Supporting Information

1,2-Arylalkylation of *N*-(arylsulfonyl)acrylamides with aliphatic aldehyde as alkyl source

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1. General experimental details

General Information: All chemicals were used as received without further purification unless stated otherwise. NMR spectra were recorded at ambient temperature on a 400 MHz NMR spectrometer. Chemical shifts (δ) are given in ppm relative to TMS, the coupling constants *J* are given in Hz. HRMS were recorded on a TOF LC/MS equipped with electrospray ionization (ESI) probe operating in positive or negative ion mode.

Experimental procedure for the procedure for 1,2-arylalkylation of N-(arylsulfonyl)acrylamide with aldehyde: Under N_2, the mixture of *N*-(arylsulfonyl)acrylamide **1** (0.2 mmol), aldehyde **2** (0.6 mmol), DTBP (0.6 mmol) and PhH (2 mL) were added into the sealed tube. The reaction mixture was vigorously stirred at 120 ^{o}C for 20 h. Then, the solvent was evaporated under reduced pressure and the residue was purified by flash column chromatography on silica gel to give the products.

2. Mechanism studies

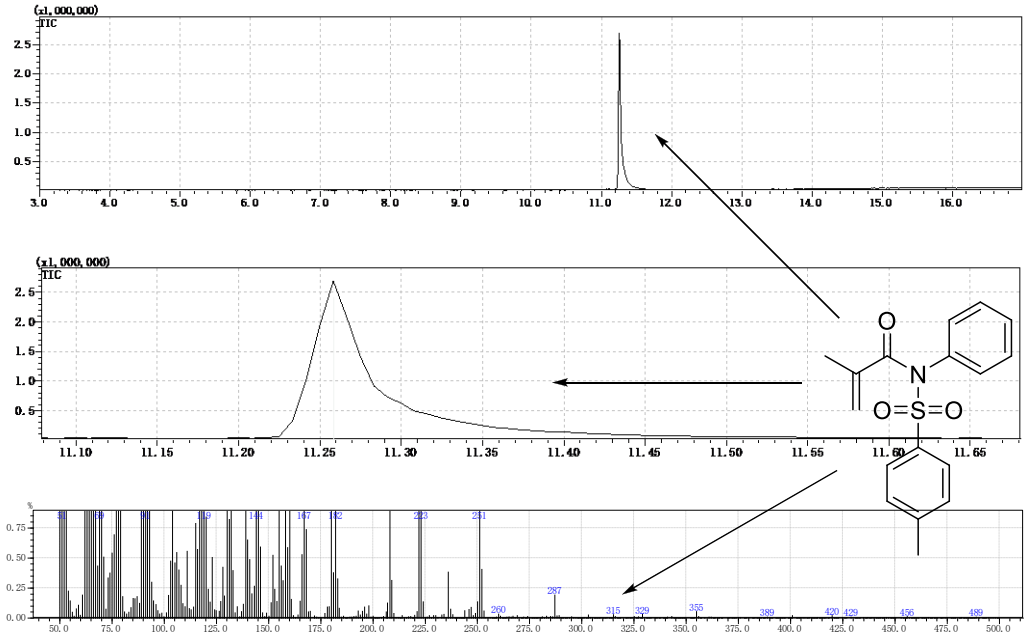
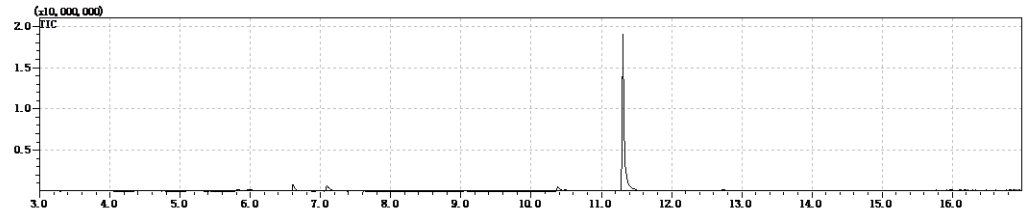


Figure S1 GC-MS spectra of the **1a**



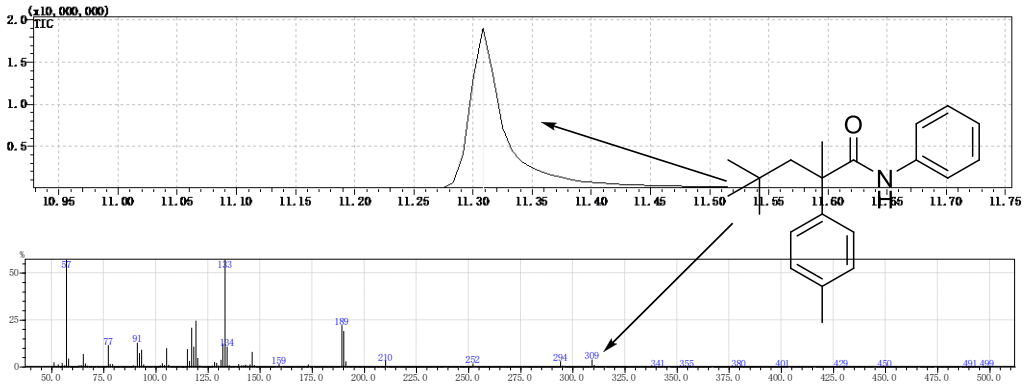


Figure S2 GC-MS spectra of the **3aa**

Standard Procedure + TEMPO (3.0 equiv)

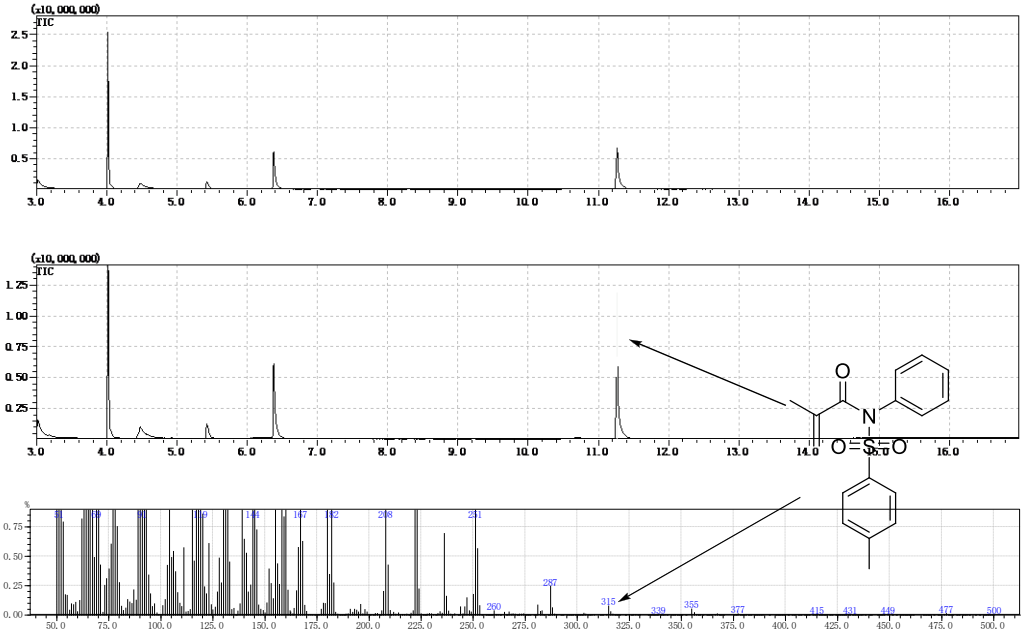
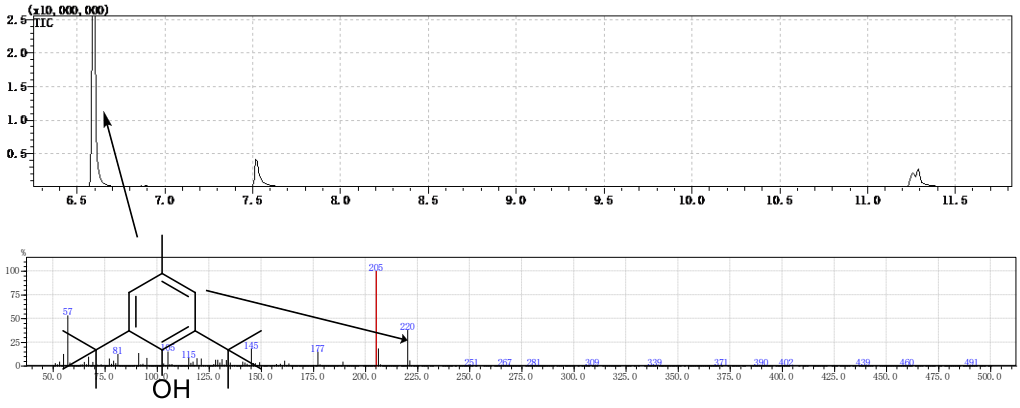


Figure S3 GC-MS spectra of the free radical capture results

Standard Procedure + BHT (3.0 equiv)



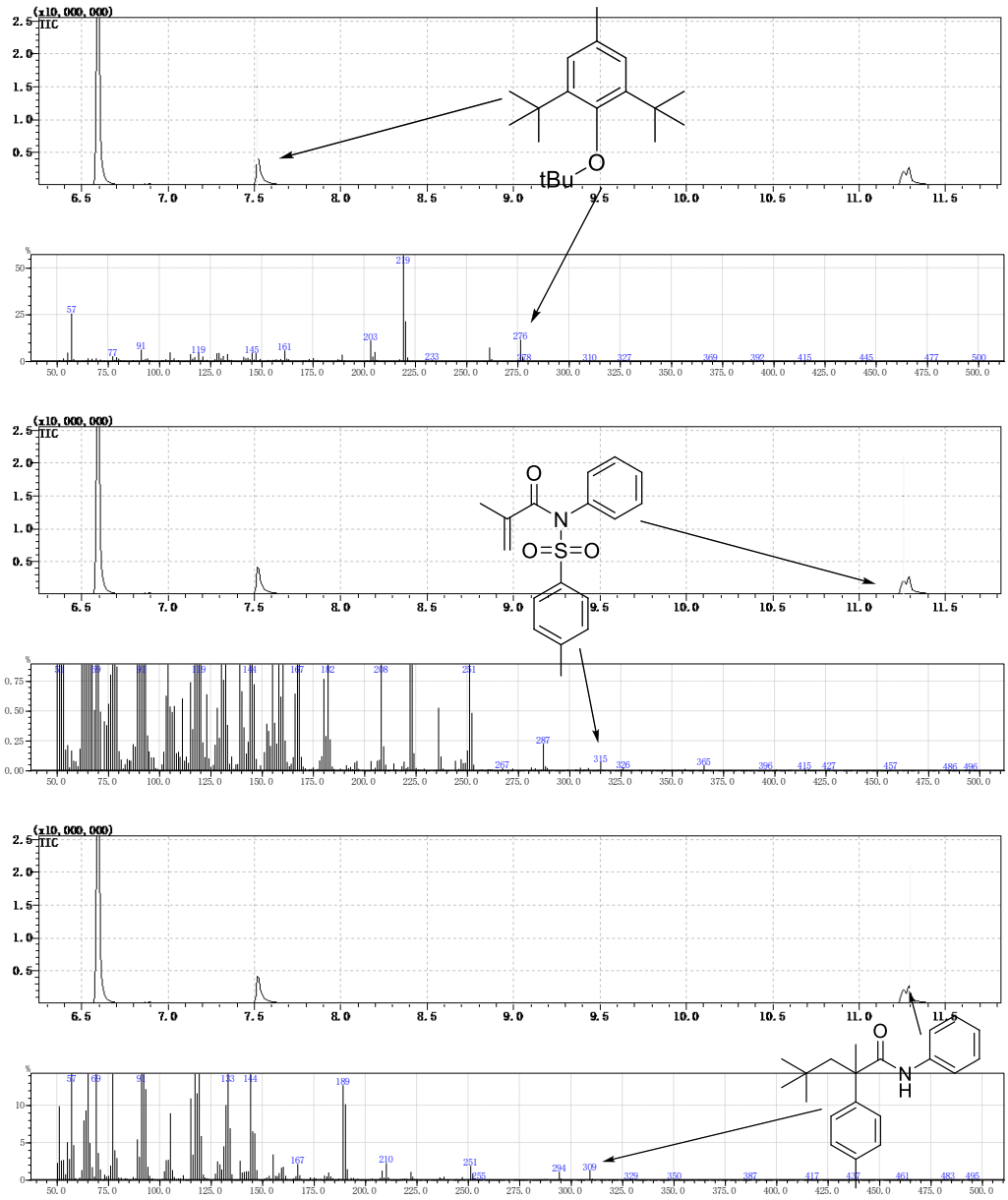


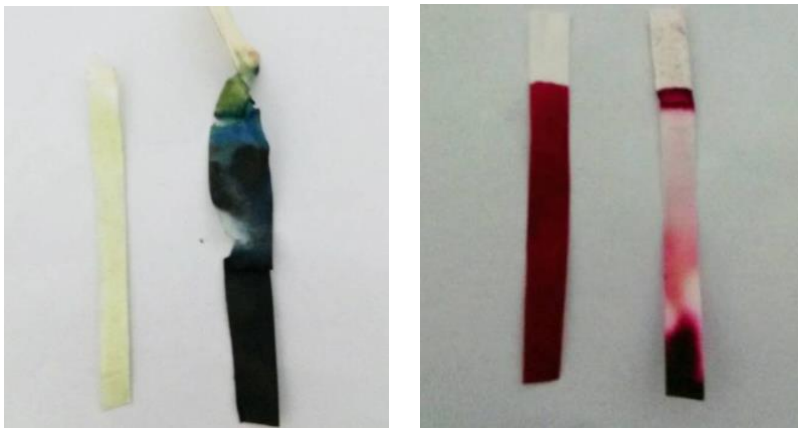
Figure S4 GC-MS spectra of the free radical capture results

3. Test for the evolution of CO and SO_2 gas

A piece of test strip prepared from PMA (phosphomolybdic acid)-$PdCl_2$ solution[11] was put into the reaction tube and sealed. After the completion of the reaction, the color of the test strip was changed from light yellow to dark blue (Figure S5a).

After the completion of the reaction, the reaction mixture was cooled to room temperature. A piece of test strip prepared from magenta solution was put into the reaction tube and sealed. The magenta was fade rapidely (Figure S5b).

[1] A. Verma and S. kumar, *Org. Lett.*, 2016, **18**, 4388.

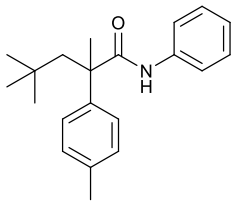


(a) **(b)**

Figure 5 a). The PMA-$PdCl_2$ test strip as prepared (left) and the PMA-$PdCl_2$ test strip in the reaction tube (right). **b**) The magenta test strip as prepared (left) and the magenta test strip that put into the reaction tube (right).

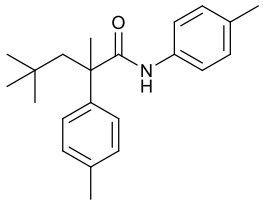
2. Characterization data of the products

2,4,4-trimethyl-N-phenyl-2-(p-tolyl)pentanamide (3aa)



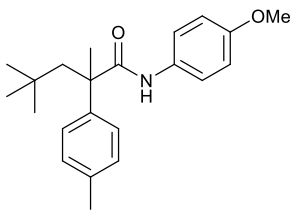
Flash column chromatography on silica gel (petroleum ether/ethyl acetate 20/1) gave a light yellow solid (71%, 43.9 mg). m.p.121-123 ^{o}C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 7.38-7.35 (m, 4H), 7.29-7.25 (m, 2H), 7.20 (d, *J* = 8.1 Hz, 2H), 7.07 (d, *J* = 7.3 Hz, 1H), 6.88 (s, 1H), 2.38 (s, 3H), 2.35 (d, *J* = 14.7 Hz, 1H), 2.15 (d, *J* = 14.7 Hz, 1H), 1.78 (s, 3H), 0.91 (s, 9H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 175.9, 141.9, 138.0, 136.9, 129.5, 128.9, 126.9, 124.0, 119.7, 51.5, 50.4, 31.9, 31.7, 25.2, 21.0. IR (cm^{-1}): 3405, 3018, 2951, 2867, 1666, 1597, 1518, 1499, 1436, 1308, 1242, 1177. HRMS (ESI) *m/z* calcd for $C_{21}H_{28}NO$ $(M+H)^+$ 310.2165, found 310.2167.

2,4,4-trimethyl-N,2-di-p-tolylpentanamide (3ba)



Flash column chromatography on silica gel (petroleum ether/ethyl acetate 20/1) gave a light yellow solid (70%, 45.2 mg). m.p.145-147 ^{o}C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 7.33 (d, *J* = 7.4 Hz, 2H), 7.23 (d, *J* = 7.5 Hz, 2H), 7.17 (d, *J* = 7.6 Hz, 2H), 7.06 (d, *J* = 7.8 Hz, 2H), 6.80 (s, 1H), 2.35 (s, 3H), 2.32 (d, *J* = 14.9 Hz, 1H), 2.27 (s, 3H), 2.11 (d, *J* = 14.7 Hz, 1H), 1.75 (s, 3H), 0.88 (s, 9H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 175.8, 142.0, 136.8, 135.5, 133.6, 129.4, 129.3, 126.9, 119.7, 51.5, 50.4, 31.9, 31.7, 25.2, 21.0, 20.8. IR (cm^{-1}): 3408, 3016, 2950, 2867, 1659, 1594, 1515, 1480, 1402, 1309, 1241, 1191. HRMS (ESI) *m/z* calcd for $C_{22}H_{30}NO$ $(M+H)^+$ 324.2322, found 324.2323.

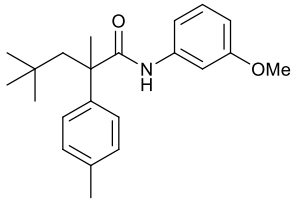
N-(4-methoxyphenyl)-2,4,4-trimethyl-2-(p-tolyl)pentanamide (3ca)



Flash column chromatography on silica gel (petroleum ether/ethyl acetate 5/1) gave a yellow solid (70%, 47.5 mg). m.p.117-119 ^{o}C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 7.36 (d, *J* = 8.3 Hz, 2H), 7.29-7.24 (m, 2H), 7.19 (d, *J* = 8.1 Hz, 2H), 6.83-6.79 (m, 3H), 3.77 (s, 3H), 2.37 (s, 3H), 2.34 (d,

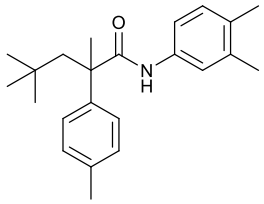
J = 14.7 Hz, 1H), 2.12 (d, *J* = 14.7 Hz, 1H), 1.77 (s, 3H), 0.90 (s, 9H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 175.8, 156.2, 142.1, 136.8, 131.2, 129.4, 126.9, 121.5, 114.0, 55.5, 51.3, 50.4, 31.9, 31.7, 25.2, 21.0. IR (cm^{-1}): 3405, 3339, 3013, 2951, 2868, 2834, 1659, 1597, 1513, 1466, 1441, 1409, 1365, 1299, 1244, 1179, 1036. HRMS (ESI) *m/z* calcd for $C_{22}H_{30}NO_2$ $(M+H)^+$ 340.2271, found 340.2272.

N-(3-methoxyphenyl)-2,4,4-trimethyl-2-(p-tolyl)pentanamide (3da)



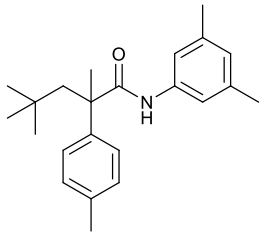
Flash column chromatography on silica gel (petroleum ether/ethyl acetate 5/1) gave a light yellow solid (68%, 46.1 mg). m.p. 110-112 ^{o}C.^{1}H NMR ($CDCl_3$, 400 MHz): δ 7.33 (d, *J* = 8.2 Hz, 2H), 7.24-7.23 (m, 1H), 7.18 (d, *J* = 8.1 Hz, 2H), 7.12 (t, *J* = 8.1 Hz, 1H), 6.85 (s, 1H), 6.71 (dd, *J* = 8.0, 1.2 Hz, 1H), 6.60 (dd, *J* = 8.2, 2.4 Hz, 1H), 3.78 (s, 3H), 2.36 (s, 3H), 2.32 (d, *J* = 14.7 Hz, 1H), 2.13 (d, *J* = 14.7 Hz, 1H), 1.75 (s, 3H), 0.88 (s, 9H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 176.0, 160.1, 141.7, 139.4, 136.9, 129.5, 126.9, 111.6, 110.0, 105.1, 55.3, 51.6, 50.3, 31.9, 31.7, 25.1, 21.0. IR (cm^{-1}): 3404, 3015, 2951, 2865, 1674, 1606, 1525, 1491, 1450, 1424, 1287, 1206, 1157, 1042. HRMS (ESI) *m/z* calcd for $C_{22}H_{30}NO_2$ $(M+H)^+$ 340.2271, found 340.2273.

N-(3,4-dimethylphenyl)-2,4,4-trimethyl-2-(p-tolyl)pentanamide (3ea)



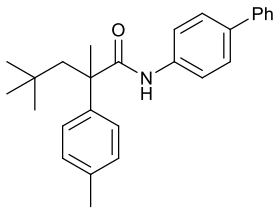
Flash column chromatography on silica gel (petroleum ether/ethyl acetate 20/1) gave a yellow liquid (74%, 49.8 mg). m.p. 131-132 ^{o}C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 7.34 (d, *J* = 8.2 Hz, 2H), 7.18 (d, *J* = 8.0Hz, 3H), 7.09-7.06 (m, 1H), 7.01 (d, *J* = 8.1 Hz, 2H), 6.79 (s, 1H), 2.36 (s, 3H), 2.33 (d, *J* = 14.7 Hz, 1H), 2.21 (s, 3H), 2.19 (s, 3H), 2.12 (d, *J* = 14.7 Hz, 1H), 1.75 (s, 3H), 0.89 (s, 9H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 175.7, 142.1, 137.1, 136.8, 135.8, 132.3, 129.8, 129.4, 126.9, 120.9, 117.1, 51.5, 50.5, 31.9, 31.7, 25.3, 21.0, 19.9, 19.2. IR (cm^{-1}): 3407, 3342, 3022, 2949, 2866, 1660, 1592, 1514, 1481, 1448, 1403, 1384, 1306, 1210, 1193, 1019. HRMS (ESI) *m/z* calcd for $C_{23}H_{32}NO$ $(M+H)^+$ 338.2478, found 338.2475.

N-(3,5-dimethylphenyl)-2,4,4-trimethyl-2-(p-tolyl)pentanamide (3fa)



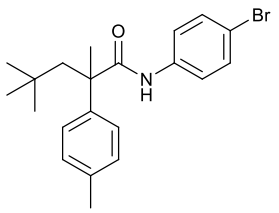
Flash column chromatography on silica gel (petroleum ether/ethyl acetate 20/1) gave a light yellow solid (51%, 34.4 mg). m.p.75-77 ^{o}C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 7.69 (d, *J* = 8.2 Hz, 1H), 7.38 (d, *J* = 8.2 Hz, 2H), 7.19 (d, *J* = 8.1 Hz, 2H), 6.97 (d, *J* = 8.1 Hz, 1H), 6.88 (s, 1H), 6.68 (s, 1H), 2.37 (d, *J* = 14.8 Hz, 1H), 2.36 (s, 3H), 2.24 (s, 3H), 2.16 (d, *J* = 14.8 Hz, 1H), 1.79 (s, 3H), 1.78 (s, 3H), 0.87 (s, 9H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 176.0, 141.8, 136.8, 134.1, 133.5, 130.9, 129.4, 128.1, 127.2, 127.1, 121.9, 51.6, 49.9, 31.9, 31.8, 24.8, 21.0, 20.8, 17.0. IR (cm^{-1}): 3418, 3338, 3020, 2951, 2866, 1682, 1594, 1514, 1479, 1396, 1300, 1265, 1222, 1193, 1018. HRMS (ESI) *m/z* calcd for $C_{23}H_{32}NO$ $(M+H)^+$ 338.2478, found 338.2481.

N-([1,1'-biphenyl]-4-yl)-2,4,4-trimethyl-2-(p-tolyl)pentanamide (3ga)



Flash column chromatography on silica gel (petroleum ether/ethyl acetate 20/1) gave a yellow liquid (81%, 62.4 mg). m.p. 156-158 ^{o}C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 7.57-7.51 (m, 4H), 7.47-7.31 (m, 7H), 7.21 (d, *J* = 8.0 Hz, 2H), 6.87 (s, 1H), 2.39 (s, 3H), 2.36 (d, *J* = 14.6 Hz, 1H), 2.17 (d, *J* = 14.6 Hz, 1H), 1.80 (s, 3H), 0.93 (s, 9H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 175.9, 141.9, 140.6, 137.5, 136.95, 136.93, 129.5, 128.8, 127.5, 127.1, 126.9, 126.8, 119.9, 51.6, 50.4, 31.9, 31.8, 25.2, 21.1. IR (cm^{-1}): 3412, 3343, 3028, 2951, 2867, 1678, 1590, 1522, 1486, 1446, 1401, 1311, 1242, 1191, 1019. HRMS (ESI) *m/z* calcd for $C_{27}H_{32}NO$ $(M+H)^+$ 386.2478, found 386.2479.

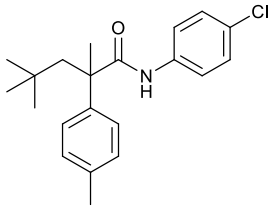
N-(4-bromophenyl)-2,4,4-trimethyl-2-(p-tolyl)pentanamide (3ha)



Flash column chromatography on silica gel (petroleum ether/ethyl acetate 20/1) gave a light yellow solid (86%, 66.6 mg). m.p. 159-161 ^{o}C.^{1}H NMR ($CDCl_3$, 400 MHz): δ 7.37-7.32 (m, 4H), 7.27-7.24 (m, 2H), 7.19 (d, *J* = 8.0 Hz, 2H), 6.90 (s, 1H), 2.37 (s, 3H), 2.32 (d, *J* = 14.7 Hz, 1H),

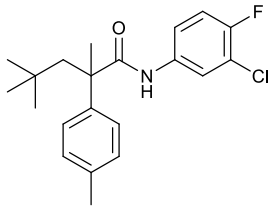
2.13 (d, *J* = 14.7 Hz, 1H), 1.76 (s, 3H), 0.89 (s, 9H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 176.0, 141.6, 137.2, 137.0, 131.8, 129.5, 126.9, 121.3, 116.5, 51.6, 50.3, 31.9, 31.7, 25.1, 21.0. IR (cm^{-1}): 3343, 3025, 2951, 2868, 1663, 1588, 1510, 1489, 1392, 1301, 1240, 1171, 1009. HRMS (ESI) *m/z* calcd for $C_{21}H_{27}BrNO$ $(M+H)^+$ 388.1271, found 388.1276.

N-(4-chlorophenyl)-2,4,4-trimethyl-2-(p-tolyl)pentanamide (3ia)



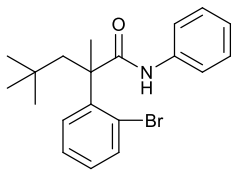
Flash column chromatography on silica gel (petroleum ether/ethyl acetate 20/1) gave a light yellow solid (71%, 48.7 mg). m.p. 151-152 ^{o}C.^{1}H NMR ($CDCl_3$, 400 MHz): δ 7.33-6.27 (m, 4H), 7.22-7.17 (m, 4H), 6.84 (s, 1H), 2.35 (s, 3H), 2.30 (d, *J* = 14.7 Hz, 1H), 2.11 (d, *J* = 14.7 Hz, 1H), 1.74 (s, 3H), 0.87 (s, 9H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 176.0, 141.6, 137.0, 136.6, 129.5, 128.9, 128.8, 126.9, 120.9, 51.5, 50.3, 31.9, 31.7, 25.1, 21.0. IR (cm^{-1}): 3402, 3346, 3021, 2952, 2864, 1663, 1592, 1511, 1492, 1395, 1301, 1240, 1174, 1088, 1013. HRMS (ESI) *m/z* calcd for $C_{21}H_{27}ClNO$ $(M+H)^+$ 344.1776, found 344.1778.

N-(3-chloro-4-fluorophenyl)-2,4,4-trimethyl-2-(p-tolyl)pentanamide (3ja)



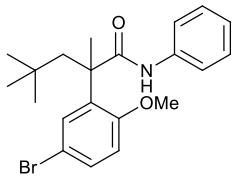
Flash column chromatography on silica gel (petroleum ether/ethyl acetate 20/1) gave a light yellow solid (70%, 50.5 mg). m.p. 130-131 ^{o}C.^{1}H NMR ($CDCl_3$, 400 MHz): δ 7.53 (dd, *J* = 6.6, 2.6 Hz, 2H), 7.31 (d, *J* = 8.2 Hz, 2H), 7.18 (d, *J* = 8.0 Hz, 2H), 7.14-7.10 (m, 1H), 7.31 (t, *J* = 8.8 Hz, 1H), 6.85 (s, 1H), 2.36 (s, 3H), 2.29 (d, *J* = 14.7 Hz, 1H), 2.10 (d, *J* = 14.7 Hz, 1H), 1.74 (s, 3H), 0.87 (s, 9H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 176.1, 154.6 (d, J_{C-F} = 244.3 Hz), 141.4, 137.1, 134.6 (d, J_{C-F} = 3.3 Hz), 129.6, 126.9, 121.9, 120.9 (d, J_{C-F} = 18.4 Hz), 119.4 (d, J_{C-F} = 6.7 Hz), 116.4 (d, J_{C-F} = 21.9 Hz), 51.5, 50.3, 31.9, 31.7, 25.1, 21.0. IR (cm^{-1}): 3409, 3323, 3026, 2952, 2868, 1659, 1601, 1500, 1386, 1366, 1303, 1259, 1212, 1190, 1057. HRMS (ESI) *m/z* calcd for $C_{21}H_{26}ClFNO$ $(M+H)^+$ 362.1681, found 362.1685.

2-(2-bromophenyl)-2,4,4-trimethyl-N-phenylpentanamide (3ka)



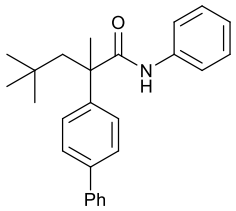
Flash column chromatography on silica gel (petroleum ether/ethyl acetate 20/1) gave a light yellow solid (71%, 53.0 mg). m.p. 159-161 ^{o}C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 7.67-7.62 (m, 2H), 7.46-7.42 (m, 1H), 7.37 (d, *J* = 7.6 Hz, 2H), 7.31-7.26 (m, 2H), 7.25-7.21 (m, 1H), 6.85 (s, 1H), 7.08 (t, *J* = 7.4 Hz, 1H), 6.77 (s, 1H), 3.78 (s, 1H), 2.88 (d, *J* = 14.9 Hz, 1H), 2.05 (d, *J* = 14.9 Hz, 1H), 1.91 (s, 3H), 0.76 (s, 9H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 175.7, 141.6, 138.1, 135.2, 130.1, 129.4, 128.9, 127.8, 125.9, 124.2, 120.3, 53.0, 45.7, 31.9, 31.1, 27.3. IR (cm^{-1}): 3283, 3056, 2982, 2956, 1660, 1596, 1500, 1464, 1438, 1379, 1312, 1252, 1023. HRMS (ESI) *m/z* calcd for $C_{20}H_{25}BrNO$ $(M+H)^+$ 374.1114, found 374.1117.

2-(5-bromo-2-methoxyphenyl)-2,4,4-trimethyl-N-phenylpentanamide (3la)



Flash column chromatography on silica gel (petroleum ether/ethyl acetate 5/1) gave a light yellow solid (70%, 56.4 mg). m.p. 121-123 ^{o}C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 7.57 (d, *J* = 2.4 Hz, 1H), 7.46-7.43 (m, 1H), 7.35 (d, *J* = 7.7 Hz, 2H), 7.29-7.25 (m, 2H), 7.05 (t, *J* = 7.3 Hz, 1H), 6.78 (s, 1H), 6.76 (d, *J* = 8.6 Hz, 1H), 3.72 (s, 3H), 2.48 (d, *J* = 14.5 Hz, 1H), 1.99 (d, *J* = 14.5 Hz, 1H), 1.75 (s, 3H), 0.78 (s, 9H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 175.9, 157.2, 138.3, 134.5, 131.7, 131.0, 128.9, 123.8, 119.9, 113.2, 113.1, 55.7, 49.5, 46.8, 31.8, 31.3, 25.6. IR (cm^{-1}): 3412, 3334, 3056, 3026, 2953, 2867, 1682, 1596, 1518, 1499, 1483, 1462, 1436, 1393, 1309, 1288, 1245, 1178, 1129, 1027. HRMS (ESI) *m/z* calcd for $C_{21}H_{27}BrNO_2$ $(M+H)^+$ 404.1220, found 404.1226.

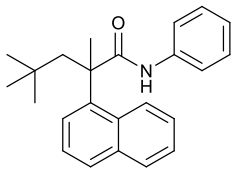
2-([1,1'-biphenyl]-4-yl)-2,4,4-trimethyl-N-phenylpentanamide (3ma)



Flash column chromatography on silica gel (petroleum ether/ethyl acetate 20/1) gave a light yellow solid (55%, 40.8 mg). m.p. 168-170 ^{o}C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 7.64 (d, *J* = 8.4 Hz, 4H), 7.56 (d, *J* = 8.3 Hz, 2H), 7.48 (t, *J* = 7.4 Hz, 2H), 7.42-7.37 (m, 3H), 7.29 (t, *J* = 7.6 Hz, 2H),

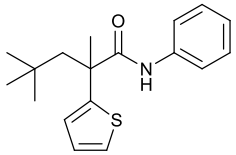
7.09 (t, *J* = 7.3 Hz, 1H), 6.94 (s, 1H), 2.41 (d, *J* = 14.7 Hz, 1H), 2.20 (d, *J* = 14.7 Hz, 1H), 1.84 (s, 3H), 0.96 (s, 9H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 175.5, 144.2, 140.3, 139.9, 138.0, 128.9, 128.8, 127.5, 127.4, 127.3, 127.0, 124.2, 119.8, 51.7, 50.6, 32.0, 31.8, 25.2. IR (cm^{-1}): 3405, 3346, 3056, 3028, 2952, 2868, 1667, 1597, 1520, 1499, 1486, 1436, 1309, 1242, 1177, 1075, 1006. HRMS (ESI) *m/z* calcd for $C_{26}H_{30}NO$ $(M+H)^+$ 372.2322, found 372.2324.

2,4,4-trimethyl-2-(naphthalen-1-yl)-N-phenylpentanamide (3na)



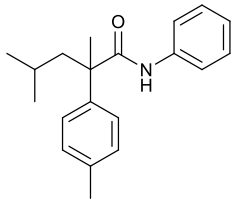
Flash column chromatography on silica gel (petroleum ether/ethyl acetate 20/1) gave a light yellow solid (73%, 50.4 mg). m.p. 157-159 ^{o}C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 8.05-8.02 (m, 1H), 7.89-7.87 (m, 2H), 7.77 (d, *J* = 7.0 Hz, 1H), 7.54 (t, *J* = 7.8 Hz, 1H), 7.48-7.44 (m, 2H), 7.22-7.16 (m, 4H), 7.03-7.00 (m, 1H), 6.79 (s, 1H), 2.68 (d, *J* = 14.9 Hz, 1H), 2.33 (d, *J* = 14.9 Hz, 1H), 2.04 (s, 3H), 0.62 (s, 9H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 177.7, 137.9, 134.4, 132.4, 129.3, 128.8, 126.4, 125.9, 125.7, 125.4, 125.1, 124.2, 120.2, 51.7, 32.0, 31.1, 27.8. IR (cm^{-1}): 3405, 3330, 3051, 3030, 2952, 2866, 1682, 1596, 1518, 1500, 1483, 1396, 1309, 1241, 1204, 1103, 1029. HRMS (ESI) *m/z* calcd for $C_{24}H_{28}NO$ $(M+H)^+$ 346.2165, found 346.2166.

2,4,4-trimethyl-N-phenyl-2-(thiophen-2-yl)pentanamide (3oa)



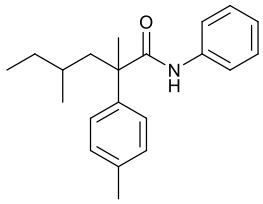
Flash column chromatography on silica gel (petroleum ether/ethyl acetate 20/1) gave a light yellow solid (61%, 36.7 mg). m.p. 104-105 ^{o}C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 7.40 (d, *J* = 8.3 Hz, 2H), 7.32-7.27 (m, 4H), 7.11-7.03 (m, 3H), 2.47 (d, *J* = 14.6 Hz, 1H), 2.10 (d, *J* = 14.6 Hz, 1H), 1.88 (s, 3H), 0.98 (s, 9H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 173.9, 150.8, 137.8, 128.9, 127.1, 124.9, 124.8, 124.3, 119.8, 52.2, 50.5, 32.2, 31.4, 25.9. IR (cm^{-1}): 3391, 3058, 3023, 2952, 2869, 1667, 1597, 1521, 1499, 1480, 1437, 1366, 1309, 1241, 1177, 1057. HRMS (ESI) *m/z* calcd for $C_{18}H_{24}NOS$ $(M+H)^+$ 302.1573, found 302.1575.

2,4-dimethyl-N-phenyl-2-(*p*-tolyl)pentanamide (3ab)



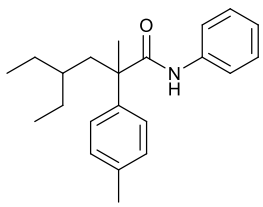
Flash column chromatography on silica gel (petroleum ether/ethyl acetate 20/1) gave a light yellow solid (61%, 36.0 mg). m.p. 109-110 ^{o}C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 7.39-7.34 (m, 4H), 7.29-7.25 (m, 2H), 7.21 (d, *J* = 8.0 Hz, 2H), 7.07 (t, *J* = 7.4 Hz, 1H), 6.87 (s, 1H), 2.38 (s, 3H), 2.13-2.08 (q, 1H), 2.04-1.99 (q, 1H), 1.67 (s, 3H), 0.94 (d, *J* = 6.6 Hz, 3H), 0.71 (d, *J* = 6.7 Hz, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 175.7, 141.0, 138.0, 136.9, 129.6, 128.9, 126.9, 124.0, 119.7, 51.3, 47.2, 24.8, 24.7, 24.6, 24.3, 21.0. IR (cm^{-1}): 3296, 3055, 3024, 2952, 2925, 2866, 1658, 1596, 1524, 1498, 1464, 1437, 1313, 1248, 1144, 1021. HRMS (ESI) *m/z* calcd for $C_{20}H_{26}NO$ $(M+H)^+$ 296.2009, found 296.2007.

2,4-dimethyl-N-phenyl-2-(p-tolyl)hexanamide (3ac)



Flash column chromatography on silica gel (petroleum ether/ethyl acetate 20/1) gave a light yellow solid (55%, 34.0 mg). m.p. 98-100 ^{o}C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 7.39-7.25 (m, 6H), 7.21 (d, *J* = 8.0 Hz, 2H), 7.07 (t, *J* = 7.4 Hz, 1H), 6.88 (s, 1H), 2.39 (s, 3H), 2.23-2.18 (q, 0.52H), 2.13-2.08 (q, 0.57H), 2.03-1.98 (q, 0.57H), 1.95-1.89 (q, 0.52H), 1.66-1.65 (d, 3H), 1.43-1.36 (m, 1.51H), 1.29-1.06 (m, 2.57H), 0.92 (d, *J* = 6.7 Hz, 1.6H), 0.86 (t, *J* = 7.4 Hz, 1.49H), 0.79 (t, *J* = 7.4vHz, 1.6H), 0.67 (d, *J* = 6.5 Hz, 1.48H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 175.8, 175.7, 141.2, 140.9, 138.1, 138.0, 137.0, 136.9, 129.5, 128.9, 127.1, 126.9, 124.0, 119.7, 51.4, 51.3, 45.4, 45.3, 31.5, 31.4, 30.8, 30.7, 24.5, 24.3, 21.2, 21.1, 21.0, 11.4, 11.3. IR (cm^{-1}): 3406, 3337, 3056, 3022, 2960, 2925, 2872, 1666, 1597, 1517, 1499, 1460, 1437, 1379, 1310, 1241, 1116, 1019. HRMS (ESI) *m/z* calcd for $C_{21}H_{28}NO$ $(M+H)^+$ 310.2165, found 310.2167.

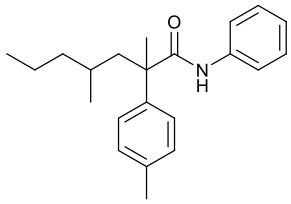
4-ethyl-2-methyl-N-phenyl-2-(p-tolyl)hexanamide (3ad)



Flash column chromatography on silica gel (petroleum ether/ethyl acetate 20/1) gave a light yellow solid (48%, 31.0 mg). m.p. 111-113 ^{o}C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 7.37 (d, *J* = 7.7 Hz,

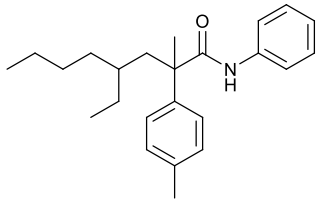
2H), 7.33-7.25 (m, 4H), 7.20 (d, *J* = 8.1 Hz, 2H), 7.07 (t, *J* = 7.3 Hz, 1H), 6.84 (s, 1H), 2.38 (s, 3H), 2.11-2.06 (q, 1H), 2.01-1.96 (q, 1H), 1.64 (s, 3H), 1.37-1.24 (m, 3H), 1.15-1.08 (m, 2H), 0.83(t, *J* = 7.1 Hz, 3H), 0.71 (t, *J* = 7.4 Hz, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 175.8, 141.1, 138.0, 136.9, 129.5, 128.9, 127.0, 124.0, 119.6, 51.4, 42.0, 36.1, 26.8, 26.7, 24.3, 21.0, 10.7, 10.5. IR (cm^{-1}): 3408, 3331, 3020, 2960, 2925, 2873, 1655, 1596, 1515, 1499, 1458, 1436, 1379, 1310, 1241, 1114, 1074, 1019. HRMS (ESI) *m/z* calcd for $C_{22}H_{30}NO$ $(M+H)^+$ 324.2322, found 324.2324.

2,4-dimethyl-N-phenyl-2-(p-tolyl)heptanamide (3ae)



Flash column chromatography on silica gel (petroleum ether/ethyl acetate 20/1) gave a yellow solid (60%, 38.7 mg). m.p. 80-82 ^{o}C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 7.39 (m, 2H), 7.33-7.25 (m, 4H), 7.21 (d, *J* = 8.3 Hz, 2H), 7.09-7.04 (m, 1H), 6.86 (d, *J* = 4.0 Hz, 1H), 2.38 (s, 3H), 2.21-2.07 (m, 1H), 1.99-1.89 (m, 1H), 1.65 (d, *J* = 2.1 Hz, 4H), 1.51-1.43 (m, 1H), 1.35-1.06 (m, 4H), 0.91 (d, *J* = 6.6 Hz, 1.72H), 0.84 (t, *J* = 6.9 Hz, 1.35H), 0.78 (t, *J* = 6.8 Hz, 1.66H), 0.91 (d, *J* = 6.6 Hz, 1.4H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 175.8, 175.7, 141.2, 140.9, 138.1, 138.0, 136.97, 136.93, 129.5, 128.9, 128.8, 127.1, 126.9, 124.0, 119.7, 51.5, 51.3, 45.8, 45.7, 41.4, 41.3, 28.9, 28.8, 24.5, 24.3, 21.7, 21.6, 21.04, 21.02, 20.1, 19.9, 14.3, 14.2. IR (cm^{-1}): 3406, 3335, 3022, 2956, 2927, 2870, 1667, 1597, 1515, 1499, 1436, 1378, 1310, 1242, 1192, 1136, 1075, 1019. HRMS (ESI) *m/z* calcd for $C_{22}H_{30}NO$ $(M+H)^+$ 324.2322, found 324.2323.

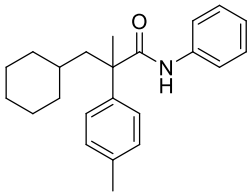
4-ethyl-2-methyl-N-phenyl-2-(p-tolyl)octanamide (3af)



Flash column chromatography on silica gel (petroleum ether/ethyl acetate 20/1) gave a light yellow liquid (51%, 35.8 mg). ^{1}H NMR ($CDCl_3$, 400 MHz): δ 7.36 (d, *J* = 7.9 Hz, 2H), 7.32-7.25 (m, 4H), 7.20 (d, *J* = 8.0 Hz, 2H), 7.08-7.04 (m, 1H), 6.84 (d, *J* = 4.0 Hz, 1H), 2.38 (s, 3H), 2.13-1.94 (m, 2H), 1.63 (s, 3H), 1.34-1.21 (m, 5H), 1.12-1.04 (m, 4H), 0.85-0.77 (m, 4.49H), 0.71 (t, *J* = 7.3 Hz, 1.54H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 175.9, 175.8, 141.1, 141.0, 138.1, 136.98, 136.96, 129.5, 129.5, 129.4, 128.9, 128.8, 127.1, 127.0, 123.99, 123.98, 119.6, 119.5, 51.5, 51.4, 42.4, 34.7, 34.6, 34.3, 34.1, 28.7, 28.4, 27.4, 27.2, 24.4, 24.2, 23.1, 22.9, 21.02, 21.00, 14.1, 14.0,

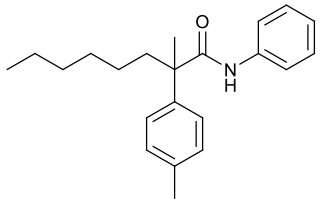
10.7, 10.4. IR (cm^{-1}): 3408, 3340, 3025, 2957, 2927, 2871, 2857, 1666, 1597, 1517, 1499, 1459, 1437, 1378, 1310, 1241, 1116, 1075, 1019. HRMS (ESI) *m/z* calcd for $C_{24}H_{34}NO$ $(M+H)^+$ 352.2635, found 352.2638.

3-cyclohexyl-2-methyl-N-phenyl-2-(p-tolyl)propanamide (3ag)[2]



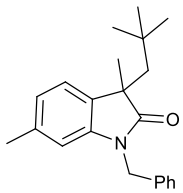
Flash column chromatography on silica gel (petroleum ether/ethyl acetate 20/1) gave a light yellow solid (64%, 43.9 mg). m.p. 240-242 ^oC. ^1H NMR ($CDCl_3$, 400 MHz): δ 7.38-7.31 (m, 4H), 7.30-7.25 (m, 2H), 7.21 (d, *J* = 8.1 Hz, 2H), 7.07 (t, *J* = 7.4 Hz, 1H), 6.87 (s, 1H), 2.38 (s, 3H), 2.09-2.05 (q, 1H), 2.00-1.95 (q, 1H), 1.72-1.69 (m, 1H), 1.65 (s, 3H), 1.59-1.56 (m, 2H), 1.45-0.86 (m, 8H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 175.7, 141.2, 138.0, 136.9, 129.5, 128.9, 126.9, 124.0, 119.7, 51.2, 45.9, 35.3, 35.2, 34.1, 26.5, 26.4, 26.2, 24.4, 21.0.

2-methyl-N-phenyl-2-(*p*-tolyl)octanamide (3ah)



Flash column chromatography on silica gel (petroleum ether/ethyl acetate 20/1) gave a yellow liquid (14%, 9 mg). ^1H NMR ($CDCl_3$, 400 MHz): δ 7.39-7.36 (m, 2H), 7.31-7.25 (m, 4H), 7.21 (d, *J* = 8.0 Hz, 2H), 7.07 (t, *J* = 7.4 Hz, 1H), 6.83 (s, 1H), 2.38 (s, 3H), 2.11-2.01 (m, 1H), 1.62 (s, 3H), 1.30-1.19 (m, 8H), 0.86 (t, *J* = 6.8 Hz, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 175.6, 140.6, 138.0, 136.9, 129.6, 128.9, 126.9, 124.0, 119.7, 51.2, 38.9, 31.7, 29.9, 24.4, 24.0, 22.7, 21.0, 14.1. IR (cm^{-1}): 3411, 3346, 3020, 2953, 2922, 2852, 1658, 1593, 1497, 1461, 1440, 1372, 1305, 1120, 1069, 1011. HRMS (ESI) *m/z* calcd for $C_{22}H_{30}NO$ $(M+H)^+$ 324.2322, found 324.2324.

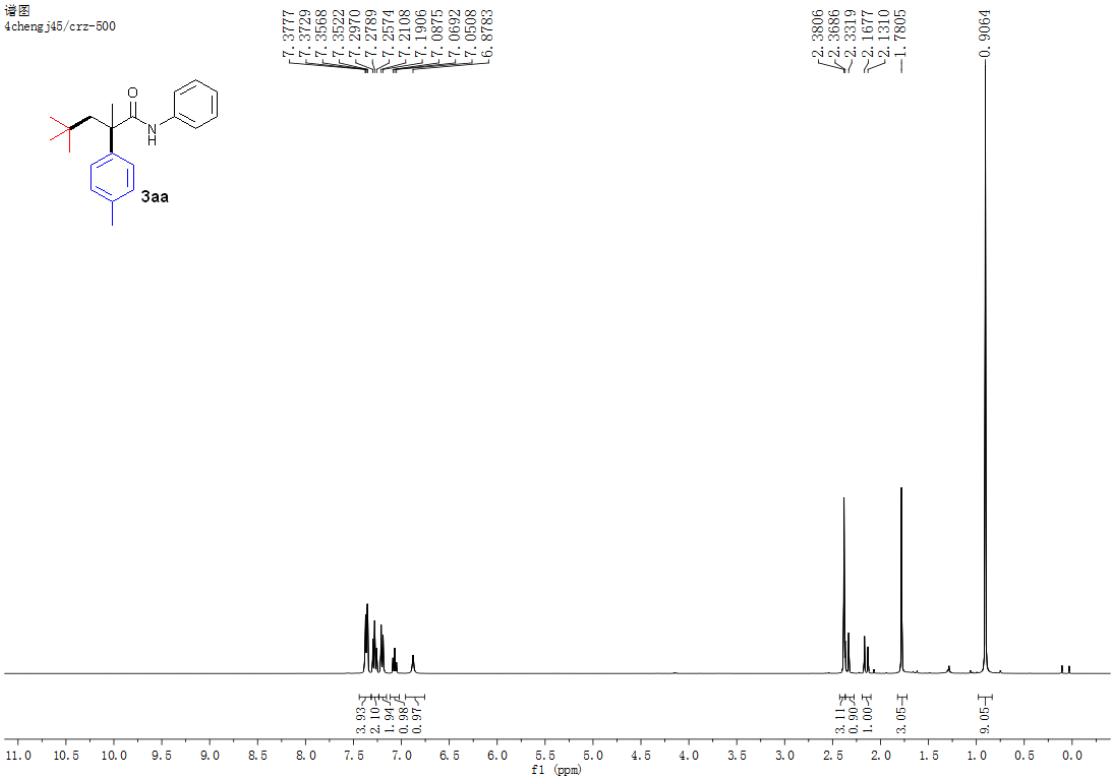
1-benzyl-3,6-dimethyl-3-neopentylindolin-2-one (4)

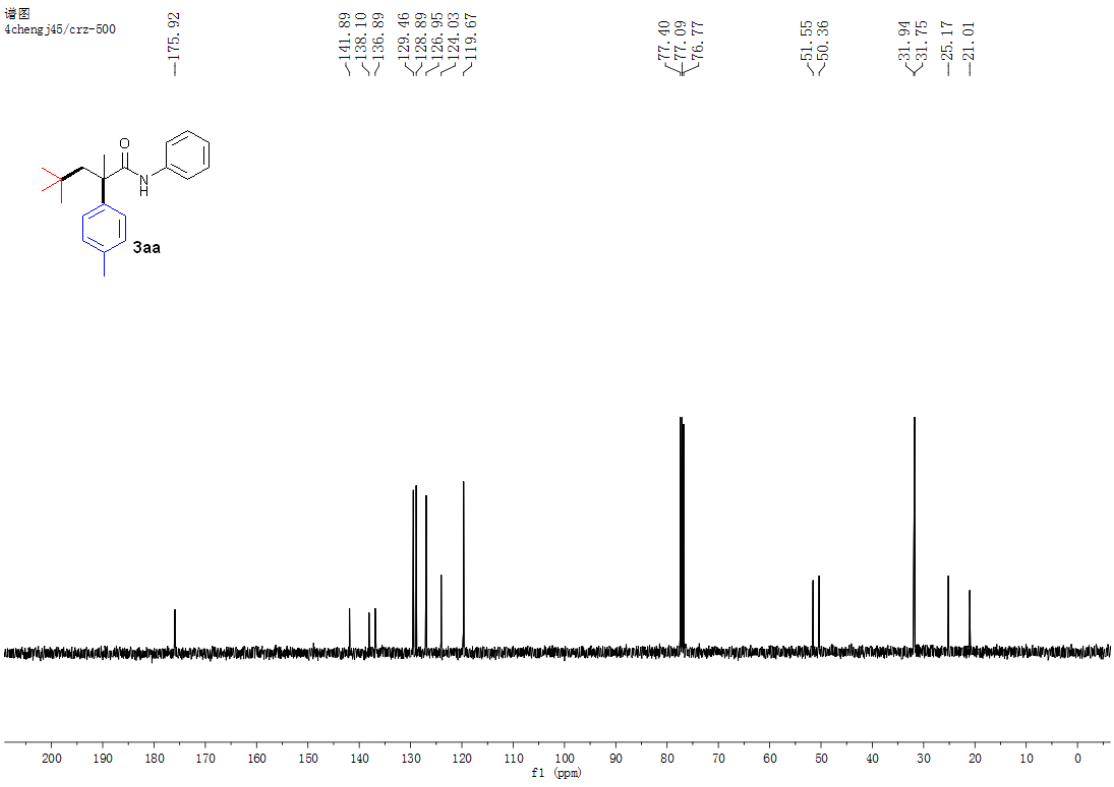


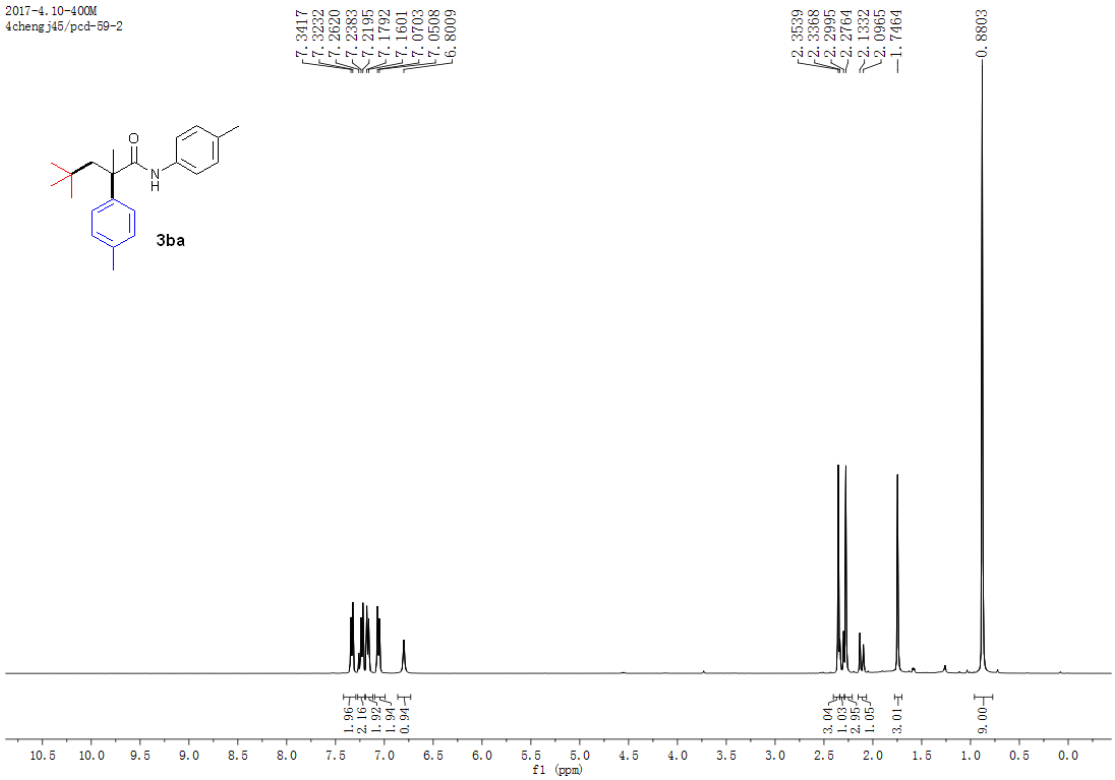
[2] H. Zhang, C. Pan, N. Jin, Z. Gu, H. Hu and C. Zhu, *Chem. Commun.*, 2015, **51**, 1320.

Flash column chromatography on silica gel (petroleum ether/ethyl acetate 10/1) gave a yellow liquid (51%, 32.7 mg). ^{1}H NMR ($CDCl_3$, 400 MHz): δ 7.32-7.22 (m, 5H), 7.08 (d, *J* = 7.5 Hz, 1H), 6.81 (d, *J* = 7.5 Hz, 1H), 6.60 (s, 1H), 5.03 (t, *J* = 15.5 Hz, 1H), 4.77 (t, *J* = 15.5 Hz, 1H), 2.30 (s, 3H), 2.19 (t, *J* = 14.4 Hz, 1H), 1.87 (t, *J* = 14.4 Hz, 1H), 1.32 (s. 3H), 0.64 (s, 9H). ^{13}C NMR ($CDCl_3$, 100 MHz): δ 181.5, 142.1, 137.4, 136.3, 131.2, 128.7, 127.6, 127.5, 123.8, 122.6, 109.9, 50.5, 47.3, 43.8, 31.9, 30.9, 29.2, 21.8. IR (cm^{-1}): 3011, 2950, 2852, 1685, 1602, 1517, 1491, 1462, 1352, 1235, 1016. HRMS (ESI) *m/z* calcd for $C_{22}H_{28}NO$ $(M+H)^+$ 322.2165, found 322.2169.

3. Copies of ^{1}H NMR and ^{13}C NMR spectra of the products



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7.0703
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6.8009
2.3539
2.3368
2.2995
2.2764
2.1332
2.0965
1.7464
0.8803
3ba
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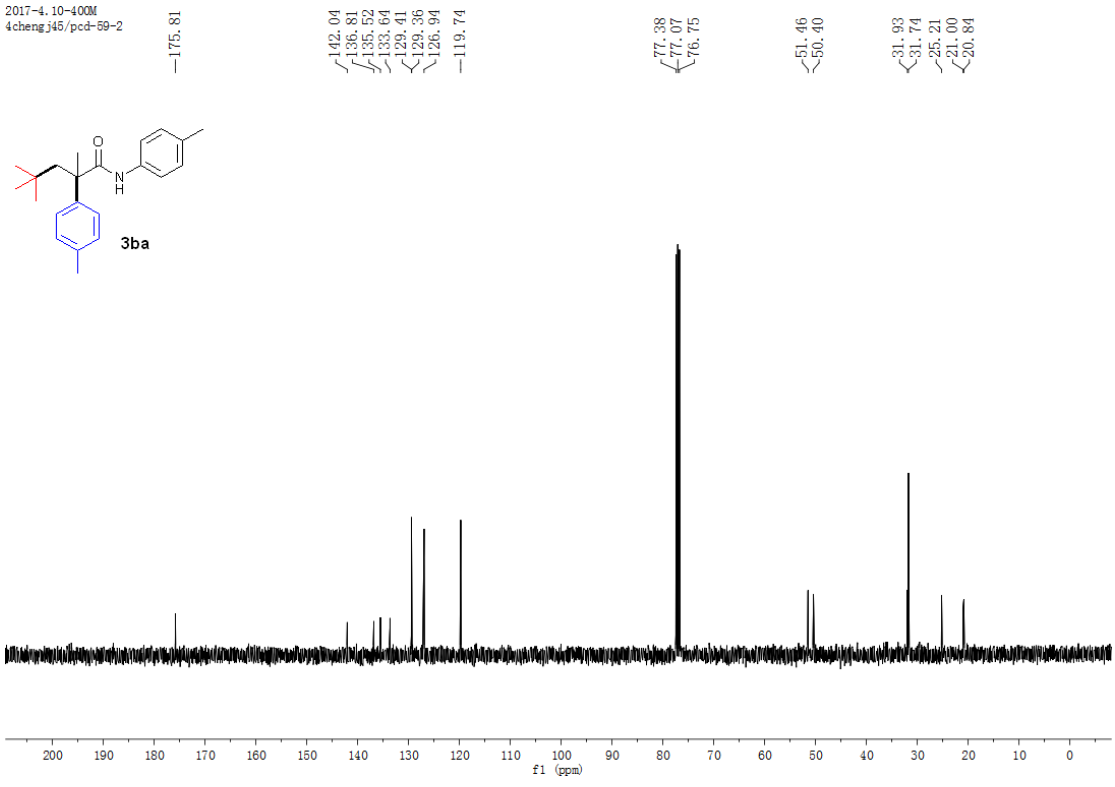
2.16
1.92
1.94
0.94
3.04
1.03
2.95
1.05
3.01
9.00
f1 (ppm)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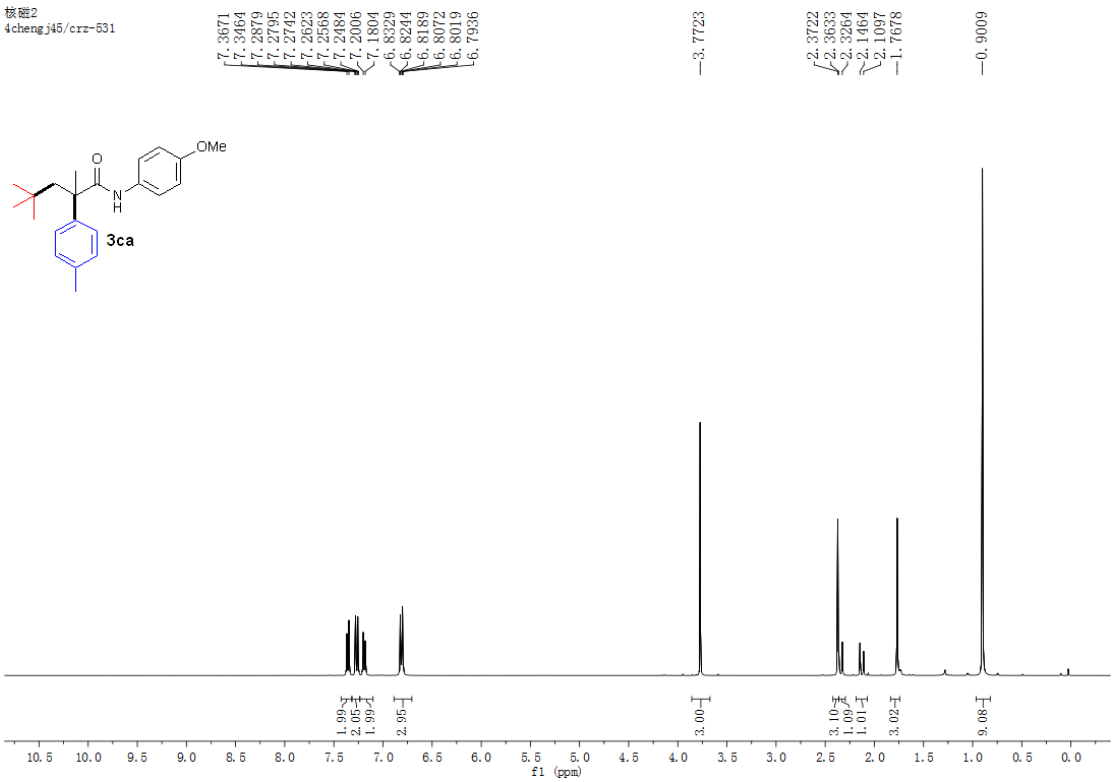
31.74
25.21
21.00
20.84
3ba
f1 (ppm)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6.8189
6.8072
6.8019
6.7936
3.7723
2.3722
2.3633
2.3264
2.1464
2.1097
1.7678
0.9009
OMe
O
N
H
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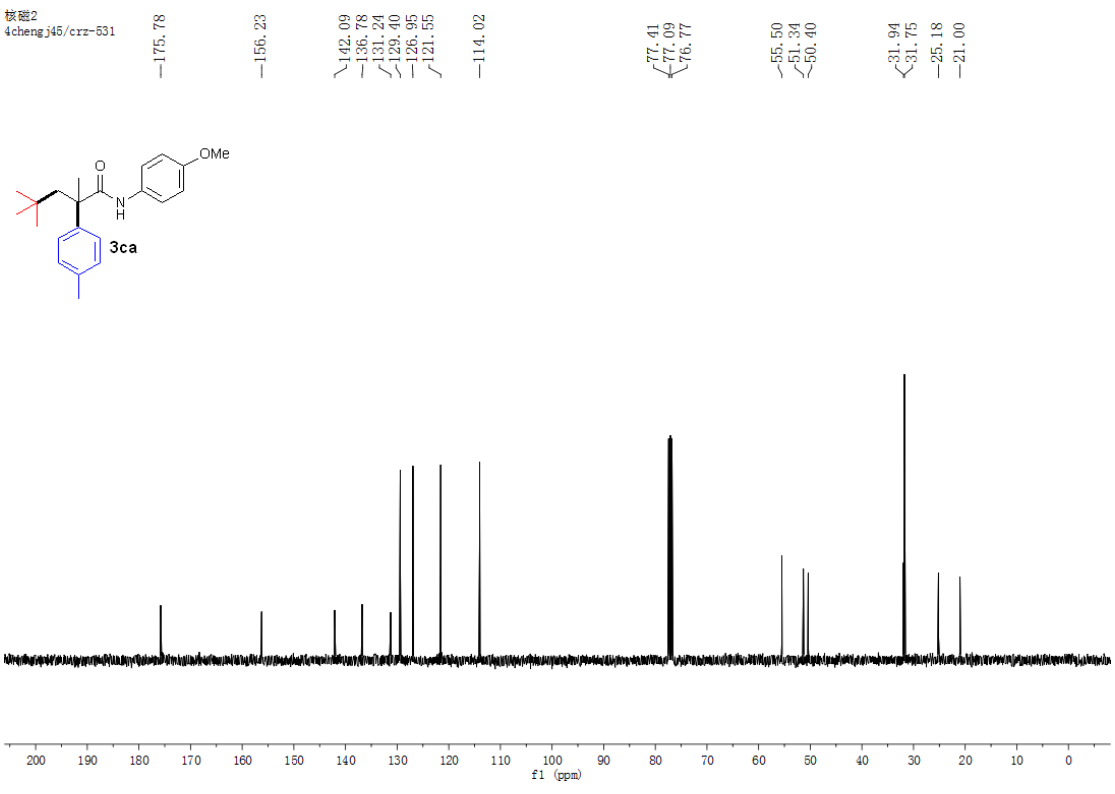
3.00
3.10
1.09
1.01
3.02
9.08
f1 (ppm)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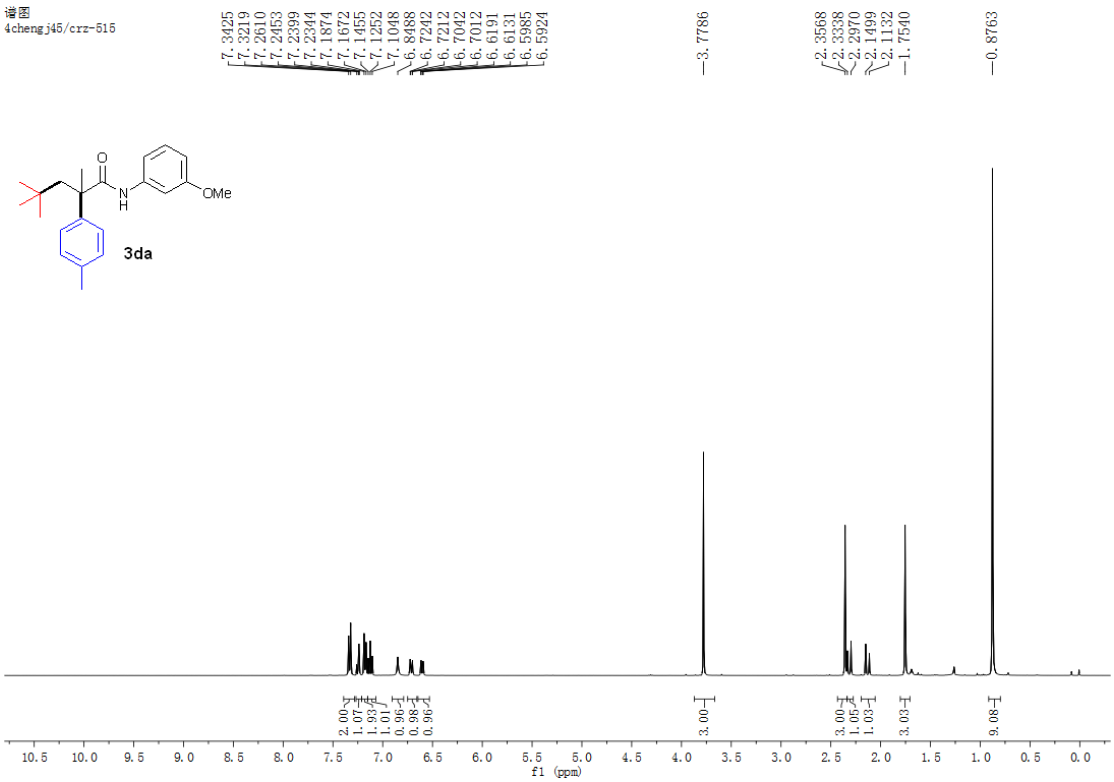
51.34
50.40
31.94
31.75
25.18
21.00
OMe
O
N
H
3ca
f1 (ppm)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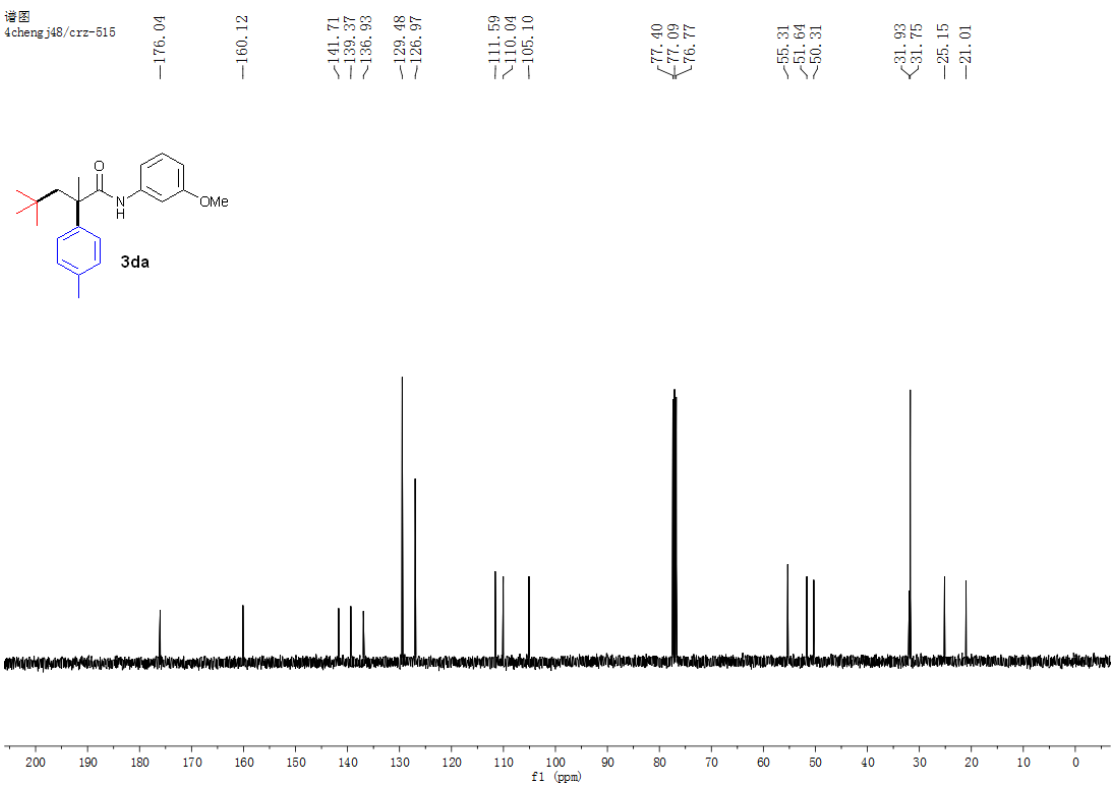
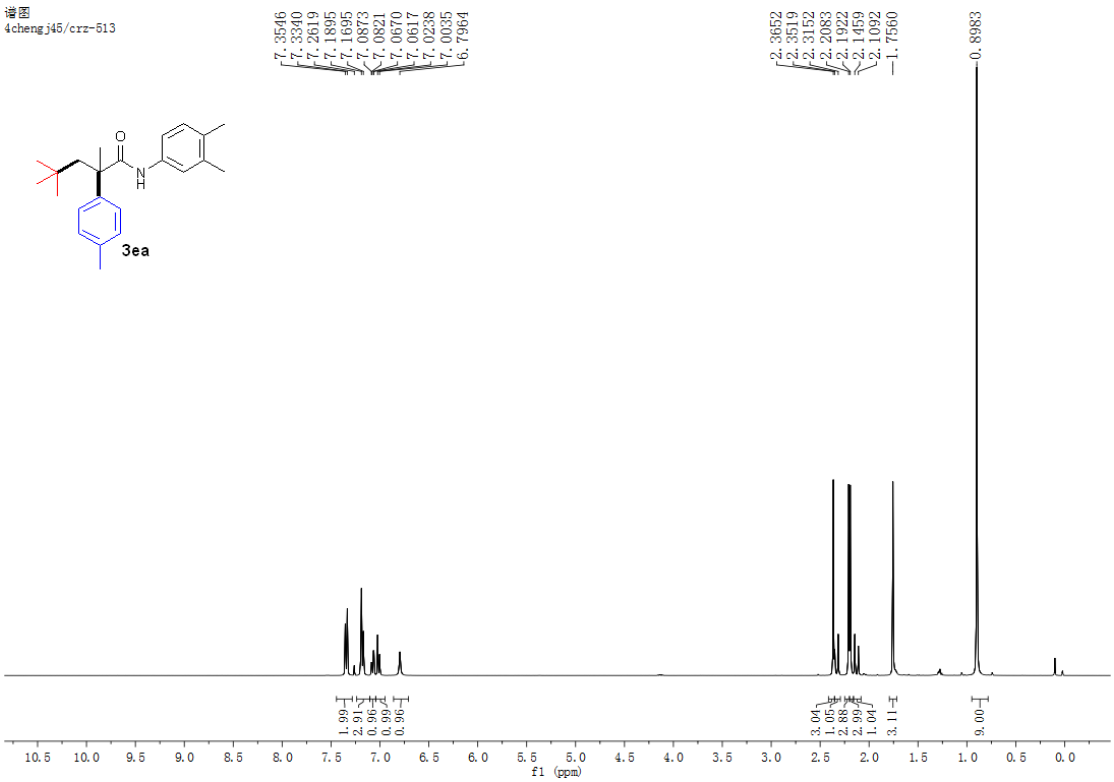
7.3219
7.2610
7.2453
7.2399
7.2344
7.1874
7.1672
7.1455
7.1252
7.1048
6.8488
6.7242
6.7212
6.7042
6.7012
6.6191
6.6131
6.5985
6.5924
3.7786
2.3568
2.3338
2.2970
2.1499
2.1132
1.7540
0.8763
OMe
3da
2.00
1.07
1.93
1.01
0.96
0.98
0.96
3.00
3.00
1.05
1.03
3.03
9.08
f1 (ppm)


4chengj48/crz-515
176.04
160.12
141.71
139.37
136.93
129.48
126.97
111.59
110.04
105.10
77.40
77.09
76.77
55.31
51.64
50.31
31.93
31.75
25.15
21.01
OMe
3da
f1 (ppm)


4chengj45/crz-513
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7.2619
7.1895
7.1695
7.0873
7.0821
7.0670
7.0617
7.0238
7.0035
6.7964
2.3652
2.3519
2.3152
2.2083
2.1922
2.1459
2.1092
1.7560
0.8983
3ea
1.99
2.91
0.96
0.99
0.96
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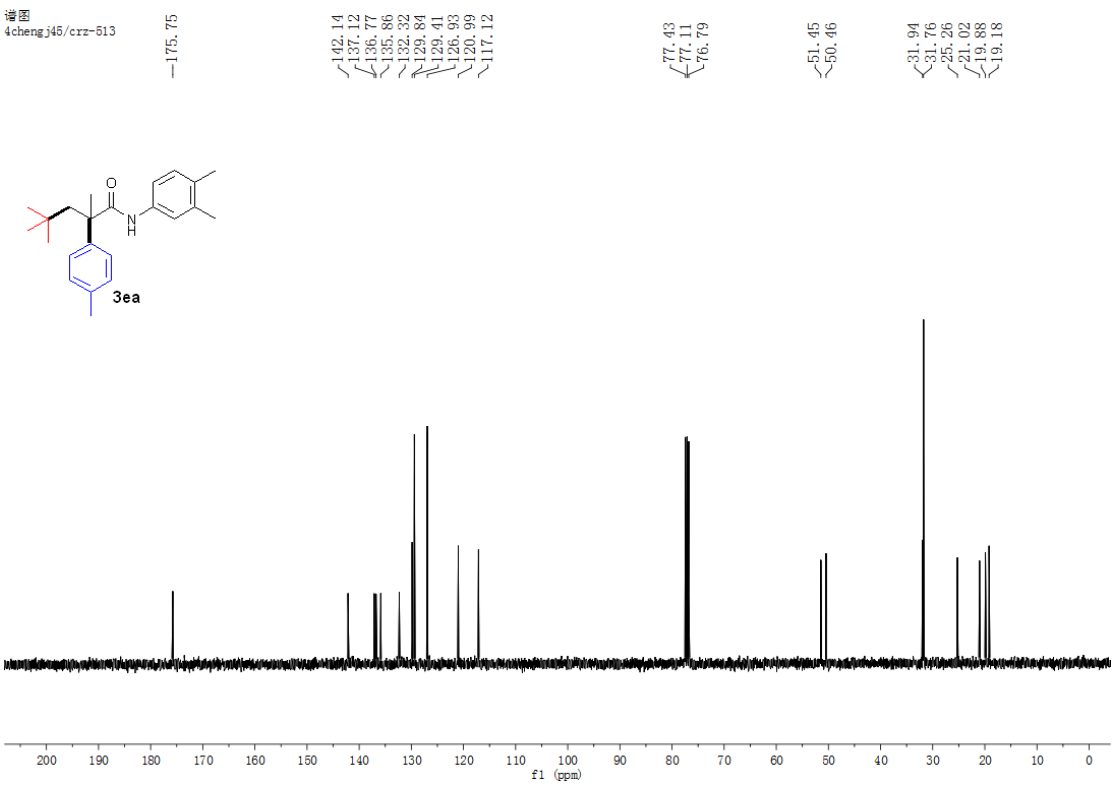
1.05
2.88
2.99
1.04
3.11
9.00
f1 (ppm)


4chengj45/crz-513
175.75
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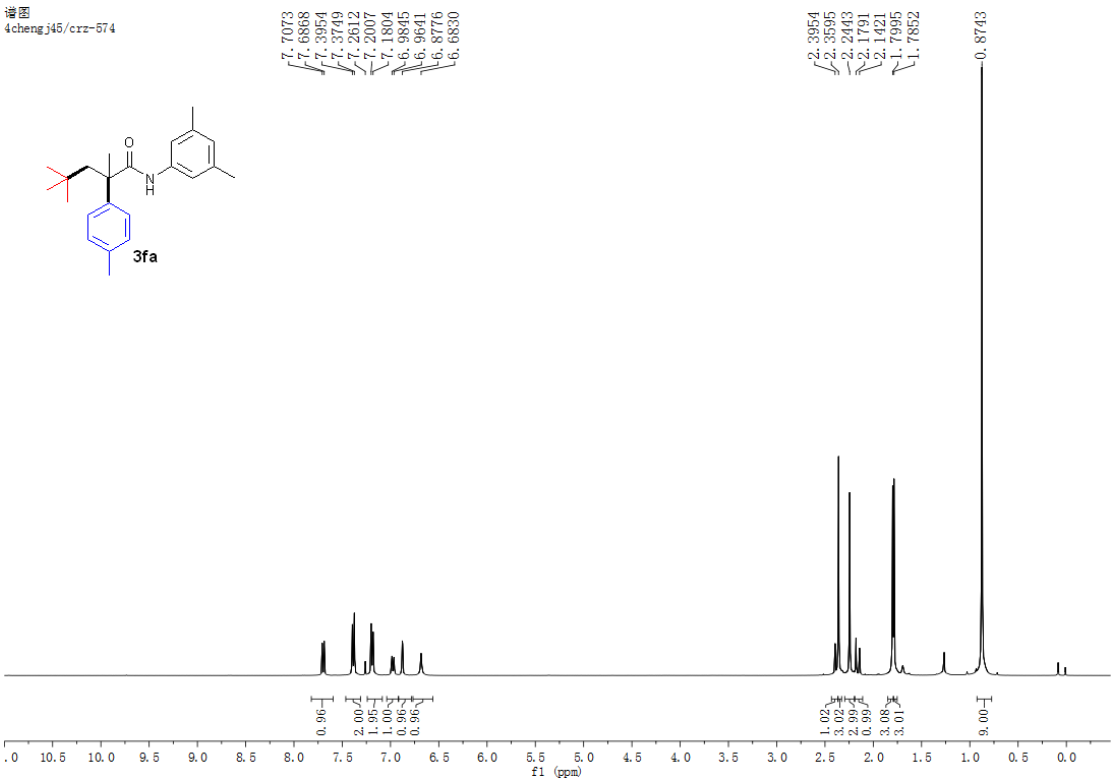
137.12
136.77
135.86
132.32
129.84
129.41
126.93
120.99
117.12
77.43
77.11
76.79
51.45
50.46
31.94
31.76
25.26
21.02
19.88
19.18
3ea
f1 (ppm)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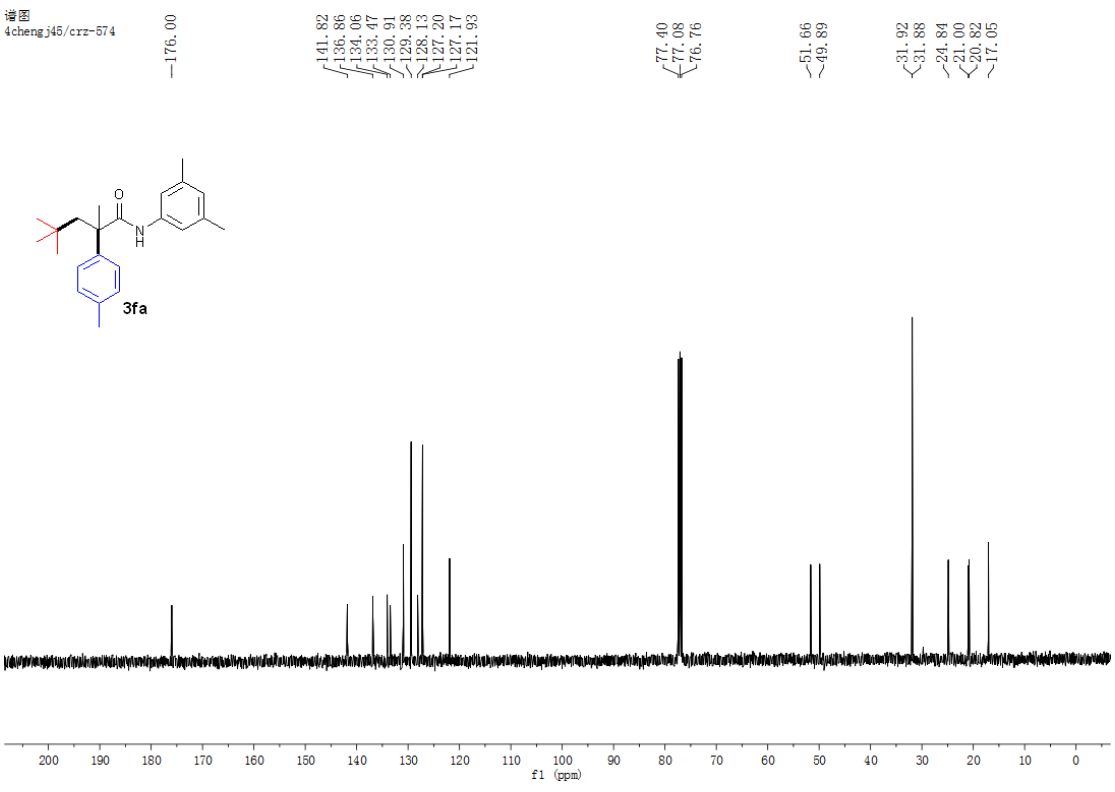
7.7073
7.6868
7.3954
7.3749
7.2612
7.2007
7.1804
6.9845
6.9641
6.8776
6.6830
2.3954
2.3595
2.2443
2.1791
2.1421
1.7995
1.7852
0.8743
3fa
0.96
2.00
1.95
1.00
0.96
0.96
1.02
3.02
2.99
0.99
3.08
3.01
9.00
f1 (ppm)


4chengj45/crz-574
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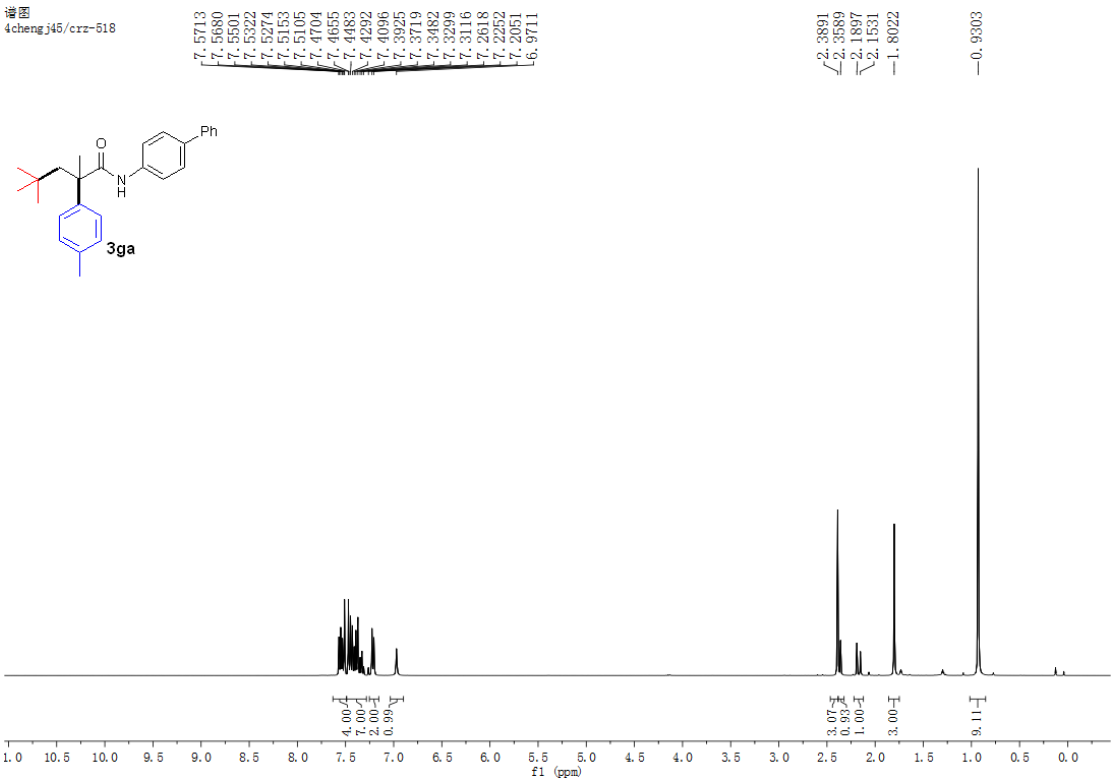
141.82
136.86
134.06
133.47
130.91
129.38
128.13
127.20
127.17
121.93
77.40
77.08
76.76
51.66
49.89
31.92
31.88
24.84
21.00
20.82
17.05
3fa
f1 (ppm)


4chengj45/crz-518
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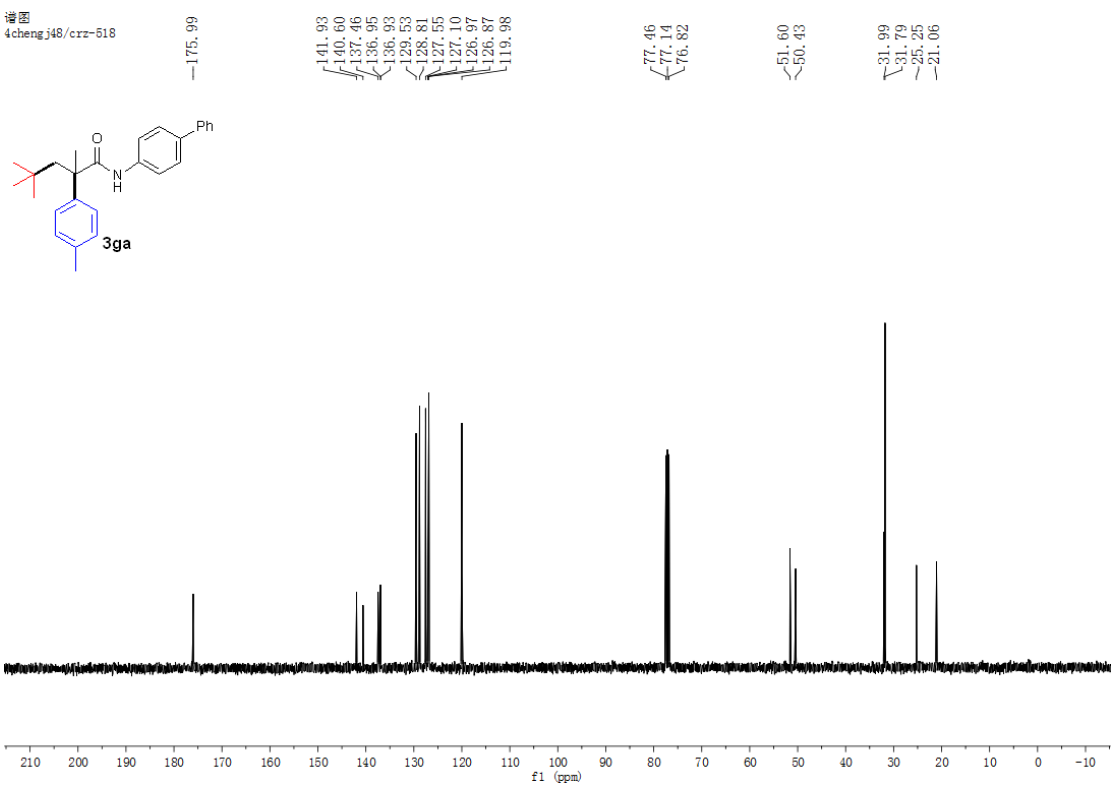
7.5680
7.5501
7.5322
7.5274
7.5153
7.5105
7.4704
7.4655
7.4483
7.4292
7.4096
7.3925
7.3719
7.3482
7.3299
7.3116
7.2618
7.2252
7.2051
6.9711
2.3891
2.3589
2.1897
2.1531
1.8022
0.9303
Ph
O
N
H
3ga
4.00
7.00
2.00
0.99
3.07
0.93
1.00
3.00
9.11
f1 (ppm)


4chengj48/crz-518
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141.93
140.60
137.46
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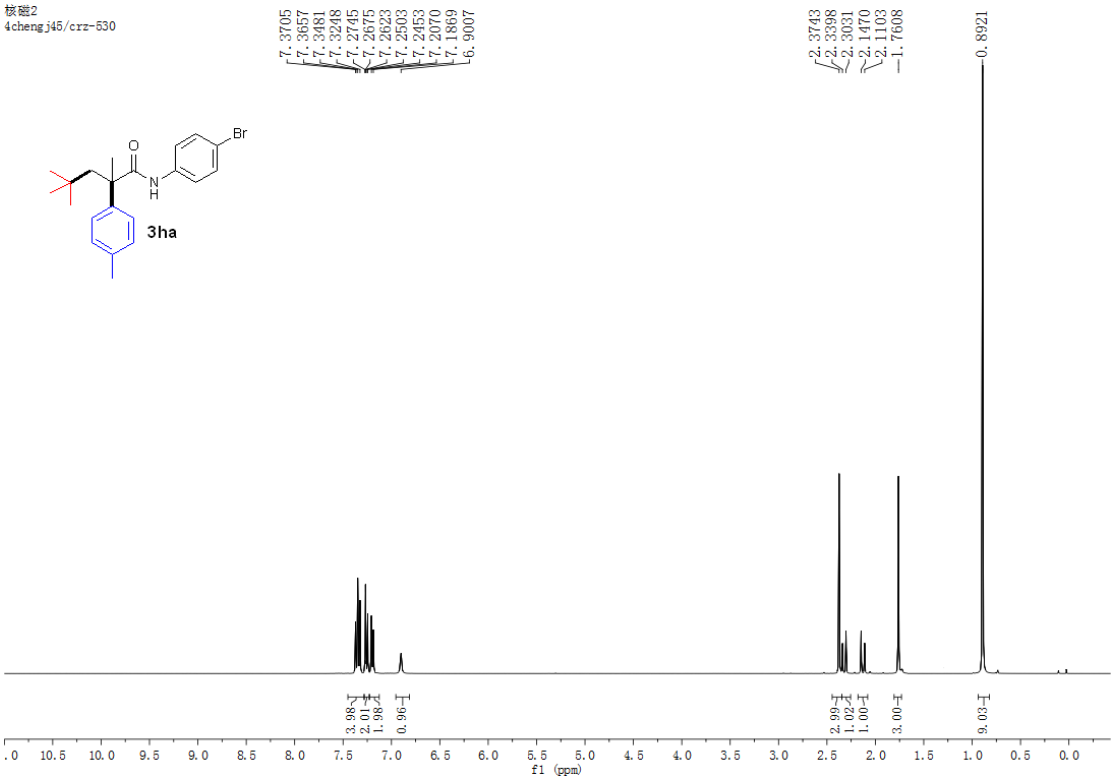
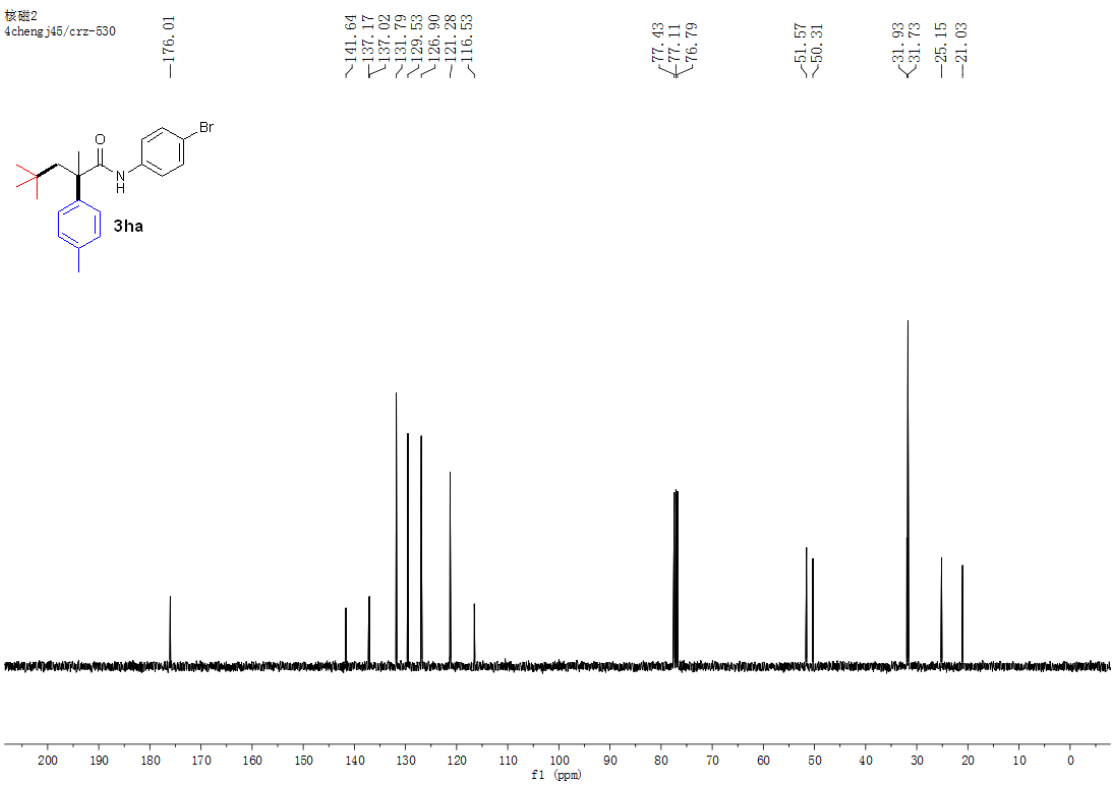
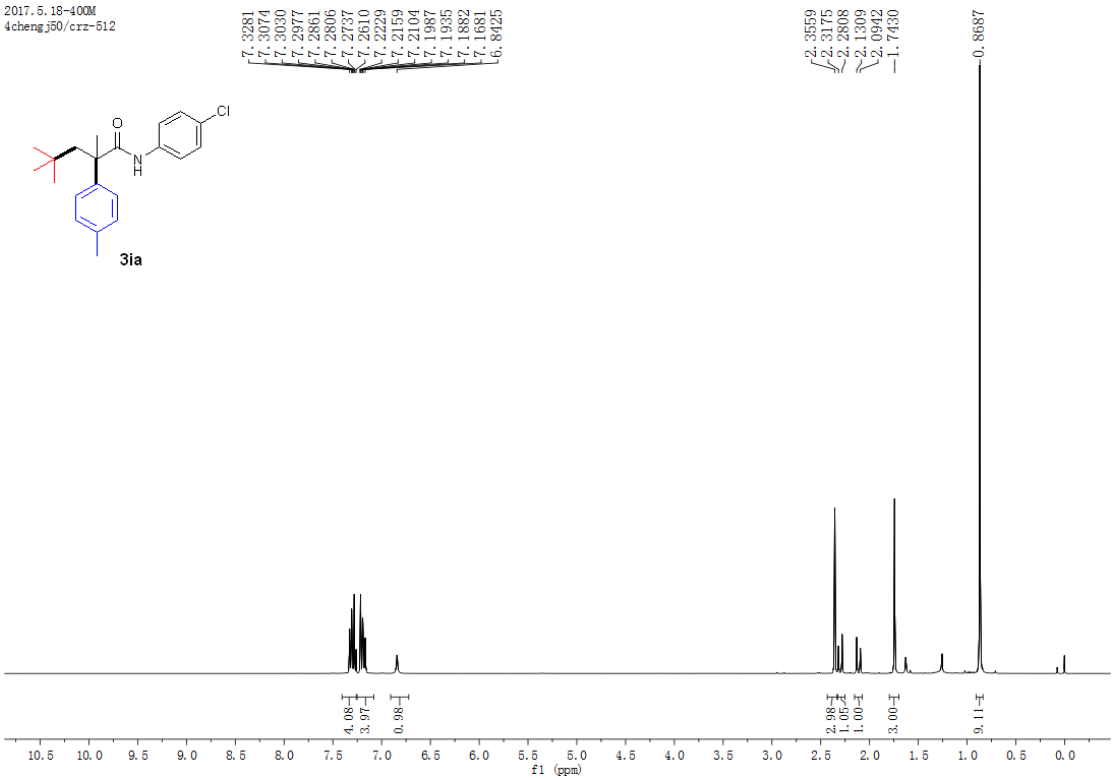
136.93
129.53
128.81
127.55
127.10
126.97
126.87
119.98
77.46
77.14
76.82
51.60
50.43
31.99
31.79
25.25
21.06
Ph
O
N
H
3ga
f1 (ppm)


核磁2
4chengj45/crz-530
7.3705
7.3657
7.3481
7.3248
7.2745
7.2675
7.2623
7.2503
7.2453
7.2070
7.1869
6.9007
2.3743
2.3398
2.3031
2.1470
2.1103
1.7608
0.8921
3ha
Br
O
N
H
3.98
2.01
1.98
0.96
2.99
1.02
1.00
3.00
9.03
f1 (ppm)


核磁2
4chengj45/crz-530
176.01
141.64
137.17
137.02
131.79
129.53
126.90
121.28
116.53
77.43
77.11
76.79
51.57
50.31
31.93
31.73
25.15
21.03
3ha
Br
O
N
H
f1 (ppm)


2017.5.18-400M
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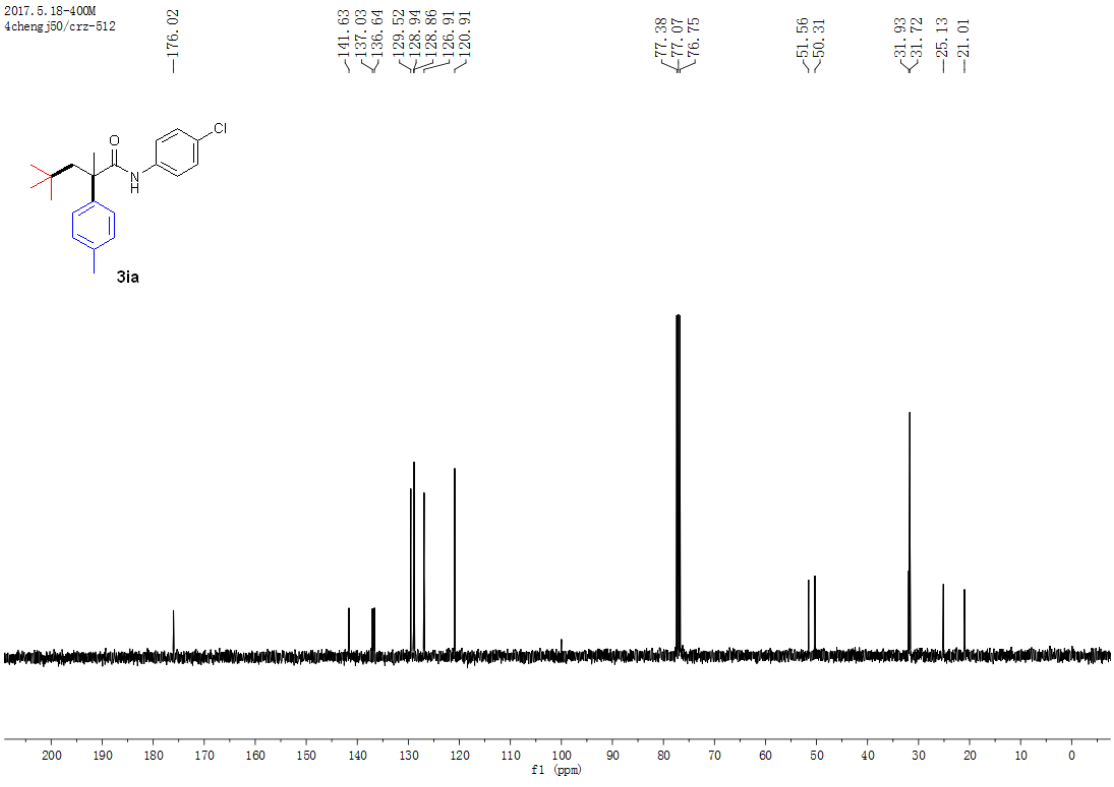
7.3074
7.3030
7.2977
7.2861
7.2806
7.2737
7.2610
7.2229
7.2159
7.2104
7.1987
7.1935
7.1882
7.1681
6.8425
2.3559
2.3175
2.2808
2.1309
2.0942
1.7430
0.8687
Cl
O
N
H
3ia
4.08
3.97
0.98
2.98
1.05
1.00
3.00
9.11
f1 (ppm)


2017.5.18-400M
4chengj50/crz-512
176.02
141.63
137.03
136.64
129.52
128.94
128.86
126.91
120.91
77.38
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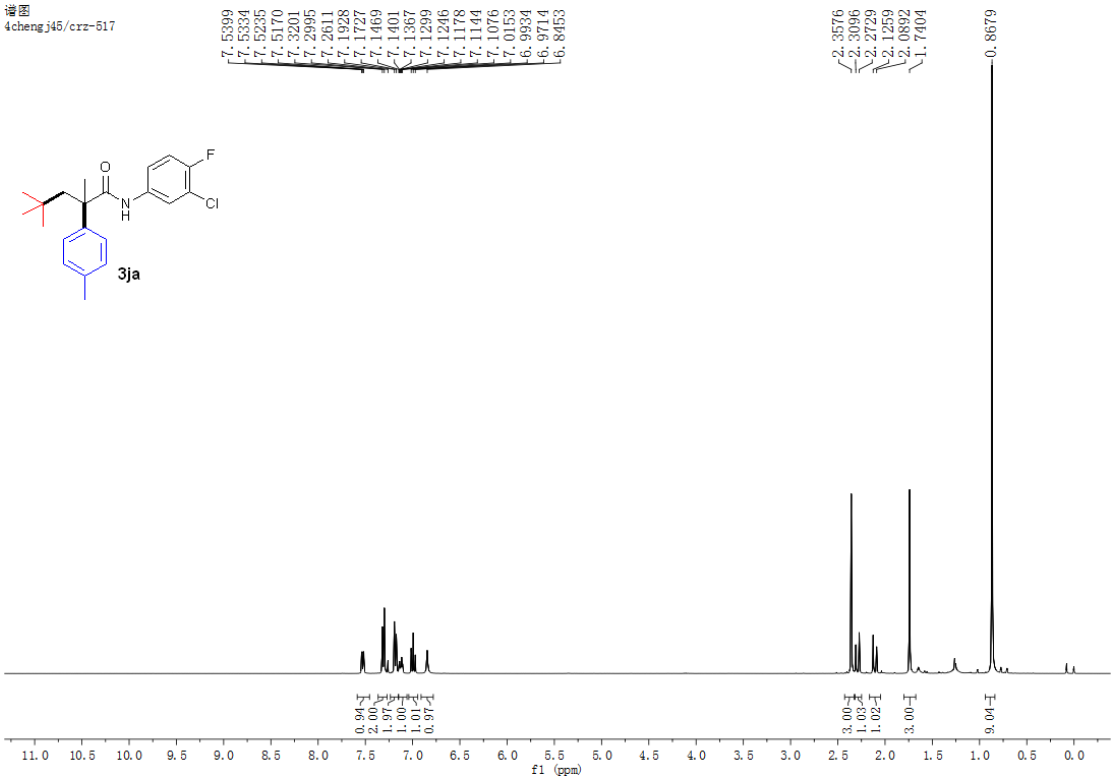
21.01
Cl
O
N
H
3ia
f1 (ppm)


4chengj45/crz-517
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7.5334
7.5235
7.5170
7.3201
7.2995
7.2611
7.1928
7.1727
7.1469
7.1401
7.1367
7.1299
7.1246
7.1178
7.1144
7.1076
7.0153
6.9934
6.9714
6.8453
2.3576
2.3096
2.2729
2.1259
2.0892
1.7404
0.8679
3ja
0.94
2.00
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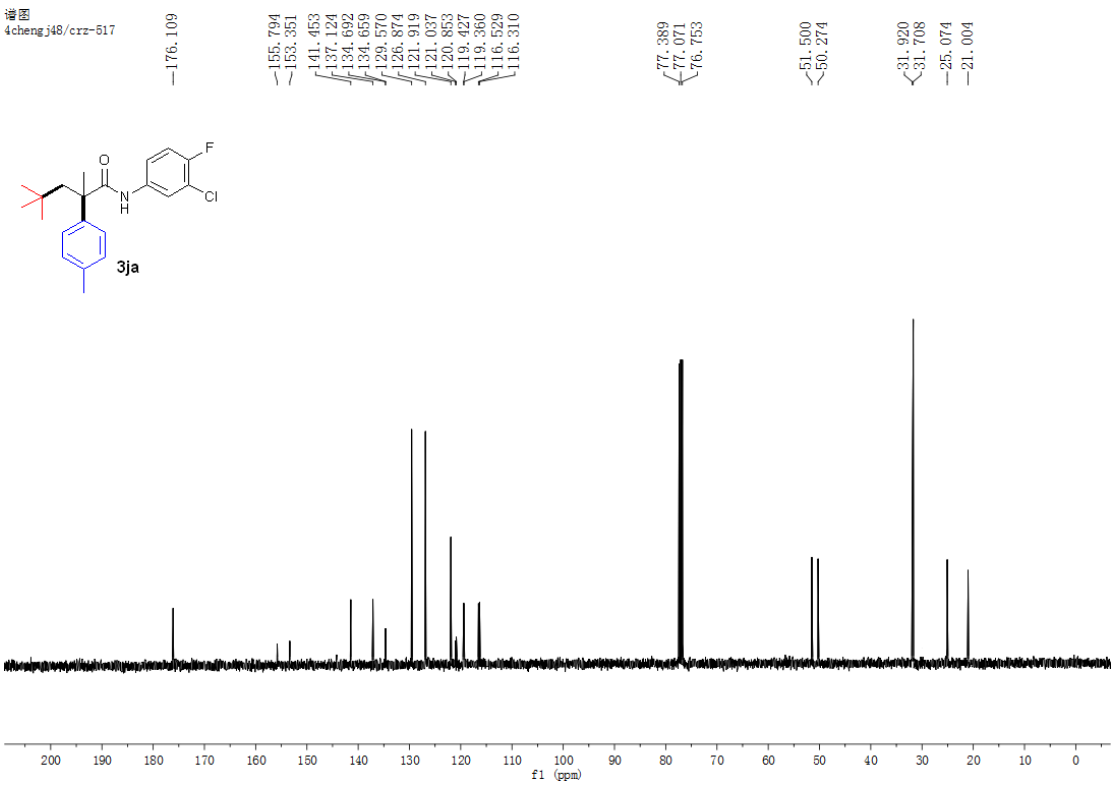
1.00
1.01
0.97
3.00
1.03
1.02
3.00
9.04
f1 (ppm)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134.692
134.659
129.570
126.874
121.919
121.037
120.853
119.427
119.360
116.529
116.310
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76.753
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31.920
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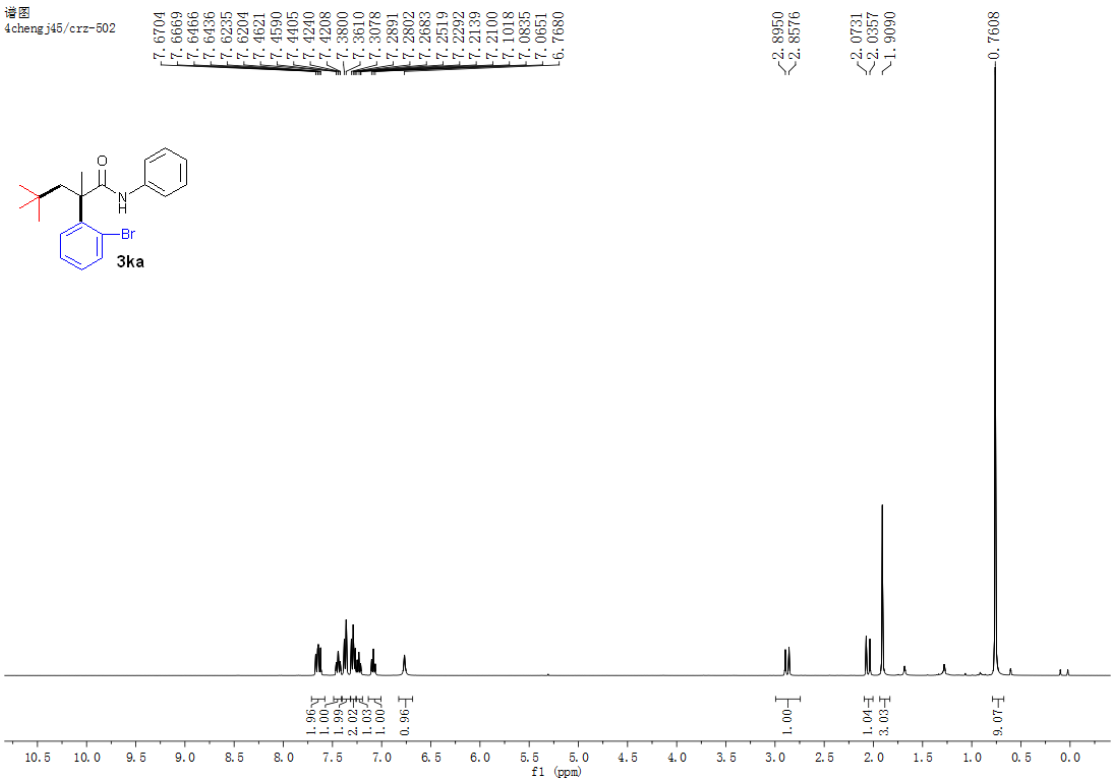
25.074
21.004
3ja
f1 (ppm)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7.6466
7.6436
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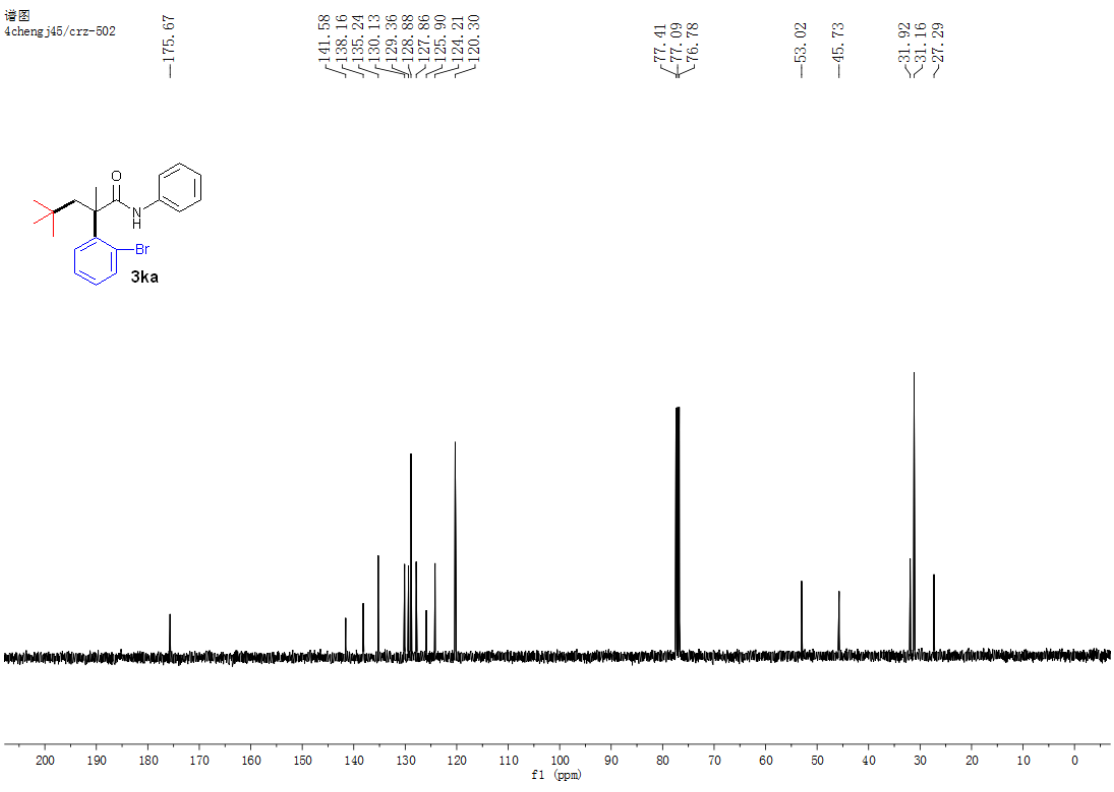
7.6204
7.4621
7.4590
7.4405
7.4240
7.4208
7.3800
7.3610
7.3078
7.2891
7.2802
7.2683
7.2519
7.2292
7.2139
7.2100
7.1018
7.0835
7.0651
6.7680
2.8950
2.8576
2.0731
2.0357
1.9090
0.7608
O
N
H
Br
3ka
1.96
1.00
1.99
2.02
1.03
1.00
0.96
1.00
1.04
3.03
9.07
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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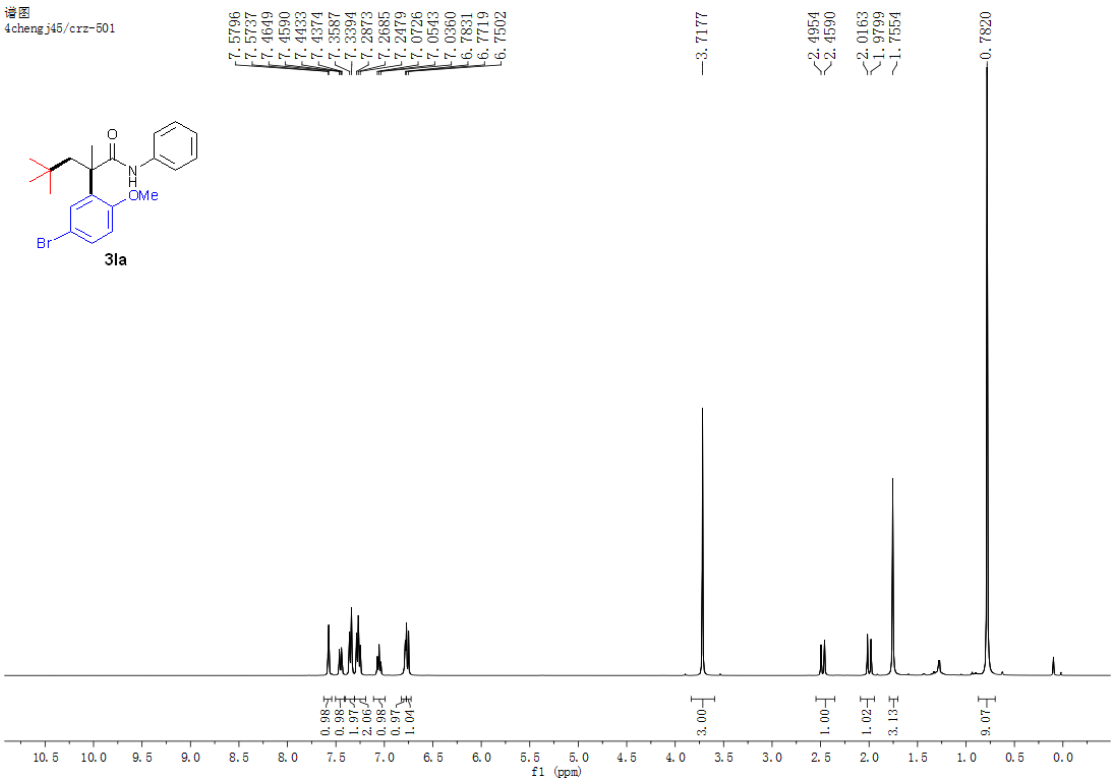
135.24
130.13
129.36
128.88
127.86
125.90
124.21
120.30
77.41
77.09
76.78
53.02
45.73
31.92
31.16
27.29
O
N
H
Br
3ka
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)


4chengj45/crz-501
7.5796
7.5737
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7.4590
7.4433
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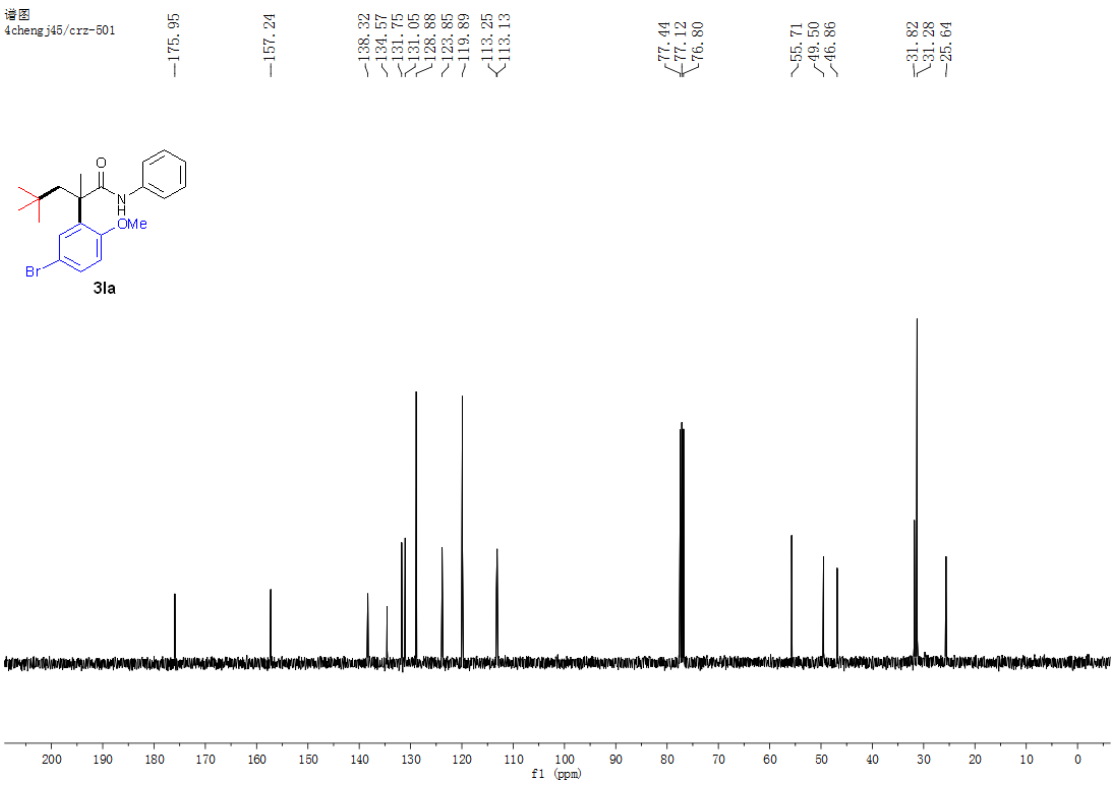
7.3587
7.3394
7.2873
7.2685
7.2479
7.0726
7.0543
7.0360
6.7831
6.7719
6.7502
3.7177
2.4954
2.4590
2.0163
1.9799
1.7554
0.7820
OMe
Br
3la
0.98
0.98
1.97
2.06
0.98
0.97
1.04
3.00
1.00
1.02
3.13
9.07
f1 (ppm)


4chengj45/crz-501
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131.05
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123.85
119.89
113.25
113.13
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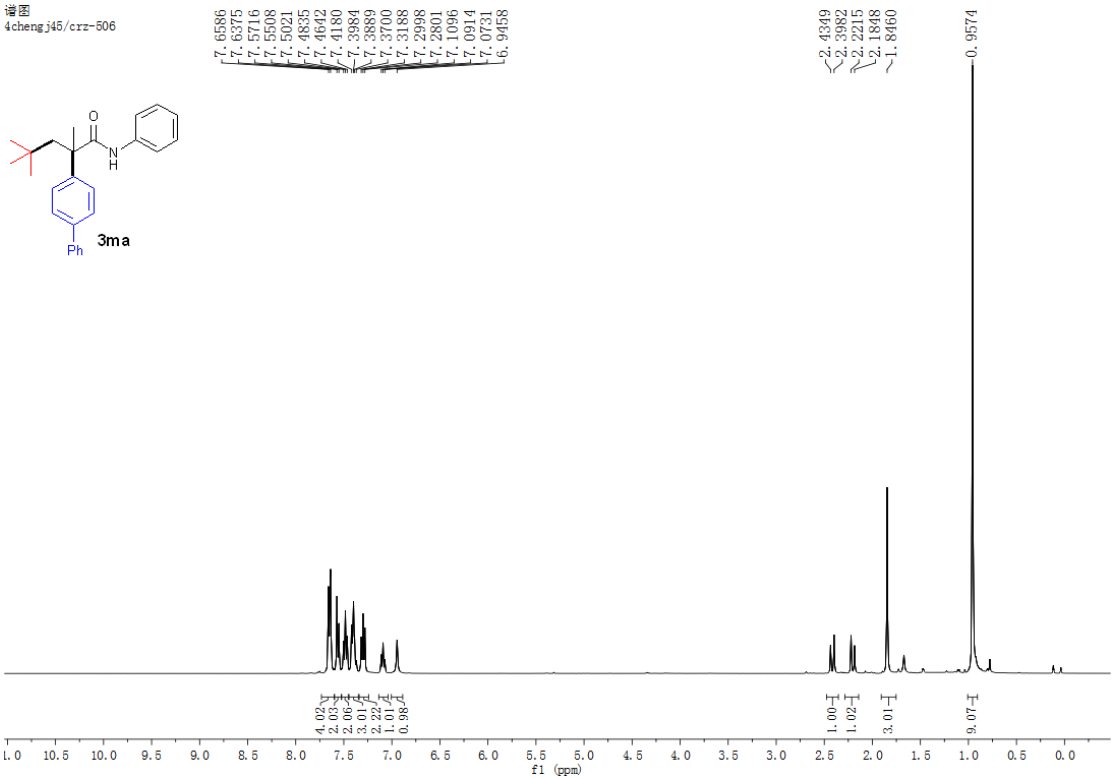
55.71
49.50
46.86
31.82
31.28
25.64
OMe
Br
3la
f1 (ppm)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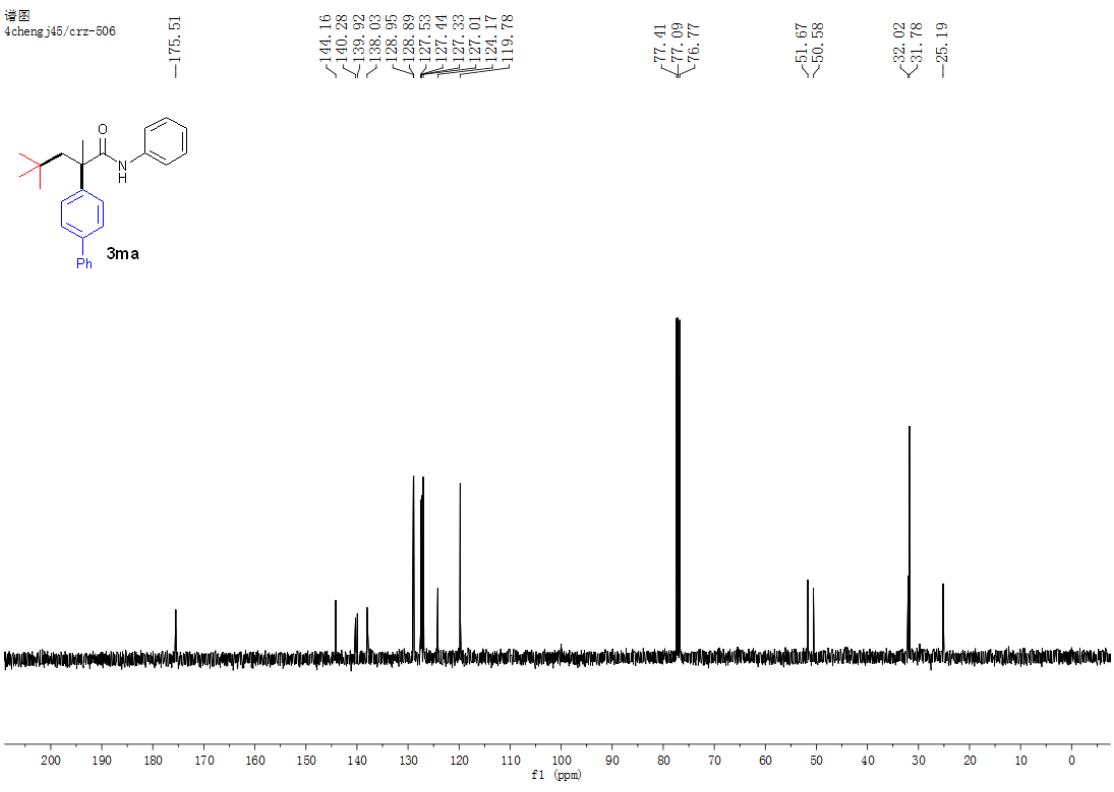
7.4642
7.4180
7.3984
7.3889
7.3700
7.3188
7.2998
7.2801
7.1096
7.0914
7.0731
6.9458
2.4349
2.3982
2.2215
2.1848
1.8460
0.9574
4.02
2.03
2.06
3.01
2.22
1.01
0.98
1.00
1.02
3.01
9.07
3ma
f1 (ppm)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139.92
138.03
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127.53
127.44
127.33
127.01
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119.78
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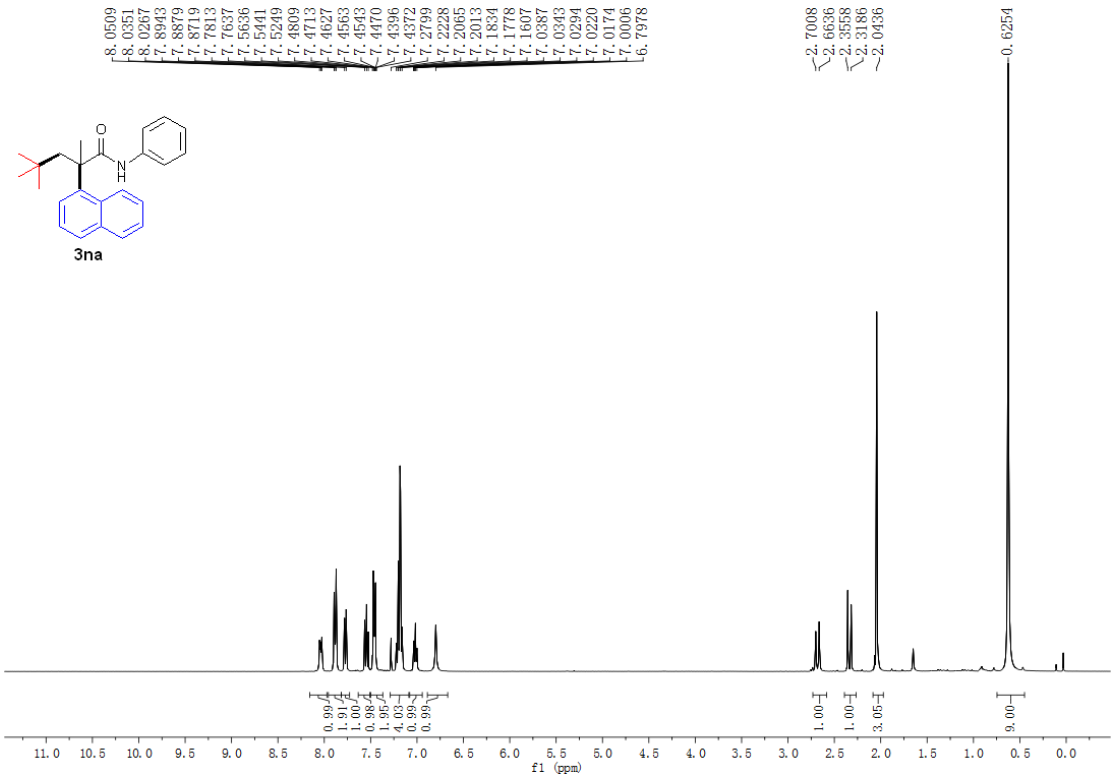
77.09
76.77
51.67
50.58
32.02
31.78
25.19
3ma
f1 (ppm)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7.4809
7.4713
7.4627
7.4563
7.4543
7.4470
7.4396
7.4372
7.2799
7.2228
7.2065
7.2013
7.1834
7.1778
7.1607
7.0387
7.0343
7.0294
7.0220
7.0174
7.0006
6.7978
2.7008
2.6636
2.3558
2.3186
2.0436
0.6254
3na
0.99
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1.00
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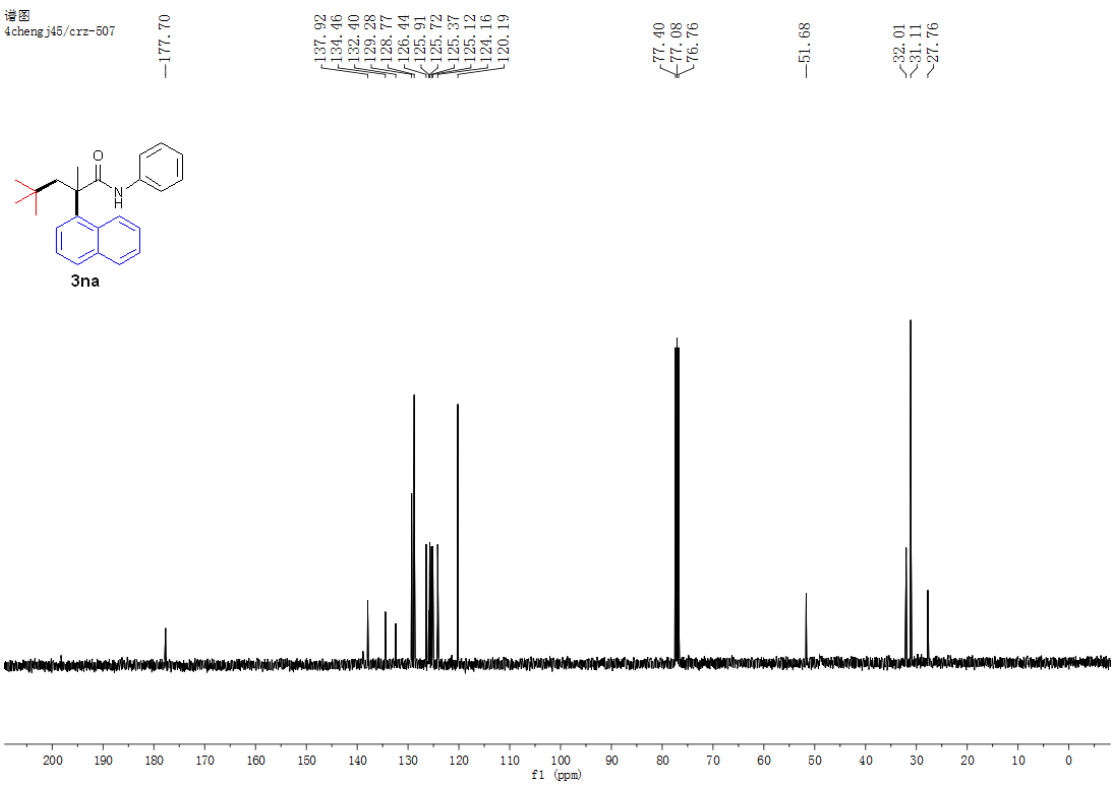
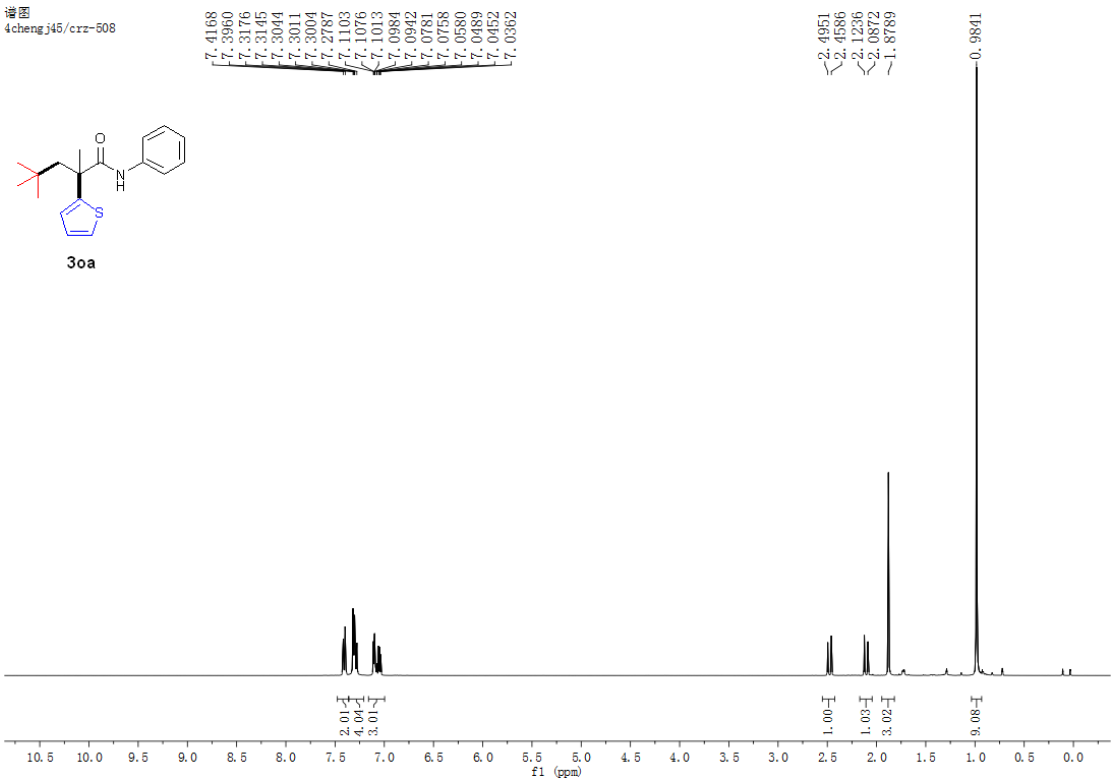
1.95
4.03
0.99
0.99
1.00
1.00
3.05
9.00
f1 (ppm)


4chengj45/crz-507
177.70
137.92
134.46
132.40
129.28
128.77
126.44
125.91
125.72
125.37
125.12
124.16
120.19
77.40
77.08
76.76
51.68
32.01
31.11
27.76
3na
f1 (ppm)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7.3004
7.2787
7.1103
7.1076
7.1013
7.0984
7.0942
7.0781
7.0758
7.0580
7.0489
7.0452
7.0362
2.4951
2.4586
2.1236
2.0872
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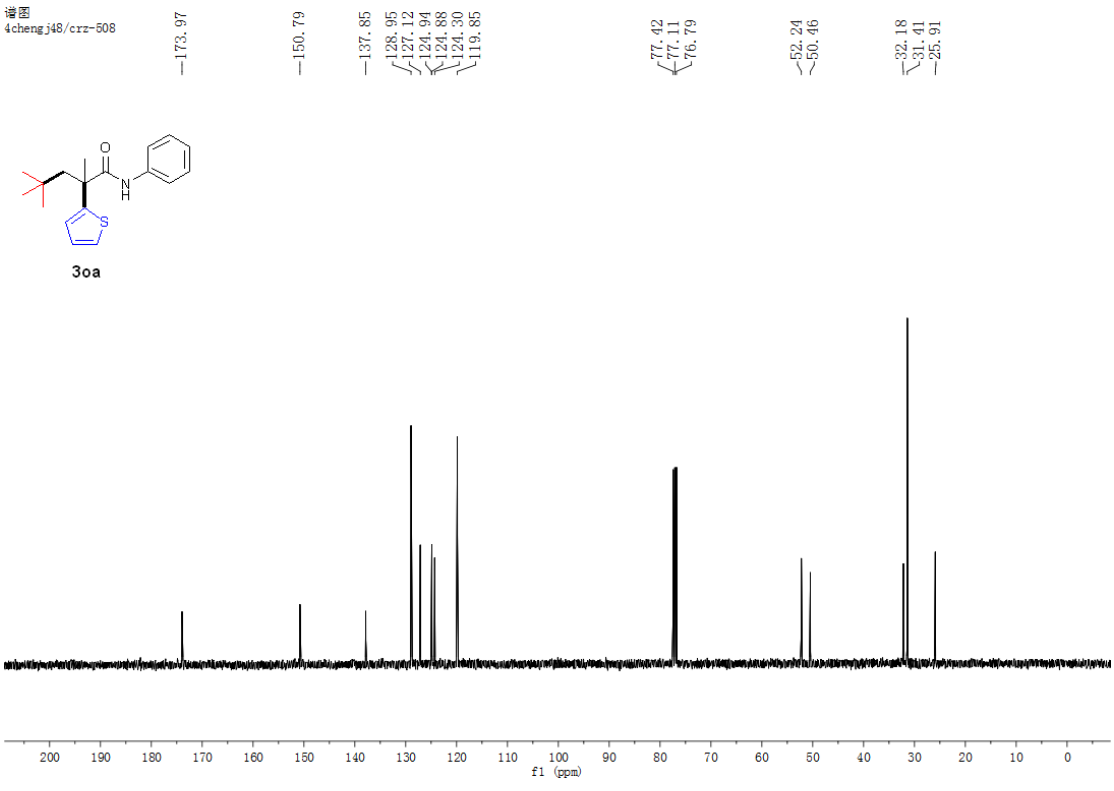
2.01
4.04
3.01
1.00
1.03
3.02
9.08
f1 (ppm)

3oa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124.94
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119.85
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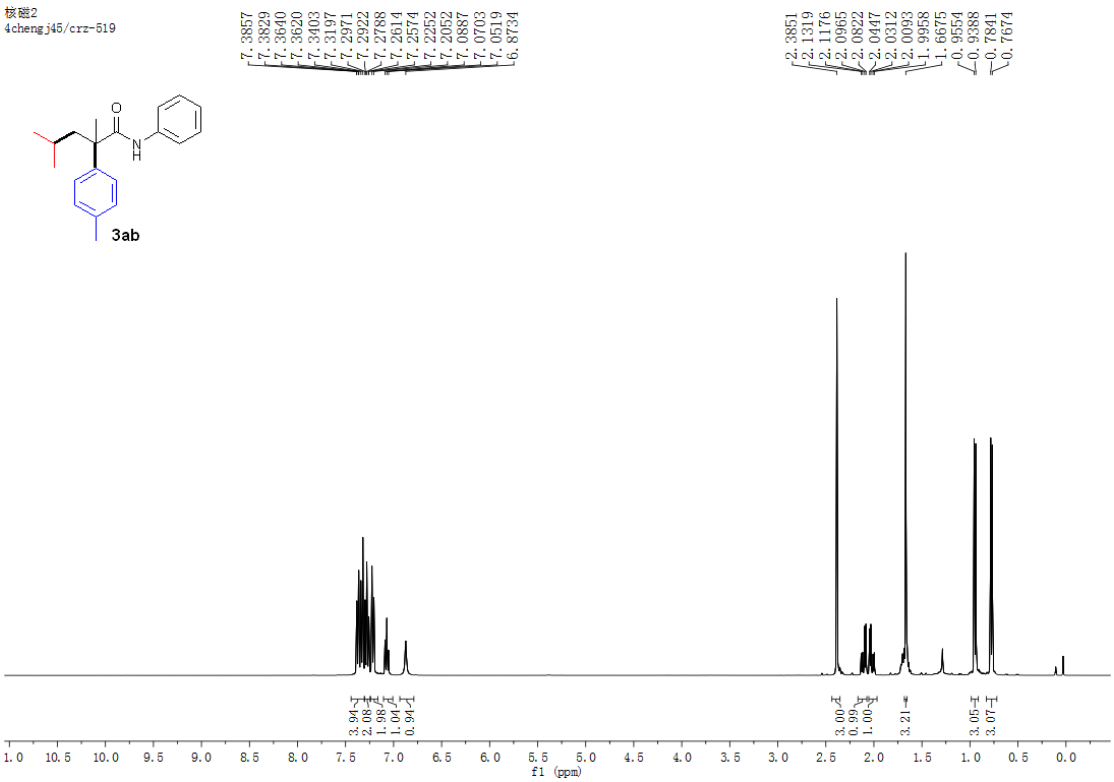
77.11
76.79
52.24
50.46
32.18
31.41
25.91
f1 (ppm)

3oa


核磁2
4chengj45/crz-519
7.3857
7.3829
7.3640
7.3620
7.3403
7.3197
7.2971
7.2922
7.2788
7.2614
7.2574
7.2252
7.2052
7.0887
7.0703
7.0519
6.8734
2.3851
2.1319
2.1176
2.0965
2.0822
2.0447
2.0312
2.0093
1.9958
1.6675
0.9554
0.9388
0.7841
0.7674
3ab
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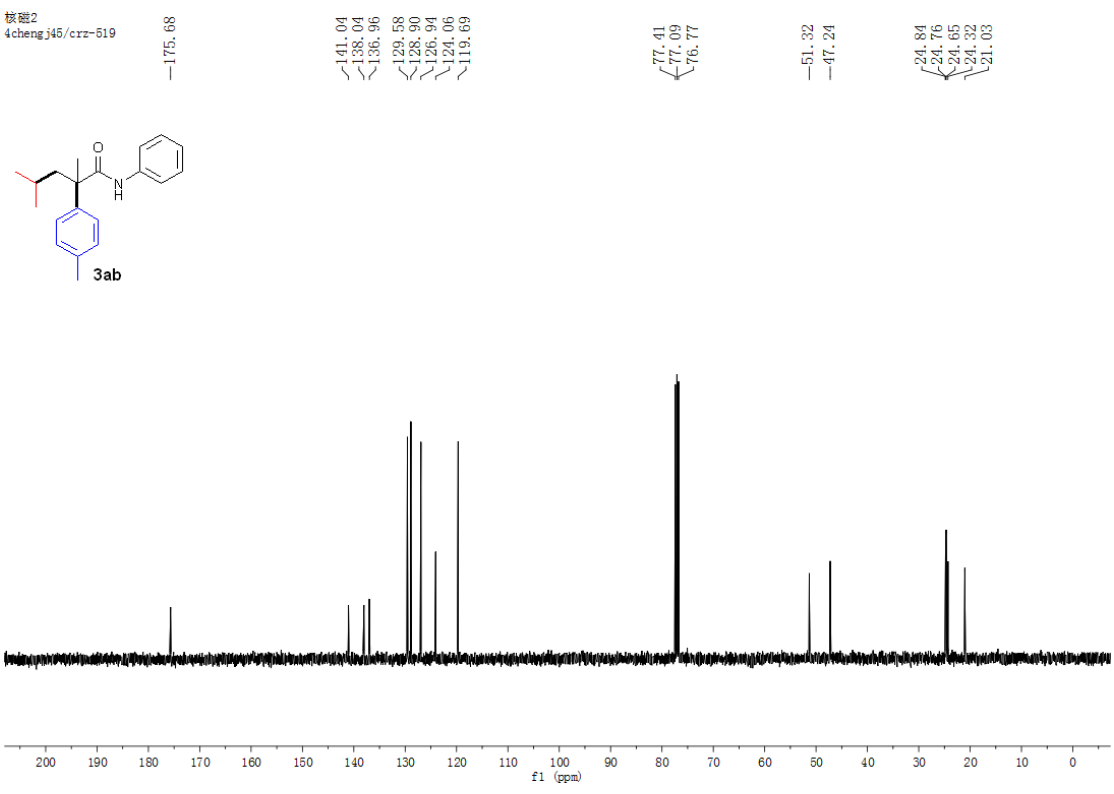
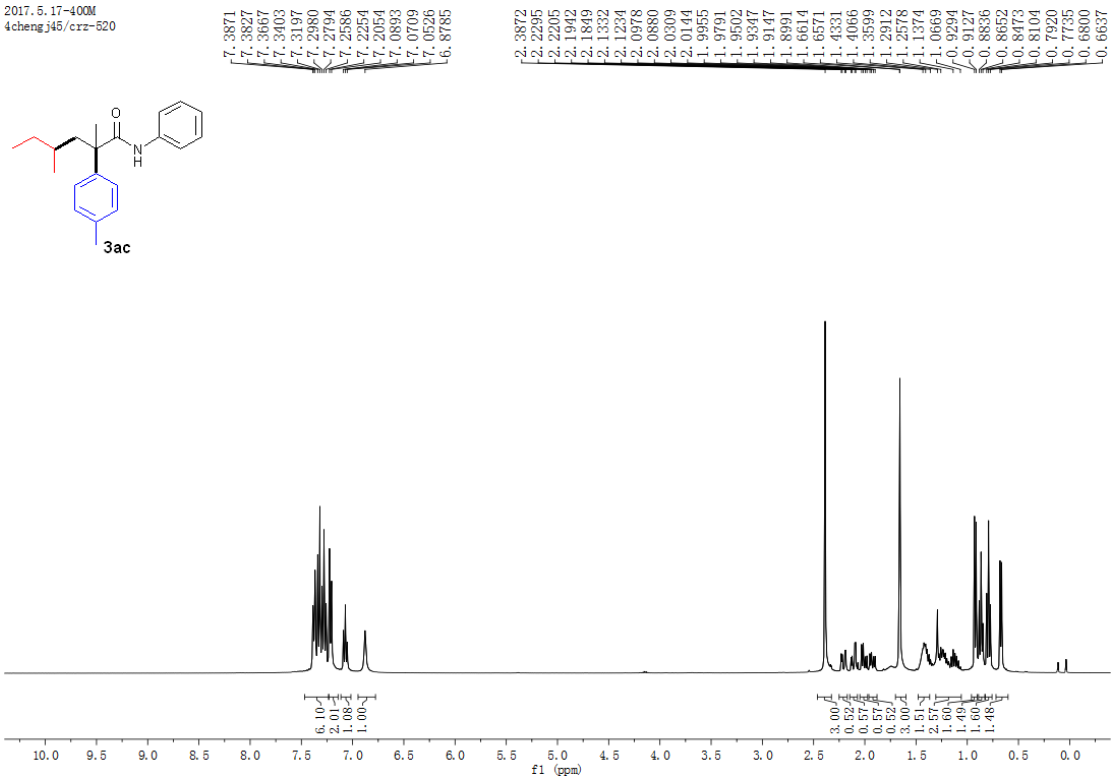
2.08
1.98
1.04
0.94
3.00
0.99
1.00
3.21
3.05
3.07
f1 (ppm)


核磁2
4chengj45/crz-519
175.68
141.04
138.04
136.96
129.58
128.90
126.94
124.06
119.69
77.41
77.09
76.77
51.32
47.24
24.84
24.76
24.65
24.32
21.03
3ab
f1 (ppm)


2017.5.17-400M
4chengj45/crz-520
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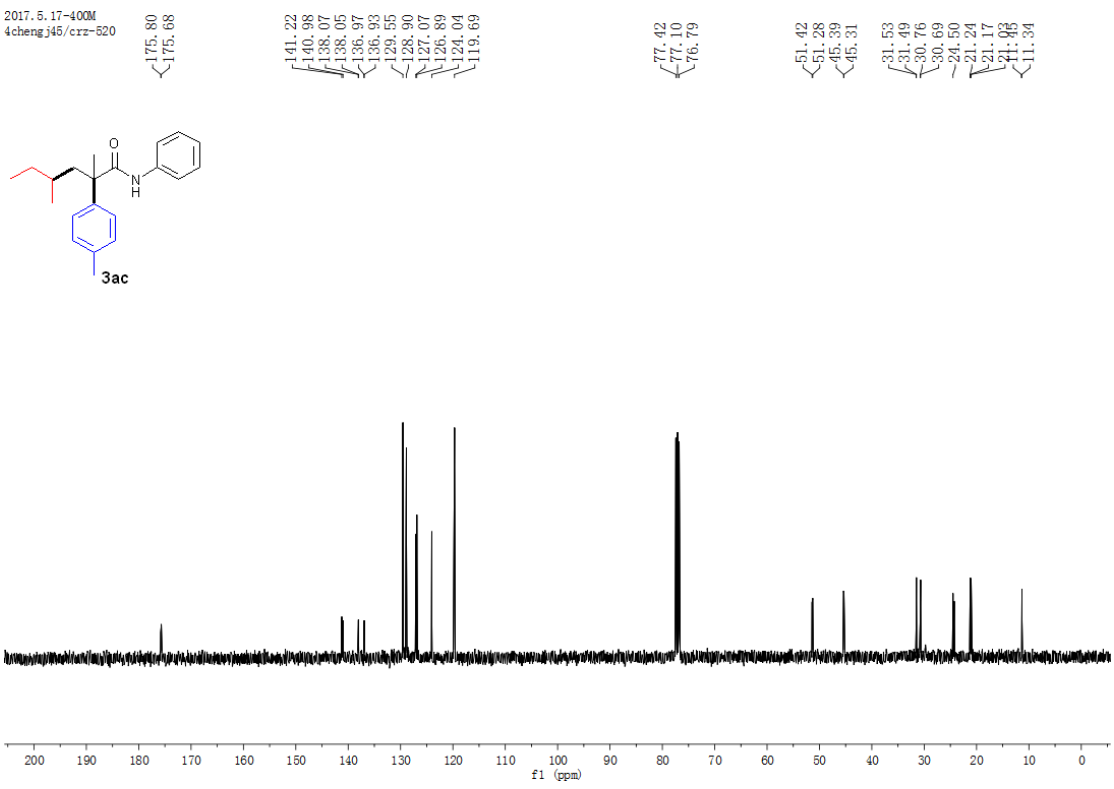
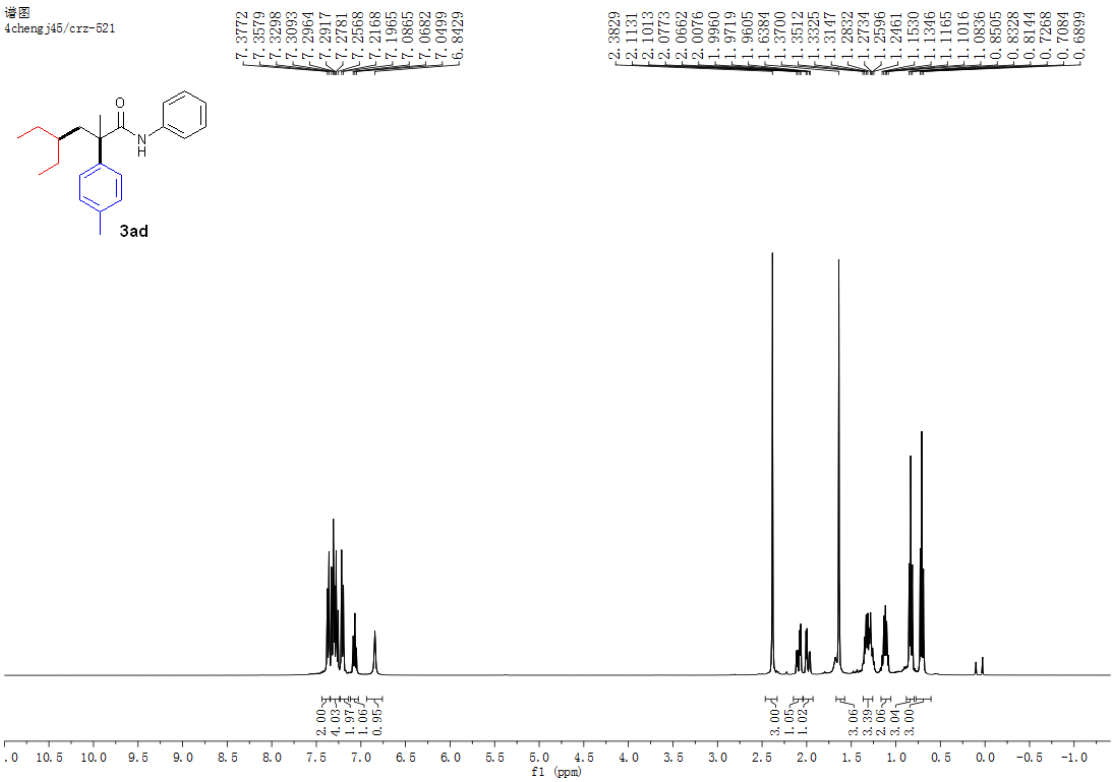
7.3827
7.3667
7.3403
7.3197
7.2980
7.2794
7.2586
7.2254
7.2054
7.0893
7.0709
7.0526
6.8785
2.3872
2.2295
2.2205
2.1942
2.1849
2.1332
2.1234
2.0978
2.0880
2.0309
2.0144
1.9955
1.9791
1.9502
1.9347
1.9147
1.8991
1.6614
1.6571
1.4331
1.4066
1.3599
1.2912
1.2578
1.1374
1.0669
0.9294
0.9127
0.8836
0.8652
0.8473
0.8104
0.7920
0.7735
0.6800
0.6637
O
N
H
3ac
6.10
2.01
1.08
1.00
3.00
0.52
0.57
0.57
0.52
3.00
1.51
2.57
1.60
1.49
1.60
1.48
10.0
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
0.0
f1 (ppm)


2017.5.17-400M
4chengj45/crz-520
175.80
175.68
141.22
140.98
138.07
138.05
136.97
136.93
129.55
128.90
127.07
126.89
124.04
119.69
77.42
77.10
76.79
51.42
51.28
45.39
45.31
31.53
31.49
30.76
30.69
24.50
21.24
21.17
21.03
11.45
11.34
O
N
H
3ac
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


4chengj45/crz-521
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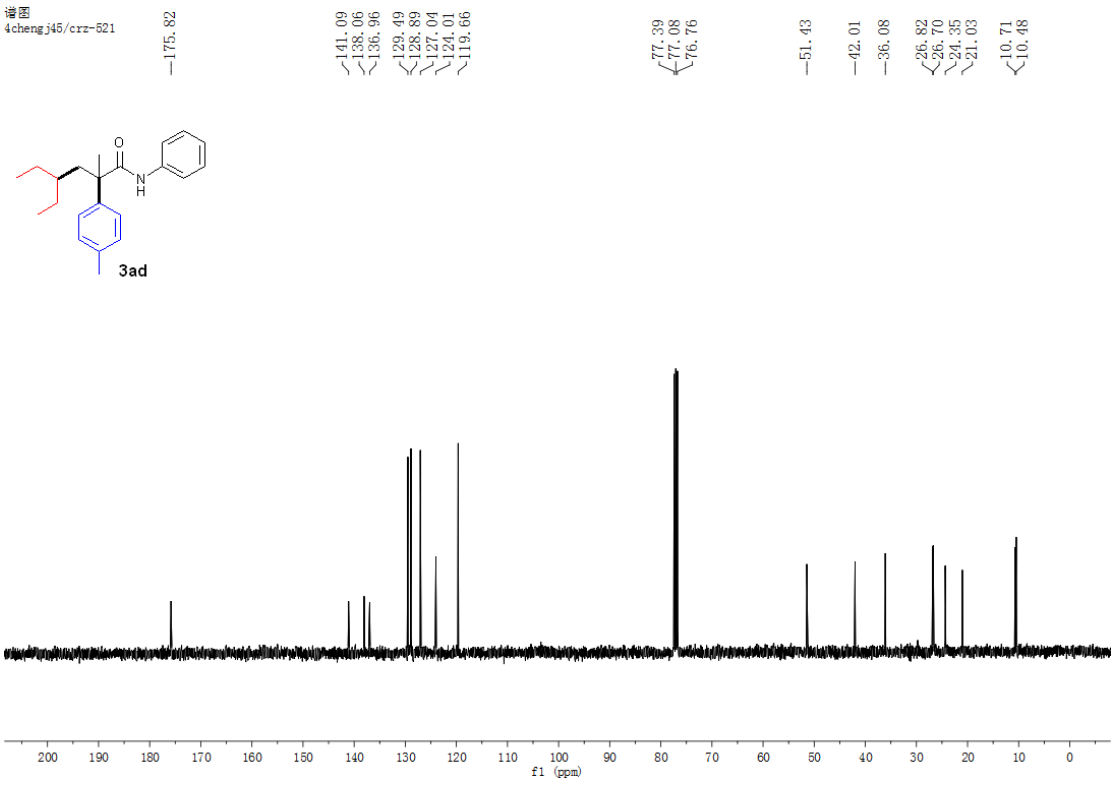
7.3579
7.3298
7.3093
7.2964
7.2917
7.2781
7.2568
7.2168
7.1965
7.0865
7.0682
7.0499
6.8429
2.3829
2.1131
2.1013
2.0773
2.0662
2.0076
1.9960
1.9719
1.9605
1.6384
1.3700
1.3512
1.3325
1.3147
1.2832
1.2734
1.2596
1.2461
1.1530
1.1346
1.1165
1.1016
1.0836
0.8505
0.8328
0.8144
0.7268
0.7084
0.6899
3ad
2.00
4.03
1.97
1.06
0.95
3.00
1.05
1.02
3.06
3.39
2.06
3.04
3.00
f1 (ppm)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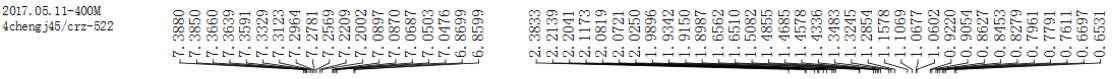
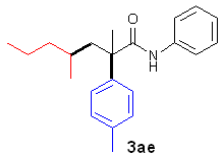
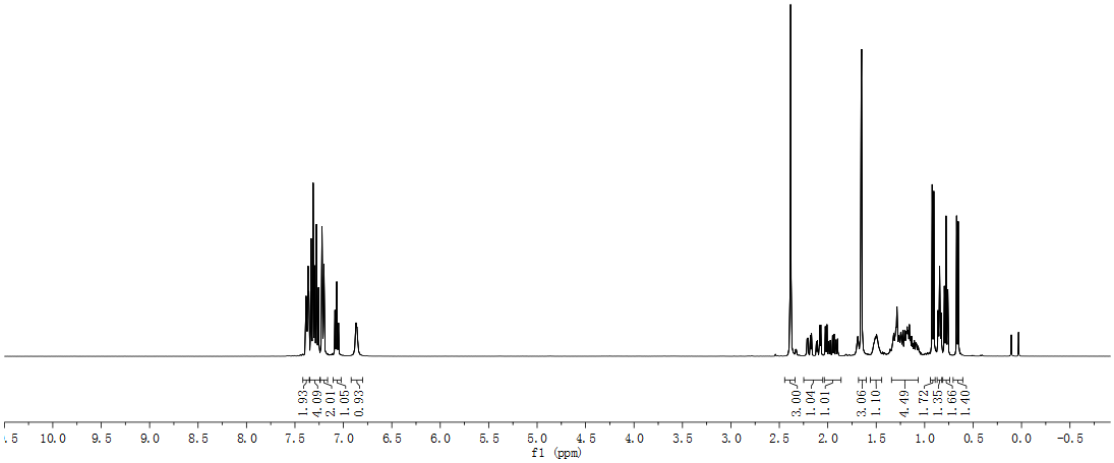
138.06
136.96
129.49
128.89
127.04
124.01
119.66
77.39
77.08
76.76
51.43
42.01
36.08
26.82
26.70
24.35
21.03
10.71
10.48
3ad
f1 (ppm)

2017.05.11-400M
4chengj45/crz-522

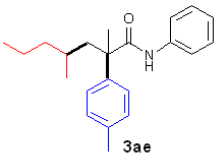




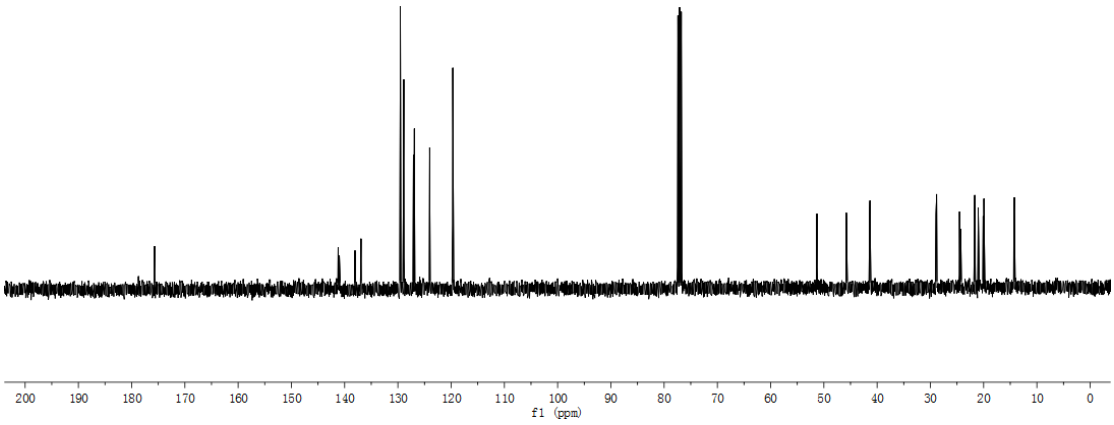
3ae



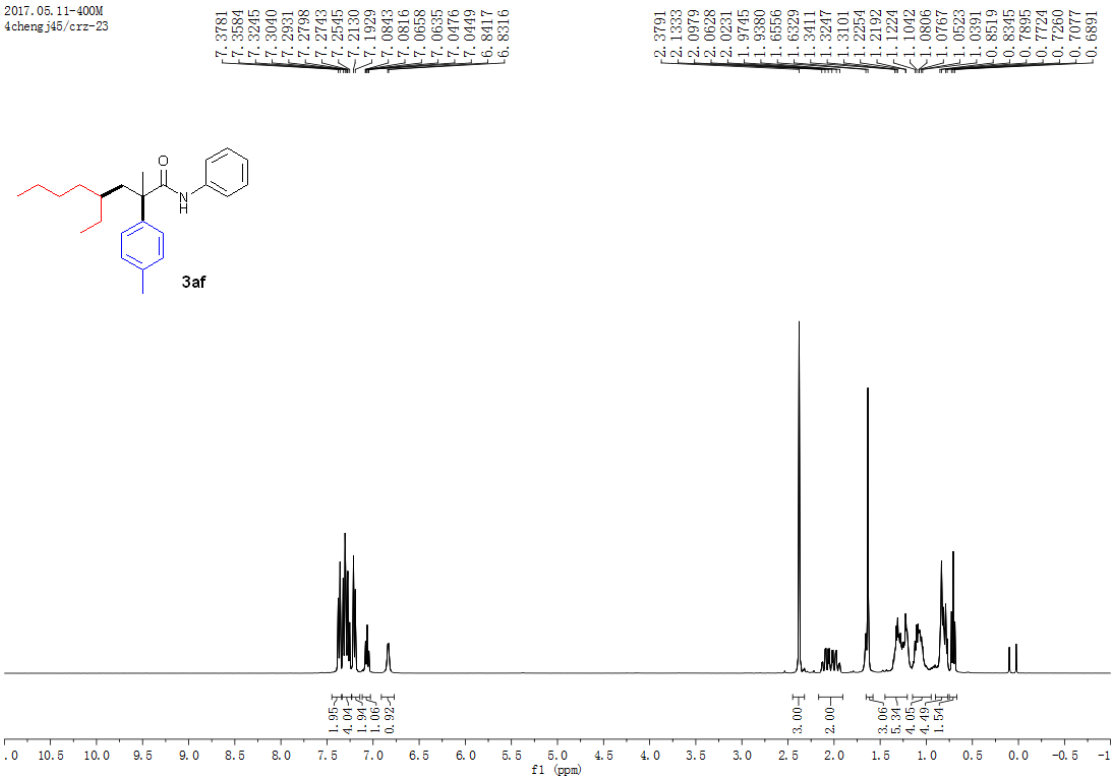
核磁2
4chengj45/crz-522



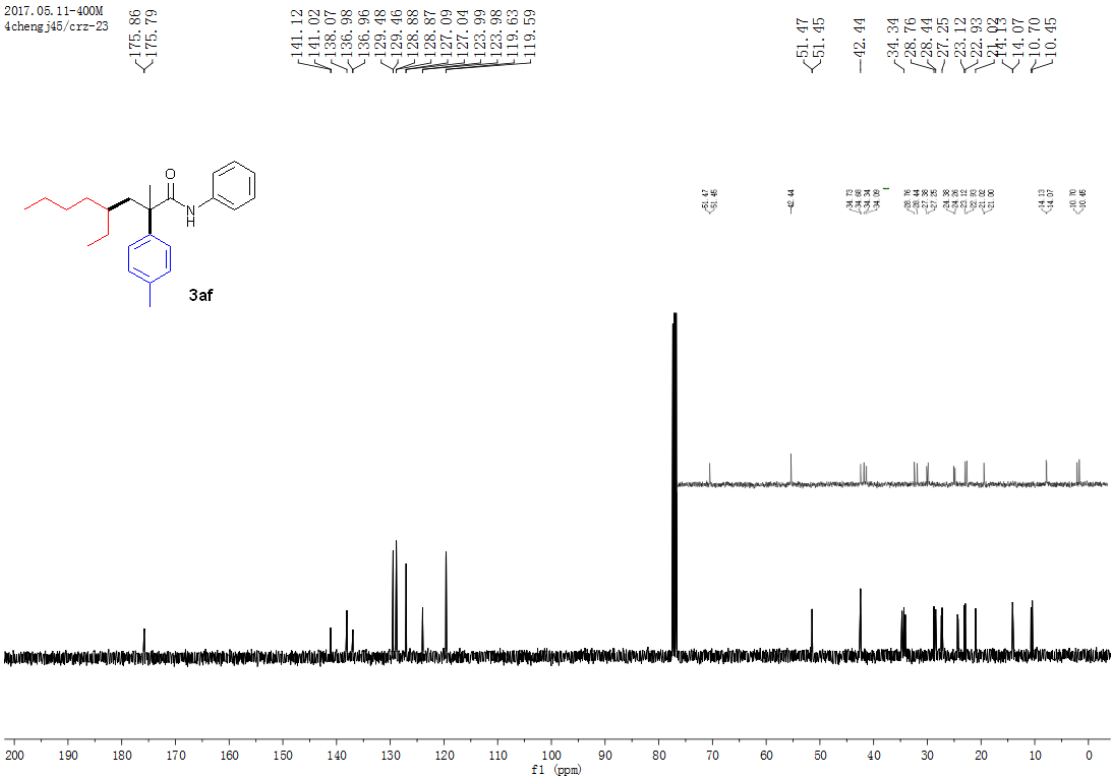
3ae



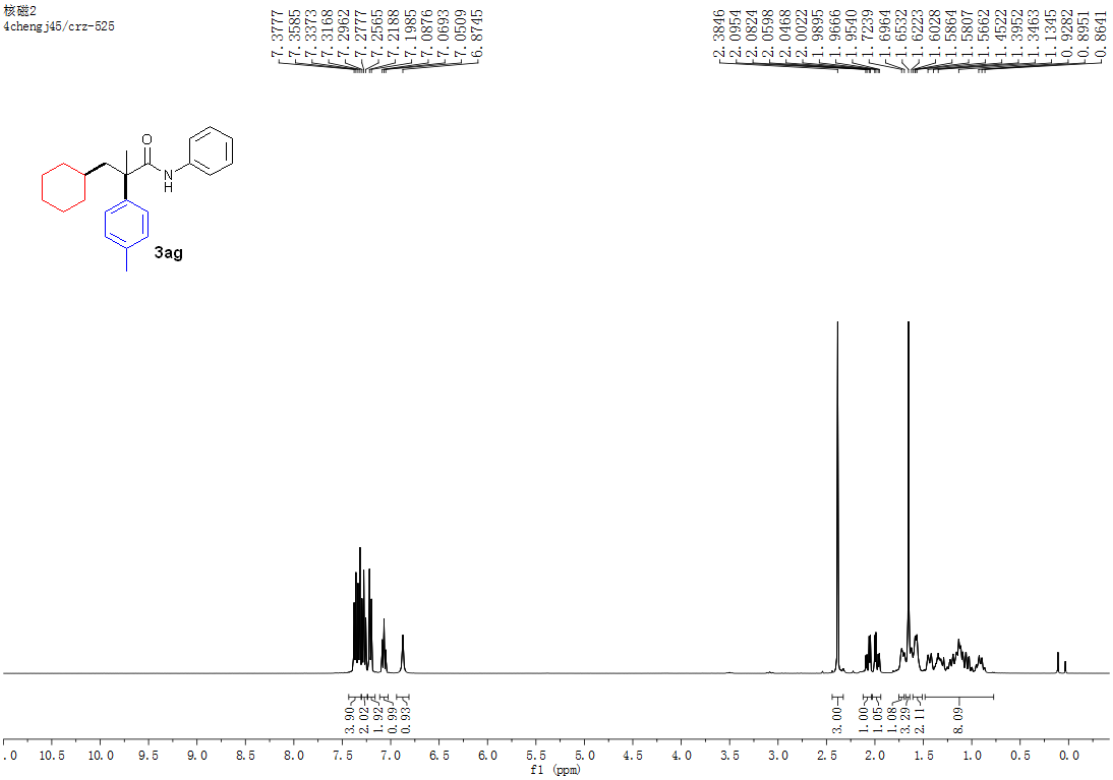
2017.05.11-400M
4chengj45/crz-23



2017.05.11-400M
4chengj45/crz-23



核磁2
4chengj45/crz-525



核磁2
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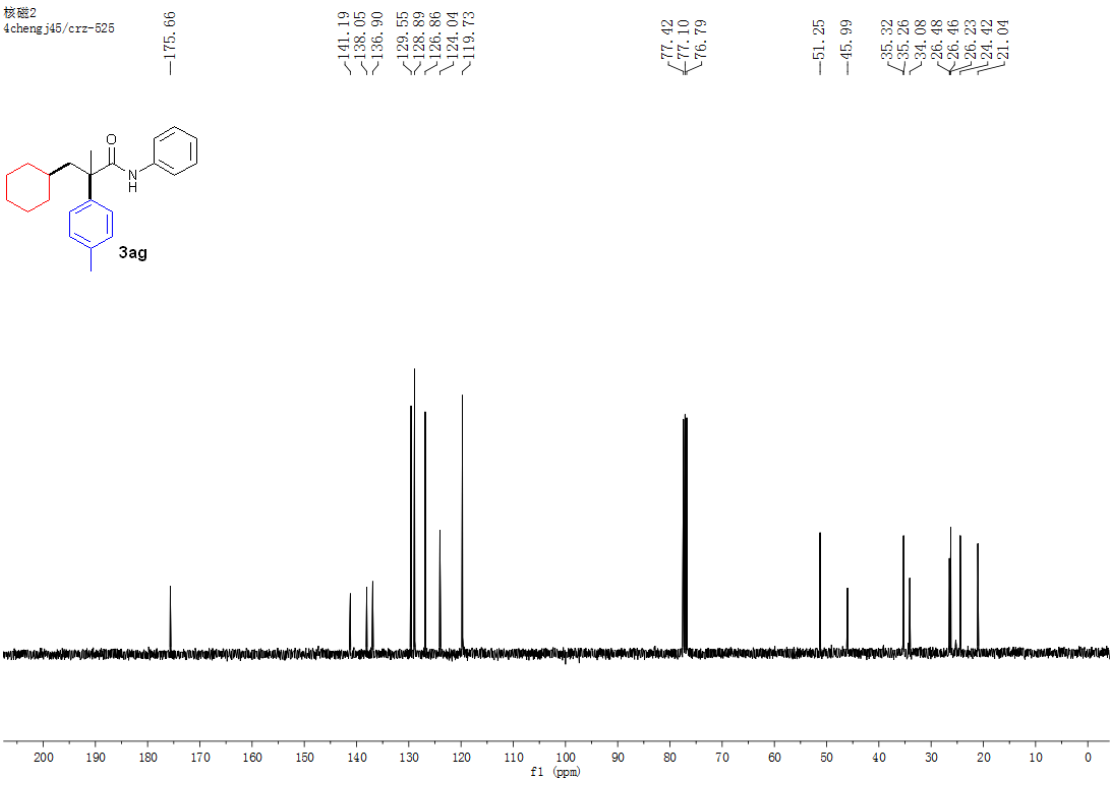

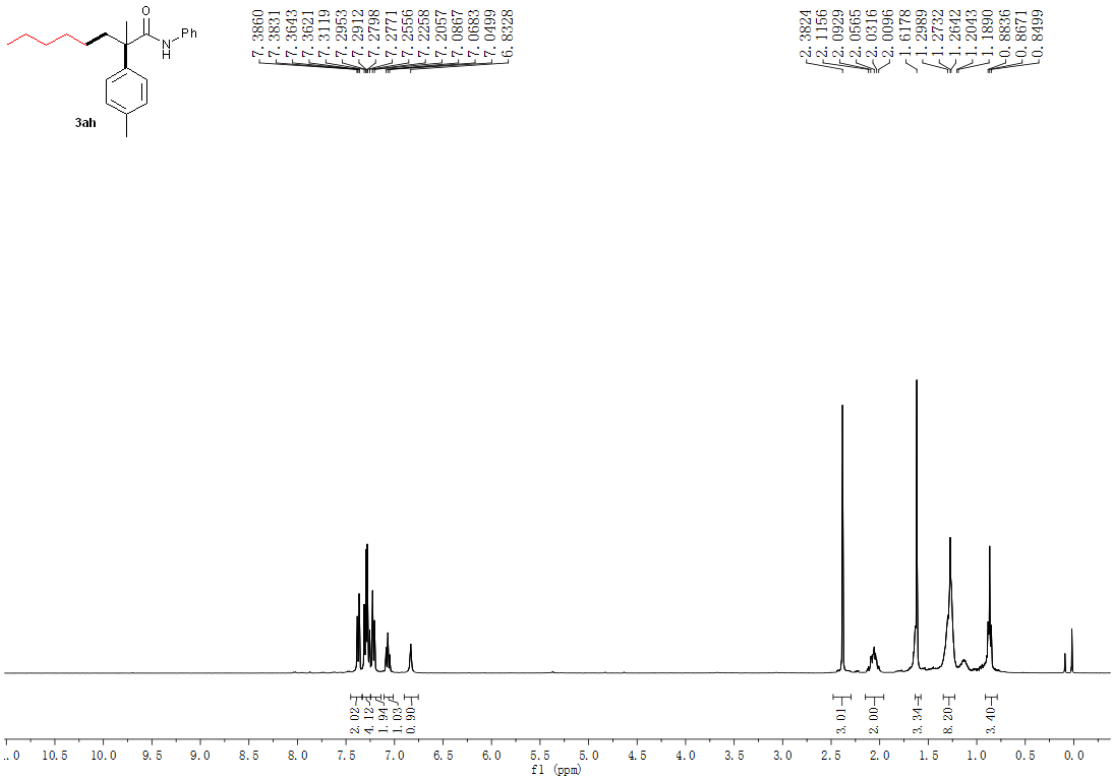
3ah
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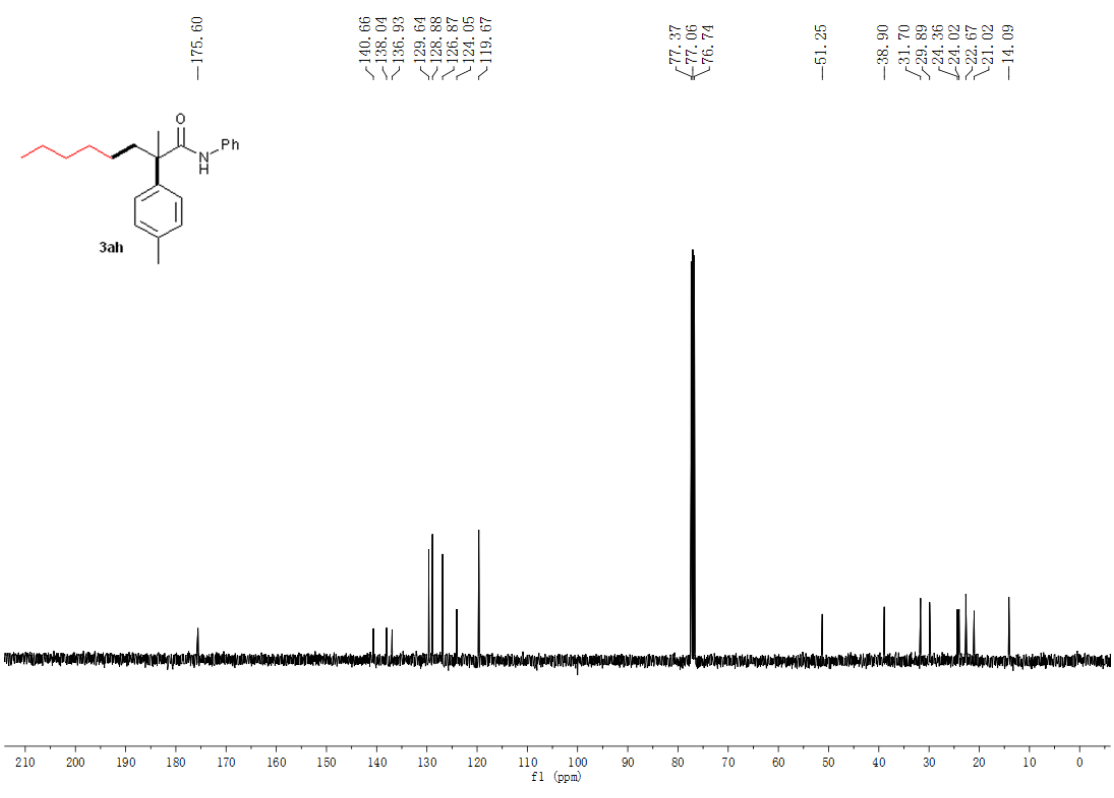
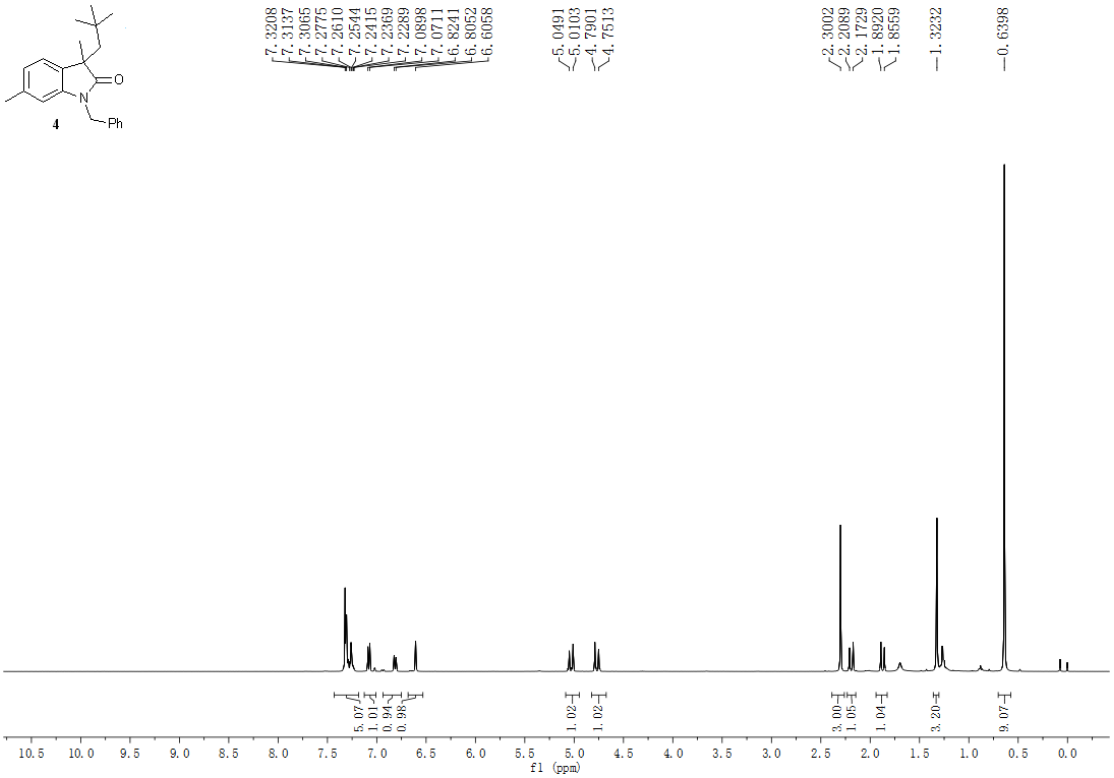
7.3831
7.3643
7.3621
7.3119
7.2953
7.2912
7.2798
7.2771
7.2556
7.2258
7.2057
7.0867
7.0683
7.0499
6.8328
2.3824
2.1156
2.0929
2.0565
2.0316
2.0096
1.6178
1.2989
1.2732
1.2642
1.2043
1.1890
0.8836
0.8671
0.8499
2.02
4.12
1.94
1.03
0.90
3.01
2.00
3.34
8.20
3.40
f1 (ppm)


175.60
140.66
138.04
136.93
129.64
128.88
126.87
124.05
119.67
77.37
77.06
76.74
51.25
38.90
31.70
29.89
24.36
24.02
22.67
21.02
14.09
3ah
f1 (ppm)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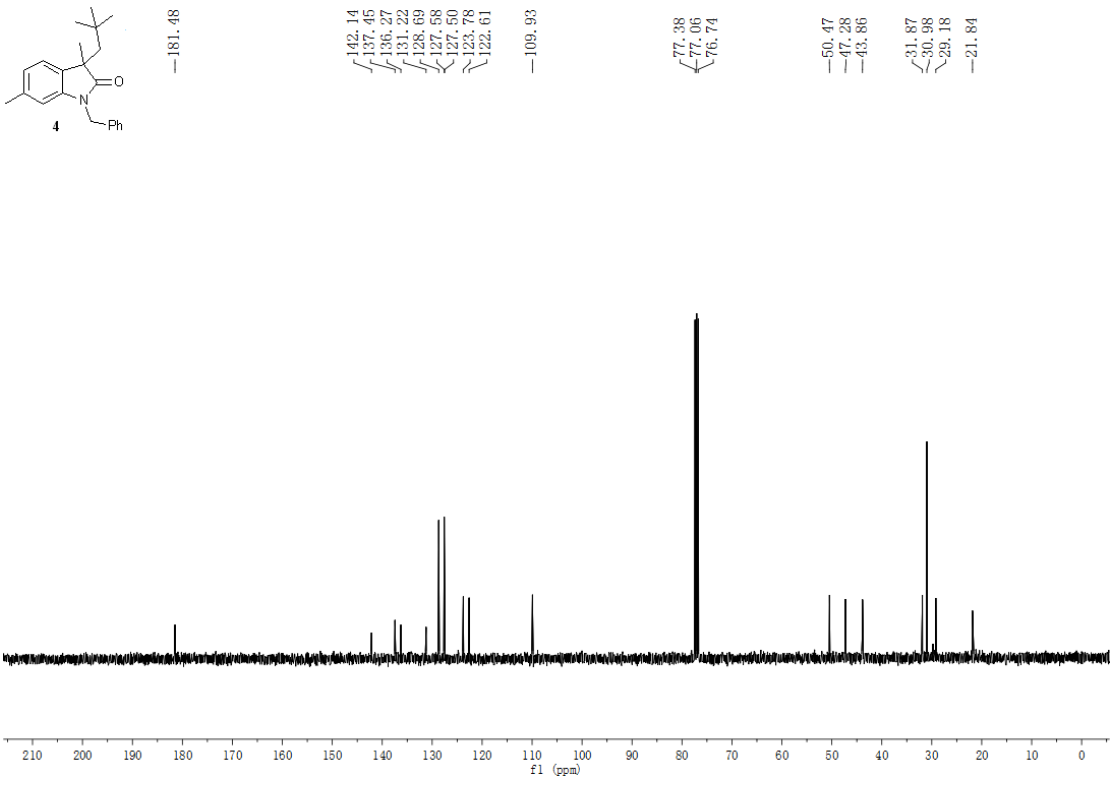
7.3137
7.3065
7.2775
7.2610
7.2544
7.2415
7.2369
7.2289
7.0898
7.0711
6.8241
6.8052
6.6058
5.0491
5.0103
4.7901
4.7513
2.3002
2.2089
2.1729
1.8920
1.8559
1.3232
0.6398
5.07
1.01
0.94
0.98
1.02
1.02
3.00
1.05
1.04
3.20
9.07
f1 (ppm)


181.48
142.14
137.45
136.27
131.22
128.69
127.58
127.50
123.78
122.61
109.93
77.38
77.06
76.74
50.47
47.28
43.86
31.87
30.98
29.18
21.84
f1 (ppm)