

Supporting Information

Catalysts A1-A3 were prepared according to reported procedures, and the NMR results were consistent to the references.^{1,2,3,4} Enone 1a, 1c-d were purchased from Acros[®] and 1b, 1e-j were prepared via aldol condensation according to recommended procedures.⁵

General procedure for catalytic epoxidation of enones under phase transfer conditions: A solution of enone (1.00mmol) and chiral PTC (0.100mmol) in toluene (3ml) was cooled to 0°C. TCCA (156mg, 0.67mmol) was added slowly by portions and then 50% KOH aq. (0.336g, 3.00mmol) was added dropwise by a syringe. The reaction mixture was stirred at 0°C until chalcone disappeared (detected by TLC), followed by addition of ether and filtration. The filtrate was washed with water and dried over MgSO₄. Evaporation of the solvents and purification of the residue on silica gel column with 50:1 petroleum ether / ethyl acetate as eluent gave the epoxidation product. The enantiomeric excess was determined by chiral HPLC analysis with a Chiralpak[®] AD-H column.

***trans*-2,3-Epoxy-1,3-diphenylproan-1-one (2a)**¹ m.p. = 56-57°C; ¹H-NMR(400MHz, CDCl₃) δ 8.01-7.99 (m, 2H), 7.63-7.59 (m, 1H), 7.49-7.46 (m, 2H), 7.38 (m, 5H), 4.28(d, J=1.8Hz, 1H), 4.01(d, J=1.8Hz, 1H); Chiralpak AD-H, hexane : isopropanol = 9:1, flow rate = 0.6 ml/min, retention time: 21.83min (major), 23.73min (minor).

***trans*-2,3-Epoxy-1-(4-methoxyphenyl)-3-phenylproan-1-one (2b)**¹ m.p. = 55-57°C; ¹H-NMR(400MHz, CDCl₃) δ 8.02-8.00(d, 2H), 7.41-7.36(m, 5H), 6.96-6.94 (m, 2H), 4.26-4.25(d, J=1.8Hz, 1H), 4.07(d, J=1.8Hz, 1H), 3.87(s, 3H); Chiralpak AD-H, hexane : isopropanol = 9:1, flow rate = 0.6 ml/min, retention time: 45.51min (major), 51.42min (minor).

***trans*-2,3-Epoxy-3-(4-chlorophenyl)-1-(4-fluorophenyl) proan-1-one (2c)**¹ m.p. = 89-92°C; ¹H-NMR (400MHz, CDCl₃) δ 8.08-8.04 (m, 2H), 7.39-7.37 (m, 2H), 7.31-7.29 (m, 2H), 7.19-7.15 (m, 2H), 4.20 (d, 1H), 4.06 (d, 1H); Chiralpak AD-H, hexane : isopropanol = 9:1, flow rate = 0.6 ml/min, retention time: 25.44min (major), 28.85min (minor).

***trans*-2,3-Epoxy-1-(4-fluorophenyl)-3-phenylproan-1-one (2d)**³ m.p. = 73-75°C; ¹H-NMR(400MHz, CDCl₃) δ 8.09-8.05 (m, 2H), 7.37-7.43 (m, 5H), 7.19-7.14 (m, 2H), 4.24(d, J=1.8Hz, 1H), 4.07(d, J=1.8Hz, 1H); Chiralpak AD-H, hexane : isopropanol = 9:1, flow rate = 0.6 ml/min, retention time: 22.03min (minor), 26.51min (major).

***trans*-2,3-Epoxy-3-(4-nitrophenyl)-1-phenylproan-1-one (2e)**¹ m.p. = 109-111°C; ¹H-NMR(400MHz, CDCl₃) δ 8.29-8.27 (m, 2H), 8.02-8.00 (m, 2H), 7.68-7.64 (m, 1H), 7.58-7.50 (m, 4H), 4.29 (d, 1H), 4.21 (d, 1H); Chiralpak AD-H, hexane : isopropanol = 9:1, flow rate = 0.8 ml/min, retention time: 43.27min (major), 58.62min (minor).

***trans*-2,3-Epoxy-1-(4-chlorophenyl)-3-phenylproan-1-one (2f)**¹ m.p. = 67-68°C; ¹H-NMR(400MHz, CDCl₃) δ 7.98-7.96 (m, 2H), 7.48-7.46 (m, 2H), 7.42-7.35 (m, 5H), 4.24 (d, 1H), 4.08-4.07 (d, 1H); Chiralpak AD-H, hexane : isopropanol = 9:1, flow rate = 0.6 ml/min, retention time: 23.94min (minor), 28.37min (major).

***trans*-2,3-Epoxy-3-(4-chlorophenyl)-1-phenylproan-1-one (2g)**¹ m.p. = 48-49°C; ¹H-NMR(400MHz, CDCl₃) δ 8.01-7.99 (m, 2H), 7.63-7.62 (m, 1H), 7.52-7.48 (m, 2H), 7.39-7.37 (m, 2H), 7.32-7.30 (m, 2H), 4.26 (d, 1H), 4.07-4.06 (d, 1H); Chiralpak AD-H, hexane : isopropanol = 9:1, flow rate = 0.6 ml/min, retention time: 19.82min (major), 22.02min (minor).

***trans*-2,3-Epoxy-3-(2-chlorophenyl)-1-phenylproan-1-one (2h)**⁴ m.p. = 65-67°C; ¹H-NMR(400MHz, CDCl₃) δ 8.06-8.04 (m, 2H), 7.65-7.61 (m, 1H), 7.52-7.48 (m, 2H), 7.41-7.38 (m, 2H), 7.33-7.31 (m, 2H), 4.41-4.40 (d, 1H), 4.18-4.17 (d, 1H); Chiralpak AD-H, hexane : isopropanol = 40:1, flow rate = 0.6 ml/min, retention time: 39.27 min (minor), 43.09 min (major).

***trans*-2,3-Epoxy-1,3-bis(4-chlorophenyl)proan-1-one (2i)**¹ m.p. = 115-117°C; ¹H-NMR(400MHz, CDCl₃)

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δ 7.97-7.94 (m, 2H), 7.48-7.46 (m, 2H), 7.39- 7.37 (m, 2H), 7.31-7.27 (m, 2H), 4.19 (d, 1H), 4.06 (d, 1H); Chiralpak AD-H, hexane : isopropanol = 9:1, flow rate = 0.6 ml/min, retention time: 27.66min (major), 31.28min (minor).

***trans*-2,3-Epoxy-1-(4-chlorophenyl)-3-(4-methoxyphenyl)propan-1-one (2j)** ¹ m.p. = 97-98°C; ¹H-NMR (400MHz, CDCl₃) δ 8.02-7.99 (m, 2H), 7.39-7.37 (m, 2H), 7.31-7.29 (m, 2H), 6.97-6.95 (m, 2H), 4.21 (d, 1H), 4.05 (d, 1H), 3.88 (s, 3H); Chiralpak AD-H, hexane : isopropanol = 9:1, flow rate = 0.6 ml/min, retention time: 19.73min (major), 21.91min (minor).

References

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