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Supporting Information

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General Remarks

All experiments were carried out under argon atmosphere using standard Schlenk techniques. THF, toluene and CH$_2$Cl$_2$ were dried and distilled by standard procedures. Optical rotations: Perkin Elmer Model 241, measurements were carried out at 20 or 22 °C, $\lambda = 589$ nm. $^1$H and $^{13}$C NMR (300 or 400 and 75 or 100 MHz, respectively) spectra were recorded in CDCl$_3$ using TMS as internal standard. H$_3$PO$_4$ was used as external standard for $^{31}$P NMR (121 or 161 MHz). Chemical shifts are listed in ppm and spin-spin coupling constants, $J$, are given in Hz. Elemental analysis were measures with a Heraeus Model CHN Rapid. HRMS were recorded on a Finnigan MAT 95 system. Complexes 1a-g and 1i are known compounds.$^{[1]}$ Complex 1h is new and was synthesized as follows:

(S)-N-[8-(Di(3,5-dimethylphenyl)-phosphinoyl)naphthyl]-S-isobutyl-S-phenyl-sulfoximine
Under an argon atmosphere, a 50 mL Schlenk-flask was charged with (S)-S-isobutyl-S-phenyl-sulfoxime (5.5 mmol), 1-[di-(3,5-dimethylphenyl)-phosphinoyl]-8-iodonaphthalene (5.0 mmol), CuI (0.5 mmol), and Cs₂CO₃ (12.5 mmol). The mixture was dissolved in distilled toluene (20 mL). Then, DMEDA (1.0 mmol) was added. After being heated to 110 °C over night, the mixture was cooled to room temperature and neutralized with an aqueous solution of HCl (2 M). The aqueous layer was extracted with CH₂Cl₂ (3 x 20 mL) and the combined organic extracts were dried over Na₂SO₄, filtered and concentrated under reduced pressure. The product was purified by flash chromatography (silica gel, pentane/EtOAc, 1:1~1:5).

Yield: 86%, [α]D²² = −147.2 (c = 0.90, CHCl₃); ¹H NMR (300 MHz, CDCl₃): δ = 8.29 (br, 2H, Ar-H), 7.82 (d, 1H, J = 7.0 Hz, Ar-H), 7.37-7.42 (m, 3H, Ar-H), 7.03-7.30 (m, 11H, Ar-H), 3.78 (br, 1H, CH₂), 2.57 (br, 1H, CH₂), 2.27 (s, 12H, CH₃), 1.78-1.81 (m, 1H, CH), 0.92 (d, 3H, J = 6.9 Hz, CH₃), 0.58 (d, 3H, J = 6.6 Hz, CH₃); ¹³C NMR (75 MHz, CDCl₃): δ = 186.7, 142.7, 138.8, 138.4, 137.7, 137.4, 137.3, 137.1, 137.0, 135.9, 135.8, 133.6 (d, J_CP = 3.1 Hz), 132.6, 132.4, 132.1 (d, J_CP = 3.0 Hz), 131.1 (d, J_CP = 5.4 Hz), 130.5 (d, J_CP = 8.3 Hz), 130.3, 129.1, 127.8, 126.8, 124.0, 123.8, 121.0, 118.0, 62.2, 23.1, 22.9, 22.6, 21.6, 21.5; ³¹P NMR (121.5 MHz, CDCl₃): δ = 38.0;

HR-MS: m/z=found 579.2363, calcd. for C₃₆H₃₈NO₂PS: 579.2361.

(S)-N-[8-[Di(3,5-dimethylphenyl)phosphanylnaphthyl]-S-isobutyl-S-phenyl-sulfoximine
Under an argon atmosphere, a dry 100 mL Schlenk-tube was charged with (S)-N-[8-(di(3,5-dimethylphenyl)-phosphinoyl)naphthyl]-S-isobutyl-S-phenyl-sulfoximine (1.0 mmol) and distilled toluene (12-20 mL). Then NEt₃ (0.8 g, 1.1 mL, 8 mmol) and Cl₃SiH (0.8 g, 0.6 mL, 6 mmol) were added. After stirring at 105 °C for 16 h, the reaction mixture was cooled to room temperature under argon and degassed water (30 mL) was added. Then, the mixture was filtered through celite and washed three times with CH₂Cl₂. The aqueous layer was extracted with CH₂Cl₂ (3 x 20 mL) and the combined organic extracts were dried over Na₂SO₄, filtered and concentrated under reduced pressure. The product was then purified by flash chromatography (silica gel, pentane/EtOAc, 10:1~3:1).

Yield: 47%, [α]D²² = -212.7 (c = 0.6, CHCl₃); ¹H NMR (300 MHz, CDCl₃): δ = 7.75 (d, 2H, J = 7.9 Hz, Ar-H), 7.68 (d, 2H, J = 7.4 Hz, Ar-H), 7.47-7.53 (m, 1H, Ar-H), 7.37-7.42 (m, 2H, Ar-H), 7.32 (d, 1H, J = 6.9 Hz, Ar-H), 7.23 (t, 1H, J = 7.7 Hz, Ar-H), 7.08 (t, 1H, J = 7.7 Hz, Ar-H), 6.91-6.97 (m, 8H, Ar-H), 3.20 (m, 2H, CH₂), 2.28 (s, 6H, CH₃), 2.26 (s, 6H, CH₃), 2.09-2.16 (m, 2H, CH), 1.05 (d, 3H, J = 6.7 Hz, CH₃), 0.76 (d, 3H, J = 6.7 Hz, CH₃); ¹³C NMR (75MHz, CDCl₃): δ = 143.0, 138.1, 137.6 (d, JCP = 6.6 Hz), 137.4 (d, JCP = 7.2 Hz), 135.7, 133.9, 132.7, 132.2, 131.9, 131.7, 129.8, 129.6, 129.3, 129.2, 125.9, 125.3, 121.4, 116.7, 63.5, 23.5, 22.7, 22.5, 21.4; ³¹P NMR (121.5 MHz, CDCl₃): δ = -2.7; HR-MS: m/z=found 381.1645, calcd. for C₃₆H₃₈NOPS–C₁₀H₁₄OS = C₂₆H₂₄NP: 381.1646.

**Preparation of complex 1h**

Under an argon atmosphere, a dry 100 mL Schlenk-tube was charged with:

(S)-N-[8-(di(3,5-dimethylphenyl)-phosphinoyl)naphthyl]-S-isobutyl-S-phenyl-sulfoximine (1.0 mmol) and distilled toluene (12-20 mL). Then NEt₃ (0.8 g, 1.1 mL, 8 mmol) and Cl₃SiH (0.8 g, 0.6 mL, 6 mmol) were added. After stirring at 105 °C for 16 h, the reaction mixture was cooled to room temperature under argon and degassed water (30 mL) was added. Then, the mixture was filtered through celite and washed three times with CH₂Cl₂. The aqueous layer was extracted with CH₂Cl₂ (3 x 20 mL) and the combined organic extracts were dried over Na₂SO₄, filtered and concentrated under reduced pressure. The product was then purified by flash chromatography (silica gel, pentane/EtOAc, 10:1~3:1).

Yield: 47%, [α]D²² = -212.7 (c = 0.6, CHCl₃); ¹H NMR (300 MHz, CDCl₃): δ = 7.75 (d, 2H, J = 7.9 Hz, Ar-H), 7.68 (d, 2H, J = 7.4 Hz, Ar-H), 7.47-7.53 (m, 1H, Ar-H), 7.37-7.42 (m, 2H, Ar-H), 7.32 (d, 1H, J = 6.9 Hz, Ar-H), 7.23 (t, 1H, J = 7.7 Hz, Ar-H), 7.08 (t, 1H, J = 7.7 Hz, Ar-H), 6.91-6.97 (m, 8H, Ar-H), 3.20 (m, 2H, CH₂), 2.28 (s, 6H, CH₃), 2.26 (s, 6H, CH₃), 2.09-2.16 (m, 2H, CH), 1.05 (d, 3H, J = 6.7 Hz, CH₃), 0.76 (d, 3H, J = 6.7 Hz, CH₃); ¹³C NMR (75MHz, CDCl₃): δ = 143.0, 138.1, 137.6 (d, JCP = 6.6 Hz), 137.4 (d, JCP = 7.2 Hz), 135.7, 133.9, 132.7, 132.2, 131.9, 131.7, 129.8, 129.6, 129.3, 129.2, 125.9, 125.3, 121.4, 116.7, 63.5, 23.5, 22.7, 22.5, 21.4; ³¹P NMR (121.5 MHz, CDCl₃): δ = -2.7; HR-MS: m/z=found 381.1645, calcd.

for C₃₆H₃₈NOPS–C₁₀H₁₄OS = C₂₆H₂₄NP: 381.1646.
Under an argon atmosphere, a dry Schlenk-tube was charged with (S)-N-[8-(diphenyl-phosphanylnaphthyl]-S-isobutyl-S-phenylsulfoximine (52 mg, 0.1 mmol), [Ir(COD)Cl]₂ (34 mg, 0.05 mmol), NaBArF (133 mg, 0.15 mmol) and dry CH₂Cl₂ (3 mL). After stirring at room temperature for 2 h, the product was purified by flash chromatography (silica gel, pentane/CH₂Cl₂, 1:1~1:2) to afford the complex as orange-yellow foaming solid.

Yield: 68%, [α]₂° = -247.5 (c = 0.48, CHCl₃); ¹H NMR (300 MHz, CDCl₃): δ = 7.83-7.85 (m, 1H, Ar-H), 7.63 (m, 8H, Ar-H), 7.18-7.45 (m, 12H, Ar-H), 6.98-7.06 (m, 6H, Ar-H), 6.49-6.52 (m, 2H, Ar-H), 5.38 (br, 1H, CH), 5.02-5.04 (m, 1H, CH), 4.43 (dd, 1H, J = 5.6, 15.0 Hz, CH), 3.71 (br, 1H, CH), 3.06-3.08 (m, 1H, CH), 2.12-2.44 (m, 4H, CH₂), 2.30 (s, 6h, CH₃), 2.16 (s, 3H, CH₃), 2.12 (s, 3H, CH₃), 2.01-2.10 (m, 1H, CH₂), 1.83-1.93 (m, 2H, CH₂), 1.73 (dd, 1H, J = 6.7, 15.0 Hz, CH), 1.56-1.63 (m, 1H, CH₂), 1.36-1.39 (m, 1H, CH₂); ³¹P NMR (121.5 MHz, CDCl₃): δ = 19.2; +ESIMS, MeOH and CHCl₃: m/z = found 863.9 ([M-BArF]⁺, 100%)

**General procedure for the preparation of compounds 4a-k**

Literature procedures were used to prepare enones 4a-h.²

To a suspension of NaH (2.0 g, 60% in mineral oil, 30 mmol) in THF (20 mL), a solution of triethyl phosphonoacetate (7.02 g, 30 mmol) in THF (10 mL) was slowly added. The mixture was stirred at room temperature for 30 min. Then, ketone (20 mmol) in THF (10 mL) was added at 0 °C, and the mixture was stirred at room temperature over night. After confirmation of consumption of ketone by TLC, a solution of saturated aqueous sodium bicarbonate (30 mL) was added. The mixture was extracted with ethyl acetate (3 x 50 mL), washed with brine (30 mL) and dried over Na₂SO₄. After concentration of the organic phase, the residue was purified by silica-gel column chromatography (pentane : ethyl acetate as eluent 30:1~10:1) to give (E)-ester and (Z)-ester.

To a solution of the (E)-ester (15 mmol) and N,O-dimethylhydroxyamine hydrochloride (2.93 g, 30 mmol) in THF (30 mL), a solution of i-PrMgCl (32.5 mL, 2M in THF) was slowly added at −5 °C. The mixture was stirred for 30 min. and then
treated with a saturated aqueous NH₄Cl (20 mL). The mixture was extracted with ethyl acetate (3 x 30 mL), washed with brine (30 mL) and dried over Na₂SO₄. After concentration of organic phase, the residue was purified by silica-gel column chromatography (pentane : ethyl acetate as eluent) to give the N-methoxy amide.

At –30 °C, a solution of RMgBr (15 mmol) in THF (20 mL) was slowly added to a solution of the N-methoxy amide (2.05 g, 10 mmol) in THF (20 mL). After addition, the mixture was stirred at –5 °C for 30 min. and then treated with a saturated aqueous NH₄Cl solution (20 mL). The mixture was extracted with ethyl acetate (3 x 30 mL), washed with brine (30 mL) and dried over Na₂SO₄. After concentration of the organic phase, the residue was purified by silica-gel column chromatography (pentane : ethyl acetate as eluent) to give (E)-enones.

\[ \text{(E)-1,3-Diphenyl-2-buten-1-one [(E)-4a]} \]

\[ \text{\( ^1 \)H NMR (300 MHz, CDCl}_3\): \( \delta = 8.00-8.04 \text{ (m, 2H)}, 7.41-7.88 \text{ (m, 8H)}, 7.19 \text{ (s, 1H)}, 2.62 \text{ (s, 3H); \( ^{13} \)C NMR (75 MHz, CDCl}_3\): \( \delta = 191.9, 155.1, 142.8, 139.4, 132.6, 129.1, 128.6, 128.5, 128.3, 126.5, 122.1, 18.9.} \]

\[ \text{(E)-1,3-Diphenyl-2-penten-1-one [(E)-4b]} \]

\[ \text{\( ^1 \)H NMR (300 MHz, CDCl}_3\): \( \delta = 8.01-8.05 \text{ (m, 2H)}, 7.40-7.60 \text{ (m, 8H)}, 7.08 \text{ (s, 1H)}, 3.12 \text{ (q, \( J = 7.4 \) Hz, 2H)}, 1.18 \text{ (t, \( J = 7.4 \) Hz, 3H); \( ^{13} \)C NMR (75 MHz, CDCl}_3\): \( \delta = 191.5, 161.4, 141.6, 139.3, 132.6, 129.0, 128.7, 128.6, 128.4, 126.9, 121.9, 25.1, 13.7; HR-MS: \( m/z = \text{found 236.1202, calcd. for C}_{17}H_{16}O: 120.1201.} \]

\[ \text{(E)-4-Methyl-1,3-diphenyl-2-penten-1-one [(E)-4c]} \]

\[ \text{\( ^1 \)H NMR (400 MHz, CDCl}_3\): \( \delta = 7.99-8.01 \text{ (m, 2H)}, 7.31-7.57 \text{ (m, 8H)}, 6.70 \text{ (s, 1H)}, 3.87-3.94 \text{ (m, 1H)}, 1.15 \text{ (d, \( J = 7.2 \) Hz, 6H); \( ^{13} \)C
NMR (100 MHz, CDCl₃): δ = 191.9, 165.6, 141.2, 138.9, 132.6, 128.5, 128.4, 127.9, 127.8, 127.6, 123.8, 30.7, 21.7; HR-MS: m/z=found 250.1363, calcd. for C₁₈H₁₈O: 250.1358.

(Z)-4-Methyl-1,3-diphenyl-2-penten-1-one [(Z)-4c]

¹H NMR (400 MHz, CDCl₃): δ = 7.81-7.85 (m, 2H), 7.42-7.46 (m, 1H), 7.32-7.36 (m, 2H), 7.18-7.26 (m, 3H), 7.10-7.13 (m, 1H), 6.60 (s, 1H), 2.80-2.87 (m, 1H), 1.20 (d, 6H, J = 6.9 Hz); ¹³C NMR (100 MHz, CDCl₃): δ = 193.9, 162.4, 140.2, 138.3, 132.4, 128.7, 128.2, 127.9, 127.8, 127.5, 121.8, 36.9, 21.7.

(E)-3-Cyclohexyl-1,3-diphenylpropenone [(E)-4d]

¹H NMR (400 MHz, CDCl₃): δ = 7.98-8.00 (m, 2H), 7.28-7.56 (m, 8H), 6.68 (s, 1H), 3.53-3.61 (m, 1H), 1.64-1.82 (m, 5H), 1.27-1.45 (m, 4H), 1.03-1.14 (m, 1H); ¹³C NMR (100 MHz, CDCl₃): δ = 191.8, 165.6, 141.9, 139.0, 132.6, 128.5, 128.4, 127.8, 127.7, 127.5, 123.8, 41.6, 31.8, 26.5, 26.1; anal. calcd. for C₂₁H₂₂O (290.17): C 86.85, H 7.64; found C 86.37, H 7.63.

(E)-1-(4-Chlorophenyl)-4-methyl-3-phenyl-2-penten-1-one [(E)-4e]

¹H NMR (400 MHz, CDCl₃): δ = 7.90-7.94 (m, 2H), 7.28-7.44 (m, 7H), 6.64 (s, 1H), 3.85-3.92 (m, 1H), 1.13 (d, 6H, J = 6.9 Hz); ¹³C NMR (100 MHz, CDCl₃): δ = 190.4, 166.6, 141.0, 139.0, 137.2, 129.8, 128.8, 127.9, 127.8, 127.7, 123.1, 30.7, 21.6; anal. calcd. for C₁₈H₁₇ClO (284.10): C 75.92, H 6.02; found C 75.69, H 5.81.

(E)-1-(4-Methoxyphenyl)-4-methyl-3-phenyl-2-penten-1-one [(E)-4f]
$^1$H NMR (400 MHz, CDCl$_3$): $\delta$ = 7.87-7.91 (m, 2H), 7.20-7.30 (m, 5H), 6.82-6.86 (m, 2H), 6.54 (s, 1H), 3.71-3.78 (m, 1H), 3.76 (s, 3H), 1.02 (d, 6H, $J$ = 6.9 Hz); $^{13}$C NMR (100 MHz, CDCl$_3$): $\delta$ = 190.7, 164.1, 163.2, 141.3, 131.9, 130.7, 127.9, 127.8, 127.7, 127.5, 124.0, 113.7, 55.5, 30.7, 21.7; anal. calcd. for C$_{19}$H$_{20}$O$_2$ (280.15): C 81.40, H 7.19; found C 81.08, H 7.08.

**(E)-3-Methyl-1,5-diphenyl-2-penten-1-one [(E)-4g]**

$^1$H NMR (400 MHz, CDCl$_3$): $\delta$ = 7.76-7.79 (m, 2H), 7.21-7.53 (m, 8H), 6.62 (s, 1H), 2.89 (t, $J$ = 7.8 Hz, 1H), 2.57 (t, $J$ = 7.7 Hz, 1H), 2.23 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$): $\delta$ = 191.7, 157.9, 141.0, 139.1, 132.3, 128.5, 128.4, 128.3, 128.2, 126.1, 121.6, 43.1, 34.1, 19.9; HR-MS: m/z = found 250.1361, calcd. for C$_{18}$H$_{18}$O: 250.1358.

**(E)-4-Phenyl-3-penten-2-one [(E)-4h]**

$^1$H NMR (300 MHz, CDCl$_3$): $\delta$ = 7.48-7.52 (m, 2H), 7.37-7.42 (m, 3H), 6.53 (s, 1H), 2.56 (s, 3H), 2.32 (s, 3H); $^{13}$C NMR (75 MHz, CDCl$_3$): $\delta$ = 198.9, 153.9, 142.5, 129.1, 128.6, 128.5, 128.3, 127.2, 126.5, 124.5, 32.2, 27.3, 18.4.

**General Procedure for Hydrogenation**

Complex 1a (4.1 mg, 0.0025 mmol) and substrate 4 (0.25 mmol) were placed in a 5 mL vial equipped with a stirrer bar. This vial was then put into an argon-filled steel autoclave. To the mixture was added toluene (1.0 mL) under an argon atmosphere. The autoclave was then closed, purged three times with hydrogen (less than the pressure needed) and finally pressurized to the value needed. The reaction mixture was stirred for the indicated period of time, and then the hydrogen gas slowly released. The conversion of the substrate was determined by $^1$H NMR spectroscopy of the crude reaction mixture, and the product was purified by chromatography with
pentane/ethyl acetate (10:1). Enantiomeric ratios were analyzed with HPLC using a Chiralcel column.

(S)-1,3-Diphenyl-butan-1-one (5a) \(^{[2a]}\)

81% ee, \([\alpha]_D^{22} = +0.57\) (c = 1.0, CHCl\(_3\)); HPLC separation conditions: Chiralcel AD-H, 230 nm, 30:1 heptane / \(i\)-PrOH; 0.5 mL min\(^{-1}\), \(t_R = 14.2\) min \((S)\), 16.3 min \((R)\); \(^1\)H NMR (300 MHz, CDCl\(_3\)): \(\delta = 7.94-7.98\) (m, 2H), 7.54-7.60 (m, 1H), 7.43-7.50 (m, 2H), 7.29-7.36 (m, 4H), 7.19-7.25 (m, 1H), 3.50-3.57 (m, 1H), 3.17-3.37 (m, 2H), 1.37 (d, 3H, \(J = 6.9\) Hz); \(^{13}\)C NMR (75 MHz, CDCl\(_3\)): \(\delta = 199.1, 146.6, 137.2, 133.0, 128.6, 128.5, 128.1, 126.9, 126.3, 47.0, 35.6, 21.9\).

(S)-1,3-Diphenyl-pentan-1-one (5b) \(^{[3]}\)

89% ee, \([\alpha]_D^{22} = +2.49\) (c = 1.1, CHCl\(_3\)); HPLC separation conditions: Chiralcel OJ, 254 nm, 97.3 heptane / \(i\)-PrOH; 1.0 mL min\(^{-1}\), \(t_R = 16.9\) min \((S)\), 21.5 min \((R)\); \(^1\)H NMR (400 MHz, CDCl\(_3\)): \(\delta = 7.81-7.83\) (m, 2H), 7.43-7.47 (m, 1H), 7.33-7.37 (m, 2H), 7.08-7.23 (m, 5H), 3.14-3.25 (m, 3H), 1.68-1.75 (m, 1H), 1.51-1.62 (m, 1H), 0.78 (t, 3H, \(J = 7.5\) Hz); \(^{13}\)C NMR (100 MHz, CDCl\(_3\)): \(\delta = 199.1, 144.6, 137.2, 132.9, 128.5, 128.4, 128.0, 127.6, 126.2, 45.7, 43.1, 29.3, 12.2\).
(+)-4-Methyl-1,3-diphenyl-pentan-1-one (5c)\(^4\)

97% ee, \([\alpha]^2_{D} = +0.75\) (c = 1.2, CHCl\(_3\)); HPLC separation conditions: Chiralcel OJ, 254 nm, 94:6 heptane / i-PrOH; 0.6 mLmin\(^{-1}\), \(t_R = 22.0\) min, 24.5 min; \(^1\)H NMR (400 MHz, CDCl\(_3\)): \(\delta = 7.86\text{-}7.89\) (m, 2H), 7.50-7.54 (m, 1H), 7.40-7.43 (m, 2H), 7.23-7.27 (m, 2H), 7.13-7.19 (m, 3H), 3.66 (d, 2H, \(J = 6.9\) Hz), 3.14-3.20 (m, 1H), 1.90-2.00 (m, 1H), 0.99 (d, 3H, \(J = 6.6\) Hz), 0.79 (d, 3H, \(J = 6.9\) Hz); \(^{13}\)C NMR (100 MHz, CDCl\(_3\)): \(\delta = 199.3, 143.6, 137.3, 132.8, 128.4, 128.3, 128.0, 127.9, 126.1, 47.9, 42.6, 33.4, 21.1, 20.5\).

(+)-3-Cyclohexyl-1,3-diphenyl-propan-1-one (5d)\(^4\)

97% ee, \([\alpha]^2_{D} = +5.6\) (c = 1.4, CHCl\(_3\)); HPLC separation conditions: Chiralcel OD-H, 254 nm, 98:2 heptane / i-PrOH; 0.5 mLmin\(^{-1}\), \(t_R = 11.8\) min, 12.7 min. \(^1\)H NMR (400 MHz, CDCl\(_3\)): \(\delta = 7.86\text{-}7.88\) (m, 2H), 7.50-7.54 (m, 1H), 7.39-7.43 (m, 2H), 7.22-7.26 (m, 2H), 7.13-7.17 (m, 3H), 3.42 (dd, 1H, \(J = 5.5, 15.5\) Hz), 3.30 (dd, 1H, \(J = 8.0, 16.5\) Hz), 3.17-3.21 (m, 1H), 1.48-1.87 (m, 6H), 0.83-1.25 (m, 5H); \(^{13}\)C NMR (100 MHz, CDCl\(_3\)): \(\delta = 199.4, 143.8, 137.3, 132.7, 128.4, 128.3, 128.0, 127.9, 126.0, 47.1, 43.2, 42.6, 31.5, 30.9, 26.7, 26.6, 26.5\).

(−)-1-(4-Chlorophenyl)-4-methyl-3-phenyl-pentan-1-one

(5e)

96% ee, \([\alpha]^2_{D} = -6.3\) (c = 0.94, CHCl\(_3\)); HPLC separation conditions: Chiralcel AD-H, 254 nm, 97:3 heptane / i-PrOH; 1.0 mLmin\(^{-1}\), \(t_R = 9.4\) min, 11.2 min; \(^1\)H NMR (300 MHz, CDCl\(_3\)): \(\delta = 7.69\text{-}7.73\) (m, 2H), 7.27-7.31 (m, 2H), 7.13-7.18 (m, 2H), 7.03-7.09 (m, 3H), 3.23 (d, 2H, \(J = 7.2\) Hz), 3.01-3.08 (m, 1H), 1.80-1.89 (m, 1H), 0.90 (d, 3H, \(J = 6.7\) Hz), 0.70 (d, 3H, \(J = 6.7\) Hz); \(^{13}\)C NMR (75 MHz, CDCl\(_3\)): \(\delta = 198.3, 143.4, 139.2, 135.7, 129.5, 128.8, 128.3, 128.1, 126.2, 48.0, 42.6, 33.3, 21.0, 20.4\); anal. calcd. for C\(_{18}\)H\(_{15}\)ClO (286.11): C 75.38, H 6.68; found C 74.99, H 6.62.
(-)-1-(4-Methoxyphenyl)-4-methyl-3-phenyl-pentan-1-one (5f)

89% ee, $[\alpha]_D^{22} = -11.3$ (c = 1.4, CHCl$_3$); HPLC separation conditions: Chiralcel OD-H, 254 nm, 98:2 heptane / i-PrOH; 0.78 mLmin$^{-1}$, $t_R = 14.1$ min, 15.8 min; $^1$H NMR (400 MHz, CDCl$_3$): $\delta = 7.85$-$7.89$ (m, 2H), 7.12-$7.26$ (m, 5H), 6.87-$6.91$ (m, 2H), 3.84 (s, 3H), 3.30 (d, 2H, $J = 6.8$ Hz), 3.14-$3.19$ (m, 1H), 1.90-$1.98$ (m, 1H), 0.98 (d, 3H, $J = 6.6$ Hz), 0.79 (d, 3H, $J = 6.6$ Hz); $^{13}$C NMR (100 MHz, CDCl$_3$): $\delta = 197.8$, 163.2, 143.7, 130.4, 130.2, 128.3, 128.0, 126.0, 113.6, 55.5, 48.1, 42.2, 33.4, 21.1, 20.5; anal. calcd. for C$_{19}$H$_{22}$O$_2$ (282.16): C 80.82, H 7.85; found C 80.73, H 7.87.

(+)-3-Methyl-1,5-diphenylpentan-1-one (5g)

81% ee, $[\alpha]_D^{22} = +7.1$ (c = 1.1, CHCl$_3$); HPLC separation conditions: Chiralcel OD-H, 254 nm, 99:1 heptane / i-PrOH; 0.5 mLmin$^{-1}$, $t_R = 22.7$ min, 25.6 min.

$^1$H NMR (400 MHz, CDCl$_3$): $\delta = 7.92$-$7.94$ (m, 2H), 7.53-$7.57$ (m, 1H), 7.43-$7.47$ (m, 2H), 7.26-$7.29$ (m, 2H), 7.15-$7.19$ (m, 3H), 3.00 (dd, 1H, $J = 4.5$, 15.9 Hz), 2.81 (dd, 1H, $J = 7.9$, 15.9 Hz), 2.61-$2.76$ (m, 2H), 2.24-$2.26$ (m, 1H), 1.70-$1.77$ (m, 1H), 1.56-$1.63$ (m, 1H), 1.03 (d, 3H, $J = 6.4$ Hz); $^{13}$C NMR (100 MHz, CDCl$_3$): $\delta = 200.0$, 142.4, 137.3, 132.9, 128.9, 128.5, 128.4, 128.3, 128.1, 125.7, 46.0, 39.0, 33.6, 29.7, 20.1; anal. calcd. for C$_{10}$H$_{20}$O (252.15): C 85.67, H 7.99; found C 85.72, H 8.14.

(S)-4-Phenyl-pentan-2-one (5h)$^{[2a]}$

81% ee, $[\alpha]_D^{22} = +37.9$ (c = 1.1, CHCl$_3$); HPLC separation conditions: Chiralcel AS, 210 nm, 98:2 heptane / i-PrOH; 0.5 mLmin$^{-1}$, $t_R = 14.7$ min (S), 18.1 min (R); $^1$H NMR (300 MHz, CDCl$_3$): $\delta = 7.18$-$7.35$ (m, 5H), 2.64-$2.86$ (m, 2H), 2.09 (s, 3H), 1.29 (d, 3H, $J = 6.9$ Hz); $^{13}$C NMR (75 MHz, CDCl$_3$): $\delta = 207.9$, 146.2, 128.6, 126.8, 126.3, 52.0, 35.5, 30.6, 22.0.
4-Phenyl-pentan-2-ol$^5$

60% ee, [α]$_D^{22}$ = +27.3 (c = 0.7, CHCl$_3$); HPLC separation conditions: Chiralcel OD-H, 210 nm, 99:1 heptane / i-PrOH; 0.5 mLmin$^{-1}$, $t_R$ = 23.1, 28.7, 32.2, 43.9 min. $^1$H NMR (300 MHz, CDCl$_3$): δ = 7.19-7.35 (m, 5H), 3.54-3.61 (m, 1H), 2.95-3.03 (m, 1H), 1.70-1.75 (m, 2H), 1.29 (d, 3H, $J = 6.9$ Hz), 1.15 (d, 3H, $J = 6.1$ Hz). $^{13}$C NMR (75 MHz, CDCl$_3$): δ = 146.8, 128.5, 127.1, 126.1, 65.9, 47.7, 36.6, 24.2, 23.1.

References