Electronic Supplementary Material (ESI) for Organic & Biomolecular Chemistry.

Chiral Brønsted Acid Catalyzed Enantioselective Intermolecular Allylic Aminations

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Supporting Information

General consideration:

All the solvents were purified under standard method. ^{1}H, ^{13}C, ^{19}F, and ^{31}P NMR spectra were recorded in $CDCl_3$ solution on Bruker AX-400 MHz instruments and spectral data were reported in ppm relative to tetramethylsilane (TMS) as internal standard. IR spectra were recorded on a Thermo Nicolet 6700 spectrometer. High-resolution mass spectralanalysis (HRMS) data were measured on the Thermo Exactive by means of the ESI technique. Ee's were determined by high performance liquid chromatography (HPLC) analysis. All the amine nucleophiles were used directly after purchase.

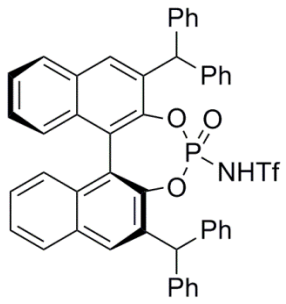
General procedure for the synthesis of Allylic alcohols: allylic alcohols were prepared according to the reported method**.** To a stirred solution of α,β-unsaturated ketone chalcone (10 mmol) in methanol (25 mL) was added $CeCl_3 \cdot 7H_2O$ (3.73 g, 10 mmol), the solution was cooled to 0 °C and $NaBH_4$ (0.418 g, 11 mmol) was added. The mixture was stirred at room temperature for 1 h before water was added and exacted with CH_2Cl_2. The combined organic phases were dried with Na_2SO_4, and the solvents evaporated under vacuum. The pure compound was obtained after flash chromatography on silica gel.

P. N. Chatterjee and S. Roy, *Tetrahedron*, 2012, **68**, 3776.

Typical procedure for the synthesis of chiral sulfonamides from allylic alcohol (Table 2, entry 1): To a dried Schlenk flask was added (*E*)-1,3-diphenylpropenol (**1a**) (0.084 g, 0.40 mmol), toluene sulfonamide (**3**) (0.1026 g, 0.60 mmol), and $CHCl_3$ (1.0 mL) under Ar. The reaction mixture was stirred at -60 °C for 10 min before addition of chiral phosphoramide **2g** (0.0325 g, 0.04 mmol). The reaction mixture was stirred at -60 ºC for 10 h and quenched with saturated $NaHCO_3$. The organic phase was directly purified by flash chromatography on silica gel (CH_2Cl_2) to afford the desired product **4a** as a white solid.

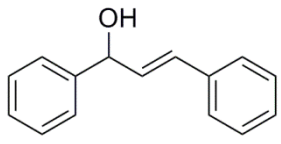
Typical procedure for the determination of the structures of regioisomers (4i and 4i'): To a solution of **4i** and **4i'** (0.0782 g, 0.19 mmol) in a mixed solvent $CCl_4/CH_3CN/H_2O$ (1:1:1.6, v/v/v, 1.1 mL), $NaIO_4$ (0.165 g, 0.77 mmol) was added and stirred for 10 min. Then $RuCl_3 \cdot H_2O$ (0.0013 g, 0.0056 mmol) was added, and the mixture was stirred for 24 h at room temperature and quenched with 1N HCl. The mixture was extracted with CH_2Cl_2, filtered with celite, concentrated and used directly for the GC-MS analysis.

C.-Y. Zhou, S.-F. Zhu, L.-X. Wang and Q.-L. Zhou, *J. Am. Chem. Soc.*, 2010, **132**, 10955.



2g

(S)-(+)-[3,3'-Bis(diphenylmethyl)-1,1'-binaphthalen-2,2'-yl)-N-triflylphosphoramide: Yellow solid; m.p. 218-220 ºC; $[\alpha]_D^{20}$ -101.6 (*c* 1.03, CH_2Cl_2); IR (film) 3061.1, 3027.3, 1647.5, 1598.6, 1494.3, 1450.8 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ 7.72 (t, *J* = 7.6 Hz, 2H), 7.50 (d, *J* = 5.0 Hz, 1H), 7.45-7.34 (m, 4H), 7.32-7.10 (m, 19H), 7.12-7.08 (m, 4H), 6.34-6.23 (m, 2H), 3.47 (brs, 1H); ^{31}P NMR (122 MHz, $CDCl_3$) δ -1.5; ^{19}F NMR (376 MHz, $CDCl_3$) δ -77.3; HRMS (FT-ICRMS) calcd for $C_{47}H_{33}F_3NO_5PSNa$ (M+Na): 834.1661, found: 834.1653.

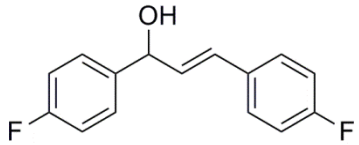


1a

(*E*)-1,3-diphenylprop-2-en-1-ol (1a): 85% yield, white solid; ^1H NMR (400 MHz, $CDCl_3$) δ 7.42 (d, *J* = 7.2 Hz, 2H), 7.37 (t, *J* = 8.0 Hz, 4H), 7.30 (t, *J* = 7.6 Hz, 3H), 7.26-7.20 (m, 1H), 6.68 (d, *J* = 15.8 Hz, 1H), 6.37 (dd, *J* = 15.8, 6.4 Hz, 1H), 5.37 (d, *J* = 6.4 Hz, 1H), 2.12 (brs, 1H); ^{13}C NMR

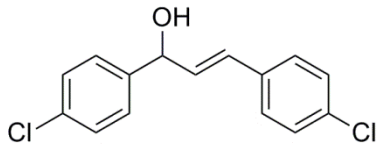
(100 MHz, $CDCl_3$) δ 143.0, 136.7, 131.7, 130.8, 128.8, 128.7, 128.0, 127.9, 126.8, 126.6, 75.3.

J. M. Dickinson, J. A. Murphy, C. W. Patterson and N. F. Wooster, *J. Chem. Soc., Perkin Trans. 1* , 1990, 1179;



1b

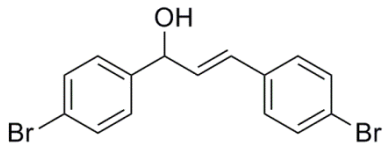
(*E*)-1,3-bis(4-fluorophenyl)prop-2-en-1-ol (1b): 61% yield, colorless oil; IR (film) 3371, 1602, 1508, 1227, 1157, 1085 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ 7.34-7.22 (m, 4H), 7.15-6.90 (m, 4H), 6.52 (d, *J* = 16.0 Hz, 1H), 6.18 (dd, *J* = 16.0, 6.0 Hz, 1H), 5.24 (d, *J* = 6.0 Hz, 1H), 2.99 (brs, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.6 (d, *J* = 246.0 Hz), 162.4 (d, *J* = 244.0 Hz), 138.6 (d, *J* = 3.0 Hz), 132.6 (d, *J* = 3.0 Hz), 131.2 (d, *J* = 2.0 Hz), 129.6, 128.3 (d, *J* = 9.0 Hz), 128.2 (d, *J* = 8.0 Hz), 115.7 (d, *J* = 12.0 Hz), 115.5 (d, *J* = 12.0 Hz), 74.4; HRMS (FT-ICRMS) calcd for $C_{15}H_{11}F_2O$ (M-H): 245.0772, found: 245.0781.



1c

(*E*)-1,3-bis(4-chlorophenyl)prop-2-en-1-ol (1c): 72% yield, white solid; ^1H NMR (400 MHz, $CDCl_3$) δ 7.35-7.25 (m, 4H), 7.25-7.21 (m, 4H), 6.55 (d, *J* = 16.0 Hz, 1H), 6.24 (dd, *J* = 16.0, 6.4 Hz, 1H), 5.27 (d, *J* = 6.4 Hz, 1H), 2.61 (brs, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 141.1, 134.9, 133.7, 131.8, 129.8, 128.9, 128.0, 127.9, 74.4.

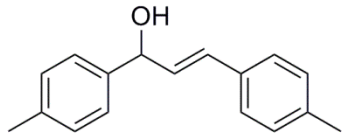
P. N. Chatterjee and S. Roy, *Tetrahedron*, 2012, **68**, 3776.



1d

(*E*)-1,3-bis(4-bromophenyl)prop-2-en-1-ol (1d): 89% yield, white solid; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.49 (d, *J* = 6.8, 2H), 7.43 (d, *J* = 6.8, 2H), 7.29 (d, *J* = 8.4 Hz, 2H), 7.23 (d, *J* = 6.8 Hz, 2H), 6.59 (d, *J* = 16.0 Hz, 1H), 6.30 (dd, *J* = 16.0, 6.4 Hz, 1H), 5.36-5.30 (m, 1H), 2.15 (d, *J* = 3.6 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 141.7, 135.5, 132.0, 132.0, 130.0, 128.4, 128.3, 122.0, 74.6.

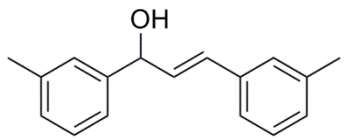
P. N. Chatterjee and S. Roy, *Tetrahedron*, 2012, **68**, 3776.



1e

(*E*)-1,3-di-p-tolylprop-2-en-1-ol (1e): 81% yield, white solid; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.24 (d, *J* =8.0 Hz, 4H), 7.20 (d, *J* = 8.0 Hz, 4H), 7.10 (d, *J* = 8.0 Hz, 2H), 7.05 (d, *J* = 8.0 Hz, 2H), 6.54 (d, *J* = 14.6 Hz, 1H), 6.24 (dd, *J* = 14.6, 6.4 Hz, 1H), 5.21 (d, *J* = 6.4 Hz, 1H), 2.63 (brs, 1H), 2.30 (s, 3H), 2.28 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 140.2, 137.5, 137.4, 134.0, 130.9, 130.3, 129.3, 129.3, 126.6, 126.5, 75.0, 21.3, 21.2.

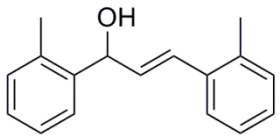
P. N. Chatterjee and S. Roy, *Tetrahedron*, 2012, **68**, 3776.



1f

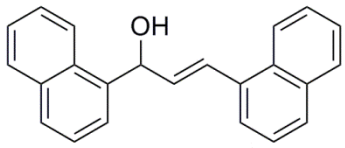
(*E*)-1,3-di-m-tolylprop-2-en-1-ol (1f): 79% yield, colorless oil; IR (film) 3348, 1605, 1487, 1455, 1081 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.25-7.13 (m, 6H), 7.06 (d, *J* = 7.2 Hz, 1H), 7.02 (d, *J* =

6.0 Hz, 1H), 6.59 (d, *J* = 15.8 Hz, 1H), 6.28 (dd, *J* = 15.8, 6.4 Hz, 1H), 5.25 (d, *J* = 6.4 Hz, 1H), 2.44 (brs, 1H), 2.32 (s, 3H), 2.29 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.0, 138.4, 138.2, 136.7, 131.6, 130.6, 128.7, 128.6, 128.6, 128.6, 127.5, 127.2, 124.0, 123.6, 75.2, 21.6, 21.5; HRMS (FT-ICRMS) calcd for $C_{17}H_{17}O$ (M-H): 237.1274, found: 237.1280.



1g

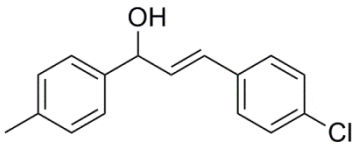
(*E*)-1,3-di-o-tolylprop-2-en-1-ol (1g): 80% yield, colorless oil; IR (film) 3336, 1602, 1486, 1460, 1011 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.52 (d, *J* = 7.6 Hz, 1H), 7.44-7.37 (m, 1H), 7.40-7.10 (m, 6H), 6.86 (d, *J* = 16.0 Hz, 1H), 6.22 (dd, *J* = 16.0, 6.0 Hz, 1H), 5.57 (d, *J* = 6.0 Hz, 1H), 2.39 (s, 3H), 2.33 (s, 3H), 2.10 (brs, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 140.9, 135.9, 135.8, 135.4, 132.3, 130.8, 130.5, 128.7, 127.8, 126.6, 126.3, 126.0, 126.0, 72.3, 20.0, 19.4; HRMS (FT-ICRMS) calcd for $C_{17}H_{17}O$ (M-H): 237.1274, found: 237.1280.



1h

(*E*)-1,3-di(naphthalen-1-yl)prop-2-en-1-ol (1h): 65% yield, yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.34 (d, *J* = 8.4 Hz, 1H), 8.13-8.05 (m, 1H), 7.95-7.89 (m, 1H), 7.88-7.81 (m, 2H), 7.70 (t, *J* = 7.2 Hz, 2H), 7.60-7.46 (m, 7H), 7.41 (t, *J* = 8.0 Hz, 1H), 6.63 (dd, *J* = 15.6, 5.6 Hz, 1H), 6.25-6.21 (m, 1H), 2.35 (d, *J* = 4.0 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 138.5, 134.6, 134.4, 134.3, 133.8, 131.4, 131.0, 129.1, 128.9, 128.7, 128.4, 128.3, 126.5, 126.3, 126.0, 126.0, 125.8, 125.7, 124.4, 124.2, 124.0, 124.0, 72.6.

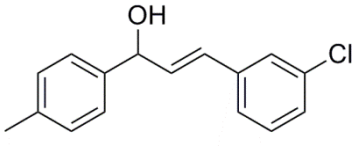
K. Itoh, T. Ikeda, S. Tazuke and T. Shibatal, *J. Phys. Chem.*, 1992, **96**, 5759–5765



1i

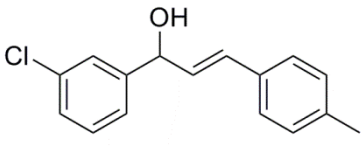
(*E*)-3-(4-chlorophenyl)-1-(p-tolyl)prop-2-en-1-ol (1i): 73% yield, white solid; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.33-7.23 (m, 6H), 7.18 (d, *J* = 8.0 Hz, 2H), 6.63 (d, *J* = 15.8 Hz, 1H), 6.35 (dd, *J* = 15.8, 6.2 Hz, 1H), 5.37-5.31 (m, 1H), 2.35 (s, 3H), 2.00 (d, *J* = 3.0 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 139.9, 138.0, 135.4, 133.5, 132.5, 129.6, 129.2, 128.9, 128.0, 126.5, 75.1, 21.4.

P. N. Chatterjee and S. Roy, *Tetrahedron*, 2012, **68**, 3776.



1j

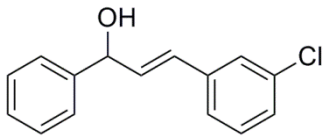
(*E*)-3-(3-chlorophenyl)-1-(p-tolyl)prop-2-en-1-ol (1j): 83% yield, colorless oil; IR (film) 3342, 1594, 1566, 1512, 1426 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.27 (s, 1H), 7.25-7.20 (m, 2H), 7.16-7.08 (m, 5H), 6.49 (d, *J* = 15.8 Hz, 1H), 6.31 (dd, *J* = 15.8, 6.2 Hz, 1H), 5.21 (d, *J* = 6.2 Hz, 1H), 2.98 (brs, 1H), 2.30 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 139.7, 138.7, 137.7, 134.5, 133.3, 129.8, 129.4, 128.7, 127.7, 126.6, 126.5, 124.9, 74.7, 21.3; HRMS (FT-ICRMS) calcd for $C_{16}H_{14}ClO$ (M-H): 257.0728, found: 257.0736.



1k

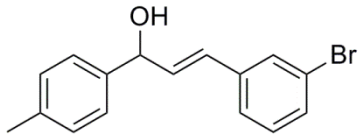
(*E*)-1-(3-chlorophenyl)-3-(p-tolyl)prop-2-en-1-ol (1k): 77% yield, colorless oil; IR (film) 3339, 1596, 1574, 1512, 1428, 1188 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.33 (s, 1H), 7.20-7.13 (m, 5H),

7.08-7.01 (m, 2H), 6.49 (d, J = 15.8 Hz, 1H), 6.14 (dd, J = 15.8, 6.8 Hz, 1H), 5.14 (d, J = 6.8 Hz, 1H), 3.27 (brs, 1H), 2.27 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.1, 137.9, 134.4, 133.5, 131.2, 129.9, 129.4, 127.7, 126.7, 126.5, 124.6, 74.5, 21.3; HRMS (FT-ICRMS) calcd for $C_{16}H_{14}ClO$ (M-H): 257.0728, found: 257.0736.



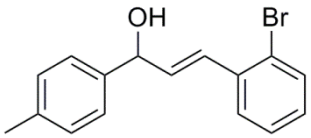
1l

(*E*)-3-(3-chlorophenyl)-1-phenylprop-2-en-1-ol (1l): 88%, colorless oil; IR (film) 3338, 1594, 1565, 1453, 1094, 1076 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.40-7.26 (m, 6H), 7.20-7.15 (m, 3H), 6.57 (d, J = 16.0 Hz, 1H), 6.33 (dd, J = 16.0, 6.4 Hz, 1H), 5.33-5.28 (m, 1H), 2.47 (brs, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 142.6, 138.6, 134.7, 133.2, 129.9, 129.1, 128.9, 128.1, 127.8, 126.7, 126.5, 125.0, 75.0; HRMS (FT-ICRMS) calcd for $C_{15}H_{12}ClO$ (M-H): 243.0571, found: 243.0578.



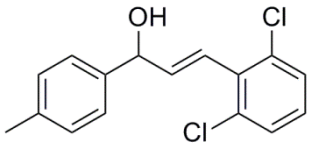
1m

(*E*)-3-(3-bromophenyl)-1-(p-tolyl)prop-2-en-1-ol (1m): 75% yield, white solid; IR (film) 3340, 1590, 1562, 1473, 1072 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.45 (s, 1H), 7.30 (d, J = 8.0 Hz, 1H), 7.26-7.18 (m, 3H), 7.16-7.05 (m, 3H), 6.50 (d, J = 16.0 Hz, 1H), 6.29 (dd, J = 16.0, 6.0 Hz, 1H), 5.24 (d, J = 6.0 Hz, 1H), 2.75 (brs, 1H), 2.31 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 139.7, 139.0, 137.7, 133.4, 130.6, 130.2, 129.5, 129.4, 128.6, 126.5, 125.4, 122.8, 74.7, 21.3; HRMS (FT-ICRMS) calcd for $C_{16}H_{14}BrO$ (M-H): 301.0222, found: 301.0231.



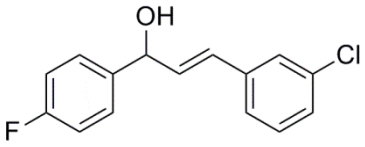
1n

(*E*)-3-(2-bromophenyl)-1-(p-tolyl)prop-2-en-1-ol (1n): 67% yield, white solid; IR (film) 3355, 1512, 1466, 1436, 1022 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.51 (d, *J* = 8.0 Hz, 1H), 7.45 (d, *J* = 8.0 Hz, 1H), 7.30 (d, *J* = 8.0 Hz, 2H), 7.23-7.13 (m, 3H), 7.10-6.98 (m, 2H), 6.28 (dd, *J* = 15.6, 6.4 Hz, 1H), 5.36-5.30 (m, 1H), 2.36 (d, *J* = 3.2 Hz, 1H), 2.33 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 139.7, 137.7, 136.7, 134.9, 133.1, 129.5, 129.1, 127.6, 127.4, 126.5, 125.6, 124.0, 75.0, 21.3; HRMS (FT-ICRMS) calcd for $C_{16}H_{14}BrO$ (M-H): 301.0222, found: 301.0232.



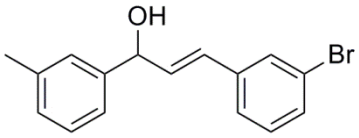
1o

(*E*)-3-(2,6-dichlorophenyl)-1-(p-tolyl)prop-2-en-1-ol (1o): 80% yield, white solid; IR (film) 3294, 1555, 1512, 1428, 1180, 1090 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.37 (d, *J* = 8.0 Hz, 2H), 7.30 (d, *J* = 8.0 Hz, 2H), 7.20 (d, *J* = 8.0 Hz, 2H), 7.09 (t, *J* = 8.0 Hz, 1H), 6.74 (d, *J* = 16.0 Hz, 1H), 6.42 (dd, *J* = 16.0, 5.6 Hz, 1H), 5.44-5.37 (m, 1H), 2.36 (s, 3H), 2.06 (d, *J* = 4.0 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 140.1, 139.4, 137.9, 134.7, 134.5, 129.6, 128.6, 128.4, 126.9, 124.0, 75.0, 21.4; HRMS (FT-ICRMS) calcd for $C_{16}H_{13}Cl_2O$ (M-H): 291.0338, found: 291.0336.



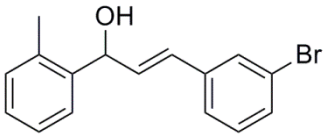
1p

(*E*)-3-(3-chlorophenyl)-1-(4-fluorophenyl)prop-2-en-1-ol (1p): 66% yield, colorless oil; IR (film) 3339, 1602, 1509, 1224, 1078 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ 7.36-7.28 (m, 3H), 7.20-7.13 (m, 3H), 7.06-6.93 (m, 2H), 6.53 (d, *J* = 16.0 Hz, 1H), 6.28 (dd, *J* = 16.0, 6.4 Hz, 1H), 5.28-5.24 (m, 1H), 2.80 (brs, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.4 (d, *J* = 244.0 Hz), 138.4, 138.3 (d, *J* = 3.0 Hz), 134.7, 132.9, 130.0, 129.3, 128.2 (d, *J* = 8.0 Hz), 128.0, 126.6, 125.0, 115.6 (d, *J* = 21.0 Hz), 74.3; HRMS (FT-ICRMS) calcd for $C_{15}H_{11}ClFO$ (M-H): 261.0477, found: 261.0485.



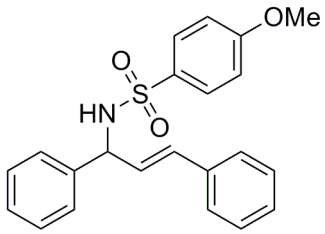
1q

(*E*)-3-(3-bromophenyl)-1-(m-tolyl)prop-2-en-1-ol (1q): 73% yield, colorless oil; IR (film) 3339, 1562, 1474, 1072 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ 7.53 (s, 1H), 7.37-7.31 (m, 1H), 7.29-7.10 (m, 6H), 6.61 (d, *J* = 15.6 Hz, 1H), 6.37 (dd, *J* = 15.6, 6.0 Hz, 1H), 5.35-5.31 (m, 1H), 2.36 (s, 3H), 2.09 (d, *J* = 3.4 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 142.6, 139.0, 138.7, 133.3, 130.8, 130.3, 129.6, 129.0, 128.9, 128.8, 127.2, 125.5, 123.6, 123.0, 75.1, 21.7; HRMS (FT-ICRMS) calcd for $C_{16}H_{14}BrO$ (M-H): 301.0222, found: 301.0231.



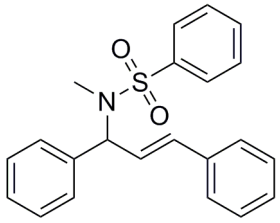
1r

(E)-3-(3-bromophenyl)-1-(o-tolyl)prop-2-en-1-ol (1r): 79% yield, colorless oil; IR (film) 3326, 1590, 1562, 1473, 1072 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ 7.52-7.46 (m, 2H), 7.37-7.31 (m, 1H), 7.29-7.11 (m, 5H), 6.56 (d, *J* = 16.0 Hz, 1H), 6.37 (dd, *J* = 16.0, 6.0 Hz, 1H), 5.58-5.48 (m, 1H), 2.37 (s, 3H), 2.06 (d, *J* = 3.4 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 140.5, 139.0, 135.5, 132.5, 130.9, 130.8, 130.3, 129.6, 129.1, 128.0, 126.7, 126.1, 125.4, 123.0, 71.8, 19.4; HRMS (FT-ICRMS) calcd for $C_{16}H_{14}BrO$ (M-H): 301.0222, found: 301.0231.

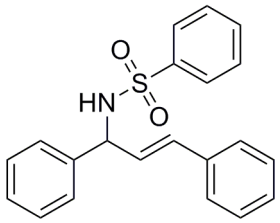


(*E*)-N-(1,3-diphenylallyl)-4-methoxybenzenesulfonamide(Table 1, entry 12): White solid; yield: 72%; $[\alpha]_D^{20}$-22.4 (*c* 0.82, CH_2Cl_2) (72% ee); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.69 (d,*J* = 8.8 Hz, 2H), 7.29-7.14 (m,10H), 6.78(d,*J* = 8.8 Hz, 2H), 6.35 (d, *J* = 15.6 Hz, 1H), 6.07 (dd, *J* = 15.6, 6.6 Hz, 1H), 5.17-5.05 (m,2H), 3.74 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.9, 139.8, 136.3, 132.5, 132.3, 129.6, 128.9, 128.7, 128.4, 128.1, 128.0, 127.3, 126.7, 114.2, 60.0, 55.7.

P. Trillo, A. Baeza and C. Nájera, *Eur. J. Org. Chem.*, 2012, 2929.

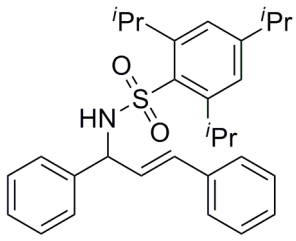


(*E*)-N-(1,3-diphenylallyl)-N-methylbenzenesulfonamide(Table 1, entry 13):Colorless oil; yield: 93%; $[\alpha]_D^{20}$-0.5 (*c*0.98, CH_2Cl_2) (2% ee); IR (film) 3060, 1447, 1339, 1164, 1088 cm^{-1};^{1}H NMR (400 MHz, $CDCl_3$) δ 7.83 (d,*J* = 8.6 Hz, 2H), 7.50-7.46 (m,1H), 7.45-7.38 (m,2H), 7.35-7.18 (m, 10H), 6.40 (d, *J* = 16.0 Hz, 1H), 6.16 (dd, *J* = 16.0, 7.4 Hz, 1H), 5.87 (d, *J* = 7.4 Hz, 1H), 2.71 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ139.7, 138.6, 136.3, 134.9, 132.6, 129.1, 128.8, 128.3, 128.1, 128.0, 127.6, 126.7, 124.2, 62.6, 30.4; HRMS (ESI) calcd for $C_{22}H_{21}NO_2SNa$ (M+Na): 386.1185, found: 386.1182.

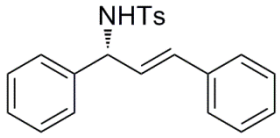


(*E*)-N-(1,3-diphenylallyl)benzenesulfonamide(Table 1, entry 14): White solid; yield: 78%; $[\alpha]_D^{20}$-19.9(*c*0.96, CH_2Cl_2) (72% ee); ^1H NMR (400 MHz, $CDCl_3$) δ 7.77 (d,*J* = 8.0 Hz, 2H), 7.48-7.42 (m,1H), 7.39-7.31 (m,2H), 7.29-7.13 (m, 10H), 6.38 (d, *J* = 15.8 Hz, 1H), 6.06 (dd, *J* = 15.8, 6.4 Hz, 1H), 5.19-5.08 (m,2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ140.9, 139.7, 136.2, 132.6, 132.4, 129.0, 128.9, 128.7, 128.4, 128.2, 128.1, 127.2, 126.7, 60.0.

G.-W. Wang, Y.-B. Shen and X.-L. Wu, *Eur. J. Org. Chem.*, 2008, 4367.



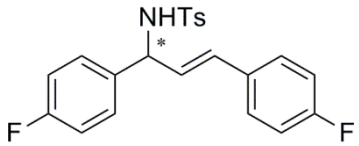
(*E*)-N-(1,3-diphenylallyl)-2,4,6-triisopropylbenzenesulfonamide(Table 1, entry 15): White solid; yield: 82%; m.p. 151-153 ºC;$[\alpha]_D^{20}$-22.4(*c*0.78, CH_2Cl_2) (84% ee); IR (film) 3300, 1600, 1455, 1425, 1321, 1151 cm^{-1};^1H NMR (400 MHz, $CDCl_3$) δ 7.28-7.21 (m,4H), 7.21-7.15 (m,4H), 7.15-7.10 (m,2H), 7.09 (s, 2H), 6.39 (d, *J* = 15.8 Hz, 1H), 6.10 (dd, *J* = 15.8, 6.6 Hz, 1H), 5.19 (dd, *J* = 6.6, 6.0 Hz, 1H), 4.75 (d, *J* = 6.0 Hz, 1H), 4.16-4.04 (m, 2H), 2.90-2.80 (m, 1H), 1.25 (s, 3H), 1.24 (s, 3H), 1.23 (s, 3H), 1.21 (s, 3H), 1.15 (s, 3H), 1.14 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ152.9, 150.1, 140.2, 136.3, 134.0, 132.2, 129.0, 128.7, 128.6, 128.2, 128.1, 127.4, 126.7, 123.8, 59.9, 34.3, 30.0, 25.2, 24.8, 23.8, 23.7; HRMS (ESI) calcd for $C_{30}H_{37}NO_2SNa$ (M+Na): 498.2437, found: 498.2432.



4a

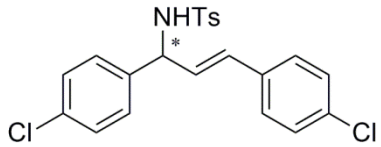
N-[1,3-diphenyl-(*E*)-2-propenyl]-4-methylbenzenesulfonamide (4a) (Table 2, entry 1): White solid; yield: 88%; $[\alpha]_D^{20}$ -23.2 (*c* 0.98, CH_2Cl_2) (75% ee) ($[\alpha]_D^{25}$ -31.4 (*c* 1.0, $CHCl_3$), 95% ee for *R*); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 (d, *J* = 8.2 Hz, 2H), 7.29-7.10 (m, 12H), 6.35 (d, *J* = 15.8 Hz, 1H), 6.07 (dd, *J* = 15.8, 6.8 Hz, 1H), 5.11 (dd, *J* = 7.0, 6.8 Hz, 1H), 4.97 (d, *J* = 7.0 Hz, 1H), 2.32 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.5, 139.9, 138.0, 136.3, 132.4, 129.7, 129.0, 128.7, 128.4, 128.1, 128.0, 127.6, 127.3, 126.7, 60.0, 21.6.

Bower, J. F., Jumnah,R., Williams, A. C. and Williams, J. M. J. *J. Chem. Soc., Perkin Trans. 1*, **1997**, 1411-1420.



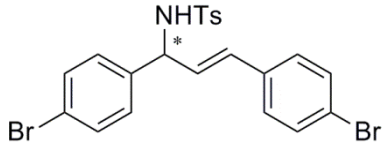
4b

(*E*)-N-(1,3-bis(4-fluorophenyl)allyl)-4-methylbenzenesulfonamide (4b) (Table 2, entry 2): White solid; yield: 82%; m.p. 137-139 ºC; $[\alpha]_D^{20}$ -20.4 (*c* 1.04, CH_2Cl_2) (70% ee); IR (film) 3269, 1601, 1509, 1158 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (d, *J* = 8.2 Hz, 2H), 7.20-7.08 (m, 6H), 6.96-6.84 (m, 4H), 6.28 (d, *J* = 15.8 Hz, 1H), 5.98 (dd, *J* = 15.8, 6.8 Hz, 1H), 5.69 (d, *J* = 7.6 Hz, 1H), 5.07 (dd, *J* = 7.6, 6.8 Hz, 1H), 2.31 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.6 (d, *J* = 246.0 Hz), 162.4 (d, *J* = 245.0 Hz), 143.4, 137.8, 135.6 (d, *J* = 3 Hz), 132.3 (d, *J* = 4 Hz), 131.1, 129.6, 129.0 (d, *J* = 8 Hz), 128.3 (d, *J* = 8 Hz), 127.9, 127.4, 115.7 (d, *J* = 9 Hz), 115.5 (d, *J* = 10 Hz), 59.2, 21.5; HRMS (FT-ICRMS) calcd for $C_{22}H_{19}F_2NO_2SNa$ (M+Na): 422.0997, found: 422.0992.



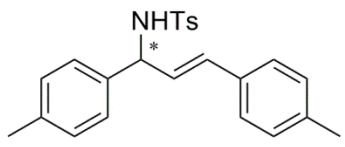
4c

(*E*)-N-(1,3-bis(4-chlorophenyl)allyl)-4-methylbenzenesulfonamide (4c) (Table 2, entry 3): White solid; yield: 61%; m.p. 170-172 ºC; $[\alpha]_D^{20}$-11.5 (*c* 1.00, CH_2Cl_2) (85% ee); IR (film) 3270, 1490, 1324, 1159 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ 7.62 (d, *J* = 8.2 Hz, 2H), 7.23-7.03 (m, 10H), 6.26 (d, *J* = 15.8 Hz, 1H), 6.02 (dd, *J* = 15.8, 6.6 Hz, 1H), 5.66-5.60 (m, 1H), 5.07-5.02 (m, 1H), 2.32 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.7, 138.1, 137.7, 134.6, 133.9, 133.8, 131.3, 129.7, 129.0, 128.8, 128.7, 128.5, 127.9, 127.4, 59.3, 21.6; HRMS (FT-ICRMS) calcd for $C_{22}H_{19}Cl_2NO_2SNa$ (M+Na): 454.0406, found: 454.0400.



4d

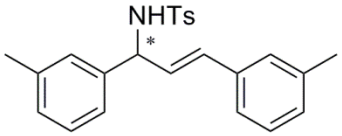
(*E*)-N-(1,3-bis(4-bromophenyl)allyl)-4-methylbenzenesulfonamide (4d) (Table 2, entry 4): White solid; yield: 60%; m.p. 203-204 ºC; $[\alpha]_D^{20}$ -8.3 (*c* 0.96, CH_2Cl_2) (86% ee); IR (film) 3261, 1487, 1321, 1158 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ 7.60 (d, *J* = 8.4 Hz, 2H), 7.40-7.30 (m, 4H), 7.14 (d, *J* = 8.0 Hz, 2H), 7.03 (d, *J* = 8.4 Hz, 4H), 6.27 (d, *J* = 15.8 Hz, 1H), 6.04 (dd, *J* = 15.8, 6.8 Hz, 1H), 5.26 (d, *J* = 7.2 Hz, 1H), 5.05 (dd, *J* = 7.2, 6.8 Hz, 1H), 2.35 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.8, 138.5, 137.7, 135.0, 132.0, 131.9, 131.6, 129.7, 129.0, 128.6, 128.3, 127.5, 122.2, 59.3, 21.7; HRMS (FT-ICRMS) calcd for $C_{22}H_{19}Br_2NO_2SNa$ (M+Na): 541.9400, found: 541.9390.



4e

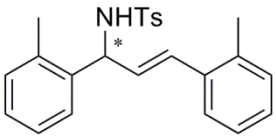
(*E*)-N-(1,3-di-p-tolylallyl)-4-methylbenzenesulfonamide (4e) (Table 2, entry 5): White solid;

yield: 77%; m.p. 121-123 ºC; $[\alpha]_D^{20}$ -16.5 (*c* 1.00, CH_2Cl_2) (66% ee); IR (film) 3273, 1512, 1434, 1324, 1159 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ 7.70 (d, *J* = 8.2 Hz, 2H), 7.19 (d, *J* = 8.0 Hz, 2H), 7.19-7.05 (m, 8H), 6.35 (d, *J* = 15.8 Hz, 1H), 6.06 (dd, *J* = 15.8, 6.4 Hz, 1H), 5.11 (dd, *J* = 7.2, 6.4 Hz, 1H), 5.05 (d, *J* = 7.2 Hz, 1H), 2.38 (s, 3H), 2.36 (s, 3H), 2.35 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.3, 138.0, 137.9, 137.8, 137.1, 133.6, 132.0, 129.6, 129.5, 129.3, 127.5, 127.2, 126.6, 59.8, 21.6, 21.4, 21.2; HRMS (FT-ICRMS) calcd for $C_{24}H_{25}NO_2SNa$ (M+Na): 414.1498, found: 414.1492.



4f

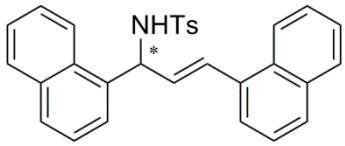
(*E*)-N-(1,3-di-m-tolylallyl)-4-methylbenzenesulfonamide (4f) (Table 2, entry 6): White solid; yield: 80%; m.p. 142-144 ºC; $[\alpha]_D^{20}$ -19.7 (*c* 0.89, CH_2Cl_2) (62% ee); IR (film) 3274, 1605, 1326, 1159, 1092 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ 7.66 (d, *J* = 7.2 Hz, 2H), 7.18-7.10 (m, 4H), 7.07-6.90 (m, 6H), 6.33 (d, *J* = 16.0 Hz, 1H), 6.06 (dd, *J* = 16.0, 6.4 Hz, 1H), 5.07 (dd, *J* = 6.4, 6.4 Hz, 1H), 4.96 (brs, 1H), 2.34 (s, 3H), 2.31 (s, 3H), 2.25 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.4, 139.8, 138.6, 138.2, 138.1, 136.3, 132.3, 129.6, 128.8, 128.7, 128.6, 128.5, 128.3, 128.0, 127.6, 127.4, 124.3, 123.9, 60.0, 21.6, 21.5, 21.4; HRMS (FT-ICRMS) calcd for $C_{24}H_{25}NO_2SNa$ (M+Na): 414.1498, found: 414.1492.



4g

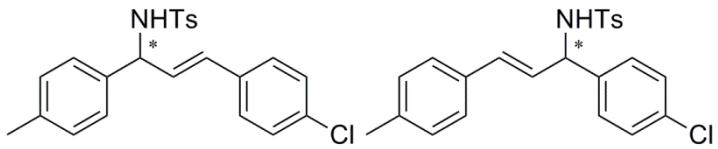
(*E*)-N-(1,3-di-o-tolylallyl)-4-methylbenzenesulfonamide (4g) (Table 2, entry 7): White solid; yield: 80%; m.p. 103-104 ºC; $[\alpha]_D^{20}$ -7.5 (*c* 0.93, CH_2Cl_2) (22% ee); IR (film) 3275, 1603, 1489, 1459, 1325, 1159, 1092 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ 7.66 (d, *J* = 8.2 Hz, 2H), 7.26-7.04 (m,

10H), 6.54 (d, *J* = 15.6 Hz, 1H), 5.99 (dd, *J* = 15.6, 6.4 Hz, 1H), 5.38 (dd, *J* = 7.2, 6.4 Hz, 1H), 5.30 (d, *J* = 7.2 Hz, 1H), 2.33 (s, 6H), 2.18 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.3, 138.0, 137.9, 135.7, 135.6, 135.4, 130.9, 130.3, 129.9, 129.6, 129.5, 127.9, 127.8, 127.3, 127.0, 126.5, 126.1, 125.9, 56.7, 21.6, 19.8, 19.4; HRMS (FT-ICRMS) calcd for $C_{24}H_{25}NO_2SNa$ (M+Na): 414.1498, found: 414.1494.



4h

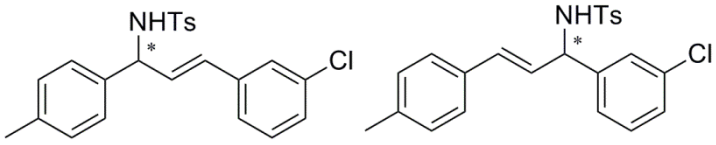
(*E*)-N-(1,3-di(naphthalen-1-yl)allyl)-4-methylbenzenesulfonamide (4h) (Table 2, entry 8): White solid; yield: 63%; m.p. 76-78 ºC; $[\alpha]_D^{20}$ -0.8 (*c* 0.80, CH_2Cl_2) (18% ee); IR (film) 3274, 1597, 1510, 1326, 1157, 1091 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.16 (d, *J* = 6.8 Hz, 1H), 7.88-7.72 (m, 5H), 7.66 (d, *J* = 8.2 Hz, 2H), 7.54-7.30 (m, 8H), 7.24 (d, *J* = 15.0 Hz, 1H), 7.02 (d, *J* = 8.0 Hz, 2H), 6.37 (dd, *J* = 15.8, 6.0 Hz, 1H), 6.02 (dd, *J* = 7.2, 6.0 Hz, 1H), 5.44 (d, *J* = 7.2 Hz, 1H), 2.24 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.4, 137.9, 135.4, 134.2, 134.1, 133.7, 131.6, 131.2, 130.7, 129.9, 129.5, 129.1, 129.0, 128.6, 128.4, 127.4, 126.8, 126.3, 126.1, 126.0, 125.8, 125.6, 125.4, 124.1, 123.9, 123.6, 57.0, 21.5; HRMS (FT-ICRMS) calcd for $C_{30}H_{25}NO_2SNa$ (M+Na): 486.1498, found: 486.1493.



4i **4i'**

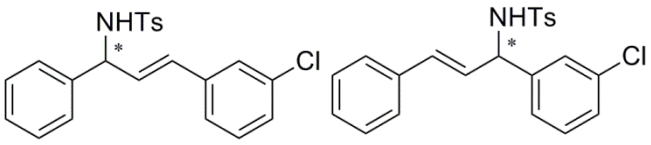
(*E*)-N-(3-(4-cholophenyl)-1-(p-tolyl)allyl)-4-methylbenzenesulfonamide (4i) and (*E*)-N-(1-(4-chlorophenyl)-3-(p-tolyl)allyl)-4-methylbenzenesulfonamide (4i') (Table 3, entry 1): White

solid; yield: 68%; m.p. 144-146 ºC; $[\alpha]_D^{20}$ -17.1 (*c* 1.01, CH_2Cl_2) (**4i**/**4i'** = 4.3:1, major product **4i** 82% ee, minor product **4i'** 69% ee); IR (film) 3271, 1511, 1492, 1325, 1159, 1090 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) for major product 4i: δ 7.64 (d, *J* = 7.8 Hz, 2H), 7.18 (d, *J* = 7.8 Hz, 2H), 7.15-7.01 (m, 8H), 6.29 (d, *J* = 15.8 Hz, 1H), 6.04 (dd, *J* = 15.8, 6.2 Hz, 1H), 5.42 (d, *J* = 6.8 Hz, 1H), 5.03 (dd, *J* = 6.8, 6.2 Hz, 1H), 2.30 (s, 3H), 2.27 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) for major product **4i**: δ 143.4, 137.9, 137.8, 136.6, 134.9, 133.5, 130.6, 130.0, 129.4, 128.7, 127.9, 127.5, 127.1, 126.6, 59.7, 21.6, 21.2; HRMS (FT-ICRMS) calcd for $C_{23}H_{22}NO_2ClSNa$ (M+Na): 434.0952, found: 434.0944.



4j **4j'**

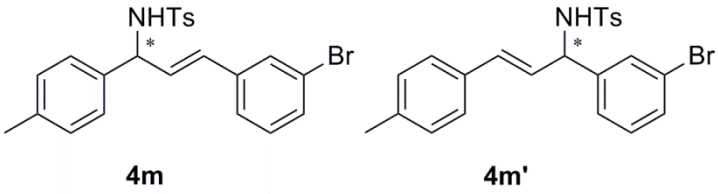
(*E*)-N-(3-(m-chlorophenyl)-1-(p-tolyl)allyl)-4-methylbenzenesulfonamide (4j) and (*E*)-N-(1-(m-chlorophenyl)-3-(p-tolyl)allyl)-4-methylbenzenesulfonamide (4j') (Table 3, entry 2): White solid; yield: 70%; m.p. 152-154 ºC; $[\alpha]_D^{20}$ -18.3 (*c* 1.01, CH_2Cl_2) (**4j**/**4j'** = 8:1, major product **4j** 66% ee); IR (film) 3270, 1595, 1430, 1324, 1158, 1092 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) for major product **4j**: δ 7.66 (d, *J* = 7.6 Hz, 2H), 7.20-7.12 (m, 4H), 7.11-7.00 (m, 6H), 6.27 (d, *J* = 15.8 Hz, 1H), 6.05 (dd, *J* = 15.8, 6.4 Hz, 1H), 5.27-5.21 (m, 1H), 5.05 (dd, *J* = 6.4, 6.4 Hz, 1H), 2.33 (s, 3H), 2.28 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) for major product **4j**: δ 143.5, 138.3, 138.0, 136.5, 134.5, 130.6, 130.2, 129.8, 129.6, 127.9, 127.5, 127.1, 126.6, 125.0, 59.6, 21.6, 21.2; HRMS (FT-ICRMS) calcd for $C_{23}H_{22}NO_2ClSNa$ (M+Na): 434.0952, found: 434.0948.



4l **4l'**

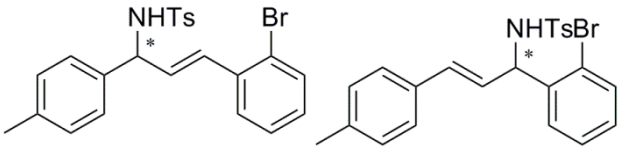
(*E*)-N-(3-(3-chlorophenyl)-1-phenylallyl)-4-methylbenzenesulfonamide (4l) and (*E*)-N-(1-(3-

chlorophenyl)-3-phenylallyl)-4-methylbenzenesulfonamide (4l') (Table 3, entry 4): White solid; yield: 56%; m.p. 123-125 ºC; $[\alpha]_D^{20}$ -17.9 (*c* 0.98, CH_2Cl_2) (**4l/4l'** = 3.5:1, major product **4l** 67% ee, minor product **4l'** 58% ee); IR (film) 3269, 1596, 1325, 1159, 1092 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) for major product **4l**: δ 7.65 (d, *J* = 8.2 Hz, 2H), 7.26-7.20 (m, 3H), 7.20-7.10 (m, 6H), 7.10-7.06 (m, 1H), 7.05-7.00 (m, 1H), 6.28 (d, *J* = 16.0 Hz, 1H), 6.06 (dd, *J* = 16.0, 6.8 Hz, 1H), 5.34 (d, *J* = 7.4 Hz, 1H), 5.08 (dd, *J* = 7.4, 6.8 Hz, 1H), 2.32 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) for major product **4l**: δ 143.6, 139.5, 138.2, 137.9, 134.6, 130.8, 130.0, 129.9, 129.7, 129.0, 128.2, 127.9, 127.5, 127.2, 126.6, 125.0, 59.8, 21.6; HRMS (FT-ICRMS) calcd for $C_{22}H_{20}NO_2ClSNa$ (M+Na): 420.0796, found: 420.0791.



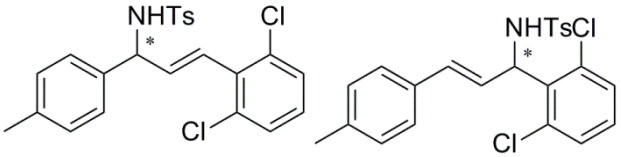
4m 4m'

(*E*)-N-(3-(3-bromophenyl)-1-(p-tolyl)allyl)-4-methylbenzenesulfonamide (4m) and (*E*)-N-(1-(3-bromophenyl)-3-(p-tolyl)allyl)-4-methylbenzenesulfonamide (4m') (Table 3, entry 5): White solid; yield: 87%; m.p. 153-155 ºC; $[\alpha]_D^{20}$ -17.9 (*c* 0.98, CH_2Cl_2) (**4m**/**4m'** = 6.7:1, major product **4m** 76% ee, minor product **4m'** 70% ee); IR (film) 3269, 1594, 1324, 1158, 1092 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) for major product **4m**: δ 7.66 (d, *J* = 8.2 Hz, 2H), 7.30 (d, *J* = 7.2 Hz, 1H), 7.26-7.20 (m, 1H), 7.14 (d, *J* = 8.2 Hz, 2H), 7.11-7.00 (m, 6H), 6.26 (d, *J* = 15.8 Hz, 1H), 6.04 (dd, *J* = 15.8, 6.6 Hz, 1H), 5.36-5.20 (m, 1H), 5.05 (dd, *J* = 6.8, 6.6 Hz, 1H), 2.33 (s, 3H), 2.28 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) for major product **4m**: δ 143.5, 138.5, 138.0, 136.5, 130.8, 130.5, 130.2, 130.1, 129.6, 129.5, 127.5, 127.1, 125.4, 122.7, 59.6, 21.6, 21.2; HRMS (FT-ICRMS) calcd for $C_{23}H_{22}NO_2BrSNa$ (M+Na): 478.0447, found: 478.0441.



4n **4n'**

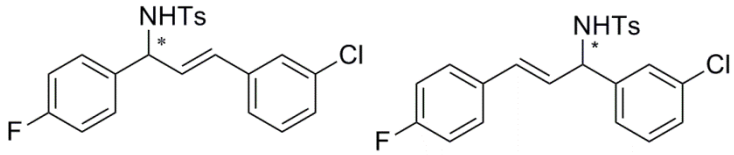
(*E*)-N-(3-(o-bromophenyl)-1-(p-tolyl)allyl)-4-methylbenzenesulfonamide (4n) and (*E*)-N-(1-(o-bromophenyl)-3-(p-tolyl)allyl)-4-methylbenzenesulfonamide (4n') (Table 3, entry 6): White solid; yield: 87%; m.p. 115-116 ºC; $[\alpha]_D^{20}$ 1.3 (*c* 1.10, CH_2Cl_2) (**4n**/**4n'** = 3:1, major product **4n** 13% ee, minor product **4n'** 94% ee); IR (film) 3271, 1600, 1512, 1436, 1325, 1159, 1092 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) for major product **4n**: δ 7.69 (d, *J* = 7.6 Hz, 2H), 7.48 (d, *J* = 7.8 Hz, 1H), 7.42-7.01 (m, 9H), 6.69 (d, *J* = 15.8 Hz, 1H), 6.01 (dd, *J* = 15.8, 7.0 Hz, 1H), 5.46-5.41 (m, 1H), 5.06 (dd, *J* = 7.0, 6.8 Hz, 1H), 2.32-2.24 (m, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) for major product **4n**: δ 143.4, 138.0, 136.6, 136.2, 132.9, 131.5, 130.7, 129.6, 129.4, 129.3, 129.2, 127.4, 127.3, 127.1, 126.6, 123.8, 59.7, 21.5, 21.2; HRMS (FT-ICRMS) calcd for $C_{23}H_{22}NO_2BrSNa$ (M+Na): 478.0447, found: 478.0441.



4o **4o'**

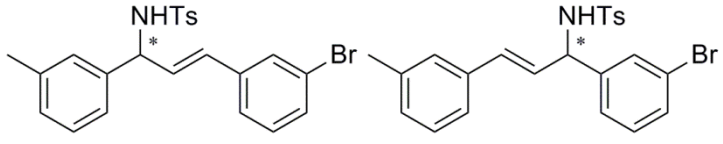
(*E*)-N-(3-(2,6-dichlorophenyl)-1-(p-tolyl)allyl)-4-methylbenzenesulfonamide (4o) and (*E*)-N-(1-(2,6-dichlorophenyl)-3-(p-tolyl)allyl)-4-methylbenzenesulfonamide (4o') (Table 3, entry 7): White solid; yield: 16%; m.p. 164-165 ºC; $[\alpha]_D^{20}$ 1.8 (*c* 0.71, CH_2Cl_2) (**4o**/**4o'** > 20:1, major product **4o** 60% ee); IR (film) 3274, 1557, 1428, 1324, 1159, 1092 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) for major product **4o**: δ 7.76 (d, *J* = 8.2 Hz, 2H), 7.33-7.28 (m, 2H), 7.24 (d, *J* = 8.0 Hz, 2H), 7.18 (d, *J* = 8.0 Hz, 2H), 7.14-7.05 (m, 3H), 6.50 (d, *J* = 16.2 Hz, 1H), 6.28 (dd, *J* = 16.2, 6.0 Hz, 1H), 5.18 (dd, *J* = 7.2, 6.0 Hz, 1H), 5.01 (d, *J* = 7.2 Hz, 1H), 2.41 (s, 3H), 2.35 (s, 3H); ^{13}C NMR (100 MHz,

$CDCl_3$) for major product **4o**: δ 143.5, 138.0, 137.9, 137.1, 136.5, 134.6, 133.9, 129.7, 129.6, 128.6, 127.5, 127.4, 125.8, 59.6, 21.7, 21.3; HRMS (FT-ICRMS) calcd for $C_{23}H_{21}NO_2Cl_2SNa$ (M+Na): 468.0562, found: 468.0556.



4p **4p'**

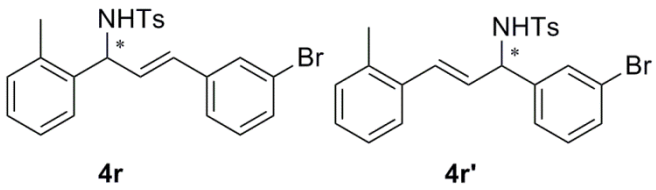
(*E*)-N-(3-(3-chlorophenyl)-1-(4-fluorophenyl)allyl)-4-methylbenzenesulfonamide (4p) and (*E*)-N-(1-(3-chlorophenyl)-1-(3-fluorophenyl)allyl)-4-methylbenzenesul-fonamide (4p') (Table 3, entry 8): White solid; yield: 63%; m.p. 131-133 ºC; $[\alpha]_D^{20}$ -17.9 (*c* 0.98, CH_2Cl_2) (**4p**/**4p'** = 3:1, major product **4p** 59% ee, minor product **4p'** 73% ee); IR (film) 3268, 1598, 1509, 1327, 1226, 1159, 1092cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) for major product **4p**: δ 7.61 (d, *J* = 8.6 Hz, 2H), 7.27-7.00 (m, 8H), 6.98-6.87 (m, 2H), 6.25 (d, *J* = 15.8 Hz, 1H), 6.04 (dd, *J* = 15.8, 6.8 Hz, 1H), 5.41 (d, *J* = 7.4 Hz, 1H), 5.09 (dd, *J* = 7.4, 6.8 Hz, 1H), 2.34 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) for major product **4p**: δ 162.5 (d, *J* = 245 Hz), 143.8, 137.9 (d, *J* = 17 Hz), 135.3 (d, *J* = 3 Hz), 134.6, 131.1, 129.9, 129.7, 129.6 (d, *J* = 6 Hz), 129.0 (d, *J* = 8 Hz), 128.1, 127.5, 127.4, 126.6, 125.0, 115.8 (d, *J* = 17 Hz), 59.1, 21.6; HRMS (FT-ICRMS) calcd for $C_{22}H_{19}NO_2ClFSNa$ (M+Na): 438.0707, found: 438.0695.



4q **4q'**

(*E*)-N-(3-(3-bromophenyl)-1-(m-tolyl)allyl)-4-methylbenzenesulfonamide (4q) and (*E*)-N-(1-

(3-bromophenyl)-3-(m-tolyl)allyl)-4-methylbenzenesulfonamide (4q') (Table 3, entry 9): White solid; yield: 64%; m.p. 136-138 ºC; $[\alpha]_D^{20}$ -19.2 (*c* 0.96, CH_2Cl_2) (**4q**/**4q'** = 6.9:1, major product **4q** 76%, minor product **4q'** 53% ee); IR (film) 3270, 1594, 1562, 1426, 1327, 1159, 1092 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) for major product **4q**: δ 7.65 (d, *J* = 8.2 Hz, 2H), 7.31 (d, *J* = 7.2 Hz, 1H), 7.26-7.22 (m, 1H), 7.16-7.06 (m, 5H), 7.01 (d, *J* = 7.4 Hz, 1H), 6.96 (d, *J* = 7.6 Hz, 1H), 6.92 (s, 1H), 6.27 (d, *J* = 15.8 Hz, 1H), 6.04 (dd, *J* = 15.8, 6.6 Hz, 1H), 5.37 (d, *J* = 7.2 Hz, 1H), 5.05 (dd, *J* = 7.2, 6.6 Hz, 1H), 2.33 (s, 3H), 2.22 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) for major product **4q**: δ 143.5, 139.3, 138.7, 138.5, 137.9, 130.8, 130.5, 130.1, 129.6, 129.5, 128.9, 127.9, 127.5, 125.4, 124.2, 122.7, 59.8, 21.6, 21.5; HRMS (FT-ICRMS) calcd for $C_{23}H_{22}NO_2BrSNa$ (M+Na): 478.0447, found: 478.0441.

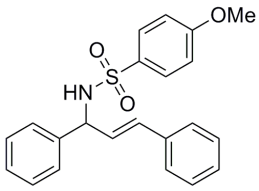


4r **4r'**

(*E*)-N-(3-(3-bromophenyl)-1-(o-tolyl)allyl)-4-methylbenzenesulfonamide (4r) and (*E*)-N-(1-(3-bromophenyl)-3-(o-tolyl)allyl)-4-methylbenzenesulfonamide (4r') (Table 3, entry 10): White solid; yield: 52%; m.p. 137-138 ºC; $[\alpha]_D^{20}$ -20.1 (*c* 0.81, CH_2Cl_2) (**4r**/**4r'** = 3.8:1, major product **4r** 71% ee, minor product **4r'** 55% ee); IR (film) 3273, 1594, 1324, 1158, 1092 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) for major product **4r**: δ 7.63 (d, *J* = 8.0 Hz, 2H), 7.30 (d, *J* = 7.6 Hz, 1H), 7.23-7.01 (m, 9H), 6.18 (d, *J* = 15.8 Hz, 1H), 6.07 (dd, *J* = 15.8, 5.2 Hz, 1H), 5.38-5.25 (m, 2H), 2.33 (s, 3H), 2.28 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) for major product **4r**: δ 143.5, 138.5, 137.9, 137.4, 135.7, 131.0, 130.8, 130.4, 130.1, 129.8, 129.6, 129.5, 128.0, 137.4, 127.0, 126.6, 125.4, 122.7, 56.3, 21.6, 19.4; HRMS (FT-ICRMS) calcd for $C_{23}H_{22}NO_2BrSNa$ (M+Na): 478.0447, found: 478.0441.

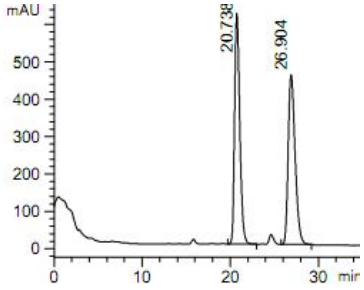
The chromatograms for determination of the enantiomeric excess

Table 1, entry 12



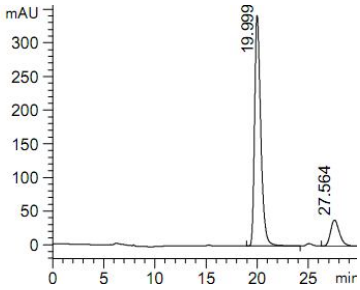
HPLC Conditions:Column: ChiralcelOD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (75/25); **Flow rate:**0.5 mL/min; **Detection:** UV 254 nm

Racemic



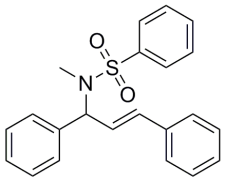
Peak #	RT [min]	Area %	Area
1	20.738	50.356	2.526e4
2	26.904	49.644	2.490e4

Chiral



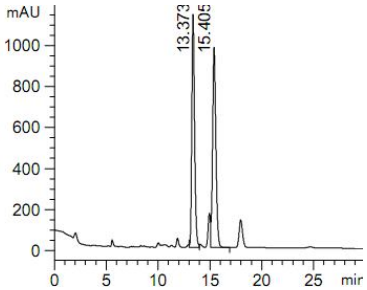
Peak #	RT [min]	Area %	Area
1	19.999	85.981	1.442e4
2	27.564	14.019	2.351e3

Table 1, entry 13



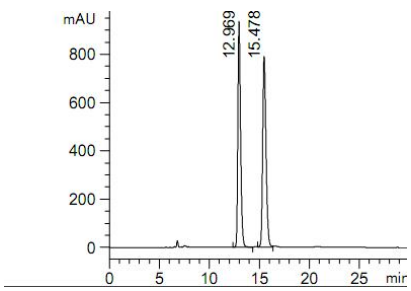
HPLC Conditions:Column: ChiralcelOD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (75/25); **Flow rate:**0.5 mL/min; **Detection:** UV 254 nm

Racemic



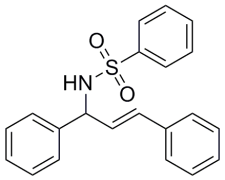
Peak #	RT [min]	Area %	Area
1	13.373	49.522	2.131e4
2	15.405	50.478	2.172e4

Chiral



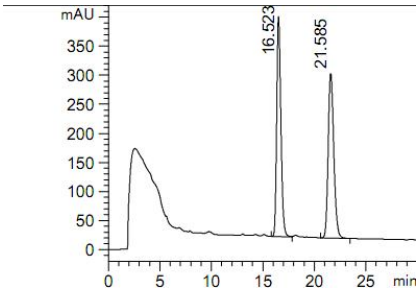
Peak #	RT [min]	Area %	Area
1	12.969	49.143	1.787e4
2	15.478	50.857	1.849e4

Table 1, entry 14



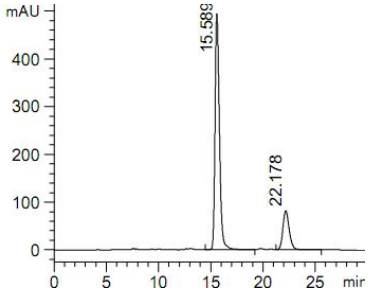
HPLC Conditions:Column: ChiralcelOD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (75/25); **Flow rate:**0.5 mL/min; **Detection:** UV 254 nm

Racemic



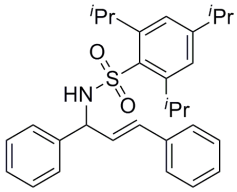
Peak #	RT [min]	Area %	Area
1	16.523	49.928	1.068e4
2	21.585	50.072	1.071e4

Chiral



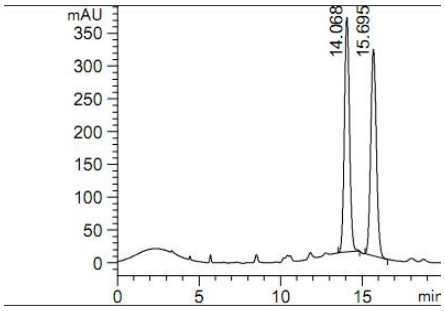
Peak #	RT [min]	Area %	Area
1	15.589	80.622	1.446e4
2	22.178	19.378	3.475e3

Table 1, entry 15



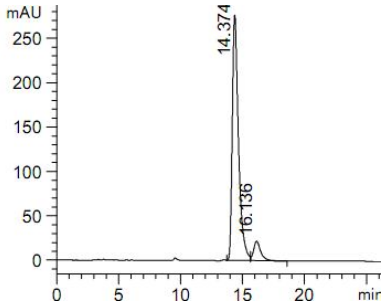
HPLC Conditions:Column: ChiralpakAD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (98/2); **Flow rate:**1 mL/min; **Detection:** UV 254 nm

Racemic



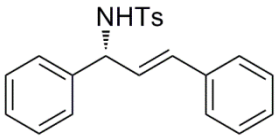
Peak #	RT [min]	Area %	Area
1	14.068	50.668	7.800e3
2	15.695	49.332	7.594e3

Chiral



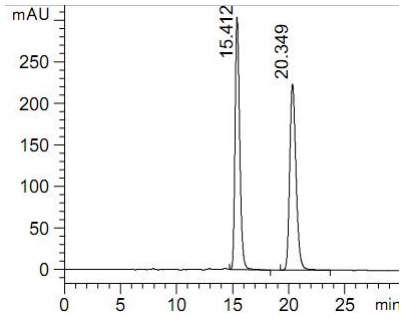
Peak #	RT [min]	Area %	Area
1	14.374	91.723	9.598e3
2	16.136	8.277	866.113

Table 2, entry 1



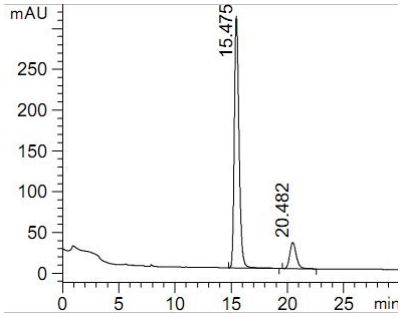
HPLC Conditions: Column: Chiralcel OD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (75/25); **Flow rate:** 0.5 mL/min; **Detection:** UV 254 nm

Racemic



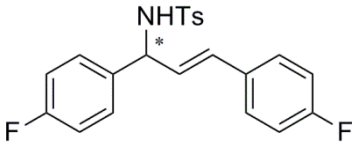
Peak #	RT [min]	Area %	Area
1	15.412	49.853	8.718e3
2	20.349	50.147	8.769e3

Chiral



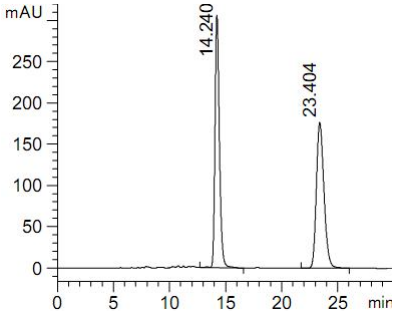
Peak #	RT [min]	Area %	Area
1	15.475	87.611	8.964e3
2	20.482	12.389	1.268e3

Table 2, entry 2



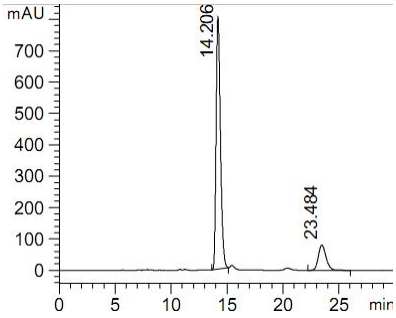
HPLC Conditions: Column: Chiralcel OD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (75/25); **Flow rate:** 0.5 mL/min; **Detection:** UV 254 nm

Racemic



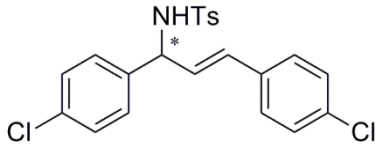
Peak #	RT [min]	Area %	Area
1	14.240	50.330	8.410e3
2	23.404	49.670	8.300e3

Chiral



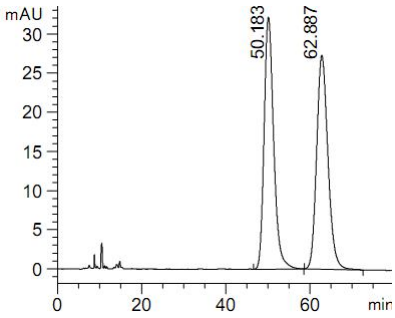
Peak #	RT [min]	Area %	Area
1	14.206	85.018	2.166e4
2	23.484	14.982	3.816e3

Table 2, entry 3



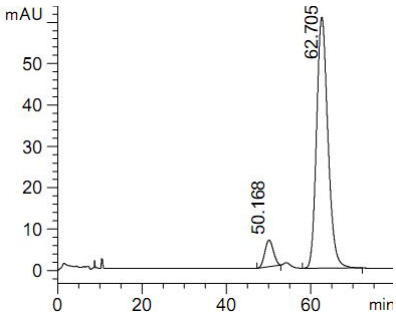
HPLC Conditions: Column: Chiralcel AS-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (75/25); **Flow rate:** 0.5 mL/min; **Detection:** UV 254 nm

Racemic



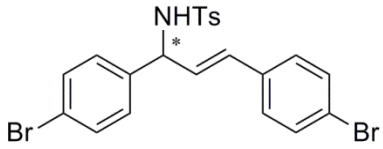
Peak #	RT [min]	Area %	Area
1	50.183	49.972	5.088e3
2	62.887	50.028	5.093e3

Chiral



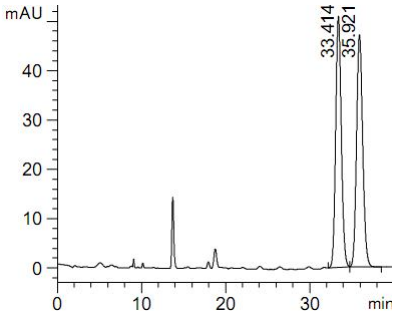
Peak #	RT [min]	Area %	Area
1	50.168	7.405	908.085
2	62.705	92.595	1.135e4

Table 2, entry 4



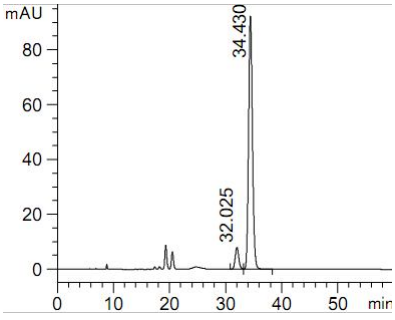
HPLC Conditions: Column: Chiralpak AD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (75/25); **Flow rate:** 0.5 mL/min; **Detection:** UV 254 nm

Racemic



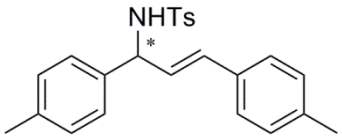
Peak #	RT [min]	Area %	Area
1	33.414	49.718	2.360e3
2	35.921	50.282	2.387e3

Chiral



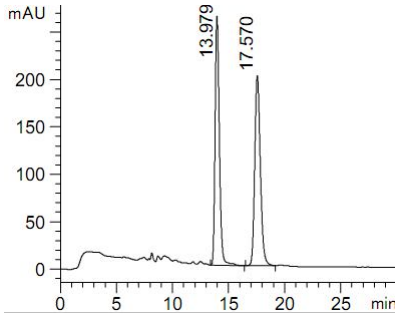
Peak #	RT [min]	Area %	Area
1	32.025	7.267	346.470
2	34.430	92.733	4.421e3

Table 2, entry 5



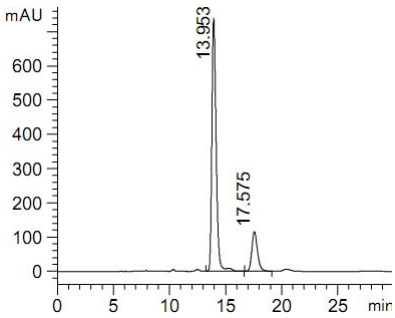
HPLC Conditions: Column: Chiralcel OD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (75/25); **Flow rate:** 0.5 mL/min; **Detection:** UV 254 nm

Racemic



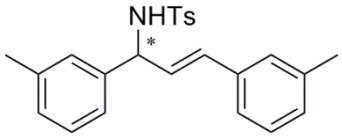
Peak #	RT [min]	Area %	Area
1	13.979	50.074	6.984e3
2	17.570	49.926	6.964e3

Chiral



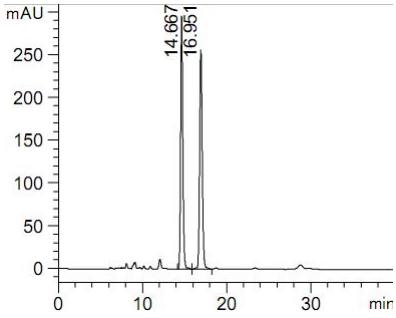
Peak #	RT [min]	Area %	Area
1	13.953	82.930	1.966e4
2	17.575	17.070	4.046e3

Table 2, entry 6



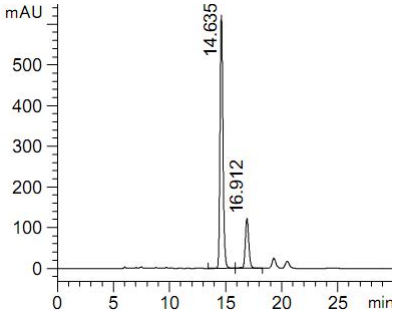
HPLC Conditions: Column: Chiralpak AD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (75/25); **Flow rate:** 1.0 mL/min; **Detection:** UV 254 nm

Racemic



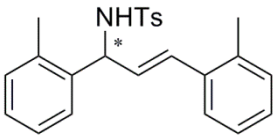
Peak #	RT [min]	Area %	Area
1	14.667	49.488	5.382e3
2	16.951	50.512	5.494e3

Chiral



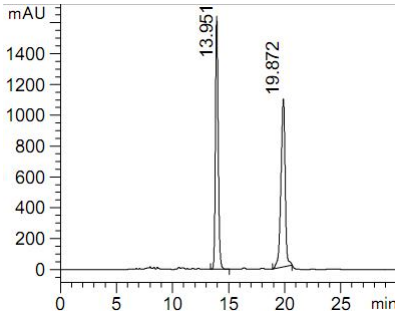
Peak #	RT [min]	Area %	Area
1	14.635	81.030	1.128e4
2	16.912	18.970	2.641e3

Table 2, entry 7



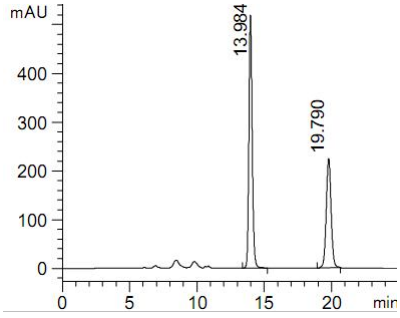
HPLC Conditions: Column: Chiralpak AD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (75/25); **Flow rate:** 1.0 mL/min; **Detection:** UV 254 nm

Racemic



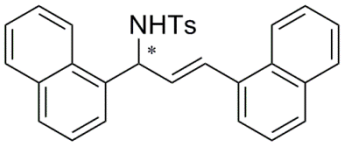
Peak #	RT [min]	Area %	Area
1	13.951	49.673	2.813e4
2	19.872	50.327	2.850e4

Chiral



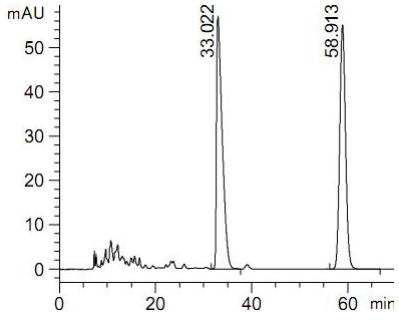
Peak #	RT [min]	Area %	Area
1	13.984	61.201	8.865e3
2	19.790	38.799	5.620e3

Table 2, entry 8



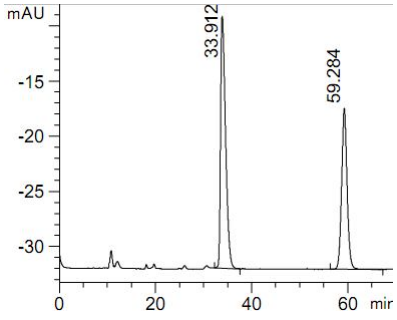
HPLC Conditions: Column: Chiralpak AD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (75/25); **Flow rate:** 0.5 mL/min; **Detection:** UV 310 nm

Racemic



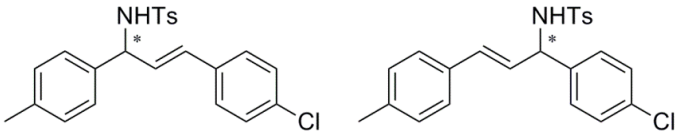
Peak #	RT [min]	Area %	Area
1	33.022	50.184	4.697e3
2	58.913	49.816	4.663e3

Chiral



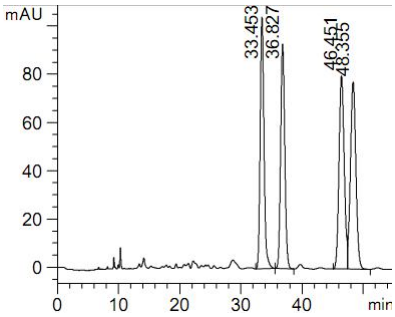
Peak #	RT [min]	Area %	Area
1	33.912	58.813	1.646e3
2	59.284	41.187	1.152e3

Table 3, entry 1



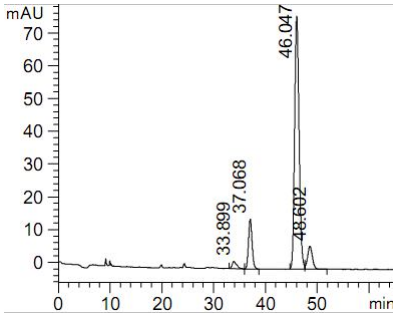
HPLC Conditions: Column: Chiralpak AD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (85/15); **Flow rate:** 0.5 mL/min; **Detection:** UV 254 nm

Racemic



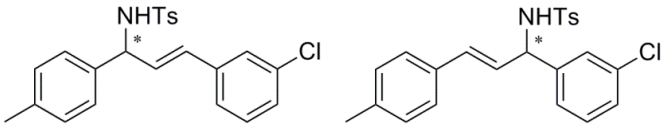
Peak #	RT [min]	Area %	Area
1	33.453	24.441	4.522e3
2	36.827	23.728	4.390e3
3	46.451	25.637	4.743e3
4	48.355	26.194	4.846e3

Chiral



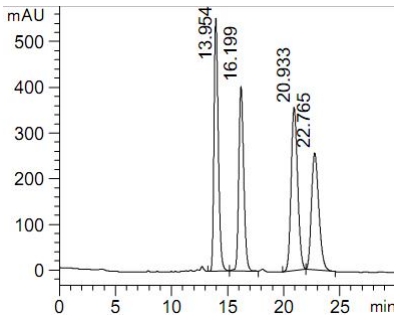
Peak #	RT [min]	Area %	Area
1	33.899	2.277	135.935
2	37.068	12.230	730.178
3	46.047	77.855	4.648e3
4	48.602	7.638	456.052

Table 3, entry 2



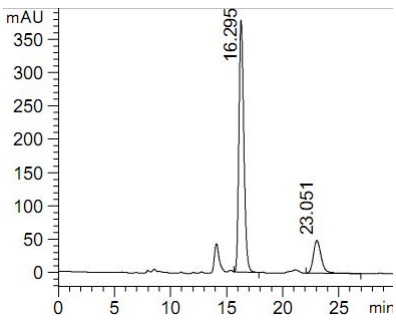
HPLC Conditions: Column: Chiralcel OD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (75/25); **Flow rate:** 0.5 mL/min; **Detection:** UV 254 nm

Racemic



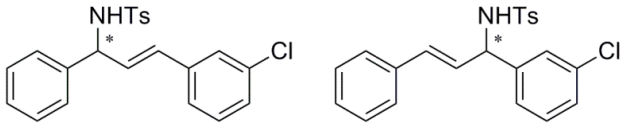
Peak #	RT [min]	Area %	Area
1	13.954	27.621	1.463e4
2	16.199	23.247	1.232e4
3	20.933	27.133	1.438e4
4	22.765	21.999	1.166e4

Chiral



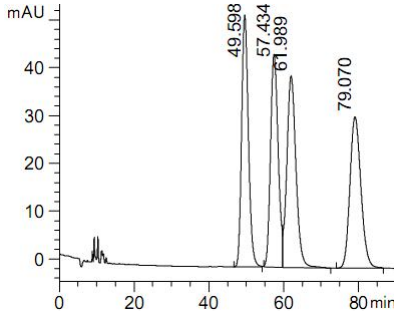
Peak #	RT [min]	Area %	Area
1	16.295	82.950	1.150e4
2	23.051	17.050	2.364e3

Table 3, entry 4



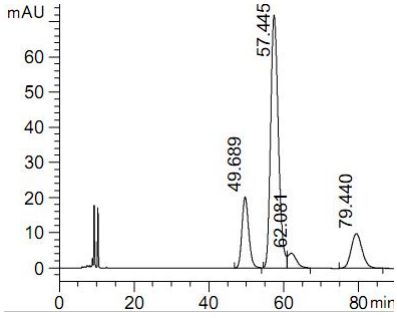
HPLC Conditions: Column: Chiralcel AS-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (75/25); **Flow rate:** 0.5 mL/min; **Detection:** UV 254 nm

Racemic



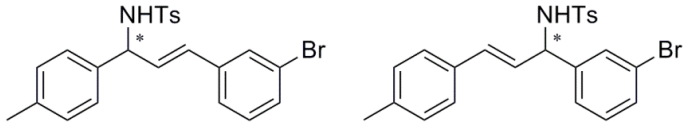
Peak #	RT [min]	Area %	Area
1	49.598	25.194	6.599e3
2	57.434	24.140	6.323e3
3	61.989	26.017	6.815e3
4	79.070	24.649	6.456e3

Chiral



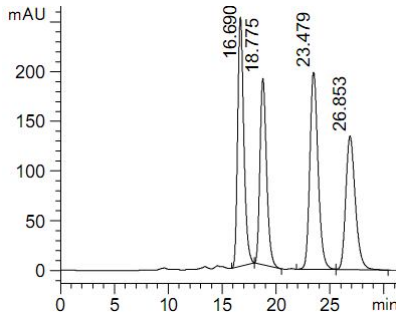
Peak #	RT [min]	Area %	Area
1	49.689	16.247	2.536e3
2	57.445	66.468	1.037e4
3	62.081	4.358	680.187
4	79.440	12.927	2.018e3

Table 3, entry 5



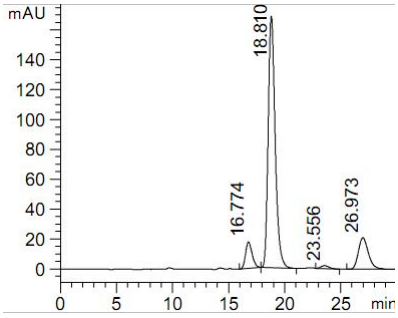
HPLC Conditions: Column: Chiralcel OD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (75/25); **Flow rate:** 0.5 mL/min; **Detection:** UV 254 nm

Racemic



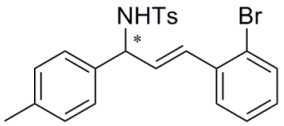
Peak #	RT [min]	Area %	Area
1	16.690	27.108	9.958e3
2	18.775	21.797	8.007e3
3	23.479	28.635	1.052e4
4	26.853	22.461	8.250e3

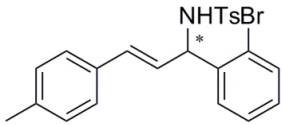
Chiral



Peak #	RT [min]	Area %	Area
1	16.774	7.700	725.537
2	18.810	77.343	7.287e3
3	23.556	1.040	97.990
4	26.973	13.917	1.311e3

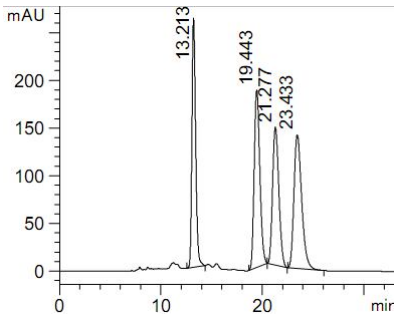
Table 3, entry 6





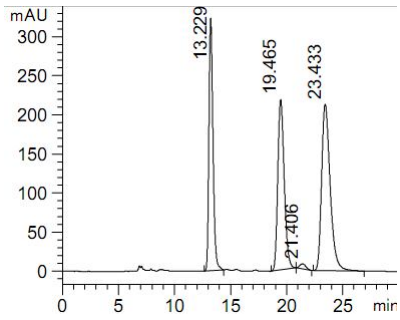
HPLC Conditions: Column: Chiralcel OD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (75/25); **Flow rate:** 0.5 mL/min; **Detection:** UV 254 nm

Racemic



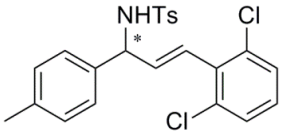
Peak #	RT [min]	Area %	Area
1	13.213	24.087	6.624e3
2	19.443	26.200	7.205e3
3	21.277	22.587	6.211e3
4	23.433	27.125	7.459e3

Chiral



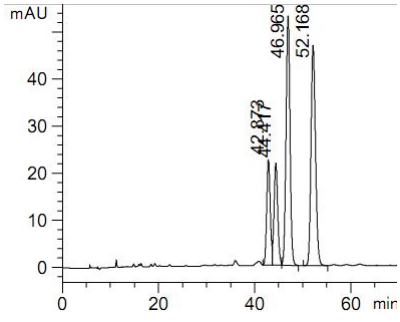
Peak #	RT [min]	Area %	Area
1	13.229	28.685	8.141e3
2	19.465	30.533	8.666e3
3	21.406	0.863	245.034
4	23.433	39.919	1.133e4

Table 3, entry 7



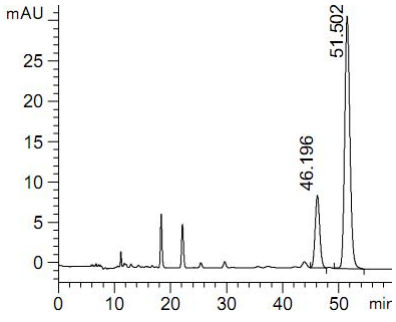
HPLC Conditions: Column: Chiralpak AD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (90/10); **Flow rate:** 0.5 mL/min; **Detection:** UV 254 nm

Racemic



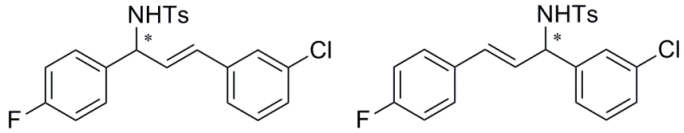
Peak #	RT [min]	Area %	Area
1	42.873	13.523	1.141e3
2	44.417	14.001	1.182e3
3	46.965	36.200	3.055e3
4	52.168	36.276	3.062e3

Chiral



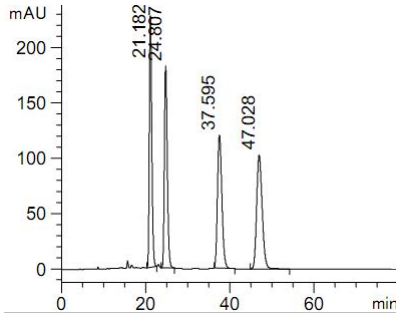
Peak #	RT [min]	Area %	Area
1	46.196	19.971	505.167
2	51.502	80.029	2.024e3

Table 3, entry 8



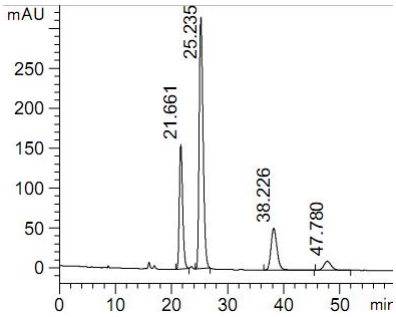
HPLC Conditions: Column: Chiralcel OD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (85/15); **Flow rate:** 0.5 mL/min; **Detection:** UV 254 nm

Racemic



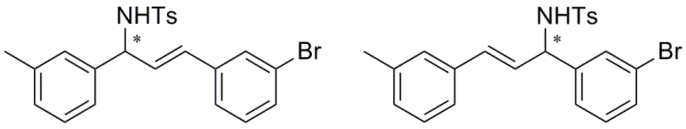
Peak #	RT [min]	Area %	Area
1	21.182	25.495	9.192e3
2	24.807	24.349	8.779e3
3	37.595	24.217	8.732e3
4	47.028	25.939	9.353e3

Chiral



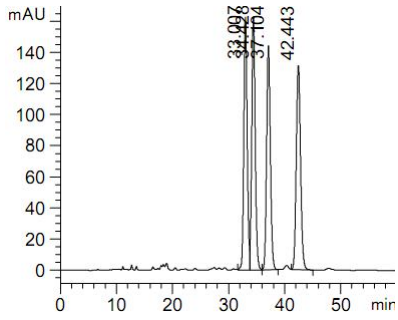
Peak #	RT [min]	Area %	Area
1	21.661	24.079	6.371e3
2	25.235	57.492	1.521e4
3	38.226	14.614	3.867e3
4	47.780	3.816	1.010e3

Table 3, entry 9



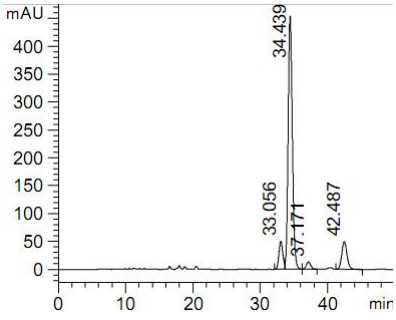
HPLC Conditions: Column: Chiralpak AD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (90/10); **Flow rate:** 0.5 mL/min; **Detection:** UV 254 nm

Racemic



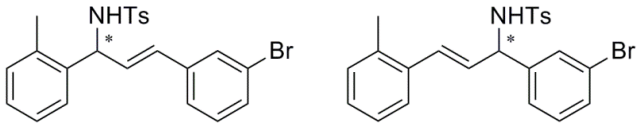
Peak #	RT [min]	Area %	Area
1	33.007	24.485	6.727e3
2	34.428	25.550	7.019e3
3	37.104	24.487	6.727e3
4	42.443	25.477	6.999e3

Chiral



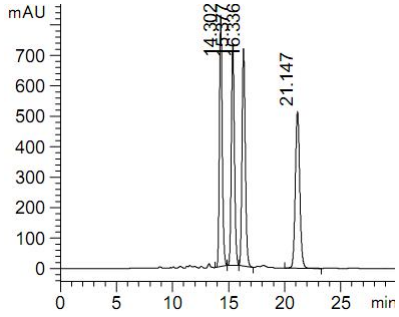
Peak #	RT [min]	Area %	Area
1	33.056	8.036	2.014e3
2	34.439	78.870	1.977e4
3	37.171	2.435	610.260
4	42.487	10.659	2.671e3

Table 3, entry 10



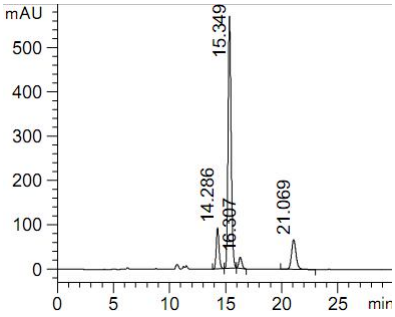
HPLC Conditions: Column: Chiralpak AD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (75/25); **Flow rate:** 0.5 mL/min; **Detection:** UV 254 nm

Racemic

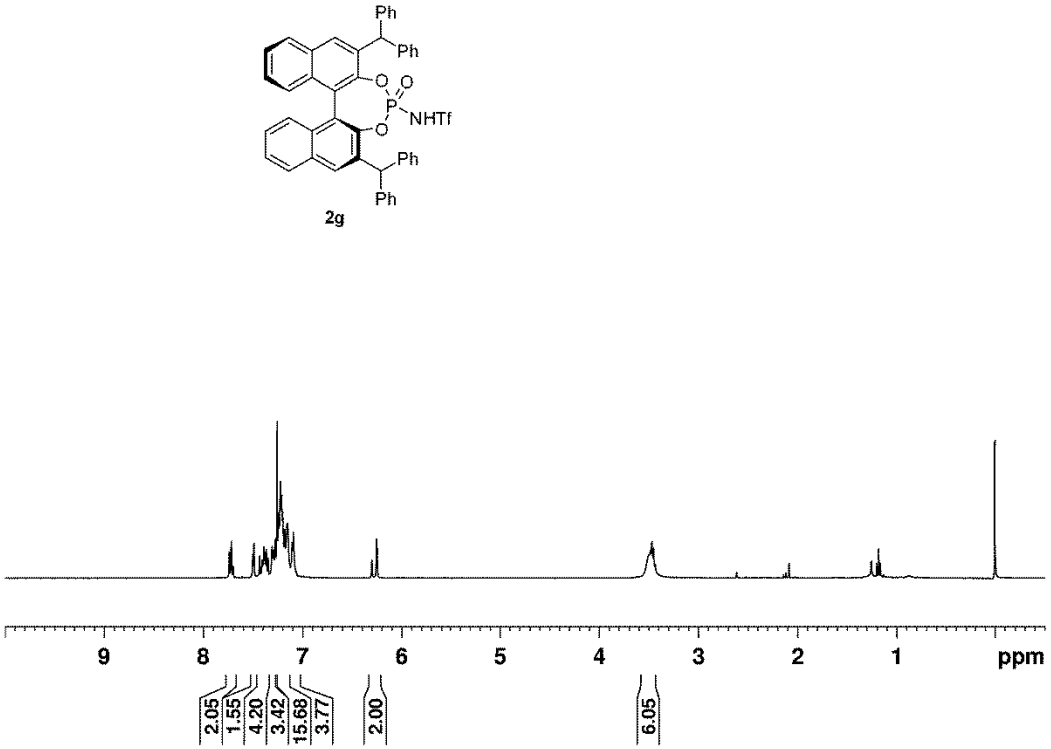


Peak #	RT [min]	Area %	Area
1	14.302	25.442	1.449e4
2	15.377	24.287	1.383e4
3	16.336	25.369	1.445e4
4	21.147	24.903	1.418e4

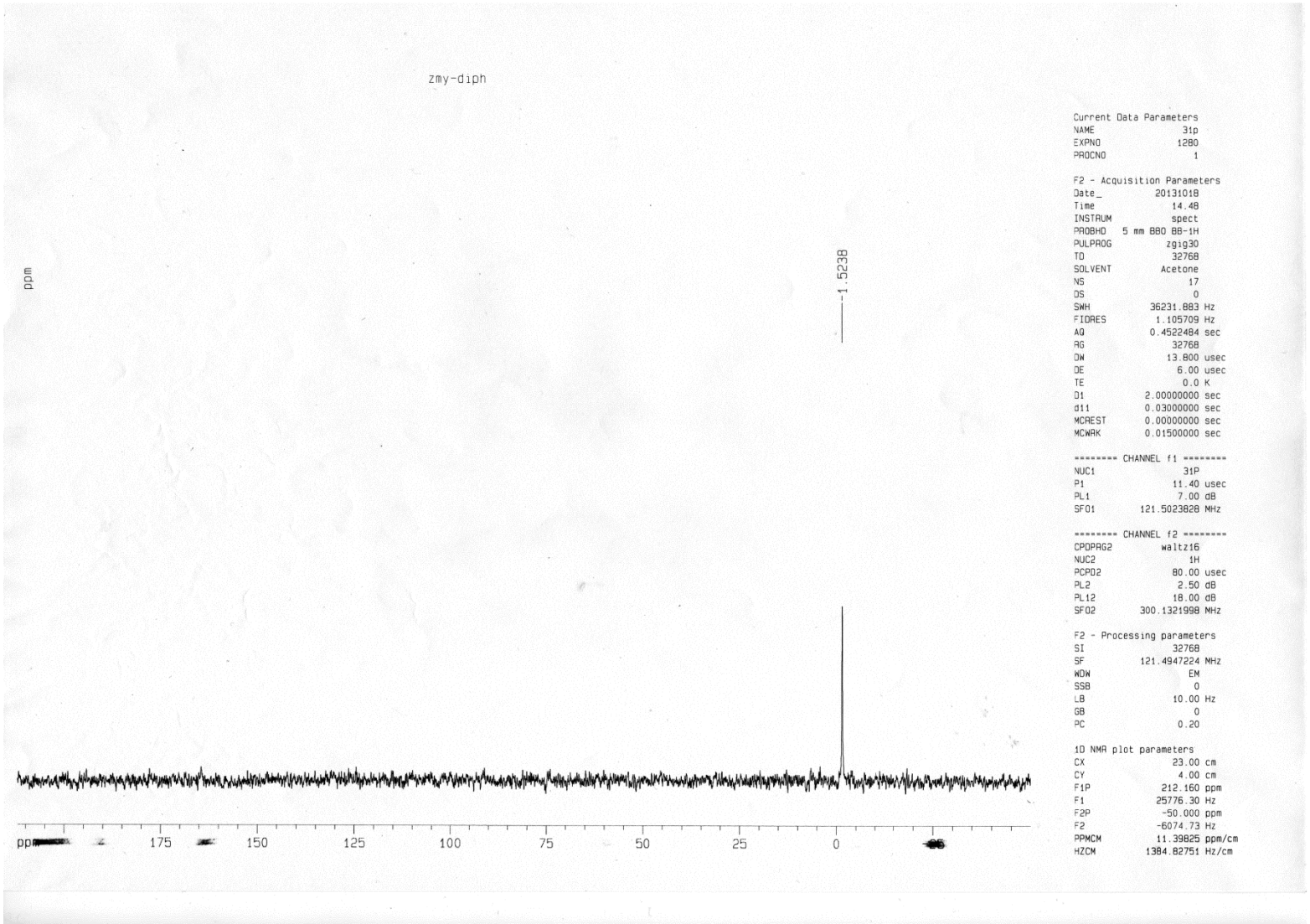
Chiral

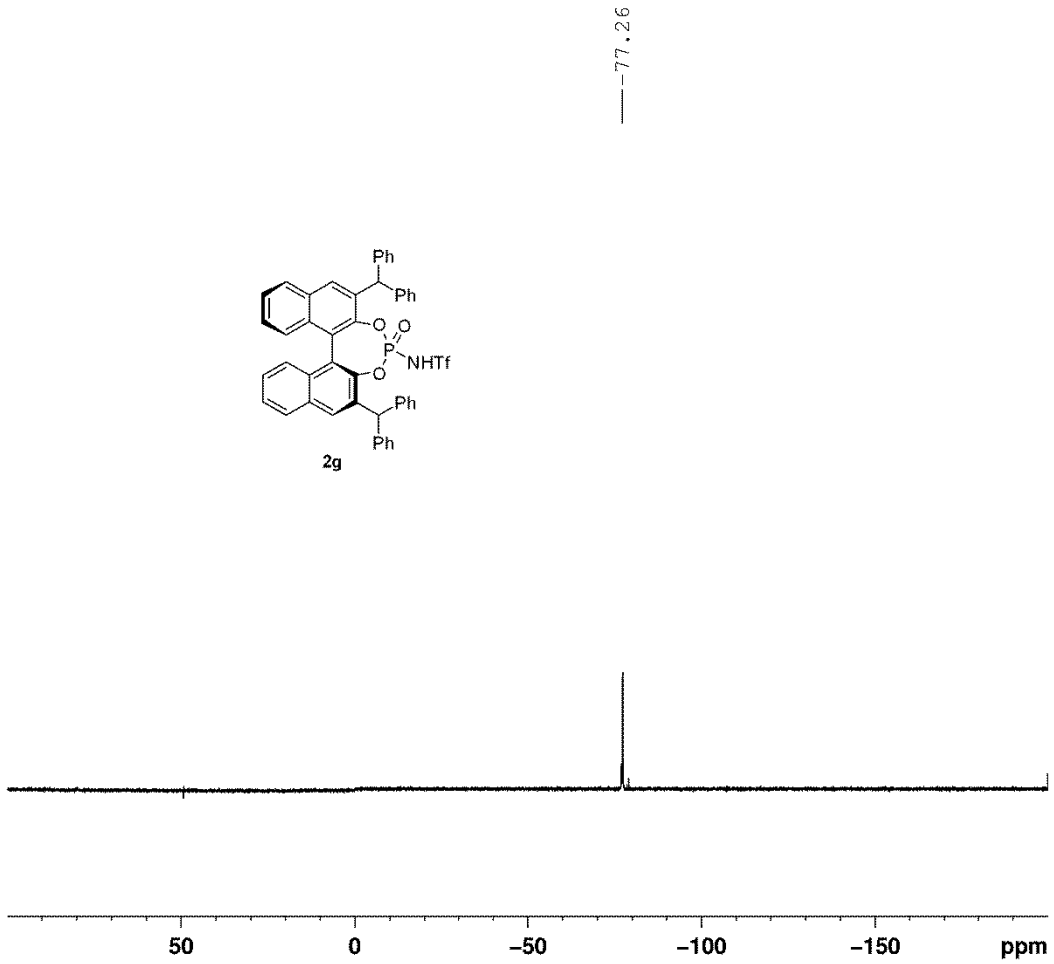


Peak #	RT [min]	Area %	Area
1	14.286	10.976	1.618e3
2	15.349	73.193	1.079e4
3	16.307	3.182	469.217
4	21.069	12.649	1.865e3

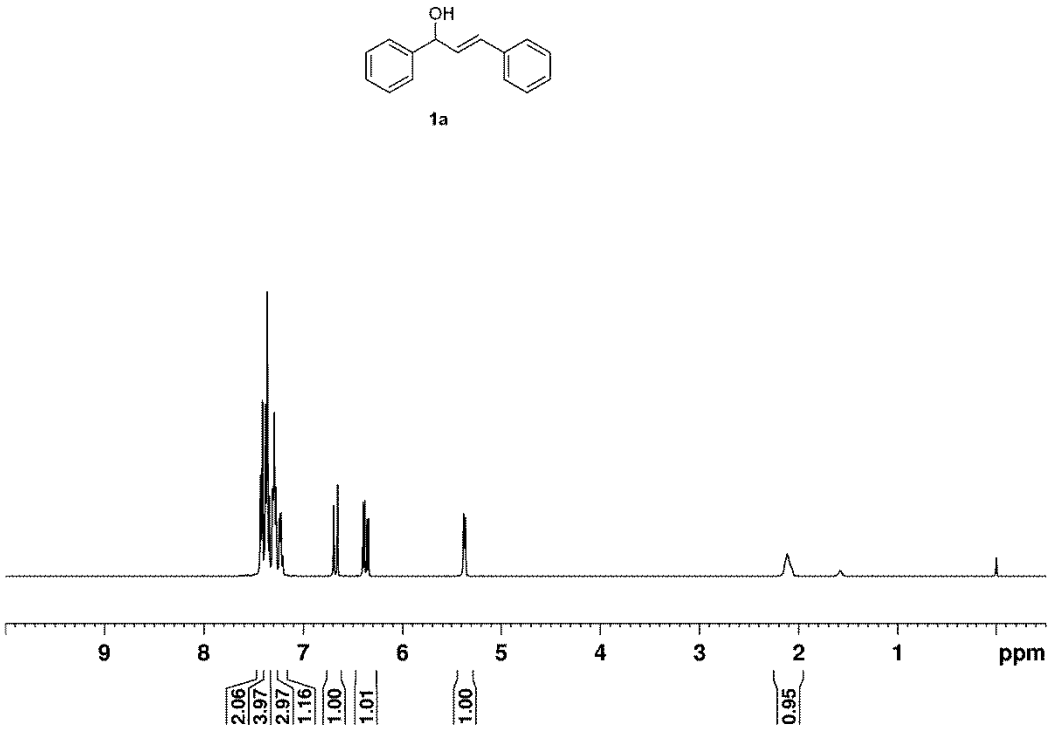


NAME	zhuangminyang-4
EXPNO	29
PROCNO	1
Date_	20130911
Time	7.47
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	16
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	203
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
========	CHANNEL f1 ========
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300178 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00

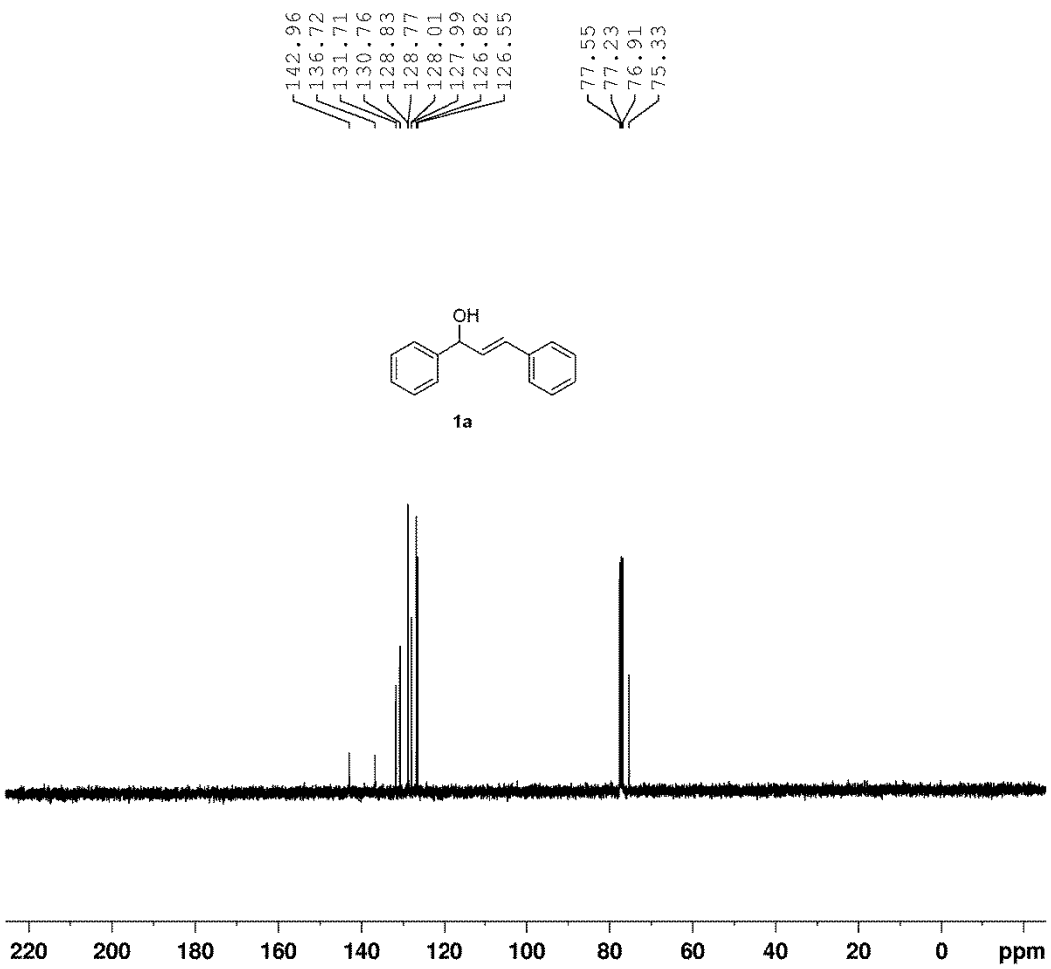

zmy-diph
ppm
-1.5238
ppm
175
150
125
100
75
50
25
0
Current Data Parameters
NAME 31p
EXPNO 1280
PROCNO 1
F2 - Acquisition Parameters
Date_ 20131018
Time 14.48
INSTRUM spect
PROBHD 5 mm BBO BB-1H
PULPROG zgig30
TD 32768
SOLVENT Acetone
NS 17
DS 0
SWH 36231.883 Hz
FIDRES 1.105709 Hz
AQ 0.4522484 sec
RG 32768
DW 13.800 usec
DE 6.00 usec
TE 0.0 K
D1 2.00000000 sec
d11 0.03000000 sec
MCREST 0.00000000 sec
MCWRK 0.01500000 sec
======== CHANNEL f1 ========
NUC1 31P
P1 11.40 usec
PL1 7.00 dB
SF01 121.5023828 MHz
======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PL2 2.50 dB
PL12 18.00 dB
SF02 300.1321998 MHz
F2 - Processing parameters
SI 32768
SF 121.4947224 MHz
WDW EM
SSB 0
LB 10.00 Hz
GB 0
PC 0.20
1D NMR plot parameters
CX 23.00 cm
CY 4.00 cm
F1P 212.160 ppm
F1 25776.30 Hz
F2P -50.000 ppm
F2 -6074.73 Hz
PPMCM 11.39825 ppm/cm
HZCM 1384.82751 Hz/cm



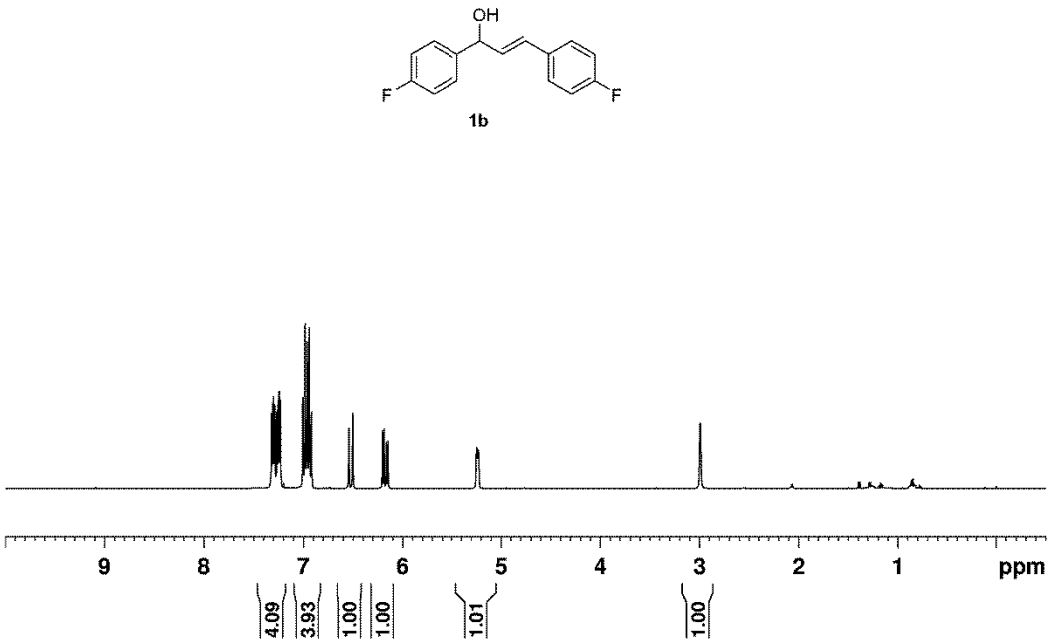
NAME	19F
EXPNO	63
PROCNO	1
Date_	20130910
Time	21.25
INSTRUM	spect
PROBHD	5 mm PATBO BB-
PULPROG	zgfhigqn
TD	65536
SOLVENT	CDCl3
NS	20
DS	0
SWH	285714.281 Hz
FIDRES	4.359654 Hz
AQ	0.1147398 sec
RG	35.9
DW	1.750 usec
DE	4.50 usec
TE	298.1 K
D1	1.00000000 sec
D11	0.03000000 sec
D12	0.00002000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	19F
P1	23.50 usec
PL1	0.00 dB
SFO1	564.6412131 MHz
======== CHANNEL f2 ========	
CPDPRG2	waltz16
NUC2	1H
PCPD2	70.00 usec
PL2	-3.20 dB
PL12	10.18 dB
PL2W	52.48074722 W
PL12W	2.40990520 W
SFO2	600.1324005 MHz
SI	65536
SF	564.6863880 MHz
WDW	EM
SSB	0
LB	10.00 Hz
GB	0
PC	1.00



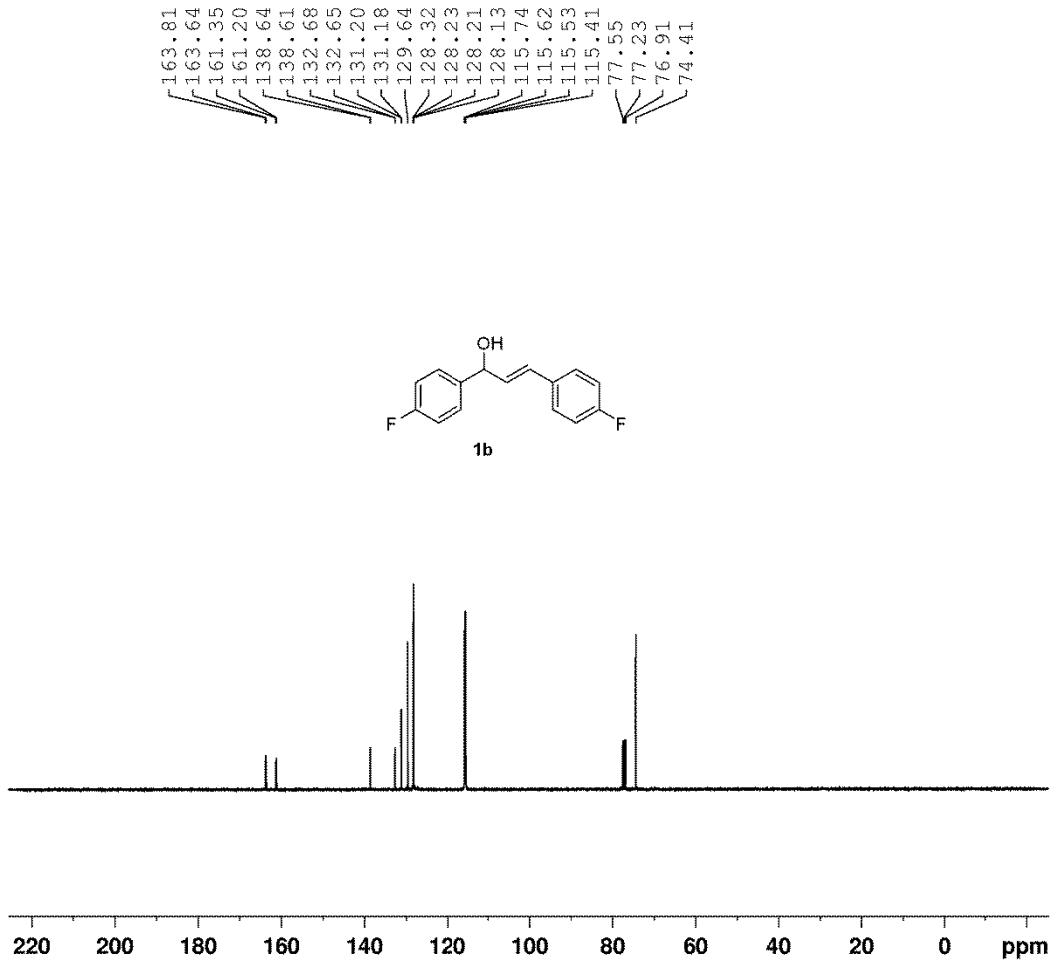
NAME	zhuangminyang-5
EXPNO	16
PROCNO	1
Date_	20131029
Time	6.45
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	5
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	101
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
========	CHANNEL f1 ========
SFO1	400.1320007 MHz
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300196 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



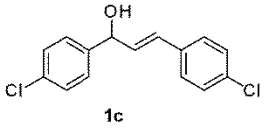
NAME	zhuangminyang-C2
EXPNO	33
PROCNO	1
Date_	20131029
Time	6.46
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	66
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
========	CHANNEL f1 ========
SFO1	100.6228298 MHz
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127518 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



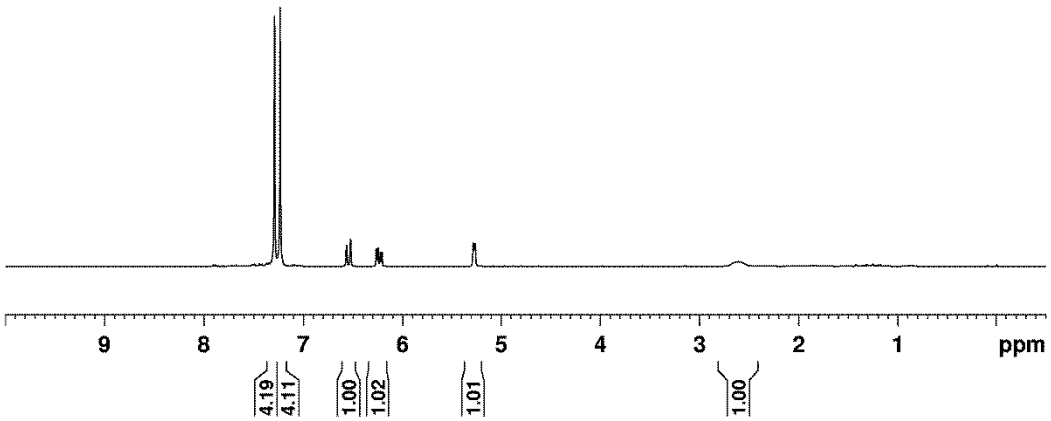
NAME	zhuangminyang-3
EXPNO	98
PROCNO	1
Date_	20130827
Time	10.19
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	16
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	32
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300412 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



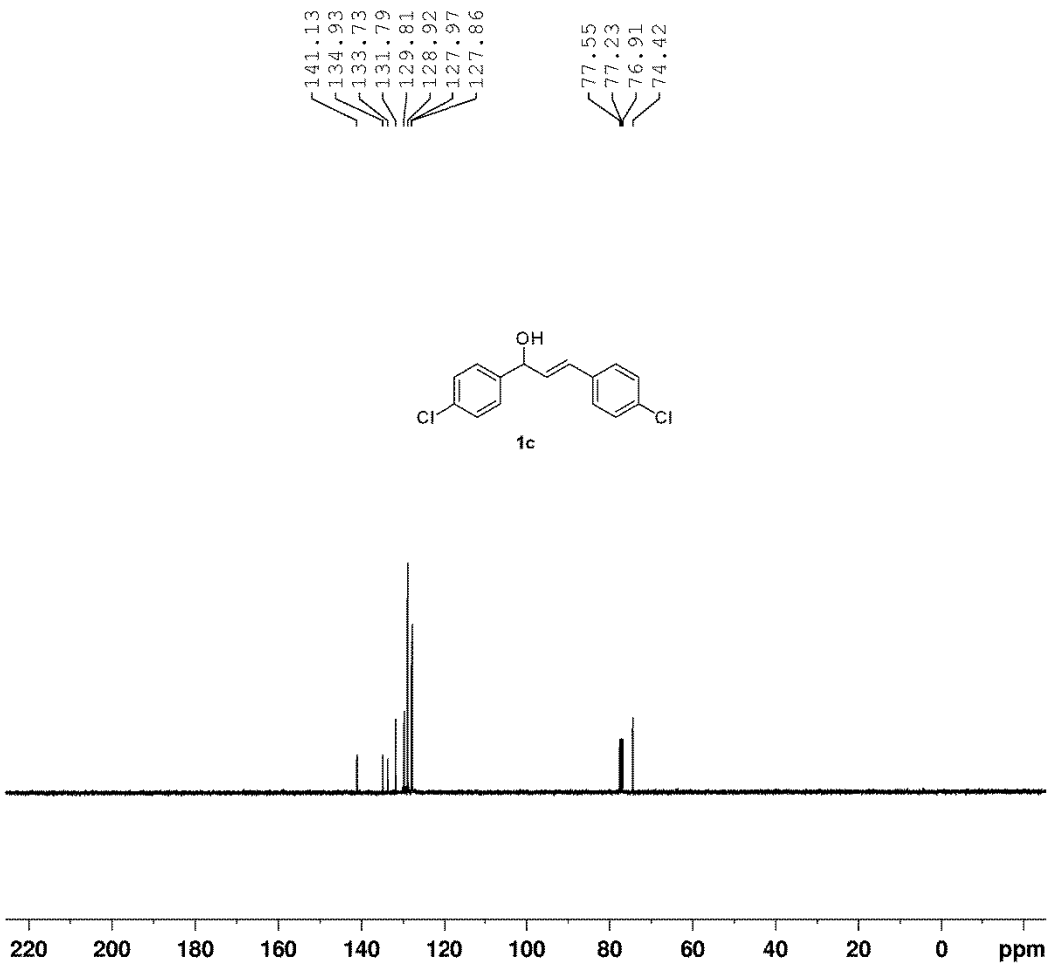
NAME	zhuangminyang-C1
EXPNO	128
PROCNO	1
Date_	20130827
Time	10.21
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	48
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127635 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



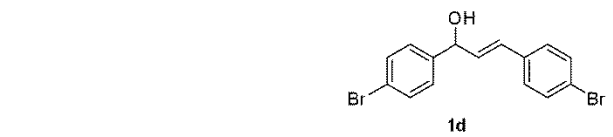
1c



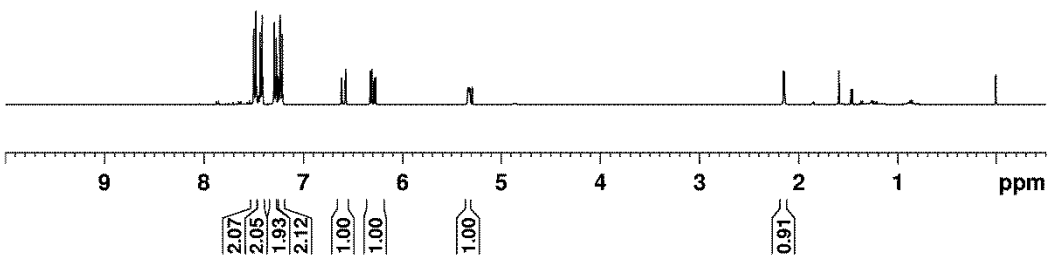
NAME	zhuangminyang-3
EXPNO	84
PROCNO	1
Date_	20130828
Time	7.17
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	16
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	57
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300300 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



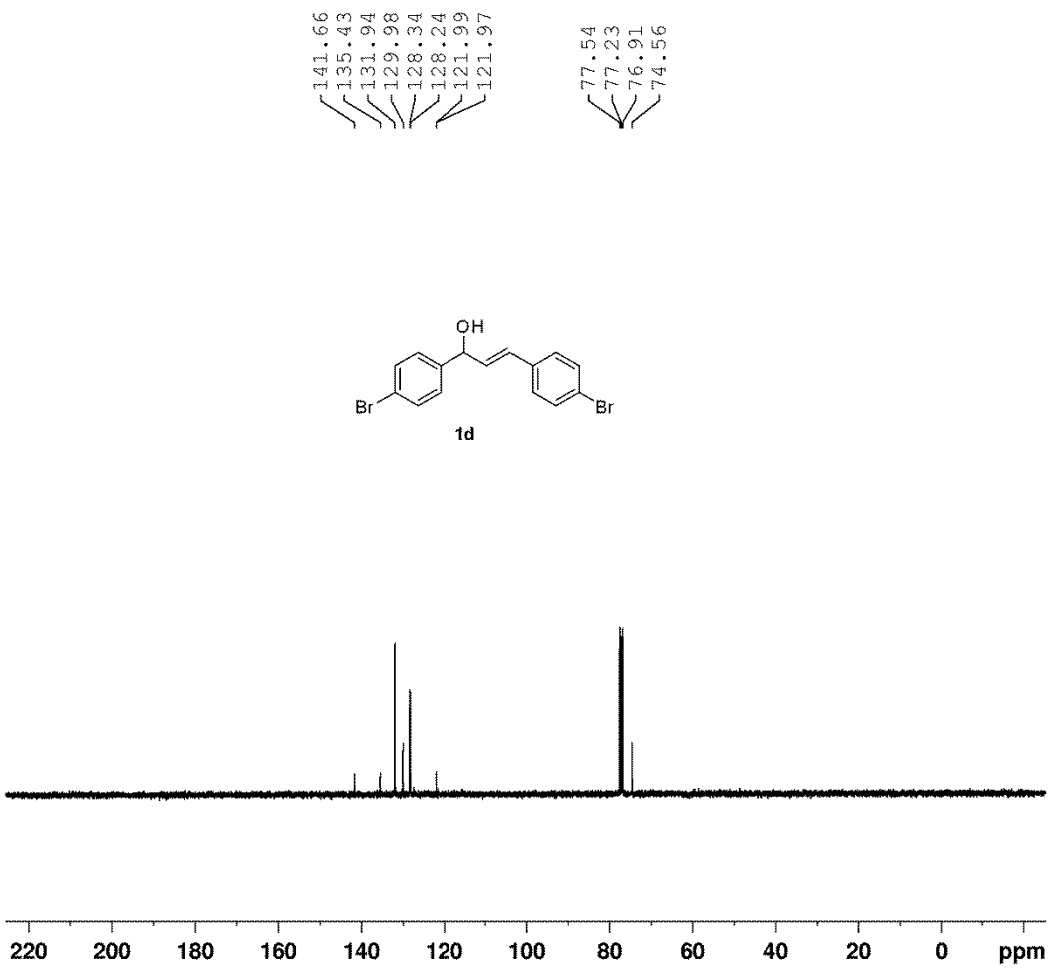
NAME	zhuangminyang-C1
EXPNO	130
PROCNO	1
Date_	20130828
Time	7.20
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	27
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127595 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



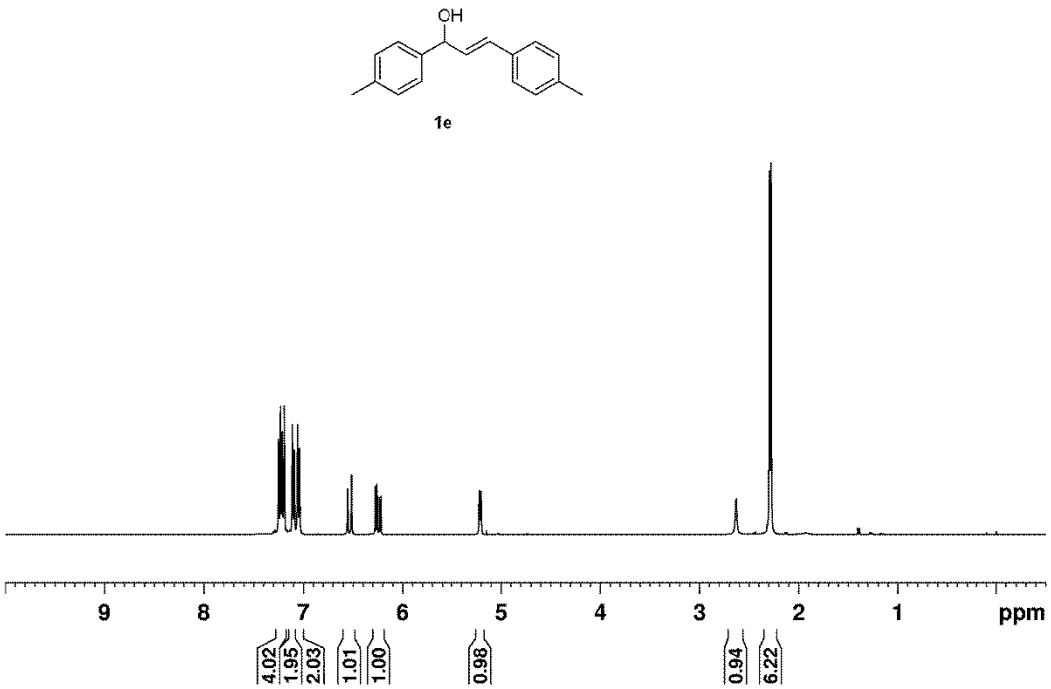
1d



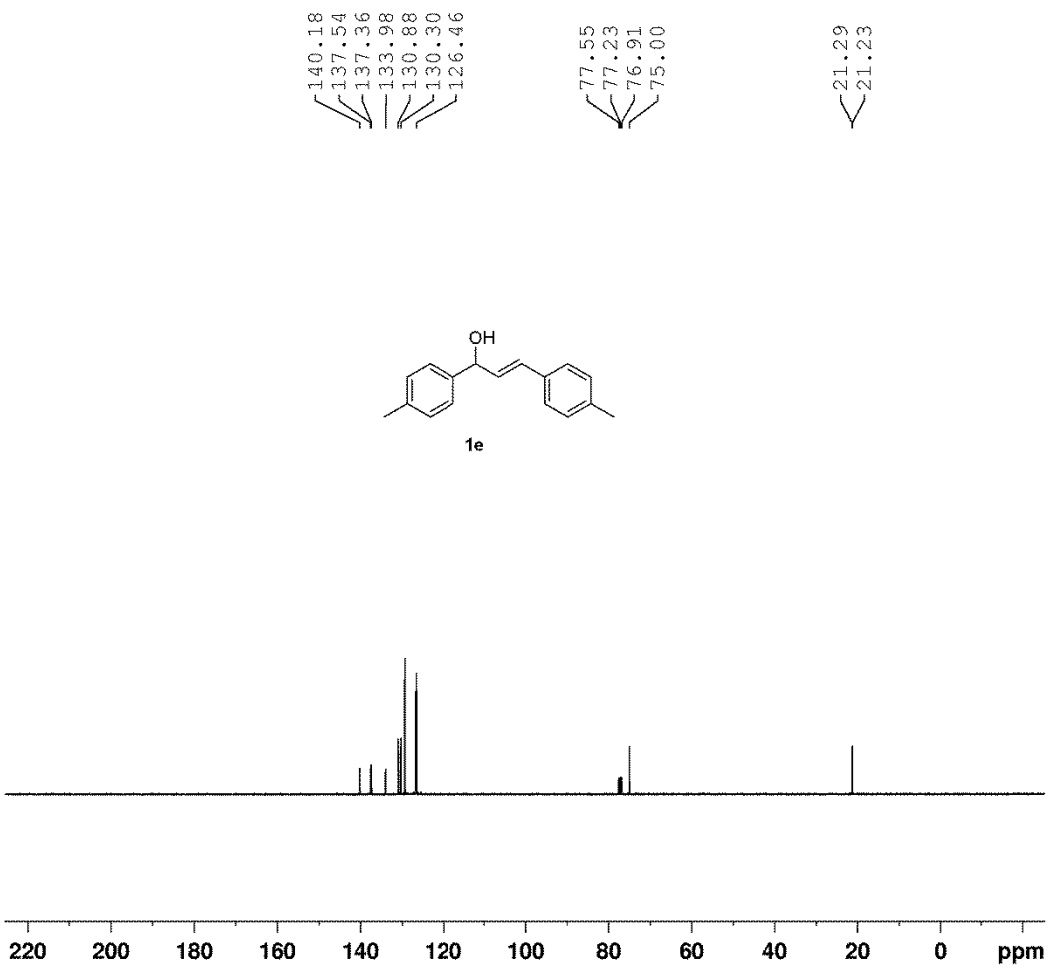
NAME	zhuangminyang-3
EXPNO	100
PROCNO	1
Date_	20130828
Time	7.22
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	16
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	203
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300189 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



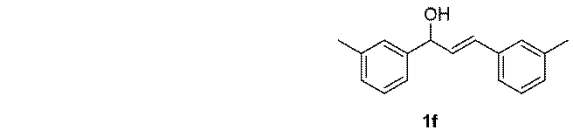
NAME	zhuangminyang-C1
EXPNO	129
PROCNO	1
Date_	20130828
Time	7.25
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	62
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127517 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



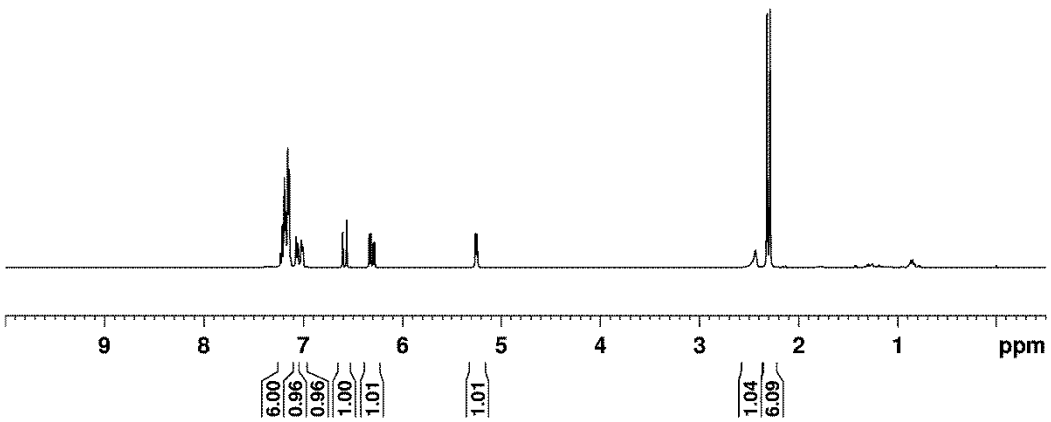
NAME	zhuangminyang-3
EXPNO	83
PROCNO	1
Date_	20130821
Time	23.52
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	13
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	22.6
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300757 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



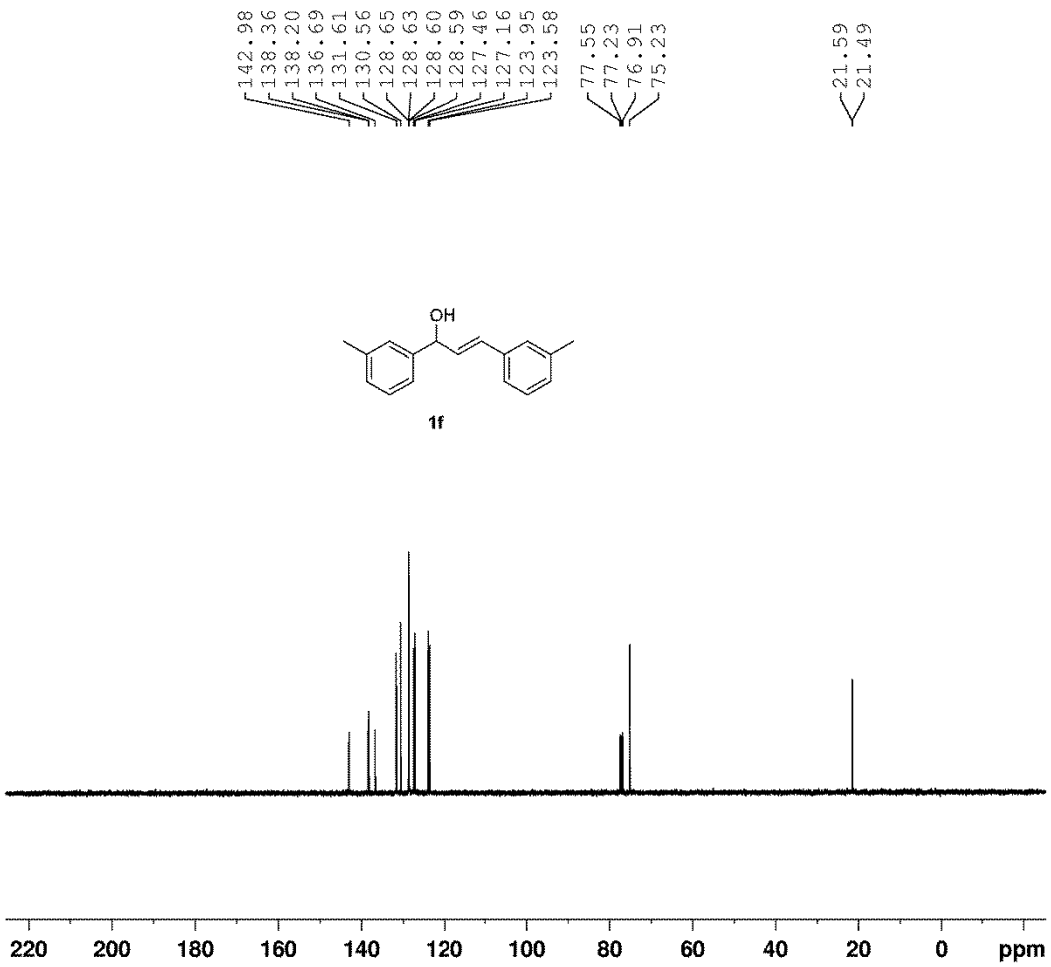
NAME	zhuangminyang-C1
EXPNO	123
PROCNO	1
Date_	20130821
Time	23.54
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	39
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127741 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



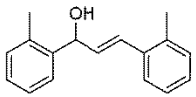
1f



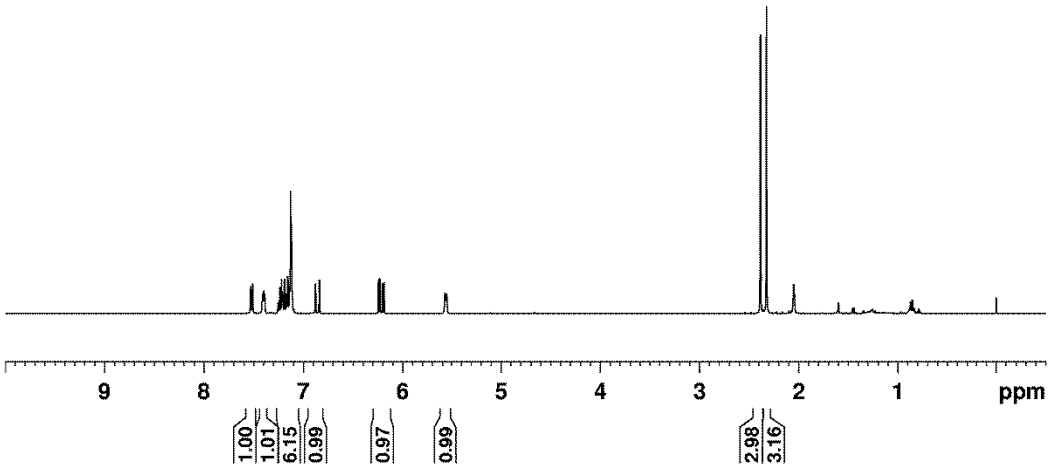
NAME	zhuangminyang-3
EXPNO	87
PROCNO	1
Date_	20130822
Time	11.02
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	12
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	25.4
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300606 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



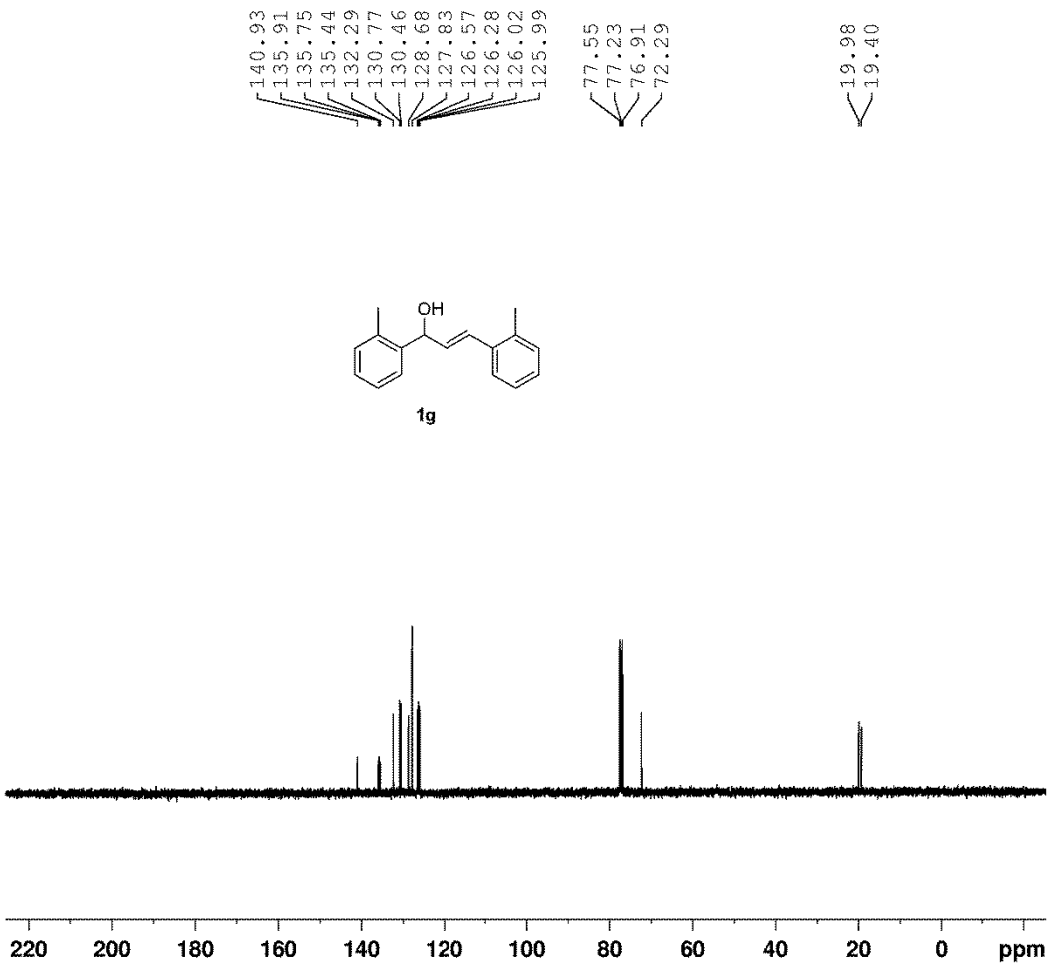
NAME	zhuangminyang-C1
EXPNO	124
PROCNO	1
Date_	20130822
Time	11.03
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	38
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
========	CHANNEL f1 ========
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127670 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



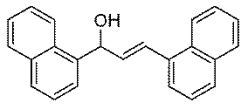
1g



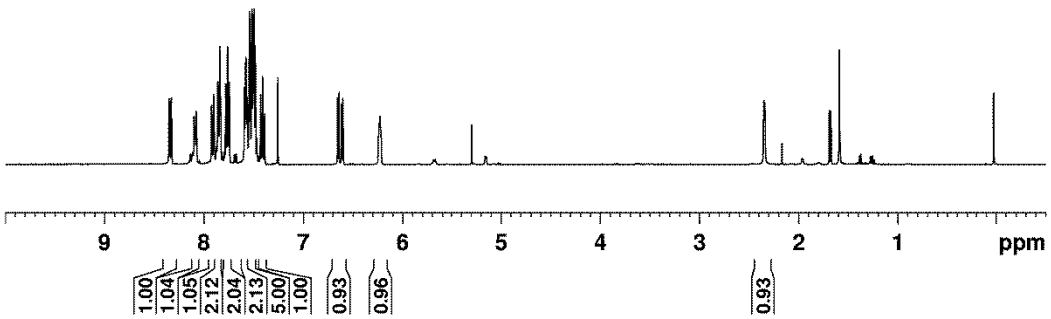
NAME	zhuangminyang-3
EXPNO	92
PROCNO	1
Date_	20130824
Time	1.33
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	16
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	101
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300328 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



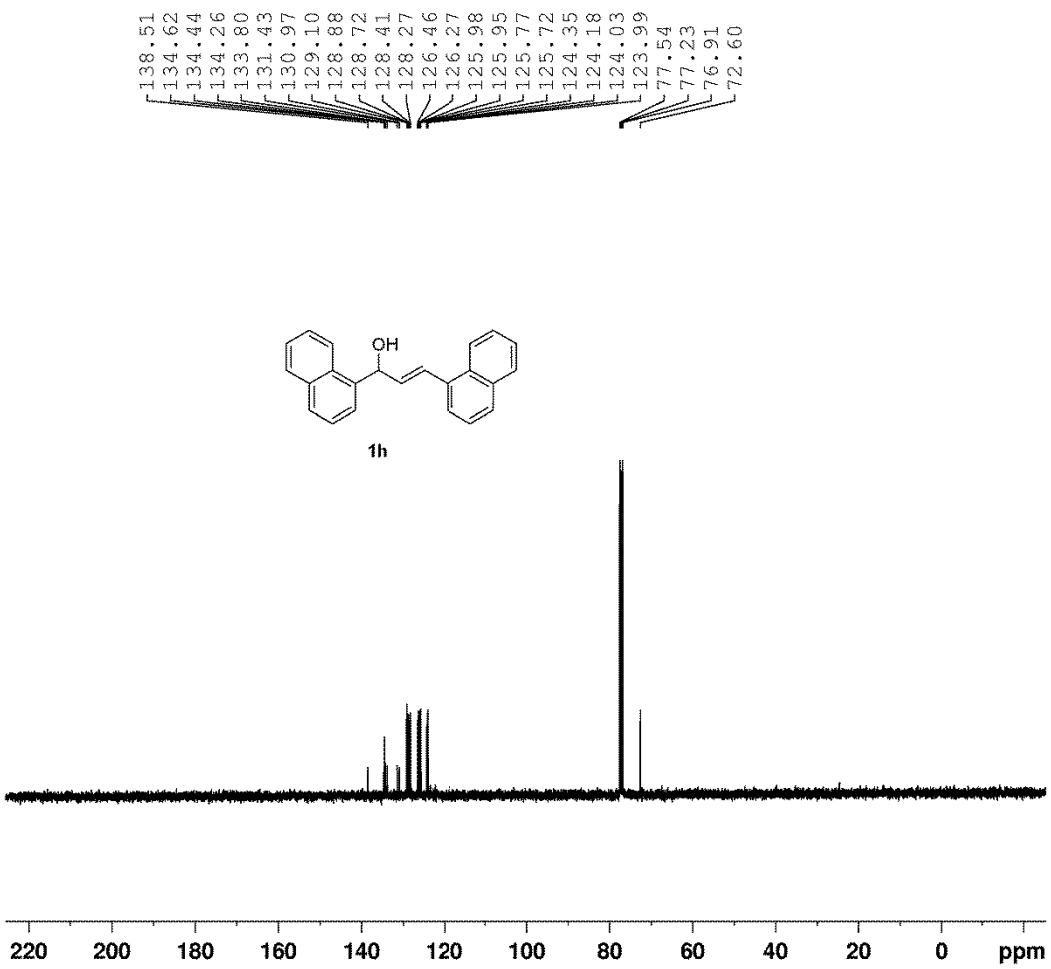
NAME	zhuangminyang-C1
EXPNO	127
PROCNO	1
Date_	20130824
Time	1.36
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	30
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
========	CHANNEL f1 ========
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127551 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



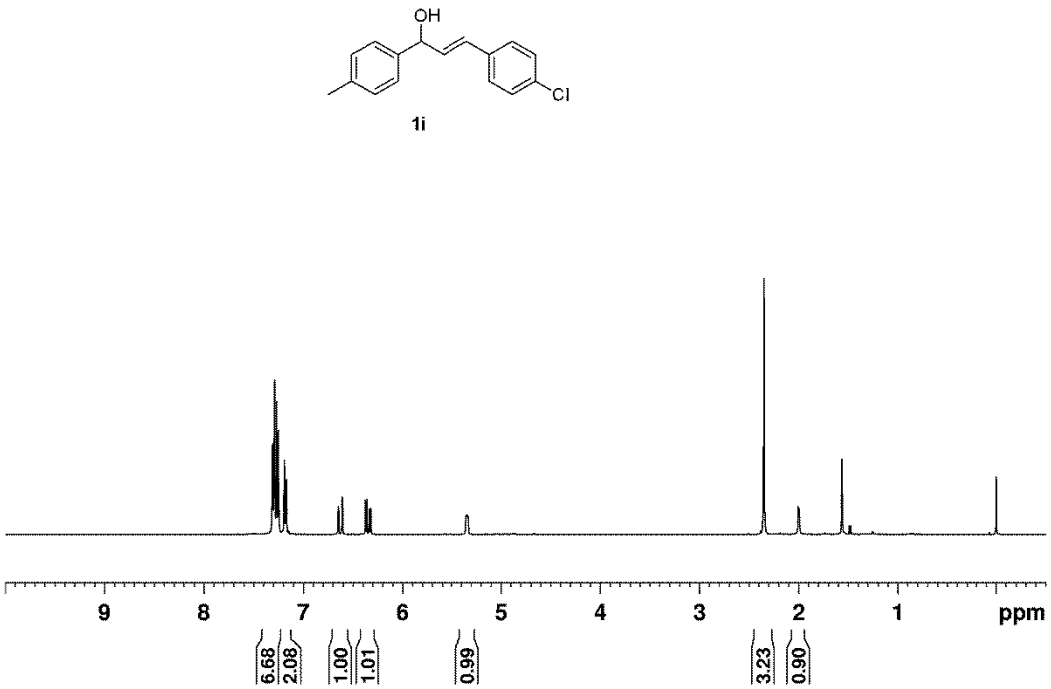
1h



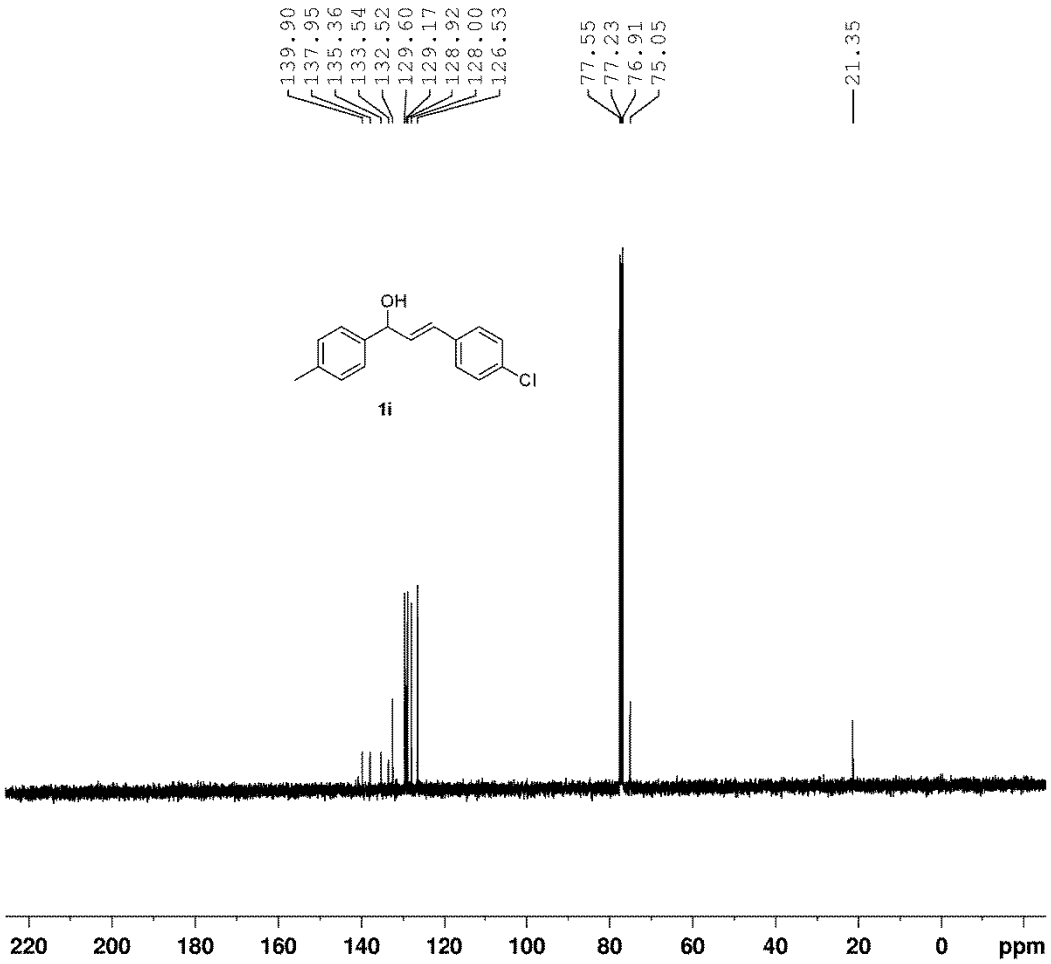
NAME	zhuangminyang-4
EXPNO	2
PROCNO	1
Date_	20130831
Time	12.36
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	16
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	101
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300175 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



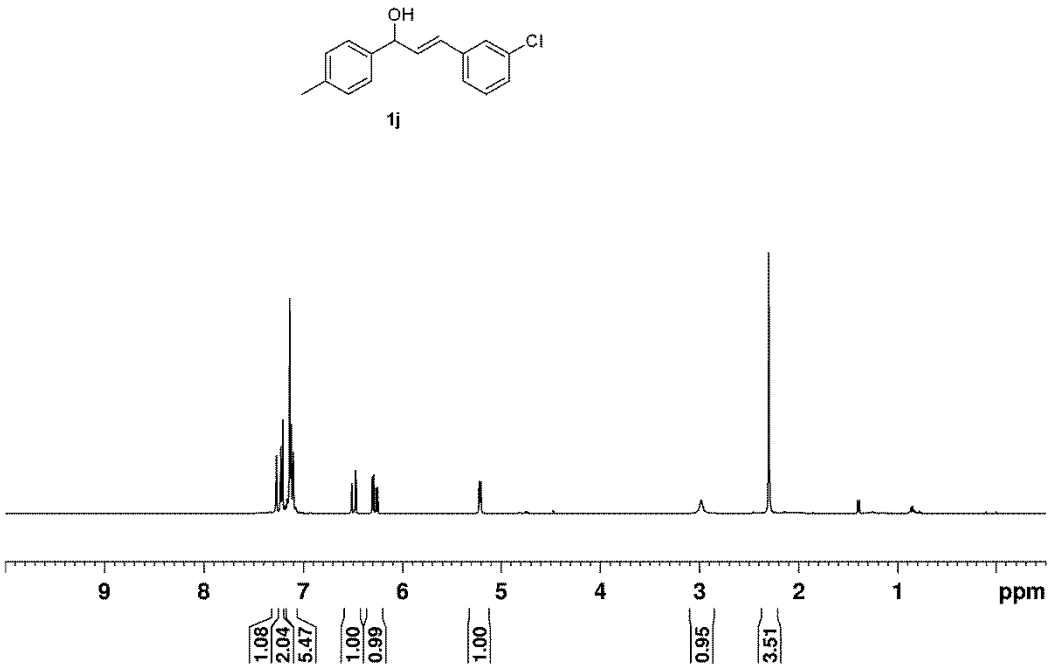
NAME	zhuangminyang-C1
EXPNO	134
PROCNO	1
Date_	20130831
Time	12.39
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	112
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
========	CHANNEL f1 ========
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127525 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



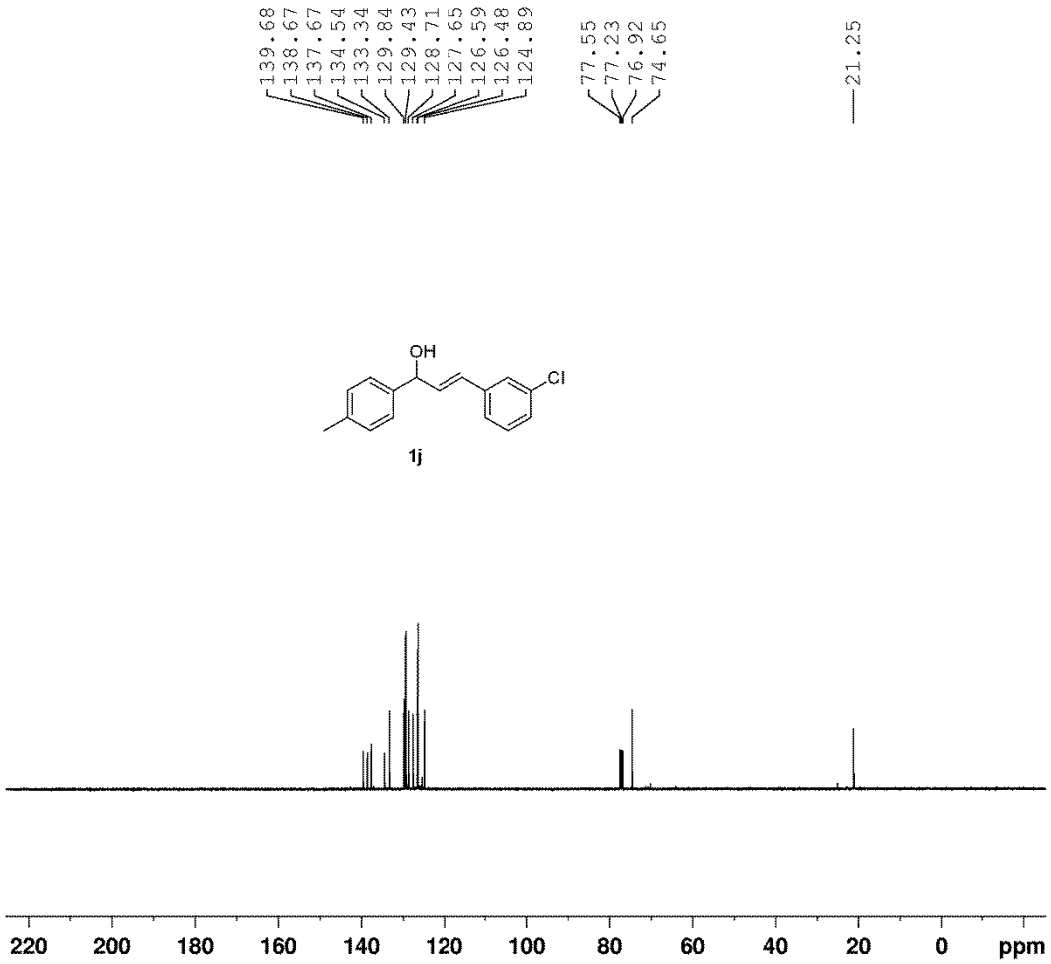
NAME	zhuangminyang-3
EXPNO	8
PROCNO	1
Date_	20130623
Time	0.18
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	16
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	203
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300197 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



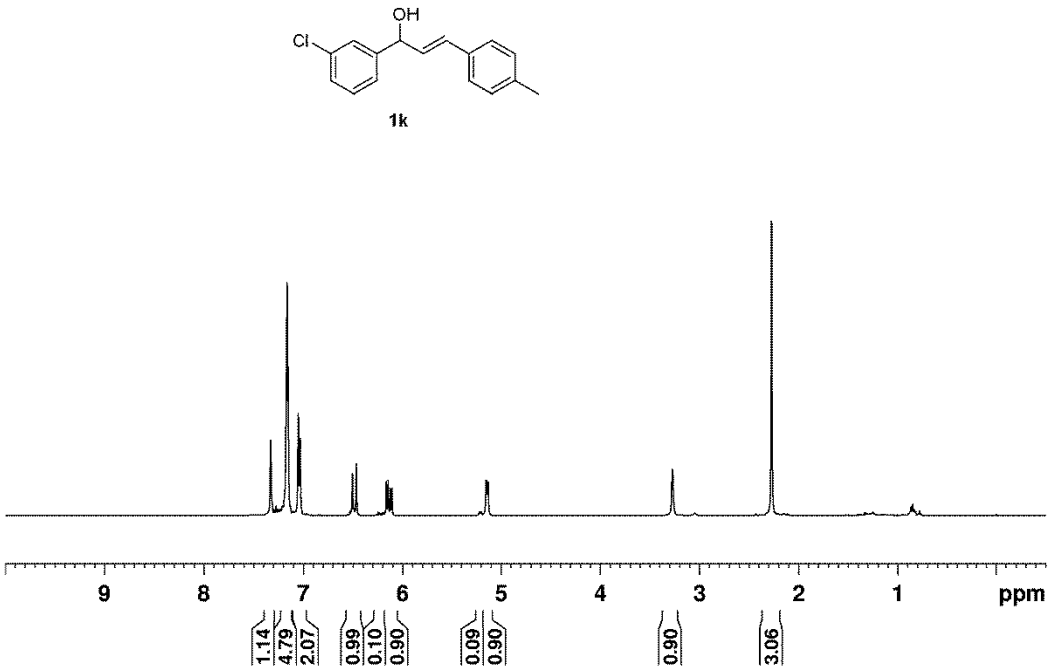
NAME	zhuangminyang-C1
EXPNO	105
PROCNO	1
Date_	20130623
Time	0.21
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	280
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
========	CHANNEL f1 ========
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127502 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



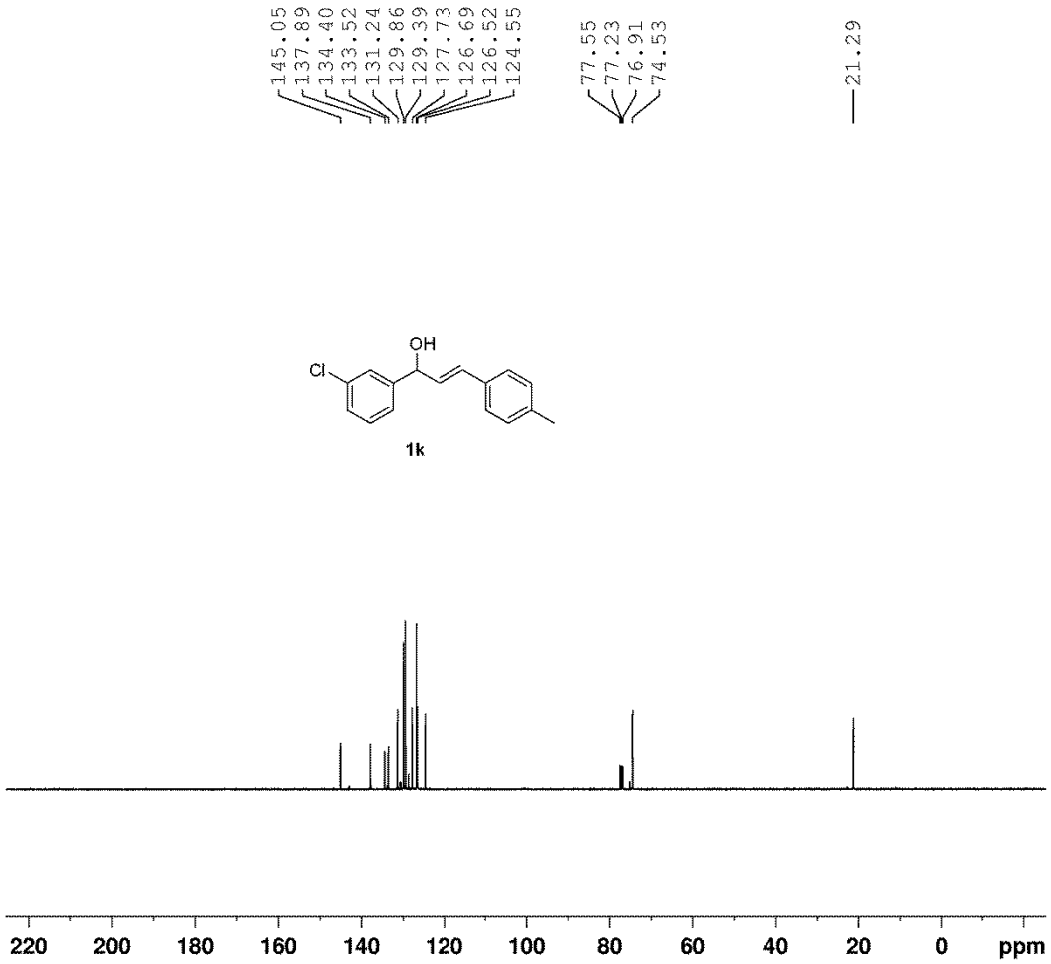
NAME	zhuangminyang-4
EXPNO	50
PROCNO	1
Date_	20130919
Time	5.23
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	16
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	22.6
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300563 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



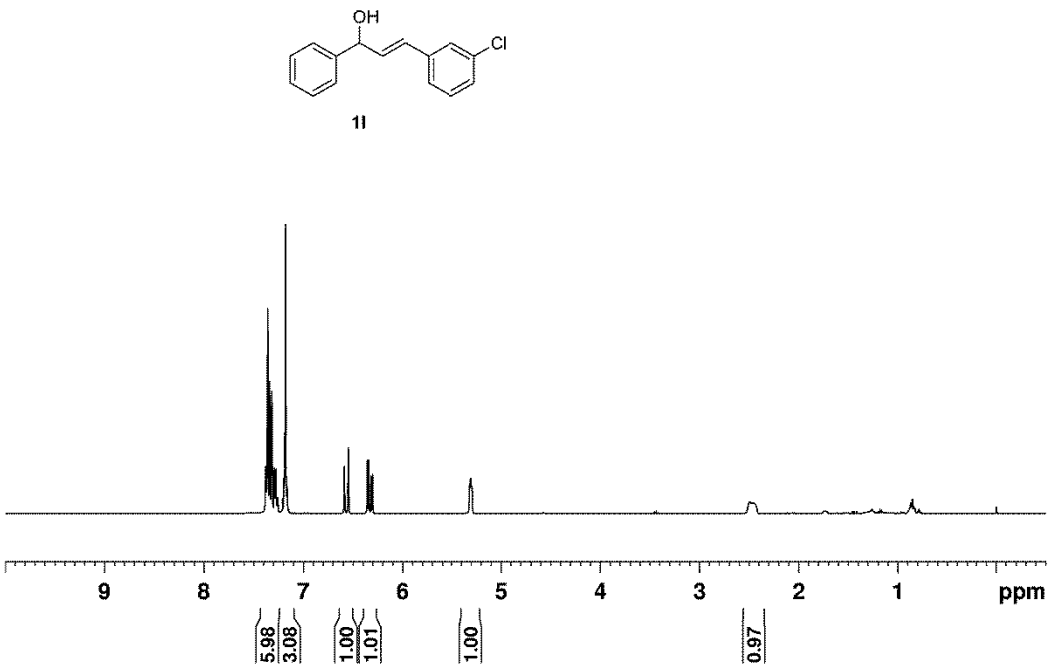
NAME	zhuangminyang-C1
EXPNO	150
PROCNO	1
Date_	20130919
Time	5.25
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	30
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
========	CHANNEL f1 ========
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127702 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



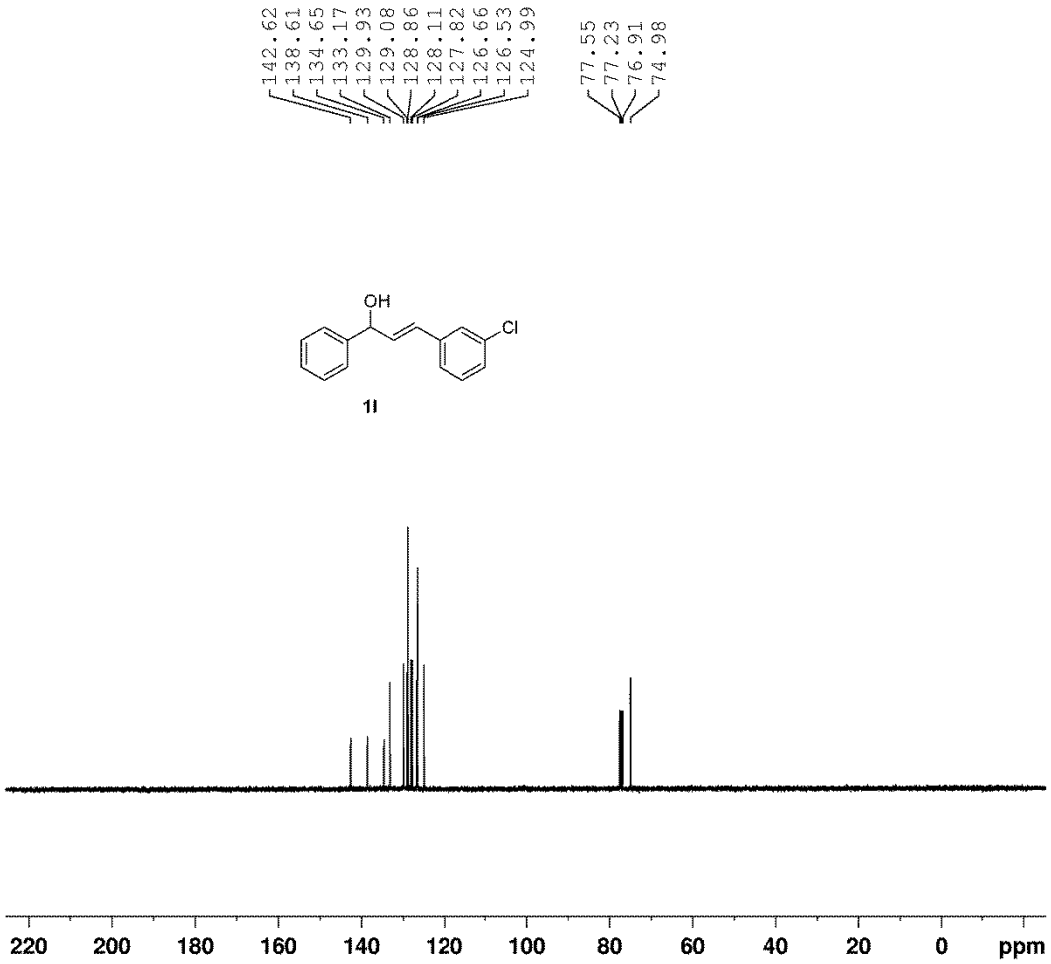

```
NAME      zhuangminyang-4
EXPNO                  68
PROCNO                  1
Date_           20130928
Time                5.43
INSTRUM            spect
PROBHD   5 mm PADUL 13C
PULPROG              zg30
TD                  32768
SOLVENT             CDCl3
NS                      6
DS                      0
SWH           12019.230 Hz
FIDRES         0.366798 Hz
AQ            1.3631988 sec
RG                     16
DW                41.600 usec
DE                 6.50 usec
TE                300.0 K
D1           2.00000000 sec
TD0                     1

======== CHANNEL f1 ========
NUC1                   1H
P1                 12.60 usec
SI                 65536
SF          400.1300777 MHz
WDW                    EM
SSB                     0
LB                 0.50 Hz
GB                      0
PC                 1.00
```



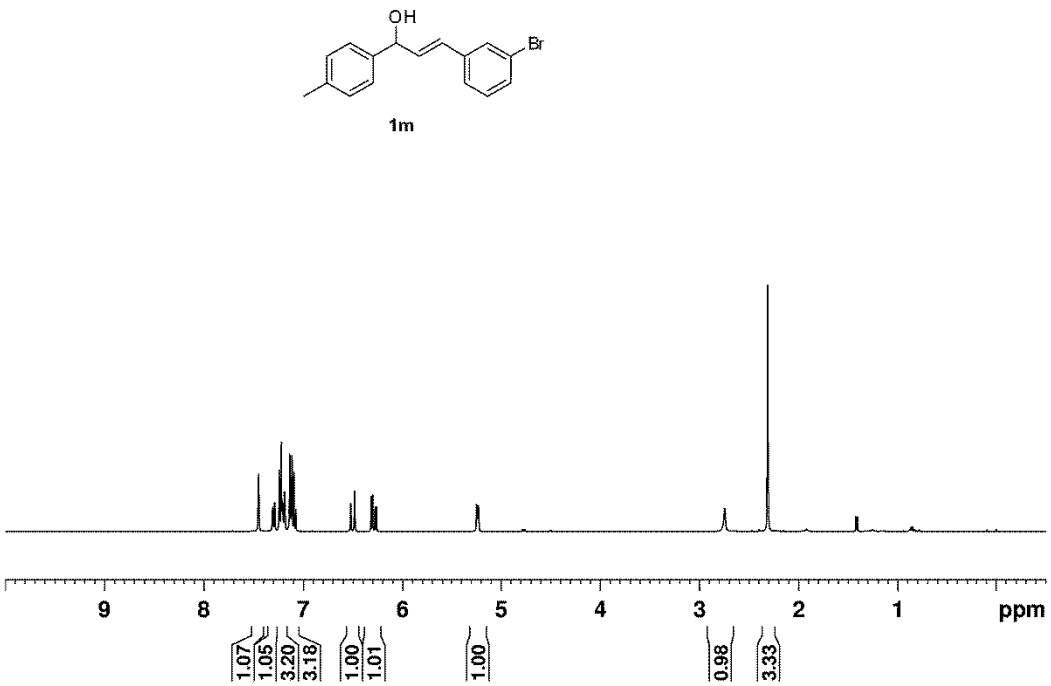
NAME	zhuangminyang-C2
EXPNO	4
PROCNO	1
Date_	20130928
Time	5.46
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	47
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127781 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



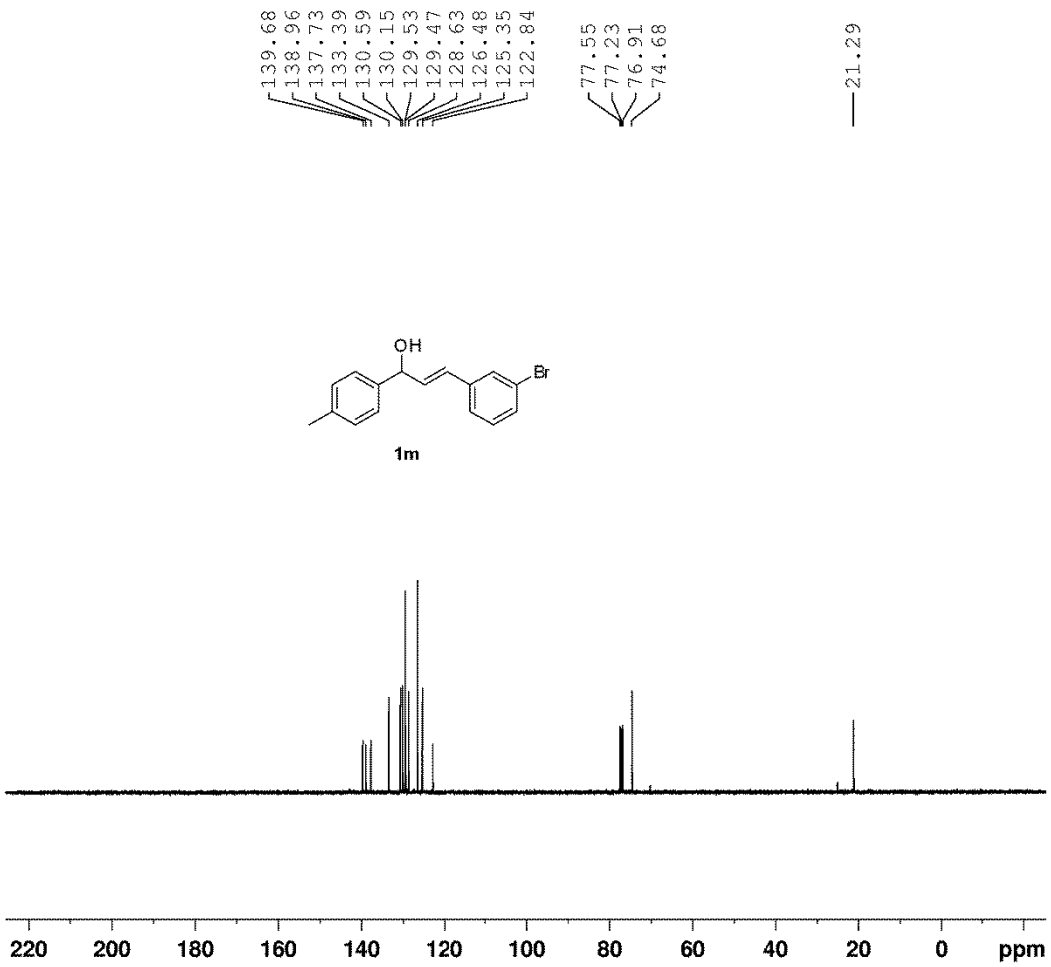
NAME	zhuangminyang-4
EXPNO	70
PROCNO	1
Date_	20130928
Time	12.53
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	8
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	57
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300365 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



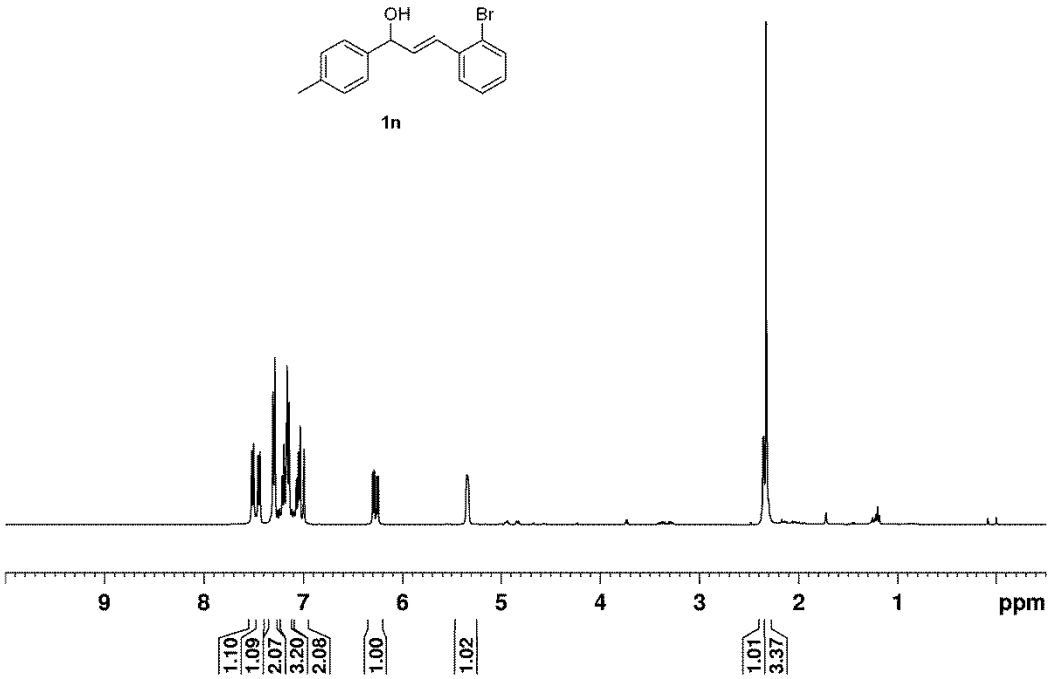
NAME	zhuangminyang-C2
EXPNO	6
PROCNO	1
Date_	20130928
Time	12.55
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	37
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127602 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



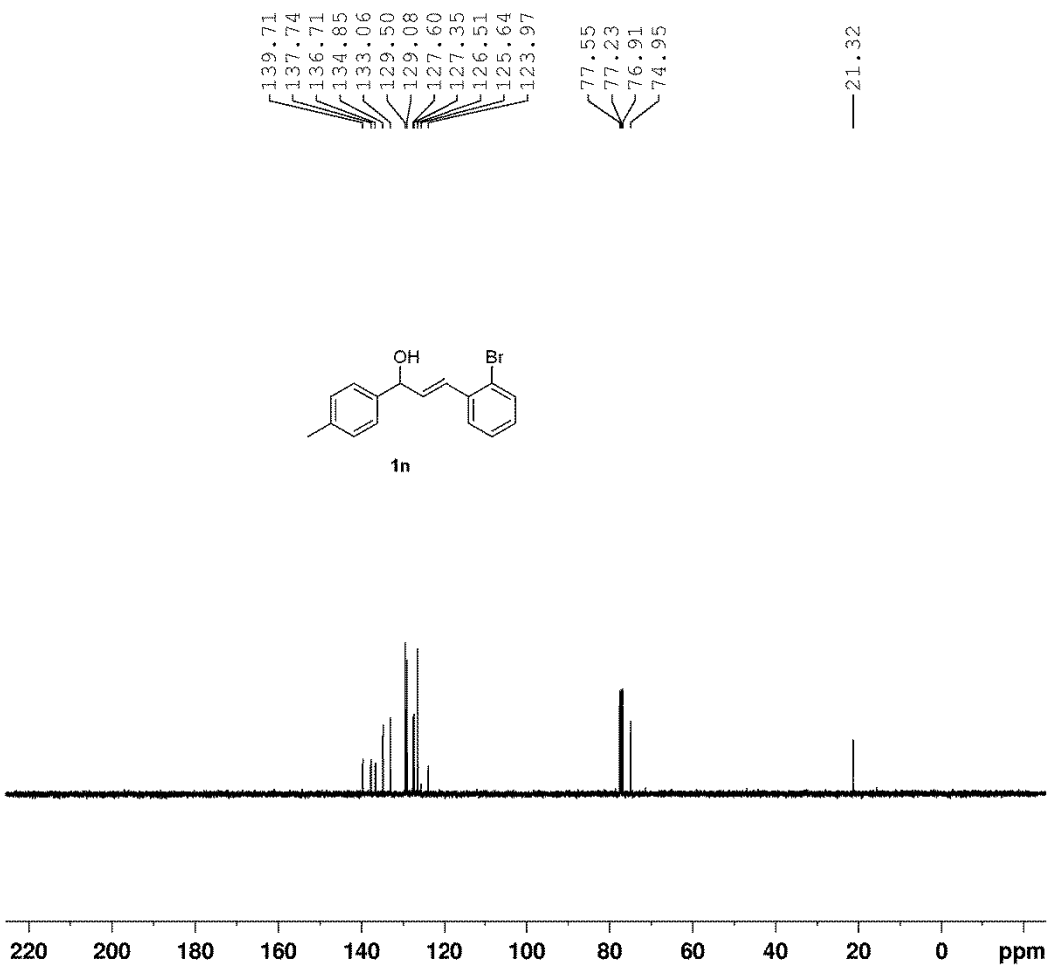
NAME	zhuangminyang-4
EXPNO	76
PROCNO	1
Date_	20131001
Time	0.03
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	8
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	25.4
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300475 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



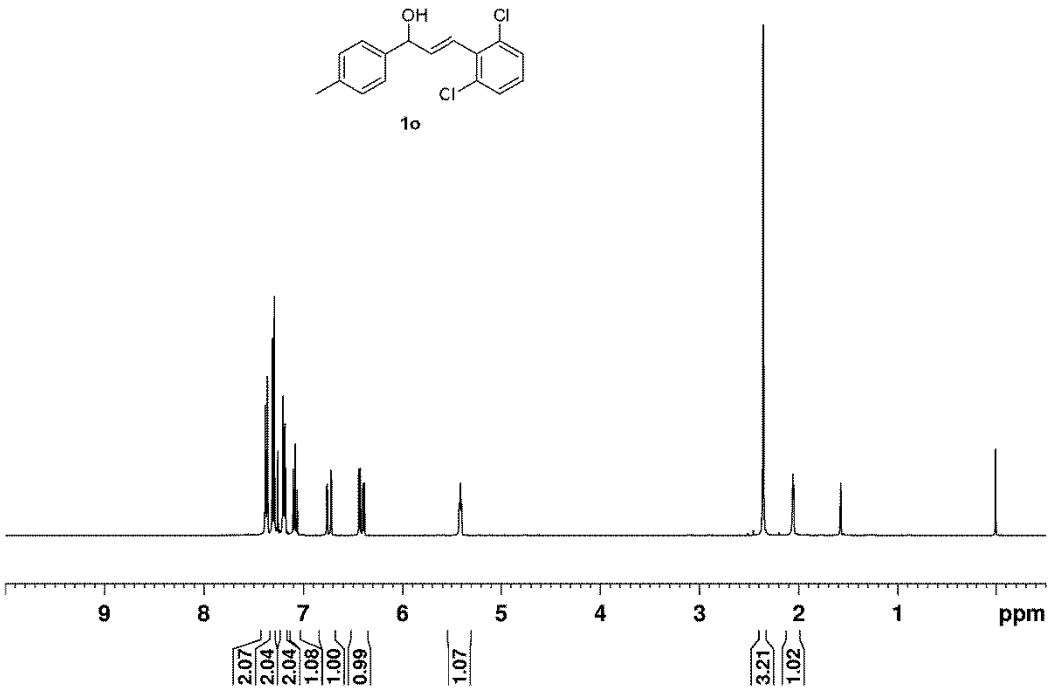
NAME	zhuangminyang-C2
EXPNO	9
PROCNO	1
Date_	20131001
Time	0.05
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	22
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127673 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



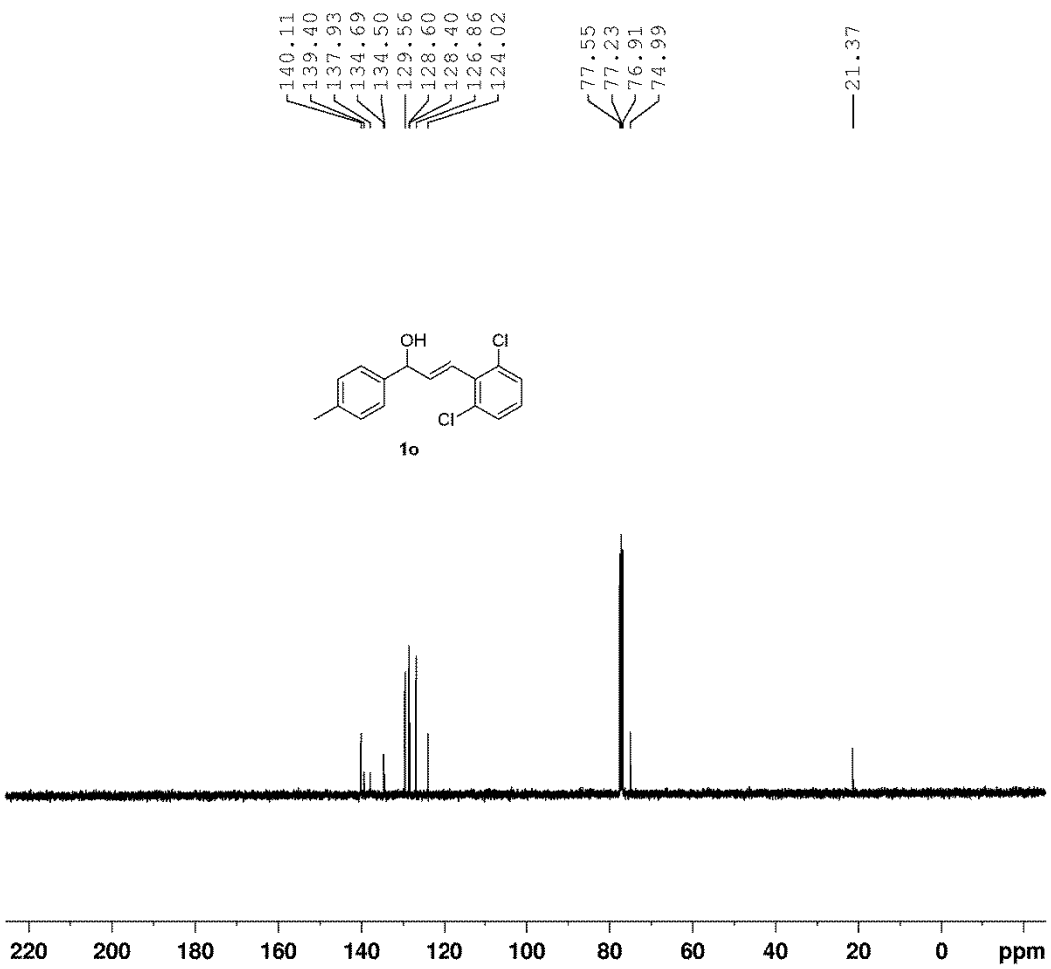
NAME	zhuangminyang-4
EXPNO	58
PROCNO	1
Date_	20130925
Time	0.20
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	16
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	57
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300369 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



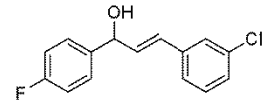
NAME	zhuangminyang-C1
EXPNO	155
PROCNO	1
Date_	20130925
Time	0.23
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	15
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127603 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



NAME	zhuangminyang-4
EXPNO	86
PROCNO	1
Date_	20131008
Time	0.15
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	16
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	203
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300177 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



NAME	zhuangminyang-C2
EXPNO	14
PROCNO	1
Date_	20131008
Time	0.17
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	131
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127502 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



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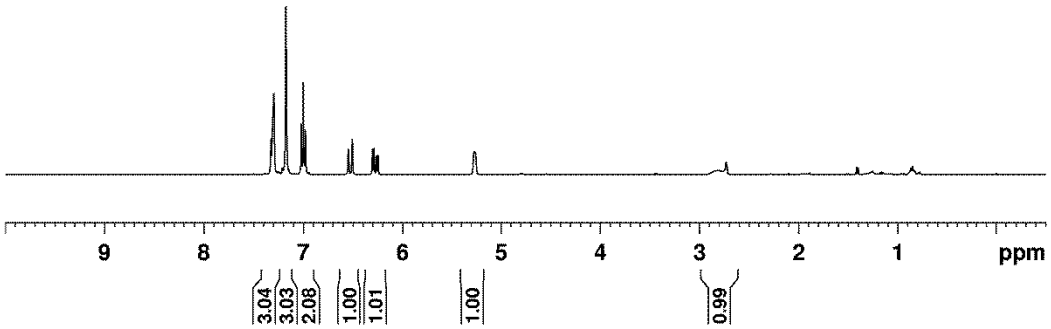
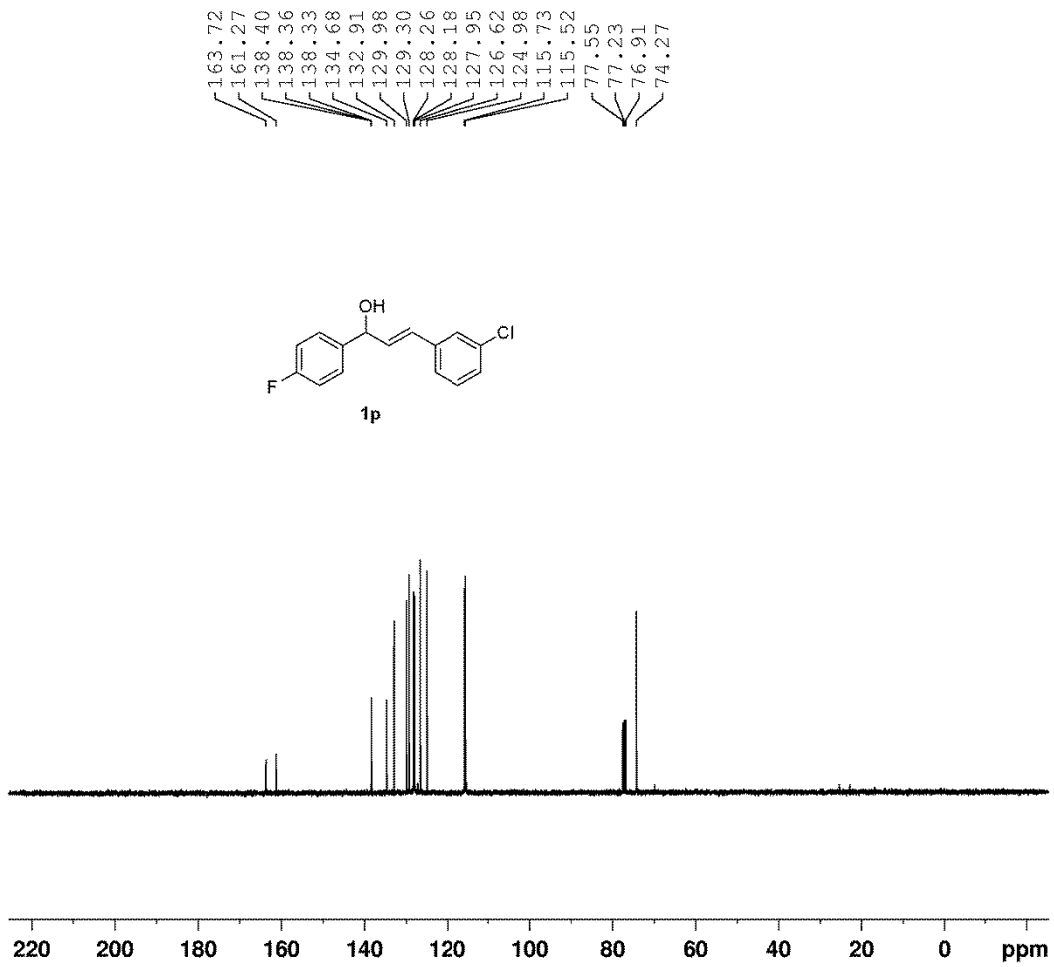
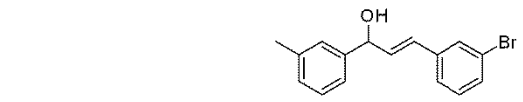


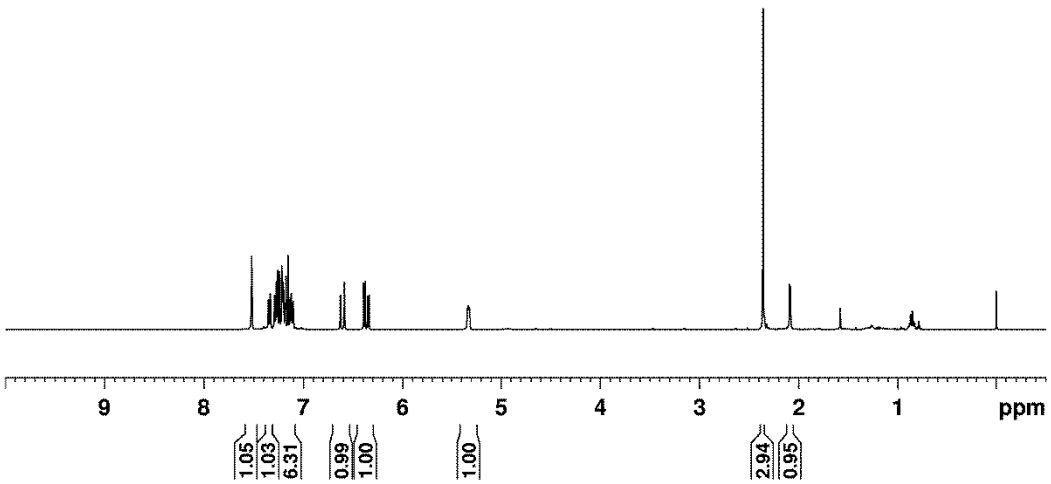
NAME	zhuangminyang-4
EXPNO	69
PROCNO	1
Date_	20130928
Time	5.48
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	5
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	45.2
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300348 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



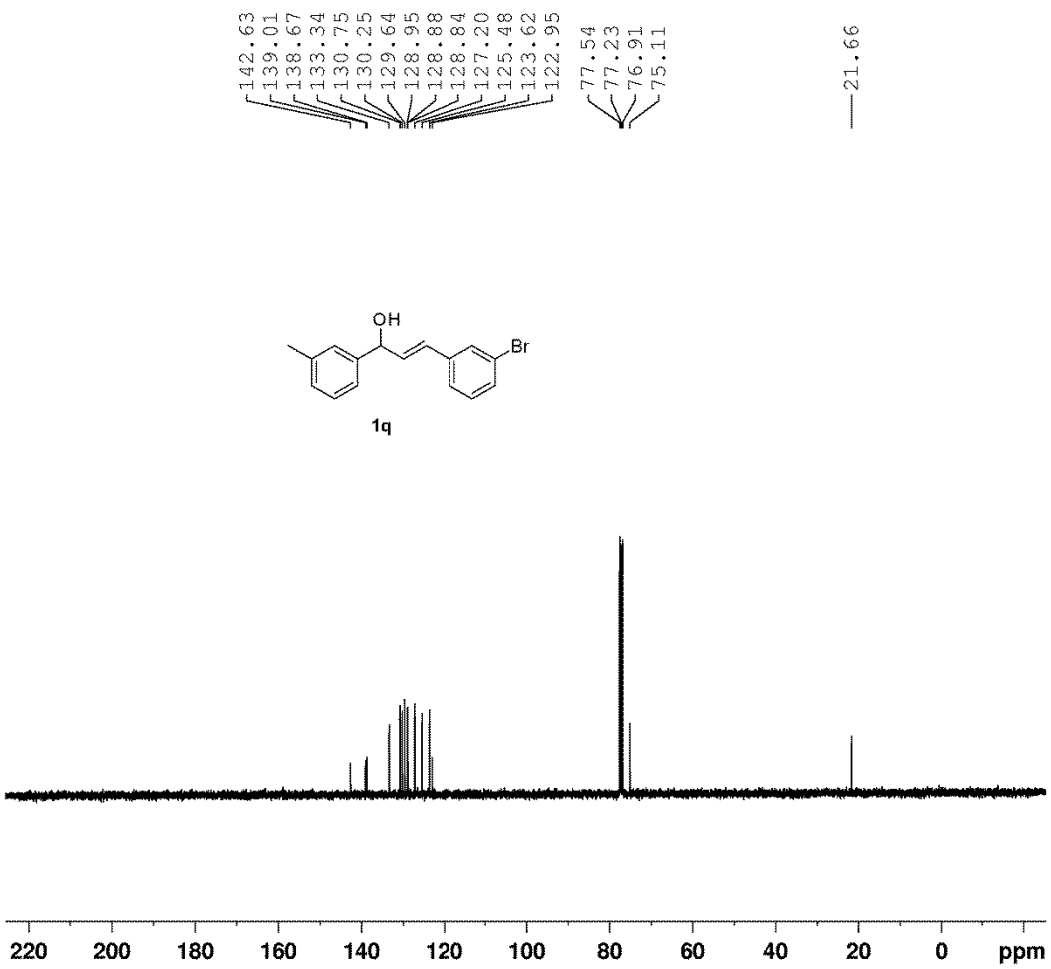
NAME	zhuangminyang-C2
EXPNO	5
PROCNO	1
Date_	20130928
Time	5.49
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	44
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127611 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



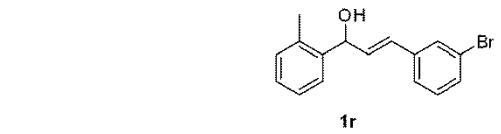
1q



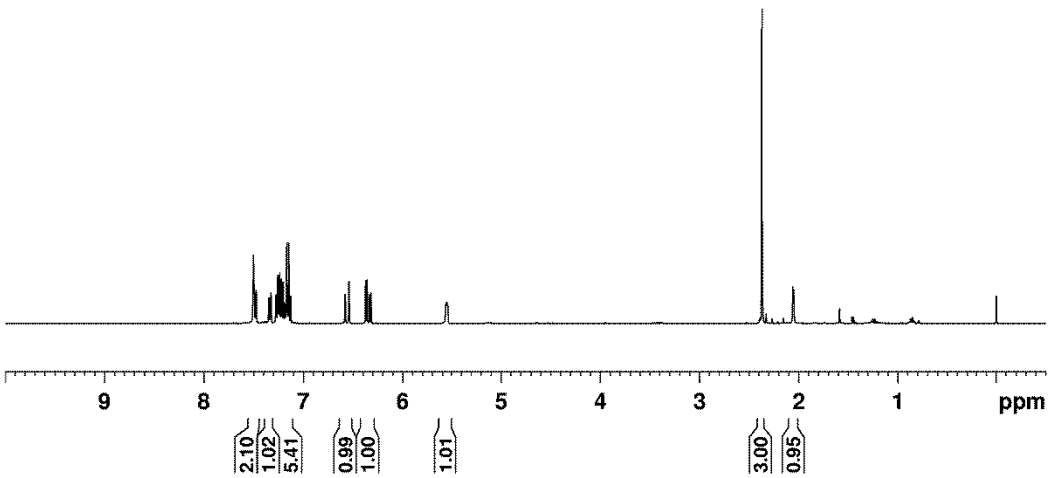
NAME	zhuangminyang-4
EXPNO	97
PROCNO	1
Date_	20131013
Time	7.02
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	6
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	144
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300237 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



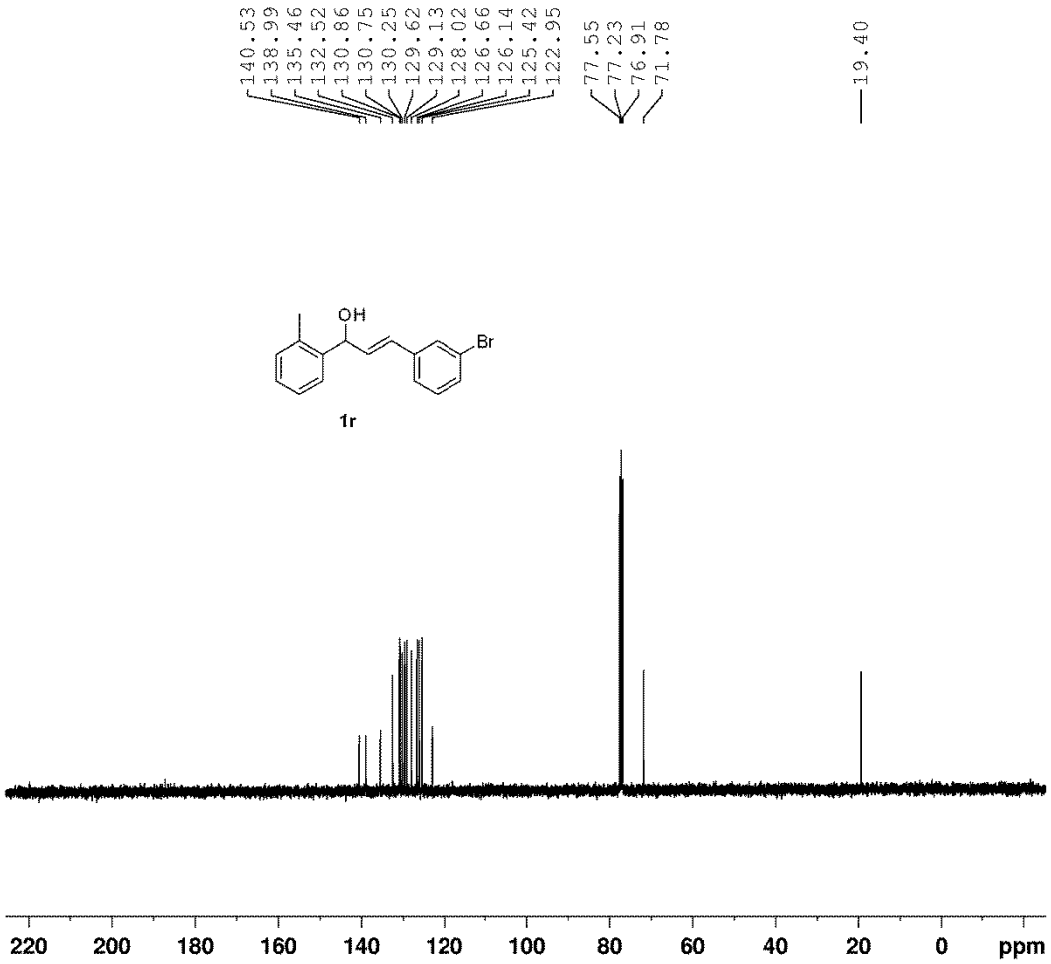
NAME	zhuangminyang-C2
EXPNO	24
PROCNO	1
Date_	20131013
Time	7.04
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	74
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127526 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



1r



NAME	zhuangminyang-4
EXPNO	98
PROCNO	1
Date_	20131013
Time	7.08
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	4
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	144
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300254 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



NAME	zhuangminyang-C2
EXPNO	25
PROCNO	1
Date_	20131013
Time	7.10
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	62
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1

======== CHANNEL f1 ========	
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127533 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40

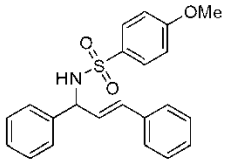
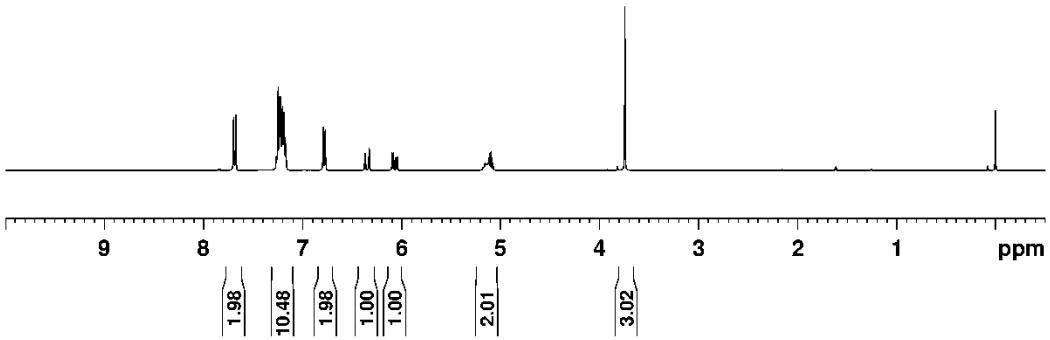
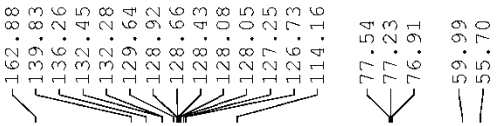


Table 1, entry 12




```
Current Data Parameters
NAME      zhuangminyang-6
EXPNO                  47
PROCNO                  1

F2 - Acquisition Parameters
Date_           20140403
Time               9.56
INSTRUM           spect
PROBHD   5 mm PADUL 13C
PULPROG             zg30
TD                 32768
SOLVENT            CDCl3
NS                     6
DS                     0
SWH            12019.230 Hz
FIDRES          0.366798 Hz
AQ             1.3631488 sec
RG                   114
DW                41.600 usec
DE                 6.50 usec
TE                300.0 K
D1            2.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         400.1320007 MHz
NUC1                1H
P1                12.60 usec
PLW1         13.06000042 W

F2 - Processing parameters
SI                 65536
SF           400.1300136 MHz
WDW                  EM
SSB      0
LB                 0.50 Hz
GB       0
PC                 1.00
```



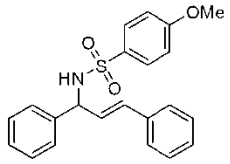
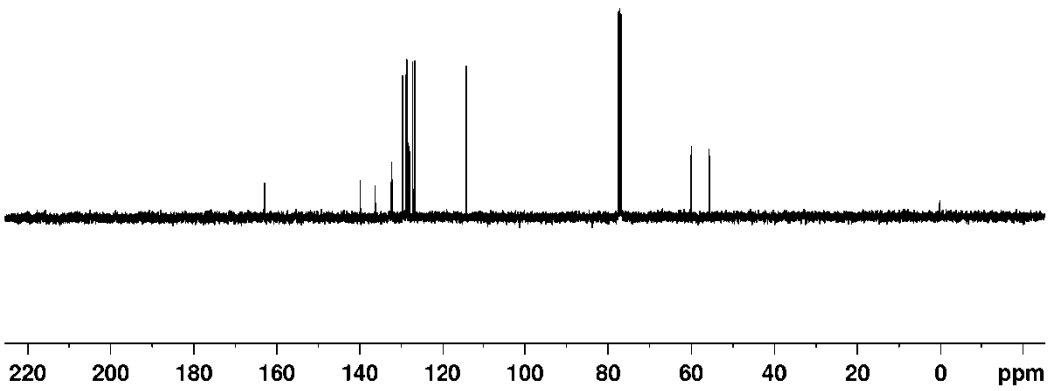


Table 1, entry 12




```
Current Data Parameters
NAME      zhuangminyang-C2
EXPNO                   49
PROCNO                   1

F2 - Acquisition Parameters
Date_           20140403
Time                9.58
INSTRUM            spect
PROBHD   5 mm PADUL 13C
PULPROG          zgpg30
TD                32768
SOLVENT           CDCl3
NS                   50
DS                    0
SWH           25252.525 Hz
FIDRES         0.770646 Hz
AQ             0.6488064 sec
RG                  203
DW                19.800 usec
DE                 6.50 usec
TE                300.0 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                  1

======== CHANNEL f1 ========
SFO1         100.6228298 MHz
NUC1                13C
P1                 9.40 usec
PLW1        43.63899994 W

======== CHANNEL f2 ========
SFO2         400.1316005 MHz
NUC2                1H
CPDPRG[2         waltz16
PCPD2             90.00 usec
PLW2        13.06000042 W
PLW12        0.25598001 W
PLW13        0.20734000 W

F2 - Processing parameters
SI                32768
SF           100.6127526 MHz
WDW                  EM
SSB       0
LB                1.00 Hz
GB        0
PC                1.40
```

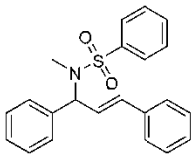
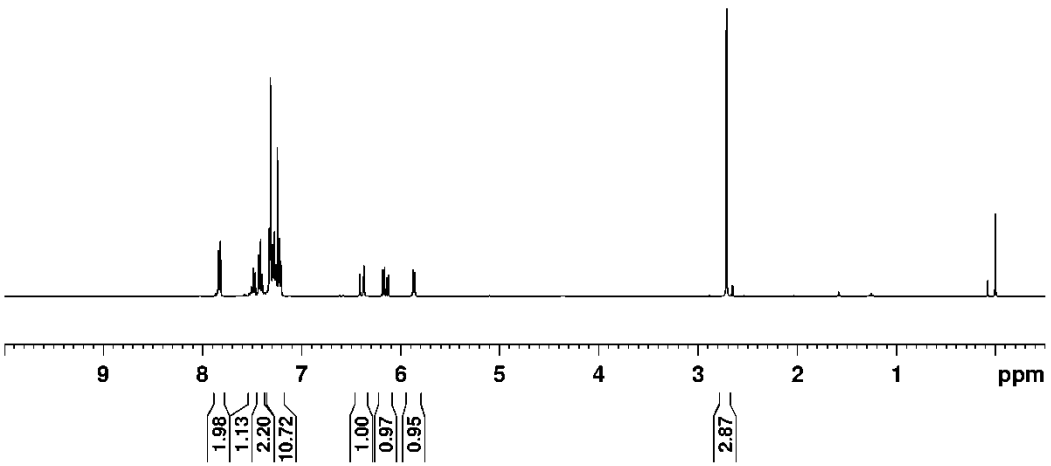
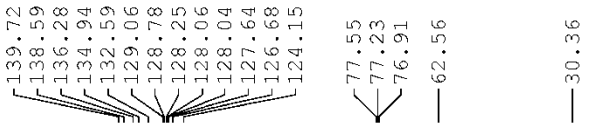


Table 1, entry 13




```
Current Data Parameters
NAME      zhuangminyang-6
EXPNO                  48
PROCNO                  1

F2 - Acquisition Parameters
Date_           20140403
Time               12.40
INSTRUM            spect
PROBHD   5 mm PADUL 13C
PULPROG             zg30
TD                 32768
SOLVENT            CDCl3
NS                    11
DS                     0
SWH            12019.230 Hz
FIDRES          0.366798 Hz
AQ             1.3631488 sec
RG                   114
DW                41.600 usec
DE                 6.50 usec
TE                300.0 K
D1           2.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         400.1320007 MHz
NUC1                   1H
P1                 12.60 usec
PLW1         13.06000042 W

F2 - Processing parameters
SI                 65536
SF           400.1300145 MHz
WDW                   EM
SSB       0
LB                 0.50 Hz
GB        0
PC                 1.00
```



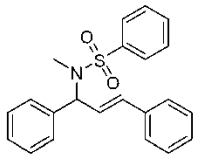
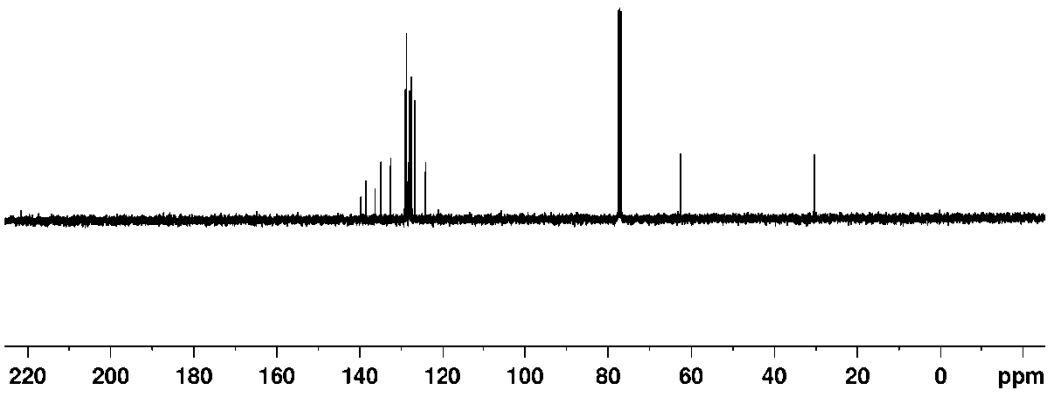


Table 1, entry 13




```
Current Data Parameters
NAME      zhuangminyang-C2
EXPNO                   50
PROCNO                   1

F2 - Acquisition Parameters
Date_           20140403
Time               12.42
INSTRUM            spect
PROBHD   5 mm PADUL 13C
PULPROG          zgpg30
TD                32768
SOLVENT           CDCl3
NS                   43
DS                    0
SWH           25252.525 Hz
FIDRES         0.770646 Hz
AQ             0.6488064 sec
RG                  203
DW                19.800 usec
DE                 6.50 usec
TE                300.0 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                  1

======== CHANNEL f1 ========
SFO1         100.6228298 MHz
NUC1                 13C
P1                  9.40 usec
PLW1         43.63899994 W

======== CHANNEL f2 ========
SFO2         400.1316005 MHz
NUC2                 1H
CPDPRG[2          waltz16
PCPD2              90.00 usec
PLW2         13.06000042 W
PLW12         0.25598001 W
PLW13         0.20734000 W

F2 - Processing parameters
SI                32768
SF           100.6127525 MHz
WDW                  EM
SSB       0
LB                1.00 Hz
GB        0
PC                1.40
```

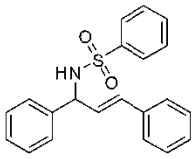
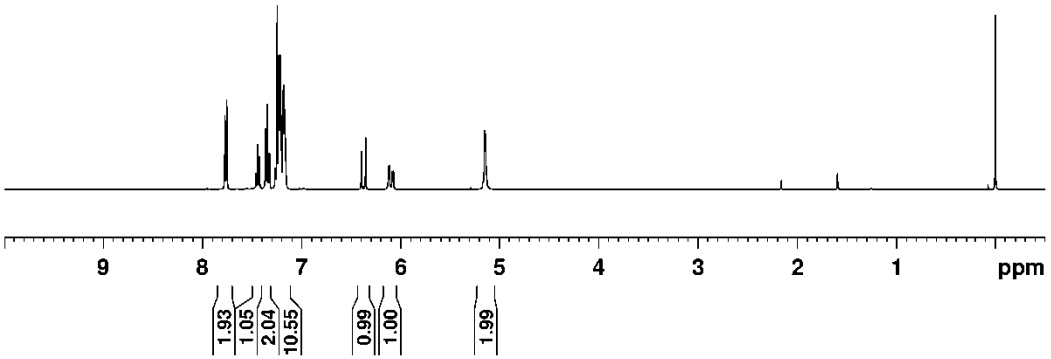
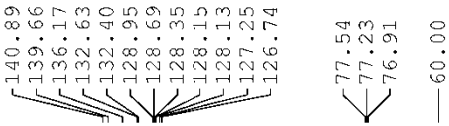


Table 1, entry 14




```
Current Data Parameters
NAME      zhuangminyang-6
EXPNO                  49
PROCNO                  1

F2 - Acquisition Parameters
Date_           20140403
Time               10.09
INSTRUM            spect
PROBHD   5 mm PADUL 13C
PULPROG             zg30
TD                 32768
SOLVENT            CDCl3
NS                     6
DS                     0
SWH            12019.230 Hz
FIDRES          0.366798 Hz
AQ             1.3631488 sec
RG                   128
DW                41.600 usec
DE                 6.50 usec
TE                300.0 K
D1           2.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         400.1320007 MHz
NUC1                   1H
P1                 12.60 usec
PLW1         13.06000042 W

F2 - Processing parameters
SI                 65536
SF           400.1300136 MHz
WDW                   EM
SSB       0
LB                 0.50 Hz
GB        0
PC                 1.00
```



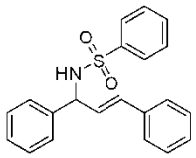
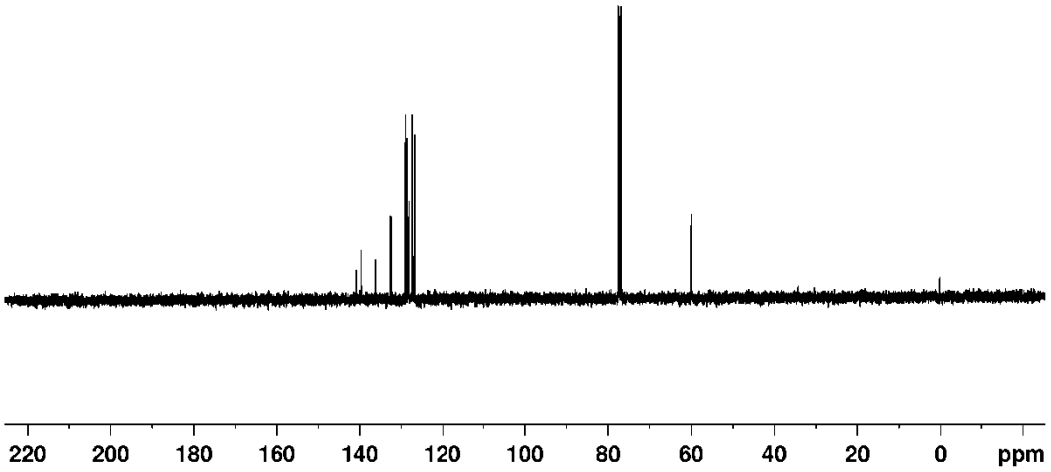


Table 1, entry 14




```
Current Data Parameters
NAME      zhuangminyang-C2
EXPNO                   51
PROCNO                   1

F2 - Acquisition Parameters
Date_           20140403
Time               10.10
INSTRUM            spect
PROBHD   5 mm PADUL 13C
PULPROG          zgpg30
TD                32768
SOLVENT           CDCl3
NS                   68
DS                    0
SWH           25252.525 Hz
FIDRES         0.770646 Hz
AQ             0.6488064 sec
RG                  203
DW                19.800 usec
DE                 6.50 usec
TE                300.0 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                  1

======== CHANNEL f1 ========
SFO1        100.6228298 MHz
NUC1                13C
P1                 9.40 usec
PLW1        43.63899994 W

======== CHANNEL f2 ========
SFO2        400.1316005 MHz
NUC2                1H
CPDPRG[2         waltz16
PCPD2             90.00 usec
PLW2        13.06000042 W
PLW12        0.25598001 W
PLW13        0.20734000 W

F2 - Processing parameters
SI                32768
SF          100.6127518 MHz
WDW                 EM
SSB       0
LB                1.00 Hz
GB        0
PC                1.40
```

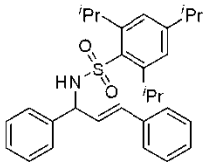
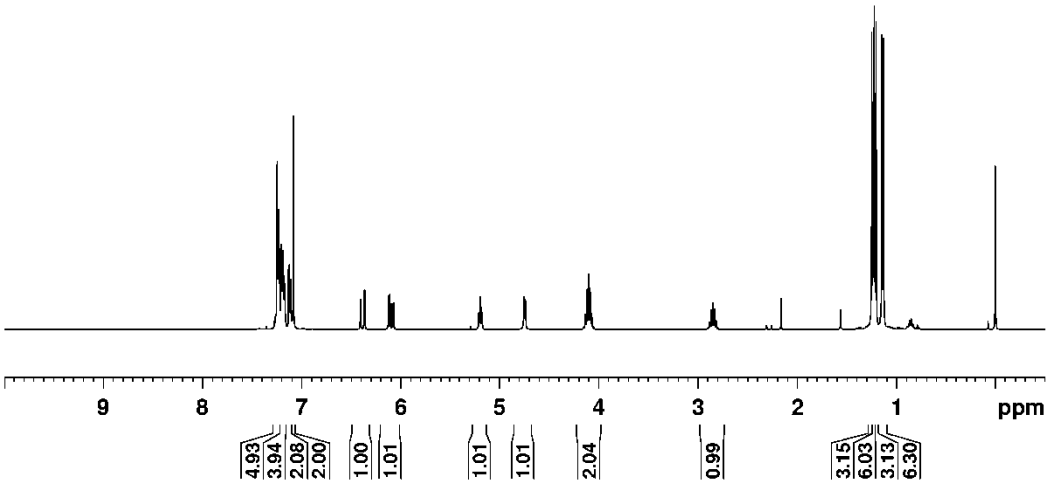
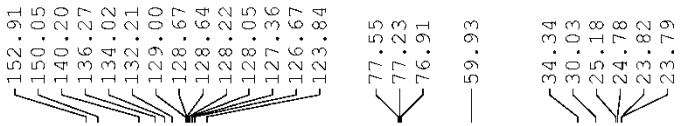


Table 1, entry 15




```
Current Data Parameters
NAME      zhuangminyang-6
EXPNO                  50
PROCNO                  1

F2 - Acquisition Parameters
Date_           20140403
Time               10.15
INSTRUM            spect
PROBHD   5 mm PADUL 13C
PULPROG             zg30
TD                 32768
SOLVENT            CDCl3
NS                     9
DS                     0
SWH            12019.230 Hz
FIDRES          0.366798 Hz
AQ             1.3631488 sec
RG                   101
DW                41.600 usec
DE                 6.50 usec
TE                300.0 K
D1           2.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         400.1320007 MHz
NUC1                   1H
P1                 12.60 usec
PLW1         13.06000042 W

F2 - Processing parameters
SI                 65536
SF           400.1300131 MHz
WDW                   EM
SSB       0
LB                 0.50 Hz
GB        0
PC                 1.00
```



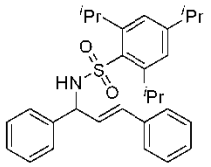
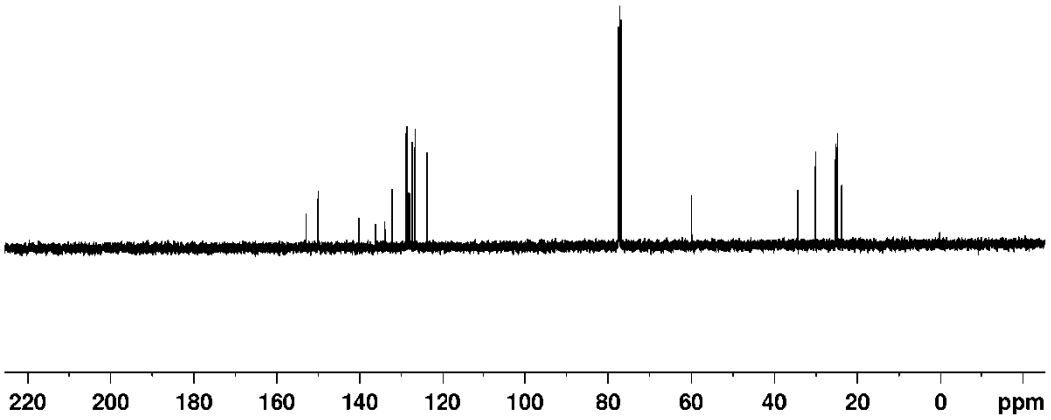
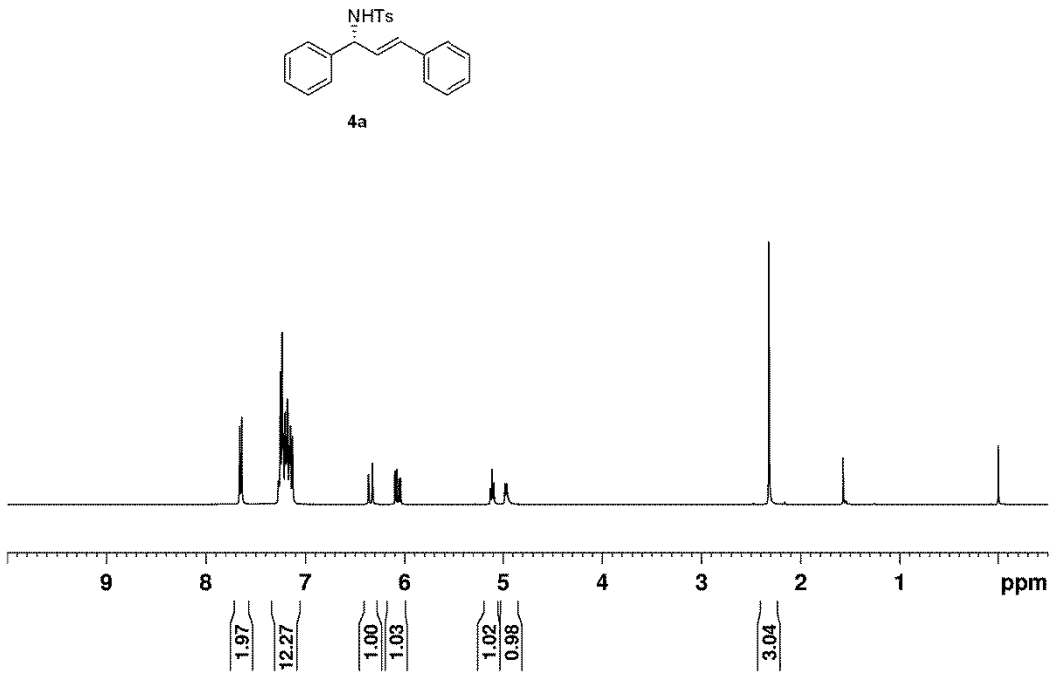


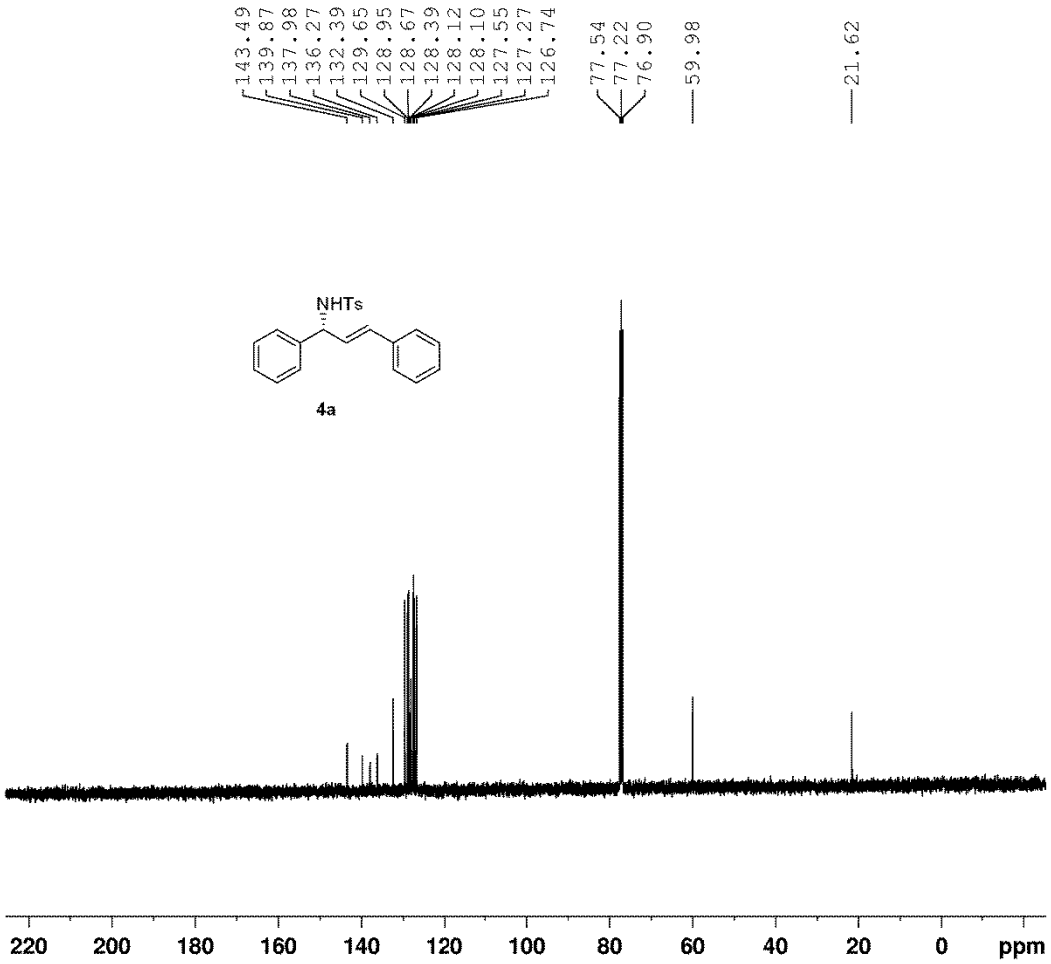
Table 1, entry 15



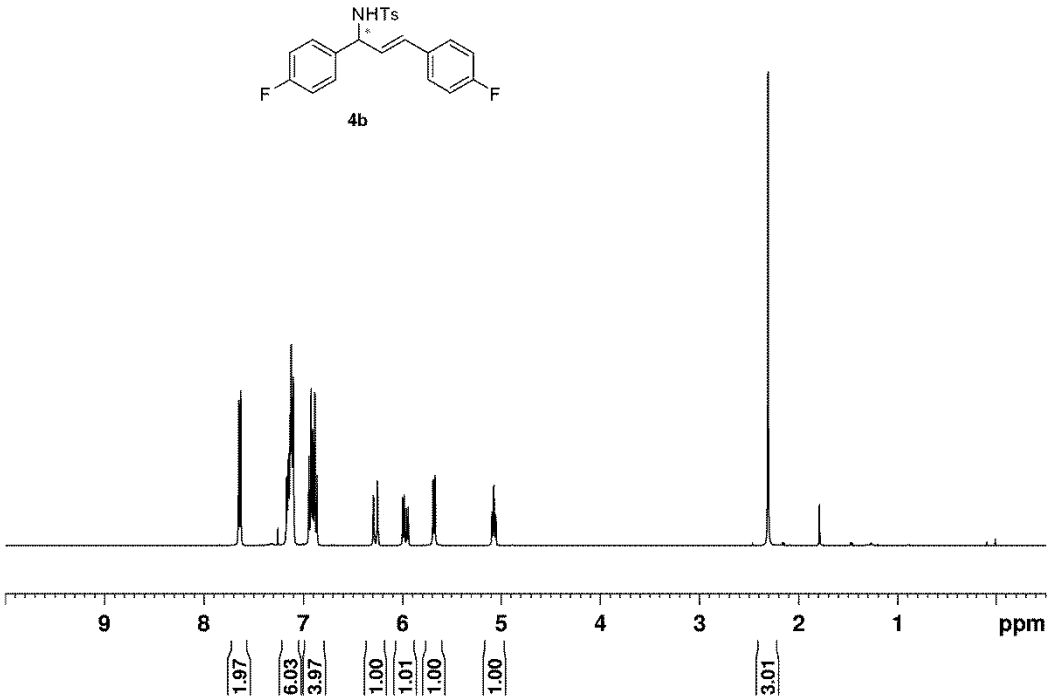

```
Current Data Parameters
NAME      zhuangminyang-C2
EXPNO                   52
PROCNO                   1

F2 - Acquisition Parameters
Date_           20140403
Time               10.17
INSTRUM            spect
PROBHD   5 mm PADUL 13C
PULPROG          zgpg30
TD                32768
SOLVENT           CDCl3
NS                   57
DS                    0
SWH           25252.525 Hz
FIDRES         0.770646 Hz
AQ             0.6488064 sec
RG                  203
DW                19.800 usec
DE                 6.50 usec
TE                300.0 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                  1

======== CHANNEL f1 ========
SFO1         100.6228298 MHz
NUC1                13C
P1                 9.40 usec
PLW1         43.63899994 W

======== CHANNEL f2 ========
SFO2         400.1316005 MHz
NUC2                1H
CPDPRG[2         waltz16
PCPD2             90.00 usec
PLW2         13.06000042 W
PLW12         0.25598001 W
PLW13         0.20734000 W

F2 - Processing parameters
SI                32768
SF           100.6127502 MHz
WDW                  EM
SSB       0
LB                1.00 Hz
GB        0
PC                1.40
```



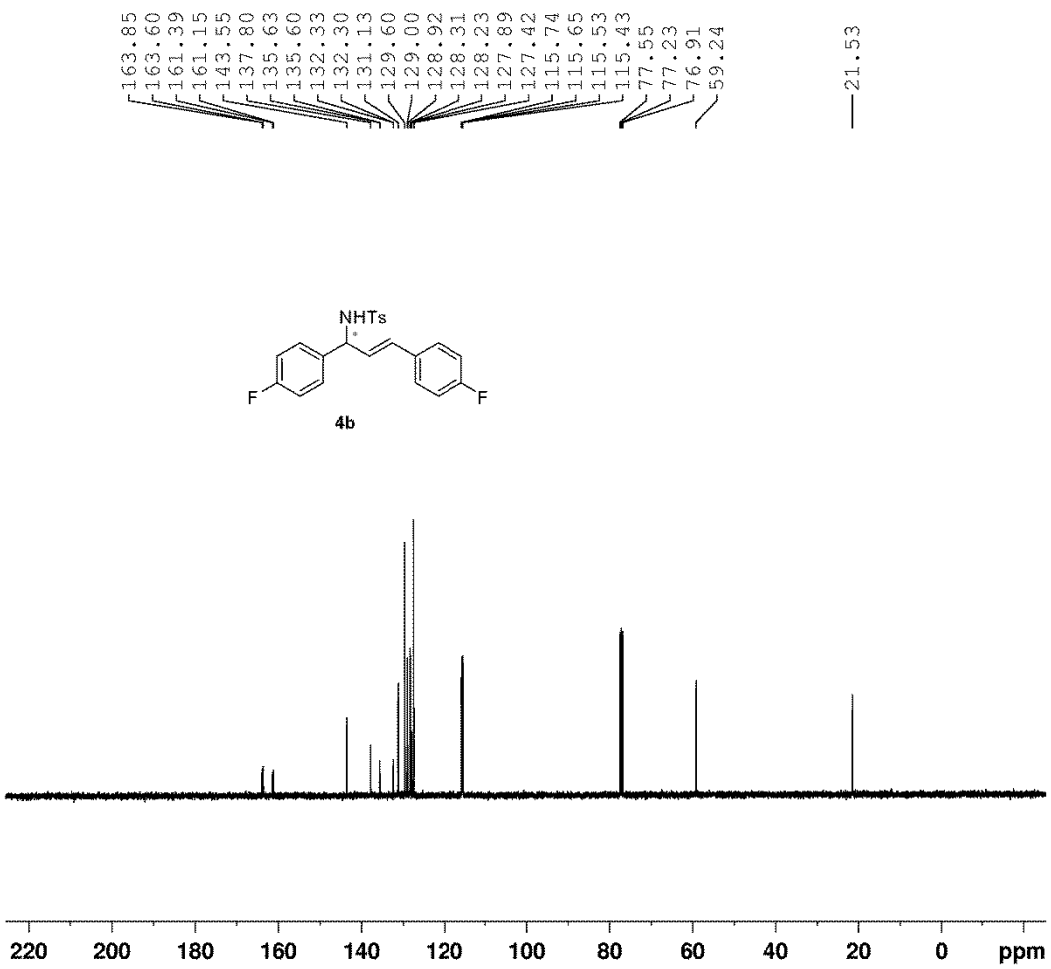
NAME	zhuangminyang-4
EXPNO	15
PROCNO	1
Date_	20130910
Time	6.41
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	16
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	161
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300204 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



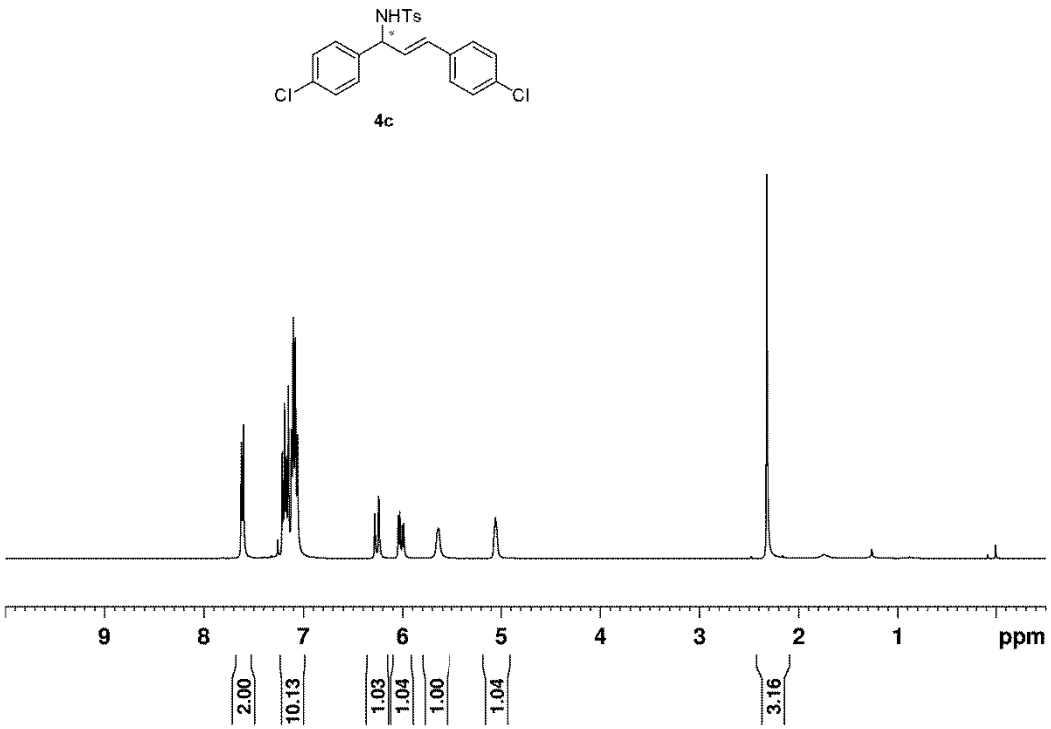
NAME	zhuangminyang-C1
EXPNO	140
PROCNO	1
Date_	20130910
Time	6.43
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	254
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
========	CHANNEL f1 ========
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127510 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



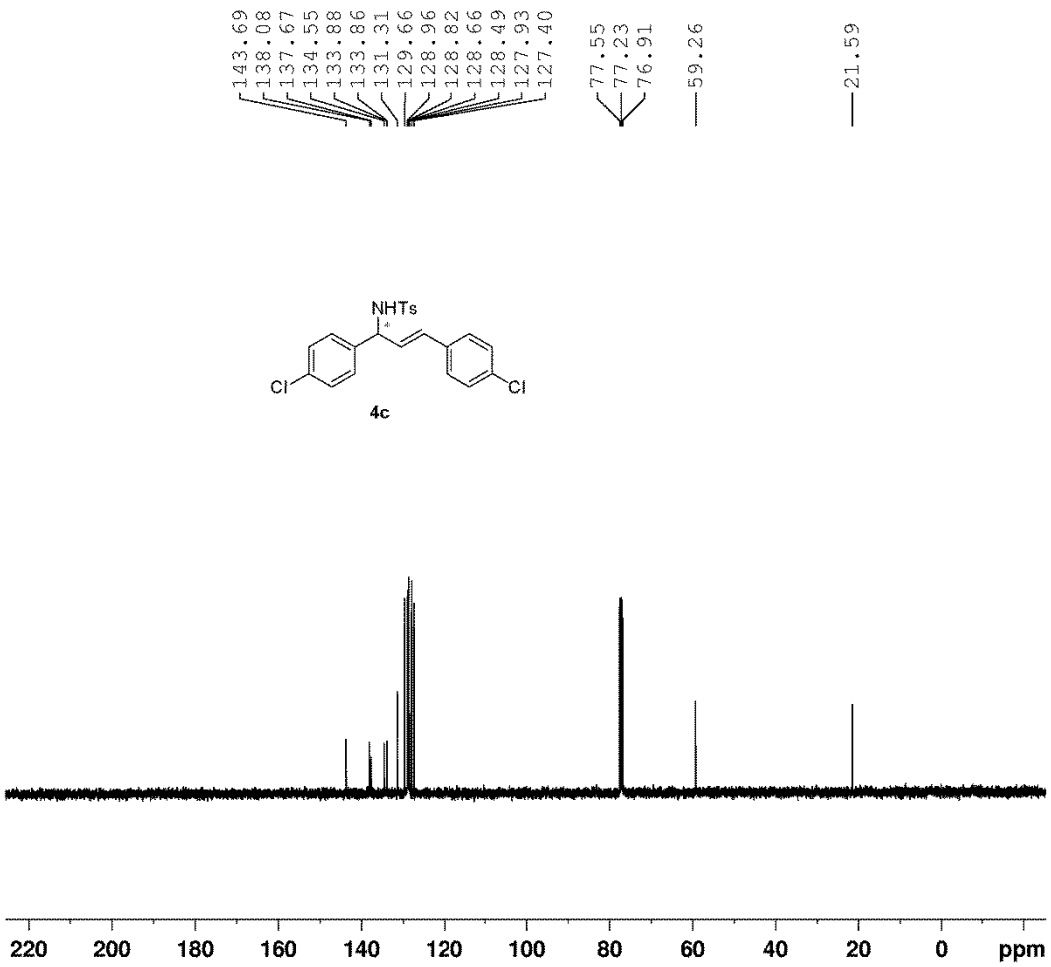
NAME	zhuangminyang-4
EXPNO	38
PROCNO	1
Date_	20130912
Time	13.07
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	13
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	64
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300176 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



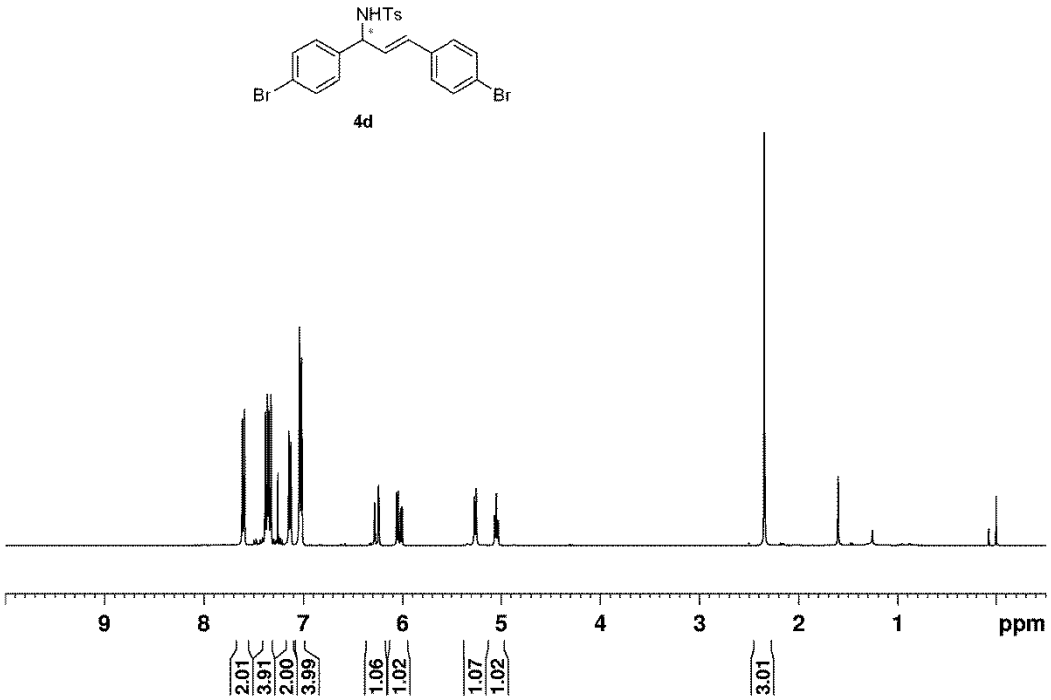
NAME	zhuangminyang-C1
EXPNO	144
PROCNO	1
Date_	20130912
Time	13.09
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	65
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127564 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



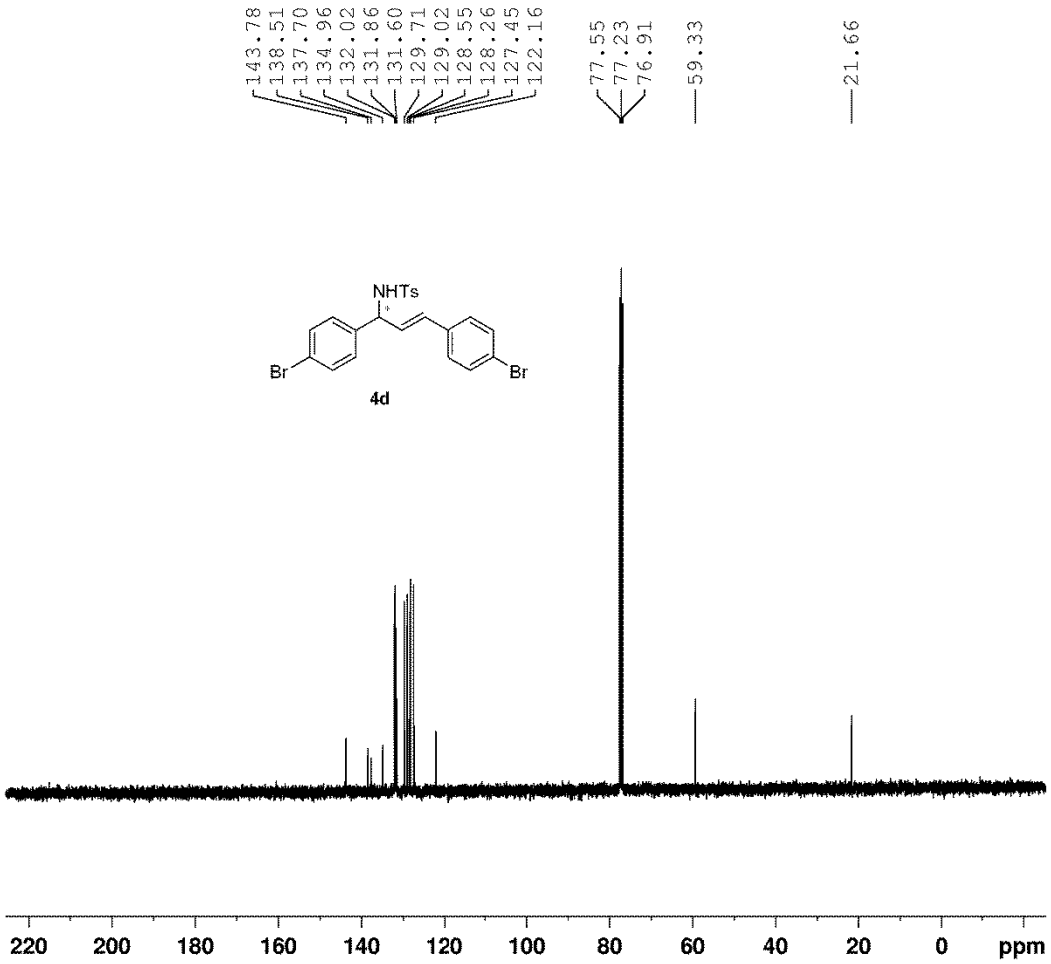
NAME	zhuangminyang-4
EXPNO	16
PROCNO	1
Date_	20130910
Time	10.35
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	16
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	90.5
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300179 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



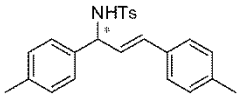
NAME	zhuangminyang-C1
EXPNO	139
PROCNO	1
Date_	20130910
Time	10.37
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	41
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127550 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



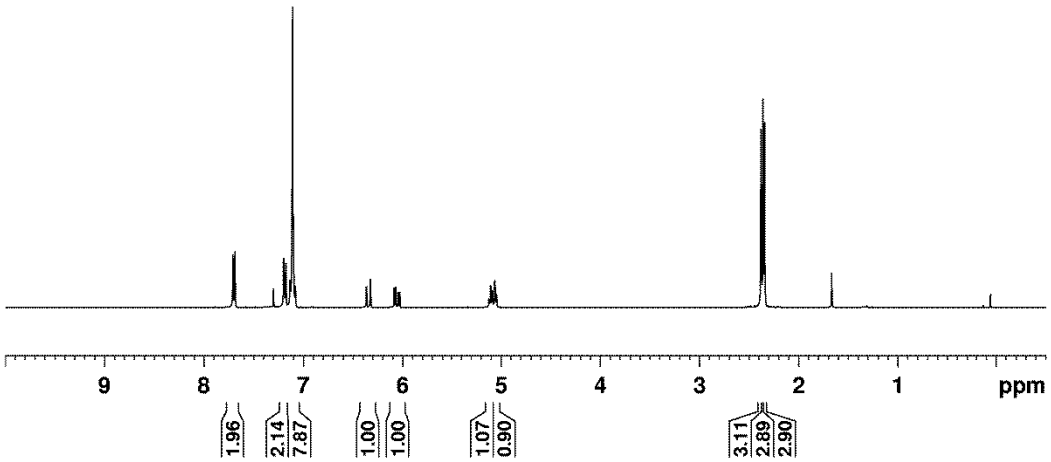
NAME	zhuangminyang-4
EXPNO	46
PROCNO	1
Date_	20130916
Time	8.08
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	14
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	203
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300178 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



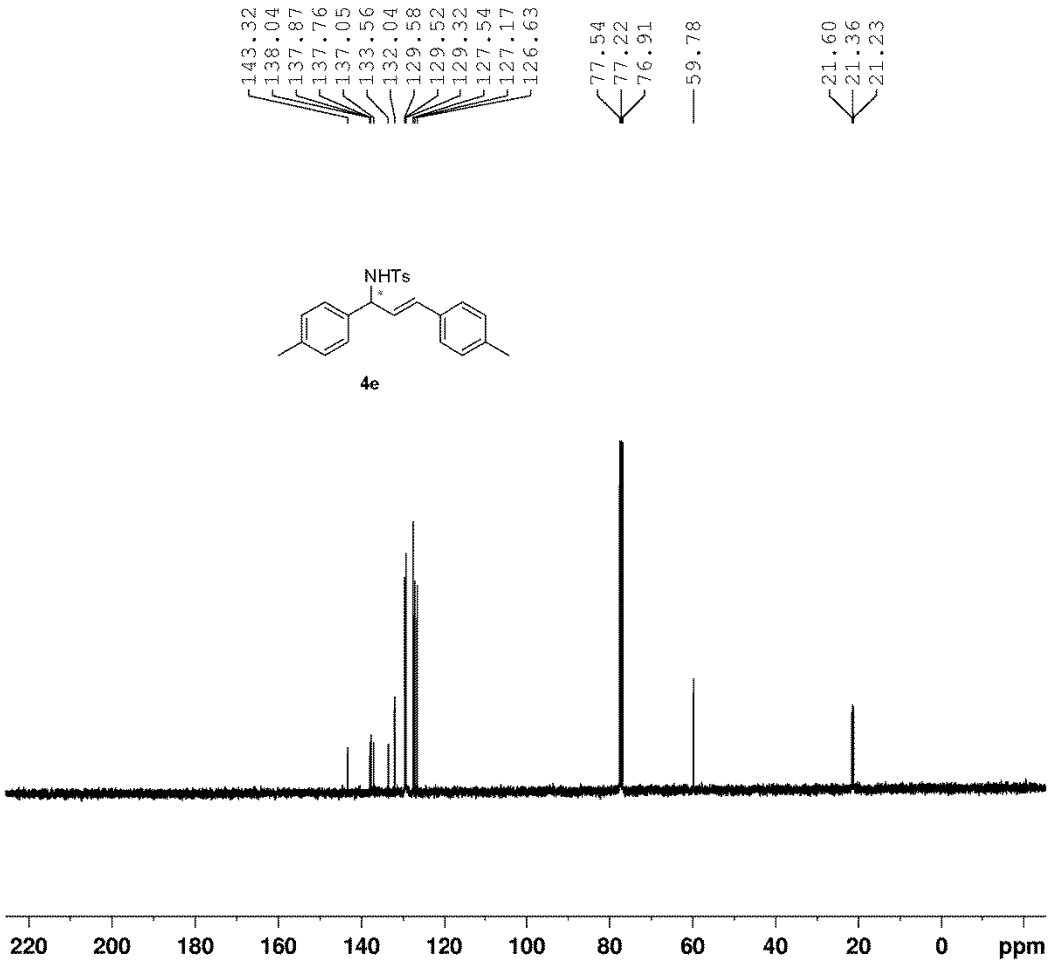
NAME	zhuangminyang-C1
EXPNO	146
PROCNO	1
Date_	20130916
Time	8.10
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	136
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
========	CHANNEL f1 ========
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127511 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



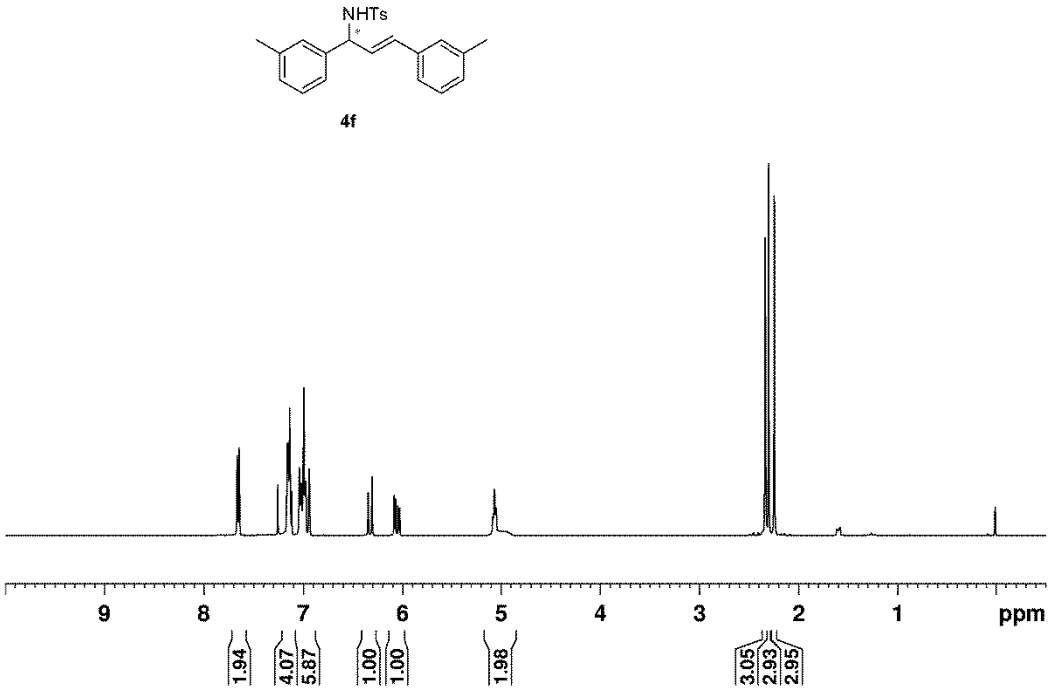
4e



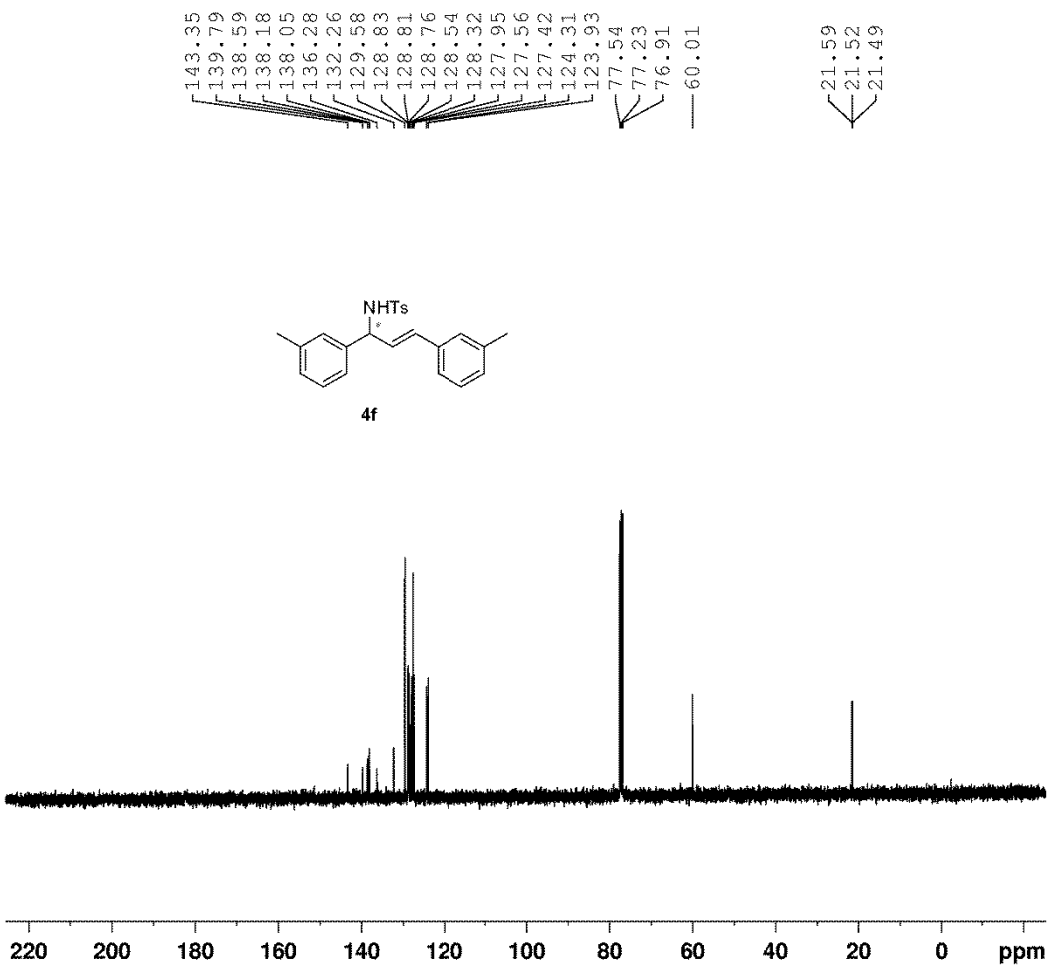
NAME	zhuangminyang-4
EXPNO	37
PROCNO	1
Date_	20130912
Time	12.55
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	15
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	114
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300000 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



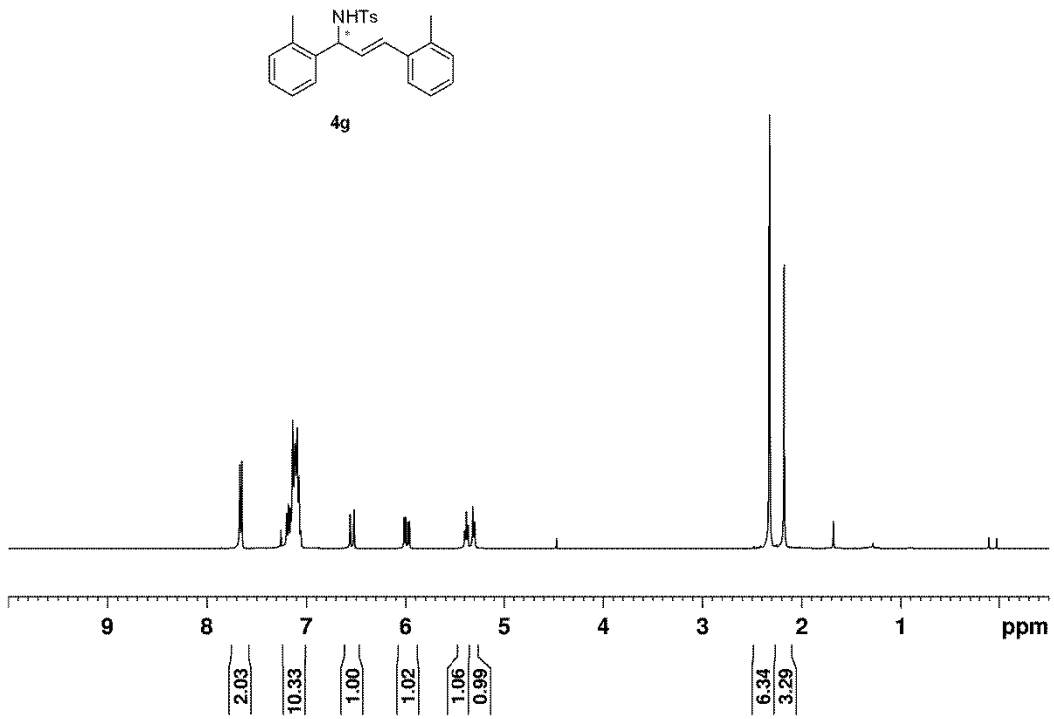
NAME	zhuangminyang-C1
EXPNO	143
PROCNO	1
Date_	20130912
Time	12.58
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	146
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127533 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



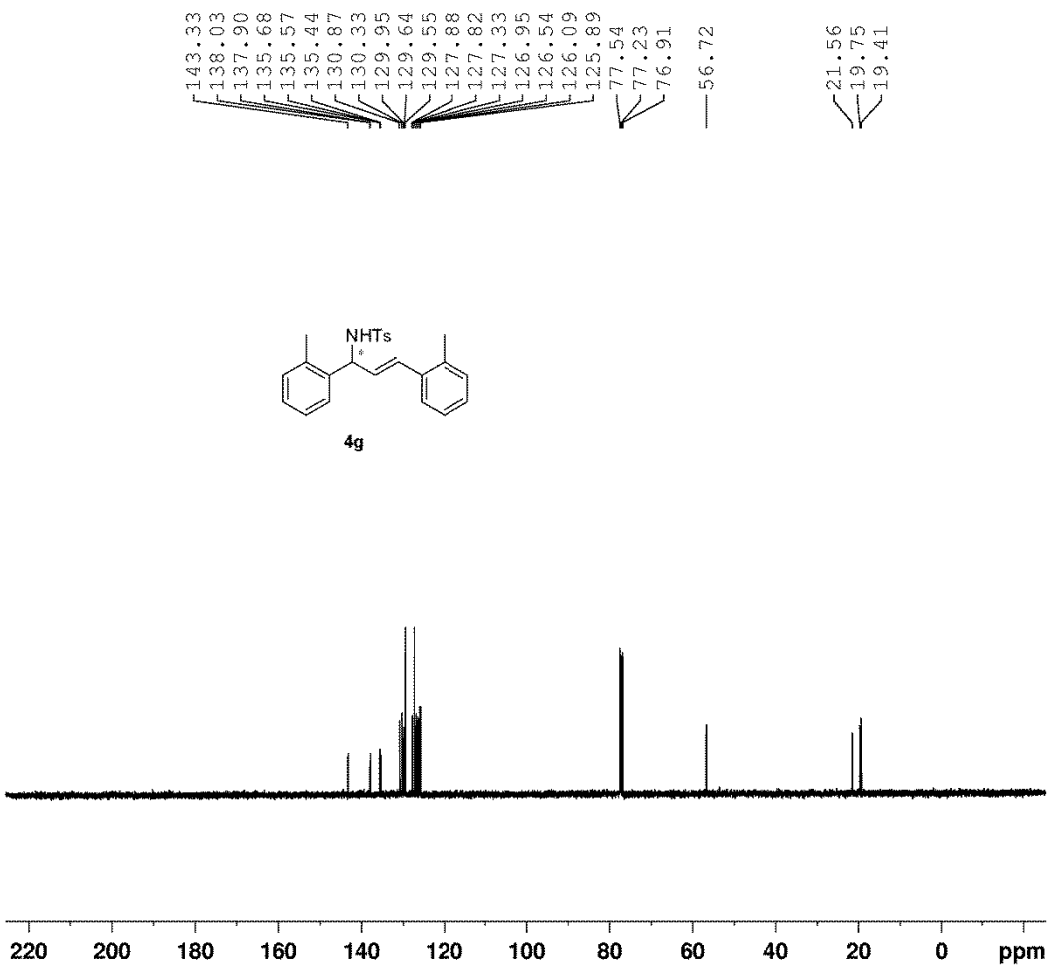
NAME	zhuangminyang-4
EXPNO	34
PROCNO	1
Date_	20130912
Time	0.28
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	12
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	128
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300177 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



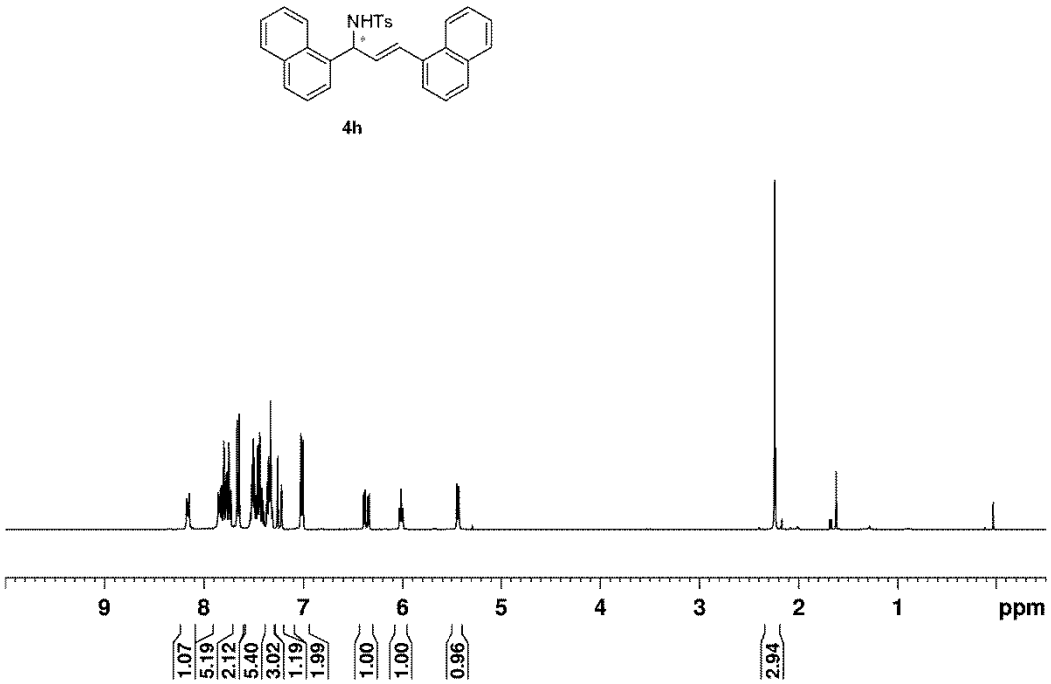
NAME	zhuangminyang-C1
EXPNO	141
PROCNO	1
Date_	20130912
Time	0.30
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	117
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127524 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



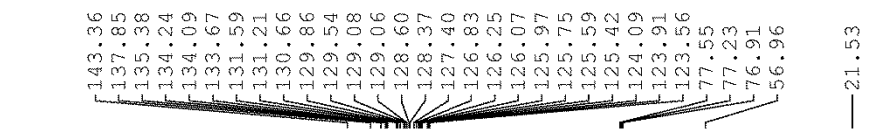
NAME	zhuangminyang-4
EXPNO	36
PROCNO	1
Date_	20130912
Time	12.53
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	6
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	71.8
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300180 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00

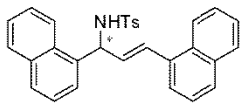



```
NAME        zhuangminyang-C1
EXPNO                    142
PROCNO                     1
Date_               20130912
Time                    0.39
INSTRUM                spect
PROBHD    5 mm PADUL 13C
PULPROG             zgpg30
TD                      32768
SOLVENT                 CDCl3
NS                         48
DS                          0
SWH                25252.525 Hz
FIDRES              0.770646 Hz
AQ                  0.6488564 sec
RG                        203
DW                     19.800 usec
DE                      6.50 usec
TE                     300.0 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                         1

======== CHANNEL f1 ========
NUC1                      13C
P1                       9.40 usec
SI                      32768
SF                100.6127571 MHz
WDW                        EM
SSB                         0
LB                       1.00 Hz
GB                          0
PC                       1.40
```

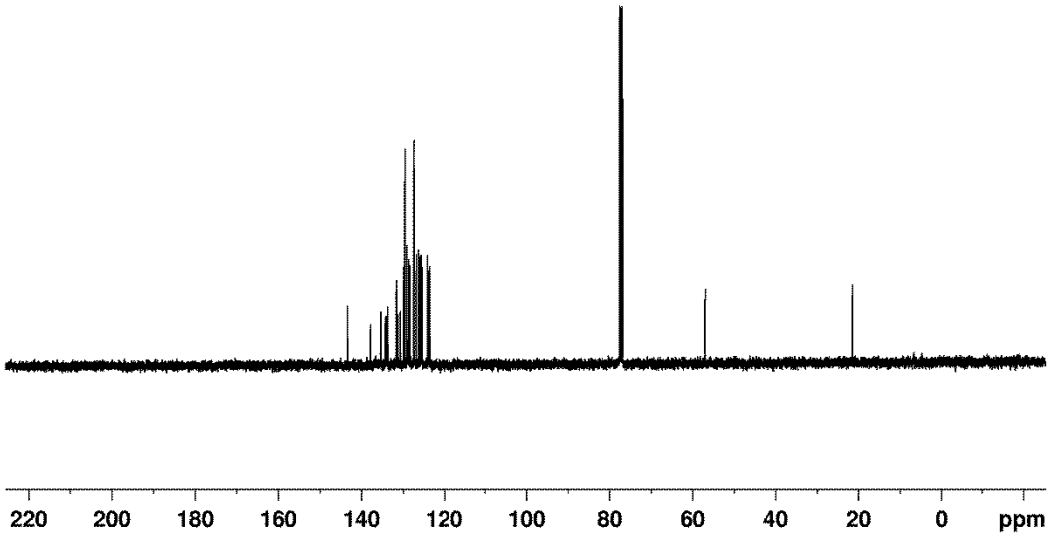


NAME	zhuangminyang-4
EXPNO	47
PROCNO	1
Date_	20130916
Time	8.17
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	15
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	101
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300176 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00

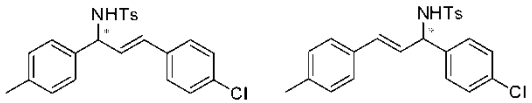




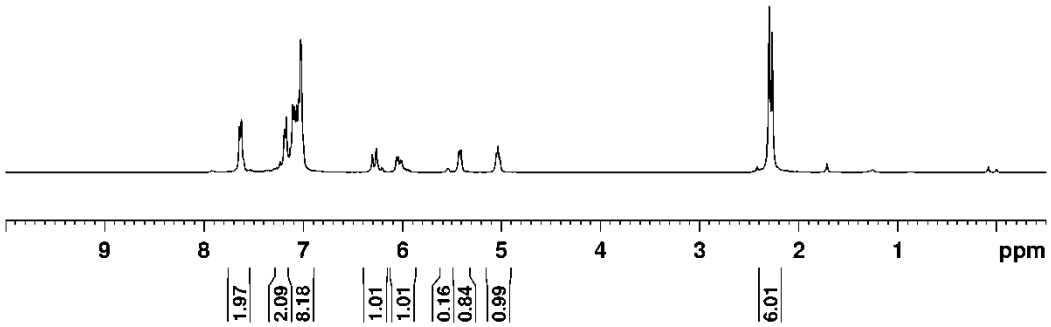
4h



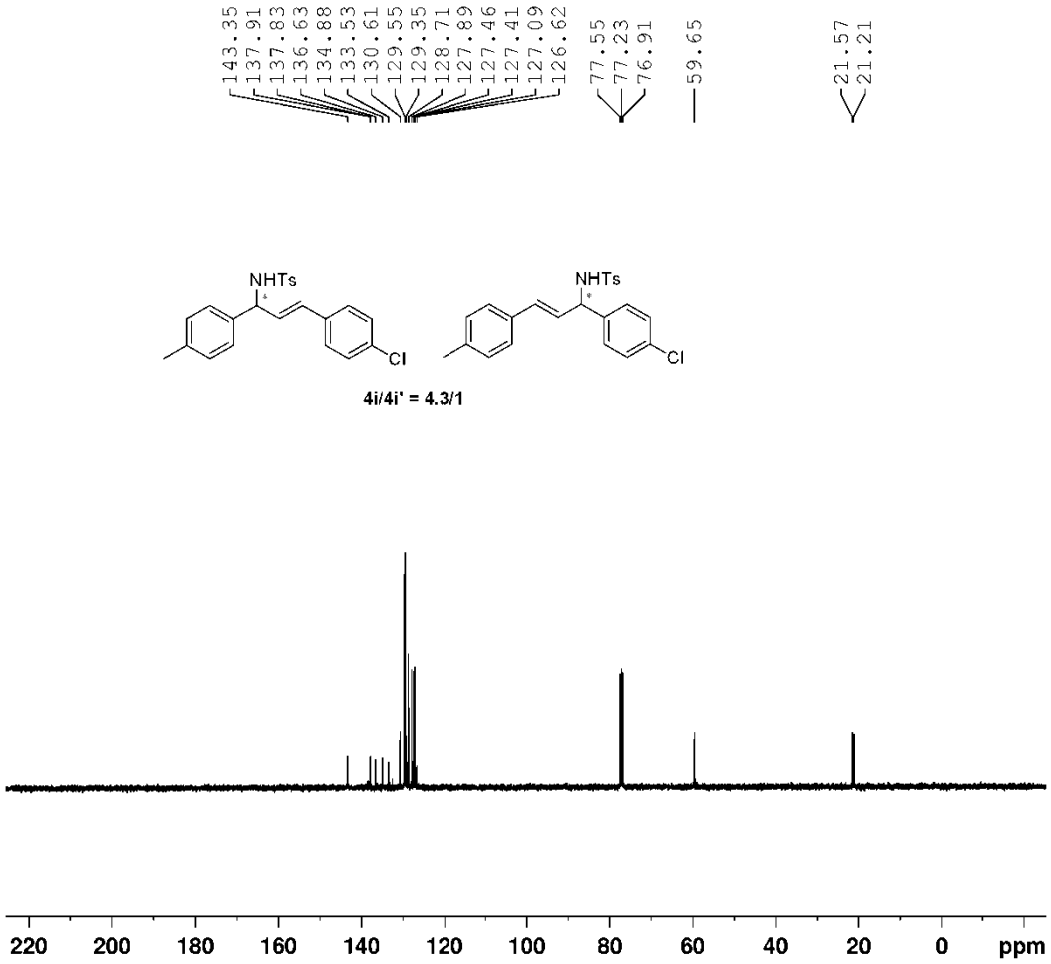
NAME	zhuangminyang-C1	
EXPNO	147	
PROCNO	1	
Date_	20130916	
Time	8.21	
INSTRUM	spect	
PROBHD	5 mm PADUL 13C	
PULPROG	zgpg30	
TD	32768	
SOLVENT	CDCl3	
NS	107	
DS	0	
SWH	25252.525	Hz
FIDRES	0.770646	Hz
AQ	0.6488564	sec
RG	203	
DW	19.800	usec
DE	6.50	usec
TE	300.0	K
D1	2.00000000	sec
D11	0.03000000	sec
TD0	1	
========	CHANNEL f1	========
NUC1	13C	
P1	9.40	usec
SI	32768	
SF	100.6127548	MHz
WDW	EM	
SSB	0	
LB	1.00	Hz
GB	0	
PC	1.40	



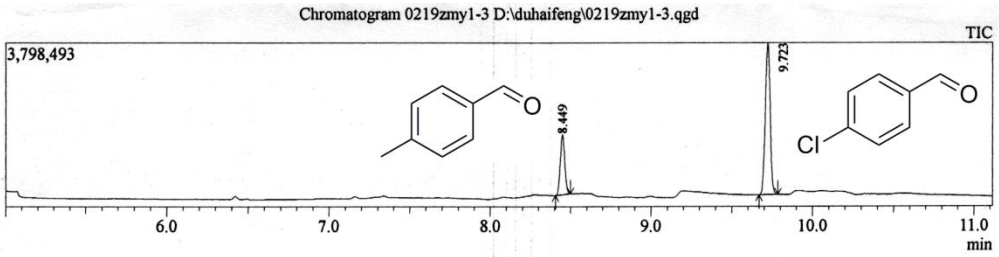
4i/4i' = 4.3/1



NAME	zhuangminyang-5
EXPNO	14
PROCNO	1
Date_	20131019
Time	11.13
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	12
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	64
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
SFO1	400.1320007 MHz
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300184 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00

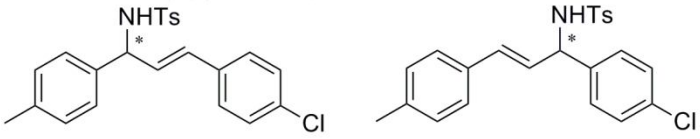


NAME	zhuangminyang-C2
EXPNO	32
PROCNO	1
Date_	20131019
Time	11.14
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	61
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
SFO1	100.6228298 MHz
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127564 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



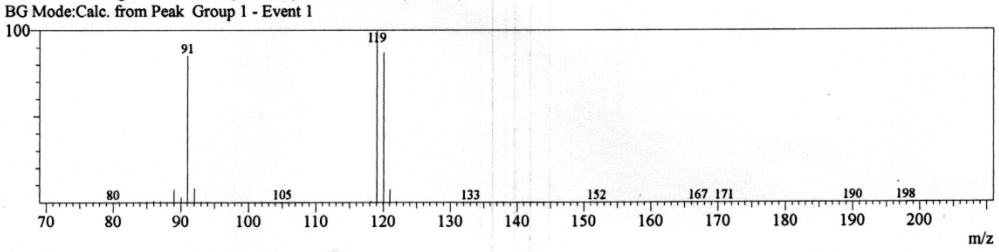
Peak Report TIC

Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Height%	A/H	Mark	Name
1	8.449	8.405	8.500	2661711	26.45	1399683	28.45	1.90		
2	9.723	9.670	9.785	7402449	73.55	3520924	71.55	2.10		
				10064160	100.00	4920607	100.00			

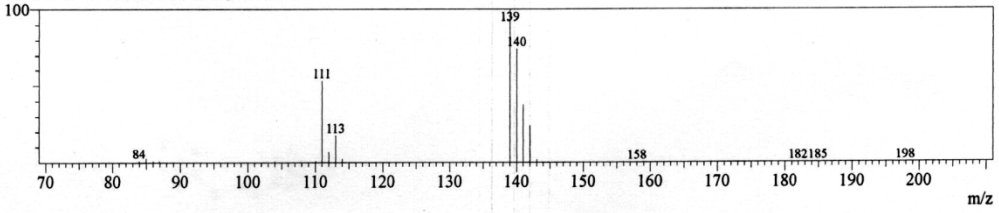


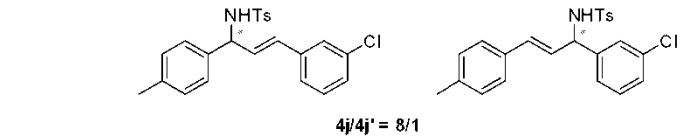
4i/4i' = 4.3/1

Line#:1 R.Time:8.450(Scan#:691)
MassPeaks:64
RawMode:Averaged 8.445-8.455(690-692) BasePeak:119(438317)
BG Mode:Calc. from Peak Group 1 - Event 1

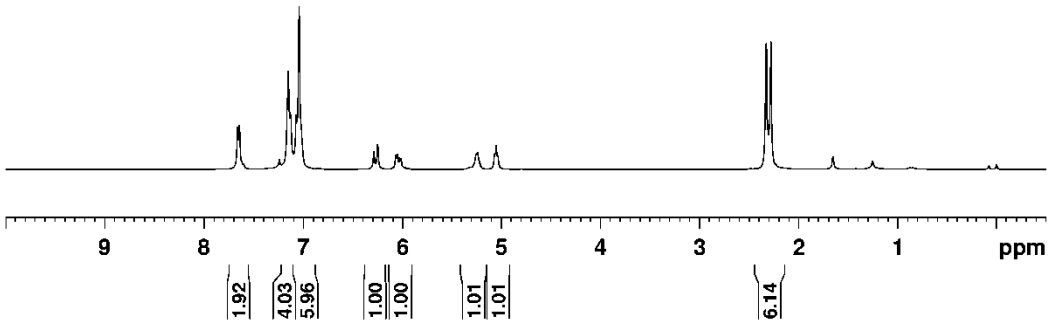


Line#:2 R.Time:9.725(Scan#:946)
MassPeaks:78
RawMode:Averaged 9.720-9.730(945-947) BasePeak:139(1037101)
BG Mode:Calc. from Peak Group 1 - Event 1

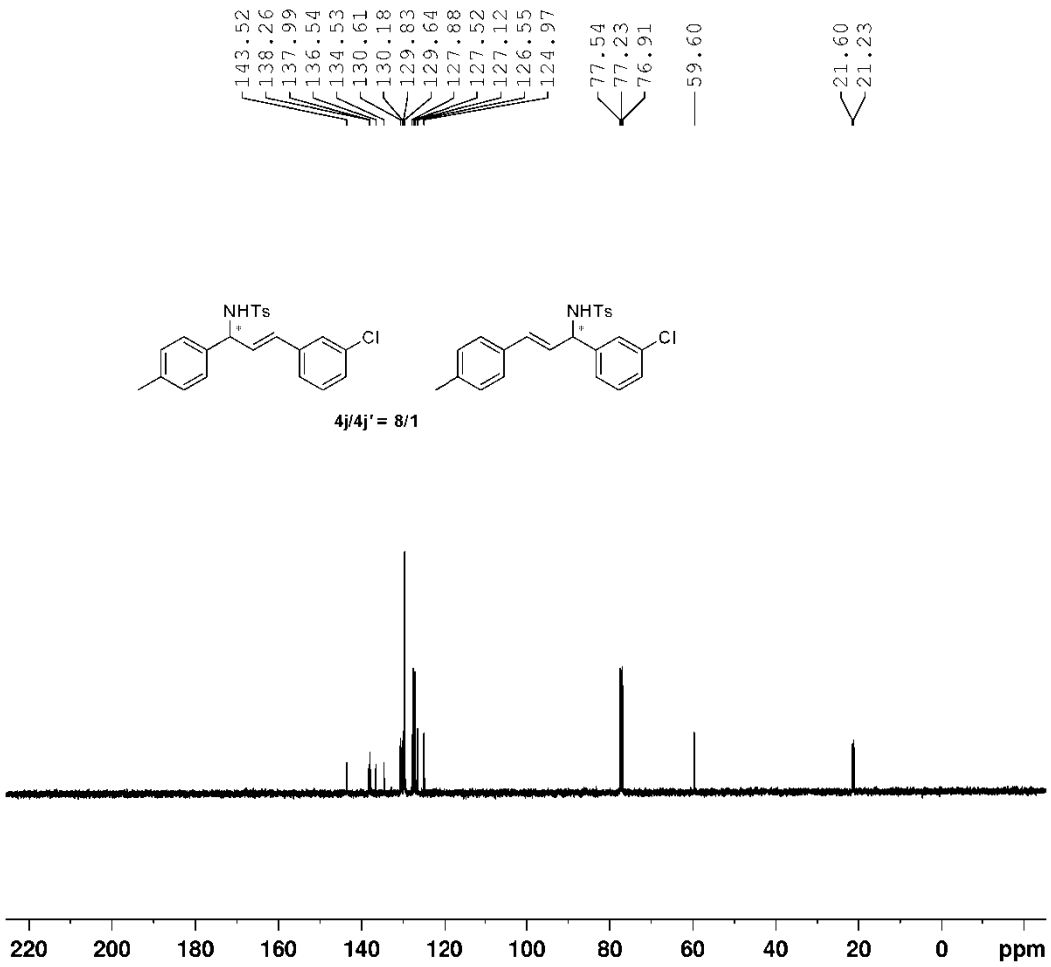




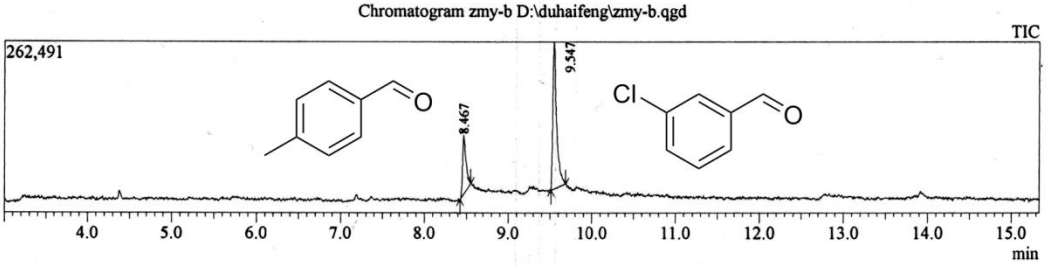
4j/4j' = 8/1




```
NAME      zhuangminyang-4
EXPNO                  55
PROCNO                  1
Date_           20130923
Time                7.57
INSTRUM            spect
PROBHD   5 mm PADUL 13C
PULPROG             zg30
TD                 32768
SOLVENT            CDCl3
NS                    10
DS                     0
SWH           12019.230 Hz
FIDRES         0.366798 Hz
AQ            1.3631988 sec
RG                 90.5
DW                41.600 usec
DE                 6.50 usec
TE                300.0 K
D1           2.00000000 sec
TD0                    1

======== CHANNEL f1 ========
NUC1                   1H
P1                 12.60 usec
SI                 65536
SF          400.1300237 MHz
WDW                   EM
SSB                    0
LB                  0.50 Hz
GB                     0
PC                  1.00
```

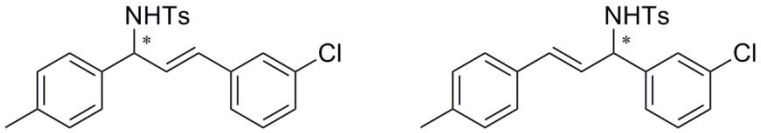



```
NAME      zhuangminyang-C1
EXPNO                  153
PROCNO                   1
Date_             20130923
Time                 7.59
INSTRUM             spect
PROBHD   5 mm PADUL 13C
PULPROG            zgpg30
TD                  32768
SOLVENT             CDCl3
NS                     89
DS                      0
SWH             25252.525 Hz
FIDRES          0.770646 Hz
AQ              0.6488564 sec
RG                    203
DW                19.800 usec
DE                 6.50 usec
TE                300.0 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                     1

======== CHANNEL f1 ========
NUC1                  13C
P1                 9.40 usec
SI                 32768
SF           100.6127548 MHz
WDW                   EM
SSB                    0
LB                1.00 Hz
GB                     0
PC                 1.40
```



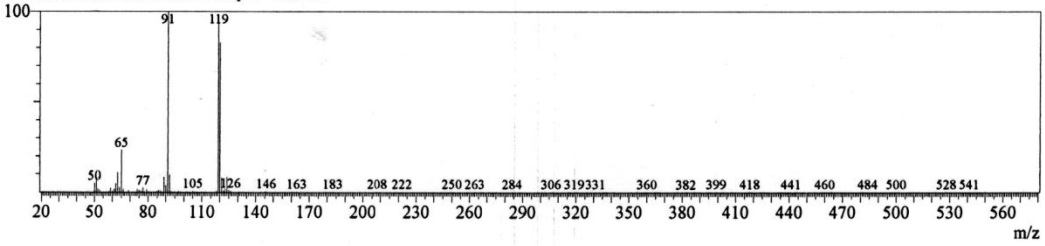
Peak Report TIC

Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Height%	A/H	Mark	Name
1	8.467	8.425	8.550	262579	26.90	90925	28.76	2.89		
2	9.547	9.510	9.685	713388	73.10	225185	71.24	3.17		
				975967	100.00	316110	100.00			

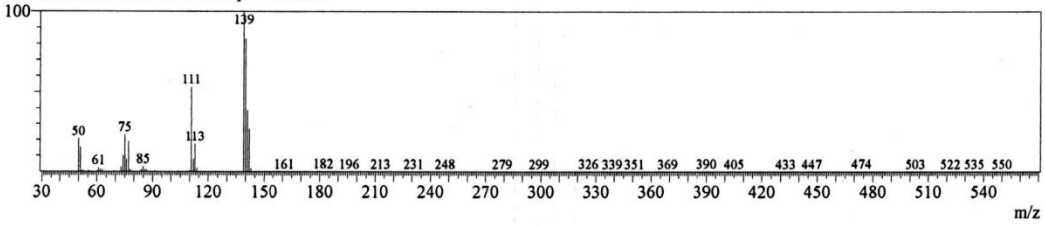


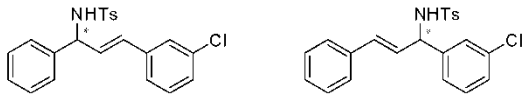
4j/4j' = 8/1

Line#:1 R.Time:8.465(Scan#:1094)
MassPeaks:295
RawMode:Averaged 8.460-8.470(1093-1095) BasePeak:91(21669)
BG Mode:Calc. from Peak Group 1 - Event 1

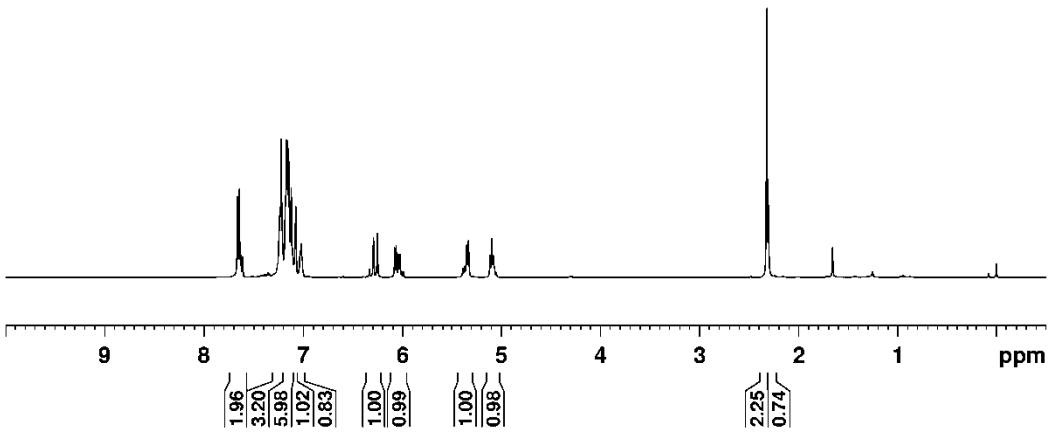


Line#:2 R.Time:9.545(Scan#:1310)
MassPeaks:280
RawMode:Averaged 9.540-9.550(1309-1311) BasePeak:139(48619)
BG Mode:Calc. from Peak Group 1 - Event 1

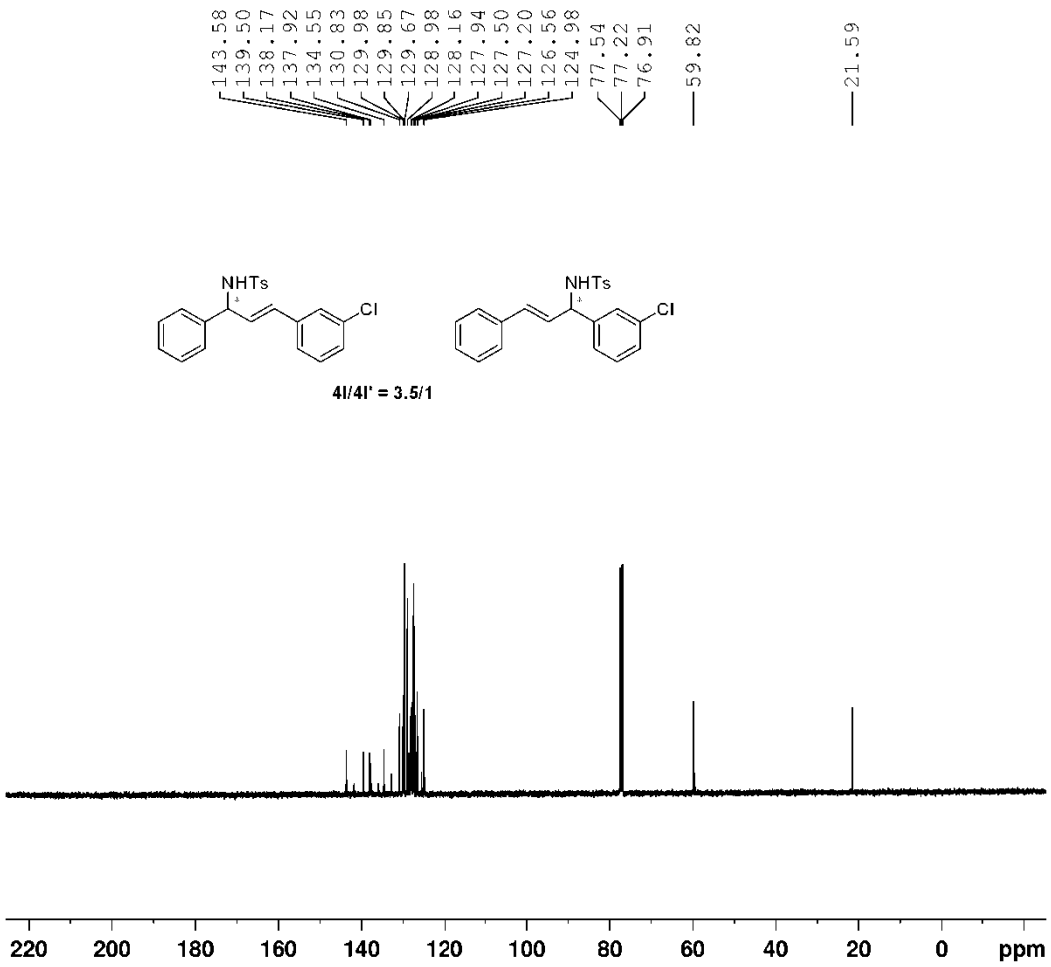




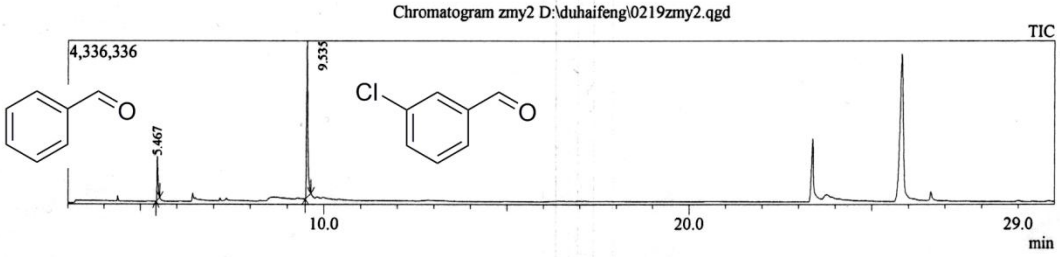
4l/4l' = 3.5/1




```
NAME      zhuangminyang-4
EXPNO                  83
PROCNO                  1
Date_            20131004
Time                6.57
INSTRUM            spect
PROBHD   5 mm PADUL 13C
PULPROG              zg30
TD                  32768
SOLVENT             CDCl3
NS                      7
DS                      0
SWH           12019.230 Hz
FIDRES         0.366798 Hz
AQ             1.3631988 sec
RG                  90.5
DW                41.600 usec
DE                 6.50 usec
TE                300.0 K
D1           2.00000000 sec
TD0                     1

======== CHANNEL f1 ========
NUC1                   1H
P1                 12.60 usec
SI                 65536
SF          400.1300224 MHz
WDW                   EM
SSB                    0
LB                  0.50 Hz
GB                     0
PC                  1.00
```

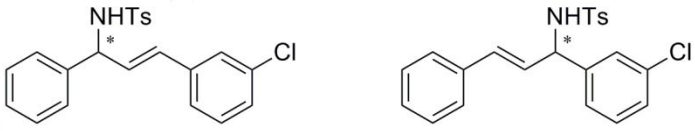


NAME	zhuangminyang-C2
EXPNO	12
PROCNO	1
Date_	20131004
Time	7.00
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	211
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127549 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



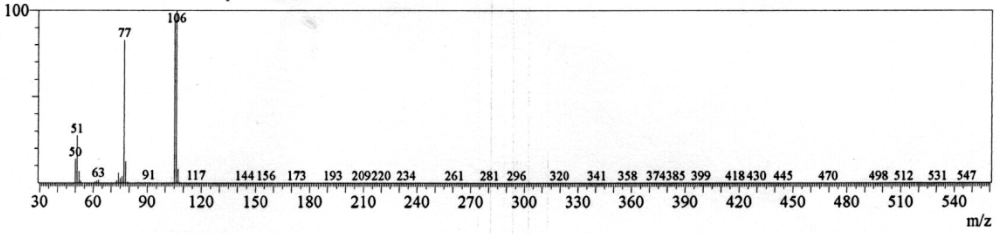
Peak Report TIC

Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Height%	A/H	Mark	Name
1	5.467	5.435	5.535	2330264	18.62	1161463	21.91	2.01		
2	9.535	9.490	9.645	10186921	81.38	4139118	78.09	2.46		
				12517185	100.00	5300581	100.00			

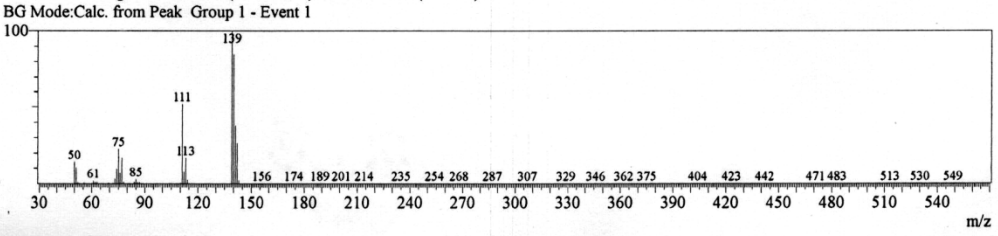


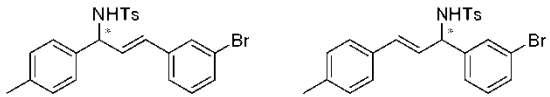
4l/4l' = 3.5/1

Line#:1 R.Time:5.465(Scan#:494)
MassPeaks:258
RawMode:Averaged 5.460-5.470(493-495) BasePeak:106(293239)
BG Mode:Calc. from Peak Group 1 - Event 1

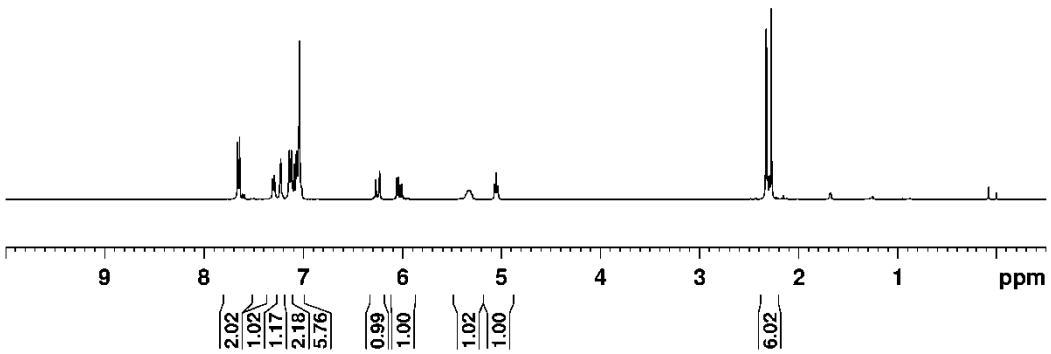


Line#:2 R.Time:9.535(Scan#:1308)
MassPeaks:305
RawMode:Averaged 9.530-9.540(1307-1309) BasePeak:139(923786)
BG Mode:Calc. from Peak Group 1 - Event 1

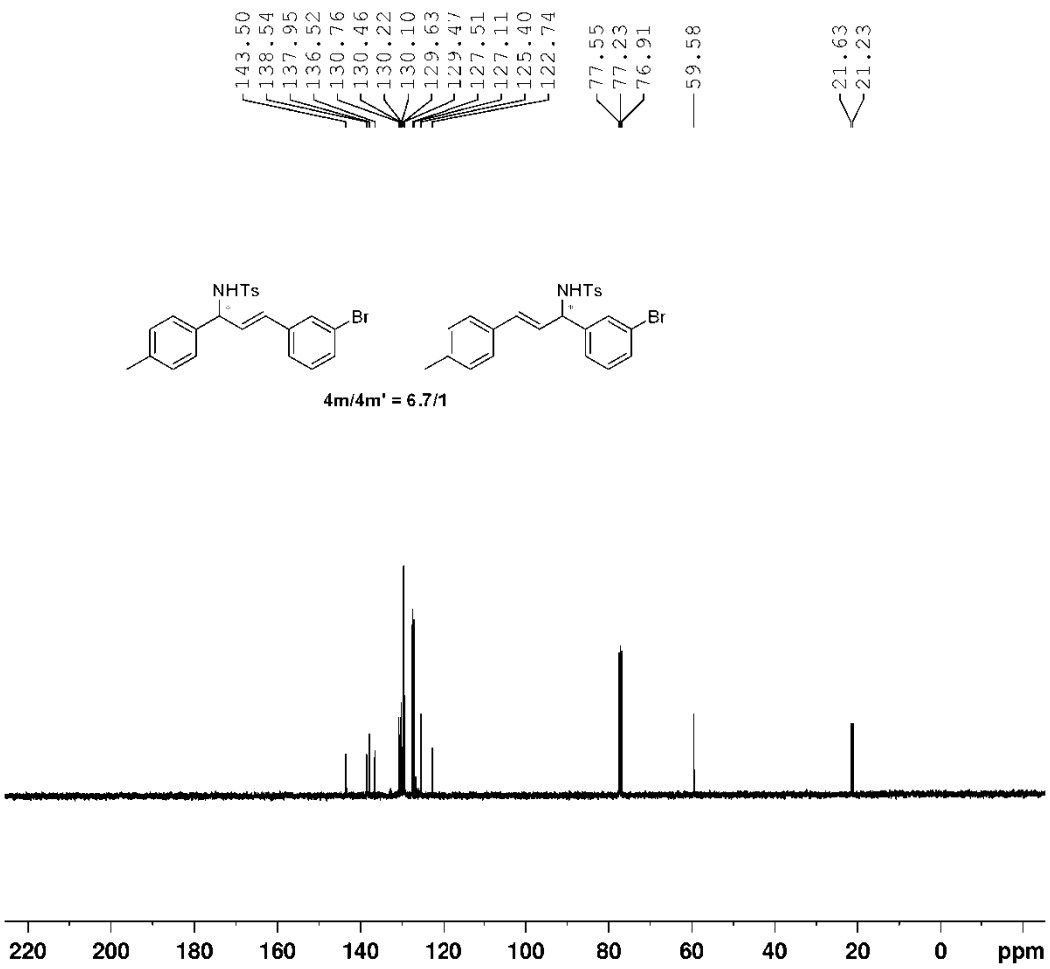




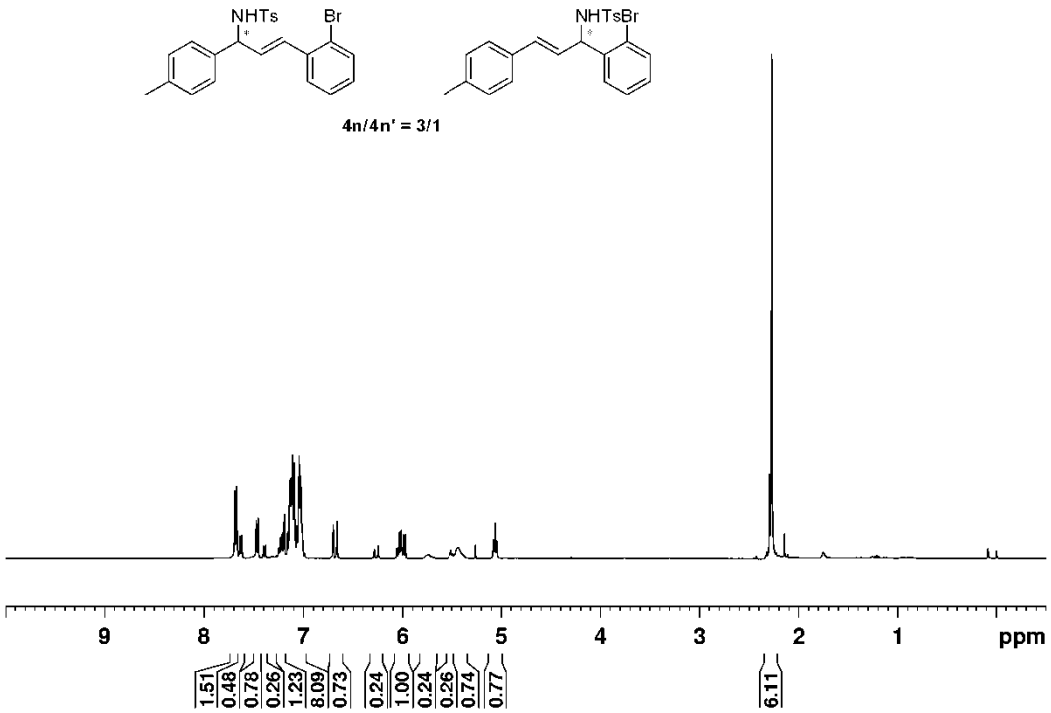
4m/4m' = 6.7/1



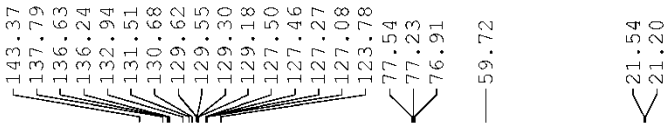
NAME	zhuangminyang-4
EXPNO	84
PROCNO	1
Date_	20131004
Time	7.09
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	8
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	71.8
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300240 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00

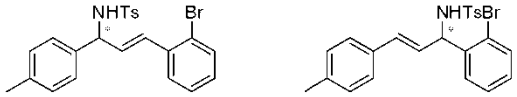



```
NAME      zhuangminyang-C2
EXPNO                   13
PROCNO                   1
Date_             20131004
Time                  7.14
INSTRUM              spect
PROBHD    5 mm PADUL 13C
PULPROG            zgpg30
TD                  32768
SOLVENT             CDCl3
NS                     98
DS                      0
SWH             25252.525 Hz
FIDRES          0.770646 Hz
AQ              0.6488564 sec
RG                    203
DW                 19.800 usec
DE                  6.50 usec
TE                 300.0 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                     1

======== CHANNEL f1 ========
NUC1                   13C
P1                    9.40 usec
SI                   32768
SF           100.6127565 MHz
WDW                    EM
SSB                     0
LB                   1.00 Hz
GB                      0
PC                   1.40
```

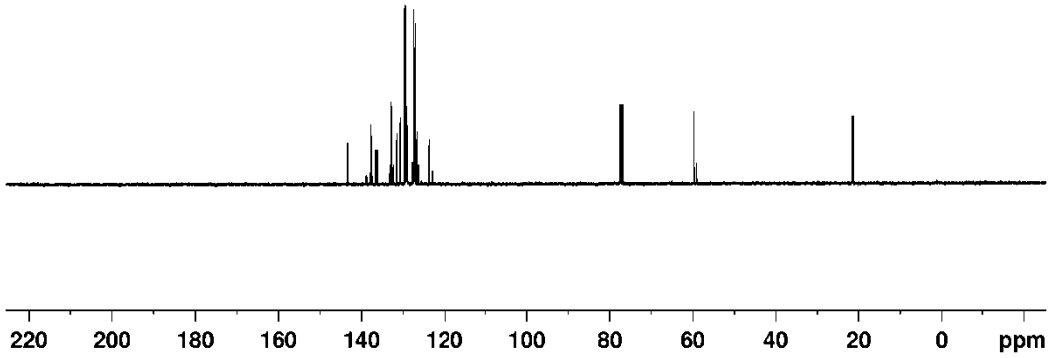



```
NAME      zhuangminyang-4
EXPNO                  72
PROCNO                  1
Date_           20130928
Time               13.09
INSTRUM            spect
PROBHD   5 mm PADUL 13C
PULPROG             zg30
TD                 32768
SOLVENT            CDCl3
NS                     9
DS                     0
SWH           12019.230 Hz
FIDRES         0.366798 Hz
AQ            1.3631988 sec
RG                 50.8
DW                41.600 usec
DE                 6.50 usec
TE                300.0 K
D1           2.00000000 sec
TD0                    1

======== CHANNEL f1 ========
NUC1                  1H
P1                12.60 usec
SI                65536
SF          400.1300280 MHz
WDW                   EM
SSB                    0
LB                 0.50 Hz
GB                     0
PC                 1.00
```

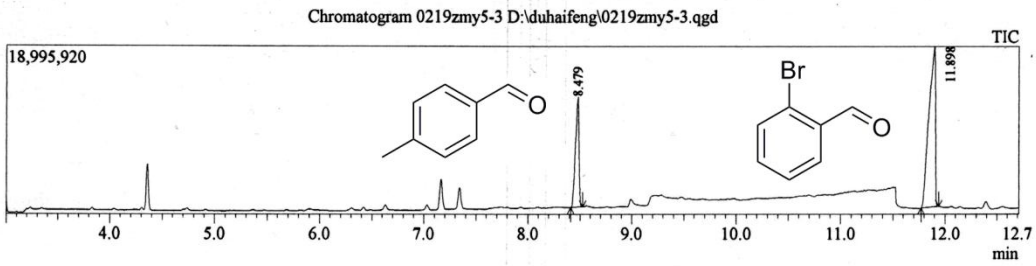




4n/4n' = 3/1

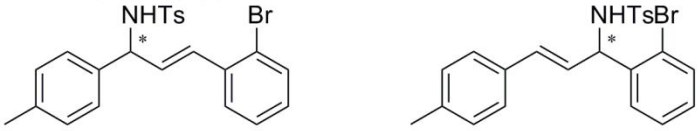


NAME	zhuangminyang-C2
EXPNO	8
PROCNO	1
Date_	20130928
Time	13.11
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	227
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127603 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



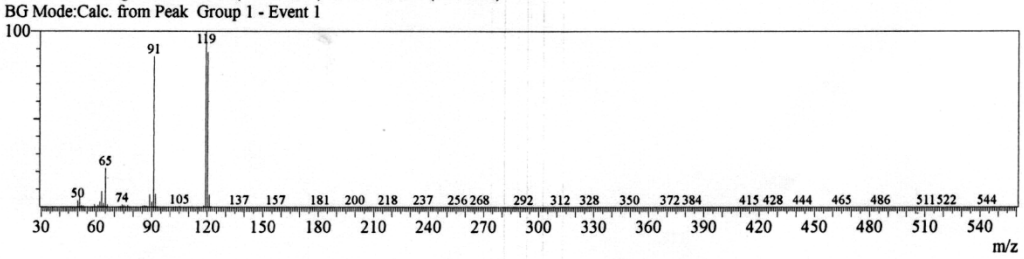
Peak Report TIC

Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Height%	A/H	Mark	Name
1	8.479	8.410	8.525	29242938	27.05	12468853	40.74	2.35		
2	11.898	11.770	11.940	78875584	72.95	18138877	59.26	4.35		
				108118522	100.00	30607730	100.00			

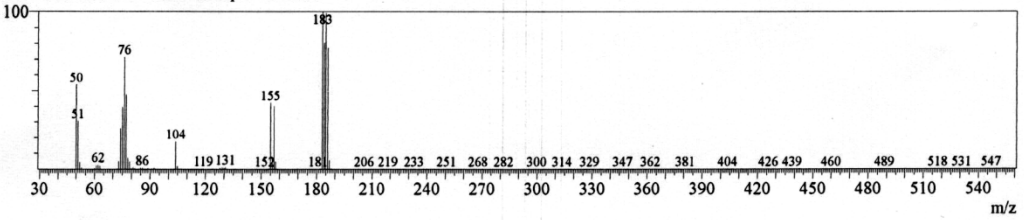


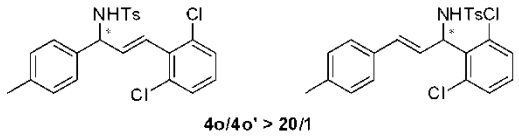
4n/4n' = 3/1

Line#:1 R.Time:8.480(Scan#:1097)
MassPeaks:254
RawMode:Averaged 8.475-8.485(1096-1098) BasePeak:119(3256888)
BG Mode:Calc. from Peak Group 1 - Event 1

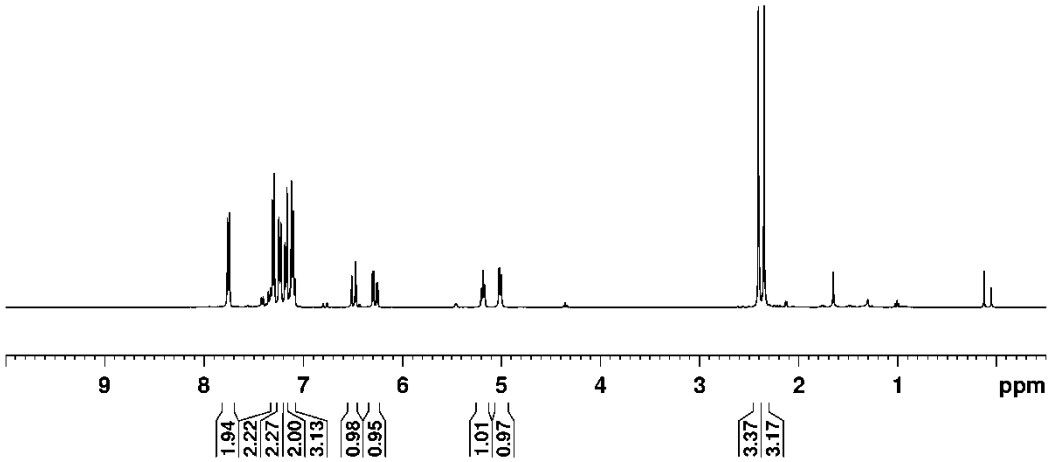


Line#:2 R.Time:11.900(Scan#:1781)
MassPeaks:279
RawMode:Averaged 11.895-11.905(1780-1782) BasePeak:183(2211311)
BG Mode:Calc. from Peak Group 1 - Event 1

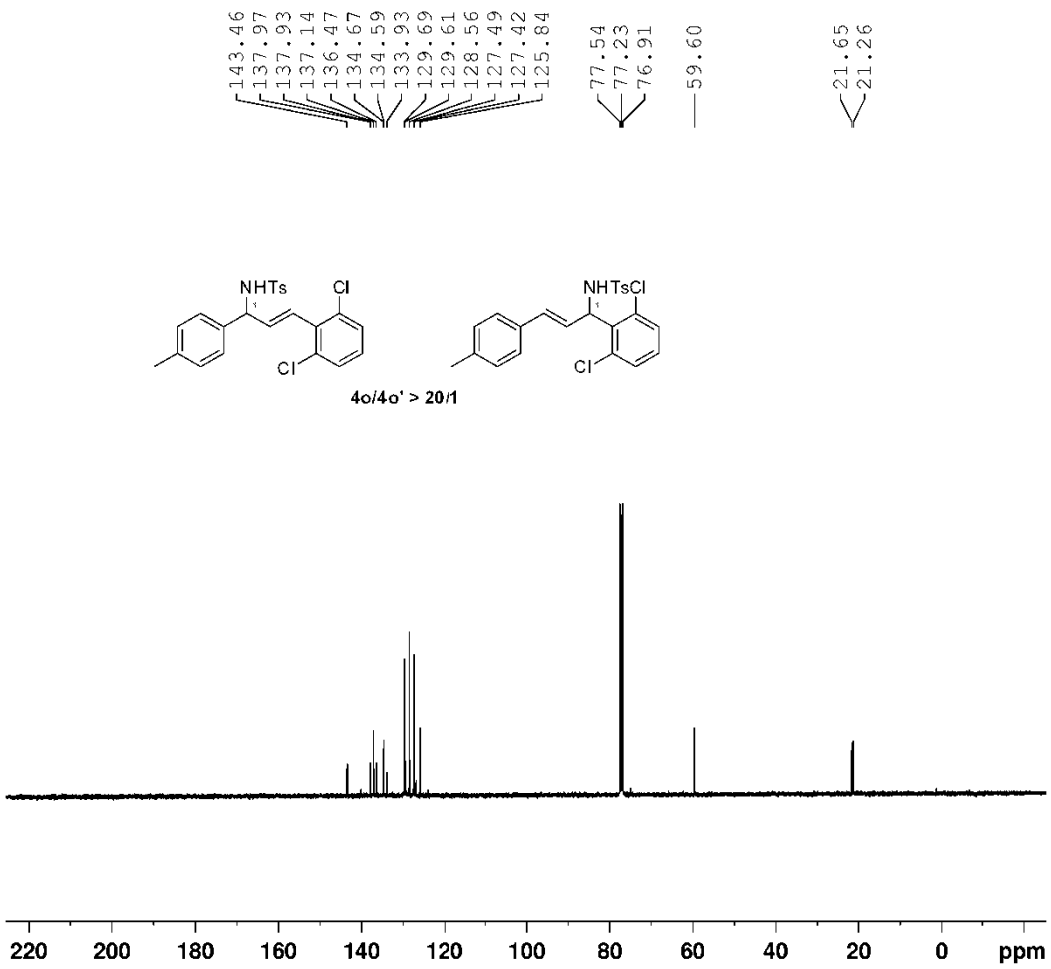




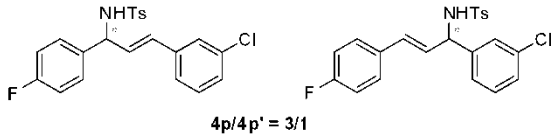
4o/4o' > 20/1



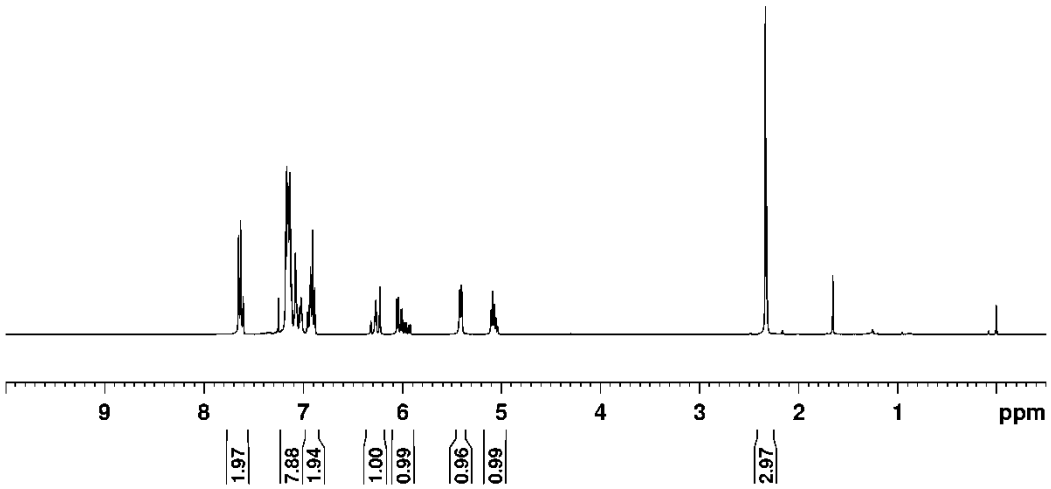

```
NAME      zhuangminyang-4
EXPNO                  87
PROCNO                  1
Date_           20131008
Time                7.16
INSTRUM            spect
PROBHD   5 mm PADUL 13C
PULPROG             zg30
TD                 32768
SOLVENT            CDCl3
NS                    16
DS                     0
SWH           12019.230 Hz
FIDRES         0.366798 Hz
AQ            1.3631988 sec
RG                   144
DW                41.600 usec
DE                 6.50 usec
TE                300.0 K
D1           2.00000000 sec
TD0                    1

======== CHANNEL f1 ========
NUC1                  1H
P1                12.60 usec
SI                65536
SF          400.1300000 MHz
WDW                   EM
SSB                    0
LB                  0.50 Hz
GB                     0
PC                  1.00
```



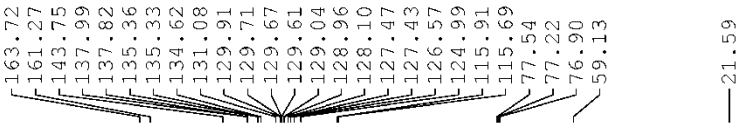

```
NAME        zhuangminyang-C2
EXPNO                     15
PROCNO                     1
Date_               20131008
Time                    7.21
INSTRUM                spect
PROBHD    5 mm PADUL 13C
PULPROG             zgpg30
TD                      32768
SOLVENT                 CDCl3
NS                        494
DS                          0
SWH                 25252.525 Hz
FIDRES              0.770646 Hz
AQ                  0.6488564 sec
RG                        203
DW                     19.800 usec
DE                      6.50 usec
TE                     300.0 K
D1                 2.00000000 sec
D11                0.03000000 sec
TD0                         1

======== CHANNEL f1 ========
NUC1                      13C
P1                      9.40 usec
SI                      32768
SF                100.6127518 MHz
WDW                        EM
SSB                         0
LB                      1.00 Hz
GB                          0
PC                      1.40
```

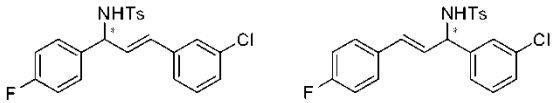


4p/4p' = 3/1

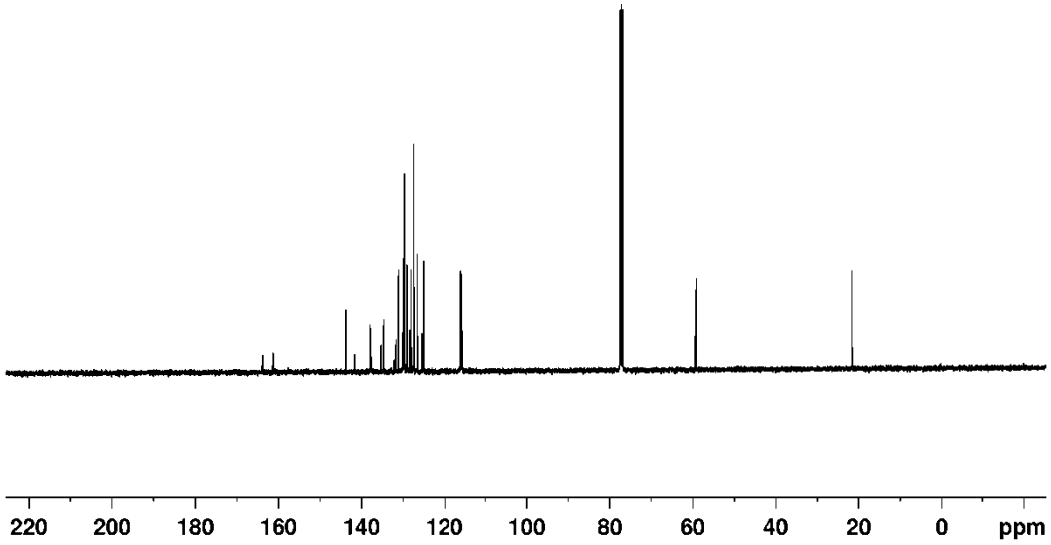



```
NAME      zhuangminyang-4
EXPNO                  82
PROCNO                  1
Date_            20131004
Time                6.28
INSTRUM            spect
PROBHD   5 mm PADUL 13C
PULPROG             zg30
TD                 32768
SOLVENT            CDCl3
NS                     8
DS                     0
SWH           12019.230 Hz
FIDRES         0.366798 Hz
AQ            1.3631988 sec
RG                   114
DW                41.600 usec
DE                 6.50 usec
TE                300.0 K
D1           2.00000000 sec
TD0                    1

======== CHANNEL f1 ========
NUC1                  1H
P1                12.60 usec
SI                65536
SF          400.1300193 MHz
WDW                   EM
SSB                    0
LB                  0.50 Hz
GB                     0
PC                  1.00
```

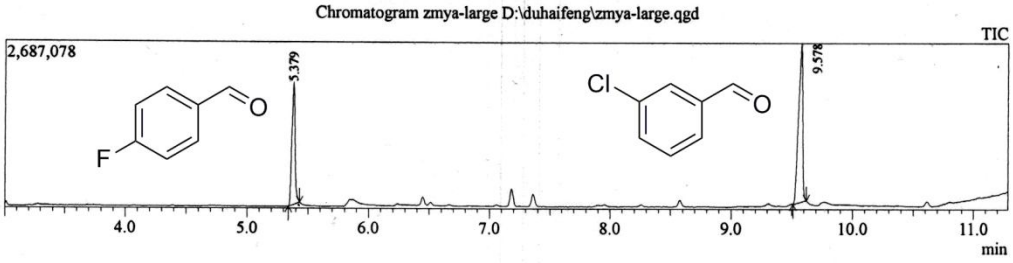




4p/4p' = 3/1

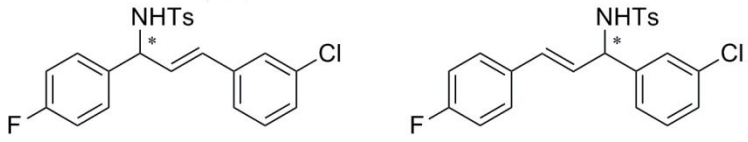



```
NAME      zhuangminyang-C2
EXPNO                   11
PROCNO                   1
Date_             20131004
Time                  6.32
INSTRUM              spect
PROBHD    5 mm PADUL 13C
PULPROG            zgpg30
TD                   32768
SOLVENT              CDCl3
NS                     514
DS                       0
SWH              25252.525 Hz
FIDRES            0.770646 Hz
AQ                0.6488564 sec
RG                     203
DW                  19.800 usec
DE                   6.50 usec
TE                  300.0 K
D1             2.00000000 sec
D11            0.03000000 sec
TD0                      1

======== CHANNEL f1 ========
NUC1                   13C
P1                    9.40 usec
SI                   32768
SF           100.6127533 MHz
WDW                    EM
SSB                      0
LB                    1.00 Hz
GB                       0
PC                    1.40
```



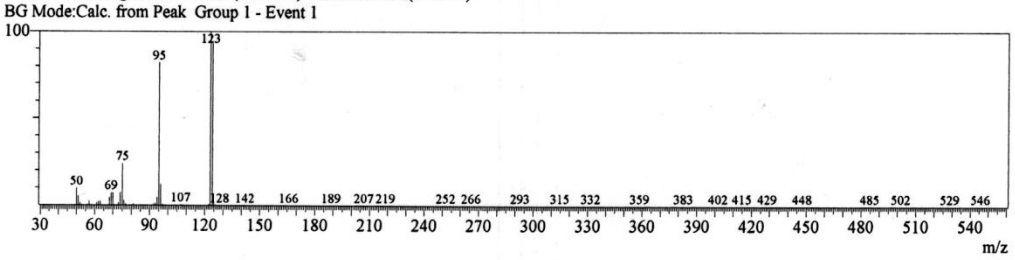
Peak Report TIC

Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Height%	A/H	Mark	Name
1	5.379	5.340	5.430	3392367	35.46	1972078	43.47	1.72		
2	9.578	9.510	9.620	6173146	64.54	2564186	56.53	2.41		
				9565513	100.00	4536264	100.00			

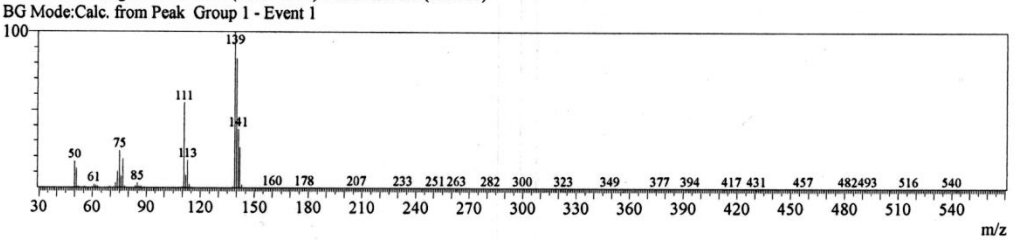


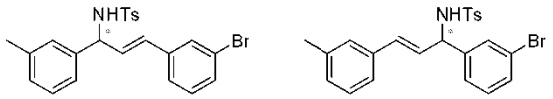
4p/4p' = 3/1

Line#:1 R.Time:5.380(Scan#:477)
MassPeaks:259
RawMode:Averaged 5.375-5.385(476-478) BasePeak:123(471797)
BG Mode:Calc. from Peak Group 1 - Event 1

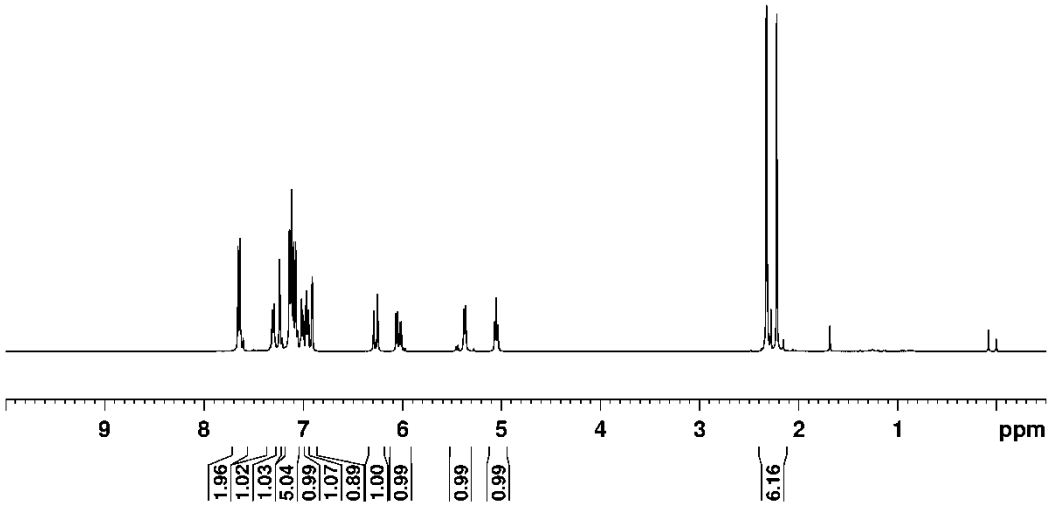


Line#:2 R.Time:9.580(Scan#:1317)
MassPeaks:247
RawMode:Averaged 9.575-9.585(1316-1318) BasePeak:139(535108)
BG Mode:Calc. from Peak Group 1 - Event 1

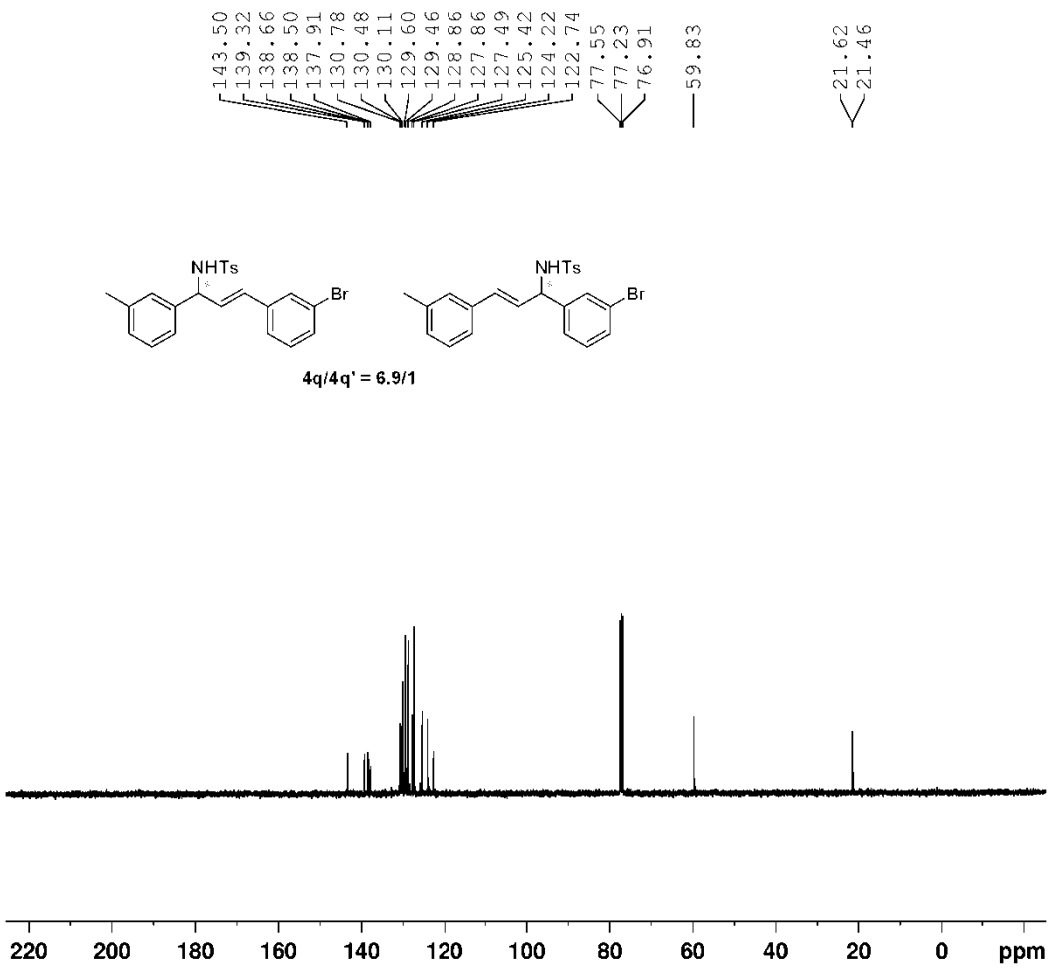




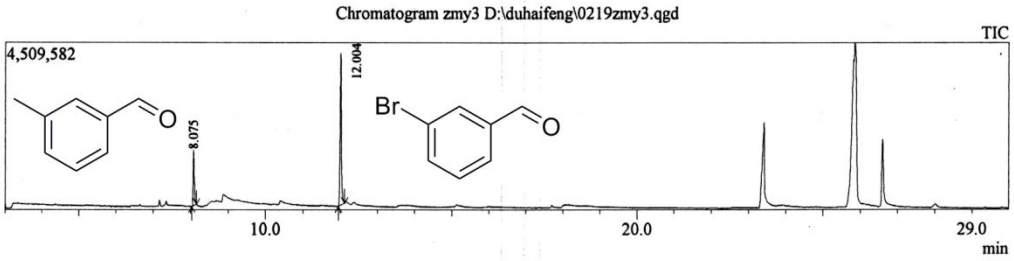
4q/4q' = 6.9/1




```
NAME      zhuangminyang-5
EXPNO                   8
PROCNO                  1
Date_            20131017
Time                0.16
INSTRUM            spect
PROBHD    5 mm PADUL 13C
PULPROG             zg30
TD                 32768
SOLVENT            CDCl3
NS                      8
DS                      0
SWH           12019.230 Hz
FIDRES         0.366798 Hz
AQ             1.3631988 sec
RG                  71.8
DW                41.600 usec
DE                 6.50 usec
TE                300.0 K
D1           2.00000000 sec
TD0                     1

======== CHANNEL f1 ========
NUC1                   1H
P1                 12.60 usec
SI                 65536
SF          400.1300237 MHz
WDW                   EM
SSB                    0
LB                  0.50 Hz
GB                     0
PC                  1.00
```

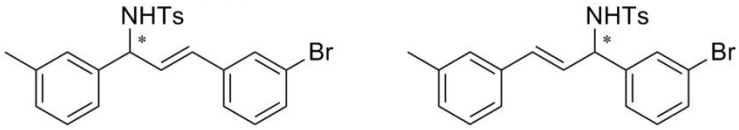



```
NAME        zhuangminyang-C2
EXPNO                     29
PROCNO                     1
Date_               20131017
Time                    0.19
INSTRUM                spect
PROBHD    5 mm PADUL 13C
PULPROG              zgpg30
TD                     32768
SOLVENT                CDCl3
NS                        66
DS                         0
SWH                25252.525 Hz
FIDRES              0.770646 Hz
AQ                  0.6488564 sec
RG                       203
DW                    19.800 usec
DE                     6.50 usec
TE                    300.0 K
D1                 2.00000000 sec
D11                0.03000000 sec
TD0                        1

======== CHANNEL f1 ========
NUC1                      13C
P1                     9.40 usec
SI                     32768
SF               100.6127572 MHz
WDW                       EM
SSB                        0
LB                      1.00 Hz
GB                         0
PC                      1.40
```



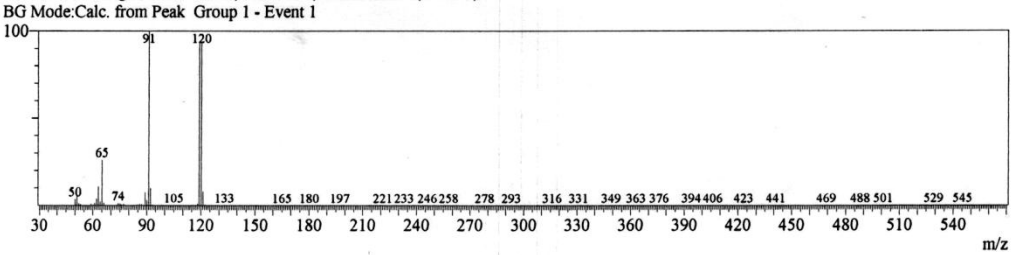
Peak Report TIC

Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Height%	A/H	Mark	Name
1	8.075	8.030	8.155	3370751	24.81	1504126	26.72	2.24		
2	12.004	11.950	12.110	10216488	75.19	4124529	73.28	2.48		
				13587239	100.00	5628655	100.00			

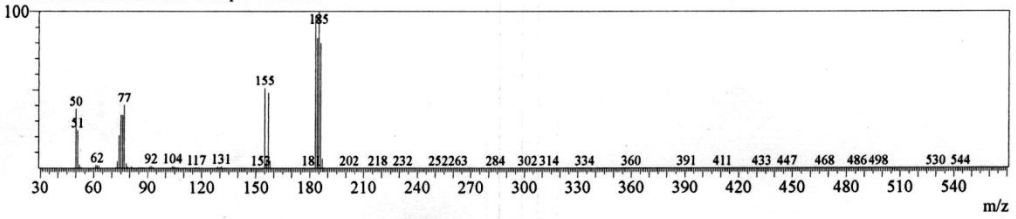


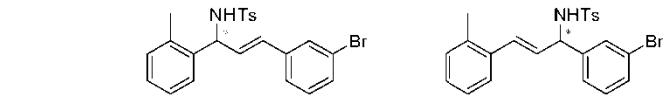
4q/4q' = 6.9/1

Line#:1 R.Time:8.075(Scan#:1016)
MassPeaks:300
RawMode:Averaged 8.070-8.080(1015-1017) BasePeak:91(371002)
BG Mode:Calc. from Peak Group 1 - Event 1

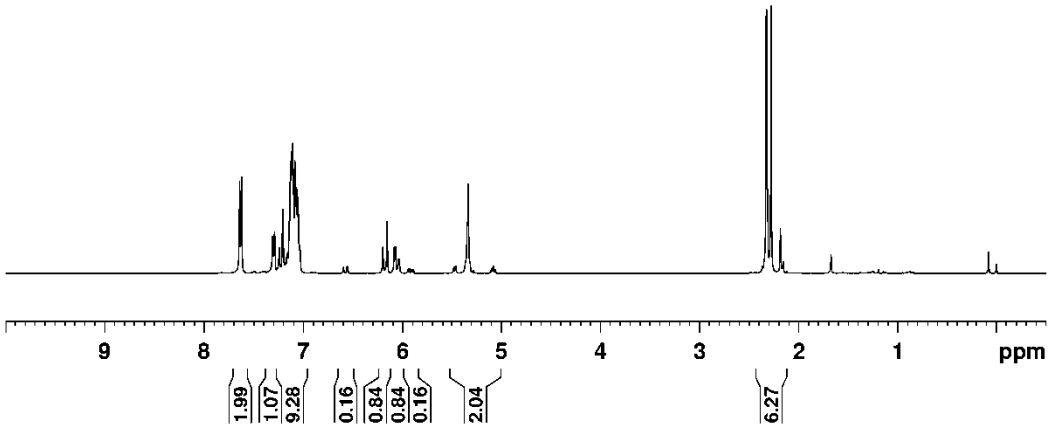


Line#:2 R.Time:12.005(Scan#:1802)
MassPeaks:320
RawMode:Averaged 12.000-12.010(1801-1803) BasePeak:185(567179)
BG Mode:Calc. from Peak Group 1 - Event 1

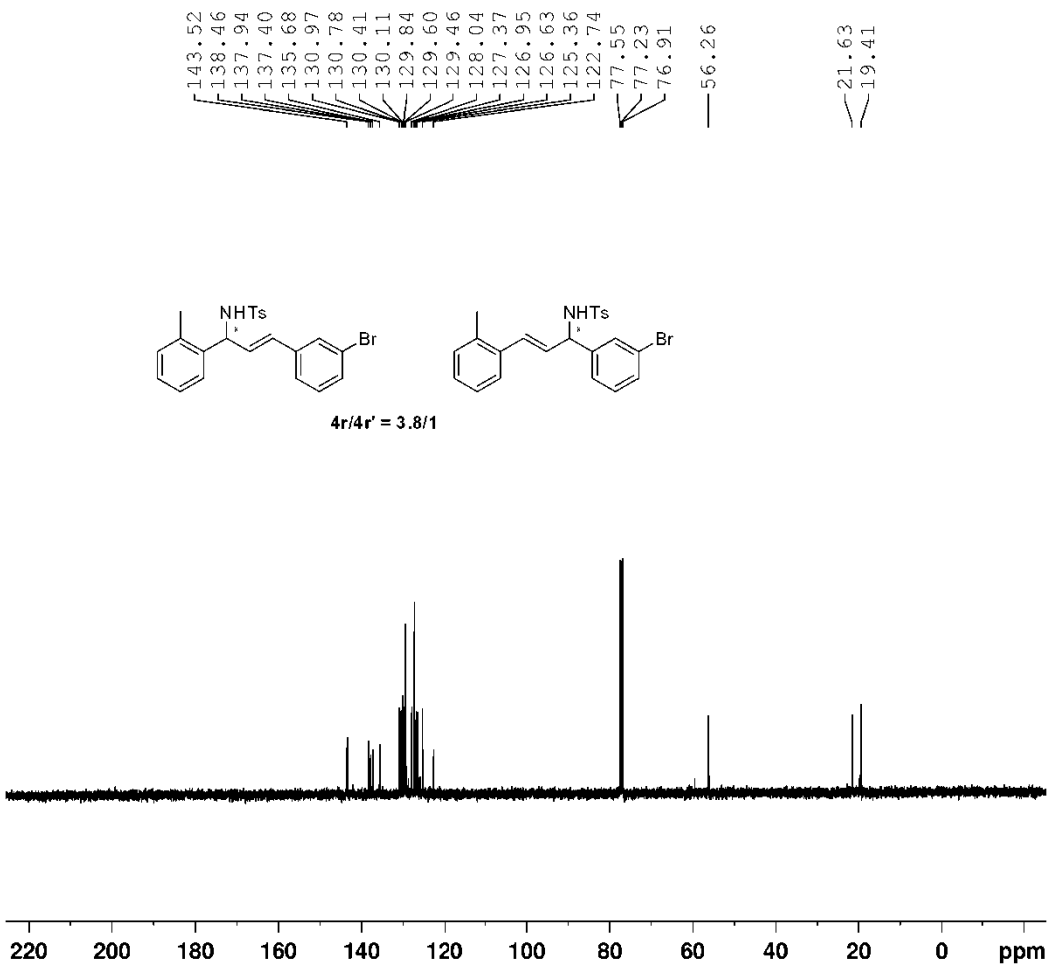




4r/4r' = 3.8/1

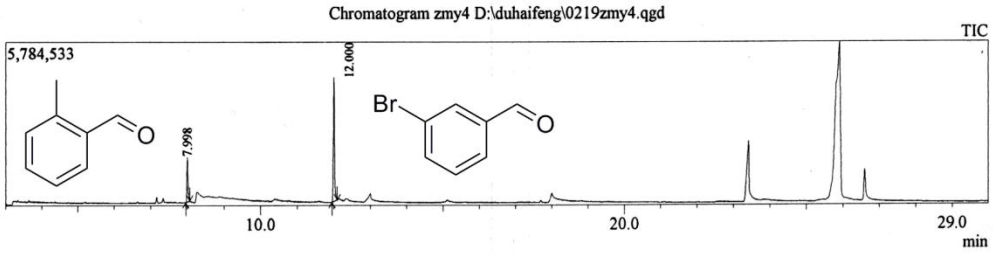


NAME	zhuangminyang-5
EXPNO	9
PROCNO	1
Date_	20131017
Time	0.22
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	8
DS	0
SWH	12019.230 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	71.8
DW	41.600 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
NUC1	1H
P1	12.60 usec
SI	65536
SF	400.1300237 MHz
WDW	EM
SSB	0
LB	0.50 Hz
GB	0
PC	1.00



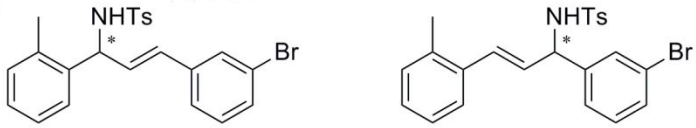
NAME	zhuangminyang-C2
EXPNO	30
PROCNO	1
Date_	20131017
Time	0.25
INSTRUM	spect
PROBHD	5 mm PADUL 13C
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	46
DS	0
SWH	25252.525 Hz
FIDRES	0.770646 Hz
AQ	0.6488564 sec
RG	203
DW	19.800 usec
DE	6.50 usec
TE	300.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1

======== CHANNEL f1 ========	
NUC1	13C
P1	9.40 usec
SI	32768
SF	100.6127571 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40



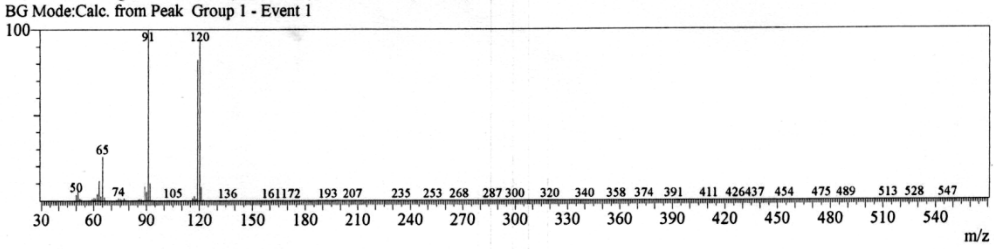
Peak Report TIC

Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Height%	A/H	Mark	Name
1	7.998	7.955	8.065	3254762	24.79	1582725	26.48	2.06		
2	12.000	11.945	12.085	9876032	75.21	4393446	73.52	2.25		
				13130794	100.00	5976171	100.00			



4r/4r' = 3.8/1

Line#:1 R.Time:8.000(Scan#:1001)
MassPeaks:261
RawMode:Averaged 7.995-8.005(1000-1002) BasePeak:91(395665)
BG Mode:Calc. from Peak Group 1 - Event 1



Line#:2 R.Time:12.000(Scan#:1801)
MassPeaks:268
RawMode:Averaged 11.995-12.005(1800-1802) BasePeak:183(585401)
BG Mode:Calc. from Peak Group 1 - Event 1