N-Heterocyclic Carbene-Catalyzed [2 + 3] Cyclocondensation of α-Chloroaldehydes with Azomethine Imines

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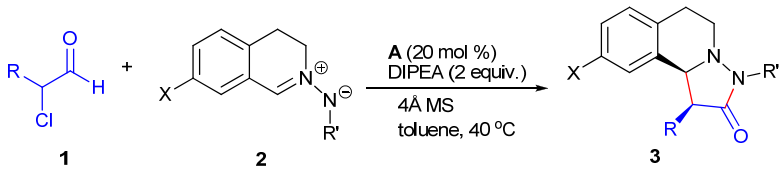
Part I General information

Unless otherwise indicated, all reactions were carried out under N_2 protection at room temperature with magnetic stirring. Anhydrous THF and toluene were distilled from sodium and benzophenone. Anhydrous CH_2Cl_2 was distilled from CaH_2. Chiral triazolium salts **A-D**,[1] α-chloroaldehydes[2] and C,N-cyclic azomethine imines[3] were synthesized according to literatures. Column chromatography was performed on silica gel 200~300 mesh. All ^1H NMR (300 and 400 MHz), ^{13}C NMR (75 and 100 MHz) spectra were recorded on a Bruker-DMX 300 and Bruker Avance 400 spectrometer in $CDCl_3$, with tetramethylsilane as an internal standard and reported in parts per million (ppm, δ). ^1H NMR Spectroscopy splitting patterns were designated as singlet (s), doublet (d), triplet (t), quartet (q). Splitting patterns that could not be interpreted or easily visualized were designated as multiplet (m) or broad (br). Infrared spectra were recorded on a JASCO FT/IR-480 spectrophotometer and reported as wave number (cm^{-1}). Chiral HPLC analyses were performed on an Agilent 1100 Series using a Daicel Chiralpak (AD-H, OD-H) column with hexanes/*i*PrOH/MeOH as the eluent. Optical rotations were measured on Perkin Elmer/Model-343 digital polarimeter operating at the sodium D line with a 100 mm path cell, and are reported as follows: $[\alpha]_D^T$ (concentration (g/100 mL), solvent).

Part II Experimental part

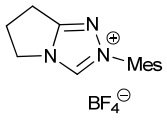
1. NHC catalyzed [2 + 3] annulation of α-chloroaldehydes 1 and azomethine imines 2 (Scheme 2)



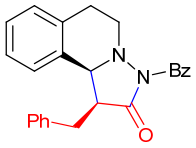
1 2 3

To the solution of C,N-cyclic azomethine imines **2** (0.2 mmol), NHC precursor **A** (0.04 mmol, 16.8 mg, 0.2 equiv.) and DIPEA (0.4 mmol, 51.6 mg, 2.0 equiv.) in toluene (2 mL) was added α-chloroaldehydes **2** (0.4 mmol, 2 equiv.). The reaction mixture was stirred at 40 °C until the full consumption of the imines **2** (12 h). The reaction mixture was concentrated under reduced pressure, and the residue was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20:1-6:1) to furnish the cycloadduct **3.**

Racemic samples for the chiral phase HPLC analysis were prepared using triazolium **D** as the NHC pre-catalyst under the same conditions.



D

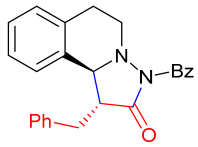


3a

(1*S*,10b*S*)-3-benzoyl-1-benzyl-1,5,6,10b-tetrahydropyrazolo[5,1-*a*]isoquinolin-2(3*H*)-one

62.7 mg, 8:1 d.r., 82% yield. White solid, m.p. 155-157 °C. R_f = 0.3 (petroleum ether/ethyl acetate 3:1); $[\alpha]_D^{25}$ -20 (*c* 0.1, CH_2Cl_2); HPLC analysis: > 99% ee [Daicel CHIRALPAK AD-H column, 20 °C, 254 nm, hexane/*i*-PrOH = 70:30, 1.0 mL /min,

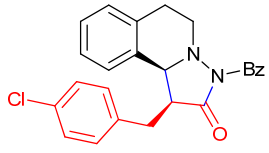
254 nm, 16.7 min (minor), 27.8 min (major)]; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.65-7.57 (m, 2H), 7.45 (t, *J* = 7.4 Hz, 1H), 7.34 (t, *J* = 7.4 Hz, 2H), 7.21-7.03 (m, 6H), 6.90 (d, *J* = 7.4 Hz, 1H), 6.86-6.78 (m, 2H), 5.15 (d, *J* = 8.5 Hz, 1H), 3.55 (m, 1H), 3.36-3.20 (m, 1H), 3.12 (m, 1H), 2.92-2.60 (m, 4H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 175.1, 166.6, 139.0, 134.3, 134.0, 132.0, 131.0, 128.9, 128.8, 128.7, 128.4, 128.0, 127.7, 127.5, 126.5, 60.4, 49.8, 49.7, 35.6, 28.5. IR (KBr) 2920, 2849, 1752, 1293. HRMS (ESI) calcd for $C_{25}H_{22}N_2O_2Na$ $[M+Na]^+$ 405.15735, found 405.15712.



3a' (*trans*-**3a**)

(1*S*,10b*R*)-3-benzoyl-1-benzyl-1,5,6,10b-tetrahydropyrazolo[5,1-*a*]isoquinolin-2(3*H*)-one

For the reaction in Table 1, entry 4. 36.7 mg, 1:4 d.r., 60% yield. White solid, m.p. = 116-118 °C. R_f = 0.3 (petroleum ether/ethyl acetate 5:1); $[\alpha]_D^{25}$ +28 (*c* 0.1, CH_2Cl_2); HPLC analysis: 58% ee [Daicel CHIRALPAK OD-H column, 20 °C, 254 nm, hexane/*i*-PrOH/MeOH = 70:20:10, 1.0 mL /min, 254 nm, 18.2 min (major), 23.7 min (minor)]; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.55-7.48 (m, 3H), 7.45-7.13 (m, 11H), 4.69 (d, *J* = 9.6 Hz, 1H), 3.58 (m, 1H), 3.473.34 (m, 1H), 3.34-3.01 (m, 4H), 2.97-2.75 (m, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 174.2, 166.6, 136.9, 133.8, 133.8, 133.4, 132.2, 130.2, 129.0, 128.7, 127.9, 127.4, 127.1, 126.8, 126.5, 59.7, 50.3, 48.5, 33.3, 27.8. IR (KBr) 2921, 2849, 1751, 1686, 1293. HRMS (ESI) calcd for $C_{25}H_{22}N_2O_2Na$ $[M+Na]^+$ 405.15735, found 405.15730.

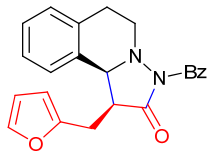


3b

(1*S*,10b*S*)-3-benzoyl-1-(4-chlorobenzyl)-1,5,6,10b-tetrahydropyrazolo[5,1-*a*]isoquinolin-2(3*H*)-one

57.4 mg, 8:1 d.r., 69% yield. Colorless oil. R_f = 0.3 (petroleum ether/ethyl acetate

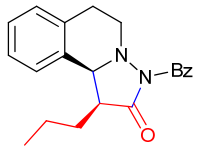
3:1); $[\alpha]_D^{25}$ -19 (*c* 0.1, CH_2Cl_2); HPLC analysis: 90% ee [Daicel CHIRALPAK OD-H column, 20 °C, 254 nm, hexane/*i*-PrOH = 70:30, 1.0 mL /min, 254 nm, 17.5 min (major), 21.7 min (minor)]; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.82-7.75 (m, 2H), 7.68-7.61 (m, 1H), 7.53 (t, *J* = 7.6 Hz, 2H), 7.45-7.28 (m, 3H), 7.27-7.21 (m, 2H), 7.06 (d, *J* = 7.5 Hz, 1H), 6.93 (d, *J* = 8.4 Hz, 2H), 5.33 (d, *J* = 8.4 Hz, 1H), 3.76 (m, 1H), 3.46-3.36 (m, 1H), 3.30 (m, 1H), 3.08-2.80 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.0, 166.5, 137.5, 134.3, 133.8, 132.4, 132.1, 130.9, 130.3, 128.8, 128.8, 128.6, 128.0, 127.7, 127.6, 126.6, 60.3, 49.9, 49.7, 35.1, 28.5. IR (KBr) 2920, 2845, 1751, 1682, 1293, 1274. HRMS (ESI) calcd for $C_{25}H_{21}N_2O_2ClNa$ $[M+Na]^+$ 439.11838, found 439.11852.



3c

(1*S*,10b*S*)-3-benzoyl-1-(furan-2-ylmethyl)-1,5,6,10b-tetrahydropyrazolo[5,1-*a*]-isoquinolin-2(3*H*)-one

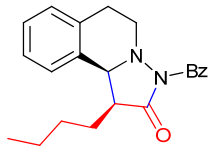
62.5 mg, 5:1 d.r., 84% yield. Colorless oil. R_f = 0.3 (petroleum ether/ethyl acetate 3:1); $[\alpha]_D^{25}$ -55 (*c* 0.1, CH_2Cl_2); HPLC analysis: 98% ee [Daicel CHIRALPAK AD-H column, 20 °C, 254 nm, hexane/*i*-PrOH = 70:30, 1.0 mL /min, 254 nm, 18.1 min (minor), 27.5 min (major)]; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.61 (d, *J* = 7.3 Hz, 2H), 7.44 (t, *J* = 7.4 Hz, 1H), 7.34 (t, *J* = 7.6 Hz, 2H), 7.17-7.06 (m, 3H), 6.94 (d, *J* = 7.4 Hz, 1H), 6.11 (dd, *J* = 2.8, 1.9 Hz, 1H), 5.67 (d, *J* = 2.9 Hz, 1H), 5.15 (d, *J* = 8.5 Hz, 1H), 3.56 (m, 1H), 3.38 (m, 1H), 3.09 (m, 1H), 2.91-2.65 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.1, 166.6, 151.4, 141.4, 134.2, 133.9, 132.1, 130.7, 129.0, 128.7, 128.0, 127.6, 127.4, 126.5, 110.5, 107.2, 59.7, 49.5, 46.7, 28.2, 28.0. IR (KBr) 2920, 2849, 1751, 1682, 1293, 1276. HRMS (ESI) calcd for $C_{23}H_{20}N_2O_2Na$ $[M+Na]^+$ 395.13661, found 395.13642.



3d

(1*S*,10b*S*)-3-benzoyl-1-propyl-1,5,6,10b-tetrahydropyrazolo[5,1-*a*]isoquinolin-2(3*H*)-one

44.0 mg, 4:1 d.r., 66% yield. Colorless oil. R_f = 0.4 (petroleum ether/ethyl acetate 3:1); $[\alpha]_D^{25}$ -46 (*c* 0.1, CH_2Cl_2); HPLC analysis: > 99% ee [Daicel CHIRALPAK AD-H column, 20 °C, 254 nm, hexane/*i*-PrOH = 90:10, 1.0 mL /min, 254 nm, 31.3 min (minor), 43.9 min (major)]; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.72-7.63 (m, 2H), 7.57-7.49 (m, 1H), 7.42 (dd, *J* = 10.5, 4.6 Hz, 2H), 7.29-7.17 (m, 3H), 7.06-7.01 (m, 1H), 5.15 (d, *J* = 8.1 Hz, 1H), 3.70-3.61 (m, 1H), 3.29-3.09 (m, 2H), 2.96-2.86 (m, 1H), 2.86-2.72 (m, 1H), 1.80-1.17 (m, 4H), 0.81 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.6, 166.6, 134.3, 131.9, 131.3, 128.8, 128.7, 127.9, 127.3, 127.3, 126.5, 60.5, 49.9, 47.4, 32.4, 28.6, 21.4, 13.7. IR (KBr) 2920, 1750, 1682, 1292, 1274. HRMS (ESI) calcd for $C_{21}H_{22}N_2O_2Na$ $[M+Na]^+$ 357.15735, found 357.15720.

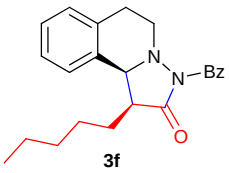


3e

(1*S*,10b*S*)-3-benzoyl-1-butyl-1,5,6,10b-tetrahydropyrazolo[5,1-*a*]isoquinolin-2(3*H*)-one

55.7 mg, 4:1 d.r., 80% yield. Colorless oil. R_f = 0.4 (petroleum ether/ethyl acetate 3:1); $[\alpha]_D^{25}$ -61 (*c* 0.1, CH_2Cl_2); HPLC analysis: > 99% ee [Daicel CHIRALPAK AD-H column, 20 °C, 254 nm, hexane/*i*-PrOH = 90:10, 1.0 mL /min, 254 nm, 30.1 min (minor), 38.9 min (major)]; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.74-7.62 (d, *J* = 7.2 Hz, 2H), 7.53 (t, *J* = 7.4 Hz, 1H), 7.42 (t, *J* = 7.5 Hz, 2H), 7.31-7.16 (m, 3H), 7.09-7.00 (m, 1H), 5.15 (d, *J* = 8.1 Hz, 1H), 3.72-3.58 (m, 1H), 3.29-3.05 (m, 2H), 2.85 (m, 2H), 1.16-1.62 (m, 6H), 0.79 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 175.6, 166.6, 134.2, 134.2, 131.9, 131.3, 128.7, 128.7, 127.9, 127.3, 127.3, 126.5,

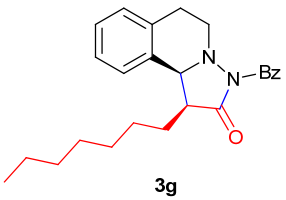
60.5, 49.9, 47.6, 30.3, 30.0, 28.6, 22.2, 13.7. IR (KBr) 2919, 2850, 1750, 1683, 1292, 1275. HRMS (ESI) calcd for $C_{22}H_{24}N_2O_2Na$ $[M+Na]^+$ 371.17300, found 371.17277.



3f

(1*S*,10b*S*)-3-benzoyl-1-pentyl-1,5,6,10b-tetrahydropyrazolo[5,1-*a*]isoquinolin-2(3*H*)-one

50.7 mg, 4:1 d.r., 70% yield. Colorless oil. R_f = 0.4 (petroleum ether/ethyl acetate 3:1); $[\alpha]_D^{25}$ -45 (*c* 0.1, CH_2Cl_2); HPLC analysis: 95% ee [Daicel CHIRALPAK AD-H column, 20 °C, 254 nm, hexane/*i*-PrOH = 90:10, 1.0 mL /min, 254 nm, 24.9 min (minor), 33.5 min (major)]; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.60 (m, 2H), 7.49-7.42 (m, 1H), 7.36 (m, 2H), 7.22-7.09 (m, 3H), 6.98 (m, 1H), 5.07 (d, *J* = 8.1 Hz, 1H), 3.62-3.53 (m, 1H), 3.21-2.98 (m, 2H), 2.87-2.65 (m, 2H), 1.72-0.96 (m, 8H), 0.73 (t, *J* = 7.0 Hz, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.6, 166.6, 134.2, 134.2, 131.9, 131.3, 128.7, 127.9, 127.3, 127.3, 126.5, 60.5, 49.9, 47.7, 31.4, 30.3, 28.6, 27.9, 22.3, 13.9. IR (KBr) 2920, 2849, 1750, 1688, 1274. HRMS (ESI) calcd for $C_{23}H_{26}N_2O_2Na$ $[M+Na]^+$ 385.18865, found 385.18847.

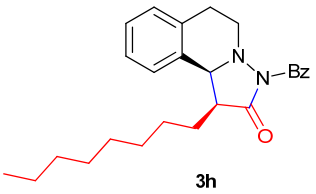


3g

(1*S*,10b*S*)-3-benzoyl-1-heptyl-1,5,6,10b-tetrahydropyrazolo[5,1-*a*]isoquinolin-2(3*H*)-one

56.2 mg, 5:1 d.r., 72% yield. Colorless oil. R_f = 0.5 (petroleum ether/ethyl acetate 3:1); $[\alpha]_D^{25}$ -43 (*c* 0.1, CH_2Cl_2); HPLC analysis: > 99% ee [Daicel CHIRALPAK AD-H column, 20 °C, 254 nm, hexane/*i*-PrOH = 90:10, 1.0 mL /min, 254 nm, 23.2 min (minor), 29.7 min (major)]; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.59 (dd, *J* = 5.2, 3.3 Hz, 2H), 7.45 (m, 1H), 7.34 (m, 2H), 7.24-7.04 (m, 3H), 7.01-6.90 (m, 1H), 5.07 (d, *J*

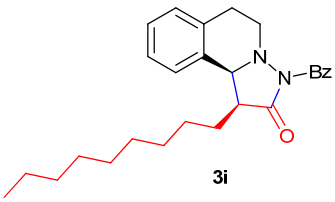
= 8.1 Hz, 1H), 3.69-3.52 (m, 1H), 3.31-2.98 (m, 2H), 2.89-2.61 (m, 2H), 1.72-0.97 (m, 12H), 0.76 (t, *J* = 6.8 Hz, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 175.6, 166.6, 134.2, 134.2, 131.9, 131.3, 128.7, 127.9, 127.3, 127.3, 126.5, 60.5, 49.9, 47.7, 31.7, 30.3, 29.1, 28.9, 28.6, 28.2, 22.6, 14.1. IR (KBr) 2920, 2851, 1752, 1685, 1274. HRMS (ESI) calcd for $C_{25}H_{30}N_2O_2Na$ $[M+Na]^+$ 413.21955, found 413.21984.



3h

(1*S*,10b*S*)-3-benzoyl-1-octyl-1,5,6,10b-tetrahydropyrazolo[5,1-*a*]isoquinolin-2(3*H*)-one

61.4 mg, 3:1 d.r., 76% yield. Colorless oil. R_f = 0.5 (petroleum ether/ethyl acetate 3:1); $[\alpha]_D^{25}$ -56 (*c* 0.1, CH_2Cl_2); HPLC analysis: > 99% ee [Daicel CHIRALPAK AD-H column, 20 °C, 254 nm, hexane/*i*-PrOH = 90:10, 1.0 mL /min, 254 nm, 22.1 min (minor), 33.4 min (major)]; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.59 (dd, *J* = 5.2, 3.3 Hz, 2H), 7.50-7.42 (m, 1H), 7.39-7.29 (m, 2H), 7.22-7.08 (m, 3H), 6.97 (m, 1H), 5.07 (d, *J* = 8.1 Hz, 1H), 3.70-3.41 (m, 1H), 3.26-2.99 (m, 2H), 2.93-2.62 (m, 2H), 1.62-0.95 (m, 14H), 0.77 (t, *J* = 7.0 Hz, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.6, 166.6, 134.2, 134.2, 131.9, 131.3, 128.7, 127.9, 127.3, 127.3, 126.5, 60.5, 49.9, 47.7, 31.8, 30.3, 29.2, 29.2, 29.1, 28.6, 28.2, 22.6, 14.1. IR (KBr) 2924, 2853, 1751, 1686, 1292, 1275. HRMS (ESI) calcd for $C_{26}H_{32}N_2O_2Na$ $[M+Na]^+$ 427.23560, found 427.23522.

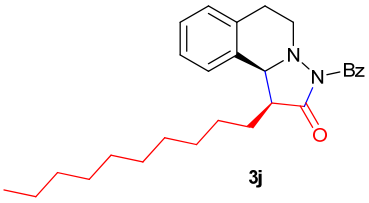


3i

(1*S*,10b*S*)-3-benzoyl-1-nonyl-1,5,6,10b-tetrahydropyrazolo[5,1-*a*]isoquinolin-2(3*H*)-one

67.7 mg, 3:1 d.r., 81% yield. Colorless oil. R_f = 0.5 (petroleum ether/ethyl acetate

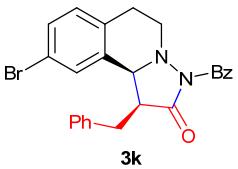
3:1); $[\alpha]_D^{25}$ -34 (*c* 0.1, CH_2Cl_2); HPLC analysis: > 99% ee [Daicel CHIRALPAK AD-H column, 20 °C, 254 nm, hexane/*i*-PrOH = 90:10, 1.0 mL /min, 254 nm, 19.5 min (minor), 24.9 min (major)]; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.71-7.64 (m, 2H), 7.56-7.49 (m, 1H), 7.42 (t, *J* = 7.6 Hz, 2H), 7.34-7.14 (m, 3H), 7.05 (m, 1H), 5.14 (d, *J* = 8.1 Hz, 1H), 3.69-3.61 (m, 1H), 3.32-3.08 (m, 2H), 2.97-2.73 (m, 2H), 1.78-1.05 (m, 16H), 0.86 (t, *J* = 7.0 Hz, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 175.6, 166.7, 134.2, 134.2, 131.9, 131.3, 128.7, 127.9, 127.3, 127.3, 126.5, 60.5, 49.9, 47.7, 31.8, 30.3, 29.4, 29.2, 29.2, 28.6, 28.2, 22.7, 14.1. IR (KBr) 2923, 2852, 1751, 1686, 1292, 1275. HRMS (ESI) calcd for $C_{27}H_{34}N_2O_2Na$ $[M+Na]^+$ 441.25125, found 441.25108.



3j

(1*S*,10b*S*)-3-benzoyl-1-decyl-1,5,6,10b-tetrahydropyrazolo[5,1-*a*]isoquinolin-2(3*H*)-one

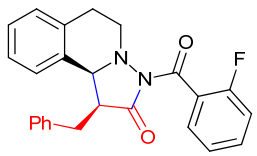
73.4 mg, 4:1 d.r., 85% yield. Colorless oil. R_f = 0.6 (petroleum ether/ethyl acetate 3:1); $[\alpha]_D^{25}$ -26 (*c* 0.1, CH_2Cl_2); HPLC analysis: > 99% ee [Daicel CHIRALPAK AD-H column, 20 °C, 254 nm, hexane/*i*-PrOH = 90:10, 1.0 mL /min, 254 nm, 17.9 min (minor), 22.4 min (major)]; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.63-7.57 (m, 2H), 7.52-7.42 (m, 1H), 7.42-7.26 (m, 2H), 7.26-7.09 (m, 3H), 7.02-6.91 (m, 1H), 5.07 (d, *J* = 8.1 Hz, 1H), 3.69-3.52 (m, 1H), 3.23-2.99 (m, 2H), 2.92-2.70 (m, 2H), 1.78-0.97 (m, 18H), 0.79 (t, *J* = 6.9 Hz, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.7, 166.7, 134.2, 134.2, 131.9, 131.3, 128.7, 127.9, 127.3, 127.3, 126.5, 60.5, 49.9, 47.7, 31.9, 30.3, 29.5, 29.5, 29.3, 29.3, 29.2, 28.6, 28.2, 22.7, 14.1. IR (KBr) 2922, 2851, 1749, 1688, 1274. HRMS (ESI) calcd for $C_{28}H_{36}N_2O_2Na$ $[M+Na]^+$ 455.2690, found 455.269649.



3k

(1*S*,10b*S*)-3-benzoyl-1-benzyl-9-bromo-1,5,6,10b-tetrahydropyrazolo[5,1-*a*]isoquinolin-2(3*H*)-one

59.8 mg, 4:1 d.r., 65% yield. White crystal, mp. 150-152 °C. R_f = 0.3 (petroleum ether/ethyl acetate 3:1); $[\alpha]_D^{25}$ -37 (*c* 0.1, CH_2Cl_2); HPLC analysis: > 99% ee [Daicel CHIRALPAK AD-H column, 20 °C, 254 nm, hexane/*i*-PrOH = 70:30, 1.0 mL /min, 254 nm, 24.2 min (minor),35.0 min (major)] ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.59 (d, *J* = 7.3 Hz, 2H), 7.46 (t, *J* = 7.4 Hz, 1H), 7.35 (t, *J* = 7.6 Hz, 2H), 7.28 (d, *J* = 8.2 Hz, 1H), 7.16-7.05 (m, 3H), 7.01 (d, *J* = 8.2 Hz, 1H), 6.93 (s, 1H), 6.79 (d, *J* = 6.4 Hz, 2H), 5.07 (d, *J* = 8.5 Hz, 1H), 3.63-3.50 (m, 1H), 3.27 (dd, *J* = 14.7, 6.4 Hz, 1H), 3.05 (m, 1H), 2.97-2.79 (m, 2H), 2.79-2.62 (m, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.7, 166.5, 138.6, 133.8, 133.2, 133.1, 132.2, 130.8, 130.7, 130.3, 128.9, 128.7, 128.6, 128.0, 126.9, 120.1, 59.8, 49.7, 49.4, 35.8, 28.0. IR (KBr) 2920, 2850, 1751, 1681, 1599, 1288. HRMS (ESI) calcd for $C_{25}H_{21}N_2O_2BrNa$ $[M+Na]^+$ 483.06786, found 483.06767.

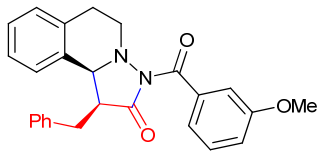


3l

(1*S*,10b*S*)-1-benzyl-3-(2-fluorobenzoyl)-1,5,6,10b-tetrahydropyrazolo[5,1-*a*]isoquinolin-2(3*H*)-one

73.6 mg, 6:1 d.r., 92% yield. Colorless oil. R_f = 0.3 (petroleum ether/ethyl acetate 3:1); $[\alpha]_D^{25}$ -41 (*c* 0.1, CH_2Cl_2); HPLC analysis: 99% ee [Daicel CHIRALPAK AD-H column, 20 °C, 254 nm, hexane/*i*-PrOH/MeOH = 70:20:10, 1.0 mL /min, 254 nm, 16.1 min (minor), 20.6 min (major)]; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.56 (m, 1H), 7.50 (m, 1H), 7.30-7.08 (m, 8H), 7.01 (d, *J* = 7.5 Hz, 1H), 6.91 (m, 2H), 5.23 (d, *J* = 8.4 Hz, 1H), 3.86-3.67 (m, 1H), 3.41-3.17 (m, 2H), 2.98-2.71 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.8, 161.8, 160.7, 158.2, 139.0, 134.3, 133.0, 132.9, 131.0, 129.8, 129.8, 128.9, 128.8, 128.4, 127.7, 127.5, 126.6, 126.6, 124.4, 124.3, 115.7, 115.4, 60.3, 49.8, 49.3, 35.6, 28.6. IR (KBr) 2920, 2849, 1752, 1686, 1305, 1226. HRMS

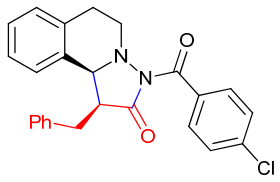
(ESI) calcd for $C_{25}H_{21}N_2O_2FNa$ $[M+Na]^+$ 423.14793, found 423.14807.



3m

(1*S*,10b*S*)-1-benzyl-3-(3-methoxybenzoyl)-1,5,6,10b-tetrahydropyrazolo[5,1-*a*]-isoquinolin-2(3*H*)-one

75.8 mg, 6:1 d.r., 92% yield. Colorless oil. R_f = 0.2 (petroleum ether/ethyl acetate 3:1); $[\alpha]_D^{25}$ -29 (*c* 0.1, CH_2Cl_2); HPLC analysis: > 99% ee [Daicel CHIRALPAK AD-H column, 20 °C, 254 nm, hexane/*i*-PrOH = 70:30, 1.0 mL /min, 254 nm, 28.4 min (minor), 36.2 min (major)]; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.24 (d, *J* = 8.0 Hz, 1H), 7.21-7.03 (m, 8H), 6.98 (dd, *J* = 8.1, 1.7 Hz, 1H), 6.90 (d, *J* = 7.5 Hz, 1H), 6.84-6.77 (m, 2H), 5.14 (d, *J* = 8.5 Hz, 1H), 3.75 (s, 3H), 3.61-3.49 (m, 1H), 3.34-3.20 (m, 1H), 3.19-3.03 (m, 1H), 2.90-2.64 (m, 4H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 175.1, 166.4, 159.2, 139.0, 135.3, 134.3, 131.0, 129.0, 128.9, 128.7, 128.5, 127.7, 127.5, 126.6, 121.1, 117.9, 114.1, 60.3, 55.4, 49.8, 49.7, 35.6, 28.5. IR (KBr) 2920, 2849, 1751, 1683, 1295, 1277. HRMS (ESI) calcd for $C_{26}H_{24}N_2O_3Na$ $[M+Na]^+$ 435.16791, found 435.16777.

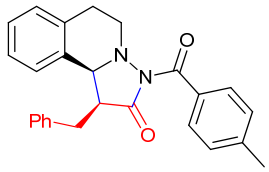


3n

(1*S*,10b*S*)-1-benzyl-3-(4-chlorobenzoyl)-1,5,6,10b-tetrahydropyrazolo[5,1-*a*]isoquinolin-2(3*H*)-one

71.6 mg, 6:1 d.r., 86% yield. Needles, m.p. 81-82 °C. R_f = 0.3 (petroleum ether/ethyl acetate 3:1); $[\alpha]_D^{25}$ -44 (*c* 0.1, CH_2Cl_2); HPLC analysis: > 99% ee [Daicel CHIRALPAK AD-H column, 20 °C, 254 nm, hexane/*i*-PrOH = 70:30, 1.0 mL /min, 254 nm, 19.7 min (major), 27.8 min (minor)]; ^{1}H NMR (400 MHz, $CDCl_3$) δ

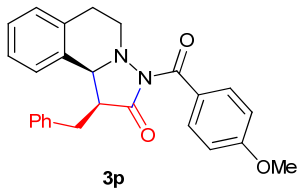
7.67-7.61 (m, 2H), 7.42-7.35 (m, 2H), 7.29-7.13 (m, 6H), 6.98 (d, J = 7.4 Hz, 1H), 6.88 (dd, J = 7.6, 1.7 Hz, 2H), 5.21 (d, J = 8.5 Hz, 1H), 3.58 (m, 1H), 3.41-3.29 (m, 1H), 3.17 (m, 1H), 2.95-2.74 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.1, 165.5, 138.9, 138.4, 134.2, 132.2, 130.9, 130.4, 128.9, 128.8, 128.5, 128.3, 127.7, 127.5, 126.6, 60.4, 49.8, 49.7, 35.6, 28.5. IR (KBr) 2921, 2850, 1752, 1686, 1296, 1275. HRMS (ESI) calcd for $C_{25}H_{21}N_2O_2ClNa$ $[M+Na]^+$ 439.11838, found 439.11827.



3o

(1*S*,10b*S*)-1-benzyl-3-(4-methylbenzoyl)-1,5,6,10b-tetrahydropyrazolo[5,1-*a*]isoquinolin-2(3*H*)-one

73.7 mg, 6:1 d.r., 93% yield. Colorless oil. R_f = 0.3 (petroleum ether/ethyl acetate 3:1); $[\alpha]_D^{25}$ -27 (*c* 0.1, CH_2Cl_2); HPLC analysis: 99% ee [Daicel CHIRALPAK AD-H column, 20 °C, 254 nm, hexane/*i*-PrOH = 70:30, 1.0 mL /min, 254 nm, 18.3 min (minor), 32.7 min (major)]; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (d, J = 8.2 Hz, 2H), 7.31-7.12 (m, 8H), 7.00 (d, J = 7.5 Hz, 1H), 6.93 (dd, J = 7.6, 1.5 Hz, 2H), 5.24 (d, J = 8.5 Hz, 1H), 3.65 (m, 1H), 3.42-3.31 (m, 1H), 3.22 (m, 1H), 2.99-2.76 (m, 4H), 2.43 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.1, 166.6, 142.9, 139.1, 134.3, 131.1, 131.0, 129.2, 128.9, 128.7, 128.7, 128.5, 127.8, 127.4, 126.5, 60.4, 49.9, 49.8, 35.6, 28.5, 21.7. IR (KBr) 2920, 2850, 1750, 1682, 1293, 1276. HRMS (ESI) calcd for $C_{26}H_{24}N_2O_2Na$ $[M+Na]^+$ 419.17300, found 419.17319.

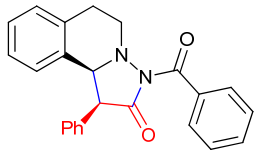


3p

(1*S*,10b*S*)-1-benzyl-3-(4-methoxybenzoyl)-1,5,6,10b-tetrahydropyrazolo[5,1-*a*]-isoquinolin-2(3*H*)-one

70.9 mg, 8:1 d.r., 86% yield. Colorless oil. R_f = 0.2 (petroleum ether/ethyl acetate

3:1); $[\alpha]_D^{25}$ -28 (*c* 0.1, CH_2Cl_2); HPLC analysis: 97% ee [Daicel CHIRALPAK AD-H column, 20 °C, 254 nm, hexane/*i*-PrOH = 70:30, 1.0 mL /min, 254 nm, 28.4 min (minor), 36.2 min (major)]; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.78-7.67 (m, 2H), 7.24-7.12 (m, 6H), 6.97 (d, *J* = 7.5 Hz, 1H), 6.94-6.87 (m, 4H), 5.21 (d, *J* = 8.5 Hz, 1H), 3.85 (s, 4H), 3.58 (m, 1H), 3.34 (m, 1H), 3.22-3.05 (m, 1H), 2.91 (m, 2H), 2.85- 2.71 (m, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.1, 166.0, 163.0, 139.1, 134.3, 131.7, 131.2, 128.9, 128.7, 128.4, 127.8, 127.4, 126.5, 125.9, 113.3, 60.4, 55.4, 49.9, 49.9, 35.6, 28.4. IR (KBr) 2920, 2849, 1751, 1679, 1603, 1255. HRMS (ESI) calcd for $C_{26}H_{24}N_2O_3Na$ $[M+Na]^+$ 435.16791, found 435.16779.

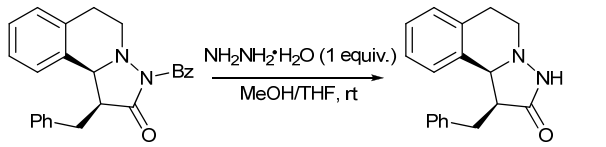


3q

(1*S*,10b*S*)-3-benzoyl-1-phenyl-1,5,6,10b-tetrahydropyrazolo[5,1-*a*]isoquinolin-2(3*H*)-one

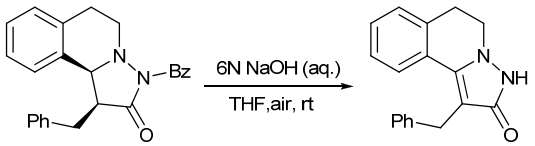
22.0 mg, > 20:1 d.r., 30% yield. White solid, m.p. = 191-192 °C. R_f = 0.3 (petroleum ether/ethyl acetate 3:1); $[\alpha]_D^{25}$ +3 (*c* 0.1, CH_2Cl_2); HPLC analysis: 55% ee [Daicel CHIRALPAK AD-H column, 20 °C, 254 nm, hexane/*i*-PrOH = 70:30, 1.0 mL /min, 254 nm, 13.6 min (minor), 17.0 min (major)]; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.71-7.59 (m, 2H), 7.45 (t, *J* = 7.4 Hz, 1H), 7.40-7.28 (m, 5H), 7.17-7.13 (m, 4H), 6.90 (m, 1H), 6.26 (d, *J* = 7.8 Hz, 1H), 4.95 (d, *J* = 12.0 Hz, 1H), 4.08 (d, *J* = 12.0 Hz, 1H), 3.73-3.59 (m, 1H), 3.30-3.15 (m, 2H), 2.89-2.73 (m, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.6, 166.3, 135.0, 133.8, 132.8, 132.6, 132.1, 129.6, 129.2, 128.9, 128.6, 128.3, 128.0, 127.6, 127.0, 126.1, 65.4, 55.5, 48.6, 28.9. IR (KBr) 2920, 2851, 1751, 1681, 1602, 1265. HRMS (ESI) calcd for $C_{24}H_{20}N_2O_2Na$ $[M+Na]^+$ 391.14170, found 391.14156.

2. Chemical transformations of compound 3a (Scheme 4)



3a (*cis* only), 99% ee **4a** (*cis* only), 85%, 95% ee

(1*S*,10b*S*)-1-benzyl-1,5,6,10b-tetrahydropyrazolo[5,1-*a*]isoquinolin-2(3*H*)-one (4a) To a stirred suspension of **3a** (38.2 mg, 0.1 mmol) in THF (1 mL) and MeOH (2 mL) was added hydrazine monohydrate (85%) (10 mg, 0.1 mmol), and the resulting solution was stirred at rt for 3h. The volatiles were removed *in vacuo* and the residue was purified by flash column chromatography (petroleum ether/EtOAc = 1:1-1:2) to afford **4a** as a white solid. Yield: 23.5 mg (85%), m.p. = 175-177 ^{o}C, R_f = 0.2 (petroleum ether/ethyl acetate 1:2); $[\alpha]_D^{25}$ +3 (*c* 0.1, CH_2Cl_2); HPLC analysis: 95% ee [Daicel CHIRALPAK AD-H column, 20 ^{o}C, 254 nm, hexane/*i*-PrOH = 65:35, 0.5 mL /min, 254 nm, 10.9 min (major), 13.4 min (minor)]; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.19-7.00 (m, 6H), 6.90 (d, *J* = 8.4 Hz, 1H), 6.81-6.73 (m, 2H), 5.11 (t, *J* = 11.1 Hz, 1H), 3.17 (m, 1H), 3.10-2.90 (m, 2H), 2.84-2.70 (m, 2H), 2.70-2.61 (m, 1H), 2.58-2.45 (m, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 176.8, 139.6, 134.4, 131.9, 129.0, 128.5, 128.3, 127.9, 127.1, 126.4, 126.3, 63.2, 52.6, 47.8, 35.7, 28.7. IR (KBr) 3184, 2921, 2849, 1687, 1496, 1454, 1276. HRMS (ESI) calcd for $C_{18}H_{18}N_2ONa$ $[M+Na]^+$ 301.13168, found 301.13042.



3a **5a**, 87%

Benzyl-5,6-dihydropyrazolo[5,1-*a*]isoquinolin-2(3*H*)-one (5a) To the solution of 3a (114.6 mg, 0.3 mmol) in THF (2 mL) was added NaOH solution (6N, 150 μL, 0.9 mmol) at rt. The mixture was stirred for 12h at room teperature. The reaction was acidified with a few drop of HCl (3N), then extracted with ethyl acetate (3x10 mL), and dried with anhydrous Na_2SO_4. The solvent was removed under reduced pressure and residue was purified by flash column chromatography (petroleum ether/EtOAc =

1:1-1:2) to afford **5a** as a white crystal. Yield: 72.0 mg (87%), m.p. = 223-224 °C, R_f = 0.2 (petroleum ether/ethyl acetate 1:2); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.45 (d, *J* = 6.8 Hz, 1H), 7.39-7.08 (m, 8H), 4.17 (t, *J* = 6.5 Hz, 2H), 4.10 (s, 2H), 3.14 (t, *J* = 6.5 Hz, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.2, 140.5, 136.5, 132.6, 128.5, 128.3, 128.1, 128.0, 127.3, 127.2, 125.9, 124.5, 98.9, 45.3, 29.5, 28.3. IR (KBr) 2922, 2849, 1646, 1530, 1510, 1215. HRMS (ESI) calcd for $C_{18}H_{17}N_2O$ $[M+H]^+$ 277.13354, found 277.13328.

3. X-ray structure of compound 3k

The crystal of compound **3k** was prepared from its solution in petroleum ether/CH_2Cl_2 by slow evaporation. The structure of compound **3k** was established by the X-ray analysis of its crystal (Figure S1).

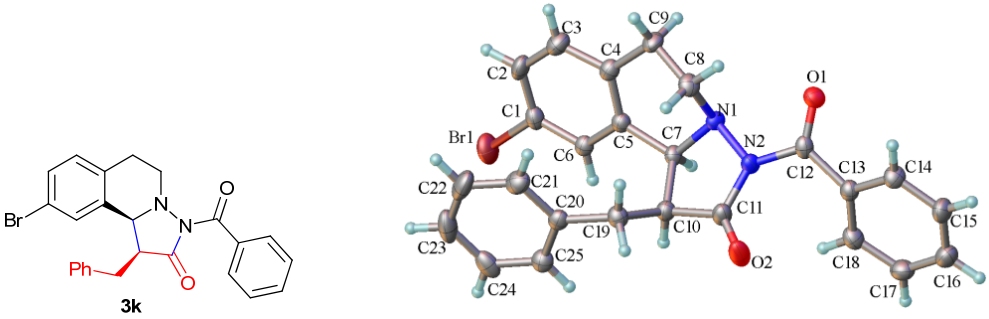


Figure S1. X-ray structure of **3k**.

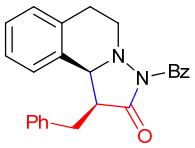
4. References

1 (a) M. He, J. R. Struble and J. W. Bode, *J. Am. Chem. Soc.*, 2006, **128**, 8418; (b) Y.-R. Zhang, L. He, X. Wu, P.-L. Shao and S. Ye, *Org. Lett.*, 2008, **10**, 277; (c) H.-M. Zhang, Z.-H. Gao and S. Ye, *Org. Lett.*, 2014, **16**, 3079.

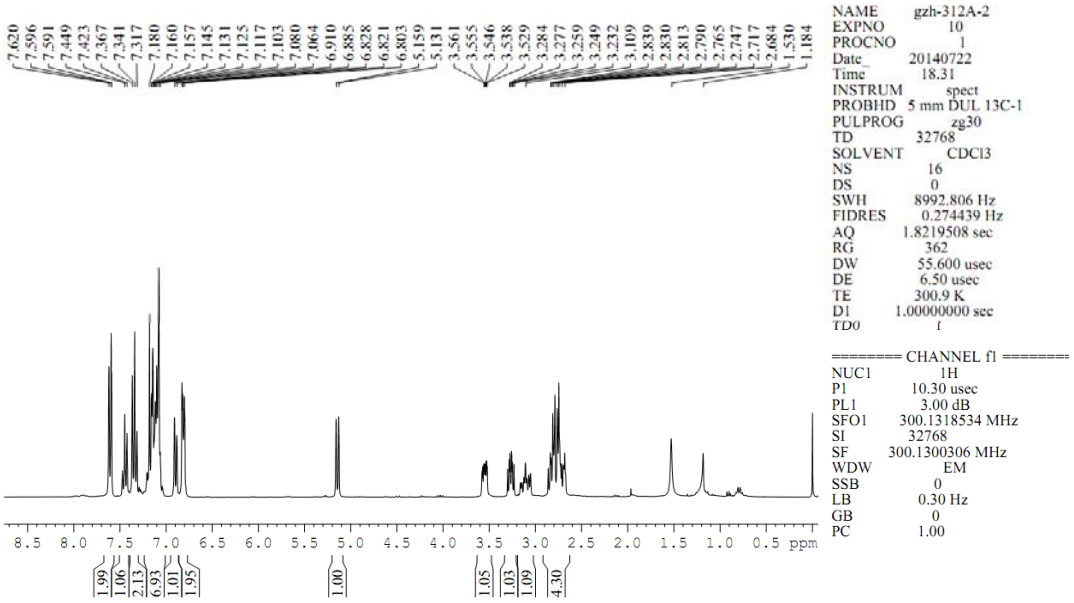
2 M. He, G. J. Uc and J. W. Bode, *J. Am. Chem. Soc.*, 2006, **128**, 15088.

3 T. Hashimoto, Y. Maeda, M. Omote, H. Nakatsu and K. Maruoka, *J. Am. Chem. Soc.*, 2010, **132**, 4076.

Part III NMR Spectra



3a



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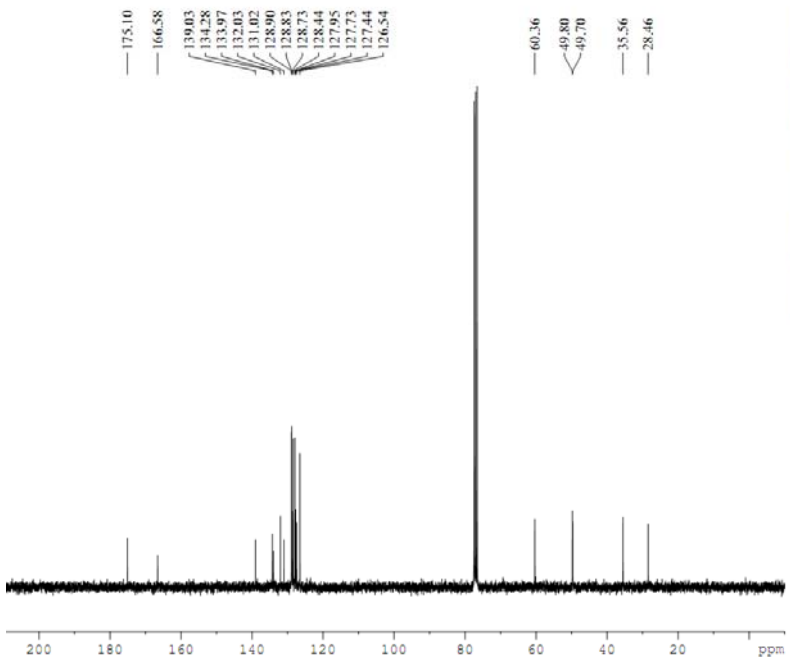

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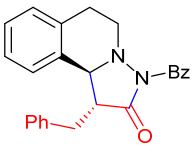
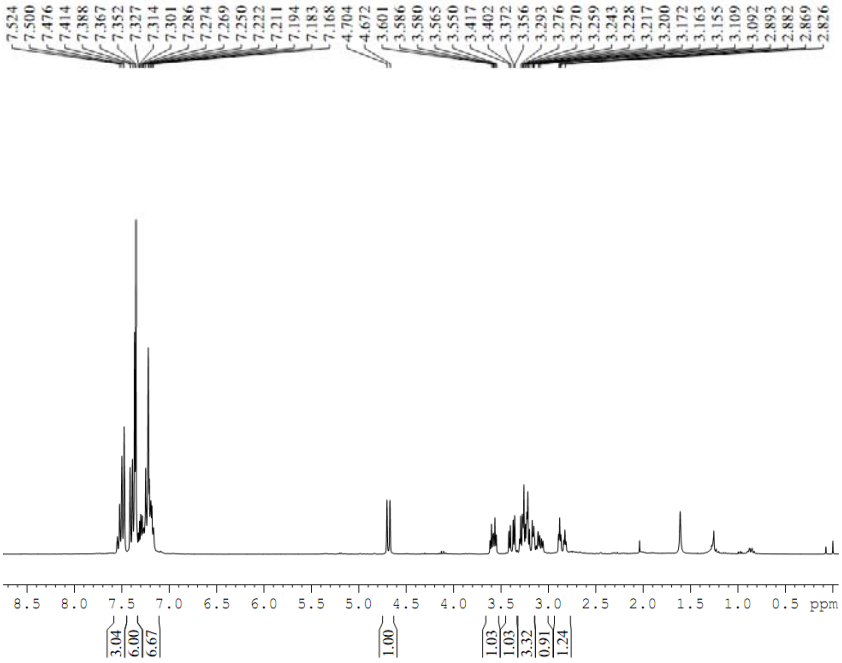


3a' (*trans*-**3a**)



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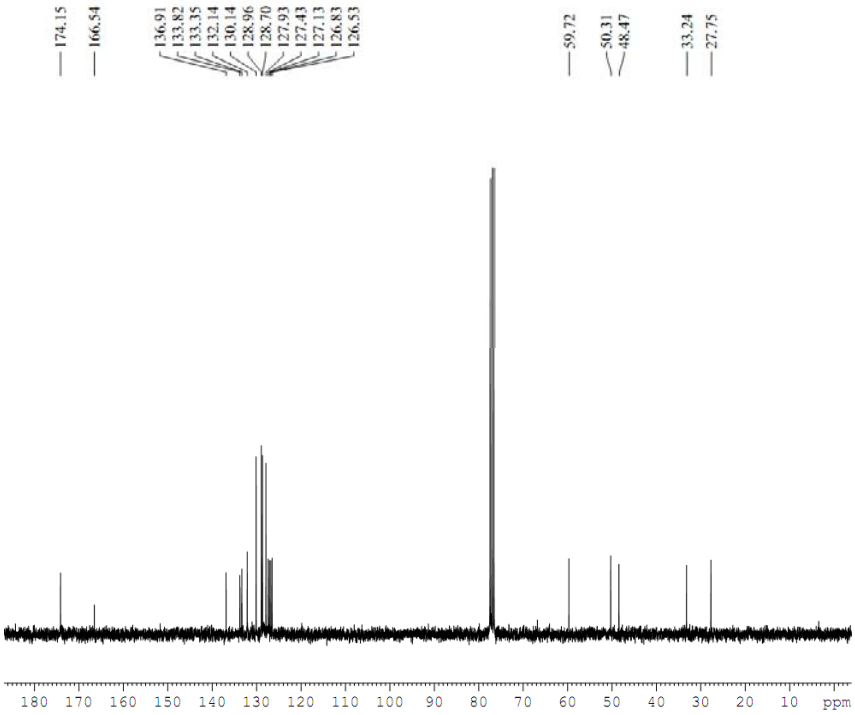
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 8992.806 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 256
DW 55.600 usec
DE 6.50 usec
TE 299.0 K
D1 1.00000000 sec
TD0 1

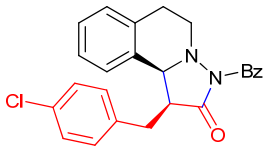
======== CHANNEL f1 ========
NUC1 1H
P1 10.30 usec
PL1 3.00 dB
SFO1 300.1318534 MHz
SI 32768
SF 300.1300098 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



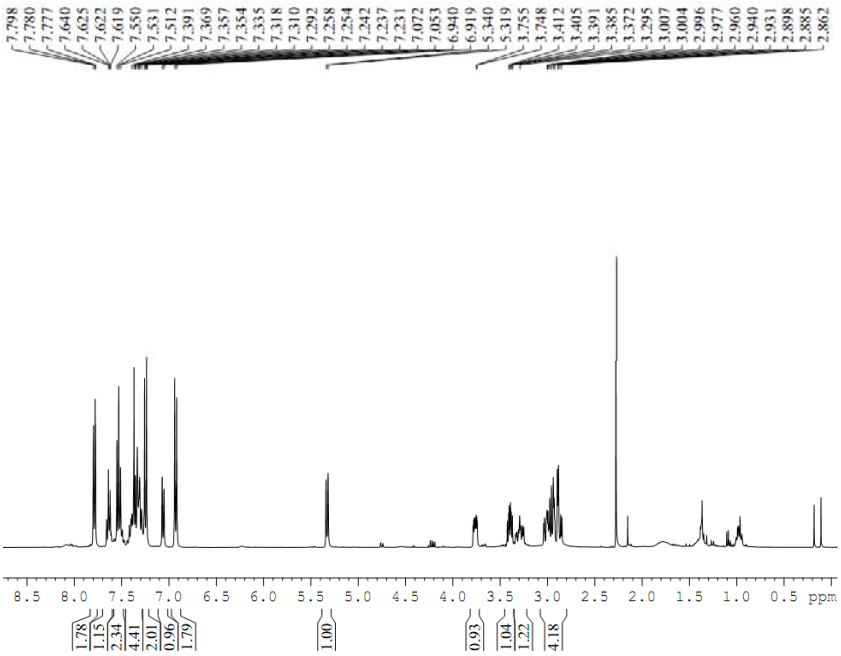
NAME gzh-319A-1
EXPNO 11
PROCNO 1
Date_ 20140816
Time 17.06
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 126
DS 4
SWH 17985.611 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 645.1
DW 27.800 usec
DE 6.50 usec
TE 299.2 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
NUC1 13C
P1 12.50 usec
PL1 2.00 dB
SFO1 75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 100.00 usec
PL2 3.00 dB
PL12 22.74 dB
PL13 23.00 dB
SFO2 300.1312005 MHz
SI 32768
SF 75.4677490 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

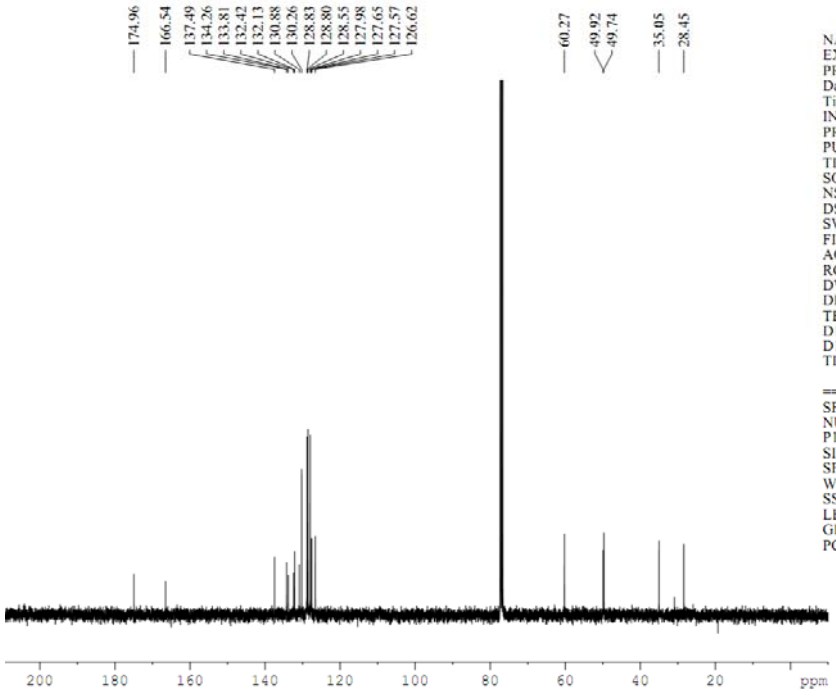


3b



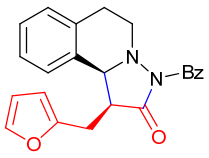
NAME gaozhonghua
EXPNO 6
PROCNO 1
Date_ 20141015
Time 18.38
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.244532 Hz
AQ 2.0447731 sec
RG 125.02
DW 62.400 usec
DE 6.50 usec
TE 298.1 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.2424716 MHz
NUC1 1H
P1 14.80 usec
SI 65536
SF 400.2399660 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

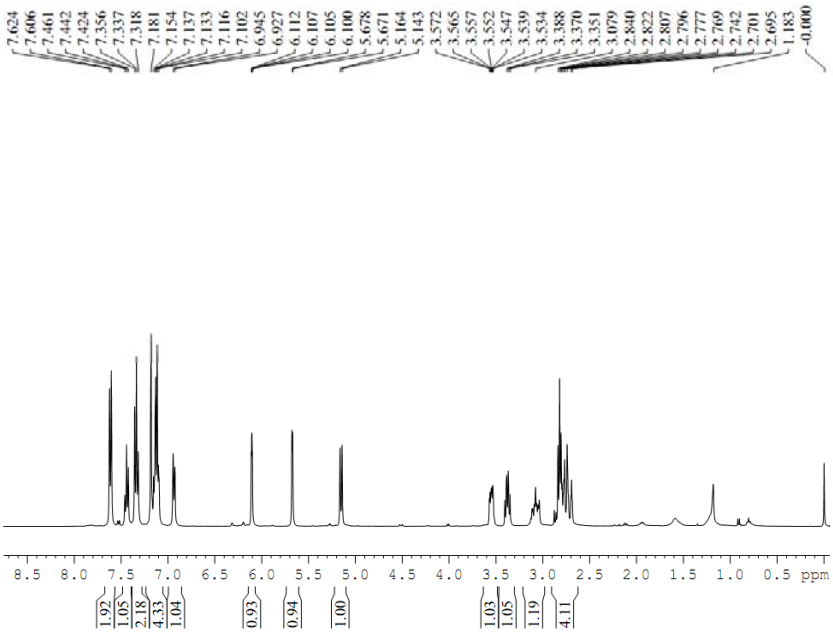


NAME NMR
EXPNO 6
PROCNO 1
Date_ 20141015
Time 18.46
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 196
DS 4
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 206.33
DW 20.800 usec
DE 6.50 usec
TE 299.3 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6504916 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6404280 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

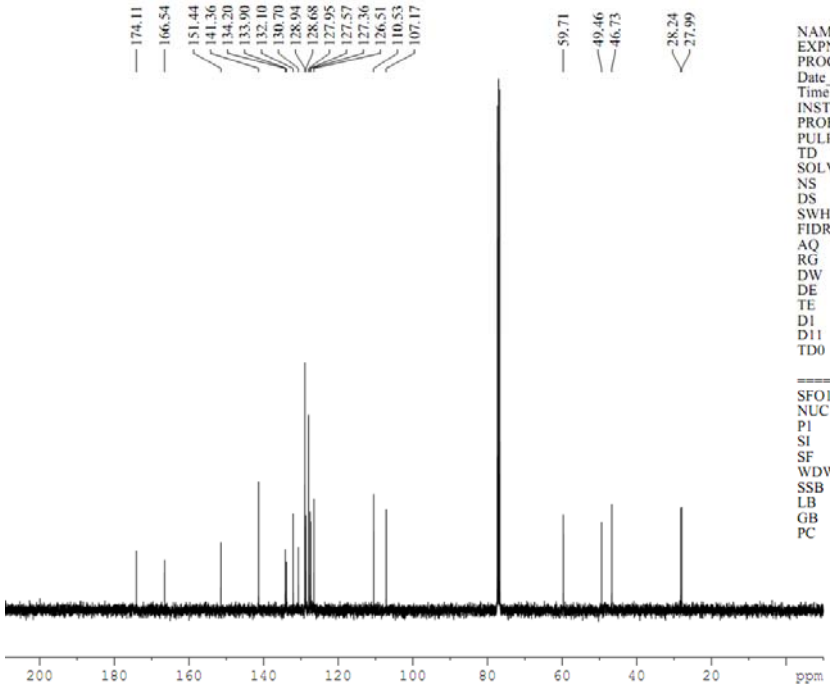


3c



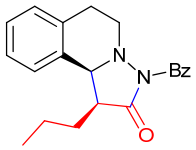
NAME gaozhonghua
EXPNO 133
PROCNO 1
Date_ 20141022
Time_ 18.49
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.244532 Hz
AQ 2.0447731 sec
RG 92.09
DW 62.400 usec
DE 6.50 usec
TE 297.4 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.2424716 MHz
NUC1 1H
P1 14.80 usec
SI 65536
SF 400.2400413 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

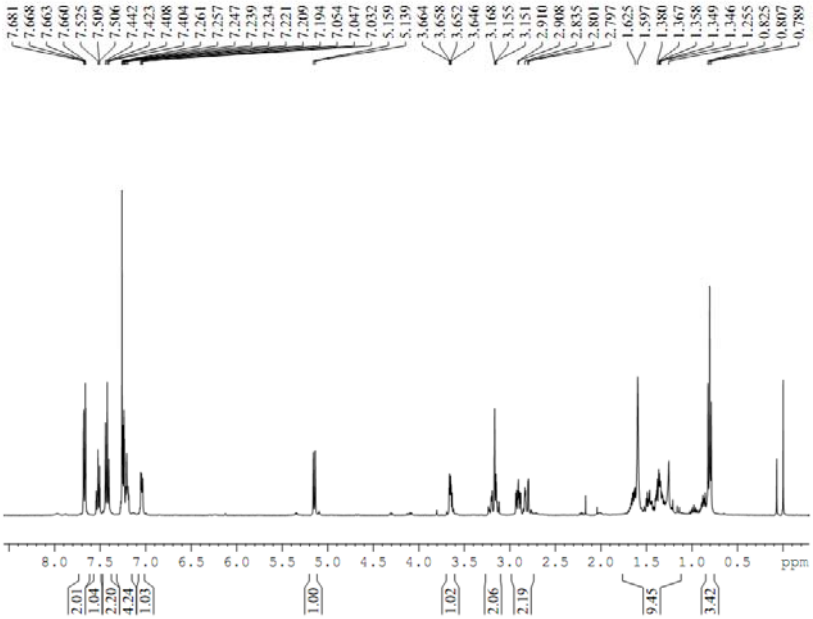


NAME NMR
EXPNO 8
PROCNO 1
Date_ 20141015
Time_ 19.05
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 109
DS 4
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 206.33
DW 20.800 usec
DE 6.50 usec
TE 299.3 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6504916 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6404280 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

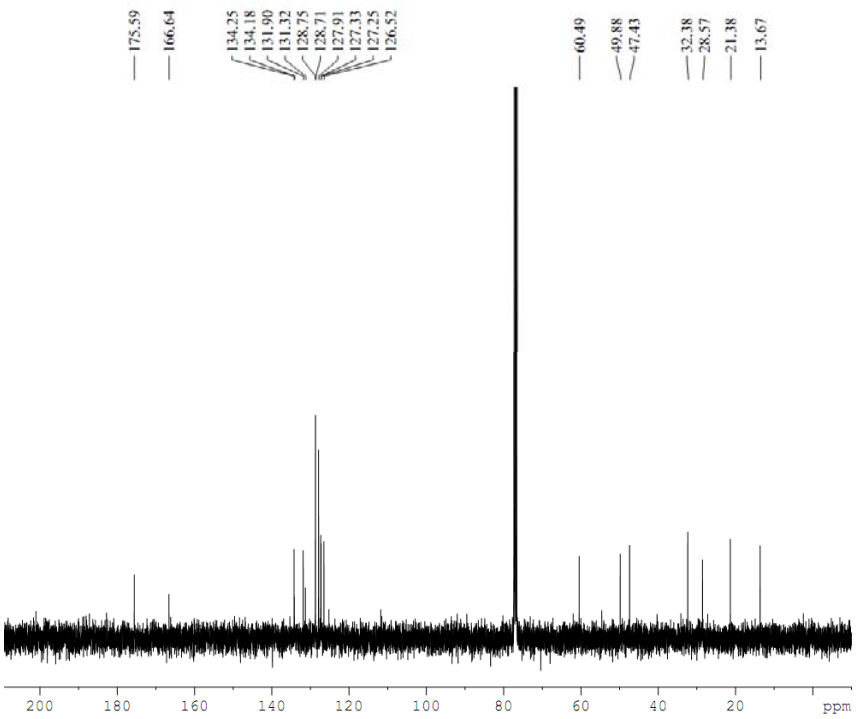


3d



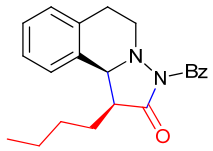
NAME gaozhonghua
EXPNO 102
PROCNO 1
Date_ 20140922
Time 9.24
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.244532 Hz
AQ 2.0447731 sec
RG 206.33
DW 62.400 usec
DE 6.50 usec
TE 299.4 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.2424716 MHz
NUC1 1H
P1 14.80 usec
SI 65536
SF 400.2400094 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

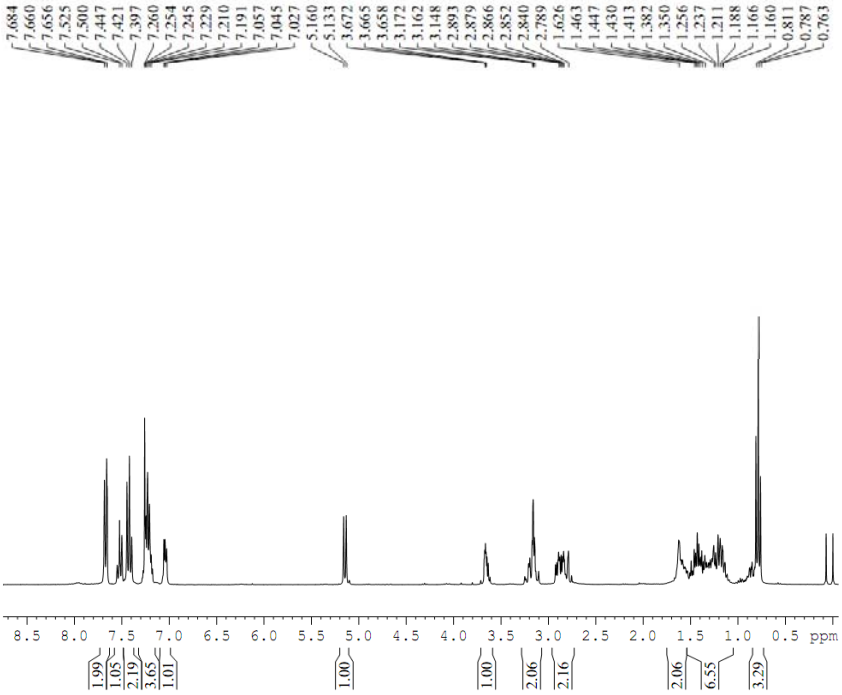


NAME gaozhonghua
EXPNO 103
PROCNO 1
Date_ 20140922
Time 9.30
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 254
DS 4
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 206.33
DW 20.800 usec
DE 6.50 usec
TE 300.2 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6504916 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6404280 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

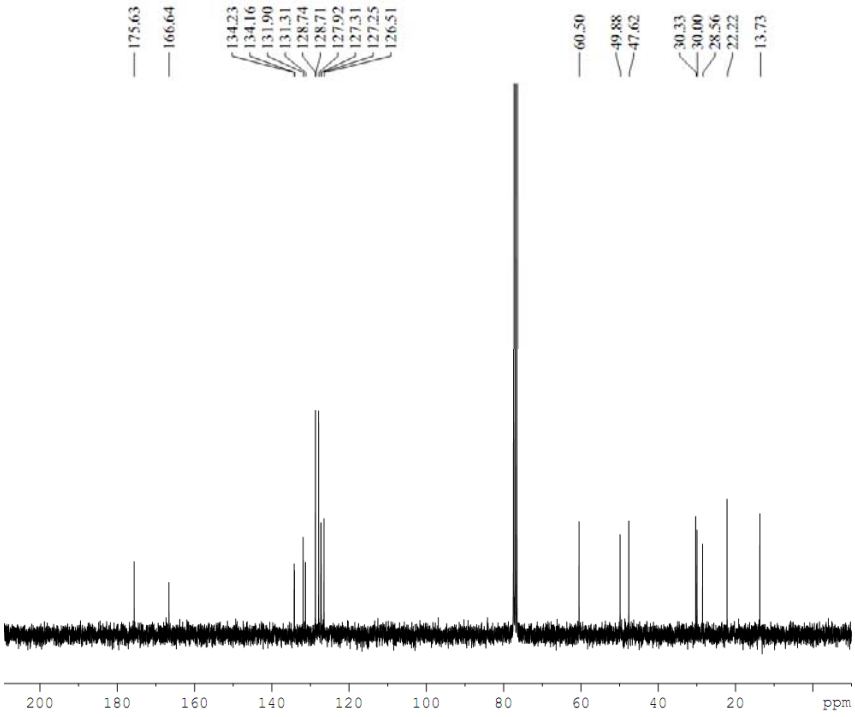


3e



NAME gzh-341A-2 C8
EXPNO 10
PROCNO 1
Date_ 20140917
Time 18.27
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 8992.806 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 322.5
DW 55.600 usec
DE 6.50 usec
TE 297.9 K
D1 1.00000000 sec
TD0 1

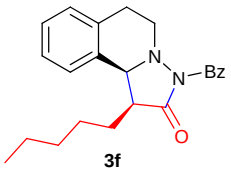
======== CHANNEL f1 ========
NUC1 1H
P1 10.30 usec
PL1 3.00 dB
SFO1 300.1318534 MHz
SI 32768
SF 300.1300070 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



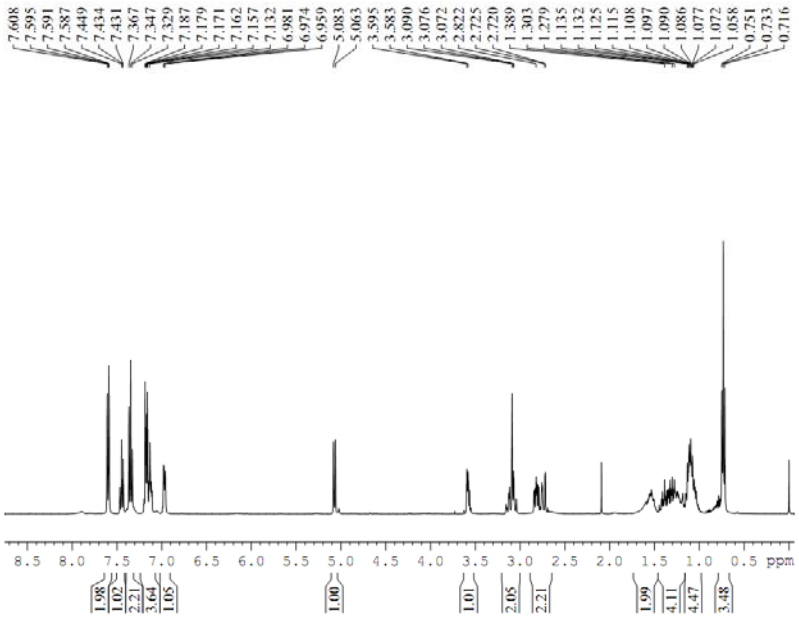
NAME gzh-341A-2 C8
EXPNO 11
PROCNO 1
Date_ 20140917
Time 18.34
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 200
DS 4
SWH 17985.611 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 2048
DW 27.800 usec
DE 6.50 usec
TE 298.2 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
NUC1 13C
P1 12.50 usec
PL1 2.00 dB
SFO1 75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 100.00 usec
PL2 3.00 dB
PL12 22.74 dB
PL13 23.00 dB
SFO2 300.1312005 MHz
SI 32768
SF 75.4677490 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

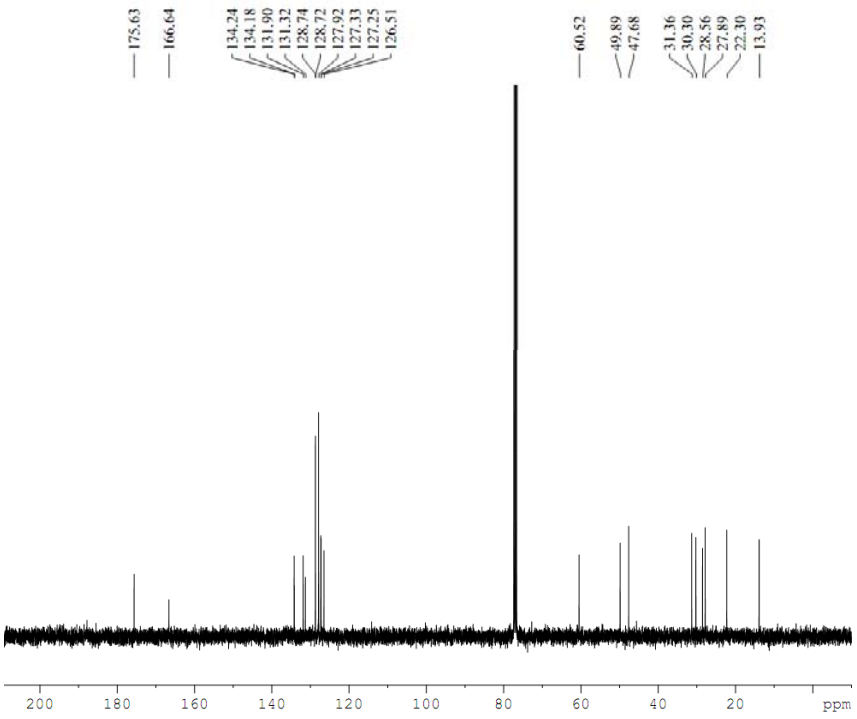


3f



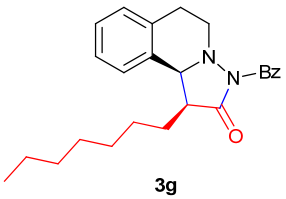
NAME gaozhonghua
EXPNO 96
PROCNO 1
Date_ 20140919
Time 17.01
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.244532 Hz
AQ 2.0447731 sec
RG 92.09
DW 62.400 usec
DE 6.50 usec
TE 299.0 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.2424716 MHz
NUC1 1H
P1 14.80 usec
SI 65536
SF 400.2400388 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

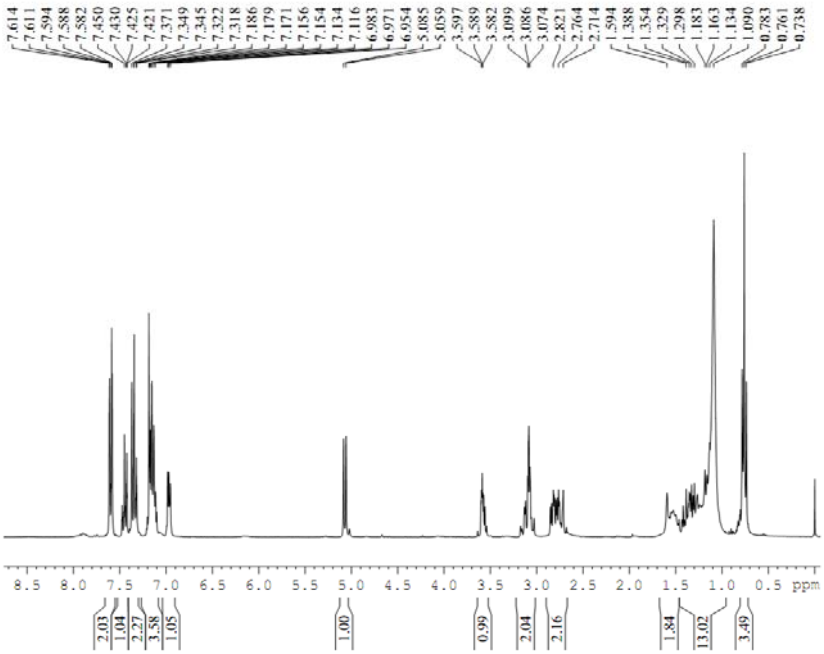


NAME gaozhonghua
EXPNO 97
PROCNO 1
Date_ 20140919
Time 17.05
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 121
DS 4
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 206.33
DW 20.800 usec
DE 6.50 usec
TE 300.1 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6504916 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6404280 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

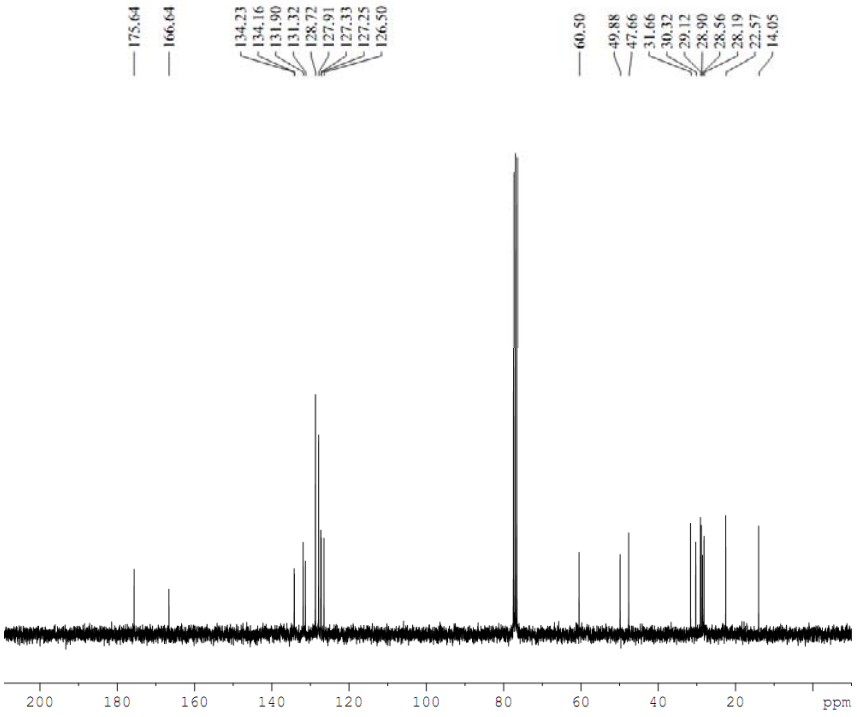


3g



NAME gzh-341C-2 C10
EXPNO 11
PROCNO 1
Date_ 20140917
Time 18.53
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 8992.806 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 181
DW 55.600 usec
DE 6.50 usec
TE 298.0 K
D1 1.00000000 sec
TD0 1

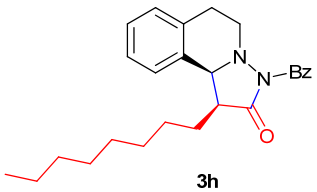
======== CHANNEL f1 ========
NUC1 1H
P1 10.30 usec
PL1 3.00 dB
SFO1 300.1318534 MHz
SI 32768
SF 300.1300289 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



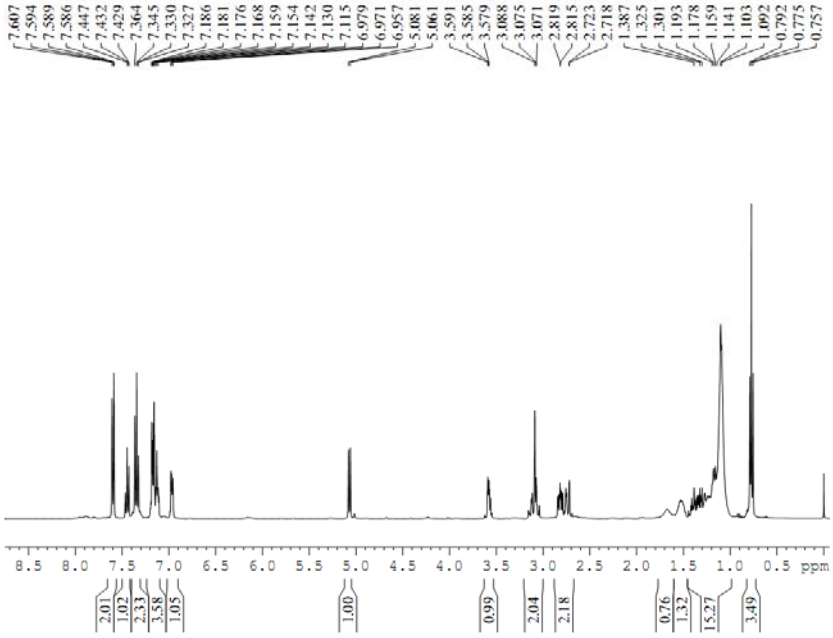
NAME gzh-341C-2 C10
EXPNO 12
PROCNO 1
Date_ 20140917
Time 19.01
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 120
DS 4
SWH 17985.611 Hz
FIDRES 0.274439 Hz
AQ 1.8219508 sec
RG 2580.3
DW 27.800 usec
DE 6.50 usec
TE 298.3 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
NUC1 13C
P1 12.50 usec
PL1 2.00 dB
SFO1 75.4752953 MHz

======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 100.00 usec
PL2 3.00 dB
PL12 22.74 dB
PL13 23.00 dB
SFO2 300.1312005 MHz
SI 32768
SF 75.4677490 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

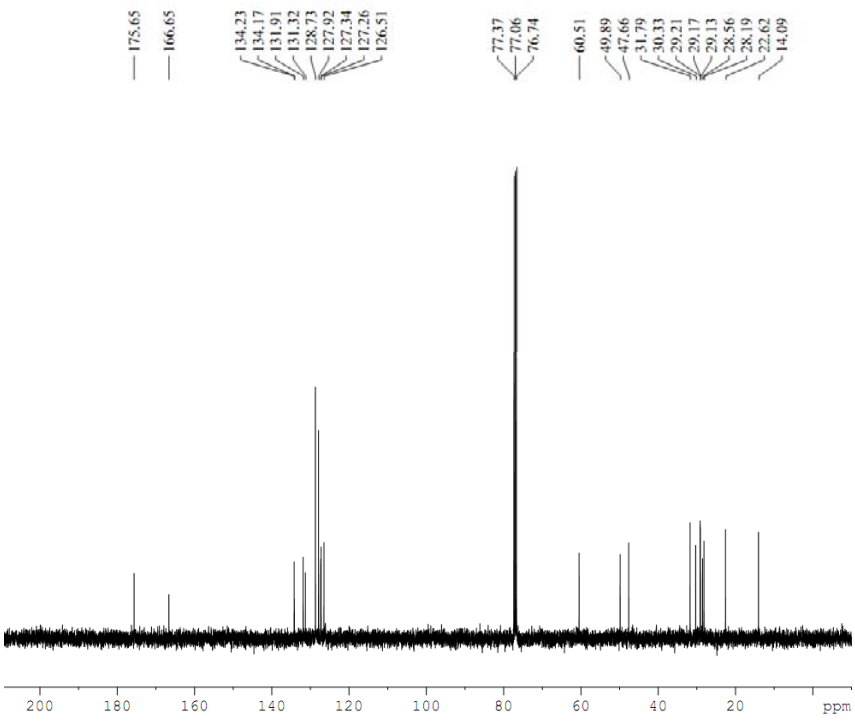


3h



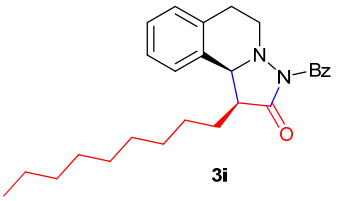
NAME gaozhonghua
EXPNO 107
PROCNO 1
Date_ 20140925
Time 16.34
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.244532 Hz
AQ 2.0447731 sec
RG 49.81
DW 62.400 usec
DE 6.50 usec
TE 298.7 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.2424716 MHz
NUC1 1H
P1 14.80 usec
SI 65536
SF 400.2400395 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

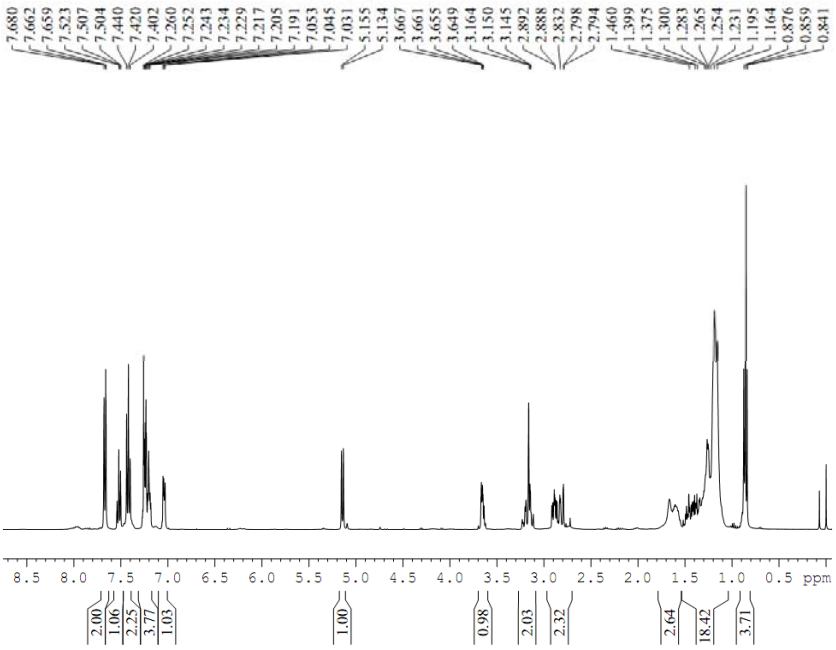


NAME gaozhonghua
EXPNO 108
PROCNO 1
Date_ 20140925
Time 16.37
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 58
DS 4
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 206.33
DW 20.800 usec
DE 6.50 usec
TE 299.6 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6504916 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6404280 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40



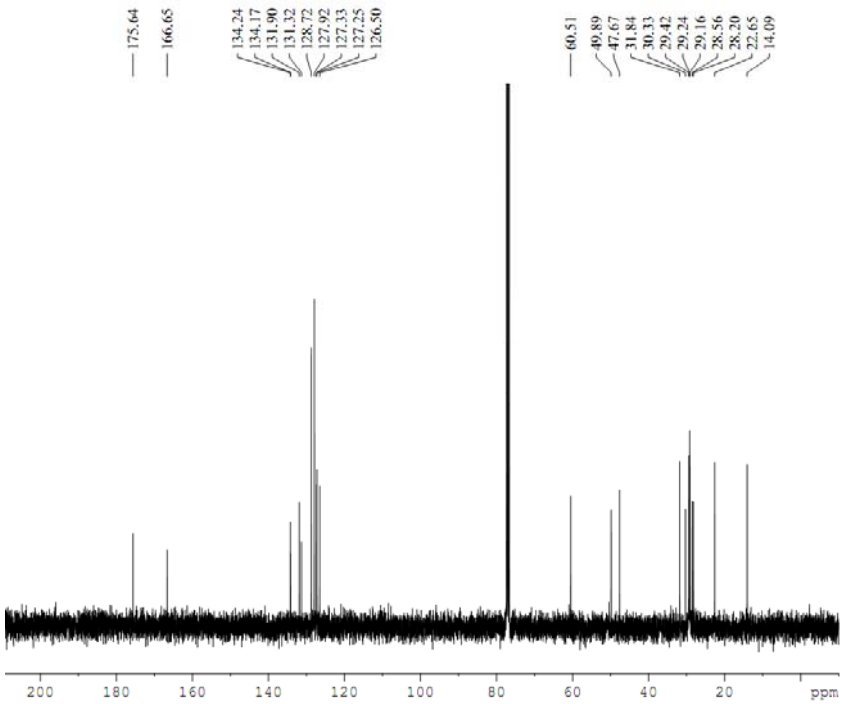
3i



NAME	gaozhonghua
EXPNO	109
PROCNO	1
Date_	20140925
Time	16.44
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	16
DS	0
SWH	8012.820 Hz
FIDRES	0.244532 Hz
AQ	2.0447731 sec
RG	102.73
DW	62.400 usec
DE	6.50 usec
TE	298.8 K
D1	2.00000000 sec
TD0	1

======== CHANNEL f1 ========

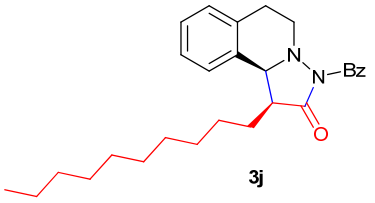
SFO1	400.2424716 MHz
NUC1	1H
P1	14.80 usec
SI	65536
SF	400.2400097 MHz
WDW	EM
SSB	0
LB	0.30 Hz
GB	0
PC	1.00



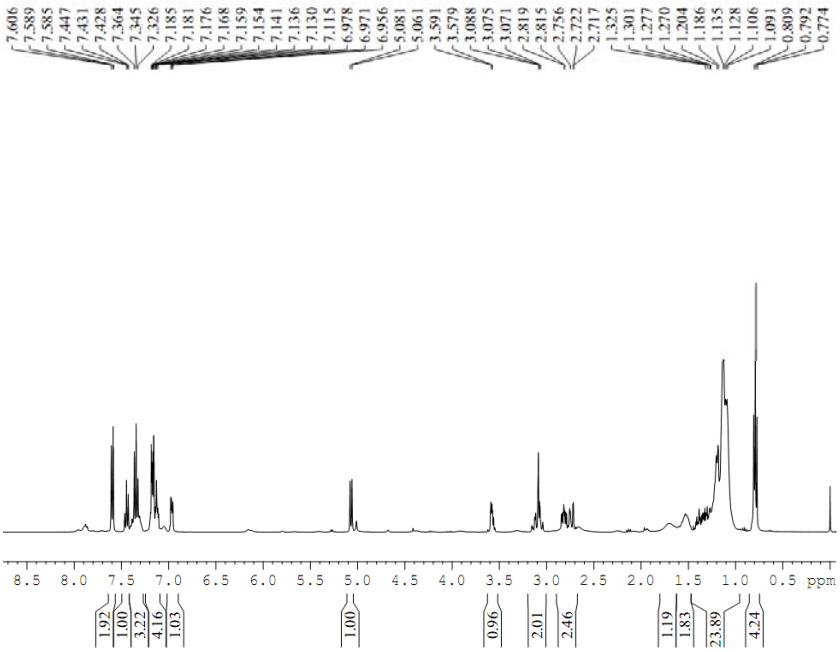
NAME	gaozhonghua
EXPNO	110
PROCNO	1
Date_	20140925
Time	16.49
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	152
DS	4
SWH	24038.461 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	206.33
DW	20.800 usec
DE	6.50 usec
TE	299.8 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1

======== CHANNEL f1 ========

SFO1	100.6504916 MHz
NUC1	13C
P1	10.00 usec
SI	32768
SF	100.6404280 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40

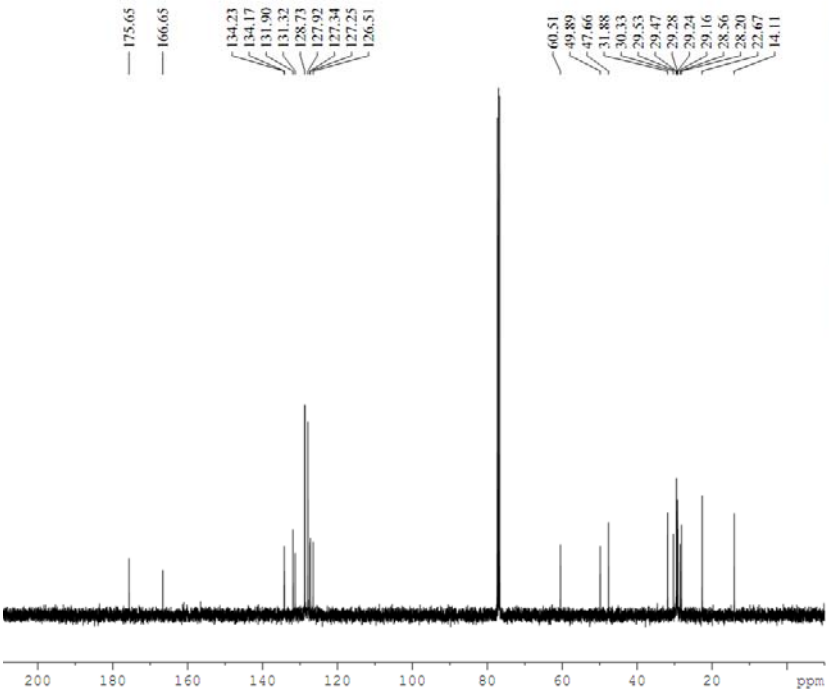


3j



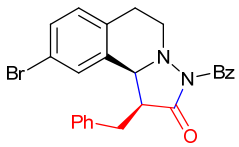
NAME gaozhonghua
EXPNO 111
PROCNO 1
Date_ 20140925
Time_ 16.59
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.244532 Hz
AQ 2.0447731 sec
RG 49.81
DW 62.400 usec
DE 6.50 usec
TE 298.9 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.2424716 MHz
NUC1 1H
P1 14.80 usec
SI 65536
SF 400.2400396 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

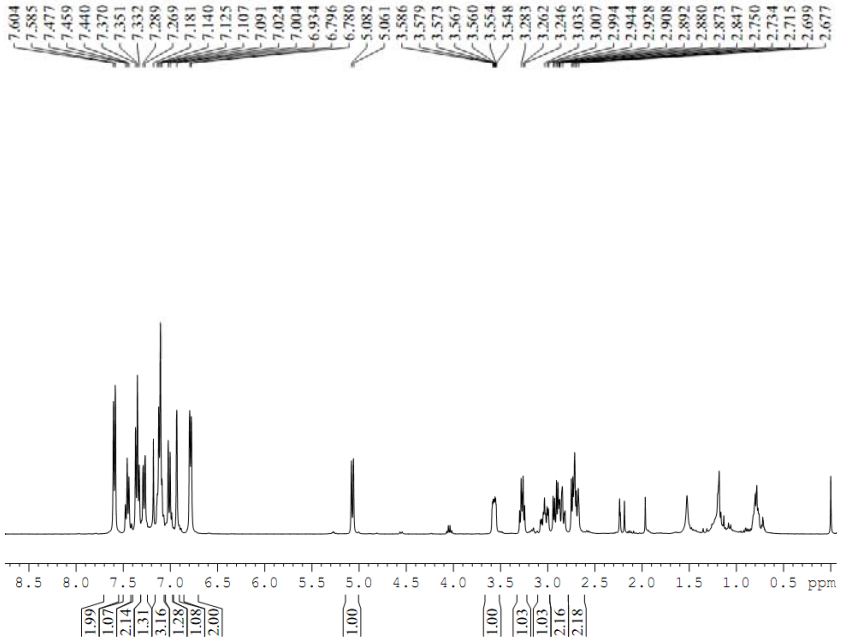


NAME gaozhonghua
EXPNO 112
PROCNO 1
Date_ 20140925
Time_ 17.03
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 131
DS 4
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 206.33
DW 20.800 usec
DE 6.50 usec
TE 299.8 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6504916 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6404280 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40



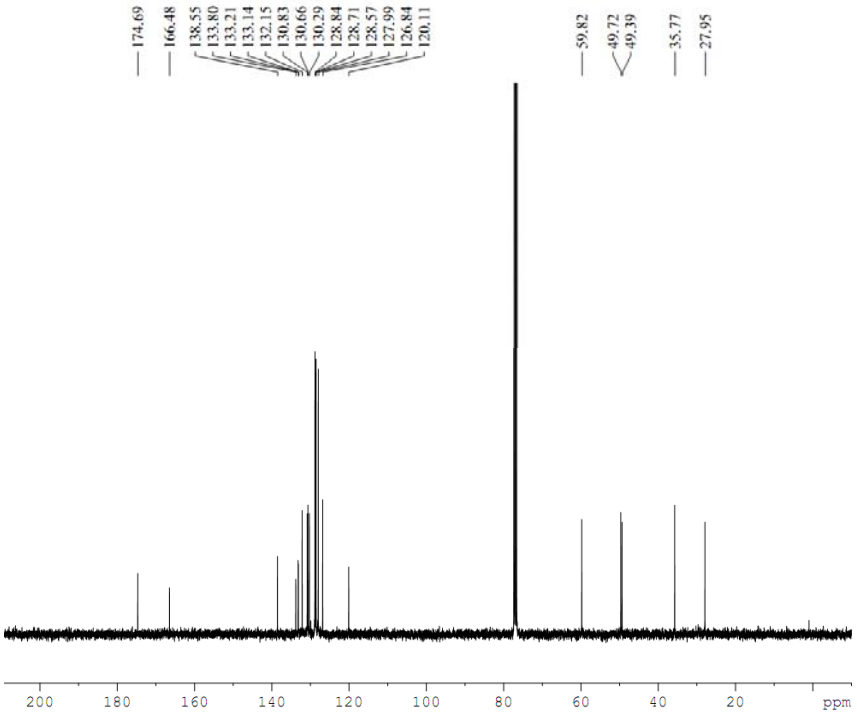
3k



NAME	gaozhonghua
EXPNO	142
PROCNO	1
Date_	20141030
Time	15.52
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	16
DS	0
SWH	8012.820 Hz
FIDRES	0.244532 Hz
AQ	2.0447731 sec
RG	125.02
DW	62.400 usec
DE	6.50 usec
TE	300.9 K
D1	2.00000000 sec
TD0	1

======== CHANNEL f1 ========

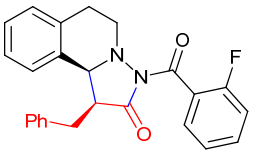
SFO1	400.2424716 MHz
NUC1	1H
P1	14.80 usec
SI	65536
SF	400.2400412 MHz
WDW	EM
SSB	0
LB	0.30 Hz
GB	0
PC	1.00



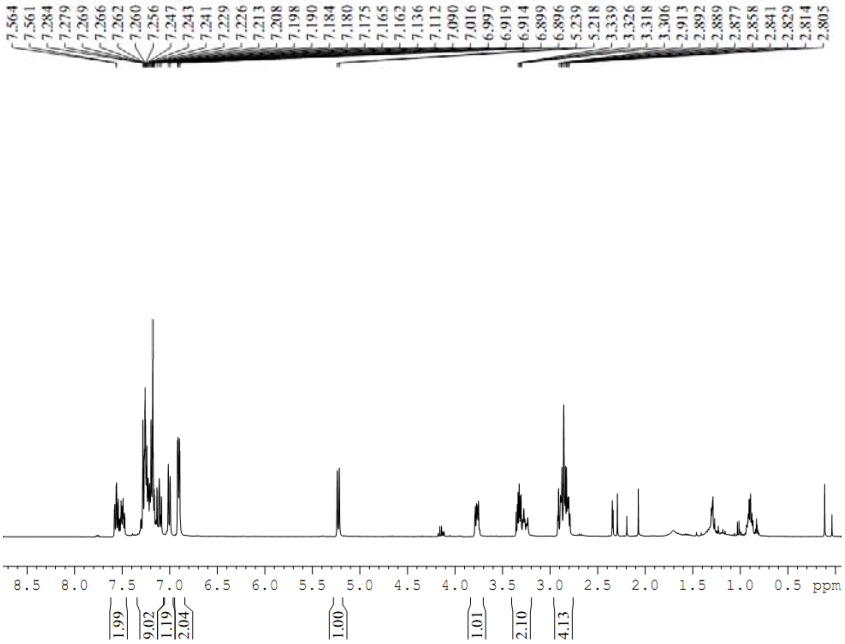
NAME	gaozhonghua
EXPNO	143
PROCNO	1
Date_	20141030
Time	15.56
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	280
DS	4
SWH	24038.461 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	206.33
DW	20.800 usec
DE	6.50 usec
TE	302.0 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1

======== CHANNEL f1 ========

SFO1	100.6504916 MHz
NUC1	13C
P1	10.00 usec
SI	32768
SF	100.6404280 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40

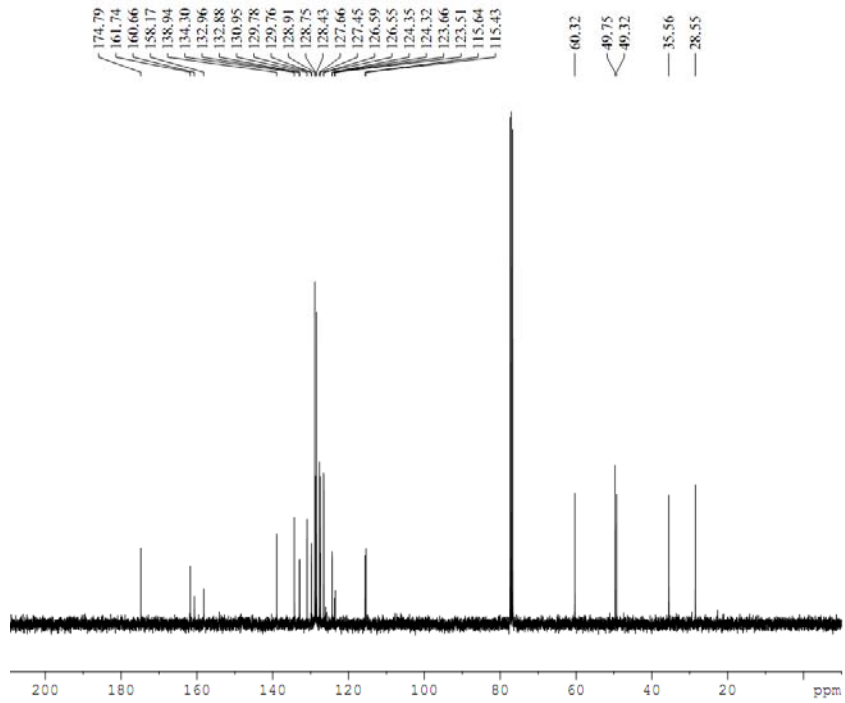


3l



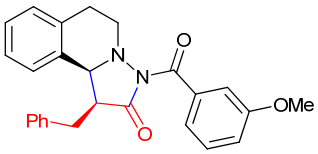
NAME gaozhonghua
EXPNO 126
PROCNO 1
Date_ 20141021
Time 8.43
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.244532 Hz
AQ 2.0447731 sec
RG 43.5
DW 62.400 usec
DE 6.50 usec
TE 297.4 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.2424716 MHz
NUC1 1H
P1 14.80 usec
SI 65536
SF 400.2400000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

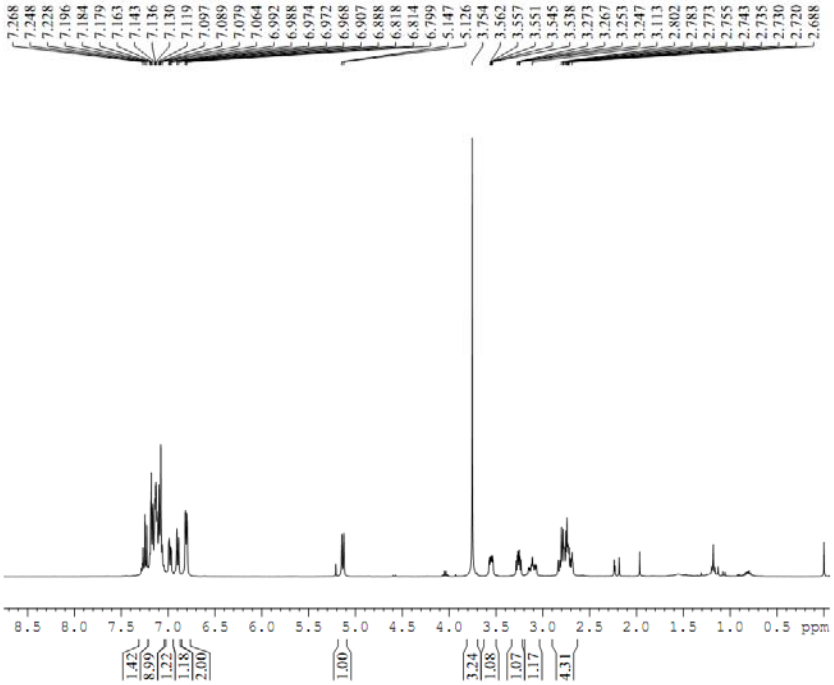


NAME gaozhonghua
EXPNO 127
PROCNO 1
Date_ 20141021
Time 8.47
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 112
DS 4
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 206.33
DW 20.800 usec
DE 6.50 usec
TE 298.2 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6504916 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6404280 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

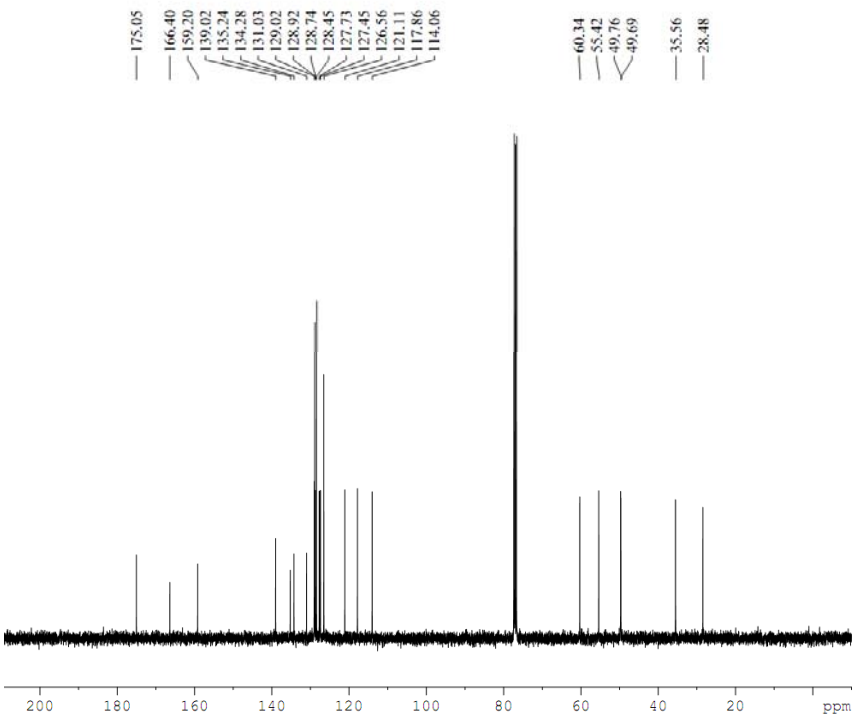


3m



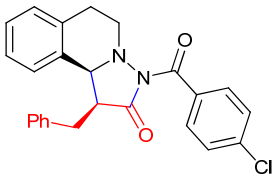
NAME gaozhonghua
EXPNO 146
PROCNO 1
Date_ 20141105
Time 18.36
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.244532 Hz
AQ 2.0447731 sec
RG 116.67
DW 62.400 usec
DE 6.50 usec
TE 297.1 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.2424716 MHz
NUC1 1H
P1 14.80 usec
SI 65536
SF 400.2400424 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

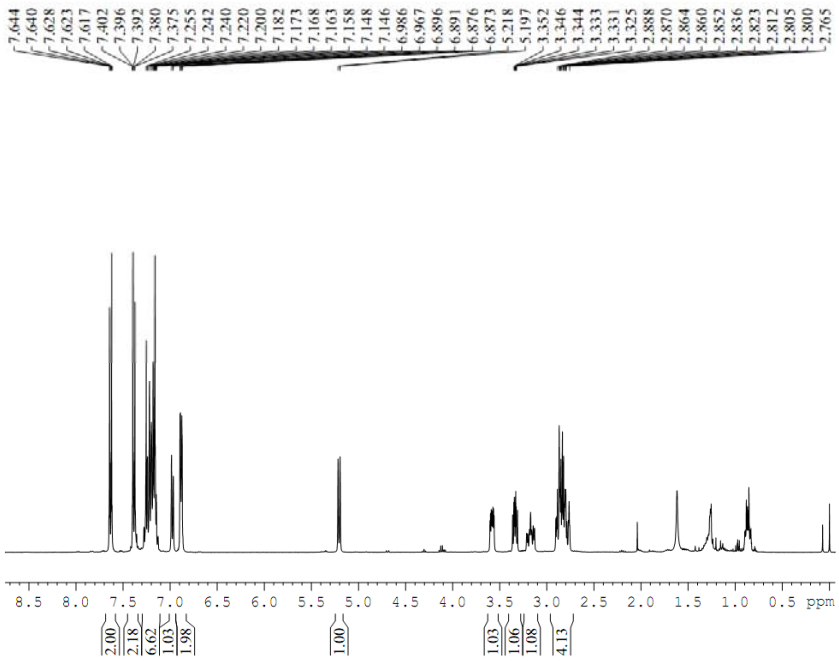


NAME gaozhonghua
EXPNO 147
PROCNO 1
Date_ 20141105
Time 18.43
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 160
DS 4
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 206.33
DW 20.800 usec
DE 6.50 usec
TE 298.5 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6504916 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6404280 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

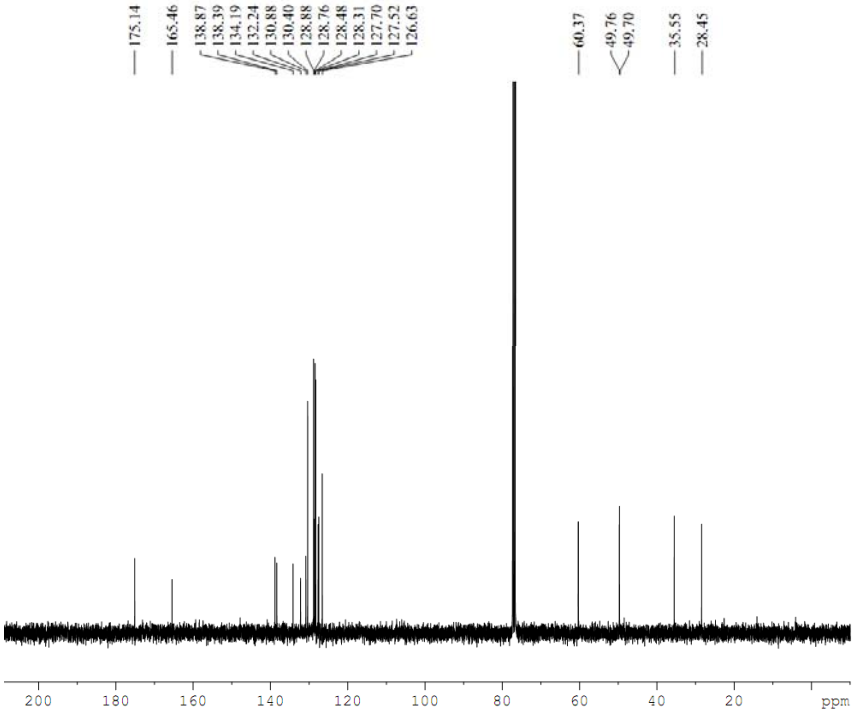


3n



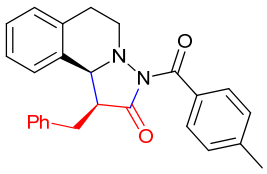
NAME gaozhonghua
EXPNO 119
PROCNO 1
Date_ 20141010
Time 17.03
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.244532 Hz
AQ 2.0447731 sec
RG 125.02
DW 62.400 usec
DE 6.50 usec
TE 299.3 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.2424716 MHz
NUC1 1H
P1 14.80 usec
SI 65536
SF 400.2400118 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

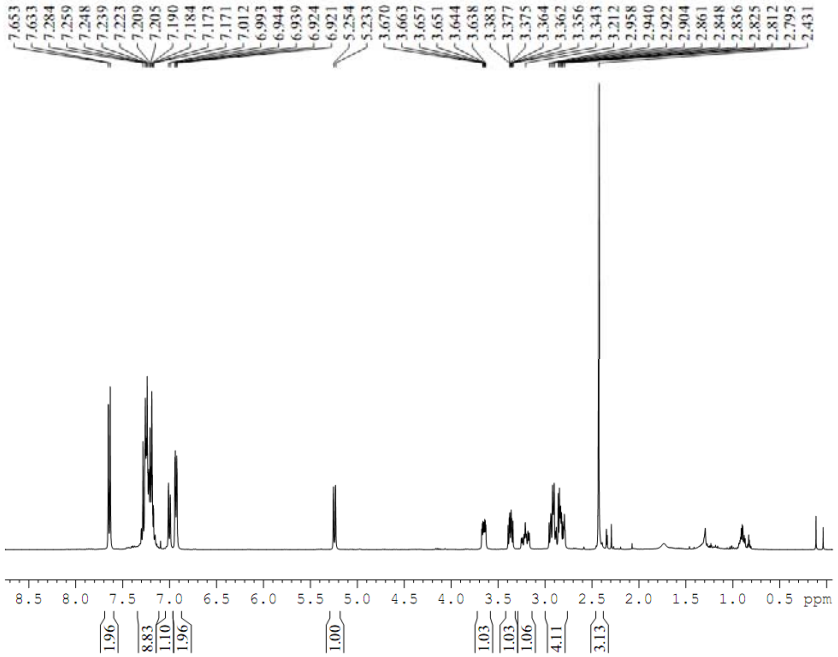


NAME gaozhonghua
EXPNO 120
PROCNO 1
Date_ 20141010
Time 17.12
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 149
DS 4
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 206.33
DW 20.800 usec
DE 6.50 usec
TE 300.4 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6504916 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6404280 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

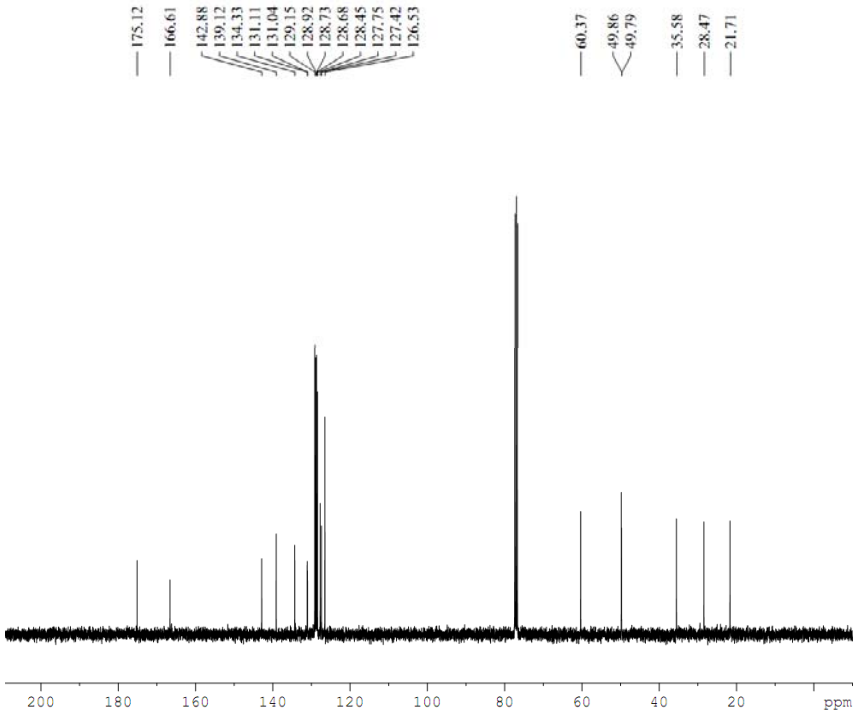


3o



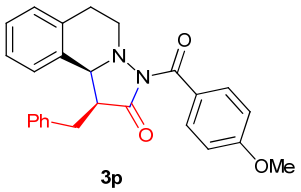
NAME gaozhonghua
EXPNO 129
PROCNO 1
Date_ 20141021
Time 9.05
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.244532 Hz
AQ 2.0447731 sec
RG 80.72
DW 62.400 usec
DE 6.50 usec
TE 297.8 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.2424716 MHz
NUC1 1H
P1 14.80 usec
SI 65536
SF 400.2400000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

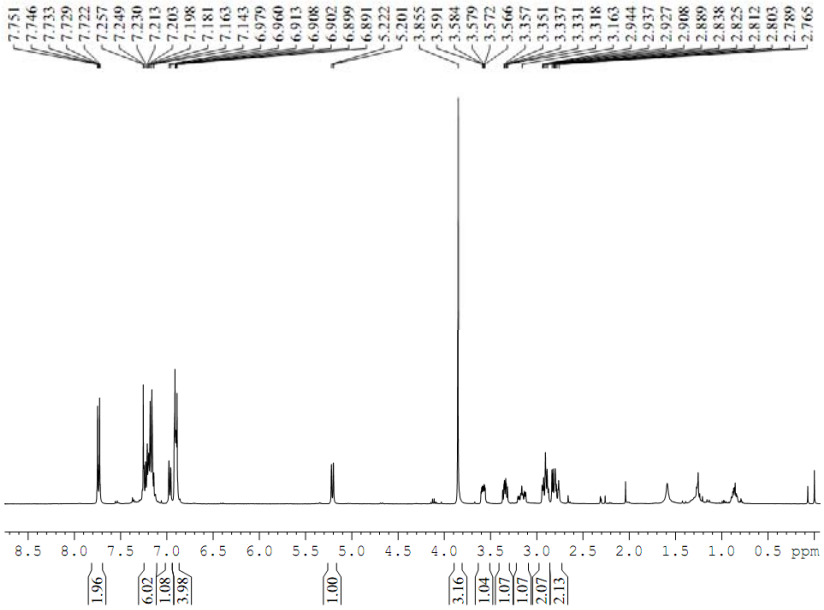


NAME gaozhonghua
EXPNO 128
PROCNO 1
Date_ 20141021
Time 9.00
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 103
DS 4
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 206.33
DW 20.800 usec
DE 6.50 usec
TE 298.6 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6504916 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6404280 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40



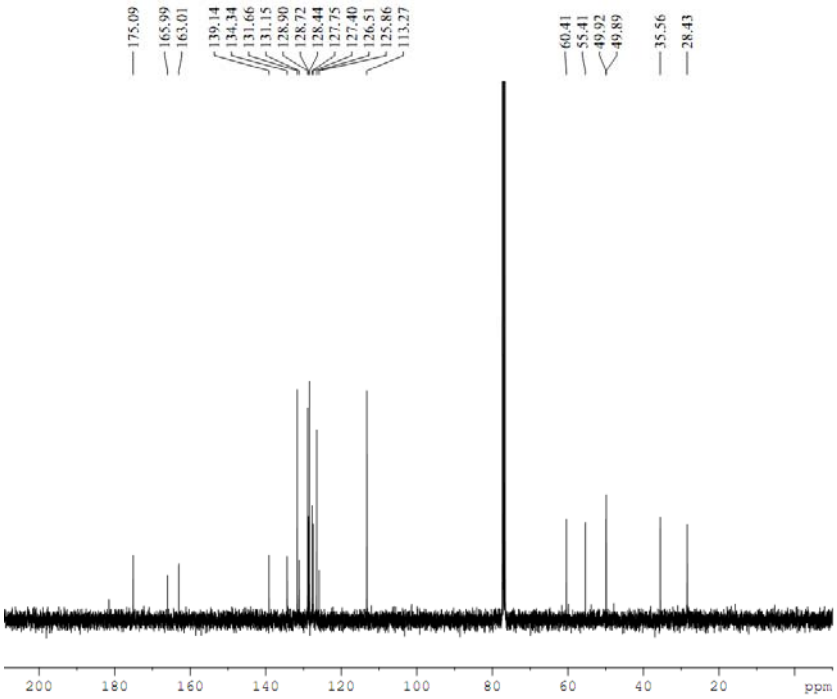
3p



NAME	gaozhonghua
EXPNO	138
PROCNO	1
Date_	20141029
Time	19.12
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zg30
TD	32768
SOLVENT	CDCl3
NS	16
DS	0
SWH	8012.820 Hz
FIDRES	0.244532 Hz
AQ	2.0447731 sec
RG	206.33
DW	62.400 usec
DE	6.50 usec
TE	300.3 K
D1	2.00000000 sec
TD0	1

======== CHANNEL f1 ========

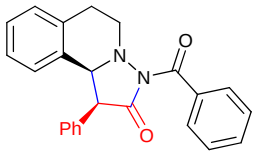
SFO1	400.2424716 MHz
NUC1	1H
P1	14.80 usec
SI	65536
SF	400.2400110 MHz
WDW	EM
SSB	0
LB	0.30 Hz
GB	0
PC	1.00



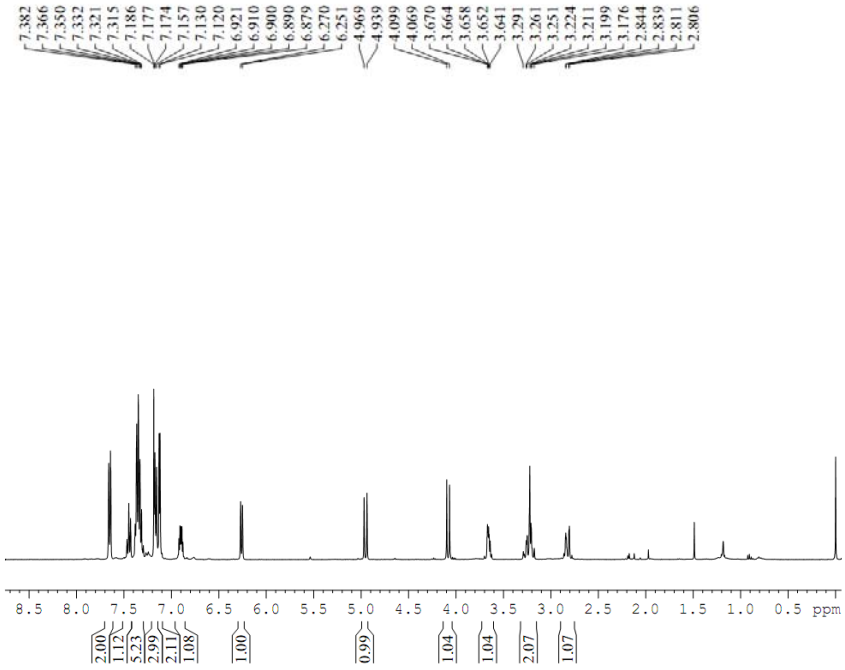
NAME	gaozhonghua
EXPNO	137
PROCNO	1
Date_	20141029
Time	19.04
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	176
DS	4
SWH	24038.461 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	206.33
DW	20.800 usec
DE	6.50 usec
TE	301.2 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1

======== CHANNEL f1 ========

SFO1	100.6504916 MHz
NUC1	13C
P1	10.00 usec
SI	32768
SF	100.6404280 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40

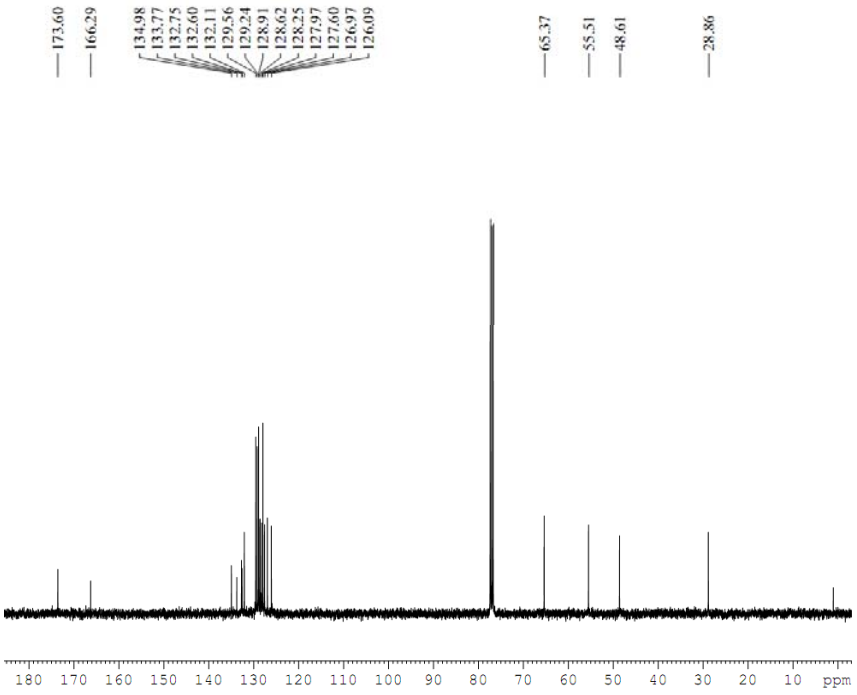


3q



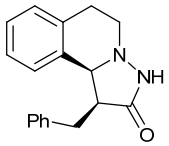
NAME gaozhonghua
EXPNO 182
PROCNO 1
Date_ 20150209
Time 15.31
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.244532 Hz
AQ 2.0447731 sec
RG 206.33
DW 62.400 usec
DE 6.50 usec
TE 296.6 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.2424716 MHz
NUC1 1H
P1 14.80 usec
SI 65536
SF 400.2400394 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

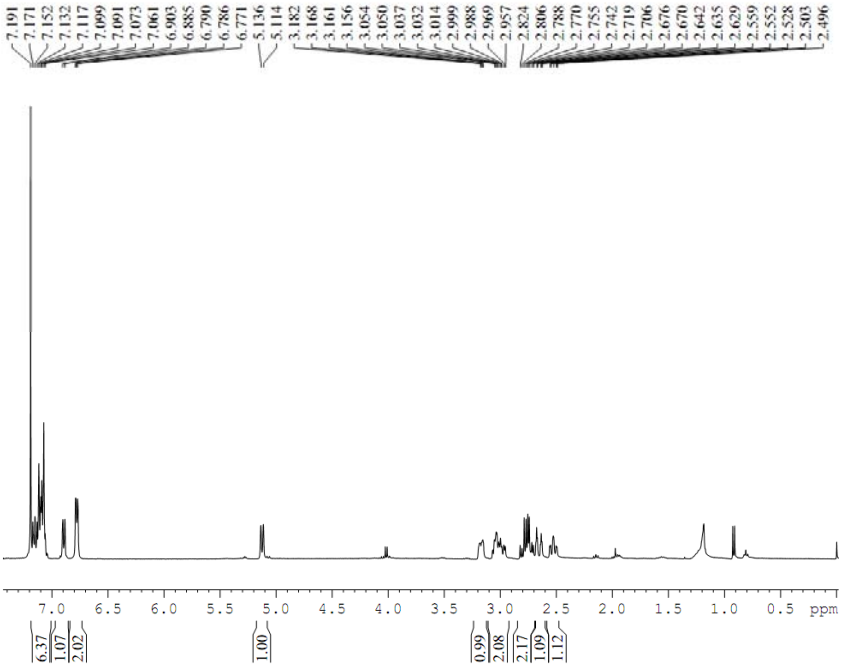


NAME gaozhonghua
EXPNO 175
PROCNO 1
Date_ 20150205
Time 20.43
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 107
DS 4
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 206.33
DW 20.800 usec
DE 6.50 usec
TE 297.8 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6504916 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6404280 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

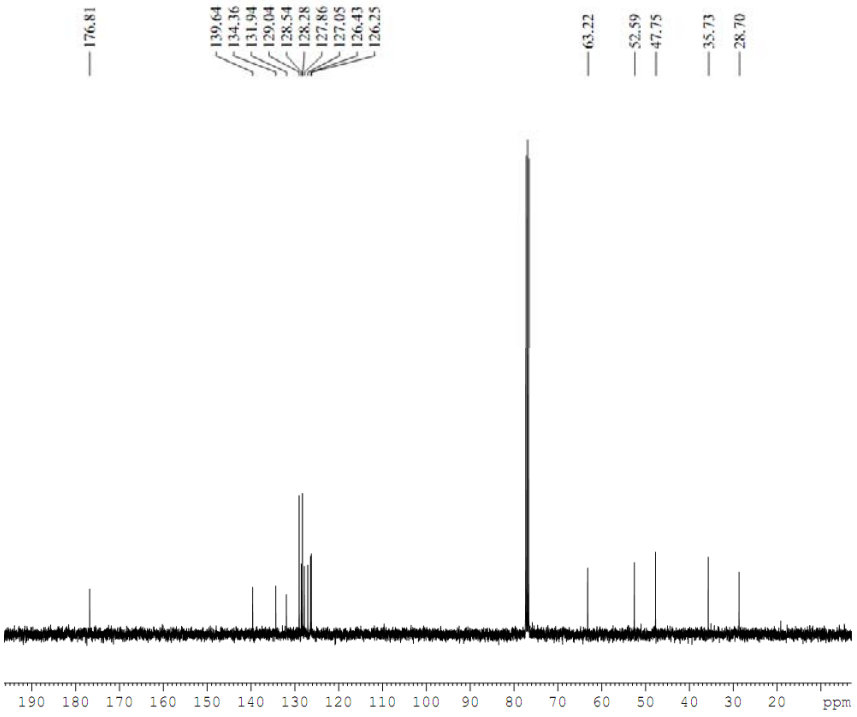


4a



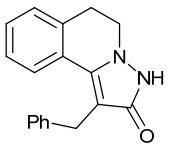
NAME NMR Original Spectra
EXPNO 221
PROCNO 1
Date_ 20150418
Time 21.07
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.244532 Hz
AQ 2.0447731 sec
RG 206.33
DW 62.400 usec
DE 6.50 usec
TE 298.0 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.2424716 MHz
NUC1 1H
P1 14.80 usec
SI 65536
SF 400.2400376 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

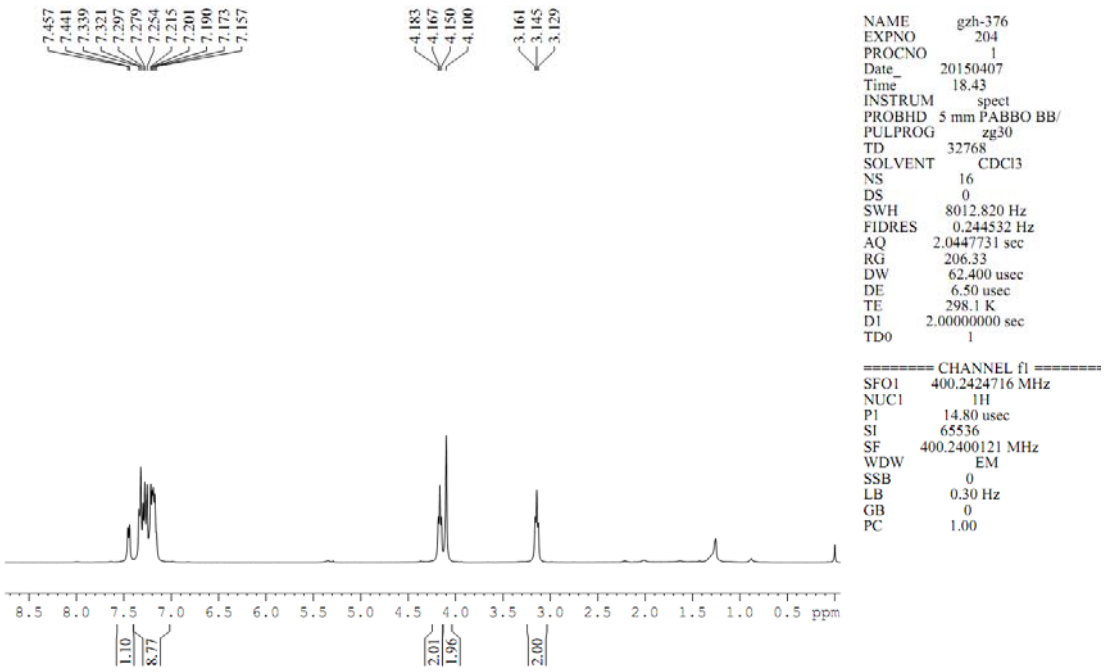


NAME gzh-385B (1)
EXPNO 209
PROCNO 1
Date_ 20150412
Time 16.20
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 101
DS 4
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 206.33
DW 20.800 usec
DE 6.50 usec
TE 299.6 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6504916 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6404280 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

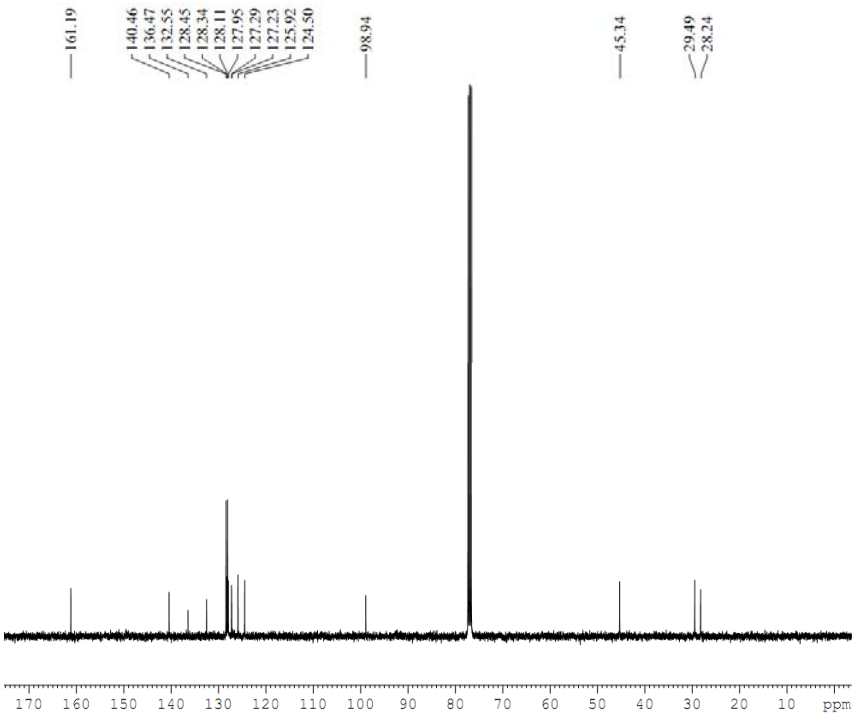


5a



NAME gzh-376
EXPNO 204
PROCNO 1
Date_ 20150407
Time 18.43
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.244532 Hz
AQ 2.0447731 sec
RG 206.33
DW 62.400 usec
DE 6.50 usec
TE 298.1 K
D1 2.00000000 sec
TD0 1

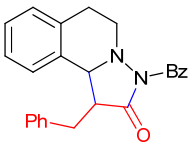
======== CHANNEL f1 ========
SFO1 400.2424716 MHz
NUC1 1H
P1 14.80 usec
SI 65536
SF 400.2400121 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



NAME gzh-376
EXPNO 205
PROCNO 1
Date_ 20150407
Time 18.51
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 350
DS 4
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 206.33
DW 20.800 usec
DE 6.50 usec
TE 298.1 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

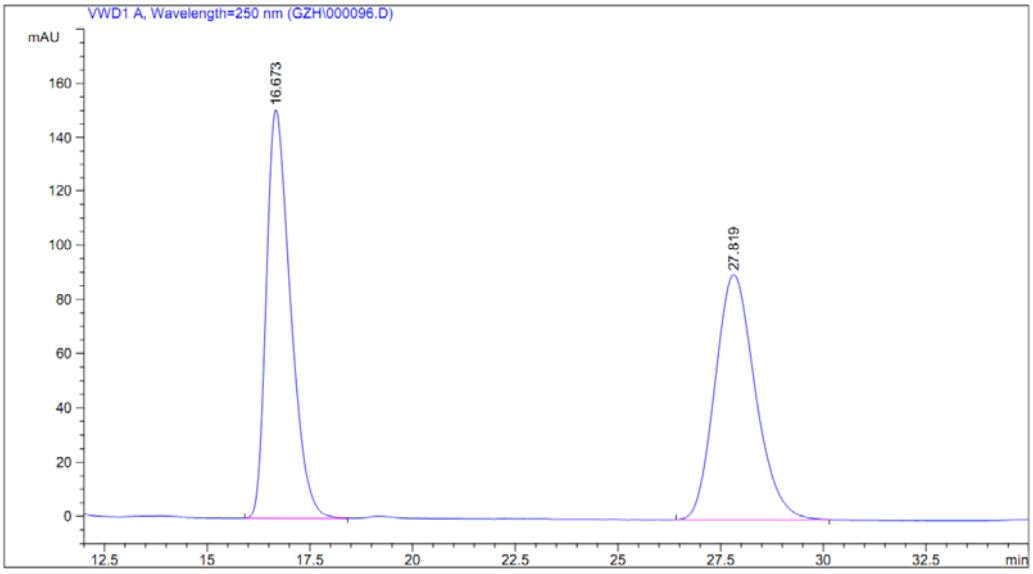
======== CHANNEL f1 ========
SFO1 100.6504916 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6404280 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

Part IV HPLC Spectra

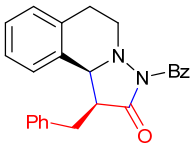


rac-3a

```
Data File C:\CHEM32\1\DATA\GZH\000096.D
 Sample Name: gzh-308B-2

    ======================================================================
    Acq. Operator    : gzh
    Acq. Instrument  : Instrument 1                    Location : Vial 1
    Injection Date   : 2014-7-15 18:40:34
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-7-15 18:29:32  by gzh
                       (modified after loading)
    Analysis Method  : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-29 17:13:58  by ckq
                       (modified after loading)
    Sample Info      : AD-H  H/I=70:30  1.0ml/min  250nm
```

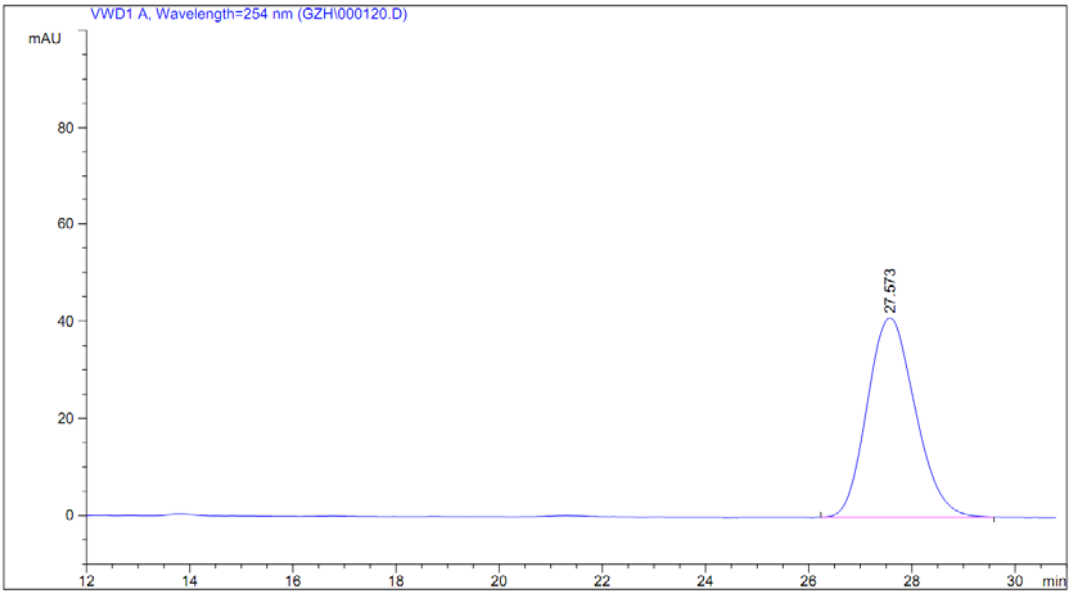



```
    ======================================================================
                              Area Percent Report
    ======================================================================

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


    Signal 1: VWD1 A, Wavelength=250 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s   [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  16.673 BB    0.6198 6154.96338  150.95761  50.0481
       2  27.819 BB    1.0458 6143.13379   90.27451  49.9519

    Totals :                  1.22981e4   241.23212

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


Instrument 1 2014-11-29 17:14:04  ckq                        Page   1 of 1
```

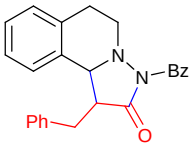


3a

```
Data File C:\CHEM32\1\DATA\GZH\000120.D
 Sample Name: gzh-329B-2

    ========================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date  : 2014-9-2 10:52:34
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-9-2 9:53:23  by cjt
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-29 17:17:53  by ckq
                       (modified after loading)
    Sample Info      : AD-H H/I=70:30  1mL/min  254nm
```

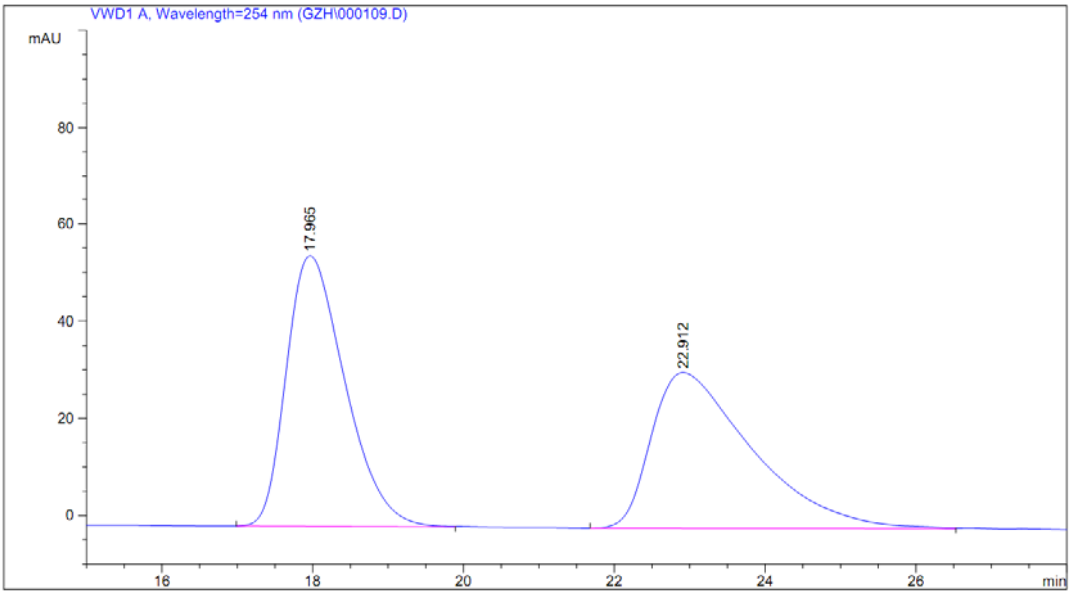



```
    ========================================================================
                              Area Percent Report
    ========================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  27.573 BB    1.0028 2652.13867   40.96864 100.0000

    Totals :                  2652.13867   40.96864

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



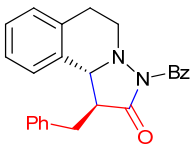
***rac*-3a' (*trans*-3a)**

```
Data File C:\CHEM32\1\DATA\GZH\000109.D
 Sample Name: GZH-319A-1

    ========================================================================
    Acq. Operator    : GZH
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date  : 2014-8-21 21:20:53
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-8-21 21:13:02  by GZH
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2015-4-17 22:41:57  by gzh
                       (modified after loading)
    Sample Info      : OD-H H/I/m=70:20:10 1mL/min  254nm
```



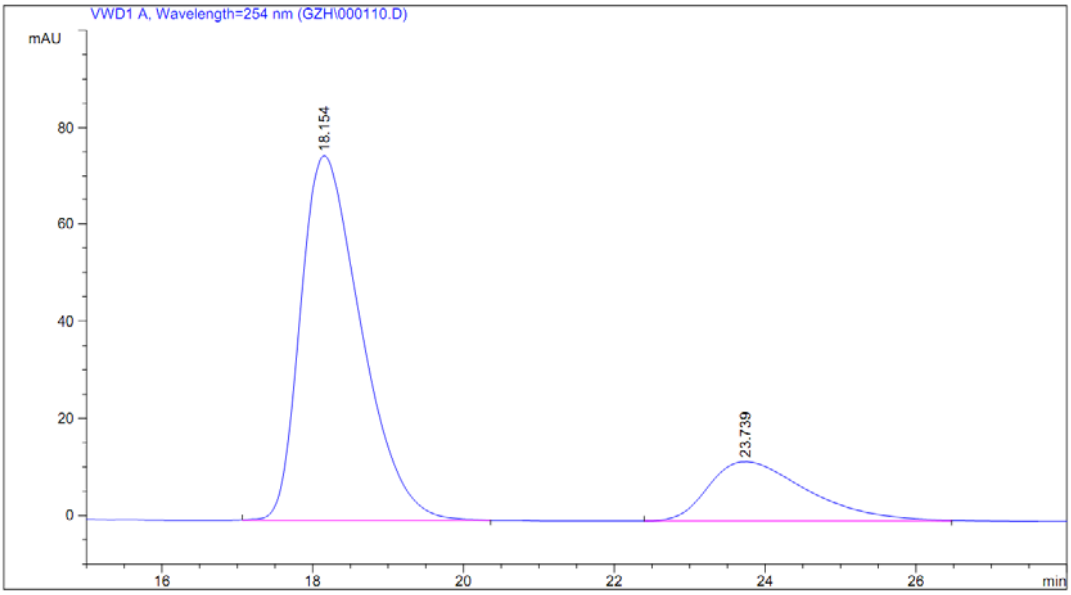

```
    ========================================================================
                              Area Percent Report
    ========================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  17.965 BB    0.8242 3012.62109   55.61173  50.3343
       2  22.912 BB    1.3664 2972.60059   32.08240  49.6657

    Totals :                  5985.22168   87.69413

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

```
Instrument 1 2015-4-17 22:42:05  gzh                          Page   1 of 1
```

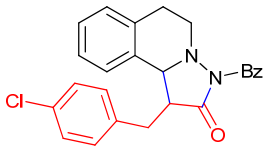


3a' (*trans*-3a)

```
Data File C:\CHEM32\1\DATA\GZH\000110.D
 Sample Name: GZH-317D-1

    ======================================================================
    Acq. Operator    : GZH
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date  : 2014-8-21 21:58:32
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-8-21 21:13:02  by GZH
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2015-4-17 22:42:49  by gzh
                       (modified after loading)
    Sample Info      : OD-H H/I/m=70:20:10 1mL/min  254nm
```

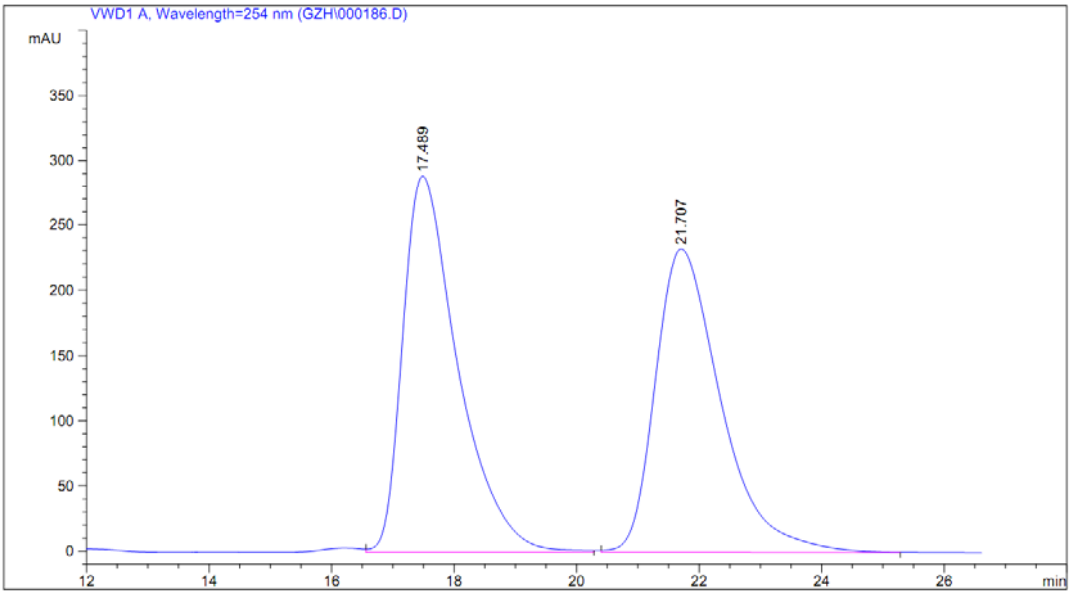



```
    ======================================================================
                              Area Percent Report
    ======================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  18.154 BB    0.8473 4183.84229   75.18125  78.9887
       2  23.739 BB    1.3221 1112.91931   12.24871  21.0113

    Totals :                  5296.76160   87.42997

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

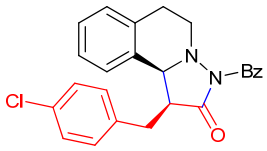


***rac*-3b**

```
Data File C:\CHEM32\1\DATA\GZH\000186.D
 Sample Name: gzh-347B-2  racemic

    ======================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date  : 2014-10-20 21:44:15
    Acq. Method     : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed    : 2014-10-20 21:27:57  by gzh
                      (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed    : 2014-11-29 17:42:33  by ckq
                      (modified after loading)
    Sample Info     : OD-H H/I=70:30  1.0 mL/min  254 nm
```

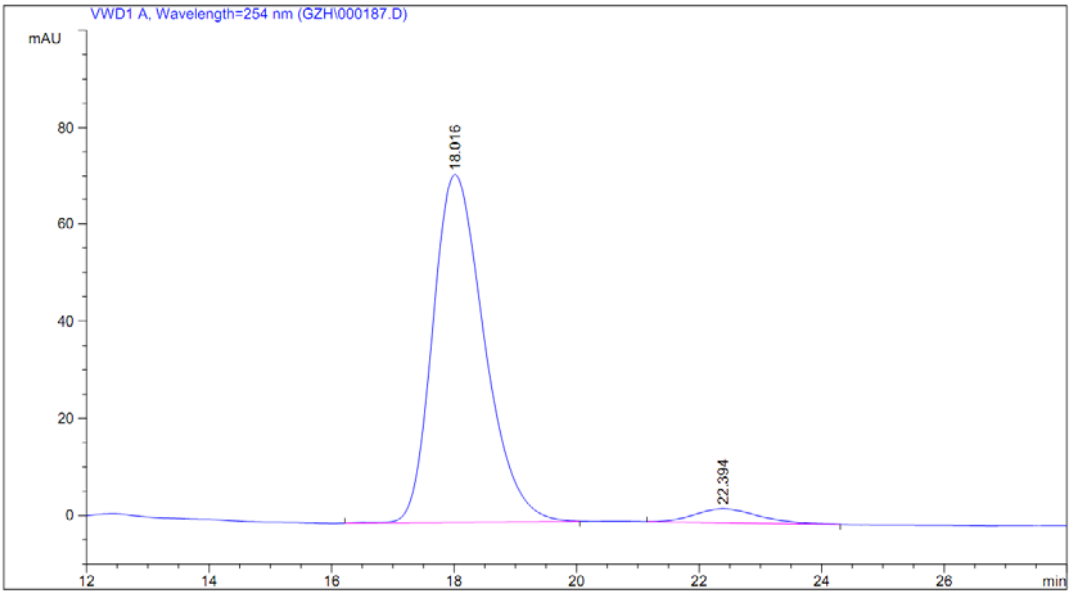



```
    ======================================================================
                              Area Percent Report
    ======================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s   [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  17.489 VB    0.9329 1.80726e4   289.19073  51.1167
       2  21.707 BB    1.1229 1.72829e4   232.65956  48.8833

    Totals :                  3.53554e4   521.85030

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


Instrument 1 2014-11-29 17:42:42  ckq                          Page   1 of 1
```

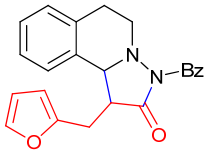


3b

```
Data File C:\CHEM32\1\DATA\GZH\000187.D
 Sample Name: gzh-347A-2

    ========================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date  : 2014-10-20 22:12:33
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-10-20 21:27:57  by gzh
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-29 17:43:19  by ckq
                       (modified after loading)
    Sample Info      : OD-H H/I=70:30  1.0 mL/min  254 nm
```

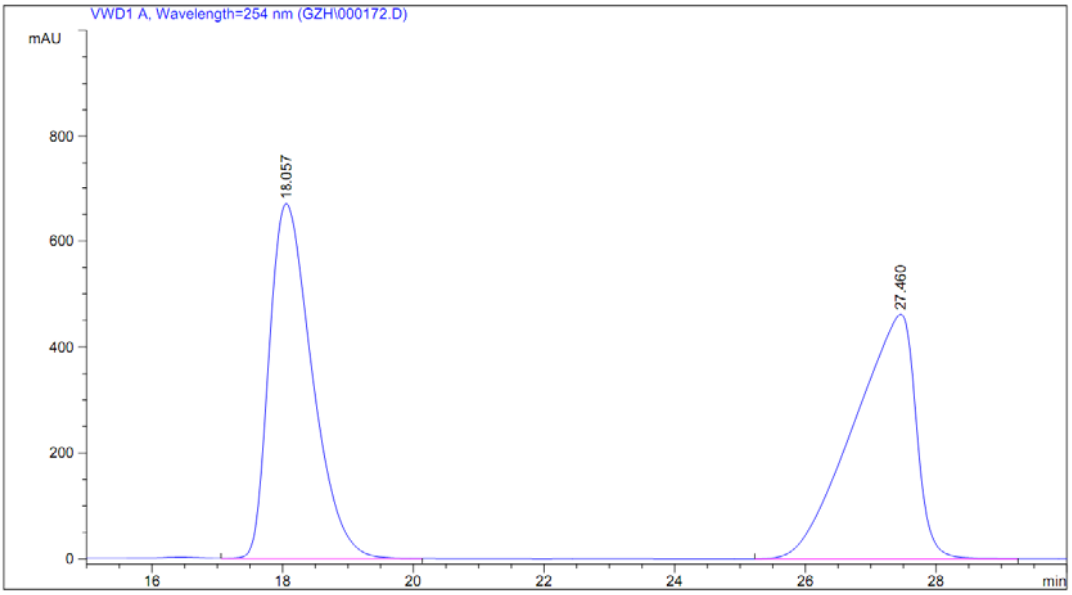



```
    ========================================================================
                              Area Percent Report
    ========================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  18.016 BB    0.8926 4181.85449   71.74633  95.2076
       2  22.394 BB    0.9092  210.50041    2.90586   4.7924

    Totals :                  4392.35490   74.65220

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

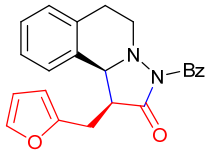


***rac*-3c**

```
Data File C:\CHEM32\1\DATA\GZH\000172.D
 Sample Name: gzh-347D-2  racemic

    ========================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date   : 2014-10-16 20:27:29
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-10-16 20:25:10  by gzh
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-29 17:44:04  by ckq
                       (modified after loading)
    Sample Info      : AD-H H/I=70:30   1.0 mL/min  254 nm
```

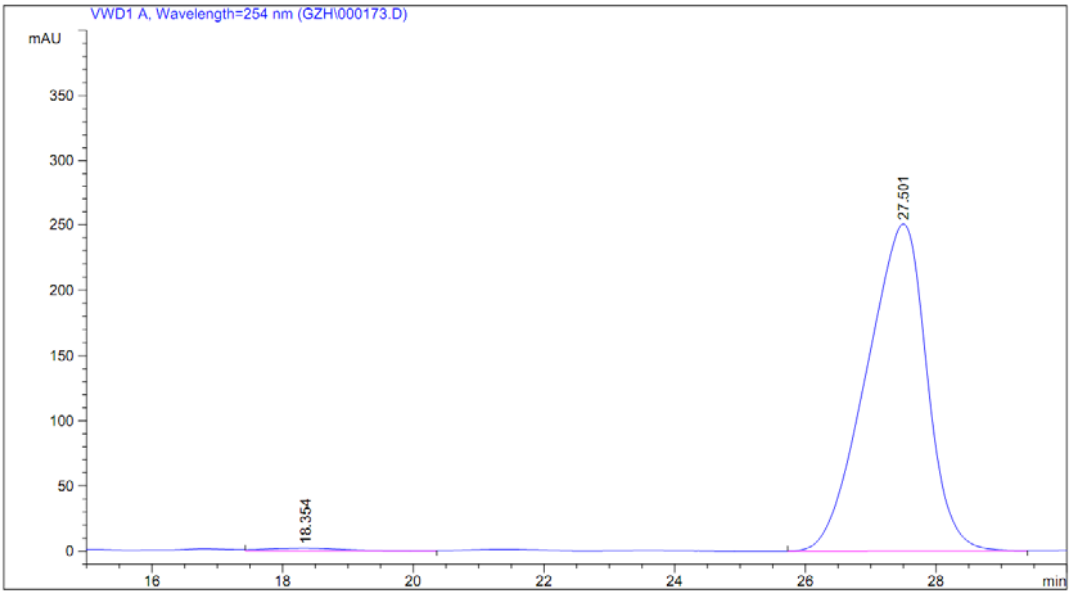



```
    ========================================================================
                              Area Percent Report
    ========================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  18.057 VB    0.7012 3.04063e4   670.07745  49.9187
       2  27.460 BB    1.0400 3.05053e4   460.93649  50.0813

    Totals :                  6.09117e4  1131.01395

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

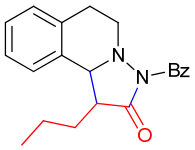


3c

```
Data File C:\CHEM32\1\DATA\GZH\000173.D
 Sample Name: gzh-347C-2

    ==================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date   : 2014-10-16 20:59:56
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-10-16 20:25:10  by gzh
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-29 17:44:55  by ckq
                       (modified after loading)
    Sample Info      : AD-H H/I=70:30   1.0 mL/min  254 nm
```

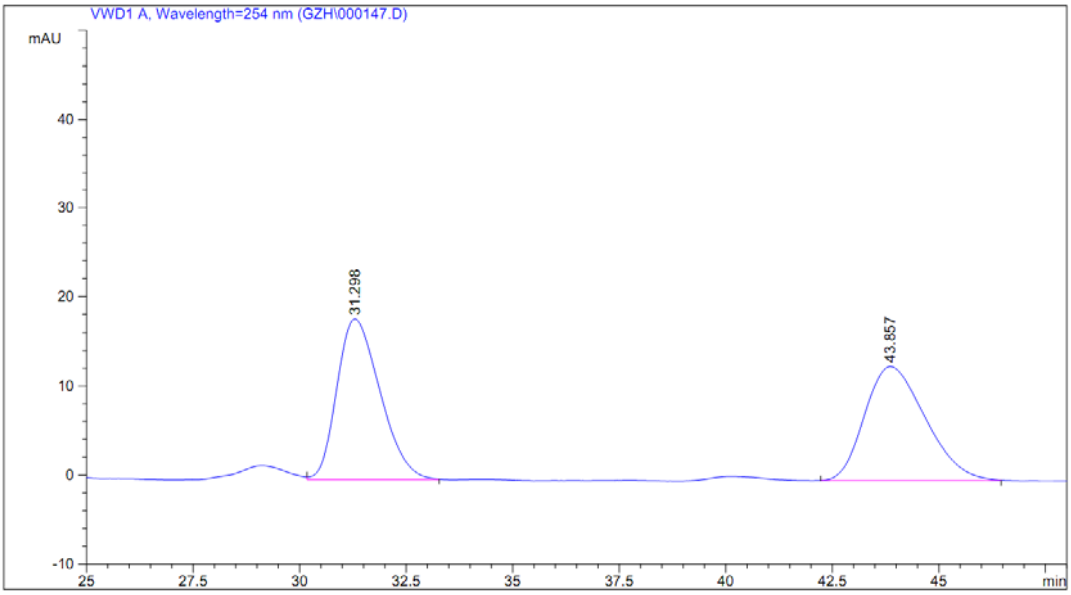



```
    ==================================================================
                          Area Percent Report
    ==================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  18.354 VV    1.1154  176.44371    2.14844   1.0857
       2  27.501 BB    0.9989 1.60755e4   250.56586  98.9143

    Totals :                  1.62519e4   252.71429

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

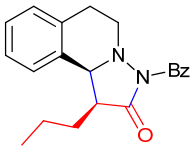


***rac*-3d**

```
Data File C:\CHEM32\1\DATA\GZH\000147.D
 Sample Name: gzh-343B-2  racemic

    ======================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date  : 2014-9-21 17:47:50
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-9-21 14:18:04  by gzh
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-29 17:32:51  by ckq
                       (modified after loading)
    Sample Info      : AD H/I=90:10   1mL/min  254nm
```

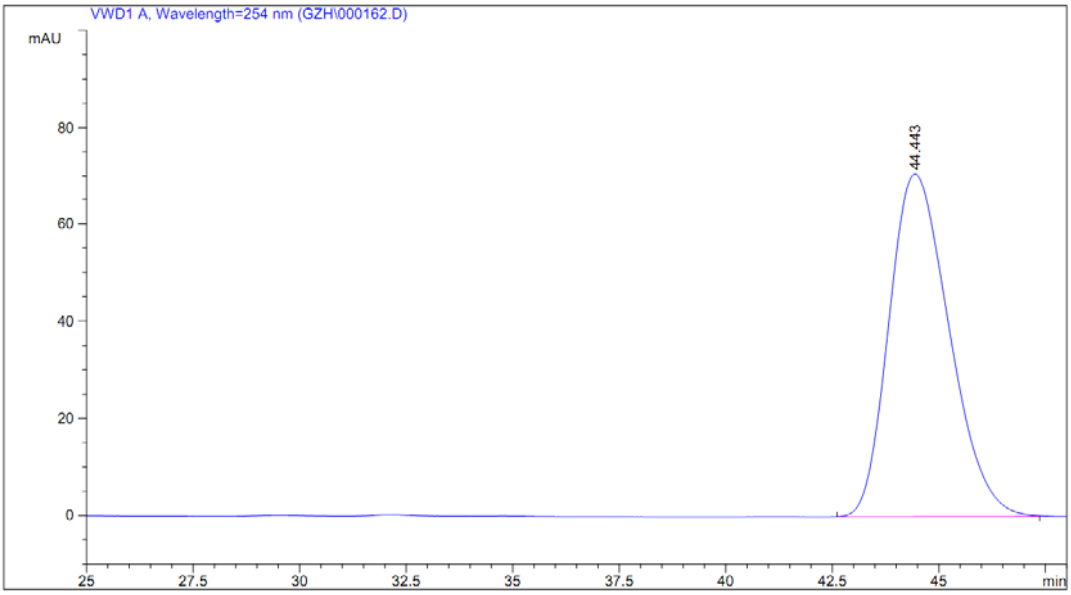



```
    ======================================================================
                              Area Percent Report
    ======================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  31.298 VB    1.0828 1269.15833   17.97711  49.9695
       2  43.857 BB    1.4285 1270.70837   12.83804  50.0305

    Totals :                  2539.86670   30.81514

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

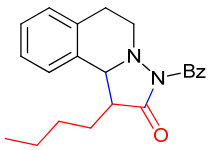


3d

```
Data File C:\CHEM32\1\DATA\GZH\000162.D
 Sample Name: gzh-346A-2

    ==================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date  : 2014-10-16 9:48:29
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-10-16 9:45:23  by gzh
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-29 17:34:12  by ckq
                       (modified after loading)
    Sample Info      : AD-H H/I=90:10   1.0 mL/min  254 nm
```

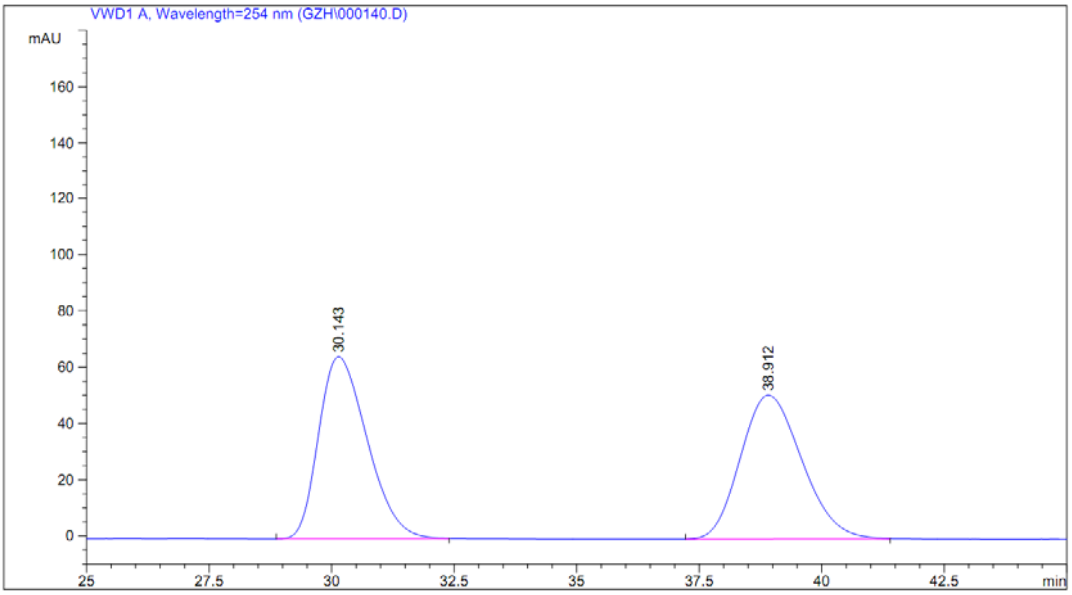



```
    ==================================================================
                            Area Percent Report
    ==================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  44.443 BB    1.5397 6928.40967   70.67503 100.0000

    Totals :                  6928.40967   70.67503


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

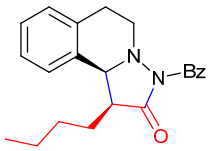


***rac*-3e**

```
Data File C:\CHEM32\1\DATA\GZH\000140.D
 Sample Name: gzh-341B-2 racemic

    ========================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date   : 2014-9-21 11:46:50
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-9-21 11:48:13  by gzh
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-29 17:20:55  by ckq
                       (modified after loading)
    Sample Info      : AD H/I=90:10   1mL/min  254nm
```



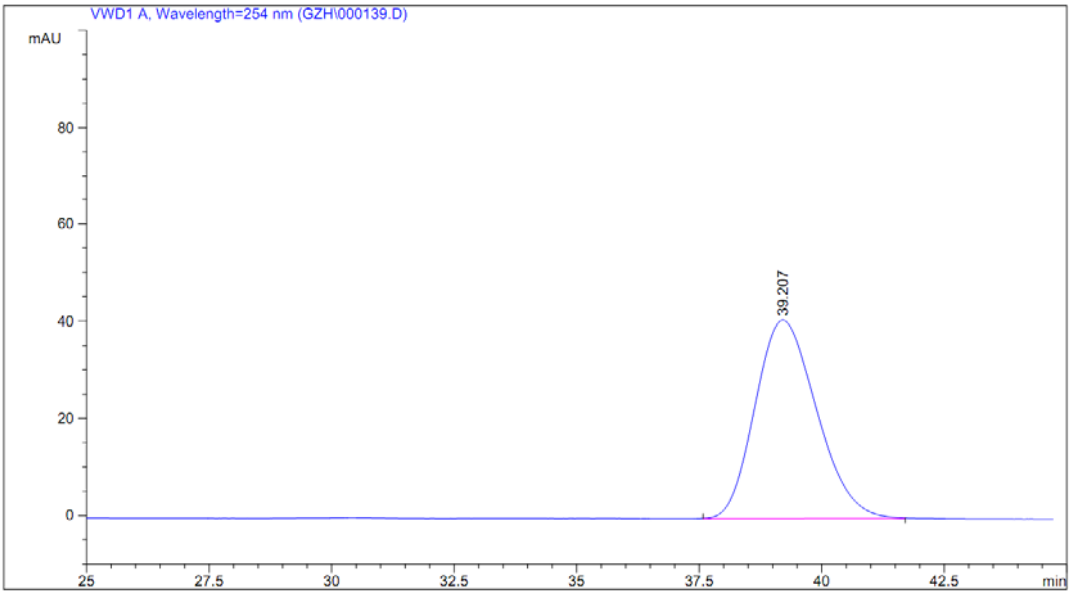

```
    ========================================================================
                            Area Percent Report
    ========================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  30.143 BB    1.0816 4449.34668   64.72449  49.9812
       2  38.912 BB    1.3573 4452.69727   51.09980  50.0188

    Totals :                  8902.04395  115.82429

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



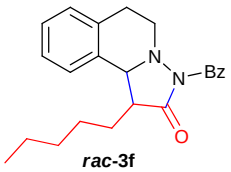
3e

Data File C:\CHEM32\1\DATA\GZH\000139.D
Sample Name: gzh-341A-2

```
==========================================================================
Acq. Operator    : gzh
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 2014-9-21 10:59:08
Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
Last changed     : 2014-9-21 10:47:14  by ckq
                   (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
Last changed     : 2014-11-29 17:22:15  by ckq
                   (modified after loading)
Sample Info      : AD H/I=90:10   1mL/min  254nm
```

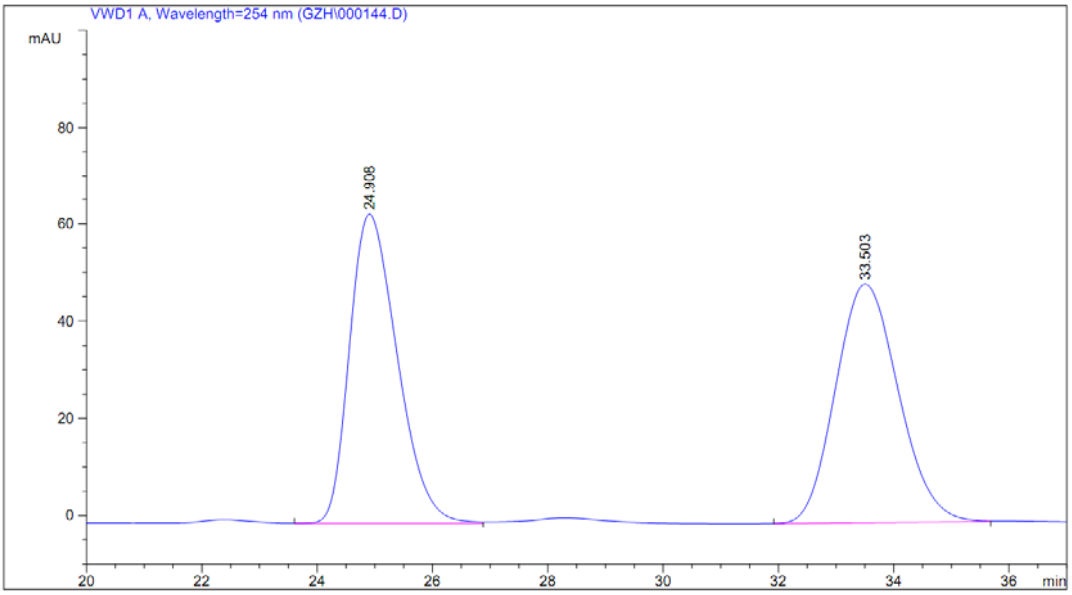



```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s    [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  39.207 BB    1.3313 3568.05542   40.82139 100.0000

Totals :                  3568.05542   40.82139

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

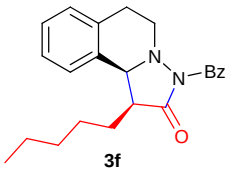


***rac*-3f**

```
Data File C:\CHEM32\1\DATA\GZH\000144.D
 Sample Name: gzh-342B-2  racemic

    ====================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date  : 2014-9-21 15:04:41
    Acq. Method     : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed    : 2014-9-21 14:18:04  by gzh
                      (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed    : 2014-11-29 17:25:11  by ckq
                      (modified after loading)
    Sample Info     : AD H/I=90:10   1mL/min  254nm
```

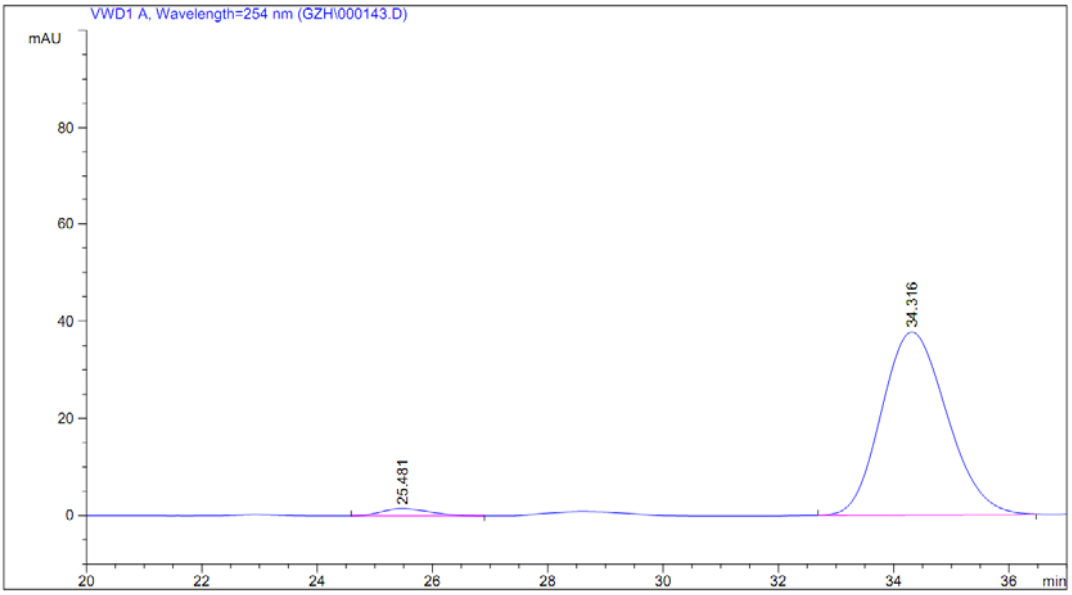



```
    ====================================================================
                            Area Percent Report
    ====================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  24.908 VB    0.9001 3652.72974   63.59785  49.5184
       2  33.503 BB    1.1885 3723.78271   49.05194  50.4816

    Totals :                  7376.51245  112.64980

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

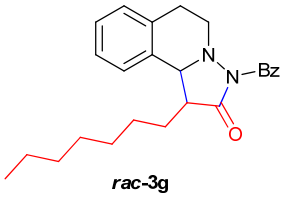


3f

```
Data File C:\CHEM32\1\DATA\GZH\000143.D
 Sample Name: gzh-342A-2

    ========================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date  : 2014-9-21 15:47:48
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-9-21 14:18:04  by gzh
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-29 17:26:14  by ckq
                       (modified after loading)
    Sample Info      : AD H/I=90:10   1mL/min  254nm
```

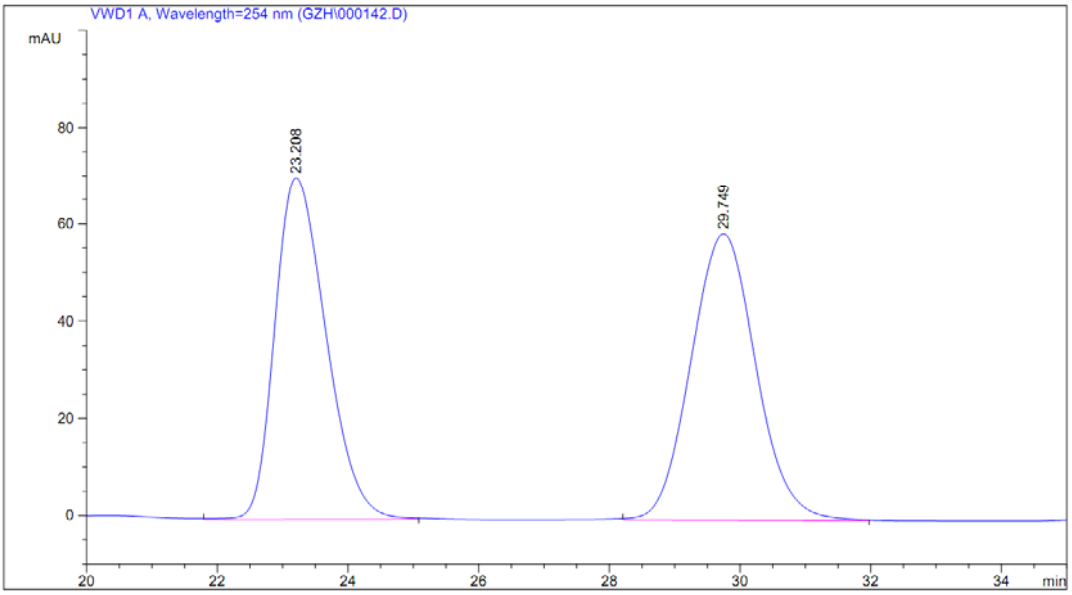



```
    ========================================================================
                              Area Percent Report
    ========================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  25.481 BB    0.7249   82.57961    1.47078   2.7082
       2  34.316 BB    1.2358 2966.69897   37.68781  97.2918

    Totals :                  3049.27858   39.15859

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


Instrument 1 2014-11-29 17:26:18  ckq                          Page   1 of 1
```

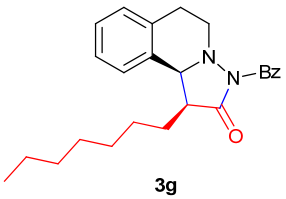


***rac*-3g**

```
Data File C:\CHEM32\1\DATA\GZH\000142.D
 Sample Name: gzh-341D-2 racemic

    ========================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date  : 2014-9-21 13:33:18
    Acq. Method     : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed    : 2014-9-21 13:34:04  by gzh
                      (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed    : 2014-11-29 17:55:04  by ckq
                      (modified after loading)
    Sample Info     : AD H/I=90:10   1mL/min  254nm
```

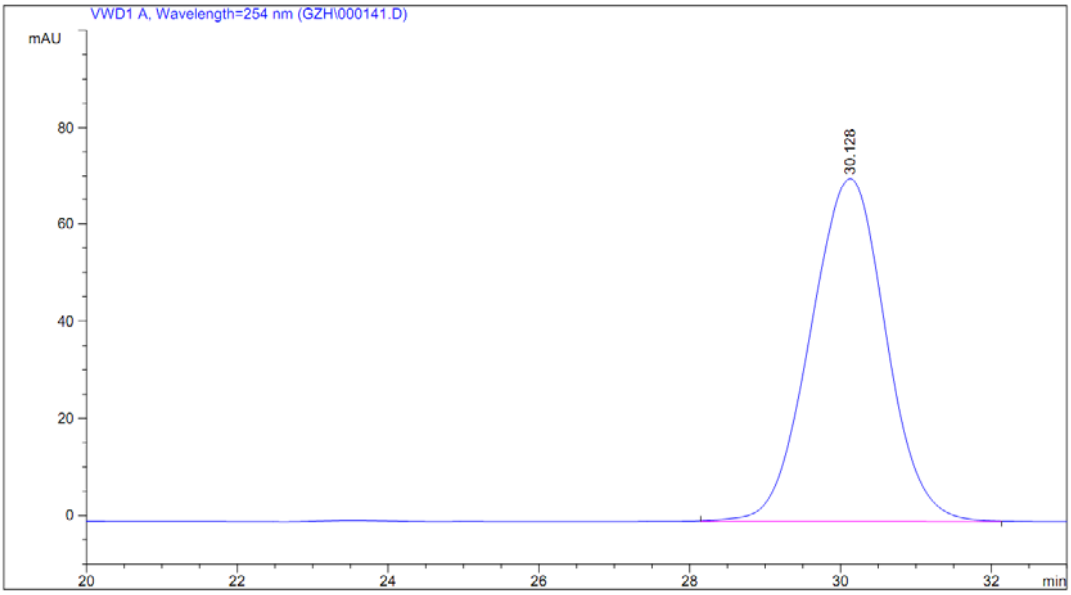



```
    ========================================================================
                              Area Percent Report
    ========================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  23.208 VB    0.8495 3828.97876   70.45702  48.5650
       2  29.749 BB    1.0836 4055.26050   58.84350  51.4350

    Totals :                  7884.23926  129.30053

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


Instrument 1 2014-11-29 17:55:19  ckq                          Page   1 of 1
```

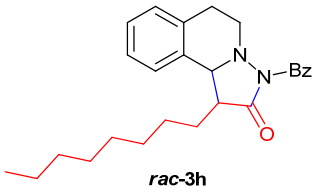


3g

```
Data File C:\CHEM32\1\DATA\GZH\000141.D
 Sample Name: gzh-341C-2

    ==================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date  : 2014-9-21 12:57:34
    Acq. Method     : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed    : 2014-9-21 12:58:00  by gzh
                      (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed    : 2014-11-29 17:24:14  by ckq
                      (modified after loading)
    Sample Info     : AD H/I=90:10   1mL/min  254nm
```

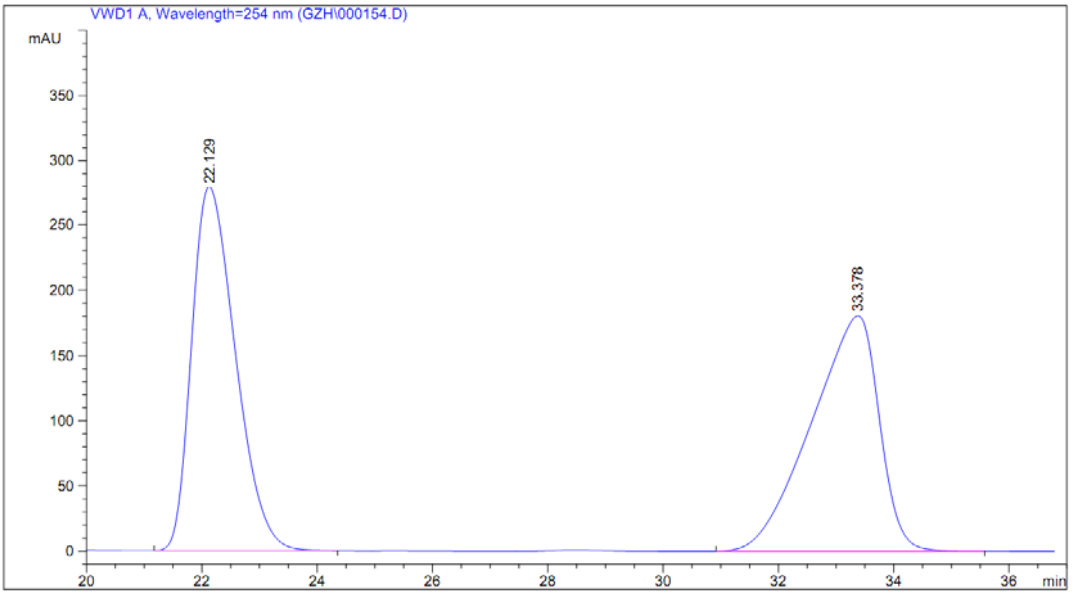



```
    ==================================================================
                            Area Percent Report
    ==================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  30.128 BB    1.0948 4906.23535   70.71573 100.0000

    Totals :                  4906.23535   70.71573


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

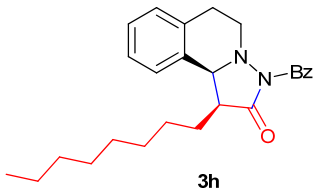


***rac*-3h**

```
Data File C:\CHEM32\1\DATA\GZH\000154.D
 Sample Name: gzh-344D-2  racemic

    ========================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date   : 2014-10-8 10:58:53
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-10-8 10:19:01  by gzh
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-29 17:27:20  by ckq
                       (modified after loading)
    Sample Info      : AD-H H/I=90:10  1.0mL/min  254nm
```



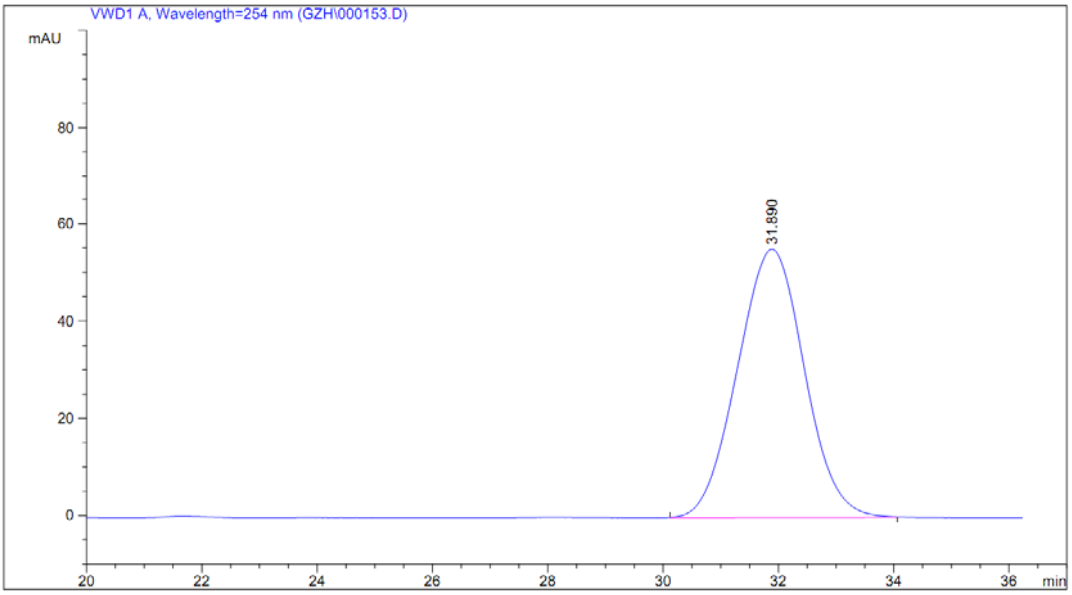

```
    ========================================================================
                              Area Percent Report
    ========================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  22.129 BB    0.8235 1.46803e4   279.03534  49.8815
       2  33.378 BB    1.2394 1.47501e4   180.36958  50.1185

    Totals :                  2.94304e4   459.40492

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



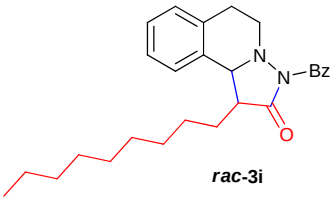
3h

Data File C:\CHEM32\1\DATA\GZH\000153.D
Sample Name: gzh-344A-2

```
==========================================================================
Acq. Operator    : gzh
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 2014-10-8 10:21:19
Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
Last changed     : 2014-10-8 10:19:01  by gzh
                   (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
Last changed     : 2014-11-29 17:28:29  by ckq
                   (modified after loading)
Sample Info      : AD-H H/I=90:10  1.0mL/min  254nm
```

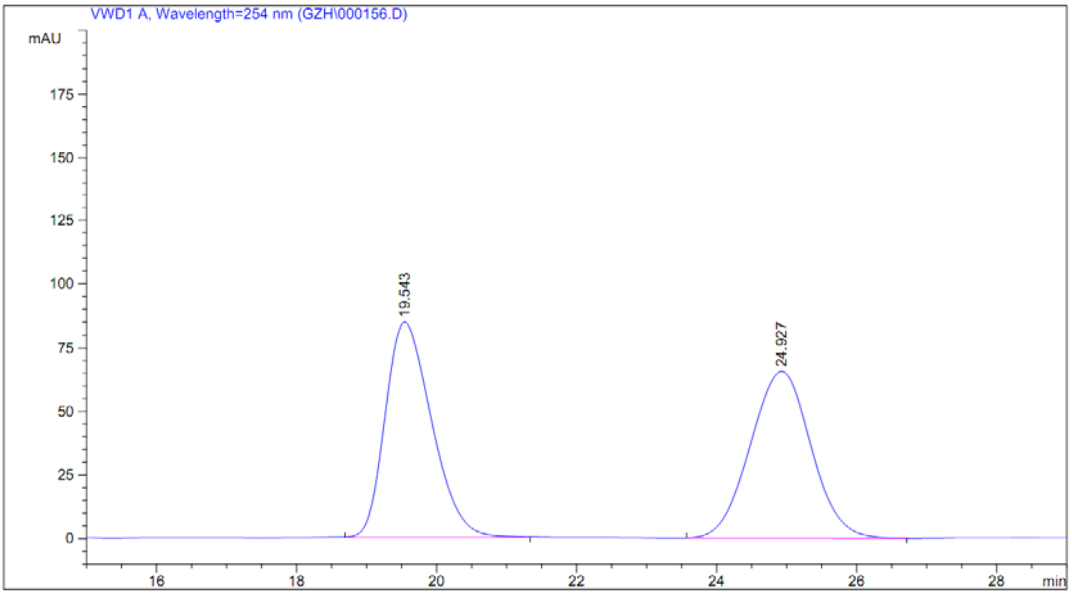



```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]       %
----|-------|----|-------|----------|----------|--------|
   1  31.890 BB    1.2631 4446.12061   55.19149 100.0000

Totals :                  4446.12061   55.19149

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

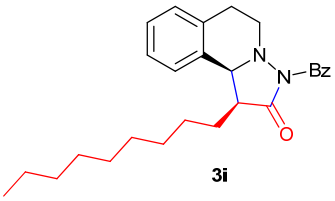


***rac*-3i**

```
Data File C:\CHEM32\1\DATA\GZH\000156.D
 Sample Name: gzh-344E-2  racemic

    ======================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date  : 2014-10-8 14:21:21
    Acq. Method     : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed    : 2014-10-8 14:18:45  by gzh
                      (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed    : 2014-11-29 17:57:18  by ckq
                      (modified after loading)
    Sample Info     : AD-H H/I=90:10  1.0mL/min  254nm
```

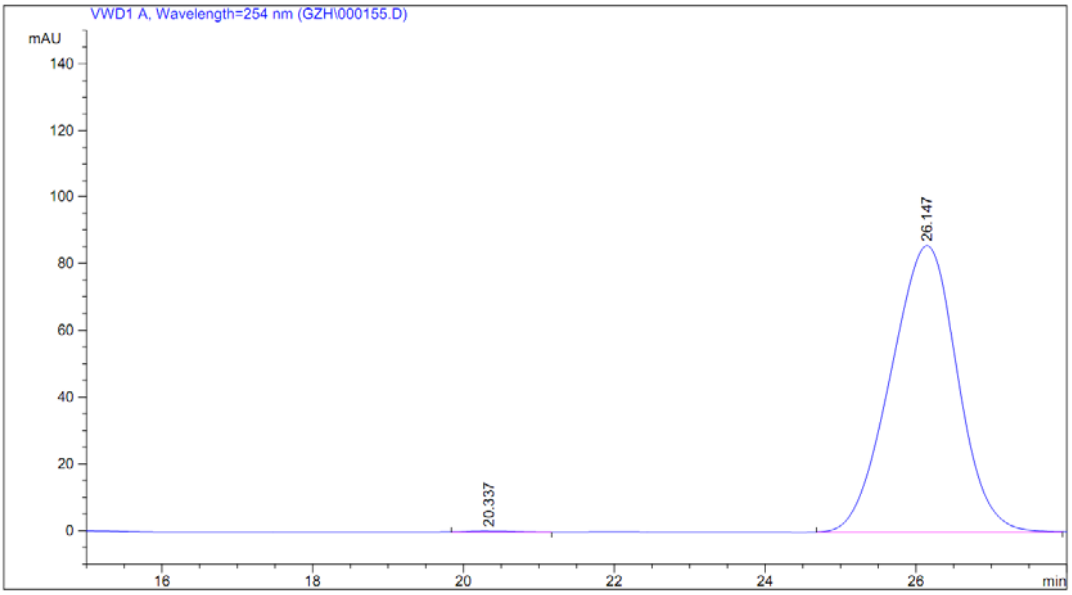



```
    ======================================================================
                              Area Percent Report
    ======================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  19.543 BB    0.7180 3895.43774   84.56001  49.7027
       2  24.927 BB    0.9466 3942.04126   65.51394  50.2973

    Totals :                  7837.47900  150.07394

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

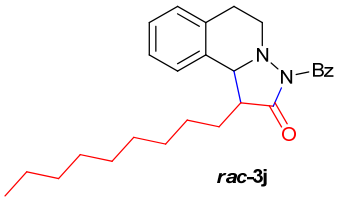


3i

```
Data File C:\CHEM32\1\DATA\GZH\000155.D
 Sample Name: gzh-344B-2

    ======================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date   : 2014-10-8 11:37:59
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-10-8 11:39:54  by gzh
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-29 17:30:05  by ckq
                       (modified after loading)
    Sample Info      : AD-H H/I=90:10  1.0mL/min  254nm
```



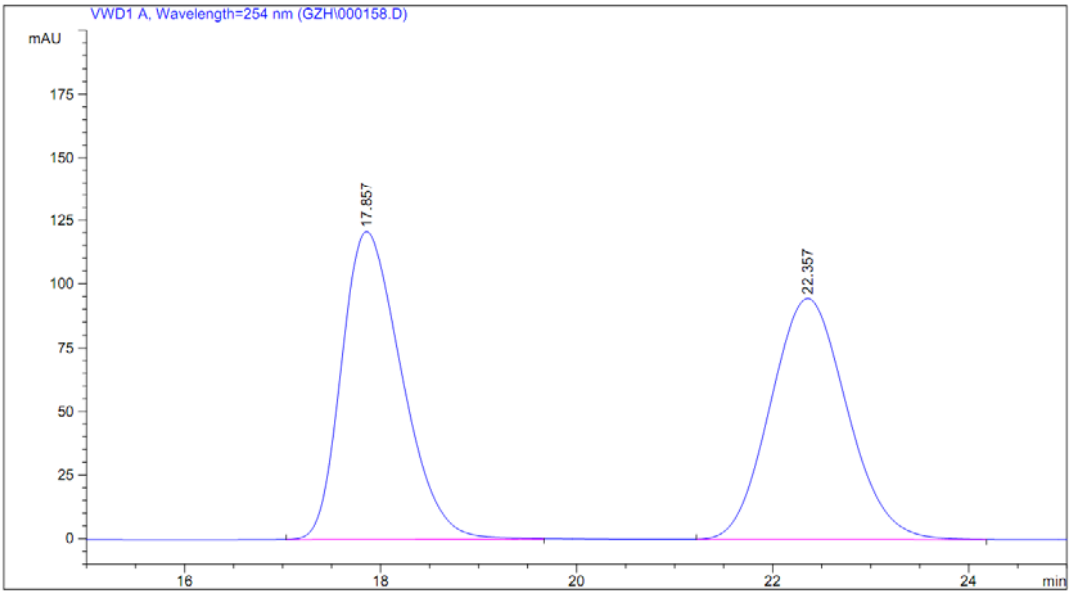

```
    ======================================================================
                              Area Percent Report
    ======================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  20.337 BB    0.5404   14.20978 3.41735e-1   0.2688
       2  26.147 BB    0.9621 5272.29980   85.72461  99.7312

    Totals :                  5286.50958   86.06634

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



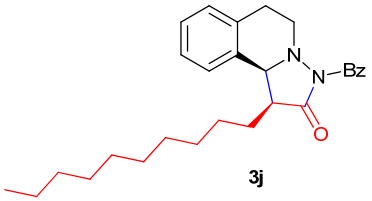
rac-3j

Data File C:\CHEM32\1\DATA\GZH\000158.D
Sample Name: gzh-344F-2 racemic

```
==========================================================================
Acq. Operator    : gzh
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 2014-10-8 15:32:10
Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
Last changed     : 2014-10-8 15:30:52  by gzh
                   (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
Last changed     : 2014-11-29 17:30:52  by ckq
                   (modified after loading)
Sample Info      : AD-H H/I=90:10  1.0mL/min  254nm
```



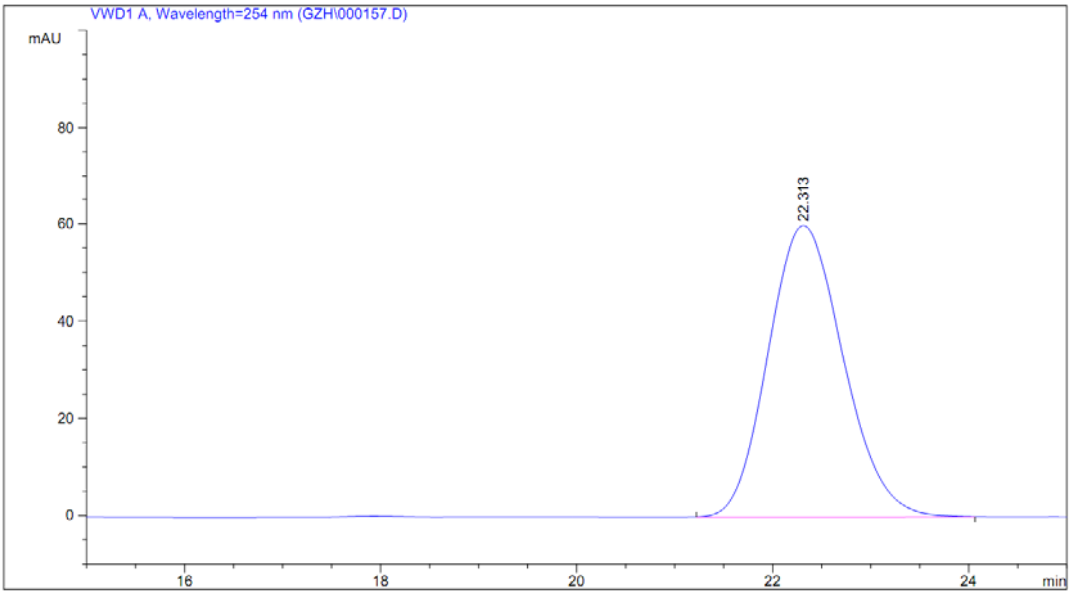

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s    [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  17.857 BB    0.6635 5154.48682  120.88164  50.0866
   2  22.357 BB    0.8489 5136.66113   94.61300  49.9134

Totals :                 1.02911e4   215.49464

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



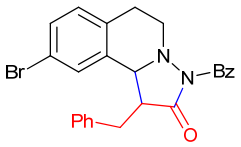
3j

Data File C:\CHEM32\1\DATA\GZH\000157.D
Sample Name: gzh-344C-2

```
==========================================================================
Acq. Operator    : gzh
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 2014-10-8 14:52:31
Acq. Method     : C:\CHEM32\1\METHODS\JWQ20121205.M
Last changed    : 2014-10-8 14:18:45  by gzh
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
Last changed    : 2014-11-29 17:31:43  by ckq
                  (modified after loading)
Sample Info     : AD-H H/I=90:10  1.0mL/min  254nm
```

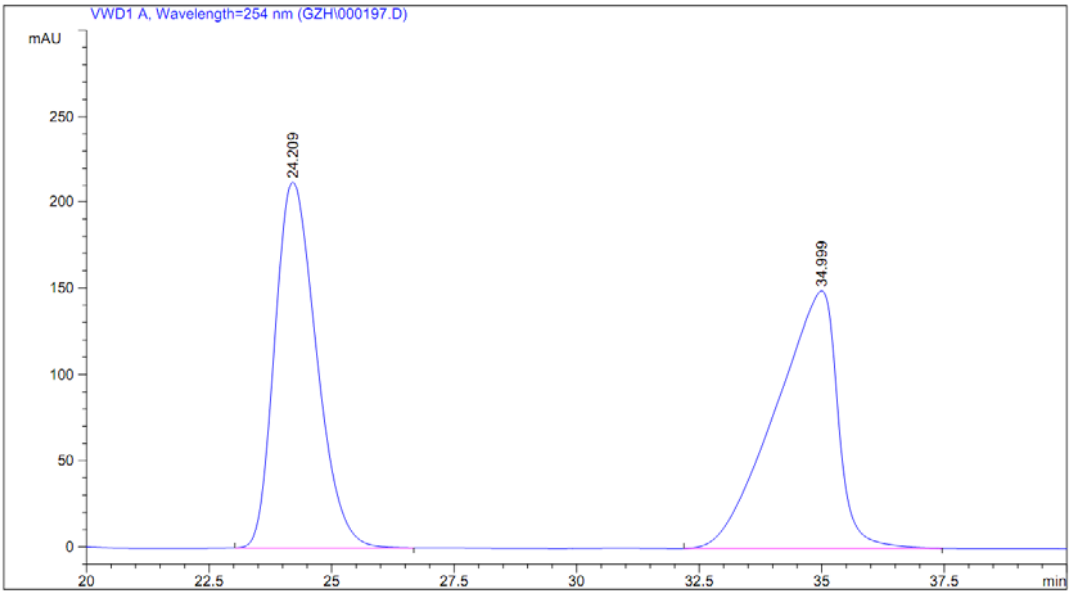



```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]       %
----|-------|----|-------|----------|----------|--------|
   1  22.313 BB    0.8328 3202.92456   59.96855 100.0000

Totals :                  3202.92456   59.96855

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

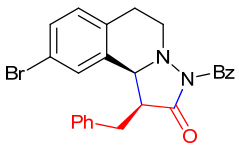


***rac*-3k**

```
Data File C:\CHEM32\1\DATA\GZH\000197.D
 Sample Name: GZH-351D-2  RACEMIC

    ========================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date  : 2014-11-13 11:46:37
    Acq. Method     : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed    : 2014-11-13 11:45:30  by gzh
                      (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed    : 2014-11-29 17:50:54  by ckq
                      (modified after loading)
    Sample Info     : AD-H  H:I=70:30 1.0 mL/min  254 nm
```

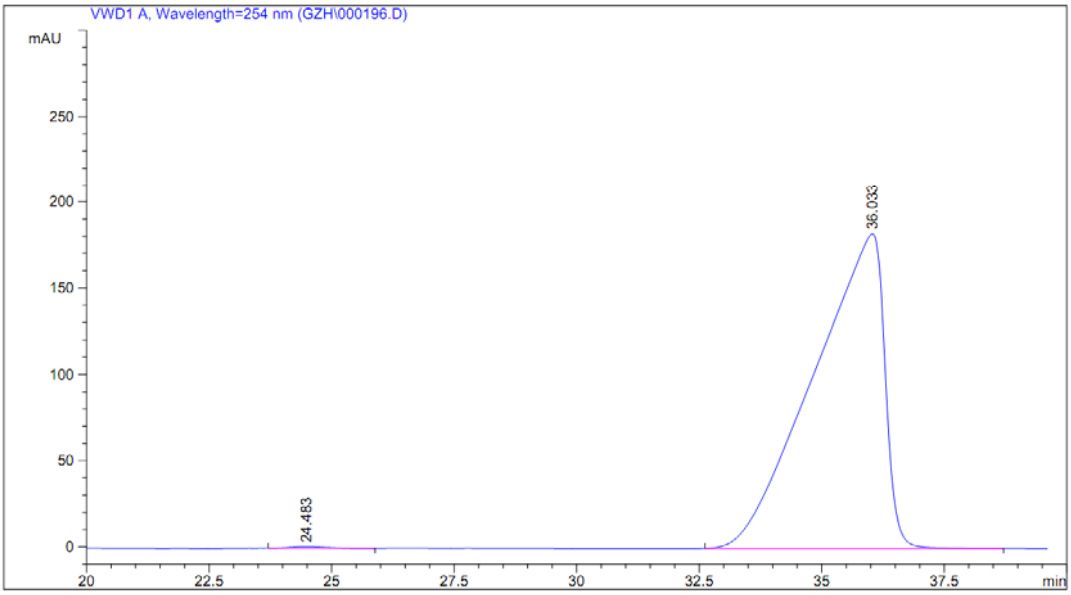



```
    ========================================================================
                              Area Percent Report
    ========================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  24.209 BB    0.9199 1.25172e4   212.59247  48.6697
       2  34.999 BB    1.2918 1.32015e4   149.15489  51.3303

    Totals :                  2.57188e4   361.74736

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

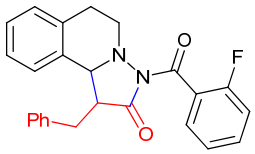


3k

```
Data File C:\CHEM32\1\DATA\GZH\000196.D
 Sample Name: GZH-351C-2

    ========================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date  : 2014-11-13 11:05:44
    Acq. Method     : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed    : 2014-11-13 9:34:03  by gzh
                      (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed    : 2014-11-29 17:51:37  by ckq
                      (modified after loading)
    Sample Info     : AD-H  H:I=70:30 1.0 mL/min  254 nm
```

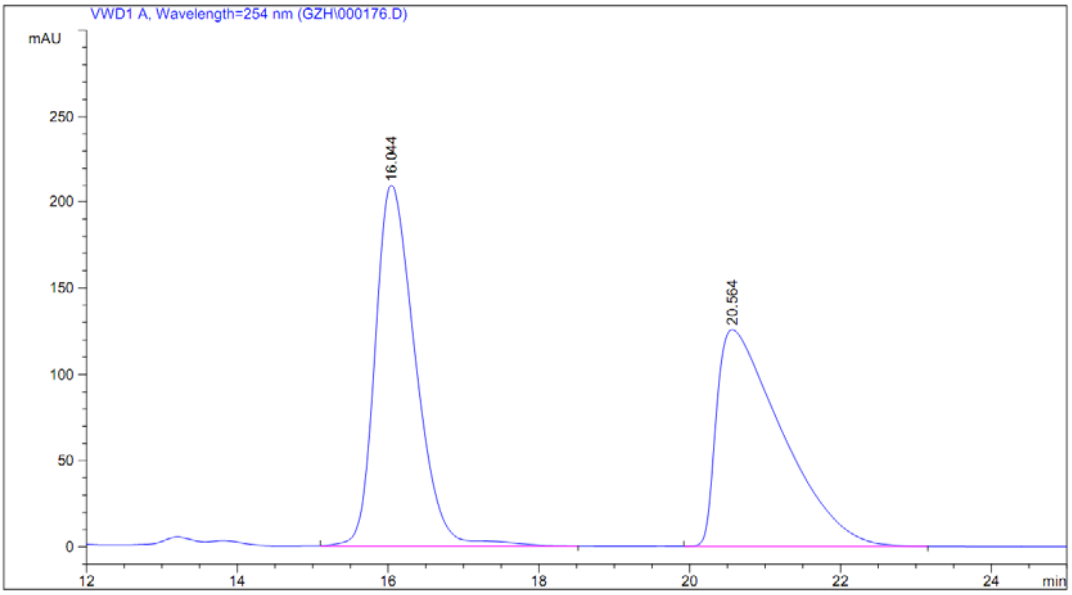



```
    ========================================================================
                              Area Percent Report
    ========================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  24.483 BB    0.7329   47.21850 8.93711e-1   0.2565
       2  36.033 BB    1.3470 1.83598e4   182.26857  99.7435

    Totals :                  1.84070e4   183.16228

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



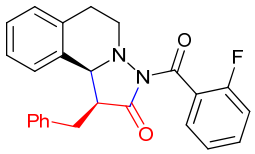
***rac*-3l**

```
Data File C:\CHEM32\1\DATA\GZH\000176.D
 Sample Name: gzh-348B-2 racemic

    ======================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date   : 2014-10-20 10:11:33
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-10-20 9:58:37  by gzh
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-29 17:45:57  by ckq
                       (modified after loading)
    Sample Info      : AD-H H/I/M=70:20:10   1.0 mL/min  254 nm
```



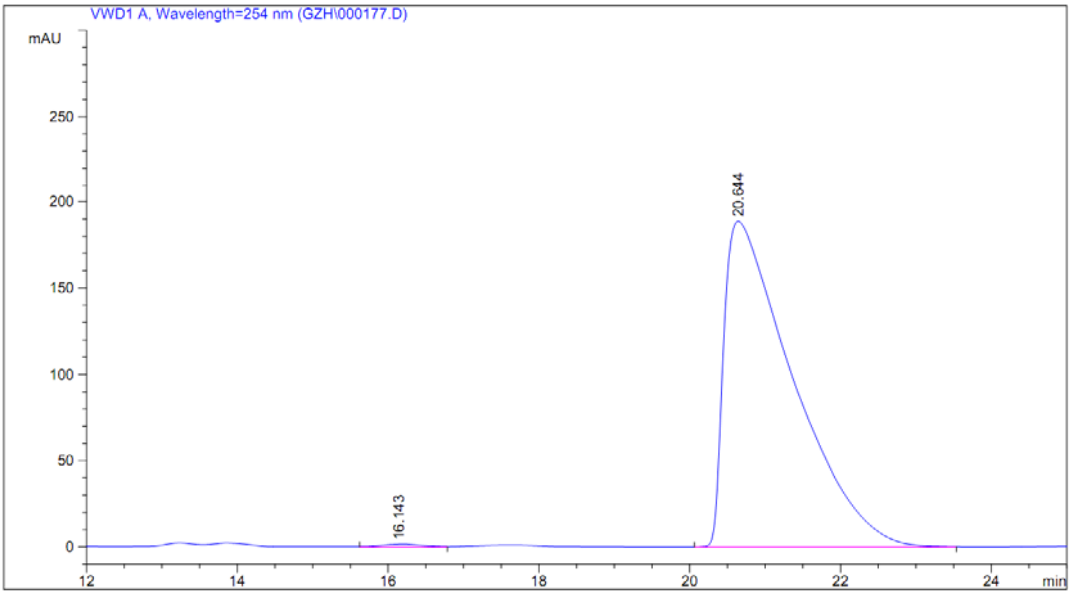

```
    ======================================================================
                              Area Percent Report
    ======================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  16.044 BB    0.5708 7745.45313  209.62529  50.5873
       2  20.564 VB    0.8941 7565.61621  125.74208  49.4127

    Totals :                  1.53111e4   335.36737

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

```
Instrument 1 2014-11-29 17:46:01  ckq                          Page   1 of 1
```

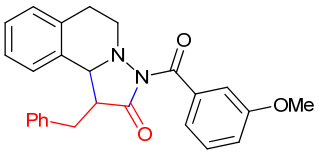


3l

```
Data File C:\CHEM32\1\DATA\GZH\000177.D
 Sample Name: gzh-348A-2

    ==================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date   : 2014-10-20 10:39:00
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-10-20 9:58:37  by gzh
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-29 17:46:35  by ckq
                       (modified after loading)
    Sample Info      : AD-H H/I/M=70:20:10   1.0 mL/min  254 nm
```

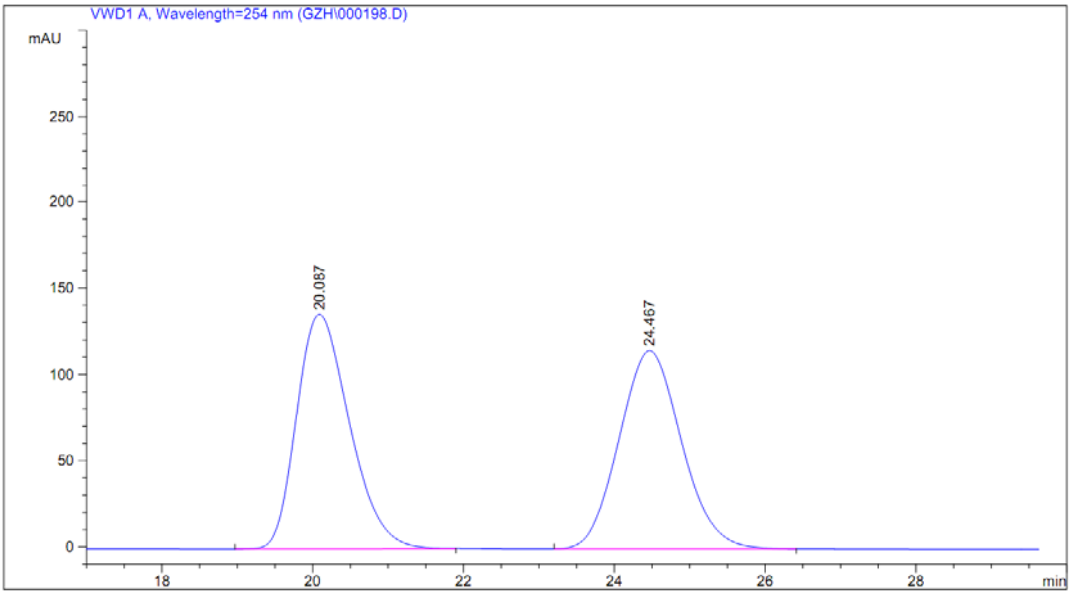



```
    ==================================================================
                            Area Percent Report
    ==================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  16.143 VV    0.5731   62.33387    1.65594   0.5174
       2  20.644 BB    0.9502 1.19855e4   188.82655  99.4826

    Totals :                  1.20479e4   190.48249

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

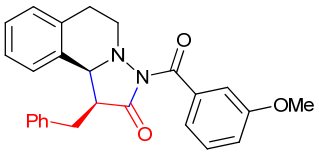


***rac*-3m**

```
Data File C:\CHEM32\1\DATA\GZH\000198.D
 Sample Name: GZH-351F-2  RACEMIC

    ========================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date  : 2014-11-13 14:17:22
    Acq. Method     : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed    : 2014-11-13 14:17:46  by gzh
                      (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed    : 2014-11-29 17:52:23  by ckq
                      (modified after loading)
    Sample Info     : AD-H  H:I=70:30 1.0 mL/min  254 nm
```

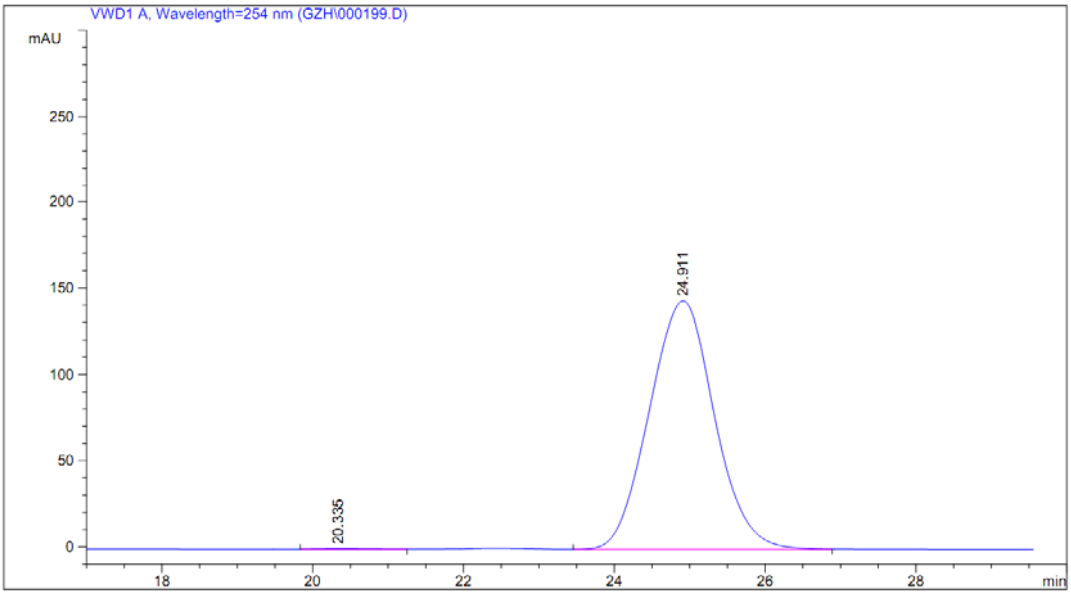



```
    ========================================================================
                              Area Percent Report
    ========================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  20.087 BB    0.7617 6632.20996  135.86139  50.0680
       2  24.467 BB    0.8884 6614.19824  115.17040  49.9320

    Totals :                  1.32464e4   251.03179

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

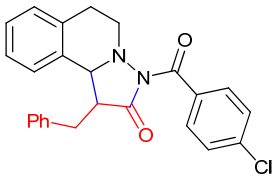


3m

```
Data File C:\CHEM32\1\DATA\GZH\000199.D
 Sample Name: GZH-351E-2

    ========================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date  : 2014-11-13 14:48:06
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-13 14:17:46  by gzh
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-29 17:53:03  by ckq
                       (modified after loading)
    Sample Info      : AD-H  H:I=70:30 1.0 mL/min  254 nm
```

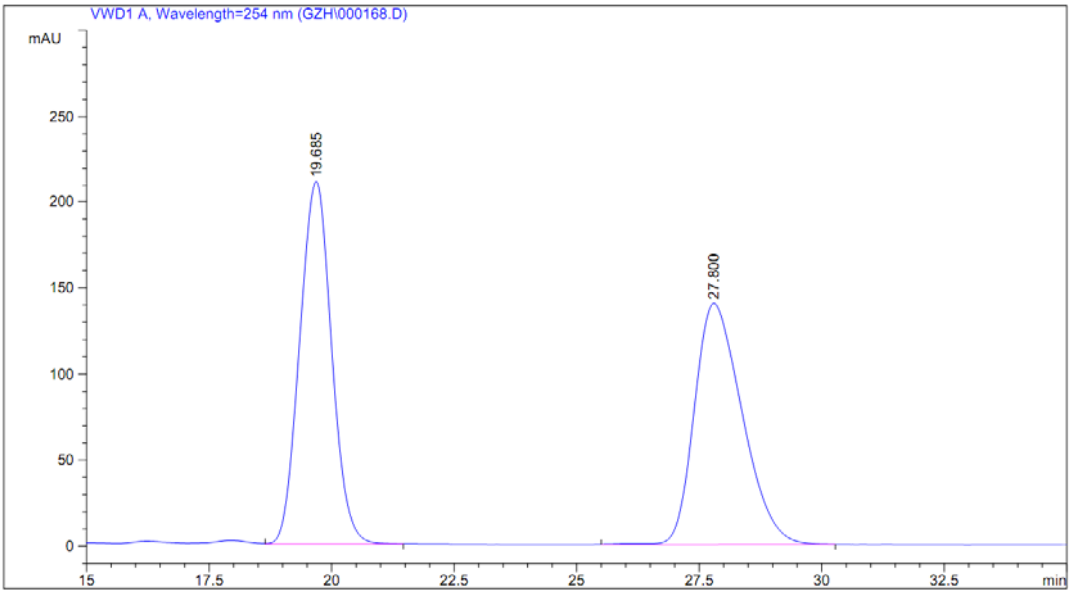



```
    ========================================================================
                              Area Percent Report
    ========================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  20.335 BB    0.4402   15.44349 4.20462e-1   0.1785
       2  24.911 VB    0.9243 8636.25977  143.91412  99.8215

    Totals :                  8651.70326  144.33459

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

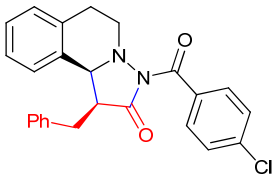


***rac*-3n**

```
Data File C:\CHEM32\1\DATA\GZH\000168.D
 Sample Name: gzh-346E-2 racemic

    ========================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date   : 2014-10-16 17:19:41
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-10-16 17:35:08  by gzh
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-29 17:39:57  by ckq
                       (modified after loading)
    Sample Info      : AD-H H/I=70:30   1.0 mL/min  254 nm
```

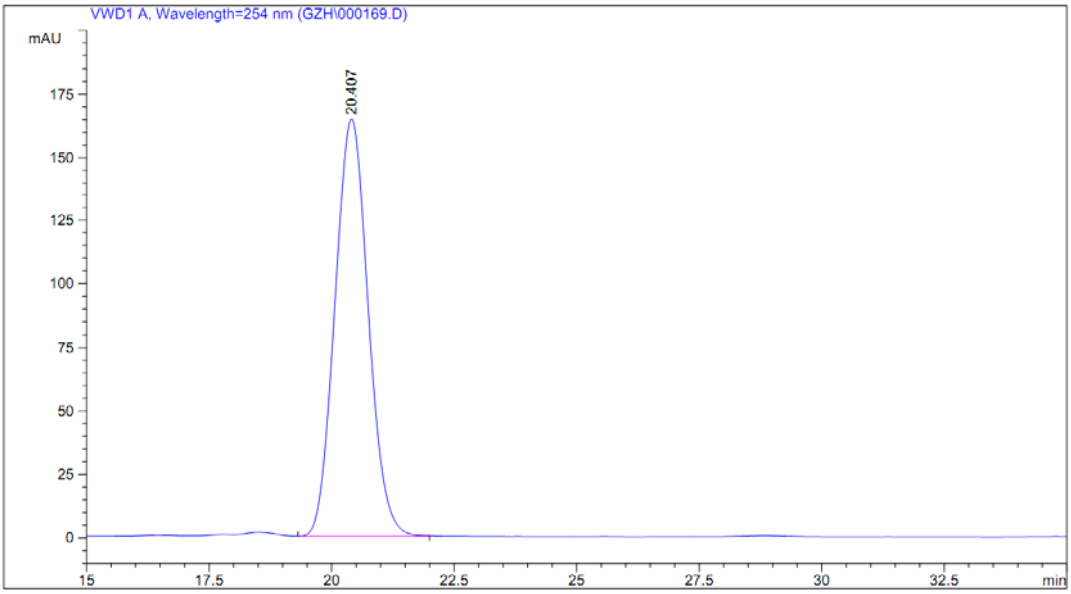



```
    ========================================================================
                            Area Percent Report
    ========================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  19.685 VB    0.7069 9521.61914  211.03049  50.0699
       2  27.800 BB    1.0531 9495.03516  140.04930  49.9301

    Totals :                  1.90167e4   351.07979

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

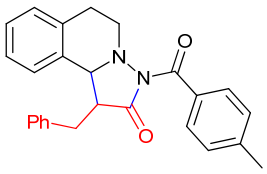


3n

```
Data File C:\CHEM32\1\DATA\GZH\000169.D
 Sample Name: gzh-346C-2

    ========================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date   : 2014-10-16 18:33:03
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-10-16 17:35:08  by gzh
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-29 17:40:50  by ckq
                       (modified after loading)
    Sample Info      : AD-H H/I=70:30   1.0 mL/min  254 nm
```

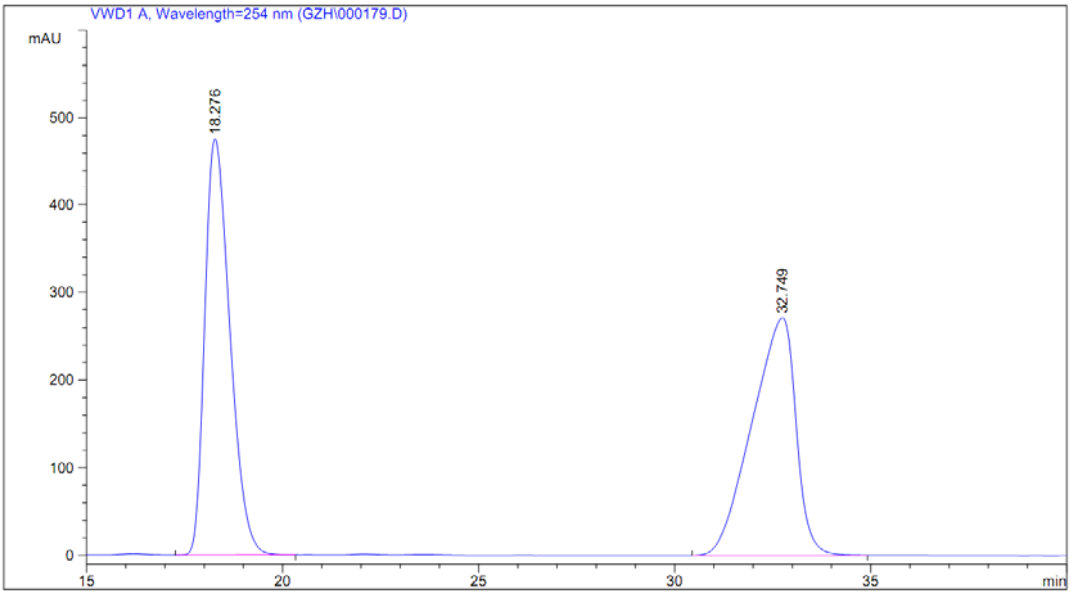



```
    ========================================================================
                            Area Percent Report
    ========================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  20.407 VB    0.7332 7752.10107  164.50688 100.0000

    Totals :                  7752.10107  164.50688

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

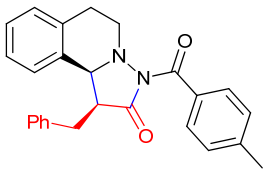


***rac*-3o**

```
Data File C:\CHEM32\1\DATA\GZH\000179.D
 Sample Name: gzh-348D-2 racemic

    ================================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date  : 2014-10-20 12:08:07
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-10-20 12:08:24  by gzh
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-29 17:47:29  by ckq
                       (modified after loading)
    Sample Info      : AD-H H/I=70:30  1.0 mL/min  254 nm
```

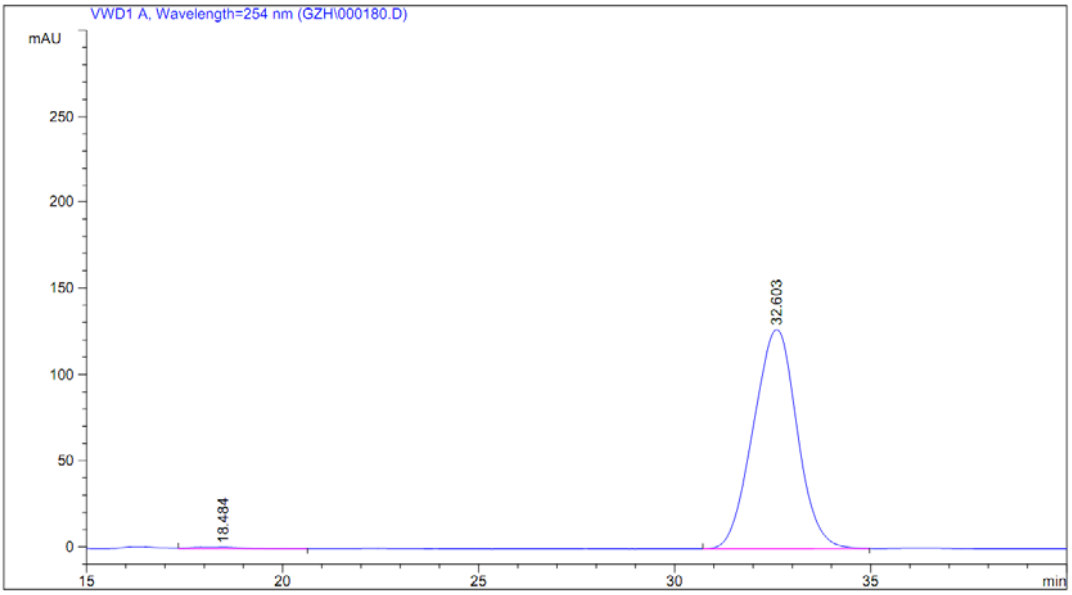



```
    ================================================================================
                              Area Percent Report
    ================================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  18.276 VB    0.6931 2.11575e4   476.14157  49.9744
       2  32.749 BB    1.1856 2.11792e4   270.96176  50.0256

    Totals :                  4.23367e4   747.10333

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

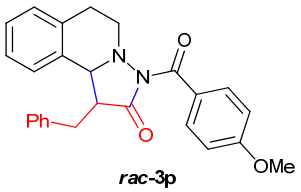


3o

```
Data File C:\CHEM32\1\DATA\GZH\000180.D
 Sample Name: gzh-348C-2

    ========================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date  : 2014-10-20 14:26:52
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-10-20 14:23:40  by gzh
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-29 17:48:22  by ckq
                       (modified after loading)
    Sample Info      : AD-H H/I=70:30  1.0 mL/min  254 nm
```

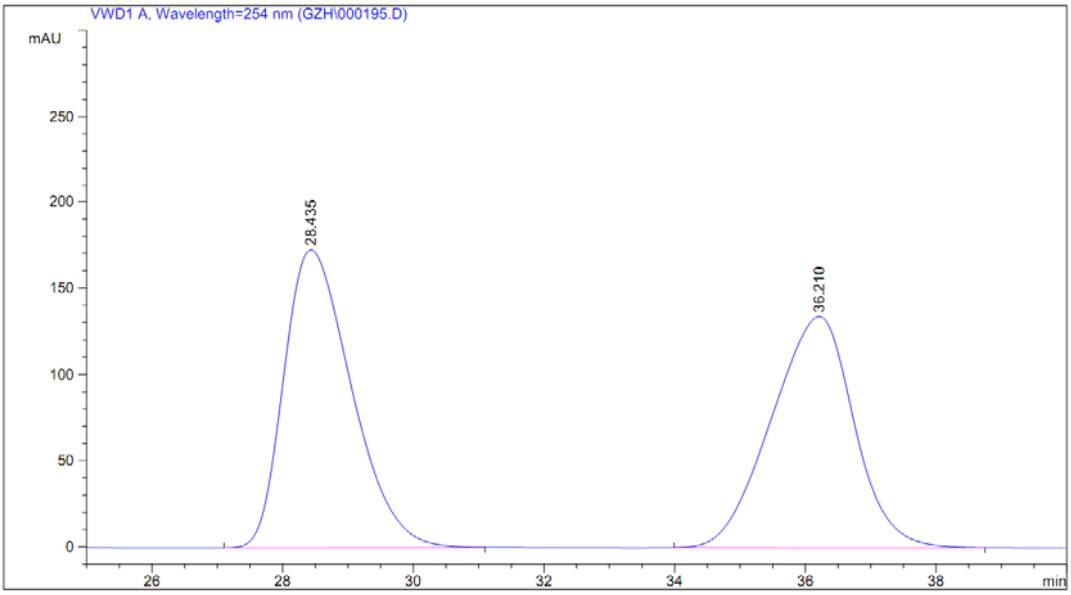



```
    ========================================================================
                              Area Percent Report
    ========================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  18.484 VB    1.0175   62.58607 8.02596e-1   0.6301
       2  32.603 BB    1.2410 9869.56152  127.07960  99.3699

    Totals :                  9932.14759  127.88219

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



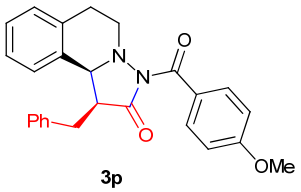
***rac*-3p**

```
Data File C:\CHEM32\1\DATA\GZH\000195.D
 Sample Name: GZH-351B-2 RACEMIC

    ========================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date   : 2014-11-13 10:22:16
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-13 9:34:03  by gzh
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-29 17:49:22  by ckq
                       (modified after loading)
    Sample Info      : AD-H  H:I=70:30 1.0 mL/min  254 nm
```



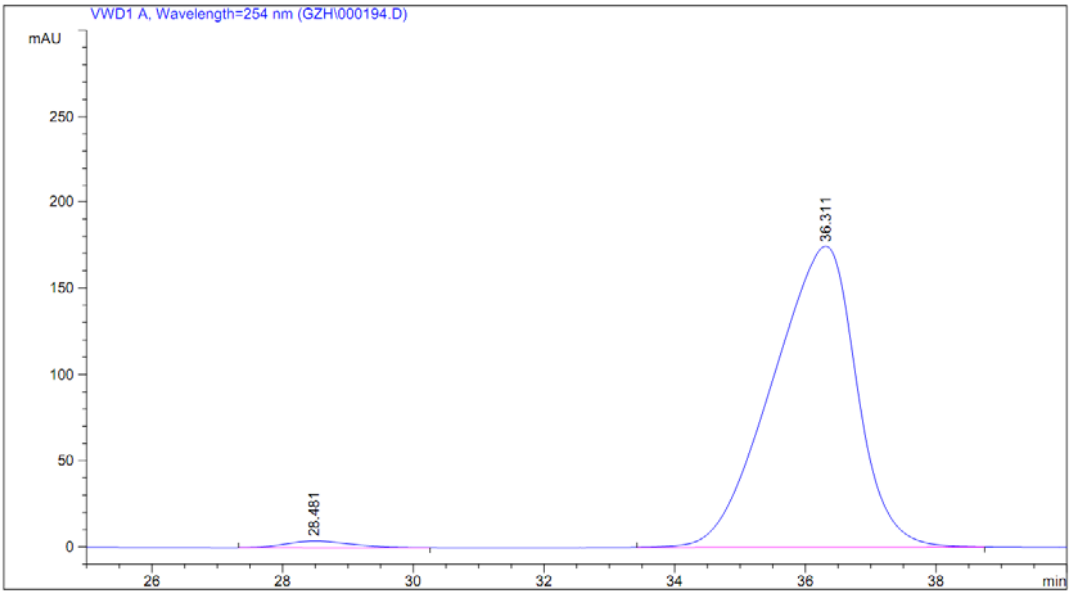

```
    ========================================================================
                              Area Percent Report
    ========================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  28.435 BB    1.1302 1.24122e4   172.60735  51.2497
       2  36.210 BB    1.3777 1.18069e4   133.96399  48.7503

    Totals :                  2.42192e4   306.57133

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

```
Instrument 1 2014-11-29 17:49:29  ckq                          Page   1 of 1
```

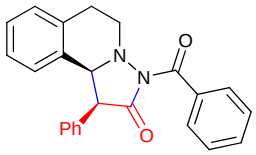


3p

```
Data File C:\CHEM32\1\DATA\GZH\000194.D
 Sample Name: GZH-351A-2

    ========================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date  : 2014-11-13 9:40:27
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-13 9:34:03  by gzh
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2014-11-29 17:50:09  by ckq
                       (modified after loading)
    Sample Info      : AD-H  H:I=70:30 1.0 mL/min  254 nm
```

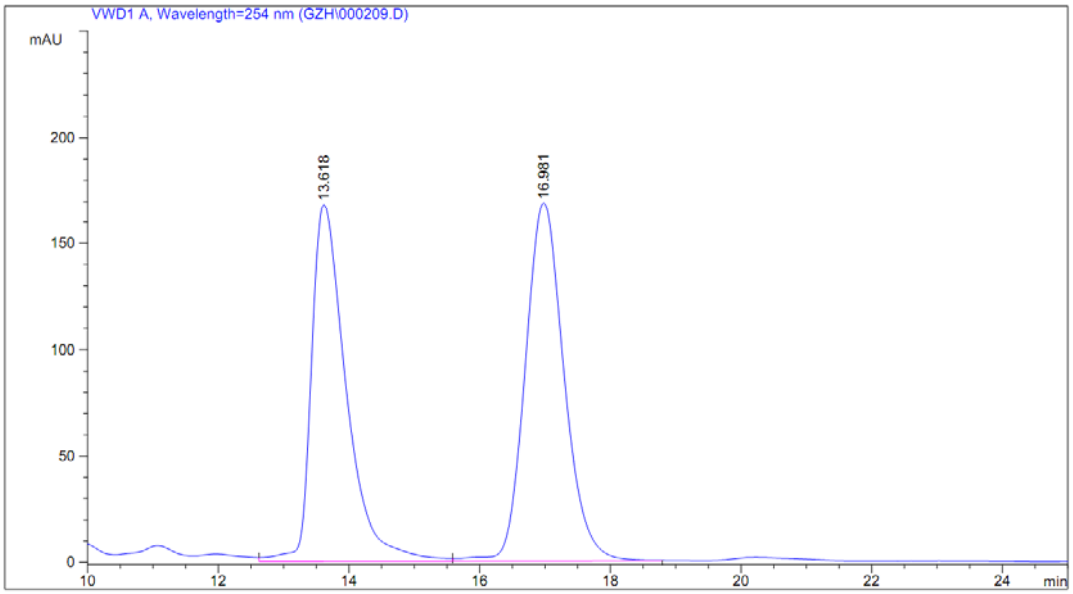



```
    ========================================================================
                              Area Percent Report
    ========================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  28.481 BB    0.8802  270.78152    3.95569   1.6995
       2  36.311 BB    1.3934 1.56626e4   174.54793  98.3005

    Totals :                  1.59334e4   178.50362

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

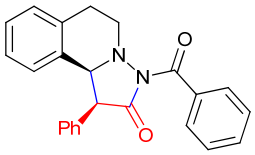


***rac*-3q**

```
Data File C:\CHEM32\1\DATA\GZH\000209.D
 Sample Name: GZH-S199B-3

    ========================================================================
    Acq. Operator    : GZH
    Acq. Instrument  : Instrument 1                    Location : Vial 1
    Injection Date   : 2015-2-6 10:23:39
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2015-2-6 8:47:31  by GZH
                       (modified after loading)
    Analysis Method  : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2015-2-9 15:53:26  by cjt
                       (modified after loading)
    Sample Info      : AD-H H/I=70:30 1.0 ml/min 254 nm
```

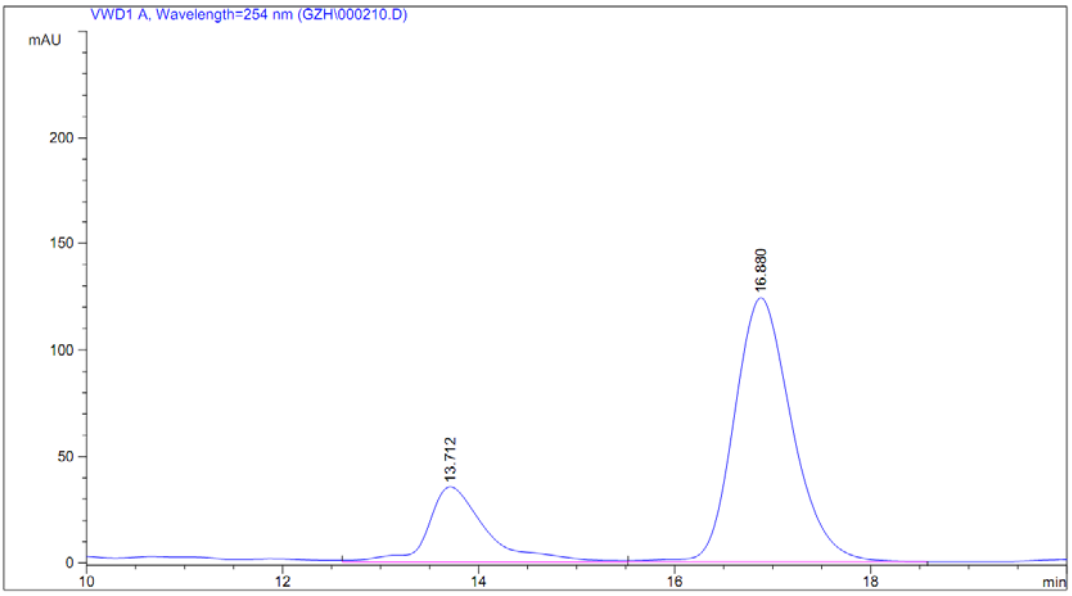



```
    ========================================================================
                              Area Percent Report
    ========================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]       [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  13.618 VV    0.5596 6209.77539  167.91258  47.2274
       2  16.981 VB    0.6315 6938.90625  168.63651  52.7726

    Totals :                  1.31487e4   336.54909

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

Instrument 1 2015-2-9 15:53:51  cjt                          Page   1 of 1
```

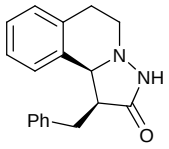


3q

```
Data File C:\CHEM32\1\DATA\GZH\000210.D
 Sample Name: GZH-S199A-2

    ========================================================================
    Acq. Operator    : GZH
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date   : 2015-2-6 11:11:57
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2015-2-6 8:47:31  by GZH
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2015-2-9 15:54:45  by cjt
                       (modified after loading)
    Sample Info      : AD-H H/I=70:30 1.0 ml/min 254 nm
```

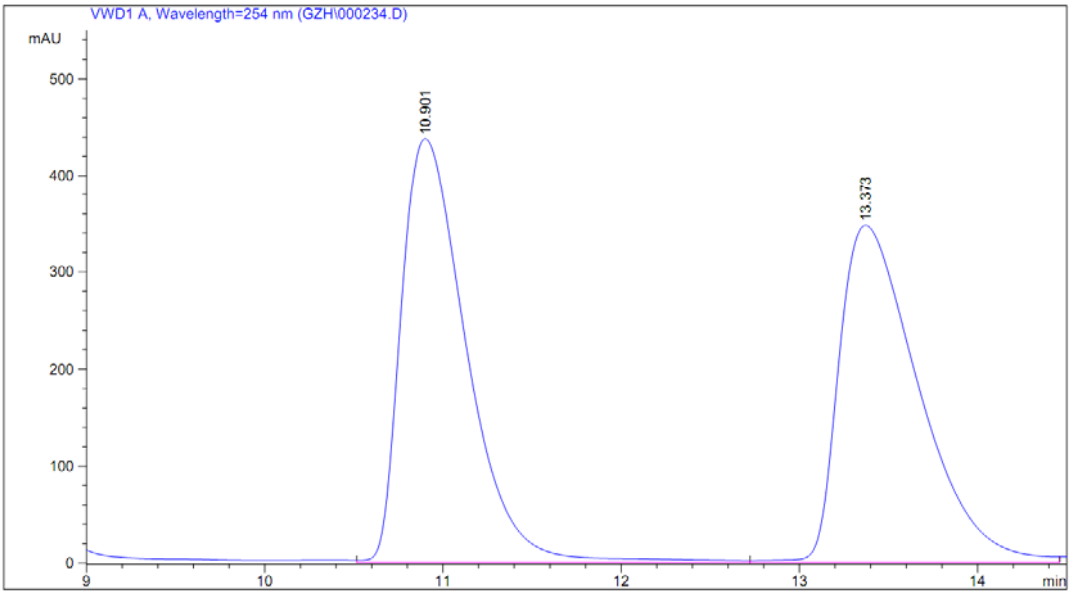



```
    ========================================================================
                            Area Percent Report
    ========================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  13.712 VV    0.6098 1447.85657   35.28292  22.3151
       2  16.880 VB    0.6294 5040.39014  123.77898  77.6849

    Totals :                  6488.24670  159.06190


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

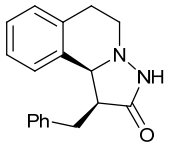


***rac*-4a**

```
Data File C:\CHEM32\1\DATA\GZH\000234.D
 Sample Name: gzh-215D

    ========================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date   : 2015-4-22 16:12:39
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2015-4-22 16:00:14  by gzh
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2015-4-22 19:42:14  by gzh
                       (modified after loading)
    Sample Info      : AD-H  H/I=65:35  0.5
                        ml/min 254 nm
```

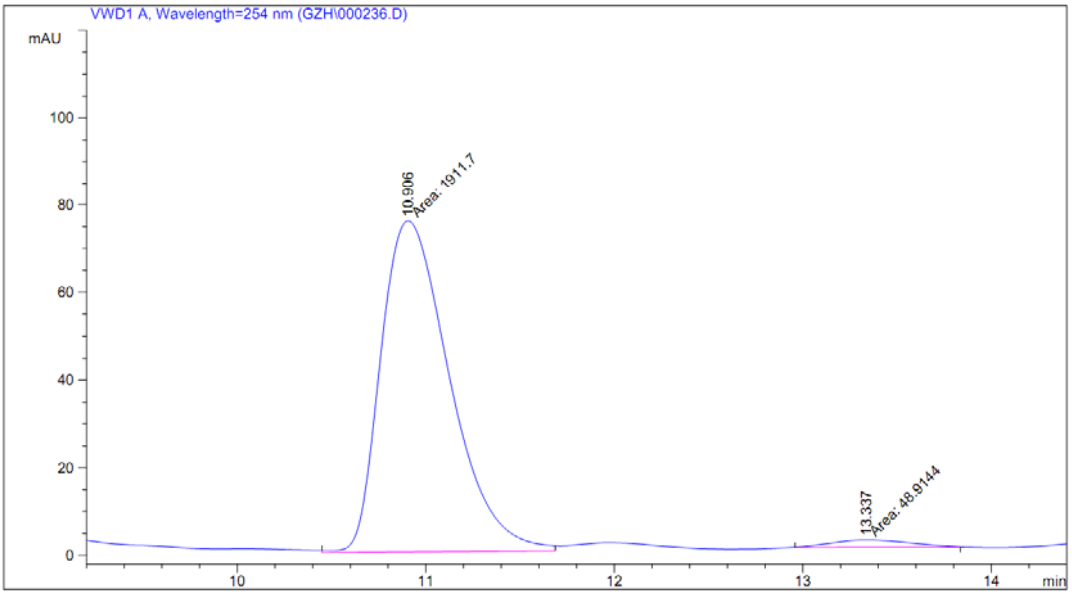



```
    ========================================================================
                              Area Percent Report
    ========================================================================

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s   [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  10.901 VV    0.3962 1.11489e4   437.65176  50.8174
       2  13.373 VV    0.4788 1.07902e4   347.40540  49.1826

    Totals :                  2.19391e4   785.05716

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



4a

```
Data File C:\CHEM32\1\DATA\GZH\000236.D
 Sample Name: gzh-215C

    ========================================================================
    Acq. Operator    : gzh
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date  : 2015-4-22 19:12:47
    Acq. Method      : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2015-4-22 17:15:49  by gzh
                       (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\JWQ20121205.M
    Last changed     : 2015-4-22 20:41:56  by gzh
                       (modified after loading)
    Sample Info      : AD-H  H/I=65:35  0.5
                        ml/min 254 nm
```




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

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


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s    [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1  10.906 MM    0.4219 1911.70020   75.52782  97.5051
       2  13.337 MM    0.4764   48.91440    1.71131   2.4949

    Totals :                  1960.61459   77.23913

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