

Supplementary Information

Metal-free synthesis of poly substituted pyrroles using surfactants in aqueous medium

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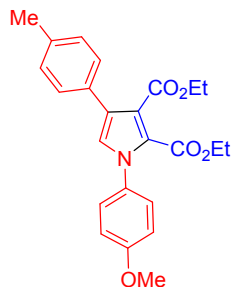
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21 General procedure for the synthesis of poly substituted pyrroles: A solution of α -amino ketone (1eqvi) and Alkyl acetylene corboxylate 1.5eqvi) in the presence of surfactants combination i.e. sodium dodecyl sulphate (0.2eqvi) and triton X-100 (0.3eqvi) in water was stirred at rt for 5 hrs. The progress of the reaction was monitored on TLC plates (20% of Hexane and EtOAc). After completion of the reaction, normal work-up was done using ethyl acetate and water. The organic layer was removed by ethyl acetate (3times), dried by Na₂SO₄, filtered and concentrated under reduced pressure. The crude product obtained was purified by column chromatography to afford the desired product.

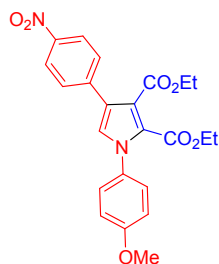
S1. Spectral data of the obtained compounds

Diethyl-1-(4-methoxyphenyl)-4-(p-tolyl)-1H-pyrrole-2,3-dicarboxylate(3aa). white solid, yield 77%, mp 128-130°C; ¹H NMR (400 MHz, CDCl₃) δ 7.38(d, *J* = 8.2, 2H), 7.31 (d, *J* = 7.9, 2H),



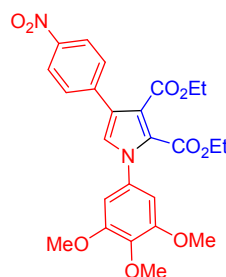
7.21 (d, *J* = 7.12, 2H), 6.99-6.96 (m, 3H), 4.31 (q, *J* = 7.2 Hz, 2H), 4.12 (q, *J* = 7.6Hz, 2H), 3.88 (s, 3H), 2.38 (s, 3H), 1.31 (t, *J* = 7.9Hz, 3H), 1.19 (t, *J* = 7.5Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 166.3, 159.9, 149.0, 148.8, 136.7, 132.6, 130.3, 129.2, 127.6, 125.8, 124.5, 123.4, 121.5, 118.3, 110.5, 110.2, 61.2, 60.7, 56.0, 21.1, 14.0, 13.9. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 2981.9, 1717.9, 1514.1, 1419.2, 1381.3, 1245.0, 1175.9, 1226.7, 1043.6, 835.7, 755.3, 663. HRESIMS: *m/z*calcd for [M+H]⁺ C₂₄H₂₆NO₅ 408.1805 found 408.1845.

Diethyl-1-(4-methoxyphenyl)-4-(4-nitrophenyl)-1H-pyrrole-2,3-dicarboxylate(3ba). Yellow solid, yield 76%, mp 115-125°C; ¹H NMR (400 MHz, CDCl₃) δ 8.15(d, *J* = 7.0, 2H), 7.54 (d, *J* = 7.0,



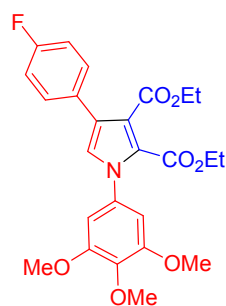
2H), 7.22-7.19 (m, 2H), 6.97 (s, 1H), 6.98 (d, *J* = 6.89, 2H), 4.21 (q, *J* = 7.0 Hz, 2H), 4.12 (q, *J* = 7.0Hz, 2H), 3.89 (s, 3H), 1.24 (t, *J* = 7.7Hz, 3H), 1.12 (t, *J* = 7.3Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 165.5, 159.8, 159.7, 146.6, 140.3, 131.9, 128.3, 127.2, 126.2, 123.8, 122.4, 120.7, 114.1, 61.4, 61.1, 55.5, 14.0, 13.9. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 3020.1, 2400.6, 1602.2, 1516.3, 1475.4, 1423.2, 1384.6, 1215.4, 1069.5, 927.1, 669.3, 626.7. HRESIMS: *m/z*calcd for [M+H]⁺ C₂₃H₂₂N₂O₇ 438.1427 found 439.1500.

Diethyl-4-(4-nitrophenyl)-1-(3,4,5-trimethoxyphenyl)-1H-pyrrole-2,3-dicarboxylate(3ca) Yellow



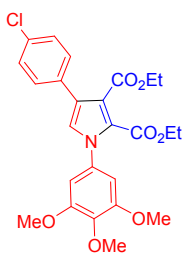
solid, yield 82%, mp 230-235°C; ¹H NMR (400 MHz, CDCl₃) δ 8.25(d, *J* = 8.8, 2H), 7.65 (d, *J* = 9.2, 2H), 7.09(s, 1H), 6.62 (s, 2H), 4.33 (q, *J* = 7.3 Hz, 2H), 4.25 (q, *J* = 7.2Hz, 2H), 3.92 (s, 3H), 3.89 (s, 6H), 1.33 (t, *J* = 6.9Hz, 3H), 1.22 (t, *J* = 6.9Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 165.1, 159.9, 153.2, 146.7, 140.2, 138.3, 134.6, 128.4, 125.8, 125.7, 123.7, 122.7, 120.4, 103.7, 61.4, 61.3, 61.0, 56.3, 14.0, 13.9. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 3021.2, 2925.2, 2401.5, 1601.5, 1509.5, 1356.9, 1117.1, 928.1, 849.9, 669.9 627.1. HRESIMS: *m/z*calcd for [M+H]⁺ C₂₅H₂₆FNO₇ 498.4880 found 499.1711.

Diethyl-1-(4-fluorophenyl)-1-(3,4,5-trimethoxyphenyl)-1H-pyrrole-2,3-dicarboxylate (3da). white solid, yield 81%, mp 129-132°C; ¹H NMR (400 MHz, CDCl₃) δ 7.45-7.41 (m, 2H),



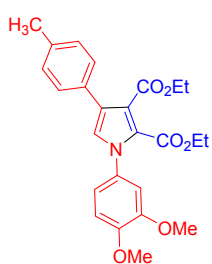
7.0(t, *J* = 8.7 Hz, 2H), 6.9 (s, 1H), 6.6(s, 2H), 4.31 (q, *J* = 7.0 Hz, 2H), 4.23 (q, *J* = 7.0Hz, 2H), 3.91 (s, 3H), 3.87 (s, 6H), 1.29 (t, *J* = 7.0Hz, 3H), 1.21 (t, *J* = 7.0Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 165.6, 163.4, 160.1, 153.1, 138.1, 135.0, 129.7, 125.3, 124.3, 123.9, 115.4, 115.2, 103.8, 61.2, 61.0, 56.2, 14.0, 13.9. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 3020.15, 2400.63, 1724.53, 1602.28, 1508.11, 1478.41, 1384.55, 1215.61, 1072.24, 928.98, 758.23, 669.32, 627.13. HRESIMS: *m/z*calcd for [M+H]⁺ C₂₅H₂₆FNO₇ 471.1693 found 472.1766.

Diethyl 4-(4-chlorophenyl)-1-(3,4,5-trimethoxyphenyl)-1H-pyrrole-2,3-dicarboxylate (3ea) Yellow



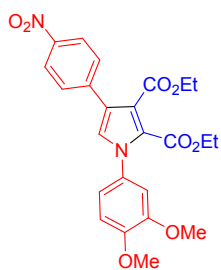
solid, yield 79%, mp 118-120°C; ¹H NMR (400 MHz, CDCl₃) δ 7.42-7.31 (m, 4H), 6.96 (s, 1H), 6.59 (s, 2H), 4.31 (q, *J* = 7.0 Hz, 2H), 4.19 (q, *J* = 7.0 Hz, 2H), 3.92 (s, 3H), 3.88 (s, 6H), 1.31 (t, *J* = 7.2 Hz, 3H), 1.21 (t, *J* = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 165.6, 160.0, 153.1, 138.1, 135.0, 133.0, 131.7, 129.2, 128.5, 125.3, 124.5, 123.7, 120.9, 103.8, 61.2, 61.0, 60.9, 56.2, 14.0, 13.9. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 3020.9, 1628.7, 1383.6, 1215.9, 1068.9. C₂₅H₂₇ClNO₆ 488.1471 found 488.0866.

Diethyl 1-(3,4-dimethoxyphenyl)-4-(p-tolyl)-1H-pyrrole-2,3-dicarboxylate (3fa) Brown solid, yield



80%, mp 150-155°C; ¹H NMR (400 MHz, CDCl₃) δ 7.38 (d, *J* = 8.2 Hz, 2H), 7.21 (d, *J* = 7.9 Hz, 2H), 6.96-6.89 (m, 4H), 4.33 (q, *J* = 7.2 Hz, 2H), 4.18 (q, *J* = 7.2 Hz, 2H), 3.95 (s, 3H), 3.89 (s, 3H), 2.38 (s, 3H), 1.33 (t, *J* = 7.2 Hz, 3H), 1.21 (t, *J* = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 166.3, 159.9, 149.0, 148.8, 136.7, 132.6, 130.3, 129.2, 127.6, 125.8, 124.5, 123.4, 121.5, 118.3, 110.5, 110.2, 61.2, 60.7, 56.0, 21.1, 14.0, 13.9. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 2928.1, 1718.5, 1601.1, 1515.9, 1461.9, 1381.2, 1239.1, 1122.4, 1025.9, 756.2, 664.1. HRESIMS: *m/z* calcd for [M+H]⁺ C₂₅H₂₈NO₆ 438.1911 found 438.1891

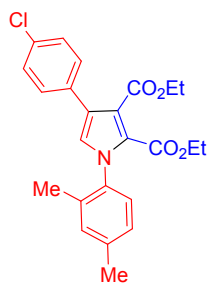
Diethyl 1-(3,4-dimethoxyphenyl)-4-(4-nitrophenyl)-1H-pyrrole-2,3-dicarboxylate (3ga). Brown solid,



yield 82 %, mp 114-116°C; ¹H NMR (500 MHz, CDCl₃) δ 8.15 (d, *J* = 7.0 Hz, 2H), 7.55 (d, *J* = 7.0 Hz, 2H), 6.99-6.81 (m, 4H), 4.25 (q, *J* = 5.8 Hz, 2H), 4.13 (q, *J* = 5.8 Hz, 2H), 3.86 (s, 3H), 3.81 (s, 3H), 1.23 (t, *J* = 5.7 Hz, 3H), 1.12 (t, *J* = 6.0 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 165.3, 159.9, 149.4, 149.0, 146.6, 140.3, 132.0, 128.3, 126.1, 123.7, 122.5, 118.1, 110.6, 109.9, 61.4, 61.3, 61.0, 56.1, 14.0, 13.9. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 3020.1, 2400.6, 1718.9, 1601.5, 1518.7, 1422.9, 1384.5, 1344.8, 1070.2, 929.2, 851.9, 669.3, 627.3. HRESIMS: *m/z* calcd for [M+H]⁺ C₂₄H₂₅N₂O₈ 469.1471

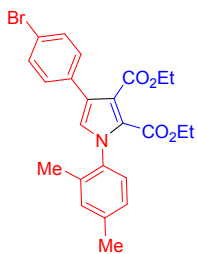
found 469.1609.

Diethyl 4-(4-chlorophenyl)-1-(2,4-dimethylphenyl)-1H-pyrrole-2,3-dicarboxylate (3ha). Yellow solid,

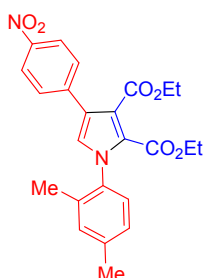


yield 80%, mp 120-122°C; ¹H NMR (500 MHz, CDCl₃) δ 7.32-7.25 (m, 3H), 7.19 (s, 1H), 7.04-6.99 (m, 3H), 6.77 (s, 1H), 4.25 (q, *J* = 7.9 Hz, 2H), 4.06 (q, *J* = 6.8 Hz, 2H), 2.31 (s, 3H), 2.01 (s, 3H), 1.23 (t, *J* = 7.2 Hz, 3H), 1.06 (t, *J* = 6.8 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 166.2, 159.5, 138.9, 136.3, 134.9, 132.8, 131.1, 130.9, 129.0, 128.6, 127.0, 126.9, 125.4, 123.9, 123.3, 121.2, 61.3, 60.6, 21.1, 19.1, 17.2, 14.1, 13.8. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 3020.2, 2400.6, 1721.4, 1601.9, 1510.5, 1424.3, 1384.3, 1344.7, 1066.1, 849.6, 669.2, 627.2. HRESIMS: *m/z* calcd for [M+H]⁺ C₂₄H₂₅ClNO₄ 426.1467 found 426.1468.

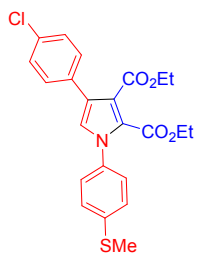
Diethyl-4-(4-bromophenyl)-1-(2,4-dimethylphenyl)-1H-pyrrole-2,3-dicarboxylate (3ia). White solid, yield 81%, mp 119-122°C; ¹H NMR (500 MHz, CDCl₃) δ 7.39 (d, *J* = 8.5 Hz, 2H), 7.19 (d, *J* = 8.0, 2H), 7.04-6.98 (m, 3H), 6.77 (s, 1H), 4.25 (q, *J* = 6.2 Hz, 2H), 4.06 (q, *J* = 7.0 Hz, 2H), 2.29 (s, 3H), 1.99 (s, 3H), 1.23 (t, *J* = 7.1 Hz, 3H), 1.05 (t, *J* = 7.1 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 166.1, 159.5, 138.9, 136.3, 134.9, 132.8, 131.1, 131.9, 129.0, 127.6, 127.0, 125.4, 123.9, 123.4, 121.2, 121.0, 61.3, 60.6, 21.1, 19.1, 17.2, 14.1, 13.8. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 3020.0, 2400.5, 1716.8, 1510.2, 1477.7, 1421.4, 1383.9, 1144.1, 1115.9, 1073.1, 929.1, 669.2, 627.7, 497.9. HRESIMS: *m/z* calcd for [M+H]⁺ C₂₄H₂₅BrNO₄ 470.0961 found 470.0955.



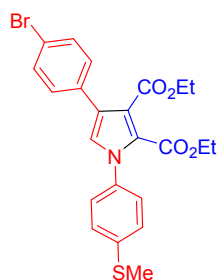
Diethyl-1-(2,4-dimethylphenyl)-4-(4-nitrophenyl)-1H-pyrrole-2,3-dicarboxylate (3ja). Yellow solid, yield 79%, mp 115-117°C; ¹H NMR (400 MHz, CDCl₃) δ 8.25 (d, *J* = 8.9 Hz, 2H), 7.64 (d, *J* = 8.9, 2H), 7.16-7.12 (m, 3H), 6.99 (s, 1H), 4.36 (q, *J* = 7.0 Hz, 2H), 4.17 (q, *J* = 7.2 Hz, 2H), 2.41 (s, 3H), 2.11 (s, 3H), 1.35 (t, *J* = 7.2 Hz, 3H), 1.16 (t, *J* = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 165.8, 159.4, 146.6, 140.3, 139.2, 136.0, 134.9, 131.2, 128.1, 127.0, 126.9, 123.8, 12.3, 120.9, 61.3, 60.6, 21.1, 19.1, 17.2, 14.1, 13.8. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 3020.2, 2400.6, 1716.4, 1601.9, 1521.5, 1424.3, 1384.3, 1344.7, 1066.1, 929.2, 669.2, 626.3. HRESIMS: *m/z* calcd for [M+H]⁺ C₂₄H₂₅N₂O₆ 437.1707 found 437.1850.



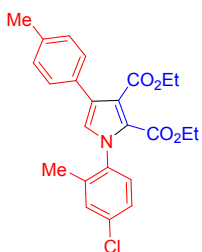
Diethyl-4-(4-chlorophenyl)-1-(4-(methylthio)phenyl)-1H-pyrrole-2,3-dicarboxylate (3ka). White solid, yield 80%, mp 107-108°C; ¹H NMR (400 MHz, CDCl₃) δ 7.46-7.42 (m, 2H), 7.34-7.28 (m, 4H), 7.08 (t, *J* = 8.7 Hz, 2H), 6.93 (s, 1H), 4.31 (q, *J* = 7.2 Hz, 2H), 4.22 (q, *J* = 7.2 Hz, 2H), 2.54 (s, 3H), 1.31 (t, *J* = 7.2 Hz, 3H), 1.22 (t, *J* = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 165.9, 163.3, 160.9, 159.9, 139.5, 136.3, 129.6, 129.5, 129.3, 126.4, 126.3, 125.4, 123.9, 123.7, 121.6, 115.4, 115.2, 61.3, 60.9, 15.6, 14.0, 13.9. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 3021.5, 2928.9, 2401.4, 1714.8, 1603.4, 1519.9, 1423.3, 1131.1, 1022.9, 928.8, 670.3, 627.7. HRESIMS: *m/z* calcd for [M+H]⁺ C₂₃H₂₃ClNO₄S 444.1031 found 444.1046.



Diethyl-4-(4-bromophenyl)-1-(4-(methylthio)phenyl)-1H-pyrrole-2,3-dicarboxylate (3la). White solid, yield 78%, mp 106-107°C; ¹H NMR (400 MHz, CDCl₃) δ 7.41-7.25 (m, 8H), 6.94 (s, 1H), 4.34 (q, *J* = 7.2 Hz, 2H), 4.22 (q, *J* = 7.2 Hz, 2H), 2.51 (s, 3H), 1.32 (t, *J* = 7.2 Hz, 3H), 1.23 (t, *J* = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 165.8, 159.8, 139.6, 136.2, 131.7, 129.1, 128.5, 126.4, 126.3, 125.4, 123.9, 123.7, 121.6, 115.4, 115.2, 61.3, 61.0, 15.6, 14.0, 13.9. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 3020.1, 2400.0, 1714.4, 1603.3, 1514.8, 1477.1, 1421.8, 1383.7, 1129.9, 1047.3, 929.1, 669.2, 627.2, 532.7. HRESIMS: *m/z* calcd for [M+H]⁺ C₂₃H₂₃BrNO₄S 488.0526 found 488.0576.

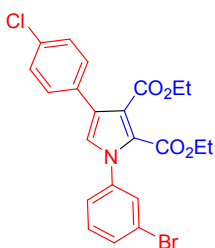


Diethyl-1-(4-chloro-2-methylphenyl)-4-(p-tolyl)-1H-pyrrole-2,3-dicarboxylate (3ma). Yellow solid, yield 76%, mp 120-122°C; ¹H NMR (400 MHz CDCl₃) δ 7.38-7.35 (m, 3H), 7.28-7.19



(m, 4H), 6.88 (s, 1H), 4.38 (q, *J* = 7.0 Hz, 2H), 4.18 (q, *J* = 7.2 Hz, 2H), 2.38 (s, 3H), 2.12 (s, 3H), 1.35 (t, *J* = 7.2 Hz, 3H), 1.17 (t, *J* = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 166.4, 159.3, 140.0, 136.8, 134.2, 131.4, 131.3, 130.0, 129.3, 129.0, 127.6, 127.4, 125.0, 124.9, 122.8, 122.3, 61.3, 60.6, 21.1, 16.1, 17.2, 14.1, 13.8. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 3020.2, 2400.6, 1714.0, 1514.5, 1423.0, 1384.1, 1215.6, 1127.4, 929.3, 756.6, 669.3. HRESIMS: *m/z* calcd for [M+H]⁺ C₂₄H₂₅ClNO₄ 426.1467 found 426.1496.

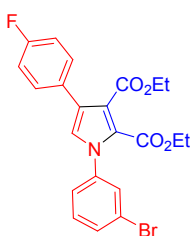
Diethyl-1-(3-bromophenyl)-4-(4-chlorophenyl)-1H-pyrrole-2,3-dicarboxylate (3na). white oil, yield 73%, mp 88-89°C; ¹H NMR (500 MHz, CDCl₃) δ 7.50 (d, *J* = 7.4 Hz, 1H), 7.46 (s, 1H),



7.32-7.19 (m, 6H), 6.88 (s, 1H), 4.25 (q, *J* = 5.7 Hz, 2H), 4.12 (q, *J* = 5.7 Hz, 2H), 1.23 (t, *J* = 5.5 Hz, 3H), 1.06 (t, *J* = 5.5 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 165.5, 159.6, 140.4, 133.1, 131.6, 131.5, 130.9, 130.1, 129.3, 129.1, 128.8, 125.3, 124.9, 123.9, 123.7, 122.2, 122.1, 14.1, 13.8. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 3021.1, 2401.5, 1719.6, 1593.4, 1522.2, 1477.8, 1426.5, 1382.4, 1285.0, 1216.3, 1131.0, 1074.0, 849.0, 669.1, 626.9. HRESIMS: *m/z* calcd for [M+H]⁺ C₂₂H₂₀BrClNO₄ 476.0259

found 476.0278.

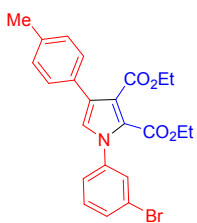
Diethyl-1-(3-bromophenyl)-4-(4-fluorophenyl)-1H-pyrrole-2,3-dicarboxylate (3oa). white oil, yield 70%, mp 85-86 °C; ¹H NMR (500 MHz, CDCl₃) δ 7.32-7.25 (m, 3H), 7.19 (s, 1H),



7.04-6.99 (m, 4H), 6.77 (s, 1H), 4.25 (q, *J* = 7.9 Hz, 2H), 4.06 (q, *J* = 6.8 Hz, 2H), 1.23 (t, *J* = 7.2 Hz, 3H), 1.06 (t, *J* = 6.8 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 166.2, 159.5, 138.9, 136.3, 134.9, 132.8, 131.1, 130.9, 129.0, 128.6, 127.0, 126.9, 125.4, 123.9, 123.3, 121.2, 61.3, 60.6, 21.1, 19.1, 17.2, 14.1, 13.8. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 3021.5, 2965.5, 2401.5, 1719.6, 1593.4, 1522.2, 1477.8, 1426.5, 1382.4, 1285.0, 1216.3, 1131.0, 1074.0, 929.0, 670.1, 626.3. HRESIMS: *m/z* calcd for [M+H]⁺ C₂₂H₂₀BrFNO₄

460.0554 found 460.0506.

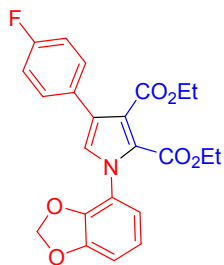
Diethyl-1-(3-bromophenyl)-4-(p-tolyl)-1H-pyrrole-2,3-dicarboxylate (3pa). Brown solid, yield 69%, mp 132-135°C; ¹H NMR (500 MHz, CDCl₃) δ 7.48-7.44 (m, 2H), 7.26-7.23 (m, 4H),



7.09 (d, *J* = 7.9 Hz, 2H), 6.86 (s, 1H), 4.253 (q, *J* = 7.1 Hz, 2H), 4.12 (q, *J* = 6.8 Hz, 2H), 2.27 (s, 3H), 1.22 (t, *J* = 7.0 Hz, 3H), 1.06 (t, *J* = 7.0 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 166.1, 159.6, 140.7, 136.9, 131.5, 130.0, 129.2, 127.5, 125.4, 125.1, 123.0, 122.7, 122.1, 61.3, 60.9, 21.1, 14.1, 13.9. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 2982.78, 1717.29, 1588.54, 1523.74, 1481.59, 1381.01, 1221.16, 1128.70, 1045.60, 756.08,

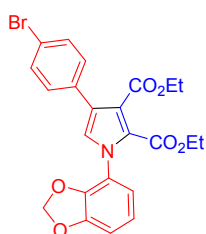
664.88. HRESIMS: *m/z* calcd for [M+H]⁺ C₂₃H₂₃BrNO₄ 456.0805 found 456.0758

Diethyl-1-(benzo[d][1,3]dioxol-4-yl)-4-(4-fluorophenyl)-1H-pyrrole-2,3-dicarboxylate (3qa). Brown solid, yield 76%, mp 105-107°C; ¹H NMR (400 MHz, CDCl₃) δ 7.45-7.41(m, 2H), 7.07



(t, *J* = 8.7MHz, 2H), 6.91 (s, 1H), 6.84-6.73 (m, 3H), 6.02 (s, 2H), 4.31 (q, *J* = 7.3 Hz, 2H), 4.23 (q, *J* = 6.8Hz, 2H), 1.29 (t, *J* = 7.4 Hz, 3H), 1.23 (t, *J* = 7.1Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 165.8, 163.3, 160.9, 159.9, 147.7, 147.6, 133.3, 129.6, 129.5, 125.6, 124.0, 123.7, 121.3, 119.5, 115.4, 107.8, 101.9, 61.1, 60.9, 14.0, 13.9. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 3021.7, 2985.1, 2928.0, 2857.2, 2401.9, 1607.4, 1554.4, 1420.6, 1382.2, 1158.0, 1120.0, 1100.1, 1040.4, 978.7, 899.2, 843.8, 669.9, 627.0, 575.5, 532.5. HRESIMS: *m/z*calcd for [M+H]⁺ C₂₃H₂₁FNO₆ 426.1347 found 426.1371

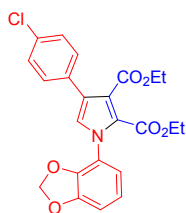
Diethyl-1-(benzo[d][1,3]dioxol-4-yl)-4-(4-bromophenyl)-1H-pyrrole-2,3-dicarboxylate (3ra). Black solid, yield 70%, mp 103-105°C; ¹H NMR (400 MHz, CDCl₃) δ 7.52 (d, 2H), 7.35 (d,



3H), 6.29 (s, 1H), 6.88-6.84 (m, 2H), 6.07 (s, 2H), 4.32 (q, *J* = 7.9Hz, 2H), 4.23 (q, *J* = 6.8 Hz, 2H), 1.32 (t, *J* = 7.2Hz, 3H), 1.24 (t, *J* = 6.8Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 165.8, 159.8, 147.8, 147.7, 133.2, 132.2, 131.5, 129.4, 125.7, 124.1, 123.4, 121.2, 121.1, 119.6, 107.7, 101.9, 61.3, 60.9, 14.0, 13.9. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 3021.1, 2961.7, 2928.3, 2401.5, 1719.9, 1489.6, 1381.3, 1284.9, 1123.8, 1074.4, 1040.0,

669.6. HRESIMS: *m/z*calcd for [M+H]⁺ C₂₃H₂₁BrNO₆ 486.0547 found 486.0508.

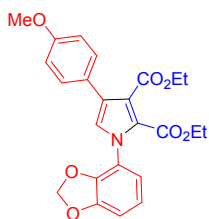
Diethyl-1-(benzo[d][1,3]dioxol-4-yl)-4-(4-chlorophenyl)-1H-pyrrole-2,3-dicarboxylate (3sa). Yellow solid, yield 73%, mp 102-104°C; ¹H NMR (400 MHz, CDCl₃) δ 7.41-7.34 (m, 4H),



6.94 (s, 1H), 6.87-6.84(m, 3H), 6.06 (s, 2H), 4.32 (q, *J* = 7.2Hz, 2H), 4.23 (q, *J* = 7.2Hz, 2H), 1.32 (t, *J* = 7.1 Hz, 3H), 1.24 (t, *J* = 7.1Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 165.8, 159.8, 147.8, 147.7, 133.2, 133.0, 131.7, 129.1, 128.6, 125.7, 124.1, 123.4, 119.6, 119.5, 107.6, 101.9, 61.1, 60.9, 14.0, 13.9. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 3020.1, 2400.5, 1716.9, 1506.2, 1492.0, 1421.2, 1384.1, 1095.1, 1040.6, 929.3, 669.2,

627.1. HRESIMS: *m/z*calcd for [M+H]⁺ C₂₃H₂₁ClNO₆ 442.1052 found 442.1073

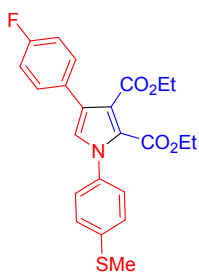
Diethyl-1-(benzo[d][1,3]dioxol-4-yl)-4-(4-methoxyphenyl)-1H-pyrrole-2,3-dicarboxylate (3ta). White solid, yield 69%, mp 102-104°C; ¹H NMR (500 MHz, CDCl₃) δ 7.3(d, *J* = 8.9, 2H), 6.9-



6.8 (m, 3H), 6.8-6.7 (m, 3H), 6.0 (s, 2H), 4.4 (q, *J* = 6.7Hz, 2H), 4.3 (q, *J* = 6.9Hz, 2H), 3.8 (s, 3H), 1.3 (t, *J* = 7.4Hz, 3H), 1.2 (t, *J* = 8.2Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 166.2, 159.9, 158.8, 147.6, 133.5, 128.9, 125.7, 125.6, 124.3, 123.3, 121.6, 119.7, 113.9, 107.8, 101.8, 61.2, 60.7, 55.2, 14, 13.9. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 3419.7, 2400.3, 1616.3, 1524.1, 1422.8, 1384.6, 1215.9, 1099.1, 908.9, 757.2, 669.2.

HRESIMS: *m/z*calcd for [M+H]⁺ C₂₄H₂₄NO₇ 438.1547 found 438.1371.

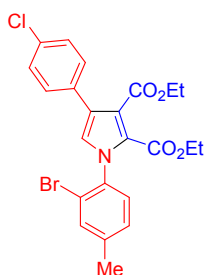
Diethyl 4-(4-fluorophenyl)-1-(4-(methylthio)phenyl)-1H-pyrrole-2,3-dicarboxylate(3ua). Yellow oil, yield 77%, mp 108-110°C; ¹H NMR (400 MHz, CDCl₃) δ 7.46-7.42(m, 2H), 7.33-7.27



(m, 4H), 7.07 (t, *J*=8.7Hz, 2H), 6.93 (s, 1H), 4.32 (q, *J* = 7.0Hz, 2H), 4.22 (q, *J*=7.5Hz, 2H), 2.53, (s, 3H), 1.31 (t, *J* = 7.1Hz, 3H), 1.21 (t, *J* = 7.1Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 165.9, 163.3, 160.9.8, 159.94, 139.5, 136.3, 129.6, 129.5, 129.3, 126.4, 126.3, 125.4, 123.9, 123.7, 121.6, 115.4, 115.2, 61.3, 60.9, 15.6, 14.0, 13.9. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 3021.3, 2401.5, 1715.6, 1602.7, 1500.9, 1423.4, 1216.1, 1129.9, 1022.4, 928.8, 670.0. HRESIMS: *m/z*calcd for [M+H]⁺ C₂₃H₂₃FNO₄S 428.1326 found

428.1284

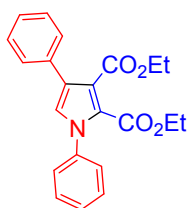
Diethyl 1-(2-bromo-4-methylphenyl)-4-(4-chlorophenyl)-1H-pyrrole-2,3-dicarboxylate(3va). Yellow oil, yield 71%, mp 120-125°C; ¹H NMR (400 MHz, CDCl₃) δ = 7.52(s, 1H), 7.42-



7.33 (m, 4H), 7.27-7.21 (m, 2H), 6.89 (s, 1H), 4.33 (q, *J* = 6.5 Hz, 2H), 4.17 (q, *J* = 5.2 Hz, 2H), 2.42 (s, 3H), 1.35 (t, *J* = 7.2Hz, 3H), 1.16 (t, *J* = 7.2Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 166.2, 159.2, 140.7, 136.5, 133.3, 132.9, 131.7, 128.9, 128.6, 128.5, 128.4, 125.4, 123.5, 123.3, 122.0, 121.5, 20.2, 14.1, 13.8. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 3020.6, 2856.8, 2400.8, 1711.4, 1501.5, 1465.3, 1421.0, 1384.3, 1216.7, 1095.0, 1066.1, 929.2, 669.2, 627.3. HRESIMS: *m/z*calcd for [M+H]⁺ C₂₃H₂₂BrClNO₄

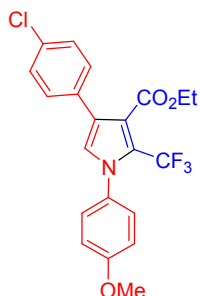
490.0415 found 490.0441.

Diethyl 1,4-diphenyl-1H-pyrrole-2,3-dicarboxylate(3wa) White solid, yield 72%, mp 118-120°C; ¹H



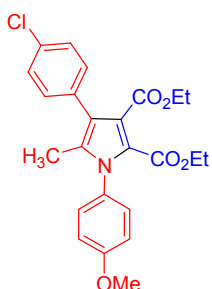
NMR (400 MHz, CDCl₃) δ 7.49-7.45(m, 5H), 7.40-7.36 (m, 4H), 7.33-7.32 (m, 1H), 7.01 (s, 1H), 4.34 (q, *J* = 7.0Hz, 2H), 4.21 (q, *J*=7.0Hz, 2H), 1.31 (t, *J* = 7.1Hz, 3H), 1.23 (t, *J* = 7.1Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 166.2, 159.9, 139.6, 133.2, 128.8, 128.4, 127.7, 127.0, 126.2, 125.6, 124.7, 123.4, 122.0, 61.3, 60.8, 14.0, 13.8. HRESIMS: *m/z*calcd for [M+H]⁺ C₂₂H₂₂NO₄ 364.1543 found 364.1542.

Diethyl 4-(4-chlorophenyl)-1-(4-methoxyphenyl)-2-(trifluoromethyl)-1H-pyrrole-3-



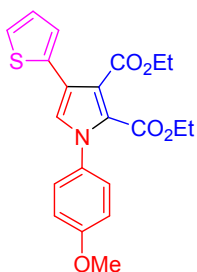
carboxylate(3ab). Yellow Oil, yield 80%, mp; ¹H NMR (400 MHz, CD₃OD) δ = 7.41-7.39(m, 6H), 7.17 (s, 1H), 7.08 (m, 2H), 4.31-4.25 (m, 2H), 3.88 (s, 3H), 1.29-1.24 (m, 3H); ¹³C NMR (100 MHz, CD₃OD) δ 164.9, 160.3, 132.6, 140.7, 136.5, 133.3, 132.9, 131.7, 128.9, 128.6, 128.5, 128.4, 125.4, 123.5, 123.3, 122.0, 121.5, 20.2, 14.1, 13.8. IR (KBr) $\tilde{\nu}$ (cm⁻¹): 3583.33, 2924.02, 1726.98, 1515.34, 1249.36, 1218.45, 1169.97, 1125.78, 1028.13, 665.77. HRESIMS: *m/z*calcd for [M+H]⁺ C₂₁H₁₈F₃NO₃ 424.0922 found 424.0915.

Diethyl 4-(4-chlorophenyl)-1-(4-methoxyphenyl)-5-methyl-1H-pyrrole-2,3-dicarboxylate(3xa). Yellow



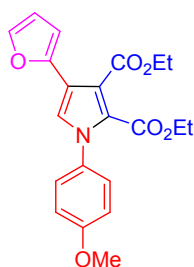
Oil, yield 84%,; $^1\text{H NMR}$ (400 MHz, CDCl_3) δ = 7.38-7.30(m, 4H), 7.21 (d, 2H), 7.21(d, 2H), 4.24 (q, J = 7.1 Hz, 2H), 4.12 (q, J = 7.1 Hz, 2H), 3.89 (s, 3H), 2.00(s, 3H), 1.23 (t, J = 7.2 Hz, 3H), 1.15(t, J = 7.2 Hz, 3H); $^{13}\text{C NMR}$ (100 MHz, CDCl_3) δ 166.2, 159.9, 159.7, 133.5, 132.9, 132.6, 130.9, 128.8, 128.4, 122.4, 122.2, 120.7, 114.2, 61.1, 60.5, 55.5, 14.1, 14.0, 11.4. IR (KBr) $\tilde{\nu}$ (cm^{-1}): 3583.1, 2923.1, 1710.1, 1512.0, 1251.6, 1179.9, 752. HRESIMS: m/z calcd for $[\text{M}+\text{H}]^+$ $\text{C}_{24}\text{H}_{25}\text{ClNO}_5$ 442.1416 found 442.1429.

Diethyl 1-(4-methoxyphenyl)-4-(thiophen-2-yl)-1H-pyrrole-2,3-dicarboxylate(5aa). Brown oil, yield



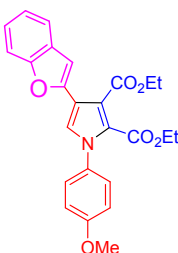
81%, $^1\text{H NMR}$ (400 MHz, CDCl_3) δ 7.7.29-7.27 (m, 2H), 7.25 (d, J = 5.1Hz, 1H), 7.18 (s, 1H), 7.14 (t, J = 4.3Hz, 1H), 7.02, (s, 1H), 7.96 (d, J = 8.7Hz, 2H), 4.38 (q, J = 7.2 Hz, 2H), 4.18 (q, J = 7.1Hz, 2H), 3.88 (s, 3H), 1.31 (t, J = 6.9Hz, 3H), 1.21 (t, J = 7.2Hz, 3H) ; $^{13}\text{C NMR}$ (100 MHz, CDCl_3) δ 165.9, 159.8, 159.6, 134.7, 132.3, 127.5, 127.5, 126.1, 125.0, 124.1, 123.7, 121.4, 117.7, 114.0, 61.5, 60.9, 55.6, 14.1, 14.0. IR (KBr) $\tilde{\nu}$ (cm^{-1}): 2933.0, 2924.8, 2853.6, 1720.1, 1617.7, 1510.6, 14462.7, 1249.3, 1245.5, 1118.1, 1023.6, 817.1, 668.1, 660.1..HRESIMS: m/z calcd for $[\text{M}+\text{H}]^+$ $\text{C}_{21}\text{H}_{22}\text{NO}_5\text{S}$ 400.1213 found 400.1213.

Diethyl 4-(furan-2-yl)-1-(4-methoxyphenyl)-1H-pyrrole-2,3-dicarboxylate(5ba). Brown oil, yield



82%; $^1\text{H NMR}$ (400 MHz, CDCl_3) δ 7.38-7.39(m,1H), 7.28-7.26 (m, 2H), 7.21 (s, 1H), 6.97-6.95 (m, 2H), 6.55-6.54 (m, 1H), 6.44-6.43 (m, 1H), 4.41 (q, J = 7.1 Hz, 2H), 4.28 (q, J = 7.1Hz, 2H), 3.89 (s, 3H), 1.41 (t, J = 7.1Hz, 3H), 1.21 (t, J = 7.2Hz, 3H) ; $^{13}\text{C NMR}$ (100 MHz, CDCl_3) δ 165.8, 159.9, 159.5, 147.6, 141.1, 132.3, 127.4, 124.9, 123.9, 119.5, 115.1, 113.9, 111.3, 105.9, 61.1, 60.9, 55.6, 14.2, 14.0. IR (KBr) $\tilde{\nu}$ (cm^{-1}): 2925.4, 1721.1, 1514.6, 1214.5, 1129.9, 750.5, 667.9.HRESIMS: m/z calcd for $[\text{M}+\text{H}]^+$ $\text{C}_{21}\text{H}_{22}\text{NO}_6$ 384.1442 found 384.1445.

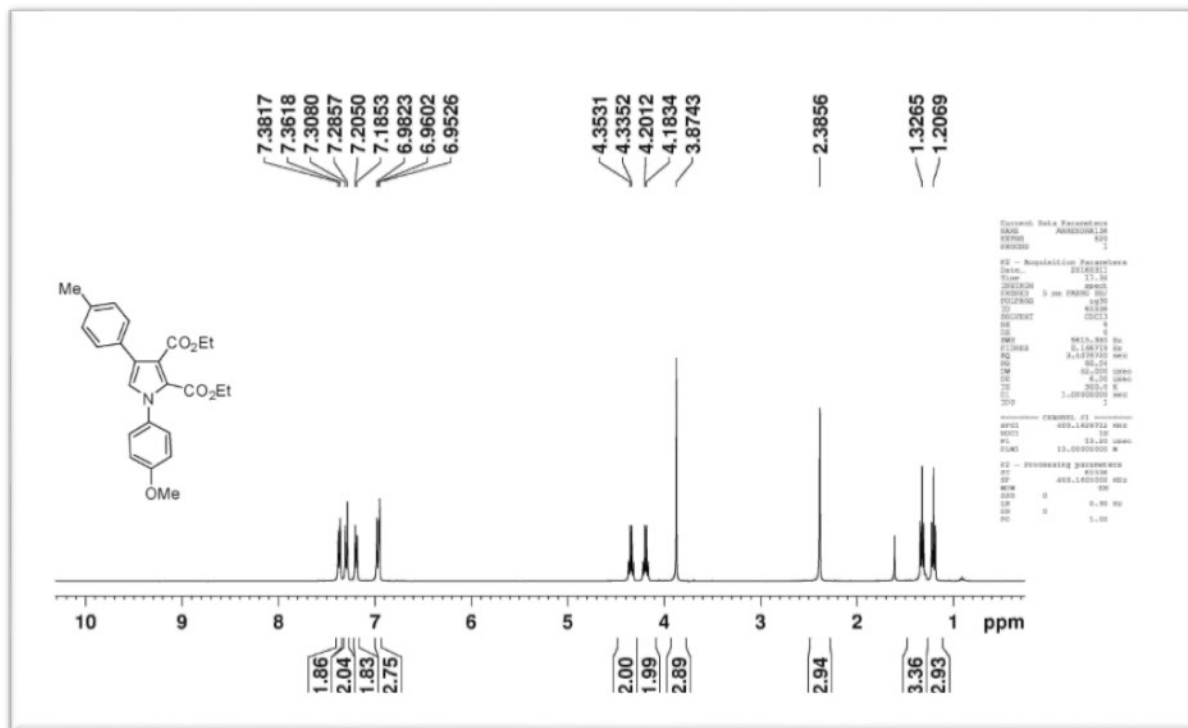
Diethyl 4-(furan-2-yl)-1-(4-methoxyphenyl)-1H-pyrrole-2,3-dicarboxylate(5ca). Brown oil, yield



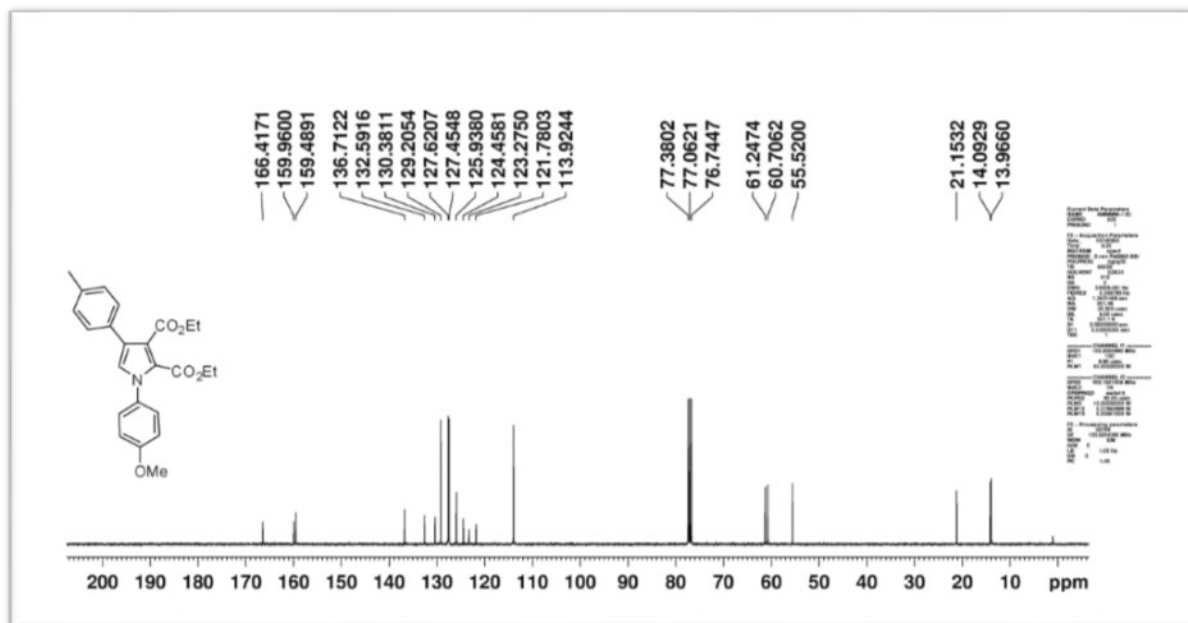
80%; $^1\text{H NMR}$ (400 MHz, CDCl_3) δ 7.38-7.39(m,1H), 7.28-7.26 (m, 2H), 7.21 (s, 1H), 6.97-6.95 (m, 2H), 6.55-6.54 (m, 1H), 6.44-6.43 (m, 1H), 4.41 (q, J = 7.1 Hz, 2H), 4.28 (q, J = 7.1Hz, 2H), 3.89 (s, 3H), 1.41 (t, J = 7.1Hz, 3H), 1.21 (t, J = 7.2Hz, 3H) ; $^{13}\text{C NMR}$ (100 MHz, CDCl_3) δ 165.8, 159.9, 159.5, 147.6, 141.1, 132.3, 127.4, 124.9, 123.9, 119.5, 115.1, 113.9, 111.3, 105.9, 61.1, 60.9, 55.6, 14.2, 14.0. IR (KBr) $\tilde{\nu}$ (cm^{-1}): 2928.1, 1713.6, 1619.8, 1573.4, 1403.6, 1249.1, 1214.6, 1225.4, 1022.3, 838.5, 747.7, 667.7.HRESIMS: m/z calcd for $[\text{M}+\text{H}]^+$ $\text{C}_{21}\text{H}_{22}\text{NO}_6$ 384.1442 found 384.1445.

S2 Copies of ¹H NMR and ¹³C NMR Spectra

Diethyl-1-(4-methoxyphenyl)-4-(p-tolyl)-1H-pyrrole 2,3dicarboxylate (3aa), ¹H NMR

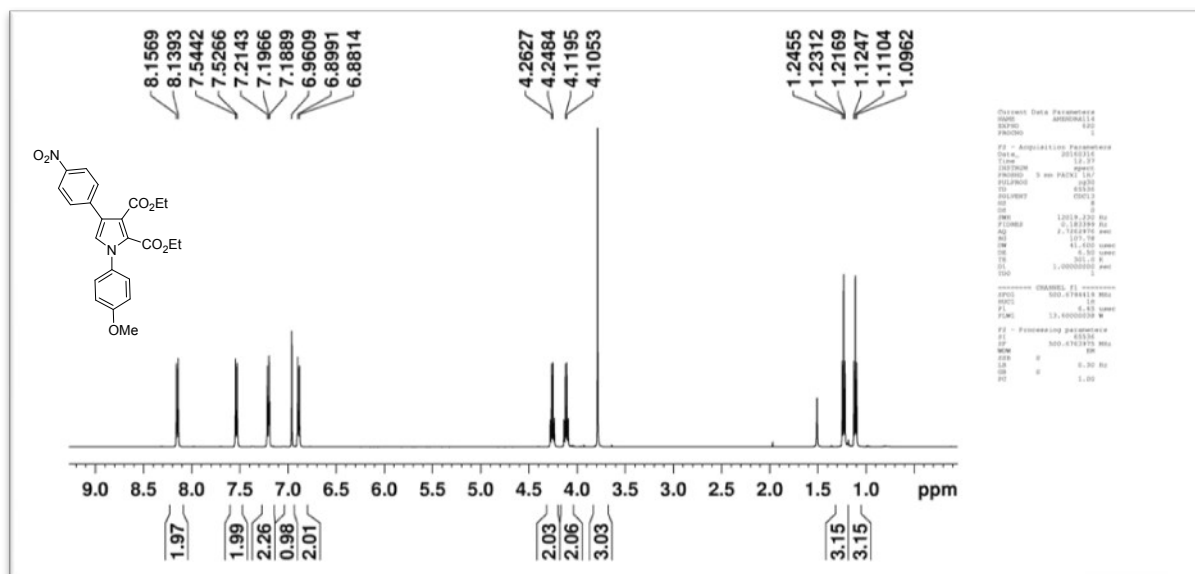


Diethyl-1-(4-methoxyphenyl)-4-(p-tolyl)-1H-pyrrole 2,3dicarboxylate (3aa), ¹³C NMR



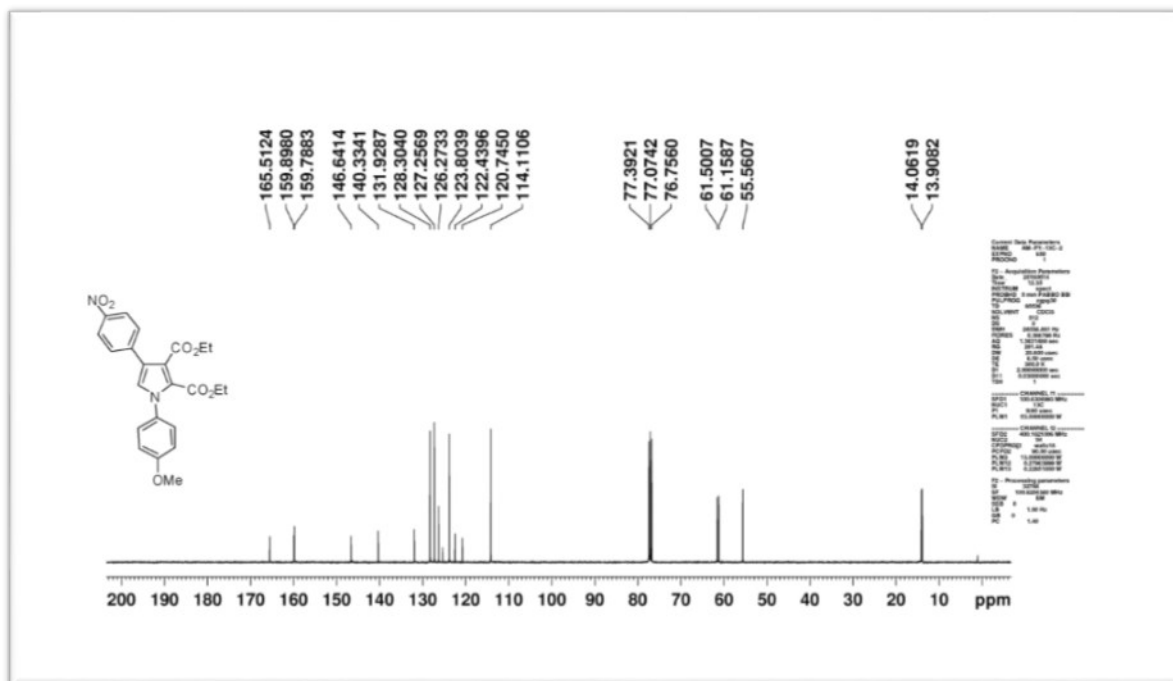
Diethyl-1-(4-methoxyphenyl)-4-(4-nitrophenyl)-1H-pyrrole-2,3-dicarboxylate(3ba),

¹H NMR



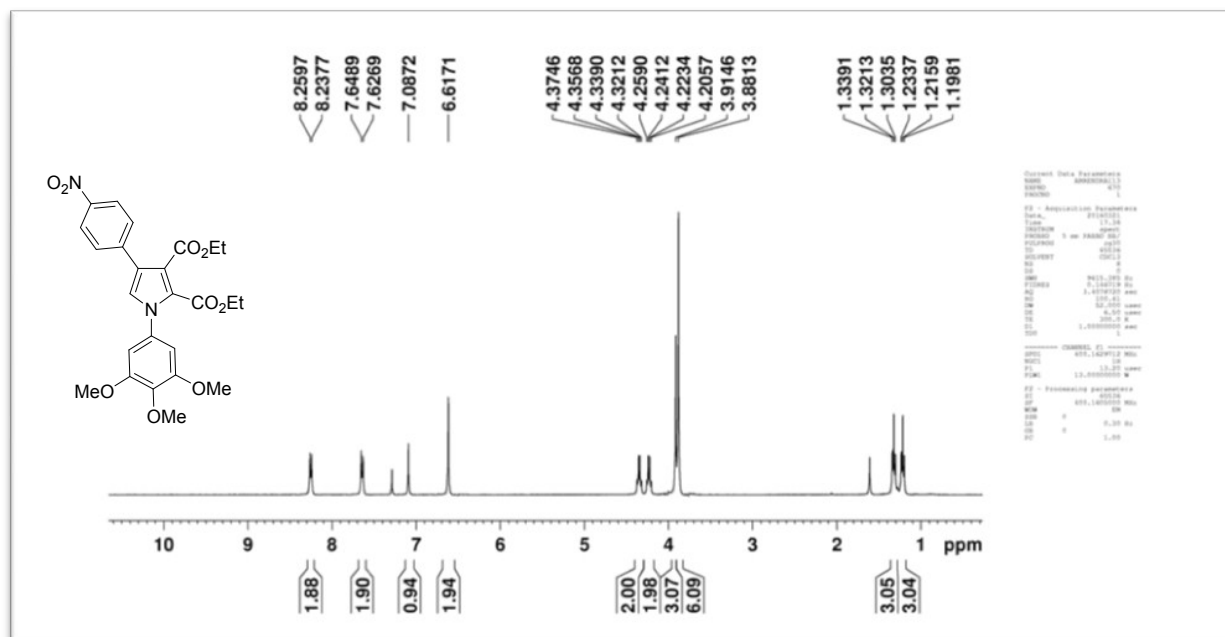
Diethyl-1-(4-methoxyphenyl)-4-(4-nitrophenyl)-1H-pyrrole-2,3-dicarboxylate(3ba)

¹³C NMR



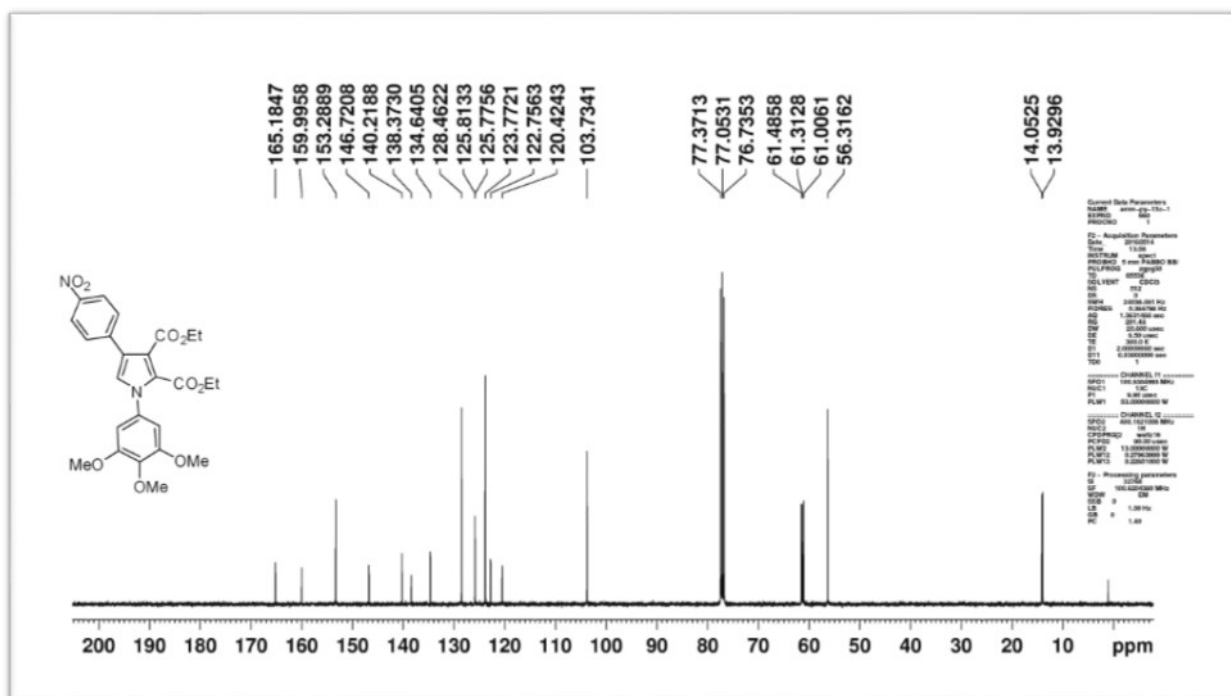
Diethyl-4-(4-nitrophenyl)-1-(3,4,5-trimethoxyphenyl)-1H-pyrrole-2,3-dicarboxylate (3ca),

¹H NMR



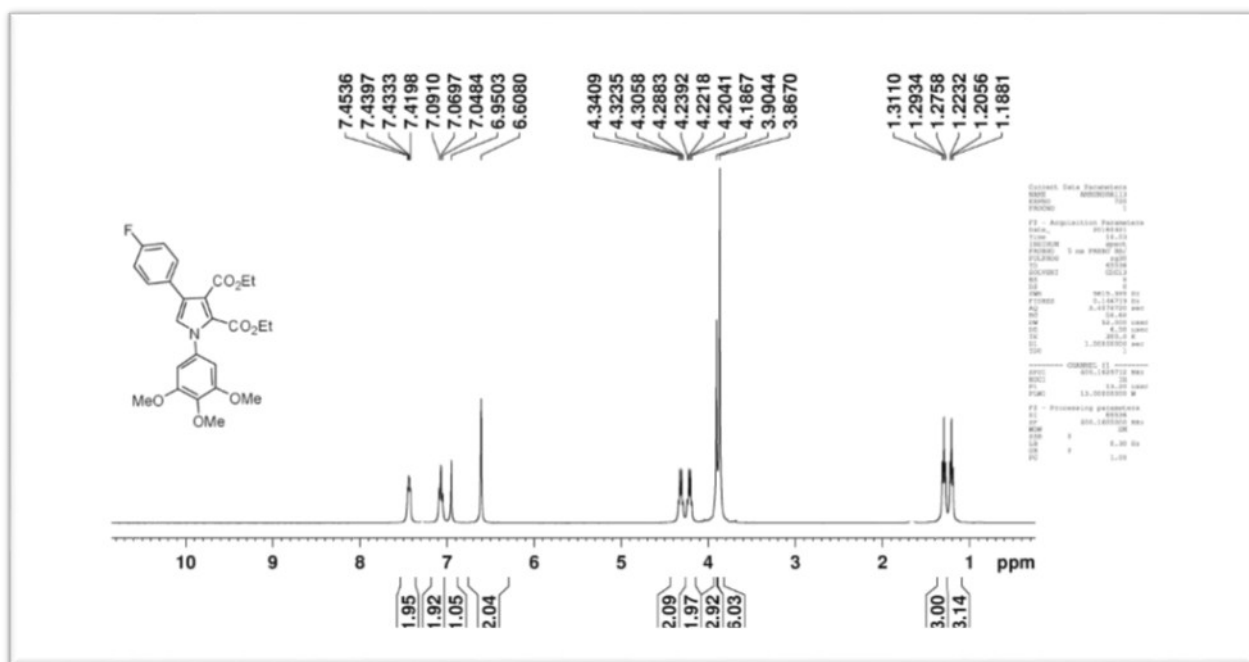
Diethyl-4-(4-nitrophenyl)-1-(3,4,5-trimethoxyphenyl)-1H-pyrrole-2,3-dicarboxylate (3ca),

¹³C NMR



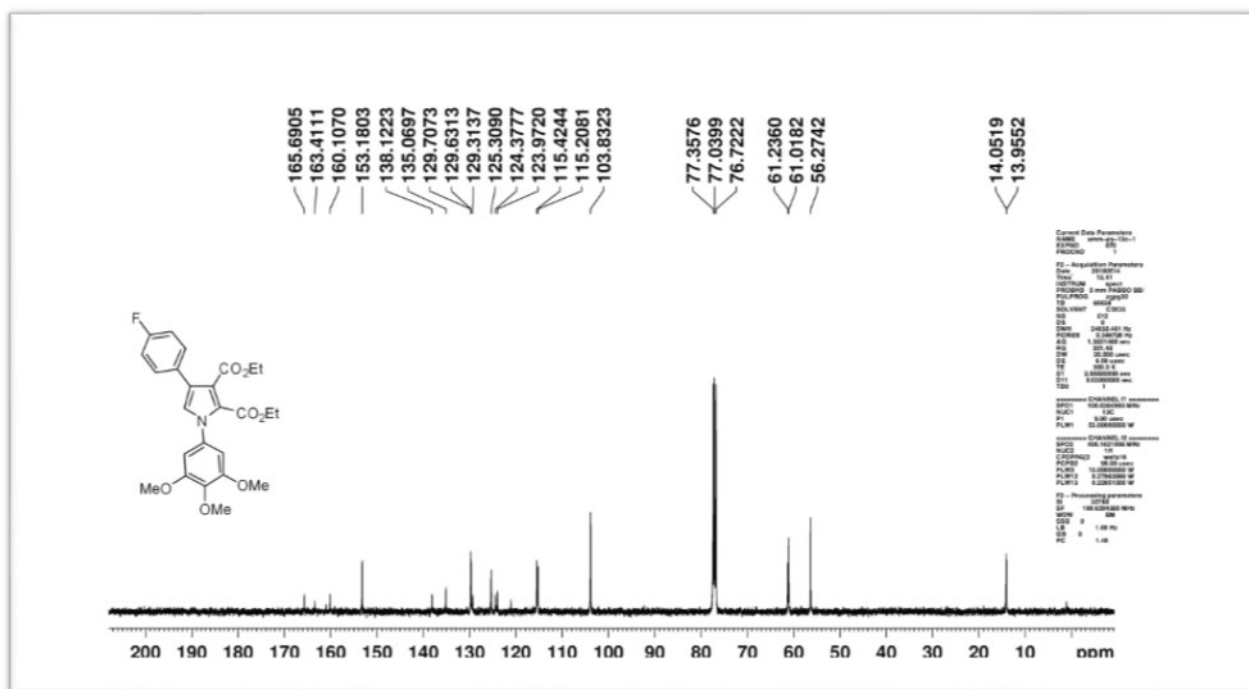
Diethyl-1-4-(4-fluorophenyl)-1-(3,4,5-trimethoxyphenyl)-1H-pyrrole-2,3-dicarboxylate (3da),

¹H NMR



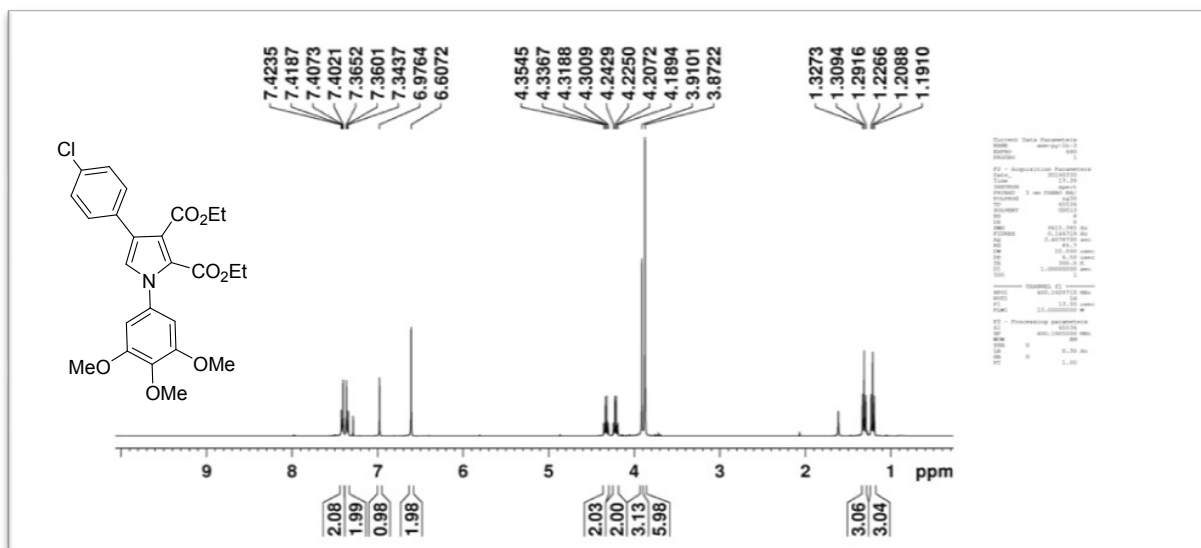
Diethyl-1-4-(4-fluorophenyl)-1-(3,4,5-trimethoxyphenyl)-1H-pyrrole-2,3-dicarboxylate (3da),

¹³C NMR



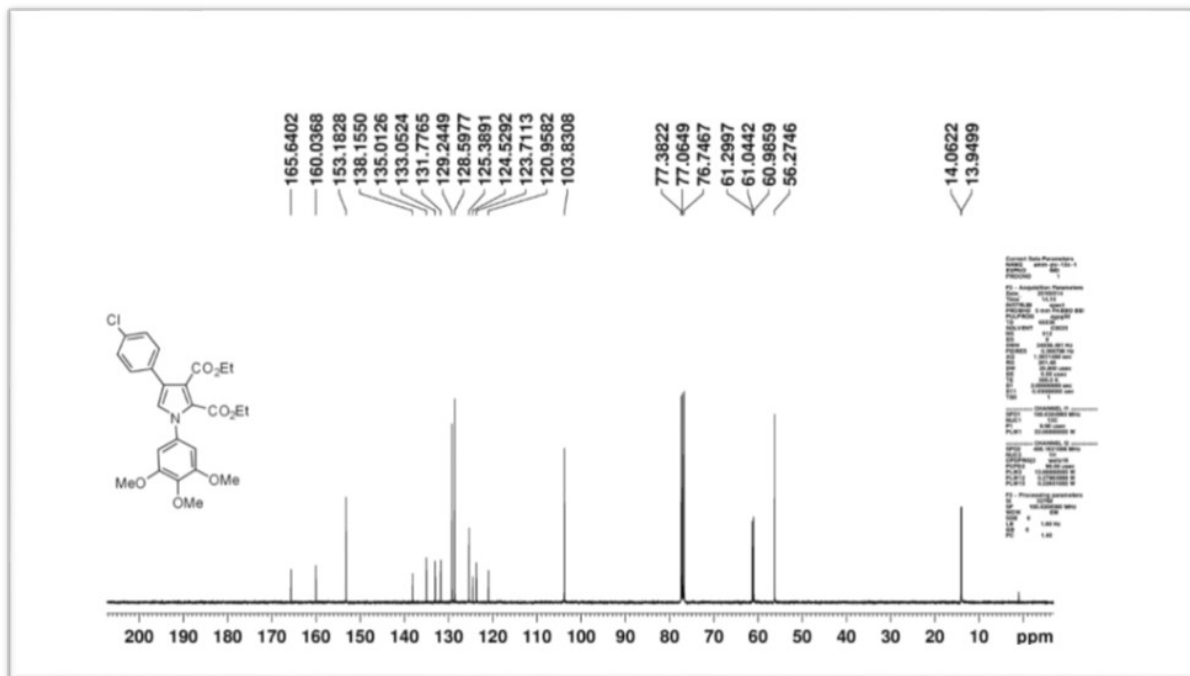
Diethyl 4-(4-chlorophenyl)-1-(3,4,5-trimethoxyphenyl)-1H-pyrrole-2,3-dicarboxylate (3ea),

$^1\text{H NMR}$



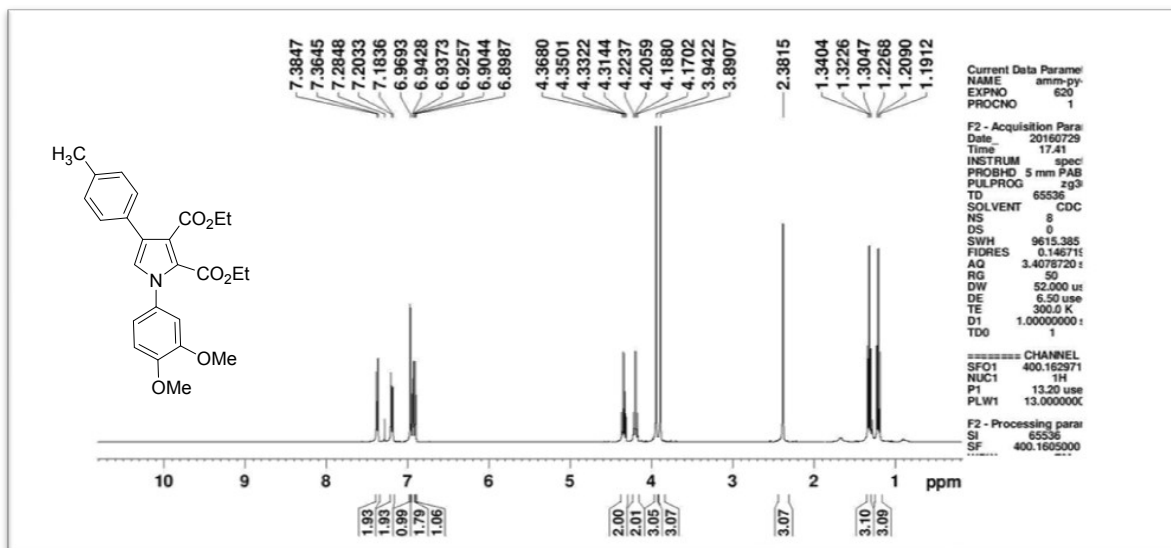
Diethyl 4-(4-chlorophenyl)-1-(3,4,5-trimethoxyphenyl)-1H-pyrrole-2,3-dicarboxylate (3ea),

$^{13}\text{C NMR}$



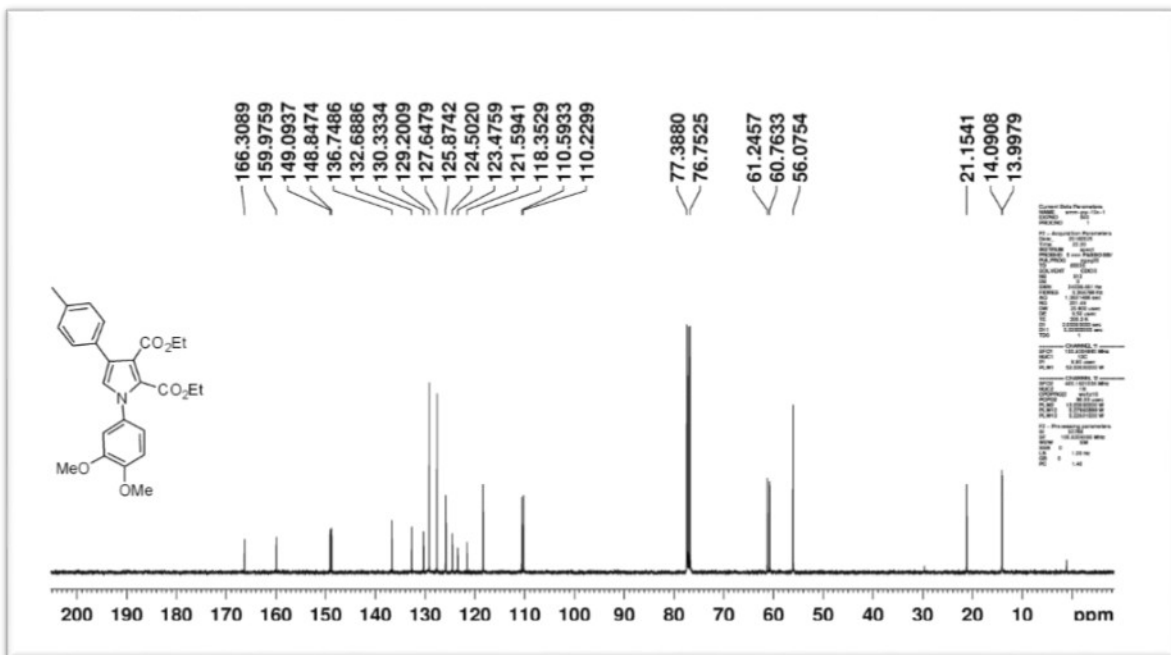
Diethyl-1-(3,4-dimethoxyphenyl)-4-(p-tolyl)-1H-pyrrole-2,3-dicarboxylate(3fa),

¹HNMR



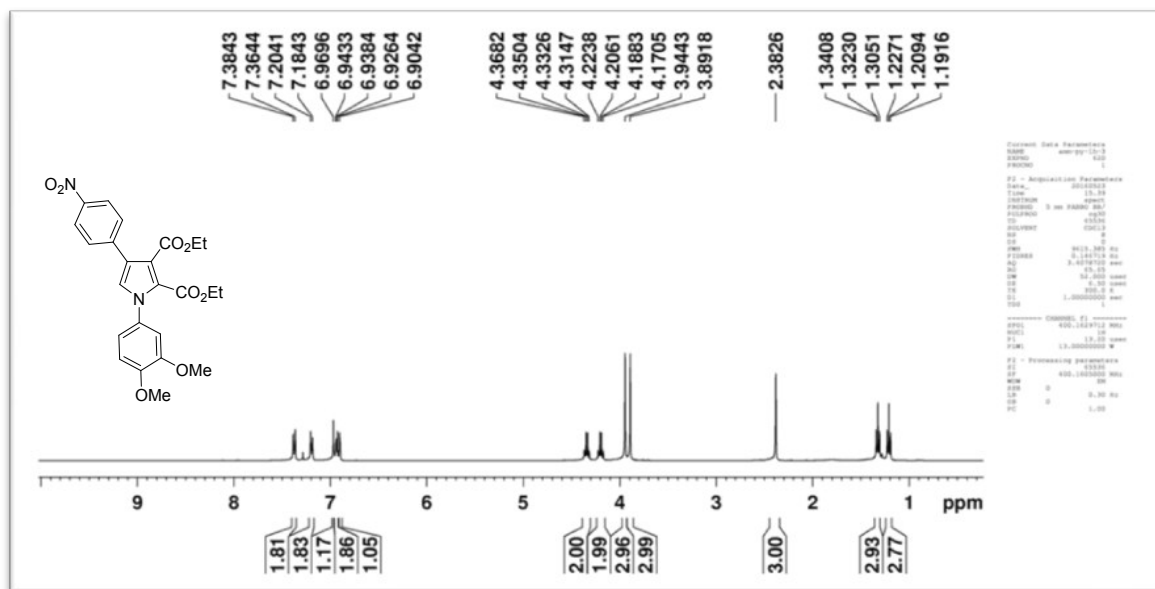
Diethyl-1-(3,4-dimethoxyphenyl)-4-(p-tolyl)-1H-pyrrole-2,3-dicarboxylate(3fa),

¹³CNMR



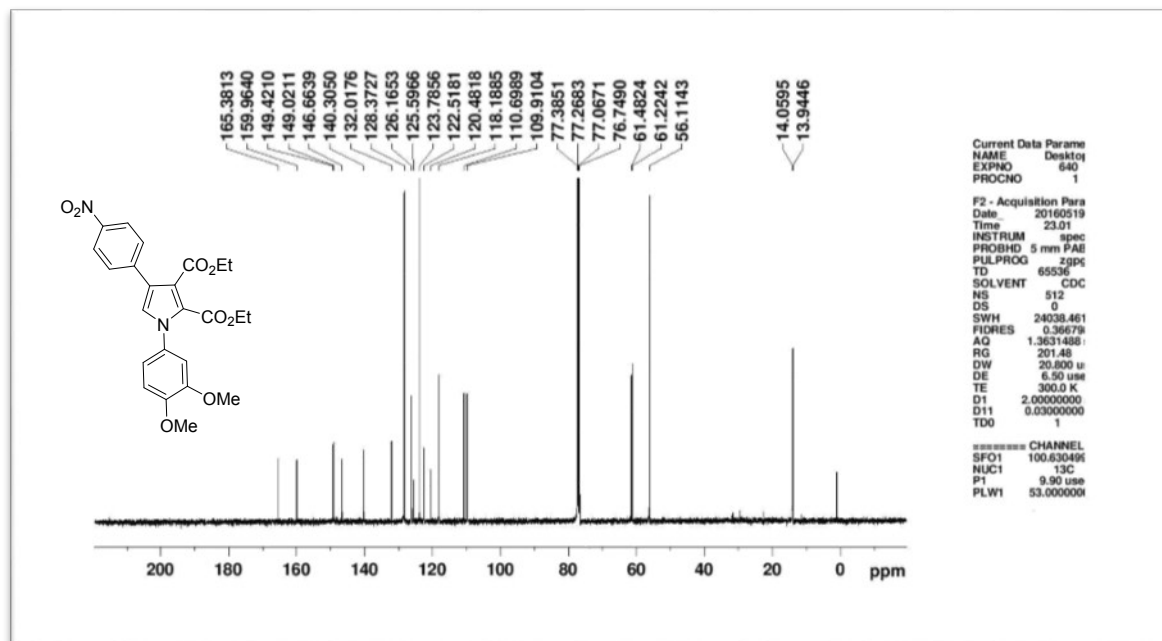
Diethyl-1-(3,4-dimethoxyphenyl)-4-(4-nitrophenyl)-1H-pyrrole-2,3-dicarboxylate (3ga),

¹H NMR



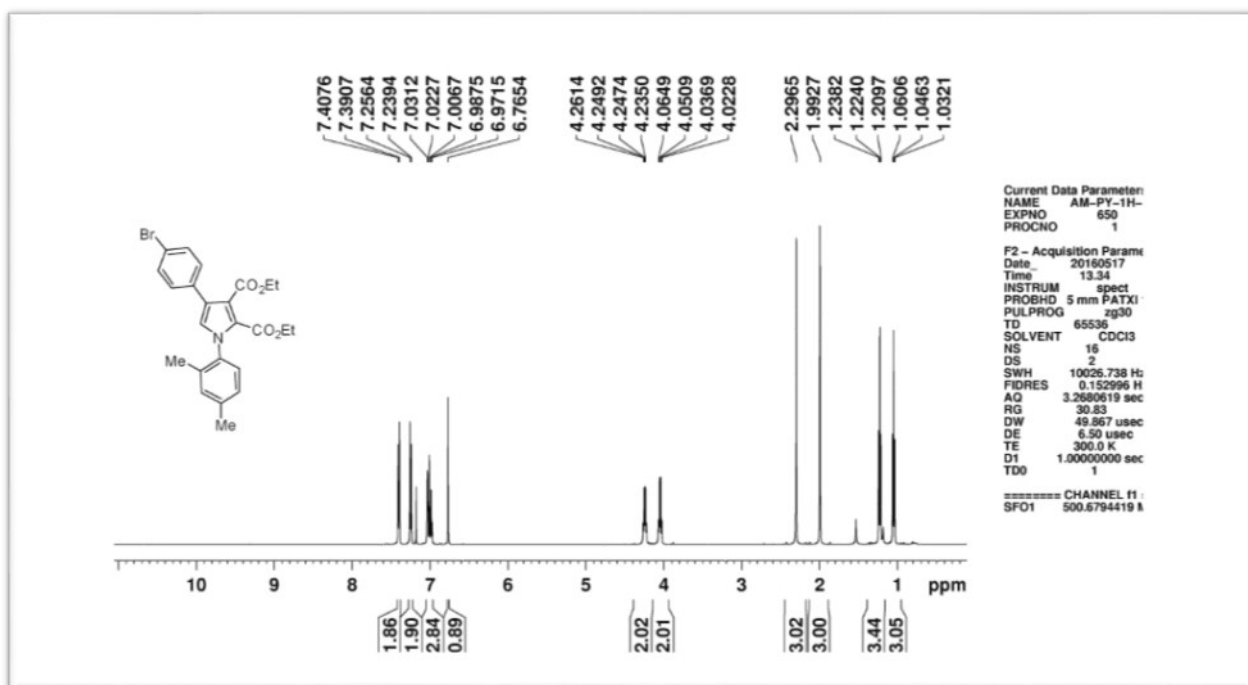
Diethyl-1-(3,4-dimethoxyphenyl)-4-(4-nitrophenyl)-1H-pyrrole-2,3-dicarboxylate (3ga),

¹³C NMR



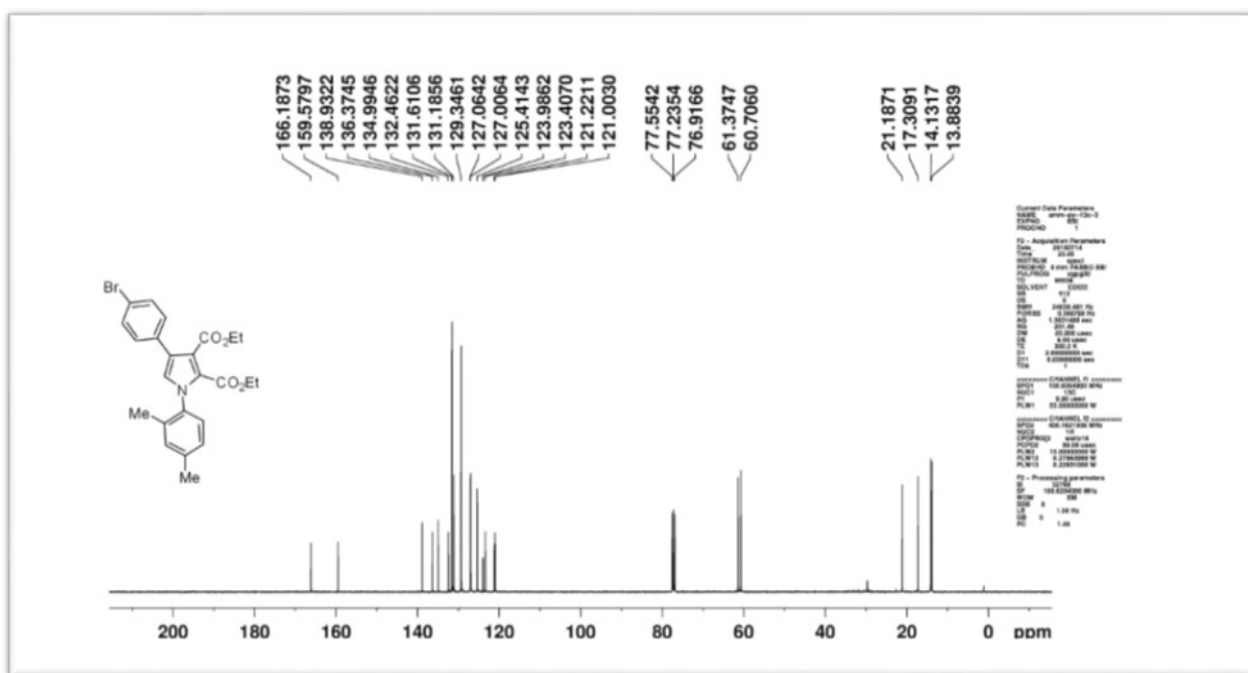
Diethyl-4-(4-bromophenyl)-1-(2,4-dimethylphenyl)-1H-pyrrole-2,3-dicarboxylate (3ia),

¹H NMR



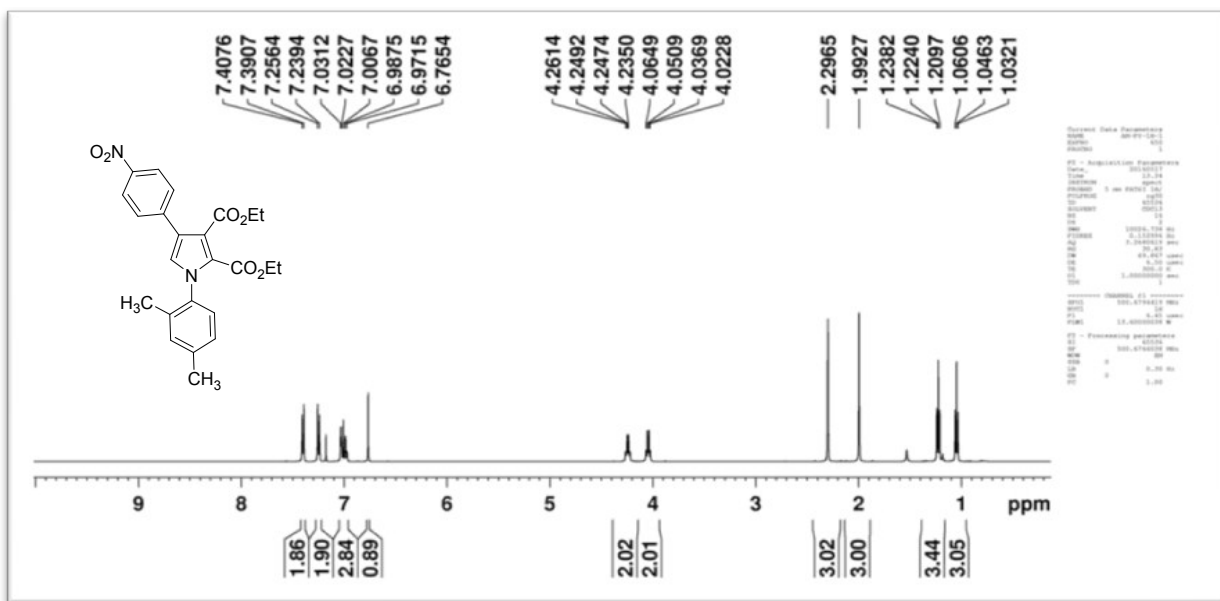
Diethyl-4-(4-bromophenyl)-1-(2,4-dimethylphenyl)-1H-pyrrole-2,3-dicarboxylate (3ia),

¹³C-NMR



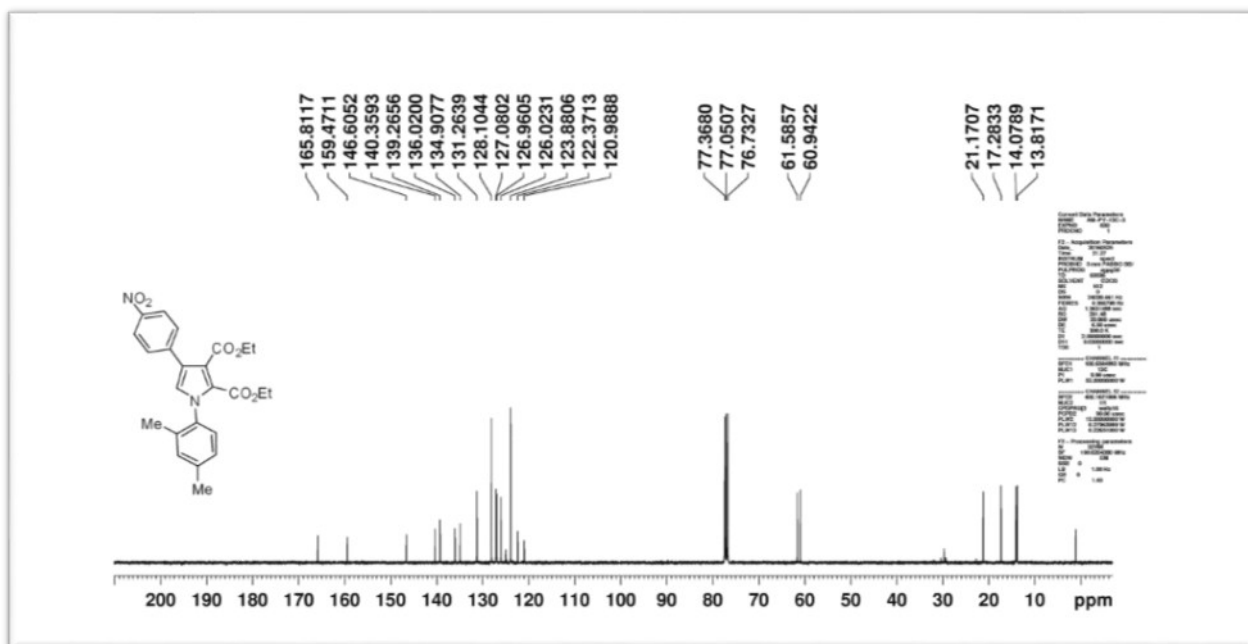
Diethyl-1-(2,4-dimethylphenyl)-4-(4-nitrophenyl)-1H-pyrrole-2,3-dicarboxylate (3ja),

¹H NMR



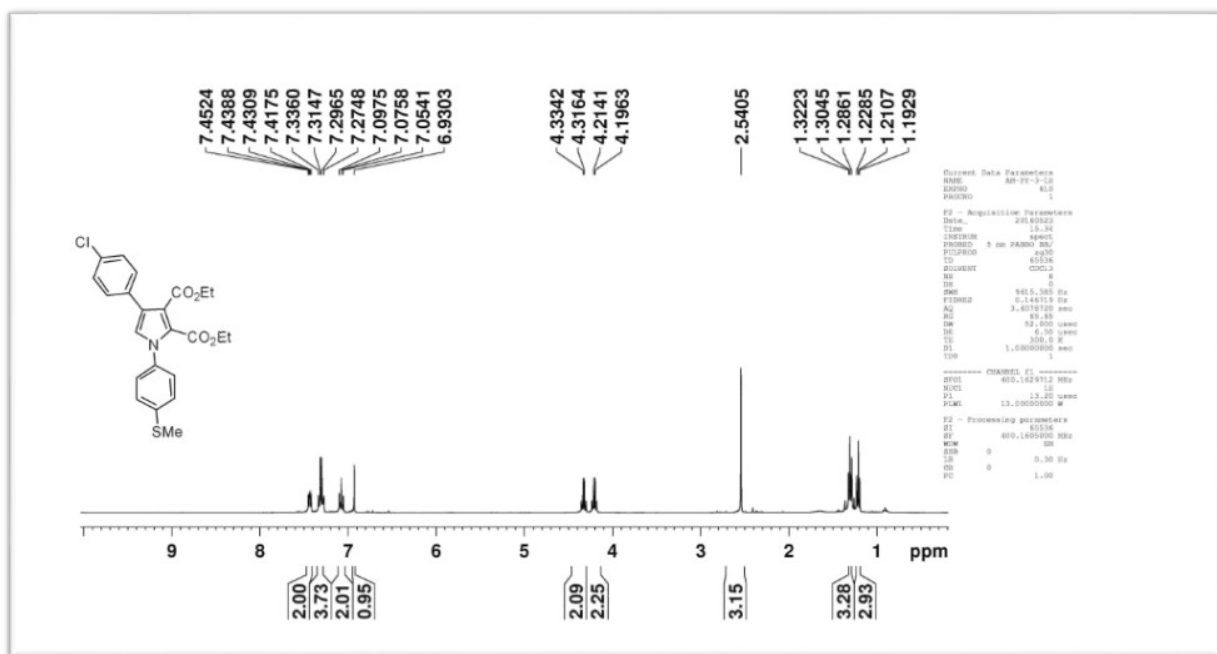
Diethyl-1-(2,4-dimethylphenyl)-4-(4-nitrophenyl)-1H-pyrrole-2,3-dicarboxylate (3ja),

¹³C NMR



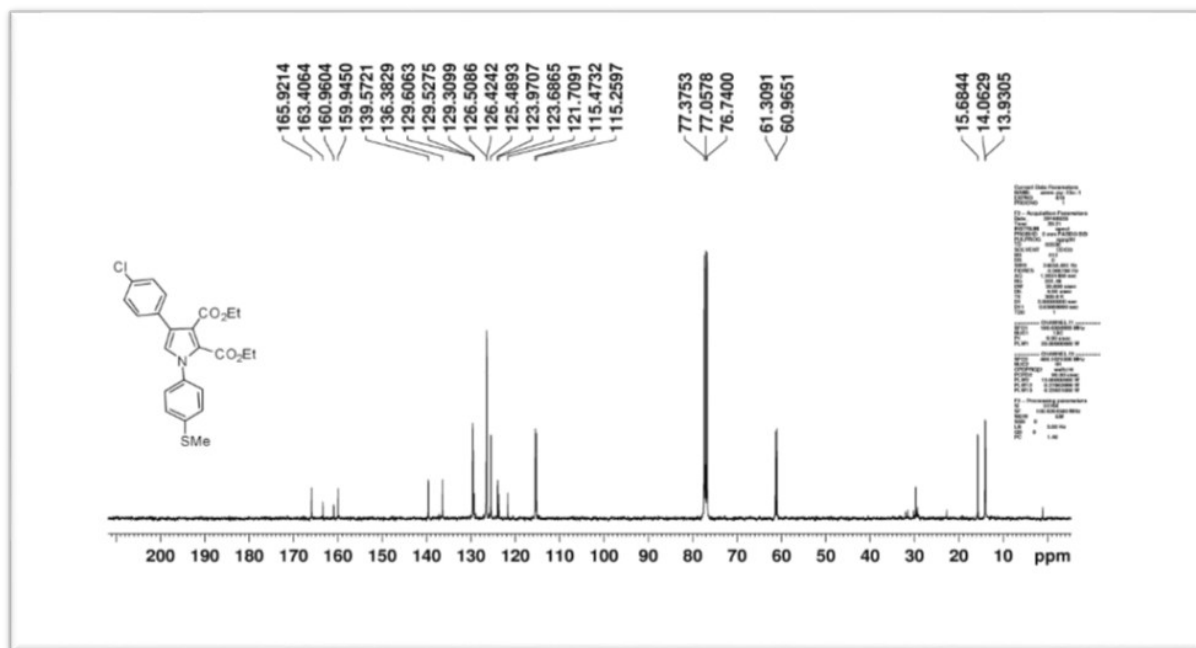
Diethyl-4-(4-chlorophenyl)-1-(4-(methylthio)phenyl)-1H-pyrrole-2,3-dicarboxylate(3ka),

¹H NMR



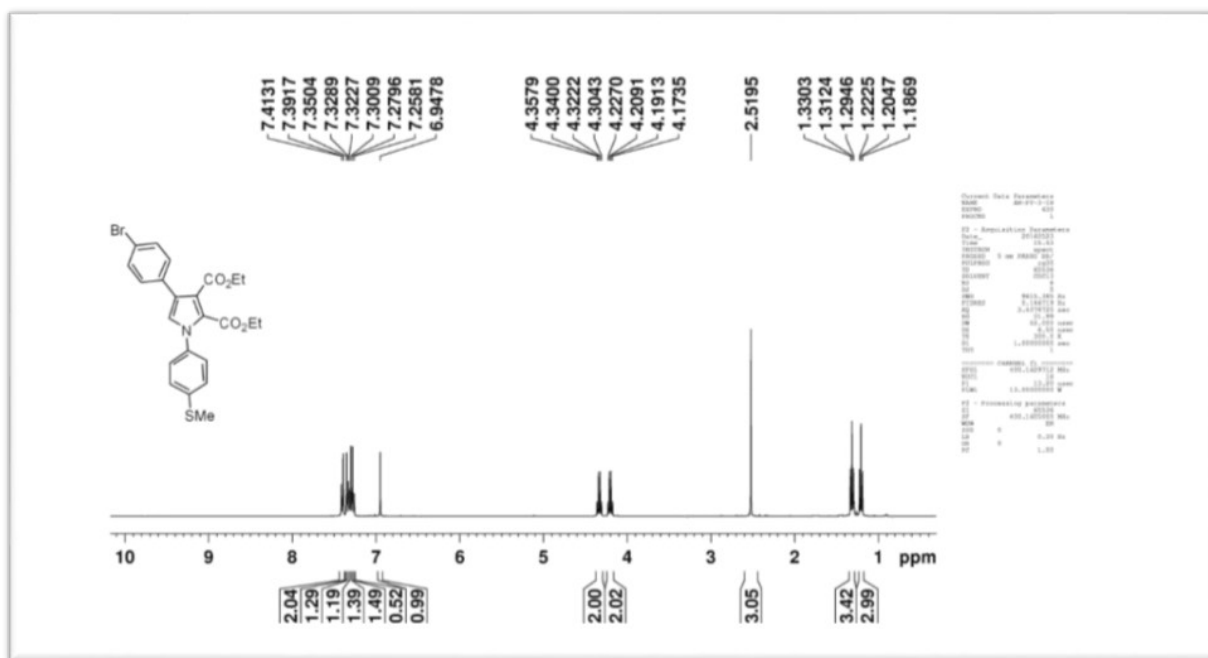
Diethyl-4-(4-chlorophenyl)-1-(4-(methylthio)phenyl)-1H-pyrrole-2,3-dicarboxylate(3ka),

¹³C NMR



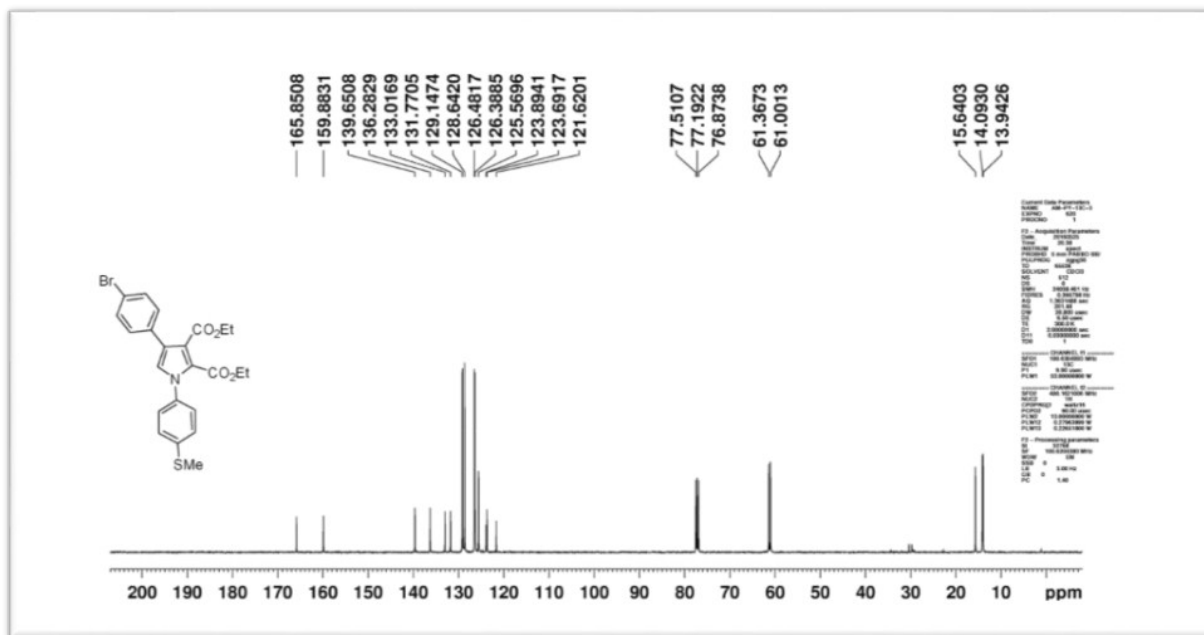
Diethyl-4-(4-bromophenyl)-1-(4-(methylthio)phenyl)-1H-pyrrole-2,3-dicarboxylate (3la),

¹H NMR



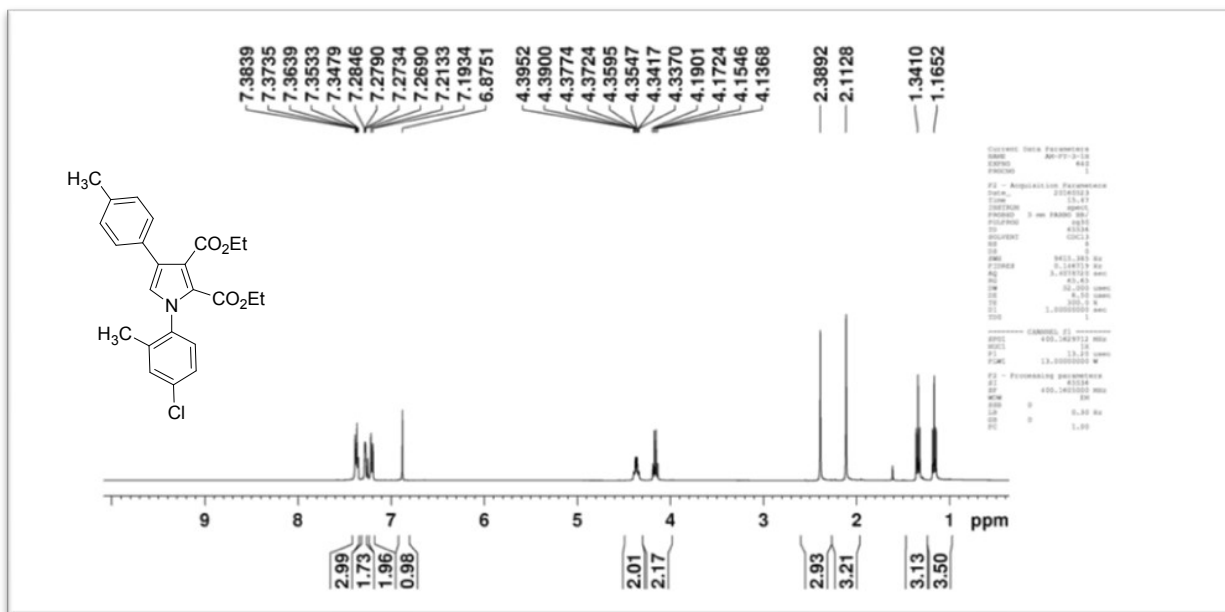
Diethyl-4-(4-bromophenyl)-1-(4-(methylthio)phenyl)-1H-pyrrole-2,3-dicarboxylate (3la),

¹³C NMR



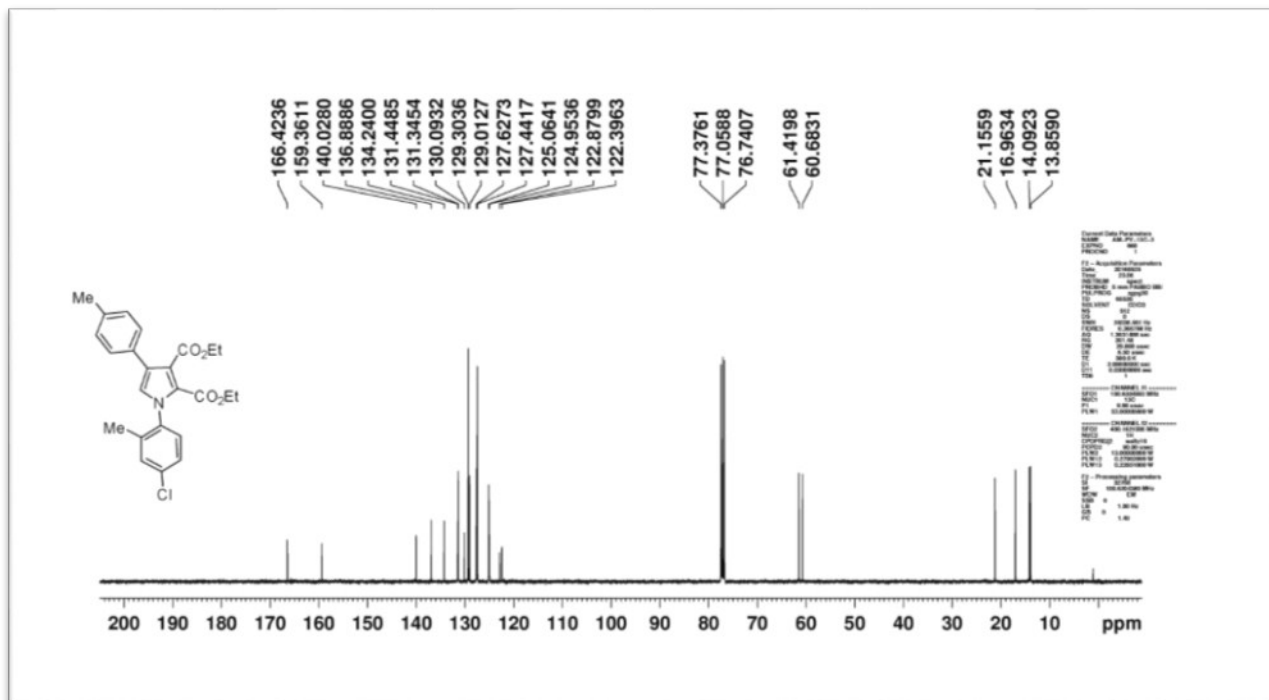
Diethyl-1-(4-chloro-2-methylphenyl)-4-(p-tolyl)-1H-pyrrole-2,3-dicarboxylate (3ma),

¹H NMR



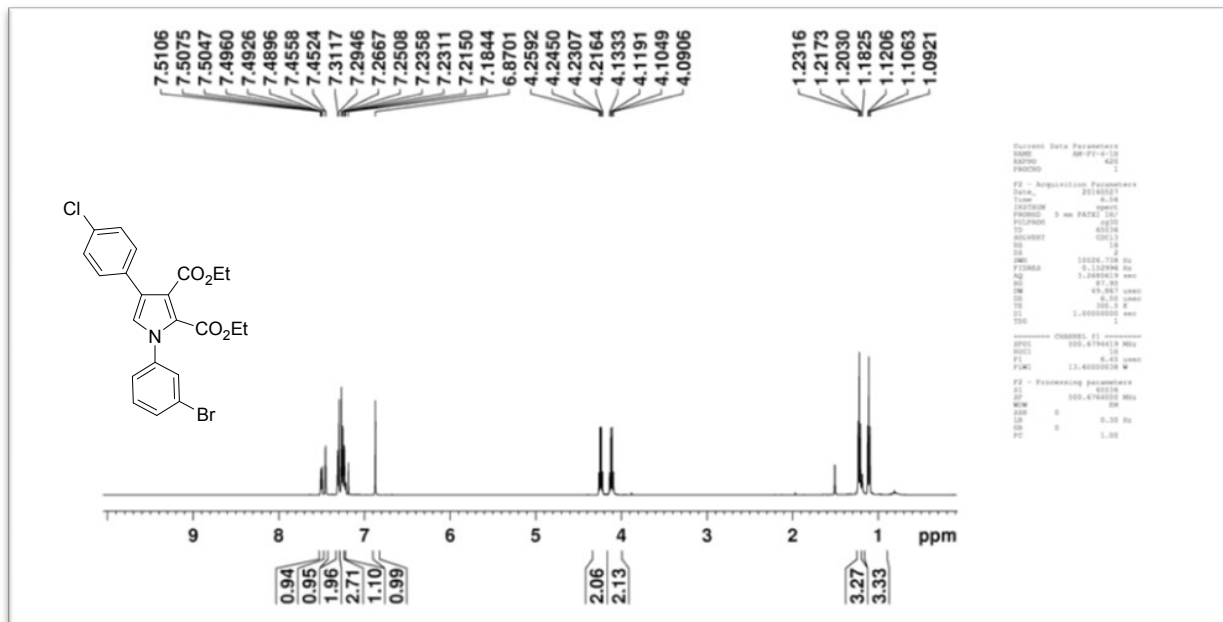
Diethyl-1-(4-chloro-2-methylphenyl)-4-(p-tolyl)-1H-pyrrole-2,3-dicarboxylate (3ma),

¹³CNMR



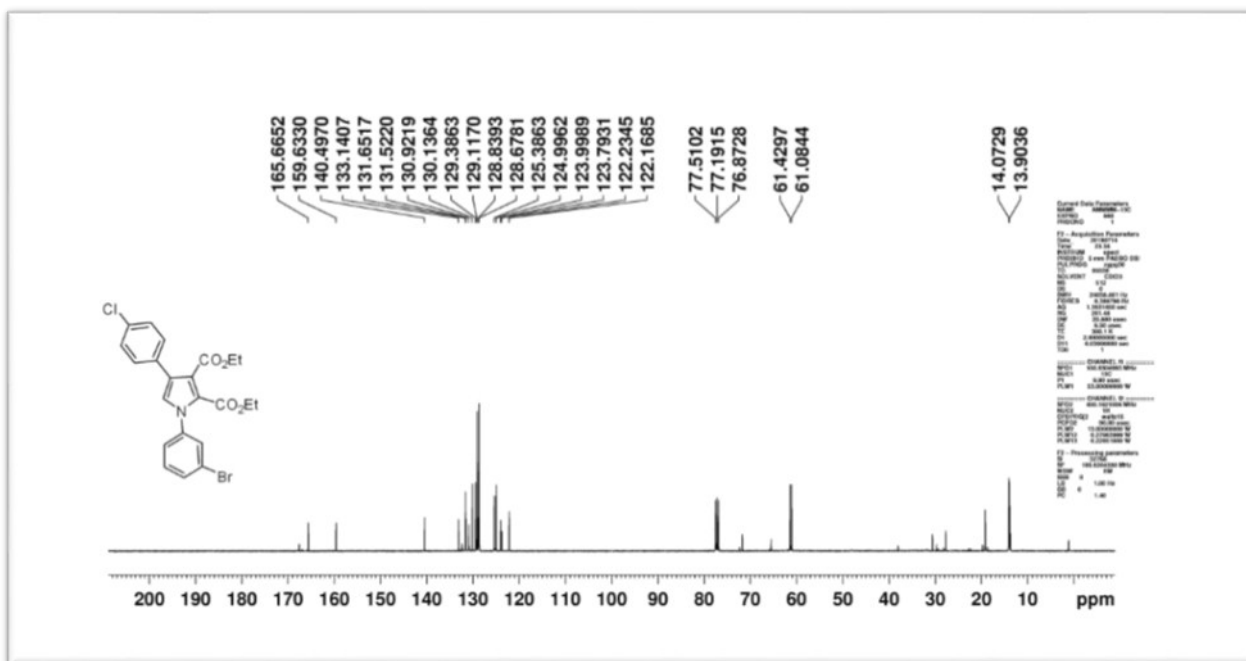
Diethyl-1-(3-bromophenyl)-4-(4-chlorophenyl)-1H-pyrrole-2,3-dicarboxylate (3na),

¹H NMR



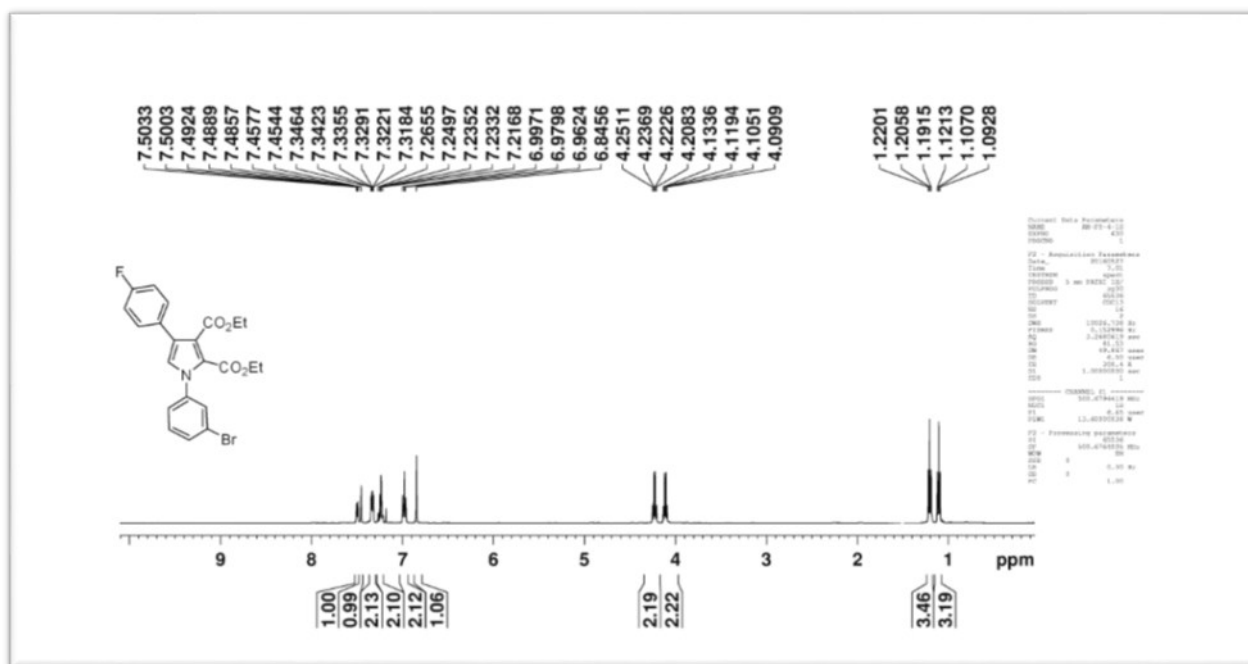
Diethyl-1-(3-bromophenyl)-4-(4-chlorophenyl)-1H-pyrrole-2,3-dicarboxylate (3na),

¹³C NMR



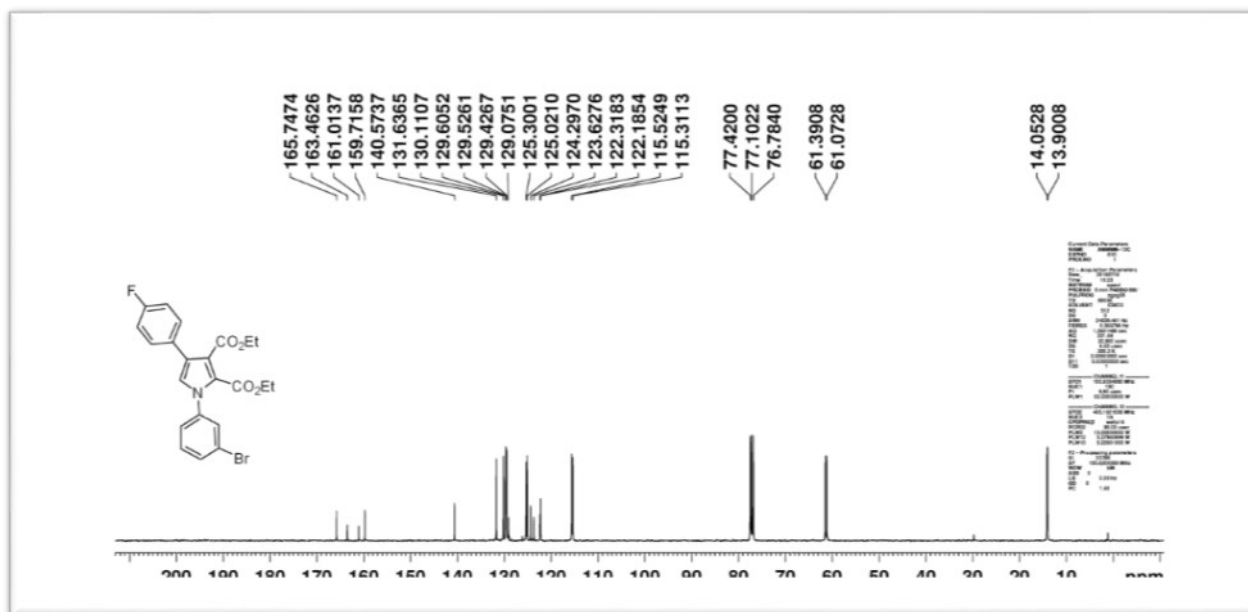
Diethyl-1-(3-bromophenyl)-4-(4-fluorophenyl)-1H-pyrrole-2,3-dicarboxylate (30a),

¹HNMR



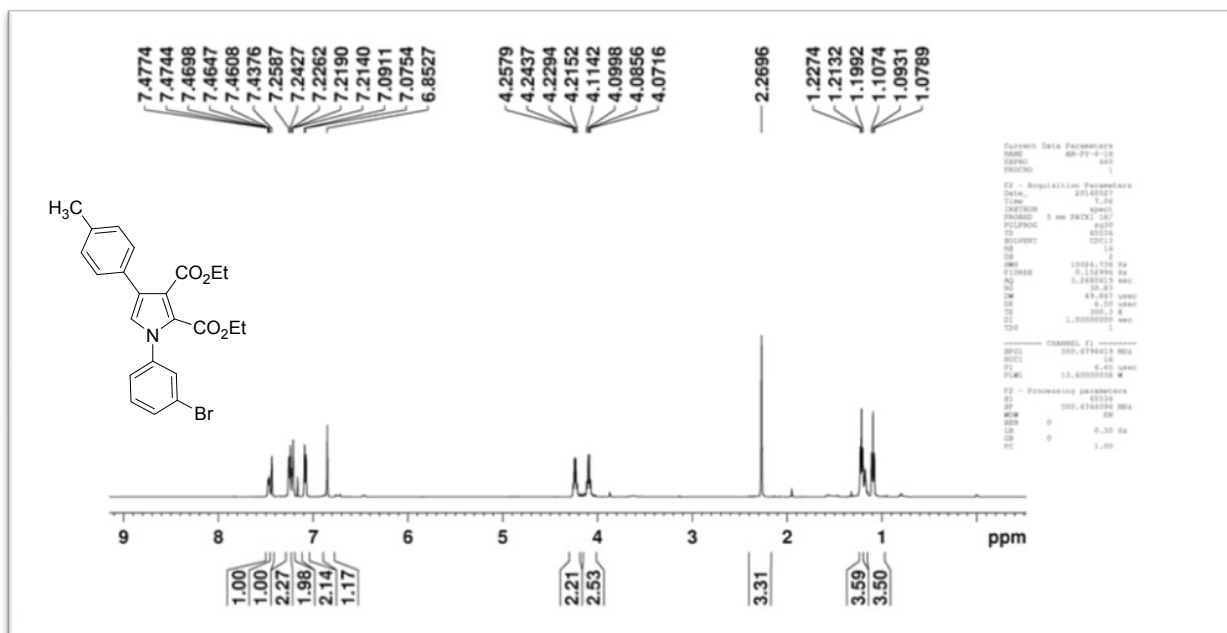
Diethyl-1-(3-bromophenyl)-4-(4-fluorophenyl)-1H-pyrrole-2,3-dicarboxylate (30a),

¹³CNMR



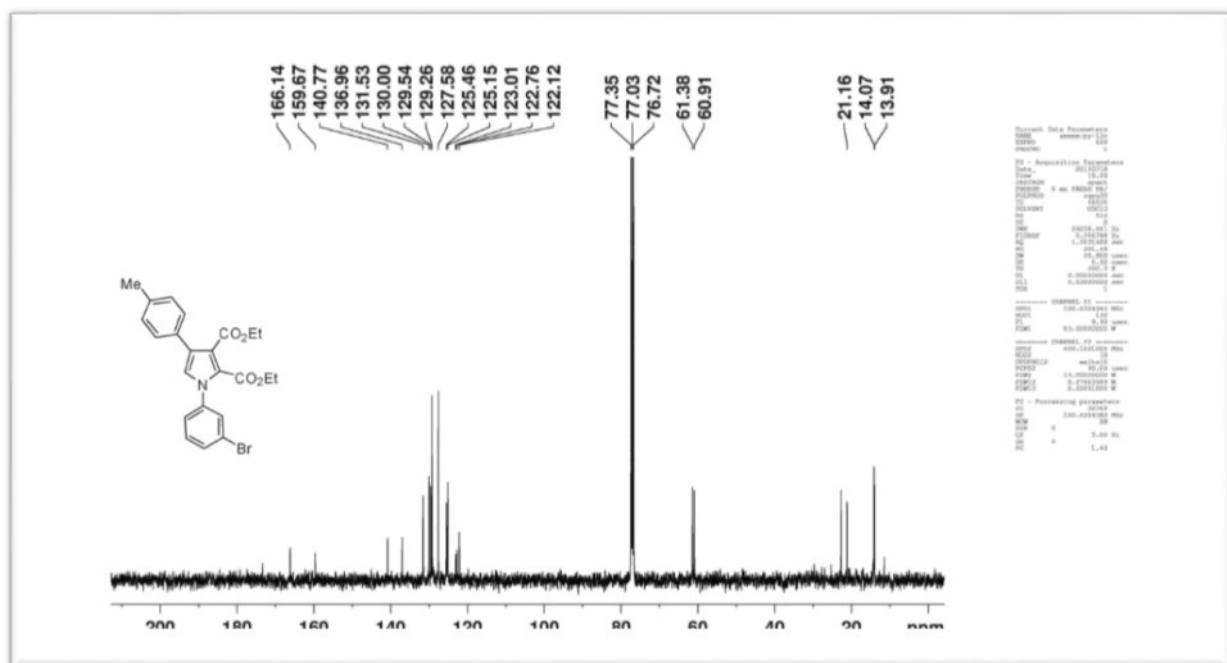
Diethyl-1-(3-bromophenyl)-4-(p-tolyl)-1H-pyrrole-2,3-dicarboxylate (3pa),

¹H NMR



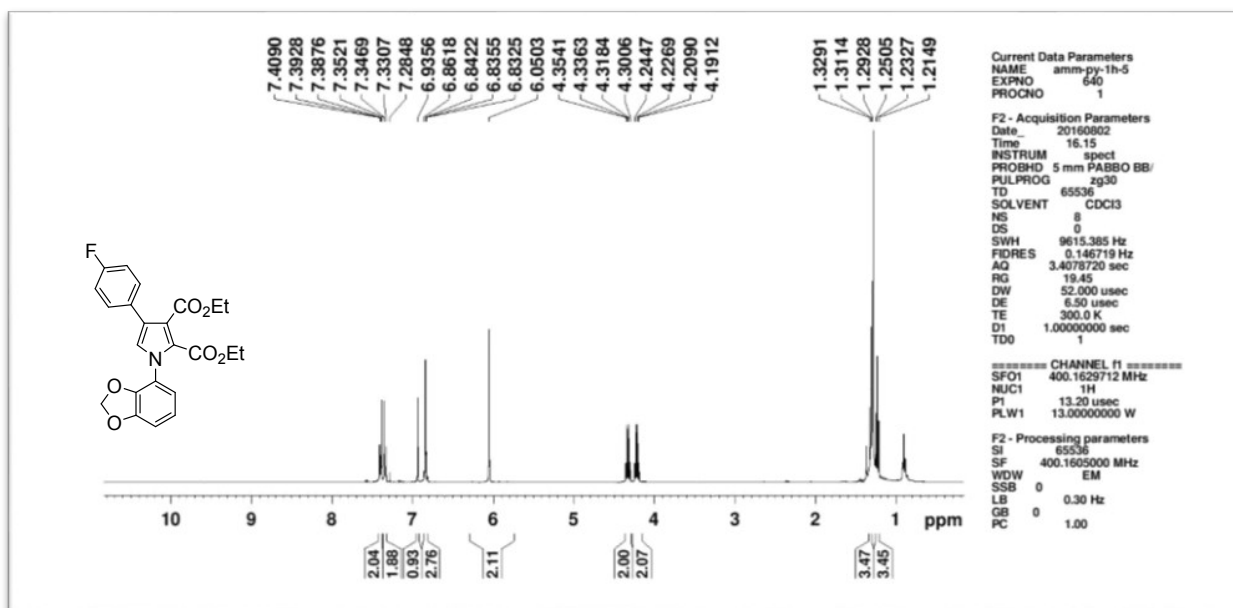
Diethyl-1-(3-bromophenyl)-4-(p-tolyl)-1H-pyrrole-2,3-dicarboxylate (3pa),

¹³C NMR



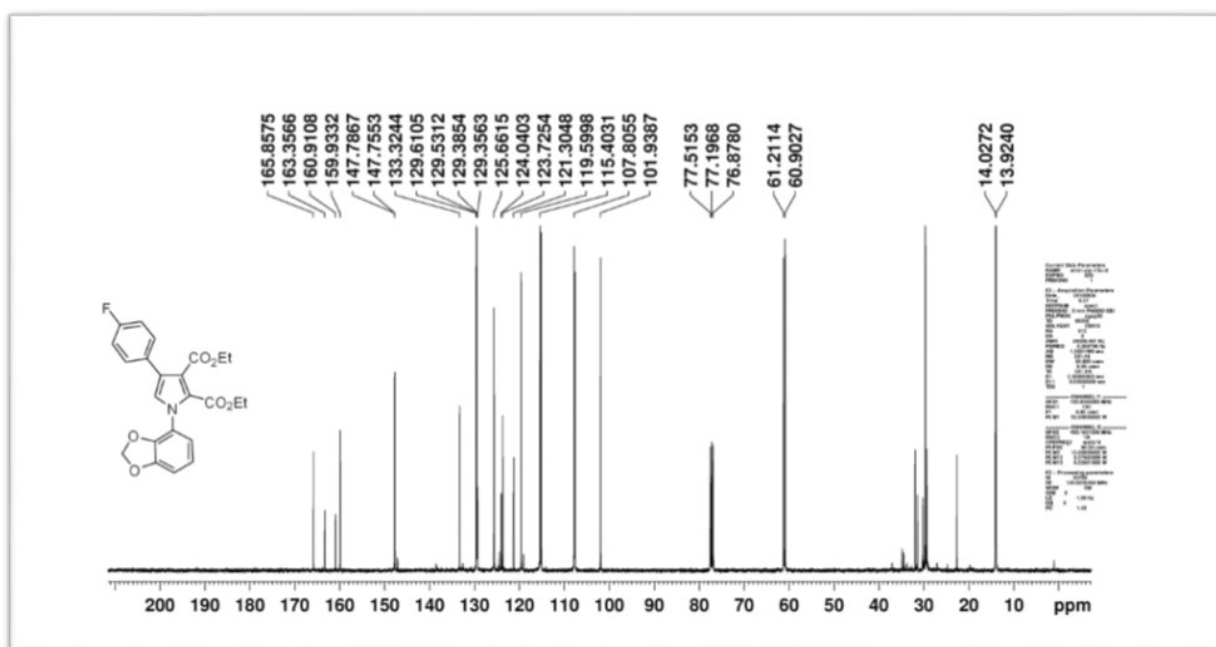
Diethyl-1-(benzo[d][1,3dioxol-4-yl)-4-(4-chlorophenyl)-1H-pyrrole-2,3-dicarboxylate (3qa),

¹H NMR

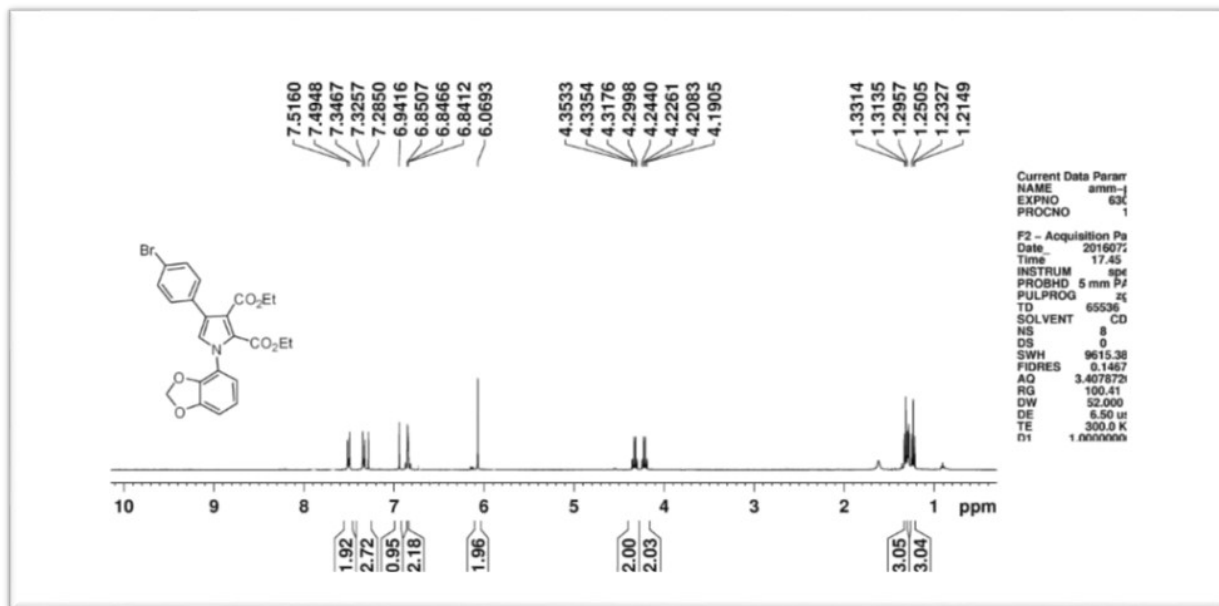


Diethyl-1-(benzo[d][1,3dioxol-4-yl)-4-(4-chlorophenyl)-1H-pyrrole-2,3-dicarboxylate (3qa),

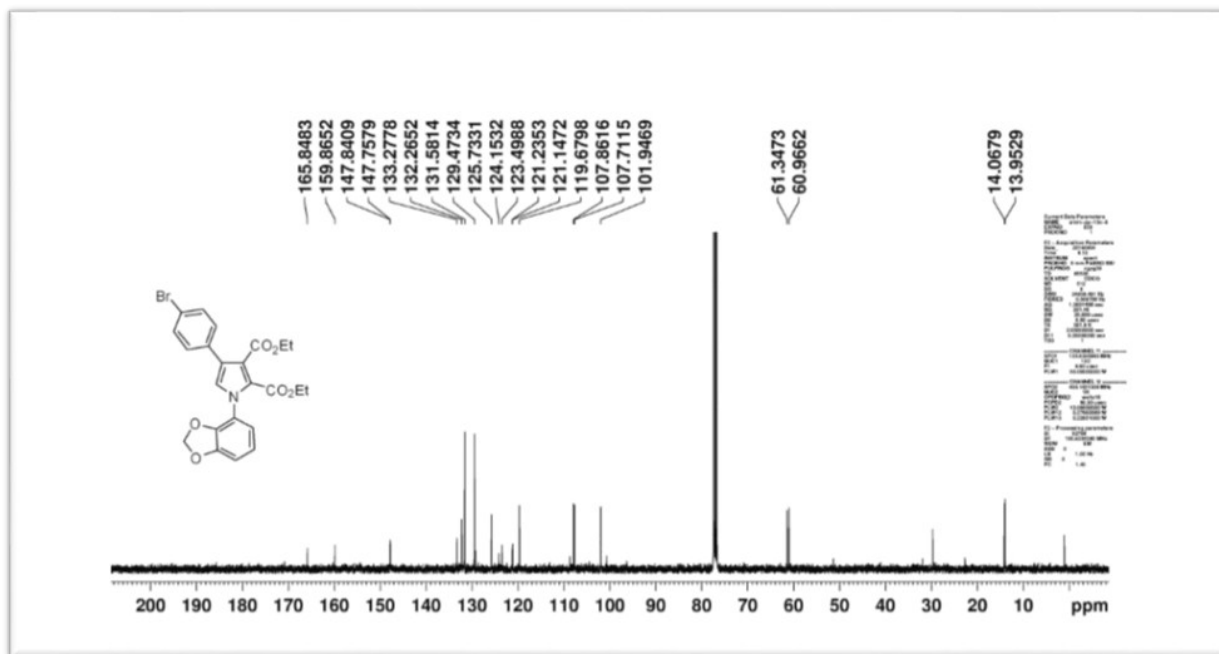
¹³C NMR



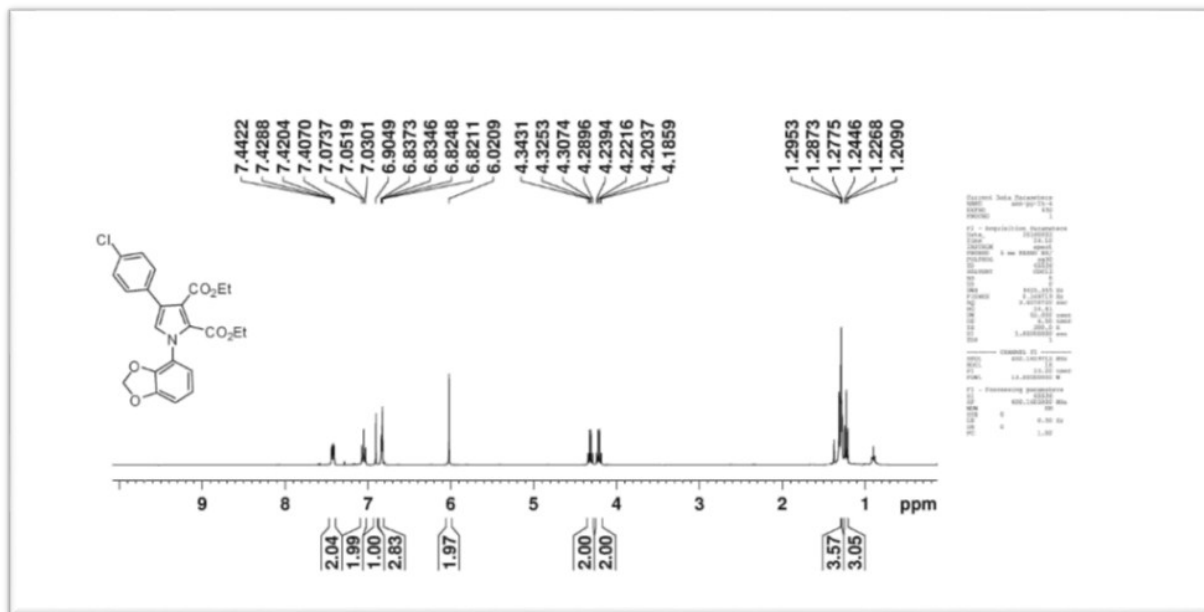
Diethyl-1-(benzo[d][1,3]dioxol-4-yl)-4-(4-bromophenyl)-1H-pyrrole-2,3-dicarboxylate (3ra),
¹H NMR



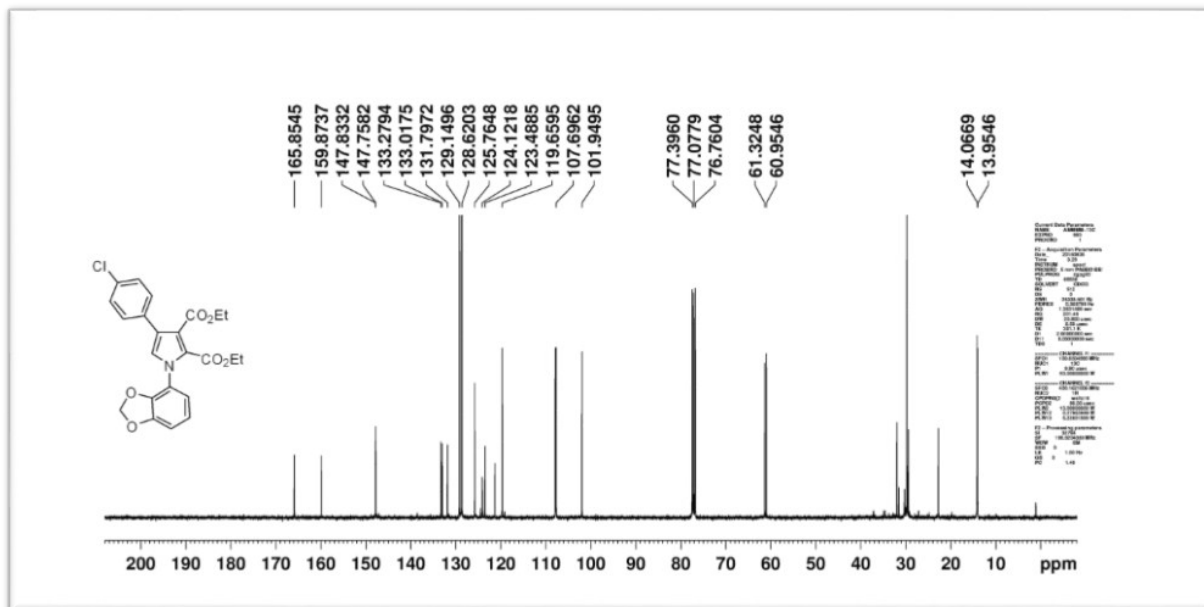
Diethyl-1-(benzo[d][1,3]dioxol-4-yl)-4-(4-bromophenyl)-1H-pyrrole-2,3-dicarboxylate (3ra),
¹³C NMR



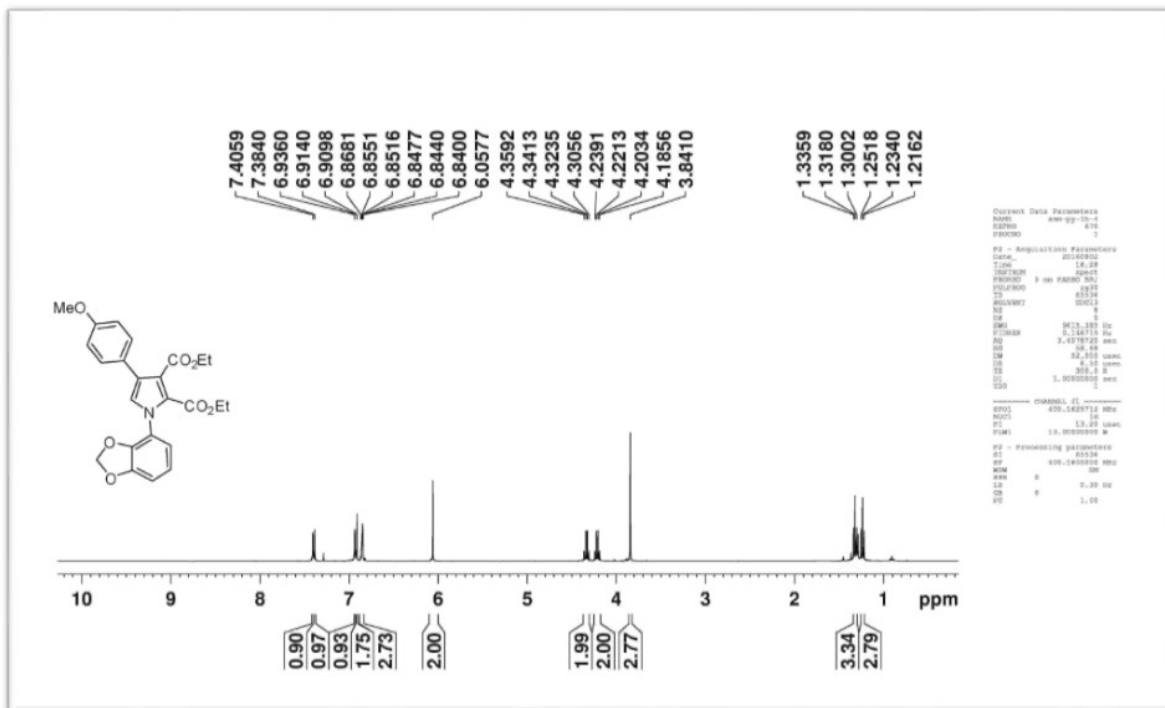
Diethyl-1-(benzo[d][1,3]dioxol-4-yl)-4-(4-fluorophenyl)-1H-pyrrole-2,3-dicarboxylate (3sa),
¹H NMR



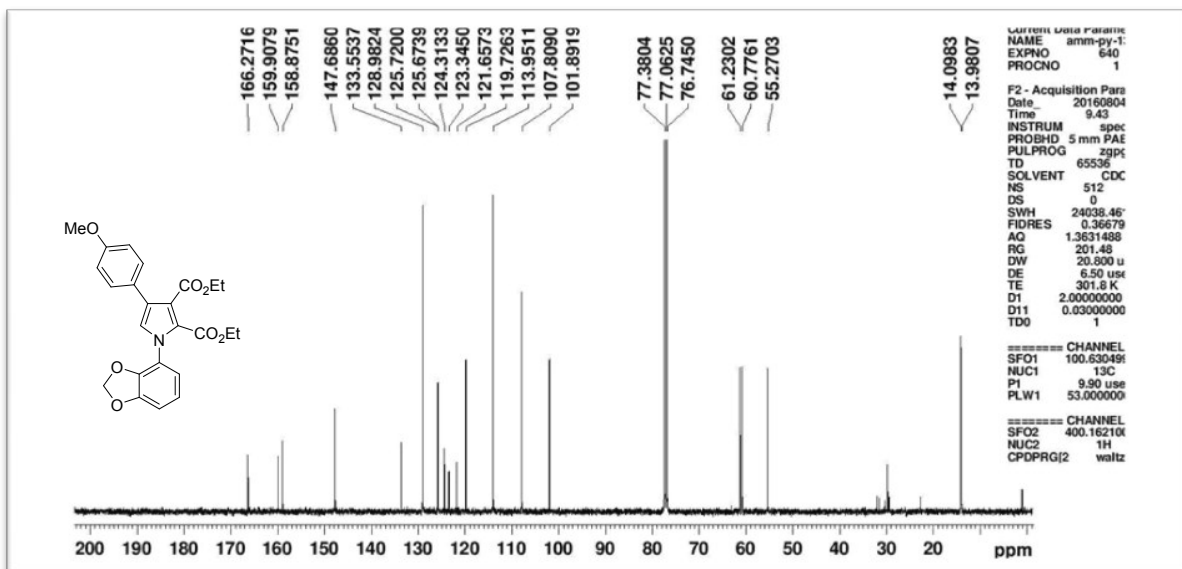
Diethyl-1-(benzo[d][1,3]dioxol-4-yl)-4-(4-fluorophenyl)-1H-pyrrole-2,3-dicarboxylate (3sa),
¹³C NMR



Diethyl-1-(benzo[d][1,3]dioxol-4-yl)-4-(4-methoxyphenyl)-1H-pyrrole-2,3-dicarboxylate (3ta),
¹H NMR

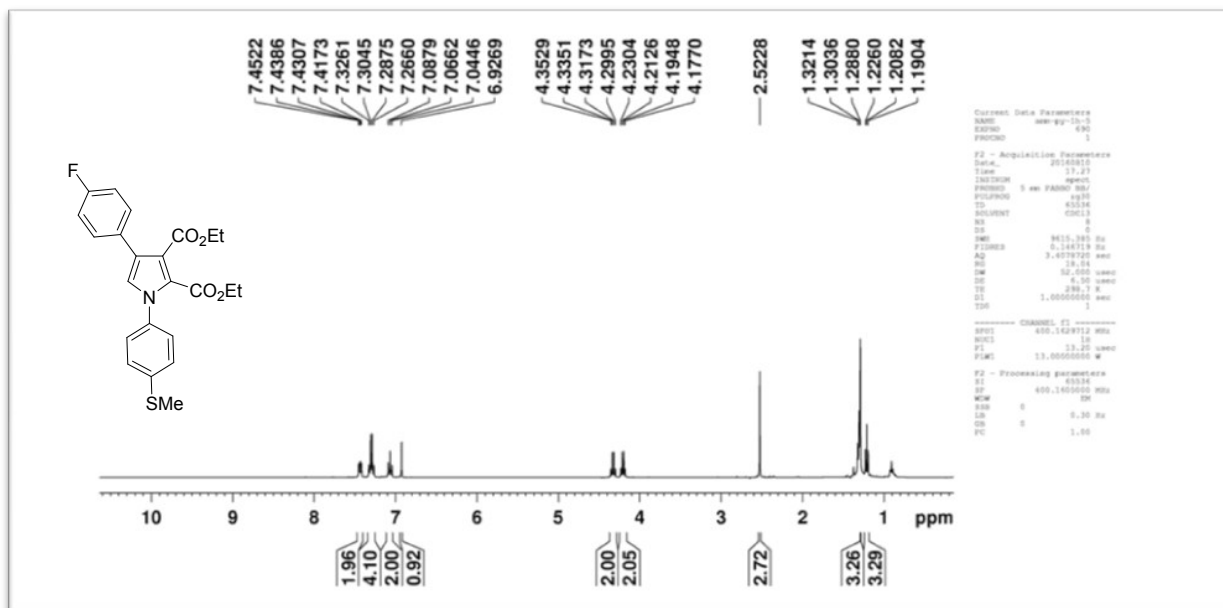


Diethyl-1-(benzo[d][1,3]dioxol-4-yl)-4-(4-methoxyphenyl)-1H-pyrrole-2,3-dicarboxylate (3ta),
¹³C NMR



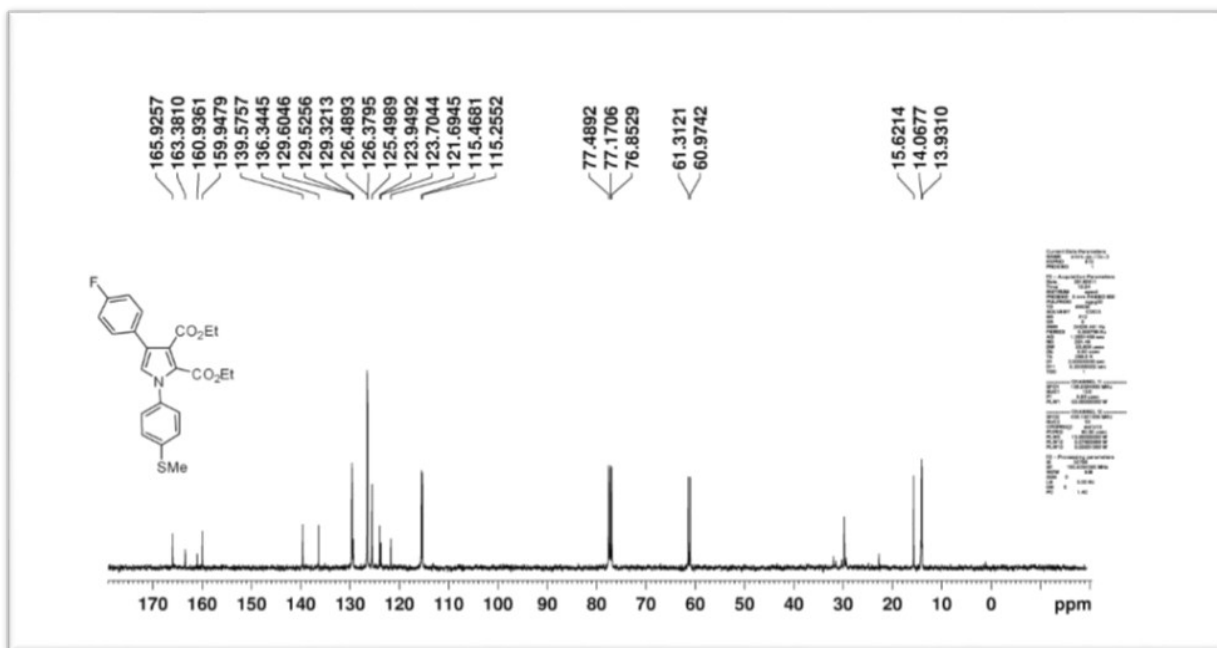
Diethyl-4-(4-fluorophenyl)-1-(4-(methylthio)phenyl)-1H-pyrrole-2,3-dicarboxylate(3ua),

¹H NMR



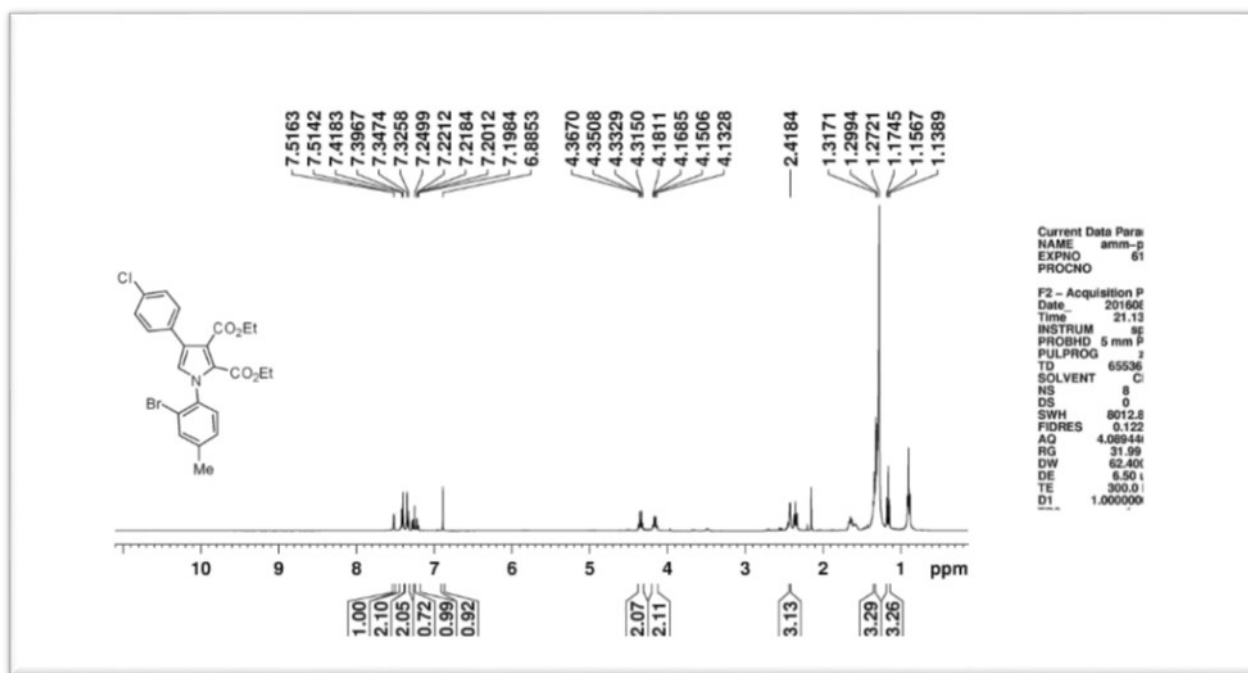
Diethyl-4-(4-fluorophenyl)-1-(4-(methylthio)phenyl)-1H-pyrrole-2,3-dicarboxylate(3ua),

¹³C NMR



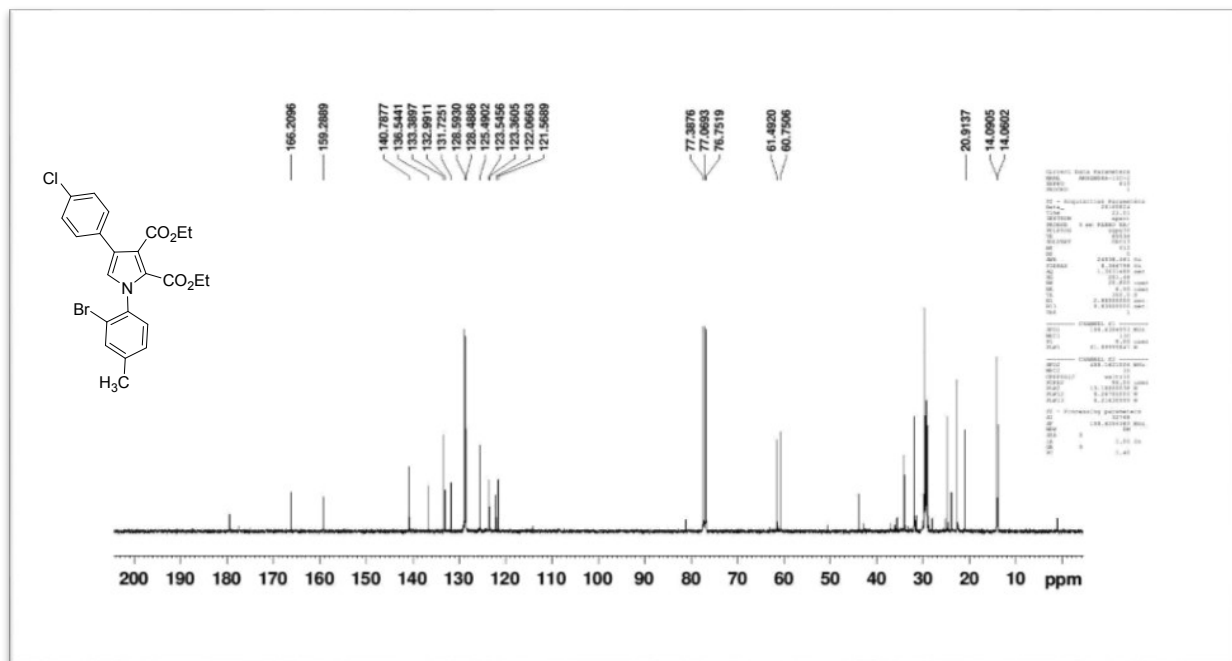
Diethyl-1-(2-bromo-4-methylphenyl)-4-(4-chlorophenyl)-1H-pyrrole-2,3-dicarboxylate (3va),

¹H NMR

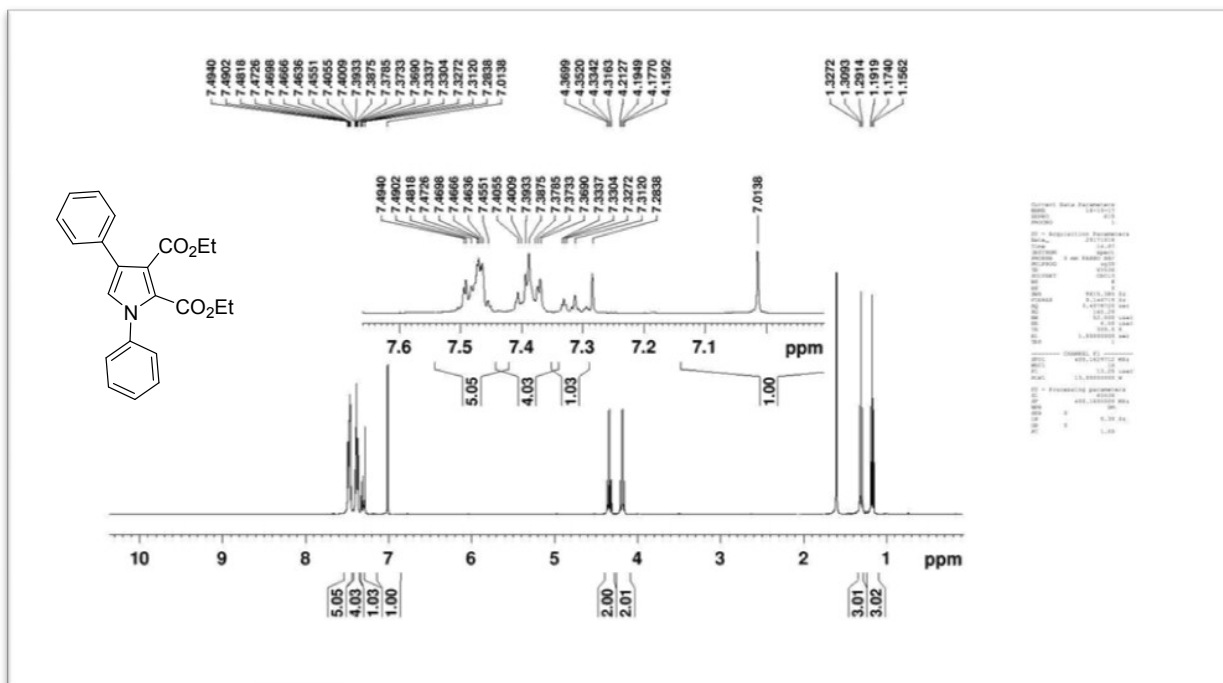


Diethyl-1-(2-bromo-4-methylphenyl)-4-(4-chlorophenyl)-1H-pyrrole-2,3-dicarboxylate (3va),

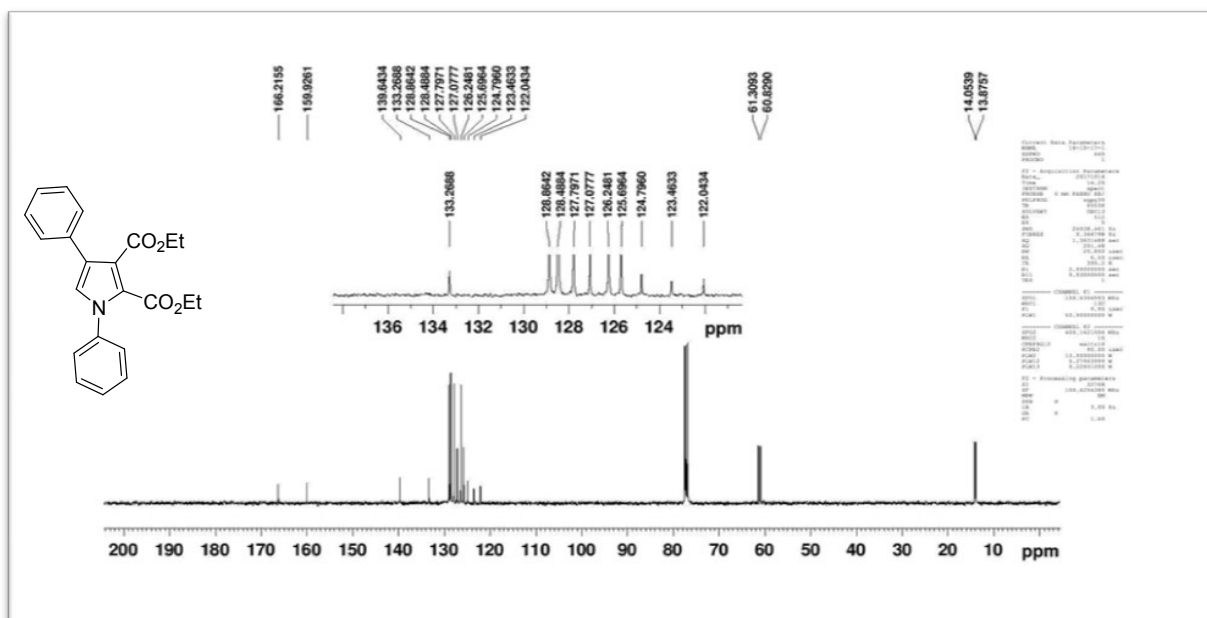
¹³C NMR



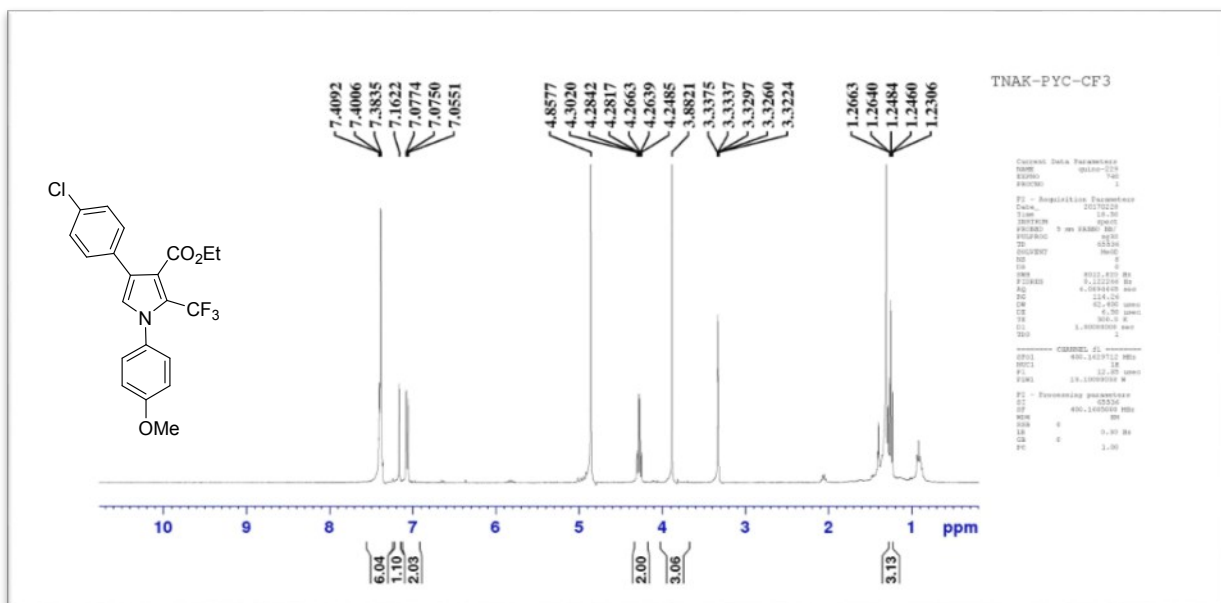
Diethyl 1,4-diphenyl-1H-pyrrole-2,3-dicarboxylate(3wa), ¹H NMR



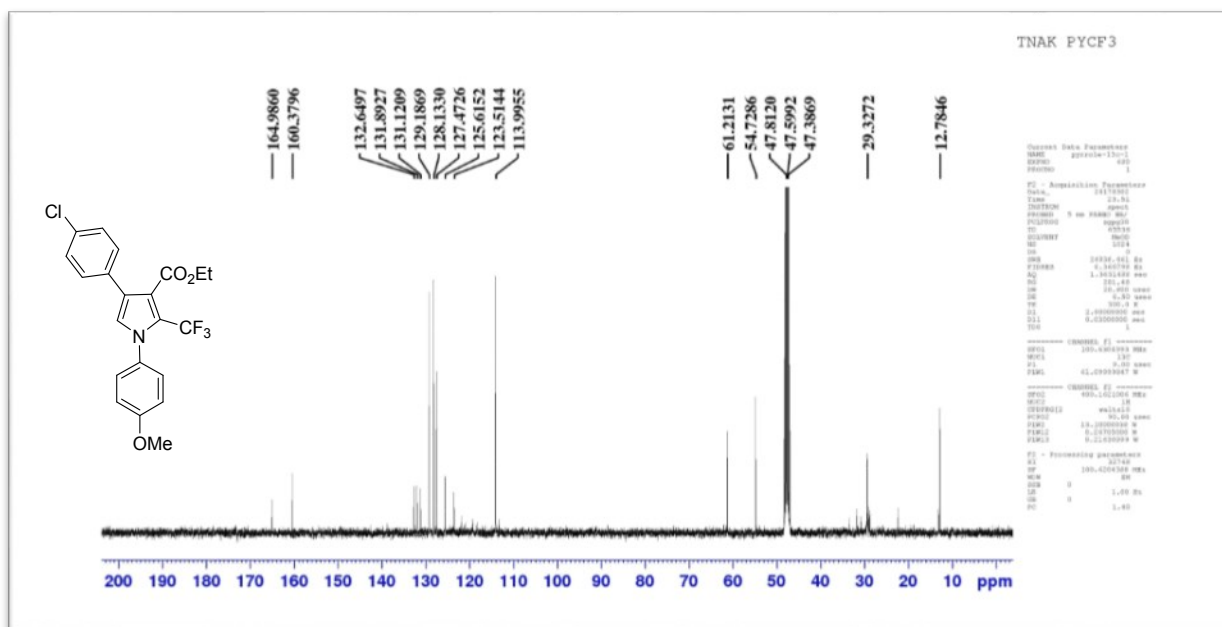
Diethyl 1,4-diphenyl-1H-pyrrole-2,3-dicarboxylate(3wa), ¹³C NMR



**Ethyl 4-(4-chlorophenyl)-1-(4-methoxyphenyl)-2-(trifluoromethyl)-1H-pyrrolcarboxylate(3ab),
¹HNMR**

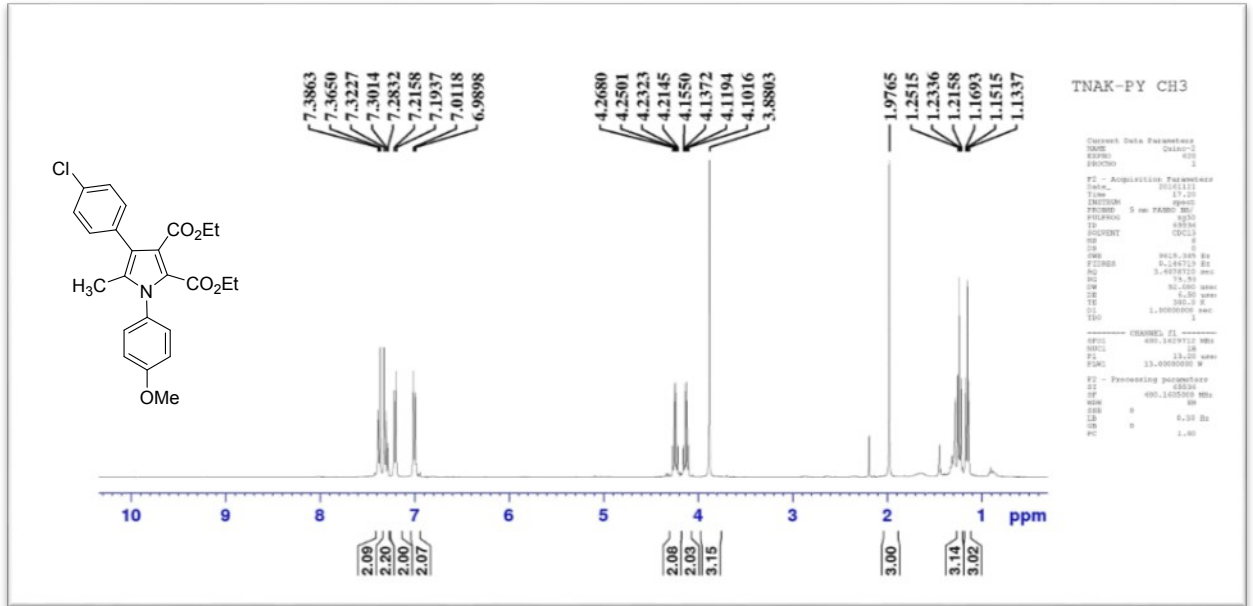


**Ethyl 4-(4-chlorophenyl)-1-(4-methoxyphenyl)-2-(trifluoromethyl)-1H-pyrrolcarboxylate(3ab),
¹³CNMR**



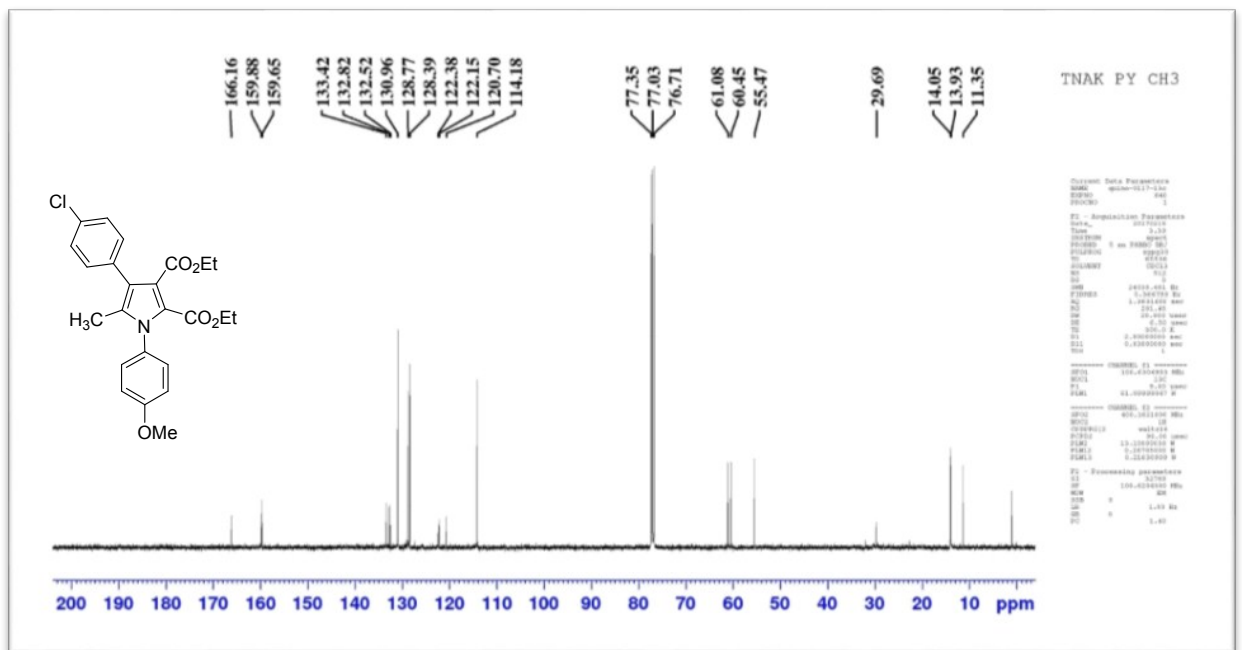
Diethyl 4-(4-chlorophenyl)-1-(4-methoxyphenyl)-5-methyl-1H-pyrrole-2,3-dicarboxylate(3xa)

¹H NMR



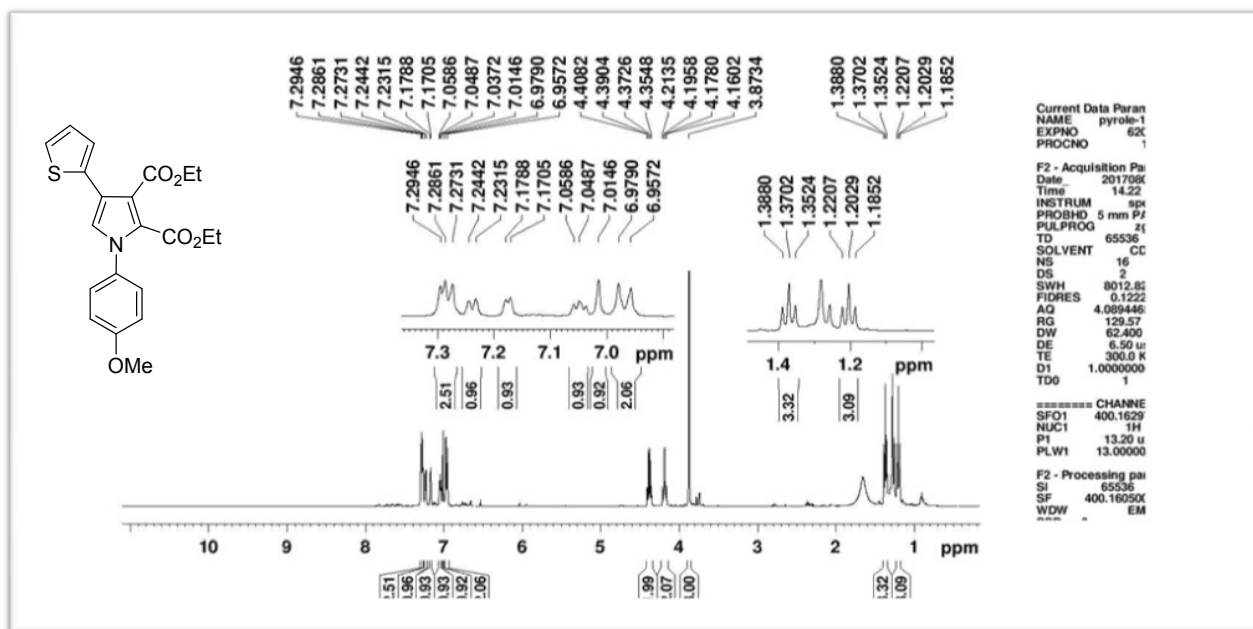
Diethyl 4-(4-chlorophenyl)-1-(4-methoxyphenyl)-5-methyl-1H-pyrrole-2,3-dicarboxylate(3xa),

¹³C NMR



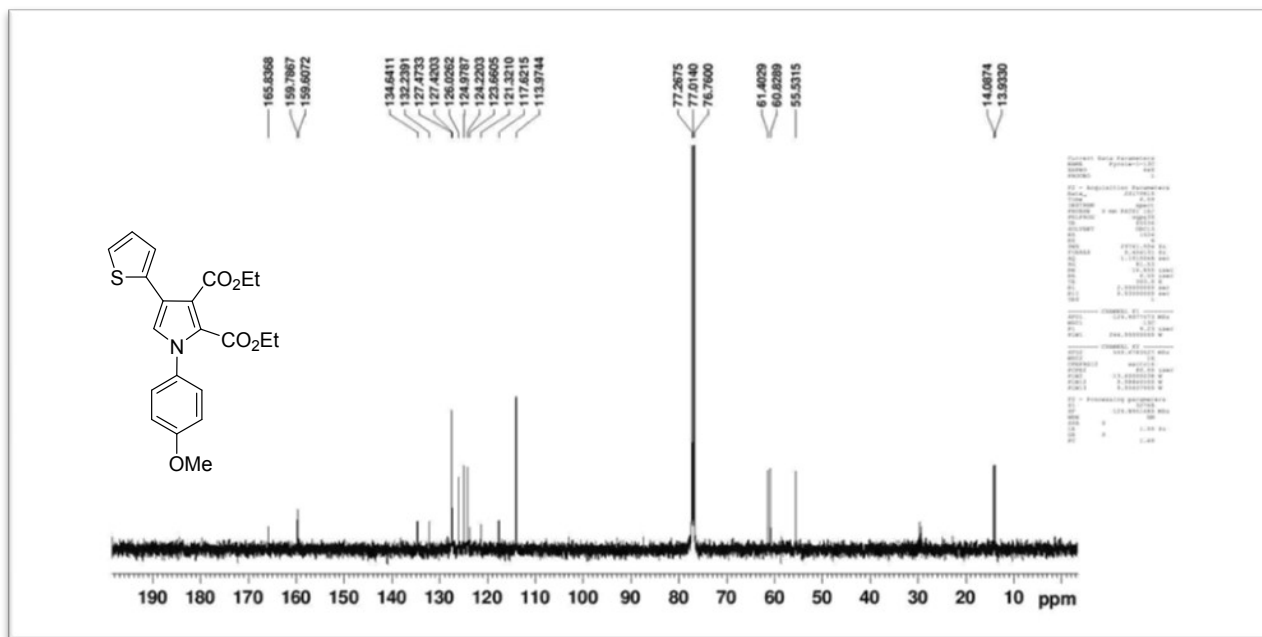
Diethyl 1-(4-methoxyphenyl)-4-(thiophen-2-yl)-1H-pyrrole-2,3-dicarboxylate(5aa)

¹H NMR.



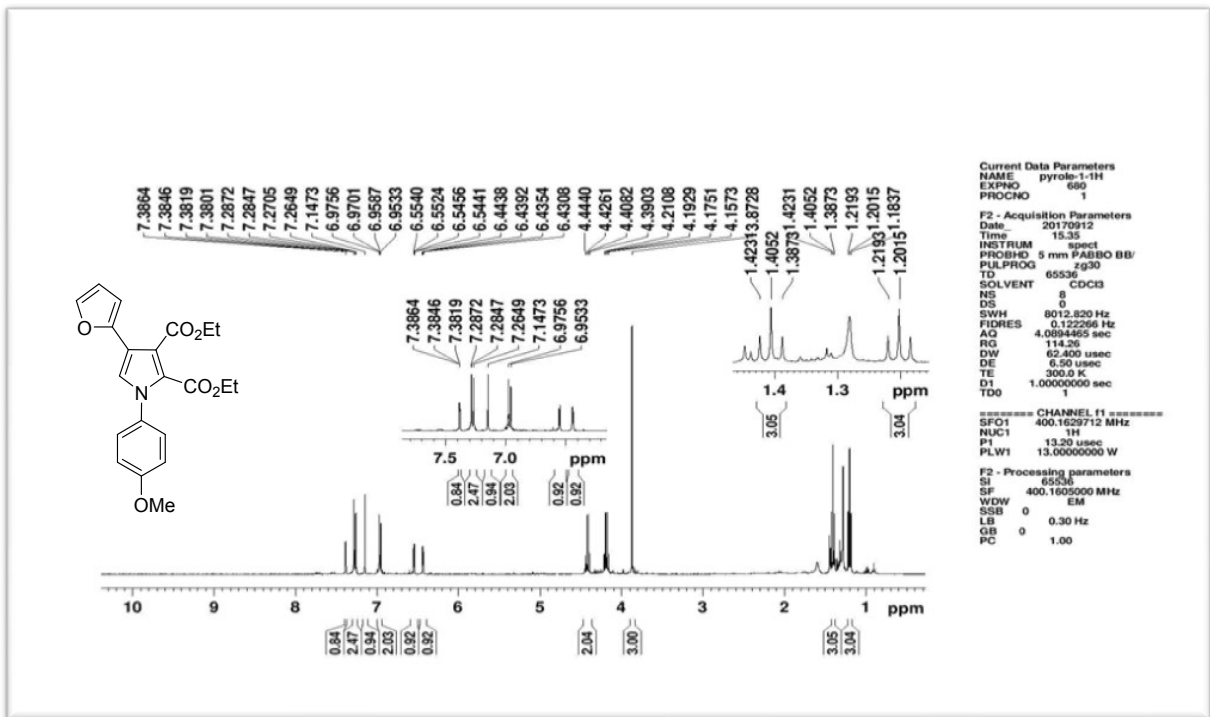
Diethyl 1-(4-methoxyphenyl)-4-(thiophen-2-yl)-1H-pyrrole-2,3-dicarboxylate(5aa)

¹³C NMR.



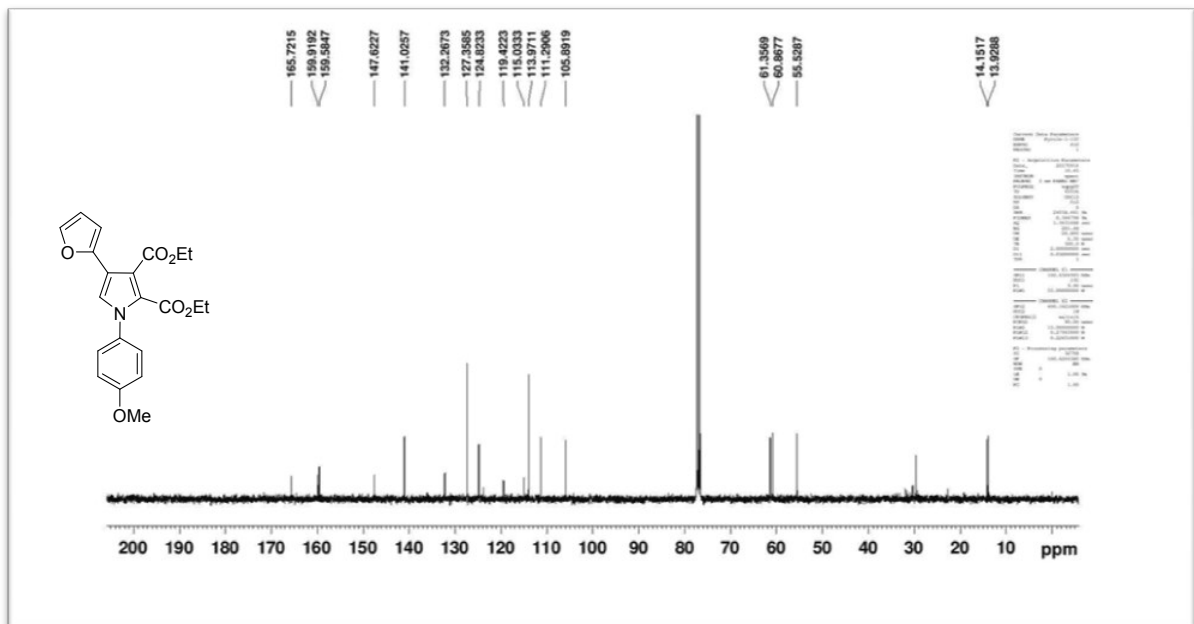
Diethyl 4-(furan-2-yl)-1-(4-methoxyphenyl)-1H-pyrrole-2,3-dicarboxylate(5ba).

¹H NMR



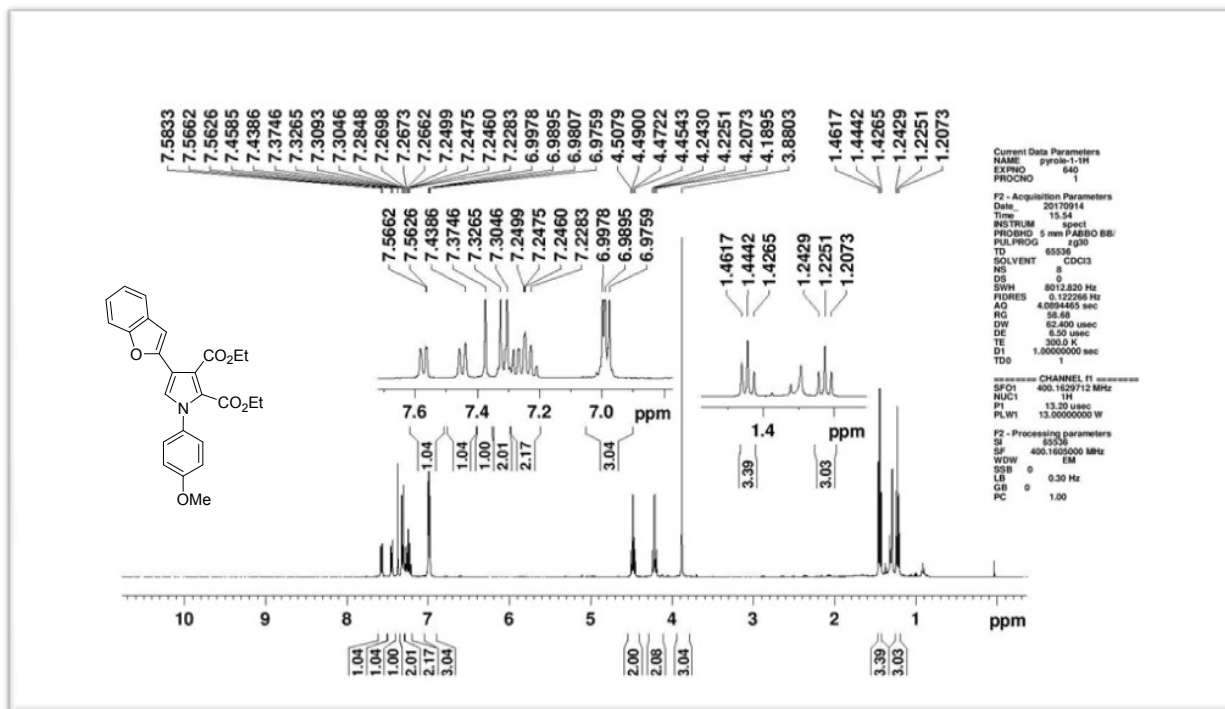
Diethyl 4-(furan-2-yl)-1-(4-methoxyphenyl)-1H-pyrrole-2,3-dicarboxylate(5ba).

¹³C NMR



Diethyl4-(benzofuran-2-yl)-1-(4-methoxyphenyl)-1H-pyrrole-2,3-dicarboxylate(5ca).

¹H NMR



Diethyl 4-(benzofuran-2-yl)-1-(4-methoxyphenyl)-1H-pyrrole-2,3-dicarboxylate(5ca).

¹³C NMR

