Supporting Information

Electrochemical hydroboration of carbonyl compounds

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Contents

EXPERIMENTAL SECTION

General Information. All air-sensitive manipulations were carried out using standard Schlenk and glove box techniques under an atmosphere of high purity argon. ^{1}H, $^{13}C\{^{1}H\}$ and ^{11}B NMR spectra were recorded at 25 °C on Bruker Avance III 600 MHz spectrometer in deuterated solvents and chemical shifts were referenced to $CDCl_3$ as an internal standard. DBpin was synthesized by literature procedure.[1-3] All reagents were used without further purification.

General Procedure for Aldehyde Hydroboration with HBpin. In a 5 mL, oven-dried, round-bottomed flask equipped with a magnetic stir bar, aldehydes (0.5 mmol), HBpin (79.8 μL, 0.55 mmol), Et_4NBF_4 (108.5 mg, 0.5 mmol) and MeCN (3 mL) were added, respectively. The flask was equipped with graphite felt electrode (10×10×3 mm^3) as the anode and platinum plate (10×10×0.10 mm^3) as the cathode. The mixture was stirred for 3 h under a continuous current of 5 mA at room temperature. The progress of the reaction was monitored by ^{1}H and ^{11}B NMR spectroscopy which indicated the completion of the reaction by the disappearance of aldehyde (RCHO) proton and appearance of a new CH_2 resonance.

General Procedure for Ketone Hydroboration with HBpin. In a 5 mL, oven-dried, round-bottomed flask equipped with a magnetic stir bar, ketones (0.5 mmol), HBpin (108.8 μL, 0.75 mmol), Et_4NBF_4 (108.5 mg, 0.5 mmol) and MeCN (3 mL) were added, respectively. The flask was equipped with graphite felt electrode (10×10×3 mm^3) as the anode and platinum plate (10×10×0.10 mm^3) as the cathode. The mixture was stirred for 3 h under a continuous current of 10 mA at room temperature. Then the mixture was extracted with ethyl acetate, the combined organic phases were washed with brine, dried with anhydrous Na_2SO_4. After the solvent were removed in vacuum, the pure alcohol product was obtained by flash column chromatography on silica gel with ethyl acetate/petroleum ether as eluents.

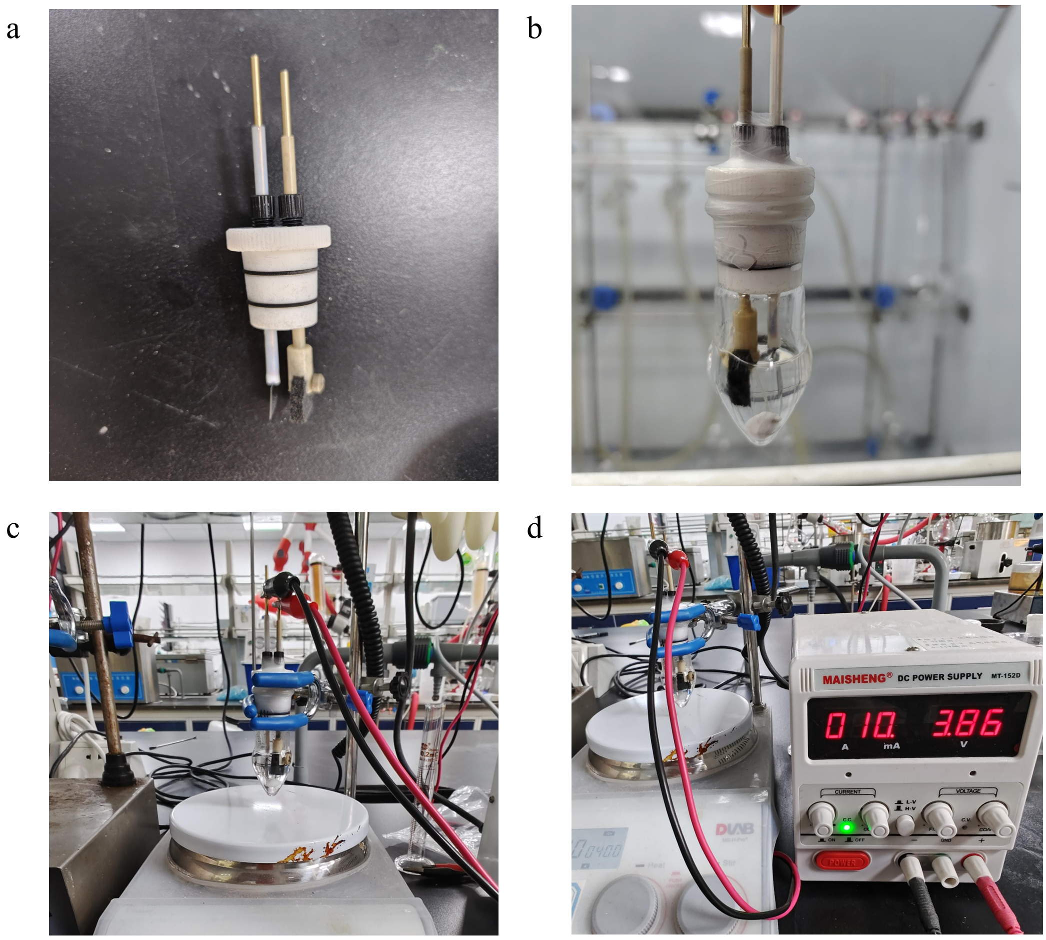


Figure S1. Set-up diagrams of undivided cell electrolysis.

Gram-scale Hydroboration of Benzophenone. In a 5 mL, oven-dried, round-bottomed flask equipped with a magnetic stir bar, benzophenone (1.82 g, 10 mmol), HBpin (2.2 mL, 15 mmol), Et_4NBF_4 (2.17 g, 10 mmol) and MeCN (15 mL) were added, respectively. The flask was equipped with graphite felt electrode (15×15×3 mm^3) as the anode and platinum plate (15×15×0.10 mm^3) as the cathode. The mixture was stirred for 6 h under a continuous current of 10 mA at room temperature. Then the mixture was extracted with ethyl acetate, the combined organic phases were washed with brine, dried with anhydrous Na_2SO_4. The pure alcohol product **4o** (1.40 g, 7.6 mmol, 76% yield) was obtained by flash column chromatography on silica gel with ethyl acetate/petroleum ether as eluents.

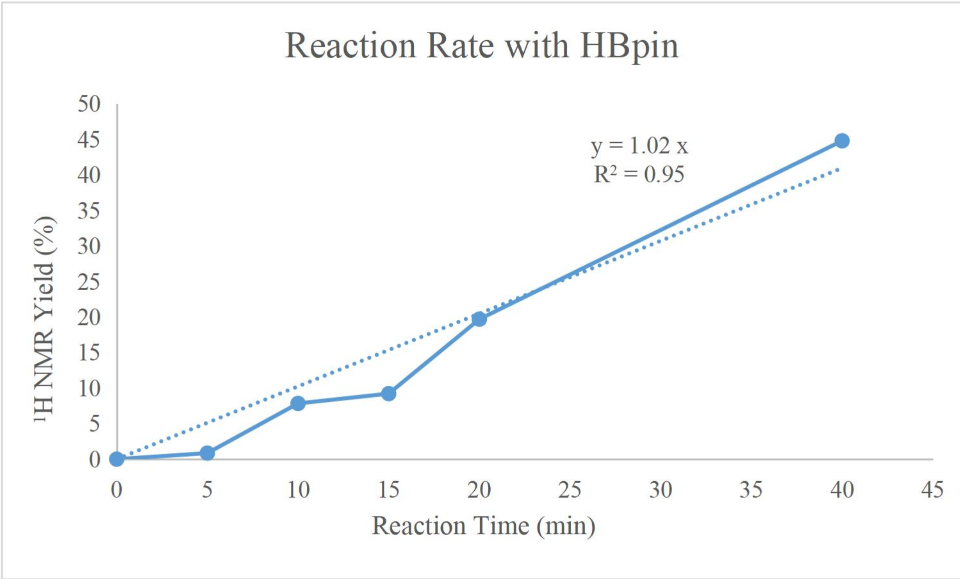
Deuterium-labelling Experiment in CD_3CN. In a 5 mL, oven-dried, round-bottomed flask equipped with a magnetic stir bar, acetophenone (58.2 μL 0.5 mmol), HBpin (108.8 μL, 0.75 mmol), Et_4NBF_4 (108.5 mg, 0.5 mmol) and CD_3CN (3 mL) were added. The flask was equipped with graphite felt electrode (10×10×3 mm^3) as the anode and platinum plate (10×10×0.10 mm^3) as the cathode. The mixture was stirred for 3 h under a continuous current of 10 mA at room temperature. The ratio of mixed products *d*-**4a** and **4a** were monitored by ^1H NMR spectroscopy.

Deuterium-labelling Experiment in DBpin. In a 5 mL, oven-dried, round-bottomed flask equipped with a magnetic stir bar, acetophenone (58.2 μL, 0.5 mmol), DBpin (560 μL, 1.33 M solution in anhydrous THF, 0.75 mmol), Et_4NBF_4 (108.5 mg, 0.5 mmol) and MeCN (3 mL) were added. The flask was equipped with graphite felt electrode (10×10×3 mm^3) as the anode and platinum plate (10×10×0.10 mm^3) as the cathode. The mixture was stirred for 3 h under a continuous current of 10 mA at room temperature. The ratio of mixed products *d*-**4a** and **4a** were monitored by ^1H NMR spectroscopy.

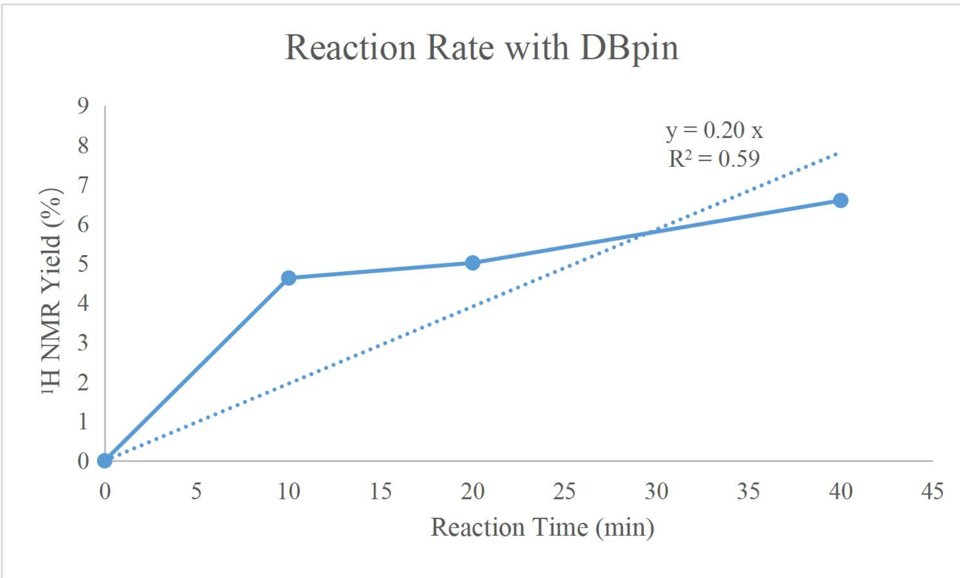
Kinetic Isotope Effect (KIE) Experiment. In a 5 mL, oven-dried, round-bottomed flask equipped with a magnetic stir bar, acetophenone (58.2 μL, 0.5 mmol), DBpin (560 μL, 1.33 M solution in anhydrous THF, 0.75 mmol) or HBpin (108.8 μL, 0.75mmol), Et_4NBF_4 (108.5 mg, 0.5 mmol) and MeCN (3 mL) were added. The flask was equipped with graphite felt electrode (10×10×3 mm^3) as the anode and platinum plate (10×10×0.10 mm^3) as the cathode. Then the mixture was extracted with ethyl acetate, the combined organic phases were washed with brine, dried with anhydrous Na_2SO_4.

HBpin: 5 reactions were set up and stopped at 5 min, 10 min, 15 min, 20 min, 40 min, respectively.

DBpin: 3 reactions were set up and stopped at 10 min, 20 min, 40 min, respectively. The reaction yields were determined by ^1H NMR using dimethylsulfoxide as an internal standard.



The coefficient of the linear trend curve corresponds to the reaction rate $\mathbf{k_H = 1.02}$



The coefficient of the linear trend curve corresponds to the reaction rate $\mathbf{k_D = 0.20}$

With the method, the **KIE** = $\mathbf{k_H/k_D = 5.1}$.

Radical Inhibition Experiment with 1,1-diphenylethylene, TEMPO or BHT. In a 25 mL, over-dried, three-necked, round-bottomed flask equipped with a magnetic stir bar, acetophenone (58.2 μL 0.5 mmol), HBpin (108.8 μL, 0.75 mmol), Et_4NBF_4 (108.5 mg, 0.5 mmol), CH_3CN (3 mL) and 1,1-diphenylethylene (132 μL, 0.75 mmol), TEMPO (117 mg, 0.75 mmol) or BHT (165mg, 0.75 mmol) were added, respectively. The flask was equipped with graphite felt electrode (10×10×3 mm^3) as the anode and platinum plate (10×10×0.10 mm^3) as the cathode. The mixtures were stirred for 3 h under a continuous current of 10 mA at room temperature. The yield of **4a** and **5** were determined by ^{1}H spectroscopy.

Procedures for Cyclic Voltammetry (CV). Cyclic voltammetry experiments were conducted in a 25 mL three-electrode cell equipped with a glassy Carbon working electrode, a Ag/AgCl reference electrode and a platinum wire counter electrode, and the reference electrode was submerged in a saturated aqueous KCl solution, at 100 mV S^{-1} scan rate: background (Et_4NBF_4, 0.1 M in MeCN) and the potential range was 0-5 V; HBpin (0.1 M in MeCN) and the potential range was -5-5 V; acetophenone (0.1 M in MeCN) and the potential range was 0-5 V; the mixture of acetophenone (0.1 M in MeCN) and HBpin (0.1 M in MeCN) and the potential range was -3.5-3.5 V. The current was reported in mA and potential was reported in V.

Spectroscopic Data for Products of 2, 4 and 5. *2-(benzyloxy)pinacolborane (2a).*[4] Yellow oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.33-7.25 (m, 5H), 4.92 (s, 2H), 1.26 (s, 12H). ^{11}B NMR (193 MHz, $CDCl_3$): δ 22.35.

2-(2-fluorobenzyloxy)pinacolborane (2b).[4] Yellow oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.44-7.42 (m, 1H), 7.27-7.25 (m, 1H), 7.14-7.11 (m, 1H), 7.03-7.00 (m, 1H), 4.99 (s, 2H), 1.27 (s, 12H). ^{11}B NMR (193 MHz, $CDCl_3$): δ 22.35.

2-(3-fluorobenzyloxy)pinacolborane (2c).[4] Yellow oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.32-7.31 (m, 1H), 7.10-7.06 (m, 2H), 6.97-6.95 (m, 1H), 4.90 (s, 2H), 1.26 (s, 12H). ^{11}B NMR (193 MHz, $CDCl_3$): δ 22.33.

2-(4-fluorobenzyloxy)pinacolborane (2d).[4] Yellow oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.24-7.22 (m, 2H), 6.94-6.91 (m, 2H), 4.79 (s, 2H), 1.17 (s, 12H). ^{11}B NMR (193 MHz, $CDCl_3$): δ 22.28.

2-(2-chlorobenzyloxy)pinacolborane (2e).[4] Yellow oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.49 (m, 1H), 7.31 (m, 1H), 7.28-7.20 (m, 2H), 5.01 (s, 2H), 1.28 (s, 12H). ^{11}B NMR (193 MHz, $CDCl_3$): δ 22.38.

2-(3-chlorobenzyloxy)pinacolborane (2f).[4] Yellow oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ

7.20 (s, 1H), 7.16-7.12 (m, 3H), 4.81 (s, 2H), 1.19 (s, 12H). ^{11}B NMR (193 MHz, $CDCl_3$): δ 24.47.

2-(4-chlorobenzyloxy)pinacolborane (2g).[4] Yellow oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.25-7.22 (m, 4H), 4.86 (s, 2H), 1.25 (s, 12H). ^{11}B NMR (193 MHz, $CDCl_3$): δ 24.35.

2-(4-nitrophenyl) pinacolborane (2h).[4] Yellow oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 8.10 (d, J = 6.0 Hz, 2H), 7.43 (d, J = 6.0 Hz, 2H), 4.94 (s, 2H), 1.18 (s, 12H). ^{11}B NMR (193 MHz, $CDCl_3$): δ 22.34.

2-((4-methylbenzyl)oxy)pinacolborane (2i).[4] Yellow oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.19 (d, J = 6.0 Hz, 2H), 7.10 (d, J = 6.0 Hz, 2H), 4.83 (s, 2H), 2.29 (s, 3H), 1.22 (s, 12H). ^{11}B NMR (193 MHz, $CDCl_3$): δ 22.33.

2-(4-methoxybenzyloxy)pinacolborane (2j).[4] Yellow oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.28 (d, J = 6.0 Hz, 2H), 7.19 (m, 2H), 4.81 (s, 2H), 3.16 (s, 3H), 1.19 (s, 12H). ^{11}B NMR (193 MHz, $CDCl_3$): δ 22.36.

N,N-dimethyl-4-(((4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)oxy)methyl)-aniline (2k).[4] Yellow oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.18 (d, J = 12 Hz, 2H), 6.68 (d, J = 12 Hz, 2H), 4.75 (s, 2H), 2.91 (s, 6H), 1.24 (s, 12H). ^{11}B NMR (193 MHz, $CDCl_3$): δ 24.47.

4-(((4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)oxy)methyl)phenyl acetate (2l).[4] Yellow oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.28 (d, J = 6.0 Hz, 2H), 6.98 (d, J = 6.0 Hz, 2H), 4.82 (s, 2H), 2.21 (s, 3H), 1.18 (s, 12H). ^{11}B NMR (193 MHz, $CDCl_3$): δ 22.08.

N-(4-(((4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)oxy)methyl)phenyl)acetamide (2m).[4] Yellow oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 8.77 (s, 1H), 7.59 (d, J = 6.0 Hz, 2H), 7.19 (d, J = 6.0 Hz, 2H), 4.82 (s, 2H), 2.13 (s, 3H), 1.25 (s, 12H). ^{11}B NMR (193 MHz, $CDCl_3$): δ 22.02.

2-(cinnamyloxy)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (2n).[4] Yellow oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.38-7.23 (m, 5H), 6.62 (d, J = 18 Hz, 1H), 6.30-6.27 (m, 1H), 4.53 (d, J = 6.0 Hz, 2H), 1.25 (s, 12H). ^{11}B NMR (193 MHz, $CDCl_3$): δ 22.18.

2-(cyclohexylmethoxy)pinacolborane (2o).[4] Yellow oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 3.54 (d, J = 6.0 Hz, 2H), 1.61-1.59 (m, 6H), 1.55-1.53 (m, 1H), 1.14 (s, 12H), 1.04-1.02 (m, 2H), 0.84-0.79 (m, 2H). ^{11}B NMR (193 MHz, $CDCl_3$): δ 22.01.

4,4,5,5-tetramethyl-2-(pentyloxy)-1,3,2-dioxaborolane (2p).[4] Yellow oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 3.70 (t, *J* = 6.0 Hz, 2H), 1.44 (m, 2H), 1.19 (m, 2H), 1.17 (s, 12H), 0.77 (m. 3H). ^{11}B NMR (193 MHz, $CDCl_3$): δ 21.98.

2-(4-chlorobutoxy)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (2q).[4] Yellow oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 3.70 (t, *J* = 6.0 Hz, 2H), 1.44 (m, 2H), 1.19 (m, 2H), 1.17 (s, 12H), 0.77 (m, 2H). ^{11}B NMR (193 MHz, $CDCl_3$): δ 21.97.

4-(((4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)oxy)methyl)pyridine (2r).[4] Yellow oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 8.38 (m, 2H), 7.17 (m, 2H), 4.75 (s, 2H), 1.05 (s, 12H). ^{11}B NMR (193 MHz, $CDCl_3$): δ 22.23.

2-(((4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)oxy)methyl)pyridine (2s).[4] Yellow oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 8.63-8.60 (m, 1H), 7.98-7.96 (m, 1H), 7.74-7.72 (m, 1H), 7.50-7.48 (m, 1H), 5.08 (s, 2H), 1.23 (s, 12H). ^{11}B NMR (193 MHz, $CDCl_3$): δ 22.32.

1-phenylethan-1-ol (4a).[5] Colorless oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.36−7.24 (m, 5H), 4.87 (q, *J* = 6.0 Hz, 1H), 2.05 (s, 1H), 1.48 (d, *J* = 6.0 Hz, 3H).

1-(2-fluorophenyl)ethan-1-ol (4b).[4] Colorless oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.49-7.46 (m, 1H), 7.25-7.21 (m, 1H), 7.25-7.21 (m, 1H), 7.02-6.99 (m, 1H), 5.20(q, *J* = 6.0 Hz, 1H), 2.07 (s, 1H) 1.51 (d, *J* = 6.0 Hz, 3H).

1-(3-fluorophenyl)ethan-1-ol (4c).[4] Colorless oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.29-7.25 (m, 1H), 7.18-7.10 (m, 1H), 6.95-6.91 (m, 2H), 4.86 (q, *J* = 6.0 Hz, 1H), 2.33 (s, 1H) 1.46 (d, *J* = 6.0 Hz, 3H).

1-(4-fluorophenyl)ethan-1-ol (4d).[5] Colorless oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.33-7.31 (m, 2H), 7.11-7.09 (m, 2H), 4.86 (q, *J* = 6.0 Hz, 1H), 2.71 (s, 1H) 1.46 (d, *J* = 6.0 Hz, 3H).

1-(4-chlorophenyl)ethan-1-ol (4e).[5] Colorless oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.31-7.30 (m, 2H), 7.12-7.10 (m, 2H), 4.87 (q, *J* = 6.0 Hz, 1H), 1.47 (d, *J* = 6.0 Hz, 3H).

1-(2-bromophenyl)ethan-1-ol (4f).[4] Colorless oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.59-7.58 (m, 1H), 7.51-7.50 (m, 1H), 7.35-7.32 (m, 1H), 7.13-7.10 (m, 1H), 5.23 (q, *J* = 6.0 Hz, 1H), 2.05 (s, 1H) 1.48 (d, *J* = 6.0 Hz, 3H).

1-(4-bromophenyl)ethan-1-ol (4g).[4] Colorless oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.46-7.44 (d, *J* = 12 Hz, 2H), 7.23-7.21 (d, *J* = 12 Hz, 2H), 4.83 (q, *J* = 6.0 Hz, 1H), 2.13 (s, 1H) 1.45-1.44 (d, *J* = 6.0 Hz, 3H).

1-(4-nitrophenyl)ethan-1-ol (4h).[5] Yellowish oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 8.20 (d, *J* = 12 Hz, 1H), 7.55 (d, *J* = 6.0 Hz, 1H), 5.02 (q, *J* = 6.0 Hz, 1H), 2.15 (s, 1H), 1.53 (d, *J* = 6.0 Hz, 3H).

1-(4-(trifluoromethyl)phenyl)ethan-1-ol (4i).[5] Colorless oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.61 (d, *J* = 6.0 Hz, 2H), 7.49 (d, *J* = 6.0 Hz, 2H), 4.97 (q, *J* = 6.0 Hz, 1H), 1.95 (s, 1H), 1.51 (d, *J* = 6.0 Hz, 3H).

1-(o-tolyl)ethan-1-ol (4j).[5] Colorless oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.51 (d, *J* = 6.0 Hz, 2H), 7.24-7.21 (m, 1H), 7.18-7.10 (m, 2H), 2.34 (s, 3H), 1.47 (d, *J* = 6.0 Hz, 3H).

1-(p-tolyl)ethan-1-ol (4k).[5] Colorless oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.27-7.26 (m, 2H), 7.16 (d, *J* = 6.0 Hz, 2H), 4.86 (q, *J* = 6.0 Hz, 1H), 2.34 (s, 3H) 1.76 (s, 1H), 1.49 (d, *J* = 6.0 Hz, 3H).

1-(4-methoxyphenyl)ethan-1-ol (4l).[5] Colorless oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.31 (d, *J* = 6.0 Hz, 2H), 6.89 (d, *J* = 6.0 Hz, 2H), 4.86 (q, *J* = 6.0 Hz, 1H), 3.81 (s, 3H), 1.49 (d, *J* = 6.0 Hz, 3H).

1-(naphthalen-2-yl)ethan-1-ol (4m).[5] White solid. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.85-7.81 (m, 4H), 7.52-7.46 (m, 3H), 5.08 (q, *J* = 6.0 Hz, 1H), 1.90 (s, 1H), 1.57 (d, *J* = 6.0 Hz, 3H).

2-methyl-1-phenylpropan-1-ol (4n).[4] Colorless oil. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.50-7.48 (m, 2H), 7.31-7.29 (m, 2H), 7.18-7.15 (m, 1H), 2.28-2.22 (m, 1H), 1.20 (s, 12H), 1.09 (d, *J* = 6.0 Hz, 3H), 0.65 (d, *J* = 6.0 Hz, 3H), ^{11}B NMR (193 MHz, $CDCl_3$): δ 22.02.

diphenylmethanol (4o).[5] White solid. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.39-7.35 (m, 4H), 7.35-7.33 (m, 4H), 7.27-7.25 (m, 2H), 5.86 (s, 1H), 2.22 (s, 1H).

(2-fluorophenyl)(phenyl)methanol (4p).[5] White solid. ^{1}H NMR (600 MHz, $CDCl_3$): δ 7.50-7.47 (m, 1H), 7.38-7.37 (m, 2H), 7.33-7.30 (m, 2H), 7.26-7.21 (m, 2H),

7.14-7.11 (m, 1H), 7.01-6.98 (m, 1H), 6.11 (s, 1H), 2.41 (s, 1H).

1-(pyridin-4-yl)ethan-1-ol (4q).[6] Colorless oil. ^{1}H NMR (500 MHz, $CDCl_3$): δ8.15-8.13 (m, 2 H), 7.51-7.49 (m, 2 H) ,5.00-4.96 (q, *J* = 6.5 Hz, 1 H), 2.69 (s, 1 H), 1.49-1.47 (dd, *J* = 6.5 and 4.5 Hz, 3 H).

1-cyclohexylethan-1-ol (4r).[6] Yellow oil. ^{1}H NMR (500 MHz, $CDCl_3$): δ 3.88-3.84 (m, 1H), 1.79-1.74 (m, 1H), 1.73-1.69 (m, 2H), 1.67-1.65 (m, 4H), 1.60-1.56 (m, 4H), 1.19 (s, 12H), 1.09-1.07(d, *J* = 6.0 Hz, 3H). ^{11}B NMR (193 MHz， $CDCl_3$) δ 21.94.

Cyclohexanol (4s).[6] Colorless oil. ^{1}H NMR (500 MHz, $CDCl_3$): δ 3.60 (br, 1 H), 1.88 (m, 2 H), 1.75-1.68 (m, 2 H), 1.54-1.50(m, 1 H,), 1.26 (m, 4 H), 1.16 (m, 1 H).

2-(2,6-di-tert-butyl-4-methylphenoxy)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (5). Green oil. ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.02(s, 2H), 2.27 (s, 3H), 1.40 (s, 18H), 1.27 (s, 12H). $^{13}C\{^{1}H\}$ NMR (126 MHz, $CDCl_3$): δ 149.1, 140.6, 131.5, 126.4, 83.6, 35.2, 31.7, 30.4, 25.2, 21.4. ^{11}B NMR (193 MHz， $CDCl_3$) δ 21.20.

NMR spectra of hydroboration products (o: residual MeCN; x: residual Et_4NBF_4)

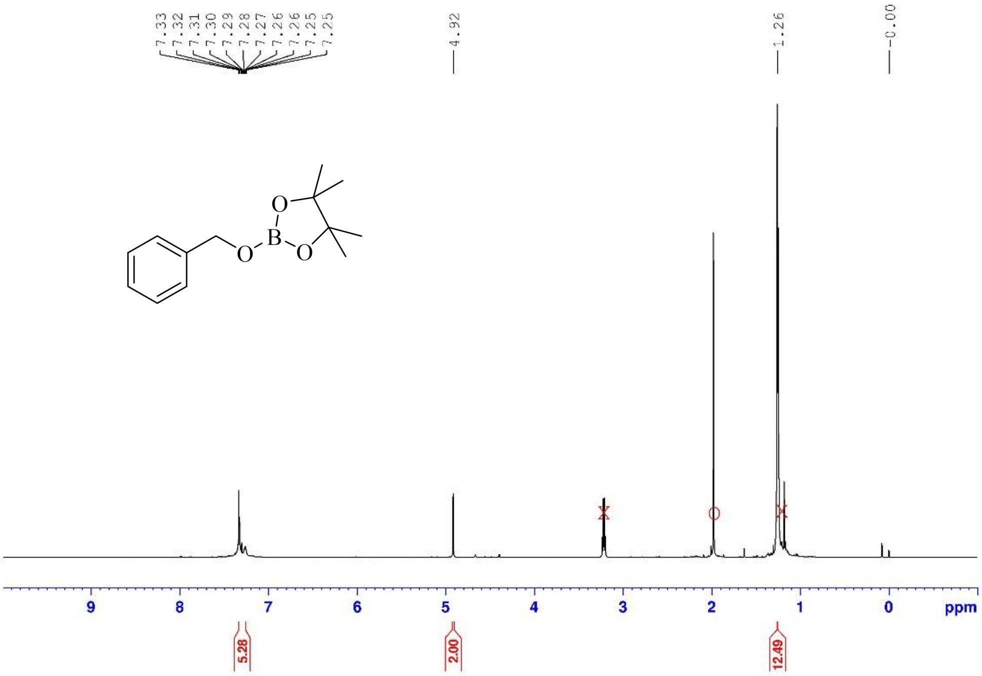


Figure S2. ^{1}H NMR spectrum of 2a in $CDCl_3$.

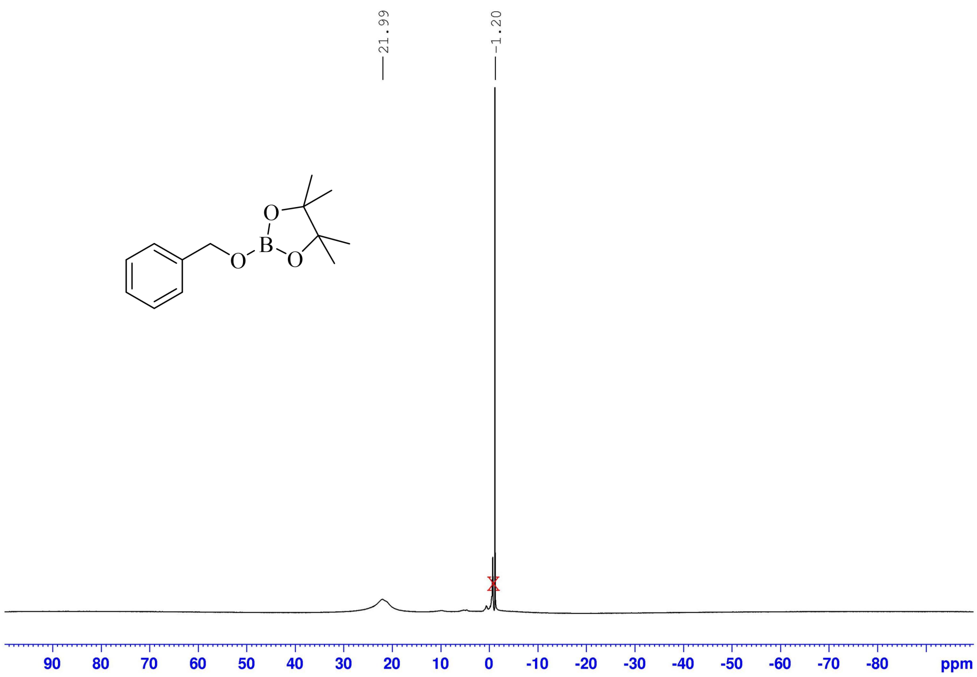


Figure S3. ^{11}B NMR spectrum of 2a in $CDCl_3$.

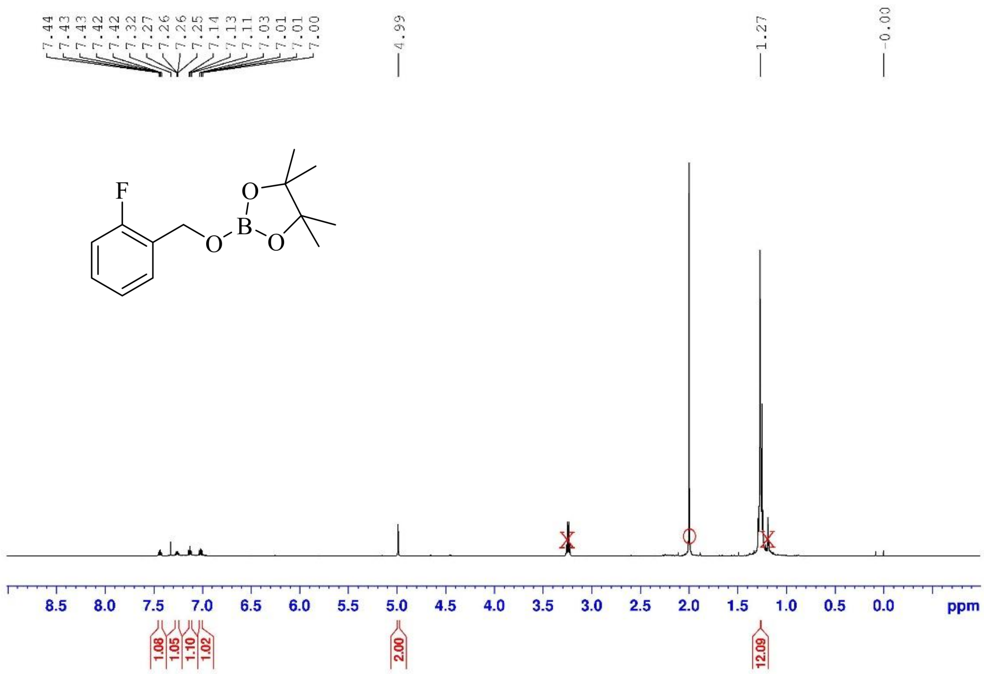


Figure S4. [1]H NMR spectrum of 2b in $CDCl_3$.

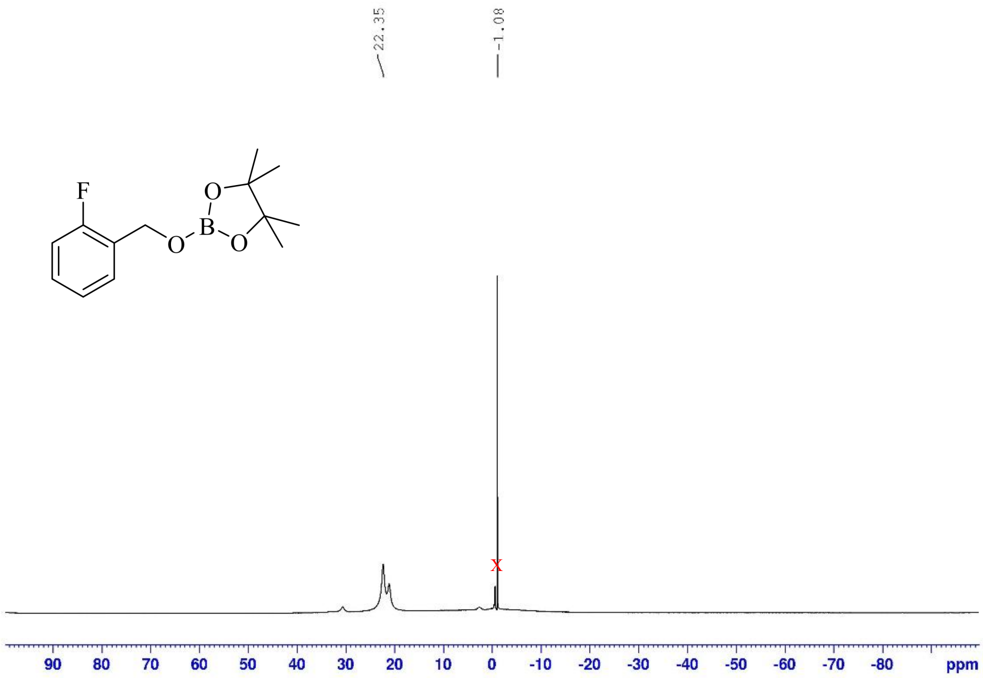


Figure S5. [11]B NMR spectrum of 2b in $CDCl_3$.

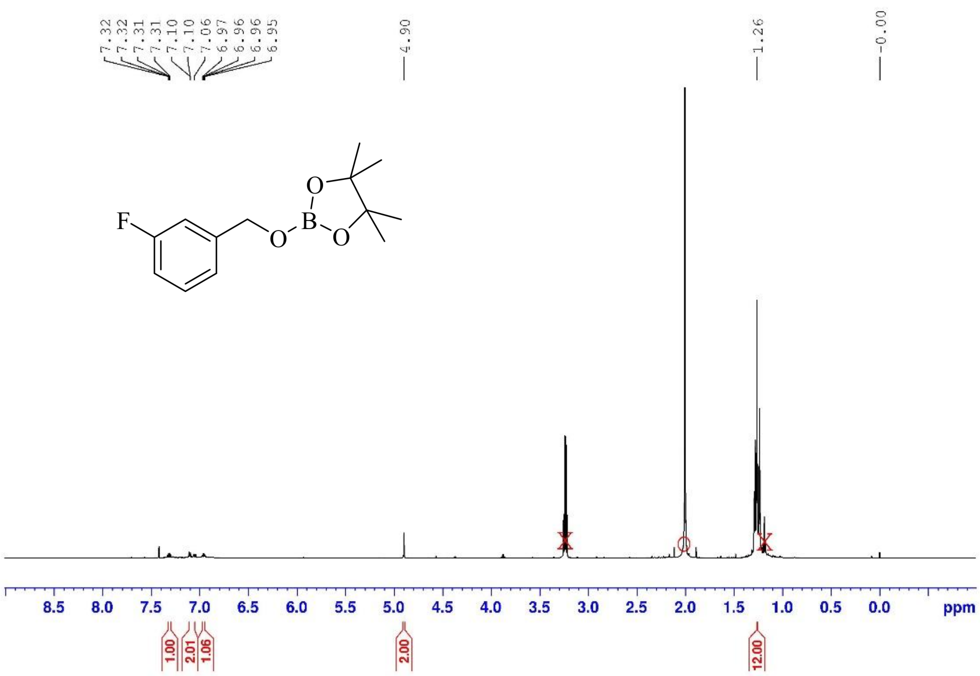


Figure S6. [1]H NMR spectrum of 2c in $CDCl_3$.

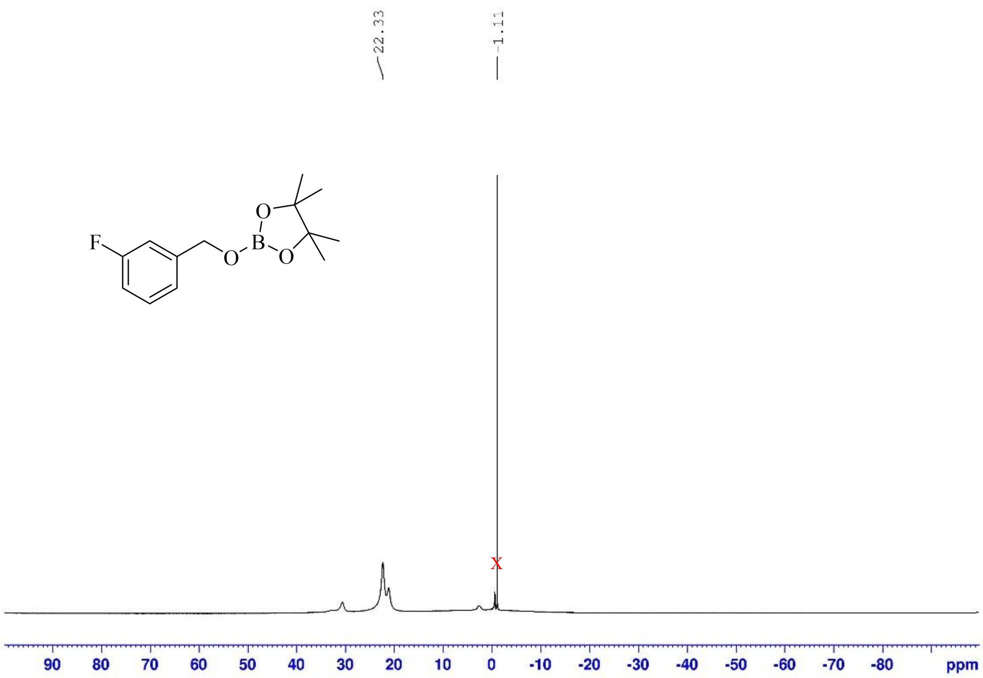


Figure S7. [11]B NMR spectrum of 2c in $CDCl_3$.

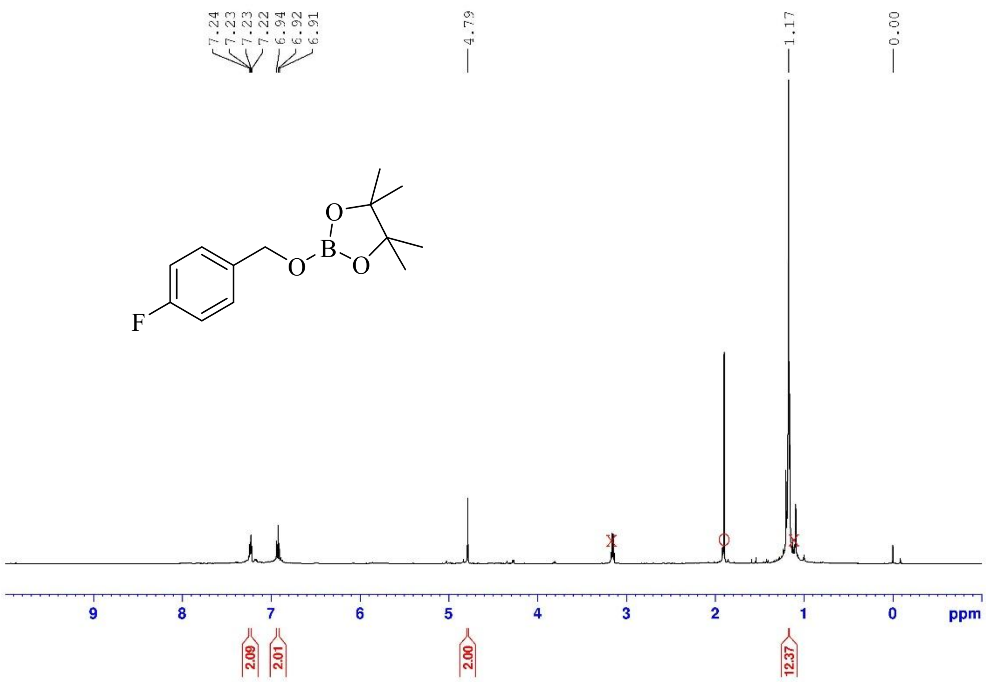


Figure S8. ^{1}H NMR spectrum of 2d in $CDCl_3$.

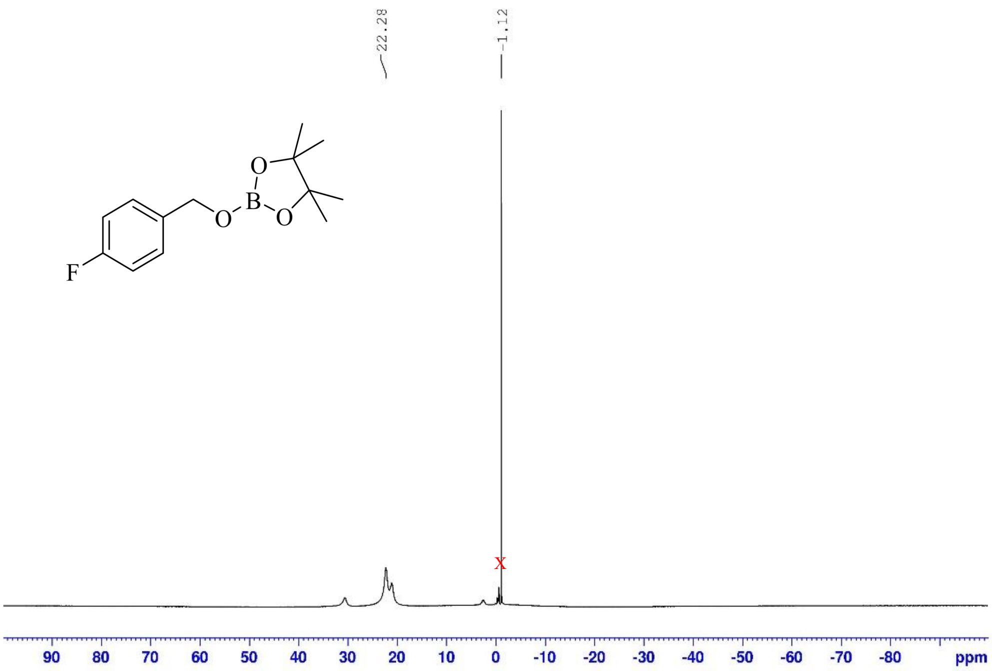


Figure S9. ^{11}B NMR spectrum of 2d in $CDCl_3$.

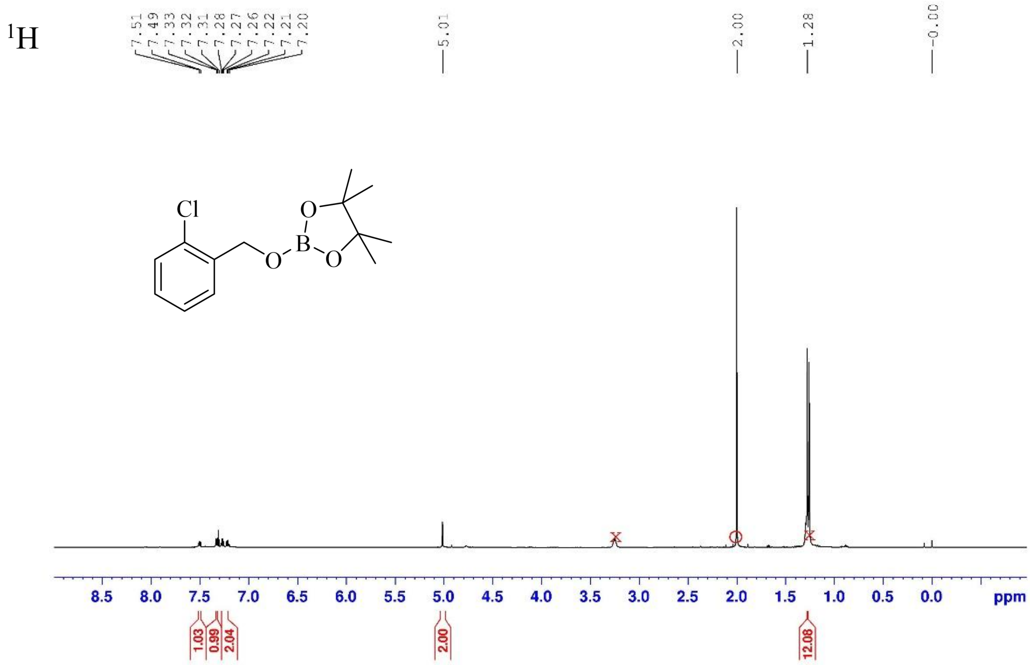


Figure S10. ^{1}H NMR spectrum of 2e in $CDCl_3$.

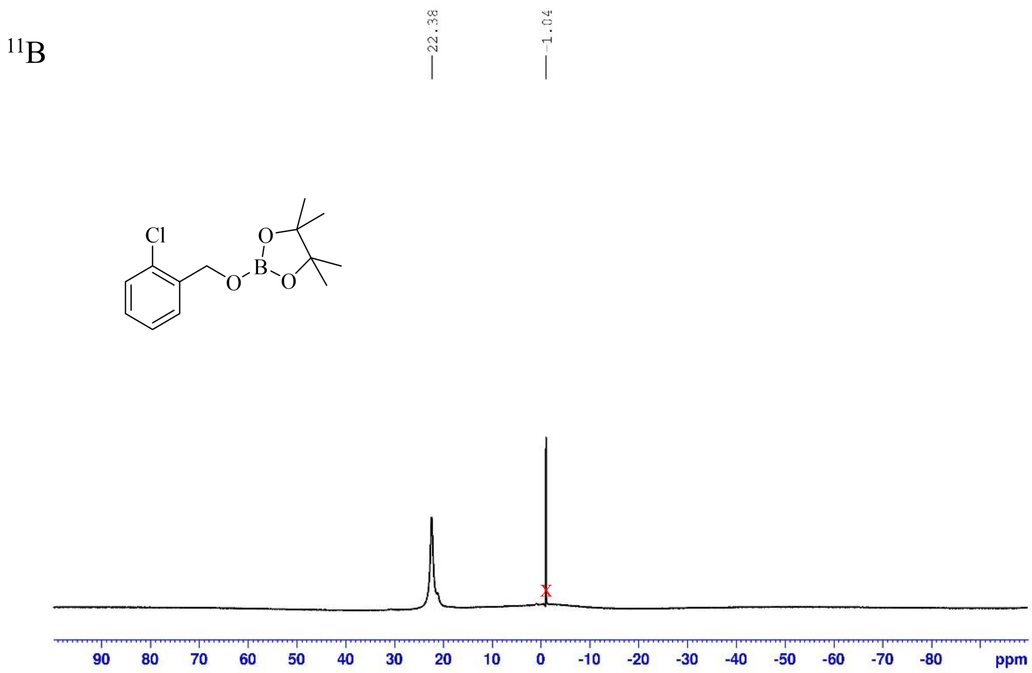


Figure S11. ^{11}B NMR spectrum of 2e in $CDCl_3$.

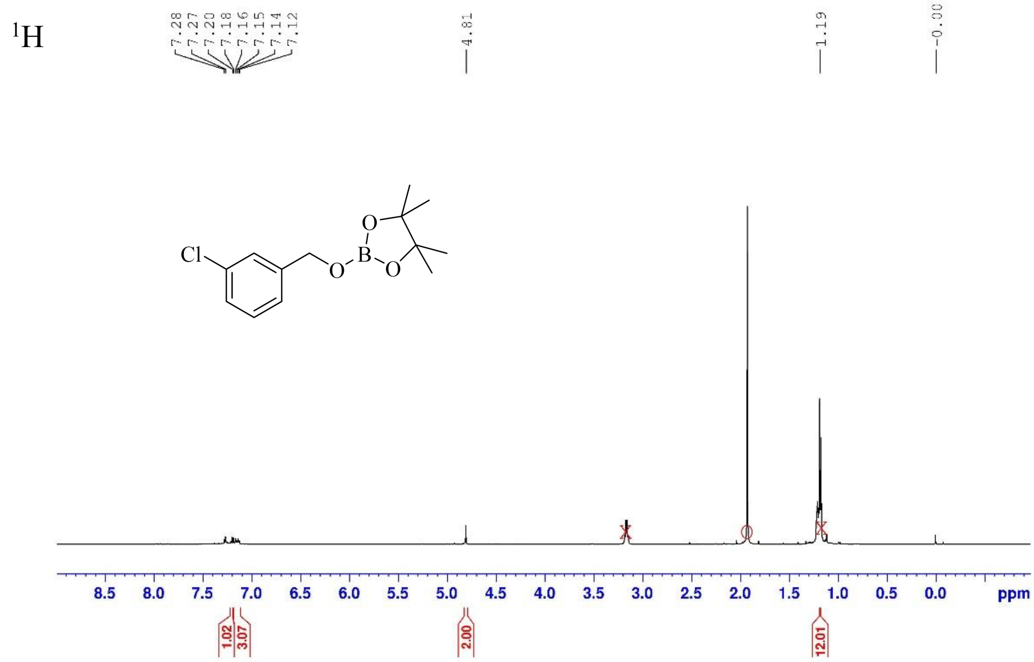


Figure S12. ^{1}H NMR spectrum of 2f in $CDCl_3$.

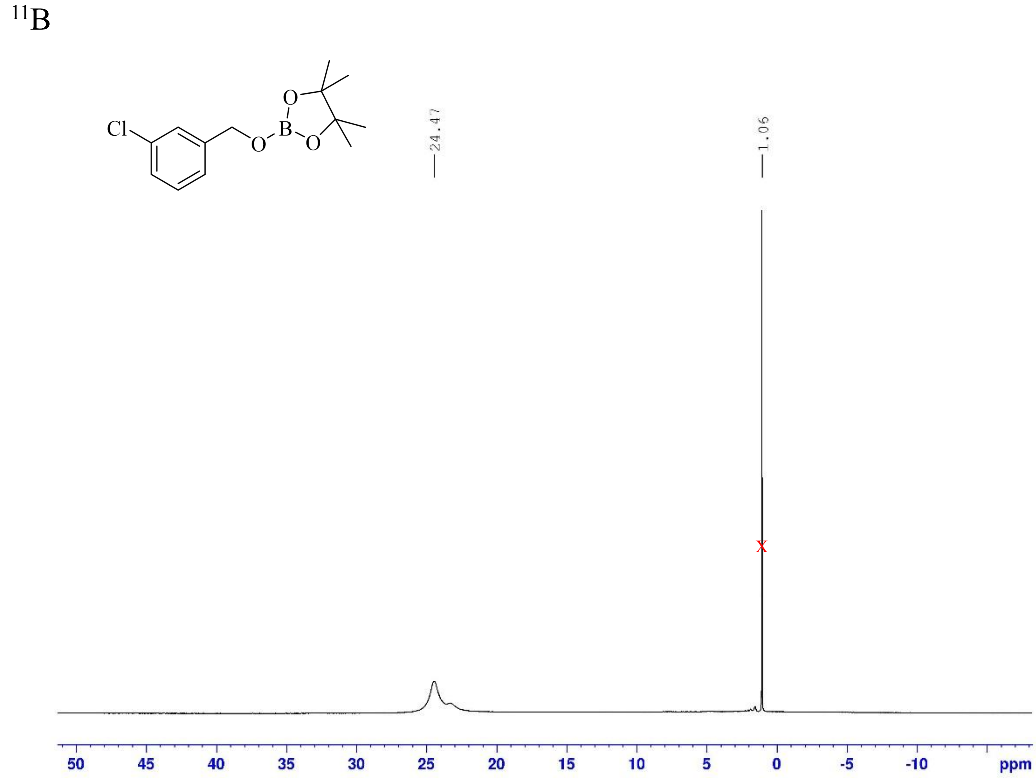


Figure S13. ^{11}B NMR spectrum of 2f in $CDCl_3$.

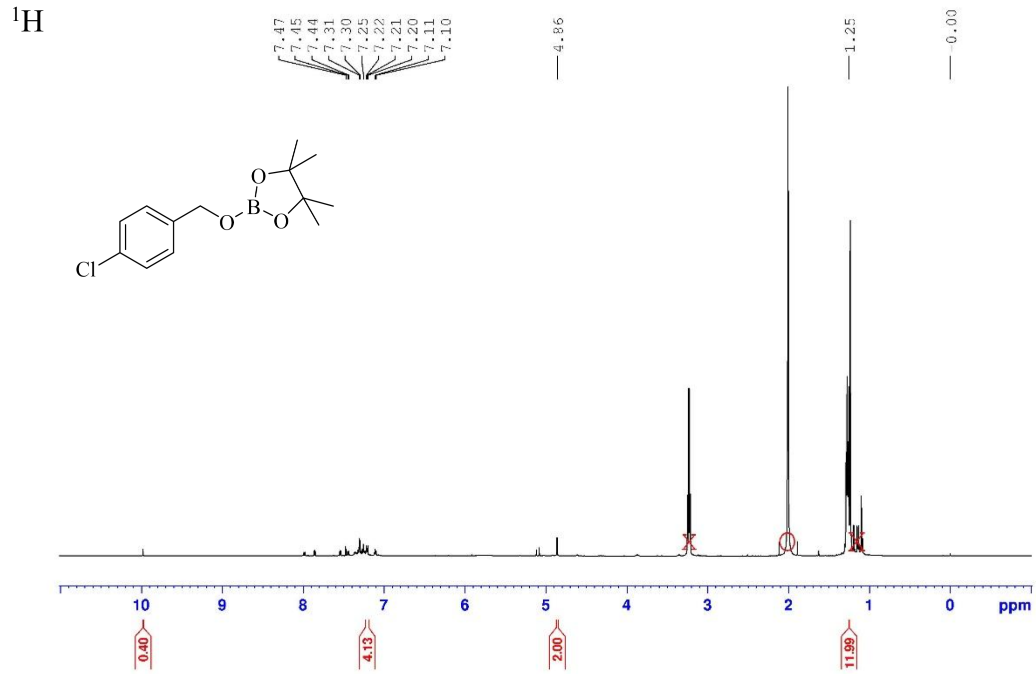
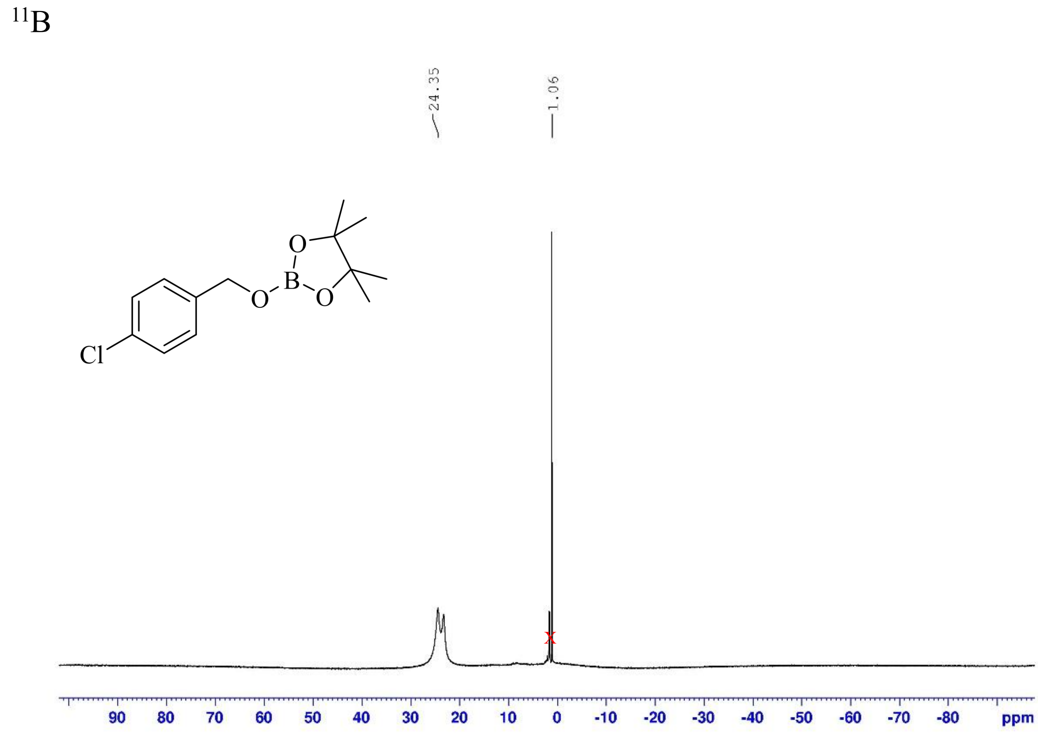


Figure S14. ^{11}B NMR spectrum of 2g in $CDCl_3$.



`**Figure S14**. ^{11}B NMR spectrum of 2g in $CDCl_3$.

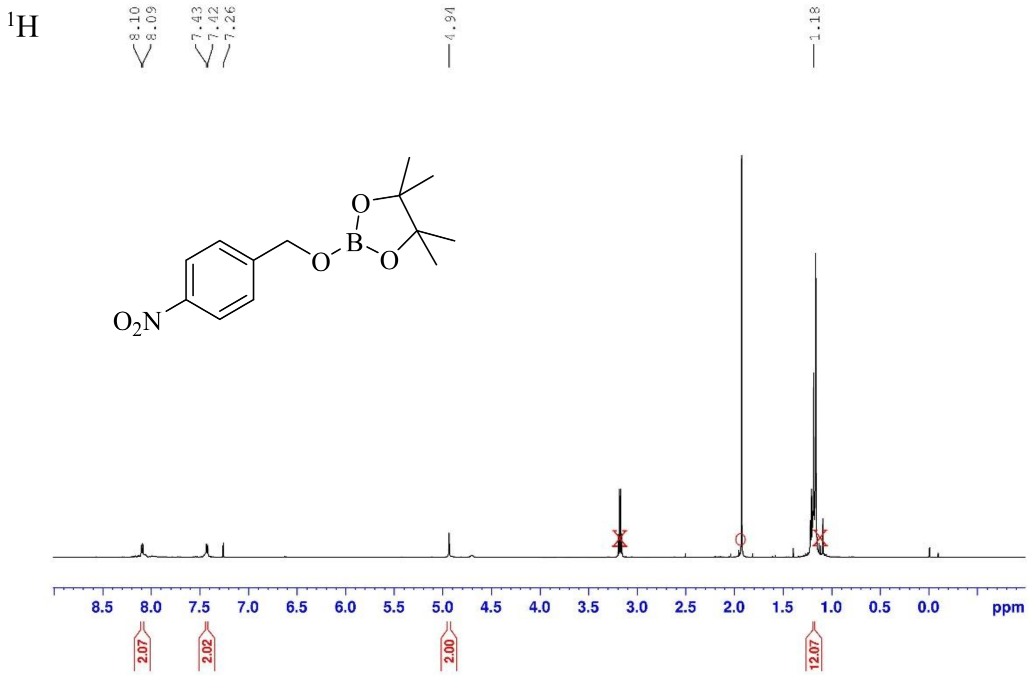


Figure S15. ^{1}H NMR spectrum of 2h in $CDCl_3$.

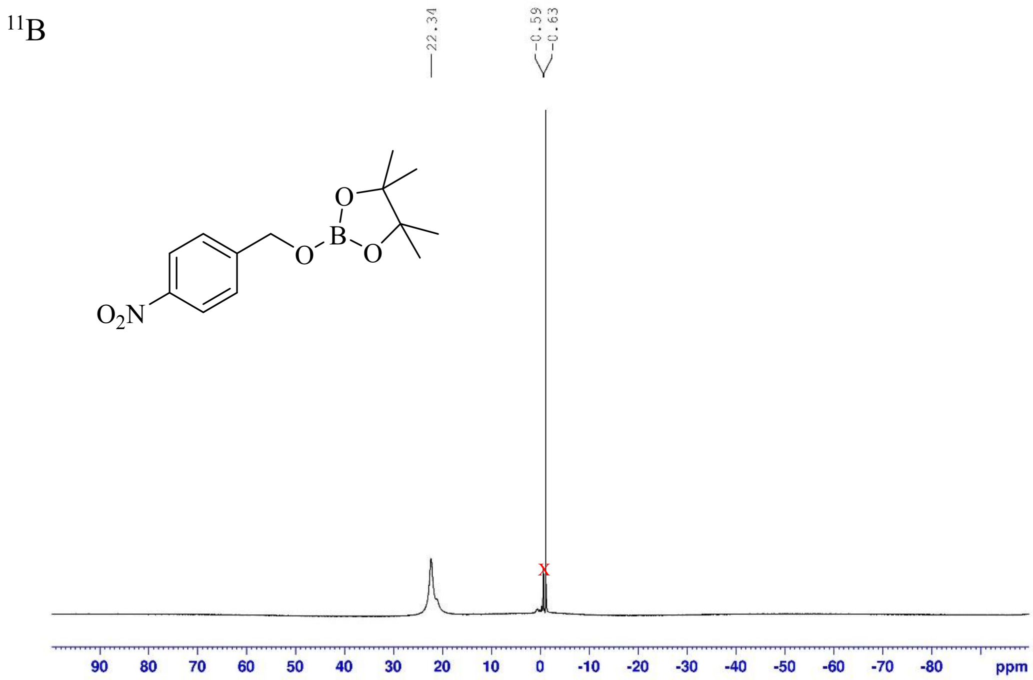


Figure S15. ^{1}H NMR spectrum of 2h in $CDCl_3$.

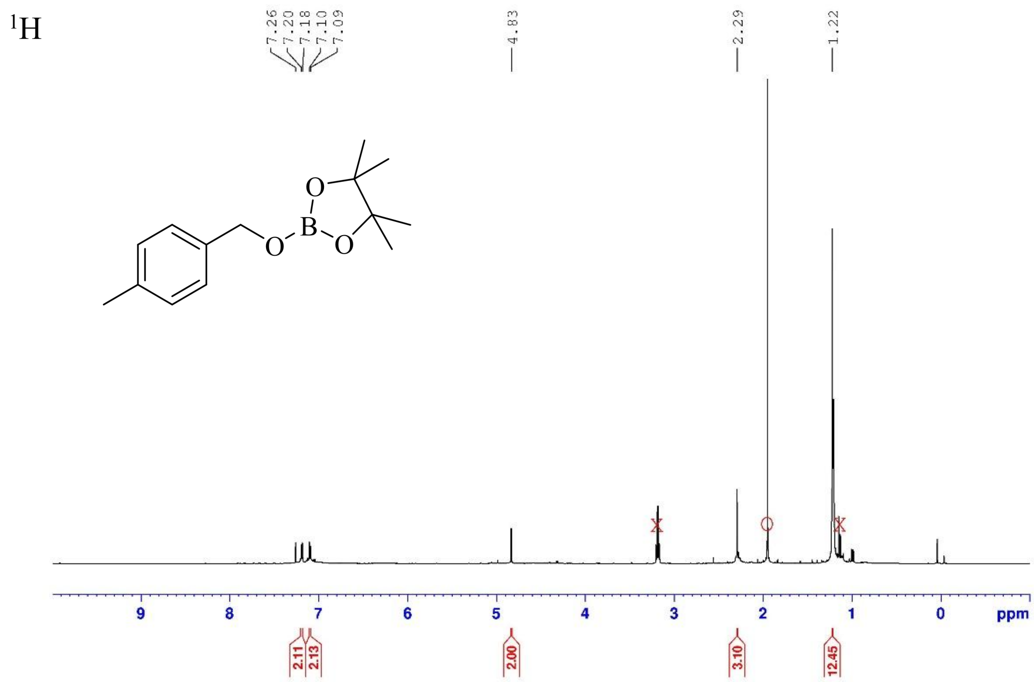


Figure S17. ^{1}H NMR spectrum of 2i in $CDCl_3$.

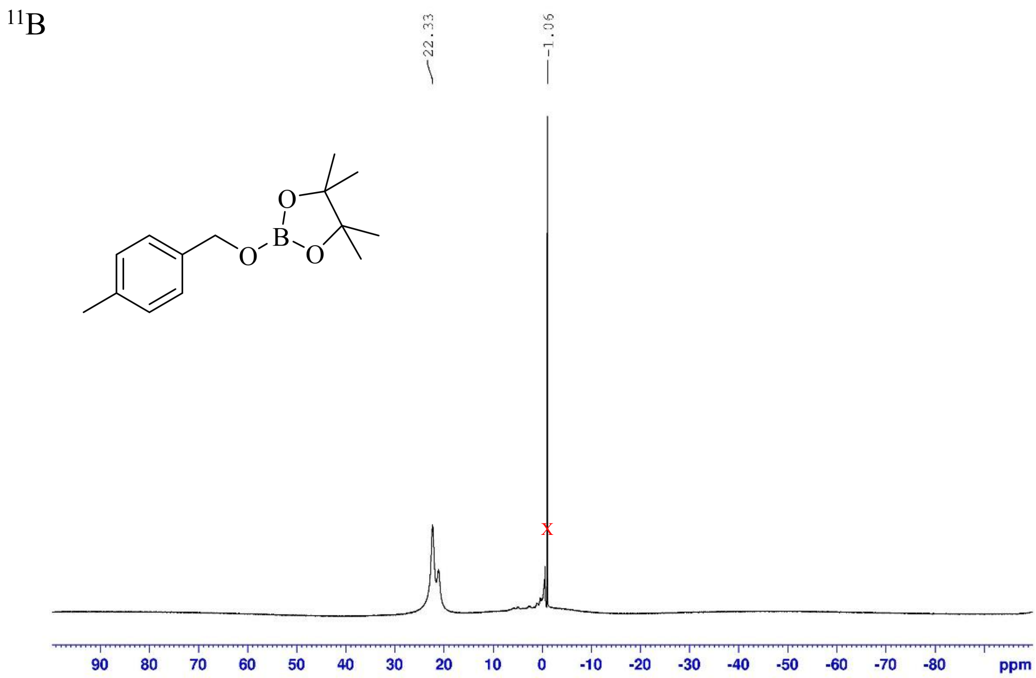


Figure S18. ^{11}B NMR spectrum of 2i in $CDCl_3$.

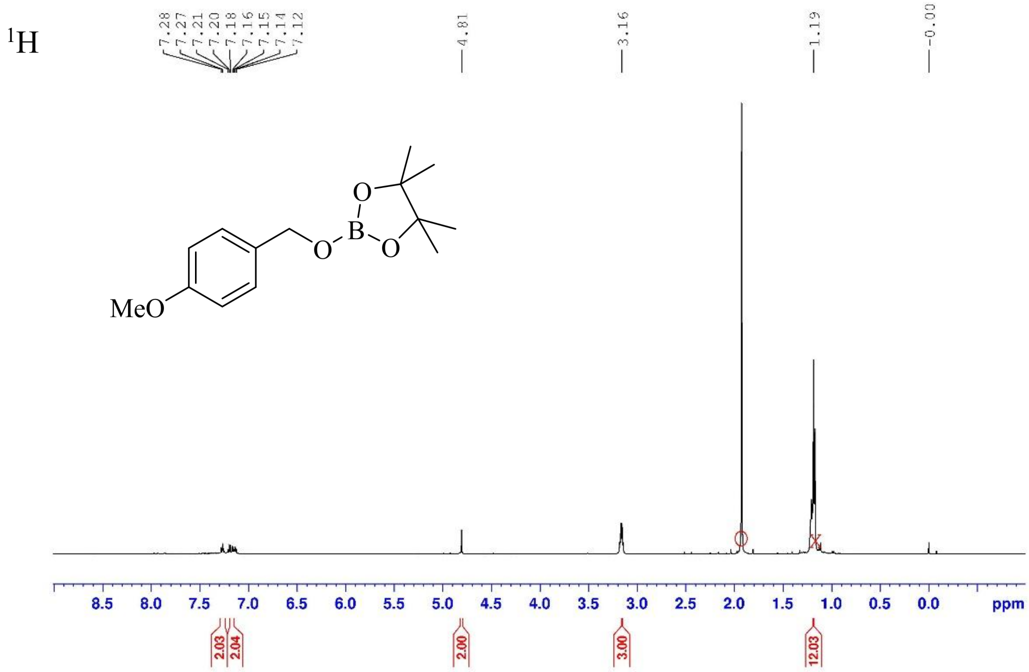


Figure S19. ^{1}H NMR spectrum of 2j in $CDCl_3$.

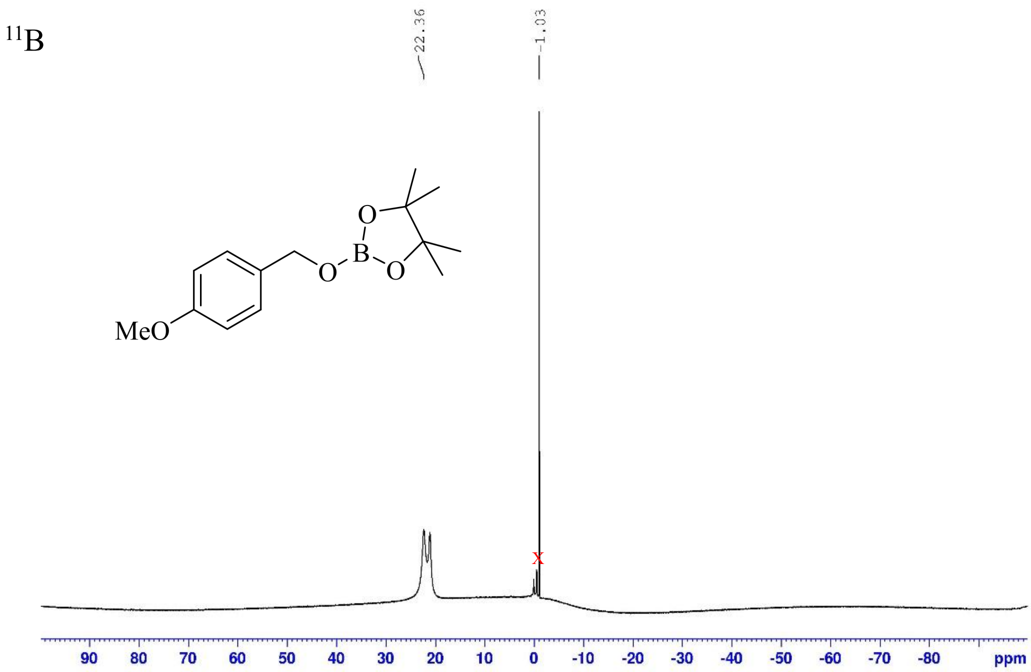


Figure S20. ^{11}B NMR spectrum of 2j in $CDCl_3$.

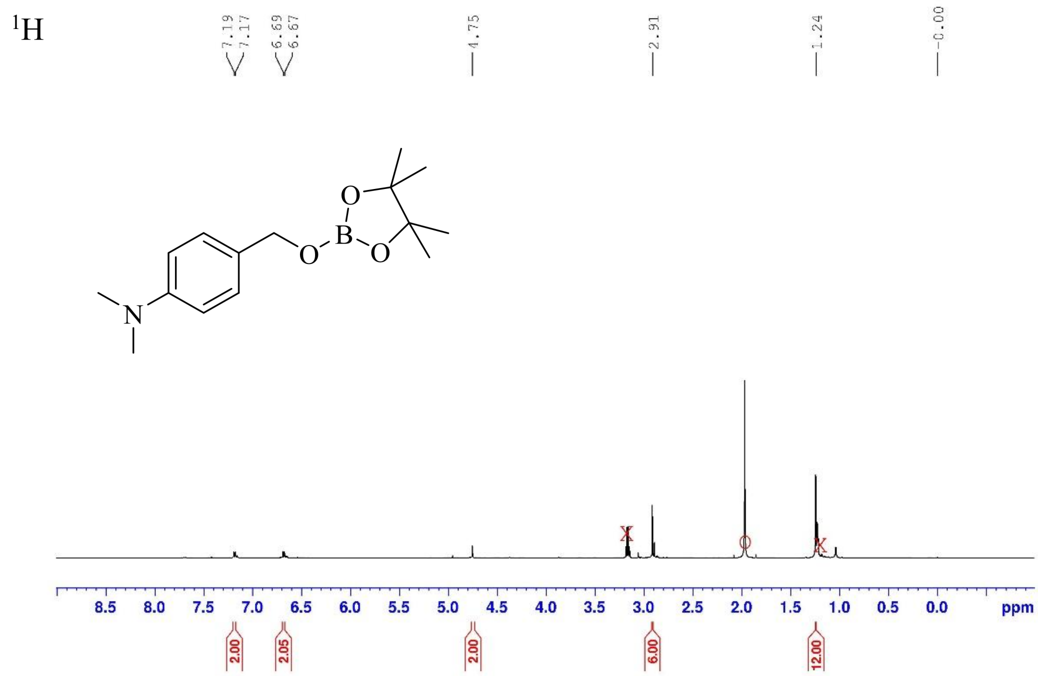


Figure S21. ^{1}H NMR spectrum of 2k in $CDCl_3$.

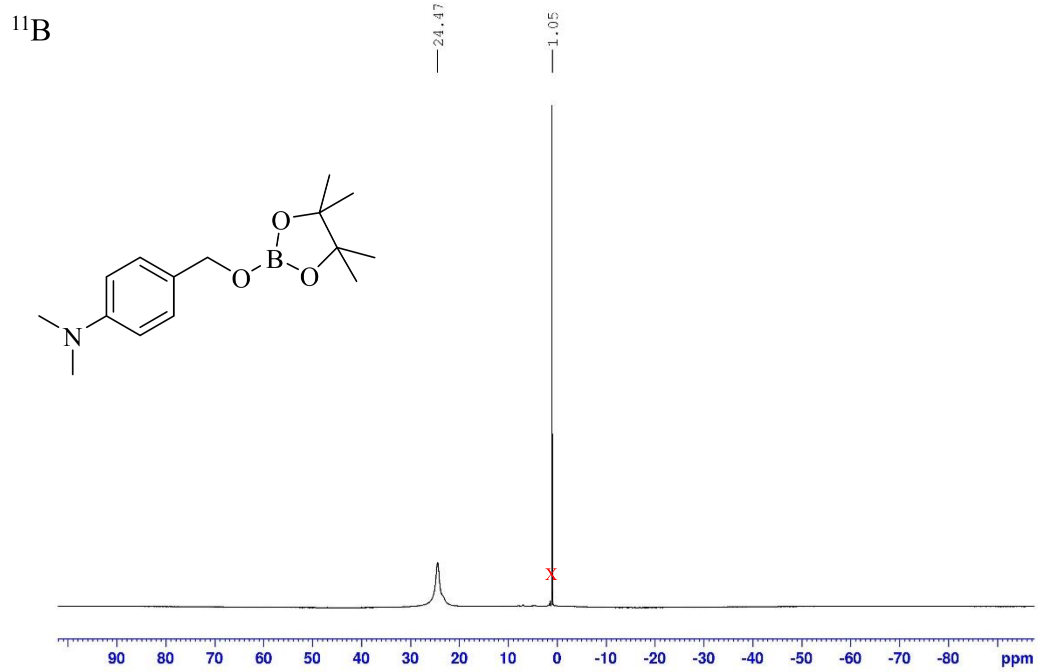


Figure S22. ^{11}B NMR spectrum of 2k in $CDCl_3$.

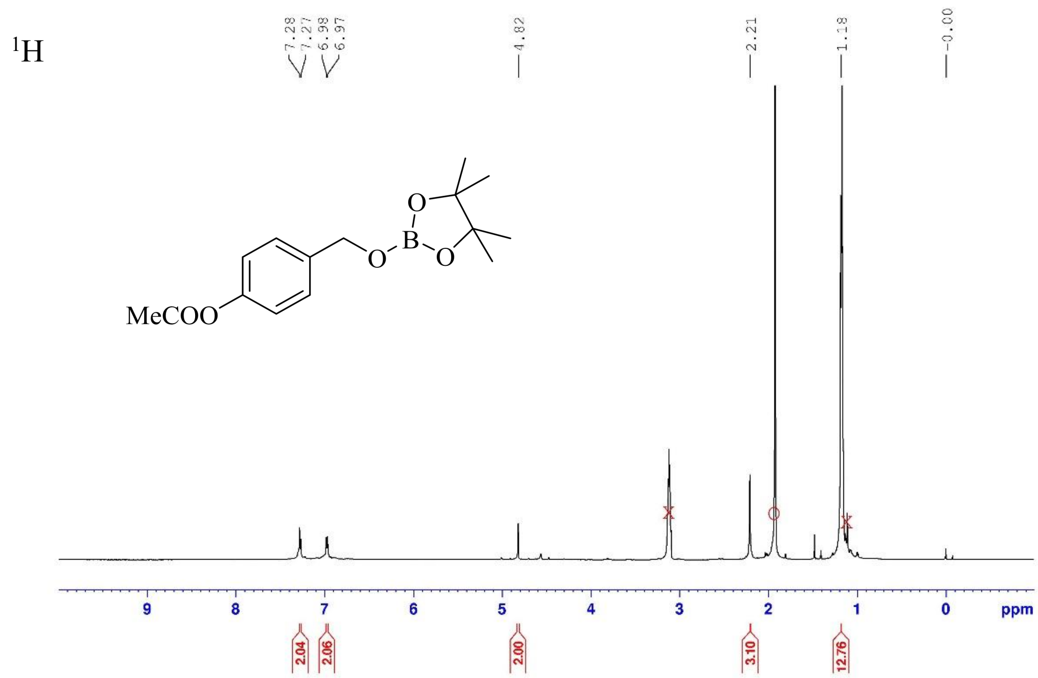


Figure S23. ^{1}H NMR spectrum of 2l in $CDCl_3$.

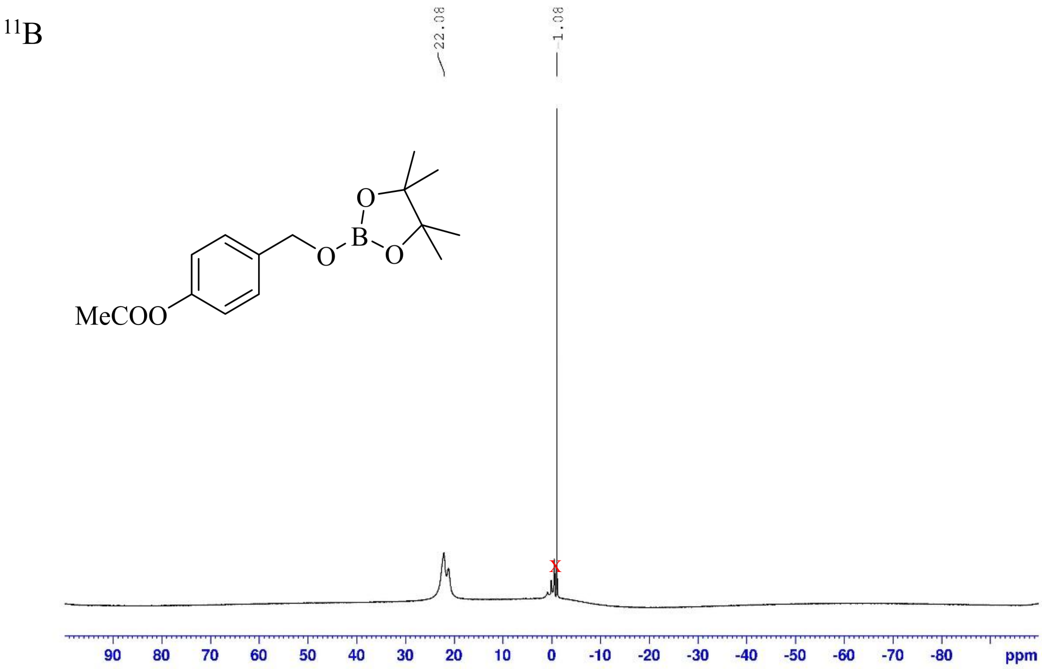


Figure S24. ^{11}B NMR spectrum of 2l in $CDCl_3$.

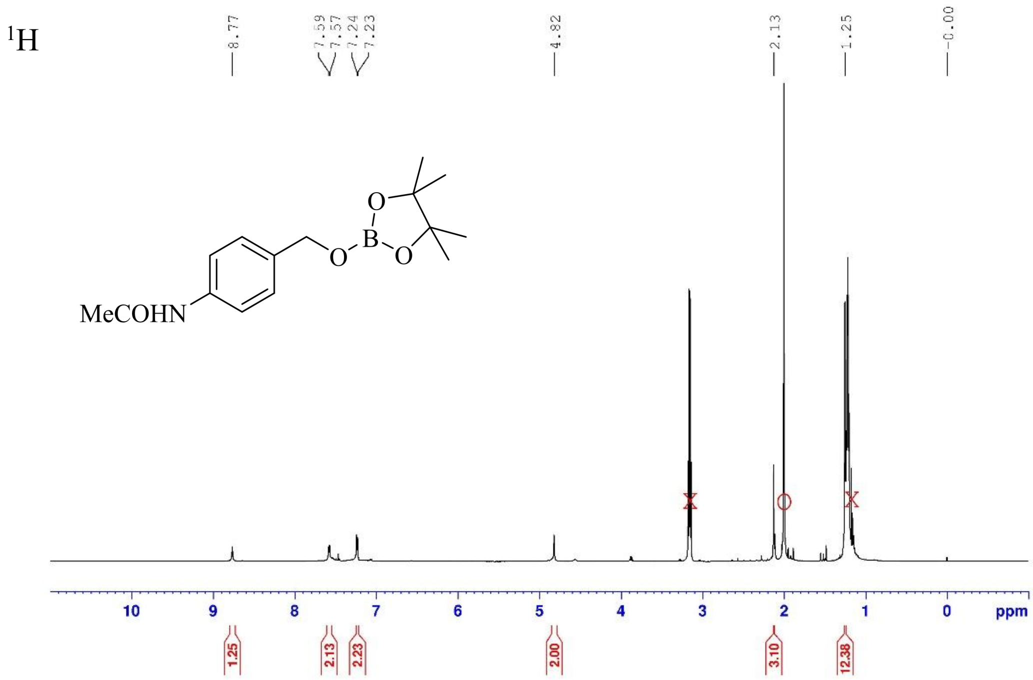


Figure S25. ^{1}H NMR spectrum of 2m in $CDCl_3$.

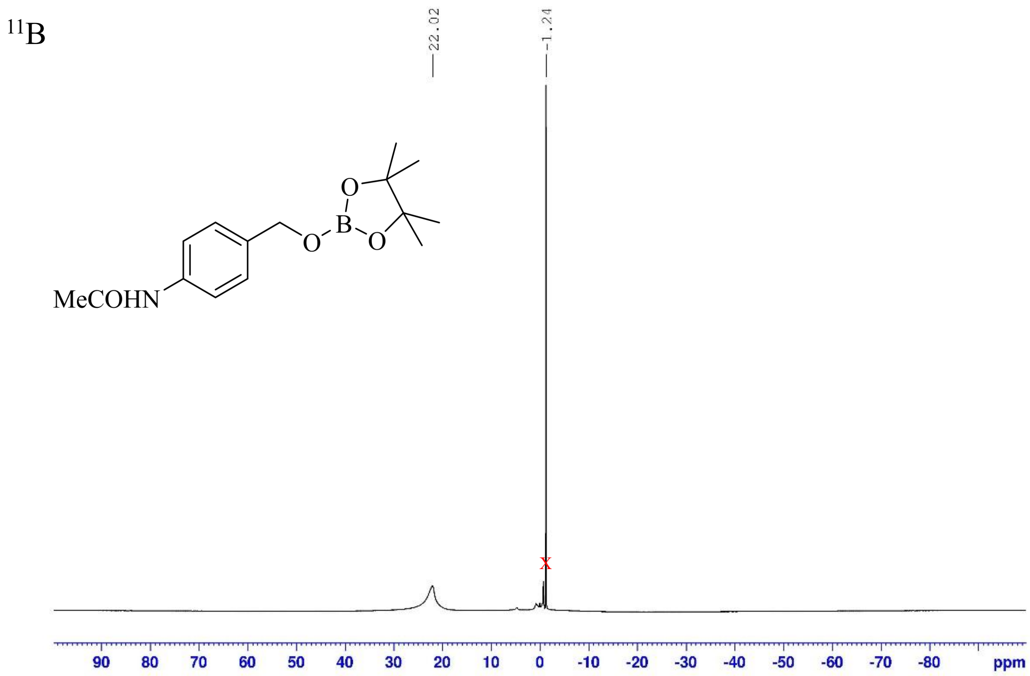


Figure S26. ^{11}B NMR spectrum of 2m in $CDCl_3$.

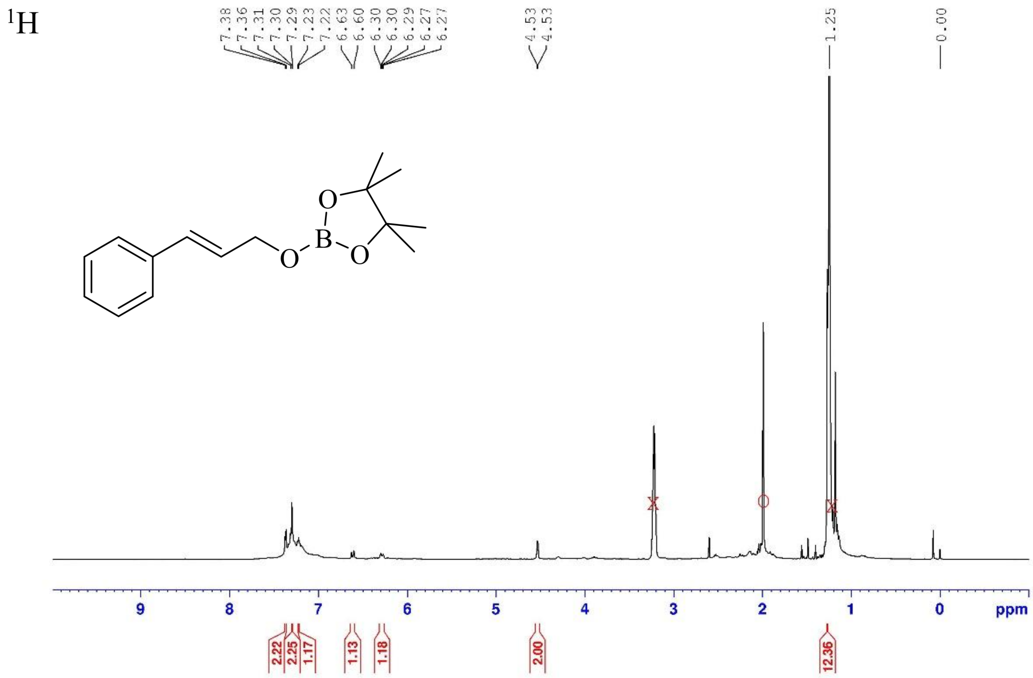


Figure S27. ^{1}H NMR spectrum of 2n in $CDCl_3$.

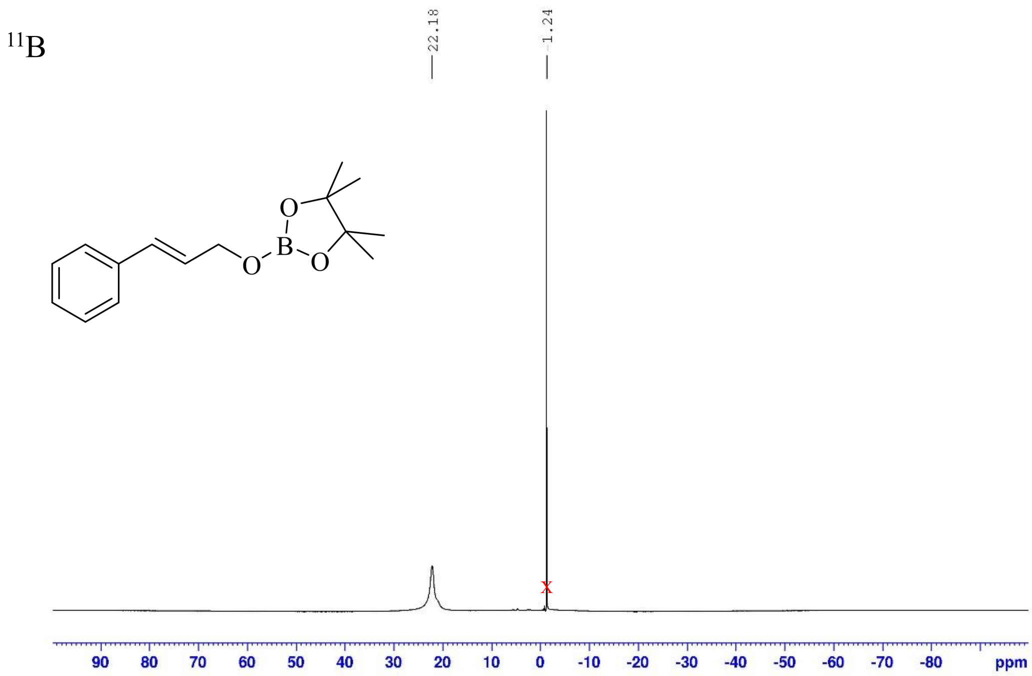


Figure S28. ^{11}B NMR spectrum of 2n in $CDCl_3$.

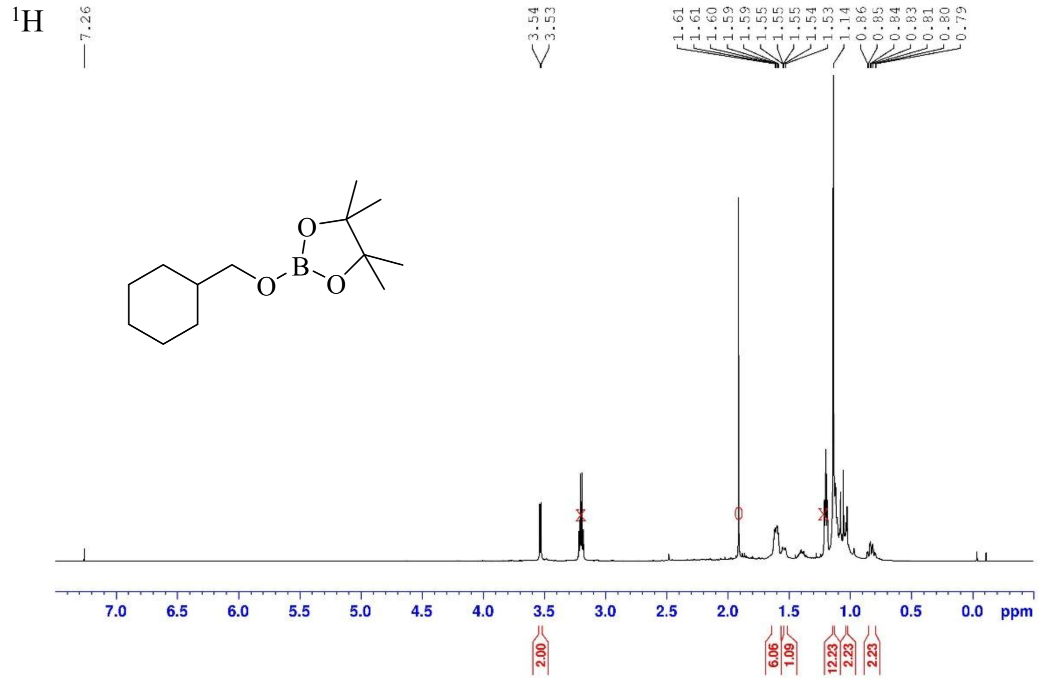


Figure S29. ^{1}H NMR spectrum of 2o in $CDCl_3$.

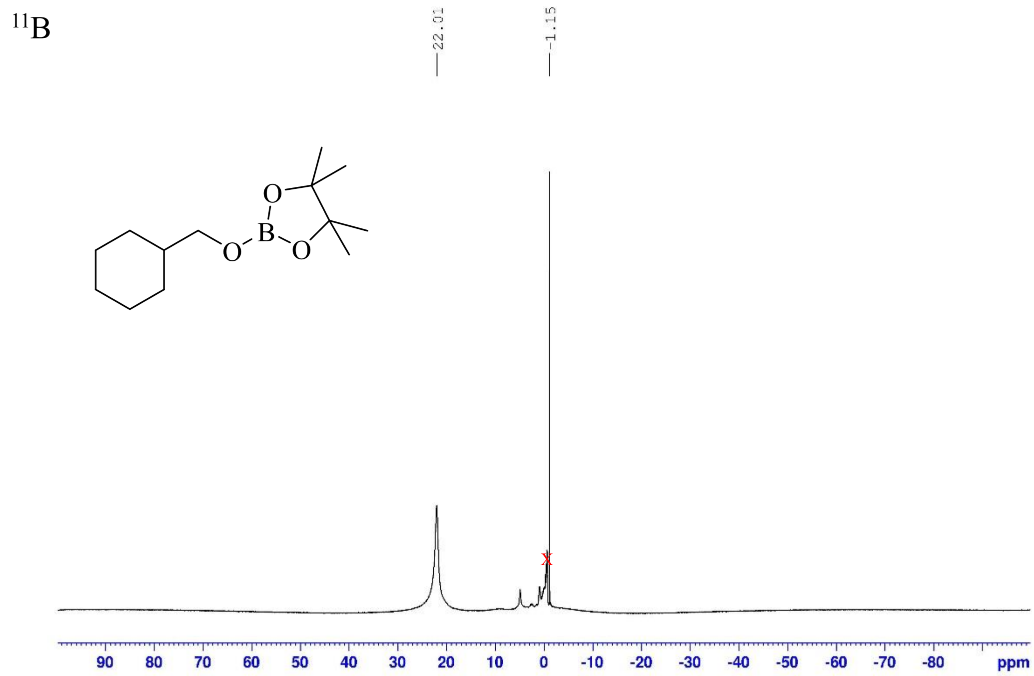


Figure S30. ^{11}B NMR spectrum of 2o in $CDCl_3$.

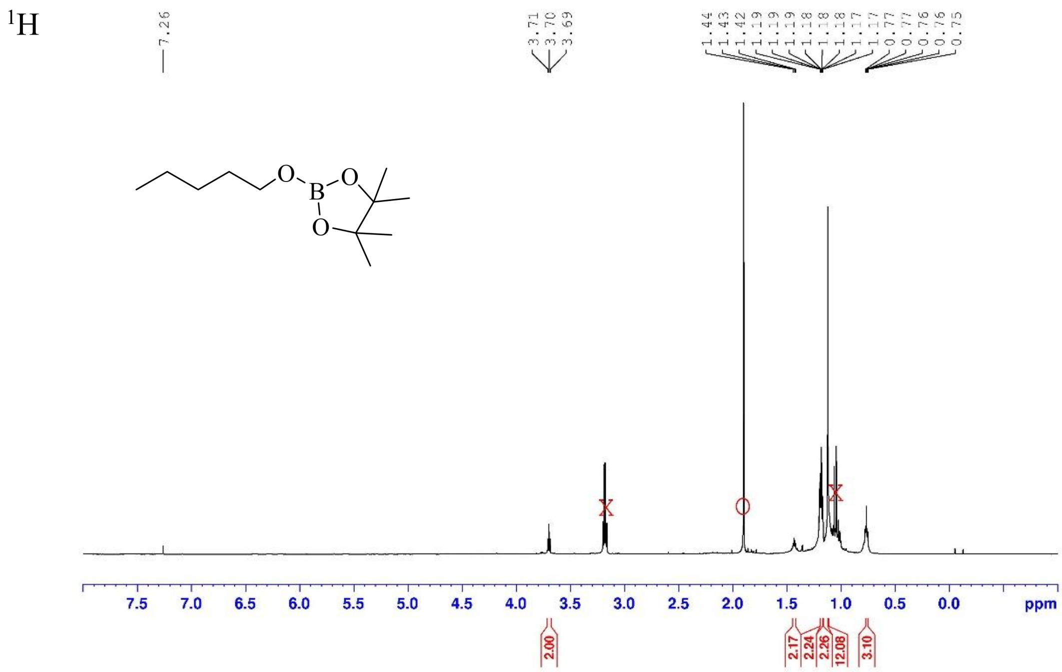


Figure S31. ^{1}H NMR spectrum of 2p in $CDCl_3$.

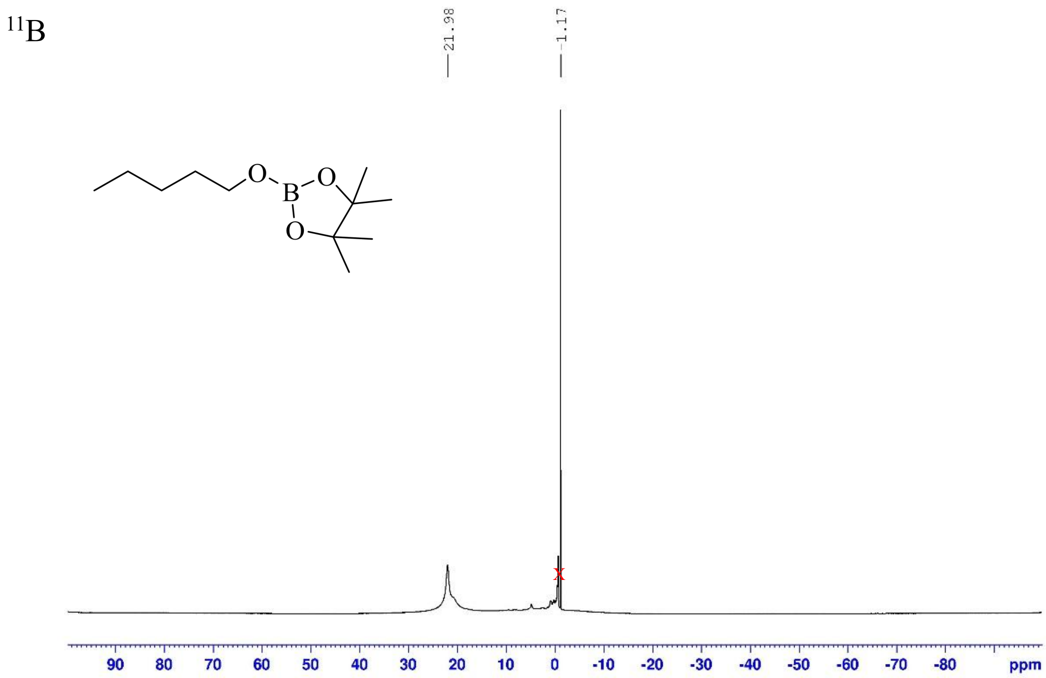


Figure S32. ^{11}B NMR spectrum of 2p in $CDCl_{3.b}$

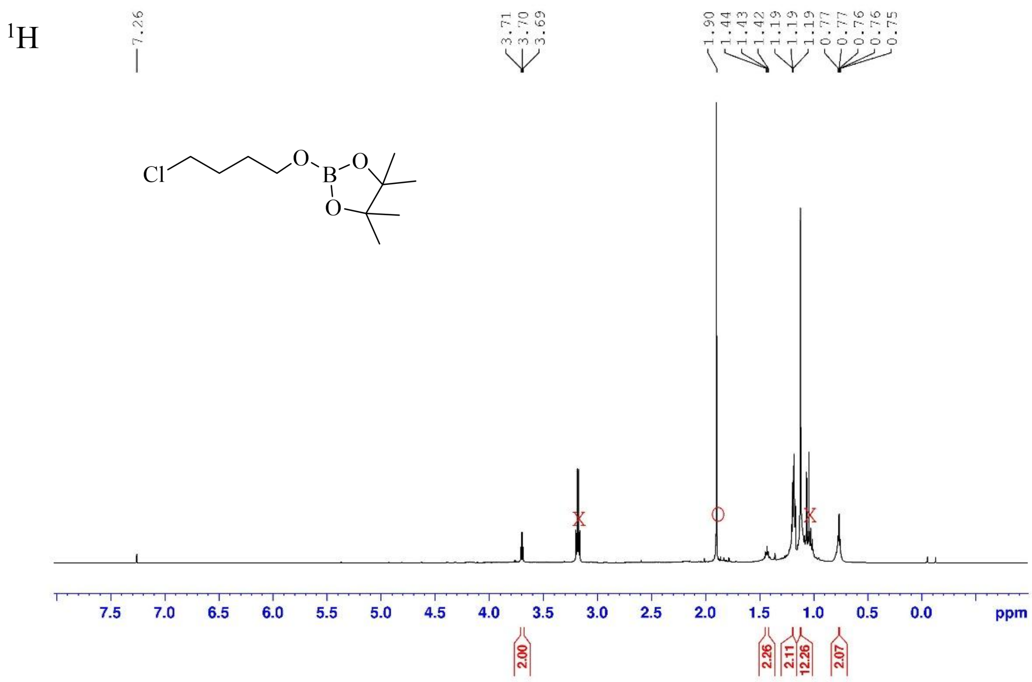


Figure S33. ^{1}H NMR spectrum of 2q in $CDCl_3$.

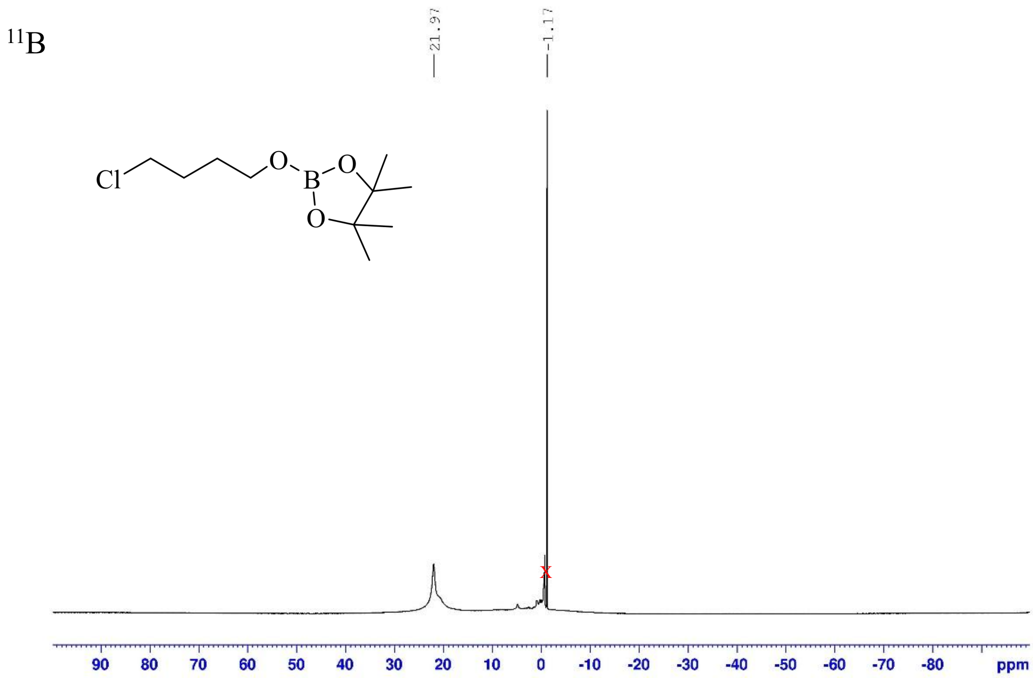


Figure S34. ^{11}B NMR spectrum of 2q in $CDCl_3$.

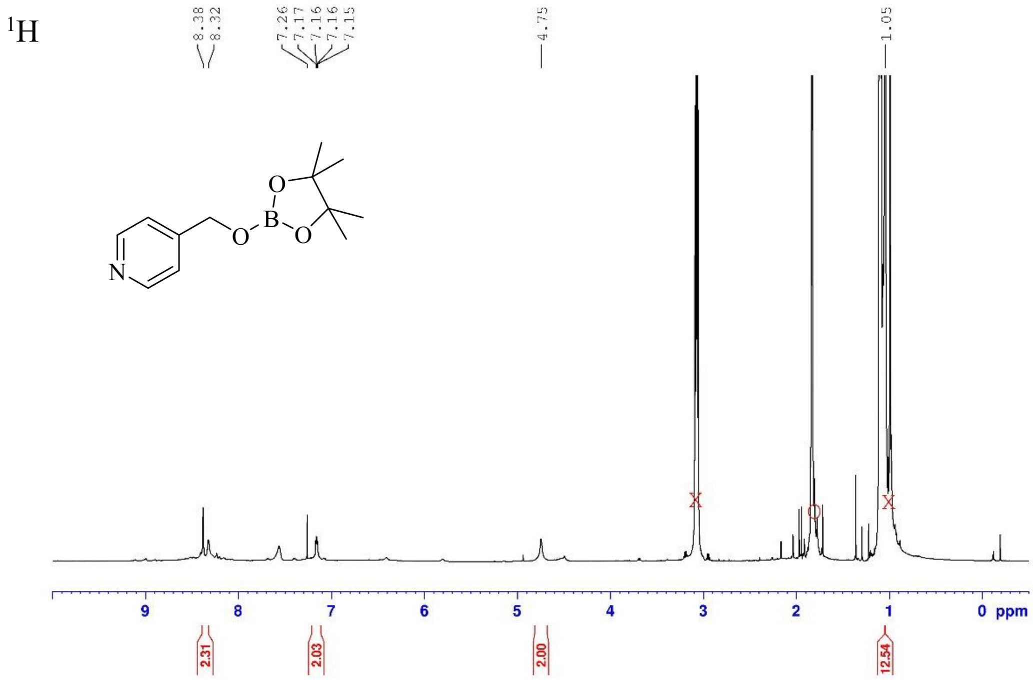


Figure S35. ^{1}H NMR spectrum of 2r in $CDCl_3$.

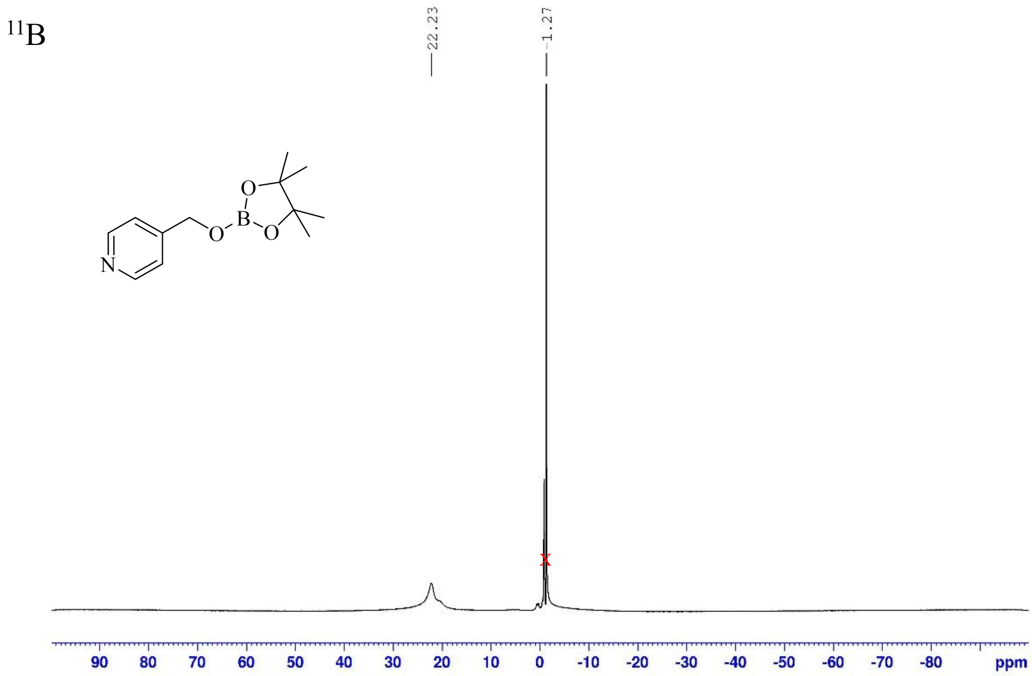


Figure S36. ^{11}B NMR spectrum of 2r in $CDCl_3$.

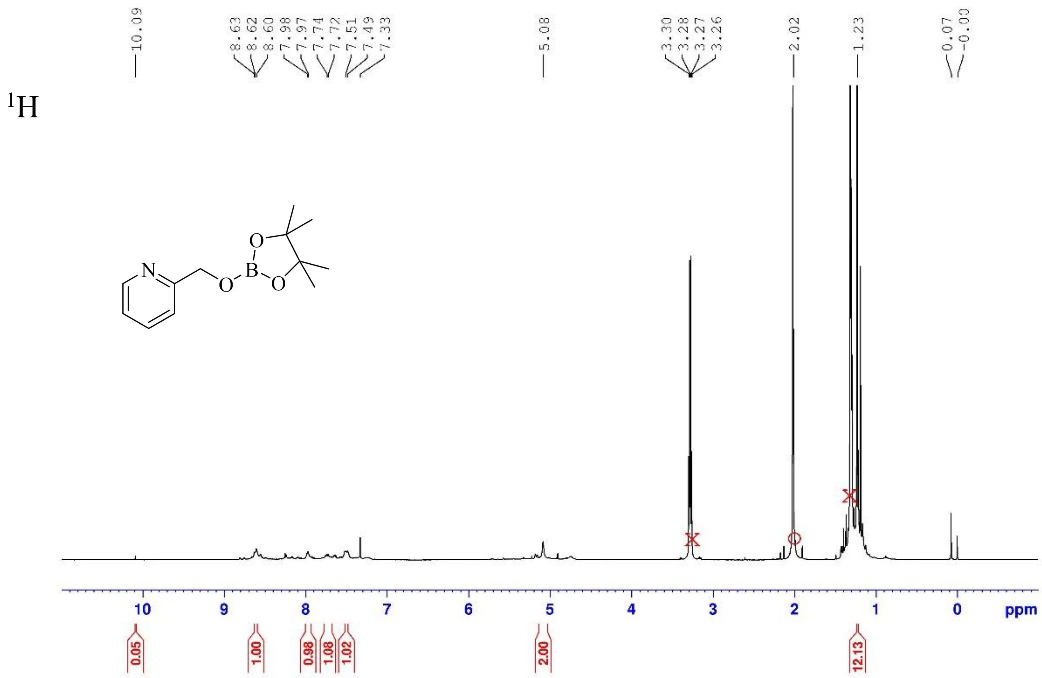


Figure S37. ^{1}H NMR spectrum of 2s in $CDCl_3$.

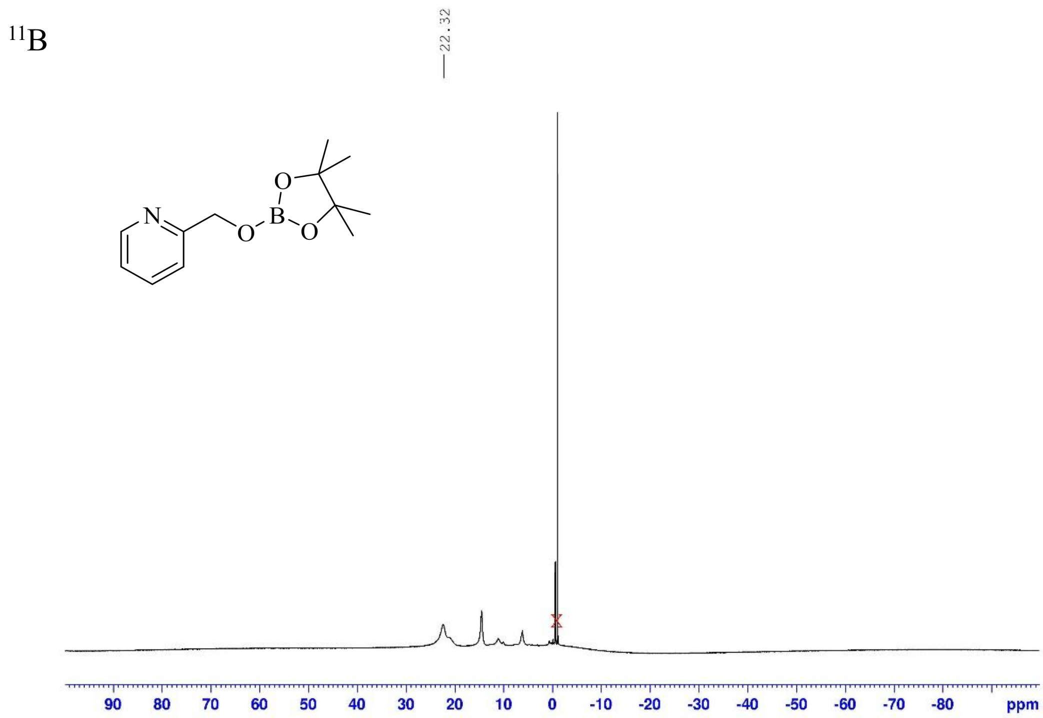


Figure S38. ^{11}B NMR spectrum of 2s in $CDCl_3$.

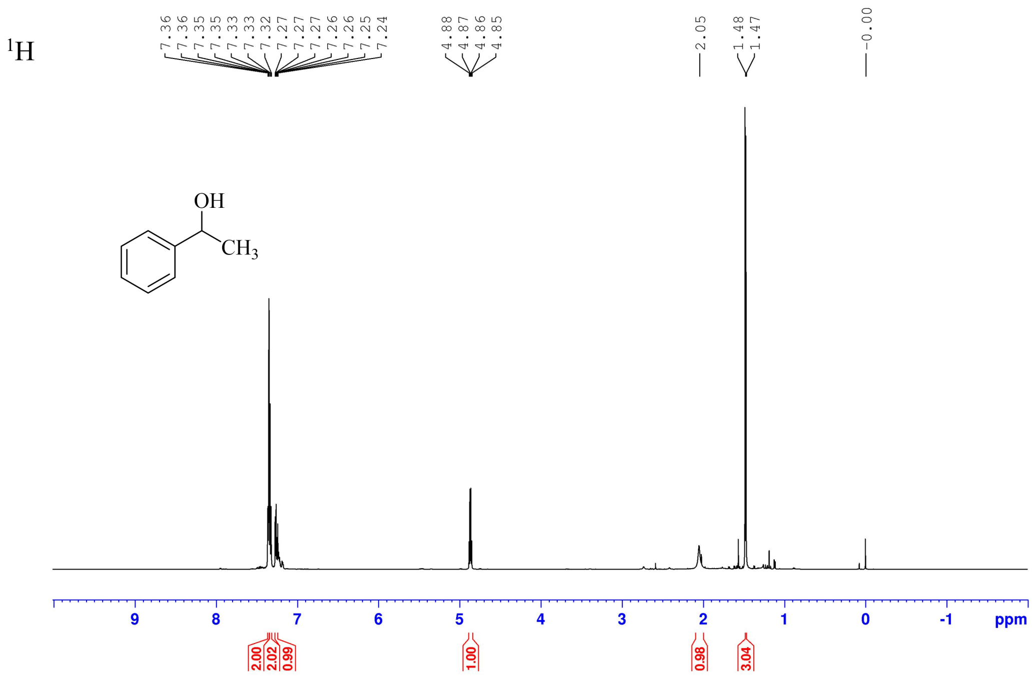


Figure S39. ^{1}H NMR spectrum of 4a in $CDCl_3$.

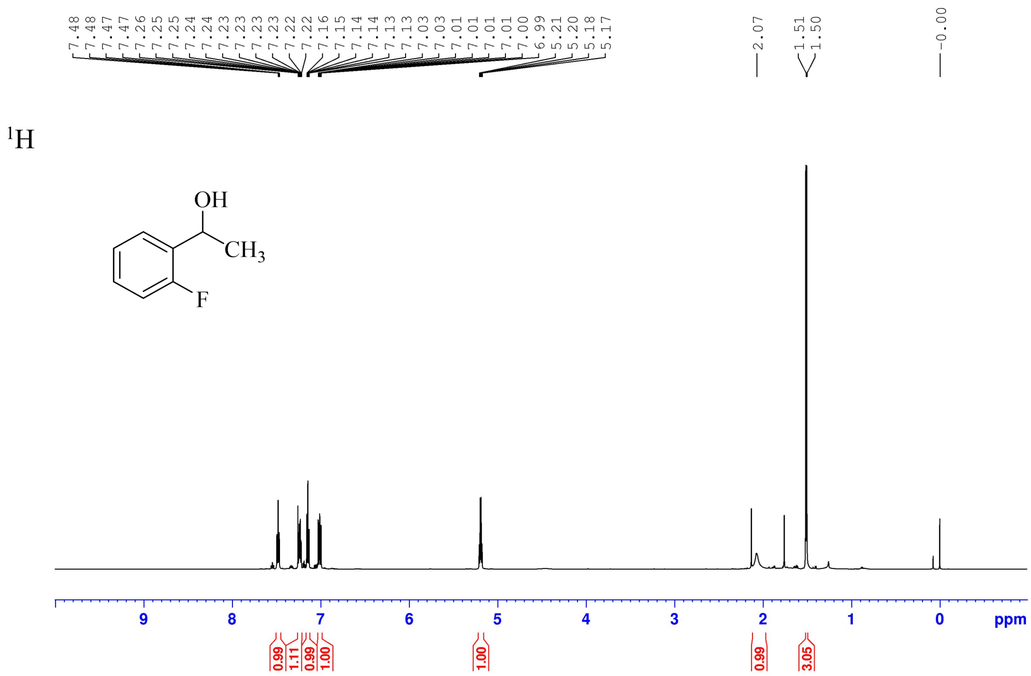


Figure S40. ^{1}H NMR spectrum of 4b in $CDCl_3$.

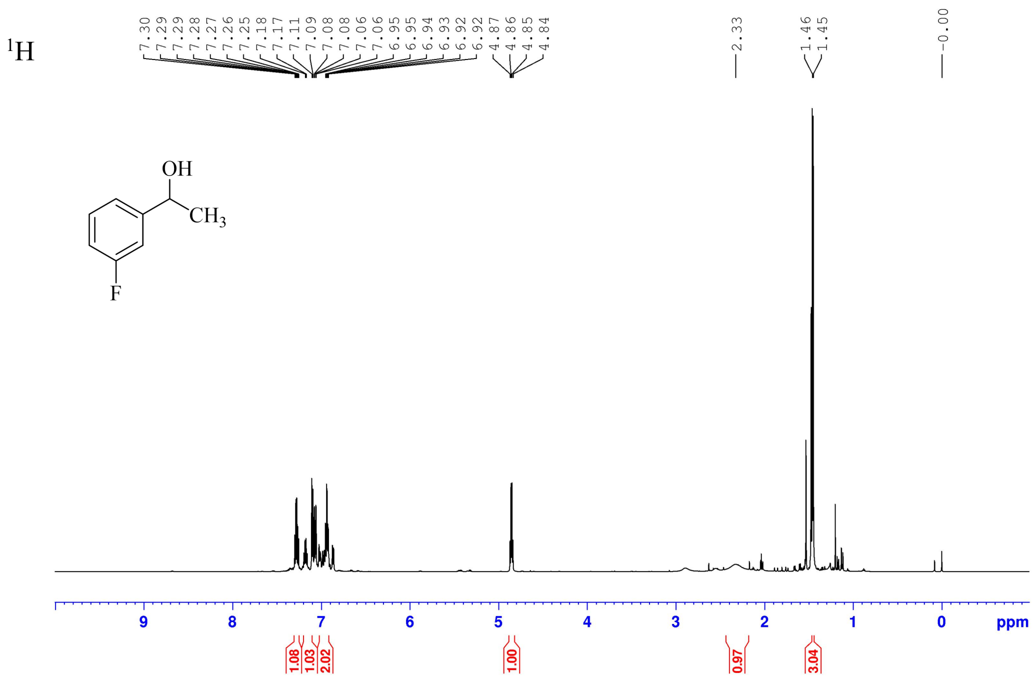


Figure S41. ^{1}H NMR spectrum of 4c in $CDCl_3$.

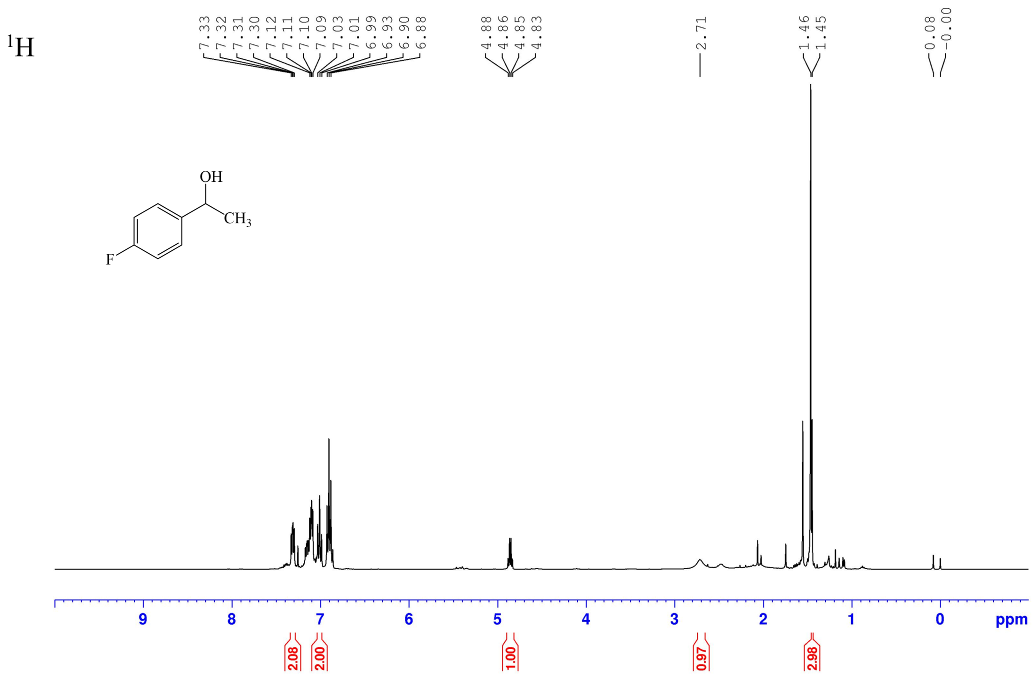


Figure S42. ^{1}H NMR spectrum of 4d in $CDCl_3$.

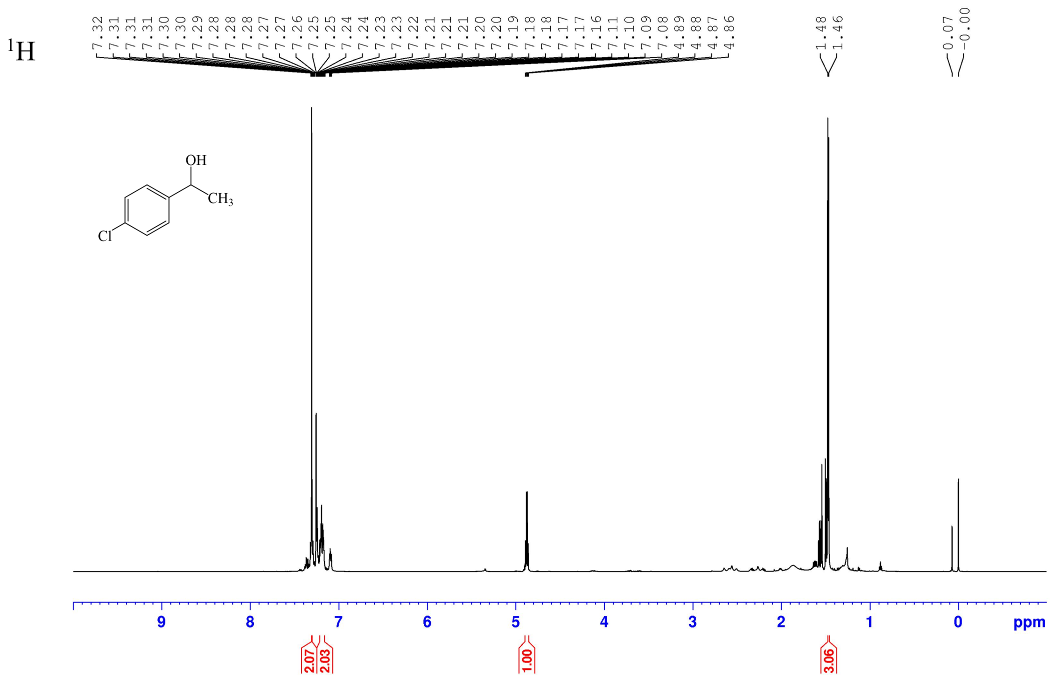


Figure S43. ^{1}H NMR spectrum of 4e in $CDCl_3$.

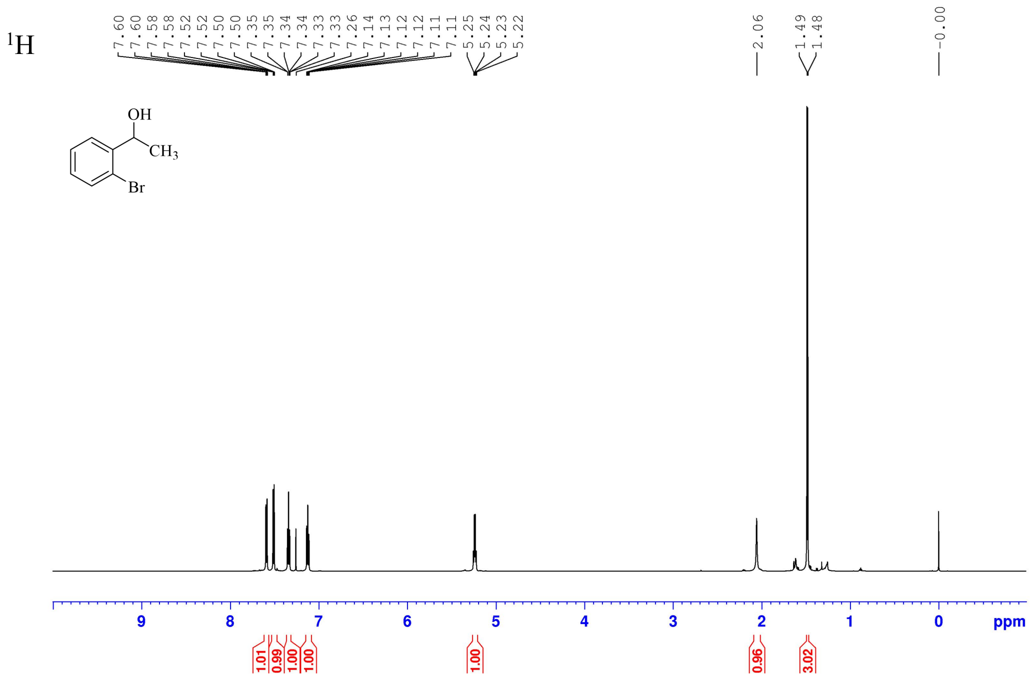


Figure S44. ^{1}H NMR spectrum of 4f in $CDCl_3$.

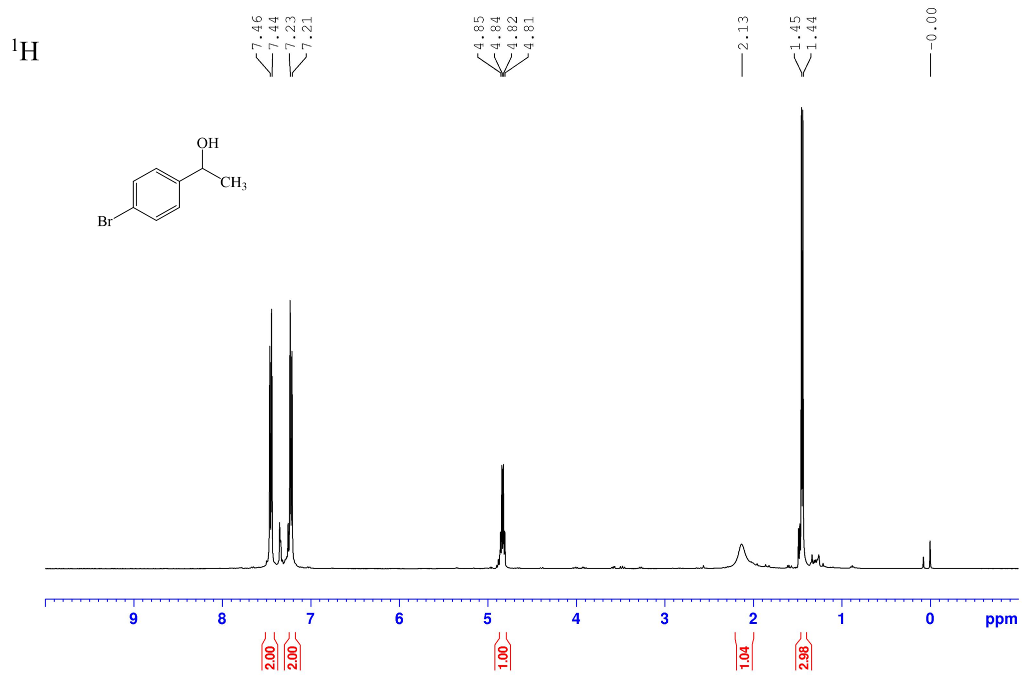


Figure S45. ^{1}H NMR spectrum of 4g in $CDCl_3$.

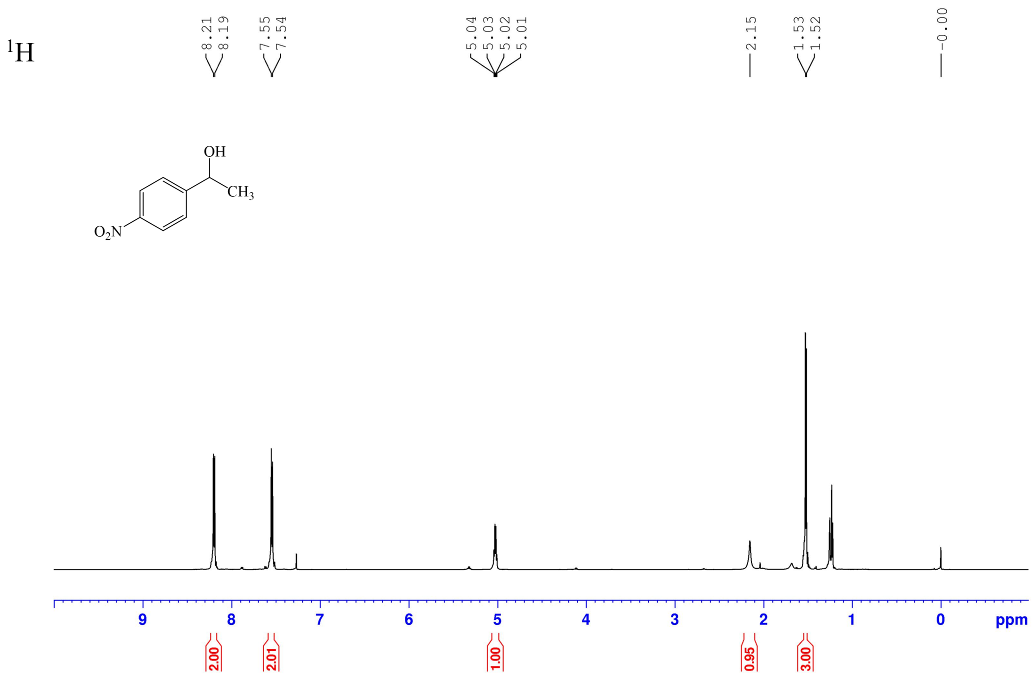


Figure S46. ^{1}H NMR spectrum of 4h in $CDCl_3$.

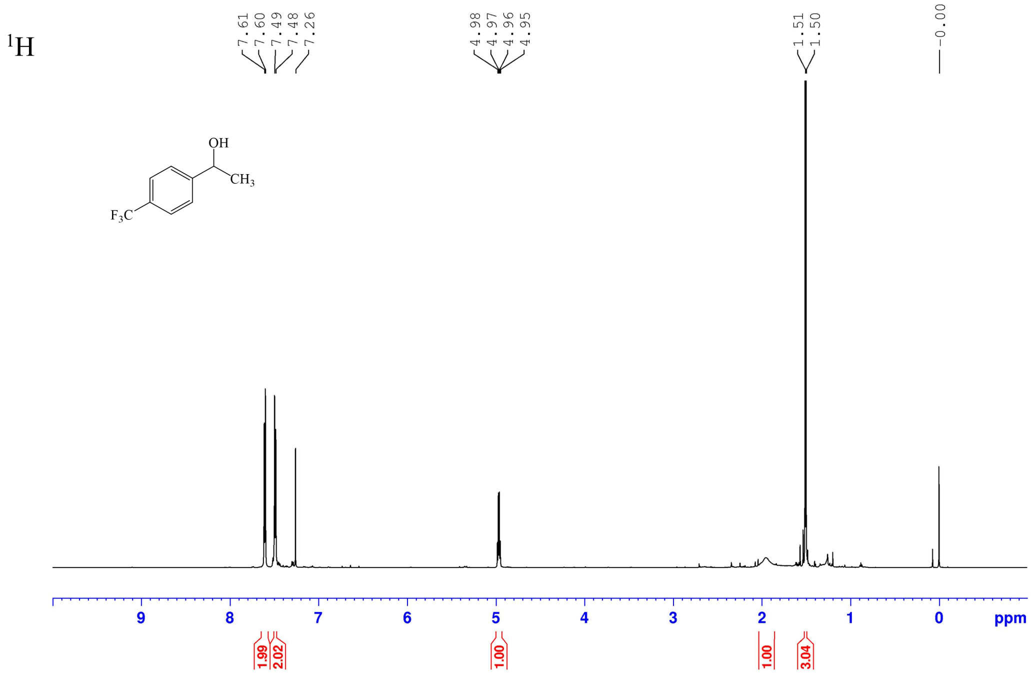


Figure S47. ^{1}H NMR spectrum of 4i in $CDCl_3$.

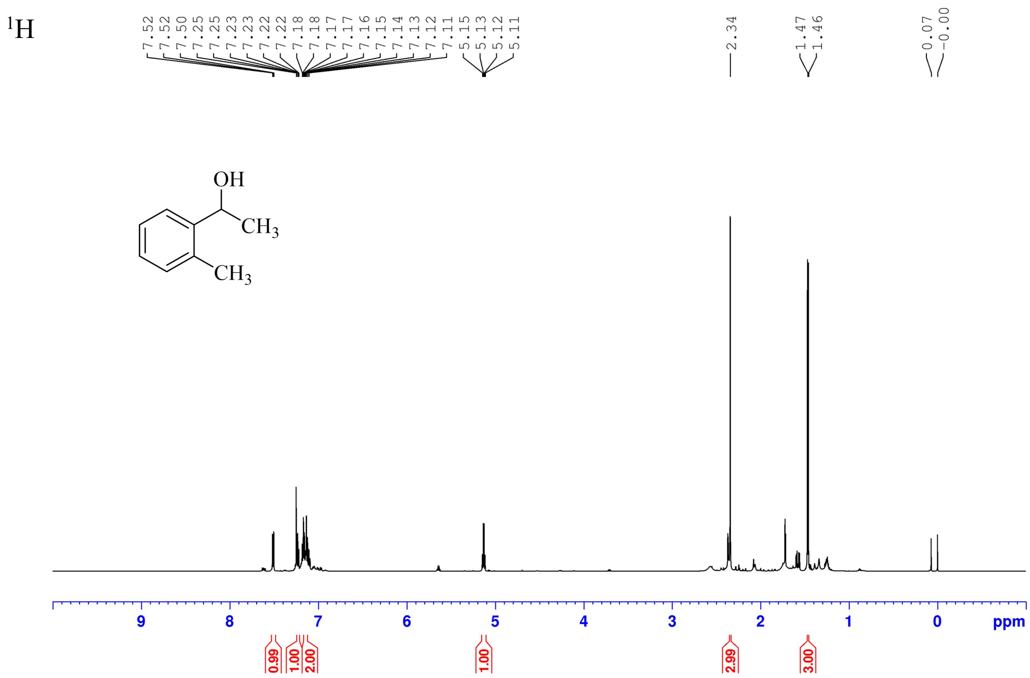


Figure S48. ^{1}H NMR spectrum of 4j in $CDCl_3$.

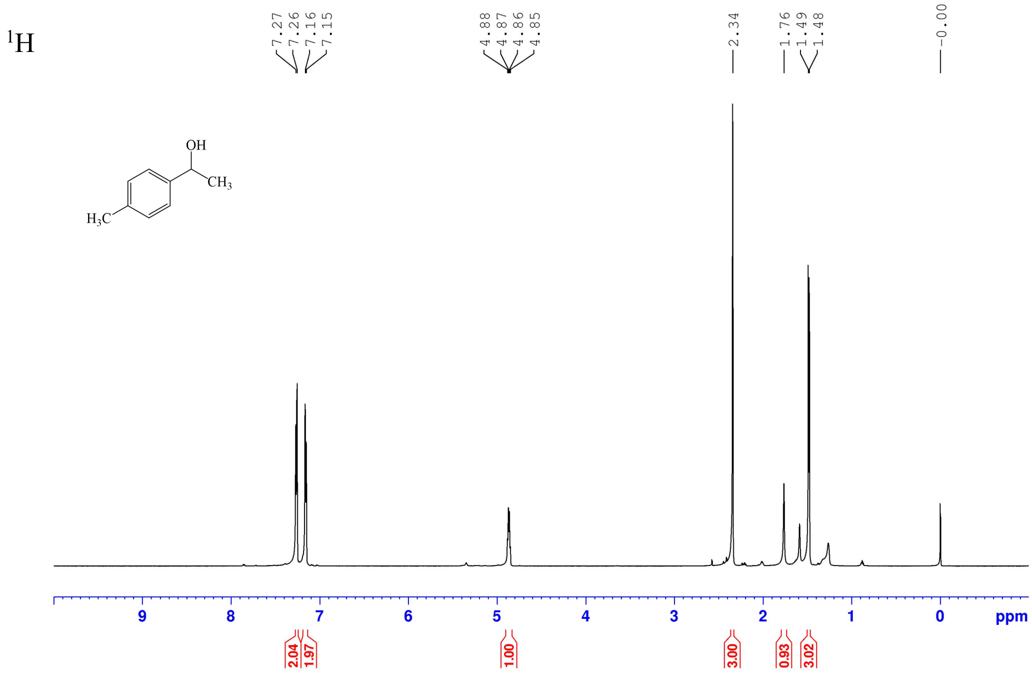


Figure S49. ^{1}H NMR spectrum of 4k in $CDCl_3$.

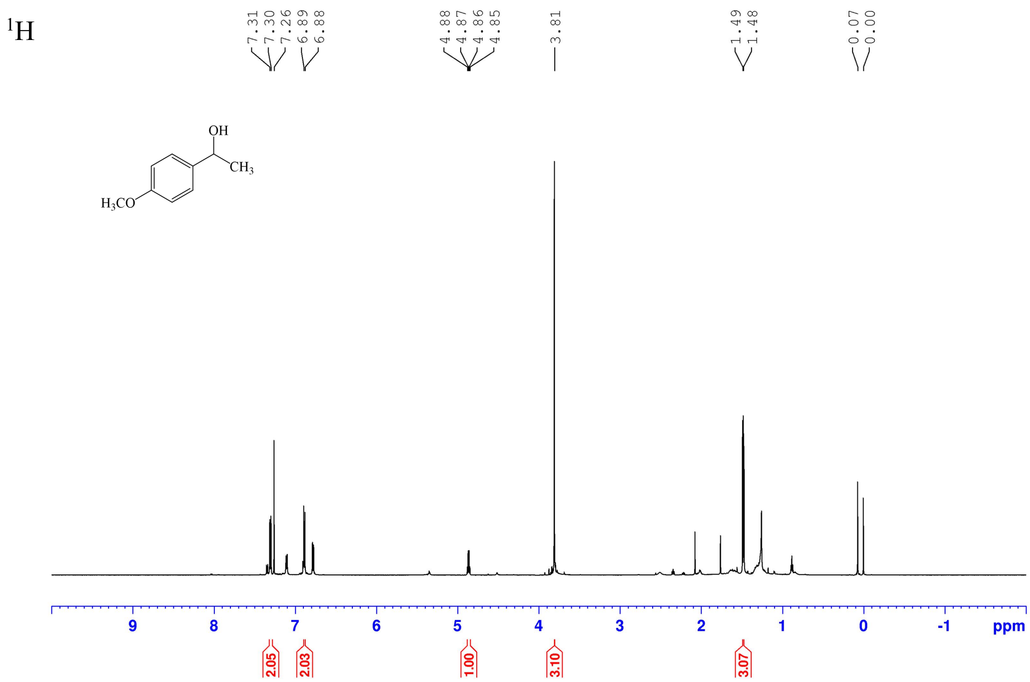


Figure S50. ^{1}H NMR spectrum of 4l in $CDCl_3$.

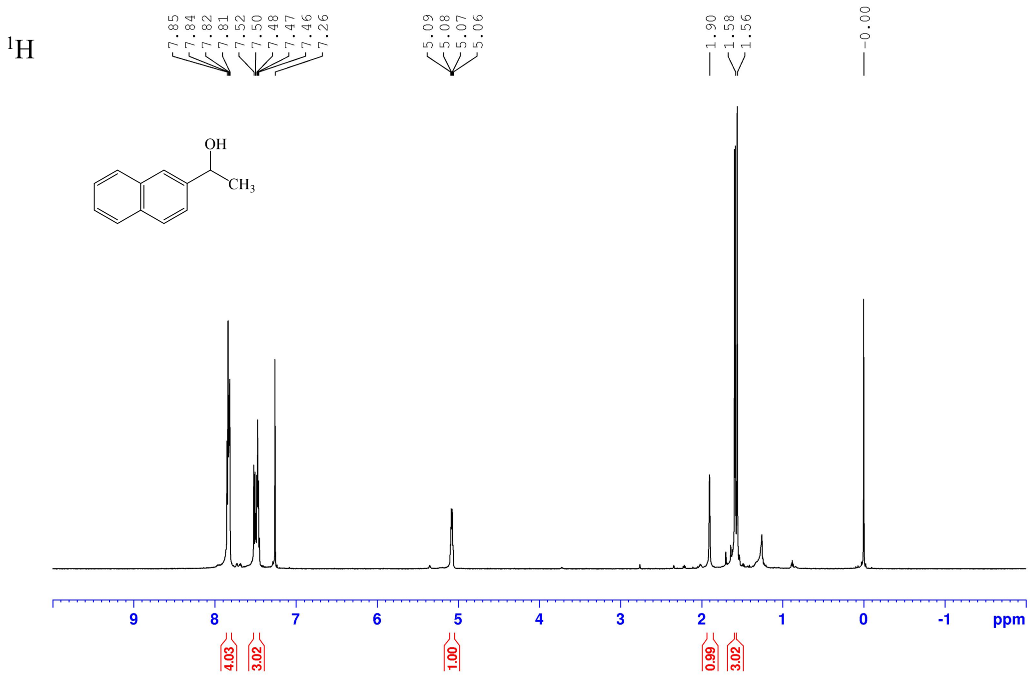


Figure S51. ^{1}H NMR spectrum of 4m in $CDCl_3$.

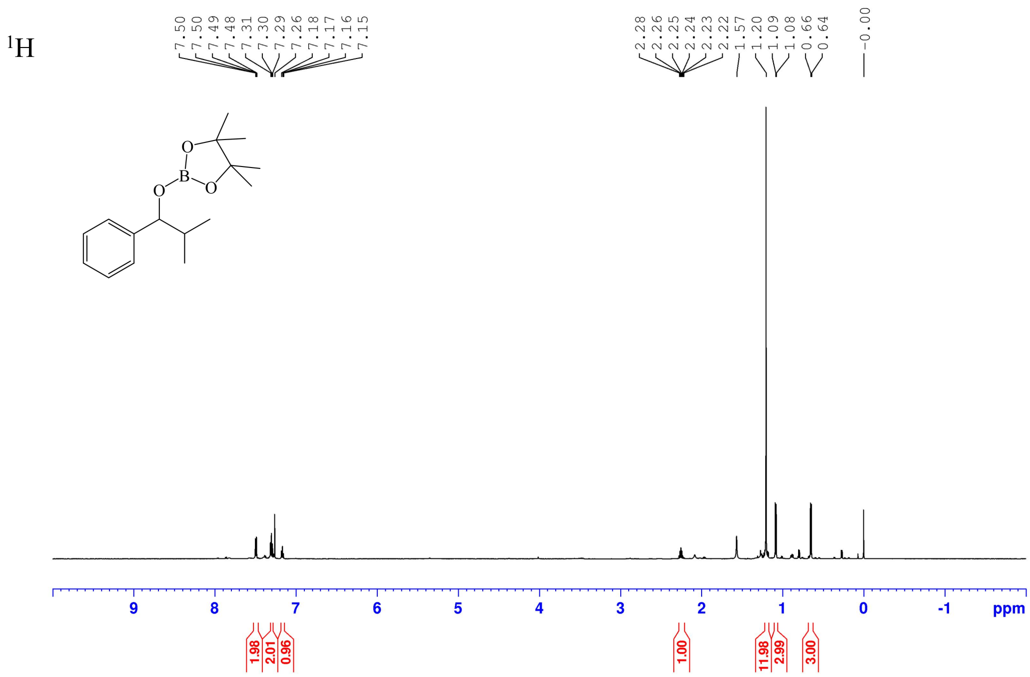


Figure S52. ^{1}H NMR spectrum of 4n in $CDCl_3$.

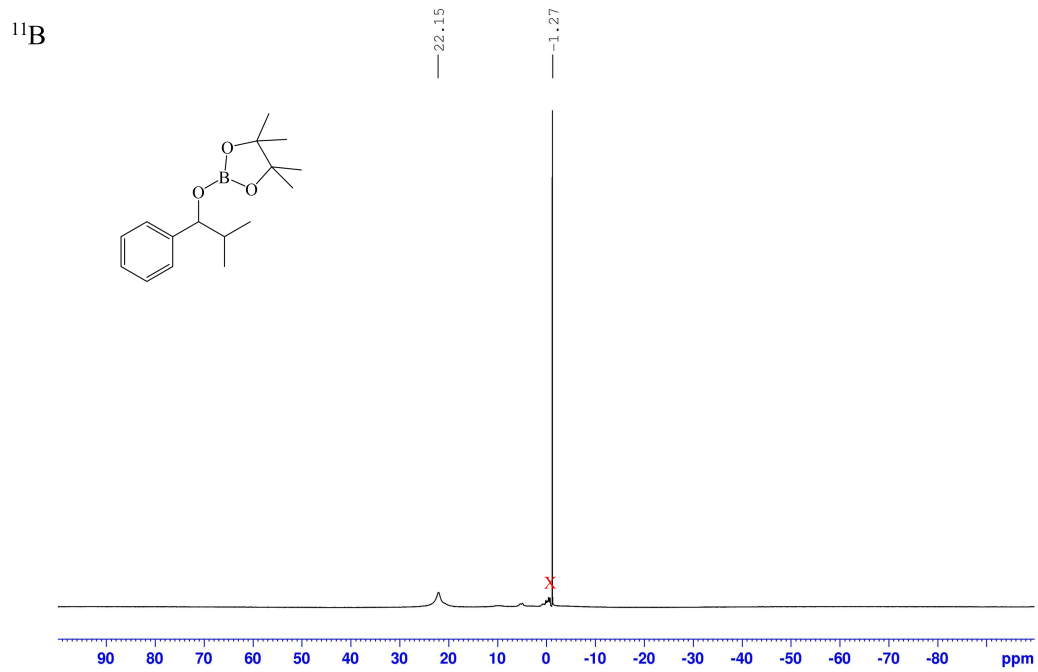


Figure S53. ^{11}B NMR spectrum of 4n in $CDCl_3$.

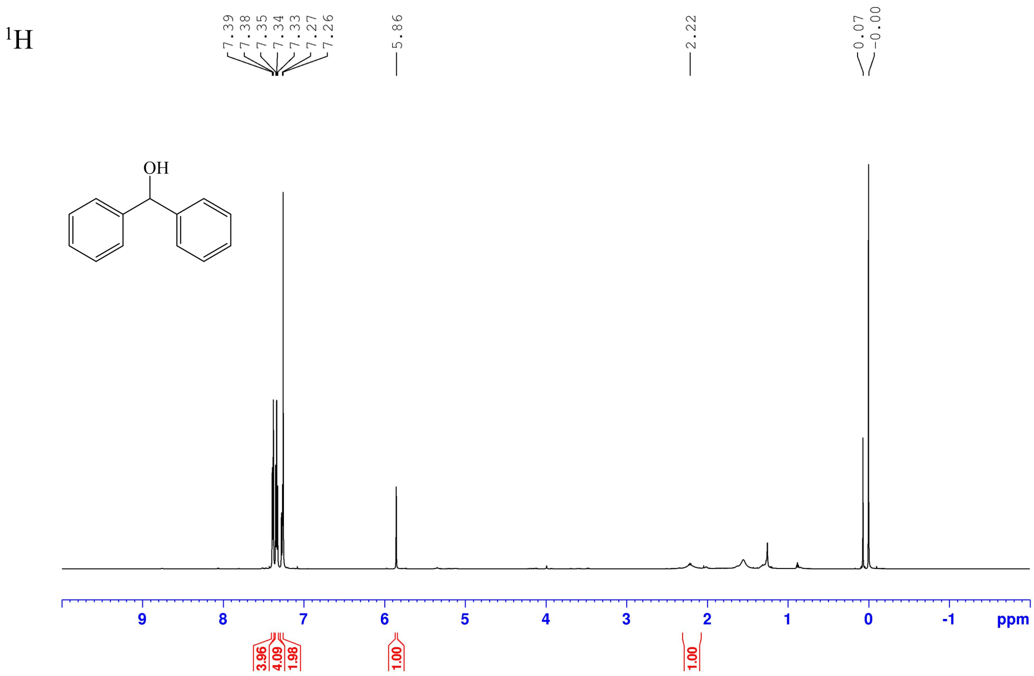


Figure S54. ^{1}H NMR spectrum of 4o in $CDCl_3$.

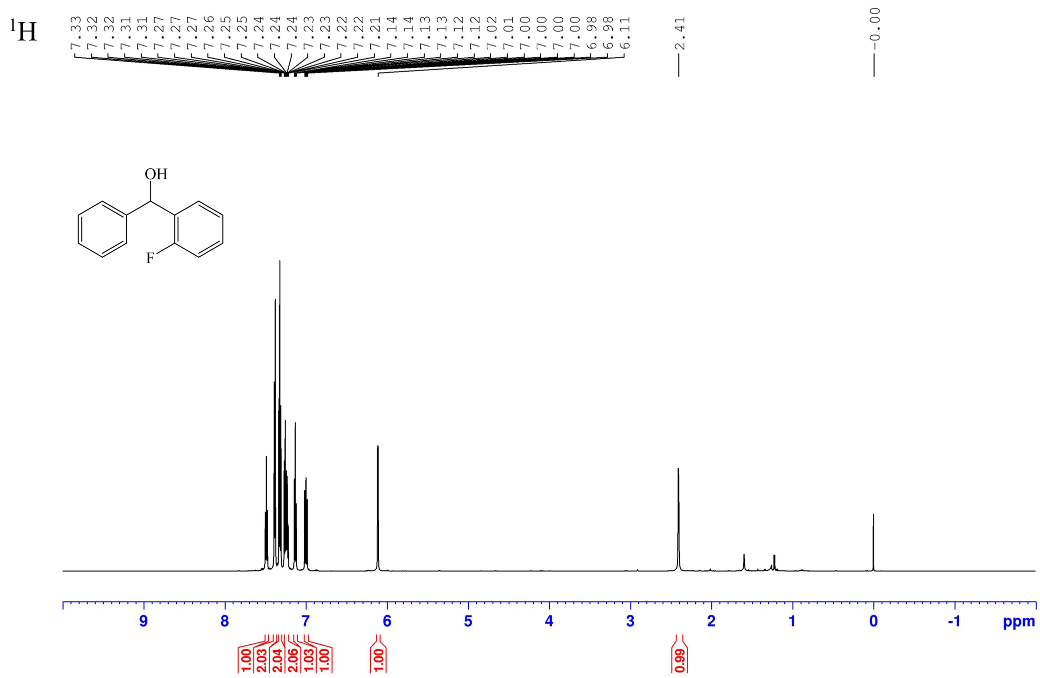


Figure S55. [1]H NMR spectrum of 4p in $CDCl_3$.

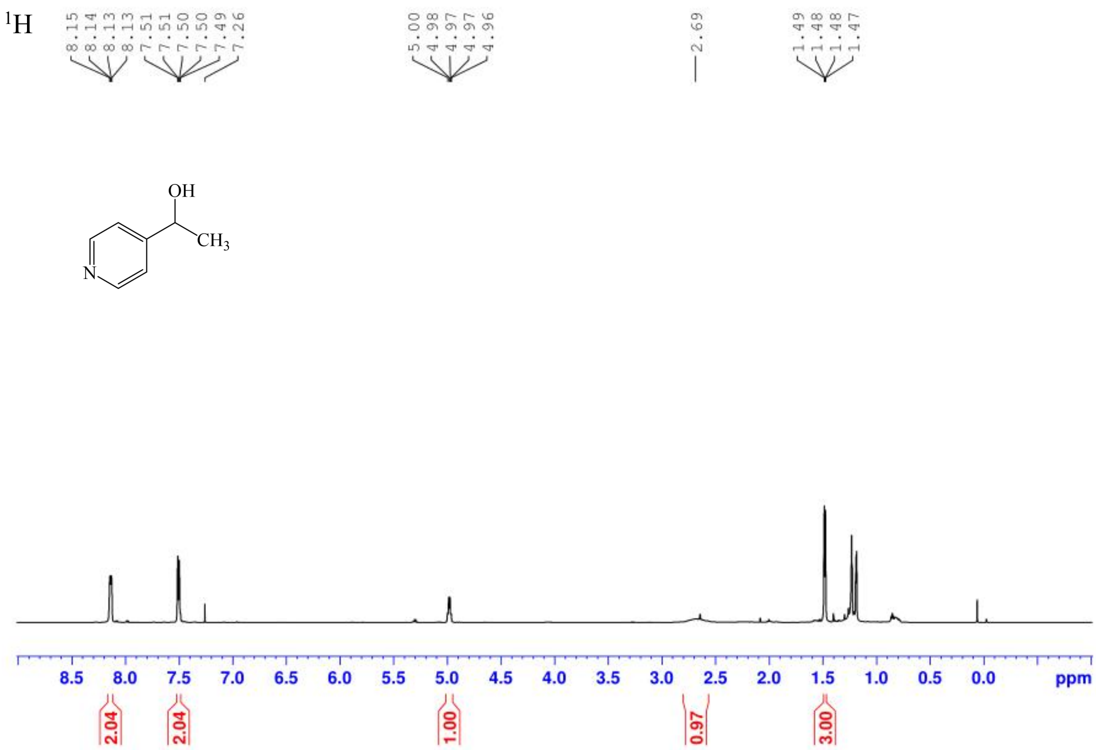


Figure S56. [1]H NMR spectrum of 4q in $CDCl_3$.

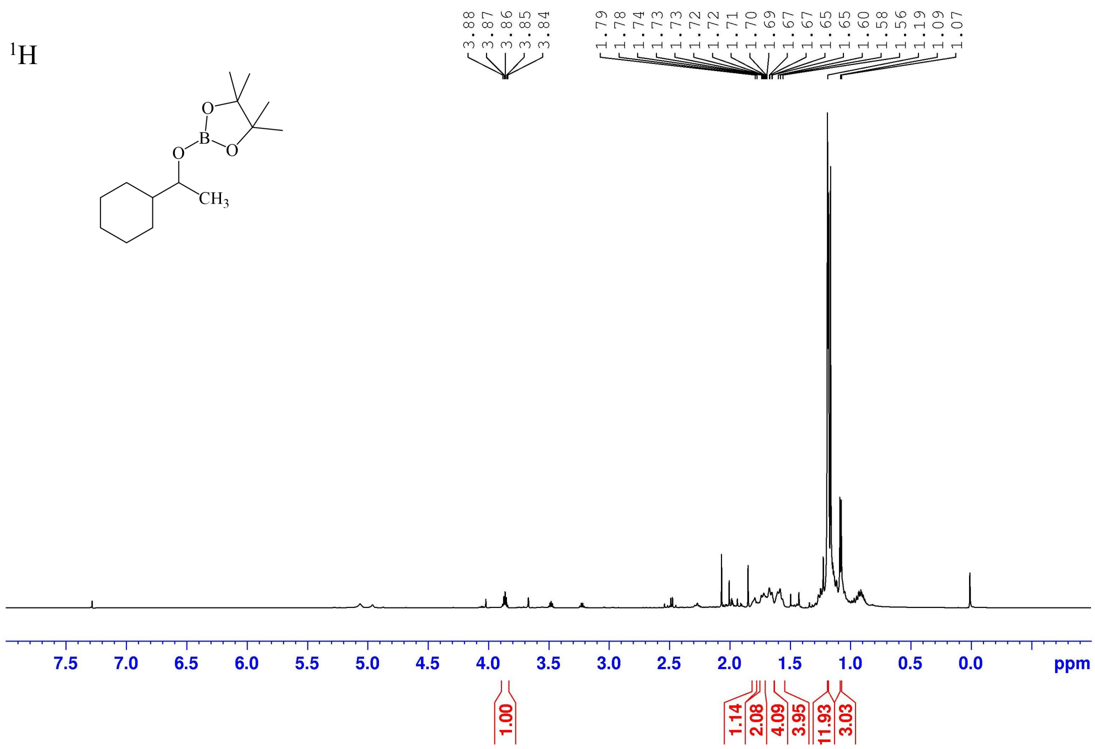


Figure S57. ^{1}H NMR spectrum of 4r in $CDCl_3$.

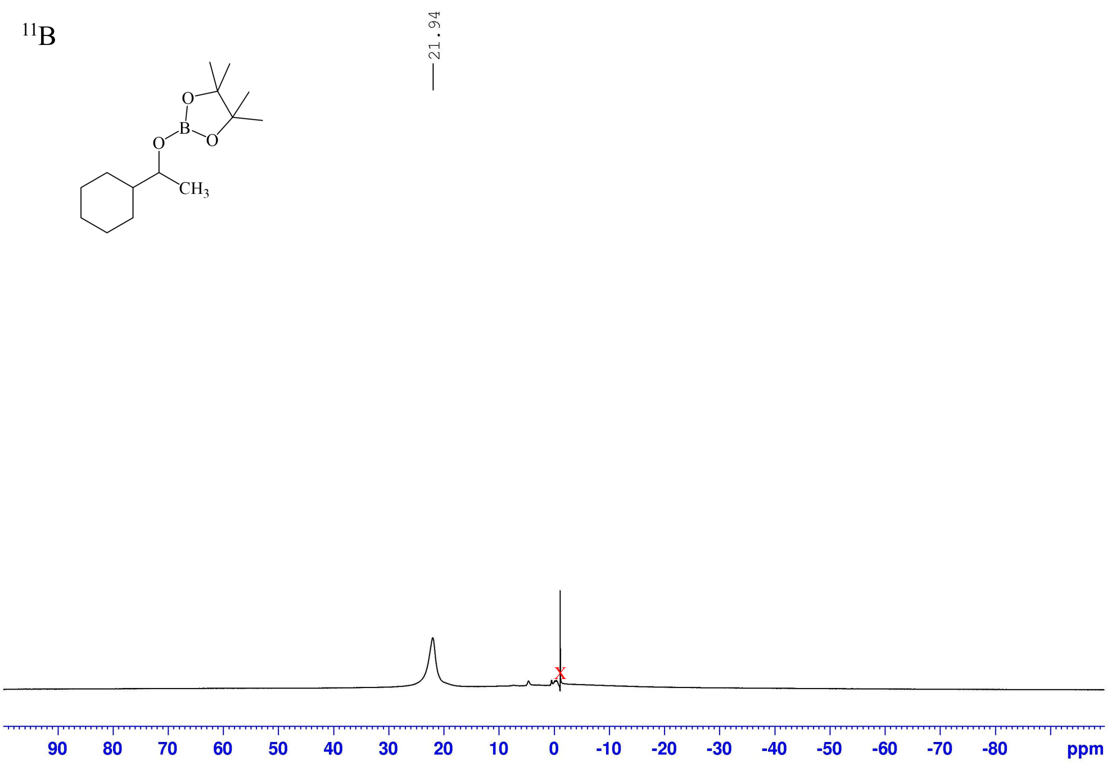


Figure S58. ^{11}B NMR spectrum of 4r in $CDCl_3$.

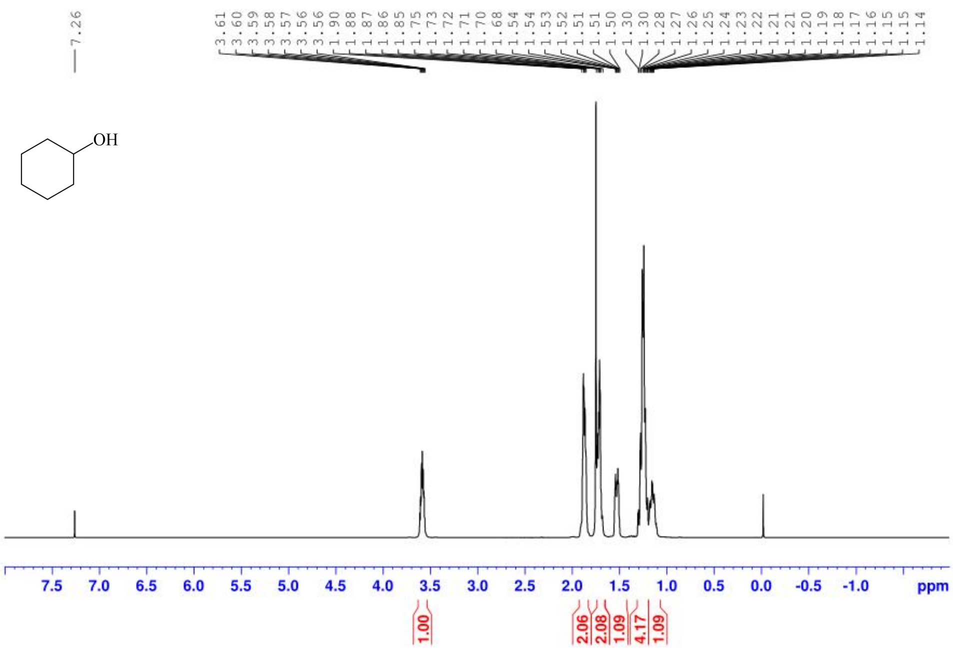


Figure S59. [1]H NMR spectrum of 4s in $CDCl_3$.

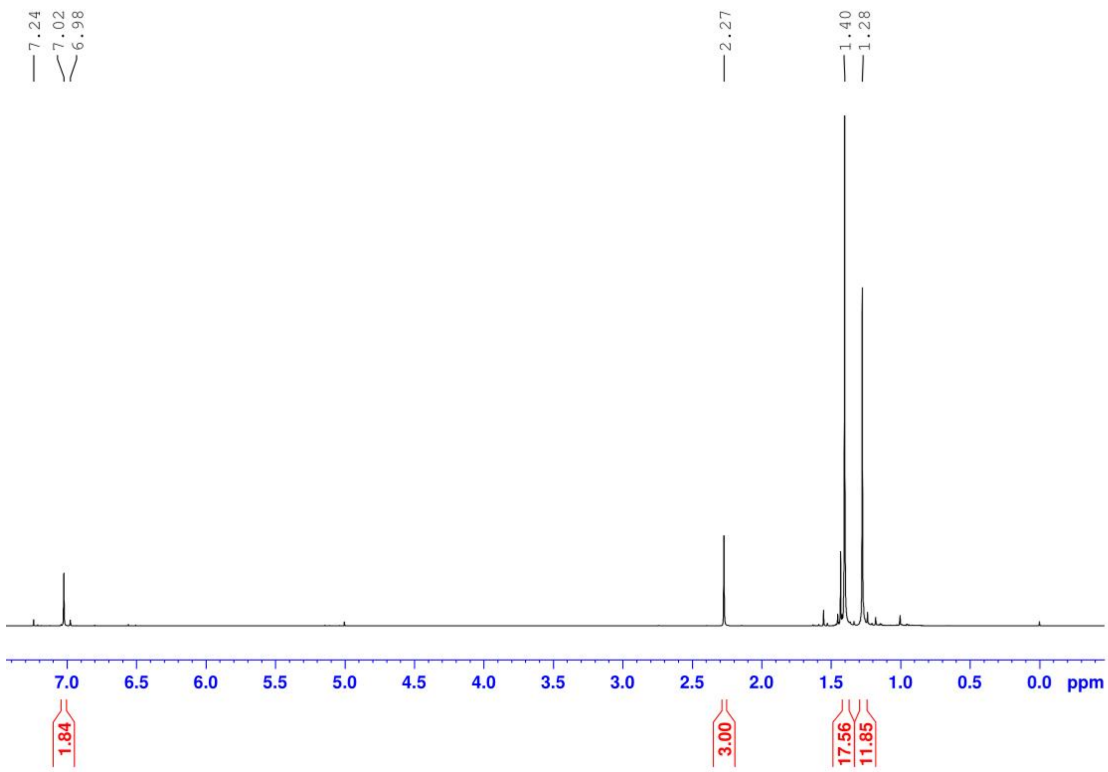


Figure S60. [1]H NMR spectrum of 5 in $CDCl_3$.

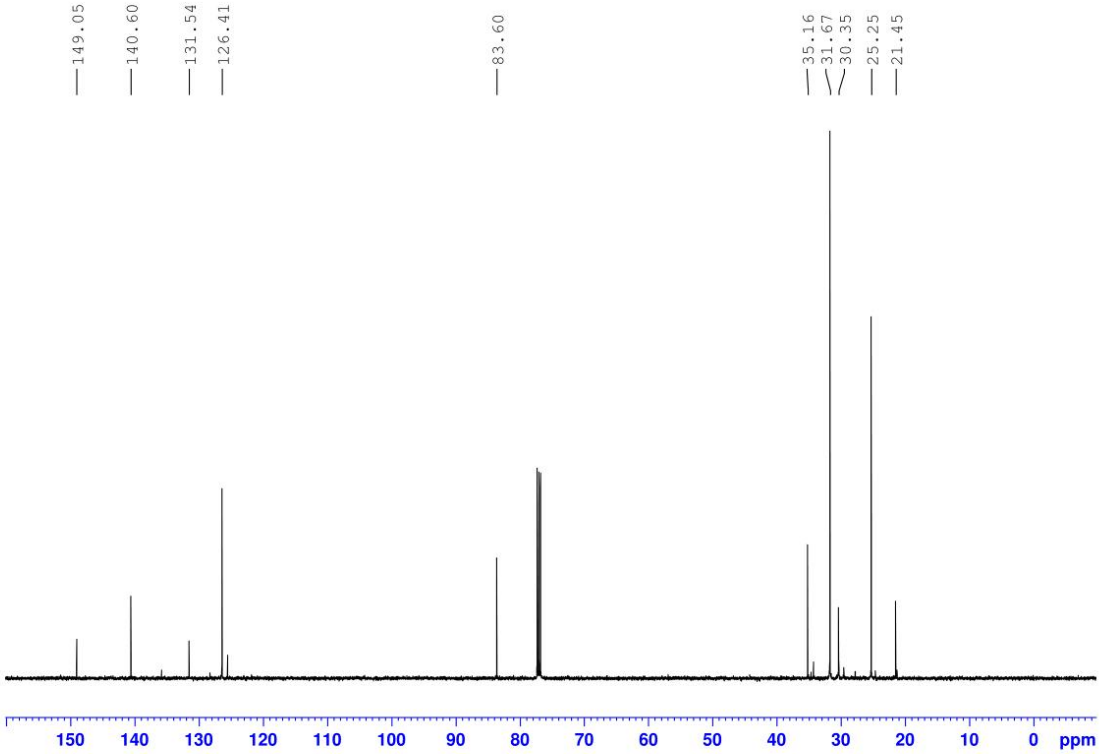


Figure S61. $^{13}C\{^{1}H\}$ NMR spectrum of 5 in $CDCl_3$.

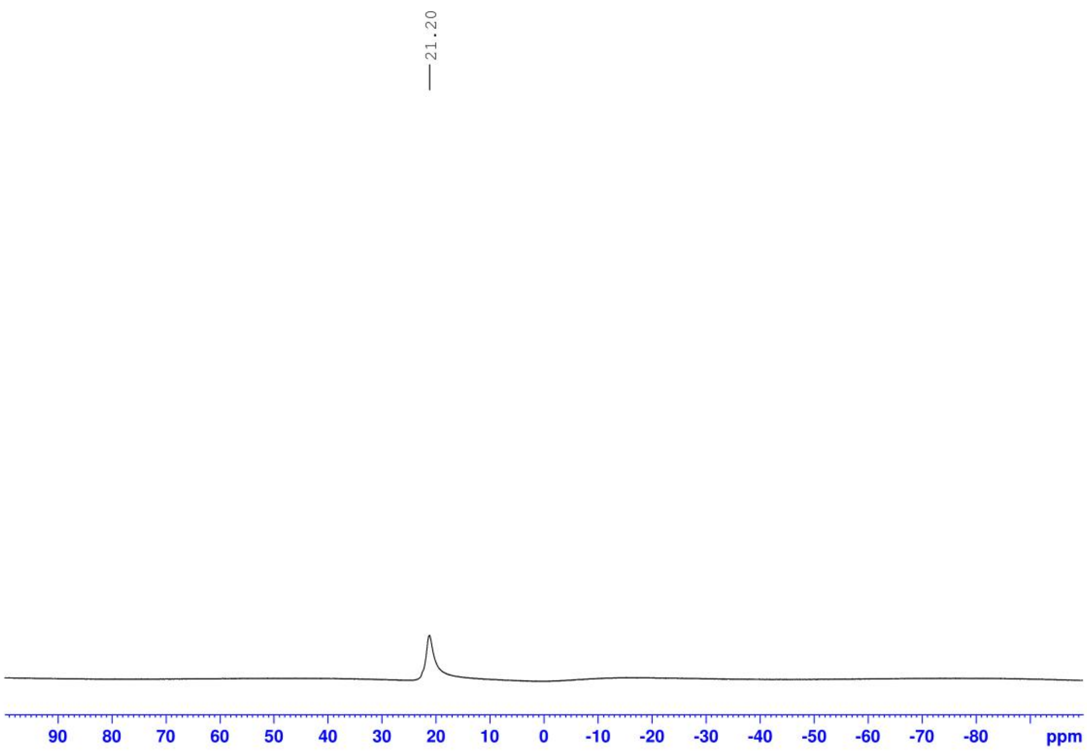


Figure S62. ^{11}B NMR spectrum of 5 in $CDCl_3$.

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