SUPPORTING INFORMATION

Lithiation and reactions of stilbene oxides: synthetic utility

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General

Tetrahydrofuran (THF) was freshly distilled under a nitrogen atmosphere over sodium/benzophenone ketyl. *N,N,N',N'*-Tetramethylethylenediamine (TMEDA) was distilled over finely powdered calcium hydride. The *trans*- and *cis*-stilbene oxides **1** and **8** are commercially available and, together with all other chemicals of commercial grade, were used without further purification. Commercial solutions of *n*-BuLi (2.5 M solution in hexanes) and *s*-BuLi (1.3 M solution in cyclohexane) were titrated by using *N*-pivaloyl-*o*-toluidine prior to use.¹ For the ¹H and ¹³C NMR spectra (270, 500 MHz; ¹³C NMR 67.9, 125 MHz), CDCl₃ was used as the solvent. GC-MS spectrometry analyses were performed on a gas chromatograph HP 6890 (dimethylsilicon capillary column, 30 m, 0.25 mm i.d.) equipped with a mass selective detector operating at 70 eV (EI). Melting points were uncorrected. Optical rotation of compound (+)-**4b** was measured with a Perkin-Elmer 341 polarimeter, using a cell of 1 dm path length at 26 °C; the concentration (c) is expressed in g/100 mL. Analytical thin-layer chromatography (TLC) was carried out on Merck pre-coated 0.25 mm thick plates of Kieselgel 60 F₂₅₄; visualization was accomplished by UV light (254 nm) or by spraying with a solution of 5 % (w/v) ammonium molybdate and 0.2 % (w/v) cerium(III) sulfate in 100 ml 17.6 % (w/v) aqueous sulphuric acid and heating to 200 °C for some time until blue spots appear. All reactions involving air-sensitive reagents were performed under nitrogen in oven-dried glassware using syringe-septum cap technique.

Preparation of α -Substituted *trans*-Stilbene Oxides 4a–e. General Procedure: A solution of **1** (196 mg, 1 mmol) and TMEDA (0.22 mL, 1.5 mmol) in 8 mL of THF¹ at –60°C (under a N₂ atmosphere), was treated with *n*-BuLi (0.95 mL, 1.5 mmol, 1.6 M in hexane) or *s*-BuLi for the preparation of **4e** (see entry 4, Table 3) and the resulting pale yellow solution was stirred for 2 hours

¹ Suffert, J. J. *Org. Chem.* **1989**, 54, 509.

¹ When the reaction was performed in Et₂O a higher temperature (–41°C) was necessary to promote the lithiation of **1** but the yield in methylated products was lowered by the isomerization reaction of oxiranyllithium to PhCOCH₂Ph and Ph₂CHCHO. Moreover, the regioselectivity was moderate (*alpha* / *ortho* = 82/18).

at -60°C . Then, the electrophile (1.2 mmol) was added at once as pure liquid or as a solution in 1 mL of THF if solid. The resulting reaction mixture was allowed to warm-up to room temperature, quenched with sat. aq. NH_4Cl and then poured into 20 mL of saturated brine, extracted with AcOEt (3×10 mL), dried (Na_2SO_4), and evaporated under reduced pressure. The crude mixture was purified by flash chromatography on silica gel (petroleum ether/AcOEt 98/2-85/15) to give the corresponding *trans*-stilbene oxide derivative.

2,3-Epoxy-1,2,3-triphenylpropan-1-ol (4d). ($1R^*,2R^*,3S^*$)-**4d**: white solid, mp $119\text{--}120^{\circ}\text{C}$, 34 %. ^1H NMR (270 MHz) δ : 1.80 (d, $^3J = 4.9$ Hz, 1 H), 4.21 (s, 1 H), 4.60 (d, $^3J = 4.9$ Hz, 1 H), 7.14–7.61 (m, 15 H); ^{13}C NMR (67.9 MHz) δ : 65.2, 68.2, 73.1, 126.2, 126.6, 127.4, 127.6, 127.7, 127.8, 128.0, 128.1, 128.5, 134.9, 136.8, 140.1; GC-MS (70 eV) m/z (%) 196 (8), 105 (100), 91 (13), 77 (40); FT-IR (KBr, cm^{-1}): 3487, 1494, 1449, 1056, 947, 748, 714, 696. Anal. calcd. for $\text{C}_{21}\text{H}_{18}\text{O}_2$: C, 83.42; H, 6.00. Found: C, 83.61; H, 5.99. ($1R^*,2S^*,3R^*$)-**4d**: white solid, mp $124\text{--}126^{\circ}\text{C}$, 22 %. ^1H NMR (500 MHz) δ : 2.70, (s, 1H), 4.31 (s, 1 H), 4.81 (s, 1 H), 6.60–6.62 (m, 2 H), 7.07–7.56 (m, 13 H); ^{13}C NMR (125 MHz) δ : 65.5, 70.9, 73.6, 126.0, 126.6, 127.3, 127.5, 127.7, 127.8, 128.2, 128.5, 128.8, 134.8, 135.9, 139.1; GC-MS (70 eV) m/z (%) 196 (3), 105 (100), 91 (5), 77 (22); FT-IR (KBr, cm^{-1}): 3454, 1495, 1453, 1046, 938, 763, 714, 698. Anal. calcd. for $\text{C}_{21}\text{H}_{18}\text{O}_2$: C, 83.42; H, 6.00. Found: C, 83.73; H, 5.94.

(E)-2,3-Epoxy-1,2,3-triphenyl-1-propanone (4e): white solid, mp $89\text{--}90^{\circ}\text{C}$, 56 %. ^1H NMR (500 MHz) δ : 4.25 (s, 1 H), 7.15–7.62 (m, 13 H), 7.95–7.99 (m, 2 H); ^{13}C NMR (125 MHz) δ : 67.1, 70.3, 125.6, 126.1, 128.28, 128.3, 128.5, 128.7, 128.8, 129.6, 133.6, 134.4, 135.6, 135.7, 193.6; GC-MS (70 eV) m/z (%) 300 (M^+ , 81), 195 (15), 167 (57), 165 (100), 105 (64), 77 (24); FT-IR (KBr, cm^{-1}): 3063, 1680 (s, C=O), 1596, 1578, 1494, 1447, 1218, 1077, 850, 753, 712, 695, 685. Anal. calcd. for $\text{C}_{21}\text{H}_{16}\text{O}_2$: C, 83.98; H, 5.37. Found: C, 83.67; H, 5.36.

(E)-2,3-Di-*o*-tolylloxirane (7): white solid, mp $105\text{--}106^{\circ}\text{C}$. ^1H NMR (500 MHz) δ : 2.38 (s, 6 H), 3.90 (s, 2 H), 7.17–7.27 (m, 6 H), 7.36–7.38 (m, 2 H); ^{13}C NMR (125 MHz) δ : 135.9, 135.5, 129.9, 127.7, 126.2, 124.1, 60.0, 18.9; GC-MS (70 eV) m/z (%) 224 (M^+ , 23), 209 (38), 195 (100), 180 (33), 165 (31), 119 (28), 103 (23); FT-IR (KBr, cm^{-1}): 3029, 2946, 1488, 1457, 1108, 1041, 888, 869, 752, 723.

Preparation of α -Substituted *cis*-Stilbene Oxides 10a–e. General Procedure: A solution of **8** (196 mg, 1 mmol) and TMEDA (0.22 mL, 1.5 mmol) in 8 mL of THF at -98°C (under a N_2 atmosphere), was treated with *n*-BuLi (0.95 mL, 1.5 mmol, 1.6 M in hexane). The resulting pale yellow solution was stirred for 30 min at -98°C . Then, the electrophile (1.2 mmol) was added at once as pure liquid or as a solution in 1 mL of THF if solid. The resulting reaction mixture was allowed to warm-up to room temperature, quenched with sat. aq. NH_4Cl and then poured into 20 mL

of saturated brine, extracted with AcOEt (3×10 mL), dried (Na_2SO_4), and evaporated under reduced pressure. The crude mixture was purified by flash chromatography on silica gel (petroleum ether/AcOEt 98/2-85/15) to give the corresponding *cis*-stilbene oxide derivative.

2,3-Epoxy-1,2,3-triphenylpropan-1-ol (*O*-acetyl) (10d): ($1R^*,2S^*,3R^*$)-**10d**: white solid, mp 123–125 °C, 64 %. ^1H NMR (500 MHz) δ 2.11 (s, 3 H), 4.37 (s, 1 H), 6.07 (s, 1 H), 6.88–6.95 (m, 4 H), 7.04–7.13 (m, 6 H), 7.24–7.31 (m, 5 H); ^{13}C NMR (125 MHz) δ 21.0, 62.52, 68.8, 77.7, 126.5, 127.3, 127.54, 127.58, 127.6, 127.8, 128.1, 128.4, 129.1, 132.9, 134.5, 135.8, 169.6; GC-MS (70 eV) m/z (%) 196 (100), 178 (17), 105 (25), 77 (18), 43 (18); FT-IR (KBr, cm^{-1}): 3065, 1749 (s, C=O), 1373, 1223, 1053, 1018, 900, 765, 703. ($1R^*,2R^*,3S^*$)-**10d**: colorless oil, 27 %. ^1H NMR (500 MHz) δ 2.18 (s, 3 H), 4.43 (s, 1 H), 6.14 (s, 1 H), 6.89–6.95 (m, 4 H), 7.02–7.08 (m, 6 H), 7.19–7.27 (m, 5 H); ^{13}C NMR (125 MHz) δ 21.1, 62.1, 69.9, 77.2, 126.4, 127.3, 127.5, 127.5, 127.6, 128.0, 128.3, 128.8, 133.3, 134.4, 135.9, 169.9; GC-MS (70 eV) m/z (%) 196 (100), 178 (21), 105 (29), 77 (19), 43 (17); FT-IR (film, cm^{-1}): 3063, 1743 (s, C=O), 1454, 1372, 1231, 1051, 948, 758, 721, 698.

(*Z*)-2,3-Epoxy-1,2,3-triphenyl-1-propanone (10e): white solid, mp 79–80 °C, 91 %. ^1H NMR (500 MHz) δ 4.54 (s, 1 H), 7.15–7.21 (m, 8 H), 7.43–7.48 (m, 4 H), 7.53–7.56 (m, 2 H); ^{13}C NMR (125 MHz) δ 63.0, 71.1, 126.6, 127.5, 127.8, 127.9, 128.1, 128.2, 128.5, 129.8, 131.9, 133.2, 133.7, 134.0, 195.2; GC-MS (70 eV) m/z (%) 300 (M^+ , 92), 195 (19), 167 (72), 165 (100), 105 (97), 77 (47); FT-IR (KBr, cm^{-1}): 3060, 1671 (s, C=O), 1446, 1278, 1178, 949, 855, 755, 696, 688. Anal. calcd. for $\text{C}_{21}\text{H}_{16}\text{O}_2$: C, 83.98; H, 5.37. Found: C, 84.31; H, 5.52.

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10a

10b

10b

10c

10c

10d (mixture of diastereoisomers)

(1*R*^{*},2*S*^{*},3*R*^{*})-**10d** (O-acetylated)

(1*R*^{*},2*S*^{*},3*R*^{*})-**10d** (O-acetylated)

(1*R*^{*},2*R*^{*},3*S*^{*})-**10d** (O-acetylated)

(1*R**,2*R**,3*S**)-**10d** (O-acetylated)

10e

10e