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Synthesis, coordination and extraction properties of 2,3-bis(diphenylphosphoryl)pyridine toward *f*-block elements

Oleg I. Artyushin, Anna V. Vologzhanina, Aleksandr N. Turanov, Vasilii K. Karandashev and Valery K. Brel

2,3-Bis(diphenylphosphino)pyridine **2**.

^{1}H NMR (500 MHz, $CDCl_3$) δ: 7.13 (dd,$^{3}J_{PH}$=7.2 Hz, $^{3}J_{HH}$=4.5 Hz, H-4, 1H), 7.20-7.35 (m, C_6H_5 + H-5, 21H), 8.68 (br.d., $^{3}J_{HH}$=4.5 Hz, H-6).
^{13}C NMR (100 MHz, $CDCl_3$) δ: 123.01 (s, C-5), 127.91 and 128.43 (d, $^{3}J_{PC}$ =7.0 Hz, *m*-C in C_6H_5), 128.30 and 128.67 (s, *p*-C in C_6H_5), 133.87 and 134.06 (d, $^{2}J_{PC}$=14.0 Hz, *o*-C in C_6H_5), 136.01 (dd, $^{1}J_{PC}$=12.0 Hz, $^{2}J_{PC}$=6.0 Hz, *ipso*-C в C_6H_5), 136.45 (dd, $^{1}J_{PC}$=8.0 Hz, $^{2}J_{PC}$=3.0 Hz, *ipso*-C in C_6H_5), 140.30 (d, $^{2}J_{PC}$=7.2 Hz, C-4), 141.46 (dd, $^{1}J_{PC}$=38.9 Hz, $^{2}J_{PC}$=17.1 Hz, C-3), 150.37 (s, C-6), 166.50 (dd, $^{1}J_{PC}$=29.7 Hz, $^{2}J_{PC}$=8.5 Hz, C-2).
^{31}P NMR (162 MHz, $CDCl_3$), δ: -16.82 and -9.40 (d, $^{3}J_{PP}$=142.6 Hz).
Found (%): C 77.76; H 5.21; N 2.96. Calcd. for $C_{29}H_{23}NP_2$ (%): C 77.84; H 5.18; N 3.13.

2,3-Bis(diphenylphosphoryl)pyridine **3**.

^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.25-7.90 (m, C_6H_5 + H-4, 21H), 8.83-8.87 (m, H-5 +H-6, 2H).).
^{13}C NMR (100 MHz, $CDCl_3$) δ: 124.15 (dd, $^{2}J_{PC}$=7.8 Hz, $^{3}J_{PC}$ =2.7 Hz, C-4), 127.63 and 127.76 (d, $^{3}J_{PC}$ =11.7 Hz, *m*-C in C_6H_5), 131.27 (br.s, *p*-C in C_6H_5), 131.80 and 132.13 (d, $^{2}J_{PC}$=10.3 Hz, *o*-C in C_6H_5), 132.08 (d, $^{1}J_{PC}$=64.0 Hz, *ipso*-C in C_6H_5), 133.14 (d, $^{1}J_{PC}$=74.0 Hz, *ipso*-C in C_6H_5), 134.86 (dd, $^{1}J_{PC}$=91.0 Hz, $^{2}J_{PC}$=22.0 Hz, C-3), 143.48 (dd, $^{3}J_{PC}$ =$^{4}J_{PC}$=7.5 Hz, C-5), 150.46 (d, $^{3}J_{PC}$ =18.0 Hz, C-6), 159.43 (dd, $^{1}J_{PC}$=130.0 Hz, $^{2}J_{PC}$=13.0 Hz, C-2).
^{31}P NMR (162 MHz, $CDCl_3$), δ: 21.53 and 29.84 (s).
Found (%): C 69.68; H 4.79; N 2.84. Calcd. for $C_{29}H_{23}NO_2P_2 \cdot H_2O$ (%): C 70.00; H 5.06; N 2.87.
IR (KBr), ν, cm^{-1}: 530, 540, 565, 690, 704, 728, 750, 1120, 1175, 1199 (P=O), 1386,

[2,3-Bis(diphenylphosphoryl)pyridine]uranyl dinitrate **4**.

^{1}H-{^{31}P} NMR (400 MHr, CD_2Cl_2) δ: 7.39 and 7.45 (t, $^{3}J_{HH}$=8.0 Hz, *m*-H in C_6H_5, 4H), 7.57 (d, $^{3}J_{HH}$=8.0 Hz, *o*-H in C_6H_5, 4H), 7.63 (t, $^{3}J_{HH}$=8.0 Hz, *p*-H in C_6H_5, 4H), 7.68 (t, $^{3}J_{HH}$=4.5 Hz, H-5, 1H), 7.71 (d, $^{3}J_{HH}$=8.0 Hz, $^{3}J_{HH}$=8.0 Hz, *o*-H in C_6H_5, 4H), 7.85 (d, $^{3}J_{HH}$=4.5 Hz, H-4, 1H), 9.04 (d, $^{3}J_{HH}$=4.5 Hz, H-6, 1H).
^{13}C NMR (100 MHz, CD_2Cl_2) δ: 125.03 (dd, $^{2}J_{PC}$=9.1 Hz, $^{3}J_{PC}$ =2.9 Hz, C-4), 127.24 (d, $^{1}J_{PC}$=111.0 Hz, *ipso*-C in C_6H_5), 128.34 (d, $^{3}J_{PC}$ =13.0 Hz, *m*-C in C_6H_5), 129.00 (d, $^{3}J_{PC}$ =14.0 Hz, *m*-C in C_6H_5), 132.15 (d, $^{2}J_{PC}$=11.0 Hz, *o*-C in C_6H_5), 132.35 (d, $^{2}J_{PC}$=11.0 Hz, *o*-C in C_6H_5), 133.0 (d, $^{4}J_{PC}$=2.6 Hz, *p*-C in C_6H_5), 133.12 (dd, $^{1}J_{PC}$=74.0 Hz, $^{2}J_{PC}$=2.0 Hz, C-3), 133.65 (d, $^{4}J_{PC}$=2.4 Hz, *p*-C in C_6H_5), 143.25 (dd, $^{3}J_{PC}$ =13.0 Hz, $^{4}J_{PC}$=7.8 Hz, C-5), 152.14 (d, $^{3}J_{PC}$ =20.5 Hz, C-6), 158.04 (dd, $^{1}J_{PC}$=127.0 Hz, $^{2}J_{PC}$=9.9 Hz, C-2).
^{31}P NMR (162 MHz, CD_2Cl_2), δ: 43.16 and 41.24 (s).
Found (%): C 36.51; H 2.70; N 4.27. Calcd. for $C_{29}H_{23}N_3O_{10}P_2U \cdot 1.5CH_2Cl_2$ (%): C 36.60; H 2.62; N 4.20.
IR (KBr), ν, cm^{-1} :535, 548, 562, 691, 729, 746, 935(UO_2),1121,1130, 1154 (P=O), 1170, 1272 (NO_2), 1286, 1385, 1439, 1491 (N=O), 1518.

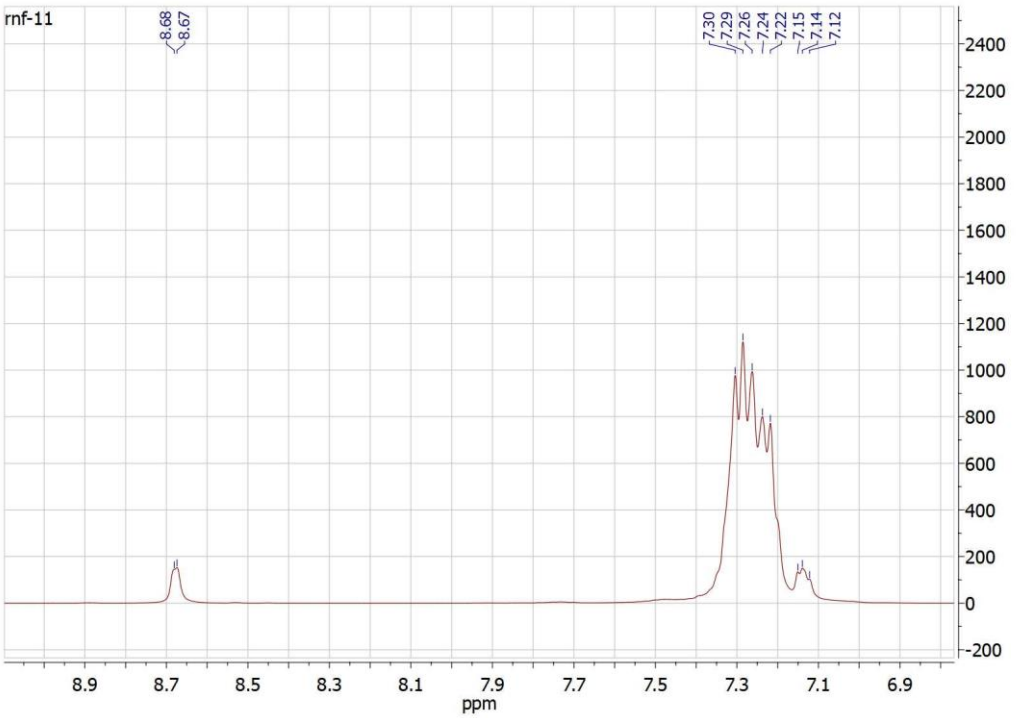

Figure S1 ^{1}H NMR for compound **2**

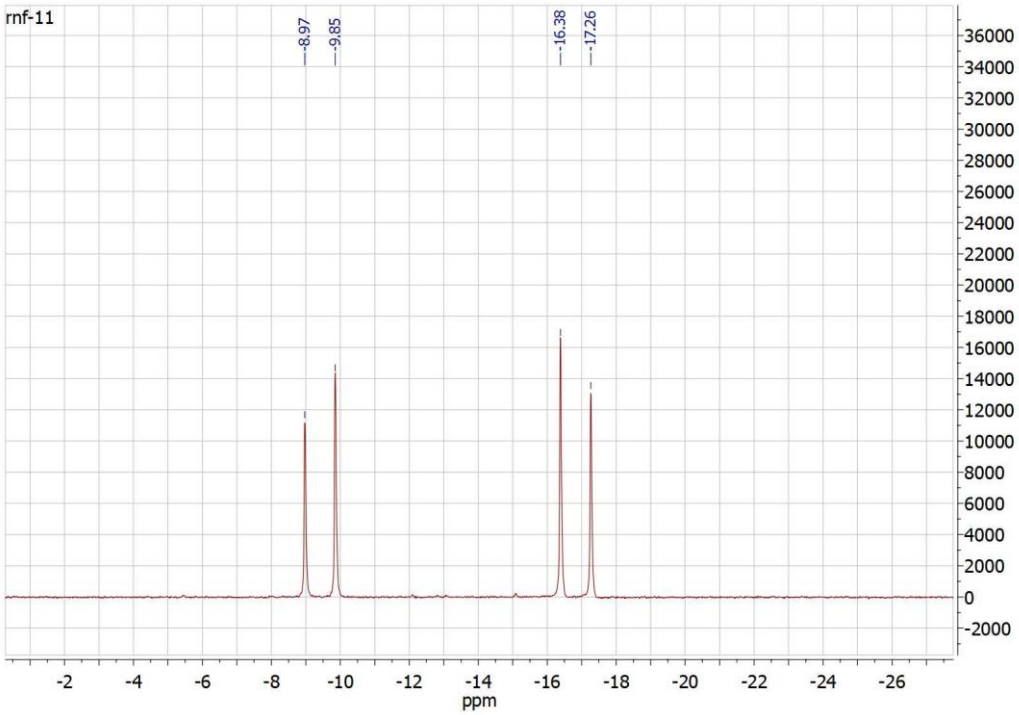

Figure S2 ^{31}P NMR for compound **2**

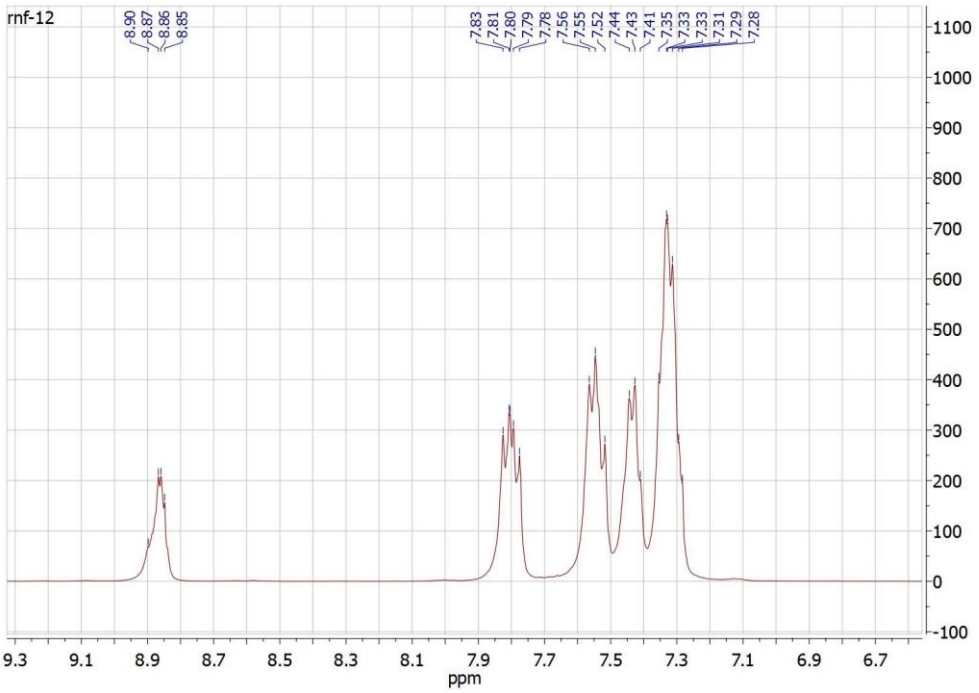

Figure S3 ^{1}H NMR for compound **3**

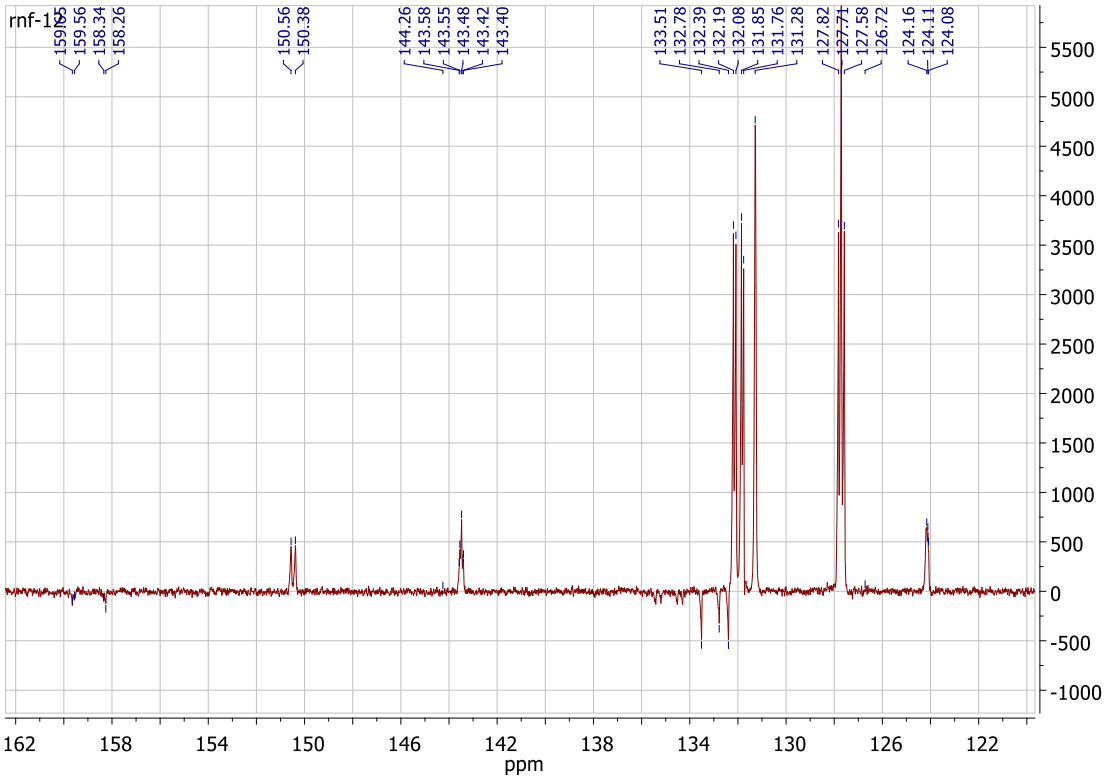

Figure S4 ^{13}C NMR for compound **3**

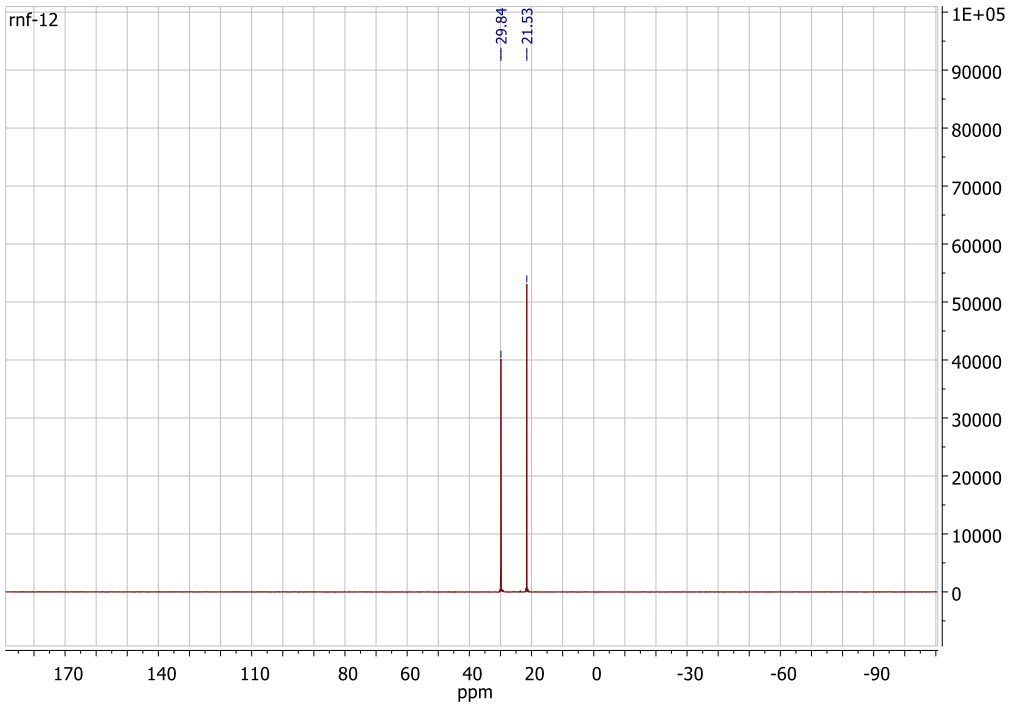

Figure S5 ^{31}P NMR for compound **3**

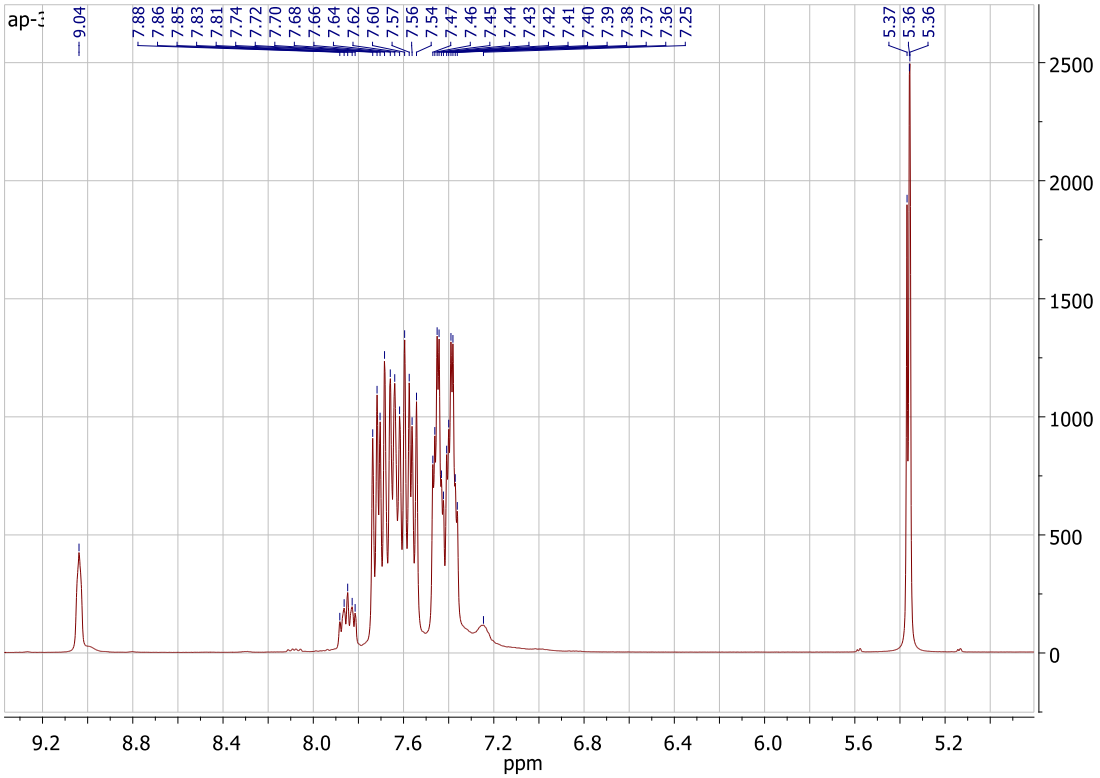

Figure S6 ^{1}H NMR for complex **4**

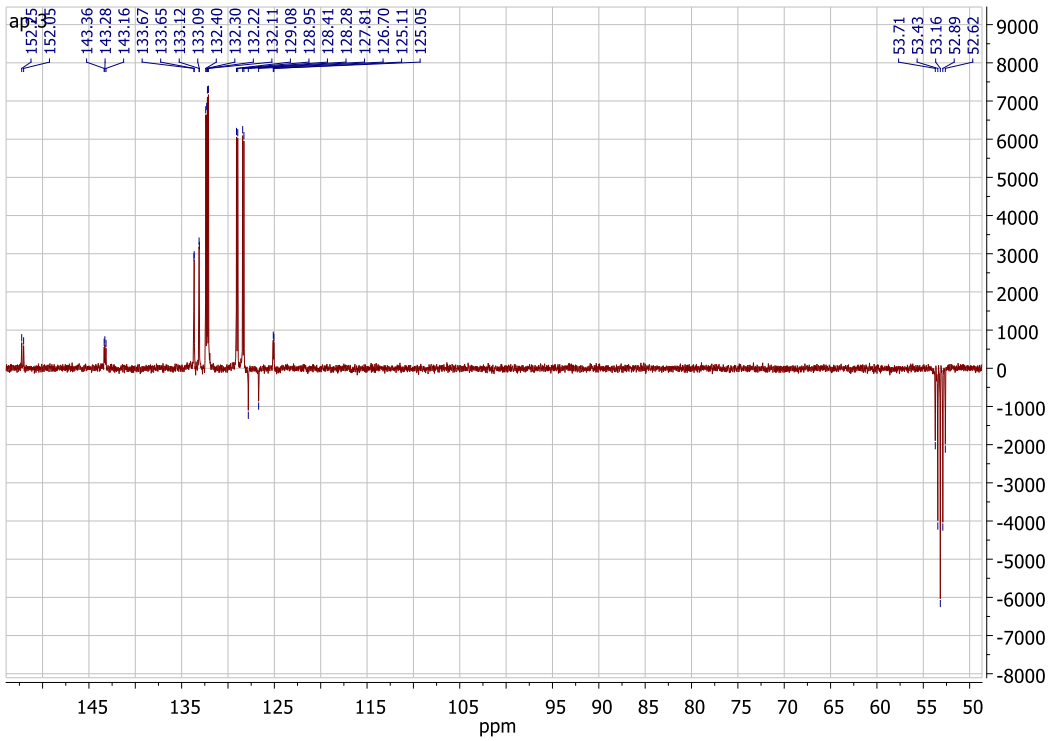

Figure S7 ^{13}C NMR for complex **4**

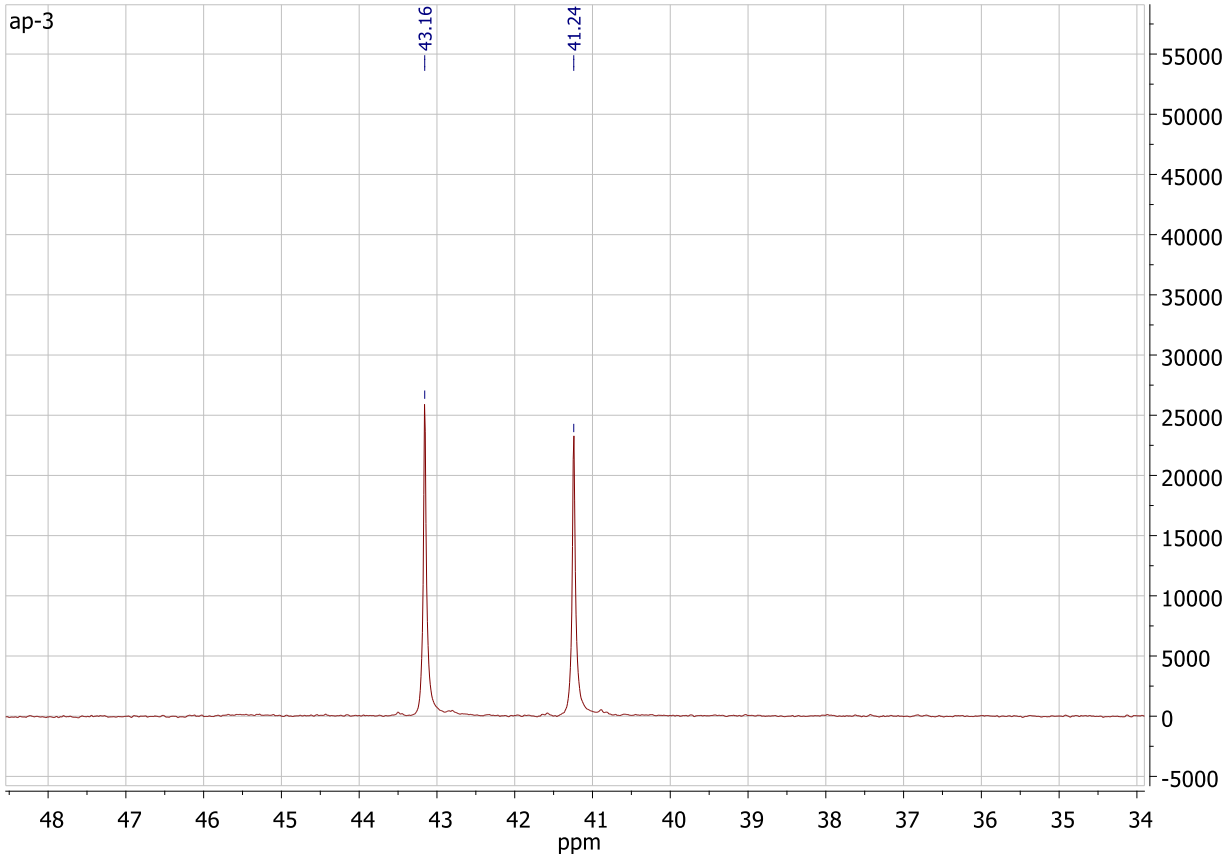

Figure S7 ^{31}P NMR for complex **4**