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Electronic Supplementary Information

Pd(II)-Catalyzed Remote Regiodivergent *ortho*- and *meta*-C–H Functionalizations of Phenylethylamines†

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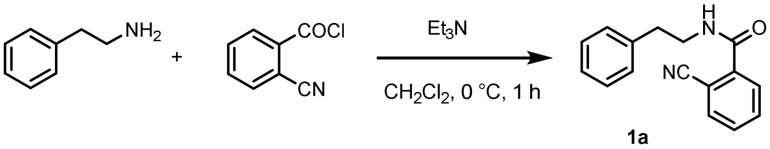
1. General Information

Unless otherwise noted, commercial available reagents were purchased from commercial suppliers (such as Strem, J&K Chemical Co., Energy Chemical and Sinopharm,), and used as received. Solvents were generally distilled over CaH_2 or dried over 3 Å molecular seives. THF was distilled over sodium under nitrogen. Hexafluoroisopropanol (HFIP) was distilled before use. Unless otherwise noted, all reactions were run under air and the indicated reaction temperature was that of the oil bath. The reaction vessels used for C–H functionalization were 38 mL sealed tube or 50 mL Schlenk tube (Synthware). Purification of products was performed by flash chromatography (FC) using silica gel or preparative thin layer chromatography. ^{1}H and ^{13}C NMR spectra were recorded on a Bruker AVANCE III spectrometer (400 MHz and 101 MHz, respectively). Chemical shifts are reported parts per million (ppm) referenced to $CDCl_3$ (δ 7.26 ppm) for ^{1}H NMR, $CDCl_3$ (δ 77.16 ppm) for ^{13}C NMR or tetramethylsilane (TMS, δ 0.00 ppm for ^{1}H NMR). The following abbreviations (or combinations thereof) were used to explain multiplicities: s = singlet, d = doublet, t = triplet, q = quartet, hept = heptaplet, m = multiplet, and br = broad. High-resolution mass spectra (HRMS) were obtained on an AB Sciex TripleTOF 5600 LC/MS equipped with an ESI source at the Shanghai Institute of Organic Chemistry (CAS). X-Ray Crystallography data was obtained at Fujian Institute of Research on the Structure of Matter.

2. Experimental Section

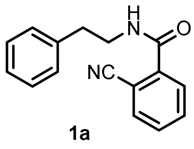
2.1 Preparation and characterization of substrates.

***General procedure for preparing substrates of remote-selective ortho-C–H bond olefination*:**

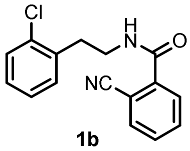


1a

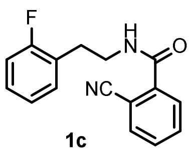
To a solution of 2-cyanobenzoic acid ^{S1} (441 mg, 3.0 mmol) and DMF (10 μL) in CH_2Cl_2 (20 mL) under N_2 atmosphere was added oxalyl chloride (570 mg, 4.5 mmol) dropwise. The reaction was stirred until the solid suspension disappeared. Then the solvent was removed under reduced pressure. The residue was dissolved in CH_2Cl_2 (10 mL). Then the above solution was added dropwise to a solution of 2-phenylethan-1-amine (363 mg, 3.0 mmol) and Et_3N (0.5 mL, 3.6 mmol) in CH_2Cl_2 (20 mL) at 0 °C. After stirring for 1 h at 0 °C, the reaction mixture was diluted with CH_2Cl_2 (20 mL) and washed with H_2O (20 mL). The organic phase was dried over anhydrous Na_2SO_4 and concentrated under reduced pressure. The residue was purified by flash silica gel chromatography with petroleum ether/EtOAc (2:1) to afford compound 2-cyano-*N*-phenethylbenzamide **1a** (607 mg, 81%).



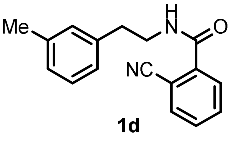
1a **2-Cyano-*N*-phenethylbenzamide**: ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.81-7.67 (m, 2H), 7.63 (t, J = 7.6 Hz, 1H), 7.55 (t, J = 7.5 Hz, 1H), 7.38-7.30 (m, 2H), 7.30-7.21 (m, 3H), 6.24 (brs, 1H), 3.77 (dd, J = 13.1, 6.7 Hz, 2H), 2.99 (t, J = 7.0 Hz, 2H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 165.4, 138.8, 138.6, 134.1, 132.9, 131.0, 128.9, 128.8, 128.5, 126.7, 117.6, 110.6, 41.6, 35.4; HRMS (m/z, ESI-TOF): Calcd for $C_{16}H_{15}N_2O^+$ [M+H$^+$] 251.1179, found 251.1180.



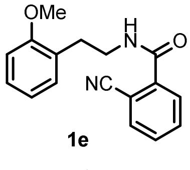
1b ***N*-(2-chlorophenethyl)-2-cyanobenzamide**: ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.74 (t, J = 8.2 Hz, 2H), 7.65 (td, J = 7.7, 1.1 Hz, 1H), 7.56 (td, J = 7.5, 1.2 Hz, 1H), 7.38 (dd, J = 7.5, 1.6 Hz, 1H), 7.33 (dd, J = 7.2, 1.8 Hz, 1H), 7.25-7.16 (m, 2H), 6.27 (brs, 1H), 3.80 (dd, J = 13.0, 6.9 Hz, 2H), 3.14 (t, J = 7.0 Hz, 2H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 165.4, 138.7, 136.4, 134.3, 134.2, 133.0, 131.3, 131.1, 129.8, 128.6, 128.4, 127.3, 117.6, 110.7, 40.3, 33.2; HRMS (m/z, ESI-TOF): Calcd for $C_{16}H_{14}ClN_2O^+$ [M+H$^+$] 285.0789, found 285.0790.



1c **2-Cyano-*N*-(2-fluorophenethyl)benzamide**: ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.75-7.67 (m, 2H), 7.62 (t, J = 7.6 Hz, 1H), 7.55 (t, J = 7.6 Hz, 1H), 7.30-7.18 (m, 2H), 7.13-6.99 (m, 2H), 6.46 (brs, 1H), 3.74 (q, J = 6.6 Hz, 2H), 3.02 (t, J = 7.0 Hz, 2H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 165.4, 161.4 (d, J_{C-F} = 245.4 Hz), 138.7, 134.2, 132.9, 131.3 (d, J_{C-F} = 5.1 Hz), 131.0, 128.6 (d, J_{C-F} = 8.1 Hz), 128.5, 125.6 (d, J_{C-F} = 16.2 Hz), 124.4 (d, J_{C-F} = 4.0 Hz), 117.6, 115.5 (d, J_{C-F} = 22.2 Hz), 110.7, 40.6, 29.1; HRMS (m/z, ESI-TOF): Calcd for $C_{16}H_{14}FN_2O^+$ [M+H$^+$] 269.1085, found 269.1085.

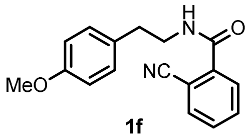


1d **2-Cyano-*N*-(3-methylphenethyl)benzamide**: ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.79-7.66 (m, 2H), 7.62 (t, J = 7.5 Hz, 1H), 7.54 (t, J = 7.6 Hz, 1H), 7.21 (t, J = 7.5 Hz, 1H), 7.15-7.00 (m, 3H), 6.35 (brs, 1H), 3.73 (q, J = 6.9 Hz, 2H), 2.93 (t, J = 7.1 Hz, 2H), 2.33 (s, 3H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 165.3, 138.8, 138.5, 134.1, 132.9, 131.0, 129.7, 128.7, 128.6, 127.5, 125.9, 117.6, 110.6, 41.7, 35.3, 21.5; HRMS (m/z, ESI-TOF): Calcd for $C_{17}H_{17}N_2O^+$ [M+H$^+$] 265.1335, found 265.1336.



1e **2-Cyano-*N*-(2-methoxyphenethyl)benzamide**: ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.73 (d, J = 7.7 Hz, 1H), 7.66 (dd, J = 7.7, 1.2 Hz, 1H), 7.61 (td, J = 7.6, 1.4 Hz, 1H), 7.54 (td, J = 7.5, 1.3 Hz, 1H), 7.26-7.17 (m, 2H), 6.92 (t, J = 7.4 Hz, 1H), 6.87 (d, J = 8.2 Hz, 1H), 6.54 (brs, 1H), 3.83 (s, 3H), 3.73 (q, J = 6.4 Hz, 2H), 2.98 (t, J = 6.7 Hz, 2H); ^{13}C NMR (101 MHz, CDCl$_3$)

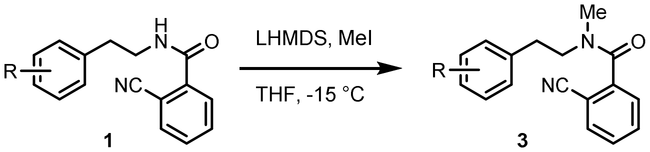
δ 165.3, 157.6, 139.1, 134.2, 132.8, 130.9, 130.9, 128.5, 128.2, 127.3, 121.0, 117.6, 110.7, 110.7, 55.5, 41.1, 30.1; HRMS (m/z, ESI-TOF): Calcd for $C_{17}H_{17}N_2O_2^+$ [M+H$^+$] 281.1285, found 281.1296.



1f **2-Cyano-*N*-(4-methoxyphenethyl)benzamide**: ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.69 (dd, *J* = 7.6, 1.3 Hz, 1H), 7.65 (dd, *J* = 7.8, 1.4 Hz, 1H), 7.59 (td, *J* = 7.6, 1.4 Hz, 1H), 7.52 (td, *J* = 7.6, 1.4 Hz, 1H), 7.15 (d, *J* = 8.5 Hz, 2H), 6.83 (d, *J* = 8.6 Hz, 2H), 6.47 (brs, 1H), 3.76 (s, 3H), 3.67 (q, *J* = 6.9 Hz, 2H), 2.88 (t, *J* = 7.1 Hz, 2H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 165.4, 158.4, 138.8, 134.1, 132.9, 130.9, 130.6, 129.8, 128.4, 117.6, 114.2, 110.6, 55.3, 41.8, 34.5; HRMS (m/z, ESI-TOF): Calcd for $C_{17}H_{17}N_2O_2^+$ [M+H$^+$] 281.1285, found 281.1295.

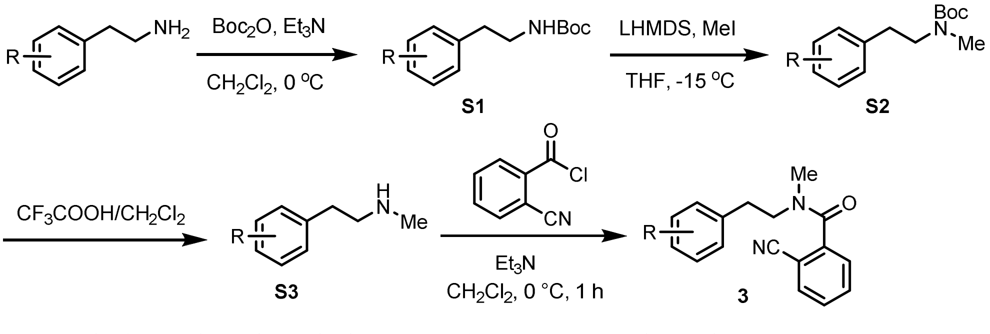
General procedure for preparing substrates of remote meta-C–H bond olefination:

Method A (for substrates **3a-3n**, except **3e** and **3i**):



To a cooled solution of amide **1** (2.0 mmol, *directly synthesized as above without purification*) in THF (20 mL) at -15 °C was added LHMDS (1.0 M in THF, 2.4 mL, 2.4 mmol, 1.2 equiv). After stirring at -15 °C for 15 min, MeI (150 μL, 2.4 mmol, 1.2 equiv) was added dropwise to the above solution. The solution was then slowly warmed to room temperature. After 1 h, the reaction was diluted with EtOAc (30 mL) and quenched with water (20 mL). After removing the organic phase, the aqueous phase was extracted again with EtOAc twice (30 mL × 2). The combined organic extract was washed with brine, dried over Na_2SO_4 and concentrated *in vacuo*. The residue was purified by flash silica gel chromatography with petroleum ether/EtOAc to afford corresponding amide **3** in 70%-90% yields.

Method B (for substrates **3e** and **3i**):



Step 1: To a solution of 2-phenylethan-1-amine (2.0 mmol) and Et_3N (404 mg, 4.0 mmol) in CH_2Cl_2 (7 mL) was added Boc_2O (654 mg, 3.0 mmol, dissolved in 3 mL CH_2Cl_2) at 0 °C. After stirring at 0 °C for 5 min, H_2O (10 mL) was added to quench the reaction. The aqueous phase was extracted with CH_2Cl_2 (10 mL × 2). The combined organic phase was dried over anhydrous Na_2SO_4 and concentrated under reduced pressure. The residue was purified by flash silica gel

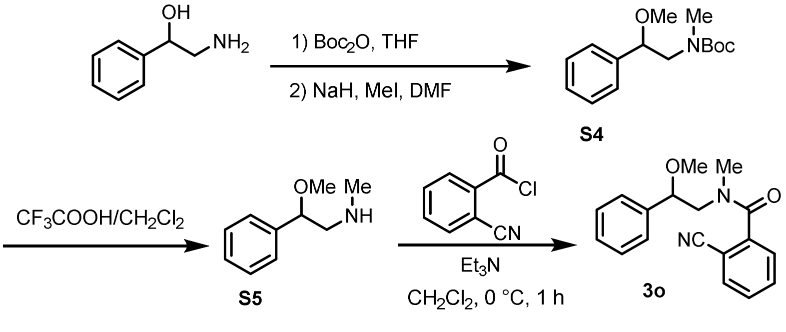
chromatography with petroleum ether/EtOAc to afford corresponding carbamate **S1** in quantitative yields.

Step 2: similar procedure as **Method A**.

Step 3: To a solution of the crude product **S2** (without purification) from Step 2 in CH_2Cl_2 (10 mL) was dropwise added CF_3COOH (10 mL) at room temperature. The reaction was then stirred for 10 minutes and the solvent was removed under reduced pressure. To the residue was added NaOH solution (1 N, 10 mL), and the aqueous phase was extracted with CH_2Cl_2 (10 mL × 3). The combined organic phase was dried over anhydrous Na_2SO_4 and concentrated under reduced pressure to yield **S3** in 80-90% yields.

Step 4: similar procedure as the preparation for substrate **1**.

Preparation for substrates **3o**:

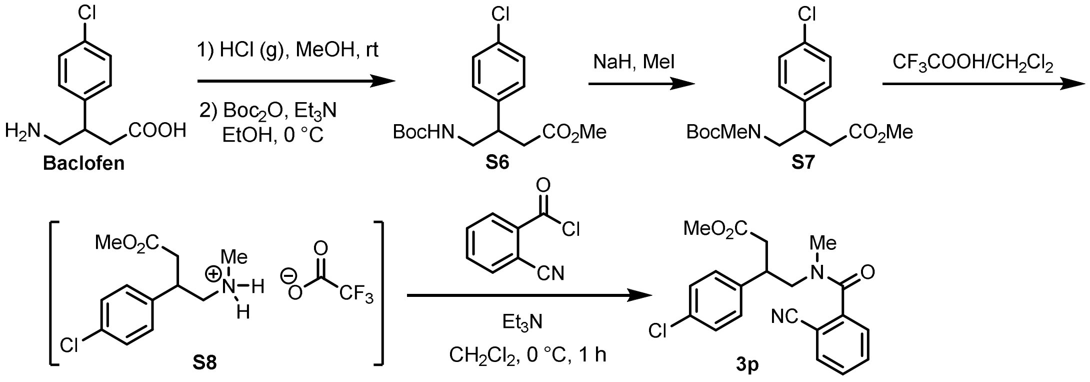


Step 1 and 2: To a solution of 2-amino-1-phenylethan-1-ol (548 mg, 4.0 mmol) in THF (10 mL) at 0 °C was added Boc_2O (959 mg, 4.4 mmol, dissolved in 5.0 mL THF). The mixture was then stirred at 0 °C for 0.5 h. After removal of the solvent, the residue was redissolved in DMF (20 mL) and cooled to 0 °C. To this solution was added NaH (60% in mineral oil, 480 mg, 12 mmol) and the reaction was stirred for 0.5 h at 0 °C. Then MeI (1.7 g, 12 mmol) was added dropwise to the reaction and the solution was stirred for another 2 h while gradually warmed to room temperature. The reaction was then quenched with water (40 mL). The aqueous phase was extracted with EtOAc (20 mL × 3). The combined organic phase was dried over anhydrous Na_2SO_4 and concentrated under reduced pressure. The residue was purified by flash silica gel chromatography with petroleum ether/EtOAc (10:1) to afford product **S4** (890 mg, 84% for two steps) as a colorless oil. **S4**: ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.41-7.26 (m, 5H), 4.52-4.26 (m, 1H), 3.49-3.37 (m, 1H), 3.37-3.28 (m, 1H), 3.24 (s, 3H), 2.96-2.68 (m, 3H), 1.51-1.34 (m, 9H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 156.0, 155.7, 140.0, 128.6, 128.5, 128.0, 127.9, 126.8, 83.3, 82.6, 79.5, 57.2, 55.9, 36.7, 36.1, 28.5.

Step 3: To a solution of **S4** in CH_2Cl_2 (10 mL) was dropwise added CF_3COOH (10 mL) at room temperature. The reaction was then stirred for 30 minutes and the solvent was removed under reduced pressure. To the residue was added H_2O (20 mL) and NaOH solution (1 N, 10 mL), and the aqueous phase was extracted with CH_2Cl_2 (20 mL × 3). The combined organic phase was dried over anhydrous Na_2SO_4 and concentrated under reduced pressure to yield **S5** (488 mg, 88%). **S5**: ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.40-7.29 (m, 5H), 4.40 (dd, J = 9.1, 3.5 Hz, 1H), 3.27 (s, 3H), 2.92-2.71 (m, 3H), 2.51 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 139.9, 128.7, 128.2, 126.8, 82.4, 58.3, 57.0, 36.0.

Step 4: **3o** was then prepared with the same procedure as the preparation for substrate **1** in **Section 2.1**.

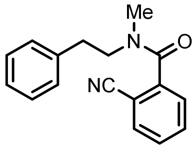
Preparation for substrate **3p**:



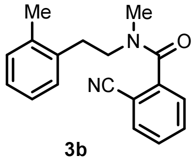
Step 1: To a suspension of baclofen [(*RS*)-4-amino-3-(4-chlorophenyl)butanoic acid] (500 mg, 2.5 mmol) in MeOH (10 mL) was bubbled with HCl gas (generated by adding concentrated H_2SO_4 dropwise to NaCl solid) until a clear solution was observed. Then HCl was bubbled for another 10 min, and the solution was evaporated to give methyl (*RS*)-4-amino-3-(4-chlorophenyl)-butanoate·HCl (590 mg) as colorless crystal. Then the salt (590 mg, 2.2 mmol) was directly dissolved in EtOH (30 mL) without further purification. To this solution was added a solution of Et_3N (1.0 mL, 7.5 mmol) and Boc_2O (1.3 g, 6.2 mmol) in EtOH (8 mL) at 0 °C. The reaction was stirred at 0 °C for 2 h. After evaporation of EtOH, the residue was dissolved in a mixture of H_2O (20 mL) and EtOAc (20 mL). The organic phase was separated and the aqueous phase was extracted with EtOAc (20 mL × 2). The combined organic phase was dried over anhydrous Na_2SO_4 and concentrated under reduced pressure to yield **S6** (688 mg, 84%). **S6** is a known compound,[S2] a sample of **S6** was purified by silica gel chromatography with petroleum ether/EtOAc (10:1). **S6**: ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.29 (d, *J* = 8.4 Hz, 2H), 7.15 (d, *J* = 8.1 Hz, 2H), 4.59 (brs, 1H), 3.59 (s, 3H), 3.49-3.36 (m, 1H), 3.36-3.20 (m, 2H), 2.70 (dd, *J* = 15.7, 6.1 Hz, 1H), 2.58 (dd, *J* = 15.7, 8.1 Hz, 1H), 1.40 (s, 9H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 172.3, 155.9, 139.8, 132.9, 129.0, 128.9, 79.5, 51.8, 45.6, 41.9, 38.1, 28.4.

Step 2: To a solution of **S6** (656 mg, 2.0 mmol, directly synthesized as above without further purification) in DMF (8 mL) at 0 °C was added NaH (60% in mineral oil, 120 mg, 3 mmol, 1.5 equiv). After stirring at 0 °C for 0.5 h, MeI (250 μL, 4 mmol, 2 equiv) was added dropwise. The solution was stirred for another 2 h while gradually warmed to room temperature. Then the reaction was diluted with EtOAc (30 mL) and quenched with water (20 mL). After removing the organic phase, the aqueous phase was extracted again with EtOAc twice (30 mL × 2). The combined organic extract was washed with brine, dried over Na_2SO_4 and concentrated *in vacuo*. The residue was purified by silica gel chromatography with petroleum ether/EtOAc (10:1) to afford **S7** (570 mg, 83%). **S7** (some peaks are broad due to existence of rotamers): ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.27 (d, *J* = 7.1 Hz, 2H), 7.21-7.08 (brm, 2H), 3.67-3.38 (brm, 5H), 3.37-3.20 (m, 1H), 2.83-2.64 (m, 4H), 2.59 (dd, *J* = 15.8, 8.2 Hz, 1H), 1.40 (s, 9H).

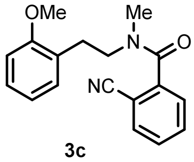
Step 3 and 4: **S7** (115 mg, 0.34 mmol) was dissolved in CH_2Cl_2 (5 mL) and cooled to 0 °C. CF_3COOH (5 mL) was added dropwise and the solution was stirred for another 30 min at 0 °C. Then the solvent was removed under reduced pressure to yield **S8**. [Note: attempt to neutralize and purify **S8** without forming a CF_3COOH salt failed since a corresponding lactam would be gradually formed from attacking of the methyl ester by the free methyl amine.] Without further purification, the residue was dissolved in CH_2Cl_2 (5 mL) under N_2 atmosphere and cooled to 0 °C. 2-Cyanobenzoyl chloride (prepared using the method described in **Section 2.1** using 2-cyanobenzoic acid and oxalyl chloride, 0.4 mmol, dissolved in 5 mL CH_2Cl_2) was added, followed by the addition of Et_3N (140 μL, 1 mmol) dropwise. After stirring for 1 h at 0 °C, the reaction mixture was diluted with CH_2Cl_2 (20 mL) and washed with H_2O (20 mL). The organic phase was dried over anhydrous Na_2SO_4 and concentrated under reduced pressure. The residue was purified by silica gel chromatography with petroleum ether/EtOAc (2:1) to afford **3p** (103 mg, 81%).



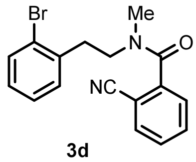
3a **2-Cyano-*N*-methyl-*N*-phenethylbenzamide**: The two rotamers' ratio is about 1:1. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.71 (d, *J* = 7.8 Hz, 0.50H), 7.63 (t, *J* = 7.1 Hz, 0.98H), 7.54-7.40 (m, 1.55H), 7.40-7.29 (m, 2.51H), 7.28-7.20 (m, 1.95H), 7.01-6.87 (m, 0.98H), 6.75 (dd, *J* = 6.4, 2.4 Hz, 0.49H), 3.82 (t, *J* = 7.6 Hz, 1.00H), 3.44 (t, *J* = 7.0 Hz, 1.00H), 3.21 (s, 1.52H), 3.05 (dd, *J* = 8.6, 6.7 Hz, 1.02H), 2.87-2.76 (m, 2.56H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 168.0, 167.6, 140.8, 140.4, 138.8, 137.7, 133.1, 133.0, 132.9, 132.6, 129.5, 129.2, 129.0, 128.9, 128.9, 128.6, 127.6, 127.4, 126.9, 126.6, 116.9, 116.8, 110.0, 109.8, 52.6, 49.5, 37.4, 34.5, 33.4, 33.0; HRMS (m/z, ESI-TOF): Calcd for $C_{17}H_{17}N_2O^+$ [M+H$^+$] 265.1335, found 265.1336.



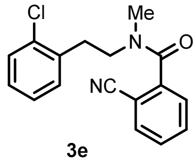
3b **2-Cyano-*N*-methyl-*N*-(2-methylphenethyl)benzamide**: The two rotamers' ratio is about 1:1. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.75-7.58 (m, 1.44H), 7.55-7.35 (m, 2.00H), 7.30-6.99 (m, 3.53H), 6.91 (d, *J* = 7.1 Hz, 0.51H), 6.85-6.78 (m, 0.50H), 3.80-3.69 (m, 0.93H), 3.38 (t, *J* = 7.2 Hz, 1.07H), 3.23 (s, 1.58H), 3.10-3.01 (m, 0.93H), 2.87 (s, 1.39H), 2.81 (t, *J* = 7.2 Hz, 1.07H), 2.43 (s, 1.38H), 1.93 (s, 1.55H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.9, 167.5, 140.7, 140.4, 136.8, 136.5, 136.1, 135.6, 133.1, 132.9, 132.6, 130.6, 130.5, 129.8, 129.6, 129.5, 129.2, 127.6, 127.4, 127.1, 126.8, 126.4, 126.2, 116.9, 116.8, 110.0, 109.8, 51.2, 48.4, 37.2, 33.1, 32.0, 30.8, 19.3, 18.8; HRMS (m/z, ESI-TOF): Calcd for $C_{18}H_{19}N_2O^+$ [M+H$^+$] 279.1492, found 279.1497.



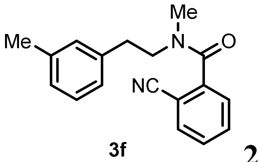
3c **2-Cyano-*N*-(2-methoxyphenethyl)-*N*-methylbenzamide**: The two rotamers' ratio is about 2:1. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.69 (d, *J* = 7.8 Hz, 0.32H), 7.66-7.58 (m, 0.96H), 7.50-7.39 (m, 1.63H), 7.35 (d, *J* = 7.7 Hz, 0.31H), 7.29-7.17 (m, 1.46H), 6.97-6.77 (m, 2.60H), 6.72 (d, *J* = 8.2 Hz, 0.64H), 3.86 (s, 0.97H), 3.84-3.77 (m, 0.69H), 3.54 (s, 1.97H), 3.43 (t, *J* = 6.9 Hz, 1.31H), 3.21 (s, 1.94H), 3.09-3.01 (m, 0.66H), 2.86-2.76 (m, 2.29H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.8, 167.3, 157.6, 157.4, 140.8, 140.4, 132.9, 132.8, 132.6, 132.3, 130.7, 130.6, 129.2, 128.8, 128.2, 127.8, 127.6, 127.2, 127.0, 125.7, 120.5, 120.5, 116.8, 110.2, 110.2, 109.8, 109.7, 55.2, 54.8, 50.6, 47.5, 37.1, 32.8, 29.4, 28.2; HRMS (m/z, ESI-TOF): Calcd for $C_{18}H_{19}N_2O_2^+$ [M+H$^+$] 295.1441, found 295.1442.



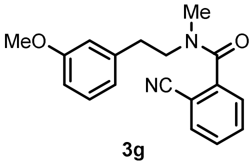
3d **N-(2-bromophenethyl)-2-Cyano-N-methylbenzamide**: The two rotamers' ratio is about 1:1. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.70 (d, *J* = 7.7 Hz, 0.48H), 7.68-7.61 (m, 0.97H), 7.58-7.37 (m, 3.47H), 7.28 (t, *J* = 7.5 Hz, 0.54H), 7.22 (t, *J* = 7.4 Hz, 0.57H), 7.10 (t, *J* = 7.6 Hz, 1.02H), 7.05 (d, *J* = 7.5 Hz, 0.52H), 6.86 (d, *J* = 7.4 Hz, 0.53H), 3.88-3.76 (m, 0.92H), 3.49 (t, *J* = 7.1 Hz, 1.06H), 3.23 (s, 1.58H), 3.19 (t, *J* = 7.6 Hz, 0.94H), 2.93 (t, *J* = 7.1 Hz, 1.04H), 2.85 (s, 1.36H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.8, 167.4, 140.3, 139.9, 137.9, 136.6, 132.9, 132.8, 132.8, 132.7, 132.5, 131.2, 131.0, 129.3, 129.2, 128.6, 128.3, 127.7, 127.6, 127.3, 127.1, 124.3, 124.2, 116.7, 116.7, 109.6, 109.6, 50.2, 47.5, 37.2, 34.6, 33.4, 32.9; HRMS (m/z, ESI-TOF): Calcd for $C_{17}H_{16}BrN_2O^+$ [M+H$^+$] 343.0441, found 343.0448.



3e **N-(2-chlorophenethyl)-2-cyano-N-methylbenzamide**: The two rotamers' ratio is about 1:1. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.61 (d, *J* = 7.7 Hz, 0.47H), 7.59-7.51 (m, 0.96H), 7.45-7.24 (m, 2.89H), 7.18-7.05 (m, 2.51H), 6.97 (dd, *J* = 6.2, 2.8 Hz, 0.51H), 6.80 (d, *J* = 7.3 Hz, 0.50H), 3.73 (dd, *J* = 8.5, 6.5 Hz, 0.92H), 3.39 (t, *J* = 7.1 Hz, 1.06H), 3.17-3.06 (m, 2.49H), 2.85 (t, *J* = 7.0 Hz, 1.08H), 2.75 (s, 1.40H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 168.0, 167.6, 140.6, 140.2, 136.4, 135.1, 134.1, 134.0, 133.1, 133.0, 132.9, 132.6, 131.5, 131.2, 129.7, 129.6, 129.5, 129.3, 128.5, 128.2, 127.5, 127.3, 127.3, 127.2, 116.8, 116.8, 109.9, 109.8, 50.4, 47.7, 37.3, 33.1, 32.6, 31.2; HRMS (m/z, ESI-TOF): Calcd for $C_{17}H_{16}ClN_2O^+$ [M+H$^+$] 299.0946, found 299.0957.

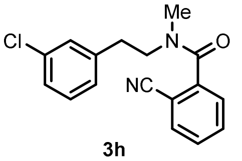


3f **2-Cyano-N-methyl-N-(3-methylphenethyl)benzamide**: The two rotamers' ratio is about 45:55. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.70 (d, *J* = 7.8 Hz, 0.45H), 7.67-7.59 (m, 0.93H), 7.54-7.40 (m, 1.46H), 7.37 (d, *J* = 7.7 Hz, 0.45H), 7.21 (t, *J* = 7.5 Hz, 0.48H), 7.17-7.07 (m, 1.42H), 7.04 (d, *J* = 7.3 Hz, 0.99H), 6.82-6.69 (m, 1.46H), 3.79 (dd, *J* = 8.4, 7.0 Hz, 0.93H), 3.42 (t, *J* = 6.9 Hz, 1.07H), 3.20 (s, 1.50H), 3.00 (dd, *J* = 8.8, 6.6 Hz, 0.95H), 2.82 (s, 1.42H), 2.77 (t, *J* = 7.0 Hz, 1.10H), 2.34 (s, 1.51H), 2.26 (s, 1.46H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 168.0, 167.5, 140.8, 140.4, 138.7, 138.4, 138.2, 137.6, 133.1, 133.0, 132.8, 132.6, 129.8, 129.6, 129.5, 129.2, 128.7, 128.5, 127.7, 127.6, 127.4, 127.3, 126.0, 125.9, 116.9, 116.9, 110.0, 109.8, 52.7, 49.6, 37.4, 34.4, 33.3, 32.9, 21.43, 21.36; HRMS (m/z, ESI-TOF): Calcd for $C_{18}H_{19}N_2O^+$ [M+H$^+$] 279.1492, found 279.1492.

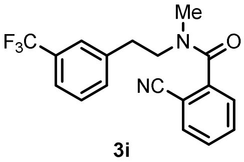


3g **2-Cyano-N-(3-methoxyphenethyl)-N-methylbenzamide**: The two rotamers' ratio is about 1:1. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 (d, *J* = 7.8 Hz, 0.51H), 7.62-7.53 (m, 0.99H), 7.49-7.36 (m, 1.50H), 7.33 (d, *J* = 7.7 Hz, 0.50H), 7.20 (t, *J* = 7.9 Hz, 0.51H), 7.12 (t, *J* = 7.9 Hz, 0.49H), 6.87 (d, *J* = 7.6 Hz, 0.50H), 6.83 (s, 0.50H), 6.79 (d, *J* = 7.4 Hz, 0.49H), 6.74

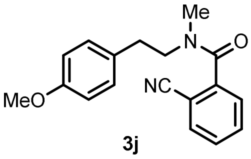
(dt, *J* = 8.0, 3.0 Hz, 0.97H), 6.51 (d, *J* = 7.5 Hz, 0.49H), 6.41 (s, 0.47H), 3.81-3.73 (m, 2.54H), 3.68 (s, 1.48H), 3.39 (t, *J* = 6.9 Hz, 0.97H), 3.14 (s, 1.48H), 2.98 (t, *J* = 7.6 Hz, 1.03H), 2.77 (s, 1.49H), 2.74 (t, *J* = 6.9 Hz, 0.98H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.8, 167.4, 159.8, 159.7, 140.5, 140.3, 140.2, 139.0, 133.0, 132.8, 132.7, 132.5, 129.7, 129.5, 129.4, 129.1, 127.5, 127.1, 121.1, 121.0, 116.8, 116.7, 114.3, 112.1, 112.0, 109.7, 109.5, 55.1, 55.0, 52.4, 49.2, 37.2, 34.3, 33.3, 32.7; HRMS (m/z, ESI-TOF): Calcd for $C_{18}H_{19}N_2O_2^+$ [M+H$^+$] 295.1441, found 295.1447.



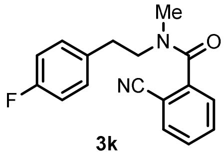
3h **_N_-(3-chlorophenethyl)-2-cyano-_N_-methylbenzamide**: The two rotamers' ratio is about 3:2. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.71 (d, *J* = 7.7 Hz, 0.57H), 7.65 (t, *J* = 7.9 Hz, 0.97H), 7.56-7.44 (m, 1.51H), 7.39 (d, *J* = 7.7 Hz, 0.58H), 7.34-7.16 (m, 3.39H), 6.91-6.79 (m, 1.26H), 3.80 (t, *J* = 7.5 Hz, 1.14H), 3.45 (t, *J* = 6.7 Hz, 0.88H), 3.20 (s, 1.33H), 3.02 (t, *J* = 7.5 Hz, 1.14H), 2.84 (s, 1.67H), 2.80 (t, *J* = 6.8 Hz, 0.91H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.5, 167.2, 140.5, 140.0, 139.7, 139.4, 134.0, 133.7, 132.8, 132.6, 132.6, 132.3, 129.7, 129.6, 129.2, 129.1, 128.6, 128.4, 127.0, 126.9, 126.8, 126.6, 126.3, 116.5, 116.4, 109.3, 109.2, 51.7, 48.6, 36.9, 33.6, 32.5, 32.4; HRMS (m/z, ESI-TOF): Calcd for $C_{17}H_{16}ClN_2O^+$ [M+H$^+$] 299.0946, found 299.0946.



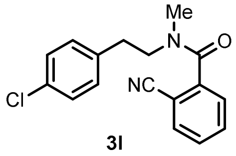
3i **2-Cyano-_N_-methyl-_N_-(3-(trifluoromethyl)phenethyl)benzamide**: The two rotamers' ratio is about 3:2. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.70 (d, *J* = 7.7 Hz, 0.61H), 7.64 (t, *J* = 7.5 Hz, 0.98H), 7.58-7.40 (m, 4.25H), 7.37 (t, *J* = 7.2 Hz, 0.95H), 7.17 (d, *J* = 7.6 Hz, 0.37H), 7.13 (s, 0.33H), 6.80 (dd, *J* = 6.6, 2.1 Hz, 0.35H), 3.81 (dd, *J* = 8.7, 6.5 Hz, 1.14H), 3.47 (t, *J* = 6.9 Hz, 0.83H), 3.20 (s, 1.12H), 3.10 (t, *J* = 7.7 Hz, 1.17H), 2.88 (t, *J* = 7.0 Hz, 0.77H), 2.84 (s, 1.75H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.8, 167.6, 140.3, 140.0, 139.7, 138.6, 133.1, 132.8, 132.6, 132.4, 132.3, 130.6 (q, J_{C-F} = 32.0 Hz), 130.5 (q, J_{C-F} = 32.1 Hz), 129.5, 129.4, 129.2, 129.0, 127.1, 125.4 (q, J_{C-F} = 4.0 Hz), 125.2 (q, J_{C-F} = 3.1 Hz), 124.1 (q, J_{C-F} = 273.2 Hz), 123.9 (q, J_{C-F} = 273.6 Hz), 123.59 (q, J_{C-F} = 3.7 Hz), 123.28 (q, J_{C-F} = 3.9 Hz), 116.7, 116.7, 109.7, 109.6, 52.1, 49.0, 37.1, 34.1, 32.9, 32.7; HRMS (m/z, ESI-TOF): Calcd for $C_{18}H_{16}F_3N_2O^+$ [M+H$^+$] 333.1209, found 333.1221.



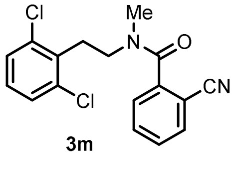
3j **2-Cyano-_N_-(4-methoxyphenethyl)-_N_-methylbenzamide**: The two rotamers' ratio is about 1:1. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.66 (d, *J* = 7.7 Hz, 0.51H), 7.60 (t, *J* = 6.9 Hz, 0.96H), 7.50-7.37 (m, 1.48H), 7.34 (d, *J* = 7.7 Hz, 0.47H), 7.20 (d, *J* = 8.3 Hz, 0.97H), 6.89-6.71 (m, 2.45H), 6.75 (d, *J* = 8.5 Hz, 0.96H), 3.82-3.66 (m, 4.00H), 3.36 (t, *J* = 6.9 Hz, 0.96H), 3.15 (s, 1.46H), 2.95 (t, *J* = 7.5 Hz, 0.99H), 2.77 (s, 1.45H), 2.72 (t, *J* = 6.9 Hz, 1.02H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.9, 167.4, 158.5, 158.2, 140.7, 140.3, 133.0, 132.9, 132.8, 132.6, 130.7, 129.8, 129.7, 129.6, 129.4, 129.2, 127.5, 127.2, 116.8, 116.8, 114.1, 114.0, 109.8, 109.6, 55.3, 55.2, 52.7, 49.6, 37.3, 33.5, 32.8, 32.4; HRMS (m/z, ESI-TOF): Calcd for $C_{18}H_{19}N_2O_2^+$ [M+H$^+$] 295.1441, found 295.1443.


3k

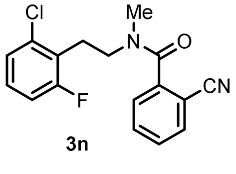
2-Cyano-*N*-(4-fluorophenethyl)-*N*-methylbenzamide: The two rotamers' ratio is about 54:46. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.70 (d, J = 7.7 Hz, 0.54H), 7.64 (t, J = 7.9 Hz, 0.98H), 7.56-7.40 (m, 1.46H), 7.37 (d, J = 7.7 Hz, 0.54H), 7.28 (t, J = 6.8 Hz, 1.21H), 7.01 (t, J = 8.5 Hz, 1.14H), 6.95-6.86 (m, 2.02H), 3.78 (t, J = 7.6 Hz, 1.12H), 3.42 (t, J = 6.9 Hz, 0.85H), 3.19 (s, 1.25H), 3.02 (t, J = 7.5 Hz, 1.12H), 2.88-2.74 (m, 2.63H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 168.0, 167.6, 161.9 (d, $J_{C\text{-}F}$ = 246 Hz), 161.7 (d, $J_{C\text{-}F}$ = 245 Hz), 140.6, 140.3, 134.5 (d, $J_{C\text{-}F}$ = 3 Hz), 133.4 (d, $J_{C\text{-}F}$ = 3 Hz), 133.1 (d, $J_{C\text{-}F}$ = 16 Hz), 132.8 (d, $J_{C\text{-}F}$ = 16 Hz), 130.4, 130.4, 130.3, 130.3, 129.5, 129.4, 127.5, 127.3, 116.9, 116.8, 115.7 (d, $J_{C\text{-}F}$ = 21 Hz), 115.4 (d, $J_{C\text{-}F}$ = 21 Hz), 110.0, 109.8, 52.7, 49.5, 37.4, 33.7, 33.0, 32.6; HRMS (m/z, ESI-TOF): Calcd for $C_{17}H_{16}FN_2O^+$ [M+H$^+$] 283.1241, found 283.1242.


3l

***N*-(4-chlorophenethyl)-2-cyano-*N*-methylbenzamide**: The two rotamers' ratio is about 56:44. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.70 (d, J = 7.8 Hz, 0.56H), 7.64 (t, J = 7.2 Hz, 0.97H), 7.55-7.42 (m, 1.41H), 7.37 (d, J = 7.7 Hz, 0.57H), 7.33-7.16 (m, 3.19H), 6.88 (t, J = 8.4 Hz, 1.19H), 3.86-3.73 (m, 1.16H), 3.42 (t, J = 7.0 Hz, 0.83H), 3.18 (s, 1.22H), 3.06-2.97 (m, 1.17H), 2.82 (s, 1.73H), 2.79 (t, J = 7.0 Hz, 0.83H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.9, 167.6, 140.6, 140.2, 137.3, 136.2, 133.2, 133.0, 133.0, 132.8, 132.7, 132.4, 130.4, 130.2, 129.6, 129.4, 129.0, 128.8, 127.6, 127.3, 116.9, 116.8, 109.9, 109.8, 52.5, 49.4, 37.4, 33.9, 33.0, 32.7; HRMS (m/z, ESI-TOF): Calcd for $C_{17}H_{16}ClN_2O^+$ [M+H$^+$] 299.0946, found 299.0947.

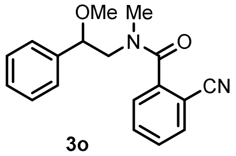

3m

2-Cyano-*N*-(2,6-dichlorophenethyl)-*N*-methylbenzamide: The two rotamers' ratio is about 2:1. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.74-7.61 (m, 1.28H), 7.57 (t, J = 7.6 Hz, 0.63H), 7.54-7.43 (m, 1.32H), 7.32 (d, J = 8.0 Hz, 0.65H), 7.28-7.23 (m, 1.23H), 7.20 (d, J = 8.0 Hz, 1.20H), 7.15-7.04 (m, 0.99H), 3.83 (t, J = 7.3 Hz, 0.68H), 3.48-3.35 (m, 1.96H), 3.29 (s, 1.87H), 3.15 (t, J = 7.8 Hz, 1.28H), 2.93 (s, 1.04H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.9, 167.6, 140.6, 140.4, 135.9, 135.7, 134.9, 133.3, 133.1, 133.0, 132.9, 132.9, 129.5, 129.4, 128.7, 128.4, 128.4, 127.5, 116.8, 110.2, 110.0, 48.9, 46.1, 37.2, 33.3, 30.2, 28.9; HRMS (m/z, ESI-TOF): Calcd for $C_{17}H_{15}Cl_2N_2O^+$ [M+H$^+$] 333.0556, found 333.0567.

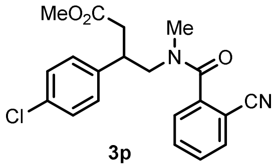

3n

***N*-(2-chloro-6-fluorophenethyl)-2-cyano-*N*-methylbenzamide**: The two rotamers' ratio is about 3:2. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.74-7.60 (m, 1.36H), 7.56-7.40 (m, 1.94H), 7.23-7.11 (m, 1.53H), 7.10-6.96 (m, 1.61H), 6.92 (t, J = 8.7 Hz, 0.61H), 3.83 (t, J = 7.1

Hz, 0.75H), 3.44 (t, J = 7.3 Hz, 1.19H), 3.30-3.18 (m, 2.56H), 3.01 (t, J = 7.2 Hz, 1.19H), 2.89 (s, 1.16H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.9, 167.6, 161.8 (d, $J_{C\text{-}F}$ = 248 Hz), 161.7 (d, $J_{C\text{-}F}$ = 249 Hz), 140.6, 140.2, 135.5 (d, $J_{C\text{-}F}$ = 6 Hz), 135.4 (d, $J_{C\text{-}F}$ = 6 Hz), 133.1, 132.9, 132.8, 129.5, 129.4, 128.8 (d, $J_{C\text{-}F}$ = 10 Hz), 128.5 (d, $J_{C\text{-}F}$ = 10 Hz), 127.4 (d, $J_{C\text{-}F}$ = 4 Hz), 125.4 (d, $J_{C\text{-}F}$ = 4 Hz), 125.3, 124.9 (d, $J_{C\text{-}F}$ = 19 Hz), 123.4 (d, $J_{C\text{-}F}$ = 19 Hz), 116.8, 114.2 (d, $J_{C\text{-}F}$ = 23 Hz), 114.0 (d, $J_{C\text{-}F}$ = 23 Hz), 110.0, 109.9, 49.4, 46.6, 37.2, 33.1, 25.3 (d, $J_{C\text{-}F}$ = 2 Hz), 24.3 (d, $J_{C\text{-}F}$ = 2 Hz); HRMS (m/z, ESI-TOF): Calcd for $C_{17}H_{15}ClFN_2O^+$ [M+H$^+$] 317.0851, found 317.0861.



3o **2-Cyano-*N*-(2-methoxy-2-phenylethyl)-*N*-methylbenzamide**: The two rotamers' ratio is about 56:44. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.72 (d, J = 7.8 Hz, 0.56H), 7.70-7.60 (m, 1.00H), 7.59-7.35 (m, 4.39H), 7.36-7.26 (m, 1.91H), 7.18 (d, J = 7.6 Hz, 0.44H), 7.09-6.97 (m, 0.88H), 4.72 (dd, J = 8.7, 3.9 Hz, 0.56H), 4.29 (dd, J = 8.3, 4.2 Hz, 0.44H), 3.95 (dd, J = 13.7, 3.9 Hz, 0.56H), 3.55-3.43 (m, 1.03H), 3.38-3.17 (m, 4.86H), 2.93 (s, 1.73H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 168.6, 167.7, 140.6, 140.4, 139.4, 138.4, 132.9, 132.8, 132.6, 132.4, 129.3, 129.1, 128.6, 128.4, 128.2, 127.9, 127.8, 127.0, 126.6, 126.3, 116.8, 116.7, 110.3, 109.7, 82.0, 80.9, 57.2, 56.9, 56.8, 54.6, 38.9, 33.8; HRMS (m/z, ESI-TOF): Calcd for $C_{18}H_{19}N_2O_2^+$ [M+H$^+$] 295.1441, found 295.1447.

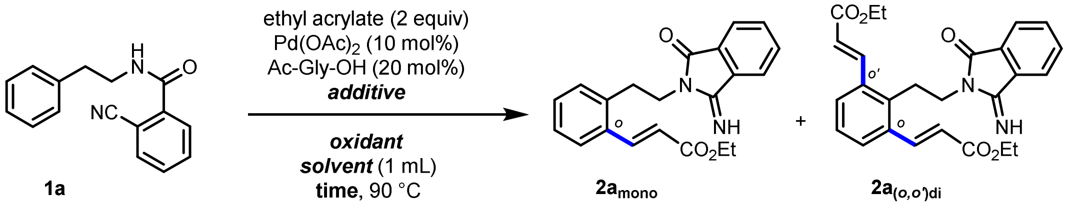


3p **Methyl 3-(4-chlorophenyl)-4-(2-cyano-*N*-methylbenzamido)butanoate**: The two rotamers' ratio is about 2:1. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.69 (d, J = 7.7 Hz, 0.68H), 7.67-7.56 (m, 1.04H), 7.55-7.42 (m, 1.42H), 7.36-7.28 (m, 2.68H), 7.22 (d, J = 8.3 Hz, 0.68H), 7.16 (d, J = 7.6 Hz, 0.69H), 6.88 (d, J = 8.3 Hz, 0.65H), 6.83-6.74 (m, 0.29H), 3.99 (dd, J = 16.6, 10.5 Hz, 0.71H), 3.73-3.63 (m, 1.47H), 3.63-3.56 (m, 3.00H), 3.56-3.30 (m, 1.09H), 3.14 (s, 0.94H), 2.92-2.82 (m, 0.75H), 2.78-2.63 (m, 2.80H), 2.59-2.42 (m, 0.69H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 172.1, 171.4, 168.1, 168.0, 140.4, 139.7, 139.6, 138.7, 133.5, 133.1, 133.1, 133.0, 132.6, 129.6, 129.5, 129.3, 129.2, 128.9, 128.2, 127.2, 116.9, 116.7, 109.9, 109.9, 56.5, 52.3, 52.0, 51.8, 39.9, 39.6, 38.3, 37.4, 33.6; HRMS (m/z, ESI-TOF): Calcd for $C_{20}H_{20}ClN_2O_3^+$ [M+H$^+$] 371.1157, found 371.1168.

2.2 Optimization of olefination reaction conditions.

2.2.1 Condition optimization for remote-selective ortho-C–H bond olefination: ^{a}

General optimization procedure: A 35 mL sealed tube or 50 mL Schlenk sealed tube (with a Teflon cap, Schlenk sealed tube was used when oxygen was the terminal oxidant) equipped with a magnetic stir bar was charged with amide **1a** (0.10 mmol, 1.0 equiv), $Pd(OAc)_2$ (2.3 mg, 0.010 mmol, 10 mol%), Ac-Gly-OH (2.4 mg, 0.020 mmol, 20 mol%), oxidant and solid additive (if additive was used) sequentially. The tube was then purged with oxygen (1 atm, if oxygen was used). *t*-Amyl-OH (0.5 mL) was added to the mixture, followed by ethyl acrylate (2.0 equiv) and HFIP (32 μL, if used). And then another 0.5 mL of *t*-Amyl-OH was added along the inside wall of the tube. The tube was then capped under a flow of O_2 (1 atm, if oxygen was used) and submerged into a preheated 90 °C oil bath. The reaction was stirred for 20–36 h and cooled to room temperature. The crude reaction mixture was diluted with EtOAc (5 mL) and filtered through a short pad of Celite. The sealed tube and Celite pad were washed with an additional 20 mL of EtOAc. The filtrate was concentrated *in vacuo*, and crude ^{1}H NMR spectrum was taken using CH_2Br_2 as internal standard. (Note: all the chemicals are added as their pure form, for example, not in a solution.)

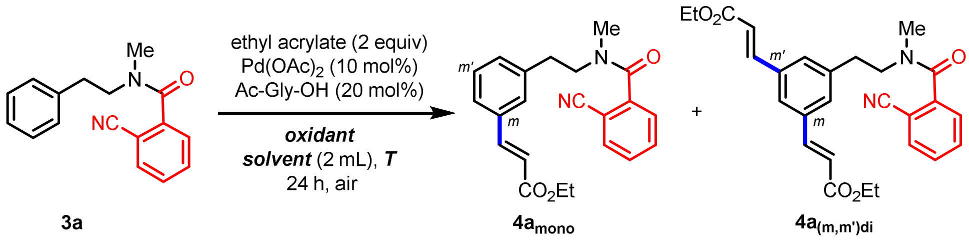


Entry	t (h)	oxidant (equiv)	additive (equiv)	solvent	Yield of $3a_{mono}$ (%)	Yield of $3a_{di(o,o')}$ (%)
1	24	AgOAc (3)	--	*t*-Amyl-OH	32	50
2	24	AgOAc (3)	--	toluene	29	6
3	**20**	**Ag_2CO_3 (3)**	**--**	***t*-Amyl-OH**	**40**	**55**
4	20	O_2 (1 atm)	$Cu(OAc)_2$ (0.3)	*t*-Amyl-OH	30	16
5	20	O_2 (1 atm)	HFIP (3)	*t*-Amyl-OH	33	40
6	36	air (1 atm)	HFIP (3)	*t*-Amyl-OH	trace	trace
7	20	O_2 (1 atm)	HFIP (3)	DCE	0	0
8[b]	20	O_2 (1 atm)	HFIP (3)	*t*-Amyl-OH	trace	--
9	36	O_2 (1 atm)	HFIP (3)	*t*-Amyl-OH	33	34
10[c]	20	O_2 (1 atm)	HFIP (3)	*t*-Amyl-OH	trace	--
11[d]	**23**	**O_2 (1 atm)**	**HFIP (3)**	***t*-Amyl-OH**	**32**	**57**
12[d]	23	O_2 (1 atm)	--	*t*-Amyl-OH	40	14

[a] Conditions: **1a** (0.1 mmol), ethyl acrylate (0.2 mmol), $Pd(OAc)_2$ (10 mol%), Ac-Gly-OH (20 mol%). Yield was determined by ^{1}H NMR analysis using CH_2Br_2 as internal standard. [b] Ac-Ile-OH (20 mol%) was used instead of Ac-Gly-OH. [c] 10 mol% *p*-benzoquinone was added. [d] 0.2 mmol scale, Ag_2CO_3 (30 mol%) was added and the isolated yields were reported for entry 11.

2.2.2 Condition optimization for remote meta-C–H bond olefination: [a]

General optimization procedure: A 35 mL sealed tube or 50 mL Schlenk sealed tube (with a Teflon cap, Schlenk sealed tube was used when the reaction was run under oxygen/nitrogen) equipped with a magnetic stir bar was charged with amide **3** (0.20 mmol, 1.0 equiv), $Pd(OAc)_2$ (4.6 mg, 0.020 mmol, 10 mol%), Ac-Gly-OH (4.7 mg, 0.040 mmol, 20 mol%) and AgOAc (100 mg, 0.60 mmol, 3 equiv). The tube was then purged with nitrogen (1 atm, if nitrogen was used). DCE (1.0 mL) was added to the mixture, followed by ethyl acrylate (2.0 equiv) [and DMF (77 μL, 1.0 mmol, 5 equiv) when necessary as noted below]. And then 1.0 mL of HFIP was added along the inside wall of the tube. The tube was then capped under a flow of nitrogen (if nitrogen was used) and submerged into a preheated 90 °C oil bath. The reaction was stirred for 24–48 h and cooled to room temperature. The crude reaction mixture was diluted with EtOAc (5 mL) and filtered through a short pad of Celite. The sealed tube and Celite pad were washed with an additional 20 mL of EtOAc. The filtrate was concentrated *in vacuo*, and crude ^{1}H NMR spectrum was taken using CH_2Br_2 as internal standard. (Note: all the chemicals are added as their pure form, for example, not in a solution.)



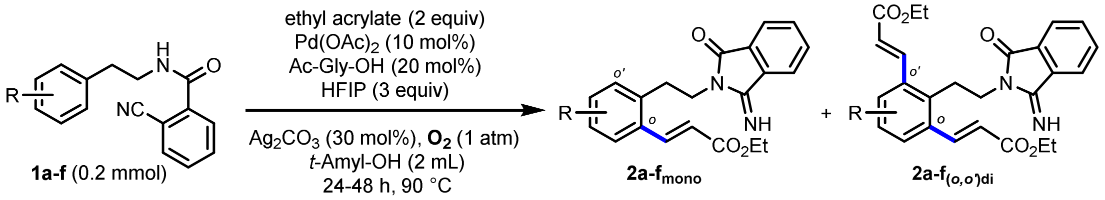
Entry	T (°C)	solvents [v/v]	oxidant (equiv)	additive (equiv)	Yield of **4a**$_{\text{mono}}$ (%)	Yield of **4a**$_{\text{(m,m')di}}$ (%)	**3a** (%)
1	90	*t*-Amyl-OH	O_2 (1 atm)	Ag_2CO_3 (0.3)	10	--	90
2	90	HFIP	AgOAc (3)	--	13	45	trace
3^b	90	HFIP	AgOAc (3)	--	17	24	trace
4^c	90	HFIP	AgOAc (3)	--	messy mixture		trace
5	90	DCE/HFIP [50/50]	AgOAc (3)	--	32	39	trace
6	90	DCE/HFIP [85/15]	AgOAc (3)	--	48	25	10
7	90	DCE/HFIP [85/15]	AgOAc (3)	$KHCO_3$ (2)	26	0	55
8	90	DCE/HFIP [85/15]	AgOAc (3)	KH_2PO_4 (2)	50	22	15
9	90	DCE/HFIP [85/15]	Ag_2CO_3 (3)	--	40	31	7
10^d	90	DCE/HFIP [85/15]	AgOAc (3)	--	44	27	10
11^d	90	DCE/HFIP [85/15]	AgOAc (3)	DMF (5)	44	42	trace
12	90	DCE/HFIP [95/5]	AgOAc (3)	--	32	7	44
13	90	DCE/HFIP [80/20]	AgOAc (3)	--	42	33	6
14	90	DCE/HFIP [70/30]	AgOAc (3)	--	43	31	trace
15^d	90	DCE/HFIP [50/50]	AgOAc (3)	--	46	37	trace
16^{d,e}	**80**	**DCE/HFIP [50/50]**	**AgOAc (3)**	**--**	**46**	**44**	**trace**

17[d,f]	**80**	**DCE/HFIP [50/50]**	**AgOAc (3)**	**DMF (5)**	**58**	**32**	**trace**
18[d]	90	EtOAc/HFIP [50/50]	AgOAc (3)	--	42	18	15
19	90	CF_3CH_2OH	AgOAc (3)	--	29	37	trace
20	90	CF_3CH_2OH/ HFIP [85/15]	AgOAc (3)	--	34	35	trace
21	90	CF_3CH_2OH/ DCE [50/50]	AgOAc (3)	--	44	28	10
22[g]	90	DCE/HFIP [50/50]	Ag_2O (3)	DMF (5)	--	--	95
23[g]	90	DCE/HFIP [50/50]	$Cu(OAc)_2$ (3)	DMF (5)	trace	--	~100
24[g,h]	60	DCE/HFIP [50/50]	AgOAc (2)	--	61	14	25
25[g,h,i]	60	DCE/HFIP [50/50]	AgOAc (2)	--	61	13	25
26[e,g,j]	80	DCE/HFIP [50/50]	AgOAc (3)	--	54	8	32

[a] Conditions: **1a** (0.2 mmol), ethyl acrylate (0.4 mmol), $Pd(OAc)_2$ (10 mol%), Ac-Gly-OH (20 mol%). Yield was determined by ^1H NMR analysis using CH_2Br_2 as internal standard. [b] Ac-Ile-OH (20 mol%) was used instead of Ac-Gly-OH. [c] Ac-Gly-OH was not added. [d] under N_2. [e] 32 h. [f] 28 h. [g] 0.1 mmol scale. [h] ethyl acrylate (0.3 mmol); 48 h. [i] DCE/HFIP (0.25mL/0.25mL). [j] $Pd(OAc)_2$ (3 mol%), Ac-Gly-OH (6 mol%; DCE/HFIP (0.3mL/0.3mL).

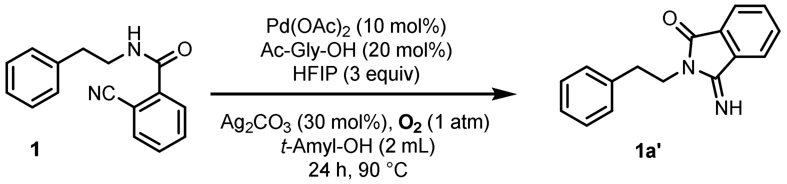
2.3 General remote-selective *ortho*-C–H bond olefination procedure and characterization of olefinated compounds.

***General remote-selective ortho-C–H bond olefination procedure**:*

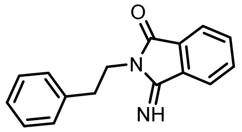


A 50 mL Schlenk sealed tube (with a Teflon cap) equipped with a magnetic stir bar was charged with amide **1** (0.20 mmol, 1.0 equiv), $Pd(OAc)_2$ (4.6 mg, 0.020 mmol, 10 mol%), Ac-Gly-OH (4.7 mg, 0.040 mmol, 20 mol%) and Ag_2CO_3 (16 mg, 0.060 mmol, 0.3 equiv). The tube was then purged with oxygen. *t*-Amyl-OH (1.0 mL) and HFIP (63 μL) was added to the mixture, followed by ethyl acrylate (2.0 equiv). And then another 1.0 mL of *t*-Amyl-OH was added along the inside wall of the tube. The tube was then capped under a flow of O_2 and submerged into a preheated 90 °C oil bath. The reaction was stirred for 20–48 h and cooled to room temperature. The crude reaction mixture was diluted with EtOAc (5 mL) and filtered through a short pad of Celite. The sealed tube and Celite pad were washed with an additional 20 mL of EtOAc. The filtrate was concentrated *in vacuo*, and the resulting residue was purified by preparative thin layer chromatography using petroleum ether/EtOAc as the eluent.

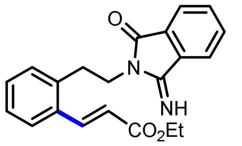
Preparation of Substrate 1a':



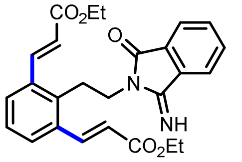
Substrate **1a'** was obtained in 85% yields (by ^{1}H NMR) using the above olefination procedure without adding ethyl acrylate in 24 h, or by heating with NaH (1.2 equiv) at 90 °C in THF for 1 h for large scale preparation in almost quantitative yield. The olefination reaction with **1a'** as the substrate using the above olefination procedure produced 32% of **2a$_{\mathbf{mono}}$** and 52% of **2a$_{\mathbf{(o,o')di}}$**, in 23 h, by ^{1}H NMR analysis using CH_2Br_2 as internal standard.



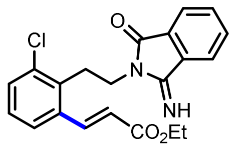
1a' **3-Imino-2-phenethylisoindolin-1-one**: ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.87-7.80 (m, 1H), 7.73 (d, *J* = 6.7 Hz, 1H), 7.65 (pd, *J* = 7.4, 1.3 Hz, 2H), 7.28 (d, *J* = 4.3 Hz, 4H), 7.25-7.16 (m, 1H), 4.06 (dd, *J* = 8.7, 6.8 Hz, 2H), 3.13-2.92 (m, 2H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.7, 160.2, 138.5, 132.9, 132.2, 131.0, 128.9, 128.5, 126.5, 123.1, 120.9, 39.7, 34.5.



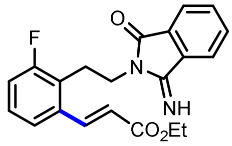
2a$_{mono}$ **(*E*)-ethyl-3-(2-(2-(1-imino-3-oxoisoindolin-2-yl)ethyl)phenyl)acrylate**: The corresponding reaction was run with standard conditions for 24 h. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.16 (d, *J* = 15.8 Hz, 1H), 7.80 (d, *J* = 7.1 Hz, 1H), 7.74-7.59 (m, 3H), 7.55 (d, *J* = 7.6 Hz, 1H), 7.32-7.21 (m, 3H), 6.27 (d, *J* = 15.7 Hz, 1H), 4.24 (q, *J* = 7.1 Hz, 2H), 4.03 (t, *J* = 7.3 Hz, 2H), 3.19 (t, *J* = 7.3 Hz, 2H), 1.35 (t, *J* = 7.1 Hz, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.7, 166.9, 141.9, 138.4, 133.9, 133.0, 132.3, 131.1, 130.8, 130.3, 127.4, 126.8, 123.4, 120.9, 120.1, 60.6, 39.5, 31.9, 14.5; HRMS (m/z, ESI-TOF): Calcd for $C_{21}H_{21}N_2O_3^+$ [M+H$^+$] 349.1547, found 349.1547.



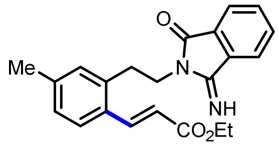
2a$_{(o,o')di}$ **(2E,2'*E)*-diethyl-3,3'-(2-(2-(1-imino-3-oxoisoindolin-2-yl)ethyl)-1,3-phenylene)diacrylate**: ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.16 (d, *J* = 15.7 Hz, 2H), 7.77-7.72 (m, 1H), 7.68-7.55 (m, 3H), 7.52 (d, *J* = 7.8 Hz, 2H), 7.26 (t, *J* = 7.8 Hz, 1H), 6.21 (d, *J* = 15.7 Hz, 2H), 4.23 (q, *J* = 7.1 Hz, 4H), 3.99 (t, *J* = 7.0 Hz, 2H), 3.31 (t, *J* = 7.0 Hz, 2H), 1.34 (t, *J* = 7.1 Hz, 6H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.5, 166.5, 160.1, 141.9, 137.2, 135.3, 132.8, 132.2, 131.0, 128.5, 127.6, 123.3, 121.5, 120.9, 60.6, 38.5, 27.6, 14.4; HRMS (m/z, ESI-TOF): Calcd for $C_{26}H_{27}N_2O_5^+$ [M+H$^+$] 447.1914, found 447.1907.



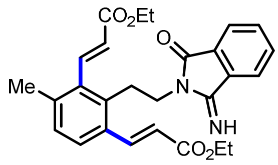
2b **(*E*)-ethyl-3-(3-chloro-2-(2-(1-imino-3-oxoisoindolin-2-yl)ethyl)phenyl) acrylate**: The corresponding reaction was run with standard conditions at 80 °C for 36 h. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.06 (d, *J* = 15.7 Hz, 1H), 7.75 (d, *J* = 7.0 Hz, 1H), 7.72-7.54 (m, 3H), 7.39 (d, *J* = 7.9 Hz, 1H), 7.36 (d, *J* = 7.8 Hz, 1H), 7.16 (t, *J* = 7.9 Hz, 1H), 6.07 (d, *J* = 15.7 Hz, 1H), 4.18 (q, *J* = 7.1 Hz, 2H), 4.05 (t, *J* = 6.5 Hz, 2H), 3.35 (t, *J* = 6.8 Hz, 2H), 1.31 (t, *J* = 7.1 Hz, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.6, 166.3, 141.7, 136.5, 135.8, 132.9, 132.2, 131.0, 130.9, 128.1, 125.4, 123.2, 121.5, 120.9, 60.6, 37.3, 28.7, 14.4; HRMS (m/z, ESI-TOF): Calcd for $C_{21}H_{20}ClN_2O_3^+$ [M+H$^+$] 383.1157, found 383.1153.



2c **(*E*)-ethyl-3-(3-fluoro-2-(2-(1-imino-3-oxoisoindolin-2-yl)ethyl)phenyl) acrylate**: The corresponding reaction was run with standard conditions at 80 °C for 48 h in 0.1 mmol scale. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.92 (d, *J* = 15.7 Hz, 1H), 7.68 (d, *J* = 7.0 Hz, 1H), 7.61 (d, *J* = 7.1 Hz, 1H), 7.59-7.48 (m, 2H), 7.19 (d, *J* = 7.7 Hz, 1H), 7.17-7.07 (m, 1H), 6.98 (t, *J* = 8.8 Hz, 1H), 6.04 (d, *J* = 15.7 Hz, 1H), 4.12 (q, *J* = 7.1 Hz, 2H), 3.97 (t, *J* = 6.7 Hz, 2H), 3.17 (t, *J* = 6.5 Hz, 2H), 1.25 (t, *J* = 7.1 Hz, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.6, 166.4, 161.8 (d, $J_{C\text{-}F}$ = 246.4 Hz), 160.2, 140.8 (d, $J_{C\text{-}F}$ = 3.0 Hz), 136.3 (d, $J_{C\text{-}F}$ = 5.1 Hz), 132.9, 132.2, 132.1, 131.0, 128.3 (d, $J_{C\text{-}F}$ = 9.1 Hz), 125.7 (d, $J_{C\text{-}F}$ = 17.2 Hz), 123.2, 122.3 (d, $J_{C\text{-}F}$ = 3.0 Hz), 121.1, 120.9, 116.5 (d, $J_{C\text{-}F}$ = 21.2 Hz), 60.6, 38.1, 24.0 (d, $J_{C\text{-}F}$ = 4.0 Hz), 14.4; HRMS (ESI-TOF): Calcd for $C_{21}H_{20}FN_2O_3^+$ [M+H$^+$] 367.1452, found 367.1450.

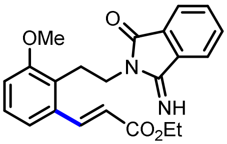


2d$_{mono}$ **(*E*)-ethyl-3-(2-(2-(1-imino-3-oxoisoindolin-2-yl)ethyl)-4-methylphenyl) acrylate**: The corresponding reaction was run with standard conditions at 70 °C for 48 h in 0.1 mmol scale. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.14 (d, *J* = 15.7 Hz, 1H), 7.81 (d, *J* = 6.8 Hz, 1H), 7.71 (d, *J* = 6.8 Hz, 1H), 7.69-7.59 (m, 2H), 7.46 (d, *J* = 8.0 Hz, 1H), 7.11 (s, 1H), 7.06 (d, *J* = 8.0 Hz, 1H), 6.25 (d, *J* = 15.7 Hz, 1H), 4.23 (q, *J* = 7.1 Hz, 2H), 4.01 (t, *J* = 7.6 Hz, 2H), 3.15 (t, *J* = 7.6 Hz, 2H), 2.31 (s, 3H), 1.34 (t, *J* = 7.1 Hz, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.7, 167.1, 141.8, 140.6, 138.3, 132.9, 132.3, 131.5, 131.2, 131.0, 128.3, 126.7, 123.3, 121.0, 119.0, 60.5, 39.6, 31.9, 21.4, 14.5; HRMS (ESI-TOF): Calcd for $C_{22}H_{23}N_2O_3^+$ [M+H$^+$] 363.1703, found 363.1701.

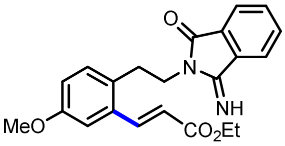


2d$_{(o,o')di}$ **(2*E*,2'*E*)-diethyl-3,3'-(2-(2-(1-imino-3-oxoisoindolin-2-yl)ethyl)-4-methyl-1,3-phenylene)diacrylate**: ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.64 (s, 1H), 8.16 (d, *J* = 15.6

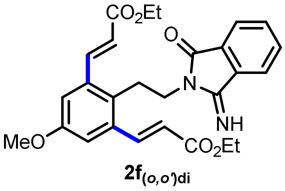
Hz, 1H), 7.91 (d, J = 16.3 Hz, 1H), 7.77 (d, J = 6.9 Hz, 1H), 7.72-7.56 (m, 3H), 7.41 (d, J = 8.0 Hz, 1H), 7.14 (d, J = 8.0 Hz, 1H), 6.17 (d, J = 15.6 Hz, 1H), 6.08 (d, J = 16.3 Hz, 1H), 4.31 (q, J = 7.1 Hz, 2H), 4.23 (q, J = 7.1 Hz, 2H), 3.94 (brs, 2H), 3.20 (t, J = 7.1 Hz, 2H), 2.33 (d, J = 9.2 Hz, 3H), 1.40-1.32 (m, 6H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.5, 166.8, 166.3, 143.1, 142.1, 138.4, 136.3, 132.9, 132.4, 132.2, 131.1, 129.6, 126.6, 126.2, 123.3, 120.9, 120.0, 60.8, 60.6, 38.3, 28.6, 21.5, 14.5; HRMS (ESI-TOF): Calcd for $C_{27}H_{29}N_2O_5^+$ [M+H$^+$] 461.2071, found 461.2064.



2e **(*E)*-ethyl-3-(2-(2-(1-imino-3-oxoisoindolin-2-yl)ethyl)-3-methoxyphenyl) acrylate**: The corresponding reaction was run with standard conditions for 24 h. ^{1}H NMR (400 MHz, CDCl$_3$) δ 8.03 (d, J = 15.7 Hz, 1H), 7.74 (d, J = 6.7 Hz, 1H), 7.70 (d, J = 7.0 Hz, 1H), 7.64-7.54 (m, 2H), 7.18 (t, J = 8.0 Hz, 1H), 7.07 (d, J = 7.8 Hz, 1H), 6.86 (d, J = 8.1 Hz, 1H), 6.08 (d, J = 15.7 Hz, 1H), 4.18 (q, J = 7.1 Hz, 2H), 3.98 (t, J = 6.8 Hz, 2H), 3.81 (s, 3H), 3.21 (t, J = 6.8 Hz, 2H), 1.31 (t, J = 7.2 Hz, 3H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.6, 166.6, 159.9, 158.1, 142.1, 135.3, 132.8, 132.1, 131.1, 127.9, 127.1, 123.1, 121.0, 120.5, 118.8, 111.5, 60.4, 55.7, 37.8, 24.7, 14.4; HRMS (ESI-TOF): Calcd for $C_{22}H_{23}N_2O_4^+$ [M+H$^+$] 379.1652, found 379.1663.

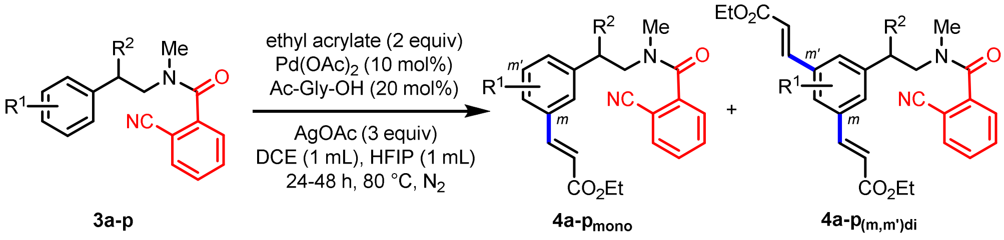


$2f_{mono}$ **(*E)*-ethyl-3-(2-(2-(1-imino-3-oxoisoindolin-2-yl)ethyl)-5-methoxyphenyl)acrylate**: The corresponding reaction was run with standard conditions for 24 h. ^{1}H NMR (400 MHz, CDCl$_3$) δ 8.11 (d, J = 15.7 Hz, 1H), 7.81 (d, J = 6.6 Hz, 1H), 7.76 (d, J = 7.0 Hz, 1H), 7.72-7.59 (m, 2H), 7.20 (d, J = 8.4 Hz, 1H), 7.05 (d, J = 2.5 Hz, 1H), 6.87 (dd, J = 8.4, 2.5 Hz, 1H), 6.25 (d, J = 15.7 Hz, 1H), 4.24 (q, J = 7.1 Hz, 2H), 4.00 (t, J = 7.3 Hz, 2H), 3.80 (s, 3H), 3.13 (t, J = 7.3 Hz, 2H), 1.35 (t, J = 7.1 Hz, 3H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.7, 166.9, 158.7, 141.9, 134.8, 133.1, 132.5, 132.1, 131.9, 131.0, 130.6, 123.4, 121.2, 120.1, 116.6, 111.3, 60.6, 55.4, 39.8, 31.1, 14.5; HRMS (ESI-TOF): Calcd for $C_{22}H_{23}N_2O_4^+$ [M+H$^+$] 379.1652, found 379.1659.

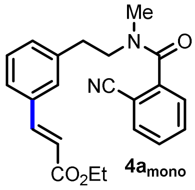


$2f_{(o,o')di}$ **(2*E*,2'*E)*-diethyl-3,3'-(2-(2-(1-imino-3-oxoisoindolin-2-yl)ethyl)-5-methoxy-1,3-phenylene)diacrylate**: ^{1}H NMR (400 MHz, CDCl$_3$) δ 8.13 (d, J = 15.6 Hz, 2H), 7.75 (dd, J = 6.3, 1.4 Hz, 1H), 7.69-7.52 (m, 3H), 7.06 (s, 2H), 6.21 (d, J = 15.6 Hz, 2H), 4.24 (q, J = 7.1 Hz, 4H), 3.95 (t, J = 7.0 Hz, 2H), 3.81 (s, 3H), 3.25 (t, J = 7.0 Hz, 2H), 1.34 (t, J = 7.1 Hz, 6H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.5, 166.6, 158.4, 142.0, 136.5, 133.9, 132.9, 132.2, 131.1, 129.9, 123.3, 121.9, 121.6, 120.9, 114.0, 60.7, 55.5, 38.8, 27.0, 14.5; HRMS (ESI-TOF): Calcd for $C_{27}H_{29}N_2O_6^+$ [M+H$^+$] 477.2020, found 477.2029.

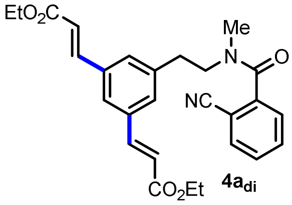
2.4 General remote-selective *meta*-C–H bond olefination procedure and characterization of olefinated compounds.



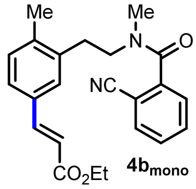
A 50 mL Schlenk sealed tube (with a Teflon cap) equipped with a magnetic stir bar was charged with amide **3** (0.20 mmol, 1.0 equiv), $Pd(OAc)_2$ (4.6 mg, 0.020 mmol, 10 mol%), Ac-Gly-OH (4.7 mg, 0.040 mmol, 20 mol%) and AgOAc (100 mg, 0.60 mmol, 3 equiv). The tube was then purged with nitrogen. DCE (1.0 mL) was added to the mixture, followed by ethyl acrylate (2.0 equiv) [and DMF (77 μL, 1.0 mmol, 5 equiv) when necessary as noted below]. And then 1.0 mL of HFIP was added along the inside wall of the tube. The tube was then capped under a flow of nitrogen and submerged into a preheated 80 °C oil bath. The reaction was stirred for 24–48 h and cooled to room temperature. The crude reaction mixture was diluted with EtOAc (5 mL) and filtered through a short pad of Celite. The sealed tube and Celite pad were washed with an additional 20 mL of EtOAc. The filtrate was concentrated *in vacuo*, and the resulting residue was purified by preparative thin layer chromatography using petroleum ether/EtOAc as the eluent. The site selectivity was assigned by ^{1}H NMR analysis of the product or the hydrolyzed product with EtOH/HCl (see **Section 2.6**).



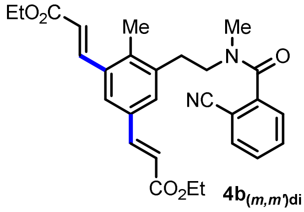
4a$_{mono}$ **(*E*)-ethyl-3-(3-(2-(2-cyano-*N*-methylbenzamido)ethyl)phenyl)acrylate**: The corresponding reaction was run with standard conditions for 32 h. The two rotamers' ratio is about 55:45. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.73-7.66 (m, 0.85H), 7.68-7.58 (m, 1.37H), 7.56 (d, J = 16.1 Hz, 0.50H), 7.53-7.40 (m, 2.16H), 7.42-7.31 (m, 2.75H), 7.27 (t, J = 7.6 Hz, 0.74H), 7.02 (s, 0.44H), 6.98 (d, J = 7.6 Hz, 0.43H), 6.80 (dd, J = 6.0, 2.9 Hz, 0.46H), 6.45 (d, J = 16.0 Hz, 0.55H), 6.33 (d, J = 16.0 Hz, 0.44H), 4.26 (q, J = 7.1 Hz, 2.14H), 3.81 (t, J = 7.6 Hz, 1.12H), 3.45 (t, J = 6.9 Hz, 0.92H), 3.20 (s, 1.47H), 3.05 (t, J = 7.6 Hz, 1.13H), 2.83 (s, 2.67H), 1.37-1.30 (m, 3.28H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 168.0, 167.6, 167.1, 166.9, 144.5, 144.0, 140.6, 140.3, 139.6, 138.5, 135.1, 134.9, 133.2, 133.0, 132.9, 132.7, 131.0, 130.8, 129.6, 129.5, 129.4, 129.3, 128.6, 128.4, 127.6, 127.4, 126.6, 126.4, 118.9, 118.6, 116.9, 116.8, 110.0, 109.8, 60.7, 60.6, 52.4, 49.4, 37.4, 34.4, 33.2, 33.0, 14.4; HRMS (m/z, ESI-TOF): Calcd for $C_{22}H_{23}N_2O_3^+$ [M+H$^+$] 363.1703, found 363.1703.



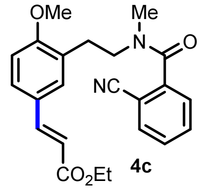
4a$_{di}$ **(2*E*,2'*E*)-diethyl-3,3'-(5-(2-(2-cyano-*N*-methylbenzamido)ethyl)-1,3-phenylene)diacrylate**: The two rotamers' ratio is about 3:2. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.74-7.59 (m, 3.17H), 7.57 (d, J = 16.0 Hz, 0.81H), 7.55-7.44 (m, 3.66H), 7.37 (d, J = 7.7 Hz, 0.61H), 7.06 (s, 0.72H), 6.92-6.84 (m, 0.38H), 6.49 (d, *J* = 16.0 Hz, 1.17H), 6.37 (d, *J* = 16.0 Hz, 0.78H), 4.27 (q, *J* = 7.1 Hz, 4.27H), 3.82 (t, *J* = 7.6 Hz, 1.19H), 3.49 (t, *J* = 6.9 Hz, 0.79H), 3.20 (s, 1.30H), 3.08 (t, *J* = 7.6 Hz, 1.24H), 2.91-2.79 (m, 2.69H), 1.39-1.30 (m, 6.41H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.9, 167.7, 166.8, 166.6, 143.6, 143.1, 140.5, 140.3, 140.2, 139.2, 135.8, 135.6, 133.2, 133.0, 132.8, 130.1, 129.7, 129.6, 129.5, 127.6, 127.4, 126.1, 119.9, 119.6, 116.8, 116.8, 110.0, 109.9, 60.8, 60.7, 52.2, 49.3, 37.4, 34.3, 33.1, 33.0, 14.4; HRMS (m/z, ESI-TOF): Calcd for $C_{27}H_{29}N_2O_5^+$ [M+H$^+$] 461.2071, found 461.2062.



4b$_{mono}$ **(*E*)-ethyl-3-(3-(2-(2-cyano-*N*-methylbenzamido)ethyl)-4-methylphenyl) acrylate**: The corresponding reaction was run with standard conditions and DMF (5 equiv) at 90 °C for 36 h. The two rotamers' ratio is about 54:46. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.75-7.60 (m, 2.09H), 7.59-7.37 (m, 3.01H), 7.31 (t, *J* = 9.9 Hz, 1.00H), 7.19 (d, *J* = 7.6 Hz, 0.60H), 7.07 (d, *J* = 8.0 Hz, 0.44H), 7.00 (s, 0.44H), 6.96 (d, *J* = 7.3 Hz, 0.41H), 6.42 (d, *J* = 16.0 Hz, 0.54H), 6.31 (d, *J* = 16.0 Hz, 0.46H), 4.26 (q, *J* = 6.9 Hz, 2.00H), 3.74 (t, *J* = 7.9 Hz, 1.09H), 3.40 (t, *J* = 7.2 Hz, 0.92H), 3.25 (s, 1.29H), 3.06 (t, *J* = 8.0 Hz, 1.09H), 2.91 (s, 1.69H), 2.83 (t, *J* = 6.9 Hz, 0.93H), 2.46 (s, 1.68H), 2.00 (s, 1.29H), 1.34 (t, *J* = 7.0 Hz, 3.00H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.9, 167.6, 167.2, 167.0, 144.5, 144.0, 140.6, 140.3, 139.4, 138.8, 137.5, 136.4, 133.2, 133.0, 133.0, 132.8, 132.7, 132.5, 131.3, 131.1, 129.6, 129.4, 129.4, 129.3, 127.6, 127.4, 126.6, 126.5, 117.9, 117.5, 116.8, 116.8, 110.0, 109.9, 60.6, 60.5, 51.3, 48.3, 37.2, 33.2, 32.0, 30.8, 19.4, 18.9, 14.4; HRMS (m/z, ESI-TOF): Calcd for $C_{23}H_{25}N_2O_3^+$ [M+H$^+$] 377.1860, found 377.1857.

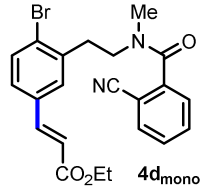


4b$_{(m,m')di}$ **(2*E*,2'*E*)-diethyl-3,3'-(5-(2-(2-cyano-*N*-methylbenzamido)ethyl)-4-methyl-1,3-phenylene)diacrylate**: The two rotamers' ratio is about 3:2. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.03 (d, *J* = 15.8 Hz, 0.62H), 7.85 (d, *J* = 15.8 Hz, 0.45H), 7.72 (d, *J* = 7.8 Hz, 0.66H), 7.71-7.61 (m, 1.63H), 7.61-7.38 (m, 4.02H), 7.09 (s, 0.38H), 7.00-6.89 (m, 0.38H), 6.47 (d, *J* = 16.0 Hz, 0.60H), 6.42-6.27 (m, 1.40H), 4.36-4.21 (m, 4.04H), 3.73 (dd, *J* = 9.0, 6.9 Hz, 1.17H), 3.42 (t, *J* = 7.2 Hz, 0.84H), 3.26 (s, 1.24H), 3.13 (dd, *J* = 6.5, 3.7 Hz, 1.20H), 2.94 (s, 1.80H), 2.89 (t, *J* = 7.3 Hz, 0.80H), 2.52 (s, 1.73H), 1.95 (s, 1.12H), 1.44-1.30 (m, 6.07H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.9, 167.7, 167.0, 166.8, 166.8, 166.7, 143.8, 143.3, 142.6, 142.1, 140.5, 140.2, 138.5, 138.5, 137.7, 137.4, 135.6, 135.5, 133.3, 133.0, 133.0, 132.8, 132.8, 132.6, 130.7, 130.7, 129.7, 129.6, 127.7, 127.5, 125.3, 125.2, 121.5, 121.2, 119.0, 118.6, 116.9, 116.8, 110.1, 110.0, 60.9, 60.8, 60.7, 51.2, 48.6, 37.4, 33.3, 32.8, 31.5, 15.6, 15.0, 14.4; HRMS (m/z, ESI-TOF): Calcd for $C_{28}H_{31}N_2O_5^+$ [M+H$^+$] 475.2227, found 475.2220.



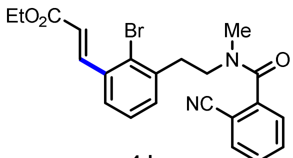
4c

(*E*)-ethyl-3-(3-(2-(2-cyano-*N*-methylbenzamido)ethyl)-4-methoxyphenyl) acrylate: The corresponding reaction was run with standard conditions and DMF (5 equiv) for 24 h. The two rotamers' ratio is about 2:3. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.68 (d, *J* = 7.7 Hz, 0.46H), 7.66-7.57 (m, 1.54H), 7.54 (d, *J* = 15.9 Hz, 0.66H), 7.50-7.42 (m, 2.03H), 7.42-7.34 (m, 1.09H), 7.31 (d, *J* = 7.7 Hz, 0.42H), 7.08 (s, 0.56H), 6.91-6.83 (m, 1.00H), 6.73 (d, *J* = 8.5 Hz, 0.58H), 6.33 (d, *J* = 16.0 Hz, 0.40H), 6.22 (d, *J* = 16.0 Hz, 0.58H), 4.24 (q, *J* = 7.1 Hz, 2.16H), 3.89 (s, 1.25H), 3.79 (t, *J* = 7.3 Hz, 0.88H), 3.60 (s, 1.82H), 3.42 (t, *J* = 6.9 Hz, 1.25H), 3.20 (s, 1.93H), 3.03 (t, *J* = 7.3 Hz, 0.84H), 2.84-2.78 (m, 2.52H), 1.32 (t, *J* = 7.1 Hz, 3.16H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.9, 167.6, 167.4, 167.2, 159.7, 159.4, 144.3, 143.9, 140.9, 140.6, 133.1, 133.0, 132.8, 132.6, 130.3, 130.2, 129.4, 129.1, 128.8, 127.9, 127.8, 127.4, 127.3, 127.1, 126.6, 116.9, 116.3, 116.0, 110.7, 110.6, 110.0, 60.5, 60.4, 55.7, 55.3, 50.8, 47.5, 37.3, 33.0, 29.5, 28.4, 14.4; HRMS (m/z, ESI-TOF): Calcd for $C_{23}H_{25}N_2O_4^+$ [M+H$^+$] 393.1809, found 393.1805.



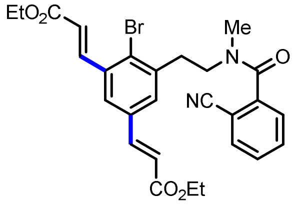
4d$_{mono\ (m)}$

(*E*)-ethyl-3-(4-bromo-3-(2-(2-cyano-*N*-methylbenzamido)ethyl)phenyl) acrylate: The corresponding reaction was run with standard conditions and ethyl acrylate (2.5 equiv) at 90 °C for 36 h using HFIP as the sole solvent. The two rotamers' ratio is about 54:46. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.72 (d, *J* = 7.7 Hz, 0.54H), 7.70-7.63 (m, 1.29H), 7.60 (d, *J* = 7.2 Hz, 0.55H), 7.58-7.48 (m, 2.86H), 7.45 (d, *J* = 8.3 Hz, 0.57H), 7.42 (d, *J* = 7.7 Hz, 0.54H), 7.28 (d, *J* = 2.6 Hz, 0.48H), 7.25 (dd, *J* = 6.0, 2.2 Hz, 0.56H), 7.14 (d, *J* = 1.9 Hz, 0.52H), 7.01 (dd, *J* = 7.4, 1.5 Hz, 0.47H), 6.48 (d, *J* = 16.0 Hz, 0.52H), 6.37 (d, *J* = 16.0 Hz, 0.45H), 4.31-4.23 (m, 2.00H), 3.82 (dd, *J* = 8.4, 6.9 Hz, 1.08H), 3.50 (t, *J* = 7.2 Hz, 0.97H), 3.26 (s, 1.44H), 3.21 (dd, *J* = 8.7, 6.6 Hz, 1.08H), 2.97 (t, *J* = 7.3 Hz, 0.99H), 2.89 (s, 1.66H), 1.38-1.31 (m, 3.07H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 168.0, 167.8, 166.8, 166.6, 143.1, 142.7, 140.6, 140.3, 138.9, 137.7, 134.5, 134.4, 133.8, 133.6, 133.2, 133.1, 133.1, 132.9, 130.9, 130.6, 129.6, 129.5, 127.8, 127.7, 127.7, 127.5, 126.4, 126.4, 119.7, 119.5, 116.9, 116.9, 110.1, 110.1, 60.8, 60.7, 50.6, 47.8, 37.4, 35.1, 33.7, 33.3, 14.4; HRMS (m/z, ESI-TOF): Calcd for $C_{22}H_{22}BrN_2O_3^+$ [M+H$^+$] 441.0808, found 441.0818.

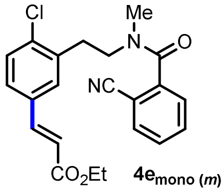


4d$_{mono\ (m')}$

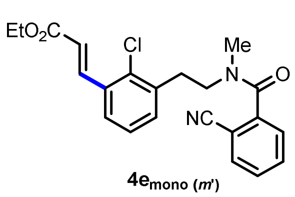
(*E*)-ethyl-3-(2-bromo-3-(2-(2-cyano-*N*-methylbenzamido)ethyl) phenyl)acrylate: The two rotamers' ratio is about 1:1. ^{1}H NMR (400 MHz, CDCl$_3$) δ 8.14 (d, *J* = 15.9 Hz, 0.43H), 7.93 (d, *J* = 15.9 Hz, 0.47H), 7.72 (d, *J* = 7.8 Hz, 0.53H), 7.70-7.61 (m, 1.05H), 7.55-7.40 (m, 3.63H), 7.34-7.23 (m, 1.13H), 7.10 (dd, *J* = 7.5, 1.4 Hz, 0.49H), 6.84-6.79 (m, 0.45H), 6.41-6.30 (m, 0.90H), 4.28 (q, *J* = 7.1 Hz, 2.07H), 3.82 (dd, *J* = 8.5, 6.7 Hz, 0.99H), 3.54 (t, *J* = 7.0 Hz, 1.00H), 3.31-3.18 (m, 2.67H), 3.00 (t, *J* = 7.0 Hz, 1.11H), 2.88 (s, 1.47H), 1.35 (t, *J* = 7.0 Hz, 3.01H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 168.0, 167.6, 166.4, 166.3, 143.8, 143.4, 140.5, 140.0, 139.5, 138.2, 135.9, 135.6, 133.1, 133.0, 132.8, 132.7, 132.4, 129.5, 129.4, 127.9, 127.8, 127.5, 127.4, 127.2, 127.1, 126.8, 126.5, 121.7, 121.4, 116.8, 116.8, 109.9, 109.9, 60.8, 60.7, 50.1, 47.7, 37.4, 35.5, 34.3, 33.1, 14.3; HRMS (m/z, ESI-TOF): Calcd for $C_{22}H_{22}BrN_2O_3^+$ [M+H$^+$] 441.0808, found 441.0819.



4d$_{(m,m')\text{di}}$ **(2*E*,2'*E*)-diethyl-3,3'-(4-bromo-5-(2-(2-cyano-*N*-methylbenzamido)ethyl)-1,3-phenylene)diacrylate**: The two rotamers' ratio is about 53:47. ^{1}H NMR (400 MHz, CDCl$_3$) δ 8.10 (d, *J* = 15.9 Hz, 0.53H), 7.91 (d, *J* = 15.9 Hz, 0.47H), 7.73 (d, *J* = 7.7 Hz, 0.60H), 7.71-7.63 (m, 1.43H), 7.63-7.55 (m, 1.80H), 7.57-7.46 (m, 1.81H), 7.43 (d, *J* = 7.6 Hz, 0.60H), 7.20 (d, *J* = 1.6 Hz, 0.41H), 7.01-6.96 (m, 0.39H), 6.53 (d, *J* = 16.0 Hz, 0.52H), 6.48-6.33 (m, 1.37H), 4.34-4.23 (m, 4.10H), 3.90-3.80 (m, 1.07H), 3.54 (t, *J* = 7.1 Hz, 0.92H), 3.33-3.21 (m, 2.56H), 3.03 (t, *J* = 7.1 Hz, 0.94H), 2.92 (s, 1.52H), 1.40-1.31 (m, 6.18H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.9, 167.8, 166.5, 166.3, 166.2, 166.1, 143.3, 142.8, 142.4, 142.0, 140.5, 140.3, 140.1, 139.0, 136.7, 136.4, 134.3, 134.2, 133.2, 133.0, 133.0, 132.9, 131.3, 131.0, 129.6, 129.6, 128.6, 128.4, 127.6, 127.4, 125.9, 125.9, 122.6, 122.3, 120.5, 120.3, 116.9, 116.8, 110.1, 110.0, 61.0, 60.9, 60.8, 50.2, 47.6, 37.4, 35.7, 34.3, 33.3, 14.4; HRMS (m/z, ESI-TOF): Calcd for $C_{27}H_{28}BrN_2O_5^+$ [M+H$^+$] 539.1176, found 539.1185.

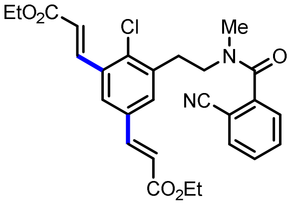


4e$_{\text{mono }(m)}$ **(*E*)-ethyl-3-(4-chloro-3-(2-(2-cyano-*N*-methylbenzamido)ethyl)phenyl)acrylate**: The corresponding reaction was run with standard conditions and ethyl acrylate (2.5 equiv) at 90 °C for 48 h using HFIP as the sole solvent. The two rotamers' ratio is about 53:47. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.72 (d, *J* = 7.7 Hz, 0.53H), 7.72-7.59 (m, 1.54H), 7.59-7.45 (m, 2.53H), 7.44-7.31 (m, 2.13H), 7.30-7.24 (m, 0.95H), 7.15 (d, *J* = 2.1 Hz, 0.50H), 7.01 (d, *J* = 7.6 Hz, 0.50H), 6.46 (d, *J* = 16.0 Hz, 0.53H), 6.35 (d, *J* = 16.0 Hz, 0.47H), 4.27 (q, *J* = 7.1 Hz, 2.00H), 3.83 (dd, *J* = 8.6, 6.5 Hz, 1.06H), 3.49 (t, *J* = 7.2 Hz, 0.94H), 3.25 (s, 1.38H), 3.20 (dd, *J* = 8.5, 6.6 Hz, 1.07H), 2.96 (t, *J* = 7.2 Hz, 0.94H), 2.88 (s, 1.61H), 1.34 (t, *J* = 7.1 Hz, 3.05H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 168.0, 167.7, 166.9, 166.7, 143.1, 142.7, 140.6, 140.3, 137.2, 136.0, 136.0, 133.9, 133.8, 133.2, 133.1, 132.9, 131.0, 130.7, 130.4, 130.3, 129.6, 129.5, 127.7, 127.7, 127.5, 119.6, 119.4, 116.9, 116.9, 110.1, 60.8, 60.7, 50.5, 47.7, 37.4, 33.3, 32.7, 31.3, 14.4; HRMS (m/z, ESI-TOF): Calcd for $C_{22}H_{22}ClN_2O_3^+$ [M+H$^+$] 397.1313, found 397.1324.

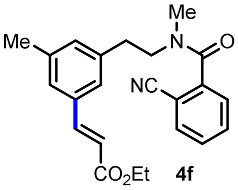


4e$_{\text{mono }(m')}$ **(*E*)-ethyl-3-(2-chloro-3-(2-(2-cyano-*N*-methylbenzamido)ethyl)phenyl)acrylate**: The two rotamers' ratio is about 1:1. ^{1}H NMR (400 MHz, CDCl$_3$) δ 8.17 (d, *J* = 16.0 Hz, 0.43H), 7.96 (d, *J* = 16.0 Hz, 0.47H), 7.72 (d, *J* = 7.7 Hz, 0.55H), 7.71-7.62 (m, 1.09H), 7.57-7.50 (m, 1.53H), 7.50-7.39 (m, 2.19H), 7.28 (t, *J* = 3.8 Hz, 0.57H), 7.23 (t, *J* = 7.7

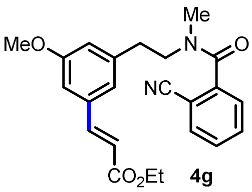
Hz, 0.51H), 7.12 (d, *J* = 7.4 Hz, 0.50H), 6.88-6.81 (m, 0.48H), 6.45-6.35 (m, 1.00H), 4.29 (q, *J* = 7.1 Hz, 2.11H), 3.84 (dd, *J* = 8.6, 6.5 Hz, 1.05H), 3.53 (t, *J* = 7.0 Hz, 1.09H), 3.31-3.19 (m, 2.63H), 2.99 (t, *J* = 7.0 Hz, 1.06H), 2.87 (s, 1.50H), 1.36 (t, *J* = 7.1 Hz, 3.18H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 168.1, 167.7, 166.6, 166.4, 141.1, 140.6, 140.1, 137.8, 136.4, 134.8, 134.7, 133.9, 133.7, 133.2, 133.1, 132.9, 132.9, 132.8, 132.6, 129.6, 129.5, 127.6, 127.4, 127.3, 127.2, 126.7, 126.4, 121.6, 121.3, 116.9, 116.8, 110.1, 110.0, 60.9, 60.8, 50.1, 47.7, 37.4, 33.2, 33.2, 31.7, 14.4; HRMS (m/z, ESI-TOF): Calcd for $C_{22}H_{22}ClN_2O_3^+$ [M+H$^+$] 397.1313, found 397.1324.



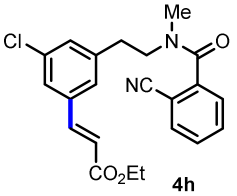
4e$_{(m,m')di}$ **(2*E*,2'*E*)-diethyl-3,3'-(4-chloro-5-(2-(2-cyano-*N*-methylbenzamido)ethyl)-1,3-phenylene)diacrylate**: The two rotamers' ratio is about 55:45. ^{1}H NMR (400 MHz, CDCl$_3$) δ 8.09 (d, *J* = 16.0 Hz, 0.52H), 7.89 (d, *J* = 16.0 Hz, 0.43H), 7.69 (d, *J* = 7.7 Hz, 0.58H), 7.67-7.56 (m, 3.05H), 7.53 (d, *J* = 16.3 Hz, 0.64H), 7.51-7.43 (m, 1.28H), 7.39 (d, *J* = 7.7 Hz, 0.56H), 7.19 (d, *J* = 1.8 Hz, 0.47H), 7.02-6.93 (m, 0.45H), 6.48 (d, *J* = 16.1 Hz, 0.51H), 6.46-6.34 (m, 1.42H), 4.31-4.19 (m, 4.00H), 3.85-3.77 (m, 1.09H), 3.49 (t, *J* = 7.2 Hz, 0.91H), 3.26-3.17 (m, 2.47H), 2.98 (t, *J* = 7.2 Hz, 0.91H), 2.87 (s, 1.55H), 1.36-1.27 (m, 6.01H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.9, 167.7, 166.5, 166.3, 166.3, 166.1, 142.4, 142.0, 140.5, 140.4, 140.1, 140.0, 138.4, 137.1, 136.1, 136.0, 134.5, 134.3, 133.7, 133.6, 133.2, 133.0, 132.9, 132.8, 131.5, 131.2, 129.6, 129.6, 127.5, 127.4, 125.9, 125.8, 122.5, 122.2, 120.4, 120.2, 116.8, 116.8, 110.1, 110.0, 61.0, 60.9, 60.8, 60.7, 50.1, 47.5, 37.4, 33.2, 33.2, 31.7, 14.3; HRMS (m/z, ESI-TOF): Calcd for $C_{27}H_{28}ClN_2O_5^+$ [M+H$^+$] 495.1681, found 495.1689.



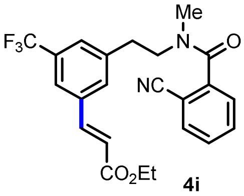
4f **(*E*)-ethyl-3-(3-(2-(2-cyano-*N*-methylbenzamido)ethyl)-5-methylphenyl)acrylate**: The corresponding reaction was run with standard conditions and DMF (5 equiv) for 32 h. The two rotamers' ratio is about 53:47. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.69 (d, *J* = 7.7 Hz, 0.61H), 7.68-7.58 (m, 1.54H), 7.53 (d, *J* = 16.4 Hz, 0.66H), 7.51-7.41 (m, 1.34H), 7.37 (d, *J* = 7.7 Hz, 0.57H), 7.27 (s, 0.57H), 7.20 (s, 1.01H), 7.16 (s, 0.49H), 6.86-6.69 (m, 1.39H), 6.43 (d, *J* = 16.0 Hz, 0.50H), 6.31 (d, *J* = 16.0 Hz, 0.44H), 4.25 (q, *J* = 7.1 Hz, 2.02H), 3.78 (dd, *J* = 8.8, 6.5 Hz, 1.05H), 3.44 (t, *J* = 6.9 Hz, 0.95H), 3.19 (s, 1.43H), 3.00 (t, *J* = 7.7 Hz, 1.05H), 2.83 (s, 1.58H), 2.78 (t, *J* = 6.8 Hz, 0.95H), 2.35 (s, 1.57H), 2.28 (s, 1.44H), 1.36-1.28 (m, 3.03H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.9, 167.6, 167.1, 166.9, 144.6, 144.2, 140.7, 140.3, 139.4, 139.2, 138.9, 138.3, 135.0, 134.8, 133.2, 133.0, 132.8, 132.7, 131.9, 131.7, 129.5, 129.3, 127.7, 127.4, 127.2, 127.1, 125.8, 125.6, 118.6, 118.3, 116.9, 116.8, 110.0, 109.8, 60.6, 60.5, 52.4, 49.5, 37.4, 34.2, 33.1, 32.9, 21.3, 21.2, 14.4; HRMS (m/z, ESI-TOF): Calcd for $C_{23}H_{25}N_2O_3^+$ [M+H$^+$] 377.1860, found 377.1856.



4g **(*E*)-ethyl-3-(3-(2-(2-cyano-*N*-methylbenzamido)ethyl)-5-methoxyphenyl) acrylate**: The corresponding reaction was run with standard conditions and DMF (5 equiv) for 32 h. The two rotamers' ratio is about 54:46. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.69 (d, *J* = 7.7 Hz, 0.65H), 7.67-7.57 (m, 1.68H), 7.56-7.38 (m, 2.22H), 7.36 (d, *J* = 7.7 Hz, 0.56H), 7.06 (s, 0.49H), 6.94-6.83 (m, 1.96H), 6.62 (s, 0.40H), 6.49 (s, 0.43H), 6.43 (d, *J* = 16.0 Hz, 0.51H), 6.31 (d, *J* = 16.0 Hz, 0.44H), 4.25 (q, *J* = 7.0 Hz, 2.15H), 3.84-3.77 (m, 2.77H), 3.75 (s, 1.48H), 3.45 (t, *J* = 6.9 Hz, 0.91H), 3.18 (s, 1.37H), 3.01 (t, *J* = 7.6 Hz, 1.09H), 2.83 (s, 1.58H), 2.78 (t, *J* = 6.8 Hz, 0.93H), 1.36-1.29 (m, 3.32H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 168.0, 167.6, 167.0, 166.8, 160.3, 160.3, 144.5, 144.0, 141.0, 140.7, 140.3, 139.8, 136.3, 136.1, 133.2, 133.0, 132.9, 132.7, 129.6, 129.4, 127.7, 127.4, 121.4, 121.1, 119.1, 118.9, 116.9, 116.8, 116.7, 111.4, 111.2, 110.0, 109.9, 60.7, 60.6, 55.5, 55.4, 52.3, 49.3, 37.4, 34.5, 33.4, 33.0, 14.4; HRMS (m/z, ESI-TOF): Calcd for $C_{23}H_{25}N_2O_4^+$ [M+H$^+$] 393.1809, found 393.1805.

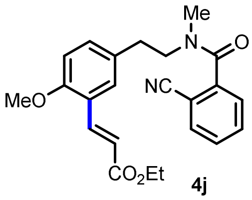


4h **(*E*)-ethyl-3-(3-chloro-5-(2-(2-cyano-*N*-methylbenzamido)ethyl) phenyl)acrylate**: The corresponding reaction was run with standard conditions and DMF (5 equiv) for 32 h. The two rotamers' ratio is about 3:2. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.73-7.57 (m, 2.11H), 7.56 (s, 0.38H), 7.54-7.44 (m, 1.93H), 7.41-7.32 (m, 2.15H), 7.30 (s, 0.56H), 6.95-6.83 (m, 1.07H), 6.44 (d, *J* = 16.0 Hz, 0.58H), 6.33 (d, *J* = 16.0 Hz, 0.38H), 4.24 (q, *J* = 6.9 Hz, 2.07H), 3.78 (t, *J* = 7.6 Hz, 1.28H), 3.45 (t, *J* = 6.8 Hz, 0.78H), 3.17 (s, 1.32H), 3.02 (t, *J* = 7.6 Hz, 1.26H), 2.84 (s, 1.79H), 2.84-2.76 (m, 0.87H), 1.31 (t, *J* = 7.0 Hz, 3.15H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.9, 167.7, 166.6, 166.4, 142.9, 142.4, 141.4, 140.5, 140.3, 140.1, 136.7, 136.6, 135.3, 135.0, 133.2, 133.0, 132.8, 130.5, 130.3, 129.6, 129.6, 127.6, 127.4, 127.0, 126.7, 126.2, 126.1, 120.4, 120.1, 116.8, 116.7, 110.0, 109.8, 60.8, 60.7, 52.0, 49.2, 37.4, 34.1, 32.9, 14.3; HRMS (m/z, ESI-TOF): Calcd for $C_{22}H_{22}ClN_2O_3^+$ [M+H$^+$] 397.1313, found 397.1309.

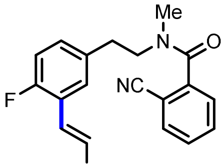


4i **(*E*)-ethyl-3-(3-(2-(2-cyano-*N*-methylbenzamido)ethyl)-5-(trifluoromethyl) phenyl)acrylate**: The corresponding reaction was run with standard conditions at 90 ^{o}C for 48 h using HFIP as the sole solvent. The two rotamers' ratio is about 65:35. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.80-7.60 (m, 3.97H), 7.58 (d, *J* = 3.1 Hz, 0.70H), 7.55-7.45 (m, 1.61H), 7.39 (d, *J* = 7.7 Hz, 0.76H), 7.25 (s, 0.32H), 7.15 (s, 0.33H), 6.95-6.88 (m, 0.30H), 6.53 (d, *J* = 16.1 Hz, 0.59H), 6.43 (d, *J* = 16.0 Hz, 0.34H), 4.34-4.22 (m, 2.00H), 3.89-3.78 (m, 1.30H), 3.51 (t, *J* = 7.0 Hz, 0.71H), 3.22 (s, 1.03H), 3.14 (dd, *J* = 8.8, 6.6 Hz, 1.31H), 2.95-2.83 (m, 2.74H), 1.40-1.30 (m, 3.00H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.9, 167.8, 166.5, 166.3, 142.6, 142.2, 140.7, 140.4, 140.1, 139.6, 136.0, 135.8, 133.2, 133.0, 133.0, 132.9, 131.9, 131.7, 131.6, 131.5, 131.3, 129.7, 129.6, 129.0, 127.4, 127.4, 127.1 (d, $J_{C\text{-}F}$ = 3.7 Hz), 126.7 (q, $J_{C\text{-}F}$ = 3.6 Hz), 125.6, 123.8

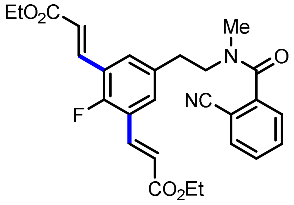
(d, $J_{C\text{-}F}$ = 273.7 Hz), 123.6 (d, $J_{C\text{-}F}$ = 272.7 Hz), 123.1 (q, $J_{C\text{-}F}$ = 4.1 Hz), 122.95 (q, $J_{C\text{-}F}$ = 3.6 Hz), 120.9, 120.6, 116.8, 116.7, 110.0, 109.9, 60.9, 60.8, 52.1, 49.1, 37.4, 34.3, 33.0, 33.0, 14.3; HRMS (m/z, ESI-TOF): Calcd for $C_{23}H_{22}F_3N_2O_3^+$ [M+H$^+$] 431.1577, found 431.1586.



4j **(*E*)-ethyl-3-(5-(2-(2-cyano-*N*-methylbenzamido)ethyl)-2-methoxyphenyl) acrylate**: The corresponding reaction was run with standard conditions and DMF (5 equiv) for 48 h. The two rotamers' ratio is about 55:45. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.97 (d, *J* = 16.2 Hz, 0.54H), 7.86 (d, *J* = 16.2 Hz, 0.45H), 7.71 (d, *J* = 7.8 Hz, 0.56H), 7.69-7.59 (m, 1.03H), 7.55-7.41 (m, 2.09H), 7.37 (d, *J* = 7.7 Hz, 0.54H), 7.32 (d, *J* = 8.4 Hz, 0.47H), 7.00-6.78 (m, 2.42H), 6.56 (d, *J* = 16.2 Hz, 0.54H), 6.36 (d, *J* = 16.2 Hz, 0.45H), 4.26 (q, *J* = 7.1 Hz, 2.06H), 3.88 (s, 3.03H), 3.78 (dd, *J* = 8.8, 6.5 Hz, 1.10H), 3.43 (t, *J* = 6.9 Hz, 0.90H), 3.19 (s, 1.40H), 2.99 (t, *J* = 7.6 Hz, 1.10H), 2.84 (s, 1.60H), 2.77 (t, *J* = 6.9 Hz, 0.90H), 1.34 (td, *J* = 7.1, 3.0 Hz, 3.03H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 168.0, 167.6, 167.6, 167.4, 157.4, 157.2, 140.7, 140.3, 139.9, 139.6, 133.2, 133.0, 132.9, 132.8, 132.0, 131.8, 130.9, 129.7, 129.5, 129.4, 129.3, 129.1, 127.7, 127.4, 123.8, 123.6, 119.4, 119.1, 116.9, 116.8, 111.6, 111.6, 110.1, 109.9, 60.5, 60.4, 55.8, 55.7, 52.7, 49.6, 37.4, 33.6, 33.0, 32.5, 14.5; HRMS (m/z, ESI-TOF): Calcd for $C_{23}H_{25}N_2O_4^+$ [M+H$^+$] 393.1809, found 393.1804.

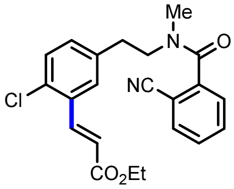


4k$_{mono}$ **(*E*)-ethyl-3-(5-(2-(2-cyano-*N*-methylbenzamido)ethyl)-2-fluorophenyl) acrylate**: The corresponding reaction was run with standard conditions at 90 °C for 36 h. The two rotamers' ratio is about 3:2. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.79 (d, *J* = 16.2 Hz, 0.58H), 7.75-7.58 (m, 2.00H), 7.56-7.42 (m, 2.00H), 7.41-7.29 (m, 1.20H), 7.11-6.90 (m, 2.20H), 6.57 (d, *J* = 16.2 Hz, 0.57H), 6.41 (d, *J* = 16.2 Hz, 0.38H), 4.27 (q, *J* = 7.0 Hz, 2.00H), 3.80 (t, *J* = 7.4 Hz, 1.21H), 3.45 (t, *J* = 6.6 Hz, 0.77H), 3.20 (s, 1.19H), 3.03 (t, *J* = 7.3 Hz, 1.25H), 2.91-2.75 (m, 2.66H), 1.34 (t, *J* = 6.9 Hz, 3.08H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.9, 167.7, 166.9, 166.6, 160.3 (d, $J_{C\text{-}F}$ = 254 Hz), 160.3 (d, $J_{C\text{-}F}$ = 254 Hz), 140.5, 140.2, 137.1, 136.7, 135.0 (d, $J_{C\text{-}F}$ = 4 Hz), 134.0 (d, $J_{C\text{-}F}$ = 4 Hz), 133.2, 133.0, 133.0, 132.8, 132.2 (d, $J_{C\text{-}F}$ = 9 Hz), 131.9 (d, $J_{C\text{-}F}$ = 9 Hz), 129.6, 129.5, 129.33 (d, $J_{C\text{-}F}$ = 3 Hz), 129.14 (d, $J_{C\text{-}F}$ = 3 Hz), 127.5, 127.4, 122.8 (d, $J_{C\text{-}F}$ = 12 Hz), 122.5 (d, $J_{C\text{-}F}$ = 12 Hz), 121.4 (d, $J_{C\text{-}F}$ = 7 Hz), 121.1 (d, $J_{C\text{-}F}$ = 7 Hz), 116.8, 116.7 (d, $J_{C\text{-}F}$ = 5 Hz), 116.5 (d, $J_{C\text{-}F}$ = 3 Hz), 116.3, 110.0, 109.9, 60.8, 60.7, 52.5, 49.4, 37.4, 33.7, 33.0, 32.5, 14.4; HRMS (m/z, ESI-TOF): Calcd for $C_{22}H_{22}FN_2O_3^+$ [M+H$^+$] 381.1609, found 381.1605.



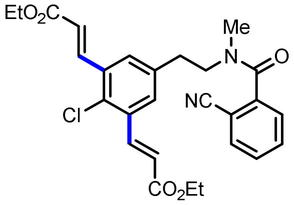
4k$_{(m,m')di}$ **(2*E*,2'*E*)-diethyl-3,3'-(5-(2-(2-cyano-*N*-methylbenzamido)ethyl)-2-fluoro-1,3-phenylene)diacrylate**: The two rotamers' ratio is about 2:1. ^{1}H NMR (400 MHz,

$CDCl_3$) δ 7.82 (d, J = 16.2 Hz, 1.30H), 7.77-7.61 (m, 2.50H), 7.57-7.46 (m, 2.75H), 7.39 (d, J = 7.7 Hz, 0.70H), 7.08 (d, J = 6.4 Hz, 0.70H), 7.01 (d, J = 7.3 Hz, 0.33H), 6.58 (d, J = 16.2 Hz, 1.27H), 6.42 (d, J = 16.2 Hz, 0.64H), 4.34-4.24 (m, 4.11H), 3.81 (t, J = 7.6 Hz, 1.34H), 3.49 (t, J = 6.9 Hz, 0.66H), 3.21 (s, 1.05H), 3.05 (t, J = 7.5 Hz, 1.37H), 2.92-2.80 (m, 2.84H), 1.40-1.31 (m, 6.21H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.9, 167.8, 166.7, 166.5, 158.6 (d, $J_{C\text{-}F}$ = 263 Hz), 158.5 (d, $J_{C\text{-}F}$ = 262 Hz), 140.5, 140.2, 136.4 (d, $J_{C\text{-}F}$ = 4 Hz), 136.0 (d, $J_{C\text{-}F}$ = 3 Hz), 135.2 (d, $J_{C\text{-}F}$ = 4 Hz), 134.1 (d, $J_{C\text{-}F}$ = 3 Hz), 133.3, 133.1, 133.0, 133.0, 130.7 (d, $J_{C\text{-}F}$ = 3 Hz), 130.3 (d, $J_{C\text{-}F}$ = 3 Hz), 129.7, 127.7, 127.4, 123.8 (d, $J_{C\text{-}F}$ = 12 Hz), 123.6 (d, $J_{C\text{-}F}$ = 13 Hz), 122.3 (d, $J_{C\text{-}F}$ = 7 Hz), 122.0 (d, $J_{C\text{-}F}$ = 6 Hz), 116.9, 116.8, 110.0, 61.0, 60.8, 52.3, 49.3, 37.4, 33.9, 33.1, 32.6, 14.4; HRMS (m/z, ESI-TOF): Calcd for $C_{27}H_{28}FN_2O_5^+$ [M+H$^+$] 479.1977, found 479.1966.



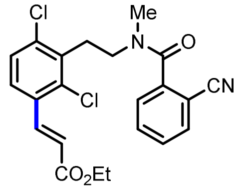
4l$_{mono}$

(*E*)-ethyl-3-(2-chloro-5-(2-(2-cyano-*N*-methylbenzamido)ethyl)phenyl) acrylate: The corresponding reaction was run with standard conditions at 90 ^{o}C for 36 h. The NMR sample contains about 6% isomer. The two rotamers' ratio is about 5:3. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.06 (d, J = 16.0 Hz, 0.57H), 7.99 (d, J = 16.0 Hz, 0.36H), 7.77-7.60 (m, 1.76H), 7.58 (s, 0.65H), 7.55-7.45 (m, 1.44H), 7.38 (d, J = 8.7 Hz, 1.21H), 7.34-7.25 (m, 1.23H), 7.13 (s, 0.36H), 6.92 (t, J = 9.7 Hz, 0.75H), 6.49 (d, J = 16.0 Hz, 0.57H), 6.24 (d, J = 16.0 Hz, 0.33H), 4.28 (q, J = 6.8 Hz, 2.02H), 3.81 (t, J = 7.5 Hz, 1.25H), 3.46 (t, J = 6.8 Hz, 0.75H), 3.20 (s, 1.16H), 3.04 (t, J = 7.5 Hz, 1.25H), 2.86 (s, 1.83H), 2.82 (t, J = 6.6 Hz, 0.83H), 1.39-1.30 (m, 3.03H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.9, 167.7, 166.6, 166.3, 140.5, 140.2, 140.1, 139.9, 138.0, 136.9, 133.5, 133.2, 133.2, 133.1, 133.0, 132.9, 132.8, 131.7, 131.4, 130.5, 130.4, 129.6, 129.5, 128.1, 127.9, 127.6, 127.4, 121.4, 121.2, 116.8, 116.8, 110.0, 109.9, 60.8, 60.7, 52.4, 49.2, 37.4, 34.0, 33.1, 32.7, 14.4; HRMS (m/z, ESI-TOF): Calcd for $C_{22}H_{22}ClN_2O_3^+$ [M+H$^+$] 397.1313, found 397.1309.

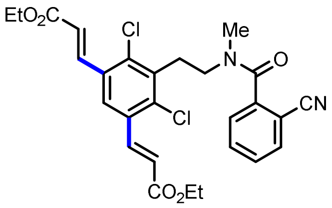


4l$_{(m,m')di}$

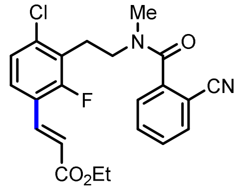
(2*E*,2'*E*)-diethyl-3,3'-(2-chloro-5-(2-(2-cyano-*N*-methylbenzamido) ethyl)-1,3-phenylene)diacrylate: The two rotamers' ratio is about 65:35. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.11 (d, J = 16.0 Hz, 1.23H), 8.04 (d, J = 16.0 Hz, 0.63H), 7.76-7.63 (m, 1.88H), 7.60 (s, 1.23H), 7.56-7.47 (m, 1.38H), 7.39 (d, J = 7.6 Hz, 0.71H), 7.15 (s, 0.65H), 6.98 (d, J = 7.3 Hz, 0.30H), 6.47 (d, J = 16.0 Hz, 1.29H), 6.24 (d, J = 16.0 Hz, 0.67H), 4.29 (q, J = 7.1 Hz, 4.00H), 3.83 (t, J = 7.6 Hz, 1.30H), 3.49 (t, J = 6.8 Hz, 0.70H), 3.22 (s, 1.00H), 3.06 (t, J = 7.7 Hz, 1.30H), 2.90 (s, 2.00H), 2.84 (t, J = 7.2 Hz, 0.73H), 1.41-1.31 (m, 6.02H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.9, 167.8, 166.4, 166.2, 140.4, 140.4, 140.1, 140.0, 137.9, 136.9, 134.6, 134.4, 133.6, 133.4, 133.3, 133.1, 133.0, 132.9, 129.7, 129.5, 129.1, 127.7, 127.4, 122.4, 122.2, 116.8, 116.8, 110.0, 110.0, 61.0, 60.9, 52.3, 49.1, 37.4, 34.1, 33.1, 32.8, 14.4; HRMS (m/z, ESI-TOF): Calcd for $C_{27}H_{28}ClN_2O_5^+$ [M+H$^+$] 495.1681, found 495.1669.



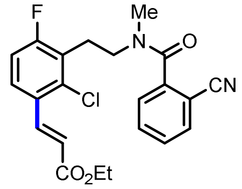
$4m_{mono}$ **(*E*)-ethyl-3-(2,4-dichloro-3-(2-(2-cyano-*N*-methylbenzamido)ethyl)phenyl) acrylate**: The corresponding reaction was run with standard conditions at 90 °C for 48 h using HFIP as the sole solvent. The two rotamers' ratio is about 62:38. ^{1}H NMR (400 MHz, CDCl$_3$) δ 8.08 (d, *J* = 16.0 Hz, 0.36H), 7.90 (d, *J* = 16.0 Hz, 0.59H), 7.75-7.63 (m, 1.45H), 7.58 (td, *J* = 7.7, 1.4 Hz, 0.65H), 7.55-7.38 (m, 2.47H), 7.35 (d, *J* = 8.4 Hz, 0.40H), 7.32-7.21 (m, 1.34H), 6.44-6.30 (m, 0.97H), 4.33-4.22 (m, 2.00H), 3.82 (dd, *J* = 8.7, 6.3 Hz, 0.79H), 3.50-3.36 (m, 2H), 3.30 (s, 1.90H), 3.20 (dd, *J* = 9.4, 6.2 Hz, 1.30H), 2.96 (s, 1.16H), 1.39-1.30 (m, 3.03H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.8, 167.6, 166.2, 166.1, 140.5, 140.2, 139.7, 137.1, 136.8, 136.1, 135.8, 135.8, 134.2, 133.1, 132.9, 132.9, 132.9, 132.6, 132.4, 129.5, 129.4, 128.3, 128.3, 127.4, 126.7, 126.5, 122.0, 121.7, 116.8, 110.1, 109.9, 60.8, 60.8, 48.6, 45.9, 37.1, 33.3, 30.6, 29.3, 14.3; HRMS (m/z, ESI-TOF): Calcd for $C_{22}H_{21}Cl_2N_2O_3^+$ [M+H$^+$] 431.0924, found 431.0934.



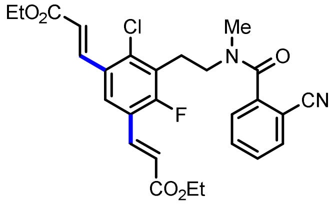
$4m_{(m,m')di}$ **(2*E*,2'*E*)-diethyl-3,3'-(4,6-dichloro-5-(2-(2-cyano-*N*-methylbenzamido)ethyl)-1,3-phenylene)diacrylate**: The two rotamers' ratio is about 60:40. ^{1}H NMR (400 MHz, CDCl$_3$) δ 8.04 (d, *J* = 15.9 Hz, 0.74H), 7.88 (d, *J* = 15.9 Hz, 1.11H), 7.73 (s, 0.40H), 7.71-7.61 (m, 2.12H), 7.57 (t, *J* = 7.4 Hz, 0.63H), 7.49 (t, *J* = 7.6 Hz, 1.06H), 7.43 (d, *J* = 7.8 Hz, 0.40H), 7.29 (d, *J* = 7.6 Hz, 0.58H), 6.46-6.33 (m, 1.80H), 4.32-4.19 (m, 4.00H), 3.80 (dd, *J* = 8.9, 6.2 Hz, 0.80H), 3.47 (dd, *J* = 8.8, 6.3 Hz, 0.80H), 3.39 (dd, *J* = 9.7, 6.2 Hz, 1.20H), 3.28 (s, 1.80H), 3.23 (dd, *J* = 9.9, 6.0 Hz, 1.20H), 2.96 (s, 1.20H), 1.40-1.30 (m, 6.04H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.9, 167.7, 166.1, 165.9, 140.5, 140.3, 140.0, 139.5, 137.1, 136.9, 136.7, 135.3, 133.2, 133.0, 133.0, 132.8, 132.6, 129.6, 127.5, 124.8, 124.6, 122.8, 122.5, 116.8, 116.8, 110.3, 110.0, 61.0, 61.0, 48.5, 45.8, 37.2, 33.4, 31.3, 29.9, 14.3; HRMS (m/z, ESI-TOF): Calcd for $C_{27}H_{27}Cl_2N_2O_5^+$ [M+H$^+$] 529.1392, found 529.1297.



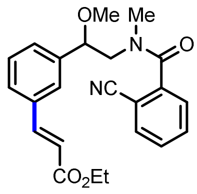
$4n_{mono\ (m)}$ **(*E*)-ethyl-3-(4-chloro-3-(2-(2-cyano-*N*-methylbenzamido)ethyl)-2-fluoro phenyl)acrylate**: The corresponding reaction was run with standard conditions and ethyl acrylate (2.5 equiv) at 90 °C for 48 h using HFIP as the sole solvent. The two rotamers' ratio is about 56:44. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.78 (d, *J* = 16.3 Hz, 0.43H), 7.73-7.59 (m, 1.98H), 7.59-7.45 (m, 1.73H), 7.44-7.32 (m, 1.39H), 7.23 (d, *J* = 8.2 Hz, 0.42H), 7.14-7.06 (m, 1.04H), 6.52 (d, *J* = 16.2 Hz, 0.41H), 6.44 (d, *J* = 16.1 Hz, 0.52H), 4.28 (q, *J* = 7.0 Hz, 2.00H), 3.83 (t, *J* = 6.9 Hz, 0.89H), 3.45 (t, *J* = 7.0 Hz, 1.17H), 3.33-3.21 (m, 2.61H), 3.04 (t, *J* = 7.0 Hz, 1.16H), 2.93 (s, 1.31H), 1.34 (t, *J* = 7.0 Hz, 3.02H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.9, 167.6, 166.6, 166.4, 160.1 (d, $J_{C\text{-}F}$ = 257 Hz), 159.8 (d, $J_{C\text{-}F}$ = 256 Hz), 140.5, 140.1, 137.2 (d, $J_{C\text{-}F}$ = 6 Hz), 136.9 (d, $J_{C\text{-}F}$ = 6 Hz), 136.2 (d, $J_{C\text{-}F}$ = 3 Hz), 135.7 (d, $J_{C\text{-}F}$ = 3 Hz), 133.1, 133.0, 132.9, 132.8, 129.5, 129.5, 127.6 (d, $J_{C\text{-}F}$ = 4 Hz), 127.4 (d, $J_{C\text{-}F}$ = 3 Hz), 127.4, 125.7, 125.7, 125.6, 125.6, 125.5, 124.14 (d, $J_{C\text{-}F}$ = 19 Hz), 121.71 (d, $J_{C\text{-}F}$ = 6 Hz), 121.58 (d, $J_{C\text{-}F}$ = 14 Hz), 121.4, 121.3 (d, $J_{C\text{-}F}$ = 7 Hz), 116.8, 116.7, 110.0, 110.0, 60.8, 60.8, 49.3, 46.4, 37.1, 33.2, 25.6 (d, $J_{C\text{-}F}$ = 4 Hz), 24.4 (d, $J_{C\text{-}F}$ = 6 Hz), 14.3; HRMS (m/z, ESI-TOF): Calcd for $C_{22}H_{21}ClFN_2O_3^+$ [M+H$^+$] 415.1219, found 415.1227.



$4n_{\mathrm{mono}\,(m')}$ **(*E*)-ethyl-3-(2-chloro-3-(2-(2-cyano-*N*-methylbenzamido)ethyl)-4-fluorophenyl)acrylate**: The two rotamers' ratio is about 62:38. ^{1}H NMR (400 MHz, CDCl$_3$) δ 8.06 (d, *J* = 16.0 Hz, 0.35H), 7.87 (d, *J* = 15.9 Hz, 0.57H), 7.75-7.58 (m, 1.60H), 7.55-7.43 (m, 2.63H), 7.40 (d, *J* = 7.7 Hz, 0.40H), 7.08-6.93 (m, 1.50H), 6.39-6.27 (m, 0.90H), 4.26 (q, *J* = 7.1 Hz, 2.00H), 3.81 (t, *J* = 7.2 Hz, 0.84H), 3.45 (t, *J* = 7.2 Hz, 1.20H), 3.33-3.19 (m, 2.72H), 3.07-2.99 (m, 1.21H), 2.90 (s, 1.20H), 1.32 (t, *J* = 7.1 Hz, 3.03H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.9, 167.7, 166.4, 166.3, 162.4 (d, $J_{C\text{-}F}$ = 254 Hz), 162.2 (d, $J_{C\text{-}F}$ = 254 Hz), 140.5, 140.2, 140.1, 139.7, 136.2 (d, $J_{C\text{-}F}$ = 6 Hz), 136.0 (d, $J_{C\text{-}F}$ = 5 Hz), 133.2, 133.0, 132.9, 132.8, 130.0 (d, $J_{C\text{-}F}$ = 4 Hz), 129.9 (d, $J_{C\text{-}F}$ = 4 Hz), 129.6, 129.5, 127.5, 127.4, 127.3 (d, $J_{C\text{-}F}$ = 10.0 Hz), 127.1 (d, $J_{C\text{-}F}$ = 10 Hz), 125.8 (d, $J_{C\text{-}F}$ = 19 Hz), 124.2 (d, $J_{C\text{-}F}$ = 19 Hz), 121.3 (d, $J_{C\text{-}F}$ = 2 Hz), 121.0 (d, $J_{C\text{-}F}$ = 2 Hz), 116.8, 116.7, 114.7 (d, $J_{C\text{-}F}$ = 22 Hz), 114.5 (d, $J_{C\text{-}F}$ = 22 Hz), 110.1, 110.0, 60.9, 60.8, 49.1, 46.5, 37.2, 33.2, 25.7 (d, $J_{C\text{-}F}$ = 2 Hz), 24.7 (d, $J_{C\text{-}F}$ = 2 Hz), 14.4; HRMS (m/z, ESI-TOF): Calcd for $C_{22}H_{21}ClFN_2O_3^+$ [M+H$^+$] 415.1219, found 415.1227.

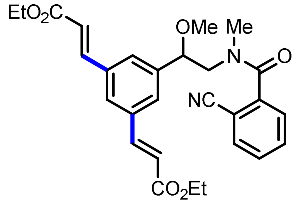


$4n_{(m,m')\mathrm{di}}$ **(2*E*,2'*E*)-diethyl-3,3'-(4-chloro-5-(2-(2-cyano-*N*-methylbenzamido)ethyl)-6-fluoro-1,3-phenylene)diacrylate**: The two rotamers' ratio is about 56:44. ^{1}H NMR (400 MHz, CDCl$_3$) δ 8.06 (d, *J* = 15.9 Hz, 0.44H), 7.88 (d, *J* = 15.9 Hz, 0.56H), 7.77 (d, *J* = 16.2 Hz, 0.54H), 7.74-7.61 (m, 2.87H), 7.59-7.45 (m, 1.66H), 7.40 (d, *J* = 7.6 Hz, 0.45H), 7.13-7.06 (m, 0.54H), 6.58 (d, *J* = 16.2 Hz, 0.44H), 6.51 (d, *J* = 16.2 Hz, 0.50H), 6.45-6.33 (m, 0.93H), 4.40-4.20 (m, 4.00H), 3.83 (t, *J* = 7.2 Hz, 0.90H), 3.47 (t, *J* = 7.3 Hz, 1.10H), 3.37-3.23 (m, 2.55H), 3.08 (t, *J* = 6.5 Hz, 1.11H), 2.95 (s, 1.35H), 1.35 (t, *J* = 7.1 Hz, 6.06H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.8, 167.7, 166.3, 166.1, 166.0, 160.4 (d, $J_{C\text{-}F}$ = 260 Hz), 160.1 (d, $J_{C\text{-}F}$ = 260 Hz), 140.3, 140.0, 139.6, 139.1, 137.3 (d, $J_{C\text{-}F}$ = 6 Hz), 136.9 (d, $J_{C\text{-}F}$ = 6 Hz), 135.7 (d, $J_{C\text{-}F}$ = 2 Hz), 135.2 (d, $J_{C\text{-}F}$ = 2 Hz), 133.1, 133.0, 132.9, 132.9, 130.9, 130.2 (d, $J_{C\text{-}F}$ = 4 Hz), 130.1 (d, $J_{C\text{-}F}$ = 4 Hz), 129.6, 129.5, 128.8, 127.4, 127.3, 126.5 (d, $J_{C\text{-}F}$ = 19 Hz), 125.9 (d, $J_{C\text{-}F}$ = 4 Hz), 125.8 (d, $J_{C\text{-}F}$ = 4 Hz), 124.9 (d, $J_{C\text{-}F}$ = 19 Hz), 122.6 (d, $J_{C\text{-}F}$ = 6 Hz), 122.3 (d, $J_{C\text{-}F}$ = 6 Hz), 122.1, 122.0, 121.8, 121.7, 121.6, 116.7, 116.7, 110.1, 110.0, 60.9, 60.8, 49.0, 46.3, 37.1, 33.1, 25.9 (d, $J_{C\text{-}F}$ = 2 Hz), 24.7 (d, $J_{C\text{-}F}$ = 2 Hz), 14.3; HRMS (m/z, ESI-TOF): Calcd for $C_{27}H_{27}ClFN_2O_5^+$ [M+H$^+$] 513.1587, found 513.1593.



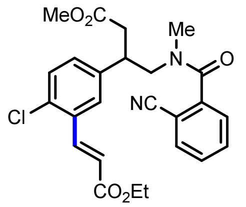
4o$_{\text{mono}}$

(*E*)-ethyl-3-(3-(2-(2-cyano-*N*-methylbenzamido)-1-methoxyethyl) phenyl) acrylate: The corresponding reaction was run with standard conditions and DMF (5 equiv) for 48 h. The two rotamers' ratio is about 62:38. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.80-7.59 (m, 3.35H), 7.60-7.37 (m, 4.62H), 7.33 (t, *J* = 7.7 Hz, 0.40H), 7.19 (d, *J* = 7.5 Hz, 0.38H), 7.13 (s, 0.35H), 7.06 (d, *J* = 7.4 Hz, 0.36H), 6.50 (d, *J* = 16.0 Hz, 0.58H), 6.35 (d, *J* = 16.0 Hz, 0.36H), 4.74 (dd, *J* = 8.6, 3.4 Hz, 0.60H), 4.39-4.22 (m, 2.42H), 3.99 (dd, *J* = 13.7, 3.5 Hz, 0.60H), 3.55-3.30 (m, 3.45H), 3.30-3.18 (m, 2.50H), 2.97 (s, 2.00H), 1.34 (t, *J* = 7.1 Hz, 3.06H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 168.7, 168.0, 167.0, 166.8, 144.3, 143.8, 140.7, 140.5, 140.5, 139.6, 135.2, 135.0, 133.1, 133.0, 132.9, 132.6, 129.5, 129.5, 129.4, 129.3, 128.7, 128.4, 128.4, 128.1, 127.9, 127.2, 126.1, 125.8, 119.1, 118.9, 116.9, 116.8, 110.5, 110.1, 82.1, 81.0, 60.7, 60.6, 57.4, 57.3, 57.2, 54.9, 39.3, 34.1, 14.4; HRMS (m/z, ESI-TOF): Calcd for $C_{23}H_{25}N_2O_4^+$ [M+H$^+$] 393.1809, found 393.1807.



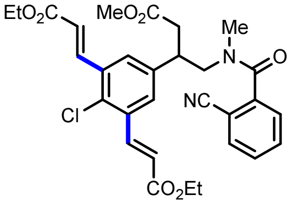
4o$_{(m,m')\text{di}}$

(2*E*,2'*E*)-diethyl-3,3'-(5-(2-(2-cyano-*N*-methylbenzamido)-1-methoxy ethyl)-1,3-phenylene)diacrylate: The two rotamers' ratio is about 68:32. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.87-7.46 (m, 7.32H), 7.41 (d, *J* = 7.7 Hz, 0.68H), 7.24 (d, *J* = 7.6 Hz, 0.34H), 7.15 (s, 0.56H), 6.53 (d, *J* = 16.0 Hz, 1.29H), 6.38 (d, *J* = 16.0 Hz, 0.64H), 4.77 (d, *J* = 6.5 Hz, 0.68H), 4.46-4.17 (m, 4.32H), 4.03 (d, *J* = 12.7 Hz, 0.66H), 3.53-3.31 (m, 3.41H), 3.26 (s, 2.00H), 3.11-2.93 (m, 2.06H), 1.35 (t, *J* = 7.0 Hz, 6.07H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 168.7, 168.0, 166.7, 166.5, 143.4, 143.0, 141.5, 140.6, 140.5, 140.4, 136.0, 135.8, 133.2, 133.1, 132.7, 129.6, 129.5, 128.1, 127.5, 127.3, 127.2, 120.2, 119.9, 116.9, 116.9, 110.6, 110.1, 82.1, 81.0, 60.8, 60.7, 57.5, 57.4, 55.0, 54.9, 39.4, 34.2, 14.4; HRMS (m/z, ESI-TOF): Calcd for $C_{28}H_{31}N_2O_6^+$ [M+H$^+$] 491.2177, found 491.2166.

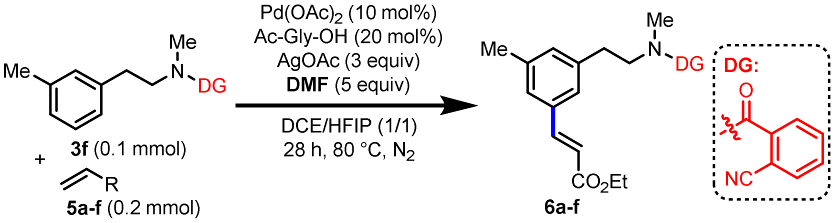


4p$_{\text{mono}}$

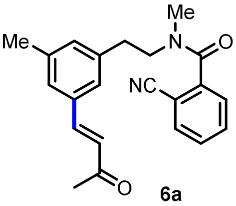
(*E*)-methyl-3-(4-chloro-3-(3-ethoxy-3-oxoprop-1-enyl)phenyl)-4-(2-cyano-*N*-methylbenzamido)butanoate: The corresponding reaction was run with standard conditions at 90 ^{o}C for 48 h. The two rotamers' ratio is about 74:26. ^{1}H NMR (400 MHz, CDCl$_3$) δ 8.06 (d, *J* = 16.0 Hz, 0.68H), 7.99 (d, *J* = 16.0 Hz, 0.24H), 7.80-7.55 (m, 2.72H), 7.53-7.44 (m, 1.33H), 7.40 (d, *J* = 8.3 Hz, 0.68H), 7.32 (dd, *J* = 8.3, 2.1 Hz, 0.94H), 7.17 (d, *J* = 7.7 Hz, 0.67H), 7.10 (d, *J* = 1.7 Hz, 0.24H), 6.93 (dd, *J* = 8.2, 1.8 Hz, 0.25H), 6.81 (brs, 0.22H), 6.51 (d, *J* = 16.0 Hz, 0.67H), 6.20 (d, *J* = 16.0 Hz, 0.25H), 4.36-4.23 (m, 2.00H), 3.97 (dd, *J* = 13.0, 6.9 Hz, 0.68H), 3.83-3.36 (m, 5.49H), 3.16 (s, 0.78H), 2.88 (dd, *J* = 16.3, 5.8 Hz, 0.74H), 2.84-2.69 (m, 2.82H), 2.59-2.44 (m, 0.62H), 1.42-1.31 (m, 3.08H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 172.0, 171.3, 168.2, 167.9, 166.6, 166.3, 140.4, 140.3, 140.2, 139.8, 139.6, 139.5, 134.2, 133.8, 133.4, 133.2, 133.1, 133.1, 133.0, 132.7, 130.8, 130.6, 130.5, 129.7, 129.6, 128.2, 127.3, 127.3, 126.5, 121.8, 121.5, 116.9, 116.7, 110.0, 60.9, 60.8, 56.4, 52.1, 52.1, 51.9, 40.0, 39.7, 38.3, 37.4, 33.6, 14.4; HRMS (m/z, ESI-TOF): Calcd for $C_{25}H_{26}ClN_2O_5^+$ [M+H$^+$] 469.1525, found 469.1530.



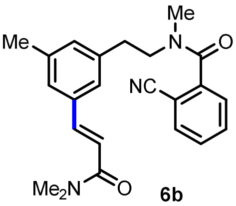
4p$_{(m,m')\text{di}}$ **(2*E*,2'*E*)-diethyl-3,3'-(2-chloro-5-(1-(2-cyano-*N*-methylbenzamido)-4-methoxy-4-oxobutan-2-yl)-1,3-phenylene)diacrylate**: The two rotamers' ratio is about 77:23. ^{1}H NMR (400 MHz, CDCl$_3$) δ 8.11 (d, *J* = 16.0 Hz, 1.44H), 8.05 (d, *J* = 16.0 Hz, 0.44H), 7.72-7.56 (m, 3.41H), 7.53-7.42 (m, 1.36H), 7.17 (d, *J* = 7.7 Hz, 0.72H), 7.14 (s, 0.43H), 6.81 (s, 0.18H), 6.49 (d, *J* = 16.0 Hz, 1.42H), 6.21 (d, *J* = 16.0 Hz, 0.45H), 4.30-4.23 (m, 4.00H), 3.94 (dd, *J* = 13.5, 7.5 Hz, 0.71H), 3.85 (dd, *J* = 13.6, 8.1 Hz, 0.71H), 3.77-3.41 (m, 5.11H), 3.18 (s, 0.72H), 2.90 (dd, *J* = 16.3, 5.7 Hz, 0.76H), 2.82 (s, 2.05H), 2.75 (dd, *J* = 16.3, 8.8 Hz, 1.06H), 2.52 (dd, *J* = 12.9, 6.5 Hz, 0.45H), 1.41-1.32 (m, 6.15H); HRMS (m/z, ESI-TOF): ^{13}C NMR (101 MHz, CDCl$_3$) δ 171.9, 171.1, 168.3, 167.9, 166.4, 166.1, 140.3, 140.2, 139.9, 139.5, 139.5, 134.9, 134.5, 134.2, 134.0, 133.3, 133.1, 132.8, 129.7, 128.6, 128.2, 128.0, 127.3, 122.7, 122.5, 116.9, 116.7, 109.9, 61.1, 60.9, 56.3, 52.2, 52.0, 51.8, 40.1, 39.7, 38.3, 37.4, 37.4, 33.7, 14.4; Calcd for $C_{30}H_{32}ClN_2O_7^+$ [M+H$^+$] 567.1893, found 567.1897.



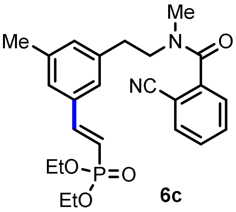
A 50 mL Schlenk sealed tube (with a Teflon cap) equipped with a magnetic stir bar was charged with amide **3f** (0.10 mmol, 1.0 equiv), Pd(OAc)$_2$ (2.3 mg, 0.010 mmol, 10 mol%), Ac-Gly-OH (2.4 mg, 0.020 mmol, 20 mol%) and AgOAc (50 mg, 0.30 mmol, 3 equiv). The tube was then purged with nitrogen. DCE (0.5 mL) was added to the mixture, followed by olefin **5** (2.0 equiv) and DMF (39 µL, 0.5 mmol, 5 equiv). And then 0.5 mL of HFIP was added along the inside wall of the tube. The tube was then capped under a flow of nitrogen and submerged into a preheated 80 °C oil bath. The reaction was stirred for 28 h and cooled to room temperature. The crude reaction mixture was diluted with EtOAc (5 mL) and filtered through a short pad of Celite. The sealed tube and Celite pad were washed with an additional 20 mL of EtOAc. The filtrate was concentrated *in vacuo*, and the resulting residue was purified by preparative thin layer chromatography using petroleum ether/EtOAc as the eluent. The site selectivity was assigned by ^{1}H NMR analysis of the product.



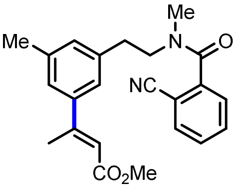
6a **(E)-2-cyano-N-methyl-N-(3-methyl-5-(3-oxobut-1-enyl)phenethyl) benzamide**: The corresponding reaction was run with standard conditions and DMF (5 equiv) for 28 h. The two rotamers' ratio is about 57:43. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.72 (d, J = 7.7 Hz, 0.61H), 7.70-7.60 (m, 1.10H), 7.54-7.43 (m, 2.24H), 7.42-7.34 (m, 1.00H), 7.32 (s, 0.56H), 7.24 (s, 0.94H), 7.20 (s, 0.54H), 6.89 (s, 0.44H), 6.87-6.81 (m, 0.44H), 6.79 (s, 0.43H), 6.74 (d, J = 16.3 Hz, 0.59H), 6.61 (d, J = 16.3 Hz, 0.43H), 3.80 (dd, J = 8.5, 6.9 Hz, 1.14H), 3.47 (t, J = 6.9 Hz, 0.86H), 3.20 (s, 1.33H), 3.07-2.99 (m, 1.15H), 2.86 (s, 1.72H), 2.80 (t, J = 6.9 Hz, 0.88H), 2.42-2.33 (m, 4.54H), 2.30 (s, 1.39H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 198.6, 198.3, 168.0, 167.6, 143.6, 143.1, 140.6, 140.3, 139.6, 139.3, 139.1, 138.5, 135.0, 134.8, 133.2, 133.0, 132.8, 132.8, 132.2, 131.9, 129.6, 129.4, 127.7, 127.5, 127.4, 127.3, 127.2, 126.2, 125.9, 116.9, 116.8, 110.0, 109.9, 52.4, 49.5, 37.4, 34.3, 33.2, 33.0, 27.7, 21.3, 21.3; HRMS (m/z, ESI-TOF): Calcd for $C_{22}H_{23}N_2O_2^+$ [M+H$^+$] 347.1754, found 347.1765.



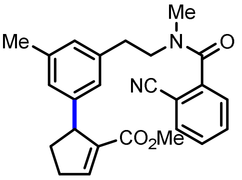
6b **(E)-2-cyano-N-(3-(3-(dimethylamino)-3-oxoprop-1-enyl)-5-methyl phenethyl)-N-methylbenzamide**: The corresponding reaction was run with standard conditions and DMF (5 equiv) for 28 h. The two rotamers' ratio is about 55:45. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.71 (d, J = 7.7 Hz, 0.56H), 7.68-7.58 (m, 1.53H), 7.57-7.41 (m, 1.97H), 7.37 (d, J = 7.7 Hz, 0.56H), 7.33 (s, 0.51H), 7.20 (d, J = 8.6 Hz, 0.95H), 7.14 (s, 0.51H), 6.93 (d, J = 15.4 Hz, 0.53H), 6.87-6.78 (m, 1.32H), 6.75 (s, 0.44H), 3.81 (t, J = 7.6 Hz, 1.11H), 3.46 (t, J = 6.8 Hz, 0.89H), 3.25-3.13 (m, 4.39H), 3.07 (s, 3.00H), 3.03 (dd, J = 8.6, 6.6 Hz, 1.18H), 2.83 (s, 1.65H), 2.79 (t, J = 6.8 Hz, 0.88H), 2.36 (s, 1.60H), 2.30 (s, 1.32H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 168.0, 167.6, 166.9, 166.7, 142.4, 142.0, 140.7, 140.3, 139.3, 139.0, 138.9, 138.2, 136.0, 135.8, 133.2, 133.0, 132.9, 132.7, 131.1, 131.0, 129.5, 129.4, 127.7, 127.4, 127.4, 126.9, 125.6, 125.1, 117.9, 117.6, 116.9, 116.9, 110.1, 109.9, 52.5, 49.5, 37.6, 37.6, 37.6, 37.5, 36.0, 34.3, 33.3, 33.0, 21.3; HRMS (m/z, ESI-TOF): Calcd for $C_{23}H_{26}N_3O_2^+$ [M+H$^+$] 376.2020, found 376.2028.



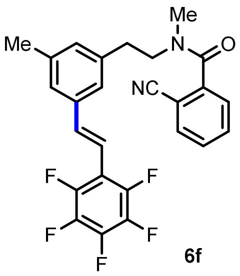
6c **(E)-diethyl-3-(2-(2-cyano-N-methylbenzamido)ethyl)-5-methylstyryl phosphonate**: The corresponding reaction was run with standard conditions and DMF (5 equiv) for 28 h. The two rotamers' ratio is about 56:44. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.71 (d, J = 7.8 Hz, 0.58H), 7.70-7.61 (m, 1.00H), 7.57-7.43 (m, 2.00H), 7.44-7.28 (m, 1.17H), 7.26 (s, 0.49H), 7.19 (s, 1.52H), 6.86 (d, J = 8.1 Hz, 0.45H), 6.81 (s, 0.42H), 6.78 (s, 0.41H), 6.28 (t, J = 17.7 Hz, 0.56H), 6.15 (t, J = 17.5 Hz, 0.44H), 4.20-4.07 (m, 4.01H), 3.87-3.75 (m, 1.10H), 3.46 (t, J = 6.9 Hz, 0.90H), 3.20 (s, 1.34H), 3.08-2.98 (m, 1.13H), 2.85 (s, 1.72H), 2.80 (t, J = 6.9 Hz, 0.88H), 2.36 (s, 1.70H), 2.30 (s, 1.34H), 1.44-1.30 (m, 6.08H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 167.9, 167.6, 148.8 (d, $J_{C\text{-}P}$ = 7 Hz), 148.3 (d, $J_{C\text{-}P}$ = 7 Hz), 140.7, 140.3, 139.5, 139.2, 139.0, 138.3, 135.6, 135.4, 135.3, 135.1, 133.2, 133.0, 132.9, 132.8, 131.9, 131.6, 129.6, 129.4, 127.7, 127.4, 126.9, 125.4, 125.3, 116.9, 116.8, 115.5, 115.0, 113.6, 113.1, 110.0, 109.9, 61.9 (d, $J_{C\text{-}P}$ = 5 Hz), 61.9 (d, $J_{C\text{-}P}$ = 5 Hz), 52.4, 49.5, 37.4, 34.3, 33.2, 33.0, 21.3, 21.3, 16.5 (d, $J_{C\text{-}P}$ = 7 Hz); HRMS (m/z, ESI-TOF): Calcd for $C_{24}H_{30}N_2O_4P^+$ [M+H$^+$] 441.1938, found 441.1946.



6d **(*E*)-methyl-3-(3-(2-(2-cyano-*N*-methylbenzamido)ethyl)-5-methylphenyl) but-2-enoate**: The corresponding reaction was run with standard conditions and DMF (5 equiv) for 28 h. The two rotamers' ratio is about 52:48. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.71 (d, *J* = 7.7 Hz, 0.56H), 7.69-7.61 (m, 0.99H), 7.55-7.42 (m, 1.65H), 7.39 (d, *J* = 7.7 Hz, 0.47H), 7.21 (s, 0.57H), 7.19-7.13 (m, 1.39H), 6.86-6.78 (m, 0.47H), 6.77 (d, *J* = 6.7 Hz, 0.82H), 6.14 (q, *J* = 1.4 Hz, 0.46H), 6.00 (q, *J* = 1.4 Hz, 0.42H), 3.84-3.74 (m, 4.16H), 3.45 (t, *J* = 6.9 Hz, 0.90H), 3.21 (s, 1.38H), 3.08-2.98 (m, 1.02H), 2.86 (s, 1.58H), 2.80 (t, *J* = 6.9 Hz, 1.04H), 2.57 (d, *J* = 0.9 Hz, 1.51H), 2.49 (d, *J* = 1.0 Hz, 1.45H), 2.37 (s, 1.56H), 2.30 (s, 1.44H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 168.0, 167.6, 167.4, 167.2, 156.1, 155.6, 142.9, 142.6, 140.7, 140.4, 139.1, 138.8, 138.6, 138.0, 133.2, 133.0, 132.8, 132.7, 130.6, 130.4, 129.6, 129.3, 127.7, 127.5, 125.7, 125.5, 124.1, 124.0, 116.9, 116.9, 116.8, 116.7, 110.1, 109.9, 52.6, 51.3, 51.2, 49.6, 37.4, 34.5, 33.3, 33.0, 21.5, 21.4, 18.2, 18.1; HRMS (m/z, ESI-TOF): Calcd for $C_{23}H_{25}N_2O_3^+$ [M+H$^+$] 377.1860, found 377.1868.



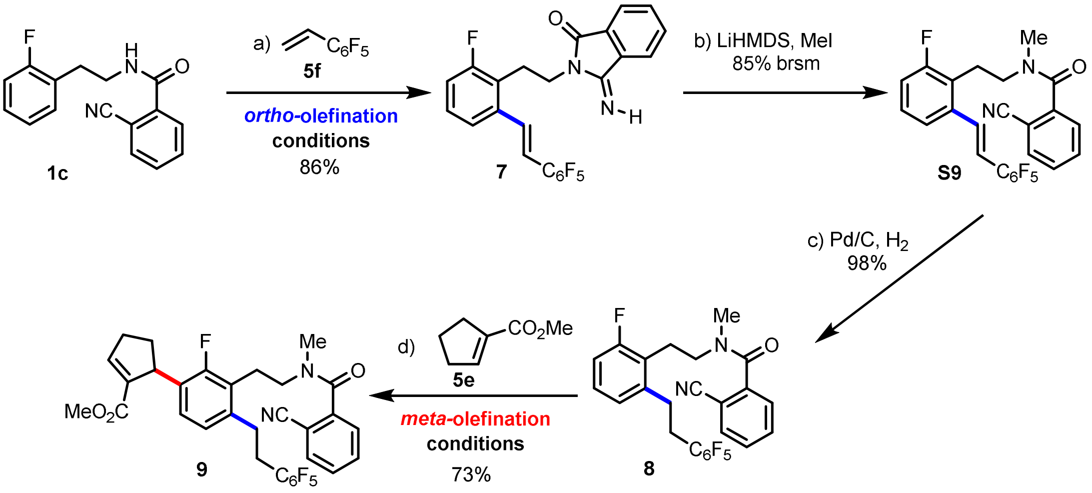
6e **Methyl-5-(3-(2-(2-isocyano-*N*-methylbenzamido)ethyl)-5-methylphenyl) cyclopent-1-ene-1-carboxylate**: The corresponding reaction was run with standard conditions and DMF (5 equiv) for 28 h. The two rotamers' ratio is about 50:50. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.70 (d, *J* = 7.7 Hz, 0.49H), 7.64 (t, *J* = 7.2 Hz, 1.00H), 7.53-7.38 (m, 1.55H), 7.37 (d, *J* = 7.7 Hz, 0.46H), 6.99 (t, *J* = 2.2 Hz, 0.93H), 6.96 (s, 0.50H), 6.90 (s, 0.49H), 6.84 (s, 0.93H), 6.80 (d, *J* = 7.3 Hz, 0.45H), 6.57 (s, 0.48H), 6.52 (s, 0.48H), 4.16-3.98 (m, 0.96H), 3.78 (dd, *J* = 8.8, 6.5 Hz, 1.00H), 3.60 (s, 1.55H), 3.57 (s, 1.45H), 3.40 (t, *J* = 7.0 Hz, 1.01H), 3.17 (s, 1.49H), 2.96 (t, *J* = 7.6 Hz, 0.98H), 2.78 (s, 1.47H), 2.73 (t, *J* = 7.0 Hz, 1.05H), 2.70-2.43 (m, 3.01H), 2.30 (s, 1.50H), 2.21 (s, 1.50H), 1.93-1.77 (m, 1.04H); ^{13}C NMR (101 MHz, CDCl$_3$) δ 168.0, 167.5, 165.3, 165.2, 145.7, 145.5, 145.2, 145.1, 140.9, 140.6, 139.2, 139.0, 138.8, 138.5, 138.3, 137.7, 133.1, 133.0, 132.8, 132.6, 129.4, 129.1, 127.9, 127.8, 127.6, 127.5, 126.3, 126.0, 124.7, 116.9, 110.1, 109.8, 52.7, 51.5, 51.4, 50.1, 49.9, 49.7, 37.5, 34.5, 34.3, 34.3, 33.3, 33.0, 32.3, 32.3, 21.5, 21.4; HRMS (m/z, ESI-TOF): Calcd for $C_{25}H_{27}N_2O_3^+$ [M+H$^+$] 403.2016, found 403.2024.



6f

(*E*)-2-cyano-*N*-methyl-*N*-(3-methyl-5-(perfluorostyryl)phenethyl) benzamide: The corresponding reaction was run with standard conditions and DMF (5 equiv) for 28 h. The two rotamers' ratio is about 55:45. ^{1}H NMR (400 MHz, $CDCl_3$) δ 1.72 (d, J = 7.7 Hz, 0.56H), 7.69-7.60 (m, 1.12H), 7.55-7.36 (m, 2.69H), 7.29 (t, J = 9.1 Hz, 0.98H), 7.25-7.19 (m, 0.96H), 7.14 (s, 0.51H), 6.99 (d, J = 16.8 Hz, 0.55H), 6.89-6.80 (m, 1.29H), 6.74 (s, 0.46H), 3.82 (dd, J = 8.9, 6.6 Hz, 1.10H), 3.48 (t, J = 6.9 Hz, 0.90H), 3.22 (s, 1.39H), 3.04 (t, J = 7.6 Hz, 1.10H), 2.87 (s, 1.52H), 2.81 (t, J = 6.8 Hz, 0.93H), 2.39 (s, 1.63H), 2.32 (s, 1.33H); ^{13}C NMR (101 MHz, $CDCl_3$, the signal of the peaks of the carbons on the pentafluoroarene are very low and not interpreted.) δ 168.0, 167.7, 140.8, 140.4, 139.5, 139.2, 139.0, 138.4, 137.4, 137.1, 136.9, 133.2, 133.1, 132.8, 132.8, 130.7, 130.5, 129.6, 129.3, 127.8, 127.5, 126.2, 126.0, 124.8, 124.6, 116.9, 116.9, 113.0, 112.7, 110.1, 110.0, 52.6, 49.7, 37.5, 34.4, 33.3, 33.0, 21.4, 21.4; HRMS (m/z, ESI-TOF): Calcd for $C_{26}H_{20}F_5N_2O^+$ [M+H$^+$] 471.1490, found 471.1497.

2.5 Sequential remote-selective *ortho*- and *meta*-C–H bond olefination and characterization of the products.

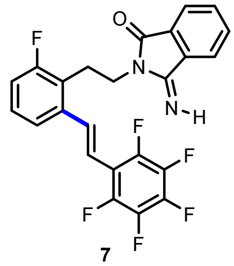


Step a: **7** was obtained in 86% yield using standard *ortho*-olefination conditions in 24 h.

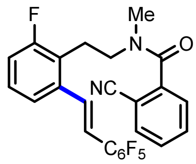
Step b: LHMDS (0.6 mL, 1.0 M in THF) was added to a solution of **7** (110 mg, 0.24 mmol) in anhydrous THF (3 mL) at -15 °C. After stirring for 0.5 h, MeI (45 μL, 0.72 mmol) was added dropwise to the reaction. The reaction mixture was gradually warmed to room temperature and stirred for another 2 h. Then H_2O (10 mL) was added slowly to quench the reaction. The aqueous phase was extracted with ethyl acetate (10 mL × 3). The combined organic phase was dried over anhydrous Na_2SO_4 and concentrated under reduced pressure. The residue was purified by flash silica gel chromatography with petroleum ether/EtOAc (2:1) to afford compound **S9** (66 mg) in 58% yield, and 32% of substrate **7** (35 mg) was also recovered.

Step c: To a solution of compound **S9** (56 mg, 0.12 mmol) in methanol (5 mL) was added Palladium on carbon (10% w/w, 15 mg). The reaction was then stirred at room temperature under hydrogen gas atmosphere (1 atm) for 1 hour. The catalyst was filtered through a short pad of Celite, and the filtrate was concentrated under reduced pressure. The residue was purified by flash silica gel chromatography with petroleum ether/EtOAc (2:1) to obtain compound **8** (56 mg) in 98% yield.

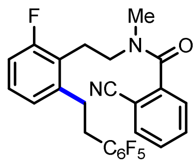
Step d: **9** was obtained in 73% yield using standard *meta*-olefination conditions at 90 °C in 48 h.



7 **(*E*)-2-(2-fluoro-6-(perfluorostyryl)phenethyl)-3-iminoisoindolin-1-one**: ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.53 (brs, 1H), 7.72-7.50 (m, 5H), 7.32-7.20 (m, 2H), 7.05 (t, J = 8.8 Hz, 1H), 6.61 (d, J = 16.5 Hz, 1H), 4.05 (t, J = 6.8 Hz, 2H), 3.21 (t, J = 6.0 Hz, 2H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.6, 161.8 (d, J = 245 Hz), 146.1 (m), 143.6 (m), 138.75 (d, J = 4.5 Hz), 133.8, 132.8, 132.1, 131.0, 128.4 (d, J = 9 Hz), 124.8 (d, J = 15 Hz), 123.1, 121.7, 120.6 (m), 115.7, 115.5 (d, J = 23 Hz), 112.0 (m), 38.1, 24.2 (d, J = 4 Hz).

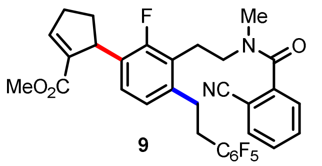


S9 **(*E*)-2-cyano-*N*-(2-fluoro-6-(perfluorostyryl)phenethyl)-*N*-methylbenzamide**: The two rotamers' ratio is about 50:50. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.84 (d, J = 16.5 Hz, 0.48H), 7.69 (d, J = 7.7 Hz, 0.47H), 7.64 (t, J = 7.7 Hz, 0.51H), 7.58 (d, J = 7.6 Hz, 0.51H), 7.54-7.36 (m, 2.71H), 7.36-7.23 (m, 1.94H), 7.07 (t, J = 8.9 Hz, 0.49H), 7.02-6.90 (m, 1.47H), 6.67 (d, J = 16.5 Hz, 0.50H), 3.83-3.70 (m, 0.95H), 3.43 (t, J = 7.0 Hz, 1.02H), 3.32-3.16 (m, 2.49H), 3.01 (t, J = 6.9 Hz, 1.02H), 2.93 (s, 1.40H); HRMS (m/z, ESI-TOF): Calcd for $C_{25}H_{17}F_6N_2O^+$ [M+H$^+$] 475.1240, found 475.1247.



8 **2-Cyano-*N*-(2-fluoro-6-(perfluorophenethyl)phenethyl)-*N*-methylbenzamide**: The two rotamers' ratio is about 57:43. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.71 (d, J = 7.7 Hz, 0.57H), 7.70-7.61 (m, 1.00H), 7.56-7.41 (m, 2.03H), 7.18-7.10 (m, 1.02H), 7.07 (d, J = 7.5 Hz, 0.43H), 6.94 (t, J = 9.0 Hz, 0.59H), 6.85 (q, J = 7.7 Hz, 1.42H), 3.80-3.66 (m, 1.14H), 3.40 (t, J = 7.4 Hz, 0.85H), 3.26 (s, 1.29H), 3.18-3.00 (m, 3.51H), 2.98 (s, 1.69H), 2.92 (t, J = 7.1 Hz, 0.89H), 2.79 (dd, J = 9.6, 6.7 Hz, 0.86H), 2.61 (dd, J = 9.9, 6.3 Hz, 0.84H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.9, 167.7, 161.9 (d, $J_{C\text{-}F}$ = 244 Hz), 161.8 (d, $J_{C\text{-}F}$ = 246 Hz), 146.5 (m), 143.9 (m), 141.5, 141.5, 140.6, 140.6, 140.3, 138.8 (m), 136.5 (m), 133.1 (d, $J_{C\text{-}F}$ = 27 Hz), 132.9 (d, $J_{C\text{-}F}$ =

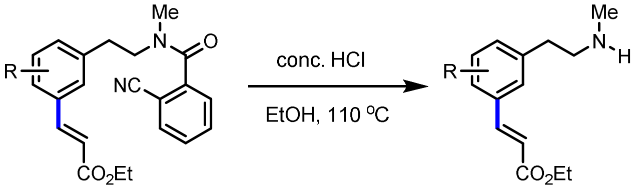
9 Hz), 129.6, 129.4, 128.5 (d, $J_{C\text{-}F}$ = 10 Hz), 128.0 (d, $J_{C\text{-}F}$ = 9 Hz), 127.5, 127.5, 125.4 (d, $J_{C\text{-}F}$ = 3 Hz), 125.2 (d, $J_{C\text{-}F}$ = 3 Hz), 124.0 (d, $J_{C\text{-}F}$ = 15 Hz), 123.0 (d, $J_{C\text{-}F}$ = 15 Hz), 116.8, 114.0 (d, $J_{C\text{-}F}$ = 23 Hz), 113.7 (d, $J_{C\text{-}F}$ = 23 Hz), 110.1, 50.8, 47.9, 37.1, 33.2, 32.2, 31.9, 24.4 (d, $J_{C\text{-}F}$ = 2 Hz), 24.2, 24.0, 23.1 (d, $J_{C\text{-}F}$ = 3 Hz); HRMS (m/z, ESI-TOF): Calcd for $C_{25}H_{19}F_6N_2O^+$ [M+H$^+$] 477.1396, found 477.1403.



9

Methyl-5-(3-(2-(2-cyano-*N*-methylbenzamido)ethyl)-2-fluoro-4-(perfluorophenethyl)phenyl)cyclopent-1-enecarboxylate: The two rotamers' ratio is about 57:43. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.71 (d, *J* = 7.7 Hz, 0.57H), 7.69-7.61 (m, 0.99H), 7.55-7.39 (m, 2.01H), 7.07 (d, *J* = 7.6 Hz, 0.44H), 7.03 (t, *J* = 2.2 Hz, 1.00H), 6.84 (td, *J* = 7.8, 3.2 Hz, 0.99H), 6.80-6.69 (m, 0.97H), 4.48-4.38 (m, 0.53H), 4.37-4.27 (m, 0.42H), 3.82-3.68 (m, 1.17H), 3.61 (s, 3.00H), 3.39 (t, *J* = 7.4 Hz, 0.94H), 3.26 (s, 1.30H), 3.13 (t, *J* = 7.5 Hz, 1.08H), 3.01 (s, 2.08 H), 2.97 (s, 1.70H), 2.91 (t, *J* = 7.0 Hz, 0.92H), 2.74 (t, *J* = 8.1 Hz, 0.96H), 2.69-2.42 (m, 3.90H), 1.92-1.72 (m, 1.30H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.9, 167.7, 165.1, 165.0, 159.5 (d, $J_{C\text{-}F}$ = 245 Hz), 146.2, 145.9, 143.9 (m), 140.7, 140.5, 139.0 (d, $J_{C\text{-}F}$ = 4 Hz), 138.7 (m), 138.2 (d, $J_{C\text{-}F}$ = 4 Hz), 137.8, 137.4, 136.3 (m), 133.2, 133.0, 132.8, 130.3 (d, $J_{C\text{-}F}$ = 36 Hz), 130.1 (d, $J_{C\text{-}F}$ = 36 Hz), 129.6, 129.3, 127.6, 126.7 (d, $J_{C\text{-}F}$ = 6 Hz), 126.1 (d, $J_{C\text{-}F}$ = 6 Hz), 125.0 (d, $J_{C\text{-}F}$ = 3 Hz), 124.7 (d, $J_{C\text{-}F}$ = 3 Hz), 123.9 (d, $J_{C\text{-}F}$ = 17 Hz), 122.8 (d, $J_{C\text{-}F}$ = 16 Hz), 116.9, 116.8, 114.2 (m), 110.1, 110.0, 77.5, 77.2, 76.8, 51.5, 51.5, 50.9, 48.0, 43.0 (d, $J_{C\text{-}F}$ = 2 Hz), 37.2, 33.2, 33.0, 32.9, 32.2, 32.2, 32.1, 31.7, 24.6 (d, $J_{C\text{-}F}$ = 3 Hz), 24.2, 23.8, 23.4 (d, $J_{C\text{-}F}$ = 4 Hz); HRMS (m/z, ESI-TOF): Calcd for $C_{32}H_{27}F_6N_2O_3^+$ [M+H$^+$] 601.1920, found 601.1927.

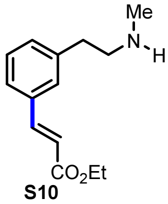
2.6 Removal of the directing group and characterization of selected hydrolyzed products.



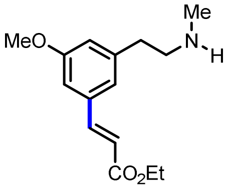
4 and **9**

S10-S16

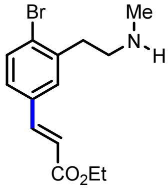
To a solution of **4** (0.1 mmol) in EtOH (1 mL) was added HCl (aqueous solution, 1 mL, 36 wt%) dropwise at 0 °C. After stirring for 10 min at 0 °C, the reaction mixture was allowed to reflux at 110 °C under nitrogen atmosphere. After the reaction was completed, the reaction mixture was diluted with 5 mL of water. After basification with ammonium hydroxide solution at 0 °C under inert atmosphere until pH value reached about 10, the solution was extracted with EtOAc (20 mL × 2). The combined organic phase was washed with brine, dried over Na_2SO_4 and concentrated *in vacuo*. The crude mixture was purified by preparative thin layer chromatography using EtOAc/Et_3N (50/1) as the eluent to yield the product in 70% to 90% yield.



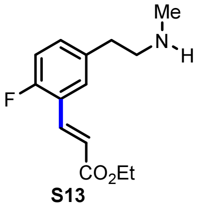
S10 **Ethyl-(*E*)-3-(3-(2-(methylamino)ethyl)phenyl)acrylate**: ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.63 (d, *J* = 16.0 Hz, 1H), 7.43-7.35 (m, 2H), 7.31 (td, *J* = 7.4, 1.1 Hz, 1H), 7.24 (dt, *J* = 7.5, 1.5 Hz, 1H), 6.42 (d, *J* = 16.0 Hz, 1H), 5.63 (brs, 1H), 4.25 (q, *J* = 7.1 Hz, 2H), 3.02 (s, 4H), 2.58 (s, 3H), 1.32 (t, *J* = 7.1 Hz, 3H).



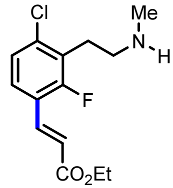
S11 **Ethyl-(*E*)-3-(3-methoxy-5-(2-(methylamino)ethyl)phenyl)acrylate**: Note: one drop of D$_2$O was added to the sample solution to suppress the NH peak in the NMR spectrum. ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.59 (d, *J* = 16.1 Hz, 1H), 6.98 (s, 1H), 6.90 (t, *J* = 1.7 Hz, 1H), 6.80 (s, 1H), 6.40 (d, *J* = 16.0 Hz, 1H), 4.25 (q, *J* = 7.1 Hz, 2H), 3.80 (s, 3H), 2.99 (s, 4H), 2.56 (s, 3H), 1.32 (t, *J* = 7.1 Hz, 3H).



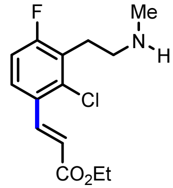
S12 **Ethyl-(*E*)-3-(4-bromo-3-(2-(methylamino)ethyl)phenyl)acrylate**: ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.58 (d, *J* = 16.4 Hz, 1H), 7.55 (d, *J* = 8.6 Hz, 1H), 7.43 (d, *J* = 2.2 Hz, 1H), 7.26-7.22 (m, 1H), 6.43 (d, *J* = 16.0 Hz, 1H), 4.25 (q, *J* = 7.1 Hz, 2H), 3.78 (brs, 1H), 3.11 (dd, *J* = 8.7, 6.3 Hz, 2H), 2.99 (dd, *J* = 9.1, 6.2 Hz, 2H), 2.59 (s, 3H), 1.33 (t, *J* = 7.1 Hz, 3H).



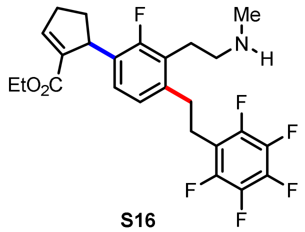
S13 **Ethyl-(*E*)-3-(2-fluoro-5-(2-(methylamino)ethyl)phenyl)acrylate**: ^{1}H NMR (400 MHz, CDCl$_3$) δ 7.74 (d, *J* = 16.2 Hz, 1H), 7.38 (dd, $J_{F\text{-}H}$ = 6.9, $J_{H\text{-}H}$ = 2.3 Hz, 1H), 7.20 (ddd, $J_{F\text{-}H}$ = 4.9, $J_{H\text{-}H}$ = 8.4, 2.3 Hz, 1H), 7.02 (dd, $J_{F\text{-}H}$ = 10.4, $J_{H\text{-}H}$ = 8.4 Hz, 1H), 6.52 (d, *J* = 16.2 Hz, 1H), 5.07 (s, 3H), 4.25 (q, *J* = 7.1 Hz, 2H), 2.98 (s, 4H), 2.57 (s, 3H), 1.32 (t, *J* = 7.1 Hz, 3H).



S14 **Ethyl-(*E*)-3-(4-chloro-2-fluoro-3-(2-(methylamino)ethyl)phenyl)acrylate**: ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.75 (d, J = 16.2 Hz, 1H), 7.34 (t, $J_{F-H \text{ and } H-H}$ = 8.1 Hz, 1H), 7.18 (dd, J_{H-H} = 8.4, J_{F-H} = 1.2 Hz, 1H), 6.49 (d, J = 16.2 Hz, 1H), 4.26 (q, J = 7.1 Hz, 2H), 3.05 (td, J_{H-H} = 7.5, J_{F-H} = 2.3 Hz, 2H), 2.86 (dd, J = 8.4, 6.6 Hz, 2H), 2.53 (brs, 1H), 2.51 (s, 3H), 1.33 (t, J = 7.1 Hz, 3H).

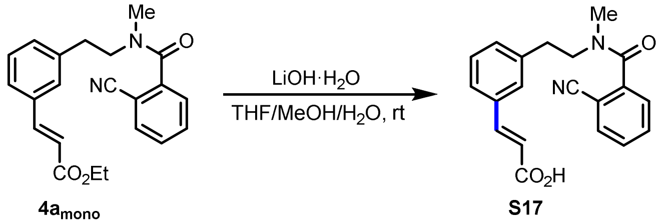


S15 **Ethyl-(*E*)-3-(2-chloro-4-fluoro-3-(2-(methylamino)ethyl)phenyl)acrylate**: ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.05 (d, J = 15.9 Hz, 1H), 7.50 (dd, J_{H-H} = 8.8, J_{F-H} = 5.9 Hz, 1H), 7.01 (t, $J_{F-H \text{ and } H-H}$ = 8.7 Hz, 1H), 6.33 (d, J = 15.9 Hz, 1H), 4.27 (q, J = 7.2 Hz, 2H), 3.72 (s, 1H), 3.14 (td, J_{H-H} = 8.2, J_{F-H} = 2.0 Hz, 2H), 2.92 (dd, J = 8.7, 6.6 Hz, 2H), 2.56 (s, 3H), 1.34 (t, J = 7.1 Hz, 3H).



S16 **Ethyl-5-(2-fluoro-3-(2-(methylamino)ethyl)-4-(perfluorophenethyl)phenyl)cyclopent-1-enecarboxylate**: ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.01 (s, 1H), 6.84 (t, $J_{F-H \text{ and } H-H}$ = 7.7 Hz, 1H), 6.78 (d, J = 8.0 Hz, 1H), 4.41 (d, J = 8.4 Hz, 1H), 4.14-3.99 (m, 2H), 3.01-2.78 (m, 8H), 2.71 – 2.43 (m, 8H), 1.14 (t, J = 7.1 Hz, 3H).

2.7 Hydrolysis of compound **4a$_{\text{mono}}$** to S17.



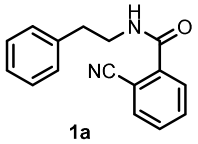
Compound **4a$_{\text{mono}}$** (22 mg, 0.06 mmol) was dissolved in a solution of THF (1.5 mL), MeOH (1.0 mL) and H_2O (0.5 mL). The solution was cooled to 0 °C and LiOH·H_2O (10 mg, 0.24 mmol) was added. The mixture was stirred at room temperature for 2 h and then H_2O (10 mL) was added. The solution was extracted with Et_2O (5 mL × 2) and the aqueous phase was acidized with 1N HCl (1 mL). The aqueous phase was extracted with CH_2Cl_2 (5 mL × 4). The combined organic phase was dried over anhydrous Na_2SO_4 and concentrated under reduced pressure to give compound **S17** (17 mg) in 85% yield. **S17**: ^1H NMR (400 MHz, $CDCl_3$) δ 7.78 (d, *J* = 16.0 Hz, 0.63H), 7.74-7.59 (m, 2.09H), 7.56-7.28 (m, 5.50H), 7.12-6.95 (m, 0.88H), 6.89-6.77 (m, 0.42H), 6.49 (d, *J* = 15.9 Hz, 0.56H), 6.35 (d, *J* = 15.9 Hz, 0.42H), 3.83 (t, *J* = 7.4 Hz, 1.14H), 3.48 (t, *J* = 6.5 Hz, 0.86H), 3.22 (s, 1.36H), 3.08 (t, *J* = 7.3 Hz, 1.26H), 2.89-2.79 (m, 2.61H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 171.3, 171.1, 168.1, 167.8, 146.9, 146.3, 140.6, 140.2, 139.7, 138.6, 134.8, 134.6, 133.3, 133.1, 133.0, 132.8, 131.5, 131.3, 129.65, 129.62, 129.5, 129.4, 129.0, 128.7, 127.7, 127.5, 127.0, 126.8, 117.9, 117.6, 116.9, 116.9, 110.1, 109.9, 52.5, 49.5, 37.5, 34.4, 33.3, 33.1.

2.8 Reference.

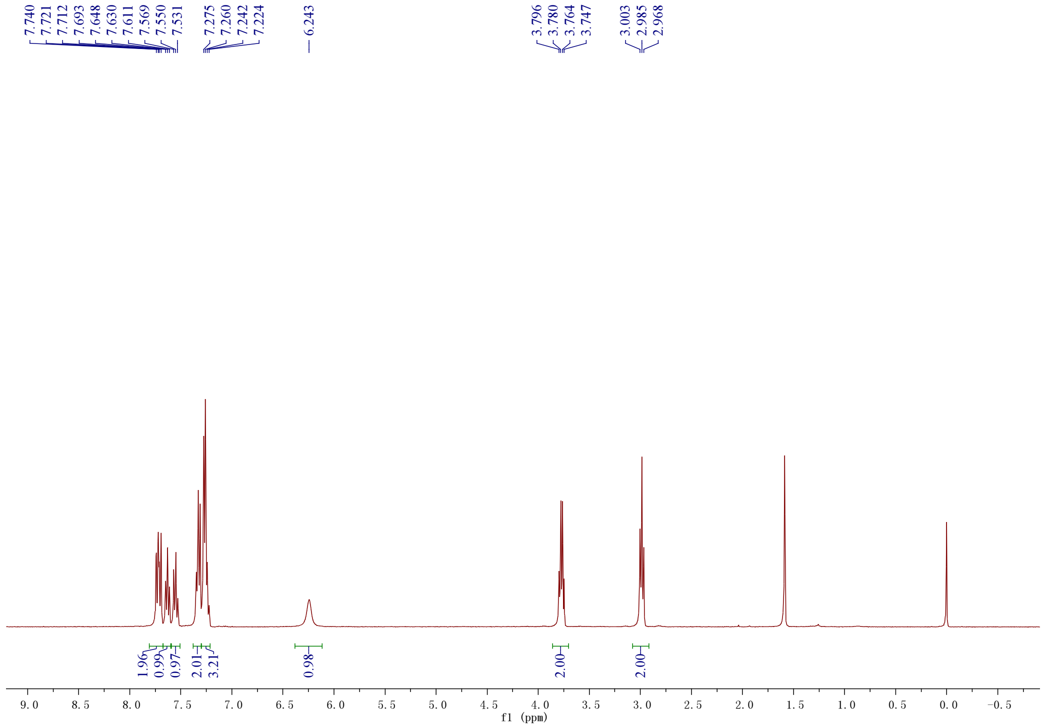
[S1] 2-Cyanobenzoic acid was synthesized in large scale as reported: Goossen, L. J.; Melzer, B. *J. Org. Chem.* **2007**, *72*, 7473. 2-Cyanobenzoic acid could be stored as a solid at -18 °C for a few months.

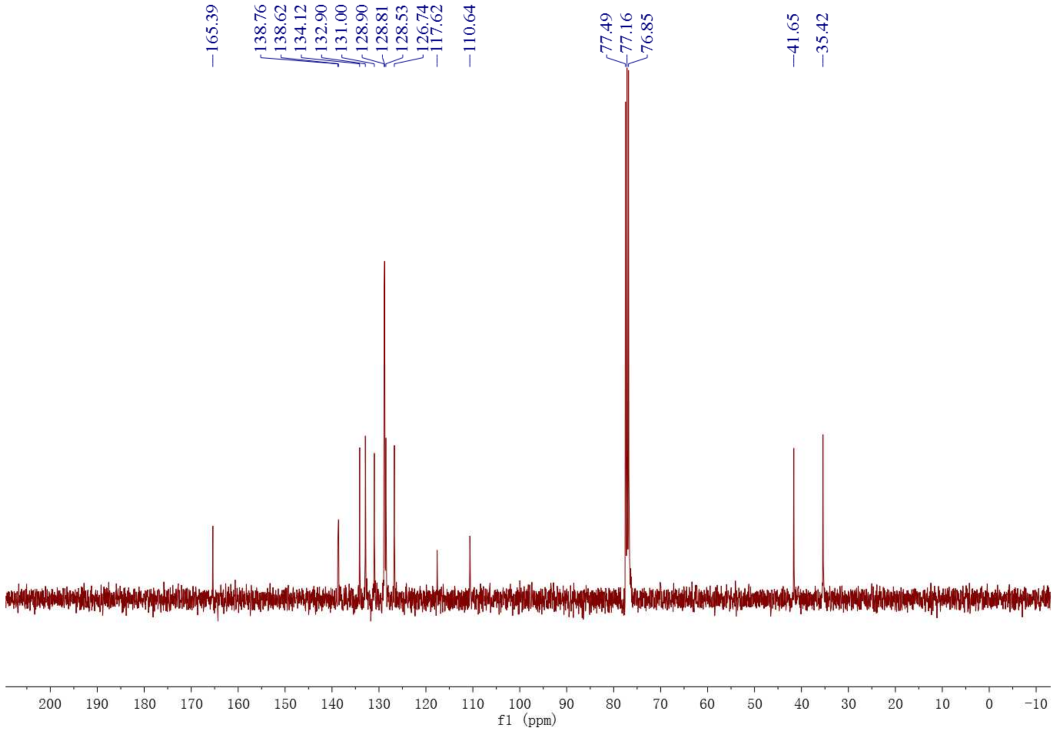
[S2] Karla, R.; Ebert, B.; Thorkildsen, C.; Herdeis, C.; Johansen, T. N.; Nielsen, B.; Krogsgaard-Larsen, P. *J. Med. Chem.* **1999**, *42*, 2053.

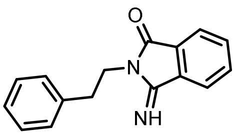
3. NMR Spectra of New Compounds



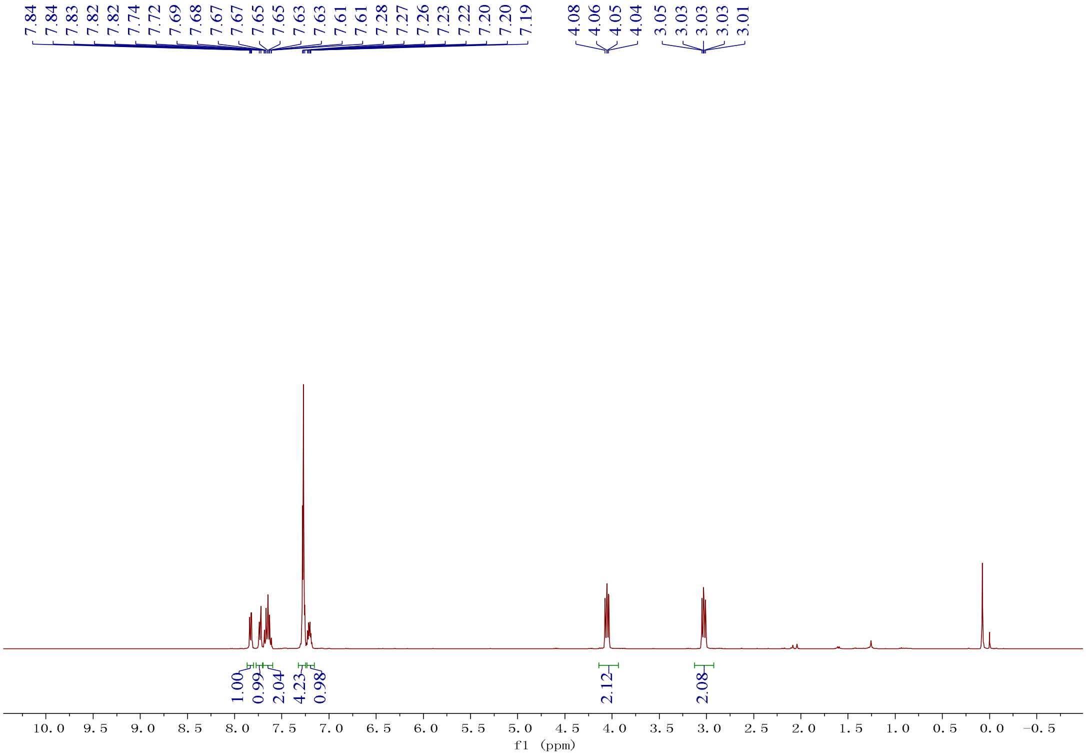
1a







1a'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7.67
7.67
7.65
7.65
7.63
7.63
7.61
7.61
7.28
7.27
7.26
7.23
7.22
7.20
7.20
7.19
4.08
4.06
4.05
4.04
3.05
3.03
3.03
3.03
3.01
1.00
0.99
2.04
4.23
0.98
2.12
2.08
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
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2.5
2.0
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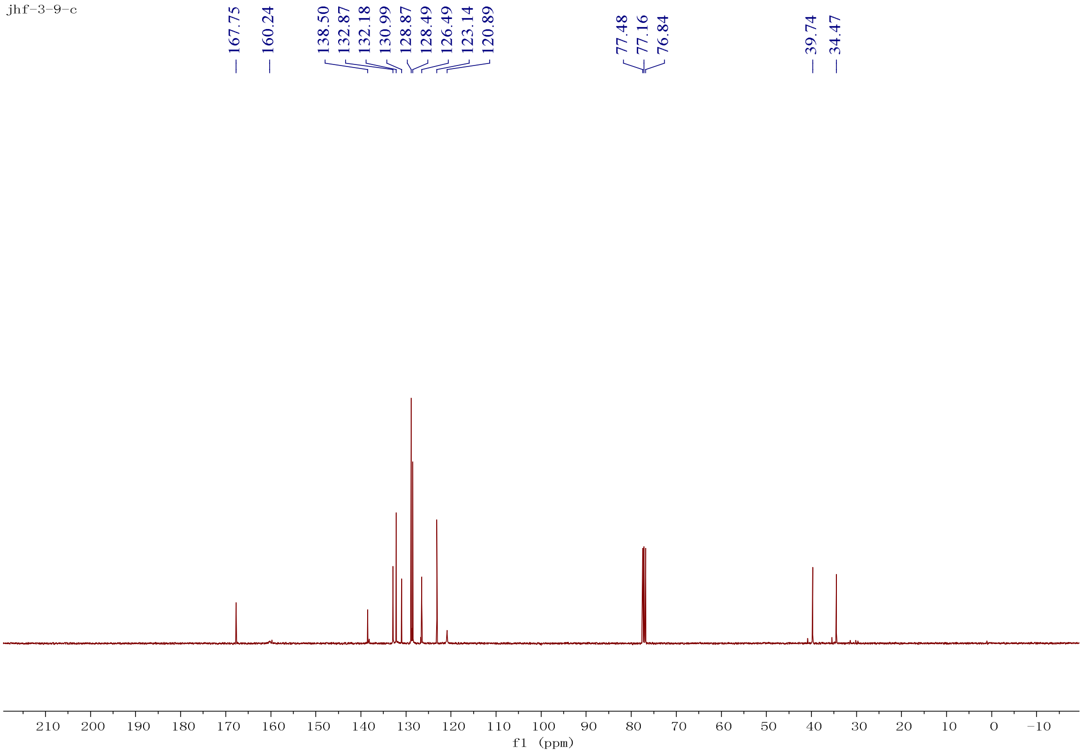
0.5
0.0
-0.5
f1 (ppm)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130.99
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128.49
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123.14
120.89
77.48
77.16
76.84
39.74
34.47
210
200
190
180
170
160
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140
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120
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100
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80
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20
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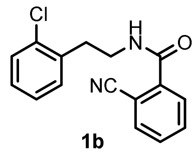
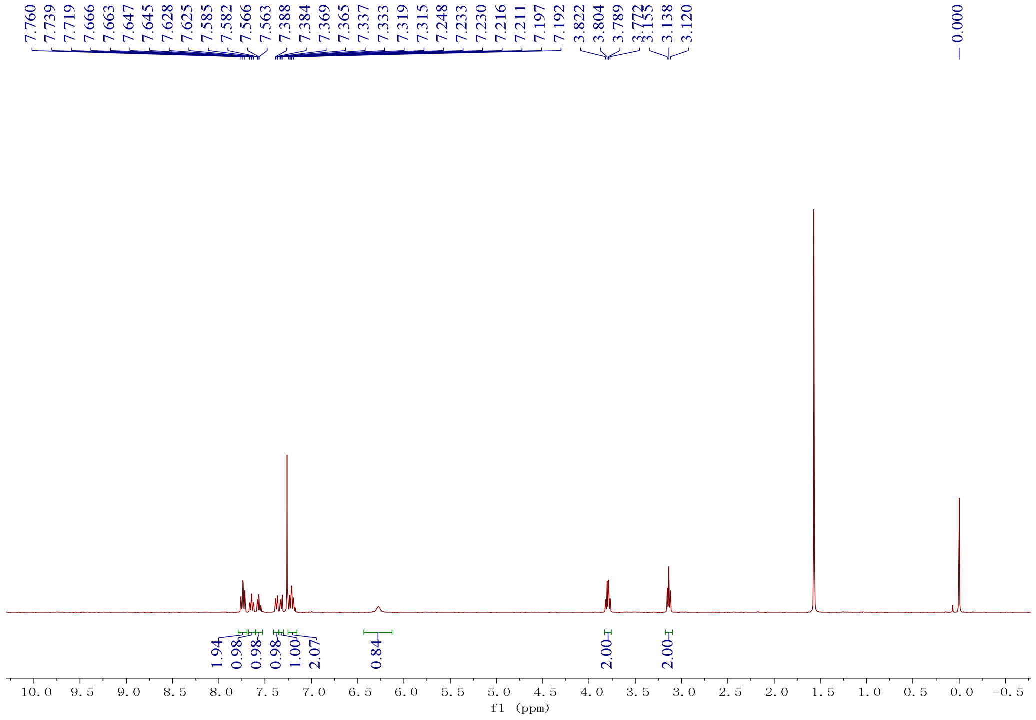
-10
f1 (ppm)


Cl
H
N
O
NC

1b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7.566
7.563
7.388
7.384
7.369
7.365
7.337
7.333
7.319
7.315
7.248
7.233
7.230
7.216
7.211
7.197
7.192
3.822
3.804
3.789
3.772
3.155
3.138
3.120
0.000
1.94
0.98
0.98
0.98
1.00
2.07
0.84
2.00
2.00
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
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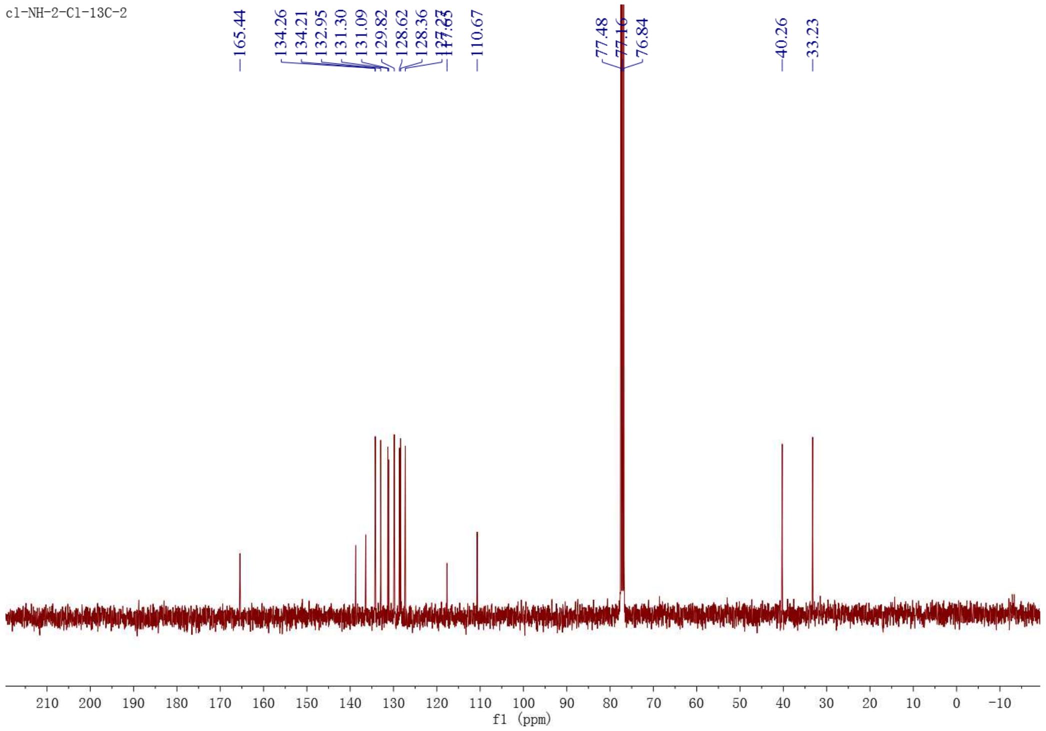
f1 (ppm)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117.65
110.67
77.48
77.16
76.84
40.26
33.23
210
200
190
180
170
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120
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100
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80
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40
30
20
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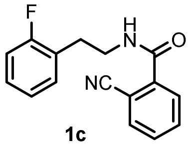
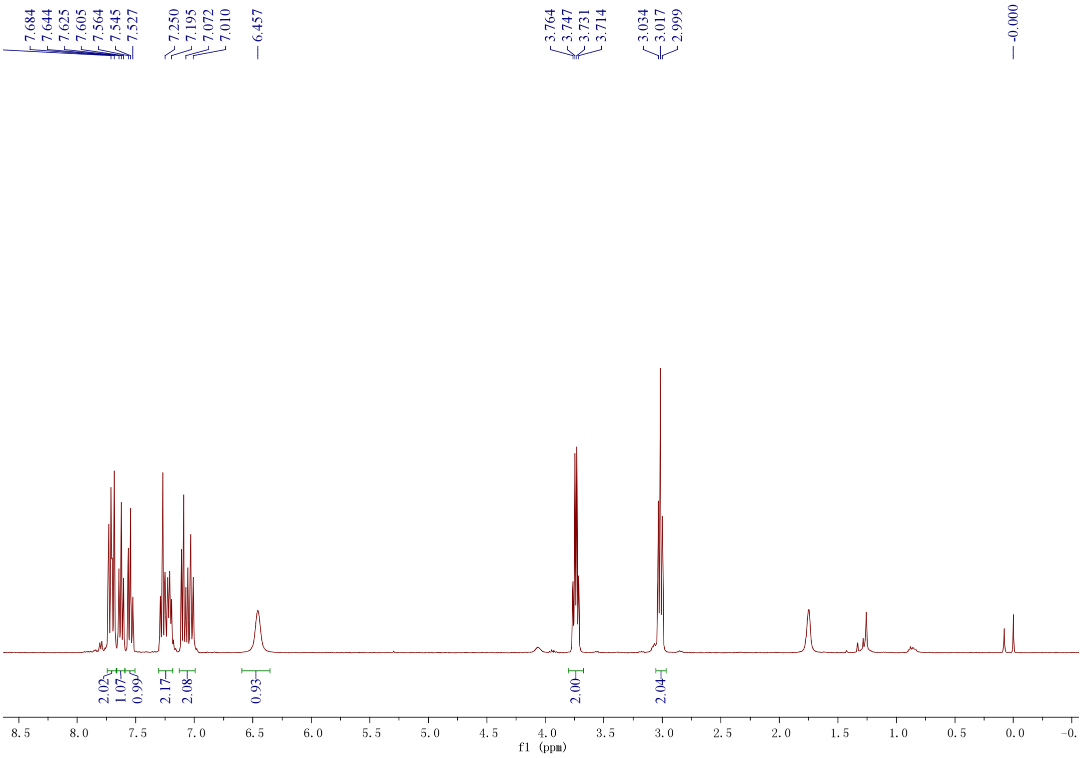
0
-10
f1 (ppm)


F
H
N
O
NC

1c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7.010
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3.764
3.747
3.731
3.714
3.034
3.017
2.999
-0.000
2.02
1.07
0.99
2.17
2.08
0.93
2.00
2.04
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
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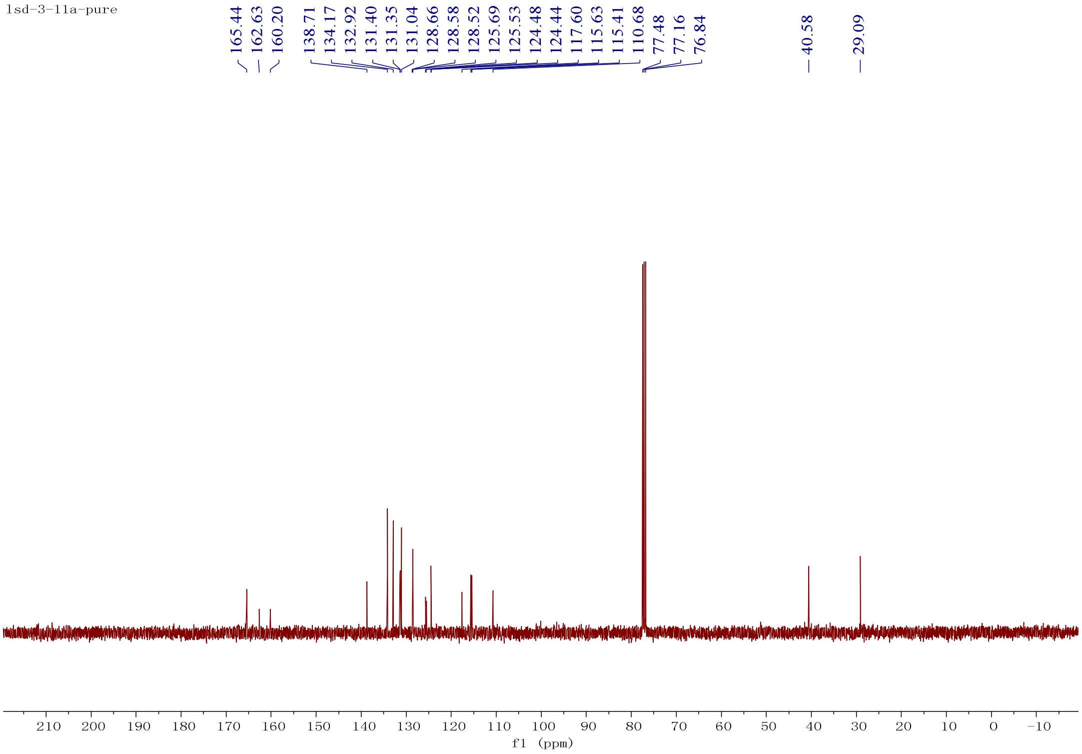
-0.
f1 (ppm)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125.69
125.53
124.48
124.44
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115.63
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76.84
40.58
29.09
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200
190
180
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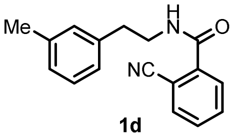
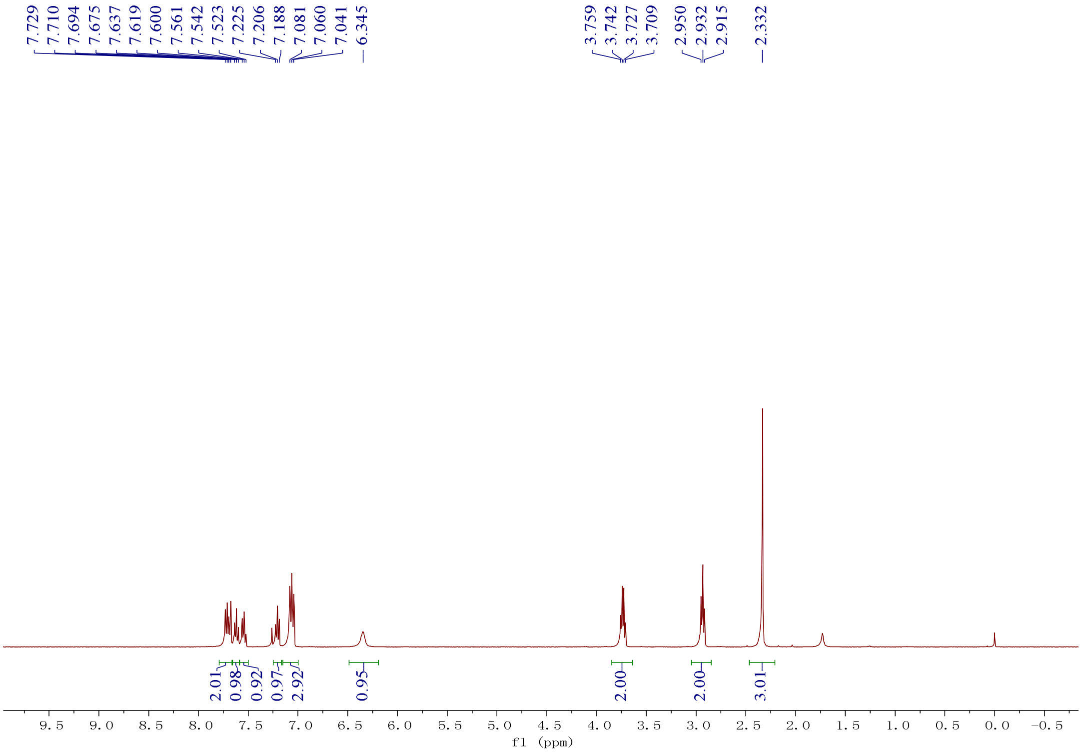
f1 (ppm)



Me
H
N
O
NC

1d



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7.060
7.041
6.345
3.759
3.742
3.727
3.709
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2.332
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2.92
0.95
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2.00
3.01
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8.5
8.0
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7.0
6.5
6.0
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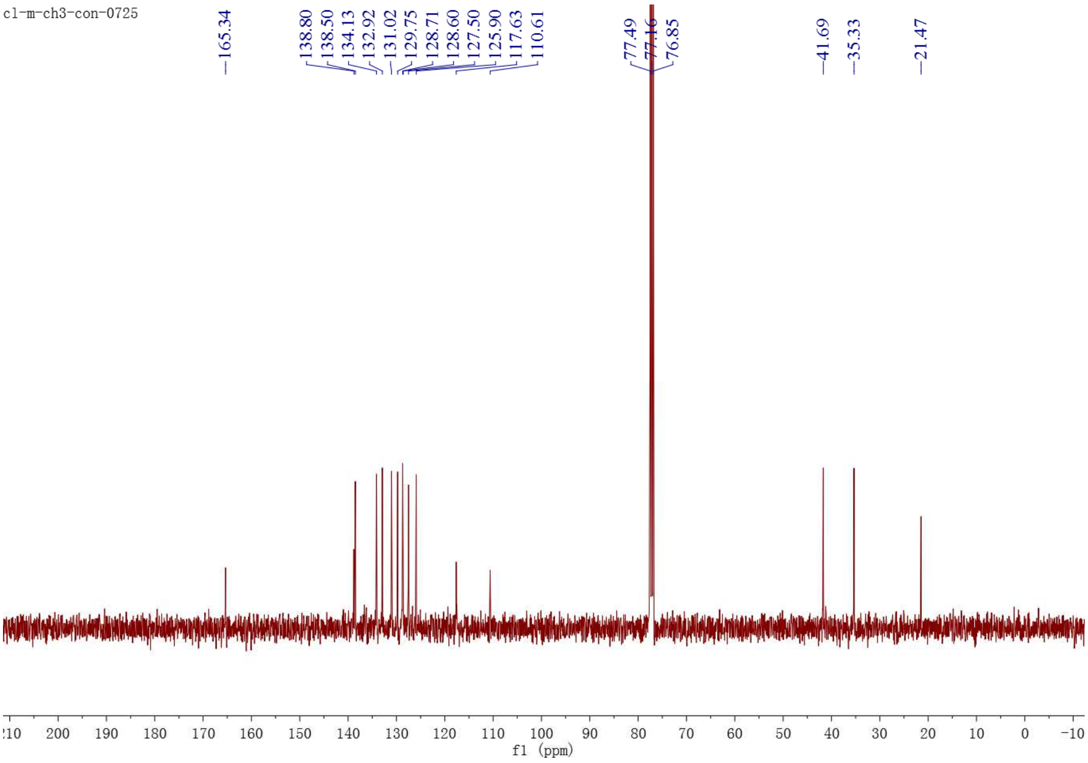
f1 (ppm)



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77.49
77.16
76.85
41.69
35.33
21.47
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200
190
180
170
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50
40
30
20
10
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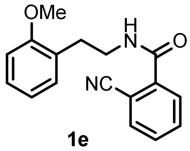
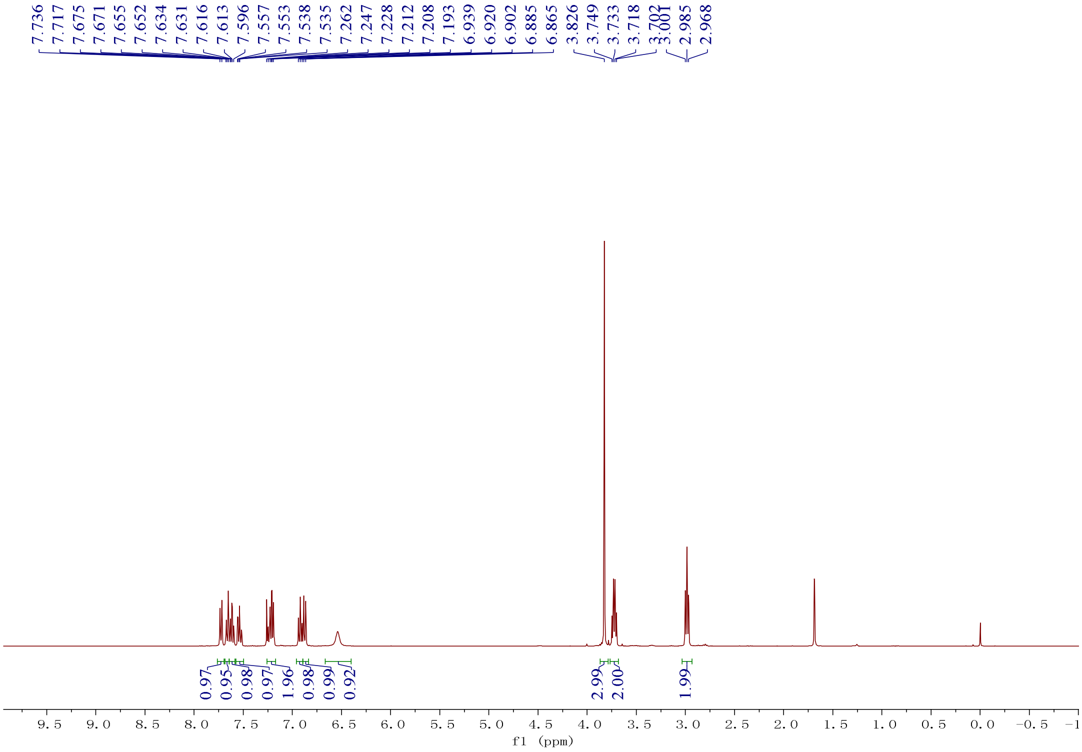
-10
f1 (ppm)


OMe
H
N
O
NC

1e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6.920
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6.885
6.865
3.826
3.749
3.733
3.718
3.702
3.001
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0.95
0.98
0.97
1.96
0.98
0.99
0.92
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2.00
1.99
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7.0
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5.0
4.5
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1.5
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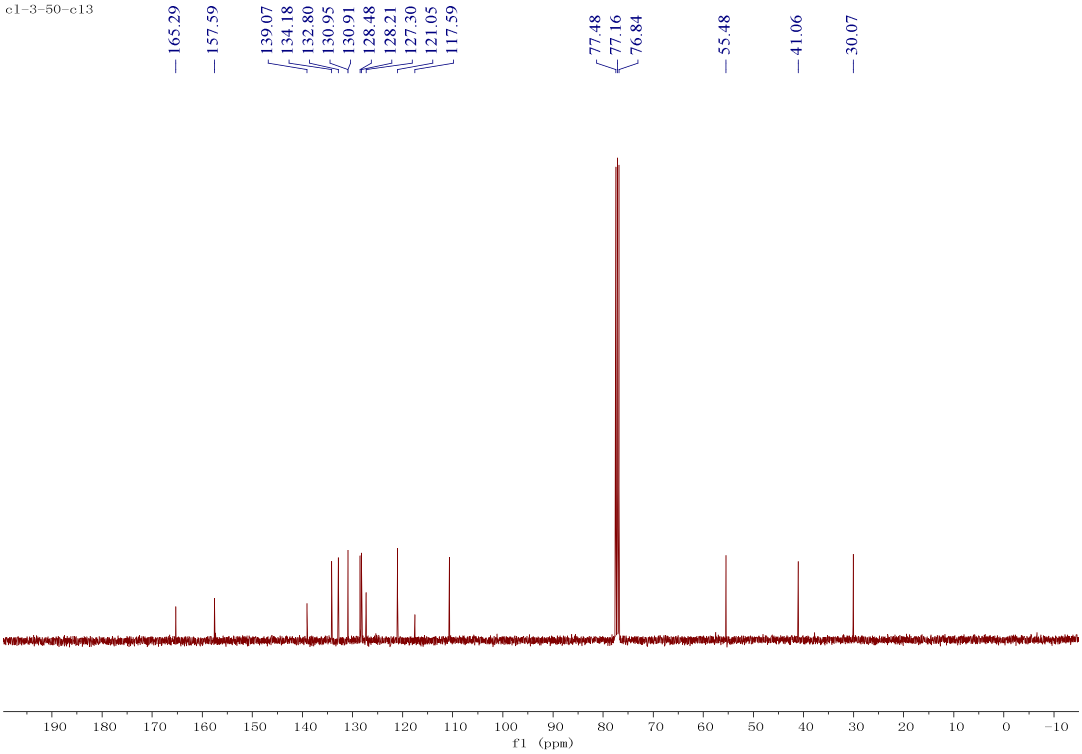
−1
f1 (ppm)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55.48
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30.07
190
180
170
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30
20
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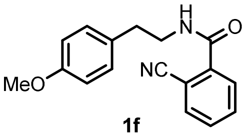
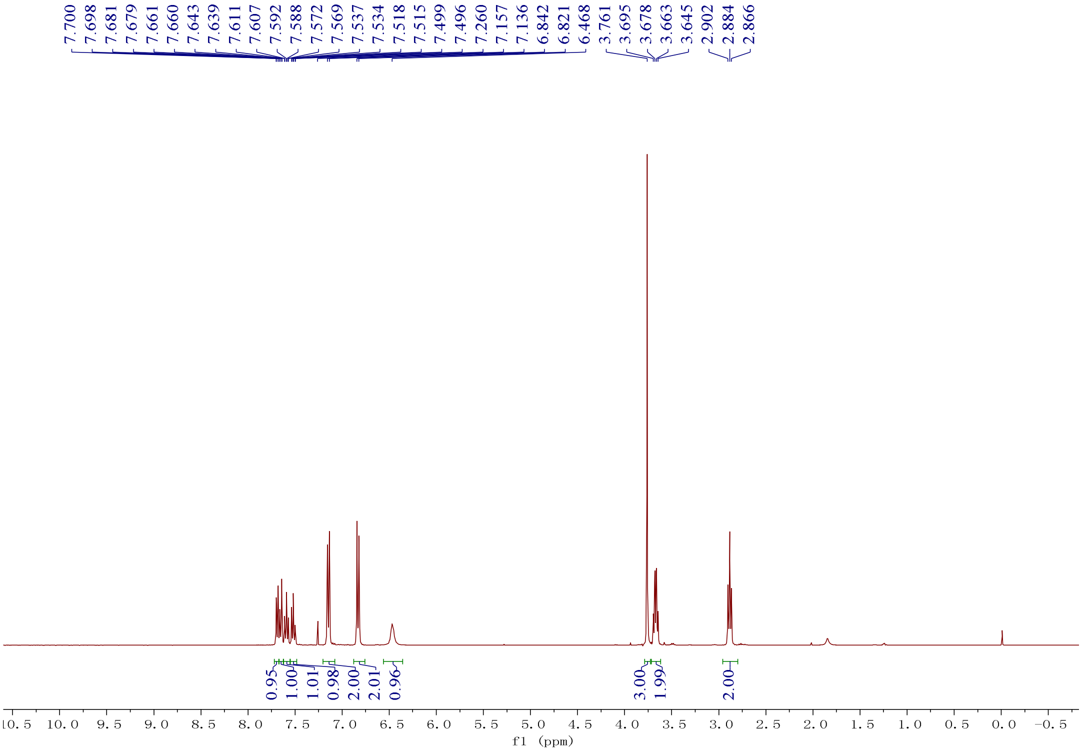
−10
f1 (ppm)


H
N
O
NC
MeO

1f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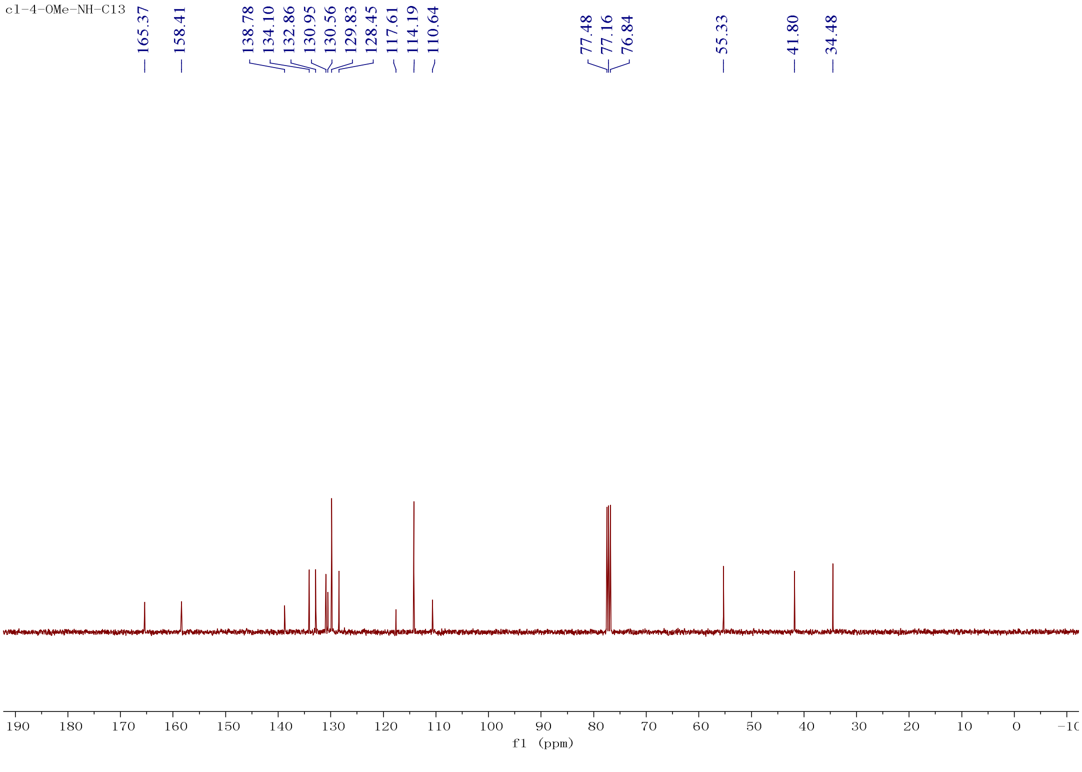
f1 (ppm)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55.33
41.80
34.48
190
180
170
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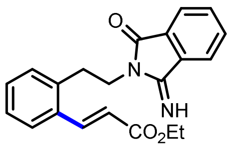
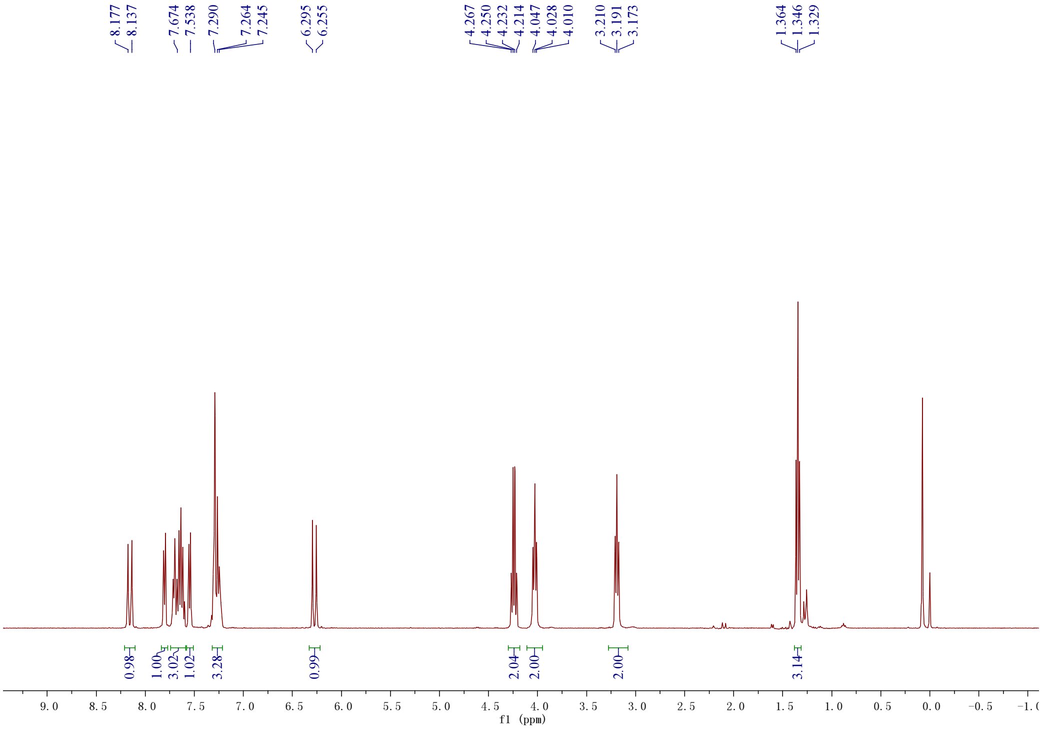
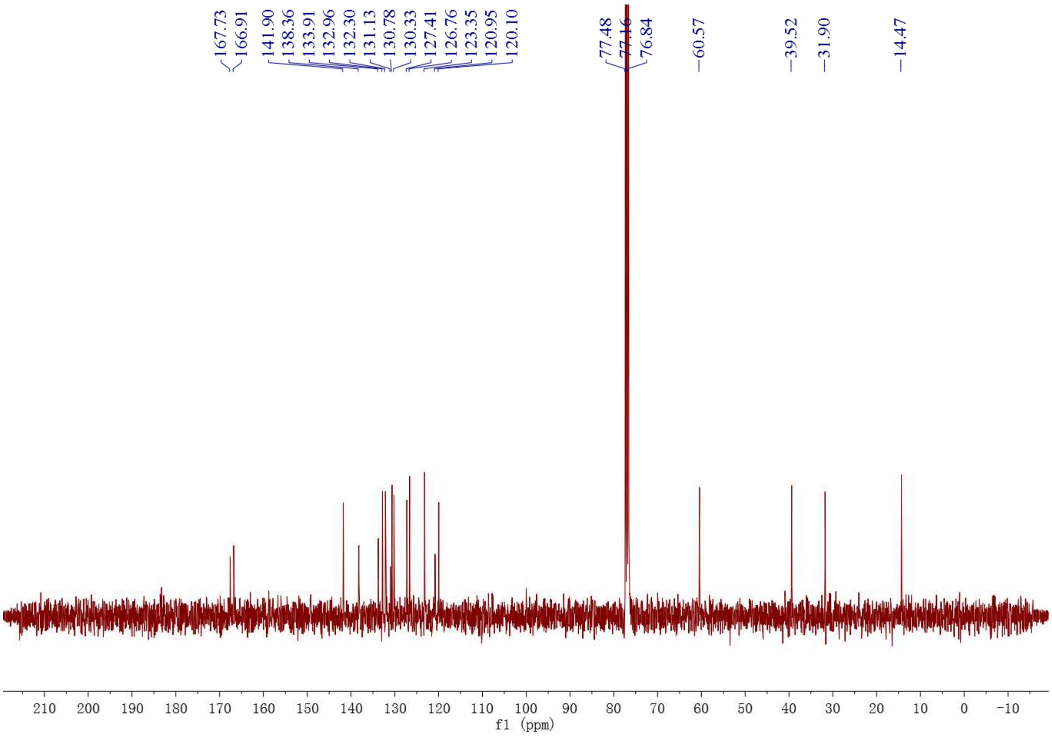
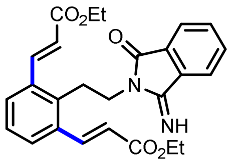
f1 (ppm)



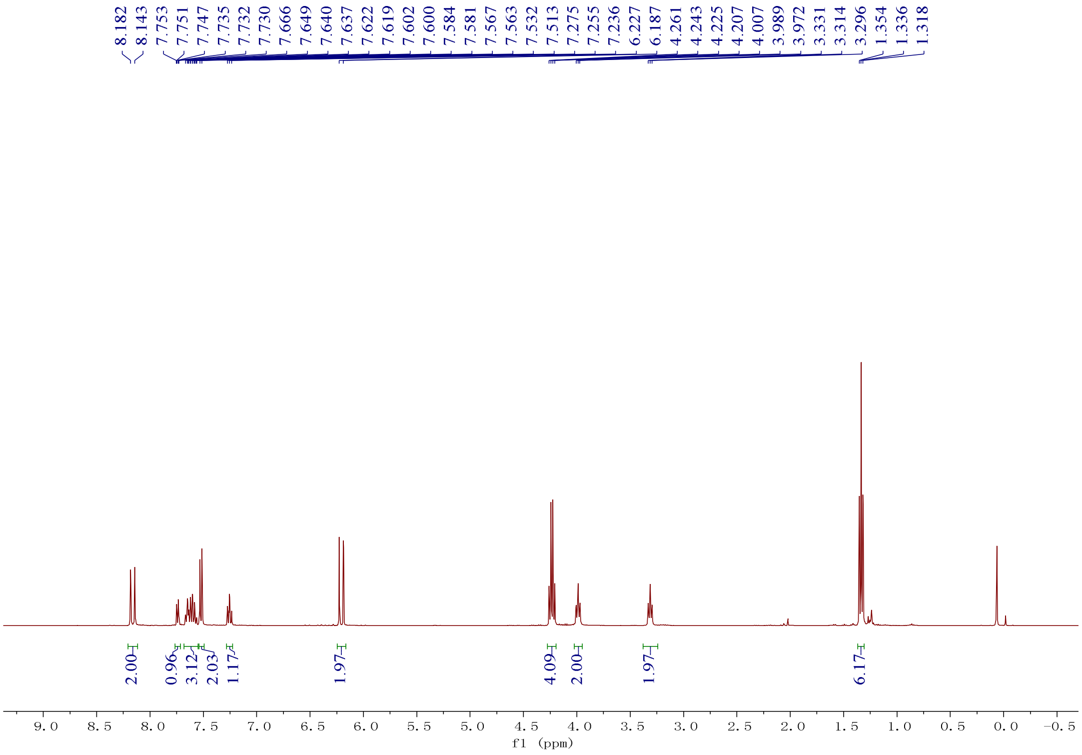
2a$_{\mathbf{mono}}$






CO2Et
O
N
NH
CO2Et

$2a_{(o,o')di}$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7.602
7.600
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7.581
7.567
7.563
7.532
7.513
7.275
7.255
7.236
6.227
6.187
4.261
4.243
4.225
4.207
4.007
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3.314
3.296
1.354
1.336
1.318
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3.12
2.03
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1.97
4.09
2.00
1.97
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9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
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3.0
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1.0
0.5
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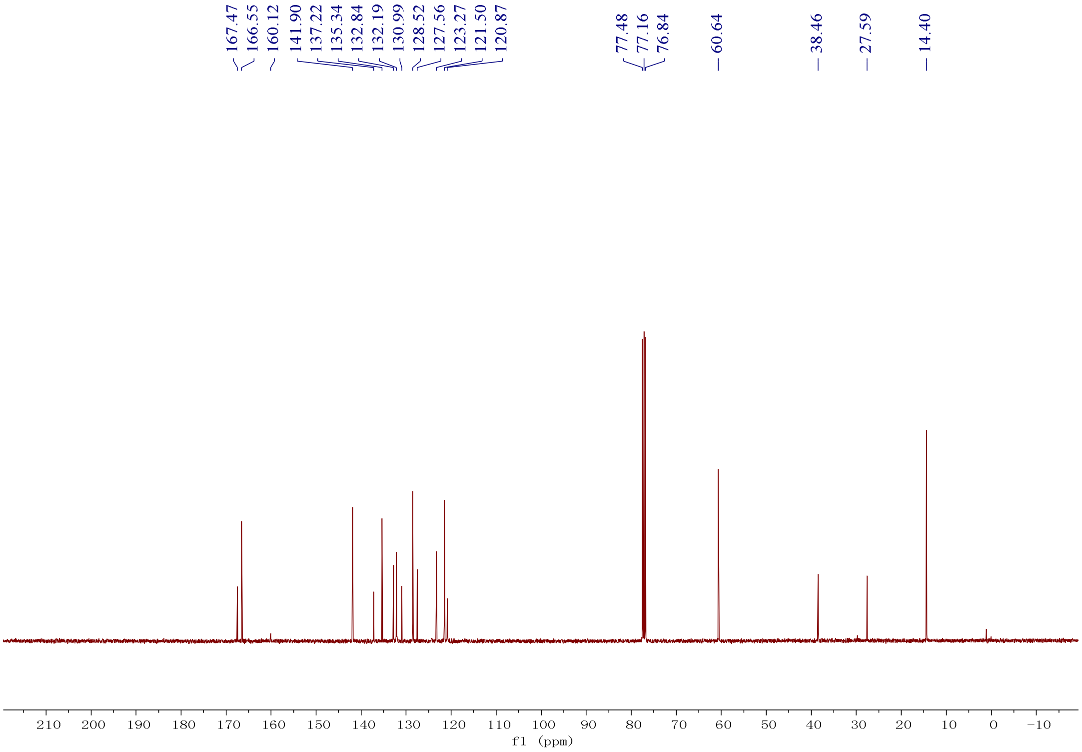
f1 (ppm)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127.56
123.27
121.50
120.87
77.48
77.16
76.84
60.64
38.46
27.59
14.40
210
200
190
180
170
160
150
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130
120
110
100
90
80
70
60
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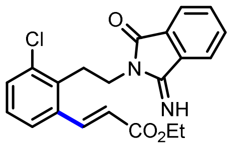
40
30
20
10
0
-10
f1 (ppm)


Cl
O
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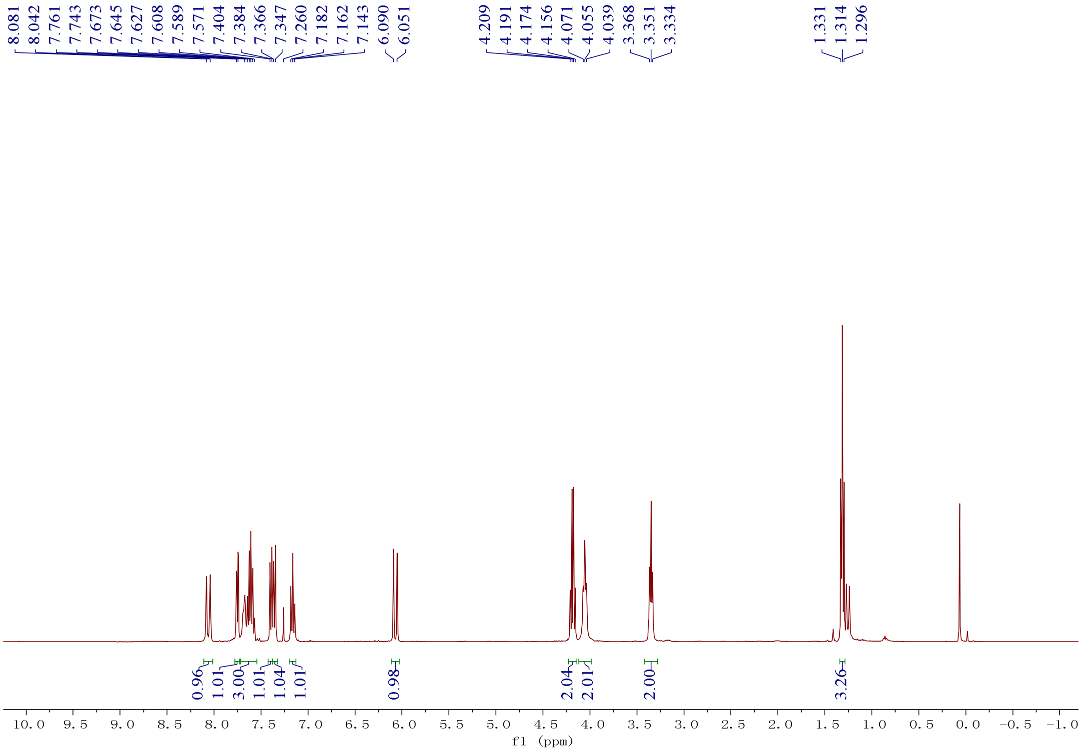
NH
CO2Et

2b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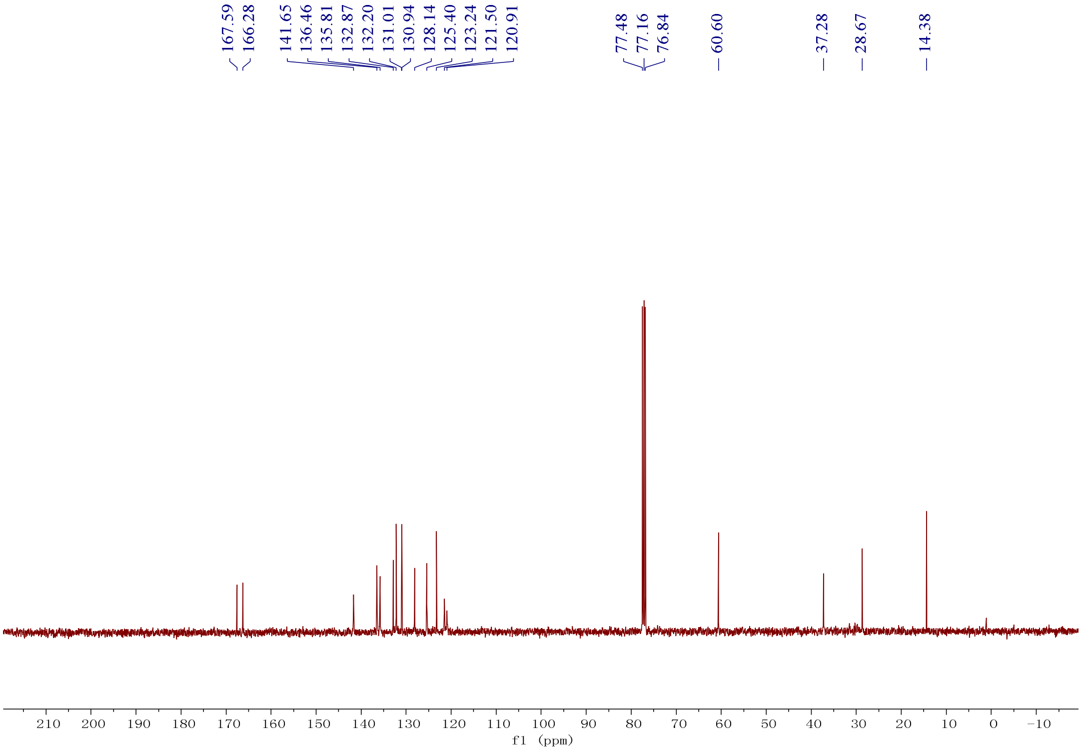
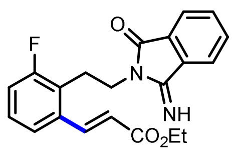
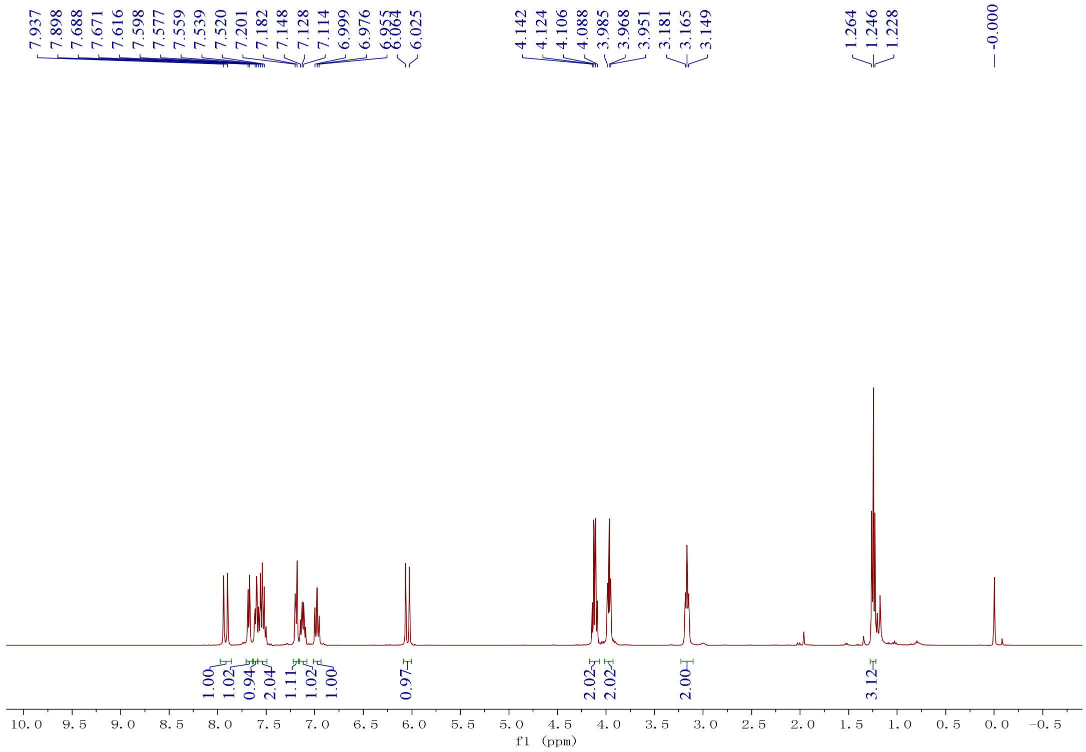
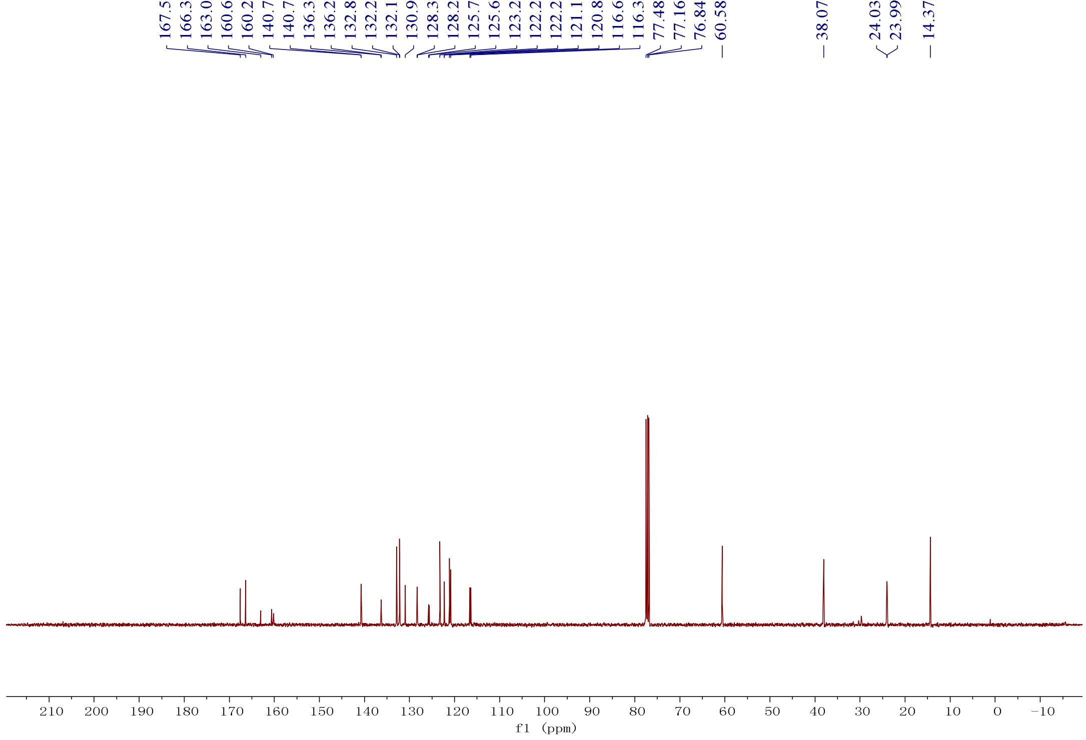
7.366
7.347
7.260
7.182
7.162
7.143
6.090
6.051
4.209
4.191
4.174
4.156
4.071
4.055
4.039
3.368
3.351
3.334
1.331
1.314
1.296
0.96
1.01
3.00
1.01
1.04
1.01
0.98
2.04
2.01
2.00
3.26
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1.0
f1 (ppm)

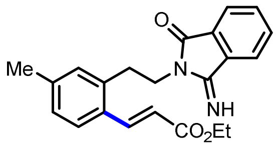

167.59
166.28
141.65
136.46
135.81
132.87
132.20
131.01
130.94
128.14
125.40
123.24
121.50
120.91
77.48
77.16
76.84
60.60
37.28
28.67
14.38
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)



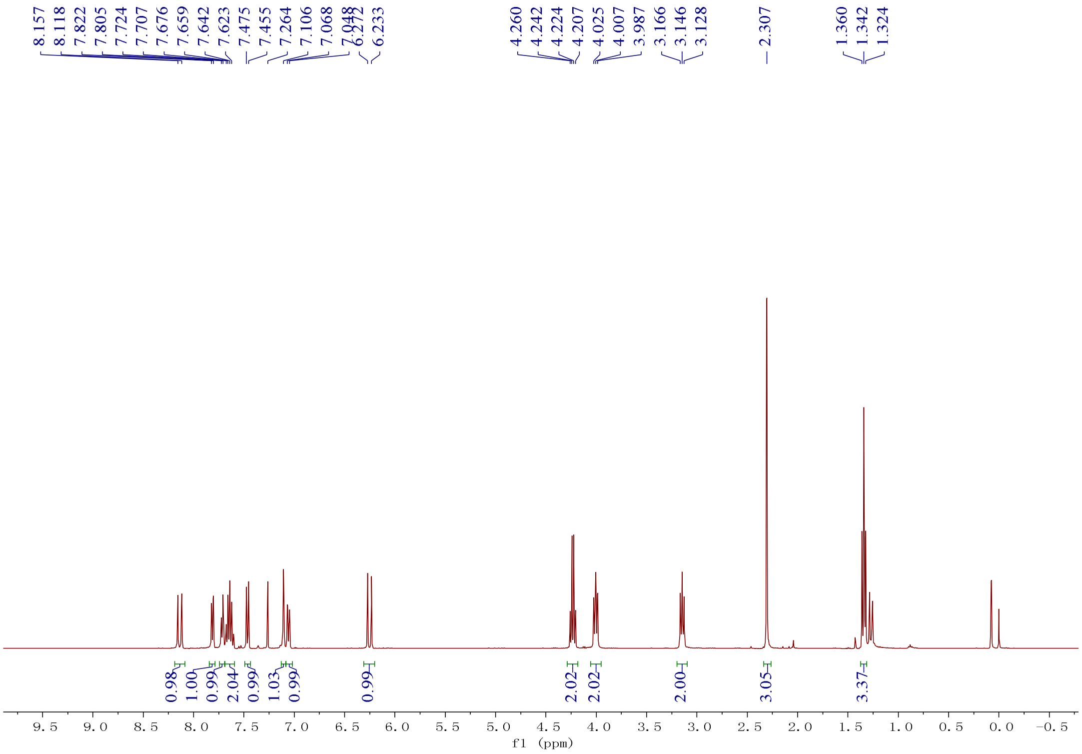
2c

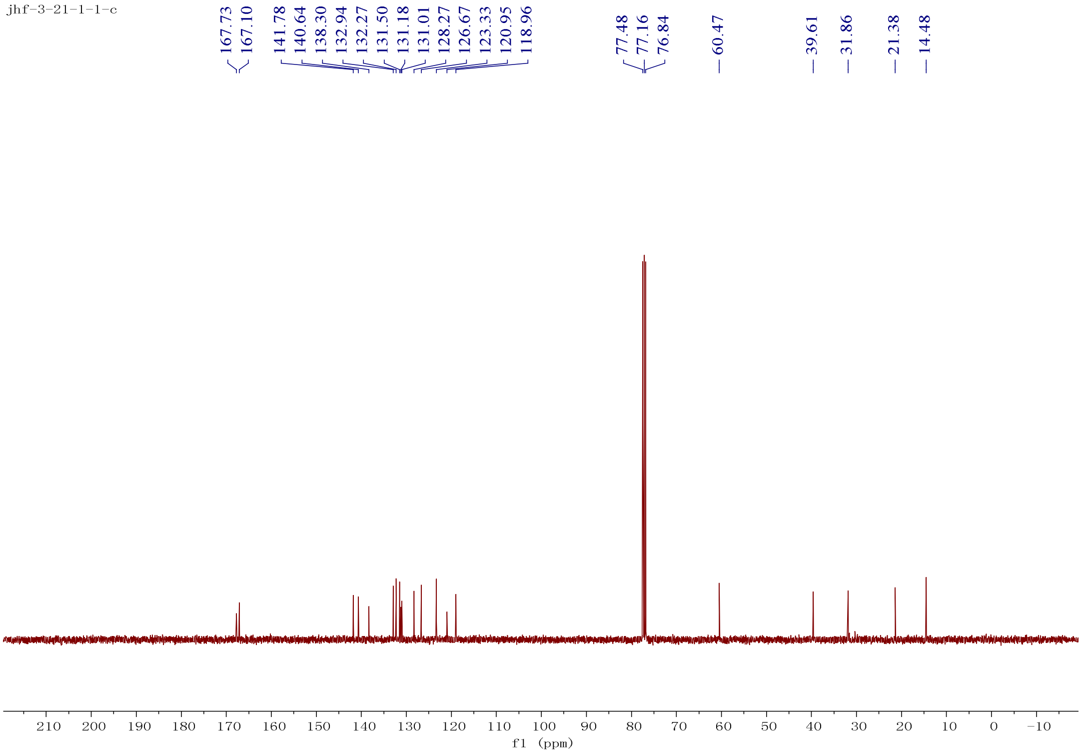

7.937
7.898
7.688
7.671
7.616
7.598
7.577
7.559
7.539
7.520
7.201
7.182
7.148
7.128
7.114
6.999
6.976
6.955
6.064
6.025
4.142
4.124
4.106
4.088
3.985
3.968
3.951
3.181
3.165
3.149
1.264
1.246
1.228
-0.000
1.00
1.02
0.94
2.04
1.11
1.02
1.00
0.97
2.02
2.02
2.00
3.12
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)

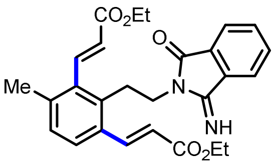

167.57
166.36
163.04
160.60
160.21
140.77
140.73
136.33
136.28
132.85
132.20
132.14
130.95
128.35
128.26
125.78
125.62
123.24
122.28
122.25
121.14
120.89
116.60
116.37
77.48
77.16
76.84
60.58
38.07
24.03
23.99
14.37
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)


O
Me
N
NH
CO2Et

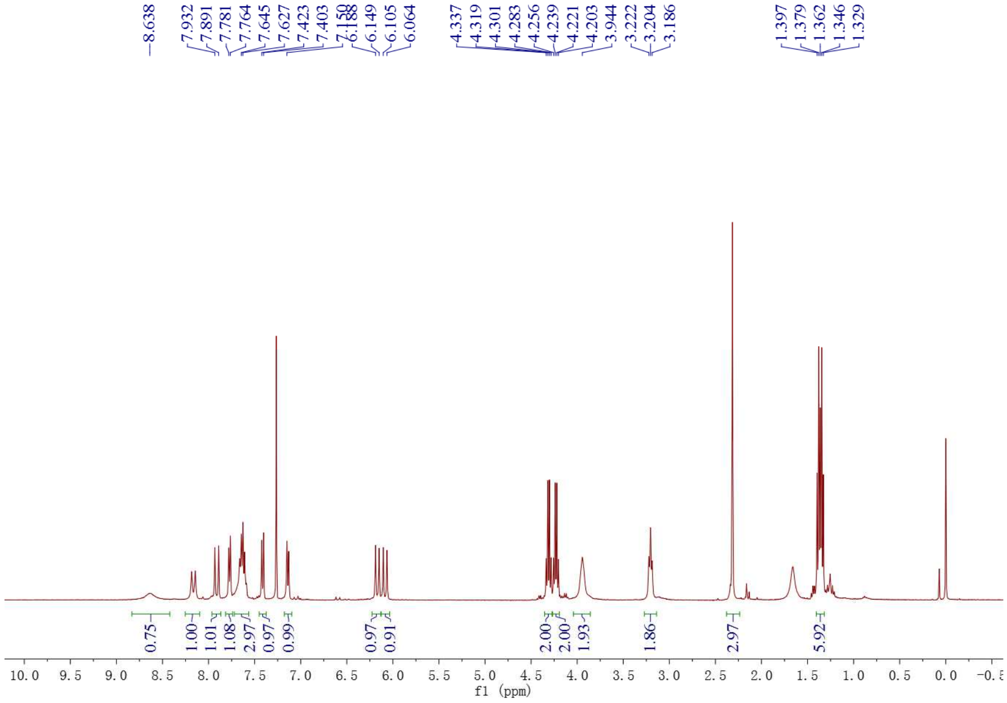
2d$_{mono}$

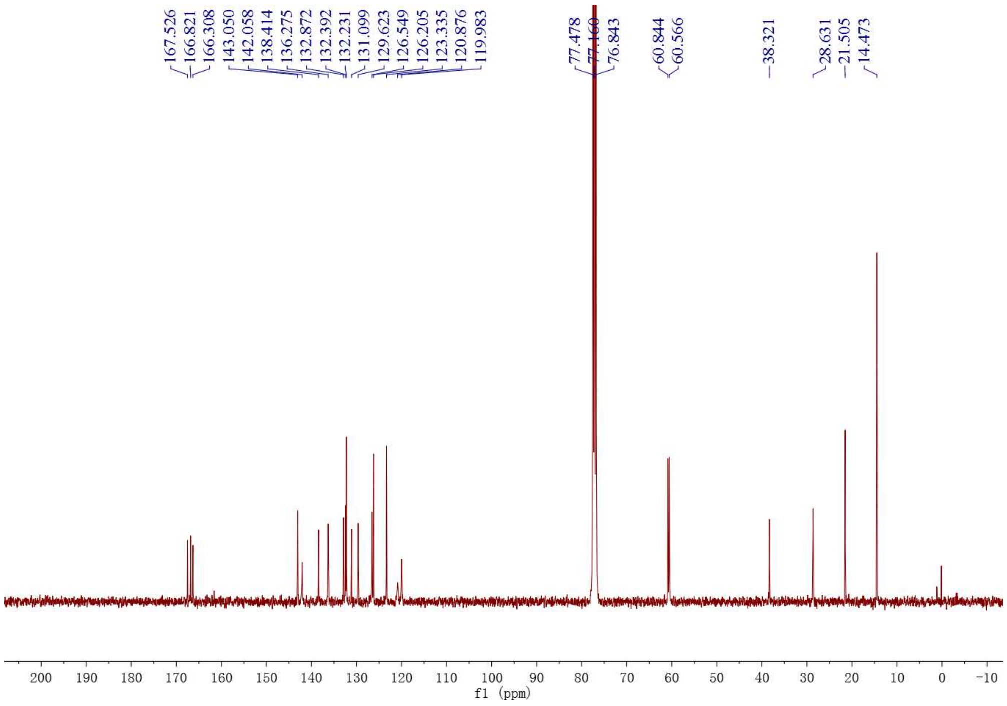

8.157
8.118
7.822
7.805
7.724
7.707
7.676
7.659
7.642
7.623
7.475
7.455
7.264
7.106
7.068
7.048
6.272
6.233
4.260
4.242
4.224
4.207
4.025
4.007
3.987
3.166
3.146
3.128
2.307
1.360
1.342
1.324
0.98
1.00
0.99
2.04
0.99
1.03
0.99
0.99
2.02
2.02
2.00
3.05
3.37
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)

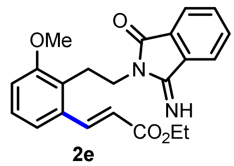

jhf-3-21-1-1-c
167.73
167.10
141.78
140.64
138.30
132.94
132.27
131.50
131.18
131.01
128.27
126.67
123.33
120.95
118.96
77.48
77.16
76.84
60.47
39.61
31.86
21.38
14.48
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)


CO2Et
O
Me
N
NH
CO2Et

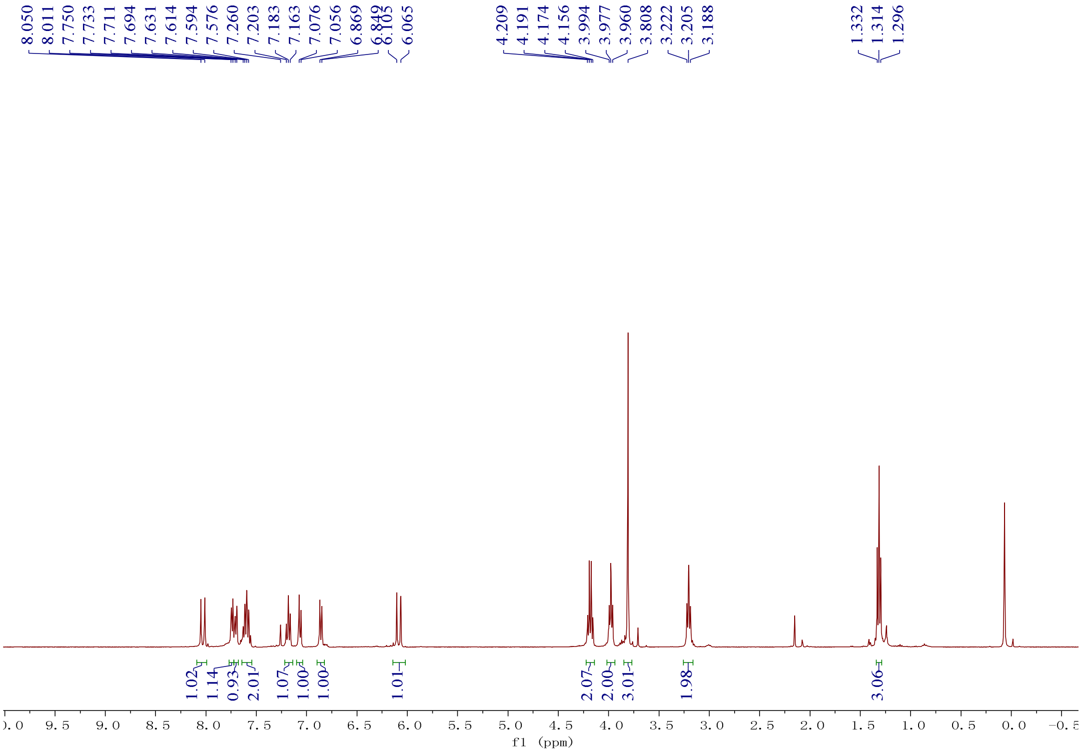
2d$_{(o,o')di}$

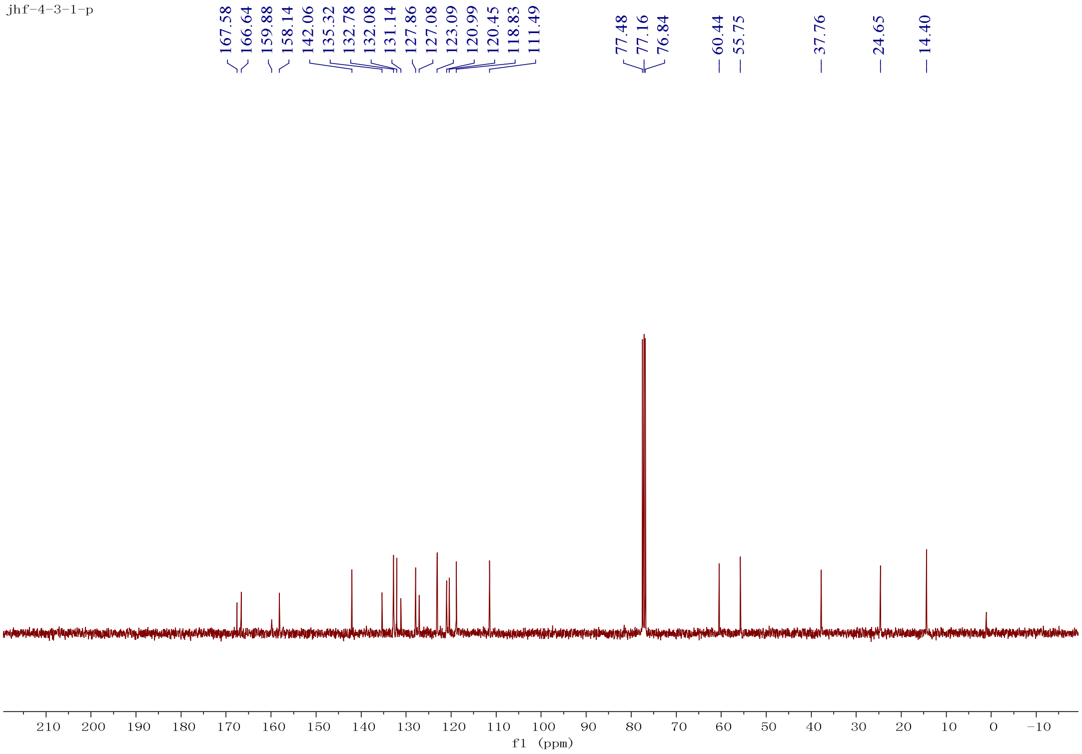

8.638
7.932
7.891
7.781
7.764
7.645
7.627
7.423
7.403
7.150
6.188
6.149
6.105
6.064
4.337
4.319
4.301
4.283
4.256
4.239
4.221
4.203
3.944
3.222
3.204
3.186
1.397
1.379
1.362
1.346
1.329
0.75
1.00
1.01
1.08
2.97
0.97
0.99
0.97
0.91
2.00
2.00
1.93
1.86
2.97
5.92
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.
f1 (ppm)

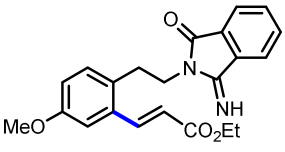

167.526
166.821
166.308
143.050
142.058
138.414
136.275
132.872
132.392
132.231
131.099
129.623
126.549
126.205
123.335
120.876
119.983
77.478
77.160
76.843
60.844
60.566
38.321
28.631
21.505
14.473
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)


OMe
O
N
NH
CO2Et

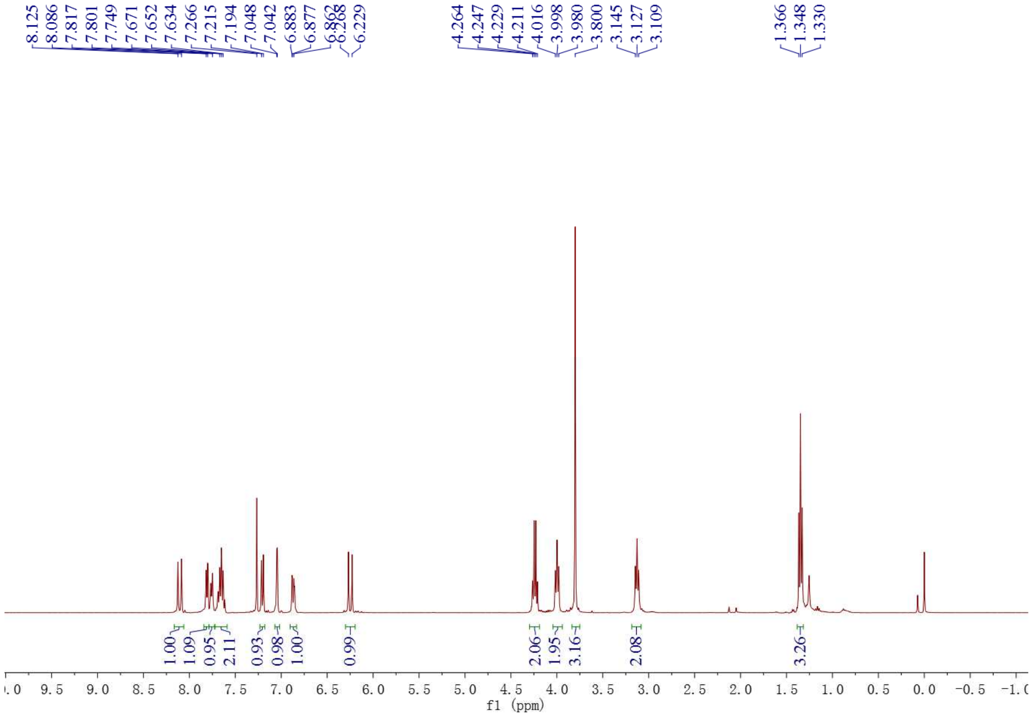
2e

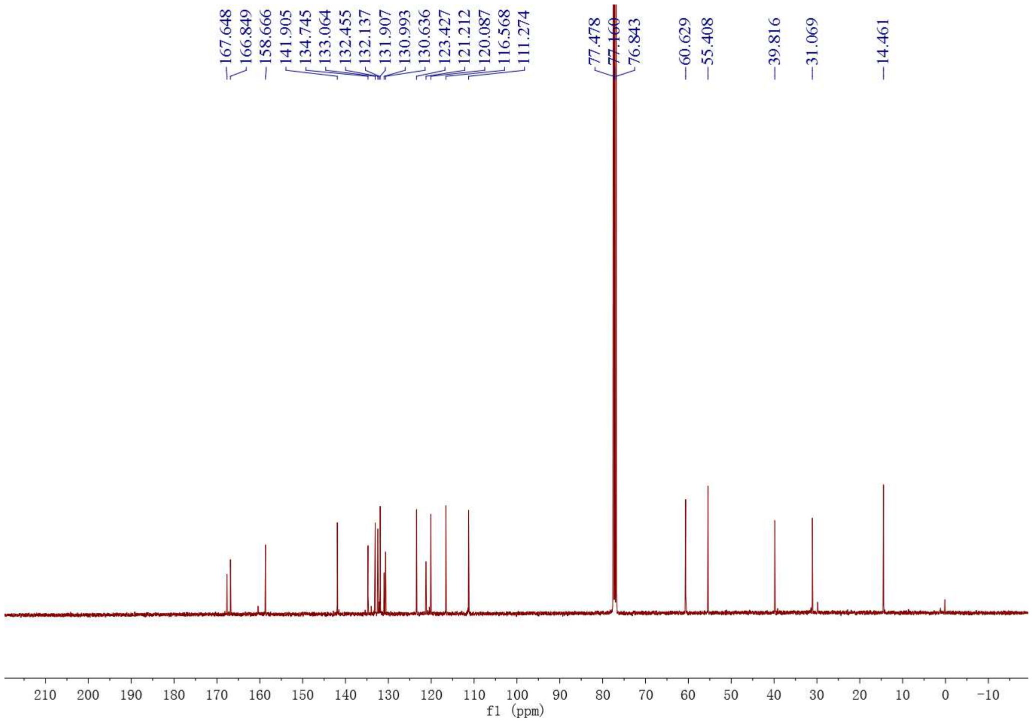

8.050
8.011
7.750
7.733
7.711
7.694
7.631
7.614
7.594
7.576
7.260
7.203
7.183
7.163
7.076
7.056
6.869
6.849
6.105
6.065
4.209
4.191
4.174
4.156
3.994
3.977
3.960
3.808
3.222
3.205
3.188
1.332
1.314
1.296
1.02
1.14
0.93
2.01
1.07
1.00
1.00
1.01
2.07
2.00
3.01
1.98
3.06
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

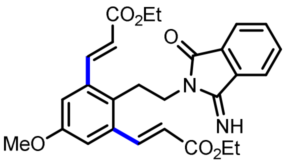

jhf-4-3-1-p
167.58
166.64
159.88
158.14
142.06
135.32
132.78
132.08
131.14
127.86
127.08
123.09
120.99
120.45
118.83
111.49
77.48
77.16
76.84
60.44
55.75
37.76
24.65
14.40
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)


O
N
NH
MeO
CO2Et

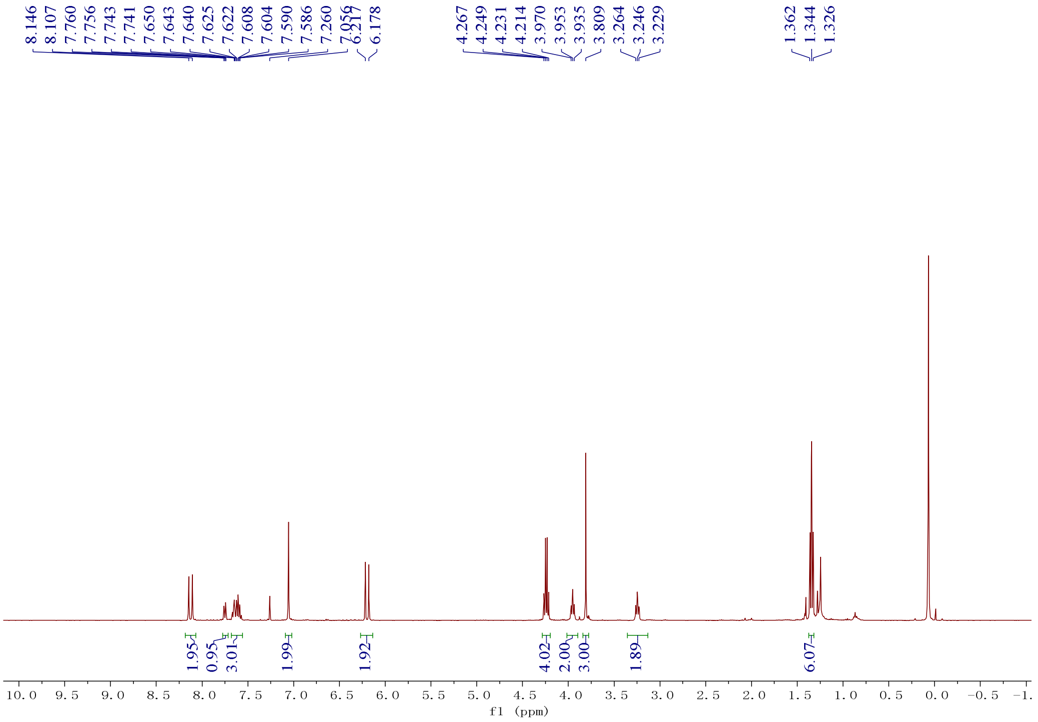
2f$_{mono}$

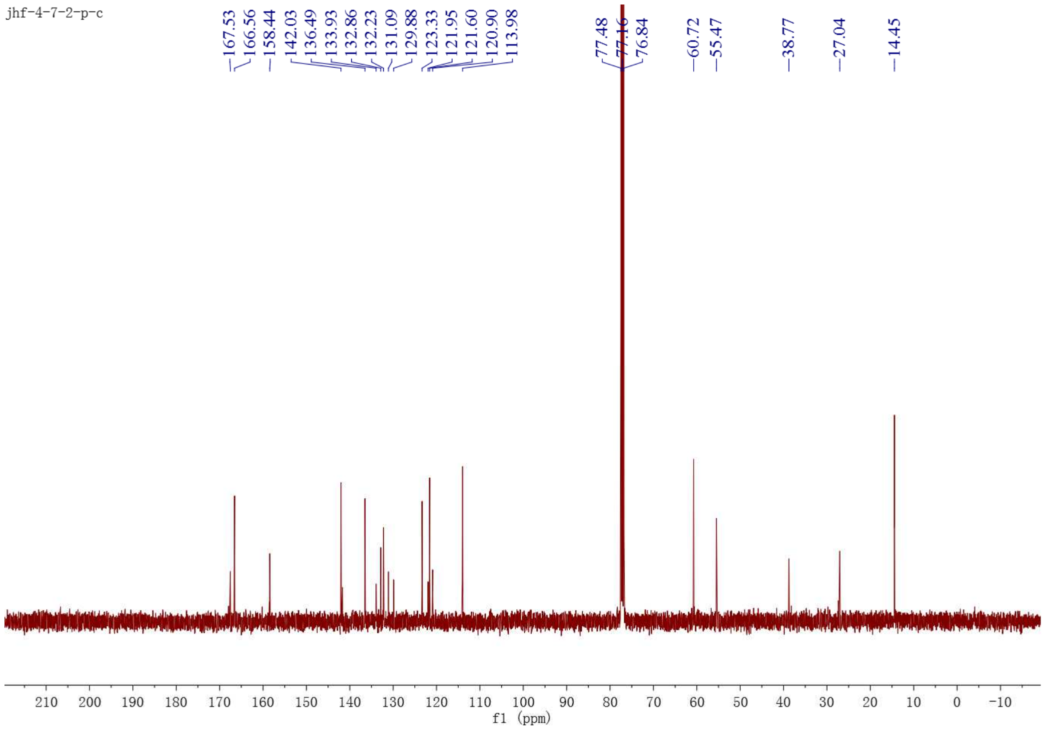

8.125
8.086
7.817
7.801
7.749
7.671
7.652
7.634
7.266
7.215
7.194
7.048
7.042
6.883
6.877
6.862
6.268
6.229
4.264
4.247
4.229
4.211
4.016
3.998
3.980
3.800
3.145
3.127
3.109
1.366
1.348
1.330
1.00
1.09
0.95
2.11
0.93
0.98
1.00
0.99
2.06
1.95
3.16
2.08
3.26
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
f1 (ppm)

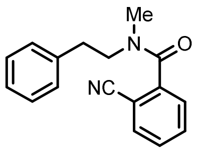

167.648
166.849
158.666
141.905
134.745
133.064
132.455
132.137
131.907
130.993
130.636
123.427
121.212
120.087
116.568
111.274
77.478
77.160
76.843
60.629
55.408
39.816
31.069
14.461
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)


CO2Et
O
N
NH
MeO
CO2Et

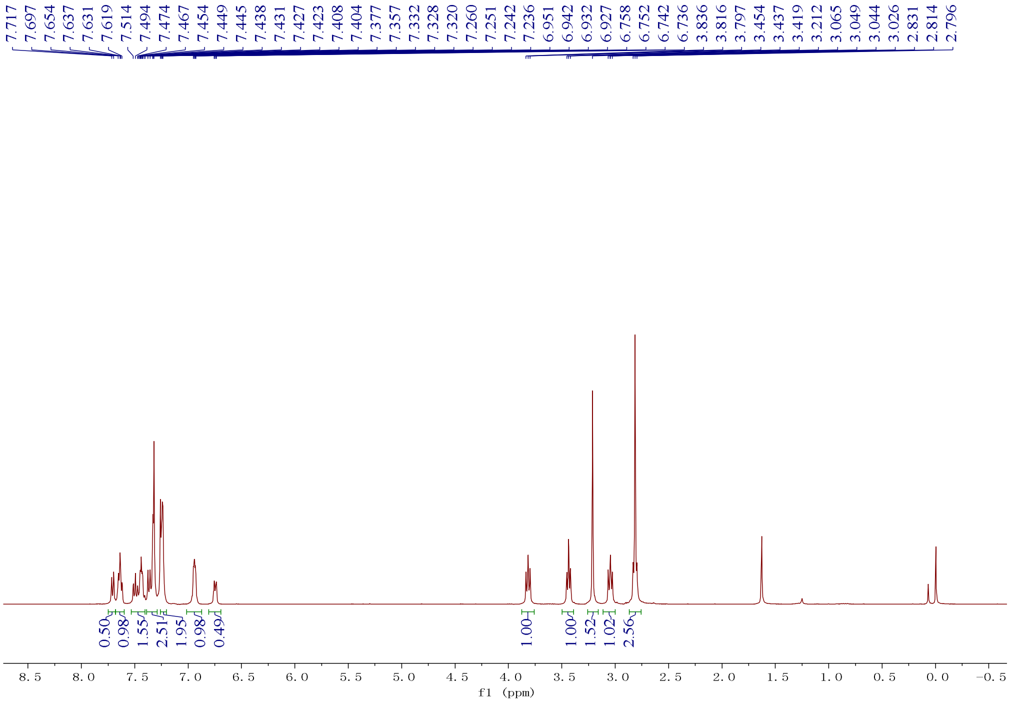
2f$_{(o,o')di}$

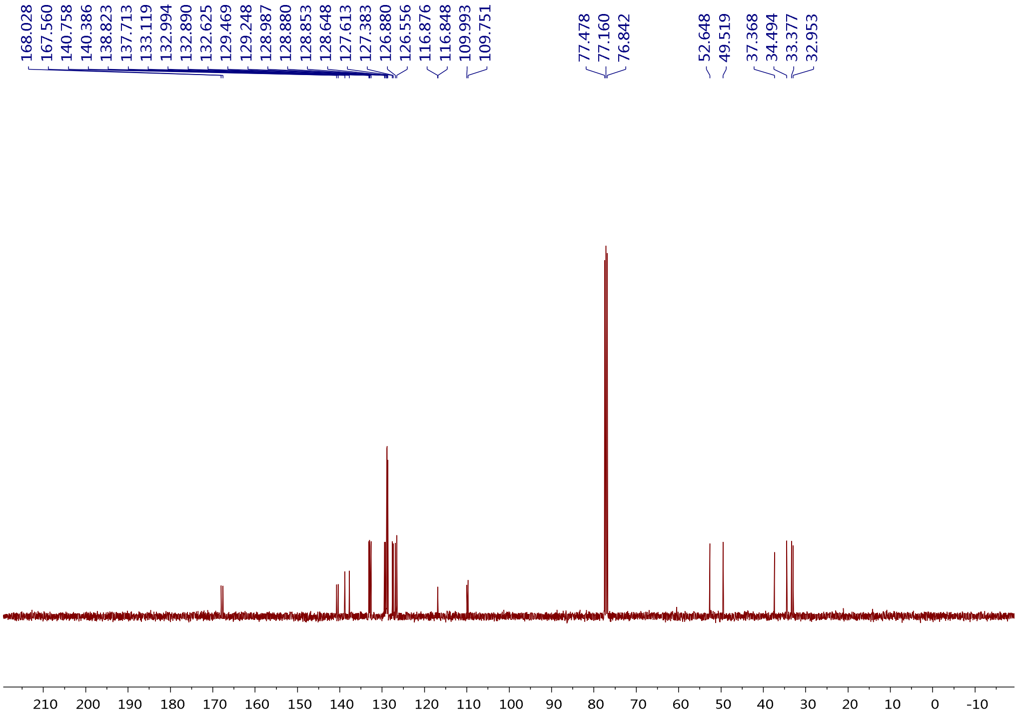

8.146
8.107
7.760
7.756
7.743
7.741
7.650
7.643
7.640
7.625
7.622
7.608
7.604
7.590
7.586
7.260
7.056
6.217
6.178
4.267
4.249
4.231
4.214
3.970
3.953
3.935
3.809
3.264
3.246
3.229
1.362
1.344
1.326
1.95
0.95
3.01
1.99
1.92
4.02
2.00
3.00
1.89
6.07
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.
f1 (ppm)

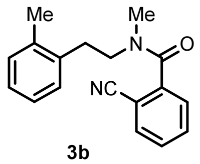

jhf-4-7-2-p-c
167.53
166.56
158.44
142.03
136.49
133.93
132.86
132.23
131.09
129.88
123.33
121.95
121.60
120.90
113.98
77.48
77.16
76.84
60.72
55.47
38.77
27.04
14.45
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)


Me
N
O
NC

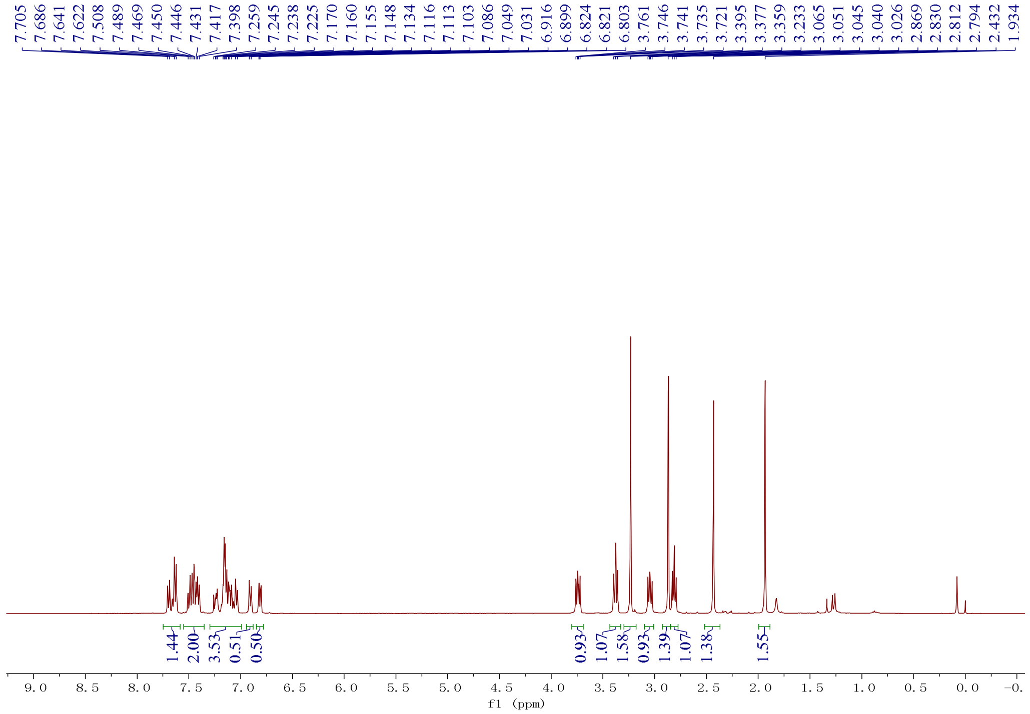
3a

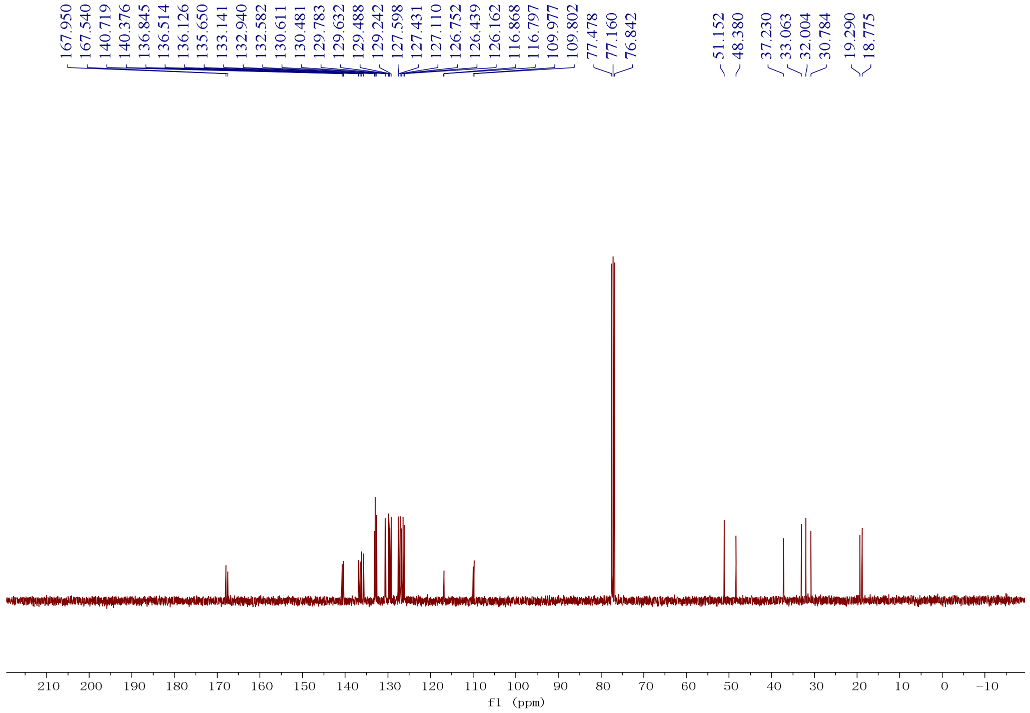

7.717
7.697
7.654
7.637
7.631
7.619
7.514
7.494
7.474
7.467
7.454
7.449
7.445
7.438
7.431
7.427
7.423
7.408
7.404
7.377
7.357
7.332
7.328
7.320
7.260
7.251
7.242
7.236
6.951
6.942
6.932
6.927
6.758
6.752
6.742
6.736
3.836
3.816
3.797
3.454
3.437
3.419
3.212
3.065
3.049
3.044
3.026
2.831
2.814
2.796
0.50
0.98
1.55
2.51
1.95
0.98
0.49
1.00
1.00
1.52
1.02
2.56
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)

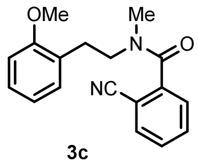

168.028
167.560
140.758
140.386
138.823
137.713
133.119
132.994
132.890
132.625
129.469
129.248
128.987
128.880
128.853
128.648
127.613
127.383
126.880
126.556
116.876
116.848
109.993
109.751
77.478
77.160
76.842
52.648
49.519
37.368
34.494
33.377
32.953
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10


Me
Me
N
O
NC

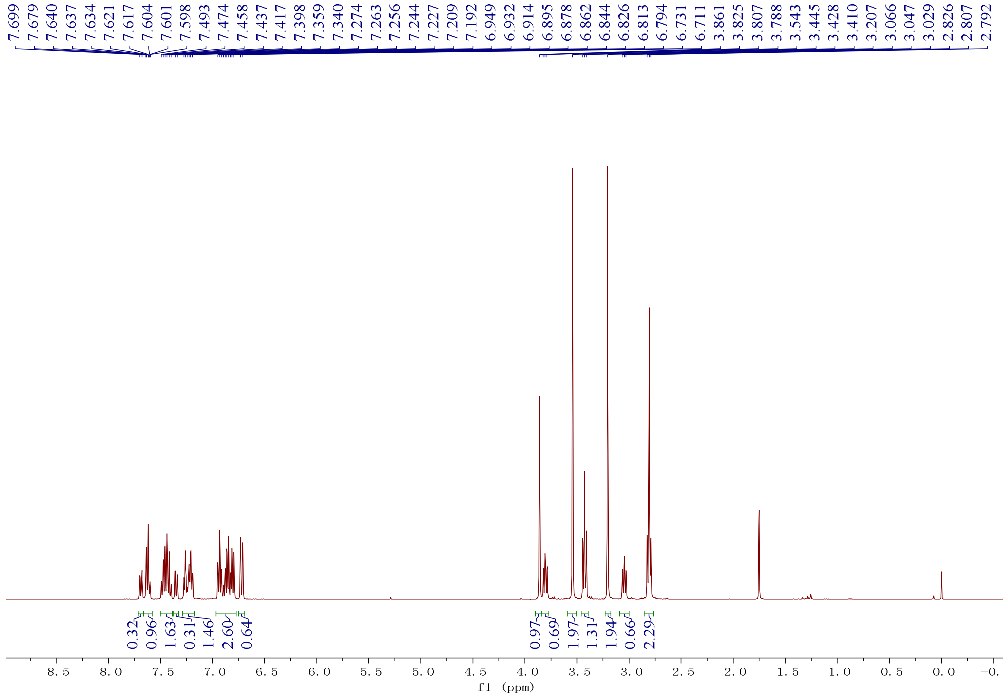
3b


7.705
7.686
7.641
7.622
7.508
7.489
7.469
7.450
7.446
7.431
7.417
7.398
7.259
7.245
7.238
7.225
7.170
7.160
7.155
7.148
7.134
7.116
7.113
7.103
7.086
7.049
7.031
6.916
6.899
6.824
6.821
6.803
3.761
3.746
3.741
3.735
3.721
3.395
3.377
3.359
3.233
3.065
3.051
3.045
3.040
3.026
2.869
2.830
2.812
2.794
2.432
1.934
1.44
2.00
3.53
0.51
0.50
0.93
1.07
1.58
0.93
1.39
1.07
1.38
1.55
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.
f1 (ppm)


167.950
167.540
140.719
140.376
136.845
136.514
136.126
135.650
133.141
132.940
132.582
130.611
130.481
129.783
129.632
129.488
129.242
127.598
127.431
127.110
126.752
126.439
126.162
116.868
116.797
109.977
109.802
77.478
77.160
76.842
51.152
48.380
37.230
33.063
32.004
30.784
19.290
18.775
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)


OMe
Me
N
O
NC

3c


7.699
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7.634
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7.617
7.604
7.601
7.598
7.493
7.474
7.458
7.437
7.417
7.398
7.359
7.340
7.274
7.263
7.256
7.244
7.227
7.209
7.192
6.949
6.932
6.914
6.895
6.878
6.862
6.844
6.826
6.813
6.794
6.731
6.711
3.861
3.825
3.807
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3.543
3.445
3.428
3.410
3.207
3.066
3.047
3.029
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2.807
2.792
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0.31
1.46
2.60
0.64
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0.69
1.97
1.31
1.94
0.66
2.29
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7.0
6.5
6.0
5.5
5.0
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2.0
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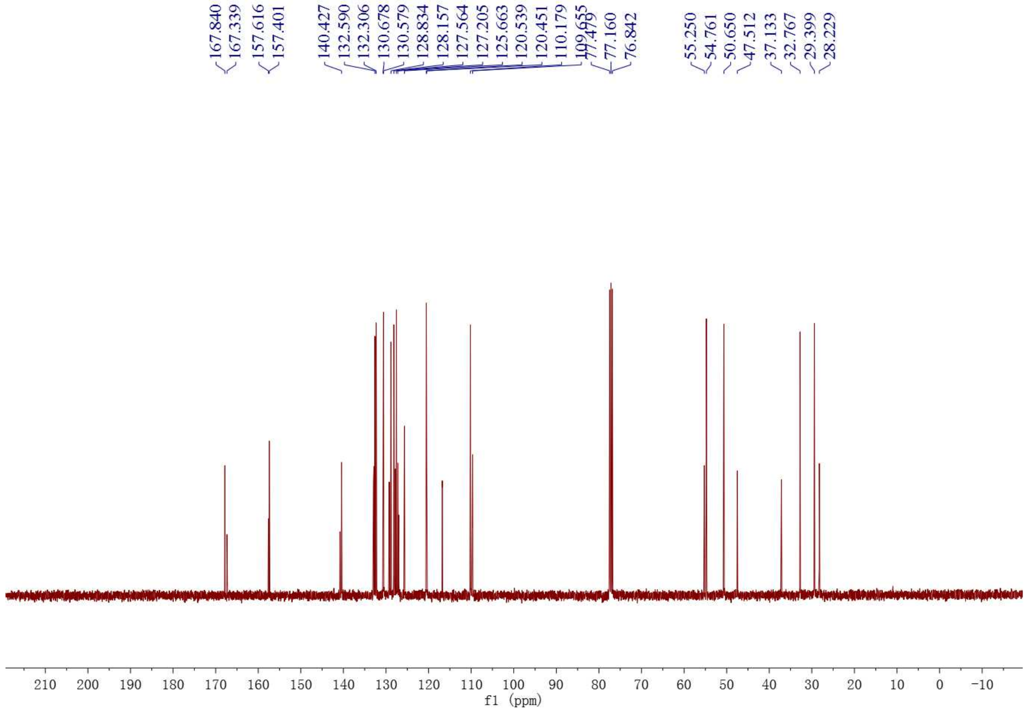
f1 (ppm)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125.663
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120.451
110.179
109.655
77.479
77.160
76.842
55.250
54.761
50.650
47.512
37.133
32.767
29.399
28.229
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200
190
180
170
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100
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80
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30
20
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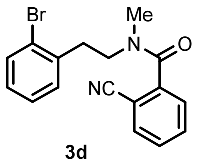
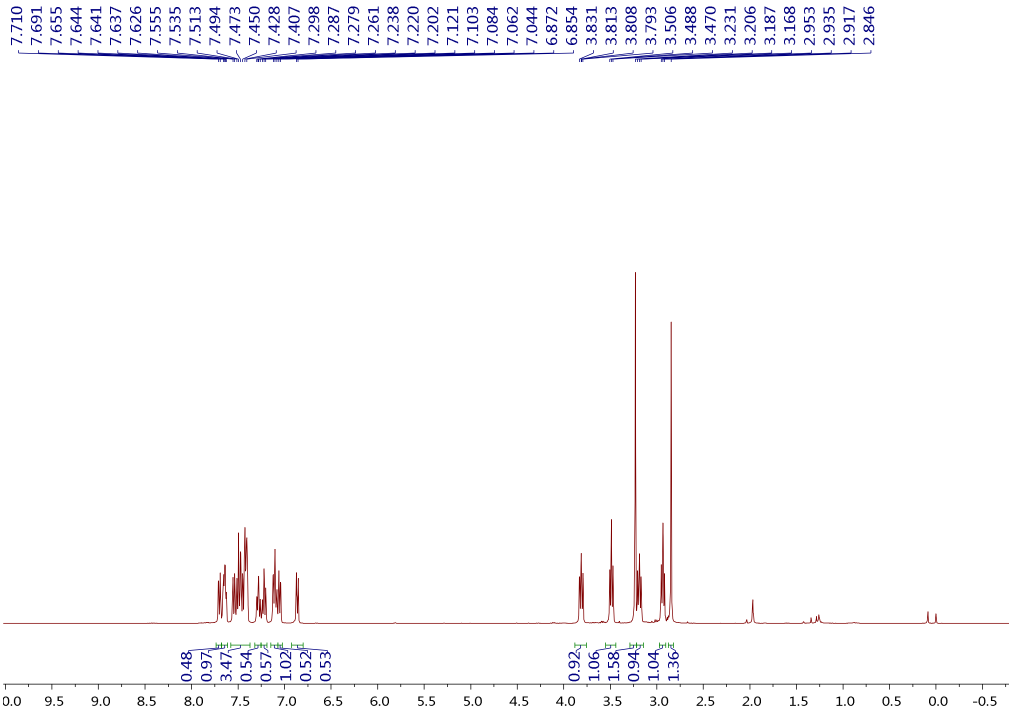
-10
f1 (ppm)



3d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7.428
7.407
7.298
7.287
7.279
7.261
7.238
7.220
7.202
7.121
7.103
7.084
7.062
7.044
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3.506
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3.231
3.206
3.187
3.168
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2.917
2.846
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0.97
3.47
0.54
0.57
1.02
0.52
0.53
0.92
1.06
1.58
0.94
1.04
1.36
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9.0
8.5
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7.5
7.0
6.5
6.0
5.5
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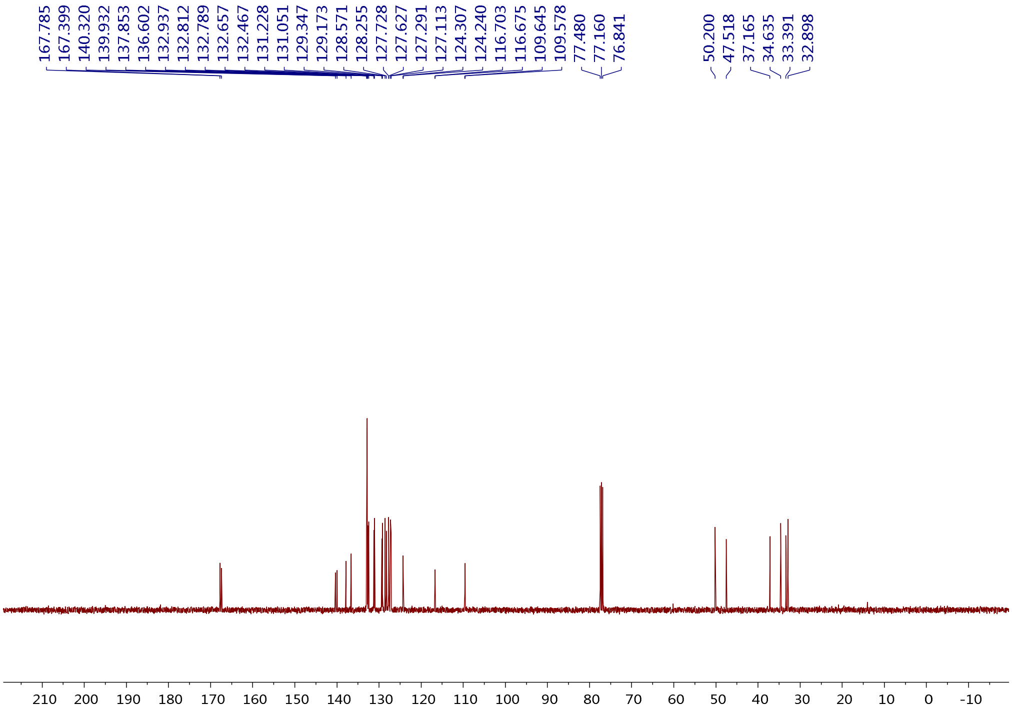
0.0
-0.5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129.173
128.571
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127.627
127.291
127.113
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124.240
116.703
116.675
109.645
109.578
77.480
77.160
76.841
50.200
47.518
37.165
34.635
33.391
32.898
210
200
190
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120
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60
50
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20
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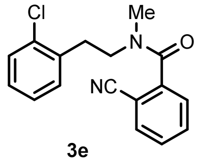
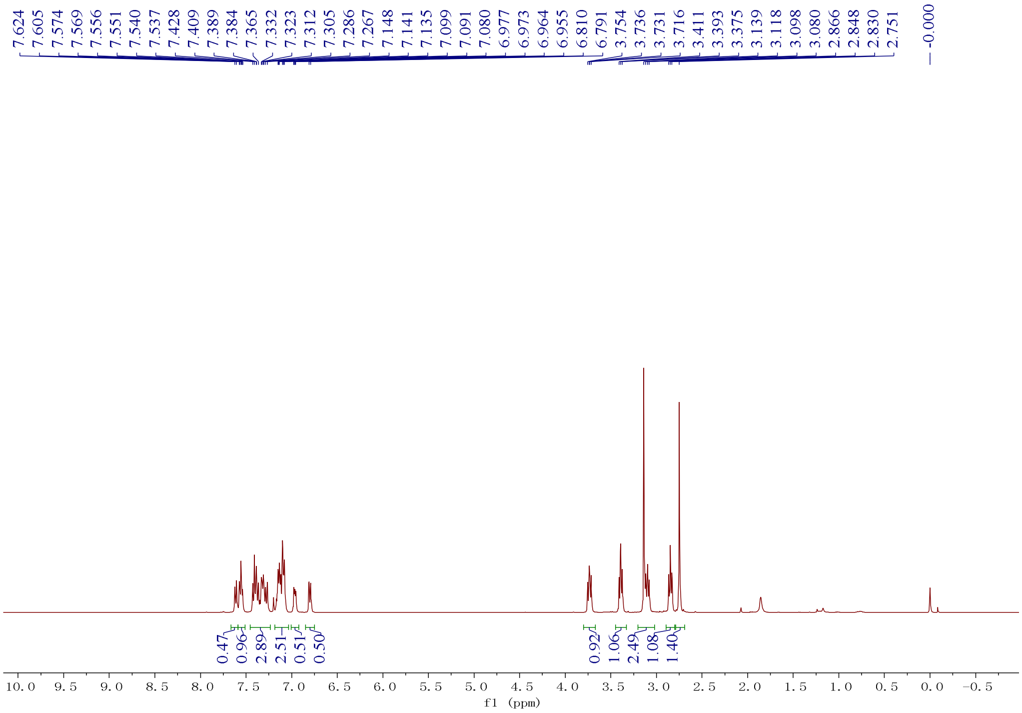
0
-10


Cl
Me
N
O
NC

3e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7.537
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7.365
7.332
7.323
7.312
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7.286
7.267
7.148
7.141
7.135
7.099
7.091
7.080
6.977
6.973
6.964
6.955
6.810
6.791
3.754
3.736
3.731
3.716
3.411
3.393
3.375
3.139
3.118
3.098
3.080
2.866
2.848
2.830
2.751
-0.000
0.47
0.96
2.89
2.51
0.51
0.50
0.92
1.06
2.49
1.08
1.40
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
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2.0
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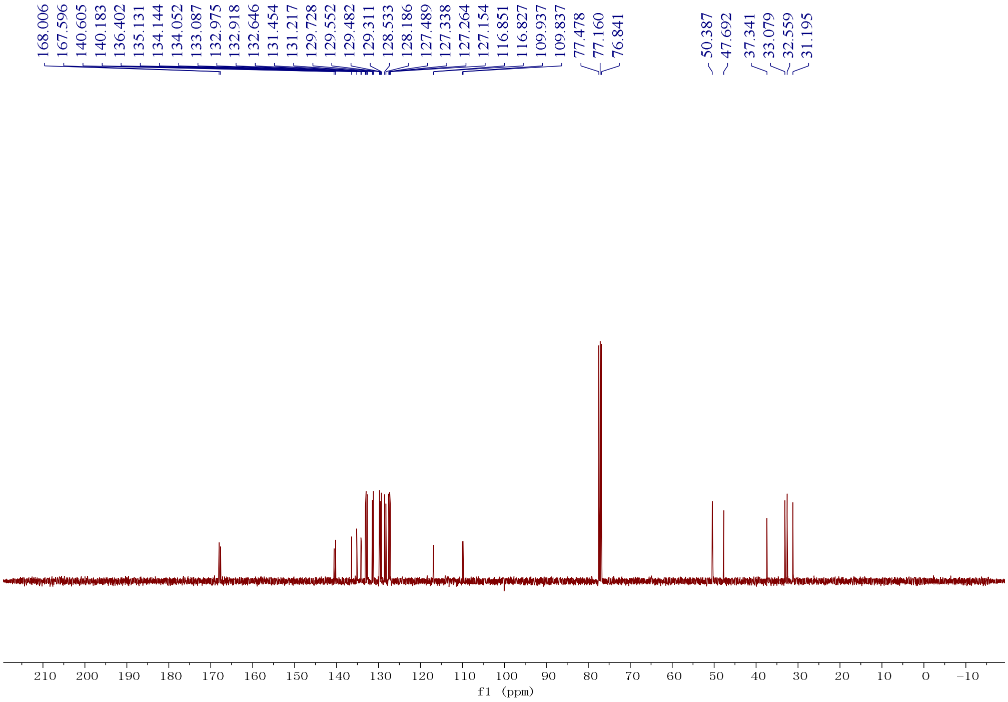
0.5
0.0
-0.5
f1 (ppm)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134.144
134.052
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132.918
132.646
131.454
131.217
129.728
129.552
129.482
129.311
128.533
128.186
127.489
127.338
127.264
127.154
116.851
116.827
109.937
109.837
77.478
77.160
76.841
50.387
47.692
37.341
33.079
32.559
31.195
210
200
190
180
170
160
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140
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120
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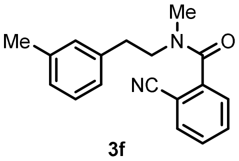
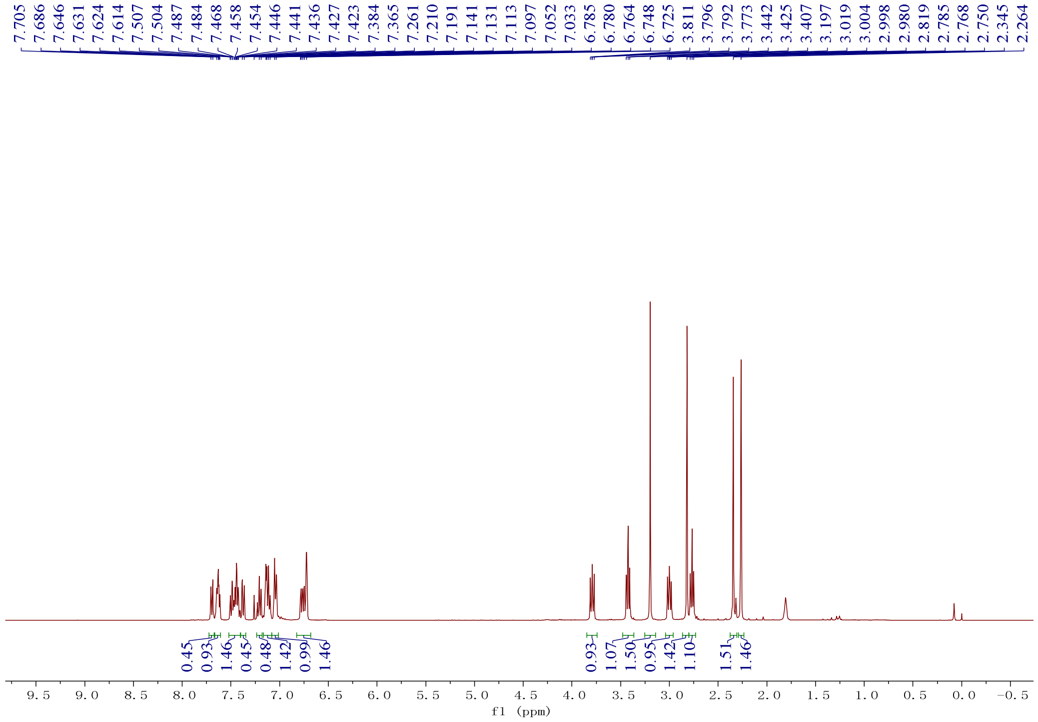
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)


Me
Me
N
O
NC

3f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7.504
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7.484
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7.458
7.454
7.446
7.441
7.436
7.427
7.423
7.384
7.365
7.261
7.210
7.191
7.141
7.131
7.113
7.097
7.052
7.033
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6.780
6.764
6.748
6.725
3.811
3.796
3.792
3.773
3.442
3.425
3.407
3.197
3.019
3.004
2.998
2.980
2.819
2.785
2.768
2.750
2.345
2.264
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0.93
1.46
0.45
0.48
1.42
0.99
1.46
0.93
1.07
1.50
0.95
1.42
1.10
1.51
1.46
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
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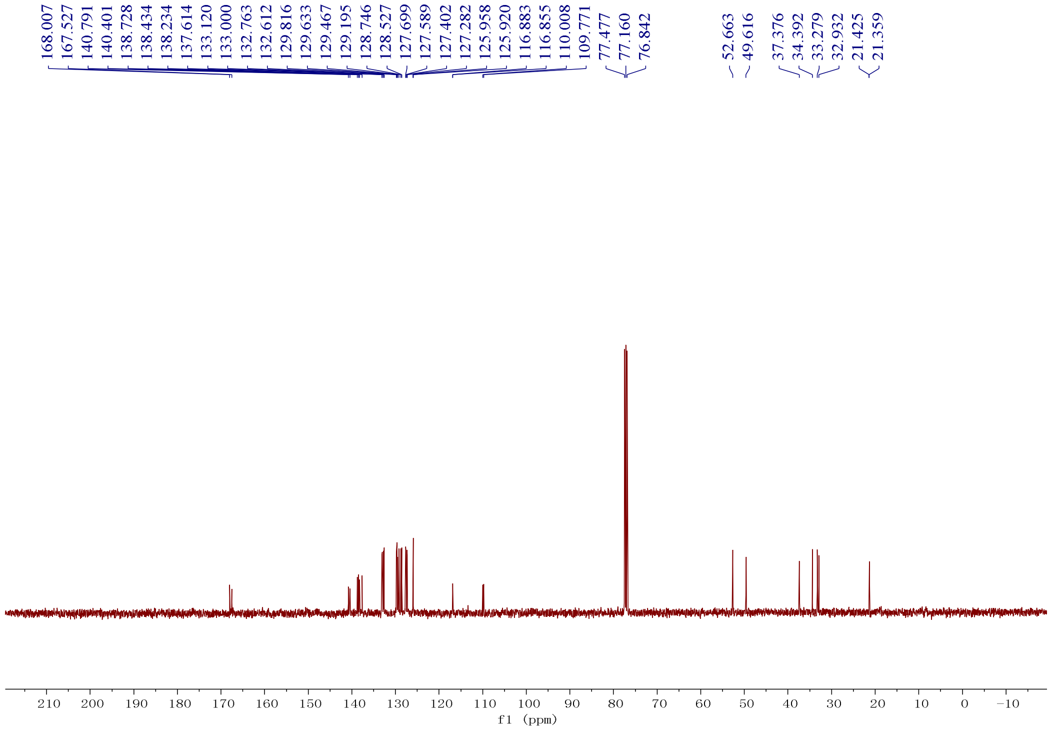
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)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129.816
129.633
129.467
129.195
128.746
128.527
127.699
127.589
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127.282
125.958
125.920
116.883
116.855
110.008
109.771
77.477
77.160
76.842
52.663
49.616
37.376
34.392
33.279
32.932
21.425
21.359
210
200
190
180
170
160
150
140
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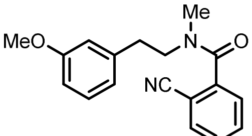
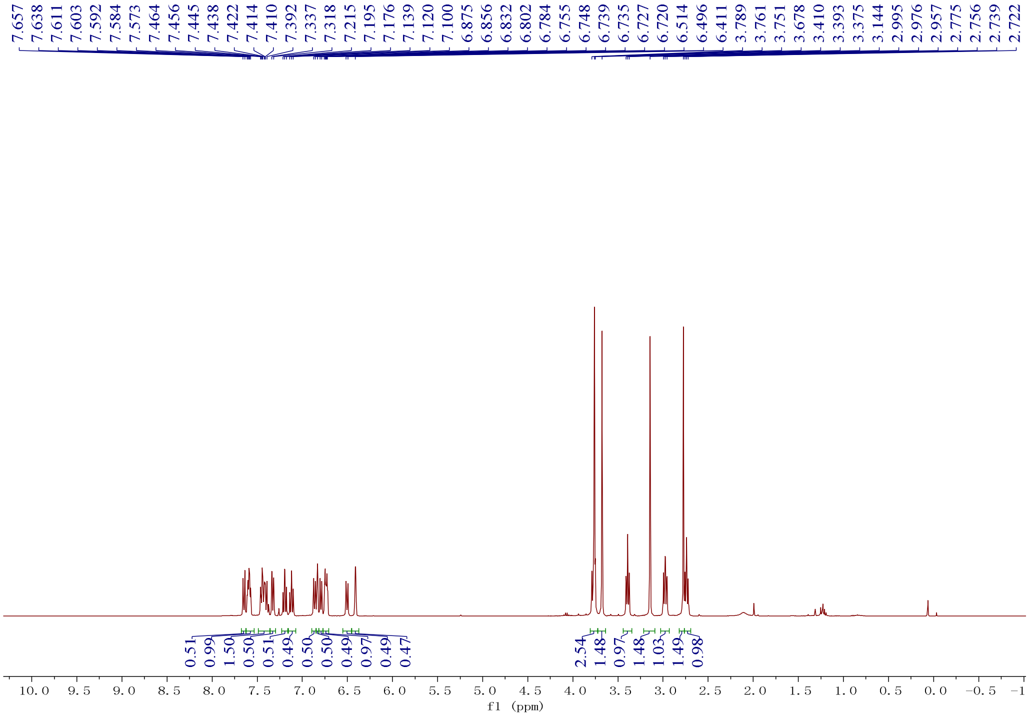
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)


Me
MeO
N
O
NC

3g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7.414
7.410
7.392
7.337
7.318
7.215
7.195
7.176
7.139
7.120
7.100
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6.856
6.832
6.802
6.784
6.755
6.748
6.739
6.735
6.727
6.720
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3.410
3.393
3.375
3.144
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2.976
2.957
2.775
2.756
2.739
2.722
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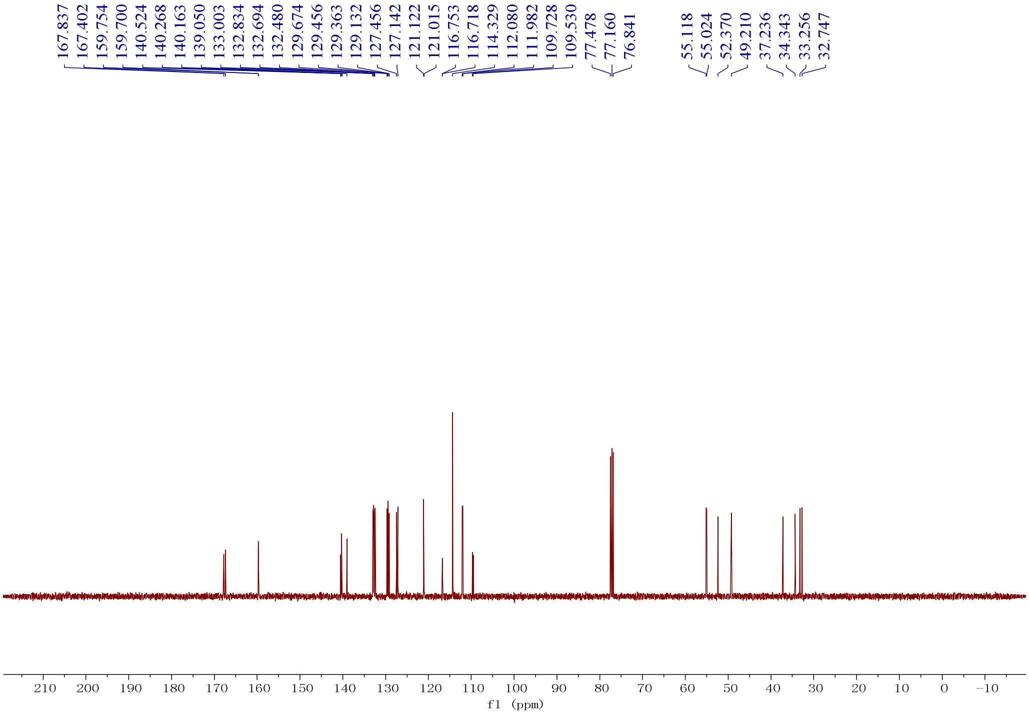
0.99
1.50
0.50
0.51
0.49
0.50
0.50
0.49
0.97
0.49
0.47
2.54
1.48
0.97
1.48
1.03
1.49
0.98
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1
f1 (ppm)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129.456
129.363
129.132
127.456
127.142
121.122
121.015
116.753
116.718
114.329
112.080
111.982
109.728
109.530
77.478
77.160
76.841
55.118
55.024
52.370
49.210
37.236
34.343
33.256
32.747
210
200
190
180
170
160
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120
110
100
90
80
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50
40
30
20
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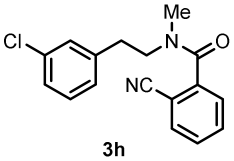
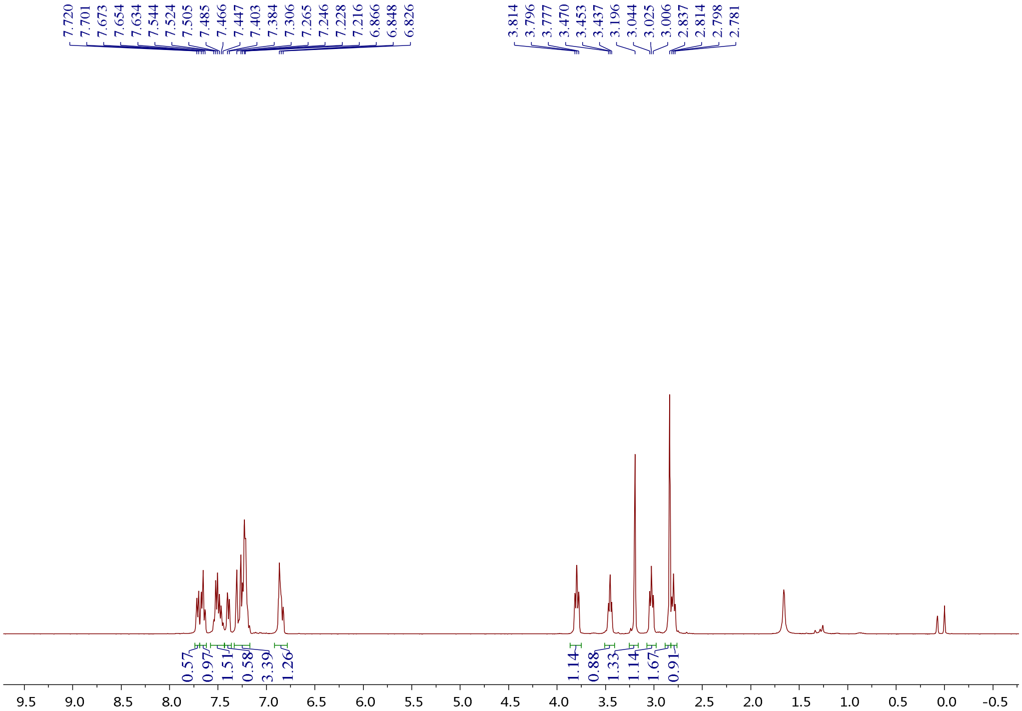
-10
f1 (ppm)


Me
N
O
Cl
NC

3h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7.447
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7.384
7.306
7.265
7.246
7.228
7.216
6.866
6.848
6.826
3.814
3.796
3.777
3.470
3.453
3.437
3.196
3.044
3.025
3.006
2.837
2.814
2.798
2.781
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0.97
1.51
0.58
3.39
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1.14
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1.33
1.14
1.67
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6.0
5.5
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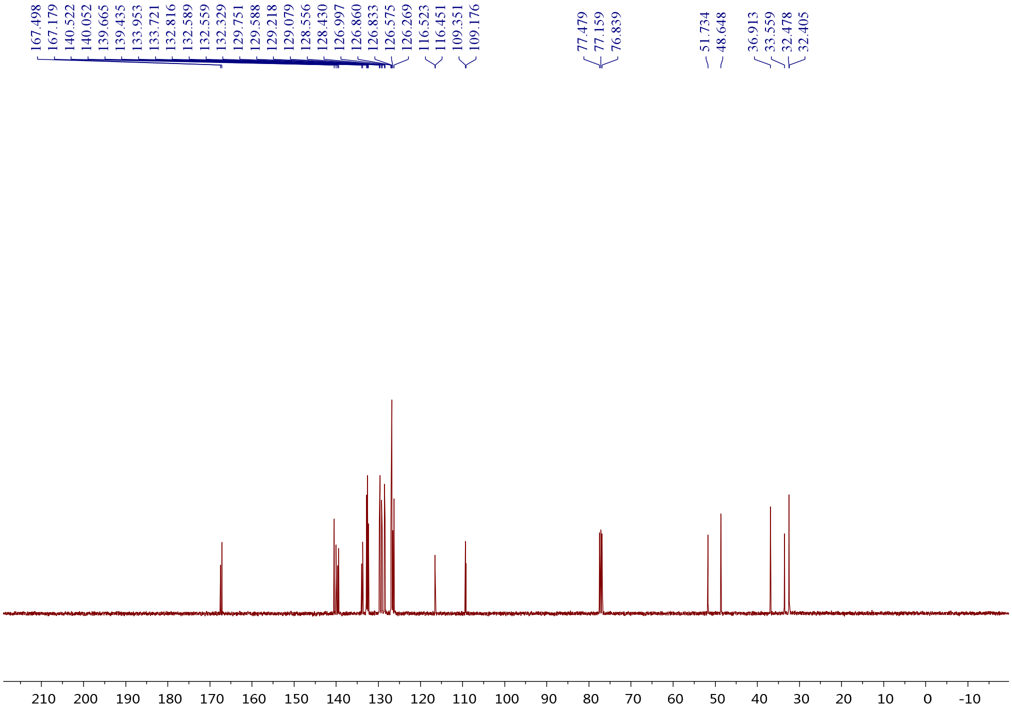
0.0
-0.5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109.176
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77.159
76.839
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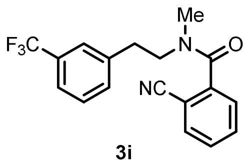
-10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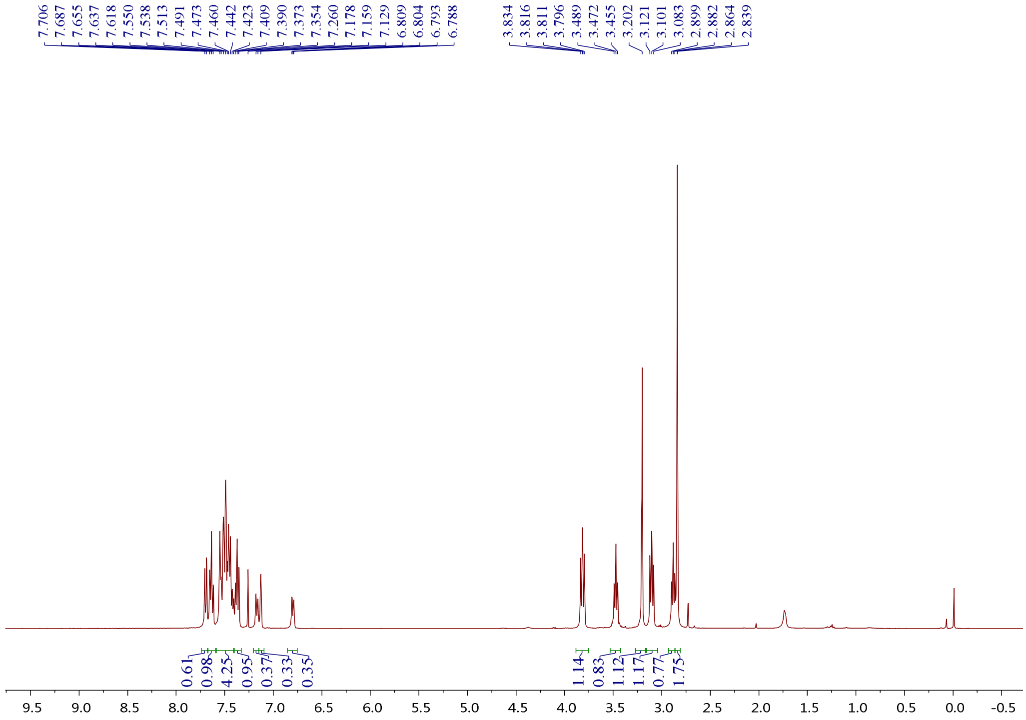
F3C
N
O
NC

3i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7.473
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7.423
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7.373
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7.159
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3.811
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0.95
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0.35
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0.83
1.12
1.17
0.77
1.75
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7.0
6.5
6.0
5.5
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0.0
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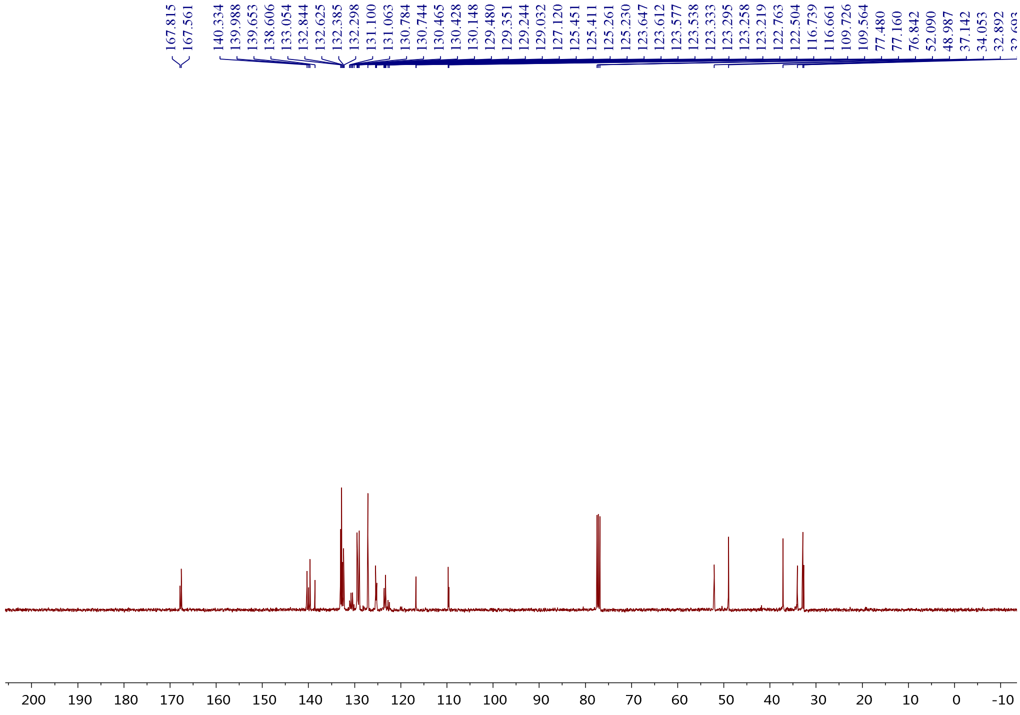
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131.063
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123.577
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123.295
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123.219
122.763
122.504
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76.842
52.090
48.987
37.142
34.053
32.892
200
190
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100
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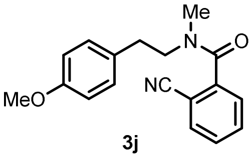
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N
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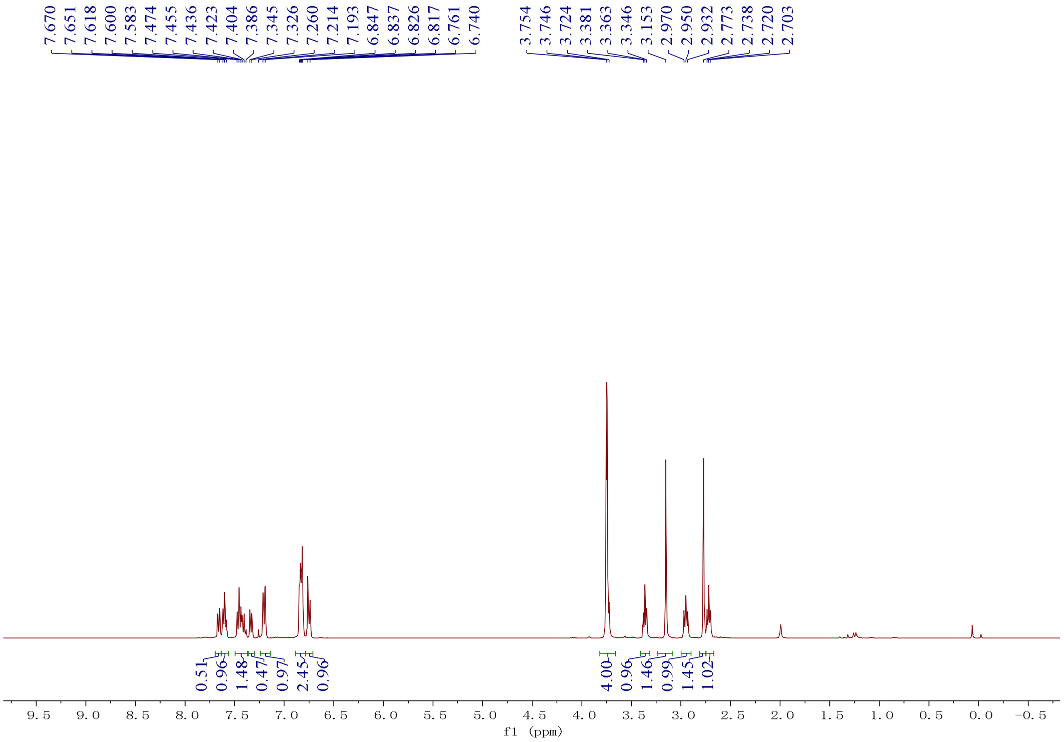
NC
MeO

3j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7.326
7.260
7.214
7.193
6.847
6.837
6.826
6.817
6.761
6.740
3.754
3.746
3.724
3.381
3.363
3.346
3.153
2.970
2.950
2.932
2.773
2.738
2.720
2.703
0.51
0.96
1.48
0.47
0.97
2.45
0.96
4.00
0.96
1.46
0.99
1.45
1.02
9.5
9.0
8.5
8.0
7.5
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6.5
6.0
5.5
5.0
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2.5
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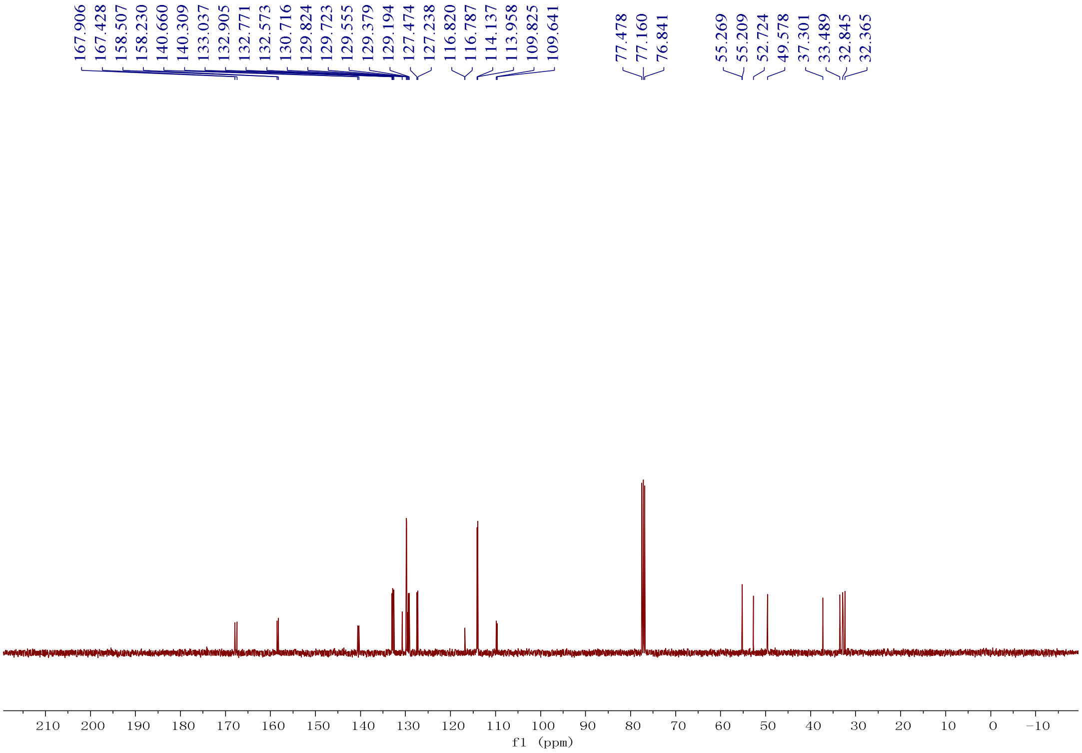
f1 (ppm)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109.641
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77.160
76.841
55.269
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52.724
49.578
37.301
33.489
32.845
32.365
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200
190
180
170
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100
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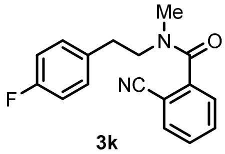
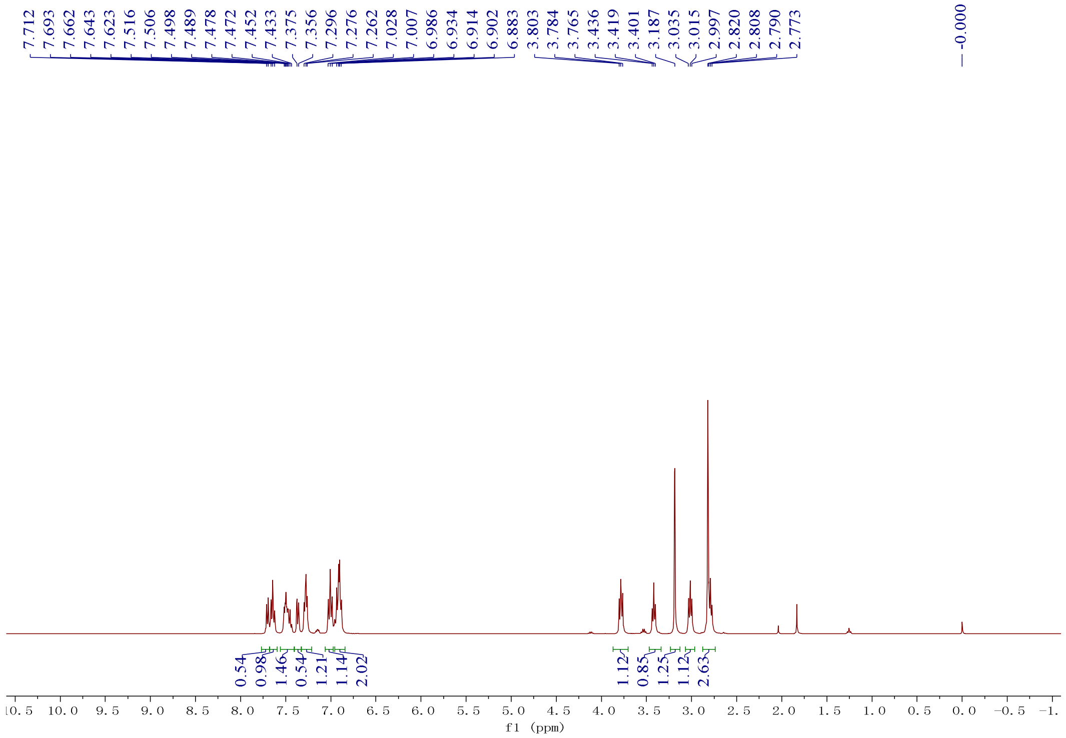
0
-10
f1 (ppm)


Me
N
O
NC
F

3k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7.433
7.375
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7.296
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7.262
7.028
7.007
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6.883
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3.784
3.765
3.436
3.419
3.401
3.187
3.035
3.015
2.997
2.820
2.808
2.790
2.773
-0.000
0.54
0.98
1.46
0.54
1.21
1.14
2.02
1.12
0.85
1.25
1.12
2.63
10.5
10.0
9.5
9.0
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8.0
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7.0
6.5
6.0
5.5
5.0
4.5
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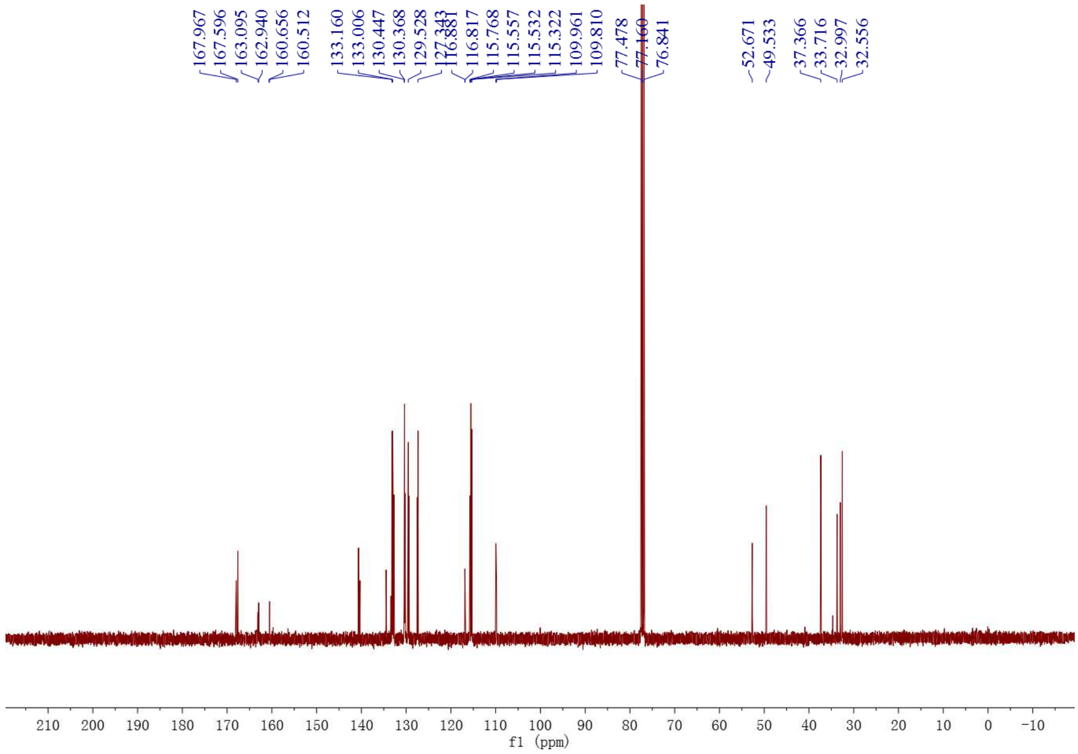
-1.
f1 (ppm)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133.006
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130.368
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127.343
116.881
116.817
115.768
115.557
115.532
115.322
109.961
109.810
77.478
77.160
76.841
52.671
49.533
37.366
33.716
32.997
32.556
210
200
190
180
170
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100
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80
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30
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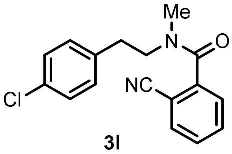
-10
f1 (ppm)


Me
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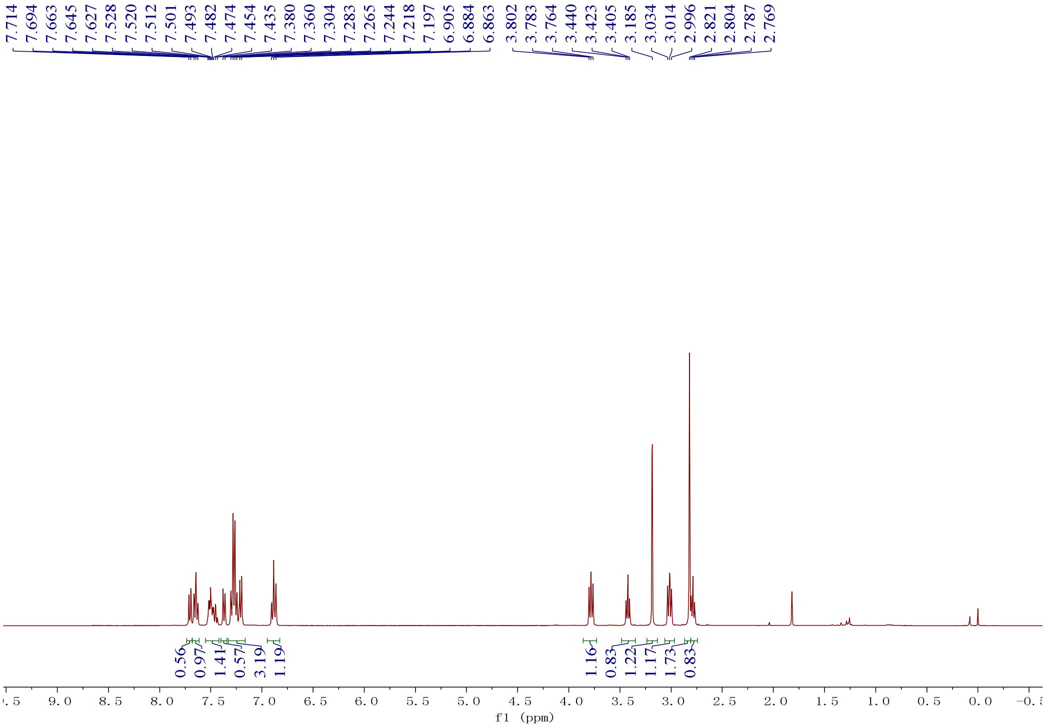
O
NC
Cl

3l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7.501
7.493
7.482
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7.454
7.435
7.380
7.360
7.304
7.283
7.265
7.244
7.218
7.197
6.905
6.884
6.863
3.802
3.783
3.764
3.440
3.423
3.405
3.185
3.034
3.014
2.996
2.821
2.804
2.787
2.769
0.56
0.97
1.41
0.57
3.19
1.19
1.16
0.83
1.22
1.17
1.73
0.83
.5
9.0
8.5
8.0
7.5
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6.5
6.0
5.5
5.0
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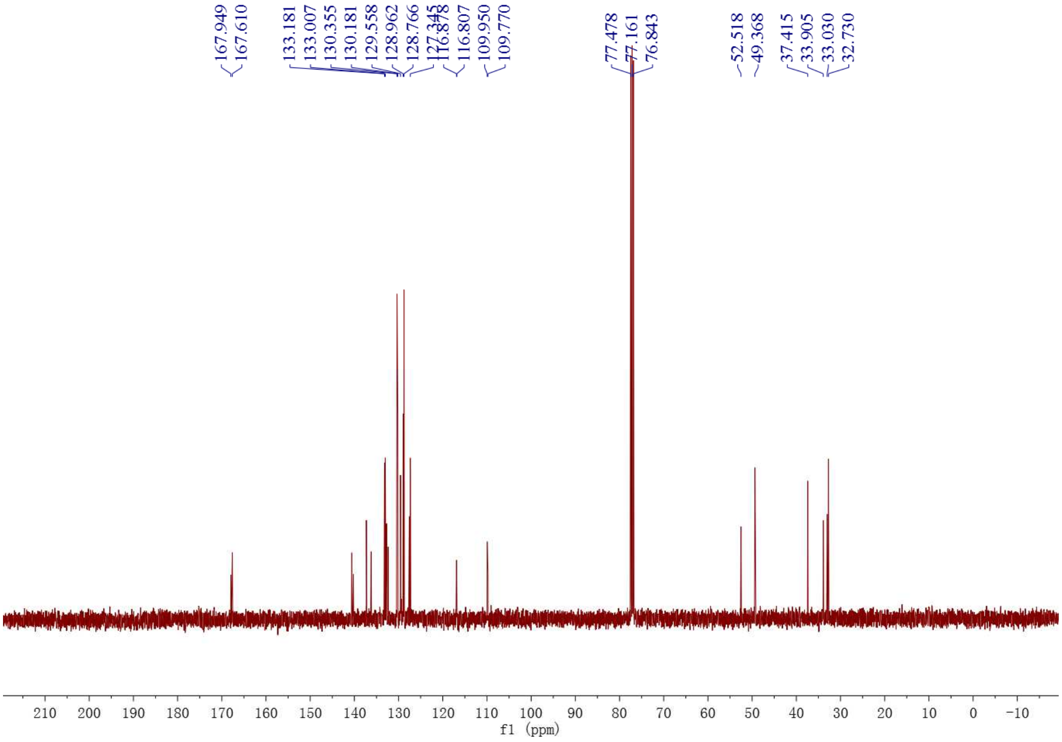
f1 (ppm)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109.770
77.478
77.161
76.843
52.518
49.368
37.415
33.905
33.030
32.730
210
200
190
180
170
160
150
140
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120
110
100
90
80
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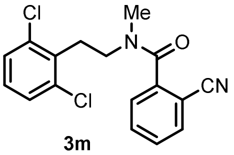
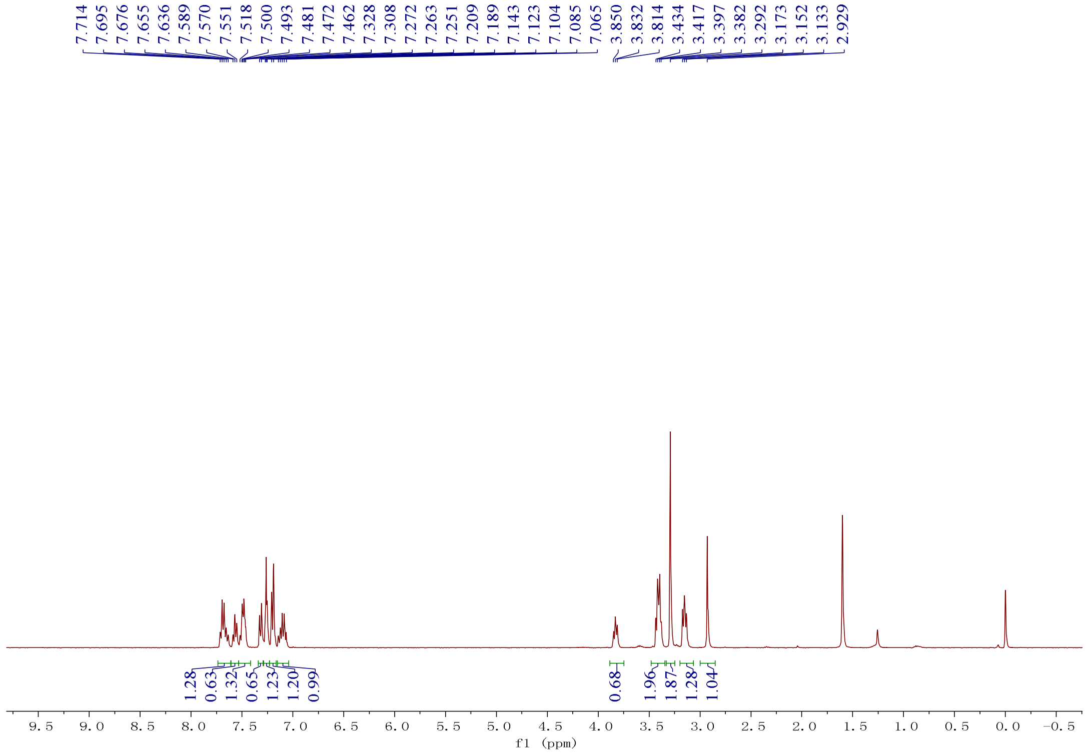
60
50
40
30
20
10
0
−10
f1 (ppm)



3m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7.518
7.500
7.493
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7.472
7.462
7.328
7.308
7.272
7.263
7.251
7.209
7.189
7.143
7.123
7.104
7.085
7.065
3.850
3.832
3.814
3.434
3.417
3.397
3.382
3.292
3.173
3.152
3.133
2.929
1.28
0.63
1.32
0.65
1.23
1.20
0.99
0.68
1.96
1.87
1.28
1.04
9.5
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8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
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4.0
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3.0
2.5
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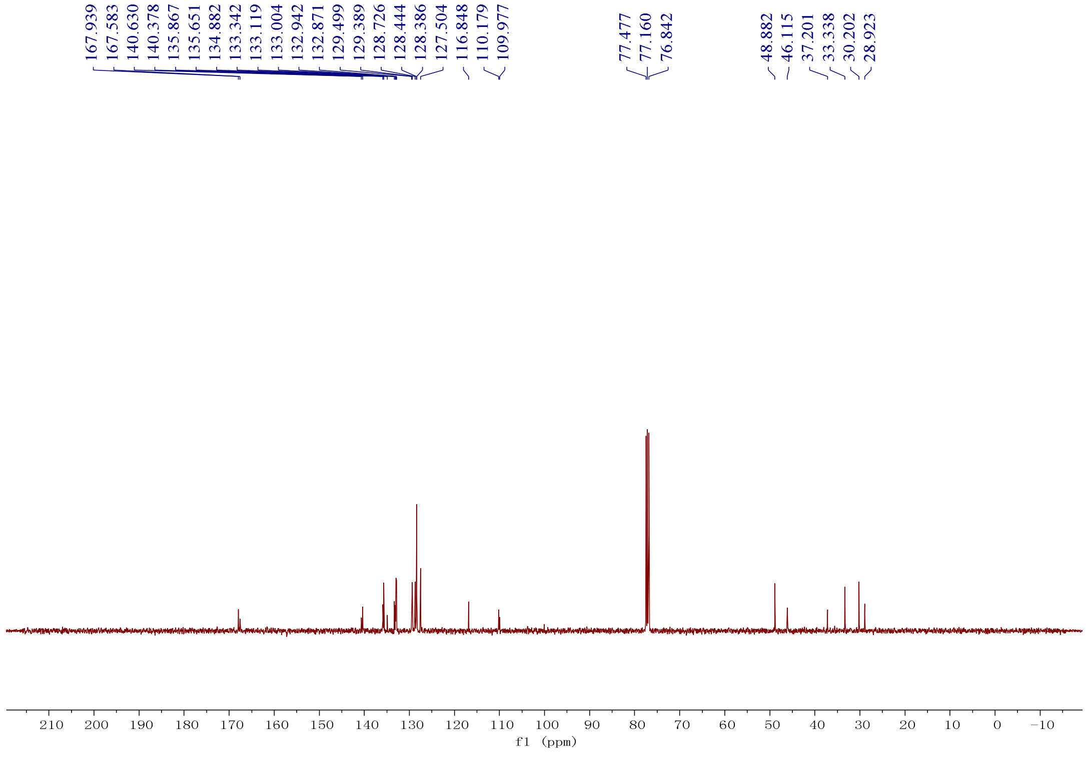
0.5
0.0
-0.5
f1 (ppm)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128.726
128.444
128.386
127.504
116.848
110.179
109.977
77.477
77.160
76.842
48.882
46.115
37.201
33.338
30.202
28.923
210
200
190
180
170
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110
100
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80
70
60
50
40
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20
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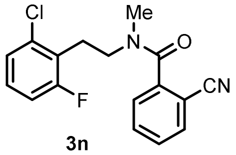
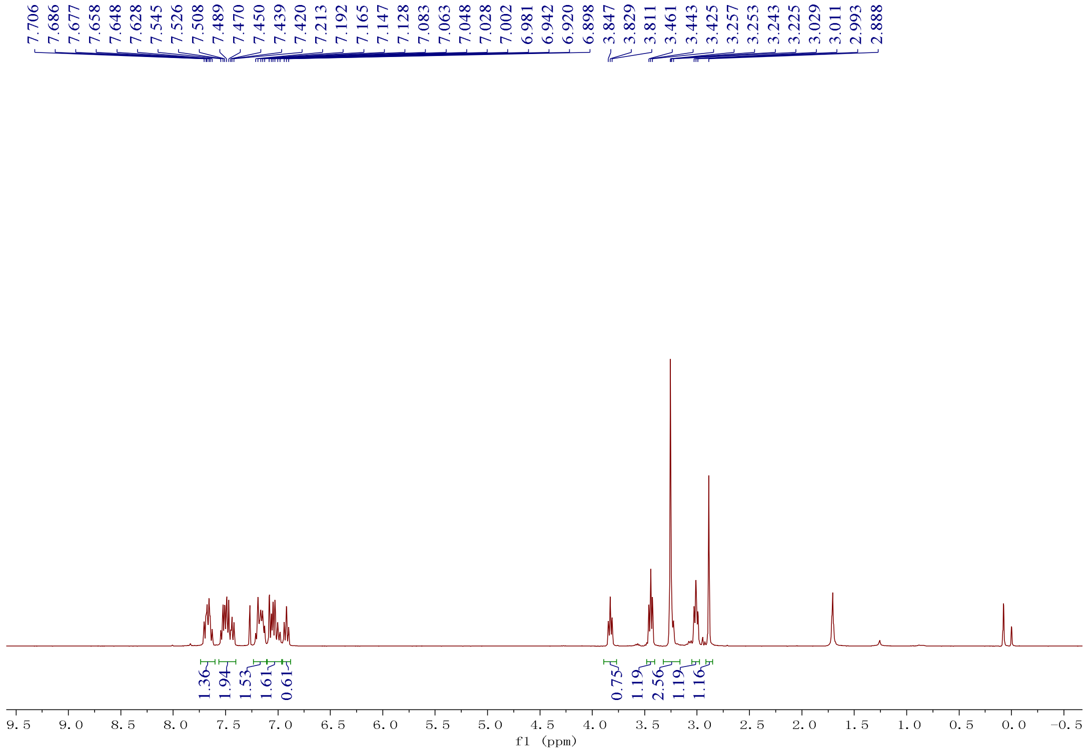
0
-10
f1 (ppm)


Cl
Me
N
O
F
CN

3n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7.545
7.526
7.508
7.489
7.470
7.450
7.439
7.420
7.213
7.192
7.165
7.147
7.128
7.083
7.063
7.048
7.028
7.002
6.981
6.942
6.920
6.898
3.847
3.829
3.811
3.461
3.443
3.425
3.257
3.253
3.243
3.225
3.029
3.011
2.993
2.888
1.36
1.94
1.53
1.61
0.61
0.75
1.19
2.56
1.19
1.16
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
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3.0
2.5
2.0
1.5
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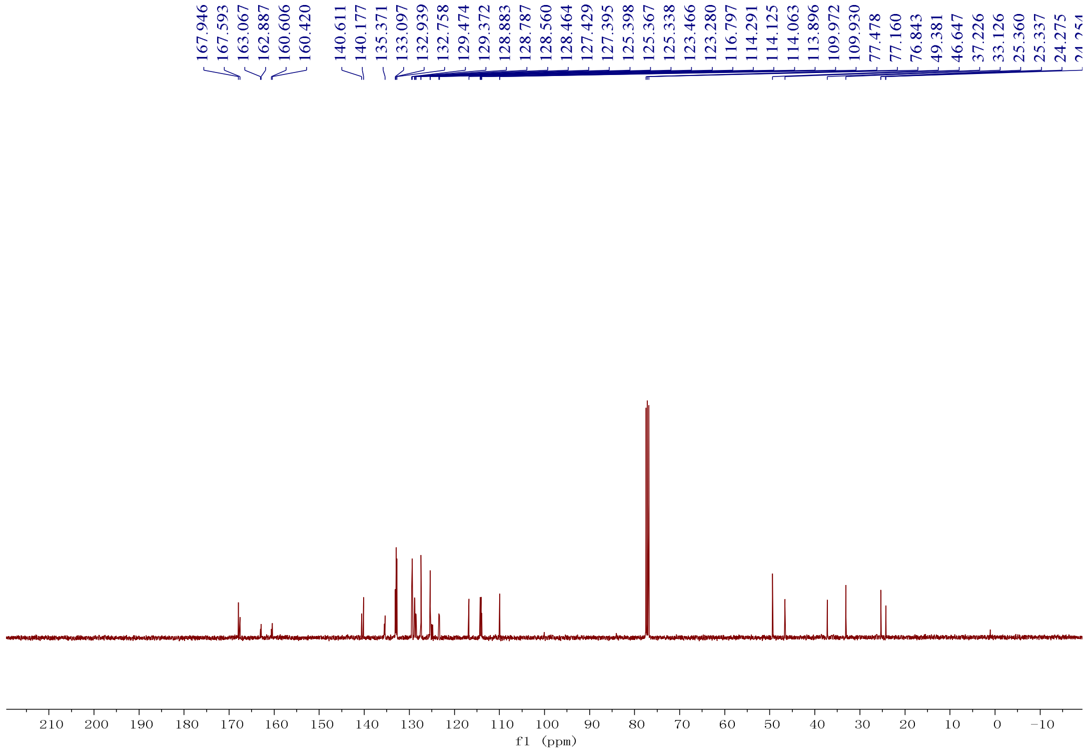
0.5
0.0
−0.5
f1 (ppm)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129.474
129.372
128.883
128.787
128.560
128.464
127.429
127.395
125.398
125.367
125.338
123.466
123.280
116.797
114.291
114.125
114.063
113.896
109.972
109.930
77.478
77.160
76.843
49.381
46.647
37.226
33.126
25.360
25.337
24.275
24.254
210
200
190
180
170
160
150
140
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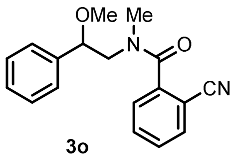
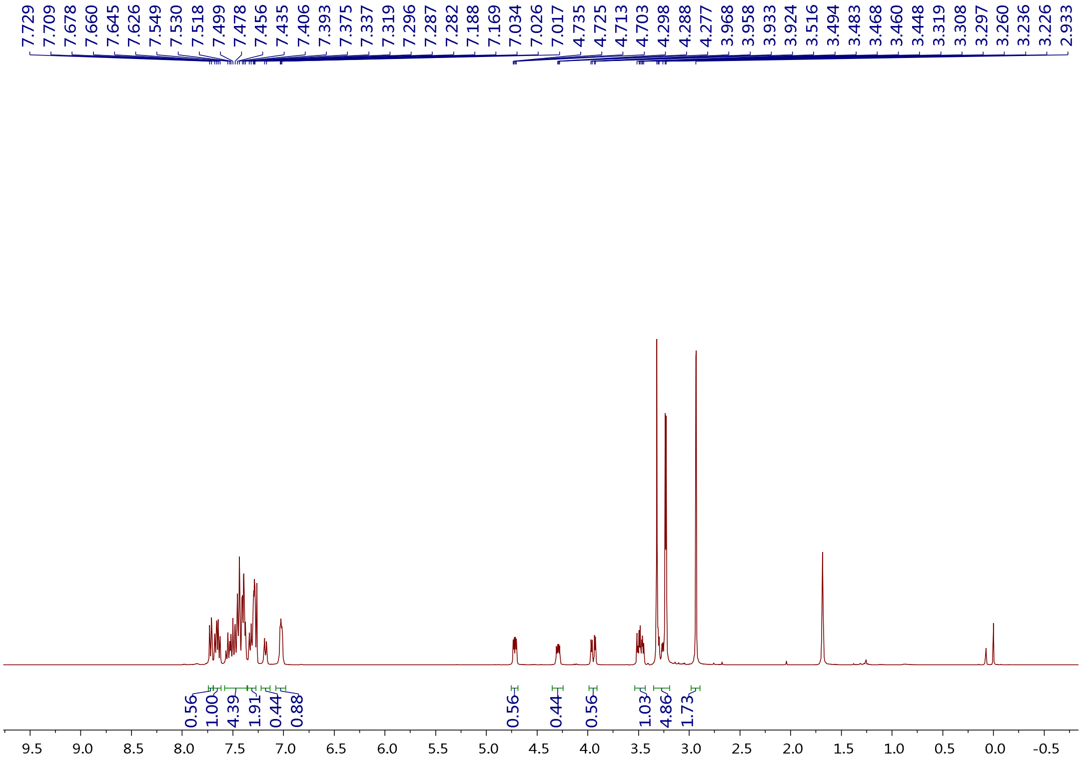
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)


OMe
Me
N
O
CN

3o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7.435
7.406
7.393
7.375
7.337
7.319
7.296
7.287
7.282
7.188
7.169
7.034
7.026
7.017
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4.725
4.713
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3.933
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3.516
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3.483
3.468
3.460
3.448
3.319
3.308
3.297
3.260
3.236
3.226
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0.88
0.56
0.44
0.56
1.03
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1.73
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6.5
6.0
5.5
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2.0
1.5
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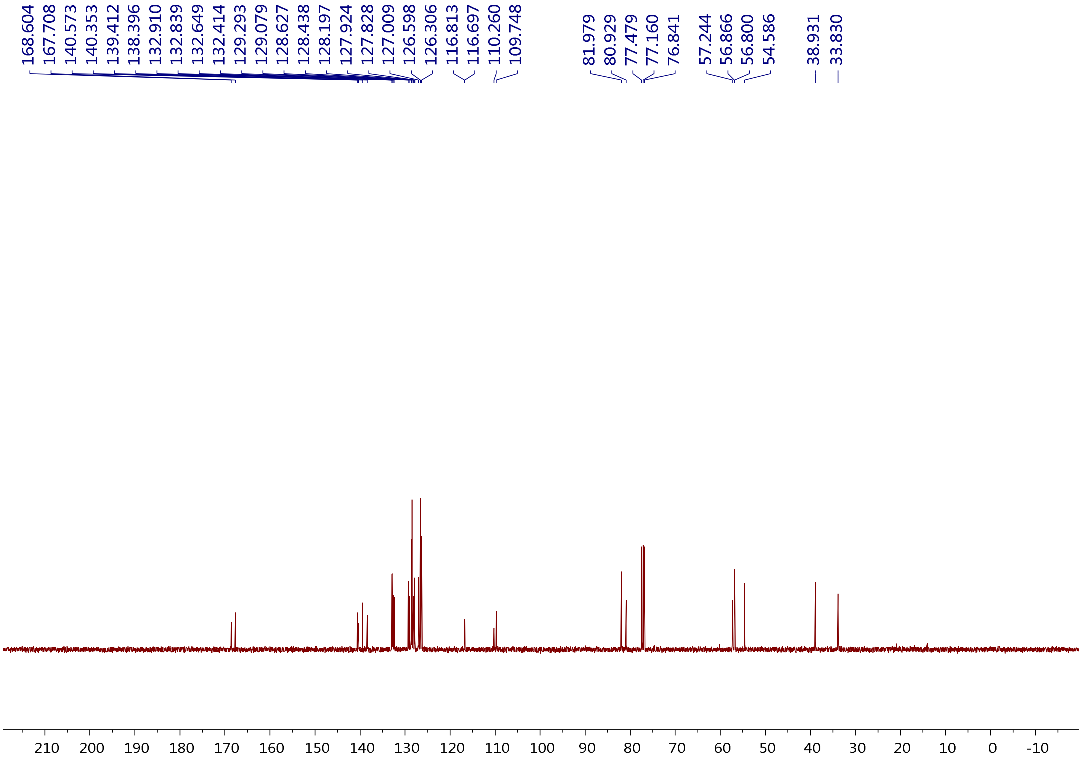
0.0
-0.5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128.627
128.438
128.197
127.924
127.828
127.009
126.598
126.306
116.813
116.697
110.260
109.748
81.979
80.929
77.479
77.160
76.841
57.244
56.866
56.800
54.586
38.931
33.830
210
200
190
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100
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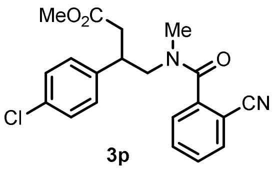
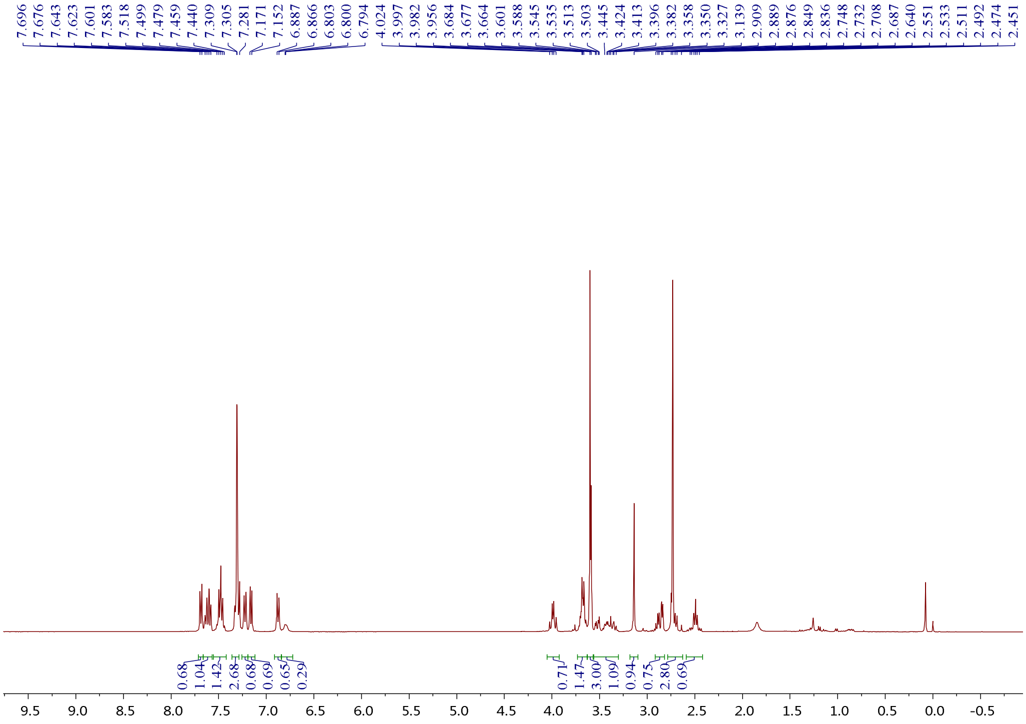
0
-10


MeO$_2$C
Me
N
O
CN
Cl

3p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7.309
7.305
7.281
7.171
7.152
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6.800
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3.588
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3.535
3.513
3.503
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3.424
3.413
3.396
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3.350
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2.836
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2.533
2.511
2.492
2.474
2.451
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0.69
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0.29
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1.09
0.94
0.75
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0.69
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7.5
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6.0
5.5
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3.5
3.0
2.5
2.0
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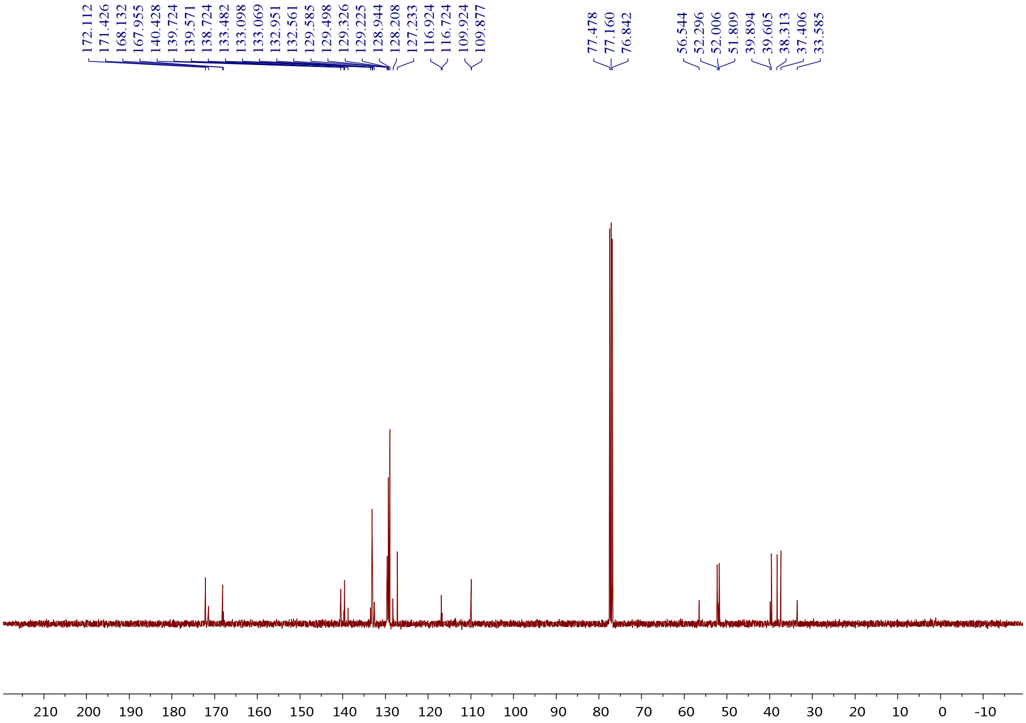
0.0
-0.5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132.561
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129.498
129.326
129.225
128.944
128.208
127.233
116.924
116.724
109.924
109.877
77.478
77.160
76.842
56.544
52.296
52.006
51.809
39.894
39.605
38.313
37.406
33.585
210
200
190
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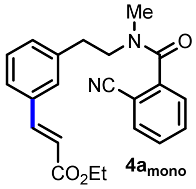
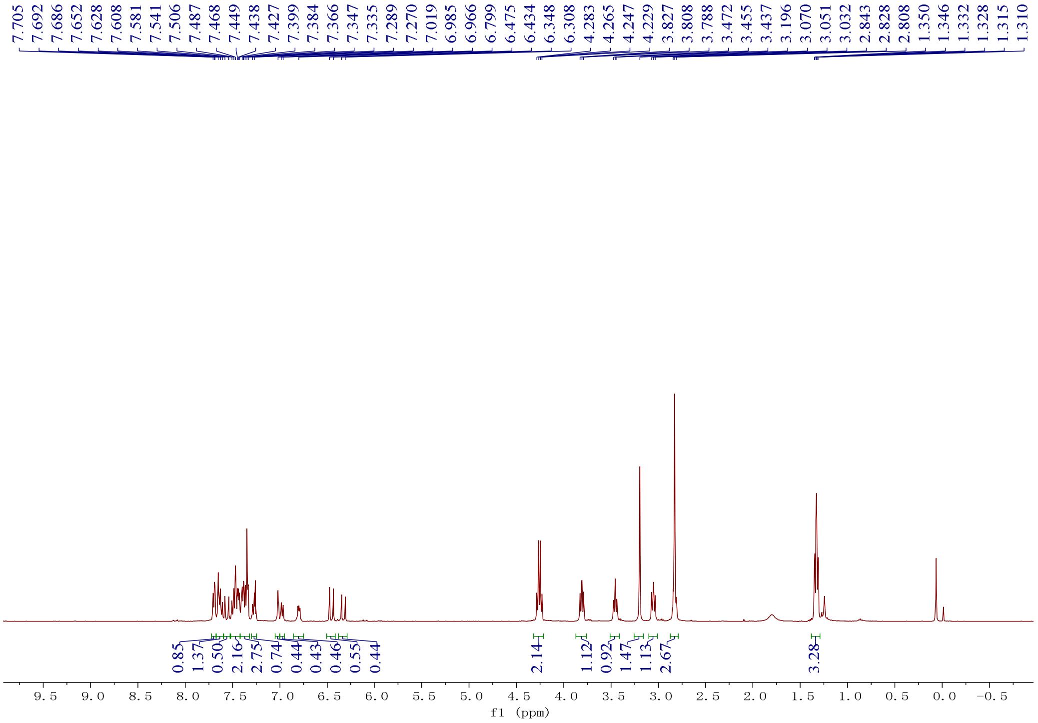
-10


Me
N
O
NC
CO2Et

4a$_{mono}$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7.427
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7.270
7.019
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6.966
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6.434
6.348
6.308
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4.247
4.229
3.827
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3.472
3.455
3.437
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3.051
3.032
2.843
2.828
2.808
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1.346
1.332
1.328
1.315
1.310
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1.37
0.50
2.16
2.75
0.74
0.44
0.43
0.46
0.55
0.44
2.14
1.12
0.92
1.47
1.13
2.67
3.28
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8.5
8.0
7.5
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6.5
6.0
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5.0
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3.0
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2.0
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0.5
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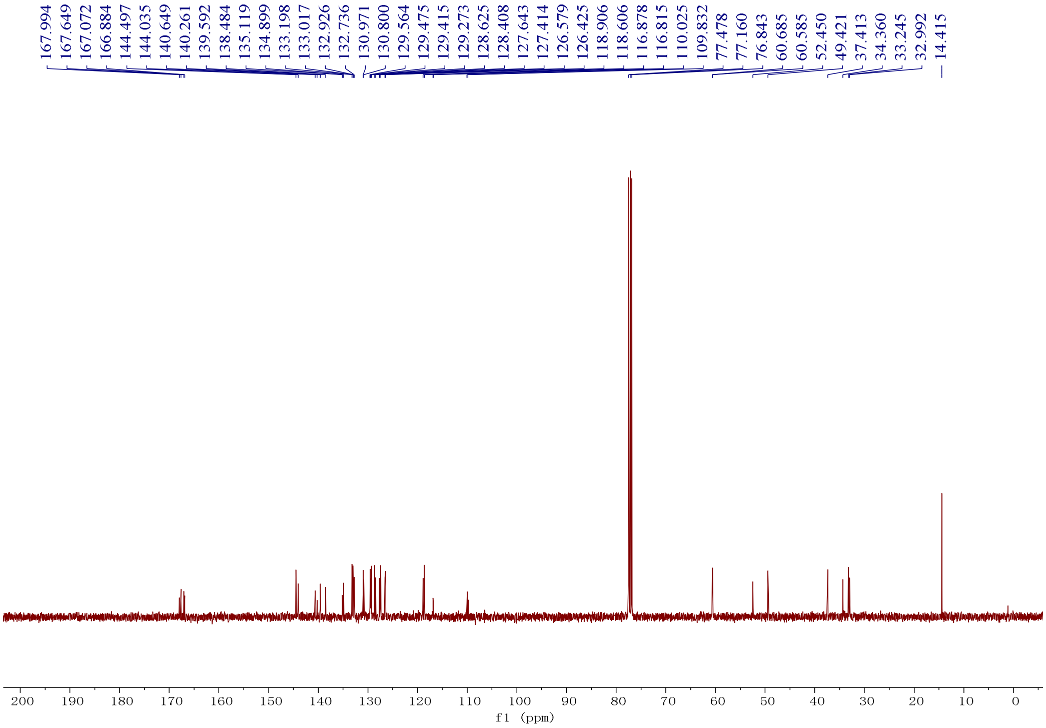
-0.5
f1 (ppm)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133.017
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132.736
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130.800
129.564
129.475
129.415
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128.625
128.408
127.643
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126.579
126.425
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118.606
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77.160
76.843
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52.450
49.421
37.413
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33.245
32.992
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200
190
180
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120
110
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90
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50
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30
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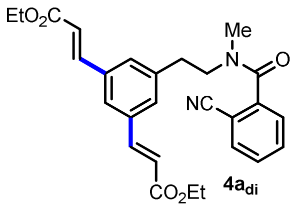
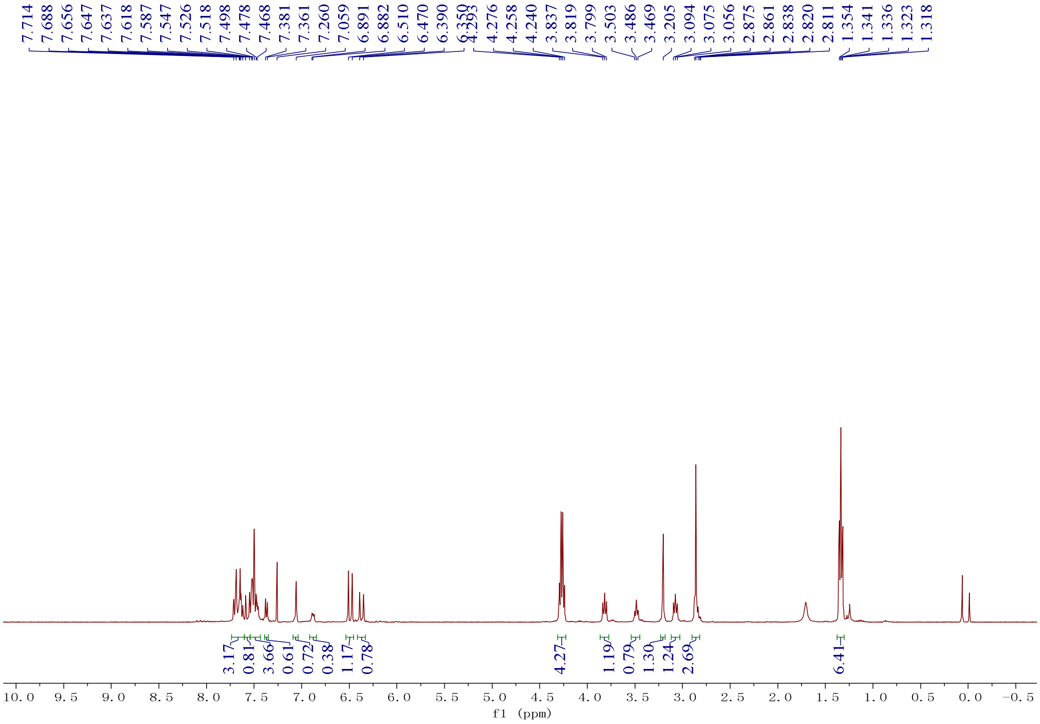
0
f1 (ppm)


EtO2C
Me
N
O
NC
CO2Et

$4a_{di}$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7.260
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6.882
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6.470
6.390
6.350
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4.276
4.258
4.240
3.837
3.819
3.799
3.503
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1.323
1.318
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0.72
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0.78
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1.24
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7.5
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6.5
6.0
5.5
5.0
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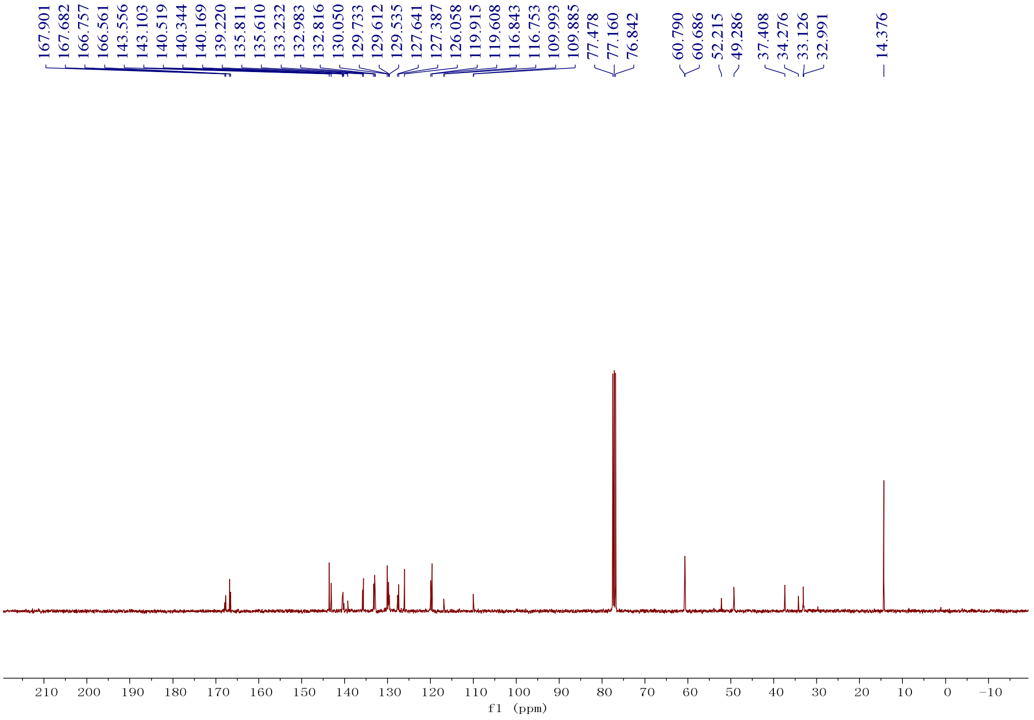
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)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132.816
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129.612
129.535
127.641
127.387
126.058
119.915
119.608
116.843
116.753
109.993
109.885
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77.160
76.842
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49.286
37.408
34.276
33.126
32.991
14.376
210
200
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180
170
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100
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80
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50
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30
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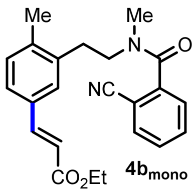
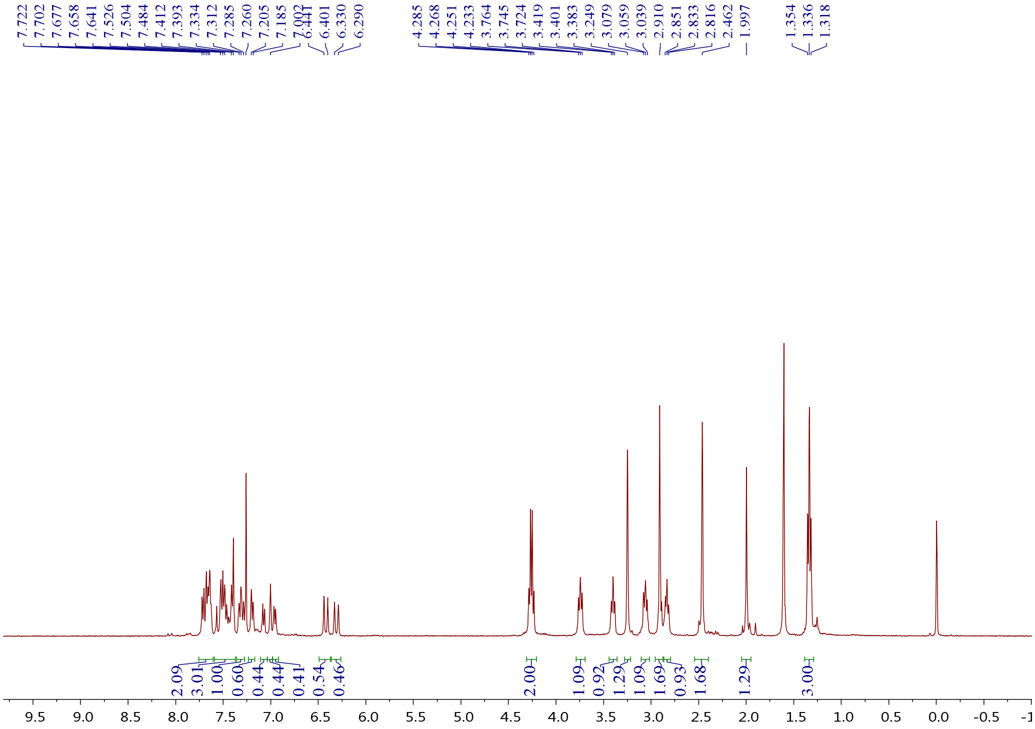
0
-10
f1 (ppm)


Me
Me
N
O
NC
CO2Et

4b$_{mono}$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7.285
7.260
7.205
7.185
7.002
6.441
6.401
6.330
6.290
4.285
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4.251
4.233
3.764
3.745
3.724
3.419
3.401
3.383
3.249
3.079
3.059
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1.354
1.336
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0.44
0.41
0.54
0.46
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1.29
1.09
1.69
0.93
1.68
1.29
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6.0
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4.0
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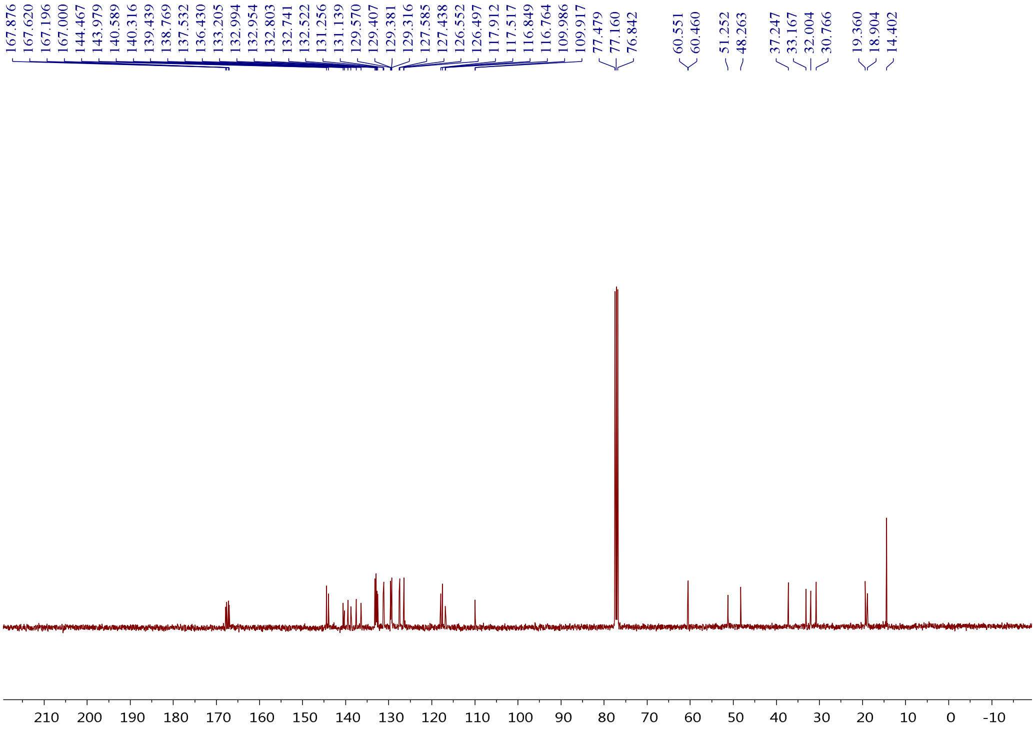
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136.430
133.205
132.994
132.954
132.803
132.741
132.522
131.256
131.139
129.570
129.407
129.381
129.316
127.585
127.438
126.552
126.497
117.912
117.517
116.849
116.764
109.986
109.917
77.479
77.160
76.842
60.551
60.460
51.252
48.263
37.247
33.167
32.004
30.766
19.360
18.904
14.402
210
200
190
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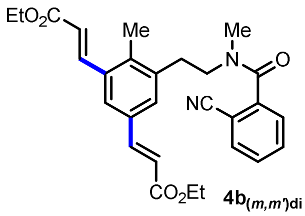
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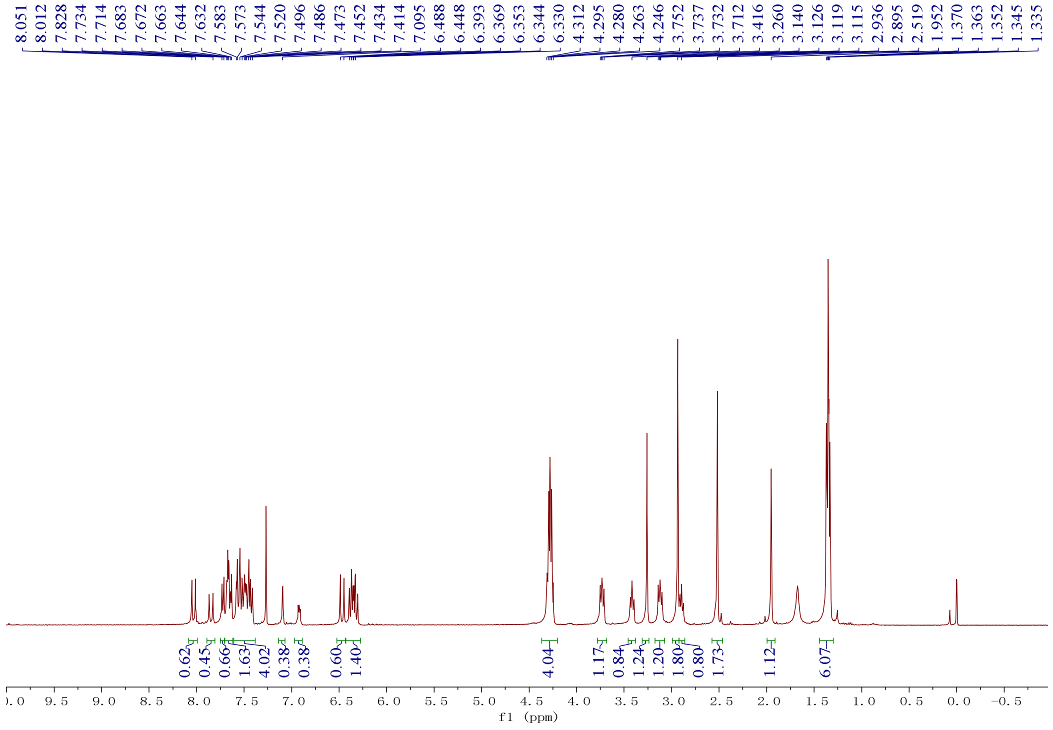
Me
Me
N
O
NC
CO2Et

4b$_{(m,m')di}$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7.544
7.520
7.496
7.486
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7.434
7.414
7.095
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6.393
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6.353
6.344
6.330
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4.280
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4.246
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3.732
3.712
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3.260
3.140
3.126
3.119
3.115
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2.519
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1.363
1.352
1.345
1.335
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0.45
0.66
1.63
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0.38
0.60
1.40
4.04
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0.84
1.24
1.20
1.80
0.80
1.73
1.12
6.07
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9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
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2.0
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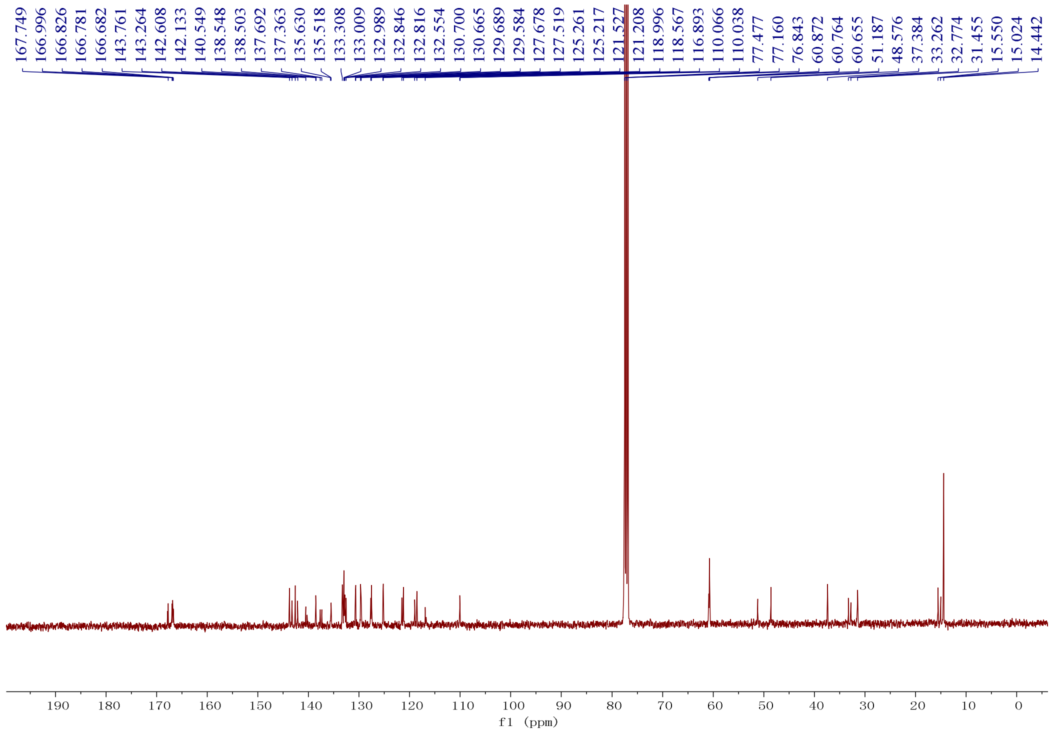
-0.5
f1 (ppm)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133.308
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132.816
132.554
130.700
130.665
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127.519
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125.217
121.527
121.208
118.996
118.567
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110.038
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77.160
76.843
60.872
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33.262
32.774
31.455
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15.024
14.442
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180
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160
150
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130
120
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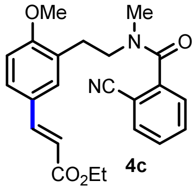
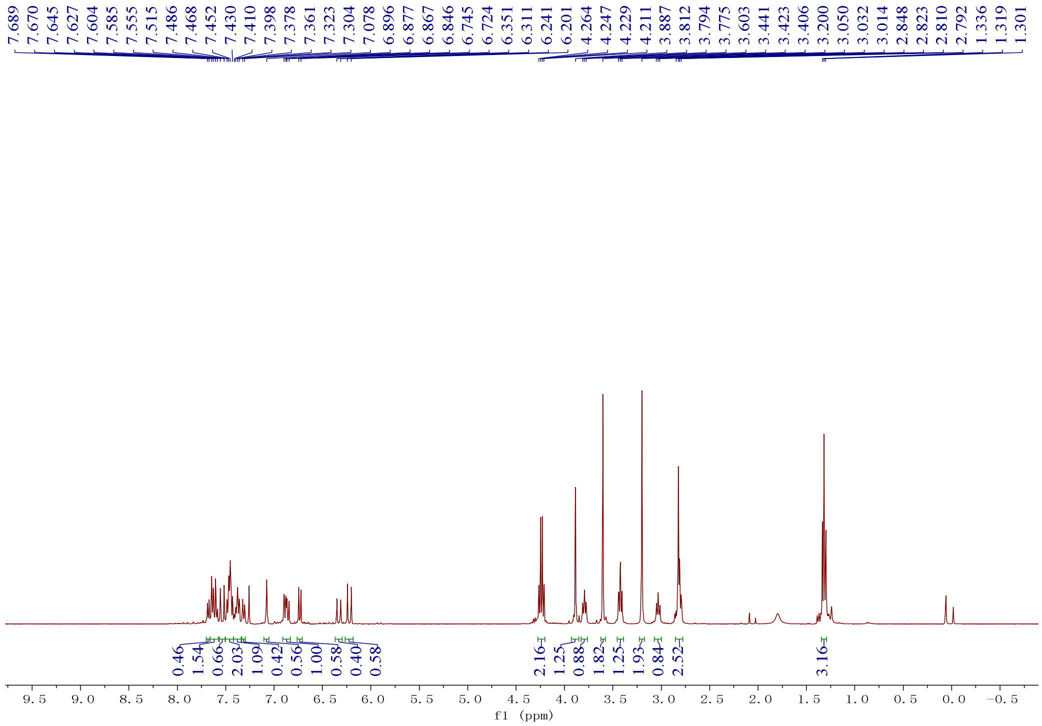
f1 (ppm)


OMe
Me
N
O
NC
CO2Et

4c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7.515
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7.468
7.452
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7.410
7.398
7.378
7.361
7.323
7.304
7.078
6.896
6.877
6.867
6.846
6.745
6.724
6.351
6.311
6.241
6.201
4.264
4.247
4.229
4.211
3.887
3.812
3.794
3.775
3.603
3.441
3.423
3.406
3.200
3.050
3.032
3.014
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2.823
2.810
2.792
1.336
1.319
1.301
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1.54
0.66
2.03
1.09
0.42
0.56
1.00
0.58
0.40
0.58
2.16
1.25
0.88
1.82
1.25
1.93
0.84
2.52
3.16
9.5
9.0
8.5
8.0
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7.0
6.5
6.0
5.5
5.0
4.5
4.0
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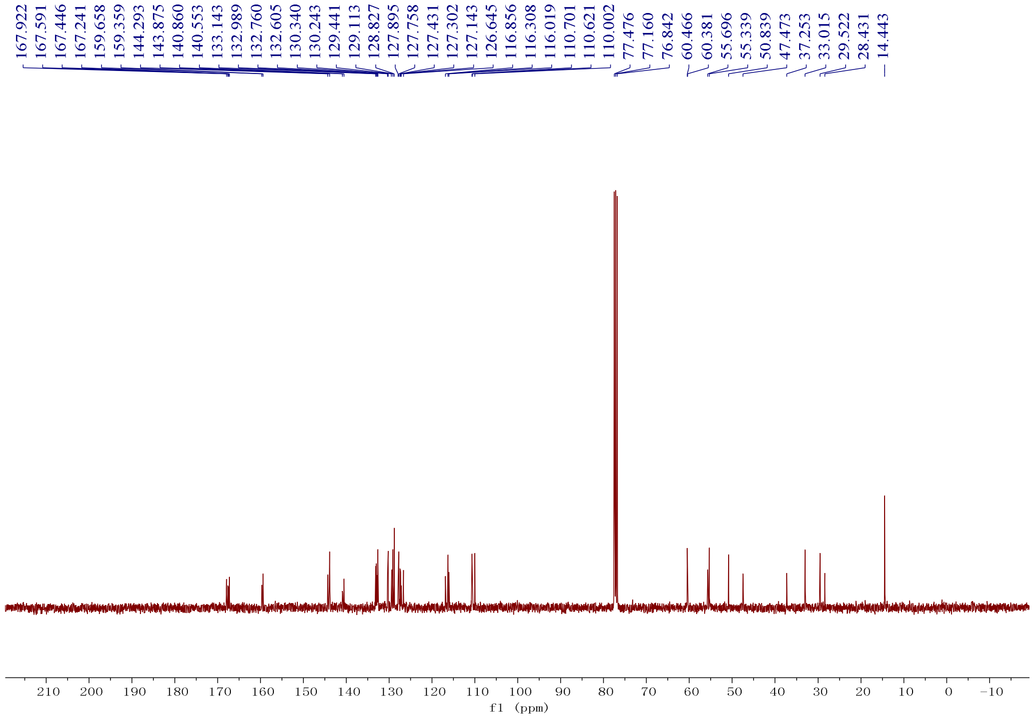
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)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140.553
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132.760
132.605
130.340
130.243
129.441
129.113
128.827
127.895
127.758
127.431
127.302
127.143
126.645
116.856
116.308
116.019
110.701
110.621
110.002
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77.160
76.842
60.466
60.381
55.696
55.339
50.839
47.473
37.253
33.015
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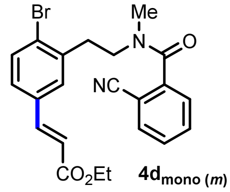
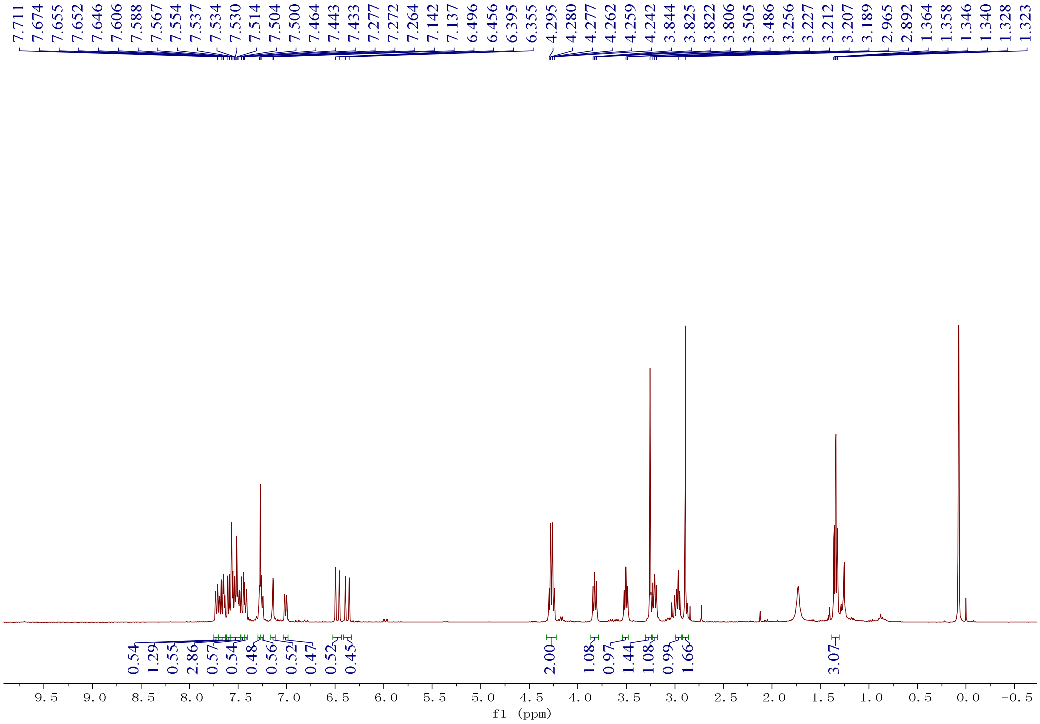
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)



$4d_{mono\ (m)}$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7.537
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7.530
7.514
7.504
7.500
7.464
7.443
7.433
7.277
7.272
7.264
7.142
7.137
6.496
6.456
6.395
6.355
4.295
4.280
4.277
4.262
4.259
4.242
3.844
3.825
3.822
3.806
3.505
3.486
3.256
3.227
3.212
3.207
3.189
2.965
2.892
1.364
1.358
1.346
1.340
1.328
1.323
0.54
1.29
0.55
2.86
0.57
0.54
0.48
0.56
0.52
0.47
0.52
0.45
2.00
1.08
0.97
1.44
1.08
0.99
1.66
3.07
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
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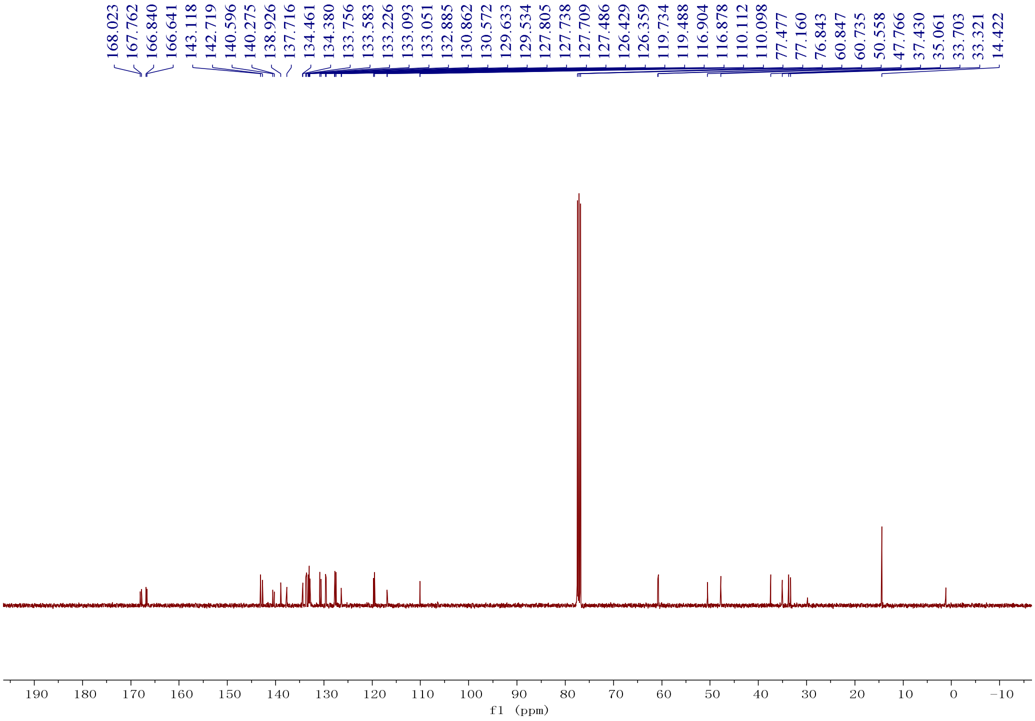
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)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133.093
133.051
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130.572
129.633
129.534
127.805
127.738
127.709
127.486
126.429
126.359
119.734
119.488
116.904
116.878
110.112
110.098
77.477
77.160
76.843
60.847
60.735
50.558
47.766
37.430
35.061
33.703
33.321
14.422
190
180
170
160
150
140
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120
110
100
90
80
70
60
50
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30
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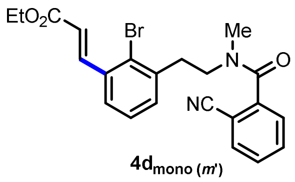
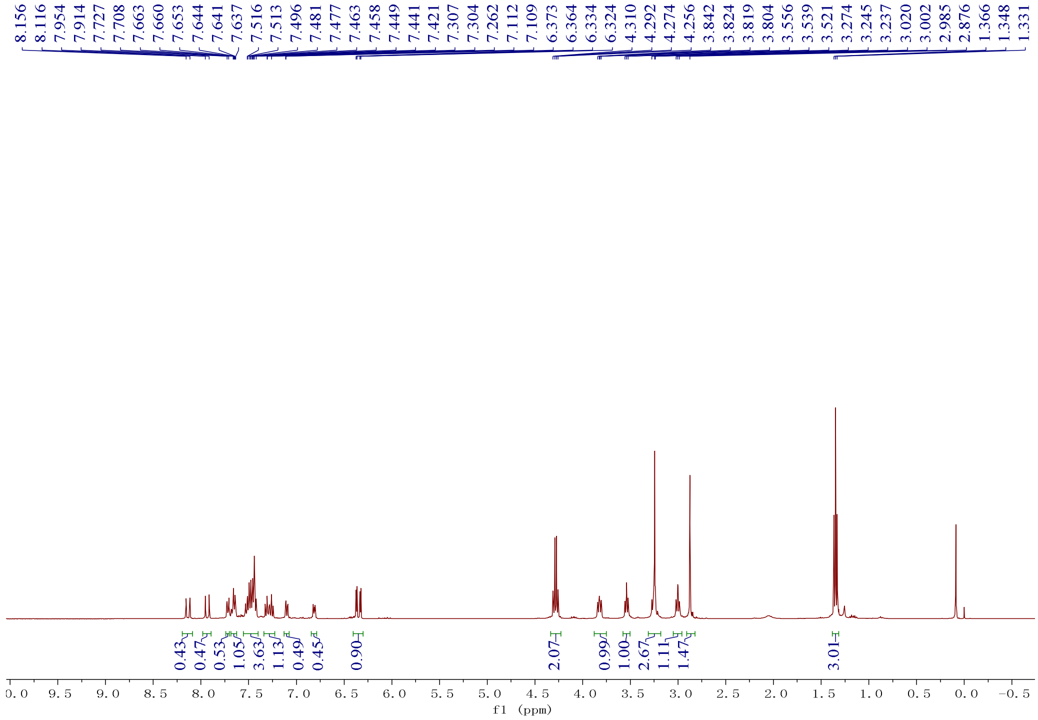
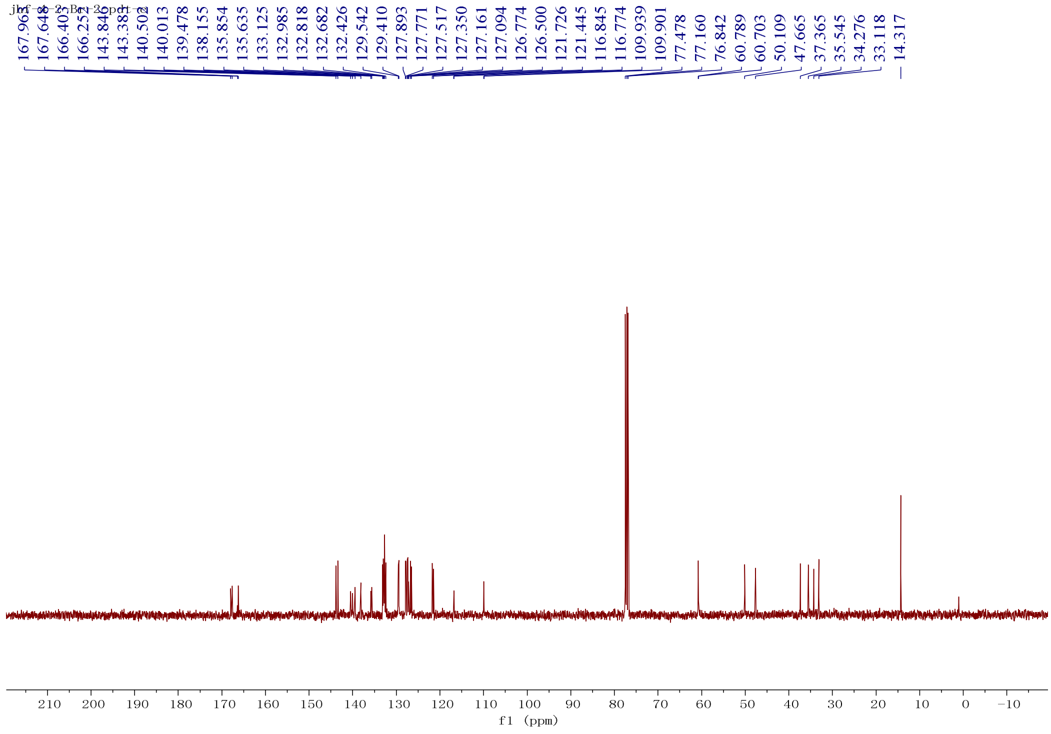
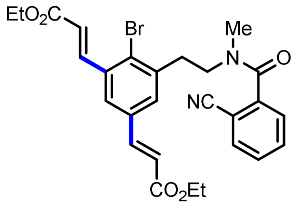
10
0
-10
f1 (ppm)



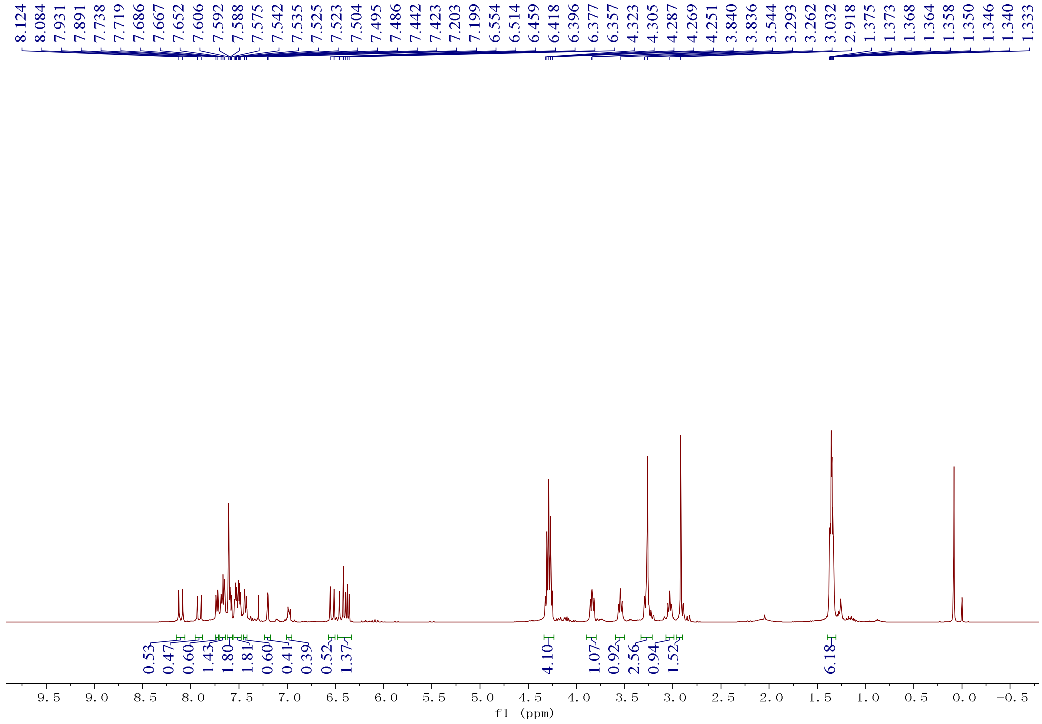
4d$_{\text{mono (}m'\text{)}}$






EtO2C
Br
Me
N
O
NC
CO2Et

4d$_{(m,m')di}$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7.575
7.542
7.535
7.525
7.523
7.504
7.495
7.486
7.442
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6.514
6.459
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6.396
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1.346
1.340
1.333
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0.47
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0.39
0.52
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2.0
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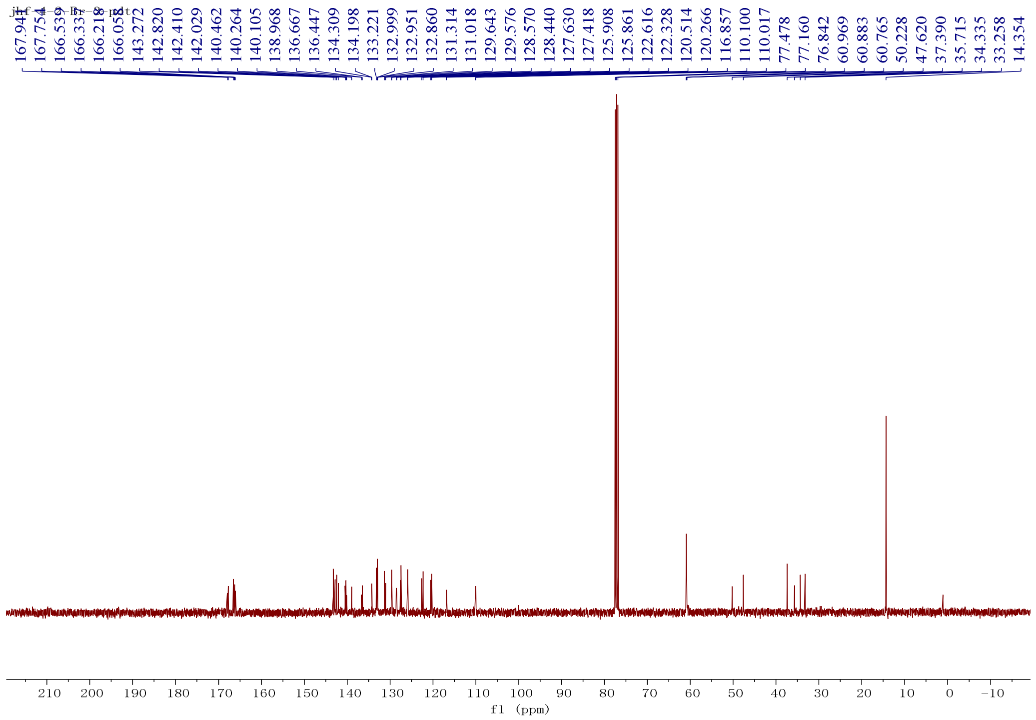
-0.5
f1 (ppm)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142.029
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140.264
140.105
138.968
136.667
136.447
134.309
134.198
133.221
132.999
132.951
132.860
131.314
131.018
129.643
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128.570
128.440
127.630
127.418
125.908
125.861
122.616
122.328
120.514
120.266
116.857
110.100
110.017
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77.160
76.842
60.969
60.883
60.765
50.228
47.620
37.390
35.715
34.335
33.258
14.354
210
200
190
180
170
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120
110
100
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80
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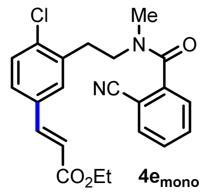
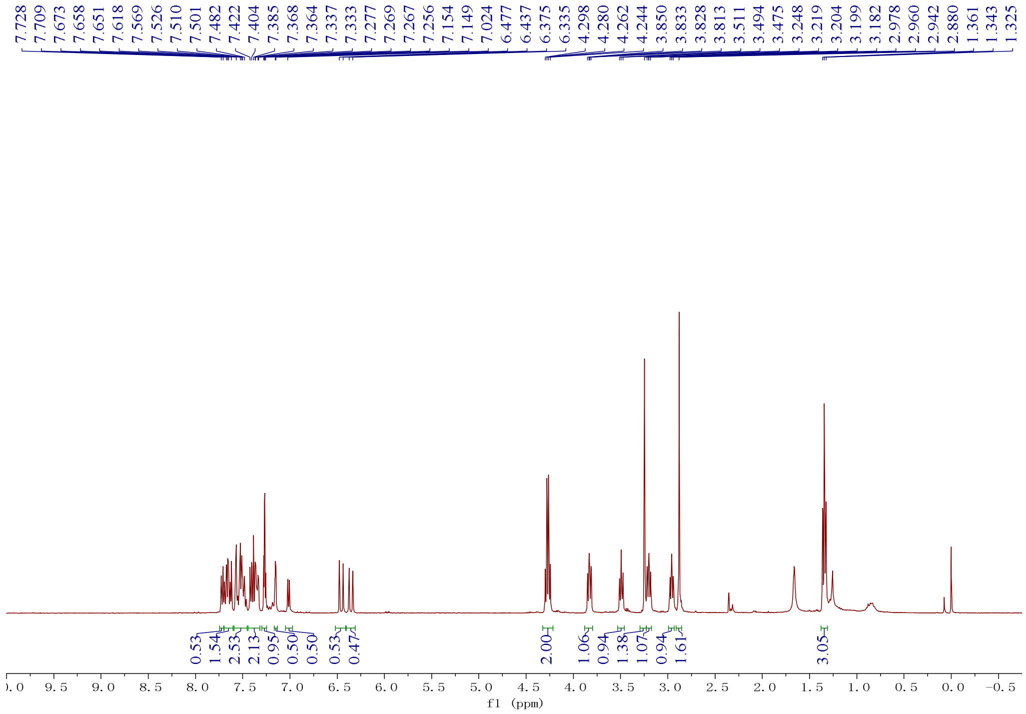
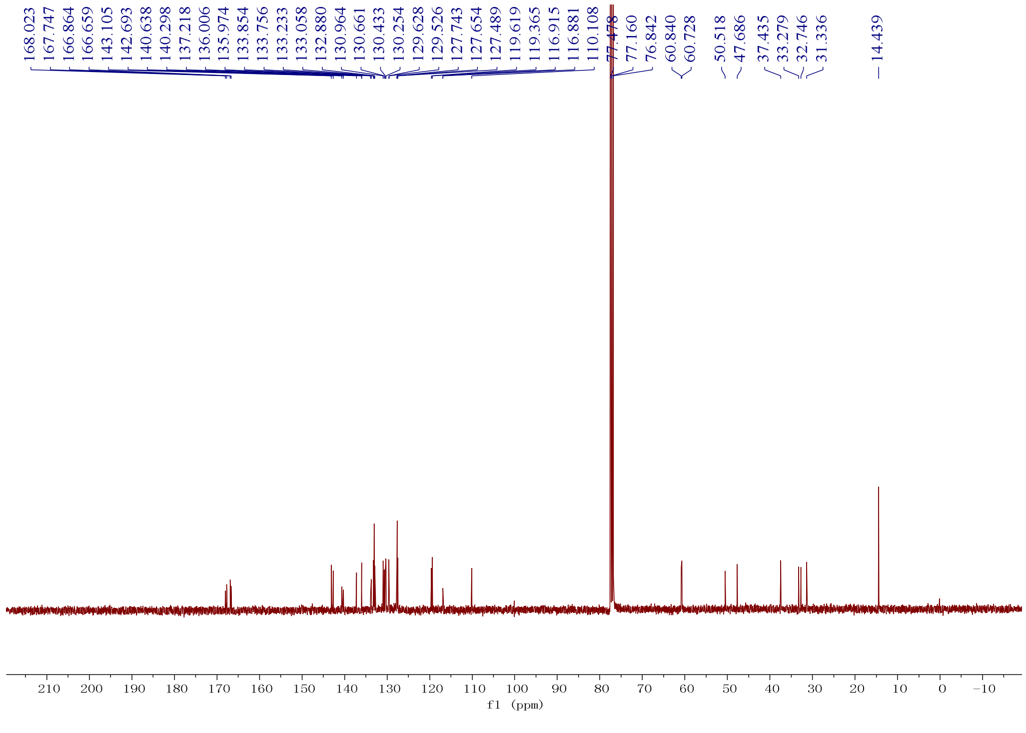
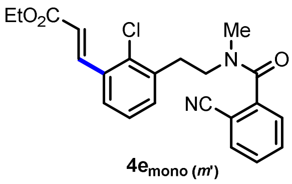
40
30
20
10
0
-10
f1 (ppm)



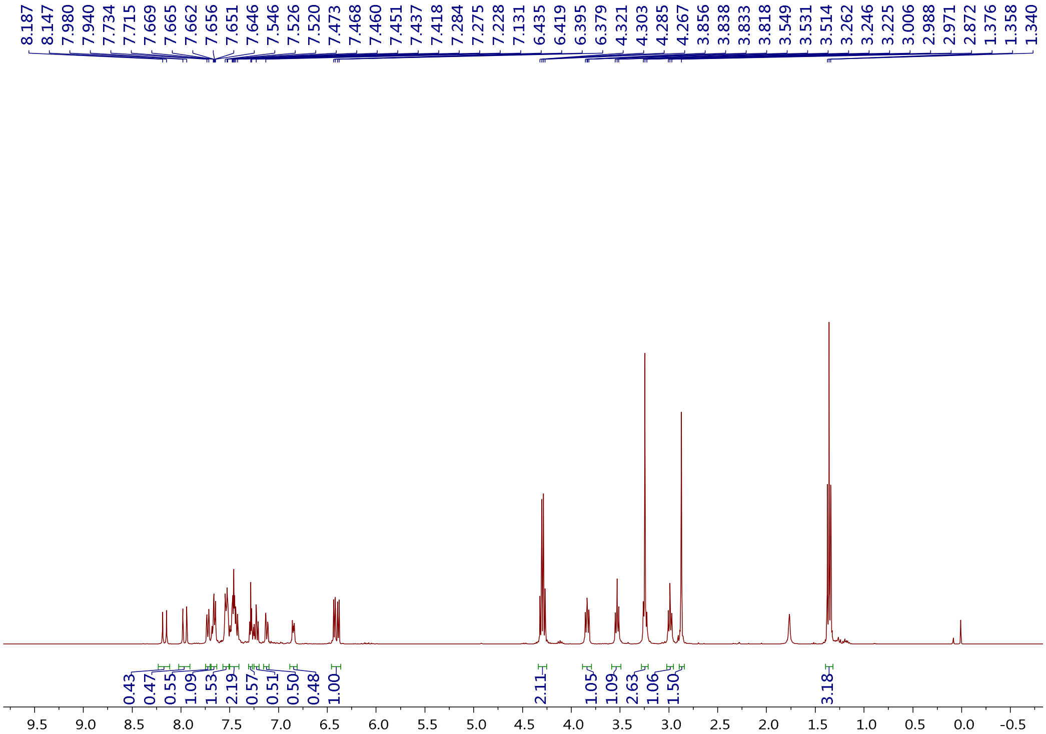
4e$_{\text{mono (}m\text{)}}$

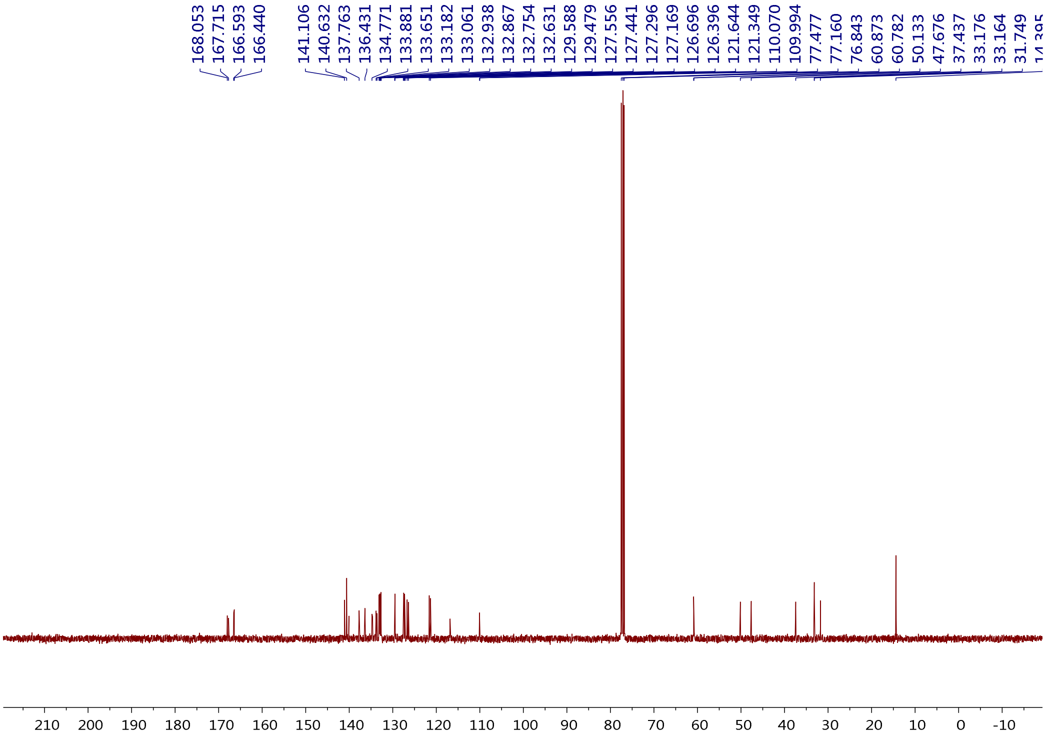


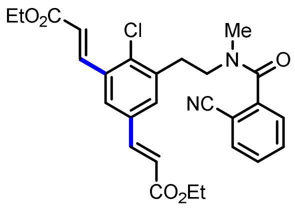




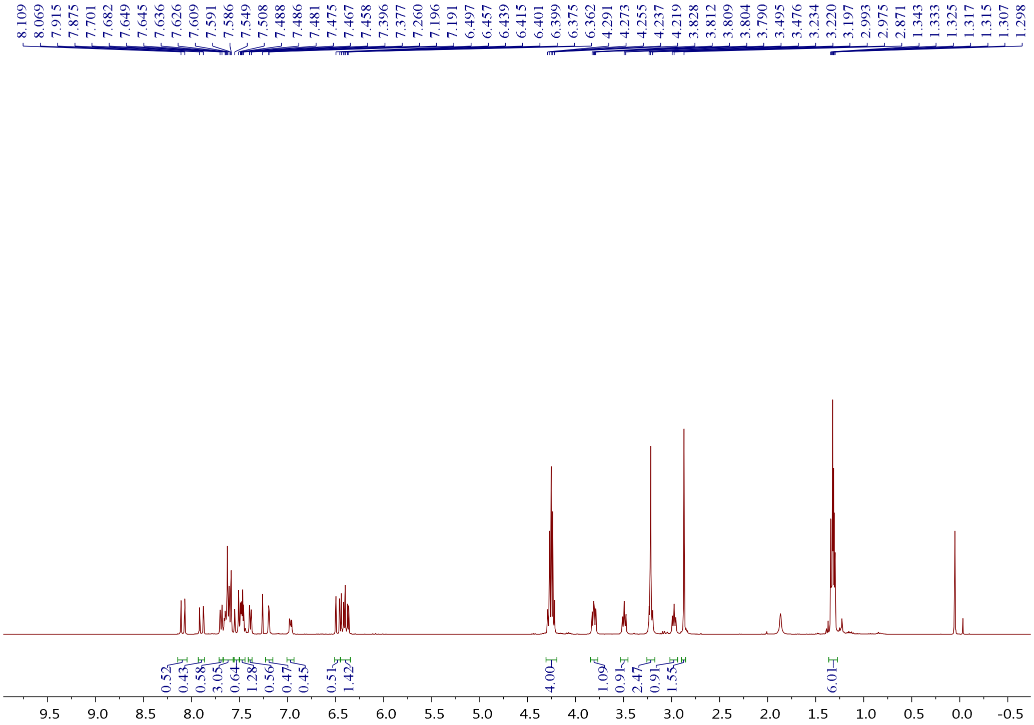
$\mathbf{4e}_{\mathbf{mono}\ (m')}$






EtO2C
Cl
Me
N
O
NC
CO2Et

4e$_{(m,m')di}$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7.0
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6.0
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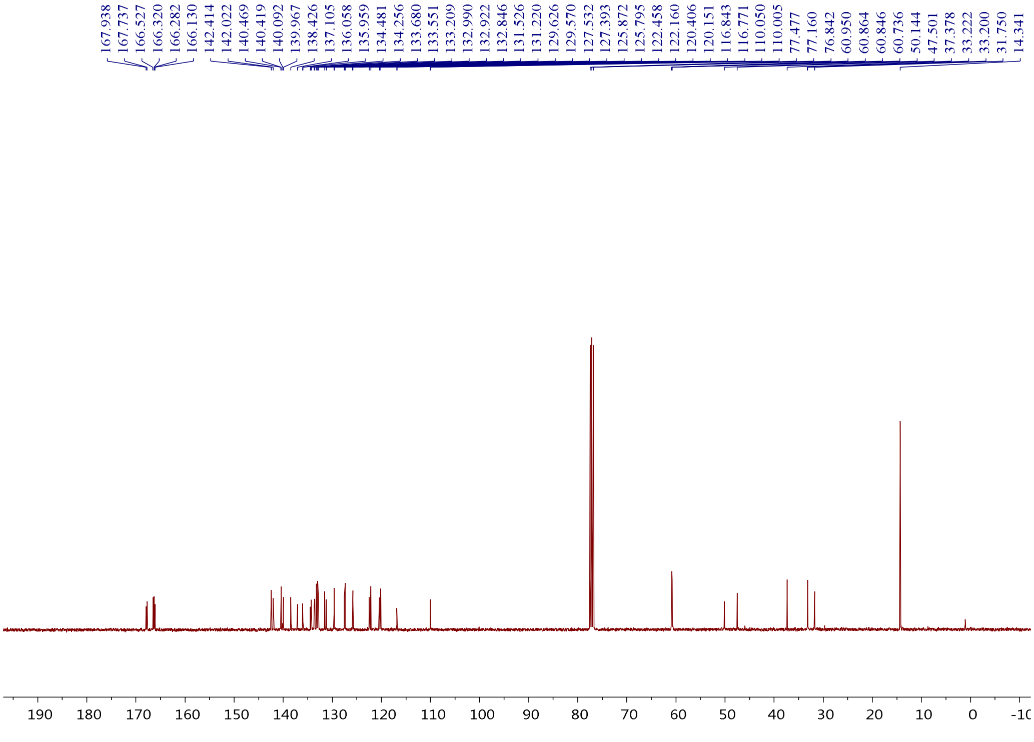
-0.5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127.532
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110.005
77.477
77.160
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60.950
60.864
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50.144
47.501
37.378
33.222
33.200
31.750
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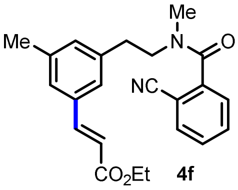
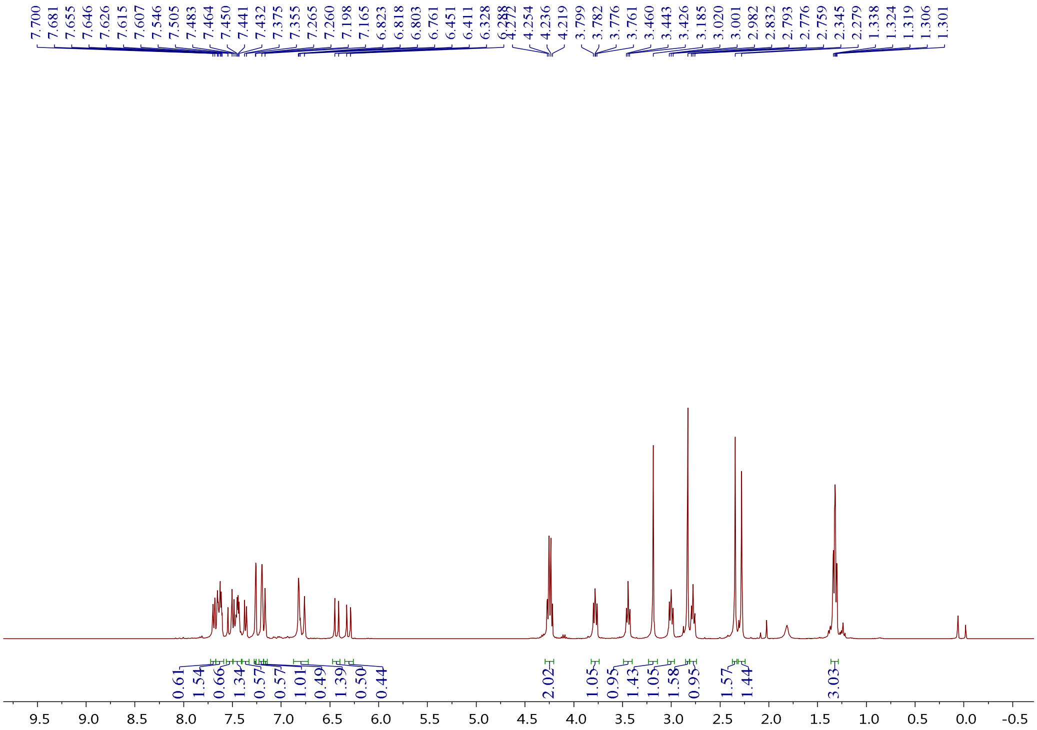
-1


Me
Me
N
O
NC
CO2Et

4f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3.020
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1.43
1.05
1.58
0.95
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1.44
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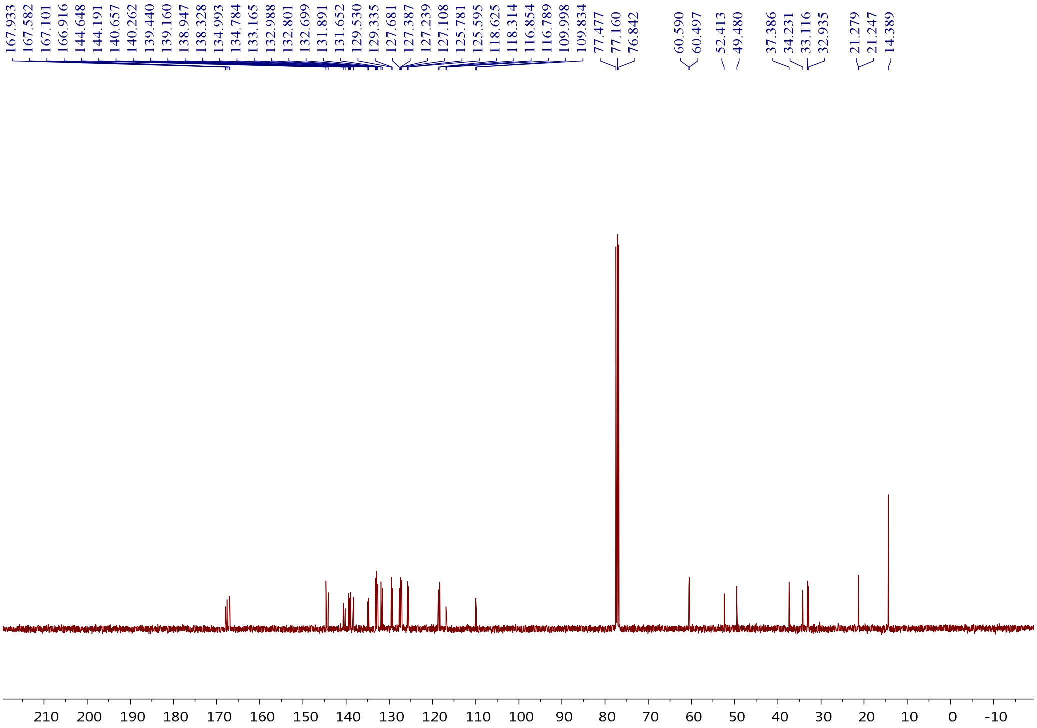
-0.5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129.335
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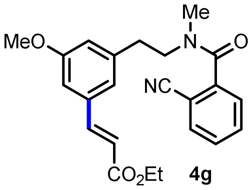
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NC
CO2Et

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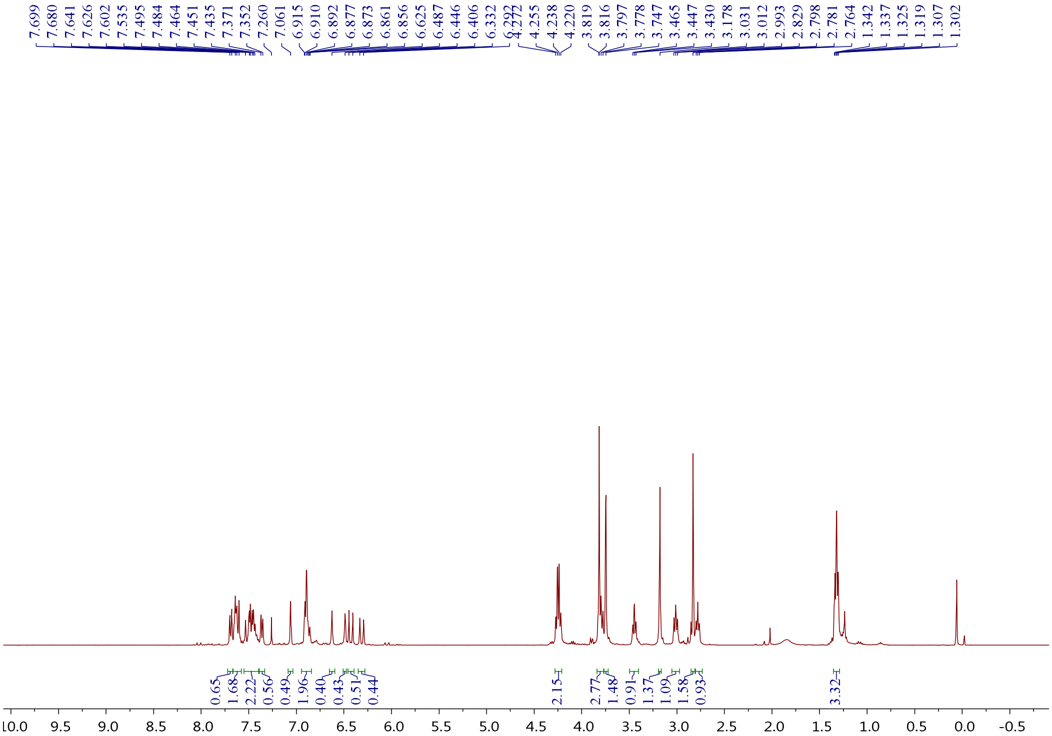
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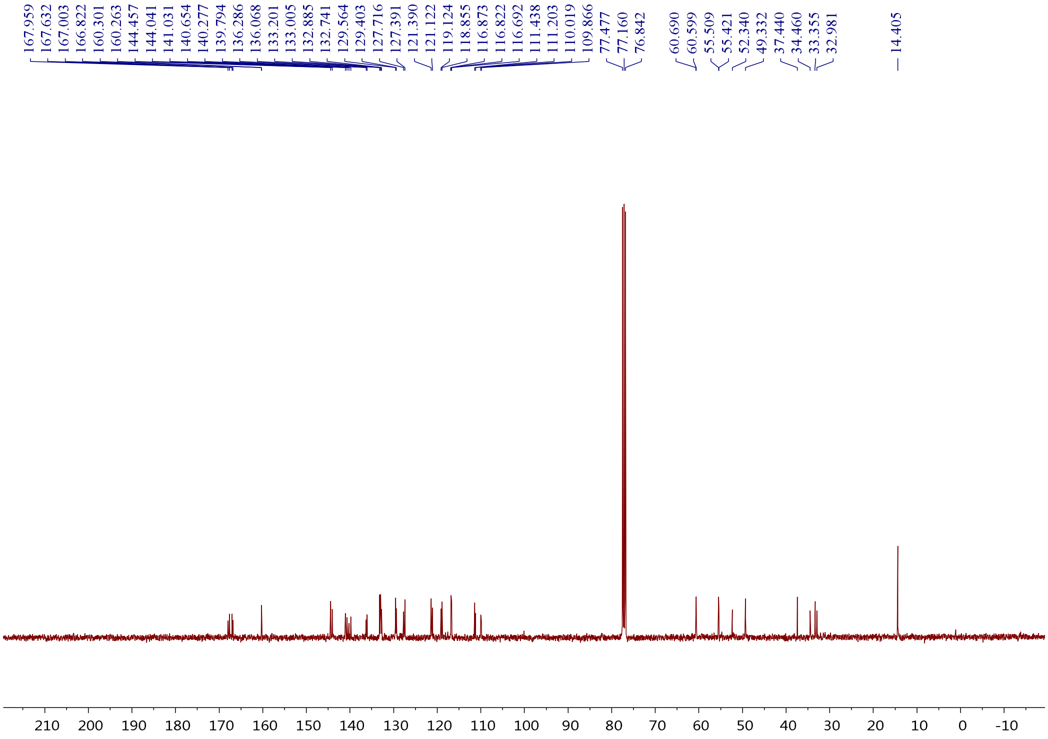
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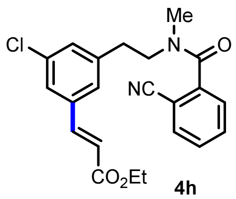
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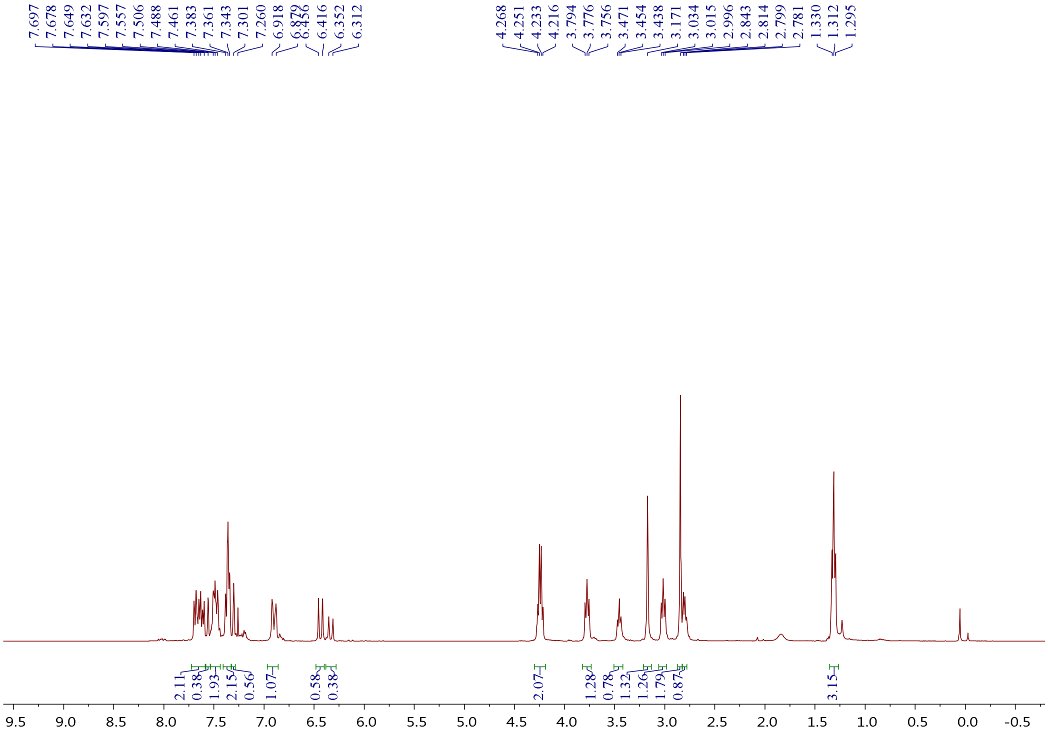
Me
N
O
NC
CO2Et

4h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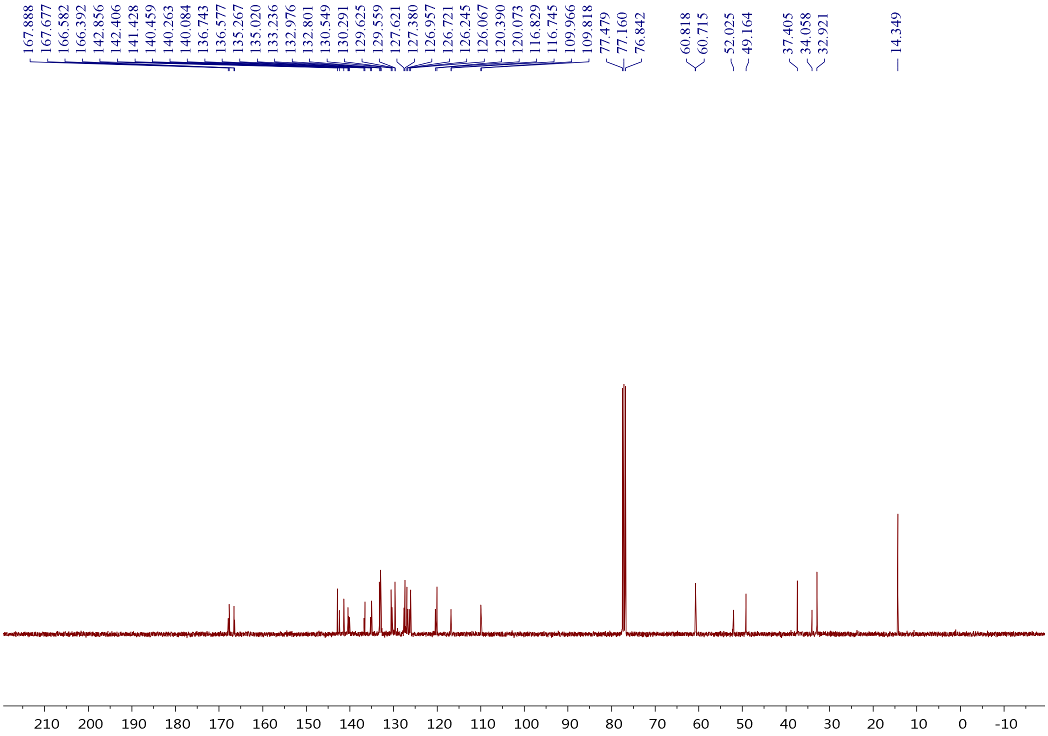
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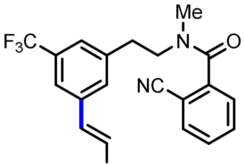
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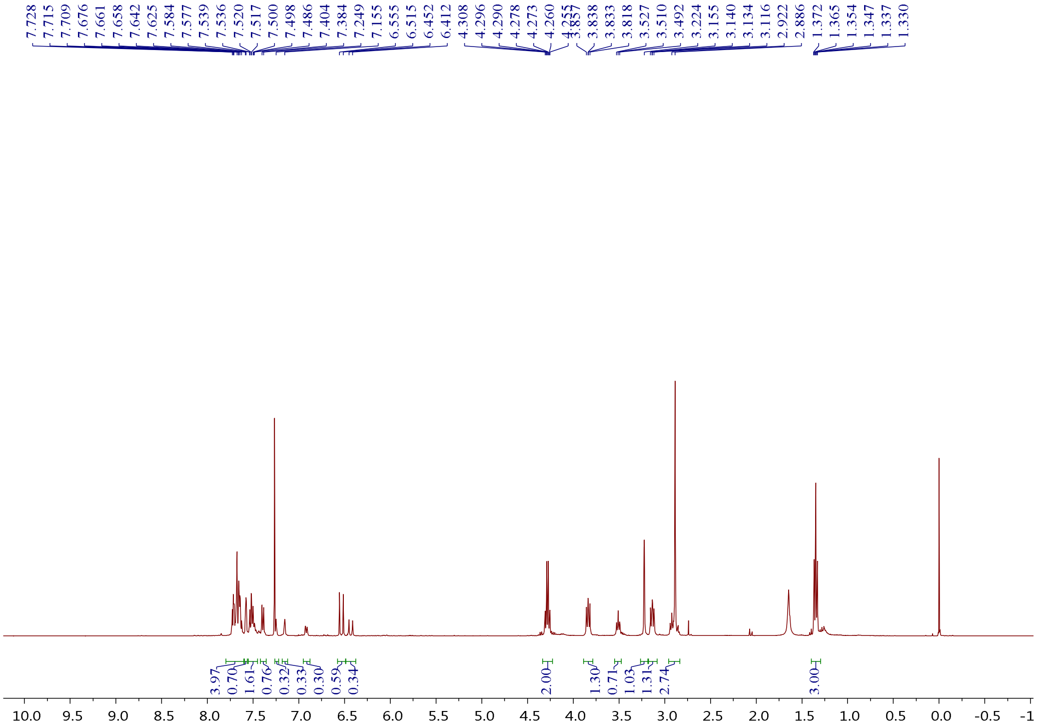
O
NC
CO2Et

4i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7.498
7.486
7.404
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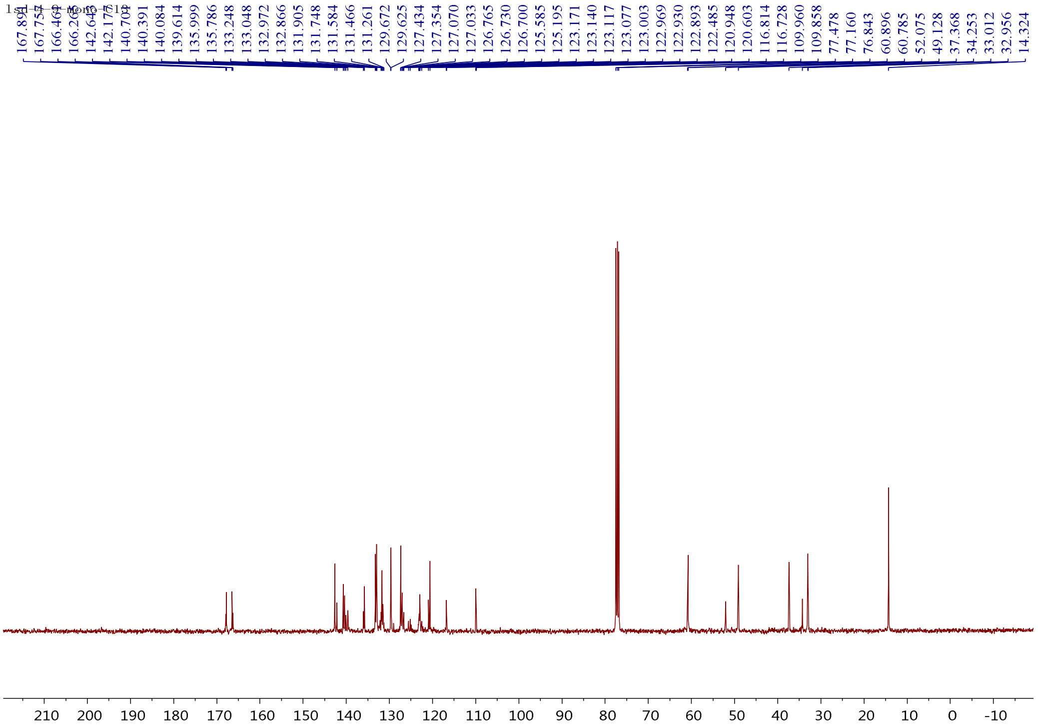
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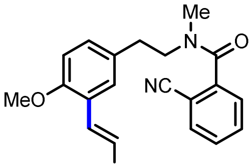
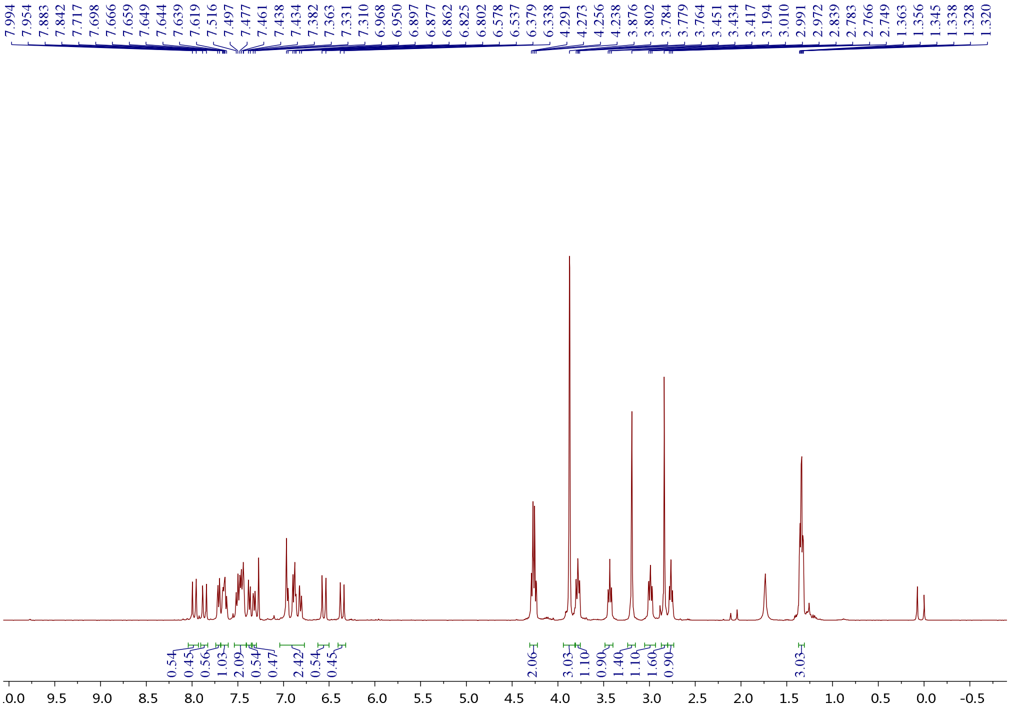


Me
N
O
NC
MeO
CO_2Et

4j



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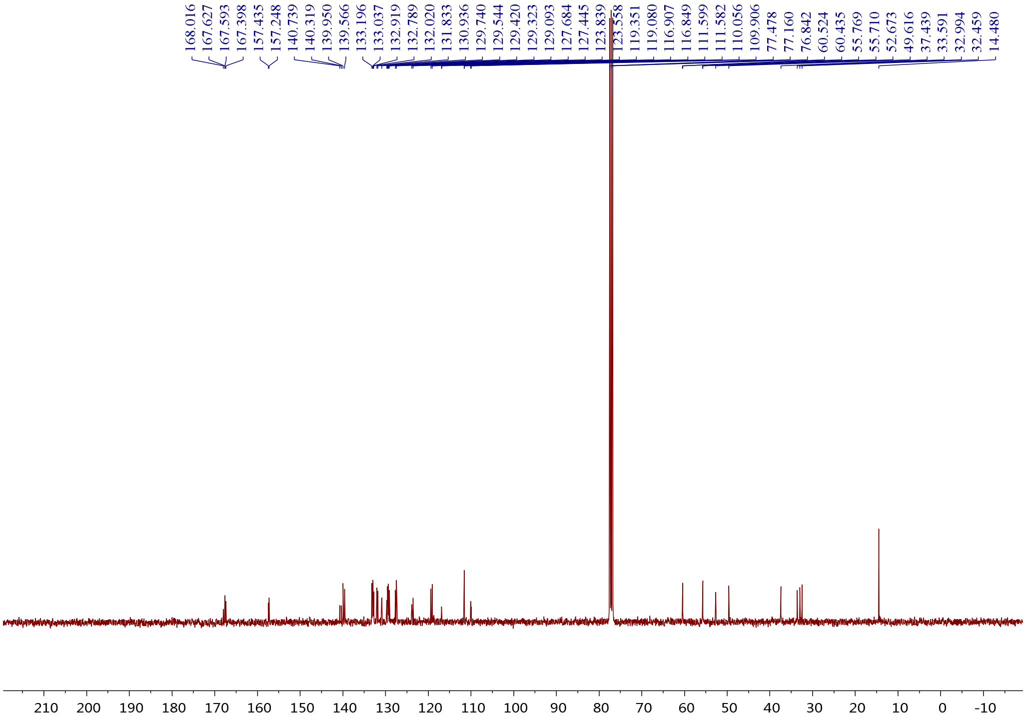

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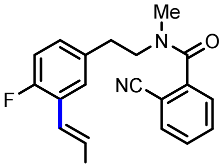
Me
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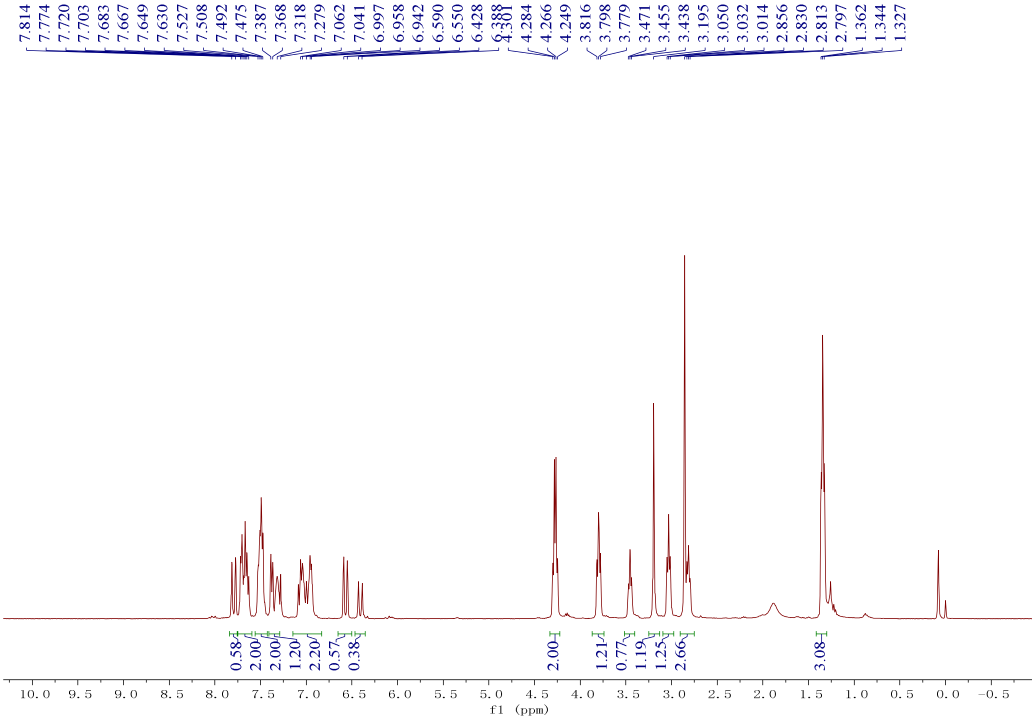
O
F
NC
CO2Et

4k$_{mono}$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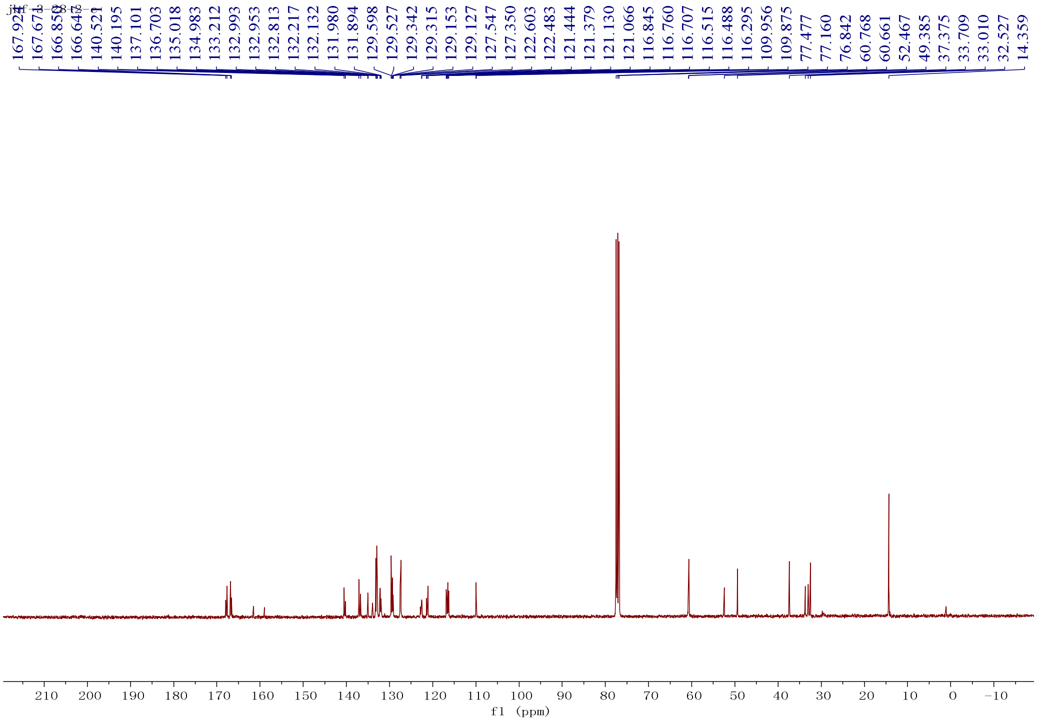
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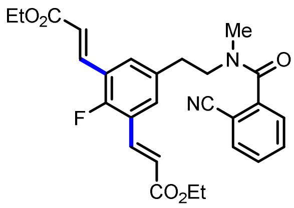
f1 (ppm)


EtO2C
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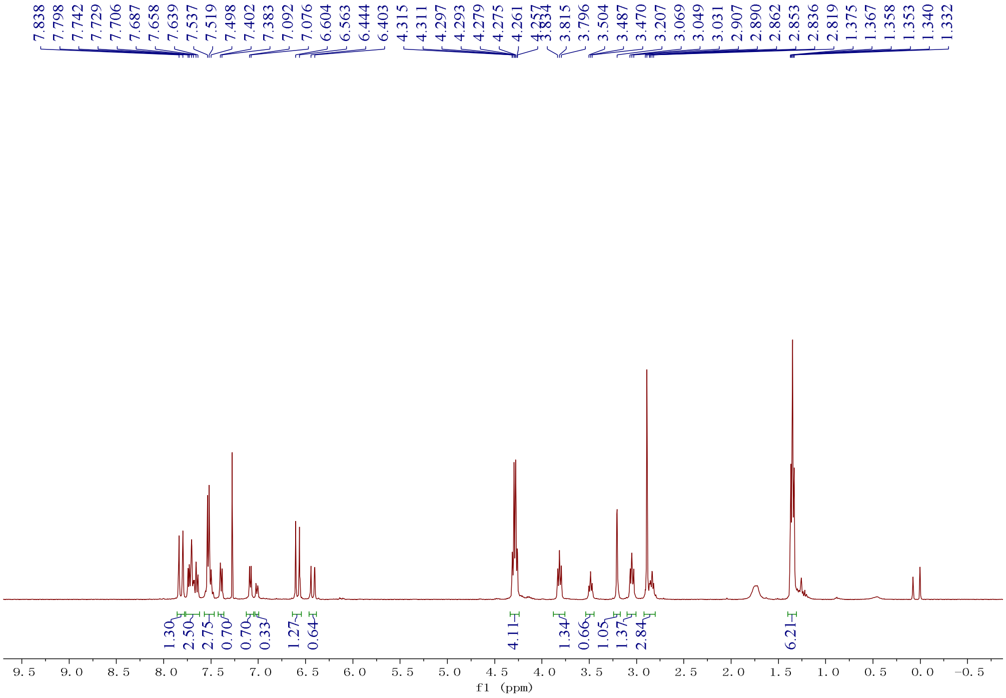
CO2Et

4k$_{(m,m')\text{di}}$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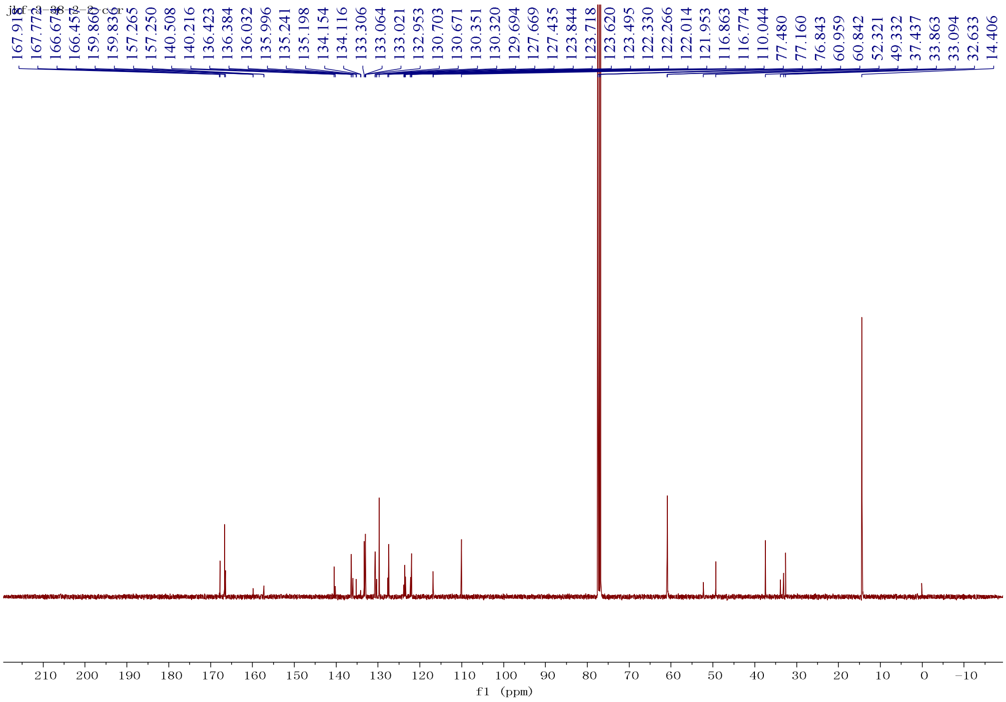
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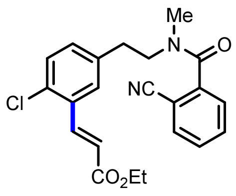
f1 (ppm)


Me
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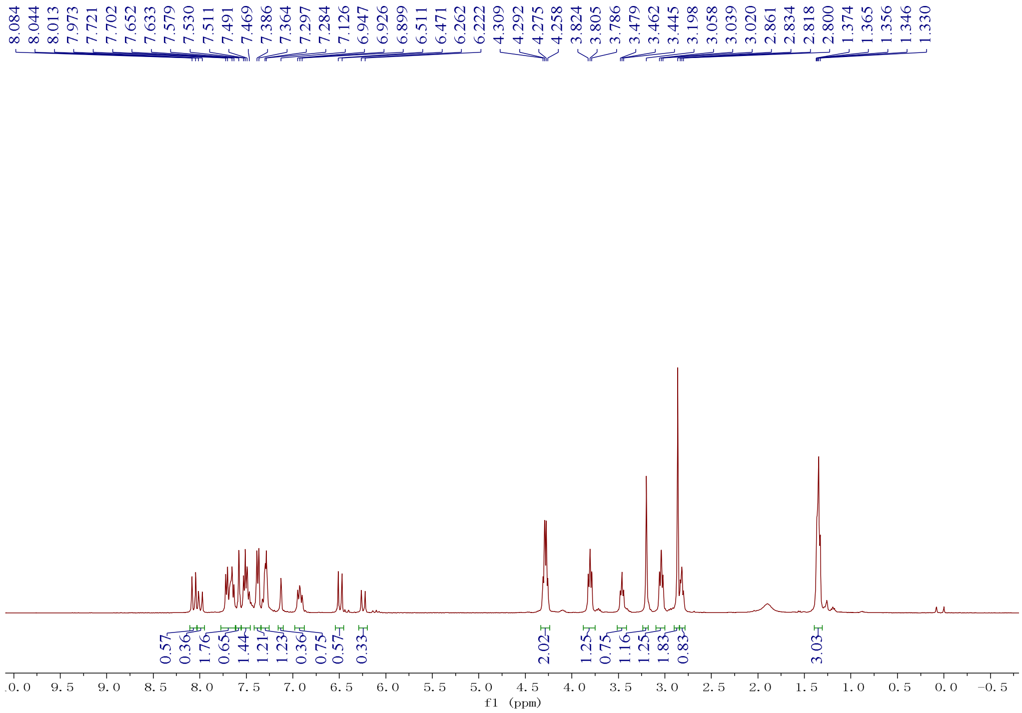
Cl
NC
CO2Et

4l$_{mono}$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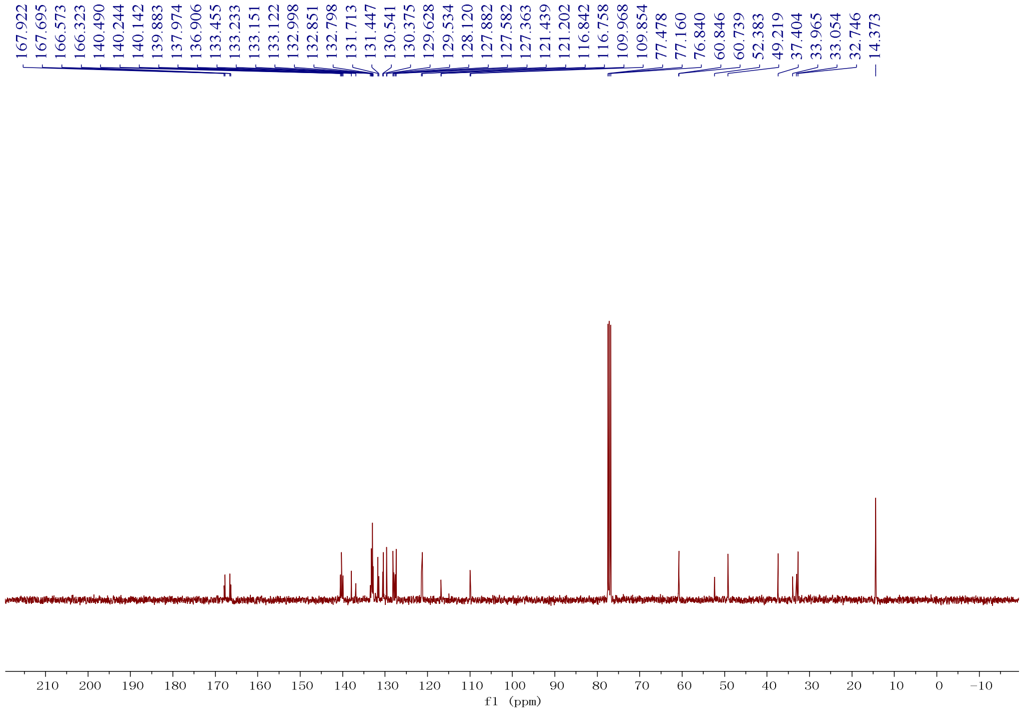
f1 (ppm)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30
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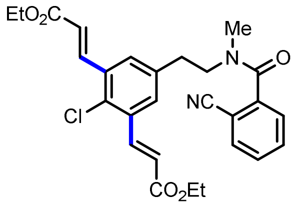
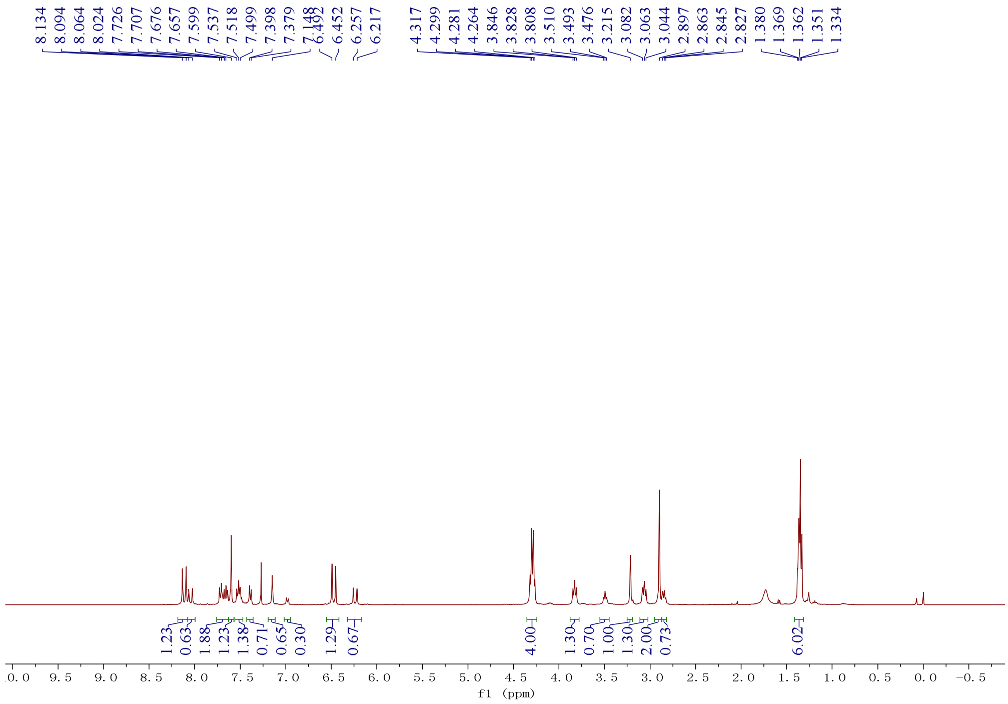
10
0
−10
f1 (ppm)


EtO$_2$C
Me
N
O
NC
Cl
CO$_2$Et

4l$_{(m,m')di}$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8.024
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7.537
7.518
7.499
7.398
7.379
7.148
6.492
6.452
6.257
6.217
4.317
4.299
4.281
4.264
3.846
3.828
3.808
3.510
3.493
3.476
3.215
3.082
3.063
3.044
2.897
2.863
2.845
2.827
1.380
1.369
1.362
1.351
1.334
1.23
0.63
1.88
1.23
1.38
0.71
0.65
0.30
1.29
0.67
4.00
1.30
0.70
1.00
1.30
2.00
0.73
6.02
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
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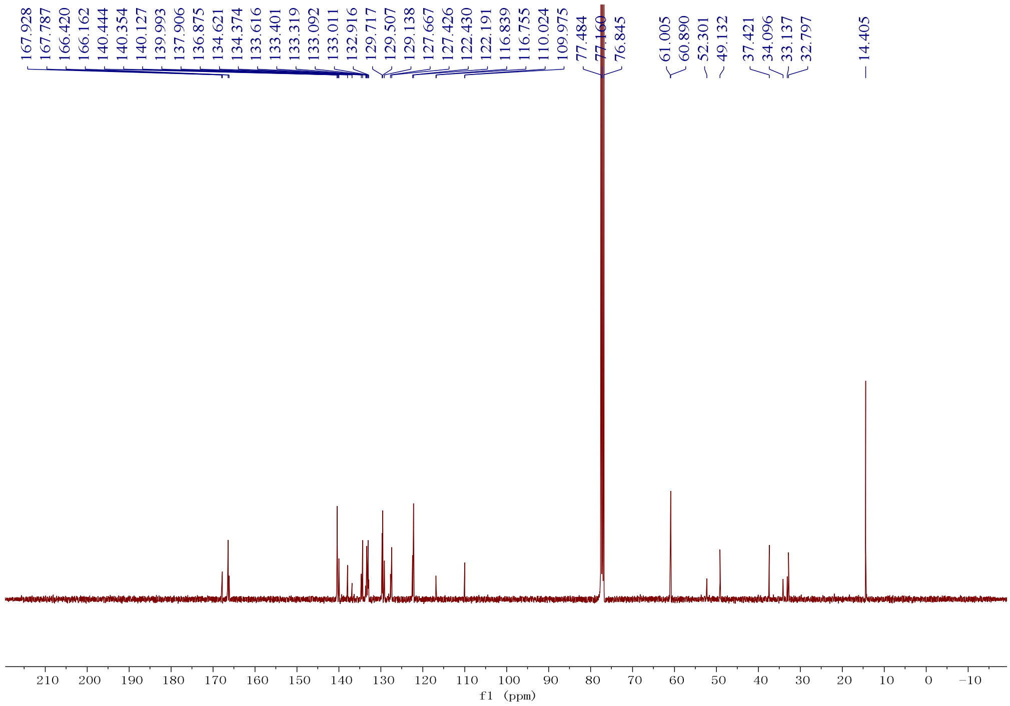
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)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166.162
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140.354
140.127
139.993
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136.875
134.621
134.374
133.616
133.401
133.319
133.092
133.011
132.916
129.717
129.507
129.138
127.667
127.426
122.430
122.191
116.839
116.755
110.024
109.975
77.484
77.160
76.845
61.005
60.890
52.301
49.132
37.421
34.096
33.137
32.797
14.405
210
200
190
180
170
160
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100
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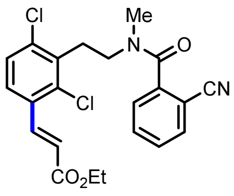
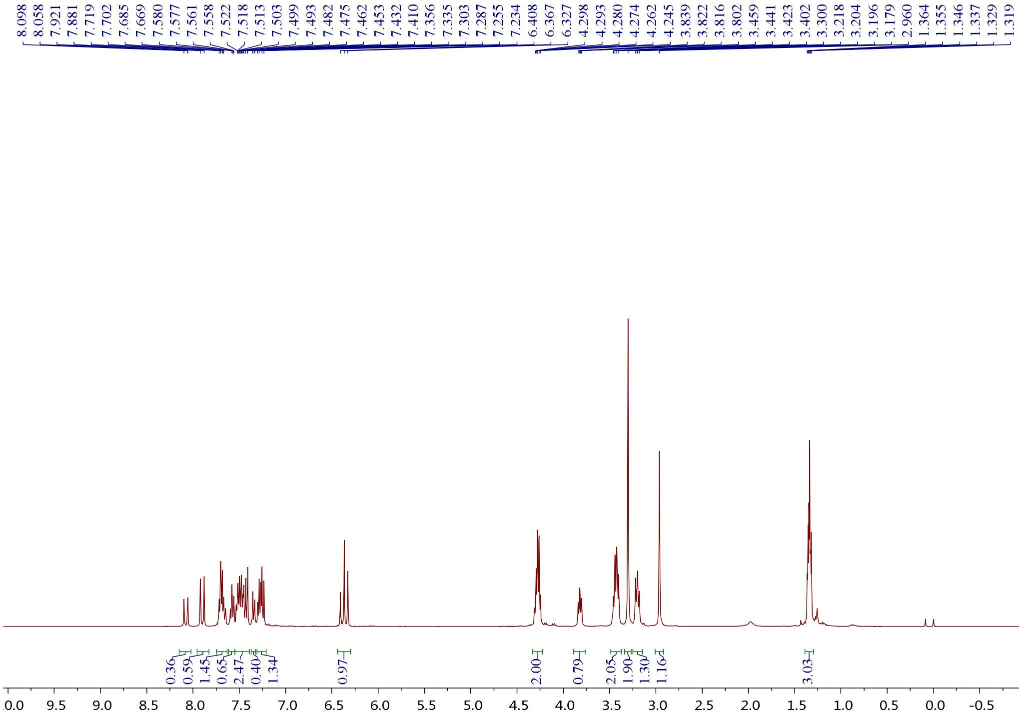
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)


Cl
Me
N
O
CN
Cl
CO2Et

$4m_{mono}$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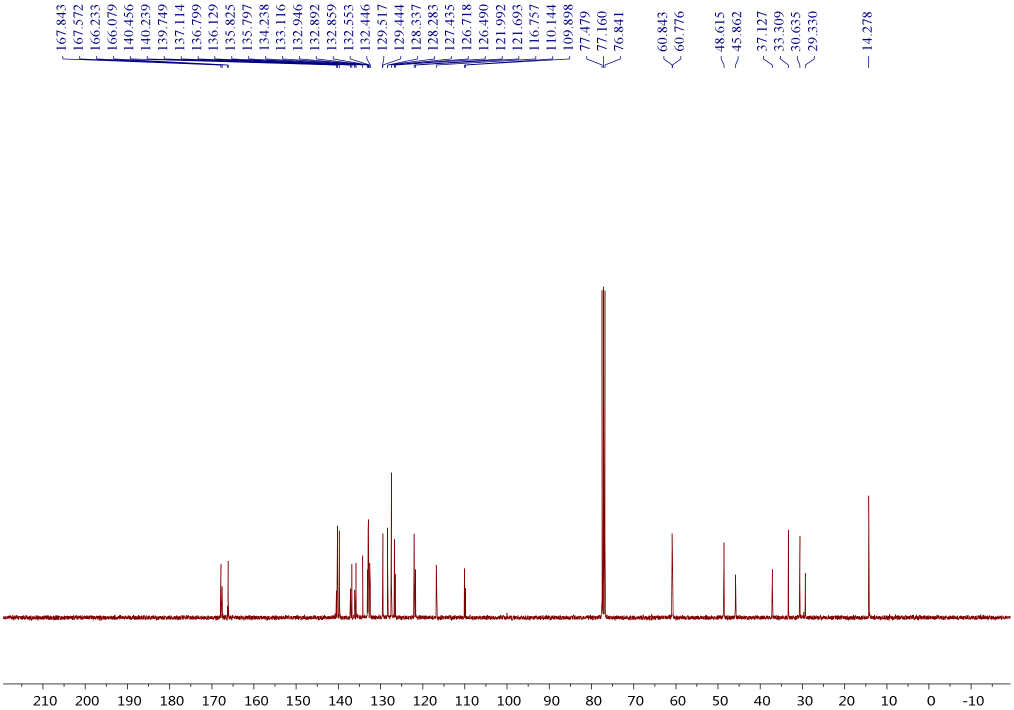
7.558
7.522
7.518
7.513
7.503
7.499
7.493
7.482
7.475
7.462
7.453
7.432
7.410
7.356
7.335
7.303
7.287
7.255
7.234
6.408
6.367
6.327
4.298
4.293
4.280
4.274
4.262
4.245
3.839
3.822
3.816
3.802
3.459
3.441
3.423
3.402
3.300
3.218
3.204
3.196
3.179
2.960
1.364
1.355
1.346
1.337
1.329
1.319
0.36
0.59
1.45
0.65
2.47
0.40
1.34
0.97
2.00
0.79
2.05
1.90
1.30
1.16
3.03
0.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5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137.114
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135.825
135.797
134.238
133.116
132.946
132.892
132.859
132.553
132.446
129.517
129.444
128.337
128.283
127.435
126.718
126.490
121.992
121.693
116.757
110.144
109.898
77.479
77.160
76.841
60.843
60.776
48.615
45.862
37.127
33.309
30.635
29.330
14.278
210
200
190
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100
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60
50
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20
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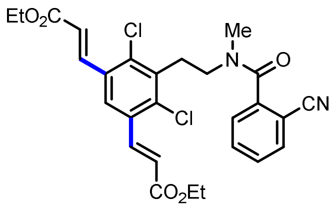
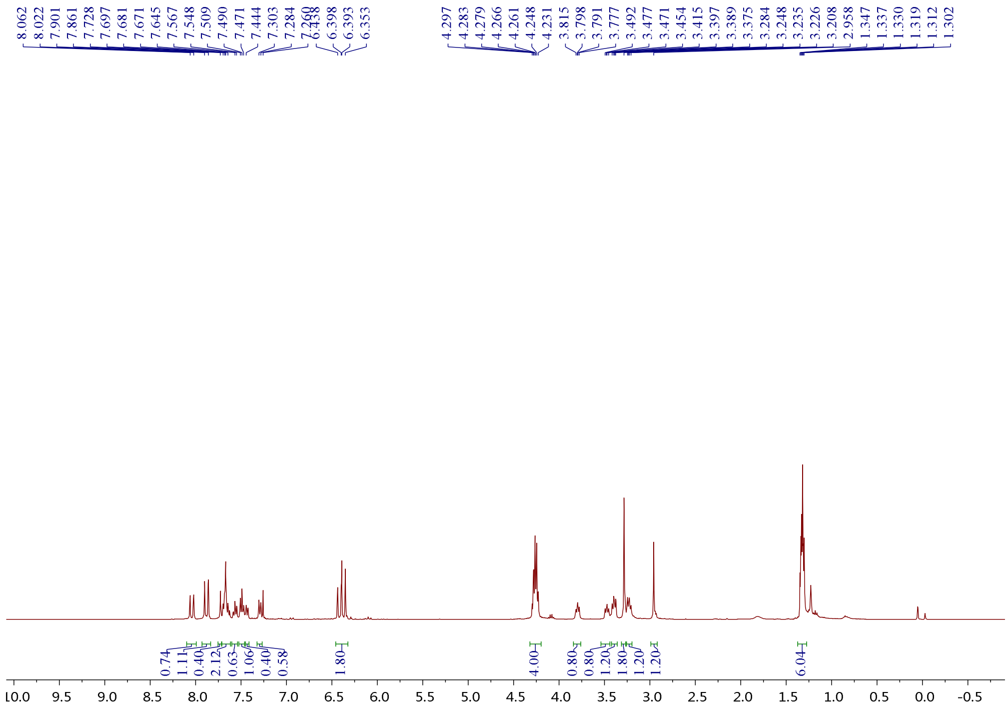
0
-10


EtO$_2$C
Cl
Me
N
O
CN
Cl
CO$_2$Et

4m$_{(m,m')\text{di}}$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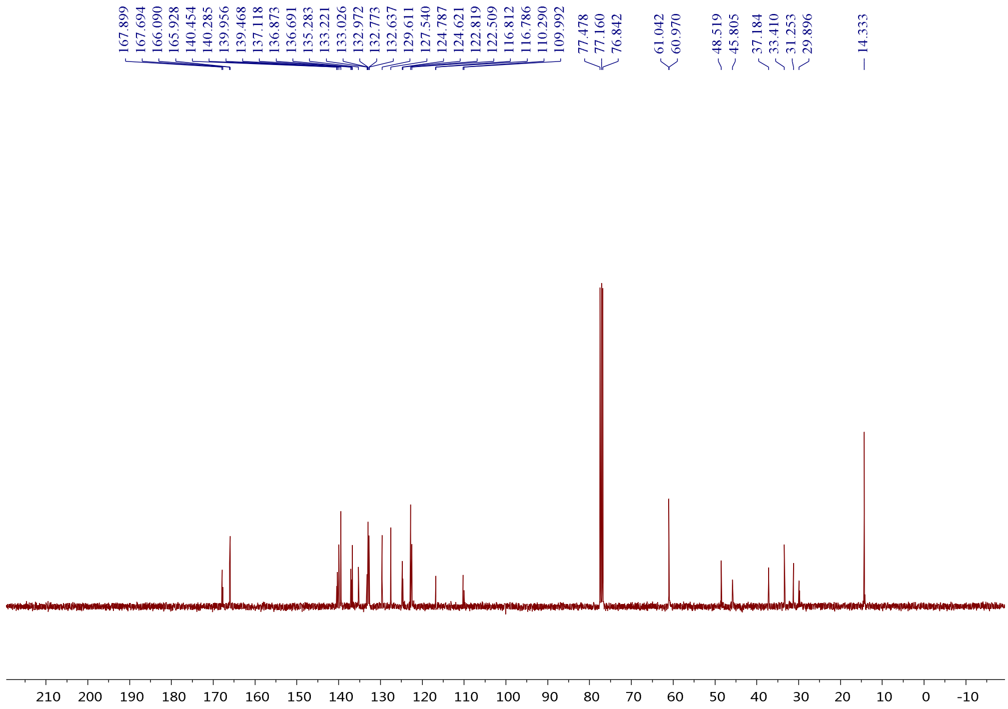
8.022
7.901
7.861
7.728
7.697
7.681
7.671
7.645
7.567
7.548
7.509
7.490
7.471
7.444
7.303
7.284
7.260
6.438
6.398
6.393
6.353
4.297
4.283
4.279
4.266
4.261
4.248
4.231
3.815
3.798
3.791
3.777
3.492
3.477
3.471
3.454
3.415
3.397
3.389
3.375
3.284
3.248
3.235
3.226
3.208
2.958
1.347
1.337
1.330
1.319
1.312
1.302
0.74
1.11
0.40
2.12
0.63
1.06
0.40
0.58
1.80
4.00
0.80
0.80
1.20
1.80
1.20
1.20
6.04
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5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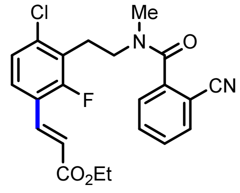
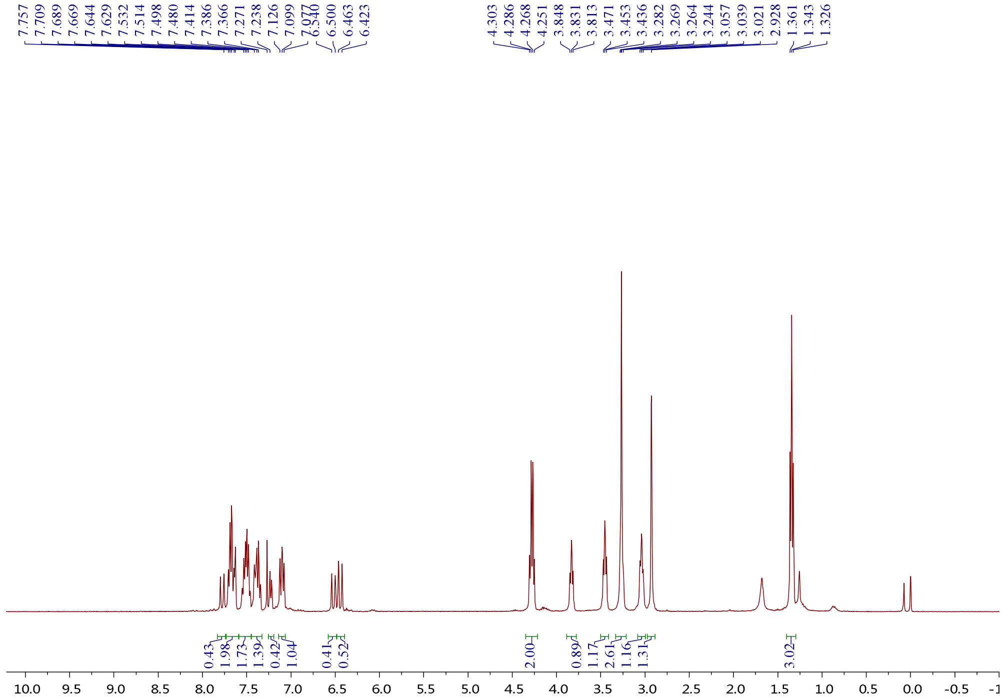
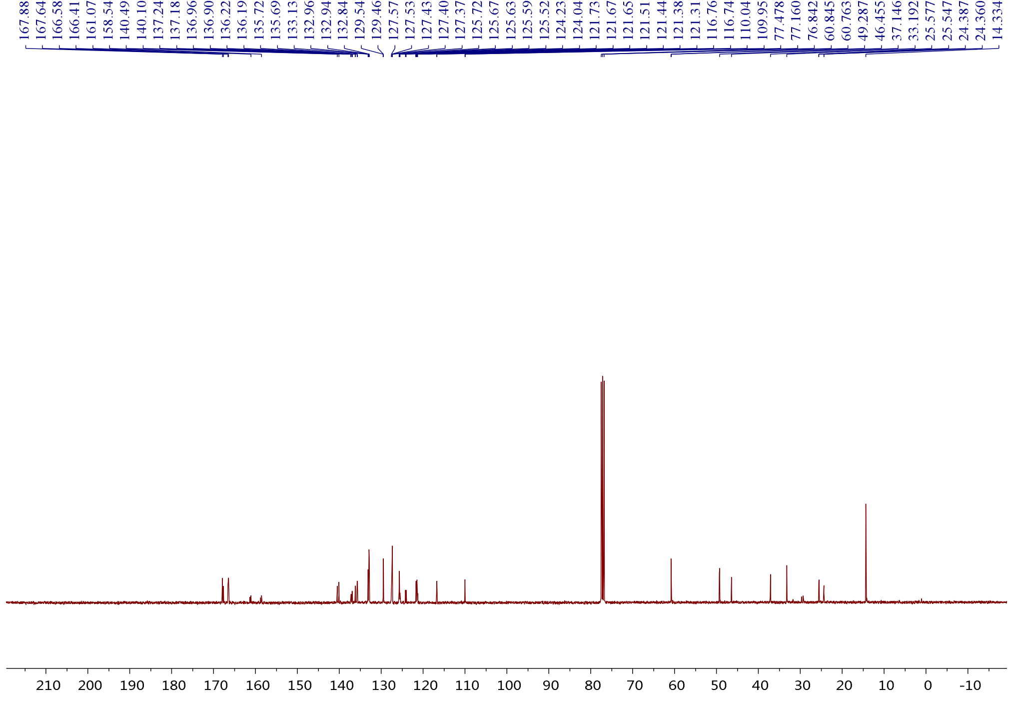
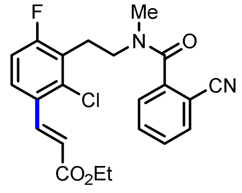
139.468
137.118
136.873
136.691
135.283
133.221
133.026
132.972
132.773
132.637
129.611
127.540
124.787
124.621
122.819
122.509
116.812
116.786
110.290
109.992
77.478
77.160
76.842
61.042
60.970
48.519
45.805
37.184
33.410
31.253
29.896
14.333
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10



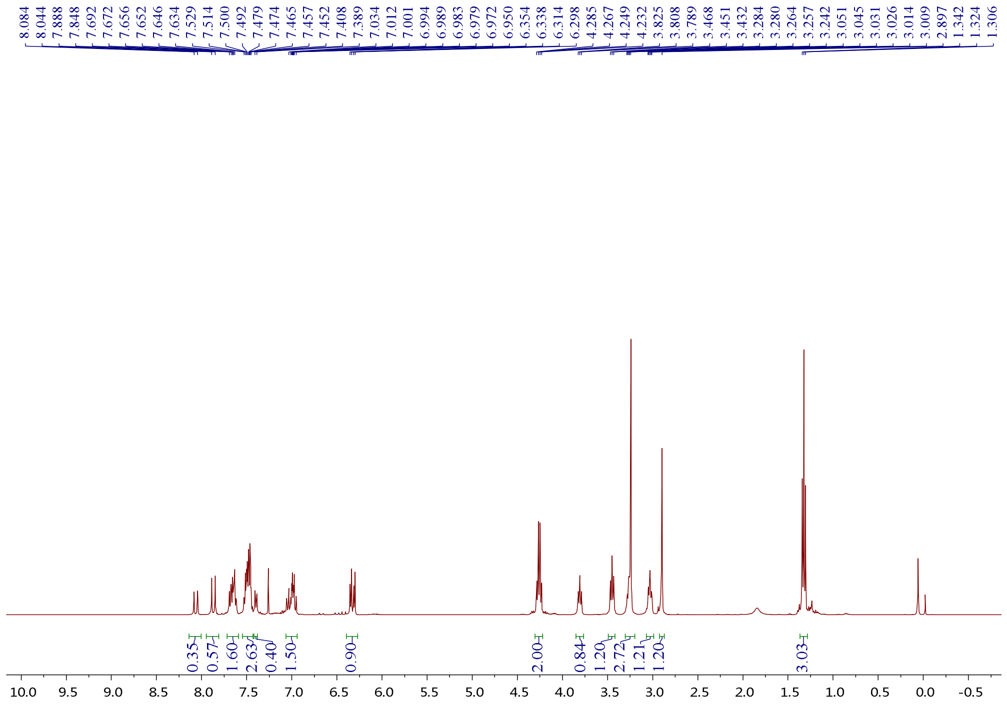
4n$_{\text{mono }(m)}$






F
Me
N
O
CN
Cl
CO2Et

$4n_{mono\ (m')}$


8.084
8.044
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7.848
7.692
7.672
7.656
7.652
7.646
7.634
7.529
7.514
7.500
7.492
7.479
7.474
7.465
7.457
7.452
7.408
7.389
7.034
7.012
7.001
6.994
6.989
6.983
6.979
6.972
6.950
6.354
6.338
6.314
6.298
4.285
4.267
4.249
4.232
3.825
3.808
3.789
3.468
3.451
3.432
3.284
3.280
3.264
3.257
3.242
3.051
3.045
3.031
3.026
3.014
3.009
2.897
1.342
1.324
1.306
0.35
0.57
1.60
2.63
0.40
1.50
0.90
2.00
0.84
1.20
2.72
1.21
1.20
3.03
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
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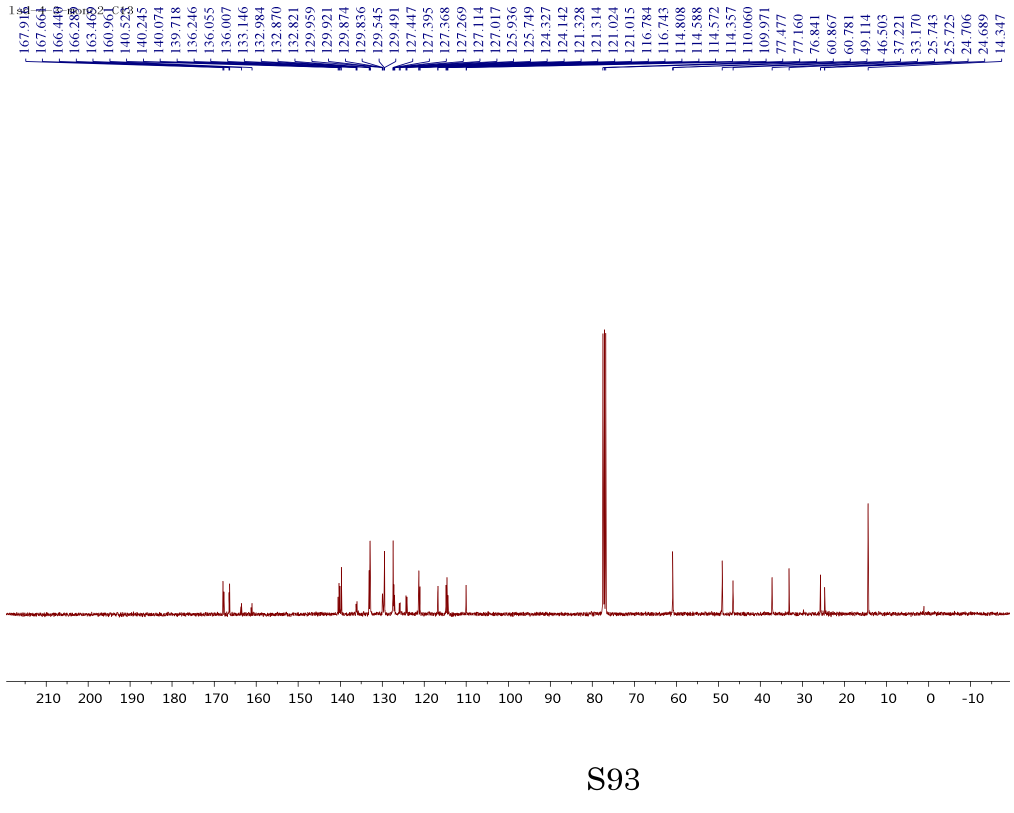
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5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166.288
163.469
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140.523
140.245
140.074
139.718
136.246
136.055
136.007
133.146
132.984
132.870
132.821
129.959
129.921
129.874
129.836
129.545
129.491
127.447
127.395
127.368
127.269
127.114
127.017
125.936
125.749
124.327
124.142
121.328
121.314
121.024
121.015
116.784
116.743
114.808
114.588
114.572
114.357
110.060
109.971
77.477
77.160
76.841
60.867
60.781
49.114
46.503
37.221
33.170
25.743
25.725
24.706
24.689
14.347
210
200
190
180
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120
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100
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40
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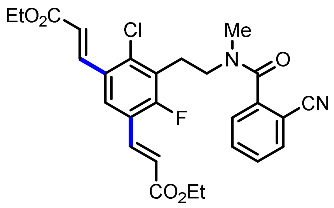
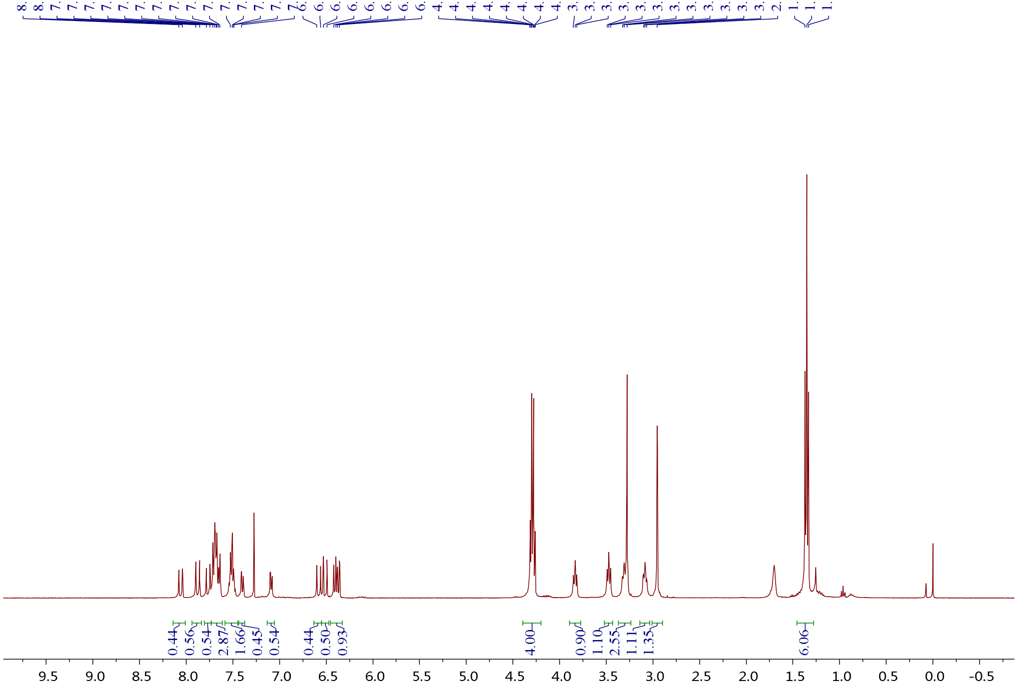
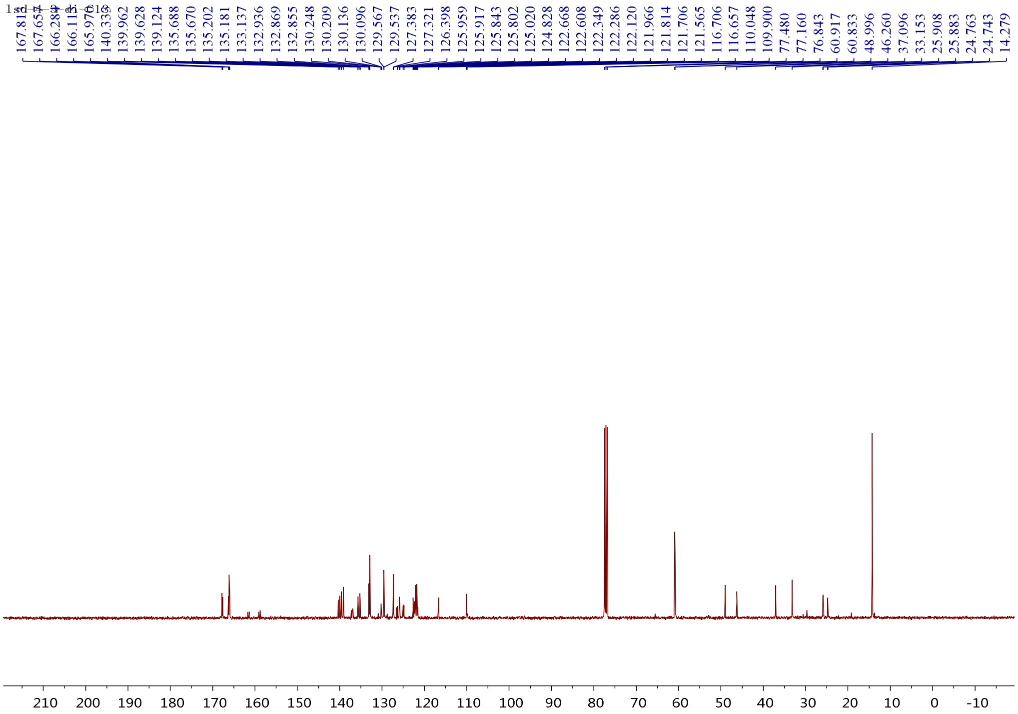
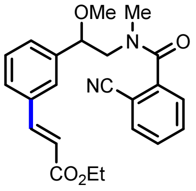
20
10
0
-10



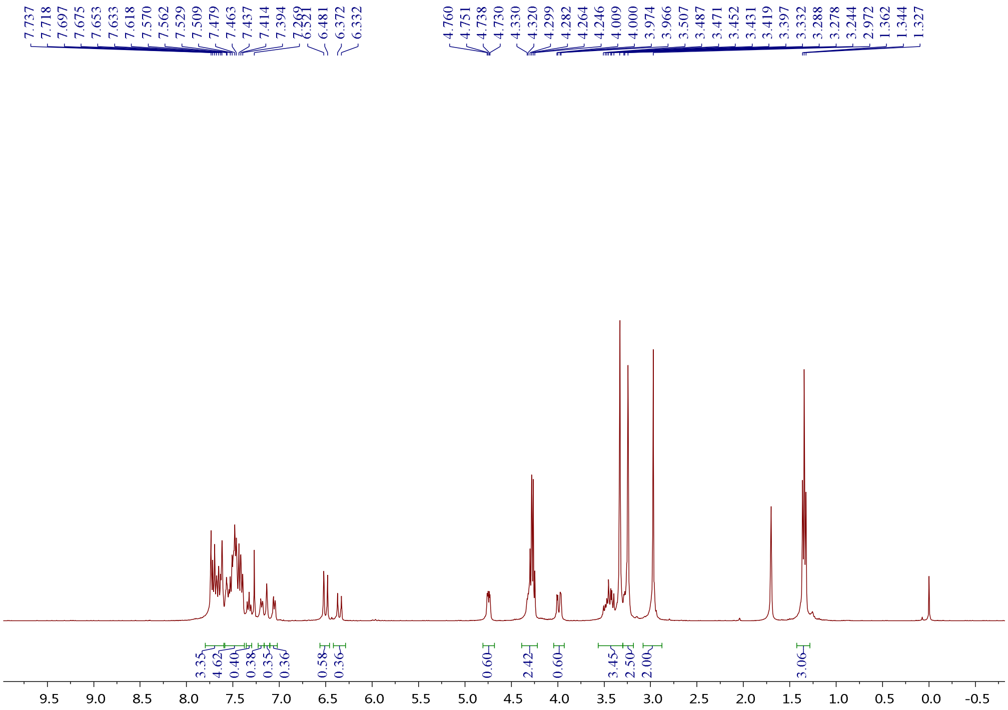
4n$_{(m,m')\mathrm{di}}$






OMe
Me
N
O
NC
CO2Et

$4o_{mono}$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7.633
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7.570
7.562
7.529
7.509
7.479
7.463
7.437
7.414
7.394
7.269
6.521
6.481
6.372
6.332
4.760
4.751
4.738
4.730
4.330
4.320
4.299
4.282
4.264
4.246
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4.000
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3.288
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3.244
2.972
1.362
1.344
1.327
3.35
4.62
0.40
0.38
0.35
0.36
0.58
0.36
0.60
2.42
0.60
3.45
2.50
2.00
3.06
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
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3.5
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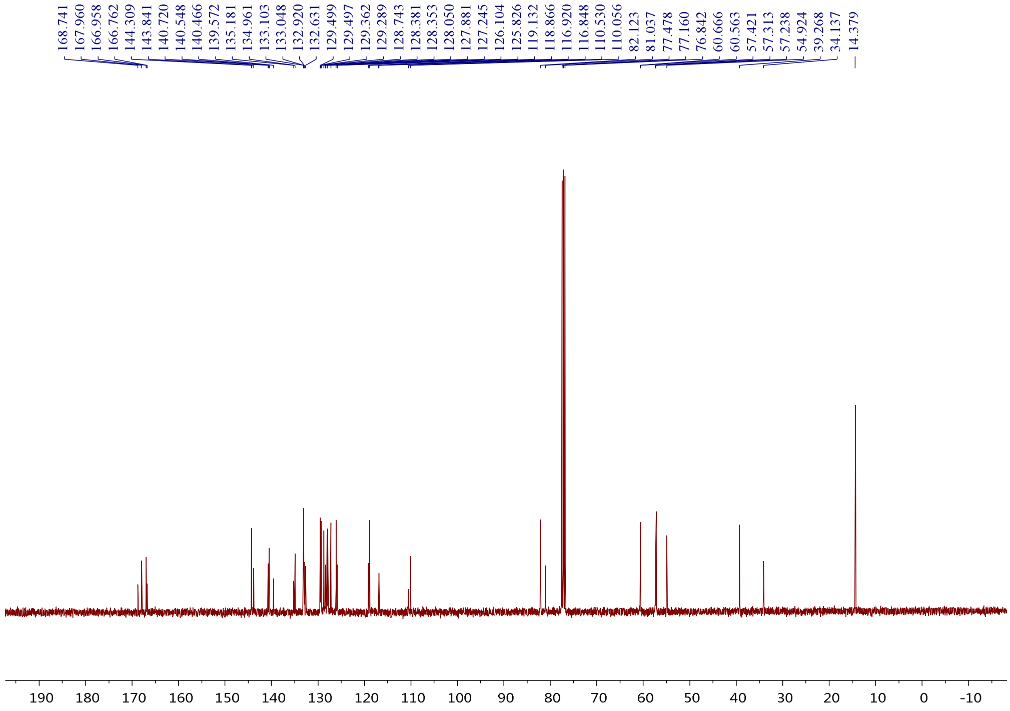
2.5
2.0
1.5
1.0
0.5
0.0
-0.5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166.762
144.309
143.841
140.720
140.548
140.466
139.572
135.181
134.961
133.103
133.048
132.920
132.631
129.499
129.497
129.362
129.289
128.743
128.381
128.353
128.050
127.881
127.245
126.104
125.826
119.132
118.866
116.920
116.848
110.530
110.056
82.123
81.037
77.478
77.160
76.842
60.666
60.563
57.421
57.313
57.238
54.924
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34.137
14.379
190
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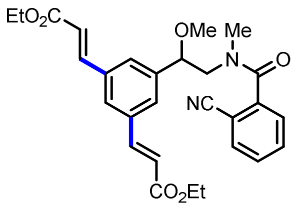
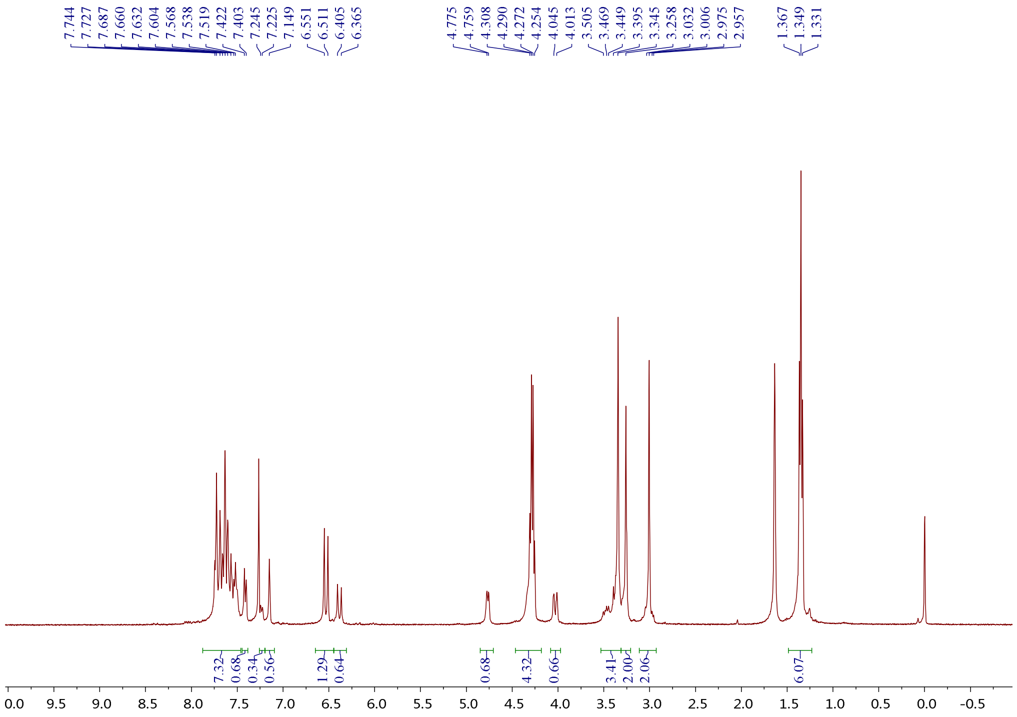
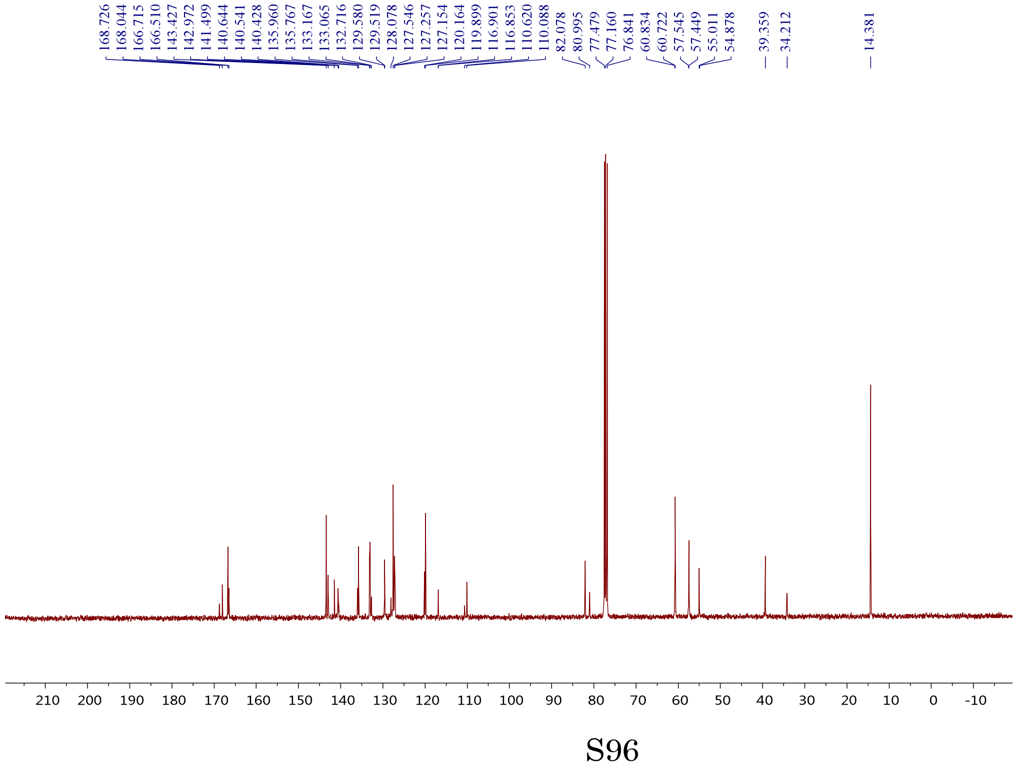
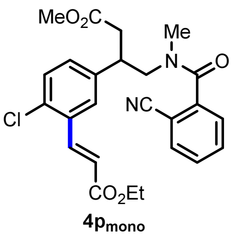
0
-10



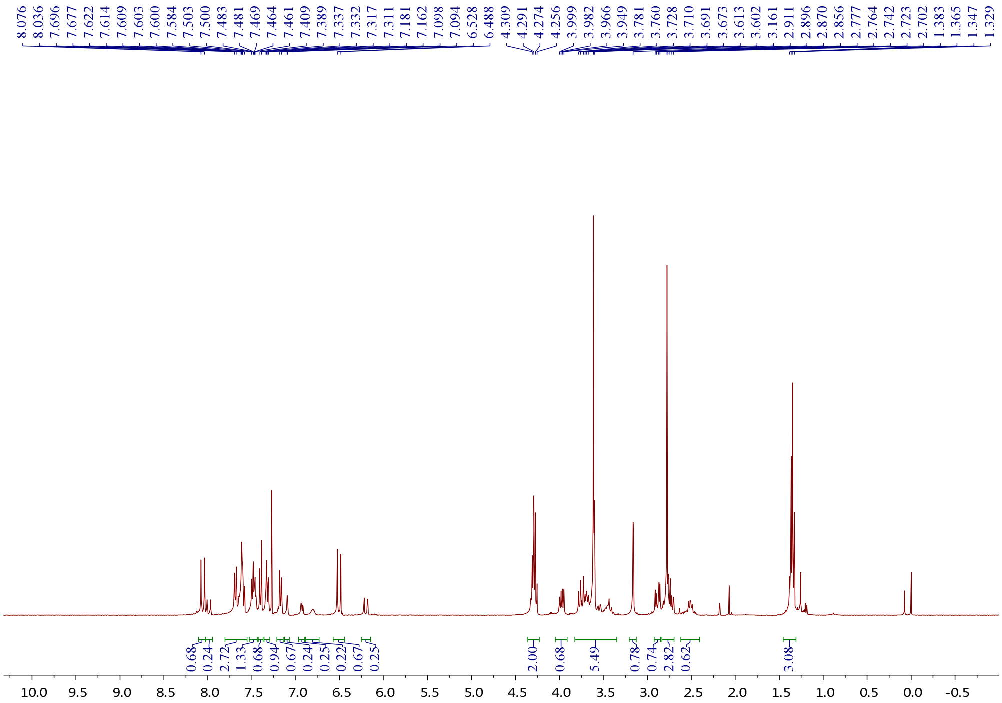
4o$_{(m,m')\mathrm{di}}$






MeO2C
Me
N
O
NC
Cl
CO2Et

$4p_{mono}$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7.677
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7.614
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7.603
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7.584
7.503
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7.483
7.481
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7.461
7.409
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7.181
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1.329
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0.25
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0.68
5.49
0.78
0.74
2.82
0.62
3.08
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
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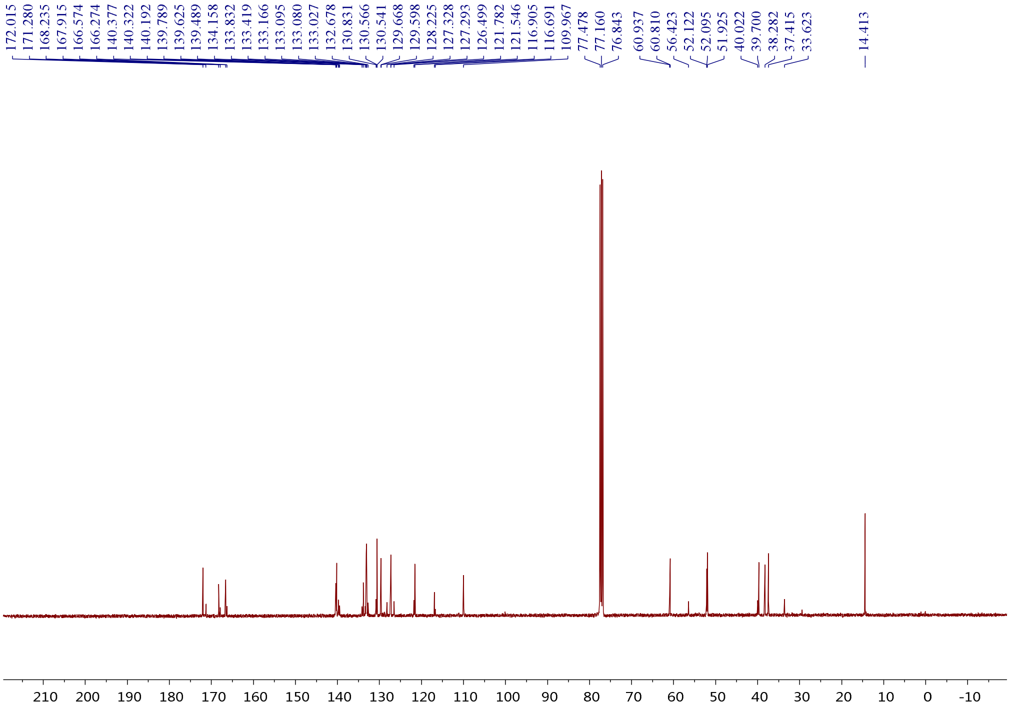
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5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171.280
168.235
167.915
166.574
166.274
140.377
140.322
140.192
139.789
139.625
139.489
134.158
133.832
133.419
133.166
133.095
133.080
133.027
132.678
130.831
130.566
130.541
129.668
129.598
128.225
127.328
127.293
126.499
121.782
121.546
116.905
116.691
109.967
77.478
77.160
76.843
60.937
60.810
56.423
52.122
52.095
51.925
40.022
39.700
38.282
37.415
33.623
14.413
210
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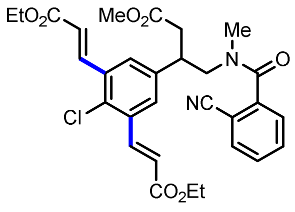
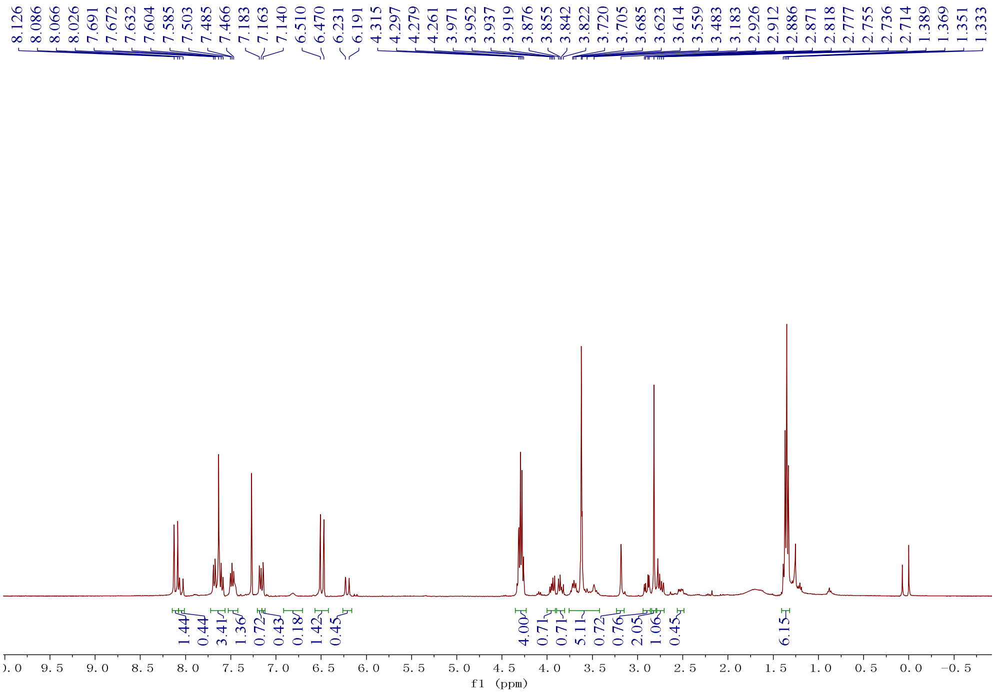
0
-10


EtO2C
MeO2C
Me
N
O
NC
Cl
CO2Et

4p$_{(m,m')}$di


8.126
8.086
8.066
8.026
7.691
7.672
7.632
7.604
7.585
7.503
7.485
7.466
7.183
7.163
7.140
6.510
6.470
6.231
6.191
4.315
4.297
4.279
4.261
3.971
3.952
3.937
3.919
3.876
3.855
3.842
3.822
3.720
3.705
3.685
3.623
3.614
3.559
3.483
3.183
2.926
2.912
2.886
2.871
2.818
2.777
2.755
2.736
2.714
1.389
1.369
1.351
1.333
1.44
0.44
3.41
1.36
0.72
0.43
0.18
1.42
0.45
4.00
0.71
0.71
5.11
0.72
0.76
2.05
1.06
0.45
6.15
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
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3.0
2.5
2.0
1.5
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0.0
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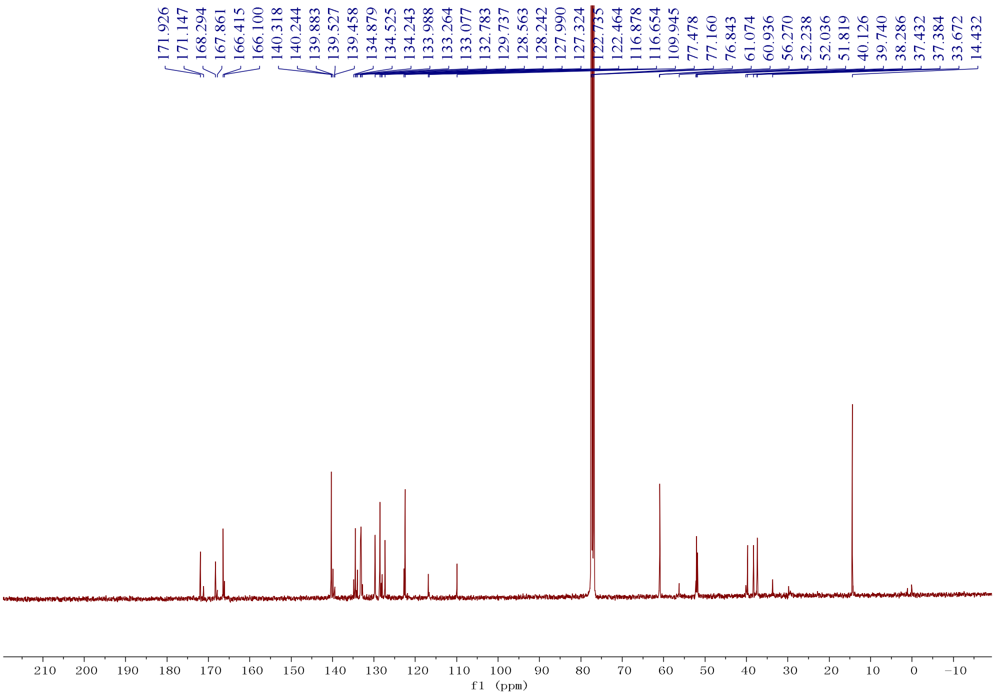
f1 (ppm)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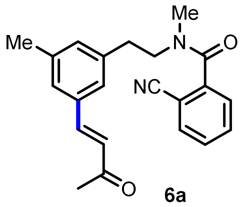
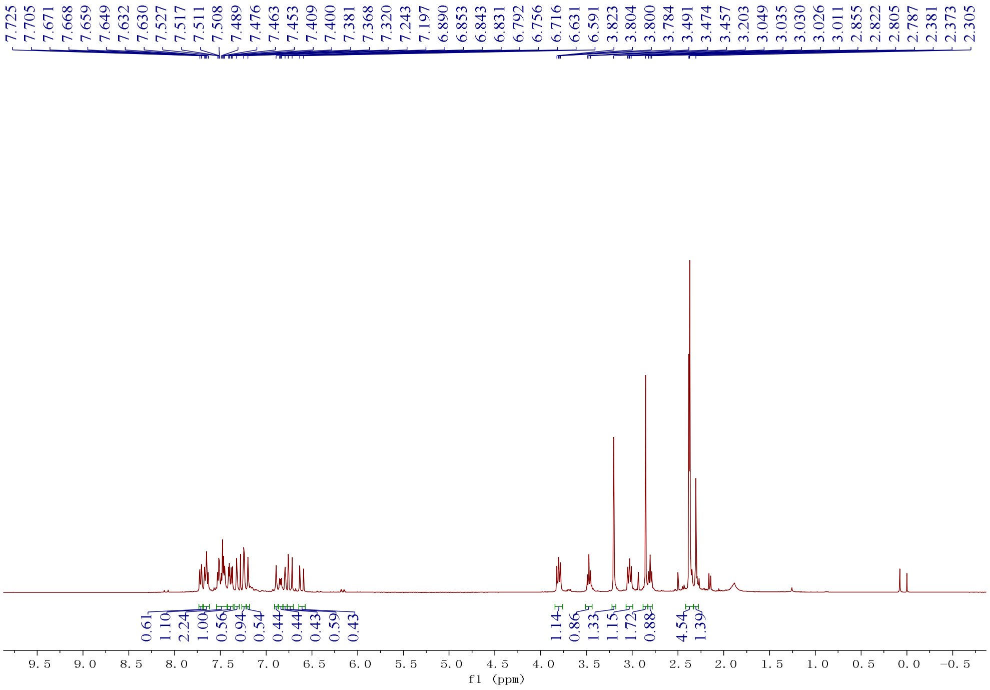
134.525
134.243
133.988
133.264
133.077
132.783
129.737
128.563
128.242
127.990
127.324
122.735
122.464
116.878
116.654
109.945
77.478
77.160
76.843
61.074
60.936
56.270
52.238
52.036
51.819
40.126
39.740
38.286
37.432
37.384
33.672
14.432
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
−10
f1 (ppm)


Me
Me
N
O
NC
O

6a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7.649
7.632
7.630
7.527
7.517
7.511
7.508
7.489
7.476
7.463
7.453
7.409
7.400
7.381
7.368
7.320
7.243
7.197
6.890
6.853
6.843
6.831
6.792
6.756
6.716
6.631
6.591
3.823
3.804
3.800
3.784
3.491
3.474
3.457
3.203
3.049
3.035
3.030
3.026
3.011
2.855
2.822
2.805
2.787
2.381
2.373
2.305
0.61
1.10
2.24
1.00
0.56
0.94
0.54
0.44
0.44
0.43
0.59
0.43
1.14
0.86
1.33
1.15
1.72
0.88
4.54
1.39
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
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3.0
2.5
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0.5
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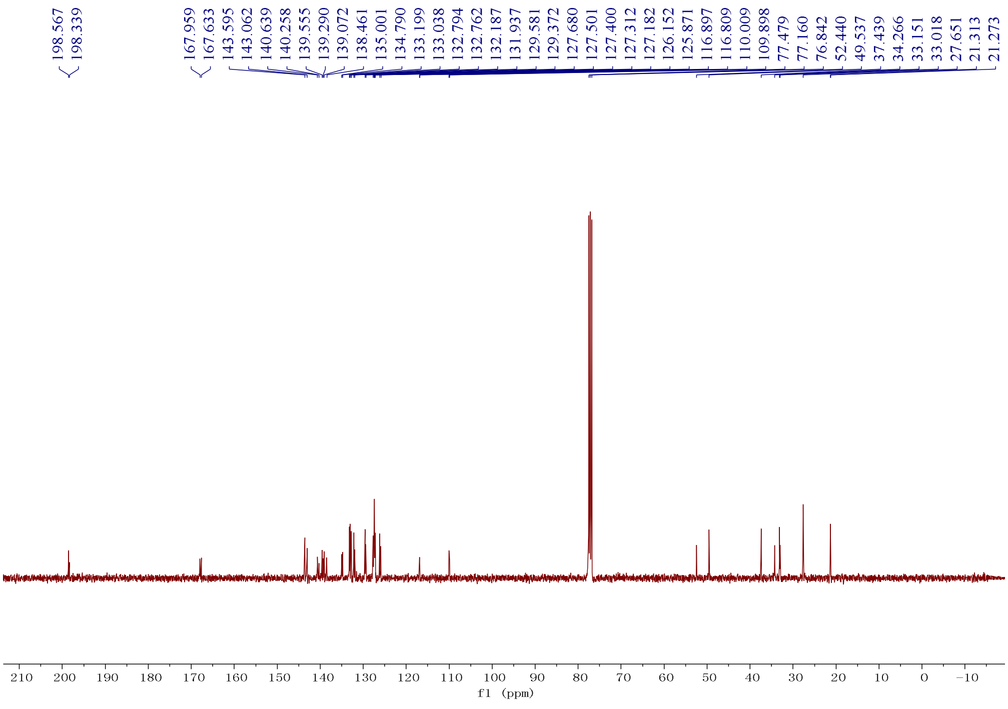
f1 (ppm)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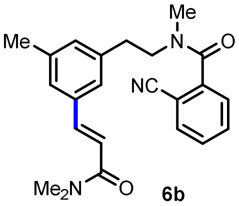
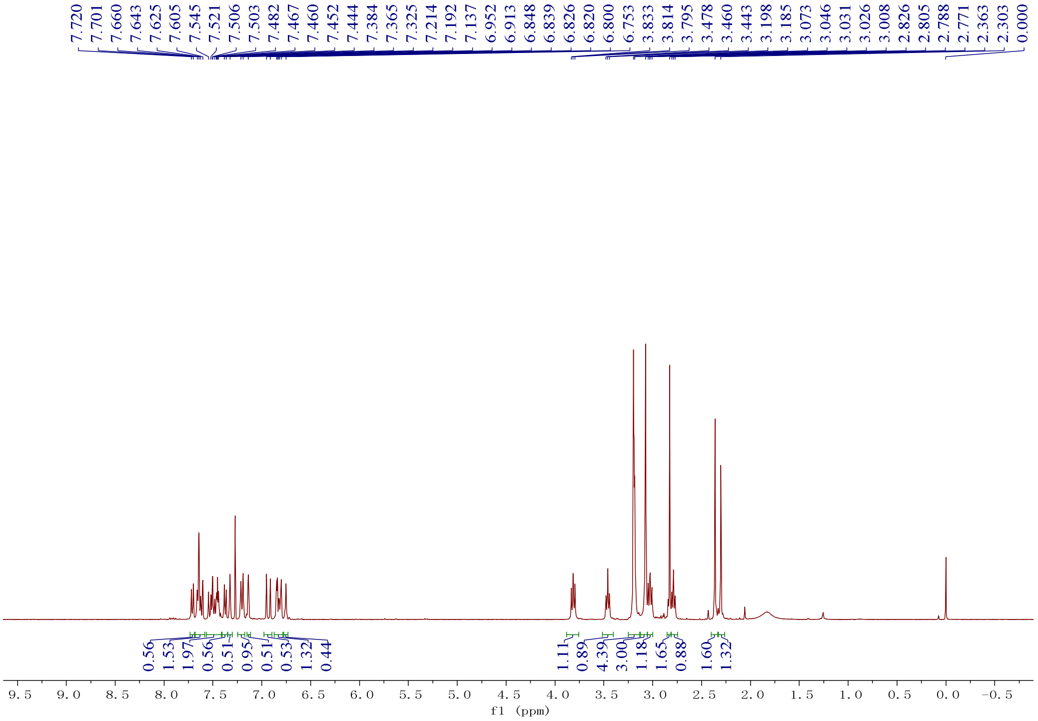
139.555
139.290
139.072
138.461
135.001
134.790
133.199
133.038
132.794
132.762
132.187
131.937
129.581
129.372
127.680
127.501
127.400
127.312
127.182
126.152
125.871
116.897
116.809
110.009
109.898
77.479
77.160
76.842
52.440
49.537
37.439
34.266
33.151
33.018
27.651
21.313
21.273
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)


Me
Me
N
O
NC
Me2N
O

6b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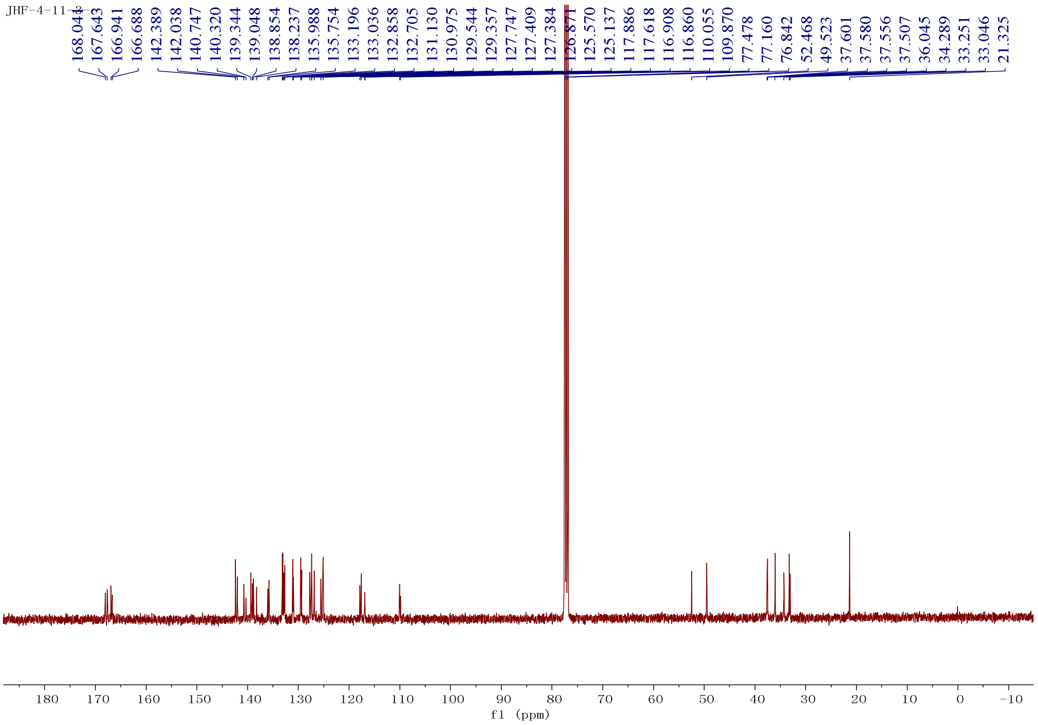
7.605
7.545
7.521
7.506
7.503
7.482
7.467
7.460
7.452
7.444
7.384
7.365
7.325
7.214
7.192
7.137
6.952
6.913
6.848
6.839
6.826
6.820
6.800
6.753
3.833
3.814
3.795
3.478
3.460
3.443
3.198
3.185
3.073
3.046
3.031
3.026
3.008
2.826
2.805
2.788
2.771
2.363
2.303
0.000
0.56
1.53
1.97
0.56
0.51
0.95
0.51
0.53
1.32
0.44
1.11
0.89
4.39
3.00
1.18
1.65
0.88
1.60
1.32
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)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140.320
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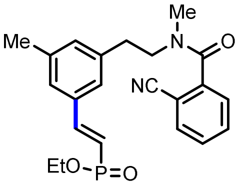
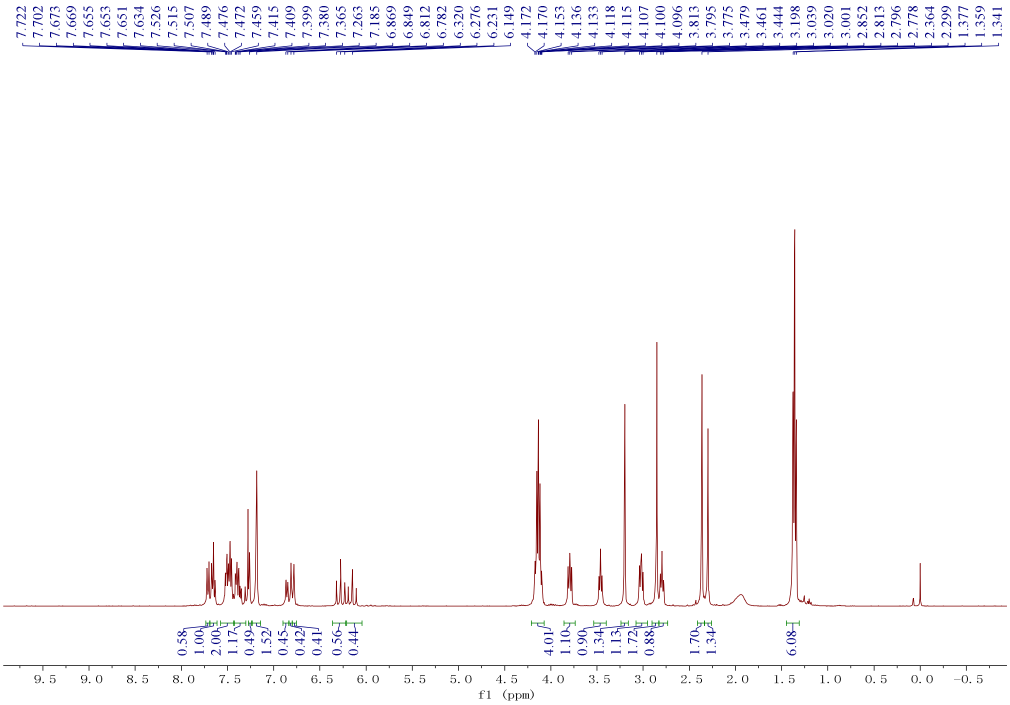
139.048
138.854
138.237
135.988
135.754
133.196
133.036
132.858
132.705
131.130
130.975
129.544
129.357
127.747
127.409
127.384
126.871
125.570
125.137
117.886
117.618
116.908
116.860
110.055
109.870
77.478
77.160
76.842
52.468
49.523
37.601
37.580
37.556
37.507
36.045
34.289
33.251
33.046
21.325
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)


Me
Me
N
O
NC
EtO
P
O
EtO

6c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7.673
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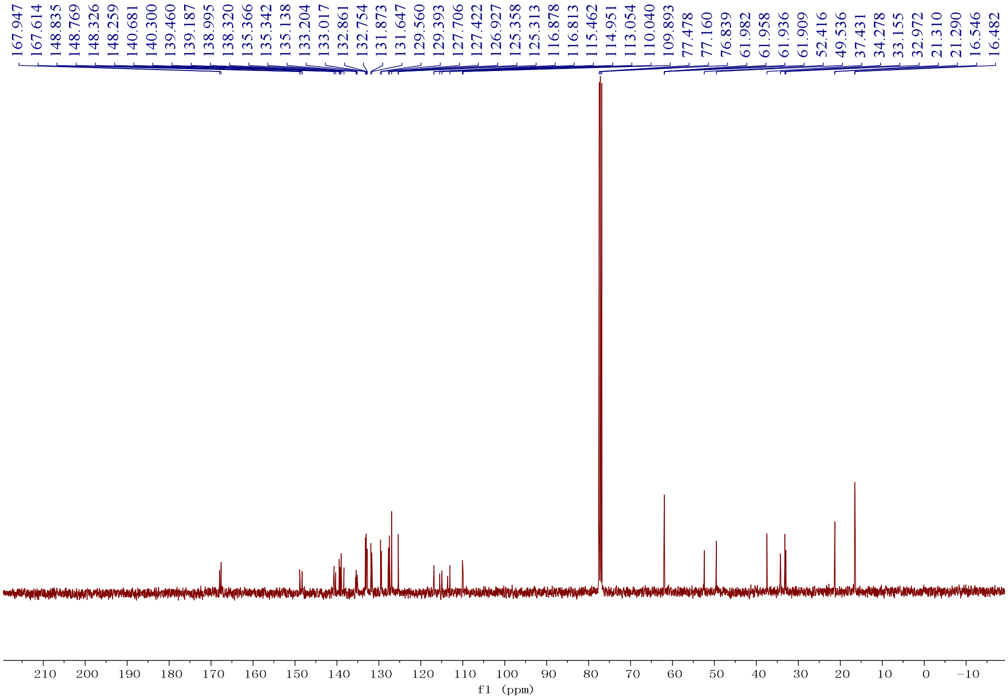
7.655
7.653
7.651
7.634
7.526
7.515
7.507
7.489
7.476
7.472
7.459
7.415
7.409
7.399
7.380
7.365
7.263
7.185
6.869
6.849
6.812
6.782
6.320
6.276
6.231
6.149
4.172
4.170
4.153
4.136
4.133
4.118
4.115
4.107
4.100
4.096
3.813
3.795
3.775
3.479
3.461
3.444
3.198
3.039
3.020
3.001
2.852
2.813
2.796
2.778
2.364
2.299
1.377
1.359
1.341
0.58
1.00
2.00
1.17
0.49
1.52
0.45
0.42
0.41
0.56
0.44
4.01
1.10
0.90
1.34
1.13
1.72
0.88
1.70
1.34
6.08
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)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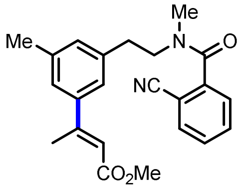
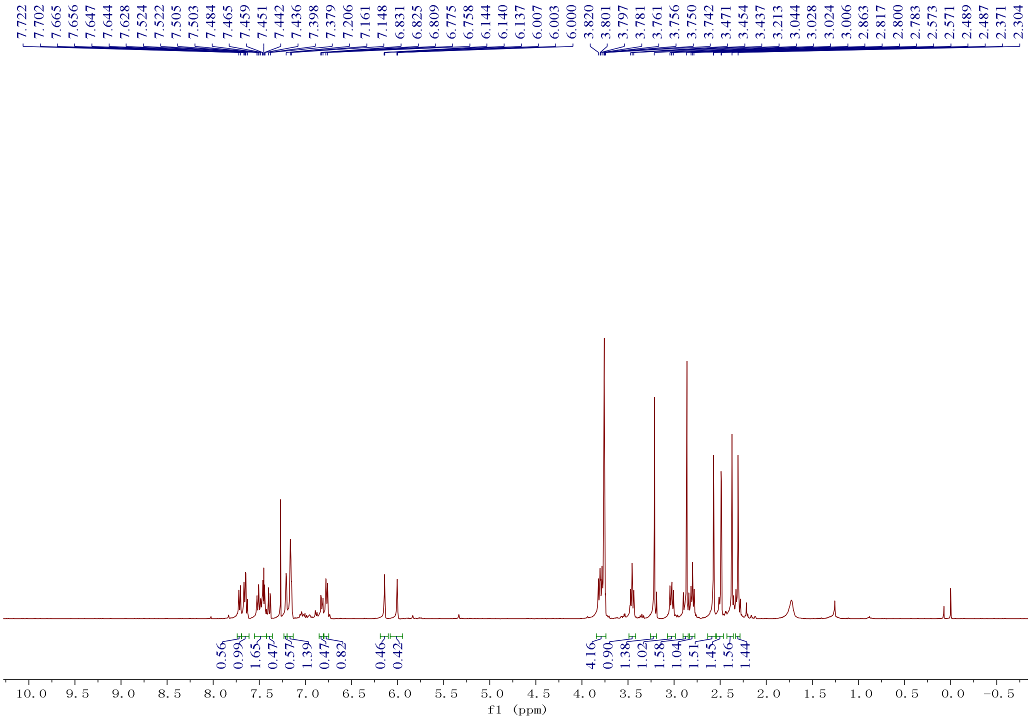
139.187
138.995
138.320
135.366
135.342
135.138
133.204
133.017
132.861
132.754
131.873
131.647
129.560
129.393
127.706
127.422
126.927
125.358
125.313
116.878
116.813
115.462
114.951
113.054
110.040
109.893
77.478
77.160
76.839
61.982
61.958
61.936
61.909
52.416
49.536
37.431
34.278
33.155
32.972
21.310
21.290
16.546
16.482
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)


Me
Me
N
O
NC
CO2Me

6d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7.647
7.644
7.628
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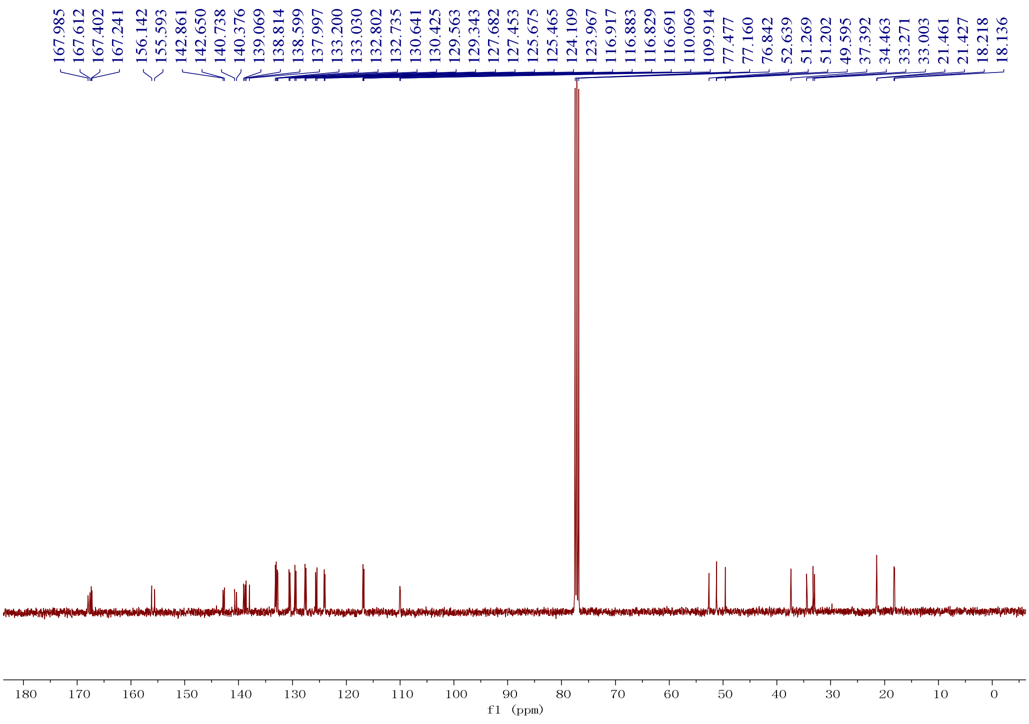
7.522
7.505
7.503
7.484
7.465
7.459
7.451
7.442
7.436
7.398
7.379
7.206
7.161
7.148
6.831
6.825
6.809
6.775
6.758
6.144
6.140
6.137
6.007
6.003
6.000
3.820
3.801
3.797
3.781
3.761
3.756
3.750
3.742
3.471
3.454
3.437
3.213
3.044
3.028
3.024
3.006
2.863
2.817
2.800
2.783
2.573
2.571
2.489
2.487
2.371
2.304
0.56
0.99
1.65
0.47
0.57
1.39
0.47
0.82
0.46
0.42
4.16
0.90
1.38
1.02
1.58
1.04
1.51
1.45
1.56
1.44
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)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140.376
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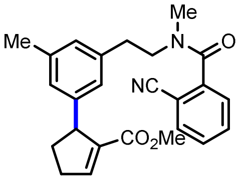
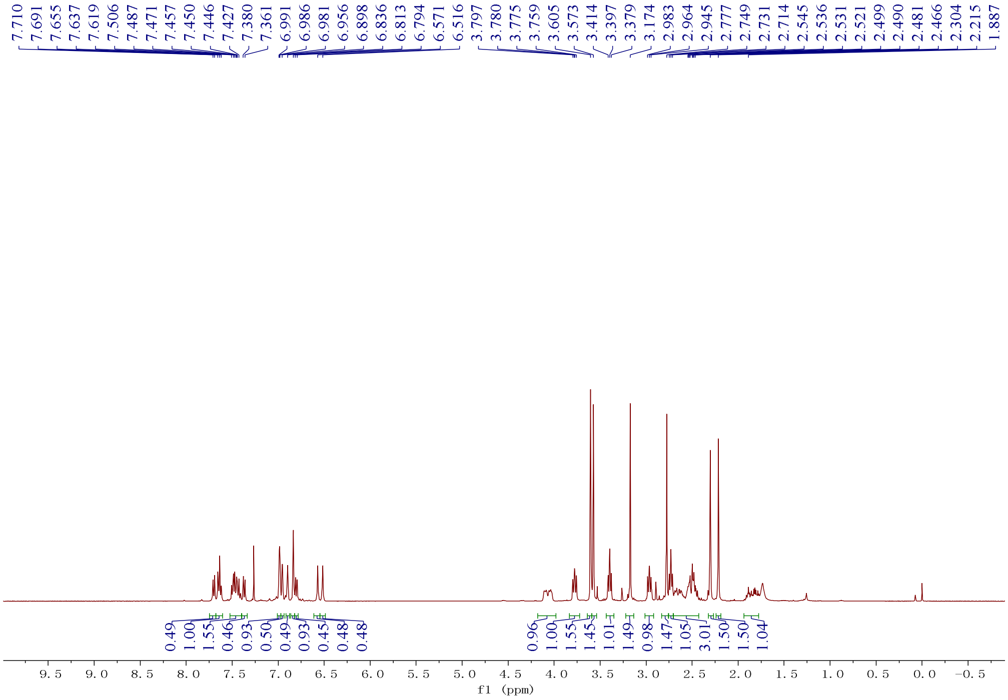
138.599
137.997
133.200
133.030
132.802
132.735
130.641
130.425
129.563
129.343
127.682
127.453
125.675
125.465
124.109
123.967
116.917
116.883
116.829
116.691
110.069
109.914
77.477
77.160
76.842
52.639
51.269
51.202
49.595
37.392
34.463
33.271
33.003
21.461
21.427
18.218
18.136
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


Me
Me
N
O
NC
CO2Me

6e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7.471
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7.427
7.380
7.361
6.991
6.986
6.981
6.956
6.898
6.836
6.813
6.794
6.571
6.516
3.797
3.780
3.775
3.759
3.605
3.573
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3.397
3.379
3.174
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2.964
2.945
2.777
2.749
2.731
2.714
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2.536
2.531
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2.466
2.304
2.215
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1.00
1.55
0.46
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0.50
0.49
0.93
0.45
0.48
0.48
0.96
1.00
1.55
1.45
1.01
1.49
0.98
1.47
1.05
3.01
1.50
1.50
1.04
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
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3.0
2.5
2.0
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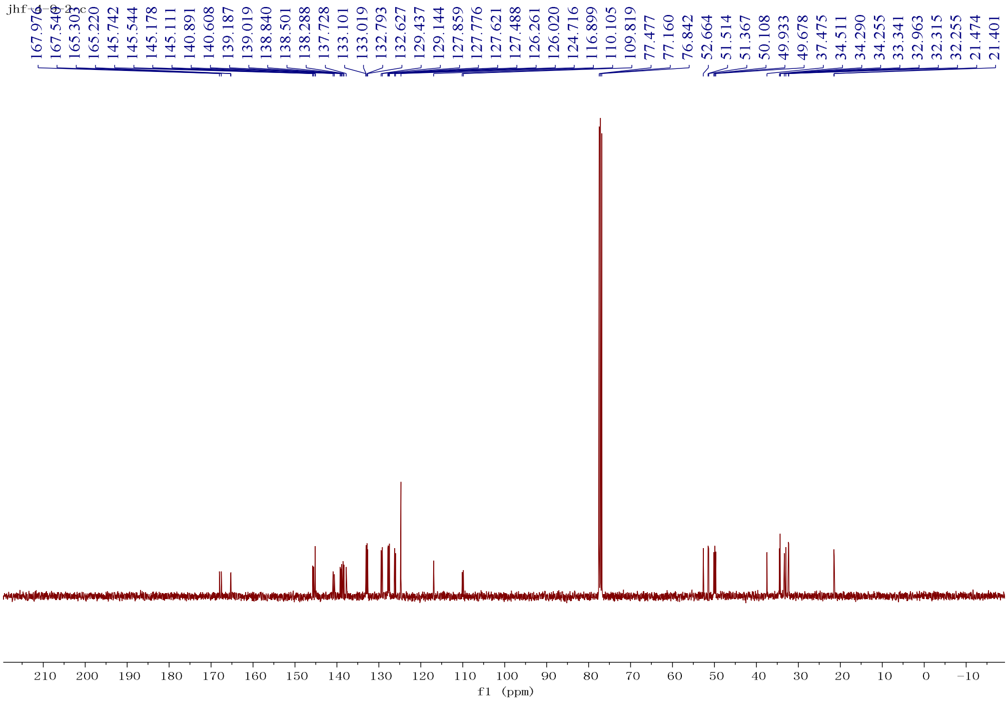
1.0
0.5
0.0
-0.5
f1 (ppm)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138.840
138.501
138.288
137.728
133.101
133.019
132.793
132.627
129.437
129.144
127.859
127.776
127.621
127.488
126.261
126.020
124.716
116.899
110.105
109.819
77.477
77.160
76.842
52.664
51.514
51.367
50.108
49.933
49.678
37.475
34.511
34.290
34.255
33.341
32.963
32.315
32.255
21.474
21.401
210
200
190
180
170
160
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120
110
100
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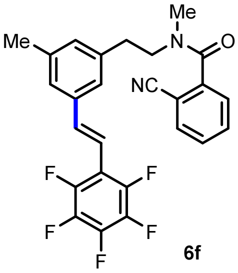
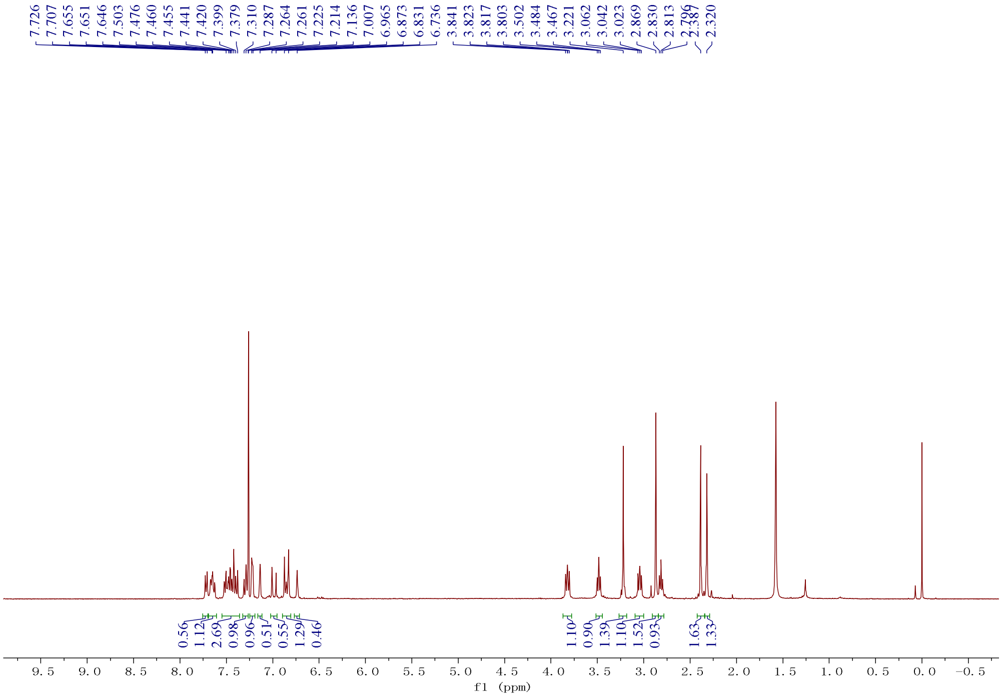
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)


Me
Me
N
O
NC
F
F
F
F
F

6f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7.441
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7.310
7.287
7.264
7.261
7.225
7.214
7.136
7.007
6.965
6.873
6.831
6.736
3.841
3.823
3.817
3.803
3.502
3.484
3.467
3.221
3.062
3.042
3.023
2.869
2.830
2.813
2.796
2.387
2.320
0.56
1.12
2.69
0.98
0.96
0.51
0.55
1.29
0.46
1.10
0.90
1.39
1.10
1.52
0.93
1.63
1.33
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
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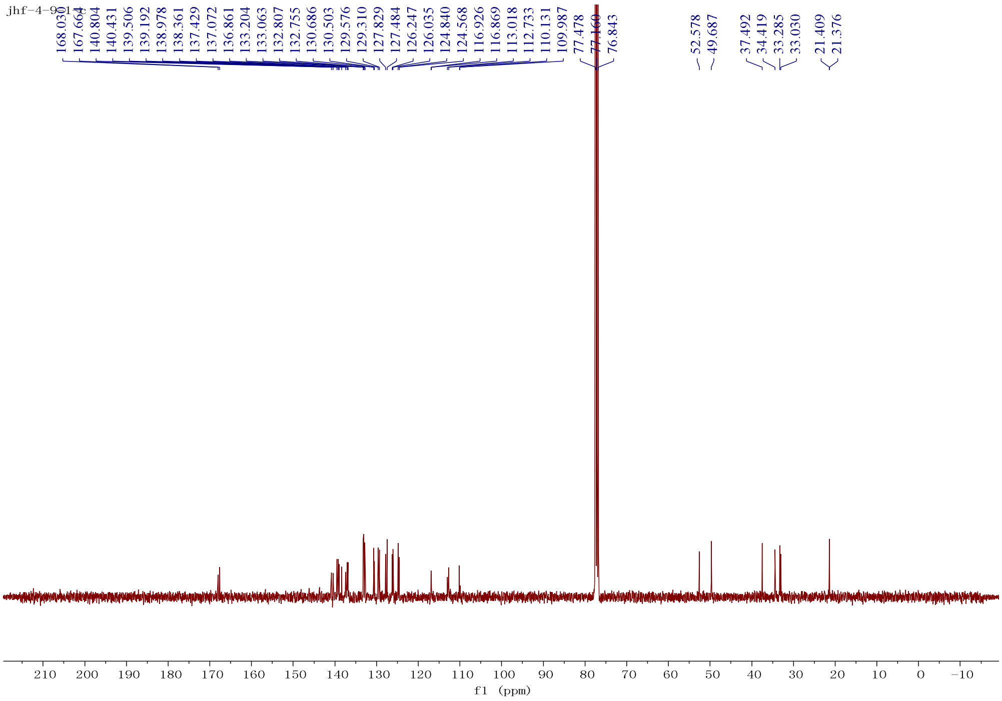
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)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136.861
133.204
133.063
132.807
132.755
130.686
130.503
129.576
129.310
127.829
127.484
126.247
126.035
124.840
124.568
116.926
116.869
113.018
112.733
110.131
109.987
77.478
77.160
76.843
52.578
49.687
37.492
34.419
33.285
33.030
21.409
21.376
210
200
190
180
170
160
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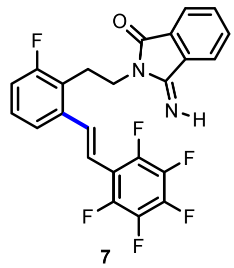
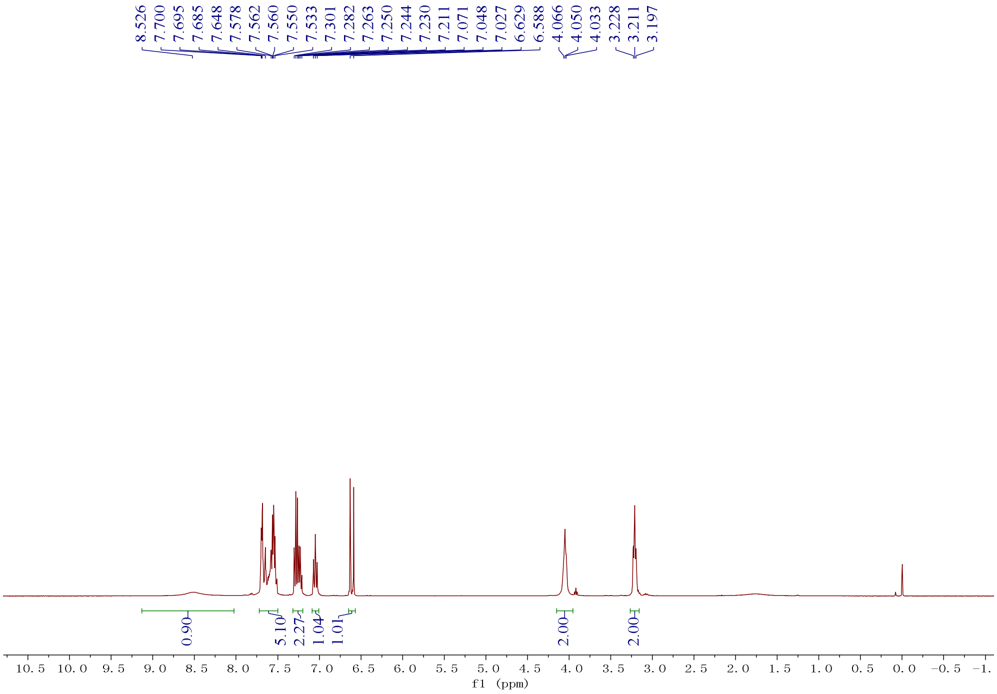
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)


O
N
N
H
F
F
F
F
F
F

7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7.560
7.550
7.533
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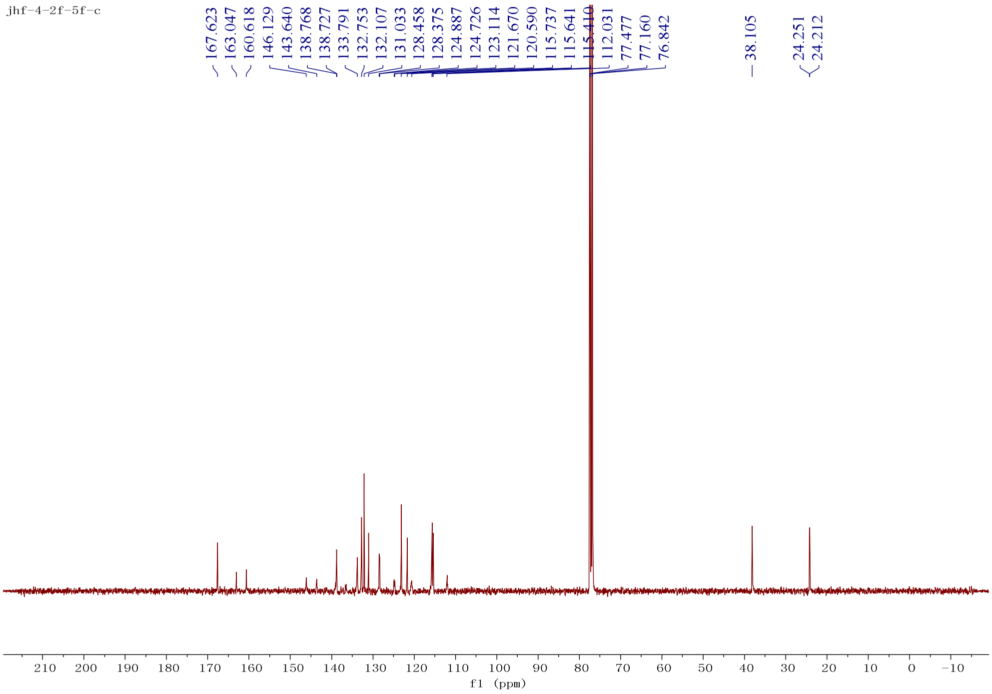
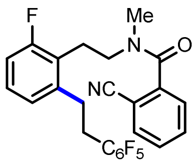
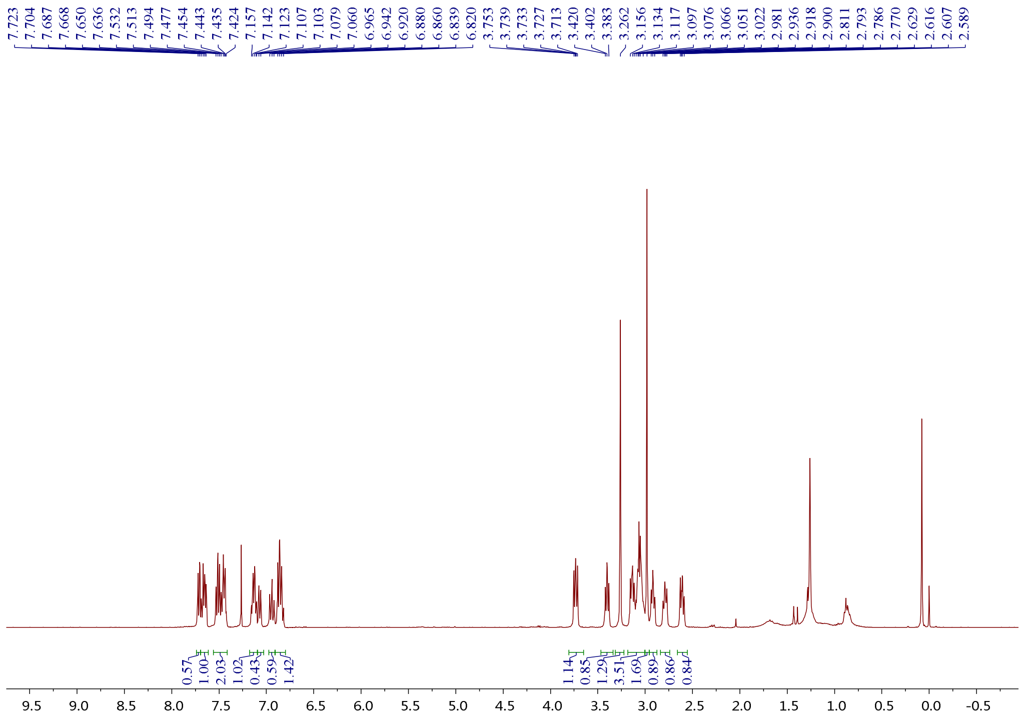
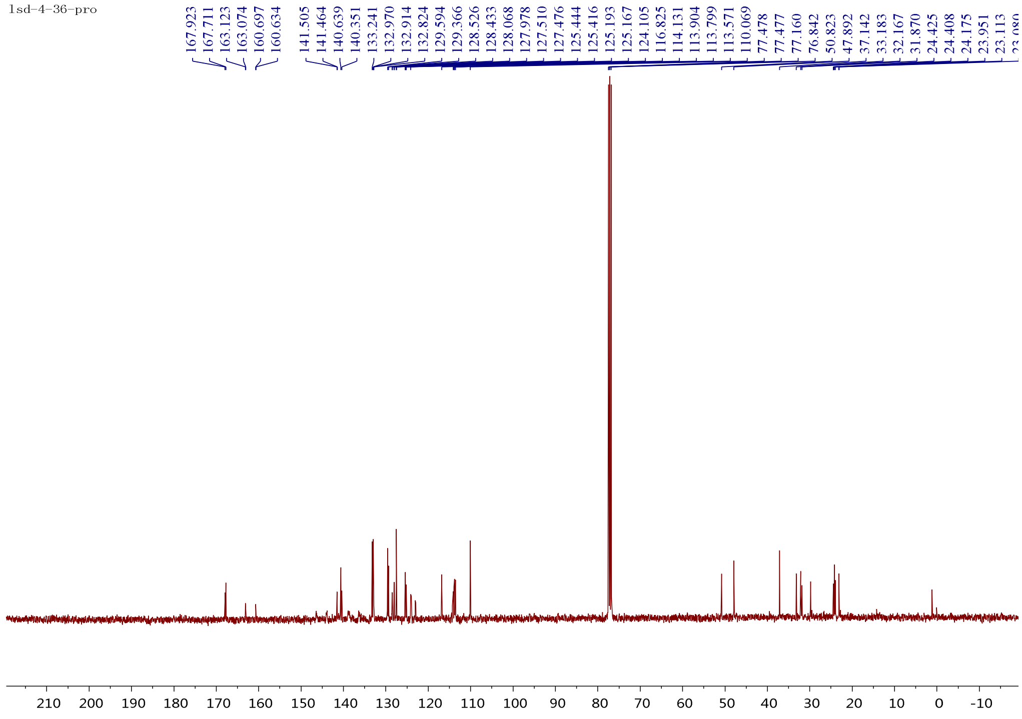
7.282
7.263
7.250
7.244
7.230
7.211
7.071
7.048
7.027
6.629
6.588
4.066
4.050
4.033
3.228
3.211
3.197
0.90
5.10
2.27
1.04
1.01
2.00
2.00
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5 −1.
f1 (ppm)

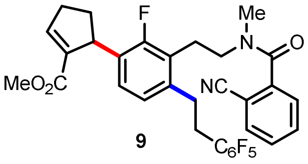

jhf-4-2f-5f-c
167.623
163.047
160.618
146.129
143.640
138.768
138.727
133.791
132.753
132.107
131.033
128.458
128.375
124.887
124.726
123.114
121.670
120.590
115.737
115.641
115.410
112.031
77.477
77.160
76.842
38.105
24.251
24.212
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)


F
Me
N
O
NC
C6F5

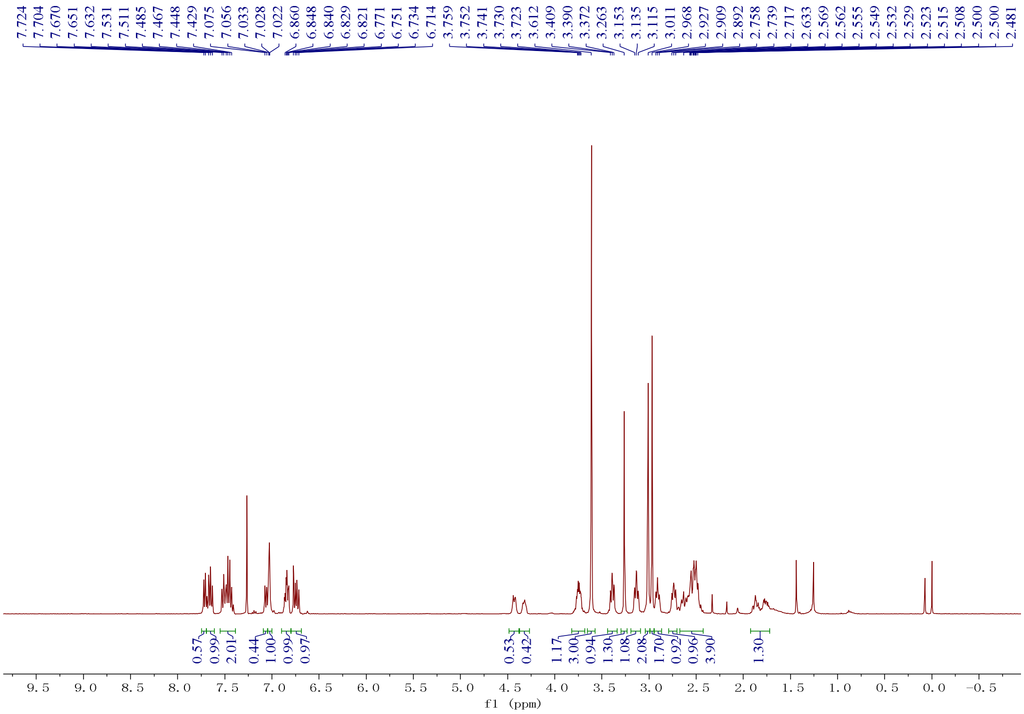
8

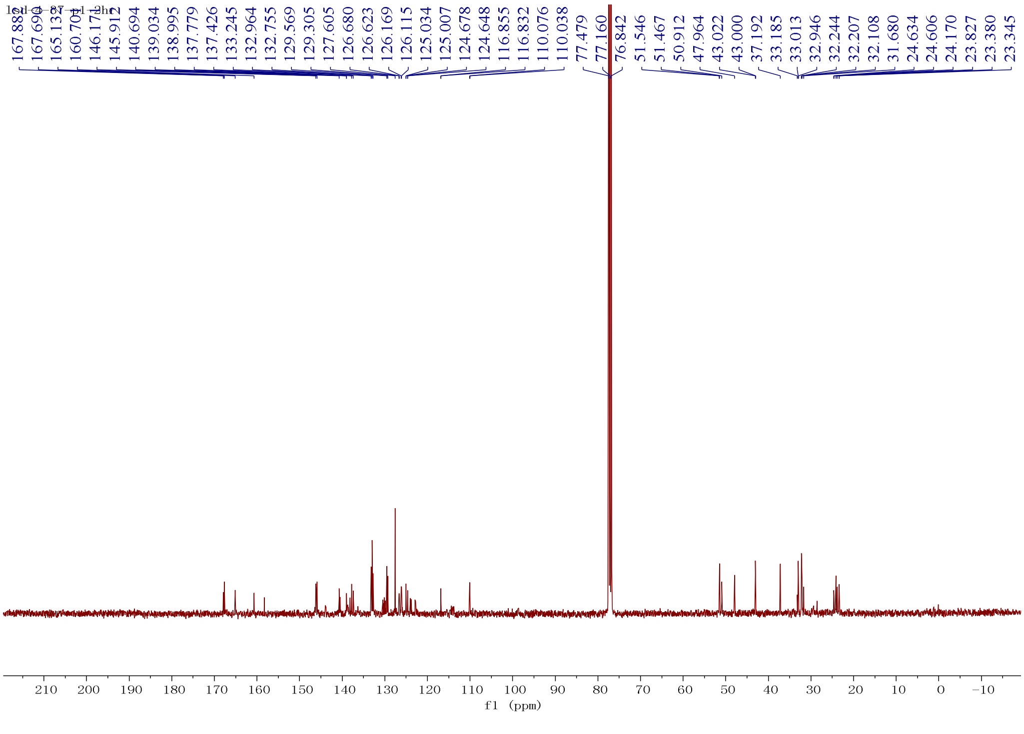

7.723
7.704
7.687
7.668
7.650
7.636
7.532
7.513
7.494
7.477
7.454
7.443
7.435
7.424
7.157
7.142
7.123
7.107
7.103
7.079
7.060
6.965
6.942
6.920
6.880
6.860
6.839
6.820
3.753
3.739
3.733
3.727
3.713
3.420
3.402
3.383
3.262
3.156
3.134
3.117
3.097
3.076
3.066
3.051
3.022
2.981
2.936
2.918
2.900
2.811
2.793
2.786
2.770
2.629
2.616
2.607
2.589
0.57
1.00
2.03
1.02
0.43
0.59
1.42
1.14
0.85
1.29
3.51
1.69
0.89
0.86
0.84
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5

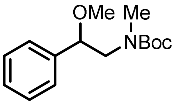

1sd-4-36-pro
167.923
167.711
163.123
163.074
160.697
160.634
141.505
141.464
140.639
140.351
133.241
132.970
132.914
132.824
129.594
129.366
128.526
128.433
128.068
127.978
127.510
127.476
125.444
125.416
125.193
125.167
124.105
116.825
114.131
113.904
113.799
113.571
110.069
77.478
77.477
77.160
76.842
50.823
47.892
37.142
33.183
32.167
31.870
24.425
24.408
24.175
23.951
23.113
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10


F
Me
N
O
MeO$_2$C
NC
C$_6$F$_5$

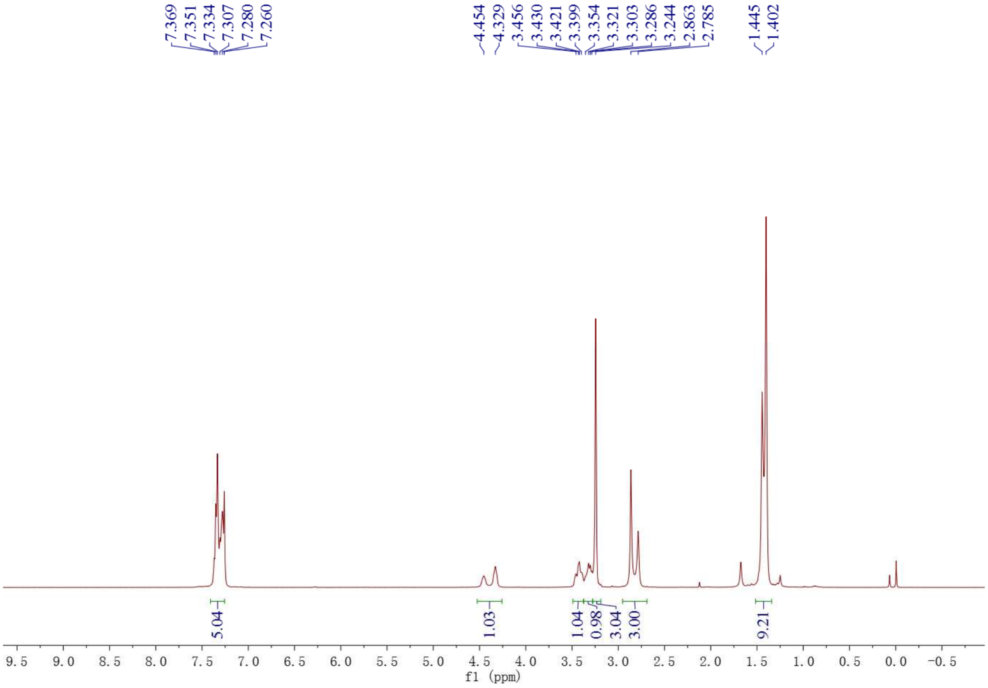
9

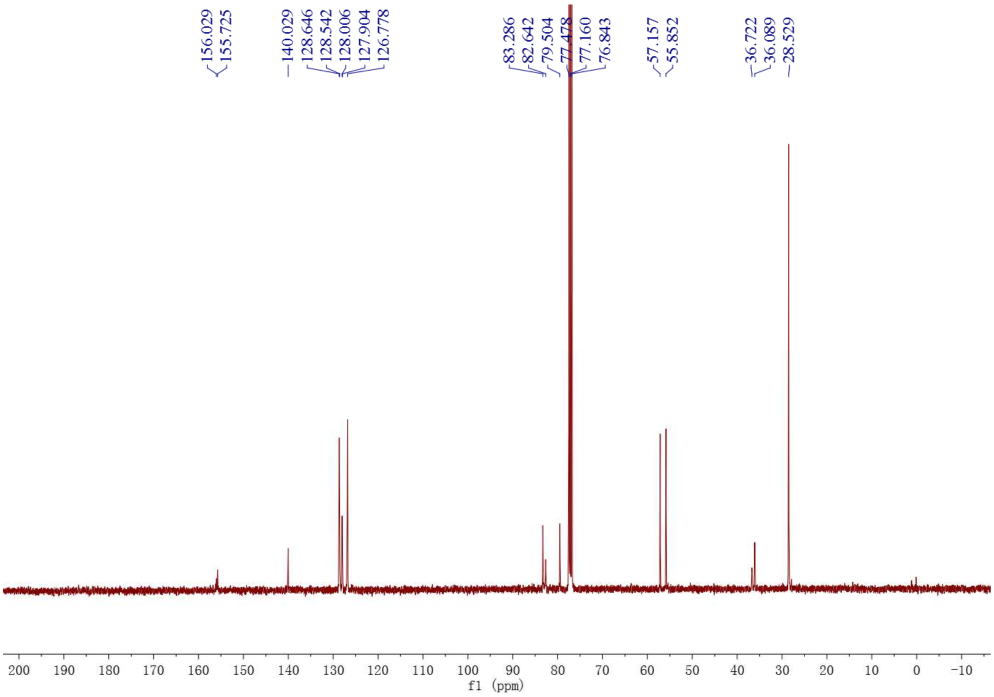

7.724
7.704
7.670
7.651
7.632
7.531
7.511
7.485
7.467
7.448
7.429
7.075
7.056
7.033
7.028
7.022
6.860
6.848
6.840
6.829
6.821
6.771
6.751
6.734
6.714
3.759
3.752
3.741
3.730
3.723
3.612
3.409
3.390
3.372
3.263
3.153
3.135
3.115
3.011
2.968
2.927
2.909
2.892
2.758
2.739
2.717
2.633
2.569
2.562
2.555
2.549
2.532
2.529
2.523
2.515
2.508
2.500
2.500
2.481
0.57
0.99
2.01
0.44
1.00
0.99
0.97
0.53
0.42
1.17
3.00
0.94
1.30
1.08
2.08
1.70
0.92
0.96
3.90
1.30
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)

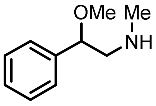

167.882
167.690
165.137
160.701
146.171
145.912
140.694
139.034
138.995
137.779
137.426
133.245
132.964
132.755
129.569
129.305
127.605
126.680
126.623
126.169
126.115
125.034
125.007
124.678
124.648
116.855
116.832
110.076
110.038
77.479
77.160
76.842
51.546
51.467
50.912
47.964
43.022
43.000
37.192
33.185
33.013
32.946
32.244
32.207
32.108
31.680
24.634
24.606
24.170
23.827
23.380
23.345
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)


OMe Me
NBoc

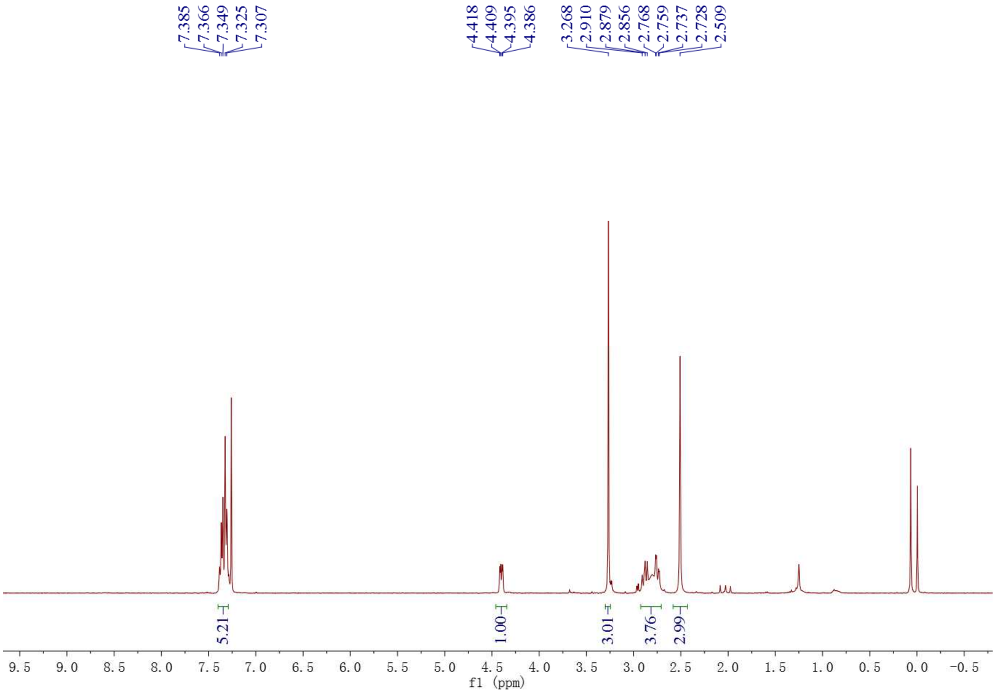
S4

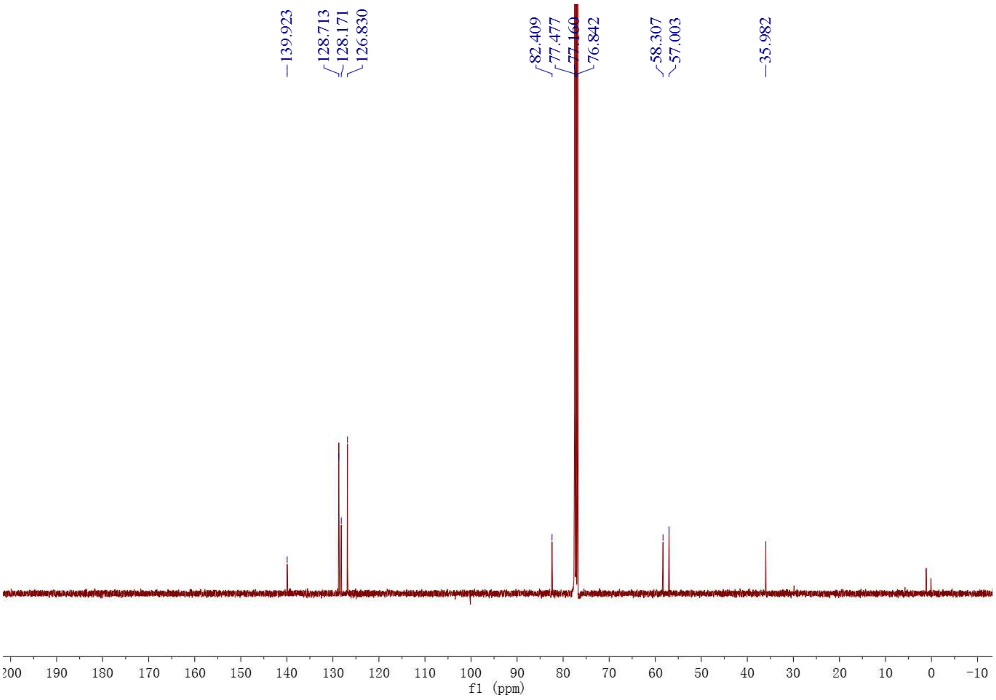

7.369
7.351
7.334
7.307
7.280
7.260
4.454
4.329
3.456
3.430
3.421
3.399
3.354
3.321
3.303
3.286
3.244
2.863
2.785
1.445
1.402
5.04
1.03
1.04
0.98
3.04
3.00
9.21
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)

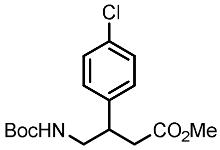

156.029
155.725
140.029
128.646
128.542
128.006
127.904
126.778
83.286
82.642
79.504
77.478
77.160
76.843
57.157
55.852
36.722
36.089
28.529
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)


OMe
Me
NH

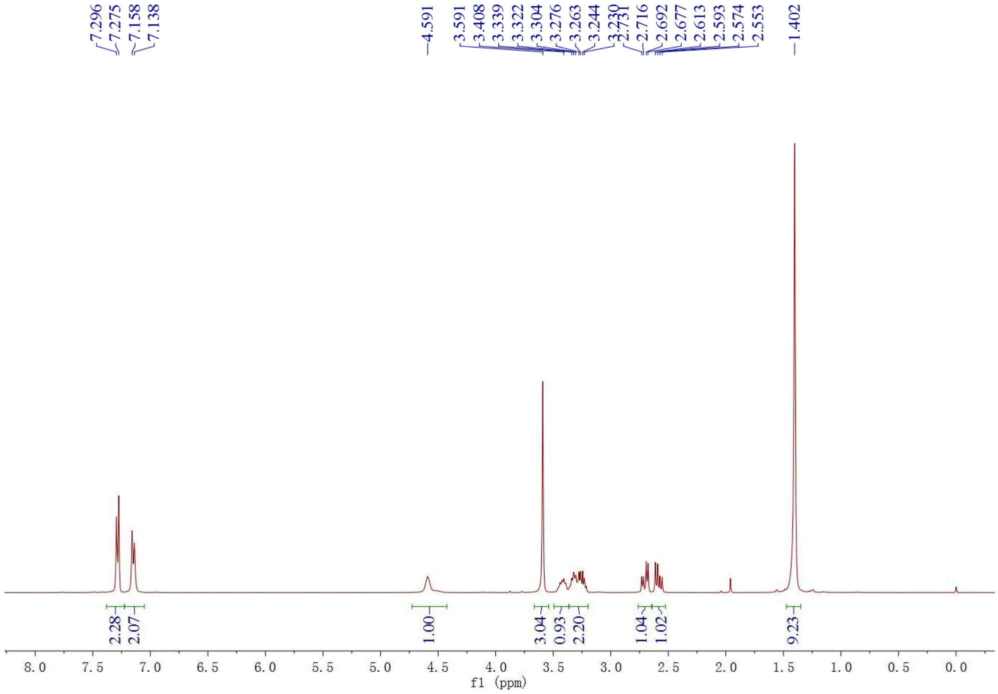
S5

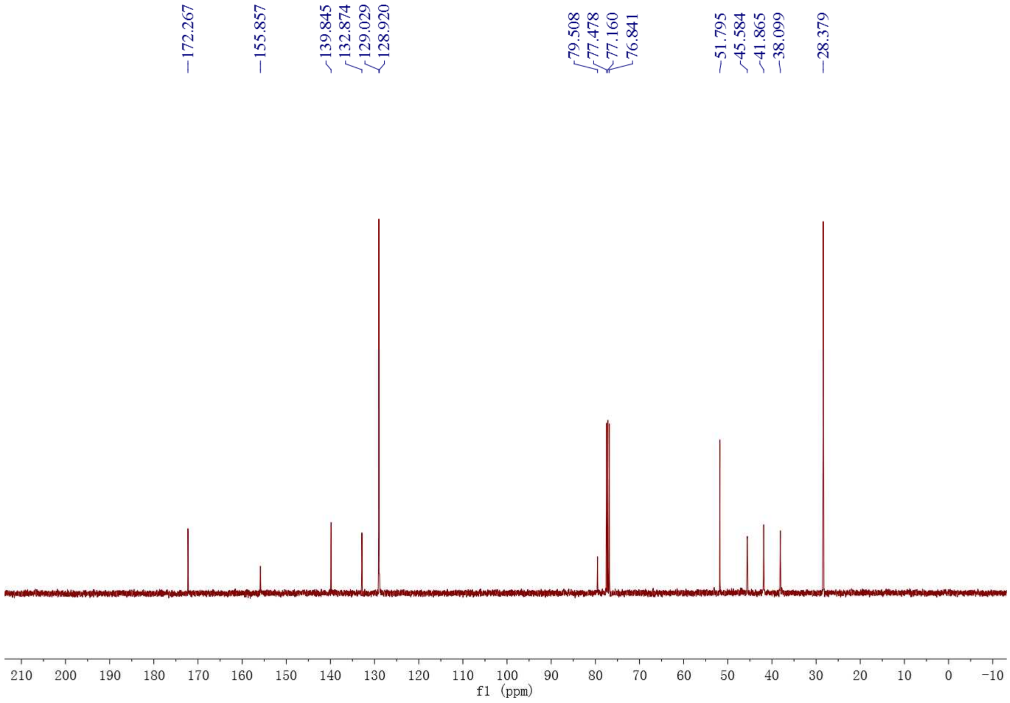

7.385
7.366
7.349
7.325
7.307
4.418
4.409
4.395
4.386
3.268
2.910
2.879
2.856
2.768
2.759
2.737
2.728
2.509
5.21
1.00
3.01
3.76
2.99
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)

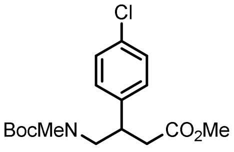

139.923
128.713
128.171
126.830
82.409
77.477
77.160
76.842
58.307
57.003
35.982
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)


Cl
BocHN
CO2Me

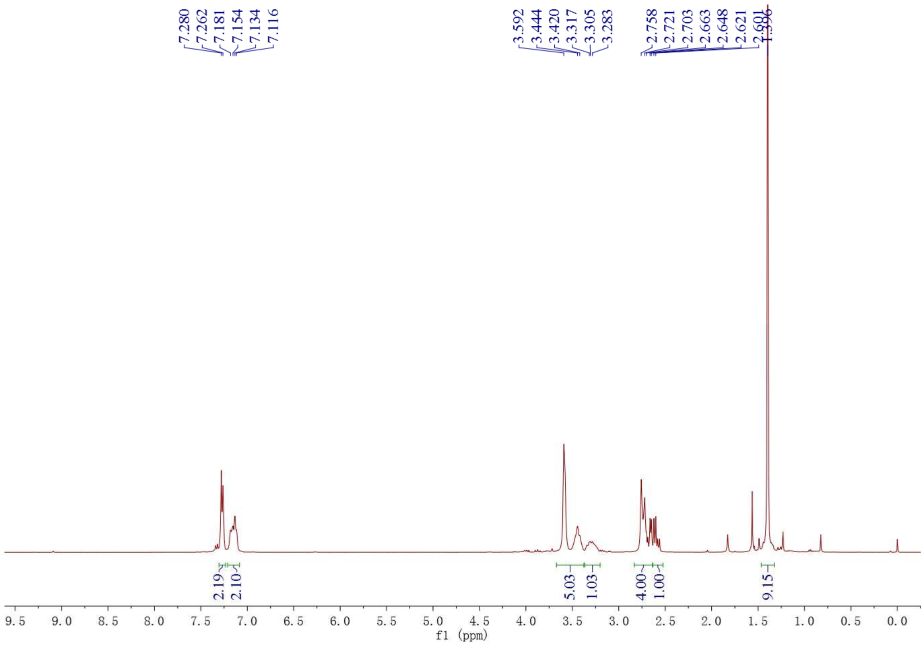
S6

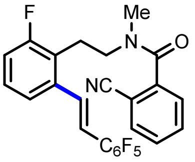

7.296
7.275
7.158
7.138
4.591
3.591
3.408
3.339
3.322
3.304
3.276
3.263
3.244
3.230
2.731
2.716
2.692
2.677
2.613
2.593
2.574
2.553
1.402
2.28
2.07
1.00
3.04
0.93
2.20
1.04
1.02
9.23
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)


172.267
155.857
139.845
132.874
129.029
128.920
79.508
77.478
77.160
76.841
51.795
45.584
41.865
38.099
28.379
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)

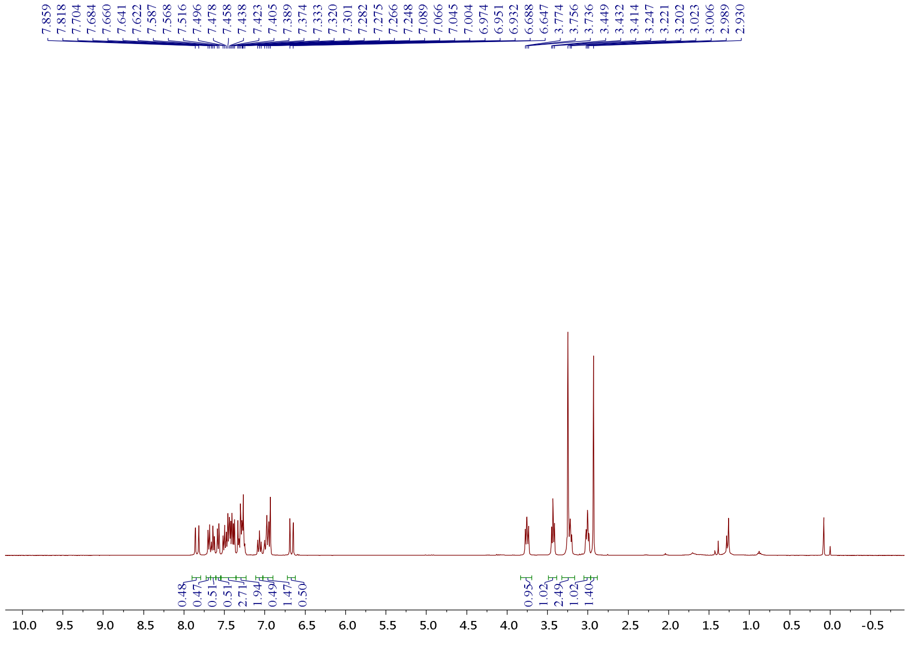

Cl
BocMeN
CO2Me

S7


7.280
7.262
7.181
7.154
7.134
7.116
3.592
3.444
3.420
3.317
3.305
3.283
2.758
2.721
2.703
2.663
2.648
2.621
2.601
1.396
2.19
2.10
5.03
1.03
4.00
1.00
9.15
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)


F
Me
N
O
NC
C6F5

S9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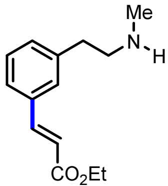
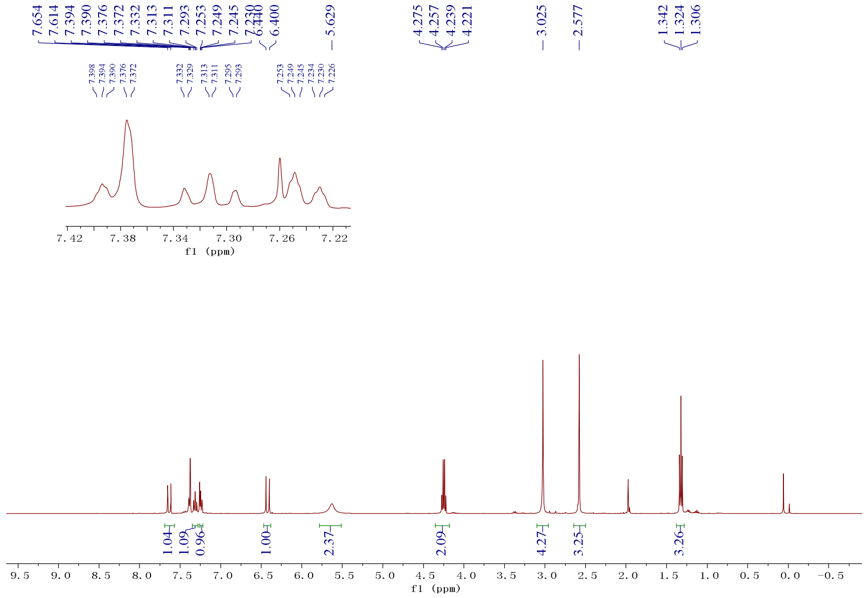
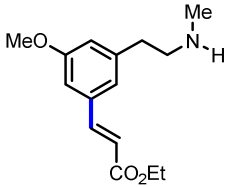
7.704
7.684
7.660
7.641
7.622
7.587
7.568
7.516
7.496
7.478
7.458
7.438
7.423
7.405
7.389
7.374
7.333
7.320
7.301
7.282
7.275
7.266
7.248
7.089
7.066
7.045
7.004
6.974
6.951
6.932
6.688
6.647
3.774
3.756
3.736
3.449
3.432
3.414
3.247
3.221
3.202
3.023
3.006
2.989
2.930
0.48
0.47
0.51
0.51
2.71
1.94
0.49
1.47
0.50
0.95
1.02
2.49
1.02
1.40
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5

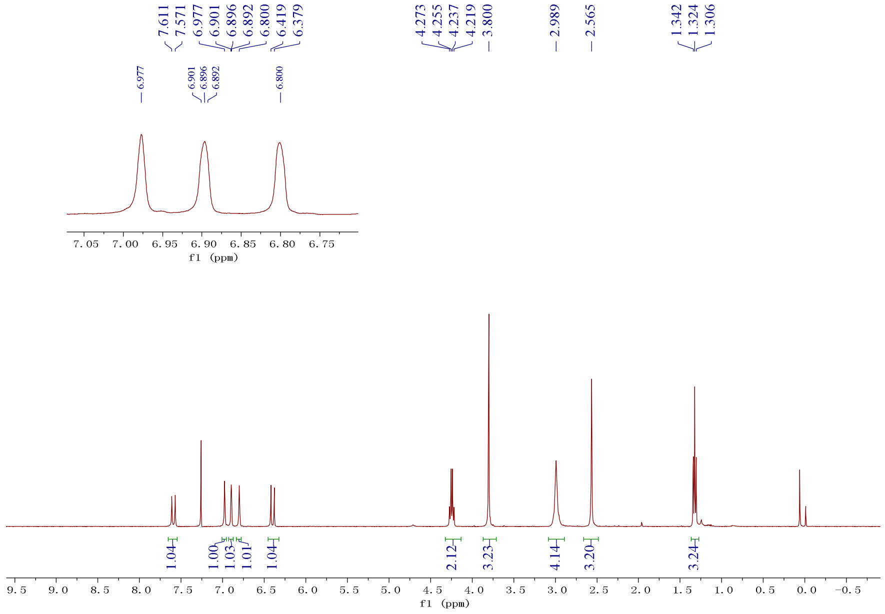

Me
N
H
CO2Et

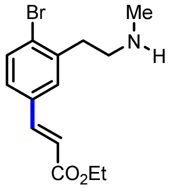
S10


7.654
7.614
7.394
7.390
7.376
7.372
7.332
7.313
7.311
7.293
7.253
7.249
7.245
7.230
6.440
6.400
5.629
4.275
4.257
4.239
4.221
3.025
2.577
1.342
1.324
1.306
7.398
7.394
7.390
7.376
7.372
7.332
7.329
7.313
7.311
7.295
7.293
7.253
7.249
7.245
7.234
7.230
7.226
7.42
7.38
7.34
7.30
7.26
7.22
f1 (ppm)
1.04
1.09
0.96
1.00
2.37
2.09
4.27
3.25
3.26
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)

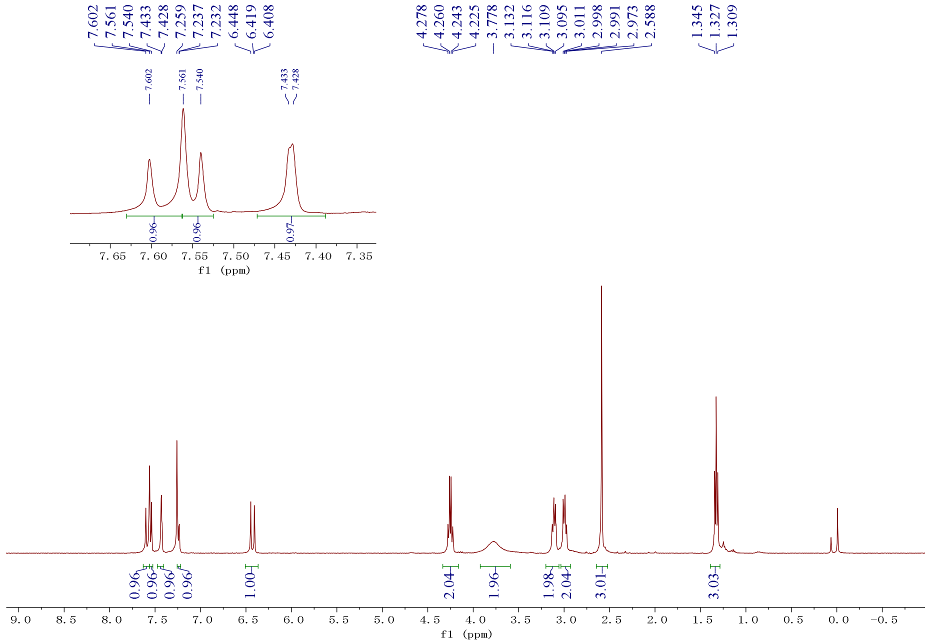

Me
MeO
N
H
CO2Et

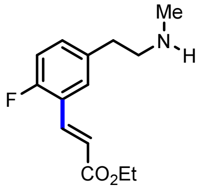
S11


7.611
7.571
6.977
6.901
6.896
6.892
6.800
6.419
6.379
4.273
4.255
4.237
4.219
3.800
2.989
2.565
1.342
1.324
1.306
6.977
6.901
6.896
6.892
6.800
7.05
7.00
6.95
6.90
6.85
6.80
6.75
f1 (ppm)
1.04
1.00
1.03
1.01
1.04
2.12
3.23
4.14
3.20
3.24
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)

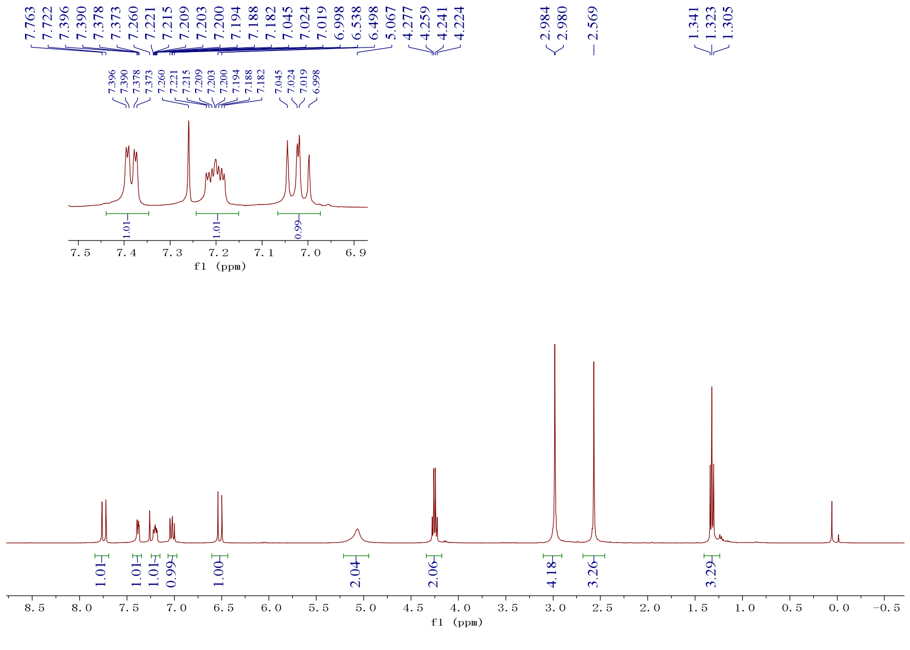

Br
Me
N
H
CO2Et

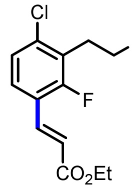
S12


7.602
7.561
7.540
7.433
7.428
7.259
7.237
7.232
6.448
6.419
6.408
4.278
4.260
4.243
4.225
3.778
3.132
3.116
3.109
3.095
3.011
2.998
2.991
2.973
2.588
1.345
1.327
1.309
7.602
7.561
7.540
7.433
7.428
0.96
0.96
0.97
7.65 7.60 7.55 7.50 7.45 7.40 7.35
f1 (ppm)
0.96
0.96
0.96
0.96
1.00
2.04
1.96
1.98
2.04
3.01
3.03
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)

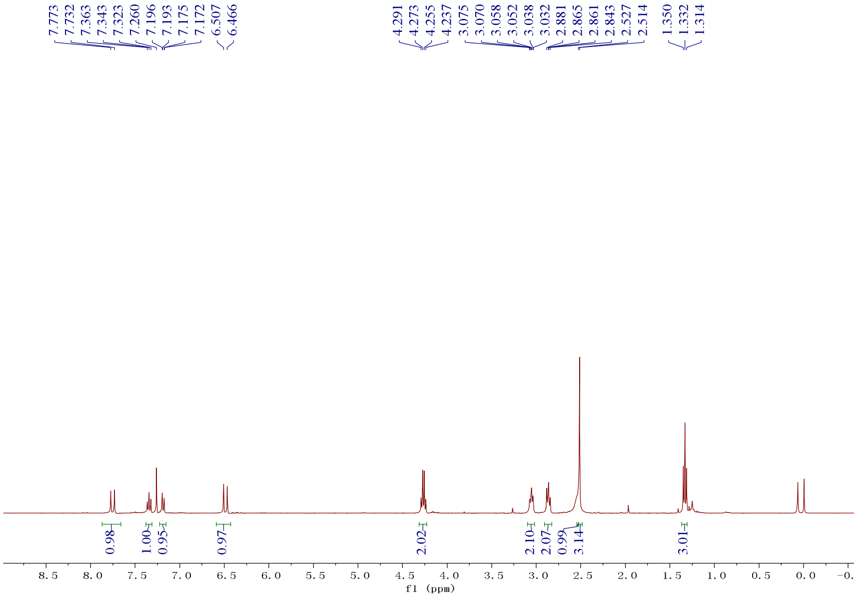

Me
N
H
F
CO2Et

S13


7.763
7.722
7.396
7.390
7.378
7.373
7.260
7.221
7.215
7.209
7.203
7.200
7.194
7.188
7.182
7.045
7.024
7.019
6.998
6.538
6.498
5.067
4.277
4.259
4.241
4.224
2.984
2.980
2.569
1.341
1.323
1.305
7.396
7.390
7.378
7.373
7.260
7.221
7.215
7.209
7.203
7.200
7.194
7.188
7.182
7.045
7.024
7.019
6.998
1.01
1.01
0.99
7.5 7.4 7.3 7.2 7.1 7.0 6.9
f1 (ppm)
1.01
1.01
1.01
0.99
1.00
2.04
2.06
4.18
3.26
3.29
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)


Cl
Me
N
H
F
CO2Et

S14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7.363
7.343
7.323
7.260
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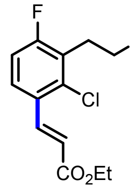
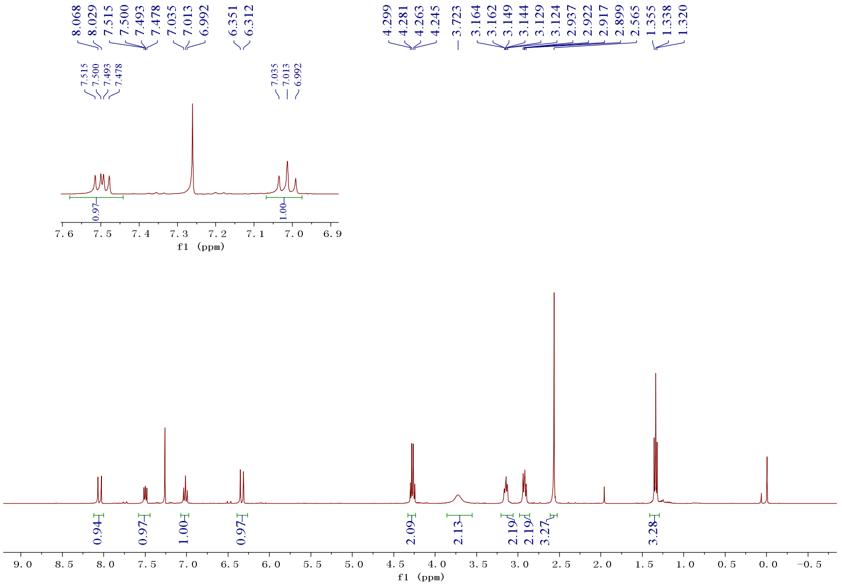
7.193
7.175
7.172
6.507
6.466
4.291
4.273
4.255
4.237
3.075
3.070
3.058
3.052
3.038
3.032
2.881
2.865
2.861
2.843
2.527
2.514
1.350
1.332
1.314
0.98
1.00
0.95
0.97
2.02
2.10
2.07
0.99
3.14
3.01
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.
f1 (ppm)


F
Me
N
H
Cl
CO2Et

S15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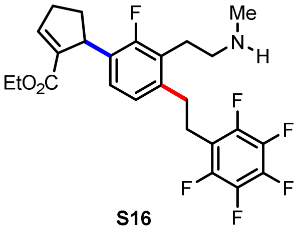
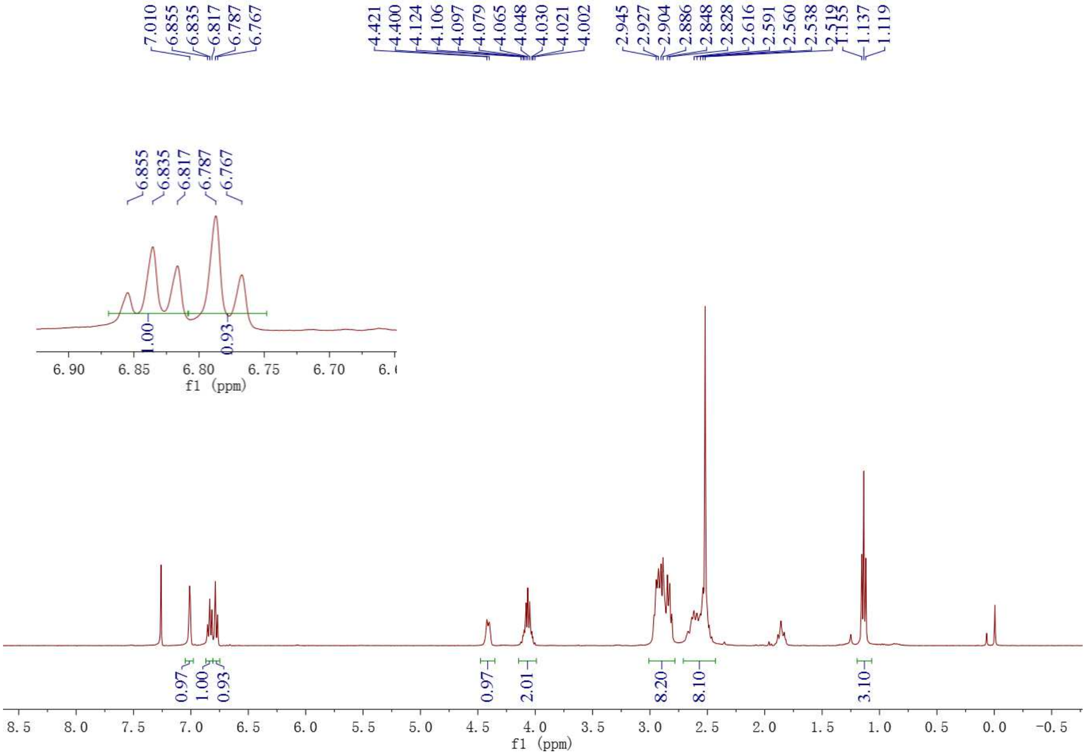
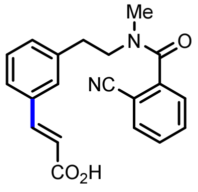
8.029
7.515
7.500
7.493
7.478
7.035
7.013
6.992
6.351
6.312
4.299
4.281
4.263
4.245
3.723
3.164
3.149
3.144
3.129
3.124
2.937
2.922
2.917
2.899
2.565
1.355
1.338
1.320
7.515
7.500
7.493
7.478
7.035
7.013
6.992
0.97
1.00
7.6
7.5
7.4
7.3
7.2
7.1
7.0
6.9
f1 (ppm)
0.94
0.97
1.00
0.97
2.09
2.13
2.19
2.19
3.27
3.28
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)

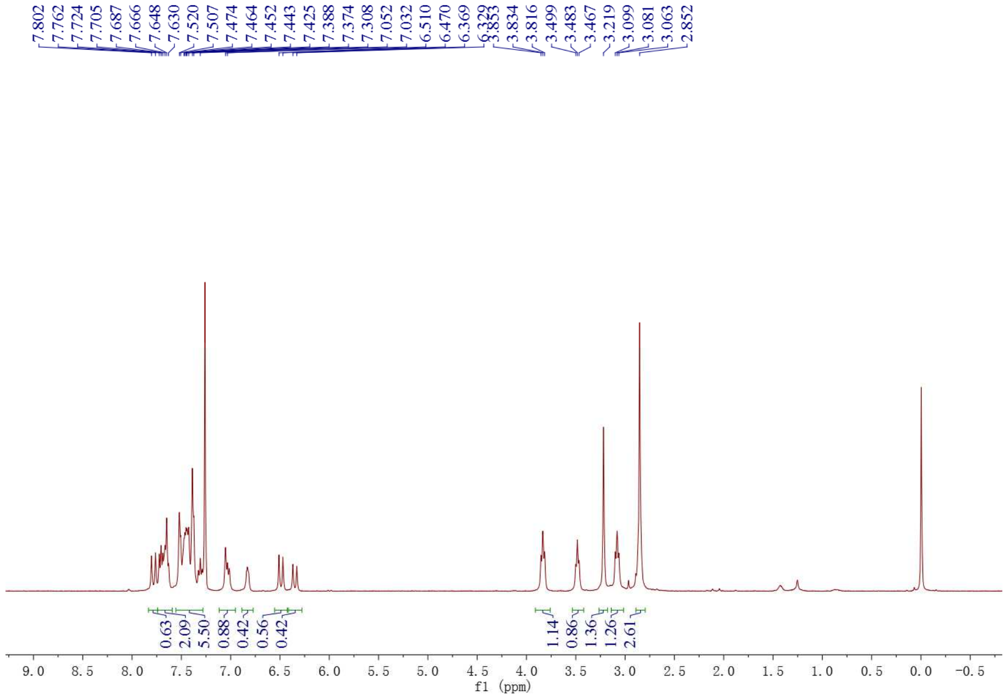

F
Me
N
H
EtO2C
F
F
F
F
F

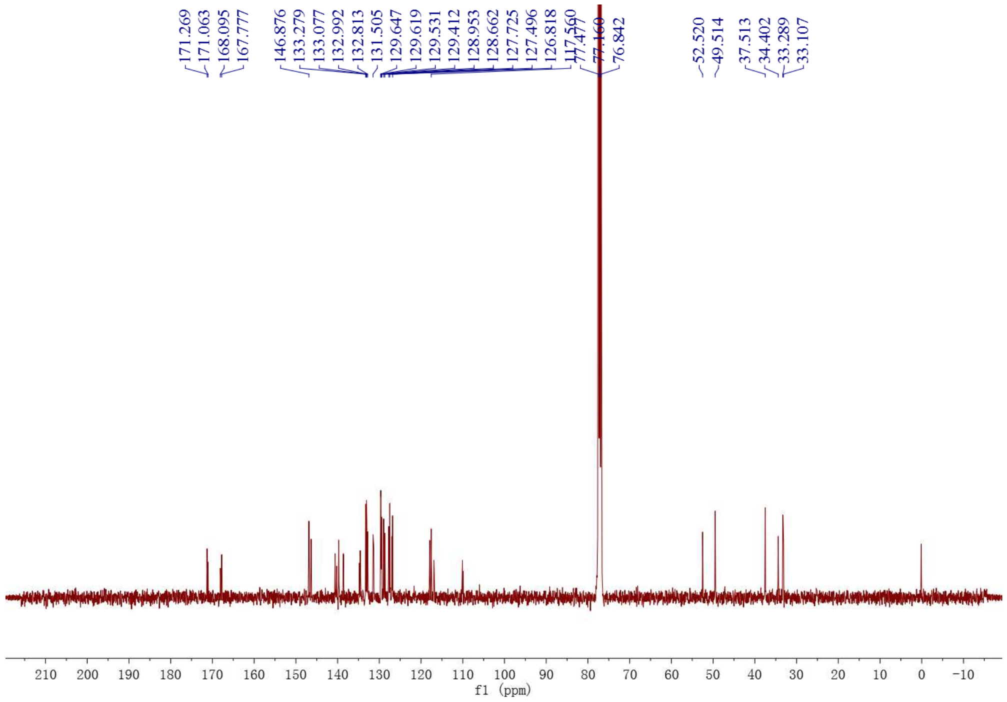
S16


7.010
6.855
6.835
6.817
6.787
6.767
4.421
4.400
4.124
4.106
4.097
4.079
4.065
4.048
4.030
4.021
4.002
2.945
2.927
2.904
2.886
2.848
2.828
2.616
2.591
2.560
2.538
2.519
1.155
1.137
1.119
6.855
6.835
6.817
6.787
6.767
1.00
0.93
6.90
6.85
6.80
6.75
6.70
f1 (ppm)
0.97
1.00
0.93
0.97
2.01
8.20
8.10
3.10
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)


Me
N
O
NC
CO2H

S17


7.802
7.762
7.724
7.705
7.687
7.666
7.648
7.630
7.520
7.507
7.474
7.464
7.452
7.443
7.425
7.388
7.374
7.308
7.052
7.032
6.510
6.470
6.369
6.329
3.853
3.834
3.816
3.499
3.483
3.467
3.219
3.099
3.081
3.063
2.852
0.63
2.09
5.50
0.88
0.42
0.56
0.42
1.14
0.86
1.36
1.26
2.61
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)


171.269
171.063
168.095
167.777
146.876
133.279
133.077
132.992
132.813
131.505
129.647
129.619
129.531
129.412
128.953
128.662
127.725
127.496
126.818
117.560
77.477
77.160
76.842
52.520
49.514
37.513
34.402
33.289
33.107
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)

4. X-Ray Crystallography data for 1a' (CCDC 1056709) and S17 (CCDC 1406595)

1a' (CCDC 1056709):

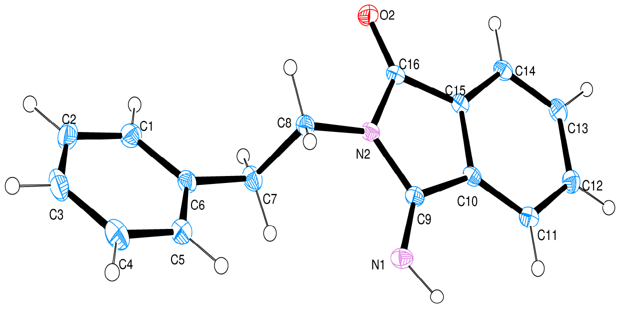


Table S1. Crystal data and structure refinement for Compound **1a'**.

Identification code	Compound-1a	
Empirical formula	C16 H14 N2 O	
Formula weight	250.29	
Temperature	100.0(2) K	
Wavelength	1.54184 Å	
Crystal system	Monoclinic	
Space group	P 21/n	
Unit cell dimensions	a = 13.4616(3) Å	α= 90°.
	b = 4.95900(10) Å	β= 93.710(2)°.
	c = 19.7696(5) Å	γ = 90°.
Volume	1316.98(5) Å^3	
Z	4	
Density (calculated)	1.262 Mg/m^3	
Absorption coefficient	0.637 mm^{-1}	
F(000)	528	
Crystal size	0.120 x 0.030 x 0.020 mm^3	
Theta range for data collection	3.859 to 73.251°.	
Index ranges	-15<=h<=16, -3<=k<=5, -20<=l<=24	
Reflections collected	4354	
Independent reflections	2540 [R(int) = 0.0222]	
Completeness to theta = 67.684°	99.9 %	
Absorption correction	Semi-empirical from equivalents	
Max. and min. transmission	1.00000 and 0.87424	
Refinement method	Full-matrix least-squares on F^2	

Data / restraints / parameters	2540 / 0 / 176
Goodness-of-fit on F^2	1.042
Final R indices [I>2sigma(I)]	R1 = 0.0368, wR2 = 0.0911
R indices (all data)	R1 = 0.0474, wR2 = 0.0986
Extinction coefficient	n/a
Largest diff. peak and hole	0.211 and -0.205 e.Å^{-3}

Table S2. Atomic coordinates (x 10^4) and equivalent isotropic displacement parameters ($Å^2$x 10^3) for lg-003_a. U(eq) is defined as one third of the trace of the orthogonalized U^{ij} tensor.

	x	y	z	U(eq)
O(2)	6167(1)	5269(2)	6691(1)	26(1)
N(1)	3017(1)	2771(2)	7234(1)	22(1)
N(2)	4512(1)	4401(2)	6853(1)	19(1)
C(1)	3362(1)	8744(3)	4795(1)	27(1)
C(2)	2802(1)	10768(3)	4462(1)	32(1)
C(3)	1881(1)	11453(3)	4677(1)	33(1)
C(4)	1514(1)	10119(3)	5223(1)	32(1)
C(5)	2073(1)	8106(3)	5555(1)	27(1)
C(6)	3004(1)	7395(3)	5348(1)	22(1)
C(7)	3614(1)	5276(3)	5733(1)	24(1)
C(8)	4060(1)	6445(3)	6403(1)	20(1)
C(9)	3962(1)	2696(3)	7252(1)	18(1)
C(10)	4707(1)	1037(3)	7653(1)	18(1)
C(11)	4585(1)	-984(3)	8126(1)	21(1)
C(12)	5446(1)	-2135(3)	8433(1)	23(1)
C(13)	6390(1)	-1270(3)	8277(1)	23(1)
C(14)	6506(1)	756(3)	7799(1)	21(1)
C(15)	5647(1)	1864(3)	7490(1)	18(1)
C(16)	5531(1)	4030(3)	6971(1)	19(1)

Table S3. Bond lengths [Å] and angles [°] for lg-003_a.

O(2)-C(16)	1.2162(16)
N(1)-C(9)	1.2713(16)
N(1)-H(1N)	0.937(19)
N(2)-C(16)	1.3889(15)
N(2)-C(9)	1.4007(17)
N(2)-C(8)	1.4554(16)
C(1)-C(6)	1.3940(19)
C(1)-C(2)	1.394(2)
C(1)-H(1)	0.9500
C(2)-C(3)	1.378(2)
C(2)-H(2)	0.9500
C(3)-C(4)	1.384(2)
C(3)-H(3)	0.9500
C(4)-C(5)	1.389(2)
C(4)-H(4)	0.9500
C(5)-C(6)	1.3904(19)
C(5)-H(5)	0.9500
C(6)-C(7)	1.5081(19)
C(7)-C(8)	1.5331(18)
C(7)-H(7A)	0.9900
C(7)-H(7B)	0.9900
C(8)-H(8A)	0.9900
C(8)-H(8B)	0.9900
C(9)-C(10)	1.4855(18)
C(10)-C(15)	1.3880(17)
C(10)-C(11)	1.3878(19)
C(11)-C(12)	1.3950(18)
C(11)-H(11)	0.9500
C(12)-C(13)	1.3961(19)
C(12)-H(12)	0.9500
C(13)-C(14)	1.394(2)
C(13)-H(13)	0.9500
C(14)-C(15)	1.3852(18)
C(14)-H(14)	0.9500
C(15)-C(16)	1.4867(19)

C(9)-N(1)-H(1N)	111.5(11)
C(16)-N(2)-C(9)	112.16(11)
C(16)-N(2)-C(8)	124.34(11)
C(9)-N(2)-C(8)	123.37(10)
C(6)-C(1)-C(2)	120.79(14)
C(6)-C(1)-H(1)	119.6
C(2)-C(1)-H(1)	119.6
C(3)-C(2)-C(1)	120.10(14)
C(3)-C(2)-H(2)	119.9
C(1)-C(2)-H(2)	119.9
C(2)-C(3)-C(4)	119.74(14)
C(2)-C(3)-H(3)	120.1
C(4)-C(3)-H(3)	120.1
C(3)-C(4)-C(5)	120.17(14)
C(3)-C(4)-H(4)	119.9
C(5)-C(4)-H(4)	119.9
C(4)-C(5)-C(6)	120.93(13)
C(4)-C(5)-H(5)	119.5
C(6)-C(5)-H(5)	119.5
C(5)-C(6)-C(1)	118.27(13)
C(5)-C(6)-C(7)	119.96(12)
C(1)-C(6)-C(7)	121.74(13)
C(6)-C(7)-C(8)	110.03(11)
C(6)-C(7)-H(7A)	109.7
C(8)-C(7)-H(7A)	109.7
C(6)-C(7)-H(7B)	109.7
C(8)-C(7)-H(7B)	109.7
H(7A)-C(7)-H(7B)	108.2
N(2)-C(8)-C(7)	112.95(11)
N(2)-C(8)-H(8A)	109.0
C(7)-C(8)-H(8A)	109.0
N(2)-C(8)-H(8B)	109.0
C(7)-C(8)-H(8B)	109.0
H(8A)-C(8)-H(8B)	107.8
N(1)-C(9)-N(2)	122.07(12)
N(1)-C(9)-C(10)	132.16(12)
N(2)-C(9)-C(10)	105.77(10)
C(15)-C(10)-C(11)	121.25(12)

C(15)-C(10)-C(9)	107.89(11)
C(11)-C(10)-C(9)	130.85(11)
C(10)-C(11)-C(12)	117.26(12)
C(10)-C(11)-H(11)	121.4
C(12)-C(11)-H(11)	121.4
C(11)-C(12)-C(13)	121.35(13)
C(11)-C(12)-H(12)	119.3
C(13)-C(12)-H(12)	119.3
C(14)-C(13)-C(12)	121.00(12)
C(14)-C(13)-H(13)	119.5
C(12)-C(13)-H(13)	119.5
C(15)-C(14)-C(13)	117.23(12)
C(15)-C(14)-H(14)	121.4
C(13)-C(14)-H(14)	121.4
C(14)-C(15)-C(10)	121.90(13)
C(14)-C(15)-C(16)	129.66(12)
C(10)-C(15)-C(16)	108.44(11)
O(2)-C(16)-N(2)	125.01(12)
O(2)-C(16)-C(15)	129.27(12)
N(2)-C(16)-C(15)	105.72(10)

Symmetry transformations used to generate equivalent atoms:

Table S4. Anisotropic displacement parameters ($Å^2 x 10^3$)for lg-003_a. The anisotropic displacement factor exponent takes the form: $-2\pi^2[h^2a^{*2}U^{11} + ... + 2 h k a^* b^* U^{12}]$

	U^{11}	U^{22}	U^{33}	U^{23}	U^{13}	U^{12}
O(2)	18(1)	32(1)	29(1)	5(1)	2(1)	-5(1)
N(1)	14(1)	20(1)	30(1)	-1(1)	2(1)	1(1)
N(2)	14(1)	19(1)	23(1)	0(1)	-1(1)	-1(1)
C(1)	30(1)	28(1)	23(1)	-3(1)	1(1)	-6(1)
C(2)	49(1)	26(1)	21(1)	3(1)	-5(1)	-10(1)
C(3)	42(1)	24(1)	29(1)	0(1)	-16(1)	2(1)
C(4)	25(1)	37(1)	33(1)	-2(1)	-6(1)	5(1)
C(5)	24(1)	31(1)	26(1)	4(1)	-1(1)	-2(1)
C(6)	25(1)	19(1)	21(1)	-2(1)	-4(1)	-2(1)
C(7)	26(1)	21(1)	25(1)	-3(1)	-4(1)	2(1)
C(8)	19(1)	17(1)	24(1)	1(1)	-2(1)	0(1)
C(9)	17(1)	16(1)	21(1)	-3(1)	0(1)	0(1)
C(10)	16(1)	17(1)	20(1)	-4(1)	-1(1)	1(1)
C(11)	18(1)	21(1)	23(1)	-3(1)	1(1)	-1(1)
C(12)	25(1)	22(1)	22(1)	1(1)	0(1)	2(1)
C(13)	18(1)	26(1)	24(1)	-1(1)	-3(1)	5(1)
C(14)	14(1)	25(1)	25(1)	-1(1)	-1(1)	1(1)
C(15)	16(1)	20(1)	19(1)	-3(1)	0(1)	0(1)
C(16)	15(1)	21(1)	22(1)	-4(1)	-1(1)	-1(1)

S17 (CCDC 1406595):

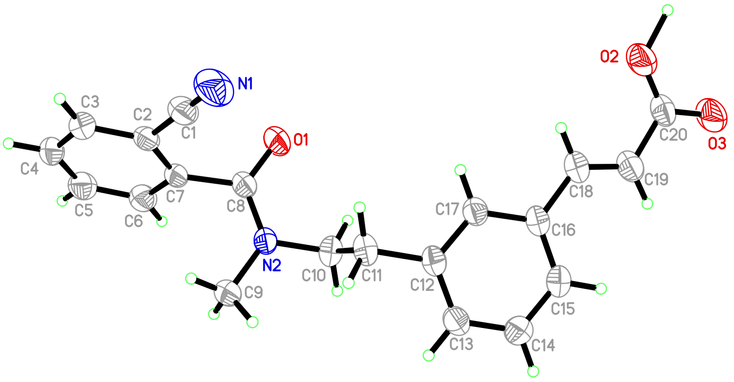


Table 1. Crystal data and structure refinement for 1_a.

Identification code	compound-1	
Empirical formula	C20 H18 N2 O3	
Formula weight	334.36	
Temperature	293(2) K	
Wavelength	0.71073 Å	
Crystal system	Monoclinic	
Space group	C 2/c	
Unit cell dimensions	a = 33.970(16) Å	α= 90°.
	b = 6.299(3) Å	β= 92.257(8)°.
	c = 16.431(8) Å	γ = 90°.
Volume	3513(3) Å^3	
Z	8	
Density (calculated)	1.264 Mg/m^3	
Absorption coefficient	0.086 mm^{-1}	
F(000)	1408	
Crystal size	0.200 x 0.180 x 0.150 mm^3	
Theta range for data collection	2.400 to 27.516°.	
Index ranges	-44<=h<=42, -8<=k<=8, -20<=l<=21	
Reflections collected	12961	
Independent reflections	4016 [R(int) = 0.0269]	
Completeness to theta = 25.242°	99.7 %	
Absorption correction	Semi-empirical from equivalents	
Max. and min. transmission	1.0000 and 0.9560	
Refinement method	Full-matrix least-squares on F^2	
Data / restraints / parameters	4016 / 0 / 230	

Goodness-of-fit on F^2	1.090
Final R indices [I>2sigma(I)]	R1 = 0.0586, wR2 = 0.1406
R indices (all data)	R1 = 0.0856, wR2 = 0.1579
Extinction coefficient	n/a
Largest diff. peak and hole	0.202 and -0.178 e.Å^{-3}

Table 2. Atomic coordinates (x 10^4) and equivalent isotropic displacement parameters ($Å^2$x 10^3) for 1_a. U(eq) is defined as one third of the trace of the orthogonalized U^{ij} tensor.

	x	y	z	U(eq)
O(1)	6374(1)	358(3)	4870(1)	100(1)
O(2)	5338(1)	548(3)	9311(1)	91(1)
O(3)	4831(1)	2477(3)	9675(1)	92(1)
N(1)	7374(1)	36(4)	5463(1)	97(1)
N(2)	6407(1)	3734(2)	4426(1)	51(1)
C(1)	7270(1)	70(3)	4796(1)	65(1)
C(2)	7135(1)	118(3)	3949(1)	51(1)
C(3)	7372(1)	-688(3)	3355(1)	62(1)
C(4)	7239(1)	-648(3)	2551(1)	68(1)
C(5)	6876(1)	156(3)	2344(1)	66(1)
C(6)	6640(1)	968(3)	2932(1)	60(1)
C(7)	6768(1)	960(3)	3743(1)	49(1)
C(8)	6499(1)	1682(3)	4398(1)	58(1)
C(9)	6603(1)	5366(3)	3965(1)	62(1)
C(10)	6134(1)	4463(3)	5033(1)	57(1)
C(11)	6344(1)	5200(3)	5814(1)	58(1)
C(12)	6052(1)	5940(3)	6419(1)	52(1)
C(13)	5885(1)	7952(3)	6357(1)	58(1)
C(14)	5618(1)	8629(3)	6919(1)	62(1)
C(15)	5510(1)	7305(3)	7541(1)	58(1)
C(16)	5659(1)	5249(3)	7599(1)	52(1)
C(17)	5934(1)	4611(3)	7038(1)	53(1)
C(18)	5535(1)	3720(3)	8211(1)	58(1)
C(19)	5234(1)	3871(4)	8687(1)	65(1)
C(20)	5133(1)	2203(4)	9259(1)	63(1)

Table 3. Bond lengths [Å] and angles [°] for 1_a.

O(1)-C(8)	1.226(2)
O(2)-C(20)	1.254(3)
O(2)-H(2O)	1.26(3)
O(3)-C(20)	1.268(2)
N(1)-C(1)	1.139(3)
N(2)-C(8)	1.331(2)
N(2)-C(9)	1.454(2)
N(2)-C(10)	1.462(2)
C(1)-C(2)	1.448(3)
C(2)-C(3)	1.386(3)
C(2)-C(7)	1.387(3)
C(3)-C(4)	1.380(3)
C(3)-H(3)	0.9500
C(4)-C(5)	1.363(3)
C(4)-H(4)	0.9500
C(5)-C(6)	1.378(3)
C(5)-H(5)	0.9500
C(6)-C(7)	1.385(3)
C(6)-H(6)	0.9500
C(7)-C(8)	1.508(2)
C(9)-H(9A)	0.9800
C(9)-H(9B)	0.9800
C(9)-H(9C)	0.9800
C(10)-C(11)	1.517(3)
C(10)-H(10A)	0.9900
C(10)-H(10B)	0.9900
C(11)-C(12)	1.506(2)
C(11)-H(11A)	0.9900
C(11)-H(11B)	0.9900
C(12)-C(17)	1.387(2)
C(12)-C(13)	1.390(3)
C(13)-C(14)	1.387(3)
C(13)-H(13)	0.9500
C(14)-C(15)	1.380(3)
C(14)-H(14)	0.9500
C(15)-C(16)	1.393(3)

C(15)-H(15)	0.9500
C(16)-C(17)	1.397(2)
C(16)-C(18)	1.467(3)
C(17)-H(17)	0.9500
C(18)-C(19)	1.314(3)
C(18)-H(18)	0.9500
C(19)-C(20)	1.459(3)
C(19)-H(19)	0.9500

C(20)-O(2)-H(2O)	122.8(11)
C(8)-N(2)-C(9)	123.76(16)
C(8)-N(2)-C(10)	119.01(15)
C(9)-N(2)-C(10)	116.66(15)
N(1)-C(1)-C(2)	179.6(3)
C(3)-C(2)-C(7)	120.70(16)
C(3)-C(2)-C(1)	119.92(18)
C(7)-C(2)-C(1)	119.38(17)
C(4)-C(3)-C(2)	119.3(2)
C(4)-C(3)-H(3)	120.3
C(2)-C(3)-H(3)	120.3
C(5)-C(4)-C(3)	120.31(18)
C(5)-C(4)-H(4)	119.8
C(3)-C(4)-H(4)	119.8
C(4)-C(5)-C(6)	120.64(18)
C(4)-C(5)-H(5)	119.7
C(6)-C(5)-H(5)	119.7
C(5)-C(6)-C(7)	120.21(19)
C(5)-C(6)-H(6)	119.9
C(7)-C(6)-H(6)	119.9
C(6)-C(7)-C(2)	118.80(16)
C(6)-C(7)-C(8)	120.65(18)
C(2)-C(7)-C(8)	120.35(16)
O(1)-C(8)-N(2)	123.41(18)
O(1)-C(8)-C(7)	118.74(18)
N(2)-C(8)-C(7)	117.85(15)
N(2)-C(9)-H(9A)	109.5
N(2)-C(9)-H(9B)	109.5
H(9A)-C(9)-H(9B)	109.5

N(2)-C(9)-H(9C)	109.5
H(9A)-C(9)-H(9C)	109.5
H(9B)-C(9)-H(9C)	109.5
N(2)-C(10)-C(11)	112.59(15)
N(2)-C(10)-H(10A)	109.1
C(11)-C(10)-H(10A)	109.1
N(2)-C(10)-H(10B)	109.1
C(11)-C(10)-H(10B)	109.1
H(10A)-C(10)-H(10B)	107.8
C(12)-C(11)-C(10)	110.68(15)
C(12)-C(11)-H(11A)	109.5
C(10)-C(11)-H(11A)	109.5
C(12)-C(11)-H(11B)	109.5
C(10)-C(11)-H(11B)	109.5
H(11A)-C(11)-H(11B)	108.1
C(17)-C(12)-C(13)	118.38(17)
C(17)-C(12)-C(11)	120.85(18)
C(13)-C(12)-C(11)	120.74(17)
C(14)-C(13)-C(12)	120.49(18)
C(14)-C(13)-H(13)	119.8
C(12)-C(13)-H(13)	119.8
C(15)-C(14)-C(13)	120.43(19)
C(15)-C(14)-H(14)	119.8
C(13)-C(14)-H(14)	119.8
C(14)-C(15)-C(16)	120.43(17)
C(14)-C(15)-H(15)	119.8
C(16)-C(15)-H(15)	119.8
C(15)-C(16)-C(17)	118.25(17)
C(15)-C(16)-C(18)	122.90(17)
C(17)-C(16)-C(18)	118.84(18)
C(12)-C(17)-C(16)	121.95(18)
C(12)-C(17)-H(17)	119.0
C(16)-C(17)-H(17)	119.0
C(19)-C(18)-C(16)	127.8(2)
C(19)-C(18)-H(18)	116.1
C(16)-C(18)-H(18)	116.1
C(18)-C(19)-C(20)	122.6(2)
C(18)-C(19)-H(19)	118.7

C(20)-C(19)-H(19)	118.7
O(2)-C(20)-O(3)	122.4(2)
O(2)-C(20)-C(19)	119.91(19)
O(3)-C(20)-C(19)	117.7(2)

Symmetry transformations used to generate equivalent atoms:

Table 4. Anisotropic displacement parameters (Å^{2}x 10^3)for 1_a. The anisotropic displacement factor exponent takes the form: $-2\pi^2[h^2a^{*2}U^{11} + ... + 2 h k a^* b^* U^{12}]$

	U^{11}	U^{22}	U^{33}	U^{23}	U^{13}	U^{12}
O(1)	143(2)	59(1)	105(1)	17(1)	77(1)	0(1)
O(2)	92(1)	100(1)	82(1)	30(1)	40(1)	20(1)
O(3)	83(1)	106(1)	91(1)	29(1)	45(1)	17(1)
N(1)	137(2)	100(2)	54(1)	10(1)	-6(1)	4(1)
N(2)	58(1)	49(1)	48(1)	-2(1)	16(1)	-3(1)
C(1)	85(2)	59(1)	51(1)	7(1)	8(1)	2(1)
C(2)	70(1)	40(1)	44(1)	5(1)	10(1)	-3(1)
C(3)	72(1)	57(1)	58(1)	7(1)	16(1)	11(1)
C(4)	97(2)	57(1)	52(1)	0(1)	27(1)	10(1)
C(5)	96(2)	59(1)	43(1)	-2(1)	3(1)	2(1)
C(6)	69(1)	58(1)	52(1)	3(1)	3(1)	2(1)
C(7)	63(1)	38(1)	46(1)	2(1)	15(1)	-3(1)
C(8)	72(1)	48(1)	55(1)	3(1)	21(1)	-5(1)
C(9)	80(1)	49(1)	59(1)	3(1)	19(1)	-4(1)
C(10)	52(1)	67(1)	52(1)	-9(1)	11(1)	1(1)
C(11)	55(1)	75(1)	46(1)	-1(1)	10(1)	-1(1)
C(12)	52(1)	64(1)	41(1)	-3(1)	5(1)	-6(1)
C(13)	63(1)	62(1)	49(1)	5(1)	7(1)	-5(1)
C(14)	62(1)	60(1)	64(1)	0(1)	6(1)	4(1)
C(15)	55(1)	68(1)	51(1)	-7(1)	10(1)	0(1)
C(16)	52(1)	64(1)	41(1)	-2(1)	7(1)	-7(1)
C(17)	59(1)	56(1)	44(1)	-1(1)	6(1)	-2(1)
C(18)	58(1)	72(1)	44(1)	0(1)	7(1)	-6(1)
C(19)	64(1)	80(2)	52(1)	10(1)	9(1)	2(1)
C(20)	56(1)	85(2)	48(1)	7(1)	11(1)	1(1)

Table 5. Hydrogen coordinates (x 10^4) and isotropic displacement parameters ($Å^2$x 10^3) for 1_a.

	x	y	z	U(eq)
H(2O)	5263(7)	-960(40)	9787(16)	109
H(3)	7624	-1263	3500	75
H(4)	7401	-1184	2139	82
H(5)	6785	156	1790	79
H(6)	6388	1536	2780	72
H(9A)	6868	4881	3839	94
H(9B)	6623	6671	4289	94
H(9C)	6451	5646	3457	94
H(10A)	5952	3291	5159	68
H(10B)	5975	5648	4801	68
H(11A)	6502	4018	6052	70
H(11B)	6526	6378	5692	70
H(13)	5954	8869	5926	70
H(14)	5508	10014	6875	74
H(15)	5333	7798	7932	69
H(17)	6043	3225	7080	63
H(18)	5690	2471	8270	70
H(19)	5076	5115	8658	78

Table 6. Hydrogen bonds for 1_a [Å and °].

D-H...A	d(D-H)	d(H...A)	d(D...A)	<(DHA)
O(2)-H(2O)...O(2)#1	1.26(3)	2.58(3)	3.361(3)	117.7(15)
O(2)-H(2O)...O(3)#1	1.26(3)	1.35(3)	2.610(2)	176(2)

Symmetry transformations used to generate equivalent atoms:

#1 -x+1,-y,-z+2