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Supporting Information

Asymmetric Michael addition reactions of pyrrolones with chalcones catalyzed by vicinal primary-diamine salts

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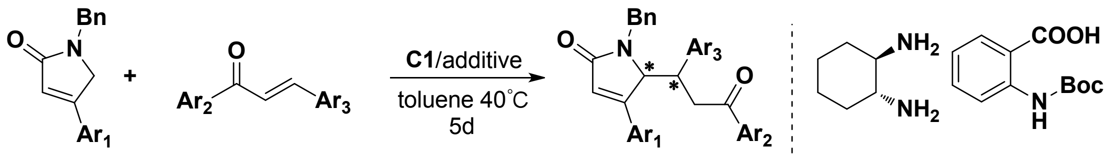
Contents

A. General information

^{1}H NMR spectra were recorded on a Bruker AVANCE III-400 spectrometer. Chemical shifts (in ppm) were referenced to the solvent residual signal (δ = 7.26 ppm) of $CDCl_3$. ^{13}C NMR spectra were obtained by using the same NMR spectrometer and were calibrated to $CDCl_3$ (δ = 77.00 ppm). High Resolution Mass spectra were recorded using a Fourier Transform Ion Cyclotron Resonance Mass Spectrometer (APEX IV, Bruker). Unless otherwise noted, materials obtained from commercial suppliers were used without further purification. Column chromatography was carried out on silica gel (particle size 200–300 mesh ASTM).

B. Experimental procedures and characterization data of products

a. General procedure for the synthesis of products

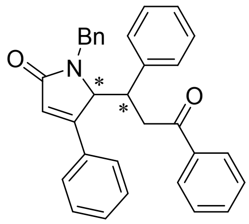


1 **2** **3** **C1** **additive**

1a Ar_1=Ph **1b Ar_1=4-BrC_6H_4** **1c Ar_1=4-$OMeC_6H_4$**

Pyrrolone **1** (0.15 mmol), chalcone **2** (0.225 mmol) was dissoloved in toluene (1.5 mL), and the catalyst **C1** (0.03 mmol), acid additive (0.06 mmol) was added. The mixture was reacted at 40 ^{o}C for 5 days. After the completion of the reaction as indicated by TLC, the mixture was cooled to room temperture and the solvent was evaporated. 10 mL of CH_2Cl_2 was added and the mixture was washed with 5% HCl, 2% NaOH, satured NaCl, the organic phase was dried with anhydrous Na_2SO_4. The mixture was filtered, the solvent was evaporated in vacuo to afford the crude product. Chromatography on silica gel (ethyl acetate-dichloromethane-petroleum ether=1:1:4) gave the corresponding product **3** as a colourless oil.

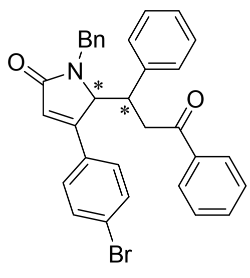
b. Characterization data



***N*-Benzyl-5-(3-oxo-1,3-diphenylpropyl)-4-phenyl-1H-pyrrol-2(5*H*)-one (3a)**

Yield 65%，colourless oil；^{1}H NMR (400 MHz, $CDCl_3$): (syn) δ 7.89 (d, J = 7.7 Hz, 2H), 7.62 (t, J = 7.4 Hz, 1H), 7.50 (t, J = 7.6 Hz, 2H), 7.30 (m, 4H), 7.28 – 7.20 (m, 4H), 7.18 – 7.11 (m, 2H), 7.09 (d, J = 7.1 Hz, 1H), 7.03 (t, J = 7.4 Hz, 2H), 6.65 (d, J = 7.5 Hz, 2H), 6.22 (s, 1H), 5.49 (dd, J = 15.3 Hz, 1H), 4.91 (d, J = 1.6 Hz, 1H), 4.34 (d, J = 15.4 Hz, 1H), 4.16 (td, J = 7.3, 2.3 Hz, 1H), 3.46 – 3.29 (m, 2H). ^{13}C NMR (100 MHz, $CDCl_3$): (syn) δ 197.57, 171.86, 160.48, 137.67, 137.00, 136.70, 133.43, 132.48, 129.52, 128.95, 128.71, 128.58, 128.14, 128.08, 128.01, 127.94, 127.79, 127.37, 126.92, 122.43, 64.53, 45.67, 40.94, 37.41； ES-HRMS: Calcd for $C_{32}H_{28}NO_2$ $[M+H]^+$, 458.2114, Found 458.2105.

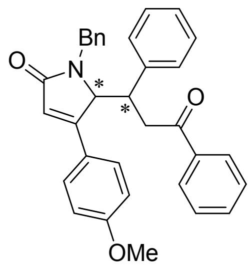
The enantiomeric excess was determined by HPLC analysis.（OD-H，hexane:IPA= 85:15，flow rate:1.0 mL/min）：t_R 9.90min（minor），t_R 20.71min（major），ee 95%



***N*-Benzyl-5-(3-oxo-1,3-diphenylpropyl)-4-(4-bromophenyl)-1H-pyrrol-2(5*H*)-one (3b)**

Yield 40%，colourless oil；^{1}H NMR (400 MHz, $CDCl_3$): (syn) δ 7.89 (d, J = 7.6 Hz, 2H), 6.80-7.80(m, 15H), 6.66 (d, J = 7.4 Hz, 2H), 6.22 (s, 1H), 5.48 (d, J = 15.3 Hz, 1H), 4.87 (m, 1H), 4.32 (d, J = 15.4 Hz, 1H), 4.18 – 4.06 (m, 1H), 3.37 (d, J = 7.1 Hz, 2H). ^{13}C NMR (100 MHz, $CDCl_3$): (syn) δ 197.48, 171.52, 159.14, 139.11, 137.51, 137.04, 136.84, 136.64, 133.52, 132.42, 131.79, 128.98, 128.84, 128.75, 128.21, 128.15, 127.98, 127.93, 123.93, 122.89, 64.38, 45.72, 40.91, 37.30； ES-HRMS: Calcd for $C_{32}H_{27}BrNO_2$ $[M+H]^+$, 536.1219, Found 536.1199.

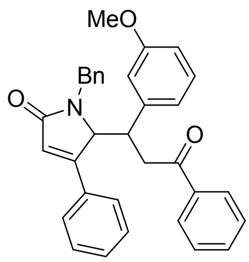
The enantiomeric excess was determined by HPLC analysis.（OD-H，hexane:IPA= 85:15，flow rate:1.0 mL/min）：t_R 11.41min（minor），t_R 26.52min（major）, ee 90%



N-Benzyl-5-(3-oxo-1,3-diphenylpropyl)-4-methoxyphenyl-1H-pyrrol-2(5H)-one (3c)

Yield 55%，colourless oil；^{1}H NMR (400 MHz, $CDCl_3$): (syn) δ 7.95 – 7.86 (m, 2H), 7.62 (t, J = 7.4 Hz, 1H), 7.50 (t, J = 7.7 Hz, 2H), 7.30 (m, 3H), 7.24 (m, 2H), 7.19 – 7.10 (m, 3H), 7.07 (t, J = 7.2 Hz, 2H), 6.79 (d, J = 8.8 Hz, 2H), 6.69 (d, J = 7.1 Hz, 2H), 6.12 (s, 1H), 5.49 (d, J = 15.4 Hz, 1H), 4.87 (d, J = 2.1 Hz, 1H), 4.34 (d, J = 15.4 Hz, 1H), 4.14 (td, J = 7.2, 2.6 Hz, 1H), 3.83 (s, 3H), 3.41 (d, J = 7.3 Hz, 2H). ^{13}C NMR (100 MHz, $CDCl_3$): (syn) δ 197.70, 172.31, 160.73, 160.10, 137.75, 137.09, 136.71, 133.44, 128.93, 128.90, 128.71, 128.11, 128.07, 127.95, 127.72, 126.94, 125.00, 120.41, 114.03, 64.29, 55.36, 45.84, 41.27, 37.86； ES-HRMS: Calcd for $C_{33}H_{30}NO_3$ $[M+H]^+$, 488.2220, Found 488.2202.

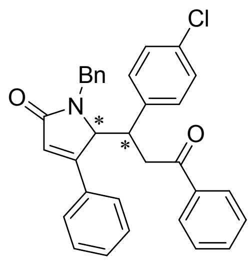
The enantiomeric excess was determined by HPLC analysis.（OD-H，hexane:IPA= 85:15，flow rate:1.0 mL/min）：t_R 12.07min（minor），t_R 27.83min（major）, ee 90%



***N*-Benzyl-5-(1-(3-methoxyphenyl)-3-oxo-3-phenylpropyl)-4-phenyl-1H-pyrrol-2(5*H*)-one (3d)**

Yield 70%，colourless oil；^{1}H NMR (400 MHz, $CDCl_3$): (syn) δ 7.79 (d, J = 7.8 Hz, 2H), 6.80-7.65 (m, 15H), 6.65 (m, 2H), 6.35 (s, 1H), 5.27 (d, J = 14.9 Hz, 1H), 4.90 (m, 1H), 4.09 (m, 1H), 3.91 (d, J = 14.9 Hz, 1H), 3.76 (s, 3H), 3.32 (ddd, J = 24.2, 17.9, 7.1 Hz, 2H). ^{13}C NMR (100 MHz, $CDCl_3$): (syn) δ 197.37, 171.66, 159.71, 159.36, 140.98, 137.22, 136.51, 133.31, 132.45, 130.20, 129.56, 129.18, 128.96, 128.62, 128.49, 128.18, 127.97, 127.33, 123.37, 120.26, 114.34, 112.20, 65.11, 55.19, 45.00, 40.65, 35.55； ES-HRMS: Calcd for $C_{33}H_{30}NO_3$ $[M+H]^+$, 488.2220, Found 488.2220.

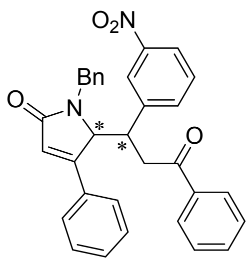
The enantiomeric excess was determined by HPLC analysis.（OD-H，hexane:IPA= 85:15，flow rate:1.0 mL/min）：t_R 12.39min（minor），t_R 30.86min（major）, ee 90%



***N*-Benzyl-5-(1-(4-chlorophenyl)-3-oxo-3-phenylpropyl)-4-phenyl-1H-pyrrol-2(5*H*)-one (3e)**

Yield 62%，colourless oil；^{1}H NMR (400 MHz, $CDCl_3$): (syn) δ 7.92 – 7.84 (m, 2H), 7.63 (t, J = 7.4 Hz, 1H), 7.50 (t, J = 7.7 Hz, 2H), 7.35 – 7.30 (m, 4H), 7.29 – 7.24 (m, 4H), 7.20 – 7.15 (m, 2H), 7.00 (t, J = 5.5 Hz, 2H), 6.56 (d, J = 8.4 Hz, 2H), 6.23 (s, 1H), 5.46 (d, J = 15.4 Hz, 1H), 4.87 (d, J = 2.1 Hz, 1H), 4.34 (d, J = 15.4 Hz, 1H), 4.10 (td, J = 7.2, 2.7 Hz, 1H), 3.36 (d, J = 7.2 Hz, 2H). ^{13}C NMR (100 MHz, $CDCl_3$): (syn) δ 197.23, 171.93, 160.25, 136.90, 136.55, 136.22, 133.56, 132.80, 132.36, 129.74, 129.32, 128.98, 128.76, 128.71, 128.18, 128.11, 127.93, 127.87, 127.36, 122.51, 64.41, 45.96, 40.62, 37.65； ES-HRMS: Calcd for $C_{32}H_{27}ClNO_2$ $[M+H]^+$, 492.1724, Found 492.1727.

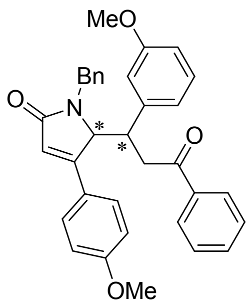
The enantiomeric excess was determined by HPLC analysis.（OD-H，hexane:IPA= 85:15，flow rate:1.0 mL/min）：t_R 10.19min（minor），t_R 20.38min（major）, ee 81%



***N*-Benzyl-5-(1-(3-nitrophenyl)-3-oxo-3-phenylpropyl)-4-phenyl-1H-pyrrol-2(5*H*)-one (3f)**

Yield 75%，colourless oil；^{1}H NMR (400 MHz, $CDCl_3$): (syn) δ 7.89 (d, J = 7.4 Hz, 2H), 7.22-7.55 (m, 15H), 7.14 (m, 2H), 6.23 (s, 1H), 5.37 (d, J = 15.3 Hz, 1H), 4.87 (m, 1H), 4.40 (d, J = 15.4 Hz, 1H), 4.24 (m, 1H), 3.41 (d, J = 7.1 Hz, 2H). ^{13}C NMR (100 MHz, $CDCl_3$): (syn) δ 196.82, 171.79, 160.02, 147.77, 140.00, 136.76, 136.27, 134.76, 134.25, 133.80, 129.98, 129.32, 129.14, 128.95, 128.88, 128.84, 128.77, 128.17, 128.06, 127.98, 127.49, 127.27, 123.02, 122.82, 122.05, 64.70, 46.13, 40.78, 36.96； ES-HRMS: Calcd for $C_{32}H_{27}N_2O_4$ $[M+H]^+$, 503.1965, Found 503.1971.

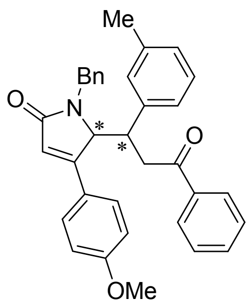
The enantiomeric excess was determined by HPLC analysis.（OD-H，hexane:IPA= 75:25，flow rate:0.3 mL/min）：t_R 48.27min（minor），t_R 81.21min（major）, ee 92%



N-Benzyl-5-(1-(3-methoxyphenyl)-3-oxo-3-phenylpropyl)-4-(4-methoxyphenyl)-1H-pyrrol-2(5H)-one (3g)

Yield 64%，colourless oil；^{1}H NMR (400 MHz, $CDCl_3$): (syn) δ 7.92 – 7.86 (m, 2H), 7.50 (t, J = 7.7 Hz, 2H), 7.41 (dd, J = 17.8, 8.3 Hz, 3H), 7.28 – 7.20 (m, 5H), 7.02 – 6.91 (m, 2H), 6.87 – 6.80 (m, 2H), 6.29 (s, 1H), 6.16 (s, 2H), 5.48 (d, J = 15.4 Hz, 1H), 4.84 (d, J = 2.1 Hz, 1H), 4.30 (d, J = 15.4 Hz, 1H), 4.14 (td, J = 7.4, 2.7 Hz, 1H), 3.82 (s, 3H), 3.58 (s, 3H), 3.34 (qd, J = 18.0, 7.2 Hz, 2H). ^{13}C NMR (100 MHz, $CDCl_3$): (syn) δ 197.65, 172.10, 160.73, 160.05, 159.24, 139.44, 137.09, 136.73, 133.41, 129.05, 128.91, 128.70, 128.43, 128.17, 127.94, 127.73, 125.10, 120.58, 120.46, 114.62, 113.94, 112.54, 64.53, 55.34, 54.92, 45.54, 41.00, 37.24； ES-HRMS: Calcd for $C_{34}H_{32}NO_4$ $[M+H]^+$, 518.2325, Found 518.2326.

The enantiomeric excess was determined by HPLC analysis.（OD-H，hexane:IPA= 85:15，flow rate:1.0 mL/min）：t_R 14.63min（minor），t_R 40.45min（major）, ee 93%

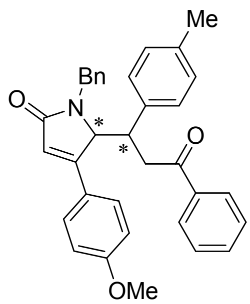


N-Benzyl-5-(1-(3-methylphenyl)-3-oxo-3-phenylpropyl)-4-(4-methoxyphenyl)-1H-pyrrol-2(5H)-one (3h)

Yield 55%；colourless oil；^{1}H NMR (400 MHz, $CDCl_3$): (syn) δ 7.89 (d, J = 7.3 Hz, 2H), 7.50 (t, J = 7.7 Hz, 2H), 7.30 (m, 5H), 6.95(m, 4H), 6.78 (t, J = 6.8 Hz, 2H), 6.38

(s, 1H), 6.14 (s, 1H), 5.43 (d, J = 15.4 Hz, 1H), 4.83 (m, 1H), 4.34 (d, J = 15.4 Hz, 1H), 4.12 (td, J = 7.1, 2.7 Hz, 1H), 3.82 (s, 3H), 3.35 (m, 2H), 2.11 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$): (syn) δ 197.74, 172.15, 160.70, 160.19, 139.56, 137.73, 137.46, 137.22, 136.79, 133.37, 128.96, 128.89, 128.68, 128.38, 128.21, 127.96, 127.70, 127.31, 125.26, 124.78, 120.60, 113.88, 64.80, 55.33, 45.67, 40.96, 37.33, 21.28; ES-HRMS: Calcd for $C_{34}H_{32}NO_3$ $[M+H]^+$, 502.2376, Found 502.2373.

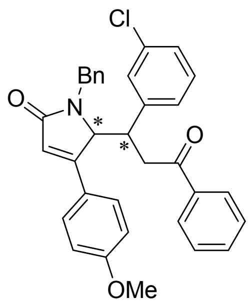
The enantiomeric excess was determined by HPLC analysis.（OD-H，hexane:IPA= 85:15，flow rate:1.0 mL/min）：t_R 10.72min（minor），t_R 22.10min（major）, ee 85%



***N*-Benzyl-5-(1-(p-tolyl)-3-oxo-3-phenylpropyl)-4-(4-methoxyphenyl)-1H-pyrrol-2(5*H*)-one (3i)**

Yield 60%，colourless oil；^{1}H NMR (400 MHz, $CDCl_3$): (syn) δ 7.89 (d, J = 8.0 Hz, 2H), 7.62 (t, J = 7.3 Hz, 1H), 7.50 (t, J = 7.6 Hz, 2H), 7.28 (m, 3H), 7.20 (m. 4H), 6.88 (d, J = 7.8 Hz, 2H), 6.81 (d, J = 8.6 Hz, 2H), 6.58 (d, J = 7.8 Hz, 2H), 6.11 (s, 1H), 5.48 (d, J = 15.4 Hz, 1H), 4.86 (d, J = 1.0 Hz, 1H), 4.33 (d, J = 15.4 Hz, 1H), 4.07 (t, J = 6.2 Hz, 1H), 3.84 (s, 3H), 3.50 – 3.32 (m, 2H), 2.25 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$): (syn) δ 197.79, 172.40, 160.75, 160.12, 137.14, 136.48, 134.58, 133.37, 128.97, 128.85, 128.71, 128.68, 128.07, 127.98, 127.95, 127.66, 125.08, 120.31, 114.01, 64.22, 55.34, 45.95, 41.13, 38.35, 20.96； ES-HRMS: Calcd for $C_{34}H_{32}NO_3$ $[M+H]^+$, 502.2376, Found 502.2374.

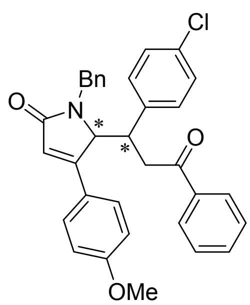
The enantiomeric excess was determined by HPLC analysis.（OD-H，hexane:IPA= 85:15，flow rate:1.0 mL/min）：t_R 10.20min（minor），t_R 20.41min（major）, ee 85%



N-Benzyl-5-(1-(3-chloroophenyl)-3-oxo-3-phenylpropyl)-4-(4-methoxyphenyl)-1H-pyrrol-2(5*H*)-one (3j)

Yield 82%，colourless oil；^{1}H NMR (400 MHz, $CDCl_3$): (syn) δ 7.88 (d, J = 7.7 Hz, 2H), 7.63 (t, J = 7.2 Hz, 1H), 7.51 (t, J = 7.5 Hz, 2H), 7.32 (m, 3H), 7.28 (m, 2H), 7.10 (t, J = 7.7 Hz, 3H), 7.02 (t, J = 7.7 Hz, 1H), 6.81 (d, J = 8.2 Hz, 3H), 6.62 (d, J = 7.6 Hz, 1H), 6.53 (s, 1H), 6.15 (s, 1H), 5.39 (d, J = 15.4 Hz, 1H), 4.81 (s, 1H), 4.34 (d, J = 15.3 Hz, 1H), 4.11 (t, J = 6.6 Hz, 1H), 3.84 (s, 3H), 3.38 – 3.27 (m, 2H). ^{13}C NMR (100 MHz, $CDCl_3$): (syn) δ 197.25, 172.22, 160.95, 159.96, 140.01, 137.02, 136.52, 133.88, 133.58, 129.28, 128.99, 128.91, 128.75, 128.39, 128.16, 127.96, 127.84, 127.13, 126.38, 124.83, 120.69, 114.14, 64.60, 55.38, 45.92, 40.86, 37.23； ES-HRMS: Calcd for $C_{33}H_{29}ClNO_3$ $[M+H]^+$, 522.1830, Found 522.1830.

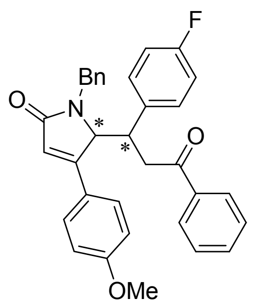
The enantiomeric excess was determined by HPLC analysis.（OD-H，hexane:IPA= 92:8，flow rate:1.0 mL/min）：t_R 25.87min（minor），t_R 57.63min（major）, ee 83%



N-Benzyl-5-(1-(4-chlorophenyl)-3-oxo-3-phenylpropyl)-4-(4-methoxyphenyl)-1H-pyrrol-2(5*H*)-one (3k)

Yield 64%, colourless oil; ^{1}H NMR (400 MHz, $CDCl_3$): (syn) δ 7.88 (d, J = 7.6 Hz, 2H), 7.63 (t, J = 7.4 Hz, 1H), 7.51 (t, J = 7.7 Hz, 2H), 7.30 (m, 3H), 7.26 – 7.20 (m, 2H), 7.15 (d, J = 8.7 Hz, 2H), 7.03 (d, J = 8.4 Hz, 2H), 6.82 (d, J = 8.7 Hz, 2H), 6.59 (d, J = 8.4 Hz, 2H), 6.12 (s, 1H), 5.45 (d, J = 15.4 Hz, 1H), 4.83 (d, J = 2.3 Hz, 1H), 4.33 (d, J = 15.4 Hz, 1H), 4.08 (td, J = 7.1, 2.4 Hz, 1H), 3.84 (s, 3H), 3.46 – 3.30 (m, 2H). ^{13}C NMR (100 MHz, $CDCl_3$): (syn) δ 197.37, 172.39, 160.89, 159.91, 136.98, 136.54, 136.29, 133.58, 132.76, 129.41, 128.94, 128.89, 128.76, 128.14, 128.08, 127.94, 127.81, 124.81, 120.47, 114.14, 64.21, 55.40, 46.10, 40.92, 37.99; ES-HRMS: Calcd for $C_{33}H_{29}ClNO_3$ $[M+H]^+$, 522.1830, Found 522.1833.

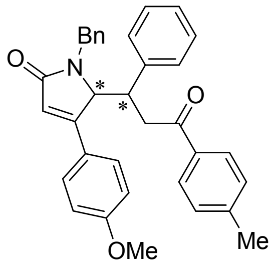
The enantiomeric excess was determined by HPLC analysis. (OD-H, hexane:IPA= 90:10, flow rate:1.0 mL/min) : t_R 18.24min (minor), t_R 38.63min (major), ee 87%



N-Benzyl-5-(1-(4-fluorophenyl)-3-oxo-3-phenylpropyl)-4-(4-methoxyphenyl)-1H-pyrrol-2(5H)-one (3l)

Yield 55%, colourless oil; ^{1}H NMR (400 MHz, $CDCl_3$): (syn) δ 7.90 – 7.86 (m, 2H), 7.63 (t, J = 7.4 Hz, 1H), 7.51 (t, J = 7.7 Hz, 2H), 7.30 (m, 3H), 7.23 (m, 2H), 7.17 (d, J = 8.8 Hz, 2H), 6.83 (d, J = 8.8 Hz, 2H), 6.77 (t, J = 8.7 Hz, 2H), 6.63 (m, 2H), 6.12 (s, 1H), 5.46 (d, J = 15.4 Hz, 1H), 4.84 (d, J = 1.9 Hz, 1H), 4.34 (d, J = 15.4 Hz, 1H), 4.09 (td, J = 7.2, 2.3 Hz, 1H), 3.84 (s, 3H), 3.43 (dd, J = 18.2, 7.1 Hz, 1H), 3.36 (dd, J = 18.1, 7.7 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$): (syn) δ 197.49, 172.44, 161.71(d, J = 244.0Hz), 160.88, 160.00, 137.02, 136.60, 133.54, 129.63, 129.55, 128.92(d, J = 1.5Hz), 128.75, 128.07, 127.94, 127.78, 124.88, 120.42, 114.97, 114.76, 114.14, 64.25, 55.39, 46.12, 40.81, 38.34； ES-HRMS: Calcd for $C_{33}H_{29}FNO_3$ $[M+H]^+$, 506.2126, Found 506.2126.

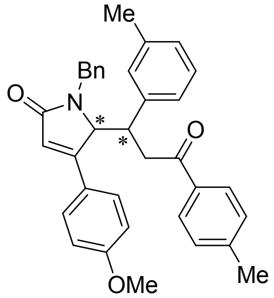
The enantiomeric excess was determined by HPLC analysis.（OD-H，hexane:IPA= 85:15，flow rate:1.0 mL/min）：t_R 13.20min（minor），t_R 29.05min（major）, ee 85%



N-Benzyl-5-(3-oxo-1-phenyl-3-(p-tolyl)propyl)-4-(4-methoxyphenyl)-1H-pyrrol-2(5*H*)-one (3m)

Yield 69%; colourless oil; ^{1}H NMR (400 MHz, $CDCl_3$): (syn) δ 7.81 (d, J = 8.2 Hz, 2H), 7.39 (d, J = 8.7 Hz, 2H), 7.34 – 7.04 (m, 12H), 6.81 (m, 2H), 6.11 (s, 1H), 5.48 (d, J = 15.4 Hz, 1H), 4.89 (d, J = 1.9 Hz, 1H), 4.35 (d, J = 15.4 Hz, 1H), 4.15 (m, 1H), 3.82 (s, 3H), 3.38 (m, 2H), 2.45 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$): (syn) δ 197.33, 172.37, 160.75, 160.17, 144.28, 137.86, 137.18, 134.31, 129.38, 128.94, 128.88, 128.45, 128.16, 128.09, 127.96, 127.70, 126.91, 125.04, 120.37, 114.05, 64.31, 55.35, 45.91, 41.41, 37.85, 21.70; ES-HRMS: Calcd for $C_{34}H_{32}NO_3$ $[M+H]^+$, 502.2376, Found 502.2373.

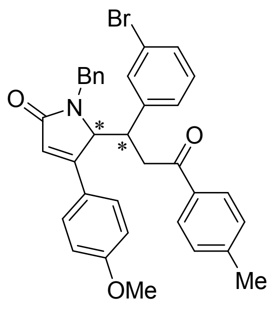
The enantiomeric excess was determined by HPLC analysis.（OD-H，hexane:IPA= 95:5，flow rate:1.0 mL/min）：t_R 39.43min（minor），t_R 93.11min（major）, ee 84%



***N*-Benzyl-5-(1-(3-bromophenyl)-3-oxo-3-(p-tolyl)propyl)-4-(4-methoxyphenyl)-1H-pyrrol-2(5*H*)-one (3n)**

Yield 66%; colourless oil ; ^{1}H NMR (400 MHz, CDCl$_3$): (syn+anti) δ 7.81 (d, J = 8.0 Hz, 1H), 7.74 (d, J = 8.0 Hz, 1H), 7.38 (t, J = 12.4 Hz, 1H), 7.35 – 7.27 (m, 3H), 7.22 (dd, J = 11.2, 8.6 Hz, 2H), 7.10 (d, J = 8.8 Hz, 1H), 6.99 – 6.87 (m, 2H), 6.78 (t, J = 7.3 Hz, 2H), 6.53 (d, J = 7.4 Hz, 0H), 6.38 (s, 0H), 6.27 (s, 0H), 6.13 (s, 0H), 5.43 (d, J = 15.3 Hz, 0H), 5.23 (d, J = 14.9 Hz, 0H), 4.84 (s, 1H), 4.35 (d, J = 15.3 Hz, 0H), 4.21 – 4.03 (m, 1H), 3.82 (dd, J = 13.1, 8.6 Hz, 3H), 3.50 (dd, J = 17.8, 9.3 Hz, 0H), 3.33 (d, J = 7.2 Hz, 1H), 2.94 (dd, J = 17.8, 5.0 Hz, 0H), 2.45 (s, 1H), 2.42 (s, 1H). ^{13}C NMR (100 MHz, CDCl$_3$): (syn+anti) δ 197.37, 197.13, 172.23, 172.15, 161.15, 160.69, 160.26, 159.15, 144.22, 144.10, 139.65, 138.16, 137.81, 137.41, 137.36, 137.27, 134.34, 134.17, 129.36, 129.28, 128.97, 128.91, 128.88, 128.86, 128.44, 128.39, 128.24, 128.18, 128.15, 128.10, 127.92, 127.90, 127.69, 127.61, 127.31, 125.28, 125.22, 124.80, 121.21, 120.53, 114.58, 113.89, 65.35, 64.79, 55.40, 55.33, 45.73, 45.05, 41.04, 40.80, 37.28, 34.95, 21.70, 21.65, 21.52, 21.29; ES-HRMS: Calcd for $C_{34}H_{31}BrNO_3$ [M+H]$^+$, 516.2533, Found 516.2534.

The enantiomeric excess was determined by HPLC analysis.（OD-H，hexane:IPA= 85:15，flow rate:1.0 mL/min）：t_R 9.88min（minor），t_R 18.34min（major）, ee 85%

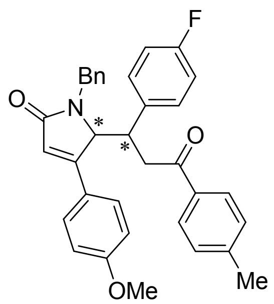


***N*-Benzyl-5-(1-(3-bromophenyl)-3-oxo-3-(p-tolyl)propyl)-4-(4-methoxyphenyl)-1H-pyrrol-2(5*H*)-one (3o)**

Yield 64%，colourless oil；^{1}H NMR (400 MHz, CDCl$_3$): (syn) δ 7.78 (d, J = 8.0 Hz, 2H), 7.37 – 7.20 (m, 8H), 7.11 (d, J = 8.5 Hz, 2H), 6.96 (t, J = 8.0 Hz, 1H), 6.81 (d, J

= 8.6 Hz, 2H), 6.66 (d, *J* = 6.5 Hz, 2H), 6.14 (s, 1H), 5.37 (d, *J* = 15.3 Hz, 1H), 4.81 (s, 1H), 4.38 – 4.27 (d, *J* =15.3Hz, 1H), 4.08 (td, *J* = 7.0, 2.2 Hz, 1H), 3.84 (s, 3H), 3.37 – 3.21 (m, 2H), 2.46 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$): (syn) δ 196.85, 172.26, 160.94, 160.01, 144.47, 140.40, 137.07, 134.08, 131.31, 130.01, 129.54, 129.42, 128.98, 128.91, 128.20, 128.09, 127.82, 126.84, 124.85, 122.12, 120.69, 114.14, 64.66, 55.37, 45.95, 40.90, 37.05, 21.71, 1.02； ES-HRMS: Calcd for $C_{34}H_{31}BrNO_3$ $[M+H]^+$, 580.1481, Found 580.1478.

The enantiomeric excess was determined by HPLC analysis.（OD-H，hexane:IPA= 85:15，flow rate:1.0 mL/min）：t_R 13.07min（minor），t_R 23.90min（major）, ee 86%



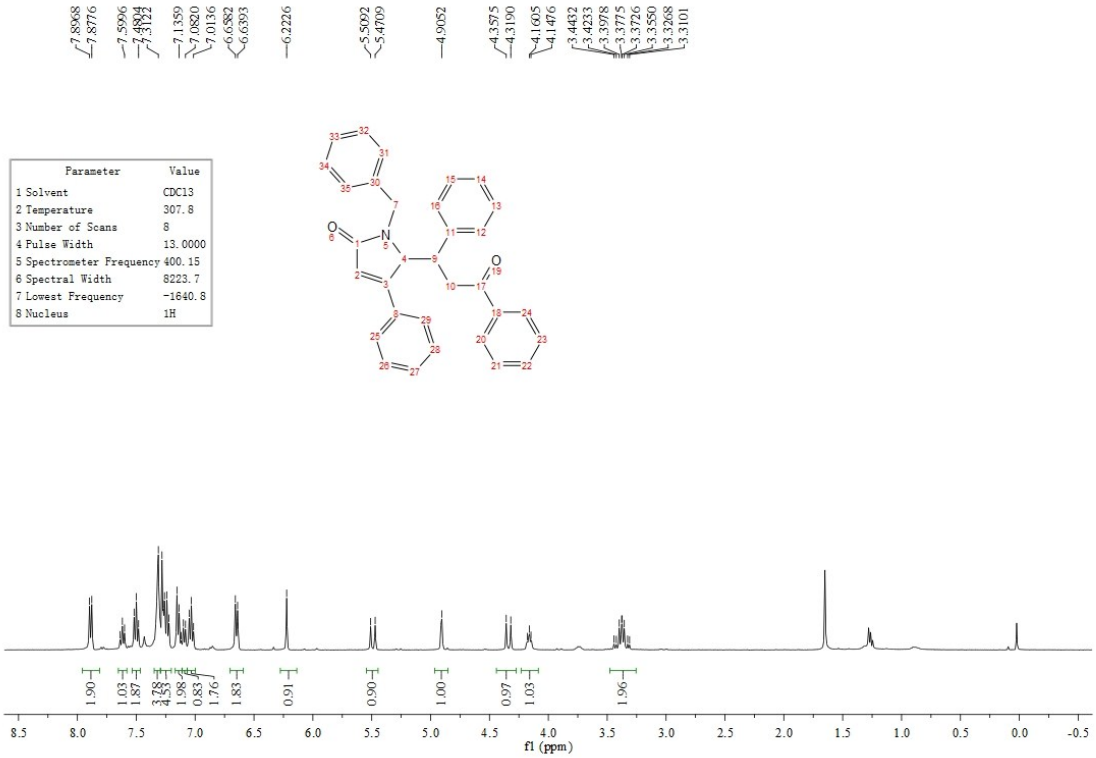
N-Benzyl-5-(1-(4-fluorophenyl)-3-oxo-3-(p-tolyl)propyl)-4-(4-methoxyphenyl)-1H-pyrrol-2(5*H*)-one (3p)

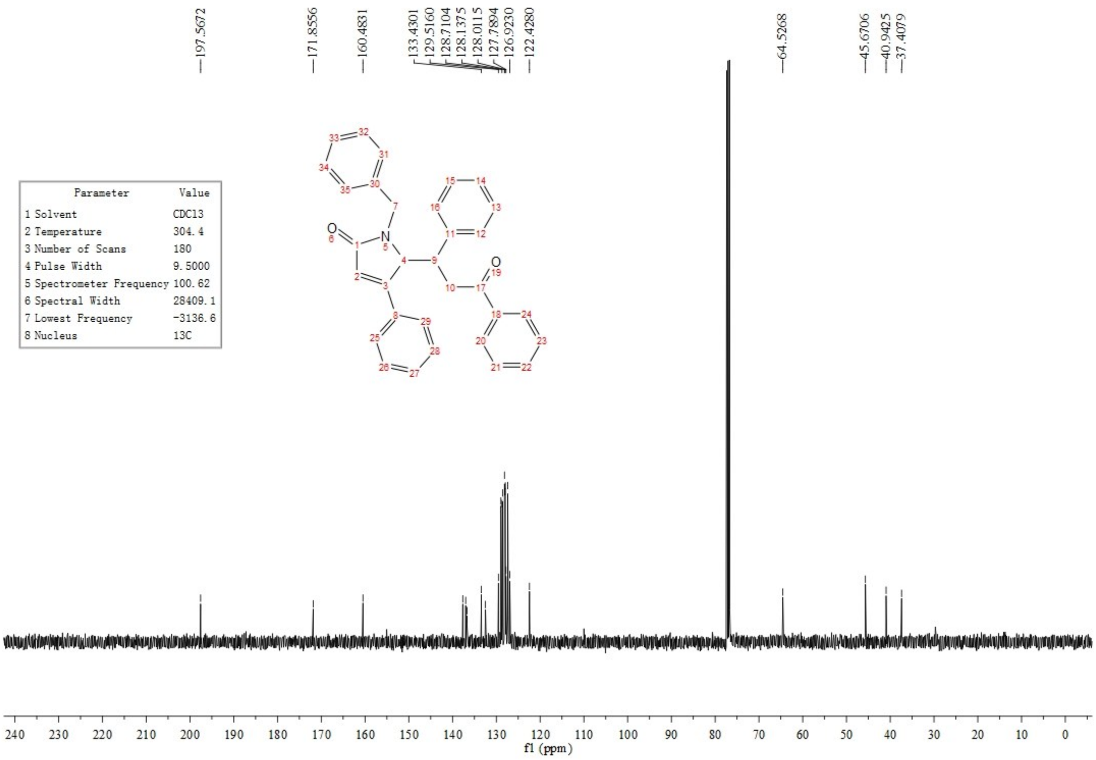
Yield 90%，colourless oil；^{1}H NMR (400 MHz, $CDCl_3$): (syn) δ 7.77 (t, *J* = 16.7 Hz, 2H), 7.30 (m, 5H), 7.26 – 7.21 (m, 2H), 7.18 (d, *J* = 8.8 Hz, 2H), 6.83 (d, *J* = 8.8 Hz, 2H), 6.76 (m, *J* = 8.6 Hz, 2H), 6.63 (m, 2H), 6.11 (s, 1H), 5.45 (d, *J* = 15.4 Hz, 1H), 4.84 (d, *J* = 2.2 Hz, 1H), 4.33 (d, *J* = 15.4 Hz, 1H), 4.07 (dt, *J* = 20.2, 10.1 Hz, 1H), 3.84 (s, 3H), 3.37 (m, 2H), 2.46 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$): (syn) δ 197.12, 172.50, 160.87, 160.06, 144.44, 137.06, 134.16, 133.55, 129.64, 129.56, 129.42, 128.91, 128.10, 128.07, 127.76, 124.90, 120.37, 114.93, 114.72, 114.12, 64.25, 55.38, 46.15, 40.87, 38.24, 21.70； ES-HRMS: Calcd for $C_{34}H_{31}FNO_3$ $[M+H]^+$, 520.2282, Found 520.2283.

The enantiomeric excess was determined by HPLC analysis.（OD-H，hexane:IPA= 92:8，flow rate:1.0 mL/min）：t_R 20.47min（minor），t_R 50.49min（major）, ee 87%

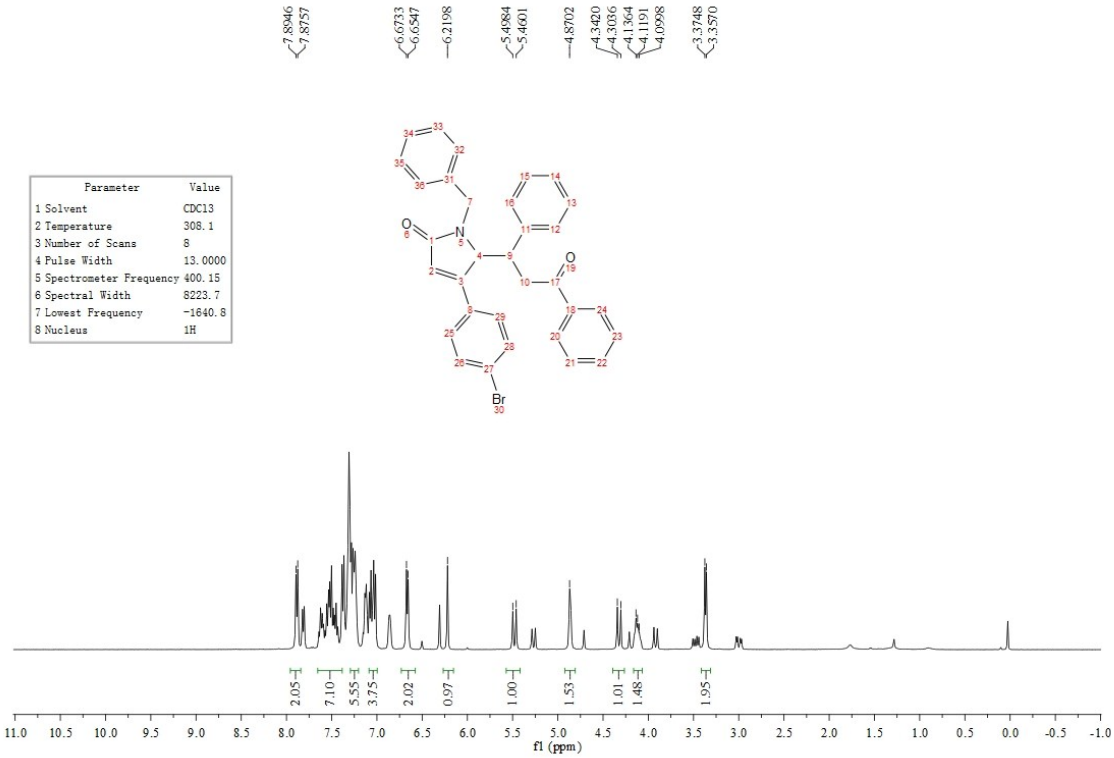
c NMR Spectra

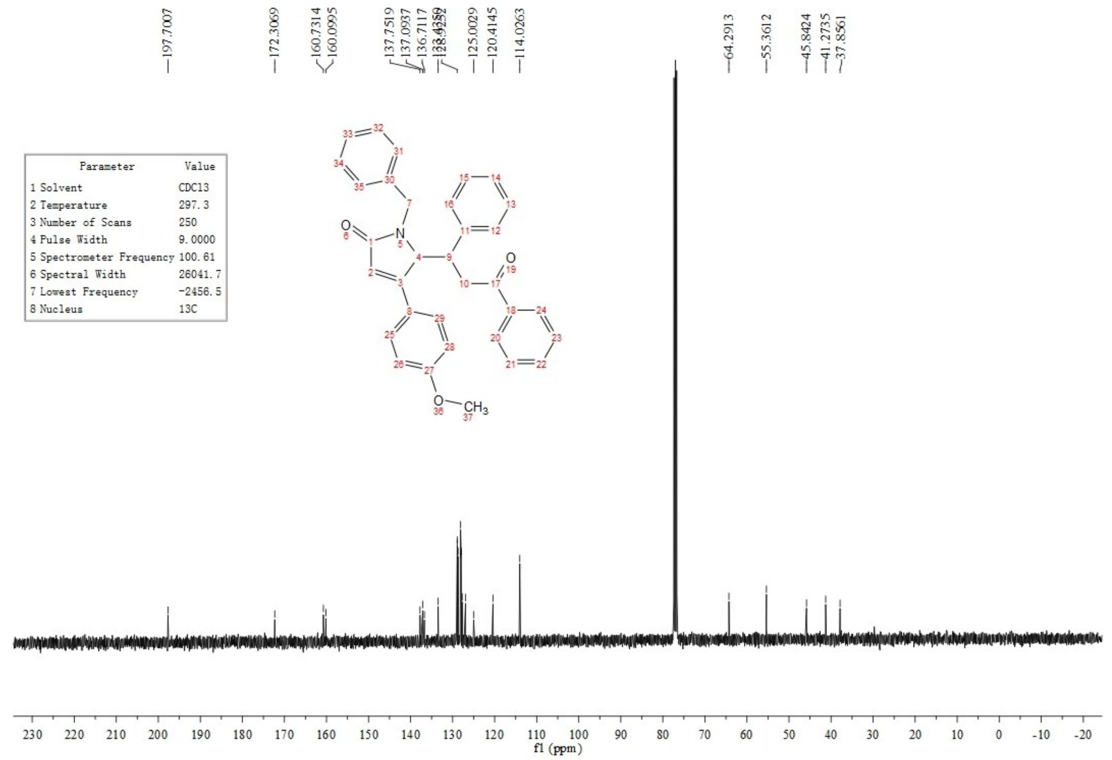
^{1}H NMR and ^{13}C NMR spectra of 3a



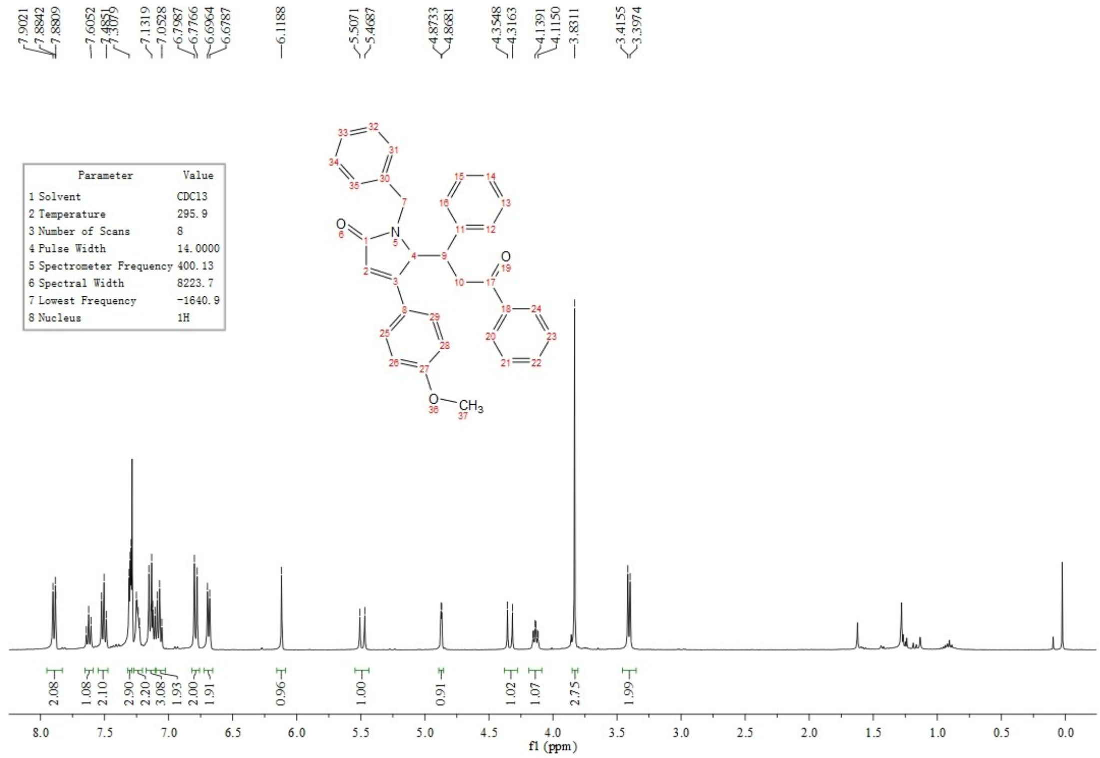


^{1}H NMR and ^{13}C NMR spectra of 3b

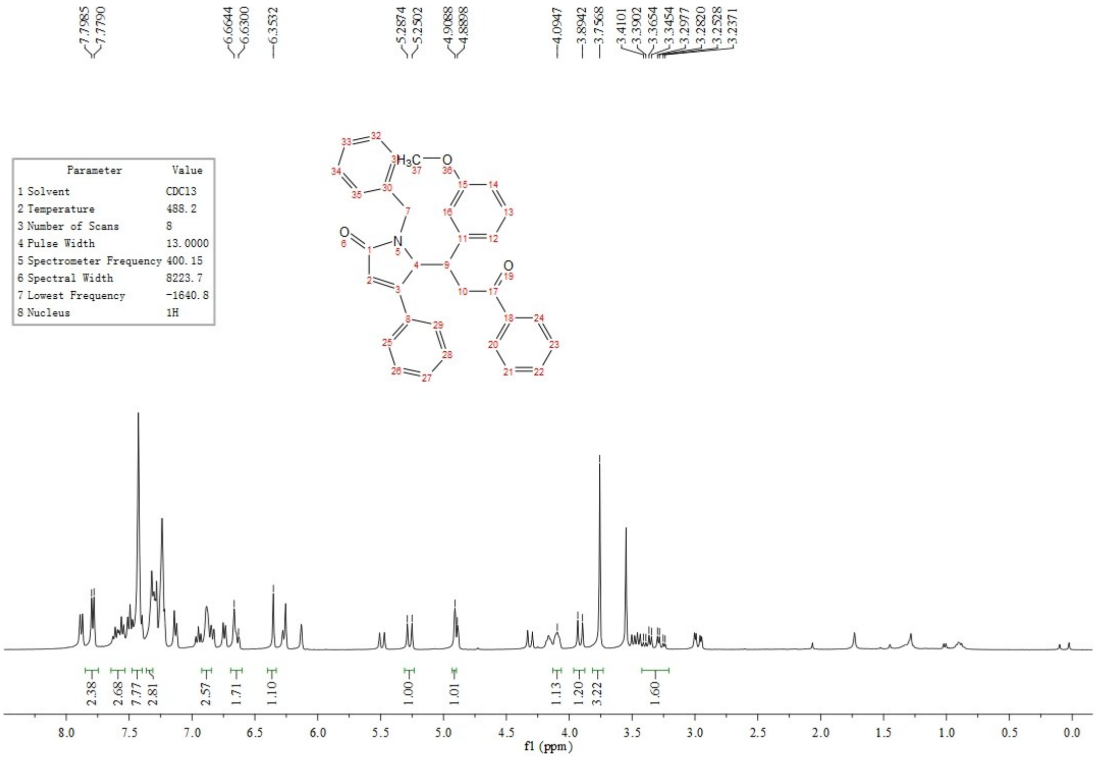


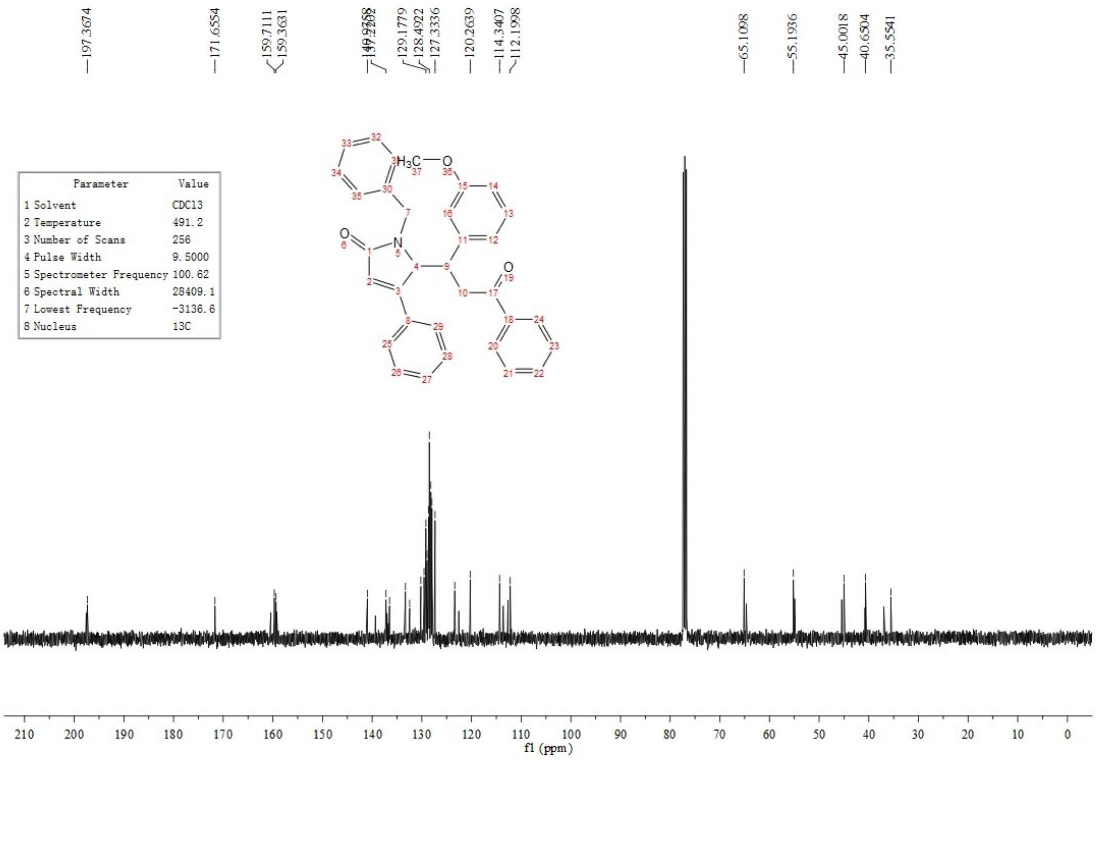


^{1}H NMR and ^{13}C NMR spectra of 3c

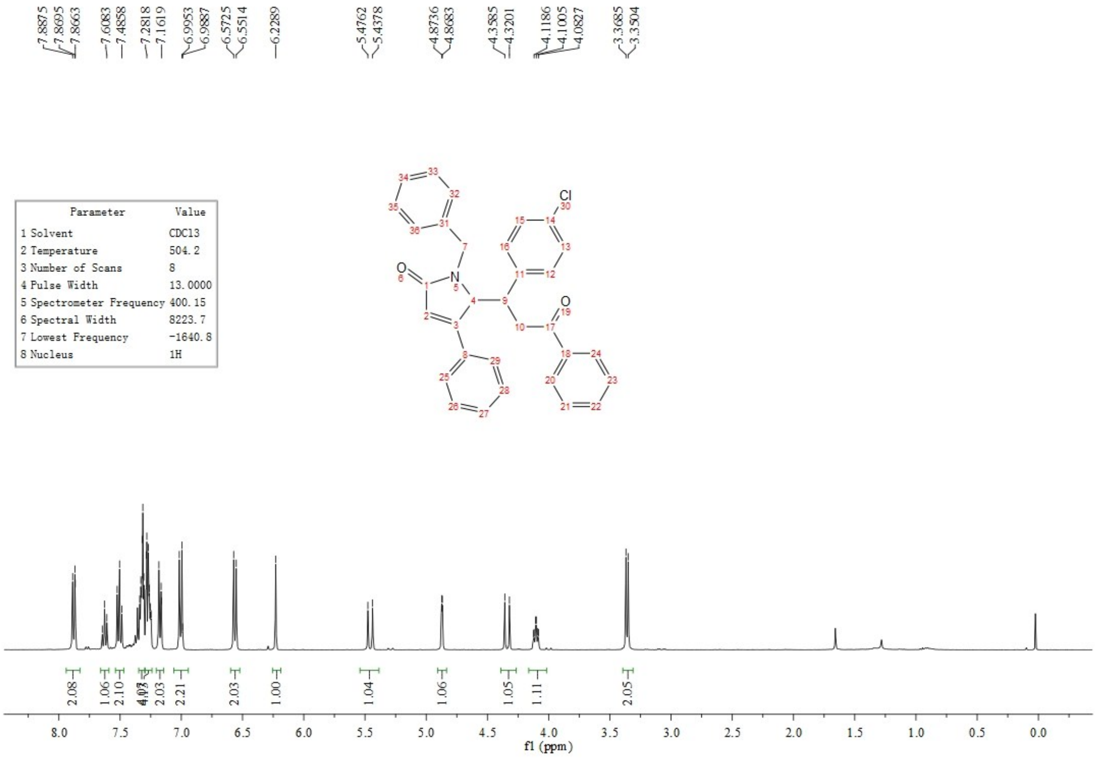


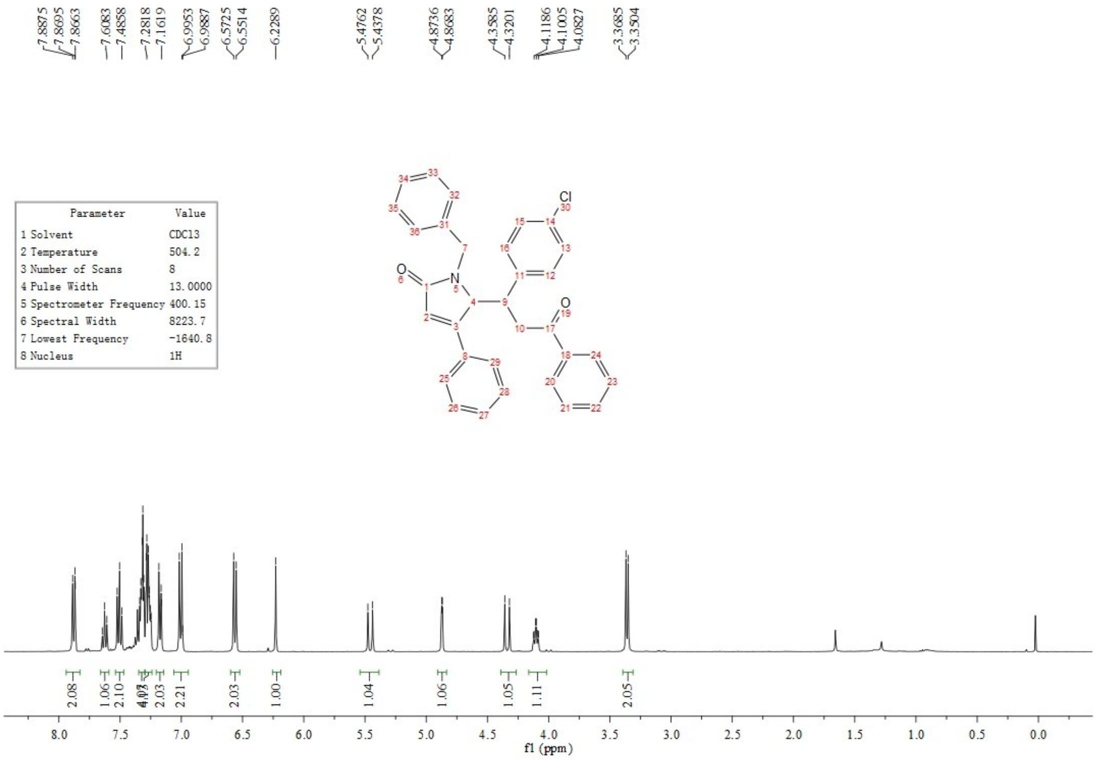
[1]H NMR and [13]C NMR spectra of 3d



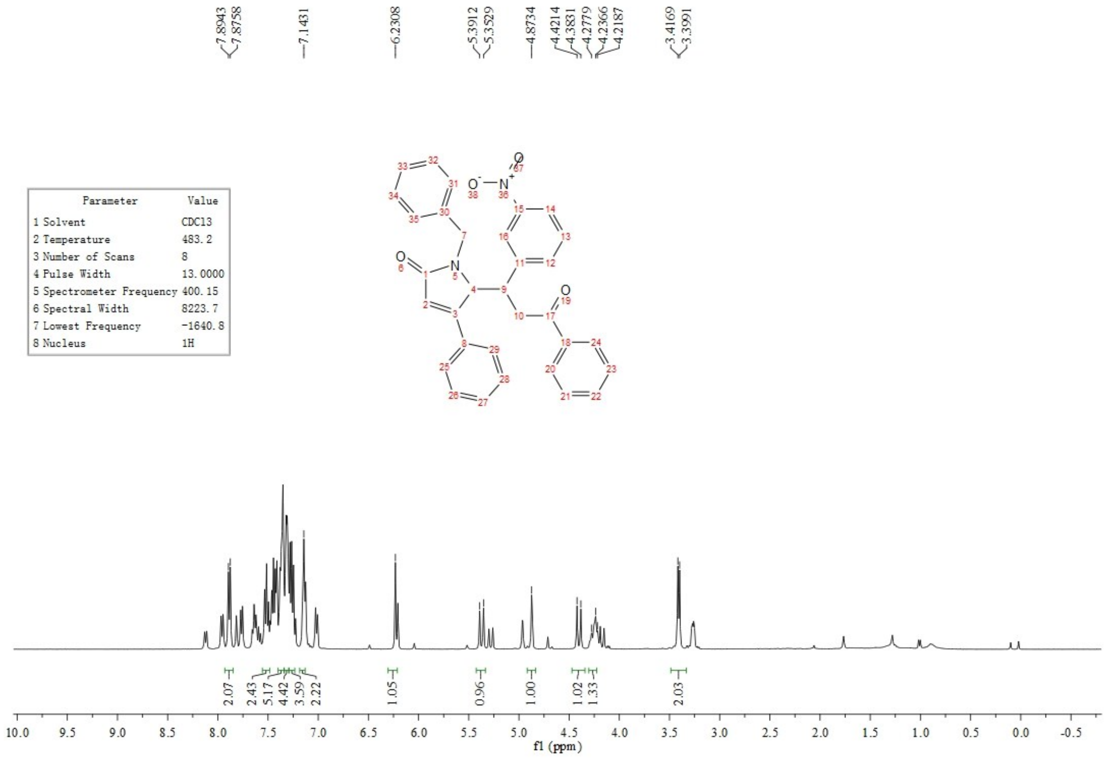


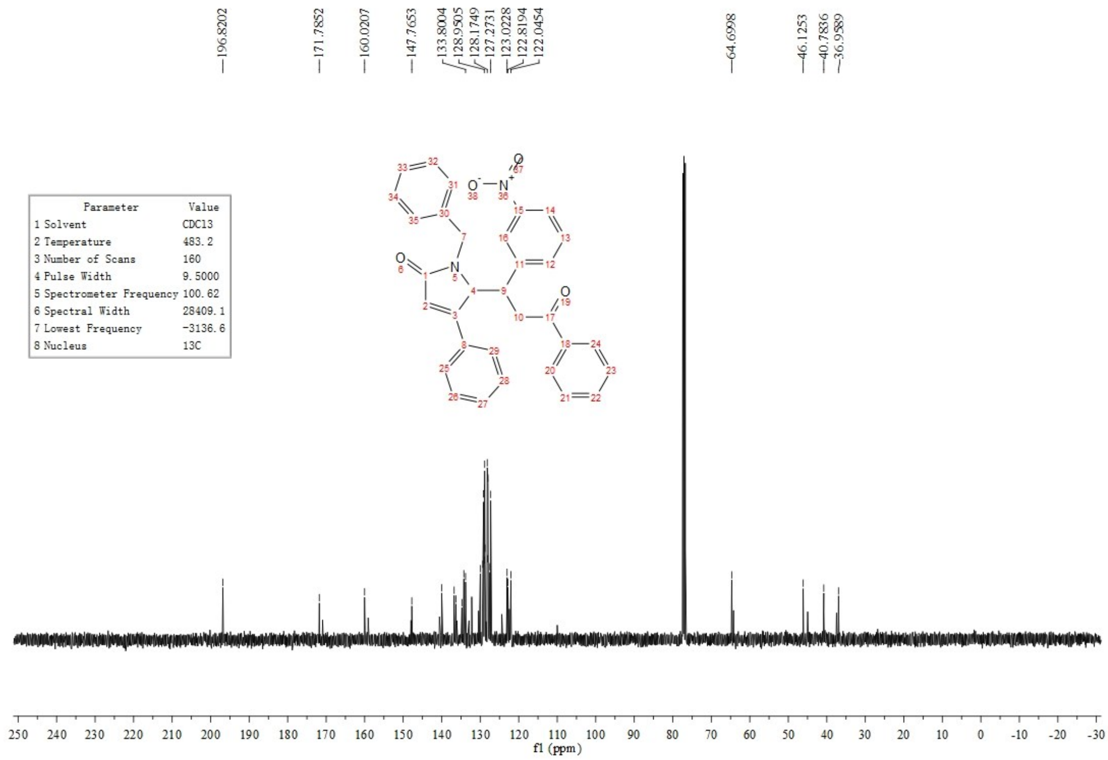
^{1}H NMR and ^{13}C NMR spectra of 3e



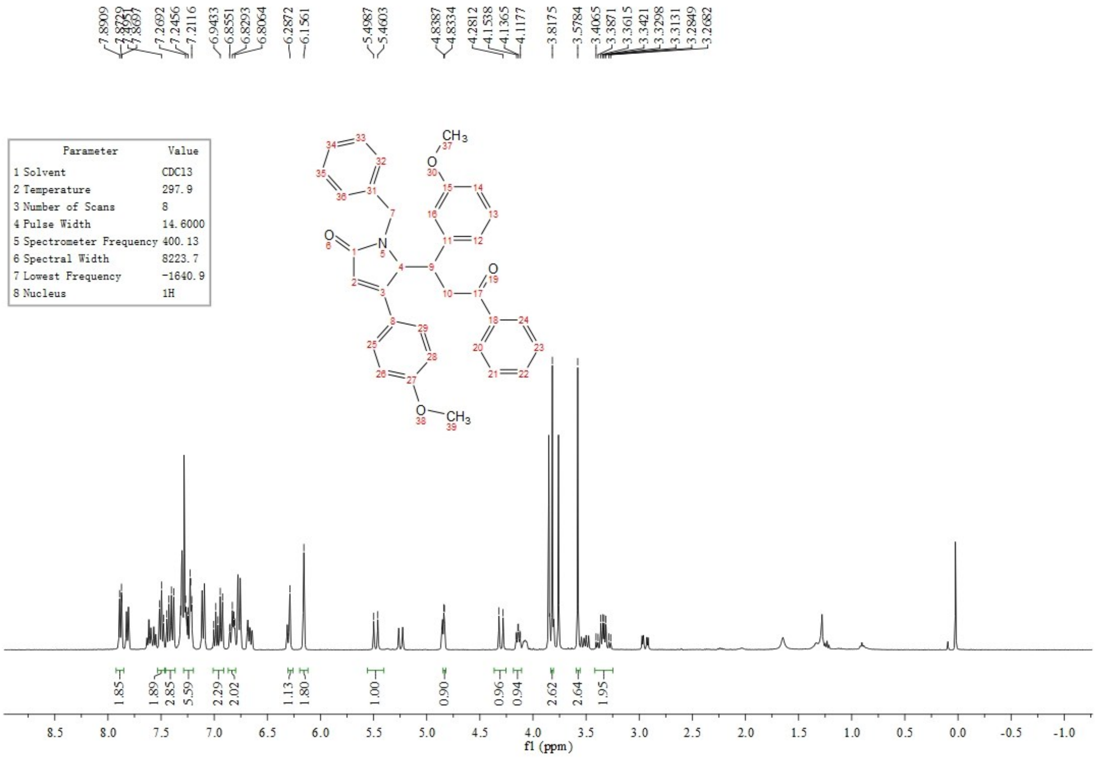


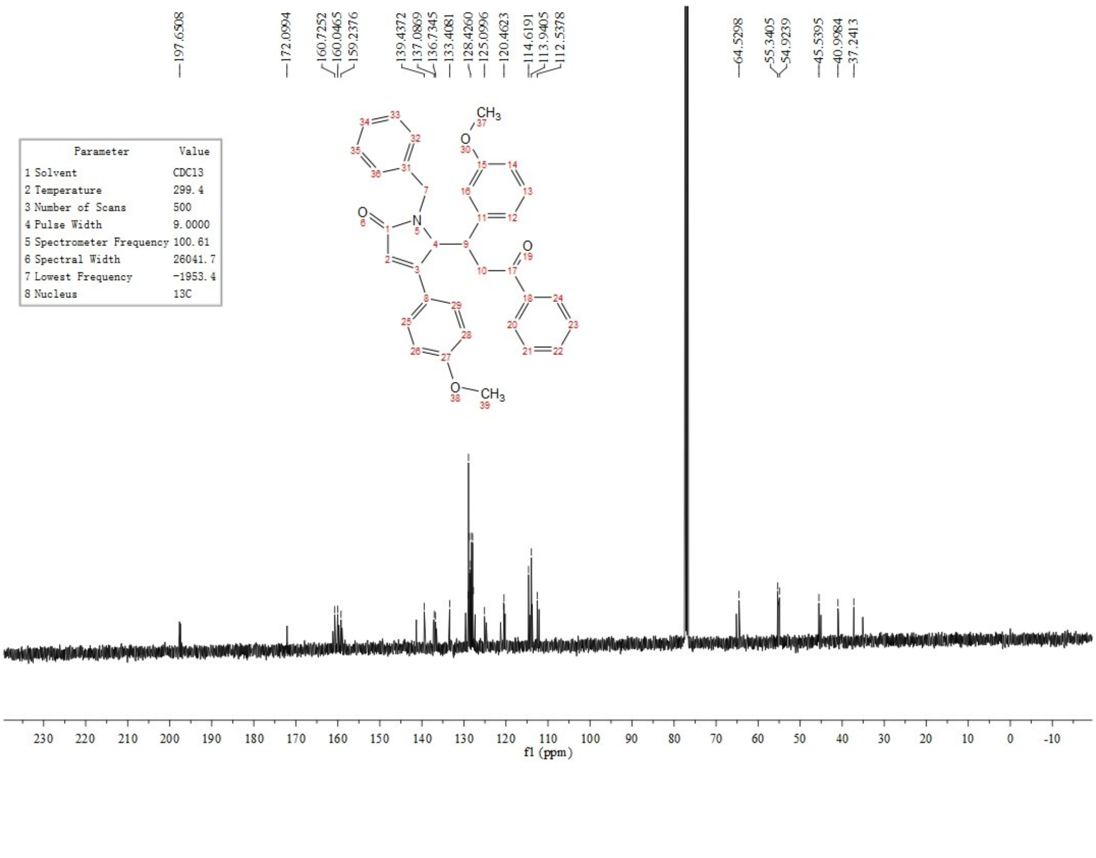
^{1}H NMR and ^{13}C NMR spectra of 3f



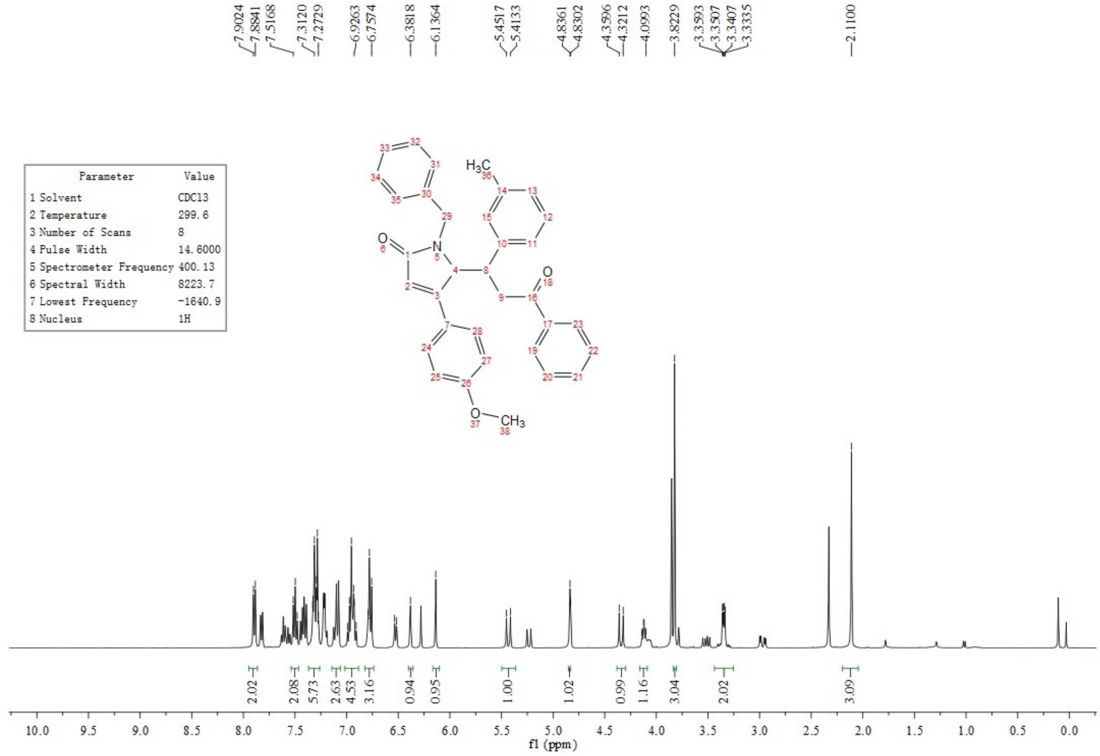


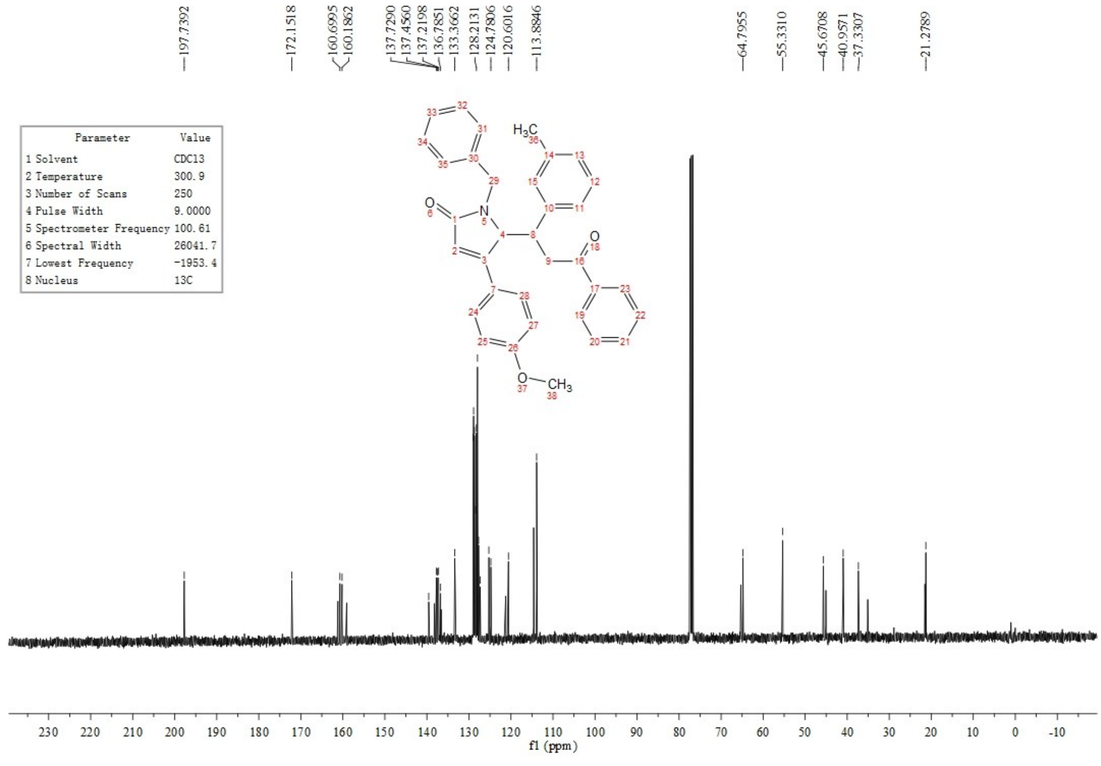
^{1}H NMR and ^{13}C NMR spectra of 3g



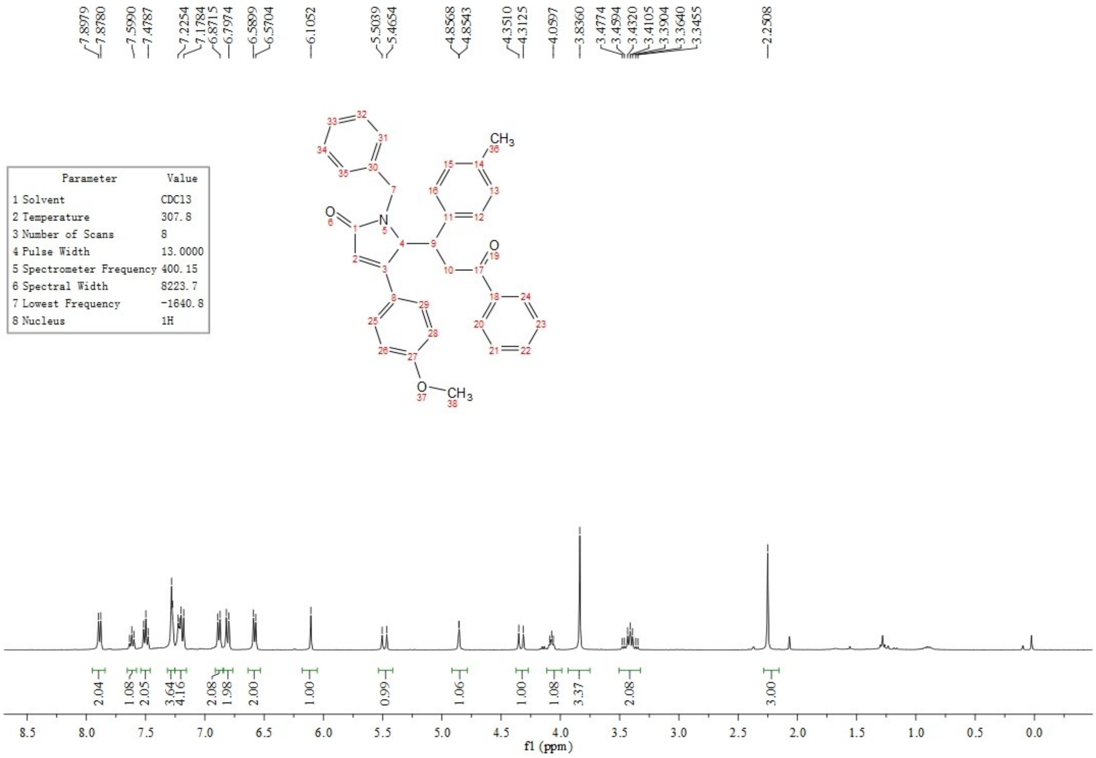


[1]H NMR and [13]C NMR spectra of 3h





[1]H NMR and [13]C NMR spectra of 3i


7.8979
7.8780
7.5990
7.4787
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6.1052
5.5039
5.4654
4.8568
4.8543
4.3510
4.3125
4.0597
3.8360
3.4774
3.4594
3.4320
3.4105
3.3904
3.3640
3.3455
2.2508
Parameter Value
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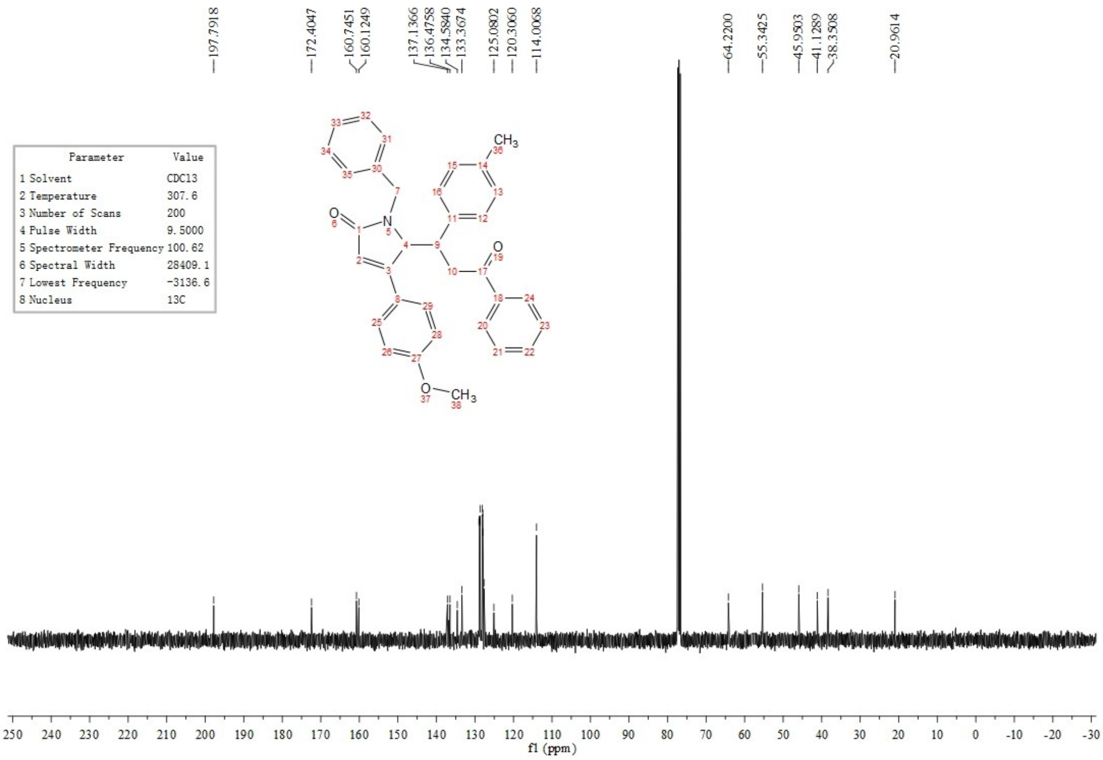
2 Temperature 307.8
3 Number of Scans 8
4 Pulse Width 13.0000
5 Spectrometer Frequency 400.15
6 Spectral Width 8223.7
7 Lowest Frequency -1640.8
8 Nucleus 1H
2.04
1.08
2.05
3.64
4.16
2.08
1.98
2.00
1.00
0.99
1.06
1.00
1.08
3.37
2.08
3.00
f1 (ppm)


197.7918
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160.1249
137.1366
136.4758
134.5840
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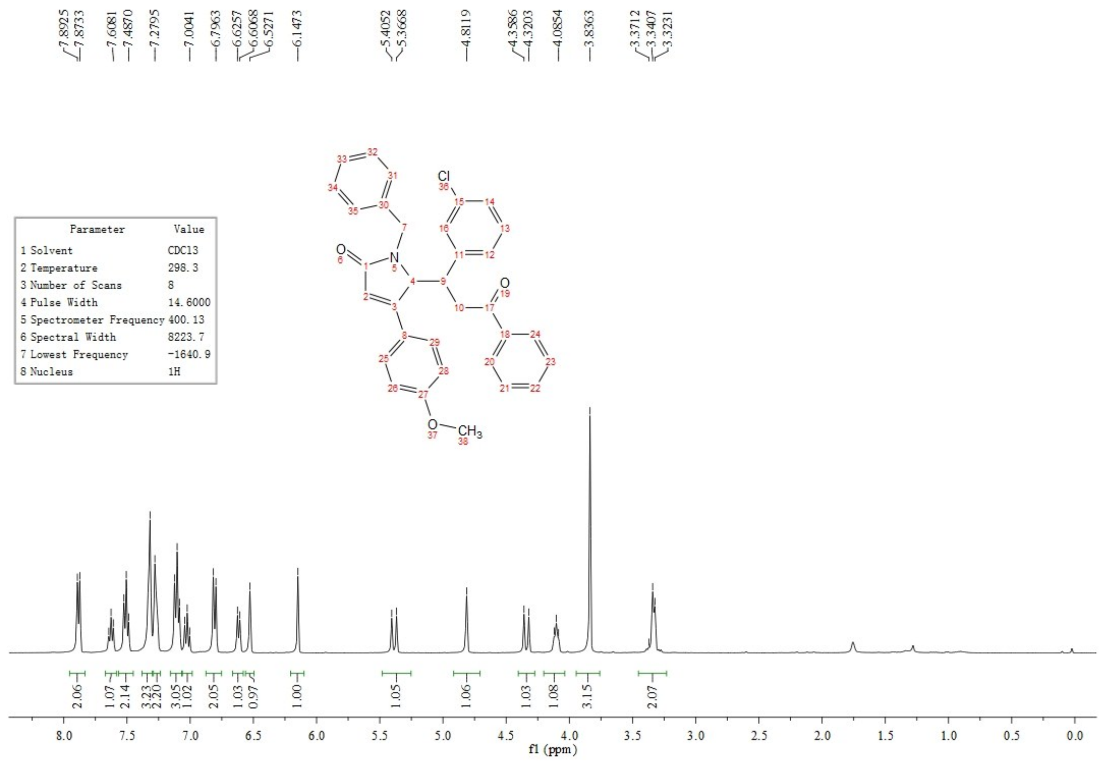
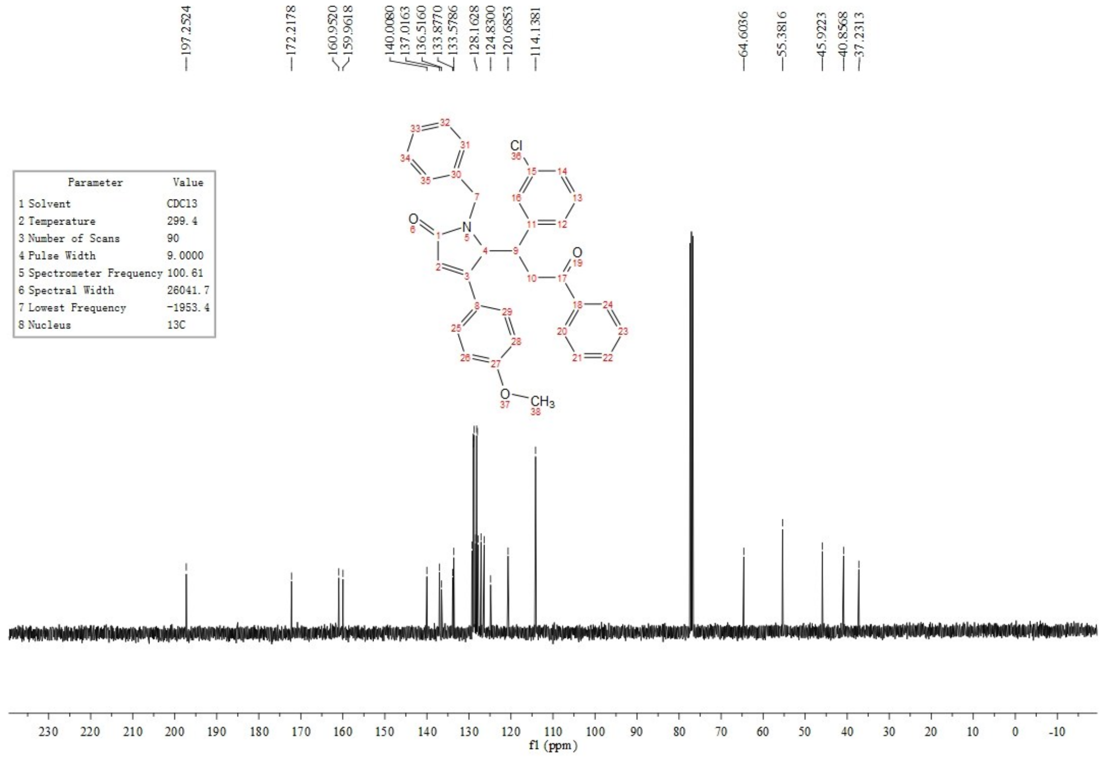
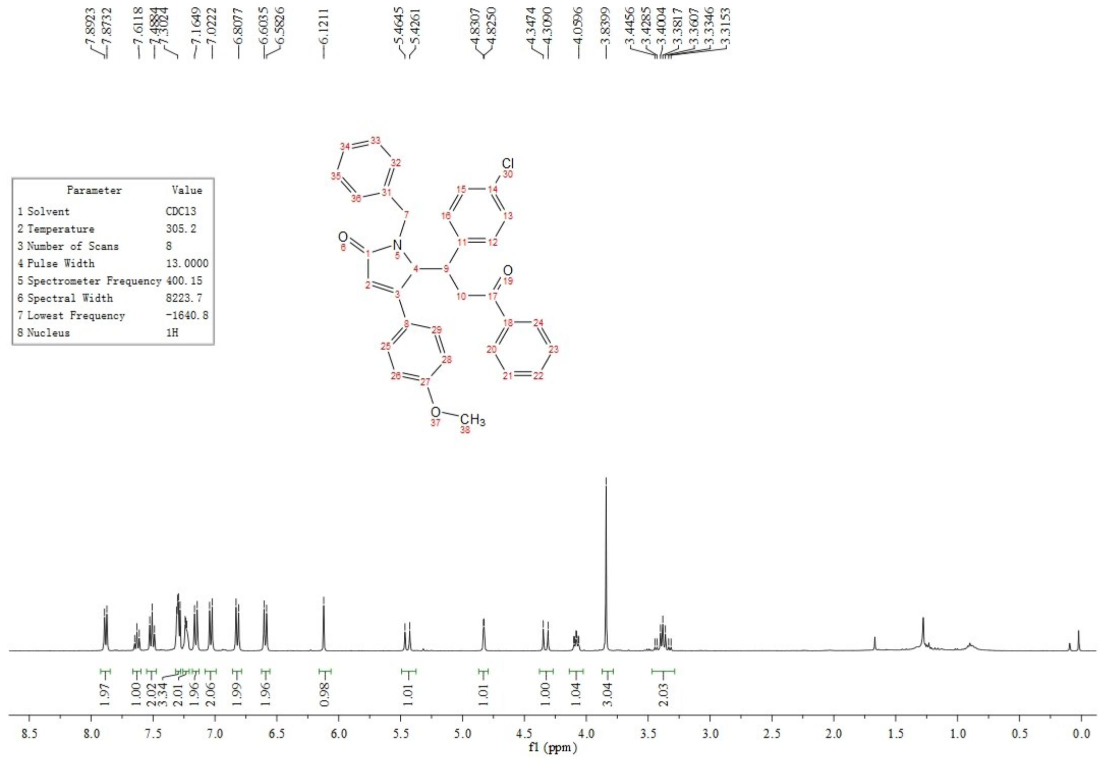
125.0802
120.3060
114.0068
64.2200
55.3425
45.9503
41.1289
38.3508
20.9614
Parameter Value
1 Solvent CDCl3
2 Temperature 307.6
3 Number of Scans 200
4 Pulse Width 9.5000
5 Spectrometer Frequency 100.62
6 Spectral Width 28409.1
7 Lowest Frequency -3136.6
8 Nucleus 13C
f1 (ppm)

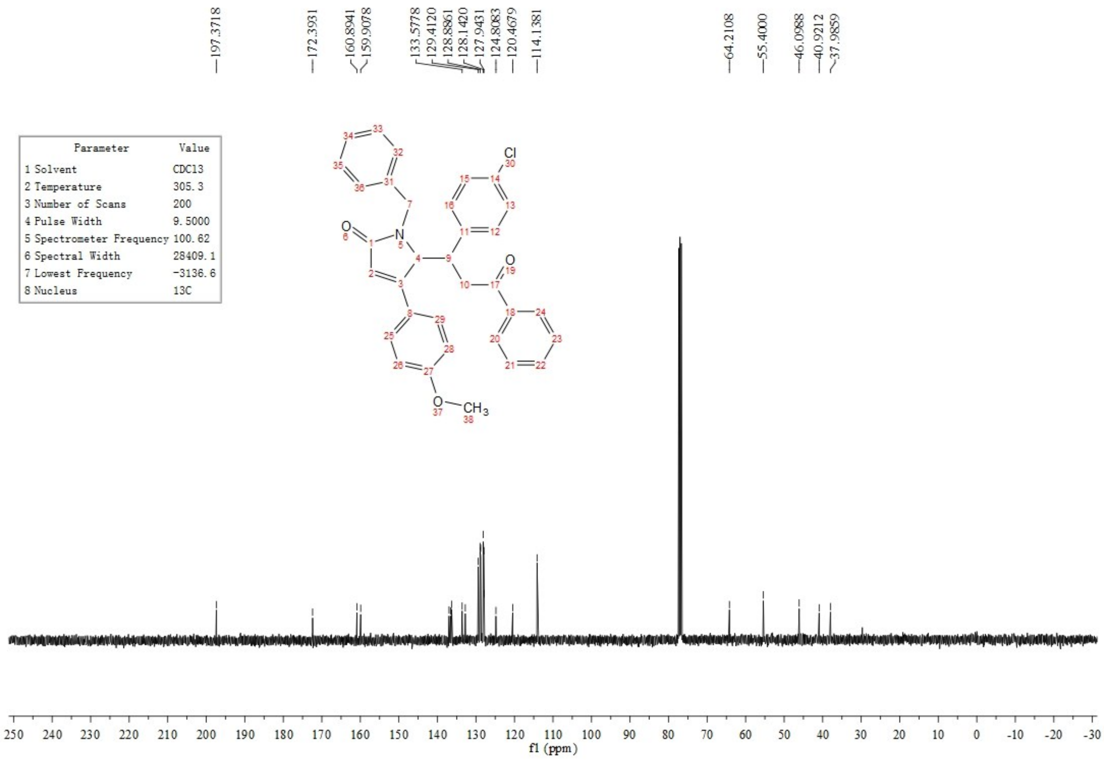
^{1}H NMR and ^{13}C NMR spectra of 3j



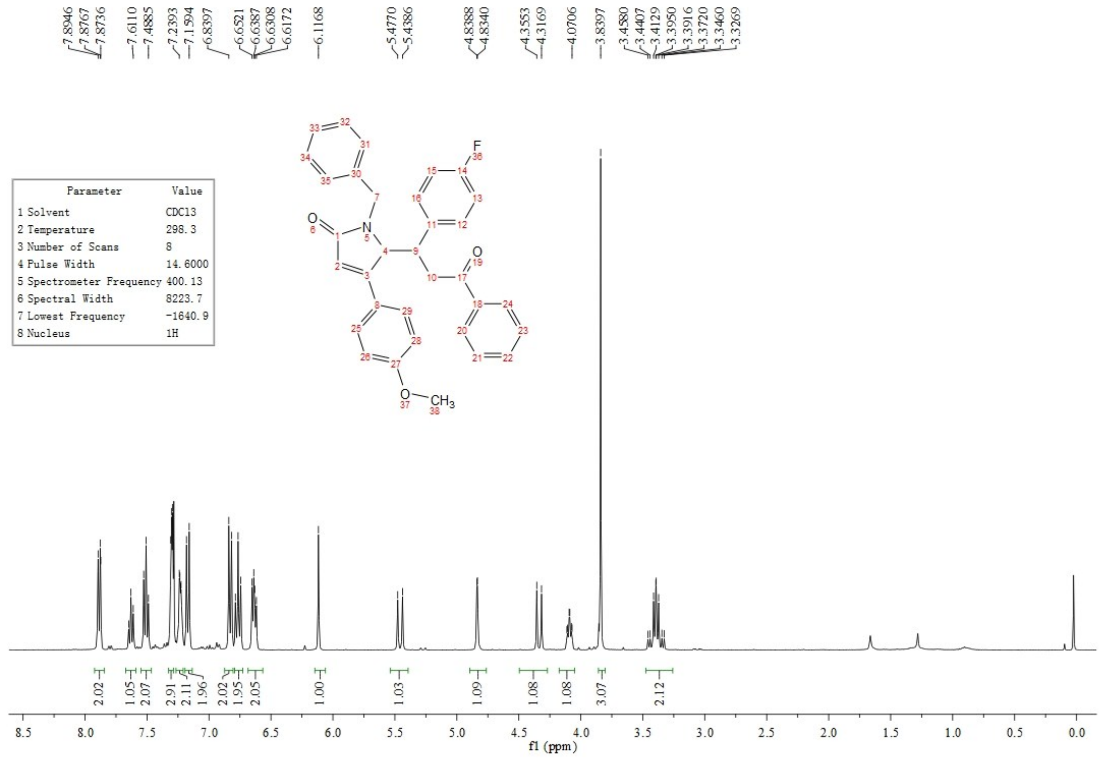


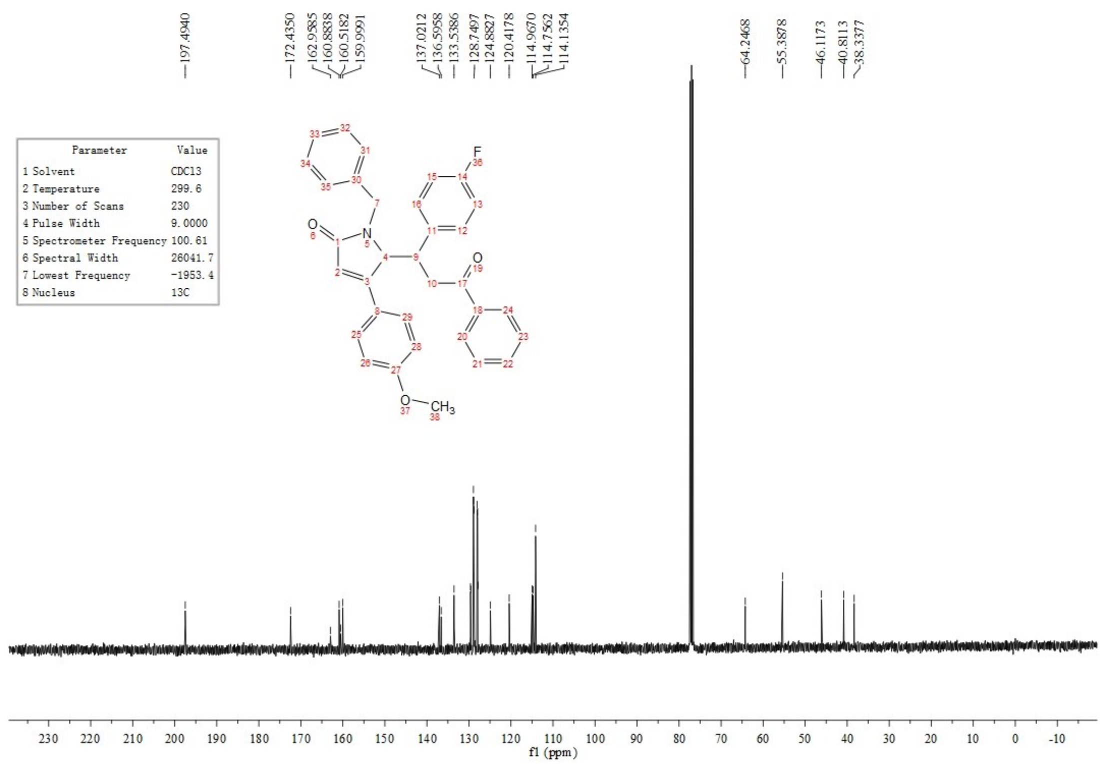
[1]H NMR and [13]C NMR spectra of 3k



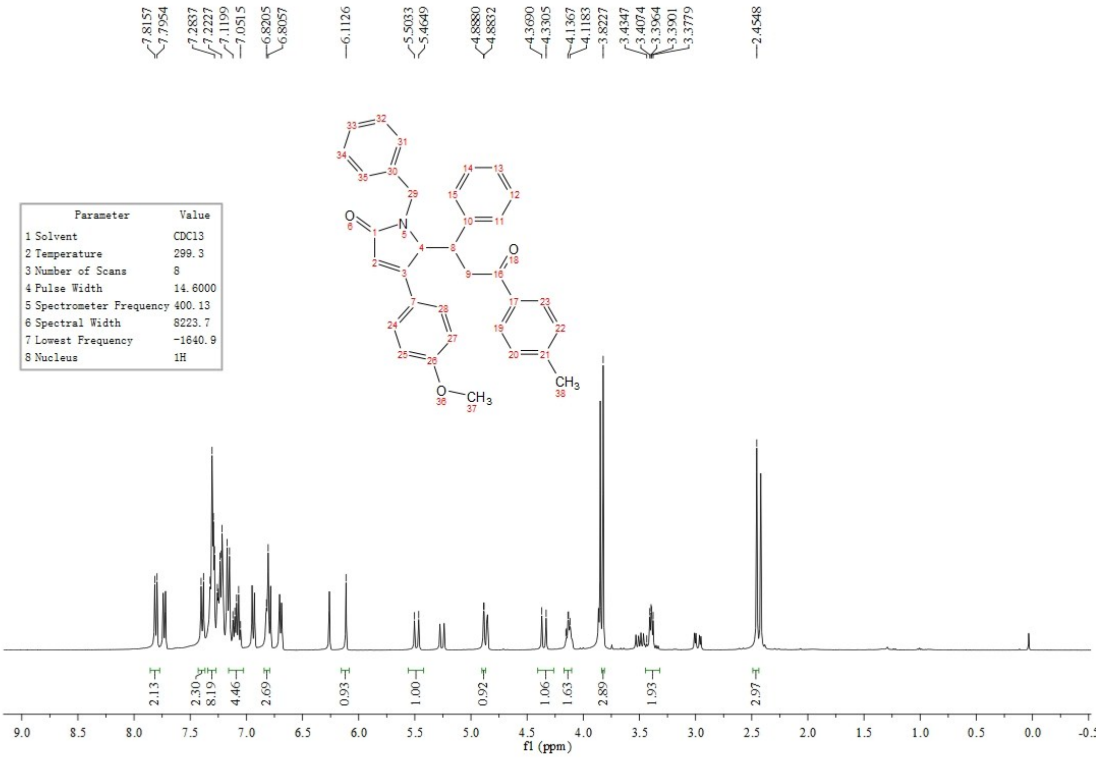


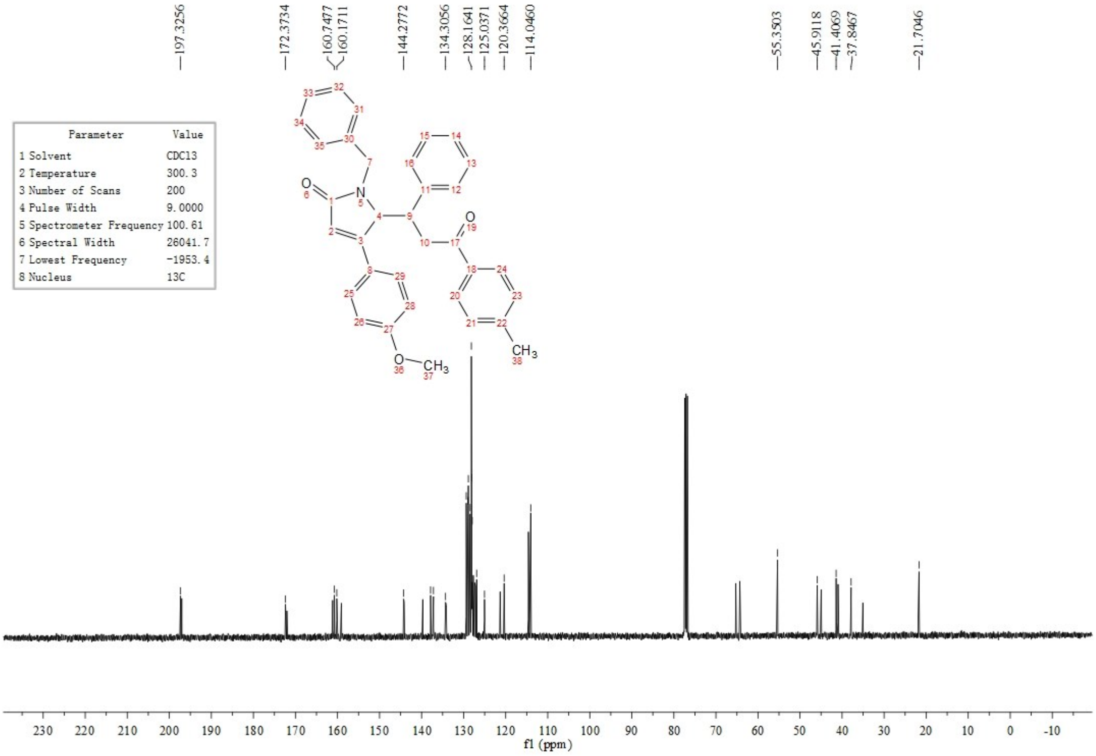
^{1}H NMR and ^{13}C NMR spectra of 3l



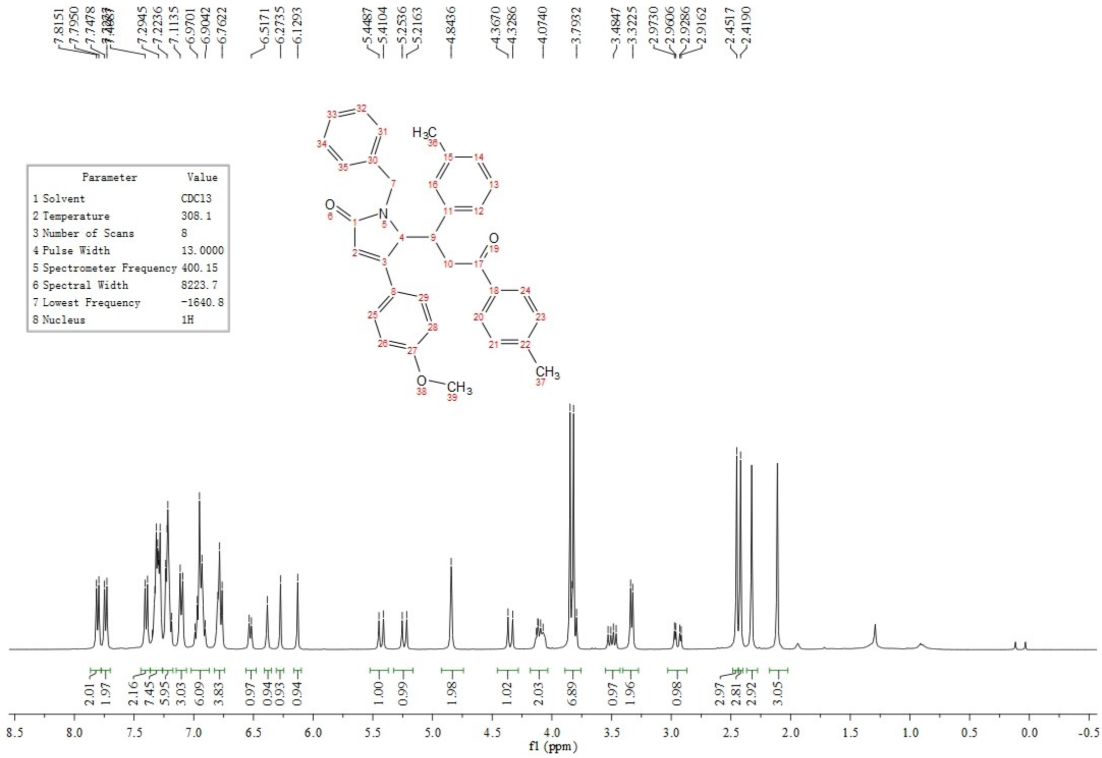


^{1}H NMR and ^{13}C NMR spectra of 3m





^{1}H NMR and ^{13}C NMR spectra of 3n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4.3670
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4.0740
3.7932
3.4847
3.3225
2.9730
2.9606
2.9286
2.9162
2.4517
2.4190
Parameter Value
1 Solvent CDCl3
2 Temperature 308.1
3 Number of Scans 8
4 Pulse Width 13.0000
5 Spectrometer Frequency 400.15
6 Spectral Width 8223.7
7 Lowest Frequency -1640.8
8 Nucleus 1H
H3C
O
N
CH3
O—CH3
2.01
1.97
2.16
7.45
5.95
3.03
6.09
3.83
0.97
0.94
0.93
0.94
1.00
0.99
1.98
1.02
2.03
6.89
0.97
1.96
0.98
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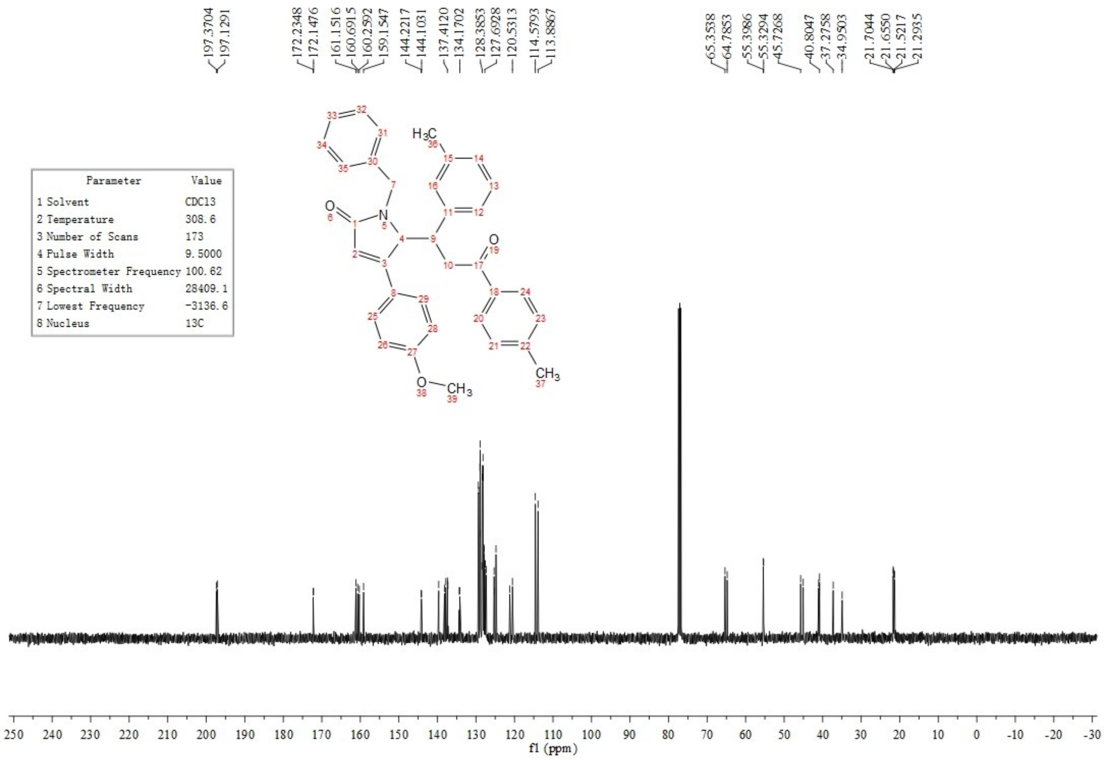
2.81
2.92
3.05
f1 (ppm)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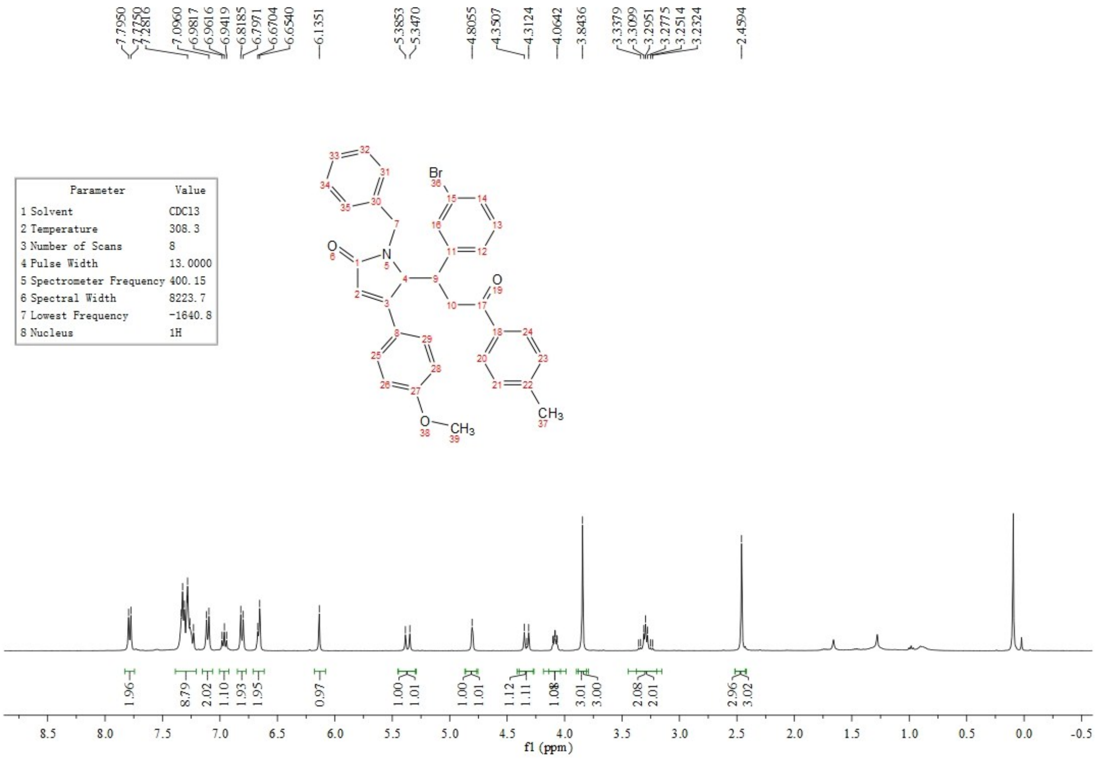
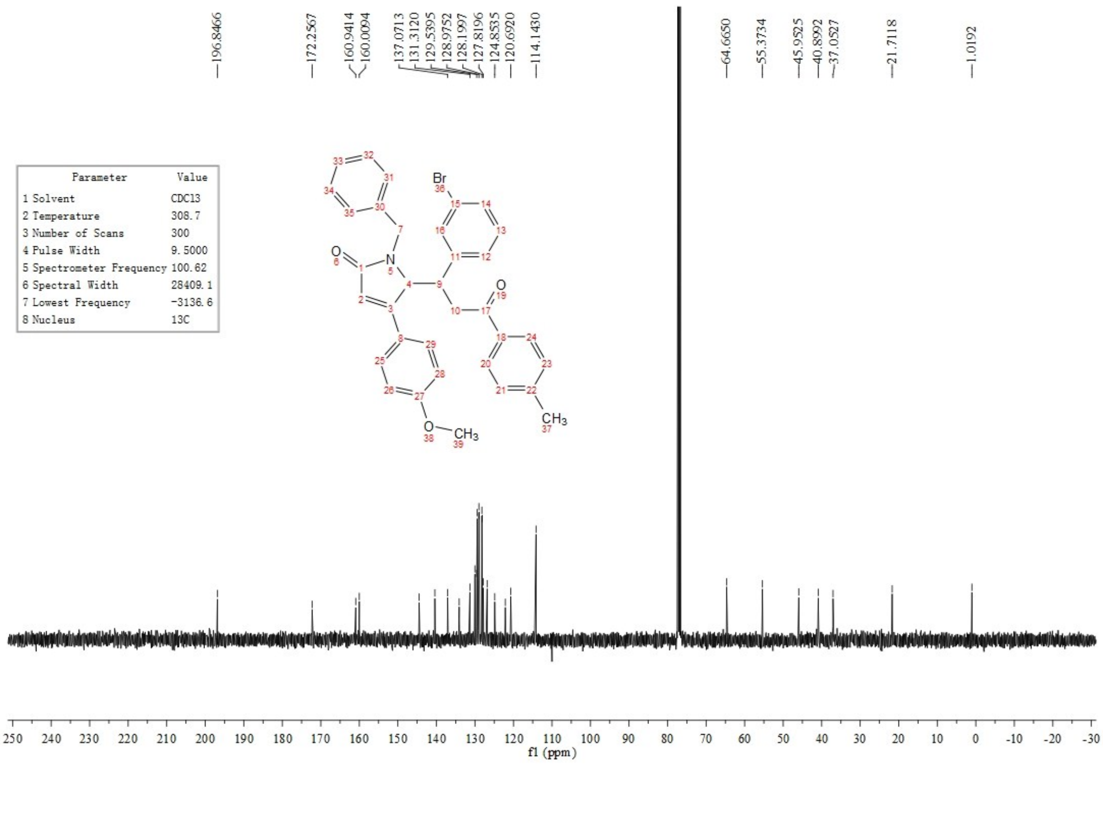
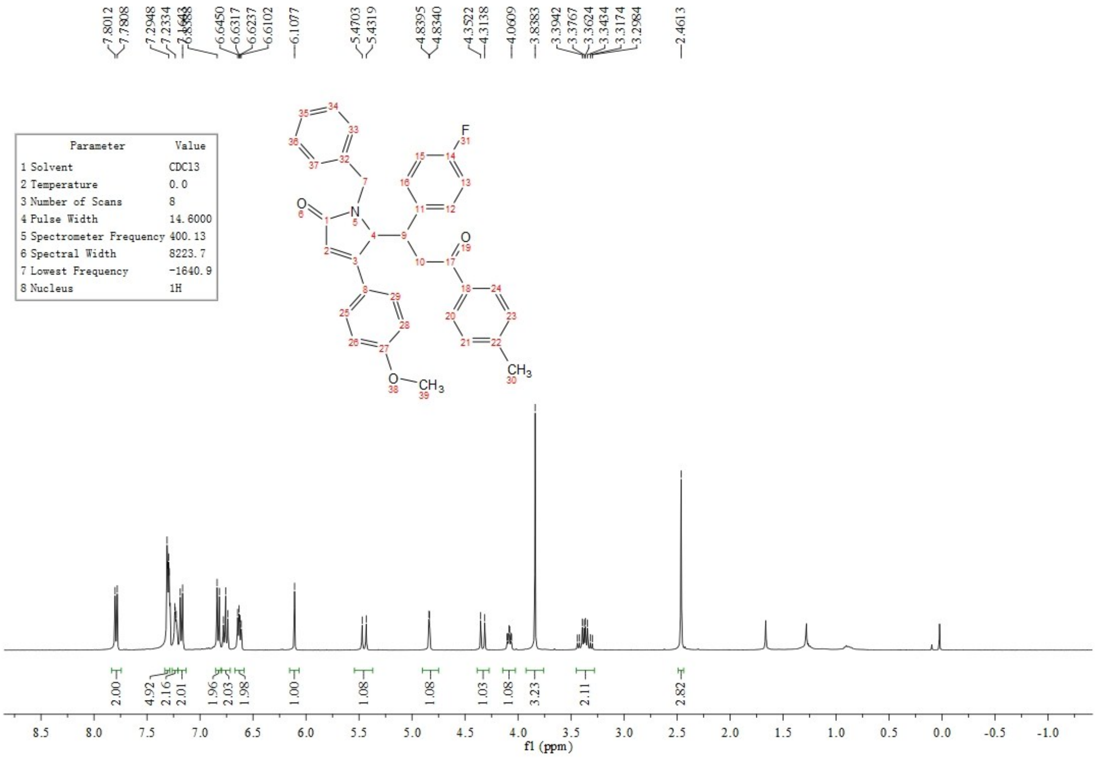
134.1702
128.3853
127.6928
120.5313
114.5793
113.8867
65.3538
64.7853
55.3986
55.3294
45.7268
40.8047
37.2758
34.9503
21.7044
21.6550
21.5217
21.2935
Parameter Value
1 Solvent CDCl3
2 Temperature 308.6
3 Number of Scans 173
4 Pulse Width 9.5000
5 Spectrometer Frequency 100.62
6 Spectral Width 28409.1
7 Lowest Frequency -3136.6
8 Nucleus 13C
H3C
O
N
CH3
O—CH3
f1 (ppm)

[1]H NMR and [13]C NMR spectra of 3o





[1]H NMR and [13]C NMR spectra of 3p



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6.6317
6.6237
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4.3138
4.0609
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3.3942
3.3767
3.3624
3.3434
3.3174
3.2984
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6 Spectral Width | 8223.7
7 Lowest Frequency | -1640.9
8 Nucleus | 1H
F
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4.92
2.16
2.01
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1.00
1.08
1.08
1.03
1.08
3.23
2.11
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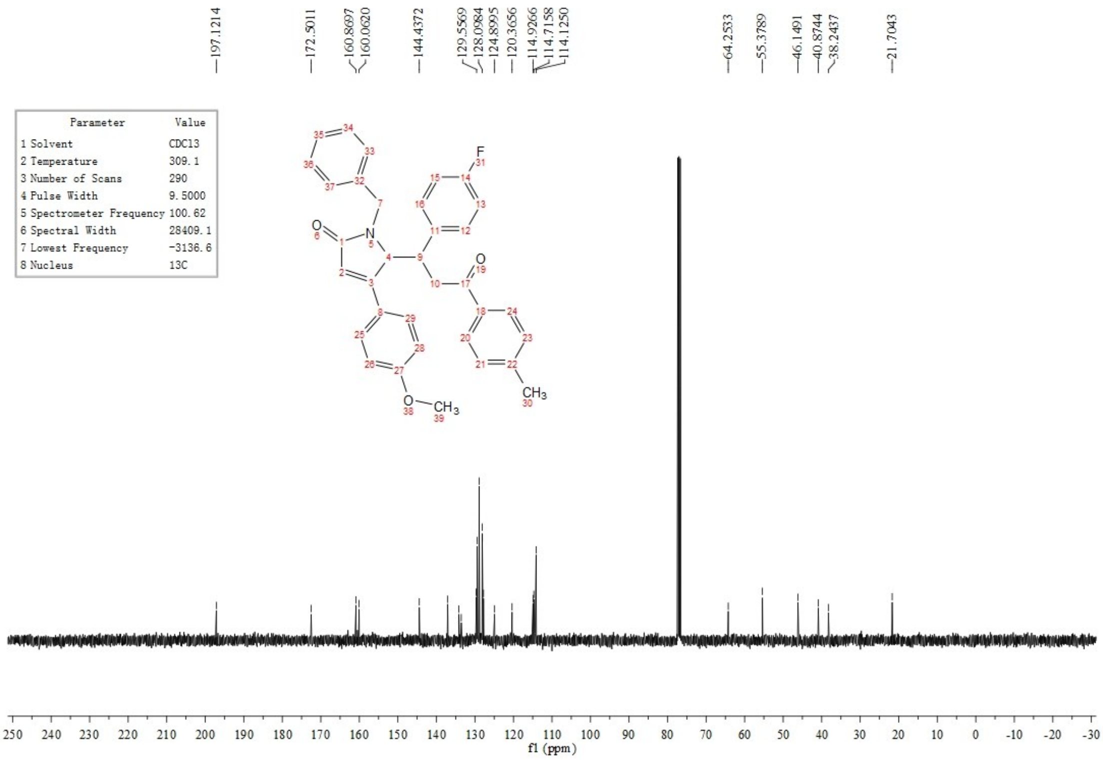
f1 (ppm)



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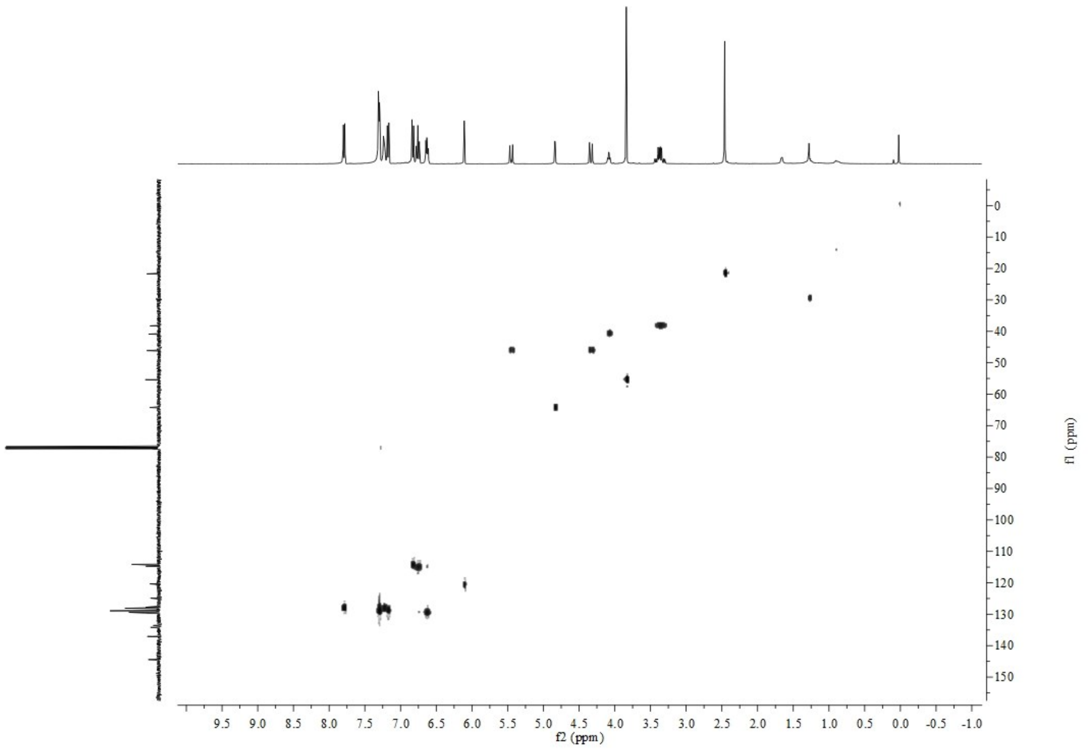
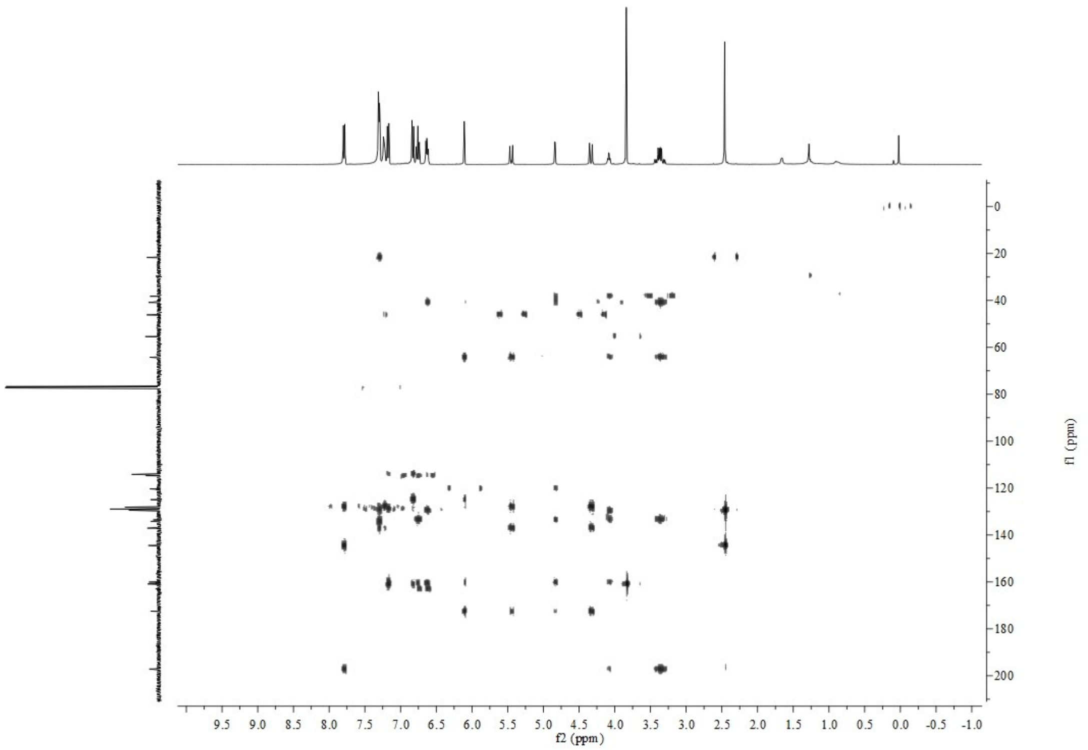
114.1250
64.2533
55.3789
46.1491
40.8744
38.2437
21.7043
Parameter | Value
1 Solvent | CDCl3
2 Temperature | 309.1
3 Number of Scans | 290
4 Pulse Width | 9.5000
5 Spectrometer Frequency | 100.62
6 Spectral Width | 28409.1
7 Lowest Frequency | -3136.6
8 Nucleus | 13C
F
CH3
f1 (ppm)

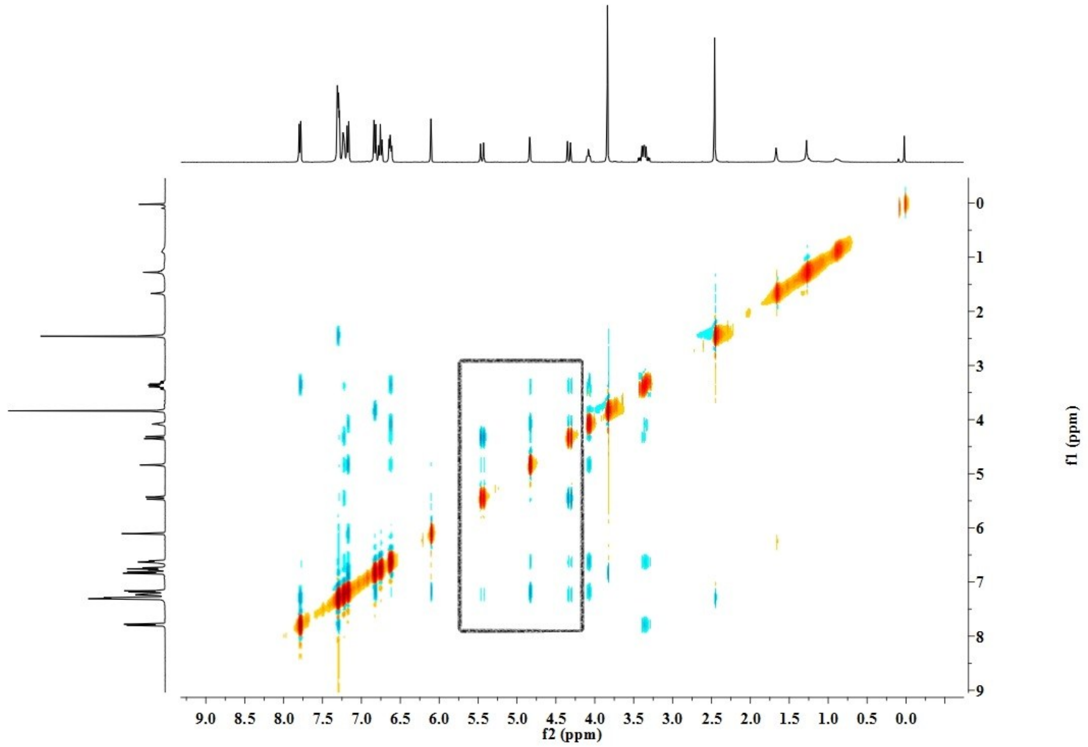
HSQC of $3p_1$



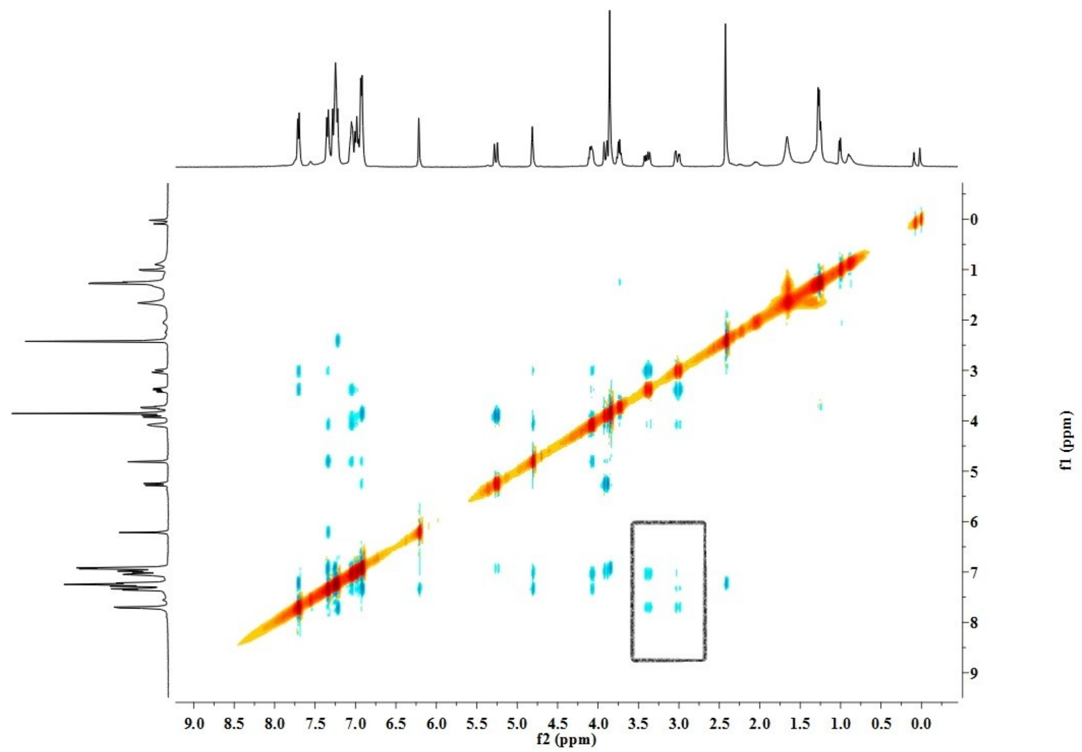
HMBC of $3p_1$



NOE of $3p_1$

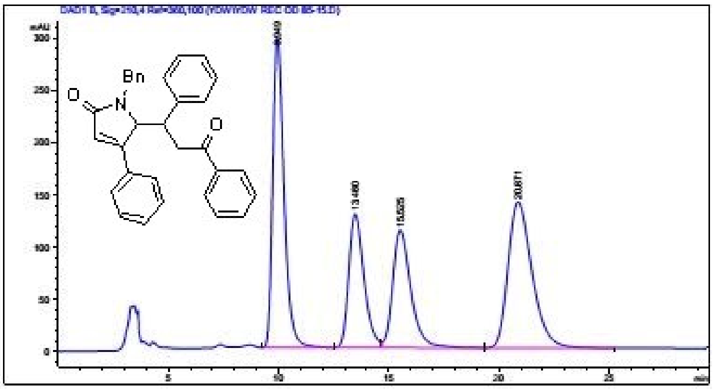


NOE of $4\text{-}3p_2$



d HPLC Spectra

3a (racemate)



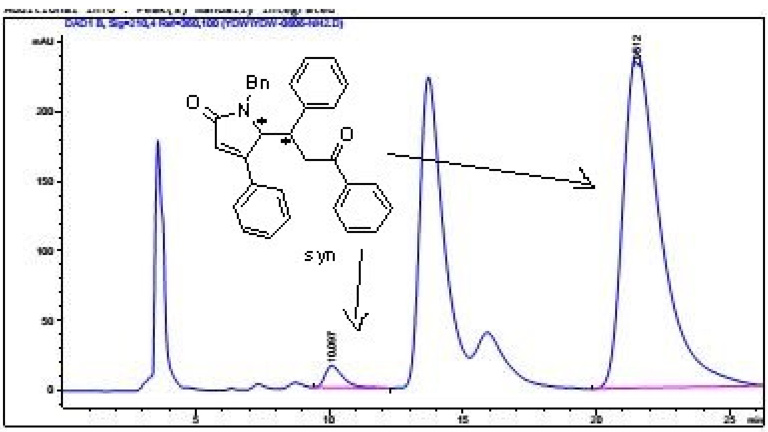
Area Percent Report

```
Sorted By            :      Signal
Multiplier           :      1.0000
Dilution             :      1.0000
Sample Amount:              :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.949	BB	0.5468	1.06185e4	297.20639	31.3540
2	13.480	BV	0.7381	6161.34131	127.89252	18.1931
3	15.525	VB	0.8750	6455.24316	112.57828	19.0609
4	20.871	BB	1.1551	1.06313e4	139.81512	31.3920

3a (chiral synthesis)



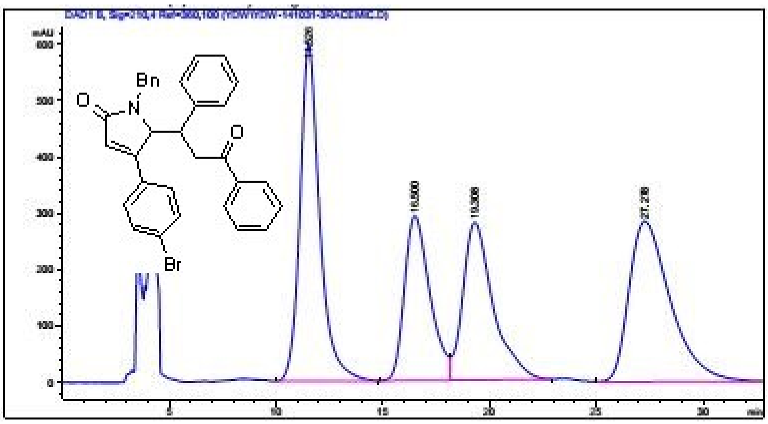
Area Percent Report

```
Sorted By            :      Signal
Multiplier           :      1.0000
Dilution             :      1.0000
Sample Amount:              :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.097	BB	0.7018	730.05920	15.60619	2.9962
2	21.512	BBA	1.4495	2.36363e4	241.14729	97.0038

3b (racemate)



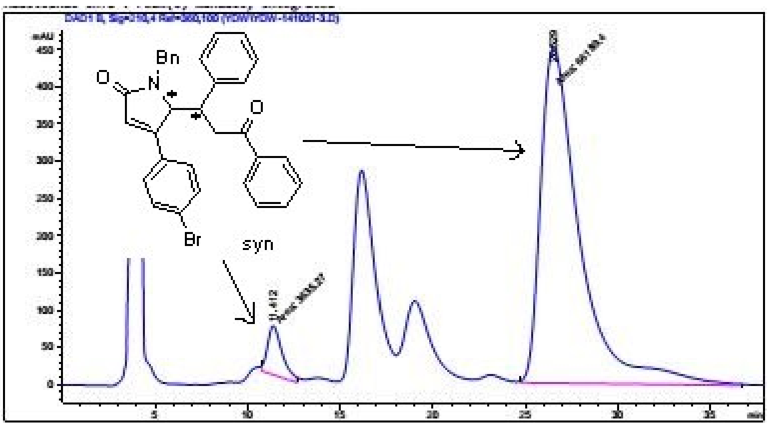
Area Percent Report

Sorted By : Signal
Multiplier : 1.0000
Dilution : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.526	BB	0.9501	3.84969e4	597.18274	29.8923
2	16.500	BV	1.2671	2.43091e4	292.03491	18.8757
3	19.308	VB	1.4643	2.75767e4	279.69925	21.4130
4	27.278	BBA	2.0175	3.84024e4	284.72656	29.8190

3b (chiral synthesis)



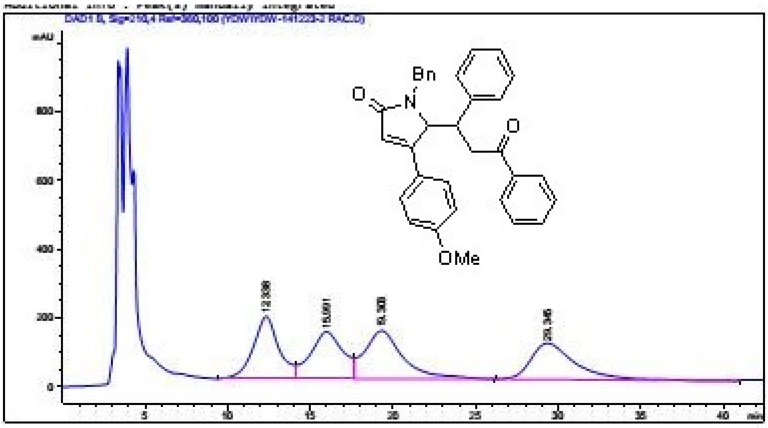
Area Percent Report

Sorted By : Signal
Multiplier : 1.0000
Dilution : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.412	MM	0.9221	3635.26733	65.70590	5.2063
2	26.529	MM	2.4506	6.61894e4	450.15533	94.7937

3c (racemate)



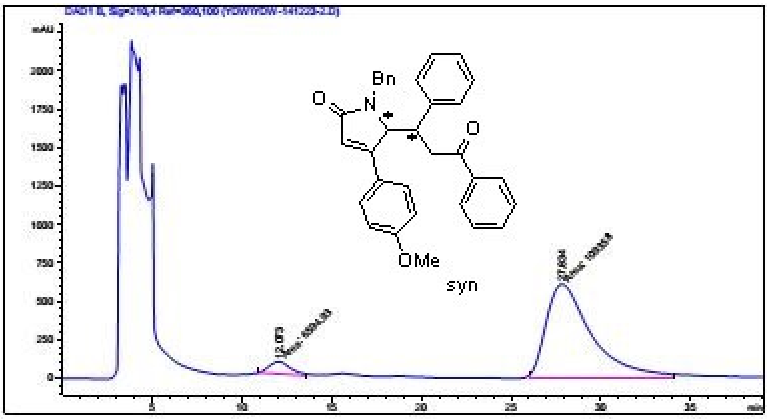
Area Percent Report

```
Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Sample Amount:                :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.338	BV	1.5369	1.95040e4	181.04088	24.4051
2	15.991	VV	1.9647	1.86333e4	136.48779	23.3156
3	19.308	VB	2.2646	2.21968e4	139.48050	27.7745
4	29.345	BBA	2.7290	1.95837e4	105.33674	24.5049

3c (chiral synthesis)（TLC）



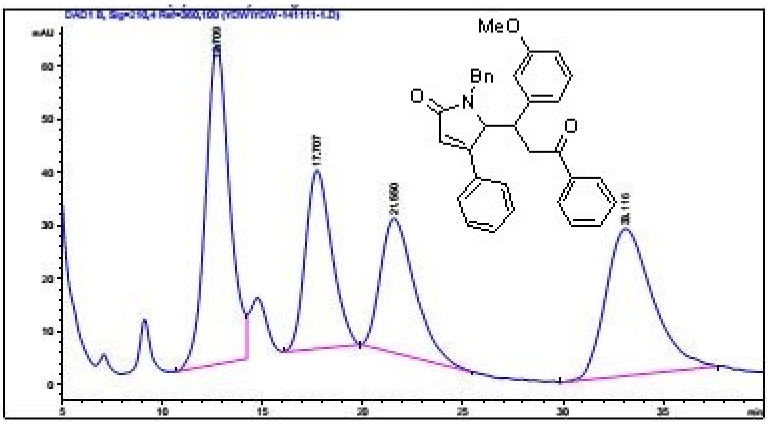
Area Percent Report

```
Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Sample Amount:                :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs
```

Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.073	MM	1.3720	6594.92725	80.11118	5.6876
2	27.834	MM	2.9727	1.09358e5	613.12994	94.3124

3d (racemate)



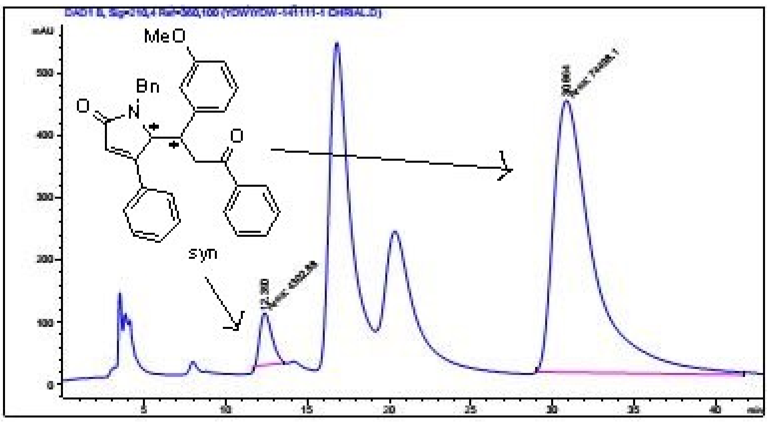
Area Percent Report

Sorted By : Signal
Multiplier : 1.0000
Dilution : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.709	BV	1.2297	5016.85791	60.23509	32.0046
2	17.707	BB	1.2972	3086.44604	33.61441	19.6897
3	21.550	BB	1.5107	3040.83301	25.25569	19.3987
4	33.116	BB	1.9179	4531.30322	27.73825	28.9070

3d (chiral synthesis)



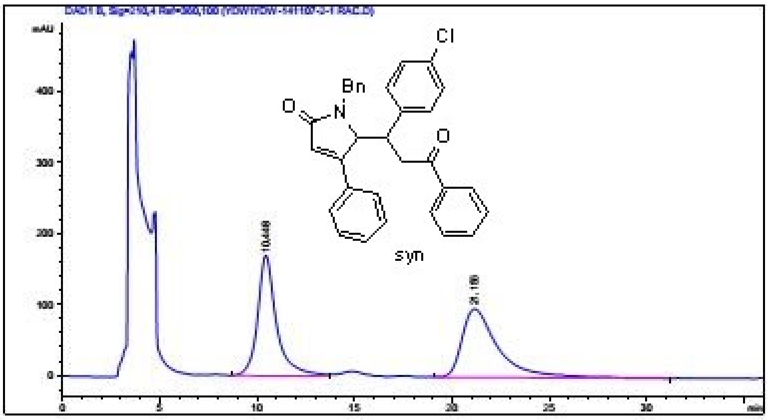
Area Percent Report

Sorted By : Signal
Multiplier : 1.0000
Dilution : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.390	MM	0.8572	4302.87549	83.66238	5.4604
2	30.864	MM	2.8452	7.44981e4	436.40228	94.5396

3e (racemate)（TLC）



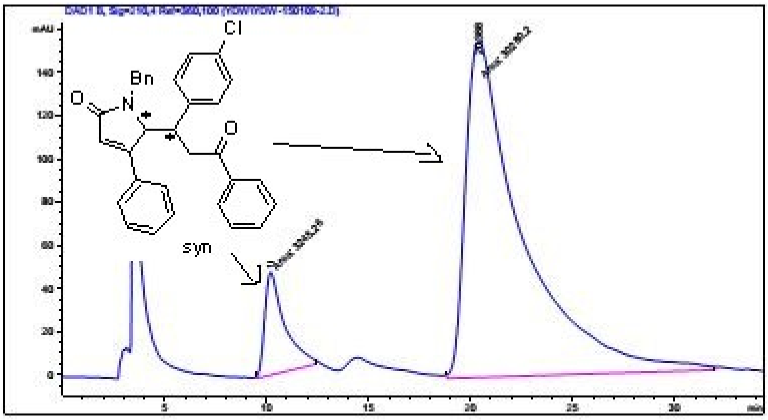

```
================================================================
                     Area Percent Report
================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Sample Amount:               :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  10.448 BV    0.9826 1.15052e4   169.77585  47.8761
   2  21.156 BB    1.9048 1.25260e4    96.34589  52.1239
```

3e (chiral synthesis)（TLC）



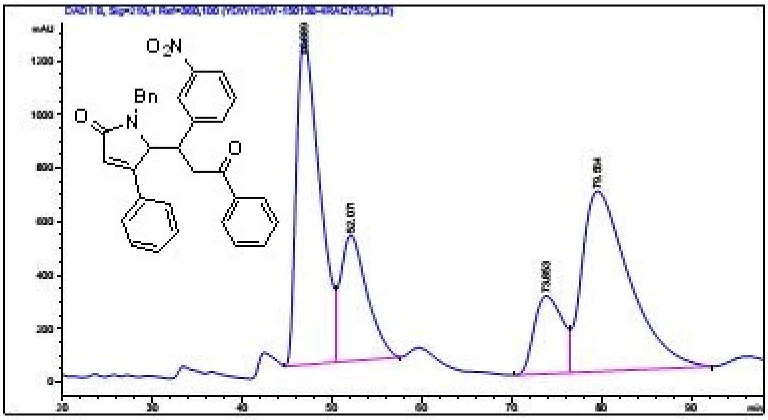

```
================================================================
                     Area Percent Report
================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Sample Amount:               :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  10.196 MM    1.1392 3245.25586   47.47949   9.6800
   2  20.388 MM    3.2326 3.02802e4   156.11835  90.3200
```

3f (racemate)



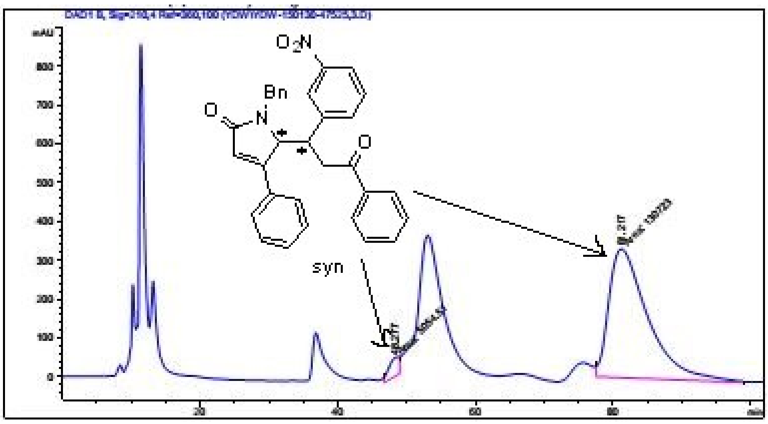

```
=====================================================================
                          Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Sample Amount:               :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=210,4 Ref=360,100
```

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	46.889	BV	2.6564	2.19694e5	1211.08545	34.9578
2	52.071	VB	2.9011	9.72297e4	470.86469	15.4713
3	73.853	BV	3.3129	6.36035e4	291.12088	10.1206
4	79.564	VB	5.1004	2.47927e5	673.85468	39.4503

3f (chiral synthesis)



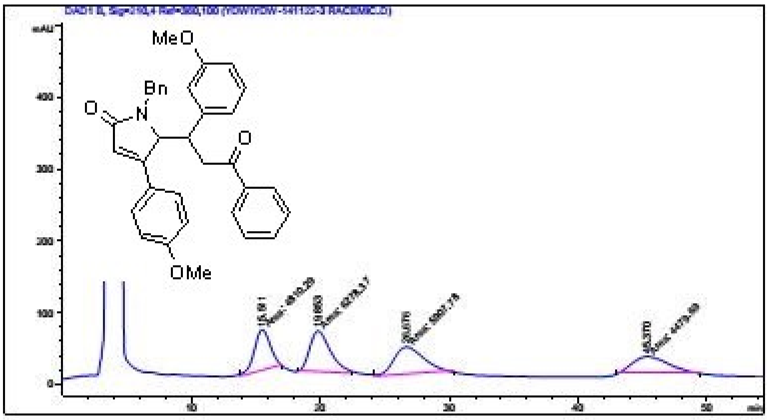

```
=====================================================================
                          Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Sample Amount:               :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=210,4 Ref=360,100
```

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	48.277	MM	1.7692	5054.51025	47.61495	3.7226
2	81.217	MM	6.5722	1.30723e5	331.50284	96.2774

3g (racemate)



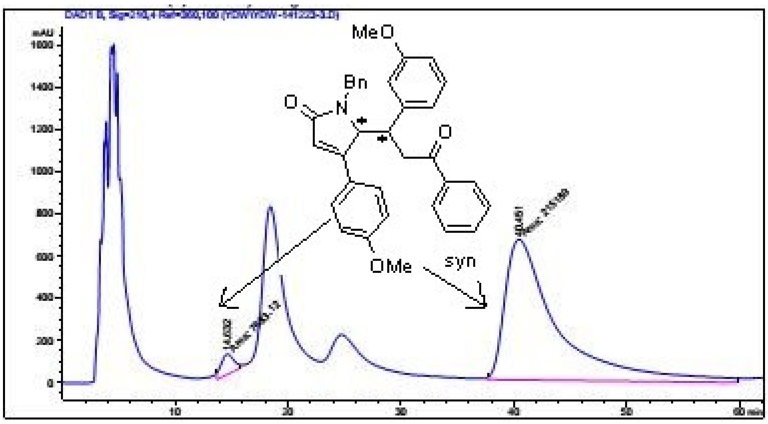
Area Percent Report

Sorted By : Signal
Multiplier : 1.0000
Dilution : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.511	MM	1.4236	4810.29248	56.31573	22.3983
2	19.853	MM	1.8553	6278.37207	56.40105	29.2342
3	26.676	MM	2.6323	5907.78320	37.40553	27.5086
4	45.370	MM	3.2365	4479.69336	23.06875	20.8589

3g (chiral synthesis)



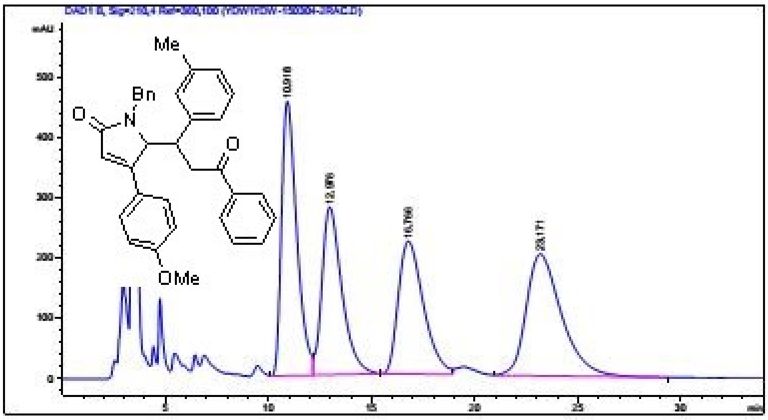
Area Percent Report

Sorted By : Signal
Multiplier : 1.0000
Dilution : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.632	MM	1.3393	7683.11768	95.61041	3.4473
2	40.451	MM	5.3806	2.15189e5	666.56329	96.5527

3h (racemate)



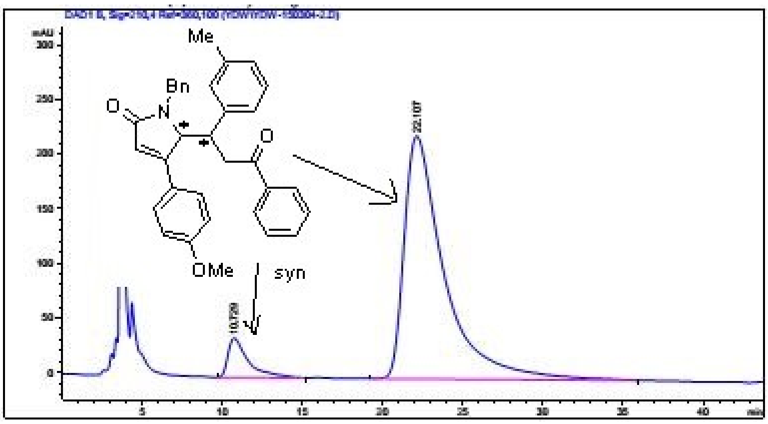
Area Percent Report

Sorted By : Signal
Multiplier : 1.0000
Dilution : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.918	BV	0.7829	2.33706e4	455.28555	27.5040
2	12.976	VB	1.0170	1.87172e4	278.17017	22.0275
3	16.766	BV	1.3162	1.87503e4	220.47824	22.0666
4	23.171	BB	1.8190	2.41335e4	201.82687	28.4019

3h (chiral synthesis)（TLC）



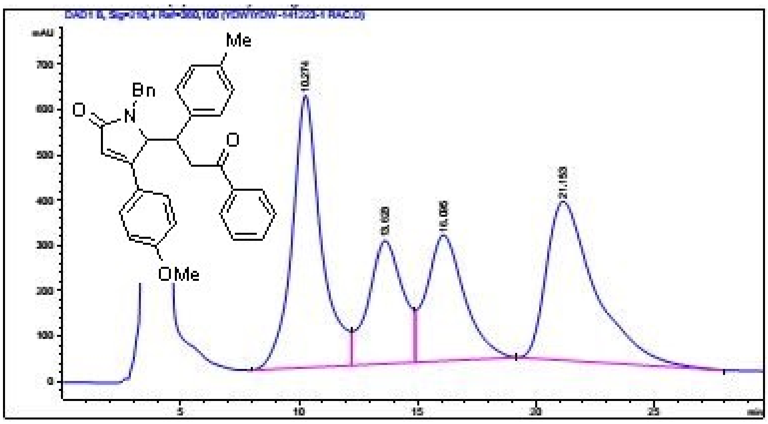
Area Percent Report

Sorted By : Signal
Multiplier : 1.0000
Dilution : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.729	BB	1.2774	3184.38110	35.81236	7.5819
2	22.107	BB	2.5188	3.88154e4	222.54672	92.4181

3i (racemate)

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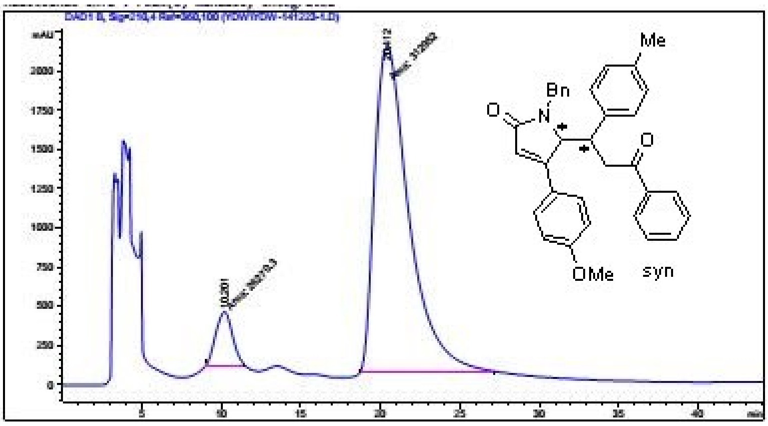
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Sample Amount:               :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]        %
----|-------|----|-------|----------|----------|--------|
   1  10.274 BV    1.2318 5.16034e4   599.76312  32.1674
   2  13.623 VV    1.4704 2.74204e4   271.46628  17.0927
   3  16.095 VB    1.6450 3.10892e4   277.92630  19.3797
   4  21.153 BBA   2.1169 5.03084e4   350.00052  31.3602
```

3i (chiral synthesis)（TLC）



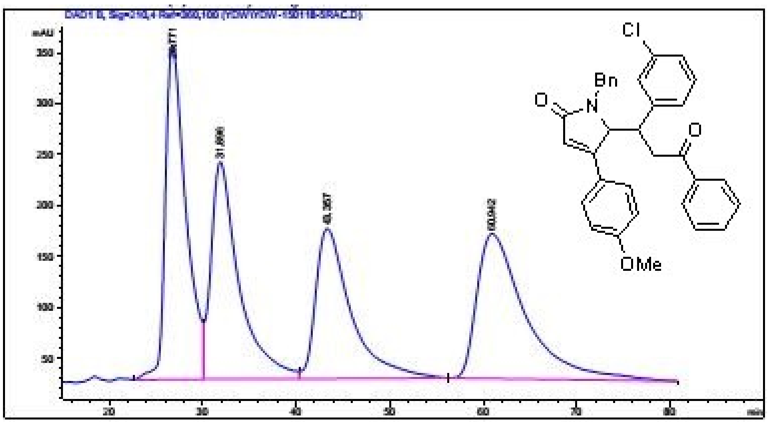

```
=====================================================================
                        Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Sample Amount:               :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]        %
----|-------|----|-------|----------|----------|--------|
   1  10.201 MM    1.2408 2.62703e4   352.86407   7.7443
   2  20.412 MM    2.5029 3.12952e5  2083.89814  92.2557
```

3j (racemate)



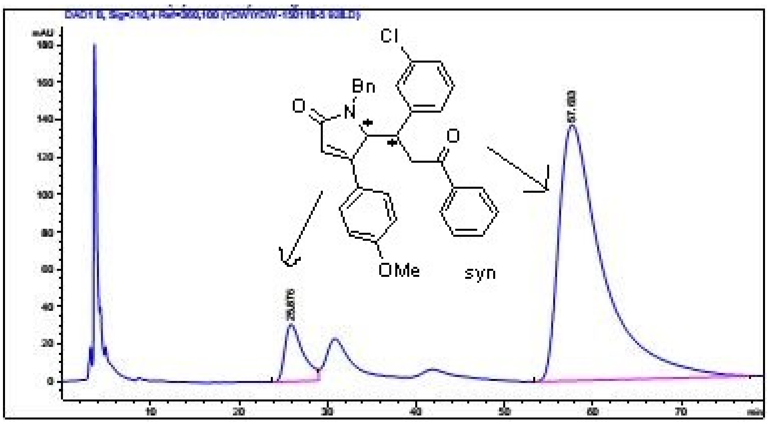

```
=====================================================================
                         Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Sample Amount:              :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  26.771 BV    2.2724 5.04326e4  328.99509  27.2560
   2  31.896 VV    3.0178 4.47513e4  213.12099  24.1856
   3  43.357 VB    3.7344 3.85054e4  147.26816  20.8100
   4  60.942 BBA   4.8309 5.13437e4  142.25073  27.7484
```

3j (chiral synthesis)



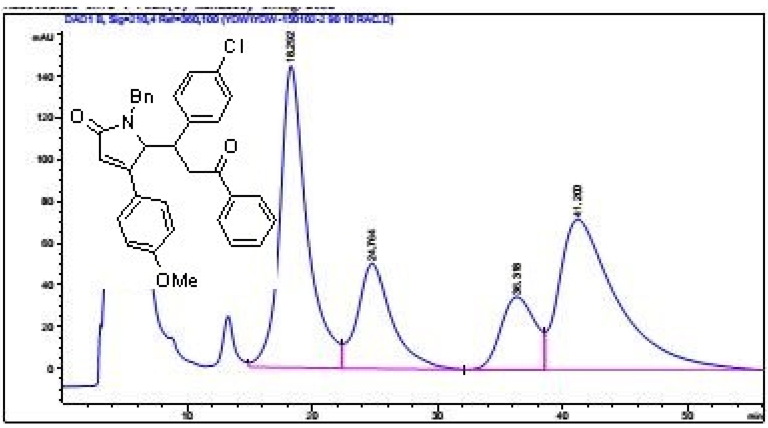

```
=====================================================================
                         Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Sample Amount:              :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  25.876 BV    2.0809 4350.59033   30.48610   8.3778
   2  57.633 BB    4.8283 4.75793e4  136.84790  91.6222
```

3k (racemate)



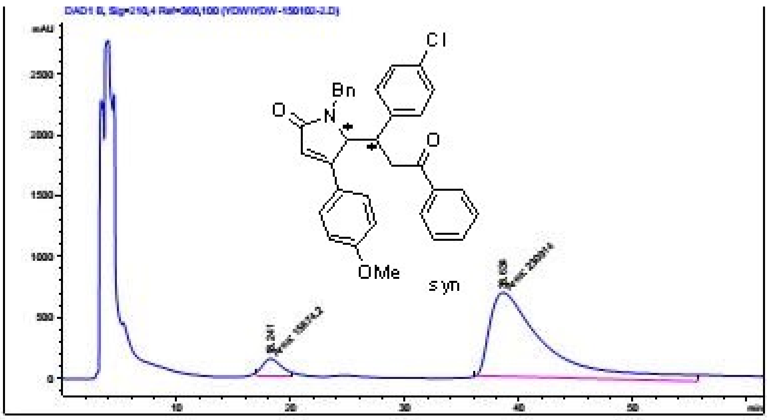

```
=====================================================================
                         Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Sample Amount:               :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=210,4 Ref=360,100
```

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	18.292	VV	2.2181	2.19898e4	144.28152	35.5651
2	24.764	VB	2.7537	9597.01172	50.30546	15.5217
3	36.318	BV	2.9055	6677.47559	34.87929	10.7998
4	41.200	VBA	4.6747	2.35654e4	72.22219	38.1134

3k (chiral synthesis)（TLC）



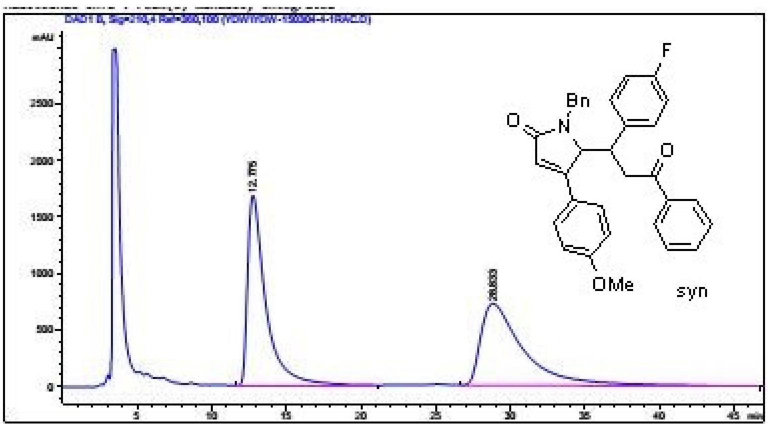

```
=====================================================================
                         Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Sample Amount:               :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=210,4 Ref=360,100
```

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	18.241	MM	1.9073	1.56742e4	136.96678	6.3564
2	38.634	MM	5.6135	2.30914e5	685.58960	93.6436

3l (racemate)（TLC）



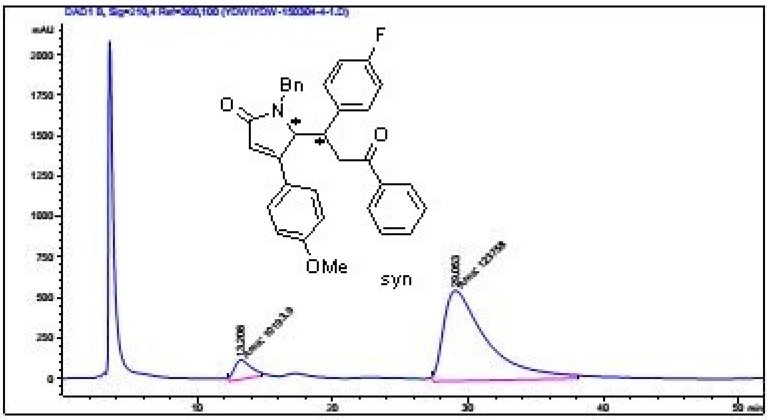

```
==================================================================
                    Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Sample Amount:               :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]        %
----|-------|----|-------|----------|----------|--------|
   1  12.775 BB    1.2417 1.43227e5 1681.60352 49.4632
   2  28.833 VBA   2.9138 1.46336e5  725.31012 50.5368
```

3l (chiral synthesis)（TLC）



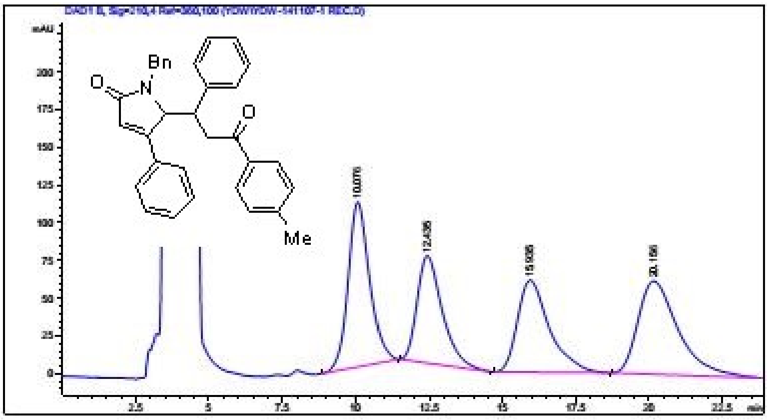

```
==================================================================
                    Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Sample Amount:               :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]        %
----|-------|----|-------|----------|----------|--------|
   1  13.208 MM    1.4396 1.01939e4  118.01665   7.6101
   2  29.053 MM    3.7035 1.23758e5  556.93903  92.3899
```

3m (racemate)



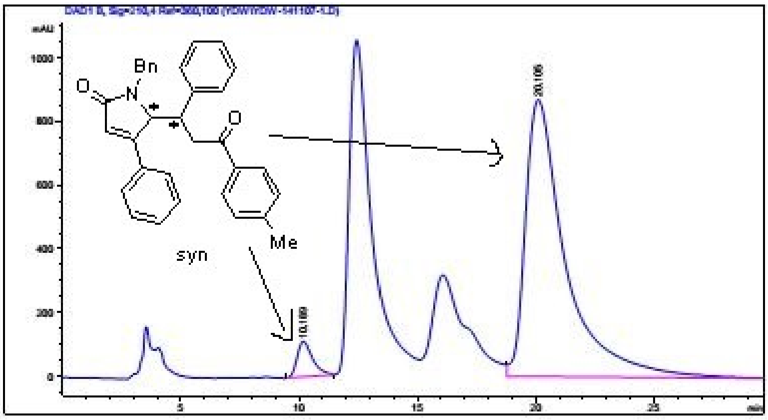
Area Percent Report

```
Sorted By              :      Signal
Multiplier             :      1.0000
Dilution               :      1.0000
Sample Amount:                :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: DAD1 B, Sig=210,4 Ref=360,100
```

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.076	BB	0.6870	5559.17383	109.08704	27.3819
2	12.435	BB	0.6996	4244.03760	70.97652	20.9042
3	15.935	BB	0.8908	4616.91357	60.74260	22.7408
4	20.156	BBA	1.1121	5882.22412	61.79204	28.9731

3m (chiral synthesis)



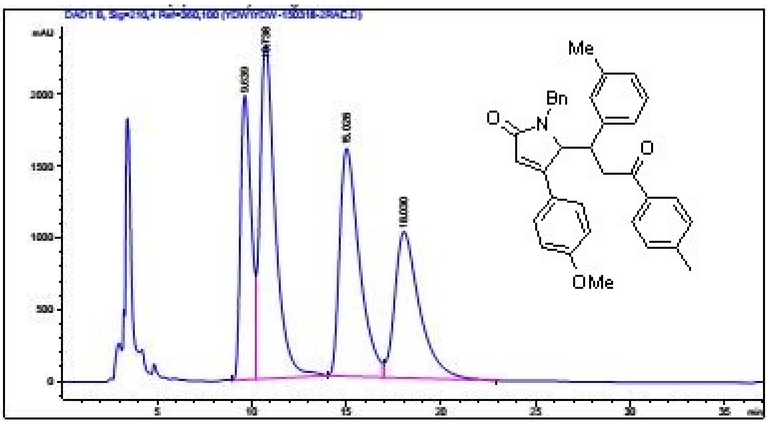
Area Percent Report

```
Sorted By              :      Signal
Multiplier             :      1.0000
Dilution               :      1.0000
Sample Amount:                :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: DAD1 B, Sig=210,4 Ref=360,100
```

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.189	BB	0.6838	5028.90186	111.16707	4.6734
2	20.105	VBA	1.7304	1.02578e5	868.20459	95.3266

3n (racemate)



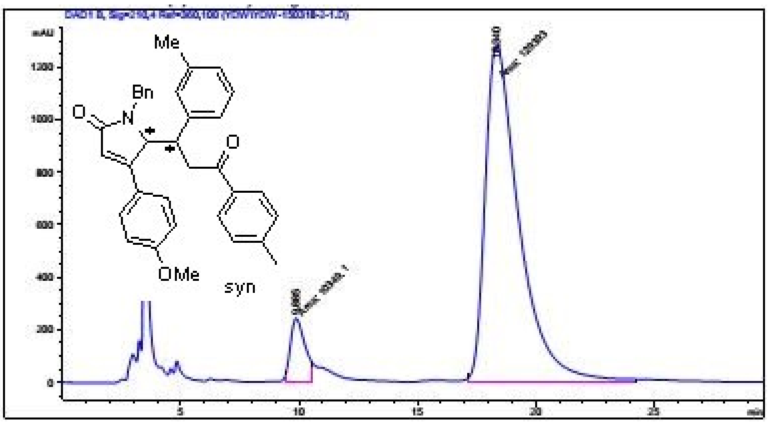
Area Percent Report

Sorted By : Signal
Multiplier : 1.0000
Dilution : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.639	BV	0.6025	7.78054e4	1979.83740	18.6021
2	10.738	VB	0.8407	1.31915e5	2329.24609	31.5390
3	15.028	BV	1.0923	1.15353e5	1586.44910	27.5792
4	18.090	VB	1.3516	9.31871e4	1018.35791	22.2797

3n (chiral synthesis)（TLC）



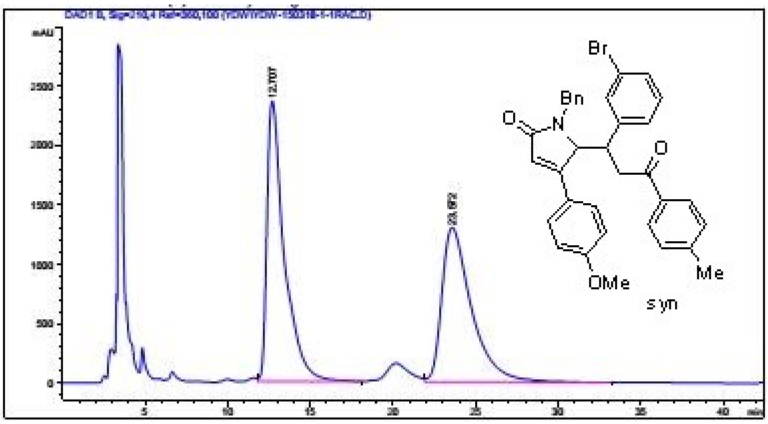
Area Percent Report

Sorted By : Signal
Multiplier : 1.0000
Dilution : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.885	MM	0.7097	1.03491e4	243.03770	7.4058
2	18.340	MM	1.6763	1.29393e5	1286.47400	92.5942

4-3o (racemate)（TLC）



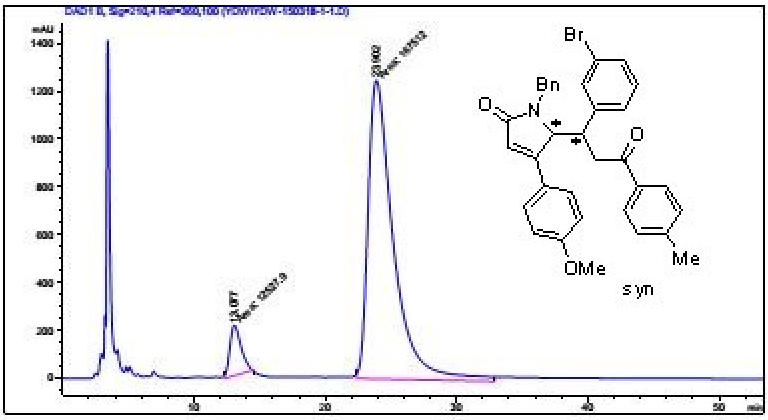
Area Percent Report

Sorted By : Signal
Multiplier : 1.0000
Dilution : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.707	VB	1.0690	1.72929e5	2365.11572	51.4293
2	23.572	VV	1.8607	1.63317e5	1304.45227	48.5707

4-3o (chiral synthesis)（TLC）



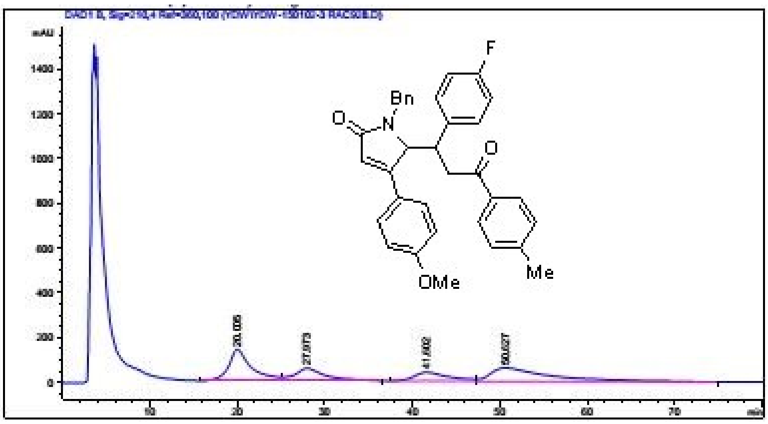
Area Percent Report

Sorted By : Signal
Multiplier : 1.0000
Dilution : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.077	MM	0.9931	1.25279e4	210.25302	6.9584
2	23.902	MM	2.2377	1.67512e5	1247.65112	93.0416

3p (racemate)




```
=====================================================================
                         Area Percent Report
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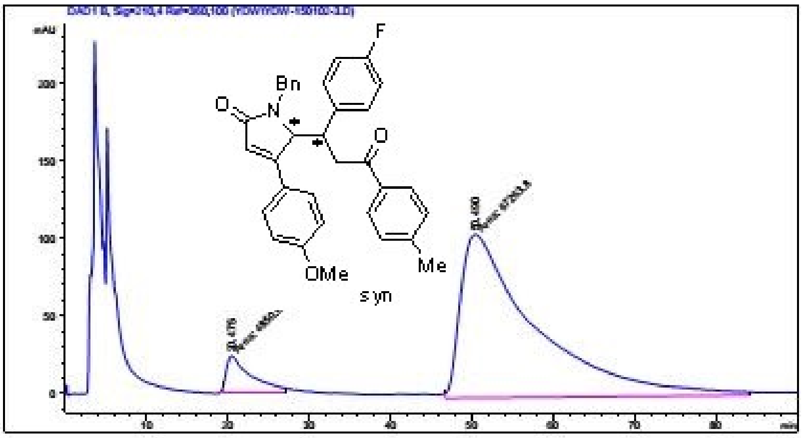
Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Sample Amount:               :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]        %
----|-------|----|-------|----------|----------|--------|
   1  20.005 BV    2.5089 2.54519e4  140.27394  33.5232
   2  27.973 VB    3.3375 1.32702e4   54.94941  17.4785
   3  41.602 BV    3.7916 1.00480e4   37.48143  13.2344
   4  50.627 VV    6.0889 2.71532e4   58.65455  35.7640
```

3p (chiral synthesis)（TLC）




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

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Sample Amount:               :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: DAD1 B, Sig=210,4 Ref=360,100

Peak RetTime Type  Width     Area       Height     Area
  #   [min]        [min]   [mAU*s]      [mAU]        %
----|-------|----|-------|-----------|----------|--------|
   1  20.475 MM    3.4647 4850.07861   23.33111   6.7256
   2  50.490 MM   10.6406 6.72637e4   105.35722  93.2744
```