Synthesis of Tetrahydrofurans by Cyclization of Homoallylic Alcohols using Iodine/Iodine(III)

Supporting Information

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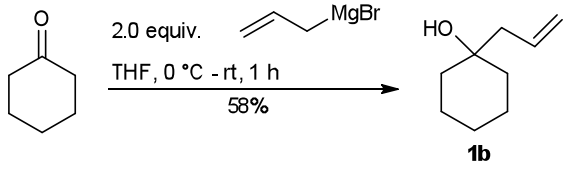
1. General Information

DIB and iodine are commercially available and were used as received. HTIB, vinyl magnesium bromide, allyl magnesium were obtained from comercial sources and/or were prepared according published procedures.[1-3] Potassium iodide paper was prepared by spraying 10% KI solution in a piece of filter paper then dried with heat gun. THF was freshly distilled from sodium/benzophenone. Column chromatography was performed using silica gel 200-400 Mesh. TLC analyses were performed in silica gel plates, using UV, I_2 or *p*-anisaldehyde solution for visualization. Melting points are uncorrected. All NMR analyses were recorded using $CDCl_3$ as solvent and TMS as pattern.

2. Experimental Procedures

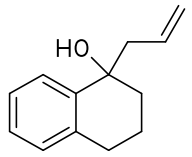
2.1. Preparation of Homoallylic Alcohols

*1-Allylcyclohexanol (**1b**). General Procedure for the Preparation of Homoallylic Alcohols.*[4]



To a stirred solution of allylmagnesium bromide (10 mL, 1.0 mol.L^{-1}, 10 mmol) in anhydrous Et_2O at 0 °C was added a solution of cyclohexanone (5.0 mmol, 0.52 mL) in anhydrous THF (2 mL). After 1 h at rt, the reaction was quenched with an aqueous solution of NH_4Cl (10%, 5 mL). The mixture was extracted with Et_2O (3 X 10 mL) and dried over anhydrous $MgSO_4$. The solvent was removed under reduced pressure. The crude product was purified by flash chromatography (10% AcOEt in hexanes), giving **1b**[4] (0.407 g, 2.90 mmol, 58%), as a colorless oil.

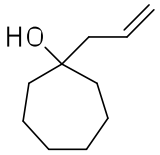
*1-Allyl-1,2,3,4-tetrahydronaphthalen-1-ol (**1a**).*[5,6]



1a

The alcohol **1a** was prepared according to the general procedure, but using α-tetralone (10 mmol, 1.3 mL), anhydrous Et_2O (5 mL), allylmagnesium bromide (20 mL, 1.0 mol.L^{-1}; 20 mmol) in anhydrous Et_2O. The reaction was stirred for 1 h under reflux. After work-up and purification, **1a**[5,6] (1.62 g, 8.58 mmol, 86%) was obtained as a colorless oil.

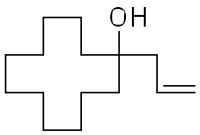
*1-Allylcycloheptanol (**1c**).*[4,7]



1c

The alcohol **1c** was prepared according to the general procedure, but using cycloheptanone (20 mmol, 2.3 mL), anhydrous THF (8 mL), and allylmagnesium bromide (40 mL, 1.0 mol.L^{-1}, 40 mmol) in anhydrous Et_2O. The reaction was stirred for 15 h a rt. After work-up and purification by distillation (83-85 °C, 10 mbar), **1c**[8] (1.84 g, 11.9 mmol, 60%) was obtained as a colorless oil.

*1-Allylcyclododecanol (**1d**)*[4]

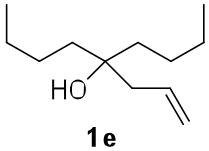


1d

The alcohol **1d** was prepared according to the general procedure, but using cyclododecanone (0.912 g, 5.00 mmol), anhydrous THF (2 mL), and allylmagnesium bromide (10 mL, 1.0 mol.L^{-1}, 10 mmol) in anhydrous Et_2O. The reaction was stirred for 1 h at rt. After work-up and purification, **1d**[4] (0.892 g, 3.97 mmol, 79%) was obtained as white solid (m.p.: 61.8-63.5 °C; lit.:[9] colorless oil).

*1-Allylcyclododecanol (**1d**):* IR (KBr): 665, 895, 906, 989, 1471, 1638, 2845, 2863, 2908, 2931, 3072, 3302 cm^{-1}.. ^1H NMR (200 MHz, $CDCl_3$) δ: 1.35 (s, 19H), 1.40 (s, 1H, OH), 1.46-1.60 (m, 3H), 2.17 (dd, *J* = 1.0 and 7.4 Hz, 2H), 5.07-5.18 (m, 2H), 5.92 (ddt, *J* = 7.4, 10.6 and 16.7 Hz, 1H); ^{13}C RMN (50 MHz, $CDCl_3$) δ: 19.5, 22.1, 22.5, 26.0, 26.4, 34.4, 45.2, 74.6, 118.7, 133.9; LRMS *m/z* (%): 224 ($M^{\cdot+}$, 0,02), 183 (9), 109 (7), 95 (10), 83 (24), 69 (23), 55 (75), 41 (100); HRMS [ESI(+)] calc. for $[C_{15}H_{28}O + Na]^+$ 247.20324, found 247.20326.

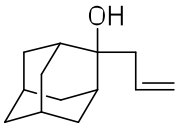
*5-Allylnonan-5-ol (**1e**)*[7]



1e

The alcohol **1e** was prepared according to the general procedure, but using nonanone (3.0 mmol, 0.52 mL), anhydrous THF (3 mL), and allylmagnesium bromide (8 mL, 1.0 $mol.L^{-1}$, 8 mmol) in anhydrous Et_2O. The reaction was stirred for 14 h at rt. After work-up and purification, **1e**[7] (0.494 g, 2.68 mmol, 89%) was obtained as colorless oil.

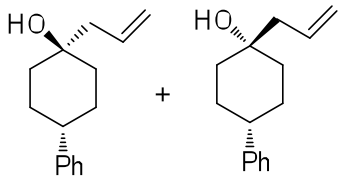
*1-Adamantil-3-buten-1-ol (**1f**)*[10]



1f

The alcohol **1f** was prepared according to the general procedure, but using adamantanone (4.00 mmol, 0.600 g), anhydrous Et_2O (5 mL), and allylmagnesium bromide (6 mL, 1.0 $mol.L^{-1}$, 6 mmol) in anhydrous Et_2O. The reaction was stirred for 2 h under reflux. After work-up and purification, **1f**[11] (0.310 g, 1.61 mmol, 40%) was obtained as white solid (m.p.: 44.7-45.7 °C, lit.[11] 46-48 °C).

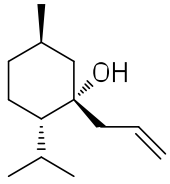
*1-Allyl-4-phenylcyclohexanol (**1g**)*[12]



1g 25% **S1** 15%

To a mixture of 4-phenylcyclohexanona (2.00 mmol, 0.349 g) and allyl bromide (4.0 mmol, 0.35 mL) in a saturated aqueous solution of NH_4Cl (2 mL) and THF (0.4 mL) was added powder Zn (4.00 mmol, 0.262 g). The mixture was stirred for 24 h at rt. The mixture was extracted AcOEt (3 X 10 mL) and dried over anhydrous $MgSO_4$. The solvent was removed under reduced pressure. The crude product was purified by flash chromatography (10% AcOEt in hexanes), giving **1g**[13]as a slightly yellow oil (0.109 g, 0.504 mmol, 25%) and **S1**[13] (0.066 g, 0.31 mmol, 15%) as white solid (m.p.: 91.8-92.8 °C, m.p. was not reported in the literature).

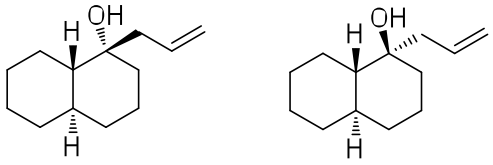
*(1S,2S,5R)-1-allyl-2-isopropyl-5-methylcyclohexanol ((+)-**1h**)*[14]



1h

The alcohol (+)-**1h** was prepared according to the general procedure, but using (–)-mentona (3.0 mmol, 0.52 mL), anhydrous THF (3 mL), and allylmagnesium bromide (8 mL, 1.0 $mol.L^{-1}$; 8 mmol) in anhydrous Et_2O. The reaction was stirred for 2 h at rt. After work-up and purification, **1h**[14] (0.364 g, 1.85 mmol, 62%) was obtained as colorless oil. $[\alpha]_D^{25}$: +7.4 (1.0, $CHCl_3$), lit.[14] +7.4 (1.0, $CHCl_3$). A small amount of (*1R,2S,5R*)-1-allyl-2-isopropyl-5-methylcyclohexanol was also isolated (0.027 g, 0.14 mmol, 5%).

*1-Allyldecahydronaphthalen-1-ol (**1i**)*[4,7]



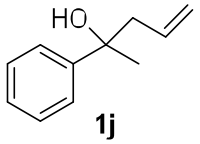
1i **S2**

The alcohol **1i** was prepared according to the general procedure, but using *trans*-1-decalone (3.00 mmol, 0.457 g), anhydrous THF (1.5 mL), and allylmagnesium bromide (5 mL, 1.0 $mol.L^{-1}$; 5 mmol) in anhydrous Et_2O. The reaction was stirred for 18 h under reflux. After work-up and purification, **1i** (0.287 g, 1.48 mmol, 49%) and **S2** (0.040 g, 0.21 mmol, 7%) were obtained, both as colorless oil.

(1S,4aR,8aS)-1-Allyldecahydronaphthalen-1-ol (**1i**):* IR (film): 912, 1447, 1639, 2845, 2851, 2908, 2927, 3004, 3075, 3478 cm^{-1}. ^1H NMR (200 MHz, $CDCl_3$) δ: 0.89-1.81 (m, 16H + OH), 2.24 (d, *J* = 7.4 Hz, 2H), 5.03-5.06 (m, 1H), 5.11 (sl, 1H), 5.70-5.91 (m, 1H); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 21.1, 24.8, 26.2, 26.7, 34.0, 34.6, 37.1, 37.2, 45.0, 48.5, 72.6, 118.0, 134.2; HRMS [ESI(+)] calc. 217.1563 for $[C_{13}H_{22}O + Na]^+$, found 217.1566;

(1R,4aR,8aS)-1-Allyldecahydronaphthalen-1-ol (**S2**):* IR (film): 913, 1448, 1639, 2845, 2851, 2927, 3004, 3075, 3481 cm^{-1}. ^1H NMR (200 MHz, $CDCl_3$) δ: 0.98-1.90 (m, 16H + OH), 2.17 (dd, *J* = 7.0 and 13.9 Hz, 1H), 2.35 (dd, *J* = 7.7 and 13.9 Hz, 1H), 5.07-5.16 (m, 2H), 5.79-6.00 (m, 1H); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 22.4, 25.1, 26.4, 26.7, 33.9, 34.7, 36.7, 38.2, 38.9, 53.3, 73.5, 118.2, 134.2; HRMS [ESI(+)] calc. 217.1563 for $[C_{13}H_{22}O + Na]^+$, found 217.1560; IR (film): 913, 1448, 1639, 2845, 2851, 2927, 3004, 3075, 3481 cm^{-1}.

*2-Phenylpent-4-en-2-ol (**1j**)*[15]

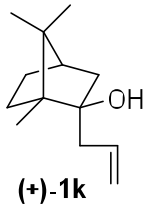


1j

The alcohol **1j** was prepared according to the general procedure, but using acetophenone (3.0 mmol, 0.35 mL), anhydrous THF (3 mL), and allylmagnesium bromide (6 mL, 1.0 $mol.L^{-1}$, 6

mmol) in anhydrous Et_2O. The addition was performed at rt. The reaction was stirred for 2 h at rt. After work-up and purification, **1j**[15] (0.357 g, 2.20 mmol, 73%) was obtained as colorless oil.

*(+)-(1S,2R,4R)-2-Allyl-1,7,7-trimethylbicyclo[2.2.1]heptan-2-ol ((+)-**1k**)*[4,16]

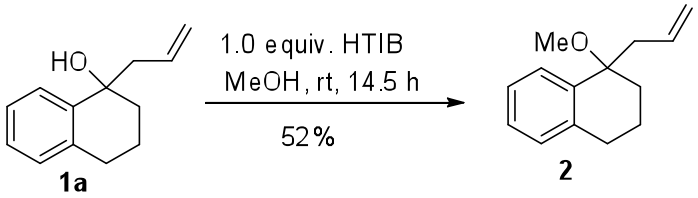


(+)-1k

The alcohol (+)-**1k** was prepared according to the general procedure, but using (*R*)-(+)-cânfora (3.0 mmol, 0.457 g), anhydrous THF (5 mL), and allylmagnesium bromide (6 mL, 1.0 $mol.L^{-1}$, 6 mmol) in anhydrous Et_2O. The reaction was stirred for 1 h under reflux. After work-up and purification, (+)-**1k**[16] (0.468 g, 2.41 mmol, 80%) was obtained as colorless oil. $[\alpha]_D^{20}$: +4.1 (3.95 $CHCl_3$), lit.[16]+4.1 (3.95 $CHCl_3$).

2.2. Reaction of Homoallylic Alcohols with Iodine(III)

*Oxidation of **1a** with HTIB in MeOH*



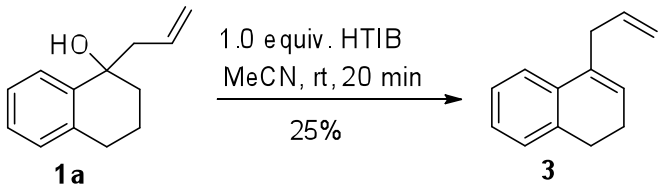
1a **2**

To a stirred solution of **1a** (0.094 g, 0.50 mmol) in MeOH (1.5 mL) at rt, was added HTIB (0.196 g, 0.500 mmol). The mixture was stirred at rt for 14.5 h. The reaction was quenched with saturated aqueous solution of $NaHCO_3$ (5 mL) and with H_2O (10 mL). The aqueous phase was extracted with AcOEt (5 X 5 mL). The combined organic phase was washed with brine (5 mL) and dried over anhydrous $MgSO_4$. The solvent was removed under reduced pressure. The crude product was purified by flash chromatography (gradient elution, 19:1 to 9:1 of hexanes:AcOEt),

giving **2**[17] (0.053 g, 0.26 mmol, 52%), as a slightly yellow oil. The NMR data of **2** has not been reported in the literature.

*1-Allyl-1,2,3,4-tetrahydro-1-methoxynaphthalene (**2**):* ^{1}H NMR (200 MHz, $CDCl_3$) δ: 1.78-2.12 (m, 4H), 2.56 (d, J = 7.4 Hz, 2H), 2.62-2.88 (m, 2H), 3.07 (s, 3H), 4.99-5.05 (m, 1H), 5.09 (m, 1H), 5.82 (ddt, J = 7.4, 11.2 and 16.1 Hz, 1H), 7.07-7.26 (m, 3H), 7.43-7.48 (m, 1H); ^{13}C NMR (50 MHz, $CDCl_3$) δ: 20.4, 29.6, 29.7, 47.3, 50.2, 77.5, 117.4, 125.9, 126.9, 128.7, 134.5, 138.5, 139.1.

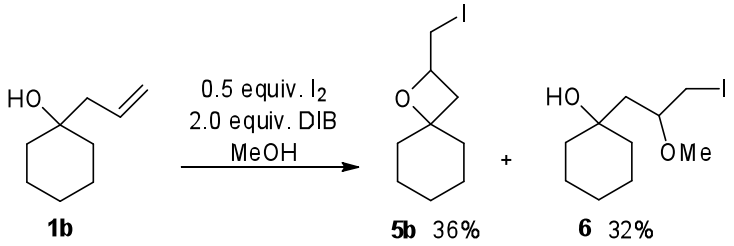
*Oxidation of **1a** with HTIB in MeCN*



To a stirred solution of **1a** (0.094 g, 0.50 mmol) in anhydrous MeCN (1.5 mL) at rt was added HTIB (0.196 g, 0.500 mmol). The mixture of stirred at rt for 20 min. The reaction was quenched with aqueous saturated solution of $NaHCO_3$ (5 mL) and with H_2O (10 mL). The aqueous phase was extracted with AcOEt (5 X 5 mL). The combined organic phase was washed with brine (5 mL) and dried over anhydrous $MgSO_4$. The solvent was removed under reduced pressure. The crude product was purified by flash chromatography (gradient elution, 19:1 to 9:1, hexanes:AcOEt), giving **3** (0.021 g, 0.12 mmol, 25%), as a slightly yellow oil.

*4-Allyl-1,2-dihydronaphthalene (**3**):* IR (film): 738, 751, 767, 912, 994, 1437, 1450, 1486, 1639, 2831, 2885, 2931, 2976, 3019, 3029, 3061. ^{1}H NMR (400 MHz, $CDCl_3$) δ: 2.26-2.32 (m, 2H), 2.75-2.79 (m, 1H), 3.20-3.22 (m, 2H), 5.09 (ddd, J = 1.7, 3.3, and 10.1 Hz, 1H), 5.14 (ddd, J = 1.7, 3.5 and 16.6 Hz, 1H), 5.89-5.92 (m, 1H), 5.97 (ddt, J = 6.4, 10.1, and 16.6 Hz, 1H), 7.14-7.27 (m, 4H); ^{13}C NMR (50 MHz, $CDCl_3$) δ: 23.2, 28.3, 37.0, 116.1, 122.8, 126.0, 126.2, 126.7, 127.5, 134.7, 134.9, 136.6, 136.7. LRMS *m/z* (%): 170 ($M^{\cdot+}$, 14), 152 (7), 141 (27), 128 (100), 115 (42), 102 (15), 77 (20), 63 (37).

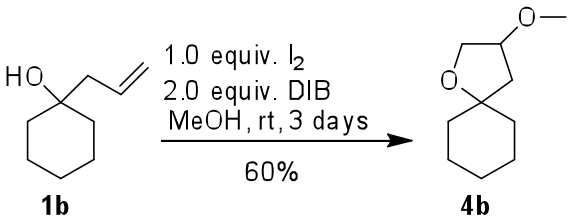
*Oxidation of **1b** with DIB/I_2: Characterization of **5b** and **6**.*



To a stirred solution of **1b** (0.035 g, 0.25 mmol) and I_2 (0.032 g, 0.13 mmol) in MeOH (1 mL) at rt was added DIB (0.161 g, 0.500 mmol). The mixture was stirred for 16 h at rt. The reaction was quenched with 10% solution of Na_2SO_3 (6 mL). The aqueous phase was extracted with EtOAc (4x4 mL). The combined organic phase was washed with saturated solution of $NaHCO_3$ (4 mL), with brine (4 mL), and dried over anhydrous $MgSO_4$. The solvent was removed under reduced pressure. The crude product was purified by flash chromatography (35% hexane, 5% Et_2O, 60% CH_2Cl_2), giving **5b**[18] (0.024 g, 36%) and **6** (0.024 g, 32%), both as a colorless oil.

*1-(3-Iodo-2-methoxypropyl)cyclohexanol (**6**):* IR (film): 1080, 1446, 2856, 2931, 3429 cm^{-1}. ^1H NMR (400 MHz, $CDCl_3$) δ: 1.29-1.65 (m, 11H), 1.69 (dd, *J* 9.7, 14.8 Hz, 1H), 1.86 (dd, *J* 2.7, 14.8 Hz, 1H), 3.23 (dd, *J* 7.0, 10.4 Hz, 1H), 3.33 (dd, *J* 2.7, 10.4 Hz, 1H), 3.38 (s, 3H), 3.45 (dddd, *J* 2.7, 2.7, 7.0, 9.7 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 9.1, 22.2, 22.4, 25.8, 37.3, 39.0, 44.9, 56.3, 70.6, 77.3. LRMS m/z (%) 298 ($M^{\cdot+}$, 3), 242 (2), 185 (29), 157 (9), 139 (25), 99 (21), 81 (30), 69 (21). HRMS [ESI(+)] calc. for $[C_{10}H_{19}IO_2+Na]^+$ 321.03219, found 321.03225.

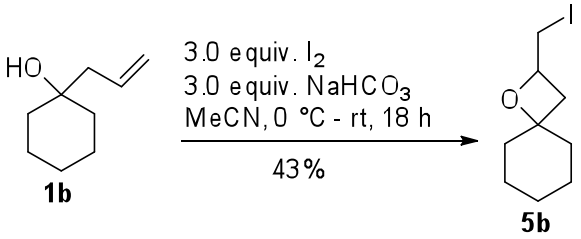
*Oxidation of **1b** with 2.0 equiv of DIB and 1.0 equiv of I_2*



To a stirred solution of **1b** (0.035 g, 0.25 mmol) and I_2 (0.064 g, 0.25 mmol) in MeOH (1.0 mL) at rt was added DIB (0.161 g, 0.500 mmol). The reaction was stirred for 3 days and quenched with 10% aqueous solution of Na_2SO_3 (6 mL). The aqueous phase was extracted with Et_2O (5 mL +

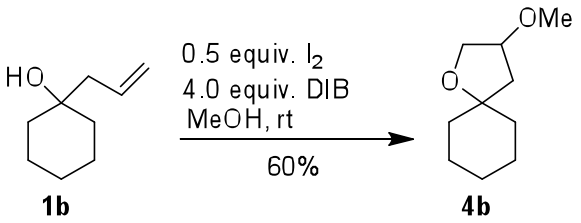
3 X 4 mL). The combined organic phase was washed with $NaHCO_3$ (4 mL), with brine (4 mL), and dried over anhydrous $MgSO_4$. The solvent was removed under reduced pressure. The solvent was removed under reduced pressure. The crude product was purified by flash chromatography (10% Et_2O in pentane), giving **4b** (0.026 g, 015 mmol, 60%), as colorless oil.

*Oxidation of **1b** with I_2 in $NaHCO_3$*



To a stirred mixture of **1b** (0.035 g, 0.25 mmol) and $NaHCO_3$ (0.063 g, 0.75 mmol) in anhydrous MeCN (1.0 mL) at 0 °C, was added I_2 (0.190 g, 0.750 mmol). The flask was protected from the light. The mixture was stirred for 18 h at rt. The reaction was quenched with 10% aqueous solution of Na_2SO_3 (6 mL). The aqueous phase was extracted with AcOEt (5 mL + 3 X 4 mL). The combined organic phase was washed with aqueous saturated solution of $NaHCO_3$ (4 mL), with brine (4 mL), and dried with anhydrous $MgSO_4$. The solvent was removed under reduced pressure. The crude product was purified by flash chromatography (10% Et_2O in CH_2Cl_2), giving **5b**[18] (0.029 g, 0.11 mmol, 43%).

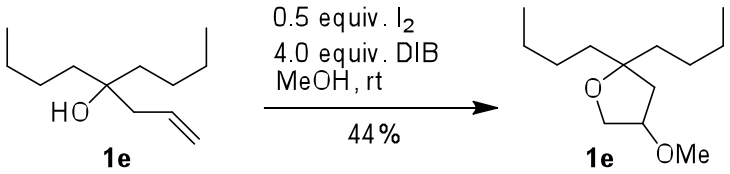
*Oxidation of **1b** with 4.0 equiv of DIB and 0.50 equiv of I_2. General Procedure A: Reaction of Homoallylic Alcohols with 4.0 equiv of DIB and 0.50 equiv of I_2.*



To a stirred solution of **1b** (0.035 g, 0.25 mmol) and I_2 (0.032 g, 0.13 mmol) in MeOH (1.0 mL) at rt was added DIB (0.161 g, 0.500 mmol). The mixture was stirred at rt for 3 days. During this time, two more portions of DIB (0.081 g, 0.25 mmol) were needed after 24h and 48h. The reaction

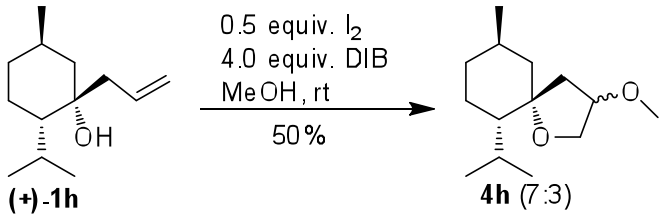
was quenched with 10% aqueous solution of Na_2SO_3 10% (6 mL). The aqueous phase was extracted with Et_2O (5 mL + 3 X 4 mL). The combined organic phase was washed with aqueous saturated solution of $NaHCO_3$ (4 mL), with brine NaCl (4 mL), and dried with anhydrous $MgSO_4$. The solvent was removed under reduced pressure. The crude product was purified by flash chromatography (10% Et_2O in pentane), giving **4b** (0.026 g, 0.15 mmol, 60%).

*Oxidation of **1e** with 4.0 equiv of DIB and 0.50 equiv of I_2.*



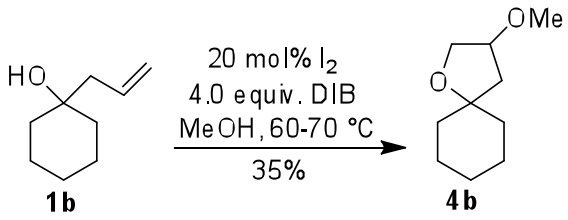
The reaction was performed according to the general procedure A, but using **1e** (0.0461 g, 0.250 mmol), I_2 (0.032g, 0.13 mmol) and DIB (0.161 g, 0.500 mmol) in MeOH (1.0 mL). The mixture was stirred at rt for 3 days. During this time, two more portions of DIB (0.081 g, 0.25 mmol) were added after 19 h and 25 h. After work-up and purification by flash chromatography (10% AcOEt in hexanes), **4e** (0.0235 g, 0.110 mmol, 44%) was obtained as a colorless oil.

*Oxidation of (+)-**1h** with 4.0 equiv of DIB and with 0.50 equiv of I_2*



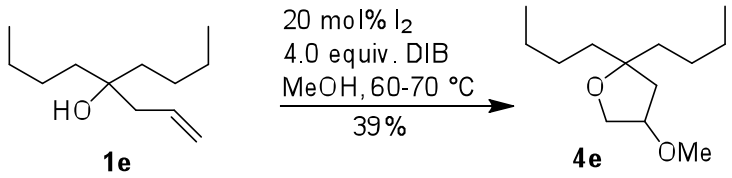
The reaction was performed according to the general procedure A, but using (+)-**1h** (0.049 g, 0.25 mmol), I_2 (0.032g, 0.13 mmol) and DIB (0.161 g, 0.500 mmol) in MeOH (1.0 mL). The mixture was stirred at rt for 7 days. During this time, two more portions of DIB (0.081 g, 0.25 mmol) were needed after 2 days and 4 days. After work-up and purification by flash chromatography (gradient elution, 0 to 5% Et_2O in CH_2Cl_2), **4h** (0.028 g, 0.13 mmol, 50%) was obtained as a colorless oil and as a 7:3 mixture of diastereomers.

*Oxidation of **1b** with 4.0 equiv of DIB and with 20 mol% of I_2. General Procedure B: Reaction of Homoallylic Alcohols with 4.0 equiv of DIB and 20 mol% of I_2.*



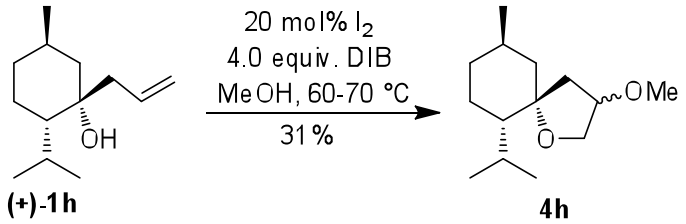
To stirred solution of **1b** (0.035 g, 0.25 mmol) and I_2 (0.013 g, 0.050 mmol) in MeOH (1.0 mL) at rt was added DIB (0.081 g, 0.25 mmol). The mixture was stirred for 3 days at 60-70 °C. During this time, three more portions of DIB (0.081 g, 0.25 mmol) were added after 21h, 44h and 53h. The reaction was quenched with 10% aqueous solution of Na_2SO_3 10% (6 mL). The aqueous phase was extracted with Et_2O (5 mL + 3 X 4 mL). The combined organic phase was washed with aqueous saturated solution of $NaHCO_3$ (4 mL), with brine NaCl (4 mL), and dried with anhydrous $MgSO_4$. The solvent was removed under reduced pressure. The crude product was purified by flash chromatography (10% Et_2O in pentane), giving **4b** (0.015 g, 0.086 mmol, 35%).

*Oxidation of **1e** with 4.0 equiv of DIB and with 20 mol% of I_2.*



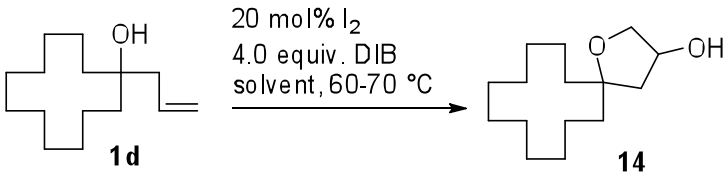
The reaction was performed according to the general procedure B, but using **1e** (0.0461 g, 0.250 mmol) and I_2 (0.013 g, 0.050 mmol) in MeOH (1.0 mL) at rt was added DIB (0.081 g, 0.25 mmol). The mixture was stirred for 4 days at 60-70 °C. During this time, three more portions of DIB (0.081 g, 0.25 mmol) were needed after 20h, 52h and 72h. After work-up and purification by flash chromatography (10% AcOEt em hexano), **4e** (0.0207 g, 0.0966 mmol, 39%) was obtained as a colorless oil.

*Oxidation of (+)-**1h** with 4.0 equiv of DIB and with 20 mol% of I_2.*



The reaction was performed according to the general procedure B, but using **(+)-1h** (0.049 g, 0.25 mmol) and I_2 (0.013 g, 0.050 mmol) in MeOH (1.0 mL) at rt was added DIB (0.081 g, 0.25 mmol). The mixture was stirred for 6 days at 60-70 °C. During this time, three more portions of DIB (0.081 g, 0.25 mmol) were needed after 7 h, 49 h and 81 h. After work-up and purification by flash chromatography (gradient elution, 0 to 5% Et_2O in CH_2Cl_2), **4h** (0.018 g, 0.078 mmol, 31%) was obtained as a colorless oil and as a 3:2 mixture of diastereomers.

*Reaction of **1d** with 4.0 equiv of DIB and with 20 mol % de I_2 in H_2O.*

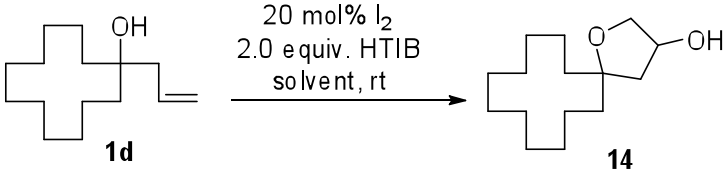


The reaction was performed according to the general procedure, but using **1d** (0.056 g, 0.25 mmol), I_2 (0.013 g, 0.050 mmol), and DIB (0.081 g, 0.25 mmol) at 60-70 °C. The solvent was MeOH/H_2O (2.0 mL), MeCN/H_2O (1.0 mL), or *t*-BuOH/H_2O (1.0 mL). After work-up and purification by flash chromatography (20% AcOEt in hexanes), **14** was obtained in the yield indicated below, as colorless oil.

Solvent	Time	Yield
MeOH/H_2O 3:1	5 days	**14** (0.010 g, 0.042 mmol, 17%) + **1d** (0.018 g, 0.072, 29%)
MeCN/H_2O 10:1	5 days	(0.014 g, 0.059 mmol, 23%)
t-BuOH/H_2O 10:1	8 days	(0.011 g, 0.047 mmol, 18%)

*1-Oxa-spiro[4,11]hexadecan-3-ol (**14**)*: IR (film): 1059, 1445, 1471, 1728, 2846, 2941, 3388 cm^{-1}. ^1H NMR (400 MHz, $CDCl_3$) δ: 1.35 (s, 18H + OH), 1.52-1.63 (m, 2H), 1.72 (ddd, *J* = 1.1, 2.7 and 13.5 Hz, 1H), 1.77-1.89 (m, 2H), 1.95 (dd, *J* = 6.7 and 13.5 Hz, 1H), 3.73 (ddd, *J* = 1.1, 2.7, and 9.9 Hz, 1H), 3.90 (dd, *J* = 4.7 and 9.9 Hz, 1H), 4.47 (dddd, *J* = 2.7, 2.7, 4.7, and 6.7 Hz, 1H); ^{13}C NMR (75 MHz, $CDCl_3$) δ: 19.9, 20.1, 22.2, 22.5, 26.0, 26.4, 33.2, 34.1, 46.2, 73.2, 73.6, 85.9; LRMS *m/z* (%): 240 ($M^{\cdot+}$, 24), 197 (23), 169 (37), 127 (58), 113 (100), 95 (46); HRMS [ESI(+)] calc. for $[C_{15}H_{28}O_2 + Na]^+$ 263.19870, found 263.19815.

*Reaction of **1d** with 2.0 equiv of HTIB and with 20 mol % de I_2 in H_2O.*



The reaction was performed according to the general procedure, but using **1d** (0.056 g, 0.25 mmol), I_2 (0.013 g, 0.050 mmol), and HTIB (0.196 g, 0.500 mmol). The solvent and temperate were MeCN/H_2O (2.5 mL) at rt, DME/H_2O (1.0 mL) at 45-50 °C, and *t*-BuOH/H_2O (1.0 mL) at 45-50 °C. After work-up and purification by flash chromatography (20% AcOEt in hexanes), **14** was obtained in the yield indicated below, as colorless oil.

Solvent	Time	Rendimento
DME/H_2O 10:1	1 day	(0.0179 g, 0.0744 mmol, 30%)
MeCN/H_2O 4:1	4 days	(0.0202 g, 0.0840 mmol, 33%)
t-BuOH/H_2O 10:1	8 days	(0.0176 g, 0.0732 mmol, 29%)

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