Supporting Information for

Chiral gold(III) complexes: speciation, *in vitro,* and *in vivo* anticancer profile

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Experimental Section

Materials

Reactions were carried out under ambient conditions in air unless otherwise stated. Solvents were of ACS grade purchased from Greenfield Global and used as purchased. 1,2-bis[(2*R*,5*R*)-2,5-dimethylphospholano]benzene (Me-DuPhos), 1,2-bis[(2*R*,5*R*)-2,5-diisopropylphospholano]benzene (iPrDuphos), 2-(phenyl)-pyridine, 2-(*p*-tolyl)-pyridine, and 2-benzylpyridine were purchased from Alfa Aesar. 2-benzoylpyridine was purchased from Sigma Aldrich and crystal violet was purchased from VWR. $HAuCl_4 \cdot 3H_2O$ was purchased from NANOPARTZ and stored in a desiccator before use. Deuterated solvents were purchased from Cambridge Isotope Laboratories (Andover, MA). ^{1}H, ^{13}C (^{1}H-decoupled), and ^{31}P (^{1}H-decoupled) NMR spectra were recorded on a Bruker Avance NEO 400 MHz spectrometer and 500 MHz JEOL ECZr and samples calibrated for: ^{1}H NMR ($CDCl_3$ δ = 7.26 ppm), ^{13}C NMR ($CDCl_3$ δ = 77.16), and ^{31}P NMR externally referenced to H_3PO_4 δ = 0.00). Liquid chromatography mass spectra were obtained by direct flow injection (injection volume = 2 µL) using ElectroSpray Ionization (ESI) on an Advion Expression CMS MassExpress 6.7.15.1 mass spectrometer instrument in the positive mode coupled with RP-HPLC using an Agilent Technologies 1100 series HPLC instrument and an Agilent Phase Eclipse Plus C18 column (4.6 mm $\times$ 100 mm; 3.5 µm particle size). All compounds were found to be $\geq$ 97% pure. DMEM was used as purchased from Corning® (4.5 g/L glucose, L-glutamine, and sodium pyruvate). PBS was used as received from Corning® (without calcium or magnesium). Fluorescent images were obtained from Olympus IX71 fluorescence microscope fitted with Zyla CMOS camera using 488 and 510 nm excitation lamp with a 20X air objective. Images were processed with ImageJ software.

Synthesis and Characterization

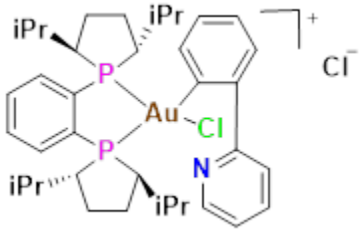
Preparation of Dichloro(2-arylpyridine)gold(III) complexes: The starting materials dichloro(2-benzoylpyridine)gold(III), dichloro(2-*p*-tolylpyridine)gold(III), dichloro(2-phenylpyridine)gold(III) and dichloro(2-benzylpyridine)gold(III) compounds were prepared according to reported procedures.[1, 2]

Preparation of (2-benzoylpyridine)[1,2-bis[(2*R*,5*R*)-2,5-diisopropylphospholano]benzene]chlorogold(III) chloride (1) Dichloro(2-benzoylpyridine)gold(III) (56 mg, 0.1244 mmol) was placed in a 50 mL round bottom flask and 10 mL of dichloromethane was added. To this was added 1,2-bis[(2*R*,5*R*)-2,5-diisopropylphospholano]benzene (55.2 mg, 0.1319 mmol) and the solution turned light yellow instantly. After stirring for about 5 minutes, the solution was monitored by TLC in 5% MeOH in CH_2Cl_2 as an eluent. Separation of compound was achieved via flash chromatography using CombiFlashR Rf +Lumen with 5% MeOH:CH_2Cl_2, concentrated on the rotary evaporator and pure compound was precipitated from diethyl ether as an off-white solid (40 mg, 37 %). R_f = 0.29 in 5:95 MeOH:CH_2Cl_2; ^{1}H NMR (500 MHz, $CDCl_3$-*d*) δ 9.13 (t, *J* = 10 Hz, 1H), 8.74 (d, *J* = 5 Hz, 1H), 8.14 (m, 1H), 8.06 (dd, *J* = 10, 5 Hz, 1H), 7.94 (m, 4H), 7.74 (t, *J* = 10 Hz, 1H), 7.60 – 7.52 (m, 2H), 7.36 (t, *J* = 5 Hz, 1H), 3.81 (m, 1H), 3.46 (m, 1H), 2.95 (m, 1H), 2.82 (m, 1H), 2.72 – 2.51 (m, 2H), 2.38 (m, 2H), 2.23 (m, 2H), 2.07 (m, 4H), 1.28 (d, *J* = 5 Hz, 3H), 1.10 (d, *J* = 5 Hz, 3H), 1.02 (d, *J* = 5 Hz, 3H), 0.97 (d, *J* = 5 Hz, 3H), 0.94 (d, *J* = 5 Hz, 3H), 0.74 (d, *J* = 6.5 Hz, 3H), 0.65 (d, *J* = 5 Hz, 1H), 0.48 (m, 1H), 0.38 (d, *J* = 5 Hz, 3H), 0.14 (d, *J* = 5 Hz, 3H). ^{31}P NMR (202 MHz, $CDCl_3$) δ 78.96, 77.12, 76.84, 74.78. ^{13}C NMR (126 MHz, $CDCl_3$) δ 197.62, 156.06, 148.66, 140.15, 137.75, 137.48, 137.06, 135.68, 134.71, 134.41, 126.73, 126.43, 124.92, 77.37, 77.11, 76.86, 57.44, 57.25, 55.55, 55.31, 50.27, 50.06, 49.73, 49.49, 31.98, 31.80, 30.12, 29.79, 29.64, 29.43, 29.18, 28.91, 27.62, 25.97, 25.89, 25.38, 25.22, 25.17, 22.78, 21.62, 21.52, 21.03, 20.97, 20.87, 20.77, 20.50, 20.44, 14.22. ESI+ MS (found) = 832.3 $[M - Cl]^+$ (calculated = 832.29). Purity was determined to be > 97% by RP-HPLC: R_f = 10.23 minutes using the following method: Flow rate: 1 mL/min; λ = 280 nm; Eluent A = DI water with 0.1% trifluoroacetic acid; Eluent B = Acetonitrile with 0.05% formic acid; Solvent Gradient: 0 – 16 min (0:100 H_2O: ACN). 16 min until end of run (100:0 H_2O: ACN).

Preparation of (2-*p*-tolylpyridine)[1,2-bis[(2*R*,5*R*)-2,5-diisopropylphospholano]benzene] chlorogold(III) chloride (2). Dichloro(2-*p*-tolylpyridine)gold(III) (50.5 mg, 0.1158 mmol) was placed in a 50 mL round bottom flask and 10 mL of dichloromethane was added. To this was added 1,2-bis[(2*R*,5*R*)-2,5-diisopropylphospholano]benzene (53.3 mg, 0.1274

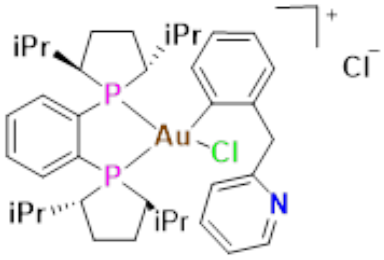
mmol) and the solution turned pale yellow. After stirring for about 5 minutes, the solution was monitored by TLC in 5% MeOH in CH_2Cl_2 as an eluent. Separation of compound was achieved via flash chromatography using CombiFlashR Rf + Lumen with 5% MeOH:CH_2Cl_2 concentrated on the rotary evaporator and pure compound was precipitated from diethyl ether as an off-white solid. (70 mg, 71 %) R_f = 0.32 in 5:95 MeOH:CH_2Cl_2; ^{1}H NMR (400 MHz, $CDCl_3$): δ 9.18 (t, J = 8 Hz, 1H), 8.53 (d, J = 8 Hz, 1H), 8.08 (m, 1H), 7.96 (d, J = 8 Hz, 2 H), 7.91 (t, 4 Hz, 1 H), 7.78 (q, J= 8 Hz 2 H), 7.38 (d, J= 12 Hz, 1 H), 7.31 (t, J= 4 Hz, 1 H), 7.17 (d, J= 8 Hz, 1 H), 3.73 (m, 1 H), 3.47 (m, 1H), 3.02 (m, 1H), 2.52 (m, 2H), 2.40 (s, 3H), 2.08 (m, 4 H), 1.74 (m, 5H), 1.50 (q, J = 12 Hz, 1 H), 1.37 (d, J= 8 Hz, 3 H), 1.08 (d, J = 4Hz, 3H), 1.03 (d, J = 8 Hz, 3H), 0.95 (d, J= 8 Hz, 3H), 0.89 (d, J= 8 Hz, 3H), 0.63 (d, J= 8 Hz, 3H), 0.49 (d, J= 8 Hz, 3H), 0.26 (m, 1H), 0.02 (d, J= 8 Hz, 3H). ^{31}P NMR (161.9 MHz, $CDCl_3$)) δ = 76.3, 73.7, 71.9, 69.9 ^{13}C NMR (101 MHz, $CDCl_3$): δ = 159.19, 149.47, 149.02, 148.02, 140.99, 140.92, 139.83, 138.02, 137.87, 137.42, 136.87, 136.24, 135.30, 134.89, 134.79, 134.65, 130.50, 130.43, 128.54, 122.56, 122.03, 65.94, 56.66, 56.49, 54.93, 54.68, 50.71, 50.5,1 49.85, 49.62, 31.97, 29.84, 29.20, 29.16, 28.95, 28.87, 28.02, 27.93, 25.65, 25.56, 25.34, 25.30, 25.13, 22.82, 22.80, 21.53, 21.39, 21.28, 21.21, 21.18, 21.14,19.99, 19.95, 15.35. ESI+ MS (found) = 818.2 $[M - Cl]^+$ (calculated = 818.31) Purity was determined to be > 97% by RP-HPLC: R_f = 8.9 minutes using the following method: Flow rate: 1 mL/min; λ = 280 nm; Eluent A = DI. water with 0.1% trifluoroacetic acid; Eluent B = Acetonitrile with 0.05% formic acid; Solvent Gradient: 0 – 16 min (0:100 H_2O: ACN). 16 min until end of run (100:0 H_2O: ACN).

Preparation of (2-phenylpyridine)[1,2-bis[(2*R*,5*R*)-2,5-diisopropylphospholano]benzene]chlorogold(III) chloride (3). Dichloro(2-phenylpyridine)gold(III) (43 mg, 0.1019 mmol) was placed in a 50 mL round bottom flask and 10 mL of dichloromethane was added. To this was added 1,2-bis[(2*R*,5*R*)-2,5-diisopropylphospholano]benzene (46.9 mg, 0.1121 mmol) to give a clear solution. After stirring for about 5 minutes, the solution was monitored by TLC in 5% MeOH in CH_2Cl_2 as an eluent. Separation of compound was achieved via flash chromatography using CombiFlashR Rf + Lumen with 5% MeOH:CH_2Cl_2 concentrated on the rotary evaporator and pure compound was precipitated from diethyl ether as an off-white solid. (30 mg, 36.7 %) R_f = 0.53 in 5:95 MeOH:CH_2Cl_2; ^{1}H NMR (500 MHz, $CDCl_3$-*d*) δ = 9.16 (t, J=



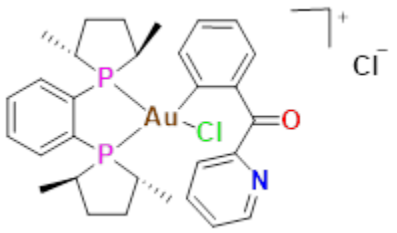
10 Hz, 1H), 8.56 (d, *J* = 5 Hz, 1H), 8.09 - 8.07 (m, 1H), 7.98 (d, *J* = 10 Hz, 1H), 7.94 (dd, *J* = 10, 5 Hz, 1H), 7.92 – 7.86 (m, 2H), 7.84 (td, *J* = 10, 5 Hz, 1H), 7.60 (t, *J* = 10 Hz, 1H), 7.39-7.35 (m, 2H), 7.35 – 7.31 (m, 1H), 3.76- 3.72 (m, 1H), 3.56 – 3.49 (m, 1H), 3.09 – 2.98 (m, 1H), 2.68 – 2.53 (m, 3H), 2.38 – 2.27 (m, 1H), 2.17 (dq, *J* = 20, 10, 10 Hz, 1H), 2.08 (q, *J* = 10 Hz, 3H), 1.98 (dt, *J* = 15.0, 10 Hz, 1H), 1.74 (m, 2H), 1.49 – 1.41 (m, 1H), 1.37 (d, *J* = 5 Hz, 3H), 1.09 (d, *J* = 5 Hz, 3H), 1.03 (d, *J* = 5 Hz, 3H), 0.95 (d, *J* = 5 Hz, 3H), 0.88 (d, *J* = 5 Hz, 3H), 0.63 (d, *J* = 5 Hz, 3H), 0.57 (dd, *J* = 5 Hz, 1H), 0.50 (d, *J* = 5 Hz, 3H), 0.35 (m, 1H), 0.02 (d, *J* = 5 Hz, 3H) ^{31}P NMR (202 MHz, $CDCl_3$) δ = 76.93, 74.00, 73.33, 70.13 ^{13}C NMR (126 MHz, MeCN-d_3) δ = 159.55, 150.79, 150.00, 148.99, 143.82, 139.32, 138.72, 137.19, 137.09, 135.65, 134.95, 134.88, 131.47, 131.40, 129.02, 128.27, 124.38, 123.50, 122.71, 118.26, 56.96, 56.78, 55.95, 55.69, 51.66, 51.45, 50.08, 49.85, 32.61, 32.06, 30.83, 29.86, 29.46, 29.42, 29.37, 28.42, 28.32, 25.77, 25.73, 25.40, 25.31, 25.22, 22.99, 22.97, 21.71, 21.61, 21.07, 21.00, 20.90, 20.80, 19.80, 19.76, 1.75, 1.58, 1.41, 1.25, 1.08, 0.92, 0.75. ESI+ MS (found) = $[M - Cl]^+$ = 804.1, $[M - 2Cl + CF_3COO^-]^+$ = 882.2 (calculated = 804.29) Purity was determined to be > 97% by RP-HPLC: R_f = 7.6 minutes using the following method: Flow rate: 1 mL/min; λ = 280 nm; Eluent A = DI. water with 0.1% trifluoroacetic acid; Eluent B = Acetonitrile with 0.05% formic acid; Solvent Gradient: 0 – 16 min (0:100 H_2O: ACN). 16 min until end of run (100:0 H_2O: ACN).

Preparation of (2-benzylpyridine)[1,2-bis[(2*R*,5*R*)-2,5-diisopropylphospholano]benzene]chlorogold(III) chloride (4). Dichloro(2-benzylpyridine)gold(III) (43 mg, 0.1019 mmol) was placed in a 50 mL round bottom flask and 10 mL of dichloromethane was added. To this was added 1,2-bis[(2*R*,5*R*)-2,5-diisopropylphospholano]benzene (46.9 mg, 0.1121 mmol) to give a clear solution. After stirring for about 5 minutes, the solution was monitored by TLC in 5% MeOH in CH_2Cl_2 as an eluent. Separation of compound was achieved via flash chromatography using CombiFlashR Rf + Lumen with 5% MeOH:CH_2Cl_2 concentrated on the rotary evaporator and pure compound was precipitated from diethyl ether an off-white solid. R_f = 0.38 in 5:95 MeOH:CH_2Cl_2; (35.1 mg, 35.46 %) ^{1}H NMR (500 MHz, MeCN-d_3) δ = 8.55 (t, *J* = 5 Hz, 1H), 8.14 – 8.06 (m, 2H), 7.97 – 7.90 (m, *J* = 2.9 Hz, 2H), 7.73 – 7.64 (m, 1H), 7.46 (dt, *J* = 20, 10 Hz, 1H), 7.32 – 7.11 (m, 5H), 7.03 (t, *J* = 5 Hz, 1H),



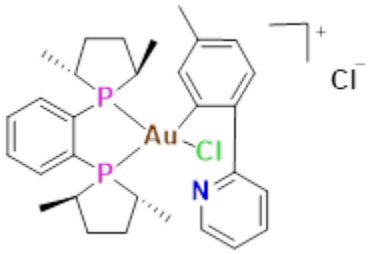
4.29 (dd, *J* = 10, 5 Hz, 1H), 4.16 (dd, *J* = 10, 5 Hz, 1H), 3.34 – 3.20 (m, 2H), 3.11 (m, 2H), 2.66 – 2.49 (m, 3H), 2.31 – 2.20 (m, 2H), 2.09-2.02 (m, 2H), 1.87 – 1.68 (m, 4H), 1.09 (dd, *J* = 10, 5 Hz, 2H), 1.03 – 0.96 (m, 6H), 0.92 (d, *J* = 5 Hz, 2H), 0.86 – 0.82 (m, 6H), 0.78 (dd, *J* = 5, 5 Hz, 2H), 0.71 (d, *J* = 5 Hz, 1H), 0.66 (t, *J* = 5 Hz, 3H), 0.42 (d, *J* = 5 Hz, 2H). ^{31}P NMR (202 MHz, MeCN-d_3) δ = 78.47, 77.46, 76.24, 75.65. ^{13}C NMR (126 MHz, $CDCl_3$) δ = 159.08, 136.85, 135.78, 134.96, 132.72, 128.21, 127.81, 124.19, 121.98, 77.37, 77.11, 76.86, 57.82, 57.64, 56.29, 56.05, 51.06, 50.92, 50.72, 46.53, 32.55, 32.24, 31.59, 31.27, 30.28, 29.98, 29.41, 28.93, 27.79, 27.43, 26.27, 25.52, 23.77, 21.80, 21.70, 21.22, 21.12, 20.85, 20.78, 20.68. ESI+ MS (found) = $[M - Cl]^+$ = 818.3, $[M - 2Cl + OOCCF_3]^+$ = 896.3 (calculated = 818.319) Purity was determined to be > 97% by RP-HPLC: R_f = 7.7 minutes using the following method: Flow rate: 1 mL/min; λ = 280 nm; Eluent A = DI. water with 0.1% trifluoroacetic acid; Eluent B = Acetonitrile with 0.05% formic acid; Solvent Gradient: 0 – 16 min (0:100 H_2O: ACN). 16 min until end of run (100:0 H_2O: ACN).

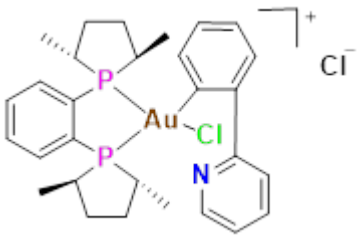
Preparation of (2-benzoylpyridine)[1,2-bis[(2*R*,5*R*)-2,5-dimethylphospholano]benzene]chlorogold(III) chloride (5). Dichloro(2-benzoylpyridine)gold(III) (50 mg, 0.111 mmol) was placed in a 50 mL round bottom flask and 10 mL of dichloromethane was added. To this solution off-white was added 1,2-bis[(2*R*,5*R*)-2,5-diisopropylphospholano]benzene (34 mg, 0.111 mmol) and the solution gradually became clear. After stirring for about 5 minutes, the solution was monitored by TLC in 5% MeOH in CH_2Cl_2 as an eluent. Separation of compound was achieved via flash chromatography using CombiFlashR Rf +Lumen with 5% MeOH:CH_2Cl_2, concentrated on the rotary evaporator and pure compound was precipitated from diethyl ether as an off-white solid. (30 mg, 35.7 %) R_f = 0.55 in 5:95 MeOH:CH_2Cl_2; ^{1}H NMR (400 MHz, $CDCL_3$) δ 8.78 – 8.70 (m, 2H), 8.17 – 8.10 (m, 1H), 8.06 (dd, *J* = 4, 4 Hz, 1H), 8.00 (t, *J* = 8.0 Hz, 1H), 7.96 – 7.81 (m, 4H), 7.59 (t, *J* = 8.0 Hz, 1H), 7.51 (t, 8.0 Hz 1H), 7.36 (t, *J* = 8 Hz, 1H), 3.79 – 3.68 (m, 1H), 3.56 – 3.43 (m, 1H), 3.42 – 3.30 (m, 1H), 2.89 – 2.75 (m, 1H), 2.71 – 2.51 (m, 2H), 2.48 – 2.33 (m, 2H), 2.21 – 2.05 (m, 3H), 2.03 – 1.97 (m, 3H), 1.78 (dd, *J* = 12, 8 Hz, 3H), 1.52 (dd, *J* = 12, 8 Hz, 3H), 1.08 (dd, *J* = 12, 8 Hz, 3H), 0.77 (dd, *J* = 12, 8 Hz, 3H). ^{31}P NMR (162 MHz, $CDCl_3$) δ 84.87, 83.18. ^{13}C NMR (101 MHz, $CDCl_3$) δ 198.42, 161.58, 160.31, 155.84, 148.56, 138.89, 138.28, 138.20, 137.40, 136.38, 136.04, 135.95, 134.78, 134.29, 134.20,



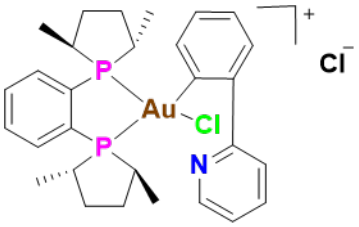
126.40, 124.80, 45.06, 44.71, 43.07, 42.78, 37.26, 37.12, 36.92, 36.67, 36.49, 36.38, 36.04, 35.02, 16.01, 15.34, 14.20, 13.37. ESI+ MS (ACN) = 720.2 $[M - Cl]^+$ (calculated = 720.16) Purity was determined to be > 97% by RP-HPLC: R_f = 6.02 minutes using the following method: Flow rate: 1 mL/min; λ = 280 nm; Eluent A = DI. water with 0.1% trifluoroacetic acid; Eluent B = Acetonitrile with 0.05% formic acid; Solvent Gradient: 0 – 16 min (0:100 H_2O: ACN). 16 min until end of run (100:0 H_2O: ACN).

Preparation of (2-*p*-tolylpyridine)[1,2-bis[(2*R*,5*R*)-2,5-diisopropylphospholano]benzene]chlorogold(III) chloride (6). Dichloro(2-*p*-tolylpyridine)gold(III) (50.0 mg, 0.115 mmol) was placed in a 50 mL round bottom flask and 10 mL of dichloromethane was added. To this was added 1,2-bis[(2*R*,5*R*)-2,5-diisopropylphospholano]benzene (38 mg, 0.126 mmol) and the solution became pale yellow. After stirring for about 5 minutes, the solution was monitored by TLC in 5% MeOH in CH_2Cl_2 as an eluent. Separation of compound was achieved via flash chromatography using CombiFlashR Rf + Lumen with 5% MeOH:CH_2Cl_2 concentrated on the rotary evaporator and pure compound was precipitated from diethyl ether as an off-white solid. (25 mg, 29 %) R_f = 0.52 in 5:95 MeOH:CH_2Cl_2; ^{1}H NMR (400 MHz, $CDCl_3$-*d*): δ 8.89 (d, 8 Hz, 1H,) 8.24 (t, 12 Hz, 1H), 8.06 (d, 8 Hz, 2 H), 8.0 (d, 12 Hz, 1H), 7.58 (m, 3H), 7.48 (m, 1H), 7.40 (d, J = 8 Hz, 2H), 3.34 (m, 1H), 2.77 (m, 1H), 2.64 (m, 1 H) 2.43 (s, 3H), 2.30 (m, 2 H), 2.11 (m, 2H), 2.0 (m, 1H), 1.93 (m, 1H), 1.75 (m, 1H), 1.46 (dd, *J* = 16 Hz, 3H), 1.30 (m, 2 H), 1.22 (dd, 12 Hz, 3 H), 1.02 (dd. *J* = 16 Hz, 3 H), 0.88(dd, *J* = 16 Hz, 3 H) ^{31}P NMR (161.9 MHz, $CDCl_3$): δ 67.73, 56.81 ^{13}C 153.77, 143.65, 136.22, 134.56, 134.14, 132.61, 132.56, 132.52, 132.47, 132.01, 131.92, 131.80, 131.65, 131.58, 130.55, 130.20, 130.09, 128.09, 123.50, 123.37, 37.67, 37.02, 35.69, 35.29, 35.11, 34.44, 33.14, 33.05, 32.86, 32.73, 32.31, 31.96, 31.82, 31.72, 21.56, 19.91, 17.86, 16.40, 12.17. ESI+ MS (Found) = 706.2 $[M - Cl]^+$ (calculated = 706.18) Purity was determined to be > 97% by RP-HPLC: R_f = 4.6 minutes using the following method: Flow rate: 1 mL/min; λ = 280 nm; Eluent A = DI. water with 0.1% trifluoroacetic acid; Eluent B = Acetonitrile with 0.05% formic acid; Solvent Gradient: 0 – 16 min (0:100 H_2O: ACN). 16 min until end of run (100:0 H_2O: ACN).



Preparation of (2-phenylpyridine)[1,2-bis[(2*R*,5*R*)-2,5-diisopropylphospholano]benzene]chlorogold(III) chloride (7). 

Dichloro(2-phenylpyridine)gold(III) (50 mg, 0.118 mmol) was placed in a 50 mL round bottom flask and 10 mL of dichloromethane was added. To this was added 1,2-bis[(2*R*,5*R*)-2,5-diisopropylphospholano]benzene (39.9 mg, 0.130 mmol) to give a clear solution after stirring for about 5 minutes. The solution was monitored by TLC in 5% MeOH in CH_2Cl_2 as an eluent. Separation of compound was achieved via flash chromatography using CombiFlashR Rf + Lumen with 5% MeOH:CH_2Cl_2 concentrated on the rotary evaporator and pure compound was precipitated from diethyl ether as an off-white solid. (28 mg, 32.4 %) R_f = 0.58 in 5:95 MeOH:CH_2Cl_2; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.91 (d, *J* = 4, 1H), 8.27 (t, *J* = 8 Hz, 1H), 8.18 – 8.12 (m, 2H), 8.03 (d, *J* = 8 Hz, 1H), 7.68 (t, *J* = 12 Hz, 1H), 7.60 (m, 5H), 7.47 (m, 1H), 3.45 - 3.36 (m, 1H), 2.84 – 2.72 (m, 1H), 2.71 – 2.61 (m, 1H), 2.46 – 2.26 (m, 2H), 2.25 – 2.06 (m, 1H), 2.04 – 1.88 (m, 2H), 1.86 – 1.72 (m, 1H), 1.44 (dd, *J* = 12.0, 8 Hz, 3H), 1.39 – 1.27 (m, 1H), 1.25 – 1.19 (dd, *J* = 12, 8 Hz 3H), 1.03 (dd, *J* = 8, 8 Hz, 3H), 0.91 (dd, *J* = 8, 8 Hz, 3H). ^{31}P NMR (162 MHz, $CDCl_3$) δ 67.82, 57.39 ^{13}C NMR (101 MHz, $CDCl_3$) δ 154.03, 144.17, 143.31, 134.04, 132.61, 131.97, 131.57, 130.22, 130.13, 129.72, 128.10, 123.74, 123.66, 37.68, 37.03, 35.69, 35.29, 35.11, 34.44, 32.94, 32.86, 32.73, 32.30, 31.95, 31.82, 31.72, 19.91, 19.85, 17.94, 17.87, 16.39, 12.20. ESI+ MS (Found) = 692.2 $[M - Cl]^+$ (calculated = 692.17) Purity was determined to be > 97% by RP-HPLC: R_f = 3.8 minutes using the following method: Flow rate: 1 mL/min; λ = 280 nm; Eluent A = DI. water with 0.1% trifluoroacetic acid; Eluent B = Acetonitrile with 0.05% formic acid; Solvent Gradient: 0 – 16 min (0:100 H_2O: ACN). 16 min until end of run (100:0 H_2O: ACN).

Preparation of (2-phenylpyridine)[1,2-bis[(2*S*,5*S*)-2,5-diisopropylphospholano]benzene]chlorogold(III) chloride (S,S-isomer of 7). 

Dichloro(2-phenylpyridine)gold(III) (20 mg, 0.0472 mmol) was placed in a 50 mL round bottom flask and 5 mL of dichloromethane was added. To this was added 1,2-bis[(2*S*,5*S*)-2,5-diisopropylphospholano]benzene (16 mg, 0.052 mmol) to give a clear solution after stirring for about 5 minutes. The solution was monitored by TLC in 5% MeOH in CH_2Cl_2 as an eluent. Separation of

compound was achieved via flash chromatography using CombiFlashR Rf + Lumen with 5% MeOH:CH_2Cl_2 concentrated on the rotary evaporator and pure compound was precipitated from diethyl ether as an off-white solid. ^{1H} NMR (400 MHz, $CDCl_3$-*d*) δ 8.98 (d, *J* = 4 Hz, 1H), 8.41 (t, *J* = 8 Hz, 1H), 8.22 – 8.17 (m, 2H), 8.11 (d, *J* = 8 Hz, 1H), 7.79 (t, *J* = 12 Hz, 1H), 7.63 (m, 5H), 7.51 – 7.45 (m, 1H), 3.38 (m, 1H), 2.85 – 2.61 (m, 2H), 2.47 – 2.26 (m, 3H), 2.22 – 2.06 (m, 1H), 1.96 (m, Hz, 2H), 1.86 – 1.72 (m, 1H), 1.44 (dd, *J* = 18.0, 6.7 Hz, 3H), 1.36 – 1.28 (m, 1H), 1.25 – 1.20 (dd, *J*= 12 Hz, 8 Hz, 3H), 1.03 (d,d*J*= 8, 8 Hz, 3H), 0.95 (*J*= 8, 8 Hz, 3H). ^{31}P NMR (162 MHz, $CDCl_3$) δ 67.61, 57.30 ^{13}C NMR (101 MHz, $CDCl_3$) δ 153.18, 144.94, 142.78, 136.38, 135.49, 134.53, 132.75, 132.60, 132.55, 132.51, 132.46, 132.00, 131.91, 131.79, 131.64, 131.56, 131.53, 130.21, 130.18, 130.10, 129.97, 128.41, 124.42, 124.12, 77.35, 77.03, 76.71, 37.67, 37.02, 35.71, 35.31, 35.09, 34.43, 33.13, 33.04, 32.94, 32.90, 32.84, 32.73, 32.29, 31.94, 31.82, 31.72, 19.89, 19.83, 17.94, 17.86, 16.41, 12.18, 12.15. Purity was determined to be > 97% by RP-HPLC: R_f = 3.8 minutes using the following method: Flow rate: 1 mL/min; λ = 280 nm; Eluent A = DI. water with 0.1% trifluoro-acetic acid; Eluent B = Acetonitrile with 0.05% formic acid; Solvent Gradient: 0 – 16 min (0:100 H_2O: ACN). 16 min until end of run (100:0 H_2O: ACN).

Physical and Chemical characterization

X-ray Crystallography. Crystal for complexes **2**, **3** and **5** were grown at room temperature from a vapor diffusion of either concentrated acetonitrile (**2**, **3**) or chloroform into diethylether. Crystals were mounted using polyisobutene oil on the end of a glass fibre, which had been mounted to a copper pin using an electrical solder after careful selection of suitable crystals by microscopic examination through crossed polarizers. The selected crystal was transferred to the cold gas stream of a liquid nitrogen cryostat[3, 4] diffraction collected by a Bruker D8 Venture diffractometer with graded multilayer focused MoKα X-rays (λ = 0.71073 Å). APEX3 package was used for integrating, scaling, merging and correcting for Lorentz-polarization effects from the raw data gotten from the diffractometer.[5-7] SHELXT and SHELXL were used for space group determination and structure solution and refinement respectively while ellipsoid plots were drawn using SHELXTL-XP.[8-10] The positioning of hydrogen atoms were determined after calculation and refining using a riding model with their isotropic displacement parameters (U_{iso}) determined based on the atom

to which they were attached while anisotropic displacement parameters were to refine non-hydrogen atoms. The structures, deposited in the Cambridge Structural Database, were checked for missed symmetry, twinning, and overall quality with PLATON,[11] an R-tensor,[12] and finally validated using CheckCIF.[11] See Fig. 1, Fig S1-S3 and Table S1-S3 for structural details.

UV-vis studies of complex 1-7 in DMEM

The Uv-vis spectra for 1-7 were recorded on a Shimadzu UV-1280 model instrument. Stock solutions (1 mM) of **1** - **7** were prepared in DMSO and further diluted to 50 µM in DMEM at 37^{o}C before diluting. A blank of 5% DMSO in DMEM was recorded prior to spectra acquisition from 600 nm to 200nm. The spectra were normalized to maximum absorbance and data plotted in GraphPad Prism 9.2.

LC-MS speciation studies with GSH.

Freshly prepared stock solution of **2** (2.3 mM) was prepared in acetonitrile. Glutathione solution was prepared as a 2.3 mM stock solution in D.I water. Equal volume of **2** and GSH was reacted at room temperature and monitored over 4 h on Advion Expression CMS MassExpress 6.7.15.1 coupled with RP-HPLC using an Agilent Technologies 1100 series HPLC instrument and an Agilent Phase Eclipse Plus C18 column (4.6 mm $\times$ 100 mm; 3.5 µm particle size). The data was analyzed in OriginPro 2021 software.

In Vitro Biological Assay

Cell Culture. All cell lines were purchased from ATCC and routinely grown in a humidified incubator at 37 °C with 5-10% CO_2. MDA-MB-231, MDA-MB-468, and BT-333 were grown in DMEM supplemented with 10% FBS, 1% amphotericin and 1% penicillin/streptomycin. H460 cells was grown in RPMI supplemented with 10% FBS, 1% amphotericin, and 1% penicillin/streptomycin, and 4 mM glutamine. All supplements along with PBS and trypsin-EDTA were purchased from Corning Inc. and used as purchased.

In vitro **Cytotoxicity of 1-7**. The cytotoxicity of all 7 complexes were performed in MDA-MB-231, MDA-MB-468, BT-333 and H460 cancer cells. Cells were grown to 80 % confluency and trypsinized to detach and harvest cells. The cells were suspended in 10 mL of media, centrifuged at 2000 rpm for 5 minutes, the pellet washed with 2 mL of PBS and then suspended in 5 mL of the appropriate media. The cells were plated at a density of 3,000 cells/well in a 96-well clear bottom plate and

allowed to adhere overnight at 37 °C with 5-10% CO_2. All compounds were prepared as 1 mM stock in DMSO, diluted with appropriate media and used fresh. The compounds were then added at seven concentrations with a 3x serial dilution starting at 100 µM for the highest concentration and incubated at 37 °C for 72 h with 5 - 10% CO_2. Then, the media was removed, cells were washed with warm PBS, fixed with 100 µL of 1% glutaraldehyde solution in PBS for 1 h and washed with D.I water. The plate was allowed to dry and a solution of crystal violet (50 µL, prepared by dissolving 0.5 g of crystal violet dye in 20% MeOH:water mixture) was added while rocking at 20 rpm for 20 minutes. The plates were washed with water and allowed to dry. Methanol (200 µL) was then added to each well, and the absorbance measured at 570 nm using a Biotek Synergy H1 Plate Reader at 570 nm (peak absorbance).

Mitochondrial Metabolism Analysis with Seahorse XF96 Analysis. MDA-MB-231 cells were seeded at 30,000 cells per well with a final volume of 100 µL for the mitostress assay and allowed to adhere overnight at 37 °C with 5-10% CO_2. Complex **2** was prepared as a stock in DMSO and diluted to a working concentration of 100 µM with Seahorse XF96 assay buffer. The assay was performed using a pneumatic injection of **2**, with the final injection concentrations of 20 µM, 10 µM, 5 µM and 1 µM. This was followed by injection of oligomycin (1.5 µM), FCCP (0.6 µM) and rotenone/ antimycin A (0.5 µM). The metabolic parameters were calculated based on the reading gotten from a minimum of 6 wells.

Mitochondrial Membrane Potential (TMRE). MDA-MB-468 cells were plated at a density of 2 x 10^5 cells/plate using a 6-well clear bottom plate with a final volume of 2 mL and allowed to adhere overnight at 37 °C. A 1 mM stock solution of **2** in DMSO was prepared and diluted to a final concentration of 10 µM and treated with the cells for 90 minutes. Carbonyl cyanide 3-chlorophenylhydrazone (CCCP) was used as a positive control. A stock solution of CCCP in DMSO was prepared and added at a final concentration of 100 µM to the cells and the cells were treated for 1 h. At the end of the treatment period, cells were collected into falcon tube via trysinization, centrifuged, supernatant removed and resuspended in PBS (100 µL). TMRE dye (Cayman Chemicals) was then prepared by adding 5 µL of TMRE stock into 12.5 mL of PBS to make 200 nM working solution. Then, 100 µL TMRE dye was then added to the cells and incubated at 37 °C for 20 minutes. After 20 minutes, the cells were centrifuged and the TMRE

dye solution was removed and replaced with PBS (200 µL). The samples were then subjected to FACS analysis. Graphs are representative of three technical replicates. Percentages are plotted as the mean ± s.e.m. (n = 3)

ROS Analysis (DFC-DA). MDA-MB-468 cells were seeded at a density of 5 x 10^5 cells/well in a 6-well clear bottom plate with a final volume of 2 mL and allowed to adhere overnight at 37 °C. For pre-treated wells, a solution of *N*-acetylcysteine in DMEM (10 mM) was added to cells for 2 h prior to addition of **2**. Stock solution of **2** (1mM) in DMSO was prepared and diluted to a final concentration of 10 µM. Cells were treated with compound at a concentration 10 µM and treated for 2 h. For the positive control, H_2O_2 was used and diluted with PBS and added at a final concentration of 1 mM with a treatment time of 1 h. Following treatment, the media were removed, cells were washed with PBS (2 mL x 2), and 500 µL DCF-DA (20 µM) solution in PBS was added and incubated for 30 minutes at 37 °C in the dark. DCF-DA was removed and washed with 1 mL of PBS twice. 500 µL of PBS was added and the cells were visualized on fluorescent microscopy (excitation, λ = 488 nm). Each data set is representative of three technical replicates

Apoptosis Analysis. MDA-MB-468 cells were seeded at a density of 5 x 10^5 cells/well in a 6 well clear bottom plate with a final media volume of 2 mL and allowed to adhere overnight at 37 °C. A stock of **2** was prepared fresh in DMSO and added to the desired well at a concentration of 1.3 and 2.5 µM with a final volume of 3 mL and incubated for 24 h at 37 °C. A stock of H_2O_2 was prepared in PBS and the cells treated at a final concentration of 2 mM for 1 hour as a positive control. After 24 h, the wells were washed with PBS (5 mL), and cell collected via trypsinization (1 mL trypsin followed by addition of 5mL of media). Typsinized cells were centrifuged, and the pellet resuspended in 2 mL of DMEM and reconstituted to a concentration of 1 x 10^5 cells /mL. The cells were centrifuged again, the pellet suspended in 500 µL of Annexin binding buffer, 5 µl of Annexin V-FITC and 5 µl PI and incubated in the dark at room temperature for 5 minutes. The control wells were separated and treated with Annexin binding buffer and 5 µl of the corresponding stain. The samples were then subjected to FACS analysis. Graphs are representative of three technical replicates. Percentages are plotted as the mean ± s.e.m. (n = 3)

In vivo experiment of 2. 5-week-old female BALB/c mice were purchased from Jackson Laboratories, and they had an acclimation period of one week before inoculation with 1,000,000 4T1 cells subcutaneously on their right flanks. After 3 days of implantation, the mice were systemically treated with 10 mg/kg **2** via intraperitoneal administration. Complex 2 was formulated in DMSO (1%), Kolliphor (10%), and PBS (89%) and delivered at 100 μL. The control group was treated with a PBS solution containing 1% DMSO and 10% Kolliphor. The injection of **2** was performed three times a week for two weeks. Tumor size and body weight measurements were performed three days a week, and mice were euthanized 15 days later.

Supplementary Figures and Tables:

X-Ray Crystallographic Details:

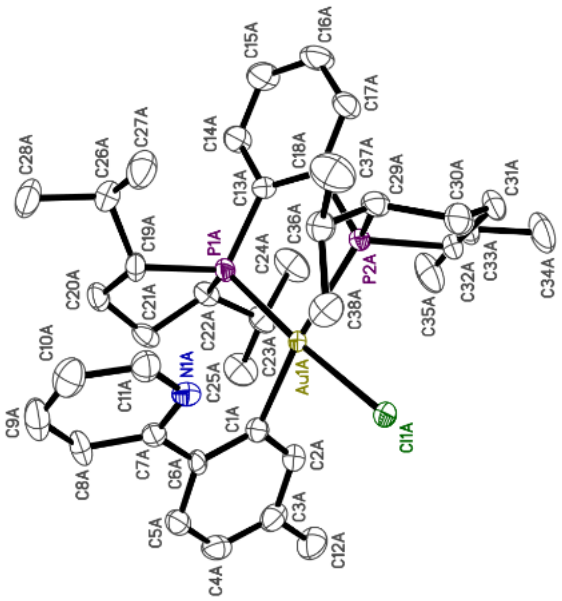


Fig. S1. Crystal structure of **2**. Thermal ellipsoids are shown at the 50% probability level. Hydrogen and solvent molecule are omitted for clarity. Only one representative molecule from the asymmetric unit is shown.

Table S1: X-ray Parameters of **2**

X-ray Structural Data and Crystal Refinement

	2
Empirical Formula	$C_{81.64}H_{120.10}Au_2Cl_4N_3O_{0.91}P_4$
Molecular Weight (g/mol)	1817.75

Temperature (K)	90.0(2)
X-ray Radiation (Å)	Mo Kα (0.71073 Å)
Crystal System, Space Group	Monoclinic, P2(1)
Unit Cell Dimensions (A), (o)	a = 13.6785(4) A alpha = 90 deg. b = 14.3981(4) A beta = 103.178(1) deg. c = 24.5362(8) A gamma = 90 deg.
Volume	4705.0(2) A^3
Z	2
Absorption Coefficient	3.335 mm^{-1}
F(000)	1848
Crystal Size (mm)	0.130 x 0.110 x 0.080
Theta Range	2.014 to 27.502 deg
Completeness to Theta = 25.242	99.9%
F^2	1.018
Final R indices [I>2sigma(I)]	R1 = 0.0223, wR2 = 0.0459

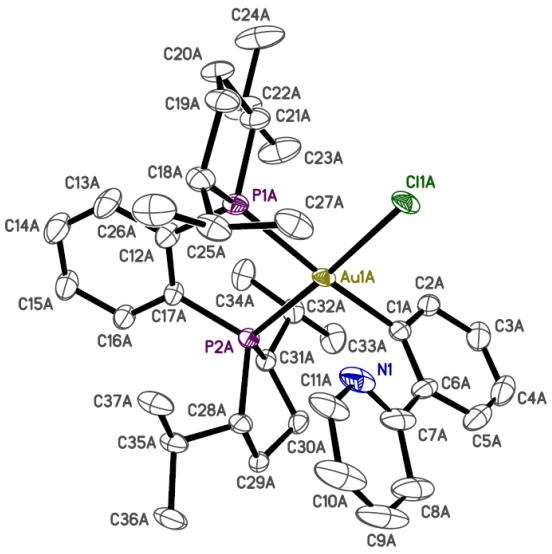


Fig S2. Crystal structure of **3**. Thermal ellipsoids are shown at the 50% probability level. Hydrogen and solvent molecules are omitted for clarity. Only one representative molecule from the asymmetric unit is shown.

Table S2: X-ray Parameters of **3**

X-ray Structural Data and Crystal Refinement

	3
Empirical Formula	$C_{76}H_{107}Au_2Cl_4N_3P_4$
Molecular Weight (g/mol)	1722.25
Temperature (K)	90.0(2)
X-ray Radiation (Å)	Mo Kα (0.71073 Å)
Crystal System, Space Group	Orthorhombic, P2(1)2(1)2(1)
Unit Cell Dimensions (A), (o)	a = 14.7916(4) A alpha = 90 deg. b = 20.4903(5) A beta = 90 deg. c = 30.1218(7) A gamma = 90 deg.
Volume	9129.4(4) A^3

Z	4
Absorption Coefficient	3.433 mm^{-1}
F(000)	3480
Crystal Size (mm)	0.170 x 0.150 x 0.080
Theta Range	2.10 to 27.502 deg
Completeness to Theta = 25.242	99.9%
F^2	1.042
Final R indices [I>2sigma(I)]	R1 = 0.0285, wR2 = 0.0666

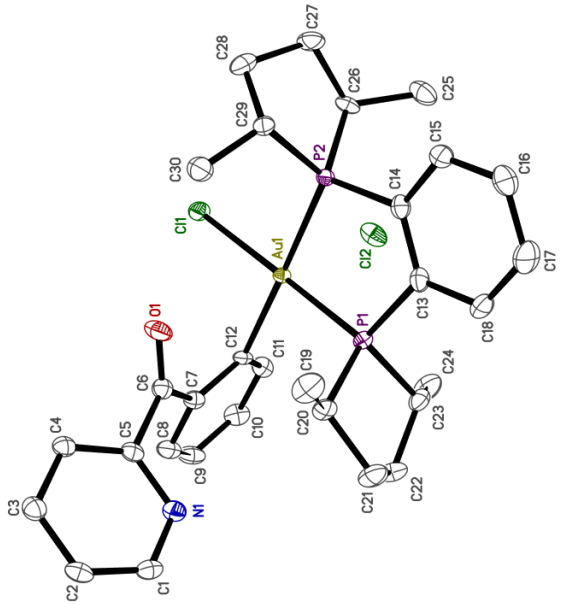


Fig S3. Crystal structure of **5**. Thermal ellipsoids are shown at the 50% probability level. Outer-sphere solvent molecules are omitted for clarity.

Table S3: X-ray Parameters of **5**

X-ray Structural Data and Crystal Refinement

	5
Empirical Formula	$C_{30}H_{36}AuCl_2NOP_2$
Molecular Weight (g/mol)	756.4
Temperature (K)	90.0(2)
X-ray Radiation (Å)	Mo Kα (0.71073 Å)
Crystal System, Space Group	Orthorhombic, P2(1)2(1)2(1)
Unit Cell Dimensions (A), (o)	a = 11.4288(3) A alpha = 90 deg. b = 15.0311(4) A beta = 90 deg. c = 16.9907(4) A gamma = 90 deg.
Volume	2918.79(13) A^3
Z	4
Absorption Coefficient	5.358 mm^{-1}
F(000)	1496
Crystal Size (mm)	0.110 x 0.070 x 0.060
Theta Range	2.148 to 27.502 deg
Completeness to Theta = 25.242	99.8%
F^2	1.001
Final R indices [I>2sigma(I)]	R1 = 0.0151, wR2 = 0.0333

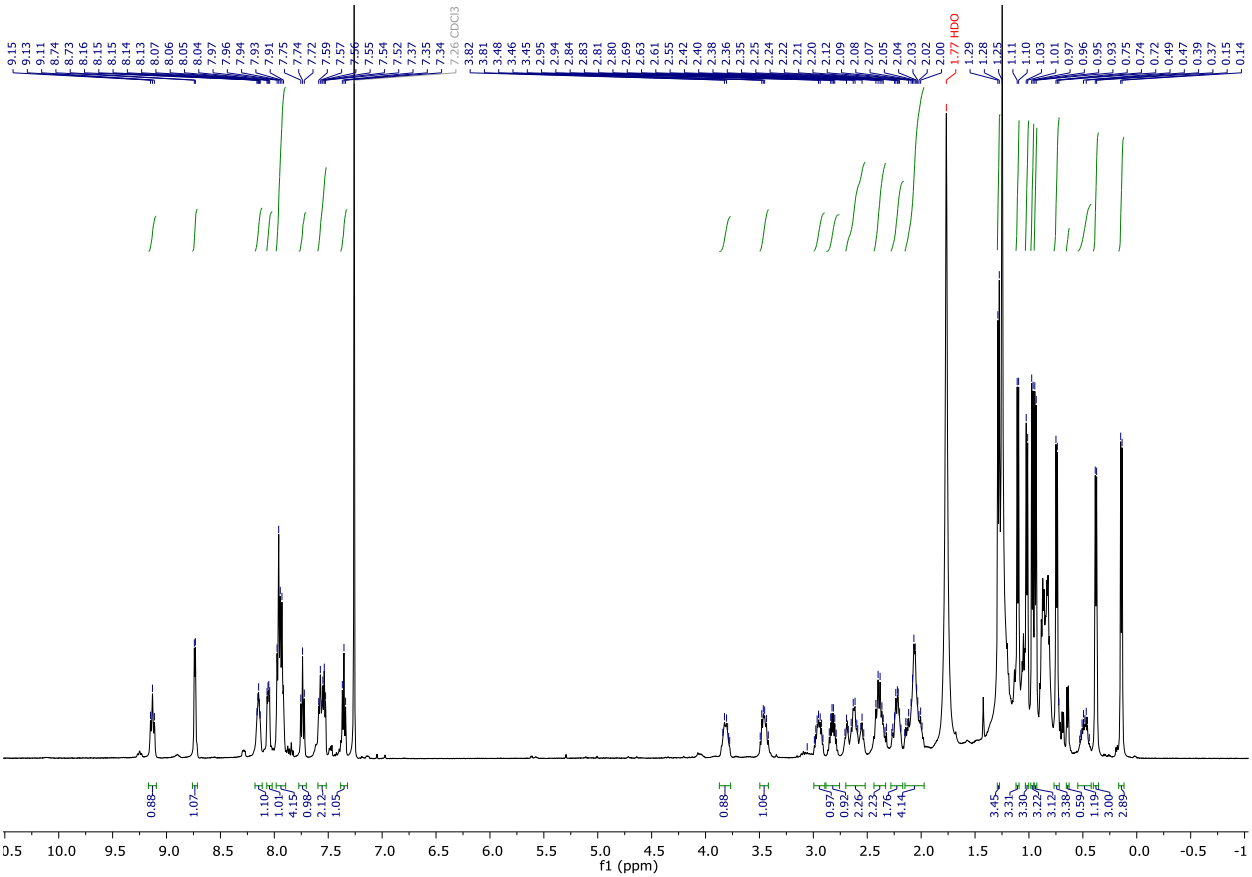


Fig. S4. ^{1}H NMR spectrum of **1** in $CDCl_3$ at 298K.

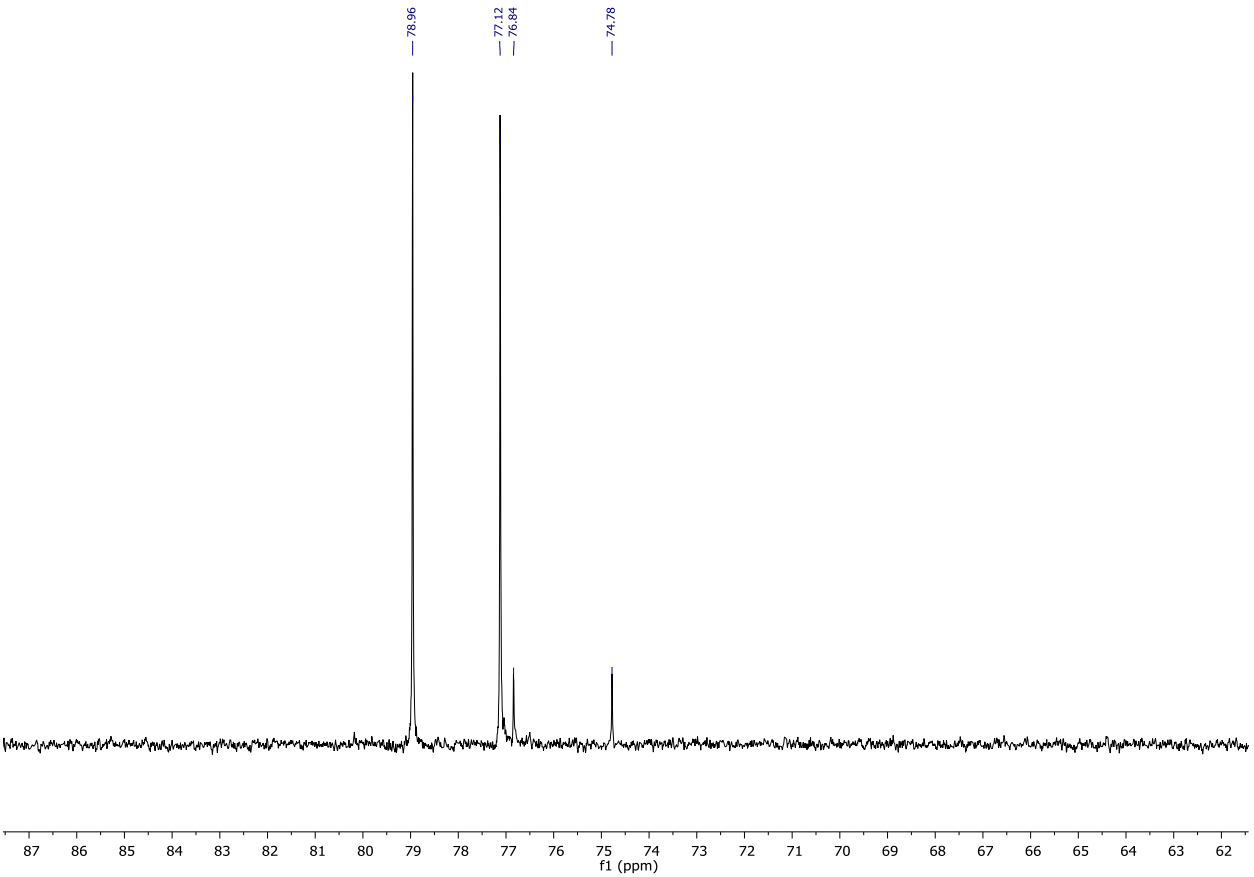


Fig. S5. ^{31}P NMR spectrum of **1** in $CDCl_3$ at 298K.

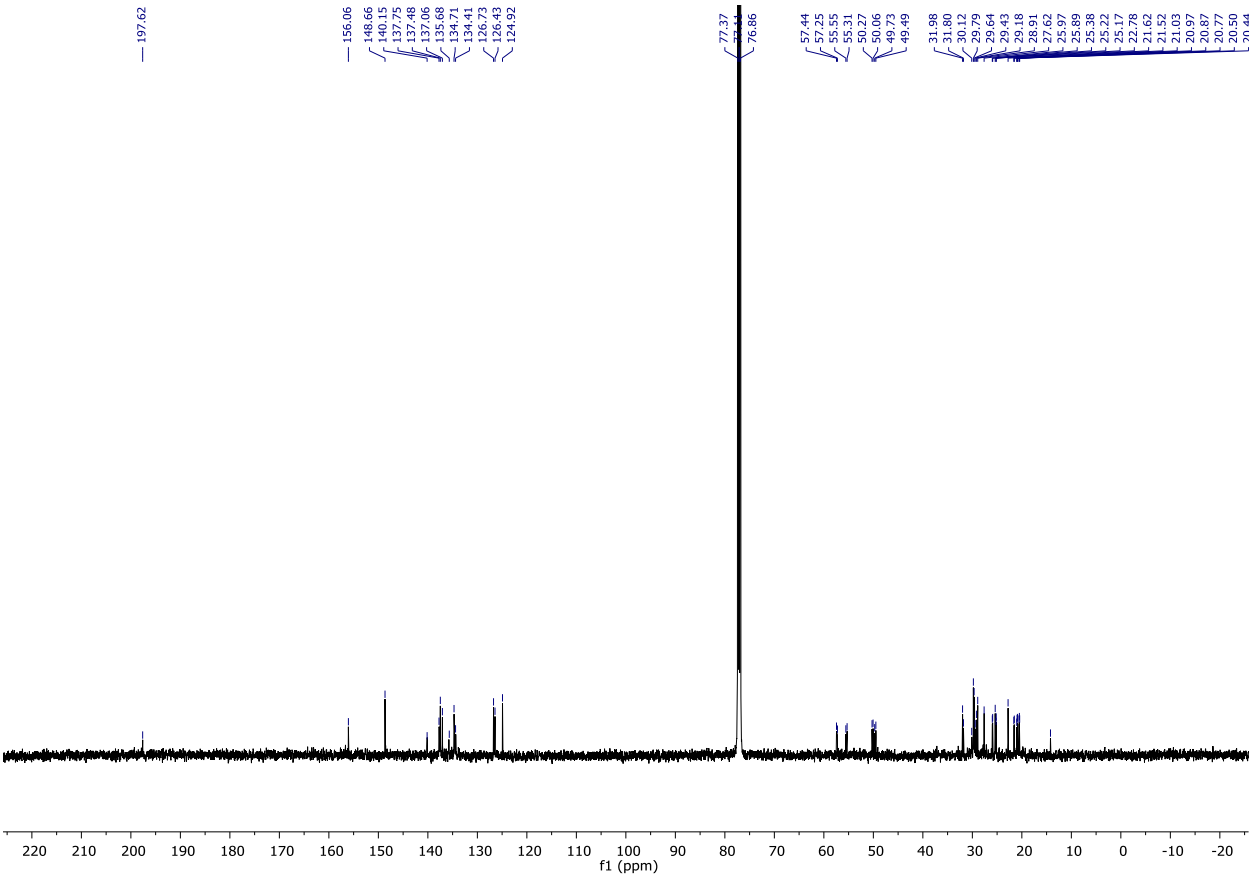


Fig. S6. ^{13}C NMR spectrum of **1** in $CDCl_3$ at 298K.

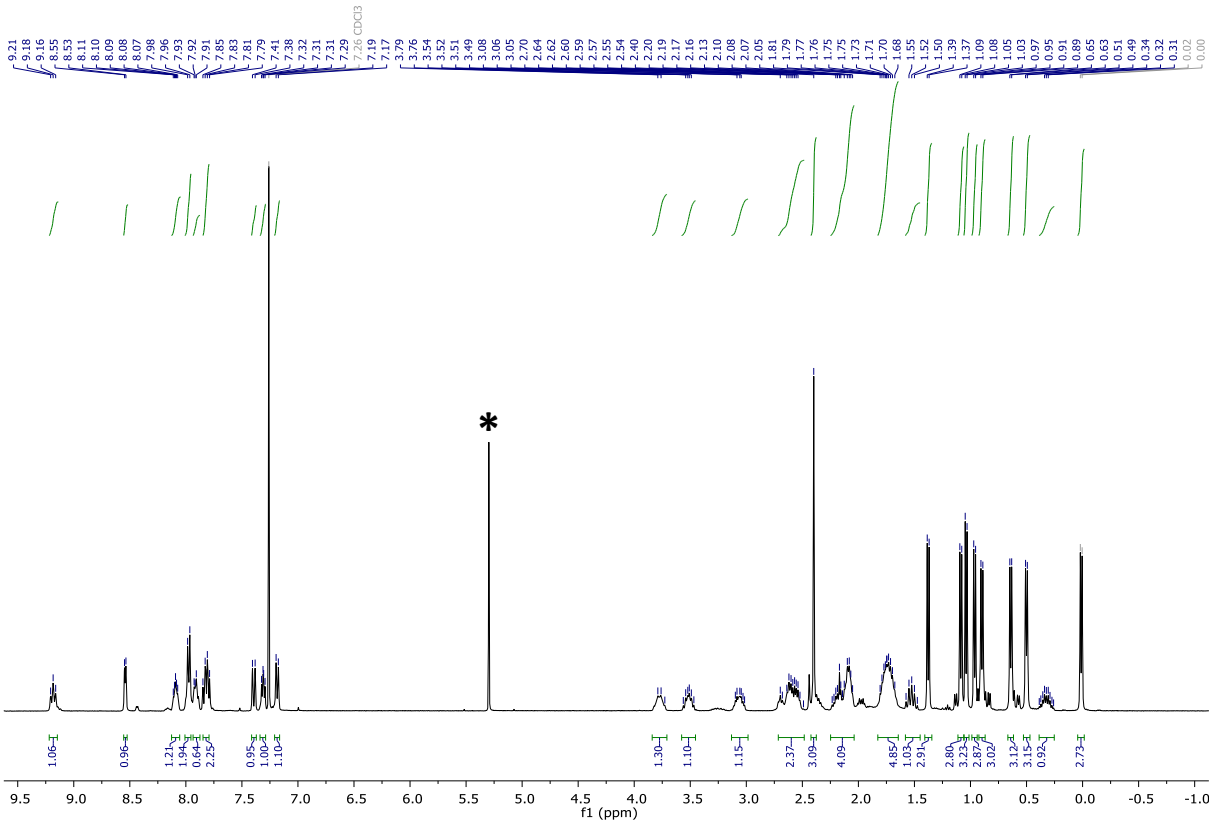


Fig. S7. ^{1}H NMR spectrum of **2** in $CDCl_3$ at 298K. * = CH_2Cl_2

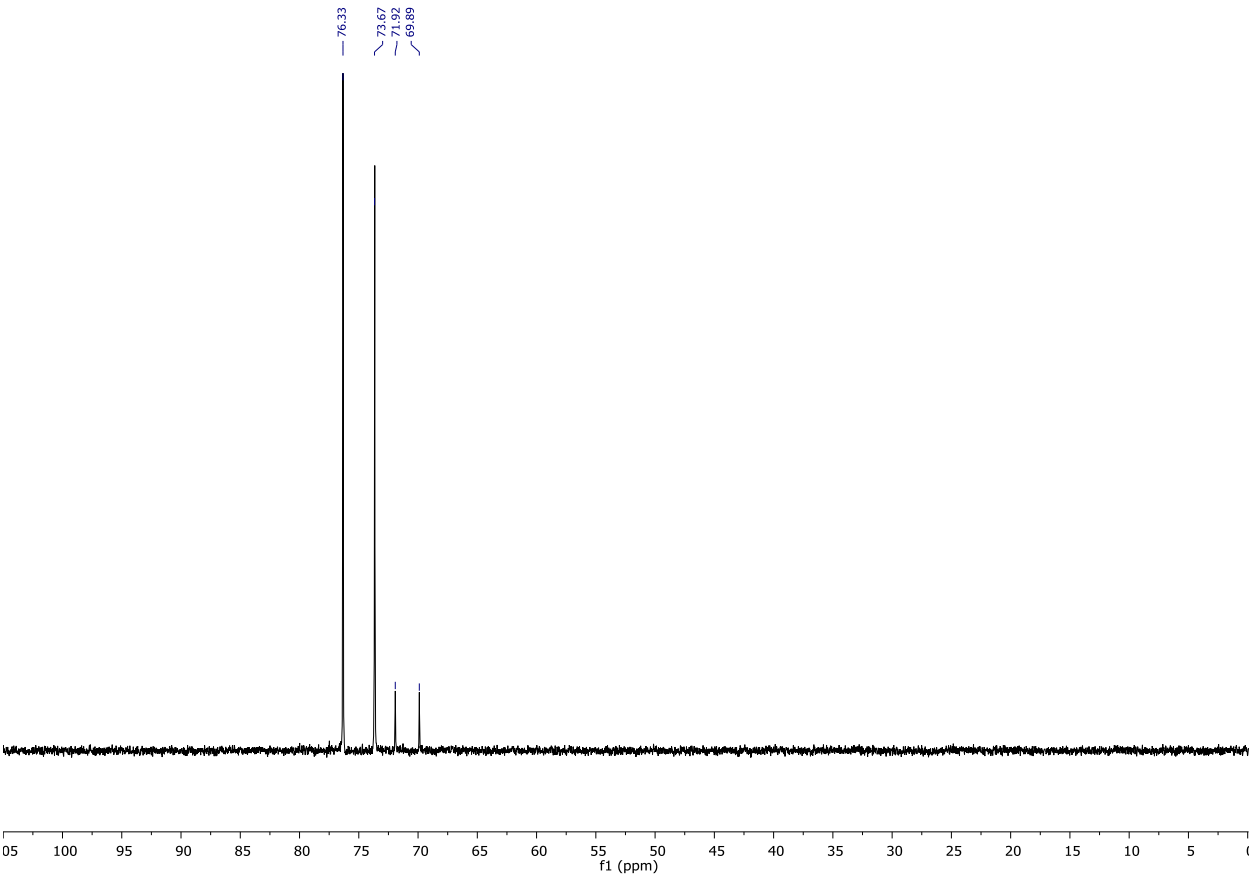


Fig. S8. ^{31}P NMR spectrum of **2** in $CDCl_3$ at 298K.

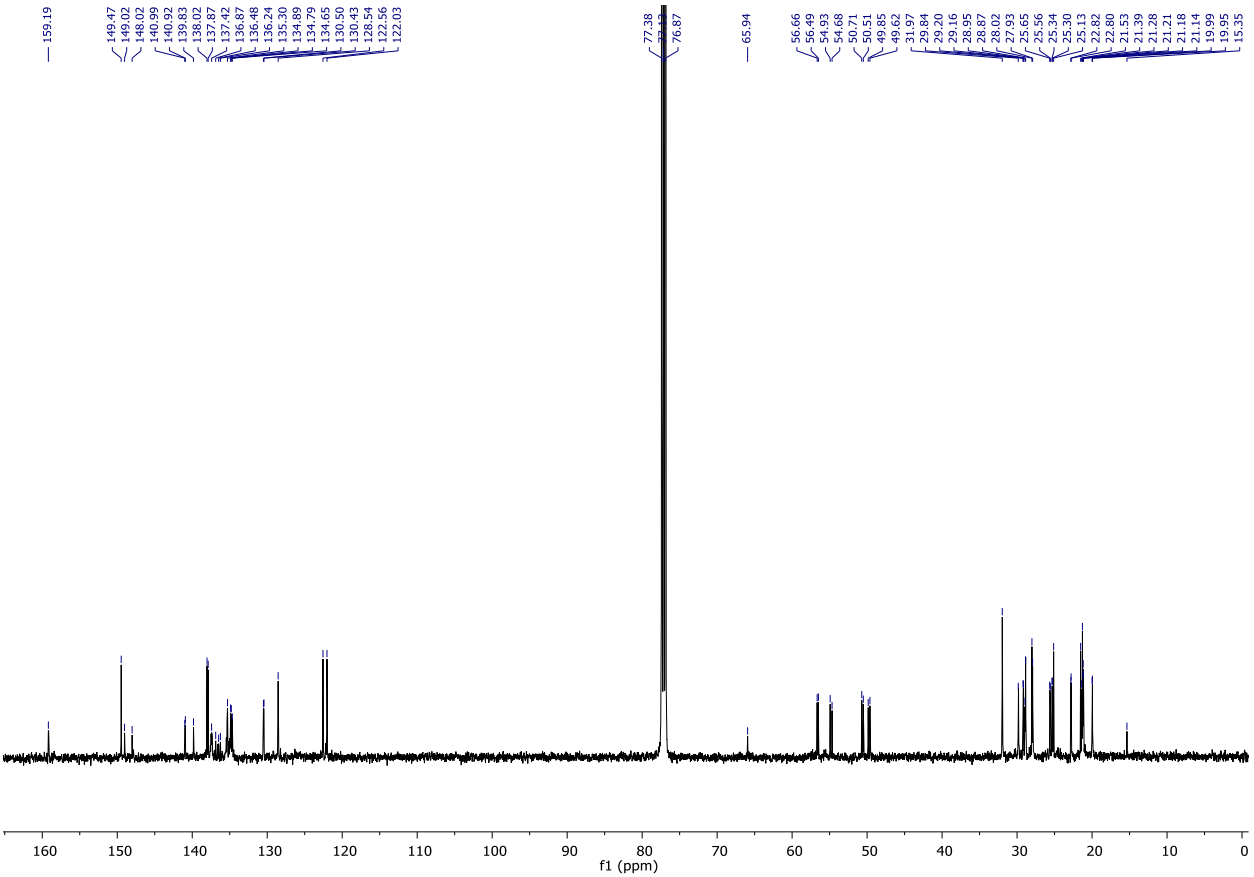


Fig. S9. ^{13}C NMR spectrum of **2** in $CDCl_3$ at 298K.

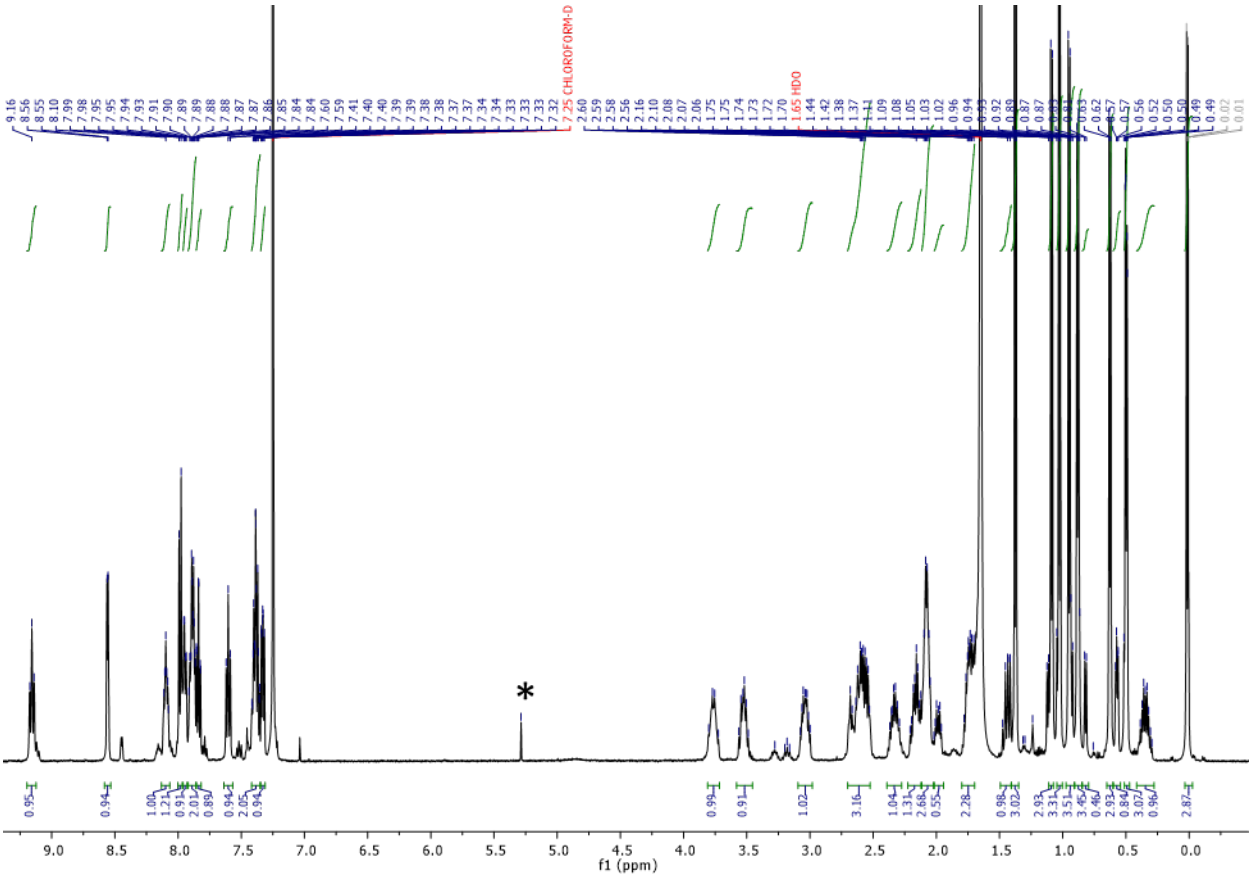


Fig. S10. ^{1}H NMR spectrum of **3** in $CDCl_3$ at 298K *= CH_2Cl_2

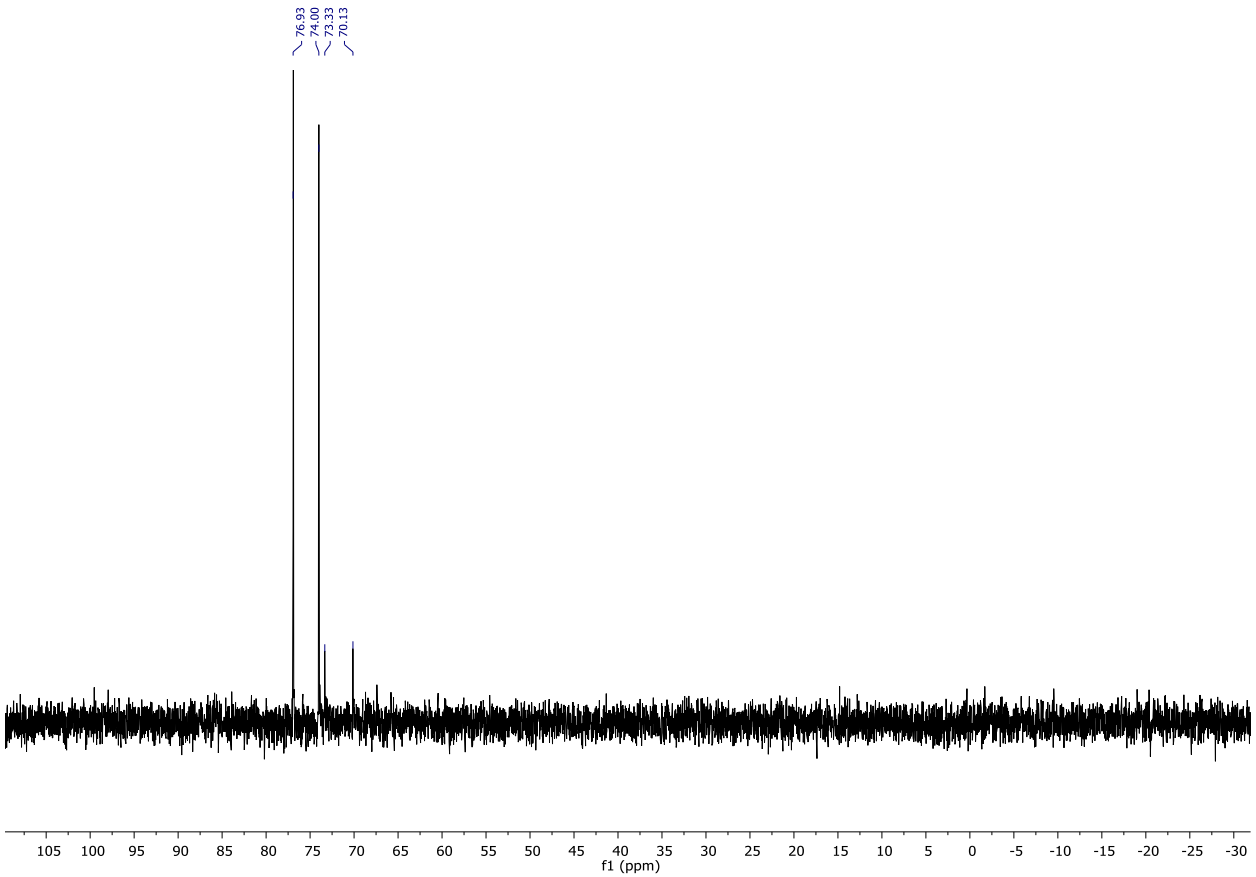


Fig. S11. ^{31}P NMR spectrum of **3** in $CDCl_3$ at 298K

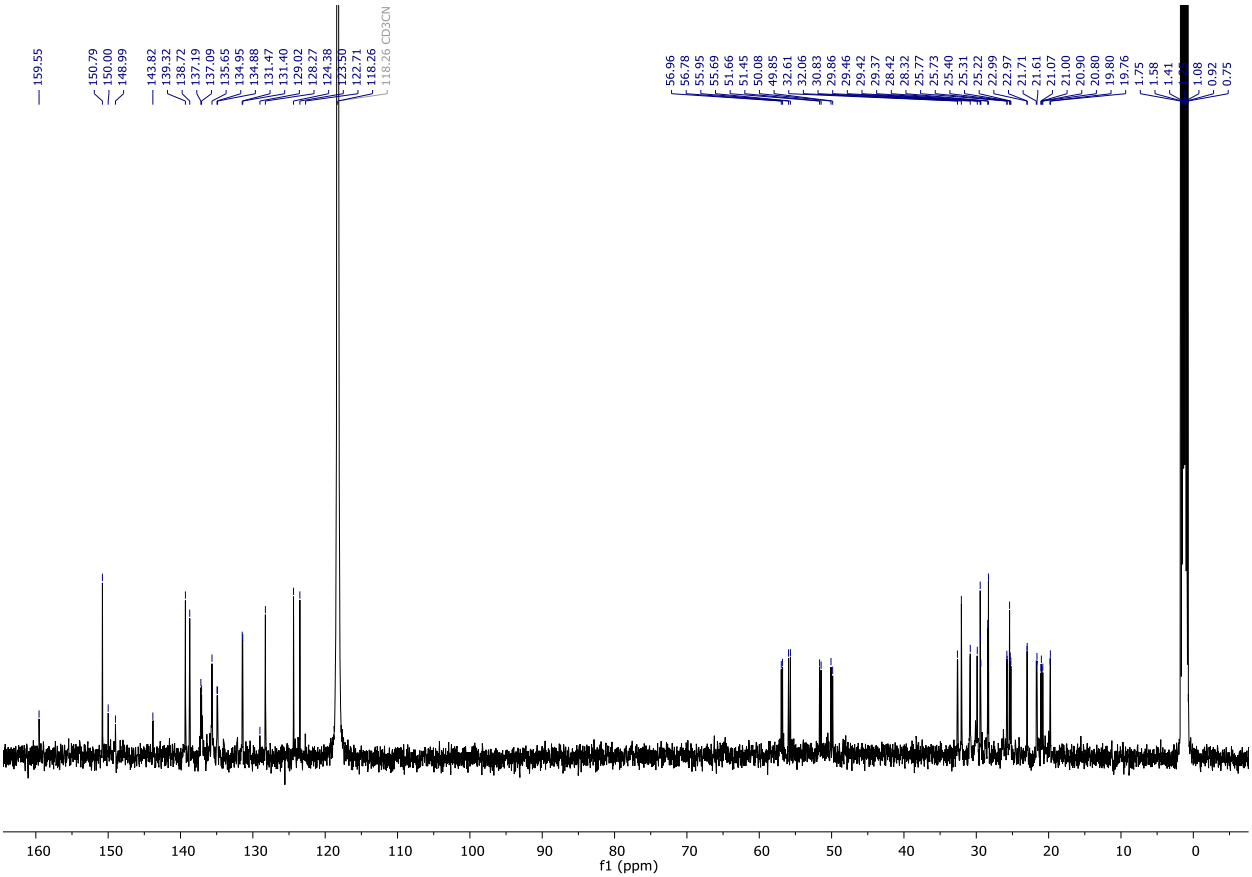


Fig. S12. ^{13}C NMR spectrum of **3** in $CDCl_3$ at 298K

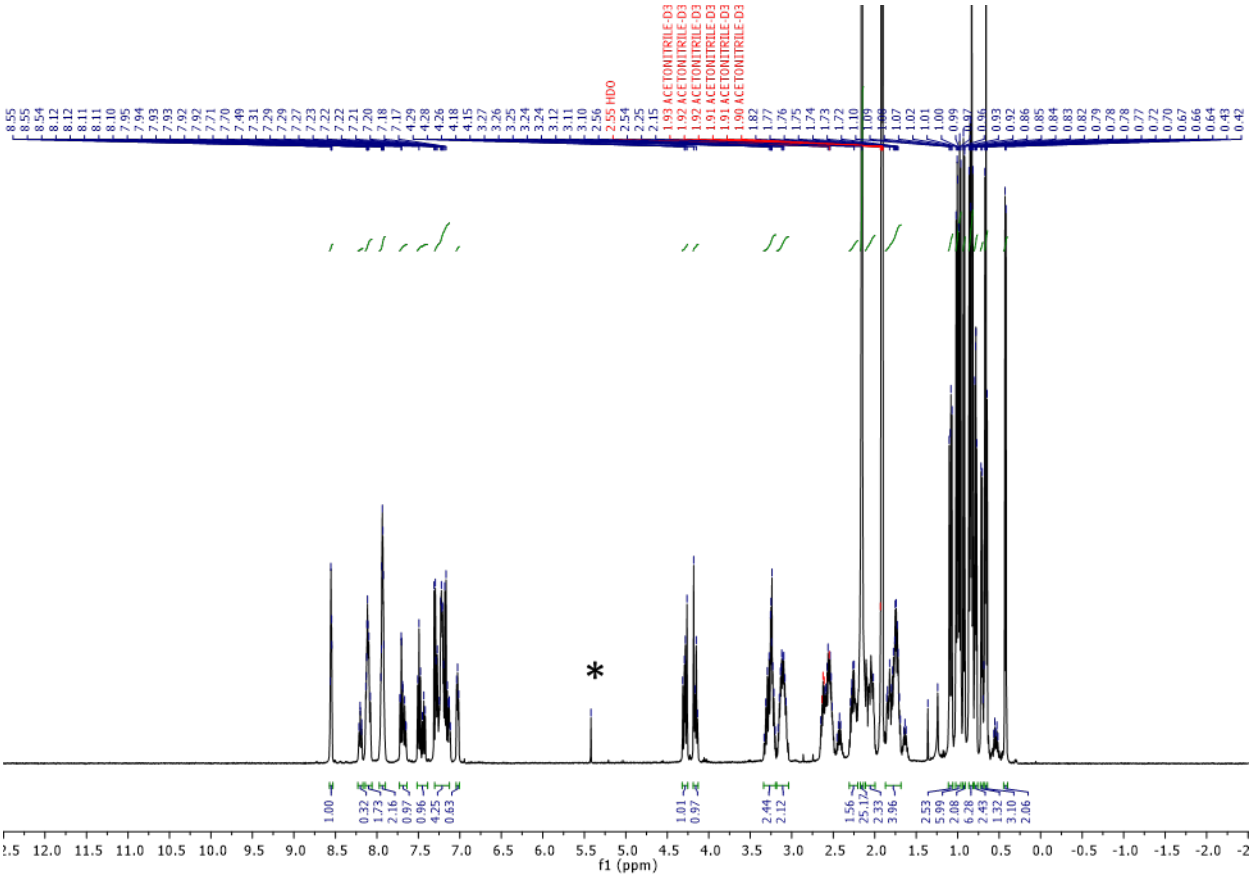


Fig. S13. ^{1}H NMR spectrum of **4** in MeCN-d_3 at 298K *= CH_2Cl_2

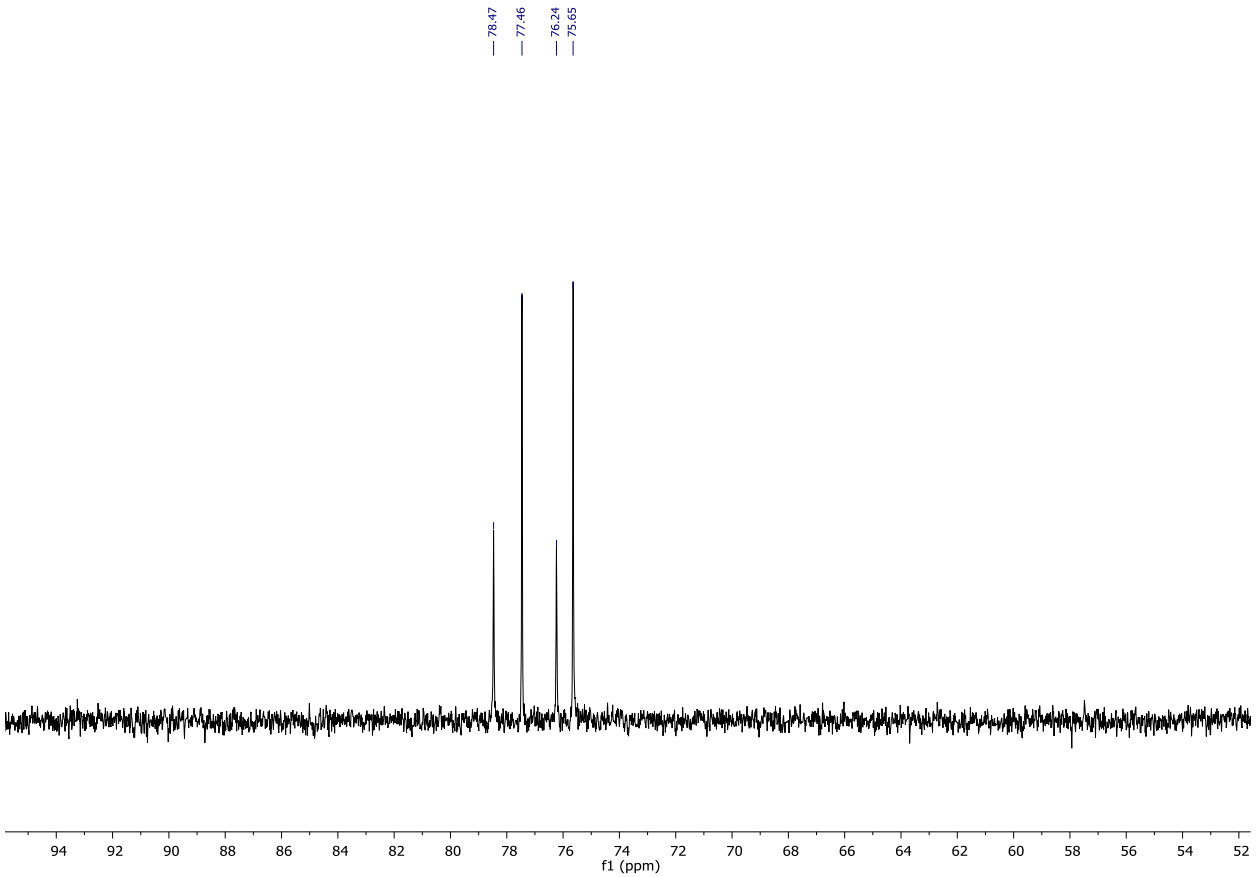


Fig. S14. ^{13}P NMR spectrum of **4** in MeCN-d_3 at 298K

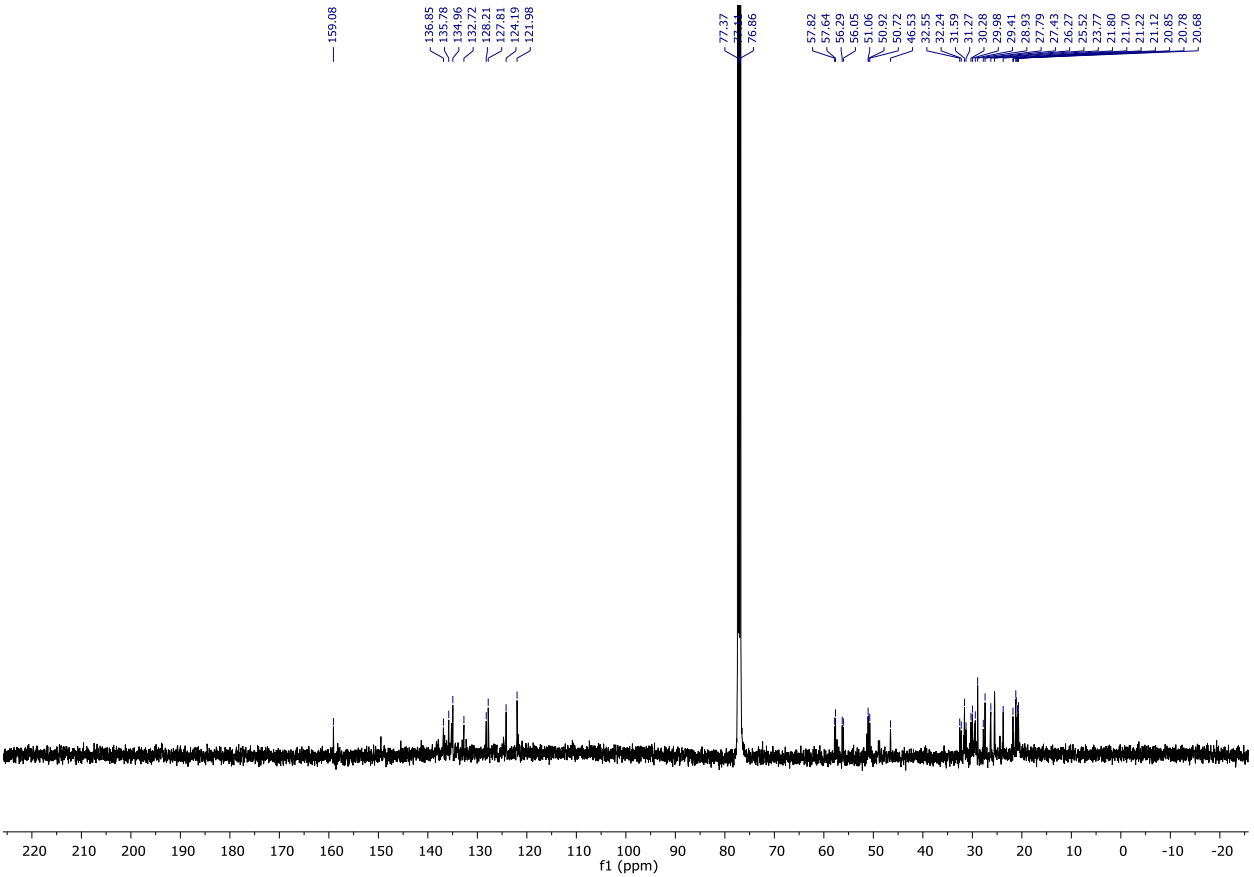


Fig. S15. ^{13}C NMR spectrum of **4** in $CDCl_3$ at 298K.

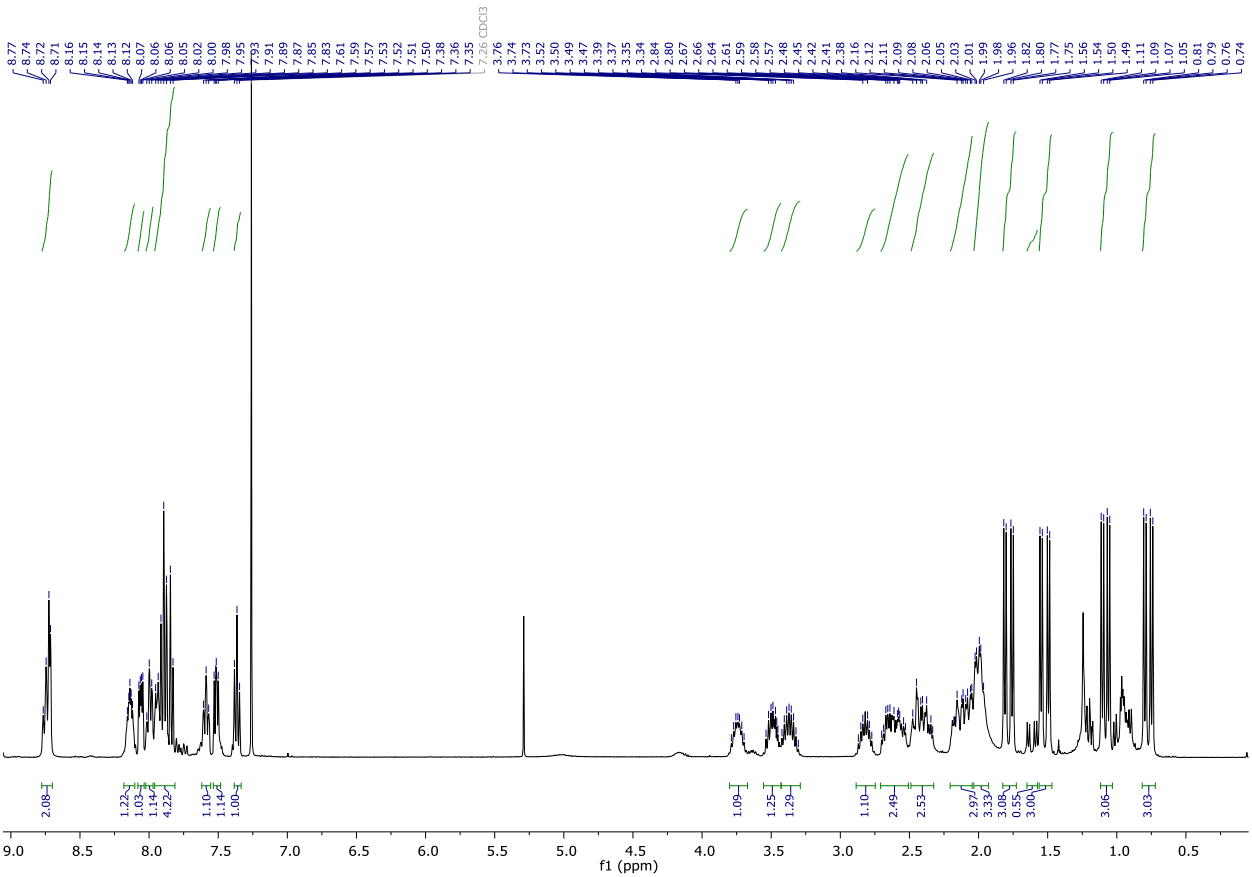


Fig. S16. ^{1}H NMR spectrum of **5** in $CDCl_3$ at 298K. CH_2Cl_2

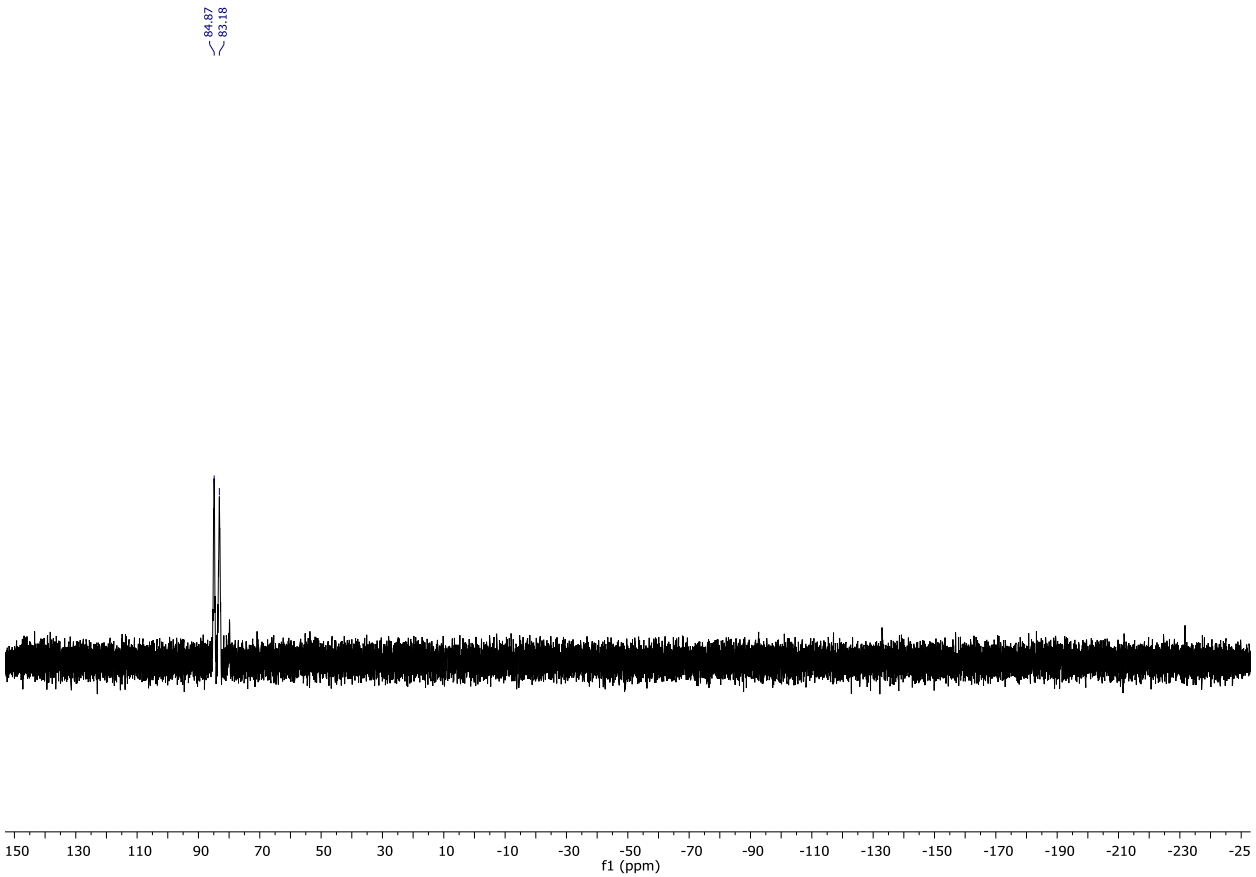


Fig. S17. ^{31}P NMR spectrum of **5** in $CDCl_3$ at 298K.

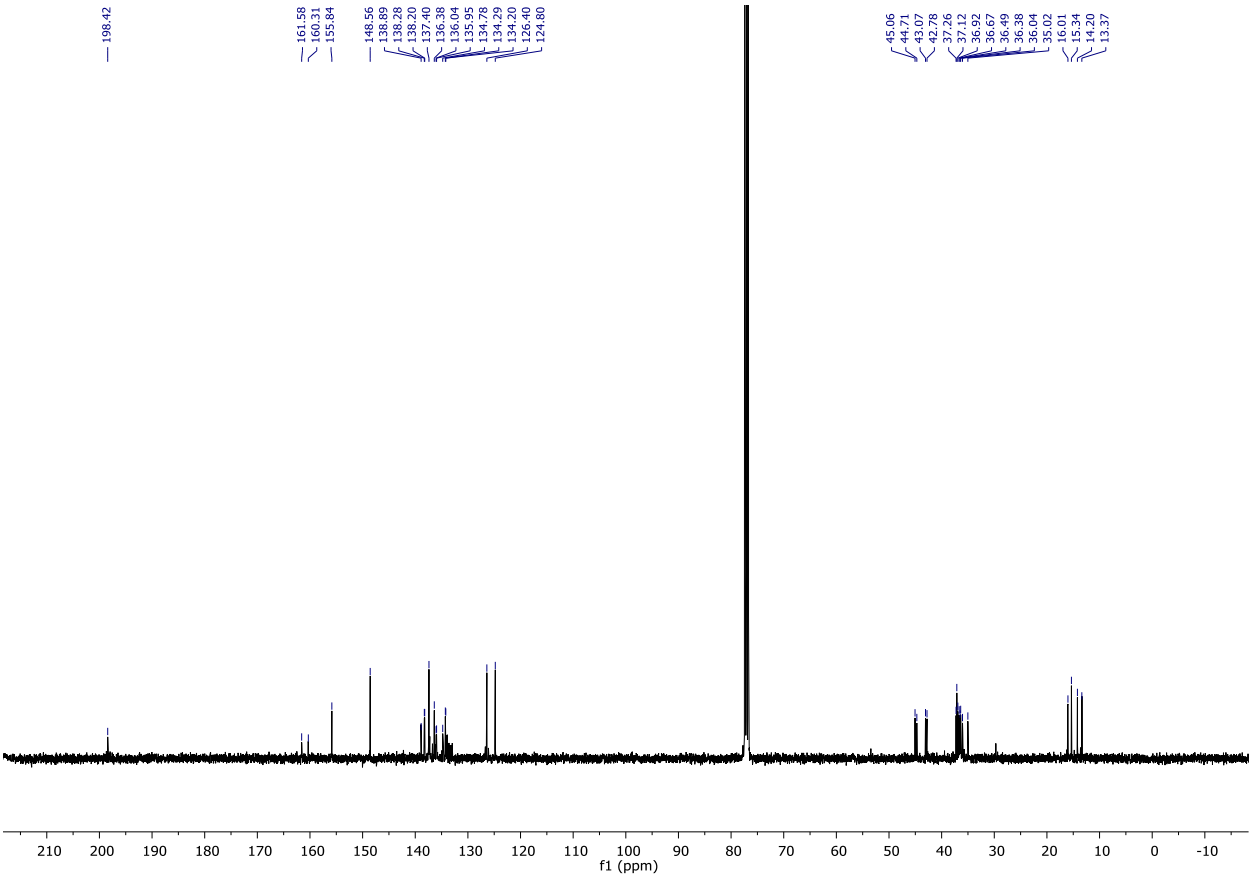


Fig. S18. ^{13}C NMR spectrum of **5** in $CDCl_3$ at 298K.

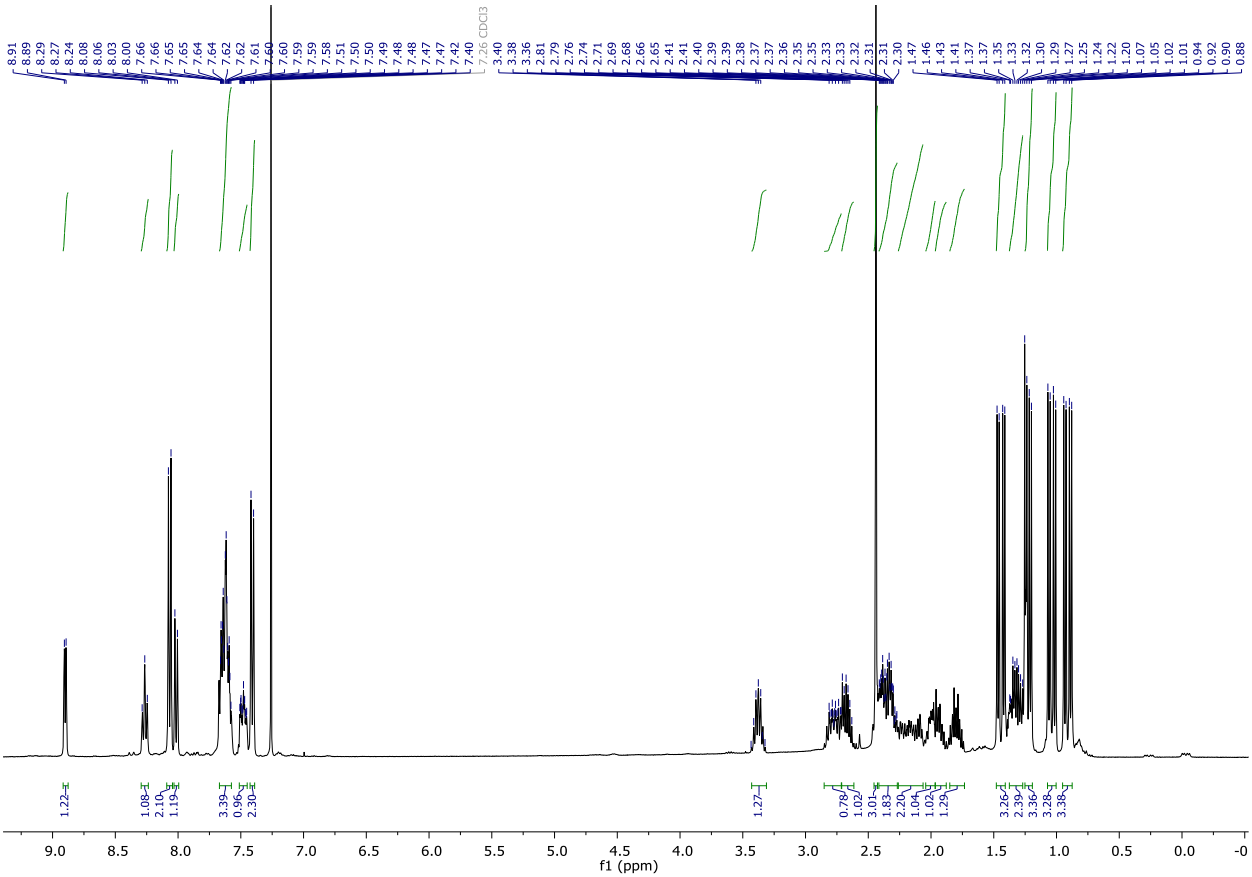


Fig. S19. ^{1}H NMR spectrum of **6** in $CDCl_3$ at 298K.

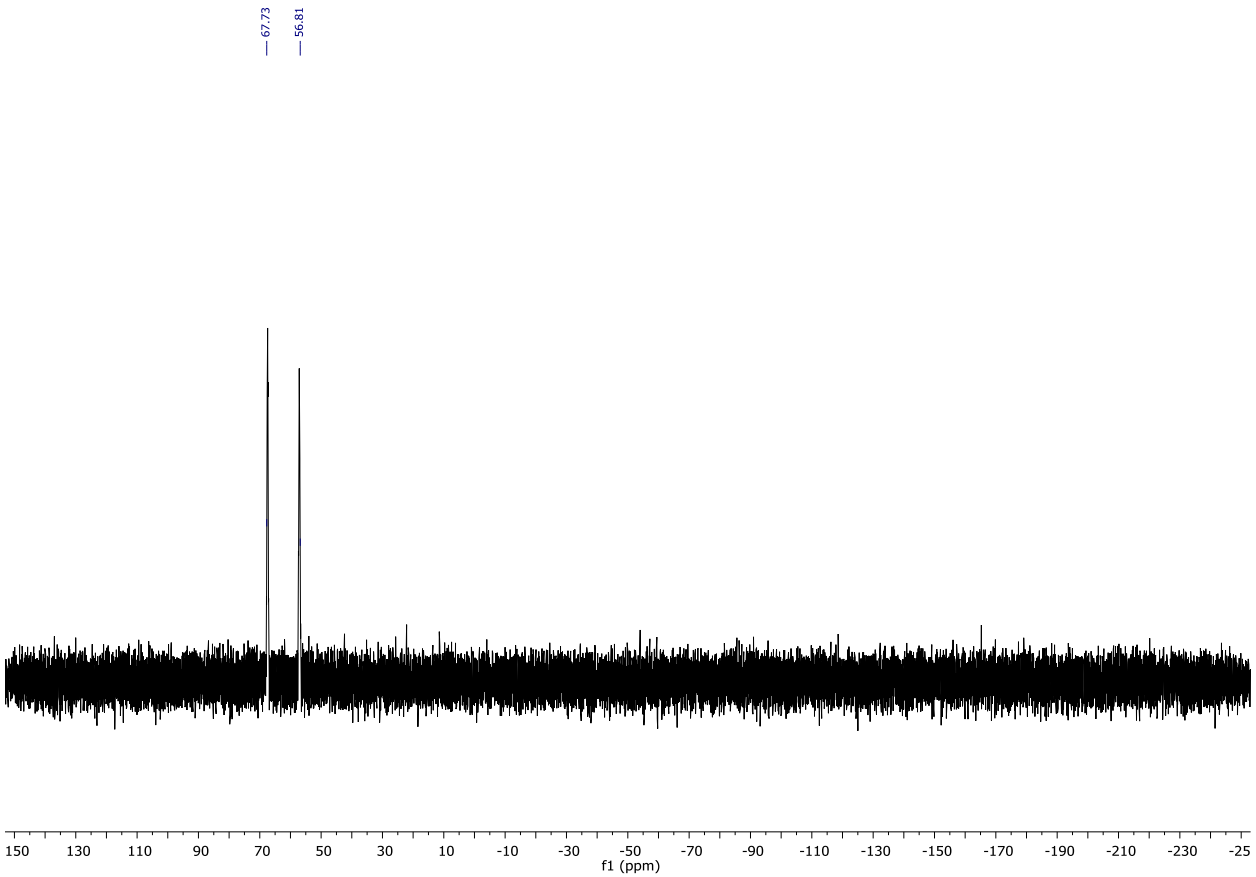


Fig. S20. ^{31}P NMR spectrum of **6** in $CDCl_3$ at 298K.

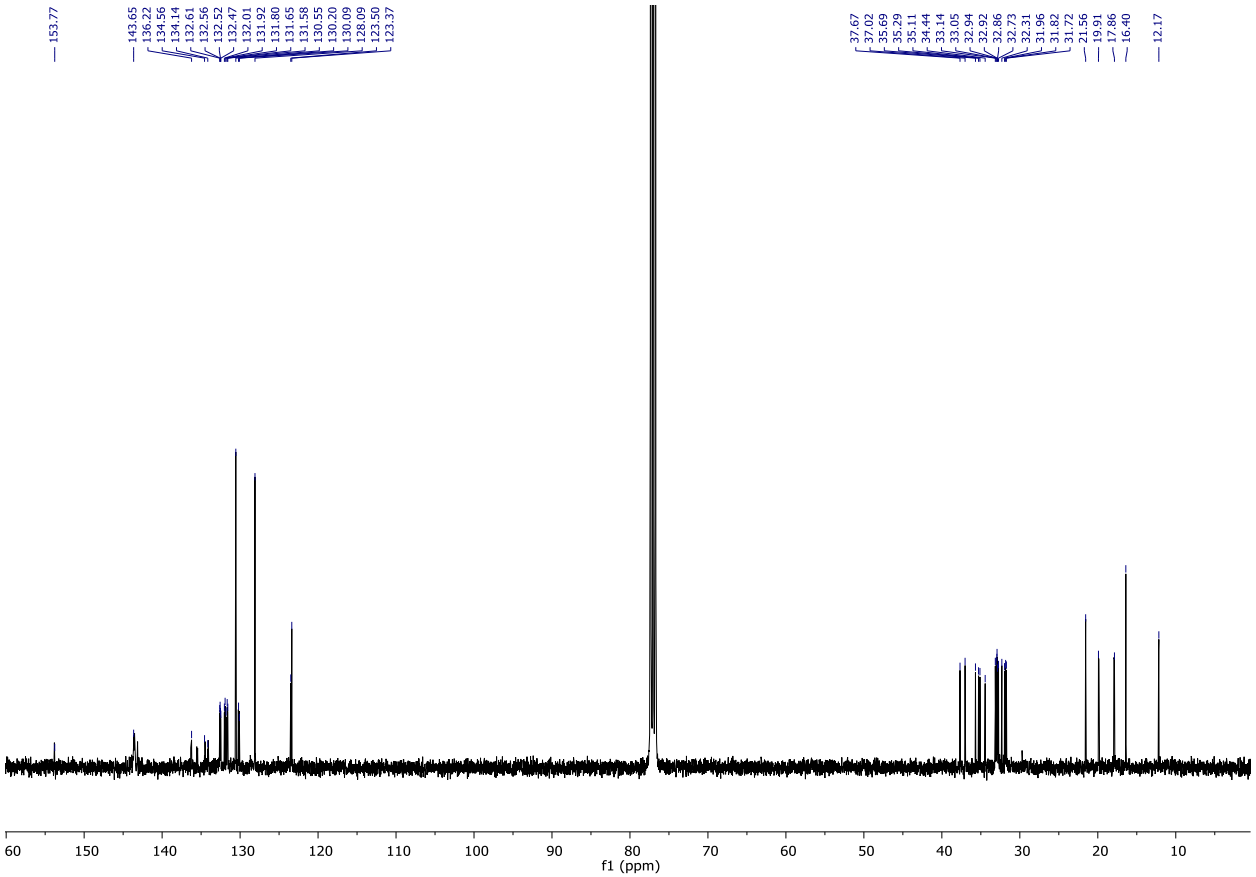


Fig. S21. ^{13}C NMR spectrum of **6** in $CDCl_3$ at 298K.

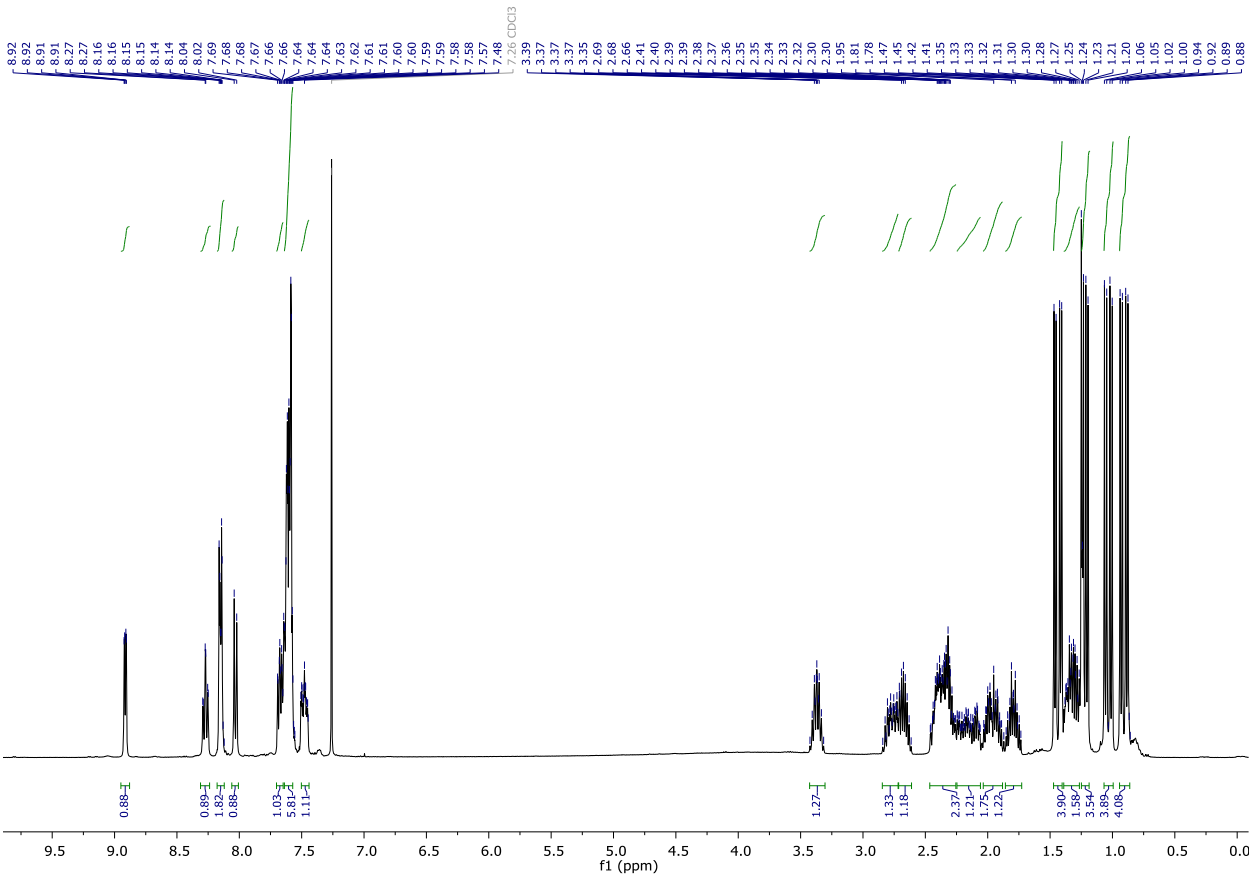


Fig. S22. ^{1}H NMR spectrum of **7** in $CDCl_3$ at 298K.

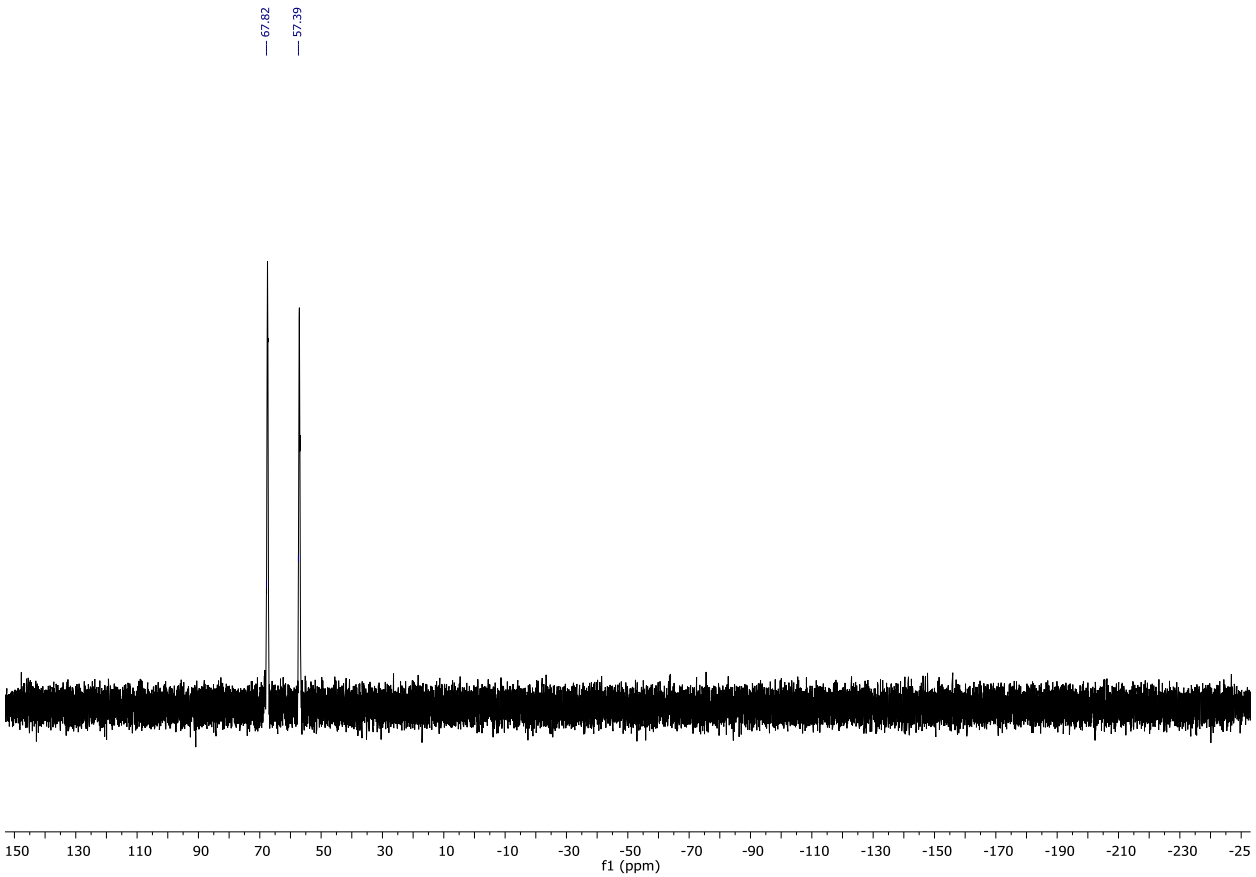


Fig. S23. ^{31}P NMR spectrum of **7** in $CDCl_3$ at 298K.

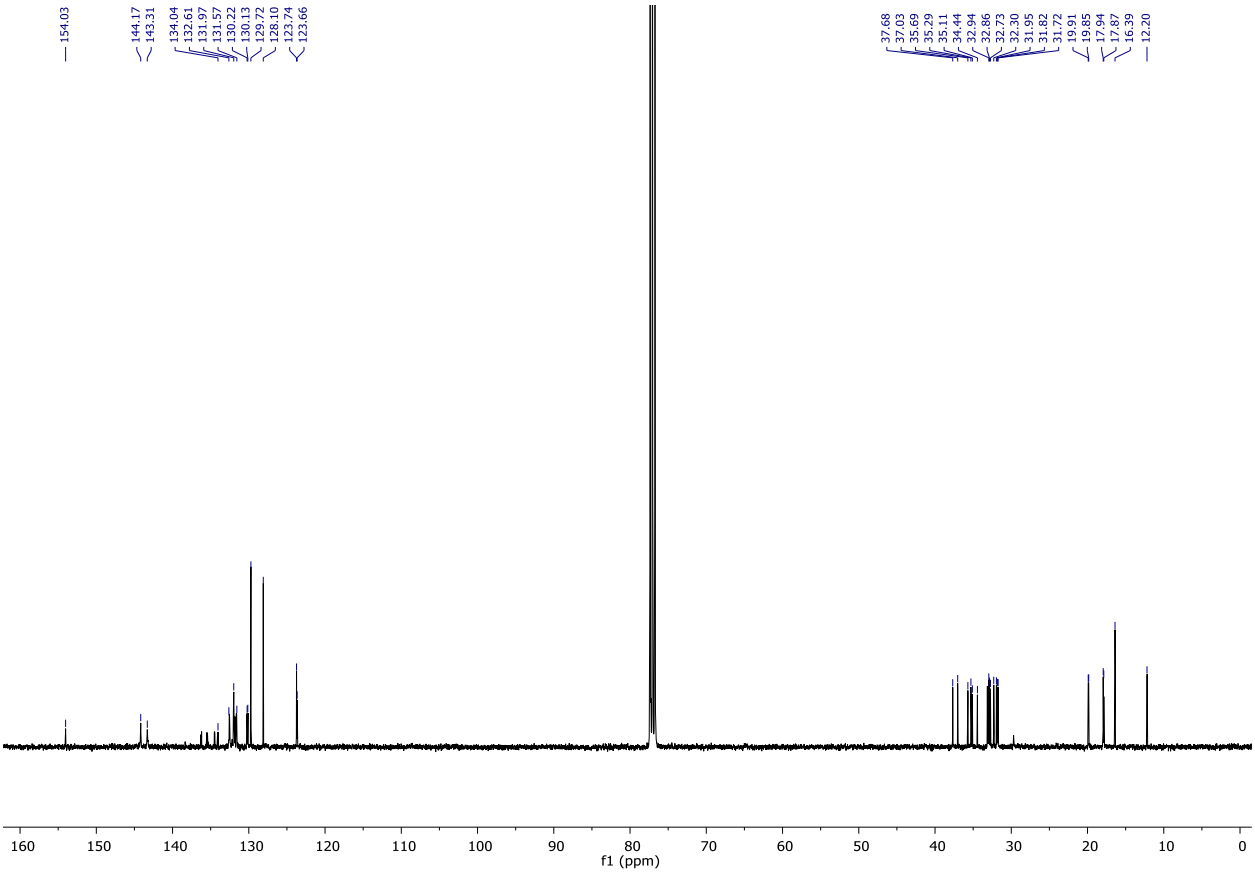


Fig. S24. ^{13}C NMR spectrum of **7** in $CDCl_3$ at 298K.

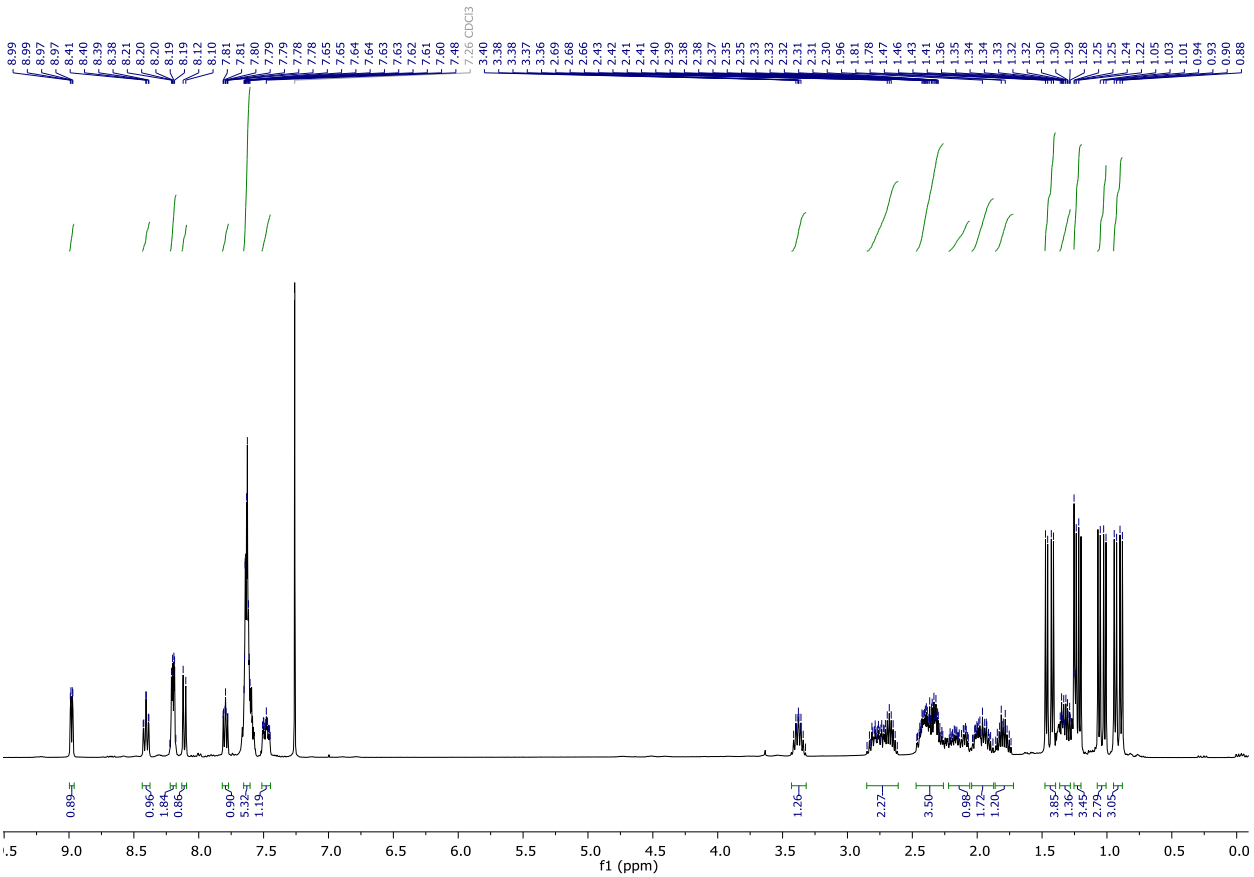


Fig. S25. ^{1}H NMR spectrum of *S,S*- isomer of **7** in $CDCl_3$ at 298K.

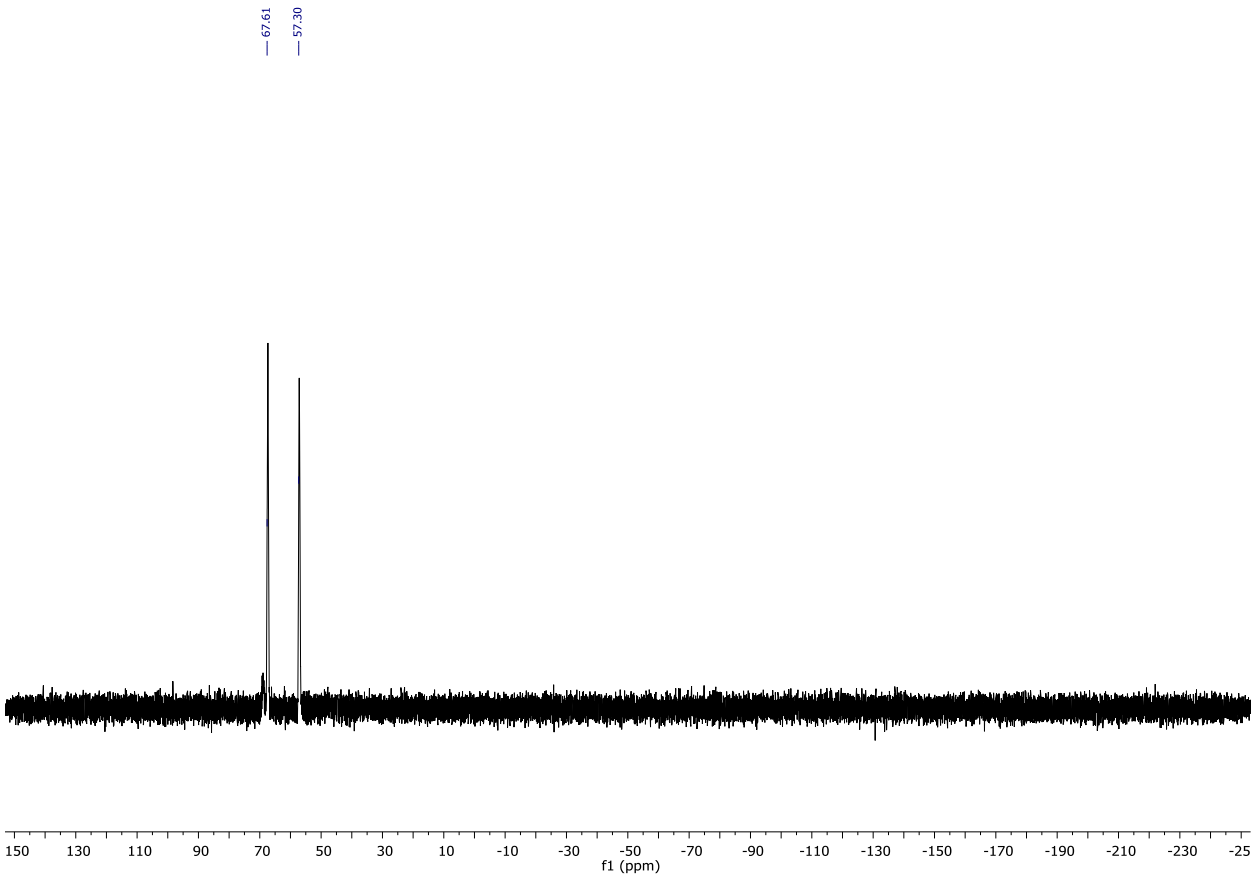


Fig. S26. ^{31}P NMR spectrum of *S,S*-isomer of **7** in $CDCl_3$ at 298K.

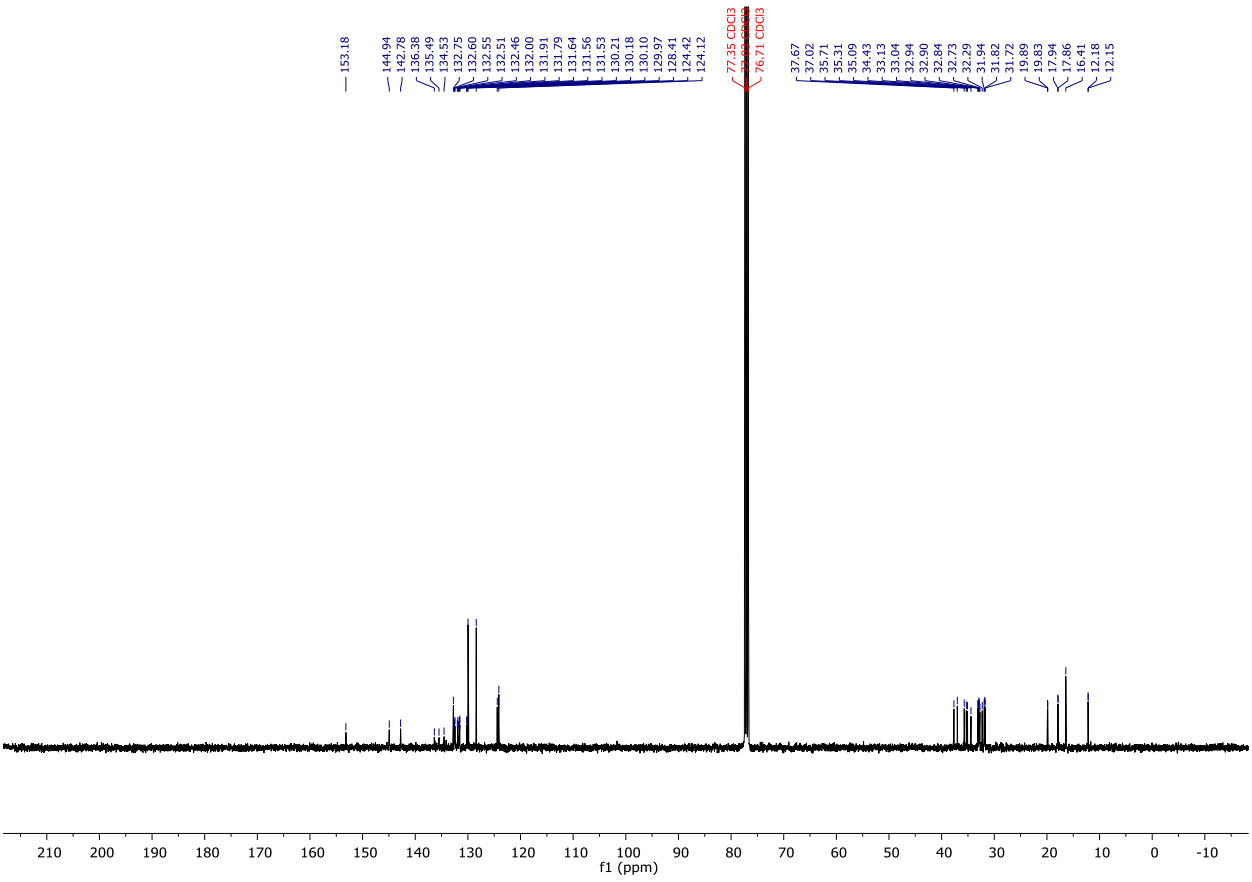


Fig. S27. ^{13}C NMR spectrum of *S,S*-isomer of **7** in $CDCl_3$ at 298K.

HPLC Trace of complex 1-7

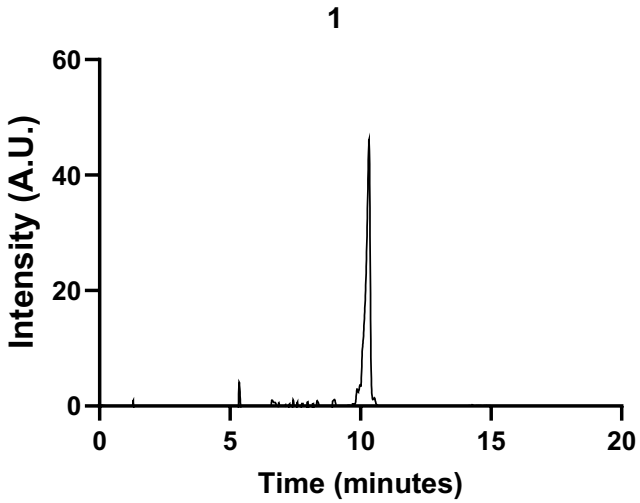


Fig. S28. HPLC chromatogram of **1**, (λ = 280 nm)

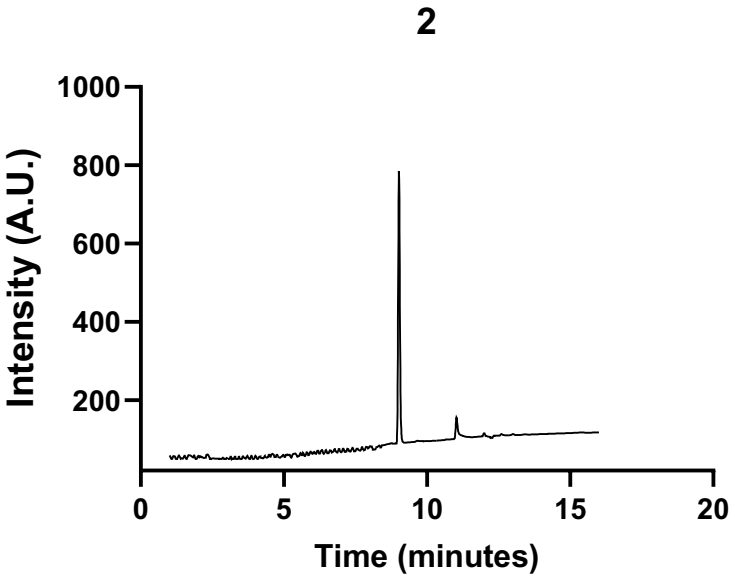


Fig. S29. HPLC chromatogram of **2**, (λ = 280 nm)

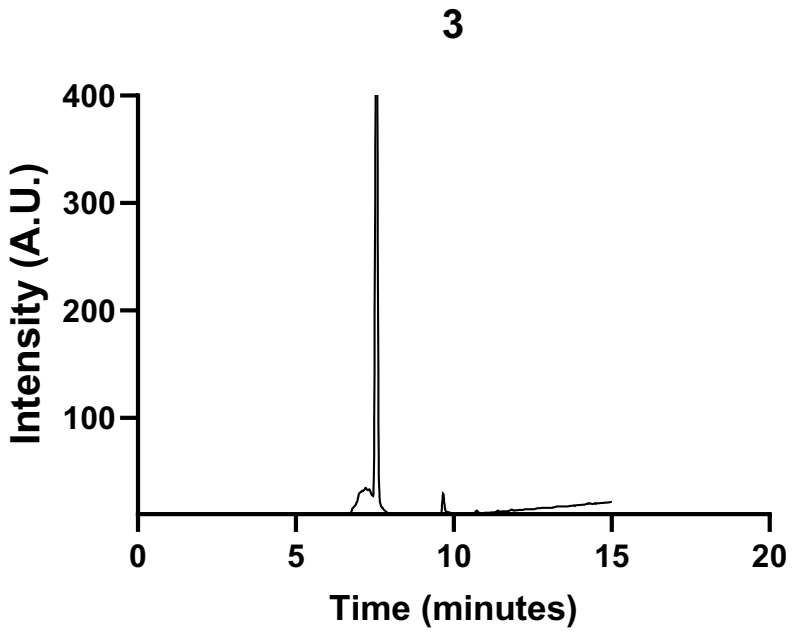


Fig. S30. HPLC chromatogram of **3**, (λ = 280 nm)

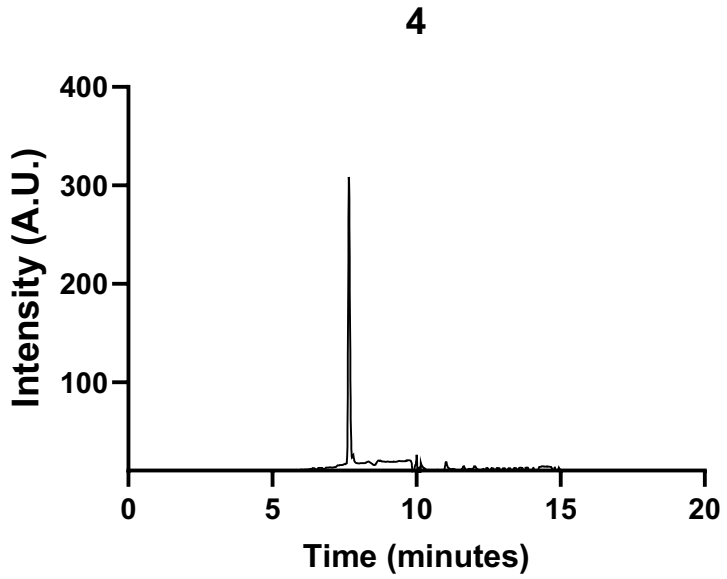


Fig. S31. HPLC chromatogram of **4**, (λ = 280 nm)

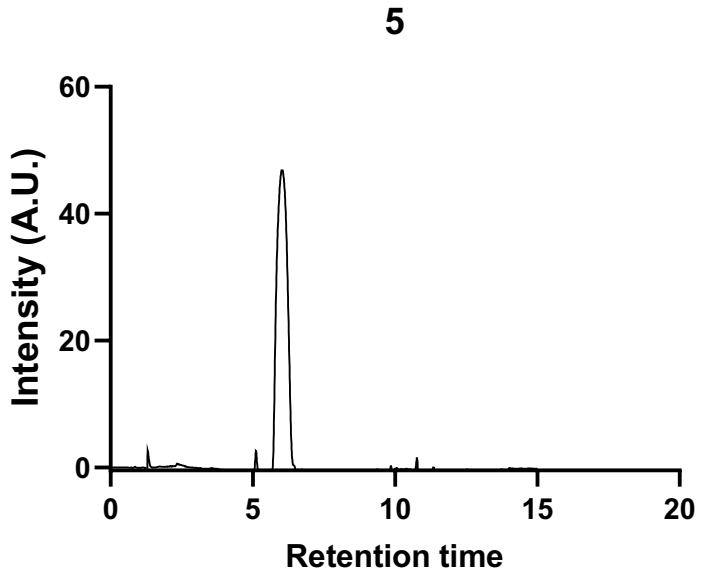


Fig. S32. HPLC chromatogram of **5**, (λ = 280 nm)

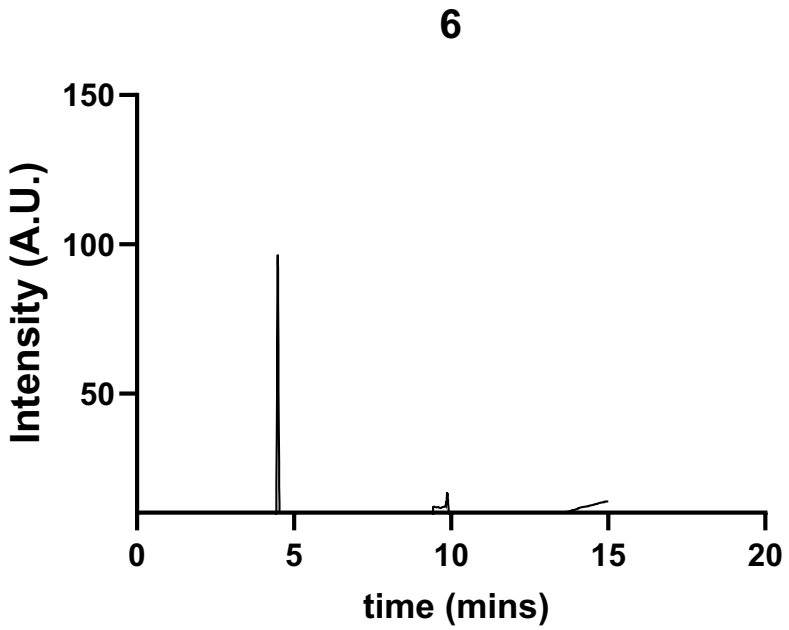


Fig. S33. HPLC chromatogram of **6**, (λ = 280 nm)

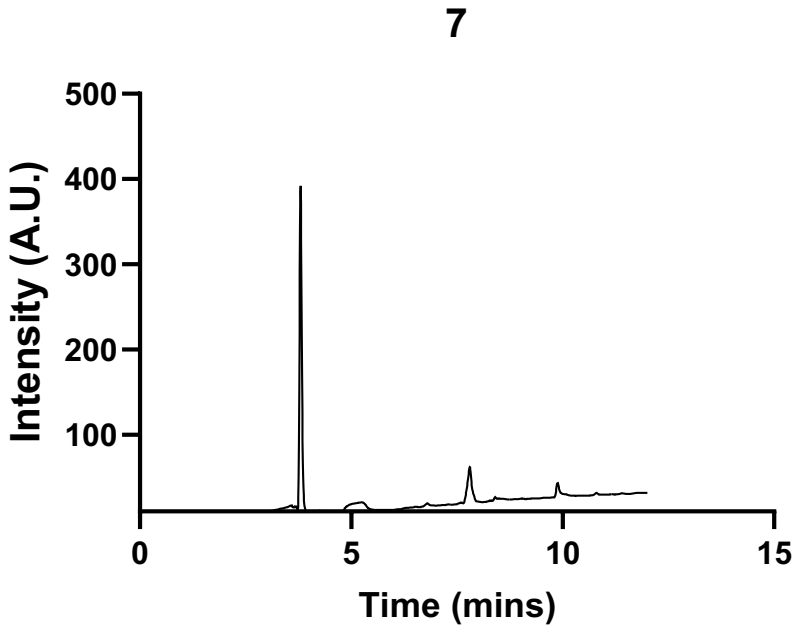


Fig. S34. HPLC chromatogram of **7**, (λ = 280 nm)

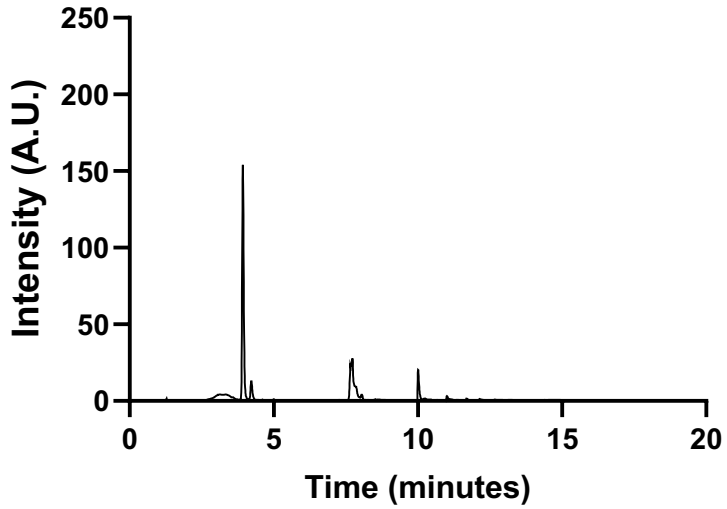


Fig. S35. HPLC chromatogram of *S,S*- isomer of **7**, (λ = 280 nm)

ESI-MS of complex 1-7

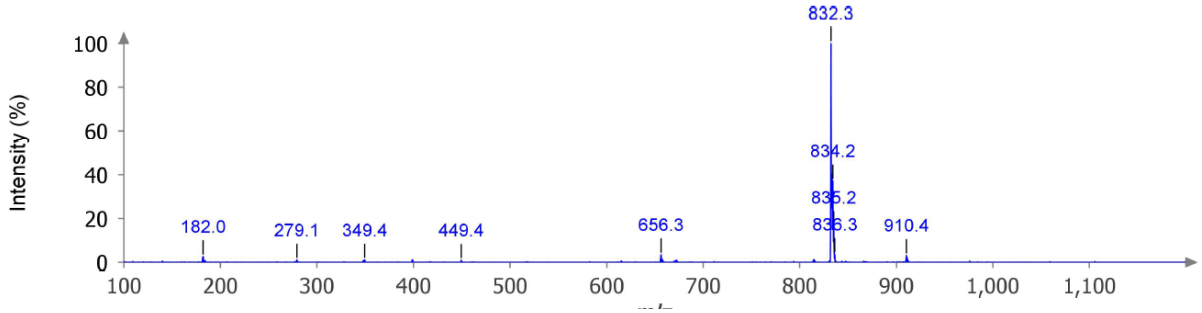


Fig. S36. ESI mass spectrum of complex **1**. $[M\text{-}Cl]^+$

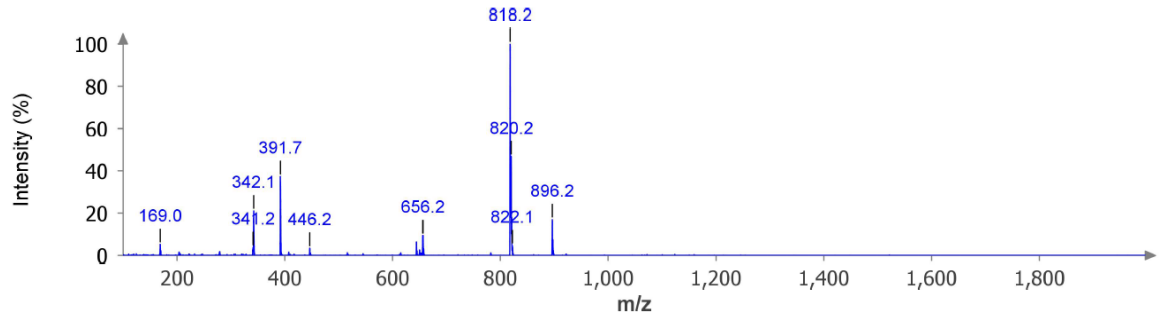


Fig. S37. ESI mass spectrum of complex **2**. $[M\text{-}Cl]^+$

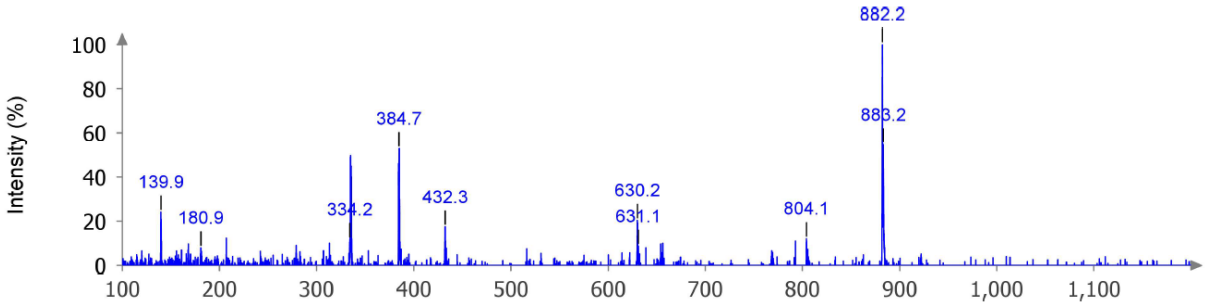


Fig. S38. ESI mass spectrum of complex **3**. $[M - Cl]^+$ = 804.1, $[M - 2Cl + OOCCF_3]^+$ = 882.2

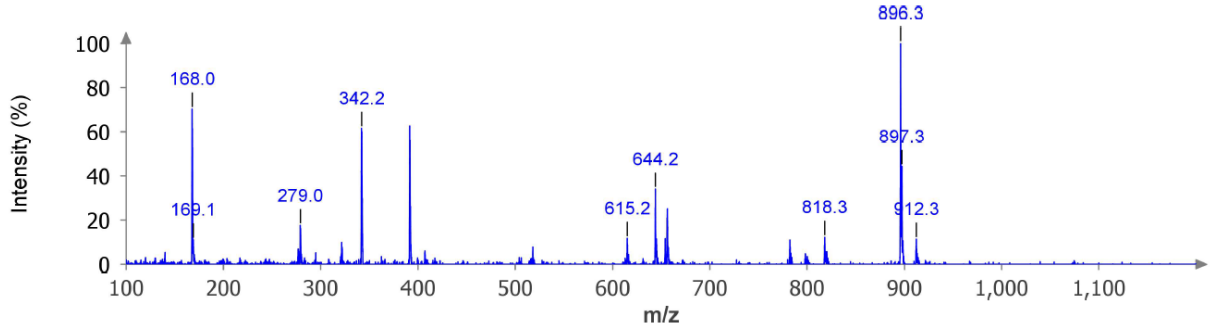


Fig. S39. ESI mass spectrum of complex **4**. $[M – Cl]^+$ = 818.3, $[M - 2Cl + OOCCF_3]^+$ = 896.3

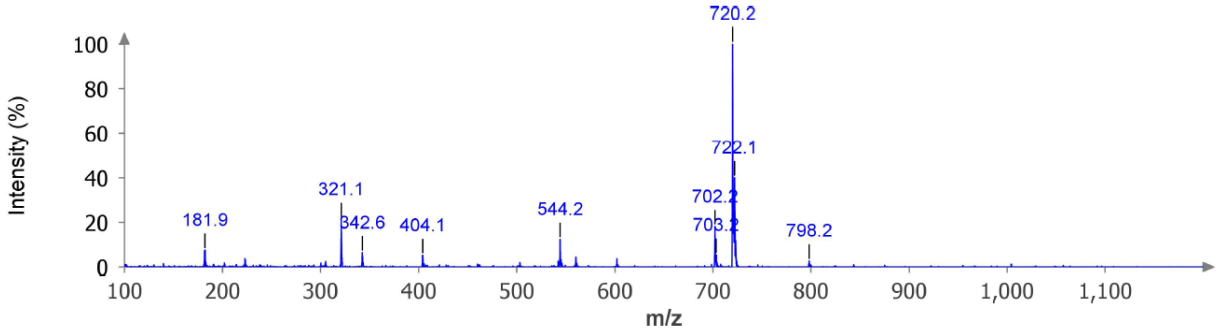


Fig. S40. ESI mass spectrum of complex **5**. $[M-Cl]^+$

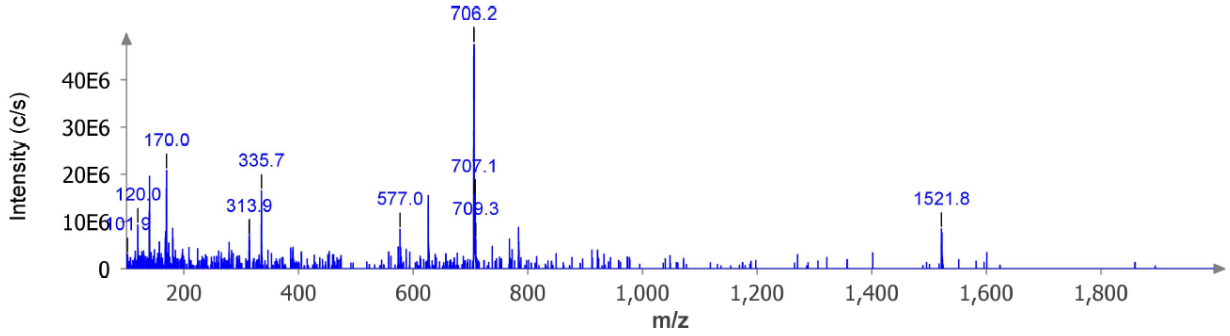


Fig. S41. ESI mass spectrum of complex **6** $[M-Cl]^+$

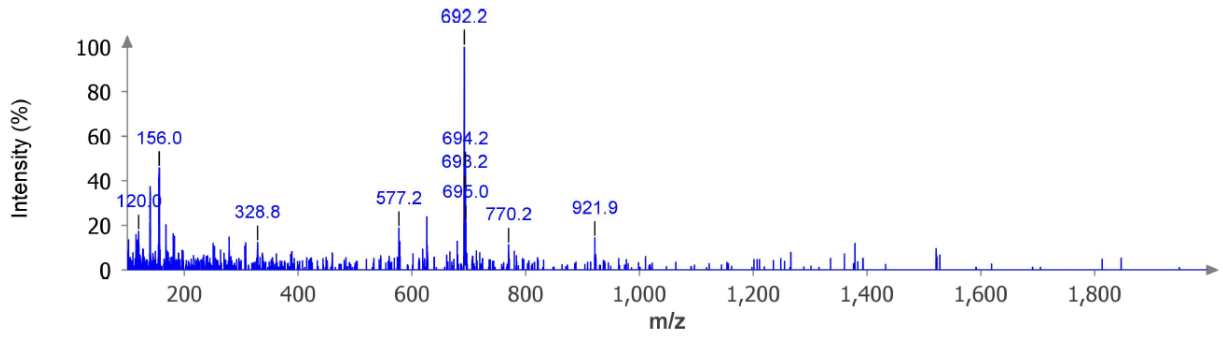


Fig. S42. ESI mass spectrum of complex **7** $[M\text{-}Cl]^+$

UV-vis Spectra

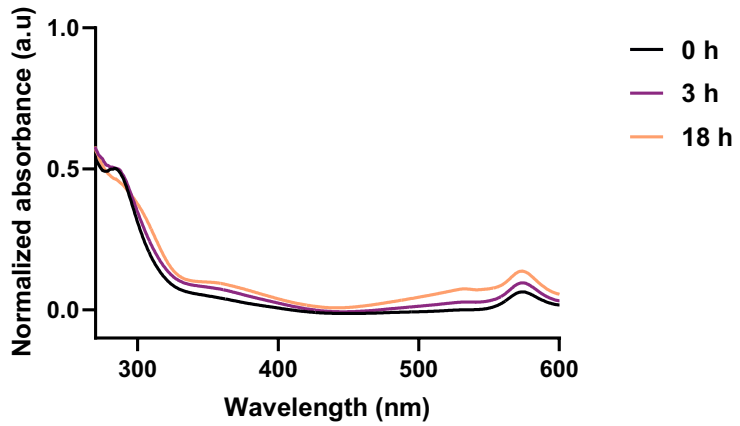


Fig. S43. UV-vis of **1** in DMEM (50 µM)

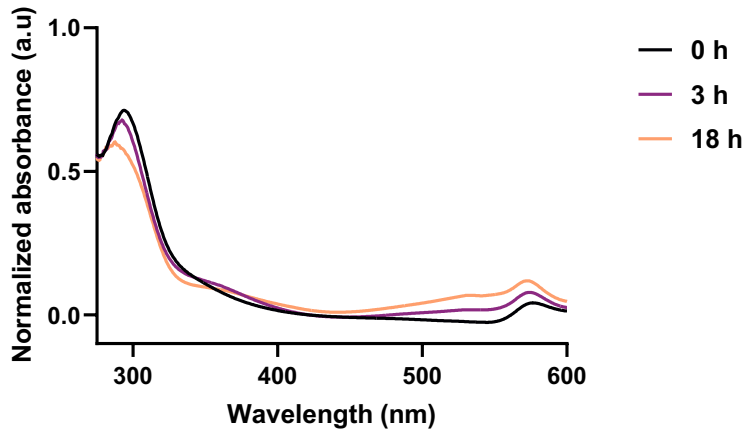


Fig. S44. UV-vis of **2** in DMEM (50 µM)

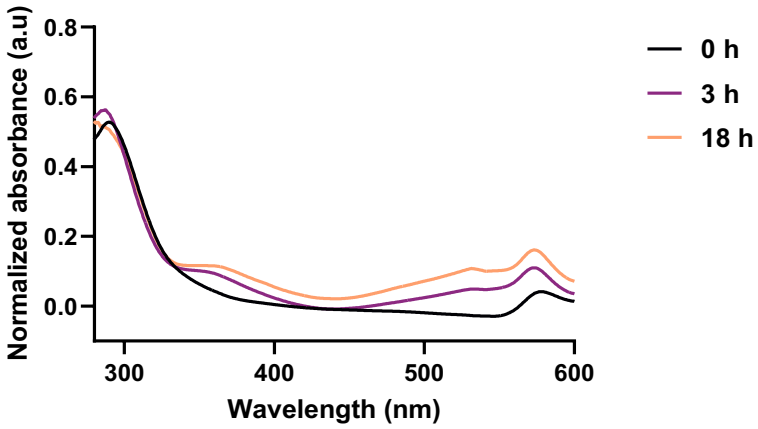


Fig. S45. UV-vis of **3** in DMEM (50 µM)

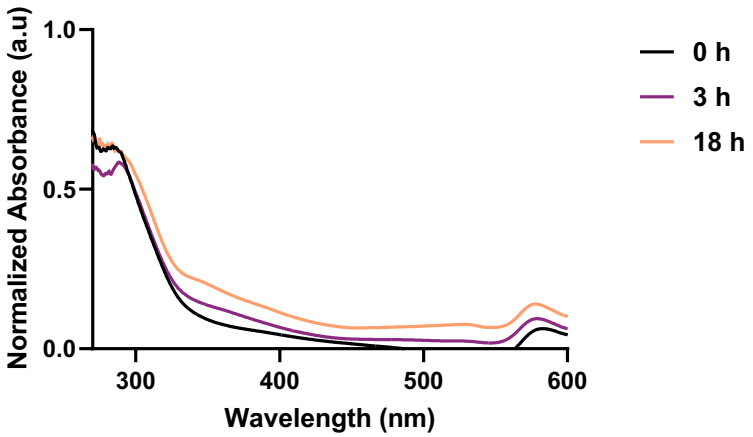


Fig. S46. UV-vis of **4** in DMEM (50 µM)

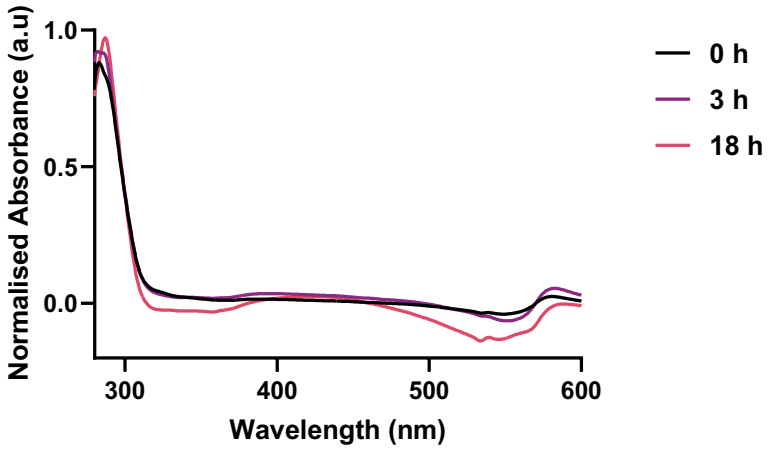


Fig. S47. UV-vis of **5** in DMEM (50 µM)

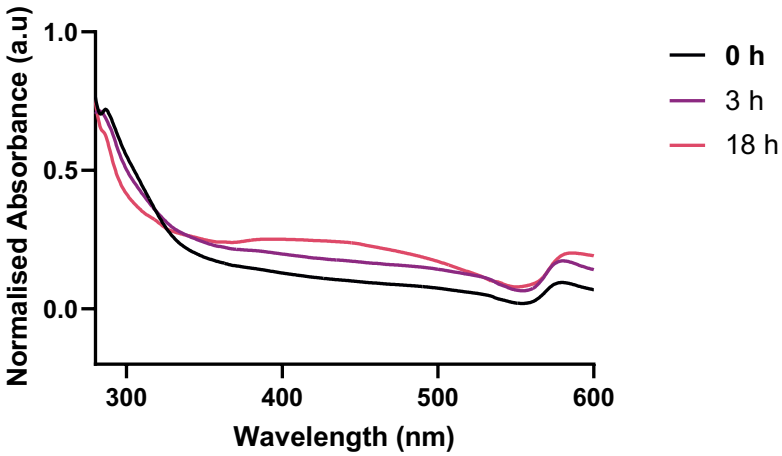


Fig. S48. UV-vis of **6** in DMEM (50 µM)

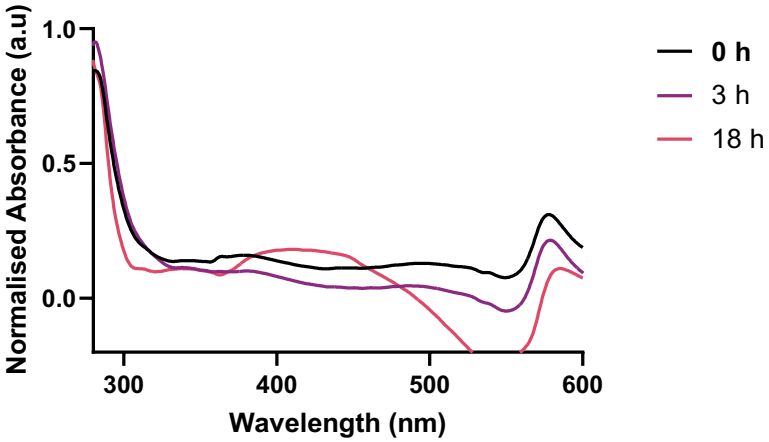


Fig. S49. UV-vis of **7** in DMEM (50 µM)

LC-MS Speciation studies

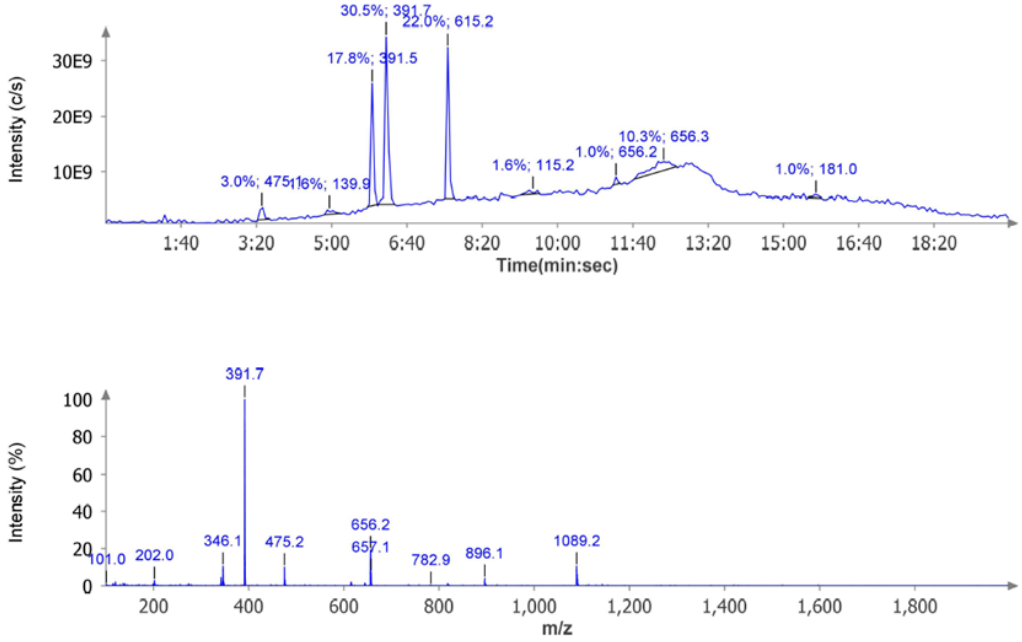


Fig. S50. TIC (top) and ESI+ (bottom) spectra of **2** (50 µM) + GSH (50 µM) 0 h

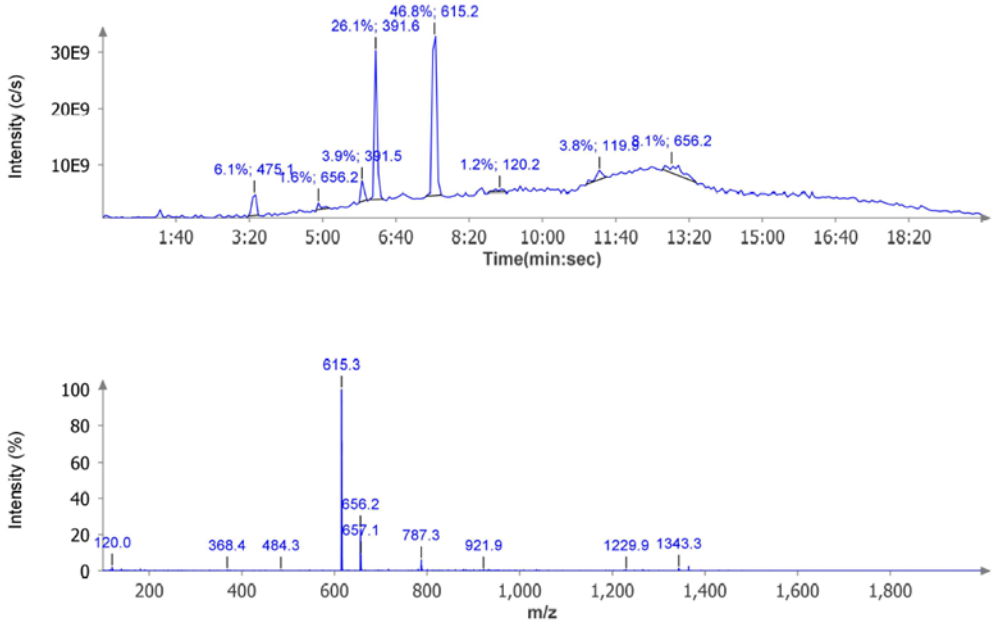


Fig. S51. TIC (top) and ESI+ (bottom) spectra of **2** (50 µM) + GSH (50 µM) 1 h

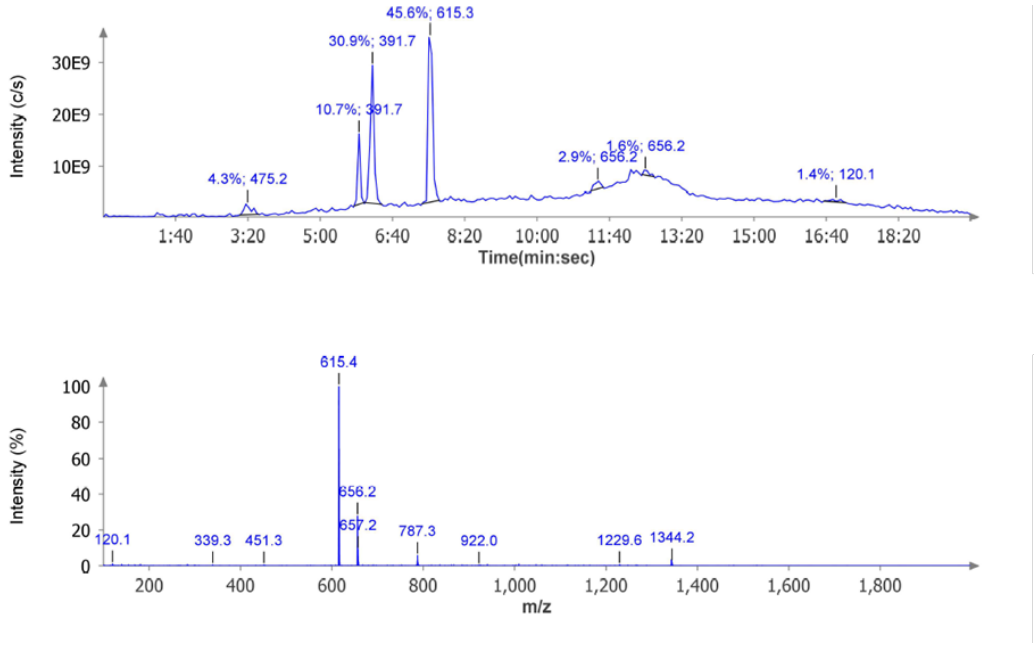


Fig. S52. TIC (top) and ESI+ spectra (bottom)of **2** (50 µM) + GSH (50 µM) 2 h

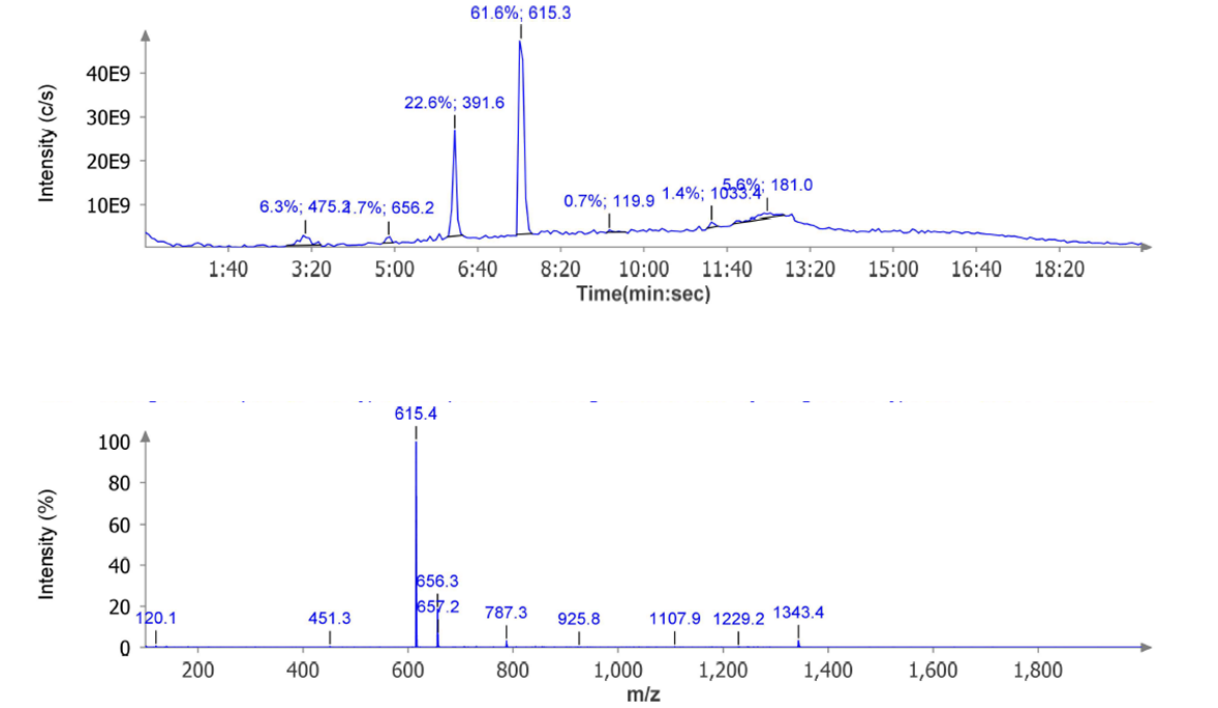


Fig. S53. TIC (top) and ESI+ (bottom) spectra of **2** (50 µM) + GSH (50 µM) 3 h

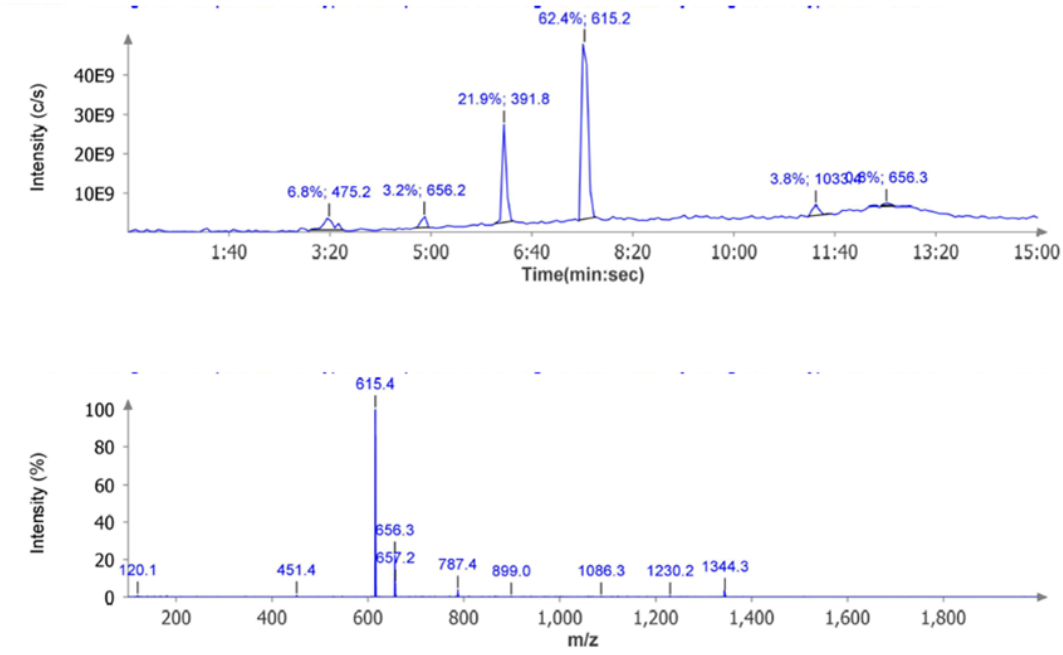


Fig. S54. TIC (top) and ESI+ (bottom) spectra of **2** (50 µM) + GSH (50 µM) 4 h.

Table S4. Integration of chromatogram peaks from speciation studies of **2** (50 µM) + GSH (50 µM) for 4 h

m/z	0 h	1 h	2 h	3 h	4 h
391.7	60.5 %	55.6 %	52.7 %	50.1 %	48.5 %
475.1	9.8 %	13.7 %	15.4 %	16.6 %	17.8 %
615.2	4.9 %	7.4 %	9.1 %	10.2 %	11.1 %
656.2	7.5 %	13.3	14.9	15.4 %	16 %

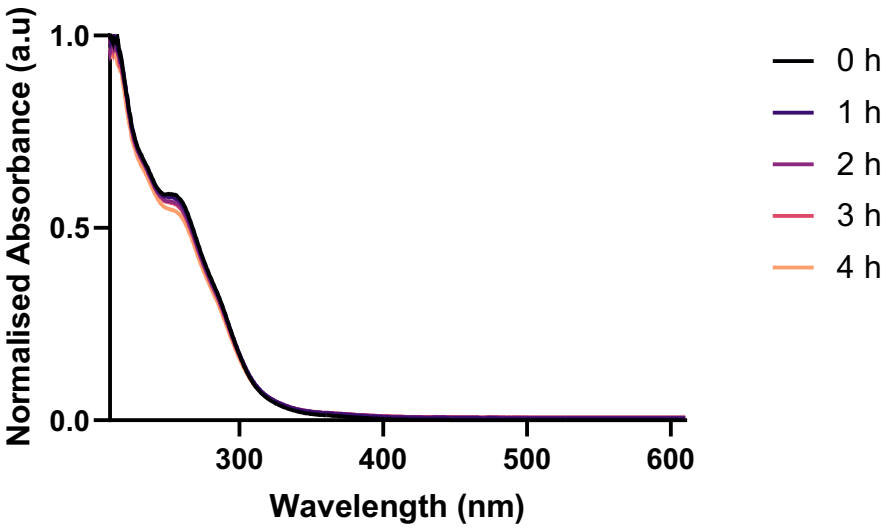


Fig. S55. UV-Vis studies of **2** (50 µM) + GSH (50 µM) for 4 h

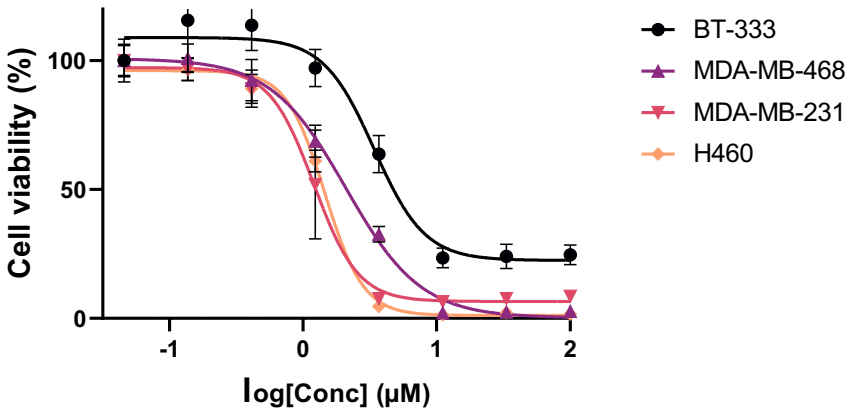


Fig S56. Dose response curve for **1** in 4 different cell lines

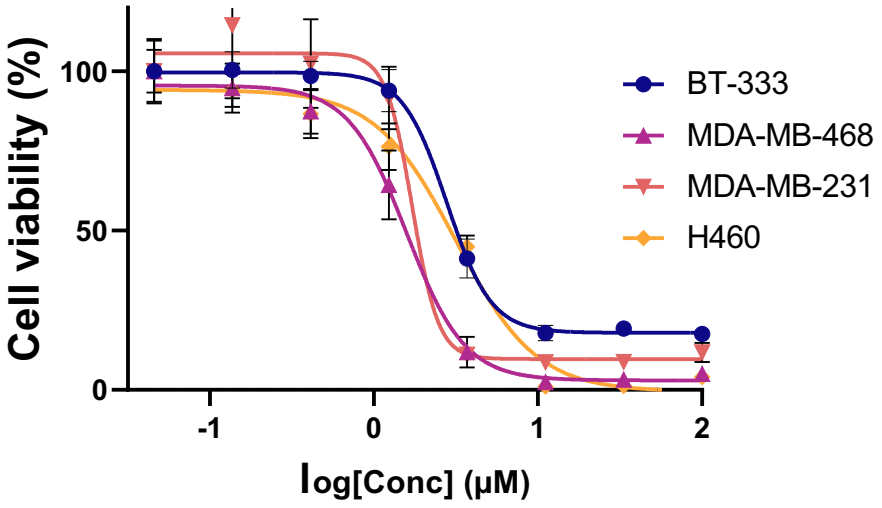


Fig S57. Dose response curve for **2** in 4 different cell lines

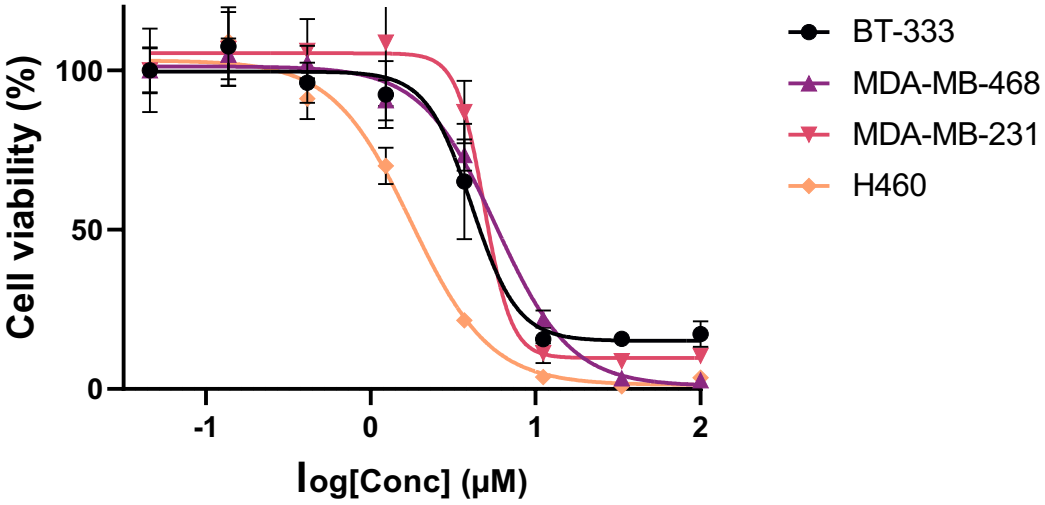


Fig S58. Dose response curve for **3** in 4 different cell lines

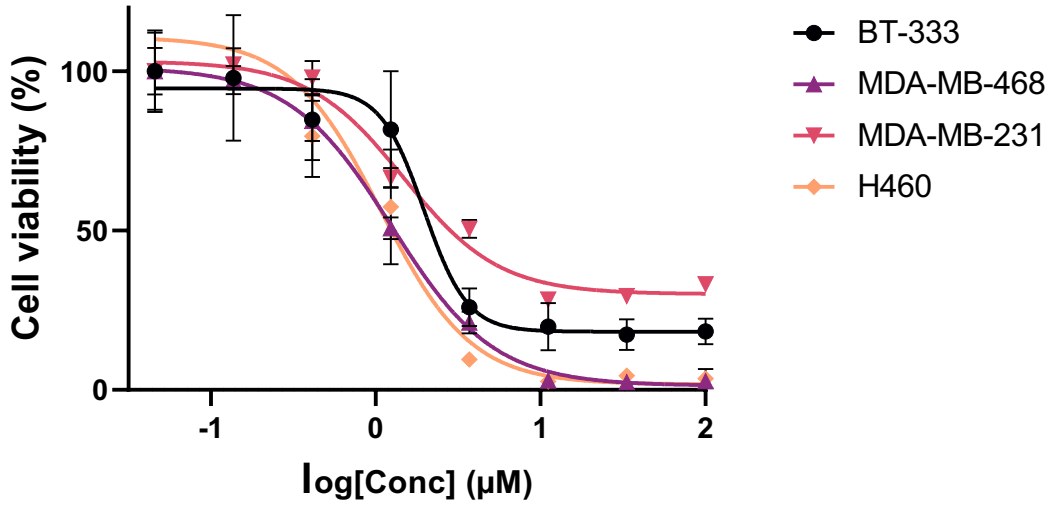


Fig. S59. Dose response curve for **4** in 4 different cell lines

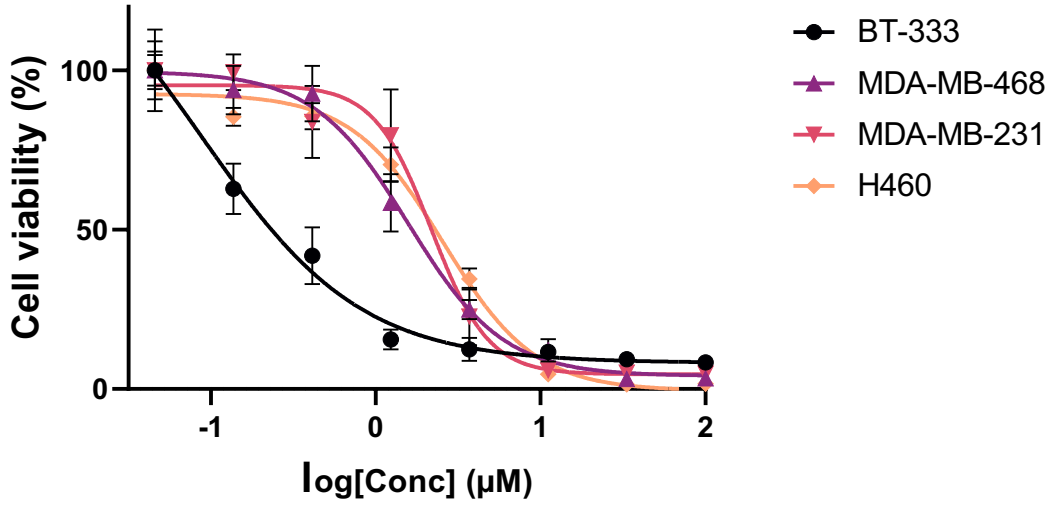


Fig. S60. Dose response curve for **5** in 4 different cell lines

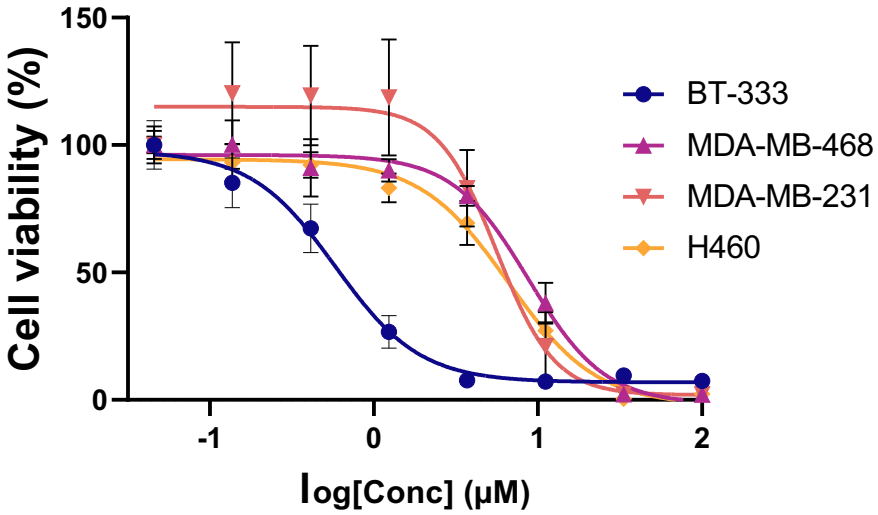


Fig. S61. Dose response curve for **6** in 4 different cell lines

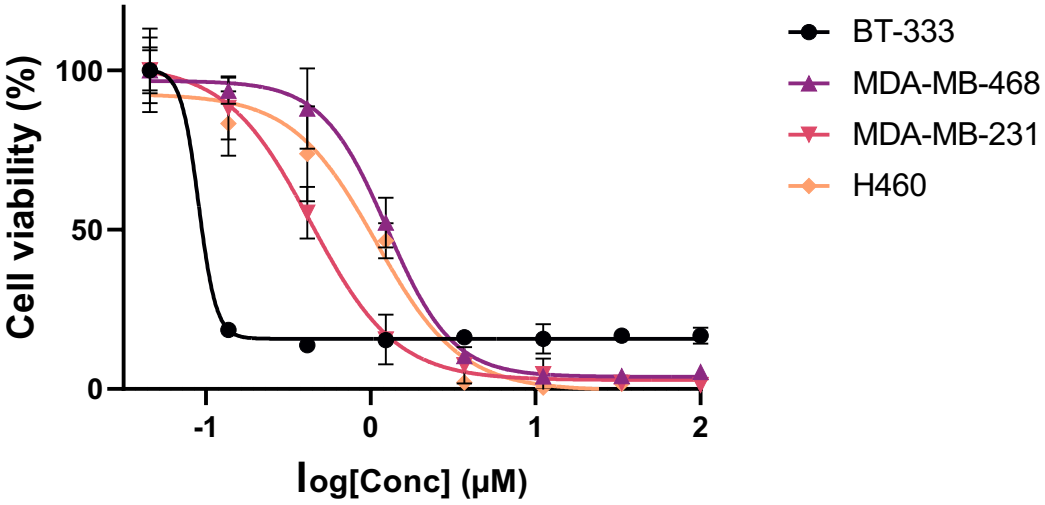


Fig. S62. Dose response curve for **7** in 4 different cell lines

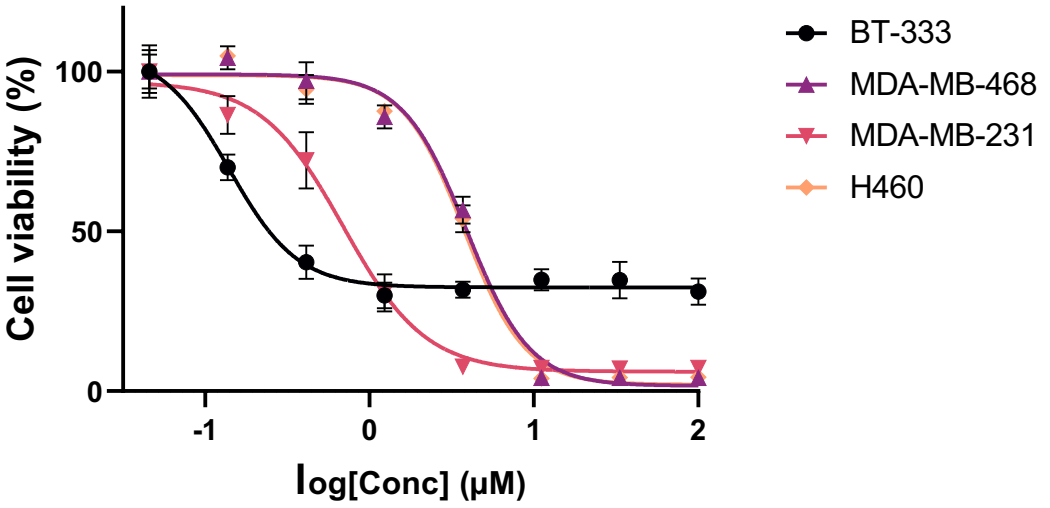


Fig. S63. Dose response curve for *S,S*- isomer of **7** in 4 different cell lines

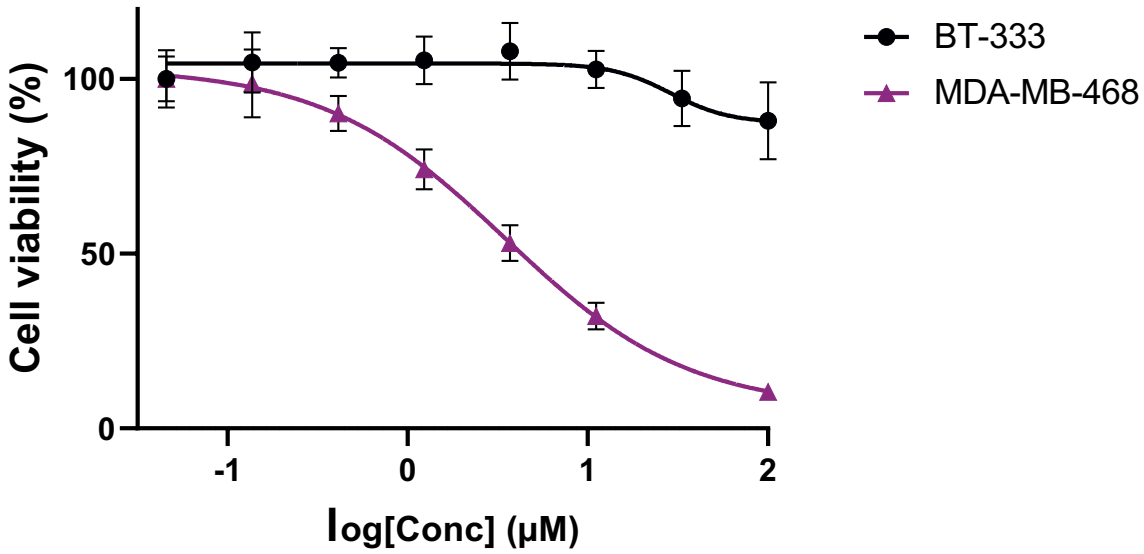


Fig. S64. Dose response curve for cisplatin in 4 different cell lines

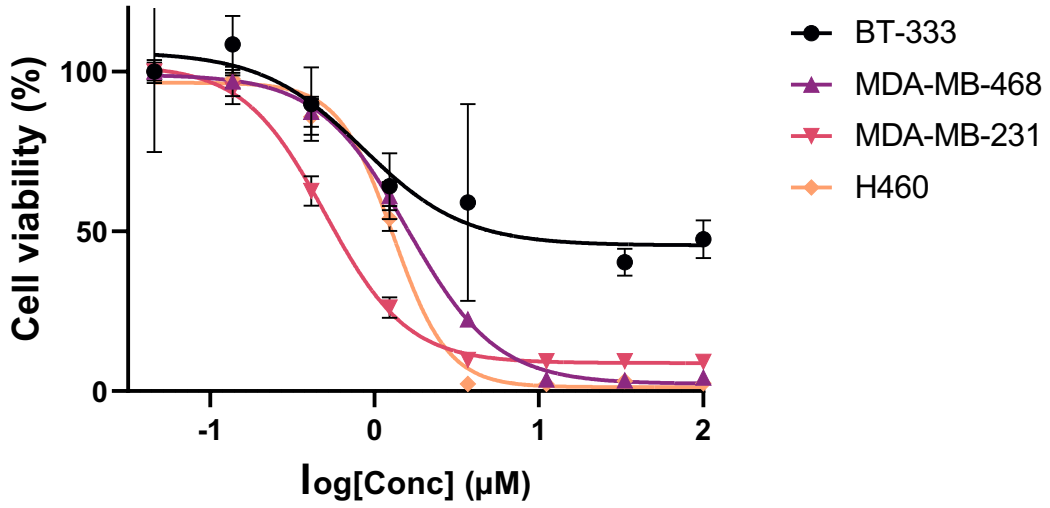


Fig. S65 Dose response curve for auranofin in 4 different cell lines

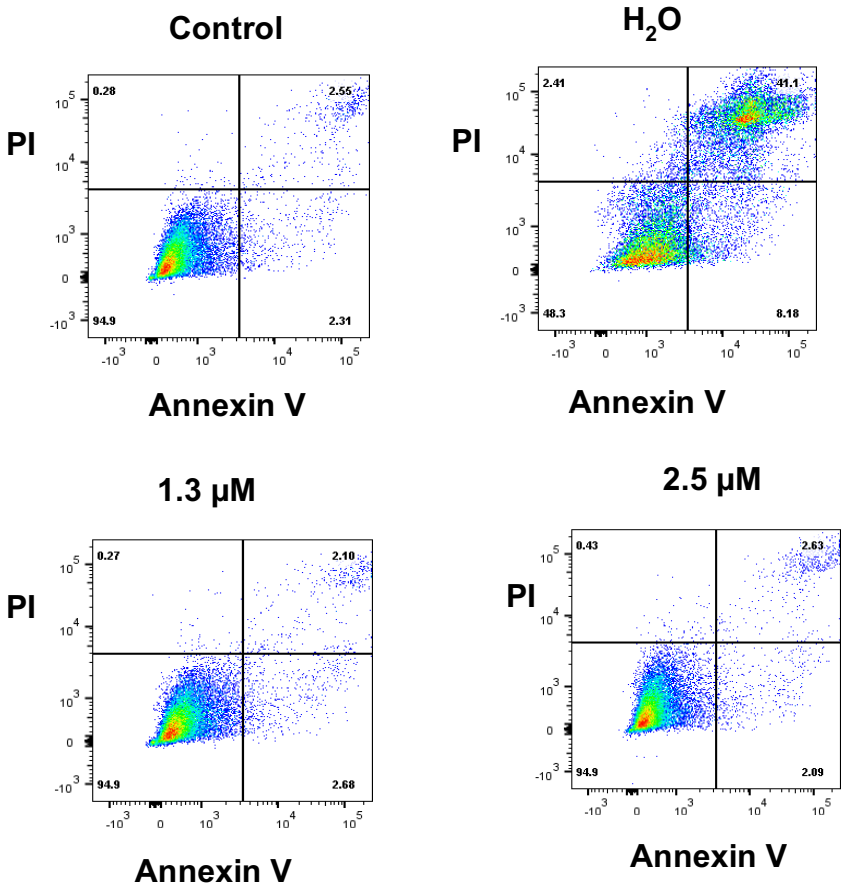


Fig. S66 Effect of **2** on apoptosis at 24 h

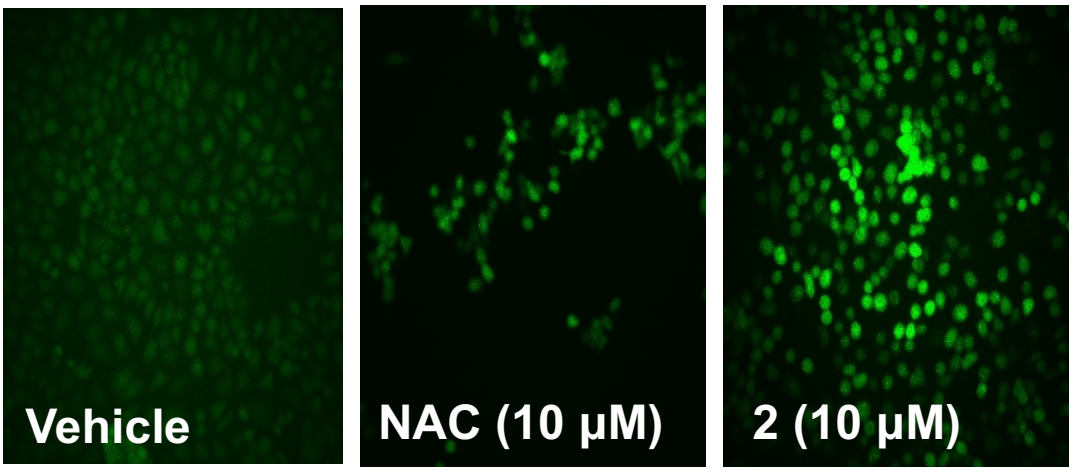


Fig. S67. Effect of 2 on ROS using DCF-DA dye. **2** was added at 10 µM for 2 h and fluorescence was observed using a fluorescence microscopy with 20X magnification at 488 nm

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