Supporting Information

Tao-Phos -Controlled Desymmetrization of Succinimide-based Bisalkynes via Asymmetric Copper-Catalyzed Huisgen Alkyne-Azide Click Cycloaddition: Substrate Scope and Mechanism

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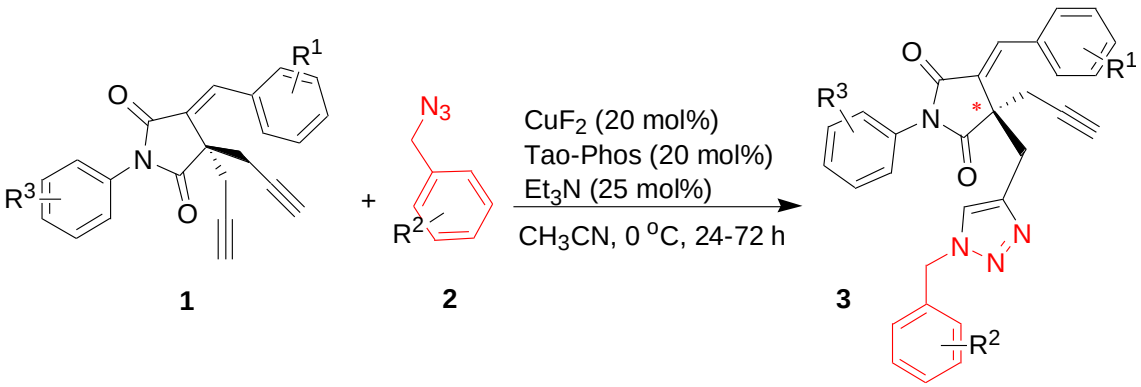
S-1. General information

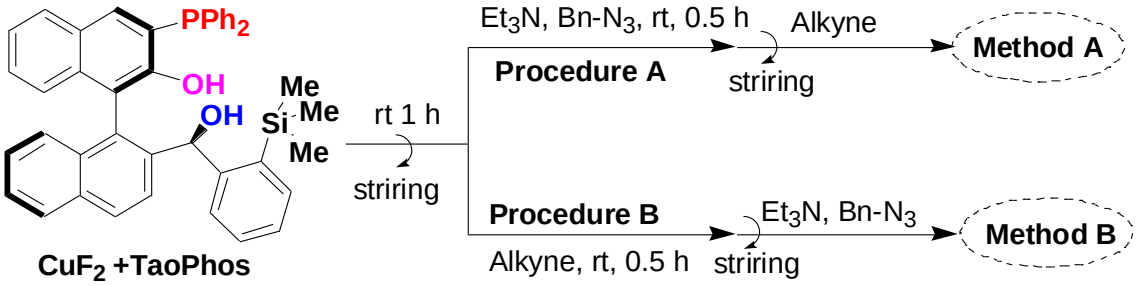
All reactions were performed in flame-dried glassware under an atmosphere of dry nitrogen, and the subsequent workup was carried out in air, unless otherwise noted. Toluene, Acetonitrile, dichloromethane (DCM), triethylamine (Et_3N) and *N*,*N*-dimethylformamide (DMF) were dried and distilled from calcium hydride. Ether (Et_2O) and tetrahydrofuran (THF) were dried and distilled from metal sodium and benzophenone. Alcohol solvents were dried and distilled from metal magnesium. CuF_2 was purchased from Aldrich and used directly without further purification. All reactions were monitored by thin layer chromatography (TLC). The NMR of ^1H and ^{13}C spectra were recorded in $CDCl_3$ using Bruker 500 MHz or 400 MHz spectrometer, and referenced with respect to internal TMS standard. The following abbreviations were used to designate chemical shift multiplicities: s = singlet, d = doublet, t = triplet, q = quartet, dd = double doublet, m = multiplet. The HPLC analyses of products were performed on the Angilent series with Chiralcel AD-H columns, AS-H columns, OD-H columns, IA-H columns, and IB-H columns. The Mass spectra were recorded on an Angilent instrument using the TOF MS technique.

S-2. General procedure for the catalytic asymmetric CuAAC reaction



1 + **2** → **3**

3a: R^1 = *p*-Cl, R^2 = *m*-Me, R^3 = *p*-OEt;
3b: R^1 = *o*-F, R^2 = *p*-Me, R^3 = *p*-OEt;
3c: R^1 = *o*-F, R^2 = *m*-Me, R^3 = *p*-OEt;
3d: R^1 = *o*-Br, R^2 = *p*-Me, R^3 = *p*-OEt;
3e: R^1 = *p*-Cl, R^2 = *o*-OMe, R^3 = *p*-OEt;
3f: R^1 = *o*-Br, R^2 = *o*-OMe, R^3 = *p*-OEt;
3g: R^1 = *p*-Br, R^2 = *p*-Me, R^3 = H;
3h: R^1 = *o*-Br, R^2 = *p*-Me, R^3 = *m*-Br;
3i: R^1 = *p*-Cl, R^2 = *p*-Me, R^3 = *p*-OEt;
3j: R^1 = *o*-Br R^2 = *m*-Me, R^3 = *p*-OEt;
3k: R^1 = *o*-F, R^2 = *o*-OMe, R^3 = *p*-OEt;
3l: R^1 = *o*-Me, R^2 = *m*-Me, R^3 = *p*-OEt;
3m: R^1 = o,*p*-2Cl, R^2 = *m*-Me, R^3 = *p*-OEt;
3n: R^1 = *o*-Br, R^2 = *m*-Me, R^3 = *p*-*t*-Bu;
3o: R^1 = *o*-OMe, R^2 = *m*-Me, R^3 = H;
3p: R^1 = *o*-Br, R^2 = *p*-Me, R^3 = *p*-*t*-Bu



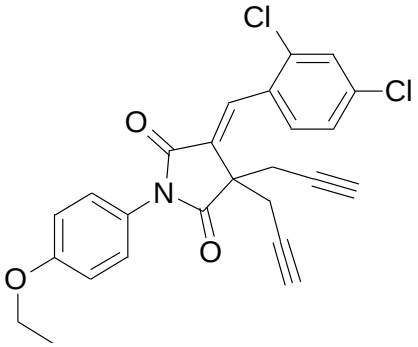
Method A: Under an atmosphere of N_2, to an oven-dried Schlenk tube were added **Tao-Phos** (25 mg, 0.04 mmol) and CuF_2 (4 mg, 0.04 mmol), followed by the addition of CH_3CN (1.0 mL). After the solution was stirred at 25 ^oC for 1 hour, NEt_3 (7 μL, 0.05 mmol, 0.25 eq.) and benzyl azidoacetate (27.5 μL, 0.22 mmol) were added, and keep stirring for 0.5 hour. The reaction was cooled to 0 ^oC and the substrate (0.2 mmol) was added in additional CH_3CN (1 mL). The resulting mixture was stirred for 72 hours till almost full conversation to product **3** (TLC analysis). When the reaction was complete, it was quenched with saturated aqueous NH_4Cl (1 mL) and stirred vigorously for 5 minutes. The aqueous phase was extracted with ethyl acetate (3x5 mL). The combined organic layers were dried over Na_2SO_4 and concentrated under reduced pressure. The residue was purified by silica gel column chromatography (PE/EA, 5/1-3/1) to get the products **3**.

Method B: Under an atmosphere of N_2, to an oven-dried Schlenk tube were added **Tao-Phos** (25 mg, 0.04 mmol) and CuF_2 (4 mg, 0.04 mmol), followed by the addition of 1.0 mL CH_3CN. After the solution was stirred at 25^oC for 1 hour, the substrate (0.2 mmol) was added in another CH_3CN (1 mL), and keep stirring for 0.5 hour. NEt_3 (7 μL, 0.05 mmol, 0.25 eq.) and Benzyl azidoacetate (27.5 μL, 0.22 mmol) were added. The reaction was cooled to 0^oC.The resulting mixture was stirred for 72 hours till almost full conversation to product **3** (TLC analysis). When the reaction was complete, it was quenched with saturated aqueous NH_4Cl (1 mL) and stirred vigorously for 5 minutes. The aqueous phase was extracted with ethyl acetate (3x5 mL). The combined organic layers were dried over Na_2SO_4 and concentrated under reduced pressure. The

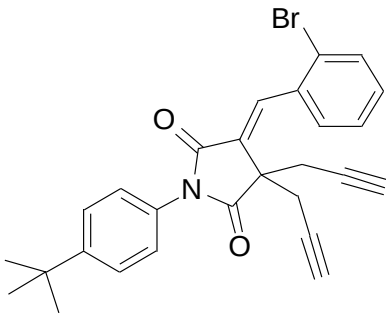
residue was purified by silica gel column chromatography (PE/EA, 5/1-3/1) to get the products **3**.

S-3. characterization data of the substrates 1

The synthesis of compound **L1-L6** and substrates **1** have already reported in the previous work.[1,2]



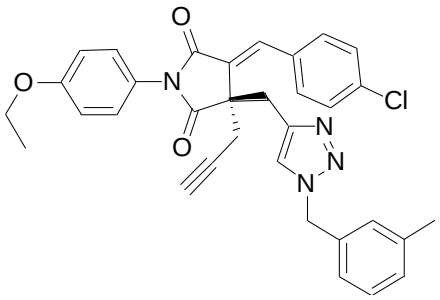
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.99 (s, 1 H), 7.51 (d, *J*=2.0Hz, 1 H), 7.40-7.38 (m, 1 H), 7.33 (dd, *J*=2.0, 8.4Hz, 1 H), 7.29-7.26 (m, 3 H), 6.98 (d, *J*=8.8Hz, 2 H), 4.06 (q, *J*=6.8Hz, 2 H), 2.74 (dd, *J*=2.8, 16.8Hz, 2 H), 2.31 (dd, *J*=2.4, 16.4Hz, 2 H), 2.08 (t, *J*=2.4Hz, 2 H), 1.43 (t, *J*=6.4Hz, 3 H), ; **^{13}C NMR** (100 MHz, $CDCl_3$) δ 176.4, 168.5, 159.2, 135.8, 135.1, 134.8, 132.0, 131.5, 134.8, 132.0, 131.5, 129.9, 129.8, 127.7, 127.1, 124.3, 115.0, 77.7, 72.3, 63.8, 50.4, 26.6, 14.8; **HRMS (ESI-TOF)**: Exact mass calcd for $C_{25}H_{19}Cl_2NNaO_3$ $[M + Na]^+$: 474.0637, Found: 474.0634.



^{1}H NMR (400 MHz, $CDCl_3$) δ 8.04 (s, 1 H), 7.67 (d, *J*=6.4Hz, 1 H), 7.53 (s, 1 H), 7.50 (s, 1 H), 7.46-7.44 (m, 1 H), 7.39 (t, *J*=6.8Hz, 1 H), 7.35 (s, 1 H), 7.32 (s, 1 H), 7.32-7.29 (m, 1 H), 2.73 (dd, *J*=2.4, 16.4Hz, 2 H), 2.35 (dd, *J*=2.4, 16.4Hz, 2 H), 2.07 (t, *J*=2.4Hz, 2 H), 1.35 (s, 9 H), ; **^{13}C NMR** (100 MHz, $CDCl_3$) δ 176.4, 168.6, 151.8,

138.1, 134.9, 133.0, 131.8, 130.5, 129.3, 129.0, 127.2, 126.2, 126.0, 123.4, 78.0, 72.2, 50.4, 34.8, 31.3, 26.6; **HRMS (ESI-TOF)**: Exact mass calcd for $C_{27}H_{24}BrNNaO_2$ [M + Na]$^+$: 496.0890, Found: 496.0883.

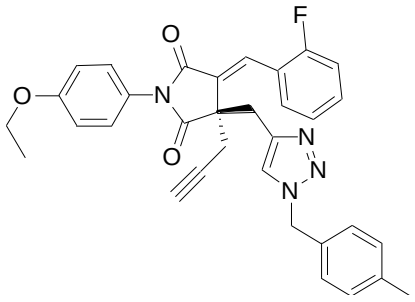
S-3. Characterization data of the products in the click cycloaddition reaction



3a

4-(4-Chloro-benzylidene)-1-(4-ethoxy-phenyl)-3-[1-(3-methyl-benzyl)-1H-[1,2,3]triazol-4-ylmethyl]-3-prop-2-ynyl-pyrrolidine-2,5-dione

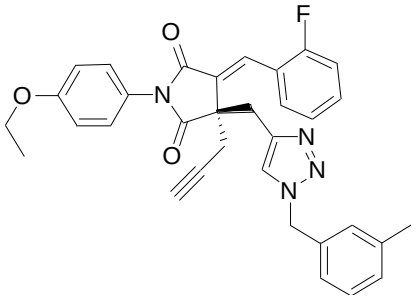
Compound **3a** was obtained in 61% yield as white solid, 90% *ee* determined by HPLC analysis (Chiralcel IB-H column, hexane: *i*-PrOH 70 : 30, 1.0 ml/min, 254nm) . Retention time: t_{minor}= 25.92, t_{major}= 18.69. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.94 (s, 1 H), 7.74 (dd, *J*=4.0, 6.4Hz, 1 H), 7.43 (dd, *J*=3.6, 6.4Hz, 1 H), 7.36-7.34 (m, 2 H), 7.26-7.21 (m, 1 H), 7.14 (d, *J*=8.4Hz, 2 H), 7.05 (d, *J*=8.8Hz, 2 H), 6.98 (s, 2 H), 6.89 (d, 8.8Hz, 2 H), 5.39 (dd, *J*=14.8, 32.4Hz, 2 H), 4.04 (q, *J*=6.8Hz, 2 H), 3.23 (d, *J*=14.8Hz, 1 H), 2.93-2.87 (m, 2 H), 2.55 (dd, *J*=2.4, 16.4Hz, 1 H), 2.30 (s, 3 H), 2.08 (q, *J*=3.6Hz, 1 H), 1.42 (q, *J*=7.2Hz, 3 H), ; **^{13}C NMR** (100 MHz, $CDCl_3$) δ 177.3, 168.6, 159.0, 139.1, 136.0, 134.5, 133.9, 133.0, 132.2, 130.4, 129.7, 129.5, 129.0, 128.6, 127.7, 126.7, 125.0, 124.6, 122.0, 115.0, 78.2, 72.1, 63.7, 54.1, 51.1, 32.4, 27.9, 21.3, 14.8; **IR** (KBr, cm^{-1}) υ $_{max}$ 3305, 2977, 1709, 1651, 1513, 1396, 1248, 1168, 1050, 745. $[\alpha]_D^{20}$= +20.98 (c=3.71 $CHCl_3$). **HRMS (ESI-TOF)**: Exact mass calcd for $C_{33}H_{29}ClN_4O_3H$ [M + H]$^+$: 565.2001, Found: 565.2001.



3b

1-(4-Ethoxy-phenyl)-4-(2-fluoro-benzylidene)-3-[1-(4-methyl-benzyl)-1H-[1,2,3]triazol-4-ylmethyl]-3-prop-2-ynyl-pyrrolidine-2,5-dione

Compound **3b** was obtained in 75% yield as white solid, 83% *ee* determined by HPLC analysis (Chiralcel IA-H column, hexane: *i*-PrOH 70 : 30, 1.0 ml/min, 254nm) . Retention time: t_{minor}= 30.12, t_{major}= 41.13. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.91 (s, 1 H), 7.61 (t, *J*=7.2Hz, 1 H), 7.41 (dd, *J*=6.4, 13.2Hz, 1 H), 7.23 (t, *J*=7.6Hz, 1 H), 7.51-7.11 (m, 4 H), 7.07-7.03 (m, 4 H), 6.90 (d, *J*=8.8Hz, 2 H), 5.33 (dd, *J*=14.8, 34.0Hz, 2 H), 4.04 (q, *J*=7.2Hz, 2 H), 3.26 (d, *J*=14.4Hz, 1 H), 2.94-2.89 (m, 2 H), 2.56 (dd, *J*=3.2, 16.8Hz, 1 H), 2.34 (s, 3 H), 2.06 (s, 1 H), 1.42 (t, *J*=7.2Hz, 3 H), ; **^{13}C NMR** (100 MHz, $CDCl_3$) δ 177.2, 168.6, 159.9 (d, *J* = 247.4 Hz), 159.0, 138.6, 133.1, 132.1, 131.6, 131.1 (d, *J* = 7.9 Hz), 129.9 (d, *J* = 2.2 Hz), 127.9, 127.7, 124.5, 124.2 (d, *J* = 3.6 Hz), 122.2 (d, *J* = 15.3 Hz), 121.9, 115.9 (d, *J* = 21.1 Hz), 114.9, 78.1, 77.3, 77.0, 76.7, 71.9, 63.7, 53.8, 51.4, 32.2, 27.2, 21.1, 14.8; **^{19}F NMR** (471 MHz,) δ -110.89 ppm. **IR** (KBr, cm^{-1}) υ $_{max}$ 3304, 2977, 1710, 1652, 1513, 1396, 1248, 1119, 824, 756. $[\alpha]_D^{20}$= +5.32 (c=3.00 $CHCl_3$). **HRMS (ESI-TOF)**: Exact mass calcd for $C_{33}H_{29}FN_4O_3H$ $[M + H]^+$: 549.2296, Found: 549.2296.

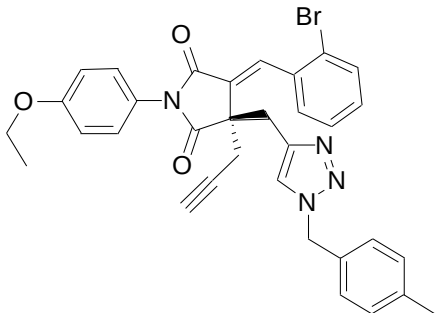


3c

1-(4-Ethoxy-phenyl)-4-(2-fluoro-benzylidene)-3-[1-(3-methyl-benzyl)-1H-[1,2,3]triazol-4-ylmethyl]-3-prop-2-ynyl-pyrrolidine-2,5-dione

Compound **3c** was obtained in 61% yield as white solid, 81% *ee* determined by HPLC

analysis (Chiralcel IB-H column, hexane: *i*-PrOH 70 : 30, 1.0 ml/min, 254nm) . Retention time: t_{minor}= 27.61, t_{major}= 20.19. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.90 (s, 1 H), 7.60 (t, *J*=7.2Hz, 1 H), 7.43-7.37 (m, 1H), 7.22 (t, *J*=8.0Hz, 2 H), 7.15-7.09 (m, 3 H), 7.06-7.04 (m, 2 H), 6.96 (d, *J*=6.0Hz, 2 H), 6.89 (d, *J*=13.6Hz, 2 H), 5.39 (dd, *J*=14.8, 28.0Hz, 2 H), 4.04 (q, *J*=7.2Hz, 2 H), 3.26 (d, *J*=14.4Hz, 1 H), 2.94-2.89 (m, 2 H), 2.56 (dd, *J*=2.8, 16.4Hz, 1 H), 2.29 (s, 3 H), 2.06 (t, *J*=2.4Hz, 1 H), 1.42 (t, *J*=6.8Hz, 3 H), ; **^{13}C NMR** (100 MHz, $CDCl_3$) δ 177.2, 168.6, 159.9 (d, *J* = 247.4 Hz), 159.0 , 142.1, 139.0, 134.6, 133.1, 132.0, 131.1 (d, *J* = 8.0 Hz), 129.9 (d, *J* = 2.4 Hz), 129.4, 129.0, 128.5, 127.7, 124.9, 124.5, 124.2 (d, *J* = 3.4 Hz), 122.2 (d, *J* = 15.2 Hz), 122.0, 115.9 (d, *J* = 21.1 Hz), 115.0, 78.1, 71.9, 63.7, 54.0, 51.4, 32.2, 27.2, 21.2, 14.8; **^{19}F NMR** (471 MHz,) δ -110.86 ppm. **IR** (KBr, cm^{-1}) υ_{max} 3306, 2977, 1710, 1652, 1513, 1396, 1248, 1168, 1050, 745. $[\alpha]_D^{20}$= +21.09 (c=2.71 $CHCl_3$). **HRMS (ESI-TOF)**: Exact mass calcd for $C_{33}H_{29}FN_4O_3H$ $[M + H]^+$: 549.2296, Found: 549.2296.

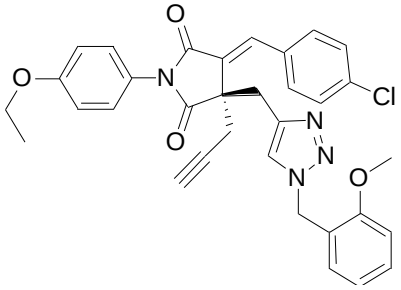


3d

4-(2-Bromo-benzylidene)-1-(4-ethoxy-phenyl)-3-[1-(4-methyl-benzyl)-1H-[1,2,3]triazol-4-ylmethyl]-3-prop-2-ynyl-pyrrolidine-2,5-dione

Compound **3d** was obtained in 67% yield as white solid, 97% *ee* determined by HPLC analysis (Chiralcel IB-H column, hexane: *i*-PrOH 70 : 30, 1.0 ml/min, 254nm) . Retention time: t_{minor}= 24.76, t_{major}= 19.68. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.88 (s, 1 H), 7.76 (d, *J*=7.6Hz, 1 H), 7.62 (d, *J*=8.0Hz, 1 H), 7.41 (t, *J*=7.6Hz, 1 H), 7.29-7.26 (m, 1 H), 7.14 (d, *J*=3.6Hz, 3 H), 7.07 (t, *J*=7.6Hz, 4 H), 6.90 (d, *J*=9.2Hz, 4 H), 5.45 (dd, *J*=14.8, 35.2Hz, 2 H), 4.05 (q, *J*=7.2Hz, 2 H), 3.23 (d, *J*=14.8Hz, 1 H), 2.90 (d, *J*=15.6Hz, 2 H), 2.56 (dd, *J*=2.8,14Hz, 1 H), 2.34 (s, 3 H), 2.08 (s, 1 H), 1.43 (t, *J*=6.8Hz, 3 H), ; **^{13}C NMR** (100 MHz, $CDCl_3$) δ 177.3, 168.9, 158.9, 138.6, 137.8,

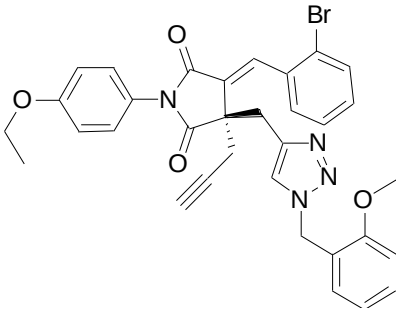
134.9, 132.9, 131.8, 131.5, 130.5, 129.8, 128.0, 127.7, 127.3, 124.5, 123.5, 114.9, 78.3, 72.2, 63.7, 53.9, 51.0, 32.4, 28.0, 21.1, 14.8; **IR** (KBr, cm^{-1}) υ_{max} 3454, 2924, 1713, 1660, 1512, 1397, 1251, 1169, 1046, 750. $[\alpha]_D^{20}$= +31.24 (c=3.00 $CHCl_3$). **HRMS (ESI-TOF)**: Exact mass calcd for $C_{33}H_{29}BrN_4O_3H$ $[M + H]^+$: 609.1497, Found: 609.1496.



3e

4-(4-Chloro-benzylidene)-1-(4-ethoxy-phenyl)-3-[1-(2-methoxy-benzyl)-1H-[1,2,3]triazol-4-ylmethyl]-3-prop-2-ynyl-pyrrolidine-2,5-dione

Compound **3e** was obtained in 72% yield as white solid, 83% *ee* determined by HPLC analysis (Chiralcel IB-H column, hexane: *i*-PrOH 70 : 30, 1.0 ml/min, 254nm) . Retention time: t_{minor}= 34.01, t_{major}= 24.75. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.85 (s, 1 H), 7.39 (q, *J*=8.8Hz, 4 H), 7.25-7.21 (t, 1 H), 7.02 (s, 1 H), 6.94 (d, *J*=8.8Hz, 2 H), 6.87-6.84 (m, 3 H), 6.73-6.68 (m, 2 H), 5.35 (dd, *J*=14.8, 28.0Hz, 2 H), 4.01 (dd, *J*=7.2, 14Hz, 2 H), 3.71 (s, 3 H), 3.20 (d, *J*=14.8Hz, 1 H), 2.96-2.84 (m, 2 H), 2.55-2.51 (m, 1 H), 2.23 (t, *J*=2.4Hz, 1 H), 1.39 (t, *J*=6.8Hz, 3 H), ; **^{13}C NMR** (100 MHz, $CDCl_3$) δ 168.9, 160.2, 159.0, 142.3, 137.8, 136.0, 135.1, 132.8, 131.1, 130.3, 129.7, 128.9, 127.6, 124.4, 121.8, 120.1, 115.0, 114.6, 113.3, 78.1, 72.0, 63.7, 55.3, 54.0, 51.4, 31.9, 29.7, 27.4, 14.8; **IR** (KBr, cm^{-1}) υ_{max} 3414, 2923, 1711, 1512, 1385, 1252, 1166, 1045, 751. $[\alpha]_D^{20}$= +6.73 (c=3.20 $CHCl_3$). **HRMS (ESI-TOF)**: Exact mass calcd for $C_{33}H_{29}ClN_4O_4H$ $[M + H]^+$: 581.1950, Found: 581.1950.

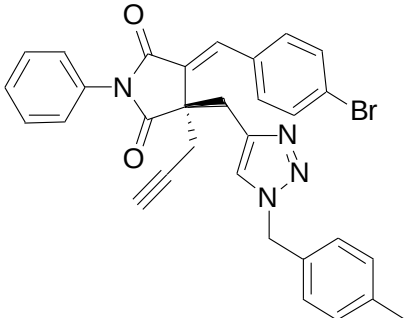


3f

4-(2-Bromo-benzylidene)-1-(4-ethoxy-phenyl)-3-[1-(2-methoxy-benzyl)-1H-[1,2,3]

triazol-4-ylmethyl]-3-prop-2-ynyl-pyrrolidine-2,5-dione

Compound **3f** was obtained in 73% yield as white solid, 87% *ee* determined by HPLC analysis (Chiralcel IB-H column, hexane: *i*-PrOH 70 : 30, 1.0 ml/min, 254nm) . Retention time: t_{minor}= 32.74, t_{major}= 23.70. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.88 (s, 1 H), 7.76 (d, *J*=7.2Hz, 1 H), 7.63 (d, *J*=8.0Hz, 1 H), 7.41 (q, *J*=7.2Hz, 1 H), 7.30-7.26 (m, 2 H), 7.12 (s, 1 H), 7.07 (d, *J*=8.8Hz, 2 H), 6.92-6.87 (m, 3 H), 6.78-6.73 (m, 2 H), 5.40 (dd, *J*=14.8, 36.4Hz, 2 H), 4.05 (q, *J*=6.8Hz, 2 H), 3.75 (s, 3 H), 3.23 (d, *J*=7.2Hz, 1 H), 2.90 (d, *J*=14.4Hz, 2 H), 2.56 (dd, *J*=2.4, 16.8Hz, 1 H), 2.08 (q, *J*=2.4, 1 H), 1.43 (q, *J*=6.8Hz, 3 H), ; **^{13}C NMR** (100 MHz, $CDCl_3$) δ 177.3, 168.7, 160.2, 159.0, 137.8, 136.0, 134.9, 132.9, 131.8, 130.5, 130.2, 129.8, 127.7, 127.3, 124.5, 123.5, 122.1, 120.2, 115.0, 114.6, 113.3, 78.2, 72.2, 63.7, 55.3, 54.1, 51.0, 32.4, 29.7, 28.0, 14.8; **IR** (KBr, cm^{-1}) υ $_{max}$ 3302, 2925, 2853, 1713, 1512, 1397, 1250, 1046, 748. $[\alpha]_D^{20}$= +4.21 (c=2.87 $CHCl_3$). **HRMS (ESI-TOF)**: Exact mass calcd for $C_{33}H_{29}BrN_4O_4H$ $[M + H]^+$: 625.1441, Found: 625.1445.

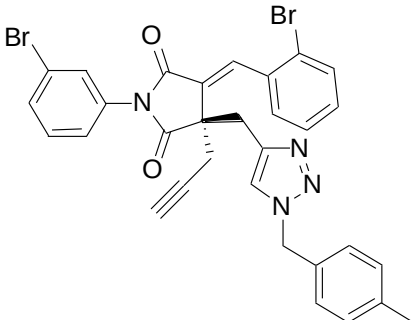


3g

4-(4-Bromo-benzylidene)-3-[1-(4-methyl-benzyl)-1H-[1,2,3]triazol-4-ylmethyl]-1-phenyl-3-prop-2-ynyl-pyrrolidine-2,5-dione

Compound **3g** was obtained in 80% yield as white solid, 75% *ee* determined by HPLC analysis (Chiralcel IB-H column, hexane: *i*-PrOH 70 : 30, 1.0 ml/min, 254nm) . Retention time: t_{minor}= 16.54, t_{major}= 41.31. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.87 (s, 1 H), 7.55 (d, J=8.4Hz, 2 H), 7.39-7.36 (m, 5 H), 7.14 (d, *J*=8.0Hz, 2 H), 7.10-7.07 (m, 3 H), 7.05 (s, 1 H), 7.03 (s, 1 H), 5.37 (dd, *J*=14.8, 28.4Hz, 2 H), 3.22 (d, *J*=14.4Hz, 1 H), 2.99-2.87 (m, 2 H), 2.56 (dd, *J*=2.4, 16.4Hz, 1 H), 2.34 (s, 3 H), 2.63 (q, *J*=2.8Hz, 1 H), ; **^{13}C NMR** (100 MHz, $CDCl_3$) δ 177.3, 168.6, 138.7, 137.9, 133.3, 132.0, 131.9, 131.6, 131.1, 129.9, 129.8, 129.1, 128.6, 128.0, 126.5, 123.4, 121.7, 78.1, 72.4, 53.9,

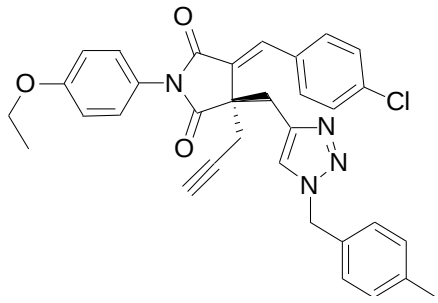
51.5, 32.0, 27.4, 21.2; **IR** (KBr, cm^{-1}) υ_{max} 3458, 2922, 1711, 1641, 1486, 1391, 1275, 1148, 750. $[\alpha]_D^{20}$= +7.19 (c=3.00 $CHCl_3$). **HRMS (ESI-TOF)**: Exact mass calcd for $C_{31}H_{25}BrN_4O_2H$ $[M + H]^+$: 565.1232, Found: 565.1234.



3h

4-(2-Bromo-benzylidene)-1-(3-bromo-phenyl)-3-[1-(4-methyl-benzyl)-1H-[1,2,3]triazol-4-ylmethyl]-3-prop-2-ynyl-pyrrolidine-2,5-dione

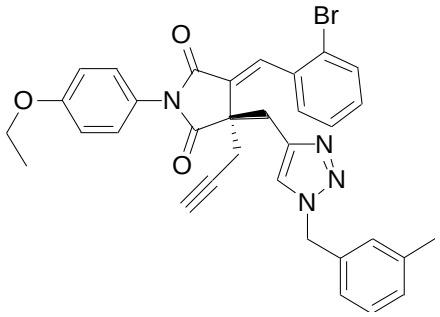
Compound **3h** was obtained in 81% yield as white solid, 68% *ee* determined by HPLC analysis (Chiralcel IB-H column, hexane: *i*-PrOH 70 : 30, 1.0 ml/min, 254nm) . Retention time: t_{minor}= 15.72, t_{major}= 14.54. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.88 (s, 1 H), 7.67 (d, J=7.2Hz, 1 H), 7.61 (d, *J*=7.6Hz, 1 H), 7.52-7.48 (m, 2 H), 7.39 (t, *J*=7.2Hz, 1 H), 7.30-7.25 (m, 3 H), 7.21 (d, *J*=8.4Hz, 1 H), 7.14-7.11 (m, 3 H), 7.07 (d, *J*=8.0Hz, 2 H), 5.36 (dd, *J*=14.4, 20.4Hz, 2 H), 3.22 (d, *J*=14.8Hz, 1 H), 2.93-2.84 (m, 2 H), 2.58 (dd, *J*=2.4, 16.4Hz, 1 H), 2.32 (s, 3 H), 2.11 (t, *J*=2.4Hz, 1 H), ; **^{13}C NMR** (100 MHz, $CDCl_3$) δ 176.8, 168.1, 138.6, 138.2, 134.7, 133.4, 132.9, 131.7, 130.6, 130.3, 129.8, 129.6, 128.0, 127.3, 125.3, 123.5, 122.3, 122.0, 78.1, 72.5, 53.9, 51.1, 32.3, 28.2, 21.1; **IR** (KBr, cm^{-1}) υ_{max} 3430, 2989, 1716, 1478, 1384, 1276, 750. $[\alpha]_D^{20}$= +3.32 (c=4.37 $CHCl_3$). **HRMS (ESI-TOF)**: Exact mass calcd for $C_{31}H_{24}Br_2N_4O_2H$ $[M + H]^+$: 643.0320, Found: 643.0339.



3i

4-(4-Chloro-benzylidene)-1-(4-ethoxy-phenyl)-3-[1-(4-methyl-benzyl)-1H-[1,2,3]triazol-4-ylmethyl]-3-prop-2-ynyl-pyrrolidine-2,5-dione

Compound **3i** was obtained in 62% yield as white solid, 85% *ee* determined by HPLC analysis (Chiralcel IB-H column, hexane: *i*-PrOH 70 : 30, 1.0 ml/min, 254nm) . Retention time: t_{minor}= 40.67, t_{major}= 58.32. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.88 (s, 1 H), 7.41 (dd, *J*=8.4, 16.4Hz, 4 H), 7.24 (t, *J*=8.0Hz, 1 H), 7.15 (d, *J*=7.6Hz, 1 H), 7.04 (s, 1 H), 6.98-6.96 (m, 4 H), 6.87 (d, *J*=9.2Hz, 2 H), 5.37 (dd, *J*=14.8, 25.6Hz, 2 H), 4.03 (q, 7.2Hz, 2 H), 3.23 (d, *J*=14.4Hz, 1 H), 2.99-2.87 (m, 2 H), 2.55 (dd, *J*=2.4, 16.4Hz, 1 H), 2.30 (s, 3 H), 2.06 (s, 1 H), 1.42 (t, *J*=7.2Hz, 3 H), ; **^{13}C NMR** (100 MHz, $CDCl_3$) δ 177.5, 168.9, 159.0, 142.3, 139.1, 137.6, 135.1, 134.6, 132.8, 131.2, 129.7, 128.9, 128.6, 127.6, 125.0, 121.8, 115.0, 78.1, 72.0, 63.7, 54.0, 51.4, 32.0, 27.4, 21.3, 14.8; **IR** (KBr, cm^{-1}) υ $_{max}$ 3282, 2972, 1713, 1510, 1395, 1248, 1165, 1046, 750. $[\alpha]_D^{20}$= +6.21 (c=4.33 $CHCl_3$). **HRMS (ESI-TOF)**: Exact mass calcd for $C_{33}H_{29}ClN_4O_3H$ $[M + H]^+$: 565.2001, Found: 565.2001.

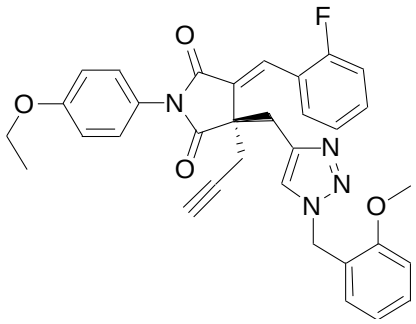


3j

4-(2-Bromo-benzylidene)-1-(4-ethoxy-phenyl)-3-[1-(3-methyl-benzyl)-1H-[1,2,3]triazol-4-ylmethyl]-3-prop-2-ynyl-pyrrolidine-2,5-dione

Compound **3j** was obtained in 66% yield as white solid, 83% *ee* determined by HPLC analysis (Chiralcel IB-H column, hexane: *i*-PrOH 70 : 30, 1.0 ml/min, 254nm) . Retention time: t_{minor}= 27.61, t_{major}= 19.11. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.79 (s, 1 H), 7.67 (d, *J*=7.6Hz, 1 H), 7.53(d, 1 H), 7.32 (t, *J*=7.6Hz, 1 H), 7.21-7.13 (m, 2 H), 7.06 (d, *J*=7.6Hz, 1 H), 6.98 (d, *J*=7.2Hz, 2 H), 6.90 (s, 2 H), 6.82 (d, *J*=8.8Hz, 2 H), 5.31 (dd, *J*=14.8, 33.2Hz, 2 H), 3.96 (q, *J*=6.8Hz, 2 H), 3.15 (d, *J*=14.8Hz, 1 H), 2.85-2.79 (m, 2 H), 2.48 (dd, J=2.4, 16.4Hz, 1 H), 2.22 (s, 3 H), 2.01 (q, *J*=2.4Hz, 1 H), 1.34 (q, *J*=6.8Hz, 3 H), ; **^{13}C NMR** (100 MHz, $CDCl_3$) δ 177.4, 168.7, 158.9, 142.1, 139.1, 137.7, 134.9, 134.5, 132.9, 131.8, 130.5, 129.8, 129.5, 129.0, 128.7, 127.7, 127.3, 125.1, 124.6, 123.5, 122.1, 114.9, 78.3, 72.3, 63.7, 54.1, 51.0, 32.4, 28.0,

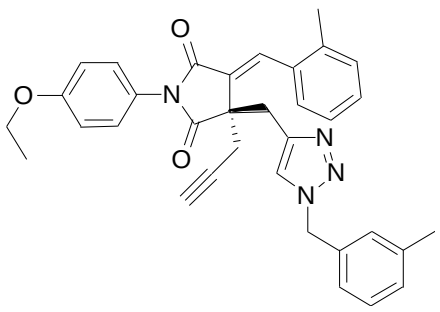
21.3, 14.8; **IR** (KBr, cm^{-1}) υ_{max} 3304, 2977, 1708, 1651, 1514, 1396, 1248, 1168, 1049, 758. $[\alpha]_D^{20}$= +4.15 (c=2.67 $CHCl_3$). **HRMS (ESI-TOF)**: Exact mass calcd for $C_{33}H_{29}BrN_4O_3H$ $[M + H]^+$: 609.1494, Found: 609.1496.



3k

1-(4-Ethoxy-phenyl)-4-(2-fluoro-benzylidene)-3-[1-(2-methoxy-benzyl)-1H-[1,2,3] triazol-4-ylmethyl]-3-prop-2-ynyl-pyrrolidine-2,5-dione

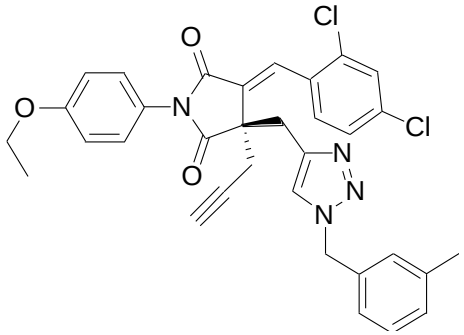
Compound **3k** was obtained in 70% yield as white solid, 79% *ee* determined by HPLC analysis (Chiralcel IB-H column, hexane: *i*-PrOH 70 : 30, 1.0 ml/min, 254nm) . Retention time: t_{minor}= 32.90, t_{major}= 24.63. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.82 (s, 1 H), 7.51 (q, *J*=7.6Hz, 1 H), 7.33 (dd, *J*=7.0, 13.6Hz, 1 H), 7.16 (q, *J*=7.6Hz, 2 H), 7.06-7.04 (m 2 H), 6.83-6.80 (m, 3 H), 6.66 (q., *J*=7.6Hz, 2 H), 5.32 (dd, *J*=14.8, 34.0Hz, 2 H), 3.96 (q, *J*=6.8Hz, 2 H), 3.66 (s, 3 H), 3.18 (d, *J*=14.8Hz, 1 H), 2.83 (d, 14.4Hz, 2 H), 2.49 (dd, *J*=2.4, 16.4Hz, 1 H), 1.99 (s, 1 H), 1.34 (q, *J*=6.8Hz, 3 H), ; **^{13}C NMR** (100 MHz, $CDCl_3$) δ 177.3, 168.6, 160.2, 159.9 (d, *J* = 247.2 Hz), 159.0, 142.2, 136.1, 133.1, 132.1, 131.2 (d, *J* = 8.0 Hz), 130.2, 129.8 (d, *J* = 8.8 Hz), 127.7, 124.5, 124.3 (d, *J* = 3.6 Hz), 122.2 (d, J = 15.0Hz), 122.1, 120.1, 115.9 (d, *J* = 21.9 Hz), 115.0, 114.6, 113.2, 78.1, 71.9, 63.7, 55.3, 54.0, 51.4, 32.1, 27.3, 14.8; **^{19}F NMR** (471 MHz,) δ -110.84 ppm. **IR** (KBr, cm^{-1}) υ_{max} 3301, 2972, 1709, 1513. 1396, 1248, 1168, 1049, 758. $[\alpha]_D^{20}$= +3.42 (c=2.67 $CHCl_3$). **HRMS (ESI-TOF)**: Exact mass calcd for $C_{33}H_{29}FN_4O_4H$ $[M + H]^+$: 565.2245, Found: 565.2245.



3l

1-(4-Ethoxy-phenyl)-4-(2-methyl-benzylidene)-3-[1-(3-methyl-benzyl)-1H-[1,2,3]triazol-4-ylmethyl]-3-prop-2-ynyl-pyrrolidine-2,5-dione

Compound **3l** was obtained in 70% yield as white solid, 67% *ee* determined by HPLC analysis (Chiralcel IB-H column, hexane: i-PrOH 70 : 30, 1.0 ml/min, 254nm) . Retention time: t_{minor}= 23.43, t_{major}= 15.12. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.92 (s, 1 H), 7.31 (t, *J*=7.2Hz, 1 H), 7.26-7.22 (m, 4 H), 7.19-7.15 (m, 2 H), 7.03 (d, *J*=8.4Hz, 2 H), 6.97 (s, 1 H), 6.89 (d, *J*=8.4Hz, 2 H), 5.39 (dd, *J*=15.2, 20.4Hz, 2 H), 4.04 (q, *J*=6.8Hz, 2 H), 3.26 (d, *J*=2.8Hz, 1 H), 3.00 (t, *J*=2.8Hz, 1 H), 2.92 (d, *J*=16.0Hz, 1 H), 2.66 (d, *J*=15.6Hz, 1 H), 2.37 (s, 3 H), 2.31 (s, 3 H), 2.05 (s, 1 H), 1.43 (q, *J*=6.8Hz, 3 H), ; **^{13}C NMR** (100 MHz, $CDCl_3$) δ 175.4, 167.0, 156.6, 136.9, 136.8, 136.0, 132.3, 131.9, 127.9, 127.5, 127.2, 126.7, 126.2, 125.4, 123.0, 122.6, 122.3, 112.6, 76.0, 69.4, 61.4, 51.8, 49.0, 29.5, 25.1, 19.0, 12.5; **IR** (KBr, cm^{-1}) υ_{max} 3413, 1773, 1638, 1559, 1275, 1261, 764, 750. $[\alpha]_D^{20}$= +29.16 (c=13.7 $CHCl_3$). **HRMS (ESI-TOF)**: Exact mass calcd for $C_{34}H_{32}N_4O_3Na$ $[M + Na]^+$: 567.2372, Found: 567.2367.

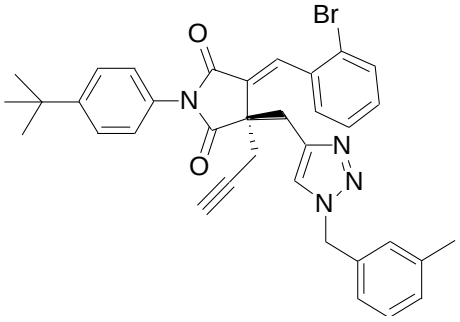


3m

4-(2,4-Dichloro-benzylidene)-1-(4-ethoxy-phenyl)-3-[1-(3-methyl-benzyl)-1H-[1,2,3]triazol-4-ylmethyl]-3-prop-2-ynyl-pyrrolidine-2,5-dione

Compound **3k** was obtained in 69% yield as yellow solid, 81% *ee* determined by HPLC analysis (Chiralcel IB-H column, hexane: *i*-PrOH 70 : 30, 1.0 ml/min, 254nm) . Retention time: t_{minor}= 18.31, t_{major}= 23.80. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.82 (s, 1 H), 7.76 (d, *J*=8.4Hz, 1 H), 7.42 (s, 1 H), 7.32 (d, *J*=7.6Hz, 1 H), 7.22-7.19 (m, 1 H), 7.12 (d, *J*=7.6Hz, 2 H), 6.98-6.95 (m, 4 H), 6.85 (d, *J*=8.8Hz, 2 H), 5.36 (dd, *J*=14.8, 38.0Hz, 2 H), 3.99 (q, *J*=7.2Hz, 2 H), 3.22 (d, *J*=9.2Hz, 1 H), 2.87 (d, J=15.6Hz, 2 H), 2.47 (d, *J*=16.4Hz, 1 H), 2.27 (s, 3 H), 2.04 (s, 3 H), 1.39 (q, *J*=7.2Hz, 3 H), ; **^{13}C**

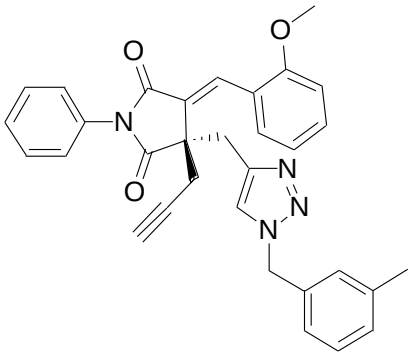
NMR (100 MHz, $CDCl_3$) δ 174.9, 166.1, 156.6, 136.8, 133.4, 132.6, 132.4, 132.4, 132.1, 130.4, 129.2, 128.3, 127.3, 127.2, 126.7, 126.3, 125.3, 124.9, 122.7, 122.0, 112.6, 75.6, 70.0, 61.4, 51.8, 48.8, 30.2, 25.3, 19.0, 12.4; **IR** (KBr, cm^{-1}) υ_{max} 3413, 1714, 1512, 1298, 1275, 764, 750. $[\alpha]_D^{20}$= +2.58 (c=1.83 $CHCl_3$). **HRMS (ESI-TOF)**: Exact mass calcd for $C_{33}H_{28}Cl_2N_4O_3Na$ $[M + H]^+$: 621.1436, Found: 621.1431.



3n

4-(2-Bromo-benzylidene)-1-(4-tert-butyl-phenyl)-3-[1-(3-methyl-benzyl)-1H-[1,2, 3]triazol-4-ylmethyl]-3-prop-2-ynyl-pyrrolidine-2,5-dione

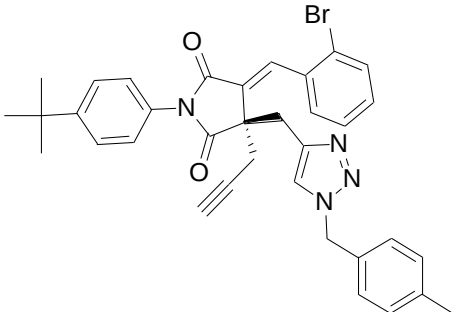
Compound **3n** was obtained in 74% yield as yellow solid, 90% *ee* determined by HPLC analysis (Chiralcel IA-H column, hexane: *i*-PrOH 80 : 20, 0.6 ml/min, 254nm) . Retention time: t_{minor}= 36.05, t_{major}= 33.07. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.82 (s, 1 H), 7.69 (d, *J*=7.6Hz, 1 H), 7.54 (d, *J*=8.0Hz, 1 H), 7.33 (d, *J*=8.8Hz, 3 H), 7.21-7.16 (m, 1 H), 7.13 (d, *J*=8.0Hz, 1 H), 7.10-7.05 (m, 2 H), 7.00 (d, *J*=8.4Hz, 2 H), 6.91 (s, 2 H), 5.31 (dd, *J*=14.8, 34.0Hz, 2 H), 3.16 (d, *J*=14.8Hz, 1 H), 2.86-2.80 (m, 2 H), 2.49 (dd, *J*=2.4, 16.4Hz, 1 H), 2.21 (s, 3 H), 2.00 (s, 1 H), 1.25 (s, 9 H), ; **^{13}C NMR** (100 MHz, $CDCl_3$) δ 177.2, 168.6, 151.5, 142.1, 139.1, 138.0, 134.8, 134.5, 132.9, 131.7, 130.6, 129.5, 129.0, 128.7, 127.4, 126.1, 125.9, 125.1, 123.5, 122.2, 78.2, 72.3, 54.1, 51.1, 34.7, 32.4, 31.3, 28.0, 21.3; **IR** (KBr, cm^{-1}) υ_{max} 3413, 1713, 1275, 1260, 764, 750, 620. $[\alpha]_D^{20}$= +2.59 (c=2.10 $CHCl_3$). **HRMS (ESI-TOF)**: Exact mass calcd for $C_{35}H_{33}BrN_4O_2Na$ $[M + Na]^+$: 643.1685, Found: 643.1679.



3o

4-(2-Methoxy-benzylidene)-3-[1-(3-methyl-benzyl)-1H-[1,2,3]triazol-4-ylmethyl]-1-phenyl-3-prop-2-ynyl-pyrrolidine-2,5-dione

Compound **3o** was obtained in 70% yield as white solid, 70% *ee* determined by HPLC analysis (Chiralcel IA-H column, hexane: *i*-PrOH 70 : 30, 1.0 ml/min, 254nm) . Retention time: t_{minor}= 16.61, t_{major}= 14.07. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.96 (s, 1 H), 7.43 (d, *J*=7.6Hz, 1 H), 7.33-7.27 (m, 4 H), 7.15-7.12 (m, 2 H), 7.06 (q, *J*=6.0Hz, 3 H), 6.95 (q, *J*=7.6Hz, 1 H), 6.88 (s, 2 H), 6.84 (d, *J*=8.0Hz, 1 H), 5.33 (dd, *J*=14.9, 40.4Hz, 2 H), 3.60 (s, 3 H), 3.17 (d, *J*=14.4Hz, 1 H), 2.89-2.81 (m, 2 H), 2.56 (dd, *J*=2.4, 16.4Hz, 1 H), 2.20 (s, 3 H), 1.98 (s, 1 H), ; **^{13}C NMR** (100 MHz, $CDCl_3$) δ 177.1, 168.8, 157.3,142.4, 139.1, 136.5, 134.7, 132.1, 130.9, 130.7, 129.4, 129.1, 129.0, 129.0, 128.5, 128.4, 126.6, 124.8, 123.1, 122.3, 120.5, 110.9, 78.5, 71.7, 55.2, 54.0, 51.5, 32.2, 27.6, 21.2; **IR** (KBr, cm^{-1}) υ_{max} 3552, 3481, 3143, 1275, 1260, 764, 750, 621. $[\alpha]_D^{20}$= -2.26 (c=1.46 $CHCl_3$). **HRMS (ESI-TOF)**: Exact mass calcd for $C_{32}H_{28}N_4O_3Na$ $[M + Na]^+$: 539.2059, Found: 539.2054.

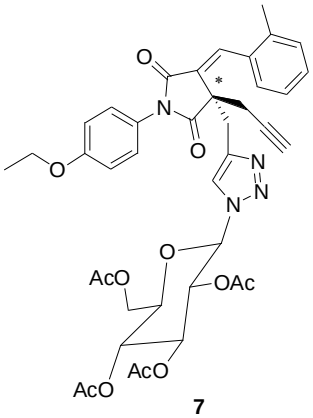


3p

4-(2-Bromo-benzylidene)-1-(4-tert-butyl-phenyl)-3-[1-(4-methyl-benzyl)-1H-[1,2,3]triazol-4-ylmethyl]-3-prop-2-ynyl-pyrrolidine-2,5-dione

Compound **3p** was obtained in 70% yield as white solid, 81% *ee* determined by HPLC analysis (Chiralcel IA-H column, hexane: *i*-PrOH 70 : 30, 1.0 ml/min, 254nm) .

Retention time: t_{minor}= 13.00, t_{major}= 15.21. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.92 (s, 1 H), 7.82 (d, *J*=3.2Hz, 1 H), 7.64 (d, *J*=6.0Hz, 1 H), 7.44 (d, *J*=6.4Hz 3 H), 7.31-7.26 (m, 1 H), 7.16 (d, *J*=6.0Hz, 3 H), 7.10 (d, *J*=6.0Hz 4 H), 5.42 (dd, *J*=11.6, 44.8Hz, 2 H), 3.30 (m, 1 H), 2.95-2.92 (m, 2 H), 2.59 (d, *J*=12.0Hz, 2 H), 2.37 (s, 3 H), 2.06 (s, 1 H), 1.35 (s, 9 H), ; **^{13}C NMR** (100 MHz, $CDCl_3$) δ 177.3, 168.6, 151.6, 138.7, 138.1, 134.8, 132.9, 131.7, 131.5, 130.6, 129.8, 128.1, 127.4, 126.1, 125.9, 123.5, 78.2, 72.3, 60.4, 34.8, 31.3, 28.0, 21.3, 14.2, 1.4; **IR** (KBr, cm^{-1}) υ_{max} 3413, 1713, 1275, 1260, 764, 750. $[\alpha]_D^{20}$= +2.17 (c=1.64 $CHCl_3$). **HRMS (ESI-TOF)**: Exact mass calcd for $C_{35}H_{33}BrN_4O_2Na$ $[M + Na]^+$: 643.1685, Found: 643.1688.



7

3,4,5-triacetoxy-6-{4-[1-(4-ethoxy-phenyl)-4-(2-methyl-benzylidene)-2,5-dioxo-3-prop-2-ynyl-pyrrolidin-3-ylmethyl]-[1,2,3]triazol-1-yl}-tetrahydro-pyran-2-ylmethyl ester (7)

Product **7** was obtained in 61% yield as white solid, 32% *ee* determined by HPLC analysis (Chiralcel IB-H column, hexane: *i*-PrOH 70 : 30, 1.0 ml/min, 254nm) . Retention time: t_{minor}= 22.43, t_{major}= 30.29. **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.93 (d, J=11.2Hz, 1 H), 7.43 (s, 1 H), 7.41-7.37 (m, 1 H), 7.34 (t, J=6.0Hz, 2 H), 7.28-7.24 (m, 1 H), 7.23 (s, 1 H), 7.21-7.19 (m, 2 H), 6.98-6.94 (m, 2 H), 5.82 (dd, J=8.8,16.8Hz, 1 H), 5.40-5.37 (m, 2 H), 5.24-5.18 (m, 1 H), 4.35-4.27 (m, 1 H), 4.14-4.11 (m, 1 H), 4.08-4.03 (m, 2 H), 4.02-3.97 (m, 1 H), 3.29 (dd, J=6.4,14.8Hz, 1 H), 3.00-2.91 (m, 2 H), 2.77-2.63 m, 1 H), 2.44 (d, J=8.8Hz, 2 H), 2.11 (s, 1 H), 2.08-2.01 (m, 12 H), 1.81 (s, 2 H), 1.78 (s, 1 H), 1.42 (t, J=6.8Hz, 3 H), ; **^{13}C NMR** (100 MHz, $CDCl_3$) δ 177.6, 170.5, 169.8, 169.4, 169.3, 169.2, 169.0, 159.0, 143.0, 139.4, 138.9, 138.4, 134.3, 138.9, 138.4, 130.0, 128.9, 128.6, 127.9, 127.8, 125.3,

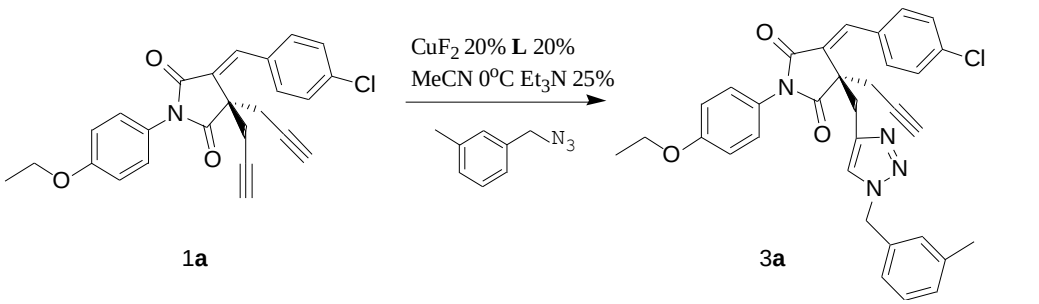
125.2, 124.7, 120.3, 114.9, 85.7, 85.6, 78.3, 75.2, 72.6, 71.8, 70.1, 67.8, 67.7, 63.7, 61.7, 51.2, 50.8, 31.7, 31.0, 28.5, 27.5, 21.5, 20.6, 20.5, 20.0, 14.8.

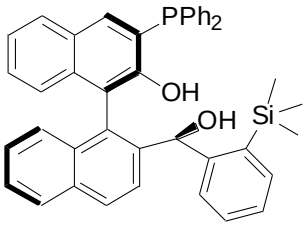
References

[1] T. Song, L. S. Zheng, F. Ye, W. H. Deng, Y. L Wei, K. Z. Jiang, L. W. Xu, *Adv. Synth. Catal.* **2014**, *356*, 1708.

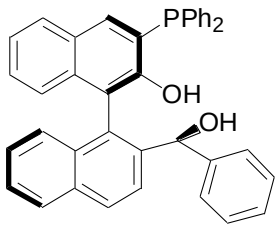
[2] T. Song, L. Li, W. Zhou, Z. J. Zheng, Y. Deng, Z. Xu, L.W. Xu, *Chem. Eur. J.* **2015**, 21, 554-558.

Table S1-S5 and Scheme S1.

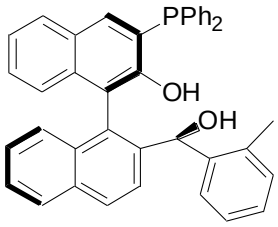




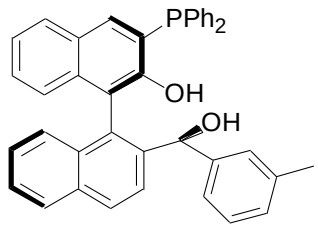
with L1
3**a**:65%yield and 90%ee



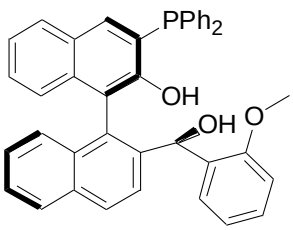
with L2
3**a**:50%yield and 45%ee



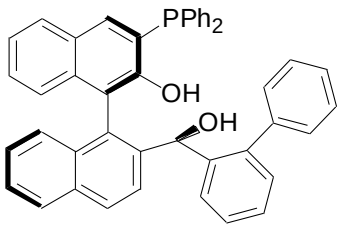
with L3
3**a**:66%yield and 50%ee



with L4
3**a**:55%yield and 5%ee



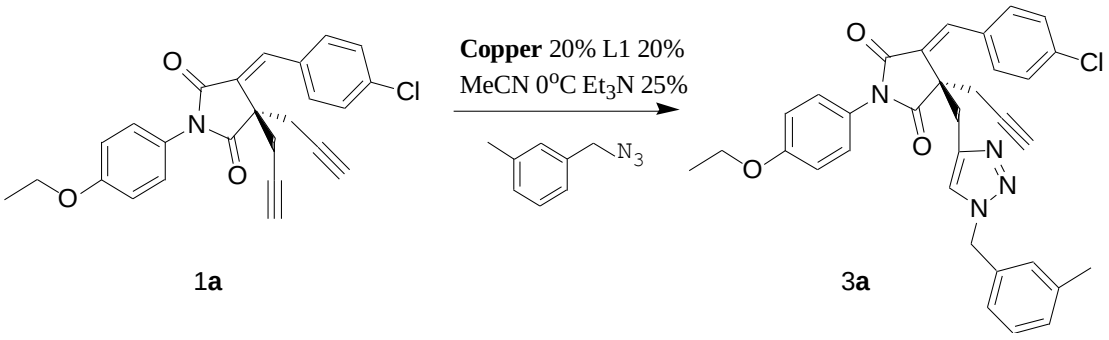
with L5
3**a**:60%yield and 40%ee



with L6
3**a**:58%yield and 47%ee

Scheme S1. Ligand effect on the copper-catalyzed azide-alkyne cycloaddition.

Table S1. Asymmetric azide-alkyne cycloaddition catalyzed by various copper salts in the presence of Tao-Phos.

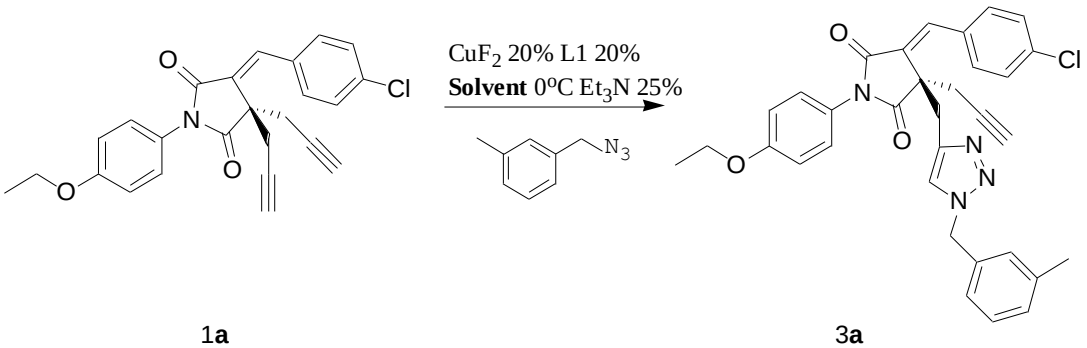


1**a** 3**a**

Entry	**copper**	**Yield(%)[a]**	**Ee(%)[b]**
1	CuCl	28	-5[c]
2	CuBr	66	10
3	CuI	58	8
4	$CuBr_2$	41	0
5	$Cu(MeCN)_4PF_6$	32	0
6	**CuF_2**	**65**	**90**

[a] Isolated yield. [b] Determined by chiral HPLC. [c] The absolute configuration of this product is in the opposite to that of the others by HPLC analysis. Although the configurations of products **3** are not formally proved by X-ray analysis, the absolute configurations of the chiral monotriazole products **3** could be referred to previous report[7] by HPLC for the determination of chiral product **5** of Table 2 (see Text).

Table S2. The effect of solvents on the CuF_2-Tao-Phos (**L1**) catalyzed azide-alkyne click cycloaddition in the presence of Tao-Phos.

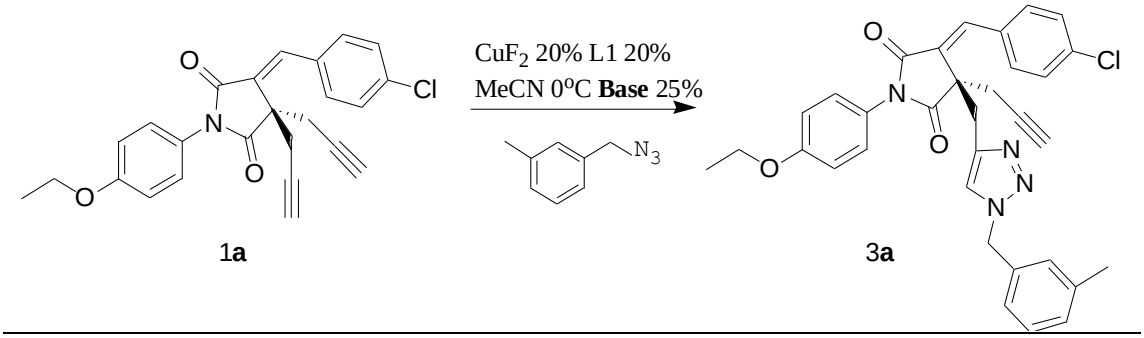


1a 3a

entry	solvent	Yield(%)[a]	Ee(%)[b]
1	THF	49	25
2	Et_2O	n.r.	-
3	**MeCN**	**65**	**90**
4	PhMe	37	7
5	DCM	45	15
6	MeOH	35	30
7	DMF	n.r.	-
8	acetone	n.r.	-

[a] Isolated yield. [b] Determined by chiral HPLC.

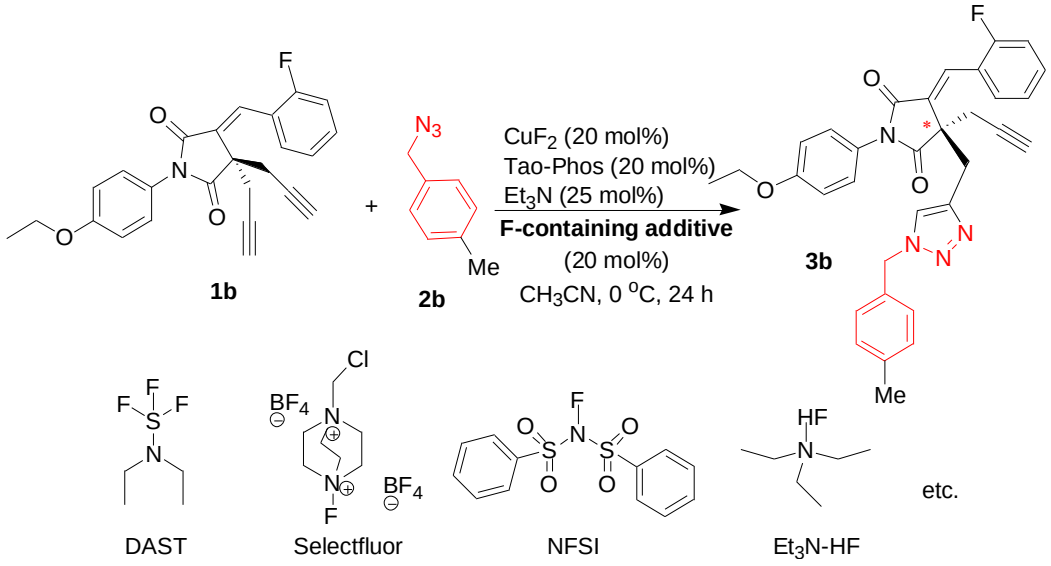
Table S3. The effect of base on the CuF_2-Tao-Phos (**L1**) catalyzed azide-alkyne click cycloaddition in the presence of Tao-Phos.



entry	Base	Yield(%)[a]	Ee(%)[b]
1	K_2CO_3	n.r.	-
2	K_3PO_4	n.r.	-
3	DMEDA	n.r.	-
4	DIPEA	n.r.	-
5	Et_3N	65	90

[a] Isolated yield. [b] Determined by chiral HPLC.

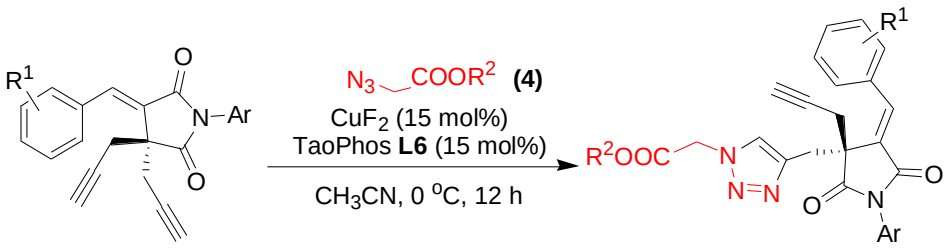
Table S4. The effect of fluoride anion or cation on the desymmetrization of bisalkyne **1a** with **2b**.[a]



Entry	Additive[a]	Yield (%)[b]	*ee* (%)[c]
1	-	75	83
2	MgF_2	76	84
3	CaF_2	76	79
4	BaF_2	<5	-
5	DAST	<5	-
6	Selectfluor	<5	-
7	NFSI	<5	-
8	$Et_3N \cdot HF$[d]	0	-

[a] The additive was used to change the effect of fluoride anion on the catalytic performance of copper-catalyzed Huisgen cycloaddition reaction. [b] Isolated yields. [c] The ee value was determined by chiral HPLC. [d] The use of $Et_3N \cdot HF$ instead of Et_3N in this reaction.

Table S5. Desymmetrization of maleimide-derived bisalkynes via copper-catalyzed Huisgen cycloaddition.[a]



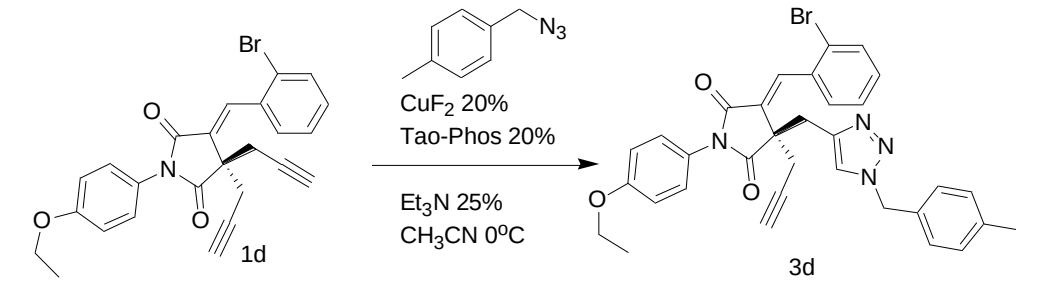
1 **5**

5a: R^1 = H, R = Et, Ar = Ph; **5g**: R^1 = 4-Br, R = Me, Ar = Ph;
5b: R^1 = 3-Br, R = Et, Ar = Ph; **5h**: R^1 = 2-Cl, R = Et, Ar = Ph;
5c: R^1 = 4-Br, R = Et, Ar = Ph; **5i**: R^1 = 4-Cl, R = Et, Ar = Ph;
5d: R^1 = 2-Me, R = Et, Ar = Ph; **5j**: R^1 = 4-Cl, R = Et, Ar = 4-OEtPh;
5e: R^1 = 3-Me, R = Et, Ar = Ph; **5k**: R^1 = 2-OMe, R = Et, Ar = Ph;
5f: R^1 = 4-Me, R = Et, Ar = Ph; **5l**: R^1 = 2-Br, R = Et, Ar = 4-OEtPh;

Entry	Product	Procedure A[ref.2]		Procedure B[a]		A-B
		Yield (%)[b]	Ee (%)[c]	Yield (%)[b]	Ee (%)[c]	
1	**5a**	68	87	68	56	+31
2	**5b**	69	74	65	91	-17
3	**5c**	71	82	70	75	+7
4	**5d**	74	76	74	65	+11
5	**5e**	72	78	68	65	+13
6	**5f**	71	80	70	51	+29
7	**5g**	69	70	65	47	+23
8	**5h**	72	83	75	55	+28
9	**5i**	74	80	67	54	+26
10	**5j**	70	77	75	64	+13
11	**5k**	69	73	75	81	-8
12	**5l**	72	74	63	69	+5

[a] In this work, all reaction is carried with CuF_2 (20 mol%), Tao-Phos (20 mol%), Et_3N (25 mol%) in CH_3CN at 0 ^oC. [b] Isolated yield. [c] Determined by chiral HPLC.

Figure S1. Negative NLE in the CuAAC of **1d** using Tao-Phos.



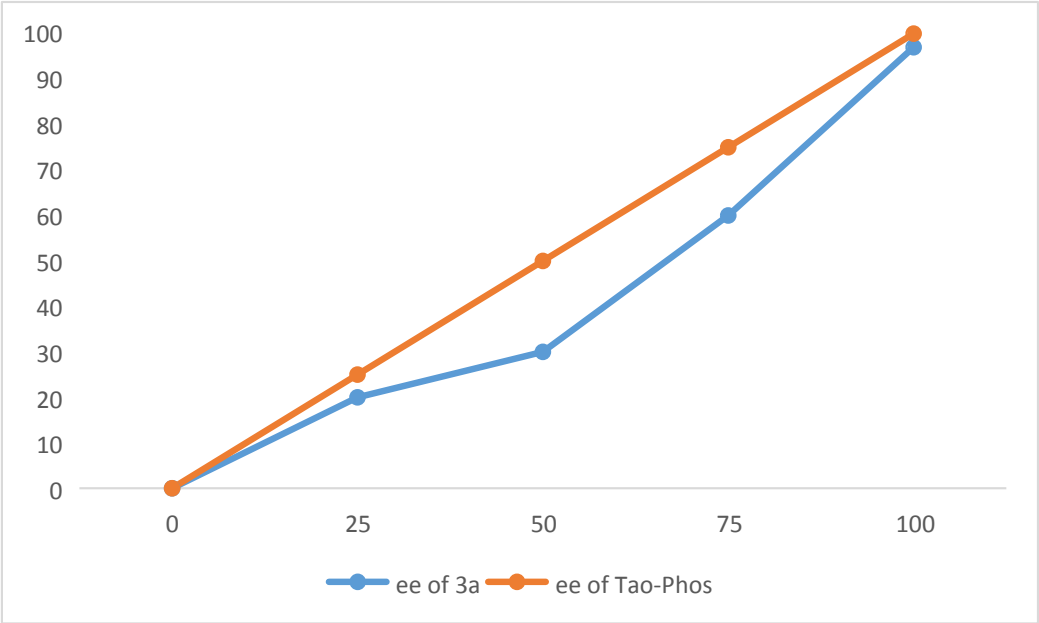
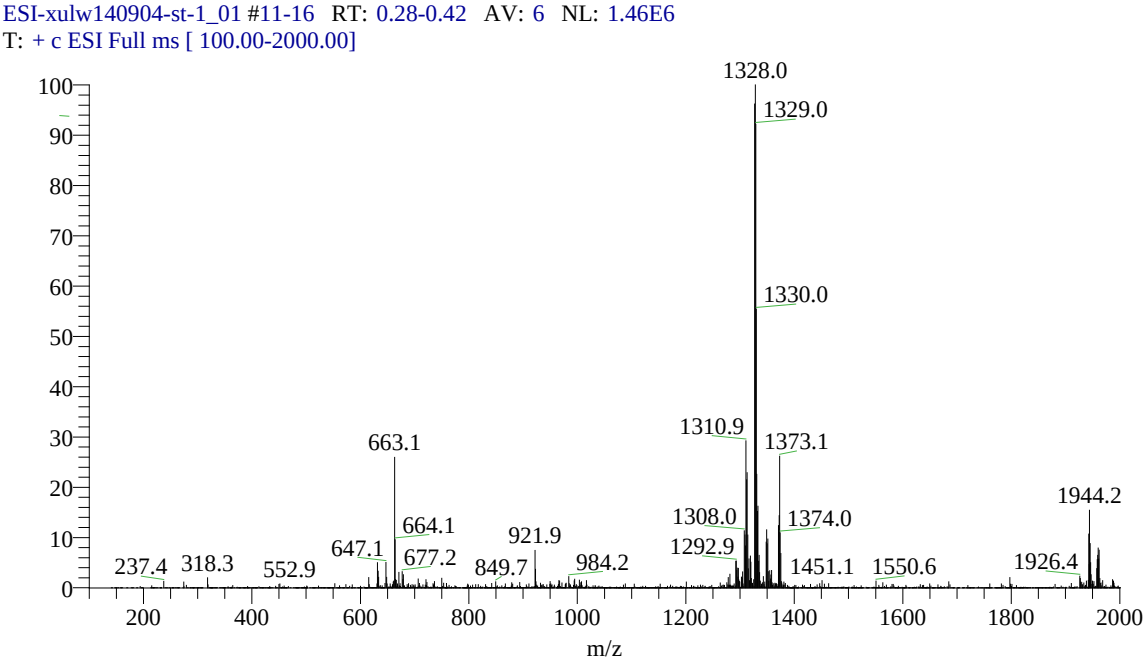


Figure S2. ESI(+)-MS analysis for the mixture of only CuF_2 and Tao-Phos in CH_3CN

Figure S2-a: (+)-ESI-MS



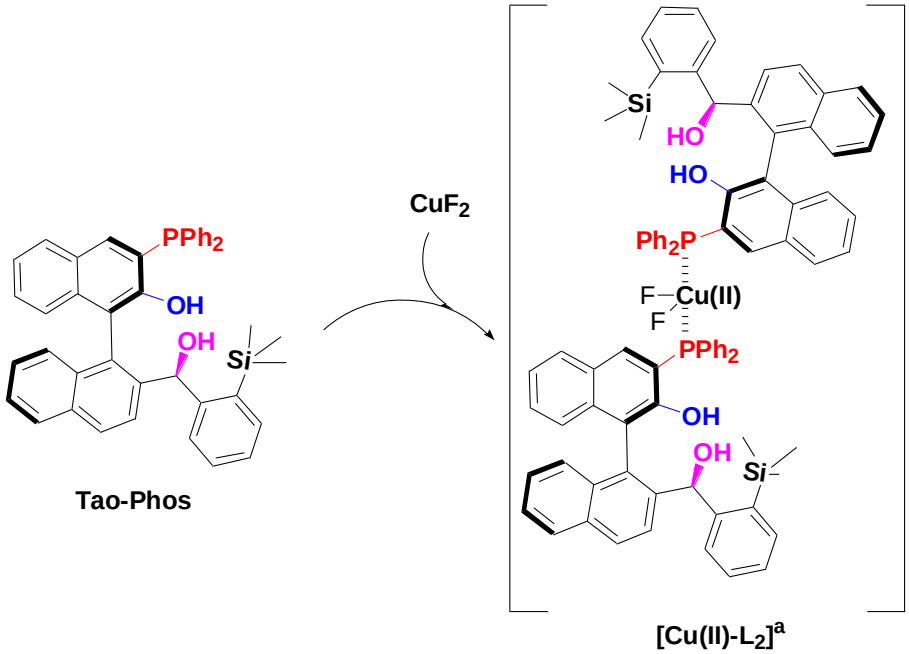
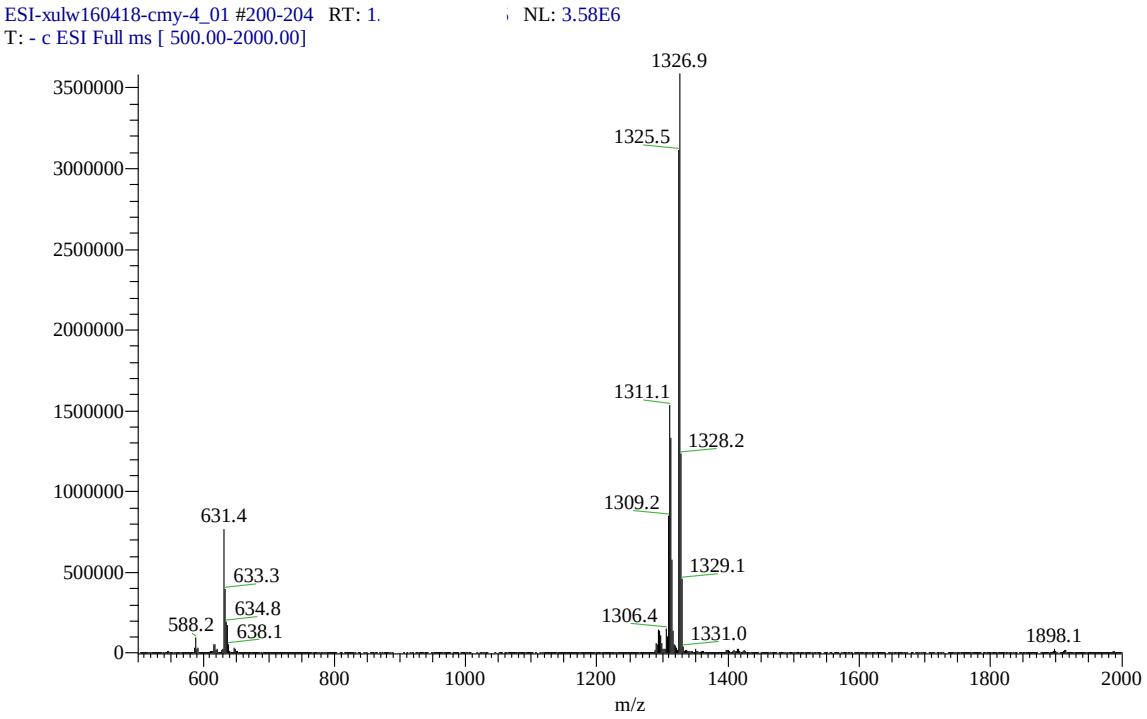
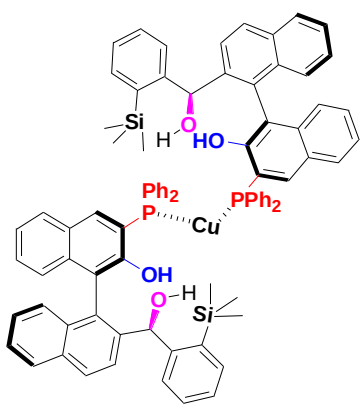
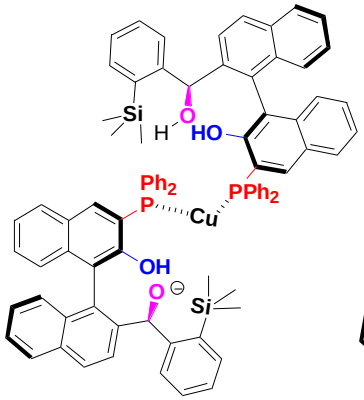


Figure S2-b: (-)-ESI-MS

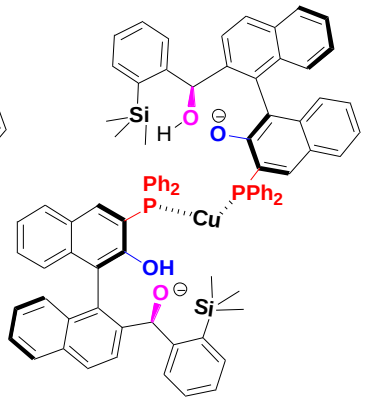




$C_{84}H_{74}CuO_4P_2Si_2$
Exact Mass: 1327.3997
Mol. Wt.: 1329.1485

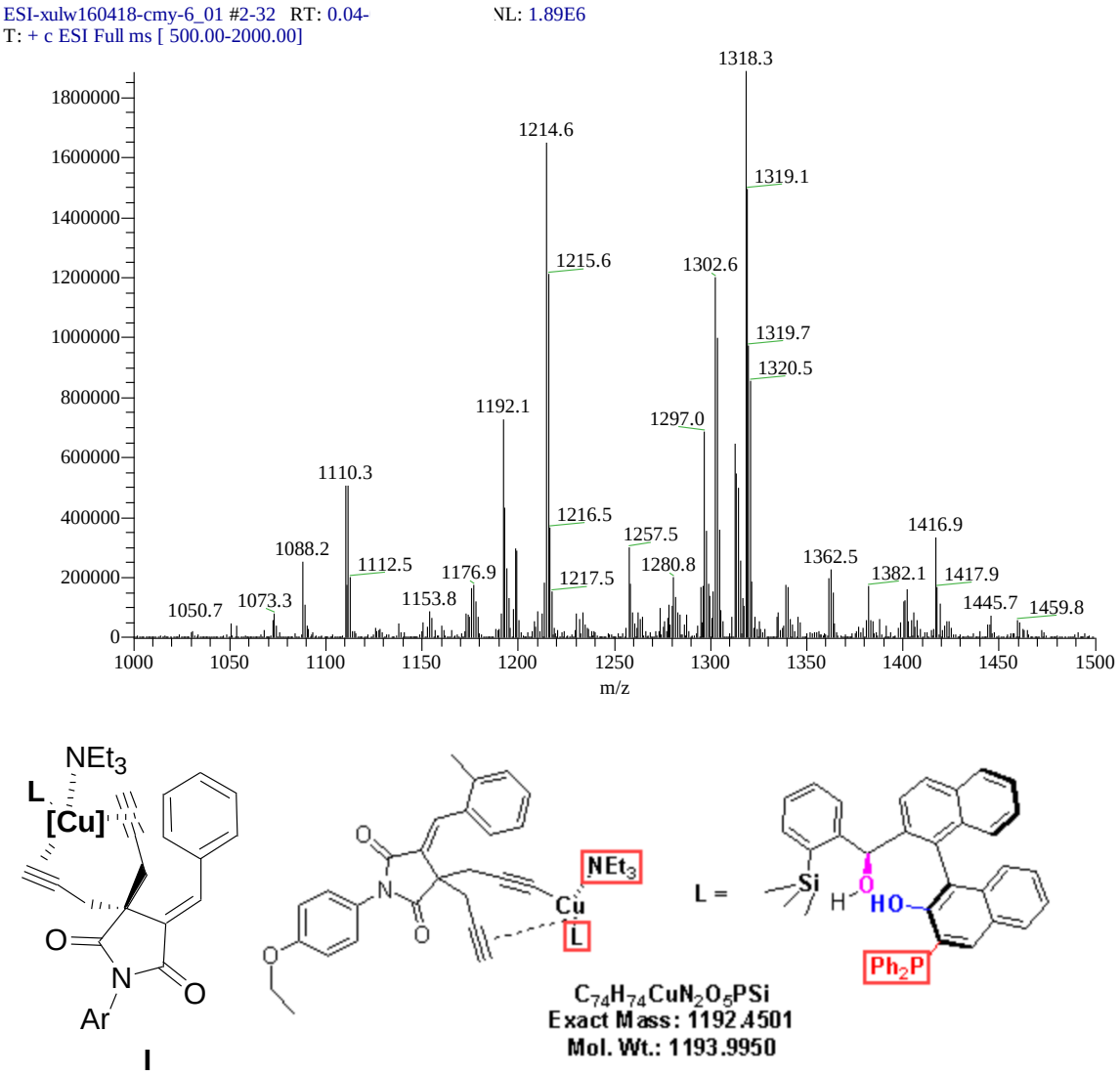


$C_{84}H_{73}CuO_4P_2Si_2^-$
Exact Mass: 1326.3924
Mol. Wt.: 1328.1411



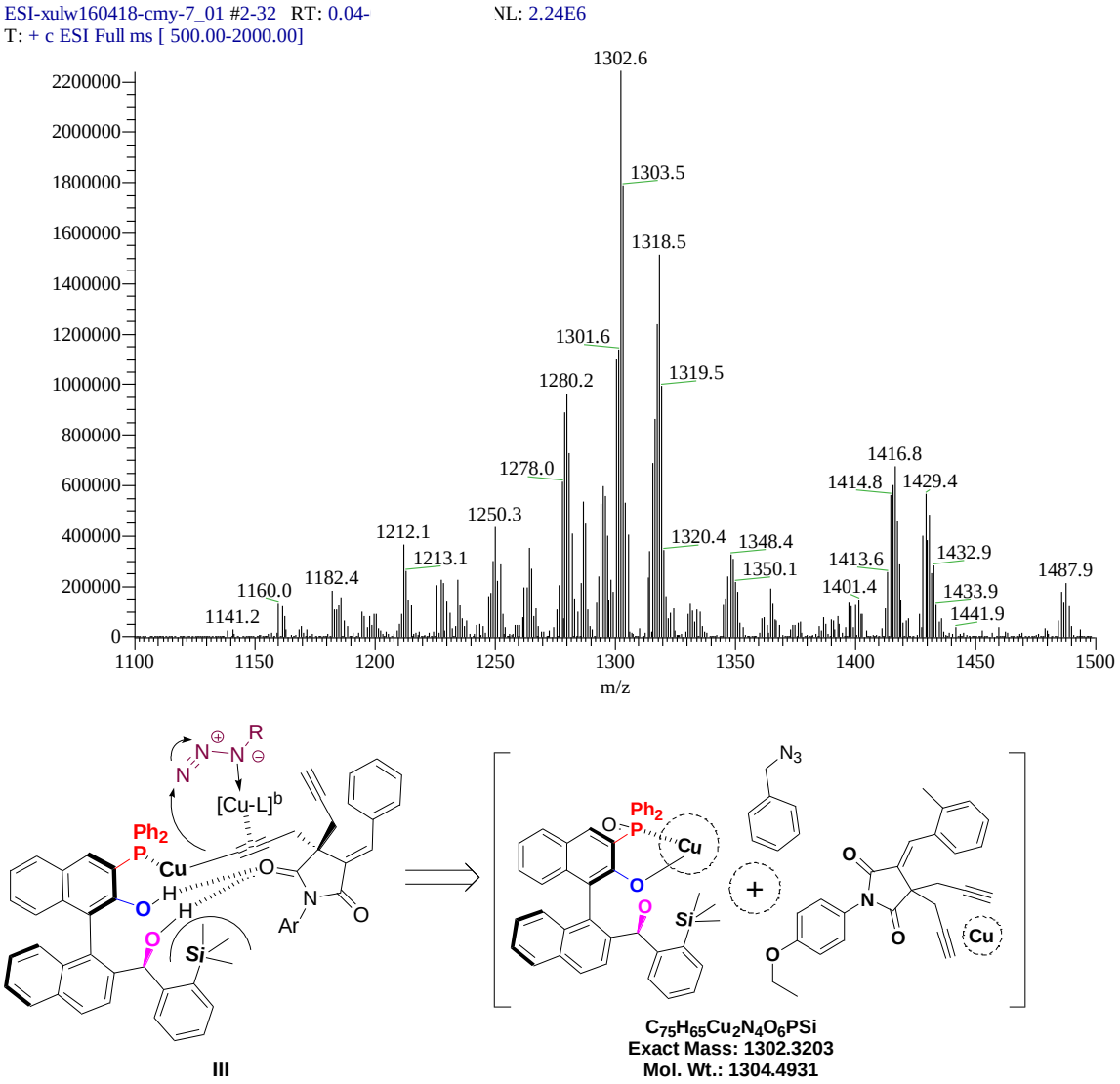
$C_{84}H_{72}CuO_4P_2Si_2^{2-}$
Exact Mass: 1325.3851
Mol. Wt.: 1327.1337

Figure S3. ESI(+)-MS analysis for the mixture of CuF_2, Et_3N, alkyne, and Tao-Phos in CH_3CN



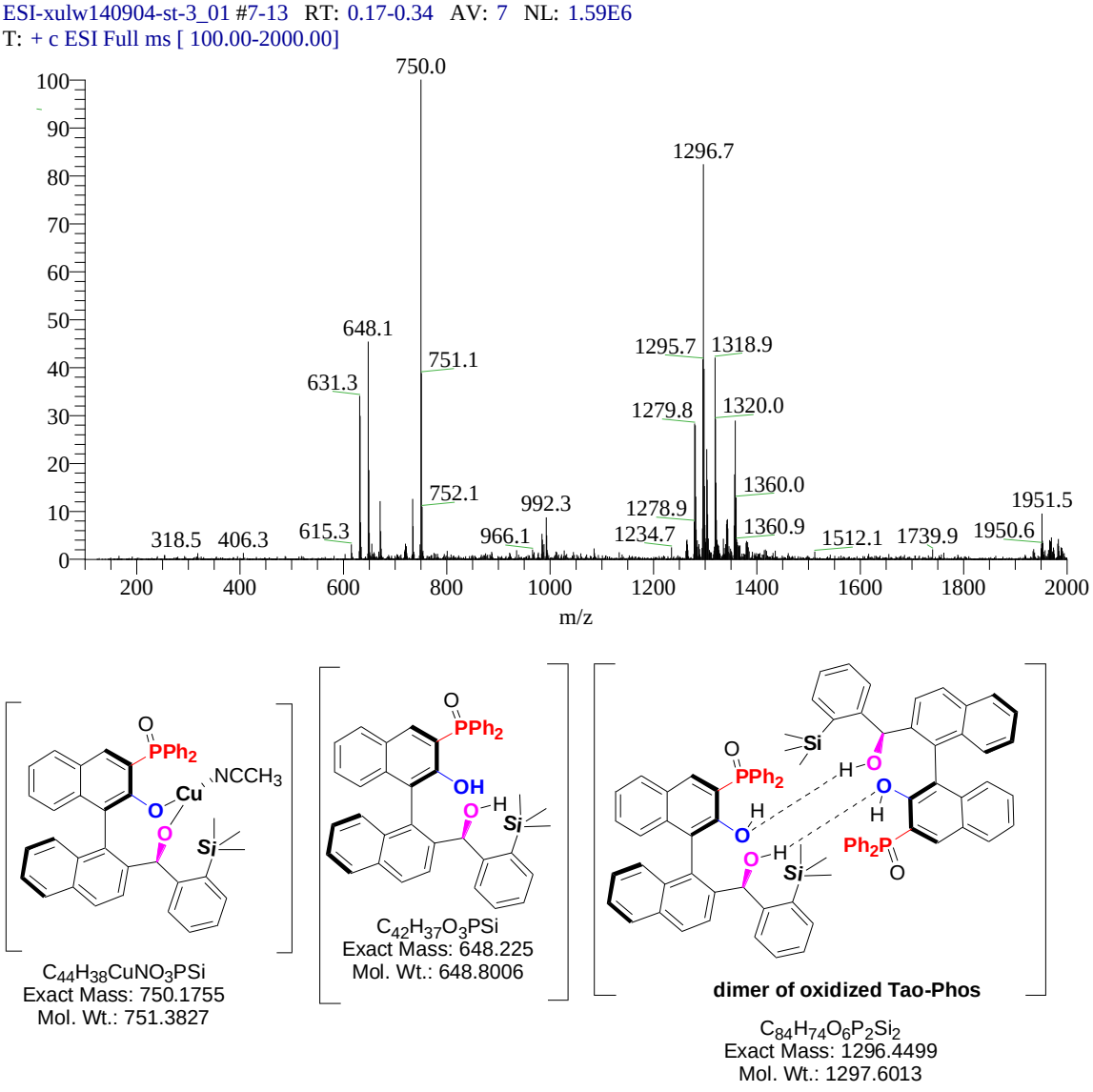
If the M represented the intermdeaite **I** of Figure 5 (m/z 1192.1, see Figure 5, Cu+**L**+Et_3N). And the ion peak at m/z 1214.6/1215.6 and m/z 1318.3/1319.1 could be anylized as the $[M+Na]^+$ (calculated m/z is 1215.4) and multinuclear copper complex as $[Cu_3(L)(Et_3N)(alkyne)]$ (calculated m/z is 1319.3).

Figure S4. ESI(+)-MS analysis for the reaction mixture of CuF_2, Et_3N, alkyne, azide, and Tao-Phos in CH_3CN



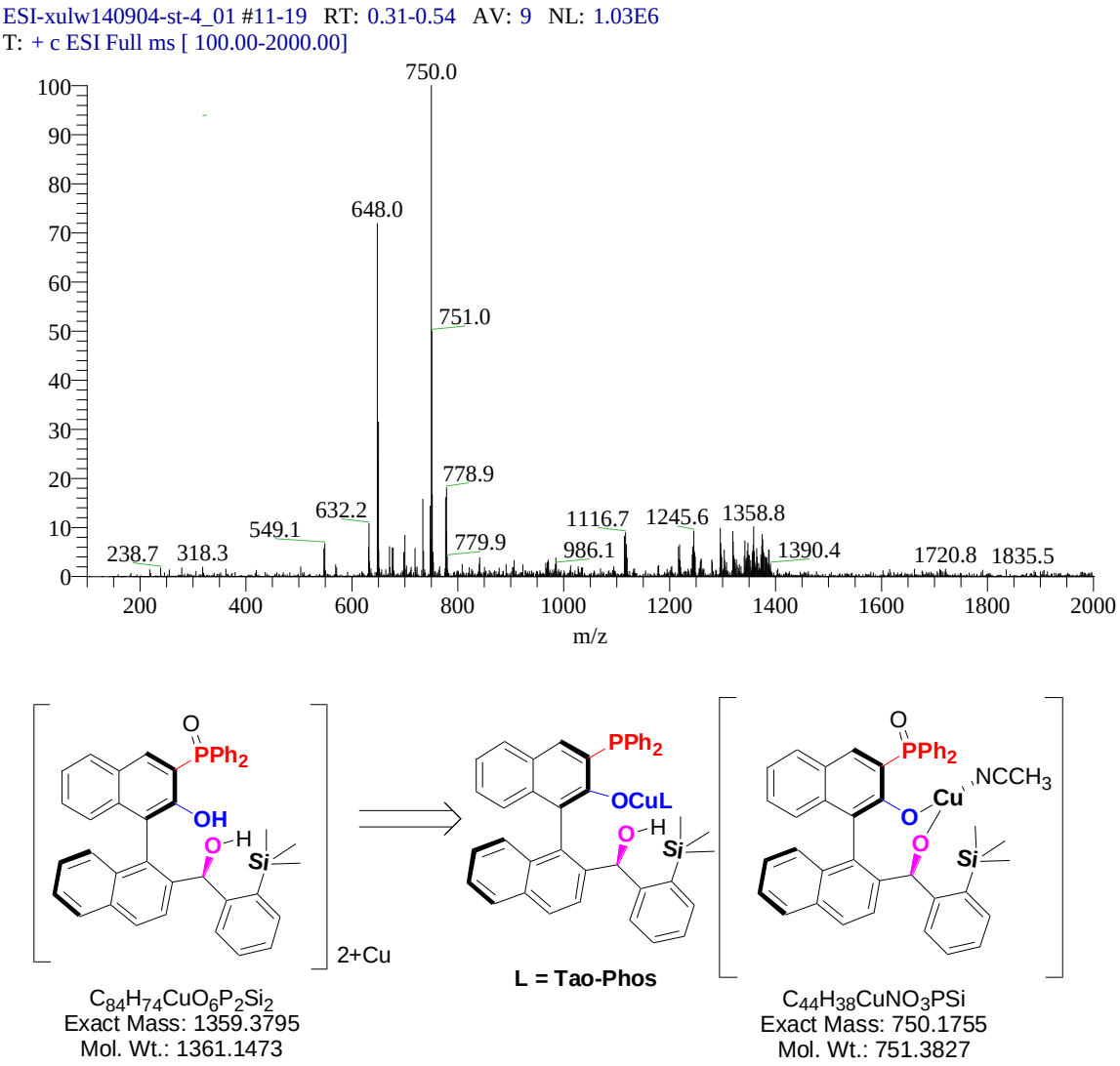
The major ion peak at m/z 1302.6 provided a direct evidence for the intermediate **III** of Figure 5 because the caculated m/z of Cu_2L(azide)(alkyne) is 1302.3, in which the L (Tao-Phos) is oxidized to phosphine oxide during the ESI-MS analysis. Therefore the ESI-MS analysis provided a powerful evidence for the mechanistic procedure showed in Figure 5.

Figure S5. ESI(+)-MS analysis for the reaction mixture of CuF_2, Et_3N, and Tao-Phos in CH_3CN



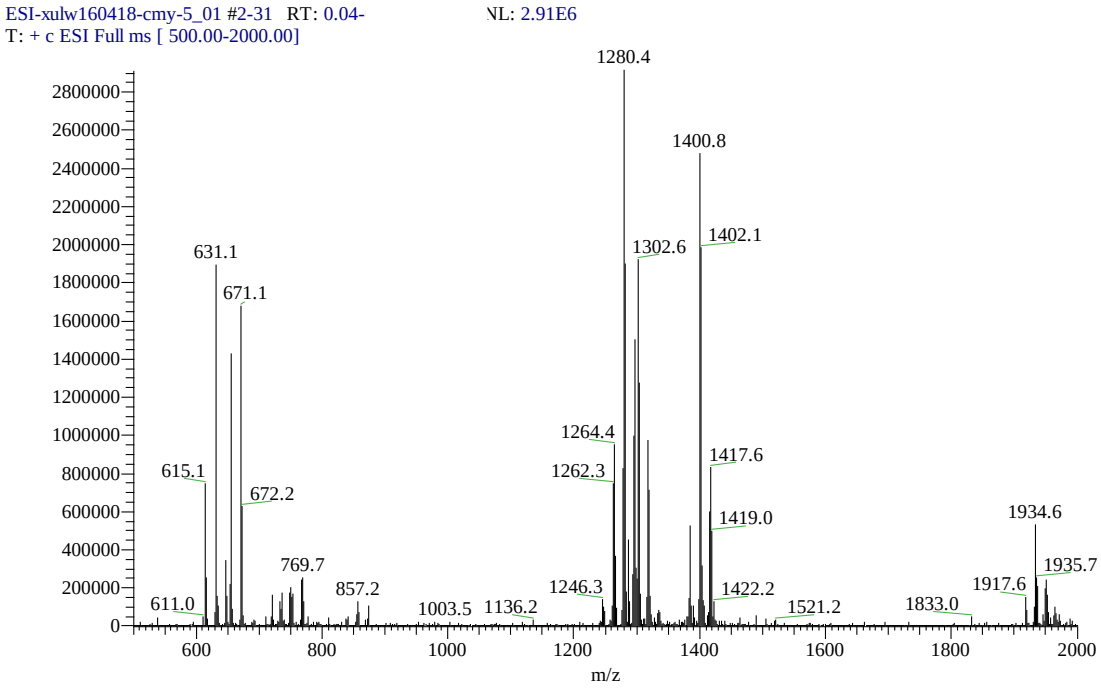
About the ion peak at m/z 750.0, it is probably aroused from the in-situ oxidized Tao-Phos and related copper complex in CH_3CN during the ESI-MS analysis. Similarly, the monomer and dimer of oxidized Tao-Phos was also detected respectively in this case (m/z = 6481 and 1296.7), which also provided indirect evidence for the highly active copper/Tao-Phos complex in the presence of Et_3N.

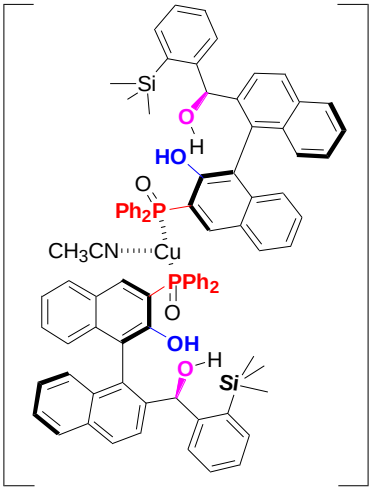
Figure S6. ESI(+)-MS analysis for the reaction mixture of CuF_2, Et_3N, azide, and Tao-Phos in CH_3CN



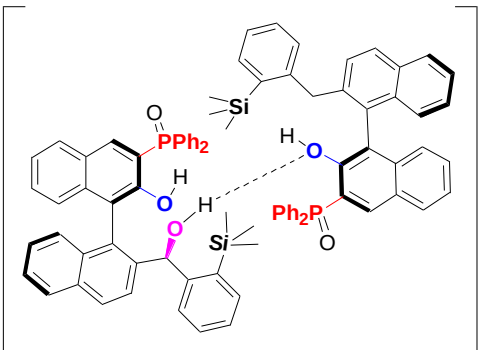
About the ion peak at m/z 750.0, it is probably aroused from the in-situ oxidized Tao-Phos and related oxidized copper complex was also detected as m/z 1358.8 during the ESI-MS analysis, which also provided indirect evidence for the highly active copper/Tao-Phos complex in the presence of Et_3N and azide substrate.

Figure S7. ESI(+)-MS analysis for the reaction mixture of CuF_2, azide, and Tao-Phos in CH_3CN





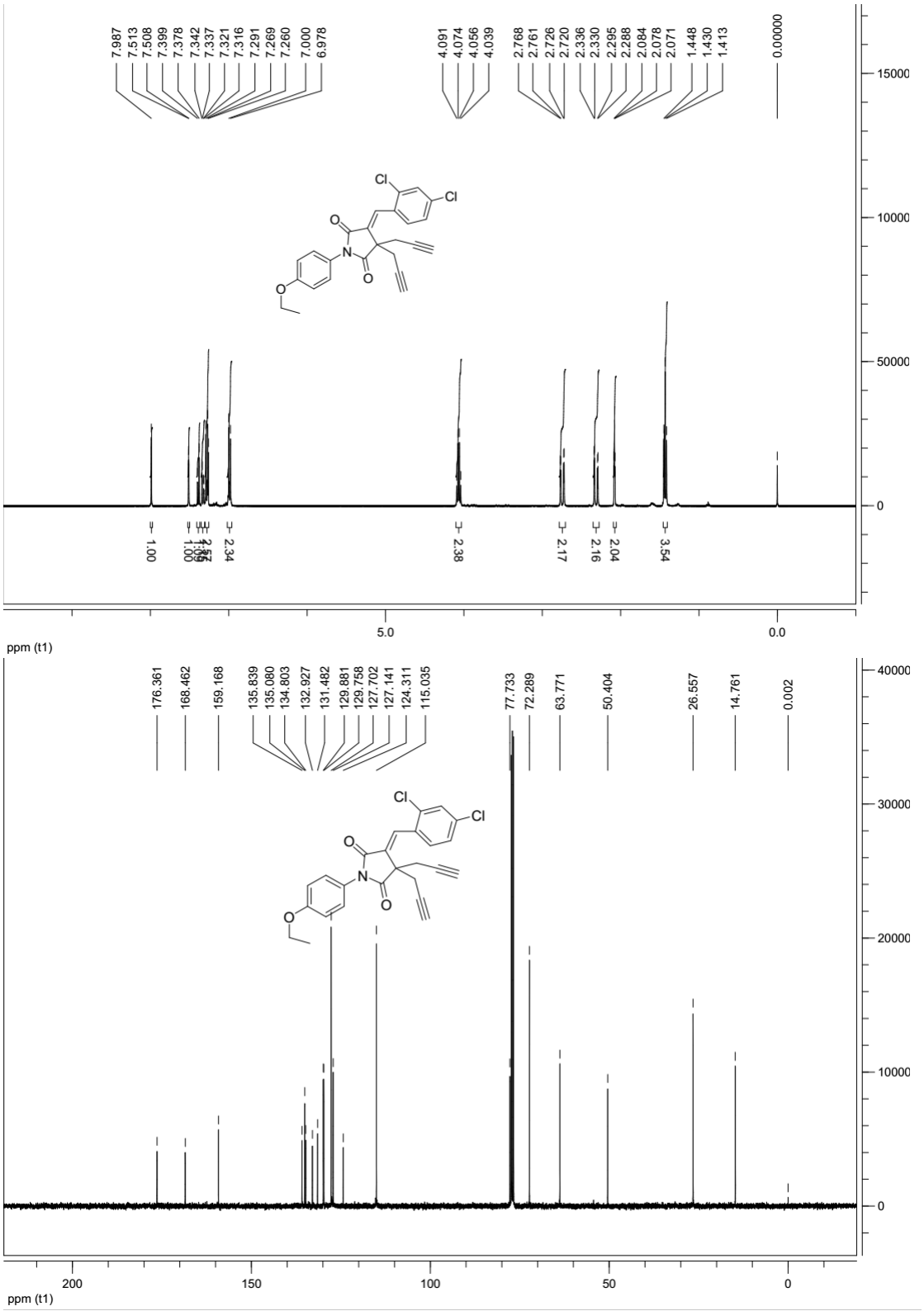
$C_{86}H_{77}CuNO_6P_2Si_2$
Exact Mass: 1400.4161
Mol. Wt.: 1402.1992

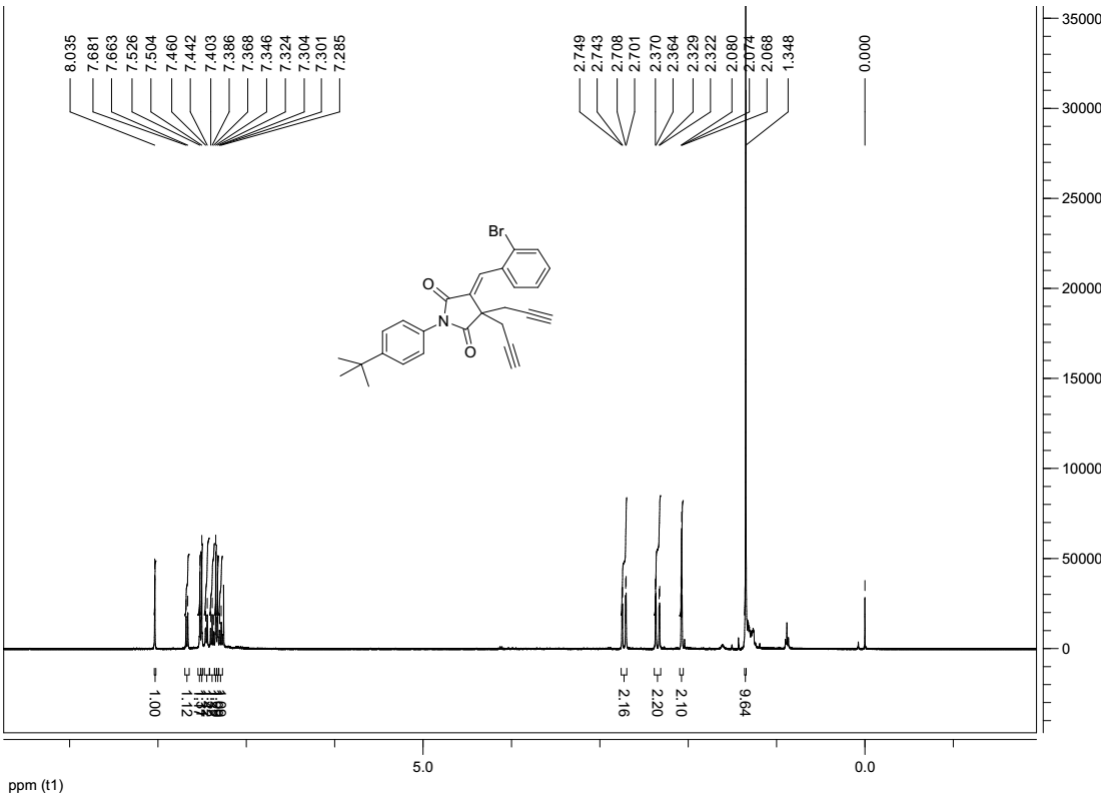


$C_{84}H_{74}O_5P_2Si_2$
Exact Mass: 1280.4550
Mol. Wt.: 1281.6019

In this case, two major ion peaks at m/z 1280.4 and m/z 1400.8 could be detected in the presence of CuF_2, Tao-Phos, and benzylic azide, in which two possible intermediates could be proposed as above structures.

S-4.NMR Spectra of the substrates 1




8.035
7.681
7.663
7.526
7.504
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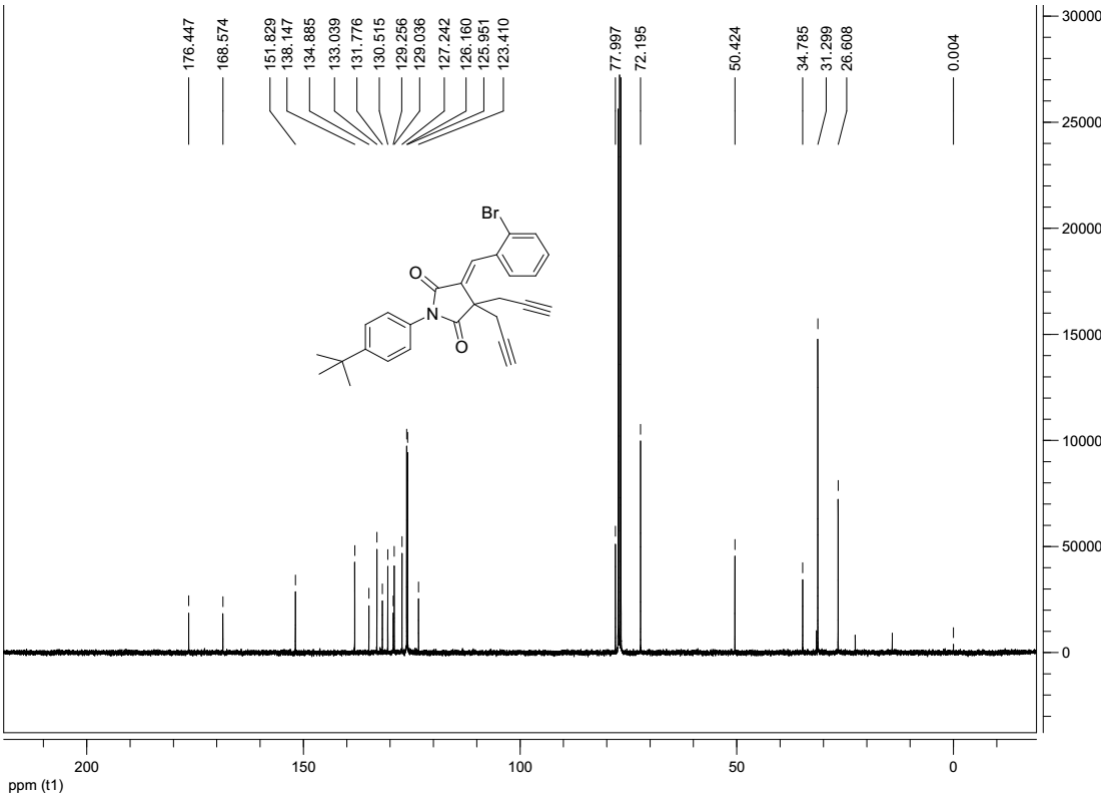
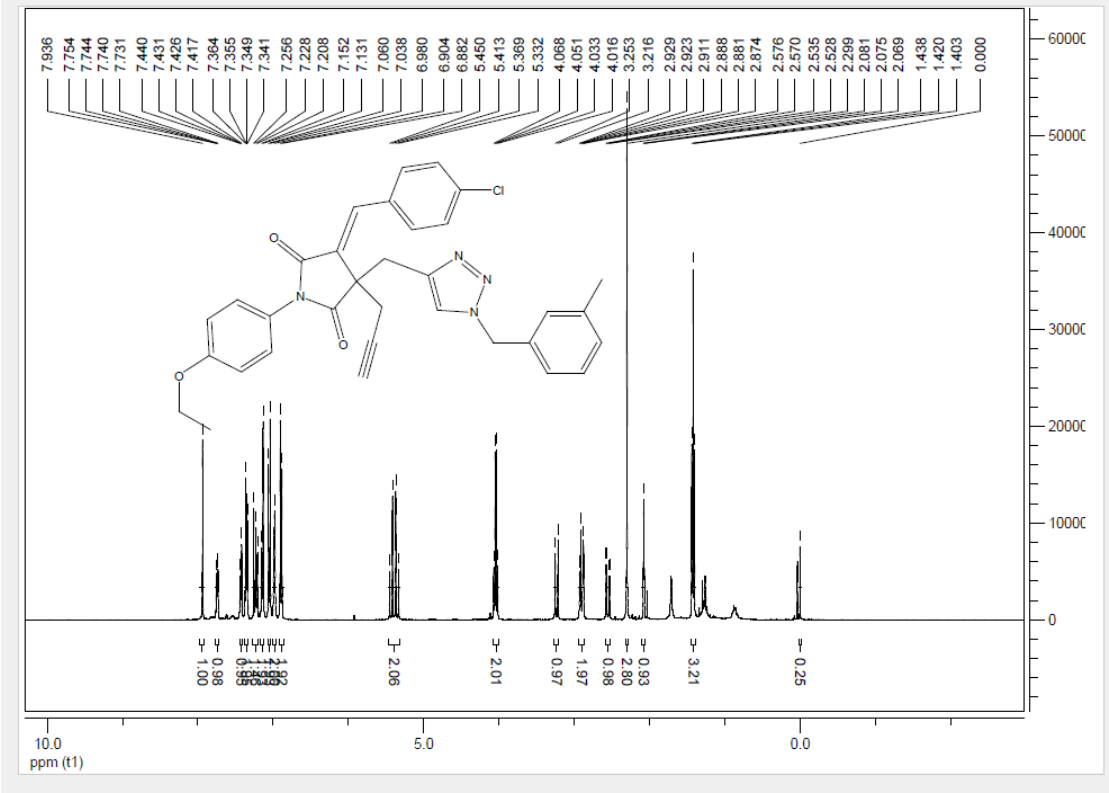
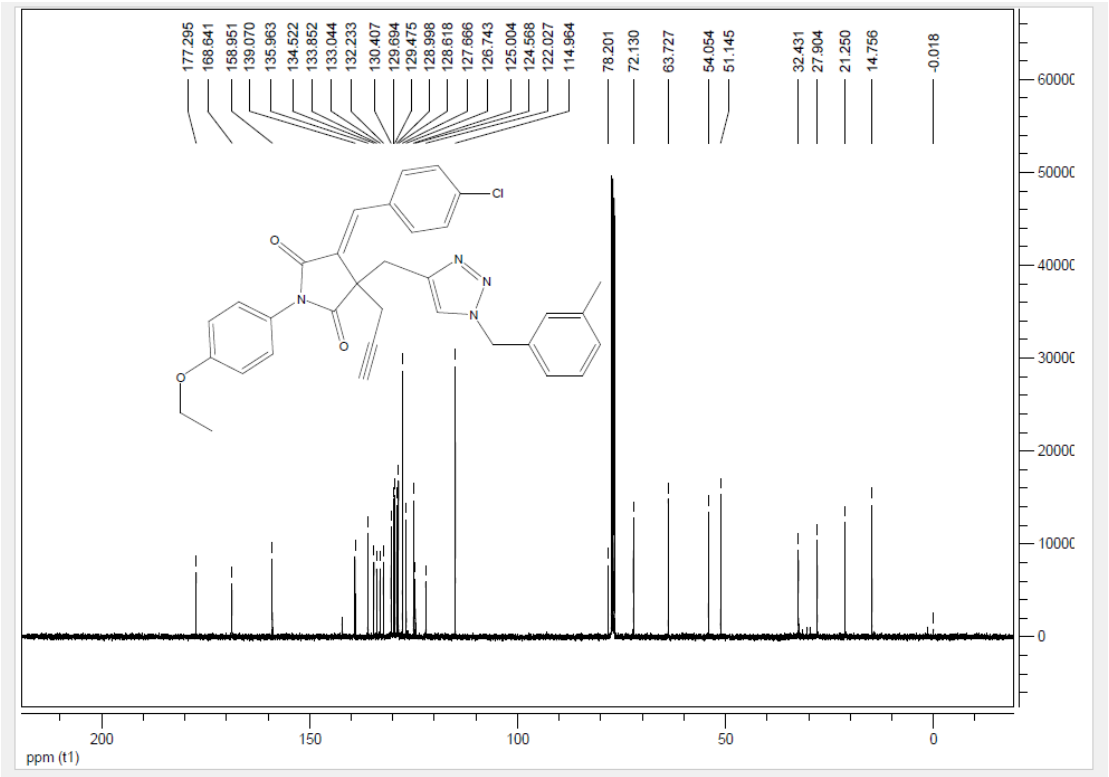
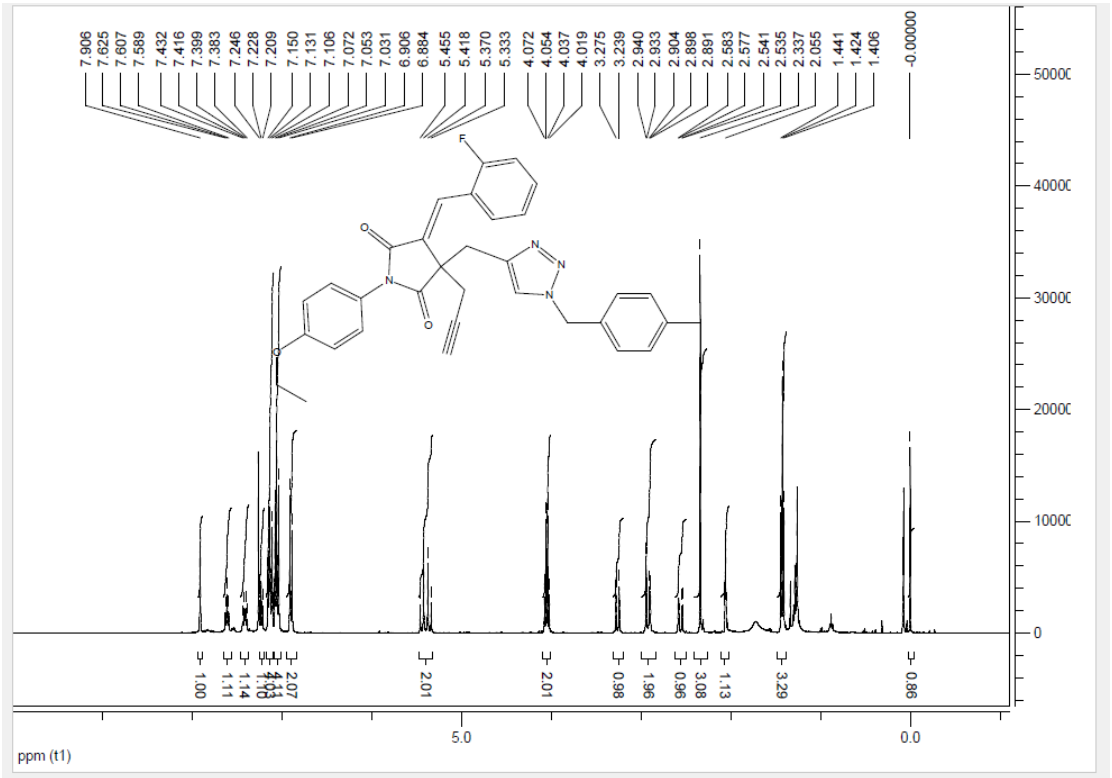
7.304
7.301
7.285
2.749
2.743
2.708
2.701
2.370
2.364
2.329
2.322
2.080
2.074
2.068
1.348
0.000
Br
O
N
O
1.00
1.12
2.19
2.20
2.10
9.64
5.0
0.0
ppm (t1)


176.447
168.574
151.829
138.147
134.885
133.039
131.776
130.515
129.256
129.036
127.242
126.160
125.951
123.410
77.997
72.195
50.424
34.785
31.299
26.608
0.004
Br
O
N
O
200
150
100
50
0
ppm (t1)

S-5. NMR Spectra of the desired products 3



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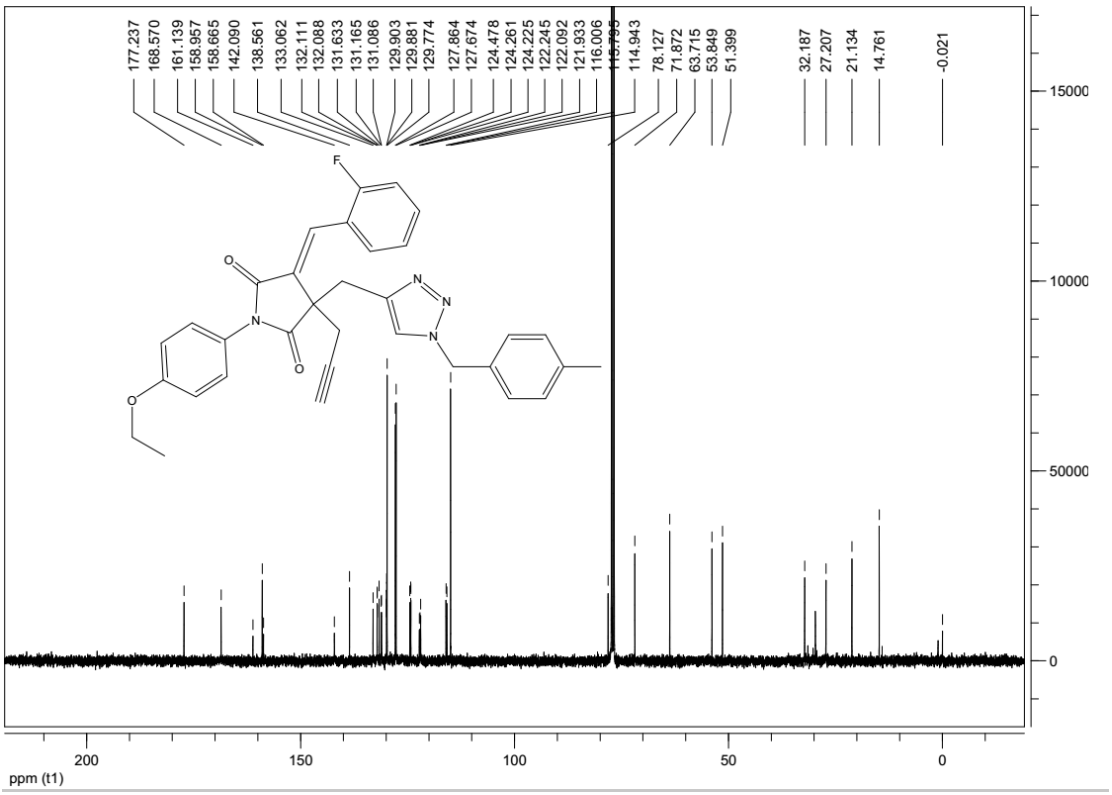
7.625
7.607
7.589
7.432
7.416
7.399
7.383
7.246
7.228
7.209
7.150
7.131
7.106
7.072
7.053
7.031
6.906
6.884
5.455
5.418
5.370
5.333
4.072
4.054
4.037
4.019
3.275
3.239
2.940
2.933
2.904
2.898
2.891
2.583
2.577
2.541
2.535
2.337
2.055
1.441
1.424
1.406
-0.00000
1.00
1.11
1.14
2.07
2.01
2.01
0.98
1.96
0.96
3.08
1.13
3.29
0.86
5.0
0.0
ppm (t1)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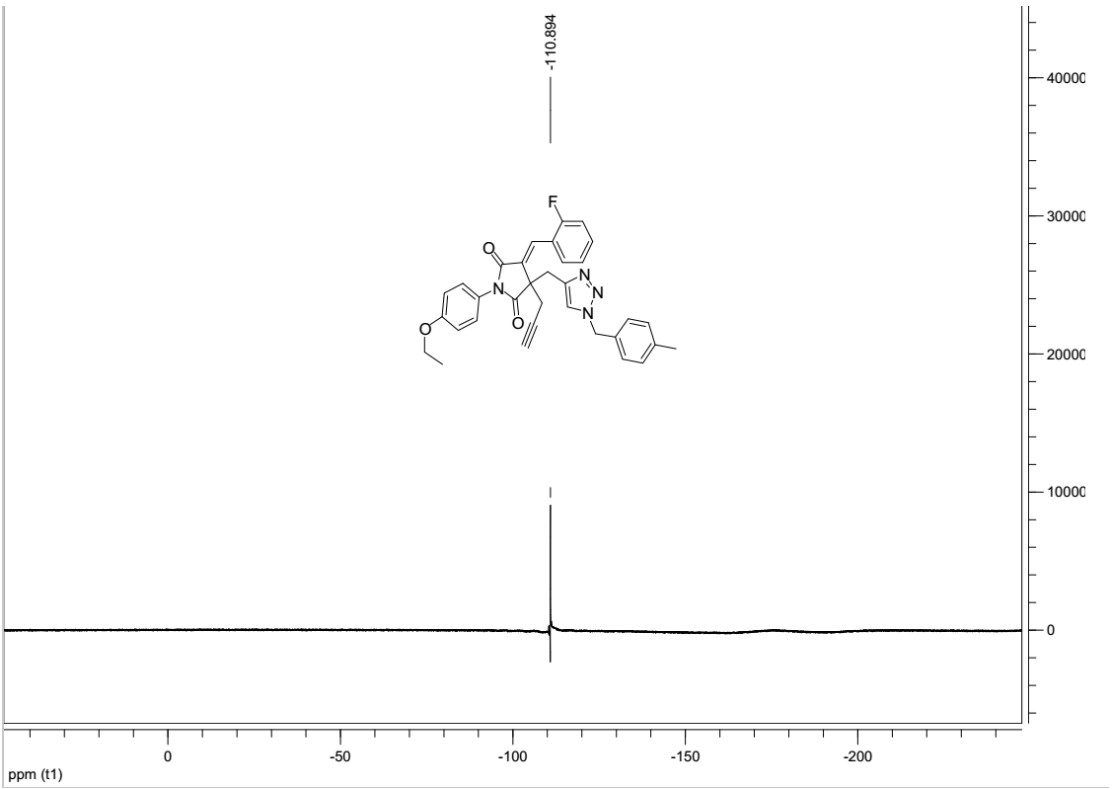
161.139
158.957
158.665
142.090
138.561
133.062
132.111
132.088
131.633
131.165
131.086
129.903
129.881
129.774
127.864
127.674
124.478
124.261
124.225
122.245
122.092
121.933
116.006
114.943
78.127
71.872
63.715
53.849
51.399
32.187
27.207
21.134
14.761
-0.021
200
150
100
50
0
ppm (t1)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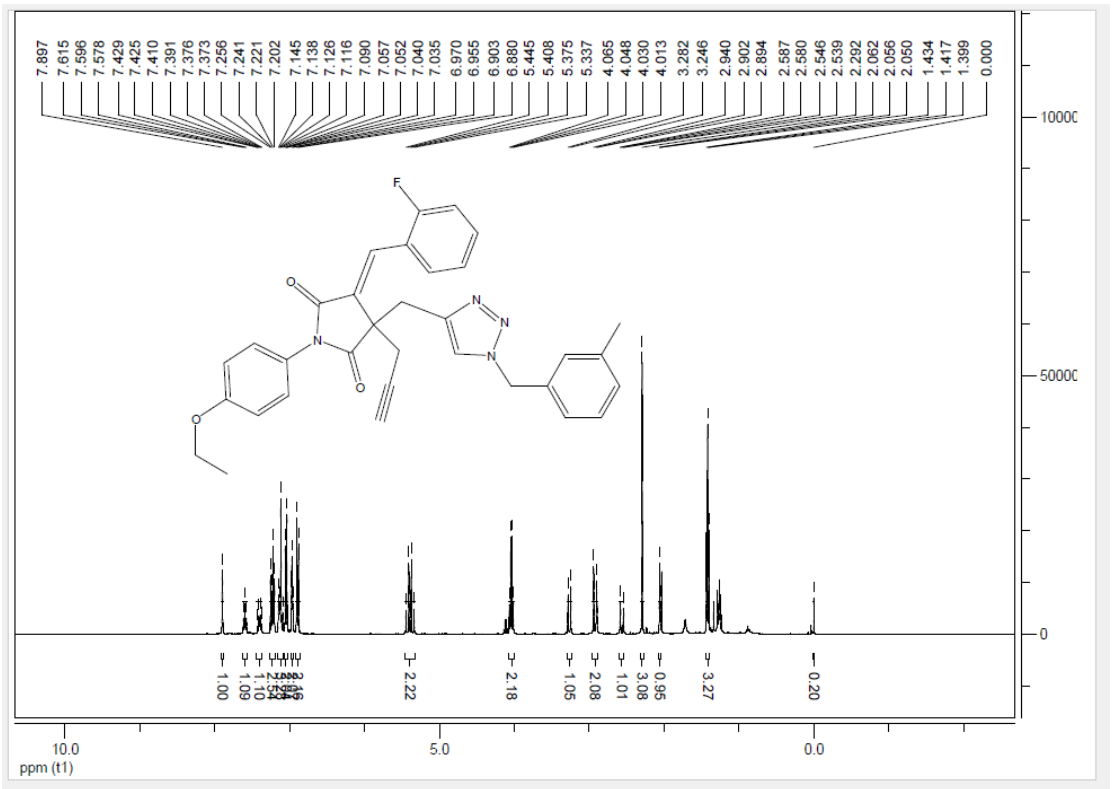
30000
20000
10000
0
0
-50
-100
-150
-200
ppm (t1)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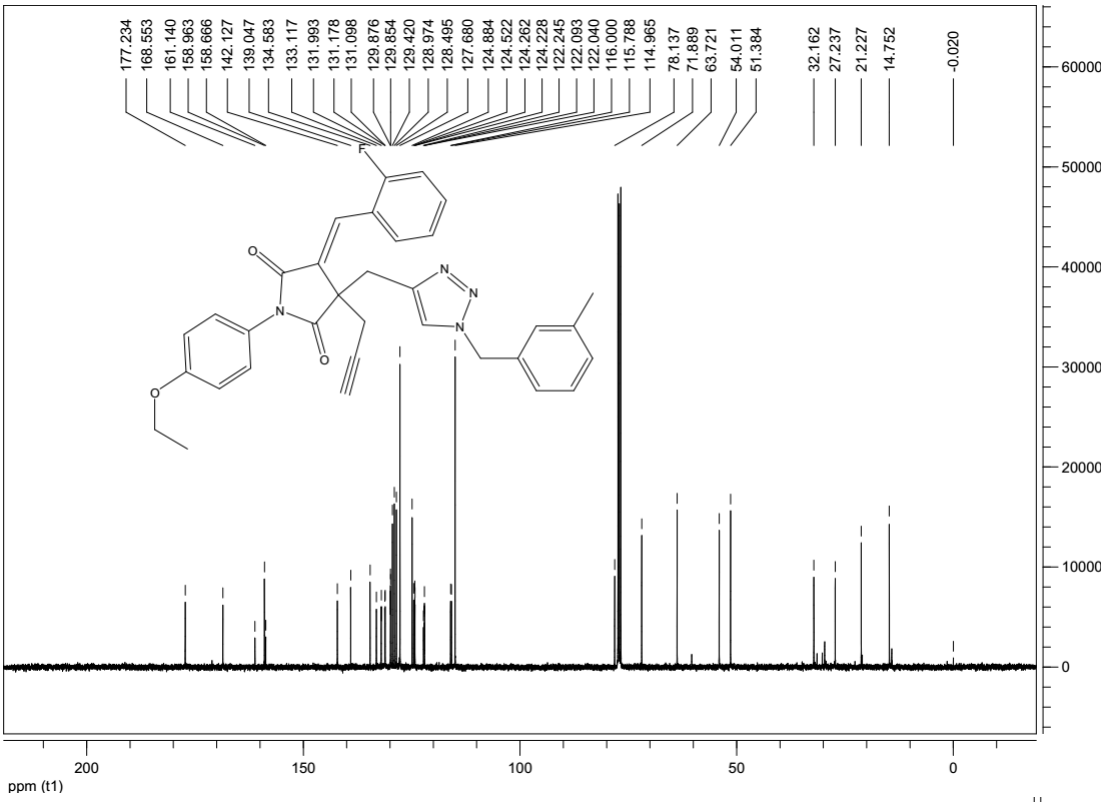
7.425
7.410
7.391
7.376
7.373
7.256
7.241
7.221
7.202
7.145
7.138
7.126
7.116
7.090
7.057
7.052
7.040
7.035
6.970
6.955
6.903
6.880
5.445
5.408
5.375
5.337
4.065
4.048
4.030
4.013
3.282
3.246
2.940
2.902
2.894
2.587
2.580
2.546
2.539
2.292
2.062
2.056
2.050
1.434
1.417
1.399
0.000
10000
50000
0
1.00
1.09
1.10
2.22
2.18
1.05
2.08
1.01
3.08
0.95
3.27
0.20
10.0
5.0
0.0
ppm (t1)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161.140
158.963
158.666
142.127
139.047
134.583
133.117
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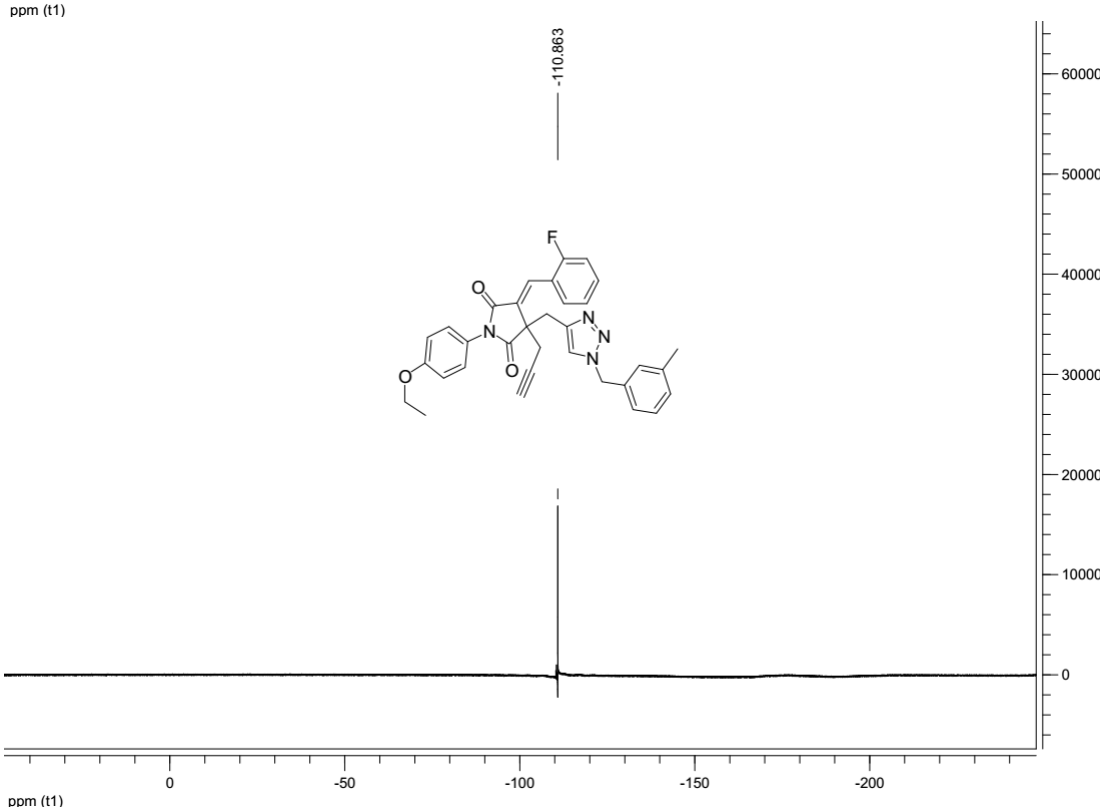
131.178
131.098
129.876
129.854
129.420
128.974
128.495
127.680
124.884
124.522
124.262
124.228
122.245
122.093
122.040
116.000
115.788
114.965
78.137
71.889
63.721
54.011
51.384
32.162
27.237
21.227
14.752
-0.020
F
O
N
O
N
N
N
O
60000
50000
40000
30000
20000
10000
0
200
150
100
50
0
ppm (t1)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N
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40000
30000
20000
10000
0
0
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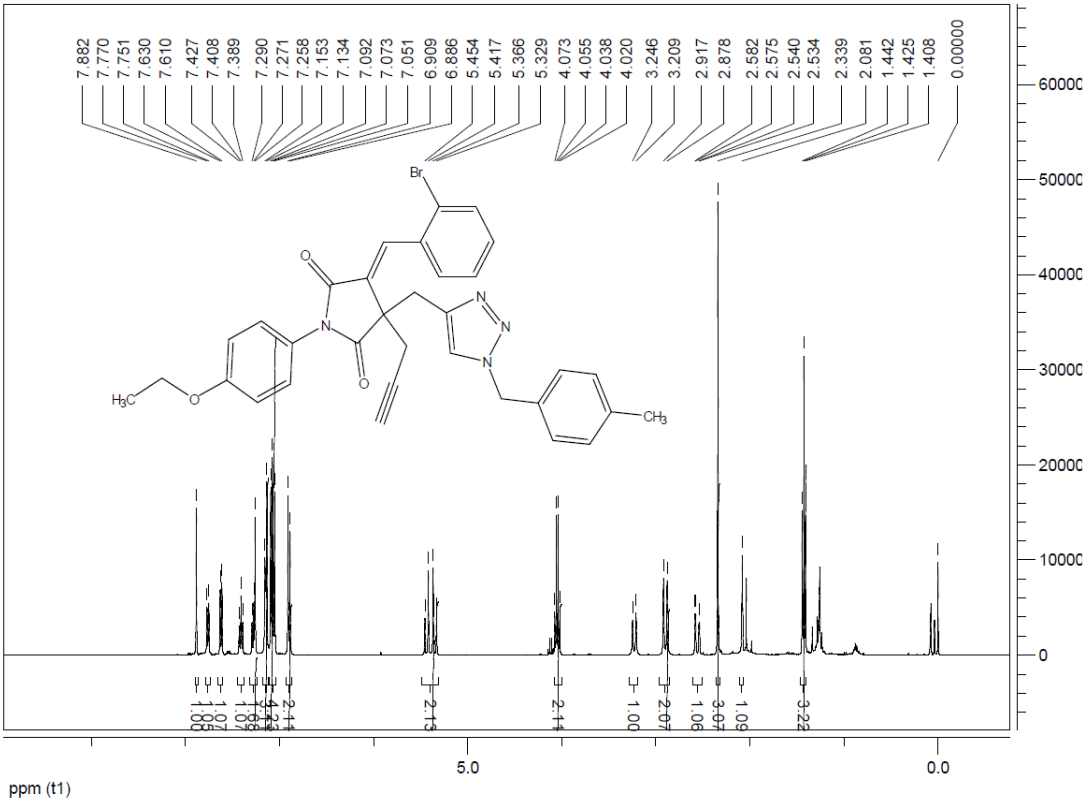
-100
-150
-200
ppm (t1)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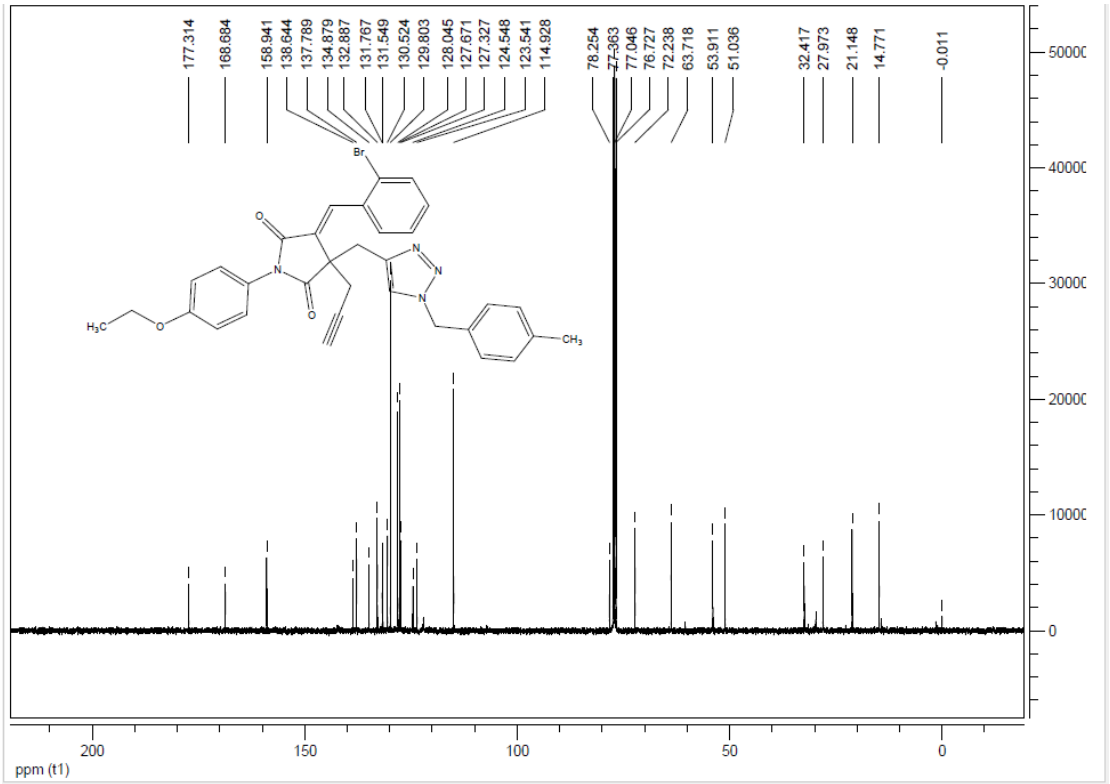
7.630
7.610
7.427
7.408
7.389
7.290
7.271
7.258
7.153
7.134
7.092
7.073
7.051
6.909
6.886
5.454
5.417
5.366
5.329
4.073
4.055
4.038
4.020
3.246
3.209
2.917
2.878
2.582
2.575
2.540
2.534
2.339
2.081
1.442
1.425
1.408
0.00000
Br
O
N
O
N
N
N
H3C
O
CH3
60000
50000
40000
30000
20000
10000
0
5.0
0.0
ppm (t1)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158.941
138.644
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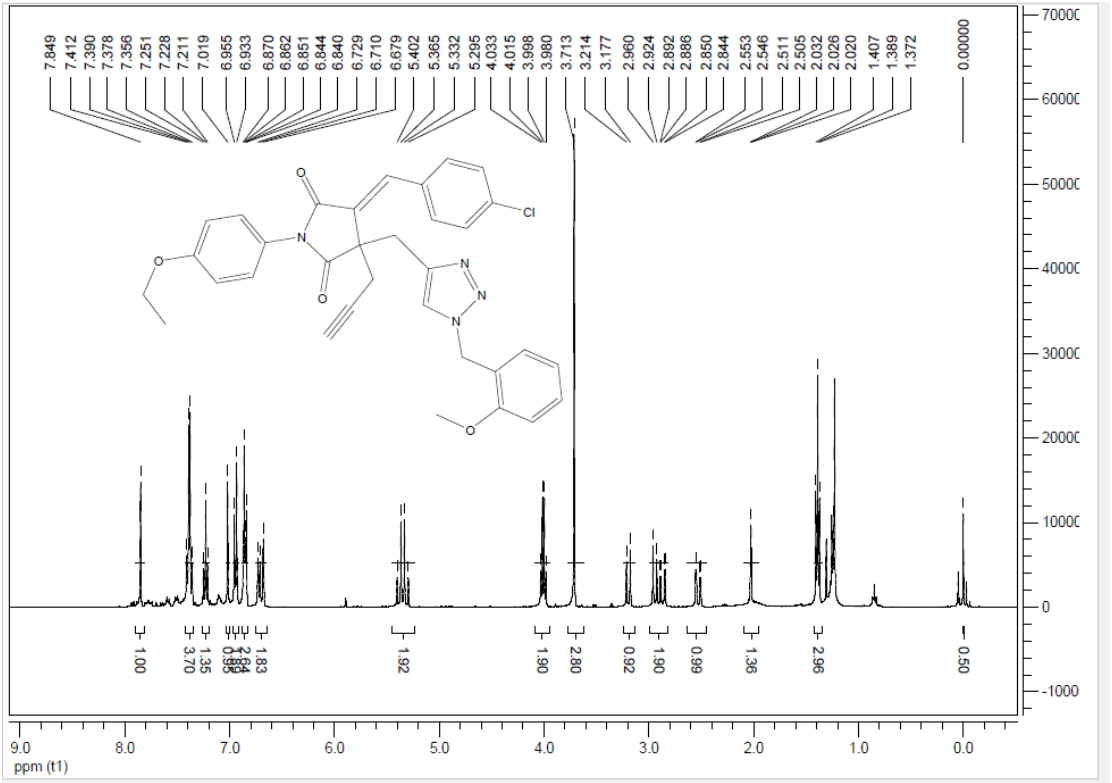
134.879
132.887
131.767
131.549
130.524
129.803
128.045
127.671
127.327
124.548
123.541
114.928
78.254
77.363
77.046
76.727
72.238
63.718
53.911
51.036
32.417
27.973
21.148
14.771
-0.011
Br
O
N
O
N
N
N
H3C
O
CH3
50000
40000
30000
20000
10000
0
200
150
100
50
0
ppm (t1)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7.412
7.390
7.378
7.356
7.251
7.228
7.211
7.019
6.955
6.933
6.870
6.862
6.851
6.844
6.840
6.729
6.710
6.679
5.402
5.365
5.332
5.295
4.033
4.015
3.998
3.980
3.713
3.214
3.177
2.960
2.924
2.892
2.886
2.850
2.844
2.553
2.546
2.511
2.505
2.032
2.026
2.020
1.407
1.389
1.372
0.00000
Cl
O
N
O
O
N
N
N
O
1.00
3.70
1.35
1.83
1.92
1.90
2.80
0.92
1.90
0.99
1.36
2.96
0.50
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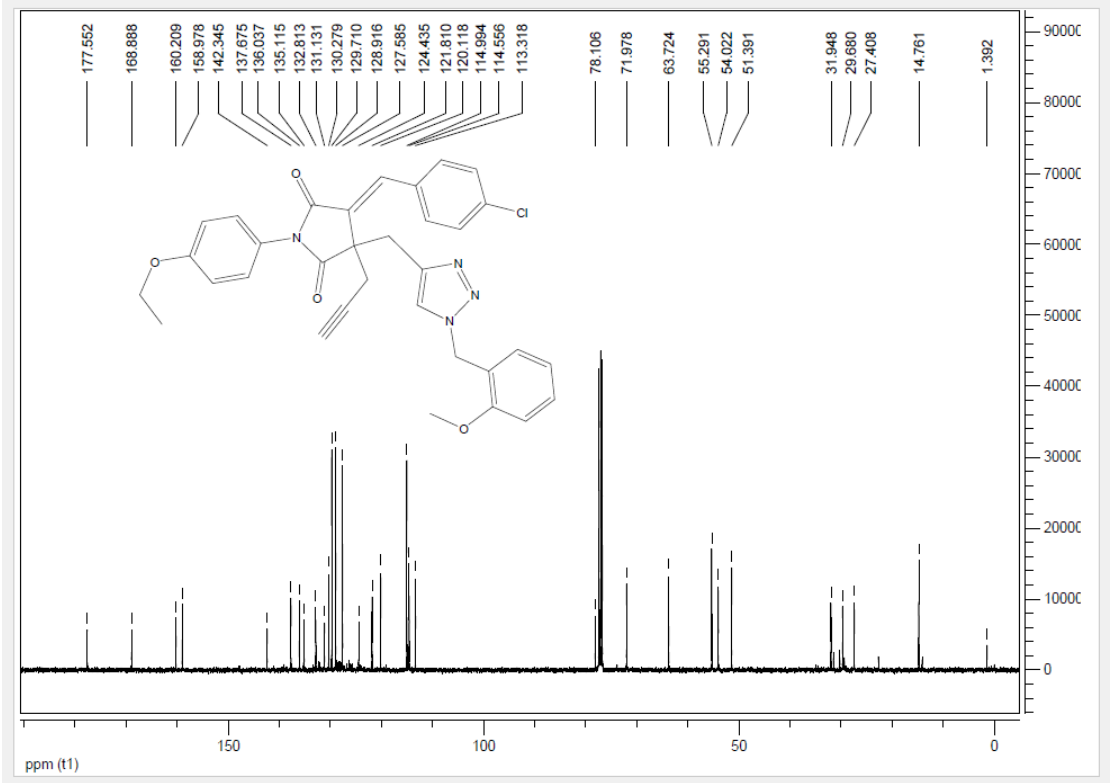
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
ppm (t1)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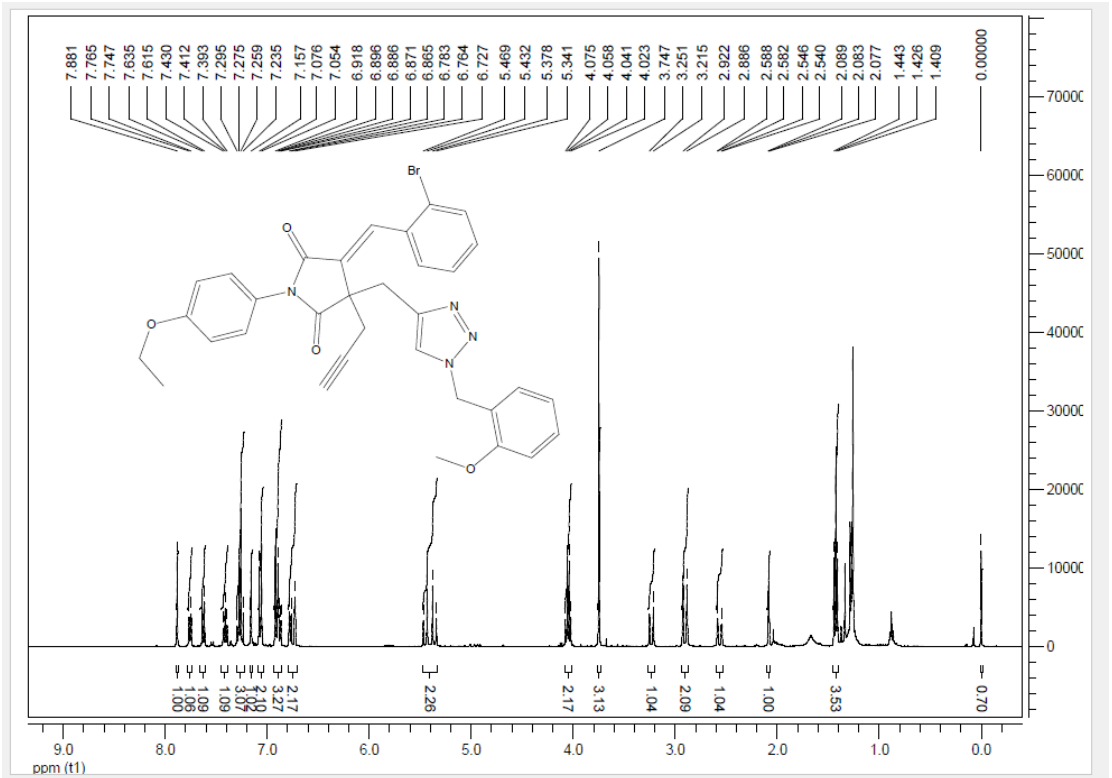
158.978
142.345
137.675
136.037
135.115
132.813
131.131
130.279
129.710
128.916
127.585
124.435
121.810
120.118
114.994
114.556
113.318
78.106
71.978
63.724
55.291
54.022
51.391
31.948
29.680
27.408
14.761
1.392
Cl
O
N
O
O
N
N
N
O
150
100
50
0
ppm (t1)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7.635
7.615
7.430
7.412
7.393
7.295
7.275
7.259
7.235
7.157
7.076
7.054
6.918
6.896
6.886
6.871
6.865
6.783
6.764
6.727
5.469
5.432
5.378
5.341
4.075
4.058
4.041
4.023
3.747
3.251
3.215
2.922
2.886
2.588
2.582
2.546
2.540
2.089
2.083
2.077
1.443
1.426
1.409
0.00000
Br
O
N
O
O
N
N
N
O
1.00
1.06
1.19
1.09
1.09
3.07
3.10
3.27
2.17
2.26
2.17
3.13
1.04
2.09
1.04
1.00
3.53
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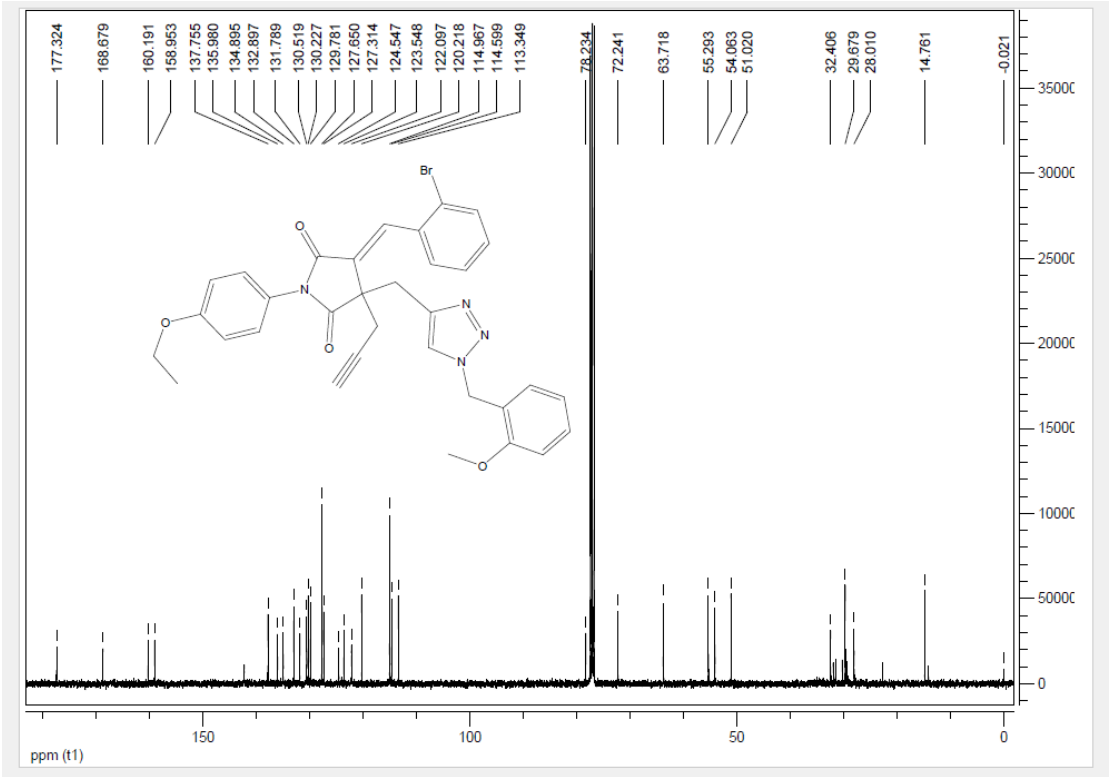
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
ppm (t1)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127.650
127.314
124.547
123.548
122.097
120.218
114.967
114.599
113.349
78.234
72.241
63.718
55.293
54.063
51.020
32.406
29.679
28.010
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Br
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N
O
O
N
N
N
O
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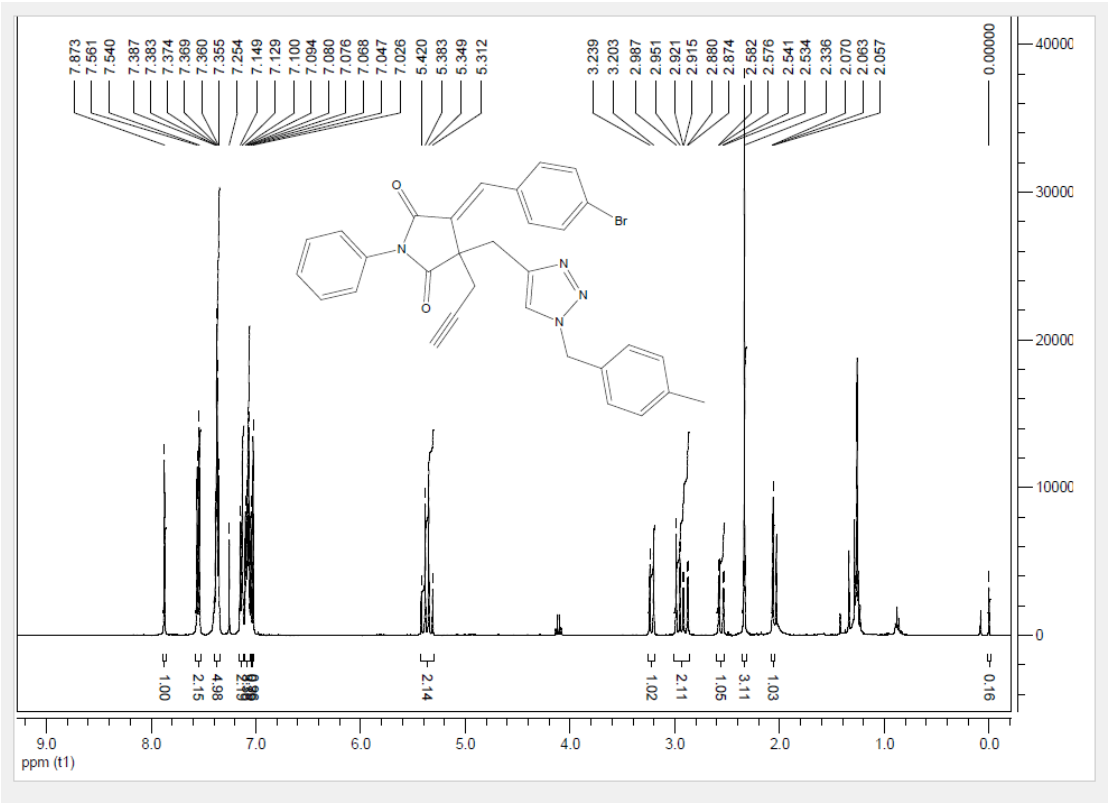
100
50
0
ppm (t1)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7.360
7.355
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7.149
7.129
7.100
7.094
7.080
7.076
7.068
7.047
7.026
5.420
5.383
5.349
5.312
3.239
3.203
2.987
2.951
2.921
2.915
2.880
2.874
2.582
2.576
2.541
2.534
2.336
2.070
2.063
2.057
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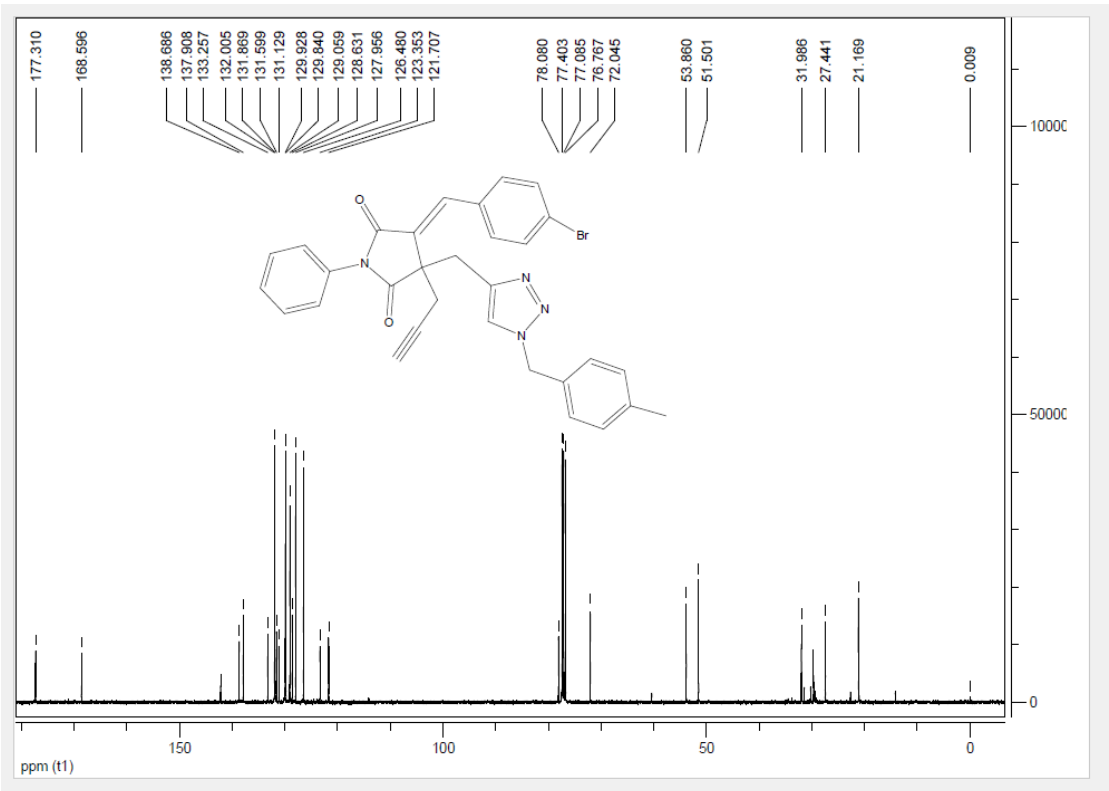
2.11
1.05
3.11
1.03
0.16
ppm (t1)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131.599
131.129
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128.631
127.956
126.480
123.353
121.707
78.080
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77.085
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72.045
53.860
51.501
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27.441
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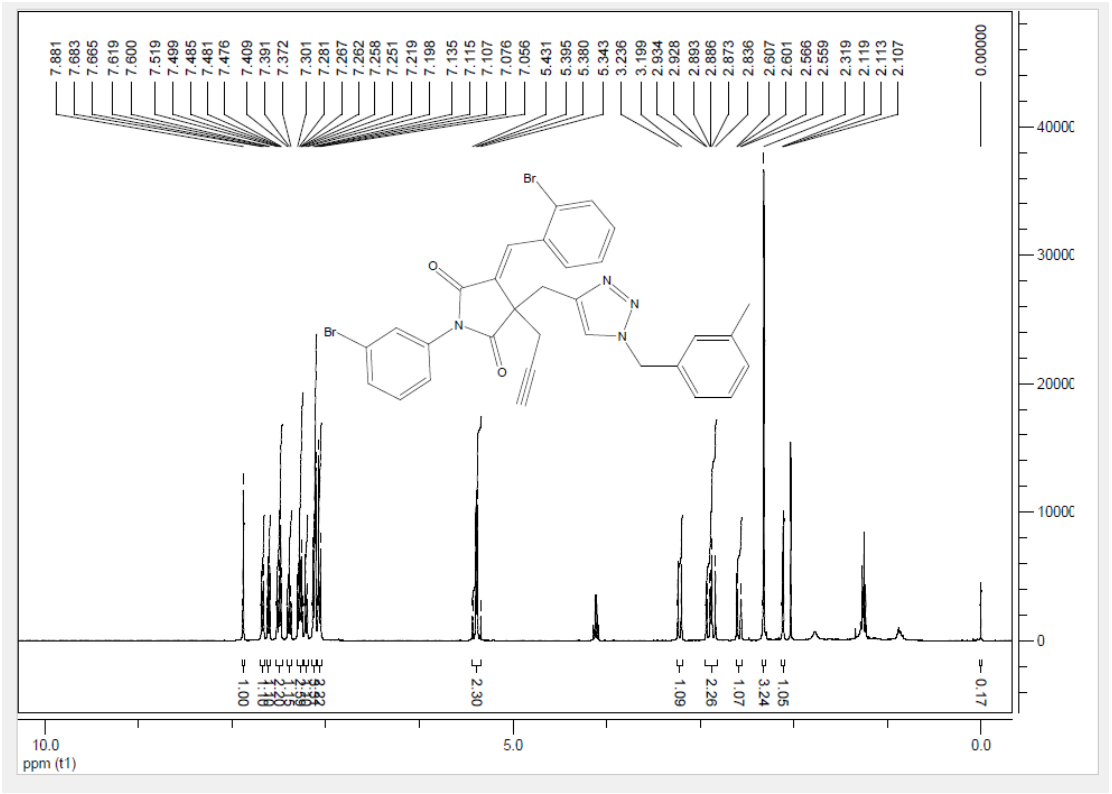
0.009
Br
ppm (t1)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7.619
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7.519
7.499
7.485
7.481
7.476
7.409
7.391
7.372
7.301
7.281
7.267
7.262
7.258
7.251
7.219
7.198
7.135
7.115
7.107
7.076
7.056
5.431
5.395
5.380
5.343
3.236
3.199
2.934
2.928
2.893
2.886
2.873
2.836
2.607
2.601
2.566
2.559
2.319
2.119
2.113
2.107
0.00000
Br
O
N
O
Br
N
N
N
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2.26
1.07
3.24
1.05
0.17
10.0
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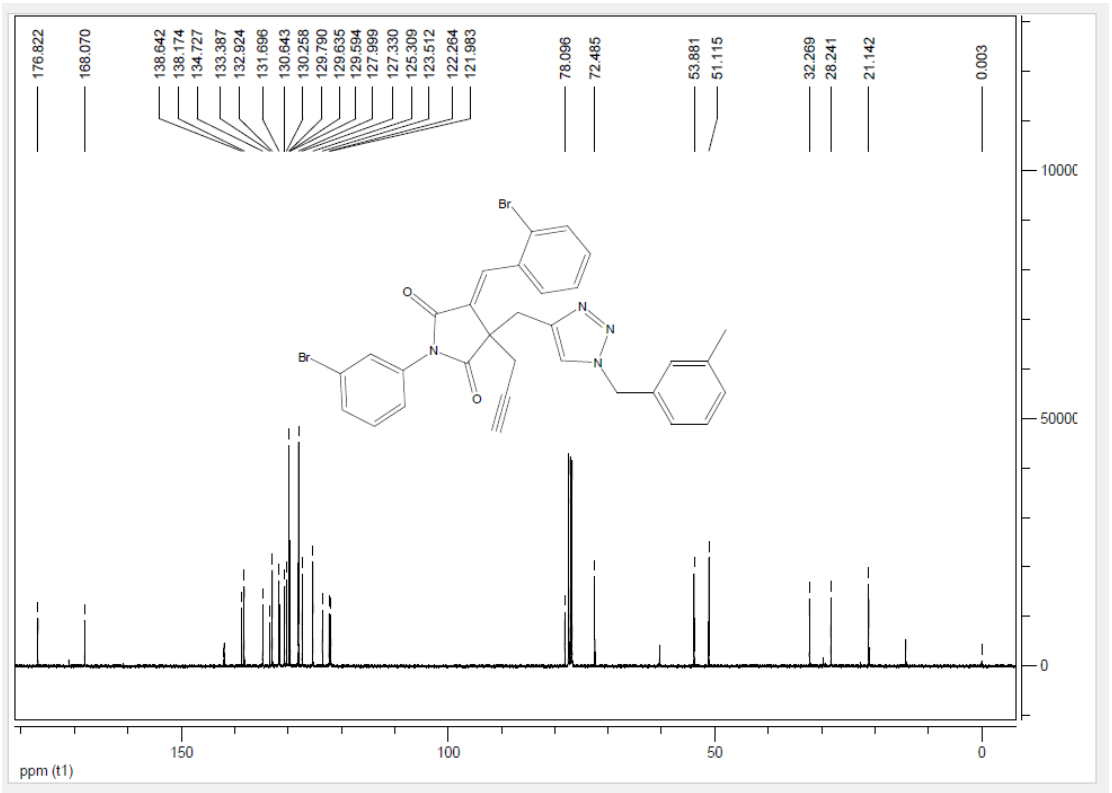
0.0
ppm (t1)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129.635
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127.999
127.330
125.309
123.512
122.264
121.983
78.096
72.485
53.881
51.115
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28.241
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0.003
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N
O
Br
N
N
N
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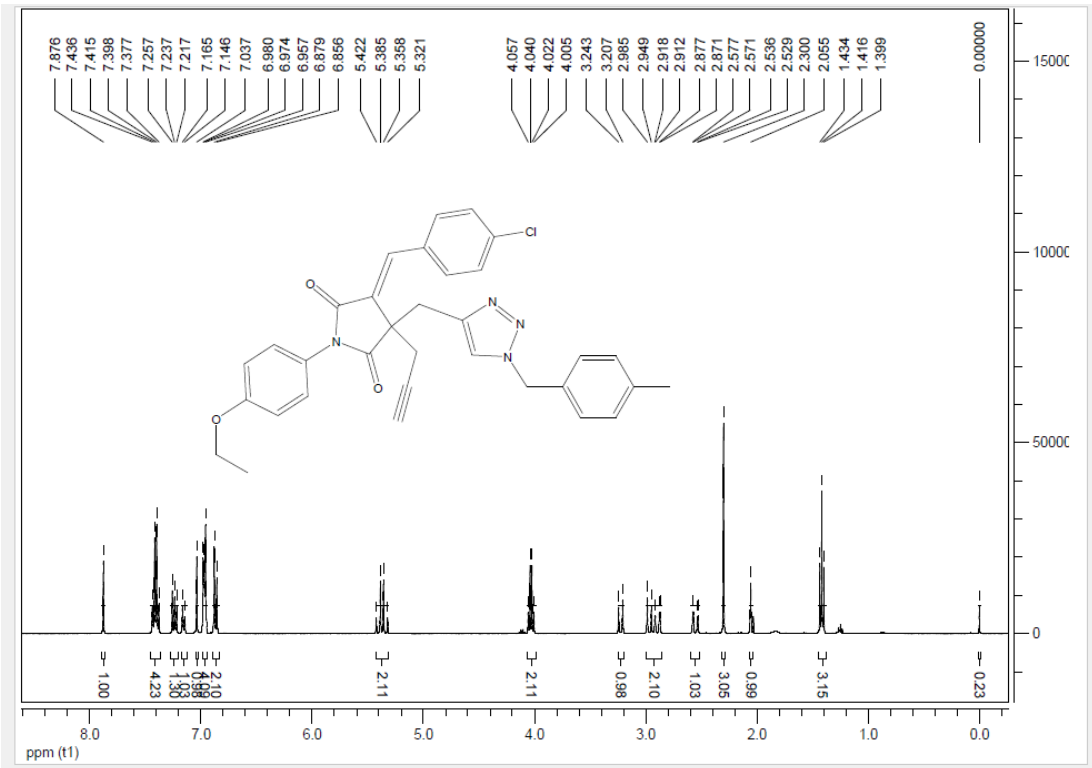
100
50
0
ppm (t1)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7.377
7.257
7.237
7.217
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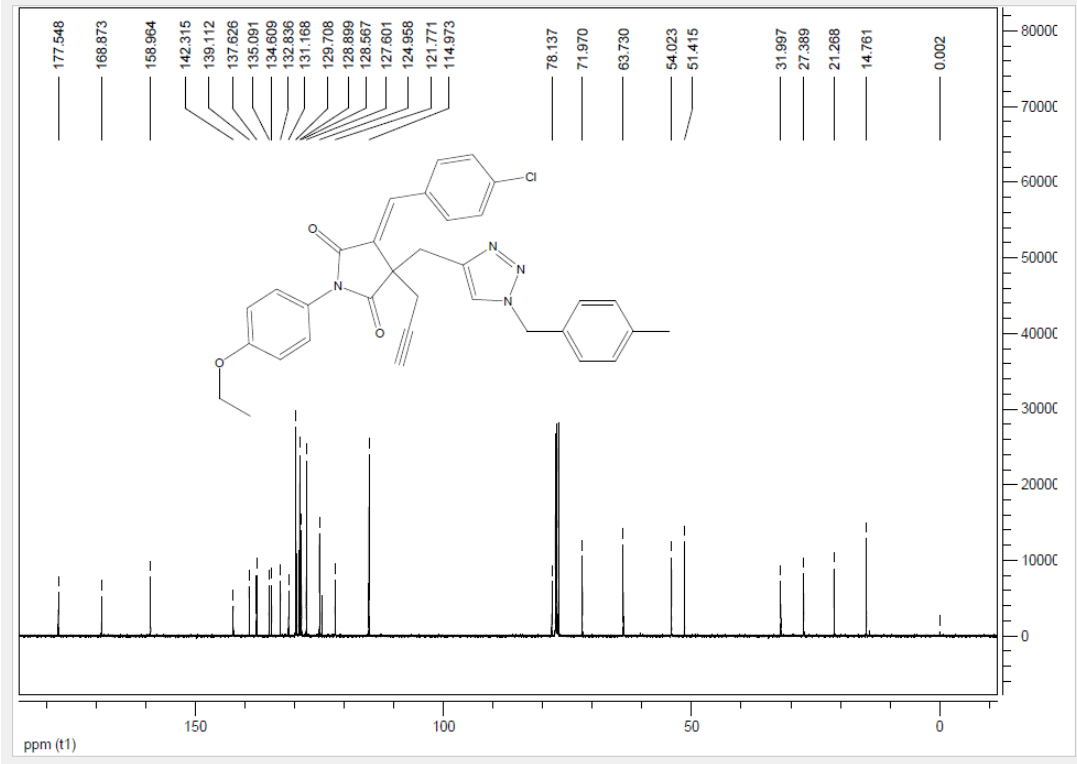
7.146
7.037
6.980
6.974
6.957
6.879
6.856
5.422
5.385
5.358
5.321
4.057
4.040
4.022
4.005
3.243
3.207
2.985
2.949
2.918
2.912
2.877
2.871
2.577
2.571
2.536
2.529
2.300
2.055
1.434
1.416
1.399
0.00000
Cl
O
N
O
O
N
N
N
O
1.00
4.23
1.30
1.03
2.10
2.11
2.11
0.98
2.10
1.03
3.06
0.99
3.15
0.23
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
ppm (t1)
15000
10000
5000
0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158.964
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128.567
127.601
124.958
121.771
114.973
78.137
71.970
63.730
54.023
51.415
31.997
27.389
21.268
14.761
0.002
Cl
O
N
O
O
N
N
N
O
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100
50
0
ppm (t1)
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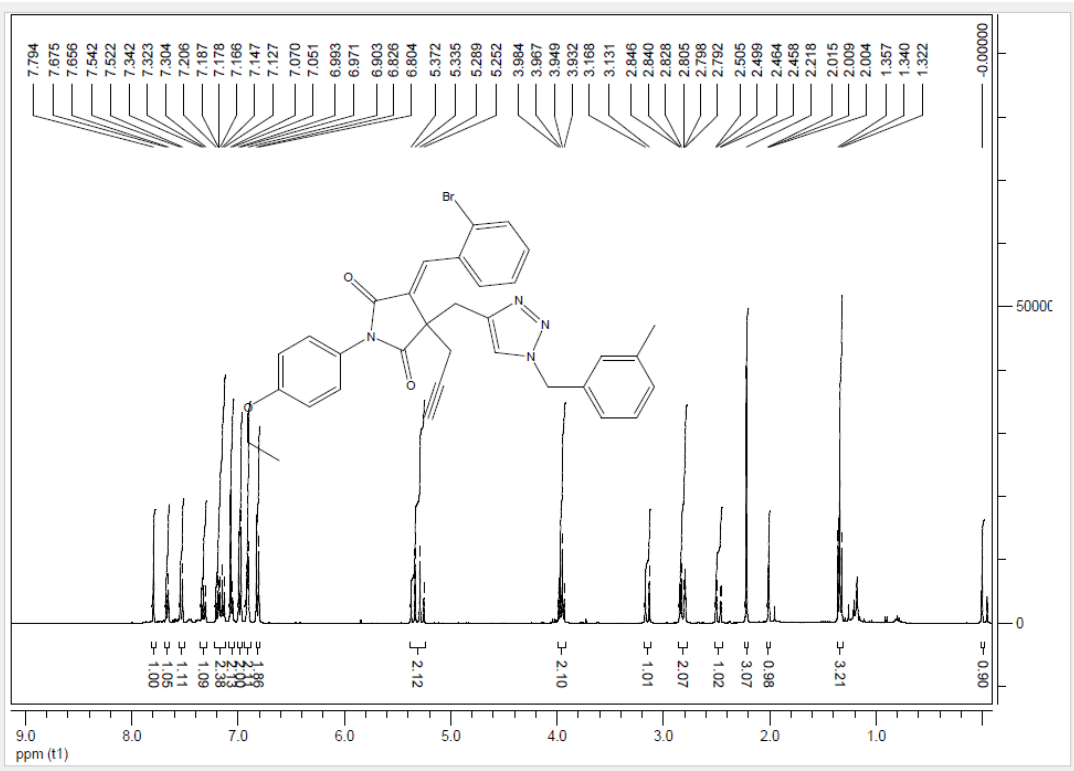
70000
60000
50000
40000
30000
20000
10000
0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7.127
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7.051
6.993
6.971
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6.826
6.804
5.372
5.335
5.289
5.252
3.984
3.967
3.949
3.932
3.168
3.131
2.846
2.840
2.828
2.805
2.798
2.792
2.505
2.499
2.464
2.458
2.218
2.015
2.009
2.004
1.357
1.340
1.322
-0.00000
Br
O
N
O
N
N
N
O
1.00
1.05
1.11
1.09
1.86
2.12
2.10
1.01
2.07
1.02
3.07
0.98
3.21
0.90
50000
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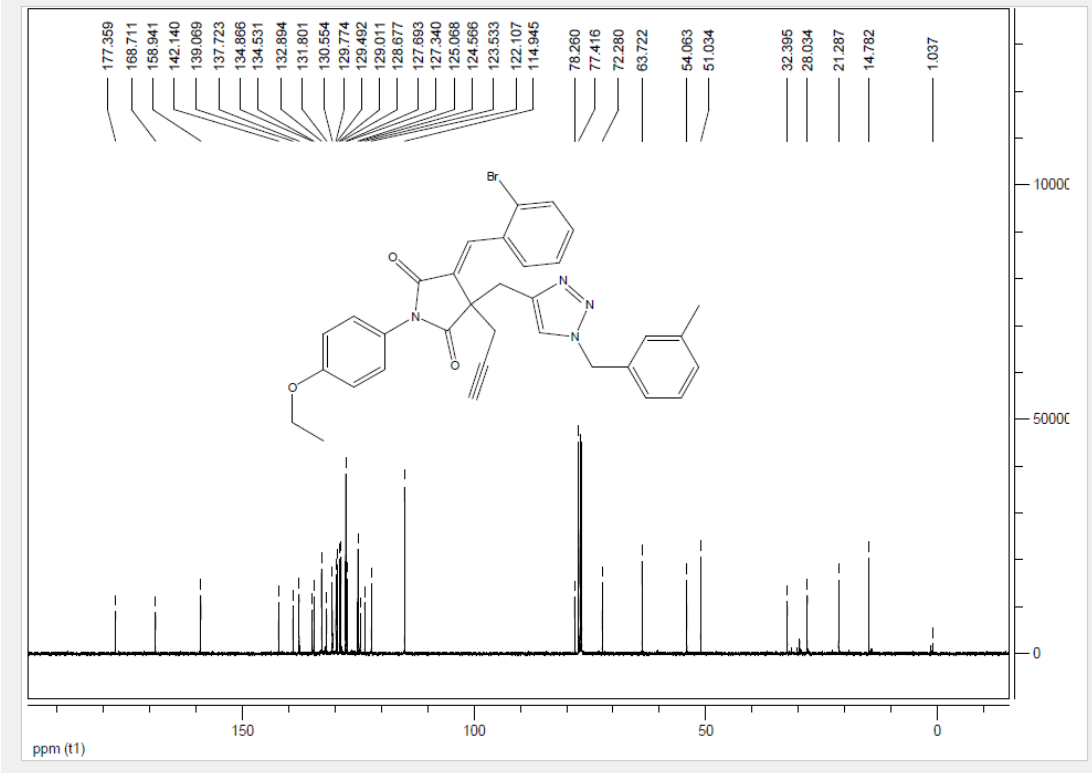
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
ppm (t1)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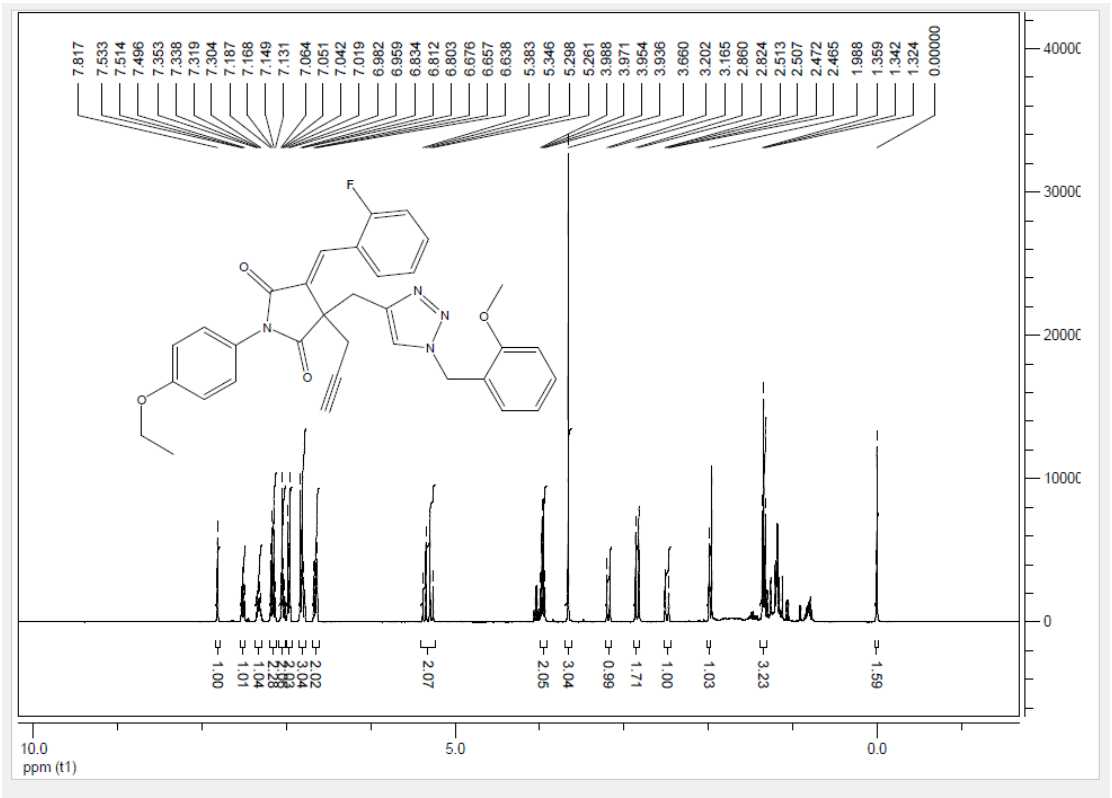
129.492
129.011
128.677
127.693
127.340
125.068
124.566
123.533
122.107
114.945
78.260
77.416
72.280
63.722
54.063
51.034
32.395
28.034
21.287
14.782
1.037
Br
O
N
O
N
N
N
O
10000
5000
0
150
100
50
0
ppm (t1)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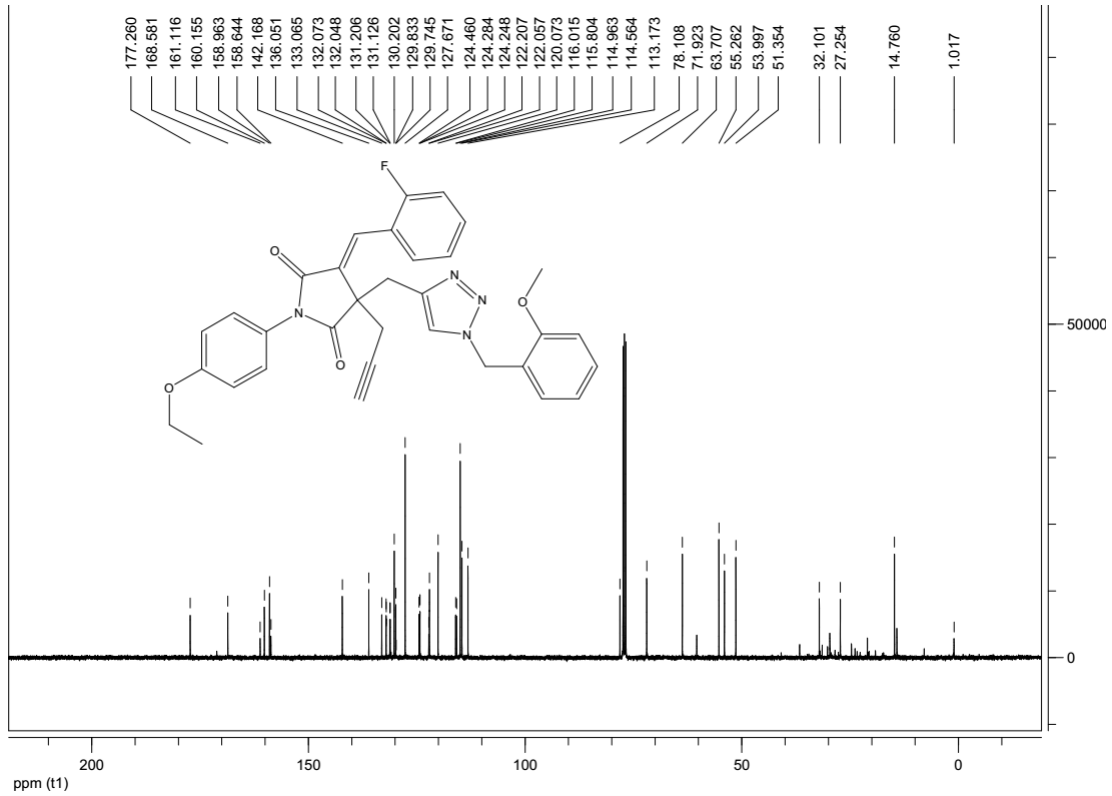
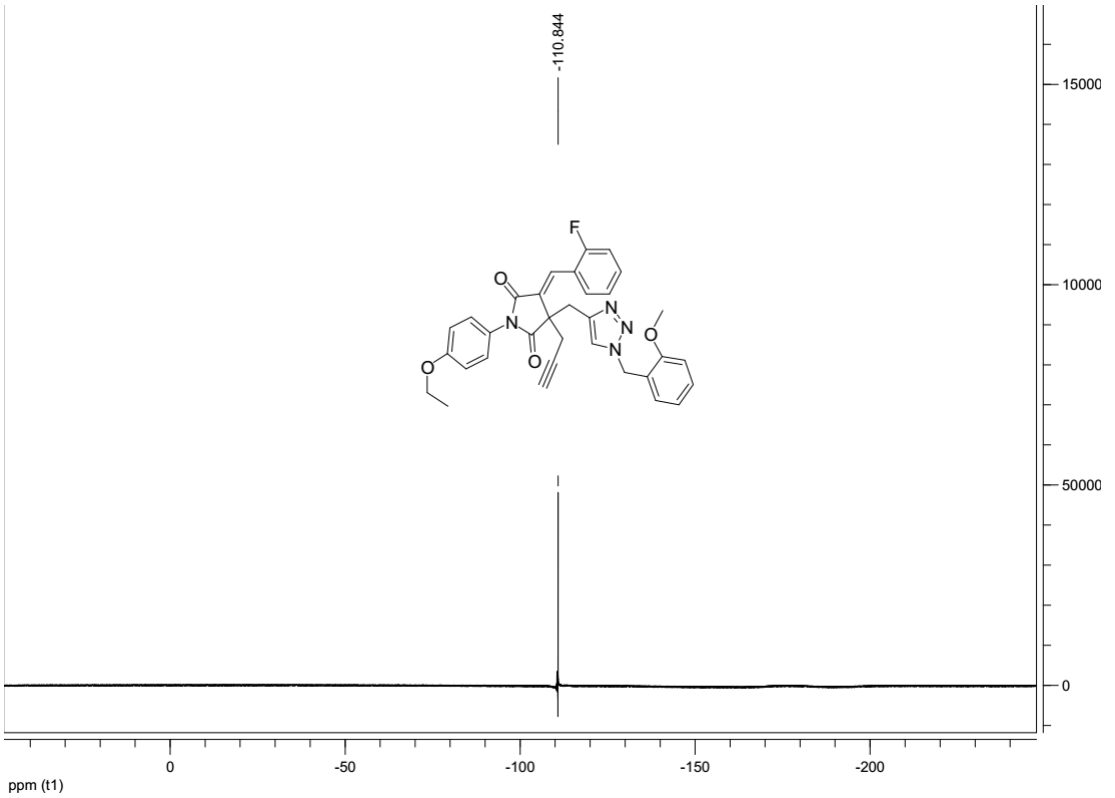
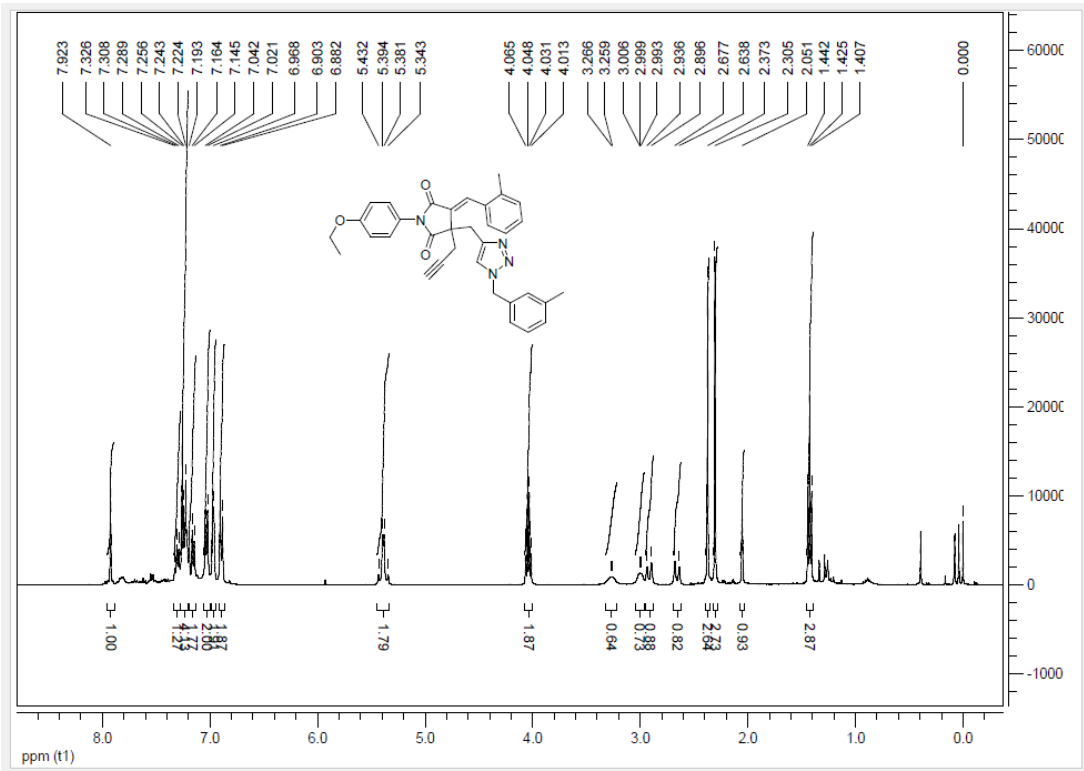
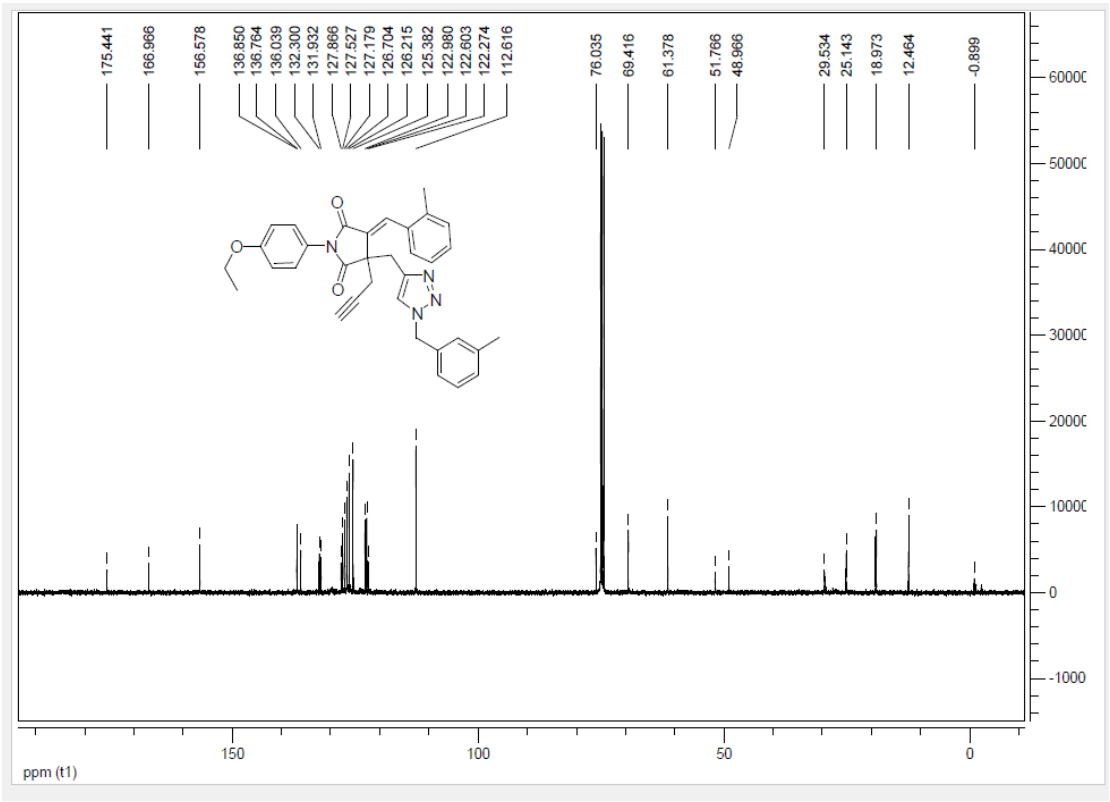
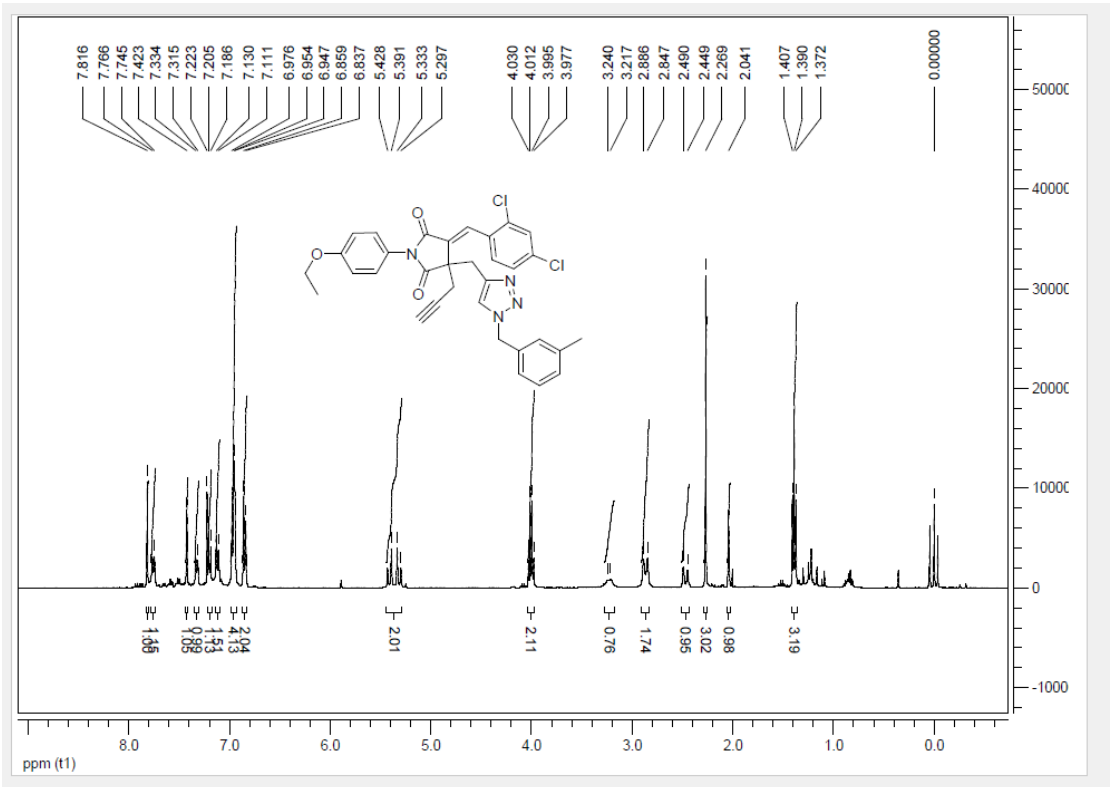
7.533
7.514
7.496
7.353
7.338
7.319
7.304
7.187
7.168
7.149
7.131
7.064
7.051
7.042
7.019
6.982
6.959
6.834
6.812
6.803
6.676
6.657
6.638
5.383
5.346
5.298
5.261
3.988
3.971
3.954
3.936
3.660
3.202
3.165
2.860
2.824
2.513
2.507
2.472
2.465
1.988
1.359
1.342
1.324
0.00000
1.00
1.01
1.04
3.04
2.02
2.07
2.05
3.04
0.99
1.71
1.00
1.03
3.23
1.59
10.0
5.0
0.0
ppm (t1)


177.260
168.581
161.116
160.155
158.963
158.644
142.168
136.051
133.065
132.073
132.048
131.206
131.126
130.202
129.833
129.745
127.671
124.460
124.284
124.248
122.207
122.057
120.073
116.015
115.804
114.963
114.564
113.173
78.108
71.923
63.707
55.262
53.997
51.354
32.101
27.254
14.760
1.017
200
150
100
50
0
ppm (t1)


-110.844
F
O
N
O
O
N
N
N
O
O
15000
10000
50000
0
0
-50
-100
-150
-200
ppm (t1)


7.923
7.326
7.308
7.289
7.256
7.243
7.224
7.193
7.164
7.145
7.042
7.021
6.968
6.903
6.882
5.432
5.394
5.381
5.343
4.065
4.048
4.031
4.013
3.266
3.259
3.006
2.999
2.993
2.936
2.896
2.677
2.638
2.373
2.305
2.051
1.442
1.425
1.407
0.000
1.00
1.79
1.87
0.64
0.82
0.93
2.87
60000
50000
40000
30000
20000
10000
0
-1000
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
ppm (t1)


175.441
166.966
156.578
136.850
136.764
136.039
132.300
131.932
127.866
127.527
127.179
126.704
126.215
125.382
122.980
122.603
122.274
112.616
76.035
69.416
61.378
51.786
48.966
29.534
25.143
18.973
12.464
-0.899
ppm (t1)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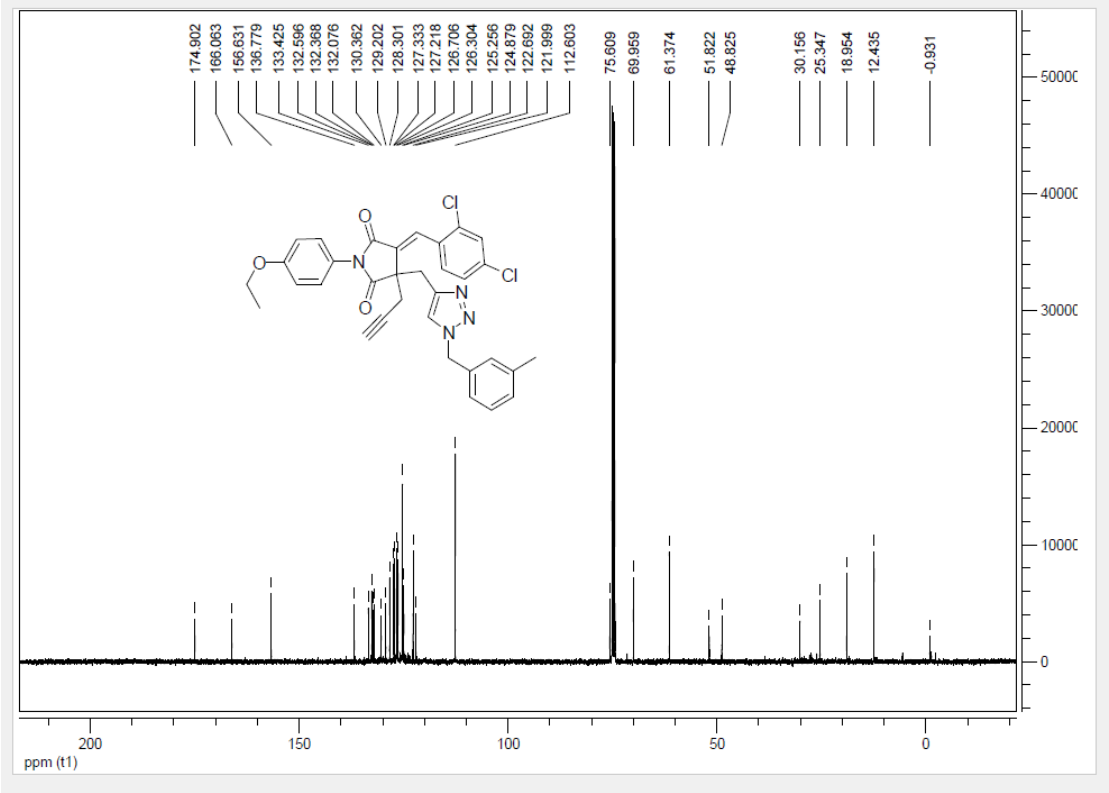
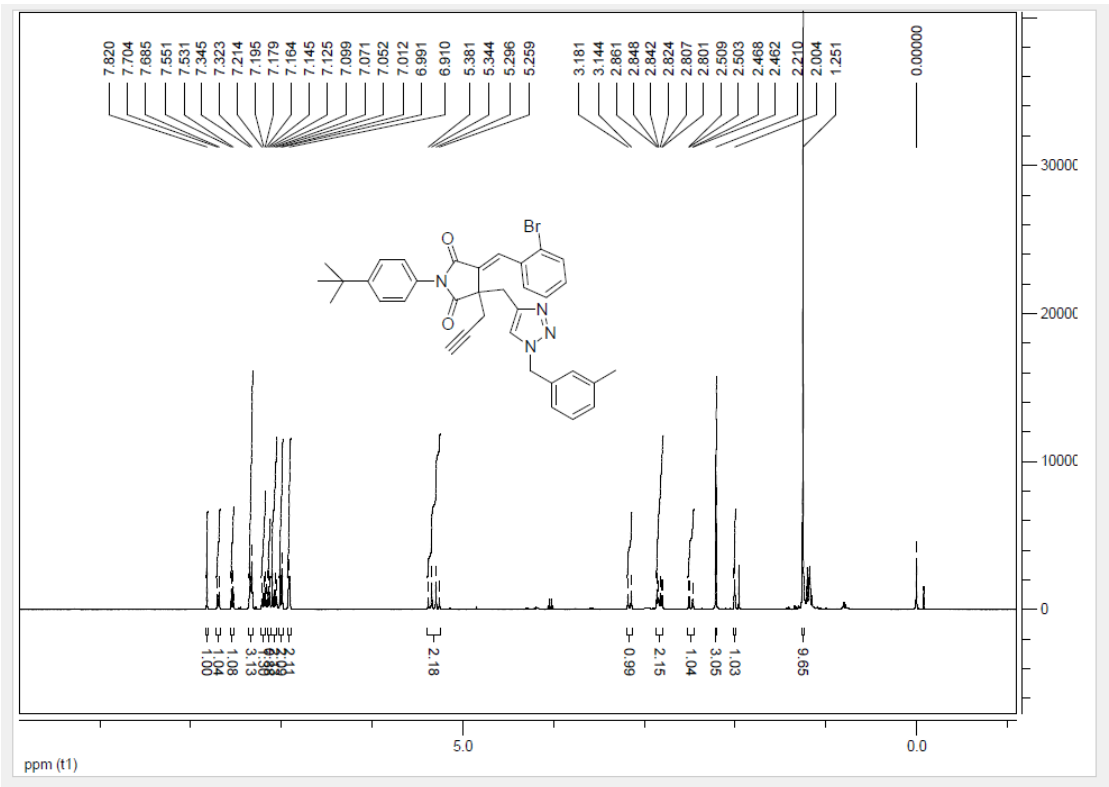
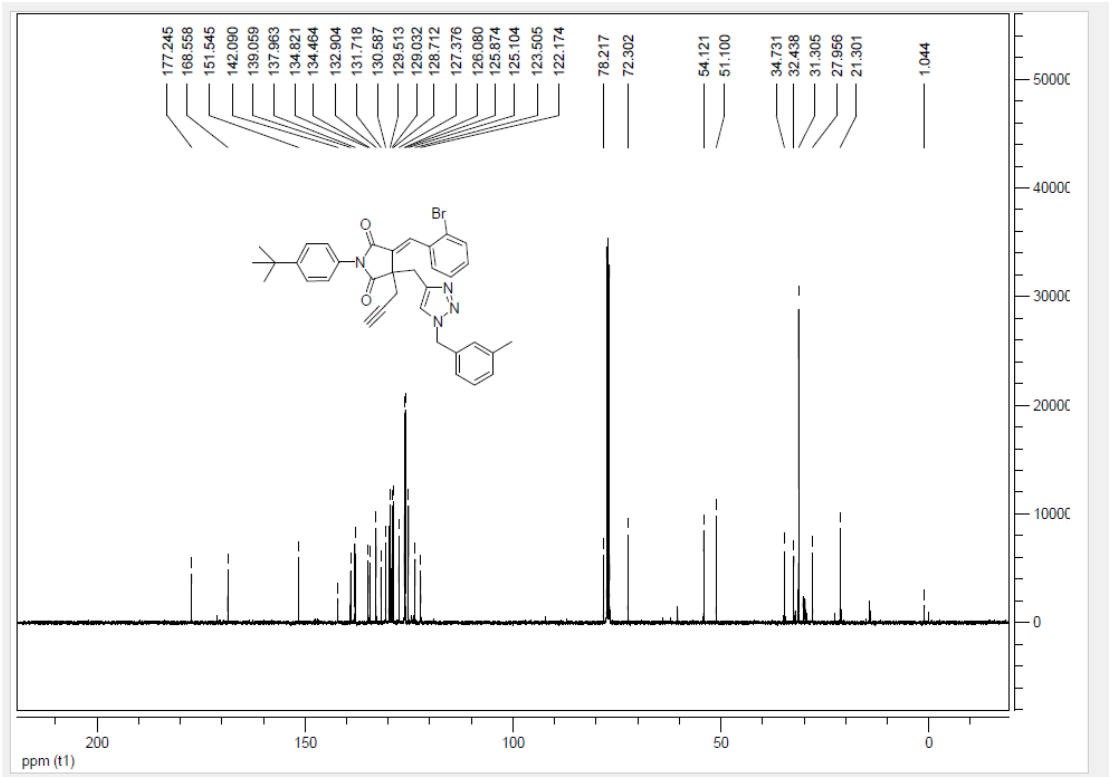
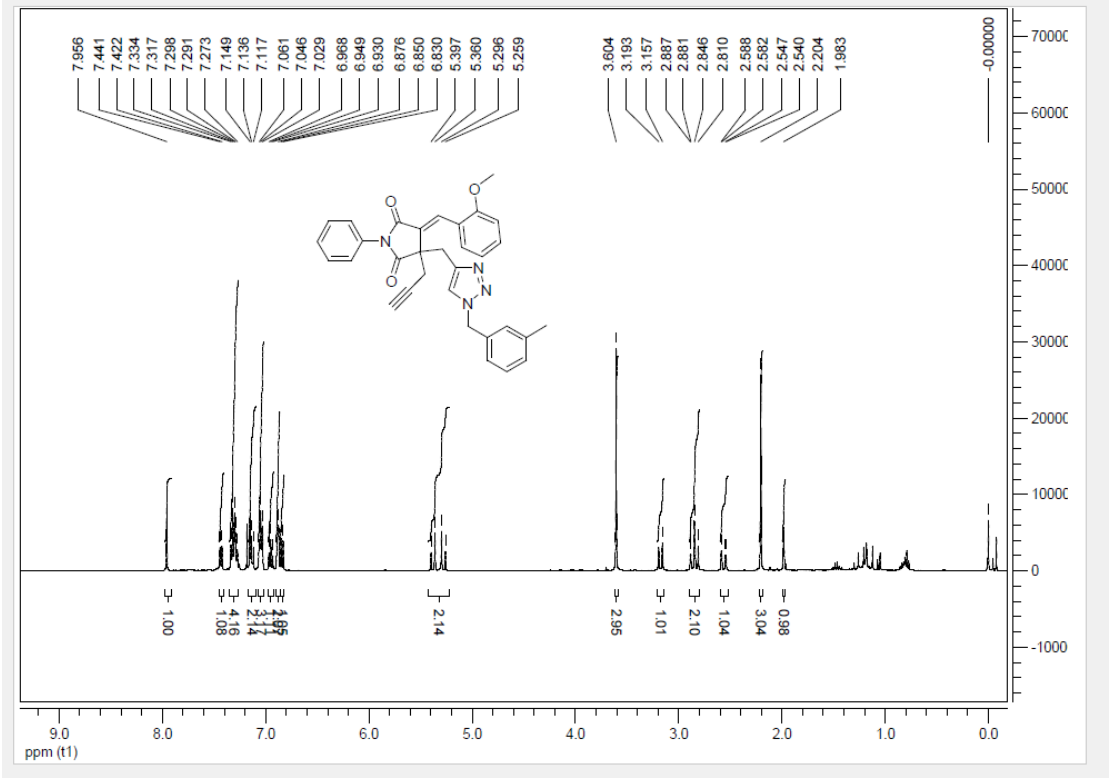
7.766
7.745
7.423
7.334
7.315
7.223
7.205
7.186
7.130
7.111
6.976
6.954
6.947
6.859
6.837
5.428
5.391
5.333
5.297
4.030
4.012
3.995
3.977
3.240
3.217
2.886
2.847
2.490
2.449
2.269
2.041
1.407
1.390
1.372
0.00000
ppm (t1)


174.902
166.063
156.631
136.779
133.425
132.596
132.368
132.076
130.362
129.202
128.301
127.333
127.218
126.706
126.304
125.256
124.879
122.692
121.999
112.603
75.609
69.959
61.374
51.822
48.825
30.156
25.347
18.954
12.435
-0.931
Cl
Cl
O
O
O
N
N
N
N
50000
40000
30000
20000
10000
0
200
150
100
50
0
ppm (t1)


7.820
7.704
7.685
7.551
7.531
7.345
7.323
7.214
7.195
7.179
7.164
7.145
7.125
7.099
7.071
7.052
7.012
6.991
6.910
5.381
5.344
5.296
5.259
3.181
3.144
2.861
2.848
2.842
2.824
2.807
2.801
2.509
2.503
2.468
2.462
2.210
2.004
1.251
0.00000
Br
O
O
N
N
N
N
30000
20000
10000
0
1.00
1.04
1.08
3.13
2.18
0.99
2.15
1.04
3.05
1.03
9.95
5.0
0.0
ppm (t1)


177.245
168.558
151.545
142.090
139.059
137.963
134.821
134.464
132.904
131.718
130.587
129.513
129.032
128.712
127.376
126.080
125.874
125.104
123.505
122.174
78.217
72.302
54.121
51.100
34.731
32.438
31.305
27.956
21.301
1.044
Br
ppm (t1)


7.956
7.441
7.422
7.334
7.317
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7.291
7.273
7.149
7.136
7.117
7.061
7.046
7.029
6.968
6.949
6.930
6.876
6.850
6.830
5.397
5.360
5.296
5.259
3.604
3.193
3.157
2.887
2.881
2.846
2.810
2.588
2.582
2.547
2.540
2.204
1.983
-0.00000
1.00
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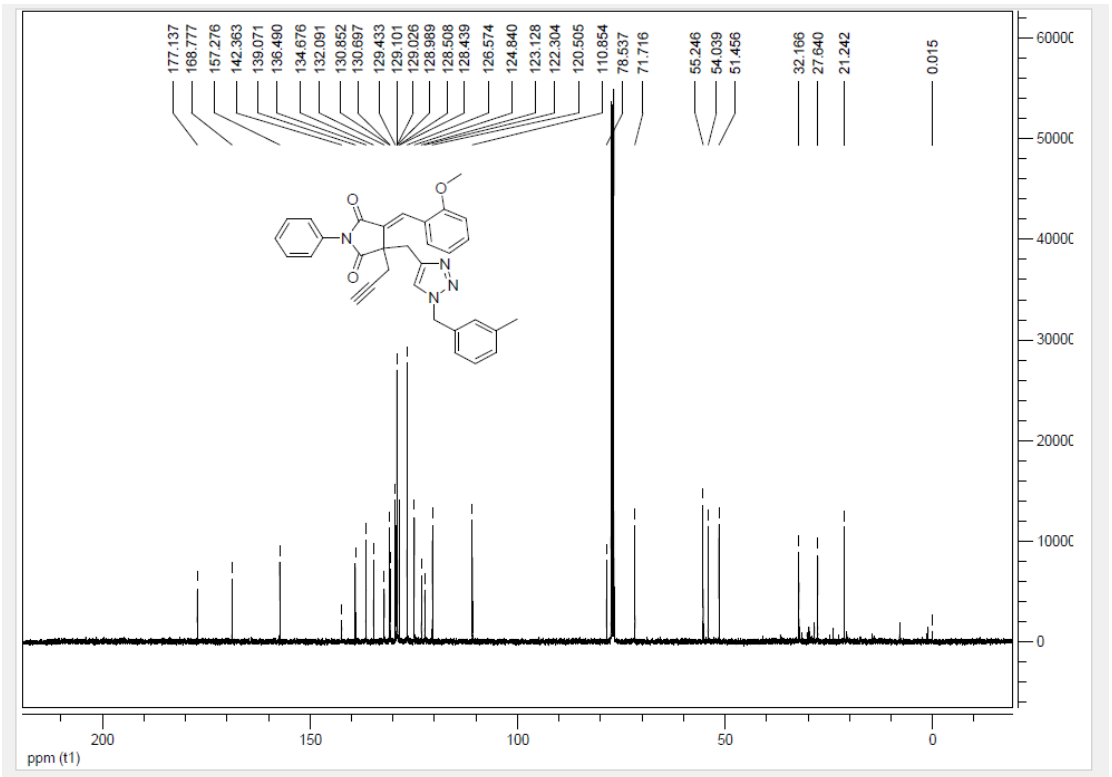
1.08
2.14
2.95
1.01
2.10
1.04
3.04
0.98
ppm (t1)


177.137
168.777
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132.091
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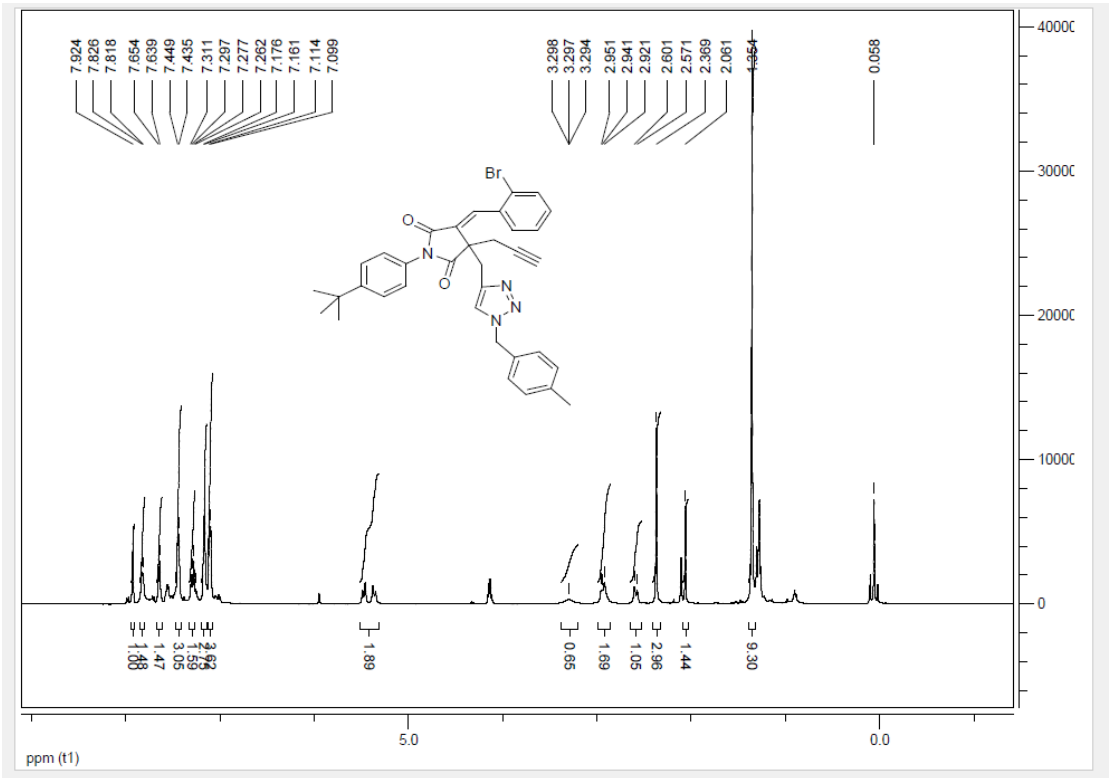
130.697
129.433
129.101
129.026
128.989
128.508
128.439
126.574
124.840
123.128
122.304
120.505
110.854
78.537
71.716
55.246
54.039
51.456
32.166
27.640
21.242
0.015
O
N
O
O
N
N
N
ppm (t1)


7.924
7.826
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7.639
7.449
7.435
7.311
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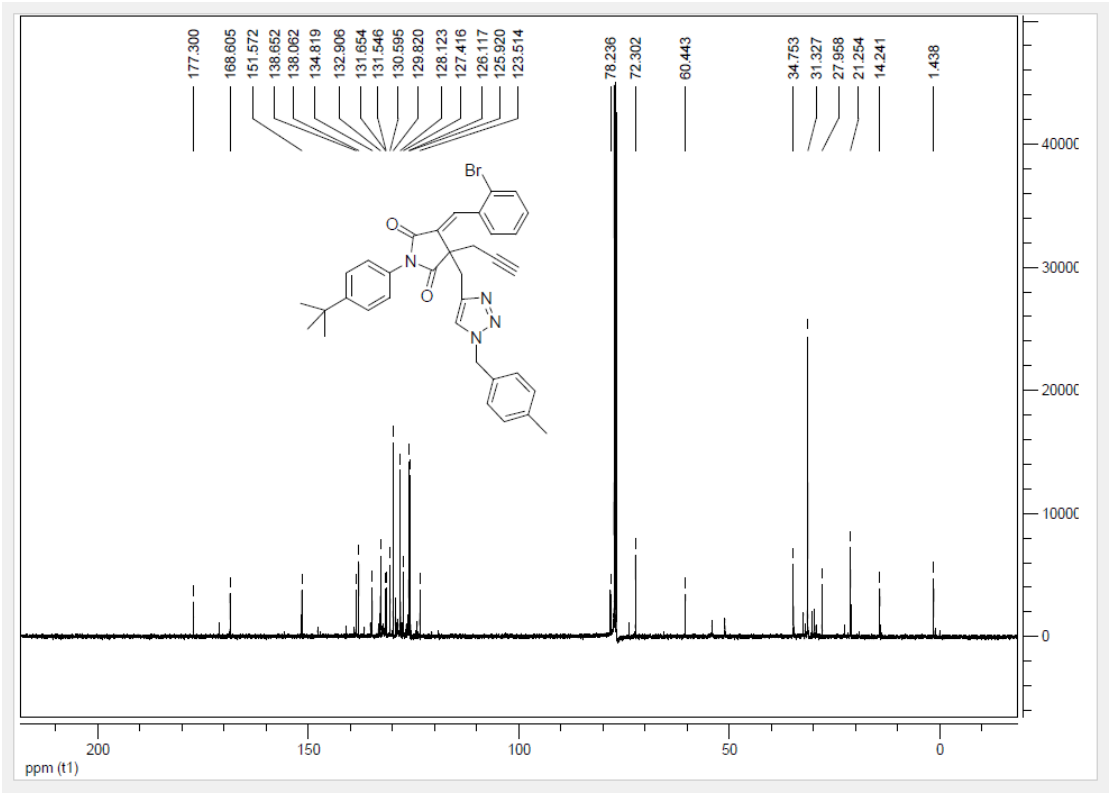
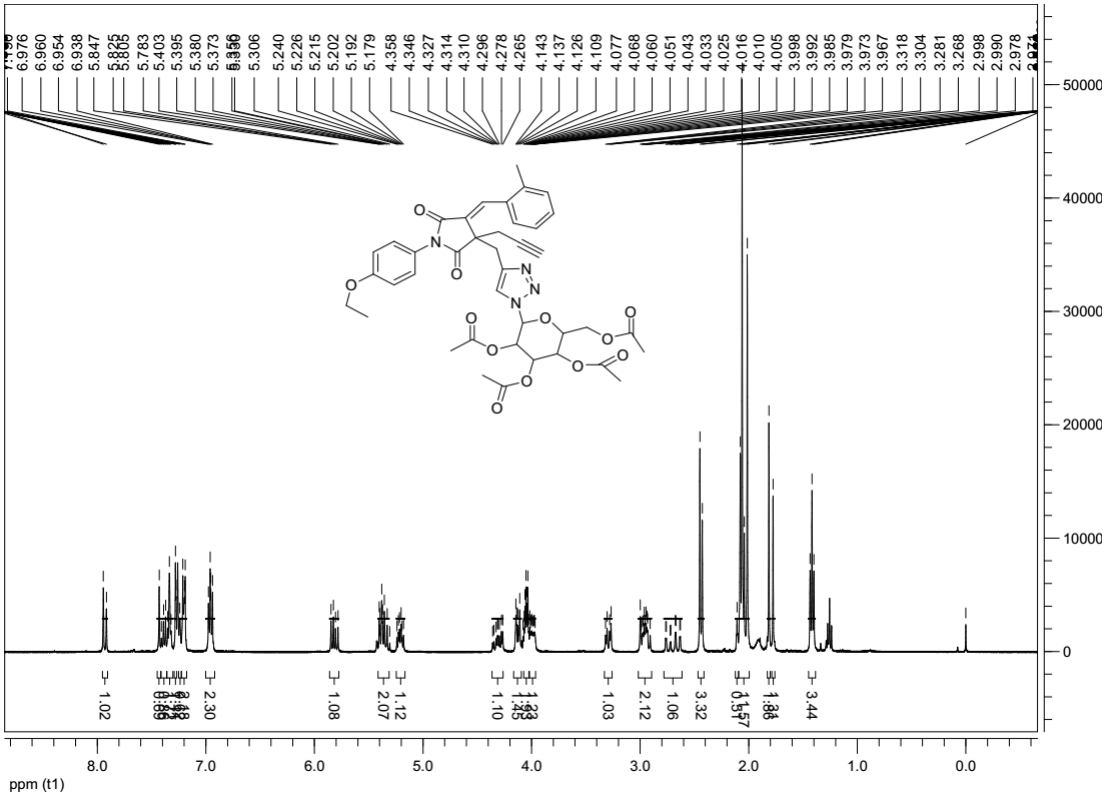
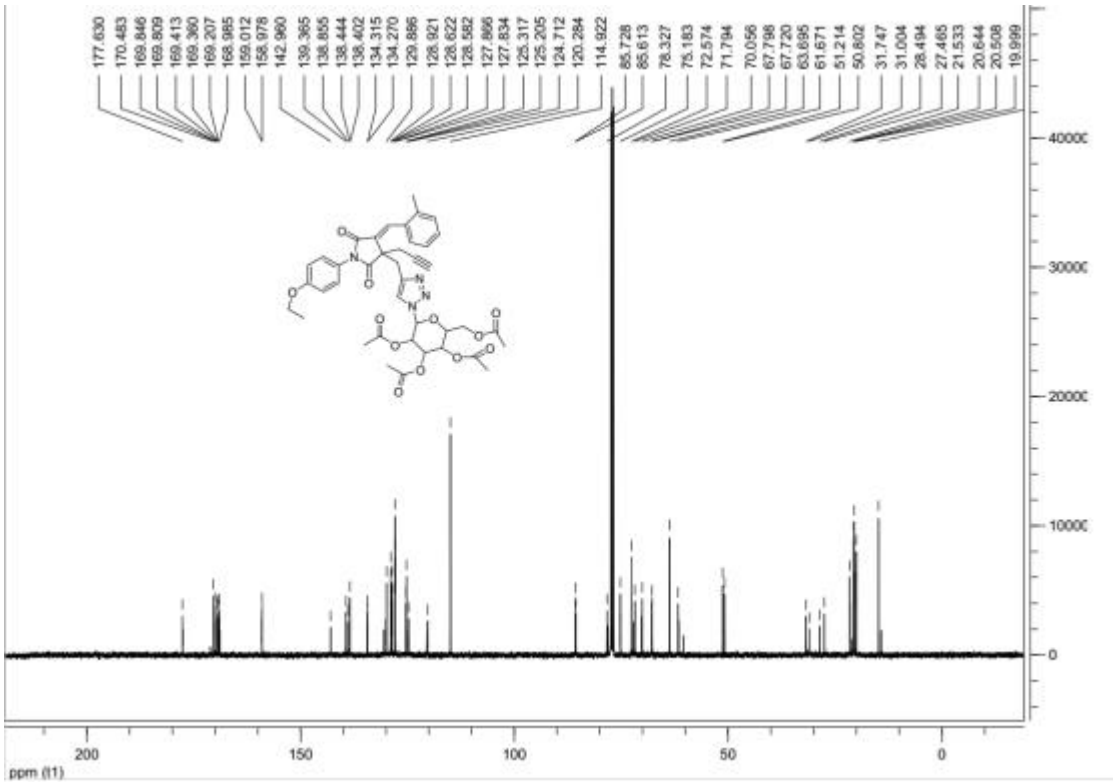
7.277
7.262
7.176
7.161
7.114
7.099
3.298
3.297
3.294
2.951
2.941
2.921
2.601
2.571
2.369
2.061
1.354
0.058
Br
O
N
O
N
N
N
1.00
1.48
1.47
3.05
1.89
0.95
1.69
1.05
2.96
1.44
9.30
ppm (t1)


177.300
168.605
151.572
138.652
138.062
134.819
132.906
131.654
131.546
130.595
129.820
128.123
127.416
126.117
125.920
123.514
78.236
72.302
60.443
34.753
31.327
27.958
21.254
14.241
1.438
Br
O
N
O
N
N
N
40000
30000
20000
10000
0
200
150
100
50
0
ppm (t1)


6.976
6.960
6.954
6.938
6.847
5.783
5.403
5.395
5.380
5.373
5.306
5.240
5.226
5.215
5.202
5.192
5.179
4.358
4.346
4.327
4.314
4.310
4.296
4.278
4.265
4.143
4.137
4.126
4.109
4.077
4.068
4.060
4.051
4.043
4.033
4.025
4.016
4.010
4.005
3.998
3.992
3.985
3.979
3.973
3.967
3.318
3.304
3.281
3.268
2.998
2.990
2.978
50000
40000
30000
20000
10000
0
1.02
2.30
1.08
2.07
1.12
1.10
1.03
2.12
1.06
3.32
3.44
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
ppm (t1)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170.483
169.846
169.809
169.413
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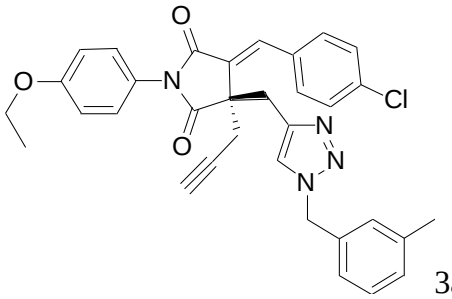
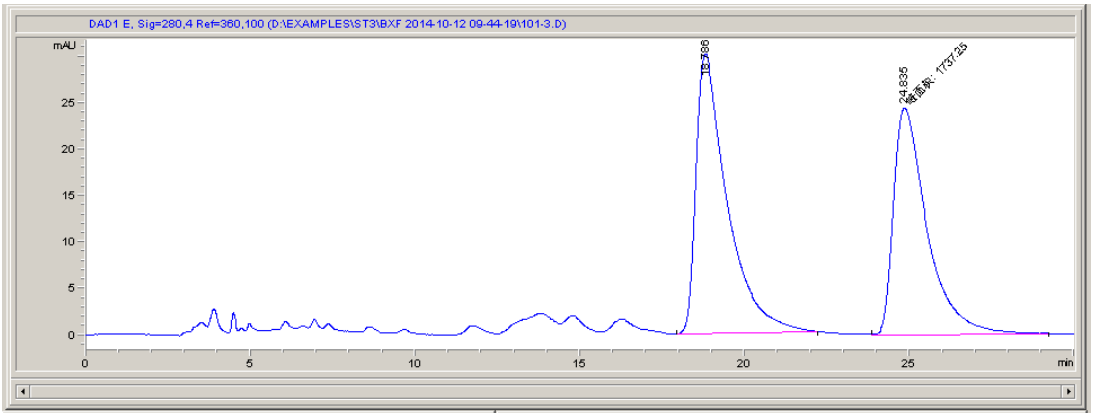
169.207
168.985
159.012
158.978
142.960
139.365
138.855
138.444
138.402
134.315
134.270
129.886
128.921
128.622
128.582
127.866
127.834
125.317
125.205
124.712
120.284
114.922
85.728
85.613
78.327
75.183
72.574
71.794
70.056
67.796
67.720
63.695
61.671
51.214
50.802
31.747
31.004
28.494
27.465
21.533
20.644
20.508
19.999
40000
30000
20000
10000
0
200
150
100
50
0
ppm (t1)

S-6. HPLC Spectra of the new products 3 (Method A)



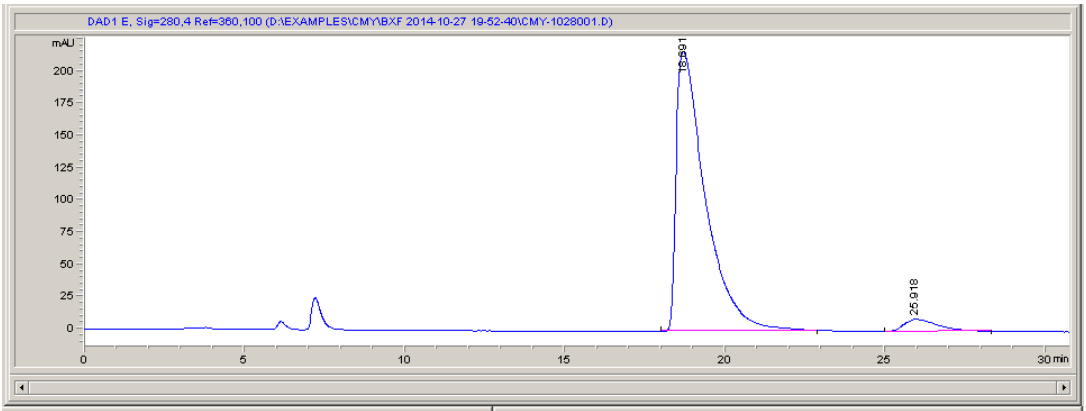
3a



文件信息	
LC文件	101-3.D
文件路径	D:\EXAMPLES\ST3\BXF 2014-10-12 09-44-19\
日期	12-Oct-14, 11:43:23
样品	101-3
样品信息	
条形码	
操作者	cyw
方法	BXF-SXYH.M
分析时间	30 min
采样频率	0.0067 min (0.402 sec), 4501 数据点

#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	18.786	2002.9	30.2	0.8924	0.394	53.552
2	24.835	1737.2	24.5	1.184	0.462	46.448

#	Time	Area	Height	Width	Symmetry	Area%
1	18.786	2002.9	30.2	0.8924	0.394	53.552
2	24.835	1737.2	24.5	1.184	0.462	46.448

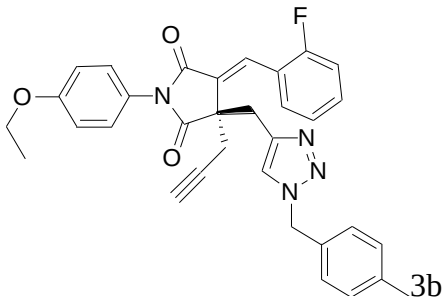


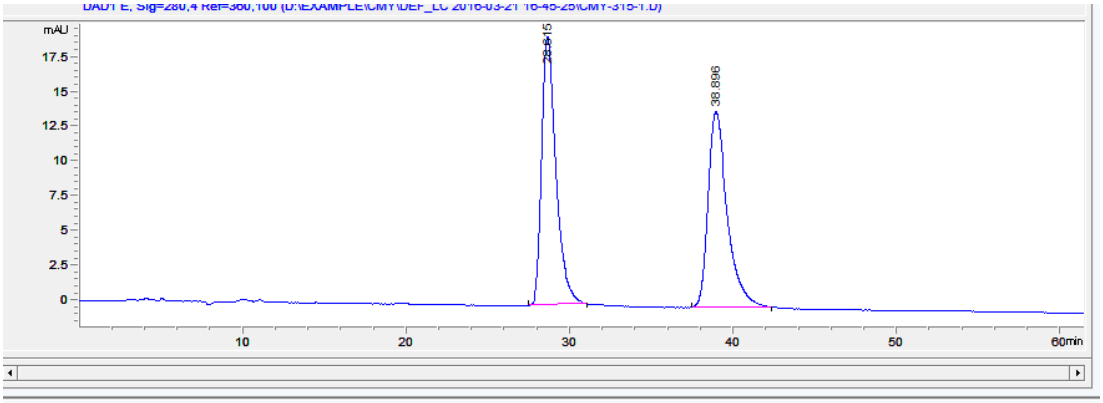
文件信息

LC文件	CMY-1028001.D
文件路径	D:\EXAMPLES\CMY\BXF 2014-10-27 19-52-40\
日期	27-Oct-14, 19:53:32
样品	cmy-1028001
样品信息	
条形码	
操作者	cyw
方法	BXF-SXYH.M
分析时间	30.76 min
采样频率	0.0067 min (0.402 sec), 4615 数据点

#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	18.691	13763.1	217.1	0.9315	0.306	95.249
2	25.918	686.5	9.4	0.8705	0.468	4.751

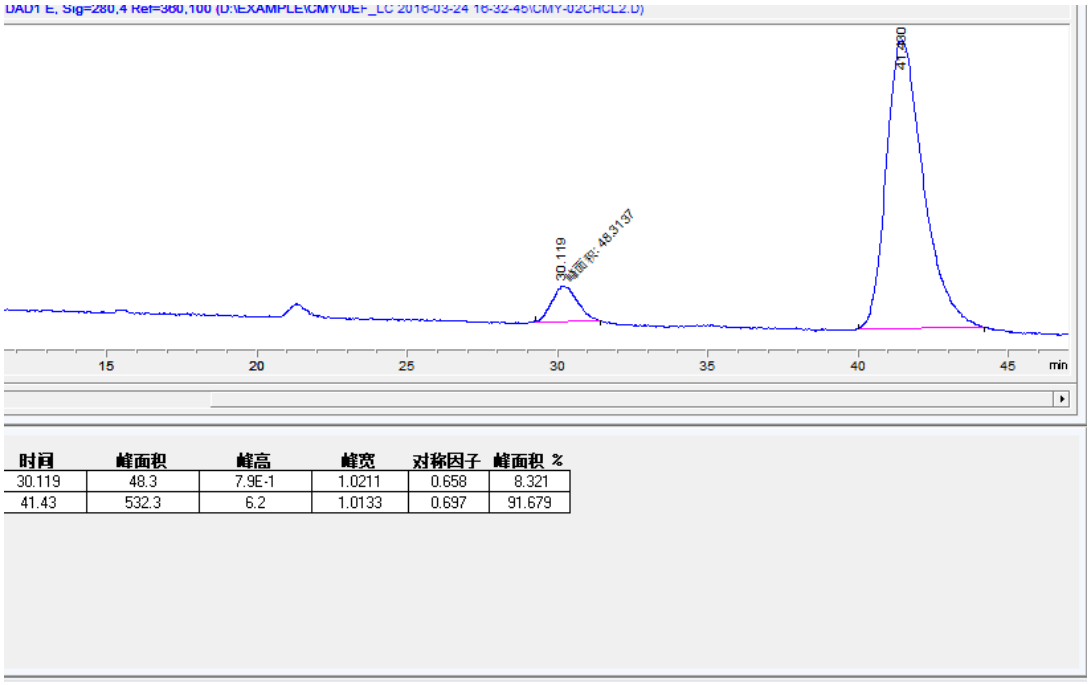
#	Time	Area	Height	Width	Symmetry	Area%
1	18.691	13763.1	217.1	0.9315	0.306	95.249
2	25.918	686.5	9.4	0.8705	0.468	4.751





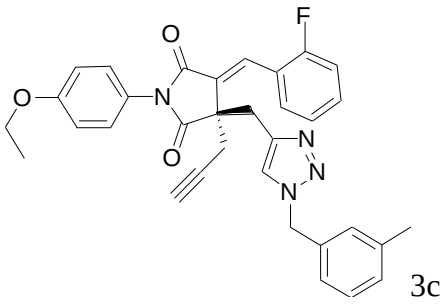
#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	28.615	1146.1	19.3	0.856	0.622	49.959
2	38.896	1148	14.1	1.0233	0.593	50.041

#	Time	Area	Height	Width	Symmetry	Area%
1	28.615	1146.1	19.3	0.856	0.622	49.959
2	38.896	1148	14.1	1.0233	0.593	50.041

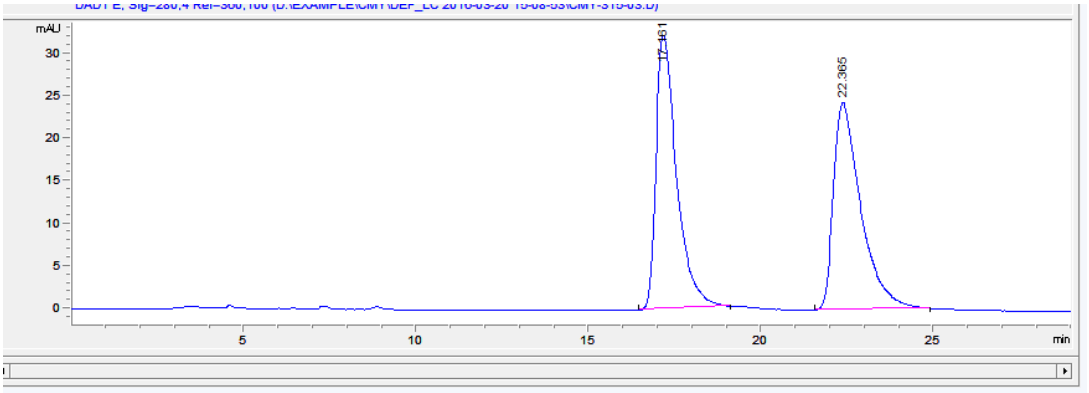


时间	峰面积	峰高	峰宽	对称因子	峰面积 %
30.119	48.3	7.9E-1	1.0211	0.658	8.321
41.43	532.3	6.2	1.0133	0.697	91.679

#	Time	Area	Height	Width	Symmetry	Area%
1	30.119	48.3	7.9E-1	1.0211	0.658	8.321
2	41.43	532.3	6.2	1.0133	0.697	91.679

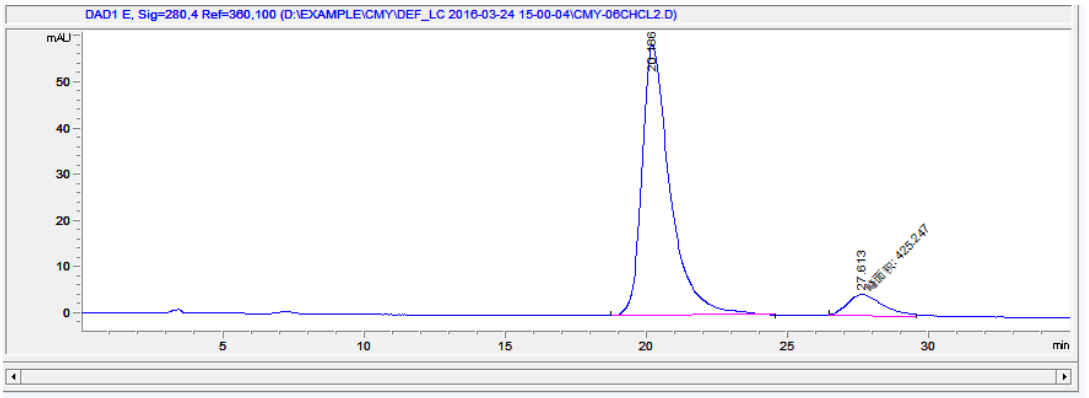


3c



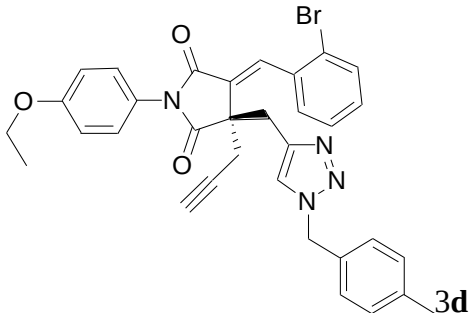
#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	17.161	1334.3	32.1	0.6088	0.525	49.820
2	22.365	1344	24.4	0.7958	0.49	50.180

#	Time	Area	Height	Width	Symmetry	Area%
1	17.161	1334.3	32.1	0.6088	0.525	49.820
2	22.365	1344	24.4	0.7958	0.49	50.180

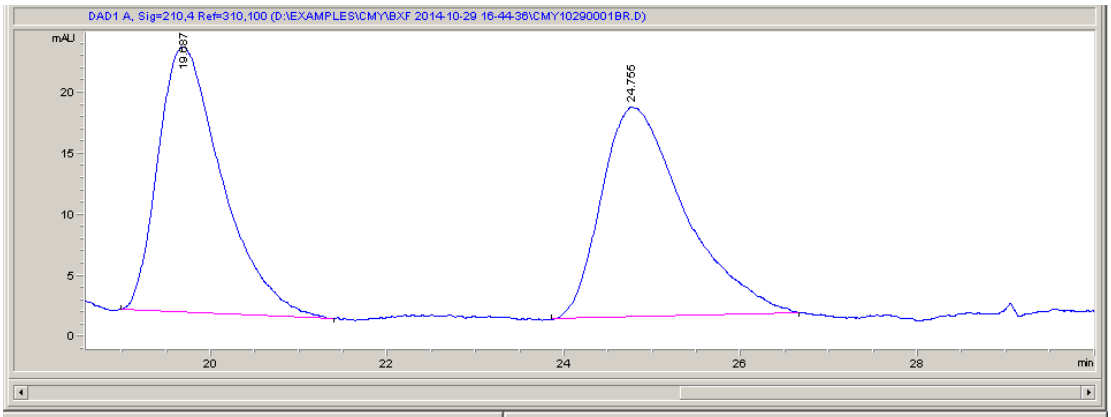


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	20.186	4071.1	58.6	0.9982	0.55	90.542
2	27.613	425.2	4.7	1.512	0.591	9.458

#	Time	Area	Height	Width	Symmetry	Area%
1	20.186	4071.1	58.6	0.9982	0.55	90.542
2	27.613	425.2	4.7	1.512	0.591	9.458



3d

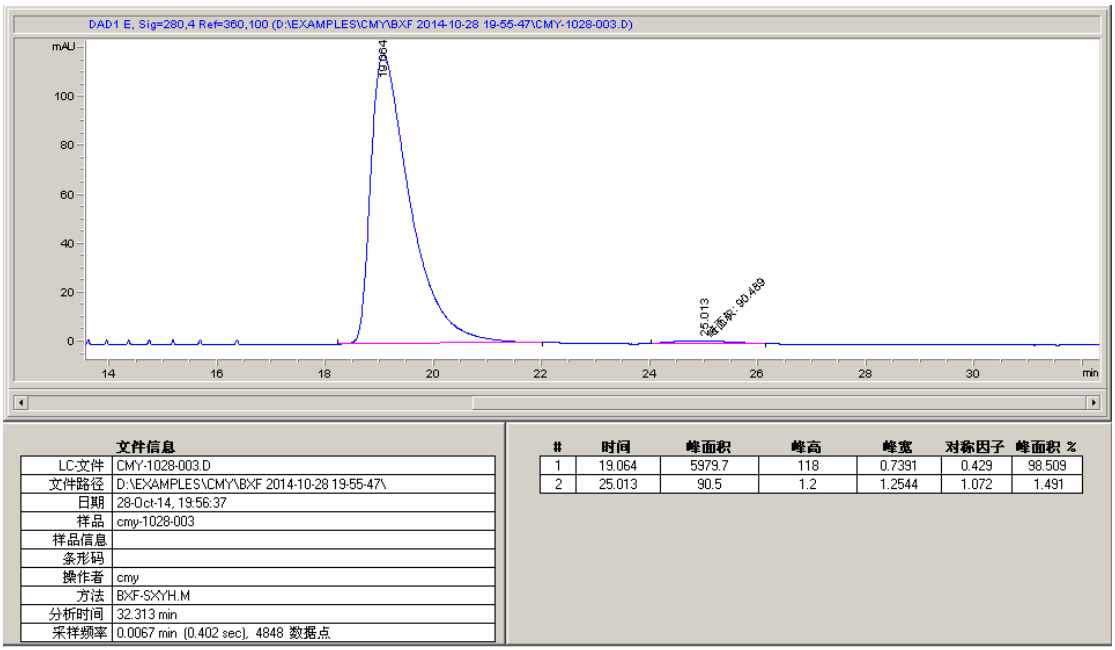


文件信息

LC文件	CMY10290001BR.D
文件路径	D:\EXAMPLES\CMY\BXF 2014-10-29 16-44-36\
日期	29-Oct-14, 17:16:21
样品	cmy10290001br
样品信息	
条形码	
操作者	cmy
方法	BXF-SXYH.M
分析时间	30 min
采样频率	0.0067 min (0.402 sec), 4501 数据点

#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	19.687	1094	21.7	0.6672	0.604	49.161
2	24.755	1131.3	17.3	0.7767	0.548	50.839

#	Time	Area	Height	Width	Symmetry	Area%
1	19.687	1094	21.7	0.6672	0.604	49.161
2	24.755	1131.3	17.3	0.7767	0.548	50.839

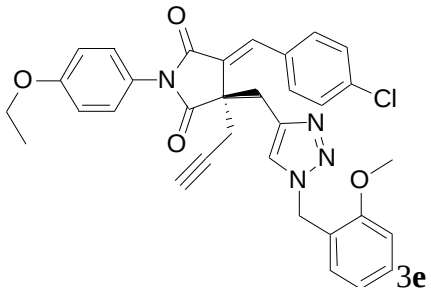


文件信息

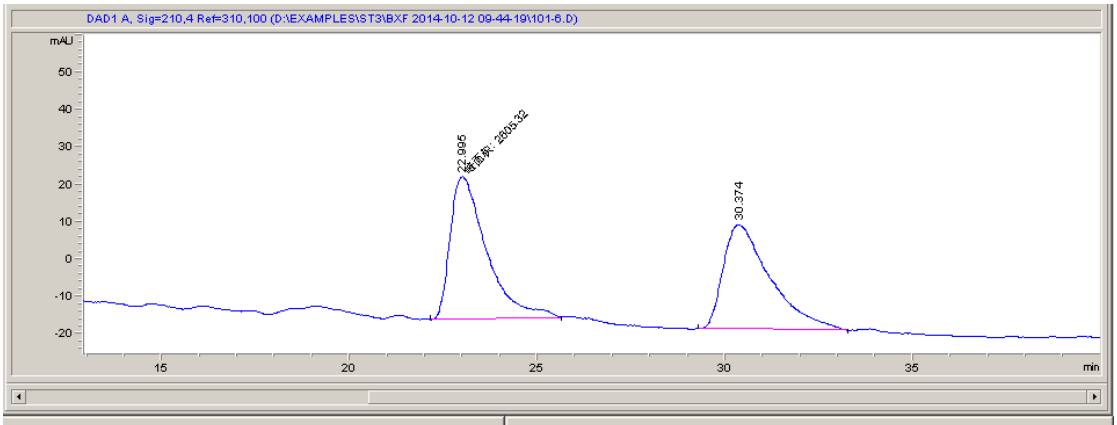
LC-文件	CMY-1028-003.D
文件路径	D:\EXAMPLES\CMY\BXF 2014-10-28 19-55-47\
日期	28-Oct-14, 19:56:37
样品	cmy-1028-003
样品信息	
条形码	
操作者	cmy
方法	BXF-SXYH.M
分析时间	32.313 min
采样频率	0.0067 min (0.402 sec), 4848 数据点

#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	19.064	5979.7	118	0.7391	0.429	98.509
2	25.013	90.5	1.2	1.2544	1.072	1.491

#	Time	Area	Height	Width	Symmetry	Area%
1	19.064	5979.7	118	0.7391	0.429	98.509
2	25.013	90.5	1.2	1.2544	1.072	1.491



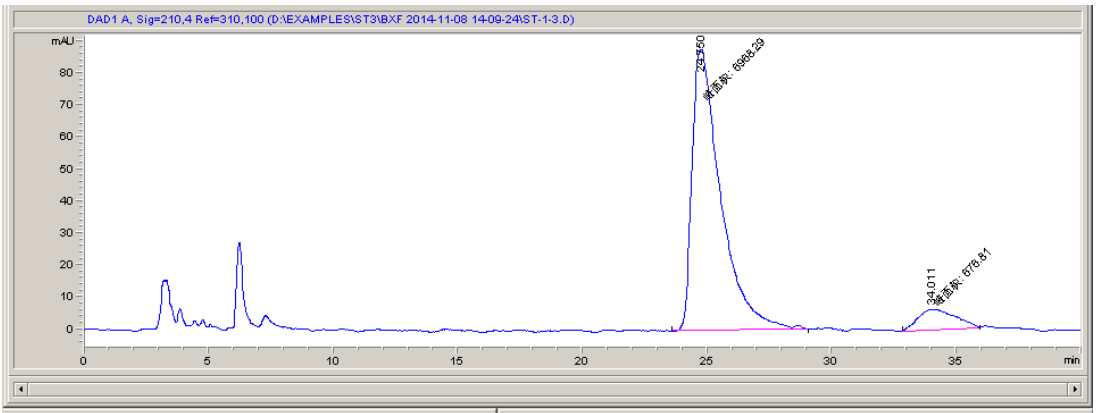
3e



文件信息	
LC文件	101-6.D
文件路径	D:\EXAMPLES\ST3\BXF 2014-10-12 09-44-19\
日期	12-Oct-14, 09:45:11
样品	101-6
样品信息	
条形码	
操作者	cyw
方法	BXF-SXYH.M
分析时间	39.993 min
采样频率	0.0067 min (0.402 sec), 6000 数据点

#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	22.995	2605.3	38.2	1.1357	0.485	51.729
2	30.374	2431.2	27.8	1.0314	0.51	48.271

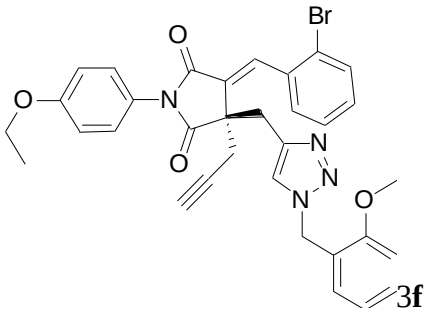
#	Time	Area	Height	Width	Symmetry	Area%
1	22.995	2605.3	38.2	1.1357	0.485	51.729
2	30.374	2431.2	27.8	1.0314	0.51	48.271



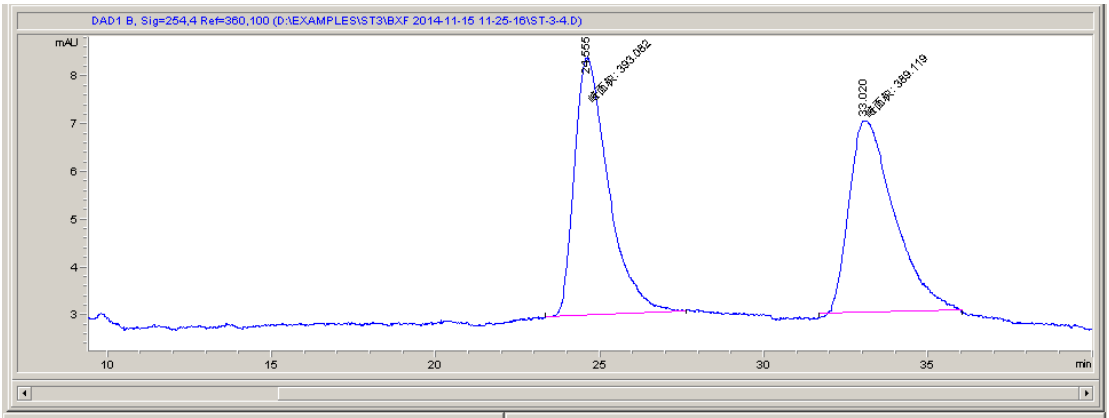
文件信息	
LC文件	ST-1-3.D
文件路径	D:\EXAMPLES\ST3\BXF 2014-11-08 14-09-24\
日期	08-Nov-14, 16:45:36
样品	st-1-3
样品信息	
条形码	
操作者	cyw
方法	BXF-SXYH.M
分析时间	40 min
采样频率	0.0067 min (0.402 sec), 6001 数据点

#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	24.75	6968.3	87.6	1.3251	0.44	91.147
2	34.011	676.8	6.5	1.7423	0.603	8.853

#	Time	Area	Height	Width	Symmetry	Area%
1	24.75	6968.3	87.6	1.3251	0.44	91.147
2	34.011	676.8	6.5	1.7423	0.603	8.853



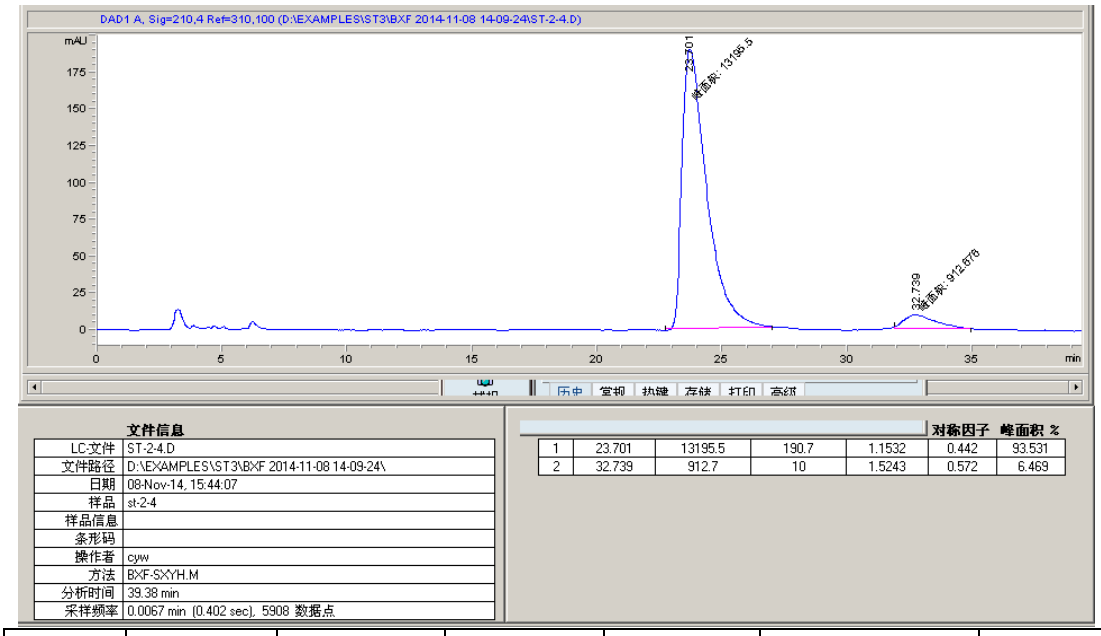
3f



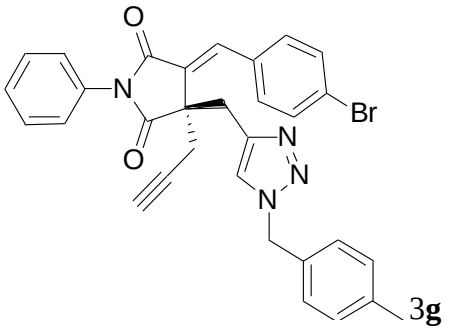
文件信息	
LC文件	ST-3-4.D
文件路径	D:\EXAMPLES\ST3\BXF 2014-11-15 11-25-16\
日期	15-Nov-14, 13:03:57
样品	st-3-4
样品信息	
条形码	
操作者	cyw
方法	BXF-SXYH.M
分析时间	40 min
采样频率	0.0067 min (0.402 sec), 6001 数据点

#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	24.555	393.1	5.4	1.2081	0.509	50.253
2	33.02	389.1	4	1.6073	0.478	49.747

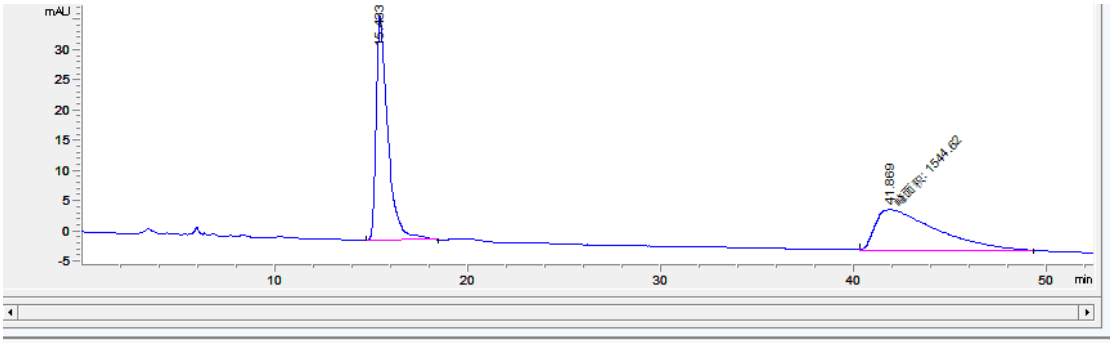
#	Time	Area	Height	Width	Symmetry	Area%
1	24.555	393.1	5.4	1.2081	0.509	50.253
2	33.02	389.1	4	1.6073	0.478	49.747



#	Time	Area	Height	Width	Symmetry	Area%
1	23.701	13195.5	190.7	1.1532	0.442	93.531
2	32.739	912.7	10	1.5243	0.572	6.489

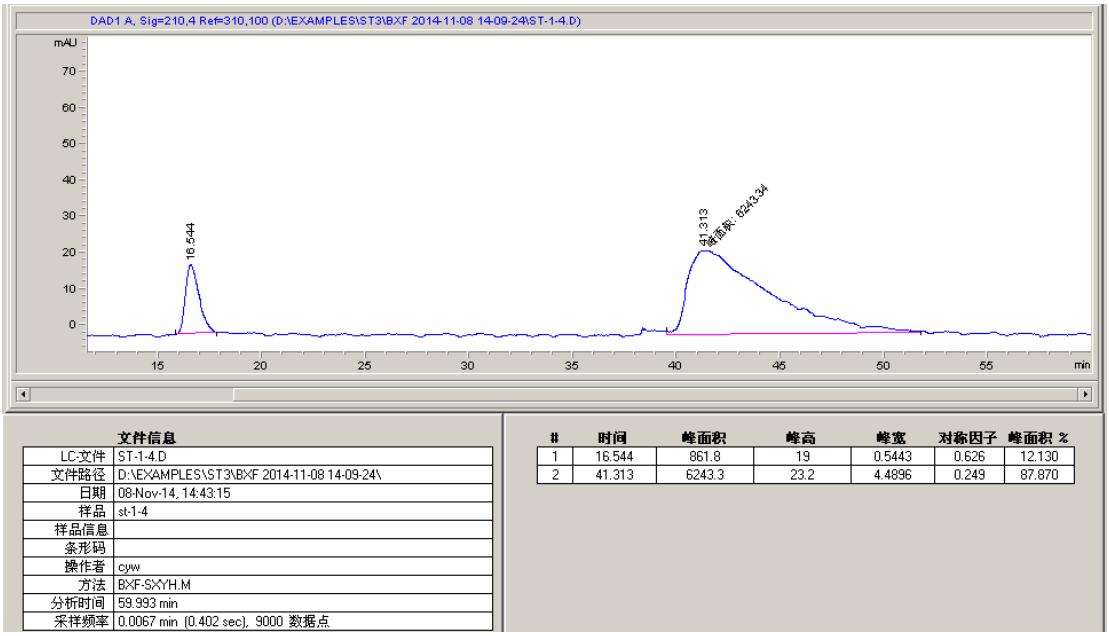


3g

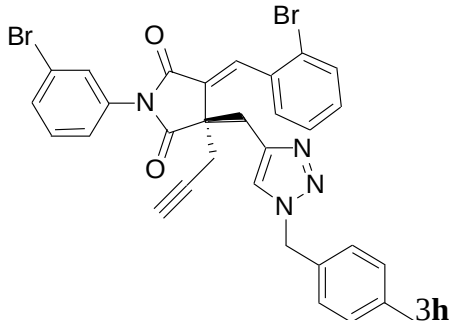


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	15.433	1597	37	0.6269	0.459	50.834
2	41.869	1544.6	7	3.6955	0.316	49.166

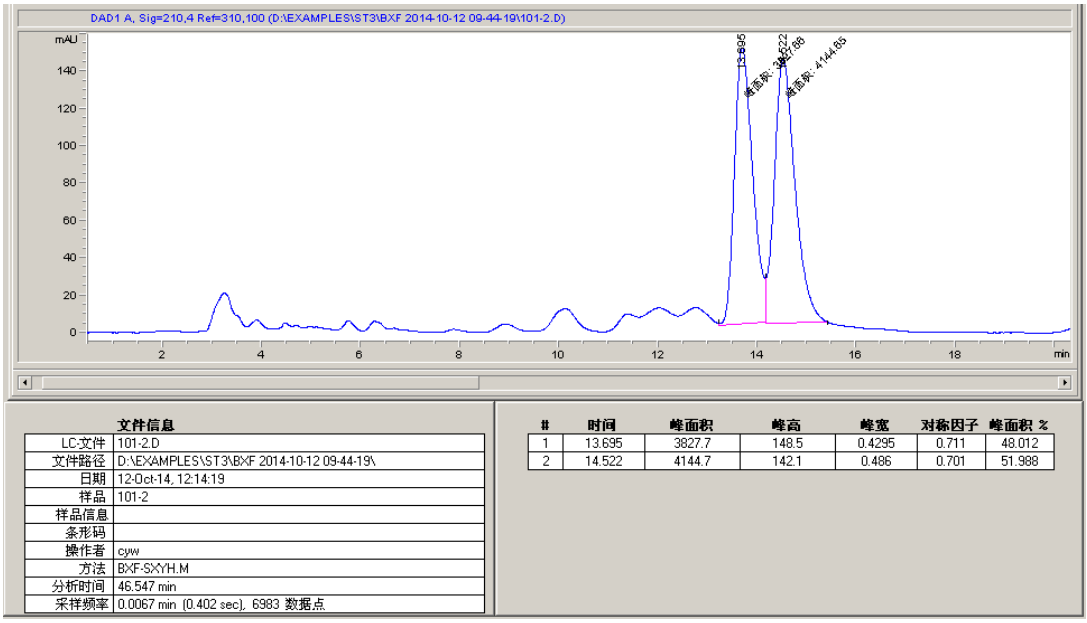
#	Time	Area	Height	Width	Symmetry	Area%
1	15.433	1597	37	0.6269	0.459	50.834
2	41.869	1544.6	7	3.6955	0.316	49.166



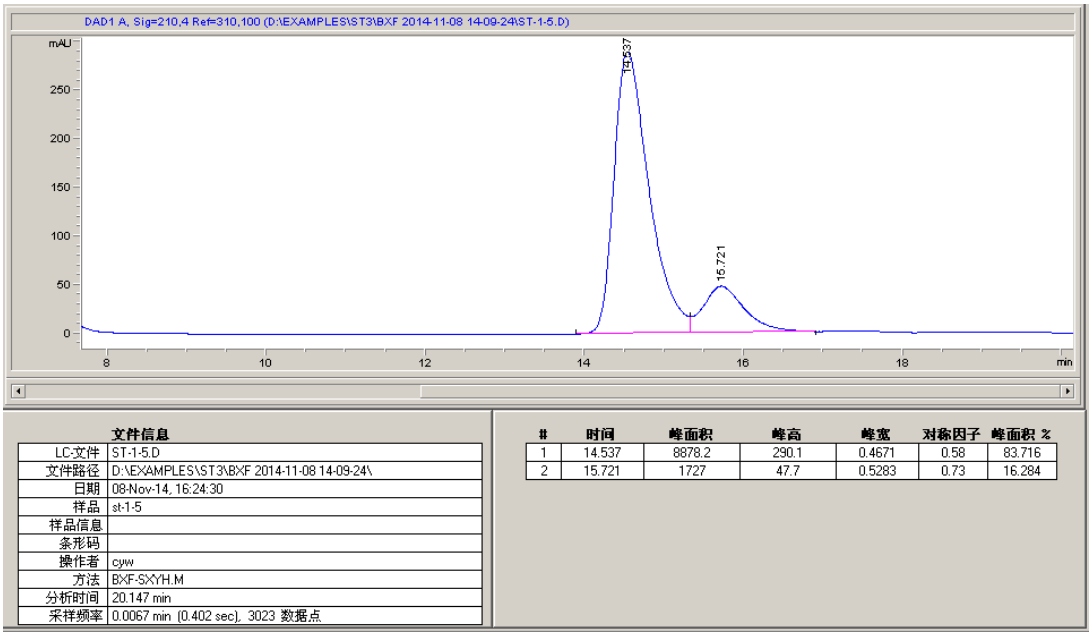
#	Time	Area	Height	Width	Symmetry	Area%
1	16.544	861.8	19	0.5443	0.626	12.130
2	41.313	6243.3	23.2	4.4996	0.249	87.870



3h



#	Time	Area	Height	Width	Symmetry	Area%
1	13.695	3827.7	148.5	0.4295	0.711	48.012
2	14.522	4144.7	142.1	0.486	0.701	51.988

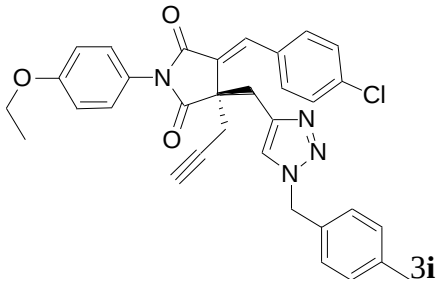


文件信息

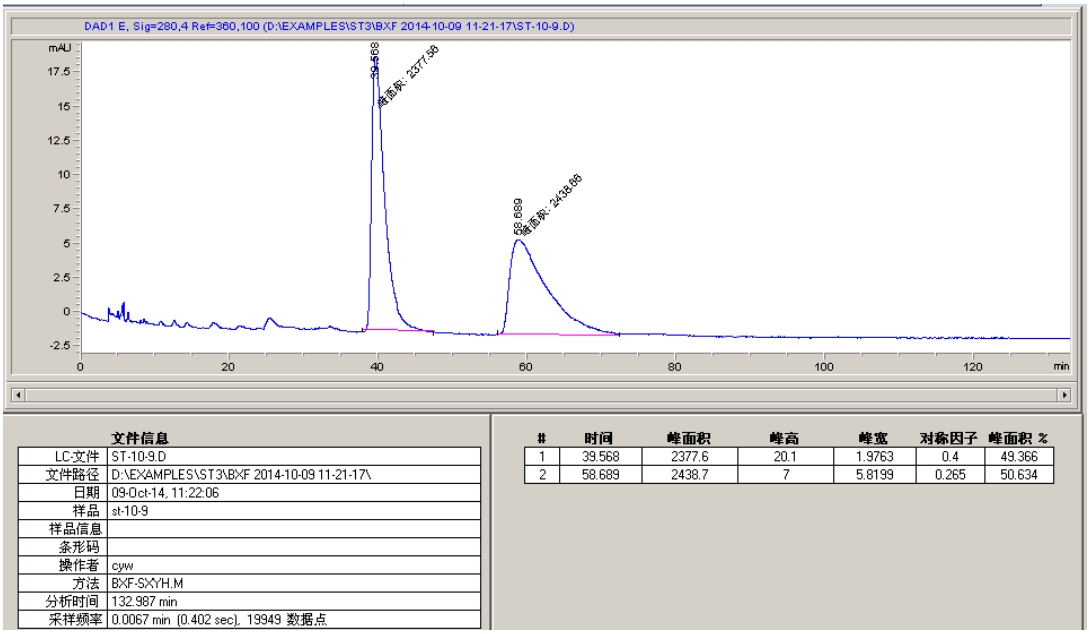
LC文件	ST-1-5.D
文件路径	D:\EXAMPLES\ST3\BXF 2014-11-08 14-09-24\
日期	08-Nov-14, 16:24:30
样品	st-1-5
样品信息	
条形码	
操作者	cyw
方法	BXF-SXYH.M
分析时间	20.147 min
采样频率	0.0067 min (0.402 sec), 3023 数据点

#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	14.537	8878.2	290.1	0.4671	0.58	83.716
2	15.721	1727	47.7	0.5283	0.73	16.284

#	Time	Area	Height	Width	Symmetry	Area%
1	14.537	8878.2	290.1	0.4671	0.58	83.716
2	15.721	1727	47.7	0.5283	0.73	16.284



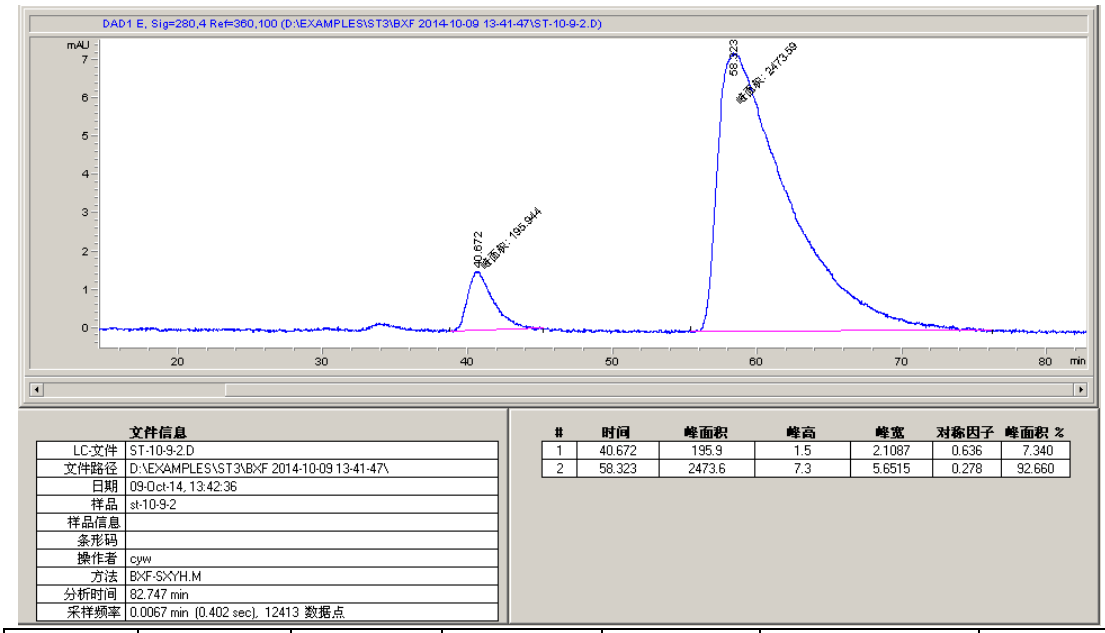
3i



文件信息	
LC文件	ST-10-9.D
文件路径	D:\EXAMPLES\ST3\BXF 2014-10-09 11-21-17\
日期	09-Oct-14, 11:22:06
样品	st-10-9
样品信息	
条形码	
操作者	cyw
方法	BXF-SXYH.M
分析时间	132.987 min
采样频率	0.0067 min (0.402 sec), 19949 数据点

#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	39.568	2377.6	20.1	1.9763	0.4	49.366
2	58.689	2438.7	7	5.8199	0.265	50.634

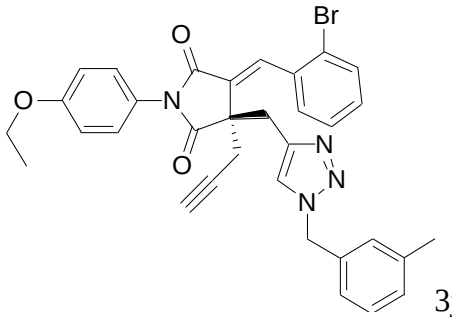
#	Time	Area	Height	Width	Symmetry	Area%
1	39.568	2377.6	20.1	1.9763	0.4	49.366
2	58.689	2438.7	7	5.8193	0.265	50.634



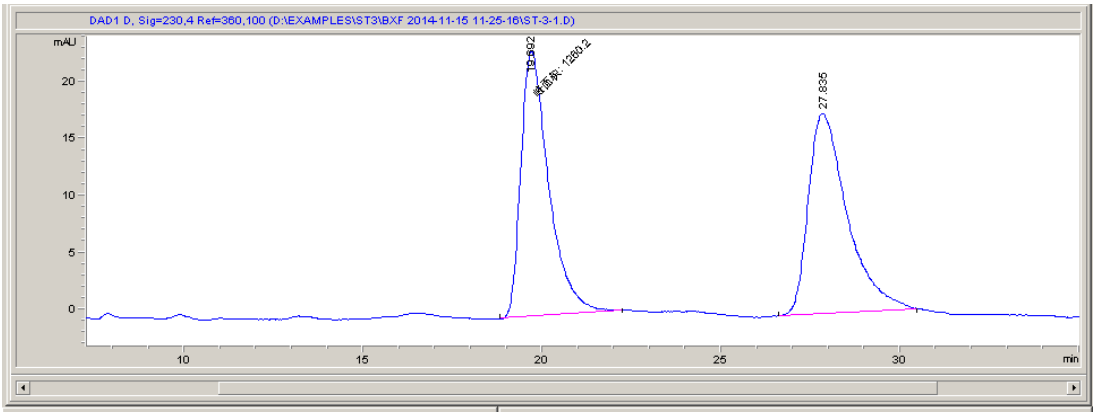
文件信息	
LC文件	ST-10-9-2.D
文件路径	D:\EXAMPLES\ST3\BXF 2014-10-09 13-41-47\
日期	09-Oct-14, 13:42:36
样品	st-10-9-2
样品信息	
条形码	
操作者	cyw
方法	BXF-SXYH.M
分析时间	82.747 min
采样频率	0.0067 min (0.402 sec), 12413 数据点

#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	40.672	195.9	1.5	2.1087	0.636	7.340
2	58.323	2473.6	7.3	5.6515	0.278	92.660

#	Time	Area	Height	Width	Symmetry	Area%
1	40.672	195.9	1.5	2.1087	0.636	7.340
2	58.323	2473.6	7.3	5.6515	0.278	92.660



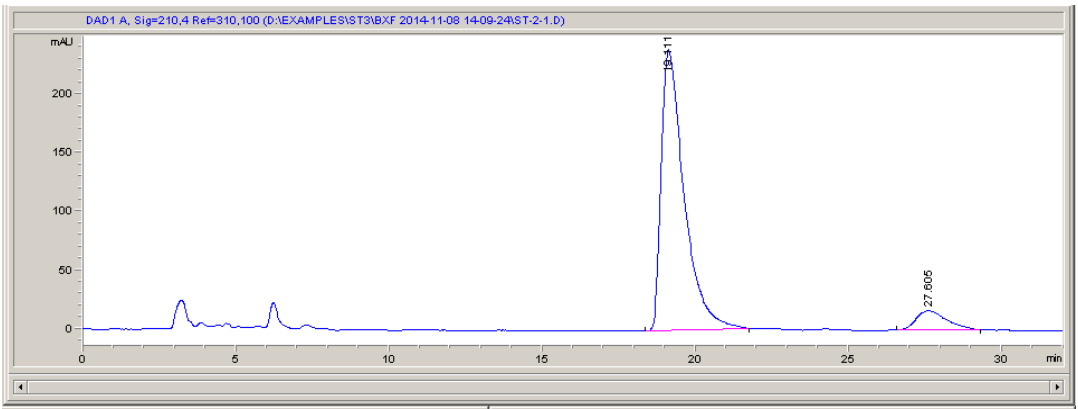
3**j**



文件信息	
LC文件	ST-3-1.D
文件路径	D:\EXAMPLES\ST3\BXF 2014-11-15 11-25-16\
日期	15-Nov-14, 12:23:06
样品	st-3-1
样品信息	
条形码	
操作者	cyw
方法	BXF-SXYH.M
分析时间	39.993 min
采样频率	0.0067 min (0.402 sec), 6000 数据点

#	时间	峰面积			对称因子	峰面积 %
1	19.692	1260.2	23.2	0.9041	0.584	48.735
2	27.835	1325.6	17.6	1.0187	0.552	51.265

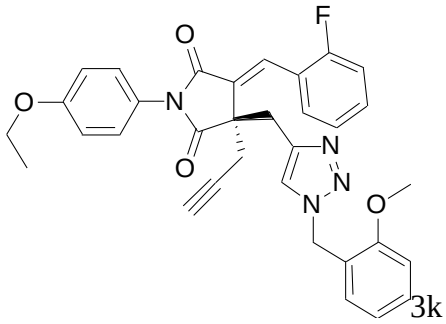
#	Time	Area	Height	Width	Symmetry	Area%
1	19.692	1260.2	23.2	0.9041	0.584	48.735
2	27.835	1325.6	17.6	1.0187	0.552	51.265

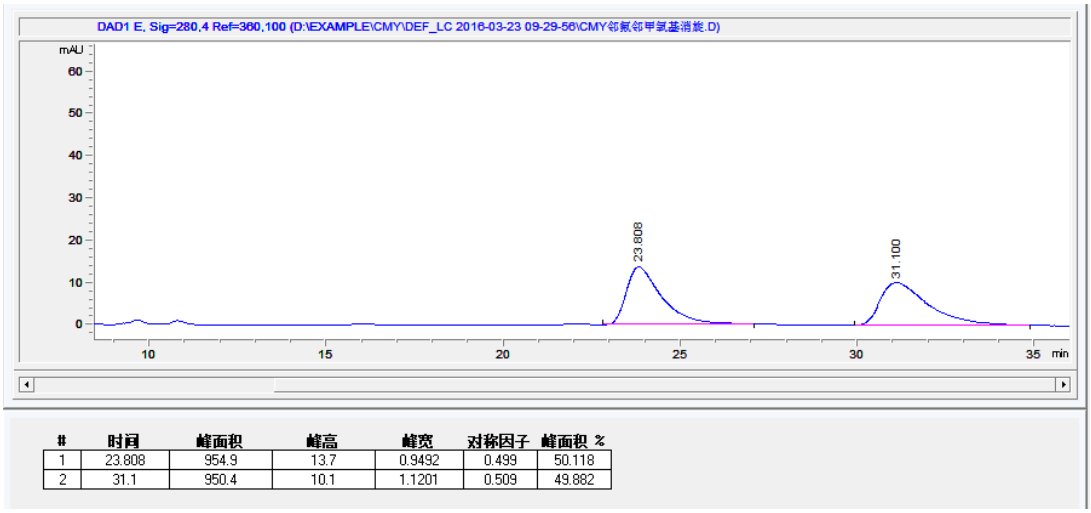


文件信息	
LC文件	ST-2-1.D
文件路径	D:\EXAMPLES\ST3\BXF 2014-11-08 14-09-24\
日期	08-Nov-14, 14:10:21
样品	st-2-1
样品信息	
条形码	
操作者	cyw
方法	BXF-SXYH.M
分析时间	32 min
采样频率	0.0067 min (0.402 sec), 4801 数据点

#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	19.111	12405.5	239.2	0.7631	0.43	91.680
2	27.605	1125.8	16.3	0.8135	0.691	8.320

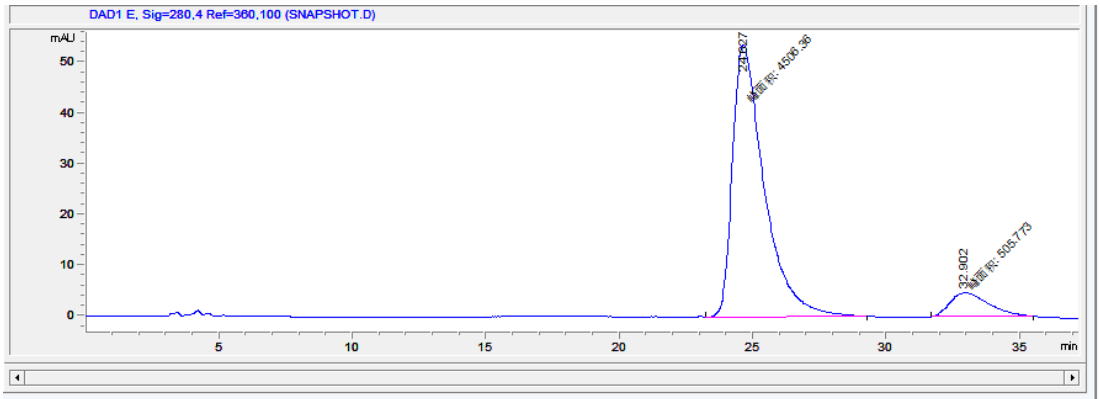
#	Time	Area	Height	Width	Symmetry	Area%
1	19.111	12405.5	239.2	0.7631	0.43	91.680
2	27.605	1125.8	16.3	0.8135	0.691	8.320





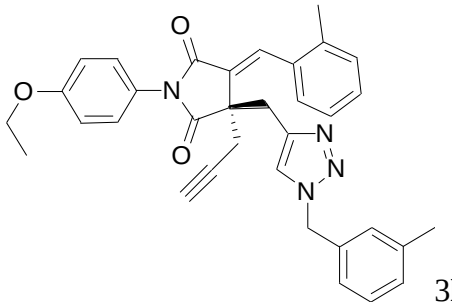
#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	23.808	954.9	13.7	0.9492	0.499	50.118
2	31.1	950.4	10.1	1.1201	0.509	49.882

#	Time	Area	Height	Width	Symmetry	Area%
1	23.808	954.9	13.7	0.9492	0.499	50.118
2	31.1	950.4	10.1	1.1201	0.509	49.882

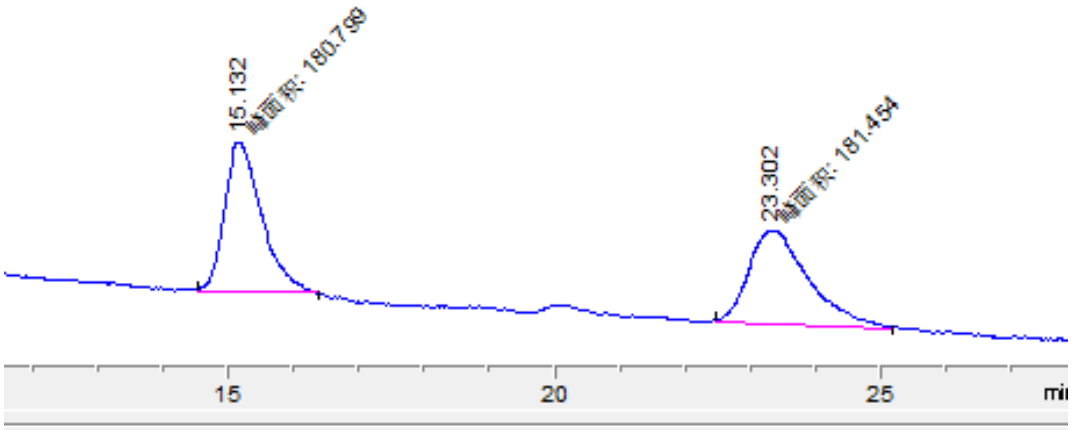


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	24.627	4506.4	53.8	1.396	0.5	89.909
2	32.902	505.8	4.8	1.7459	0.568	10.091

#	Time	Area	Height	Width	Symmetry	Area%
1	24.627	4506.4	53.8	1.396	0.5	89.909
2	32.902	505.8	4.8	1.7459	0.568	10.091

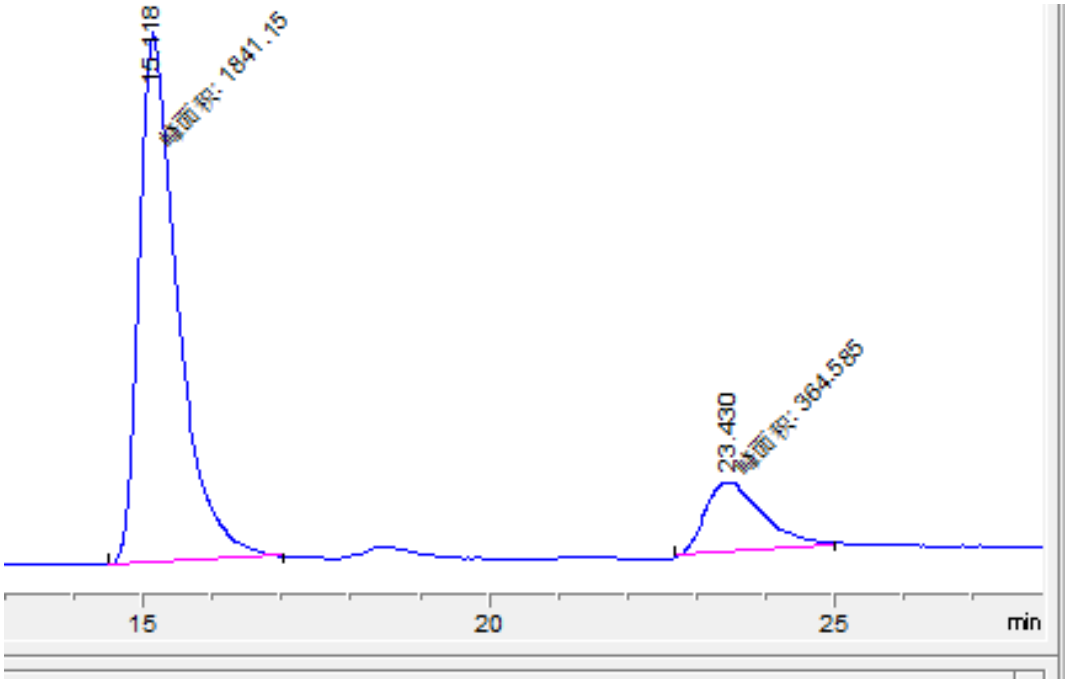


3l



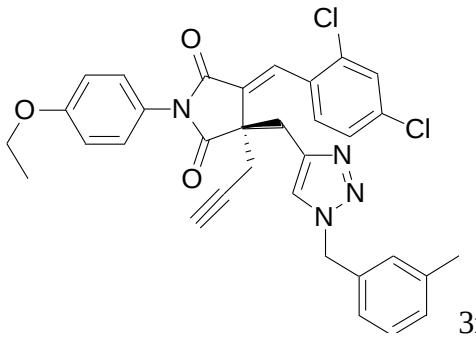
#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	15.132	180.8	4.5	0.6724	0.607	49.910
2	23.302	181.5	2.8	1.0745	0.623	50.090

#	Time	Area	Height	Width	Symmetry	Area%
1	15.132	180.8	4.5	0.6724	0.607	49.910
2	23.302	181.5	2.8	1.0745	0.623	50.090

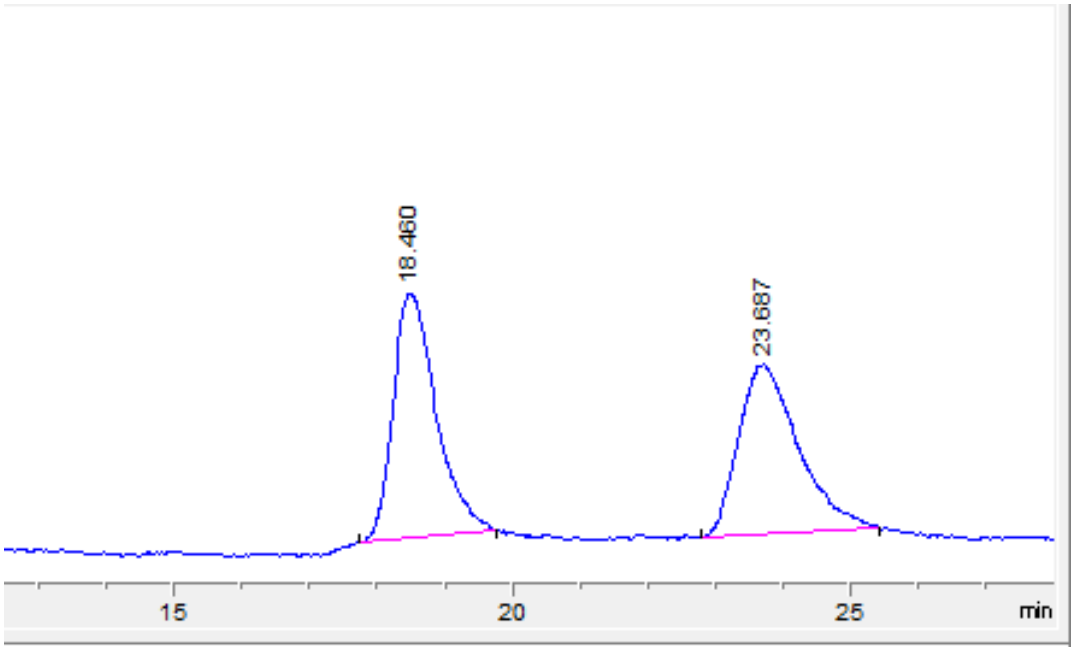


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	15.118	1841.1	46.9	0.6543	0.54	83.471
2	23.43	364.6	6.3	0.9675	0.652	16.529

#	Time	Area	Height	Width	Symmetry	Area%
1	15.118	1841.1	46.9	0.6543	0.54	83.471
2	23.43	364.6	6.3	0.9675	0.652	16.529

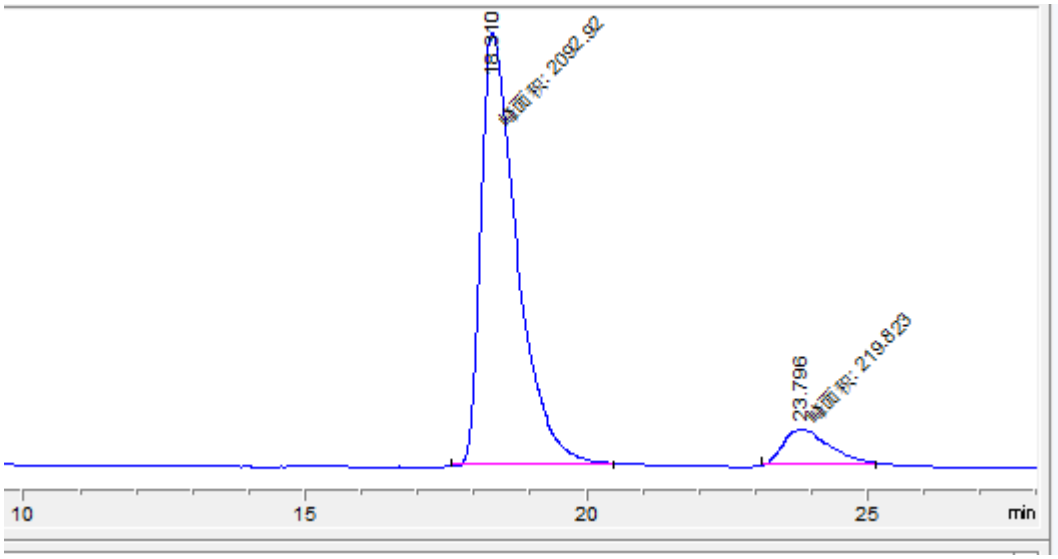


3m



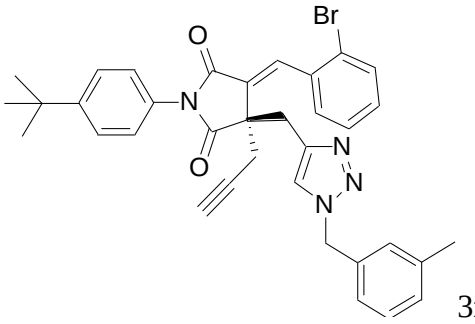
#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	18.46	240.6	5.4	0.531	0.613	50.742
2	23.687	233.5	3.8	0.7395	0.698	49.258

#	Time	Area	Height	Width	Symmetry	Area%
1	18.46	240.6	5.4	0.531	0.613	50.742
2	23.687	233.5	3.8	0.7395	0.698	49.258



#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	18.31	2092.9	46.6	0.7481	0.487	90.495
2	23.796	219.8	3.8	0.9749	0.555	9.505

#	Time	Area	Height	Width	Symmetry	Area%
1	18.37	2092.9	46.6	0.7481	0.487	90.495
2	23.796	219.8	3.8	0.9749	0.555	9.505



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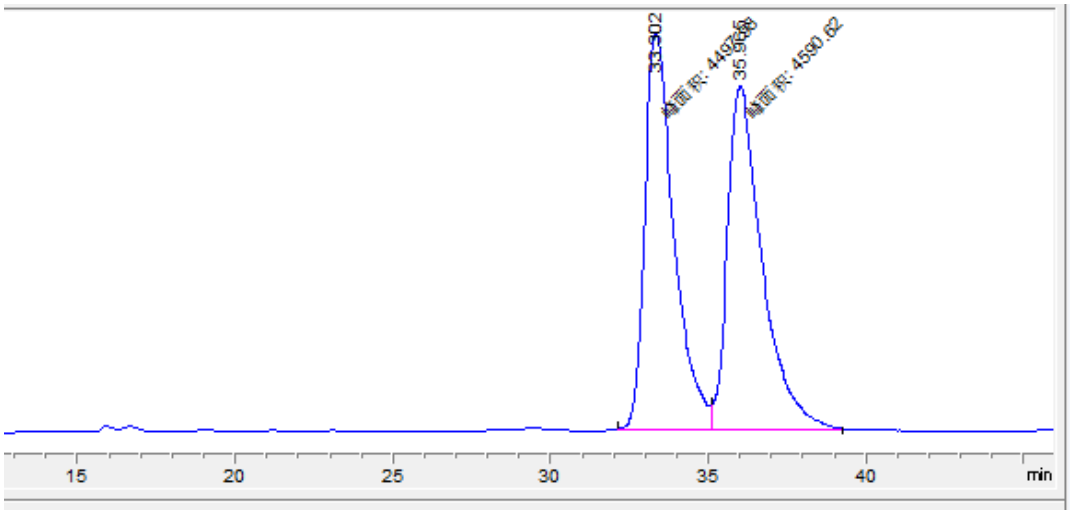
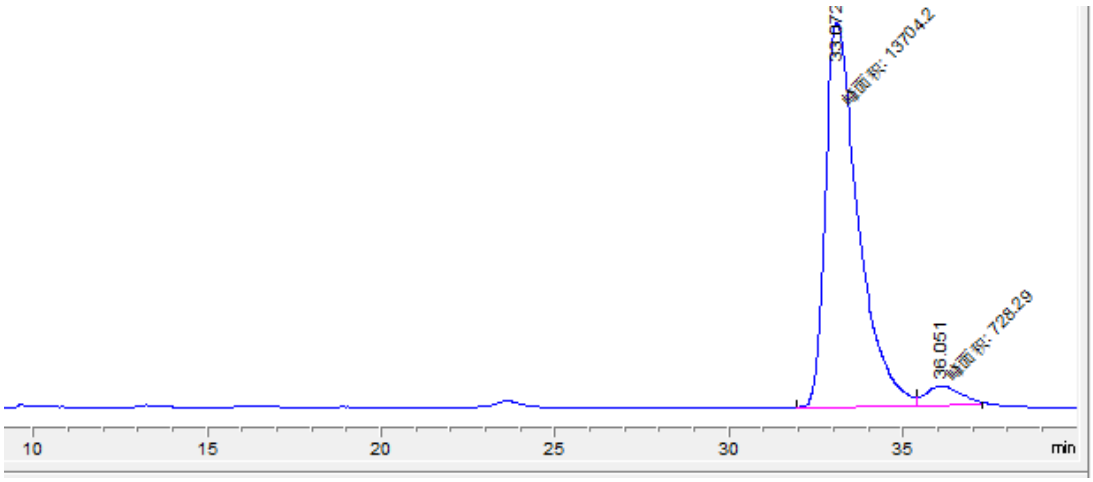


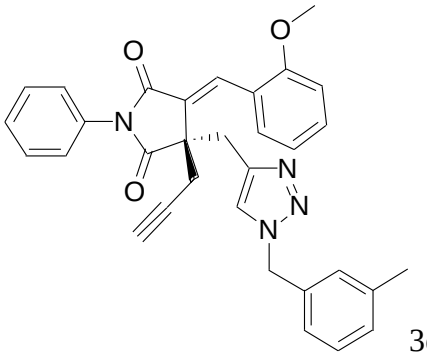
#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	33.302	4498	69.8	1.0735	0	49.490
2	35.965	4590.6	60.3	1.2698	0.522	50.510

#	Time	Area	Height	Width	Symmetry	Area%
1	33.302	4498	69.8	1.0735	0	49.490
2	35.965	4590.6	60.3	1.2698	0.522	50.510



#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	33.072	13704.2	207.8	1.099	0	94.954
2	36.051	728.3	10.5	1.1576	0.749	5.046

#	Time	Area	Height	Width	Symmetry	Area%
1	33.072	13704.2	207.8	1.099	0	94.954
2	36.051	728.3	10.5	1.1576	0.749	5.046



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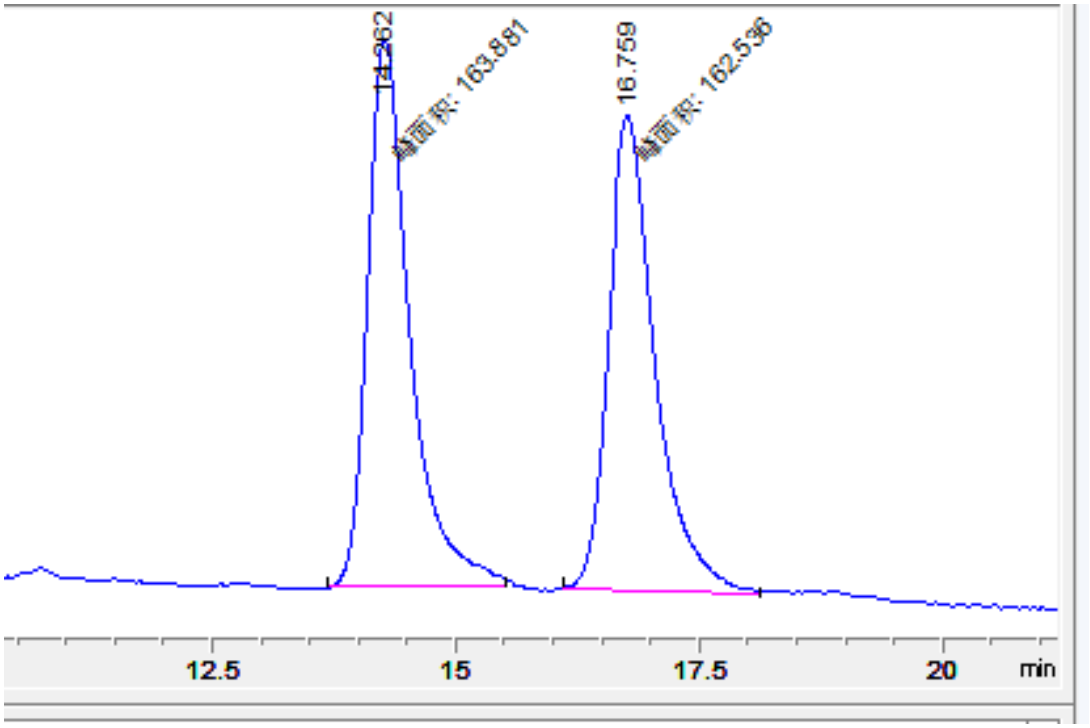
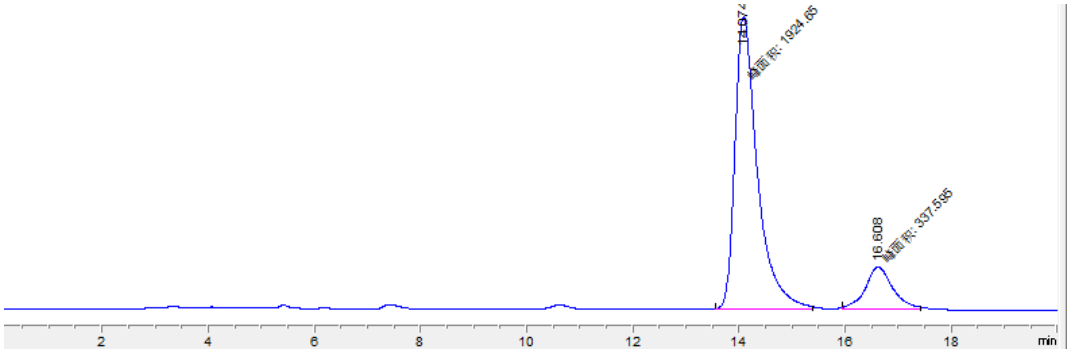


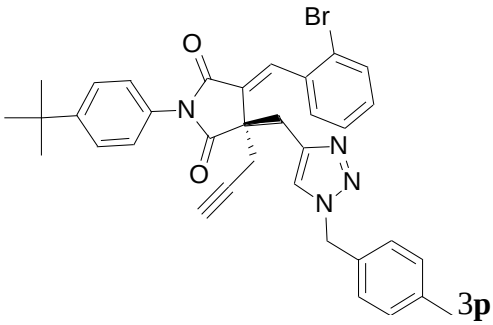
#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	14.262	163.9	5.5	0.4982	0.644	50.206
2	16.759	162.5	4.8	0.5695	0.718	49.794

#	Time	Area	Height	Width	Symmetry	Area%
1	14.262	163.9	5.5	0.4982	0.644	50.206
2	16.759	162.5	4.8	0.5695	0.718	49.794



#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	14.074	1924.6	65.3	0.4912	0.59	85.077
2	16.608	337.6	9.4	0.5973	0.856	14.923

#	Time	Area	Height	Width	Symmetry	Area%
1	14.074	1924.6	65.3	0.4912	0.59	85.077
2	16.608	337.6	9.4	0.5973	0.856	14.923



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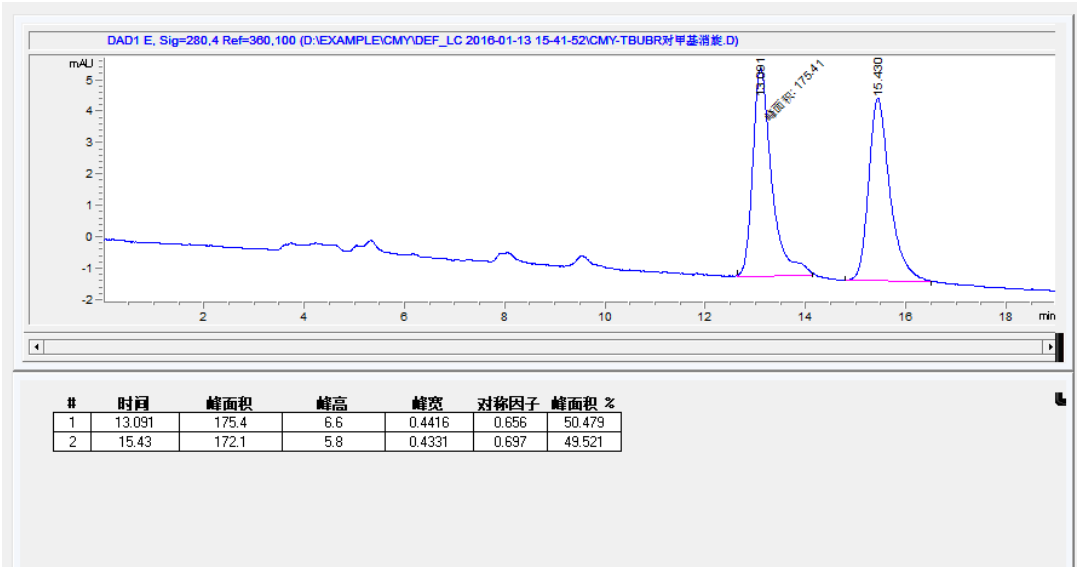
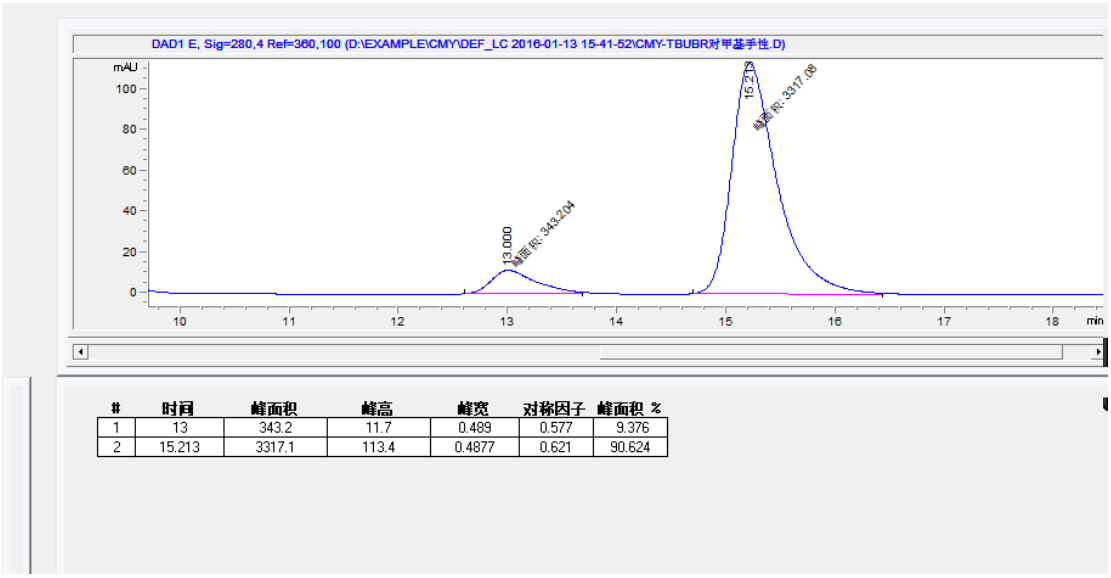


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	13.091	175.4	6.6	0.4416	0.656	50.479
2	15.43	172.1	5.8	0.4331	0.697	49.521

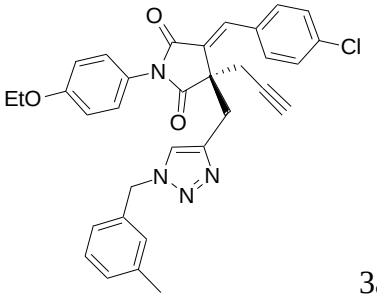
#	Time	Area	Height	Width	Symmetry	Area%
1	13.091	175.4	6.6	0.4416	0.656	50.479
2	15.43	172.1	5.8	0.4331	0.697	49.521



#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	13	343.2	11.7	0.489	0.577	9.376
2	15.213	3317.1	113.4	0.4877	0.621	90.624

#	Time	Area	Height	Width	Symmetry	Area%
1	13	343.2	11.7	0.489	0.577	9.376
2	15.213	3317.1	113.4	0.4877	0.621	90.624

S-7. HPLC Spectra of the new products 3 and 5 (Method B)



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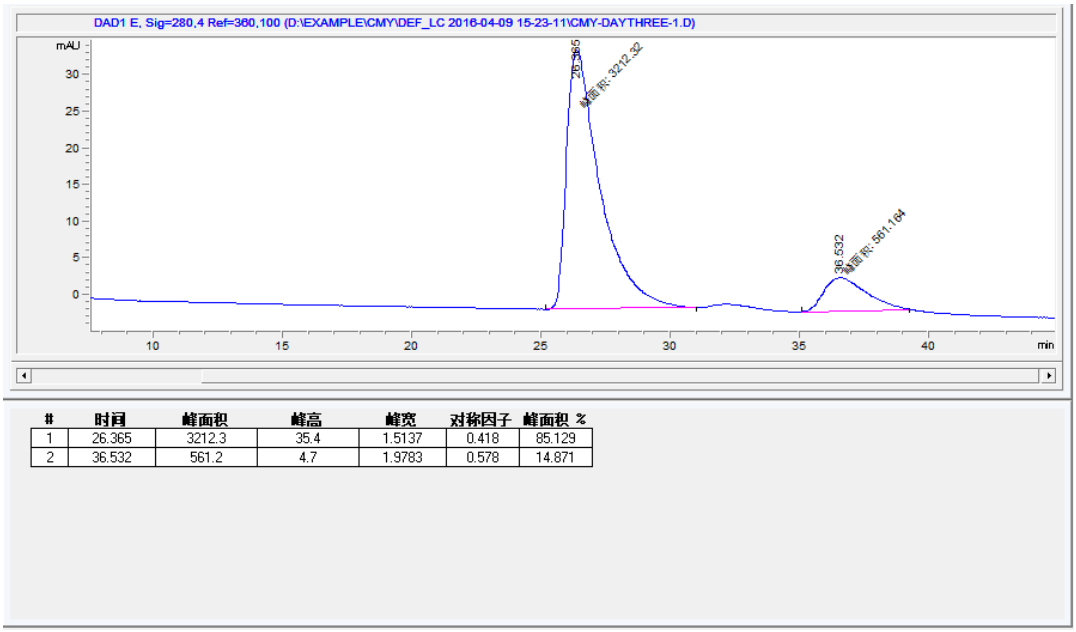
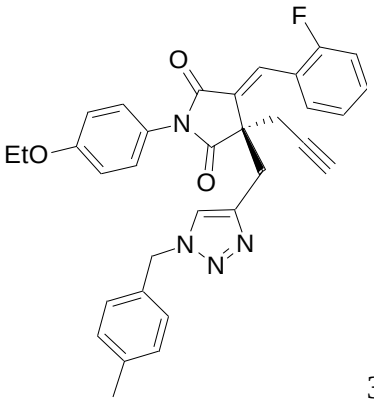


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	26.365	3212.3	35.4	1.5137	0.418	85.129
2	36.532	561.2	4.7	1.9783	0.578	14.871

#	Time	Area	Height	Width	Symmetry	Area%
1	26.365	3212.3	35.4	1.5137	0.418	85.129
2	36.532	561.2	4.7	1.9783	0.578	14.871



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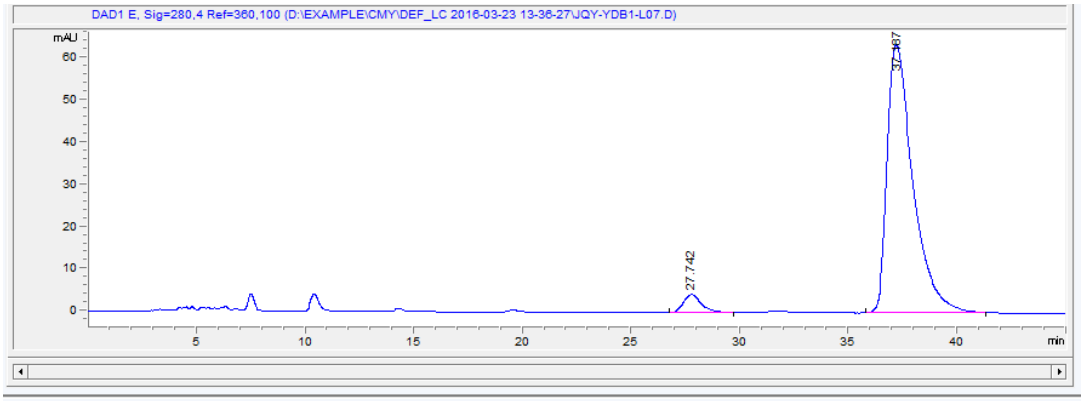
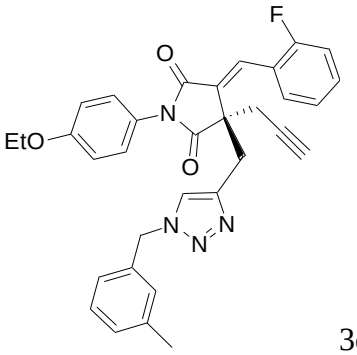


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	27.742	240.8	4.3	0.6685	0.694	4.426
2	37.187	5200.4	63.4	1.1923	0.489	95.574

#	Time	Area	Height	Width	Symmetry	Area%
1	27.742	240.8	4.3	0.6685	0.694	4.426
2	37.187	5200.4	63.4	1.1923	0.489	95.574



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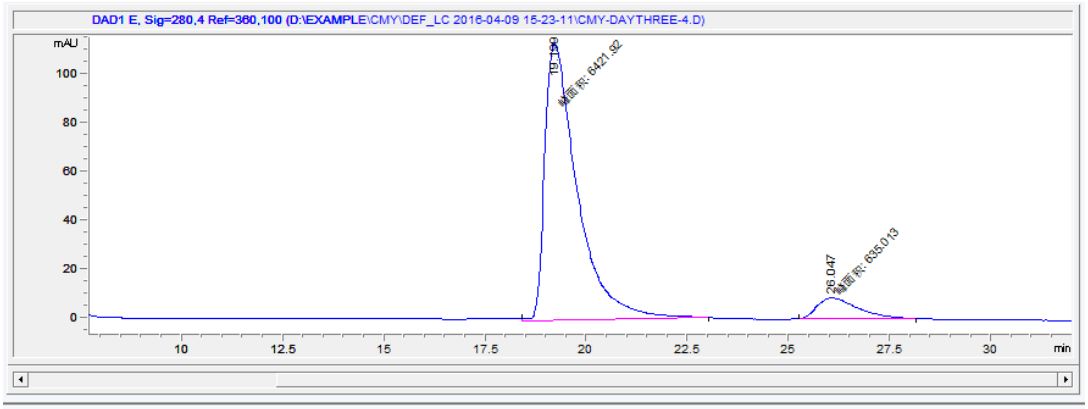
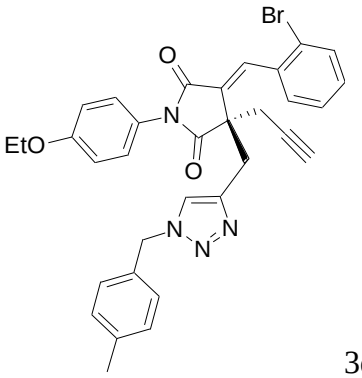


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	19.199	6421.9	113.9	0.9393	0.398	91.002
2	26.047	635	8.7	1.2098	0.525	8.998

#	Time	Area	Height	Width	Symmetry	Area%
1	19.199	6421.9	113.9	0.9393	0.398	91.002
2	26.047	635	8.7	1.2098	0.525	8.998



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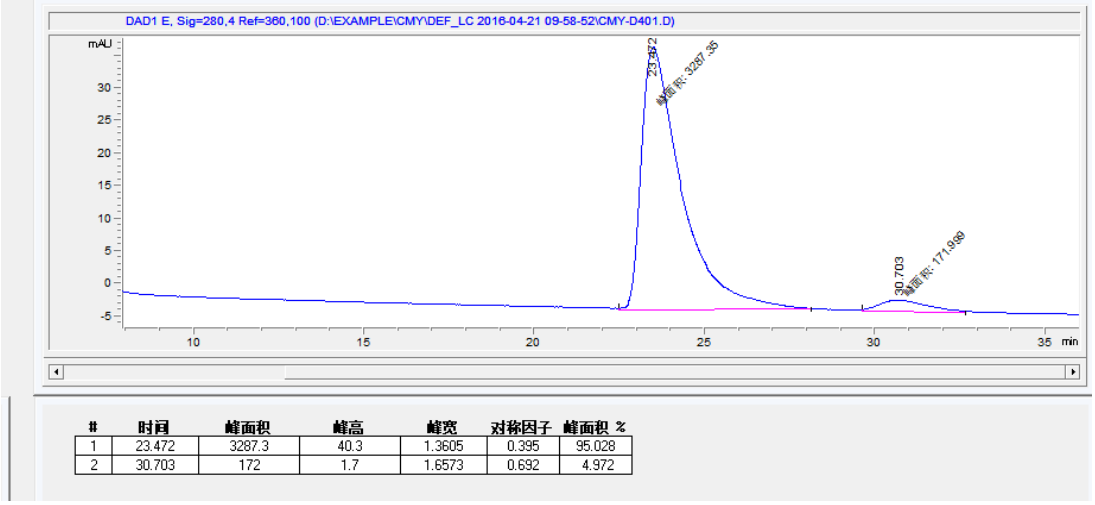
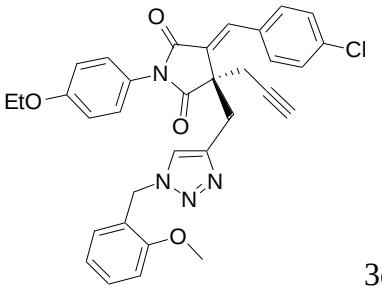


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	23.472	3287.3	40.3	1.3605	0.395	95.028
2	30.703	172	1.7	1.6573	0.692	4.972

#	Time	Area	Height	Width	Symmetry	Area%
1	23.472	3287.3	40.3	1.3605	0.395	95.028
2	30.703	172	1.7	1.6573	0.692	4.972



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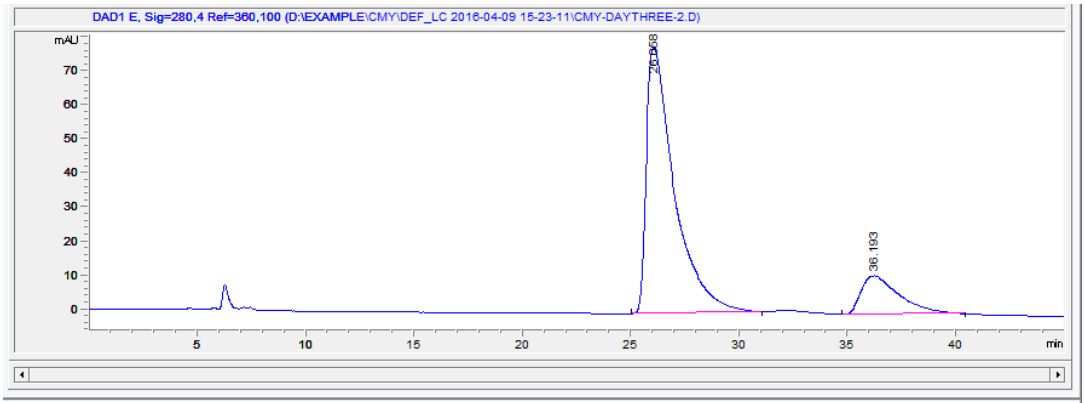
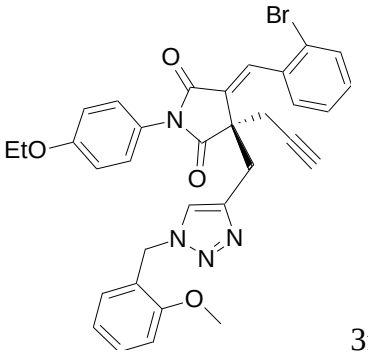


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	26.058	7022.6	78.2	1.2655	0.35	83.594
2	36.193	1378.3	11.3	1.4409	0.465	16.406

#	Time	Area	Height	Width	Symmetry	Area%
1	26.058	7022.6	78.2	1.2655	0.35	83.594
2	36.193	1378.3	11.3	1.4409	0.465	16.406



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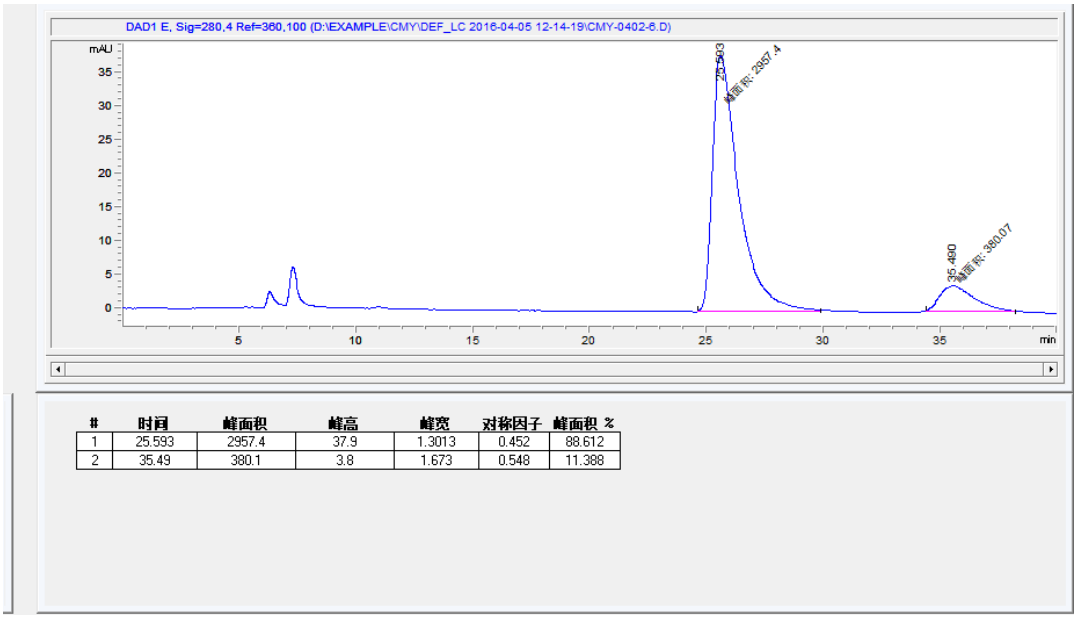
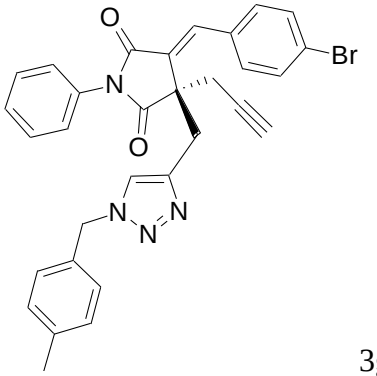


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	25.593	2957.4	37.9	1.3013	0.452	88.612
2	35.49	380.1	3.8	1.673	0.548	11.388

#	Time	Area	Height	Width	Symmetry	Area%
1	25.593	2957.4	37.9	1.3013	0.452	88.612
2	35.49	380.1	3.8	1.673	0.548	11.388



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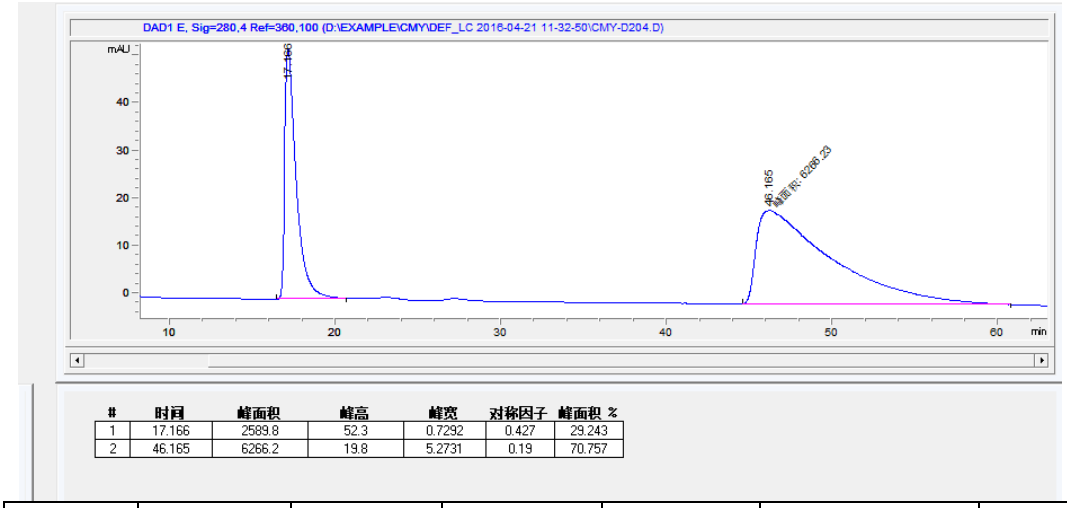
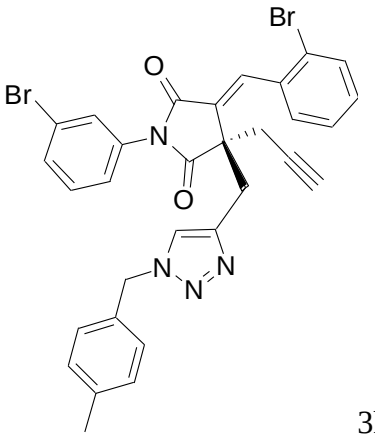


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	17.166	2589.8	52.3	0.7292	0.427	29.243
2	46.165	6266.2	19.8	5.2731	0.19	70.757

#	Time	Area	Height	Width	Symmetry	Area%
1	17.166	2589.8	52.3	0.7292	0.427	29.243
2	46.165	6266.2	19.8	5.2731	0.19	70.757



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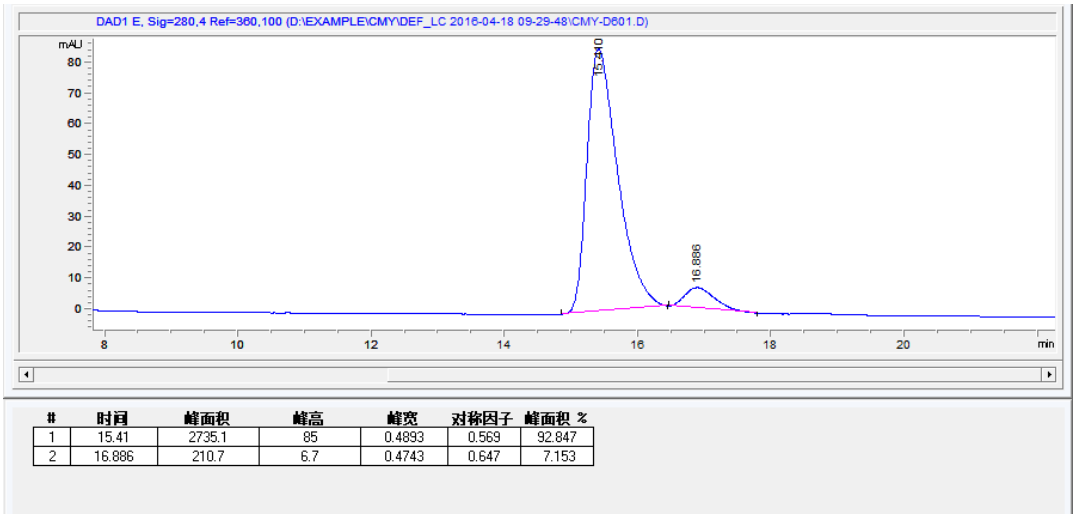
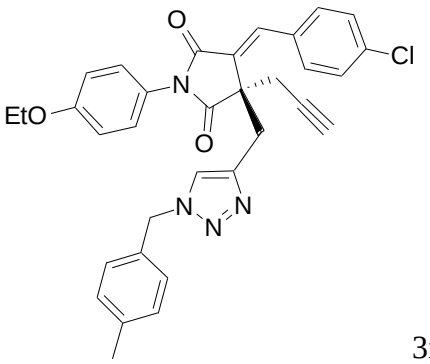


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	15.41	2735.1	85	0.4893	0.569	92.847
2	16.886	210.7	6.7	0.4743	0.647	7.153

#	Time	Area	Height	Width	Symmetry	Area%
1	15.41	2735.1	85	0.4893	0.569	92.847
2	16.886	210.7	6.7	0.4743	0.647	7.153



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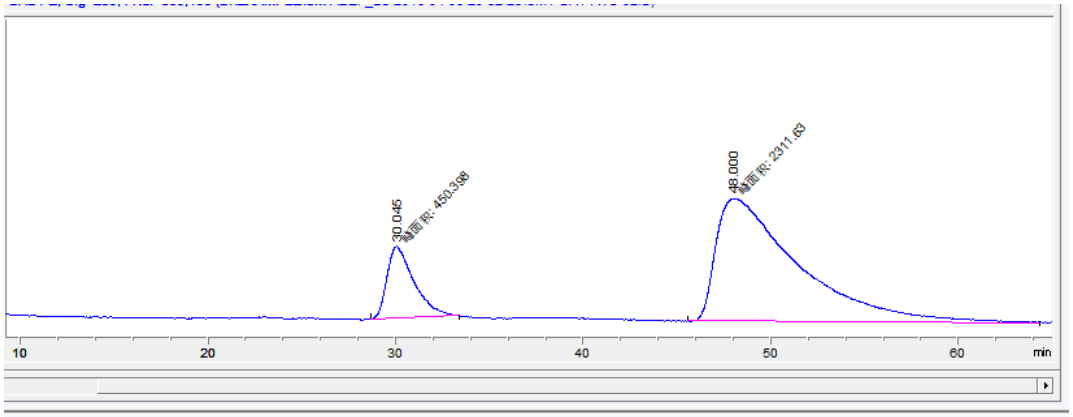
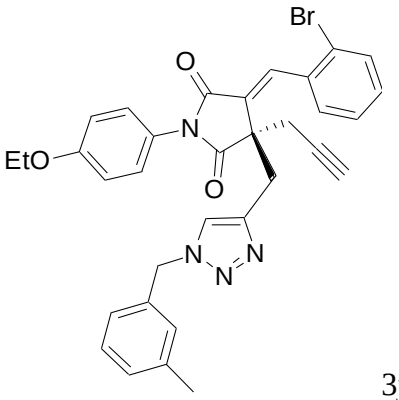


时间	峰面积	峰高	峰宽	对称因子	峰面积 %
30.045	450.4	4.4	1.7166	0.593	16.307
48	2311.6	7.4	5.1749	0.266	83.693

#	Time	Area	Height	Width	Symmetry	Area%
1	30.045	450.4	4.4	1.7166	0.593	16.307
2	48	2311.6	7.4	5.1749	0.266	83.693



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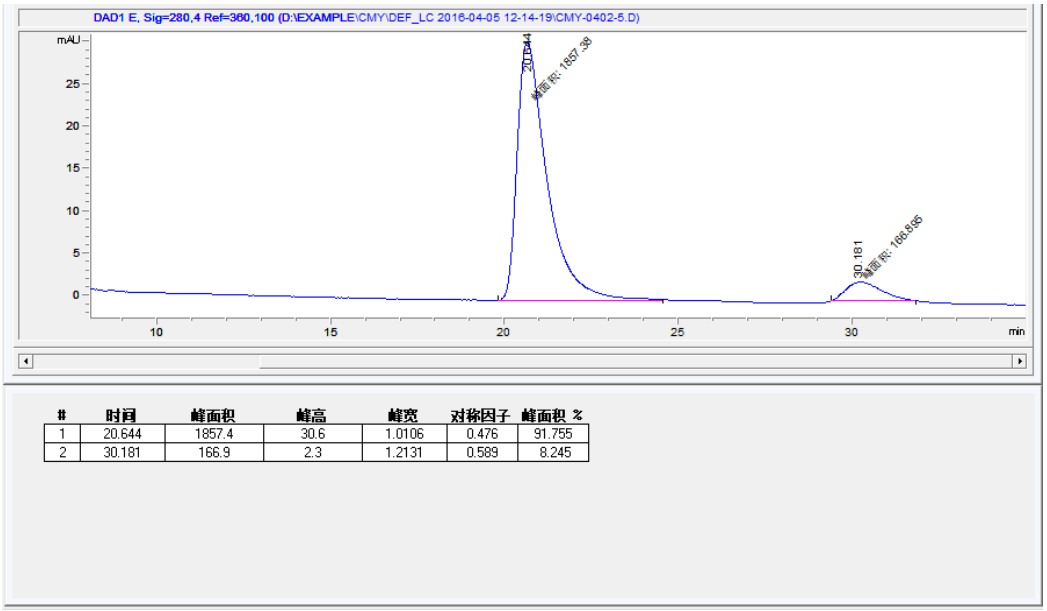
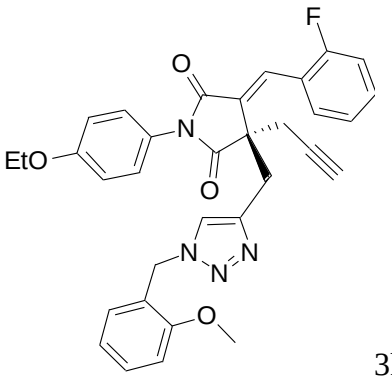


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	20.644	1857.4	30.6	1.0106	0.476	91.755
2	30.181	166.9	2.3	1.2131	0.589	8.245

#	Time	Area	Height	Width	Symmetry	Area%
1	20.644	1857.4	30.6	1.0106	0.476	91.755
2	30.181	166.9	2.3	1.2131	0.589	8.245



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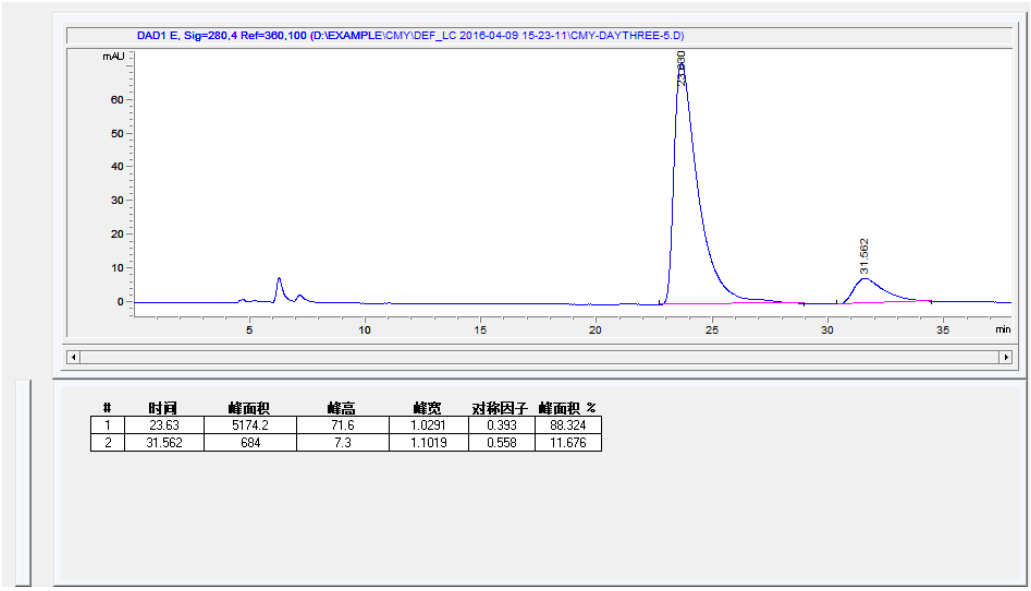
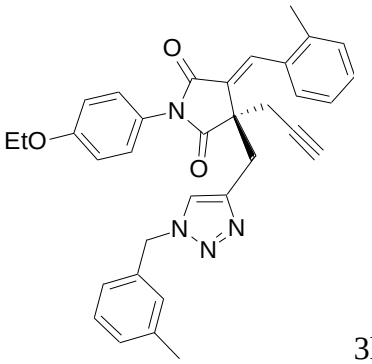


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	23.63	5174.2	71.6	1.0291	0.393	88.324
2	31.562	684	7.3	1.1019	0.558	11.676

#	Time	Area	Height	Width	Symmetry	Area%
1	23.63	5174.2	71.6	1.0291	0.393	88.324
2	31.562	684	7.3	1.1019	0.558	11.676



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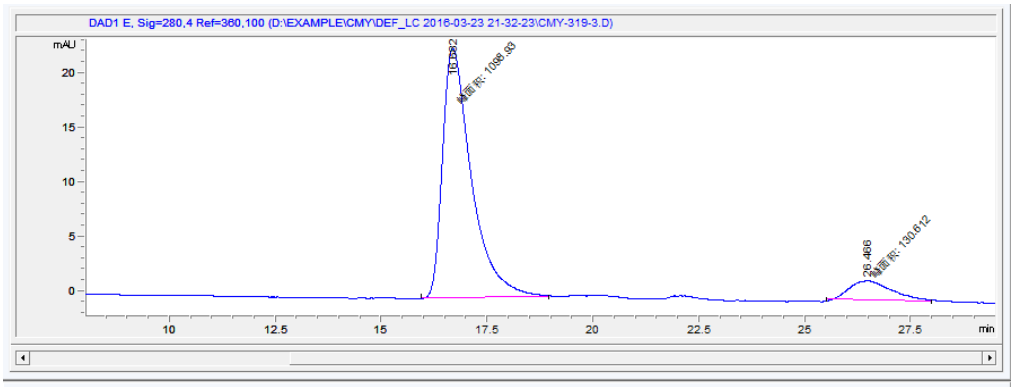
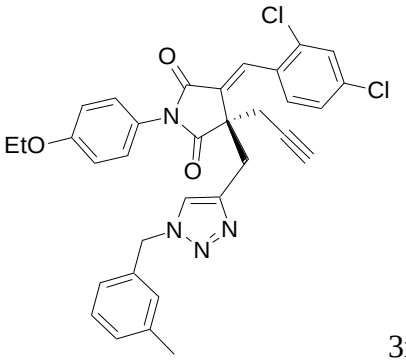


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	16.682	1098.9	23	0.7975	0.517	89.377
2	26.466	130.6	1.8	1.2038	0.638	10.623

#	Time	Area	Height	Width	Symmetry	Area%
1	16.682	1098.9	23	0.7975	0.517	89.377
2	26.466	130.6	1.8	1.2038	0.638	10.623



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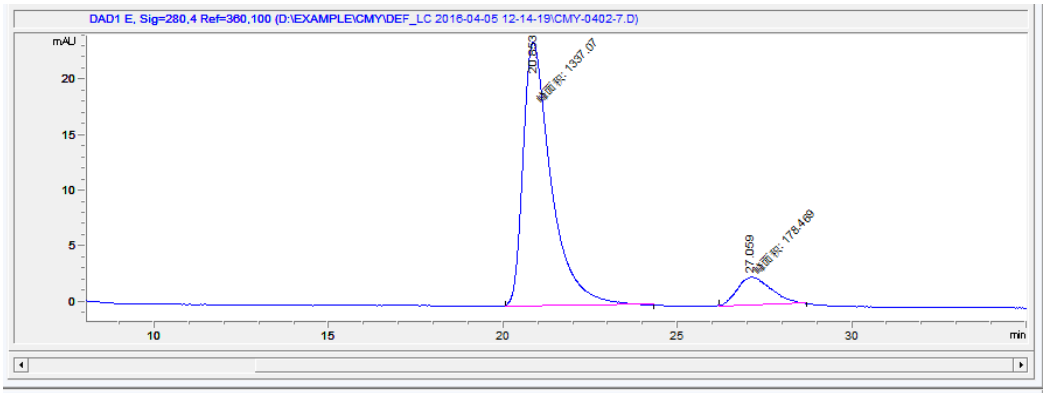
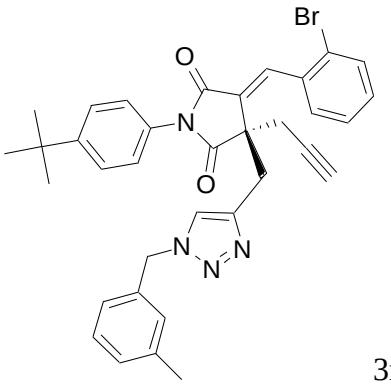


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	20.853	1337.1	23.8	0.9366	0.527	88.224
2	27.059	178.5	2.6	1.1578	0.642	11.776

#	Time	Area	Height	Width	Symmetry	Area%
1	20.853	1337.1	23.8	0.9366	0.527	88.224
2	27.059	178.5	2.6	1.1578	0.642	11.776



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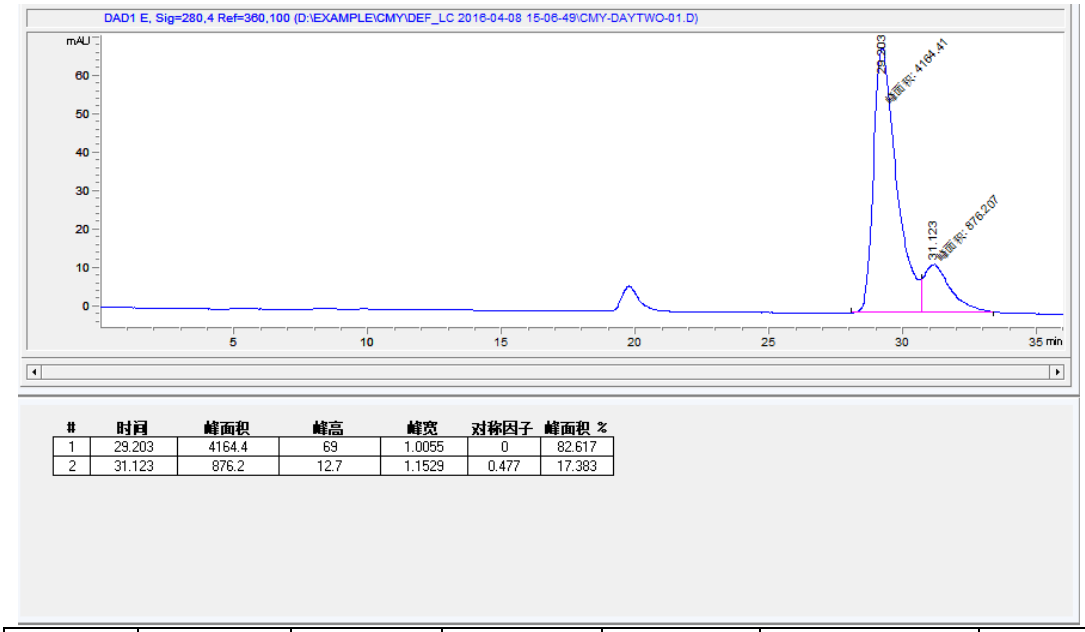
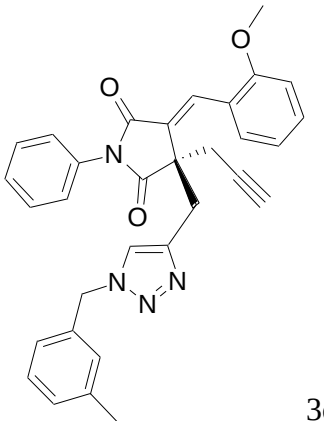
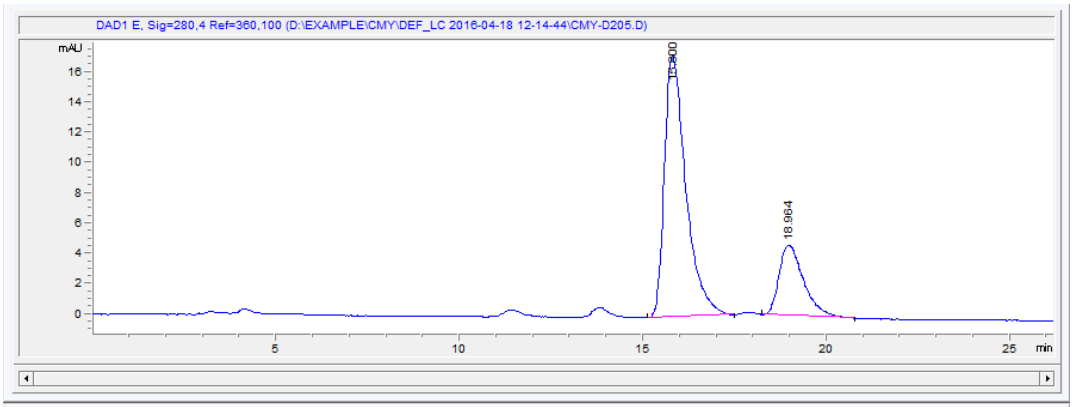


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	29.203	4164.4	69	1.0055	0	82.617
2	31.123	876.2	12.7	1.1529	0.477	17.383

#	Time	Area	Height	Width	Symmetry	Area%
1	29.203	4164.4	69	1.0055	0	82.617
2	31.123	876.2	12.7	1.1529	0.477	17.383

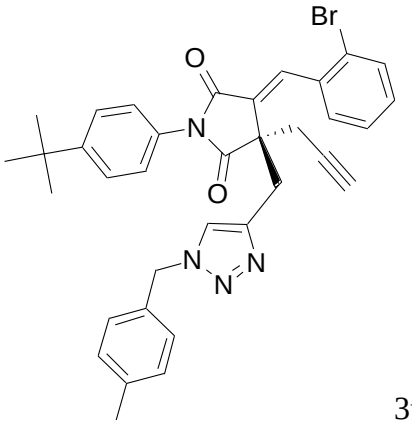


3o



#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	15.8	701.2	17.3	0.5831	0.564	76.440
2	18.964	216.1	4.7	0.6358	0.602	23.560

#	Time	Area	Height	Width	Symmetry	Area%
1	15.8	701.2	17.3	0.5831	0.564	76.440
2	18.694	216.1	4.7	0.6358	0.602	23.560



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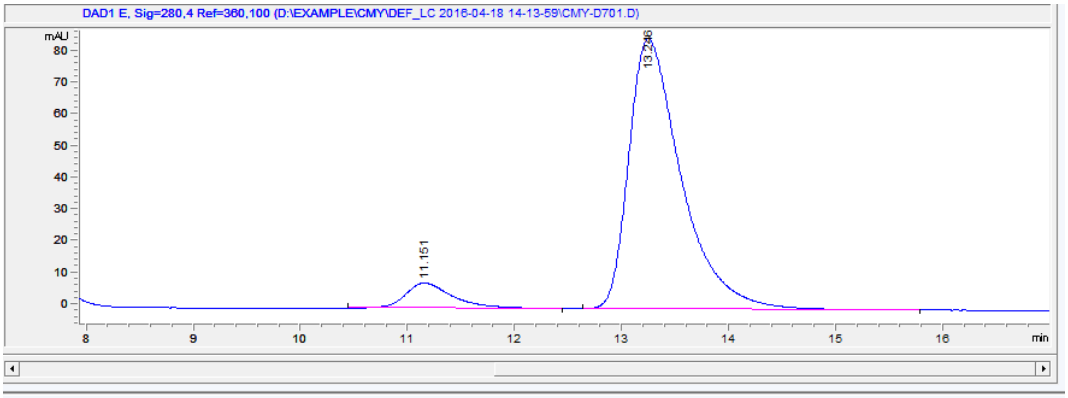
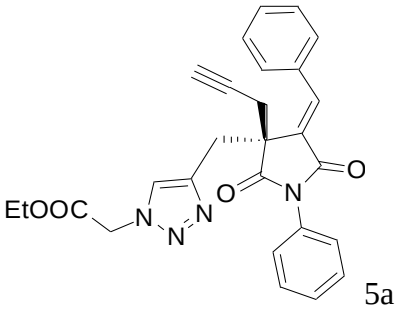


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	11.151	252.6	8	0.4525	0.628	7.997
2	13.246	2906.6	85.4	0.5113	0.549	92.003

#	Time	Area	Height	Width	Symmetry	Area%
1	11.151	252.6	8	0.4525	0.628	7.997
2	13.246	2906.6	85.4	0.5113	0.549	92.993



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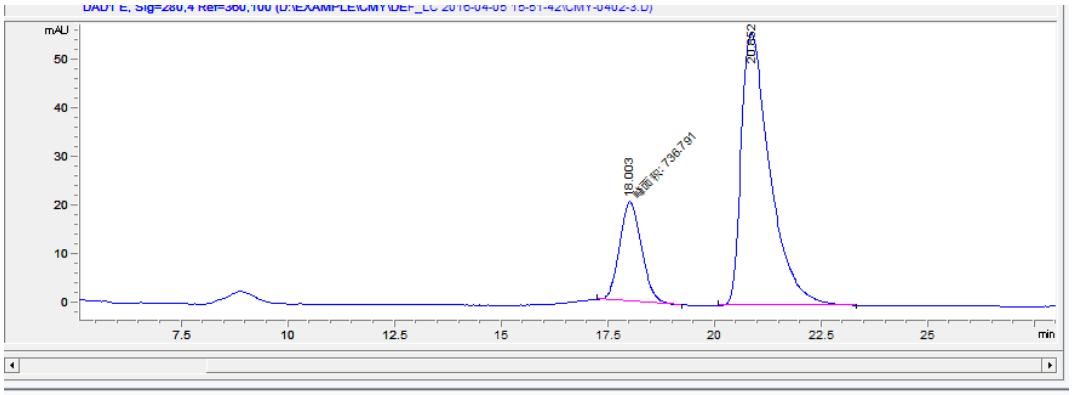
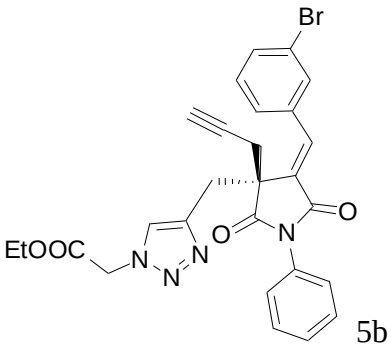


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	18.003	736.8	20.6	0.5972	0.839	21.970
2	20.852	2616.8	55.7	0.6976	0.497	78.030

#	Time	Area	Height	Width	Symmetry	Area%
1	18.003	736.8	20.6	0.5972	0.839	21.970
2	20.852	2616.8	55.7	0.6976	0.497	78.030



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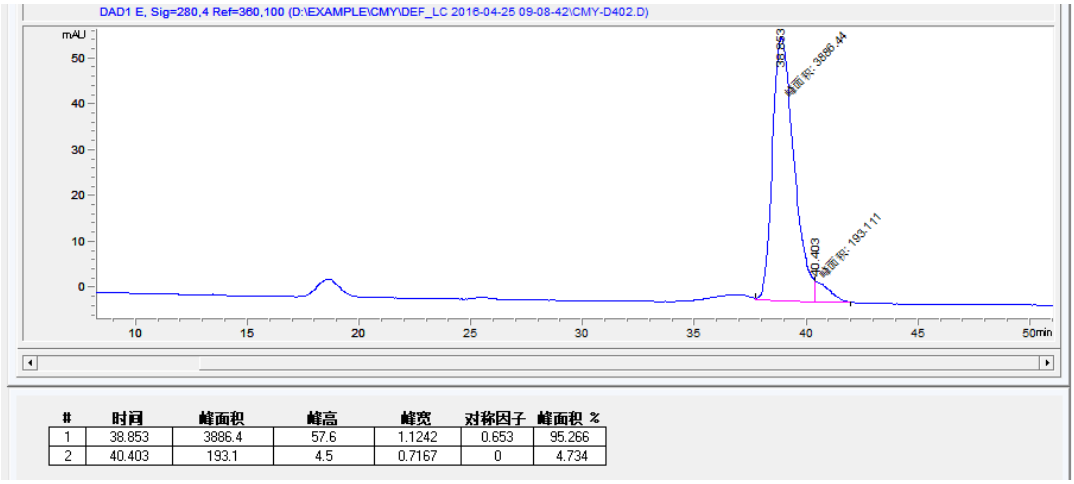
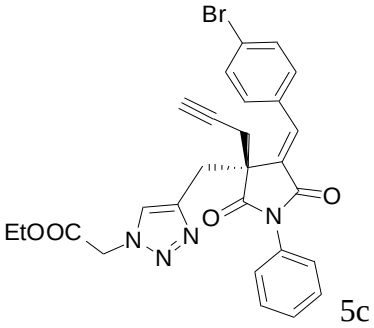
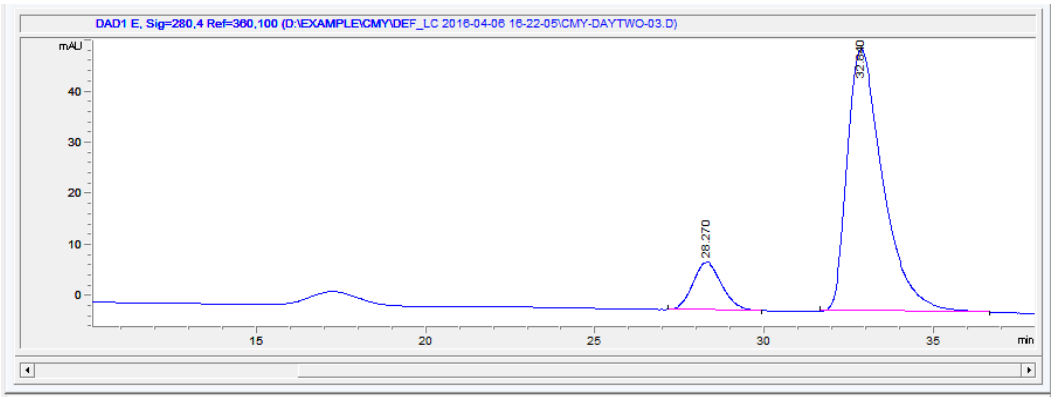


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	38.853	3886.4	57.6	1.1242	0.653	95.266
2	40.403	193.1	4.5	0.7167	0	4.734

#	Time	Area	Height	Width	Symmetry	Area%
1	38.853	3886.4	57.6	1.1242	0.653	95.266
2	40.403	193.1	4.5	0.7167	0	4.734

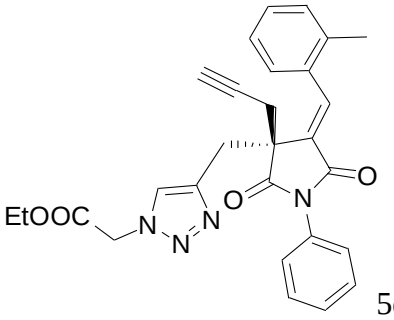


5c

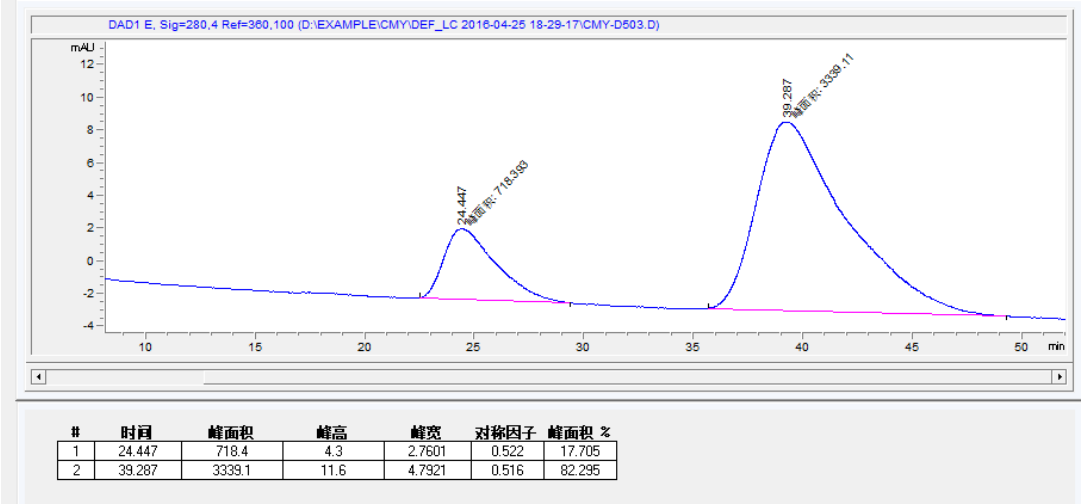


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	28.27	547.1	9.3	0.7246	0.84	12.651
2	32.84	3777.4	51.3	1.0755	0.572	87.349

#	Time	Area	Height	Width	Symmetry	Area%
1	28.27	547.1	9.3	0.7246	0.84	12.651
2	32.84	3777.4	51.3	1.0755	0.572	87.349

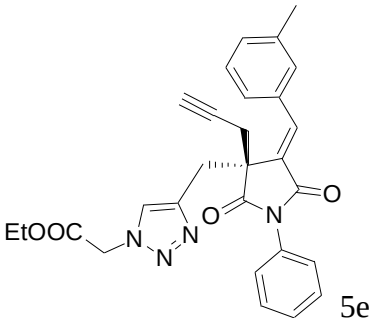


5d



#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	24.447	718.4	4.3	2.7601	0.522	17.705
2	39.287	3339.1	11.6	4.7921	0.516	82.295

#	Time	Area	Height	Width	Symmetry	Area%
1	24.447	718.4	4.3	2.7601	0.522	17.705
2	39.287	3339.1	11.6	4.7921	0.516	82.295



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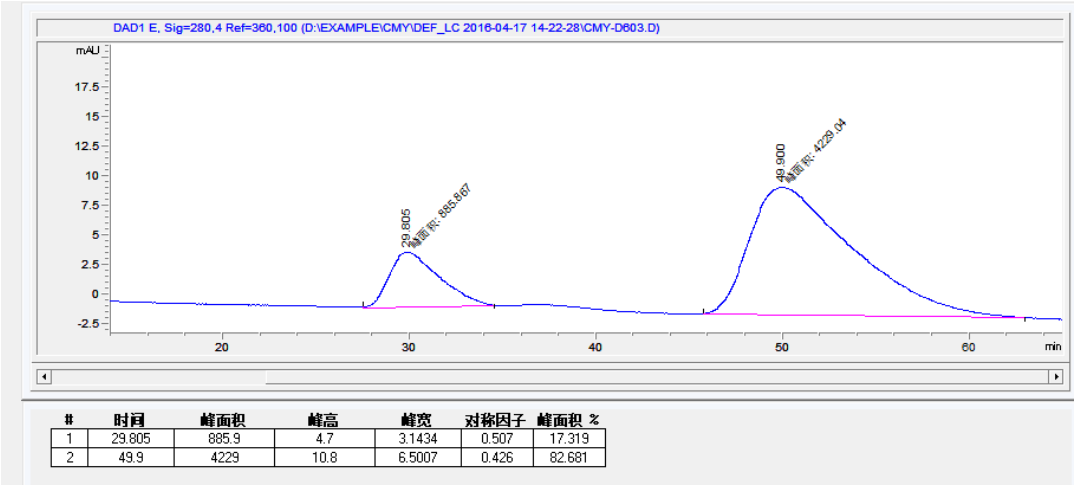
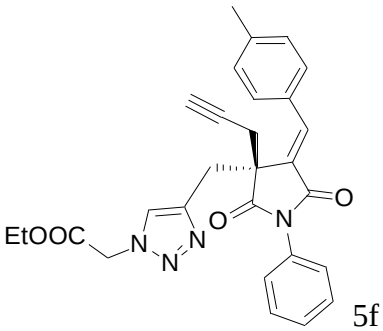
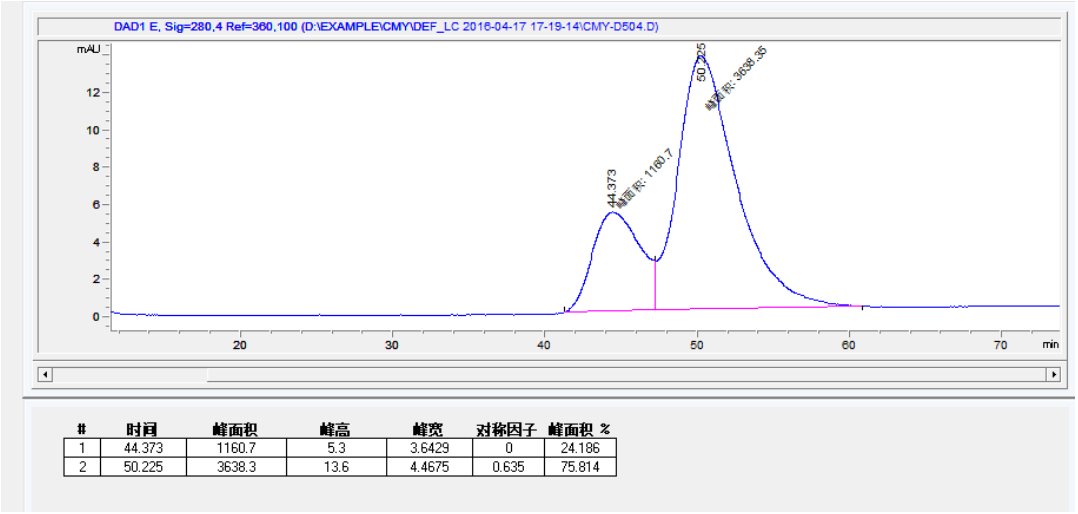


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	29.805	885.9	4.7	3.1434	0.507	17.319
2	49.9	4229	10.8	6.5007	0.426	82.681

#	Time	Area	Height	Width	Symmetry	Area%
1	29.805	885.9	4.7	3.1434	0.507	17.319
2	49.9	4229	10.8	6.5007	0.426	82.681

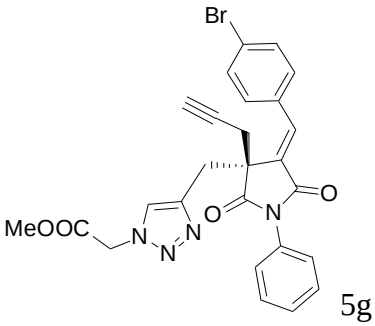


5f

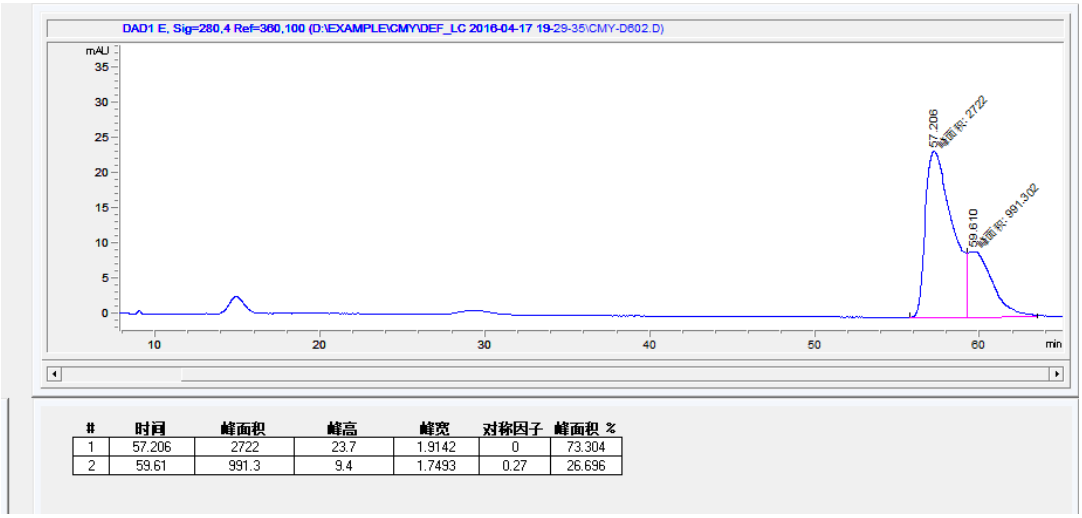


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	44.373	1160.7	5.3	3.6429	0	24.186
2	50.225	3638.3	13.6	4.4675	0.635	75.814

#	Time	Area	Height	Width	Symmetry	Area%
1	44.373	1160.7	5.3	3.6429	0	24.186
2	50.225	3638.3	13.6	4.4675	0.635	75.814

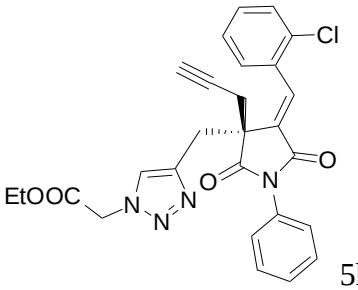


5g

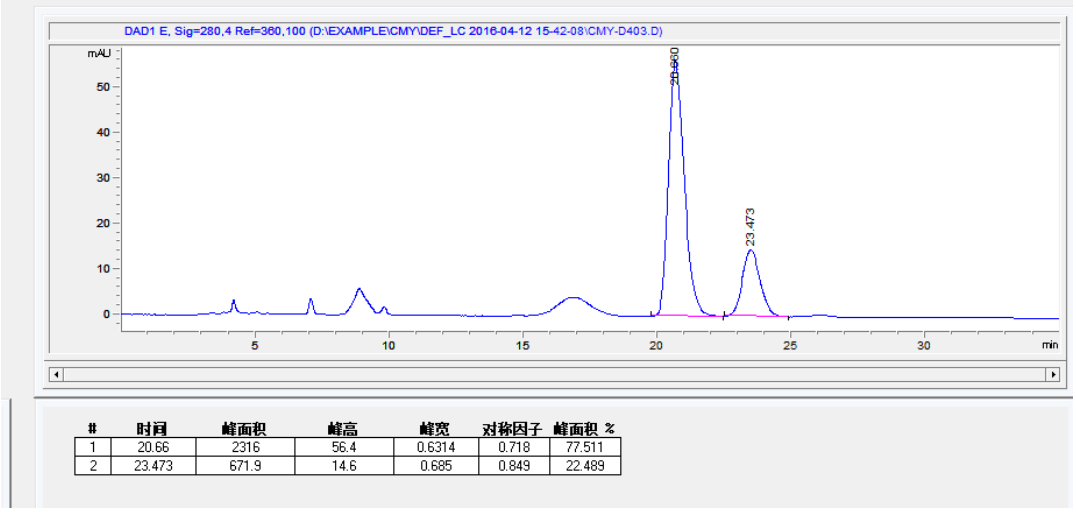


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	57.206	2722	23.7	1.9142	0	73.304
2	59.61	991.3	9.4	1.7493	0.27	26.696

#	Time	Area	Height	Width	Symmetry	Area%
1	57.206	2722	23.7	1.9142	0	73.304
2	59.61	991.3	9.4	1.7493	0.27	26.696

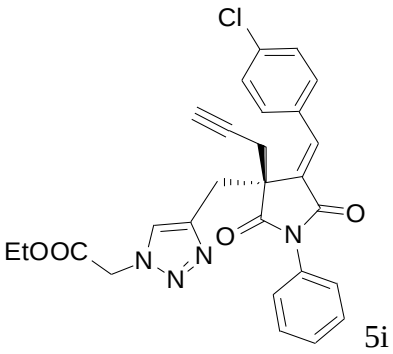


5h

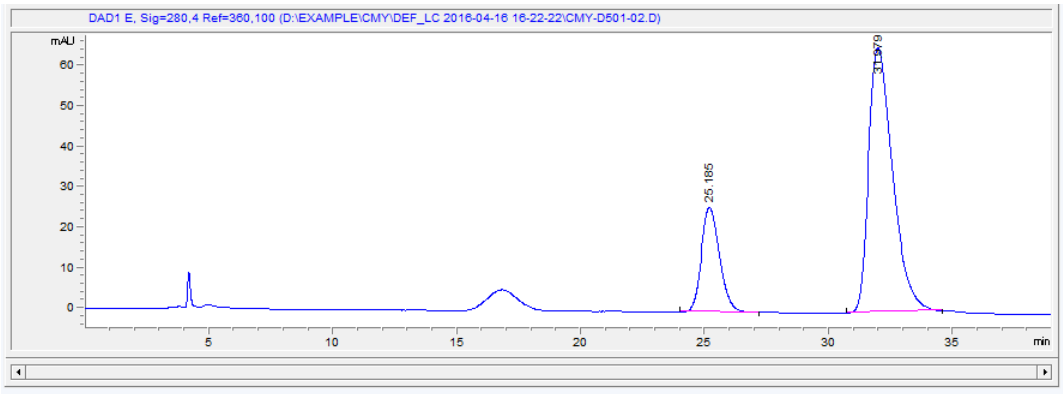


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	20.66	2316	56.4	0.6314	0.718	77.511
2	23.473	671.9	14.6	0.685	0.849	22.489

#	Time	Area	Height	Width	Symmetry	Area%
1	20.66	2316	56.4	0.6314	0.718	77.511
2	23.473	671.9	14.6	0.685	0.849	22.489

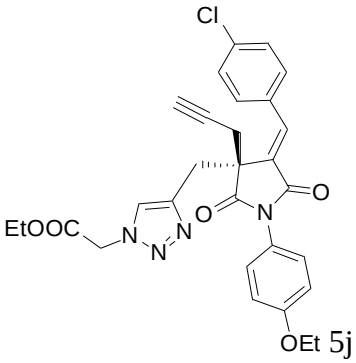


5i

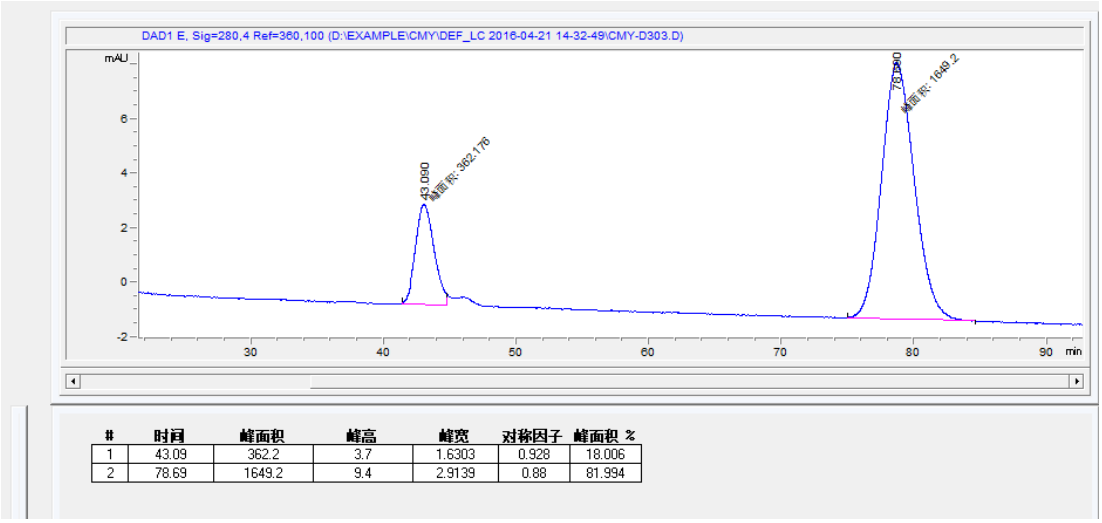


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	25.185	1321.8	25.9	0.7774	0.817	23.052
2	31.979	4412.3	65.5	1.0124	0.614	76.948

#	Time	Area	Height	Width	Symmetry	Area%
1	25.185	1321.8	25.9	0.7774	0.817	23.052
2	31.979	4412.3	65.5	1.0124	0.614	76.948

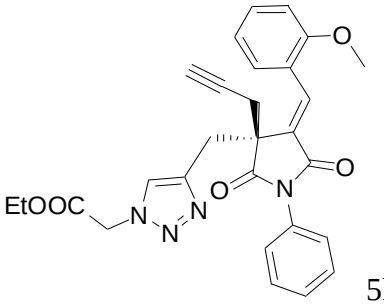


5j

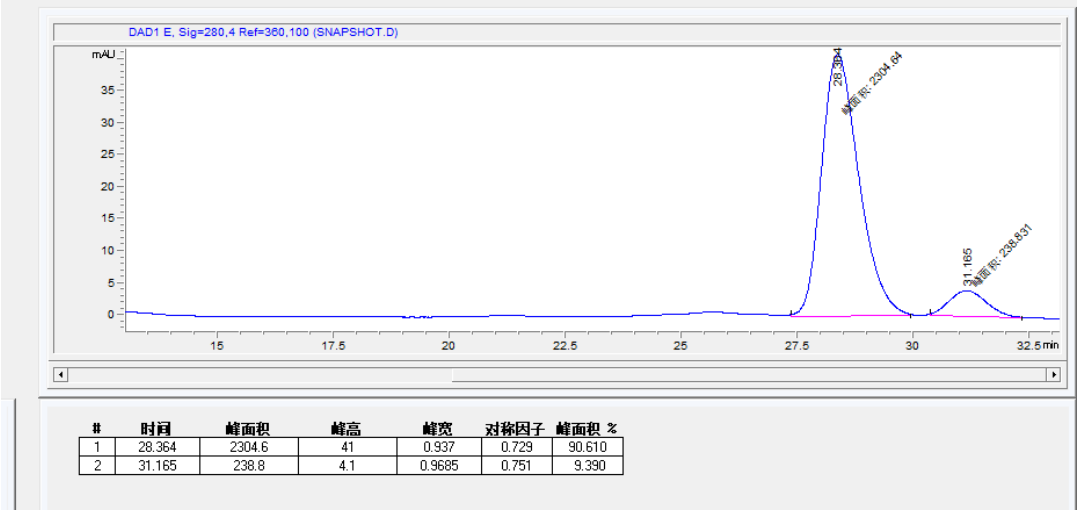


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	43.09	362.2	3.7	1.6303	0.928	18.006
2	78.69	1649.2	9.4	2.9139	0.88	81.994

#	Time	Area	Height	Width	Symmetry	Area%
1	43.09	362.2	3.7	1.6303	0.928	18.006
2	78.69	1649.2	9.4	2.9139	0.88	81.994

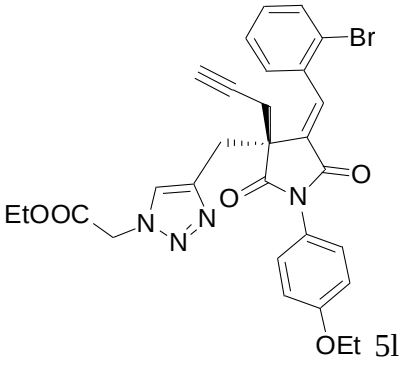


5k

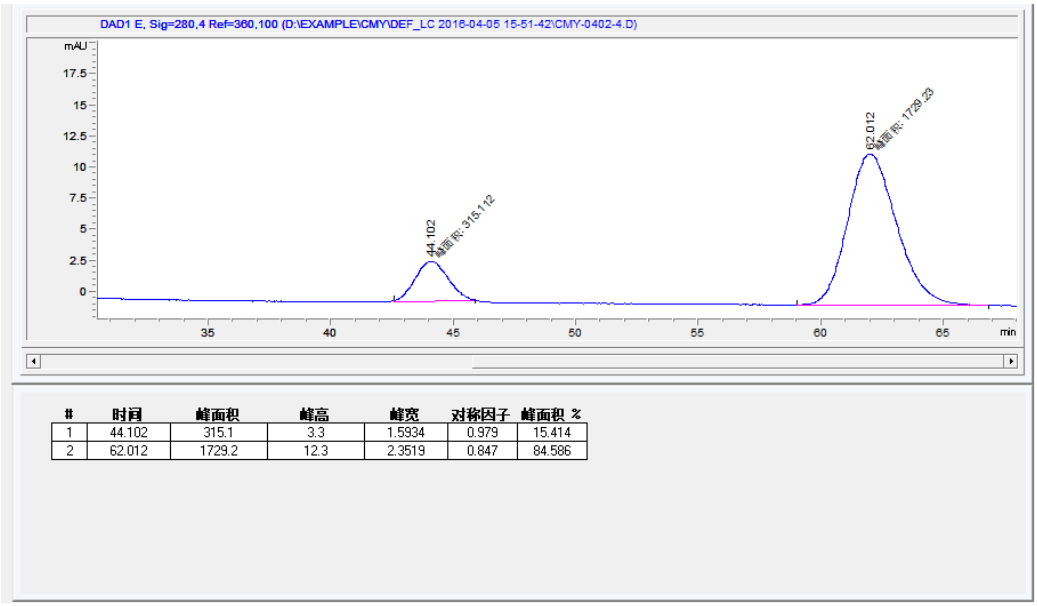


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	28.364	2304.6	41	0.937	0.729	90.610
2	31.165	238.8	4.1	0.9685	0.751	9.390

#	Time	Area	Height	Width	Symmetry	Area%
1	28.364	2304.6	41	0.937	0.729	90.610
2	31.165	238.8	4.1	0.9685	0.751	9.390

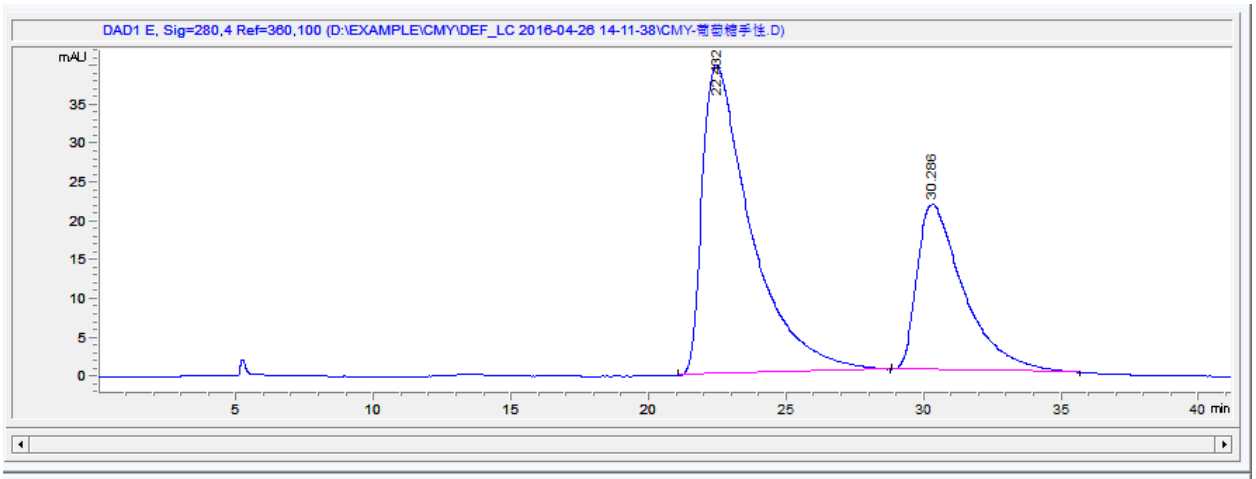


5l

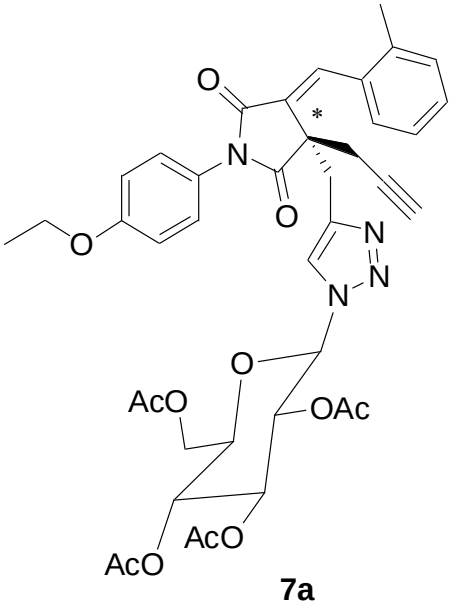


#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	44.102	315.1	3.3	1.5934	0.979	15.414
2	62.012	1729.2	12.3	2.3519	0.847	84.586

#	Time	Area	Height	Width	Symmetry	Area%
1	44.102	315.1	3.3	1.5934	0.979	15.414
2	62.012	1729.2	12.3	2.3519	0.847	84.586



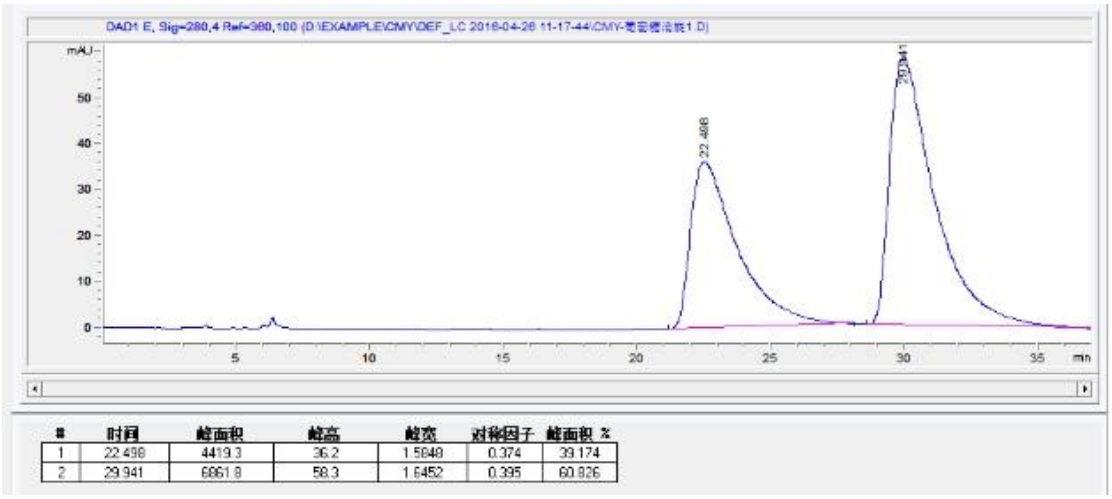
#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	22.432	4902.4	39.8	1.688	0.369	65.987
2	30.286	2527	21.3	1.4365	0.448	34.013



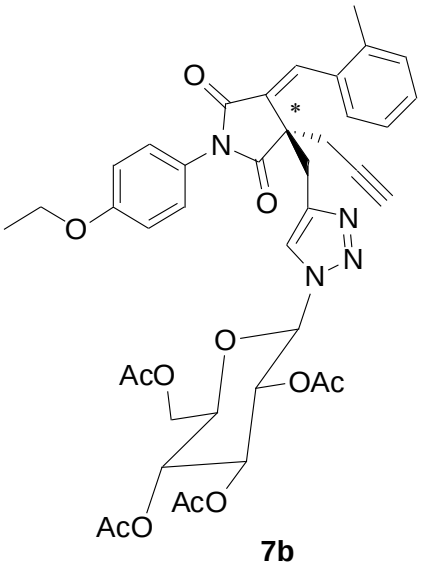
7a

61% yield

66:34 *de*



#	时间	峰面积	峰高	峰宽	对称因子	峰面积 %
1	22.498	4419.3	36.2	1.5849	0.374	39.174
2	29.941	6861.8	58.3	1.6452	0.395	60.826



7b

60% yield

60.5:39.5 *de*