



Supporting Information

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Scandium-Bipyridine-Catalyzed, Enantioselective Addition of Alcohols and Amines to *meso*-Epoxides

Christoph Schneider,* Anakallil R. Sreekanth, Enzo Mai

General Methods. All experiments were carried out under a nitrogen atmosphere. ^1H and ^{13}C NMR spectra were recorded in CDCl_3 solutions using a VARIAN Gemini 2000 spectrometer (300 or 200 MHz) and Me_4Si as an internal standard. Melting points were determined on a Boetius heating table. IR spectra were obtained with a FTIR spectrometer (Genesis ATI Mattson/Unicam). Optical rotations were measured using a Polarotronic polarimeter (Schmidt & Haensch). GC analyses were performed on a Hewlett Packard-MSD 5972 instrument with different cyclodextrin stationary phases as indicated. HPLC analyses were carried out on a JASCO MD-2010 plus instrument with a chiral stationary phase column (Daicel Chiralcel OD column). Solvents were purified by distillation from appropriate drying agents. The chiral bipyridine ligand **1** was prepared according to the reported procedure.^[1] Aromatic epoxides **2b** and **2c** were prepared by *m*CPBA oxidation of the corresponding *cis*-stilbenes according to the reported procedure.^[2] All other compounds were commercially available and used as received. The corresponding racemic products were prepared using the achiral scandium-bipyridine complex as catalyst in order to secure the chiral HPLC-assay of the enantioselective reactions.

General Procedure for the Scandium-Bipyridine-Catalyzed Addition of Alcohols and Amines to Epoxides. To a stirred solution of $\text{Sc}(\text{OTf})_3$ (49 mg, 0.10 mmol) and chiral bipyridine ligand **1** (33 mg, 0.10 mmol) in dichloromethane (10 ml) was added the epoxide (1.00 mmol) at rt. The reaction mixture was stirred for 10 minutes at rt upon which the alcohol (2.00 mmol) or amine (1.0 mmol) was added. Stirring was continued for 12-24 h at rt. The solvent was evaporated off and the product was purified by flash column chromatography over silica gel using mixtures of ether-hexane as eluent. All known compounds were compared with data reported in the literature, all new compounds were fully characterized. The absolute configuration of the products was assigned by comparison with the reported optical rotation values and for the unknown compounds by analogy.

(1R, 2R)-2-Methoxy-1,2-diphenylethanol (3a).^[3] Yield 81 %; colorless solid, mp 69-70 °C; **IR** (cm⁻¹): 3405, 3061, 1492, 1453, 1337, 1201, 1102, 1059; **¹H NMR** (200 MHz, CDCl₃): δ 3.31 (s, 3H), 3.51 (s, 1H), 4.12 (d, *J* = 8.5 Hz, 1H), 4.65 (d, *J* = 8.5 Hz, 1H), 6.97-7.26 (m, 10H); **¹³C NMR** (50 MHz, CDCl₃): δ 56.8, 78.6, 89.1, 127.2, 127.6, 127.7, 127.8, 128.0, 137.3, 139.1; **HRMS** (ESI) [M + Na]⁺ calcd. 251.10425, found 251.10446; [α]_D²⁵ = + 53.3 ° (c = 1.5, CHCl₃). The enantiomeric assay: Chiralcel OD, isocratic (n-hexane : i-PrOH 90:10, flow 0.8 ml/min) λ = 203 nm, (1*S*, 2*S*): 7.8 min; (1*R*, 2*R*): 8.7 min. **Ee** 92 %.

(1R, 2R)-2-Ethoxy-1,2-diphenylethanol (3b). Yield 75 %; colorless liquid; **IR** (cm⁻¹): 3471, 3062, 2876, 1603, 1453, 1388, 1197, 1091; **¹H NMR** (200 MHz, CDCl₃): δ 1.23 (t, *J* = 7.2 Hz, 3H), 3.35-3.55 (m, 3H), 4.21 (d, *J* = 8.5 Hz, 1H), 4.63 (d, *J* = 8.5 Hz, 1H), 6.97-7.26 (m, 10H); **¹³C NMR** (50 MHz, CDCl₃): δ 15.2, 64.5, 78.5, 87.3, 127.2, 127.6, 127.7, 127.8, 127.9, 138.0, 139.1; **HRMS** (ESI) [M + Na]⁺ calcd. 265.11990, found 265.11985, [α]_D²⁵ = + 58.8 ° (c = 1.7, CH₂Cl₂). The enantiomeric assay: Chiralcel OD, isocratic (n-hexane : i-PrOH 95:5, flow 1 ml/min) λ = 203 nm, (1*S*, 2*S*): 7.1 min; (1*R*, 2*R*): 8.1 min. **Ee** 96 %.

(1R, 2R)-2-Butyloxy-1,2-diphenylethanol (3c). Yield 80 %; colorless solid, mp: 55-56 °C; **IR** (cm⁻¹): 3525, 3029, 1490, 1386, 1257, 1025; **¹H NMR** (200 MHz, CDCl₃): δ 0.94 (t, *J* = 7.2 Hz, 3H), 1.41-1.71 (m, 4H), 3.35-3.47 (m, 2H), 3.67 (br s, 1H), 4.23 (d, *J* = 8.7 Hz, 1H), 4.68 (d, *J* = 8.7 Hz, 1H), 7.0-7.25 (m, 10H); **¹³C NMR** (50 MHz, CDCl₃): δ 14.0, 19.5, 32.0, 69.0, 78.8, 87.7, 127.4, 127.7, 127.8, 127.9, 128.0, 128.1, 138.1, 139.3; **HRMS** (ESI) [M + Na]⁺ calcd. 293.15120, found 293.15114; [α]_D²⁵ = + 31.2 ° (c = 1.6, CH₂Cl₂). The enantiomeric assay: Chiralcel OD, isocratic (n-hexane : i-PrOH 95:5, flow 1 ml/min) λ = 203 nm, (1*S*, 2*S*): 6.3 min, (1*R*, 2*R*): 7.1 min. **Ee** 94 %.

(1R, 2R)-2-(Allyloxy)-1,2-diphenylethanol (3d).^[4] Yield 78 %; colorless liquid; **IR** (cm⁻¹): 3455, 3031, 2867, 1647, 1453, 1339, 1196, 1074; **¹H NMR** (200 MHz, CDCl₃): δ 3.60 (d, *J* = 1.2 Hz, 1H), 3.82-4.08 (m, 2H), 4.33 (d, *J* = 8.4 Hz, 1H), 4.73 (d, *J* = 8.4 Hz, 1H), 5.19-5.34 (m, 2H), 5.86-5.98 (m, 1H), 7.01-7.28 (m, 10H); **¹³C NMR** (50 MHz, CDCl₃): δ 71.7, 80.6, 88.8, 107.4, 119.3, 129.3, 129.7, 129.8, 130.0, 130.1, 136.3, 139.6, 141.2; **HRMS** (ESI) [M + Na]⁺ calcd. 277.11990, found 277.11978; [α]_D²⁵ = - 27.2 ° (c = 1.1, CH₂Cl₂). The enantiomeric assay: Chiralcel OD, isocratic (n-hexane : i-PrOH 97:3, flow 1 ml/min) λ = 203 nm, (1*S*, 2*S*): 8.9 min, (1*R*, 2*R*): 10.6 min. **Ee** 95 %.

(1R, 2R)-2-(4-Methoxybenzyloxy)-1,2-diphenylethanol (3e).^[5] Yield 82 %; colorless solid, mp: 85-86 °C; **IR** (cm⁻¹): 3521, 3432, 2865, 1610, 1509, 1241, 1195, 1022; **¹H NMR** (300 MHz, CDCl₃): δ 3.53 (br s, 1H), 3.82 (s, 3H), 4.26 (d, *J* = 10.8 Hz, 1H), 4.33 (d, *J* = 8.4

Hz, 1H), 4.46 (d, $J = 10.8$ Hz, 1H), 4.70 (d, $J = 8.4$ Hz, 1H), 6.89 (dd, $J = 2.1, 6.6$ Hz, 2H), 7.00-7.25 (m, 12H); $^{13}\text{C NMR}$ (75 MHz, CDCl_3): δ 55.4, 70.6, 78.7, 86.7, 114.0, 127.4, 127.8, 127.9, 128.0, 128.2, 129.7, 137.8, 139.3, 159.5; **HRMS** (ESI) $[\text{M} + \text{Na}]^+$ calcd. 279.13555, found 279.13552; $[\alpha]_{\text{D}}^{25} = -41.6^\circ$ ($c = 0.72$, CH_2Cl_2). The enantiomeric assay: Chiralcel OD, isocratic (n-hexane : i-PrOH 90:10, flow 1 ml/min) $\lambda = 199$ nm, (1*S*, 2*S*): 10.3 min, (1*R*, 2*R*): 11.7 min. **Ee** 97 %.

(1*R*, 2*R*)-2-Methoxy-1,2-di(2-naphthyl)-ethanol (3f). Yield 83 %; colorless solid, mp: 98-99 °C; **IR** (cm^{-1}): 3444, 3019, 2890, 1600, 1506, 1361, 1268, 1162, 1062; **$^1\text{H NMR}$** : (200 MHz, CDCl_3): δ 3.38 (s, 3H), 3.74 (br s, 1H), 4.42 (d, $J = 8.3$ Hz, 1H), 4.99 (d, $J = 8.3$ Hz, 1H), 7.09-7.27 (m, 2H), 7.39-7.82 (m, 12H); $^{13}\text{C NMR}$ (50 MHz, CDCl_3): δ 57.1, 78.6, 89.2, 125.3, 125.4, 125.8, 126.1, 126.4, 127.3, 127.5, 127.6, 127.7, 128.0, 133.0, 135.0, 136.8; **HRMS** (ESI) $[\text{M} + \text{Na}]^+$ calcd. 351.13555, found 351.13527; $[\alpha]_{\text{D}}^{25} = +184.6^\circ$ ($c = 0.65$, CH_2Cl_2). The enantiomeric assay: Chiralcel OD, isocratic (n-hexane : i-PrOH 95:5, flow 0.8 ml/min) $\lambda = 210$ nm, (1*R*, 2*R*): 29.5 min, (1*S*, 2*S*): 31.1 min. **Ee** >98 %.

(1*R*, 2*R*)-2-(4-Methoxybenzyloxy)-cyclohexanol (3h).^[6] This reaction was carried out at -20°C. Yield 90 %; colorless liquid; **IR** (cm^{-1}): 3438, 2998, 2861, 1610, 1511, 1299, 1079, 1033; **$^1\text{H NMR}$** (300 MHz, CDCl_3): δ 1.19-1.33 (m, 4H), 1.69-1.77 (m, 2H), 2.01-2.04 (m, 1H), 2.13-2.17 (m, 1H), 2.92 (s, 1H), 3.16-3.22 (m, 1H), 3.48-3.51 (m, 1H), 3.82 (s, 3H), 4.43 (d, $J = 11.1$ Hz, 1H), 4.65 (d, $J = 11.1$ Hz, 1H), 6.86 (d, $J = 8.6$ Hz, 2H), 7.25 (d, $J = 8.6$ Hz, 2H); $^{13}\text{C NMR}$ (75 MHz, CDCl_3): δ 23.9, 24.2, 29.2, 32.0, 55.2, 70.4, 73.7, 83.1, 113.8, 129.3, 130.7, 159.2; **HRMS** (ESI) $[\text{M} + \text{Na}]^+$ calcd. 293.15120, found 293.15119; $[\alpha]_{\text{D}}^{25} = -25.0^\circ$ ($c = 1.6$, CH_2Cl_2). The enantiomeric assay: Chiral GC analysis 15m (2,6-Me-3-pentyl- γ -CD), 135 ° (50% in OV 1701). (1*R*, 2*R*): 38.2 min, (1*S*, 2*S*): 39.1 min. **Ee** 54 %.

(2*R*, 3*R*)-3-(4-Methoxybenzyloxy)-butan-2-ol (3i).^[6] This reaction was carried out at -20°C. Yield 93 %; colorless liquid; **IR** (cm^{-1}): 3415, 2931, 2873, 1612, 1511, 1245, 1085, 819; **$^1\text{H NMR}$** (300 MHz, CDCl_3): δ 1.14 (dd, $J = 2.6, 6.2$ Hz, 6H), 2.77 (s, 1H), 3.28 (dq, $J = 6.6, 6.2$ Hz, 1H), 3.58 (quin, $J = 6.2$ Hz, 1H), 3.79 (s, 3H), 4.36 (d, $J = 11.0$ Hz, 1H), 4.60 (d, $J = 11.0$ Hz, 1H), 6.88 (d, $J = 8.2$ Hz, 2H), 7.26 (d, $J = 8.2$ Hz, 2H); $^{13}\text{C NMR}$ (75 MHz, CDCl_3): δ 13.5, 17.7, 55.3, 69.2, 70.4, 77.9, 113.8, 129.3, 130.7, 159.2; **HRMS** (ESI) $[\text{M} + \text{Na}]^+$ calcd. 259.13047, found 259.13064; $[\alpha]_{\text{D}}^{25} = -33.3^\circ$ ($c = 2.4$, CH_2Cl_2). The enantiomeric assay: Chiral GC analysis 25m (6*T*-2,3-Me- β -CD), 120° (50% in OV 1701). (1*R*, 2*R*): 37.9 min, (1*S*, 2*S*): 38.8 min. **Ee** 49 %.

(*R*)-2-(4-Methoxybenzyloxy)-1,2-diphenylethanone (4). Yield: 94 %, colorless oil. **IR** (cm^{-1}): 2929, 1641, 1450, 1301, 1178, 1070, 962; **$^1\text{H NMR}$** (300 MHz, CDCl_3): δ 3.81 (s,

3H), 4.57 (mc, 2H), 5.63 (s, 1H), 6.87 (d, $J = 8.4$ Hz, 2H), 7.24-7.49 (m, 10H), 7.94 (d, $J = 8.4$ Hz, 2H). ^{13}C NMR (75 MHz, CDCl_3): δ 55.3, 71.0, 83.4, 113.9, 127.7, 128.5, 128.9, 129.2, 129.4, 129.9, 133.3, 135.1, 136.3, 159.5, 197.5. HRMS (ESI): $[\text{M}+\text{Na}]^+$ calcd. 355.13047, found 355.12996. $[\alpha]_{\text{D}}^{25} = -36.8^\circ$ ($c = 1.9$, CH_2Cl_2). The enantiomeric assay: Chiralcel OD, n-hexane/*i*-PrOH = 95:5, flow 0.8 ml/min) $\lambda = 203$ nm, (*S*): 13.1 min, (*R*): 14.4 min. Ee 95 %.

(1*R*, 2*R*)-1,2-Diphenylethane-1,2-diol (5).^[7] A solution of the alcohol **3f** (56 mg, 0.17 mmol) in $\text{CH}_3\text{CN} - \text{H}_2\text{O}$ (2 ml/0.5 ml) was treated with $(\text{NH}_4)_2\text{Ce}(\text{NO}_3)_6$ (0.37 g, 0.67 mmol) for 30 min at rt with stirring. 3 ml 6N HCl were added and the mixture was extracted with CH_2Cl_2 (3 x 10ml). The combined organic extracts were washed with brine, dried over MgSO_4 and the solvents were removed in vacuo. The crude product was purified by flash chromatography. Yield: 29 mg (82 %), colorless crystals, mp: 148-150 °C. IR (cm^{-1}): 3498, 2921, 1650, 1384, 1078. ^1H NMR (300 MHz, CDCl_3): 2.85 (s, 2H), 4.71 (s, 2H), 7.11-7.25 (m, 10H). ^{13}C NMR (50 MHz, CDCl_3): 79.2, 127.0, 128.0, 128.2, 139.9. HRMS (ESI): $[\text{M}+\text{Na}]^+$ calcd. 237.08860, found 237.08868. $[\alpha]_{\text{D}}^{25} = +91.9^\circ$ ($c = 0.87$, EtOH) [ref.^[7] $[\alpha]_{\text{D}}^{25} = +95^\circ$ ($c = 0.87$, EtOH)].

(1*R*, 2*R*)-1,2-Diphenyl-2-(phenylamino)-ethanol (6a).^[8] Yield 95%; colorless solid, mp: 100-103°C; IR (cm^{-1}): 3545, 3406, 3031, 2879, 2846, 1601, 1498, 1450, 1427, 1319, 1034, 758, 700; ^1H NMR (200 MHz, CDCl_3): δ 2.75 (br s, 1H), 4.60 (d, $J = 6.9$ Hz, 1H), 4.76 (br s, 1H), 4.91 (d, $J = 6.0$ Hz, 1H CH), 6.60-6.64 (m, 2H), 6.72-6.78 (m, 1H), 7.16-7.19 (m, 2H), 7.26-7.40 (m, 10H); ^{13}C NMR (50 MHz, CDCl_3): δ 64.8, 78.1, 114.2, 118.0, 126.7, 127.4, 127.6, 128.0, 128.3, 128.6, 129.1, 140.3, 140.6, 147.3; ESI-MS $m/z = 601$ $[\text{2M}+\text{Na}^+]$, 312 $[\text{M}+\text{Na}^+]$, 290 $[\text{M}+\text{H}^+]$; $[\alpha]_{\text{D}}^{23} = +48.6^\circ$ ($c = 0.525$, CH_2Cl_2). The enantiomeric assay: Chiralcel OD, isocratic (n-hexane: *i*-PrOH 85:15, flow 1 ml/min) $\lambda = 247$ nm, (1*R*, 2*R*): 13.6 min; (1*S*, 2*S*): 17.5 min. Ee 93%.

(1*R*, 2*R*)-2-(*N*-Methyl-*N*-phenylamino)-1,2-diphenylethanol (6b). Yield 85%, colorless solid mp: 56-60°C; IR (cm^{-1}): 3419, 3028, 2883, 1597, 1496, 1450, 1386, 1253, 1186, 1025, 754, 696; ^1H NMR (200 MHz, CDCl_3): δ 2.71 (s, 3H), 3.99 (s, 1H), 4.88 (d, $J = 10.0$ Hz, 1H), 5.30 (d, $J = 10.0$ Hz, 1H), 6.91-7.04 (m, 5H), 7.15-7.32 (m, 8H), 7.41 (dd, $J = 8.5, 2.0$ Hz, 2H); ^{13}C NMR (50 MHz, CDCl_3): δ 32.8, 71.6, 73.9, 117.9, 120.5, 127.5, 127.8, 127.9, 128.1, 128.4, 128.9, 129.3, 134.7, 140.8, 151.5; ESI-MS $m/z = 629$ $[\text{2M}+\text{Na}^+]$, 326 $[\text{M}+\text{Na}^+]$, 304 $[\text{M}+\text{H}^+]$; $[\alpha]_{\text{D}}^{23} = -184.4^\circ$ ($c = 0.995$, CH_2Cl_2). The enantiomeric assay: Chiralcel OD, isocratic (n-hexane: *i*-PrOH 90:10, flow 0.8 ml/min) $\lambda = 251$ nm, (1*S*, 2*S*): 20.3 min; (1*R*, 2*R*): 21.8 min. Ee 97%.

(1*R*, 2*R*)-2-(4-Methoxyphenylamino)-1,2-diphenylethanol (6c).^[9] Yield 87%; yellow solid, mp: 91-95°C; **IR** (cm⁻¹): 3479, 3428, 3027, 2933, 2831, 1807, 1510, 1452, 1240, 1030, 820, 762, 698; **¹H NMR** (200 MHz, CDCl₃): δ 3.66 (s, 3H), 4.40 (d, *J* = 6.5 Hz, 1H), 4.81 (d, *J* = 6.5 Hz, 1H), 6.51 (d, *J* = 8.8 Hz, 2H), 6.66 (d, *J* = 8.8 Hz, 1H), 7.17-7.25 (m, 10H); **¹³C NMR** (50 MHz, CDCl₃): δ 55.8, 66.3, 78.2, 114.8, 115.9, 126.8, 127.5, 127.9, 128.2, 128.5, 140.3, 140.7, 141.4; **ESI-MS** *m/z* = 661 [2M+Na⁺], 342 [M+Na⁺], 320 [M+H⁺]; [α]_D²³ = + 25.1° (c = 0.61, CH₂Cl₂). The enantiomeric assay: Chiralcel OD, isocratic (n-hexane: i-PrOH 90:10, flow 0.8 ml/min) λ = 243 nm, (1*S*, 2*S*): 31.9 min; (1*R*, 2*R*): 38.7 min. **Ee**: 82%.

(1*R*, 2*R*)-2-(Benzyloxyamino)-1,2-diphenylethanol (6d). Yield 85%; colorless solid, mp: 44-47°C; **IR** (cm⁻¹): 3421, 2358, 2330, 1630, 1450, 1028, 754, 698, 575; **¹H NMR** (200 MHz, CDCl₃): δ 3.22 (br s, 1H), 4.17 (d, *J* = 9.0 Hz, 1H), 4.62 (d, *J* = 11.5 Hz, 1H), 4.67 (d, *J* = 11.5 Hz, 1H), 4.83 (d, *J* = 9.0 Hz, 1H), 6.34 (br s, 1H), 7.07-7.37 (m, 15H); **¹³C NMR** (50 MHz, CDCl₃): δ 71.9, 76.4, 76.7, 127.0, 127.7, 127.8, 128.1, 128.1, 128.2, 128.5, 128.6, 128.7, 137.4, 138.5, 140.9; **ESI-MS** *m/z* = 661 [2M+Na⁺], 342 [M+Na⁺], 320 [M+H⁺]; [α]_D²³ = + 42.6° (c = 0.985, CH₂Cl₂). The enantiomeric assay: Chiralcel OD, isocratic (n-hexane: i-PrOH 90:10, flow 0.8 ml/min) λ = 203 nm, (1*R*, 2*R*): 20.6 min; (1*S*, 2*S*): 25.7 min. **Ee** 86%.

(1*R*, 2*R*)-1,2-Bis(2'-naphthyl)-2-(phenylamino)-ethanol (6e). Yield 76%; colorless solid, mp. 147-150°C; **IR** (cm⁻¹): 3415, 3053, 2924, 1600, 1502, 750; **¹H NMR** (200 MHz, CDCl₃): δ 2.80 (br s, 1H), 4.84 (d, *J* = 5.5 Hz, 2H), 5.13 (d, *J* = 5.5 Hz, 1H), 6.58-6.7 (m, 3H), 7.04-7.11 (m, 2H), 7.38 (ddd, *J* = 8.4, 6.6, 1.8 Hz, 2H), 7.44-7.53 (m, 4H), 7.74-7.85 (m, 8H); **¹³C NMR** (50 MHz, CDCl₃): δ 64.7, 78.0, 114.3, 118.1, 124.5, 125.4, 125.7, 126.0, 126.1, 126.2, 126.3, 126.3, 127.8, 128.1, 128.2, 128.5, 129.2, 133.1, 133.2, 133.2, 133.5, 137.9, 138.1, 147.3; **ESI-MS** *m/z* = 801 [2M+Na⁺], 412 [M+Na⁺], 390 [M+H⁺], [α]_D²³ = + 109.4° (c = 0.89, CH₂Cl₂). The enantiomeric assay: Chiralcel OD, isocratic (n-hexane: i-PrOH 90:10, flow 0.8 ml/min) λ = 227 nm, (1*S*, 2*S*): 31.9 min; (1*R*, 2*R*): 38.7 min. **Ee** 82%

(1*R*, 2*R*)-2-(Phenylamino)-1,2-bis(*m*-tolyl)-ethanol (6f). Yield 93%, pale yellow viscous liquid; **IR** (cm⁻¹): 3398, 3024, 2920, 1601, 1502, 1313, 1105, 794; **¹H NMR** (200 MHz, CDCl₃): δ 2.33 (s, 3H), 2.36 (s, 3H), 2.57 (br s, 1H), 4.52 (d, *J* = 5.0 Hz, 1H), 4.68 (br s, 1H), 4.86 (d, *J* = 5.0 Hz, 1H), 6.57 (dd, *J* = 7.5, 1.0 Hz, 2H), 6.69 (dd, *J* = 7.5, 7.5 Hz, 1H), 7.07-7.24 (m, 10H); **¹³C NMR** (50 MHz, CDCl₃): δ 21.5, 21.6, 54.6, 78.0, 114.1, 117.8, 123.6, 128.0, 128.2, 128.4, 128.5, 128.6, 129.1, 137.9, 138.2, 140.4, 140.6, 147.5; **ESI-MS** *m/z* = 657 [2M+Na⁺], 340 [M+Na⁺], 318 [M+H⁺]; [α]_D²³ = + 50.2° (c = 0.89, CH₂Cl₂). The

enantiomeric assay: Chiralcel OD, isocratic (n-hexane: i-PrOH 90:10, flow 0.8 ml/min) $\lambda = 199$ nm, (1*R*, 2*R*): 15.9 min; (1*S*, 2*S*): 21.1 min. **Ee** 91%.

(1*R*, 2*R*)-2-(Phenylamino)-1-cyclohexanol (6g).^[8] Yield 96 %; pale yellow solid, mp 57-59°C; **IR** (cm⁻¹): 3390, 3049, 2931, 2856, 1600, 1502, 1448, 1068, 748; **¹H NMR** (200 MHz, CDCl₃): δ 1.03-1.08 (m, 1H), 1.27-1.43 (m, 3H), 1.71-1.81 (m, 2H), 2.11-2.15 (m, 2H), 3.11-3.19 (m, 3H), 3.31-3.38 (m, 1H), 6.71-6.79 (m, 3H), 7.17-7.22 (m, 2H); **¹³C NMR** (50 MHz, CDCl₃): δ 24.6, 25.2, 31.8, 33.5, 60.3, 74.7, 114.6, 129.6, 148.2; **EI-MS** $m/z = 191$ (M⁺, 39), 148 (14), 132 (100), 118 (25), 106 (40), 93 (15), 77(23); $[\alpha]_D^{23} = -37.7^\circ$ (c = 0.535, CH₂Cl₂). The enantiomeric assay: Chiralcel OD, isocratic (n-hexane: i-PrOH 85:15, flow 1 ml/min) $\lambda = 247$ nm, (1*S*, 2*S*): 10.3 min; (1*R*, 2*R*): 11.9 min. **Ee** 54%.

(2*R*, 3*R*)-3-(Phenylamino)-2-butanol (6h).^[8] Yield 92%; colorless liquid; **IR** (cm⁻¹): 3398, 3050, 2972, 2927, 2357, 1601, 1504, 1452, 1315, 1253, 1170, 1091, 748, 692; **¹H NMR** (200 MHz, CDCl₃): δ 1.16 (d, $J = 6.5$ Hz, 3H), 1.27 (d, $J = 6.5$ Hz, 3H), 2.70 (br s, 1H), 3.34 (dq, $J = 6.5, 6.5$ Hz, 2H), 3.65 (dq, $J = 6.5, 6.5$ Hz, 1H), 6.67-6.78 (m, 3H), 7.16-7.23 (m, 2H); **¹³C NMR** (50 MHz, CDCl₃): δ 17.4, 19.6, 56.1, 71.4, 114.4, 118.3, 129.4, 147.9; **EI-MS** $m/z = 165$ (M⁺, 9), 120 (100), 93 (6), 77 (15), 51 (6); $[\alpha]_D^{23} = -58.8^\circ$ (c = 0.93, CH₂Cl₂). The enantiomeric assay: Chiralcel OD, isocratic (n-hexane: i-PrOH 95:5, flow 1 ml/min) $\lambda = 247$ nm, (1*S*, 2*S*): 17.2 min; (1*R*, 2*R*): 18.6 min. **Ee** 60%.

References

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