

Expeditious synthesis of (±)-diethyl 2-alkyl- and 2-aryl-(3-oxoisindolin-1-yl)phosphonates using OSU-6 catalyst

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Experimental Section

General. Commercial reagents were used directly as received. Reactions were monitored by thin layer chromatography (TLC) on silica gel GF plates (Analtech, No. 21521) and visualized using a hand-held UV lamp. Melting points were uncorrected. FT-IR spectra were run as dichloromethane solutions on NaCl disks. ^1H and ^{13}C NMR spectra were measured at 400 MHz or 100 MHz, respectively, in CDCl_3 . Chemical shifts (δ) are referenced to internal $(\text{CH}_3)_4\text{Si}$ and coupling constants (J) are given in Hz. High-resolution mass spectra (HRMS) were determined using a Thermo LTQ-OrbitrapXL mass spectrometer.

Representative procedure to prepare (\pm)-diethyl 2-alkyl and 2-aryl-(3-oxoisindoline-1-yl)phosphonates **3**:

To a stirred solution of 2-carboxybenzaldehyde (**1**, 150 mg, 1.0 mmol) in dry ethanol (10 mL) was added amine (1.0 mmol) and OSU-6 (7.5 mg, 5 wt%), followed by triethyl phosphite (166 mg, 1.0 mmol). The reaction mixture was stirred at 80 °C for a period of 2 h. The reaction mixture was cooled, and filtered (to separate the catalyst). The filtrate was concentrated along with silica gel and purified on a 2.5 cm x 10 cm silica gel column and eluted with increasing concentrations of EtOAc in hexanes to afford the pure products in yields shown in Table 1.

(\pm)-Diethyl (2-benzyl-3-oxoisindolin-1-yl)phosphonate (**3a**):

Isolated as a pale yellow oil; IR: 1697, 1265 cm^{-1} ; ^1H NMR: δ 7.92 (d, $J = 7.1$ Hz, 1H), 7.70 (d, $J = 7.4$ Hz, 1H), 7.57 (t, $J = 7.1$ Hz, 1H), 7.52 (t, $J = 7.4$ Hz, 1H), 7.32-7.22 (complex, 5H), 5.57 (d, $J = 14.9$ Hz, 1H), 4.68 (d, $J = 13.4$ Hz, 1H), 4.60 (d, $J = 14.9$ Hz, 1H), 4.12 (apparent quintet, $J = 7.4$ Hz, 2H), 3.96 (m, 1H), 3.81 (m, 1H), 1.28 (t, $J = 7.1$ Hz, 3H), 1.13 (t, $J = 7.1$ Hz, 3H); ^{13}C NMR: δ 168.9 (d, $J = 4.0$ Hz), 138.8 (d, $J = 5.1$ Hz), 136.8, 132.0 (d, $J = 5.1$ Hz), 131.7 (d, $J = 3.0$ Hz), 128.9 (d, $J = 3.0$ Hz), 128.7, 128.4, 127.7, 124.5 (d, $J = 3.0$ Hz), 124.0 (d, $J = 1.0$ Hz), 63.5 (d, $J = 7.1$ Hz), 63.3 (d, $J = 7.1$ Hz), 56.4 (d, $J = 155.5$ Hz), 45.1, 16.5 (d, $J = 6.1$ Hz), 16.2 (d, $J = 6.1$ Hz). HRMS (ESI) calcd for $\text{C}_{19}\text{H}_{22}\text{NO}_4\text{P}$ [$\text{M} + \text{H}$] $^+$: 359.1286, found: 359.1289.

(±)-Diethyl [2-(4-methylbenzyl)-3-oxoisindolin-1-yl]phosphonate (3b):

Isolated as a light yellow oil; IR: 2840, 1699, 1247 cm^{-1} ; ^1H NMR: δ 7.91 (d, $J = 7.1$ Hz, 1H), 7.69 (d, $J = 7.3$ Hz, 1H), 7.56 (t, $J = 7.0$ Hz, 1H), 7.51 (t, $J = 7.4$ Hz, 1H), 7.24 (d, $J = 8.4$ Hz, 2H), 6.83 (d, $J = 8.4$ Hz, 2H), 5.51 (d, $J = 14.7$ Hz, 1H), 4.66 (d, $J = 13.3$ Hz, 1H), 4.52 (d, $J = 14.7$ Hz, 1H), 4.12 (apparent quintet, $J = 7.3$ Hz, 2H), 3.98 (m, 1H), 3.81 (m, 1H), 3.77 (s, 3H), 1.28 (t, $J = 7.1$ Hz, 3H), 1.14 (t, $J = 7.1$ Hz, 3H); ^{13}C NMR: δ 168.8 (d, $J = 3.0$ Hz), 159.2, 138.8 (d, $J = 5.1$ Hz), 132.2 (d, $J = 5.1$ Hz), 131.6 (d, $J = 3.0$ Hz), 129.9, 129.0, 128.8 (d, $J = 2.0$ Hz), 124.4 (d, $J = 3.0$ Hz), 124.0 (d, $J = 1.0$ Hz), 114.0, 63.4 (d, $J = 7.1$ Hz), 63.3 (d, $J = 7.1$ Hz), 56.2 (d, $J = 155.5$ Hz), 55.3, 44.4, 16.5 (d, $J = 6.1$ Hz), 16.3 (d, $J = 5.1$ Hz). HRMS (ESI) calcd for $\text{C}_{20}\text{H}_{24}\text{NO}_4\text{P}$ $[\text{M} + \text{H}]^+$: 373.1443, found: 373.1449.

(±)-Diethyl [3-oxo-2-(4-trifluoromethylbenzyl)isoindolin-1-yl]phosphonate (3c):

Isolated as a light yellow oil; IR: 1699, 1325, 1258, 1125 cm^{-1} ; ^1H NMR: δ 7.93 (d, $J = 7.3$ Hz, 1H), 7.71 (d, $J = 7.5$ Hz, 1H), 7.63-7.51 (complex, 4H), 7.43 (d, $J = 8.0$ Hz, 2H), 5.56 (d, $J = 15.1$ Hz, 1H), 4.73 (d, $J = 15.1$ Hz, 1H), 4.64 (d, $J = 13.2$ Hz, 1H), 4.08 (apparent quintet, $J = 7.2$ Hz, 2H), 4.00 (m, 1H), 3.87 (m, 1H), 1.24 (t, $J = 7.1$ Hz, 3H), 1.16 (t, $J = 7.1$ Hz, 3H); ^{13}C NMR: δ 168.9 (d, $J = 4.0$ Hz), 140.9 (d, $J = 1.0$ Hz), 138.7 (d, $J = 6.1$ Hz), 131.9 (d, $J = 3.0$ Hz), 131.6 (d, $J = 4.0$ Hz), 129.9 (q, $J = 32.2$ Hz), 129.0 (d, $J = 3.0$ Hz), 128.6, 125.7 (q, $J = 4.0$ Hz), 124.4 (d, $J = 2.0$ Hz), 124.1 (d, $J = 2.0$ Hz), 124.0 (q, $J = 272.7$ Hz), 63.5 (d, $J = 7.1$ Hz), 63.4 (d, $J = 8.1$ Hz), 56.6 (d, $J = 156.6$ Hz), 44.7, 16.4 (d, $J = 6.1$ Hz), 16.2 (d, $J = 5.1$ Hz). HRMS (ESI) calcd for $\text{C}_{20}\text{H}_{21}\text{F}_3\text{NO}_4\text{P}$ $[\text{M} + \text{H}]^+$: 427.1160, found: 427.1168.

(±)-Diethyl [2-(4-chlorobenzyl)-3-oxoisindolin-1-yl]phosphonate (3d):

Isolated as a pale yellow oil; IR: 1699, 1258 cm^{-1} ; ^1H NMR: δ 7.92 (d, $J = 7.3$ Hz, 1H), 7.70 (d, $J = 7.5$ Hz, 1H), 7.58 (t, $J = 7.3$ Hz, 1H), 7.53 (t, $J = 7.4$ Hz, 1H), 7.28 (d, $J = 8.8$ Hz, 2H), 7.25 (d, $J = 8.8$ Hz, 2H), 5.50 (d, $J = 14.9$ Hz, 1H), 4.62 (overlapping d, $J = 14.4, 12.7$ Hz, 2H), 4.09 (apparent quintet, $J = 7.3$ Hz, 2H), 4.00 (m, 1H), 3.87 (m, 1H), 1.25 (t, $J = 7.1$ Hz, 3H), 1.16 (t, $J = 7.1$ Hz, 3H); ^{13}C NMR: δ 168.8 (d, $J = 3.0$ Hz), 138.7 (d, $J = 6.1$ Hz), 135.3, 133.6, 131.8 (2C,

overlapping d), 129.9, 129.0 (d, $J = 2.0$ Hz), 128.9, 124.4 (d, $J = 2.0$ Hz), 124.0 (d, $J = 1.0$ Hz), 63.5 (d, $J = 7.1$ Hz), 63.4 (d, $J = 7.1$ Hz), 56.4 (d, $J = 156.5$ Hz), 44.4, 16.5 (d, $J = 6.1$ Hz), 16.3 (d, $J = 6.1$ Hz). HRMS (ESI) calcd for $C_{19}H_{21}ClNO_4P$ [$M + H$] $^+$: 393.0897, found: 393.0901.

(±)-Diethyl [2-(4-fluorobenzyl)-3-oxoisindolin-1-yl]phosphonate (3e):

Isolated as a light yellow oil; 1H NMR: δ 7.92 (d, $J = 7.3$ Hz, 1H), 7.70 (d, $J = 7.4$ Hz, 1H), 7.58 (t, $J = 7.3$ Hz, 1H), 7.53 (t, $J = 7.4$ Hz, 1H), 7.30 (dd, $J = 8.4, 5.3$ Hz, 2H), 6.99 (t, $J = 8.5$ Hz, 2H), 5.51 (d, $J = 14.7$ Hz, 1H), 4.64 (d, $J = 13.3$ Hz, 1H), 4.60 (d, $J = 14.8$ Hz, 1H), 4.10 (apparent quintet, $J = 7.3$ Hz, 2H), 3.99 (m, 1H), 3.87 (m, 1H), 1.26 (t, $J = 7.1$, 3H), 1.16 (t, $J = 7.1$ Hz, 3H); ^{13}C NMR: δ 168.8 (d, $J = 3.0$ Hz), 162.3 (d, $J = 247.5$ Hz), 138.7 (d, $J = 6.1$ Hz), 132.6 (d, $J = 3.0$ Hz), 131.9 (d, $J = 4.0$ Hz), 131.8 (d, $J = 3.0$ Hz), 130.2 (d, $J = 8.1$ Hz), 128.9 (d, $J = 2.0$ Hz), 124.5 (d, $J = 2.0$ Hz), 124.1 (d, $J = 2.0$ Hz), 115.6 (d, $J = 22.2$ Hz), 63.4 (2C, overlapping d, $J = 7.1, 8.1$ Hz), 56.4 (d, $J = 156.6$ Hz), 44.3, 16.5 (d, $J = 6.1$ Hz), 16.3 (d, $J = 6.1$ Hz). HRMS (ESI) calcd for $C_{19}H_{21}FNO_4P$ [$M + H$] $^+$: 377.1192, found: 377.1195.

(±)-Diethyl [2-(3-methoxybenzyl)-3-oxoisindolin-1-yl]phosphonate (3f):

Isolated as a pale yellow oil; IR: 2835, 1699, 1260 cm^{-1} ; 1H NMR: δ 7.92 (d, $J = 7.2$ Hz, 1H), 7.71 (d, $J = 7.3$ Hz, 1H), 7.57 (t, $J = 7.1$ Hz, 1H), 7.52 (t, $J = 7.4$ Hz, 1H), 7.22 (t, $J = 7.9$ Hz, 1H), 6.89 (d, $J = 7.6$ Hz, 1H), 6.84 (s, 1H), 6.80 (dd, $J = 8.2, 2.5$ Hz, 1H), 5.54 (d, $J = 14.8$ Hz, 1H), 4.70 (d, $J = 13.3$ Hz, 1H), 4.56 (d, $J = 14.8$ Hz, 1H), 4.12 (apparent quintet, $J = 7.2$ Hz, 2H), 3.97 (m, 1H), 3.81 (m, 1H), 3.76 (s, 3H), 1.29 (t, $J = 7.1$ Hz, 3H), 1.12 (t, $J = 7.1$ Hz, 3H); ^{13}C NMR: δ 168.8 (d, $J = 3.0$ Hz), 159.9, 138.8 (d, $J = 6.1$ Hz), 138.3, 132.0 (d, $J = 4.0$ Hz), 131.7 (d, $J = 2.0$ Hz), 129.8, 128.9 (d, $J = 3.0$ Hz), 124.5 (d, $J = 3.0$ Hz), 124.0 (d, $J = 2.0$ Hz), 120.6, 113.9, 113.1 63.4 (d, $J = 7.1$ Hz), 63.3 (d, $J = 8.1$ Hz), 56.4 (d, $J = 155.5$ Hz), 55.2, 45.0, 16.5 (d, $J = 6.1$ Hz), 16.2 (d, $J = 5.1$ Hz). HRMS (ESI) calcd for $C_{20}H_{24}NO_5P$ [$M + H$] $^+$: 389.1392, found: 389.1396.

(±)-Diethyl [2-(4-methoxybenzyl)-3-oxoisindolin-1-yl]phosphonate (3g):

Isolated as a light yellow oil; IR: 2839, 1699, 1247 cm^{-1} ; ^1H NMR: δ 7.91 (d, $J = 7.1$ Hz, 1H), 7.69 (d, $J = 7.3$ Hz, 1H), 7.56 (t, $J = 7.0$ Hz, 1H), 7.51 (t, $J = 7.4$ Hz, 1H), 7.24 (d, $J = 8.4$ Hz, 2H), 6.83 (d, $J = 8.4$ Hz, 2H), 5.51 (d, $J = 14.7$ Hz, 1H), 4.66 (d, $J = 13.3$ Hz, 1H), 4.52 (d, $J = 14.7$ Hz, 1H), 4.12 (apparent quintet, $J = 7.3$ Hz, 2H), 3.98 (m, 1H), 3.81 (m, 1H), 3.77 (s, 3H), 1.28 (t, $J = 7.1$ Hz, 3H), 1.14 (t, $J = 7.1$ Hz, 3H); ^{13}C NMR: δ 168.8 (d, $J = 3.0$ Hz), 159.2, 138.8 (d, $J = 5.1$ Hz), 132.2 (d, $J = 5.1$ Hz), 131.6 (d, $J = 3.0$ Hz), 129.9, 129.0, 128.8 (d, $J = 2.0$ Hz), 124.4 (d, $J = 3.0$ Hz), 124.0 (d, $J = 1.0$ Hz), 114.0, 63.4 (d, $J = 7.1$ Hz), 63.3 (d, $J = 7.1$ Hz), 56.2 (d, $J = 155.5$ Hz), 55.3, 44.4, 16.5 (d, $J = 6.1$ Hz), 16.3 (d, $J = 5.1$ Hz). HRMS (ESI) calcd for $\text{C}_{20}\text{H}_{24}\text{NO}_5\text{P}$ [$\text{M} + \text{H}$] $^+$: 389.1392, found: 389.1390.

(±)-Diethyl (3-oxo-2-phenylisoindolin-1-yl)phosphonate (3h):

Isolated as white solid, mp 129-131 $^{\circ}\text{C}$; IR: 1699, 1261 cm^{-1} ; ^1H NMR: δ 7.96 (d, $J = 7.5$ Hz, 1H), 7.89 (d, $J = 7.6$ Hz, 1H), 7.65 (t, $J = 7.5$ Hz, 1H), 7.57 (d, $J = 7.5$ Hz, 1H), 7.51 (d, $J = 7.9$ Hz, 2H), 7.44 (t, $J = 7.8$ Hz, 2H), 7.29 (t, $J = 7.3$ Hz, 1H), 5.57 (d, $J = 12.7$ Hz, 1H), 3.82 (m, 3H), 3.46 (m, 1H), 0.93 (apparent quartet, $J = 7.4$ Hz, 6H); ^{13}C NMR: δ 167.5 (d, $J = 3.0$ Hz), 138.1 (d, $J = 6.1$ Hz), 133.4, 132.2 (d, $J = 3.0$ Hz), 132.1 (d, $J = 4.0$ Hz), 129.2 (d, $J = 3.0$ Hz), 129.8, 126.4, 125.2, 124.6 (d, $J = 2.0$ Hz), 124.4 (d, $J = 2.0$ Hz), 63.8 (d, $J = 7.1$ Hz), 62.6 (d, $J = 7.1$ Hz), 59.2 (d, $J = 154.5$ Hz), 16.1 (d, $J = 16.1$ Hz), 15.8 (d, $J = 7.1$ Hz). HRMS (ESI) calcd for $\text{C}_{18}\text{H}_{20}\text{NO}_4\text{P}$ [$\text{M} + \text{H}$] $^+$: 345.1130, found: 345.1127.

(±)-Diethyl [2-(2-methylphenyl)-3-oxoisoindolin-1-yl]phosphonate (3i):

Isolated as white solid, mp 125-127 $^{\circ}\text{C}$; IR: 1703, 1253 cm^{-1} ; ^1H NMR: δ 7.95 (d, $J = 7.5$ Hz, 1H), 7.88 (d, $J = 7.6$ Hz, 1H), 7.64 (t, $J = 7.5$ Hz, 1H), 7.57 (t, $J = 7.5$ Hz, 1H), 7.30 (m, 3H), 7.10 (d, $J = 7.4$ Hz, 1H), 5.54 (d, $J = 12.8$ Hz, 1H), 3.82 (overlapping m, 3H), 3.46 (m, 1H), 2.40 (s, 3H), 0.96 (t, $J = 7.1$ Hz, 3H), 0.92 (t, $J = 7.1$ Hz, 3H); ^{13}C NMR: δ 167.3 (d, $J = 2.0$ Hz), 138.6, 138.1 (d, $J = 6.1$ Hz), 137.3, 132.2 (d, $J = 4.0$ Hz), 132.1 (d, $J = 3.0$ Hz), 129.1 (d, $J = 2.0$ Hz), 128.6, 127.2, 125.9, 124.6 (d, $J = 2.0$ Hz), 124.3 (d, $J = 1.0$ Hz), 122.3, 63.7 (d, $J = 7.1$ Hz), 62.5 (d, $J = 7.1$ Hz), 59.3 (d, $J = 154.5$ Hz), 21.5, 16.1 (d, $J = 5.1$ Hz), 15.8 (d, $J = 7.1$ Hz). HRMS (ESI) calcd for $\text{C}_{19}\text{H}_{22}\text{NO}_4\text{P}$ [$\text{M} + \text{H}$] $^+$: 359.1286, found: 359.1293.

(±)-Diethyl [2-(4-methylphenyl)-3-oxoisindolin-1-yl]phosphonate (3j):

Isolated as white solid, mp 115-117 °C; IR: 1700, 1261 cm^{-1} ; ^1H NMR: δ 7.95 (d, $J = 7.5$ Hz, 1H), 7.87 (d, $J = 7.6$ Hz, 1H), 7.64 (t, $J = 7.5$ Hz, 1H), 7.56 (t, $J = 7.5$ Hz, 1H), 7.37 (d, $J = 8.2$ Hz, 2H), 7.24 (d, $J = 8.1$ Hz, 2H), 5.51 (d, $J = 12.8$ Hz, 1H), 3.82 (overlapping m, 3H), 3.50 (m, 1H), 2.38 (s, 3H), 0.95 (apparent quartet, $J = 7.4$ Hz, 6H); ^{13}C NMR: δ 167.6 (d, $J = 2.0$ Hz), 138.1 (d, $J = 5.1$ Hz), 136.3, 134.8, 132.2 (d, $J = 5.1$ Hz), 132.0 (d, $J = 3.0$ Hz), 129.4, 129.1 (d, $J = 3.0$ Hz), 125.2, 124.6 (d, $J = 2.0$ Hz), 124.3 (d, $J = 1.0$ Hz), 63.7 (d, $J = 7.1$ Hz), 62.6 (d, $J = 8.1$ Hz), 59.4 (d, $J = 153.5$ Hz), 21.1, 16.1 (d, $J = 5.1$ Hz), 15.8 (d, $J = 7.1$ Hz). HRMS (ESI) calcd for $\text{C}_{19}\text{H}_{22}\text{NO}_4\text{P}$ [$\text{M} + \text{H}$] $^+$: 359.1286, found: 359.1288.

(±)-Diethyl [2-(4-chlorophenyl)-3-oxoisindolin-1-yl]phosphonate (3k):

Isolated as white solid, mp 160-162 °C; IR: 1703, 1261 cm^{-1} ; ^1H NMR: δ 7.96 (d, $J = 7.5$ Hz, 1H), 7.88 (d, $J = 7.7$ Hz, 1H), 7.67 (t, $J = 7.5$ Hz, 1H), 7.58 (t, $J = 7.5$ Hz, 1H), 7.48 (d, $J = 8.6$ Hz, 2H), 7.42 (d, $J = 8.6$ Hz, 2H), 5.52 (d, $J = 12.4$ Hz, 1H), 3.84 (overlapping m, 3H), 3.51 (m, 1H), 1.00 (t, $J = 7.1$ Hz, 3H), 0.95 (t, $J = 7.1$ Hz, 3H); ^{13}C NMR: δ 167.6 (d, $J = 3.0$ Hz), 138.1 (d, $J = 6.1$ Hz), 136.3, 134.8, 132.2 (d, $J = 4.0$ Hz), 132.0 (d, $J = 3.0$ Hz), 129.4, 129.1 (d, $J = 3.0$ Hz), 125.2, 124.6 (d, $J = 2.0$ Hz), 124.3 (d, $J = 2.0$ Hz), 63.7 (d, $J = 7.1$ Hz), 62.6 (d, $J = 7.1$ Hz), 59.4 (d, $J = 153.5$ Hz), 16.1 (d, $J = 5.1$ Hz), 15.8 (d, $J = 7.1$ Hz). HRMS (ESI) calcd for $\text{C}_{18}\text{H}_{19}\text{ClNO}_4\text{P}$ [$\text{M} + \text{H}$] $^+$: 379.0740, found: 379.0749.

(±)-Diethyl [2-(2-fluorophenyl)-3-oxoisindolin-1-yl]phosphonate (3l):

Isolated as white solid, mp 132-134 °C; IR: 1712, 1258 cm^{-1} ; ^1H NMR: δ 7.97 (d, $J = 7.6$ Hz, 1H), 7.90 (d, $J = 7.6$ Hz, 1H), 7.67 (t, $J = 7.5$ Hz, 1H), 7.58 (t, $J = 7.5$ Hz, obscures a second signal, 2H), 7.32 (m, 1H), 7.26 (m, 1H), 7.19 (m, 1H), 5.60 (d, $J = 12.9$ Hz, 1H), 3.84 (overlapping m, 3H), 3.52 (m, 1H), 0.96 (t, $J = 7.1$ Hz, 3H), 0.93 (t, $J = 7.1$ Hz, 3H); ^{13}C NMR: δ 167.7 (d, $J = 2.0$ Hz), 157.7 (d, $J = 251.5$ Hz), 138.6 (d, $J = 6.1$ Hz), 132.4 (d, $J = 2.0$ Hz), 131.2 (d, $J = 5.1$ Hz), 129.8 129.0 (d, $J = 3.0$ Hz), 128.8 (d, $J = 8.1$ Hz), 125.0 (d, $J = 11.1$ Hz), 124.7

(d, $J = 2.0$ Hz), 124.4 (d, $J = 1.0$ Hz), 124.3 (d, $J = 3.0$ Hz), 116.2 (d, $J = 20.2$ Hz), 63.7 (d, $J = 7.1$ Hz), 62.5 (d, $J = 7.1$ Hz), 59.0 (dd, $J = 152.5, 5.1$ Hz), 16.1 (d, $J = 5.1$ Hz), 15.8 (d, $J = 7.1$ Hz). HRMS (ESI) calcd for $C_{18}H_{19}FNO_4P$ $[M + H]^+$: 363.1036, found: 363.1041.

(±)-Diethyl [2-(4-fluorophenyl)-3-oxoisindolin-1-yl]phosphonate (3m):

Isolated as white solid, mp 123-125 °C; IR: 1703, 1259 cm^{-1} ; 1H NMR: δ 7.96 (d, $J = 7.5$ Hz, 1H), 7.88 (d, $J = 7.7$ Hz, 1H), 7.66 (t, $J = 7.5$ Hz, 1H), 7.58 (d, $J = 7.5$ Hz, 1H), 7.47 (dd, $J = 8.8, 4.8$ Hz, 2H), 7.14 (t, $J = 8.6$ Hz, 2H), 5.49 (d, $J = 12.6$ Hz, 1H), 3.85 (overlapping m, 3H), 3.50 (m, 1H), 1.00 (t, $J = 7.1$ Hz, 3H), 0.95 (t, $J = 7.1$ Hz, 3H); ^{13}C NMR: δ 167.6 (d, $J = 2.0$ Hz), 160.9 (d, $J = 247.5$ Hz), 137.9 (d, $J = 5.1$ Hz), 133.5 (d, $J = 3.0$ Hz), 132.3 (d, $J = 2.0$ Hz), 131.8 (d, $J = 4.0$ Hz), 129.3 (d, $J = 2.0$ Hz), 127.1 (d, $J = 8.1$ Hz), 124.6 (d, $J = 3.0$ Hz), 124.4 (d, $J = 1.0$ Hz), 115.6 (d, $J = 23.2$ Hz), 63.5 (d, $J = 7.1$ Hz), 62.6 (d, $J = 7.1$ Hz), 59.4 (d, $J = 154.5$ Hz), 16.1 (d, $J = 5.1$ Hz), 15.9 (d, $J = 6.1$ Hz). HRMS (ESI) calcd for $C_{18}H_{19}FNO_4P$ $[M + H]^+$: 363.1036, found: 363.1047.

(±)-Diethyl [2-(3-methoxyphenyl)-3-oxoisindolin-1-yl]phosphonate (3n):

Isolated as white solid, mp 110-112 °C; IR: 2836, 1703, 1258 cm^{-1} ; 1H NMR: δ 7.95 (d, $J = 7.5$ Hz, 1H), 7.88 (d, $J = 7.6$ Hz, 1H), 7.65 (d, $J = 7.5$ Hz, 1H), 7.57 (t, $J = 7.5$ Hz, 1H), 7.34 (t, $J = 8.1$ Hz, 1H), 7.14 (t, $J = 2.4$ Hz, 1H), 7.07 (d, $J = 8.1$ Hz, 1H), 6.84 (dd, $J = 8.1, 2.4$ Hz, 1H), 5.54 (d, $J = 12.6$ Hz, 1H), 3.86 (m, 2H), 3.84 (s, 3H), 3.80 (m, 1H), 3.48 (m, 1H), 0.99 (t, $J = 7.1$ Hz, 3H), 0.93 (t, $J = 7.1$ Hz, 3H); ^{13}C NMR: δ 167.5 (d, $J = 2.0$ Hz), 159.9, 138.5, 138.1 (d, $J = 6.1$ Hz), 132.2 (d, $J = 2.0$ Hz), 132.1 (d, $J = 4.0$ Hz), 129.4, 129.2 (d, $J = 2.0$ Hz), 124.6 (d, $J = 3.0$ Hz), 124.3 (d, $J = 2.0$ Hz), 117.2, 112.2, 111.1, 63.8 (d, $J = 7.1$ Hz), 62.6 (d, $J = 7.1$ Hz), 59.3 (d, $J = 153.5$ Hz), 55.4, 16.1 (d, $J = 5.1$ Hz), 15.8 (d, $J = 7.1$ Hz). HRMS (ESI) calcd for $C_{19}H_{22}NO_5P$ $[M + H]^+$: 375.1236, found: 375.1243.

(±)-Diethyl [2-(4-methoxyphenyl)-3-oxoisindolin-1-yl]phosphonate (3o):

Isolated as white solid, mp 149-151 °C; IR: 2839, 1699, 1248 cm⁻¹; ¹H NMR: δ 7.95 (d, *J* = 7.5 Hz, 1H), 7.87 (d, *J* = 7.6 Hz, 1H), 7.64 (t, *J* = 7.5 Hz, 1H), 7.56 (t, *J* = 7.5 Hz, 1H), 7.39 (d, *J* = 8.8 Hz, 2H), 6.98 (d, *J* = 8.8 Hz, 2H), 5.46 (d, *J* = 12.9 Hz, 1H), 3.84 (overlapping m, 3H), 3.82 (s, 3H), 3.51 (m, 1H), 1.00 (t, *J* = 7.1 Hz, 3H), 0.95 (t, *J* = 7.1 Hz, 3H); ¹³C NMR: δ 167.8 (d, *J* = 3.0 Hz), 158.2, 138.1 (d, *J* = 6.1 Hz), 132.1 (d, *J* = 5.1 Hz), 132.0 (d, *J* = 2.0 Hz), 130.3, 129.1 (d, *J* = 3.0 Hz), 126.9, 124.6 (d, *J* = 3.0 Hz), 124.3 (d, *J* = 1.0 Hz), 114.1, 63.7 (d, *J* = 7.1 Hz), 62.6 (d, *J* = 7.1 Hz), 59.7 (d, *J* = 153.5 Hz), 55.6, 16.1 (d, *J* = 5.1 Hz), 15.9 (d, *J* = 7.1 Hz). HRMS (ESI) calcd for C₁₉H₂₂NO₅P [M + H]⁺: 375.1236, found: 375.1245.

(±)-Diethyl [3-oxo-2-(4-trifluoromethoxyphenyl)isoindolin-1-yl]phosphonate (3p):

Isolated as white solid, mp 132-134 °C; IR: 1688, 1305, 1253 cm⁻¹; ¹H NMR: δ 7.97 (d, *J* = 7.6 Hz, 1H), 7.89 (d, *J* = 7.6 Hz, 1H), 7.67 (t, *J* = 7.5 Hz, 1H), 7.59 (d, *J* = 7.5 Hz, 1H), 7.56 (d, *J* = 9.0 Hz, 2H), 7.31 (d, *J* = 9.0 Hz, 2H), 5.54 (d, *J* = 12.3 Hz, 1H), 3.85 (overlapping m, 3H), 3.48 (m, 1H), 0.96 (t, *J* = 7.1 Hz, 3H), 0.93 (t, *J* = 7.1 Hz, 3H); ¹³C NMR: δ 167.5 (d, *J* = 2.0 Hz), 147.0, 137.9 (d, *J* = 6.1 Hz), 136.1, 132.4 (d, *J* = 3.0 Hz), 131.7 (d, *J* = 4.0 Hz), 129.3 (d, *J* = 3.0 Hz), 126.4, 124.7 (d, *J* = 3.0 Hz), 124.5 (d, *J* = 1.0 Hz), 121.5, 120.5 (q, *J* = 257.6 Hz), 64.0 (d, *J* = 7.1 Hz), 62.6 (d, *J* = 8.1 Hz), 59.1 (d, *J* = 153.5 Hz), 16.0 (d, *J* = 5.1 Hz), 15.7 (d, *J* = 7.1 Hz). HRMS (ESI) calcd for C₁₉H₁₉F₃NO₅P [M + H]⁺: 429.0953, found: 429.0970.

(±)-Diethyl [3-oxo-2-(2-phenethyl)isoindolin-1-yl]phosphonate (3q):

Isolated as a yellow oil; IR: 1694, 1258 cm⁻¹; ¹H NMR: δ 7.87 (d, *J* = 7.3 Hz, 1H), 7.71 (d, *J* = 7.4 Hz, 1H), 7.56 (t, *J* = 7.3 Hz, 1H), 7.51 (t, *J* = 7.3 Hz, 1H), 7.29-7.16 (complex, 5H), 4.62 (d, *J* = 13.3 Hz, 1H), 4.36 (ddd, *J* = 14.3, 9.1, 5.6 Hz, 1H), 4.10 (apparent quintet, *J* = 7.5 Hz, 2H), 3.94 (m, 1H), 3.82 (m, 2H), 3.10 (ddd, *J* = 16.0, 8.6, 7.1 Hz, 1H), 2.93 (ddd, *J* = 13.9, 8.6, 5.6 Hz, 1H), 1.26 (t, *J* = 7.1 Hz, 3H), 1.11 (t, *J* = 7.1 Hz, 3H); ¹³C NMR: δ 168.7 (d, *J* = 3.0 Hz), 138.7, 138.5 (d, *J* = 6.1 Hz), 132.3 (d, *J* = 4.0 Hz), 131.5 (d, *J* = 3.0 Hz), 128.8 (d, *J* = 2.0 Hz), 128.8, 128.6, 126.5, 124.4 (d, *J* = 2.0 Hz), 123.7 (d, *J* = 1.0 Hz), 63.5 (d, *J* = 7.1 Hz), 63.2 (d, *J* = 7.1 Hz), 57.8 (d, *J* = 155.5 Hz), 43.4, 34.3, 16.5 (d, *J* = 6.1 Hz), 16.2 (d, *J* = 5.1 Hz). HRMS (ESI) calcd for C₂₀H₂₄NO₄P [M + H]⁺: 373.1443, found: 373.1451.

(±)-Diethyl {3-oxo-[2-(5,6,7,8-tetrahydronaphthalen-1-yl)]isoindolin-1-yl}phosphonate (3r):

Isolated as white solid, mp 136-138 °C; IR: 1699, 1251 cm^{-1} ; ^1H NMR: δ 7.94 (d, $J = 7.5$ Hz, 1H), 7.87 (d, $J = 7.6$ Hz, 1H), 7.63 (d, $J = 7.5$ Hz, 1H), 7.55 (d, $J = 7.5$ Hz, 1H), 7.19 (m, 2H), 7.11 (d, $J = 8.0$ Hz, 1H), 5.50 (d, $J = 12.8$ Hz, 1H), 3.87 (apparent quintet, $J = 7.1$ Hz, 2H), 3.83 (m, 1H), 3.50 (m, 1H), 2.78 (m, 4H), 1.80 (m, 4H), 0.97 (t, $J = 7.1$ Hz, 3H), 0.94 (t, $J = 7.1$ Hz, 3H); ^{13}C NMR: δ 167.6 (d, $J = 3.0$ Hz), 138.1 (d, $J = 6.1$ Hz), 137.5, 135.7, 134.6, 132.2 (d, $J = 4.0$ Hz), 131.9 (d, $J = 2.0$ Hz), 129.4, 129.0 (d, $J = 2.0$ Hz), 125.8, 124.6 (d, $J = 3.0$ Hz), 124.2, 122.6, 63.7 (d, $J = 7.1$ Hz), 62.6 (d, $J = 6.1$ Hz), 59.5 (d, $J = 155.5$ Hz), 29.5, 29.1, 23.2, 23.1, 16.0 (d, $J = 5.1$ Hz), 15.7 (d, $J = 7.1$ Hz). HRMS (ESI) calcd for $\text{C}_{22}\text{H}_{26}\text{NO}_4\text{P}$ $[\text{M} + \text{H}]^+$: 399.1599, found: 399.1612.

(±)-Diethyl (2-isobutyl-3-oxoisoindolin-1-yl)phosphonate (3s):

Isolated as a light yellow oil; IR: 1694, 1259 cm^{-1} ; ^1H NMR: δ 7.88 (d, $J = 7.4$ Hz, 1H), 7.79 (d, $J = 7.4$ Hz, 1H), 7.58 (t, $J = 7.3$ Hz, 1H), 7.52 (t, $J = 7.3$ Hz, 1H), 4.89 (d, $J = 13.8$ Hz, 1H), 4.12 (quintet of d, $J = 7.3$ Hz, 2H), 3.95 (m, 2H), 3.80 (m, 1H), 3.45 (dd, $J = 13.8, 5.2$ Hz, 1H), 2.12 (m, 1H), 1.27 (t, $J = 7.1$ Hz, 3H), 1.11 (t, $J = 7.1$ Hz, 3H), 1.00 (d, $J = 6.7$ Hz, 3H), 0.82 (d, $J = 6.7$ Hz, 3H); ^{13}C NMR: δ 168.9 (d, $J = 3.0$ Hz), 138.4 (d, $J = 6.1$ Hz), 132.3 (d, $J = 4.0$ Hz), 131.4 (d, $J = 2.0$ Hz), 128.8 (d, $J = 2.0$ Hz), 124.5 (d, $J = 3.0$ Hz), 123.8 (d, $J = 1.0$ Hz), 63.4 (d, $J = 7.1$ Hz), 63.1 (d, $J = 7.1$ Hz), 57.3 (d, $J = 155.5$ Hz), 48.7, 27.1, 20.3, 19.5, 16.4 (d, $J = 6.1$ Hz), 16.2 (d, $J = 5.1$ Hz). HRMS (ESI) calcd for $\text{C}_{16}\text{H}_{24}\text{NO}_4\text{P}$ $[\text{M} + \text{H}]^+$: 325.1443, found: 325.1440.

(±)-Diethyl (2-hexyl-3-oxoisoindolin-1-yl)phosphonate (3t):

Isolated as a light yellow oil; IR: 1697, 1260 cm^{-1} ; ^1H NMR: δ 7.80 (d, $J = 7.4$ Hz, 1H), 7.71 (d, $J = 7.5$ Hz, 1H), 7.50 (t, $J = 7.4$ Hz, 1H), 7.44 (t, $J = 7.4$ Hz, 1H), 4.81 (d, $J = 13.6$ Hz, 1H), 4.05 (m, 2H), 3.88 (m, 1H), 3.73 (m, 1H), 3.48 (ddd, $J = 13.8, 9.0, 4.8$ Hz, 1H), 1.64 (m, 1H), 1.53 (m, 1H), 1.24 (m, 7H), 1.19 (t, $J = 7.1$ Hz, 3H), 1.04 (t, $J = 7.1$ Hz, 3H), 0.80 (distorted t, $J = 6.7$

Hz, 3H); ^{13}C NMR: δ 167.6 (d, $J = 3.0$ Hz), 137.5 (d, $J = 6.1$ Hz), 131.5 (d, $J = 5.1$ Hz), 130.4 (d, $J = 3.0$ Hz), 127.8 (d, $J = 2.0$ Hz), 123.4 (d, $J = 3.0$ Hz), 122.7 (d, $J = 2.0$ Hz), 62.4 (d, $J = 7.1$ Hz), 62.1 (d, $J = 7.1$ Hz), 56.1 (d, $J = 155.5$ Hz), 40.8, 30.5, 26.9, 25.5, 21.5, 15.4 (d, $J = 6.1$ Hz), 15.2 (d, $J = 5.1$ Hz), 13.0. HRMS (ESI) calcd for $\text{C}_{18}\text{H}_{28}\text{NO}_4\text{P}$ [$\text{M} + \text{H}$] $^+$: 353.1756, found: 353.1762.

(±)-Diethyl (2-allyl-3-oxoisindolin-1-yl)phosphonate (3u):

Isolated as a light yellow oil; IR: 1698, 1642, 1257 cm^{-1} ; ^1H NMR: δ 7.89 (d, $J = 7.5$ Hz, 1H), 7.78 (d, $J = 7.7$ Hz, 1H), 7.59 (t, $J = 7.4$ Hz, 1H), 7.52 (t, $J = 7.4$ Hz, 1H), 5.80 (m, 1H), 5.23 (d, $J = 16.6$ Hz, 1H), 5.22 (d, $J = 10.7$ Hz, 1H), 4.90 (d, $J = 13.5$ Hz, 1H), 4.86 (dd, $J = 16.0, 4.4$ Hz, 1H), 4.12 (m, 3H), 3.98 (m, 1H), 3.81 (m, 1H), 1.27 (t, $J = 7.1$ Hz, 3H), 1.12 (t, $J = 7.1$ Hz, 3H); ^{13}C NMR: δ 168.9 (d, $J = 3.0$ Hz), 138.7 (d, $J = 6.1$ Hz), 132.5, 132.2 (d, $J = 4.0$ Hz), 131.7 (d, $J = 2.0$ Hz), 128.9 (d, $J = 3.0$ Hz), 124.5 (d, $J = 2.0$ Hz), 123.9 (d, $J = 1.0$ Hz), 118.4, 63.5 (d, $J = 7.1$ Hz), 63.2 (d, $J = 7.1$ Hz), 56.7 (d, $J = 156.6$ Hz), 44.0, 16.4 (d, $J = 6.1$ Hz), 16.2 (d, $J = 6.1$ Hz). HRMS (ESI) calcd for $\text{C}_{15}\text{H}_{20}\text{NO}_4\text{P}$ [$\text{M} + \text{H}$] $^+$: 309.1130, found: 309.1136.

(±)-Diethyl (2-cyclopropyl-3-oxoisindolin-1-yl)phosphonate (3v):

Isolated as a light yellow oil; IR: 1699, 1260 cm^{-1} ; ^1H NMR: δ 7.83 (d, $J = 7.5$ Hz, 1H), 7.74 (d, $J = 7.6$ Hz, 1H), 7.57 (t, $J = 7.4$ Hz, 1H), 7.50 (t, $J = 7.4$ Hz, 1H), 4.77 (d, $J = 13.2$ Hz, 1H), 4.20 (apparent quintet of d, $J = 7.2, 2.9$ Hz, 2H), 3.93 (m, 1H), 3.73 (m, 1H), 2.92 (tt, $J = 7.2, 3.9$ Hz, 1H), 1.33 (t, $J = 7.1$ Hz, 3H), 1.17 (m, 1H), 1.07 (t, $J = 7.1$ Hz, 3H), 1.05 (m, 1H), 0.84 (m, 1H), 0.67 (m, 1H); ^{13}C NMR: δ 169.1 (d, $J = 2.0$ Hz), 138.3 (d, $J = 6.1$ Hz), 132.6 (d, $J = 4.0$ Hz), 131.6 (d, $J = 3.0$ Hz), 128.8 (d, $J = 3.0$ Hz), 124.4 (d, $J = 2.0$ Hz), 123.6 (d, $J = 2.0$ Hz), 63.5 (d, $J = 7.1$ Hz), 62.9 (d, $J = 8.1$ Hz), 58.9 (d, $J = 153.5$ Hz), 25.3 16.4 (d, $J = 6.1$ Hz), 16.2 (d, $J = 5.1$ Hz), 8.7, 6.2. HRMS (ESI) calcd for $\text{C}_{15}\text{H}_{20}\text{NO}_4\text{P}$ [$\text{M} + \text{H}$] $^+$: 309.1130, found: 309.1133.

(±)-Diethyl (2-cyclohexyl-3-oxoisindolin-1-yl)phosphonate (3w):

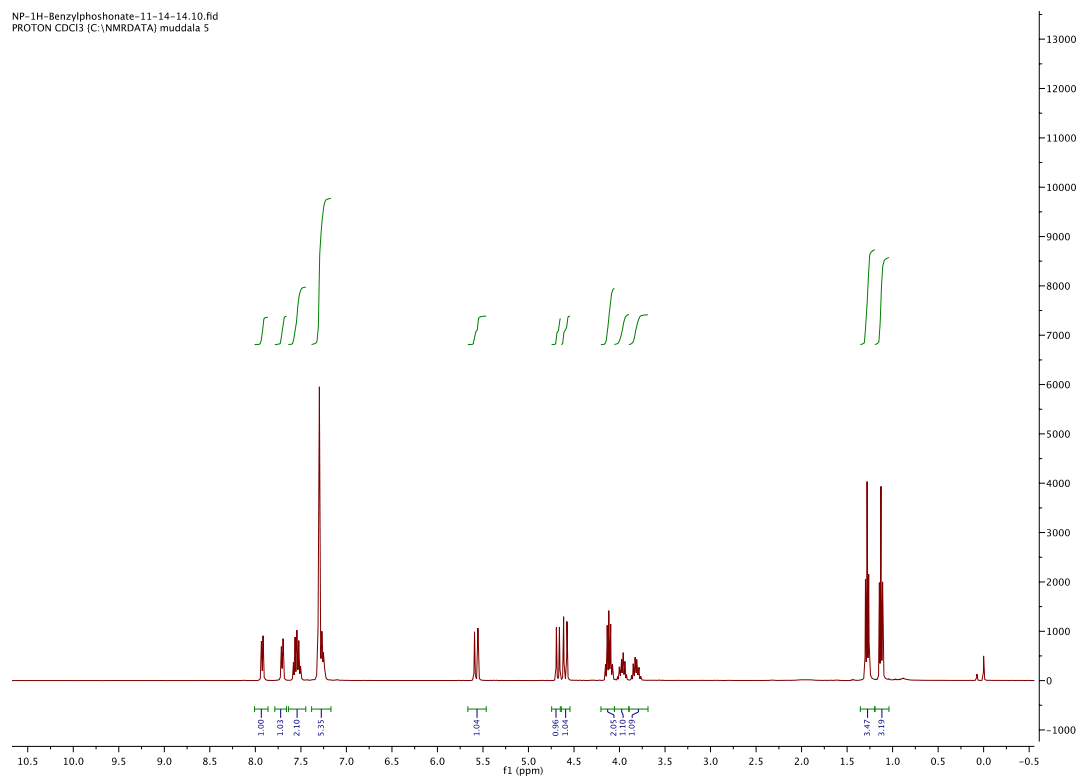
Isolated as a light yellow oil; IR: 1689, 1257 cm^{-1} ; ^1H NMR: δ 7.82 (d, $J = 7.5$ Hz, 1H), 7.74 (d, $J = 7.5$ Hz, 1H), 7.55 (t, $J = 7.4$ Hz, 1H), 7.49 (t, $J = 7.4$ Hz, 1H), 4.85 (d, $J = 13.1$ Hz, 1H), 4.10 (m, 2H), 3.97 (m, 1H), 3.79 (m, 2H), 2.45 (qd, $J = 12.5, 4.2$ Hz, 1H), 2.23 (qd, $J = 12.3, 3.7$ Hz, 1H), 1.95-1.63 (complex, 5H), 1.40-1.24 (m, 3H), 1.24 (t, $J = 7.1$ Hz, 3H), 1.15 (t, $J = 7.1$ Hz, 3H); ^{13}C NMR: δ 169.0 (d, $J = 4.0$ Hz), 138.8 (d, $J = 6.1$ Hz), 133.6 (d, $J = 4.0$ Hz), 131.2 (d, $J = 2.0$ Hz), 128.7 (d, $J = 2.0$ Hz), 124.4 (d, $J = 3.0$ Hz), 123.4 (d, $J = 1.0$ Hz), 63.4 (d, $J = 7.1$ Hz), 63.2 (d, $J = 7.1$ Hz), 58.6 (d, $J = 156.6$ Hz), 56.7, 29.7, 29.4, 26.4, 26.1, 25.3, 16.3 (2C, overlapping d, $J = 6.1, 5.1$ Hz). HRMS (ESI) calcd for $\text{C}_{18}\text{H}_{26}\text{NO}_4\text{P}$ $[\text{M} + \text{H}]^+$: 351.1599, found: 351.1604.

Procedure to regenerate OSU-6:

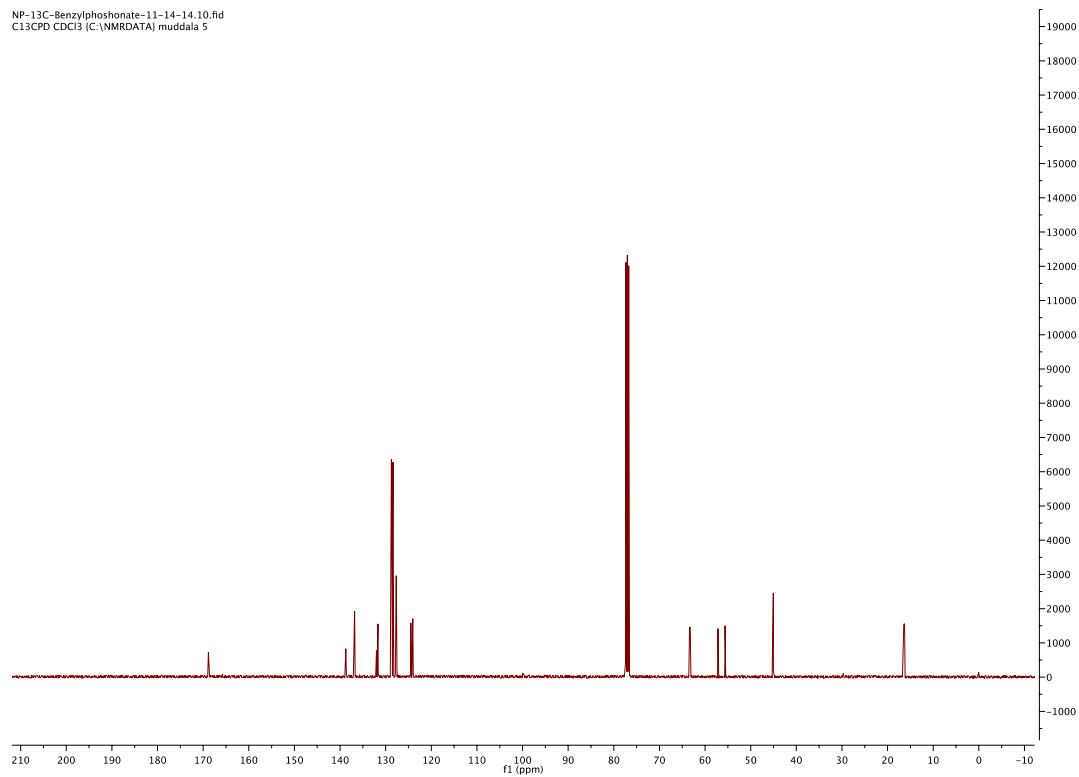
The catalyst recovered from the reaction was washed with ethanol:water (1:1, 3×15 mL) and air-dried. The catalyst was placed in a round-bottomed flask, heated to 200 $^\circ\text{C}$ and dried under high vacuum overnight (14 h). Once cooled, the catalyst was ready for reuse.

(±)-Diethyl (2-benzyl-3-oxoisindolin-1-yl)phosphonate (3a):

NP-1H-Benzylphosphonate-11-14-14.10.fid
PROTON CDCl3 (C:\NMRDATA) muddala 5

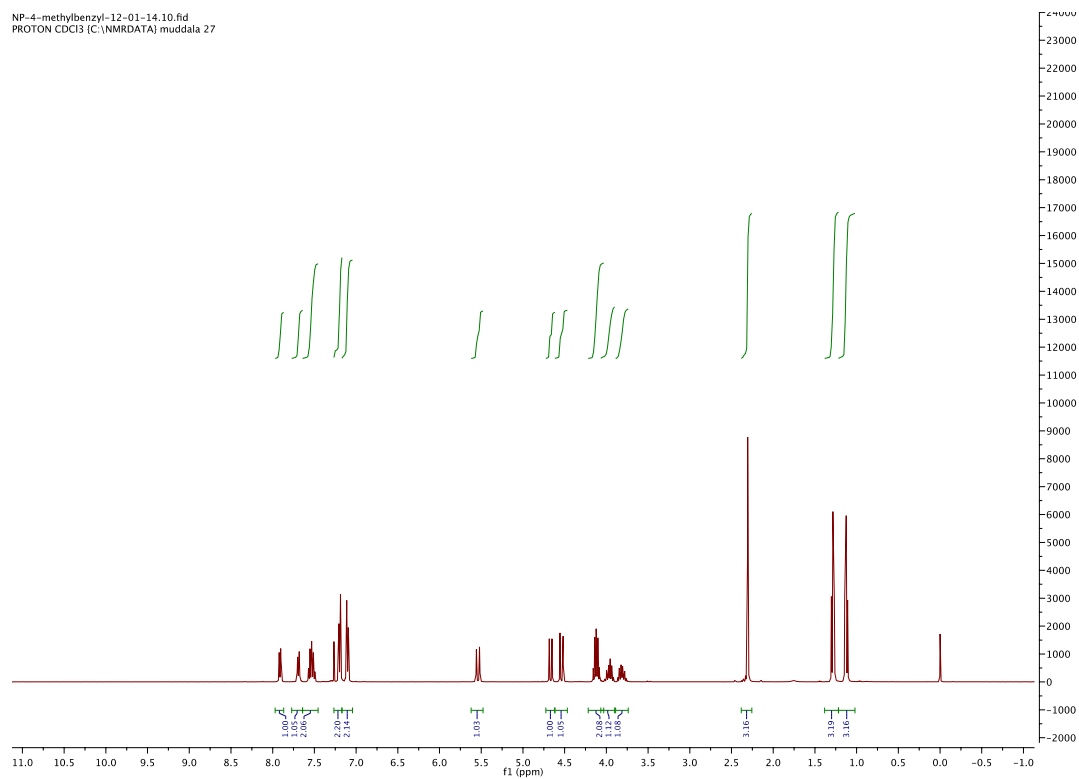


NP-13C-Benzylphosphonate-11-14-14.10.fid
C13CPD CDCl3 (C:\NMRDATA) muddala 5

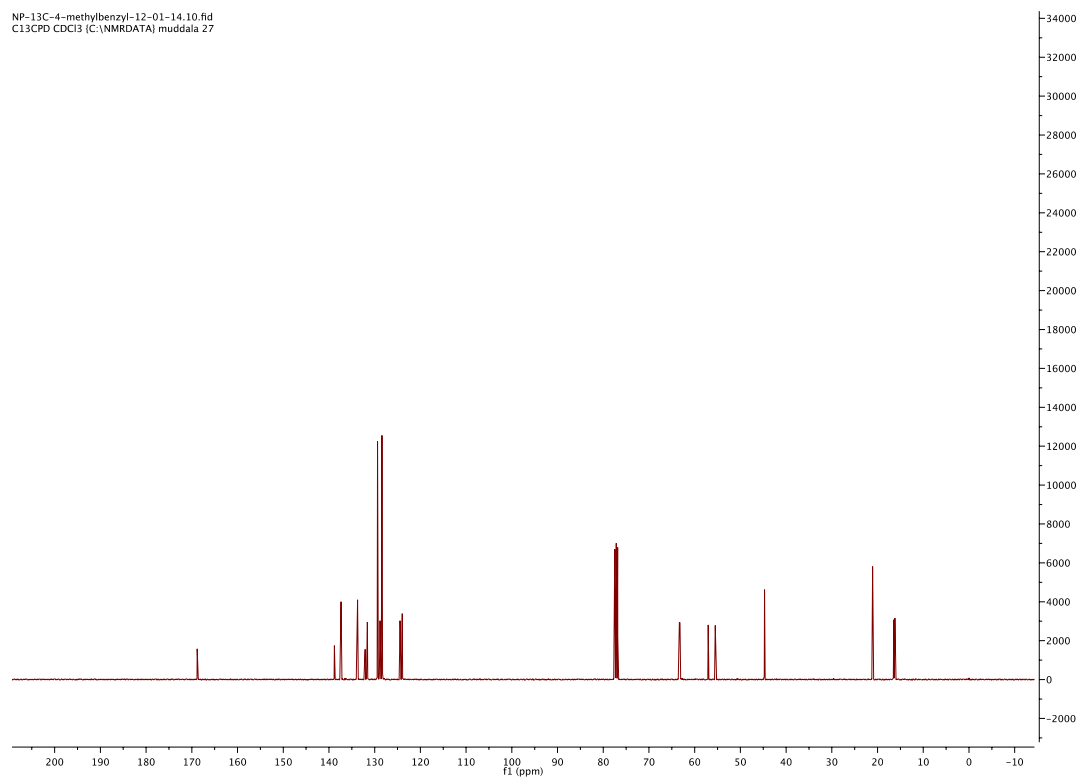


(±)-Diethyl (2-(4-methylbenzyl)-3-oxoisindolin-1-yl)phosphonate (3b):

NP-4-methylbenzyl-12-01-14.10.fid
PROTON CDCl3 (C:\NMRDATA) muddala 27

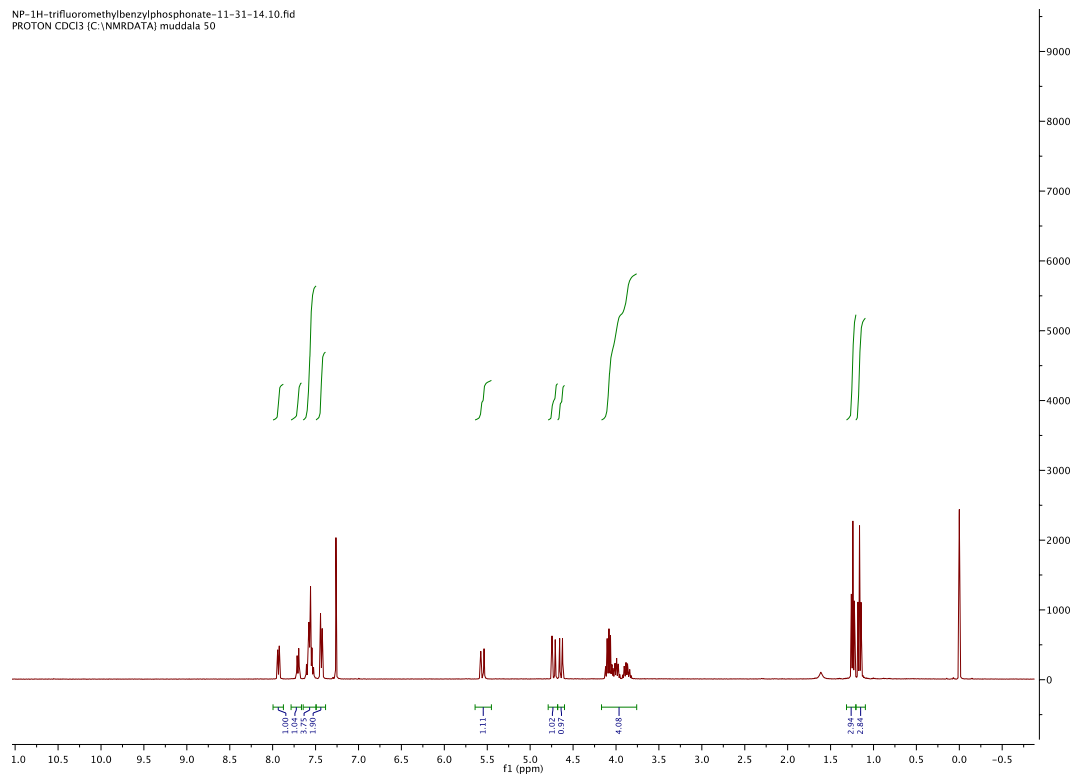


NP-13C-4-methylbenzyl-12-01-14.10.fid
C13CPD CDCl3 (C:\NMRDATA) muddala 27

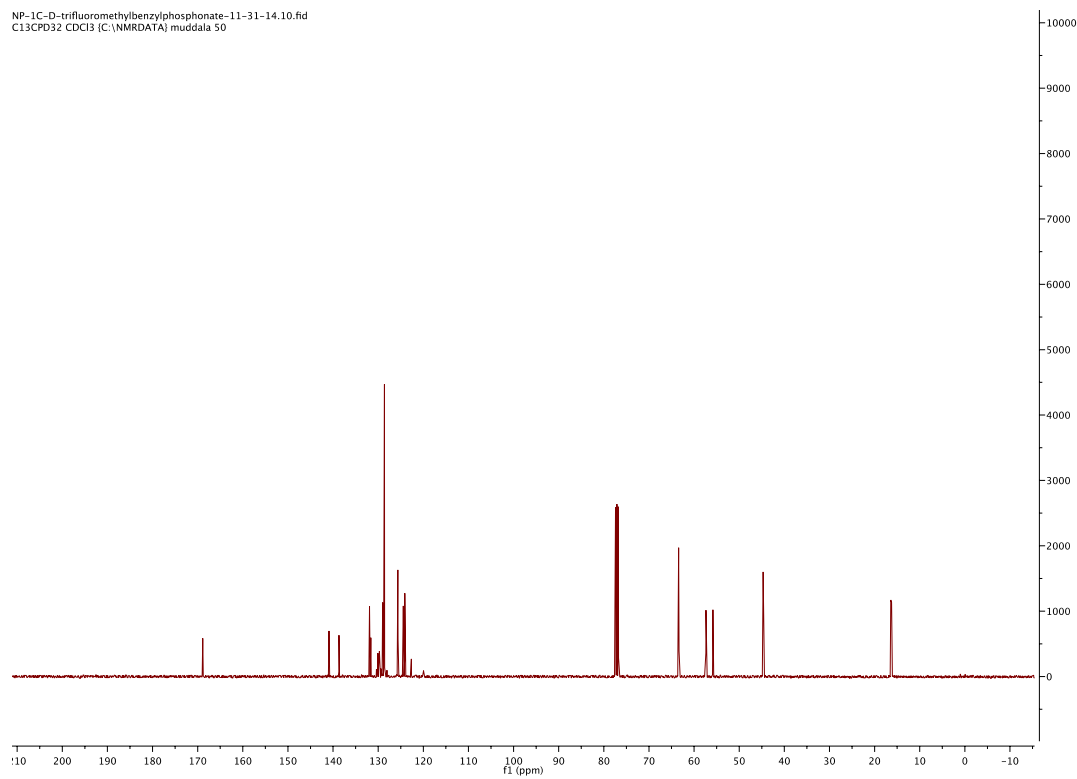


(±)-Diethyl (3-oxo-2-(4-(trifluoromethyl)benzyl)isoindolin-1-yl)phosphonate (3c):

NP-1H-trifluoromethylbenzylphosphonate-11-31-14.10.fid
PROTON CDCl3 [C:\NMRDATA] muddala 50

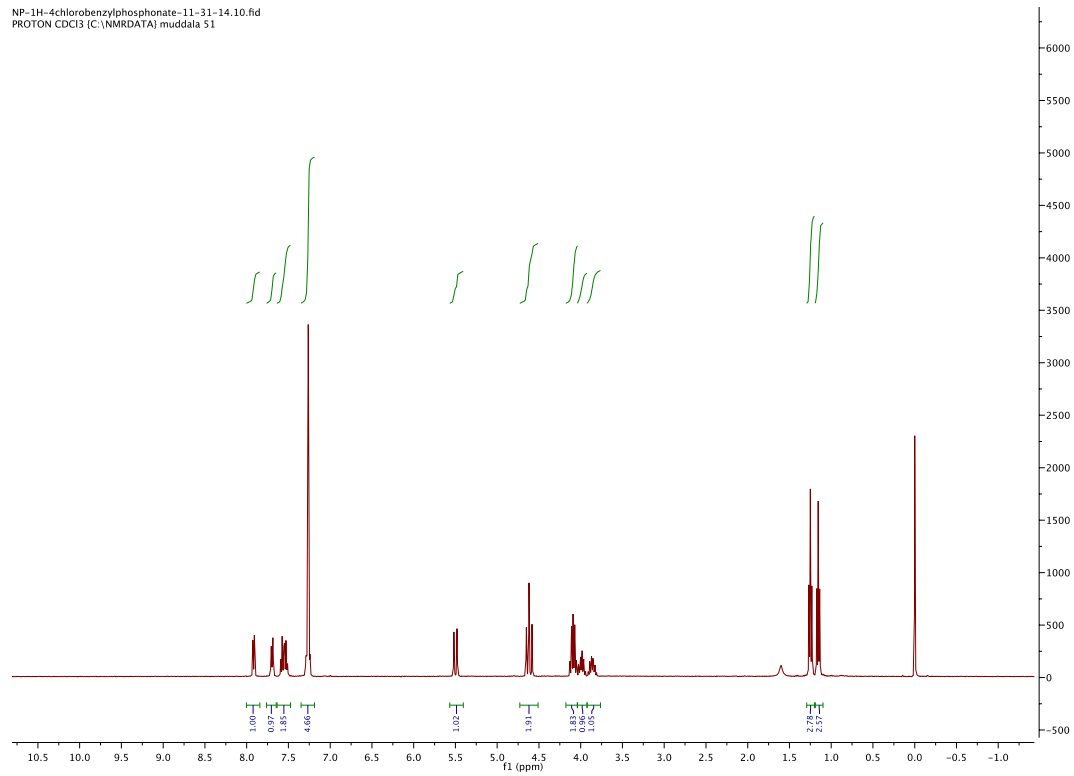


NP-1C-D-trifluoromethylbenzylphosphonate-11-31-14.10.fid
C13CPD32 CDCl3 [C:\NMRDATA] muddala 50

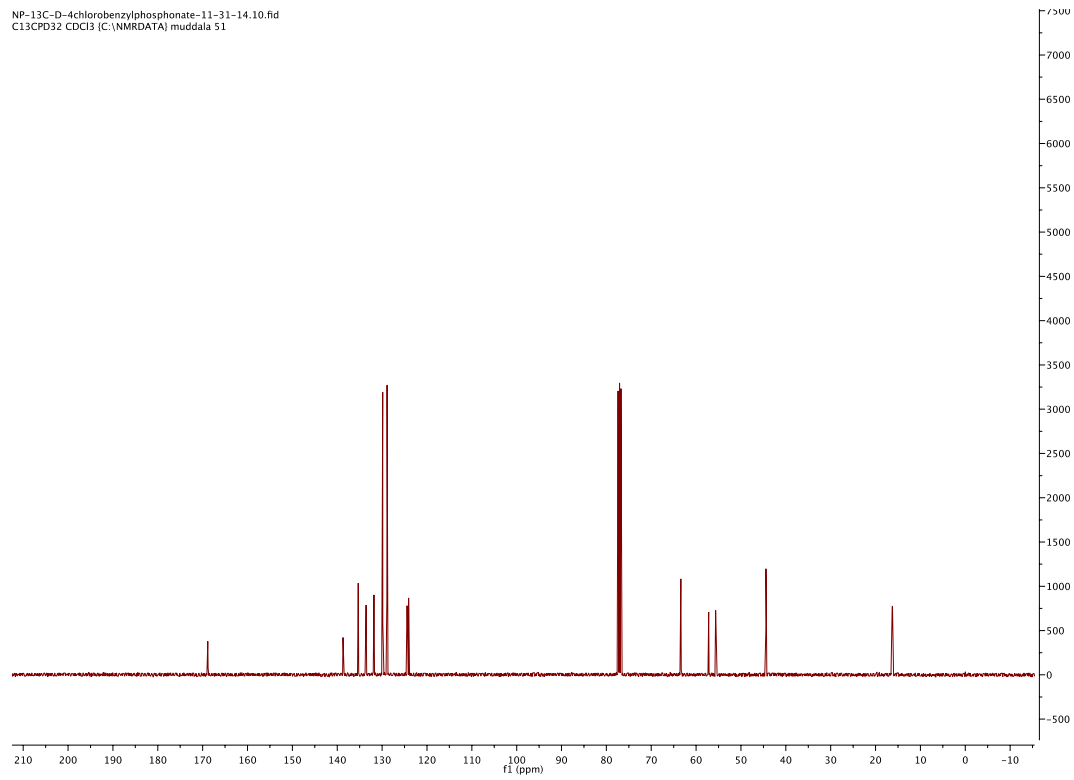


(±)-Diethyl (2-(4-chlorobenzyl)-3-oxoisindolin-1-yl)phosphonate (3d):

NP-1H-4chlorobenzylphosphonate-11-31-14.10.fid
PROTON CDCl3 (C:\NMRDATA) muddala 51

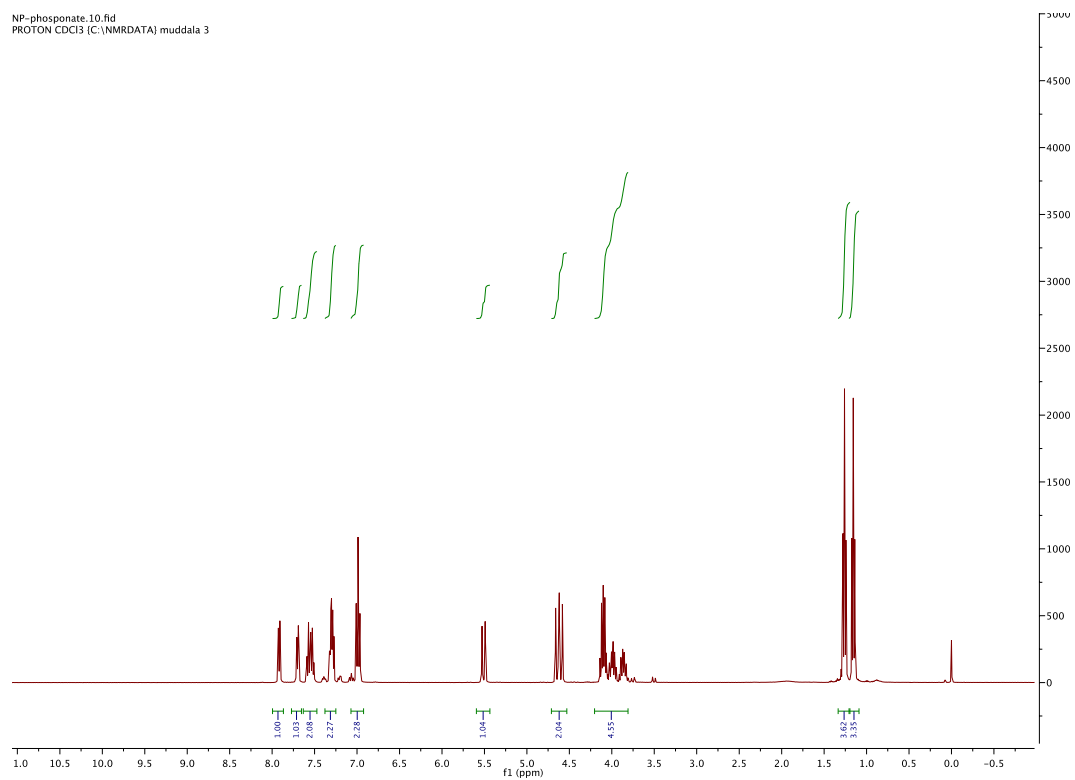


NP-13C-D-4chlorobenzylphosphonate-11-31-14.10.fid
C13CPD32 CDCl3 (C:\NMRDATA) muddala 51

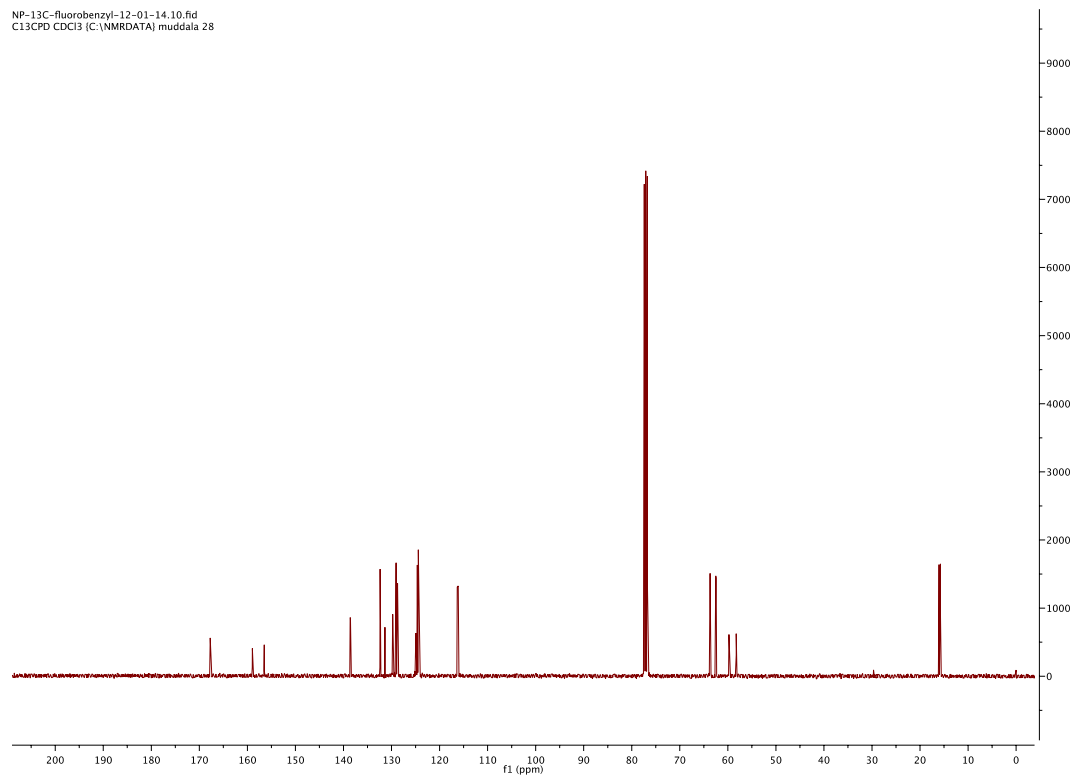


(±)-Diethyl (2-(4-fluorobenzyl)-3-oxoisindolin-1-yl)phosphonate (3e):

NP-phosponate.10.fid
PROTON CDCl3 (C:\NMRDATA) muddala 3

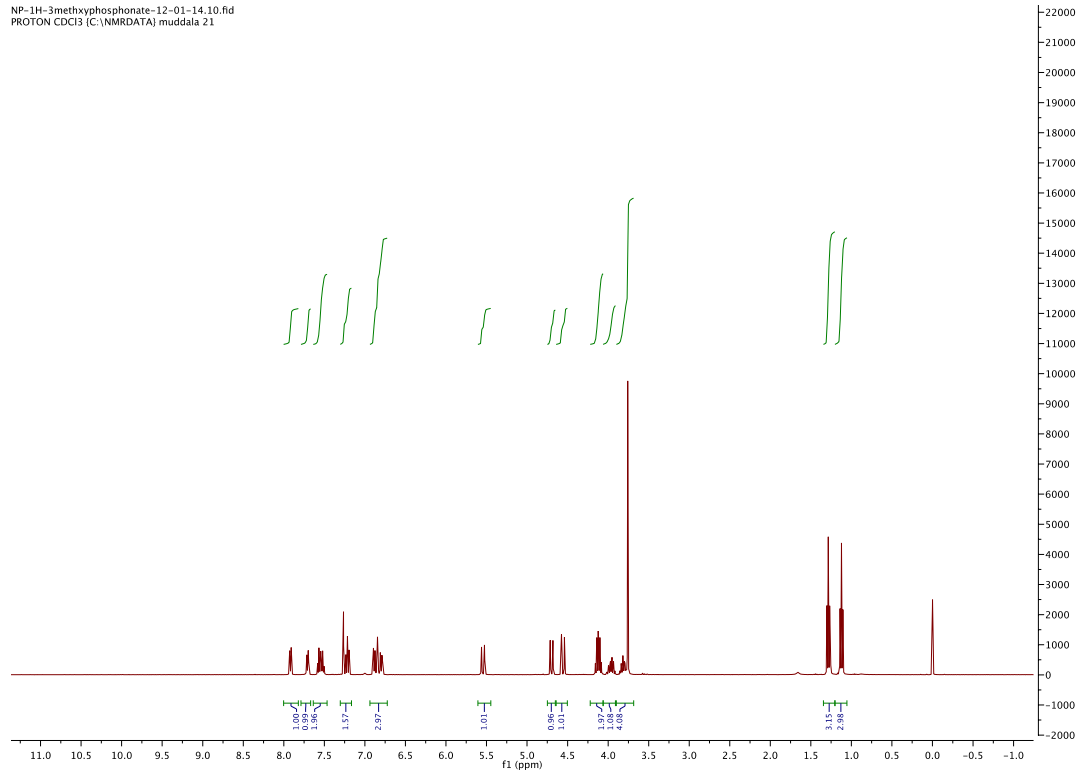


NP-13C-fluorobenzyl-12-01-14.10.fid
C13CPD CDCl3 (C:\NMRDATA) muddala 28

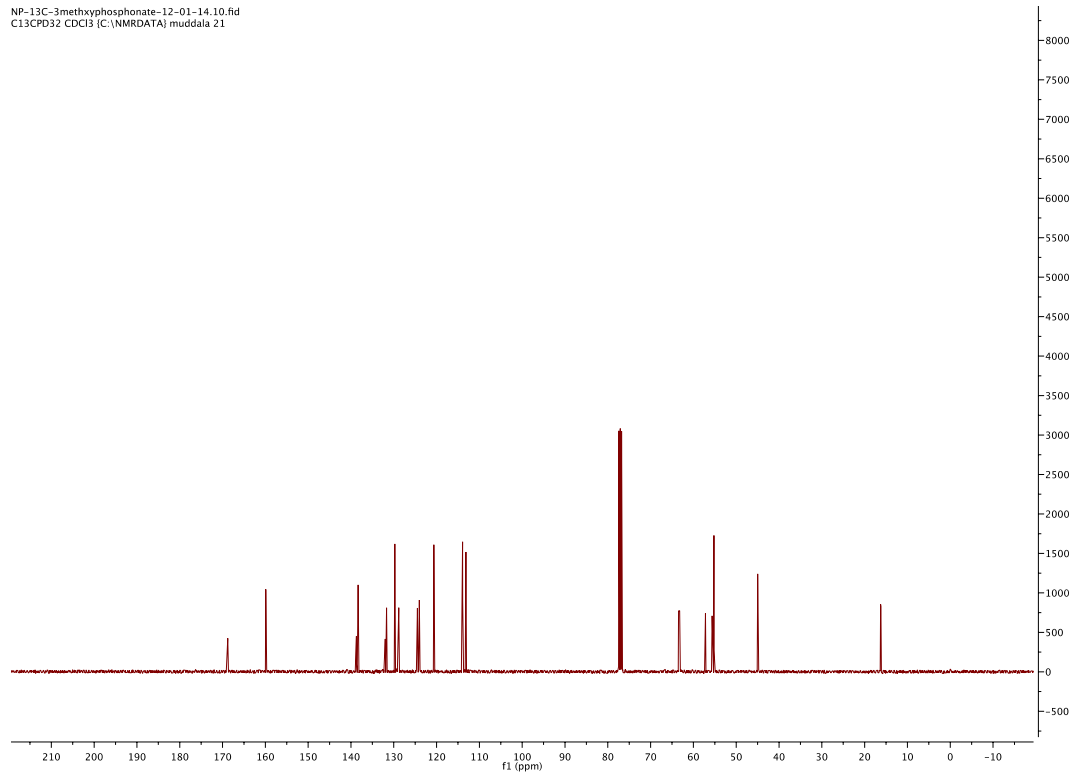


(±)-Diethyl (2-(3-methoxybenzyl)-3-oxoisindolin-1-yl)phosphonate (3f):

NP-1H-3methoxyphosphonate-12-01-14.10.fid
PROTON CDCl3 [C:\NMRDATA] muddala 21

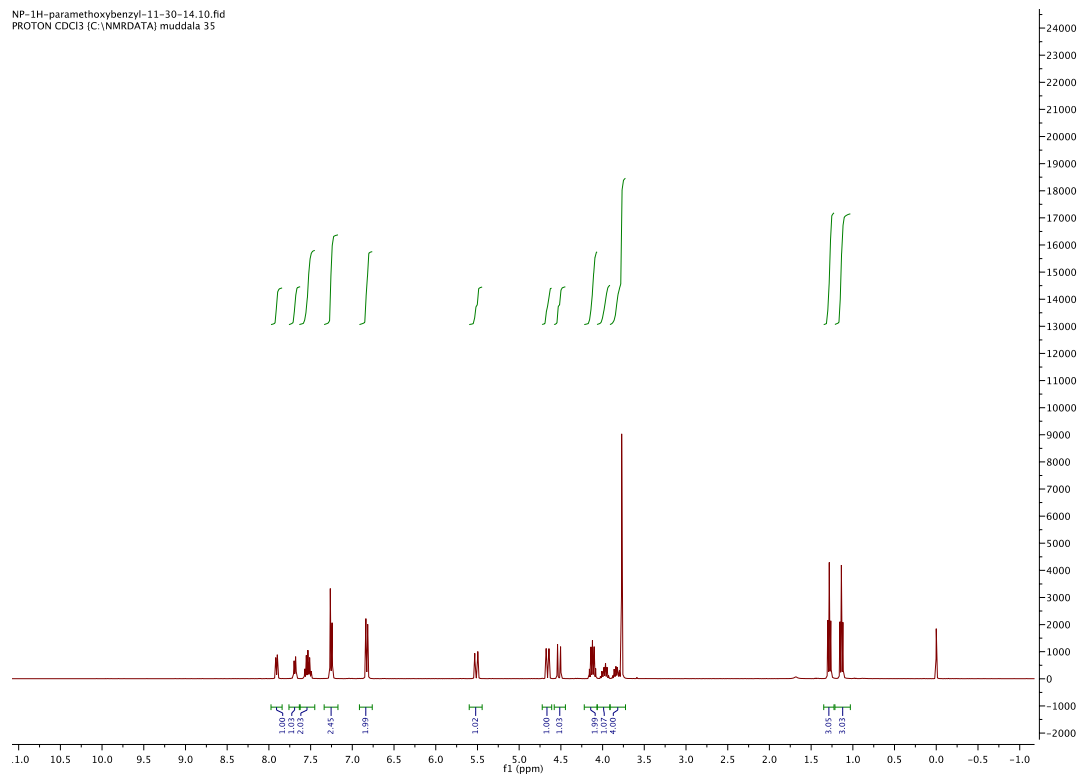


NP-13C-3methoxyphosphonate-12-01-14.10.fid
C13CPD32 CDCl3 [C:\NMRDATA] muddala 21

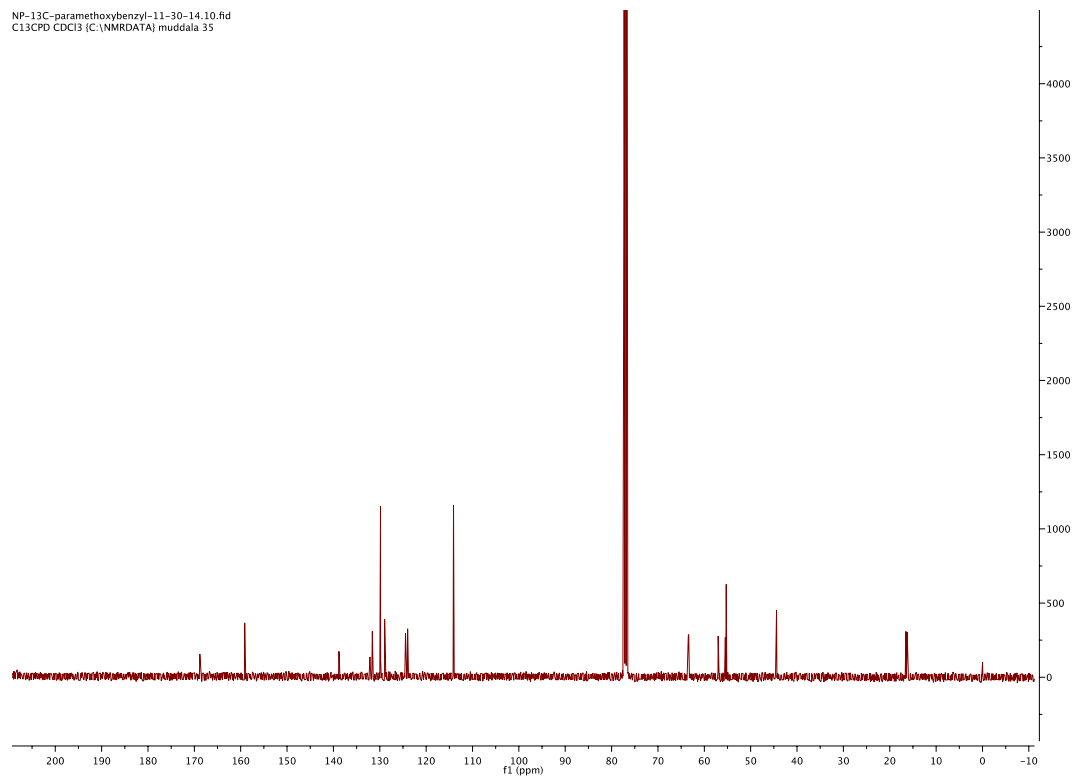


(±)-Diethyl (2-(4-methoxybenzyl)-3-oxoisindolin-1-yl)phosphonate (3g):

NP-1H-paramethoxybenzyl-11-30-14.10.fid
PROTON CDCl3 [C:\NMRDATA] muddala 35

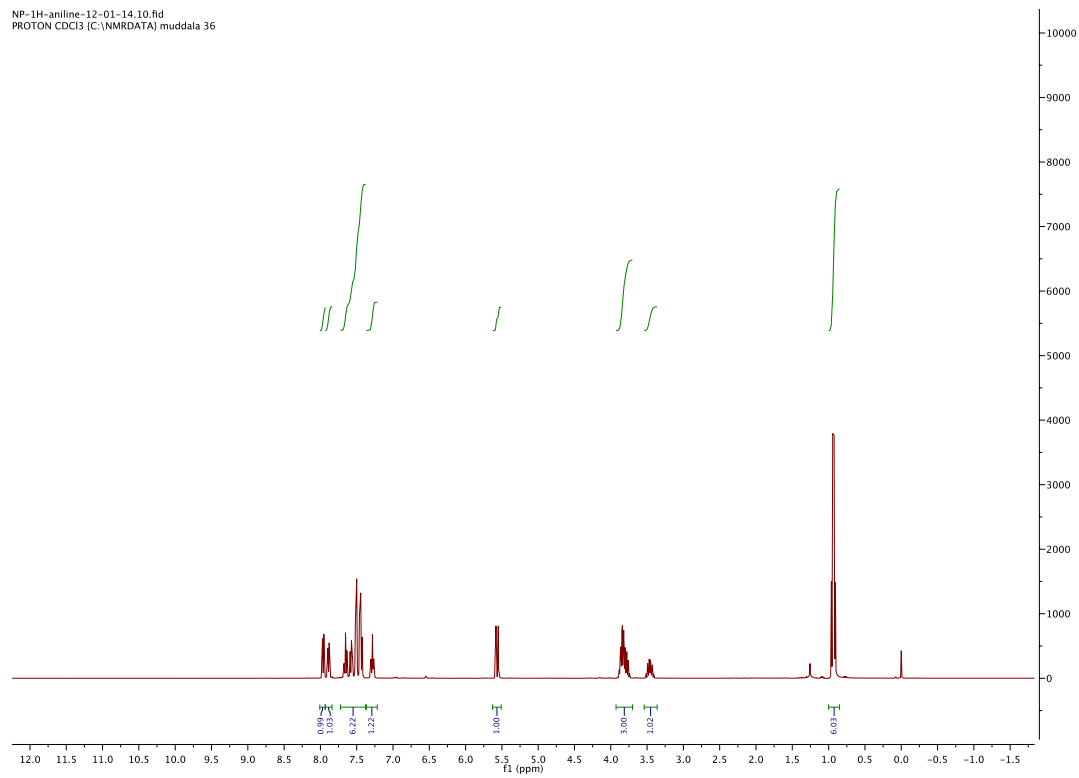


NP-13C-paramethoxybenzyl-11-30-14.10.fid
C13CPD CDCl3 [C:\NMRDATA] muddala 35

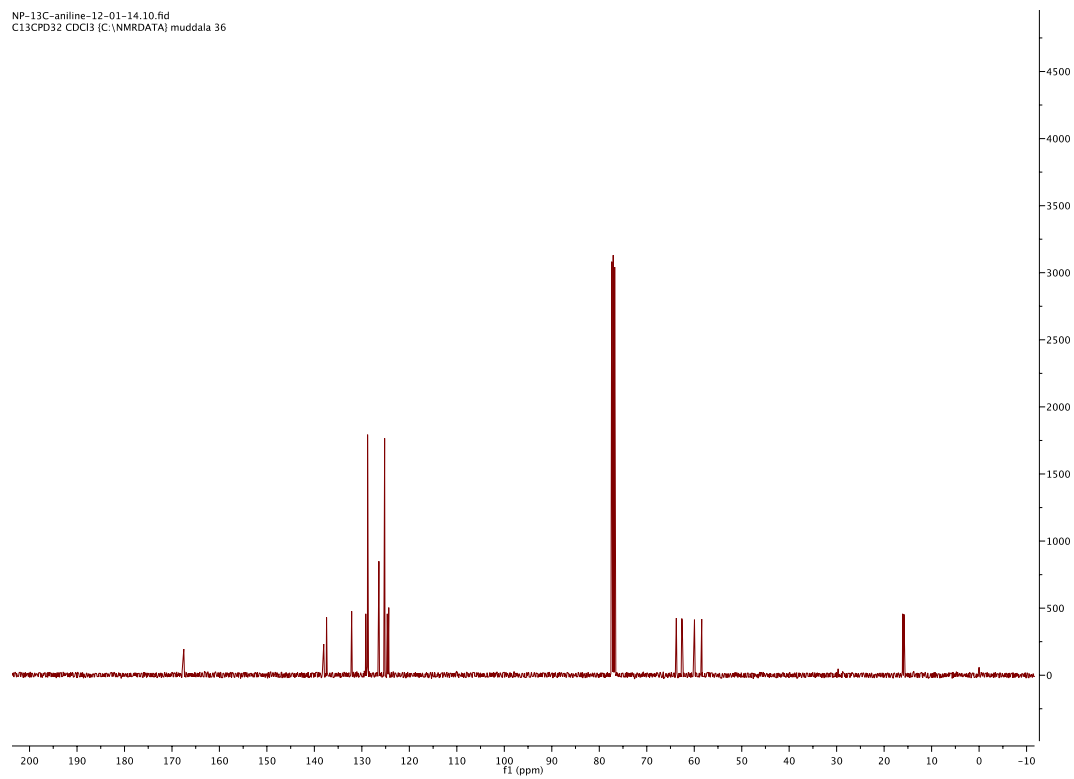


(±)-Diethyl (3-oxo-2-phenylisoindolin-1-yl)phosphonate (3h):

NP-13H-aniline-12-01-14.10.fid
PROTON CDCl3 [C:\NMRDATA] muddala 36

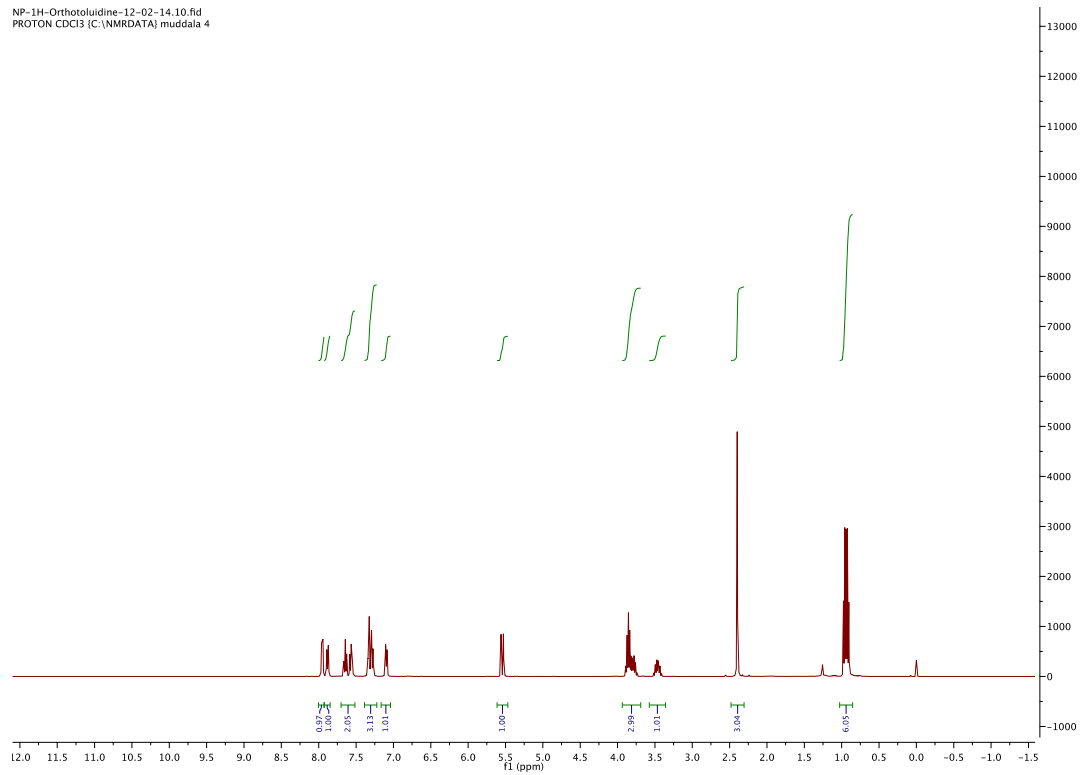


NP-13C-aniline-12-01-14.10.fid
C13CPD32 CDCl3 [C:\NMRDATA] muddala 36

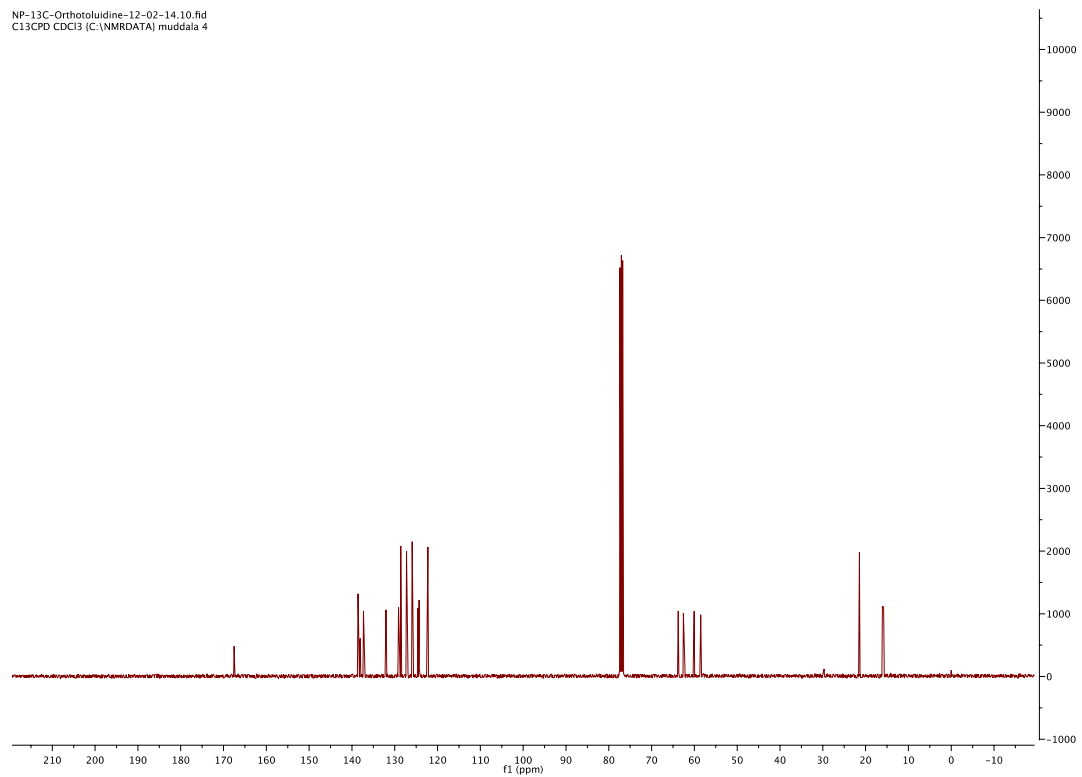


(±)-Diethyl [2-(2-methylphenyl)-3-oxoisindolin-1-yl]phosphonate (3i):

NP-1H-Orthotoluidine-12-02-14.10.fid
PROTON CDCl3 [C:\NMRDATA] muddala 4

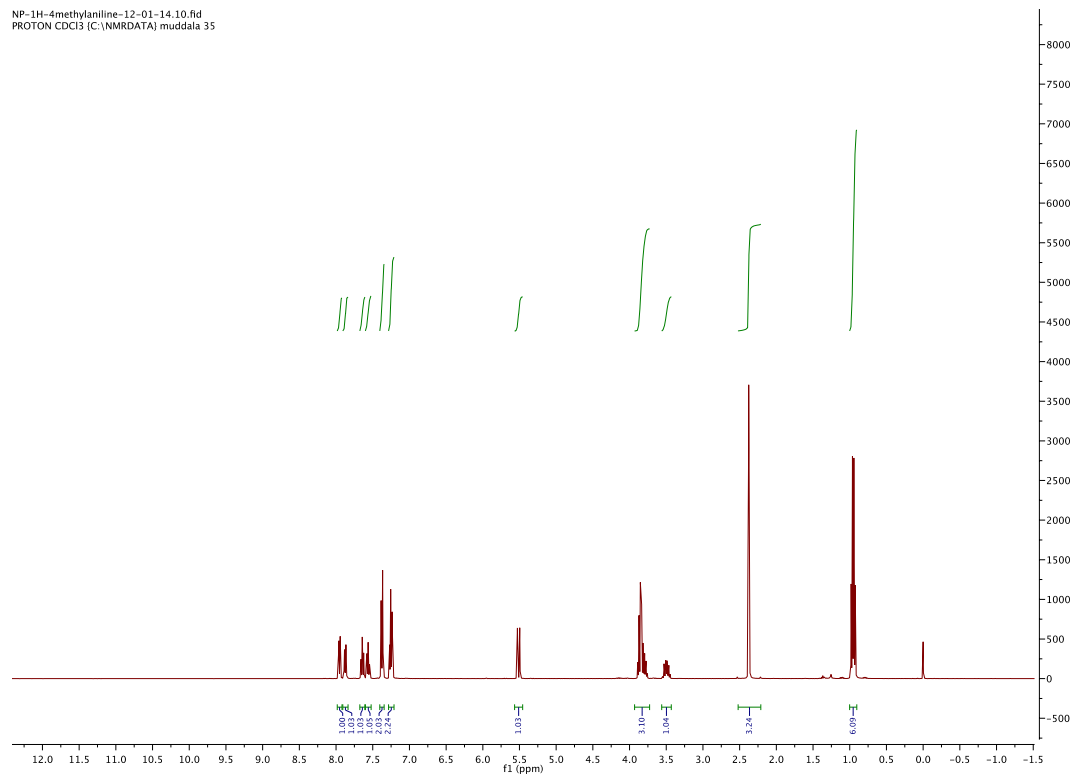


NP-13C-Orthotoluidine-12-02-14.10.fid
C13CPD CDCl3 [C:\NMRDATA] muddala 4

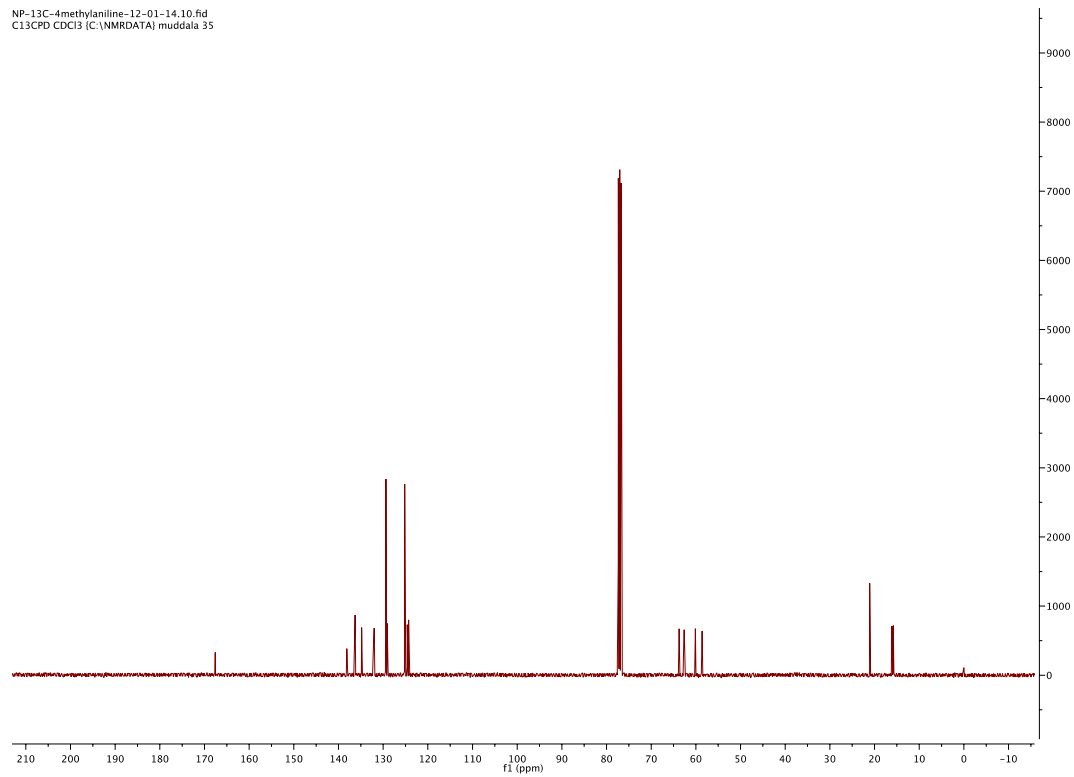


(±)-Diethyl [2-(4-methylphenyl)-3-oxoisoindolin-1-yl]phosphonate (3j):

NP-1H-4methylaniline-12-01-14.10.fid
PROTON CDCl3 [C:\NMRDATA] muddala 35

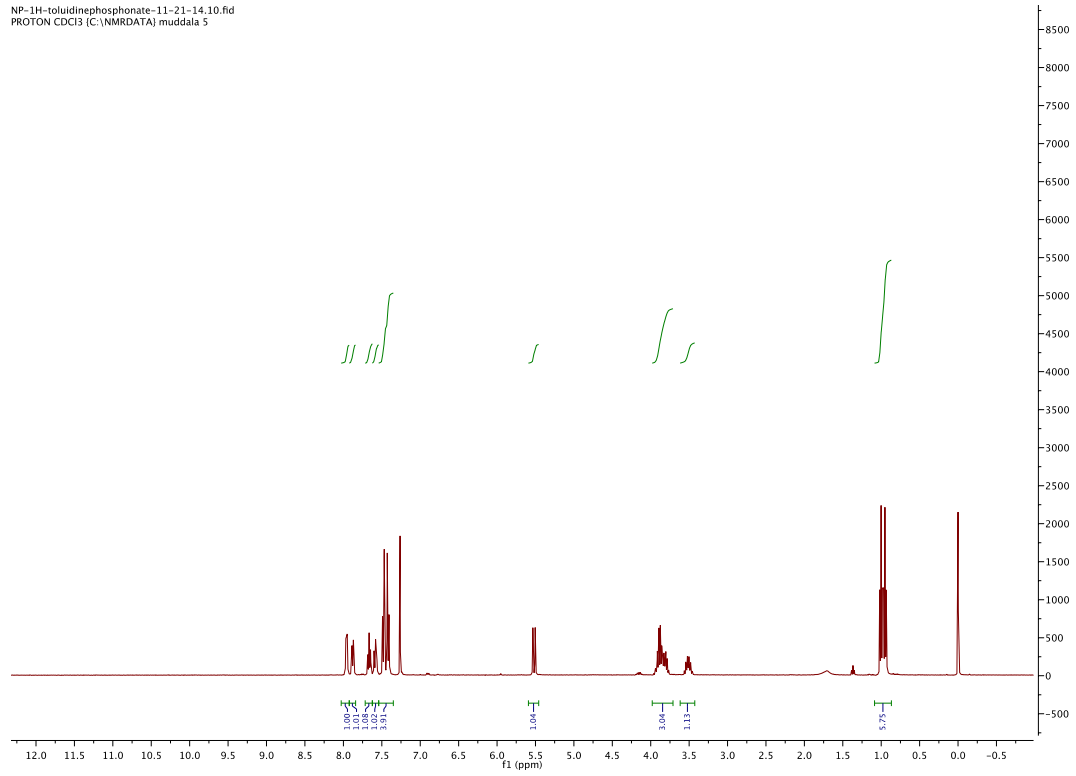


NP-13C-4methylaniline-12-01-14.10.fid
C13CPD CDCl3 [C:\NMRDATA] muddala 35

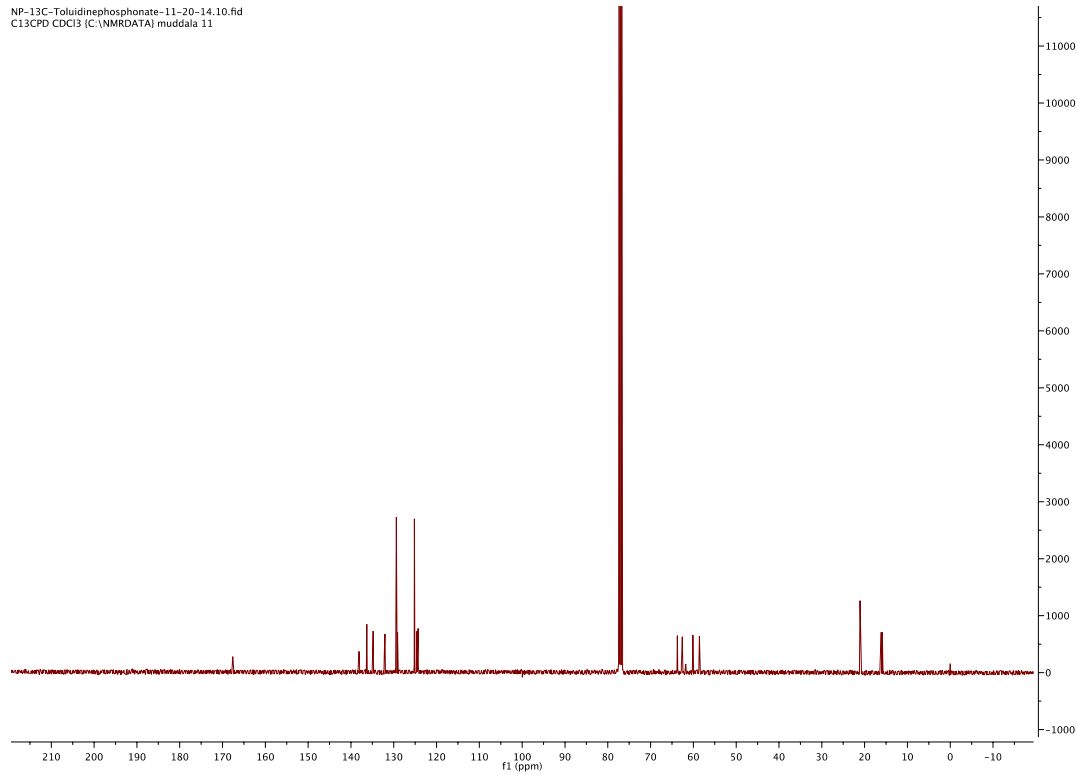


(±)-Diethyl (2-(4-chlorophenyl)-3-oxoisindolin-1-yl)phosphonate (3k):

NP-1H-Toluidinephosphonate-11-21-14.10.fid
PROTON CDCl3 (C:\NMRDATA) muddala 5

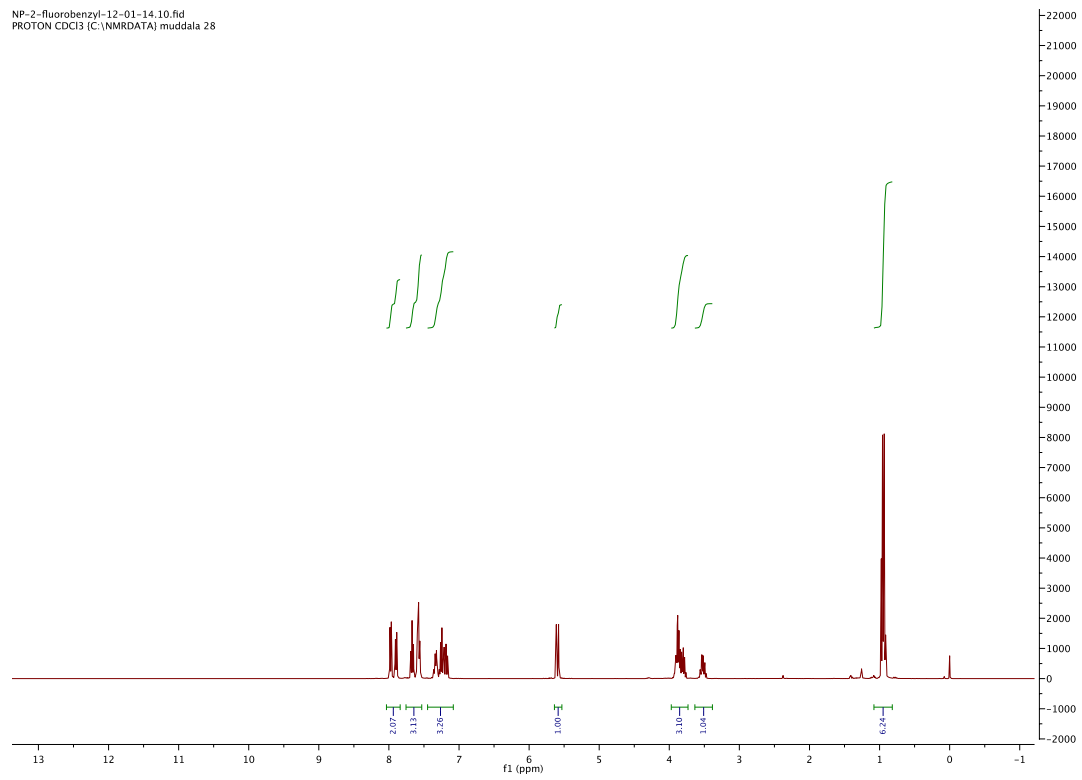


NP-13C-Toluidinephosphonate-11-20-14.10.fid
C13CPD CDCl3 (C:\NMRDATA) muddala 11

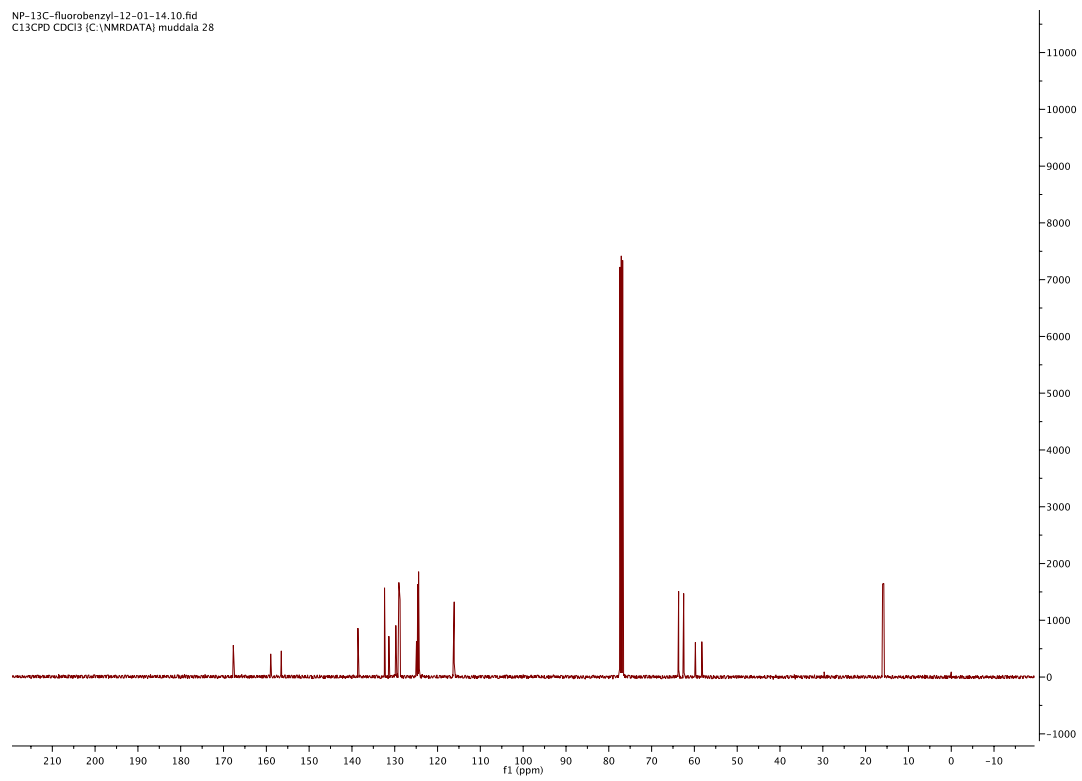


(±)-Diethyl (2-(2-fluorophenyl)-3-oxoisindolin-1-yl)phosphonate (3l):

NP-2-fluorobenzyl-12-01-14.10.fid
PROTON CDCl3 [C:\NMRDATA] muddala 28

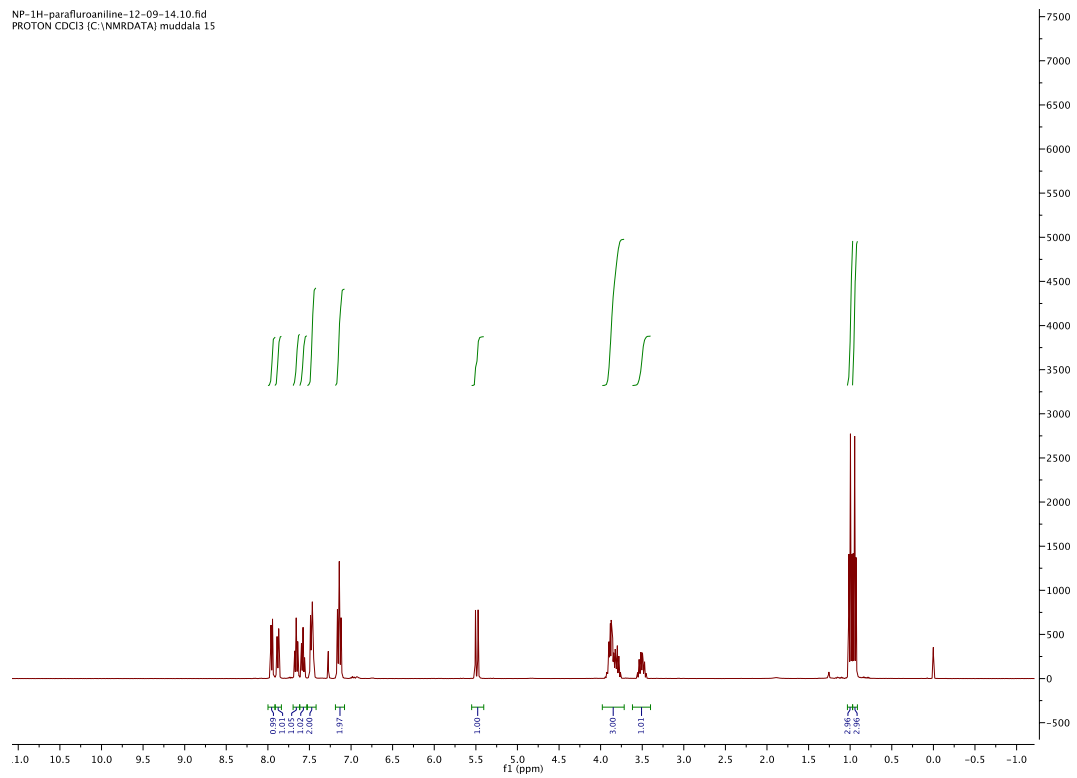


NP-13C-fluorobenzyl-12-01-14.10.fid
C13CPD CDCl3 [C:\NMRDATA] muddala 28

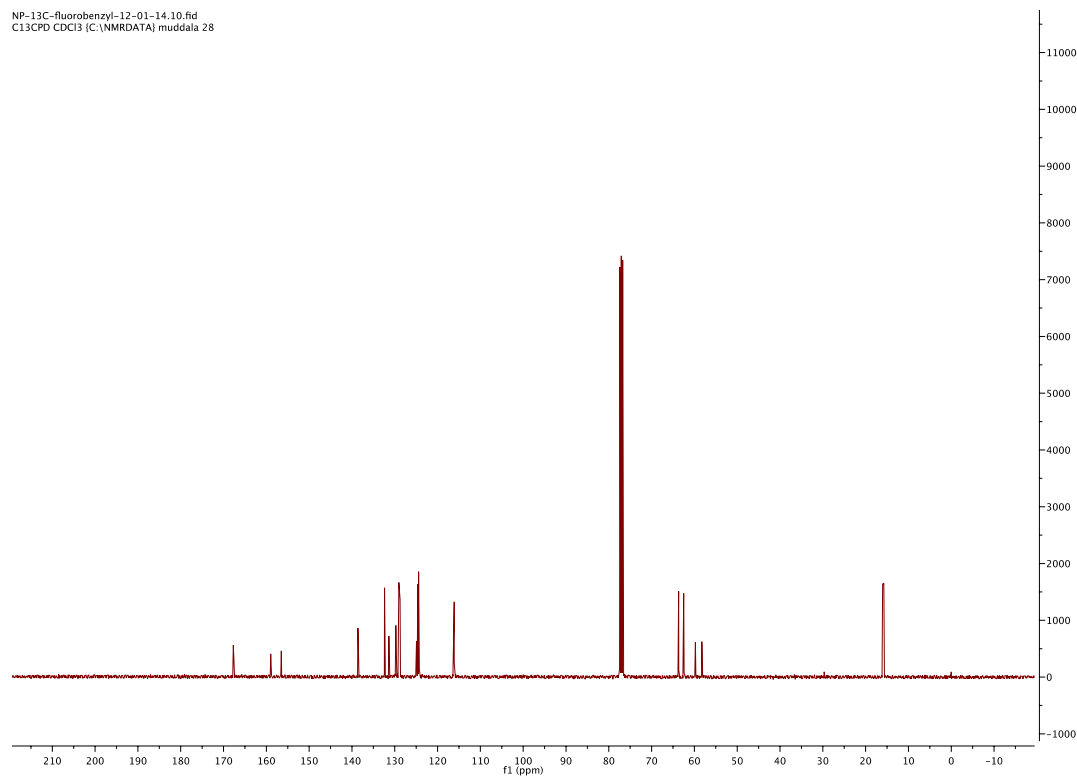


(±)-Diethyl (2-(4-fluorophenyl)-3-oxoisindolin-1-yl)phosphonate (3m):

NP-1H-parafuoroaniline-12-09-14.10.fid
PROTON CDCl3 [C:\NMRDATA] muddala 15

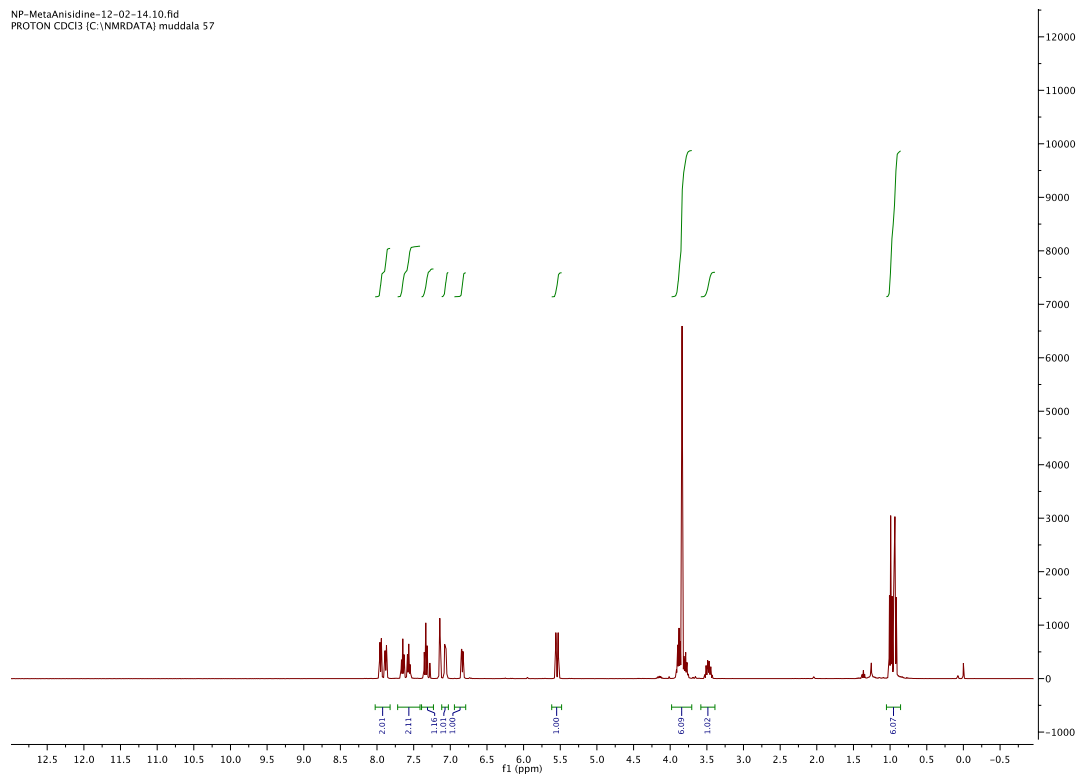


NP-13C-fluorobenzyl-12-01-14.10.fid
C13CPD CDCl3 [C:\NMRDATA] muddala 28

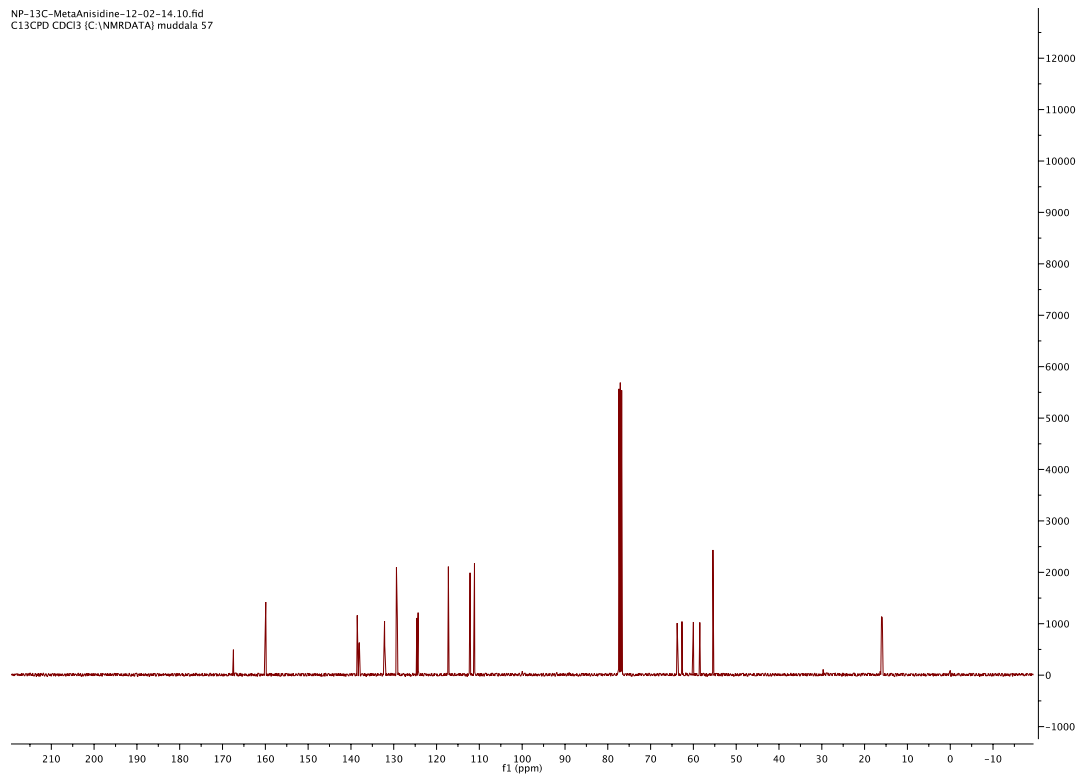


(±)-Diethyl (2-(3-methoxyphenyl)-3-oxoisindolin-1-yl)phosphonate (3n):

NP-MetaAnisidine-12-02-14.10.fid
PROTON CDCl3 [C:\NMRDATA] muddala 57

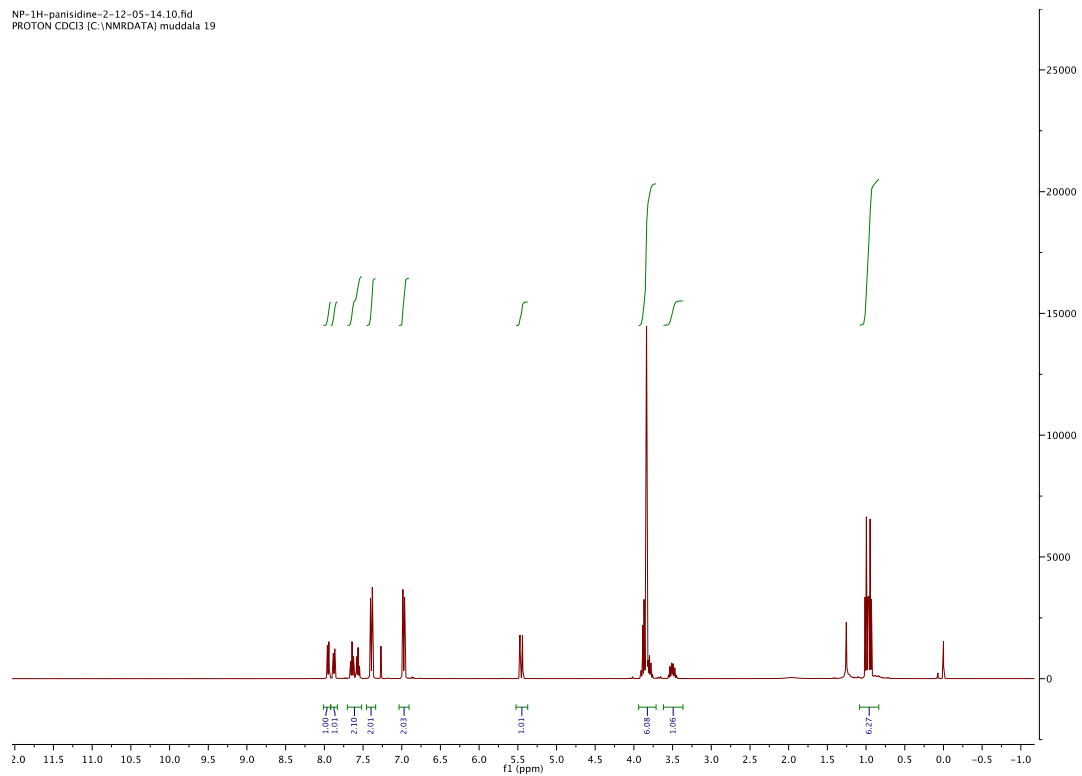


NP-13C-MetaAnisidine-12-02-14.10.fid
C13CPD CDCl3 [C:\NMRDATA] muddala 57

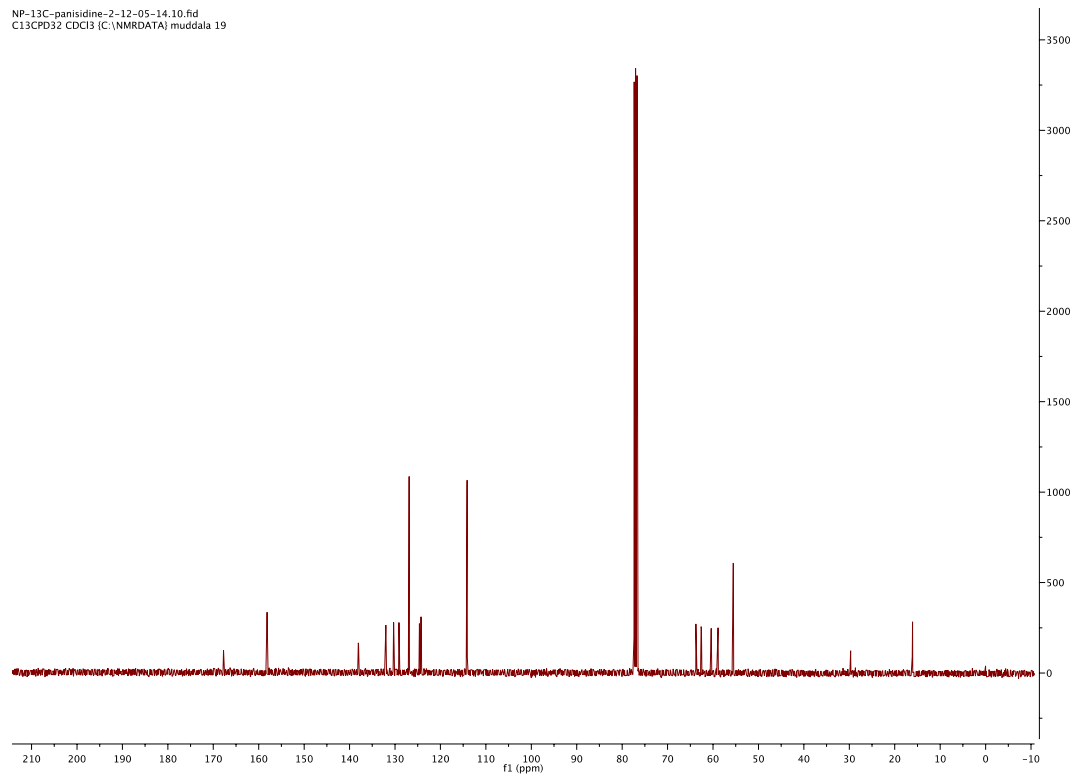


(±)-Diethyl (2-(4-methoxyphenyl)-3-oxoisindolin-1-yl)phosphonate (3o):

NP-1H-panisidine-2-12-05-14.10.fid
PROTON CDCl3 [C:\NMRDATA] muddala 19

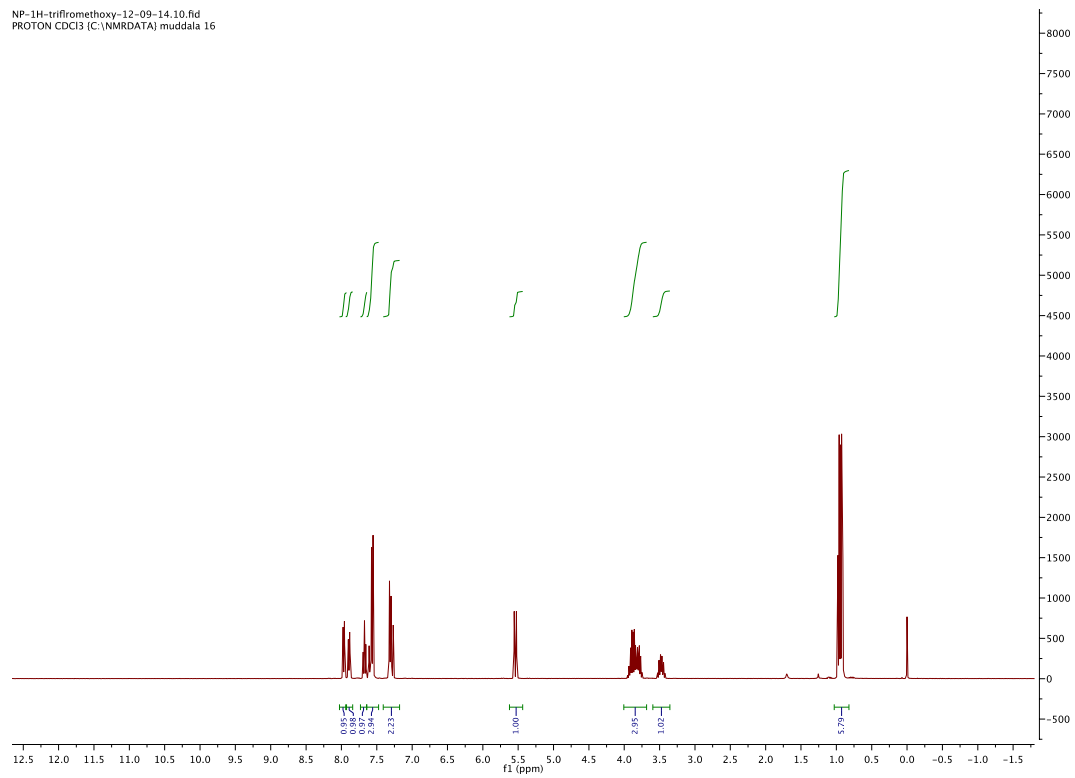


NP-13C-panisidine-2-12-05-14.10.fid
C13CPD32 CDCl3 [C:\NMRDATA] muddala 19

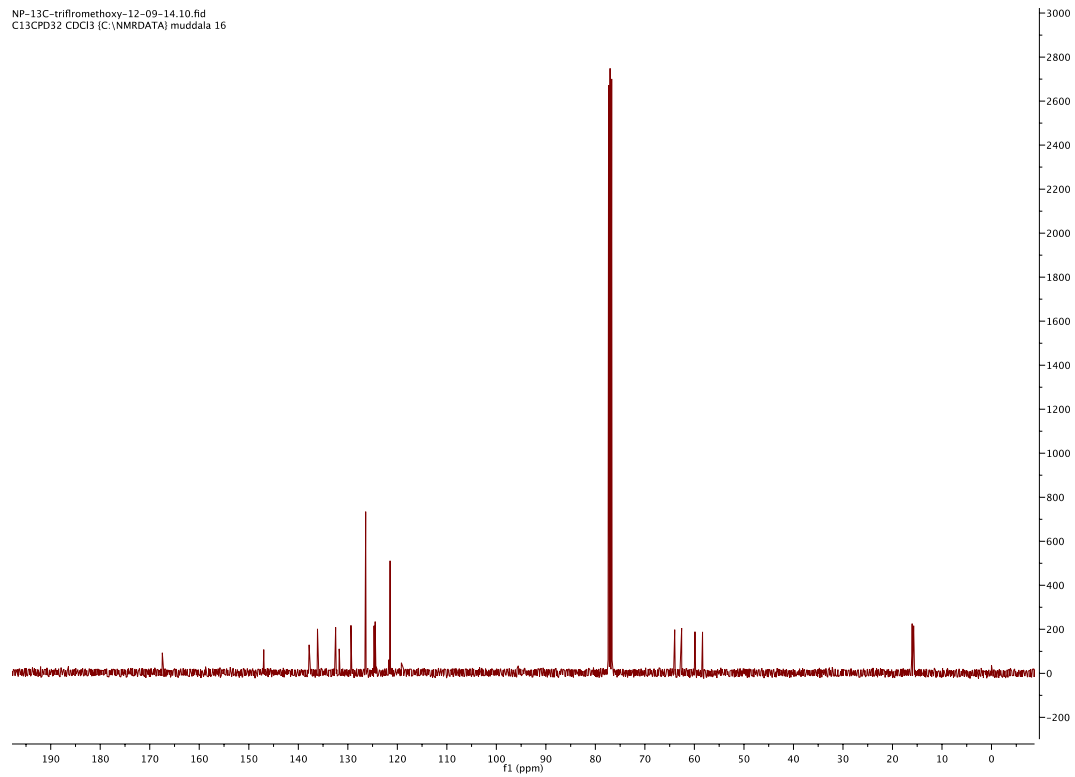


(±)-Diethyl (3-oxo-2-(4-(trifluoromethoxy)phenyl)isoindolin-1-yl)phosphonate (3p):

NP-1H-trifluoromethoxy-12-09-14.10.fid
PROTON CDCl3 [C:\NMRDATA] muddala 16

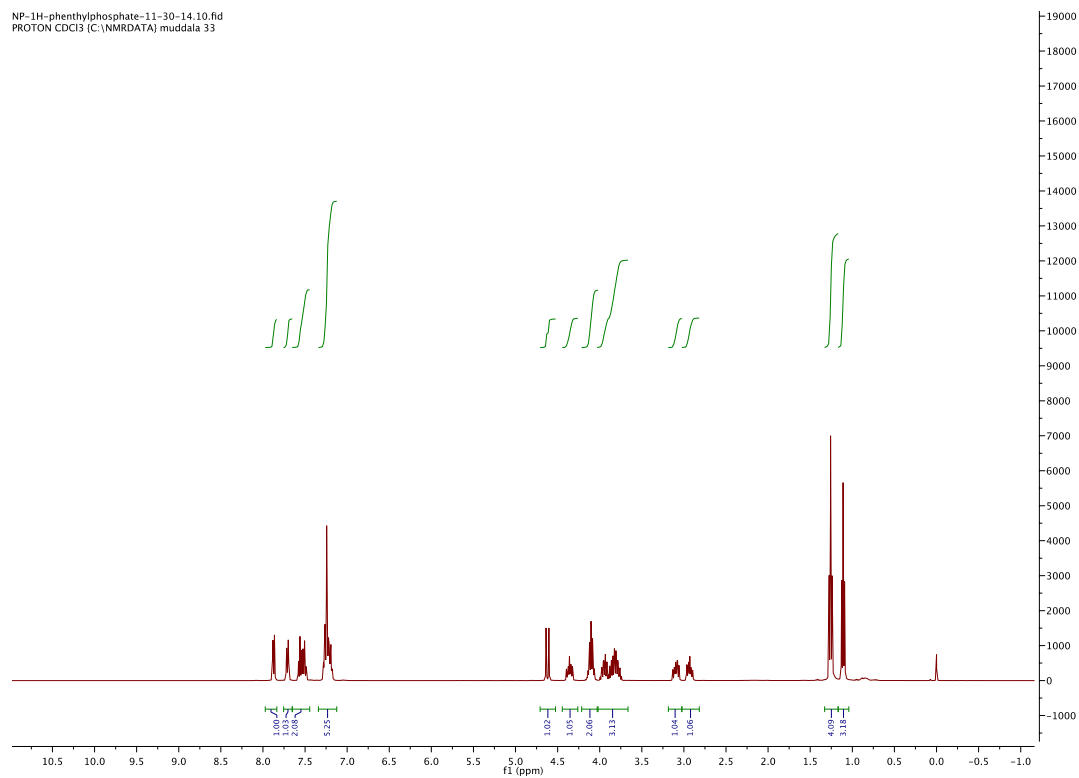


NP-13C-trifluoromethoxy-12-09-14.10.fid
C13CPD32 CDCl3 [C:\NMRDATA] muddala 16

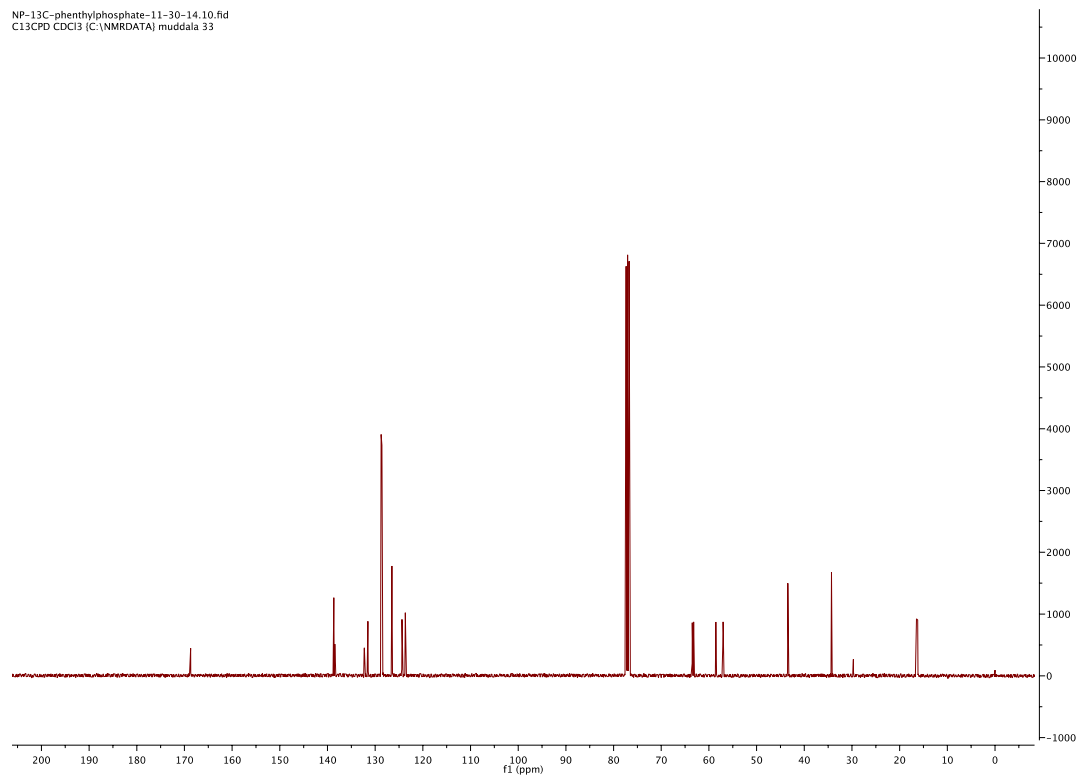


(±)-Diethyl (3-oxo-2-phenethylisoindolin-1-yl)phosphonate (3q):

NP-1H-phentylphosphate-11-30-14.10.fid
PROTON CDCl3 (C:\NMRDATA) muddala 33

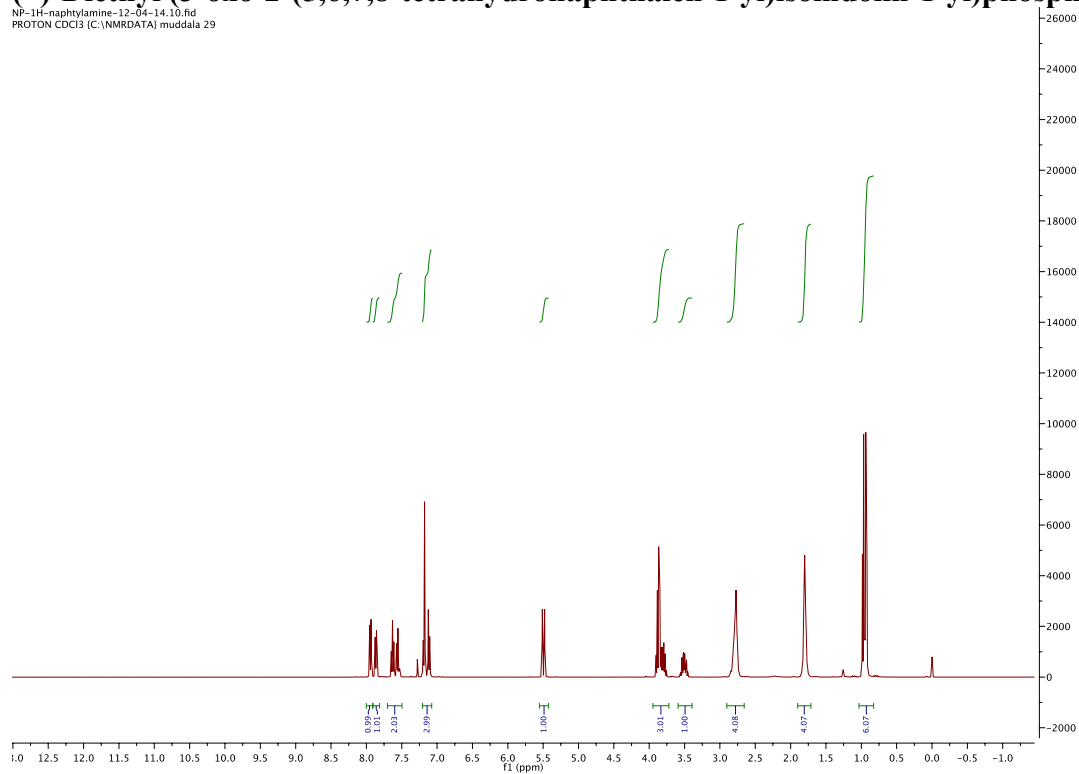


NP-13C-phentylphosphate-11-30-14.10.fid
C13CPD CDCl3 (C:\NMRDATA) muddala 33

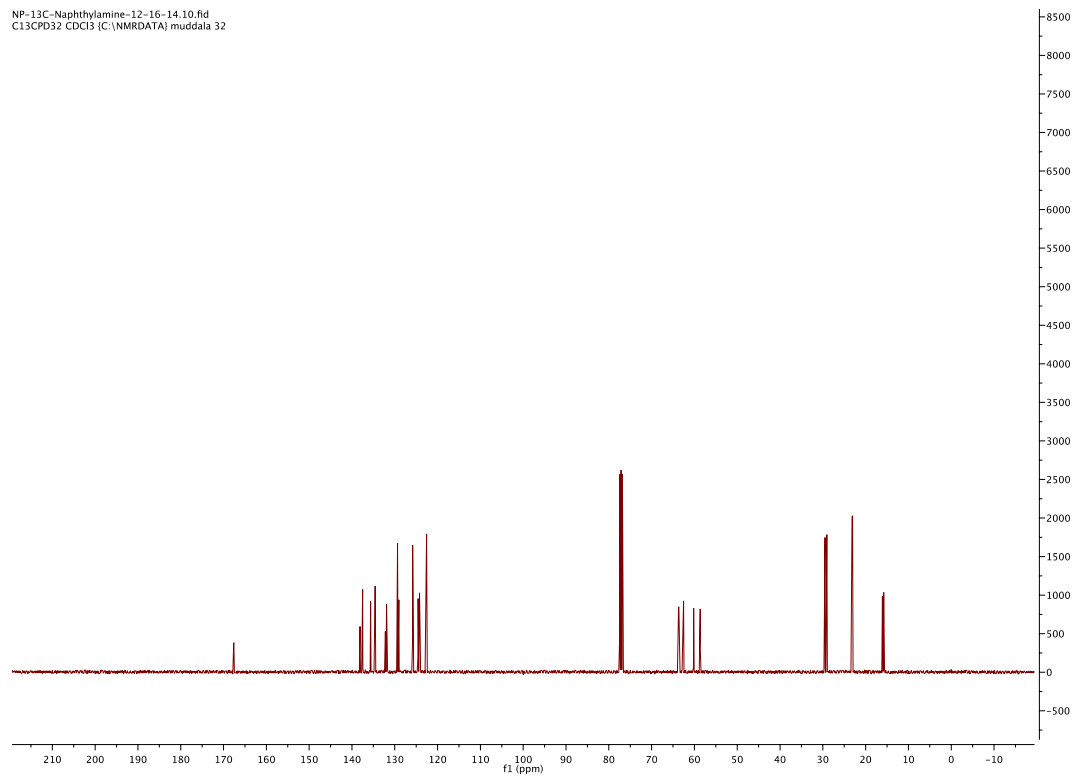


(±)-Diethyl (3-oxo-2-(5,6,7,8-tetrahydronaphthalen-1-yl)isoindolin-1-yl)phosphonate (3r):

NP-1H-naphthylamine-12-04-14.10.fid
PROTON CDCl3 [C:\NMRDATA] muddala 29

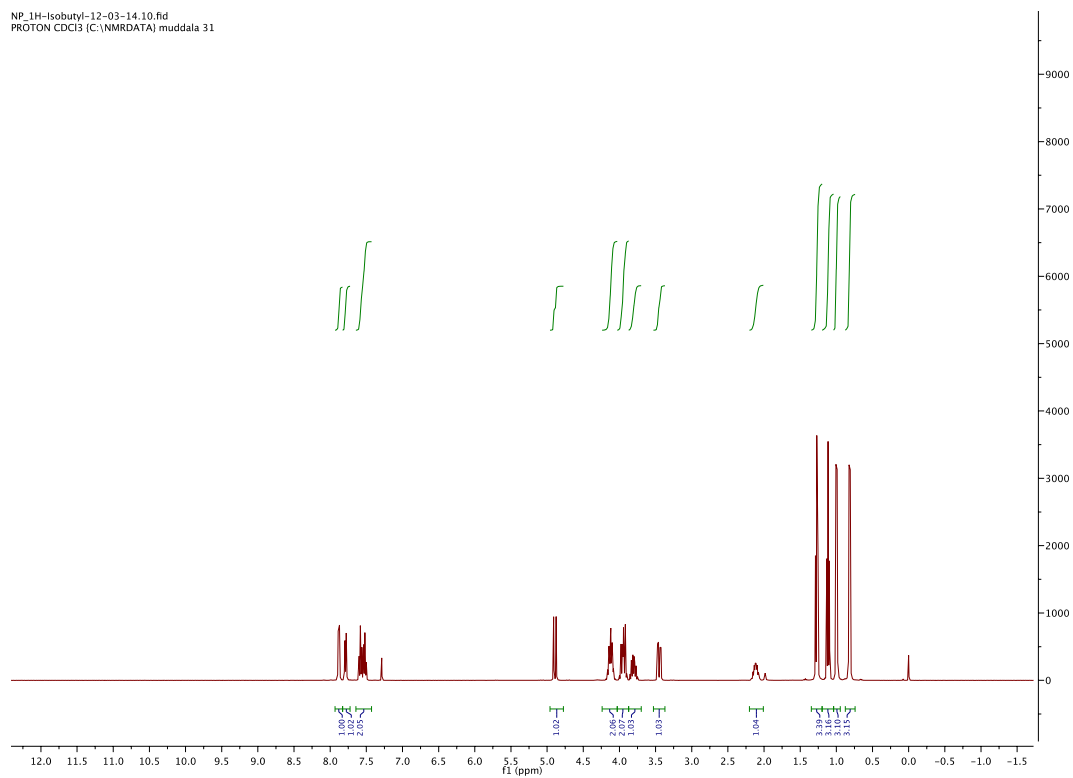


NP-13C-Naphthylamine-12-16-14.10.fid
C13CPD32 CDCl3 [C:\NMRDATA] muddala 32

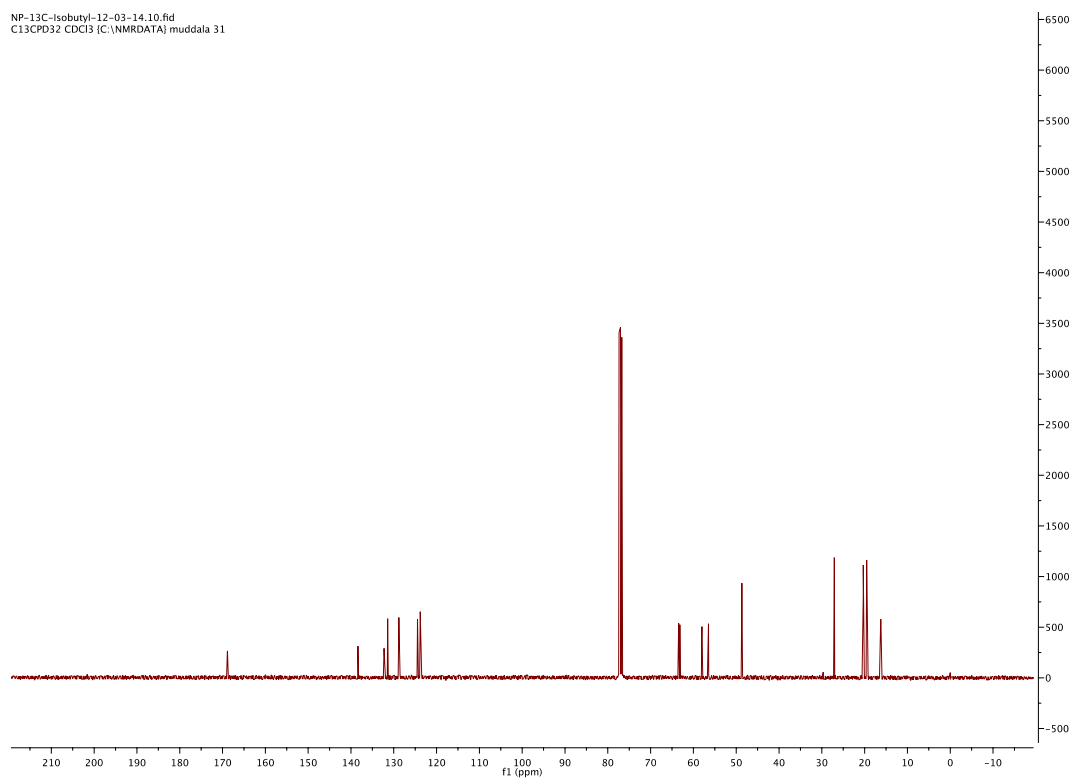


(±)-Diethyl (2-isobutyl-3-oxoisoindolin-1-yl)phosphonate (3s):

NP_1H-Isobutyl-12-03-14.10.fid
PROTON CDCl3 (C:\NMRDATA) muddala 31

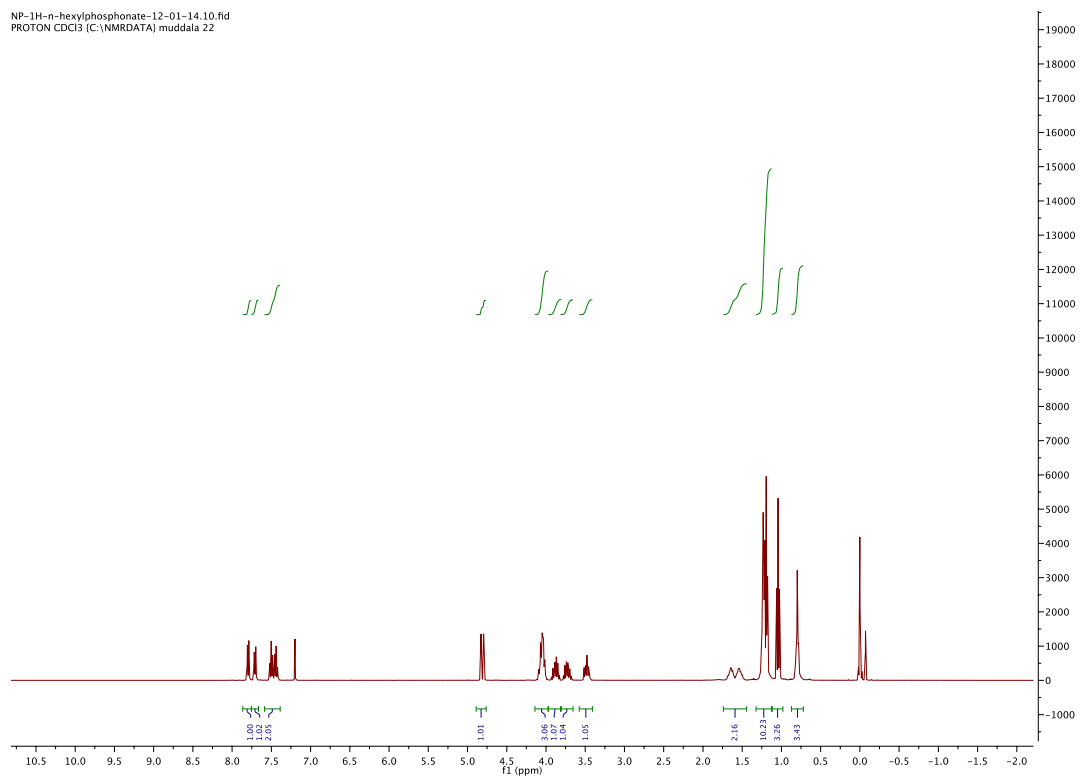


NP-13C-Isobutyl-12-03-14.10.fid
C13CPD32 CDCl3 (C:\NMRDATA) muddala 31

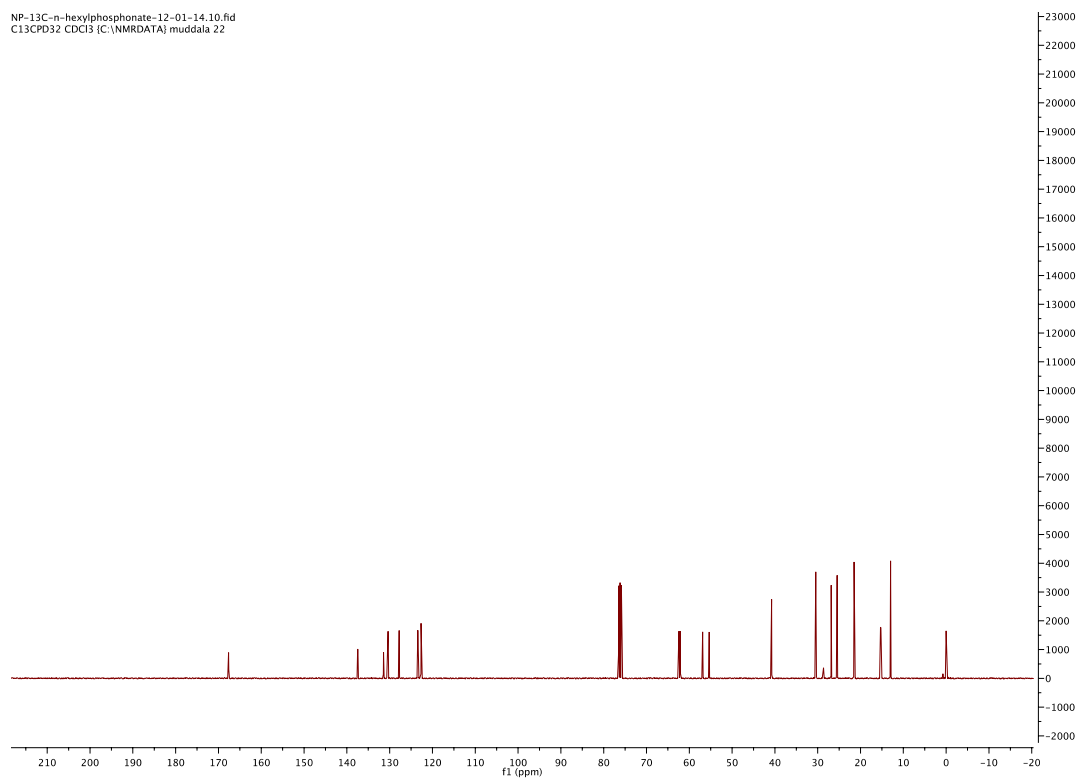


(±)-Diethyl (2-hexyl-3-oxoisindolin-1-yl)phosphonate (3t):

NP-1H-n-hexylphosphonate-12-01-14.10.fid
PROTON CDCl3 [C:\NMRDATA] muddala 22

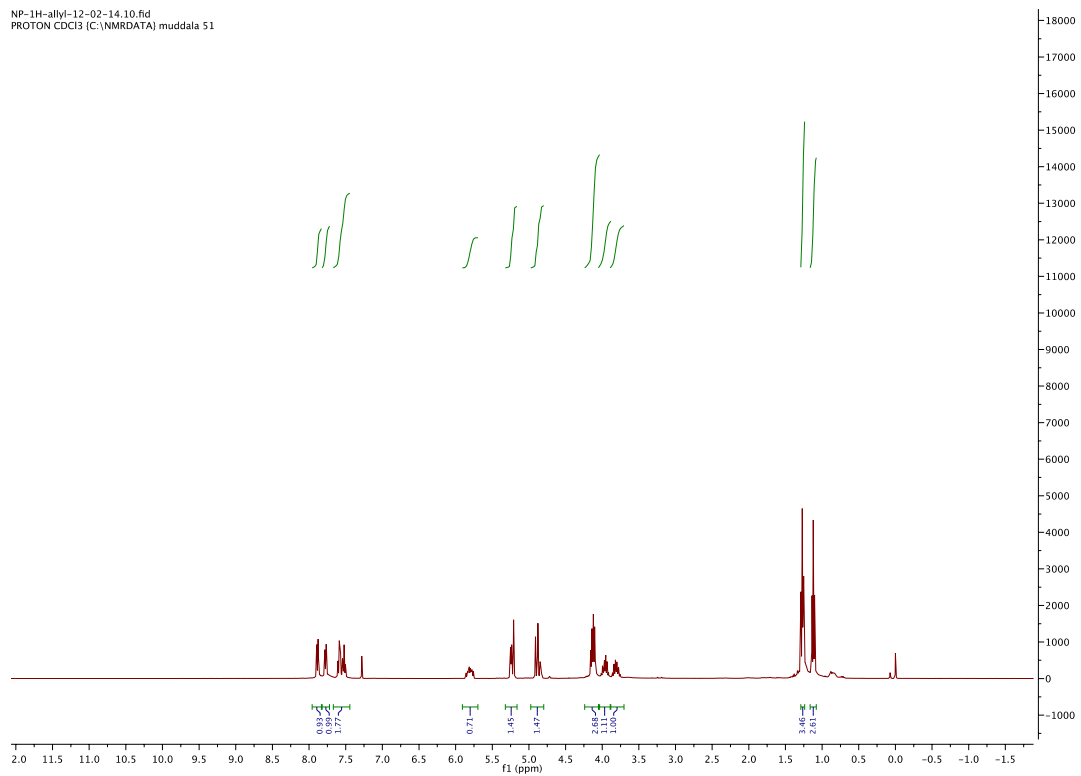


NP-13C-n-hexylphosphonate-12-01-14.10.fid
C13CPD32 CDCl3 [C:\NMRDATA] muddala 22

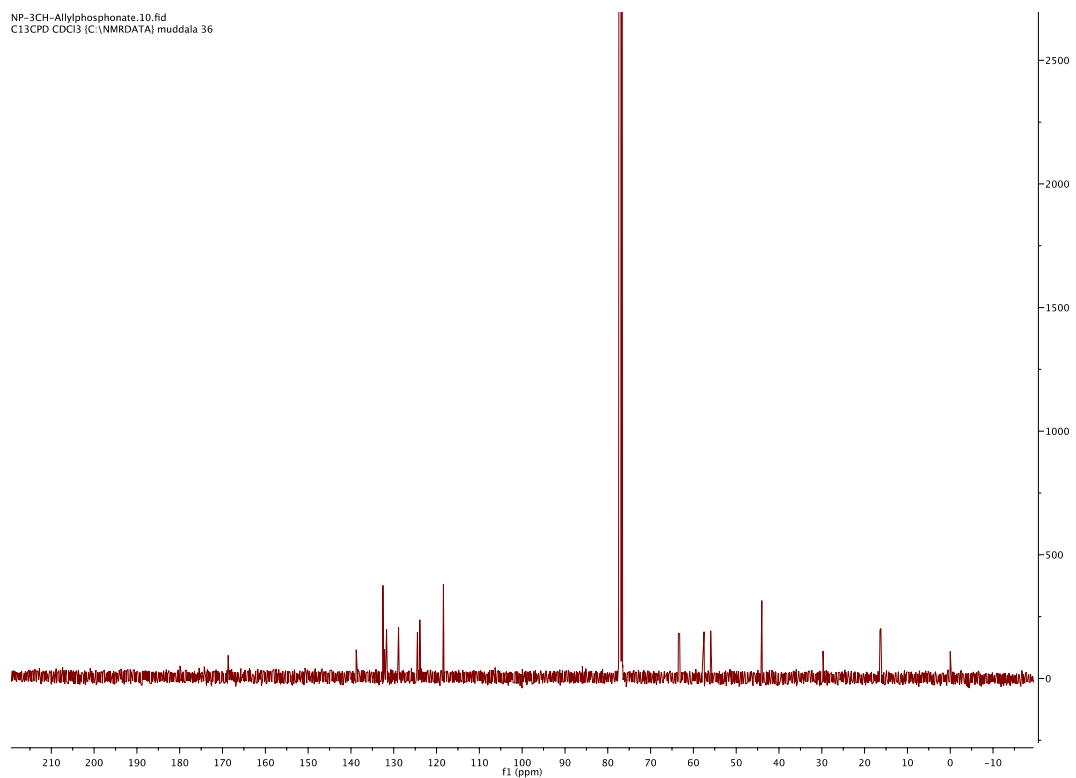


(±)-Diethyl (2-allyl-3-oxoisindolin-1-yl)phosphonate (3u):

NP-1H-allyl-12-02-14.10.fid
PROTON CDCl3 (C:\NMRDATA) muddala 51

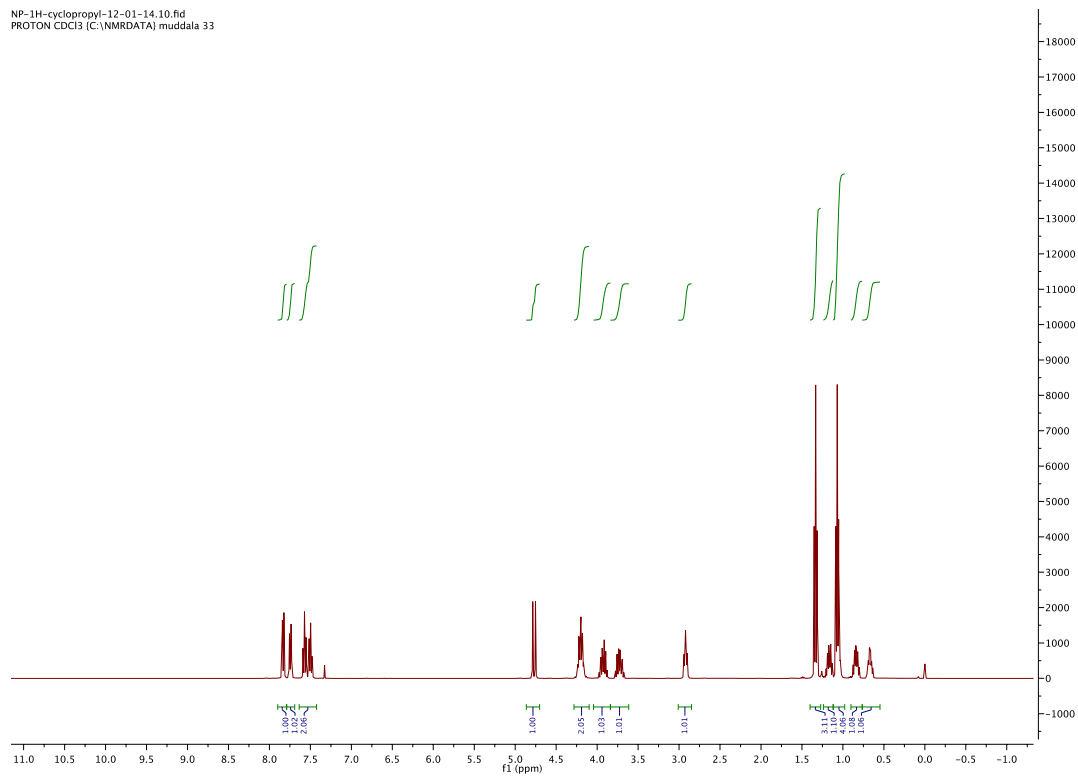


NP-3CH-Allylphosphonate.10.fid
C13CPD CDCl3 (C:\NMRDATA) muddala 36

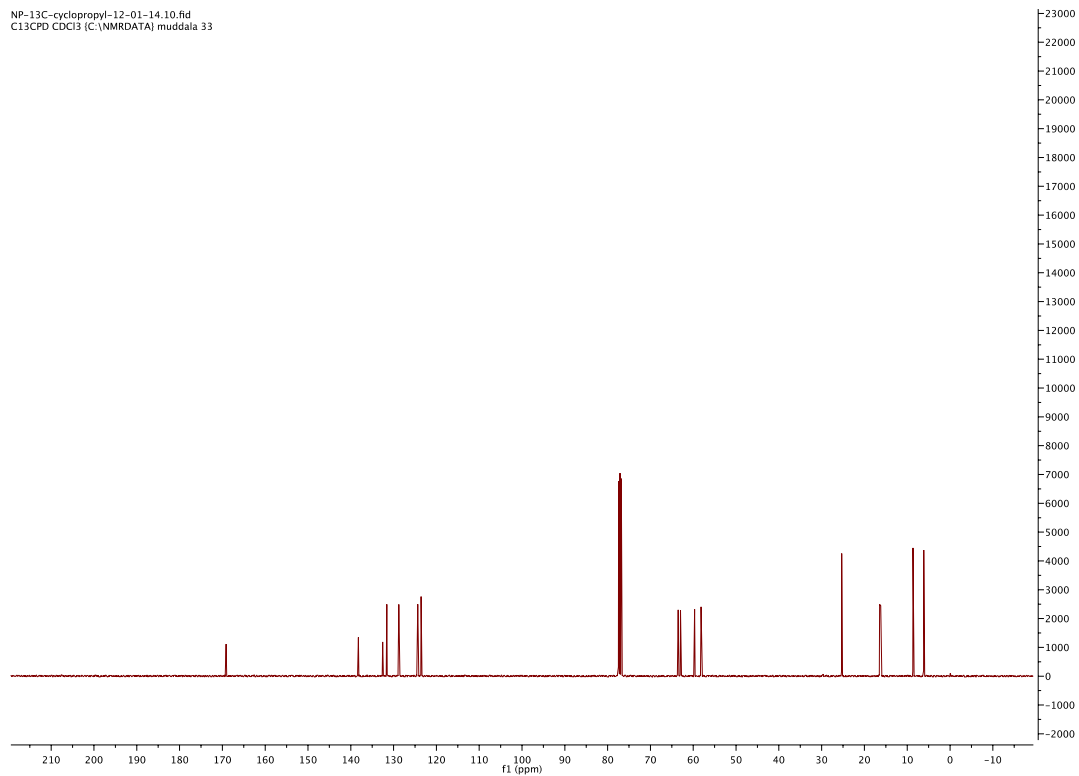


(±)-Diethyl (2-cyclopropyl-3-oxoisindolin-1-yl)phosphonate (3v):

NP-1H-cyclopropyl-12-01-14.10.fid
PROTON CDCl3 (C:\NMRDATA) muddala 33

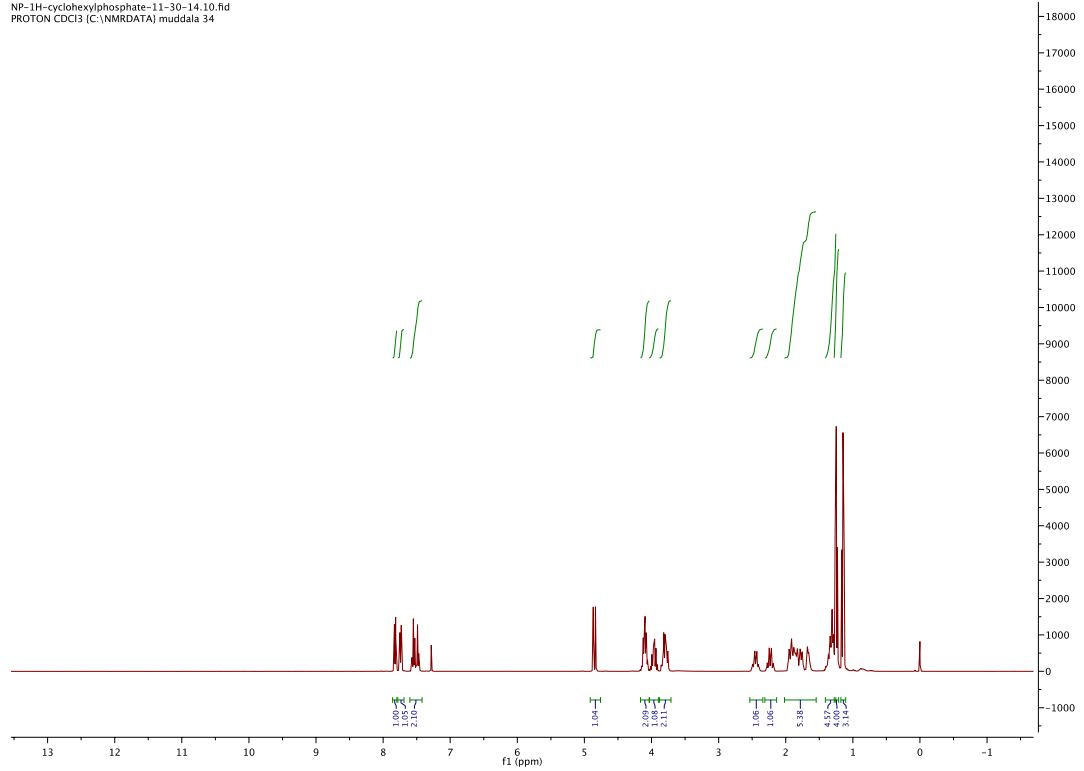


NP-13C-cyclopropyl-12-01-14.10.fid
C13CPD CDCl3 (C:\NMRDATA) muddala 33



(±)-Diethyl (2-cyclohexyl-3-oxoisindolin-1-yl)phosphonate (3w):

NP-1H-cyclohexylphosphate-11-30-14.10.fid
PROTON CDCl3 (C:\NMRDATA) muddala 34



NP-13C-cyclohexylphosphate-11-30-14.10.fid
C13CPD CDCl3 (C:\NMRDATA) muddala 34

