Supporting Information

Asymmetric Mannich-type Reaction of Aldimine with Chiral Acetate

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General. Infrared (IR) spectra were recorded on a Shimazu FTIR-8100 spectrometer. ^{1}H-NMR spectra were measured on a Varian Gemini-300 spectrometer (300 MHz) at ambient temperature. Data were recorded as follows: chemical shift in ppm from internal tetramethylsilane on the δ scale, multiplicity (b = broad, s = singlet, d = doublet, t = triplet, and m = multiplet), coupling constant (Hz), integration, and assignment. ^{13}C-NMR spectra were recorded on Varian Gemini-300 (75 MHz) spectrometer at ambient temperature. Chemical shifts were recorded in ppm from the solvent resonance employed as the internal standard (deuterochloroform at 77.07 ppm). Chiral high-performance liquid chromatography (chiral HPLC) analyses were conducted using Shimazu LC-10AD coupled with diode array–detector SPD-MA10A-VP and the chiral column of CHIRALCEL OD-H or AD (Daicel chemical industries, LTD.). All experiments were carried out under an atmosphere of dry argon. For thin-layer chromatography (TLC) analysis throughout this work, Merck precoated TLC plates (silica gel 60 GF254 0.25 mm) were used. The products were purified by preparative column chromatography on normal silica gel (Merck Art. 9385: Cl <0.02%; Fe, <0.02%) or for some instances, on silanized silica gel (Merck Art. 7719) or on extra pure one (Merck Art. 7754: Cl <0.008%; Fe, <0.002%). Microanalyses were accomplished at the Faculty of Agriculture, Nagoya University.

In experiments which required dry solvent toluene and CH_2Cl_2 were freshly distilled from calcium hydride, and tetrahydrofuran (THF) was freshly distilled from sodium metal using benzophenone ketyl as indicator. Organic substrates *N*-benzylidenedenzylamine (Table 1, entry13) was commercially available, and were used without any purification. *n*-BuLi (hexane solution) was obtained from Mitsuwa. Compounds **1**,[1] **2**[2] and aldimines **9**,[3] **10**,[4] **11**,[5] **13**,[6] **14**,[7] **17**,[8] *N*-methoxy-*N*-(phenylmethylene)amine,[9] *N*-methanesulfonyl-*N*-(phenylmethylene)amine,[10] (*E*)-2-methoxy-*N*-(2-naphthylenylmethylene)benzenamine,[11] (*E*)-*N*-(2-furfurylidene)-*o*-anisidine,[12] (*E,E*)-2-methoxy-*N*-(3-phenyl-2-propenylidene)benzenamine,[13] **20**[14] and **22**[15] are all known compounds, and were prepared as described in the literature.

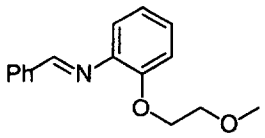
Preparation of (*R*,*R*)-2. To a solution of (*R*,*R*)-**1** (1.57 g, 4.4 mmol) in anhydrous THF (9 mL) was added a 1.62 M hexane solution of *n*-BuLi (3.27 mL, 5.3 mmol) dropwise at 0 ℃ under an argon atmosphere. After 15 min of stirring, to the mixture was added acetyl chloride (469 μL, 6.6 mmol) dropwise at this temperature, and stirring was maintained for additional 1.5h. The reaction mixture was quenched with H_2O, extracted with diethyl ether, dried, and concentrated. The residue was purified by column chromatography on silanized silica gel (hexane only as the eluent. The top of the silica gel-column should be cooled with dry-ice or something in order to avoid decomposition of the desired chiral acetate prior to charging the crude mixture) to give (*R*,*R*)-**2** (1.78g, yield >99%) as a colorless solid.

General Procedure for Asymmetric Mannich-type Addition Using Chiral Acetate 2 and aldimine 9. To a solution of (*R*,*R*)-**2** (80.0 mg, 0.2 mmol) in THF (0.80 mL) was added a 1.61 M hexane solution of *n*-BuLi (0.12 mL, 0.20 mL) at -78 ℃ under argon atmosphere, and the mixture was stirred at this temperature for 0.5h. Sequential treatment with a 1.0 M hexane solution of Et_2Zn (0.10 mL, 0.1 mmol) for 0.5h and aldimine **9** (42 mg, 0.2 mmol) in THF (0.40 mL) was followed by being stirred at -78 ℃ for 27h. The reaction mixture was quenched with H_2O, and extracted with diethyl ether, and dried over Na_2SO_4. Evaporation of solvents and purification by column chromatography on silica gel (diethyl ether/hexane = 1/20 to 1/5 as the eluent) gave β-aminoester **3** (84 mg, yield, 69%) in 91% de as colorless solids.

(*R*,*R*)-2,6-bis(2-isopropylphenyl)-3,5-dimethylphenyl 3-(2-mehtoxyphenyl) amino-3-phenylpropionate (3). IR (KBr) 3425, 1759, 1514 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 7.28 (d, 1H, *J* = 7.8 Hz), 7.25 (s, 1H), 7.20-7.13 (m, 5H), 7.12 (s, 1H), 6.98-6.96 (m, 6H), 6.71 (dd, 1H, *J* = 2.4, 7.2 Hz), 6.66-6.60 (m, 2H), 6.03 (dd, 1H, *J* = 2.7, 7.2 Hz), 4.54 (bs, 1H), 3.98 (bdd, 1H, *J* = 6.3, 6.6 Hz), 2.70 (bs, 2H), 2.18 (dd, 1H, *J* = 8.1, 15.3 Hz), 2.04 (s, 6H), 2.00 (dd, 1H, *J* = 5.4, 15.3 Hz), 1.14 (d, 6H, *J* = 6.9 Hz), 1.07 (bd, 6H, *J* = 5.7 Hz); ^{13}C NMR (75 MHz, $CDCl_3$) δ 168.6, 147.3, 146.9, 146.5, 142.4, 136.7, 136.6, 134.4, 132.1, 130.3, 128.8, 128.6, 127.8, 127.0, 126.1, 125.3, 125.2, 120.8, 116.6, 111.4, 109.0, 55.3, 53.8, 41.9, 30.1, 24.2, 20.1. Anal. Calcd for $C_{42}H_{45}NO_3$: C, 82.45, H, 7.41, N, 2.29; Found: C, 82.24, H, 7.62, N, 2.24. The chiral HPLC analytical data (column OD-H) of **3**: retention times: t_R = 5.9 min for (3*S*)-**3** and t_R = 10.3 min for (3*R*)-**3** using *i*-PrOH/hexane (1/200) as eluent at a flow rate of 1.0 mL/min.

(*R*,*R*)-2,6-bis(2-isopropylphenyl)-3,5-dimethylphenyl 3-(2-fluorophenyl) amino-3-phenylpropionate (3b). ^1H NMR (300 MHz, $CDCl_3$) δ 7.36-6.88 (m, 15H), 6.74 (dd, 1H, *J* = 7.5, 7.5 Hz), 6.59-6.50 (m, 1H), 6.10 (dd, 1H, *J* = 7.8, 7.8

Hz), 4.21 (bs, 1H), 4.00 (bs, 1H), 2.80-2.60 (m, 2H), 2.13 (dd, 1H, J = 8.7, 15.1 Hz), 2.05 (s, 6H), 2.01 (dd, 1H, J = 4.2, 15.1 Hz), 1.14 (d, 6H, J = 6.6 Hz), 1.07 (bs, 6H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 168.3, 151.6 (d, $^1J_{CF}$ = 237.9 Hz), 147.3, 146.4, 135.2 (d, $^2J_{CF}$ = 11.4 Hz), 134.3, 132.0, 130.5, 130.2, 128.9, 128.7, 127.9, 127.7, 127.2, 125.8, 125.3, 125.1, 124.0 (d, $^4J_{CF}$ = 2.9 Hz), 116.8 (d, $^3J_{CF}$ = 7.1 Hz), 114.0 (d, $^2J_{CF}$ = 18.5 Hz), 113.7 (d, $^3J_{CF}$ = 3.2 Hz), 53.8, 41.7, 30.0, 24.2, 20.1. The de% was determined by conversion into the corresponding methyl ester by: (1) removal of (*R,R*)-**1**; and (2) methylation. See the experimental procedure below for this derivation. The chiral HPLC analytical data (column OD-H) of the methyl ester derived from **3b**: retention times: t_R = 8.3 min (minor); t_R = 15.8 min (ma*J*or) using *i*-PrOH/hexane (1/9) as eluent at a flow rate of 1.0 mL/min.

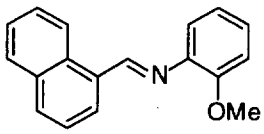


2-(Methoxyethoxy)-*N*-(phenylmethylene)benzenamine (Table 2, entry 5). IR (neat) 1630, 1248, 1116 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.49 (s, 1H), 7.91 (dd, 2H, J = 3.6, 3.6 Hz), 7.47 (d, 3H, J = 3.6 Hz), 7.15 (dd, 1H, J = 8.1, 8.4 Hz), 7.05-6.97 (m, 3H), 4.18 (t, 2H, J = 5.1 Hz), 3.73 (t, 2H, J = 5.1 Hz), 3.40 (s, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 161.5, 151.1, 142.3, 136.4, 131.1, 128.7, 128.5, 126.3, 121.7, 121.0, 114.4, 71.0, 68.8, 59.2.

(*R,R*)-2,6-bis(2-isopropylphenyl)-3,5-dimethylphenyl 3-[(2-mehtoxyethoxy) phenyl] amino-3-phenylpropionate (3c). IR (neat) 3372, 1750, 1521 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.28 (d, 2H, J = 8.1 Hz), 7.19-6.94 (m, 12H), 6.75 (dd, 1H, J = 1.5, 7.8 Hz), 6.68 (ddd, 1H, J = 1.5, 7.5, 7.8 Hz), 6.57 (ddd, 1H, J = 1.5, 7.5, 7.8 Hz), 6.33 (dd, 1H, J = 1.5, 7.8 Hz), 4.71 (bs, 1H), 4.08 (t, 2H, J = 4.8 Hz), 3.95 (bs, 1H), 3.71 (t, 2H, J = 4.8 Hz), 3.63 (s, 3H), 2.70 (bs, 2H), 2.17 (dd, 1H, J = 7.2, 15.6 Hz), 2.04 (s, 6H), 2.03 (dd, 1H, J = 6.0, 15.6 Hz), 1.14 (bd, 6H, J = 6.9 Hz), 1.08 (bs, 6H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 168.4, 146.5, 146.0, 142.4, 137.3, 136.7, 134.3, 132.1, 130.2, 128.8, 128.5, 127.9, 127.0, 126.1, 125.2, 125.17, 121.7, 116.4, 112.1, 111.7, 71.1, 68.5, 59.1, 53.7, 41.3, 30.0, 24.2, 20.1. Anal. Calcd for $C_{44}H_{49}NO_4$: C, 80.58, H, 7.53, N, 2.14; Found: C, 80.45, H, 7.74, N, 2.15. The chiral HPLC analytical data (column AD) of **3c**: retention times: t_R = 12.8 min (ma*J*or); t_R = 16.6 min (minor) using *i*-PrOH/hexane (1/200) as eluent at a flow rate of 0.5 mL/min.

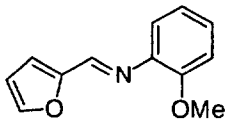
(*R,R*)-2,6-bis(2-isopropylphenyl)-3,5-dimethylphenyl 3-[(2-methoxymethoxy) phenyl] amino-3-phenylpropionate (3d). IR (neat) 3391,

1748, 1514 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 7.30-6.95 (m, 15H), 6.70 (dd, 1H, *J* = 7.5, 7.8 Hz), 6.58 (dd, 1H, *J* = 6.9, 7.8 Hz), 6.05 (d, 1H, *J* = 7.5 Hz), 5.15 (s, 2H), 4.63 (bs, 1H), 3.91 (bs, 1H), 3.48 (s, 3H), 2.80-2.60 (m, 2H), 2.17 (dd, 1H, *J* = 8.1, 15.3 Hz), 2.04 (s, 6H), 2.03 (dd, 1H, *J* = 5.4, 15.3 Hz), 1.15 (d, 6H, *J* = 6.9 Hz), 1.09 (bs, 6H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 168.5, 147.2, 146.4, 144.5, 142.3, 137.3, 136.7, 134.3, 132.0, 130.2, 128.8, 128.5, 127.9, 127.0, 126.0, 125.2, 125.16, 122.2, 116.7, 113.7, 112.1, 95.0, 56.1, 53.8, 41.3, 30.0, 24.3, 24.2, 20.1. Anal. Calcd for $C_{43}H_{47}NO_4$: C, 80.47, H, 7.38, N, 2.18; Found: C, 80.47, H, 7.65, N, 2.18. The chiral HPLC analytical data (column AD) of **3d**: retention times: t_R = 9.7 min (major); t_R = 11.1 min (minor) using *i*-PrOH/hexane (1/200) as eluent at a flow rate of 0.5 mL/min.



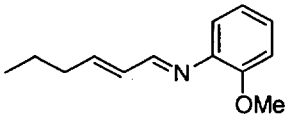
(*E*)-2-Methoxy-*N*-(2-naphthylenylmethylene)benzenamine. ^1H NMR (300 MHz, $CDCl_3$) δ 9.16 (s, 1H), 8.95 (d, 1H, *J* = 8.4 Hz), 8.17 (d, 1H, *J* = 7.2 Hz), 7.97 (d, 1H, *J* = 8.1 Hz), 7.91 (d, 1H, *J* = 8.1 Hz), 7.65-7.52 (m, 3H), 7.26-7.19 (m, 1H), 7.11-6.98 (m, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 160.3, 152.1, 142.2, 133.6, 131.5, 131.4, 131.3, 129.2, 128.4, 127.1, 126.4, 125.9, 125.0, 123.9, 120.8, 120.1, 111.4, 55.6.

(*R,R*)-2,6-bis(2-isopropylphenyl)-3,5-dimethylphenyl 3-(2-methoxyphenyl) amino-3-(2-naphthyl)propionate (4). IR (KBr) 3430, 1759, 1510 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 7.85-6.90 (m, 16H), 6.74 (d, 1H, *J* = 7.8 Hz), 6.58 (dd, 1H, *J* = 7.5, 7.8 Hz), 6.54 (dd, 1H, *J* = 7.8, 7.8 Hz), 5.86 (d, 1H, *J* = 7.5 Hz), 4.72 (bs, 2H), 3.84 (s, 3H), 2.71 (bs, 2H), 2.29 (dd, 1H, *J* = 3.6, 15.9 Hz), 2.15 (dd, 1H, *J* = 9.6, 15.9 Hz), 2.05 (s, 6H), 1.16 (d, 6H, *J* = 6.9 Hz), 1.06 (d, 6H, *J* = 6.6 Hz); ^{13}C NMR (75 MHz, $CDCl_3$) δ 168.8, 147.0, 146.5, 136.8, 136.5, 134.3, 134.0, 132.1, 130.2, 130.1, 128.9, 128.8, 127.9, 127.6, 126.1, 125.7, 125.3, 125.2, 122.9, 122.6, 122.4, 120.7, 116.6, 111.6, 108.9, 50.1, 40.1, 30.1, 24.2, 20.1. The de% was determined by conversion into the corresponding methyl ester by: (1) removal of (*R,R*)-**1**; and (2) methylation. See the experimental procedure below for this derivation. The chiral HPLC analytical data (column AD) of the methyl ester derived from **4**: retention times: t_R = 15.7 min (minor); t_R = 18.9 min (major) using *i*-PrOH/hexane (1/20) as eluent at a flow rate of 0.5 mL/min.



***N*-(Furfurylidene)-2-methoxybenzenamine.** ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.33 (s, 1H), 7.60 (d, 1H, J = 0.9 Hz), 7.19 (ddd, 1H, J = 1.8, 7.8, 8.1 Hz), 7.04 (dd, 1H, J = 1.8, 8.1 Hz), 6.96-6.30 (m, 3H), 6.53 (ss, 1H, J = 1.8, 3.6 Hz), 3.88 (s, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 152.3, 152.0, 148.3, 145.2, 140.6, 126.7, 120.6, 120.0, 115.7, 111.8, 111.1, 55.4.

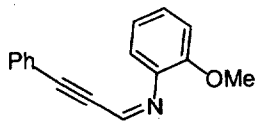
(*R*, *R*)-2,6-bis(2-isopropylphenyl)-3,5-dimethylphenyl 3-(2-mehtoxyphenyl) amino-3-(2-furfuryl)propionate (5). IR (KBr) 3419, 1759, 1513 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.31-7.00 (m, 10H), 6.75 (ddd, 1H, J = 1.8, 7.8, 7.8 Hz), 6.65 (ddd, 1H, J = 1.5, 7.2, 7.2 Hz), 6.71 (dd, 1H, J = 2.1, 7.8 Hz), 6.27 (dd, 1H, J = 1.8, 7.8 Hz), 6.08 (dd, 1H, J = 1.8, 3.8 Hz), 5.59 (dd, 1H, J = 0.9, 3.3 Hz), 4.38 (bs, 2H), 3.76 (s, 3H), 2.71 (bs, 2H), 2.25 (dd, 1H, J = 4.8, 16.2 Hz), 2.17 (dd, 1H, J = 7.2, 16.2 Hz), 2.06 (s, 6H), 1.15 (d, 6H, J = 6.9 Hz), 1.08 (bs, 6H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 168.2, 153.6, 147.3, 146.9, 146.5, 141.5, 136.7, 135.8, 134.4, 132.0, 130.9, 130.3, 128.8, 127.8, 125.3, 125.2, 120.9, 117.0, 110.6, 110.4, 109.3, 106.3, 55.2, 47.3, 37.3, 30.0, 24.2, 20.1. The chiral HPLC analytical data (column: an array of two ADs) of **5**: retention times: t_R = 10.8 min (minor); t_R = 11.5 min (major) using *i*-PrOH/hexane (1/200) as eluent at a flow rate of 1.0 mL/min.



(*E*, *E*)-2-methoxy-*N*-(2-hexenylidene)benzenamine. This compound was prepared by treatment of (*E*)-2-hexenal with *o*-anisidine over MS 4A in toluene at rt and used without any purification. The aldimine mixture was transferred by a cannula to a mixture of the lithium enolate of **2** and Et_2Zn.

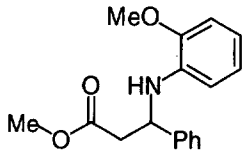
(*R*, *R*)-2,6-bis(2-isopropylphenyl)-3,5-dimethylphenyl 3-(2-mehtoxyphenyl) amino-4-octenoate (6). IR (neat) 3425, 1756, 1514 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.34-7.03 (m, 9H), 6.75 (dd, 1H, J = 7.2, 7.8 Hz), 6.70 (d, 1H, J = 7.8 Hz), 6.36 (dd, 1H, J = 7.2, 7.8 Hz), 6.25 (d, 1H, J = 7.8 Hz), 5.24 (dt, 1H, J = 6.9, 15.6 Hz), 4.77 (dd, 1H, J = 5.4, 15.6 Hz), 4.05 (bs, 1H), 3.80 (s, 3H), 3.62 (bs, 1H), 2.70 (bs, 2H), 2.06 (s, 6H), 2.02 (dd, 1H, J = 4.2, 15.0 Hz), 1.80 (dt, 2H, J = 7.2, 7.2 Hz), 1.75 (dd, 1H, J = 15.0, 8.4 Hz), 1.25 (tq, 2H, 7.2, 7.5 Hz), 1.17 (d, 6H, J = 6.9 Hz), 1.13 (d, 6H, J = 6.3 Hz), 0.81 (t, 3H, J = 7.5 Hz); ^{13}C NMR (75 MHz, $CDCl_3$) δ 168.7, 147.3, 146.7, 146.6, 136.7, 136.3, 134.5, 132.1, 131.0, 130.4, 129.4, 128.8, 127.9, 125.3, 125.2, 121.0, 116.3, 110.7, 109.2, 55.2, 50.1, 39.4, 34.1, 30.1, 24.1, 22.3, 20.1, 13.7. The chiral HPLC analytical data (column OD-H) of **6**: retention times: t_R = 9.0 min (minor); t_R = 9.7 min (major) using *i*-PrOH/hexane (1/100) as eluent at a flow rate of 0.5 mL/min.

(*R, R*)-2,6-bis(2-isopropylphenyl)-3,5-dimethylphenyl 3-(2-mehtoxyphenyl) amino-5-phenyl-4-pentenoate (7). IR (KBr) 3420, 1755, 1509 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 7.32-7.02 (m, 14H), 6.76 (ddd, 1H, *J* = 2.0, 7.5, 7.5 Hz), 6.73 (dd, 1H, *J* = 1.7, 8.3 Hz), 6.64 (ddd, 1H, *J* = 1.5, 8.0, 8.0 Hz), 6.31 (d, 1H, *J* = 1.5, 7.8 Hz), 6.29 (d, 1H, *J* = 15.9), 5.68 (dd, 1H, *J* = 5.7, 15.9 Hz), 4.20 (bs, 1H), 3.82 (bs, 1H), 3.80 (s, 3H), 2.80-2.60 (bs, 2H), 2.15 (dd, 1H, *J* = 4.8, 15.6 Hz), 2.06 (s, 6H), 1.89 (dd, 1H, *J* = 8.4, 15.5 Hz), 1.16 (bs, 6H), 1.00 (bs, 6H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 168.5, 147.3, 146.8, 146.5, 136.73, 136.67, 136.1, 134.4, 132.1, 130.3, 129.5, 128.8, 128.2, 127.9, 127.3, 126.6, 125.4, 125.2, 125.15, 121.0, 116.6, 110.8, 109.2, 55.2, 50.5, 39.0, 31.6, 30.0, 24.4, 24.1, 22.6. Anal. Calcd for $C_{44}H_{47}NO_3$: C, 82.85, H, 7.43, N, 2.20; Found: C, 82.71, H, 7.65, N, 2.26. The chiral HPLC analytical data (column OD-H) of **7**: retention times: t_R = 8.9 min for (3*R*)-**7** and t_R = 23.0 min for (3*S*)-**7** using *i*-PrOH/hexane (1/200) as eluent at a flow rate of 1.0 mL/min.

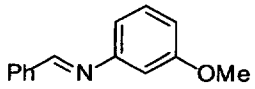


(*E*)-2-methoxy-*N*-(3-phenyl-2-propylenylidene)benzenamine. IR (KBr) 2203, 1601 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 8.00 (s, 1H), 7.60-7.40 (m, 2H), 7.41-7.30 (m, 3H), 7.22 (d, 1H, *J* = 6.6 Hz), 7.02 (d, 1H, *J* = 8.1 Hz), 6.97 (d, 1H, *J* = 6.6 Hz), 6.95 (d, 1H, *J* = 8.1 Hz); ^{13}C NMR (75 MHz, $CDCl_3$) δ 152.5, 144.3, 140.4, 132.4, 129.7, 128.4, 128.0, 121.5, 120.9, 120.1, 111.5, 94.6, 88.0, 55.7. HRFABMS (NBA) *m/z* Calcd for $C_{16}H_{13}NO$ (M^+): 235.0997; Found: 235.1010.

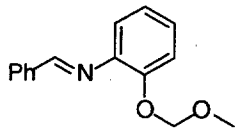
(*R, R*)-2,6-bis(2-isopropylphenyl)-3,5-dimethylphenyl 3-(2-mehtoxyphenyl) amino-5-phenyl-4-pentynoate (8). IR (KBr) 3394, 1761, 1510 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 7.27-7.04 (m, 14H), 6.81 (ddd, 1H, *J* = 2.1, 7.2, 7.2 Hz), 6.74 (dd, 1H, *J* = 2.1, 8.1 Hz), 6.70 (dd, 1H, *J* = 8.4, 8.4 Hz), 6.48 (d, 1H, *J* = 7.2 Hz), 4.31 (bs, 1H), 4.09 (bs, 1H), 3.79 (s, 3H), 2.80-2.60 (bs, 2H), 2.15 (dd, 1H, *J* = 4.8, 15.6 Hz), 2.06 (s, 6H), 1.89 (dd, 1H, *J* = 8.2, 15.5 Hz), 1.15 (d, 6H, *J* = 6.6 Hz), 1.05 (bs, 6H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 167.6, 147.2, 146.5, 136.7, 135.5, 134.3, 132.1, 131.8, 130.2, 128.8, 128.0, 127.89, 127.85, 125.4, 125.2, 122.8, 120.9, 117.5, 111.4, 109.4, 88.3, 82.7, 55.2, 41.8, 39.4, 30.0, 24.3, 24.2, 20.1. The chiral HPLC analytical data (column OD-H) of **8**: retention times: t_R = 12.9 min for (3*R*)-**8** and t_R = 16.6 min for (3*S*)-**8** using *i*-PrOH/hexane (1/200) as eluent at a flow rate of 0.5 mL/min.



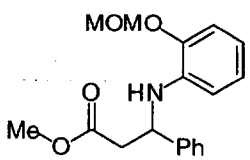
Methyl 3-(2-mehtoxyphenyl)amino-3-phenylpropionate (20) (Table 1, entry 3). IR (neat) 3376, 1730, cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 7.35 (d, 2H, *J* = 7.8 Hz), 7.29 (dd, 2H, *J* = 7.2, 7.8 Hz), 7.22 (d, 1H, *J* = 7.2 Hz), 6.74 (d, 1H, *J* = 7.8 Hz), 6.71 (dd, 1H, *J* = 7.5, 7.8 Hz), 6.61 (dd, 1H, *J* = 7.5, 7.8 Hz), 6.42 (d, 1H, *J* = 7.8 Hz), 5.03 (bd, 1H, *J* = 6.3 Hz), 4.87 (dt, 1H, *J* = 6.3, 6.9 Hz), 3.84 (s, 3H), 3.62 (s, 3H), 2.86 (dd, 1H, *J* = 7.8, 15.0 Hz), 2.80 (dd, 1H, *J* = 6.3, 15.0 Hz); ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.4, 146.8, 142.2, 136.5, 128.6, 127.3, 126.1, 121.0, 116.8, 111.1, 109.3, 55.4, 54.6, 51.7, 42.9. Anal. Calcd for $C_{17}H_{19}NO_3$: C, 71.56, H, 6.71, N, 4.91; Found: C, 71.73, H, 6.80, N, 5.02.



(*E*)-3-Methoxy -*N*-(phenylmethylene)benzenamine (10). ^1H NMR (300 MHz, $CDCl_3$) δ 8.46 (s, 1H), 7.94-7.88 (m, 2H), 7.50-7.48 (m, 3H), 7.26 (s, 1H), 6.81-6.78 (m, 3H), 3.85 (s, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 160.5, 160.2, 153.4, 136.0, 131.6, 129.8, 128.7, 112.8, 111.7, 106.6, 55.2.

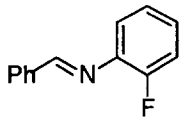


(*E*)-2-(Methoxymethoxy)-*N*-(phenylmethylene)benzenamine (12). IR (neat) 1630, 1242, 1078 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 8.45 (s, 1H), 7.92 (dd, 2H, *J* = 2.1, 7.5 Hz), 7.47 (d, 2H, *J* = 2.1 Hz), 7.46 (s, 1H), 7.19 (d, 1H, *J* = 8.1 Hz), 7.15 (dd, 1H, *J* = 8.1, 8.1 Hz), 7.04 (d, 1H, *J* = 7.8 Hz), 7.02 (dd, 1H, *J* = 7.8, 7.8 Hz), 5.23 (s, 2H), 3.49 (s, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 161.4, 149.7, 143.1, 136.3, 131.4, 128.9, 128.7, 126.5, 122.9, 120.5, 117.2, 95.7, 56.3. HRFABMS (NBA) *m/z* Calcd for $C_{15}H_{15}NO_2$ (M^+): 241.1103; Found: 241.1114.

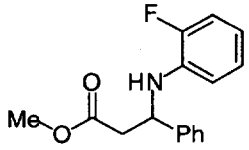


Methyl 3-[(2-mehtoxymethoxy)phenyl]amino-3-phenylpropionate (Table 1, entry 6). IR (KBr) 3400, 1740, 1516 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 7.36 (d, 2H, *J* = 7.8 Hz), 7.30 (dd, 2H, *J* = 7.2, 7.8 Hz), 7.21 (d, 1H, *J* = 7.2 Hz), 6.98 (d, 1H, *J* = 7.8 Hz), 6.75 (dd, 1H, *J* = 7.5, 7.8 Hz), 6.58 (dd, 1H, *J* = 7.5, 7.8 Hz), 6.44 (d,

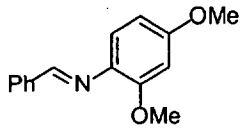
1H, J = 7.8 Hz), 5.21 (s, 2H), 5.08 (bs, 1H), 4.85 (t, 1H, J = 6.6 Hz), 3.62 (s, 3H), 3.50 (s, 3H), 2.83 (d, 2H, J = 6.6 Hz); ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.3, 144.4, 142.2, 137.2, 128.7, 127.3, 126.1, 122.4, 116.9, 113.8, 111.7, 95.0, 56.0, 54.7, 51.7, 42.9. Anal. Calcd for $C_{18}H_{21}NO_4$: C, 68.55, H, 6.71, N, 4.44; Found: C, 68.40, H, 6.89, N, 4.44.



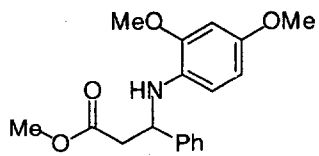
(*E*)-2-Fluoro-*N*-(phenylmethylene)benzenamine (13). ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.51 (s, 1H), 7.94-7.91 (m, 2H), 7.49-7.47 (m, 3H), 7.16-7.14 (m, 4H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 162.7, 155.1 (d, $^1J_{CF}$ = 247 Hz), 139.9 (d, $^2J_{CF}$ = 10.3 Hz), 135.8, 131.6, 128.9, 128.6, 126.6 (d, $^3J_{CF}$ = 7.7 Hz), 124.4 (d, $^3J_{CF}$ = 3.7 Hz), 121.8 (d, $^4J_{CF}$ = 1.7 Hz), 116.1 (d, $^2J_{CF}$ = 19.9 Hz).



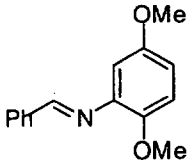
Methyl 3-(2-fluorophenyl)amino-3-phenylpropionate (Table 1, entry 7). IR (KBr) 3382, 1717, 1534 cm^{-1}; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.39-7.22 (m, 5H), 6.95 (dd, 1H, J = 8.1, 11.7 Hz), 6.84 (dd, 1H, J = 7.8 Hz), 6.59 (ddd, 1H, J = 5.1, 7.8, 8.1 Hz), 6.51 (d, 1H, J = 8.1 Hz), 4.86 (dt, 1H, J = 6.6, 6.9 Hz), 4.75 (bs, 1H), 3.67 (s, 3H), 2.85 (d, 2H, J = 6.9 Hz); ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.2, 151.6 (d, $^1J_{CF}$ = 237 Hz), 141.7, 135.1 (d, $^2J_{CF}$ = 11.3 Hz), 128.8, 127.6, 126.1, 124.4 (d, $^3J_{CF}$ = 3.2 Hz), 117.1 (d, $^3J_{CF}$ = 7.1 Hz), 114.3 (d, $^2J_{CF}$ = 18.4 Hz), 54.6, 51.9, 42.7. Anal. Calcd for $C_{16}H_{16}FNO_2$: C, 70.31, H, 5.90, N, 5.13; Found: C, 70.18, H, 6.07, N, 5.13.



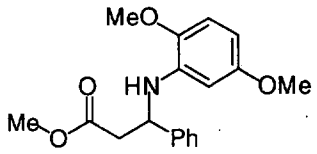
(*E*)-2,4-Dimethoxy-*N*-(phenylmethylene)benzenamine (14). ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.51 (s, 1H), 7.92-7.89 (m, 2H), 7.46 -7.44 (m, 3H), 7.02 (d, 1H, J = 8.4 Hz), 6.55-6.48 (m, 2H), 3.88 (s, 3H), 3.84 (s, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 159.4, 159.0, 153.6, 136.5, 134.9, 130.9, 128.6, 120.3, 104.2, 99.4, 55.8, 55.4.



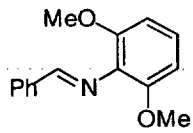
Methyl 3-(2,4-dimehtoxyphenyl)amino-3-phenylpropionate (21) (Table 1, entry 8). IR (neat) 3407, 1736, 1518 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 7.36-7.18 (m, 5H), 6.42 (d, 1H, J = 2.4 Hz), 6.34 (d, 1H, 8.7 Hz), 4.78 (dd, 1H, J = 6.3, 7.5 Hz), 4.97 (bs, 1H), 3.82 (s, 3H), 3.66 (s, 3H), 3.62 (s, 3H), 2.85 (dd, 1H, J = 7.5 15.0 Hz), 2.78 (dd, 1H, J = 6.3, 15.0 Hz); ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.5, 151.9, 147.9, 142.5, 130.8, 128.6, 127.2, 126.1, 111.6, 103.4, 99.0, 55.5, 55.4, 55.3, 51.7, 42.9. Anal. Calcd for $C_{18}H_{21}NO_4$: C, 68.55, H, 6.71, N, 4.44; Found: C, 68.55, H, 6.70, N, 4.50.



(*E*)-2,5-Dimethoxy-*N*-(phenylmethylene)benzenamine (15). IR (KBr) 1628, 1264, 1075 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 8.47 (s, 1H), 7.94-7.91 (m, 2H), 7.48-7.45 (m, 3H), 6.88 (d, 1H, J = 9.0 Hz), 6.71 (dd, 1H, J = 3.0, 9.0 Hz), 6.63 (d, 1H, J = 3.0 Hz), 3.82 (s, 3H), 3.80 (s, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 161.7, 153.9, 146.4, 142.5, 136.1, 131.4, 128.9, 128.6, 112.7, 110.6, 106.8, 56.5, 55.7. HRFABMS (NBA) *m/z* Calcd for $C_{15}H_{15}NO_2$ ($M+H^+$): 242.1181; Found: 242.1140.

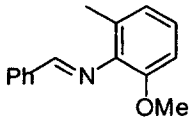


Methyl 3-(2,5-dimehtoxyphenyl)amino-3-phenylpropionate (Table 1, entry 9). IR (KBr) 3407, 1736, 1518 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 7.38-7.22 (m, 5H), 6.65 (d, 1H, J = 8.4 Hz), 6.11 (dd, 1H, J = 3.0, 8.4 Hz), 6.04 (d, 1H, J = 3.0 Hz), 5.06 (bs, 1H), 4.81 (t, 1H, J = 6.6 Hz), 3.82 (s, 3H), 3.64 (s, 3H), 3.62 (s, 3H), 2.86 (dd, 1H, J = 7.8 15.0 Hz), 2.81 (dd, 1H, J = 6.3, 15.0 Hz); ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.3, 154.4, 142.0, 141.5, 137.6, 128.7, 127.4, 126.1, 109.9, 99.3, 99.2, 56.0, 55.3, 54.6, 51.8, 42.8. Anal. Calcd for $C_{18}H_{21}NO_4$: C, 68.55, H, 6.71, N, 4.44; Found: C, 68.52, H, 6.90, N, 4.49.

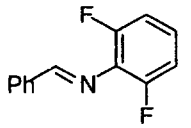


(*E*)-2,6-Dimethoxy -*N*-(phenylmethylene)benzenamine (16). IR (neat) 1640, 1252, 1036 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 8.50 (s, 1H), 7.95-7.92 (m, 2H), 7.47-7.45 (m, 3H), 7.06 (t, 1H, J = 8.4 Hz), 6.64 (d, 2H, J = 8.4 Hz), 3.80 (s, 6H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 165.5, 151.5, 136.4, 131.2, 128.7, 128.5 (two peaks are

overlapped), 124.8, 104.8, 56.1. HRFABMS (NBA) *m/z* Calcd for $C_{15}H_{15}NO_2$ (M^+): 241.1103; Found: 241.1088.

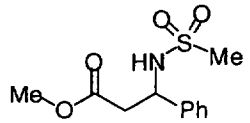


(*E*)-2-Methoxy-6-methyl-*N*-(phenylmethylene)benzenamine (17). IR (KBr) 1624, 1283 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 8.34 (s, 1H), 7.95-7.91 (m, 2H), 7.49-7.47 (m, 3H), 7.00 (dd, 1H, *J* = 7.8, 8.1 Hz), 6.86 (d, 1H, *J* = 7.8 Hz), 6.82 (d, 1H, *J* = 8.1 Hz), 3.75 (s, 3H), 2.23 (s, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 163.9, 149.4, 140.4, 136.4, 131.1, 131.0, 128.54, 128.46, 124.3, 122.5, 109.4, 55.7, 18.0.



(*E*)-2,6-Difluoro-*N*-(phenylmethylene)benzenamine (18). IR (KBr) 1634 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 8.56 (s, 1H), 7.93 (d, 2H, *J* = 8.1 Hz), 7.50 (d, 1H, *J* = 7.8 Hz), 7.47 (dd, 2H, *J* = 7.8, 8.1 Hz), 7.10-7.00 (m, 1H), 6.95 (dd, 2H, *J* = 6.9, 7.8 Hz); ^{13}C NMR (75 MHz, $CDCl_3$) δ 166.8, 155.1 (dd, $^1J_{CF}$ = 247.6 Hz; $^3J_{CF}$ = 5.4 Hz), 135.7, 132.1, 129.0, 128.7, 125.0 (dd, $^3J_{CF}$ = 8.9, 10.8 Hz), 111.8 (d, $^2J_{CF}$ = 23.9 Hz), 111.8 (d, $^3J_{CF}$ = 8.9 Hz). Anal. HRFABMS (NBA) *m/z* Calcd for $C_{13}H_9F_2N$ (M^+): 217.0703; Found: 217.0717.

(*R,R*)-2,6-bis(2-isopropylphenyl)-3,5-dimethylphenyl 3-(2,4-dimehtoxyphenyl) amino-3-phenylpropionate (19). IR (KBr) 3400, 1754, 1518 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 7.28 (d, 1H, *J* = 7.5 Hz), 7.26 (s, 1H), 7.20-7.12 (m, 6H), 7.10 (s, 1H), 6.98 (bd, 5H, *J* = 6.3 Hz), 6.39 (d, 1H, *J* = 3.0 Hz), 6.17 (dd, 1H, *J* = 3.0, 8.4 Hz), 5.92 (d, 1H, *J* = 8.4), 4.23 (s, 1H), 3.88 (dd, 1H, *J* = 4.8, 8.4 Hz), 2.70 (bs, 2H), 2.15 (dd, 1H, *J* = 8.4, 15.3 Hz), 2.04 (s, 6H), 1.99 (dd, 1H, *J* = 4.8, 15.3 Hz), 1.14 (d, 6H, *J* = 6.6 Hz), 1.09 (bs, 6H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 168.5, 151.4, 147.9, 147.0, 146.4, 142.6, 136.5, 134.2, 131.9, 130.8, 130.1, 128.7, 128.3, 127.7, 126.8, 125.8, 125.1, 111.6, 103.0, 98.5, 55.3, 55.1, 54.3, 41.9, 29.9, 24.1, 20.0. The chiral HPLC analytical data (column OD-H) of **19**: retention times: t_R = 9.4 min for (3*S*)-**19** and t_R = 14.7 min for (3*R*)-**19** using *i*-PrOH/hexane (1/200) as eluent at a flow rate of 1.0 mL/min.



Methyl 3-(methanesulfonyl)amino-3-phenylpropionate (Table 1, entry 15). ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.34-7.27 (m, 5H), 5.70 (bs, 1H), 4.93 (dt, 1H, J = 6.3, 8.4 Hz), 3.66 (s, 3H), 2.89 (d, 2H, J = 6.3 Hz), 2.69 (s, 3H)).

Removal and Recovery of Chiral Auxiliary 1. To a solution of **3** (184 mg, 0.3 mmol) in dry THF (1.20 mL) was added dropwise a concentrated *n*-Bu_4NOH in THF (1.50 mL), which was prepared from commercially available *n*-Bu_4NOH (40wt% in H_2O) by azeotropic removal of H_2O by evaporation after treatment with DME (1.50 mL) and toluene (1.50 mL) which was repeated twice. After being stirred at 0 ℃ for 1.5h, the reaction mixture was quenched with 3N HCl, extracted with EtOAc five times and dried over Na_2SO_4. Filtration and concentration of solvents afforded a crude mixture, which was dissolved in MeOH (1.0 mL), followed by addition of a 1.0 M hexane solution of $Me_3SiCH_2N_2$ at rt. The mixture was stirred until no gas evolution was observed, and subsequently quenched with HCO_2H until no more N_2 evolution was observed, and washed with H_2O. The organic layer was dried oved Na_2SO_4. Evaporation of solvents and purification by column chromatography on extra pure silica gel (EtOAc/hexane = 1/20 to 1/0 as the eluent) gave β-aminoester **20** (81 mg, >99%) in 91% ee as colorless solids.

Oxidative Removel of Methoxyphenyl Moiety Using $AgNO_3$ and $(NH_4)_2S_2O_8$.[16] To a solution of **20** (145 mg, 0.50 mmol) in a mixture of H_2O (2.5 mL)-MeCN (5.0 mL)-THF (0.5 mL) was added catalytic $AgNO_3$ (24 mg, 0.15 mmol), followed by portionwise addition of excess $(NH_4)_2S_2O_8$ (807 mg, 3.54 mmol) over 7.5 min, during which time the temperature was kept at 60 ℃. After 4h, the mixture was cooled ar rt, neutralized with $NaHCO_3$ and extracted with EtOAc. The organic layer was dried over Na_2SO_4. Evaporation of solvents and purification by column chromatography on extra pure silica gel (EtOAc/hexane = 1/1 to 1/0 as the eluent) gave β-aminoester **22** (49 mg, 53%) in 91% ee as colorless solids.

Oxidative Removal of Dimethoxyphenyl Moiety Using Cerium Ammonium Nitrate (CAN).[17] Following the above procedure for the reaction of aldimine **9** with the lithium enolate of **2** except that aldimine **14** was used, β-aminoester **19** was obtained in 63% yield (92% de). Subsequently following the above procedures for the sequential removal of auxiliary **1** from **3** and methylation with $Me_3SiCH_2N_2$, β-aminoester **21** was obtained quantitatively. To a solution of CAN (537 mg, 0.98 mmol) in H_2O (3.30 mL) was added **21** (78.0 mg, 0.24 mmol) in MeCN (2.50 mL) at 0 ℃ over 10 min. After being stirred for 40 min, H_2O (5.0 mL) was added to the reaction mixture, which was extracted with diethyl ether. After separation of the two layers, the aqueous layer was treated with Na_2CO_3 until pH of the solution became 7, and filtrated through a pad of

celite. The obtained aqueous filtrate was extracted with EtOAc, and the organic layer was dried over Na_2SO_4. Filtration and evaporation of solvents, followed by purification by column chromatography on extra pure silica gel (EtOAc/hexane = 1/0 as the eluent) gave β-aminoester **22** (90-99% yield) in 91% ee as colorless solids.

Mannich-type Addition of Chiral Acetate 2 to the $SnCl_4$–(*Z*)-9 Complex. To a solution of (*R,R*)-**2** (80 mg, 0.2 mmol) in THF (0.80 mL) was added a 1.59 M hexane solution of *n*-BuLi (0.13 mL, 0.20 mL) at -78 ℃ under argon atmosphere, and the mixture was stirred at this temperature for 0.5h. The $SnCl_4$–(*Z*)-**9** complex,[18] which was prepared by treatment of (*E*)-**9** (42 mg, 0.2 mmol) with $SnCl_4$ (200 μL, 0.2 mmol) in CH_2Cl_2 (1.4 mL) at 0 ℃ followed by being stirred at for 5 min, was transferred by a steel cannula to the solution of the lithium enolate of acetate **2** at -78 ℃. After 20h, the reaction mixture was quenched by addition of aqueous $NaHCO_3$, filtrated through a short path of celite pad, extracted with diethyl ether, and dried over Na_2SO_4. Filtration and evaporation of solvents, followed by purification by column chromatography on silica gel (EtOAc/hexane = 1/20 to 1/5 as the eluent) gave β-aminoester **3** (34 mg, 26% yield) in 70% de as colorless solids.

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