Supporting Information for:

Regioselective Heck Arylation of Unsaturated Alcohols by Palladium Catalysis in Ionic Liquid

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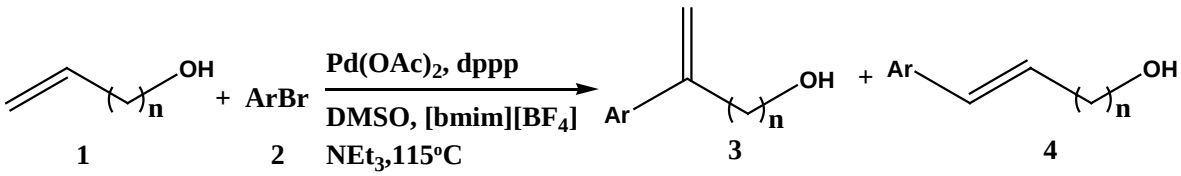
CONTENTS

A. Materials

All reactions were carried out under a nitrogen atmosphere. Chromatographic purifications were performed on silica gel (mesh 230-400) by the flash technique. 1-Butyl-3-methylimidizolium tetrafluoroborate ([bmim][BF_4]) was prepared according to the literature method.[1] Following vacuum-drying at 80 °C for 8 h, the ionic liquid was stored under nitrogen at ambient temperature and ready to use. $AgNO_3$ titration showed the chloride content of the ionic liquid to be below detection limit (<0.2%). Unsaturated alcohols **1a-f**, aryl halides **2a-p**, $Pd(OAc)_2$, 1,3-bis(diphenylphosphino)propane (DPPP) and triethylamine were purchased from Lancaster, Aldrich and TCI and were used as received. ^{1}H and ^{13}C NMR spectra were recorded on a Gemini 400 spectrometer at 400

(^{1}H) and 100 MHz (^{13}C) in ppm with reference to TMS internal standard in $CDCl_3$. Mass spectra were obtained by chemical ionization (CI). All the products were satisfactorily characterized by ^{1}H and ^{13}C NMR, MS, and HRMS, element analysis and when possible, comparison of their ^{1}H NMR spectra has been made with available literature data and/or those of authentic samples**.** The following compounds, 4-(1-hydroxymethyl-vinyl)-benzoic acid methyl ester (**3ad**),[2] 2-(4-fluorophenyl)-2-propen-1-ol (**3ae**),[3] 2-phenyl-allyl alcohol (**3af**) [6006-81-1],[4] 2-(4-methylphenyl)allyl alcohol (**3ag**) [66520-90-9],[5] 3-p-fluorophenyl-3-buten-1-ol (**3be**) [29123-91-9],[6] 4-hydroxy-2-phenyl-butene-(1) (**3bf**) [3174-83-2],[7] 3-p-methylphenyl-3-buten-1-ol (**3bg**) [29128-22-1],[8] 3-p-methoxyphenyl-3-buten-1-ol (**3bh**),[9] 3-m-fluorophenyl-3-buten-1-ol (**3bj**),[10] 3-m-methoxyphenyl-3-buten-1-ol (**3bk**) [29123-95-3],[6] 3-(1-naphthyl)-3-buten-1-ol (**3bn**) [141171-90-6],[7] and 4-(2-naphthyl)-4-penten-1-ol (**3co**) [127047-26-1],[8] have all been reported previously.



B. General procedure for the Heck arylation

An oven-dried, two-necked round-bottom flask containing a stir bar was charged with an aryl halide **2** (1.0 mmol), $Pd(OAc)_2$ (0.01-0.04 mmol), DPPP (0.02-0.08 mmol), DMSO (1 mL), and [bmim][BF_4] (1 mL) under nitrogen at room temperature. Following degassing three times, unsaturated alcohol **1** [1.0 (**1d-1f**), or 2.0 (**1a-1c**) mmol) and NEt_3 (1.5 mmol) were injected sequentially. The flask was placed in an oil bath, and the mixture was stirred and heated at the desired temperature. After an appropriate reaction

time, the flask was removed from the oil bath and cooled to room temperature, the product extracted with CH_2Cl_2 (3 x 20 mL). The combined organic layer was washed with water until neutrality, dried ($MgSO_4$), filtered, and concentrated *in vacuo*. A small sample was then taken for NMR analysis. The arylated alcohol **3** was isolated out of the crude product by flash chromatography on silica gel using a mixture of ethyl acetate and hexane (20:80 to 80:20) as eluant. The isolated yields of the product are given in Tables 2-3.

C. Compounds characterized

[4-(1-Hydroxypro-2-en-2-yl)](phenyl)methanone (3ab). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.82-7.80 (m, 4H), 7.60-7.56 (m, 3H), 7.51-7.47 (m, 2H), 5.62 (s, 1H), 5.49 (s, 1H), 4.61 (s, 2H), 1.61 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 196.6, 146.8, 143.0, 138.0, 137.2, 132.8, 130.0, 130.4, 128.7, 126.4, 115.2, 65.2; CI-MS *m/z* 239 [$(M + H)^+$, 100], 223 (30); HRMS Calcd for $C_{16}H_{15}O_2$ $(M + H)^+$: 239.1072. Found: 239.1076; Anal. Calcd for $C_{16}H_{14}O_2$: C, 80.65; H, 5.92. Found: C, 80.48; H, 5.88.

1-[4-(1-Hydroxyprop-2-en-2-yl)phenyl]ethanone (3ac). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.96-7.93 (m, 2H), 7.57-7.53 (m, 2H), 5.59 (s, 1H), 5.48 (s, 1H), 4.57 (s, 2H), 2.60 (s, 3H), 1.55 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.9, 146.9, 143.6, 136.9, 129.0, 126.6, 115.2, 65.3, 27.2; CI-MS *m/z* 177 [$(M + H)^+$, 100]; HRMS Calcd for $C_{11}H_{13}O_2$ $(M + H)^+$: 177.0916. Found: 177.0912; Anal. Calcd for $C_{11}H_{12}O_2$: C, 74.98; H, 6.86. Found: C, 74.76; H, 6.83.

4-(1-Hydroxymethyl-vinyl)-benzoic acid methyl ester (3ad). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.03-8.00 (m, 2H), 7.53-7.50 (m, 2H), 5.58 (s, 1H), 5.47 (s, 1H), 4.56 (s, 2H), 3.92 (s, 3H), 1.84 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 169.9, 146.4, 143.0, 129.8, 129.4, 126.0, 114.7, 64.8, 52.2; CI-MS *m/z* 210 {[M + $(NH_4)^+$], 100}; HRMS

Calcd for $C_{11}H_{16}NO_3$ [M + $(NH_4)^+$]: 210.1130. Found: 210.1133; Anal. Calcd for $C_{11}H_{12}O_3$: C, 68.74; H, 6.29. Found: C, 69.01; H, 6.26.

2-(4-Fluorophenyl)-2-propen-1-ol (3ae). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.45-7.42 (m, 2H), 7.07-7.02 (m, 2H), 5.43 (s, 1H), 5.34 (s, 1H), 4.52 (s, 2H), 1.60 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.0 (d, J_{CF} = 240 Hz), 146.6, 136.0 (d, J_{CF} = 4 Hz), 128.2 (d, J_{CF} = 8 Hz), 115.9 (d, J_{CF} = 21 Hz), 113.1, 65.5; CI-MS *m/z* 170 {[M + $(NH_4)^+$], 100}, 151 (55); HRMS Calcd for $C_9H_{13}NFO$ [M + $(NH_4)^+$]: 170.0981. Found: 170.0980; Anal. Calcd for C_9H_9FO: C, 71.04; H, 5.96. Found: C, 70.84; H, 6.01.

2-Phenyl-allyl alcohol (3af). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.47-7.44 (m, 2H), 7.37-7.28 (m, 3H), 5.47 (s, 1H), 5.36 (s, 1H), 4.58 (s, 2H), 1.53 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 147.4, 138.6, 128.6, 127.9, 126.1, 112.7, 65.1; CI-MS *m/z* 152 {[M + $(NH_4)^+$], 100}; HRMS Calcd for $C_9H_{14}NO$ [M + $(NH_4)^+$]: 152.1075. Found: 152.1077; Anal. Calcd for $C_9H_{10}O$: C, 80.56; H, 7.51. Found: C, 80.36; H, 7.54.

2-(4-Methylphenyl)allyl alcohol (3ag). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.36-7.34 (m, 2H), 7.17-7.15 (m, 2H), 5.44 (s, 1H), 5.31 (s, 1H), 4.54 (s, 2H), 2.35 (s, 3H), 1.52 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 147.8, 137.6, 134.4, 129.2, 126.0, 114.8, 65.2, 21.2; CI-MS *m/z* 166 {[M + $(NH_4)^+$], 60}, 149 (45), 133 (100); HRMS Calcd for $C_{10}H_{16}NO$ [M + $(NH_4)^+$]: 166.1232. Found: 166.1233; Anal. Calcd for $C_{10}H_{12}O$: C, 81.04; H, 8.16. Found: C, 80.76; H, 8.13.

3-(3-Hydroxyprop-1-en-2-yl)benzonitrile (3ai). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.76-7.75 (m, 1H), 7.74-7.69 (m, 1H), 7.60-7.57 (m, 1H), 7.48-7.44 (m, 1H), 5.54 (s, 1H), 5.47 (s, 1H), 4.54 (s, 2H), 1.67 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.4, 139.9, 131.3, 130.5, 129.9, 129.3, 118.7, 115.2, 112.8, 64.8; CI-MS *m/z* 177 {[M + $(NH_4)^+$], 100}; HRMS Calcd for $C_{10}H_{13}N_2O$ [M + $(NH_4)^+$]: 177.1028. Found: 177.1026; Anal.

Calcd for $C_{10}H_9NO$: C, 75.45; H, 5.70. Found: C, 75.21; H, 5.76.

2-(3-Fluorophenyl)-2-propen-1-ol (3aj). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.33-7.15 (m, 3H), 7.01-7.00 (m, 1H), 5.51 (s, 1H), 5.40 (s, 1H), 4.52 (s, 2H), 1.67 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.3 (d, J_{CF} = 245 Hz), 146.6, 141.2 (d, J_{CF} = 7 Hz), 130.3 (d, J_{CF} = 9 Hz), 122.1 (d, J_{CF} = 3 Hz), 115.2 (d, J_{CF} = 21 Hz), 114.2, 113.4 (d, J_{CF} = 22 Hz), 65.3; CI-MS *m/z* 170 {[M + $(NH_4)^+$], 100}, 152 (80), 151(80); HRMS Calcd for $C_9H_{13}NFO$ [M + $(NH_4)^+$]: 170.0981. Found: 170.0980; Anal. Calcd for C_9H_9FO: C, 71.04; H, 5.96. Found: C, 71.44; H, 6.02.

2-(2-Fluorophenyl)-2-propen-1-ol (3al). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.38-7.21 (m, 2H), 7.21-7.11 (m, 2H), 5.42 (s, 1H), 5.38 (s, 1H), 4.53 (s, 2H), 1.69 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.2 (d, J_{CF} = 243 Hz), 142.6, 131.3 (d, J_{CF} = 7 Hz), 129.9 (d, J_{CF} = 7 Hz), 129.0 (d, J_{CF} = 3 Hz), 124.6 (d, J_{CF} = 21 Hz), 118.7, 116.3 (d, J_{CF} = 23 Hz), 65.5; CI-MS *m/z* 170 {[M + $(NH_4)^+$], 100}, 152 (80), 151 (100); HRMS Calcd for $C_9H_{13}NFO$ [M + $(NH_4)^+$]: 170.0981. Found: 170.0982; Anal. Calcd for C_9H_9FO: C, 71.04; H, 5.96. Found: C, 71.24; H, 5.94.

3-(2-Naphthyl)-3-propen-1-ol (3ao). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.86-7.79 (m, 4H), 7.60-7.58 (m, 1H), 7.48-7.42 (m, 2H), 5.60 (s, 1H), 5.44 (s, 1H), 4.63 (s, 2H), 1.67 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 147.5, 136.1, 133.8, 133.5, 128.6, 128.5, 128.0, 126.7, 126.5, 125.2, 124.7, 113.6, 65.5; CI-MS *m/z* 202 {[M + $(NH_4)^+$], 100}, 185 (70), 169 (30); HRMS Calcd for $C_{13}H_{16}NO$ [M + $(NH_4)^+$]: 202.1232. Found: 202.1237; Anal. Calcd for $C_{13}H_{12}O$: C, 84.75; H, 6.57. Found: C, 84.86; H, 6.53.

2-(2-Methoxynaphthalen-6-yl)prop-2-en-1-ol (3ap). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.82-7.81 (m, 1H), 7.74-7.71 (m, 2H), 7.60-7.58 (m, 1H), 7.16-7.12 (m, 2H), 5.59 (s, 1H), 5.41 (s, 1H), 4.66 (s, 2H), 3.92 (s, 3H), 1.62 (s, 1H); ^{13}C NMR (100 MHz,

$CDCl_3$) δ 157.9, 147.0, 134.2, 133.4, 129.8, 128.8, 127.0, 124.8, 124.6, 119.1, 112.5, 105.6, 65.2, 55.3; CI-MS *m/z* 215 [$(M + H)^+$, 100], 199 (40); HRMS Calcd for $C_{14}H_{15}O_2$ $(M + H)^+$: 215.1072. Found: 215.1077; Anal. Calcd for $C_{14}H_{14}O_2$: C, 78.48; H, 6.59. Found: C, 78.34; H, 6.56.

4-(4-Hydroxybut-1-en-2-yl)benzonitrile (3ba). ^1H NMR (400 MHz, $CDCl_3$) δ 7.64-7.61 (m, 2H), 7.53-7.50 (m, 2H), 5.50 (s, 1H), 5.32 (s, 1H), 3.72 (t, *J* = 6.5 Hz, 2H), 2.79 (t, *J* = 6.5 Hz, 2H), 1.52 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.7, 144.1, 132.6, 127.2, 119.1, 117.6, 111.7, 61.3, 38.5; CI-MS *m/z* 191 {[M + $(NH_4)^+$], 100}; HRMS Calcd for $C_{11}H_{15}N_2O$ [M + $(NH_4)^+$]: 191.1184. Found: 191.1181; Anal. Calcd for $C_{11}H_{11}NO$: C, 76.28; H, 6.40; N, 8.09; Found: C, 76.05; H, 6.39; N, 8.06.

1-[4-(1-Hydroxybut-2-en-2-yl)phenyl]ethanone (3bc). ^1H NMR (400 MHz, $CDCl_3$) δ 7.95-7.93 (m, 2H), 7.51-7.49 (m, 2H), 5.51 (s, 1H), 5.28 (s, 1H), 3.75 (t, *J* = 6.5 Hz, 2H), 2.81 (t, *J* = 6.5 Hz, 2H), 2.60 (s, 3H), 1.58 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.9, 145.6, 144.5, 136.7, 128.9, 126.6, 116.8, 61.3, 38.7, 26.9; CI-MS *m/z* 191 [$(M + H)^+$, 100]; HRMS Calcd for $C_{12}H_{15}O_2$ $(M + H)^+$: 191.1072. Found: 191.1070; Anal. Calcd for $C_{12}H_{14}O_2$: C, 75.76; H, 7.42. Found: C, 75.57; H, 7.40.

Methyl 4-(4-hydroxybut-1-en-2-yl)benzote (3bd). ^1H NMR (400 MHz, $CDCl_3$) δ 8.03-7.99 (m, 2H), 7.49-7.46 (m, 2H), 5.49 (s, 1H), 5.26 (s, 1H), 3.91 (s, 3H), 3.74 (t, *J* = 6.5 Hz, 2H), 2.80 (t, *J* = 6.5 Hz, 2H), 1.66 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.2, 145.6, 144.6, 130.3, 129.9, 126.5, 116.6, 61.4, 52.5, 38.7; CI-MS *m/z* 207 [$(M + H)^+$, 100]; HRMS Calcd for $C_{11}H_{15}N_2O$ $(M + H)^+$: 207.1021. Found: 207.1021; Anal. Calcd for $C_{12}H_{14}O_3$: C, 69.88; H, 6.84. Found: C, 70.19; H, 6.87.

3-(4-Fluorophenyl)-3-buten-1-ol (3be). ^1H NMR (400 MHz, $CDCl_3$) δ 7.40-7.37 (m, 2H), 7.04-7.01 (m, 2H), 5.35 (s, 1H), 5.16 (s, 1H), 3.72 (t, *J* = 6.5 Hz, 2H), 2.77 (t, *J*

= 6.5 Hz, 2H), 1.45 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.0 (d, J_{CF} = 245 Hz), 144.3, 136.9 (d, J_{CF} = 4 Hz), 128.2 (d, J_{CF} = 8 Hz), 115.5 (d, J_{CF} = 15 Hz), 114.9, 61.4, 39.1; CI-MS *m/z* 167 [$(M + H)^+$, 100], 149 (45); HRMS Calcd for $C_{10}H_{12}FO$ $(M + H)^+$: 167.0872. Found: 167.0870; Anal. Calcd for $C_{10}H_{11}FO$: C, 72.27; H, 6.67; Found: C, 72.02; H, 6.65.

4-Hydroxy-2-phenyl-1-butene (3bf). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42-7.40 (m, 2H), 7.33-7.28 (m, 3H), 5.41 (s, 1H), 5.16 (s, 1H), 3.72 (t, *J* = 6.5 Hz, 2H), 2.79 (t, *J* = 6.5 Hz, 2H), 1.50 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.3, 140.9, 129.1, 128.6, 126.5, 114.9, 61.4, 39.0; CI-MS *m/z* 163 [$(M + H)^+$, 95], 145 (45), 133 (100); HRMS Calcd for $C_{11}H_{15}O$ $(M + H)^+$: 163.1123. Found: 163.1118; Anal. Calcd for $C_{10}H_{12}O$: C, 81.04; H, 8.16. Found: C, 80.71; H, 8.12.

3-(4-Methylphenyl)-3-buten-1-ol (3bg). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.33-7.30 (m, 2H), 7.15-7.12 (m, 2H), 5.38 (s, 1H), 5.11 (s, 1H), 3.72 (t, *J* = 6.4 Hz, 2H), 2.77 (t, *J* = 6.4 Hz, 2H), 2.34 (s, 3H), 1.47 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.0, 137.9, 137.8, 129.6, 126.4, 114.1, 62.5, 39.0, 21.4; CI-MS *m/z* 149 [$(M + H)^+$, 100], 131 (55); HRMS Calcd for $C_{10}H_{13}O$ $(M + H)^+$: 149.0967. Found: 149.0970; Anal. Calcd for $C_{11}H_{14}O$: C, 81.44; H, 8.70. Found: C, 81.11; H, 8.65.

3-(4-Methoxyphenyl)-3-buten-1-ol (3bh). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.36-7.34 (m, 2H), 6.87-6.85 (m, 2H), 5.33 (s, 1H), 5.06 (s, 1H), 3.79 (s, 3H), 3.70 (t, *J* = 6.5 Hz, 2H), 2.74 (t, *J* = 6.5 Hz, 2H), 1.47 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.7, 144.5, 132.5, 127.9, 114.1, 113.9, 61.4, 55.7, 39.0; CI-MS *m/z* 179 [$(M + H)^+$, 26], 161 (40), 149 (100); HRMS Calcd for $C_{11}H_{15}O_2$ $(M + H)^+$: 179.1072. Found: 179.1075; Anal. Calcd for $C_{11}H_{14}O_2$: C, 74.13; H, 7.92. Found: C, 74.42; H, 7.95.

3-(4-Hydroxybut-1-en-2-yl)benzonitrile (3bi). ^{1}H NMR (400 MHz, $CDCl_3$) δ

7.70-7.69 (m, 1H), 7.65-7.63 (m, 1H), 7.57-7.55 (m, 1H), 7.46-7.44 (m, 1H), 5.45 (s, 1H), 5.28 (s, 1H), 3.74 (t, J = 6.5 Hz, 2H), 2.52 (t, J = 6.5 Hz, 2H), 1.62 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.6, 142.4, 131.4, 130.8, 130.2, 129.7, 119.1, 116.9, 113.1, 61.2, 38.5; CI-MS *m/z* 191 {[M + $(NH_4)^+$], 100}; HRMS Calcd for $C_{11}H_{15}N_2O$ [M + $(NH_4)^+$]: 191.1184. Found: 191.1183; Anal. Calcd for $C_{11}H_{11}NO$: C, 76.28; H, 6.40; N, 8.09; Found: C, 76.35; H, 6.44; N, 8.07.

3-(3-Fluorophenyl)-3-buten-1-ol (3bj). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.23-7.17 (m, 1H), 7.12-7.06 (m, 1H), 7.00-6.95 (m, 1H), 6.93-6.87 (m, 1H), 5.42 (s, 1H), 5.15 (s, 1H), 3.74 (t, J = 6.5 Hz, 2H), 2.78 (t, J = 6.5 Hz, 2H), 1.60 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.1 (d, J_{CF} = 244 Hz), 144.3, 143.3 (d, J_{CF} = 7 Hz), 130.1 (d, J_{CF} = 8 Hz), 122.2 (d, J_{CF} = 4 Hz), 115.8 (d, J_{CF} = 21 Hz), 114.5, 113.4 (d, J_{CF} = 23 Hz), 61.4, 38.8; CI-MS *m/z* 167 [(M + $H)^+$, 100], 149 (35); HRMS Calcd for $C_{10}H_{12}FO$ (M + $H)^+$: 167.0872. Found: 167.0871; Anal. Calcd for $C_{10}H_{11}FO$: C, 72.27; H, 6.67; Found: C, 71.98; H, 6.64.

3-(3-Methoxyphenyl)-3-buten-1-ol (3bk). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.28-7.24 (m, 1H), 7.02-6.95 (m, 2H), 6.85-6.82 (m, 1H), 5.41 (s, 1H), 5.16 (s, 1H), 3.82 (s, 3H), 3.70 (t, J = 6.5 Hz, 2H), 2.79 (t, J = 6.5 Hz, 2H), 1.62 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 160.1, 145.2, 142.4, 130.9, 119.1, 115.2, 113.3, 112.1, 61.4, 55.7, 39.1; CI-MS *m/z* 179 [(M + $H)^+$, 100], 161 (40); HRMS Calcd for $C_{11}H_{15}O_2$ (M + $H)^+$: 179.1072. Found: 179.1067; Anal. Calcd for $C_{11}H_{14}O_2$: C, 74.13; H, 7.92. Found: C, 73.90; H, 7.89.

3-(2-Fluorophenyl)-3-buten-1-ol (3bl). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.28-7.21 (m, 2H), 7.11-7.01 (m, 2H), 5.32 (s, 1H), 5.28 (s, 1H), 3.65 (t, J = 6.4 Hz, 2H), 2.74 (t, J = 6.4 Hz, 2H), 1.71 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 160.2 (d, J_{CF} = 246 Hz), 141.8, 130.3, 129.9, 129.5, 124.5, 118.5, 116.1 (d, J_{CF} = 23 Hz), 61.1, 40.1; CI-MS *m/z*

167 [(M + H)$^+$, 100], 149 (30); HRMS Calcd for $C_{10}H_{12}FO$ (M + H)$^+$: 167.0872. Found: 167.0871; Anal. Calcd for $C_{10}H_{11}FO$: C, 72.27; H, 6.67; Found: C, 72.34; H, 6.69.

3-(2-Methoxyphenyl)-3-buten-1-ol (3bm). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.27-7.23 (m, 1H), 7.14-7.11 (m, 1H), 6.94-6.87 (m, 2H), 5.26 (s, 1H), 5.11 (s, 1H), 3.81 (s, 3H), 3.58 (t, *J* = 6.3 Hz, 2H), 2.71 (t, *J* = 6.3 Hz, 2H), 1.91 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 156.8, 145.1, 131.7, 130.3, 127.8, 121.4, 117.5, 111.1, 61.0, 55.9, 40.7; CI-MS *m/z* 179 [(M + H)$^+$, 100], 161 (65), 149 (30); HRMS Calcd for $C_{11}H_{15}O_2$ (M + H)$^+$: 179.1072. Found: 179.1068; Anal. Calcd for $C_{11}H_{14}O_2$: C, 74.13; H, 7.92. Found: C, 74.36; H, 7.88.

3-(1-Naphthyl)-3-buten-1-ol (3bn). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.01-8.00 (m, 1H), 7.84-7.82 (m, 1H), 7.78-7.74 (m, 1H), 7.48-7.40 (m, 3H), 7.29-7.25 (m, 1H), 5.49 (s, 1H), 5.21 (s, 1H), 3.64 (t, *J* = 6.4 Hz, 2H), 2.78 (t, *J* = 6.4 Hz, 2H), 1.50 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.9, 140.8, 134.2, 131.5, 128.8, 127.9, 126.4, 126.2, 125.9, 125.6, 125.5, 118.1, 61.1, 42.0; CI-MS *m/z* 199 [(M + H)$^+$, 100], 181 (35), 169 (45); HRMS Calcd for $C_{14}H_{15}O$ (M + H)$^+$: 199.1123. Found: 199.1124; Anal. Calcd for $C_{14}H_{14}O$: C, 84.81; H, 7.12. Found: C, 84.57; H, 7.15.

3-(2-Naphthyl)-3-buten-1-ol (3bo). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.82-7.77 (m, 4H), 7.57-7.54 (m, 1H), 7.48-7.41 (m, 2H), 5.53 (s, 1H), 5.24 (s, 1H), 3.75 (t, *J* = 6.5 Hz, 2H), 2.87 (t, *J* = 6.5 Hz, 2H), 1.65 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.1, 138.1, 133.8, 133.4, 128.6, 127.7, 127.5, 126.8, 126.7, 125.3, 124.9, 115.4, 61.6, 39.0; CI-MS *m/z* 199 [(M + H)$^+$, 100]; HRMS Calcd for $C_{14}H_{15}O$ (M + H)$^+$: 199.1123. Found: 199.1128; Anal. Calcd for $C_{14}H_{14}O$: C, 84.81; H, 7.12. Found: C, 84.47; H, 7.14.

Methyl 4-[(*E*)-4-hydroxybut-1-enyl]benzote (4bd). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.99-7.96 (m, 2H), 7.42-7.40 (m, 2H), 6.55 (d, *J* = 16.0 Hz, 1H), 6.35 (dt, *J* = 16.0, 6.9

Hz, 1H), 3.91 (s, 3H), 3.79 (t, *J* = 6.3 Hz, 2H), 2.51 (dt, *J* = 6.3, 6.9 Hz, 2H), 1.51 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.3, 142.2, 132.2, 130.3, 129.9, 129.1, 126.3, 62.3, 52.4, 36.8; CI-MS *m/z* 207 [$(M + H)^+$, 100]; HRMS Calcd for $C_{11}H_{15}N_2O$ $(M + H)^+$: 207.1021. Found: 207.1023; Anal. Calcd for $C_{12}H_{14}O_3$: C, 69.88; H, 6.84. Found: C, 70.12; H, 6.81.

1-[4-(5-Hydroxypent-1-en-2-yl)phenyl]ethanone (3cc). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.93-7.90 (m, 2H), 7.51-7.48 (m, 2H), 5.40 (s, 1H), 5.21 (s, 1H), 3.67 (t, *J* = 6.4 Hz, 2H), 2.63 (t, *J* = 6.5 Hz, 2H), 2.60 (s, 3H), 1.75-1.71 (m, 2H), 1.58 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.1, 147.6, 146.3, 136.5, 129.0, 126.8, 114.9, 62.6, 31.8, 31.5, 26.9; CI-MS *m/z* 205 [$(M + H)^+$, 100]; HRMS Calcd for $C_{13}H_{17}O_2$ $(M + H)^+$: 205.1229. Found: 205.1232; Anal. Calcd for $C_{13}H_{16}O_2$: C, 76.44; H, 7.90. Found: C, 76.52; H, 7.94.

1-[4-(6-Hydroxyhex-1-en-2-yl)phenyl]ethanone (3dc). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.93-7.90 (m, 2H), 7.49-7.47 (m, 2H), 5.37 (s, 1H), 5.18 (s, 1H), 3.62 (t, *J* = 6.3 Hz, 2H), 2.57 (t, *J* = 6.5 Hz, 2H), 2.55 (s, 3H), 1.64-1.51 (m, 5H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 198.1, 147.9, 146.5, 136.4, 129.0, 126.7, 114.8, 63.0, 35.3, 32.7, 26.4, 24.8; CI-MS *m/z* 219 [$(M + H)^+$, 100]; HRMS Calcd for $C_{14}H_{19}O_2$ $(M + H)^+$: 219.1385. Found: 219.1389; Anal. Calcd for $C_{14}H_{18}O_2$: C, 77.03; H, 8.31. Found: C, 76.69; H, 8.27.

1-[4-(7-Hydroxyhept-1-en-2-yl)phenyl]ethanone (3ec). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.93-7.89 (m, 2H), 7.49-7.46 (m, 2H), 5.36 (s, 1H), 5.17 (s, 1H), 3.64 (t, *J* = 6.3 Hz, 2H), 2.60 (s, 3H), 2.57 (t, *J* = 6.4 Hz, 2H), 1.60-1.50 (m, 7H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.7, 147.7, 146.2, 136.1, 128.6, 127.2, 114.3, 62.8, 39.0, 33.5, 28.7, 27.1, 25.8; CI-MS *m/z* 233 [$(M + H)^+$, 100]; HRMS Calcd for $C_{15}H_{21}O_2$ $(M + H)^+$: 233.1541. Found: 233.1544; Anal. Calcd for $C_{15}H_{20}O_2$: C, 77.55; H, 8.68. Found: C, 77.78; H, 8.82.

1-[4-(8-Hydroxyoct-1-en-2-yl)phenyl]ethanone (3fc). ^{1}H NMR (400 MHz,

$CDCl_3$) δ 7.93-7.90 (m, 2H), 7.49-7.46 (m, 2H), 5.37 (s, 1H), 5.18 (s, 1H), 3.63 (t, J = 6.3 Hz, 2H), 2.61 (s, 3H), 2.58 (t, J = 6.3 Hz, 2H), 1.60-1.49 (m, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.5, 147.2, 146.3, 136.5, 128.6, 127.1, 114.1, 62.9, 37.8, 33.2, 31.0, 29.0, 27.1, 25.8; CI-MS m/z 247 [$(M + H)^+$, 100]; HRMS Calcd for $C_{16}H_{23}O_2$ $(M + H)^+$: 247.1698. Found: 247.1699; Anal. Calcd for $C_{16}H_{22}O_2$: C, 78.01; H, 9.00. Found: C, 77.88; H, 9.02.

4-(2-Naphthyl)-4-penten-1-ol (3co). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.82-7.74 (m, 4H), 7.57-7.55 (m, 1H), 7.47-7.40 (m, 2H), 5.43 (s, 1H), 5.18 (s, 1H), 3.65 (t, *J* = 6.5 Hz, 2H), 2.70 (t, *J* = 6.5 Hz, 2H), 1.79-1.72 (m, 2H), 1.51 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 148.3, 138.5, 133.3, 132.7, 128.6, 128.5, 128.3, 127.0, 126.6, 125.1, 124.8, 113.5, 62.7, 32.9, 32.0; CI-MS *m/z* 213 [$(M + H)^+$, 100]; HRMS Calcd for $C_{15}H_{17}O$ $(M + H)^+$: 213.1279. Found: 213.1278; Anal. Calcd for $C_{15}H_{16}O$: C, 84.87; H, 7.60. Found: C, 84.78; H, 7.66.

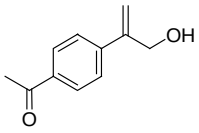
5-(2-Naphthyl)-5-hexen-1-ol (3do). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.83-7.76 (m, 4H), 7.59-7.54 (m, 1H), 7.47-7.39 (m, 2H), 5.41 (s, 1H), 5.15 (s, 1H), 3.62 (t, *J* = 6.5 Hz, 2H), 2.63 (t, *J* = 6.4 Hz, 2H), 1.64-1.57 (m, 4H), 1.42 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 148.6, 139.0, 133.3, 130.7, 128.9, 128.6, 128.0, 127.6, 126.4, 126.1, 125.1, 113.4, 63.2, 35.5, 33.0, 26.5; CI-MS *m/z* 227 [$(M + H)^+$, 100]; HRMS Calcd for $C_{16}H_{19}O$ $(M + H)^+$: 227.1436. Found: 227.1437; Anal. Calcd for $C_{16}H_{18}O$: C, 84.91; H, 8.02. Found: C, 84.55; H, 7.96.

6-(2-Naphthyl)-6-hepten-1-ol (3eo). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.83-7.74 (m, 4H), 7.57-7.55 (m, 1H), 7.48-7.40 (m, 2H), 5.40 (s, 1H), 5.15 (s, 1H), 3.61 (t, *J* = 6.5 Hz, 2H), 2.62 (t, *J* = 6.4 Hz, 2H), 1.63-1.40 (m, 7H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 148.8, 139.0, 133.8, 133.2, 128.5, 128.2, 127.9, 127.7, 126.2, 125.6, 125.1, 113.2, 63.3,

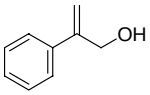
35.7, 33.0, 28.5, 25.9; CI-MS *m/z* 241 [$(M + H)^+$, 100]; HRMS Calcd for $C_{17}H_{21}O$ ($M + H)^+$: 241.1592. Found: 241.1594; Anal. Calcd for $C_{17}H_{20}O$: C, 84.96; H, 8.39. Found: C, 85.04; H, 8.36.

7-(2-Naphthyl)-7-octen-1-ol (3fo). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.82-7.74 (m, 4H), 7.57-7.54 (m, 1H), 7.47-7.39 (m, 2H), 5.41 (s, 1H), 5.15 (s, 1H), 3.58 (t, *J* = 6.5 Hz, 2H), 2.61 (t, *J* = 6.4 Hz, 2H), 1.59-1.40 (m, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 148.9, 139.0, 133.8, 132.5, 128.7, 128.5, 128.3, 128.0, 127.8, 126.8, 125.6, 113.2, 63.4, 35.7, 33.0, 29.6, 29.0, 26.0; CI-MS *m/z* 255 [$(M + H)^+$, 100]; HRMS Calcd for $C_{18}H_{23}O$ ($M + H)^+$: 255.1749. Found: 255.1750; Anal. Calcd for $C_{18}H_{22}O$: C, 84.99; H, 8.72. Found: C, 85.21; H, 8.68.

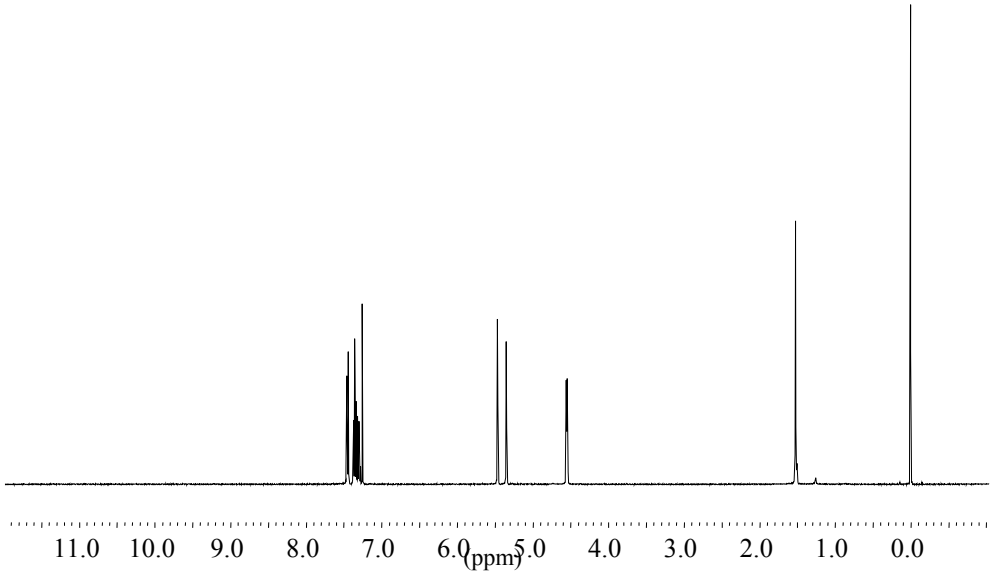
D. Sample ^{1}H NMR spectra

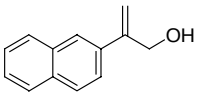


1-[4-(1-hydroxyprop-2-en-2-yl)phenyl]ethanone (**3ac**)

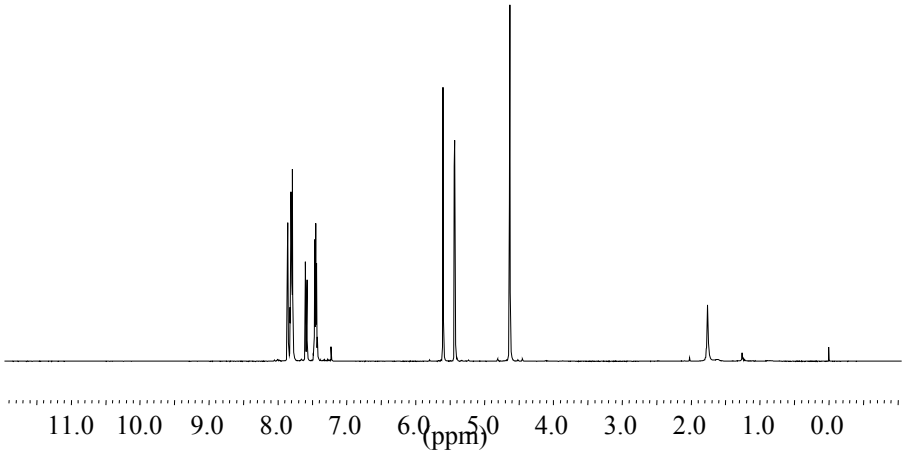


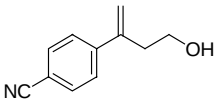
2-phenyl-allyl alcohol (**3af**)



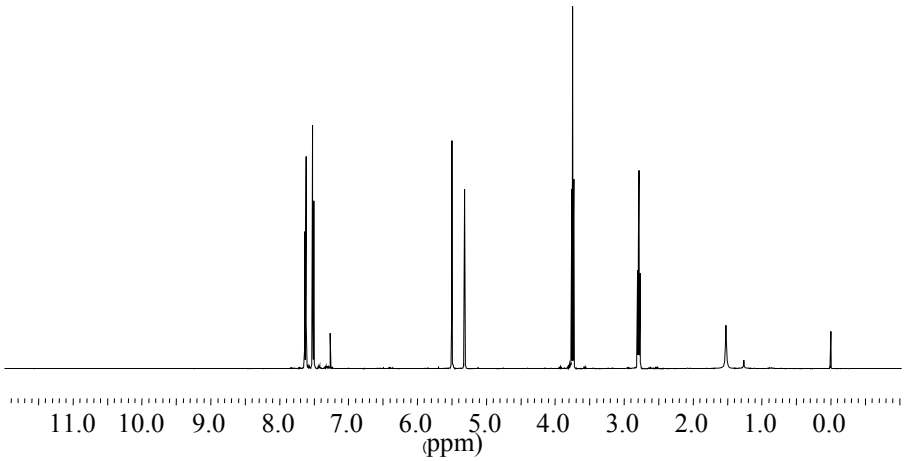


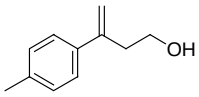
3-(2-naphthyl)-3-propen-1-ol (**3ao**)



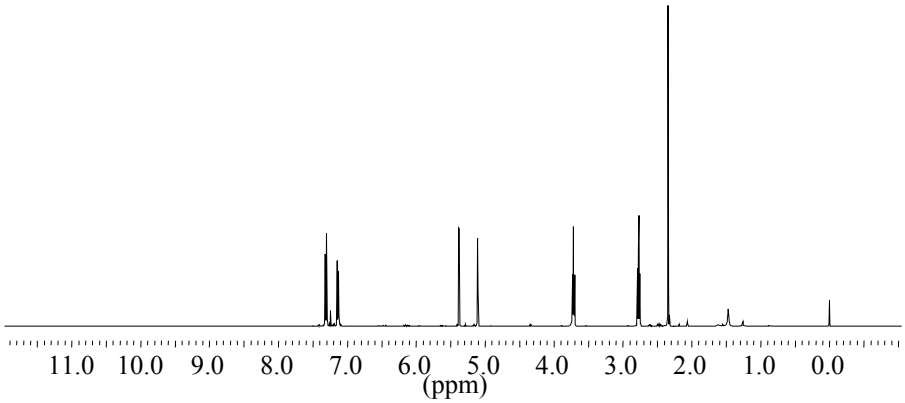


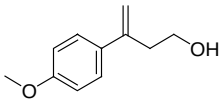
4-(4-hydroxybut-1-en-2-yl)benzonitrile (**3ba**)



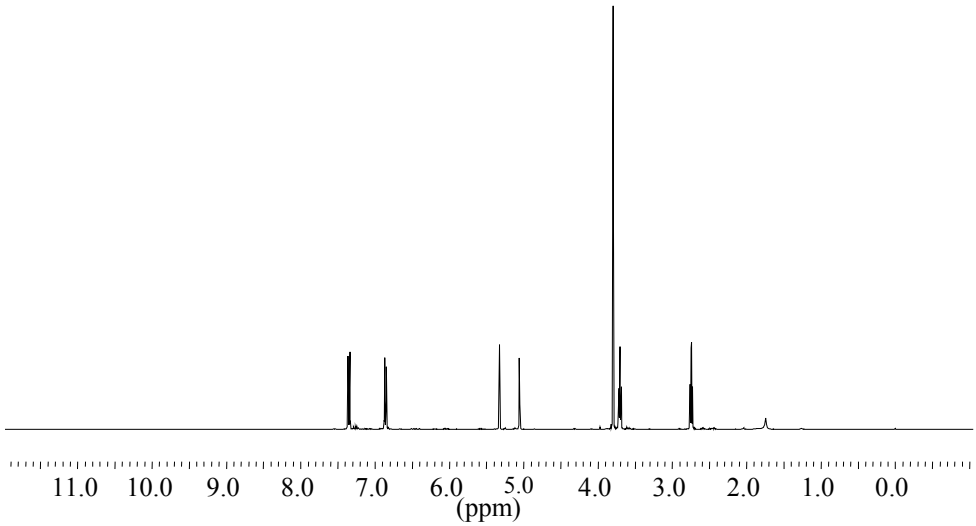


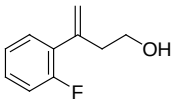
3-p-methylphenyl-3-buten-1-ol (**3bg**)



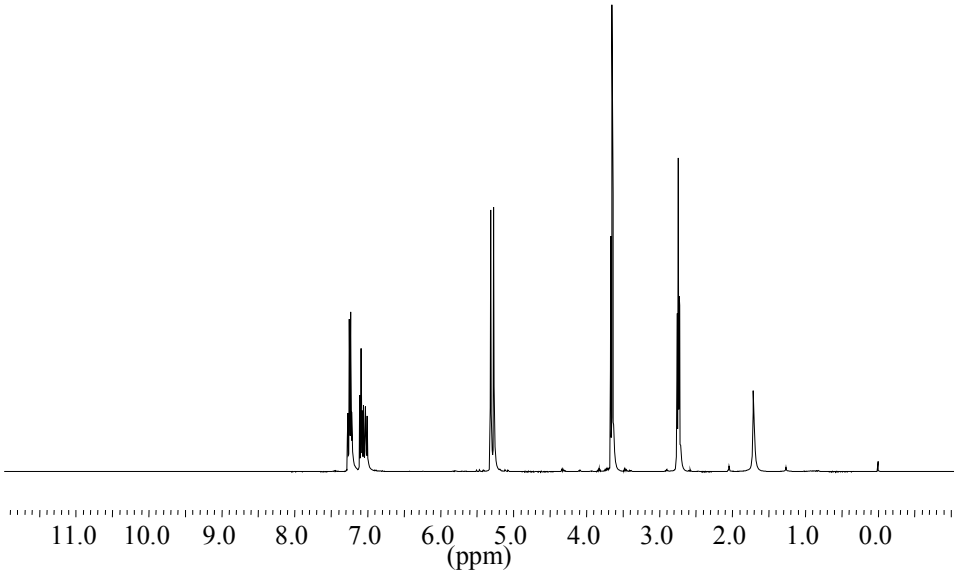


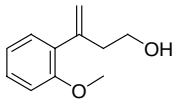
3-p-methoxyphenyl-3-buten-1-ol (**3bh**)



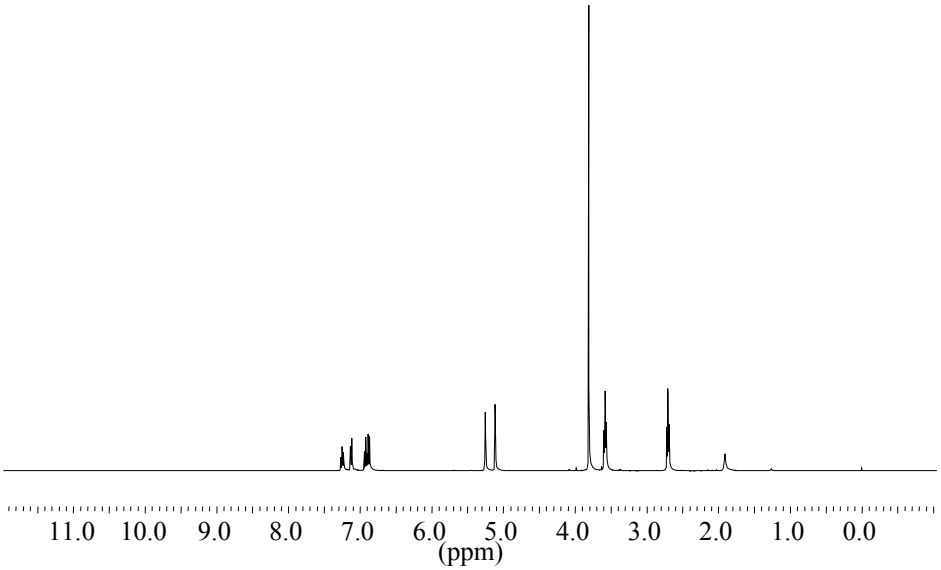


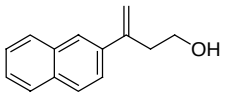
3-o-fluorophenyl-3-buten-1-ol (**3bl**)



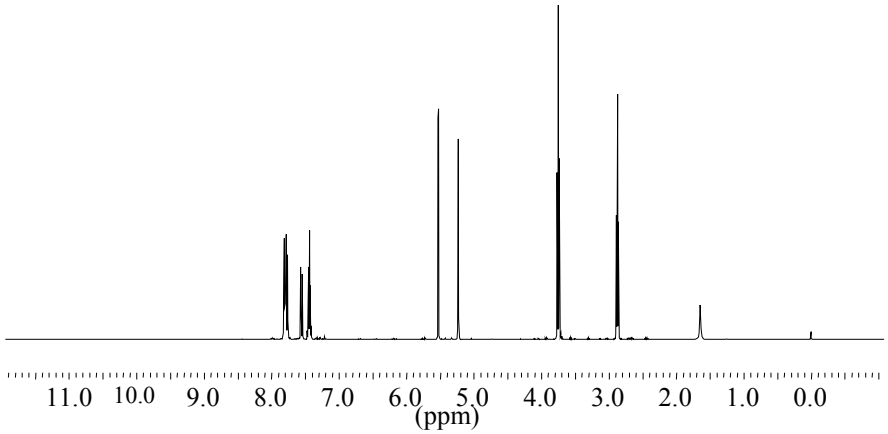


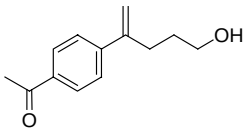
3-o-methoxyphenyl-3-buten-1-ol (**3bm**)



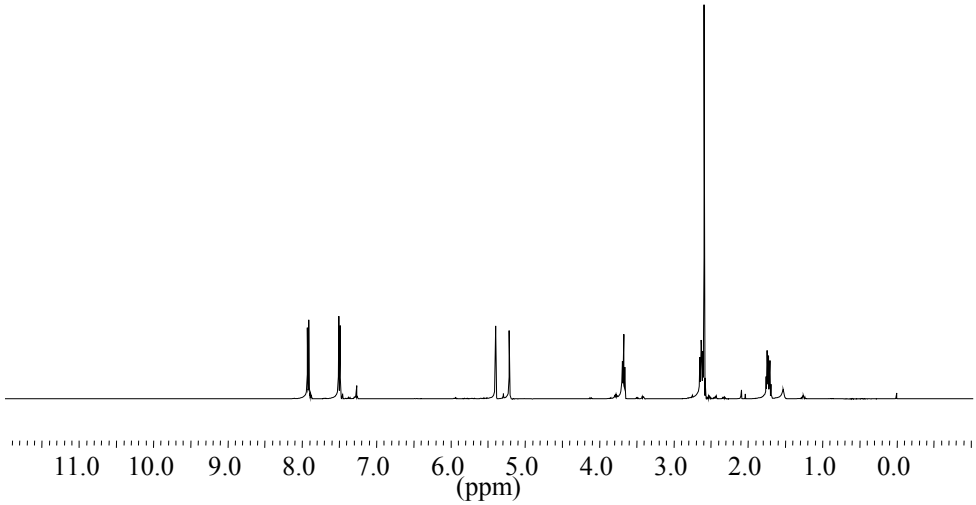


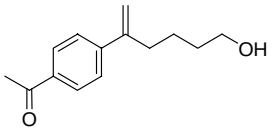
3-(2-naphthyl)-3-buten-1-ol (**3bo**)



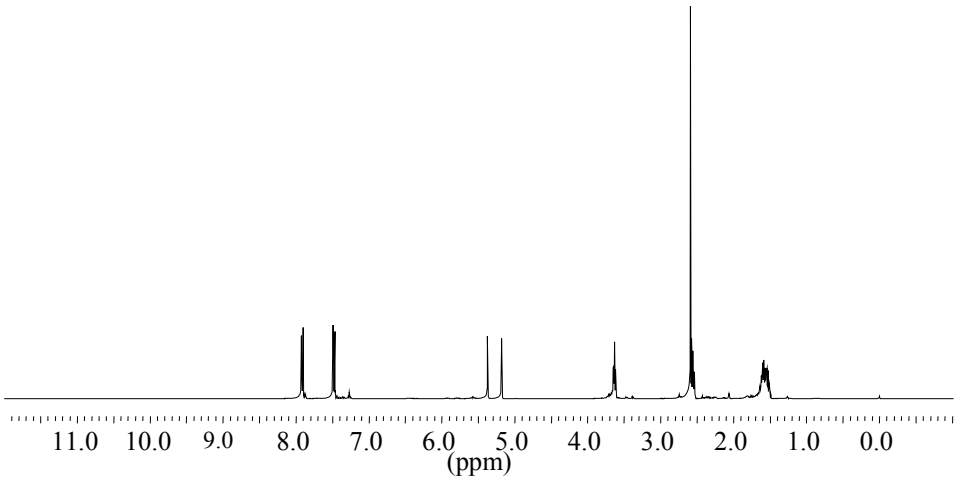


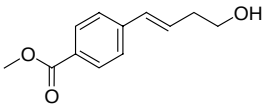
1-[4-(5-hydroxypent-1-en-2-yl)phenyl]ethanone (**3cc**)



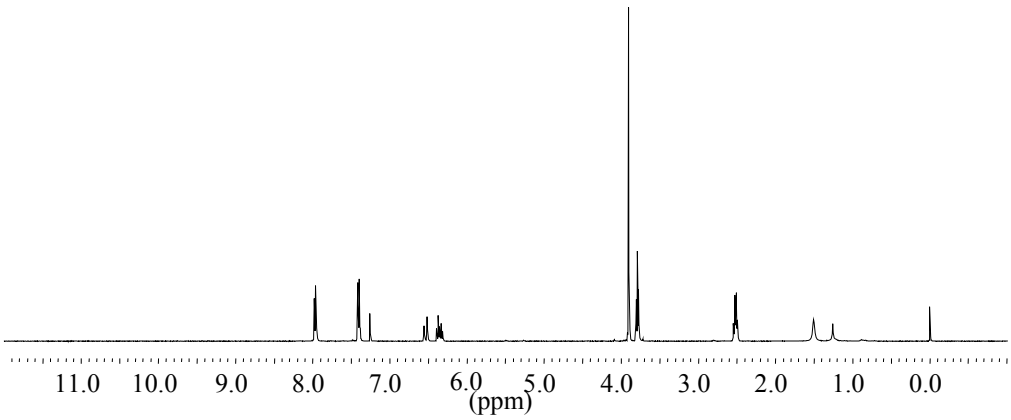


1-[4-(6-hydroxyhex-1-en-2-yl)phenyl]ethanone (**3dc**)





Methyl 4-[(E)-4-hydroxybut-1-enyl)benzote (**4bd**)



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