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Supporting Information

Organocatalytic asymmetric Michael addition of 3-substituted oxindoles to α,β-unsaturated acyl phosphonates for the synthesis of 3,3'-disubstituted oxindoles with chiral squaramides

Lin Chen, Yong You, Ming-Liang Zhang, Jian-qiang Zhao, Jian Zuo, Xiao-Mei Zhang, Wei-Cheng Yuan* and Xiao-Ying Xu*

[a]*National Engineering Research Center of Chiral Drugs, Chengdu Institute of Organic Chemistry, Chinese Academy of Sciences, Chengdu 610041, China*

[b]*Chengdu Institute of Biology, Chinese Academy of Sciences, Chengdu 610041, China*

[c]*University of Chinese Academy of Sciences, Beijing 100049, China*

yuanwc@cioc.ac.cn, xuxy@cioc.ac.cn

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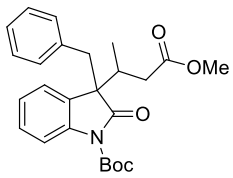
General Methods

^{1}H NMR spectra were recorded on Bruker 300 (300 MHz) spectrophotometers. Chemical shifts (δ) are reported from the solvent resonance as the internal standard ($CDCl_3$: δ 7.26, DMSO-D_6: δ 2.50). Data are reported as follows: chemical shift, multiplicity (s = singlet, d = doublet, t = triplet, q = quadruple and m = multiplet), coupling constants (Hz) and integration. ^{13}C NMR spectra were recorded on Bruker 300 (75 MHz) spectrophotometers ($CDCl_3$: δ 77.2, DMSO-D_6: δ 39.5). Mass spectra were recorded on Bruker micrOTOF-Q II mass spectrometer. HPLC data was acquired using a Shimadzu LC-20A with Daicel AD-H, Daicel OD-H, Daicel IA, Daicel IC column.

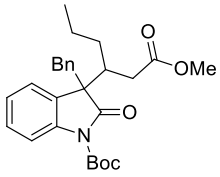
3-Mono Substituted Oxindoles (**1a-1x**) were prepared according to the reported procedures[1] or similarly. α,β-Unsaturated acyl phosphonates (**2a-2h**) were prepared according to the reported procedures[2] or similarly. Unless otherwise noted, materials were purchased from commercial suppliers and used without further purification. All reactions have been carried out with distilled and degassed solvents in oven-dried glassware. All the solvents were treated according to general methods. Column chromatography was performed using silica gel H.

General Procedure for Synthesis of 3,3-Disubstituted Oxindoles 3

An oven-dried 20-mL reaction tube containing a stir bar was charged with oxindole **1** (0.1 mmol, 1.0 equiv), catalyst **4g** (0.02 mmol, 0.2 equiv) and Et_2O (1.0 mL). After 10 min of stirring at -20 oC, α,β-unsaturated acyl phosphonates 2 (0.4 mmol, 4.0 equiv) with Et_2O (1.0 mL) was added. The stirring was maintained at the same temperature for 23 h, alcohol (0.4 mmol, 4.0 equiv)/amine (0.4 mmol, 4.0 equiv) and DBU (0.2 mmol, 2.0 equiv) were then added in the described sequence. After additionally 30 min of stirring at -20 ^{o}C, the crude reaction mixture was poured into NH_4Cl (sat.) rapidly, extracted with DCM (3 x 5 mL), dried over Na_2SO_4 and concentrated *in vacuo*. Purified on silica gel afforded the pure addition products **3**.

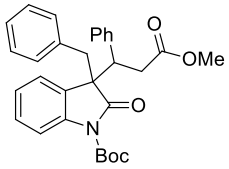


tert-butyl 3-benzyl-3-(4-methoxy-4-oxobutan-2-yl)-2-oxoindoline-1-carboxylate (**3ad**): Colorless oil; 34.1 mg, 81% yield; 12.3:1 dr, 88% ee; $[\alpha]_D^{20}$ = +13.3 (*c* = 1.0, $CHCl_3$); The ee was determined by HPLC (Chiralpak OD-H column, *i*PrOH/hexane = 1/99, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 8.9 min, t_{major} = 12.2 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.15 (d, *J* = 6.7 Hz, 3 H), 1.58 (s, 9 H), 2.26 (dd, *J* = 11.0 Hz, *J* = 15.1 Hz, 1 H), 2.44 (dd, *J* = 3.2 Hz, *J* = 15.1 Hz, 1 H), 2.77-2.84 (m, 1 H), 3.07 (d, *J* = 12.7 Hz, 1 H), 3.40 (d, *J* = 12.6 Hz, 1 H), 3.67 (s, 3H), 6.79 (d, *J* = 7.6 Hz, 2 H), 6.99 -7.06 (m, 3 H), 7.20-7.24 (m. 2 H), 7.30-7.33 (m, 1 H), 7.56 (d, *J* = 7.1 Hz, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 15.0, 28.0, 36.9, 37.7, 42.5, 51.7, 57.3, 83.9, 114.6, 123.5, 124.1, 126.6, 127.6, 128.3,129.0, 129.7, 135.1, 140.1, 148.6, 172.8, 176.9; MS calcd for $C_{25}H_{29}NNaO_5$ $[M + Na]^+$: 446.1938, found 446.1937.

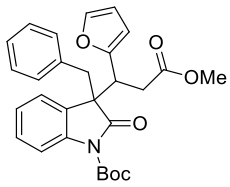


tert-butyl 3-benzyl-3-(1-methoxy-1-oxohexan-3-yl)-2-oxoindoline-1-carboxylate (3af) Colorless oil; 29.3 mg, 65% yield; 17.5:1 dr, 93% ee; $[\alpha]_D^{20}$ = +24.5 (*c* = 1.0, $CHCl_3$); The ee was determined by HPLC (Chiralpak IA column, *i*PrOH/hexane = 5/95, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 6.2 min, t_{major} = 8.6 min); ^{1}H NMR (300

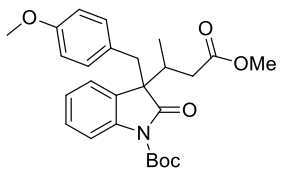
MHz, $CDCl_3$) δ 0.86 (t, *J* = 6.7 Hz, 3 H), 1.17-1.33 (m, 4 H), 1.52 (s, 9 H), 2.34 (dd, *J* = 7.4 Hz, *J* = 15.8 Hz, 1 H), 2.48 (dd, *J* = 4.8 Hz, *J* = 15.8 Hz, 1 H), 2.72-2.80 (m, 1 H), 3.24 (d, *J* = 12.5 Hz, 1 H), 3.33 (d, *J* = 12.5 Hz, 1 H), 3.61 (s, 3 H), 6.71 (d, *J* = 6.5 Hz, 2 H), 6.93-7.04 (m, 3 H), 7.13-7.22 (m, 2 H), 7.33 (d, *J* = 6.6 Hz, 1 H), 7.51 (d, *J* = 7.3 Hz, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 14.2, 21.0, 28.0, 33.5, 35.8, 42.1, 43.1, 51.7, 58.0, 83.8, 114.6, 123.6, 124.0, 126.5, 127.5, 128.2, 129.2, 129.7, 134.9, 140.0, 148.6, 173.4, 177.2; MS calcd for $C_{27}H_{33}NNaO_5$ $[M + Na]^+$: 474.2251, found 474.2246.



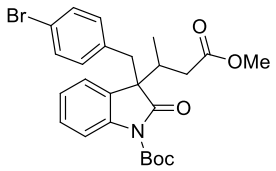
tert-butyl 3-benzyl-3-(3-methoxy-3-oxo-1-phenylpropyl)-2-oxoindoline-1-carboxylate (3ag) White solid; 34.5 mg, 71% yield; 4.9:1 dr, 74% ee; $[\alpha]_D^{20}$ = +8.8 (*c* = 1.0, $CHCl_3$); Mp: 157.2-158.9 ℃; The ee was determined by HPLC (Chiralpak AD-H column, *i*PrOH/hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 11.6 min, t_{major} = 27.7 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.43 (s, 9 H), 2.89-3.00 (m, 2 H), 3.18 (d, *J* = 12.9 Hz, 1 H), 3.28 (d, *J* = 12.6 Hz, 1 H), 3.48 (s, 3 H), 3.84 (dd, *J* = 5.3 Hz, *J* = 10.2 Hz, 1 H), 6.78-6.81 (m, 2 H), 6.94-6.99 (m, 5 H), 7.11-7.13 (m, 3 H), 7.19-7.22 (m, 2 H), 7.37-7.45 (m, 2 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 27.8, 35.5, 41.7, 49.6, 51.7, 58.3, 83.6, 114.8, 123.7, 124.0, 126.5, 127.3, 127.7, 127.7, 128.0, 128.5, 129.2, 129.9, 135.2, 137.6, 140.3, 148.2, 171.8, 176.1; MS calcd for $C_{30}H_{31}NNaO_5$ $[M + Na]^+$: 508.2094, found 508.2092.



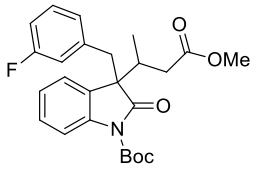
tert-butyl 3-benzyl-3-(1-(furan-2-yl)-3-methoxy-3-oxopropyl)-2-oxoindoline-1-carboxylate (3ah) White solid; 29.0 mg, 61% yield; 3.2:1 dr, 80% ee; $[\alpha]_D^{20}$ = +18.2 (*c* = 1.0, $CHCl_3$); Mp: 127.6-128.9 ℃; The ee was determined by HPLC (Chiralpak AD-H column, EtOH/hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 5.6 min, t_{major} = 9.4 min); 1.53 (s, 9 H), 2.80 (dd, *J* = 3.9 Hz, *J* = 15.7 Hz, 1 H), 2.92 (dd, *J* = 11.3 Hz, *J* = 15.7 Hz, 1 H), 3.14-3.34 (m, 2 H), 3.55 (s, 3 H), 3.93 (dd, *J* = 4.0 Hz, *J* = 11.3 Hz, 1 H), 6.17 (d, *J* = 3.2 Hz, 1 H), 6.28 (t, *J* = 3.1 Hz, 1 H), 6.74 (d, *J* = 6.2 Hz, 2 H), 6.93-7.03 (m, 3 H), 7.12-7.21 (m, 3 H), 7.42-7.50 (m, 2 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 28.0, 33.9, 41.6, 42.4, 51.8, 57.1, 83.9, 108.6, 110.4, 114.6, 123.8, 123.9, 124.8, 126.5, 127.6, 128.5, 129.8, 134.8, 139.8, 141.6, 148.5, 152.4, 171.7, 176.0; MS calcd for $C_{28}H_{29}NNaO_6$ $[M + Na]^+$: 498.1887, found 498.1885.



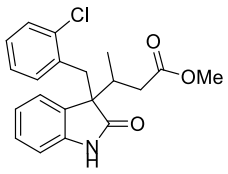
tert-butyl 3-(4-methoxy-4-oxobutan-2-yl)-3-(4-methoxybenzyl)-2-oxoindoline-1-carboxylate (**3bd**): Colorless oil; 35.5 mg, 78% yield; 11.8:1 dr, 85% ee; $[\alpha]_D^{20}$ = +22.8 (*c* = 1.0, $CHCl_3$); The ee was determined by HPLC (Chiralpak OD-H column, EtOH//hexane = 1/99, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 8.9 min, t_{major} = 12.2 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.07 (d, *J* = 6.7 Hz, 3 H), 1.53(s, 9 H), 2.19 (dd, *J* = 11.0 Hz, *J* = 14.9 Hz, 1 H), 2.39 (dd, *J* = 2.9 Hz, *J* = 15.1 Hz, 1 H), 2.70-2.75 (m, 1 H), 2.97 (d, *J* = 12.9 Hz, 1 H), 3.28 (d, *J* = 12.9 Hz, 1 H), 3.61 (s, 3H), 3.63 (s, 3H), 6.50 (d, *J* = 8.5 Hz, 2 H), 6.65 (d, *J* = 8.5 Hz, 2 H), 7.12-7.22 (m, 2 H), 7.25 (d, *J* = 7.7 Hz, 1 H), 7.53 (d, *J* = 7.4 Hz, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 14.9, 27.9, 36.8, 37.6, 41.5, 51.6, 54.9, 57.3, 83.8, 112.9, 114.6, 123.4, 124.0, 127.0, 128.2, 129.1, 130.7, 140.1, 148.6, 158.1, 172.7, 177.0; MS calcd for $C_{26}H_{31}NNaO_6$ $[M + Na]^+$: 476.2044, found 476.2048.



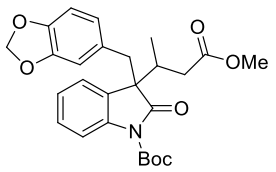
tert-butyl 3-(4-bromobenzyl)-3-(4-methoxy-4-oxobutan-2-yl)-2-oxoindoline-1-carboxylate (**3cd**) Colorless oil; 30.1 mg, 60% yield; 36.5:1 dr, 93% ee; $[\alpha]_D^{20}$ = +29.4 (*c* = 1.0, $CHCl_3$); The ee was determined by HPLC (Chiralpak OD-H column, *i*PrOH/hexane = 1/99, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 13.1 min, t_{major} = 22.7 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.07 (d, *J* = 6.7 Hz, 3 H), 1.54 (s, 9 H), 2.20 (dd, *J* = 10.9 Hz, *J* = 15.1 Hz, 1 H), 2.38 (dd, *J* = 3.2 Hz, *J* = 15.1 Hz, 1 H), 2.70-2.77 (m, 1 H), 2.97 (d, *J* = 12.7 Hz, 1 H), 3.30 (d, *J* = 12.7 Hz, 1 H), 3.62 (s, 3 H), 6.60 (d, *J* = 8.3 Hz, 2 H), 7.09 (d, *J* = 8.3 Hz, 2 H), 7.14-7.22 (m, 2 H), 7.25-7.27 (m, 1 H), 7.53 (d, *J* = 7.7 Hz, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 15.0, 27.9, 36.7, 37.7, 41.7, 51.7, 57.1, 84.2, 114.8, 120.7, 123.4, 124.2, 128.5, 128.6, 130.7, 131.4, 134.1, 140.0, 148.4, 172.6, 176.7; MS calcd for $C_{25}H_{28}BrNNaO_5$ $[M + Na]^+$: 524.1043, found 524.1052.



tert-butyl 3-(3-fluorobenzyl)-3-(4-methoxy-4-oxobutan-2-yl)-2-oxoindoline-1-carboxylate (**3dd**) Colorless oil; 34.4 mg, 78% yield; 29.2:1 dr, 94% ee; $[\alpha]_D^{20}$ = +15.6 (*c* = 1.0, $CHCl_3$); The ee was determined by HPLC (Chiralpak OD-H column, *i*PrOH/hexane = 1/99, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 10.2 min, t_{major} = 14.2 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.08 (d, *J* = 6.7 Hz, 3 H), 1.54 (s, 9 H), 2.20 (dd, *J* = 10.8 Hz, *J* = 15.1 Hz, 1 H), 2.37 (dd, *J* = 3.2 Hz, *J* = 15.1 Hz, 1 H), 2.72-2.76 (m, 1 H), 3.00 (d, *J* = 12.7 Hz, 1 H), 3.35 (d, *J* = 12.7 Hz, 1 H), 3.62 (s, 3 H), 6.49 (t, *J* = 6.8 Hz, 2 H), 6.70 (td, *J* = 1.7 Hz, *J* = 8.9 Hz, 1 H), 6.88-6.96 (m, 1 H), 7.13-7.23 (m, 2 H), 7.26-7.28 (m, 1 H), 7.54 (d, *J* = 7.2 Hz, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 14.9, 27.9, 36.7, 37.7, 42.1, 51.7, 57.1, 84.1, 113.5 (d, *J* = 20.9 Hz), 114.6, 116.5 (d, *J* = 21.4 Hz), 123.3, 124.2, 125.4 (d, *J* = 2.8 Hz), 128.5, 128.6, 128.9 (d, *J* = 8.2 Hz), 137.6 (d, *J* = 7.4 Hz), 140.0, 148.5, 162.0 (d, *J* = 243.8 Hz), 172.6, 176.6; MS calcd for $C_{25}H_{28}FNNaO_5$ $[M + Na]^+$: 464.1844, found 464.1838.

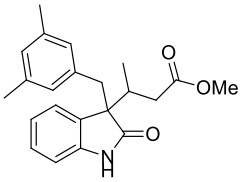


methyl 3-(3-(2-chlorobenzyl)-2-oxoindolin-3-yl)butanoate (**3fd**) Deprotected the Boc group; White solid; 30.2 mg, 86% yield; 54.9:1 dr, 98% ee; $[\alpha]_D^{20}$ = -0.2 (*c* = 1.0, $CHCl_3$); Mp: 120.2-121.5 ℃; The ee was determined by HPLC (Chiralpak AD-H column, EtOH/hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 11.5 min, t_{major} = 15.2 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.07 (d, *J* = 6.7 Hz, 3 H), 2.22 (dd, *J* = 11.0 Hz, *J* = 15.1 Hz, 1 H), 2.53 (dd, *J* = 2.9 Hz, *J* = 15.2 Hz, 1 H); 2.68-2.75 (m, 1 H); 3.39 (d, *J* = 13.6 Hz, 1 H), 3.57 (d, *J* = 13.6 Hz, 1 H), 3.63 (s, 3 H), 6.68 (d, *J* = 7.4 Hz, 1 H), 6.85-6.97 (m, 3 H), 7.06-7.11 (m, 3 H), 7.30 (d, *J* = 7.4 Hz, 1 H), 8.63 (s, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 14.7, 36.3, 36.8, 37.6, 51.7, 57.2, 109.2, 122.0, 125.1, 126.3, 127.8, 128.2, 129.2, 129.3, 129.5, 130.4, 134.4, 140.8, 173.0, 180.9; MS calcd for $C_{20}H_{20}ClNNaO_3$ $[M + Na]^+$: 380.1024, found 380.1018.

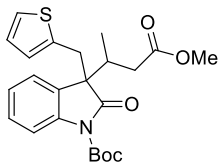


tert-butyl3-(benzo[*d*][1,3]dioxol-5-ylmethyl)-3-(4-methoxy-4-oxobutan-2-yl)-2-oxoindoline-1-carboxylate (**3gd**) Colorless oil; 34.4 mg, 84% yield; 13.8:1 dr, 89% ee; $[\alpha]_D^{20}$ = +23.5 (*c* = 1.0, $CHCl_3$); The ee was determined by HPLC (Chiralpak IC column, *i*PrOH/hexane = 20/80,

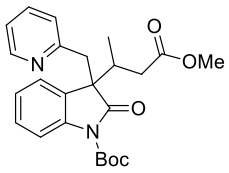
flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 10.5 min, t_{major} = 7.5 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.06 (d, *J* = 6.7 Hz, 3 H), 1.55 (s, 9 H), 2.18 (dd, *J* = 11.0 Hz, *J* = 15.1 Hz, 1 H), 2.36 (dd, *J* = 3.2 Hz, *J* = 15.1 Hz, 1 H), 2.68-2.73 (m, 1 H), 2.93 (d, *J* = 12.9 Hz, 1 H), 3.27 (d, *J* = 12.9 Hz, 1 H), 3.61 (s, 3 H), 5.75-5.77 (m, 2 H), 6.20 (dd, *J* = 1.7 Hz, *J* = 8.0 Hz, 1 H), 6.24 (d, *J* = 1.6 Hz, 1 H), 6.41 (d, *J* = 8.0 Hz, 1 H), 7.12-7.26 (m, 3 H), 7.58 (d, *J* = 6.9 Hz, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 14.9, 27.9, 36.8, 37.6, 42.1, 51.6, 57.3, 83.9, 100.6, 107.4, 110.0, 114.6, 123.0, 123.4, 124.1, 128.3, 128.7, 128.9, 140.1, 146.0, 146.8, 148.7, 172.7, 176.9; MS calcd for $C_{26}H_{29}NNaO_7$ $[M + Na]^+$: 490.1836,found 490.1830.



methyl 3-(3-(3,5-dimethylbenzyl)-2-oxoindolin-3-yl)butanoate (3hd) Deprotected the Boc group; White solid; 21.4 mg, 61% yield; 7.3:1 dr, 78% ee; $[\alpha]_D^{20}$ = +62.0 (*c* = 1.0, $CHCl_3$); Mp: 118.6-119.8 ℃; The ee was determined by HPLC (Chiralpak IA column, EtOH/hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 9.8 min, t_{major} = 11.2 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.03 (d, *J* = 6.6 Hz, 3 H), 2.02 (s, 6 H), 2.23 (dd, *J* = 11.0 Hz, *J* = 15.0 Hz, 1 H), 2.53 (dd, *J* = 3.1 Hz, *J* = 15.0 Hz, 1 H), 2.64-2.73 (m, 1 H), 3.02 (d, *J* = 12.7 Hz, 1 H), 3.20 (d, *J* = 12.9 Hz, 1 H), 3.64 (s, 3 H), 6.41 (s, 2 H), 6.64 (s, 1 H), 6.65 (d, *J* = 7.3 Hz, 1 H), 7.04 (t, *J* = 7.2 Hz, 1 H), 7.13(t, *J* = 7.6 Hz, 1 H), 7.25 (d, *J* = 5.9 Hz, 1 H), 8.00 (s, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 14.9, 21.0, 36.8, 37.2, 40.8, 51.7, 57.5, 109.5, 122.0, 124.4, 127.7, 128.0, 128.0, 130.5, 135.4, 136.8, 141.1, 173.1, 180.4; MS calcd for $C_{22}H_{25}NNaO_3$ $[M + Na]^+$: 374.1727, found 374.1724.

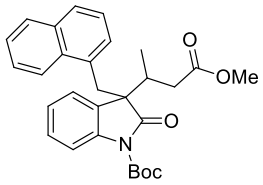


tert-butyl 3-(4-methoxy-4-oxobutan-2-yl)-2-oxo-3-(thiophen-2-ylmethyl)indoline-1-carboxylate (**3id**) Colorless oil; 32.2 mg, 75% yield; 50.3:1 dr, 98% ee; $[\alpha]_D^{20}$ = +13.1 (*c* = 1.0, $CHCl_3$); The ee was determined by HPLC (Chiralpak OD-H column, EtOH/hexane = 1/99, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 12.3 min, t_{major} = 17.8 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.09 (d, *J* = 6.7 Hz, 3 H), 1.57 (s, 9 H), 2.17 (dd, *J* = 10.9 Hz, *J* = 15.1 Hz, 1 H), 2.36 (dd, *J* = 3.2 Hz, *J* = 15.1 Hz, 1 H), 2.68-2.75 (m, 1 H), 3.27 (d, *J* = 14.0 Hz, 1 H), 3.59 (d, *J* = 14.0 Hz, 1 H), 3.62 (s, 3 H), 6.53 (d, *J* = 3.3 Hz, 1 H), 6.69 (t, *J* = 3.5 Hz, 1 H), 6.91 (d, *J* = 5.1 Hz, 1 H), 7.15-7.29 (m, 3 H), 7.65 (d, *J* = 8.0 Hz, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 14.8, 28.0, 36.2, 36.7, 37.7, 51.7, 56.9, 84.1, 114.8, 123.5, 124.3, 124.4, 126.2, 127.1, 128.6, 128.9, 136.7, 140.4, 148.7, 172.6, 176.6; MS calcd for $C_{23}H_{27}NNaO_5S$ $[M + Na]^+$: 452.1502, found 452.1502.

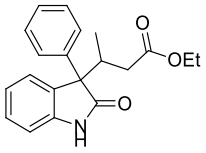


tert-butyl 3-(4-methoxy-4-oxobutan-2-yl)-2-oxo-3-(pyridin-2-ylmethyl)indoline-1-carboxylate (3jd) Colorless oil; 36.6 mg, 86% yield; >99:1 dr, 96% ee; $[\alpha]_D^{20}$ = -4.5 (*c* = 1.0, $CHCl_3$); The ee was determined by HPLC (Chiralpak AD-H column, EtOH/hexane = 30/70, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 5.3 min, t_{major} = 4.4 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.12 (d, *J* = 6.7 Hz, 3 H) 1.62 (s, 9 H), 2.17 (dd, *J* = 11.0 Hz, *J* = 15.2 Hz, 1 H), 2.37 (dd, *J* = 3.0 Hz, *J* = 15.2 Hz, 1 H), 2.66-2.72 (m, 1 H), 3.24 (d, *J* = 13.6 Hz, 1 H), 3.60 (s, 3 H), 3.66 (d, *J* = 13.6 Hz, 1 H), 6.82-6.90 (m, 2 H), 7.03 (t, *J* = 7.4 Hz, 1 H), 7.13 (t, *J* = 7.1 Hz, 2 H), 7.32 (td, *J* = 1.8 Hz, *J* = 7.7 Hz, 1 H), 7.58 (d, *J* = 7.7 Hz, 1 H),

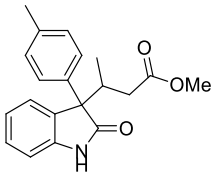
8.18 (d, J = 4.0 Hz, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 14.5, 28.1, 36.6, 38.3, 43.8, 51.6, 55.5, 83.9, 114.5, 121.3, 123.4, 123.5, 123.9, 128.0, 129.0, 135.6, 140.1, 148.6, 149.2, 156.3, 172.8, 177.2; MS calcd for $C_{24}H_{28}N_2NaO_5$ $[M + Na]^+$: 447.1890, found 447.1889.



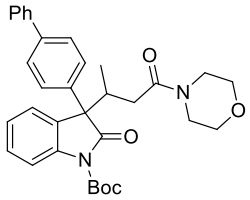
tert-butyl 3-(4-methoxy-4-oxobutan-2-yl)-3-(naphthalen-1-ylmethyl)-2-oxoindoline-1-carboxylate (3kd) Colorless oil; 38.9 mg, 82% yield; 26.2:1 dr, 96% ee; $[\alpha]_D^{20}$ = +27.1 (c = 1.0, $CHCl_3$); The ee was determined by HPLC (Chiralpak OD-H column, *i*PrOH/hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 12.1 min, t_{major} = 6.6 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.25 (d, J = 6.7 Hz, 3 H), 1.40 (s, 9 H), 2.27 (dd, J = 10.8 Hz, J = 15.4 Hz, 1 H), 2.41 (dd, J = 3.2 Hz, J = 15.2 Hz, 1 H), 2.89-2.96 (m, 1 H), 3.51 (d, J = 13.5 Hz, 1 H), 3.64 (s, 3 H), 3.96 (d, J = 13.5 Hz, 1 H), 6.87 (d, J = 7.1 Hz, 1 H), 7.00 (t, J = 7.4 Hz, 1 H), 7.08 (t, J = 7.4 Hz, 2 H), 7.24 (d, J = 7.3 Hz, 1 H), 7.31-7.41 (m, 2 H), 7.45 (d, J = 8.0 Hz, 1 H), 7.54 (d, J = 8.1 Hz, 1 H), 7.66 (d, J = 7.4 Hz, 1 H), 7.96 (d, J = 8.0 Hz, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 15.0, 27.7, 37.0, 37.8, 51.7, 56.9, 83.6, 114.4, 123.8, 123.8, 124.3, 124.4, 125.1, 125.2, 127.4, 127.7, 128.1, 128.2, 128.8, 128.9, 131.5, 131.9, 133.4, 140.0, 148.5, 172.8, 177.0; MS calcd for $C_{29}H_{31}NNaO_5$ $[M + Na]^+$: 496.2094, found 496.2088.



ethyl 3-(2-oxo-3-phenylindolin-3-yl)butanoate (3ld) Deprotected the Boc group; White solid; 27.5 mg, 85% yield; 24.8:1 dr, 81% ee; $[\alpha]_D^{20}$ = +202.3 (c = 1.0, $CHCl_3$); Mp: 188.9-190.5 ℃; The ee was determined by HPLC (Chiralpak OD-H column, *i*PrOH/hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 5.3 min, t_{major} = 10.9 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 0.83 (d, J = 6.5 Hz, 3 H), 1.22 (t, J = 7.1 Hz, 3 H), 2.24 (dd, J = 11.4 Hz, J = 15.1 Hz, 1 H), 2.46 (d, J = 13.5 Hz, 1 H), 3.33-3.38 (m, 1 H), 4.08 (q, J = 7.1 Hz, 2 H), 6.98 (d, J = 7.7 Hz, 1 H), 7.10 (t, J = 7.4 Hz, 1 H), 7.24-7.33 (m, 5 H), 7.45 (d, J = 7.3 Hz, 2 H), 9.03 (s, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 14.1, 15.1, 37.0, 37.2, 60.5, 60.8, 110.4, 122.3, 126.1, 127.5, 127.5, 128.5, 128.7, 129.6, 138.1, 141.6, 172.6, 180.2; MS calcd for $C_{20}H_{21}NNaO_3$ $[M + Na]^+$: 346.1414, found 346.1410.

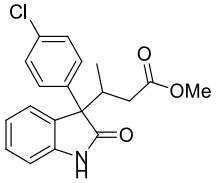


methyl 3-(2-oxo-3-(p-tolyl)indolin-3-yl)butanoate (3md) Deprotected the Boc group; Colorless oil; 22.6 mg, 70% yield; 14.8:1 dr, 79% ee; $[\alpha]_D^{20}$ = +155.0 (c = 1.0, $CHCl_3$); The ee was determined by HPLC (Chiralpak OD-H column, EtOH/hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 5.3 min, t_{major} = 11.1 min); ^{1}H NMR (300 MHz, $CDCl_3$) 0.81 (d, J = 6.5 Hz, 3 H), 2.25 (dd, J = 11.5 Hz, J = 15.2 Hz, 1 H), 2.29 (s, 3 H), 2.49 (dd, J = 1.9 Hz, J = 15.1 Hz, 1 H), 3.26-3.38 (m, 1 H), 3.63 (s, 3 H), 6.97 (d, J = 7.7 Hz, 1 H), 7.07-7.12 (m, 3 H), 7.24 (d, J = 7.4 Hz, 1 H), 7.29-7.36 (m, 3 H), 8.92 (s, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 15.1, 20.9, 36.8, 37.1, 51.7, 60.5, 110.4, 122.3, 126.0, 127.3, 128.4, 129.4, 129.7, 135.0, 137.3, 141.6, 173.1, 180.4; MS calcd for $C_{20}H_{21}NNaO_3$ $[M + Na]^+$: 346.1414, found 346.1401.

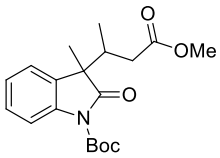


tert-butyl 3-([1,1'-biphenyl]-4-yl)-3-(4-morpholino-4-oxobutan-2-yl)-2-oxoindoline-1-carboxylate (3nd) Colorless oil; 40.5 mg, 75% yield; 11.4:1 dr, 76% ee; $[\alpha]_D^{20}$ = +65.7 (c = 1.0, $CHCl_3$); The ee was

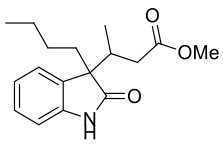
determined by HPLC (Chiralpak OD-H column, *i*PrOH/hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 9.3 min, t_{major} = 12.6 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 0.85 (d, *J* = 6.5 Hz, 3 H), 1.62 (s, 9 H), 2.28-2.39 (m, 2 H), 3.29 (s, 2 H), 3.46-3.62 (m, 7H), 7.25-7.35 (m, 3 H),7.39-7.44 (m, 3 H) 7.50-7.56 (m, 6 H), 7.99 (d, *J* = 8.2 Hz, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 15.6, 28.0, 34.8, 38.5, 44.0, 60.4, 66.5, 84.5, 115.3, 124.2, 125.5, 126.9, 127.3, 127.5, 128.1, 128.2, 128.7, 128.8, 137.1, 140.2, 140.4, 140.6, 149.1, 169.9, 176.0; MS calcd for $C_{33}H_{36}N_2NaO_5$ $[M + Na]^+$: 563.2516, found 563.2501.



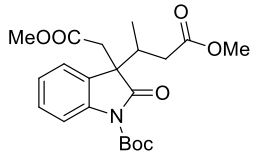
methyl 3-(3-(4-chlorophenyl)-2-oxoindolin-3-yl)butanoate (3od) Deprotected the Boc group; White solid; 25.1 mg, 73% yield; 2.0:1 dr, 79%/69% ee; $[\alpha]_D^{20}$ = +158.6 (*c* = 1.0, $CHCl_3$); Mp: 171.8-173.2 ℃; The ee was determined by HPLC (Chiralpak AD-H column, EtOH/hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 22.9 min, t_{major} = 12.9 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 0.82 (d, *J* = 6.4 Hz, 3 H), 2.21-2.30 (m, 1 H), 2.47 (td, *J* = 2.1 Hz, *J* = 15.2 Hz, 1 H), 3.29-3.38 (m, 1 H), 3.62 (s, 3 H), 6.98 (d, *J* = 7.7 Hz, 1 H), 7.08-7.13 (m, 1 H), 7.22-7.34 (m, 4 H), 7.45 (d, *J* = 7.1 Hz, 2 H), 8.92 (s, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 15.1, 36.8, 37.3, 51.7, 60.7, 110.4, 122.3, 126.1, 127.5, 128.7, 128.8, 129.0, 129.5, 138.0, 141.6, 173.0, 180.1; MS calcd for $C_{19}H_{18}ClNNaO_3$ $[M + Na]^+$: 366.0867, found 366.0877.



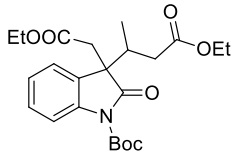
tert-butyl 3-(4-methoxy-4-oxobutan-2-yl)-3-methyl-2-oxoindoline-1-carboxylate (3pd) Colorless oil; 29.2 mg, 84% yield; 5.7:1 dr, 70% ee; $[\alpha]_D^{20}$ = +27.4 (*c* = 1.0, $CHCl_3$); The ee was determined by HPLC (Chiralpak AD-H column, *i*PrOH/hexane = 5/95, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 5.8 min, t_{major} = 5.5 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 0.97 (d, *J* = 6.7 Hz, 3 H), 1.43 (s, 3 H), 1.64 (s , 9H), 2.10 (dd, *J* = 11.0 Hz, *J* = 15.1 Hz, 1 H), 2.35 (dd, *J* = 3.3 Hz, *J* = 15.1 Hz, 1 H), 2.47-2.57 (m, 1H), 3.61 (s, 3 H), 7.12-7.20 (m, 2 H), 7.26-7.32 (m, 1 H), 7.83 (d, *J* = 8.1, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 14.6, 22.1, 28.1, 36.4, 38.4, 50.7, 51.6, 84.3, 114.8, 122.9, 124.4, 128.2, 131.7, 139.3, 149.2, 172.8, 178.1; MS calcd for $C_{19}H_{25}NNaO_5$ $[M + Na]^+$: 370.1625, found 370.1619.



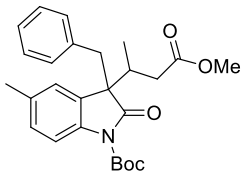
methyl 3-(3-butyl-2-oxoindolin-3-yl)butanoate (3qd) Deprotected the Boc group; Colorless oil; 22.0 mg, 76% yield; 7.8:1 dr, 68% ee; $[\alpha]_D^{20}$ = +20.8 (*c* = 1.0, $CHCl_3$); The ee was determined by HPLC (Chiralpak AD-H column, *i*PrOH/hexane = 20/80, flow rate 0.8 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 5.4 min, t_{major} = 7.3 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 0.74 (t, *J* = 7.2 Hz, 3 H), 0.93 (d, *J* = 6.6 Hz, 3 H), 0.97-1.10 (m, 2 H), 1.12-1.25 (m, 2 H), 1.76-2.00 (m, 2 H), 2.14 (dd, *J* = 11.0 Hz, *J* = 14.9 Hz, 1 H), 2.42-2.57 (m, 2 H), 3.61 (s, 3 H), 6.91 (d, *J* = 7.7 Hz, 1 H), 7.03 (t, *J* = 7.4 Hz, 1 H), 7.12 (d, *J* = 7.3 Hz, 1 H), 7.21 (t, *J* = 7.5 Hz, 1 H), 8.78 (s, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 13.8, 14.6, 22.9, 26,3, 34.9, 36.6, 37.1, 51.6, 55.9, 109.6, 122.4, 123.6, 127.9, 131.5, 141.4, 173.2, 181.8; MS calcd for $C_{17}H_{23}NNaO_3$ $[M + Na]^+$: 312.1570, found 312.1565.



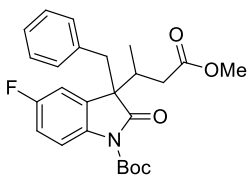
tert-butyl 3-(2-methoxy-2-oxoethyl)-3-(4-methoxy-4-oxobutan-2-yl)-2-oxoindoline-1-carboxylate (3rd) Colorless oil; 32.1 mg, 79% yield; 45.7:1 dr, 93% ee; $[\alpha]_D^{20}$ = +21.6 (*c* = 1.0, $CHCl_3$); The ee was determined by HPLC (Chiralpak OD-H column, *i*PrOH/hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 7.4 min, t_{major} = 6.4 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 0.97 (d, *J* = 6.7 Hz, 3 H), 1.64 (s, 9 H), 2.06 (dd, *J* = 10.9 Hz, *J* = 15.2 Hz, 1 H), 2.27 (dd, *J* = 3.2 Hz, *J* = 15.3 Hz, 1 H), 2.47-2.54 (m, 1 H), 2.90 (d, *J* = 16.3 Hz, 1 H), 3.19 (d, *J* = 16.3 Hz, 1 H), 3.40 (s, 3 H), 3.60 (s, 3 H), 7.11-7.16 (m, 2 H), 7.26-7.33 (m, 1 H), 7.84 (d, *J* = 8.1 Hz, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 14.2, 28.1, 36.1, 38.3, 39.9, 51.7, 51.7, 52.1, 84.2, 115.0, 122,6, 124.3, 128.7, 140.6, 140.7, 149.1, 170.0, 172.4, 176.8; MS calcd for $C_{21}H_{27}NNaO_7$ $[M + Na]^+$: 428.1680, found 428.1661.



tert-butyl 3-(2-ethoxy-2-oxoethyl)-3-(4-ethoxy-4-oxobutan-2-yl)-2-oxoindoline-1-carboxylate (3sd) Colorless oil; 33.8 mg, 78% yield; 12.1:1 dr, 97% ee; $[\alpha]_D^{20}$ = +13.4 (*c* = 1.0, $CHCl_3$); The ee was determined by HPLC (Chiralpak OD-H column, *i*PrOH/hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 5.4 min, t_{major} = 5.0 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 0.92-0.99 (m, 6 H), 1.20 (t, *J* = 7.1 Hz, 3 H), 1.64 (s, 9 H), 2.05 (dd, *J* = 11.0 Hz, *J* = 15.2 Hz, 1 H), 2.26 (dd, *J* = 3.1 Hz, *J* = 15.2 Hz, 1 H), 2.44-2.52 (m, 1 H), 2.88 (d, *J* = 16.0 Hz, 1 H), 3.20 (d, *J* = 16.0 Hz, 1 H), 3.77-3.86 (m, 2 H), 4.06 (q, *J* = 7.1 Hz, 2 H), 7.12-7.15 (m, 2 H), 7.27-7.33 (m, 1 H), 7.84 (d, *J* = 8.2 Hz, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 13.6, 14.1, 14.1, 28.1, 36.4, 38.5, 40.3, 52.2, 60.6, 60.7, 84.2, 114.9, 122.7, 124.3, 128.7, 128.8, 140.7, 149.2, 169.4, 172.0, 176.8; MS calcd for $C_{23}H_{31}NNaO_7$ $[M + Na]^+$: 456.1993, found 456.1970.

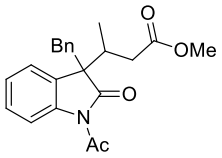


tert-butyl 3-benzyl-3-(4-methoxy-4-oxobutan-2-yl)-5-methyl-2-oxoindoline-1-carboxylate (3td) Colorless oil; 35.8 mg, 82% yield; 11.1:1 dr, 85% ee; $[\alpha]_D^{20}$ = +36.2 (*c* = 1.0, $CHCl_3$); The ee was determined by HPLC (Chiralpak AD-H column, *i*PrOH/hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 5.1 min, t_{major} = 5.6 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.09 (d, *J* = 6.7 Hz, 3 H), 1.52 (s, 9 H), 2.22 (dd, *J* = 11.1 Hz, *J* = 15.1 Hz, 1 H), 2.37-2.44 (m, 4 H), 2.70-2.77 (m, 1 H), 3.01 (d, *J* = 12.7 Hz, 1 H), 3.33 (d, *J* = 12.7 Hz, 1 H), 3.64 (s, 3 H), 6.74 (dd, *J* = 1.4 Hz, *J* = 7.4 Hz, 2 H), 6.95-7.05 (m, 5 H), 7.39 (d, *J* = 8.3 Hz, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 15.0, 21.2, 28.0, 36.9, 37.7, 42.5, 51.7, 57.3, 83.7, 114.4, 124.0, 126.5, 127.5, 128.8, 128.9, 129.8, 133.6, 135.2, 137.8, 148.7, 172.9, 177.0; MS calcd for $C_{26}H_{31}NNaO_5$ $[M + Na]^+$: 460.2094, found 460.2103.

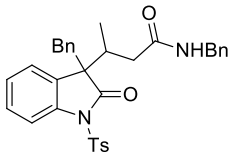


tert-butyl 3-benzyl-3-(4-methoxy-4-oxobutan-2-yl)-5-methyl-2-oxoindoline-1-carboxylate (3ud) Colorless oil; 28.6 mg, 65% yield; 36.1:1 dr, 93% ee; $[\alpha]_D^{20}$ = +12.5 (*c* = 1.0, $CHCl_3$); The ee was determined by HPLC (Chiralpak OD-H column, *i*PrOH/hexane = 5/95, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 5.5 min, t_{major} = 7.6 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.12 (d, *J* = 6.7 Hz, 3 H), 1.54 (s, 9 H), 2.20 (dd, *J* = 10.8 Hz, *J* = 15.1 Hz, 1 H), 2.36 (dd, *J* = 3.2 Hz, *J* = 15.1 Hz, 1 H), 2.70-2.76 (m, 1 H), 2.99 (d, *J* = 12.8 Hz, 1 H), 3.37 (d, *J* = 12.8 Hz, 1 H), 3.65 (s, 3 H), 6.77 (dd, *J* = 1.4 Hz, *J* = 7.5 Hz, 2 H),

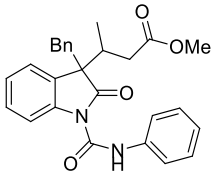
6.89 (td, J = 2.7 Hz, J = 8.9 Hz, 1 H), 6.98-7.05 (m, 4 H), 7.52 (dd, J = 4.6 Hz, J = 8.9 Hz, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 15.0, 28.0, 36.8, 37.7, 42.5, 51.8, 57.6, 84.1, 110.9 (d, J = 24.1 Hz), 114.8 (d, J = 22.6 Hz), 116.0 (d, J = 7.8 Hz), 126.8, 127.7, 129.7, 131.0 (d, J = 7.7 Hz), 134.7, 136.1, 148.5, 159.7 (d, J = 242.1 Hz), 172.5, 176.4; MS calcd for $C_{25}H_{28}FNNaO_5$ $[M + Na]^+$: 464.1844, found 464.1854.



methyl 3-(1-acetyl-3-benzyl-2-oxoindolin-3-yl)butanoate (3vd) White solid; 35.1 mg, 96% yield; 4.3:1 dr, 3% ee; $[\alpha]_D^{20}$ = +0.7 (c = 1.0, $CHCl_3$); Mp: 143.5-149 ℃; The ee was determined by HPLC (Chiralpak OD-H column, *i*PrOH/hexane = 1/99, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 12.4 min, t_{major} = 26.7 min); ; ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.03 (d, J = 6.7 Hz, 3 H), 2.22 (dd, J = 10.9 Hz, J = 15.1 Hz, 1 H), 3.47-3.53 (m, 4 H), 2.77-2.81 (m, 1 H), 3.10 (d, J = 12.8 Hz, 1 H), 3.34 (d, J = 12.8 Hz, 1 H), 3.65 (s, 3 H), 6.70 (d, J = 6.5 Hz, 2 H), 6.96-7.03 (m, 3 H), 7.21-7.27 (m, 2 H), 7.34 (dd, J = 3.7 Hz, J = 5.6 Hz, 1 H), 7.93-7.98 (m, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 15.2, 26.4, 36.7, 38.0, 42.4, 51.7, 57.6, 116.2, 123.4, 124.9, 126.9, 127.7, 128.6, 129.1, 129.6, 134.9, 140.5, 170.3, 172.6, 179.3; MS calcd for $C_{22}H_{23}NNaO_4$ $[M + Na]^+$: 388.1519, found 388.1517.



N-benzyl-3-(3-benzyl-2-oxo-1-tosylindolin-3-yl)butanamide (3wd) White solid; 54.2 mg, 98% yield; 4.9:1 dr, 60% ee; $[\alpha]_D^{20}$ = +0.9 (c = 1.0, CH_2Cl_2); Mp: 199.5-201.3 ℃; The ee was determined by HPLC (Chiralpak IA column, *i*PrOH/hexane = 20/80, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 24.3 min, t_{major} = 11.0 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 0.57 (d, J = 6.5 Hz, 3 H), 1.99 (t, J = 11.7 Hz, 1 H), 2.39-2.59 (m, 5 H), 3.08 (d, J = 13.1 Hz, 1 H), 3.29 (d, J = 13.1 Hz, 1 H), 4.25 (d, J = 5.7 Hz, 2 H), 6.50 (d, J = 7.2 Hz, 2 H), 6.73 (t, J = 7.6 Hz, 2 H), 6.90 (t, J = 7.4 Hz, 1 H), 7.21-7.32 (m, 7 H), 7.41 (d, J = 8.1 Hz, 2 H), 7.57 (d, J = 7.9 Hz, 2 H), 7.70 (d, J = 8.3 Hz, 2 H), 8.47 (t, J = 5.7 Hz, 1 H); ^{13}C NMR (75 MHz, DMSO-d_6) δ 14.1, 21.1, 37.3, 38.7, 40.2, 42.2, 57.4, 112.2, 124.4, 125.3, 126.1, 126.7, 127.2, 127.2, 127.5, 128.2, 128.4, 128.6, 129.1, 130.0, 134.4, 135.3, 138.7, 139.4, 145.6, 170.5, 176.8; MS calcd for $C_{33}H_{32}N_2NaO_4S$ $[M + Na]^+$: 575.1975, found 575.1967.



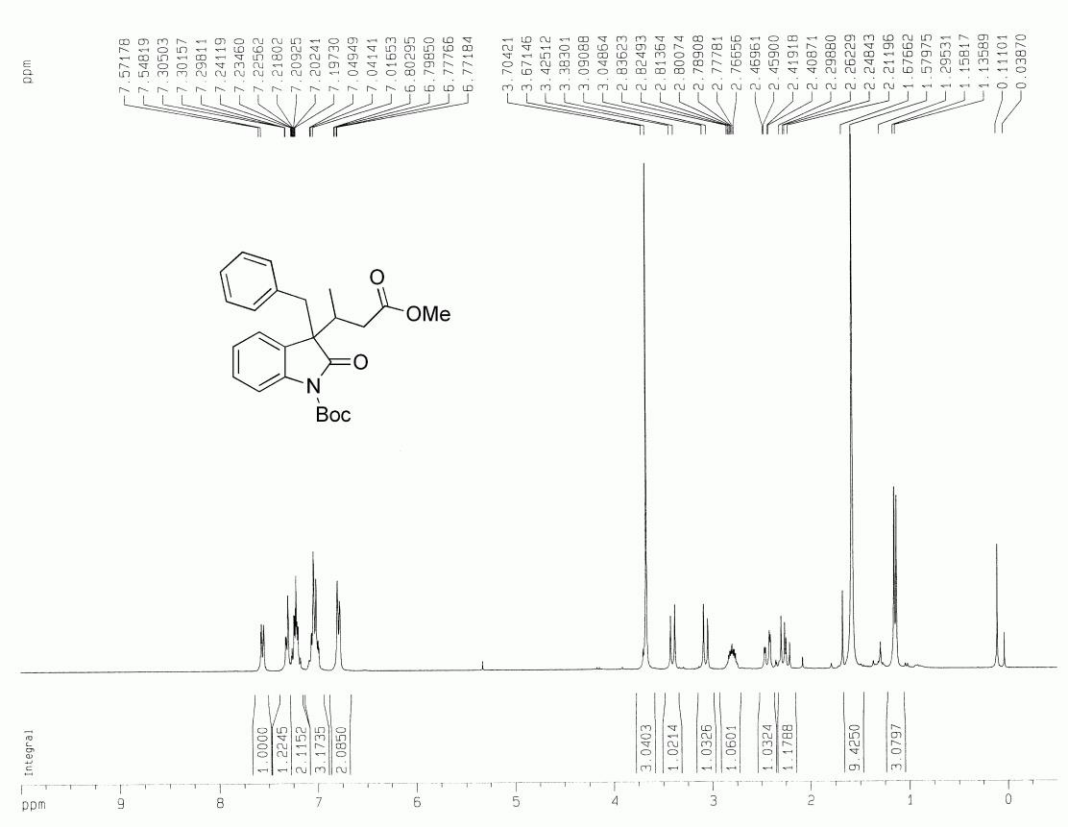
methyl 3-(3-benzyl-2-oxo-1-(phenylcarbamoyl)indolin-3-yl)butanoate (3xd) Colorless oil; 41.6 mg, 94% yield; 2.9:1 dr, 0%/35% ee; $[\alpha]_D^{20}$ = -4.3 (c = 1.0, $CHCl_3$); The ee was determined by HPLC (Chiralpak OD-H column, *i*PrOH/hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm, major diastereomer: t_{minor} = 6.1 min, t_{major} = 9.4 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.10 (d, J = 6.7 Hz, 3 H), 2.34 (dd, J = 10.9 Hz, J = 15.1 Hz, 1 H), 2.50 (dd, J = 3.2 Hz, J = 15.1 Hz, 1 H), 2.78-2.87 (m, 1 H), 3.17 (d, J = 12.9 Hz, 1 H), 3.31 (d, J = 12.9 Hz, 1 H), 3.66 (s, 3 H), 6.74-6.76 (m, 2 H), 6.96-7.04 (m, 3 H), 7.14 (t, J = 7.5 Hz, 1 H), 7.22-7.29 (m, 2 H), 7.31-7.41 (m, 3 H), 7.56 (d, J = 8.5 Hz, 2 H), 8.08 (d, J = 7.7 Hz, 1 H), 10.65 (s, 1 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 15.0, 36.7, 38.0, 42.0, 51.7, 58.4, 116.3, 120.4, 123.3, 124.4, 124.6, 127.0, 127.9, 128.7, 128.7, 129.0, 129.5, 134.6, 137.0, 140.5, 148.8, 172.5, 181.6; MS calcd for $C_{27}H_{26}N_2NaO_4$ $[M + Na]^+$: 465.1785, found 465.1785.

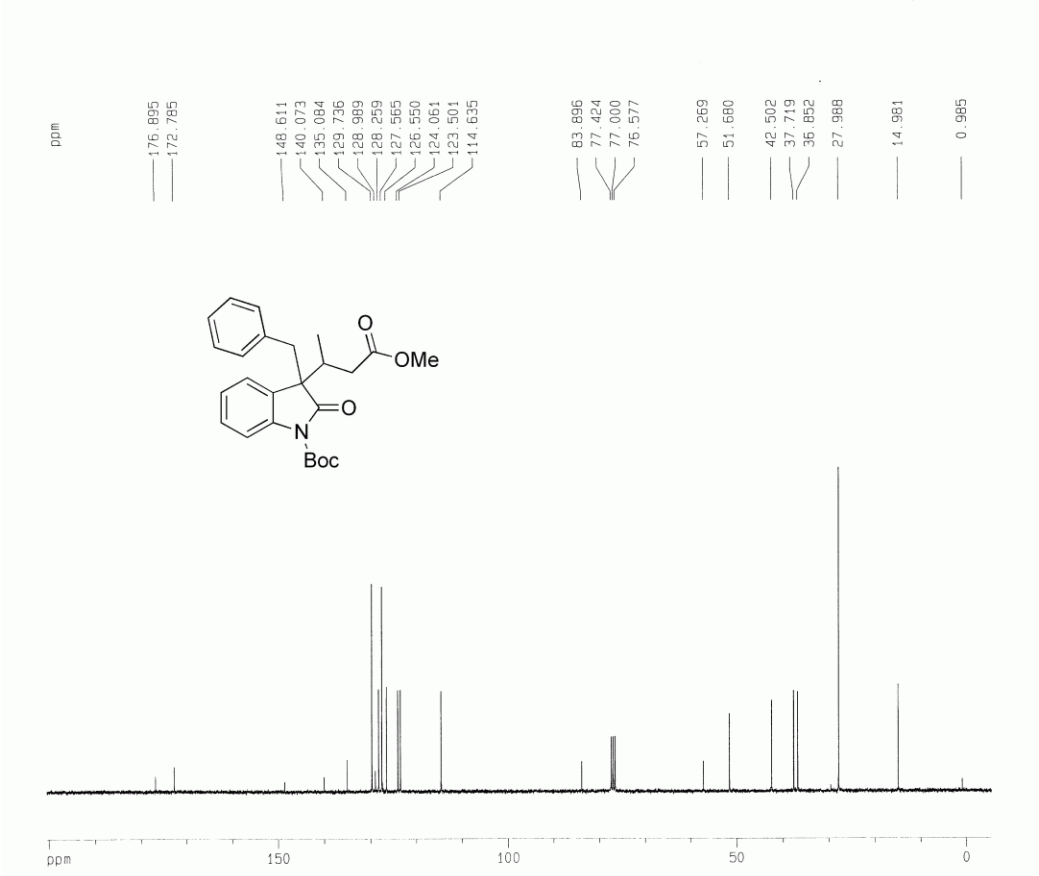
References

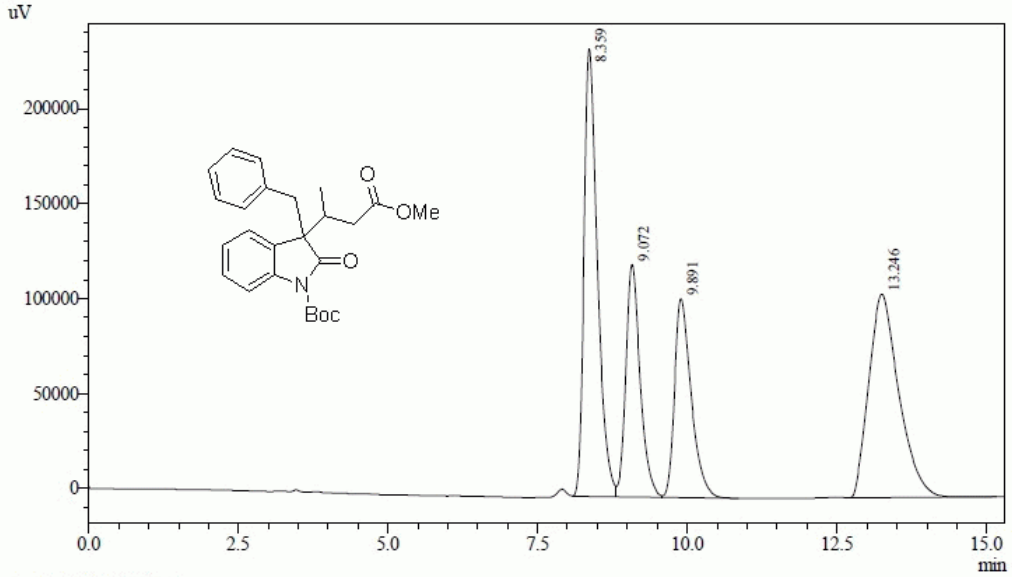
[1] For the preparation of 3-Mono Substituted Oxindoles (**1a-1x**), see: (a) F. Manoni and S. J. Connon, *Angew. Chem. Int. Ed.*, 2014, **53**, 2628; (b) A. Huang, J. J. Kodanko and L. E. Overman, *J. Am. Chem. Soc.*, 2004, **126**, 14043; (c) B. Tan, N. R. Candeias and C. F. Barbas, III, *J. Am. Chem. Soc.*, 2011, **133**, 4672; (d) Y. Hamashima, T. Suzuki, H. Takano, Y. Shimura and M. Sodeoka, *J. Am. Chem. Soc.*, 2005, **127**, 10164; (e) T. Ishimaru, N. Shibata, J. Nagai, S. Nakamura, T. Toru and S. Kanemasa, *J. Am. Chem. Soc.*, 2006, **128**, 16488; (f) S.-W. Duan, J. An, J.-R. Chen and W.-J. Xiao, *Org. Lett.*, 2011, **13**, 2290; (g) L. Cheng, L. Liu, D. Wang and Y.-J. Chen, *Org. Lett.*, 2009, **11**, 3874.

[2] For the preparation of α,β-unsaturated acyl phosphonates (**2a-2h**), see: (1) D. A. Evans, K. A. Scheidt, K. R. Fandrick, H. W. Lam and J. Wu, *J. Am. Chem. Soc.*, 2003, **125**, 10780; (2) D. A. Evans, J. S. Johnson and E. J. Olhava, *J. Am. Chem. Soc.*, 2000, **122,** 1635. (3) P. Bachu and T. Akiyama, *Chem. Commun.*, 2010, **46**, 4112; (4) C. Allais, F. Liéby-Muller, J. Rodriguez and T. Constantieux, *Eur. J. Org. Chem.*, **2013**, 4131; (5) C.-K. Pei, Y. Jiang, Y. Wei and M. Shi, *Angew. Chem. Int. Ed.*, 2012, **51**, 11328; (6) D. Sinha, S. Perera and J. C. Zhao, *Chem. Eur. J.*, 2013, **19**, 6976; (7) T. Liu, Y.-M. Wang, G.-P. Wu, H.-B. Song, Z.-H. Zhou and C.-C. Tang, *J. Org. Chem.*, 2011, **76**, 4119; (8) F. Palacios, J. Vicario, A. Maliszewska and D. Aparicio, *J. Org. Chem.*, 2007, **72**, 2682.

Copies of NMR and HPLC Spectra for 3,3-Disubstituted Oxindoles 3







1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
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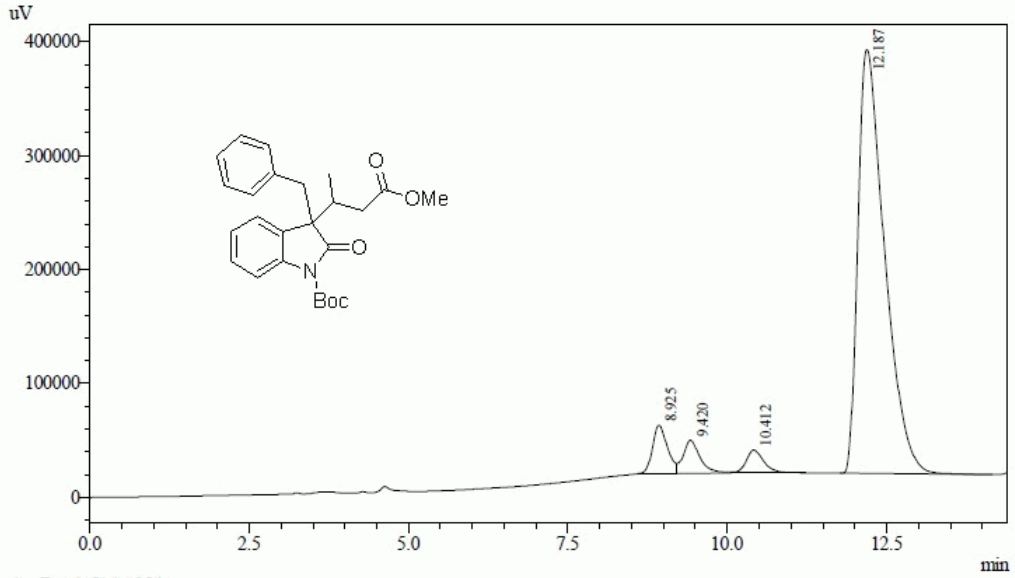
2	9.072	2024140	122421	17.699	21.503
3	9.891	2026059	104627	17.716	18.377
4	13.246	3725473	106977	32.576	18.790
Total		11436422	569332	100.000	100.000



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

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2	9.420	541237	29025	4.340	6.253
3	10.412	395057	20272	3.168	4.367
4	12.187	10841052	372297	86.938	80.205
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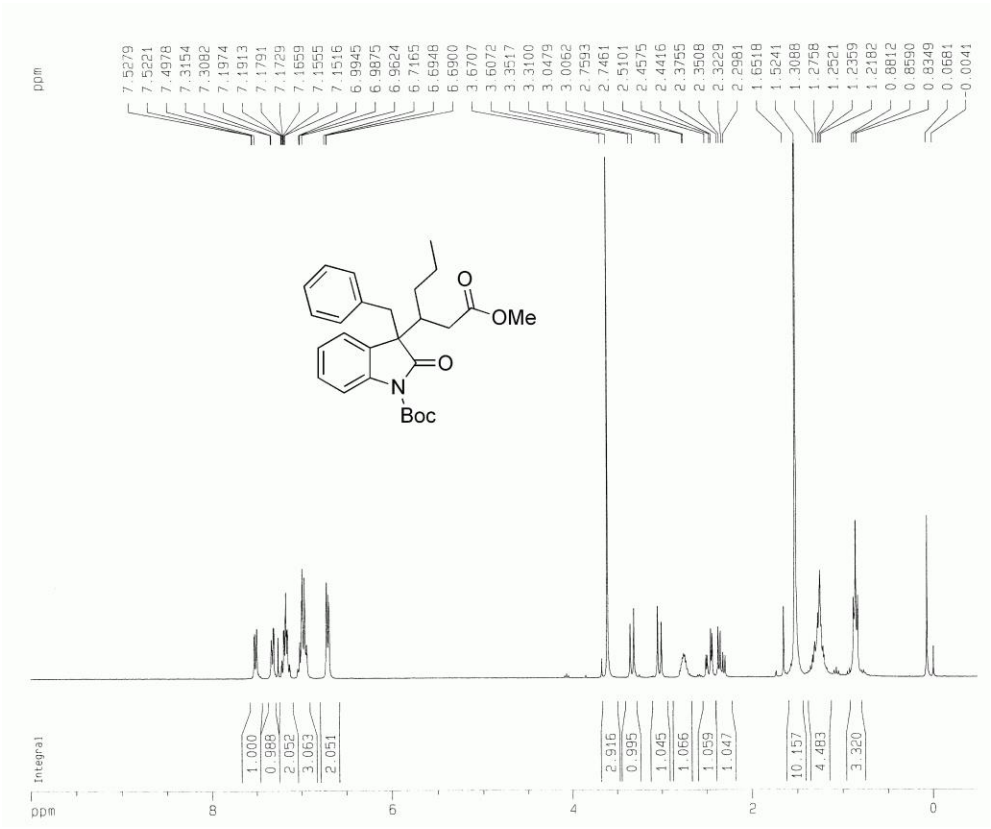
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Boc
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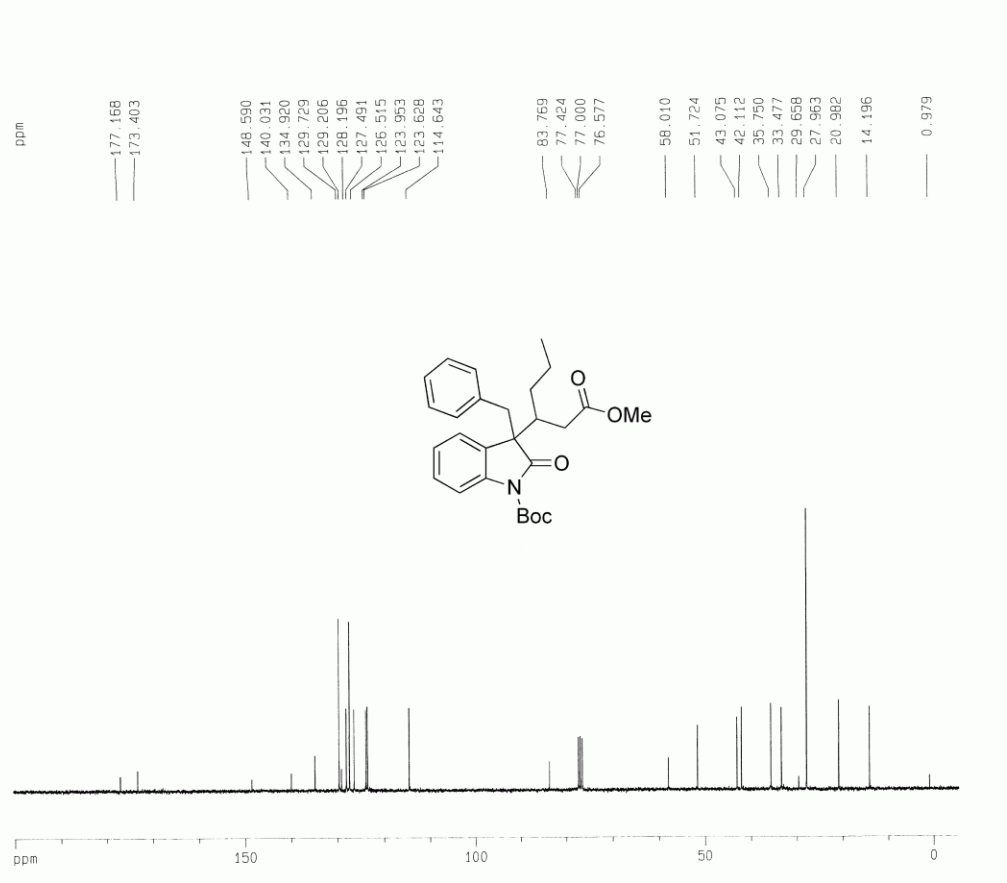
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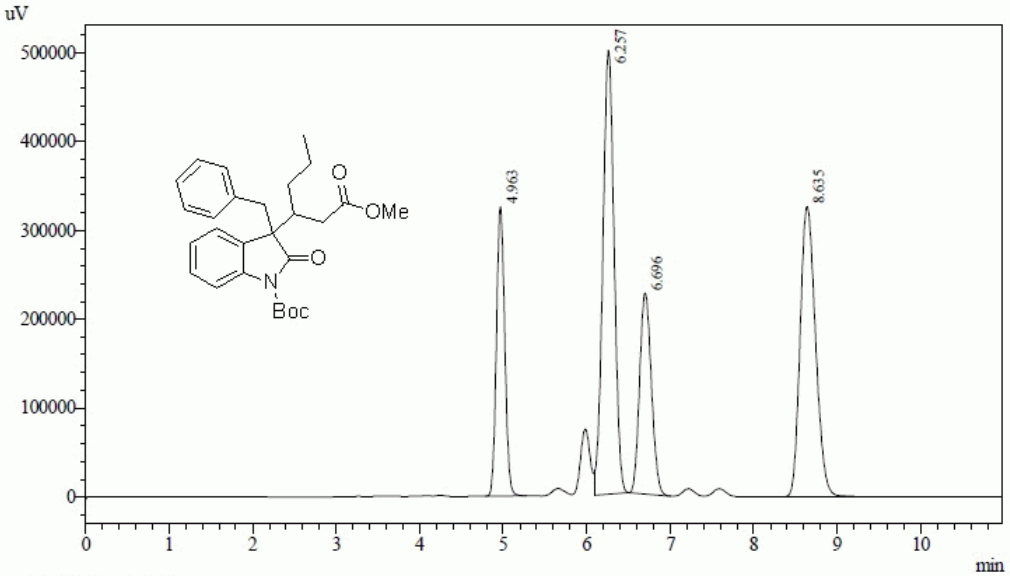

1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
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2	6.257	4675575	499880	35.030	36.257
3	6.696	2223519	226359	16.659	16.418
4	8.635	4197245	326450	31.446	23.678
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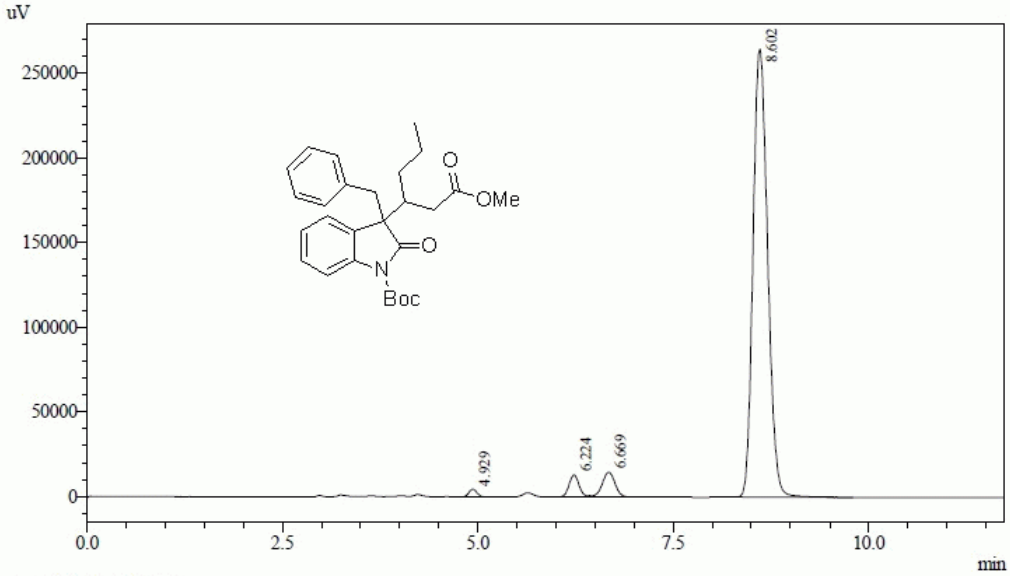

1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

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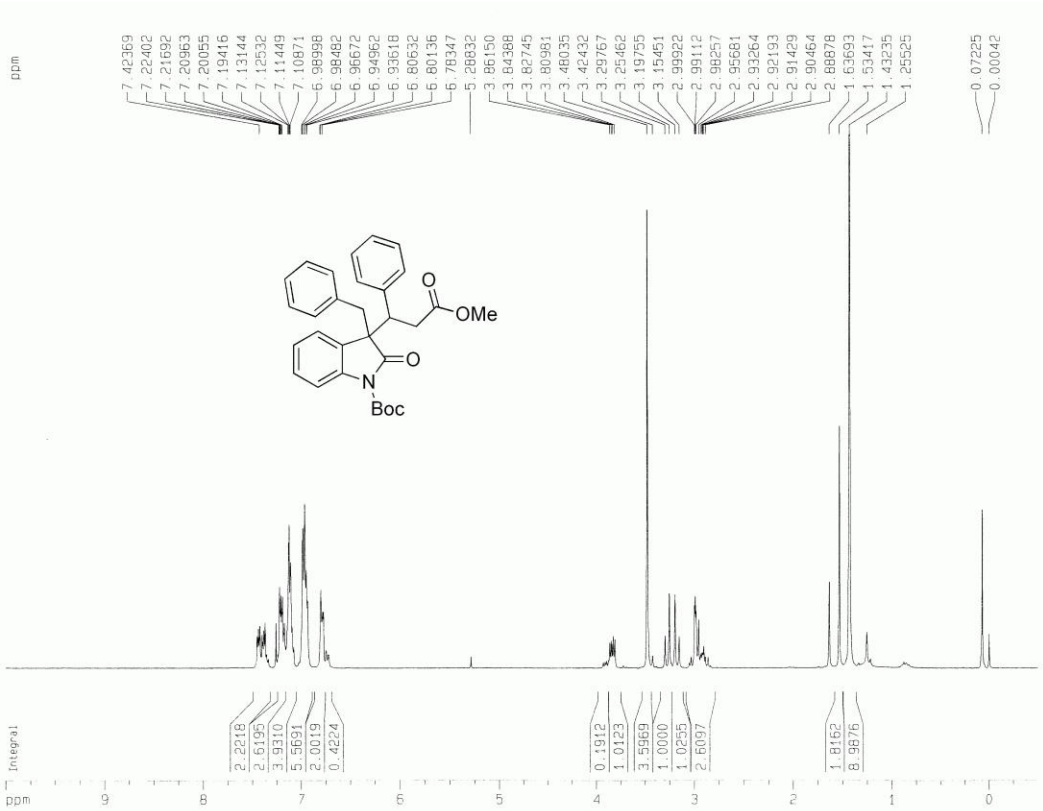
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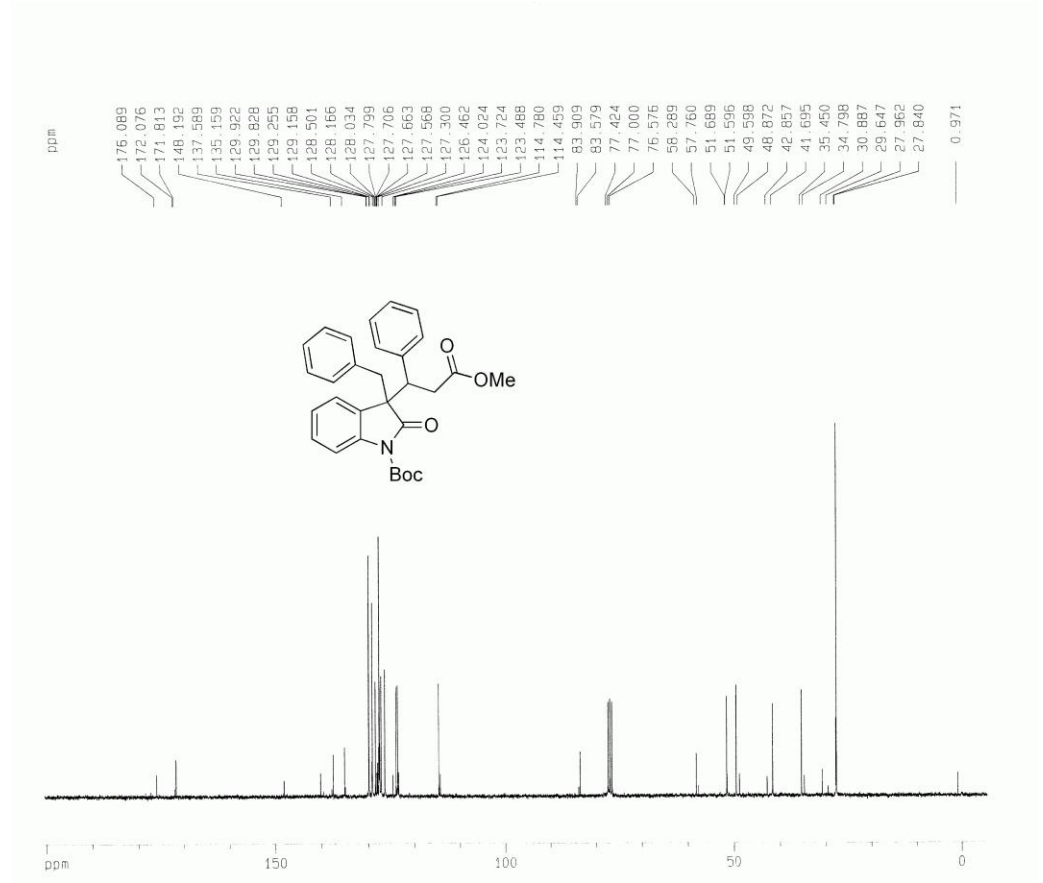
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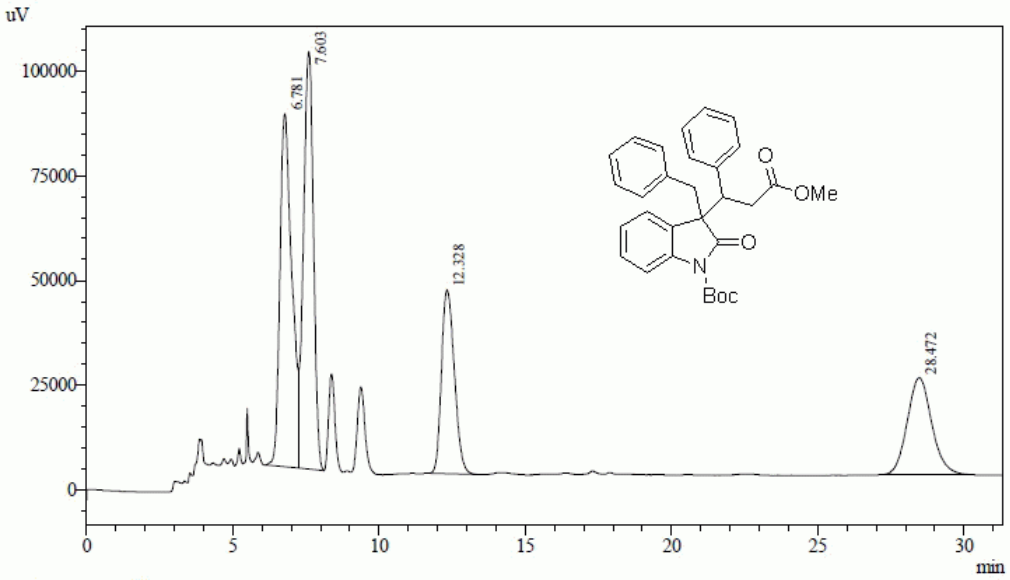

1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

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3	12.328	1351097	44025	18.061	17.507
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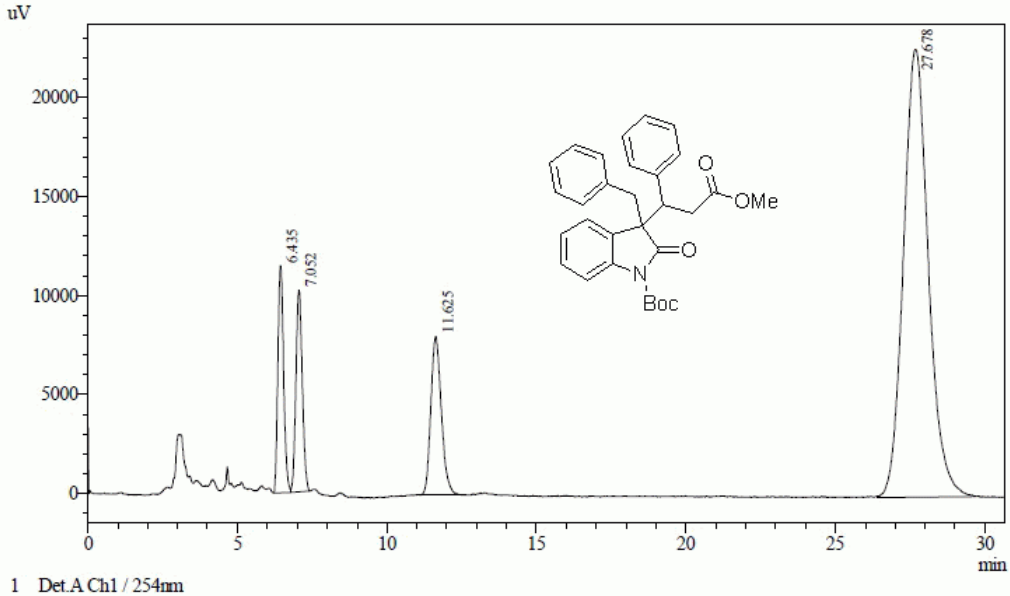
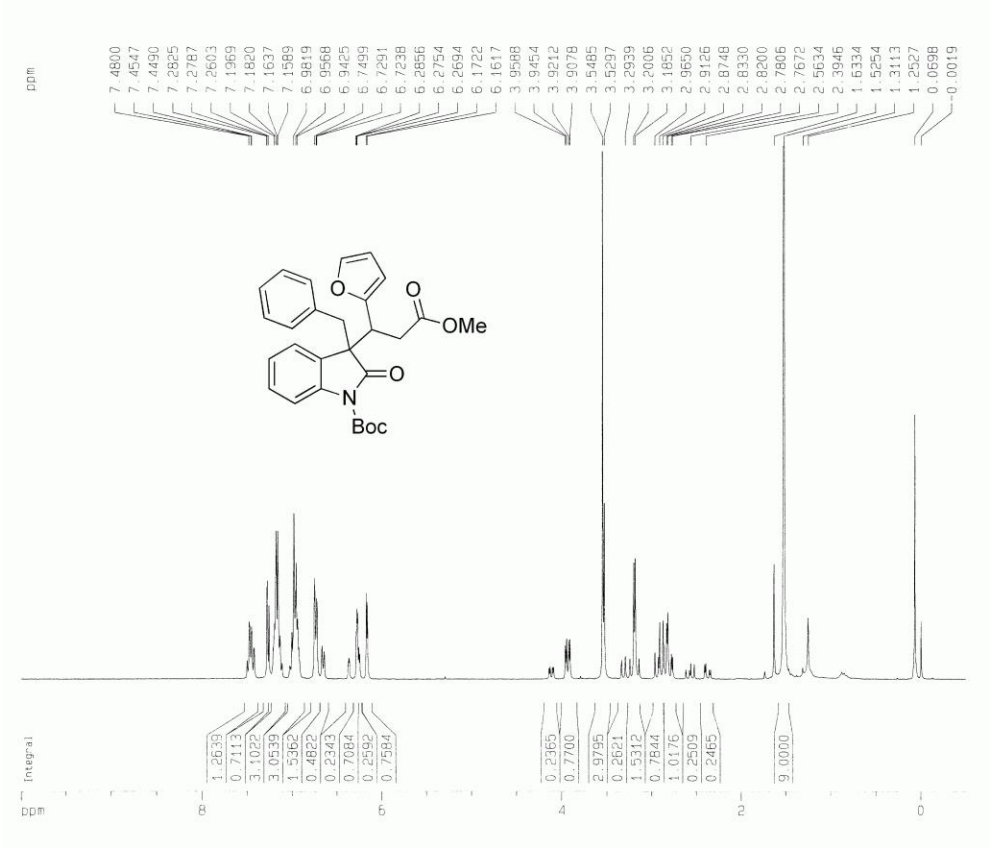
Total		7480919	251467	100.000	100.000

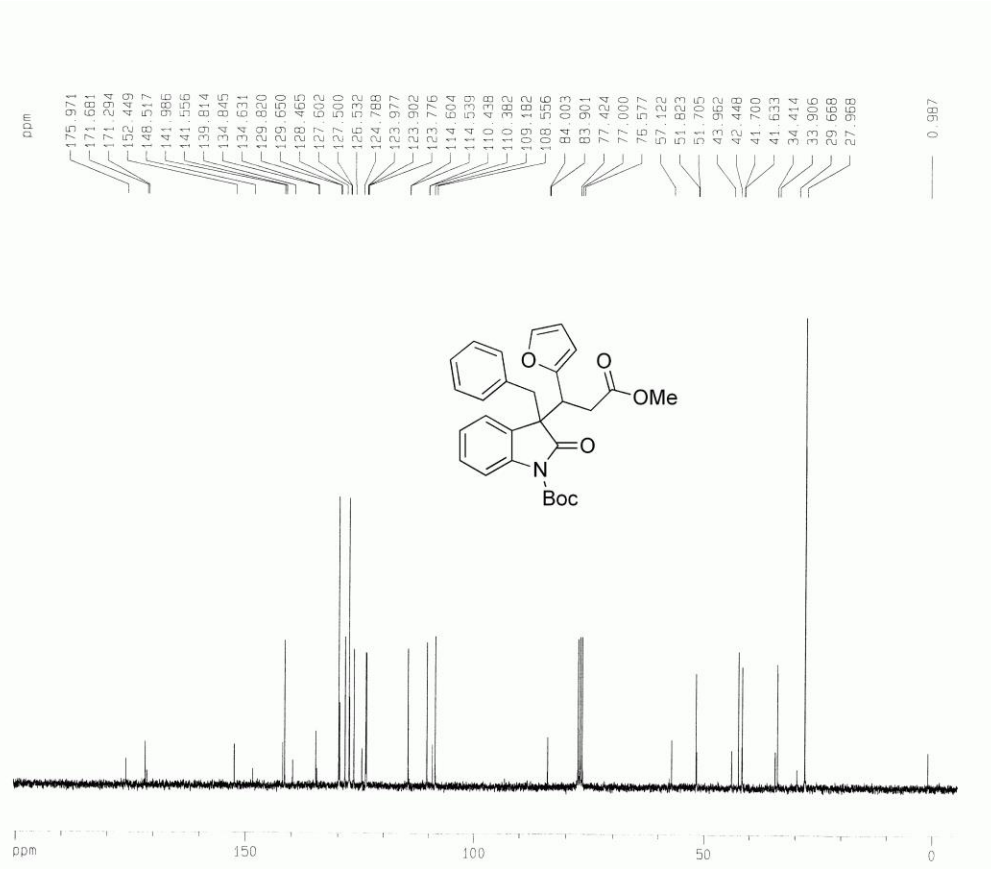


1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.435	152172	11497	8.406	21.966
2	7.052	152262	10199	8.411	19.485
3	11.625	196940	8020	10.880	15.322
4	27.678	1308802	22626	72.302	43.227
Total		1810176	52342	100.000	100.000


ppm
7.4800
7.4547
7.4490
7.2825
7.2787
7.2603
7.1969
7.1820
7.1637
7.1589
6.9819
6.9568
6.9425
6.7499
6.7291
6.7238
6.2856
6.2754
6.2694
6.1722
6.1617
3.9588
3.9454
3.9212
3.9078
3.5485
3.5297
3.2939
3.2006
3.1052
2.9650
2.9126
2.8748
2.8330
2.8200
2.7806
2.7672
2.5634
2.3946
1.6334
1.5254
1.3113
1.2527
0.0698
-0.0019
O
O
OMe
O
N
Boc
Integral
1.2639
0.7113
3.1022
3.0539
1.5362
0.4822
0.2343
0.7084
0.2592
0.7584
0.2365
0.7700
2.9795
0.2621
1.5312
0.7844
1.0176
0.2509
0.2465
9.0000
ppm
8
6
4
2
0


ppm
175.971
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171.294
152.449
148.517
141.966
141.556
139.814
134.845
134.631
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129.650
128.465
127.602
127.500
126.532
124.788
123.977
123.902
123.776
114.604
114.539
110.438
110.382
109.182
108.556
84.003
83.901
77.424
77.000
76.577
57.122
51.823
51.705
43.962
42.448
41.700
41.633
34.414
33.906
29.668
27.968
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O
OMe
O
N
Boc
ppm
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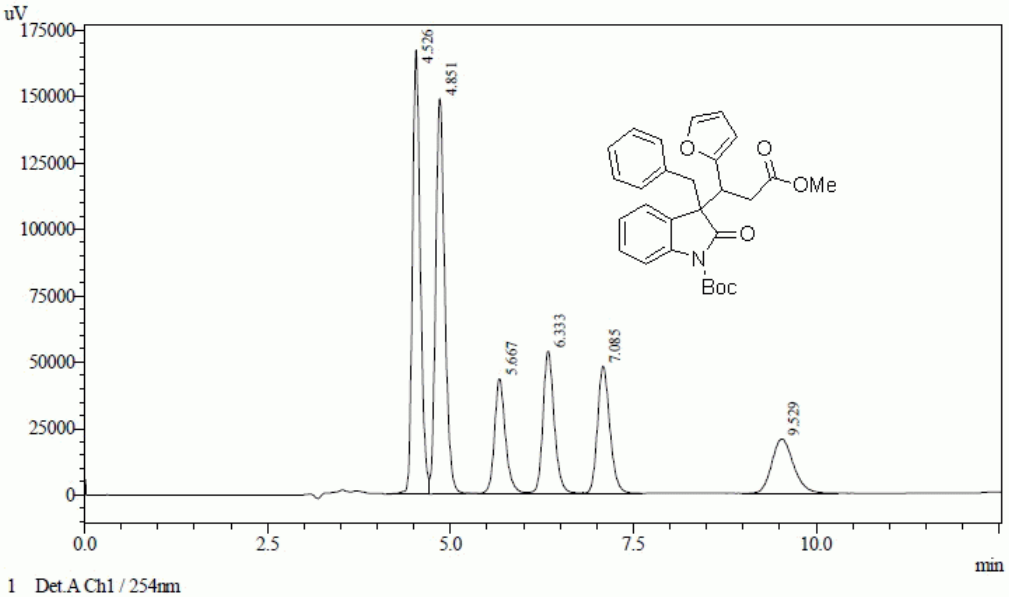
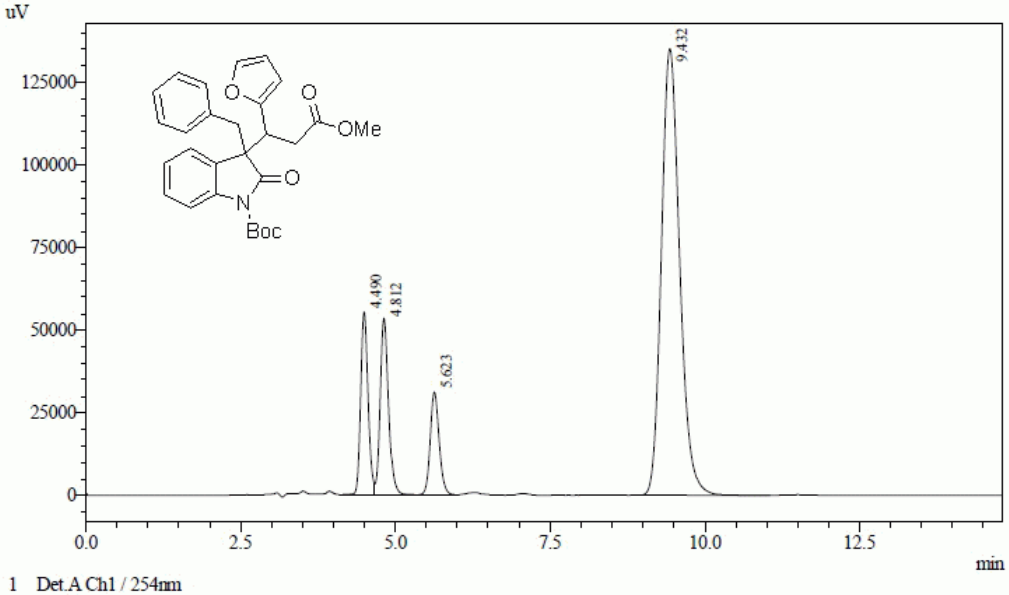
100
50
0



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

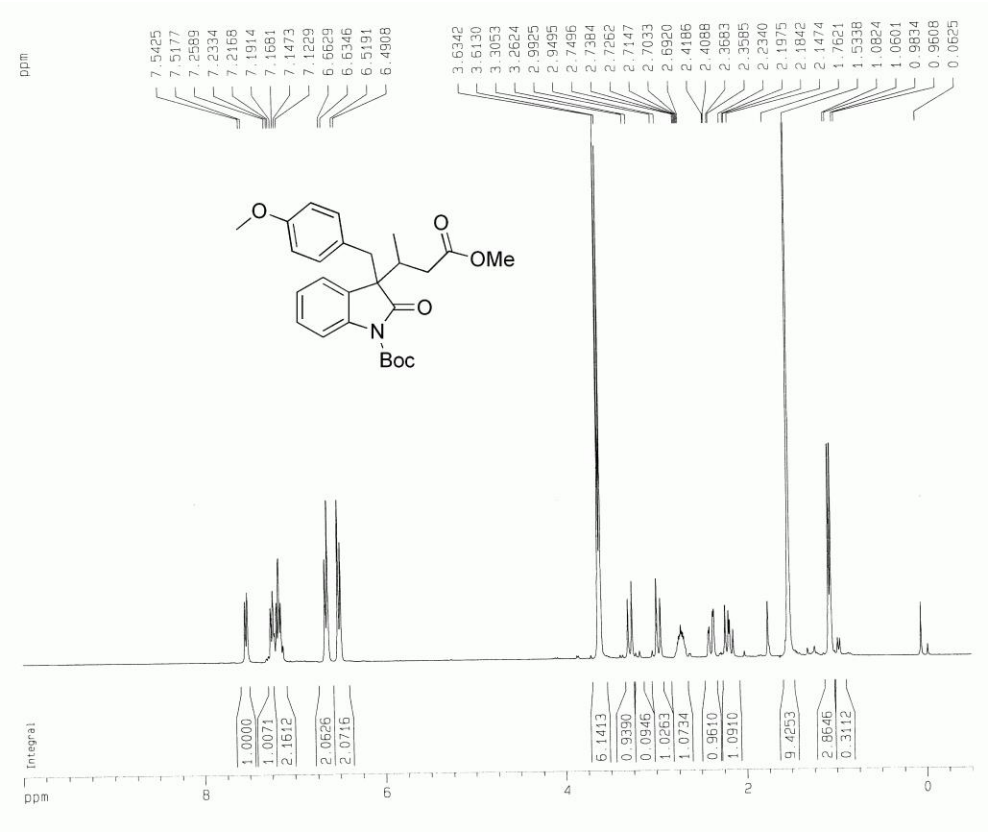
Peak#	Ret. Time	Area	Height	Area %	Height %
1	4.526	1257182	167122	27.580	34.736
2	4.851	1290279	148901	28.306	30.949
3	5.667	450581	43204	9.885	8.980
4	6.333	574961	53594	12.613	11.139
5	7.085	562522	47828	12.340	9.941
6	9.529	422861	20469	9.277	4.254
Total		4558387	481118	100.000	100.000



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	4.490	463908	55420	11.406	20.134
2	4.812	497445	53495	12.231	19.435
3	5.623	314837	31152	7.741	11.318
4	9.432	2791042	135185	68.623	49.113
Total		4067232	275251	100.000	100.000


ppm
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7.2589
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7.2168
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7.1681
7.1473
7.1229
6.6629
6.6346
6.5191
6.4908
3.6342
3.6130
3.3053
3.2624
2.9925
2.9495
2.7496
2.7384
2.7262
2.7147
2.7033
2.6920
2.4186
2.4088
2.3683
2.3585
2.2340
2.1975
2.1842
2.1474
1.7621
1.5338
1.0824
1.0601
0.9834
0.9608
0.0625
O
O
OMe
O
N
Boc
Integral
1.0000
1.0071
2.1612
2.0626
2.0716
6.1413
0.9390
0.0946
1.0263
1.0734
0.9610
1.0910
9.4253
2.8646
0.3112
ppm
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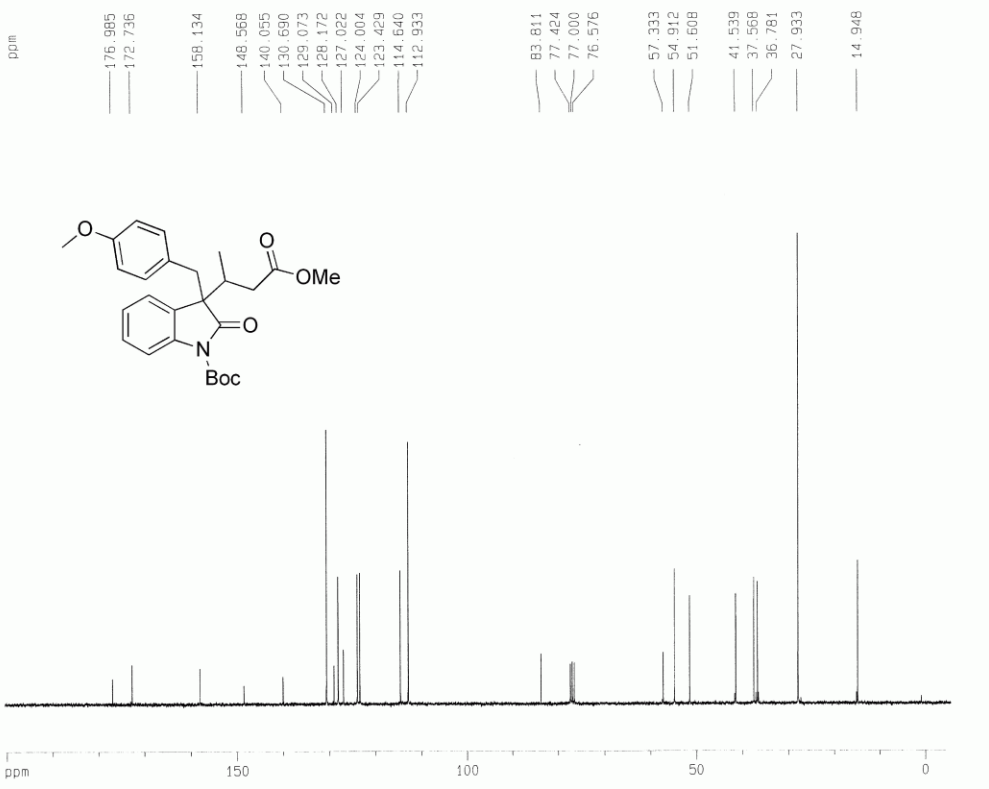
6
4
2
0


ppm
176.985
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158.134
148.568
140.055
130.690
129.073
128.172
127.022
124.004
123.429
114.640
112.933
83.811
77.424
77.000
76.576
57.333
54.912
51.608
41.539
37.568
36.781
27.933
14.948
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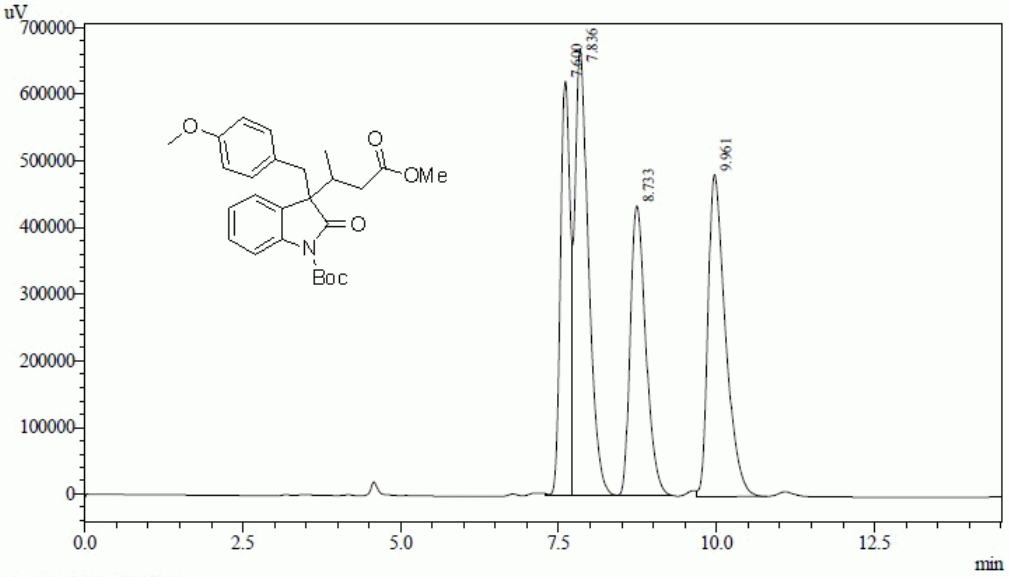
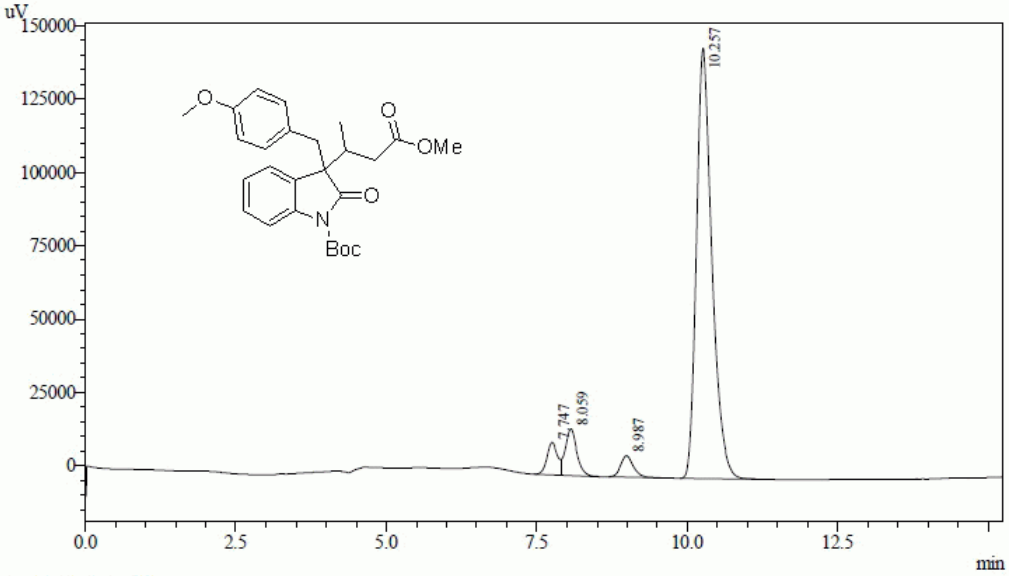
O
OMe
O
N
Boc
ppm
150
100
50
0



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

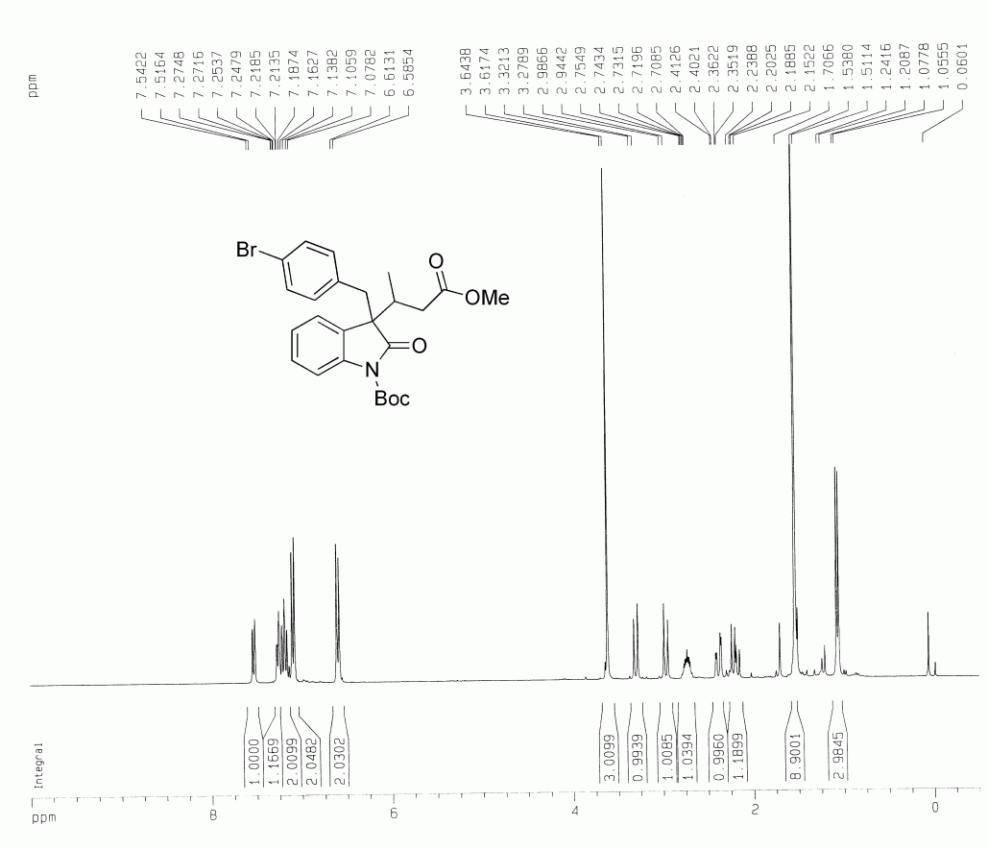
Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.600	6621974	621606	19.786	28.129
2	7.836	10077659	670086	30.111	30.323
3	8.733	7474739	434589	22.334	19.666
4	9.961	9293555	483552	27.769	21.882
Total		33467927	2209834	100.000	100.000



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.747	136180	11094	4.389	6.132
2	8.059	213239	15912	6.873	8.795
3	8.987	106706	7275	3.439	4.022
4	10.257	2646439	146629	85.298	81.051
Total		3102565	180910	100.000	100.000


ppm
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7.1627
7.1382
7.1059
7.0782
6.6131
6.5854
3.6438
3.6174
3.3213
3.2789
2.9866
2.9442
2.7549
2.7434
2.7315
2.7196
2.7085
2.4126
2.4021
2.3622
2.3519
2.2388
2.2025
2.1885
2.1522
1.7066
1.5380
1.5114
1.2416
1.2087
1.0778
1.0555
0.0601
Br
O
OMe
O
N
Boc
Integral
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1.1669
2.0099
2.0482
2.0302
3.0099
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1.0085
1.0394
0.9960
1.1899
8.9001
2.9845
ppm
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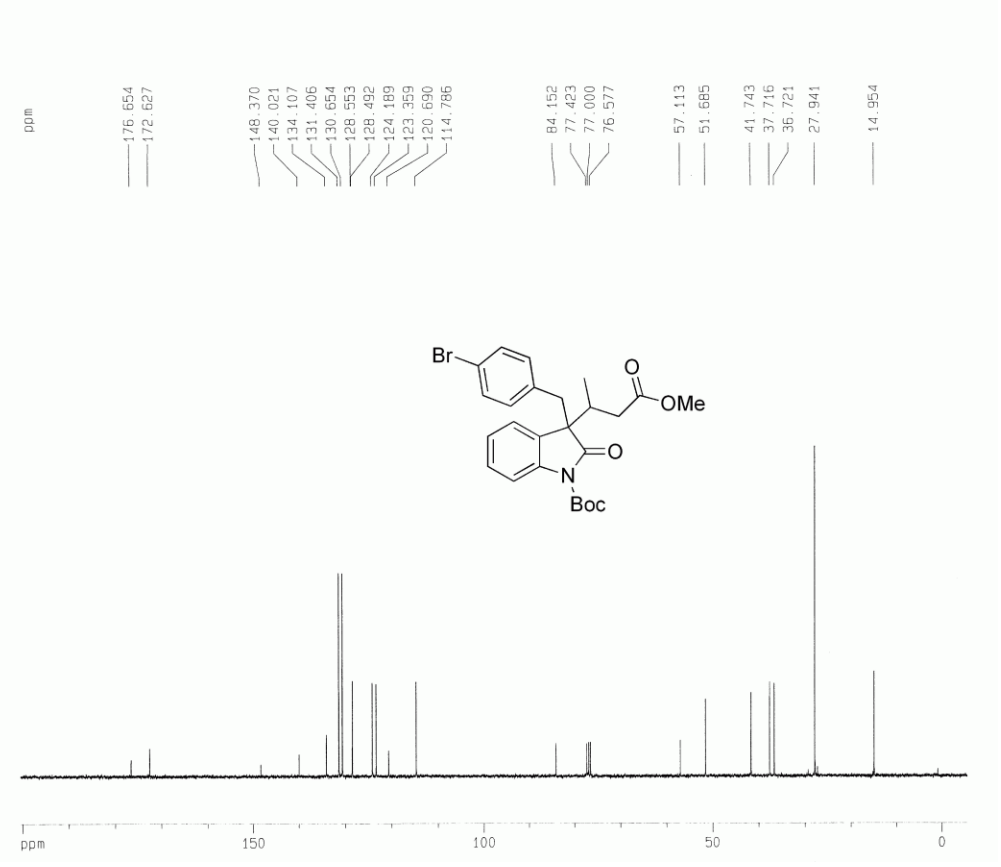
6
4
2
0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131.406
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128.492
124.189
123.359
120.690
114.786
84.152
77.423
77.000
76.577
57.113
51.685
41.743
37.716
36.721
27.941
14.954
Br
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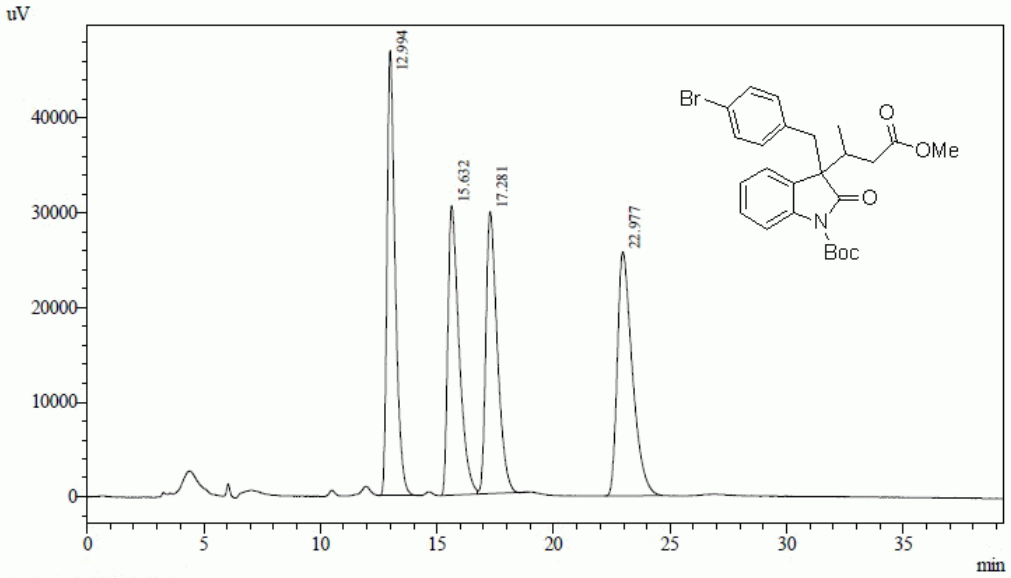
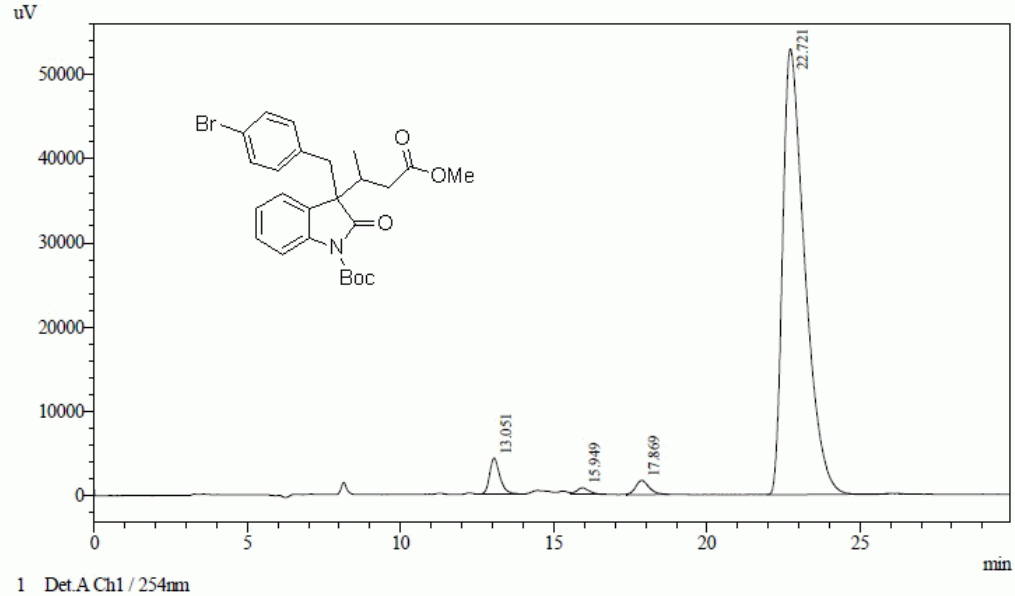
OMe
O
N
Boc
ppm
150
100
50
0



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	12.994	1148857	47065	26.407	35.314
2	15.632	1028358	30613	23.637	22.969
3	17.281	1016003	29824	23.353	22.378
4	22.977	1157341	25774	26.602	19.339
Total		4350559	133276	100.000	100.000



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	13.051	98066	4275	3.481	7.165
2	15.949	23330	778	0.828	1.304
3	17.869	51865	1690	1.841	2.832
4	22.721	2643666	52919	93.849	88.698
Total		2816928	59661	100.000	100.000


ppm
7.5588
7.5534
7.5321
7.5293
7.2562
7.2491
7.2041
7.1978
7.1843
7.1805
7.1780
7.1725
7.1608
7.1567
6.9285
6.9078
6.7038
6.5133
6.4906
6.4866
3.6446
3.6134
3.3694
3.3271
3.0175
2.9752
2.7618
2.7506
2.7385
2.7264
2.7152
2.4020
2.3913
2.3516
2.3410
2.2411
2.2050
2.1908
2.1546
1.7494
1.5371
1.5078
1.0961
1.0738
0.0601
F
O
OMe
O
N
Boc
Integral
1.0116
1.0699
2.1012
1.0936
1.0300
2.0200
3.0083
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1.0409
0.9908
1.1086
8.9496
2.9804
ppm
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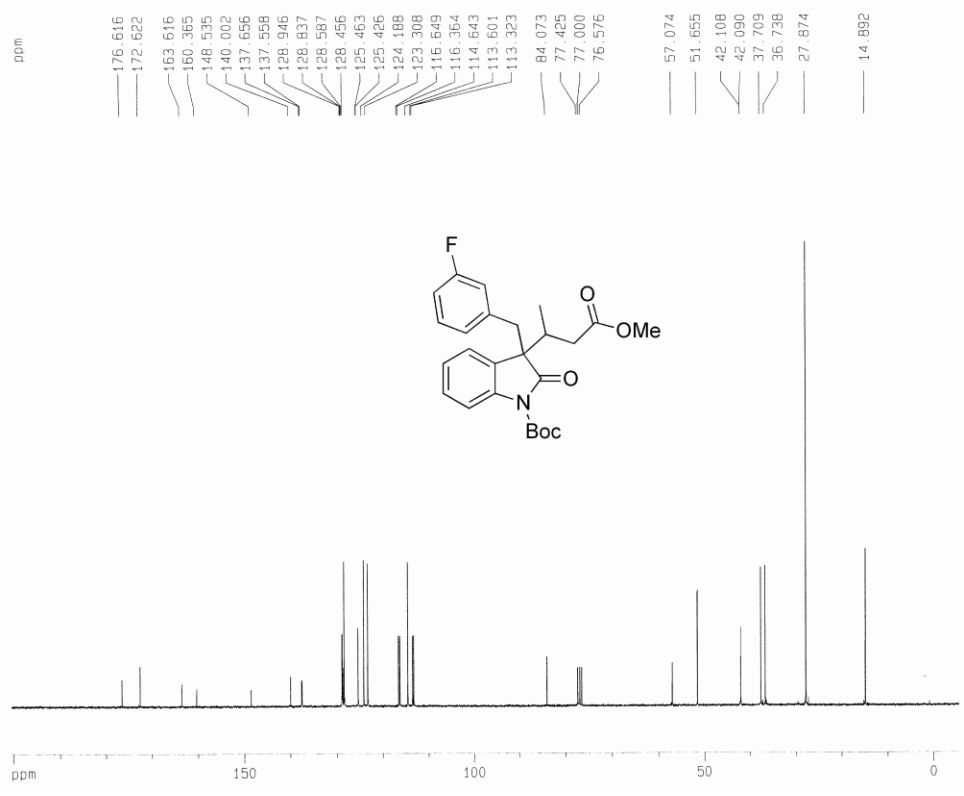
6
4
2
0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163.616
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128.837
128.587
128.456
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125.426
124.188
123.308
116.649
116.364
114.643
113.601
113.323
84.073
77.425
77.000
76.576
57.074
51.655
42.108
42.090
37.709
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27.874
14.892
F
O
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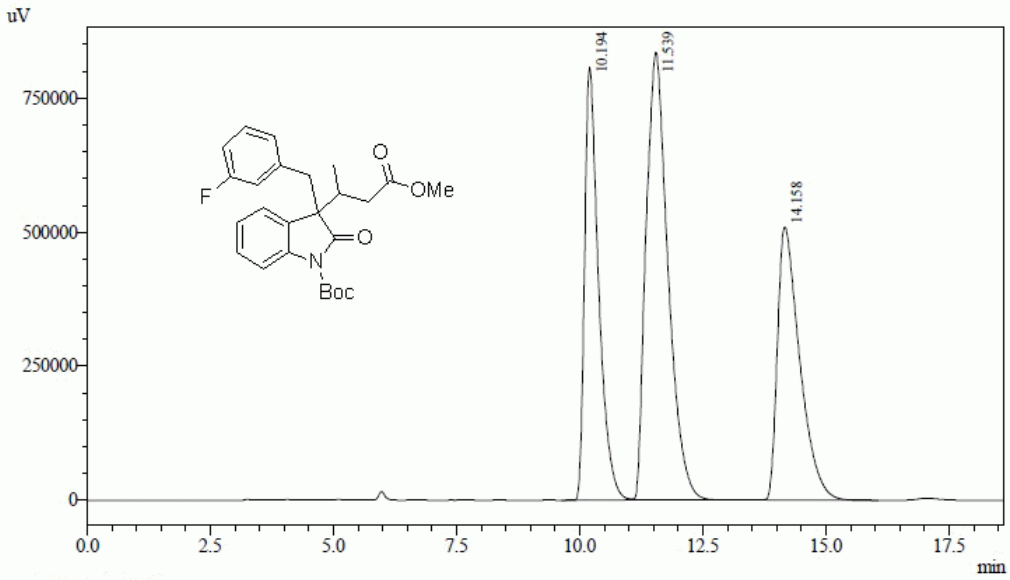
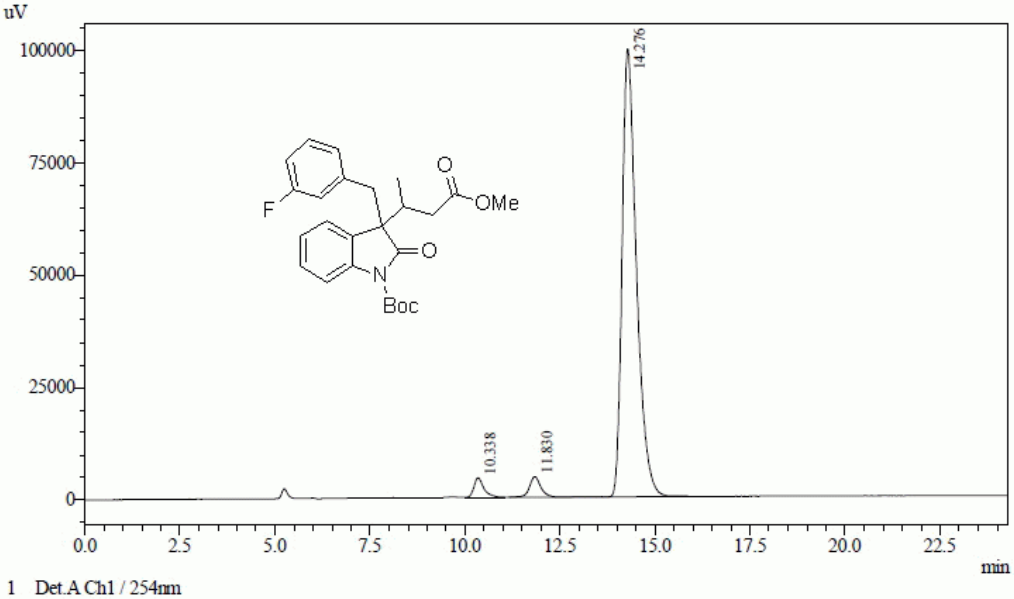
O
N
Boc
ppm
150
100
50
0



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

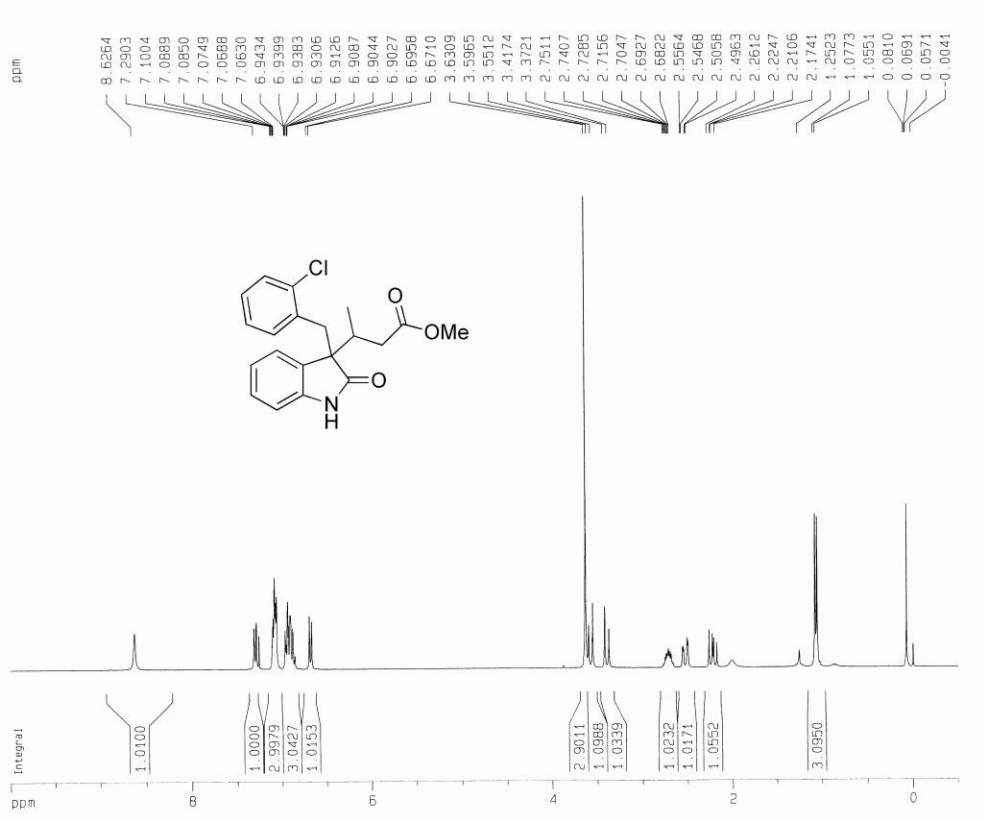
Peak#	Ret. Time	Area	Height	Area %	Height %
1	10.194	16005662	807404	27.654	37.517
2	11.539	25836862	835323	44.640	38.814
3	14.158	16036370	509380	27.707	23.669
Total		57878894	2152107	100.000	100.000



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	10.338	79182	4353	2.848	4.013
2	11.830	91991	4560	3.309	4.204
3	14.276	2608710	99561	93.842	91.783
Total		2779882	108474	100.000	100.000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6.9306
6.9126
6.9087
6.9044
6.9027
6.6958
6.6710
3.6309
3.5965
3.5512
3.4174
3.3721
2.7511
2.7407
2.7285
2.7156
2.7047
2.6927
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2.5564
2.5468
2.5058
2.4963
2.2612
2.2247
2.2106
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0.0810
0.0691
0.0571
-0.0041
Cl
O
OMe
O
N
H
Integral
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1.0000
2.9979
3.0427
1.0153
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3.0950
ppm
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6
4
2
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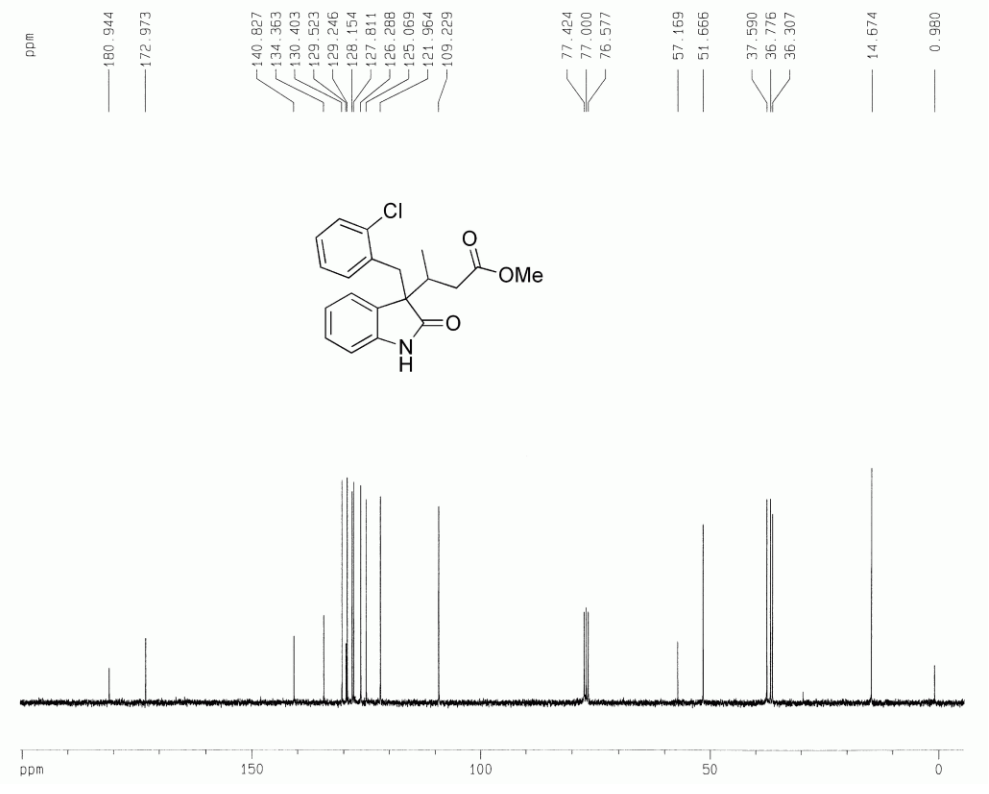
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130.403
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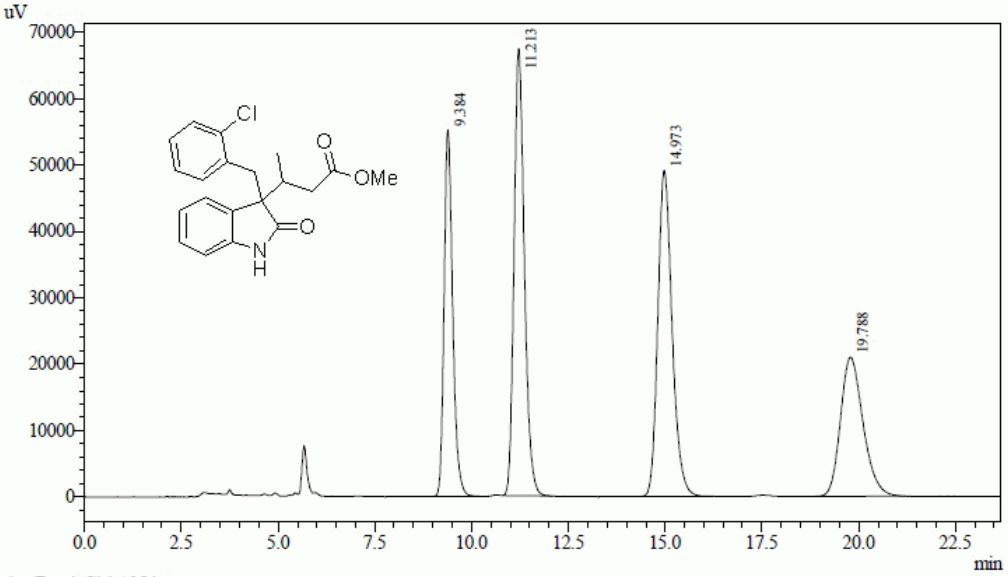
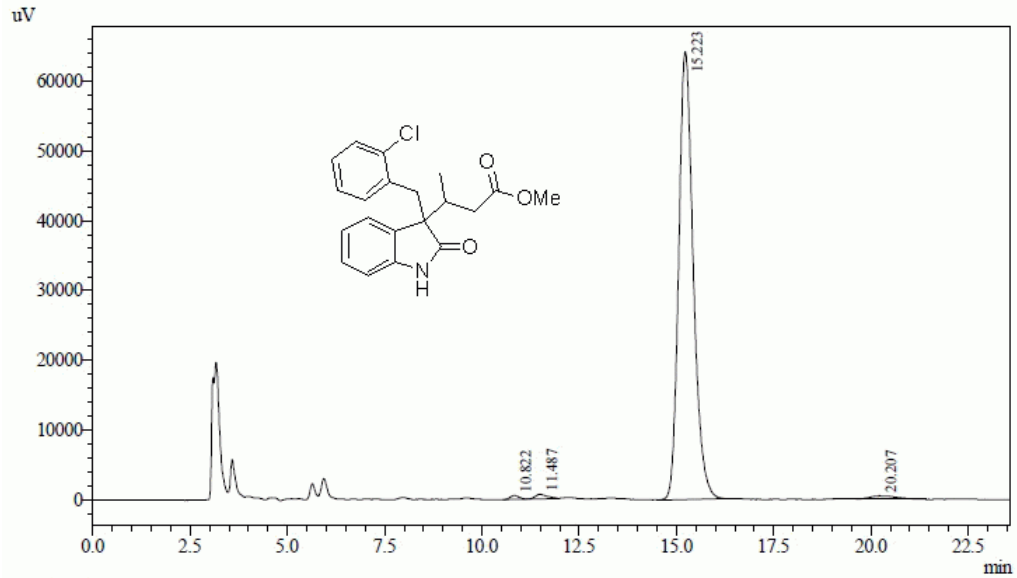
127.811
126.288
125.069
121.964
109.229
77.424
77.000
76.577
57.169
51.666
37.590
36.776
36.307
14.674
0.980
Cl
O
OMe
O
N
H
ppm
150
100
50
0



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

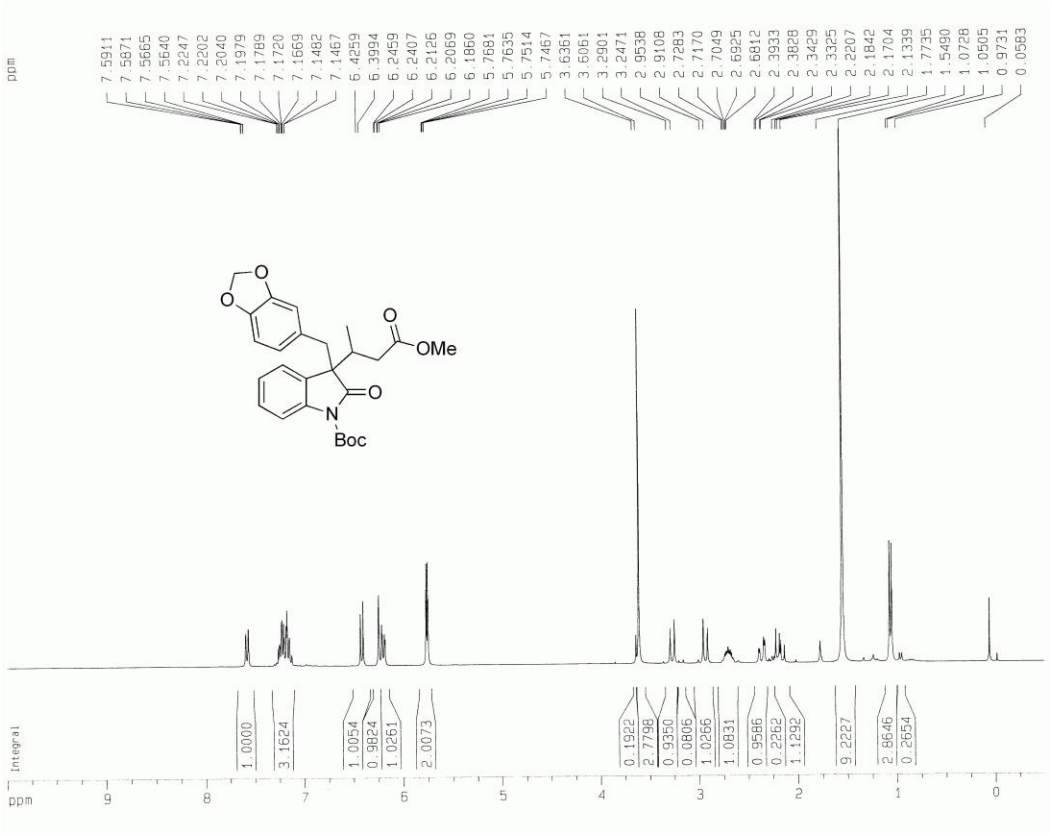
Peak#	Ret. Time	Area	Height	Area %	Height %
1	9.384	853539	55313	20.250	28.681
2	11.213	1247675	67383	29.600	34.940
3	14.973	1259706	49179	29.886	25.500
4	19.788	854163	20980	20.264	10.879
Total		4215083	192854	100.000	100.000



1 Det.A Ch1 / 220nm

Detector A Ch1 220nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	10.822	9003	560	0.525	0.850
2	11.487	14666	676	0.856	1.027
3	15.223	1668838	64102	97.353	97.412
4	20.207	21714	467	1.267	0.710
Total		1714221	65805	100.000	100.000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7.1482
7.1467
6.4259
6.3994
6.2459
6.2407
6.2126
6.2069
6.1860
5.7681
5.7635
5.7514
5.7467
3.6361
3.6061
3.2901
3.2471
2.9538
2.9108
2.7283
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2.3933
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2.3429
2.3325
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2.1704
2.1339
1.7735
1.5490
1.0728
1.0505
0.9731
0.0583
O
O
O
OMe
O
N
Boc
integral
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1.0054
0.9824
1.0261
2.0073
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2.7798
0.9350
0.0806
1.0266
1.0831
0.9586
0.2262
1.1292
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2.8646
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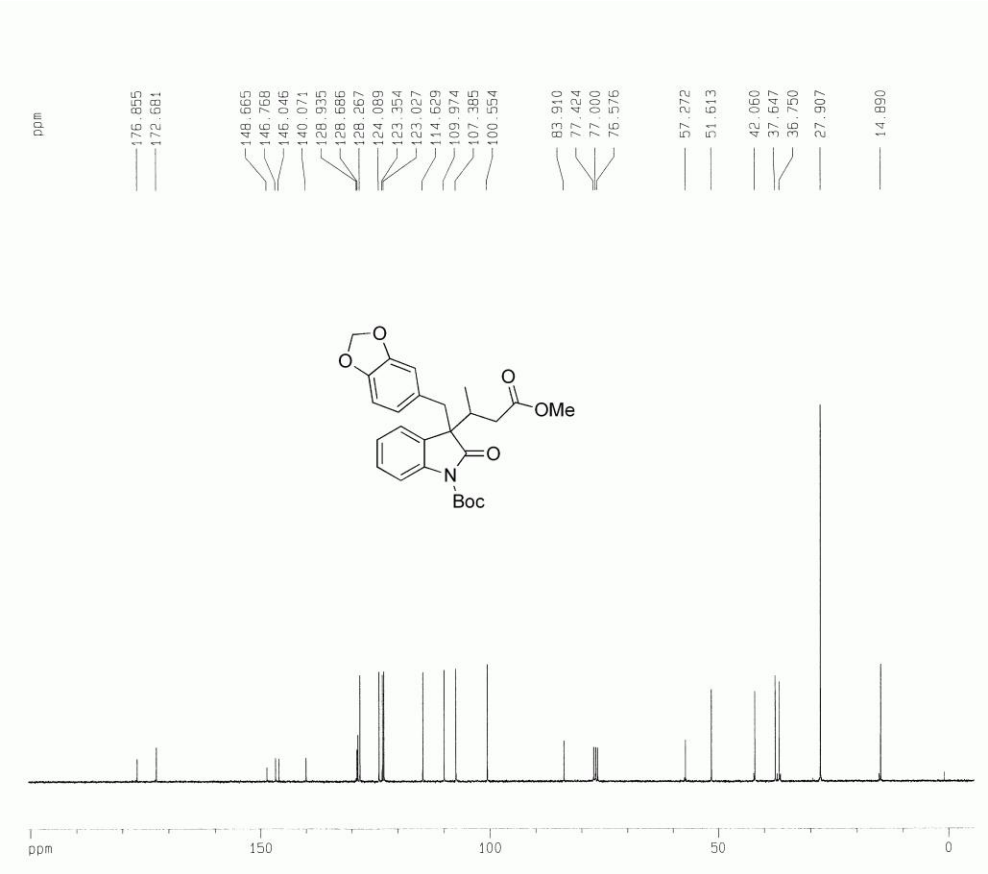
ppm
9
8
7
6
5
4
3
2
1
0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146.768
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128.935
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123.027
114.629
109.974
107.385
100.554
83.910
77.424
77.000
76.576
57.272
51.613
42.060
37.647
36.750
27.907
14.890
O
O
O
OMe
O
N
Boc
ppm
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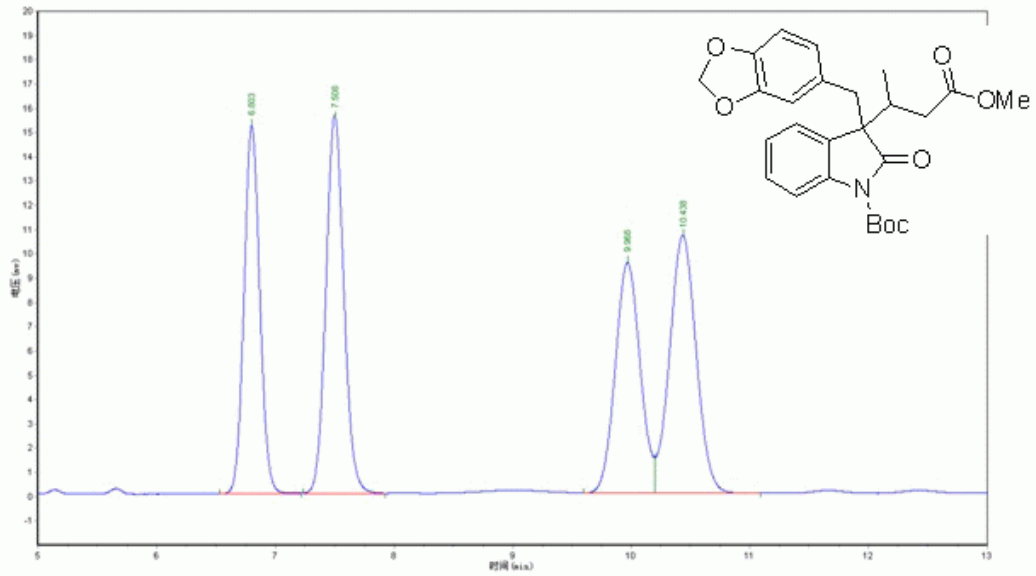
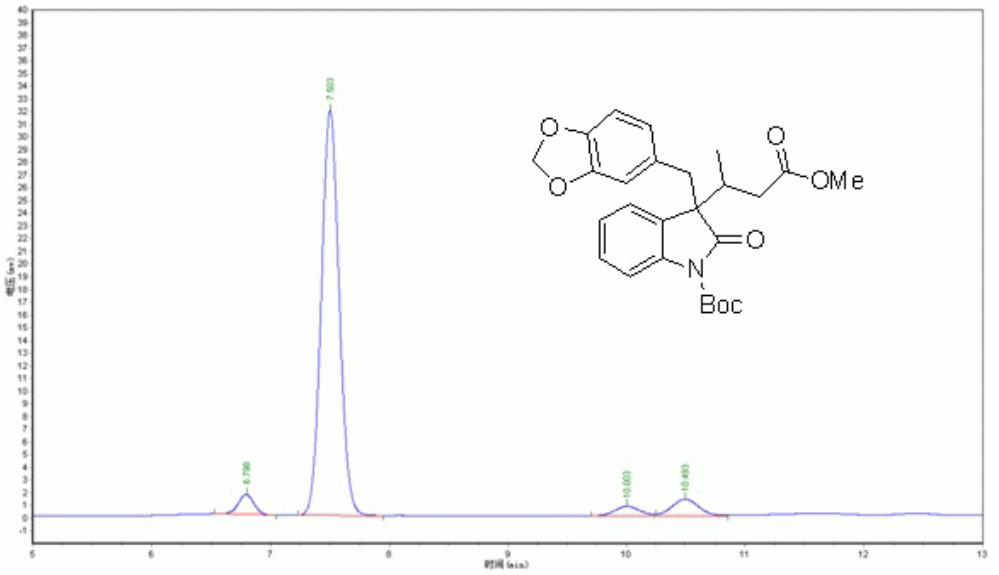
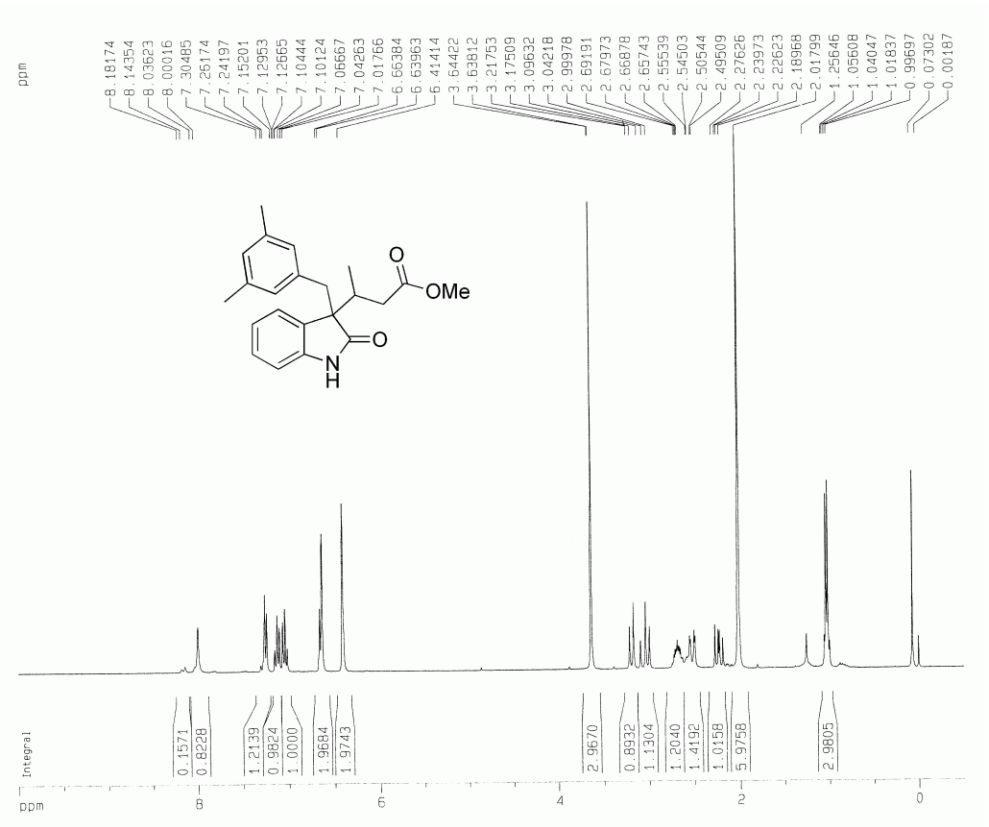


I

峰号	保留时间	峰高	峰面积	含量
1	6.803	15174.077	139998.609	23.0156
2	7.508	15541.444	163974.688	26.9573
3	9.968	9496.200	138906.500	22.8361
4	10.438	10615.857	165396.000	27.1910



峰号	保留时间	峰高	峰面积	含量
1	6.798	1585.800	14814.500	3.9126
2	7.503	31841.639	333282.406	88.0211
3	10.003	739.478	10742.404	2.8371
4	10.493	1279.826	19799.873	5.2292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7.10124
7.06667
7.04263
7.01766
6.66384
6.63963
6.41414
3.64422
3.63812
3.21753
3.17509
3.09632
3.04218
2.99978
2.69191
2.67973
2.66878
2.65743
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2.54503
2.50544
2.49509
2.27626
2.23973
2.22623
2.18968
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1.25646
1.05608
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0.07302
0.00187
O
OMe
O
N
H
Integral
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0.9824
1.0000
1.9684
1.9743
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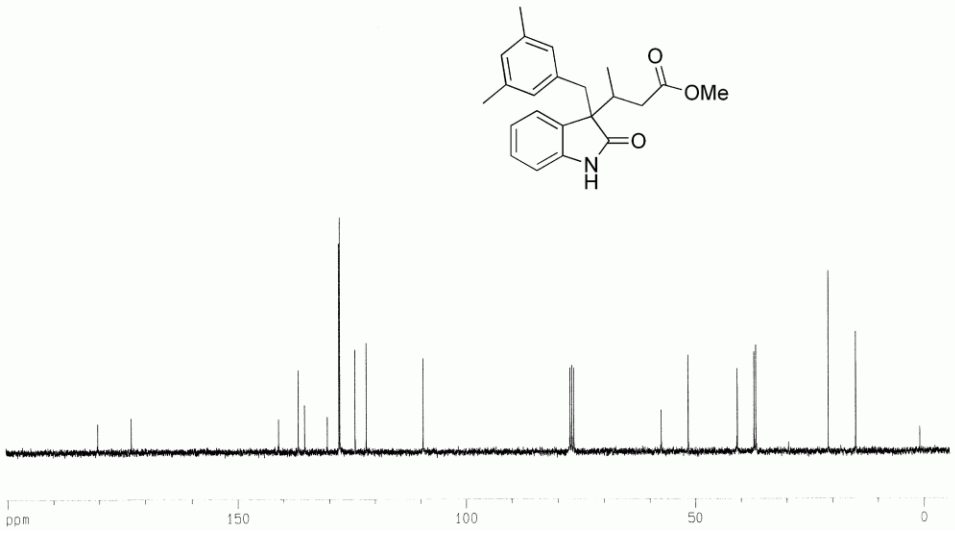
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77.000
76.577
57.539
51.660
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O
N
H
ppm
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50
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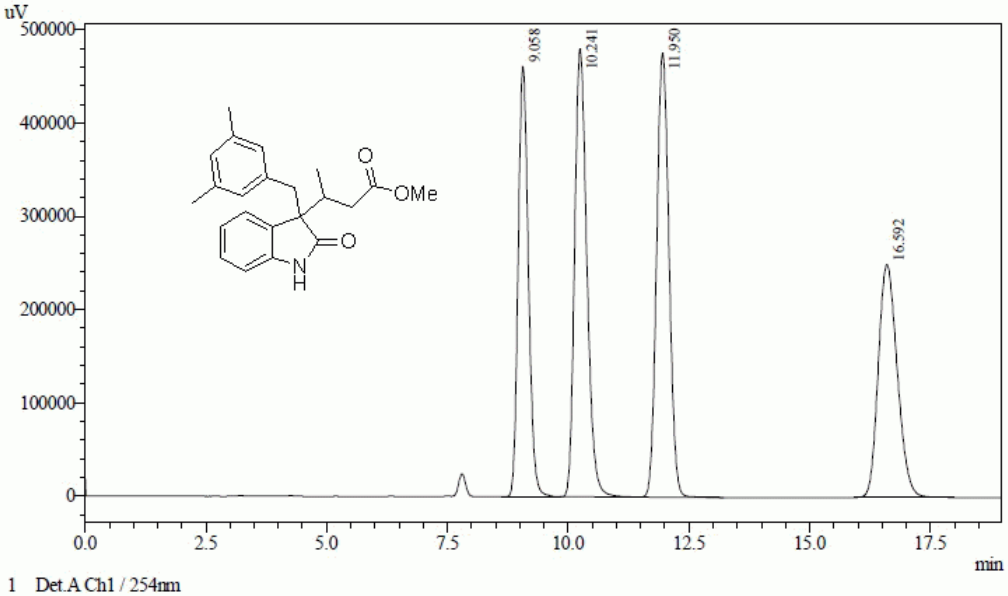
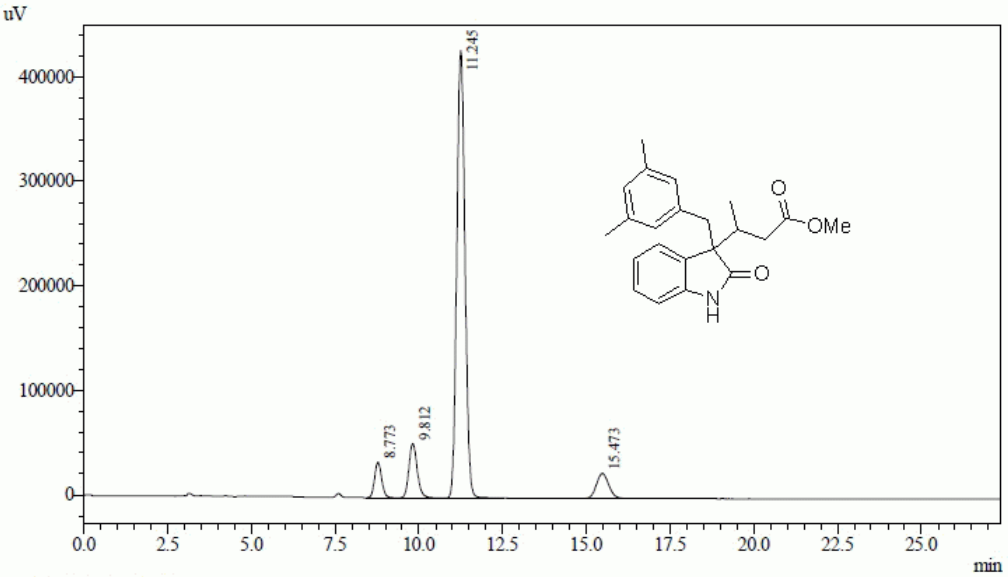


1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

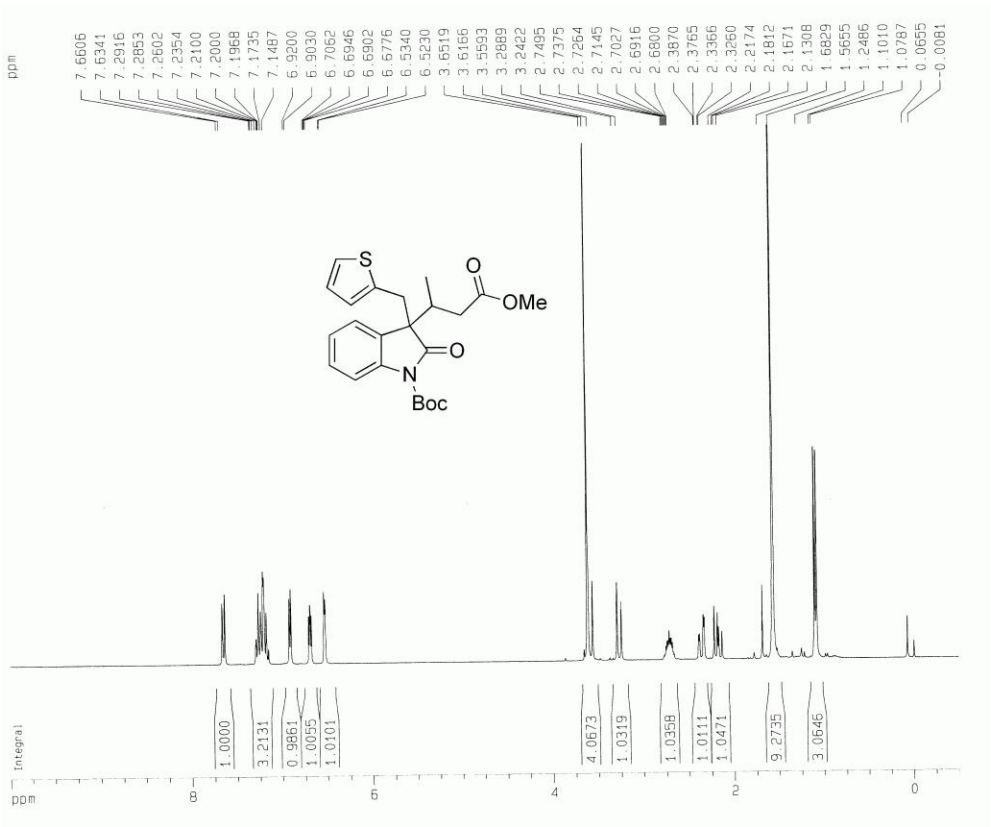
Peak#	Ret. Time	Area	Height	Area %	Height %
1	9.058	6807564	461471	22.250	27.667
2	10.241	8461929	480493	27.657	28.808
3	11.950	8490727	476302	27.751	28.556
4	16.592	6836056	249673	22.343	14.969
Total		30596276	1667939	100.000	100.000



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.773	499787	34115	5.374	6.331
2	9.812	906077	52209	9.743	9.689
3	11.245	7278356	428531	78.266	79.528
4	15.473	615281	23989	6.616	4.452
Total		9299501	538845	100.000	100.000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6.5230
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3.5593
3.2889
3.2422
2.7495
2.7375
2.7264
2.7145
2.7027
2.6916
2.6800
2.3870
2.3755
2.3366
2.3260
2.2174
2.1812
2.1671
2.1308
1.6829
1.5655
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1.1010
1.0787
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S
O
OMe
O
N
Boc
Integral
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ppm
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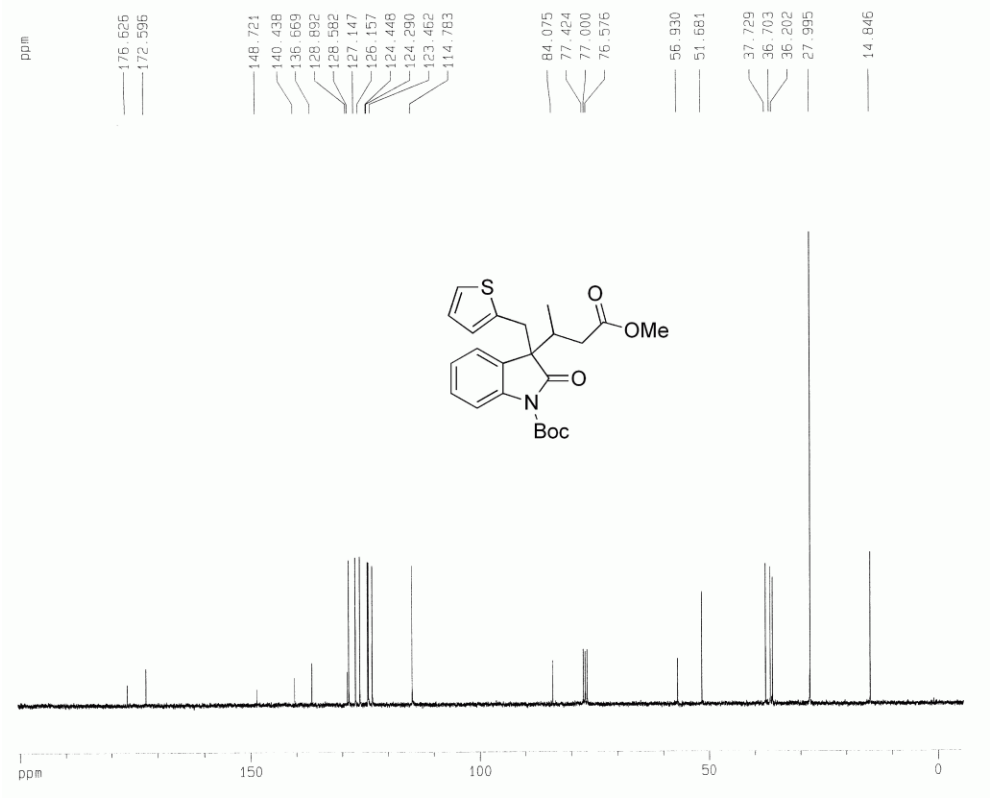
0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124.290
123.462
114.783
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77.424
77.000
76.576
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51.681
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O
N
Boc
ppm
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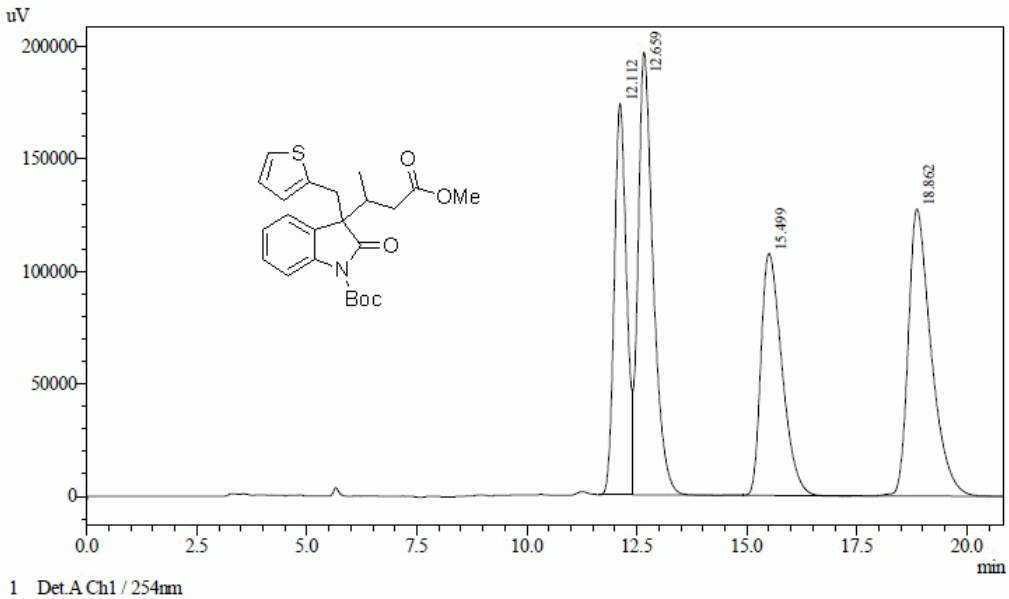
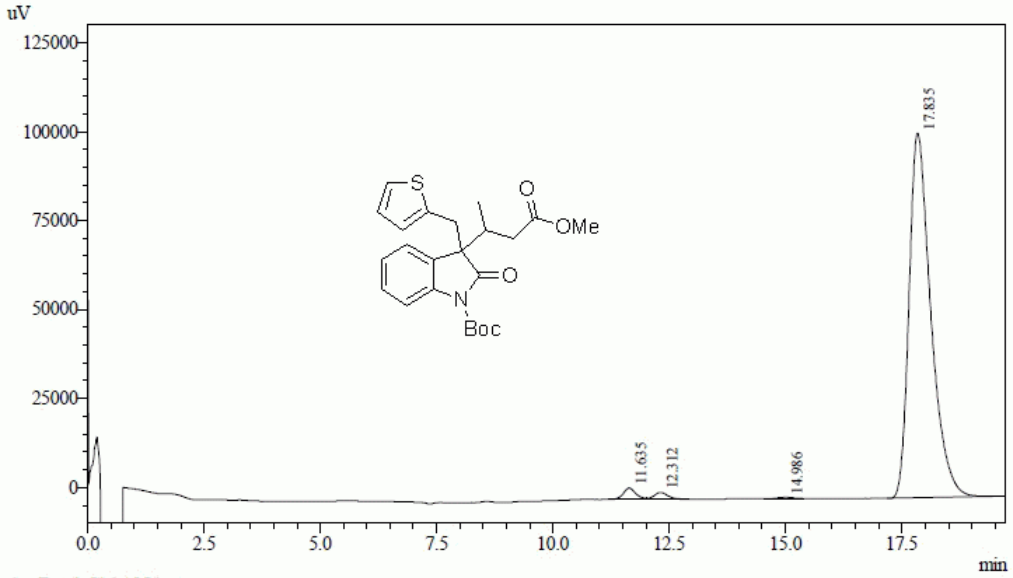


1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

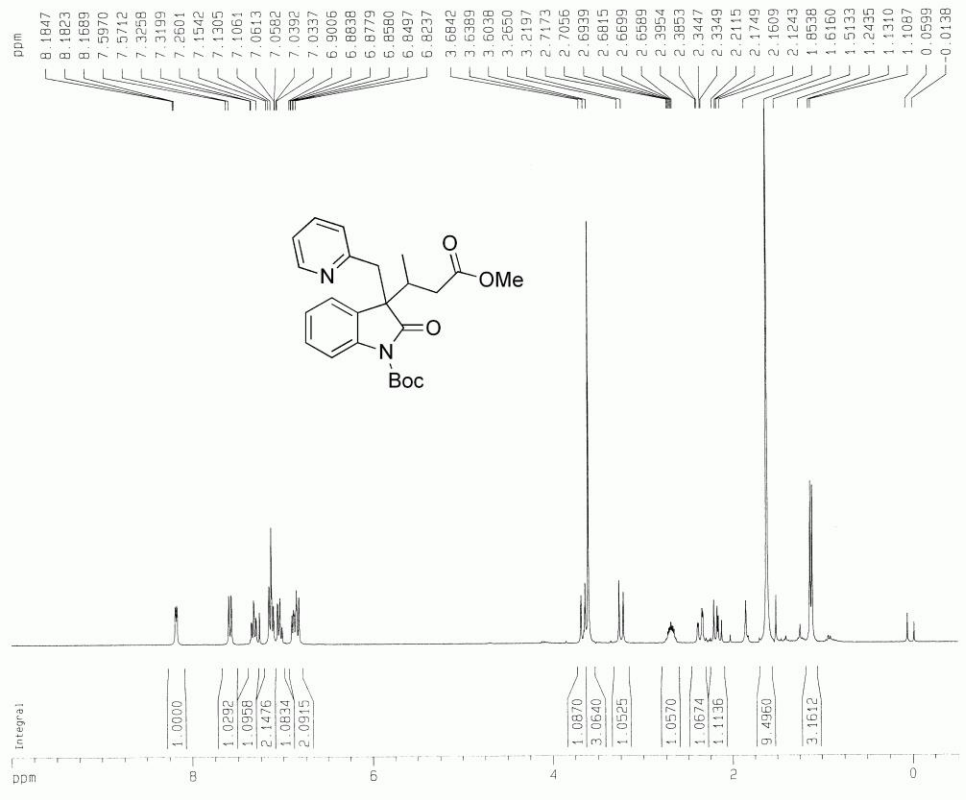
Peak#	Ret. Time	Area	Height	Area %	Height %
1	12.112	3356806	173971	20.649	28.702
2	12.659	4719631	196910	29.032	32.486
3	15.499	3567435	107607	21.944	17.753
4	18.862	4612830	127646	28.375	21.059
Total		16256702	606133	100.000	100.000



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	11.635	59285	3185	1.721	2.949
2	12.312	39992	1978	1.161	1.831
3	14.986	7842	359	0.228	0.333
4	17.835	3337209	102489	96.890	94.887
Total		3444328	108011	100.000	100.000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7.0613
7.0582
7.0392
7.0337
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6.8838
6.8779
6.8580
6.8497
6.8237
3.6842
3.6389
3.6038
3.2650
3.2197
2.7173
2.7056
2.6939
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2.6699
2.6589
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2.3349
2.2115
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2.1609
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1.1310
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OMe
N
O
N
Boc
Integral
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ppm
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2
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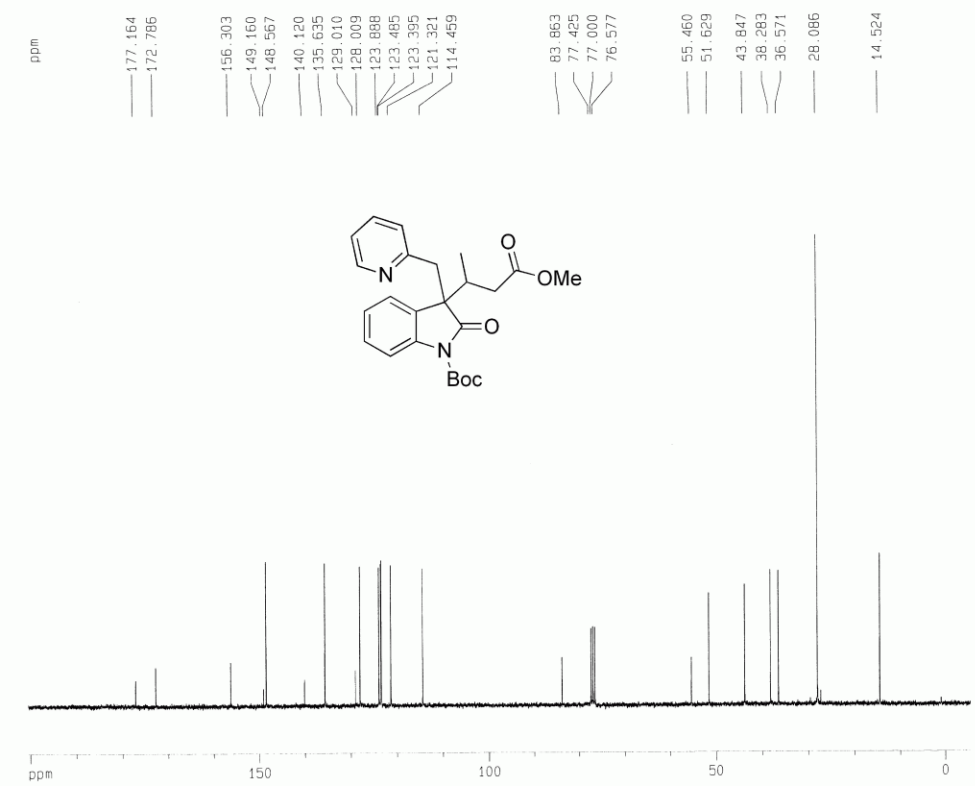
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123.485
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114.459
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77.425
77.000
76.577
55.460
51.629
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38.283
36.571
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N
Boc
ppm
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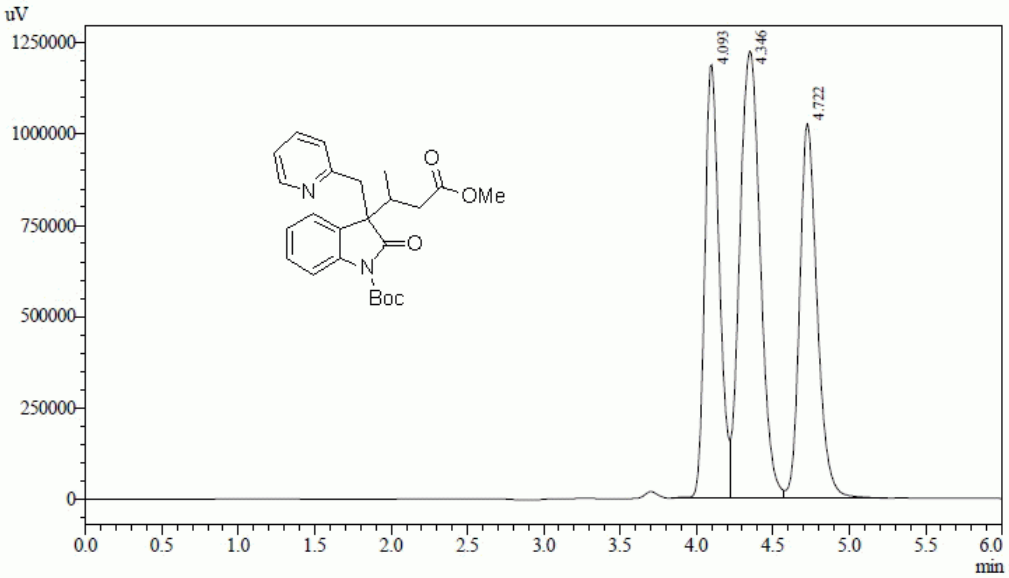
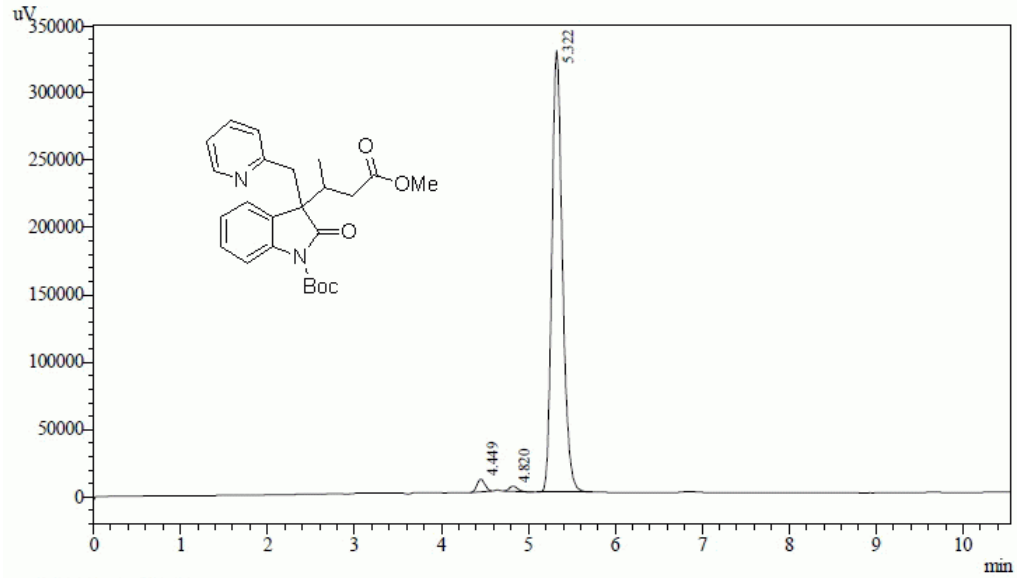


1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

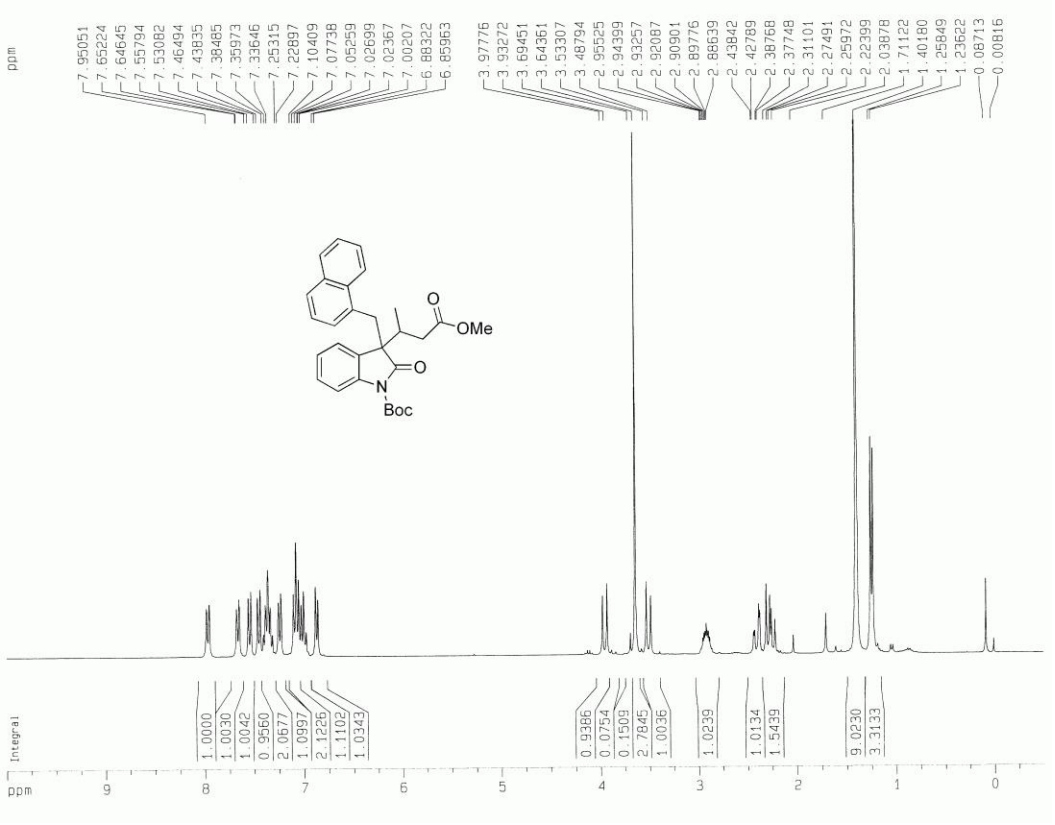
Peak#	Ret. Time	Area	Height	Area %	Height %
1	4.093	7894999	1189242	28.634	34.556
2	4.346	11445549	1225684	41.511	35.615
3	4.722	8231976	1026547	29.856	29.829
Total		27572523	3441473	100.000	100.000



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	4.449	59419	9371	2.064	2.741
2	4.820	26223	3844	0.911	1.124
3	5.322	2792639	328615	97.025	96.134
Total		2878281	341830	100.000	100.000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0.00816
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OMe
O
N
Boc
Integral
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1.0997
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ppm
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7
6
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3
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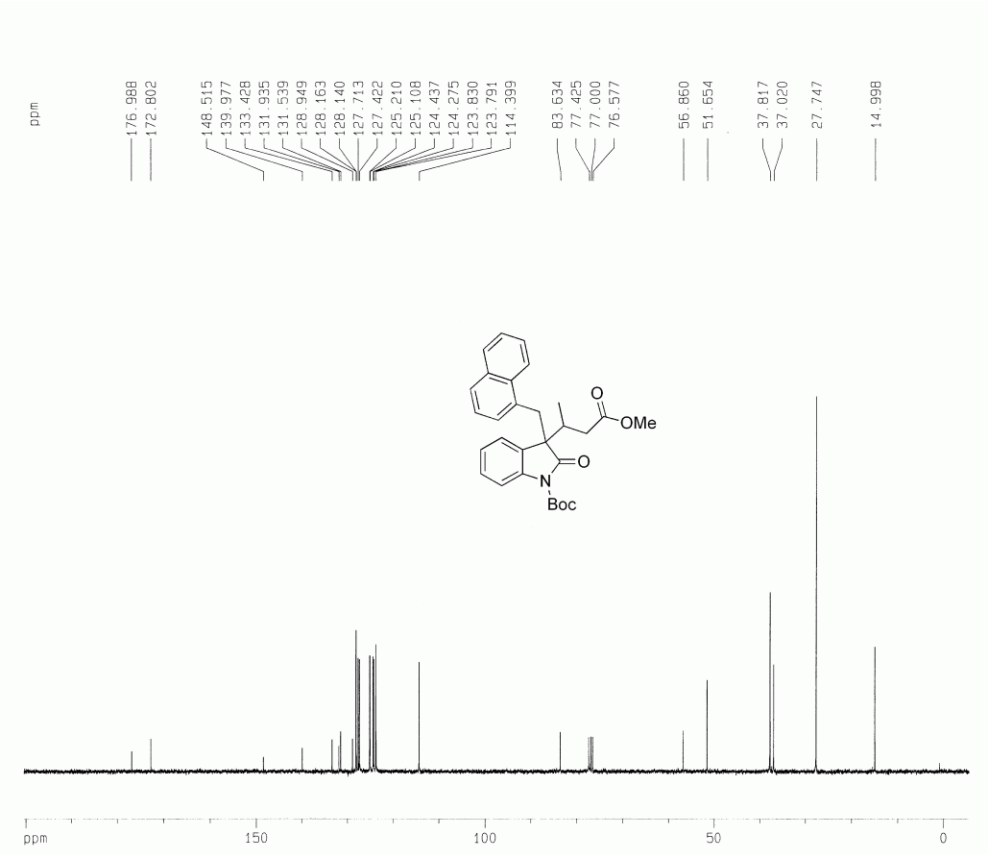
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124.275
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123.791
114.399
83.634
77.425
77.000
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N
Boc
ppm
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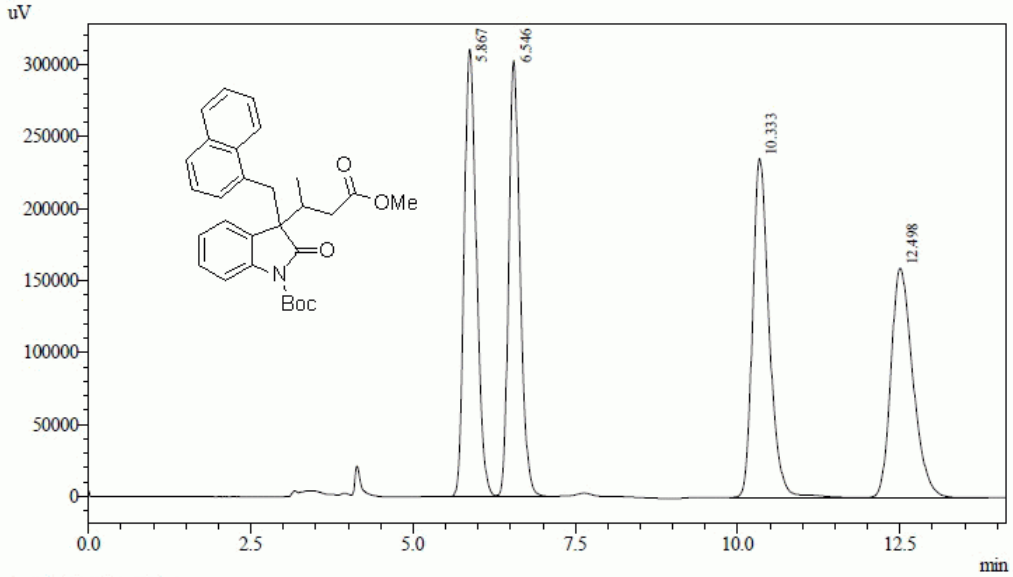
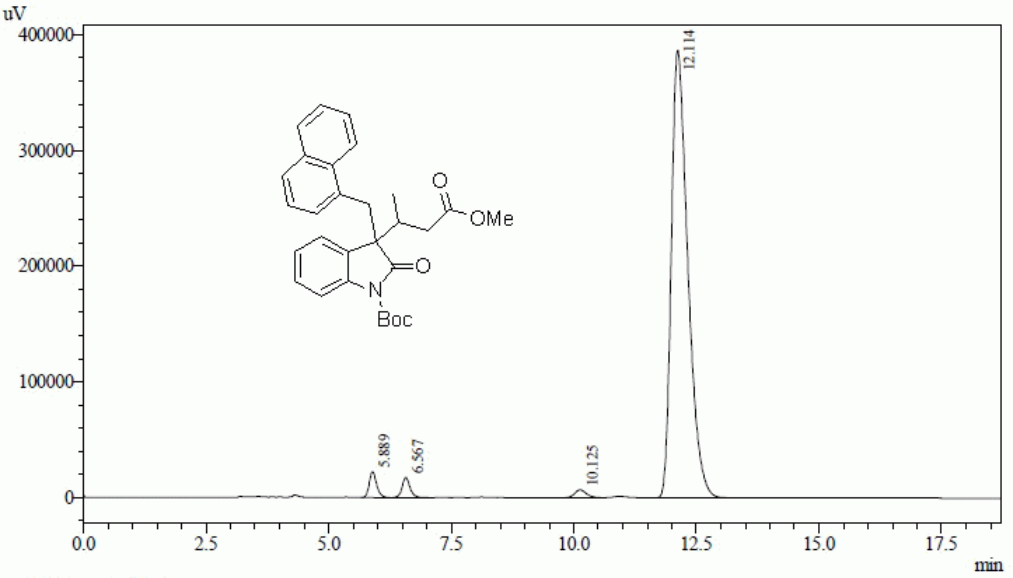


1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.867	4092807	310761	26.053	30.824
2	6.546	3709376	302889	23.612	30.044
3	10.333	4163894	235137	26.506	23.323
4	12.498	3743384	159377	23.829	15.809
Total		15709461	1008165	100.000	100.000



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.889	239051	22563	2.488	5.197
2	6.567	199504	17591	2.076	4.051
3	10.125	114705	6853	1.194	1.578
4	12.114	9055607	387178	94.242	89.174
Total		9608867	434185	100.000	100.000


ppm
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7.43593
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N
H
Integral
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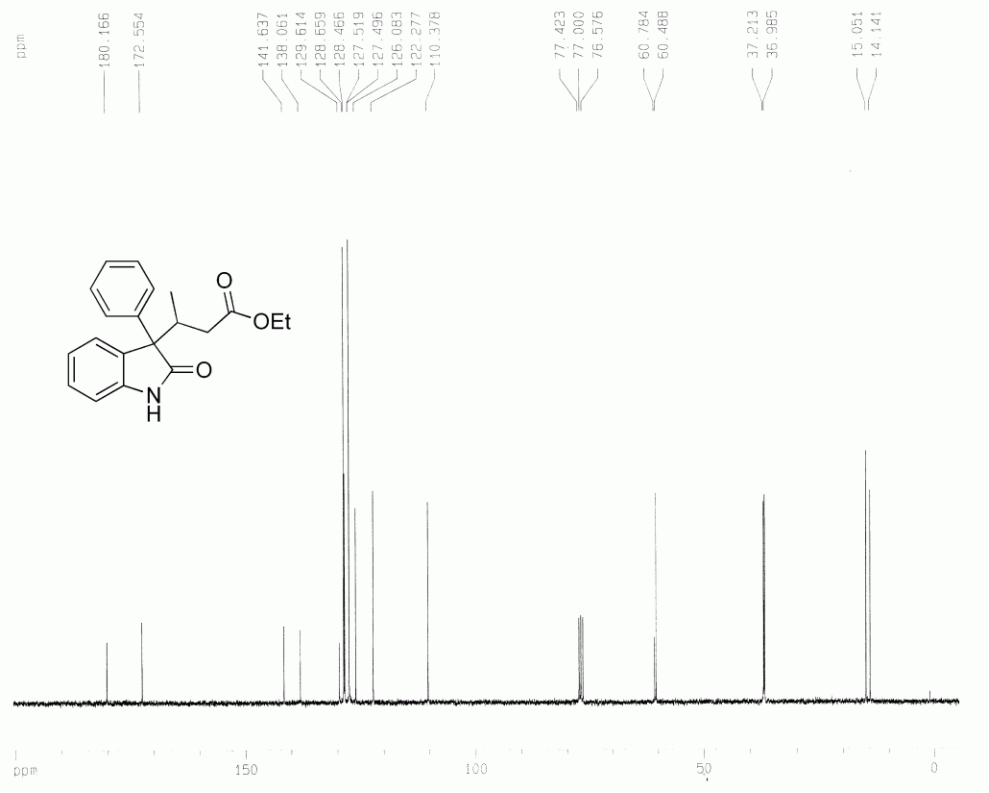
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127.496
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122.277
110.378
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77.000
76.576
60.784
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14.141
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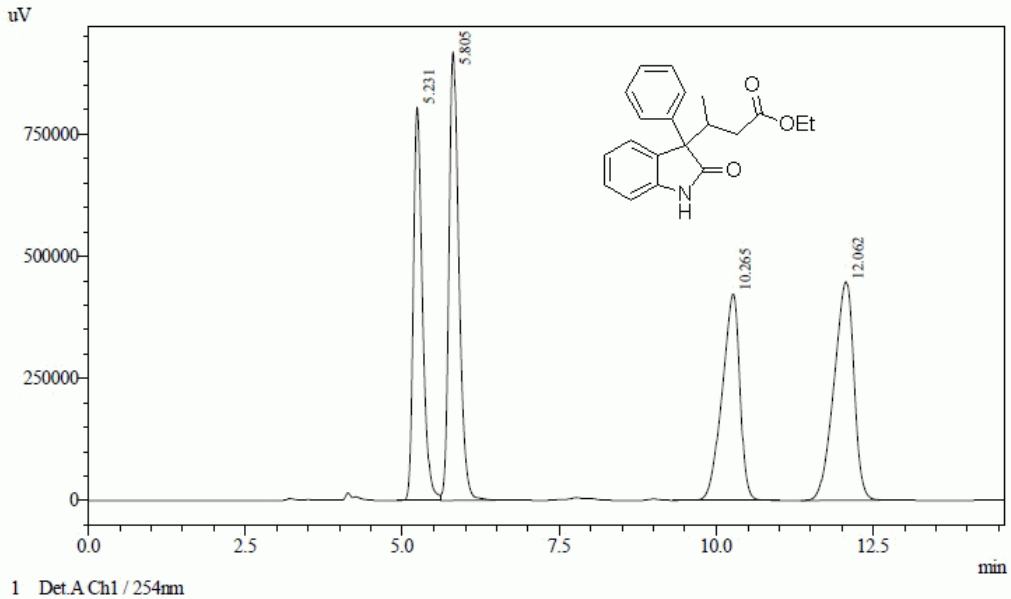
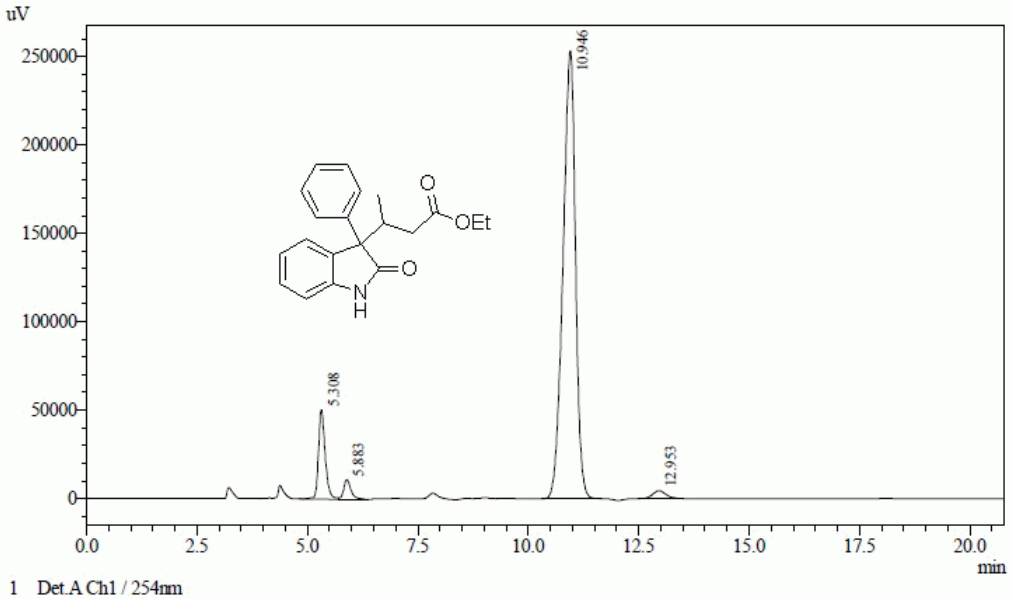


1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

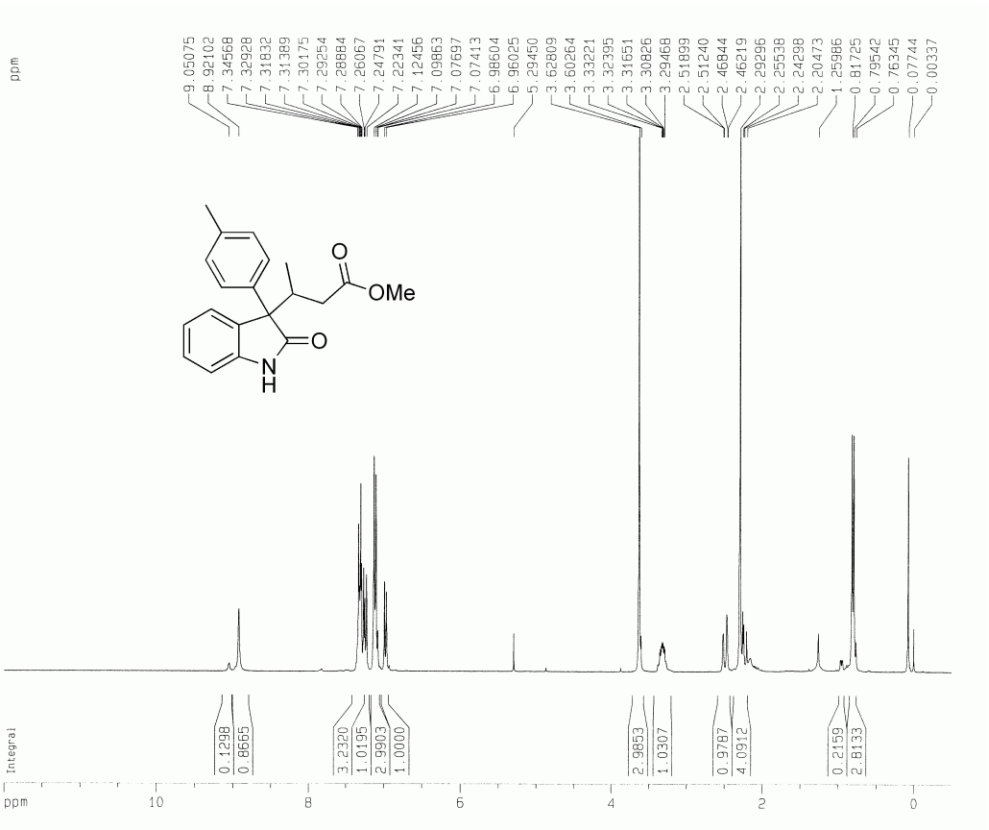
Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.231	8264935	804766	22.722	31.043
2	5.805	9947769	918485	27.348	35.430
3	10.265	8308213	422264	22.841	16.288
4	12.062	9853741	446901	27.090	17.239
Total		36374658	2592416	100.000	100.000



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.308	535192	50406	9.320	15.785
2	5.883	126060	11081	2.195	3.470
3	10.946	4985051	253396	86.810	79.354
4	12.953	96154	4439	1.674	1.390
Total		5742457	319322	100.000	100.000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7.09863
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7.07413
6.98604
6.96025
5.29450
3.62809
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O
N
H
Integral
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ppm
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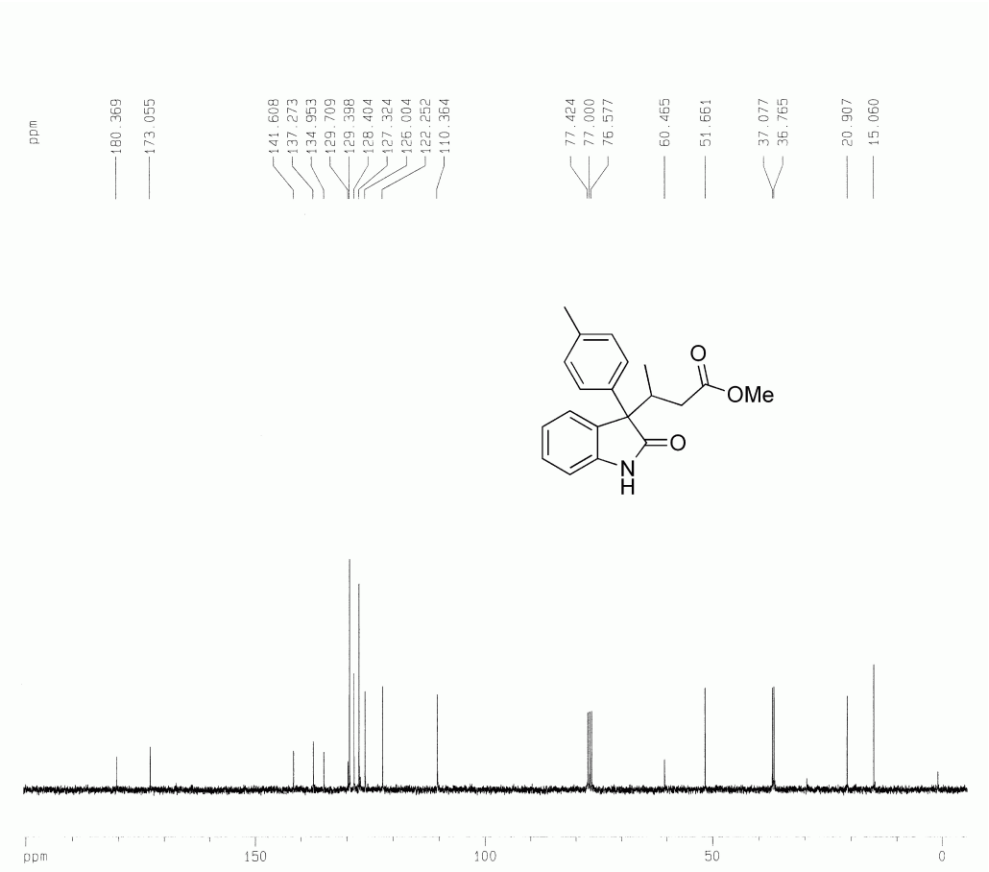
6
4
2
0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128.404
127.324
126.004
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110.364
77.424
77.000
76.577
60.465
51.661
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OMe
O
N
H
ppm
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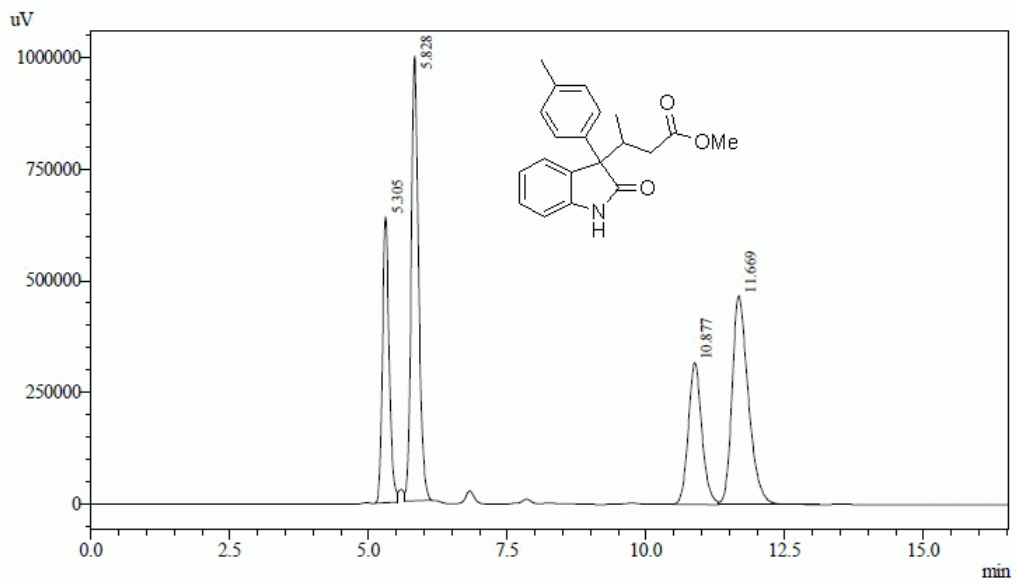
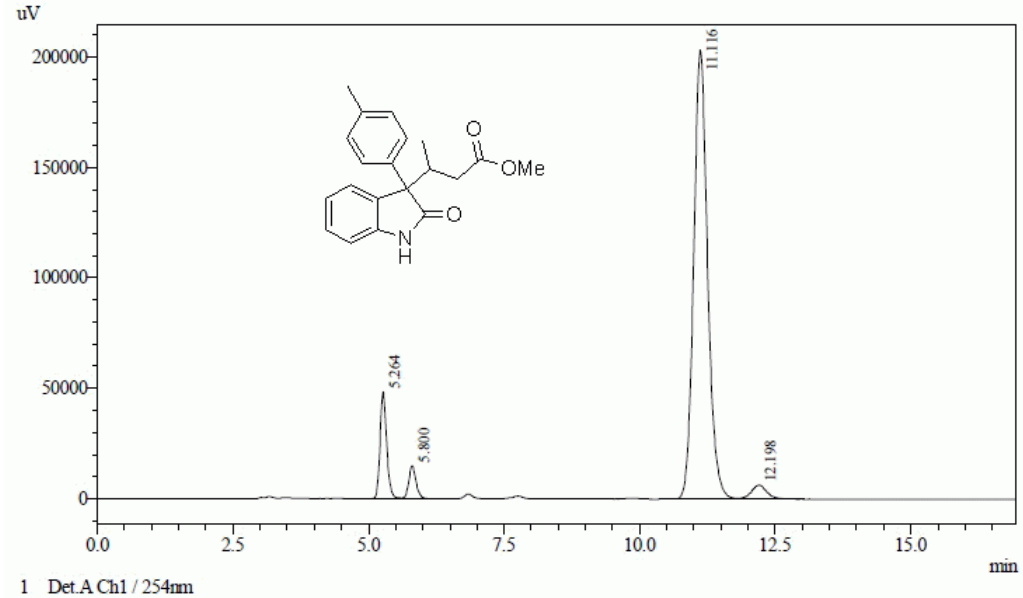
50
0



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

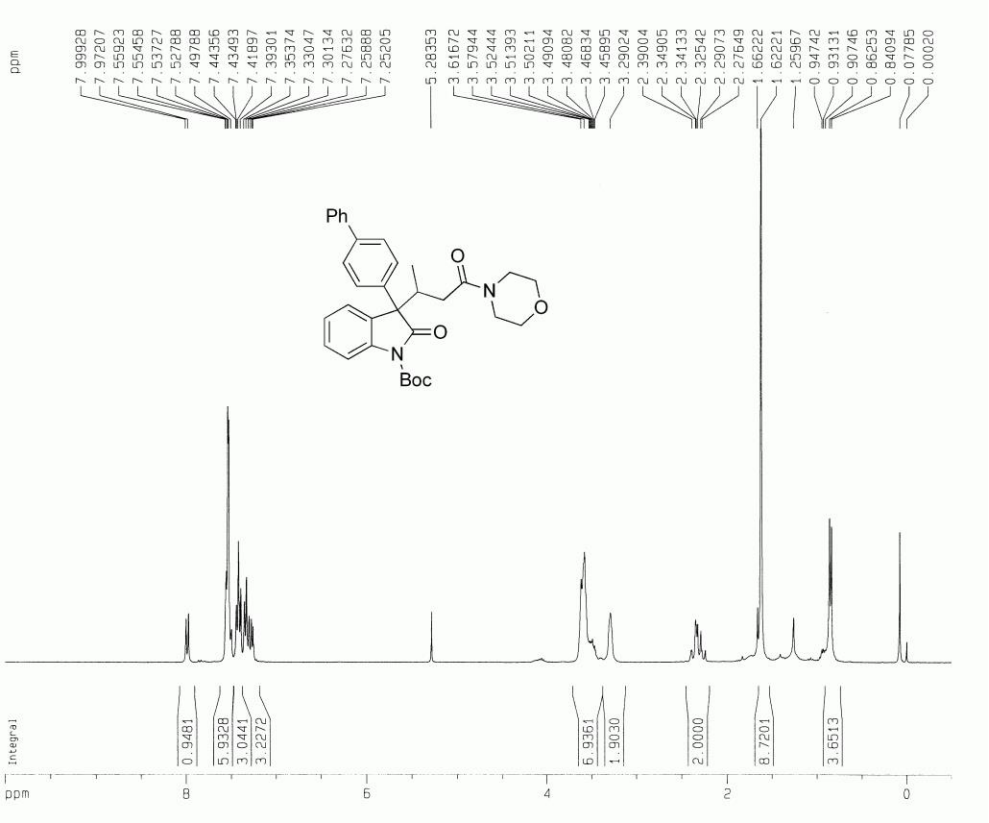
Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.305	5390079	640590	18.276	26.468
2	5.828	9225323	995367	31.280	41.127
3	10.877	5393080	317377	18.286	13.114
4	11.669	9484680	466896	32.159	19.291
Total		29493161	2420231	100.000	100.000



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.264	414820	48387	9.617	17.719
2	5.800	143499	14911	3.327	5.460
3	11.116	3626158	203454	84.069	74.503
4	12.198	128859	6329	2.987	2.317
Total		4313336	273080	100.000	100.000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7.55458
7.53727
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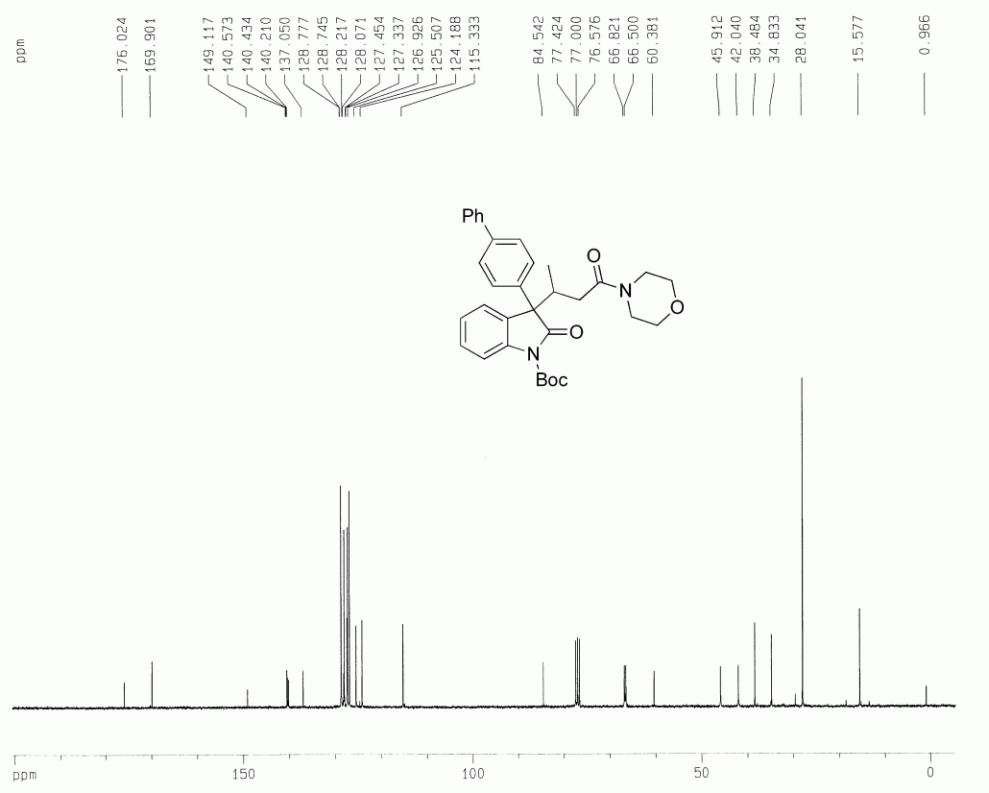
7.49788
7.44356
7.43493
7.41897
7.39301
7.35374
7.33047
7.30134
7.27632
7.25888
7.25205
5.28353
3.61672
3.57944
3.52444
3.51393
3.50211
3.49094
3.48082
3.46834
3.45895
3.29024
2.39004
2.34905
2.34133
2.32542
2.29073
2.27649
1.66222
1.62221
1.25967
0.94742
0.93131
0.90746
0.86253
0.84094
0.07785
0.00020
Ph
O
N
O
O
N
Boc
integral
0.9481
5.9328
3.0441
3.2272
6.9361
1.9030
2.0000
8.7201
3.6513
ppm
8
6
4
2
0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176.024
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149.117
140.573
140.434
140.210
137.050
128.777
128.745
128.217
128.071
127.454
127.337
126.926
125.507
124.188
115.333
84.542
77.424
77.000
76.576
66.821
66.500
60.381
45.912
42.040
38.484
34.833
28.041
15.577
0.966
Ph
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N
O
O
N
Boc
ppm
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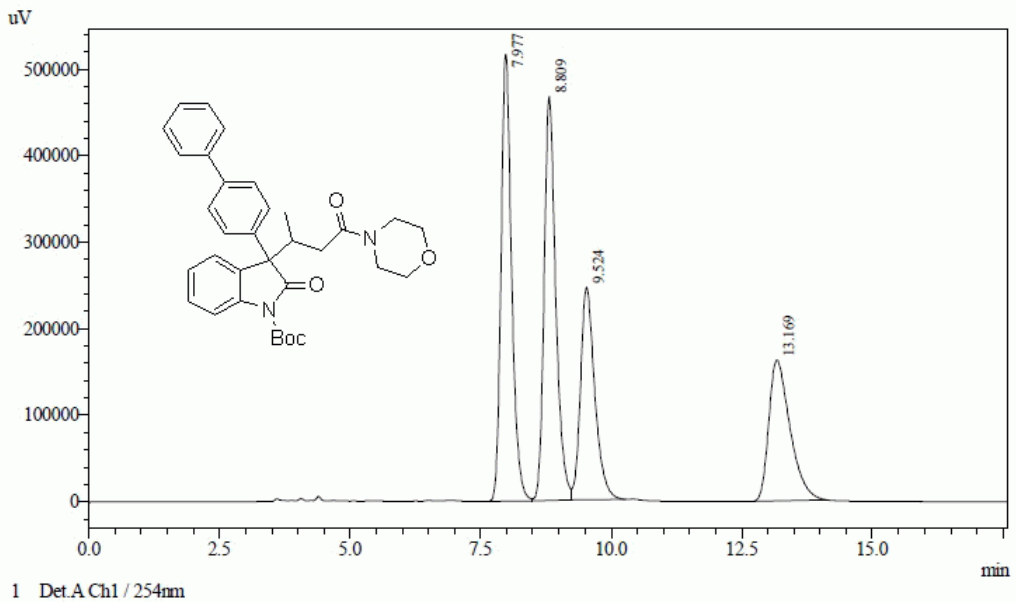
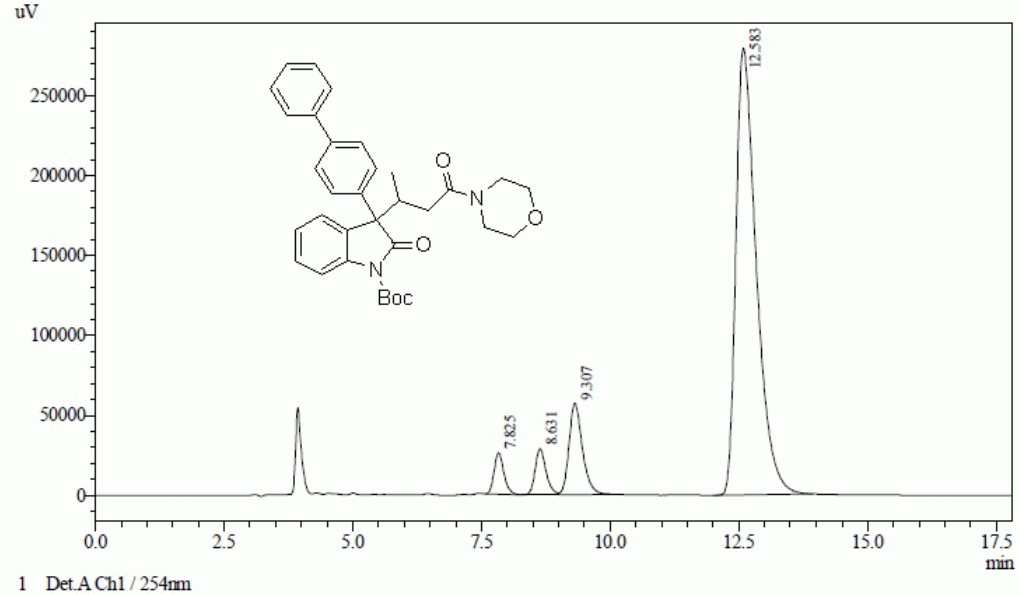
100
50
0



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

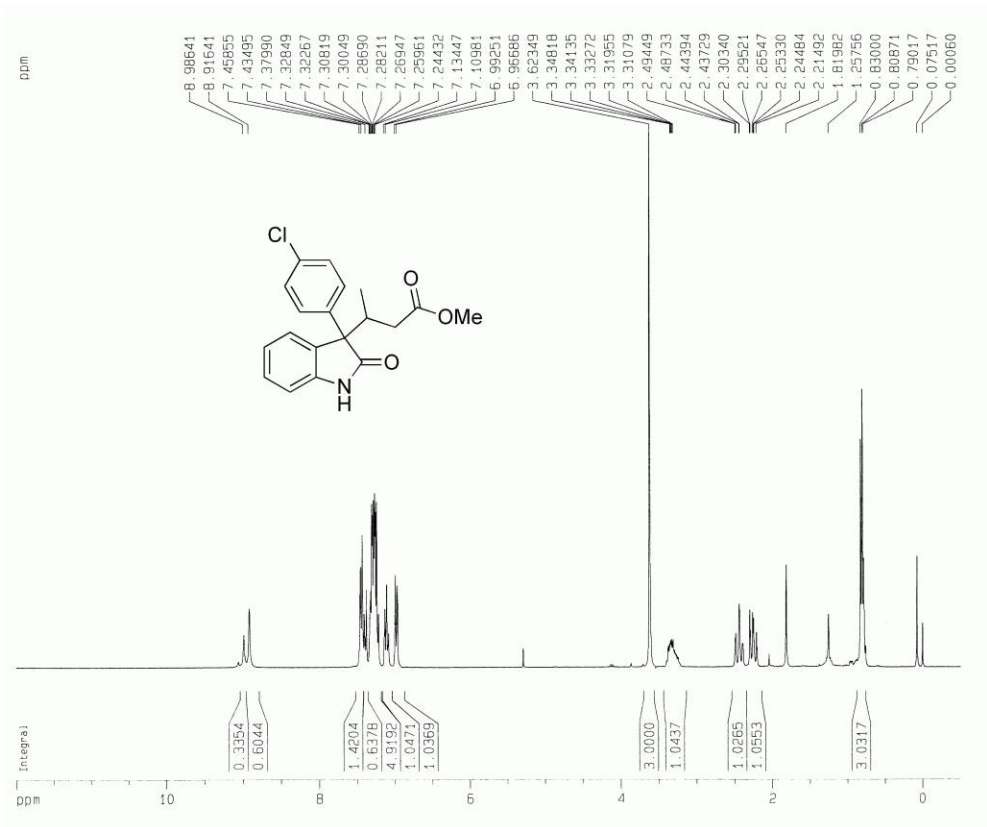
Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.977	7272679	515956	30.587	37.105
2	8.809	7220611	466289	30.368	33.533
3	9.524	4680869	245526	19.687	17.657
4	13.169	4602888	162754	19.359	11.705
Total		23777047	1390525	100.000	100.000



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.825	345179	25916	3.633	6.629
2	8.631	421767	28817	4.439	7.371
3	9.307	1033213	57042	10.873	14.591
4	12.583	7702031	279169	81.055	71.409
Total		9502189	390944	100.000	100.000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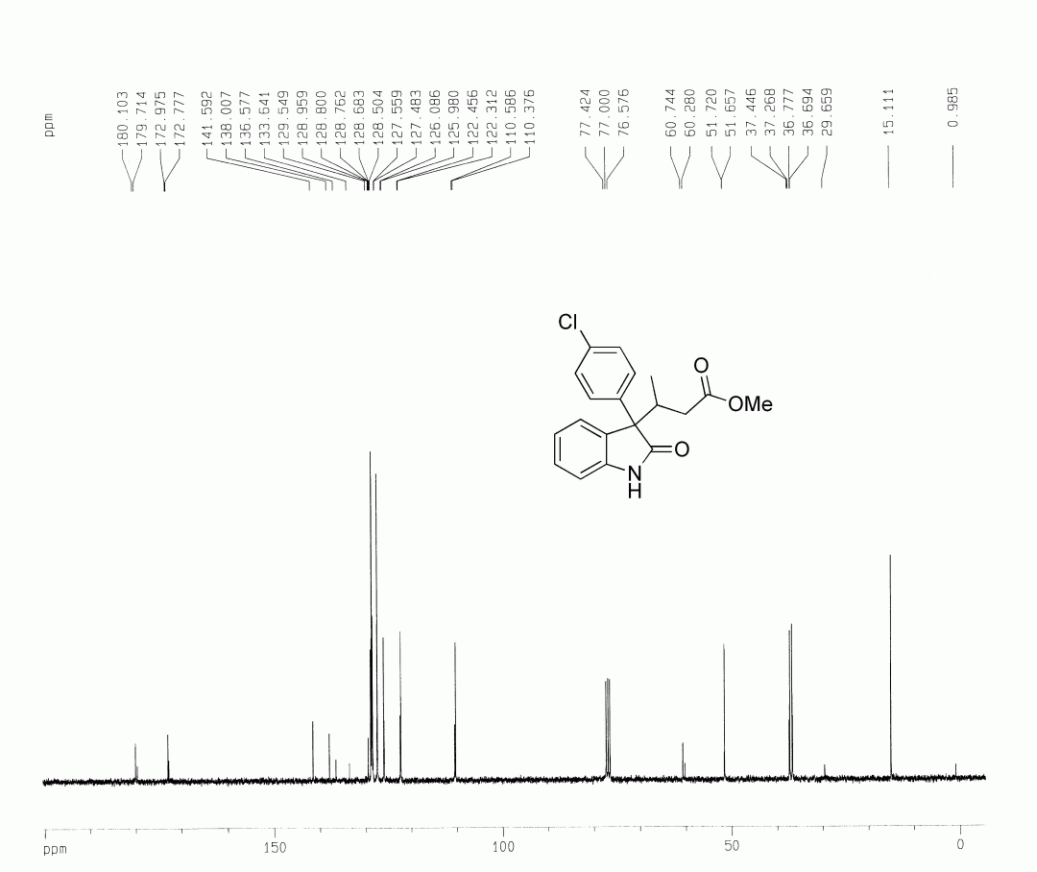
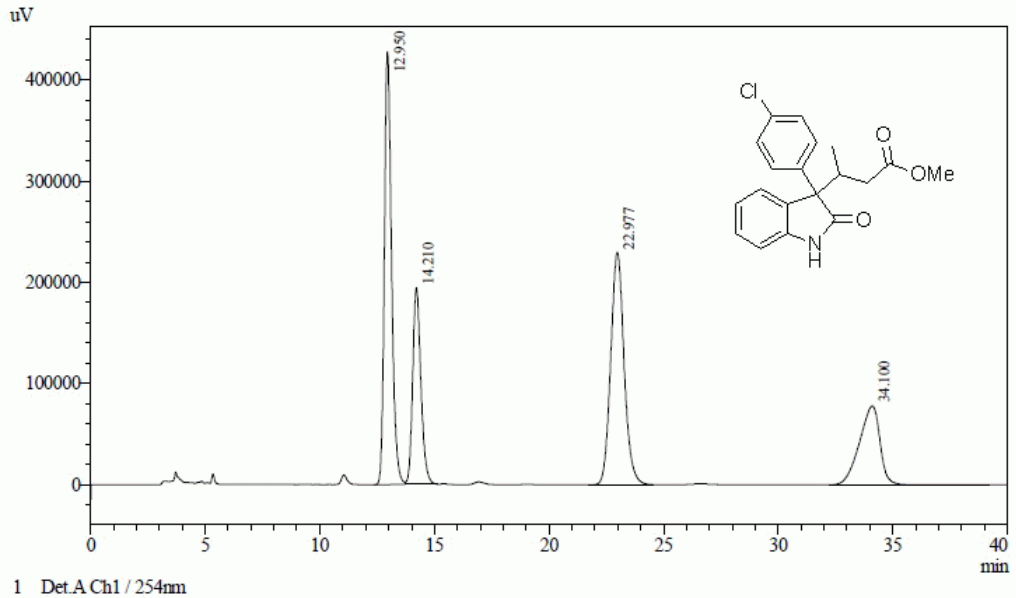
7.45855
7.43495
7.37990
7.32849
7.32267
7.30819
7.30049
7.28690
7.28211
7.26947
7.25961
7.24432
7.13447
7.10981
6.99251
6.96686
3.62349
3.34818
3.34135
3.33272
3.31955
3.31079
2.49449
2.48733
2.44394
2.43729
2.30340
2.29521
2.26547
2.25330
2.24484
2.21492
1.81982
1.25756
0.83000
0.80871
0.79017
0.07517
0.00060
Cl
O
OMe
O
N
H
Integral
0.3354
0.6044
1.4204
0.6378
4.9192
1.0471
1.0369
3.0000
1.0437
1.0265
1.0553
3.0317
ppm
10
8
6
4
2
0

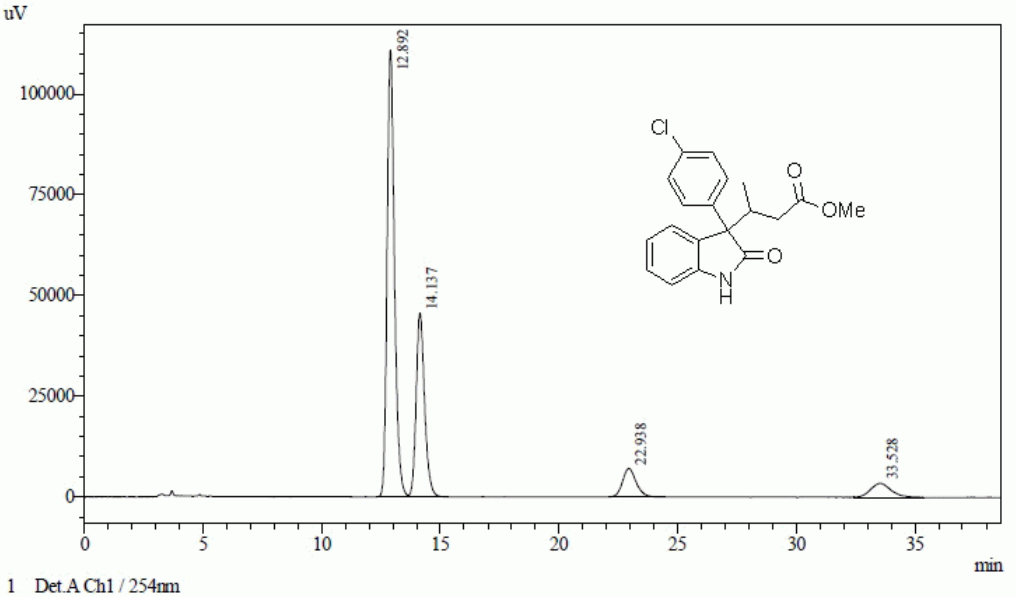

ppm
180.103
179.714
172.975
172.777
141.592
138.007
136.577
133.641
129.549
128.959
128.800
128.762
128.683
128.504
127.559
127.483
126.086
125.980
122.456
122.312
110.586
110.376
77.424
77.000
76.576
60.744
60.280
51.720
51.657
37.446
37.268
36.777
36.694
29.659
15.111
0.985
Cl
O
OMe
O
N
H
ppm
150
100
50
0



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

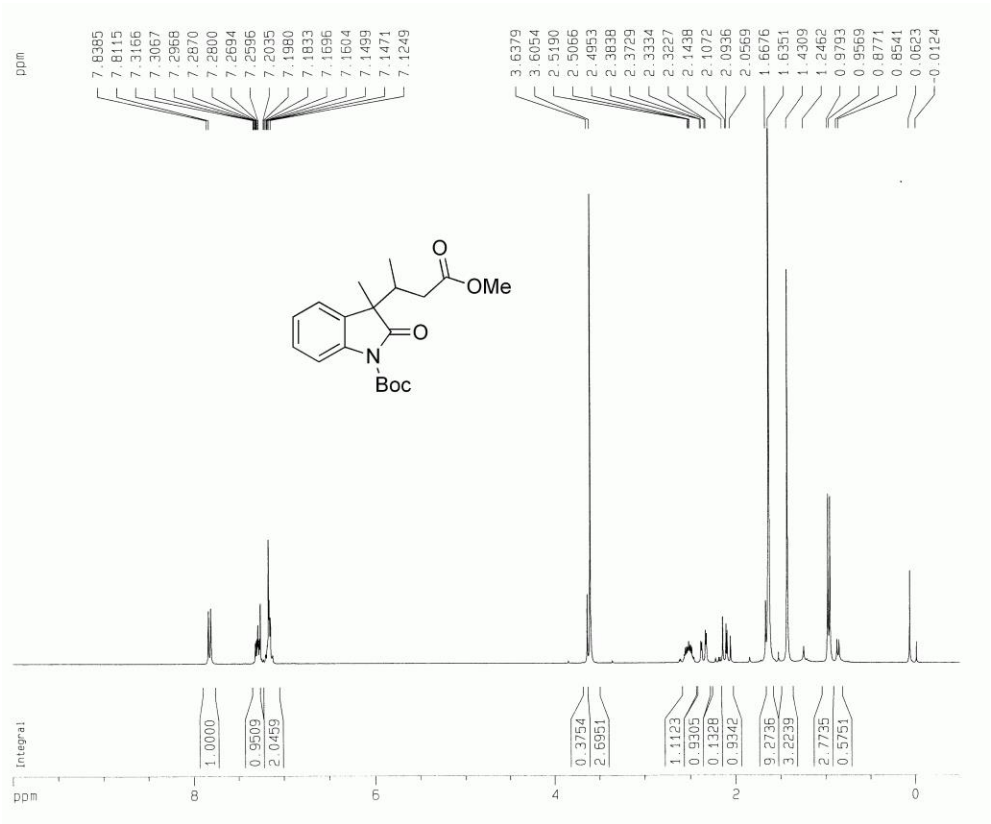
Peak#	Ret. Time	Area	Height	Area %	Height %
1	12.950	9328212	427881	32.865	46.012
2	14.210	4845638	194380	17.072	20.903
3	22.977	9335264	229716	32.890	24.702
4	34.100	4874121	77956	17.173	8.383
Total		28383234	929933	100.000	100.000



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	12.892	2400222	110998	59.503	66.364
2	14.137	1133068	45655	28.090	27.296
3	22.938	288645	7115	7.156	4.254
4	33.528	211833	3490	5.251	2.086
Total		4033767	167257	100.000	100.000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7.2968
7.2870
7.2800
7.2694
7.2596
7.2035
7.1980
7.1833
7.1696
7.1604
7.1499
7.1471
7.1249
3.6379
3.6054
2.5190
2.5066
2.4953
2.3838
2.3729
2.3334
2.3227
2.1438
2.1072
2.0936
2.0569
1.6676
1.6351
1.4309
1.2462
0.9793
0.9569
0.8771
0.8541
0.0623
-0.0124
O
OMe
O
N
Boc
Integral
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0.9509
2.0459
0.3754
2.6951
1.1123
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0.1328
0.9342
9.2736
3.2239
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ppm
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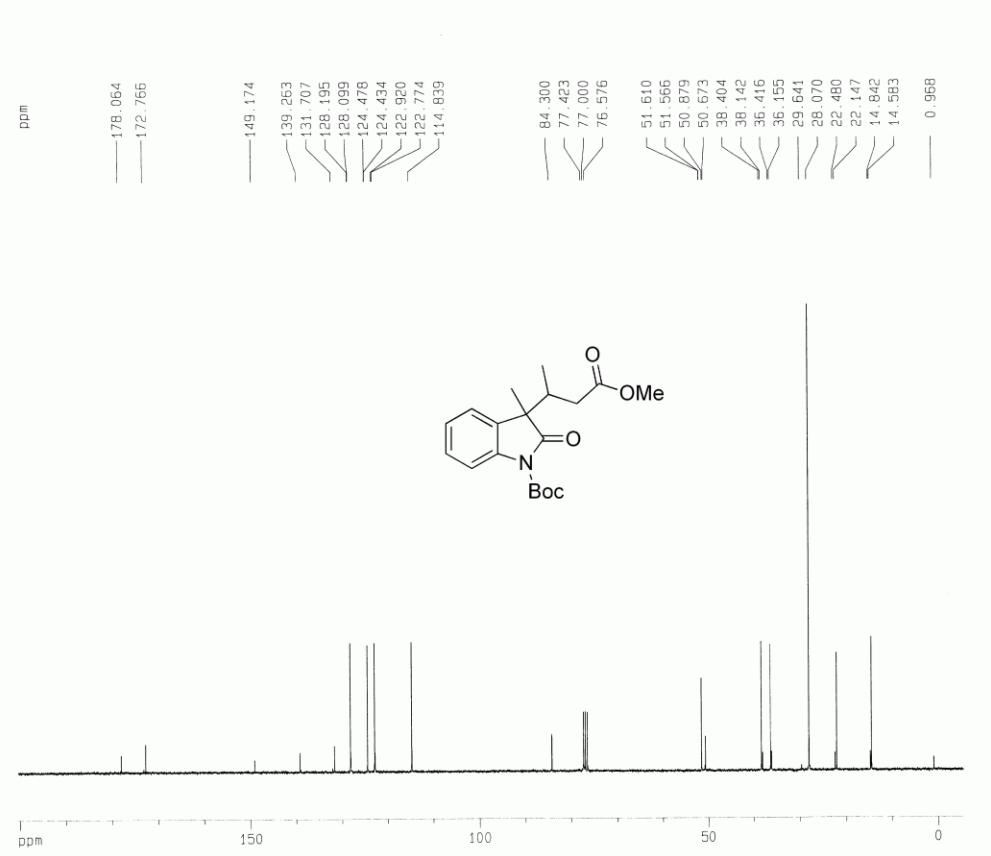
6
4
2
0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149.174
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131.707
128.195
128.099
124.478
124.434
122.920
122.774
114.839
84.300
77.423
77.000
76.576
51.610
51.566
50.879
50.673
38.404
38.142
36.416
36.155
29.641
28.070
22.480
22.147
14.842
14.583
0.968
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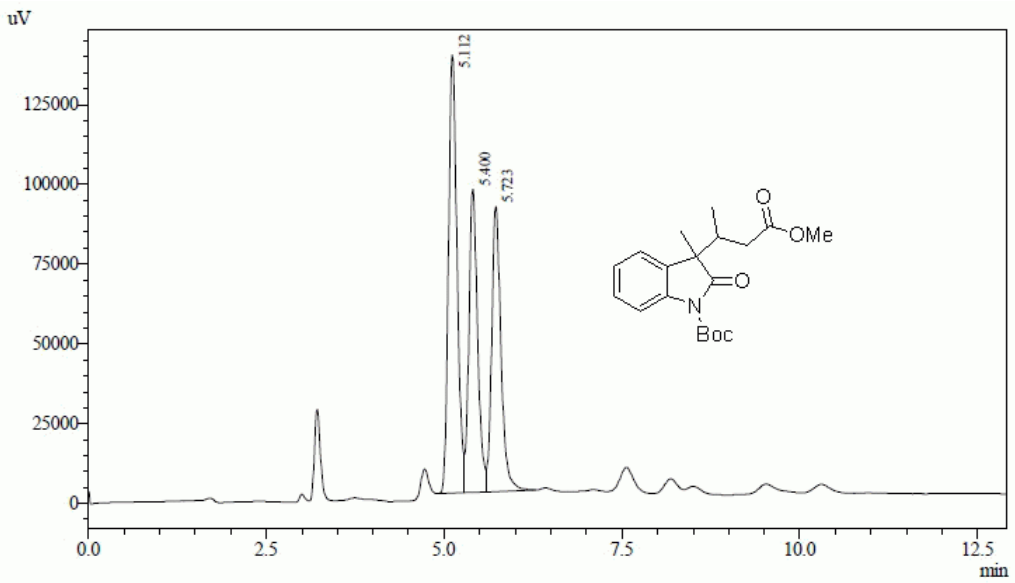
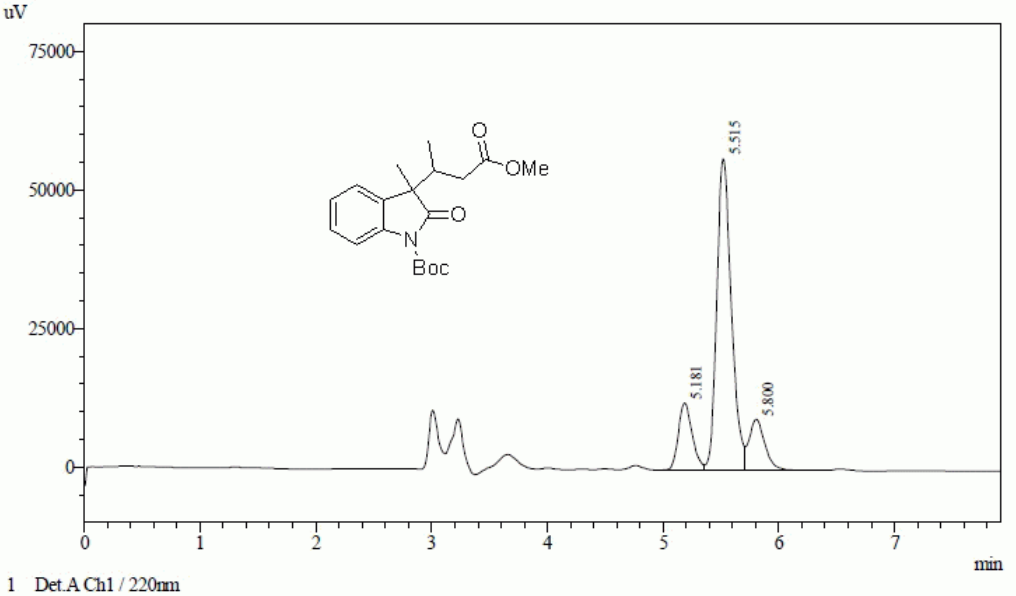
OMe
O
N
Boc
ppm
150
100
50
0



1 Det.A Ch1 / 220nm

Detector A Ch1 220nm

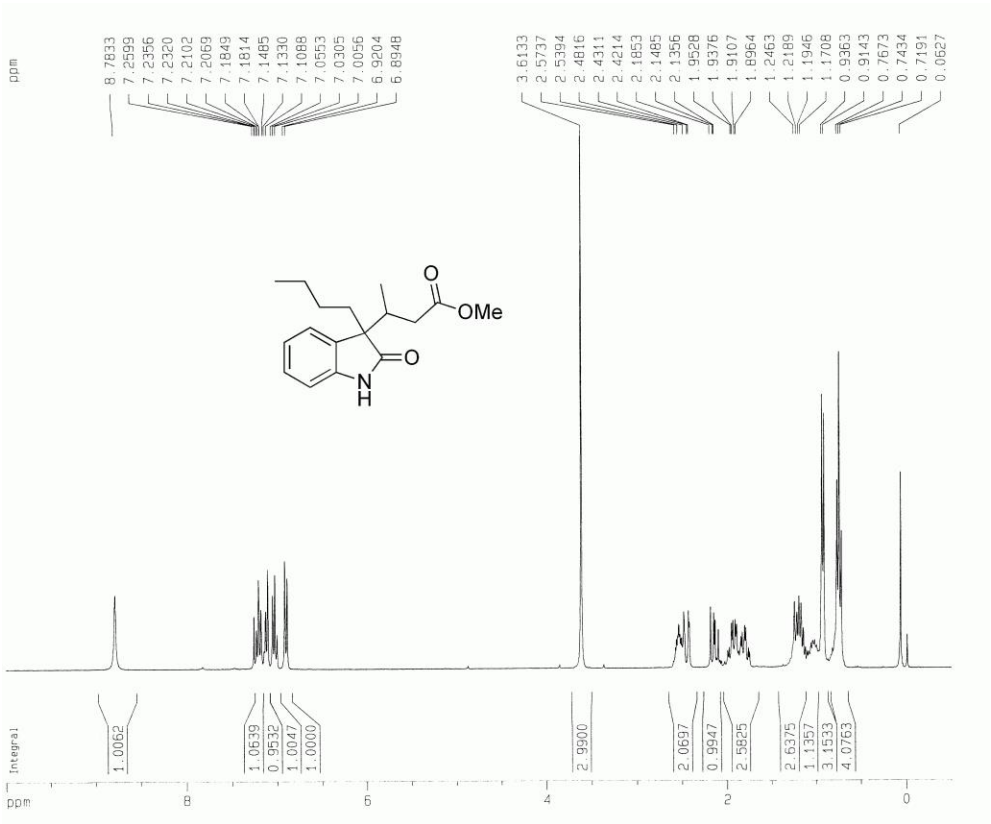
Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.112	1155111	137351	41.587	42.702
2	5.400	808592	94974	29.112	29.527
3	5.723	813848	89323	29.301	27.770
Total		2777551	321648	100.000	100.000



1 Det.A Ch1 / 220nm

Detector A Ch1 220nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.181	101189	12102	14.831	15.603
2	5.515	494813	56290	72.524	72.576
3	5.800	86275	9169	12.645	11.821
Total		682277	77560	100.000	100.000


ppm
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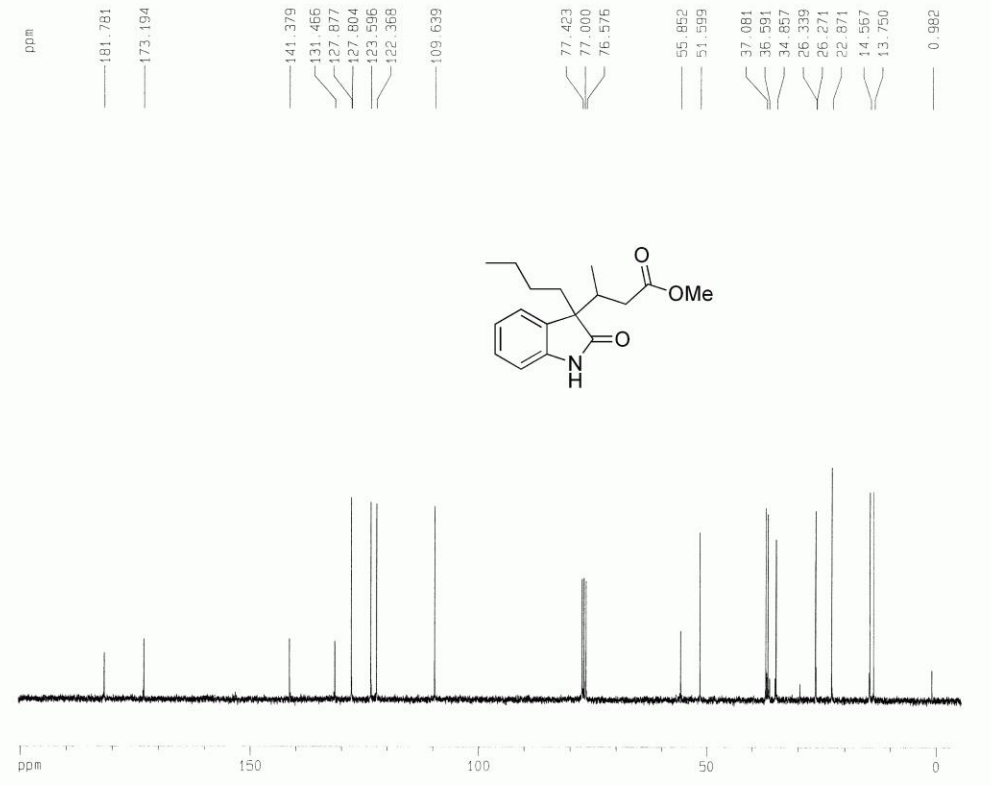
7.2599
7.2356
7.2320
7.2102
7.2069
7.1849
7.1814
7.1485
7.1330
7.1088
7.0553
7.0305
7.0056
6.9204
6.8948
3.6133
2.5737
2.5394
2.4816
2.4311
2.4214
2.1853
2.1485
2.1356
1.9528
1.9376
1.9107
1.8964
1.2463
1.2189
1.1946
1.1708
0.9363
0.9143
0.7673
0.7434
0.7191
0.0627
OMe
O
N
H
Integral
1.0062
1.0639
0.9532
1.0047
1.0000
2.9900
2.0697
0.9947
2.5825
2.6375
1.1357
3.1533
4.0763
ppm
8
6
4
2
0


ppm
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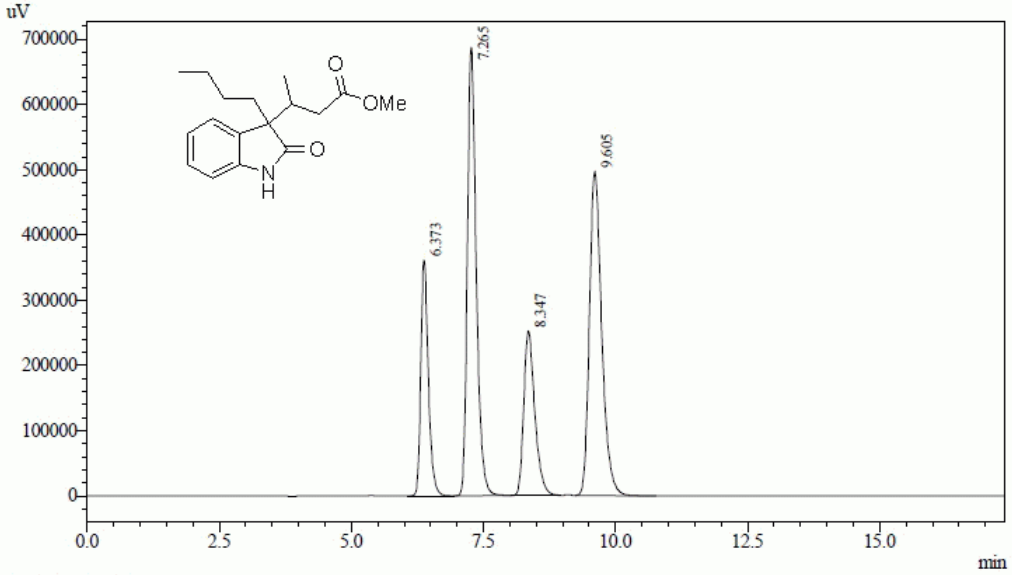
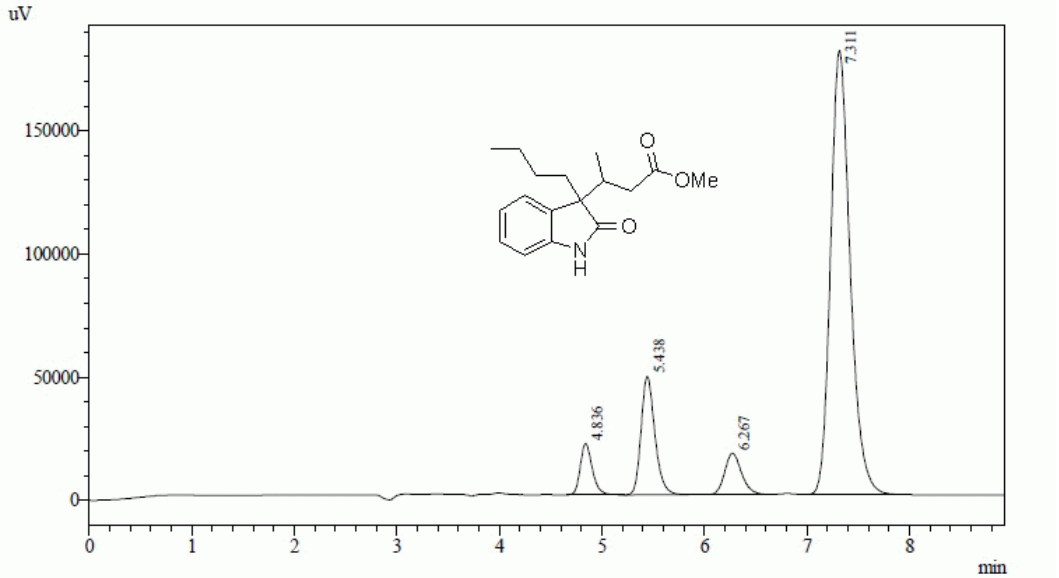
141.379
131.466
127.877
127.804
123.596
122.368
109.639
77.423
77.000
76.576
55.852
51.599
37.081
36.591
34.857
26.339
26.271
22.871
14.567
13.750
0.982
OMe
O
N
H
ppm
150
100
50
0



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

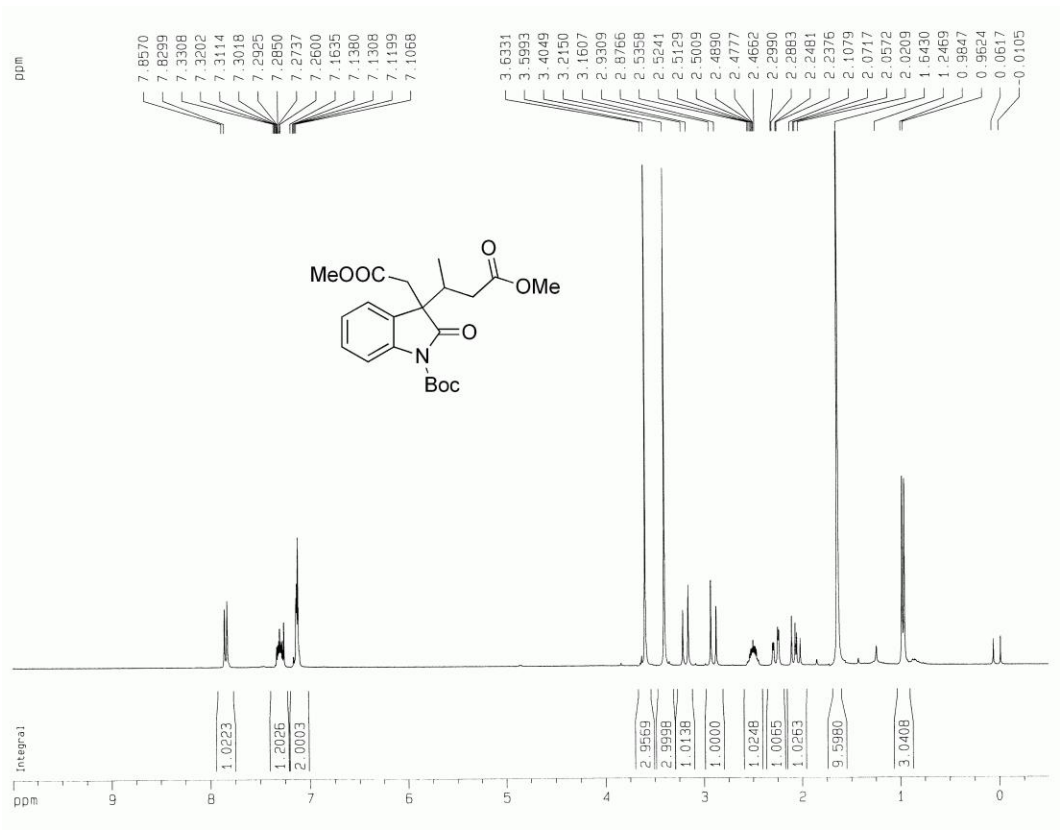
Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.373	3588098	361288	15.365	20.103
2	7.265	8051151	686797	34.477	38.215
3	8.347	3674924	252271	15.737	14.037
4	9.605	8037734	496840	34.420	27.645
Total		23351907	1797195	100.000	100.000



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	4.836	169479	20772	5.290	7.819
2	5.438	450546	47994	14.063	18.065
3	6.267	192971	16795	6.023	6.321
4	7.311	2390884	180116	74.625	67.795
Total		3203879	265677	100.000	100.000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7.3202
7.3114
7.3018
7.2925
7.2850
7.2737
7.2600
7.1635
7.1380
7.1308
7.1199
7.1068
3.6331
3.5993
3.4049
3.2150
3.1607
2.9309
2.8766
2.5358
2.5241
2.5129
2.5009
2.4890
2.4777
2.4662
2.2990
2.2883
2.2481
2.2376
2.1079
2.0717
2.0572
2.0209
1.6430
1.2469
0.9847
0.9624
0.0617
-0.0105
MeOOC
O
OMe
O
N
Boc
Integral
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1.2026
2.0003
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2.9998
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1.0000
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ppm
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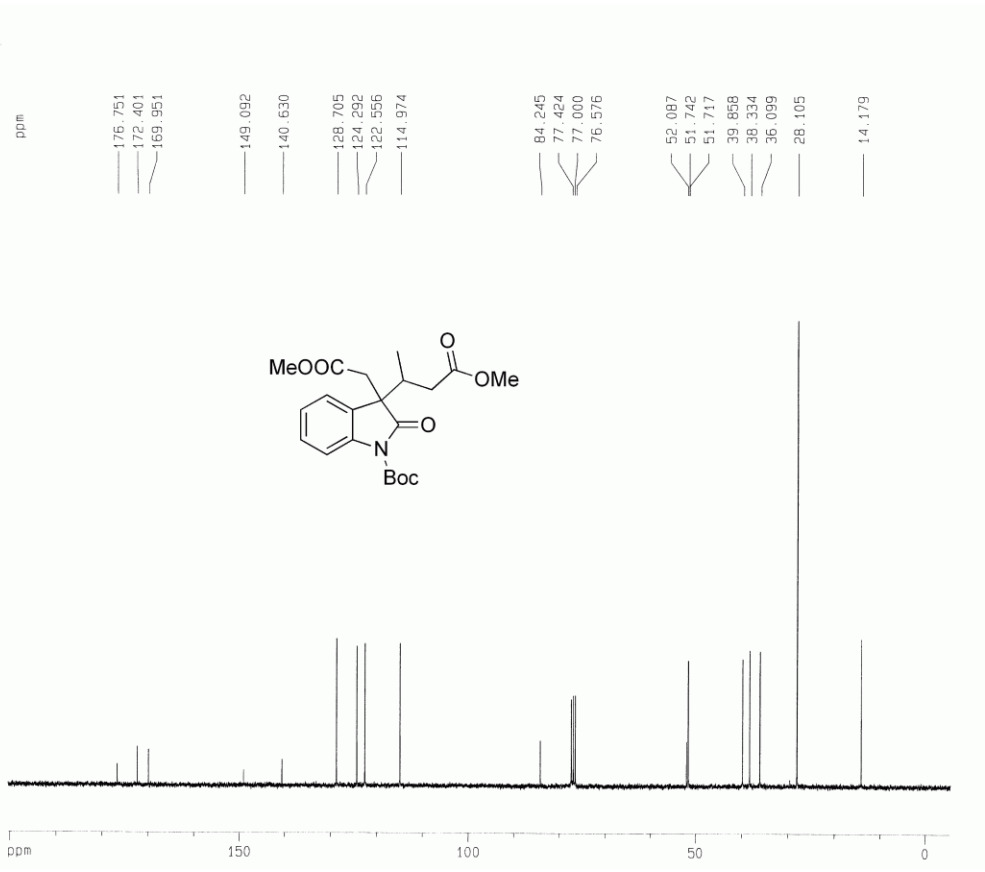
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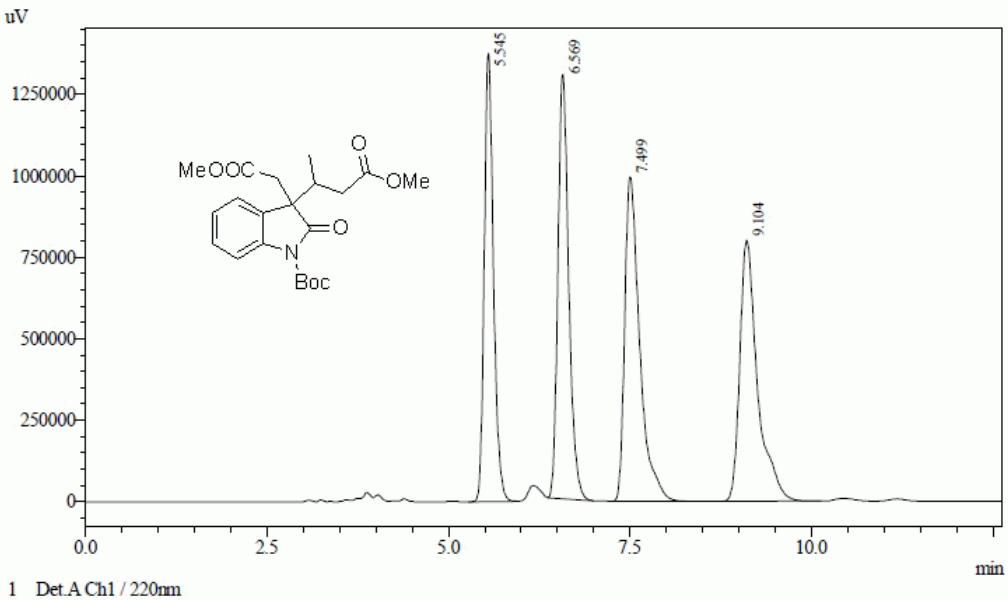
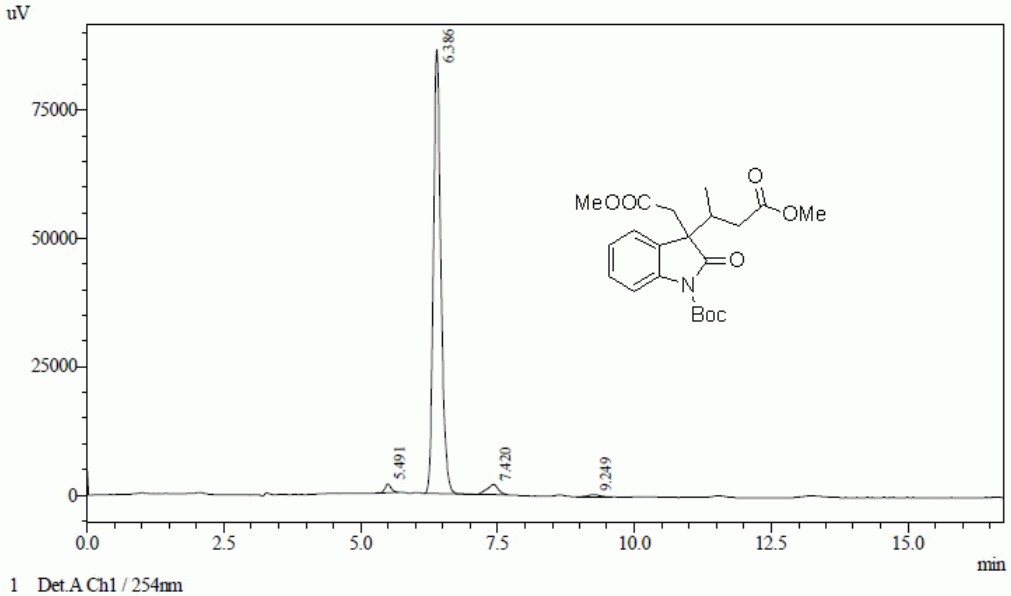
140.630
128.705
124.292
122.556
114.974
84.245
77.424
77.000
76.576
52.087
51.742
51.717
39.858
38.334
36.099
28.105
14.179
MeOOC
O
OMe
O
N
Boc
ppm
150
100
50
0



1 Det.A Ch1 / 220nm

Detector A Ch1 220nm

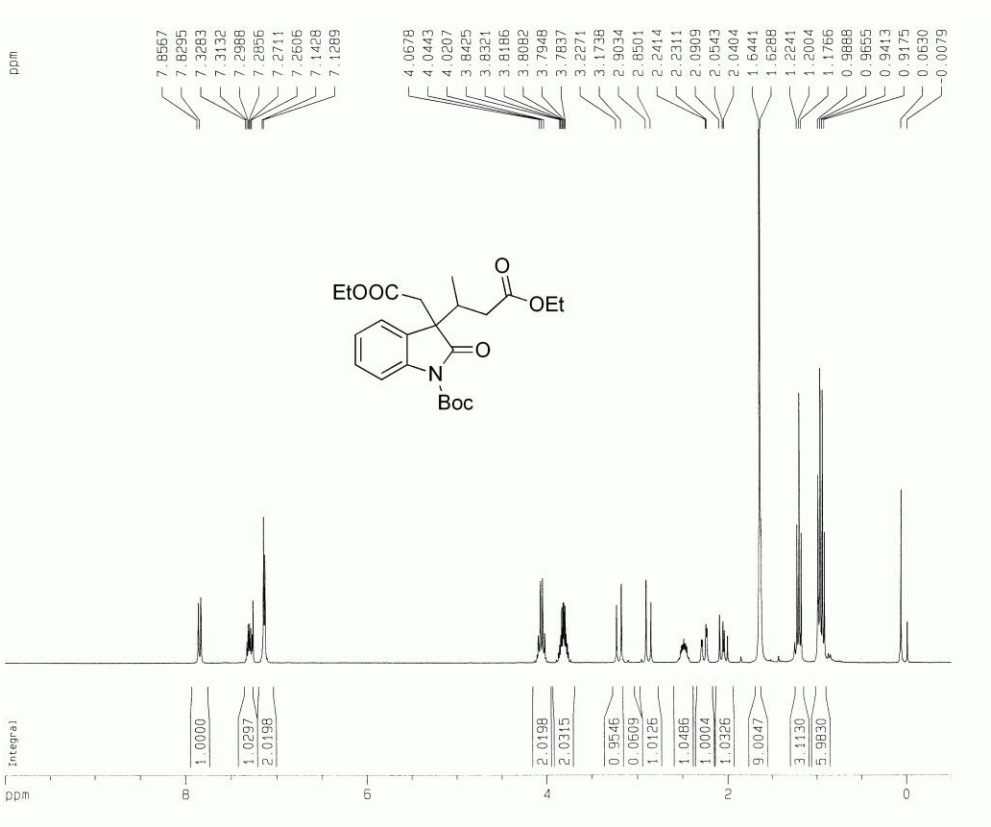
Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.545	12126353	1376091	22.644	30.756
2	6.569	13453870	1301998	25.123	29.100
3	7.499	14332301	994970	26.764	22.238
4	9.104	13639041	801102	25.469	17.905
Total		53551566	4474161	100.000	100.000



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.491	12785	1640	1.451	1.811
2	6.386	833132	86463	94.578	95.507
3	7.420	28901	1988	3.281	2.196
4	9.249	6074	440	0.690	0.486
Total		880892	90530	100.000	100.000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7.3283
7.3132
7.2988
7.2856
7.2711
7.2606
7.1428
7.1289
4.0678
4.0443
4.0207
3.8425
3.8321
3.8186
3.8082
3.7948
3.7837
3.2271
3.1738
2.9034
2.8501
2.2414
2.2311
2.0909
2.0543
2.0404
1.6441
1.6288
1.2241
1.2004
1.1766
0.9888
0.9655
0.9413
0.9175
0.0630
-0.0079
EtOOC
OEt
O
O
N
Boc
Integral
1.0000
1.0297
2.0198
2.0198
2.0315
0.9546
0.0609
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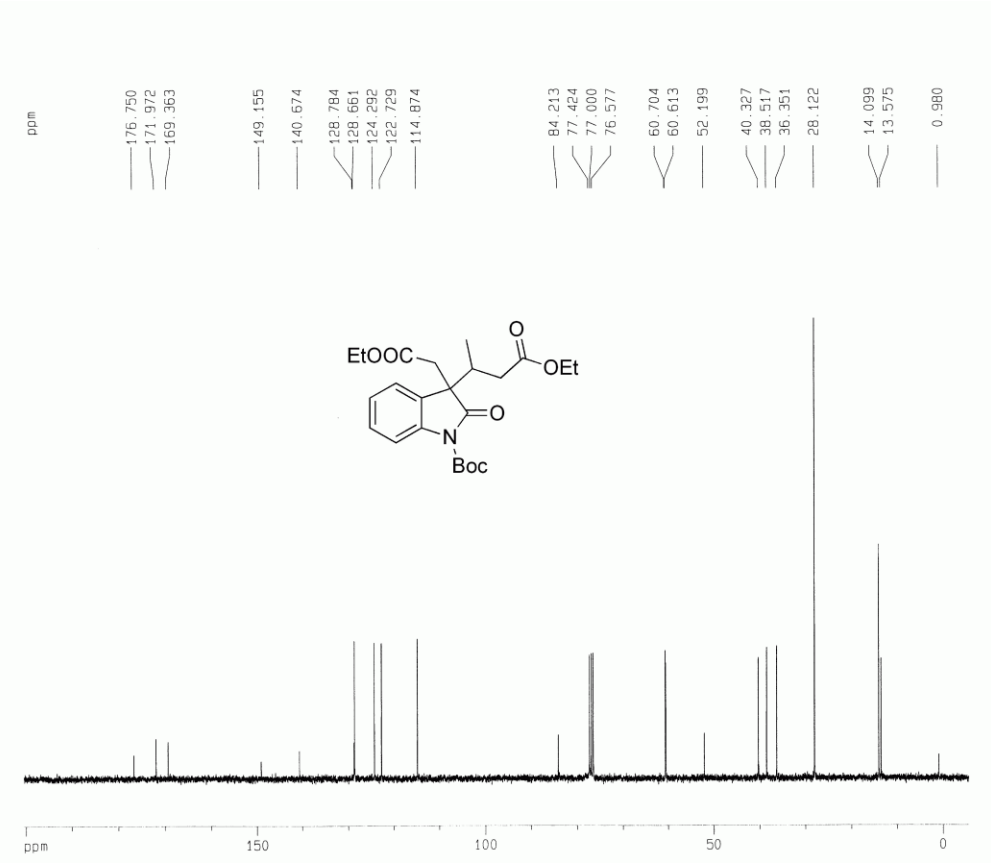
1.0004
1.0326
9.0047
3.1130
5.9830
ppm
8
6
4
2
0


ppm
176.750
171.972
169.363
149.155
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128.784
128.661
124.292
122.729
114.874
84.213
77.424
77.000
76.577
60.704
60.613
52.199
40.327
38.517
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O
N
Boc
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150
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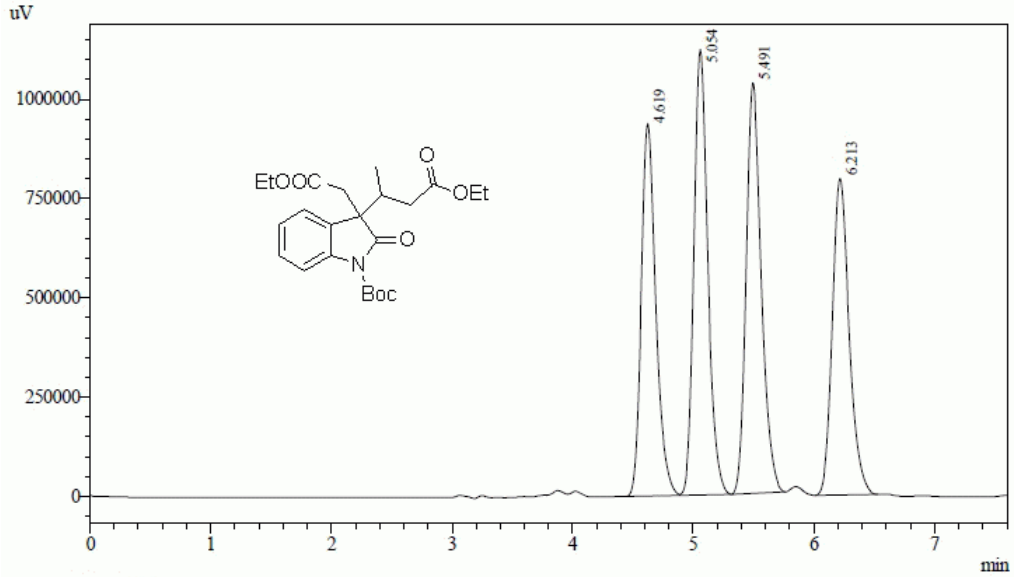
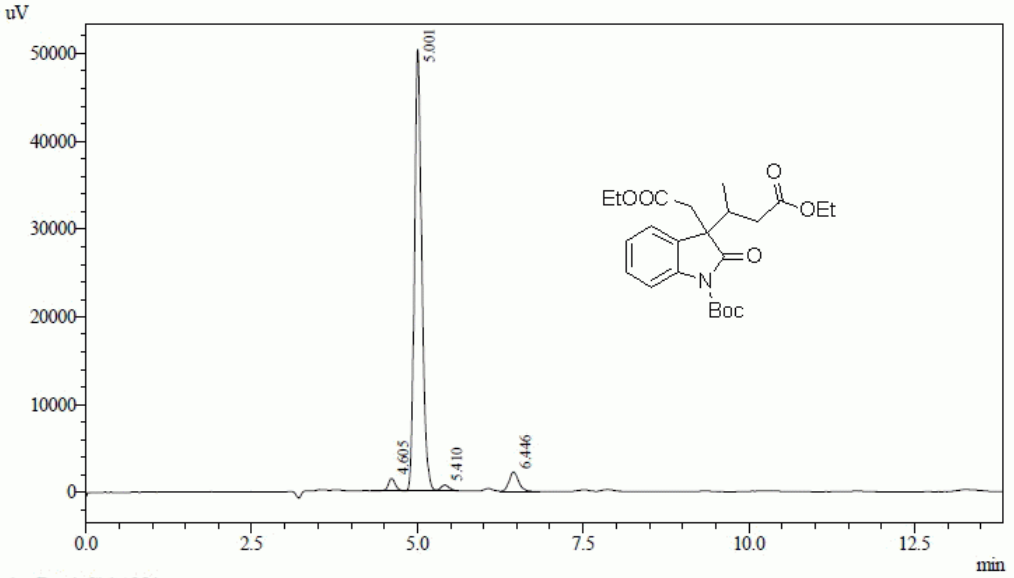
50
0



1 Det.A Ch1 / 220nm

Detector A Ch1 220nm

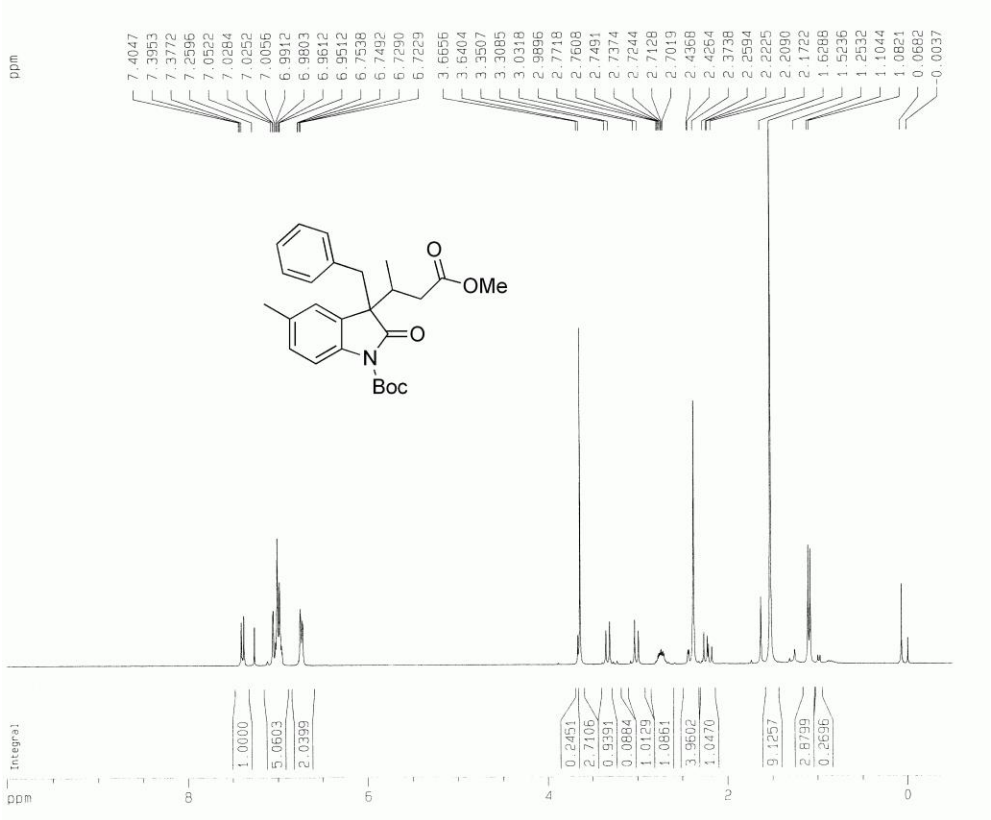
Peak#	Ret. Time	Area	Height	Area %	Height %
1	4.619	7843303	938564	23.352	24.118
2	5.054	8959334	1122053	26.675	28.833
3	5.491	9059725	1033211	26.974	26.550
4	6.213	7724305	797726	22.998	20.499
Total		33586666	3891554	100.000	100.000



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	4.605	10985	1444	2.554	2.644
2	5.001	390957	50295	90.915	92.061
3	5.410	6118	685	1.423	1.253
4	6.446	21964	2208	5.108	4.042
Total		430024	54632	100.000	100.000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7.2596
7.0522
7.0284
7.0252
7.0056
6.9912
6.9803
6.9612
6.9512
6.7538
6.7492
6.7290
6.7229
3.6656
3.6404
3.3507
3.3085
3.0318
2.9896
2.7718
2.7608
2.7491
2.7374
2.7244
2.7128
2.7019
2.4368
2.4254
2.3738
2.2594
2.2225
2.2090
2.1722
1.6288
1.5236
1.2532
1.1044
1.0821
0.0682
-0.0037
O
OMe
O
N
Boc
Integral
1.0000
5.0603
2.0399
0.2451
2.7106
0.9391
0.0884
1.0129
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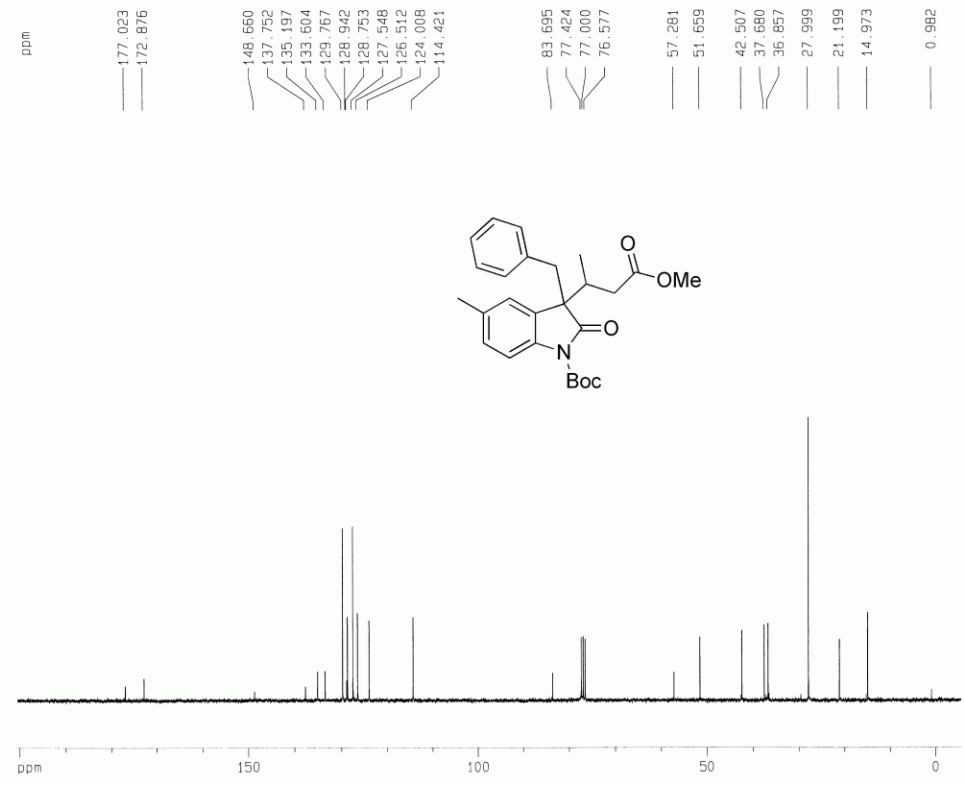
3.9602
1.0470
9.1257
2.8799
0.2696
ppm
8
6
4
2
0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148.660
137.752
135.197
133.604
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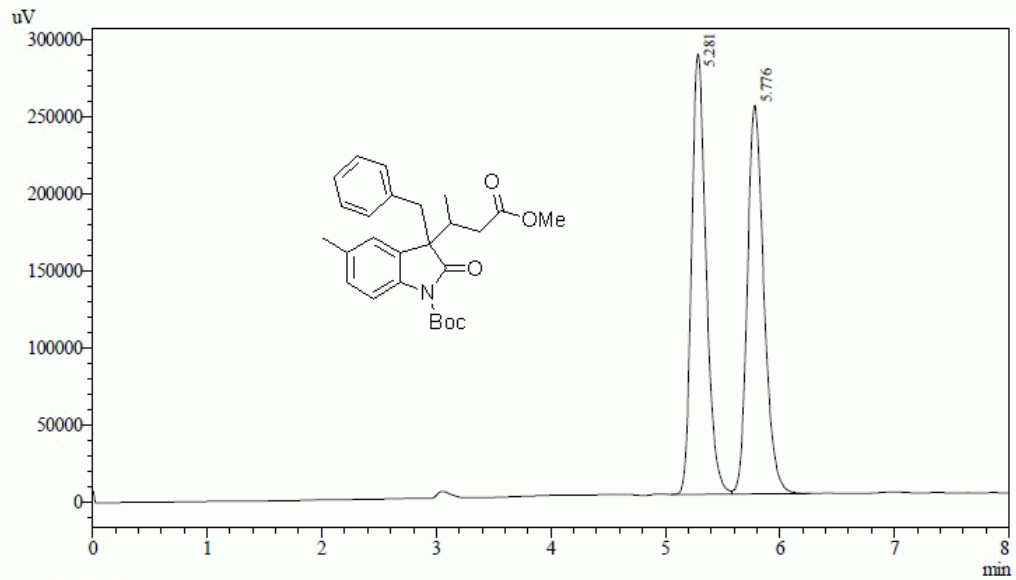
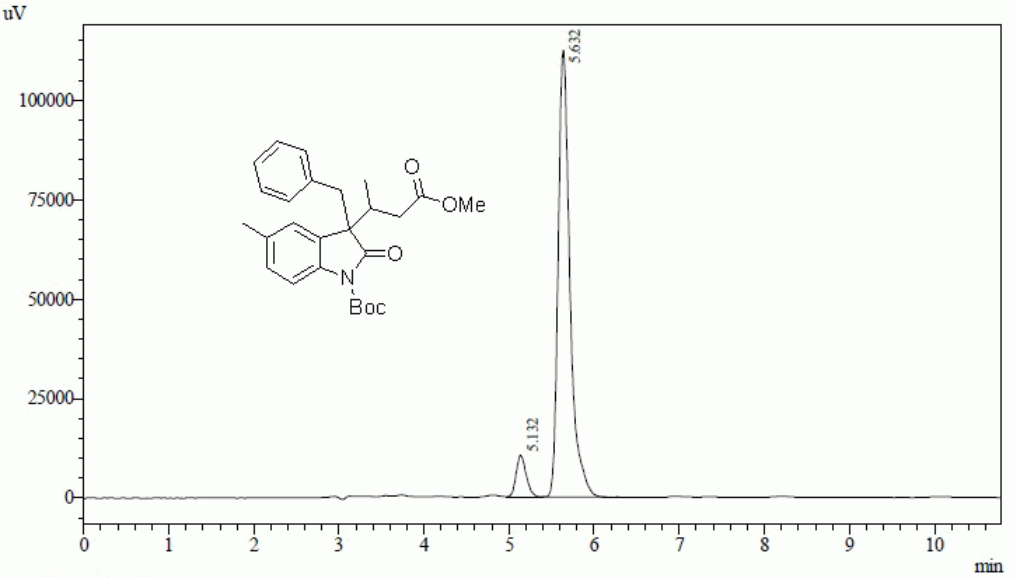
128.942
128.753
127.548
126.512
124.008
114.421
83.695
77.424
77.000
76.577
57.281
51.659
42.507
37.680
36.857
27.999
21.199
14.973
0.982
O
OMe
O
N
Boc
ppm
150
100
50
0



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

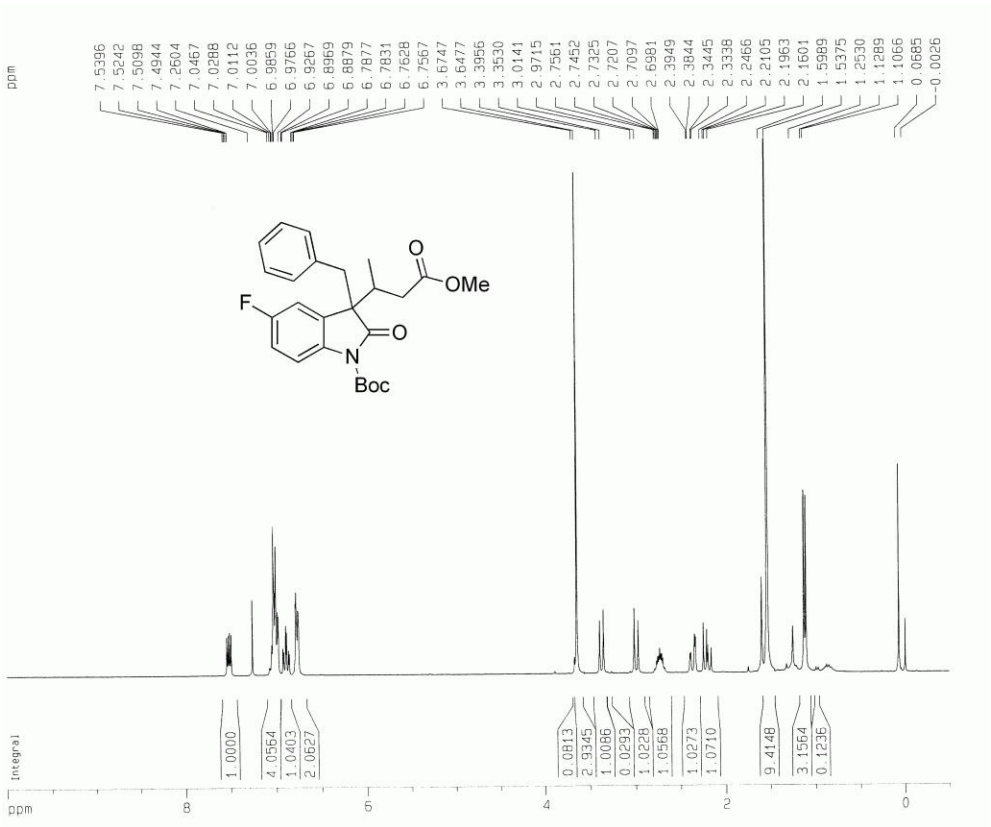
Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.281	2527214	285760	49.949	53.111
2	5.776	2532422	252280	50.051	46.889
Total		5059636	538041	100.000	100.000



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.132	85947	10420	7.378	8.488
2	5.632	1078993	112348	92.622	91.512
Total		1164940	122768	100.000	100.000


ppm
7.5396
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7.5098
7.4944
7.2604
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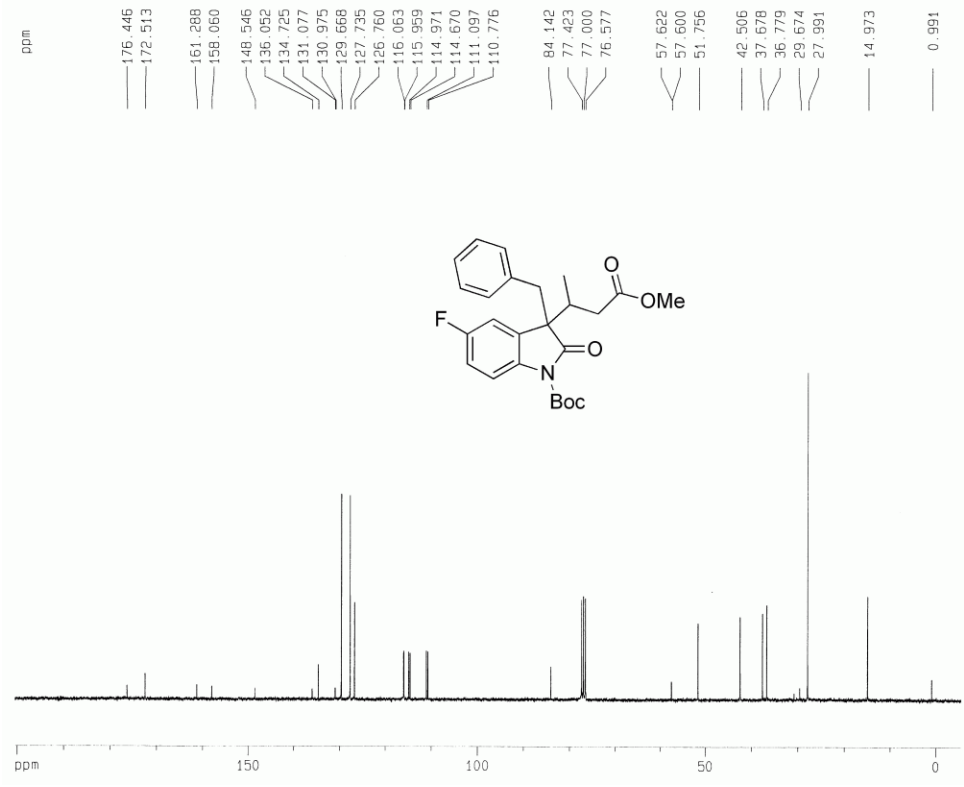
7.0288
7.0112
7.0036
6.9859
6.9766
6.9267
6.8969
6.8879
6.7877
6.7831
6.7628
6.7567
3.6747
3.6477
3.3956
3.3530
3.0141
2.9715
2.7561
2.7452
2.7325
2.7207
2.7097
2.6981
2.3949
2.3844
2.3445
2.3338
2.2466
2.2105
2.1963
2.1601
1.5989
1.5375
1.2530
1.1289
1.1066
0.0685
-0.0026
F
O
OMe
O
N
Boc
Integral
1.0000
4.0564
1.0403
2.0627
0.0813
2.9345
1.0086
0.0293
1.0228
1.0568
1.0273
1.0710
9.4148
3.1564
0.1236
ppm
8
6
4
2
0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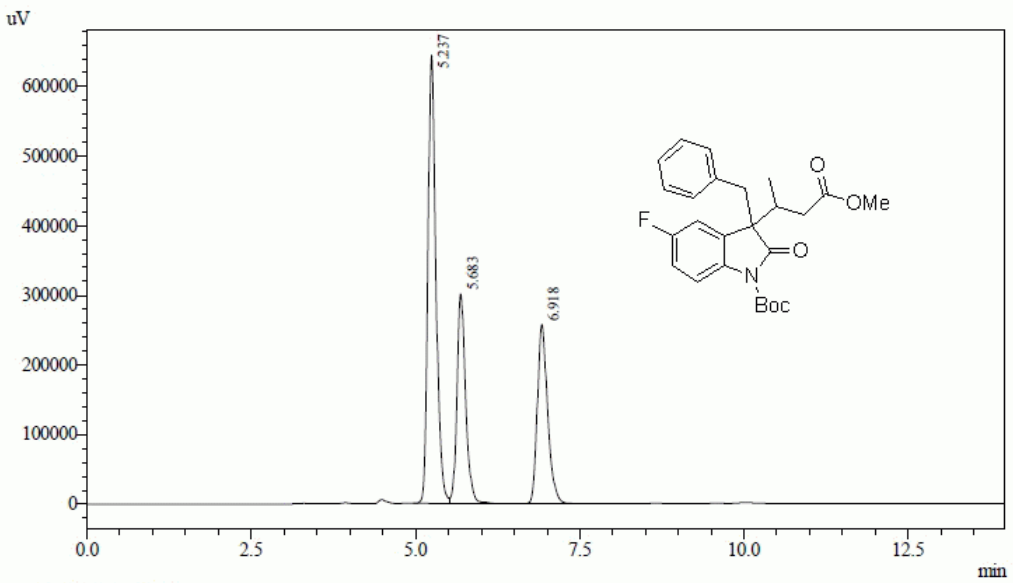
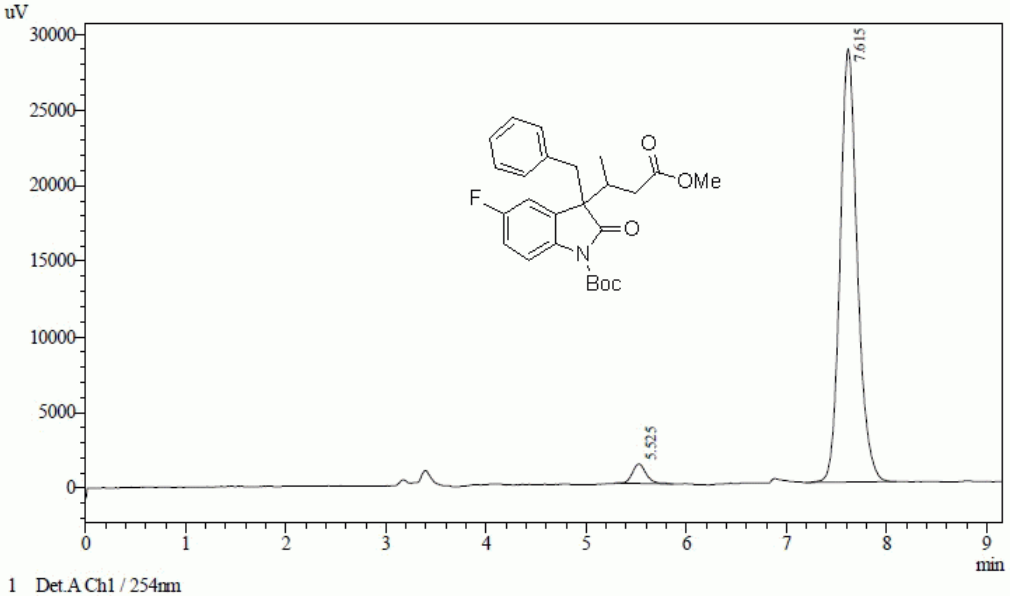
161.288
158.060
148.546
136.052
134.725
131.077
130.975
129.668
127.735
126.760
116.063
115.959
114.971
114.670
111.097
110.776
84.142
77.423
77.000
76.577
57.622
57.600
51.756
42.506
37.678
36.779
29.674
27.991
14.973
0.991
F
O
OMe
O
N
Boc
ppm
150
100
50
0



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

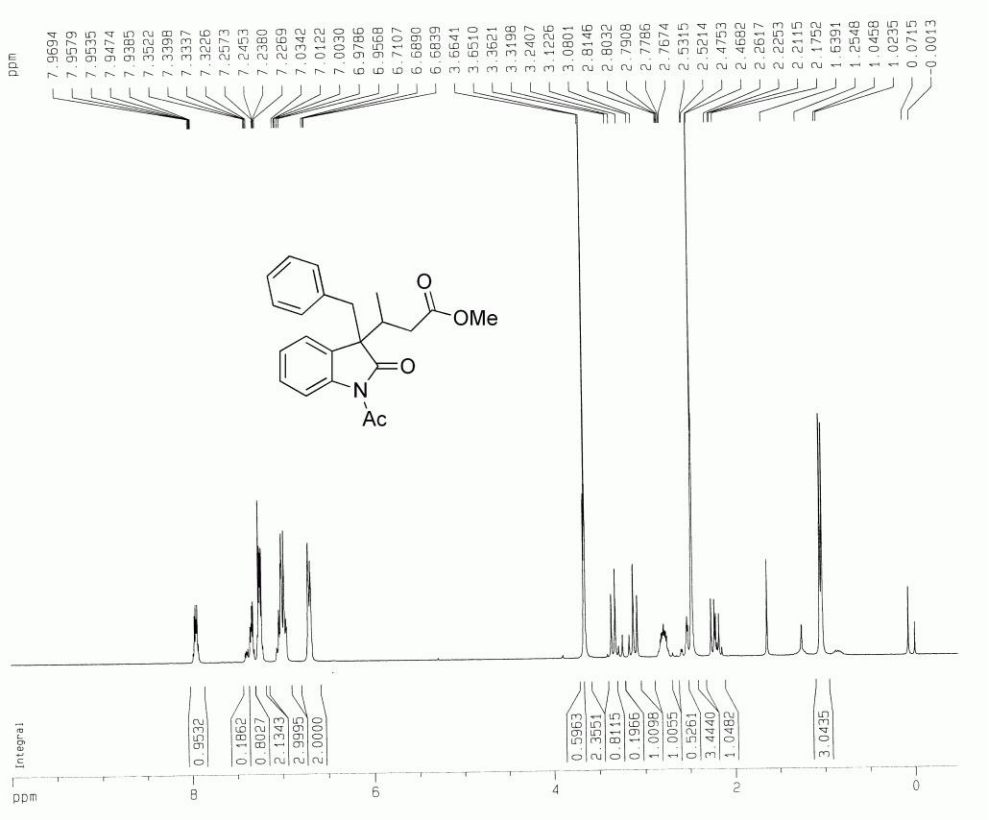
Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.237	5501003	644149	49.517	53.547
2	5.683	2771792	301254	24.950	25.043
3	6.918	2836523	257561	25.533	21.411
Total		11109317	1202965	100.000	100.000



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.525	12320	1288	3.462	4.305
2	7.615	343513	28637	96.538	95.695
Total		355834	29926	100.000	100.000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7.9385
7.3522
7.3398
7.3337
7.3226
7.2573
7.2453
7.2380
7.2269
7.0342
7.0122
7.0030
6.9786
6.9568
6.7107
6.6890
6.6839
3.6641
3.6510
3.3621
3.3198
3.2407
3.1226
3.0801
2.8146
2.8032
2.7908
2.7786
2.7674
2.5315
2.5214
2.4753
2.4682
2.2617
2.2253
2.2115
2.1752
1.6391
1.2548
1.0458
1.0235
0.0715
-0.0013
OMe
O
O
N
Ac
Integral
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0.1862
0.8027
2.1343
2.9995
2.0000
0.5963
2.3551
0.8115
0.1966
1.0098
1.0055
0.5261
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3.0435
ppm
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6
4
2
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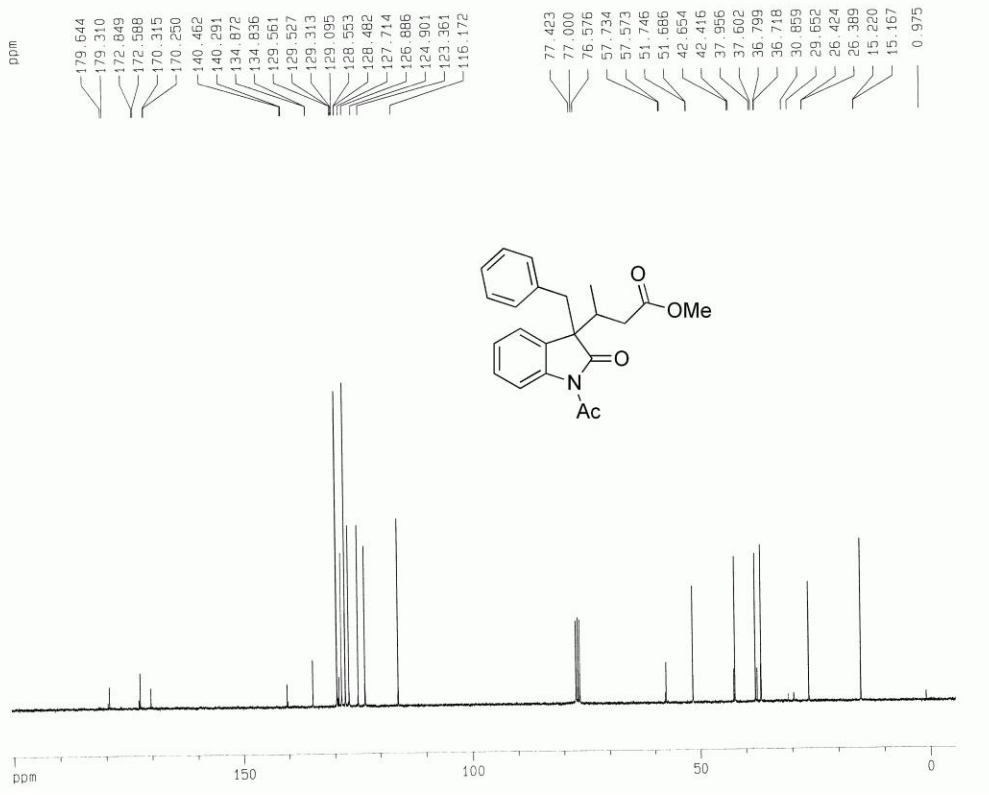
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172.588
170.315
170.250
140.462
140.291
134.872
134.836
129.561
129.527
129.313
129.095
128.553
128.482
127.714
126.886
124.901
123.361
116.172
77.423
77.000
76.576
57.734
57.573
51.746
51.686
42.654
42.416
37.956
37.602
36.799
36.718
30.859
29.652
26.424
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15.220
15.167
0.975
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O
N
Ac
ppm
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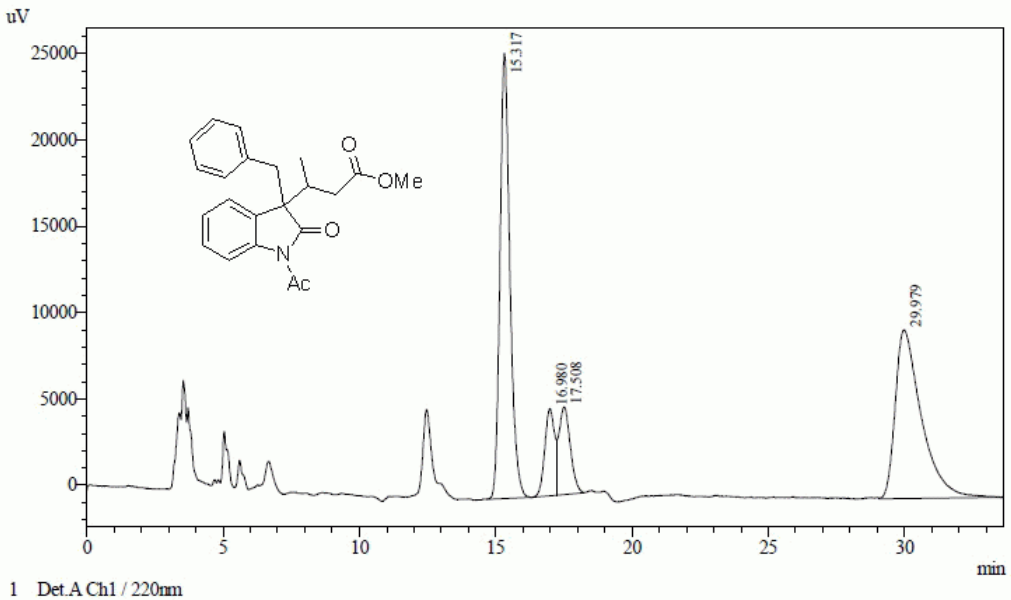
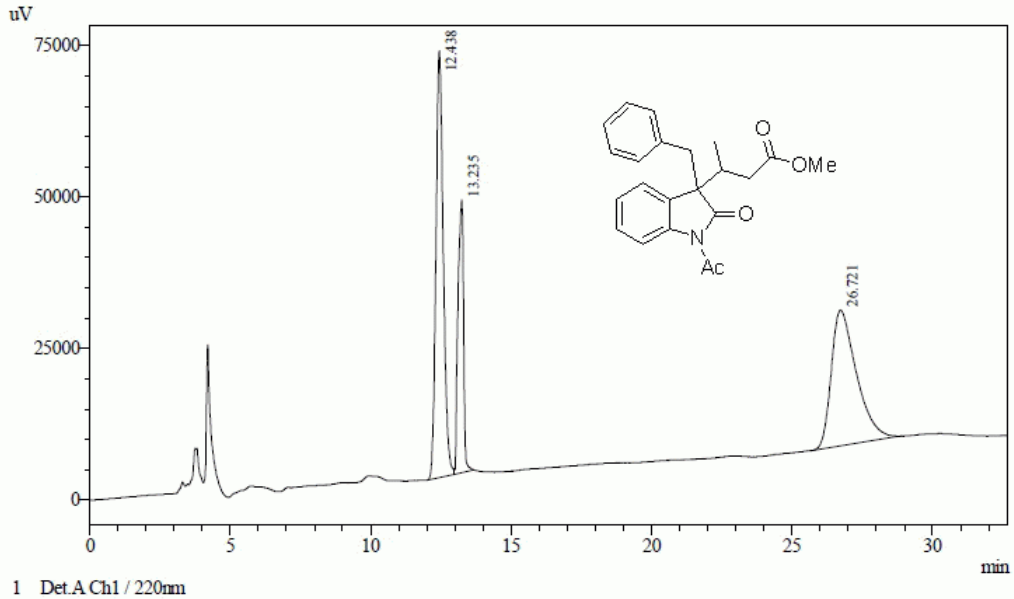
100
50
0



1 Det.A Ch1 / 220nm

Detector A Ch1 220nm

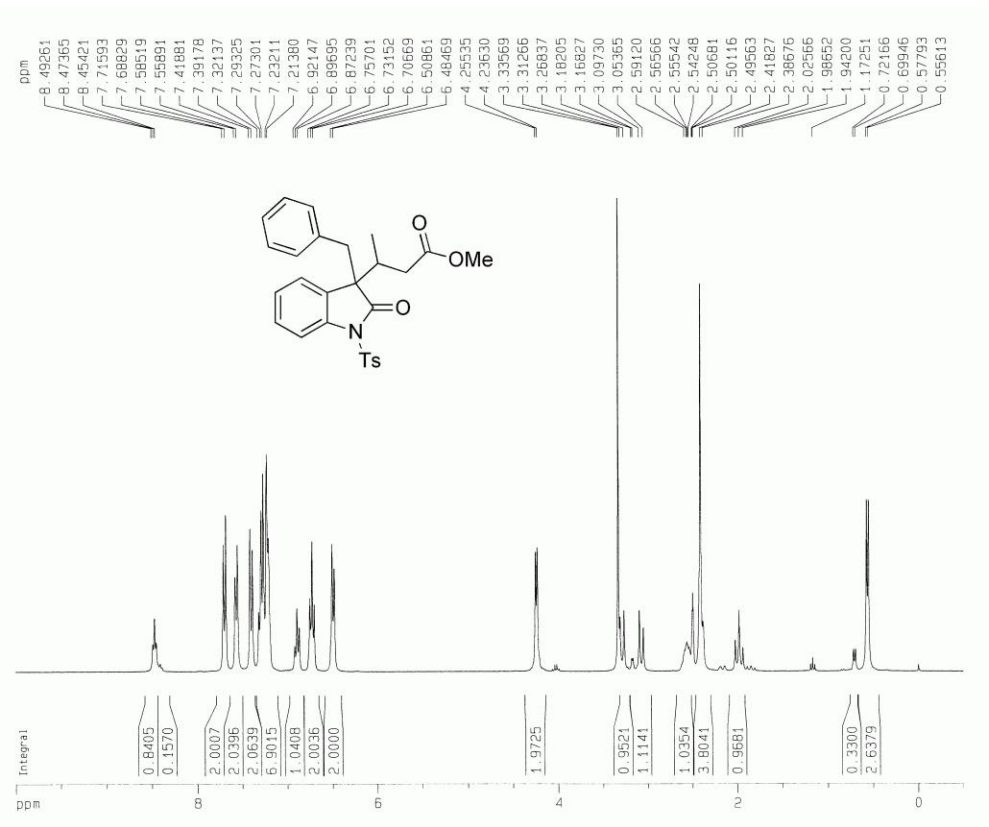
Peak#	Ret. Time	Area	Height	Area %	Height %
1	15.317	654943	25818	41.450	56.431
2	16.980	126939	5058	8.034	11.055
3	17.508	149789	5095	9.480	11.135
4	29.979	648396	9781	41.036	21.379
Total		1580068	45751	100.000	100.000



1 Det.A Ch1 / 220nm

Detector A Ch1 220nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	12.438	1283256	70399	38.971	51.103
2	13.235	618449	45001	18.782	32.666
3	26.721	1391116	22360	42.247	16.231
Total		3292821	137759	100.000	100.000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8.45421
7.71593
7.68829
7.58519
7.55891
7.41881
7.39178
7.32137
7.29325
7.27301
7.23211
7.21380
6.92147
6.89695
6.87239
6.75701
6.73152
6.70669
6.50861
6.48469
4.25535
4.23630
3.33569
3.31266
3.26837
3.18205
3.16827
3.09730
3.05365
2.59120
2.56566
2.55542
2.54248
2.50681
2.50116
2.49563
2.41827
2.38676
2.02566
1.98652
1.94200
1.17251
0.72166
0.69946
0.57793
0.55613
O
OMe
O
N
Ts
Integral
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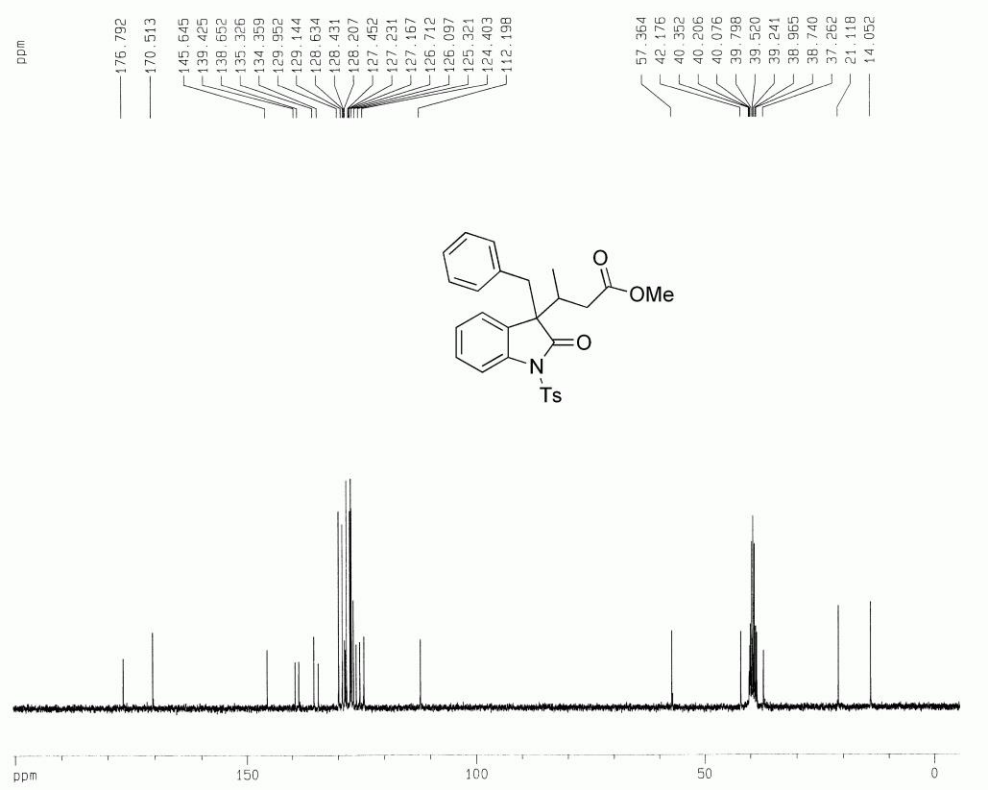
0.1570
2.0007
2.0396
2.0639
6.9015
1.0408
2.0036
2.0000
1.9725
0.9521
1.1141
1.0354
3.8041
0.9681
0.3300
2.6379
ppm
8
6
4
2
0


ppm
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129.952
129.144
128.634
128.431
128.207
127.452
127.231
127.167
126.712
126.097
125.321
124.403
112.198
57.364
42.176
40.352
40.206
40.076
39.798
39.520
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21.118
14.052
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O
N
Ts
ppm
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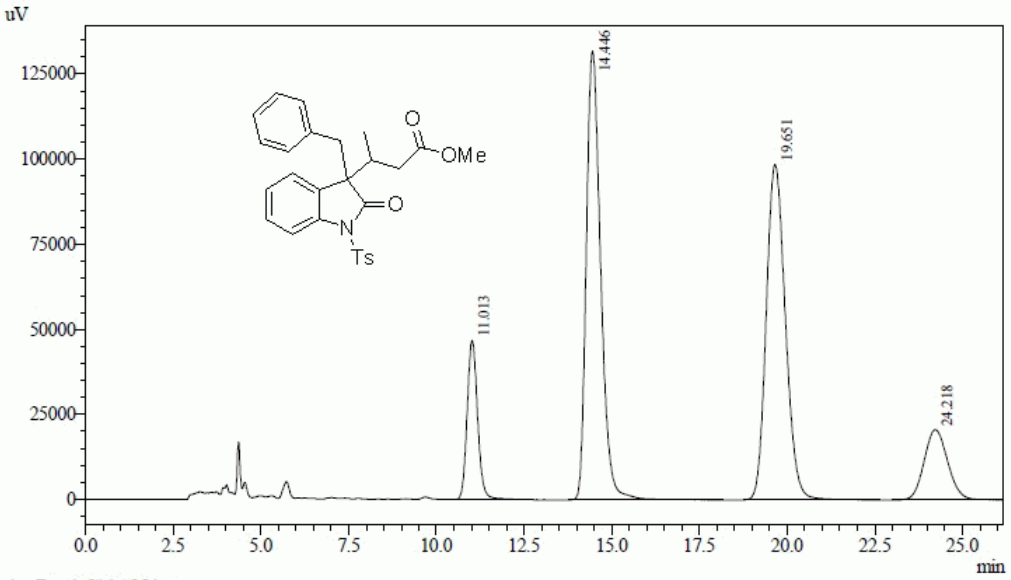
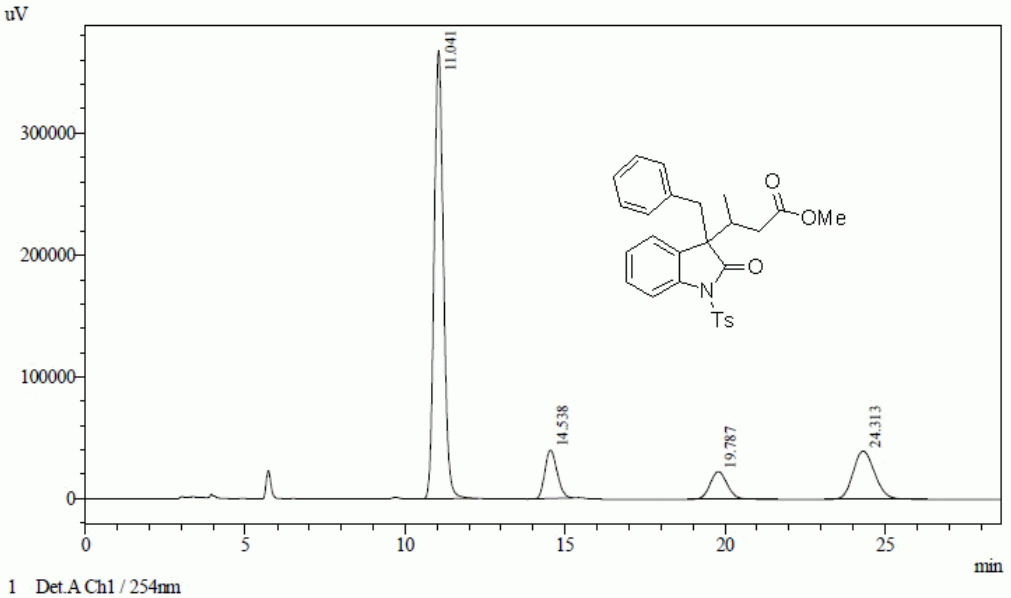
50
0



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

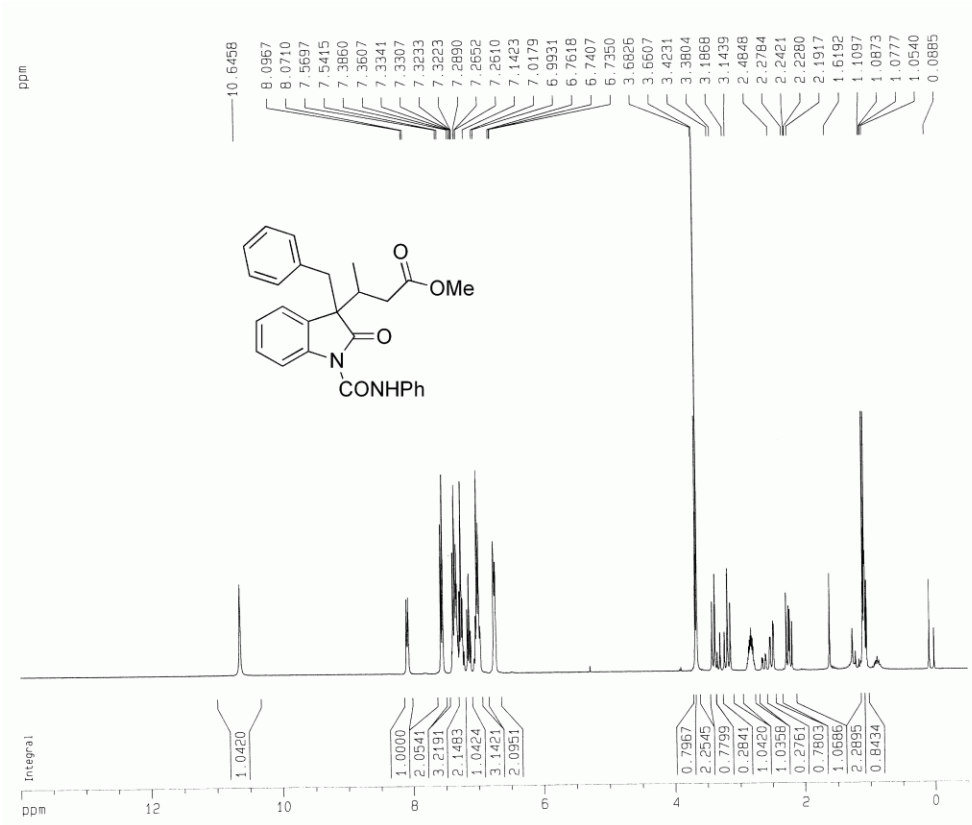
Peak#	Ret. Time	Area	Height	Area %	Height %
1	11.013	973739	46859	10.320	15.727
2	14.446	3753969	131941	39.785	44.283
3	19.651	3746086	98544	39.702	33.074
4	24.218	961779	20605	10.193	6.916
Total		9435573	297949	100.000	100.000



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	11.041	7441574	367868	66.365	78.286
2	14.538	1053325	39673	9.394	8.443
3	19.787	855481	22718	7.629	4.835
4	24.313	1862793	39645	16.613	8.437
Total		11213174	469904	100.000	100.000


ppm
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8.0967
8.0710
7.5697
7.5415
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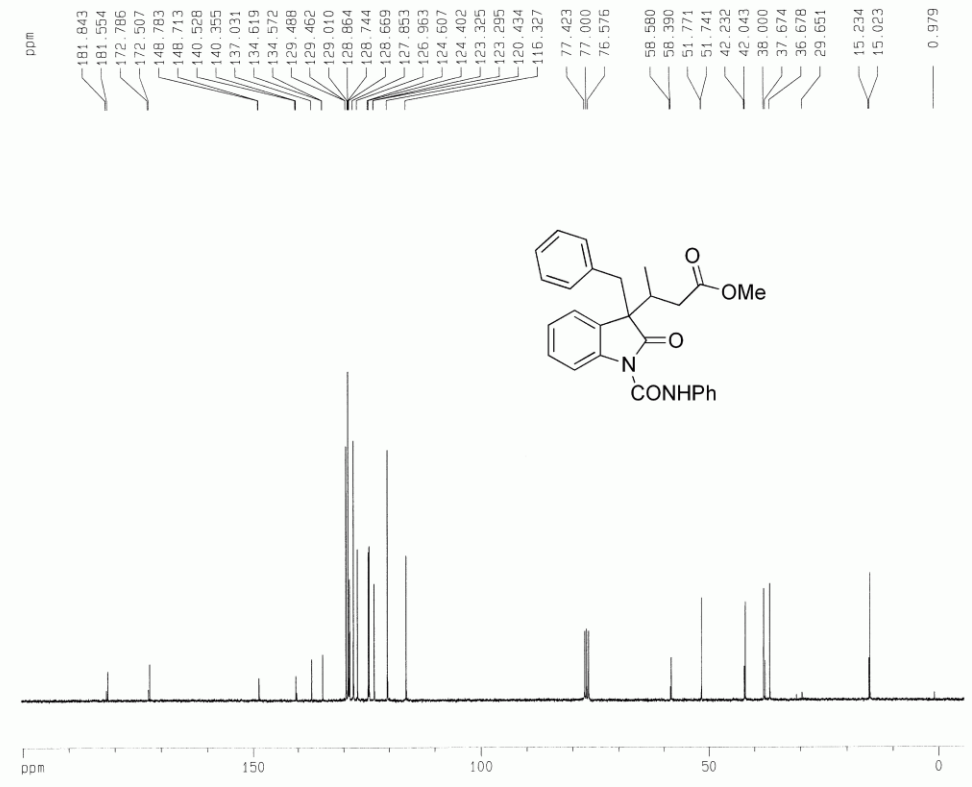
7.3607
7.3341
7.3307
7.3233
7.3223
7.2890
7.2652
7.2610
7.1423
7.0179
6.9931
6.7618
6.7407
6.7350
3.6826
3.6607
3.4231
3.3804
3.1868
3.1439
2.4848
2.2784
2.2421
2.2280
2.1917
1.6192
1.1097
1.0873
1.0777
1.0540
0.0885
O
OMe
O
N
CONHPh
Integral
1.0420
1.0000
2.0541
3.2191
2.1483
1.0424
3.1421
2.0951
0.7967
2.2545
0.7799
0.2841
1.0420
1.0358
0.2761
0.7603
1.0686
2.2895
0.8434
ppm
12
10
8
6
4
2
0


ppm
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172.786
172.507
148.783
148.713
140.528
140.355
137.031
134.619
134.572
129.488
129.462
129.010
128.864
128.744
128.669
127.853
126.963
124.607
124.402
123.325
123.295
120.434
116.327
77.423
77.000
76.576
58.580
58.390
51.771
51.741
42.232
42.043
38.000
37.674
36.678
29.651
15.234
15.023
0.979
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OMe
O
N
CONHPh
ppm
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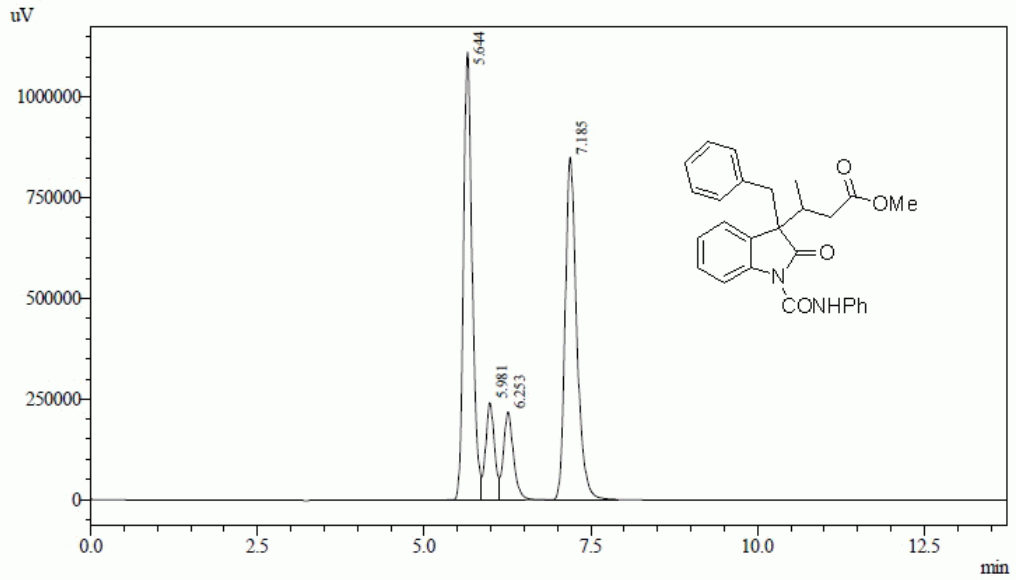
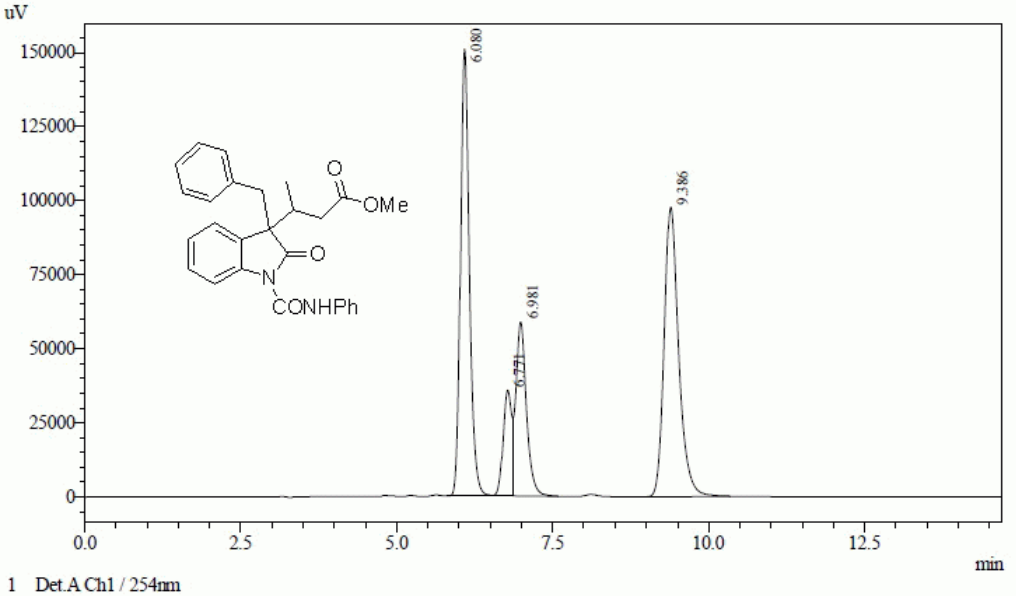
100
50
0



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.644	10137354	1113583	40.609	45.906
2	5.981	2254849	242353	9.033	9.991
3	6.253	2296518	218792	9.200	9.019
4	7.185	10274649	851060	41.159	35.084
Total		24963369	2425788	100.000	100.000



1 Det.A Ch1 / 254nm

Detector A Ch1 254nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.080	1484080	150881	36.248	43.970
2	6.771	338938	35819	8.278	10.438
3	6.981	704463	58781	17.206	17.130
4	9.386	1566813	97666	38.268	28.462
Total		4094293	343147	100.000	100.000