

Supplementary information for

Catalytic selective bisarylation of imines with anisole, phenol, thioanisole and analogues

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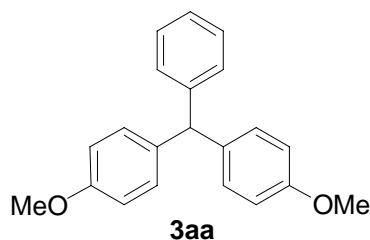
General information:

¹H and ¹³C NMR Spectra were recorded on a Bruker AC-300 FT (300 MHz and 75 MHz, respectively) using tetramethylsilane as internal reference. The chemical shifts (δ) and coupling constants (J) were expressed in ppm and Hz, respectively. The IR spectra were recorded on a Perkin-Elmer 2000FTIR spectrometer. The high resolution mass spectra were recorded on a LC-TOF spectrometer (Micromass). The melting points were uncorrected. The chemicals were purchased from Meryer, Acros and the Sinopharm Chemical Reagent Co., and used as received. Compounds **1a-1n**, **2b**, **2f**, **2g**, **2k** and **2m** were prepared according to literature procedures.¹

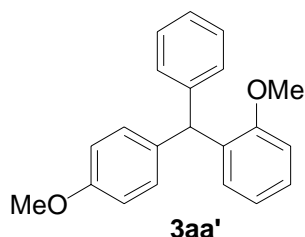
General procedure for the reaction of N-tosyl imines with aromatic compounds (anisole, phenol, thioanisole and analogues in Table 1-3):

To a solution of N-tosyl imine **1** (1.0 mmol) in CH₂Cl₂ (0.20 mL) were added aromatic compound **2** (3.0 mmol), TMSCl (21.7 mg, 25.2 μ L, 0.20 mmol) and Bi₂(SO₄)₃ (14.1 mg, 2 mol %). The resulting mixture was stirred at room temperature for 0.3-48 h (as indicated in Table 1-3), and concentrated. The residue was purified by silica gel column chromatography, eluting with petroleum ether/EtOAc (200:1 to 10:1), to give product **3**.

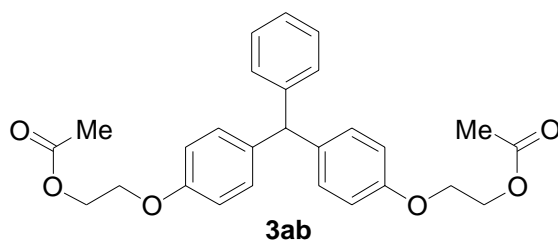
Analytical Data for Products



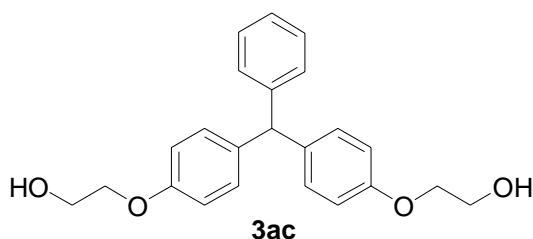
Bis(4-methoxyphenyl)phenylmethane (3aa),^{2a} white solid, m.p. 99-101 °C; ¹H NMR (300 MHz, CDCl₃): δ 7.31-7.14 (m, 3H), 7.09 (d, J = 7.2 Hz, 2H), 7.01 (d, J = 8.7 Hz, 4H), 6.81 (d, J = 8.7 Hz, 4H), 5.44 (s, 1H), 3.77 (s, 6H); ¹³C NMR (75 MHz, CDCl₃): δ 158.1, 144.7, 136.6, 130.4, 129.4, 128.4, 126.3, 113.8, 55.3.



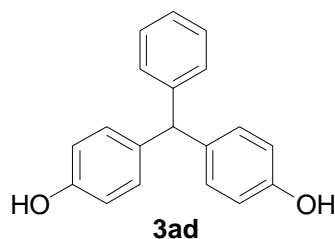
(2-Methoxyphenyl)(4-methoxyphenyl)phenylmethane (3aa'),^{2b} see Note 8, white solid, m.p. 102-104 °C; ¹H NMR (300 MHz, CDCl₃): δ 7.30-7.11 (m, 4H), 7.07 (d, *J* = 8.1 Hz, 2H), 6.98 (d, *J* = 8.1 Hz, 2H), 6.88-6.75 (m, 5H), 5.86 (s, 1H), 3.75 (s, 3H), 3.68 (s, 3H).



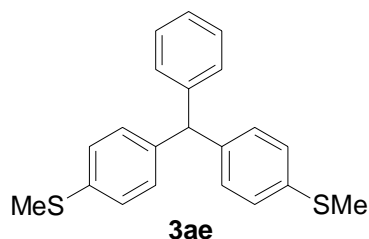
Bis[(2-acetoxyethoxy)phenyl]phenylmethane (3ab), colorless oil; ¹H NMR (300 MHz, CDCl₃): δ 7.30-7.12 (m, 3H), 7.08 (d, *J* = 6.9 Hz, 2H), 7.01 (d, *J* = 8.7 Hz, 4H), 6.83 (d, *J* = 8.7 Hz, 4H), 5.44 (s, 1H), 4.40 (t, *J* = 4.7 Hz, 4H), 4.14 (t, *J* = 4.7 Hz, 4H), 2.08 (s, 6H); ¹³C NMR (75 MHz, CDCl₃): δ 171.1, 157.1, 144.5, 137.1, 130.5, 129.4, 128.4, 126.4, 114.5, 66.1, 63.0, 55.3, 21.0; IR (film): ν 3029, 2954, 1739, 1609, 1509, 1455 cm⁻¹; HRMS (EI): Calcd for C₂₇H₂₈O₆ (M) : 448.1886. Found: 448.1881.



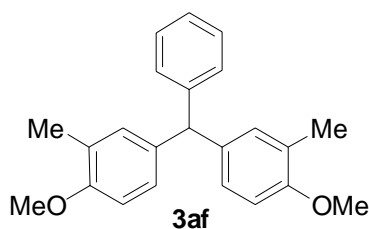
Bis[(2-hydroxyethoxy)phenyl]phenylmethane (3ac), colorless oil; ¹H NMR (300 MHz, CDCl₃): δ 7.30-7.13 (m, 3H), 7.08 (d, *J* = 7.8 Hz, 2H), 7.00 (d, *J* = 8.7 Hz, 4H), 6.81 (d, *J* = 8.7 Hz, 4H), 5.43 (s, 1H), 4.02 (t, *J* = 4.4 Hz, 4H), 3.90 (t, *J* = 4.4 Hz, 4H), 2.39 (s, br., 2H); ¹³C NMR (75 MHz, CDCl₃): δ 157.2, 144.5, 137.0, 130.5, 129.4, 128.4, 126.3, 114.5, 69.3, 61.6, 55.3; IR (film): ν 3397, 3029, 2932, 1609, 1509, 1455 cm⁻¹; HRMS (EI): Calcd for C₂₃H₂₄O₄ (M) : 364.1675. Found: 364.1668.



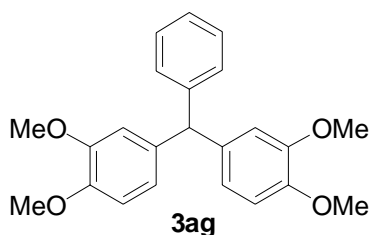
4,4'-Benzylidenediphenol(3ad),^{2a} yellow solid, m.p. 161-162 °C; ¹H NMR (300 MHz, CD₃COCD₃): δ 8.16 (s, br., 2H), 7.30-7.08 (m, 5H), 6.94 (d, *J* = 8.4 Hz, 4H), 6.77 (d, *J* = 8.4 Hz, 4H), 5.42 (s, 1H); ¹³C NMR (75 MHz, CD₃COCD₃): δ 156.5, 146.1, 136.3, 131.0, 130.0, 128.9, 126.7, 115.8, 56.0.



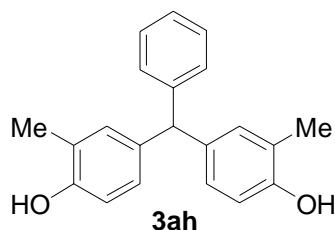
Bis(4-methylsulfonylphenyl)phenylmethane (3ae),³ white solid; m.p. 64-65 °C; ¹H NMR (300 MHz, CDCl₃): δ 7.31-7.20 (m, 3H), 7.19 (d, *J* = 8.4 Hz, 4H), 7.09 (d, *J* = 8.1 Hz, 2H), 7.02 (d, *J* = 8.4 Hz, 4H), 5.45 (s, 1H), 2.45 (s, 6H); ¹³C NMR (75 MHz, CDCl₃): δ 143.7, 140.9, 136.4, 130.0, 129.4, 128.5, 126.8, 126.5, 55.9, 16.1.



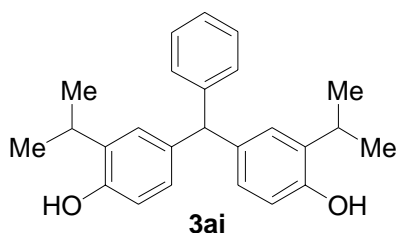
Bis(4-methoxy-3-methylphenyl)phenylmethane (3af),⁴ yellowish solid, m.p. 98-100 °C; ¹H NMR (300 MHz, CDCl₃): δ 7.30-7.06 (m, 5H), 6.90 (s, 2H), 6.85 (d, *J* = 8.4 Hz, 2H), 6.71 (d, *J* = 8.4 Hz, 2H), 5.37 (s, 1H), 3.79 (s, 6H), 2.15 (s, 6H); ¹³C NMR (75 MHz, CDCl₃): δ 156.3, 145.1, 136.2, 131.8, 129.5, 128.3, 127.6, 126.4, 126.1, 109.7, 55.5, 55.4, 16.4.



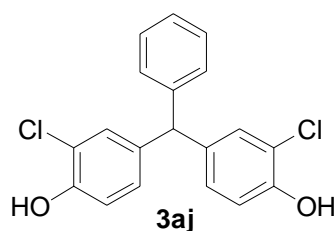
Bis(3,4-dimethoxyphenyl)phenylmethane(3ag),⁵ white solid, m.p. 122-124 °C; ¹H NMR (300 MHz, CDCl₃): δ 7.32-7.08 (m, 5H), 6.78 (d, *J* = 8.4 Hz, 2H), 6.67 (s, 2H), 6.60 (d, *J* = 8.4 Hz, 2H), 5.44 (s, 1H), 3.85 (s, 6H), 3.76 (s, 6H); ¹³C NMR (75 MHz, CDCl₃): δ 148.9, 147.6, 144.4, 136.8, 129.4, 128.3, 126.4, 121.5, 112.9, 111.0, 56.0, 55.9.



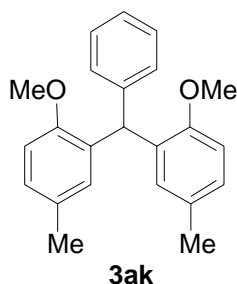
2,2'-Dimethyl-4,4'-benzylidenediphenol (3ah),⁴ white solid, m.p. 106-108 °C; ¹H NMR (300 MHz, CD₃COCD₃): δ 7.97 (s, br., 2H), 7.30-7.05 (m, 5H), 6.85 (s, 2H), 6.75-6.67 (m, 4H), 5.32 (s, 1H), 2.11 (s, 6H); ¹³C NMR (75 MHz, CD₃COCD₃): δ 154.5, 146.3, 136.4, 132.5, 130.1, 130.0, 128.9, 126.6, 124.6, 115.2, 56.2, 16.3.



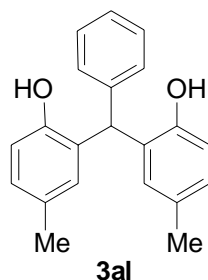
2,2'-Diisopropyl-4,4'-benzylidenediphenol (3ai), yellow solid, m.p. 122-123 °C; ^1H NMR (300 MHz, CDCl_3): δ 7.30-7.14 (m, 3H), 7.09 (d, $J = 7.2$ Hz, 2H), 6.94 (s, 2H), 6.75-6.71 (m, 2H), 6.20 (d, $J = 8.1$ Hz, 2H), 5.39 (s, 1H), 4.61 (s, br., 2H), 3.21-3.08 (m, 2H), 1.16 (d, $J = 6.9$ Hz, 12H); ^{13}C NMR (75 MHz, CDCl_3): δ 151.1, 145.2, 137.0, 134.2, 129.5, 128.3, 127.7, 127.6, 126.1, 115.1, 55.9, 27.3, 22.7; IR (film): ν 3418, 3025, 2963, 1606, 1501, 1452, 1428 cm^{-1} ; HRMS (EI): Calcd for $\text{C}_{25}\text{H}_{28}\text{O}_2$ (M): 360.2089. Found: 360.2087.



2,2'-Dichloro-4,4'-benzylidenediphenol (3aj), yellow oil; ^1H NMR (300 MHz, CDCl_3): δ 7.34-7.16 (m, 3H), 7.10-6.98 (m, 4H), 6.96-6.85 (m, 4H), 5.56 (s, br., 2H), 5.36 (s, 1H); ^{13}C NMR (75 MHz, CDCl_3): δ 150.0, 143.1, 137.1, 129.6, 129.4, 129.3, 128.7, 126.8, 120.0, 116.3, 54.9; IR (film): ν 3524, 3029, 1606, 1582, 1497, 1451 cm^{-1} ; HRMS (EI): Calcd for $\text{C}_{19}\text{H}_{14}\text{Cl}_2\text{O}_2$ (M) : 344.0371. Found: 344.0367.

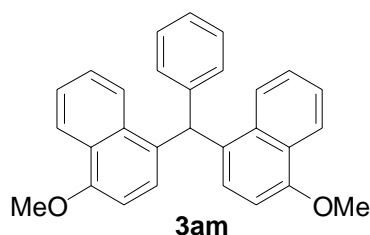


Bis(2-methoxy-5-methylphenyl)phenylmethane (3ak),⁶ white solid, m.p. 106-107 °C; ^1H NMR (300 MHz, CDCl_3): δ 7.28-7.08 (m, 3H), 7.05 (d, $J = 7.2$ Hz, 2H), 6.98 (d, $J = 8.1$ Hz, 2H), 6.76 (d, $J = 8.1$ Hz, 2H), 6.61 (s, 2H), 6.15 (s, 1H), 3.65 (s, 6H), 2.19 (s, 6H); ^{13}C NMR (75 MHz, CDCl_3): δ 155.4, 144.3, 132.6, 130.9, 130.0, 129.3, 128.0, 127.7, 125.8, 111.1, 56.1, 43.2, 20.9.

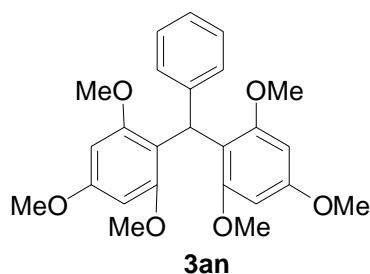


4,4'-Dimethyl-2,2'-benzylidenediphenol (3al),⁷ white solid, m.p. 160-162 °C; ^1H NMR (300 MHz,

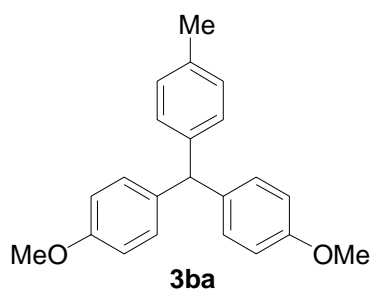
CDCl₃): δ 7.35-7.20 (m, 3H), 7.15 (d, $J = 7.8$ Hz, 2H), 6.96 (d, $J = 7.8$ Hz, 2H), 6.80-6.66 (m, 4H), 5.84 (s, 1H), 2.20 (s, 6H); ¹³C NMR (75 MHz, CDCl₃): δ 151.3, 141.6, 130.7, 130.4, 129.5, 129.4, 128.8, 126.9, 126.8, 116.3, 44.8, 21.2.



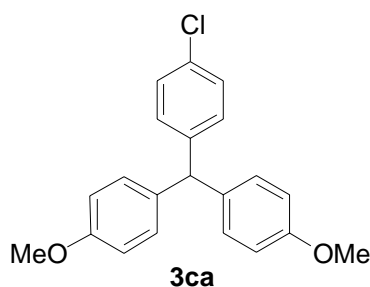
Bis(4-methoxy-1-naphthyl)phenylmethane (3am),⁸ white solid, m.p. 97-99 °C; ¹H NMR (300 MHz, CDCl₃): δ 8.32 (d, $J = 8.1$ Hz, 2H), 7.89 (d, $J = 8.1$ Hz, 2H), 7.50-7.10 (m, 8H), 6.79 (d, $J = 8.1$ Hz, 2H), 6.73 (s, 1H), 6.63 (d, $J = 8.1$ Hz, 2H), 3.95 (s, 6H); ¹³C NMR (75 MHz, CDCl₃): δ 154.6, 144.2, 132.8, 132.2, 130.0, 128.5, 127.9, 126.8, 126.4, 126.2, 124.9, 124.2, 122.6, 103.2, 55.5, 48.9.



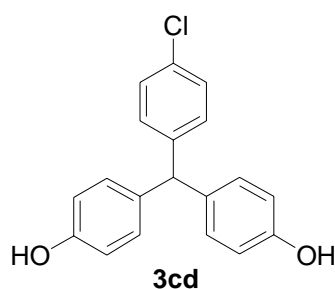
Bis(2,4,6-trimethoxyphenyl)phenylmethane (3an),⁹ white solid, m.p. 186-187 °C; ¹H NMR (300 MHz, CDCl₃): δ 7.18-7.08 (m, 2H), 7.06-6.96 (m, 3H), 6.21 (s, 1H), 6.10 (s, 4H), 3.77 (s, 6H), 3.49 (s, 12H); ¹³C NMR (75 MHz, CDCl₃): δ 160.0, 159.3, 145.8, 127.9, 127.1, 124.3, 114.6, 92.1, 56.3, 55.3, 37.3.



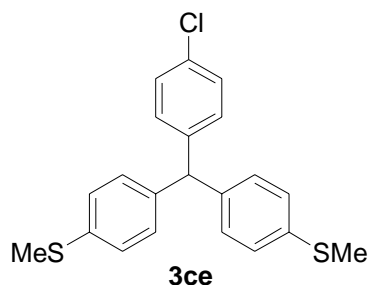
Bis(4-methoxyphenyl)(p-tolyl)methane (3ba),^{2a} white solid, m.p. 55-56 °C; ¹H NMR (300 MHz, CDCl₃): δ 7.11-6.97 (m, 8H), 6.82 (d, $J = 8.4$ Hz, 4H), 5.42 (s, 1H), 3.78 (s, 6H), 2.32 (s, 3H). ¹³C NMR (75 MHz, CDCl₃): δ 158.0, 141.8, 136.8, 130.4, 129.3, 129.1, 113.7, 55.3, 54.9, 21.1.



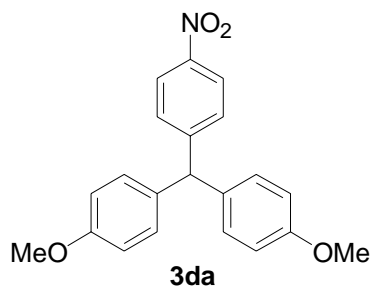
Bis(4-methoxyphenyl)(4-chlorophenyl)methane (3ca),^{2a} white solid, m.p. 69-70 °C; ¹H NMR (300 MHz, CDCl₃): δ 7.23 (d, *J* = 8.4 Hz, 2H), 7.05-6.95 (m, 6H), 6.82 (d, *J* = 8.7 Hz, 4H), 5.41 (s, 1H), 3.78 (s, 6H); ¹³C NMR (75 MHz, CDCl₃): δ 158.3, 143.3, 136.0, 132.1, 130.8, 130.3, 128.5, 113.9, 55.3, 54.7.



4,4'-[(4-Chlorophenyl)methylene]diphenol (3cd),^{2a} yellow solid, m.p. 125-127 °C; ¹H NMR (300 MHz, CDCl₃): δ 7.23 (d, *J* = 8.4 Hz, 2H), 7.01 (d, *J* = 8.1 Hz, 2H), 6.92 (d, *J* = 8.4 Hz, 4H), 6.74 (d, *J* = 8.4 Hz, 4H), 5.37 (s, 1H), 4.81 (s, br., 2H); ¹³C NMR (75 MHz, CDCl₃): δ 154.2, 143.2, 136.2, 132.1, 130.8, 130.5, 128.5, 115.4, 54.7.

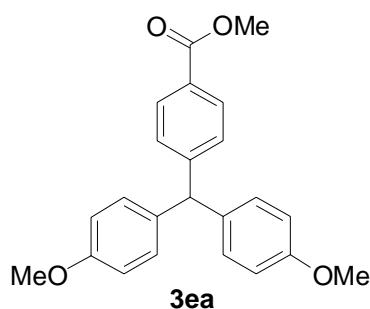


Bis(4-methylsulfanylphenyl)(4-chlorophenyl)methane (3ce),³ colorless oil; ¹H NMR (300 MHz, CDCl₃): δ 7.30-7.10 (m, 6H), 7.04-6.95 (m, 6H), 5.41 (s, 1H), 2.45 (s, 6H); ¹³C NMR (75 MHz, CDCl₃): δ 142.3, 140.3, 136.7, 132.4, 131.0, 129.9, 128.6, 126.7, 55.3, 16.0.

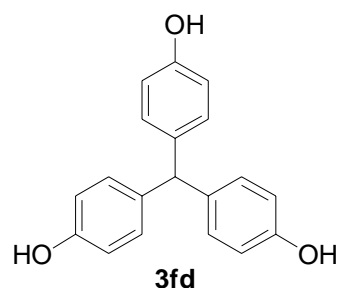


Bis(4-methoxyphenyl)(4-nitrophenyl)methane (3da),^{2a} white solid, m.p. 45-46 °C; ¹H NMR (300 MHz, CDCl₃): δ 8.13 (d, *J* = 8.7 Hz, 2H), 7.27 (d, *J* = 8.4 Hz, 2H), 6.98 (d, *J* = 8.4 Hz, 4H), 6.83 (d, *J* = 8.7 Hz, 4H), 5.53 (s, 1H), 3.79 (s, 6H); ¹³C NMR (75 MHz, CDCl₃): δ 158.5, 152.5, 146.5, 134.9, 130.3,

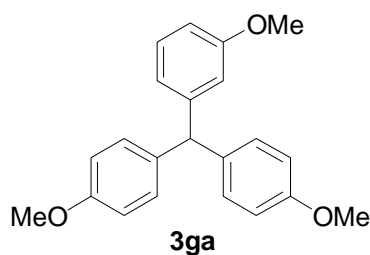
130.2, 123.6, 114.1, 55.4, 55.2.



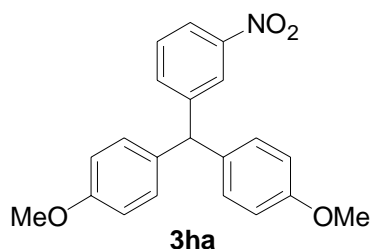
Methyl 4-[bis(4-methoxyphenyl)]methylbenzoate (3ea),^{2a} white solid, m.p. 117-119 °C; ¹H NMR (300 MHz, CDCl₃): δ 7.94 (d, *J* = 8.1 Hz, 2H), 7.17 (d, *J* = 8.1 Hz, 2H), 6.99 (d, *J* = 8.4 Hz, 4H), 6.82 (d, *J* = 8.4 Hz, 4H), 5.48 (s, 1H), 3.88 (s, 3H), 3.77 (s, 6H); ¹³C NMR (75 MHz, CDCl₃): δ 167.1, 158.3, 150.2, 135.7, 130.4, 129.7, 129.4, 128.3, 113.9, 55.3, 52.1.



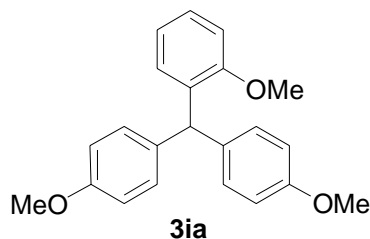
4,4',4''-methanetriyltriphenol (3fd),¹⁰ white solid, m.p. 235-237 °C; ¹H NMR (300 MHz, CD₃COCD₃): δ 8.11 (s, br., 3H), 6.93 (d, *J* = 8.4 Hz, 6H), 6.75 (d, *J* = 8.4 Hz, 6H), 5.32 (s, 1H). ¹³C NMR (75 MHz, CD₃COCD₃): δ 156.4, 137.0, 131.0, 115.7, 55.2.



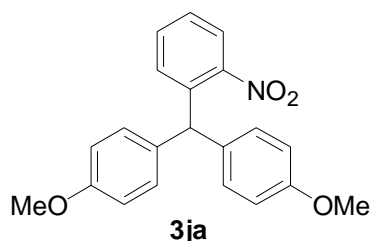
Bis(4-methoxyphenyl)(3-methoxyphenyl)methane (3ga), colorless oil; ¹H NMR (300 MHz, CDCl₃): δ 7.25-7.16 (m, 1H), 7.01 (d, *J* = 8.7 Hz, 4H), 6.81 (d, *J* = 8.7 Hz, 4H), 6.77-6.60 (m, 3H), 5.40 (s, 1H), 3.77 (s, 6H), 3.74 (s, 3H); ¹³C NMR (75 MHz, CDCl₃): δ 159.7, 158.1, 146.4, 136.4, 130.4, 129.3, 122.0, 115.6, 113.8, 111.3, 55.3, 55.2; IR (film): ν 2999, 2933, 1605, 1507, 1461 cm⁻¹; HRMS (EI): Calcd for C₂₂H₂₂O₃ (M): 334.1569. Found: 334.1565.



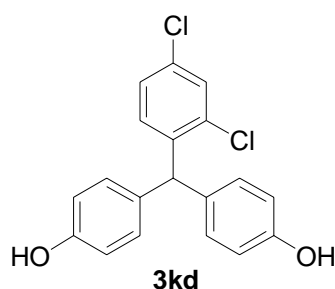
Bis(4-methoxyphenyl)(3-nitrophenyl)methane (3ha),¹¹ white solid, m.p. 69-71 °C; ¹H NMR (300 MHz, CDCl₃): δ 8.10-8.00 (m, 1H), 7.98 (s, 1H), 7.49-7.40 (m, 2H), 7.00 (d, *J* = 8.7 Hz, 4H), 6.84 (d, *J* = 8.7 Hz, 4H), 5.53 (s, 1H), 3.78 (s, 6 H); ¹³C NMR (75 MHz, CDCl₃): δ 158.5, 148.5, 147.1, 135.5, 135.0, 130.3, 129.2, 124.1, 121.5, 114.1, 55.4, 55.0.



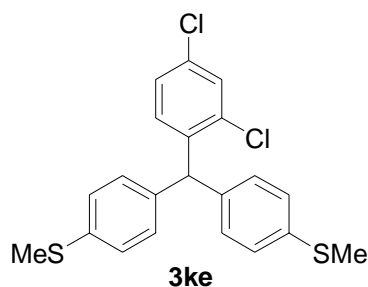
Bis(4-methoxyphenyl)(2-methoxyphenyl)methane (3ia),¹² white solid, m.p. 111-113 °C; ¹H NMR (300 MHz, CDCl₃): δ 7.25-7.10 (m, 1H), 6.99 (d, *J* = 8.7 Hz, 4H), 6.90-6.70 (m, 7H), 5.81 (s, 1H), 3.77 (s, 6H), 3.71 (s, 3H). ¹³C NMR (75 MHz, CDCl₃): δ 157.9, 157.2, 136.5, 133.4, 130.4, 130.3, 127.5, 120.4, 113.6, 110.8, 55.7, 55.3, 48.0.



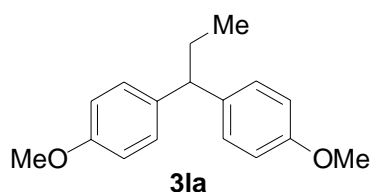
Bis(4-methoxyphenyl)(2-nitrophenyl)methane (3ja),¹³ colorless oil; ¹H NMR (300 MHz, CDCl₃): δ 7.82 (d, *J* = 8.1 Hz, 1H), 7.43 (t, *J* = 7.5 Hz, 1H), 7.34 (t, *J* = 7.5 Hz, 1H), 7.09 (d, *J* = 7.8 Hz, 1H), 6.95 (d, *J* = 8.7 Hz, 4H), 6.81 (d, *J* = 8.7 Hz, 4H), 6.16 (s, 1H), 3.77 (s, 6H); ¹³C NMR (75 MHz, CDCl₃): δ 158.4, 149.9, 139.0, 134.5, 132.4, 131.9, 130.5, 127.4, 124.7, 113.9, 55.3, 49.9.



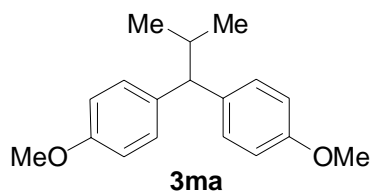
4,4'-(2,4-dichlorophenyl)methylene)diphenol (3kd), white solid, m.p. 156-158 °C; ¹H NMR (300 MHz, CD₃COCD₃): δ 8.23 (s, br., 2H), 7.47 (s, 1H), 7.32 (d, *J* = 8.4 Hz, 1H), 6.99 (d, *J* = 8.4 Hz, 1H), 6.90 (d, *J* = 8.4 Hz, 4H), 6.79 (d, *J* = 8.4 Hz, 4H), 5.75 (s, 1H); ¹³C NMR (75 MHz, CD₃COCD₃): δ 157.0, 142.7, 134.2, 133.1, 133.0, 131.1, 129.9, 127.8, 116.1, 52.3; IR (film): ν 3366, 1611, 1511, 1466 cm⁻¹; HRMS (EI): Calcd for C₁₉H₁₄Cl₂O₂ (M): 344.0371. Found: 344.0375.



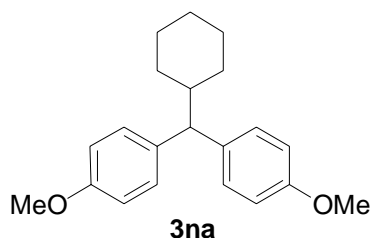
Bis(4-methylsulfanylphenyl)(4-chlorophenyl)methane (3ke), colorless oil; ^1H NMR (300 MHz, CDCl_3): δ 7.39 (s, 1H), 7.28-7.12 (m, 4H), 7.12 (s, 1H), 6.95 (d, $J = 8.1$ Hz, 4H), 6.85 (d, $J = 8.4$ Hz, 1H), 5.78 (s, 1H), 2.46 (s, 6H); ^{13}C NMR (75 MHz, CDCl_3): δ 140.2, 139.0, 137.0, 135.3, 133.1, 131.9, 130.0, 129.7, 127.1, 126.8, 52.1, 15.9; IR (film): ν 3020, 2920, 1585, 1560, 1492, 1467 cm^{-1} ; HRMS(EI): Calcd for $\text{C}_{21}\text{H}_{18}\text{Cl}_2\text{S}_2$ (M): 404.0227. Found: 404.0220.



1,1-Bis(4-methoxyphenyl)propane (3la),^{2a} white solid, m.p. 40-41 °C; ^1H NMR (300 MHz, CDCl_3): δ 7.12 (d, $J = 8.7$ Hz, 4H), 6.81 (d, $J = 8.7$ Hz, 4H), 3.76 (s, 6H), 3.70 (t, $J = 7.8$ Hz, 1H), 2.06-1.93 (m, 2H), 0.87 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (75 MHz, CDCl_3): δ 157.9, 137.9, 128.8, 113.8, 55.3, 51.6, 29.0, 12.9.



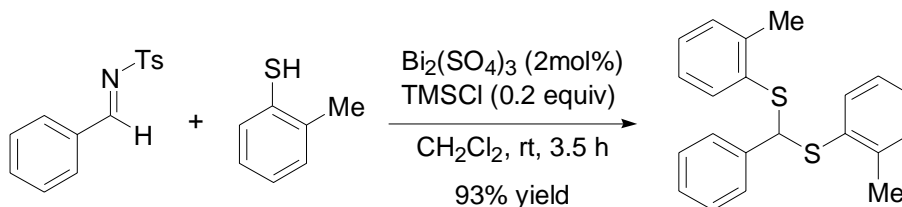
1,1-Bis(4-methoxyphenyl)-2-methylpropane (3ma),¹⁴ colorless oil; ^1H NMR (300 MHz, CDCl_3): δ 7.16 (d, $J = 8.7$ Hz, 4H), 6.79 (d, $J = 8.4$ Hz, 4H), 3.77 (s, 6H), 3.31 (d, $J = 10.5$ Hz, 1H), 2.43-2.30 (m, 1H), 0.85 (d, $J = 6.3$ Hz, 6H); ^{13}C NMR (75 MHz, CDCl_3): δ 157.8, 137.7, 128.8, 113.9, 59.2, 55.2, 32.2, 22.0.



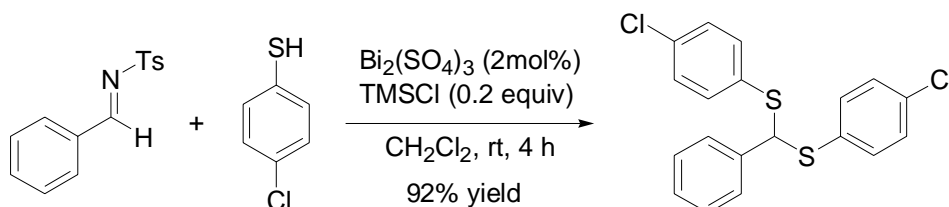
Bis(4-methoxyphenyl)cyclohexylmethane (3na), colorless oil; ^1H NMR (300 MHz, CDCl_3): δ 7.15 (d, $J = 8.7$ Hz, 4H), 6.79 (d, $J = 8.7$ Hz, 4H), 3.74 (s, 6H), 3.38 (d, $J = 10.7$ Hz, 1H), 2.08-1.92 (m, 1H), 1.78-1.49 (m, 5H), 1.33-1.06 (m, 3H), 0.95-0.75 (m, 2H); ^{13}C NMR (75 MHz, CDCl_3): δ 157.8, 137.2, 129.0, 113.9, 57.8, 55.3, 41.7, 32.3, 26.7, 26.5; IR (film): ν 2931, 1608, 1582, 1530, 1509, 1463 cm^{-1} ; HRMS(EI): Calcd for $\text{C}_{21}\text{H}_{26}\text{O}_2$ (M): 310.1933. Found: 310.1927.

The reaction of N-tosyl imine **1a** with mercapto-substituted arenes (Note 10):

The following two reactions were performed according to the general procedure for the reaction of N-tosyl imines with aromatic compounds.



Benzaldehyde bis-(2-methylphenyl)dithioacetal, white solid, m.p. 65-67 °C; ^1H NMR (300 MHz, CDCl_3): δ 7.40-7.00 (m, 13H), 5.28 (s, 1H), 2.29 (s, 6H); ^{13}C NMR (75 MHz, CDCl_3): δ 140.3, 140.1, 134.1, 133.3, 130.4, 128.5, 128.1, 128.0, 127.9, 126.5, 60.1, 20.7; IR (film): ν 2943, 1607, 1497 cm^{-1} ; HRMS (EI): Calcd for $\text{C}_{21}\text{H}_{20}\text{S}_2$ (M): 336.1006. Found: 336.1009.



Benzaldehyde bis-(4-chlorophenyl)dithioacetal,¹⁵ white solid, m.p. 59-61 °C; ^1H NMR (300 MHz, CDCl_3): δ 7.35-7.11 (m, 13H), 5.34 (s, 1H); ^{13}C NMR (75 MHz, CDCl_3): δ 139.0, 134.4, 134.3, 132.6, 129.2, 128.7, 128.5, 128.0, 60.9.

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