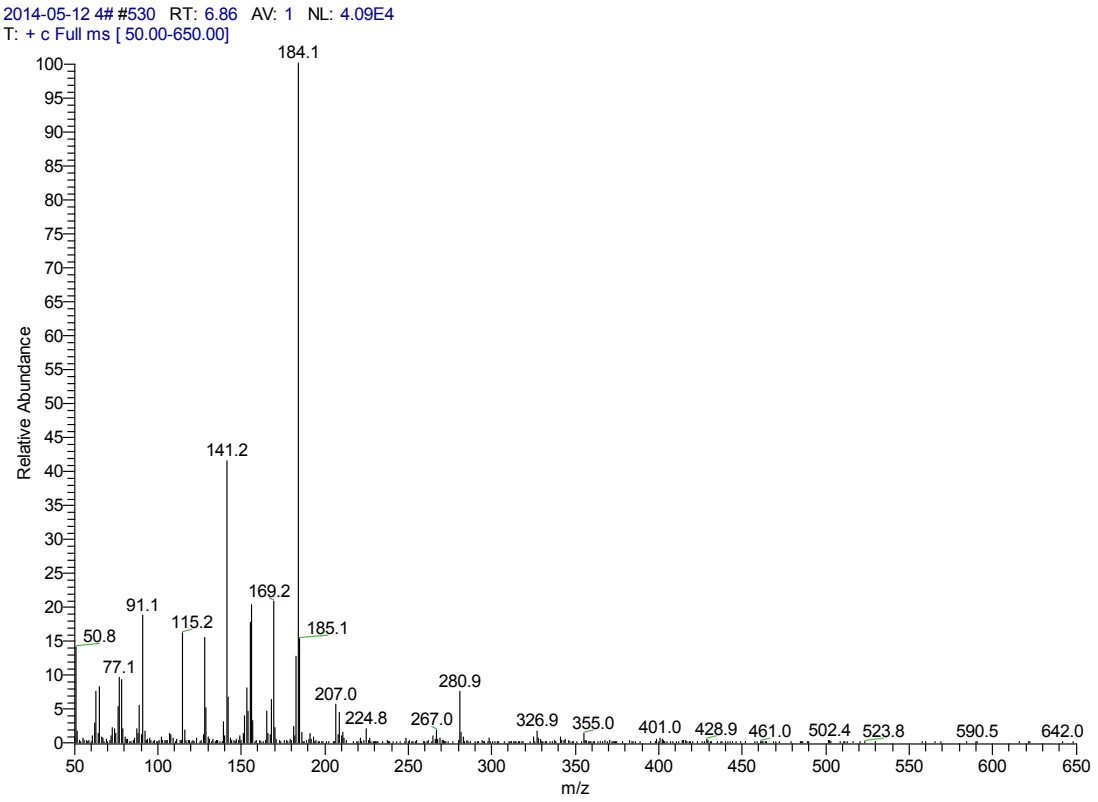
9.16
9.41
9.48
10.20
10.34


O
CH3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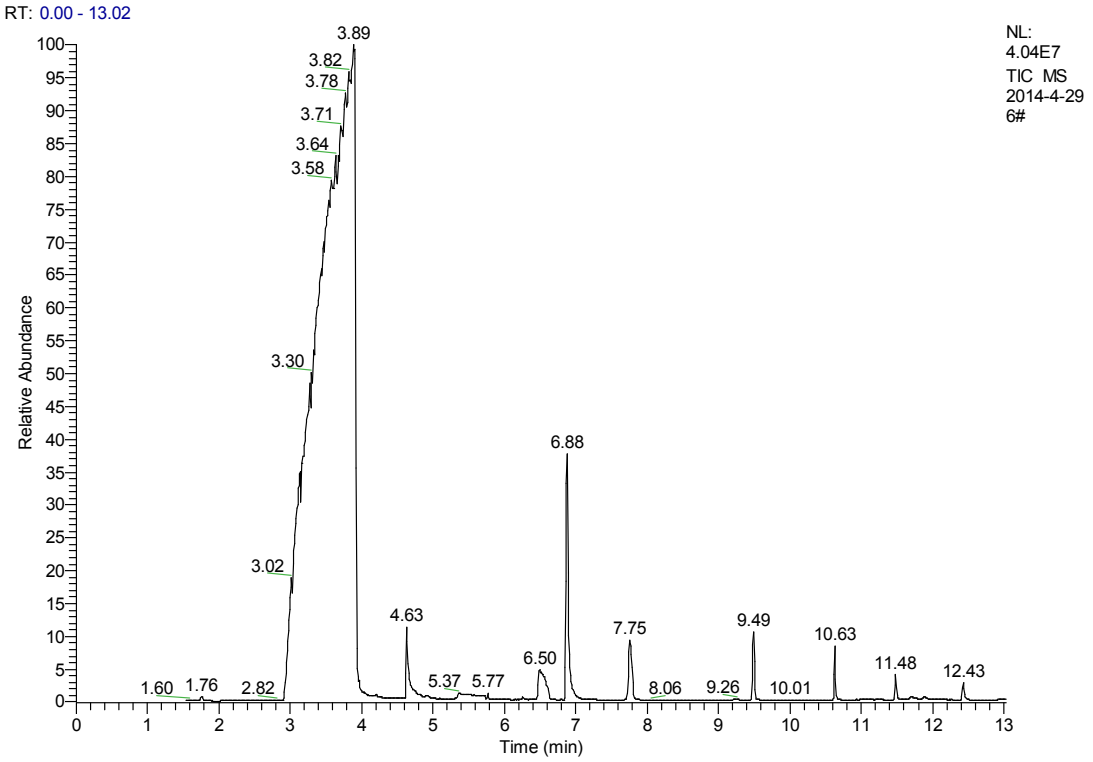
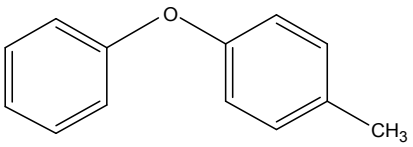
T: + c Full ms [50.00-650.00]
Relative Abundance
m/z
184.1
141.2
91.1
169.2
115.2
185.1
50.8
77.1
207.0
280.9
224.8
267.0
326.9
355.0
401.0
428.9
461.0
502.4
523.8
590.5
642.0

Entry 11


RT: 0.00 - 13.02
NL:
4.04E7
TIC MS
2014-4-29
6#
Relative Abundance
Time (min)
3.89
3.82
3.78
3.71
3.64
3.58
3.30
3.02
6.88
4.63
7.75
9.49
10.63
6.50
11.48
12.43
1.60
1.76
2.82
5.37
5.77
8.06
9.26
10.01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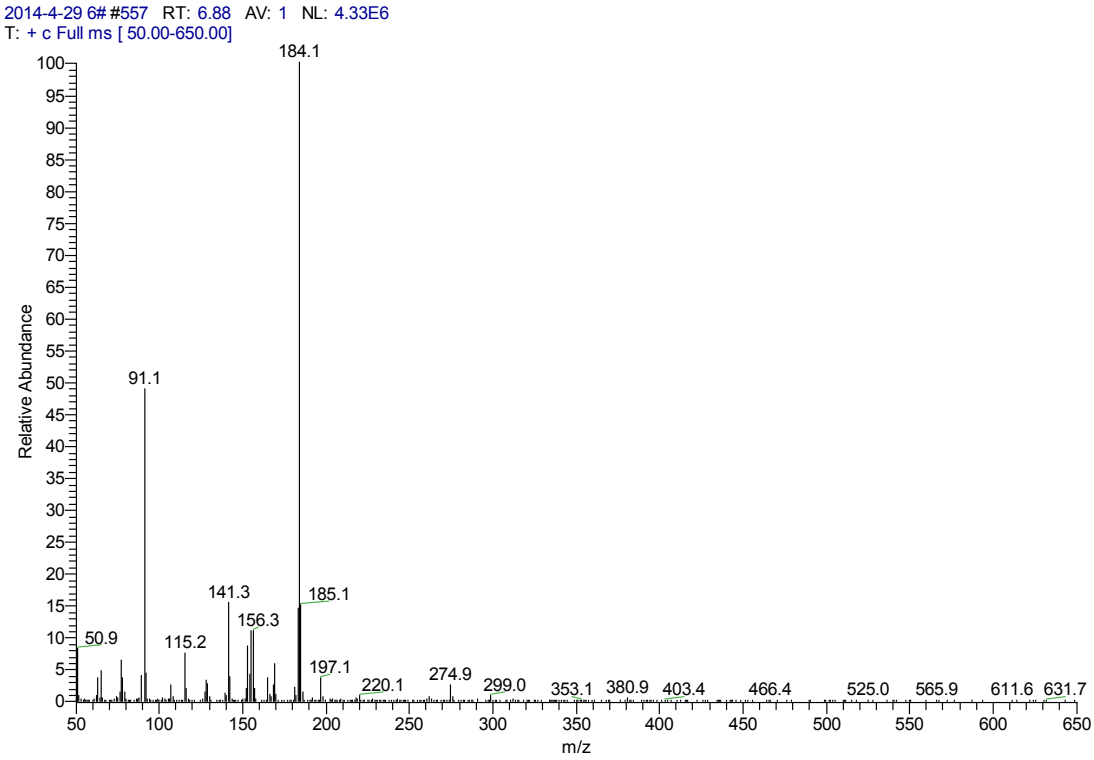
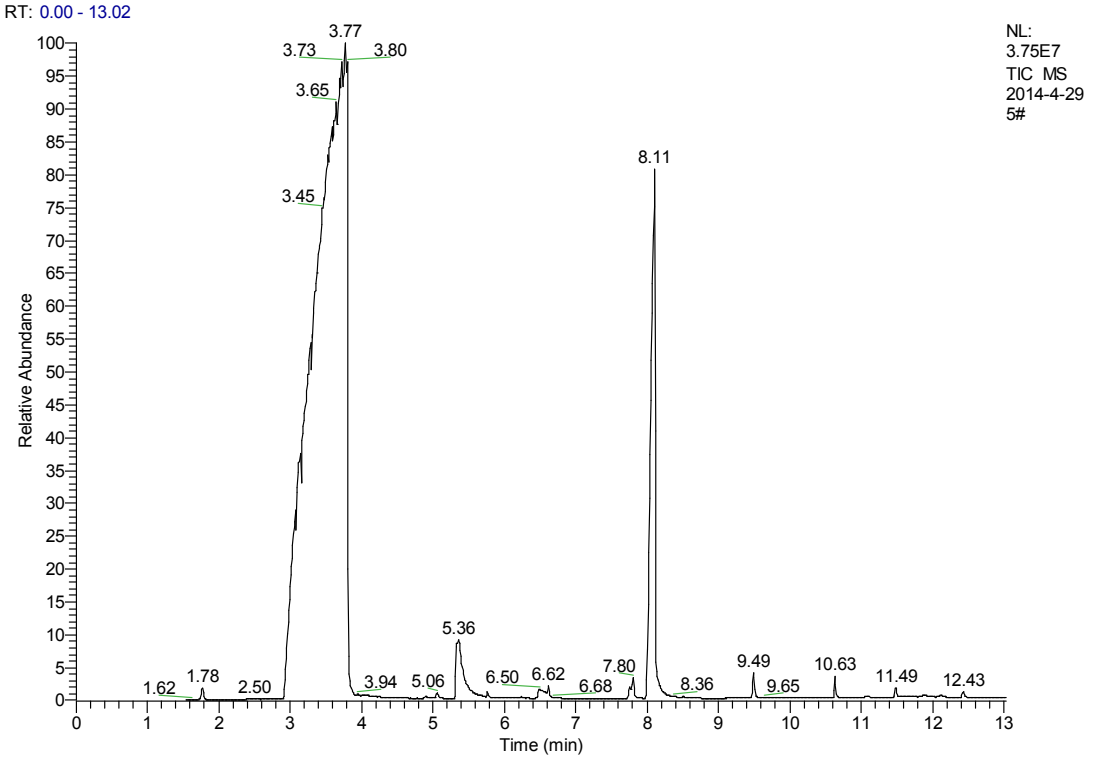
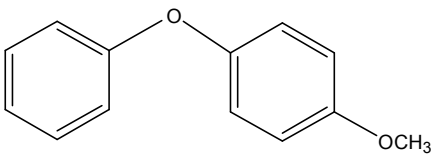
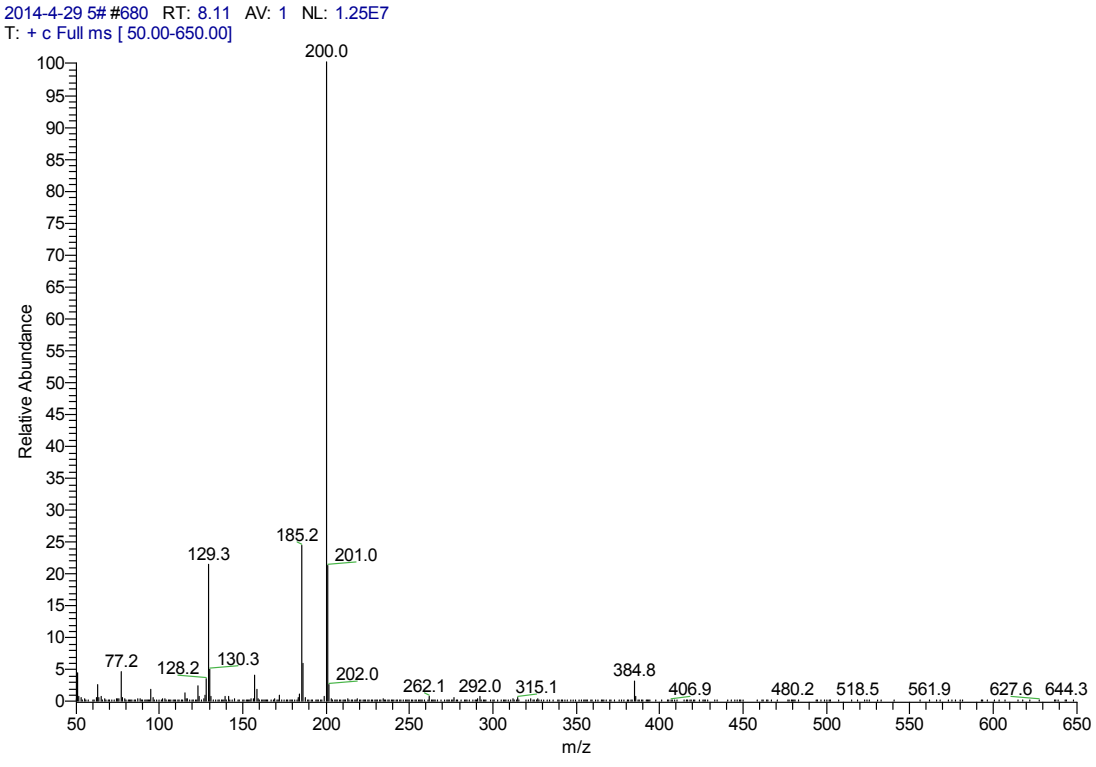
CH3


2014-4-29 6# #557 RT: 6.88 AV: 1 NL: 4.33E6
T: + c Full ms [50.00-650.00]
Relative Abundance
m/z
184.1
91.1
141.3
185.1
156.3
50.9
115.2
197.1
220.1
274.9
299.0
353.1
380.9
403.4
466.4
525.0
565.9
611.6
631.7

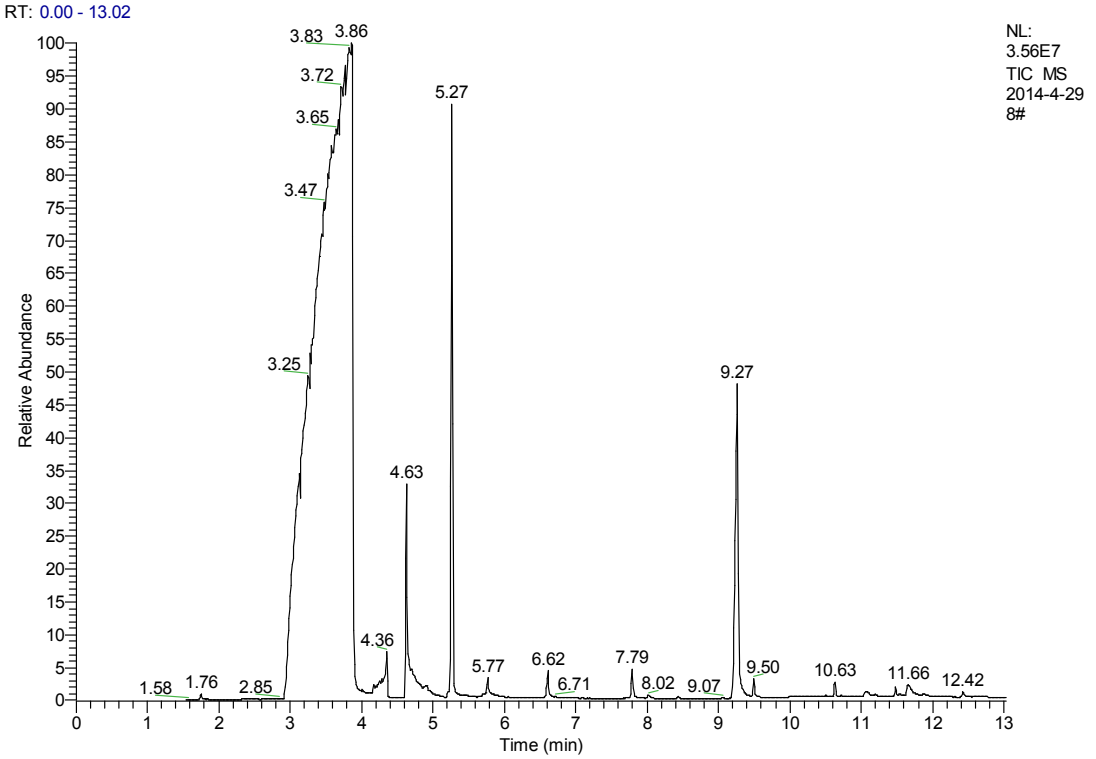
Entry 12

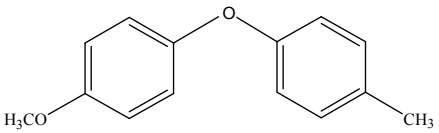

RT: 0.00 - 13.02
NL:
3.75E7
TIC MS
2014-4-29
5#
Relative Abundance
Time (min)
3.77
3.73
3.80
3.65
3.45
8.11
5.36
1.62
1.78
2.50
3.94
5.06
6.50
6.62
6.68
7.80
8.36
9.49
9.65
10.63
11.49
12.43

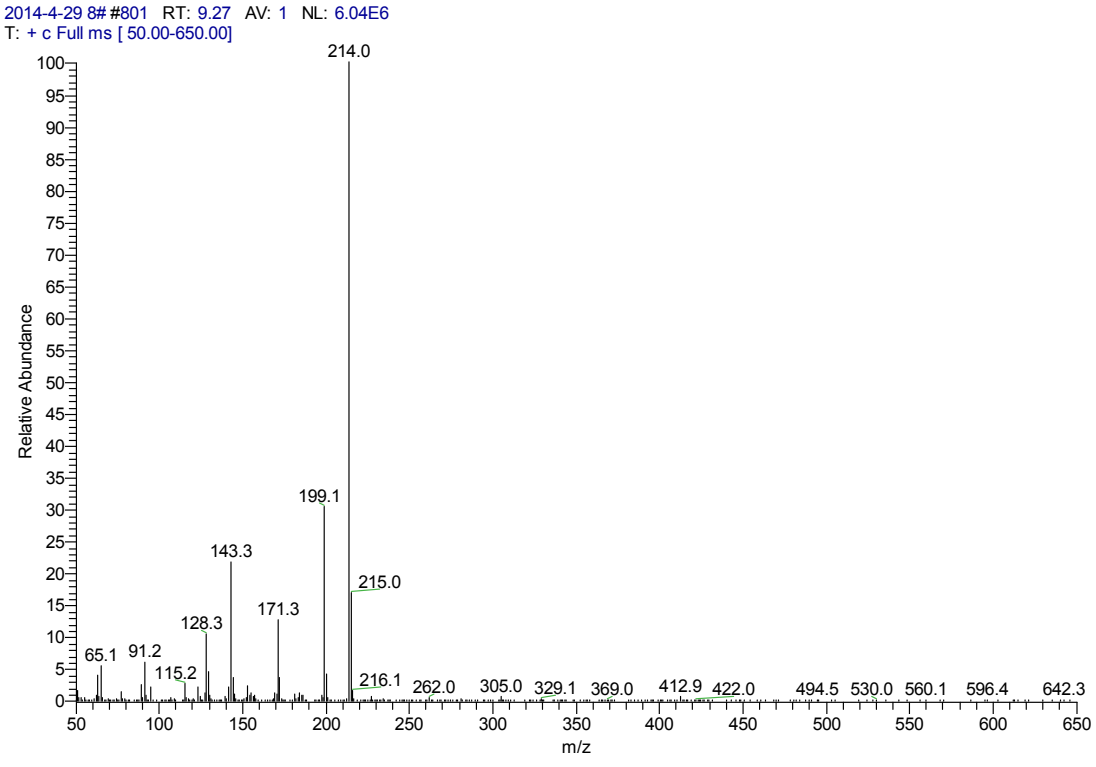

O
OCH3


2014-4-29 5# #680 RT: 8.11 AV: 1 NL: 1.25E7
T: + c Full ms [50.00-650.00]
Relative Abundance
m/z
200.0
185.2
129.3
201.0
77.2
128.2
130.3
202.0
262.1
292.0
315.1
384.8
406.9
480.2
518.5
561.9
627.6
644.3

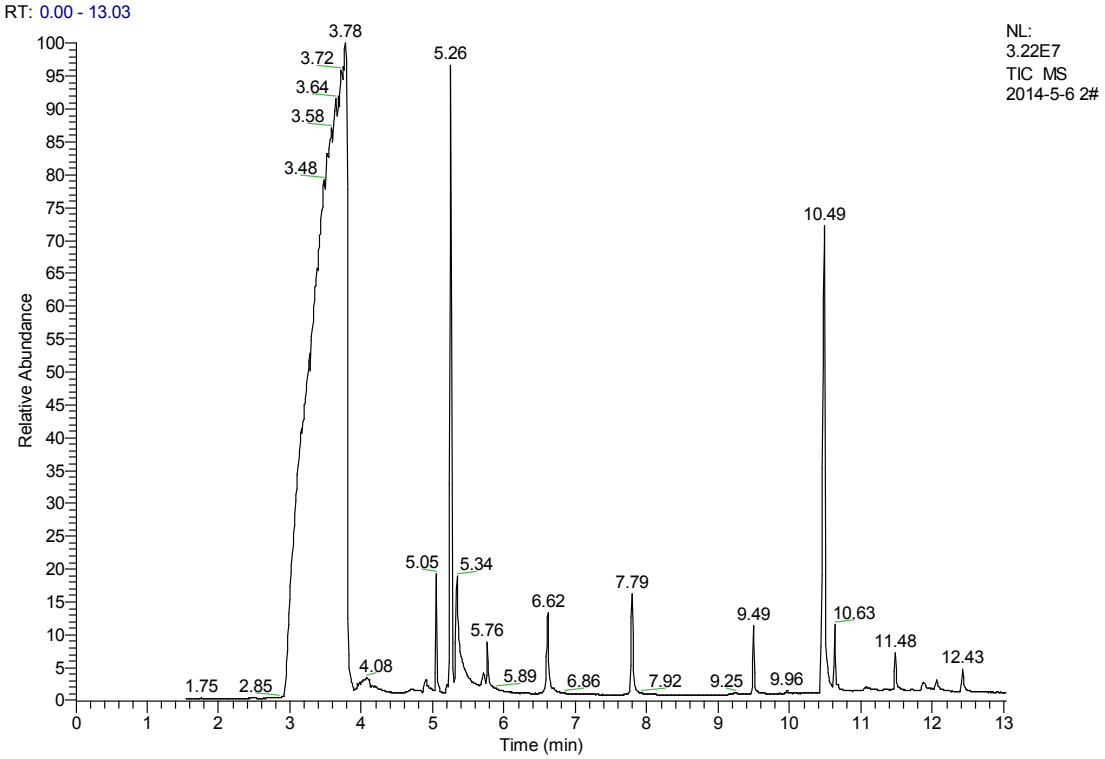
Entry 13

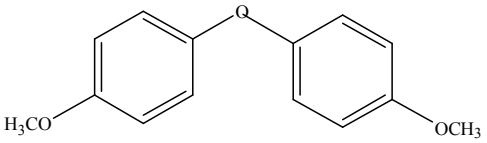

RT: 0.00 - 13.02
NL:
3.56E7
TIC MS
2014-4-29
8#
Relative Abundance
Time (min)
3.83
3.86
3.72
3.65
3.47
3.25
5.27
4.63
4.36
9.27
1.58
1.76
2.85
5.77
6.62
6.71
7.79
8.02
9.07
9.50
10.63
11.66
12.42

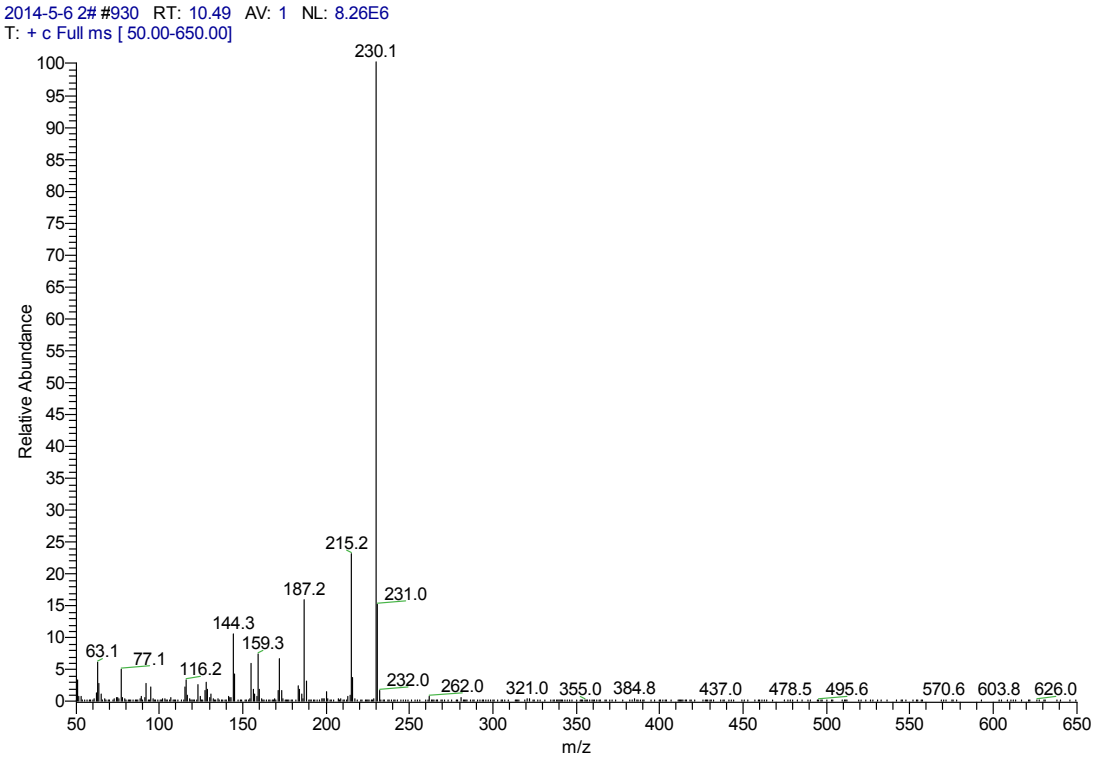

O
H3CO
CH3


2014-4-29 8# #801 RT: 9.27 AV: 1 NL: 6.04E6
T: + c Full ms [50.00-650.00]
Relative Abundance
m/z
214.0
199.1
143.3
215.0
171.3
128.3
65.1
91.2
115.2
216.1
262.0
305.0
329.1
369.0
412.9
422.0
494.5
530.0
560.1
596.4
642.3

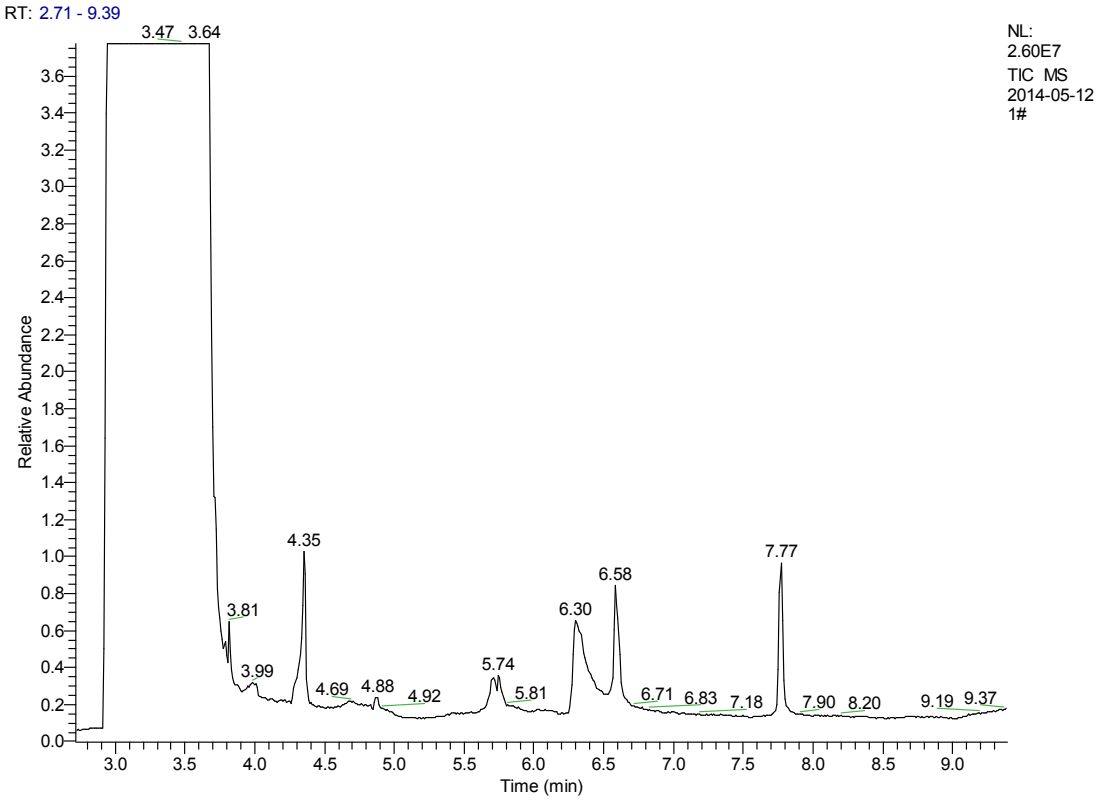
Entry 14

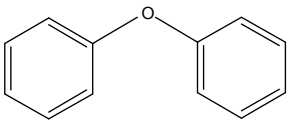

RT: 0.00 - 13.03
NL:
3.22E7
TIC MS
2014-5-6 2#
Relative Abundance
Time (min)
3.78
3.72
3.64
3.58
3.48
5.26
10.49
5.05
5.34
7.79
6.62
9.49
10.63
5.76
11.48
12.43
4.08
1.75
2.85
5.89
6.86
7.92
9.25
9.96

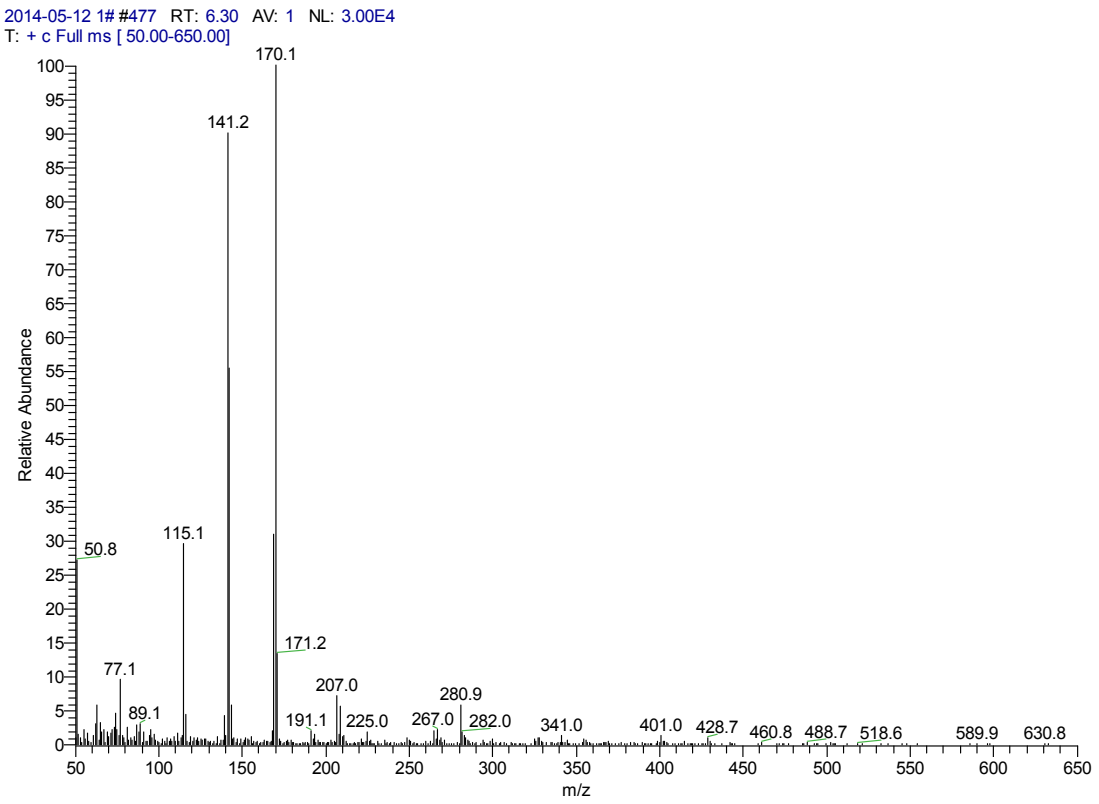

O
H3CO
OCH3


2014-5-6 2# #930 RT: 10.49 AV: 1 NL: 8.26E6
T: + c Full ms [50.00-650.00]
Relative Abundance
m/z
230.1
215.2
187.2
231.0
144.3
159.3
63.1
77.1
116.2
232.0
262.0
321.0
355.0
384.8
437.0
478.5
495.6
570.6
603.8
626.0

Entry 15

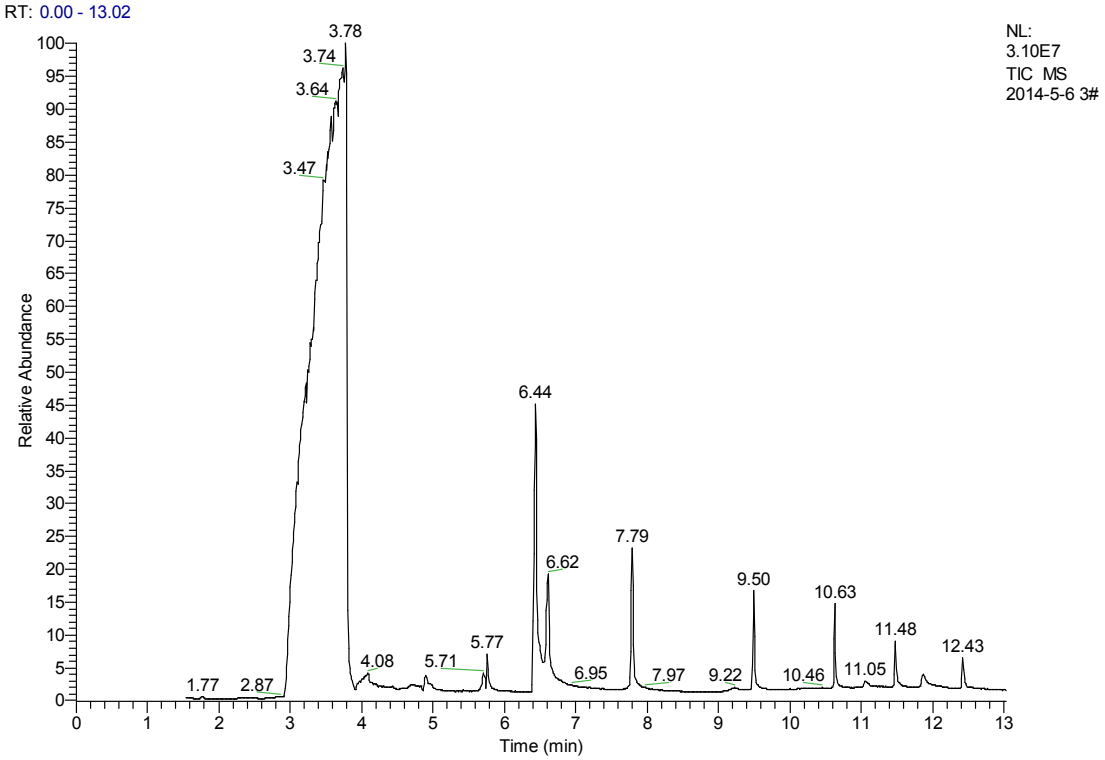

RT: 2.71 - 9.39
NL:
2.60E7
TIC MS
2014-05-12
1#
Relative Abundance
Time (min)
3.47
3.64
3.81
3.99
4.35
4.69
4.88
4.92
5.74
5.81
6.30
6.58
6.71
6.83
7.18
7.77
7.90
8.20
9.19
9.37

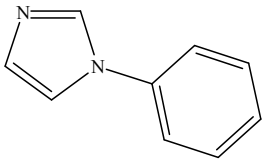

O

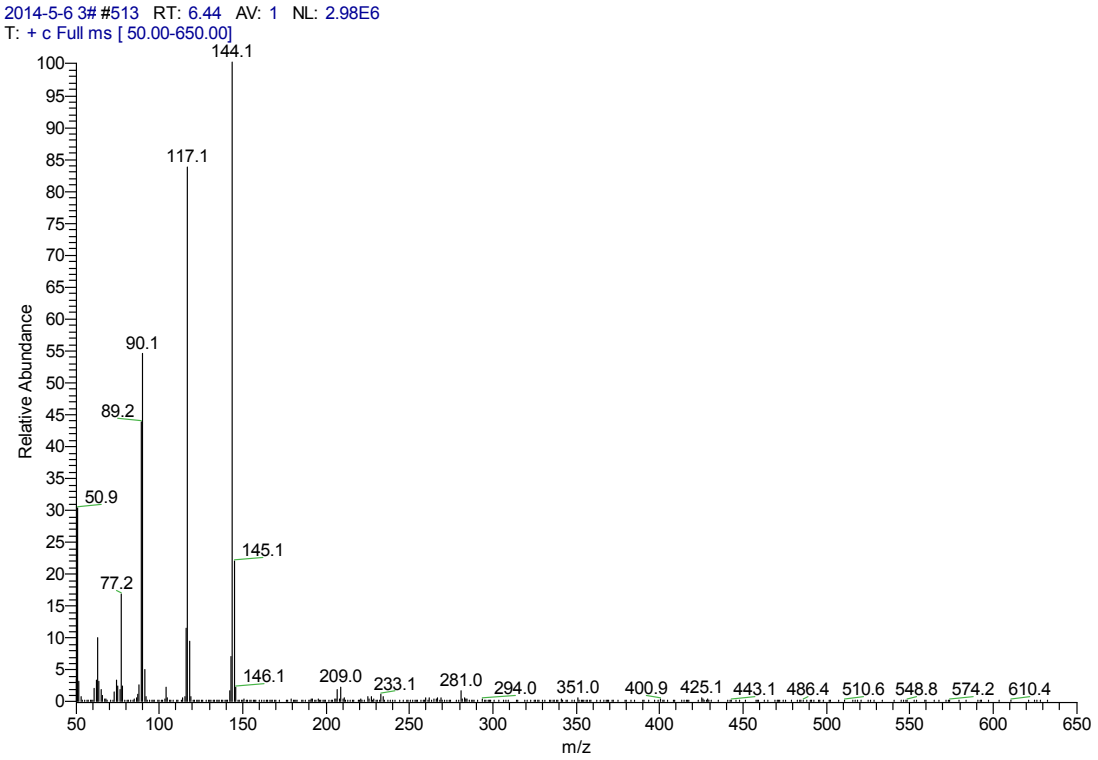

2014-05-12 1# #477 RT: 6.30 AV: 1 NL: 3.00E4
T: + c Full ms [50.00-650.00]
Relative Abundance
m/z
170.1
141.2
115.1
50.8
171.2
77.1
207.0
89.1
280.9
191.1
225.0
267.0
282.0
341.0
401.0
428.7
460.8
488.7
518.6
589.9
630.8

GC-MS Table 3

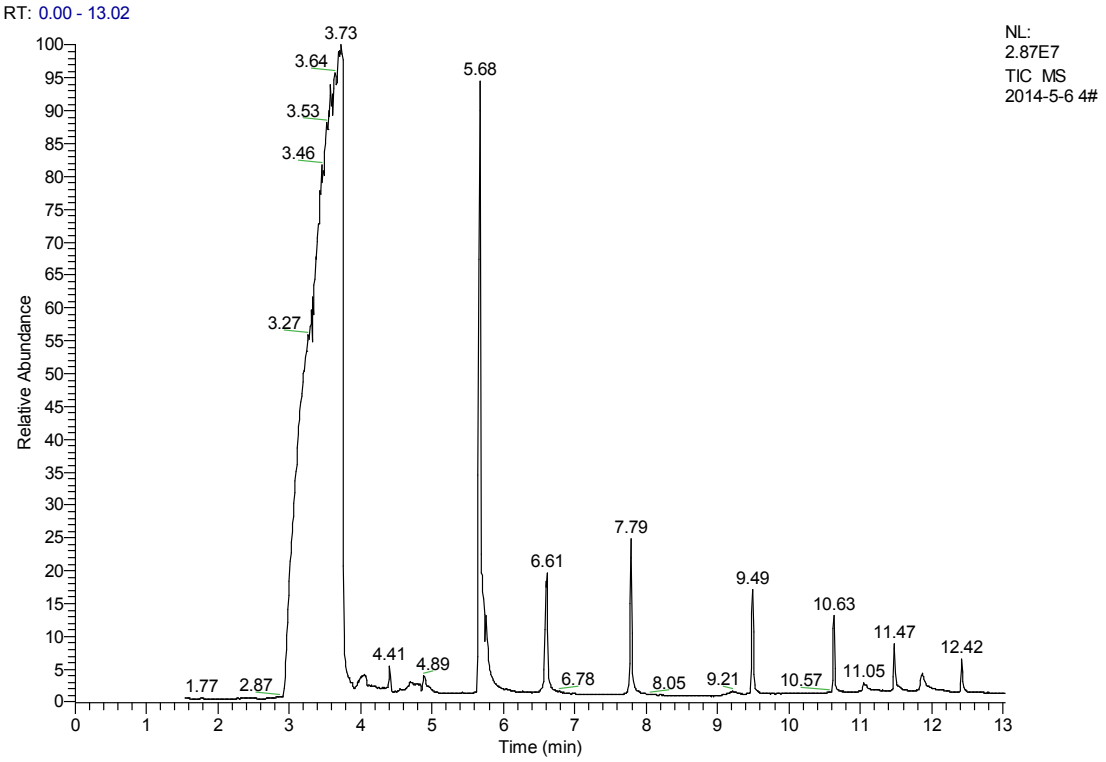
Entry 1

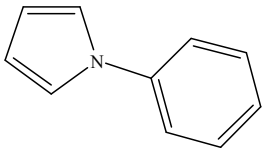


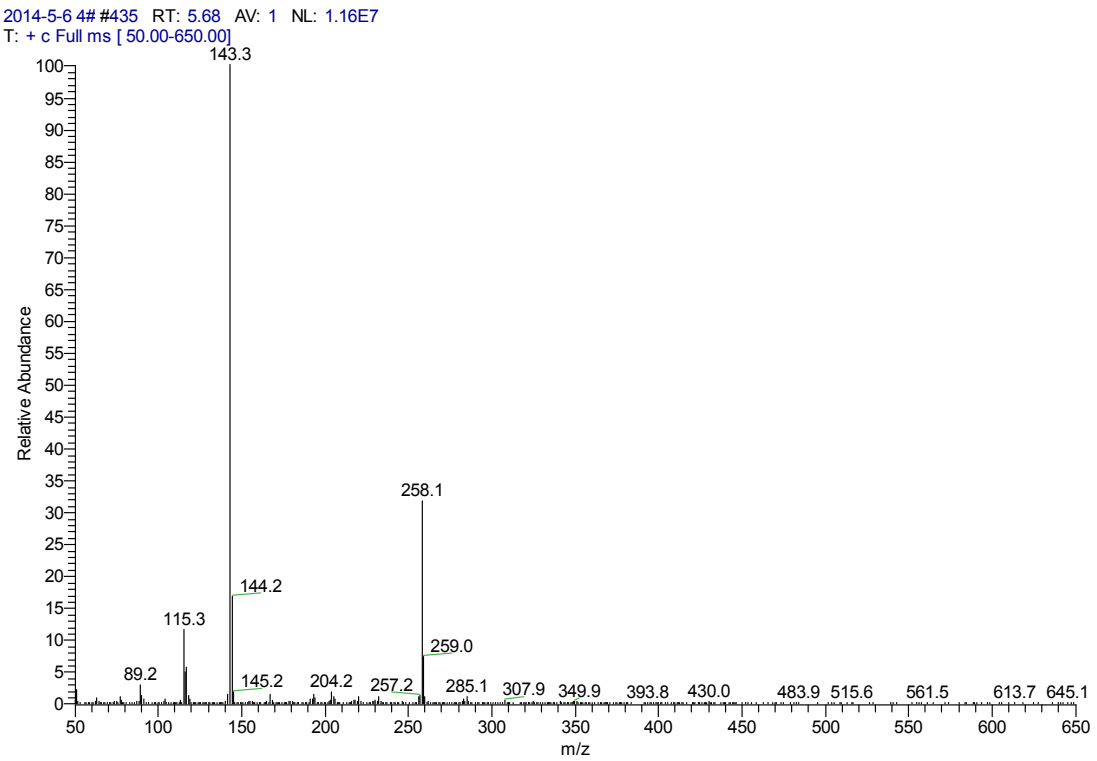




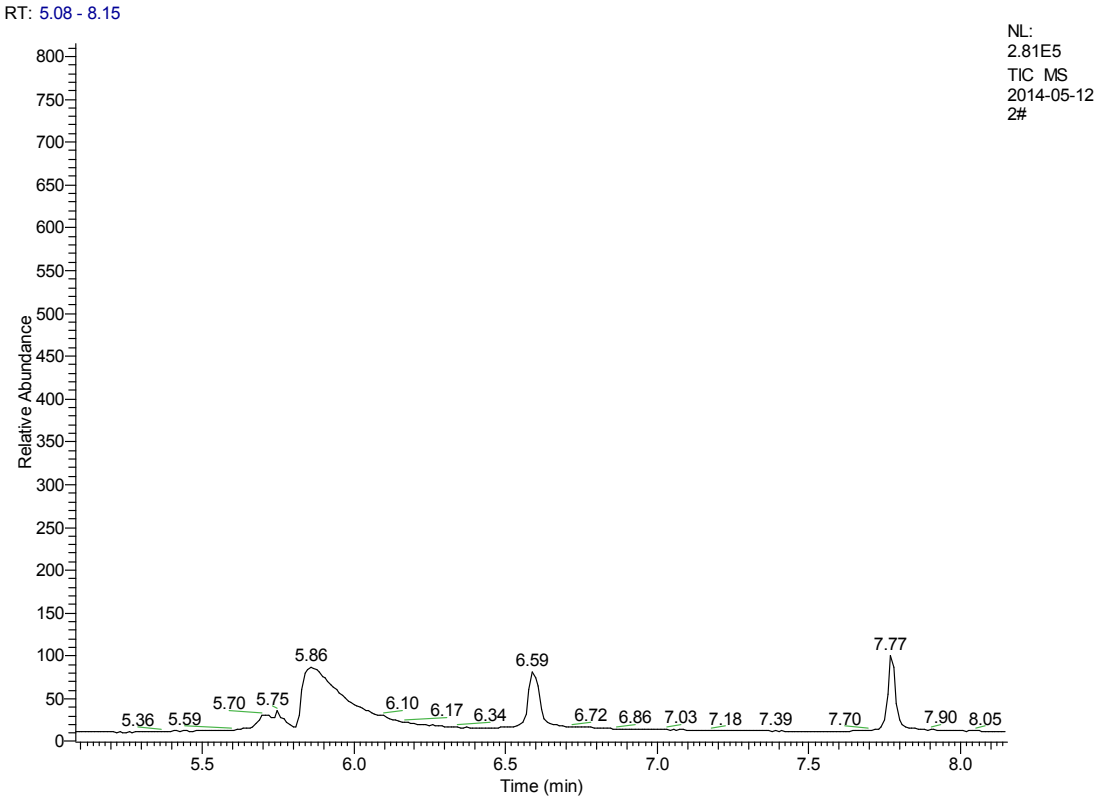
Entry 2

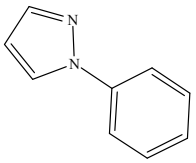

RT: 0.00 - 13.02
NL:
2.87E7
TIC MS
2014-5-6 4#
Relative Abundance
Time (min)
3.73
3.64
3.53
3.46
3.27
5.68
7.79
6.61
9.49
10.63
11.47
12.42
4.41
4.89
1.77
2.87
6.78
8.05
9.21
10.57
11.05

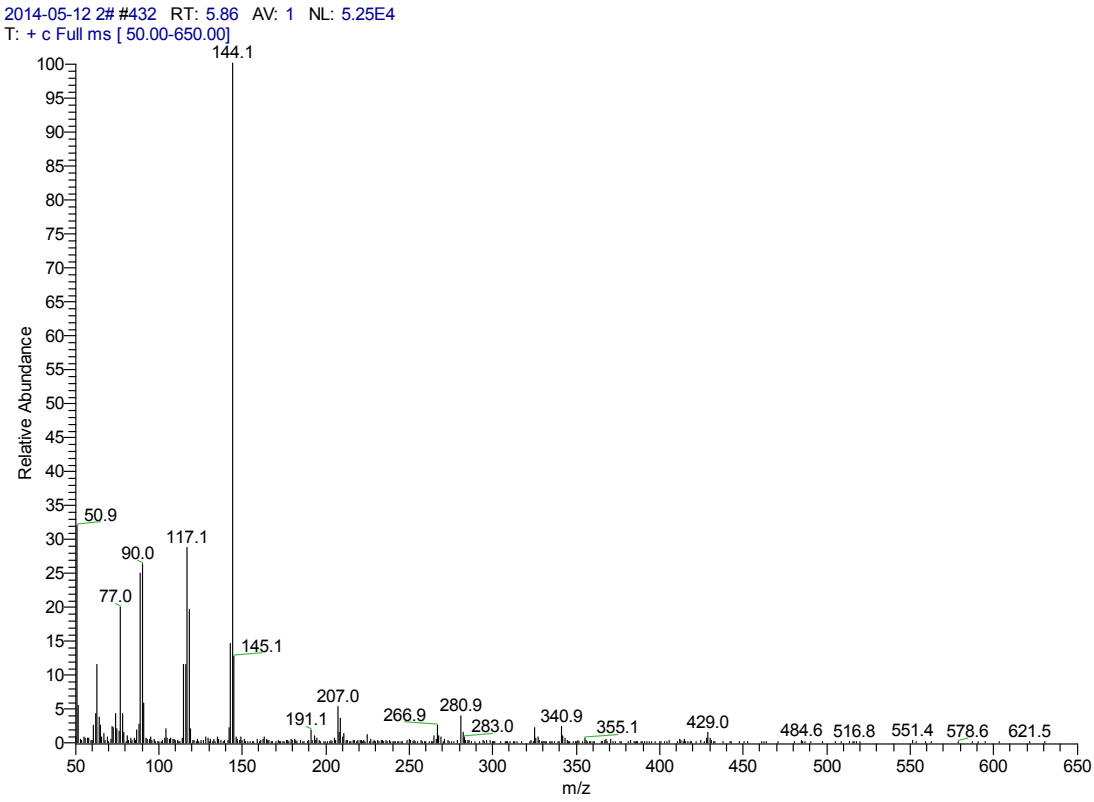

N


2014-5-6 4# #435 RT: 5.68 AV: 1 NL: 1.16E7
T: + c Full ms [50.00-650.00]
Relative Abundance
m/z
143.3
258.1
144.2
115.3
259.0
89.2
145.2
204.2
257.2
285.1
307.9
349.9
393.8
430.0
483.9
515.6
561.5
613.7
645.1

Entry 3


RT: 5.08 - 8.15
NL:
2.81E5
TIC MS
2014-05-12
2#
Relative Abundance
Time (min)
5.36
5.59
5.70
5.75
5.86
6.10
6.17
6.34
6.59
6.72
6.86
7.03
7.18
7.39
7.70
7.77
7.90
8.05




2014-05-12 2# #432 RT: 5.86 AV: 1 NL: 5.25E4
T: + c Full ms [50.00-650.00]
Relative Abundance
m/z
144.1
50.9
90.0
117.1
77.0
145.1
207.0
191.1
266.9
280.9
283.0
340.9
355.1
429.0
484.6
516.8
551.4
578.6
621.5