Supporting Information
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Supporting information

Efficient and General Synthesis of 3-Aryl Coumarins Using Cyanuric Chloride

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**General Information:**

All reagents were commercial and were used without further purification. Chromatography was carried on silica gel (60-120 and 100-200 mesh). All reactions were monitored by TLC, silica gel plates with fluorescence F$_{254}$ were used. Melting points were taken in open capillaries on Comlab melting point apparatus and are presented uncorrected. Infrared spectra were recorded on a Perkin-Elmer FT-IR RXI spectrophotometer. $^1$H NMR and $^{13}$C NMR spectra were recorded using Bruker Supercon Magnet DPX-200 or DRX-300 spectrometers (operating at 200 and 300 MHz respectively for $^1$H; 50 and 75 MHz respectively for $^{13}$C) using CDCl$_3$ and DMSO-$d_6$ as solvents and TMS as internal standard. Chemical shifts are reported in parts per million. Splitting patterns are described as singlet (s), broad singlet (brs), doublet (d), broad doublet (brd), double doublet (dd), triplet (t), quartet (q), and multiplet (m). Electrospray ionization mass spectra (ESIMS) were recorded on Thermo Lcq Advantage Max-IT.
Representative synthesis of 3-(4'-methoxy phenyl)coumarin (1c):

To a mixture of cyanuric chloride (377mg, 1.0 mmol), N-methyl mortholine (331mg, 1.5 mmol) and 4-methoxy phenyl acetic acid (340 mg, 1.0 mmol) in DMF (5 mL), was stirred at room temperature for 10 min. After that 2-hydroxy benzaldehyde (250 mg) (1a) (1.0 mmol) was added. Subsequently, the resulting reaction mixture was refluxed for 45 min (monitor by TLC). The reaction mixture was diluted with water (10 mL) and extracted 3-fold with EtOAc (15 mL). The combined organic layers were dried on Na₂SO₄, filtered, and concentrated to dryness under reduced pressure. The residue was purified over column chromatography (Al₂O₃, 70-230 mesh, neutral, hexane/DCM) provided the pure compound 1c.

White crystalline solid, yield: 95%; mp: 146-148 ºC ; IR (KBr): 3043, 1715, 1633, 1020 cm⁻¹; ¹H NMR (CDCl₃, 300 MHz) δ: 7.75. (s, 1H), 7.68 (d, J = 8.8 Hz, 2H), 7.53-7.47 (m, 2H), 7.36-7.28 (m, 2H), 6.97 (d, J = 8.8 Hz, 2H), 3.85 (s, 3H); ¹³C NMR (CDCl₃, 75 MHz) δ:160.8, 160.2, 153.3, 138.5, 131.0, 129.9, 127.9, 127.8, 127.1, 124.5, 119.9, 116.4, 113.9, 55.4; ESI-MS (m/z): 252 (M+H)⁺.

6-Bromo-3-(4-methoxyphenyl)-2H-chromen-2-one (2c):

White solid, yield: 90%; mp: 158-160 ºC; IR (KBr): 3033, 1705, 1632, 1025 cm⁻¹; ¹H NMR (CDCl₃, 300 MHz) δ: 7.67-7.65 (m, 4H), 7.59-7.56 (m, 1H), 7.23 (d, J = 8.7 Hz, 1H), 6.97 (d, J = 8.8 Hz, 2H), 3.85 (s, 3H); ESI-MS (m/z): 330 (M+H)⁺.

8-tert-Butyl-3-(4-methoxyphenyl)-2H-chromen-2-one (3c):

White crystalline solid, yield: 97%; mp: 156-158 ºC; IR (KBr): 3023, 1715, 1629, 1023 cm⁻¹; ¹H NMR (CDCl₃, 300 MHz) δ: 7.77 (s, 1H), 7.72 (d, J = 8.9 Hz, 2H), 7.51 (dd, J = 1.5 Hz, 1H), 7.40 (dd, J = 1.5 Hz, 1H), 7.28-7.20 (m, 1H), 7.00 (d, J = 8.9 Hz, 2H), 3.87 (s, 3H), 1.56 (s, 9H); ¹³C NMR (CDCl₃, 75 MHz) δ: 160.3, 160.1, 152.1, 139.4, 137.7, 129.8, 128.6, 127.2, 126.9, 126.2, 124.0, 120.4, 114.0, 55.4, 35.0, 30.0; ESI-MS (m/z): 308 (M+H)⁺.

3-(4-Methoxyphenyl)-8-methyl-2-oxo-2H-chromene-6-carbaldehyde (4c):

Light yellow solid, yield: 96%; mp: 148-150 ºC; IR (KBr): 3033, 1725, 1705, 1639, 1021 cm⁻¹; ¹H NMR (CDCl₃, 300 MHz) δ: 9.98 (s, 1H), 7.86 (d, J = 4.5 Hz, 2H), 7.79 (s, 1H), 7.67 (d, J = 8.9 Hz, 2H), 6.96 (d, J = 8.5 Hz, 2H), 3.84 (s, 3H); ¹³C NMR (CDCl₃, 75 MHz) δ: 190.6, 160.5, 155.4, 137.9, 132.4, 132.3, 129.9, 128.6, 128.1, 127.3, 126.5, 119.8, 114.1, 55.4, 15.6; ESI-MS (m/z): 295 (M+H)⁺.
8-sec-Butyl-3-(4-methoxyphenyl)-2-oxo-2H-chromene-6-carbaldehyde (5c):
Light yellow solid, yield: 98%; mp: 110-112 °C; IR (KBr): 3017, 1721, 1687, 1611, 1032 cm⁻¹; ¹H NMR (CDCl₃, 300 MHz) δ: 10.01 (s, 1H), 7.91 (d, J = 8.0 Hz, 2H), 7.82 (s, 1H), 7.69 (d, J = 8.9 Hz, 2H), 6.96 (d, J = 8.9 Hz, 2H), 3.83 (s, 3H), 3.53–3.41 (m, 1H), 1.78–1.72 (m, 2H), 1.33 (d, J = 7.0 Hz, 3H), 0.90 (t, J = 7.4 Hz, 3H); ¹³C NMR (CDCl₃, 75 MHz) δ: 190.7, 160.4, 159.8, 154.6, 138.2, 136.5, 132.6, 129.8, 128.8, 128.3, 128.0, 126.4, 119.9, 114.0, 55.3, 33.3, 29.6, 20.4, 12.0; ESI-MS (m/z): 336 (M+H)⁺.

3-(4-Methoxyphenyl)-6-methyl-2H-benzo[h]chromen-2-one (6c):
Light yellow solid, yield: 90%; mp: 135-137 °C; IR (KBr): 3067, 1705, 1641, 1026 cm⁻¹; ¹H NMR (CDCl₃, 300 MHz) δ: 8.62–8.58 (m, 1H), 8.01–7.98 (m, 1H), 7.83 (s, 1H), 7.70 (d, J = 8.8 Hz, 2H), 7.68–7.64 (m, 2H), 7.33 (s, 1H), 6.96 (d, J = 8.8 Hz, 2H), 3.87 (s, 3H), 2.70 (s, 3H); ¹³C NMR (CDCl₃, 75 MHz) δ: 161.0, 160.1, 149.1, 139.0, 133.7, 130.8, 129.8, 128.3, 127.4, 127.1, 126.8, 124.4, 123.6, 122.9, 122.7, 114.9, 114.0, 55.4, 19.2; ESI-MS (m/z): 317 (M+H)⁺.

3-Phenyl-2H-chromen-2-one(7c):
White solid, yield: 93%; mp: 138-140 °C; IR (KBr): 1641, 1026 cm⁻¹; ¹H NMR (CDCl₃, 300 MHz) δ: 7.80 (s, 1H), 7.71–7.68 (m, 2H), 7.55–7.25 (m, 7H); ESI-MS (m/z): 222 (M+H)⁺.

3-(3-Methoxyphenyl)-8-methyl-2-oxo-2H-chromene-6-carbaldehyde (8c):
Light yellow solid, yield: 95%; mp: 150-152 °C; IR (KBr): 3025, 1716, 1707, 1645, 1016 cm⁻¹; ¹H NMR (CDCl₃, 300 MHz) δ: 10.01 (s, 1H), 7.91 (s, 1H), 7.89 (s, 1H), 7.34 (t, J = 8.2 Hz, 1H), 7.28–7.26 (m, 2H), 6.99–6.95 (m, 1H), 3.86 (s, 3H), 3.50 (q, J = 7.0 Hz, 1H), 3.50 (q, J = 7.0 Hz, 1H), 1.80–1.70 (m, 2H), 1.33 (d, J = 6.9 Hz, 3H), 0.90 (t, J = 7.4 Hz, 3H); ¹³C NMR (CDCl₃, 75 MHz) δ: 190.6, 159.7, 155.7, 139.7, 135.5, 132.8, 132.5, 129.8, 129.1, 128.4, 127.5, 121.0, 119.7, 114.9, 114.4, 55.5, 15.7; ESI-MS (m/z): 294 (M+H)⁺.

8-sec-Butyl-3-(3-methoxyphenyl)-2-oxo-2H-chromene-6-carbaldehyde (9c):
Oily, yield: 98%; IR (Neat): 3076, 1722, 1697, 1695, 1023 cm⁻¹; ¹H NMR (CDCl₃, 300 MHz) δ: 10.01 (s, 1H), 7.95 (s, 1H), 7.91 (s, 1H), 7.89 (s, 1H), 7.34 (t, J = 8.2 Hz, 1H), 7.28–7.25 9m, 1H), 6.95–6.91 (m, 1H), 3.82 (s, 3H), 3.50 (q, J = 7.0 Hz, 1H), 1.80–1.70 (m, 2H), 1.33 (d, J = 6.9 Hz, 3H), 0.90 (t, J = 7.4 Hz, 3H); ¹³C NMR (CDCl₃, 75 MHz) δ: 190.6, 159.6, 159.5, 154.8, 139.8, 136.6, 135.4, 132.6, 129.6, 129.2, 128.7, 128.3, 120.8, 119.7, 114.8, 114.3, 55.3, 33.4, 29.6, 20.4, 12.0; ESI-MS (m/z): 337 (M+H)⁺.
3-(3,4-Dimethoxyphenyl)-8-methyl-2-oxo-2H-chromene-6-carbaldehyde (10c):
Light yellow solid yield: 98%; mp: 178-180 °C; IR (KBr): 3053, 1730, 1695, 1634, 1026 cm⁻¹; ¹H NMR (CDCl₃, 300 MHz) δ: 10.01 (s, 1H), 7.90 (d, J = 7.3 Hz, 2H), 7.84 (s, 1H), 7.32–7.29 (m, 2H), 6.96 (d, J = 9.0 Hz, 1H), 3.95 (s, 3H), 3.94 (s, 3H), 2.56 (s, 3H); ¹³C NMR (CDCl₃, 75 MHz) δ: 190.5, 159.9, 155.4, 150.2, 148.9, 138.2, 132.5, 132.4, 128.7, 128.0, 127.3, 126.8, 121.4, 119.8, 111.8, 111.2, 56.1, 56.0, 15.5; ESI-MS (m/z): 325 (M+H)+.

8-sec-Butyl-3-(3,4-dimethoxyphenyl)-2-oxo-2H-chromene-6-carbaldehyde (11c):
Light yellow solid; yield: 98%; mp: 140-142 °C; IR (KBr): 3065, 1728, 1697, 1607, 1032 cm⁻¹; ¹H NMR (CDCl₃, 300 MHz) δ: 10.04 (s, 1H), 7.93 (s, 2H), 7.86 (s, 1H), 7.33–7.29 (m, 2H), 6.96 (d, J = 8.6 Hz, 1H), 3.96 (s, 3H), 3.95 (s, 3H), 3.54–3.44 (m, 1H), 1.81–1.72 (m, 2H), 1.34 (d, J = 7.0 Hz, 3H), 0.91 (t, J = 7.4 Hz, 3H); ¹³C NMR (CDCl₃, 75 MHz) δ: 190.8, 160.0, 154.8, 150.2, 150.0, 138.6, 136.8, 132.8, 129.2, 128.8, 128.0, 126.9, 121.4, 120.1, 111.9, 111.3, 56.2, 56.1, 33.5, 29.8, 20.6, 12.1; ESI-MS (m/z): 367 (M+H)+.

3-(3,4-Dimethoxyphenyl)-6-methyl-2H-benzo[h]chromen-2-one (12c):
Greenish solid, yield: 92%; mp: 175-177 °C; IR (KBr): 3027, 1711, 1632, 1022 cm⁻¹; ¹H NMR (CDCl₃, 300 MHz) δ: 8.63–8.60 (m, 1H), 8.03–8.00 (m, 1H), 7.87 (s, 1H), 7.70–7.66 (m, 2H), 7.39–7.34 (m, 2H), 6.97 (d, J = 8.3 Hz, 1H), 3.98 (s, 3H), 3.95 (s, 3H), 2.71 (s, 3H); ¹³C NMR (CDCl₃, 75 MHz) δ: 161.0, 149.8, 149.2, 148.9, 139.3, 133.8, 130.9, 128.4, 127.8, 127.2, 126.9, 124.4, 123.7, 123.0, 122.8, 121.3, 114.9, 111.9, 111.2, 56.2, 56.1, 19.2; ESI-MS (m/z): 347 (M+H)+.

8-Methyl-2-oxo-3-(3,4,5-trimethoxyphenyl)-2H-chromene-6-carbaldehyde (13c):
White solid, yield: 99%; mp: 196-198 °C; IR (KBr): 3027, 1711, 1632, 1022 cm⁻¹; ¹H NMR (CDCl₃, 300 MHz) δ: 10.02 (s, 1H), 7.93 (s, 1H), 7.91 (s, 1H), 6.96 (d, J = 9.0 Hz, 1H), 3.95 (s, 3H), 3.94 (s, 3H), 2.57 (s, 3H); ¹³C NMR (CDCl₃, 75 MHz) δ: 190.5, 159.8, 155.5, 153.4, 139.4, 139.1, 132.8, 132.6, 129.6, 129.0, 128.2, 127.4, 119.7, 106.2, 61.0, 56.4, 15.6; ESI-MS (m/z): 355 (M+H)+.

6-Methyl-3-(3,4,5-trimethoxyphenyl)-2H-benzo[h]chromen-2-one (14c):
Light yellow solid, yield: 93%; mp: 138-140 °C; IR (KBr): 3024, 1702, 1619, 1031 cm⁻¹; ¹H NMR (CDCl₃, 300 MHz) δ: 8.63–8.60 (m, 1H), 8.03–8.00 (m, 1H), 7.88 (s, 1H), 7.73–7.65 (m, 2H), 7.02 (s, 2H), 3.94 (s, 3H), 3.91 (s, 3H), 2.71 (s, 3H); ¹³C NMR (CDCl₃, 75 MHz) δ:
(E)-3-(4-Methoxyphenyl)-8-methyl-6-(3-oxo-3-p-tolylprop-1-enyl)-2H-chromen-2-one (15c):
Light yellow solid, yield: 87%; mp: 196-198 °C; IR (KBr): 3024, 1702, 1619, 1031 cm⁻¹; ¹H NMR (CDCl₃, 300 MHz) δ: 7.94 (d, J = 8.1 Hz, 2H), 7.80-7.74 (m, 2H), 7.68 (d, J = 8.8 Hz, 2H), 7.63 (s, 1H), 7.57 (s, 1H), 7.52 (d, J = 15.6 Hz, 1H), 7.30 (d, J = 7.9 Hz, 2H), 6.97 (d, J = 9.0 Hz, 2H), 3.84 (s, 3H), 2.51 (s, 3H), 2.43 (s, 3H); ¹³C NMR (CDCl₃, 75 MHz) δ: 189.6, 160.4, 152.9, 144.0, 142.8, 138.3, 135.6, 131.4, 131.1, 129.9, 129.5, 128.7, 128.3, 126.9, 126.8, 126.1, 122.3, 120.0, 114.1, 55.5, 21.8, 15.7; ESI-MS (m/z): 410 (M+H)⁺.

(E)-3-(3,4-Dimethoxyphenyl)-8-methyl-6-(3-oxo-3-p-tolylprop-1-enyl)-2H-chromen-2-one (16c):
Light yellow solid, yield: 89%; mp: 204-206 °C; IR (KBr): 3020, 1705, 1619, 1035 cm⁻¹; ¹H NMR (CDCl₃, 300 MHz) δ: 7.95 (d, J = 8.0 Hz, 2H), 7.82-7.77 (m, 2H), 7.65 (s, 1H), 7.60 (s, 1H), 7.53 (d, J = 15.6 Hz, 1H), 7.32-7.29 (m, 4H), 6.94 (d, J = 8.4 Hz, 1H), 3.95 (s, 3H), 3.93 (s, 3H), 2.53 (s, 3H), 2.44 (s, 3H); ¹³C NMR (CDCl₃, 75 MHz) δ: 189.5, 160.4, 152.8, 149.9, 148.8, 144.0, 142.7, 138.5, 135.5, 131.4, 131.1, 129.4, 128.7, 128.2, 127.2, 126.7, 126.1, 122.2, 121.3, 119.9, 111.8, 111.3, 56.12, 56.0, 21.8, 15.6; ESI-MS (m/z): 440 (M+H)⁺.

(E)-8-Methyl-6-(3-oxo-3-p-tolylprop-1-enyl)-3-(3,4,5-trimethoxyphenyl)-2H-chromen-2-one (17c):
Light yellow solid, yield: 92%; mp: 210-212 °C; IR (KBr): 3019, 1702, 1629, 1011 cm⁻¹; ¹H NMR (CDCl₃, 300 MHz) δ: 7.95 (d, J = 8.1 Hz, 2H), 7.82-7.77 (m, 2H), 7.68 (s, 1H), 7.62 (s, 1H), 7.54 (d, J = 15.6 Hz, 1H), 7.31 (d, J = 7.9 Hz, 2H) 6.95 (s, 2H), 3.92 (s, 6H), 3.90 (s, 3H), 2.54 (s, 3H), 2.44 (s, 3H); ¹³C NMR (CDCl₃, 75 MHz) δ: 189.5, 160.2, 153.2, 152.9, 144.0, 142.6, 139.4, 139.1, 135.5, 131.7, 131.2, 129.9, 129.5, 128.7, 128.5, 126.8, 126.2, 122.3, 119.7, 106.1, 61.0, 56.4, 21.8, 15.6; ESI-MS (m/z): 470 (M+H)⁺.

(E)-3-(4-Methoxyphenyl)-6-(3-(4-methoxyphenyl)-3-oxoprop-1-enyl)-8-methyl-2H-chromen-2-one (18c):
Light brown solid, yield: 90%; mp: 206-208 °C; IR (KBr): 3024, 1712, 1615, 1021 cm⁻¹; ¹H NMR (CDCl₃, 200 MHz) δ: 8.04 (d, J = 8.9 Hz, 2H), 7.83-7.54 (m, 2H), 7.67 (s, 1H), 7.61 (s,
(E)-3-(3,4-Dimethoxyphenyl)-6-(3-(3,4-dimethoxyphenyl)-3-oxoprop-1-enyl)-8-methyl-2H-chromen-2-one (19c):
Light yellow solid, yield: 92%; mp: 210-212 °C; IR (KBr): 3034, 1722, 1619, 1051 cm⁻¹; ¹H NMR (CDCl₃, 300 MHz) δ: 7.79-7.74 (m, 2H), 7.68-7.57 (m, 4H), 7.52 (d, J = 15.6 Hz, 1H), 7.28-7.22 (m, 2H), 6.93-6.89 (m, 2H), 3.94 (s, 6H), 3.91 (s, 3H), 3.89 (s, 3H), 2.50 (s, 3H); ¹³C NMR (CDCl₃, 75 MHz) δ: 188.2, 160.4, 153.6, 152.8, 150.0, 149.4, 148.9, 142.4, 138.5, 131.4, 131.2, 131.1, 128.3, 127.2, 126.8, 126.1, 123.1, 121.9, 121.4, 119.9, 111.9, 111.2, 110.9, 110.1, 56.2, 56.1, 56.0 15.6; ESI-MS (m/z): 486 (M+H)+.

(E)-8-Methyl-6-(3-oxo-3-(3,4,5-trimethoxyphenyl)prop-1-enyl)-3-(3,4,5-trimethoxyphenyl)-2H-chromen-2-one (20c):
Light yellow solid, yield: 94%; mp: 220-222 °C; IR (KBr): 3021, 1702, 1617, 1011 cm⁻¹; ¹H NMR (CDCl₃, 300 MHz) δ: 7.83-7.78 (m, 2H), 7.67 (s, 1H), 7.62 (s, 1H), 7.50 (d, J = 15.6 Hz, 1H), 7.28 (s, 2H), 6.95 (s, 2H), 3.95-3.89 (m, 18H), 2.54 (s, 3H); ¹³C NMR (CDCl₃, 75 MHz) δ: 188.8, 160.2, 153.3, 153.3, 153.0, 143.1, 142.9, 139.4, 139.1, 133.3,131.7, 131.1, 129.9, 128.6, 126.9, 126.3, 122.0, 119.7, 106.4, 106.1, 61.1, 61.0, 56.6, 56.4, 15.6; ESI-MS (m/z): 546 (M+H)+.

(E)-3-(3,4-Dimethoxyphenyl)-6-(3-(furan-2-yl)-3-oxoprop-1-enyl)-8-methyl-2H-chromen-2-one (21c):
Light yellow solid, yield: 91%; mp: 196-198 °C; IR (KBr): 3034, 1702, 1640, 1025 cm⁻¹; ¹H NMR (CDCl₃, 300 MHz) δ: 7.85 (d, J = 15.6 Hz, 1H), 7.86 (s, 1H), 7.66–7.61 (m, 3H), 7.45 (d, J = 15.7 Hz, 1H), 7.36 (d, J = 3.4 Hz, 1H), 7.31-7.28 (m, 2H), 6.93 (d, J = 8.8 Hz, 1H), 6.61 (dd, J = 1.6 and 1.5 Hz, 1H), 3.94 (s, 3H), 3.92 (s, 3H), 2.52 (s, 3H); ¹³C NMR (CDCl₃, 50 MHz) δ: 177.5, 160.3, 153.5, 152.7, 149.8, 148.7, 146.7, 142.3, 138.4, 131.4, 130.7, 128.1,127.0, 126.6, 126.2, 121.3, 119.7, 117.7, 112.7, 111.6, 111.0, 56.0, 15.4; ESI-MS (m/z): 416 (M+H)+.

(E)-3-(3,4-Dimethoxyphenyl)-8-methyl-6-(3-oxo-3-(thiophen-2-yl)prop-1-enyl)-2H-chromen-2-one (22c):
Light green solid, yield: 92%; mp: 201-203 °C; IR (KBr): 3034, 1702, 1640, 1025 cm⁻¹; ¹H NMR (CDCl₃, 300 MHz) δ: 7.90-7.88 (m, 1H), 7.82 (d, J = 15.6 Hz, 1H), 7.78 (s, 1H), 7.71–
7.69 (m, 1H), 7.65 (s, 1H), 7.60 (s, 1H), 7.40 (d, $J = 15.6$ Hz, 1H), 7.31-7.28 (m, 2H), 7.21-7.18 (m, 1H), 6.94 (d, $J = 8.9$ Hz, 1H), 3.94 (s, 3H), 3.92 (s, 3H), 2.53 (s, 3H); $^{13}$C NMR (CDCl$_3$, 50 MHz) $\delta$: 181.5, 160.2, 152.8, 149.8, 148.7, 145.3, 142.3, 138.4, 134.1, 131.9, 131.3, 130.6, 128.3, 128.1, 127.0, 126.7, 126.2, 121.7, 121.3, 119.8, 111.7, 111.0, 55.9, 15.5; ESI-MS ($m/z$): 432 (M+H)$^+$. 
$^1$H NMR of compound 1c at 300 MHz (CDCl$_3$)

$^{13}$C NMR of compound 1c at 75 MHz (CDCl$_3$)
$^1$H NMR of compound 2c at 300 MHz (CDCl₃)

$^1$H NMR of compound 3c at 75 MHz (CDCl₃)
$^{13}$C NMR of compound 3c at 75 MHz (CDCl$_3$)
NMR of compound 4c at 300 MHz (CDCl₃)

¹³C NMR of compound 4c at 75 MHz (CDCl₃)

¹H
NMR of compound 5c at 300 MHz (CDCl₃)

NMR of compound 5c at 75 MHz (CDCl₃)
NMR of compound 6c at 300 MHz (CDCl₃)

13C NMR of compound 6c at 75 MHz (CDCl₃)
$^1$H NMR of compound 7c at 300 MHz (CDCl$_3$)

$^1$H NMR of compound 8c at 300 MHz (CDCl$_3$)
$^{13}$C NMR of compound 8c at 75 MHz (CDCl$_3$)

$^1$H NMR of compound 9c at 300 MHz (CDCl$_3$)
$^1$H NMR of compound 9c at 75 MHz (CDCl$_3$)
$^1$H NMR of compound 10c at 300 MHz (CDCl$_3$)

$^{13}$C NMR of compound 10c at 75 MHz (CDCl$_3$)
$^1$H
NMR of compound 11c at 300 MHz (CDCl₃)

$^{13}$C NMR of compound 11c at 75 MHz (CDCl₃)
$^1$H NMR of compound 12c at 300 MHz (CDCl$_3$)

$^{13}$C NMR of compound 12c at 75 MHz (CDCl$_3$)
\(^1\)H NMR of compound 13c at 300 MHz (CDCl\(_3\))

\(^{13}\)C NMR of compound 13c at 75 MHz (CDCl\(_3\))
$^1$H NMR of compound 14c at 300 MHz (CDCl$_3$)

$^{13}$C NMR of compound 14c at 75 MHz (CDCl$_3$)
$^1$H NMR of compound 15c at 300 MHz (CDCl$_3$)

$^{13}$C NMR of compound 15c at 75 MHz (CDCl$_3$)
$^1$H NMR of compound 16c at 300 MHz (CDCl$_3$)

$^{13}$C NMR of compound 16c at 75 MHz (CDCl$_3$)
$^{1}H$
NMR of compound 17c at 300 MHz (CDCl$_3$)

$^{13}C$
NMR of compound 17c at 75 MHz (CDCl$_3$)
$^1$H NMR of compound 18c at 200 MHz (CDCl$_3$)

$^1$H NMR of compound 19c at 300 MHz (CDCl$_3$)
$^{13}$C NMR of compound $19c$ at 75 MHz (CDCl$_3$)

$^1$H NMR of compound $20c$ at 300 MHz (CDCl$_3$)
$^{13}$C NMR of compound 20c at 75 MHz (CDCl$_3$)

$^1$H NMR of compound 21c at 300 MHz (CDCl$_3$)
$^{13}\text{C}$ NMR of compound 21e at 50 MHz (CDCl$_3$)

$^1\text{H}$ NMR of compound 22e at 300 MHz (CDCl$_3$)
$^{13}$C NMR of compound 22e at 50 MHz (CDCl$_3$)