Stereospecific Ni-Catalyzed Cross-Coupling of Potassium Alkenyltrifluoroborates with Alkyl Halides.

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**General Considerations.**

2-Acetylpyridine, 1-bromo-3-phenylpropane, 1-chloro-3-phenylpropane, cyclopentyl bromide, cycloheptyl bromide and 3-bromoheptane were distilled under reduced pressure prior to use. All others chemicals were used as received. The boronic acids, pinacol boronate esters or potassium organotrifluoroborates were used as received if commercially available, or were prepared according to literature procedures, and the boronic acids and boronates were then converted to potassium trifluoroborates using KHF$_2$.\textsuperscript{1-7} 1-Bromo-4-(3-bromopropyl)benzene\textsuperscript{8} and 4-(3-bromopropyl)-1,1'-biphenyl\textsuperscript{9} were prepared from the corresponding carboxylic acids according to previously described literature procedures. All solvents used were thoroughly dried and degassed. Standard benchtop techniques were employed for handling air–sensitive reagents. Analytical thin–layer chromatography (TLC) was performed on TLC silica gel plates (0.25 mm) precoated with a fluorescent indicator. Visualization was effected with ultraviolet light, KMnO$_4$, cerium molybdate (CAM) or phosphomolybdic acid (PMA). The compounds were purified using an automated ISCO CombiFlash system, on “Gold” silica gel columns. NMR spectra were recorded on a 500, 400 or 300 MHz spectrometer. \textsuperscript{19}F NMR Chemical shifts were referenced to external CFCl$_3$ (0.0 ppm). \textsuperscript{11}B NMR spectra were obtained on a spectrometer equipped with the appropriate decoupling accessories. All \textsuperscript{11}B NMR chemical shifts were referenced to external BF$_3$·OEt$_2$ (0.0 ppm) with a negative sign indicating an upfield shift.
Procedure for the Suzuki–Miyaura Cross-Coupling of Alkenyltrifluoroborates with Alkyl Halides

**General procedure for the cross-coupling of alkyl iodides and bromides (General Procedure A)**

Outside the glovebox, the ligand (bathophenanthroline (16.6 mg, 0.05 mmol) or 2-acetylpyrrole (5.4 mg, 0.05 mmol)) and potassium organotrifluoroborate (0.525 mmol) were added to a Biotage microwave tube equipped with a stir bar. NiBr₂•glyme (15.4 mg, 0.05 mmol) and NaHMDS (283 mg, 1.5 mmol) were then added inside the glove box. The vial was sealed and removed from the glove box, then CPME (1 mL) and t-BuOH (1 mL) were added via syringe. The mixture was stirred for 15-30 min, and alkyl halide (0.5 mmol) was added to the resulting solution. The reaction in the sealed vial was stirred at 60 °C overnight outside the glovebox, then passed through a short plug of silica, which was washed thoroughly with CH₂Cl₂ (~10 mL) and EtOAc (~5 mL). The filtrate was concentrated under reduced pressure, then purified by column chromatography on silica gel.

NB: When the ligand used was 2-acetylpyridine (6.1 mg, 0.05 mmol), the ligand was added inside the glovebox along with the Ni catalyst and the base. When the alkyl halide used was a solid or a viscous oil, it was added in the beginning of the reaction along with the potassium organotrifluoroborate.
General procedure for the cross-coupling of alkyl halides outside the glovebox using t-BuONa instead of NaHMDS (General Procedure B)

Potassium organotrifluoroborate (0.525 mmol), NiBr₂•glyme (15.4 mg, 0.05 mmol), bathophenanthroline (16.6 mg, 0.05 mmol) and t-BuONa (144 mg, 1.5 mmol) were added to a Biotage microwave vial equipped with a stir bar. The vial was sealed and purged with Ar (at least three full cycles vacuum-Ar refill), then dry, degassed CPME (1 mL) and t-BuOH (1 mL) were added via syringe under Ar. The mixture was stirred for 15-30 min, and alkyl halide (0.5 mmol) was added to the reaction via syringe (solid or very viscous electrophiles should be added in the beginning along with the potassium organotrifluoroborate). The reaction was stirred at 60 °C or 80 °C overnight, then passed through a short plug of silica gel, which was washed thoroughly with CH₂Cl₂ (~10 mL) and EtOAc (~5 mL). The filtrate was concentrated under reduced pressure, then purified by column chromatography on silica gel.

General procedure for the cross-coupling of alkyl chlorides (General Procedure C)

Outside the glovebox, potassium organotrifluoroborate (0.51 mmol) was added to a Biotage microwave tube equipped with a stir bar. L-Prolinol (10.1 mg, 0.1 mmol), Ni(COD)₂ (13.5 mg, 0.05 mmol) and NaHMDS (330 mg, 1.75 mmol) were then added in the glove box. The vial was sealed and removed from the glove box, then CPME (1 mL) and t-BuOH (1 mL) were added via syringe. The mixture was stirred for 15-30 min, and the alkyl halide (0.5 mmol) was added to the resulting solution. The reaction in the sealed vial was stirred at 80 °C overnight, then passed through a short plug of silica, which was washed thoroughly with CH₂Cl₂ (~10 mL) and EtOAc
(~5 mL). The filtrate was concentrated under reduced pressure, then purified by silica gel column chromatography on silica gel.

**Spectral Data for Cross-Coupling Products**

**$(E)$-1,8-Diphenyloct-4-ene (Table 1, entry 1).** The general procedure A was employed using potassium $(E)$-(5-phenylpent-1-en-1-yl)trifluoroborate (132 mg, 0.525 mmol) and 1-bromo-3-phenylpropane (99 mg, 0.50 mmol). The compound was obtained as a colorless oil (108 mg, 86%). $^1$H NMR (500 MHz, CDCl$_3$) $\delta = 7.31 - 7.27$ (m, 4H), $7.21 - 7.17$ (m, 6H), $5.48 - 5.44$ (m, 2H), $2.64$ (t, $J = 7.5$ Hz, 4H), $2.12 - 2.03$ (m, 4H), $1.74 - 1.66$ (m, 4H); $^{13}$C NMR (126 MHz, CDCl$_3$) $\delta = 142.8, 130.5, 128.6, 128.4, 125.8, 35.5, 32.3, 31.5$; IR (neat) = 2926, 1495, 1453, 1029, 746, 697, 639 cm$^{-1}$; HRMS (Cl) calcd. for C$_{20}$H$_{24}$ (M$^+$) 264.1878, found 264.1869.

OR using the general procedure C for the cross-coupling of alkyl chlorides (Table 3, entry1), starting with $(E)$-5-phenyl-pent-1-en-1-yltrifluoroborate (164 mg, 0.65 mmol) and 1-chloro-3-phenylpropane (77 mg, 0.50 mmol), the compound was obtained as a colorless oil (89 mg, 71%).

**$(Z)$-1,8-Diphenyloct-4-ene (Table 1, entry 2).** The general procedure B was employed using potassium $(Z)$-(5-phenylpent-1-en-1-yl)trifluoroborate (132 mg, 0.525 mmol) and 1-bromo-3-
phenylpropane (99 mg, 0.50 mmol) at 80 °C. The compound was obtained as a colorless oil (76 mg, 61%). $^1$H NMR (500 MHz, CDCl$_3$) δ = 7.34 – 7.28 (m, 4H), 7.24 – 7.19 (m, 6H), 5.49 – 5.43 (m, 2H), 2.64 (t, $J = 7.7$ Hz, 4H), 2.13 – 2.06 (m, 4H), 1.77 – 1.67 (m, 4H); $^{13}$C NMR (126 MHz, CDCl$_3$) δ = 142.5, 129.8, 128.4, 128.2, 125.6, 35.5, 31.4, 26.8; IR (neat) = 3025, 2927, 2855, 1495, 1452, , 743, 695, 669 cm$^{-1}$; HRMS (CI) calcd. for C$_{20}$H$_{24}$ (M$^+$) 264.1878, found 264.1879.

(E)-1,5-Diphenylpent-1-ene (Table 1, entry 3).$^{10}$ The general procedure A was employed using potassium (E)-2-styryltrifluoroborate (110 mg, 0.525 mmol) and 1-bromo-3-phenylpropane (99 mg, 0.50 mmol). The compound was obtained as a colorless oil (87 mg, 78%). Analyses were in accord with the previously reported data ($^1$H and $^{13}$C NMR attached). $^1$H NMR (500 MHz, CDCl$_3$) δ = 7.39-7.35 (m, 1H), 7.34-7.29 (m, 2H), 7.24-7.19 (m, 2H), 6.42 (d, $J = 16.2$ Hz, 1H), 6.22 (dt, $J = 16.2$, 7.0 Hz, 1H), 2.72 (t, $J = 7.0$ Hz, 2H), 2.30-2.28 (m, 2H), 1.88-1.80 (m, 2H).

Using the general procedure C for the cross-coupling of alkyl chlorides (Table 3, entry 2), starting with potassium (E)-2-styryltrifluoroborate (144 mg, 0.65 mmol) and 1-chloro-3-phenylpropane (77 mg, 0.50 mmol), the compound was obtained as a colorless oil (50 mg, 45%).
(Z)-1,5-Diphenylpent-1-ene (Table 1, entry 4). The general procedure B was employed using potassium (Z)-2-styryltrifluoroborate (110 mg, 0.525 mmol) and 1-bromo-3-phenylpropane (99 mg, 0.50 mmol). The compound was obtained as a colorless oil (57 mg, 52%). Analyses were in accord with the previously reported data. £H NMR (500 MHz, CDCl$_3$) $\delta$ = 7.36 - 7.15 (m, 10H), 6.47 (d, $J = 11.7$ Hz, 1H), 5.72 (dd, $J = 11.7$, 7.3 Hz, 1H), 2.72 (t, $J = 7.3$ Hz, 2H), 2.30-2.28 (m, 2H), 1.88-1.80 (m, 2H).

8-(3-Phenylpropyl)-1,4-dioaspiro[4.5]dec-7-ene (Table 1, entry 5). The general procedure A was employed using potassium (1,4-dioaspiro[4.5]dec-7-en-8-yl)trifluoroborate (129 mg, 0.525 mmol) and 1-bromo-3-phenylpropane (99 mg, 0.50 mmol). The compound was obtained as a colorless oil (103 mg, 80%). £H NMR (500 MHz CDCl$_3$) $\delta$ 7.31 – 7.25 (m, 2H), 7.21 – 7.16 (m, 3H), 5.34 (s, 1H), 3.98 (s, 4H), 2.61 (t, $J = 7.8$ Hz, 2H), 2.27 (s, 2H), 2.18 (t, $J = 6.9$ Hz, 2H), 2.04 (t, $J = 7.6$ Hz, 2H), 1.81 – 1.72 (m, 4H); $^{13}$C NMR (126 MHz, CDCl$_3$) $\delta$ 142.7, 137.4, 128.6, 128.4, 125.8, 118.2, 108.3, 64.5, 36.7, 35.8, 31.4, 29.5, 27.7; IR (neat) = 2931, 1489, 1242, 1113, 1016, 943, 853, 832, 697 cm$^{-1}$; HRMS (Cl) calcd. For C$_{17}$H$_{22}$O$_2$ (M$^+$) 259.1968, found 259.1968.
(E)-9-Phenylno-5-enenitrile (Table 1, entry 6). The general procedure A was employed using potassium (E)-(5-cyanopent-1-en-1-yl)trifluoroborate (105 mg, 0.525 mmol) and 1-bromo-3-phenylpropane (99 mg, 0.50 mmol). The compound was obtained as a colorless oil (68 mg, 64%). $^1$H NMR (500 MHz, CDCl$_3$) $\delta$ 7.31 – 7.24 (m, 2H), 7.21 – 7.14 (m, 3H), 5.53 (dd, $J$ = 15.2, 6.7 Hz, 1H), 5.34 (dd, $J$ = 15.2, 6.8 Hz, 1H), 2.61 (t, $J$ = 7.7 Hz, 2H), 2.33 (t, $J$ = 7.1 Hz, 2H), 2.20 – 2.11 (m, 2H), 2.09 – 2.00 (m, 2H), 1.76 – 1.64 (m, 4H); $^{13}$C NMR (126 MHz, CDCl$_3$) $\delta$ 142.5, 132.7, 128.6, 128.4, 127.9, 125.8, 119.9, 35.5, 32.2, 31.4, 31.3, 25.2, 16.4; IR (neat) = 2932, 2361, 1453, 969, 750, 699, 648 cm$^{-1}$; HRMS (CI) calcd. for C$_{15}$H$_{20}$N (M$^+$H$^+$) 214.1596, found 214.1613.

(E)-(9-Chloronon-4-en-1-yl)benzene (Table 1, entry 7). The general procedure A was employed using potassium (E)-(6-chlorohex-1-en-1-yl)trifluoroborate (117 mg, 0.525 mmol) and 1-bromo-3-phenylpropane (99 mg, 0.50 mmol). The compound was obtained as a colorless oil (71 mg, 60%). $^1$H NMR (500 MHz, CDCl$_3$) $\delta$ 7.30 – 7.26 (m, 2H), 7.20-7.16 (m, 3H), 5.50 – 5.35 (m, 2H), 3.54 (t, $J$ = 6.7 Hz, 2H), 2.65 – 2.58 (m, 2H), 2.09 – 1.99 (m, 4H), 1.82 – 1.75 (m, 2H), 1.73 – 1.67 (m, 2H), 1.54 – 1.47 (m, 2H); $^{13}$C NMR (126 MHz, CDCl$_3$) $\delta$ 142.7, 130.8, 130.1, 128.6, 128.4, 125.8, 45.2, 35.5, 32.2, 32.2, 31.9, 31.4, 26.9; IR (neat) = 3026, 2931, 1603, 1495, 1453, 967, 746, 698 cm$^{-1}$; HRMS (CI) calcd. for C$_{15}$H$_{21}$Cl (M$^+$) 236.1332, found 236.1345.
1-(2-Methylene-5-phenylpentyl)piperidine (Table 1, entry 8). The general procedure A was employed using potassium (3-(piperidin-1-yl)prop-1-en-2-yl)trifluoroborate (121 mg, 0.525 mmol) and 1-bromo-3-phenylpropane (99 mg, 0.50 mmol). The compound was obtained as a colorless oil (74 mg, 61%). $^1$H NMR (500 MHz, CDCl$_3$) δ 7.32 – 7.26 (m, 2H), 7.23 – 7.17 (m, 3H), 4.94 (s, 1H), 4.86 (s, 1H), 2.85 (s, 2H), 2.64 (t, $J$ = 7.8 Hz, 2H), 2.31 (br s, 4H), 2.13 (t, $J$ = 7.7 Hz, 2H), 1.84 – 1.76 (m, 2H), 1.60-1.53 (m, 4H), 1.48 – 1.38 (m, 2H); $^{13}$C NMR (126 MHz, CDCl$_3$) δ 146.9, 142.8, 128.6, 128.4, 125.8, 111.7, 65.1, 54.9, 35.8, 34.1, 29.6, 26.2, 24.7; IR (neat) = 2933, 1483, 1112, 899, 748, 697, 607 cm$^{-1}$; HRMS (ESI) calcd. for C$_{17}$H$_{26}$N (M+H$^+$) 244.2065, found 244.2061.

$\text{N-Benzyl-N-methyl-2-methylene-5-phenylpentan-1-amine (Table 1, entry 9).}$ The general procedure A was employed using potassium (3-(benzyl(methyl)amino)prop-1-en-2-yl)trifluoroborate (140 mg, 0.525 mmol) and 1-bromo-3-phenylpropane (99 mg, 0.50 mmol). The compound was obtained as a colorless oil (74 mg, 53%). $^1$H NMR (500 MHz CDCl$_3$) δ 7.34 – 7.24 (m, 7H), 7.23 – 7.17 (m, 3H), 5.01 (s, 1H), 4.90 (s, 1H), 3.46 (s, 2H), 2.93 (s, 2H), 2.64 (t, $J$ = 7.7 Hz, 2H), 2.19 (t, $J$ = 7.7 Hz, 2H), 2.15 (s, 3H), 1.81 – 1.73 (m, 2H); $^{13}$C NMR (126 MHz, CDCl$_3$) δ 147.4, 142.8, 139.7, 129.0, 128.6, 128.4, 128.3, 127.0, 125.8, 112.3, 63.3, 62.1, 42.5, 35.9, 33.9, 29.6; IR (neat) = 2753, 1452, 1025, 899, 737, 697, 643 cm$^{-1}$; HRMS (ESI) calcd. for C$_{20}$H$_{26}$N (M+H$^+$) 280.2065, found 280.2067.
(E)-4-(Hex-4-en-1-yl)-1,1'-biphenyl (Table 1, entry 10). The general procedure A was employed using potassium (E)-trifluoro(prop-1-en-1-yl)trifluoroborate (77 mg, 0.525 mmol) and 1-bromo-3-phenylpropane (137 mg, 0.50 mmol). The compound was obtained as a colorless oil (95 mg, 81%). $^1$H NMR (500 MHz, CDCl$_3$) $\delta$ 7.61 (d, $J$ = 7.8 Hz, 2H), 7.53 (d, $J$ = 7.8 Hz, 2H), 7.47-7.42 (m, 2H), 7.37 – 7.24 (m, 3H), 5.50 – 5.46 (m, 2H), 2.67 (t, $J$ = 7.6 Hz, 2H), 2.11 – 2.04 (m, 2H), 1.77 – 1.67 (m, 5H); $^{13}$C NMR (126 MHz, CDCl$_3$) $\delta$ 142.0, 141.3, 138.7, 131.2, 129.0, 128.8, 127.1, 127.1, 125.4, 35.2, 32.3, 31.4, 18.1; IR (neat) = 2930, 1486, 965, 838, 759, 696, 649 cm$^{-1}$; HRMS (CI) calcd. for C$_{18}$H$_{20}$ (M$^+$) 236.1565, found 236.1573.

(Z)-4-(Hex-4-en-1-yl)-1,1'-biphenyl (Table 1, entry 11). The general procedure A was employed using potassium (Z)-(prop-1-en-1-yl)trifluoroborate (77 mg, 0.525 mmol) and 1-bromo-3-phenylpropane (137 mg, 0.50 mmol). The compound was obtained as a colorless oil (86 mg, 73%). $^1$H NMR (500 MHz, CDCl$_3$) $\delta$ 7.64 – 7.58 (m, 2H), 7.56 – 7.52 (m, 2H), 7.48 – 7.41 (m, 2H), 7.38 – 7.32 (m, 1H), 7.31 – 7.24 (m, 2H), 5.56 – 5.42 (m, 2H), 2.69 (t, $J$ = 7.5 Hz, 2H), 2.19 – 2.10 (m, 2H), 1.80 – 1.72 (m, 2H), 1.64 (dd, $J$ = 6.6, 1.4 Hz, 3H); $^{13}$C NMR (126 MHz, CDCl$_3$) $\delta$ 141.9, 141.3, 138.8, 130.4, 129.0, 128.9, 127.2, 127.1, 127.1, 124.5, 77.4, 77.19, 76.9,
35.2, 31.4, 26.6, 13.0; IR (neat) = 2930, 1486, 1008, 837, 759, 667, 642 cm\(^{-1}\); HRMS (CI) calcd. for C\(_{18}\)H\(_{20}\) (M\(^+\)) 236.1565, found 236.1573.

4-(4-Methylpent-4-en-1-yl)-1,1'-biphenyl (Table 1, entry 12). The general procedure A was employed using potassium prop-1-en-2-yltrifluoroborate (77 mg, 0.525 mmol) and 1-bromo-3-phenylpropane (137 mg, 0.50 mmol). The compound was obtained as a colorless oil (80 mg, 68%). \(^1\)H NMR (500 MHz, CDCl\(_3\)) \(\delta\) 7.61 (d, \(J = 7.4\) Hz, 2H), 7.55 (d, \(J = 7.4\) Hz, 2H), 7.47 – 7.41 (m, 2H), 7.37 – 7.25 (m, 3H), 4.77 (s, 1H), 4.75 (s, 1H), 2.68 (t, \(J = 9.1, 7.5\) Hz, 2H), 2.12 (t, \(J = 7.5\) Hz, 2H), 1.88 – 1.80 (m, 2H), 1.77 (s, 3H); \(^{13}\)C NMR (126 MHz, CDCl\(_3\)) \(\delta\) 145.8, 141.8, 141.3, 138.8, 129.0, 128.9, 127.2, 127.1, 110.2, 37.5, 35.3, 29.5, 22.6; IR (neat) = 2934, 1487, 908, 887, 840, 761, 733, 696, 688, 660 cm\(^{-1}\); HRMS (CI) calcd. for C\(_{18}\)H\(_{20}\) (M\(^+\)) 236.1565, found 236.1584.

4-(Pent-4-en-1-yl)-1,1'-biphenyl (Table 1, entry 13). The general procedure A was employed using potassium vinyltrifluoroborate (70 mg, 0.525 mmol) and 1-bromo-3-phenylpropane (137 mg, 0.50 mmol). The compound was obtained as a colorless oil (79 mg, 72%). \(^1\)H NMR (500 MHz, CDCl\(_3\)) \(\delta\) 7.63 – 7.58 (m, 2H), 7.54 (d, \(J = 7.4\) Hz, 2H), 7.48 – 7.42 (m, 2H), 7.37 – 7.32 (m, 1H), 7.30 – 7.26 (m, 2H), 5.88 (ddt, \(J = 16.9, 10.3, 6.6\) Hz, 1H), 5.11 – 4.98 (m, 2H), 2.69 (t,
\[ J = 7.7 \text{ Hz, 2H}, \ 2.19 - 2.12 \ (m, \ 2H), \ 1.79 \ (q, \ J = 7.7 \text{ Hz, 2H}) \]; \(^{13}\text{C NMR (126 MHz, CDCl}_3 \) \[ \delta \ 141.8, \ 141.3, \ 138.8, \ 138.7, \ 129.0, \ 128.9, \ 127.2, \ 127.1, \ 114.9, \ 35.1, \ 33.5, \ 30.8; \ IR \ (\text{neat}) = 2929, \ 1486, \ 909, \ 839, \ 760, \ 732, \ 696 \text{ cm}^{-1}; \ HRMS \ (\text{CI}) \ \text{calcd.} \ \text{for} \ \text{C}_{17}\text{H}_{18} \ (\text{M}^+) \ 222.1409, \ \text{found} \ 222.1416. \]

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\begin{align*}
\text{2-Cinnamyl-1,3-dioxolane (Table 2, entry 1).} \ & \text{The general procedure A was employed using} \\
\text{potassium \ }(E)-2\text{-styryltrifluoroborate} \ (110 \ \text{mg, 0.525 mmol}) \ & \text{and} \ 2\text{-}(\text{bromomethyl})-1,3\text{-dioxolane} \\
\text{ \ (84 mg, 0.50 mmol). The compound was obtained as a colorless oil (62 mg, 64%).} \ \text{H NMR (500 MHz, CDCl}_3 \) \ [ \delta \ 7.39 - 7.35 \ (m, \ 2H), \ 7.32 - 7.27 \ (m, \ 2H), \ 7.23 - 7.18 \ (m, \ 1H), \ 6.52 \ (d, \ J = 16.0 \ \text{Hz, 1H}), \ 6.24 \ (dt, \ J = 15.9, \ 7.2 \ \text{Hz, 1H}), \ 4.99 \ (t, \ J = 4.7 \ \text{Hz, 1H}), \ 4.06 - 3.98 \ (m, \ 2H), \ 3.93 - 3.82 \ (m, \ 2H), \ 2.61 \ (dd, \ J = 4.7, \ 1.4 \ \text{Hz, 1H}), \ 2.59 \ (dd, \ J = 4.7, \ 1.4 \ \text{Hz, 1H}); \ \text{C NMR (126 MHz, CDCl}_3 \) \ [ \delta \ 137.5, \ 133.3, \ 128.6, \ 127.3, \ 126.3, \ 123.9, \ 104.0, \ 65.2, \ 38.1; \ HRMS (CI) \ \text{calcd.} \ \text{for} \ \text{C}_{12}\text{H}_{14}\text{O}_2 \ (\text{M}^+) \ 190.0994, \ \text{found} \ 190.0995. \]
\end{align*}
\]

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\begin{align*}
\text{(E)-(7-(Benzyloxy)hept-4-en-1-yl)benzene (Table 2, entry 2).} \ & \text{The general procedure A was} \\
\text{employed using potassium \ }(E)-(5\text{-phenylpent-1-en-1-yl)}\text{trifluoroborate} \ (132 \ \text{mg, 0.525 mmol}) \\
\text{and} \ 2\text{-}(\text{bromoethoxy)methyl} \ & \text{benzene (108 mg, 0.50 mmol). The compound was obtained as a} \\
\text{colorless oil (112 mg, 80%).} \ \text{H NMR (500 MHz, CDCl}_3 \) \ [ \delta \ 7.37 - 7.30 \ (m, \ 4H), \ 7.30 - 7.25 \ (m,}
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3H), 7.23 – 7.14 (m, 3H), 5.58 – 5.40 (m, 2H), 4.52 (s, 2H), 3.49 (t, $J = 6.9$ Hz, 2H), 2.61 (t, $J = 7.7$ Hz, 2H), 2.37 – 2.30 (m, 2H), 2.08 – 2.01 (m, 2H), 1.73 – 1.66 (m, 2H); $^{13}$C NMR (126 MHz, CDCl$_3$) δ 142.7, 138.7, 132.2, 128.6, 128.5, 128.4, 127.8, 127.6, 127.0, 125.8, 73.0, 70.4, 35.5, 33.2, 32.3, 31.3; HRMS (CI) calcd. for C$_{20}$H$_{24}$O (M$^+$) 280.1827, found 280.1833.

(\textit{E})-\textit{Hepta-1,6-dien-1-yl}benzene (Table 2, Entry 3). The general procedure A was employed using potassium (\textit{E})-2-styryltrifluoroborate (110 mg, 0.525 mmol) and 5-bromopent-1-ene (75 mg, 0.5 mmol). The compound was obtained as a colorless oil (41 mg, 48%). $^1$H NMR (500 MHz, CDCl$_3$) δ 7.40 – 7.27 (m, 4H), 7.24 – 7.17 (m, 1H), 6.40 (d, $J = 15.9$ Hz, 1H), 6.23 (dt, $J = 15.7$, 6.8 Hz, 1H), 5.85 (ddt, $J = 16.9$, 10.1, 6.6 Hz, 1H), 5.08 – 4.97 (m, 2H), 2.28 – 2.21 (m, 2H), 2.17 – 2.10 (m, 2H), 1.63 – 1.57 (m, 2H); $^{13}$C NMR (126 MHz, CDCl$_3$) δ 138.8, 138.0, 130.8, 130.2, 128.6, 127.0, 126.1, 114.8, 33.4, 32.6, 28.7; HRMS (CI) calcd. for C$_{13}$H$_{16}$ (M$^+$) 172.1252, found 172.1553.

(\textit{E})-13-\textit{Phenyltridec-9-en-1-ol} (Table 2, entry 4). The general procedure B was employed using potassium (\textit{E})-(5-phenylpent-1-en-1-yl)trifluoroborate (132 mg, 0.525 mmol) and 8-bromo-octan-1-ol (105 mg, 0.5 mmol). The compound was obtained as a colorless oil (49 mg, 37%). $^1$H NMR (500 MHz, CDCl$_3$) δ 7.31 – 7.24 (m, 2H), 7.21 – 7.14 (m, 3H), 5.47 – 5.35 (m,
2H), 3.63 (t, $J = 6.6$ Hz, 2H), 2.66 – 2.54 (m, 2H), 2.07 - 1.97 (m, 4H), 1.73 - 1.64 (m, 2H), 1.60 – 1.53 (m, 2H), 1.37 – 1.27 (m, 11H); $^{13}$C NMR (126 MHz, CDCl$_3$) $\delta$ 142.69, 130.95, 129.81, 128.46, 128.23, 125.60, 63.08, 35.36, 32.81, 32.59, 32.13, 31.35, 29.60, 29.46, 29.40, 29.07, 25.74; IR (neat) = 3336, 2923, 2852, 1456, 1453, 1056, 965, 720, 697, 669 cm$^{-1}$; HRMS (ESI) calcd. for C$_{19}$H$_{31}$O (M+H$^+$) 275.2375, found 275.2379.

(E)-11-Phenylundec-7-enenitrile (Table 2, entry 5). The general procedure B was employed using potassium (E)-(5-phenylpent-1-en-1-yl)trifluoroborate (132 mg, 0.525 mmol) and 8-bromooctan-1-ol (mg, 0.5 mmol). The compound was obtained as a colorless oil (58 mg, 48%). $^1$H NMR (500 MHz, CDCl$_3$) $\delta$ 7.26 – 7.18 (m, 3H), 7.11 (dd, $J = 7.6$, 2.9 Hz, 3H), 5.43 – 5.26 (m, 2H), 2.61 – 2.48 (m, 2H), 2.26 (t, $J = 7.1$ Hz, 2H), 1.98 – 1.90 (m, 4H), 1.65 – 1.55 (m, 4H), 1.43 – 1.29 (m, 4H); $^{13}$C NMR (126 MHz, CDCl$_3$) $\delta$ 142.58, 130.53, 130.06, 128.45, 128.25, 125.64, 119.79, 77.33, 77.22, 77.02, 76.70, 35.38, 32.20, 32.11, 31.28, 28.69, 28.12, 25.27, 17.12; HRMS (CI) calcd. for C$_{14}$H$_{24}$N (M+H$^+$) 242.1909, found 242.1903.

(E)-(9-Chloronon-4-en-1-yl)benzene (Table 2, entry 6). The general procedure A was employed using potassium (E)-(5-phenylpent-1-en-1-yl)trifluoroborate (132 mg, 0.525 mmol) and 1-chloro-4-iodobutane (139 mg, 0.50 mmol). The compound was obtained as a colorless oil
(92 mg, 78%). $^1$H NMR (500 MHz, CDCl$_3$) δ 7.30 – 7.26 (m, 2H), 7.20-7.16 (m, 3H), 5.50 – 5.35 (m, 2H), 3.54 (t, $J = 6.7$ Hz, 2H), 2.65 – 2.58 (m, 2H), 2.09 – 1.99 (m, 4H), 1.82 – 1.75 (m, 2H), 1.73 – 1.67 (m, 2H), 1.54 – 1.47 (m, 2H); $^{13}$C NMR (126 MHz, CDCl$_3$) δ 142.7, 130.8, 130.1, 128.6, 128.4, 125.8, 35.5, 32.2, 32.2, 31.9, 31.4, 26.9; IR (neat) = 3026, 2931, 1603, 1495, 1453, 967, 746, 698 cm$^{-1}$, HRMS (CI) calcd. for C$_{15}$H$_{21}$Cl (M$^+$) 236.1332, found 236.1333.

(E)-(8-Chlorooct-1-en-1-yl)benzene (Table 2, entry 7). The general procedure was employed using potassium (E)-2-styryltrifluoroborate (110 mg, 0.525 mmol) and 1-bromo-6-chlorohexane (100 mg, 0.50 mmol). The compound was obtained as a colorless oil (80 mg, 72%). $^1$H NMR (500 MHz, CDCl$_3$) δ 7.37 – 7.33 (m, 2H), 7.31 – 7.27 (m, 3H), 6.38 (d, $J = 6.9$ Hz, 1H), 6.22 (dt, $J = 15.8, 6.9$ Hz, 1H), 3.54 (t, $J = 6.8$ Hz, 2H), 2.29 – 2.15 (m, 2H), 1.86 – 1.72 (m, 2H), 1.53 – 1.43 (m, 4H), 1.43 – 1.34 (m, 2H); $^{13}$C NMR (126 MHz, CDCl$_3$) δ 138.0, 131.0, 130.1, 128.6, 126.9, 126.0, 42.2, 33.0, 32.7, 29.3, 28.6, 26.9; IR (neat) = 3024, 2929, 2854, 1597, 1493, 1446, 963, 743, 725, 692 cm$^{-1}$, HRMS (CI) calcd. for C$_{14}$H$_{19}$Cl (M$^+$) 222.1175, found 222.1172.

8-(3-(4-Bromophenyl)propyl)-1,4-dioxaspiro[4.5]dec-7-ene (Table 2, entry 8). The general procedure was employed using potassium (1,4-dioxaspiro[4.5]dec-7-en-8-yl)trifluoroborate (129 mg, 0.525 mmol) and 1-bromo-3-(4-bromophenyl)propane (139 mg, 0.50 mmol). The compound
was obtained as a colorless oil (98 mg, 58%). $^1$H NMR (500 MHz, CDCl$_3$) δ 7.38 (d, $J = 8.3$ Hz, 2H), 7.04 (d, $J = 8.2$ Hz, 2H), 5.33 – 5.29 (m, 1H), 3.97 (s, 4H), 2.54 (d, $J = 7.7$ Hz, 2H), 2.25 (s, 2H), 2.19 – 2.13 (m, 2H), 2.00 (t, $J = 7.8$ Hz, 2H), 1.78 – 1.68 (m, 4H); $^{13}$C NMR (126 MHz, CDCl$_3$) δ 141.6, 137.1, 131.4, 130.3, 119.5, 118.4, 108.3, 64.5, 36.6, 35.8, 35.1, 31.3, 29.3, 27.7; IR (neat) = 2930, 1487, 2854, 1113, 1058, 1010, 946, 858, 832, 801 cm$^{-1}$; HRMS (CI) calcd. for C$_{17}$H$_{22}$O$_2$Br (M+H$^+$) 337.0803, found 337.0808.

(E)-2-Styrylcyclohexane (Table 2, entry 9). The general procedure was employed using potassium (E)-2-styryltrifluoroborate (110 mg, 0.525 mmol) and iodocyclohexane (105 mg, 0.50 mmol). The compound was obtained as a colorless oil (56 mg, 60%). $^1$H NMR (500 MHz, CDCl$_3$) δ = 7.40 – 7.37 (m, 2H), 7.34 – 7.29 (m, 2H), 7.23 – 7.19 (m, 1H), 6.52 (d, $J = 16.2$ Hz, 1H), 6.23 (dd, $J = 16.2$, 6.9 Hz, 1H), 2.23 – 2.12 (m, 1H), 1.88 – 1.78 (m, 4H), 1.76 – 1.68 (m, 1H), 1.42 – 1.29 (m, 2H), 1.28 – 1.17 (m, 3H); $^{13}$C NMR (126 MHz, CDCl$_3$) δ 138.2, 137.0, 128.6, 127.4, 126.9, 126.1, 41.3, 33.1, 26.4, 26.2; IR (neat) = 3025, 2922, 2850, 1447, 963, 744, 690 cm$^{-1}$; HRMS (CI) calcd. for C$_{14}$H$_{18}$ (M$^+$) 143.0861, found 143.0869.

(E)-Styrylcycloheptane (Table 2, entry 10). The general procedure was employed using potassium (E)-2-styryltrifluoroborate (110 mg, 0.525 mmol) and bromocycloheptane (88 mg,
(E)-(6-propynon-4-en-1-yl)benzene (Table 2, entry 11). The general procedure was employed using potassium (E)-2-styryltrifluoroborate (110 mg, 0.525 mmol) and 3-bromoheptane (90 mg, 0.50 mmol). The compound was obtained as a colorless oil (63 mg, 63%). $^1$H NMR (500 MHz, CDCl$_3$) δ = 7.41 – 7.27 (m, 4H), 7.23 – 7.17 (m, 1H), 6.34 (d, $J = 15.7$ Hz, 1H), 6.20 (dd, $J = 15.7, 6.6$ Hz, 1H); 2.35 – 2.21 (m, 1H); 1.90 – 1.80 (m, 2H); 1.80 – 1.40 (m, 10H); $^{13}$C NMR (126 MHz, CDCl$_3$) δ 138.3, 137.8, 128.6, 126.8, 126.1, 43.4, 34.9, 28.6, 26.4; IR (neat) = 3023, 2920, 2852, 1458, 962, 743, 690 cm$^{-1}$; HRMS (CI) calcd. for C$_{15}$H$_{20}$ (M$^+$) 200.1565, found 200.1568.

(E)-(3-Ethylhept-1-en-1-yl)benzene (Table 2, entry 12). The general procedure was employed using potassium (E)-2-styryltrifluoroborate (110 mg, 0.525 mmol) and 3-bromoheptane (90 mg,
0.50 mmol). The compound was obtained as a colorless oil (61 mg, 61%). $^1$H NMR (500 MHz, CDCl$_3$) δ = 7.41 – 7.34 (m, 2H), 7.32 – 7.28 (m, 2H), 7.22 – 7.16 (m, 1H), 6.33 (d, $J$ = 15.8 Hz, 1H), 6.23 (dd, $J$ = 15.8, 8.7 Hz, 1H), 2.07 – 1.98 (m, 1H), 1.53 – 1.23 (m, 8H), 0.94 – 0.83 (m, 6H); $^{13}$C NMR (126 MHz, CDCl$_3$) δ 138.1, 135.8, 129.7, 128.6, 126.8, 126.1, 45.3, 34.99, 29.8 28.3, 23.0, 14.2, 12.0; IR (neat) = 3025, 2928, 2854, 1453, 968, 734, 697 cm$^{-1}$; HRMS (CI) calcd. for C$_{15}$H$_{22}$ (M$^+$) 202.1722, found 202.1716.

Obs: Small amount of isomerisation/branched linear was observed during the reaction, and the reported product is actually a mixture of 3-heptyl-(Z)-styrene/2-heptyl-(Z)-styrene/1-heptyl-(Z)-styrene = 8.5/1/0.5 as observed by $^1$H NMR.

(3-(Cyclohex-1-en-1-yl)propyl)benzene (Table 3, entry 3). The general procedure C was employed using potassium cyclohexen-1-yltrifluoroborate (122 mg, 0.65 mmol) and 1-chloro-3-phenylpropane (77 mg, 0.5 mmol). The compound was obtained as a colorless oil (42 mg, 42%). $^1$H NMR (500 MHz, CDCl$_3$) δ = 7.31 – 7.24 (m, 2H), 7.20 – 7.14 (m, 3H), 5.42 (s, 1H), 2.59 (t, $J$ = 6.9, 2H), 2.03 – 1.96 (m, 4H), 1.94 – 1.88 (m, 2H), 1.77 – 1.70 (m, 2H), 1.65 – 1.53 (m, 4H); $^{13}$C NMR (126 MHz, CDCl$_3$) δ = 142.6, 133.4, 128.6, 128.4, 125.8, 125.4, 109.0, 77.4, 77.2, 76.9, 75.8, 69.1, 37.0, 35.5, 32.3, 31.2, 27.1, 25.8; IR (neat) = 2967, 282, 1467, 1060, 741 cm$^{-1}$; HRMS (CI) calcd. for C$_{15}$H$_{20}$ (M$^+$) 200.1565, found 200.1562.
(E)-2,2-Dimethyl-4-(6-phenylhex-2-en-1-yl)-1,3-dioxolane (Table 3, entry 4). The general procedure C was employed using potassium (E)-5-phenyl-penten-1-yl trifluoroborate (164 mg, 0.65 mmol) and 4-(chloromethyl)-2,2-dimethyl-1,3-dioxolane (77 mg, 0.50 mmol), the compound was obtained as a colorless oil (83 mg, 64%). $^1$H NMR (500 MHz, CDCl$_3$) $\delta$ = 7.30 – 7.25 (m, 2H), 7.20 – 7.15 (m, 3H), 5.54 (dt, $J$ = 15.3, 6.8 Hz, 1H), 5.40 (dt, $J$ = 15.4, 7.3 Hz 1H), 4.15-4.08 (m, 1H), 4.04-3.99 (m, 1H), 3.60-3.55 (m, 1H), 2.64 – 2.57 (m, 2H), 2.43 – 2.34 (m, 1H), 2.22 (dt, $J$ = 14.2, 7.2 Hz, 1H), 2.10 – 2.02 (m, 2H), 1.75 – 1.64 (m, 2H), 1.42 (s, 3H), 1.36 (s, 3H); $^{13}$C NMR (126 MHz, CDCl$_3$) $\delta$ = 142.6, 133.4, 128.6, 128.4, 125.8, 125.4, 109.0, 75.8, 69.1, 37.1, 35.5, 32.3, 31.2, 27.1, 25.8; IR (neat) = 3022, 2967, 2831, 1467, 1060, 967, 741 cm$^{-1}$; HRMS (CI) calcd. for C$_{17}$H$_{24}$O$_2$Na (MNa$^+$) 283.1678, found 283.1674.

4-Cinnamyl-2,2-dimethyl-1,3-dioxolane (Table 3, entry 5). The general procedure C was employed using potassium (E)-5-phenyl-penten-1-yl trifluoroborate (164 mg, 0.65 mmol) and 4-(chloromethyl)-2,2-dimethyl-1,3-dioxolane (77 mg, 0.50 mmol), the compound was obtained as a colorless oil (46 mg, 47%). $^1$H NMR (500 MHz, CDCl$_3$) $\delta$ = 7.37 – 7.34 (m, 2H), 7.32 – 7.27 (m, 2H), 7.24 – 7.19 (m, 1H), 6.47 (d, $J$ = 15.8 Hz, 1H), 6.20 (dt, $J$ = 16.0, 6.7 Hz, 1H), 4.27 – 4.21 (m, 1H), 4.05 (dd, $J$ = 9.1, 5.9 Hz, 1H), 3.58 (dd, $J$ = 9.0, 7.1 Hz, 1H), 2.63 – 2.54 (m, 1H), 2.49 – 2.42 (m, 1H), 1.46 (s, 3H), 1.38 (s, 3H); $^{13}$C NMR (126 MHz, CDCl$_3$) $\delta$ = 137.4, 132.8, 128.6, 127.4, 126.2, 125.3, 109.2, 75.6, 69.0, 37.4, 27.1, 25.8; IR (neat) = 3025, 2985, 2930,
1454, 1369, 1213, 1063, 978, 745 cm$^{-1}$; HRMS (CI) calcd. for C$_{14}$H$_{18}$O$_{2}$ (M$^+$) 218.1307, found 218.1312.
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$^1$H NMR (500 MHz, CDCl$_3$) spectrum of (E)-1,8-Diphenyloct-4-ene (Table 1, entry 1).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of (E)-1,8-Diphenyloct-4-ene (Table 1, entry 1).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of (Z)-1,8-Diphenyloct-4-ene (Table 1, entry 2).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of (Z)-1,8-Diphenyloct-4-ene (Table 1, entry 1).
Superimposed $^1$H NMR (500 MHz, CDCl$_3$) spectra of (E)-1,8-Diphenyloct-4-ene (Table 1, entry 2) in red and (Z)-1,8-Diphenyloct-4-ene (Table 1, entry 1) in blue.
Superimposed $^{13}$C NMR (500 MHz, CDCl$_3$) spectra of (Z)-1,8-diphenyloct-4-ene (Table 1, entry 2) in red and (Z)-1,8-diphenyloct-4-ene (Table 1, entry 1) in blue.
\(^1\)H NMR (500 MHz, CDCl\(_3\)) spectrum of (E)-1,5-Diphenylpent-1-ene (Table 1, entry 3).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of (E)-1,5-Diphenylpent-1-ene (Table 1, entry 3).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of (Z)-1,5-Diphenylpent-1-ene (Table 1, entry 4).
Superimposed $^1$H NMR (500 MHz, CDCl$_3$) spectra of (Z)-1,5-diphenylpent-1-ene (Table 1, entry 4) in red and (E)-1,5-diphenylpent-1-ene (Table 1, entry 3) in blue.
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of 8-(3-Phenylpropyl)-1,4-dioxaspiro[4.5]dec-7-ene (Table 1, entry 5).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of 8-(3-Phenylpropyl)-1,4-dioxaspiro[4.5]dec-7-ene (Table 1, entry 5).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of (E)-9-Phenylnon-5-enenitrile (Table 1, entry 4). (Table 1, entry 6).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of (E)-9-Phenynnon-5-enenitrile (Table 1, entry 4). (Table 1, entry 6).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of (E)-(9-Chloronon-4-en-1-yl)benzene (Table 1, entry 7).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of (E)-(9-Chloronon-4-en-1-yl)benzene (Table 1, entry 7).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of 1-(2-Methylene-5-phenylpentyl)piperidine (Table 1, entry 8).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of 1-(2-Methylene-5-phenylpentyl)piperidine (Table 1, entry 8).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of $N$-Benzyl-$N$-methyl-2-methylene-5-phenylpentan-1-amine (Table 1, entry 9).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of $N$-Benzyl-$N$-methyl-2-methylene-5-phenylpentan-1-amine (Table 1, entry 9).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of (E)-4-(Hex-4-en-1-yl)-1,1'-biphenyl (Table 1, entry 8).
\(^{13}\)C NMR (126 MHz, CDCl\(_3\)) spectrum of (E)-4-(Hex-4-en-1-yl)-1,1'-biphenyl (Table 1, entry 10).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of (Z)-4-(Hex-4-en-1-yl)-1,1'-biphenyl (Table 1, entry 11).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of (Z)-4-(Hex-4-en-1-yl)-1,1'-biphenyl (Table 1, entry 11).
The final product in Table 1 - entry 11 shows the Z isomer contaminated with E isomer (Z/E \sim 95/5, see S33). However, the potassium (Z)-propen-1-yltrifluoroborate is commercially available in mixtures Z/E \sim 95/5.
$^1$H NMR (500 MHz, CDCl$_3$) 4-(4-Methylpent-4-en-1-yl)-1,1'-biphenyl (Table 1, entry 12).
$^{13}$C NMR (126 MHz, CDCl$_3$) 4-(4-Methylpent-4-en-1-yl)-1,1'-biphenyl (Table 1, entry 12).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of 4-(Pent-4-en-1-yl)-1,1'-biphenyl (Table 1, entry 13).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of 4-(Pent-4-en-1-yl)-1,1'-biphenyl (Table 1, entry 13).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of 2-Cinnamyl-1,3-dioxolane (Table 2, entry 1).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of 2-Cinnamyl-1,3-dioxolane (Table 2, entry 1).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of (E)-(7-(Benzyloxy)hept-4-en-1-yl)benzene (Table 2, entry 2).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of (E)-(7-(Benzyloxy)hept-4-en-1-yl)benzene (Table 2, entry 2).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of (E)-Hepta-1,6-dien-1-ylbenzene (Table 2, entry 3).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of (E)-Hepta-1,6-dien-1-ylbenzene (Table 2, entry 3).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of (Z)-11-Phenylundec-7-enenitrile (Table 2, entry 4).
$^1$H NMR (200 MHz, CDCl$_3$) spectrum of (Z)-11-Phenylundec-7-enenitrile (Table 2, entry 4).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of (E)-13-Phenyltridec-9-en-1-ol (Table 2, entry 5).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of (E)-13-Phenyltridec-9-en-1-ol (Table 2, entry 5).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of (E)-(9-Chloronon-4-en-1-yl)benzene (Table 2, entry 6).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of (E)-(9-Chloronon-4-en-1-yl)benzene (Table 2, entry 6).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of \((E)-(8\text{-Chlorooct-1-en-1-yl})\text{benzene (Table 2, entry 7).}
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of (E)-(8-Chlorooct-1-en-1-yl)benzene (Table 2, entry 7).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of 8-(3-(4-Bromophenyl)propyl)-1,4-dioxaspiro[4.5]dec-7-ene (Table 2, entry 8).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of 8-(3-(4-Bromophenyl)propyl)-1,4-dioxaspiro[4.5]dec-7-ene (Table 2, entry 8).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of (E)-2-Styrylcyclohexane (Table 2, entry 9).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of (E)-2-Styrylcyclohexane (Table 2, entry 9).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of (E)-Styrylcycloheptane (Table 2, entry 10).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of $(E)$-Styrylcycloheptane (Table 2, entry 10).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of (E)-(6-Propynon-4-en-1-yl)benzene (Table 2, entry 11).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of (E)-(6-Propynon-4-en-1-yl)benzene (Table 2, entry 11).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of (E)-(3-Ethylhept-1-en-1-yl)benzene (Table 2, entry 12).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of (E)-(3-Ethylhept-1-en-1-yl)benzene (Table 2, entry 12).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of (3-(Cyclohex-1-en-1-yl)propyl)benzene (Table 3, entry 3).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of (3-(Cyclohex-1-en-1-yl)propyl)benzene (Table 3, entry 3).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of (E)-2,2-Dimethyl-4-(6-phenylhex-2-en-1-yl)-1,3-dioxolane (Table 3, entry 4).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of (E)-2,2-Dimethyl-4-(6-phenylhex-2-en-1-yl)-1,3-dioxolane (Table 3, entry 4).
$^1$H NMR (500 MHz, CDCl$_3$) spectrum of 4-Cinnamyl-2,2-dimethyl-1,3-dioxolane (Table 3, entry 5).
$^{13}$C NMR (126 MHz, CDCl$_3$) spectrum of 4-Cinnamyl-2,2-dimethyl-1,3-dioxolane (Table 3, entry 5).