Supporting Information

Addition of Grignard Reagents to Aryl Acid Chlorides: An Efficient Synthesis of Aryl Ketones

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A typical experimental procedure: To a solution of bis[2-(N,N-dimethylaminoethyl)] ether (0.50 mL, 2.6 mmol) in THF (8 mL) was added EtMgBr (1.30 mL, 2.6 mmol, 2 M solution in THF) at 0 °C. The mixture was stirred at 0-5 °C for 15 min. This mixture was slowly added to a solution of **1a** (350 mg, 2.0 mmol) in THF (4 mL) at -60 °C over 15 min, and the resulting mixture was stirred at -60 °C for 3 min. The mixture was then quenched with aqueous ammonium chloride. After extraction of the mixture with EtOAc, the extract was dried over MgSO₄ and concentrated. The residue was purified by chromatography on silica gel to give **2a** (305 mg, 91%) as a white solid: ¹H NMR (400 MHz, CDCl₃) δ 8.89 (d, *J* = 2.4 Hz, 1H), 8.16 (dd, *J* = 2.4, 8.3 Hz, 1H), 7.40 (d, *J* = 8.3 Hz, 1H), 2.97 (q, *J* = 7.2 Hz, 2H), 1.20 (d, *J* = 7.2 Hz, 3H). ¹³C NMR (400 MHz, CDCl₃) δ 198.2, 155.4, 150.0, 138.0, 130.9, 124.5, 32.2, 7.7. HRMS calcd for C₈H₉ClNO (M⁺+1) 170.0367, found 170.0360.

2b: ¹H NMR (400 MHz, CDCl₃) δ 7.78 (dd, *J* = 1.5, 7.8 Hz, 1H), 7.51 (dt, *J* = 1.5, 8.1 Hz, 1H), 7.40 (t, *J* = 8.3 Hz, 1H), 7.11 (d, *J* = 8.1 Hz, 1H), 2.91 (q, *J* = 7.2 Hz, 2H), 2.34 (s, 3H), 1.17 (d, *J* = 7.2 Hz, 3H). ¹³C NMR (400 MHz, CDCl₃) δ 200.7, 169.5, 148.9, 133.0, 130.8, 129.7, 126.0, 123.8, 34.5, 21.1, 8.1. HRMS calcd for C₁₁H₁₂O₃ (M⁺+1) 193.0859, found 193.0861.

2c: ¹H NMR (400 MHz, CDCl₃) δ 8.42 (d, *J* = 2.0 Hz, 1H), 8.10 (dd, *J* = 2.0, 8.4 Hz, 1H), 7.67 (d, *J* = 8.4 Hz, 1H), 3.03 (q, *J* = 7.2 Hz, 2H), 1.25 (d, *J* = 7.2 Hz, 3H). ¹³C NMR (400 MHz, CDCl₃) δ 197.3, 148.1, 136.2, 132.4, 131.9, 131.4, 125.0, 32.0, 7.8.

2h: ¹H NMR (400 MHz, CDCl₃) δ 8.48 (d, *J* = 2.0 Hz, 1H), 8.12 (dd, *J* = 2.0, 8.4 Hz, 1H), 7.63 (d, *J* = 8.4 Hz, 1H), 7.35-7.28 (m, 5H), 4.64 (s, 2H), 4.32 (s, 2H). ¹³C NMR (400 MHz, CDCl₃) δ 197.1, 138.2, 137.1, 134.4, 133.2, 129.6, 129.2, 128.8, 128.7, 128.6, 127.0, 45.7, 45.6. HRMS calcd for C₁₅H₁₄ClO (M⁺+1) 245.0727, found 245.0733.

2i: ¹H NMR (400 MHz, CDCl₃) δ 8.07 (s, 1H), 7.99 (d, *J* = 7.8 Hz, 1H), 7.61 (d, *J* = 7.7 Hz, 1H), 7.49 (t, *J* = 7.7 Hz, 1H), 7.39-7.26 (m, 5H), 4.31 (s, 2H). ¹³C NMR (400 MHz, CDCl₃) δ 194.5, 148.0, 135.9, 133.3, 132.6, 132.5, 131.6, 129.5, 129.0, 127.4, 125.6, 45.6.

2j: ¹H NMR (500 MHz, CDCl₃) δ 9.06 (d, *J* = 2.4 Hz, 1H), 8.24 (dd, *J* = 2.4, 8.3 Hz, 1H), 7.45 (d, *J* = 8.3 Hz, 1H), 2.62 (m, 1H), 1.34 (m, 2H), 1.17 (m, 2H). ¹³C NMR (400 MHz, CDCl₃) δ 197.0, 154.3, 148.7, 136.9, 131.0, 123.4, 16.6, 11.3. HRMS calcd for C₉H₉ClNO (M⁺+1) 182.0373, found 182.0373.

2k: ¹H NMR (400 MHz, CDCl₃) δ 8.72 (d, *J* = 2.4 Hz, 1H), 8.12 (dd, *J* = 2.4, 8.3 Hz, 1H), 7.47 (d, *J* = 8.3 Hz, 1H), 7.45 (dd, *J* = 1.8, 7.4 Hz, 1H), 7.36-7.29 (m, 3H), 2.40 (s, 3H). ¹³C NMR (400 MHz, CDCl₃) δ 195.4, 155.4, 151.7, 139.6, 137.4, 136.8, 132.2, 131.6, 131.3, 128.9, 125.5, 124.4. HRMS calcd for C₁₃H₁₁ClNO (M⁺+1) 232.0523, found 232.0522.

2l: ¹H NMR (400 MHz, CDCl₃) δ 7.52 (d, *J* = 1.9 Hz, 2H), 7.45 (t, *J* = 1.9 Hz, 1H), 7.36 (dd, *J* = 2.6, 8.9 Hz, 1H), 7.27 (d, *J* = 2.6 Hz, 1H), 6.85 (d, *J* = 8.9 Hz, 1H), 3.63 (s, 3H). ¹³C NMR (400 MHz, CDCl₃) δ 192.3, 156.0, 140.0, 135.3, 132.7, 132.5, 129.5, 128.6, 127.8, 126.1, 113.1, 56.0. MS m/e 315 (M⁺+1).

2m: ^1H NMR (400 MHz, CDCl_3) δ : 7.70 (ABq, $J = 8.5$ Hz, 2H), 7.63 (ABq, $J = 8.5$ Hz, 2H), 8.72 (d, $J = 2.4$ Hz, 1H), 8.12 (dd, $J = 2.4, 8.3$ Hz, 1H), 7.47 (d, $J = 8.3$ Hz, 1H), 7.45 (dd, $J = 1.8, 7.4$ Hz, 1H), 7.36-7.29 (m, 3H), 2.40 (s, 3H). ^{13}C NMR (400 MHz, CDCl_3) δ : 195.4, 159.7, 138.5, 136.3, 131.6, 131.3, 129.4, 127.5, 122.7, 119.1, 114.3, 55.5. MS m/e 291 ($\text{M}^+ + 1$).

2n: ^1H NMR (400 MHz, CDCl_3) δ : 8.78 (d, $J = 2.4$ Hz, 1H), 8.20 (ABq, $J = 8.5$ Hz, 2H), 8.12 (dd, $J = 2.4, 8.3$ Hz, 1H), 7.85 (ABq, $J = 8.5$ Hz, 2H), 7.51 (d, $J = 8.3$ Hz, 1H), 4.44 (q, $J = 7.2$ Hz, 2H), 1.44 (t, $J = 7.2$ Hz, 3H). ^{13}C NMR (400 MHz, CDCl_3) δ : 193.0, 165.5, 155.4, 151.2, 139.8, 134.5, 131.4, 129.8, 129.6, 124.5, 61.6, 14.3. HRMS calcd for $\text{C}_{15}\text{H}_{13}\text{ClNO}_3$ ($\text{M}^+ + 1$) 290.0578, found 290.0584.

2o: ^1H NMR (400 MHz, CDCl_3) δ : 7.76 (d, $J = 1.9$ Hz, 1H), 7.63 (ABq, $J = 8.0$ Hz, 2H), 7.59 (dt, $J = 1.9, 8.4$ Hz, 1H), 7.47 (dt, $J = 1.9, 8.4$ Hz, 1H), 7.25 (ABq, $J = 8.0$ Hz, 2H), 2.39 (s, 3H). ^{13}C NMR (400 MHz, CDCl_3) δ : 193.4, 163.4, 160.9, 144.5, 141.1, 133.5, 130.2, 129.4, 122.3, 120.0, 116.3, 21.7. MS m/e 283 ($\text{M}^+ + 1$).

2p: ^1H NMR (400 MHz, CDCl_3) δ : 8.12 (ABq, $J = 6.8$ Hz, 2H), 7.84 (ABq, $J = 6.8$ Hz, 2H), 7.46 (dd, $J = 2.4, 8.8$ Hz, 1H), 7.39 (d, $J = 2.4$ Hz, 1H), 6.95 (d, $J = 8.8$ Hz, 1H), 4.43 (q, $J = 7.2$ Hz, 2H), 1.43 (t, $J = 7.2$ Hz, 3H). ^{13}C NMR (400 MHz, CDCl_3) δ : 194.3, 165.1, 140.7, 134.2, 132.1, 129.5, 129.4, 125.9, 113.0, 61.4, 55.9, 14.3. HRMS calcd for $\text{C}_{17}\text{H}_{16}\text{ClO}_4$ ($\text{M}^+ + 1$) 319.0731, found 319.0738.

4: ^1H NMR (400 MHz, CDCl_3) δ : 8.92 (d, $J = 2.4$ Hz, 1H), 8.42 (d, $J = 2.4$ Hz, 1H), 8.16 (dd, $J = 2.4, 8.3$ Hz, 1H), 7.69 (dd, $J = 2.4, 8.3$ Hz, 1H), 7.36 (d, $J = 8.3$ Hz, 1H), 7.30 (d, $J = 8.3$ Hz, 1H), 5.30 (s, 2H). HRMS calcd for $\text{C}_{12}\text{H}_9\text{Cl}_2\text{N}_2\text{O}_3$ ($\text{M}^+ + 1$) 283.0035, found 283.0042.

5: ^1H NMR (400 MHz, CDCl_3) δ : 9.00 (d, $J = 2.4$ Hz, 1H), 8.45 (d, $J = 2.4$ Hz, 1H), 8.23 (dd, $J = 2.4, 8.3$ Hz, 1H), 7.70 (dd, $J = 2.4, 8.3$ Hz, 1H), 7.42 (d, $J = 8.3$ Hz, 1H), 7.34 (d, $J = 8.3$ Hz, 1H), 5.91 (t, $J = 6.9$ Hz, 1H), 2.11 (m, 1H), 1.97 (m, 1H), 0.98 (t, $J = 7.4$ Hz, 3H). ^{13}C NMR (400 MHz, CDCl_3) δ : 163.6, 156.0, 151.3, 151.1, 148.3, 139.6, 137.1, 134.3, 124.7, 124.4, 124.3, 75.9, 28.9, 9.8. HRMS calcd for $\text{C}_{14}\text{H}_{13}\text{Cl}_2\text{N}_2\text{O}_3$ ($\text{M}^+ + 1$) 311.0348, found 311.0357.