A Simple and Robust Preparation of N-Acetylindoxyls: 
Precursors for Indigogenic Substrates

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**General methods**

Thin layer chromatography (TLC) was conducted on Merck Kieselgel 60 F$_{254}$ silica plates and visualised under shortwave UV light (254 nm). Infrared spectra were recorded for solid samples using a PerkinElmer Spectrum One Fourier transform infrared spectrometer fitted with an ATR attachment. $^1$H- and $^{13}$C-nuclear magnetic resonance spectra were obtained using a Bruker AV-500 spectrometer (500 MHz for $^1$H or 125 MHz for $^{13}$C) or Bruker Avance 600 spectrometer (600 MHz for $^1$H or 150 MHz for $^{13}$C). Each sample was dissolved in the specified deuterated solvent and each spectrum was calibrated using the residual solvent peak as follows: CDCl$_3$ ($\delta$ 7.26 for $^1$H and $\delta$ 77.0 for $^{13}$C); DMSO-$d_6$ ($\delta$ 2.50 for $^1$H and $\delta$ 39.5 for $^{13}$C). High resolution mass spectra were acquired using a Waters liquid chromatograph premier mass spectrometer. Samples were ionised using the atmospheric-pressure chemical ionisation technique (APCI) and all spectra were acquired in positive ionisation mode. For novel compounds, microanalyses were performed by Robertson Microlit, Ledgewood NJ.
General procedure for the preparation of benzonitriles (11, 16 and 22)

Following a literature procedure previously used to synthesise other nitriles, to a solution of the appropriate aldehyde 12, 15 or 21 (30.0 mmol) in formic acid (60 mL) was added hydroxylamine hydrochloride (40.0 mmol). The solution was heated at reflux for 6 h under an atmosphere of air. The mixture was then allowed to cool then diluted with ice/water (200 mL). The precipitate was then collected and the filter cake washed with water (200 mL), to give the corresponding benzonitrile 11, 16 or 22 with yields in the range of 84–89%.

2-Chloro-6-fluorobenzonitrile (11)
White solid (4.10 g, 89%). Rₚ (1:4 EtOAc/hexanes): 0.63. IR (ATR) νmax (cm⁻¹): 2241 (m, C≡N). ¹H NMR (600 MHz, CDCl₃): δ 7.49 (ddd [app dt], J = 8.2, 8.2, 6.1 Hz, 1H), 7.34 (d, J = 8.2 Hz, 1H), 7.16 (dd [app t] J = 8.2, 8.2 Hz, 1H). ¹³C NMR (150 MHz, CDCl₃): δ 163.8 (d, J = 261 Hz), 137.9 (d, J = 2 Hz), 134.8 (d, J = 9 Hz), 125.8 (d, J = 3.6 Hz), 114.6 (d, J = 19.8 Hz), 111.1, 103.4 (d, J = 17.8 Hz). HRMS (APCI) m/z: [M+Na]⁺ calcd for C₇H₃ClFNNa 177.9836; found, 177.9824.

3-Bromo-6-fluorobenzonitrile (16)
White solid (5.10 g, 85%). Rₚ (1:4 EtOAc/hexanes): 0.68. IR (ATR) νmax (cm⁻¹): 2236 (m, C≡N). ¹H NMR (600 MHz, CDCl₃): δ 7.76–7.74 (m [app dd], 1H), 7.73–7.70 (m [app ddd], 1H), 7.13 (dd [app t], J = 9.0, 9.0 Hz, 1H). ¹³C NMR (150 MHz, CDCl₃): δ 162.2 (d, J = 260 Hz), 138.1 (d, J = 8.1 Hz), 135.7, 118.2 (d, J = 20.8 Hz), 117.0 (d, J = 3.9 Hz), 112.4, 103.4 (d, J = 16.8 Hz). HRMS (APCI) m/z: [M+Na]⁺ calcd for C₇H₃BrFNNa 221.9331; found, 221.9321.

4-Chloro-2-fluorobenzonitrile (22)
White solid (3.90 g, 84%). Rₚ (1:4 EtOAc/hexanes): 0.55. IR (ATR) νmax (cm⁻¹): 2242 (m, C≡N). ¹H NMR (600 MHz, CDCl₃): δ 7.60–7.56 (m, 1H), 7.29–7.25 (m, 2H). ¹³C NMR (150 MHz, CDCl₃): δ 163.0 (d, J = 263 Hz), 141.0 (d, J = 9.8 Hz), 134.0, 125.6 (d, J = 3.8 Hz), 117.6 (d, J = 22.3 Hz), 113.1, 100.2 (d, J = 15.5 Hz). HRMS (APCI) m/z: [M+Na]⁺ calcd for C₇H₃ClFNNa 177.9836; found, 177.9829.
General procedure for the preparation of ethyl glycinates (10, 17 and 20)

To a stirring solution of the appropriate benzonitrile 11, 16 or 22 (20.0 mmol) in DMSO (50 mL) was added glycine ethyl ester hydrochloride (5.58 g, 40.0 mmol) and NEt₃ (10.2 mL, 100 mmol). The flask was stoppered and the mixture was heated at 110 °C (3 h). The reaction mixture was allowed to cool then diluted with water (500 mL) and cooled in an ice bath. The product was collected by filtration to give the corresponding ethyl glycinate 10, 17 or 20 with yields in the range of 68–76%.

Ethyl [(3-chloro-2-cyanophenyl)amino]acetate (10)

White solid (3.20 g, 68%). R₇ (1:4 EtOAc/hexanes): 0.50. IR (ATR) ν_max (cm⁻¹): 2241 (m, C≡N), 1743 (s, C−O).¹H NMR (500 MHz, DMSO-d₆): δ 7.39 (dd [app t], J = 8.0, 8.0 Hz, 1H), 6.84 (d, J = 8.0 Hz, 1H), 6.69–6.62 (m, 2H), 4.13 (q, J = 7.0 Hz, 2H), 4.07 (d, J = 6.0 Hz, 2H), 1.20 (t, J = 7.0 Hz, 3H).¹³C NMR (125 MHz, DMSO-d₆): δ 170.0, 152.2, 135.6, 134.9, 116.8, 115.1, 95.1, 60.7, 44.2, 14.1. HRMS (APCI) m/z: [M+H]+ calcd for C₁₁H₁₂ClN₂O₂ 239.0587; found, 239.0587.

Ethyl [(4-bromo-2-cyanophenyl)amino]acetate (17)

White solid (4.30 g, 76%). R₇ (1:4 EtOAc/hexanes): 0.38. IR (ATR) ν_max (cm⁻¹): 2223 (m, C≡N), 1745 (s, C−O).¹H NMR (500 MHz, DMSO-d₆): δ 7.72 (d, J = 2.4 Hz, 1H), 7.53 (dd, J = 9.0 2.4 Hz, 1H), 6.63 (d, J = 9.0 Hz, 1H), 6.56 (t, J = 6.1 Hz, 1H), 4.12 (q, J = 6.1 Hz, 2H), 4.04 (d, J = 6.2 Hz, 2H), 1.19 (t, J = 6.2 Hz, 3H).¹³C NMR (125 MHz, DMSO-d₆): δ 170.1, 149.6, 137.0, 134.6, 116.5, 113.8, 110.3, 95.1, 60.7, 44.2, 14.1. HRMS (APCI) m/z: [M+Na]+ calcd for C₁₁H₁₁BrN₂O₂Na 304.9902; found, 304.9913.

Ethyl [(5-chloro-2-cyanophenyl)amino]acetate (20)

White solid (3.40 g, 72%). R₇ (1:4 EtOAc/hexanes): 0.61. IR (ATR) ν_max (cm⁻¹): 2217 (m, C≡N), 1733 (s, C−O).¹H NMR (600 MHz, DMSO-d₆): δ 7.53 (d, J = 8.4 Hz, 1H), 6.77 (d, J = 1.8 Hz, 1H), 6.73 (dd, J = 8.4, 1.8 Hz, 1H), 6.63 (t, J = 6.6 Hz, 1H), 4.12 (q, J = 6.6 Hz, 2H), 4.08 (d, J = 6.6 Hz, 2H), 1.20 (t, J = 6.6 Hz, 3H).¹³C NMR (150 MHz, DMSO-d₆): δ 170.1, 151.2, 139.5, 134.7, 117.1, 116.6, 111.3, 93.6, 60.6, 44.0, 14.1. HRMS (APCI) m/z: [M+H]+ calcd for C₁₁H₁₂ClN₂O₂ 239.0587; found, 239.0583.
General procedure for the preparation of bromine-substituted ethyl glycinates (13 and 23)

Using a method used to brominate other anilines,² to a stirring suspension of the appropriate ethyl glycinate 10 or 20 (7.60 mmol) in AcOH (16 mL) was added ammonium bromide (780 mg, 8.00 mmol) then 30% H₂O₂ (820 µL, 8.00 mmol) dropwise over 5 min and the mixture was then stirred at room temperature (24 h). The mixture was diluted with water and cooled in an ice bath and the resulting solid collected by filtration to give the corresponding ethyl glycinate 13 or 23 with yields in the range of 76–81%.

Ethyl [(4-bromo-3-chloro-2-cyanophenyl)amino]acetate (13)

White solid (1.80 g, 76%). R_f (1:4 EtOAc/hexanes): 0.36. IR (ATR) ν_max (cm⁻¹): 2217 (m, C≡N), 1730 (s, C−O). 
¹H NMR (600 MHz, DMSO-d₆): δ 7.68 (d, J = 9.2 Hz, 1H), 6.82 (t, J = 5.8 Hz, 1H), 6.65 (d, J = 9.2 Hz, 1H), 4.13 (q, J = 7.0 Hz, 2H), 4.09 (d, J = 6.0 Hz, 2H), 1.20 (t, J = 7.0 Hz, 3H). 
¹³C NMR (150 MHz, DMSO-d₆): δ 169.8, 151.5, 138.0, 135.1, 114.8, 112.4, 106.8, 96.5, 60.7, 44.2, 14.1. HRMS (APCI) m/z: [M+Na]^+ calcd for C₁₁H₁₀BrClN₂O₂Na 338.9512; found, 338.9513. Anal. calcd for C₁₁H₁₀BrClN₂O₂: C, 41.60; H, 3.17; N, 8.82; found: C, 41.68; H, 3.19; N, 8.89.

Ethyl [(4-bromo-5-chloro-2-cyanophenyl)amino]acetate (23)

White solid (2.00 g, 81%). R_f (1:4 EtOAc/hexanes): 0.36. IR (ATR) ν_max (cm⁻¹): 2220 (m, C≡N), 1734 (s, C−O). 
¹H NMR (600 MHz, DMSO-d₆): δ 7.95 (s, 1H), 7.01 (s, 1H), 6.76 (t, J = 6.0 Hz, 1H), 4.13 (q, J = 7.2 Hz, 2H), 4.09 (d, J = 6.0 Hz, 2H), 1.20 (t, J = 7.2 Hz, 3H). 
¹³C NMR (150 MHz, DMSO-d₆): δ 169.9, 150.3, 139.4, 137.0, 115.9, 113.2, 106.2, 95.4, 60.7, 44.1, 14.1. HRMS (APCI) m/z: [M+H]^+ calcd for C₁₁H₁₁BrClN₂O₂ 316.9692; found, 316.9686. Anal. calcd for C₁₁H₁₁BrClN₂O₂: C, 41.60; H, 3.17; N, 8.82; found: C, 41.63; H, 3.27; N, 8.87.
General procedure for the preparation of dicarboxylic acids (9, 18, 24 and 25)

To a 30% w/w KOH solution (25 mL) was added the appropriate ethyl glycinate 13, 17, 20 or 23 (5.0 mmol) and the mixture was stirred at 120 °C (2 h). The mixture was then diluted with H₂O (5 mL) and the solution was heated at 120 °C (12 h). The reaction was diluted with 2 M HCl (75 mL) and cooled in an ice bath. The resulting precipitate was collected by filtration to give the corresponding dicarboxylic acid 9, 18, 24 or 25 with yields in the range of 89–95%.

3-Bromo-6-[(carboxymethyl)amino]-2-chlorobenzoic acid (9)
Pale green solid (1.40 g, 89%). Rf (8:6:1 CHCl₃/EtOAc/ACOH): 0.14. IR (ATR) νmax (cm⁻¹): 1680 (s, C=O), 1646 (s, C=O). ¹H NMR (600 MHz, DMSO-d₆): δ 13.2 (br s, 1H), 7.53 (d, J = 9.0 Hz, 1H), 6.49 (d, J = 9.0 Hz, 1H), 6.01 (br s, 1H), 3.89 (s, 2H). ¹³C NMR (150 MHz, DMSO-d₆): δ 171.7, 166.9, 145.7, 134.5, 130.3, 120.1, 111.9, 107.6, 44.2. HRMS (APCI) m/z: [M+H]⁺ calcd for C₉H₈BrClNO₄ 307.9325; found, 307.9332.

5-Bromo-2-[(carboxymethyl)amino]benzoic acid (18)
Pale green solid (1.30 g, 92%). Rf (8:6:1 CHCl₃/EtOAc/ACOH): 0.39. IR (ATR) νmax (cm⁻¹): 1717 (s, C=O). ¹H NMR (600 MHz, DMSO-d₆): δ 8.12 (br s, 1H), 7.86 (d, J = 2.4 Hz, 1H), 7.48 (dd, J = 9.0, 2.4 Hz, 1H), 6.59 (d, J = 9.0 Hz, 1H), 3.99 (s, 2H). ¹³C NMR (150 MHz, DMSO-d₆): δ 171.5, 168.5, 149.1, 136.7, 133.4, 114.2, 112.2, 105.2, 44.2. HRMS (APCI) m/z: [M+H]⁺ calcd for C₉H₉BrNO₄ 273.9715; found, 273.9717.

2-[(Carboxymethyl)amino]-4-chlorobenzoic acid (24)
Pale green solid (1.00 g, 92%). Rf (8:6:1 CHCl₃/EtOAc/ACOH): 0.42. IR (ATR) νmax (cm⁻¹): 1706 (s, C=O). ¹H NMR (600 MHz, DMSO-d₆): δ 12.8 (br s, 1H), 8.25 (br s, 1H), 7.79 (d, J = 8.4 Hz, 1H), 6.65 (d, J = 2.4 Hz, 1H), 6.62 (dd, J = 8.4, 2.4 Hz, 1H), 4.02 (s, 2H). ¹³C NMR (150 MHz, DMSO-d₆): δ 171.5, 169.1, 150.9, 139.2, 133.4, 114.7, 111.1, 109.5, 44.2. HRMS (APCI) m/z: [M+H]⁺ calcd for C₉H₉ClNO₄ 230.0220; found, 230.0219.

5-Bromo-2-[(carboxymethyl)amino]-4-chlorobenzoic acid (25)
Pale green solid (1.50 g, 95%). Rf (8:6:1 CHCl₃/EtOAc/ACOH): 0.36. IR (ATR) νmax (cm⁻¹): 1716 (s, C=O), 1649 (s, C=O). ¹H NMR (600 MHz, DMSO-d₆): δ 8.20 (br s, 1H), 8.00 (s, 1H), 8.88 (s, 1H), 4.03 (s, 2H). ¹³C NMR (150 MHz, DMSO-d₆): δ 171.3, 168.0, 149.8, 138.8, 135.7, 113.4, 111.4, 104.7, 44.2. HRMS (APCI) m/z: [M+H]⁺ calcd for C₉H₈BrClNO₄ 307.9325; found, 307.9304.
General procedure for the preparation of N-acetylindoxyl acetates (14, 19, 26 and 27)

Following a modified procedure, to a stirring suspension of the appropriate dicarboxylic acid 9, 18, 24 or 25 (8.00 mmol) in Ac₂O (10 mL) was added sodium acetate (32 mmol) and the mixture was then stirred at reflux (1 h). The mixture was then cooled and poured into of ice/water (ca 35 g) and cooled in an ice bath. The resulting precipitate was collected by filtration to give the corresponding indoxyl acetate 14, 19, 26 or 27 with yields in the range of 86–91%.

1-Acetyl-5-bromo-4-chloro-1H-indol-3-yl acetate (14)

White solid (2.30 g, 86%). R_f (1:4 EtOAc/hexanes): 0.24. IR (ATR) ν_max (cm⁻¹): 1770 (s, C=O), 1712 (s, C=O).

¹H NMR (600 MHz, DMSO-d₆): δ 8.27 (d, J = 9.0 Hz, 1H), 8.04 (s, 1H), 7.69 (d, J = 9.0 Hz, 1H), 2.62 (s, 3H), 2.37 (s, 3H).

¹³C NMR (150 MHz, DMSO-d₆): δ 169.6, 169.4, 133.0, 131.4, 130.0, 123.0, 122.5, 119.8, 119.7, 116.5, 23.7, 20.5.

HRMS (APCI) m/z: [M+H]^+ calcd for C₁₂H₁₀BrClNO₃ 329.9533; found, 329.9544.

1-Acetyl-5-bromo-1H-indol-3-yl acetate (19)

White solid (2.10 g, 91%). R_f (1:4 EtOAc/hexanes): 0.33. IR (ATR) ν_max (cm⁻¹): 1753 (s, C=O), 1713 (s, C=O).

¹H NMR (600 MHz, DMSO-d₆): δ 8.29 (d, J = 8.0 Hz, 1H), 7.94 (s, 1H), 7.77 (d, J = 1.8 Hz, 1H), 2.61 (s, 3H), 2.38 (s, 3H).

¹³C NMR (150 MHz, DMSO-d₆): δ 169.6, 169.4, 133.0, 131.4, 130.5, 122.5, 120.5, 117.9, 117.5, 116.0, 23.6, 20.5. HRMS (APCI) m/z: [M+H]^+ calcd for C₁₂H₁₁BrNO₃ 295.9922; found, 295.9941.

1-Acetyl-6-chloro-1H-indol-3-yl acetate (26)

White solid (1.70 g, 87%). R_f (1:4 EtOAc/hexanes): 0.32. IR (ATR) ν_max (cm⁻¹): 1756 (s, C=O), 1703 (s, C=O).

¹H NMR (600 MHz, DMSO-d₆): δ 8.37 (d, J = 1.8 Hz, 1H), 7.93 (s, 1H), 7.55 (d, J = 8.4 Hz, 1H), 7.36 (dd, J = 8.4, 1.8 Hz, 1H), 2.62 (s, 3H), 2.38 (s, 3H).

¹³C NMR (150 MHz, DMSO-d₆): δ 169.7, 168.2, 133.1, 131.8, 129.7, 124.2, 123.8, 122.5, 119.4, 116.7, 115.8, 23.6, 20.5. HRMS (APCI) m/z: [M+H]^+ calcd for C₁₂H₁₁ClNO₃ 252.0427; found, 252.0448.

1-Acetyl-5-bromo-6-chloro-1H-indol-3-yl acetate (27)

White solid (2.30 g, 88%). R_f (1:4 EtOAc/hexanes): 0.26. IR (ATR) ν_max (cm⁻¹): 1757 (s, C=O), 1710 (s, C=O).

¹H NMR (600 MHz, DMSO-d₆): δ 8.53 (s, 1H), 8.01 (s, 1H), 8.00 (s, 1H), 2.62 (s, 3H), 2.38 (s, 3H).

¹³C NMR (150 MHz, DMSO-d₆): δ 169.7, 168.3, 132.1, 131.8, 129.7, 124.2, 122.7, 118.3, 117.3, 116.1, 23.6, 20.5. HRMS (APCI) m/z: [M+H]^+ calcd for C₁₂H₁₀BrClNO₃ 329.9533; found, 329.9557.
General procedure for the preparation of N-acetyldioxsyls (1–4)

To a solution of sulfuric acid (80% w/w, 5 mL) was added the appropriate indoxyl acetate 14, 19, 26 or 27 (200 mg) and the mixture was stirred at room temperature (45 min). The mixture was then poured into ice/water (ca 10 g) and cooled in an ice bath. The resulting solid was collected by filtration to give the corresponding N-acetyldioxsyl 1, 2, 3 or 4 with yields in the range of 84–89%.

N-Acetyl-5-bromo-4-chloroindoxyl (IUPAC name: 1-Acetyl-5-bromo-4-chloroindolin-3-one) (1)

White solid (150 mg, 86%). RF (2:3 EtOAc/hexanes): 0.26. IR (ATR) νmax (cm⁻¹): 1715 (s, C=O), 1682 (s, C=O). ¹H NMR (600 MHz, CDCl₃): δ 8.39 (d, J = 8.4 Hz, 1H), 7.80 (d, J = 8.4 Hz, 1H), 4.35 (s, 2H), 2.31 (s, 3H). ¹³C NMR (150 MHz, CDCl₃): δ 190.6, 168.1, 154.0, 140.8, 131.7, 122.7, 118.9, 117.7, 56.4, 24.3. HRMS (APCI) m/z: [M+Na]⁺ calcd for C₁₀H₇BrClNO₂Na 309.9246; found, 309.9251.

1-Acetyl-5-bromoindolin-3-one (2)

White solid (152 mg, 89%). RF (2:3 EtOAc/hexanes): 0.25. IR (ATR) νmax (cm⁻¹): 1714 (s, C=O), 1671 (s, C=O). ¹H NMR (600 MHz, CDCl₃): δ 8.45 (d, J = 9.0 Hz, 1H), 7.72 (dd, J = 9.0, 2.4 Hz, 1H), 4.31 (s, 2H), 2.31 (s, 3H). ¹³C NMR (150 MHz, CDCl₃): δ 193.1, 168.0, 152.4, 139.8, 126.5, 126.3, 120.2, 117.3, 56.2, 24.1. HRMS (APCI) m/z: [M+Na]⁺ calcd for C₁₀H₈BrNO₂Na 275.9636; found, 275.9629.

1-Acetyl-6-chloroindolin-3-one (3)

White solid (140 mg, 84%). RF (2:3 EtOAc/hexanes): 0.26. IR (ATR) νmax (cm⁻¹): 1720 (s, C=O), 1667 (s, C=O). ¹H NMR (600 MHz, CDCl₃): δ 8.60 (br s, 1H), 7.18 (dd, J = 7.8, 1.8 Hz, 1H), 4.30 (s, 2H), 2.31 (s, 3H). ¹³C NMR (150 MHz, CDCl₃): δ 193.1, 168.2, 154.1, 143.9, 124.9, 124.5, 123.2, 118.8, 56.3, 24.2. HRMS (APCI) m/z: [M+Na]⁺ calcd for C₁₀H₈ClNO₂Na 232.0141; found, 232.0149.

1-Acetyl-5-bromo-6-chloroindolin-3-one (4)

White solid (154 mg, 88%). RF (2:3 EtOAc/hexanes): 0.26. IR (ATR) νmax (cm⁻¹): 1718 (s, C=O), 1668 (s, C=O). ¹H NMR (600 MHz, CDCl₃): δ 8.75 (s, 1H), 4.32 (s, 2H), 2.32 (s, 3H). ¹³C NMR (150 MHz, CDCl₃): δ 192.0, 168.1, 152.3, 143.5, 128.0, 124.6, 120.3, 118.0, 56.3, 24.1. HRMS (APCI) m/z: [M+Na]⁺ calcd for C₁₀H₈BrClNO₂Na 309.9246; found, 309.9243.
$^1$H NMR (600 MHz, CDCl$_3$)
$^{13}$C NMR (150 MHz, CDCl$_3$)
$^1$H NMR (600 MHz, CDCl$_3$)
$^{13}$C NMR (150 MHz, CDCl$_3$)
$^1$H NMR (600 MHz, CDCl$_3$)
$^{13}$C NMR (150 MHz, CDCl$_3$)
$^1$H NMR (500 MHz, DMSO-$d_6$)
$^{13}$C NMR (125 MHz, DMSO-\textit{d}_6)
$^1$H NMR (500 MHz, DMSO-$d_6$)
$^{13}$C NMR (125 MHz, DMSO-$d_6$)
$^1$H NMR (600 MHz, DMSO-$d_6$)
$^{13}$C NMR (150 MHz, DMSO-$d_6$)
$^1$H NMR (600 MHz, DMSO-$d_6$)
$^{13}$C NMR (150 MHz, DMSO-$d_6$)
$^1$H NMR (600 MHz, DMSO-$d_6$)
$^{13}$C NMR (150 MHz, DMSO-$d_6$)
$^1$H NMR (600 MHz, DMSO-$d_6$)
$^{13}$C NMR (150 MHz, DMSO-d$_6$)
$^1$H NMR (600 MHz, DMSO-$d_6$)
$^{13}$C NMR (150 MHz, DMSO-$d_6$)
$^1$H NMR (600 MHz, DMSO-$d_6$)
$^{13}$C NMR (150 MHz, DMSO-$d_6$)
$^1$H NMR (600 MHz, DMSO-d$_6$)
$^{13}$C NMR (150 MHz, DMSO-$d_6$)
$^1$H NMR (600 MHz, DMSO-$d_6$)
$^{13}$C NMR (150 MHz, DMSO-$d_6$)
$^1$H NMR (600 MHz, DMSO-$d_6$)
$^{13}$C NMR (150 MHz, DMSO-$d_6$)
$^1$H NMR (600 MHz, DMSO-$d_6$)
$^{13}$C NMR (150 MHz, DMSO-$d_6$)
$^1$H NMR (600 MHz, DMSO-$d_6$)
$^{13}$C NMR (150 MHz, DMSO-$d_6$)
$^1$H NMR (600 MHz, CDCl$_3$)
$^{13}$C NMR (150 MHz, CDCl$_3$)
$^1$H NMR (600 MHz, CDCl$_3$)
$^{13}$C NMR (150 MHz, CDCl$_3$)
$^{1}H$ NMR (600 MHz, CDCl$_3$)
$^{13}$C NMR (150 MHz, CDCl$_3$)
$^1$H NMR (600 MHz, CDCl$_3$)
$^{13}$C NMR (150 MHz, CDCl$_3$)
References

