Electronic Supplementary Material (ESI) for ChemComm.
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Supplementary Information

Photoredox catalysis under shear using thin film vortex fluidics

Michael N. Gandy,[a] Colin L. Raston[b*] and Keith A. Stubbs[a*]

[a]*School of Chemistry and Biochemistry, The University of Western Australia, Crawley, WA, 6009, Australia.*
E-mail: keith.stubbs@uwa.edu.au

[b]*Centre for NanoScale Science and Technology, School of Chemical and Physical Sciences, Flinders University, Bedford Park, SA, 5042, Australia.*
E-mail: colin.raston@flinders.edu.au

General

The design and operation of the vortex fluidic device (VFD) used herein is detailed elsewhere.[1] All starting materials were obtained commercially and used without further purification unless otherwise stated. Thin layer chromatography (TLC) was conducted on Merck Kieselgel 60 F254 plates and products were visualised under shortwave UV light (254 nm). ^{1}H- and ^{13}C nuclear magnetic resonance spectra were obtained using a Bruker AV-500 spectrometer (500 MHz for ^{1}H and 125 MHz for ^{13}C) or Bruker Avance 600 spectrometer (600 MHz for ^{1}H and 150 MHz for ^{13}C). Each sample was dissolved in d-chloroform and each spectrum was calibrated using the residual solvent peak (δ 7.26 for ^{1}H and δ 77.0 for ^{13}C). Mass spectra were recorded with a Waters LCT Premier XE spectrometer, run in positive ionisation W-mode, using the electrospray ionisation technique.

Optimisation of reaction conditions for the coupling of *N*-phenyltetrahydroisoquinoline and nitromethane with Rose Bengal

A 10 mm NMR tube was charged with *N*-phenyltetrahydroisoquinoline (0.075 mmol), Rose Bengal (3.80 mg, 5 mol%) and nitromethane (1 mL). The tube was capped tightly then rotated in the VFD at 2000, 4000 or 7000 rpm with a tilt angle of 15, 45 or 75° for 90 minutes in the presence of green LEDs at a distance of 3 cm. The mixture was then diluted with EtOAc (2-3 mL) transferred to a round bottom flask and evaporated to dryness. The residue was then redissolved in EtOAc and adsorbed onto silica gel and subsequent flash chromatography (EtOAc:hexanes, 1:9) gave the desired compound.

General procedure for photoredox aza-Henry reactions with Rose Bengal

A 10 mm NMR tube was charged with the appropriate tetrahydroisoquinoline (0.075 mmol), Rose Bengal (0.76 mg, 1 mol%), the appropriate nitro compound (0.4 mL) and water/MeCN (0.05 mL/0.55 mL). The tube was capped tightly then rotated in the VFD at 4000 rpm with a tilt angle of 45° for 75 minutes in the presence of green LEDs at a distance of 3 cm. The mixture was then diluted with EtOAc (2-3 mL) and transferred to a round bottom flask and evaporated to dryness. The residue was then redissolved in EtOAc and adsorbed onto silica gel and subsequent flash chromatography (EtOAc:hexanes, 1:9) gave the desired compounds.

1-Nitromethyl-2-phenyl-1,2,3,4-tetrahydroisoquinoline

Using *N*-phenyltetrahydroisoquinoline[2] the title compound was obtained (80%). ^{1}H and ^{13}C NMR spectra were consistent with literature values.[3] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.33-7.16 (m, 6H), 7.03-7.00 (m, 2H), 6.91-6.87 (m, 1H), 5.56 (t, *J* = 7.5 Hz, 1H), 4.90 (dd, *J* = 7.5, 11.5 Hz, 1H), 4.57 (dd, *J* = 7.5, 11.5 Hz, 1H), 3.73-3.63 (m, 2H), 3.15-3.09 (m, 1H), 2.82 (dt, *J* = 5.0, 16 Hz, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 148.40, 135.25, 132.91, 129.48, 129.16, 128.09, 126.98, 126.68, 119.41, 115.09, 78.76, 58.17, 42.06, 26.44.

2-(4-Methylphenyl)-1-nitromethyl-1,2,3,4-tetrahydroisoquinoline (Table 2, Entry 1)

Using *N*-(4-methylphenyl)tetrahydroisoquinoline[2] the title compound was obtained (79%). ^{1}H and ^{13}C NMR spectra were consistent with literature values.[3] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.26-7.16 (m, 4H), 7.09-7.07 (m, 2H), 6.91-6.88 (m, 2H), 5.50 (t, *J* = 7.0 Hz, 1H), 4.85 (dd, *J* = 7.0, 12.0 Hz, 1H), 4.56 (dd, *J* = 7.0, 12.0 Hz, 1H), 3.67-3.56 (m, 2H), 3.10-3.03 (m, 1H), 2.79-2.73 (m, 1H), 2.27 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 146.35, 135.32, 132.93, 129.95, 129.25, 129.10. 127.97, 126.94, 126.59, 115.89, 78.81, 58.36, 42.30, 26.22, 20.32.

2-(4-Methoxyphenyl)-1-nitromethyl-1,2,3,4-tetrahydroisoquinoline (Table 2, Entry 2)

Using *N*-(4-methoxyphenyl)tetrahydroisoquinoline[2] the title compound was obtained (81%). ^{1}H and ^{13}C NMR spectra were consistent with literature values.[3] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.25-7.13 (m, 4H), 6.93-6.91 (m, 2H), 6.83-6.81 (m, 2H), 5.39 (dd, *J* = 4.0, 8.5 Hz, 1H), 4.83 (dd, *J* = 8.5, 12.0 Hz, 1H), 4.56 (dd, *J* = 8.5, 12.0 Hz, 1H), 3.75 (s, 3H), 3.61-3.52 (m, 2H), 3.05-2.98 (m, 1H), 2.73-2.68 (m, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 153.98, 143.04, 135.41, 132.88, 129.43, 127.87. 126.89, 126.60, 118.84, 114.69, 78.94, 58.89, 55.56, 43.13, 25.80.

2-(4-Bromophenyl)-1-nitromethyl-1,2,3,4-tetrahydroisoquinoline (Table 2, Entry 3)

Using *N*-(4-bromophenyl)tetrahydroisoquinoline[2] the title compound was obtained (83%). ^{1}H and ^{13}C NMR spectra were consistent with literature values.[4] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.36-7.33 (m, 2H), 7.28-7.12 (m, 4H), 6.87-6.83 (m, 2H), 5.49 (t, *J* =

7.0 Hz, 1H), 4.85 (dd, *J* = 8.0, 12.0 Hz, 1H), 4.57 (dd, *J* = 8.0, 12.0 Hz, 1H), 3.68-3.59 (m, 2H), 3.10-3.04 (m, 1H), 2.82-2.77 (m, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 147.48, 135.01, 132.45, 132.21, 129.27, 128.26. 126.95, 126.82, 116.78, 111.58, 78.61, 58.09, 42.10, 26.19.

1-(1-Nitroethyl)-2-phenyl-1,2,3,4-tetrahydroisoquinoline (Table 2, Entry 4)

Using *N*-phenyltetrahydroisoquinoline[2] the title compound was obtained (78%). ^{1}H and ^{13}C NMR spectra were consistent with literature values.[3] d.r. = 1:1.6; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.31-7.12 (m, 6H), 7.05-7.00 (m, 2H), 6.87-6.83 (m, 1H), 5.30-5.25 (m, 1H), 5.11-5.05 (m, 0.6H, major isomer), 4.95-4.89 (m, 0.3H, minor isomer), 3.89-3.84 (m, 0.6H), 3.65-3.59 (m, 1.4H), 3.11-3.05 (m, 1H), 2.99-2.89 (m, 1H), 1.73 (d, *J* = 7.0 Hz, 1.2H, minor isomer), 1.54 (d, *J* = 7.0 Hz, 2.6H, major isomer); ^{13}C NMR (125 MHz, $CDCl_3$, minor isomer marked*) δ 149.15*, 148.87, 135.61, 134.75*, 133.81*, 132.02, 129.42*, 129.30 (major and minor isomers), 129.09*, 128.70*, 128.33, 128.19, 127.25*, 126.59*, 126.12, 119.33, 118.78*, 115.43, 114.50*, 88.94*, 85.42, 62.73, 61.15*, 43.55*, 42.69, 26.74*, 26.40, 17.42*, 16.37.

2-(4-Methylphenyl)-1-(1-nitroethyl)-1,2,3,4-tetrahydroisoquinoline (Table 2, Entry 5)

Using *N*-(4-methylphenyl)tetrahydroisoquinoline[2] the title compound was obtained (72%). ^{1}H and ^{13}C NMR spectra were consistent with literature values.[4] d.r. = 1:1.5; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.25-7.00 (m, 6H), 6.91-6.88 (m, 1H), 5.18 (m, 1H), 5.06-5.00 (m, 0.6H, major isomer), 4.91-4.85 (m, 0.3H, minor isomer), 3.84-3.79 (m, 0.6H), 3.59-3.51 (m, 1.4H), 3.06-3.00 (m, 1H), 2.90-2.81 (m, 1H), 2.27 (s, 1.2H), 2.24 (s, 1.8H), 1.70 (d, *J* = 7.0 Hz, 1.2H, minor isomer), 1.54 (d, *J* = 7.0 Hz, 1.8H, major isomer); ^{13}C NMR (125 MHz, $CDCl_3$, minor isomer marked*) δ 149.13*, 148.78, 135.71, 134.86*, 133.78*, 132.04, 129.90*, 129.80 (major and minor isomers), 129.12*, 128.91*, 128.77, 128.40, 128.35*, 128.07*, 127.23, 126.51, 126.04, 116.07, 115.20*, 88.94*, 85.50, 62.89, 61.43*, 43.88*, 43.02, 26.53*, 26.27, 20.30*, 20.25, 17.35*, 16.40.

2-(4-Methoxyphenyl)-1-(1-nitroethyl)-1,2,3,4-tetrahydroisoquinoline (Table 2, Entry 6)

Using *N*-(4-methoxyphenyl)tetrahydroisoquinoline[2] the title compound was obtained (74%). ^{1}H and ^{13}C NMR spectra were consistent with literature values.[4] d.r. = 1:1.6; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.25-7.10 (m, 4H), 6.93-6.91 (m, 2H), 6.83-6.78 (m, 2H), 5.06-4.98 (m, 1.6H), 4.89-4.84 (m, 0.4H, minor isomer), 3.80-3.74 (m, 4H), 3.53-3.47 (m, 1.4H), 3.01-2.94 (m, 1H), 2.85-2.75 (m, 1H), 1.68 (d, *J* = 7.0 Hz, 1.2H, minor isomer), 1.54 (d, *J* = 7.0 Hz, 1.8H, major isomer); ^{13}C NMR (125 MHz, $CDCl_3$, minor isomer marked*) δ 153.82, 153.57*, 143.90*, 143.51, 135.82, 135.02*, 133.67*, 132.07, 129.25, 128.95*, 128.36*, 128.01, 127.97*, 127.19*, 126.51*, 126.03, 118.91, 118.25, 114.70*, 114.58, 88.81*, 85.75, 63.46, 62.17*, 55.60*, 55.55, 45.03*, 44.03, 26.26*, 17.09*, 16.56.

2-(4-Bromophenyl)-1-(1-nitroethyl)-1,2,3,4-tetrahydroisoquinoline (Table 2, Entry 7)

Using *N*-(4-bromophenyl)tetrahydroisoquinoline[2] the title compound was obtained (76%). ^{1}H and ^{13}C NMR spectra were consistent with literature values.[4] d.r. = 1:2.2; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.35-7.00 (m, 6H), 6.86-6.81 (m, 2H), 5.20 (d, *J* = 9.0 Hz, 0.4H, minor isomer), 5.15 (d, *J* = 9.0 Hz, 0.6H, major isomer) 5.03-4.98 (m, 0.6H), 4.89-4.84 (m, 0.4H), 3.84-3.78 (m, 0.6H), 3.59-3.48 (m, 1.4H), 3.06-3.00 (m, 1H), 2.95-2.88 (m, 1H), 1.67 (d, *J* = 6.5 Hz, 1.2H, minor isomer), 1.54 (d, *J* = 6.5 Hz, 1.8H, major isomer); ^{13}C NMR (125 MHz, $CDCl_3$, minor isomer marked*) δ 148.15*, 147.88, 135.30, 134.49*, 133.46*, 132.13, 132.01 (minor and major isomers), 131.74, 129.14, 128.71*, 128.40, 128.32, 127.22*, 126.76*, 126.26, 116.98, 116.02*, 111.43, 110.81*, 88.76*, 85.40, 62.72, 61.05*, 43.74*, 42.75, 26.69*, 26.20, 17.33*, 16.57.

1-(1-Nitropropyl)-2-phenyl-1,2,3,4-tetrahydroisoquinoline (Table 2, Entry 8)

Using *N*-phenyltetrahydroisoquinoline[2] the title compound was obtained (71%). ^{1}H and ^{13}C NMR spectra were consistent with literature values.[3] d.r. = 1:1.6; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.32-7.13 (m, 6H), 7.00-6.92 (m, 2H), 6.83-6.77 (m, 1H), 5.23 (d, *J* = 9.5 Hz, 0.4H, minor isomer), 5.12 (d, *J* = 9.5 Hz, 0.6H, major isomer), 4.87 (m, 0.6H, major isomer), 4.68 (m, 0.4H, minor isomer), 3.85 (m, 0.6H, major isomer), 3.69-3.50 (m, 2H), 3.10-3.02 (m, 1H), 2.92-2.84 (m, 1H), 2.20-2.09 (m, 1.7H), 1.86-1.79 (m, 0.7H), 0.96-0.91 (m, 3H); ^{13}C NMR (125 MHz, $CDCl_3$, minor isomer

marked*) δ 149.07, 148.99*, 135.56, 134.68*, 133.91*, 132.57, 129.42, 129.32, 129.18 (major and minor isomers), 128.68, 128.59*, 128.22*, 128.17, 127.23*, 126.64*, 125.90 (major and minor isomers), 119.40, 118.58*, 115.83, 114.13*, 96.16*, 93.05, 62.18, 60.70*, 43.54*, 42.33, 26.83*, 25.74, 25.00*, 24.62, 10.69 (major and minor isomers).

2-(4-Methylphenyl)-1-(1-nitropropyl)-1,2,3,4-tetrahydroisoquinoline (Table 2, Entry 9)

Using *N*-(4-methylphenyl)tetrahydroisoquinoline[2] the title compound was obtained (76%). ^{1}H and ^{13}C NMR spectra were consistent with literature values.[4] d.r. = 1:1.6; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.25-7.00 (m, 4H), 7.00-6.98 (m, 2H), 6.89-6.86 (m, 0.8H), 6.84-6.82 (m, 1.2H), 5.15 (d, *J* = 9.5 Hz, 0.4H, minor isomer), 5.04 (d, *J* = 9.5 Hz, 0.6H, major isomer), 4.84 (m, 0.6H, major isomer), 4.68 (m, 0.4H, minor isomer), 3.82 (m, 0.6H, major isomer), 3.64-3.50 (m, 2H), 3.05-3.00 (m, 1H), 2.84-2.80 (m, 1H), 2.25 (s, 1.2H) 2.21 (s, 1.8H), 2.20-2.08 (m, 1.7H), 1.86-1.80 (m, 0.6H), 0.95-0.91 (m, 3H); ^{13}C NMR (125 MHz, $CDCl_3$, minor isomer marked*) δ 146.98, 146.94*, 135.64, 134.76*, 133.89*, 132.56, 129.89, 129.68, 129.35 (major and minor isomers), 128.95, 128.71*, 128.65*, 128.11, 128.06*, 127.22*, 126.55 (major and minor isomers), 125.82, 116.41, 114.69*, 96.15*, 93.11, 62.36, 60.91*, 43.78*, 42.61, 26.63*, 25.55, 24.98*, 24.61, 20.30, 20.23*, 10.69.

2-(4-Methoxyphenyl)-1-(1-nitropropyl)-1,2,3,4-tetrahydroisoquinoline (Table 2, Entry 10)

Using *N*-(4-methoxyphenyl)tetrahydroisoquinoline[2] the title compound was obtained (77%). ^{1}H and ^{13}C NMR spectra were consistent with literature values.[4] d.r. = 1:1.6; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.25-7.12 (m, 4H), 6.91-6.74 (m, 4H), 5.02 (d, *J* = 9.0 Hz, 0.4H, minor isomer), 4.92 (d, *J* = 9.0 Hz, 0.6H, major isomer), 4.84 (m, 0.6H, major isomer), 4.67 (m, 0.4H, minor isomer), 3.82 (m, 1H), 3.75 (s, 1.2H), 3.72 (s, 1.8H), 3.60-3.42 (m, 1.4H), 3.05-2.96 (m, 1H), 2.82-2.75 (m, 1H), 2.19-2.08 (m, 1.4H), 1.86-1.80 (m, 0.6H), 0.96-0.92 (m, 3H); ^{13}C NMR (125 MHz, $CDCl_3$, minor isomer marked*) δ 153.77, 153.27*, 143.68 (major and minor isomers), 135.73, 134.85*, 133.77*, 132.52, 129.43, 128.83*, 128.73, 128.01, 128.20*, 126.53*, 125.84, 119.10, 117.47*, 114.72*, 114.46, 96.01*, 93.28, 62.95, 61.55*, 55.62*, 55.52, 44.66*, 43.53, 26.25*, 25.31, 24.93*, 24.63, 10.70, 10.63*.

2-(4-Bromophenyl)-1-(1-nitropropyl)-1,2,3,4-tetrahydroisoquinoline (Table 2, Entry 11)

Using *N*-(4-bromophenyl)tetrahydroisoquinoline[2] the title compound was obtained (74%). ^{1}H and ^{13}C NMR spectra were consistent with literature values.[4] d.r. = 1:1.6; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.35-7.00 (m, 6H), 6.85-6.82 (m, 0.8H), 6.80-6.78 (m, 1.2H), 5.19 (d, *J* = 9.0 Hz, 0.4H, minor isomer), 5.05 (d, *J* = 9.0 Hz, 0.6H, major isomer), 4.81 (m, 0.6H, major isomer), 4.67 (m, 0.4H, minor isomer), 3.82 (m, 0.6H), 3.62-3.55 (m, 1H), 3.49-3.45 (m, 0.4H), 3.10-3.02 (m, 1H), 2.95-2.86 (m, 1H), 2.20-2.00 (m, 1.4H), 1.86-1.78 (m, 0.6H), 0.95-0.91 (m, 3H); ^{13}C NMR (125 MHz, $CDCl_3$, minor isomer marked*) δ 148.05, 147.99*, 135.26, 134.40*, 133.57*, 132.23, 132.10, 131.91, (major and minor isomers), 129.34, 128.61, 128.41, 128.39, 127.19*, 126.79*, 126.08, 117.33, 115.65*, 111.46, 110.57*, 95.95*, 92.95, 62.13, 60.65*, 43.70*, 42.45, 26.77*, 25.66, 24.94*, 24.68, 10.63.

General procedure for photoredox cyanation with Rose Bengal

A 10 mm NMR tube was charged with the appropriate tetrahydroisoquinoline (0.075 mmol), Rose Bengal (0.76 mg, 1 mol%), TMSCN (0.05 mL, 0.375 mmol) and water/MeCN (0.08 mL/0.87 mL). The tube was capped tightly then rotated in the VFD at 4000 rpm with a tilt angle of 45° for 75 minutes in the presence of green LEDs at a distance of 3 cm. The mixture was then diluted with EtOAc (2-3 mL) transferred to a round bottom flask and evaporated to dryness. The residue was then redissolved in EtOAc and adsorbed onto silica gel and subsequent flash chromatography (EtOAc:hexanes, 1:9) gave the desired compounds.

2-Phenyl-1,2,3,4-tetrahydroisoquinoline-1-carbonitrile (Table 2, Entry 12)

Using *N*-phenyltetrahydroisoquinoline[2] the title compound was obtained (83%). ^{1}H- and ^{13}C NMR spectra were consistent with literature values.[3] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.35-7.20 (m, 6H), 7.05-7.03 (m, 2H), 6.99-6.97 (m, 1H), 5.48 (s, 1H), 3.73 (dddd, *J* = 1.0, 3.0, 6.0, 12.0 Hz, 1H), 3.48-3.42 (m, 1H), 3.16-3.11 (m, 1H), 2.93 (dt, J = 3.5, 16.0 Hz, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 148.36, 134.59, 129.57, 129.55, 129.33, 128.74, 127.03, 126.83, 121.88, 117.71, 117.58, 53.20, 44.16, 28.51.

2-(4-Methylphenyl)-1,2,3,4-tetrahydroisoquinoline-1-carbonitrile (Table 2, Entry 13)

Using *N*-(4-methylphenyl)tetrahydroisoquinoline[2] the title compound was obtained (81%). ^{1}H- and ^{13}C NMR spectra were consistent with literature values.[3] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.28-7.21 (m, 4H), 7.08-7.04 (m, 2H), 6.99-6.97 (m, 2H), 5.44 (s, 1H), 3.68 (dddd, *J* = 1.5, 2.5, 6.0, 12.5 Hz, 1H), 3.45-3.40 (m, 1H), 3.17-3.10 (m, 1H), 2.92 (dt, *J* = 3.0, 16.0 Hz, 1H), 2.30 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 146.25, 134.51, 131.80, 130.07, 129.65, 129.37, 128.66, 127.05, 126.74, 118.29, 117.68, 54.07, 44.35, 28.56, 20.56.

2-(4-Methoxyphenyl)-1,2,3,4-tetrahydroisoquinoline-1-carbonitrile (Table 2, Entry 14)

Using *N*-(4-methoxyphenyl)tetrahydroisoquinoline[2] the title compound was obtained (69%). ^{1}H- and ^{13}C NMR spectra were consistent with literature values.[3] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.30-7.21 (m, 4H), 7.09-7.07 (m, 2H), 6.92-6.90 (m, 2H), 5.36 (s, 1H), 3.80 (s, 3H), 3.68 (m, 1H), 3.46-3.41 (m, 1H), 3.19-3.13 (m, 1H), 2.95-2.90 (m, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 155.69, 142.57, 134.33, 129.68, 129.44, 128.64, 127.06, 126.68, 120.99, 117.57, 114.78, 55.57, 55.52, 44.89, 28.68.

2-(4-Bromophenyl)-1,2,3,4-tetrahydroisoquinoline-1-carbonitrile (Table 2, Entry 15)

Using *N*-(4-bromophenyl)tetrahydroisoquinoline[2] the title compound was obtained (87%). ^{1}H- and ^{13}C NMR spectra were consistent with literature values.[3] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.47-7.45 (m, 2H), 7.34-7.24 (m, 4H), 6.97-6.95 (m, 2H), 5.46 (s, 1H), 3.73 (m, 1H), 3.50-3.45 (m, 1H), 3.18-3.12 (m, 1H), 2.98 (dt, J = 3.5, 16.0 Hz, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 147.38, 134.39, 132.43, 129.33, 129.17, 128.91, 127.02, 126.98, 119.08, 117.42, 114.34, 52.85, 44.21, 28.39.

General procedure for Mannich reactions under photoredox conditions with Rose Bengal

A 10 mm NMR tube was charged with the appropriate tetrahydroisoquinoline (0.075 mmol), Rose Bengal (0.76 mg, 1 mol%), diethylmalonate (0.4 mL) and water/MeCN (0.05 mL/0.55 mL). The tube was capped tightly then rotated in the VFD at 4000 rpm with a tilt angle of 45° for 75 minutes in the presence of green LEDs at a distance of 3

cm. The mixture was then diluted with EtOAc (2-3 mL) transferred to a round bottom flask and evaporated to dryness. The residue was then redissolved in EtOAc and adsorbed onto silica gel and subsequent flash chromatography (EtOAc:hexanes, 1:9) gave the desired compounds.

2-(2-Phenyl-1,2,3,4-tetrahydroisoquinolin-1-yl)malonic acid diethyl ester (Table 2, Entry 16)

Using *N*-phenyltetrahydroisoquinoline[2] the title compound was obtained (81%). ^{1}H- and ^{13}C NMR spectra were consistent with literature values.[3] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.28-7.08 (m, 6H), 6.99-6.97 (m, 2H), 6.75-6.73 (m, 1H), 5.71 (d, *J* = 9.0 Hz, 1H), 4.19-3.97 (m, 4H), 3.90 (d, *J* = 9.0 Hz, 1H), 3.71-3.50 (m, 2H), 3.11-3.03 (m, 1H), 2.91-2.85 (m, 1H), 1.17 (t, *J* = 7.0 Hz, 3H), 1.08 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 167.95, 167.13, 148.85, 135.95, 134.80, 129.04, 128.86, 127.48, 127.17, 125.99, 118.43, 115.08, 61.56, 61.55, 59.54, 57.86, 42.27, 26.12, 13.91, 13.86.

2-[2-(4-Methylphenyl)-1,2,3,4-tetrahydroisoquinolin-1-yl]malonic acid diethyl ester (Table 2, Entry 17)

Using *N*-(4-methylphenyl)tetrahydroisoquinoline[2] the title compound was obtained (74%). ^{1}H- and ^{13}C NMR spectra were consistent with literature values.[3] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.26-7.00 (m, 6H), 6.89-6.87 (m, 2H), 5.63 (d, *J* = 9.5 Hz, 1H), 4.19-4.00 (m, 4H), 3.90 (d, *J* = 9.5 Hz, 1H), 3.71-3.59 (m, 2H), 3.11-3.02 (m, 1H), 2.84-2.78 (m, 1H), 2.23 (s, 3H), 1.16 (t, *J* = 7.0 Hz, 3H), 1.11 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 167.99, 167.19, 146.81, 135.79, 134.80, 129.55, 128.95, 127.97, 127.38, 127.22, 125.88, 115.74, 61.50, 59.53, 58.28, 42.32, 25.81, 20.28, 13.92, 13.90.

2-[2-(4-Methoxyphenyl)-1,2,3,4-tetrahydroisoquinolin-1-yl]malonic acid diethyl ester (Table 2, Entry 18)

Using *N*-(4-methoxyphenyl)tetrahydroisoquinoline[2] the title compound was obtained (77%). ^{1}H- and ^{13}C NMR spectra were consistent with literature values.[3] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.23-7.07 (m, 4H), 6.89-6.87 (m, 2H), 6.76-6.74 (m, 2H), 5.49 (d, *J* = 9.0 Hz, 1H), 4.12-4.00 (m, 4H), 3.88 (d, *J* = 9.5 Hz, 1H), 3.70 (s, 3H), 3.68-3.62 (m, 1H), 3.56-3.50 (m, 1H), 3.00-2.95 (m, 1H), 2.76-2.72 (m, 1H), 1.14-1.08 (m,

6H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 167.98, 167.23, 153.10, 143.51, 135.61, 134.79, 129.04, 127.34, 127.22, 125.88, 118.05, 114.39, 61.47, 61.44, 59.52, 58.86, 55.55, 43.01, 25.57, 13.96, 13.88.

2-[2-(4-Bromophenyl)-1,2,3,4-tetrahydroisoquinolin-1-yl]malonic acid diethyl ester (Table 2, Entry 19)

Using *N*-(4-bromophenyl)tetrahydroisoquinoline[2] the title compound was obtained (78%). ^{1}H- and ^{13}C NMR spectra were consistent with literature values.[3] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.30-7.10 (m, 6H), 6.85-6.83 (m, 2H), 5.65 (d, J = 9.5 Hz, 1H), 4.16-3.94 (m, 4H), 3.85 (d, J = 9.5 Hz, 1H), 3.71-3.64 (m, 1H), 3.59-3.53 (m, 1H), 3.09-3.01 (m, 1H), 2.94-2.89 (m, 1H), 1.17 (t, J = 7.0 Hz, 3H), 1.09 (t, J = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 167.78, 166.96, 147.80, 135.69, 134.54, 131.74, 128.82, 127.69, 127.10, 126.16, 116.38, 110.29, 61.65, 59.43, 57.79, 42.48, 26.11, 13.90.

General procedure for phosphonylation reactions under photoredox conditions with Rose Bengal

A 10 mm NMR tube was charged with the appropriate tetrahydroisoquinoline (0.075 mmol), Rose Bengal (0.76 mg, 1 mol%), diethylphosphite (0.05 mL, 0.38 mmol) and water/MeCN (0.08 mL/0.87 mL). The tube was capped tightly then rotated in the VFD at 4000 rpm with a tilt angle of 45° for 75 minutes in the presence of green LEDs at a distance of 3 cm. The mixture was then diluted with EtOAc (2-3 mL) transferred to a round bottom flask and evaporated to dryness. The residue was then redissolved in EtOAc and adsorbed onto silica gel and subsequent flash chromatography (EtOAc:hexanes, 1:9) gave the desired compounds.

Diethyl 2-phenyl-1,2,3,4-tetrahydroisoquinoline-1-yl-phosphonate (Table 2, Entry 20)

Using *N*-phenyltetrahydroisoquinoline[2] the title compound was obtained (81%). ^{1}H- and ^{13}C NMR spectra were consistent with literature values.[3] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.39-7.38 (m, 1H), 7.27-7.15 (m, 5H), 6.99-6.98 (m, 2H), 6.82-6.79 (m, 1H), 5.18 (d, J = 20.0 Hz, 1H), 4.20-3.89 (m, 5H), 3.68-3.61 (m, 1H), 3.11-2.98 (m, 2H), 1.27 (t, J = 7.0 Hz, 3H), 1.15 (t, J = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ

149.37 (d, *J* = 5.8 Hz), 136.42 (d, *J* = 5.5 Hz), 130.65, 129.10, 128.71 (d, *J* = 2.6 Hz), 128.09 (d, *J* = 4.6 Hz), 127.39 (d, *J* = 3.4 Hz), 125.83 (d, *J* = 2.8 Hz), 118.43, 114.75, 63.26 (d, *J* = 7.2 Hz), 62.28 (d, *J* = 7.6 Hz), 58.80 (d, *J* = 159.3 Hz), 43.45, 26.73, 16.42 (d, *J* = 5.4 Hz), 16.34 (d, *J* = 5.4 Hz).

Diethyl 2-(4-methylphenyl)-1,2,3,4-tetrahydroisoquinoline-1-yl-phosphonate (Table 2, Entry 21)

Using *N*-(4-methylphenyl)tetrahydroisoquinoline[2] the title compound was obtained (82%). ^{1}H- and ^{13}C NMR spectra were consistent with literature values.[3] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.39-7.37 (m, 1H), 7.20-7.12 (m, 4H), 7.08-7.05 (m, 2H), 6.90-6.87 (m, 2H), 5.12 (d, *J* = 20.5 Hz, 1H), 4.13-3.90 (m, 5H), 3.63-3.58 (m, 1H), 3.00-2.98 (m, 2H), 2.25 (s, 3H), 1.26 (t, *J* = 7.0 Hz, 3H), 1.15 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 147.38 (d, *J* = 7.0 Hz), 136.42 (d, *J* = 5.6 Hz), 130.59, 129.61, 128.77 (d, *J* = 2.5 Hz), 128.10 (d, *J* = 4.4 Hz), 127.93, 127.26 (d, *J* = 3.4 Hz), 125.75 (d, *J* = 2.9 Hz), 115.29 (d, *J* = 1.0 Hz), 63.29 (d, *J* = 7.2 Hz), 62.22 (d, *J* = 7.6 Hz), 59.00 (d, *J* = 158.5 Hz), 43.78, 26.39, 20.25, 16.45 (d, *J* = 5.4 Hz), 16.33 (d, *J* = 5.4 Hz).

Diethyl 2-(4-methoxyphenyl)-1,2,3,4-tetrahydroisoquinoline-1-yl-phosphonate (Table 2, Entry 22)

Using *N*-(4-methoxyphenyl)tetrahydroisoquinoline[2] the title compound was obtained (84%). ^{1}H- and ^{13}C NMR spectra were consistent with literature values.[3] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.39-7.37 (m, 1H), 7.20-7.12 (m, 3H), 6.92-6.90 (m, 2H), 6.83-6.80 (m, 2H), 5.03 (d, *J* = 20.5 Hz, 1H), 4.13-3.93 (m, 5H), 3.75 (s, 3H), 3.55-3.53 (m, 1H), 2.94-2.91 (m, 2H), 1.25 (t, *J* = 7.0 Hz, 3H), 1.16 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 153.08, 144.15 (d, *J* = 8.2 Hz), 136.38 (d, *J* = 5.7 Hz), 130.50, 128.87 (d, *J* = 2.5 Hz), 128.14 (d, *J* = 4.4 Hz), 127.23, (d, *J* = 3.5 Hz), 125.77 (d, *J* = 2.9 Hz), 117.55, 114.48, 63.29 (d, *J* = 7.1 Hz), 62.19 (d, *J* = 7.6 Hz), 59.45 (d, *J* = 157.4 Hz), 55.61, 44.62, 26.10, 16.44 (d, *J* = 5.4 Hz), 16.33 (d, *J* = 5.4 Hz).

Diethyl 2-(4-bromophenyl)-1,2,3,4-tetrahydroisoquinolin-1-yl-phosphonate (Table 2, Entry 23)

Using *N*-(4-bromophenyl)tetrahydroisoquinoline[2] the title compound was obtained (71%). ^{1}H- and ^{13}C NMR spectra were consistent with literature values.[3] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.36-7.31 (m, 3H), 7.22-7.15 (m, 3H), 6.86-6.84 (m, 2H), 5.10 (d, *J* = 19.0 Hz, 1H), 4.10-3.85 (m, 5H), 3.58-3.61 (m, 1H), 3.20-3.12 (m, 1H), 3.02-2.94 (m, 1H), 1.24 (t, *J* = 7.0 Hz, 3H), 1.14 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 148.27 (d, *J* = 4.8 Hz), 136.25 (d, *J* = 4.8 Hz), 131.75, 130.37, 128.62 (d, *J* = 2.6 Hz), 128.08 (d, *J* = 4.7 Hz), 127.61 (d, *J* = 3.5 Hz), 125.98 (d, *J* = 2.8 Hz), 116.08, 110.25, 63.22 (d, *J* = 7.2 Hz), 62.41 (d, *J* = 7.6 Hz), 58.72 (d, *J* = 158.6 Hz), 43.59, 26.89, 16.42 (d, *J* = 5.4 Hz), 16.33 (d, *J* = 5.4 Hz).

General procedure for photoredox aza-Henry reactions with Rose Bengal under flow conditions

A 10 mm NMR tube was fed at a specific flow rate with a mixed working solution (25 ml) of *N*-phenyltetrahydroisoquinoline[2] (1.88 mmol), Rose Bengal (19 mg, 1 mol%), the appropriate coupling partner (for nitromethane/diethylmalonate, 10 mL and for TMSCN/diethylphosphite, 1.25 mL) and water/MeCN (for nitromethane/diethylmalonate, 1.25 mL/13.75 mL and for TMSCN/diethylphosphite, 2mL/21.75mL). The tube was then rotated in the VFD at 4000 rpm with a tilt angle of 45° in the presence of green LEDs at a distance of 3 cm. The solution that was liberated from the tube was collected in 2 ml aliquots and these were diluted with EtOAc (5 mL) transferred to a round bottom flask and evaporated to dryness and the residue assayed by ^{1}H nmr for conversion.

General procedure for Ugi-type multicomponent photoredox reactions with Rose Bengal

A 10 mm NMR tube was charged with the appropriate amine (0.15 mmol), isocyanide (0.075 mmol), Rose Bengal (0.76 mg, 1 mol%), and water/MeCN (0.08 mL/0.87 mL). The tube was capped tightly then rotated in the VFD at 4000 rpm with a tilt angle of 45° for 12 hours in the presence of green LEDs at a distance of 3 cm. The mixture was then diluted with EtOAc (2-3 mL) transferred to a round bottom flask and evaporated to dryness. The residue was then redissolved in EtOAc and adsorbed onto

silica gel and subsequent flash chromatography (EtOAc:hexanes, 2:3) gave the desired compounds.

2-(Methyl(phenyl)amino)-*N*-(tosylmethyl)acetamide (Table 3, Entry 1)

Using *N*,*N*-dimethylaniline and 4-toluenesulfonylmethyl isocyanide the title compound was obtained (83%). ^{1}H- and ^{13}C NMR spectra were consistent with literature values.[3] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.71 (d, *J* = 8.5 Hz, 2H), 7.33-7.25 (m, 4H), 6.88 (t, *J* = 7.5 Hz, 1H), 6.66 (d, *J* = 8.0 Hz, 2H), 4.67 (d, *J* = 7.0 Hz, 2H), 3.74 (s, 2H), 2.98 (s, 3H), 2.45 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 170.28, 148.95, 145.53, 133.73, 129.91, 129.43, 128.80, 119.22, 113.40, 59.81, 58.49, 40.01, 21.75.

2-(Methyl(4-methylphenyl)amino)-*N*-(tosylmethyl)acetamide (Table 3, Entry 2)

Using 4,*N*,*N*-Trimethylaniline and 4-toluenesulfonylmethyl isocyanide the title compound was obtained (72%). ^{1}H- and ^{13}C NMR spectra were consistent with literature values.[3] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.71 (d, *J* = 8.5 Hz, 2H), 7.42-7.40 (m, 1H), 7.33 (d, *J* = 8.0 Hz, 2H), 7.08 (d, *J* = 8.5 Hz, 2H), 6.60 (d, *J* = 8.5 Hz, 2H), 4.67 (d, *J* = 7.0 Hz, 2H), 3.69 (s, 2H), 2.94 (s, 3H), 2.45 (s, 3H), 2.29 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 170.48, 146.93, 145.47, 133.75, 129.89, 129.88, 128.80, 128.64, 113.72, 59.82, 58.79, 40.28, 21.73, 20.26.

2-((4-Bromophenyl)(methyl)amino)-*N*-(tosylmethyl)acetamide (Table 3, Entry 3)

Using 4-bromo-*N*,*N*-dimethylaniline and 4-toluenesulfonylmethyl isocyanide the title compound was obtained (79%). ^{1}H- and ^{13}C NMR spectra were consistent with literature values.[3] ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.69 (d, *J* = 7.0 Hz, 2H), 7.34-7.32 (m, 4H), 7.26-7.24 (m, 1H), 6.51 (d, *J* = 7.5 Hz, 2H), 4.67 (d, *J* = 6.0 Hz, 2H), 3.71 (s, 2H), 2.96 (s, 3H), 2.46 (s, 3H); ^{13}C NMR (150 MHz, $CDCl_3$) δ 169.78, 147.92, 145.62, 133.69, 132.12, 129.94, 128.71, 114.95, 113.34, 59.81, 58.24, 40.14, 21.76.

***N*-Butyl-2-(methyl(phenyl)amino)acetamide (Table 3, Entry 4)**

Using *N*,*N*-dimethylaniline and butyl isocyanide the title compound was obtained (44%). ^{1}H- and ^{13}C NMR spectra were consistent with literature values.[3] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.28-7.25 (m, 2H), 6.84-6.82 (t, *J* = 7.0 Hz, 1H), 6.72 (d, *J* = 8.5 Hz, 2H), 6.57 (br s, 1H), 3.84 (s, 2H), 3.26 (q, *J* = 7.0 Hz, 2H), 2.99 (s, 3H), 1.46-1.42

(m, 2H), 1.29-1.25 (m, 2H), 0.88 (t, J = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 170.17, 149.29, 129.33, 118.60, 113.11, 58.94, 39.69, 38.88, 31.60, 19.93, 13.65.

_N_-Butyl-2-(methyl(4-methylphenyl)amino)acetamide (Table 3, Entry 5)

Using 4,*N*,*N*-Trimethylaniline and butyl isocyanide the title compound was obtained (53%). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.08-7.06 (m, 2H), 6.65-6.64 (m, 3H), 3.79 (s, 2H), 3.26 (q, *J* = 6.5 Hz, 2H), 2.96 (s, 3H), 2.26 (s, 3H), 1.46-1.41 (m, 2H), 1.29-1.25 (m, 2H), 0.88 (t, J = 6.5 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 170.38, 147.28, 129.80, 127.99, 113.37, 59.26, 39.91, 38.83, 31.60, 20.18, 19.93, 13.64. HRMS calculated for $C_{14}H_{22}N_2ONa$ [M+Na] 257.1630 found 257.1639.

_N_-Butyl-2-(methyl(4-bromophenyl)amino)acetamide (Table 3, Entry 6)

Using 4-bromo-*N*,*N*-dimethylaniline and butyl isocyanide the title compound was obtained (48%). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.33-7.31 (m, 2H), 6.59-6.56 (m, 2H), 6.44 (br s, 1H), 3.80 (s, 2H), 3.26 (q, *J* = 7.0 Hz, 2H), 2.98 (s, 3H), 1.46-1.40 (m, 2H), 1.29-1.23 (m, 2H), 0.88 (t, J = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 169.60, 148.18, 132.00, 114.64, 110.74, 58.70, 39.86, 38.91, 31.56, 19.91, 13.63. HRMS calculated for $C_{13}H_{19}BrN_2ONa$ [M+Na] 321.0578 found 321.0573.

Methyl 2-(2-(methyl(phenyl)amino)acetamido)acetate (Table 3, Entry 7)

Using *N*,*N*-dimethylaniline and methyl isocyanoacetate the title compound was obtained (80%). ^{1}H- and ^{13}C NMR spectra were consistent with literature values.[3] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.29-7.25 (m, 2H), 7.06 (br s, 1H), 6.85-6.75 (m, 3H), 4.06 (d, *J* = 5.5 Hz, 2H), 3.89 (s, 2H), 3.72 (s, 3H), 3.03 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 171.03, 169.98, 149.26, 129.33, 118.76, 113.30, 58.72, 52.31, 40.74, 39.69.

Methyl 2-(2-(methyl(4-methylphenyl)amino)acetamido)acetate (Table 3, Entry 8)

Using 4,*N*,*N*-Trimethylaniline and methyl isocyanoacetate the title compound was obtained (73%). ^{1}H- and ^{13}C NMR spectra were consistent with literature values.[5] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.13 (br s, 1H), 7.09-7.07 (m, 2H), 6.70-6.68 (m, 2H), 4.06 (d, *J* = 6.0 Hz, 2H), 3.85 (s, 2H), 3.73 (s, 3H), 2.99 (s, 3H), 2,26 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 171.23, 170.00, 147.25, 129.80, 128.17, 113.60, 59.07, 52.28, 40.71, 39.93, 20.21.

Methyl 2-(2-(methyl(4-bromophenyl)amino)acetamido)acetate (Table 3, Entry 9)

Using 4-bromo-*N*,*N*-dimethylaniline and methyl isocyanoacetate the title compound was obtained (70%). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.35-7.33 (m, 2H), 6.94 (br s, 1H), 6.64-6.61 (m, 2H), 4.06 (d, *J* = 5.5 Hz, 2H), 3.87 (s, 2H), 3.73 (s, 3H), 3.02 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 170.48, 169.95, 148.19, 132.02, 114.88, 110.96, 58.51, 52.38, 40.75, 39.85. HRMS calculated for $C_{12}H_{15}BrN_2O_3Na$ [M+Na] 337.0164 found 337.0173.

***N*-Benzyl-2-(methyl(phenyl)amino)acetamide (Table 3, Entry 10)**

Using *N*,*N*-dimethylaniline and benzyl isocyanide the title compound was obtained (41%). ^{1}H- and ^{13}C NMR spectra were consistent with literature values.[3] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.31-7.24 (m, 5H), 7.21-7.19 (m, 2H), 6.95 (br s, 1H), 6.86-6.83 (m, 1H), 6.75-6.73 (m, 2H), 4.48 (d, *J* = 6.0 Hz, 2H), 3.92 (s, 2H), 3.00 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 170.40, 149.20, 137.93, 129.33, 128.61, 127.44, 127.40, 118.69, 113.19, 58.92, 43.04, 39.84.

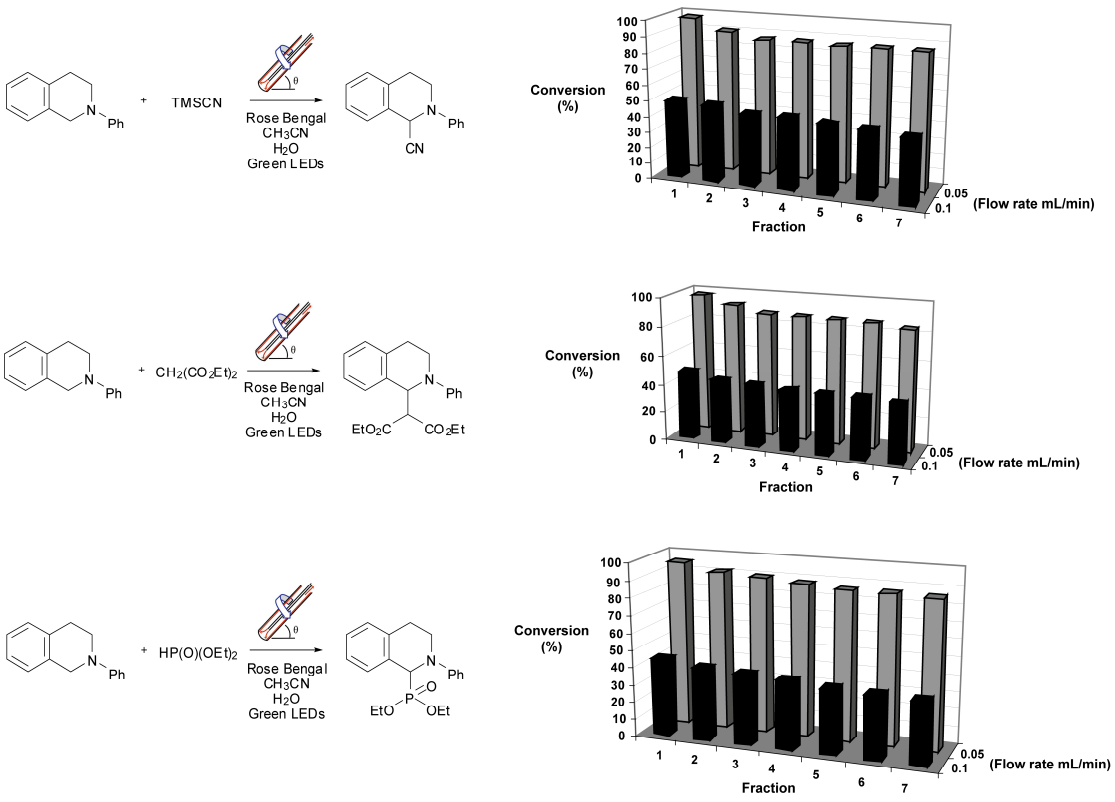
***N*-Benzyl-2-((4-methylphenyl)(methyl)amino)acetamide (Table 3, Entry 11)**

Using 4,*N*,*N*-Trimethylaniline and benzyl isocyanide the title compound was obtained (52%). ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.32-7.20 (m, 5H), 7.09-7.06 (m, 2H), 7.02 (br s, 1H), 6.68-6.66 (m, 2H), 4.48 (d, *J* = 6.0 Hz, 2H), 3.87 (s, 2H), 2.96 (s, 3H), 2.28 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 170.57, 147.22, 138.02, 129.80, 128.58, 128.12, 127.43, 127.35, 113.52, 59.23, 43.02, 40.08, 20.19. HRMS (ESI) calculated for $C_{17}H_{20}N_2ONa$ [M+Na] 291.1473 found 291.1471.

***N*-Benzyl-2-((4-bromophenyl)(methyl)amino)acetamide (Table 3, Entry 12)**

Using 4-bromo-*N*,*N*-dimethyl aniline and benzyl isocyanide the title compound was obtained (50%). ^{1}H- and ^{13}C NMR spectra were consistent with literature values.[5] ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.33-7.24 (m, 5H), 7.19-7.17 (m, 2H), 6.87 (br s, 1H), 6.59-6.57 (m, 2H), 4.46 (d, *J* = 6.0 Hz, 2H), 3.87 (s, 2H), 2.98 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 169.80, 148.16, 137.85, 132.03, 128.67, 127.51, 127.45, 114.80, 110.91, 58.73, 43.14, 40.03.

Supporting Figure



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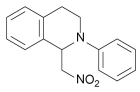

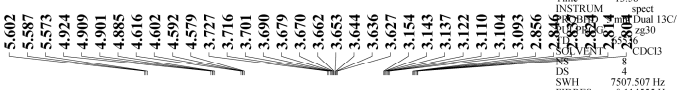

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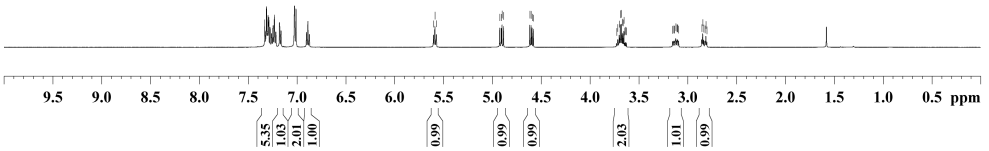

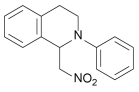

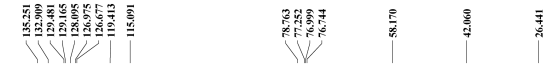

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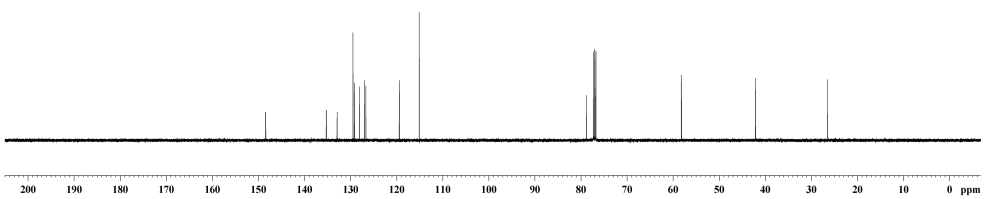
PL2 120.00 dB
PL12 16.00 dB
PL13 20.00 dB
PL2W 0.00000000 W
PL12W 0.35333613 W
PL13W 0.14066564 W
SFO2 500.1322500 MHz
SI 65536
SF 125.7577955 MHz
WDW no
SSB 0
LB 0.00 Hz
GB 0



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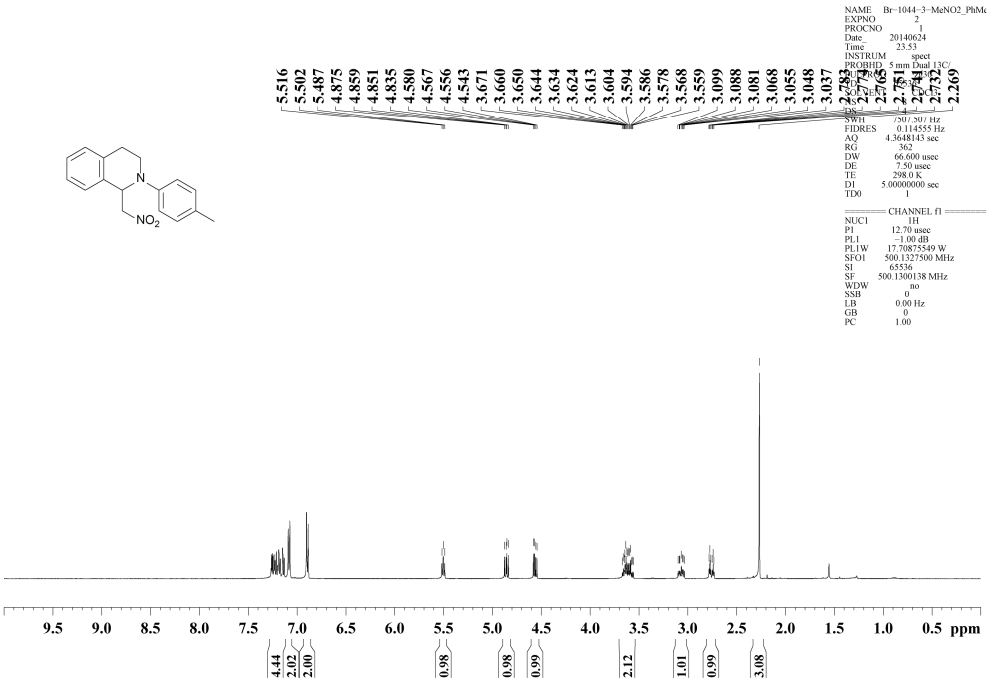

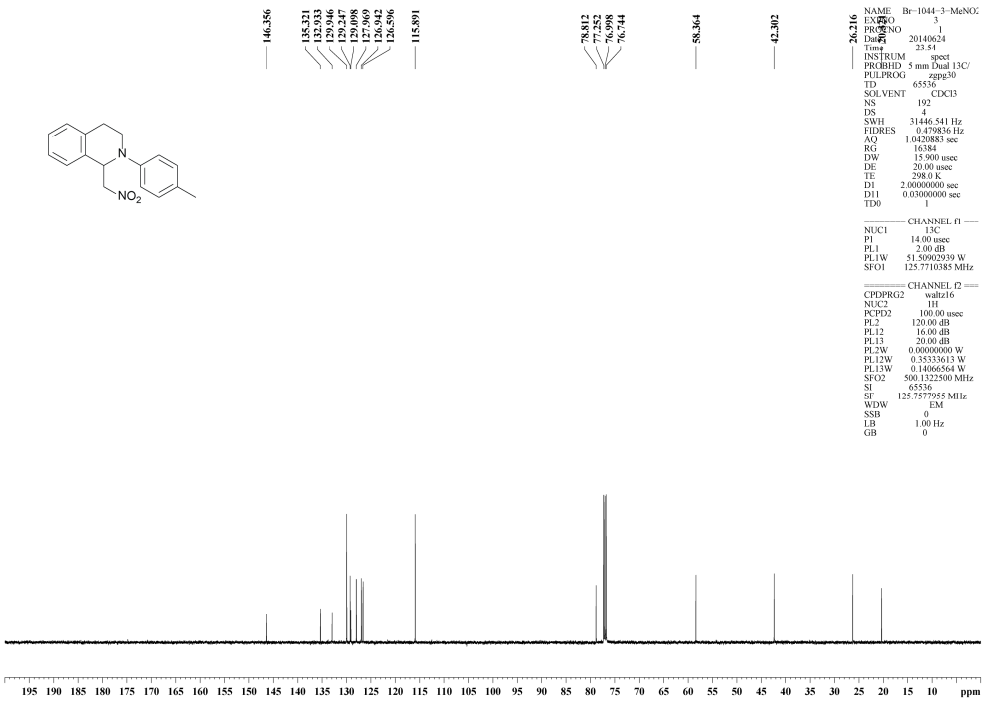

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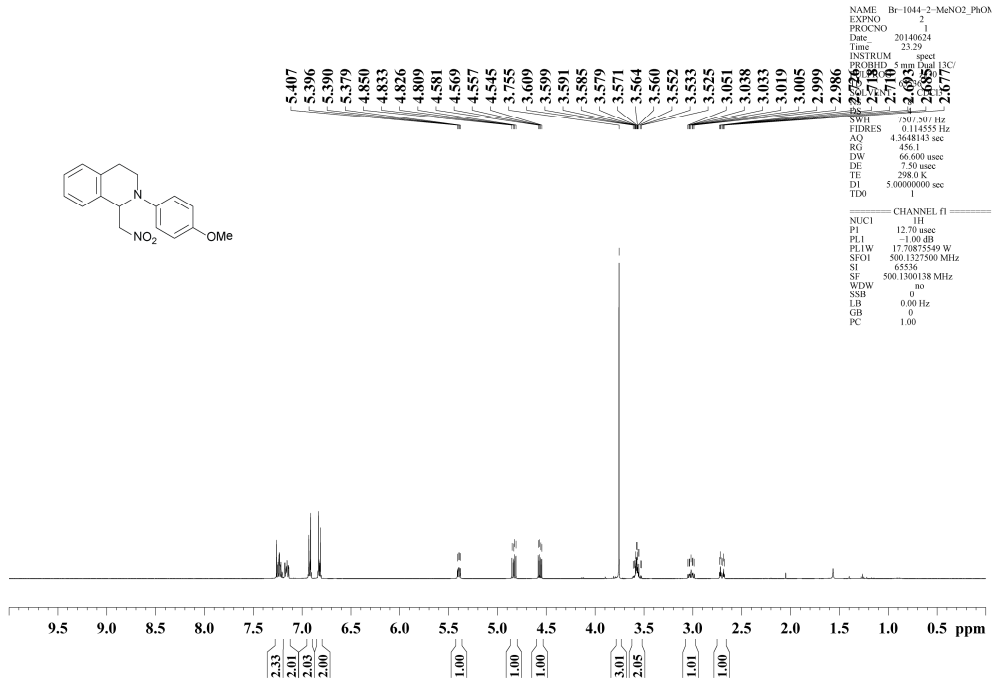

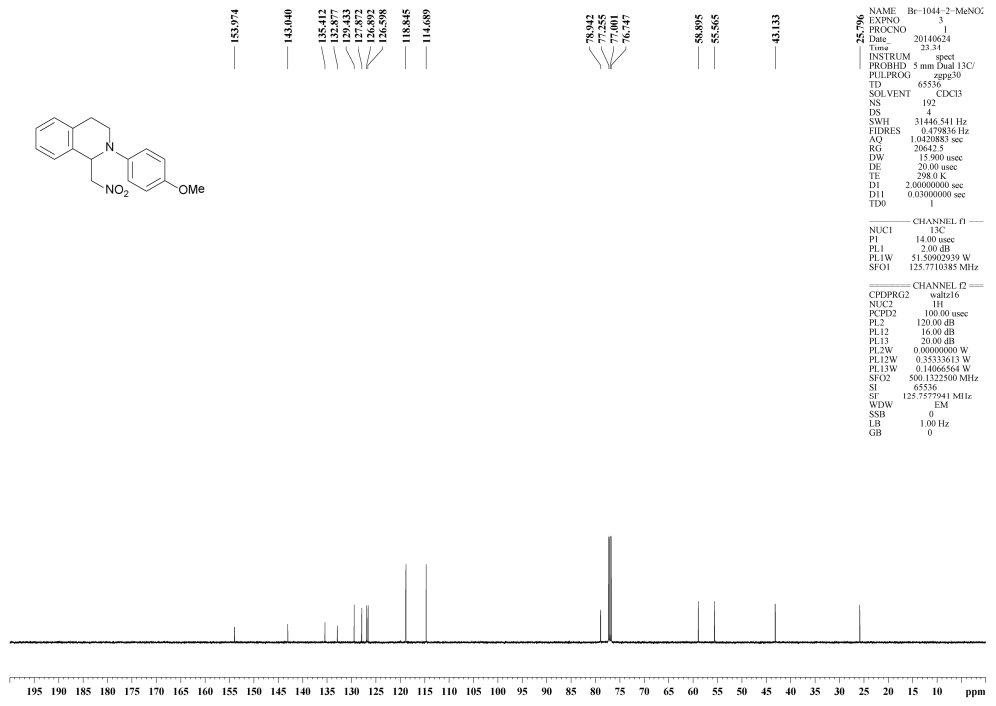

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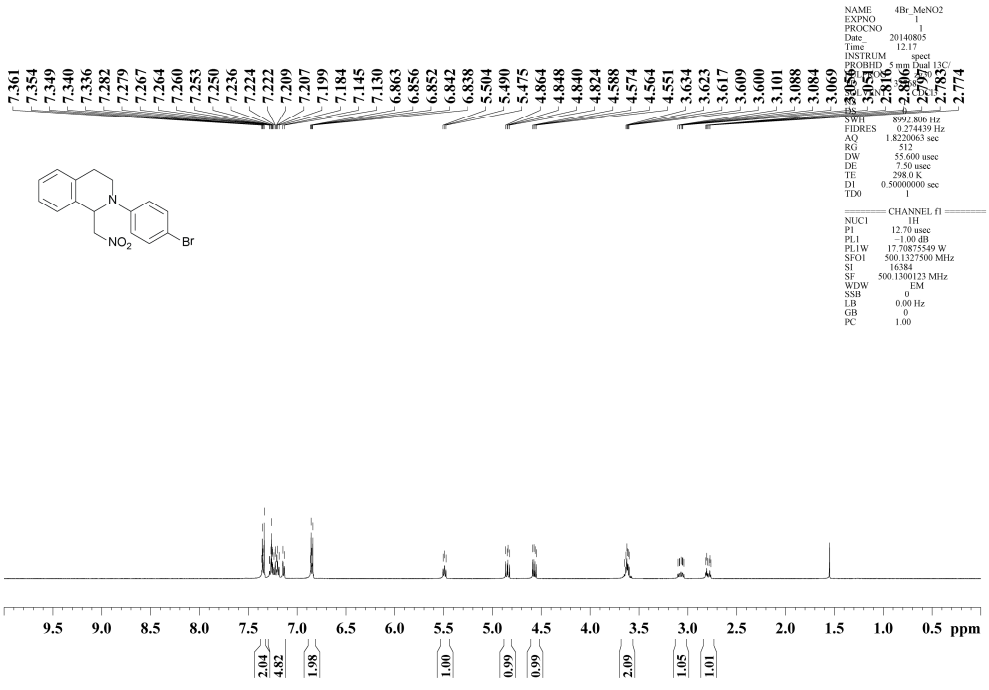

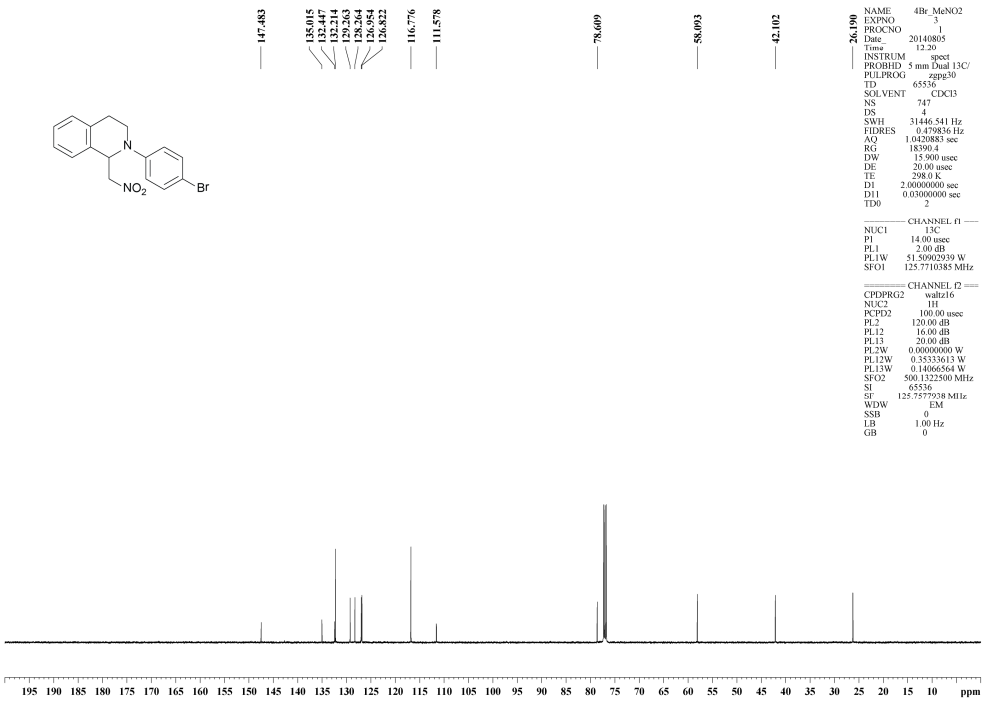

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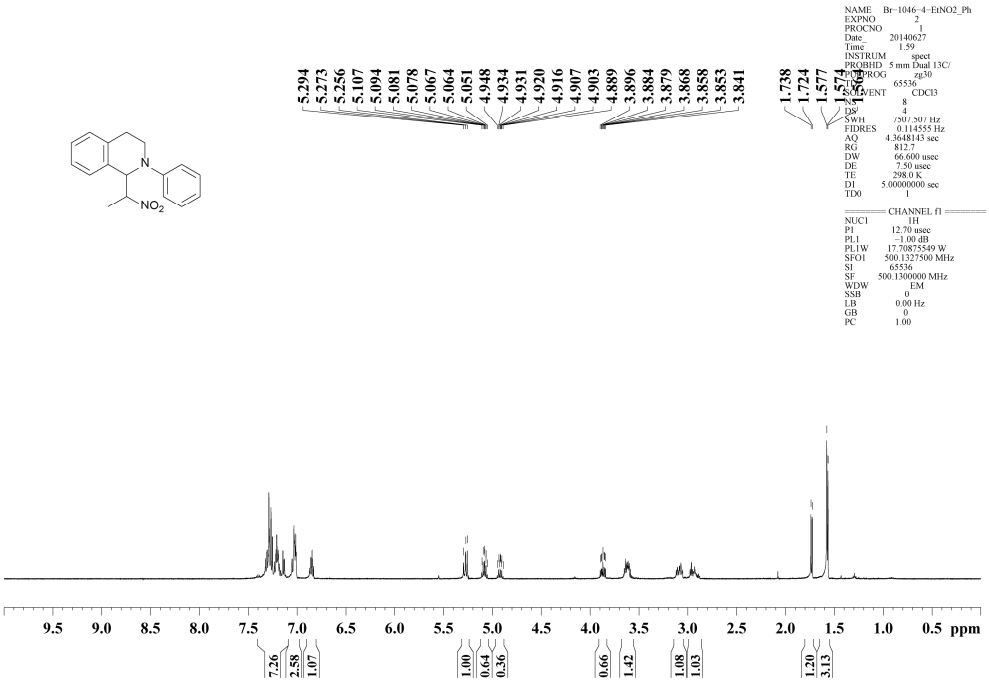

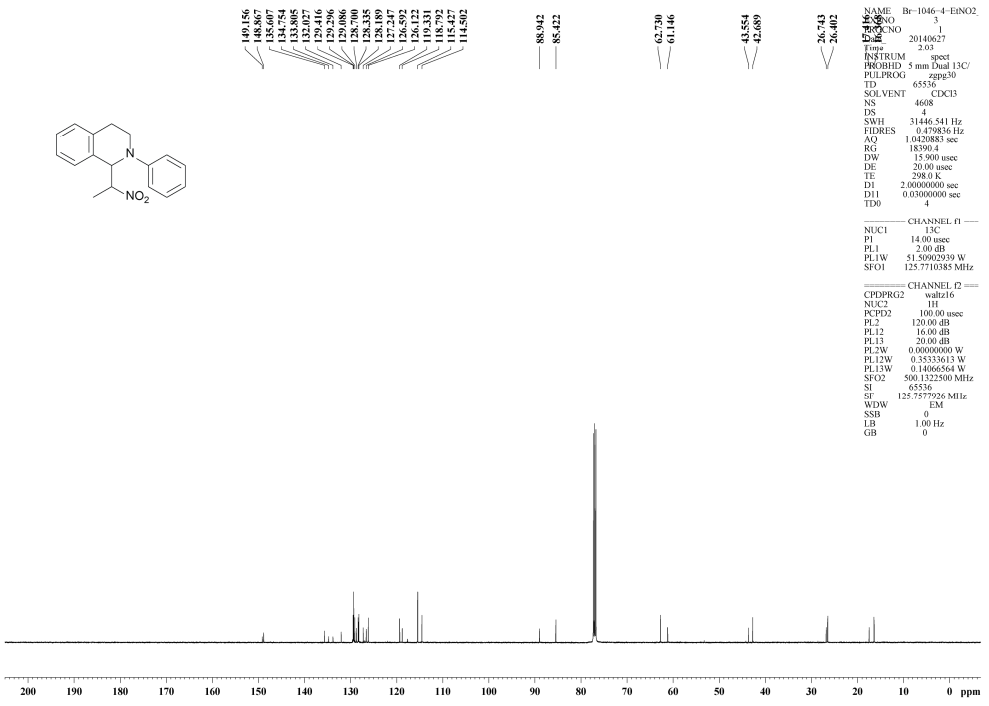

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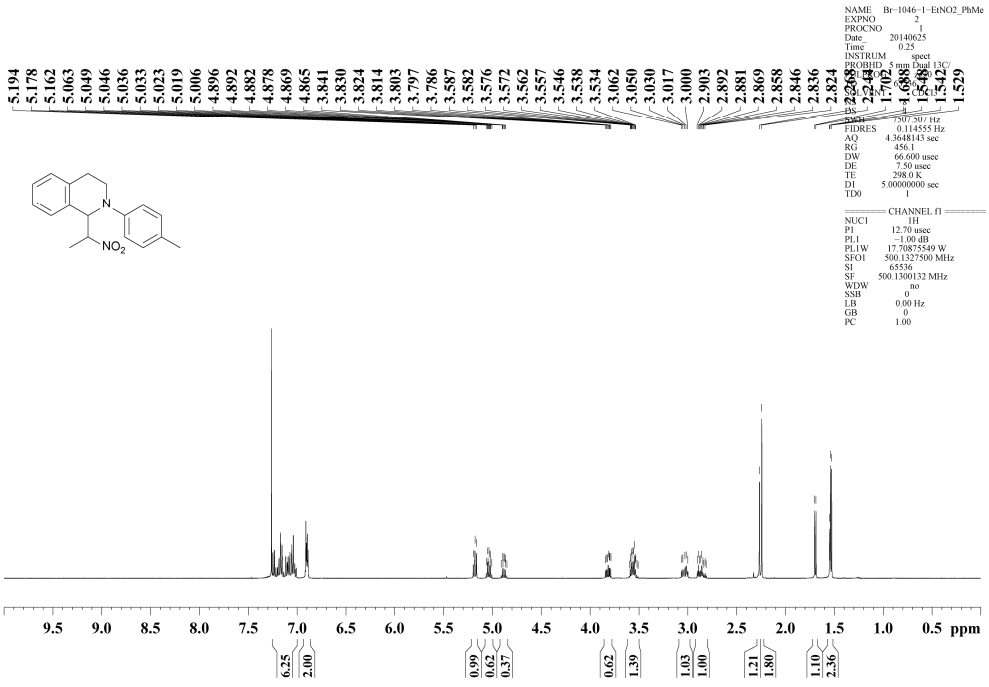

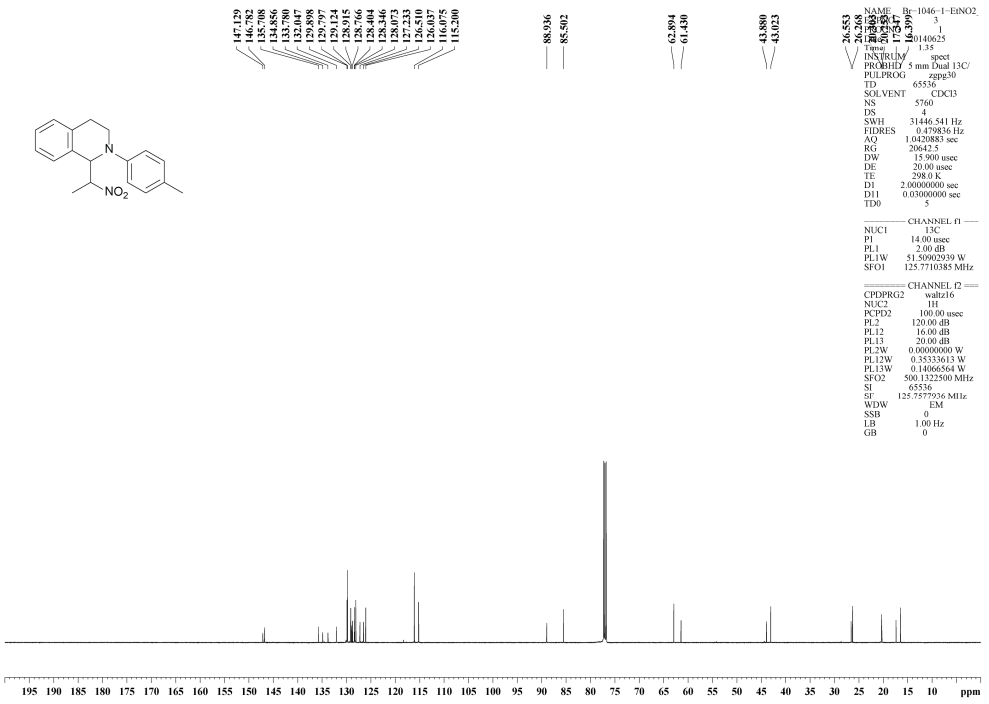

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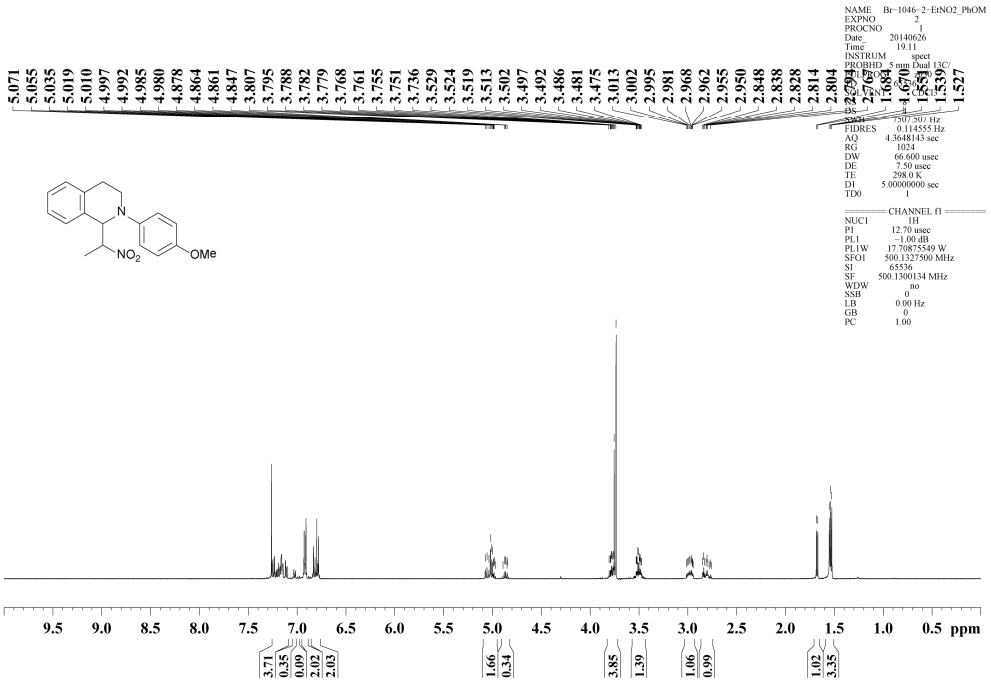

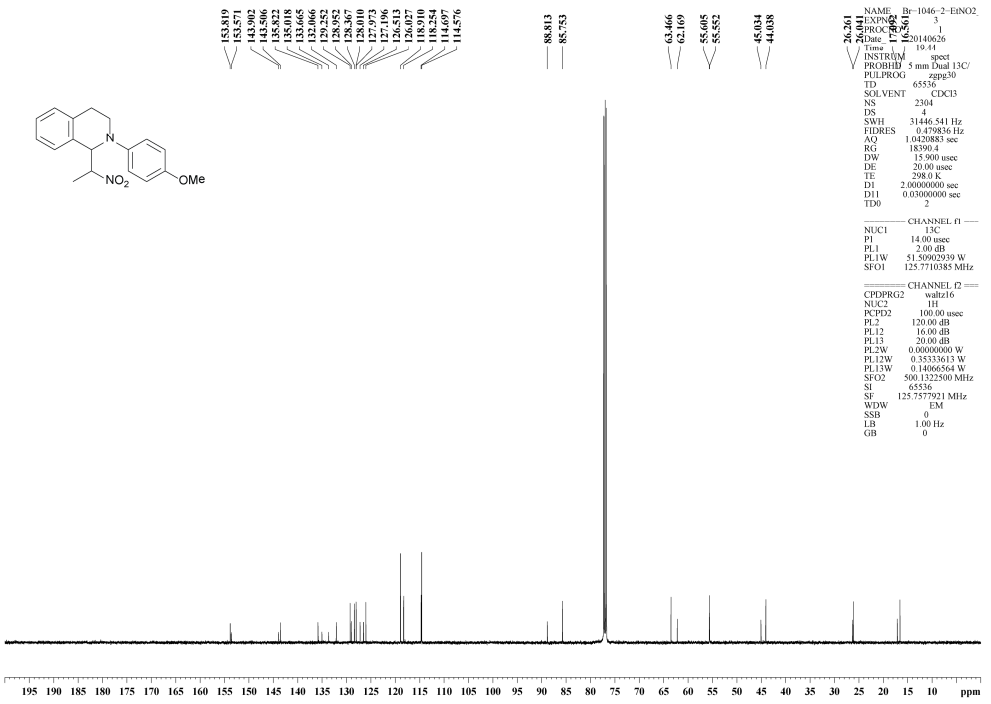

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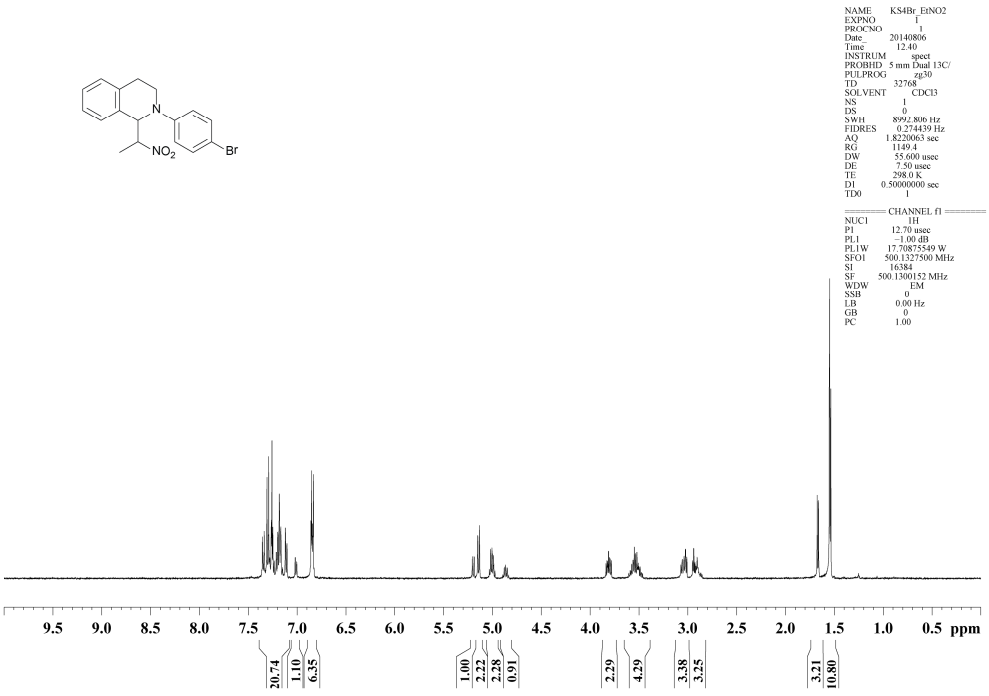

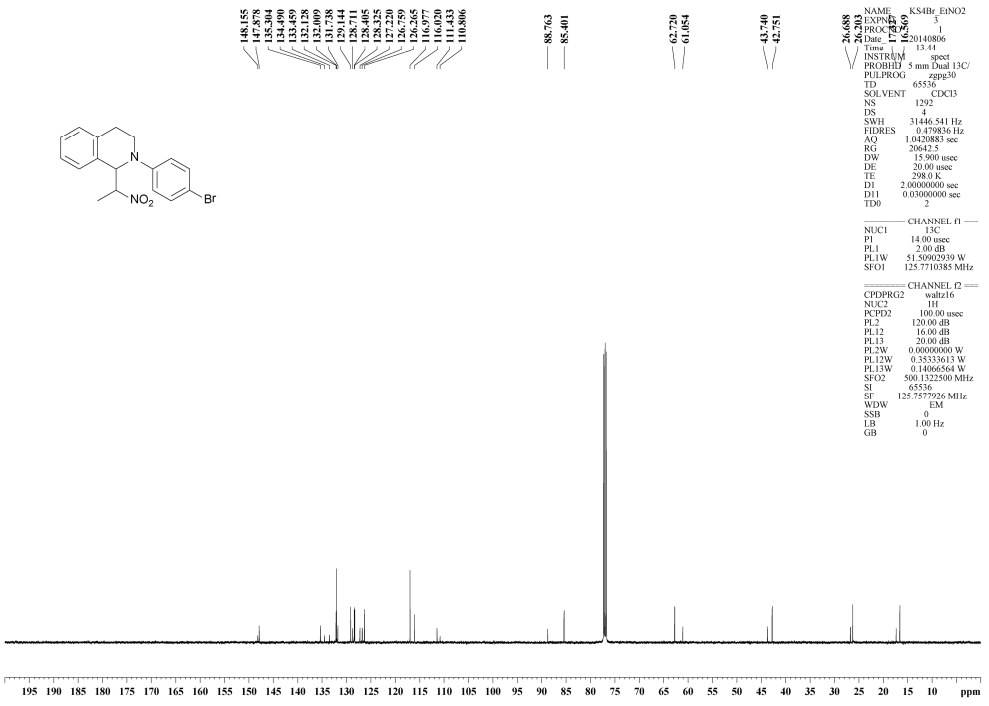

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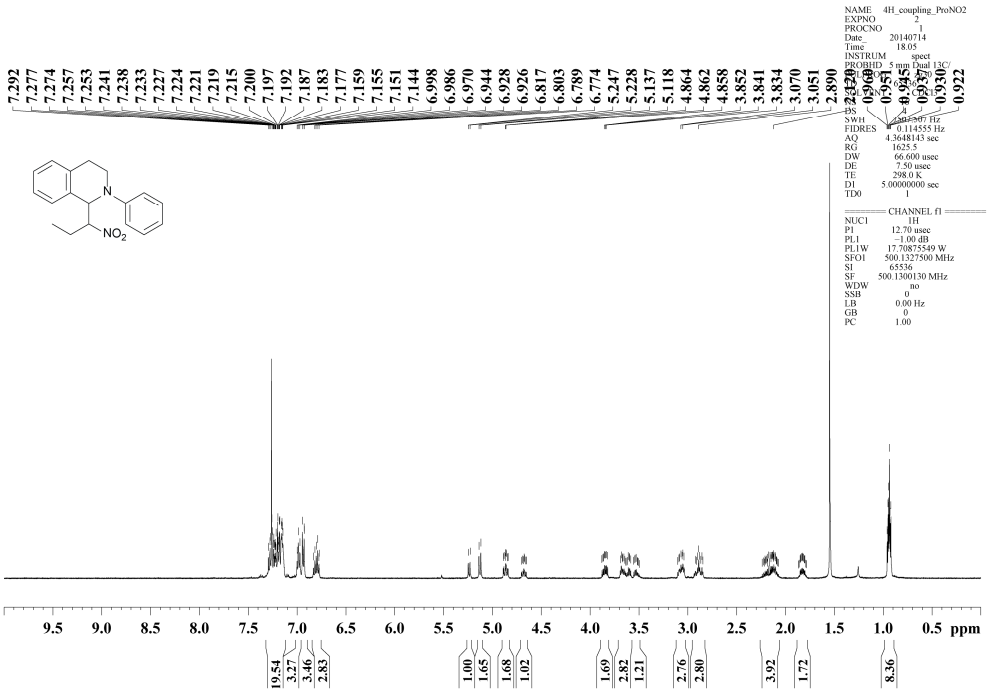

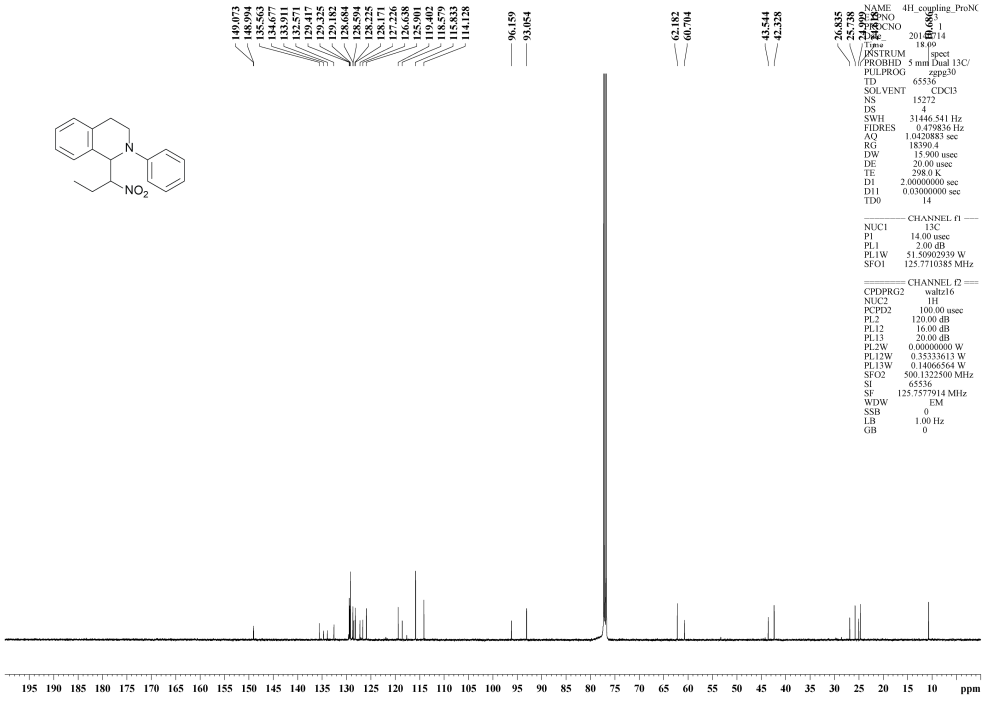

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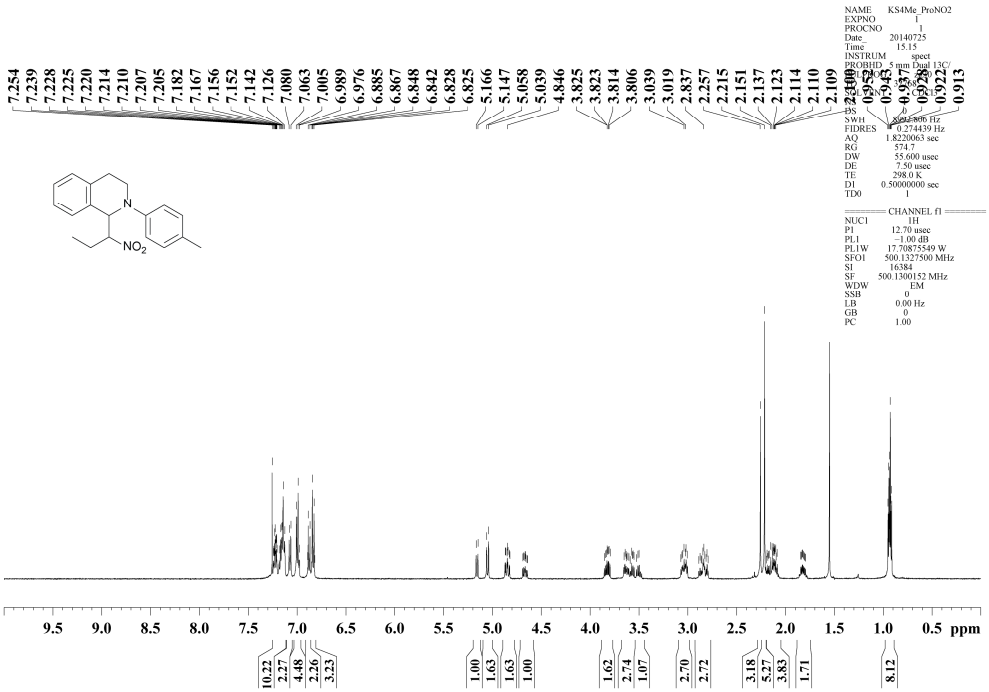

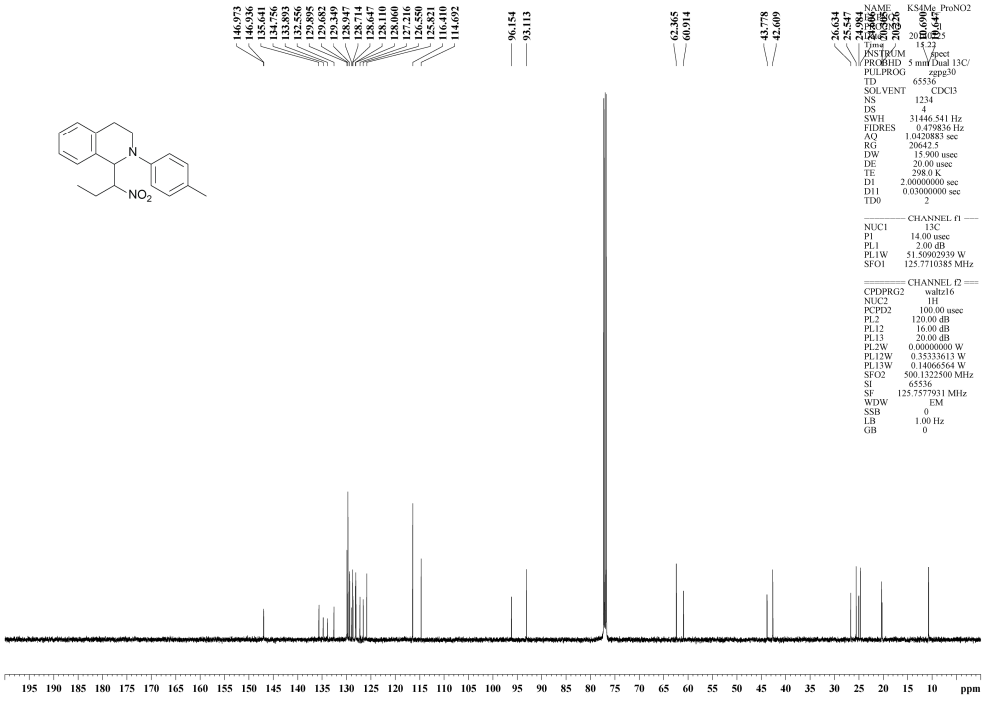

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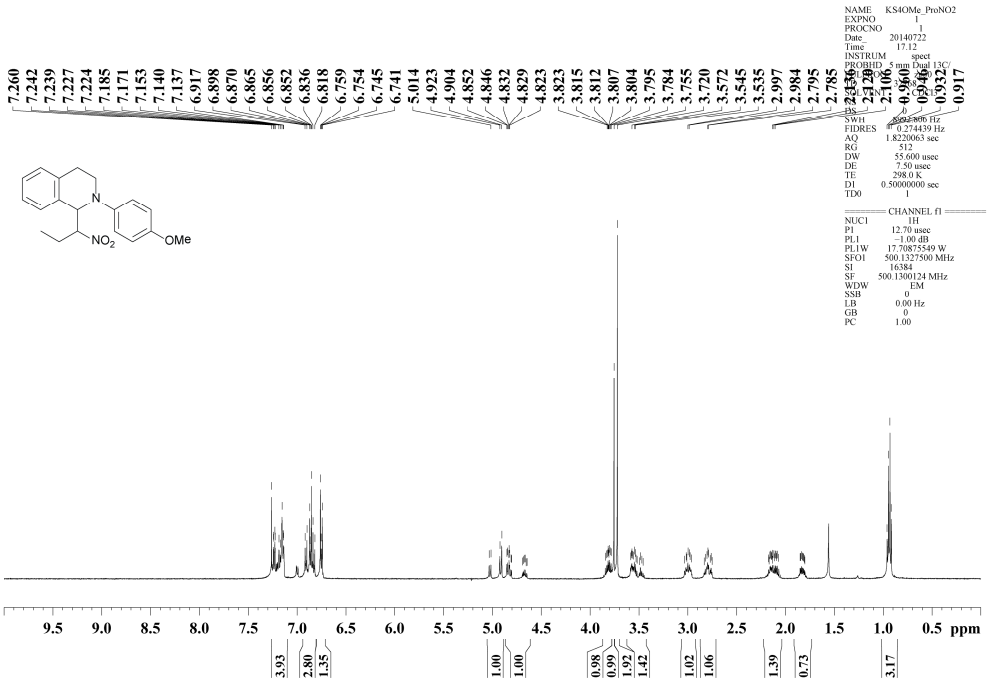

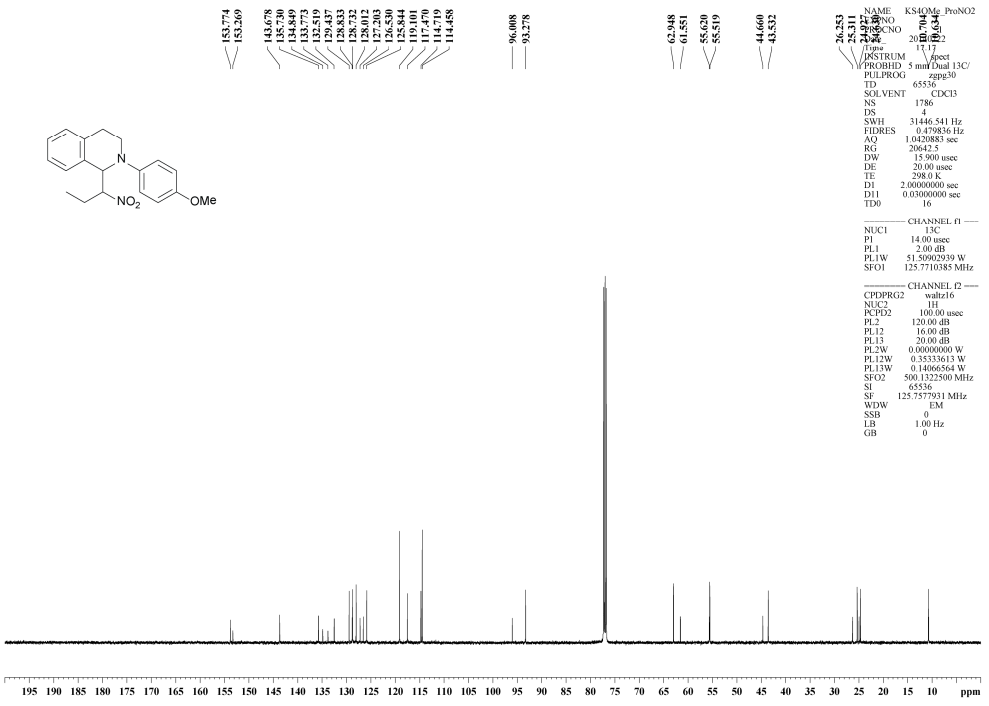

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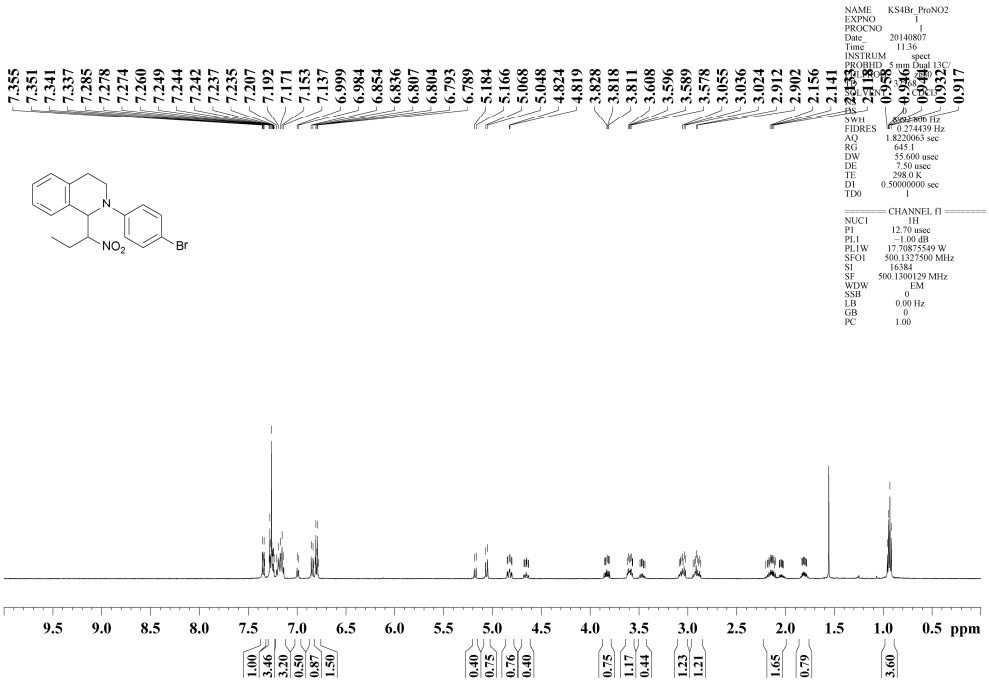

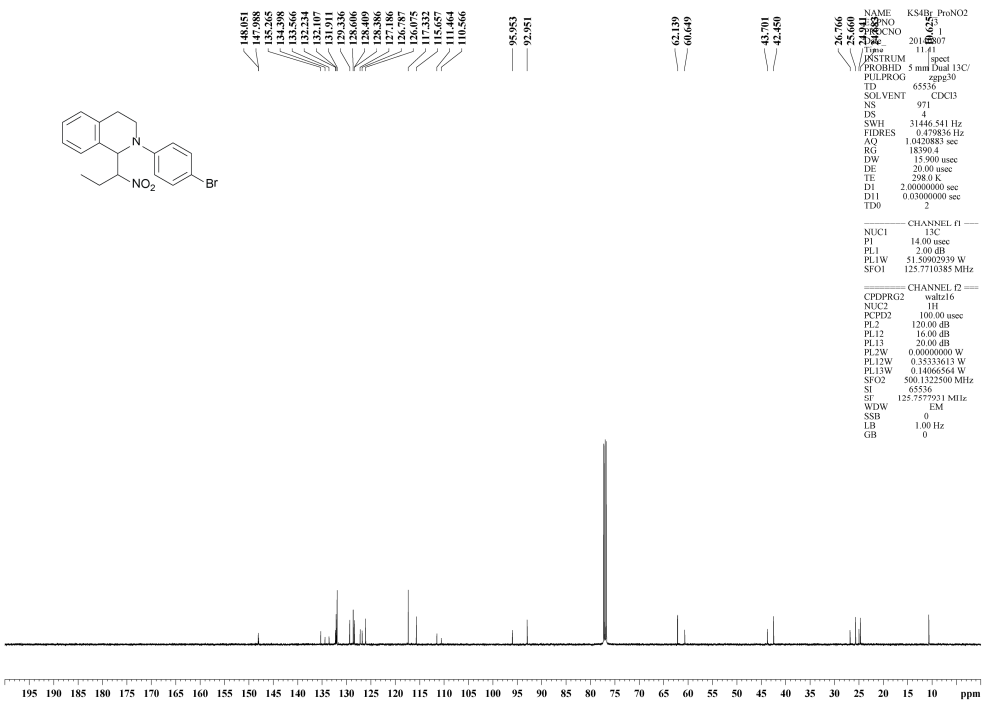

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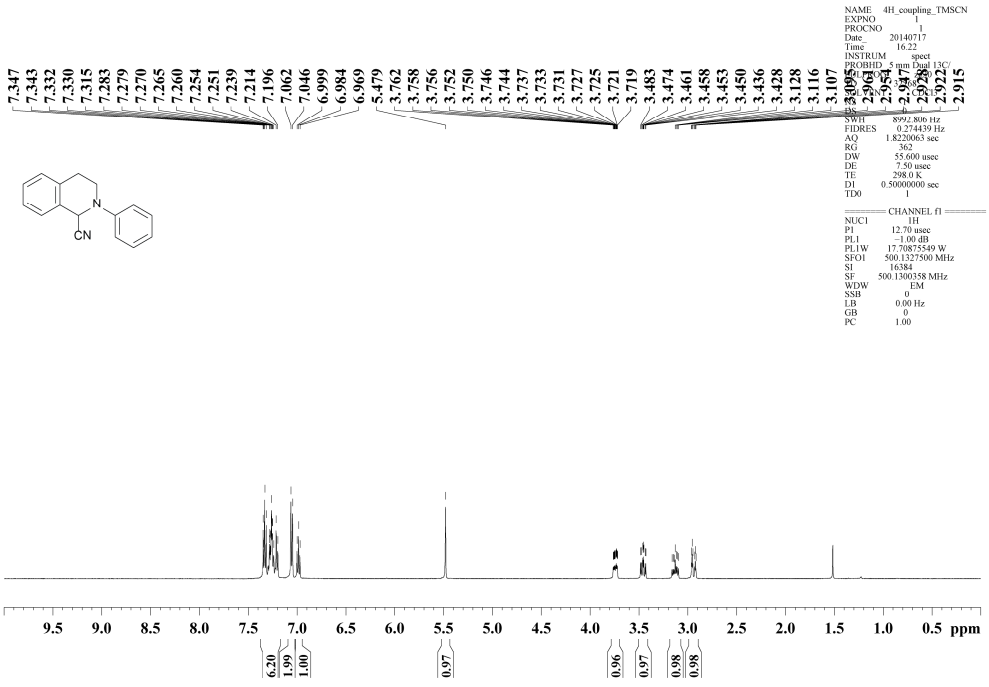

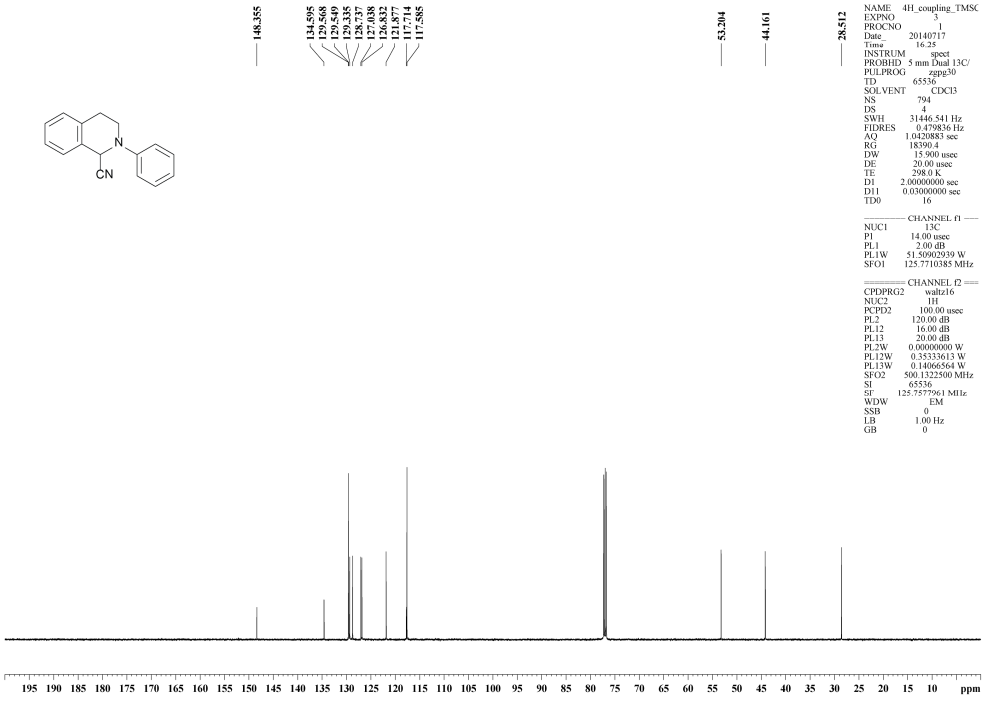

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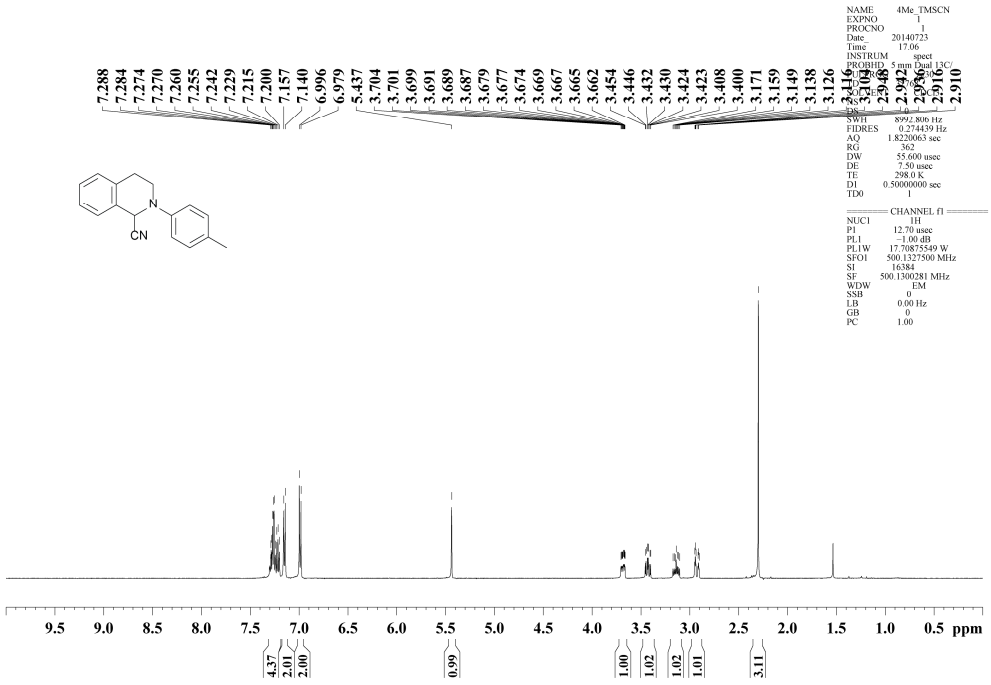

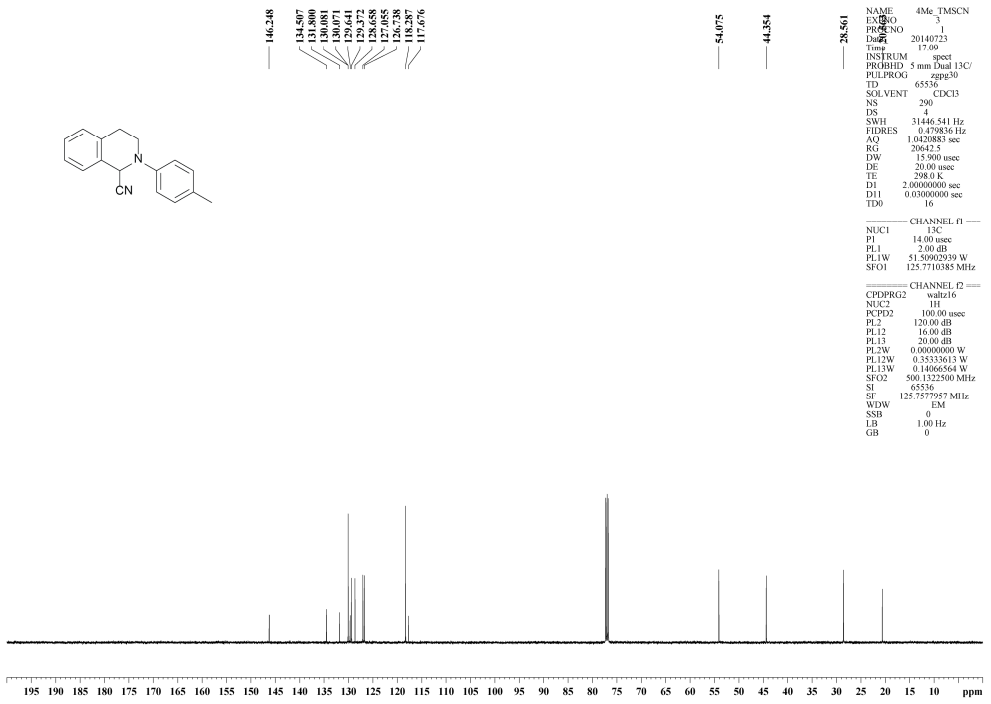

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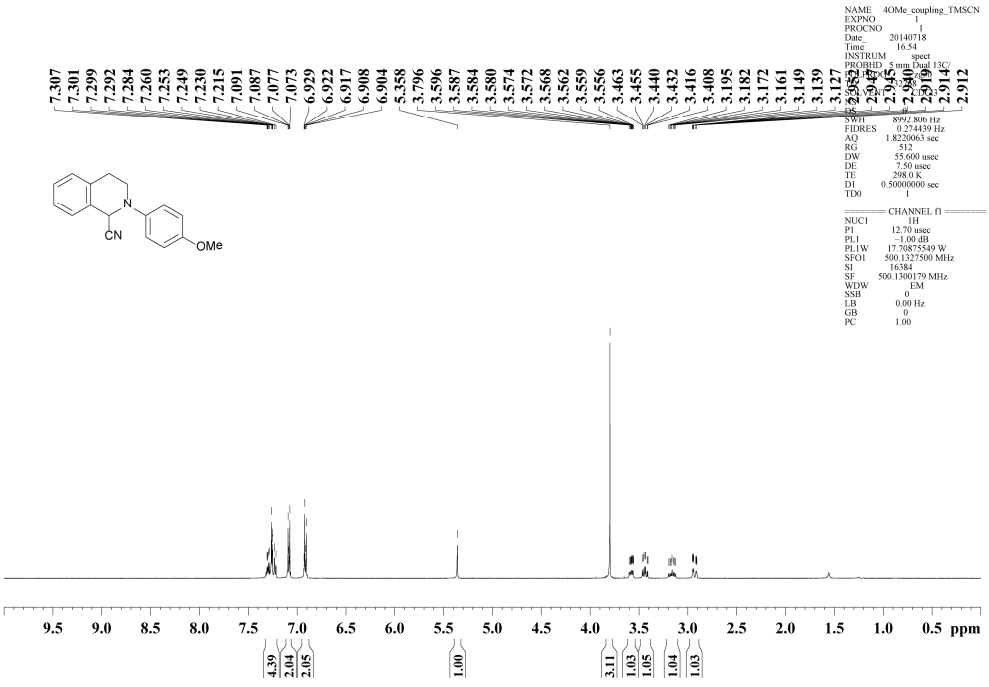

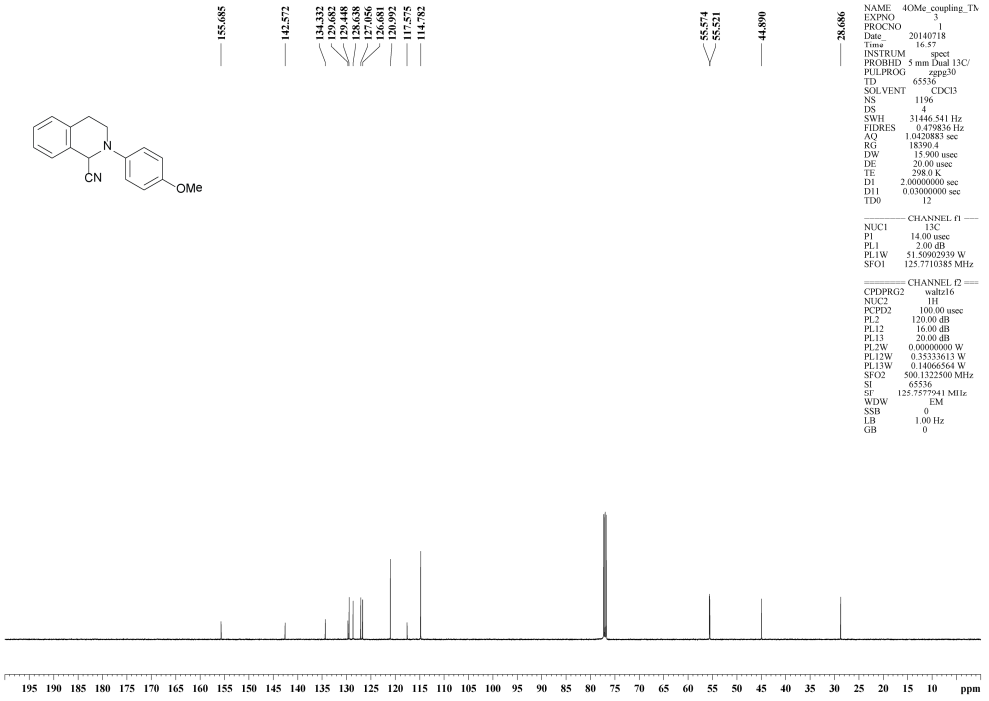

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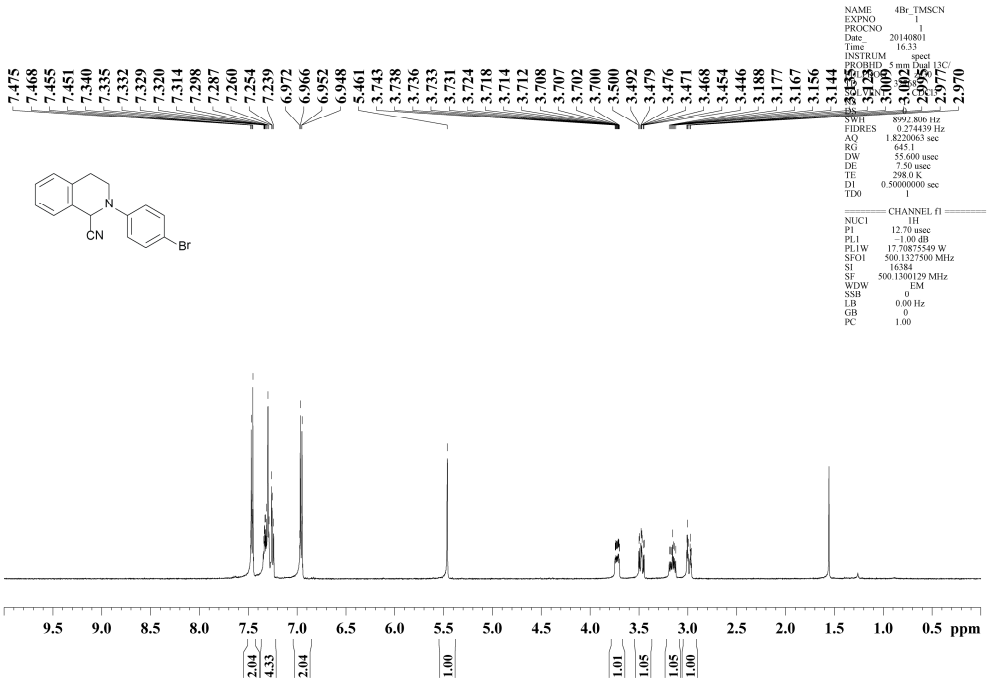

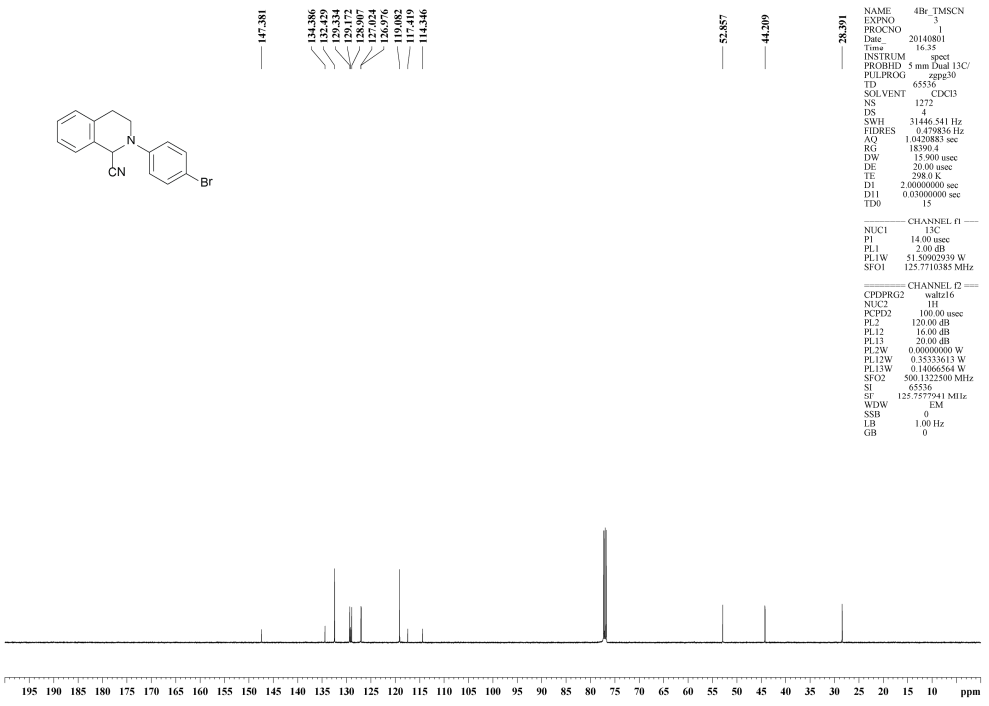

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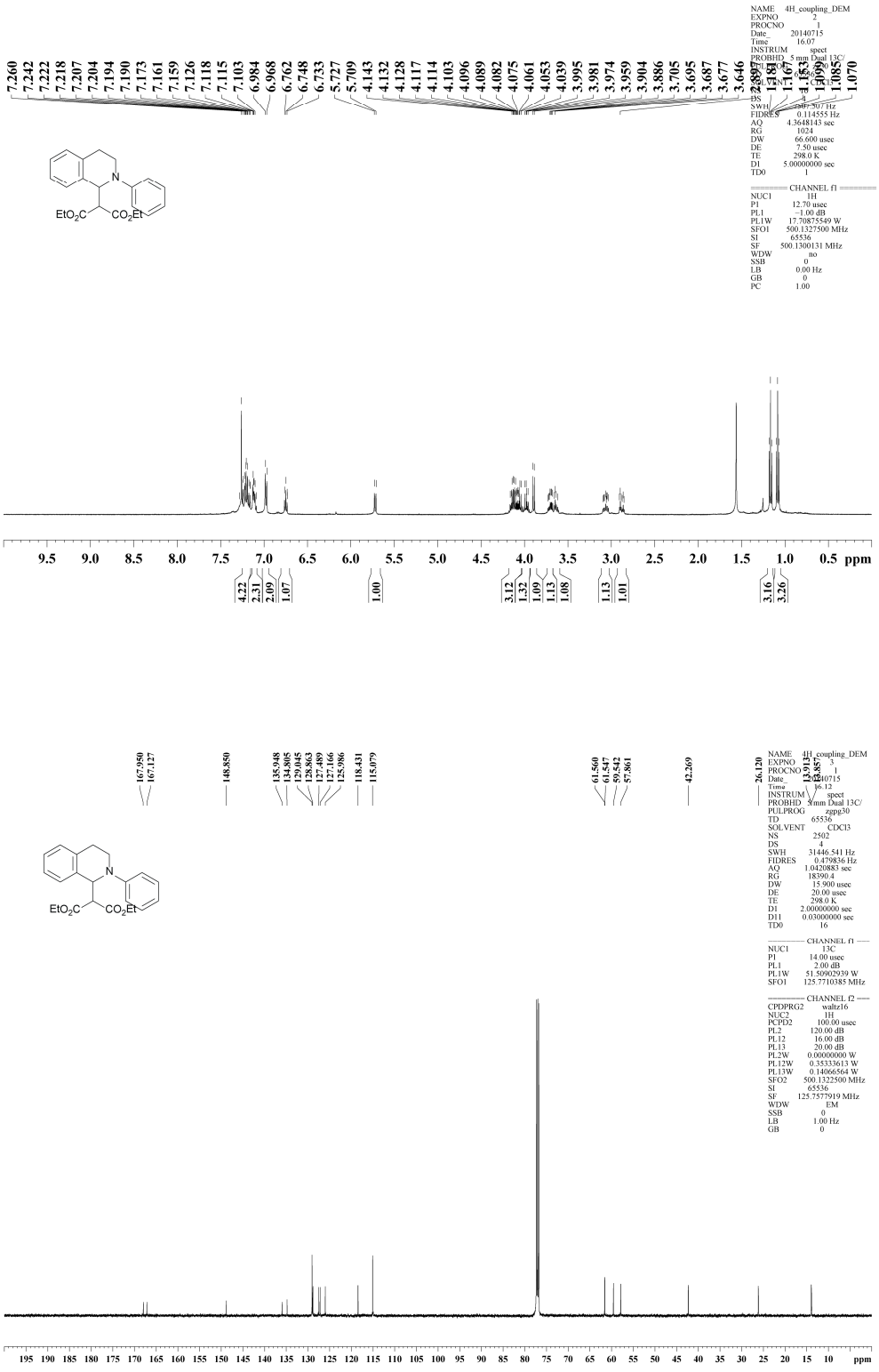

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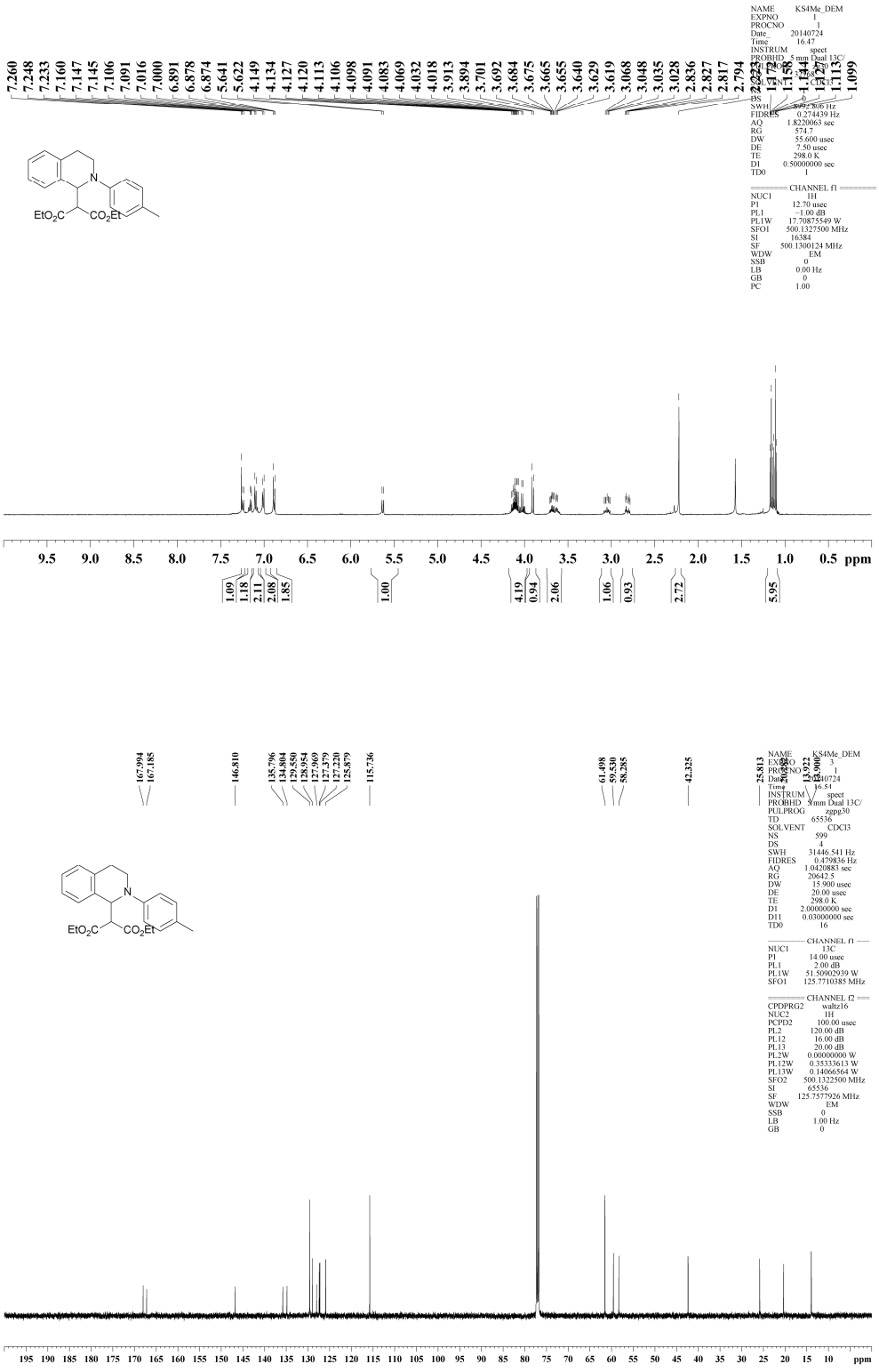

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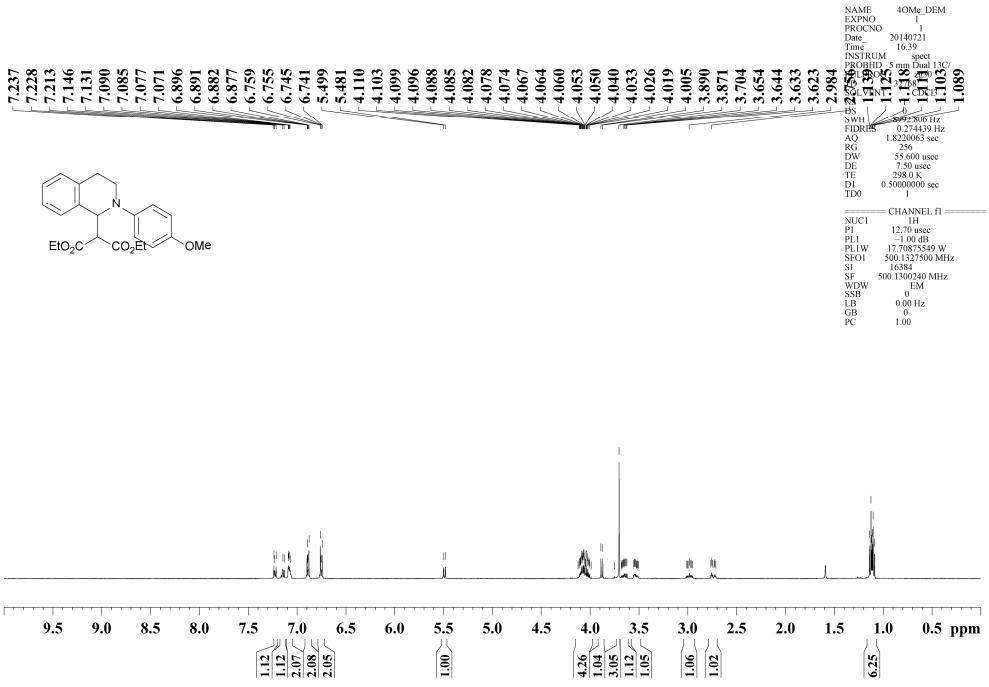

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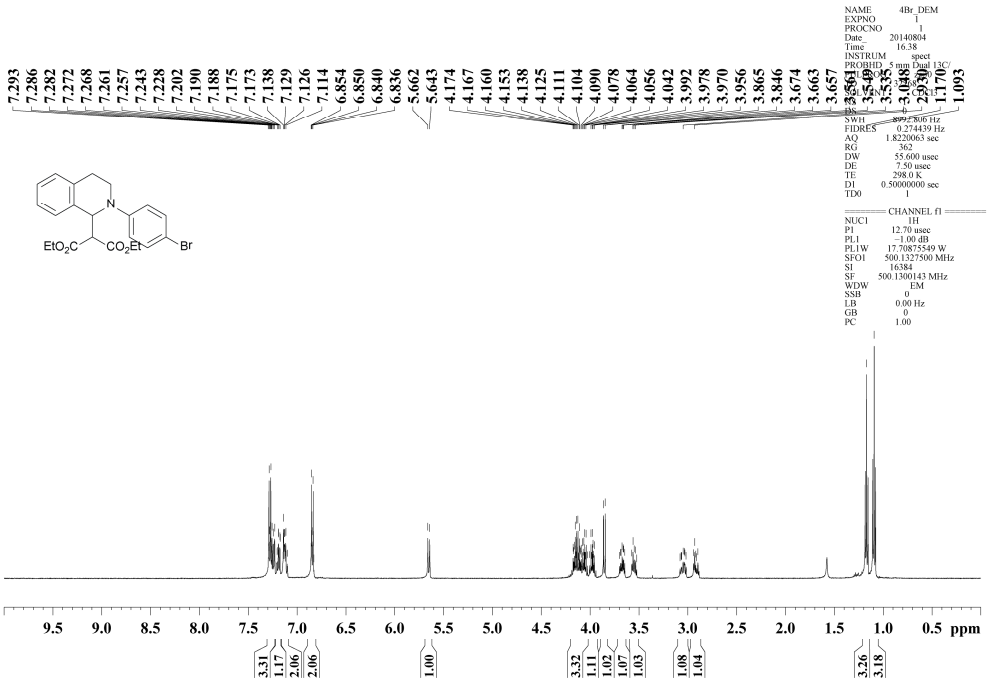

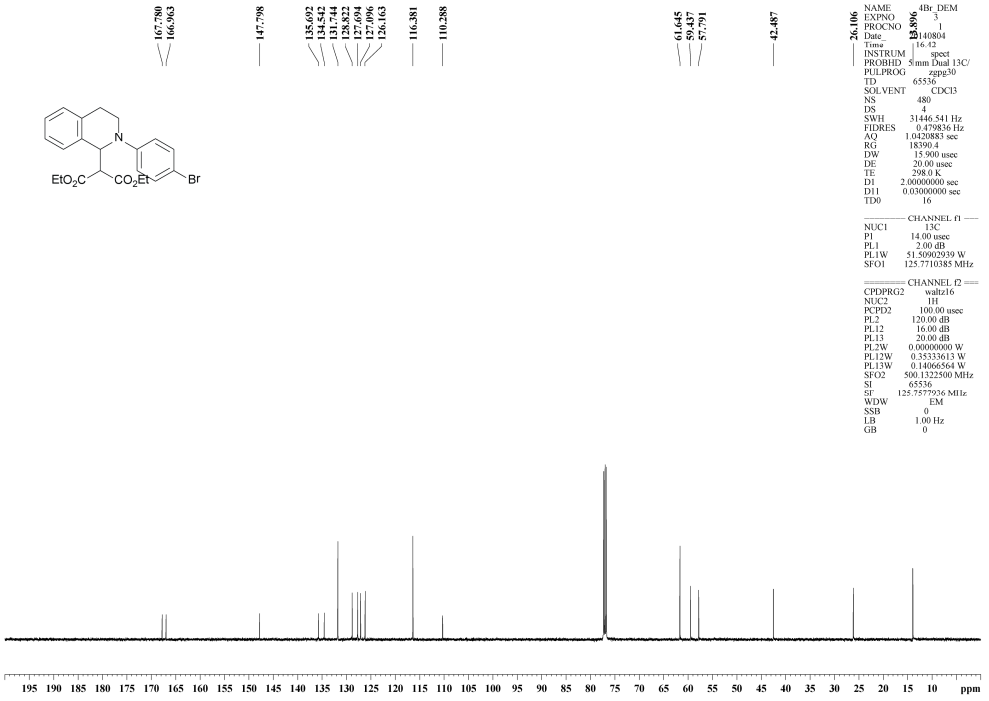

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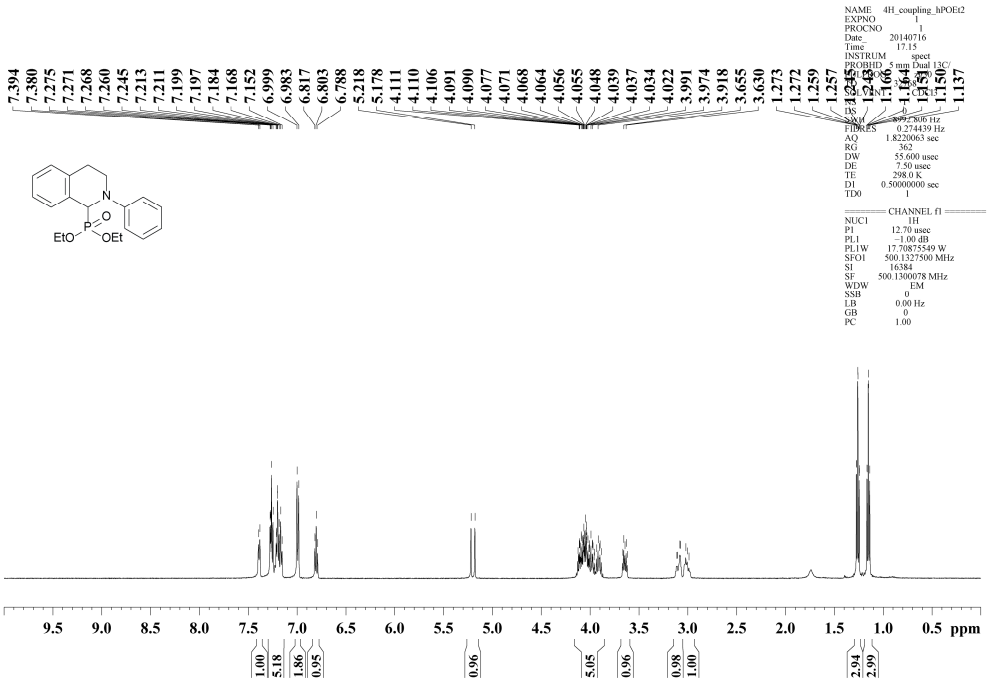

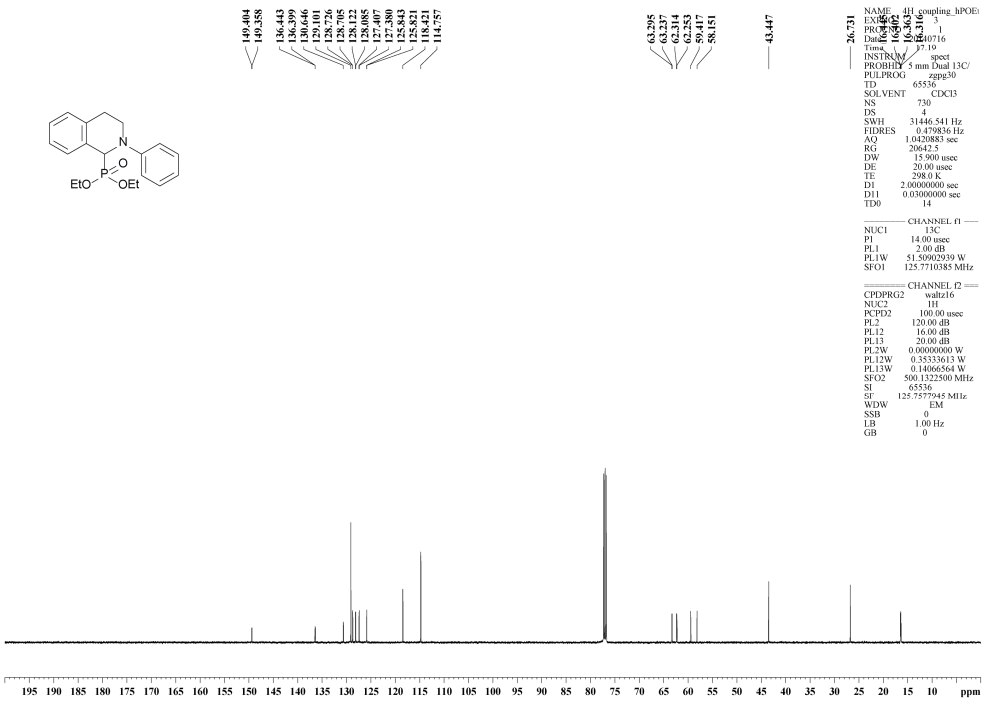

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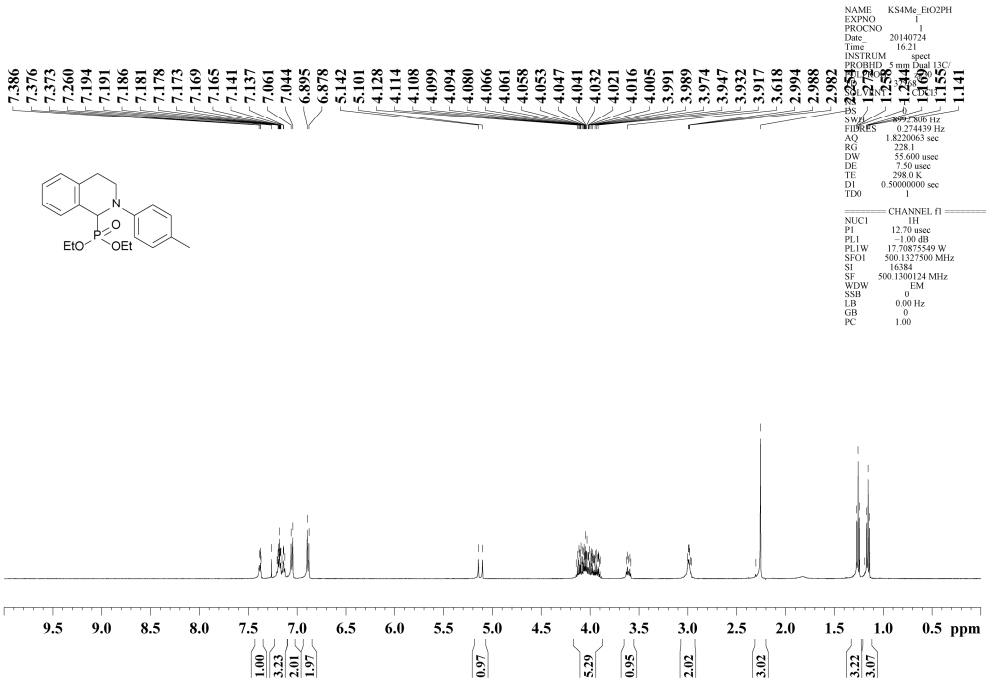

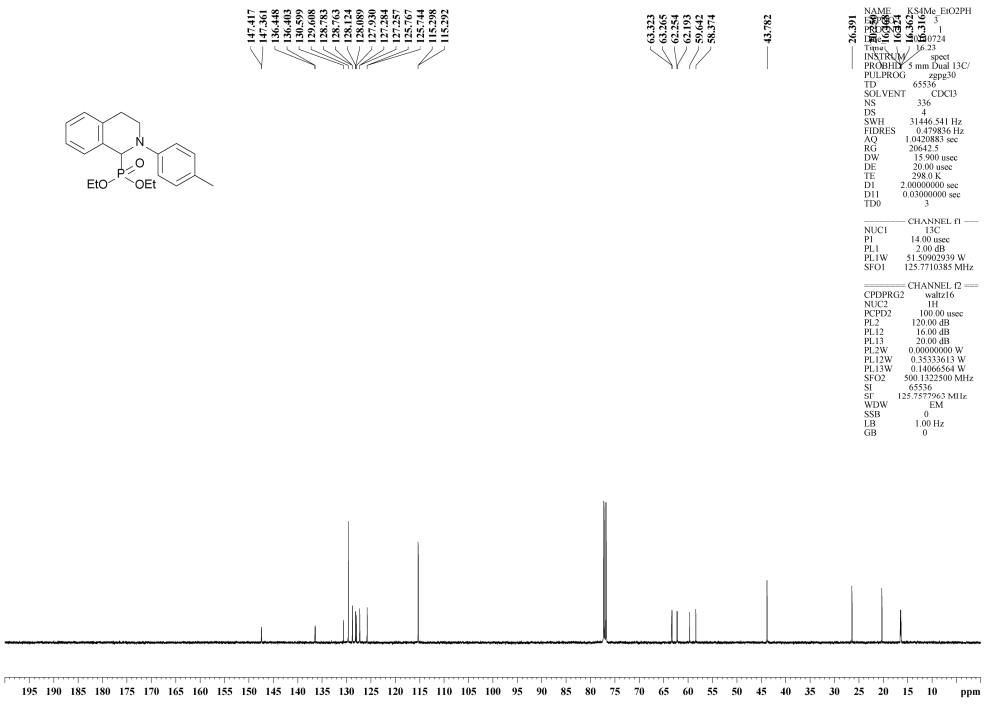

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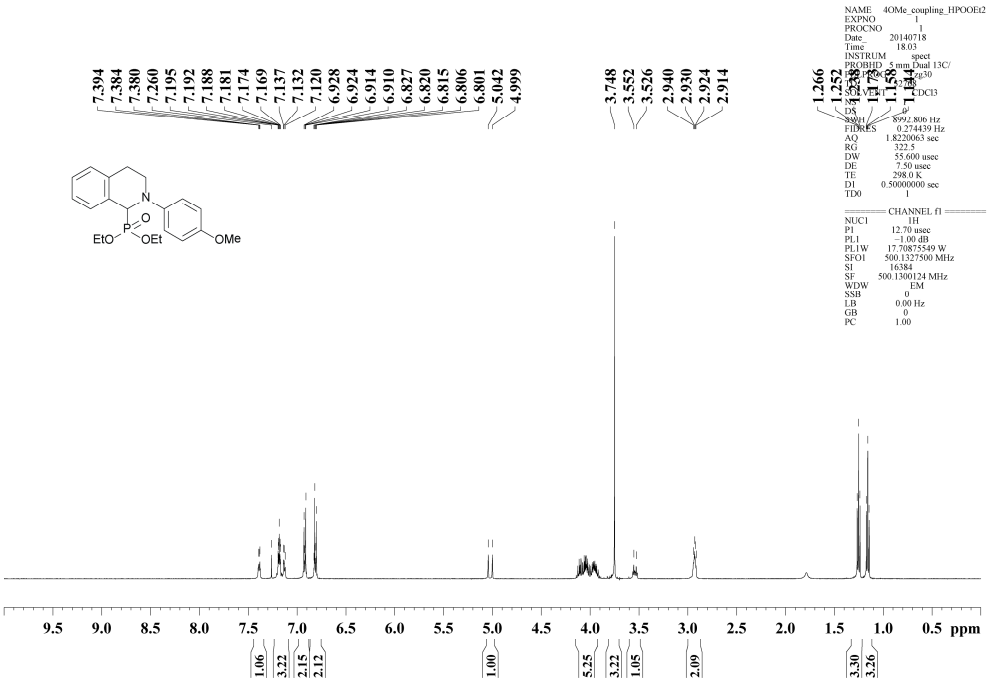

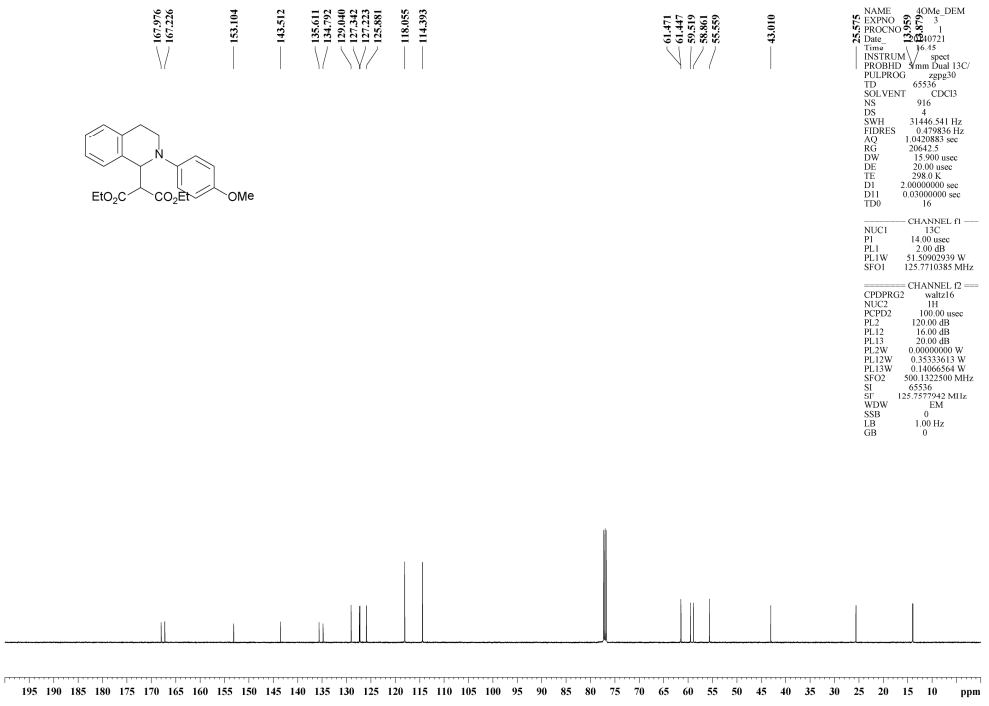

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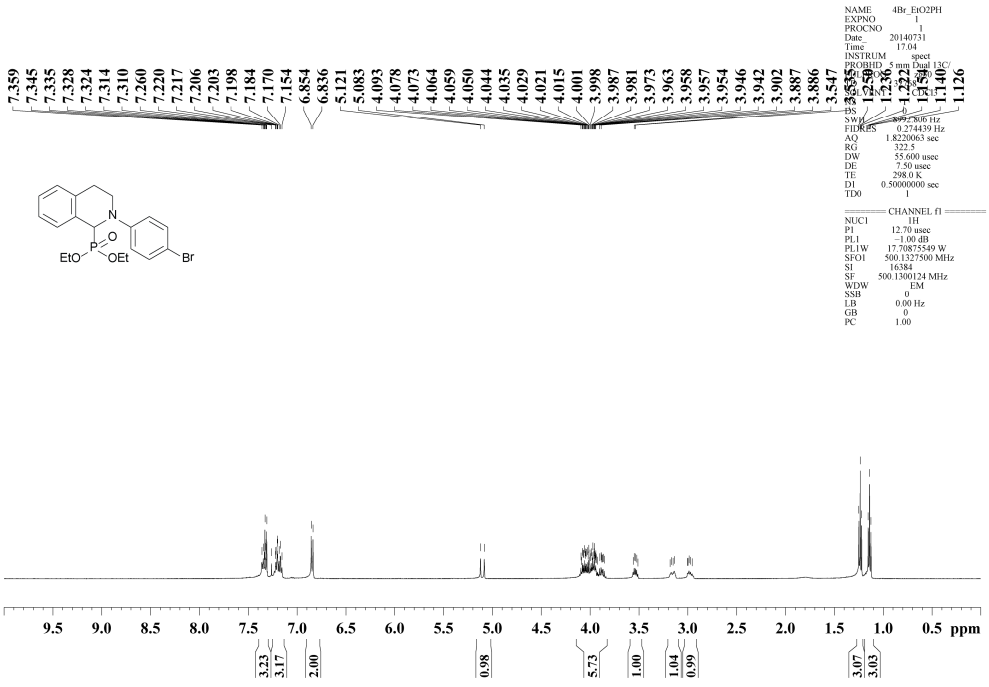

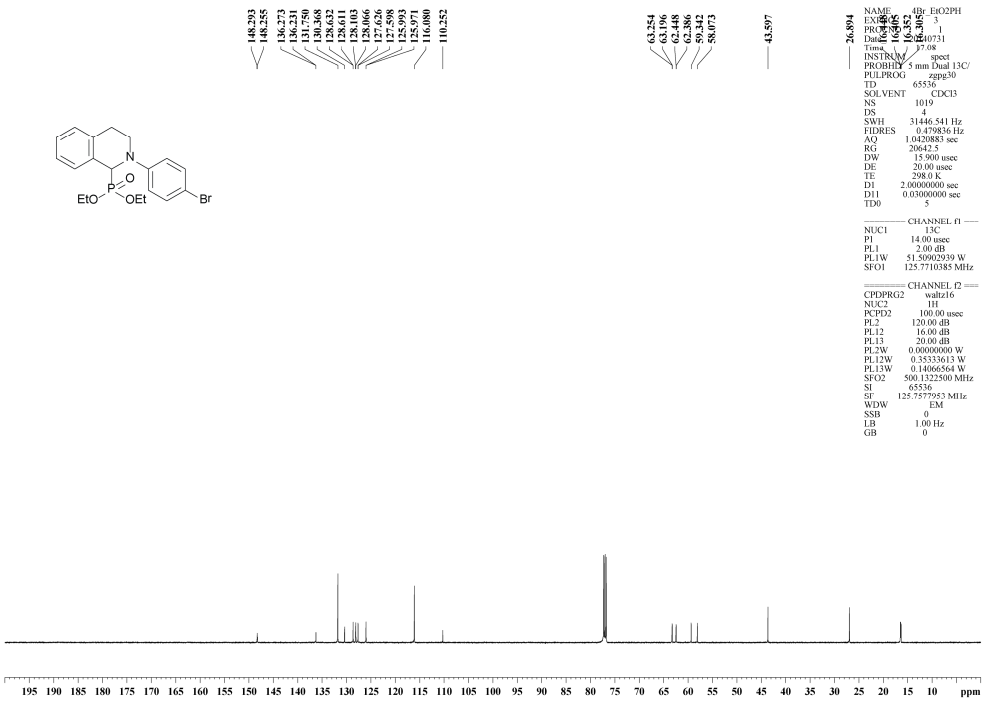

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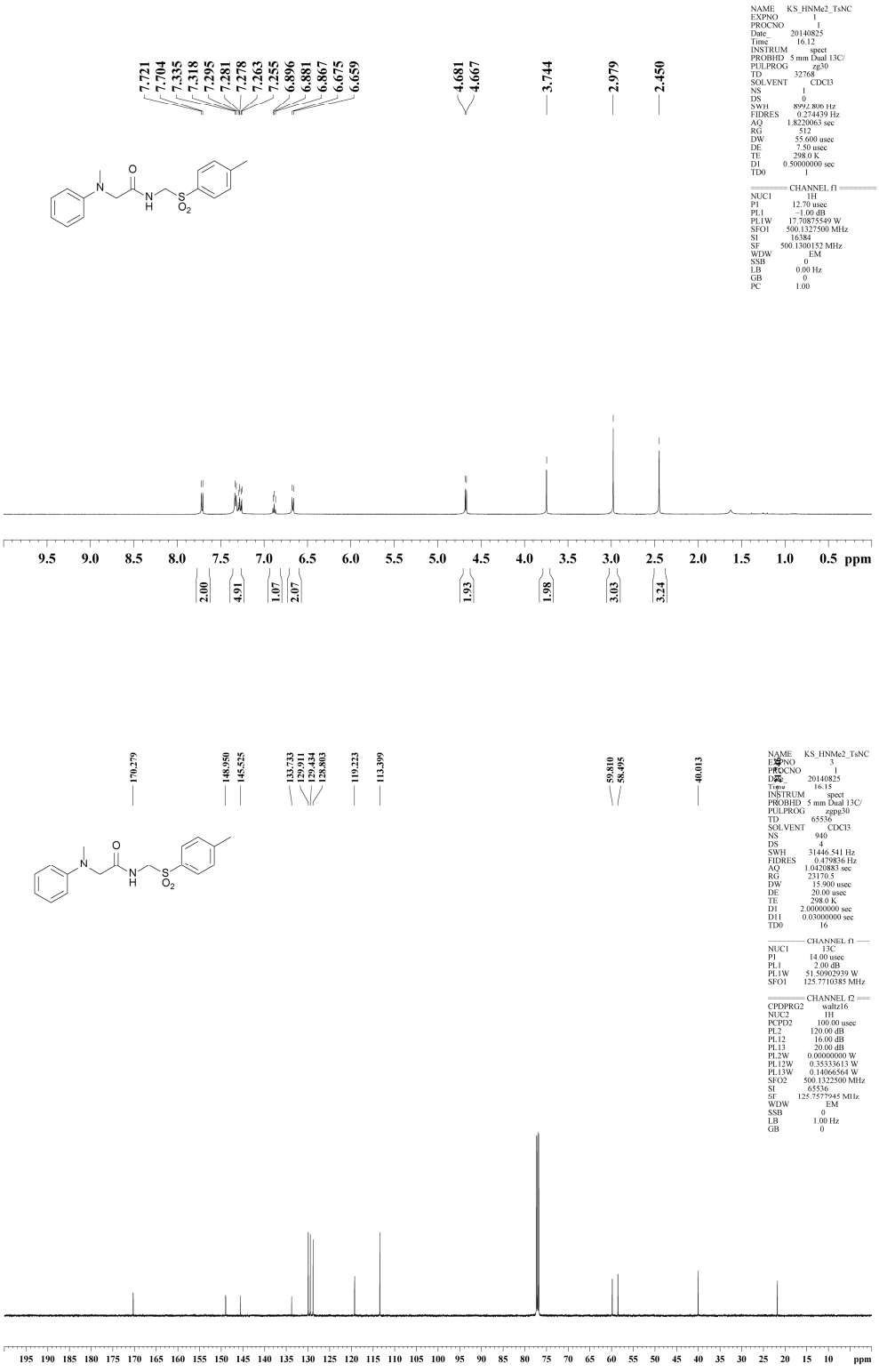

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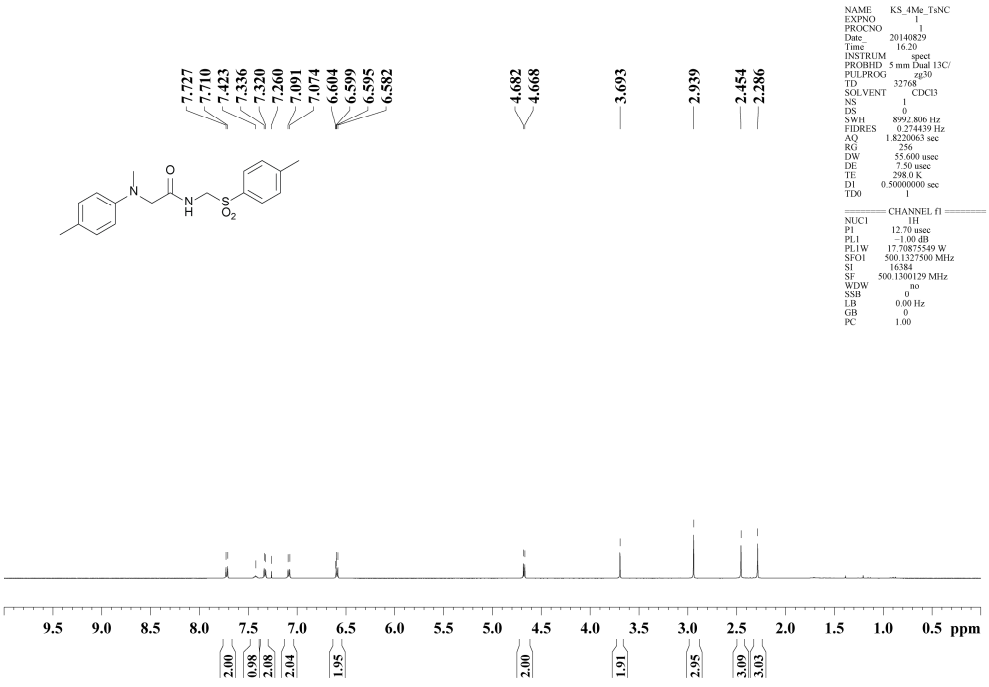

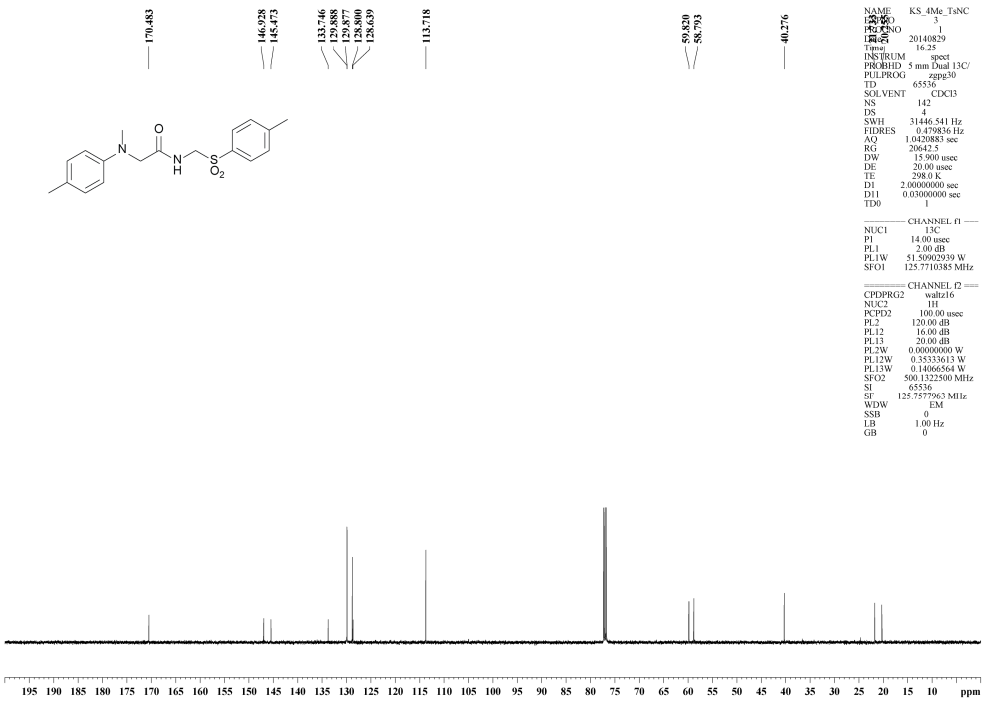

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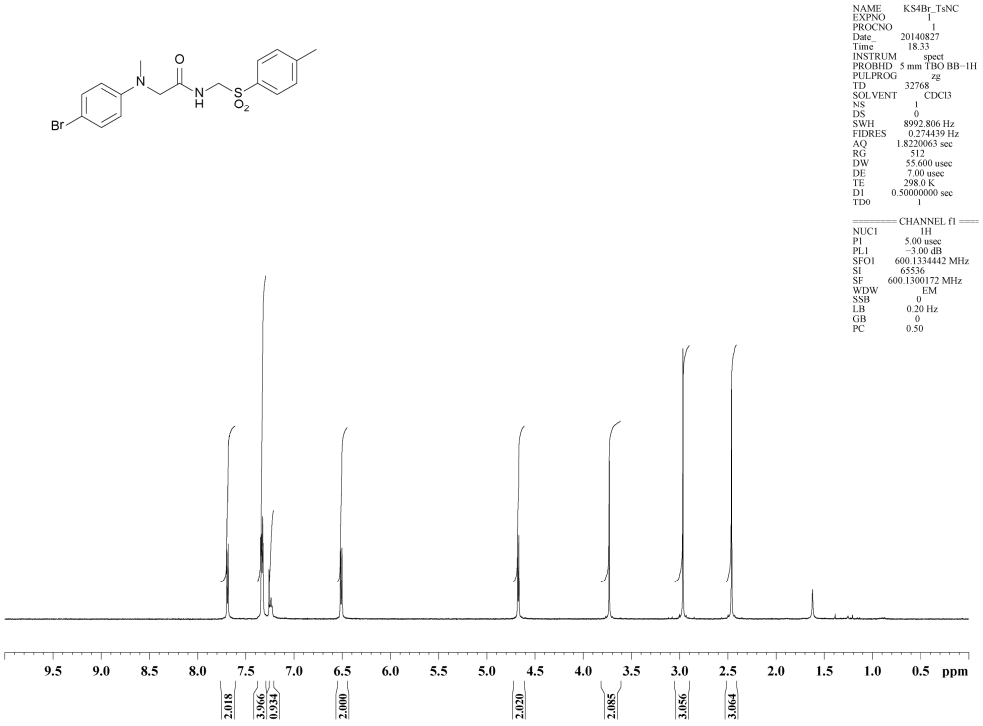

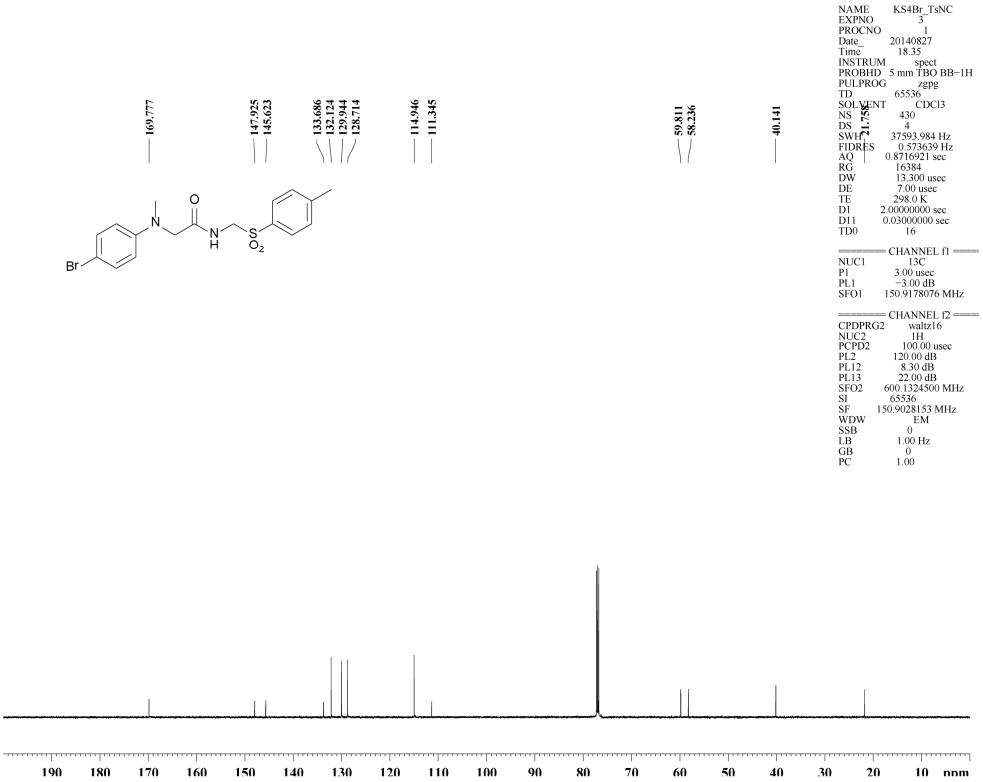

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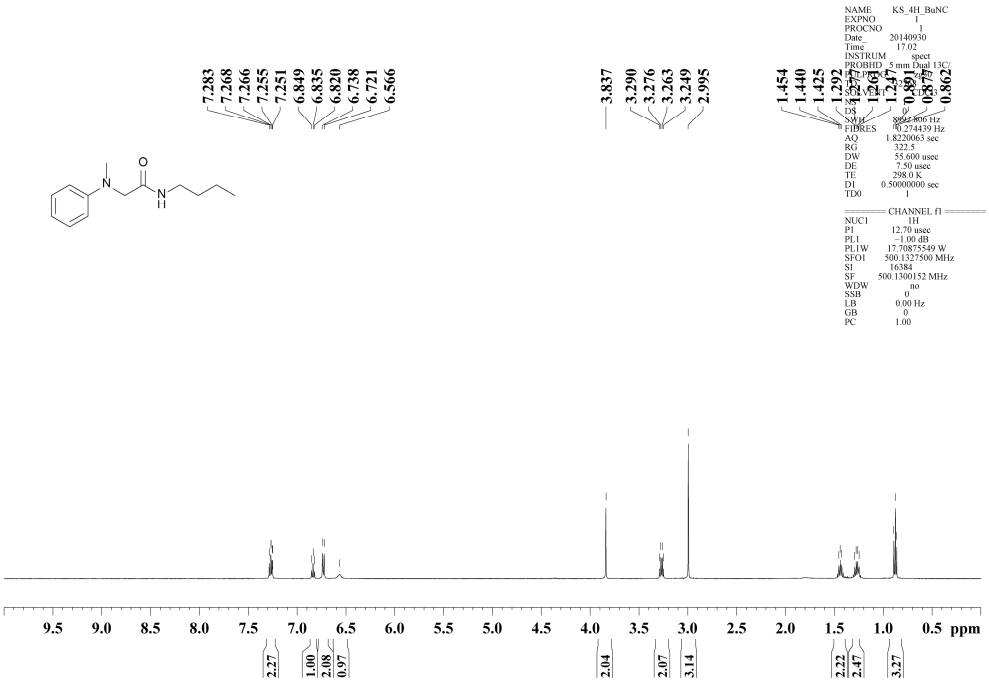

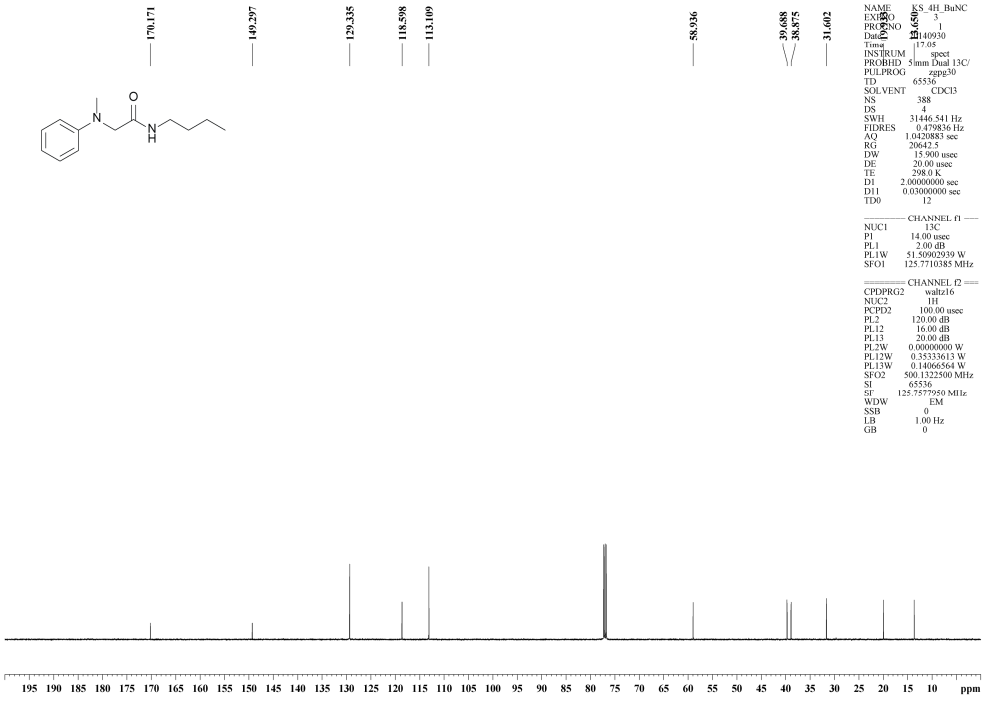

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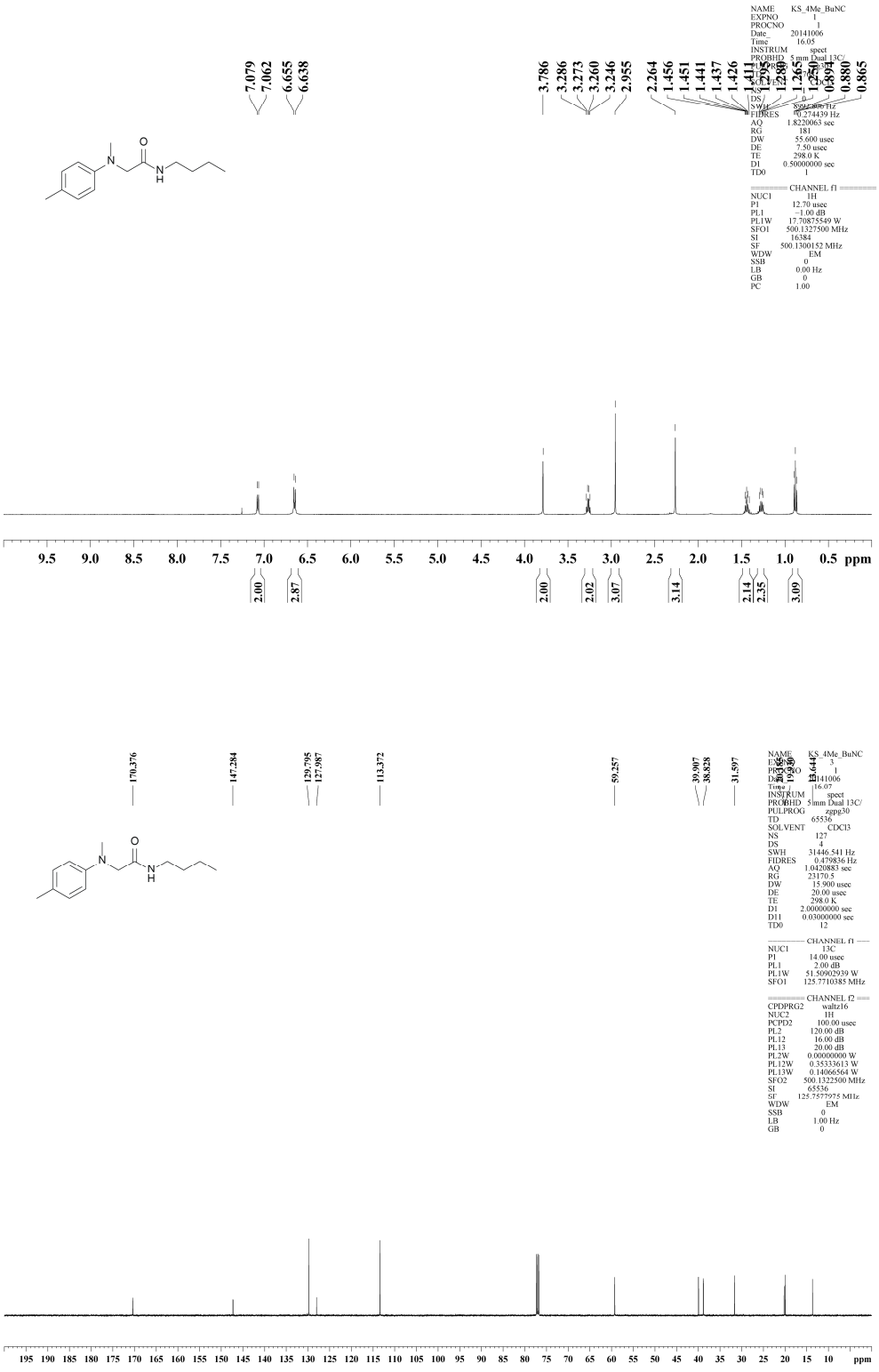

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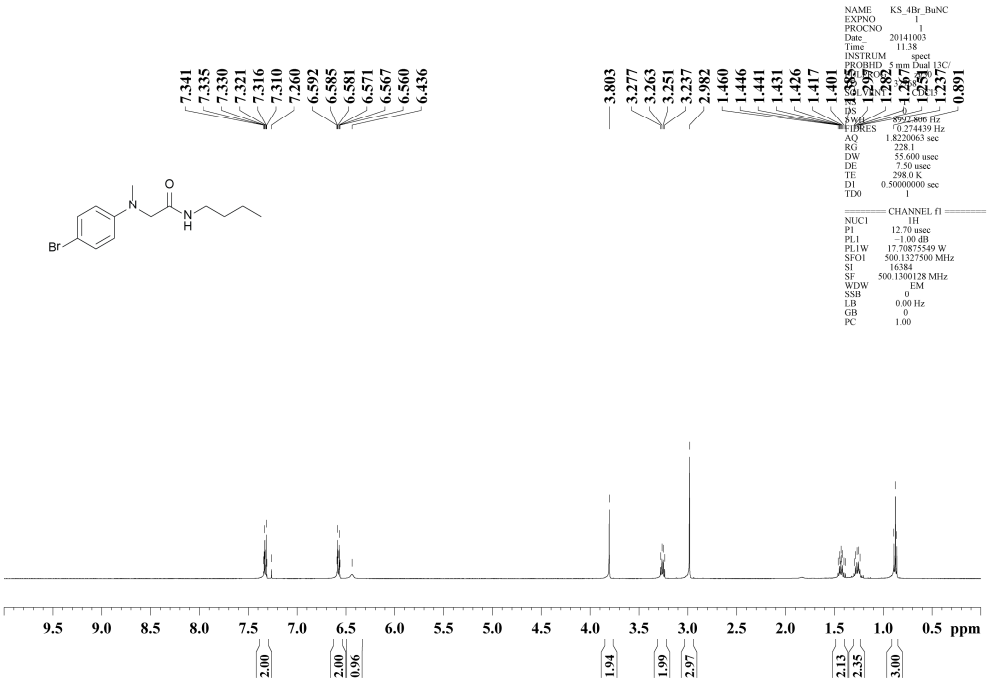

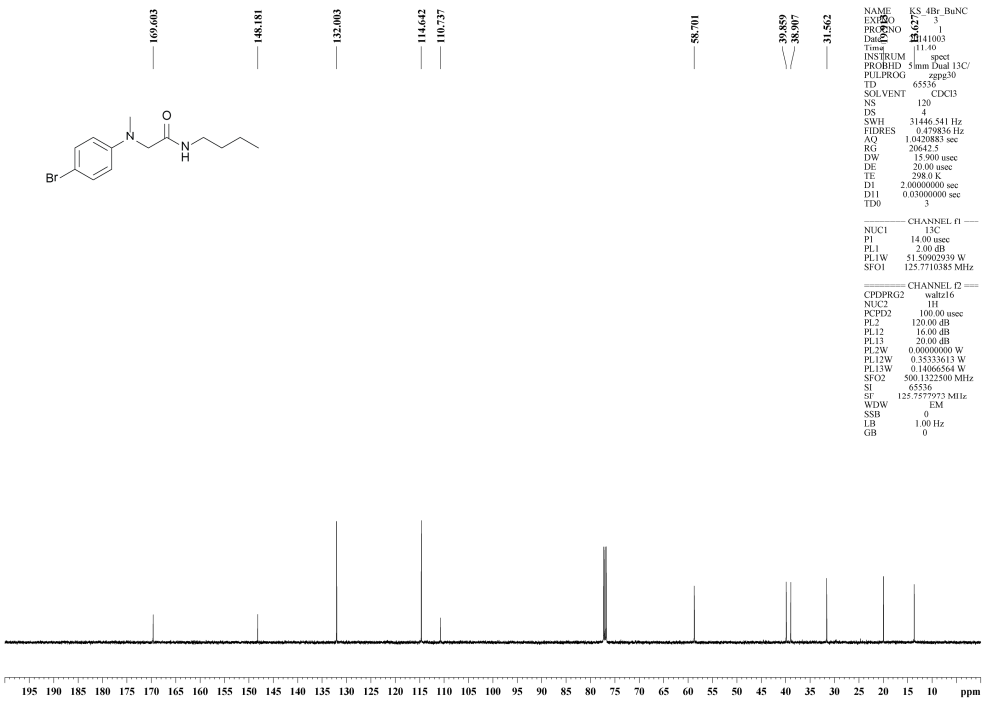

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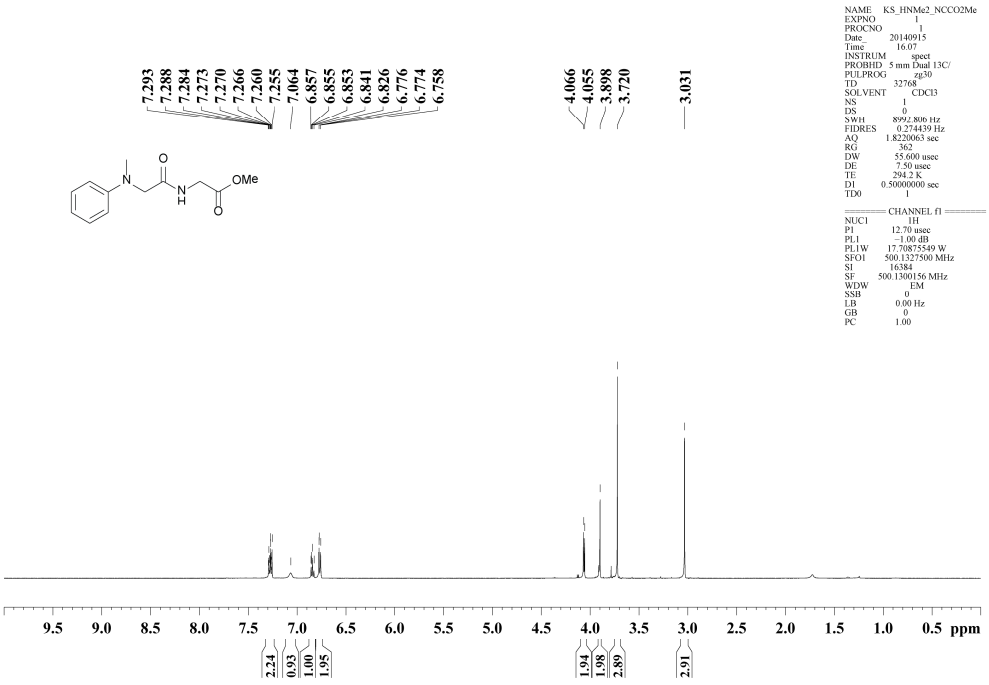

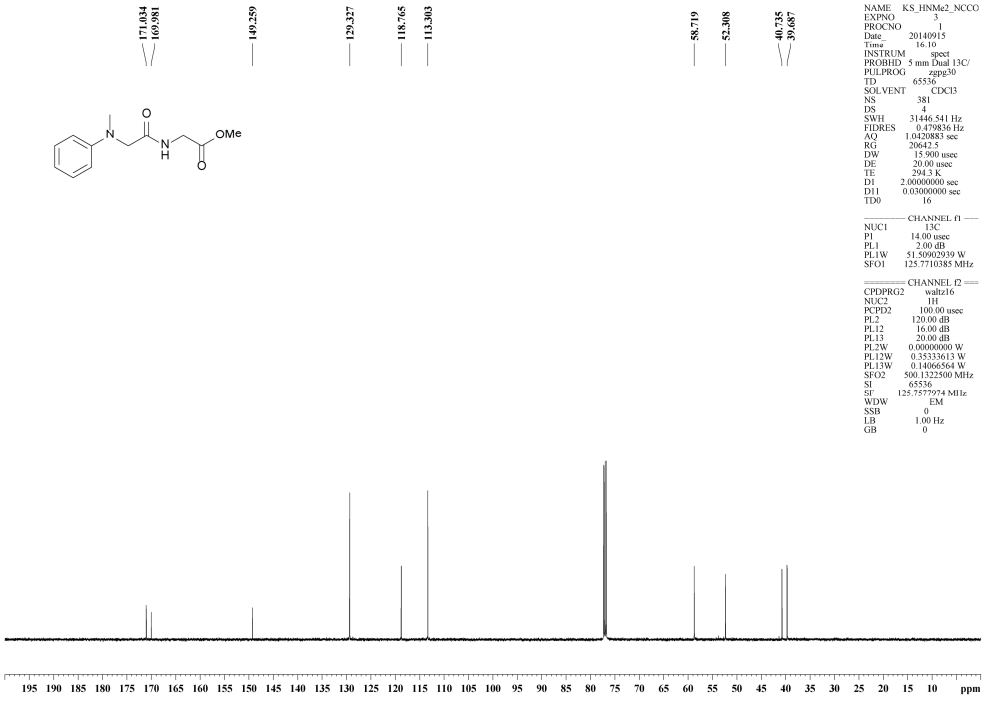

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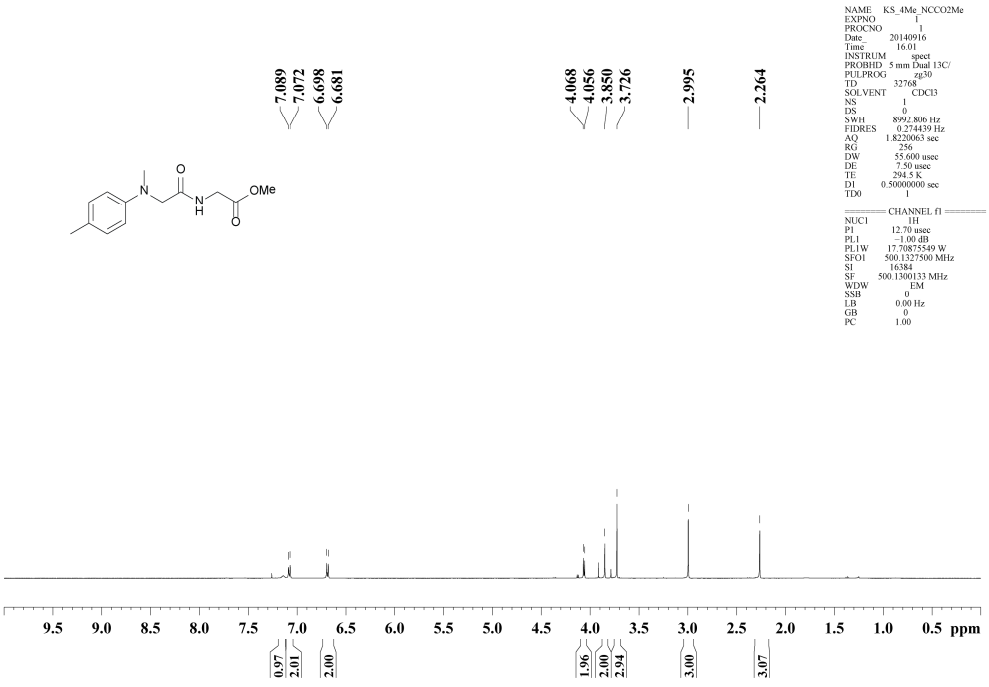

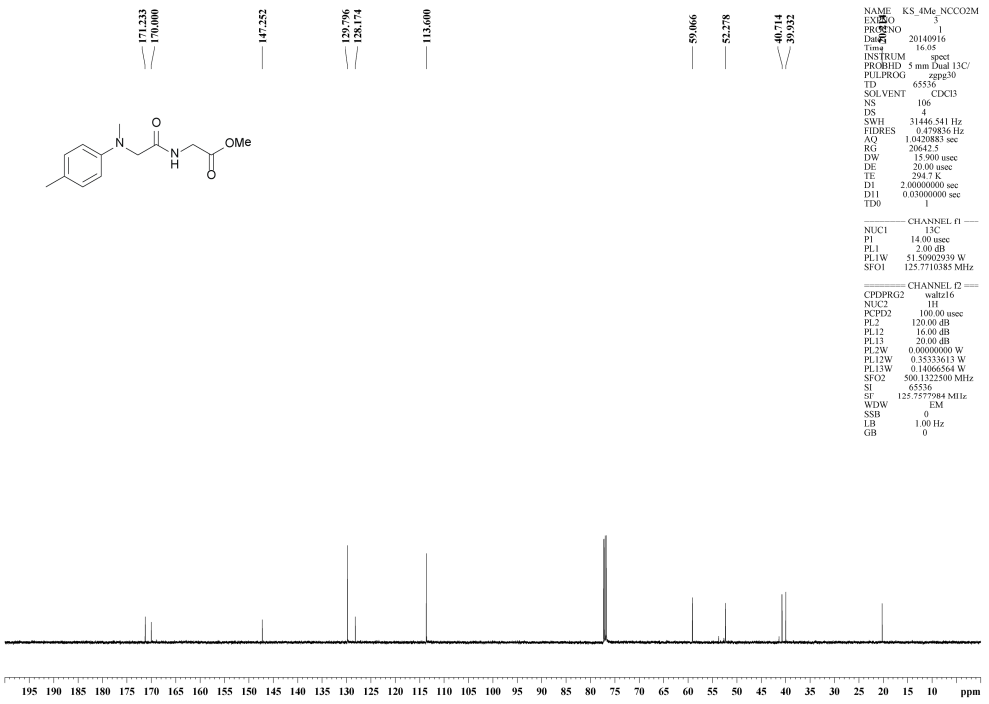

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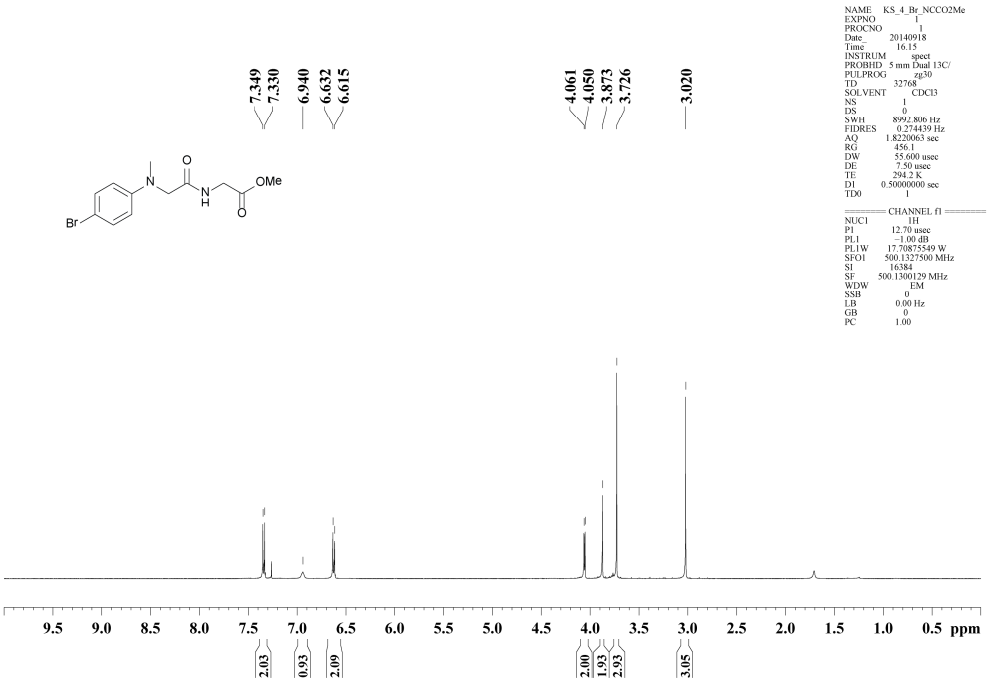


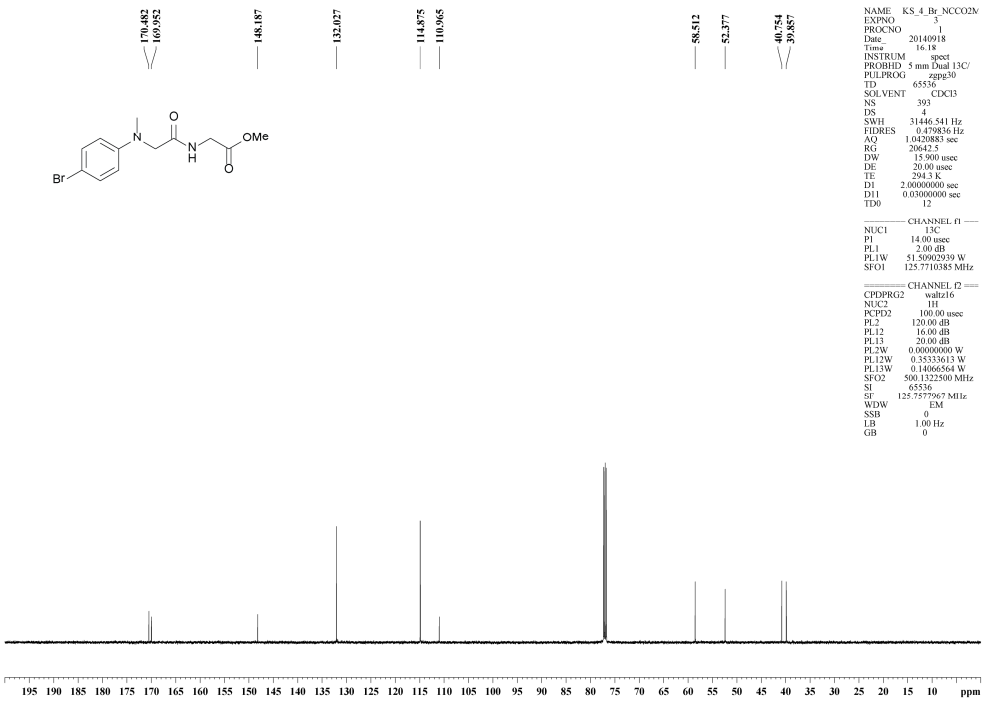
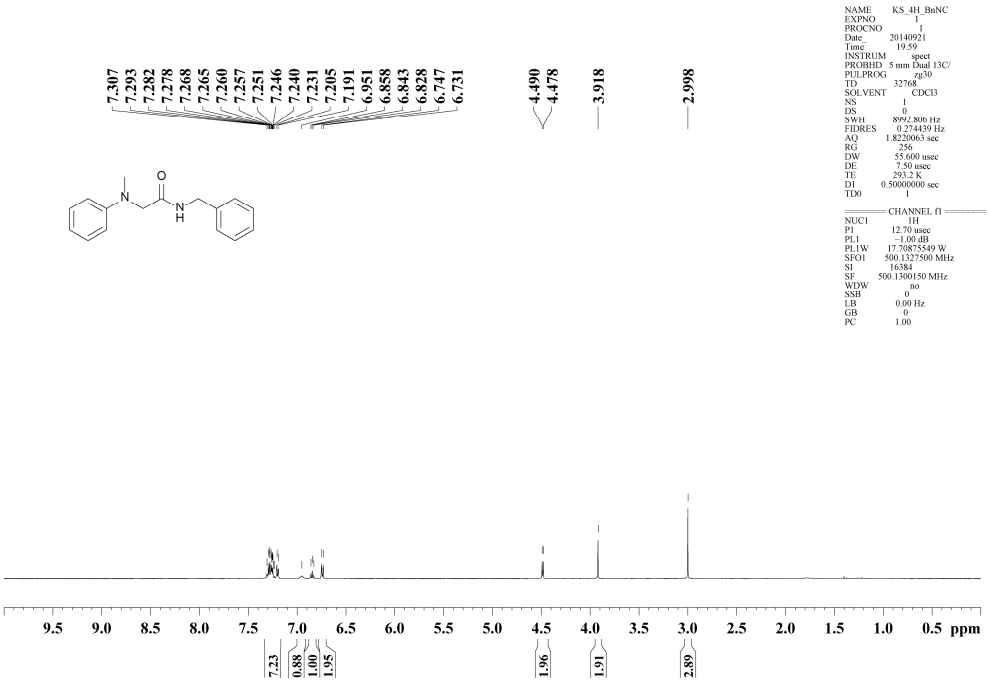


Table 3, Entry 10



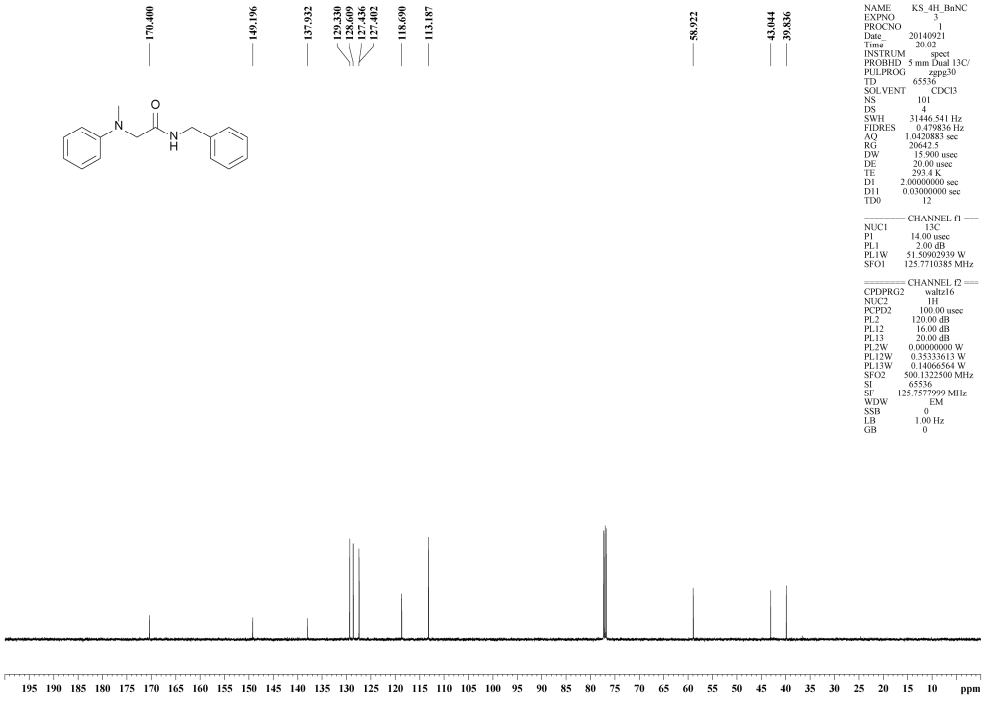
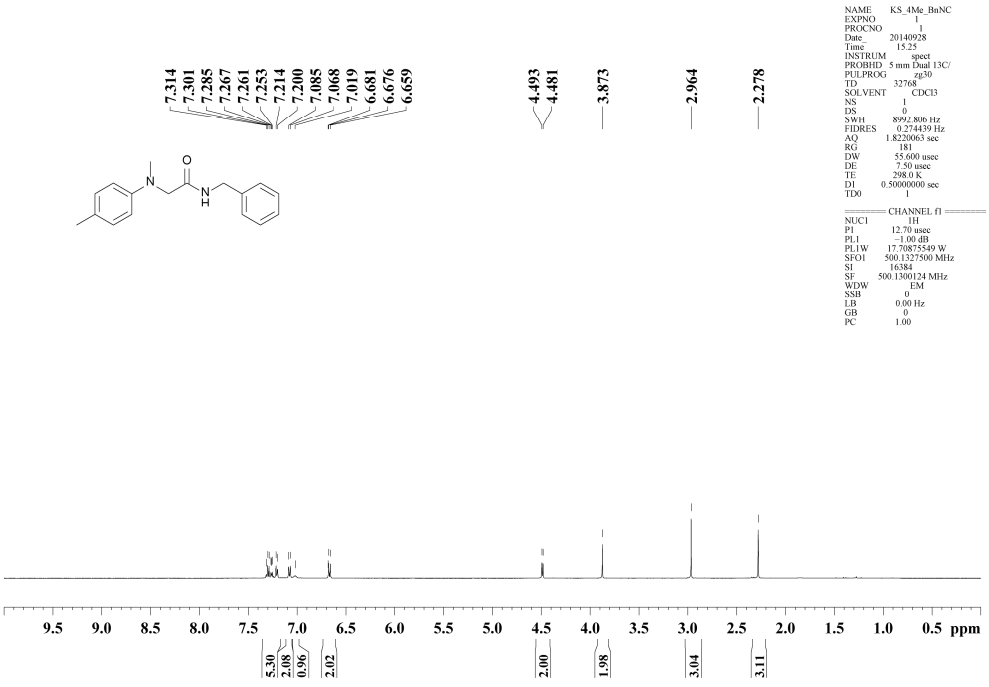


Table 3, Entry 11



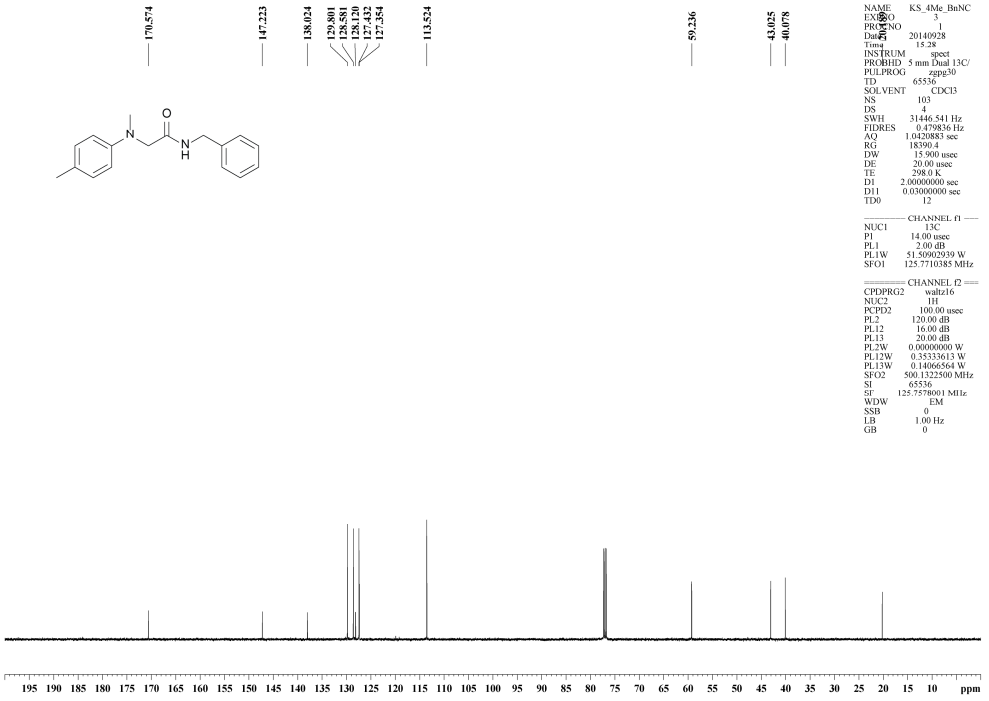


Table 3, Entry 12