

Supplementary Information

Mukaiyama Aldol Reaction (Method A) (Table 3, Entry 1)

TiCl₄ (68 mg, 0.36 mmol) was added to a stirred solution of methyl 2,2-dimethyl-3-(trimethylsilyloxy)dodec-3-enoate (100 mg, 0.30 mmol) and benzaldehyde (38 mg, 0.36 mmol) in CH₂Cl₂ (0.9 cm⁻³) at -45 °C under an Ar atmosphere. After stirring at the same temperature for 1 h, the mixture was quenched with water, which was extracted with AcOEt. The organic phase was washed with water, brine, dried (Na₂SO₄) and concentrated. The obtained crude product was purified by silica-gel column chromatography (hexane : ether = 7 : 1) to give methyl 4-(hydroxy(phenyl)methyl)-2,2-dimethyl-3-oxododecanoate (80 mg, 73%).

colorless oil; (*syn* : *anti* / 93 : 7); ¹H NMR (300 MHz, CDCl₃): δ 0.77-0.97 (1H, m), 0.85 (3H, t, *J* 6.9 Hz), 0.99-1.53 (12H, m), 1.33 (3H, s), 1.35 (3H, s), 1.53-1.75 (1H, m), 3.08-3.26 (1H, m), 3.66 (*anti*, 0.07 x 3H, s), 3.73 (*syn*, 0.93 x 3H, s), 4.80 (*anti*, 0.07H, d, *J* 6.5 Hz), 4.94 (*syn*, 0.93H, d, *J* 3.4 Hz), 7.20-7.40 (5H, m); ¹³C NMR (75 MHz; CDCl₃): δ 14.03, 21.68, 21.86, 22.03, 22.58, 26.29, 27.74, 29.10, 29.20, 29.79, 31.74, 52.47, 53.50, 54.04, 56.71, 73.00, 75.24, 125.89, 126.30, 127.39, 127.77, 128.23, 128.40, 141.59, 173.43, 212.67; IR (neat) 3520, 2928, 1736, 1703, 1265, 1030, 702 cm⁻¹.

Ti-Direct Aldol Reaction (Method B) (Table 3, Entry 2)

TiCl₄ (114 mg, 0.60 mmol) and Bu₃N (130 mg, 0.70 mmol) was successively added to a solution of methyl 2,2-dimethyl-3-oxododecanoate (128 mg, 0.50 mmol) in CH₂Cl₂ (1.5 cm⁻³) at 0 - 5 °C under an Ar atmosphere, and the mixture was stirred at the same temperature for 30 min. Then, benzaldehyde (64 mg, 0.60 mmol) was added to the mixture at the same temperature. After stirring for 2 h, the mixture was quenched with water, which was extracted with AcOEt. The organic phase was washed with water, brine, dried (Na₂SO₄), and concentrated. The obtained crude product was purified by silica-gel column chromatography (hexane : ether = 7 : 1) to give the desired product (142 mg, 78%). colorless oil; (*syn* : *anti* / 93 : 7).

Methyl 4-(1-hydroxyhexyl)-2,2-dimethyl-3-oxododecanoate (Table 3, Entries 3 and 4)

(*syn* : *anti* = 72 : 28); colorless oil; ^1H NMR (300 MHz, CDCl_3): δ 0.78 (6H, m), 1.10-1.73 (22H, m), 1.40 (6H, s), 2.20-2.64 (1H, brs), 2.78-2.95 (1H, m), 3.62-3.76 (1H, m) 3.72 (3H, s); ^{13}C NMR (75 MHz; CDCl_3): δ 13.99, 14.03, 22.00, 22.21, 22.27, 22.31, 22.54, 22.60, 25.73, 25.90, 26.23, 27.30, 28.33, 29.19, 29.33, 29.59, 29.73, 30.00, 31.70, 31.77, 34.39, 35.73, 51.60, 51.87, 52.35, 56.65, 56.90, 71.62, 72.02, 173.46, 173.50, 213.06, 213.79; IR (neat) 3524, 2928, 1739, 1703, 1466, 1149 cm^{-1} .

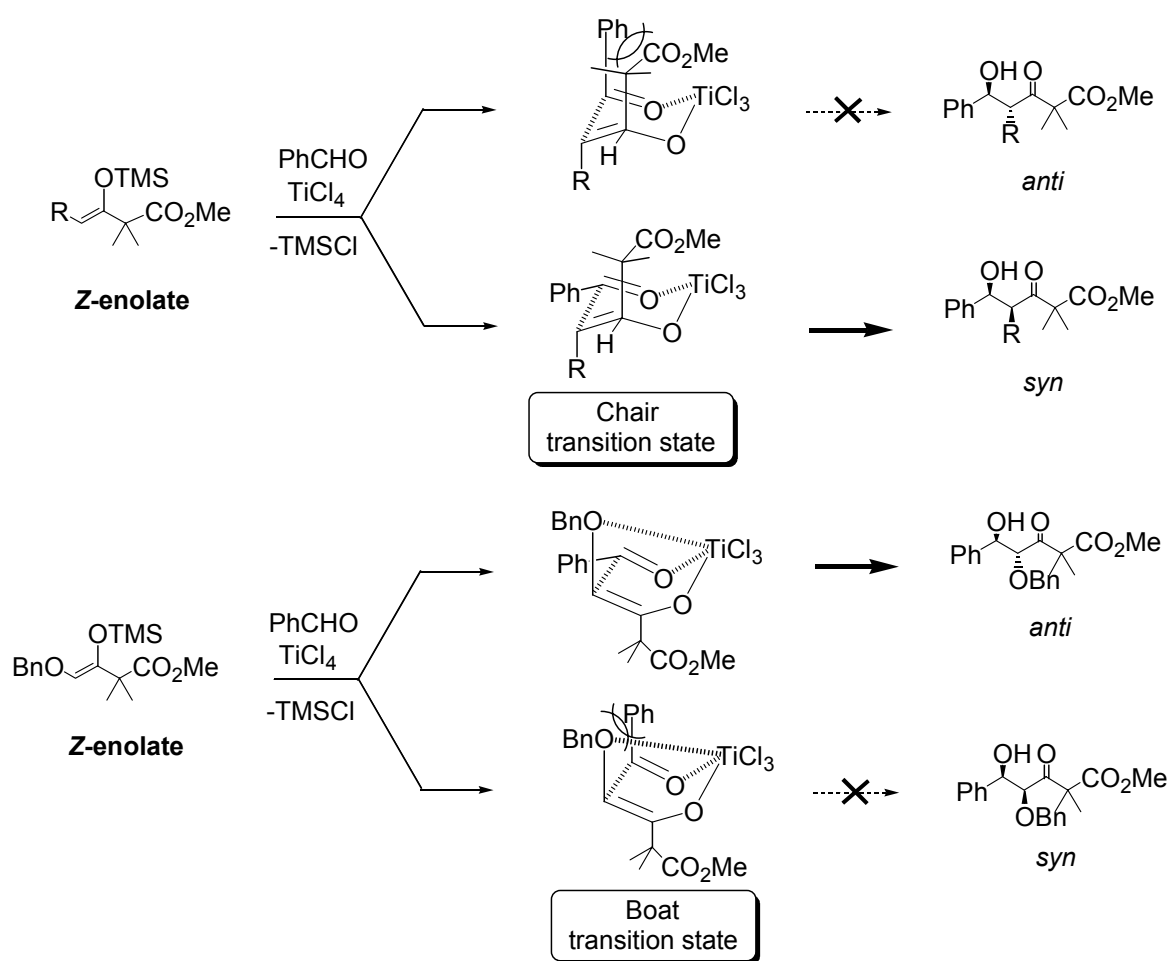
Methyl 4-(benzyloxy)-5-hydroxy-2,2-dimethyl-3-oxo-5-phenylpentanoate (Table 3, Entries 5 and 6)

(*syn* : *anti* / 25 : 75); colorless oil; ^1H NMR (300 MHz, CDCl_3): δ 1.19 (*anti*, 0.75 x 3H, s), 1.24 (*syn*, 0.25 x 3H, s), 1.30 (*syn*, 0.25 x 3H, s), 1.31 (*anti*, 0.75 x 3H, s), 3.37 (*anti*, 0.75 x 3H, s), 3.42 (*syn*, 0.25 x 3H), 3.99 (*syn*, 0.25 x 1H, d, J 10.7 Hz), 4.09 (*anti*, 0.75 x 1H, d, J 10.7 Hz), 4.22 (*anti*, 0.75 x 1H, d, J 6.2 Hz), 4.32 (*anti*, 0.75 x 1H, d, J 10.7 Hz), 4.34 (*syn*, 0.25 x 1H, d, J 10.7 Hz), 4.36 (*syn*, 0.25 x 1H, d, J 2.8 Hz), 5.06 (*anti*, 0.75 x 1H, d, J 6.2 Hz), 5.25 (*syn*, 0.25 x 1H, d, J 2.8 Hz), 7.01-7.17 (2H, m), 7.19-7.45 (8H, m); ^{13}C NMR (75 MHz; CDCl_3): δ 20.93, 21.14, 22.17, 22.40, 51.81, 51.98, 53.34, 53.53, 73.13, 74.22, 74.45, 75.75, 86.21, 87.33, 126.07, 127.45, 127.53, 127.58, 127.85, 128.08, 128.14, 128.27, 136.63, 136.93, 139.69, 140.82, 173.26, 173.82, 208.28, 210.11; IR (neat) 3499, 2949, 1749, 1714, 1454, 1151, 702 cm^{-1} .

NMR data for methyl 2,2-dimethyl-3-(trimethylsiloxy)dodec-3-enoate (A), and methyl 2,2-dimethyl-3-oxododecanoate (B)

(A) : ^1H NMR (300 MHz; CDCl_3): δ 0.16 (9H, s), 0.80 (3H, t, J 7.6 Hz), 0.88 (3H, t, J 6.9 Hz), 1.23-1.35 (12H, m), 1.24 (3H, s), 1.71 (1H, dq, J 7.6 Hz, J 13.4 Hz), 1.78 (1H, dq, J 7.6 Hz, J 13.4 Hz), 1.88-2.07 (2H, m), 3.65 (3H, s), 4.56 (1H, t, J 6.9 Hz). ^{13}C NMR (75 MHz; CDCl_3): δ 1.74, 25.24, 28.53, 36.79, 48.95, 51.95, 109.49, 114.13, 147.94, 151.55, 176.64. IR (neat) 2926, 2855, 1738, 1665, 1252, 1148, 1125, 1103, 847 cm^{-1} . (B) : ^1H NMR (300 MHz; CDCl_3): δ 0.87 (3H, t, J 6.9 Hz), 1.20-1.30 (12H, m), 1.35 (6H, s), 1.51-1.63 (2H, m), 2.41 (2H, t, J 7.2 Hz), 3.71 (3H, s). ^{13}C NMR (75 MHz; CDCl_3): δ 14.09, 21.93, 22.64, 23.84, 29.10, 29.25, 29.41, 31.85, 37.92, 52.37, 55.58, 174.29, 208.11. IR (neat) 2921, 2857, 1747, 1716, 1466, 1267, 1150 cm^{-1} .

<Proposed stereochemical mechanism of Ti-aldol reactions in Table 3>



Supplementary Material (ESI) for Chemical Communications

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