Supporting Information

Aluminum(III) Salen Complexes as Active Photoredox Catalysts

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General methods and materials

^{1}H-NMR spectra were recorded on Varian Mercury 400 spectrometer. Chemical shifts are reported in ppm from TMS with the solvent resonance as the internal standard ($CDCl_3$: δ = 7.27 ppm). Data are reported as follows: chemical shift, multiplicity (s = singlet, d = duplet, t = triplet, q = quartet, dd = double duplet, dt = double triplet, bs = broad signal, m = multiplet), coupling constants (Hz). ^{13}C-NMR spectra were recorded on Varian MR400 spectrometer. Chemical shifts are reported in ppm from TMS with the solvent as the internal standard ($CDCl_3$: δ = 77.0 ppm). GC-MS spectra were taken by EI ionization at 70 eV on a Hewlett-Packard 5971 with GC injection. LC-electrospray ionization mass spectra (ESI-MS) were obtained with Agilent Technologies MSD1100 single-quadrupole mass spectrometer. Enantiomeric excess was determined by using Agilent Technologies 1200 HPLC instrument equipped with a variable wave-length UV detector (reference 420 nm), using Daicel Chiralpak® columns (0.46 cm I.D. x 25 cm) and HPLC grade *i*-propanol and *n*-hexane as eluting solvents. Chromatographic purification was done with 240-400 mesh silica gel. All reactions were set up under an argon atmosphere in oven-dried glassware using standard Schlenk techniques.

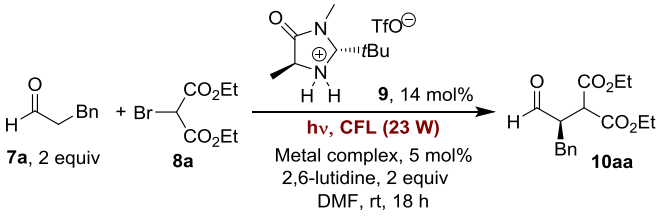
Anhydrous solvents were supplied by Aldrich in Sureseal® bottles and were used without further purification. All the reagents were purchased from Aldrich and used without further purification unless specified.

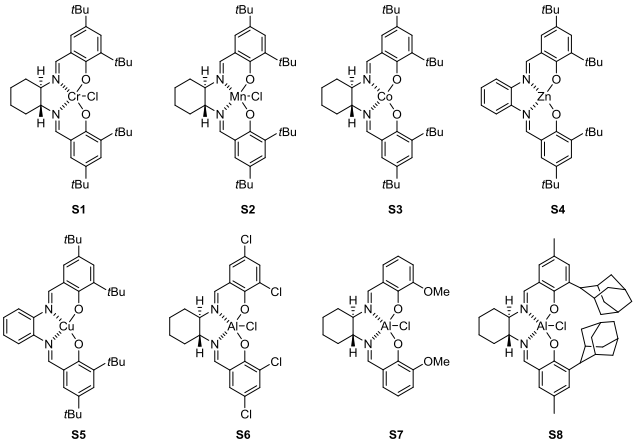
Compounds **1**, **2**, **S1**, **S2**, **S3**: commercially available

Compounds **3**,[1] **4**,[2] **5**,[2] **6**,[3] **7d**,[4] **7e**,[5] **8d,e**,[6] (2*R*,5*S*)-2-*t*-butyl-3,5-dimethylimidazolin-4-one monohydrochloride,[7] **S4**,[8] **S5**,[9] **S6**,[10] **S7**,[11] and **S8**[12] were prepared according to reported procedures.

Screening experiments

Table S1. Screening of Salen and Salophen complexes in photocatalytic stereoselective alkylation of aldehyde **7a** with **8a**.

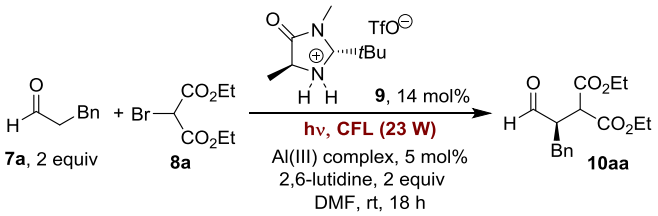




Entry[a]	Metal complex	Conversion (%)[b]	ee (%)[c]
1	**1**	37	--
2	**2**	99 (83)[d]	89
3	**3**	64	88
4	**4**	50	89
5	**5**	68	89
6	**6**	72	88
7	-	12	--
8	**S1**	0	
9	**S2**	0	
10	**S3**	0	
11	**S4**	25	89
12	**S5**	0	
13	**S6**	61	89
14	**S7**	37	88
15	**S8**	50	89

[a] Reaction was performed on 0.2 mmol of **8a** in DMF (1 mL). [b] Conversion determined by ^{1}H NMR analysis of reaction crude using internal standard method. [c] Enantiomeric excesses were determined by HPLC on chiral stationary phase. [d] Yield determined after chromatographic purification.

Table S2. Screening of Salen and Salophen complexes in photocatalytic stereoselective alkylation of aldehyde **7a** with **8a**.



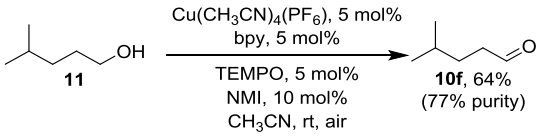
Entry[a]	Al(III) complex	Al(III) complex (mol%)	**9** (mol%)	Conversion (%)[b]	ee (%)[c]
1	**2**	5	14	99 (83)[d]	89
2	**2**	5	28	99 (80)[d]	89
3	**2**	3.5	14	95 (76)[d]	89
4	*ent*-**2**	5	14	96 (80)[d]	89
5	**2**	5	20[e]	89 (72)[d]	0
6	**3**	5	14	86	88
7	**3**	3.5	14	64	88
8	**5**	5	14	68	89
9	**5**	3.5	14	54	88

[a] Reaction was performed on 0.2 mmol of **8a** in DMF (1 mL). [b] Conversion determined by ^{1}H NMR analysis of reaction crude using internal standard method. [c] Enantiomeric excesses were determined by HPLC on chiral stationary phase. [d] Yield determined after chromatographic purification. [e] Reaction performed using morpholine as organocatalyst.

Synthesis of catalyst 9

MacMillan catalyst (2*R*,5*S*)-2-*t*-butyl-3,5-dimethylimidazolin-4-one monohydrochloride[7] (321 mg, 1.30 mmol) was dissolved in $NaHCO_3$ aq. sat. solution (4 mL) inside a separator funnel and the aqueous layer was extracted with $CHCl_3$ (5 x 5 mL). The collected organic layers were dried over Na_2SO_4, filtered and concentrated under reduced pressure. The resulting oil was dissolved in dry Et_2O (5 mL) and cooled to 0°C. Triflic acid (1.9 mmol, 167 µL) was added dropwise under stirring and a white solid precipitated. After 10 min the solution was filtered on a Gooch septum and the solid was washed with Et_2O (2.5 mL) and pentane (10 mL), recovered and dried under vacuum to furnish **9** (358 mg, 1.12 mmol, 86% yield) as white solid.

Synthesis of aldehyde 11



The reaction was performed follow the procedure reported in literature.[13] To a solution of alcohol **11** (1.83 mL, 14.7 mmol) in anhydrous acetonitrile (15 mL), copper salt (0.05 equiv., 274 mg, 0.73 mmol), 2,2'-bipyridine (0.05 equiv., 115 mg, 0.73 mmol), TEMPO (0.05 equiv., 115 mg, 0.73 mmol) and *N*-methylimidazole (0.1 equiv., 117 µL, 1.47 mmol) were added under N_2 atmosphere. The reaction was stirred under O_2 atmosphere for 22 h and HCl (1M, 5 mL) was added. The mixture was extracted with *n*-hexane (3 x 15 mL). The collected organic phases were washed with brine (15 mL) and dried over Na_2SO_4

anhydrous. The solvent was evaporated at atmospheric pressure under gently stirring and heating. The product was obtained as liquid in 64% yield and with 77% of purity (in mixture with hexane). The product was used in the next step without further purification.

^{1}H-NMR (400 MHz, $CDCl_3$, 25°C): δ = 9.76 (t, *J* = 1.9 Hz, 1H), 2.54 – 2.19 (m, 2H), 1.63 – 1.46 (m, 3H), 0.90 (d, *J* = 6.5 Hz, 6H); ^{13}C-NMR (100 MHz, $CDCl_3$, 25°C): δ = 202.8, 41.9, 31.5, 27.5, 22.1 (2C).

General procedure for enantioselective photoalkylation of aldehydes

In a Schlenk tube with rotaflo stopcock under argon atmosphere at r.t., **2** (0.05 equiv., 6 mg, 0.01 mmol) and the MacMillan catalyst **9** (0.14 equiv., 9 mg, 0.028 mmol) were dissolved in 1 mL DMF. Aldehydes **7a-e** (2 equiv, 0.4 mmol), bromo derivatives **8a-e** (1 equiv, 0.2 mmol) and 2,6-lutidine (2 equiv., 48 µL, 0.4 mmol) were then added.

The reaction mixture was carefully degassed via freeze-pump thaw (three times), and the vessel refilled with argon. The Schlelk tube was stirred and irradiated with a 23 W CFL bulb positioned approximately at 10 cm distance from the reaction vessel. After 18 h of irradiation, aq. HCl 1M (2 mL) was added and the mixture was extracted with AcOEt (4 x 5 mL). The collected organic layers were dried over Na_2SO_4, filtered and concentrated under reduced pressure.

Products were purified by column flash chromatography on SiO_2.

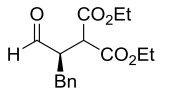
Racemic compounds were synthesized according to general procedure using morpholine (20 mol%) instead of **9**.

General procedure for determination of enantiomeric excesses of compounds 6-9.

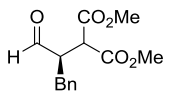
Products **10ba, 10ea** and **10fa** were transformed in their corresponding diastereomeric acetals according to the literature protocol[14] in order to determine their enantiomeric excess.

To a solution of aldehyde (0.05 mmol) in DCM (1.0 mL), (2*R*,4*R*)-(-)- (for **10fa**) and (2*S*,4*S*)-(+)-pentanediol (for **10ba** and **10ea**) (>99% ee, 12.5 mg, 0.12mmol) and *p*-toluenesulfonic acid monohydrate (1.9 mg, 0.01 mmol) were added. The solution was stirred at rt until complete conversion was observed by TLC analysis. The mixture was concentrated under reduced pressure. Enantiomeric excesses were calculated from diastereomeric ratios of the resulting acetals, determined either by ^{1}H NMR analysis.

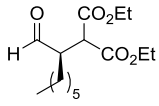
Characterization data of compounds 10aa-110ae



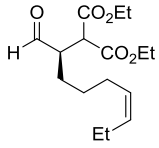
10aa: the title compound was isolated by flash column chromatography (SiO_2, cyclohexane/EtOAc 95/5) as colourless oil (49 mg, 0.17 mmol, 83% yield, 89% ee before column separation and 83% ee after column purification). ee was determined by chiral HPLC analysis using Daicel Chiralpak®IC column: hexane/*i*-PrOH 90:10, flow rate 1.00 mL/min, 30°C, λ = 210 nm: τ_{major} = 18.9 min., τ_{minor} = 14.7 min.; ^{1}H NMR and ^{13}C NMR were according to those reported in literature.[14]



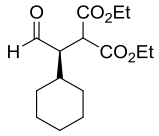
10ab: The title compound was isolated by flash column chromatography (SiO_2, cyclohexane/EtOAc 95/5)as colourless oil (45 mg, 0.17 mmol, 85% yield, 89% ee before column separation and 79% ee after column purification). ee was determined by chiral HPLC analysis using Daicel Chiralpak®IC column: hexane/*i*-PrOH 90:10, flow rate 1.00 mL/min, 30°C, λ = 210 nm: τ_{major}= 23.56 min., τ_{minor} = 18.69 min.; ^{1}H NMR and ^{13}C NMR were according to those reported in literature.[15]



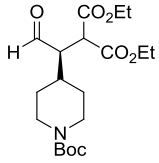
10ba: The title compound was isolated by flash column chromatography(SiO2, cyclohexane/EtOAc 95/5) as colourless oil (41.4 mg, 0.1447 mmol, 72% yield, 89% ee). Ee was determined after derivatization of 29 mg of the title compound to its corresponding diastereomeric acetal following general procedure. Ee was determined by integration of the two ^{1}H NMR (400 MHz, $CDCl_3$, 25°C) signals at 3.62 ppm (major, doublet) and 3.68 ppm (minor, doublet) corresponding to the two diastereomeric acetals.^{1}H NMR and ^{13}C NMR were according to those reported in literature.[14]



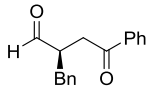
10ca: The title compound was isolated by flash column chromatography (SiO_2, cyclohexane/EtOAc 95/5) as colourless oil (42 mg, 0.15 mmol, 72% yield, 89% ee). ee was determined by chiral HPLC analysis using Daicel Chiralpak®IC column: hexane/*i*-PrOH 90:10, flow rate 1.00 mL/min, 30°C, λ = 210 nm: τ_{major}= 11.78 min., τ_{minor} = 13.03 min.; ^{1}H NMR and ^{13}C NMR were according to those reported in literature.[14]



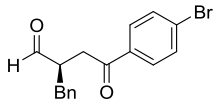
10da: The title compound was isolated by flash column chromatography (SiO_2, cyclohexane/EtOAc from 98/2 to 90/10) as colourless oil (29 mg, 0.102 mmol, 50% yield, 91% ee after column purification). ee was determined by chiral HPLC analysis using Daicel Chiralpak®IA column: hexane/*i*-PrOH 97:3, flow rate 1.00 mL/min, 30°C, λ = 210 nm: τ_{major} = 8.304 min., τ_{minor} = 9.938 min.. ^{1}H NMR and ^{13}C NMR were according to those reported in literature.[14]



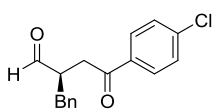
10ea: The title compound was isolated by flash column chromatography (SiO_2, cyclohexane/EtOAc, 8/2) as colourless oil (35 mg, 0.09 mmol, 45% yield, 88% ee before column separation and 83% after column purification). ee was determined after derivatization of 19 mg of the title compound to its corresponding diastereomeric acetal following general procedure. Ee was determined by integration of the two ^{1}H NMR (400 MHz, $CDCl_3$, 25°C) signals at 5.10 ppm (*major*, doublet) and 5.05 ppm (*minor*, doublet) corresponding to the two diastereomeric acetals.^{1}H NMR was according to those reported in literature.[14]



10ac: The title compound was isolated by flash column chromatography(SiO_2, cyclohexane/EtOAc 97/3) as a colourless oil (20 mg, 0.08 mmol, 40% yield, 93% ee before column purification). Ee was determined by chiral HPLC analysis using Daicel Chiralpak®IC column, hexane/*i*-PrOH 90:10, flow rate 1.00 mL/min, 30°C, λ = 210 nm: τ_{major}= 17.8 min., τ_{minor} = 14.9 min.; ^{1}H NMR and ^{13}C NMR were according to those reported in literature.[15]

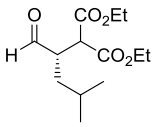


10ad: The title compound was isolated by flash column chromatography (SiO_2, cyclohexane/EtOAC 95/5) as a white solid (0.112 mmol, 56% yield, 92% ee before column, 83% ee after column purification). Ee was determined by chiral HPLC analysis using Daicel Chiralpak®IC column, hexane/*i*-PrOH 90:10, flow rate 1.00 mL/min, 30°C, λ = 210 nm: τ_{major}= 14.7 min., τ_{minor} = 13.7 min.; ^{1}H-NMR (400 MHz, $CDCl_3$, 25°C): δ = 9.87 (s, 1H), 7.74 (d, *J* = 8.1 Hz, 2H), 7.58 – 7.52 (m, 2H), 7.29 (t, *J* = 7.5 Hz, 2H), 7.25 – 7.20 (m, 1H), 7.17 (d, *J* = 7.4 Hz, 2H), 3.42 – 3.31 (m, 2H), 3.15 (dd, *J* = 13.9, 5.9 Hz, 1H), 2.97 – 2.89 (m, 1H), 2.80 (dd, *J* = 13.9, 8.1 Hz, 1H); ^{13}C-NMR (100 MHz, $CDCl_3$, 25°C): δ = 202.7, 196.8, 137.9, 135.1, 131.9 (2C), 129.5 (2C), 129.0 (2C), 128.8 (2C), 128.5, 126.8, 48.4, 37.0, 34.6; $[\alpha]_D$ (c = 0.2, CH_2Cl_2): + 14.3.



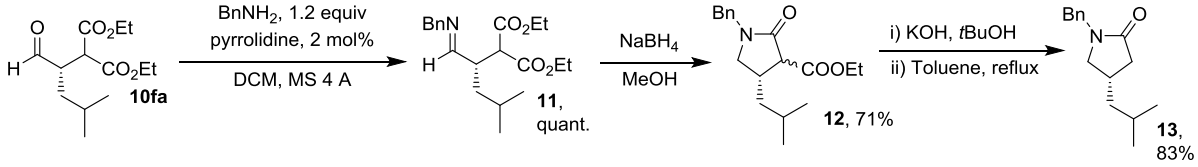
10ae: The title compound was isolated by flash column chromatography(SiO_2, cyclohexane/EtOAc 97/3) as a yellowish oil (37 mg, 0.13 mmol, 64% yield, 92% ee). Ee was determined by chiral HPLC analysis using Daicel Chiralpak®IC column, hexane/*i*-PrOH 95:5, flow rate 1.00 mL/min, 30°C, λ = 214

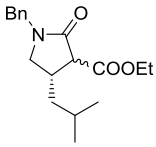
nm: τ_{major}= 19.9 min., τ_{minor} = 18.2 min.; ^{1}H NMR and ^{13}C NMR were according to those reported in literature.[15]



10fa: The title compound was isolated by flash column chromatography(SiO2, cyclohexane/EtOAc 95/5) as colourless oil (44 mg, 0.17 mmol, 86% yield, 94% ee). Ee was determined after derivatization of 19 mg of the title compound to its corresponding diastereomeric acetal following general procedure. Ee was determined by integration of the two ^{1}H NMR (400 MHz, $CDCl_3$, 25°C) signals at 3.45 ppm (major, doublet) and 3.53 ppm (minor, doublet) corresponding to the two diastereomeric acetals; ^{1}H-NMR (400 MHz, $CDCl_3$, 25°C): δ = 9.78 (s, 1H), 4.27 – 4.14 (m, 4H), 3.69 (d, *J* = 7.9 Hz, 1H), 3.09 (q, *J* = 7.8 Hz, 1H), 1.67 (ddd, *J* = 14.1, 9.9, 5.9 Hz, 2H), 1.30 – 1.21 (m, 7H), 0.94 (d, *J* = 6.2 Hz, 3H), 0.91 (d, *J* = 6.2 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$, 25°C): δ = 201.8, 168.0, 167.9, 61.9, 61.8, 52.7, 48.3, 36.5, 22.1, 14.2, 14.1, 14.0 (2C); $[\alpha]_D$ (c = 0.2, CH_2Cl_2): - 48.5.

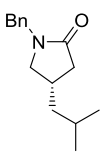
Synthesis of compound 13





12: To a solution of crude aldehyde **10fa** (103 mg, 0.4 mmol) from photochemical alkylation reaction in dry dichloromethane (3 mL), benzylamine (1.2 equiv., 52 µL, 0.48 mmol), pyrrolidine (0.02 equiv., 0.08 mmol, 1 µL approx.) and 4 Å molecular sieves (50 mg) were added.[16] After completing disappear of aldehyde (by ^{1}H-NMR analysis), anhydrous methanol (5 mL) and $NaBH_4$ (2 equiv., 30 mg, 0.4 mmol) were added at 0°C. The reaction mixture was stirred at room temperature for 3 hours. After that AcOEt (15 mL) and water (10 mL) were added and the two layers were separated. Water phase was extracted with AcOEt (2 x 15 mL) and the combined organic layers were washed with brine (10 mL), dried over Na_2SO_4, and the solvent was removed under reduced pressure. The residue was purified by flash column chromatography (SiO_2, cyclohexane to cyclohexane/ethyl acetate, 8/2) to afford **12** (71%, 86 mg, 0.28 mmol) as mixture of diastereoisomers (90:10 by ^{1}H-NMR).

^{1}H-NMR (400 MHz, $CDCl_3$, 25°C) major diastereoisomer: δ = 7.36 – 7.26 (m, 3H), 7.24 – 7.19 (m, 2H), 4.44 (s, 2H), 4.24 (q, *J* = 7.2, 6.8 Hz, 2H), 3.40 (dd, *J* = 9.0, 7.9 Hz, 1H), 3.13 (d, *J* = 7.9 Hz, 1H), 2.87 – 2.71 (m, 2H), 1.54 – 1.42 (m, 1H), 1.42 – 1.33 (m, 1H), 1.30 (t, *J* = 7.2 Hz, 3H), 1.27 – 1.19 (m, 1H), 0.86 (d, *J* = 6.6 Hz, 3H), 0.84 (d, *J* = 6.6 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$, 25°C) major diastereoisomer: δ = 170.2, 169.8, 135.9, 128.7 (2C), 128.1 (2C), 127.7, 61.5, 55.5, 51.1, 46.9, 43.3, 34.4, 25.8, 22.5, 22.4, 14.1.; GC-MS: rt 18.64; *m/z* = 303 ($M^{+\cdot}$, 018), 246 ([M-*i*-Bu]$^{+\cdot}$, 38), 200 (30), 172 (26) 91 (100); ESI-MS *m/z*: 304.3 $[M+H]^+$.



13: To a solution of compound **12** (80 mg, 0.26 mmol) in *t*-BuOH (2 mL), KOH (1 M in water, 1 mL) was slowly added. The reaction mixture was vigorous stirred for 24 hours and the solvent was evaporated. Water (5 mL) was added and the mixture was extracted with diethyl ether (5 mL). Aqueous phase was washed with diethyl ether (5 mL). HCl 1M was slowly added to aqueous phase until pH = 1 and the mixture was extracted with dichloromethane (3 x 15 mL). The combined organic layers were washed with brine (10 mL), dried over Na_2SO_4, and the solvent was removed under reduced pressure.

Crude acid was dissolvent in toluene (5 mL) and refluxed for 10 hours. The solvent was evaporated, and the residue was purified by flash column chromatography (SiO_2, cyclohexane to cyclohexane/ethyl acetate, 9/1) to afford **13** (83%, 49 mg, 0.21 mmol)

^{1}H-NMR (400 MHz, $CDCl_3$, 25°C): δ = 7.34 – 7.25 (m, 3H), 7.23 – 7.18 (m, 2H), 4.45 (d, *J* = 14.7 Hz, 1H), 4.39 (d, *J* = 14.7 Hz, 1H), 3.32 (t, *J* = 9.3, 8.1 Hz, 1H), 2.85 (dd, *J* = 9.5, 6.9 Hz, 1H), 2.56 (dd, *J* = 16.4, 9.9 Hz, 1H), 2.45 – 2.29 (m, 1H), 2.10 (dd, *J* = 16.4, 8.0 Hz, 1H), 1.56 - 1.45 (m, 1H), 1.36 – 1.19 (m, 2H), 0.85 (d, *J* = 6.3 Hz, 3H). 0.84 (d, *J* = 6.3 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$, 25°C): δ = 174.8, 136.5, 128.7 (2C), 128.1 (2C), 127.5, 77.3, 76.7, 52.7, 46.6, 44.0, 38.0, 29.8, 26.1, 22.6, 22.5; ESI-MS *m/z*: 232.1 $[M+H]^+$, 463.1 $[2M+H]^+$; $[\alpha]_D$ (c = 0.2, CH_2Cl_2): + 3.6.

Photochemical investigations

Figure S1. Emission profile of the 23W Compact Fluorescent lamp used to irradiate the solutions.

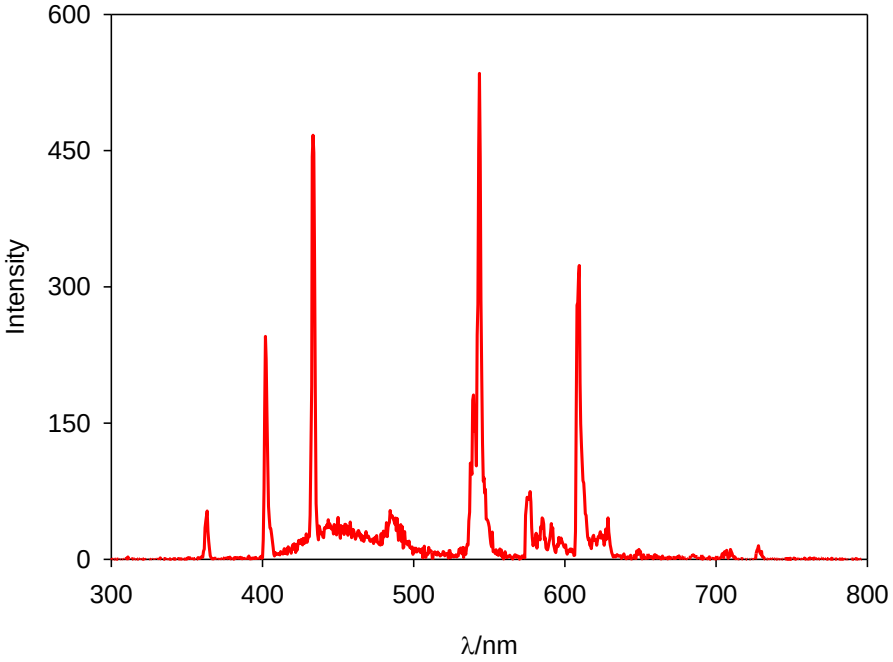


Figure S2. Reaction mixture in DMF, contains [Al(Salen)Cl] **2** 1.2×10^{-3} M, 2,6-lutidine 0.4 M, diethyl bromomalonate **8a** 0.2 M, 3-phenylpropanal **7a** 0.4 M and imidazolidinone catalyst **9** 0.04 M, irradiated for 0 min (light blue solid line), 30 min, 60 min, 120 min, 240 min and 360 min (black solid line); transmittance spectrum cut-of filter used during the irradiation (orange dotted line) Optical pathlength 0.1 cm.

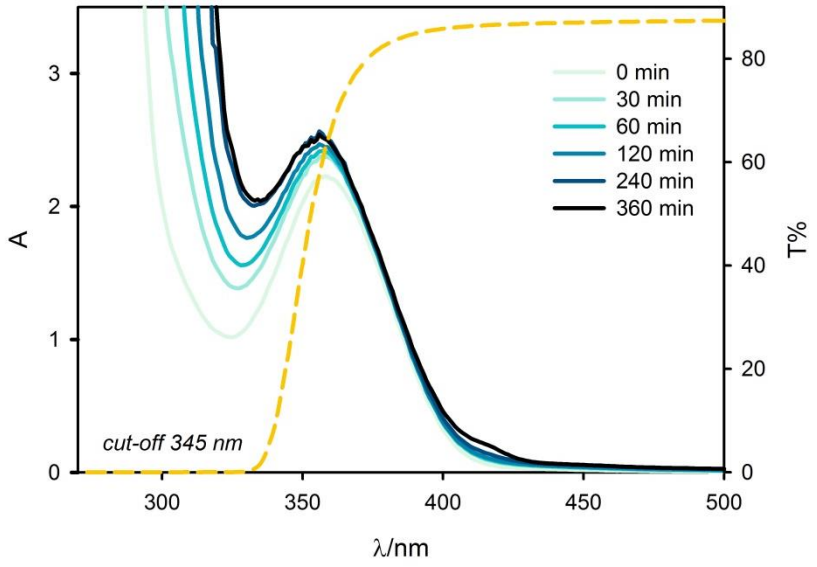
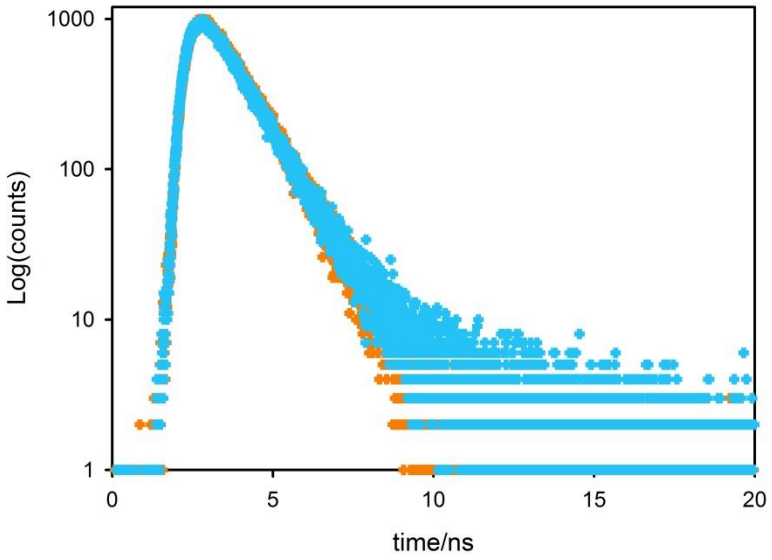


Figure S3. Emission intensity decays of [Al(Salen)Cl] **2** in DMF solution in presence of 2,6-lutidine 0.4 M, diethyl bromomalonate **8a** 0.2 M, 3-phenylpropanal **7a** 0.4 M and imidazolidinone catalyst **9** 0.04 M, before (blue dots) and after 6h of irradiation (orange dots) upon excitation at 340 nm.



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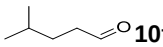
Copies of NMR spectra



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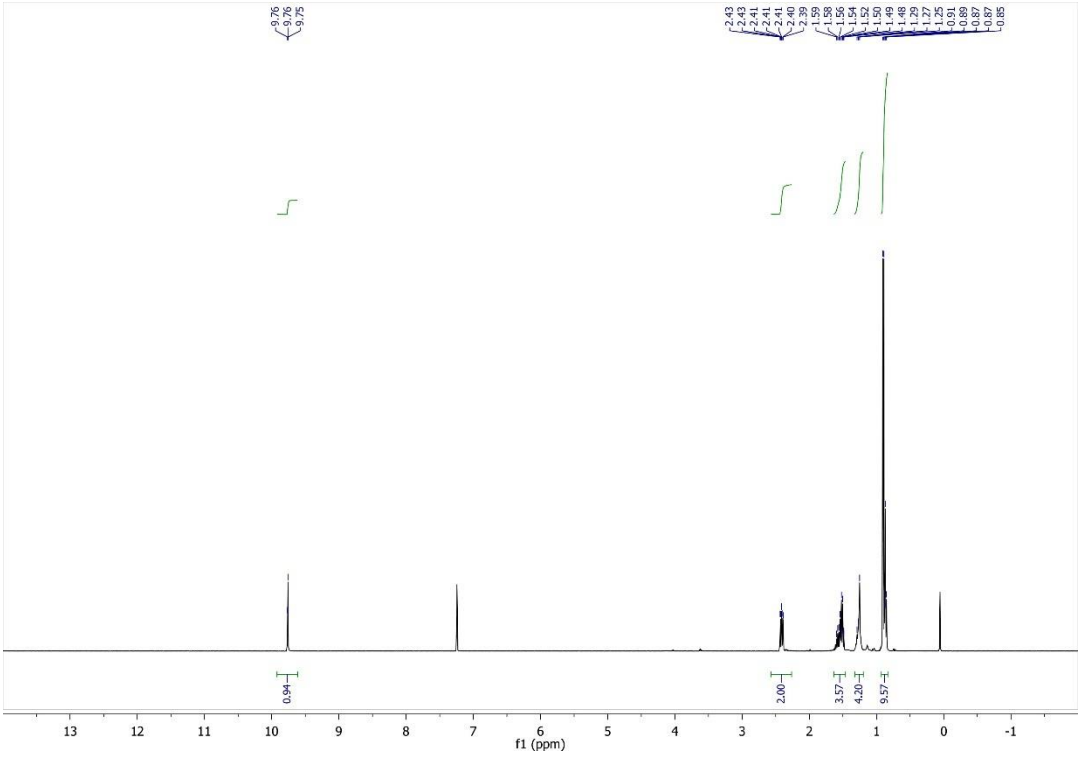

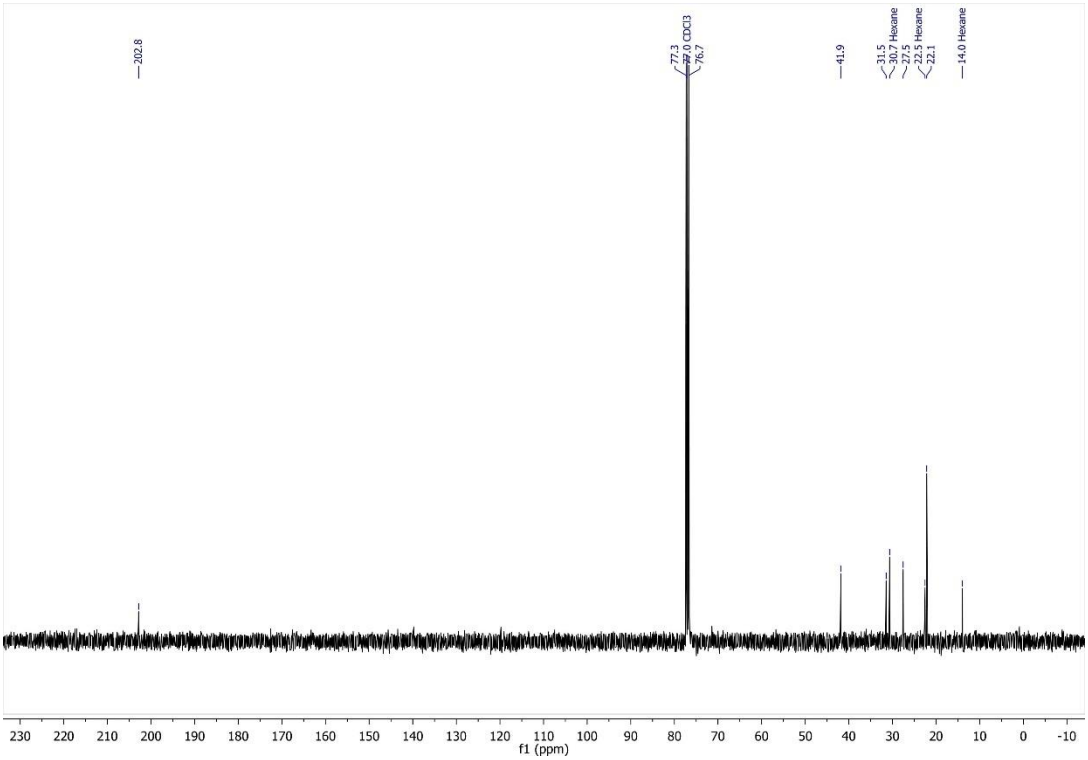

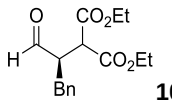
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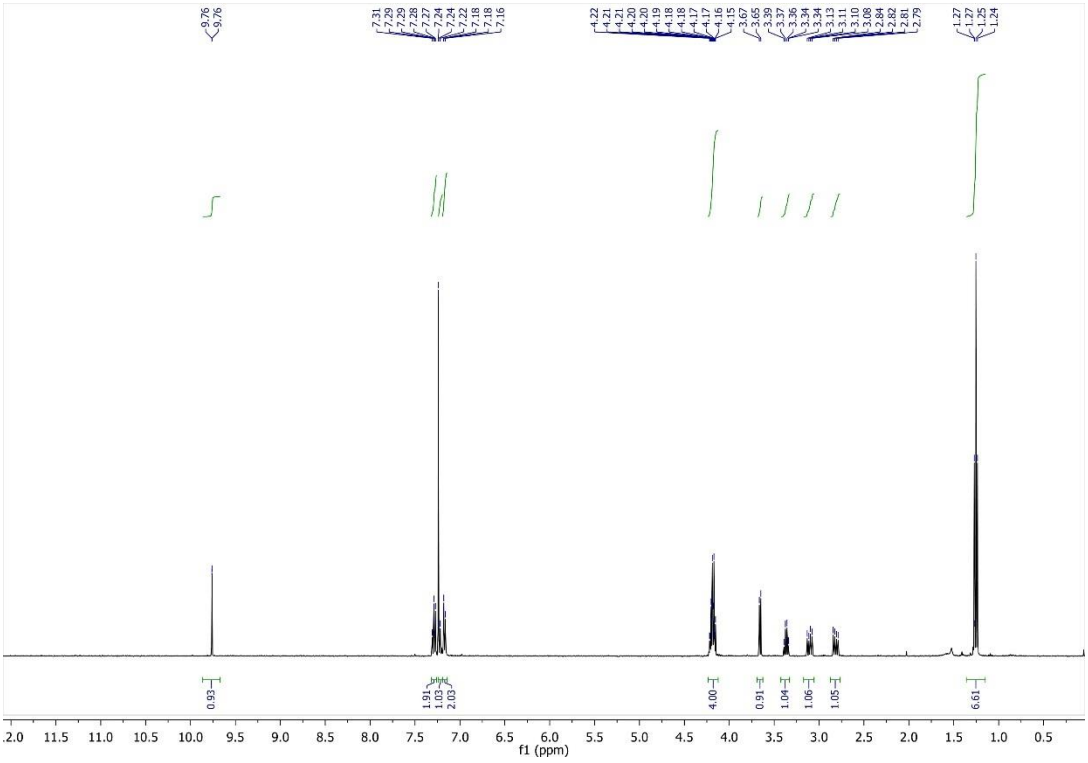
H
CO2Et
Bn

10aa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7.16
4.22
4.21
4.21
4.20
4.20
4.19
4.18
4.18
4.17
4.17
4.16
4.15
3.67
3.65
3.39
3.37
3.36
3.34
3.34
3.13
3.11
3.10
3.08
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2.82
2.81
2.79
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1.27
1.25
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0.91
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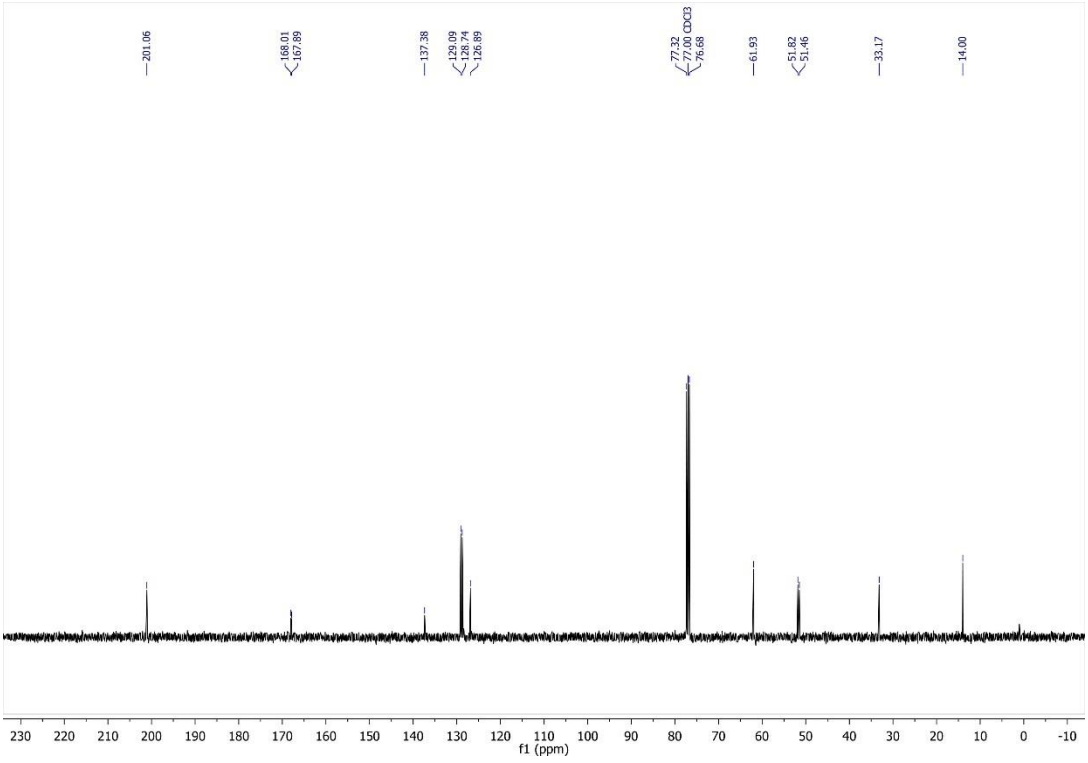
1.05
6.61
f1 (ppm)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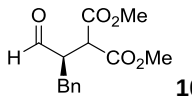
33.17
14.00
f1 (ppm)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H
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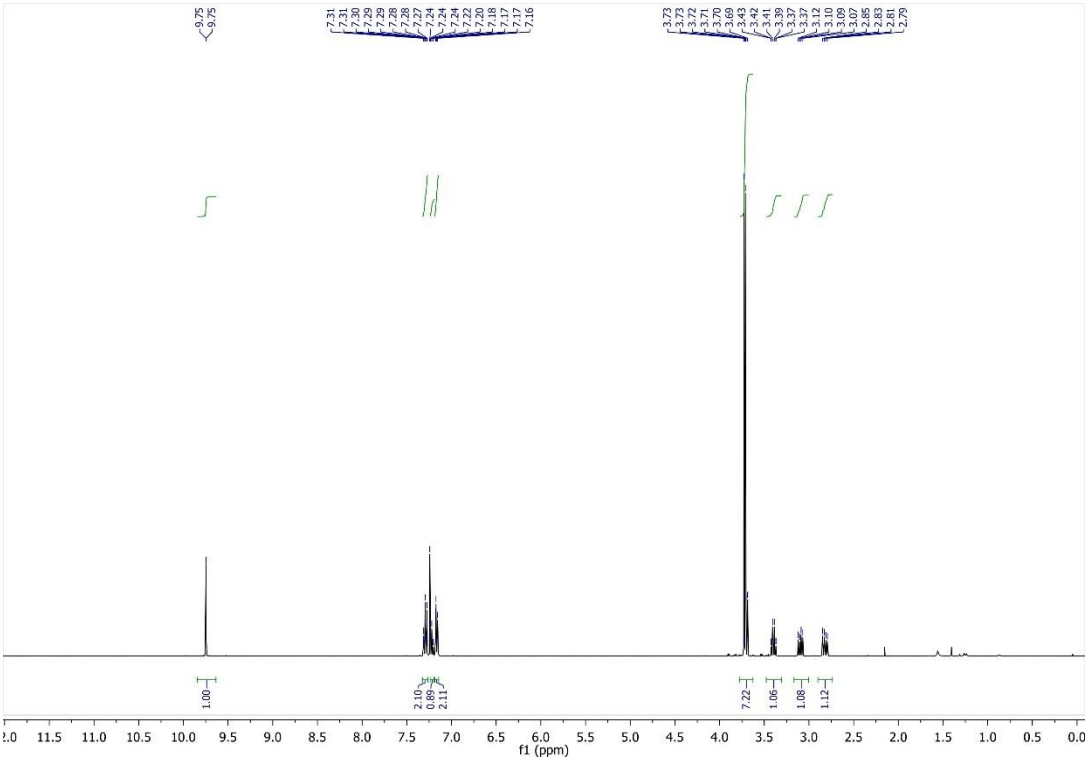
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7.18
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7.16
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3.73
3.72
3.71
3.70
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3.43
3.42
3.41
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3.37
3.37
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3.10
3.09
3.07
2.85
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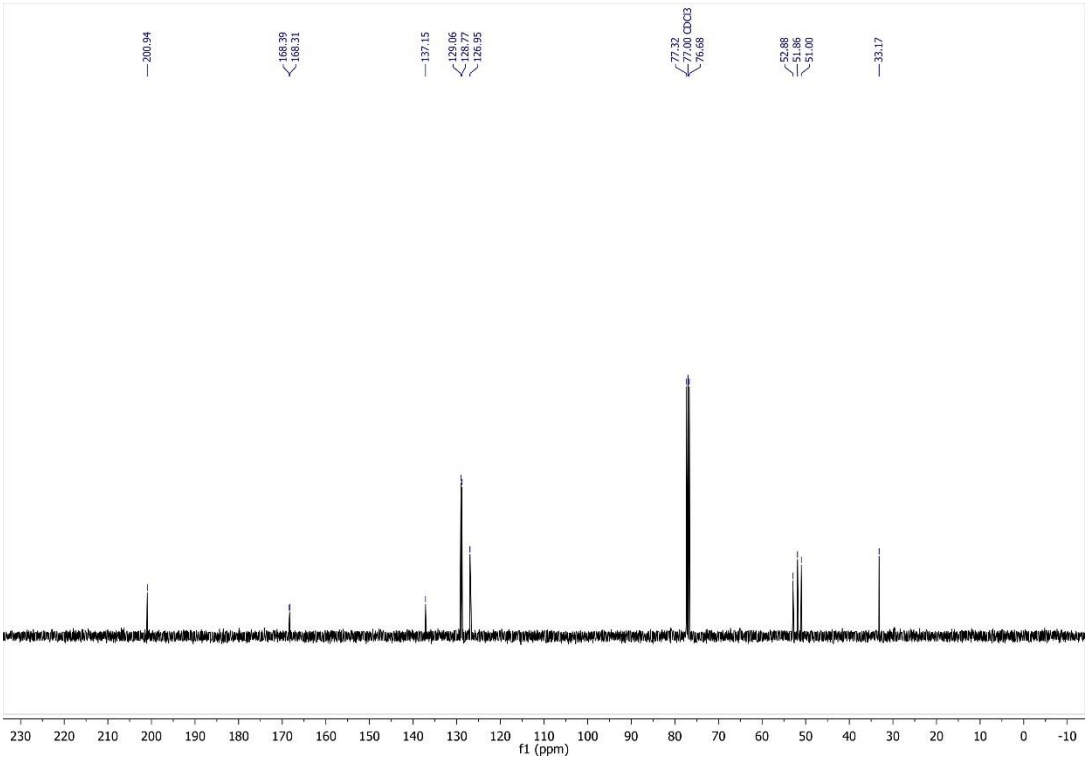
f1 (ppm)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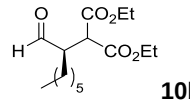
f1 (ppm)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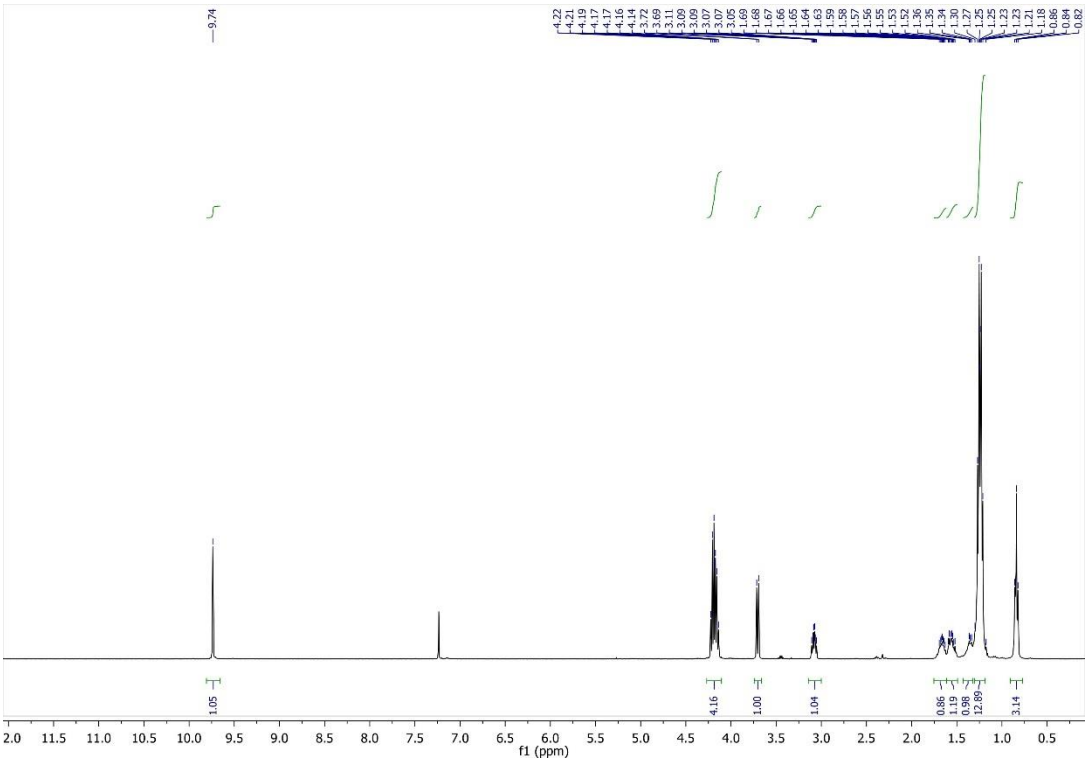
H
CO2Et
5

10ba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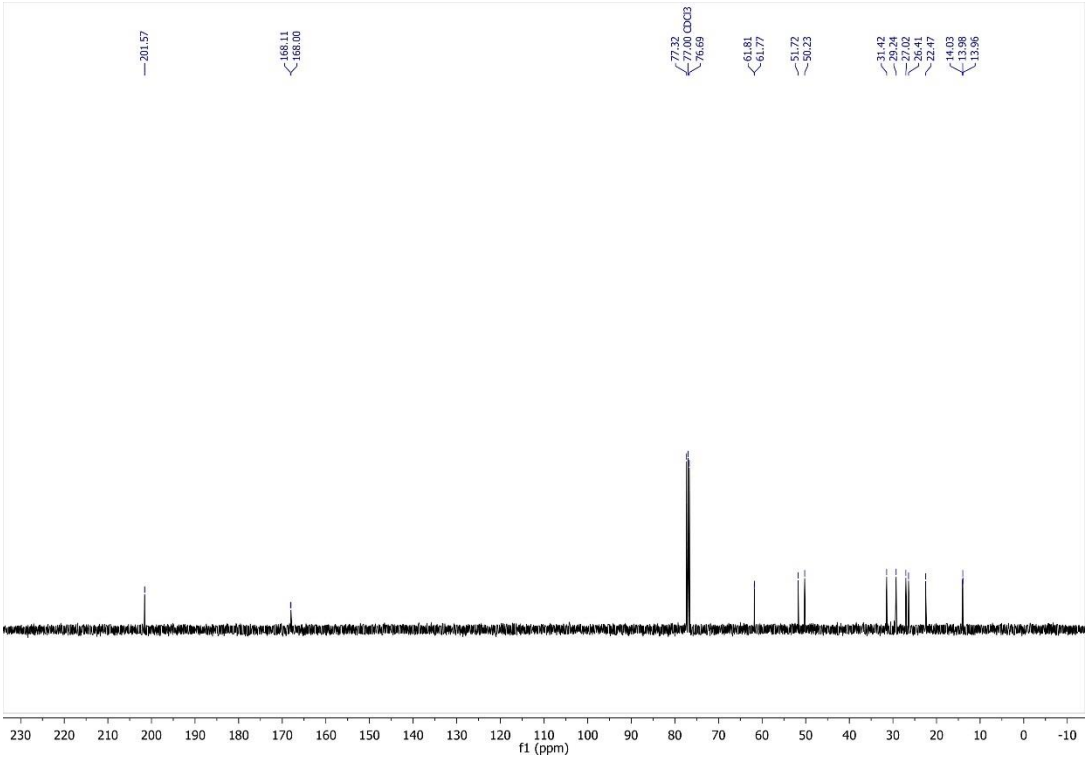
f1 (ppm)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13.98
13.96
f1 (ppm)

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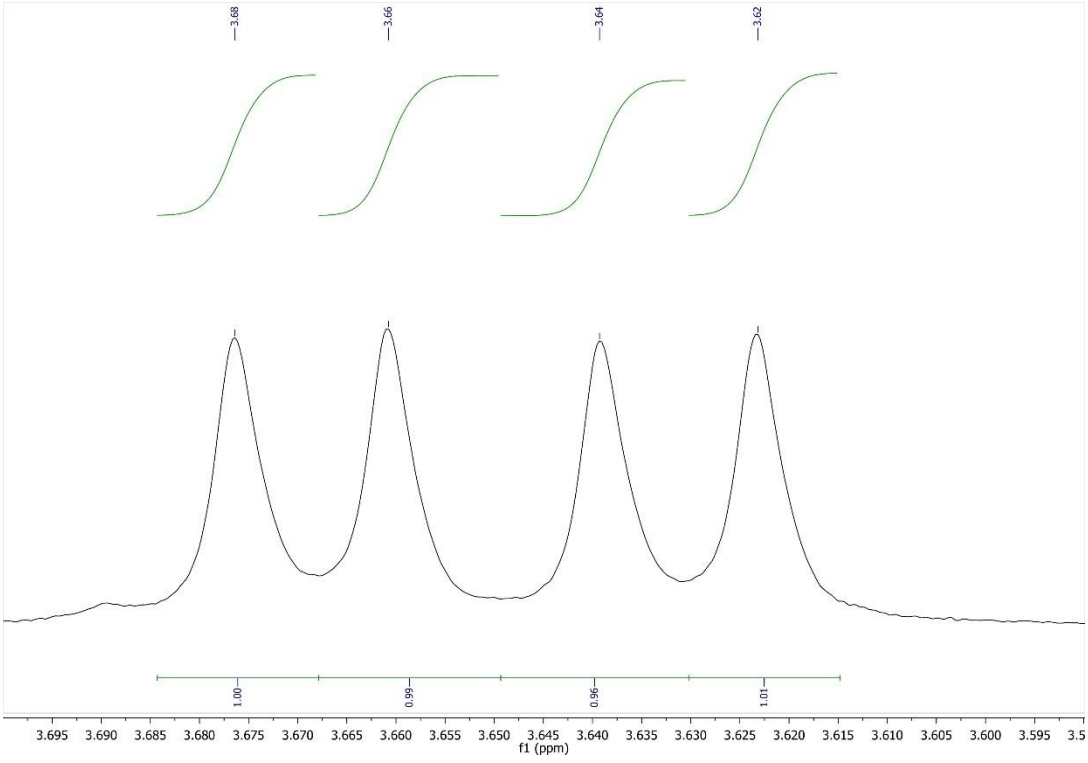

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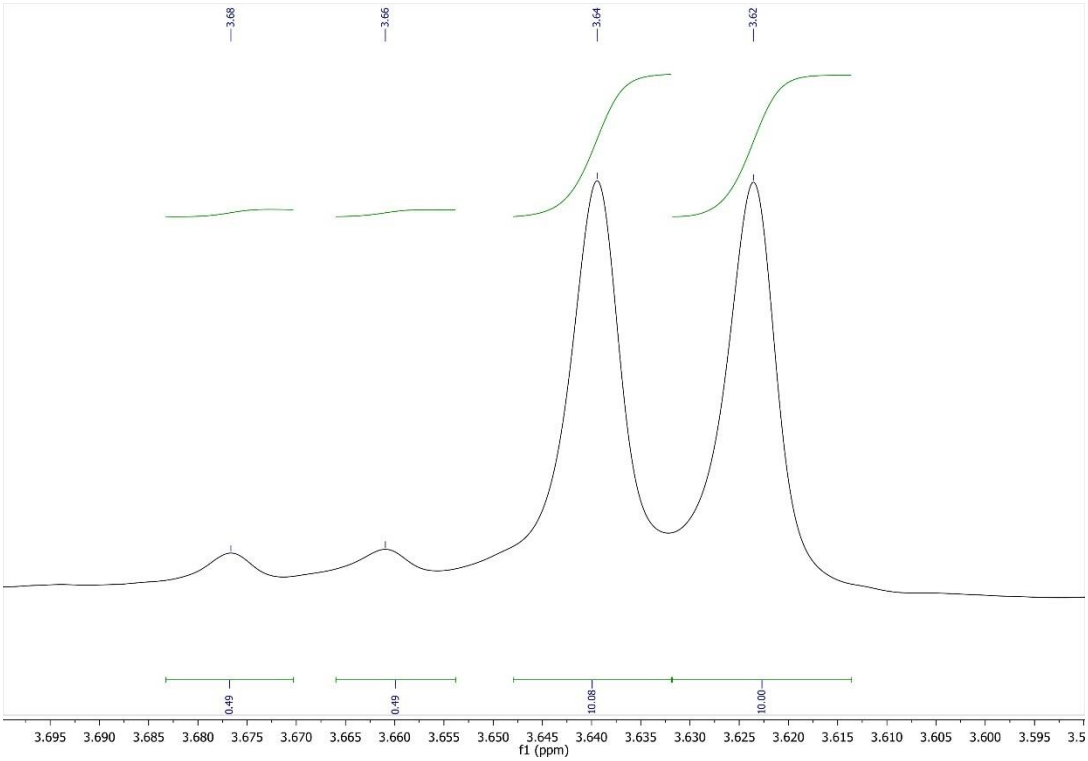

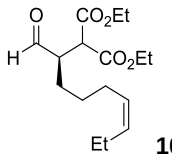

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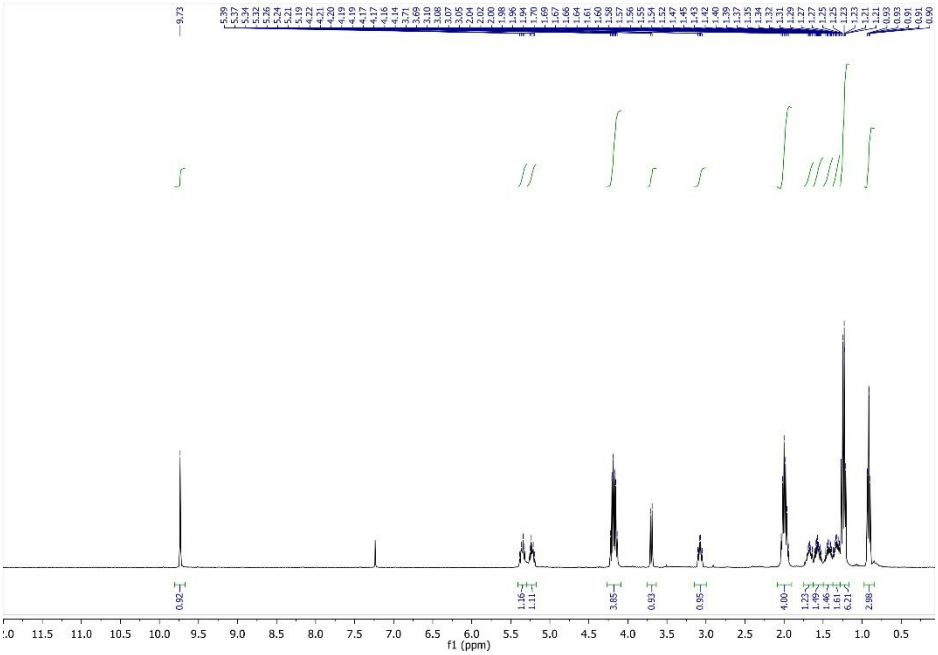

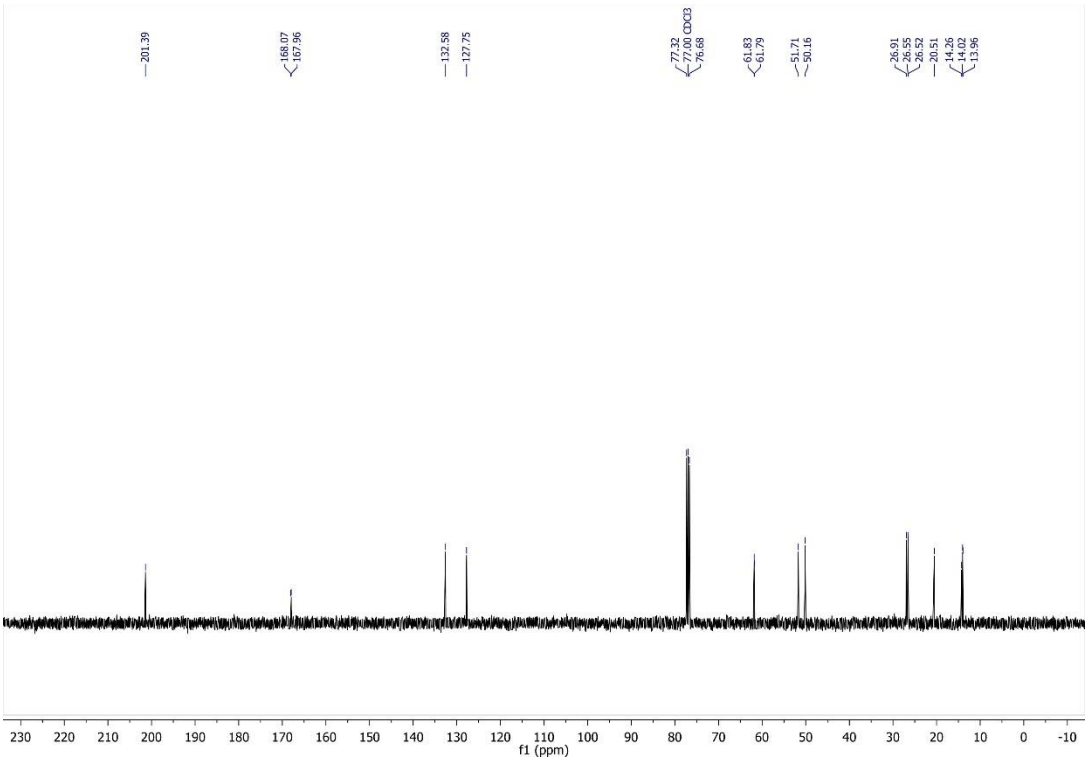

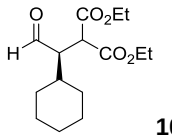
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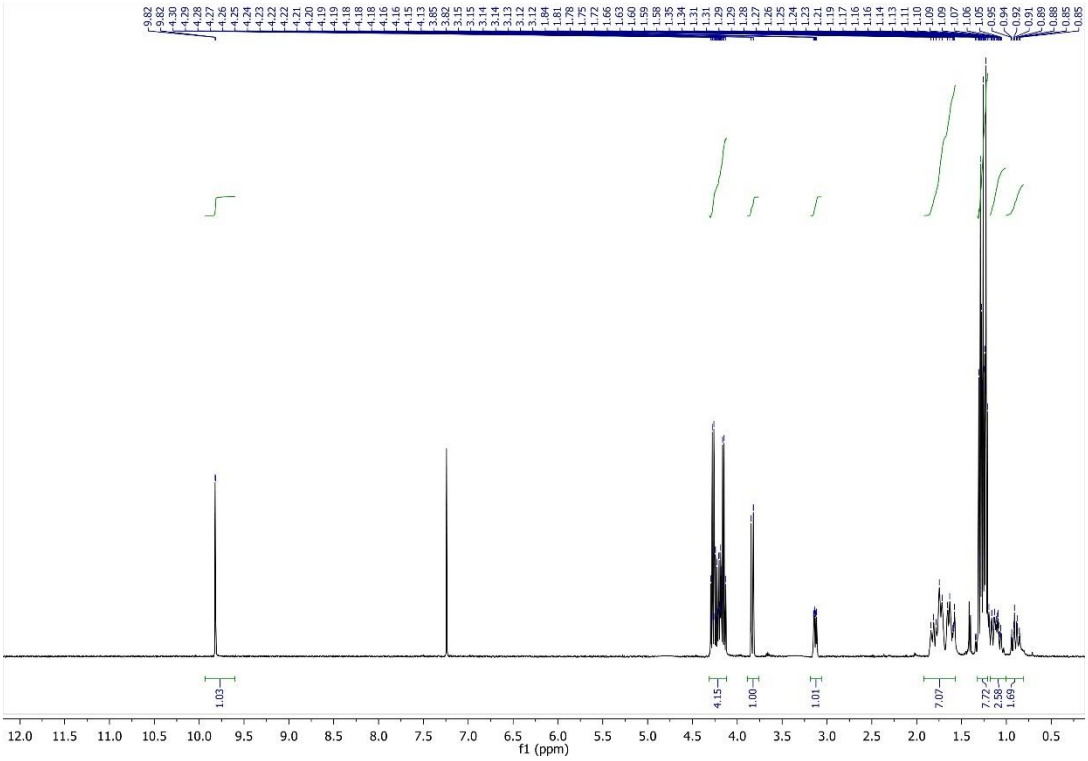
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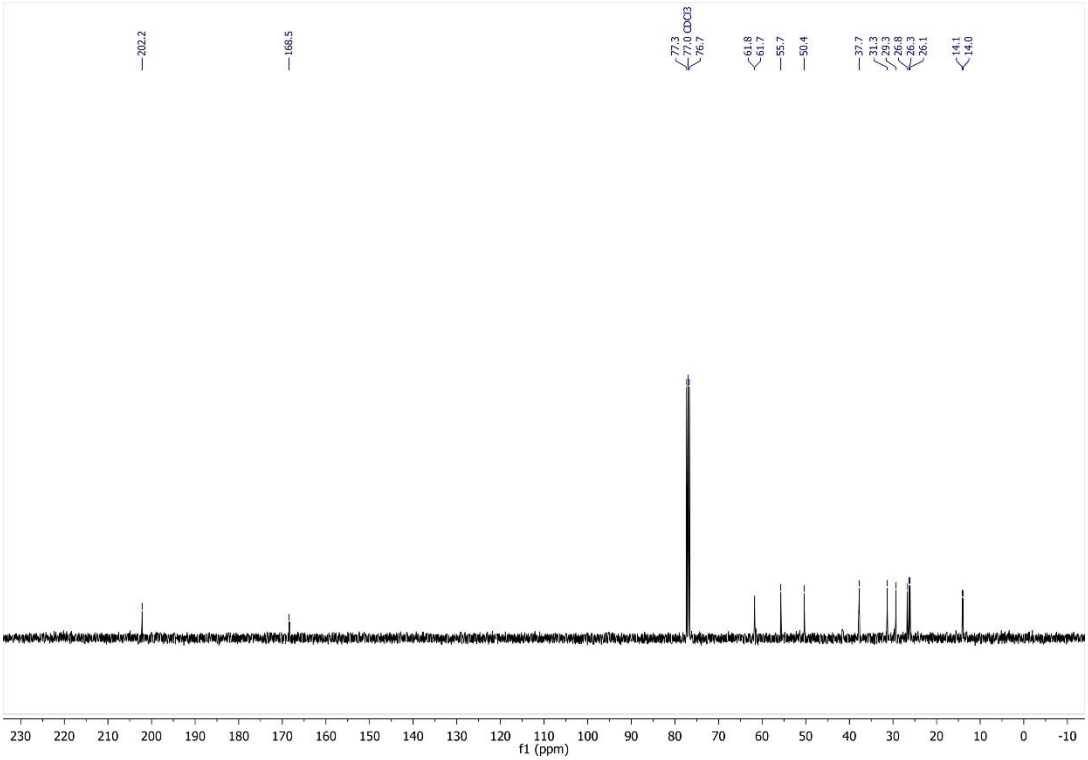
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26.3
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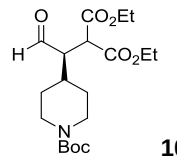
14.1
14.0
f1 (ppm)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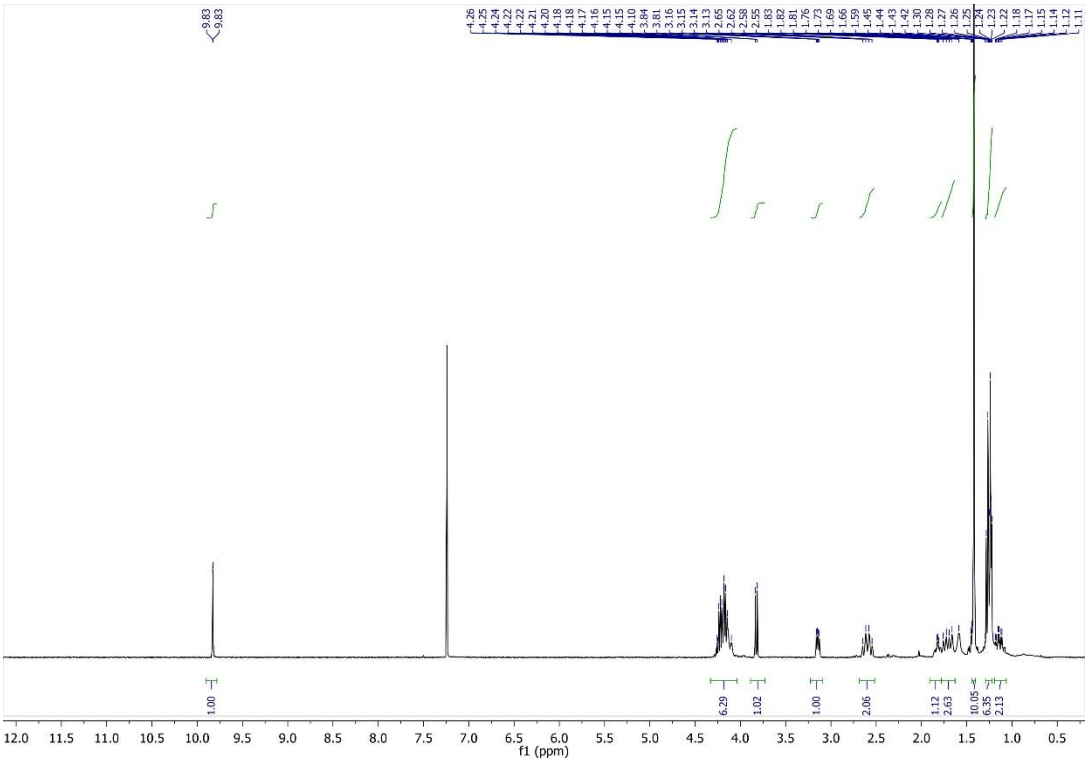
H
CO2Et
N
Boc

10ea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1.02
1.00
2.06
1.12
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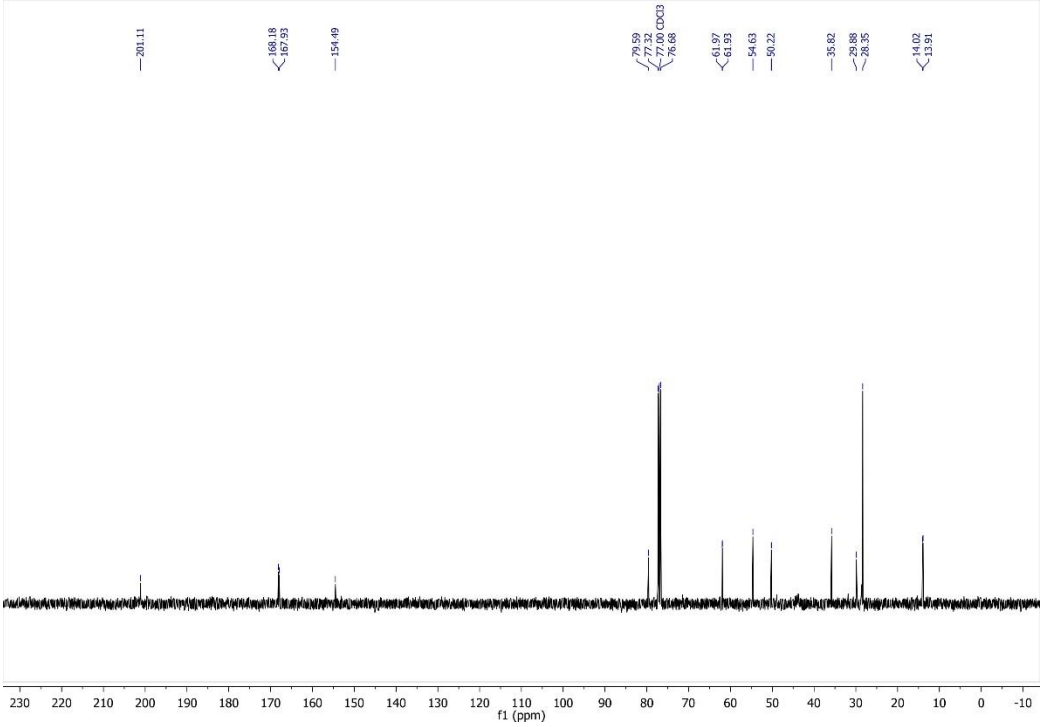
f1 (ppm)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35.82
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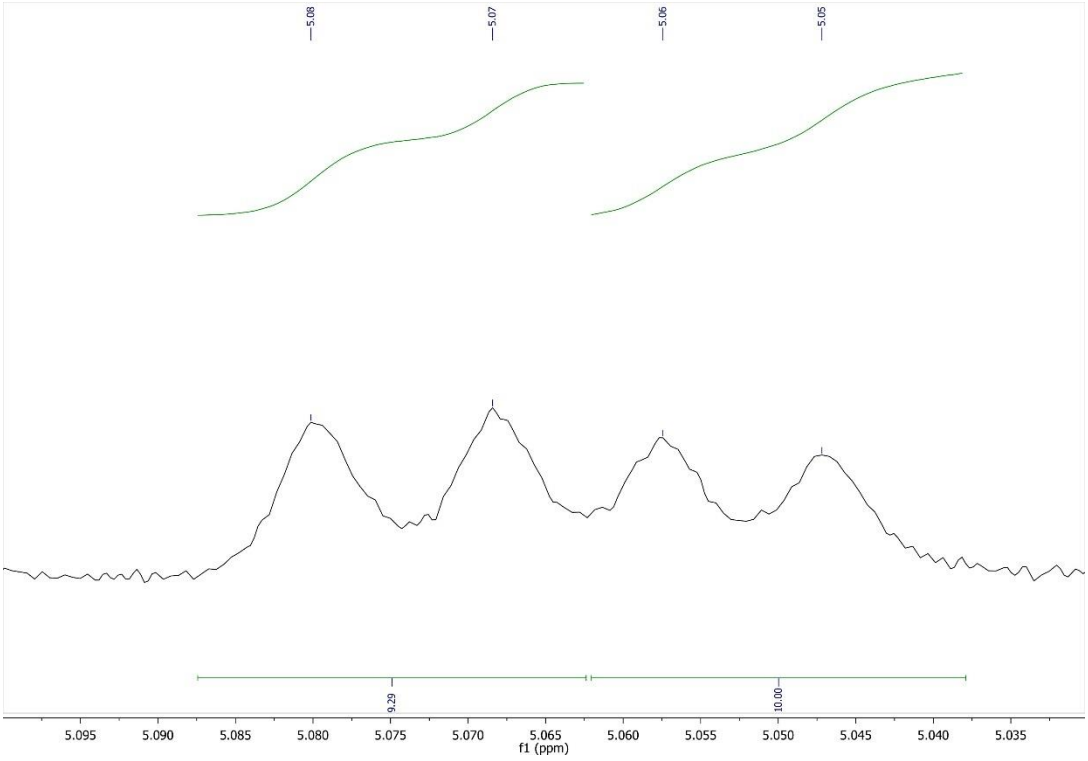
f1 (ppm)

Racemic



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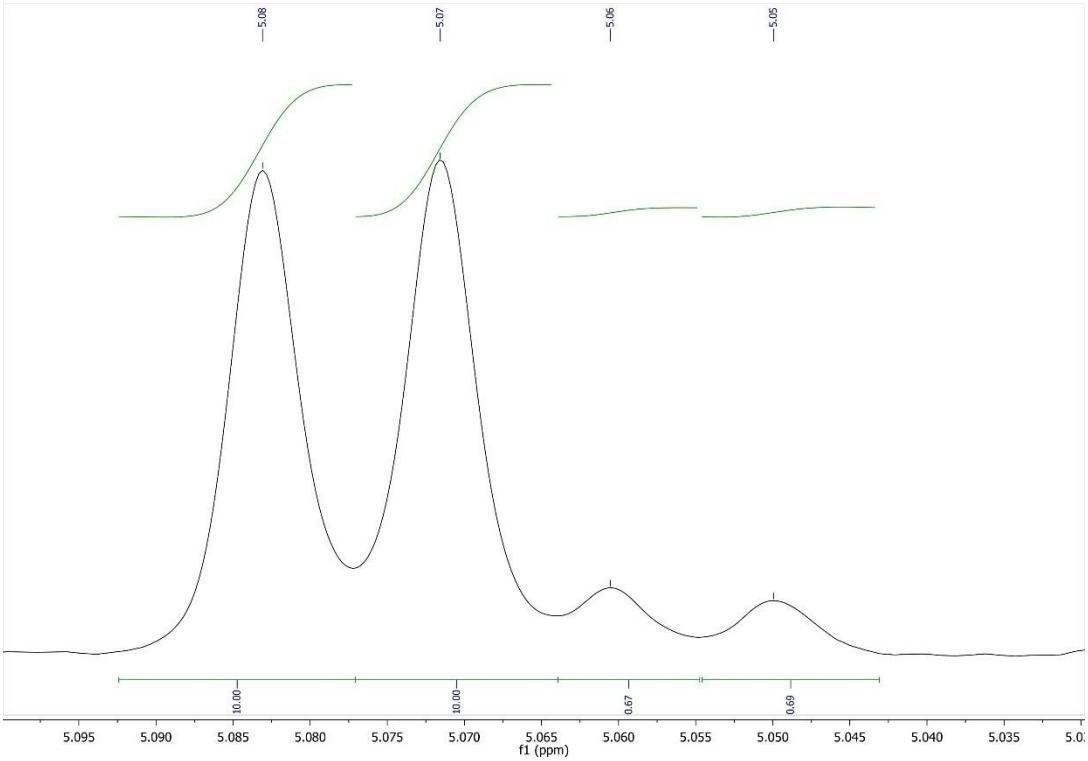

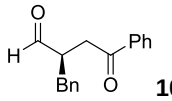
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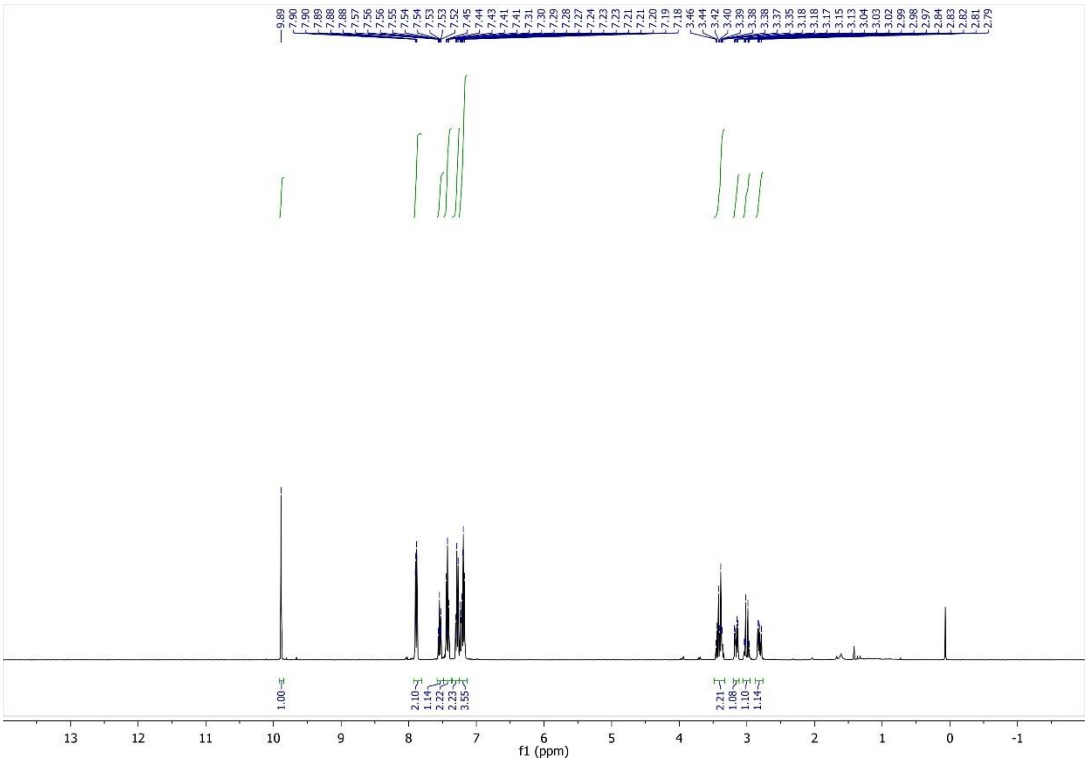
H
Ph
Bn
O

10ac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3.15
3.13
3.04
3.03
3.02
3.00
2.98
2.97
2.84
2.83
2.82
2.81
2.79
1.00
2.10
1.14
1.13
2.23
3.55
2.21
1.08
1.10
1.14
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12
11
10
9
8
7
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4
3
2
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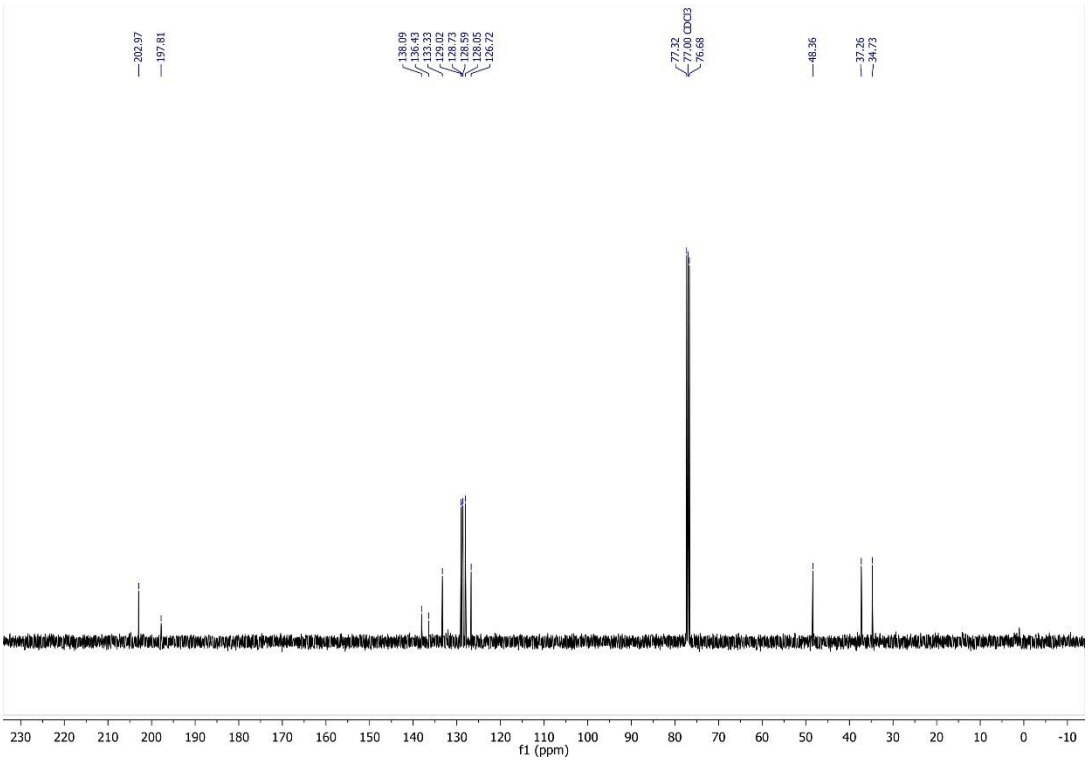
-1
f1 (ppm)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128.05
126.72
77.32
77.00 CDCl3
76.68
48.36
37.26
34.73
230
220
210
200
190
180
170
160
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100
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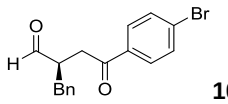
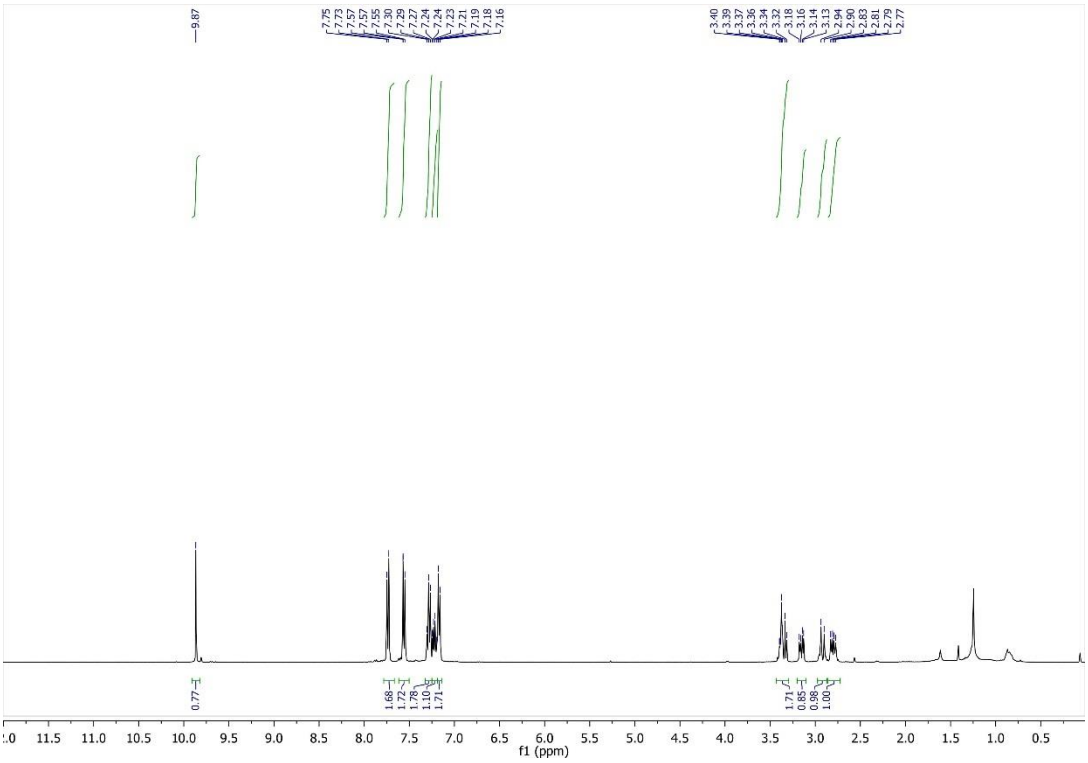
f1 (ppm)


O
H
Br
Bn
O

10ad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7.19
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3.39
3.37
3.36
3.34
3.32
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3.16
3.14
3.13
2.94
2.90
2.83
2.81
2.79
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0.77
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1.10
1.71
1.71
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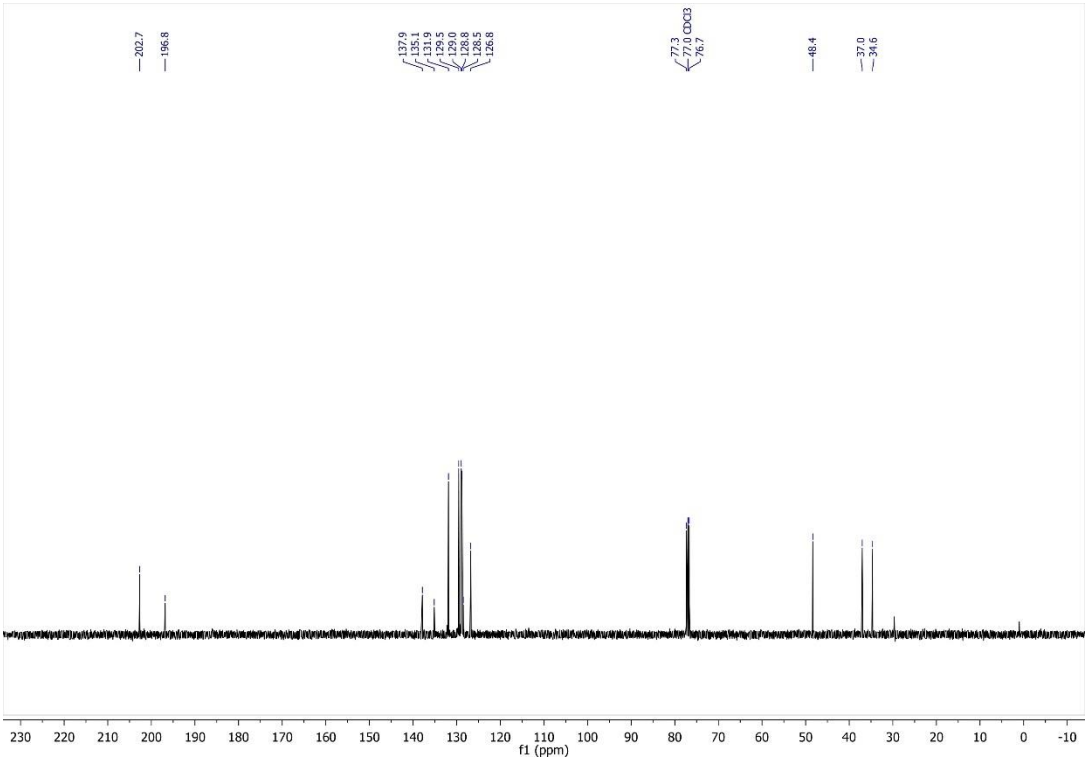
1.00
f1 (ppm)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128.8
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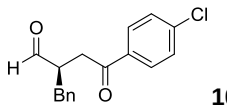
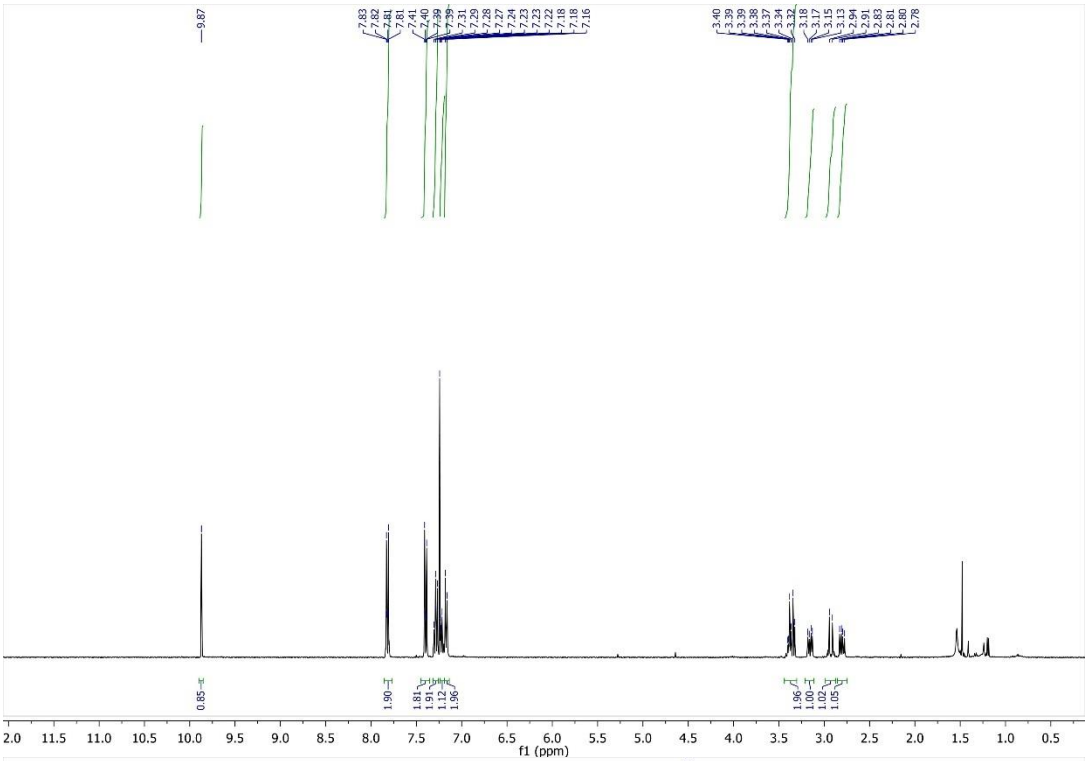
126.8
77.3
77.0 CDCl3
76.7
48.4
37.0
34.6
f1 (ppm)


O
H
Bn
O
Cl

10ae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7.24
7.23
7.22
7.18
7.18
7.16
3.40
3.39
3.39
3.38
3.37
3.34
3.32
3.18
3.17
3.15
3.13
2.94
2.91
2.83
2.81
2.80
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0.85
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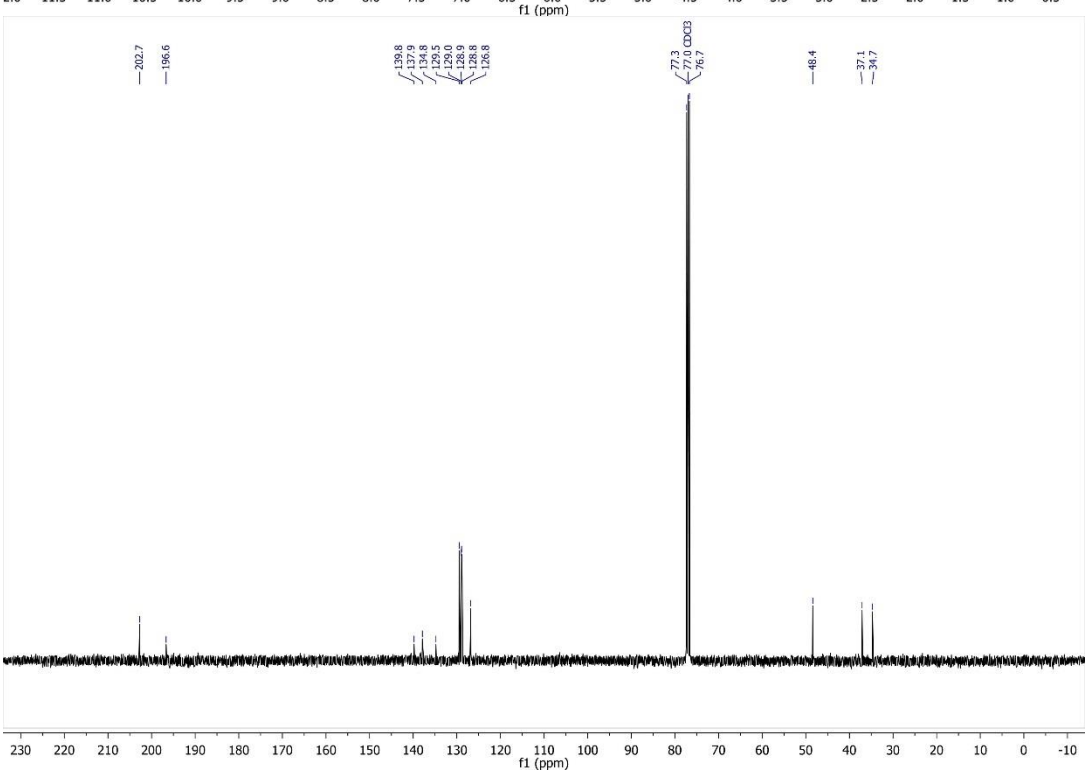
1.91
1.12
1.96
1.96
1.00
1.02
1.05
f1 (ppm)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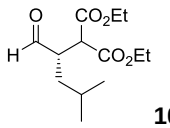
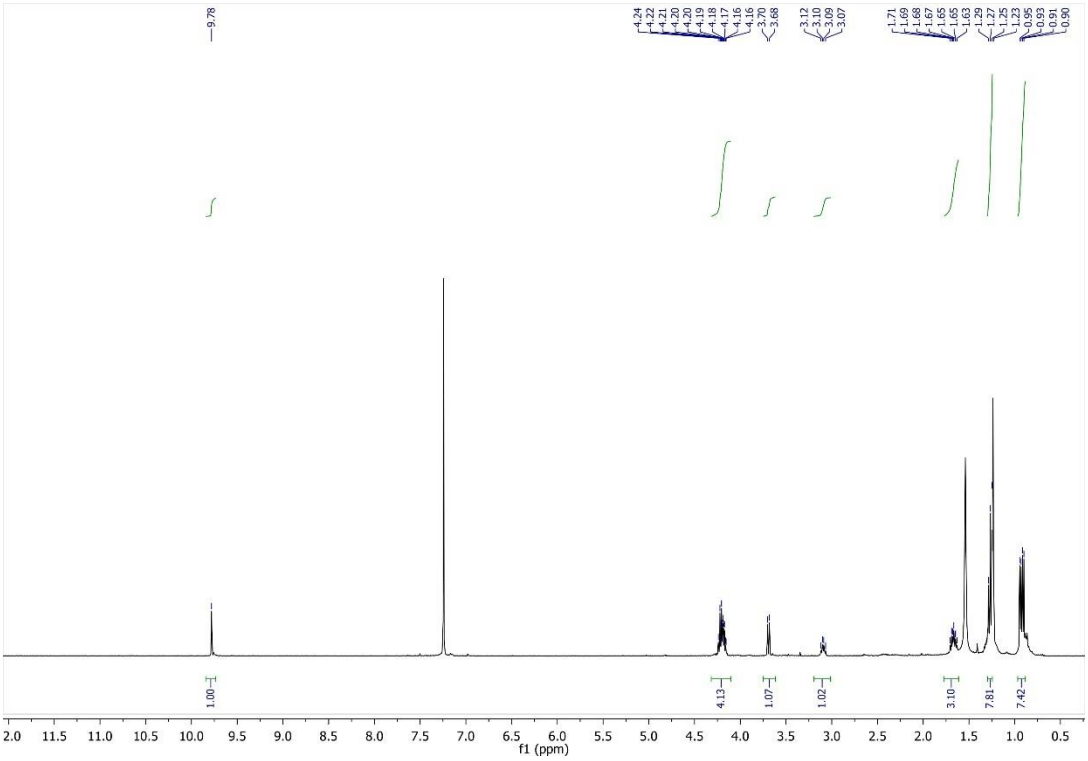
77.3
77.0 CDCl3
76.7
48.4
37.1
34.7
f1 (ppm)


O
CO2Et
H
CO2Et

10fa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3.68
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3.09
3.07
1.71
1.69
1.68
1.67
1.65
1.65
1.63
1.29
1.27
1.25
1.23
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0.93
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0.90
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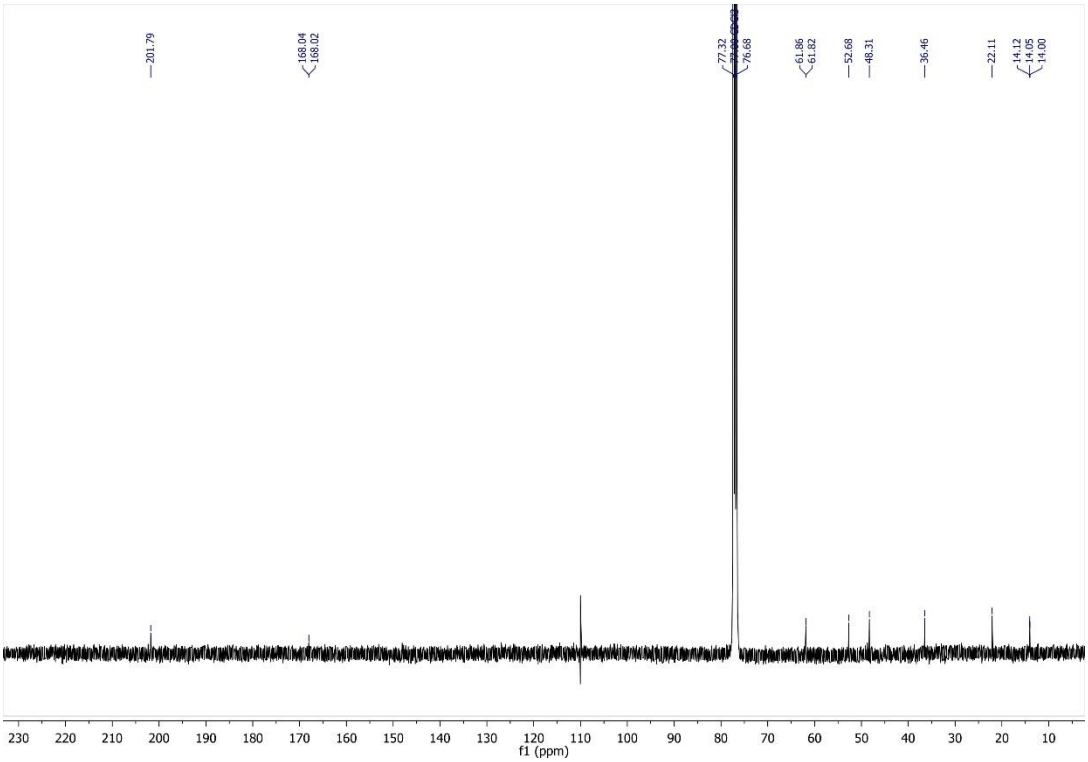
1.07
1.02
3.10
7.81
7.42
f1 (ppm)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36.46
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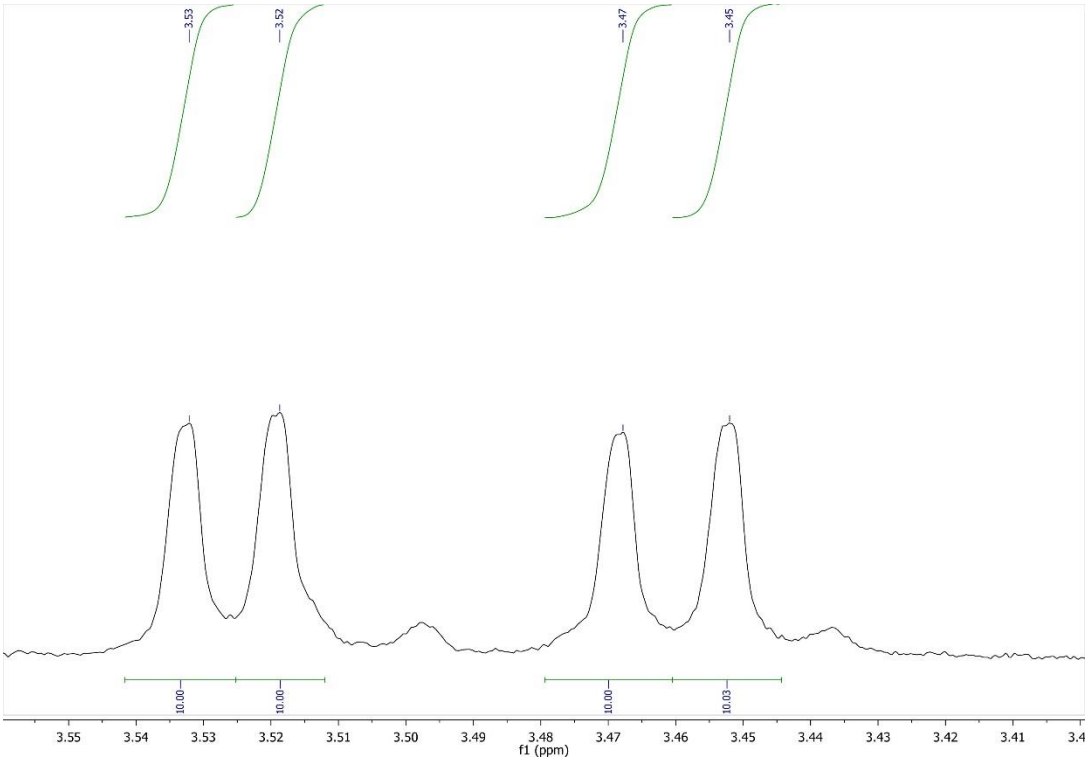
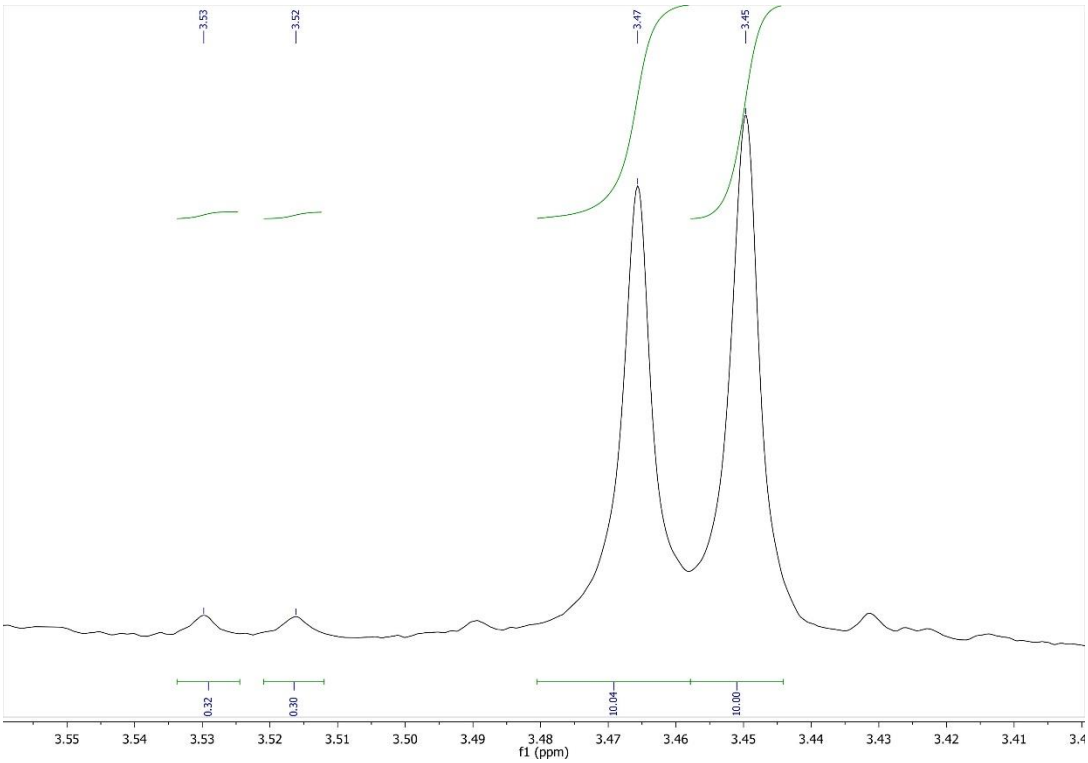
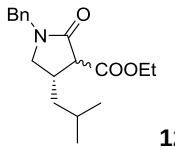
14.05
14.00
f1 (ppm)

Racemic



Active





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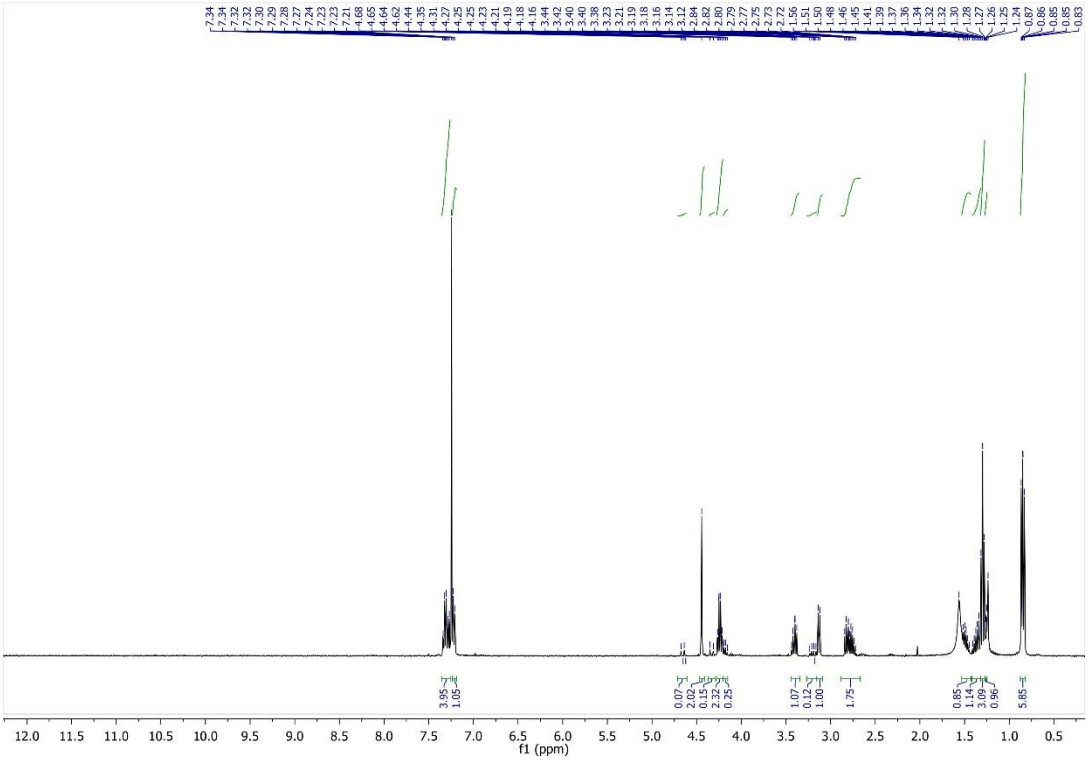
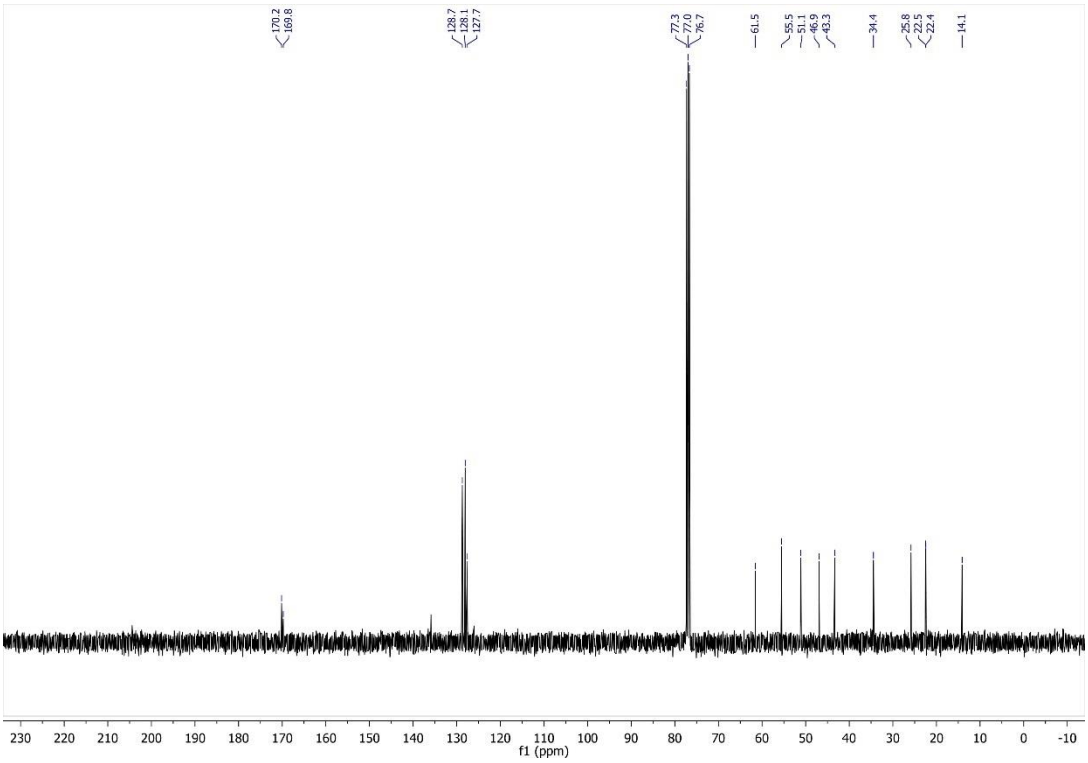
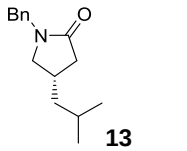
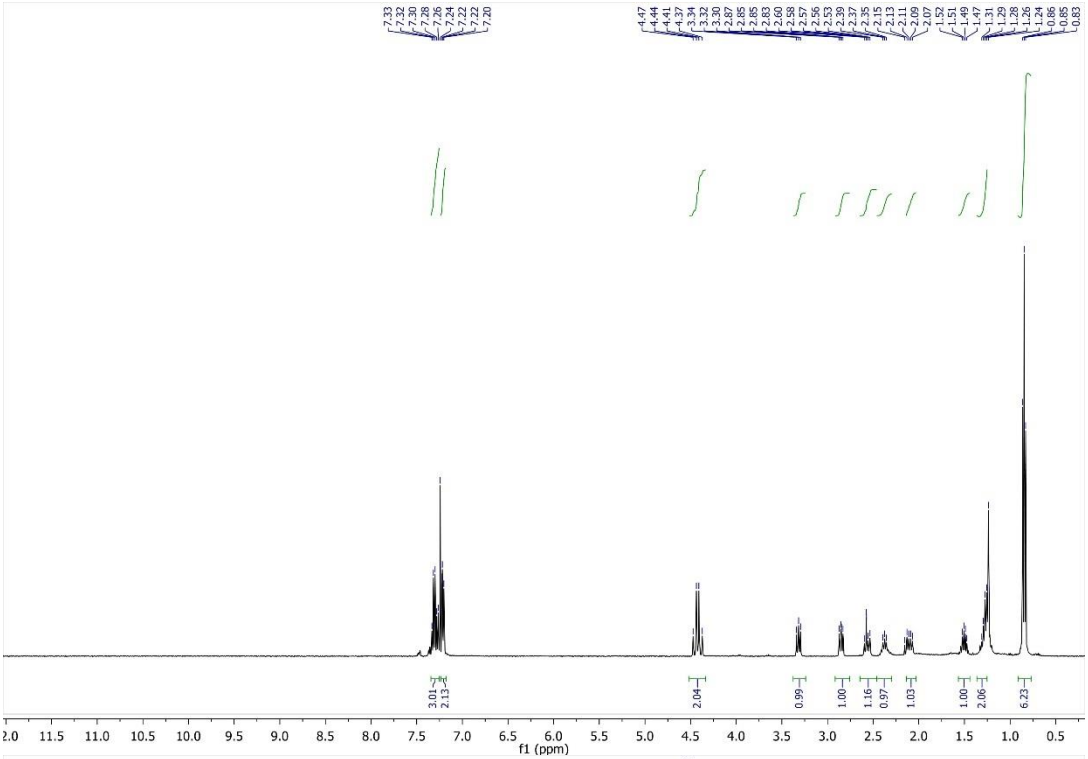





Bn
N
O

13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3.32
3.30
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2.85
2.83
2.60
2.58
2.57
2.56
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2.37
2.35
2.15
2.13
2.11
2.09
2.07
1.52
1.51
1.49
1.47
1.31
1.29
1.28
1.26
1.24
0.86
0.85
0.83
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2.13
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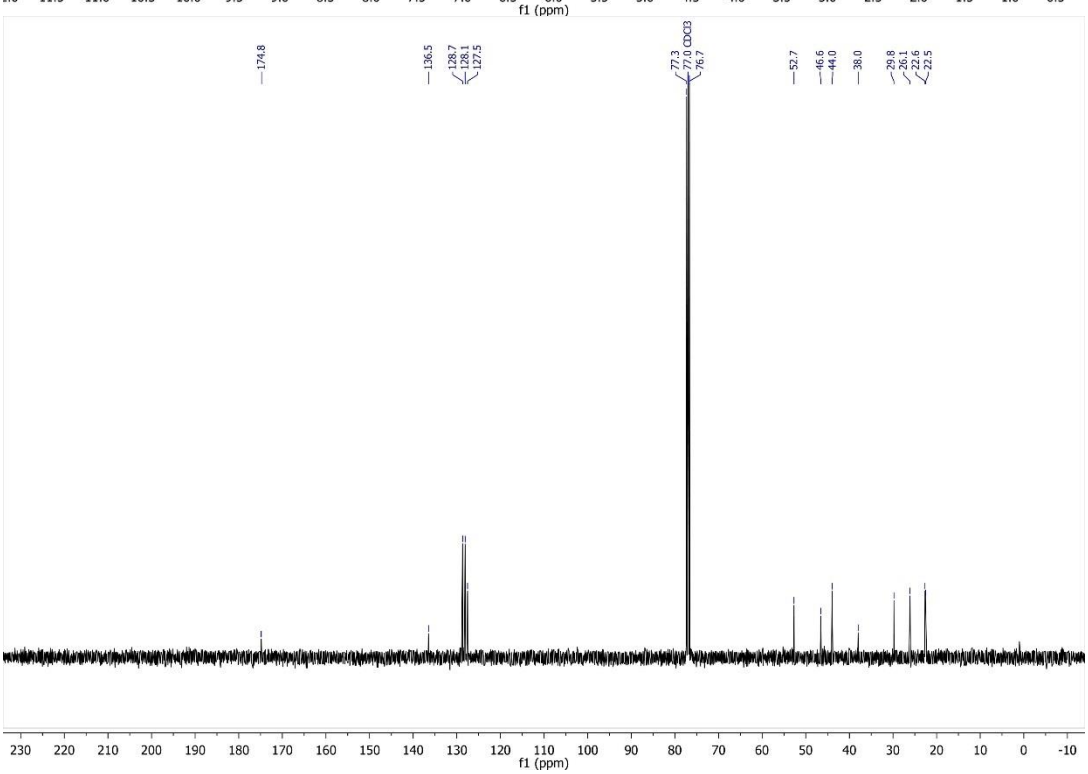
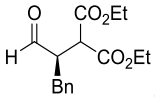
0.99
1.00
1.16
0.97
1.03
1.00
2.06
6.23
f1 (ppm)


174.8
136.5
128.7
128.1
127.5
77.3
77.0 CDCl3
76.7
52.7
46.6
44.0
38.0
29.8
26.1
23.6
22.5
f1 (ppm)

HPLC traces



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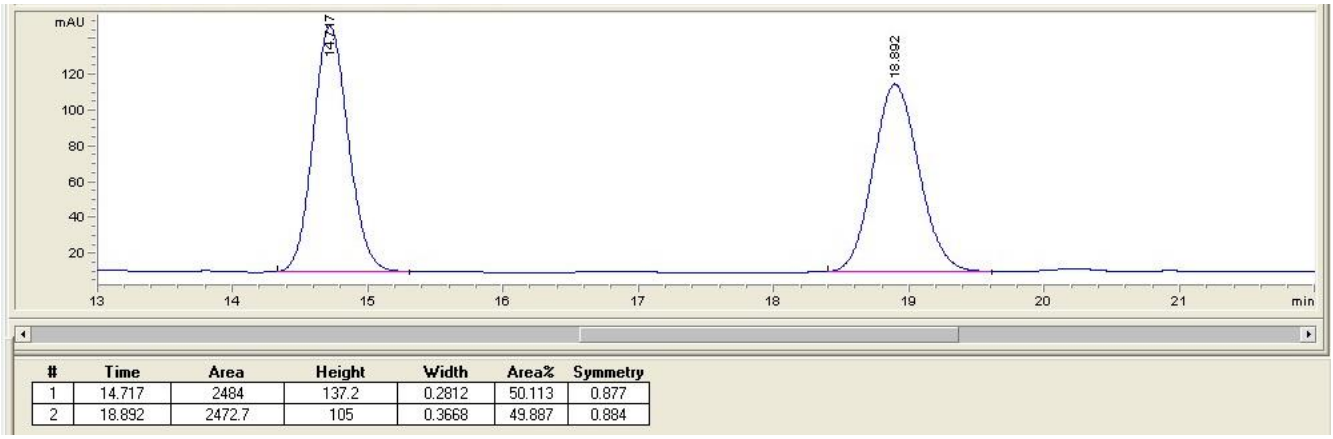
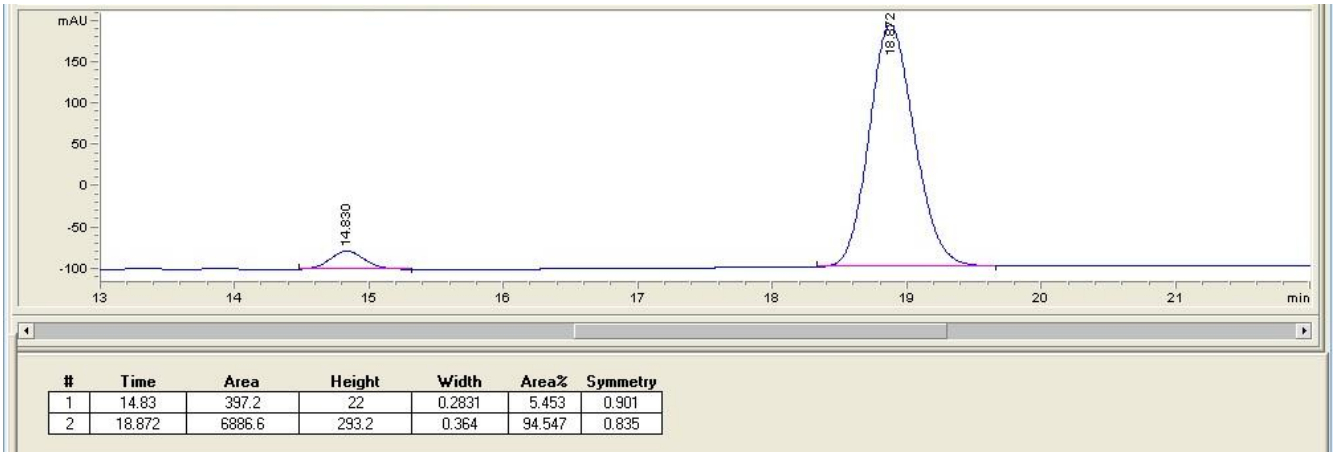
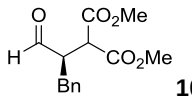


#	Time	Area	Height	Width	Area%	Symmetry
1	14.717	2484	137.2	0.2812	50.113	0.877
2	18.892	2472.7	105	0.3668	49.887	0.884



#	Time	Area	Height	Width	Area%	Symmetry
1	14.83	397.2	22	0.2831	5.453	0.901
2	18.872	6886.6	293.2	0.364	94.547	0.835



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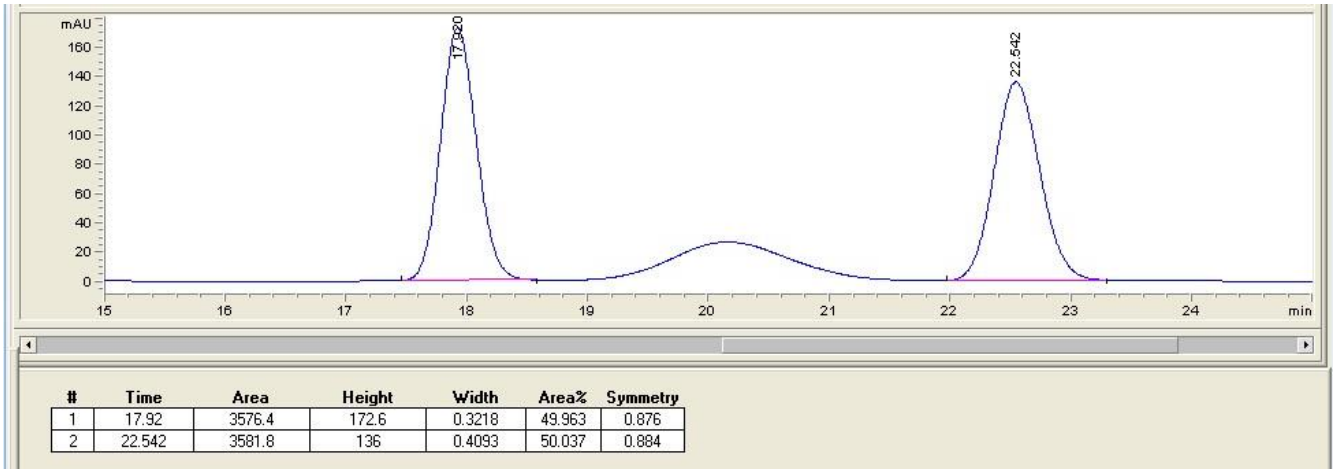
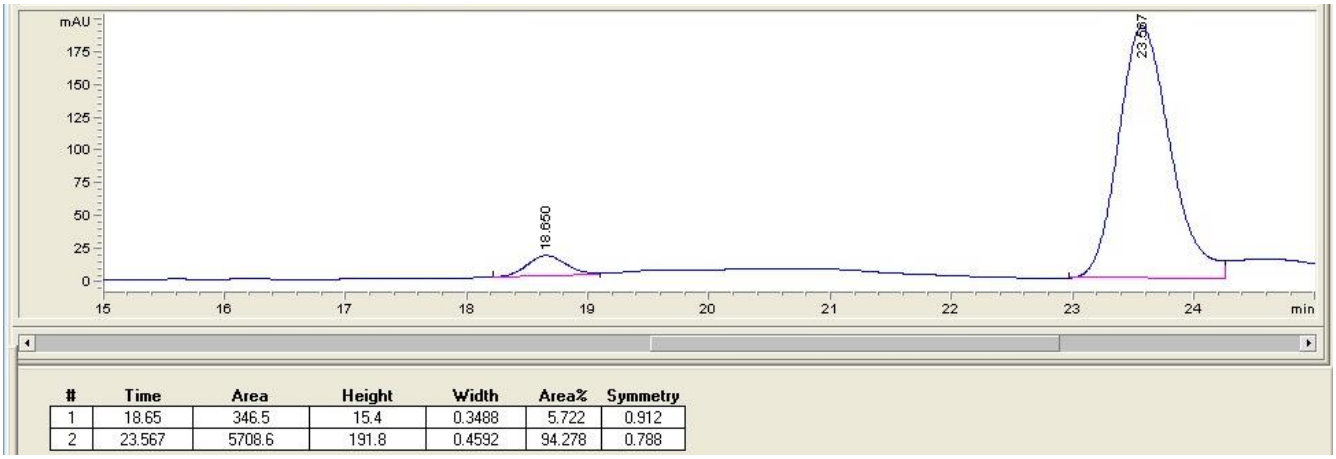


#	Time	Area	Height	Width	Area%	Symmetry
1	17.92	3576.4	172.6	0.3218	49.963	0.876
2	22.542	3581.8	136	0.4093	50.037	0.884



#	Time	Area	Height	Width	Area%	Symmetry
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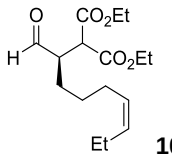
2	23.567	5708.6	191.8	0.4592	94.278	0.788



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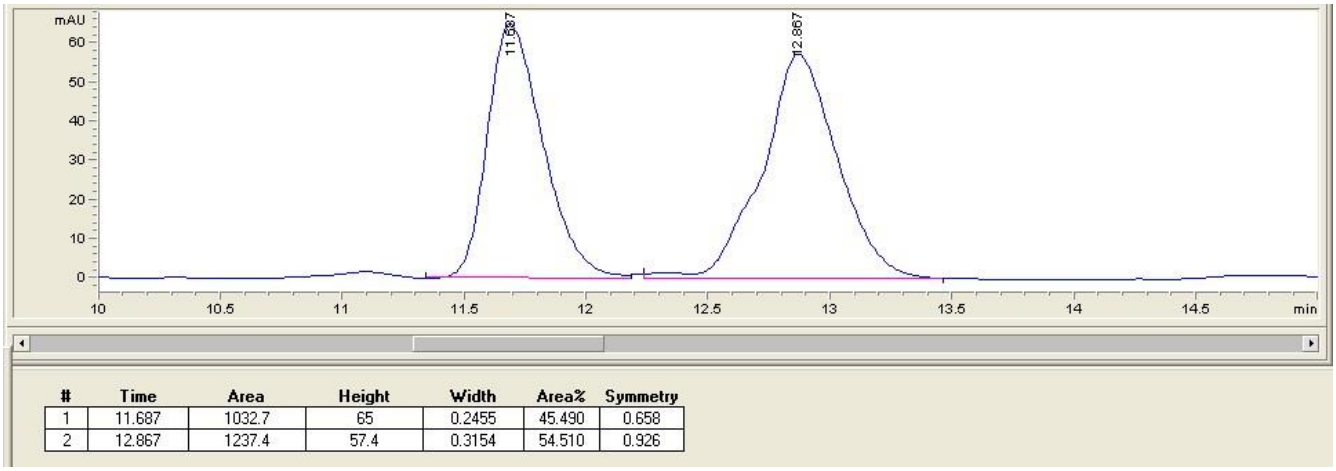
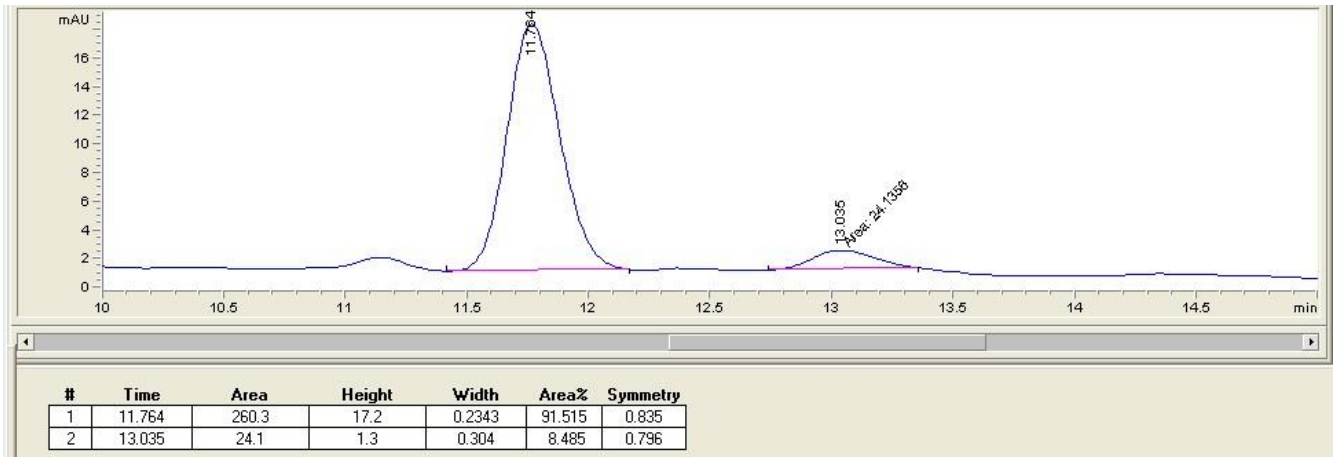
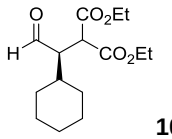


#	Time	Area	Height	Width	Area%	Symmetry
1	11.687	1032.7	65	0.2455	45.490	0.658
2	12.867	1237.4	57.4	0.3154	54.510	0.926



#	Time	Area	Height	Width	Area%	Symmetry
1	11.764	260.3	17.2	0.2343	91.515	0.835
2	13.035	24.1	1.3	0.304	8.485	0.796



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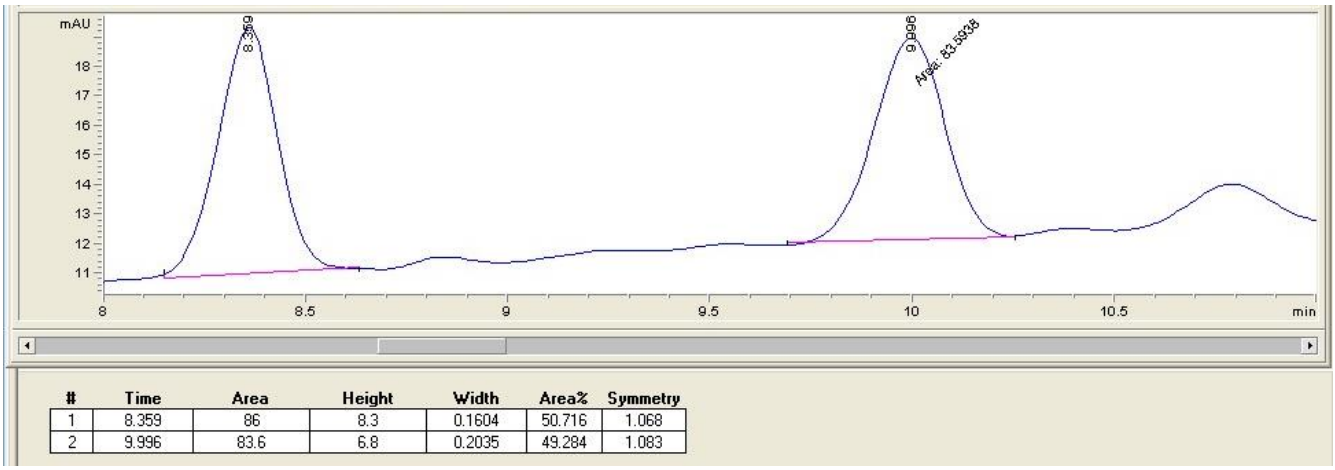
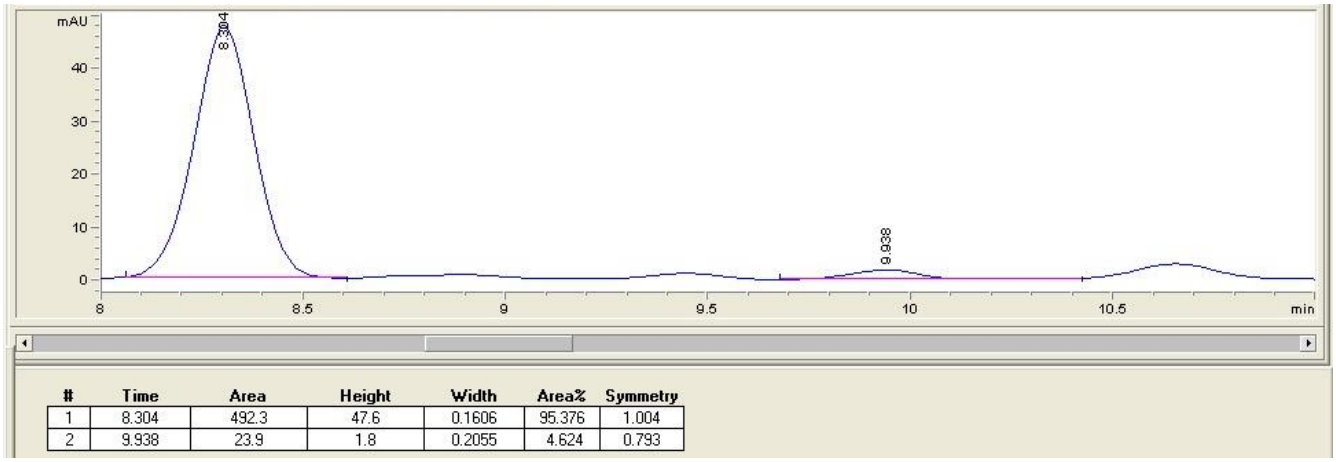
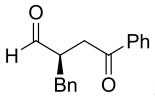


#	Time	Area	Height	Width	Area%	Symmetry
1	8.359	86	8.3	0.1604	50.716	1.068
2	9.996	83.6	6.8	0.2035	49.284	1.083



#	Time	Area	Height	Width	Area%	Symmetry
1	8.304	492.3	47.6	0.1606	95.376	1.004
2	9.938	23.9	1.8	0.2055	4.624	0.793



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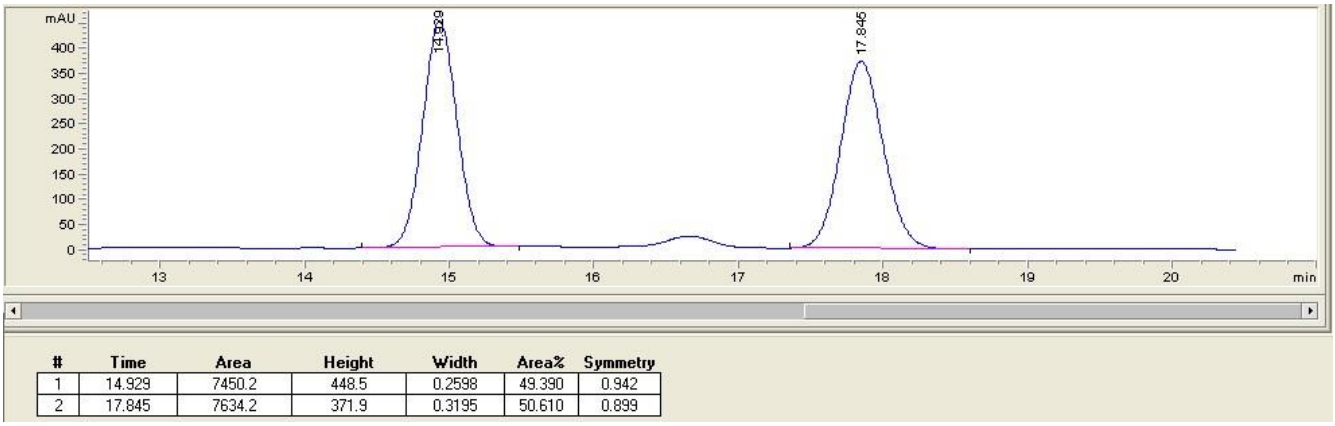
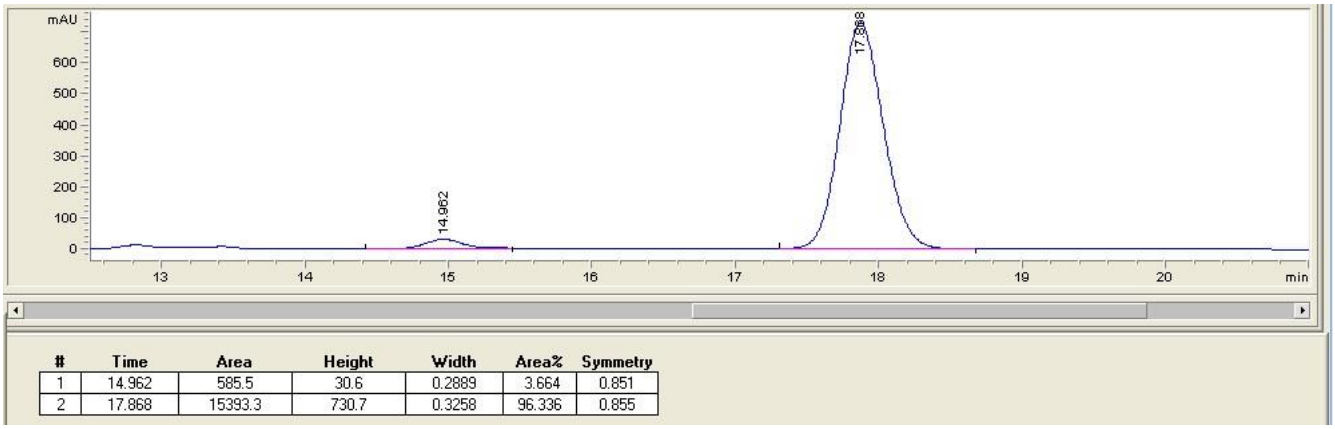
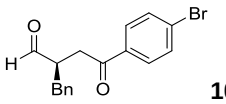


#	Time	Area	Height	Width	Area%	Symmetry
1	14.929	7450.2	448.5	0.2598	49.390	0.942
2	17.845	7634.2	371.9	0.3195	50.610	0.899



#	Time	Area	Height	Width	Area%	Symmetry
1	14.962	585.5	30.6	0.2889	3.664	0.851
2	17.868	15393.3	730.7	0.3258	96.336	0.855



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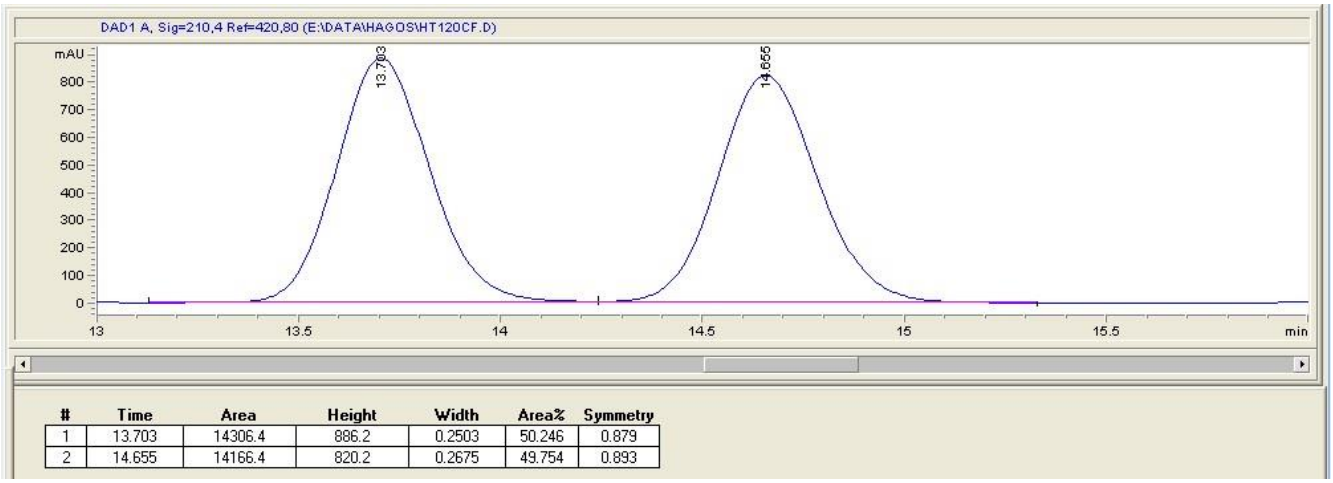
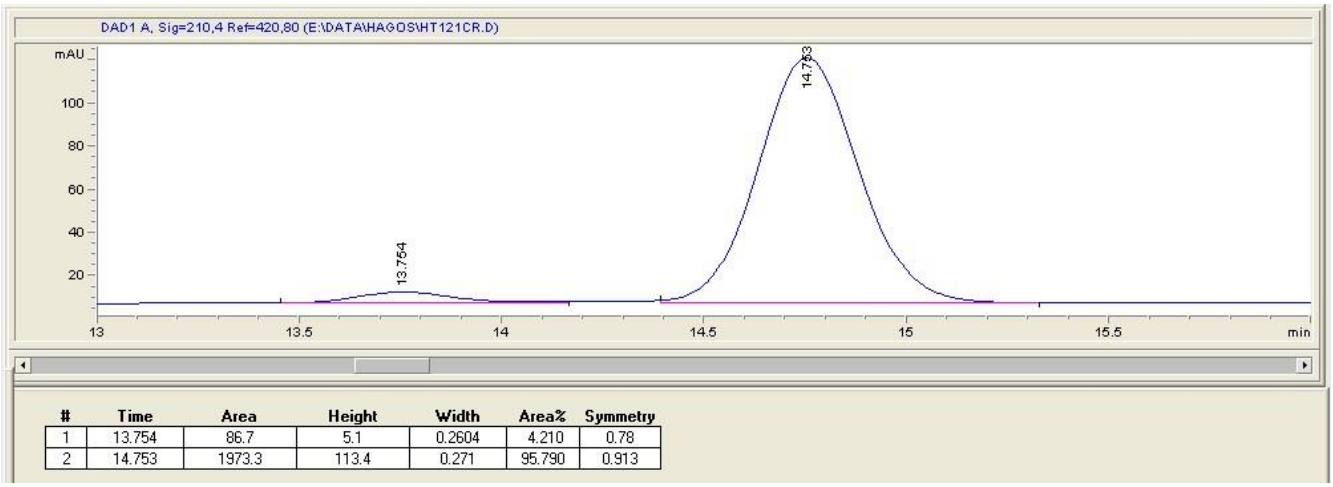
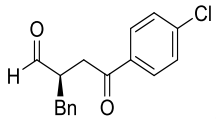


#	Time	Area	Height	Width	Area%	Symmetry
1	13.703	14306.4	886.2	0.2503	50.246	0.879
2	14.655	14166.4	820.2	0.2675	49.754	0.893



#	Time	Area	Height	Width	Area%	Symmetry
1	13.754	86.7	5.1	0.2604	4.210	0.78
2	14.753	1973.3	113.4	0.271	95.790	0.913



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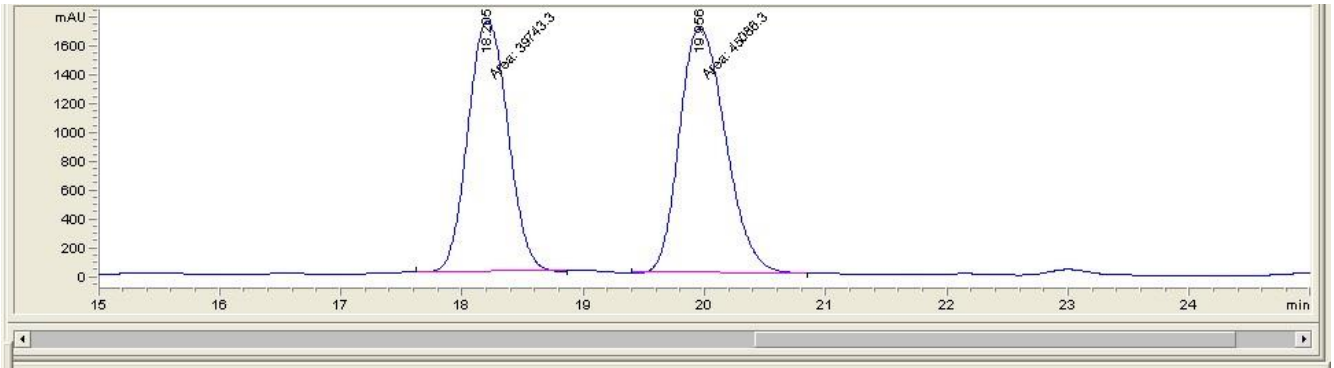
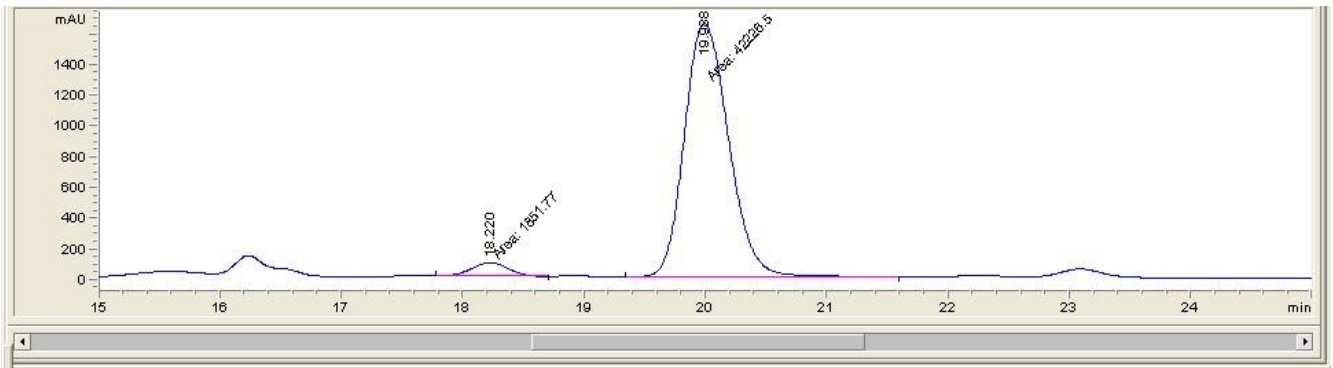


#	Time	Area	Height	Width	Area%	Symmetry
1	18.205	39743.3	1732.3	0.3824	46.851	0.918
2	19.956	45086.3	1696.6	0.4429	53.149	0.754



#	Time	Area	Height	Width	Area%	Symmetry
1	18.22	1851.8	87.7	0.3518	4.201	0.985
2	19.988	42226.5	1652.3	0.4259	95.799	0.785