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$Bi(OTf)_3$ or $Bi(TFA)_3$ Catalyzed Efficient, Regio- and Chemoselectively Synthesis of β-Hydroxy Thioethers from Aryl Disulfides in the Presence of Zinc Powder

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Product of entry 1. ^{1}H NMR (200 MHz, $CDCl_3$) δ 2.10 (s, 1H)); 3.95 (d, *J* 6.8 Hz, 2H); 4.35 (t, *J* 6.8 Hz, 1H); 7.15-7.55 (m, 10H) ppm.^{13}C NMR (50 MHz, $CDCl_3$) δ 56.50; 65.70; 128.00; 128.20; 128.50; 129.20; 129.40; 132.90; 134.20; 139.40 ppm. IR (neat) ν_{max}/cm^{-1}: 3370; 3005; 2895; 2860; 1585; 1465; 1050; 740; 695.

Product of entry 2. ^{1}H NMR (200 MHz, $CDCl_3$) δ 2.80 (s, 4H); 4.35 (d, *J* 6.9 Hz, 2H); 4.75 (t, *J* 6.9 Hz, 1H); 7.50-7.90 (m, 9H) ppm. ^{13}C NMR (50 MHz, $CDCl_3$) δ 21.60; 56.80; 65.50; 128.20; 128.60; 129.10; 130.20; 130.30; 133.70; 138.30; 139.60 ppm. IR (neat) ν_{max}/cm^{-1}: 3430; 3015; 2905; 2880; 1590; 1495; 1440; 1060; 850; 735; 690.

Product of entry 3. ^{1}H NMR (200 MHz, $CDCl_3$) δ 2.25 (s, 1H); 4.05 (d, *J* 7.0 Hz, 2H); 4.52 (t, *J* 8.0 Hz, 1H); 7.30-7.95 (m, 12H) ppm.^{13}C NMR (50 MHz, $CDCl_3$) δ 56.40; 65.70; 126.80; 127.00; 127.90; 128.10; 128.30; 128.60; 128.90; 129.20; 130.10; 131.50; 131.80; 132.80; 133.90; 139.30 ppm. IR (neat) ν_{max}/cm^{-1}: 3520; 3030; 2905; 2890; 1595; 1490; 1450; 1090; 850; 730; 695.

Product of entry 4. ^{1}H NMR (200 MHz, $CDCl_3$) δ 1.20-1.50 (m, 4H); 1.62-1.83 (m, 2H); 2.05-2.25 (m, 2H); 2.70-2.85 (m, 1H); 2.90 (s, 1H); 3.30-3.50 (m, 1H); 7.25-7.60 (m, 5H) ppm.^{13}C NMR (50 MHz, $CDCl_3$) δ 24.70; 26.60; 33.10; 34.20; 56.90; 72.40; 128.20; 129.30; 133.00; 134.20 ppm. IR (neat) ν_{max}/cm^{-1}: 3650; 3015; 2905; 2885; 1590; 1495; 1440; 1065; 840; 735; 690.

Product of entry 5. ^{1}H NMR (200 MHz, $CDCl_3$) δ 1.10-1.60 (m, 4H); 2.05-2.20 (m, 2H); 2.50-2.65 (m, 2H); 2.8 (s, 3H); 3.10-3.25 (m, 1H); 3.55 (s, 1H); 3.70-3.85 (m, 1H); 7.55 (d, *J* 10.0 Hz, 2H); 7.85 (d, *J* 10.0 Hz, 2H) ppm.^{13}C NMR (50 MHz, $CDCl_3$) δ 21.60; 24.70; 26.60; 32.90; 34.20; 56.90; 72.20; 128.90; 130.10; 134.90; 138.50 ppm. IR (neat) ν_{max}/cm^{-1}: 3450; 3010; 2900; 2880; 1590; 1495; 1450; 1060; 820.

Product of entry 6. ^{1}H NMR (200 MHz, $CDCl_3$) δ 1.15-1.60 (m, 4H); 1.70-1.90 (m, 2H); 2.10-2.25 (m, 2H); 2.90-3.05 (m, 2H); 3.40-3.60 (m, 1H); 7.50-8.10 (m, 7H) ppm.^{13}C NMR (50 MHz, $CDCl_3$) δ 24.70; 26.60; 33.20; 34.30; 57.00; 72.50; 126.90; 127.00; 127.90; 128.10; 128.90; 130.30; 131.50; 132.90; 133.30; 133.90 ppm. IR (neat) ν_{max}/cm^{-1}: 3440; 3020; 2905; 2885; 1595; 1490; 1440; 1085; 810.

Product of entry 7. ^{1}H NMR (200 MHz, $CDCl_3$) δ 2.70 (s, 1H); 3.00-3.25 (m, 2H); 3.45-3.65 (m, 2H); 3.80-3.95 (m, 1H); 4.00 (d, *J* 6.8 Hz, 2H); 5.15-5.35 (m, 2H); 5.80-6.05 (m, 1H); 7.15-7.50 (m, 5H) ppm.^{13}C NMR (50 MHz, $CDCl_3$) δ 37.90; 69.40; 72.70; 72.80; 117.80; 126.90; 129.50; 130.10; 134.80; 135.90 ppm. IR (neat) ν_{max}/cm^{-1}: 3350, 3020, 2905, 2880, 1600, 1490, 1380, 1060, 735, 690.

Product of entry 8. ^{1}H NMR (200 MHz, $CDCl_3$) δ 2.80 (s, 3H); 3.20 (s, 1H); 3.35-3.65 (m, 2H); 3.90-4.10 (m, 2H); 4.25-4.35 (m, 1H); 4.40 (d, 2H); 5.60-5.80 (m, 2H); 6.20-6.45 (m, 1H); δ 7.55 (d, *J* 8.0 Hz, 2H); 7.75 (d, *J* 8.0 Hz, 2H) ppm.^{13}C NMR (50 MHz, $CDCl_3$) δ 21.40; 38.70; 69.30; 72.70; 72.80; 117.70; 130.20; 130.90; 132.10; 134.80; 137.10 ppm. IR (neat) ν_{max}/cm^{-1}: 3700; 3015; 2905; 2885; 1590; 1495; 1440; 1080; 790.

Product of entry 9. ^{1}H NMR (200 MHz, $CDCl_3$) δ 0.95 (t, *J* 7.0 Hz, 3H); 1.15-1.70 (m, 8H); 2.70(s, 1H); 2.80-2.95 (dd, *J* 9.5 Hz, *J* 9.5 Hz, 2H); 3.10-3.25 (dd, *J* 4.5 Hz, *J* 4.5 Hz, 2H); 3.50-3.80 (m, 1H); 7.15-7.50 (m, 5H) ppm.^{13}C NMR (50 MHz, $CDCl_3$) δ 14.50; 23.00; 26.10; 29.60; 32.20; 36.60; 42.50; 69.90; 126.90; 130.00; 130.30; 136.00 ppm. IR (neat) ν_{max}/cm^{-1}: 3405; 3015; 2905; 2880; 1585; 1490; 1435; 735; 690.

Product of entry 10. ^{1}H NMR (200 MHz, $CDCl_3$) δ 0.95 (t, *J* 8.3 Hz, 3H); 1.30-1.50 (m, 2H); 1.55-1.70 (m, 2H);

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2.80 (s, 1H); 3.00-3.25 (m, 2H); 3.40-3.65 (m, 4H); 3.85-4.00 (m, 1H); 7.15-7.50 (m, 5H) ppm.^{13}C NMR (50 MHz, $CDCl_3$) δ 14.30; 19.70; 32.10; 37.80; 69.40; 71.70; 73.70; 126.70; 129.40; 129.90; 136.10 ppm. IR (neat) ν_{max}/cm^{-1}: 3410; 3025; 2900; 2890; 1590; 1490; 1430; 735; 690.

Product of entry 11. ^{1}H NMR (200 MHz, $CDCl_3$) δ 2.88 (s, 1H); 3.05-3.18 (m, 2H); 3.72 (d, *J* 8.0 Hz, 2H); 3.90-4.10 (m, 1H); 7.20-7.50 (m, 5H) ppm.^{13}C NMR (50 MHz, $CDCl_3$) δ 38.60; 48.40; 69.90; 127.30; 129.70; 130.50; 135.10 ppm. IR (neat) ν_{max}/cm^{-1}: 3425; 3010; 2920; 2830; 1600; 1490; 1430; 1365; 1110; 740; 690.

Product of entry 12. ^{1}H NMR (200 MHz, $CDCl_3$) δ 2.75 (s, 1H); 3.10-3.40 (m, 2H); 3.95-4.25 (m, 3H); 6.85-7.70 (m, 10H) ppm.^{13}C NMR (50 MHz, $CDCl_3$) δ 38.00; 69.00; 70.50; 115.00; 121.70; 127.10; 129.60; 130.00; 130.25; 135.60; 158.80 ppm. IR (neat) ν_{max}/cm^{-1}: 3400; 3010; 2900; 2880; 1590; 1480; 1245; 1050; 730; 695.