Supporting Information

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1. **General methods.** Cisplatin, $K_2[PtCl_4]$, DMSO, methanol, acetonitrile, propionitrile, and As_2O_3 were purchased from Sigma-Aldrich and used without further purification. Media for the cell cultures and all other cell supplements were purchased from Invitrogen. The following spectrometers were used: NMR: Bruker Avance-III 600 and 500 MHz; chemical shifts (^1H, ^{13}C) were referenced to tetramethylsilane at 0.000 ppm ^1H and ^{13}C if it was present, and to residual solvent signal for samples in which TMS was absent (for [D6]DMSO, δ_H = 2.50 ppm and δ_C = 39.5 ppm). The ^{195}Pt (129 MHz) and ^{15}N (61 MHz) NMR spectra were acquired on a 600 MHz Bruker Avance III spectrometer equipped with BBO (broadband observe) probe. ^{195}Pt NMR chemical shifts were referenced indirectly to TMS in ^1H NMR spectrum such that $Na_2{}^{195}PtCl_6$ in D_2O would resonate at 0.0 ppm. ^{15}N NMR chemical shifts, both those observed directly in ^{15}N-detect 1D experiments and 2D ^1H-^{15}N HSQC experiments, were referenced indirectly to TMS in the ^1H spectra, such that $^{15}NH_4Cl$ would resonate at 0.0 ppm. The ^{195}Pt NMR spectra were acquired with the simple zg pulse sequence, using an acquisition time of 0.020 sec, and a relaxation delay of 0.1 sec. Spectra acquired for the variable temperature (VT) experiments involved setting the temperature to a particular value (in 5-degree increments), waiting 15 minutes for equilibration, calibrating the temperature using a neat ethylene glycol temperature calibration standard, inserting the sample of interest, equilibrating it for five minutes, then acquiring a 24-scan ^1H spectrum employing a 90° pulse and a 30-second D1 delay for relaxation, ensuring accurate peak integration. Data were acquired using Topspin 2.1.4. UV/Vis electron absorbance measurements were performed on a Perkin Elmer Lambda 650 spectrophotometer. IR: Bruker Tensor 37 FT-IR. Elemental analysis was performed at Prevalere, Life Sciences, LLC, Whitesboro, NY.

2. Syntheses and characterization

A. Synthesis of arsenoplatin **1**, [Pt(μ-NHC(CH_3)O)$_2$ClAs(OH)$_2$]: Cisplatin (300 mg, 1.00 mmol) or $K_2[PtCl_4]$ (415 mg, 1.00 mmol) was added to 125 cm^3 of 9:1 CH_3CN/H_2O (v/v). The mixture was stirred at 90^{o}C. Once the platinum compound was dissolved, 396 mg As_2O_3 (2.00 mmol) was added to the solution, and the reaction mixture was stirred at 90 ^{o}C for 72 hours. The resulting mixture was filtered, and the filtrate was left at room temperature in a glass beaker for approximately 4 weeks until crystals formed. Crystals suitable for a single crystal X-ray analysis were retrieved from solution. The solution was filtered, washed with CH_3CN:H_2O (9:1 mixture), and the obtained crystals were dried in a dessicator. Yield 350 mg product (75 %; 23 % when cisplatin is used). Complex **1** is soluble in DMSO, methanol, ethanol, and partially in water. Elemental analysis (% calcd., found for $C_7H_{18.5}AsClN_{3.5}O_6Pt$): C (15.20, 15.24), H (3.37, 3.36), N (8.86, 8.69). NMR: ^{1}H NMR (600 MHz, [D_6]DMSO, 25^{o}C) δ: 8.91 (s, 2H-OH), 8.15 (s, 2H-NH), 2.13 (s, 6H-CH_3), (**1**). ^{13}C NMR (150 MHz, [D_6]DMSO, 25^{o}C): δ 172.1 (C-1, C-3), 171.4 (C-5, C-7), 22.5 (C-6, C-8), 16.6 (C-2, C-4). ^{15}N NMR (60 MHz, from the ^{1}H-^{15}N HSQC, [D_6]DMSO, referenced to $^{15}NH_4Cl$, 25^{o}C): δ 106.4 (N-1, N-2), ^{195}Pt NMR (129 MHz, [D_6]DMSO, 25^{o}C), δ: -3589 (s, 1Pt) ppm. UV/Vis ((methanol-water = 1:1): λ_1 = 283 nm (ε = 4062 $dm^3mol^{-1}cm^{-1}$), λ_2 = 247 nm (ε = 3621 $dm^3mol^{-1}cm^{-1}$), sh. 260 nm.

B. Synthesis and characterization of 2, [Pt(μ-NHC(CH_3CH_2)O)$_2$ClAs(OH)$_2$]. $K_2[PtCl_4]$ (415mg, 1.00 mmol) was added to 50 cm^3 of 9:1 H_2O/propionitrile (v/v). The mixture was stirred at room temperature. Once the platinum compound was dissolved, 396 mg As_2O_3 (2.00 mmol) of the reaction mixture was stirred at room temperature for 96 hours.

LC/ESI-MS data were recorded every 24 hours. The color gradually turned yellow and ultimately colorless over the 4 day period. The resulting mixture was filtered and left to sit (pH roughly 2) at 25ºC, and, within a week, crystals suitable for single crystal X-ray analysis appeared. The solution was filtered again, washed with H_2O, dried, and weighed (212 mg, 44 %). Complex **2** is soluble in methanol, DMSO, and partially soluble in H_2O. Elemental analysis (% calcd., found for $C_6H_{14}AsClN_2O_4Pt$): C (14.90, 14.80), H (2.92, 2.60), N (5.79, 5.82). NMR: ^{1}H NMR (500 MHz, [D_6]DMSO): δ 8.91 (s, 2H-OH), 8.04 (s, 2H-NH), 2.47 (q, J=7.6 Hz, 4H-CH_2,), 1.04 (t, J=7.6 Hz, 6H-CH_3). ^{13}C NMR (125 MHz, [D_6]DMSO): δ 175.0, 24.1, 11.3 ppm. UV/Vis ((methanol-water = 1:1 v/v): λ_1 = 285 nm, λ_2 = 245 nm.

C. **Synthesis and characterization of 3, [Pt(μ-NHC(CH_3CH_2)O)$_2$As(OH)$_2$(SCN)]** Arsenoplatin **1** (100 mg, 0.18 mmol) was dissolved in 4 cm^3 of methanol and added to an equal-molar solution of KSCN (17.6 mg, 0.180 mmol) in 4 cm^3 of water. The reaction mixture was allowed to stir at 50^{o}C for 5 hours. The mixture was filtered and the solution was left standing at room temperature until crystals appeared. The obtained crystals were removed by filtration. Yield: 60.00 mg (52%). Elemental analysis (% calcd., found for PtC5H10N3O4SAs): C (12.56, 12.37), H (2.11, 1.97), N (8.78, 8.56). NMR data: ^{1}H NMR (600 MHz, [D_6]DMSO): **S-isomer**: δ 2.21 (s, 6H, CH_3), 7.70 (s, 2H, NH), 9.20 (s, 2H, OH); **N-isomer**: δ 2.17 (s, 6H, CH_3), 8.57 (s, 2H, NH), 9.11 (s, 2H, OH). ^{13}C NMR (150 MHz, [D_6]DMSO) **S-isomer**: δ 17.5 (CH_3), 117.7 (SCN), 172.6 (CO); **N-isomer**: δ 16.4 (CH_3), 134.4 (NCS), 172.7 (CO). ^{195}Pt NMR (129 MHz, [D_6]DMSO) **S-isomer**: δ -3861 ppm (s, 1Pt); **N-isomer**: δ -3724 ppm (s, 1Pt). ^{15}N NMR (60 MHz, from the ^{1}H-^{15}N 2D HSQC and ^{15}N-detect 1D of the sample isotopically labeled with S^{13}C^{15}N,

[D_6]DMSO): **S-isomer**: δ 105.0 (N-1, N-2), 223.3 ppm (SCN); **N-isomer**: δ 105.8 (N-1, N-2), 91.5 ppm (SCN). UV/Vis (methanol-water = 1:1): λ_1 = 285 nm (ε = 4217 $dm^3mol^{-1}cm^{-1}$); λ_2 = 225 nm (ε = 15919 $dm^3mol^{-1}cm^{-1}$), shoulder at 265 nm. Solubility: DMSO and methanol.

3. Crystallographic structure determination and refinement details.

Colorless crystals **1-3** were mounted using oil (Infineum V8512) on a glass fiber. All measurements were made on a Bruker APEX-II CCD area detector with graphite monochromated MoK\α radiation. The data were collected at a temperature of 100(2) K (**1a, 2**, and **3**) and 111(2) K (**1b**), and integrated and corrected for decay and Lp effects using Bruker APEX II software. Final unit cell parameters were obtained through a refinement of all observed reflections during data integration. A face-indexed absorption correction was performed via XPREP. The structures were solved and refined using the SHELXTL suite of software[S1]**.** In the structure of **1a** the non-hydrogen atoms were refined anisotropically. There is an acetamide and water disordered over the inversion center. The hydrogen atoms on the water were not found in the difference map. The C8 atom (in **1a**) and N1 (in **3**) were restrained with Uij components approximate to isotropic behavior. Hydrogen atoms were included in idealized positions, but not refined. In the structure of **1b** hydrogen atoms on the oxygen and nitrogen atoms were refined isotropically. Neutral atom scattering factors, the values for Df' and Df'', and the values for the mass attenuation coefficients were taken from the usual tabulation[S2-S4]. Anomalous dispersion effects were included in F_{calc}[S5]. Explanations for B alerts generated from CheckCif are discussed in the refine special_details of the corresponding cif files.

Complex **1** can crystallize in two different crystal systems, triclinic with space group *P-1* (**1a**) and monoclinic with space group *P2(1)/n* (**1b**).

Crystal data for **1a.** C7H18.50AsClN3.50O6Pt, Mr = 553.21, Mo-Kα radiation, wavelength 0.71073, *T* 100(2) K, colorless plate, 0.54 x 0.28 x 0.09 mm, triclinic, space group P-1, a = 7.0806(2) Å, b = 9.3782(2) Å, c = 11.7356(2) Å, α = 91.1400(10)°, β = 90.8840(10)°, γ = 107.3030(10) °, V = 743.68(3) $Å^3$, Z = 2, d_{calcd} = 2.470 gcm^{-3}, μ = 11.847 mm^{-1}, F(000) = 522, 21,678 reflections, 4,341 unique, R_{int} = 0.0547, R_1 = 0.0215 [I>2σ(I)], wR_2 = 0.0591 (all data), GOF 1.037.

Crystal data for **1b.** C8H20AsClN4O6Pt, Mr = 573.74, Mo-Kα radiation, wavelength 0.71073, *T* 111(2) K, colorless block, 0.41 x 0.14 x 0.10 mm, monoclinic, space group P2(1)/n, a = 14.2328(2) Å, b = 7.62430 (10) Å, c = 16.6254(2) Å, β = 111.1120(10) °, V = 1683.01(4) $Å^3$, Z = 4, d_{calcd} = 2.264 gcm^{-3}, μ = 10.475 mm^{-1}, F(000) = 1088, 35,220 reflections, 4,900 unique, R_{int} = 0.0280, R_1 = 0.0173 [I>2σ(I)], wR_2 = 0.0417 (all data), GOF 1.144.

Crystal data for **2**. $C_6H_{14}AsClN_2O_4Pt$, Mr = 483.65, Mo-Kα radiation, wavelength 0.71073, *T* 100 (2) K, colorless plate, 0.326 x 0.271 x 0.02 mm, orthorhombic, space group Pbca, a =14.1727(5) Å, b = 9.6476 (3) Å, c = 17.2048 (6) Å, V = 2352.46 (14) $Å^3$, Z = 8, d_{calcd} = 2.731 gcm^{-3}, μ = 14.944 mm^{-1}, F(000) = 1792, 43,536 reflections, 3424 unique, R_{int} = 0.0692, R_1 = 0.0243 [I>2σ(I)], wR_2 = 0.0627 (all data), GOF 1.094.

Crystal data for **3**. C5H10AsN3O4PtS, Mr = 478.23, Mo-Kα radiation, wavelength 0.71073, *T* 100(2) K, colorless needle, 0.37 x 0.08 x 0.03 mm, orthorhombic, space group Pccn, a =17.1342 (5) Å, b = 18.7310 (5) Å, c = 6.8347 (2) Å, V = 2193.53 (11) $Å^3$, Z = 8, d_{calcd} = 2.896 gcm^{-3}, μ = 15.976 mm^{-1}, F(000) = 1760, 35,638 reflections, 3160 unique, R_{int} = 0.0890, R_1 = 0.0460 [I>2σ(I)], wR_2 = 0.1117 (all data), GOF 1.046.

4. Selected Bonds Angles and Hydrogen Bonds for 1-3

Table S1 Selected bonds (Å) and angles (^{o}) for **1a**.

Pt1 N1 2.000(3)	N2 Pt1 Cl1 92.36(11)
Pt1 N2 2.004(3)	As1 Pt1 Cl1 176.86(2)
Pt1 As1 2.2732(3)	O4 As1 O3 107.32(17)
Pt1 Cl1 2.3272(8)	O4 As1 O2 91.4(2)
As1 O4 1.721(3)	O3 As1 O2 87.09(13)
As1 O3 1.722(3)	O4 As1 O1 84.77(14)
As1 O2 1.968(3)	O3 As1 O1 91.14(11)
As1 O1 2.019(2)	O2 As1 O1 175.07(14)
O1 C1 1.302(4)	O4 As1 Pt1 128.95(12)
O2 C3 1.297(6)	O3 As1 Pt1 123.69(12)
N1 C1 1.302(4)	O2 As1 Pt1 92.69(12)
N2 C3 1.289(6)	O1 As1 Pt1 92.11(7)
N2 Pt1 As1 86.78(11)	C1 N1 Pt1 121.5(2)
N1 Pt1 Cl1 93.11(9)	N1 Pt1 As1 87.79(8)

Table S2 Hydrogen bonds for **1a** [Å and deg.].

D-H···A	[ARU]	d(D-H)	d(H···A)	d(D···A)	<DHA
N(1)-H(1)…O(5)	[2665.03]	0.93(6)	2.16(6)	3.061(4)	162(5)
N(2)-H(2)…O(7)	[1455.01]	0.93(6)	2.01(6)	2.914(5)	166(5)
N(2)-H(2)…O(6)	[2666.01]	0.93(6)	2.46(6)	3.252(6)	144(5)
O(3)-H3…O(5)	[1665.03]	0.84	1.76	2.561(3)	158
N(3)-H(3A)…Cl(1)	[2665.02]	0.87(4)	2.53(4)	3.390(3)	168(4)
N(3)-H(3B)…O(1)	[2675.02]	0.84(5)	2.26(6)	3.049(4)	157(5)
O(4)-H(4)…O(6)	[1565.01]	0.84	1.90	2.736(6)	179
O(4)-H(4)…O(7)	[2776.01]	0.84	2.15	2.751(6)	128
N(4)-H(4D)…Cl(1)	[2666.02]	0.88	2.72	3.368(6)	131
N(4)-H(4E)…O(3)	[2776.02]	0.88	2.04	2.839(6)	151
C(4)-H(4B)…O(7)	[1455.01]	0.98	2.38	3.242(8)	146
C(8)-H(8A)…O(2)	[2776.02]	0.98	2.39	3.091(10)	128

Translation of ARU-code to Equivalent Position Code: [1455.] = -1+x,y,z; [2666.] = 1-x,1-y,1-z; [2776.] = 2-x,2-y,1-z; [2665.] = 1-x,1-y,-z; [1665.] = 1+x,1+y,z; [1565.] = x,1+y,z; [2675.] = 1-x,2-y,-z.

Table S3 Selected bonds (Å) and angles (°) for **1b**.

Pt1 N1 1.999(2)	N2 Pt1 As1 87.76(6)
Pt1 N2 2.004(2)	N1 Pt1 Cl1 91.90(6)
Pt1 As1 2.2729(2)	N2 Pt1 Cl1 92.82(6)
Pt1 Cl1 2.3328(6)	As1 Pt1 Cl1 179.275(18)
As1 O3 1.7182(19)	O3 As1 O4 105.94(10)
As1 O4 1.7201(19)	O3 As1 O2 91.03(8)
As1 O2 2.0124(17)	O4 As1 O2 87.16(8)
As1 O1 2.0150(17)	O3 As1 O1 84.98(9)
O1 C1 1.298(3)	O4 As1 O1 91.51(8)
O2 C3 1.310(3)	O2 As1 O1 175.29(7)
N1 C1 1.299(3)	O3 As1 Pt1 129.37(8)
N2 C3 1.301(3)	O4 As1 Pt1 124.68(7)
N1 Pt1 N2 175.08(8)	O2 As1 Pt1 92.30(5)
N1 Pt1 As1 87.53(6)	O1 As1 Pt1 92.18(5)
	C1 N1 Pt1 121.63(17)

Table S4 Hydrogen bonds for **1b** [Å and deg.].

D-H···A	[ARU]	d(D-H)	d(H···A)	d(D···A)	<DHA
N(1)-H(1)…O(6)	[4454.03]	0.89(3)	2.06(3)	2.922(3)	163(4)
N(3)-H(3)NA…Cl(1)	[4455.01]	0.88(4)	2.45(4)	3.282(3)	160(3)
N(2)-H(2)…O(5)	[4554.02]	0.83(4)	2.16(4)	2.976(3)	170(3)
N(3)-H(3)NB…O(2)	[1556.1]	0.87(5)	2.24(5)	3.056(3)	156(4)
O(3)-H(3)…O(5)	[2545.02]	0.62(4)	1.98(5)	2.602(3)	175(6)
N4-H(4)NA…Cl(1)	[4555.01]	0.74(3)	2.59(3)	3.316(3)	172(3)
O(4)-H(4)…O(6)	[3666.03]	0.91(5)	1.74(5)	2.639(3)	167(4)
N(4)-H(4)NB…O(1)	[1656.01]	0.88(4)	2.29(4)	3.087(3)	150(3)
C(10)-H(10)A…Cl(1)	[2656.01]	0.98	2.82	3.630(3)	141
C(10)-H(10)…O(3)	[3656.01]	0.98	2.53	3.367(4)	143

Translation of ARU-code to Equivalent Position Code: [4554.] = 1/2+x,1/2-y,-1/2+z; [4454.] = -1/2+x,1/2-y,-1/2+z; [3666.] = 1-x,1-y,1-z; [2545.] = 1/2-x,-1/2+y,1/2-z; [4455.] = -1/2+x,1/2-y,1/2+z; [1556.] = x,y,1+z; [3656.] = 1-x,-y,1-z; [4555.] = 1/2+x,1/2-y,1/2+z; [1656.] = 1+x,y,1+z; [2656.] = 3/2-x,1/2+y,3/2-z.

Table S5 Selected bonds (Å) and angles (°) for **2**.

Pt(1)-N(1)	1.997(3)	O(1)-C(1)	1.301(4)
Pt(1)-N(2)	1.997(3)	N(1)-C(1)	1.299(4)
Pt(1)-As(1)	2.2687(4)	N(1)-H(1)	0.8800
Pt(1)-Cl(1)	2.3361(9)	N(2)-C(4)	1.305(5)
As(1)-O(4)	1.724(2)	O(3)-As(1)-O(1)	87.15(12)
As(1)-O(3)	1.742(3)	O(4)-As(1)-O(2)	89.11(12)
As(1)-O(1)	1.955(3)	O(3)-As(1)-O(2)	89.99(12)
As(1)-O(2)	1.976(3)	As(1)-Pt(1)-Cl(1)	177.32(3)
As(1)-O(2)	1.976(3)	O(4)-As(1)-O(3)	105.48(13)
O(2)-C(4)	1.304(4)	O(4)-As(1)-O(1)	85.55(11)
N(1)-Pt(1)-N(2)	173.59(13)	O(1)-As(1)-O(2)	
N(1)-Pt(1)-As(1)	86.22(9)	173.05(11)	
N(2)-Pt(1)-As(1)	87.42(9)	O(4)-As(1)-Pt(1)	129.78(10)
N(1)-Pt(1)-Cl(1)	91.71(9)	O(3)-As(1)-Pt(1)	124.67(9)
N(2)-Pt(1)-Cl(1)	94.68(9)	O(1)-As(1)-Pt(1)	93.75(7)
		O(2)-As(1)-Pt(1)	93.09(7)
		C(1)-N(1)-Pt(1)	122.0(3)

Table S6 Hydrogen bonds for **2** [Å and deg.].

D-H···A	[ARU]	d(D-H)	d(H···A)	d(D···A)	<DHA
N(2)-H(2)…O(4)	[3455.01]	0.88	2.23	3.077(4)	163
O(3)-H(3)…Cl(1)	[5665.01]	0.84	2.25	3.059(3)	161
O(4)-H(4)…O(3)	[7645.01]	0.84	1.93	2.729(4)	158
C(2)-H(2B)…Cl(1)	[6555.01]	0.99	2.82	3.785(4)	165

Translation of ARU-code to Equivalent Position Code: [7645.] = 3/2-x,-1/2+y,z; [5665.] = 1-x,1-y,-z; [3455.] = -1/2+x,1/2-y,-z; [6555.] = 1/2+x,y,1/2-z.

Table S7 Selected bonds (Å) and angles (^{o}) for **3**.

Pt1 N1 2.036(7)	N2 Pt1 As1 88.19(19)
Pt1 N2 2.039(7)	N1 Pt1 S1 97.4(2)
Pt1 As1 2.2987(9)	N2 Pt1 S1 88.6(2)
Pt1 S1 2.352(2)	As1 Pt1 S1 176.70(6)
As1 O3 1.720(6)	O3 As1 O4 106.6(3)
As1 O4 1.727(6)	O3 As1 O1 88.0(3)
As1 O1 1.928(6)	O4 As1 O1 89.4(3)
As1 O2 2.084(6)	O3 As1 O2 88.0(3)
S1 C5 1.675(9)	O4 As1 O2 88.5(3)
O1 C1 1.316(10)	O1 As1 O2 174.8(2)
O2 C3 1.284(10)	O3 As1 Pt1 125.6(2)
N1 C1 1.282(12)	O4 As1 Pt1 127.8(2)
N2 C3 1.303(10)	O1 As1 Pt1 93.65(18)
N3 C5 1.162(12)	O2 As1 Pt1 91.43(16)
N1 Pt1 N2 173.9(3)	C5 S1 Pt1 104.6(3)
N1 Pt1 As1 85.8(2)	C3 N2 Pt1 120.4(6)

5. Thermal ellipsoid plot for 1b

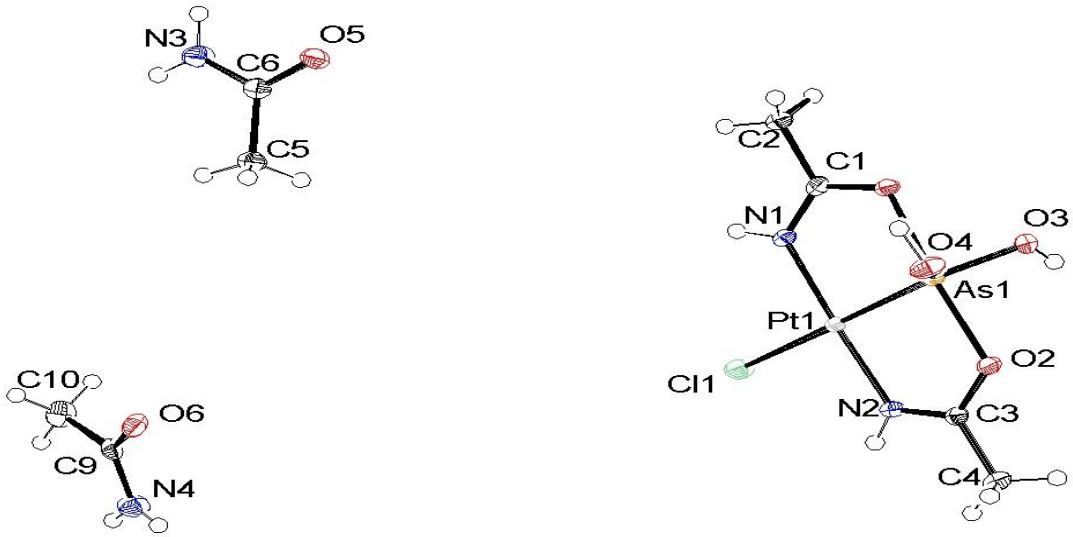

Figure S1. Thermal ellipsoid plot of **1b** with a 50 % probability level (Complex **1** crystallizes in two different crystal systems, triclinic with space group *P-1* (**1a**) and monoclinic with space group *P2(1)/n* (**1b**). The triclinic form **(1a)** contains lattice water and acetamide molecules whereas monoclinic (**1b**) contains only lattice acetamide).

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6. NMR spectra for 1-3

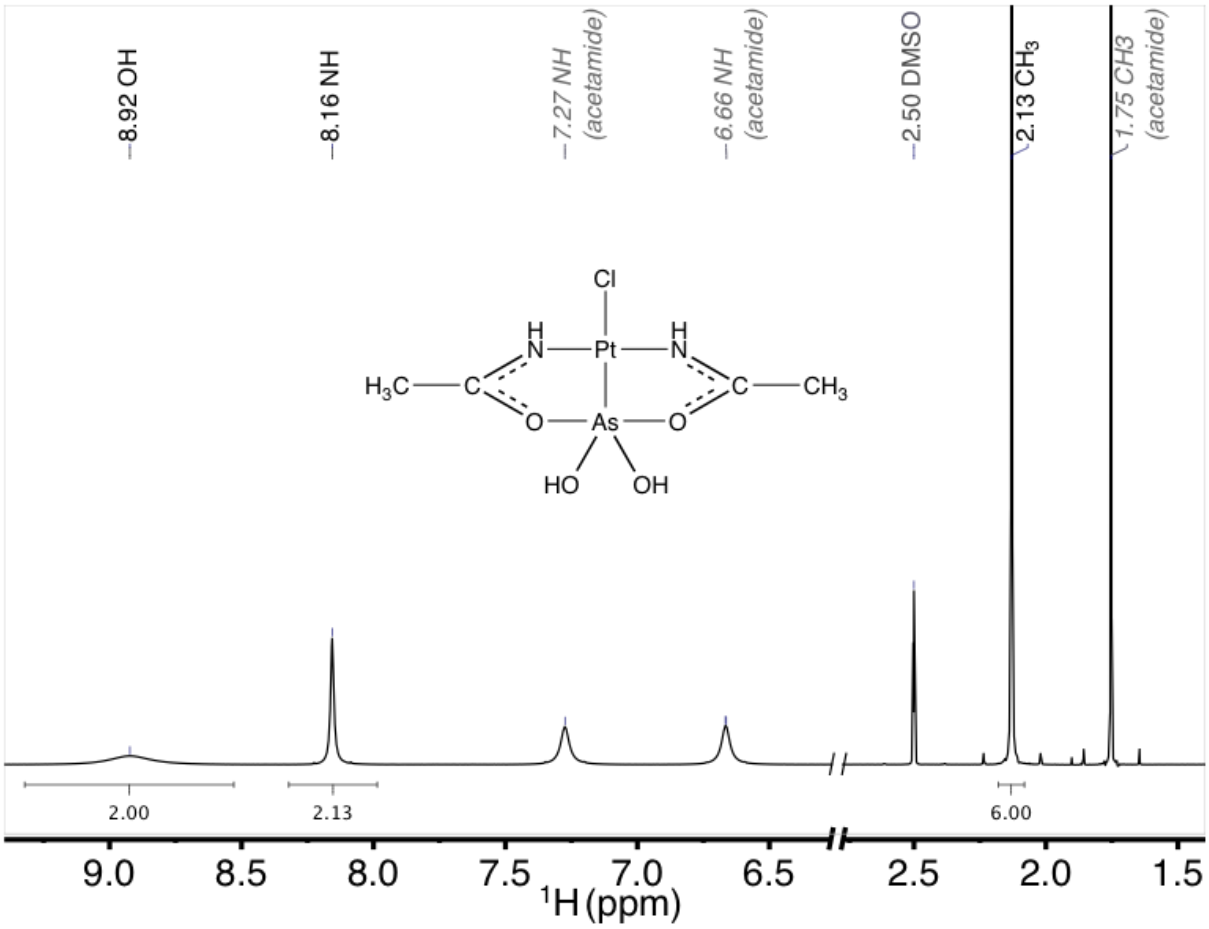

Figure S2. ^{1}H NMR spectrum of **1** in [D_6]DMSO solution, acquired at 600 MHz at 25 ^{o}C; ^{1}H referenced to residual [D_5H]DMSO at 2.50 ppm.

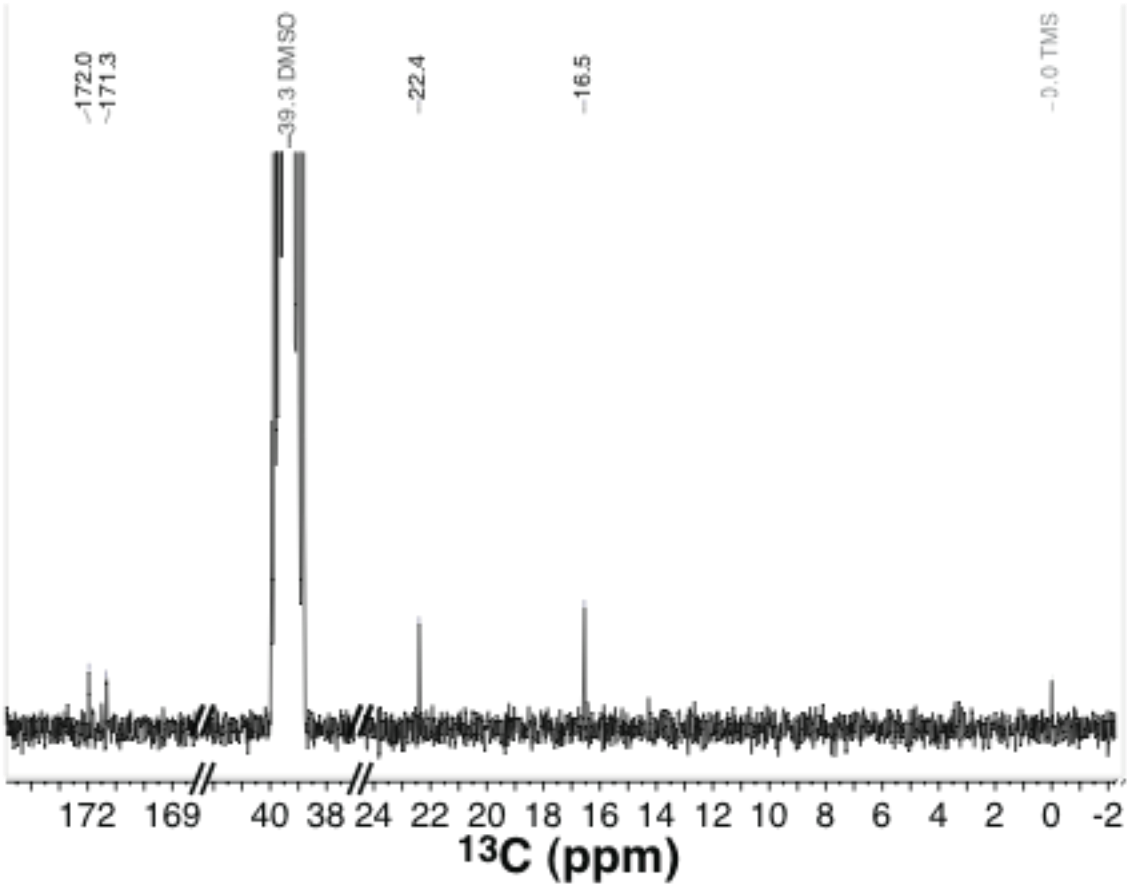

Figure S3. ^{13}C NMR spectrum of **1** in [D_6]DMSO solution, acquired at 126 MHz at 25 ^{o}C; ^{13}C referenced to TMS at 0.00 ppm

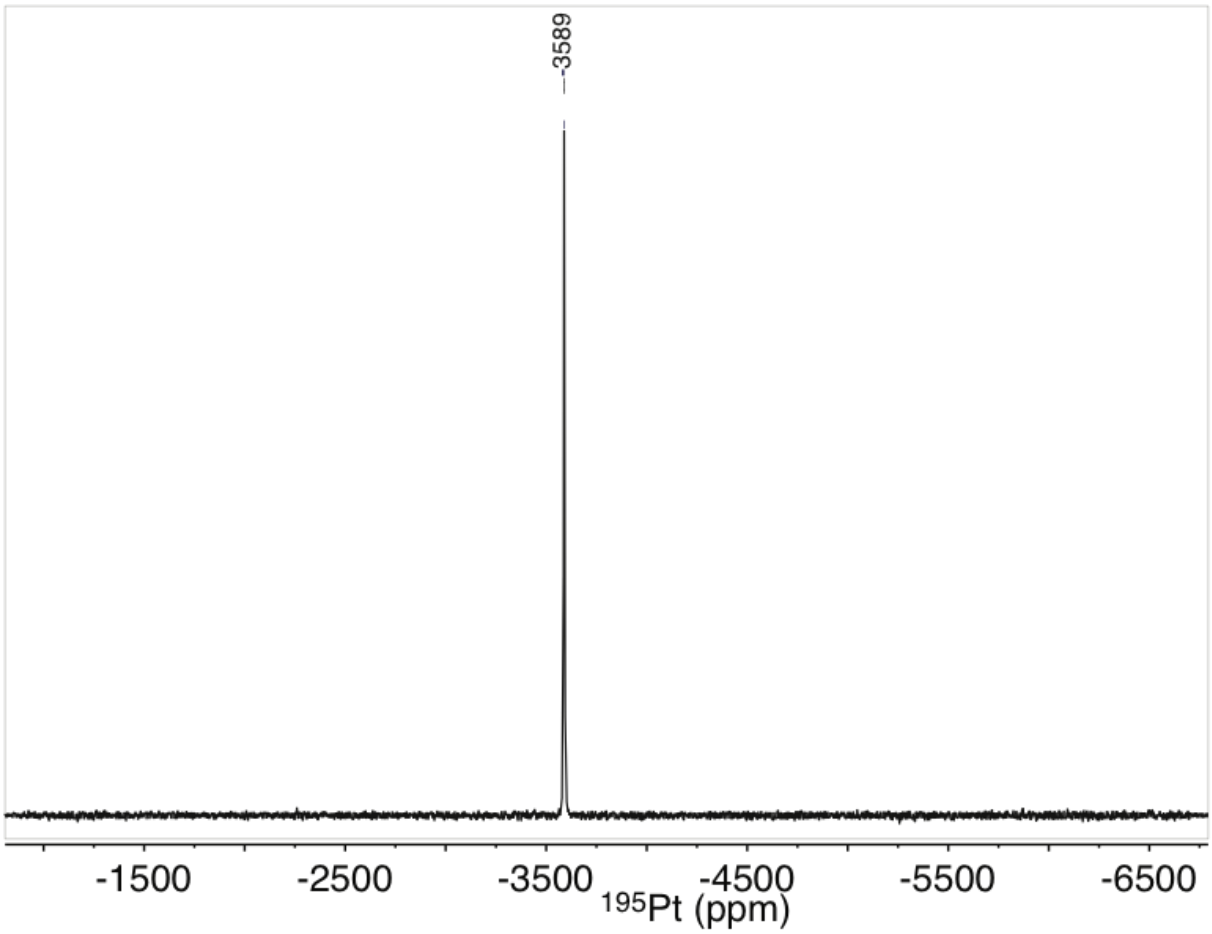

Figure S4. ^{195}Pt NMR spectrum of **1** in [D_6]DMSO solution, acquired at 129 MHz (600 MHz ^{1}H) at 25 ^{o}C.; ^{1}H referenced to residual [D_5H]DMSO at 2.50 ppm, and ^{195}Pt referenced indirectly.

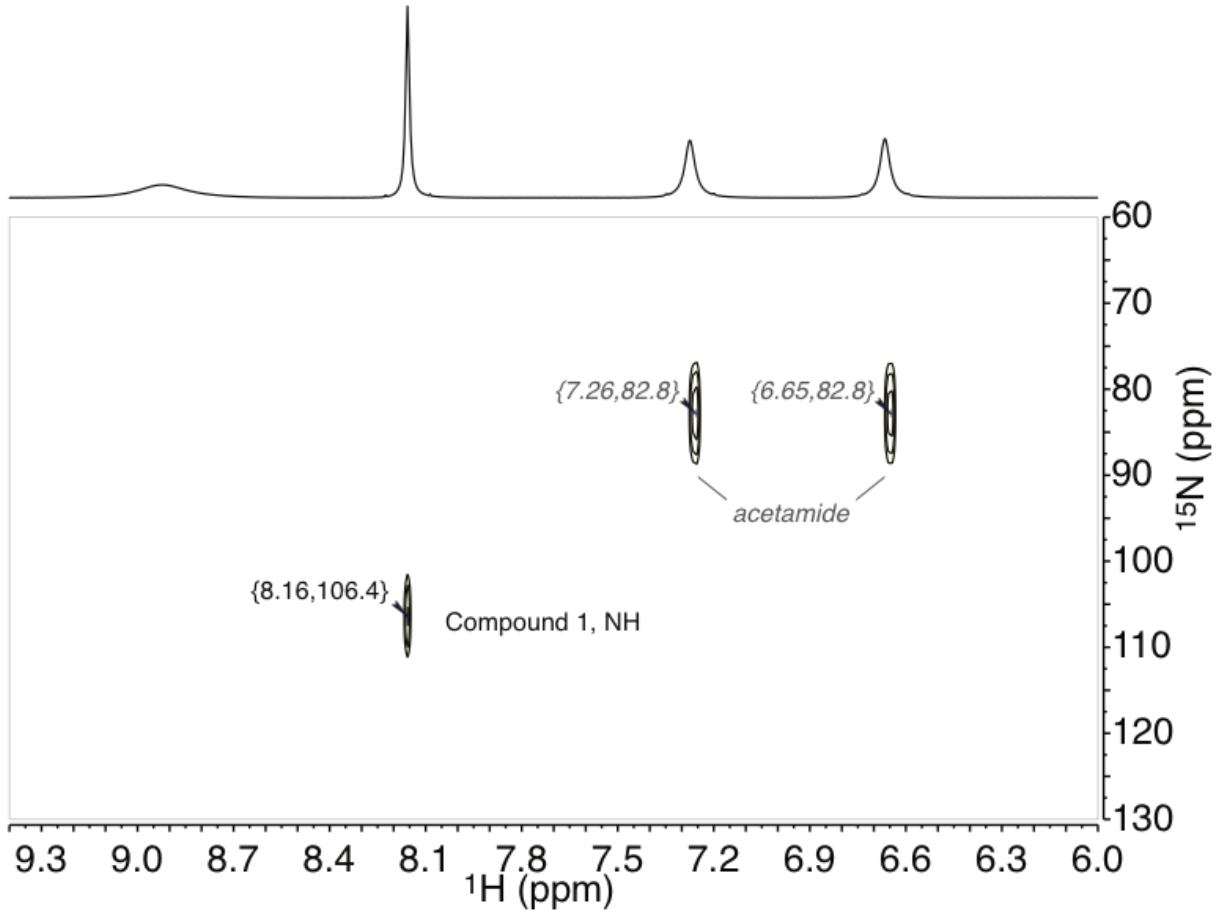

Figure S5. ^{1}H-^{15}N HSQC NMR spectrum of **1** in [D_6]DMSO solution, acquired at 600 MHz at 25 ^{o}C; ^{1}H referenced to residual [D_5H]DMSO at 2.50 ppm, and ^{15}N referenced indirectly to $^{15}NH_4Cl$.

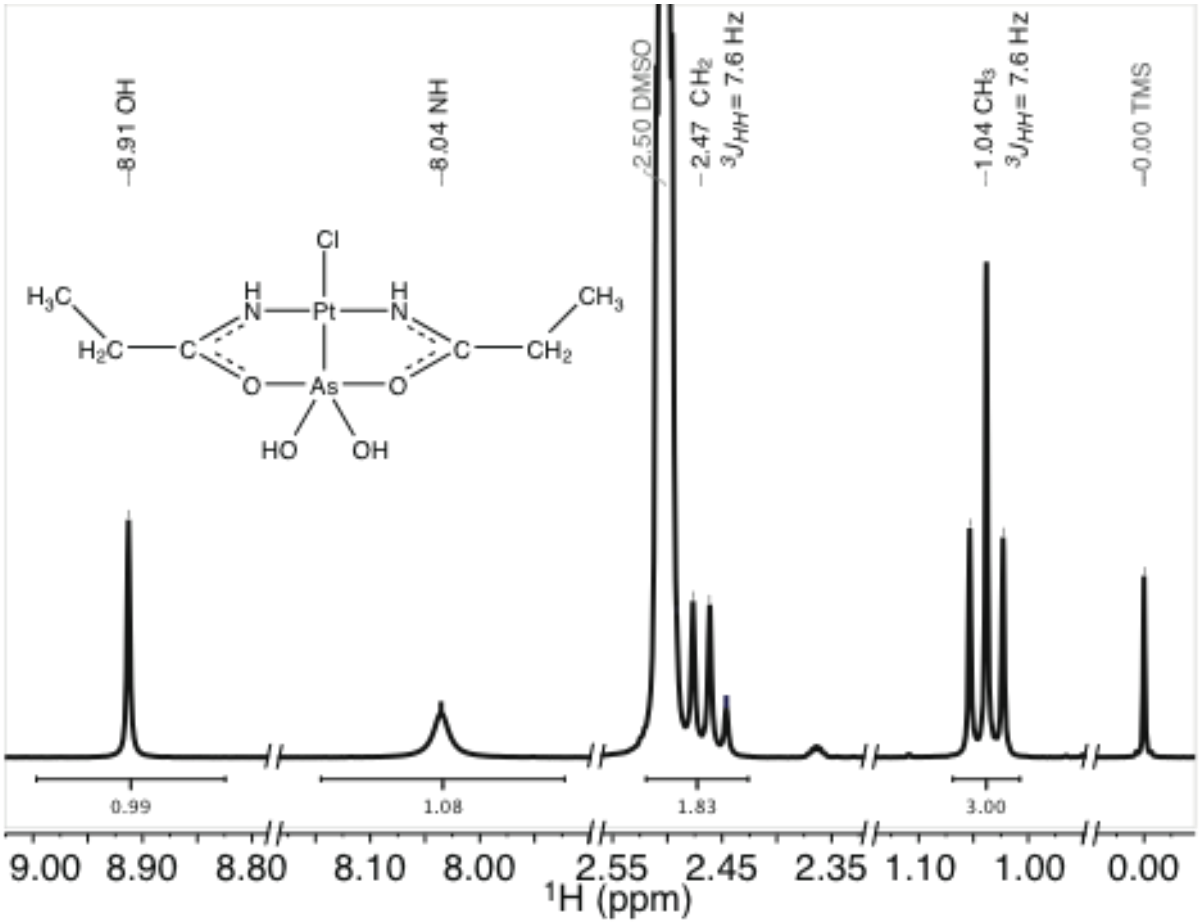

Figure S6. ^{1}H NMR spectrum of **2** in [D_6]DMSO solution, acquired at 500 MHz at 25 ^{o}C; ^{1}H referenced to TMS at 0.00 ppm.

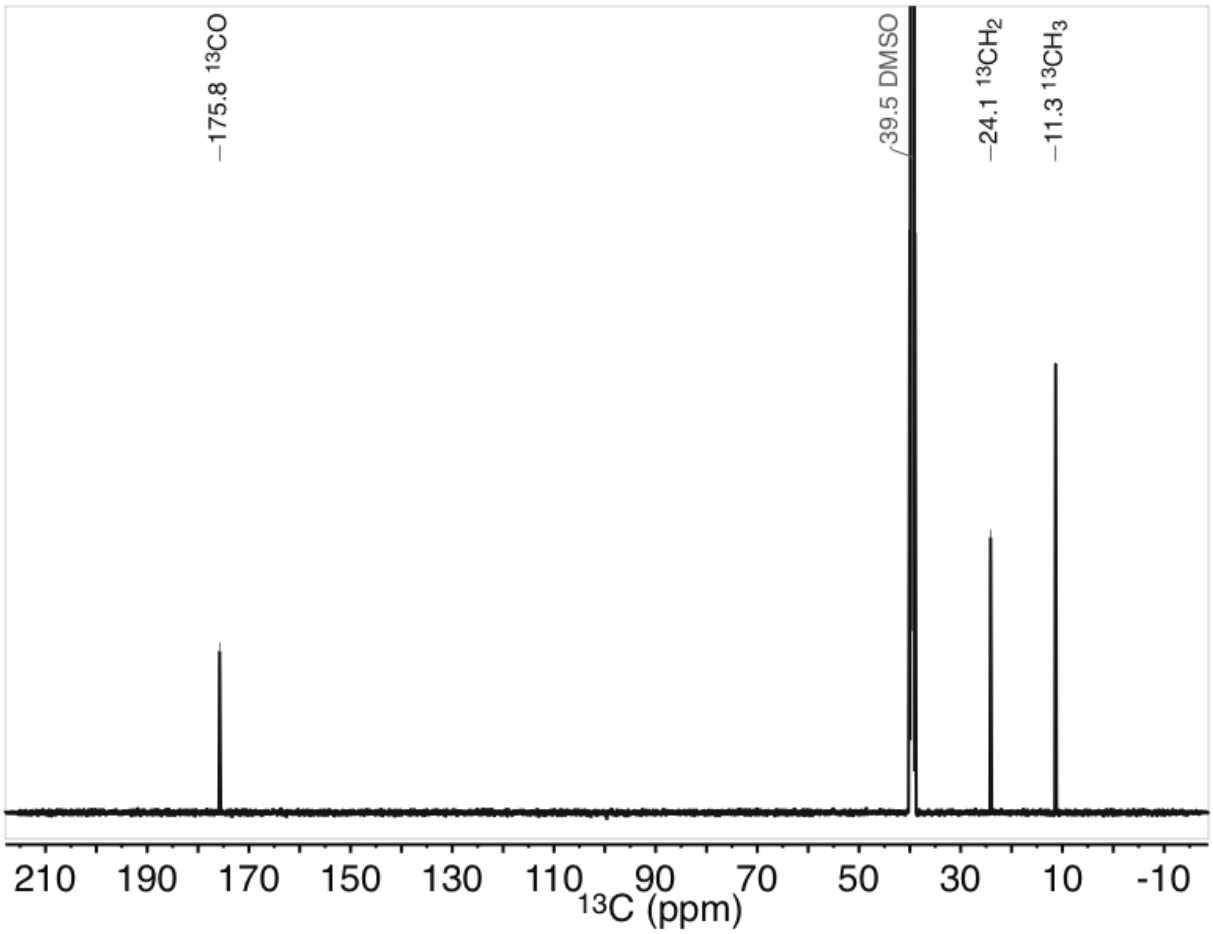

Figure S7. ^{13}C NMR spectrum of **2** in [D_6]DMSO solution, acquired at 125 MHz at 25 ^{o}C; ^{13}C referenced to residual [D_5H]DMSO at 39.5 ppm.

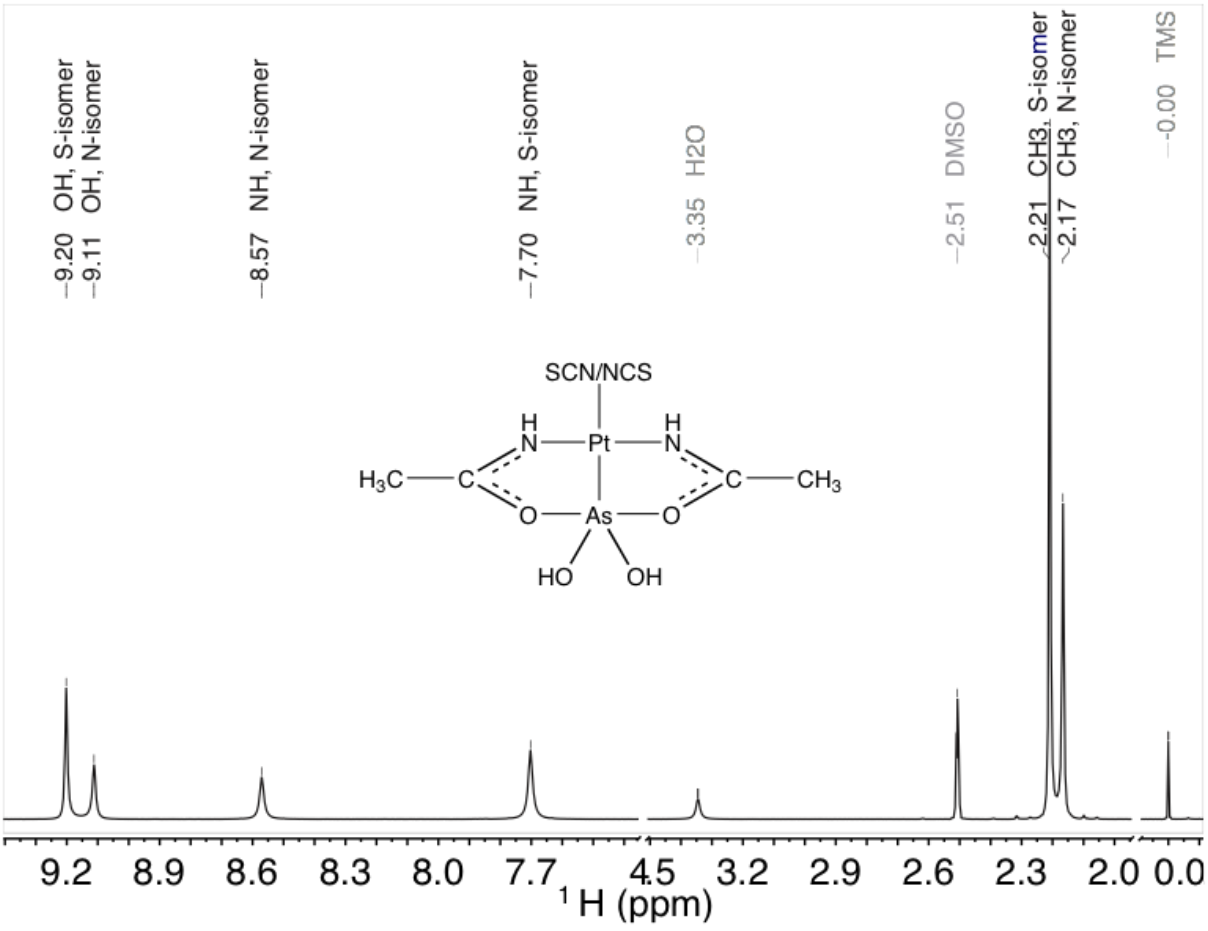

Figure S8. ^{1}H NMR spectrum of SCN^- and NCS^- isomers of **3** in [D_6]DMSO solution, acquired at 600 MHz at 25 ^{o}C; ^{1}H referenced to TMS at 0.00 ppm.

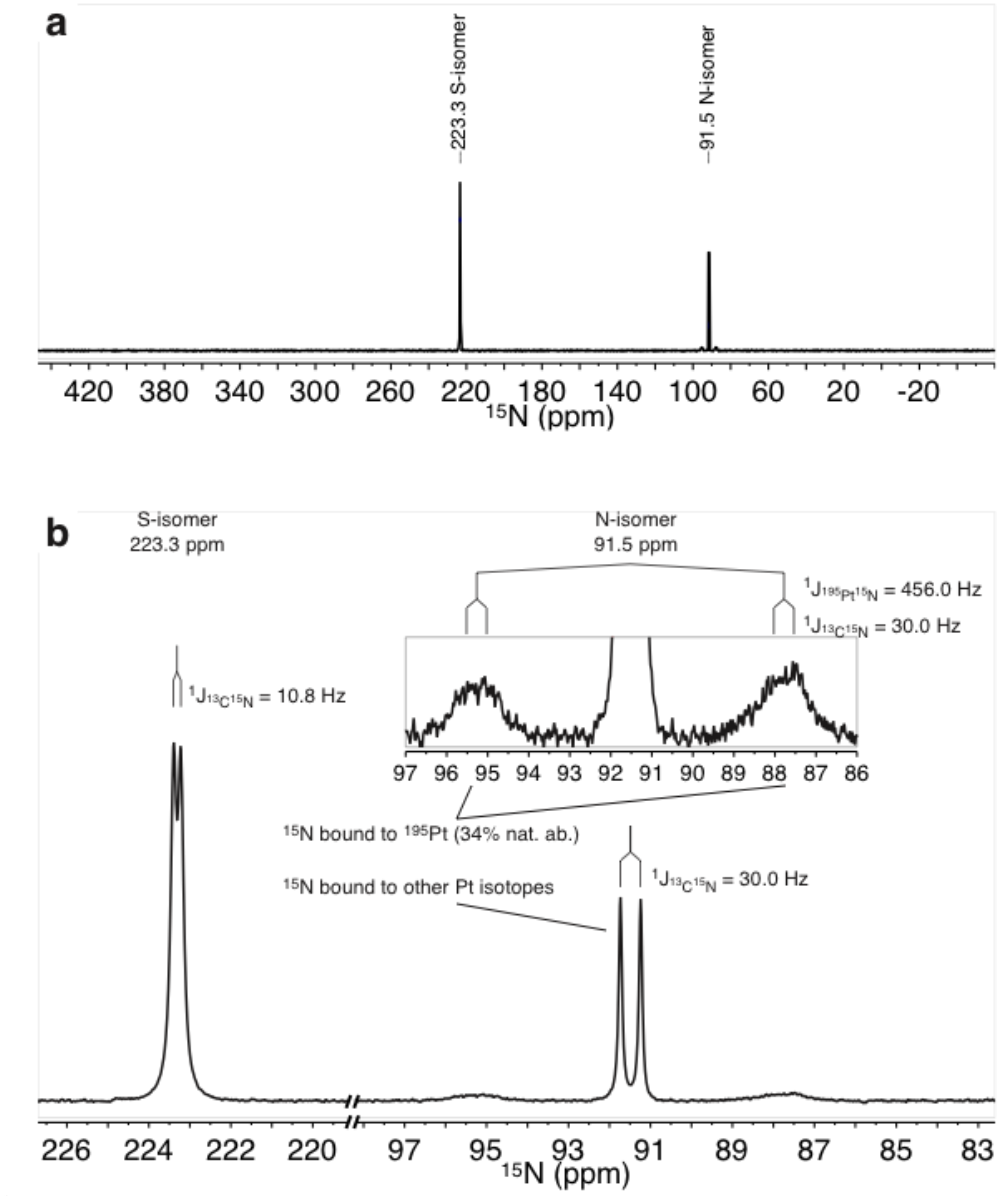

Figure S9. ^{15}N NMR spectrum of S^{13}C^{15}N^{-} and ^{15}N^{13}CS^{-} isomers of **3** in [D$_6$]DMSO solution, acquired at 125 MHz at 25 ^{o}C; ^{15}N referenced indirectly from the corresponding TMS-referenced ^{1}H spectrum to the ^{15}NH$_4$Cl scale. Note that the N-isomer exhibits two sets of peaks: one sharp doublet split by ^{13}C coupling and bound to non-^{195}Pt isotopes of platinum, and one doublet of broad doublets split by both ^{13}C and ^{195}Pt; the natural abundance of ^{195}Pt is 34%, which confers a reduced intensity on the ^{195}Pt-coupled ^{15}N resonances.

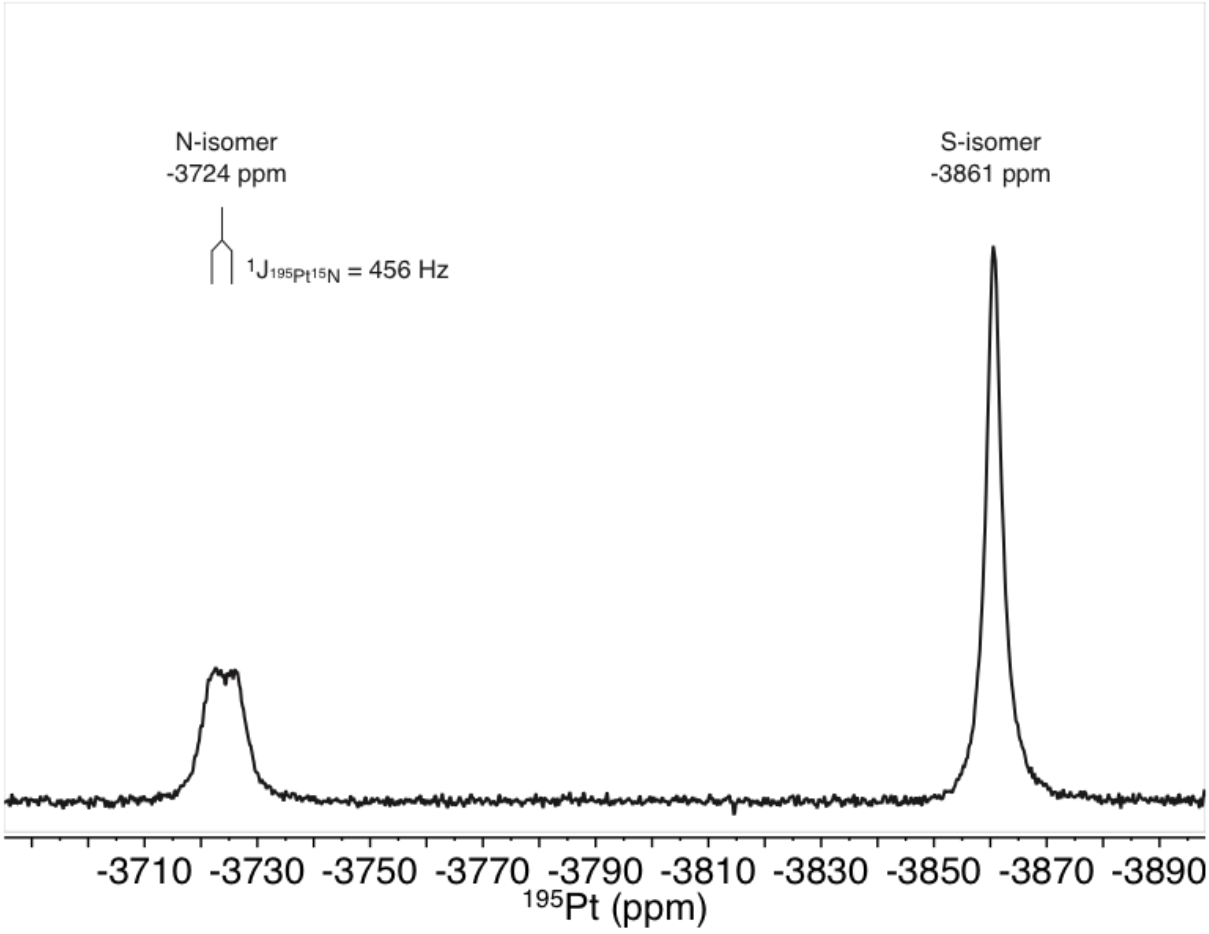

Figure S10. ^{195}Pt NMR spectrum of $S^{13}C^{15}N^{-}$ (-3861 ppm) and $^{15}N^{13}CS^{-}$ isomers (-3724 ppm) of **3** in [D_6]DMSO solution, acquired at 129 MHz (600 MHz ^{1}H) at 25 ^{o}C; ^{1}H referenced to TMS at 0.00 ppm, and ^{195}Pt referenced indirectly.

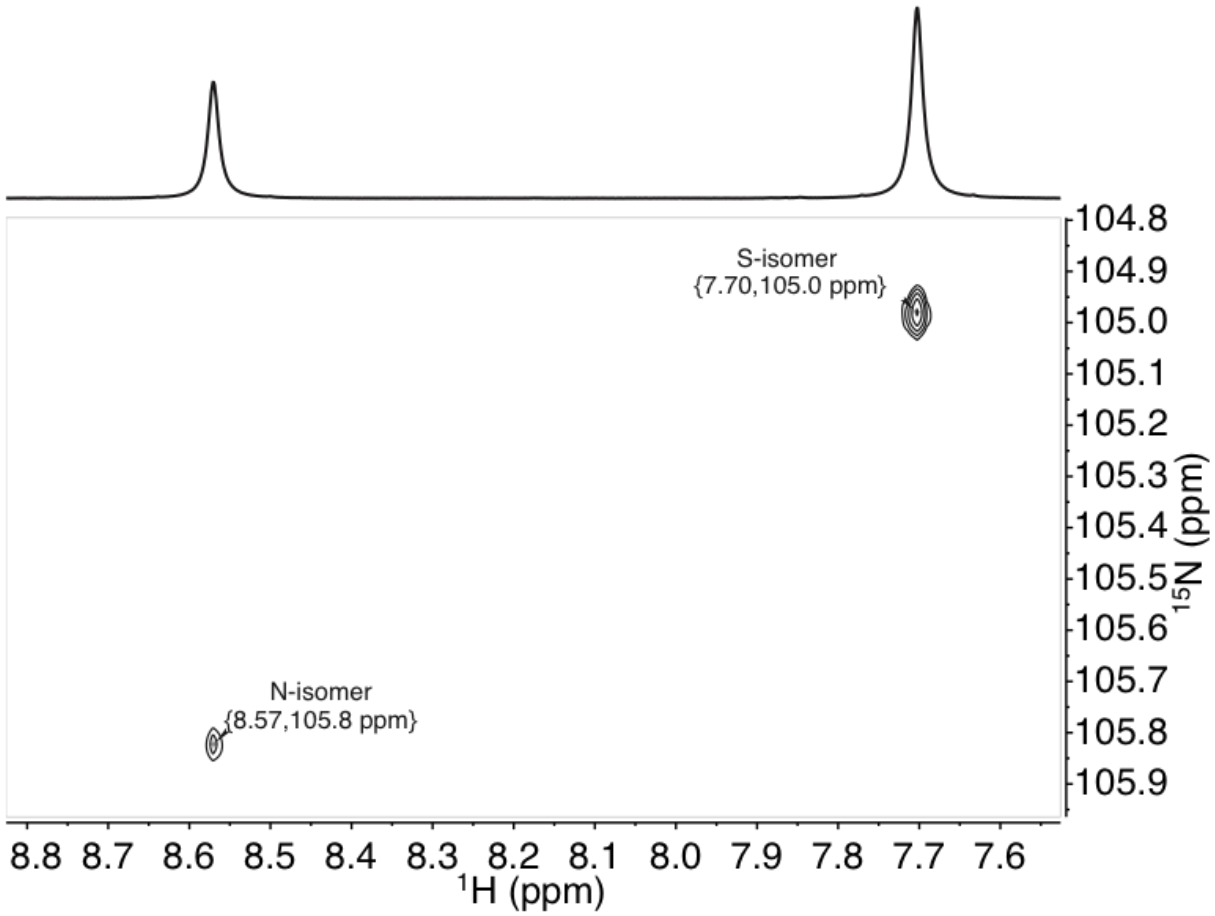

Figure S11. ^{1}H-^{15}N HSQC NMR spectrum of **3** in [D_6]DMSO solution, acquired at 600 MHz at 25 ^{o}C; ^{1}H referenced to residual TMS at 0.00 ppm, and ^{15}N referenced indirectly to $^{15}NH_4Cl$. The spectrum was acquired with a small indirect spectral width to enhance ^{15}N resolution.

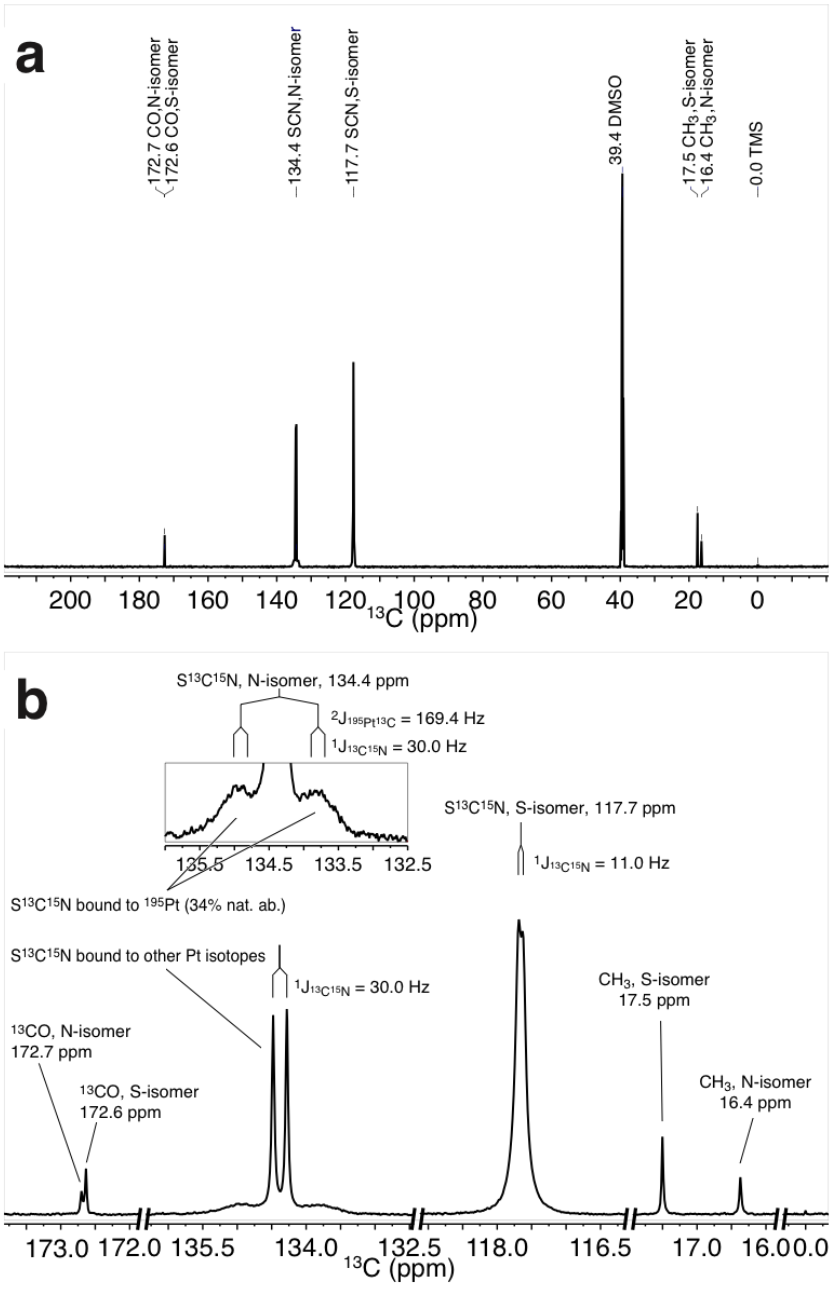

Figure S12. ^{13}C NMR spectrum of **3** in [D_6]DMSO solution, acquired at 126 MHz at 25 ^{o}C; referenced to TMS at 0.00 ppm. Note that the N-isomer exhibits two sets of S^{13}CN peaks: one sharp doublet split by ^{15}N coupling and bound to non-^{195}Pt isotopes of platinum, and one doublet of broad doublets split by both ^{15}N and ^{195}Pt; the natural abundance of ^{195}Pt is 34%, which confers a reduced intensity on the ^{195}Pt-coupled ^{13}C resonances.

In the ^{195}Pt NMR spectrum (Figure S10), the singlet at - 3861 ppm corresponds to ^{195}Pt resonance of the S-isomer, and the doublet at - 3724 ppm corresponds to ^{195}Pt resonance of the N-isomer. The ^{195}Pt signal of the N-isomer is split into a doublet because of ^{195}Pt-^{15}N coupling (s = ½ for both nuclei) with a $^{1}J(^{195}\text{Pt},^{15}\text{N})$ coupling constant of 456 Hz . ^{195}Pt-^{33}S coupling is not obtained for S-isomers since the ^{33}S isotope (s = 3/2) is only 0.76% abundant. In the ^{15}N NMR spectrum of **3** (Figure S9), the chemical shifts of ^{15}N signals at 223.3 ppm (S-isomer) and 91.5 ppm (N-isomer), referenced to $^{15}NH_4Cl$. The 456 Hz splitting of both ^{15}N and ^{195}Pt signals supports assignment of the N-isomer, and indicates that the $^{1}J(^{195}\text{Pt},^{15}\text{N})$ coupling constant is 456 Hz.

Inversion from S- to N-coordination causes an upfield shift of ^{195}Pt and ^{15}N resonance signals, but the opposite trend is obtained for ^{13}C resonance of the thiocyanate ligand. The ^{13}C NMR spectrum of **3** contains two peaks, at 117.7 and 134.4 ppm, which exhibit $^{1}J(^{13}\text{C},^{15}\text{N})$ scalar couplings of 10.8 and 30 Hz, respectively (Figure S12). Because we assigned the ^{15}N peaks to their respective N- and S-isomers, we may thus use the unique $^{1}J(^{13}\text{C},^{15}\text{N})$ coupling constants to assign the ^{13}C resonances at 117.7 and 134.4 to the S- and N-isomers, respectively.

7. Variable temperature NMR results for 3

Table S8

Results from the variable-temperature ^{1}H NMR (600 MHz, [D_6]DMSO solution) experiments.

Temperature (^{o}C)	S-isomer (%)	N-isomer (%)
20.5	62	38
25.3	64	36
31.5	65	35
36.9	67	33
42.6	68	32
47.7	70	30
53.8	71	29
59.6	72	28
65.1	74	26
71.3	76	24

Table S9

Abundance of S- and N-isomers (in %) at room temperature determined by VT NMR of different nuclei resonances

	S-isomer	N-isomer
^{1}H, OH	64	36
^{1}H, NH	62	38
^{1}H, CH_3	64	36
^{13}C, CO	63	37
^{13}C, CH_3	62	38
^{195}Pt	66	34

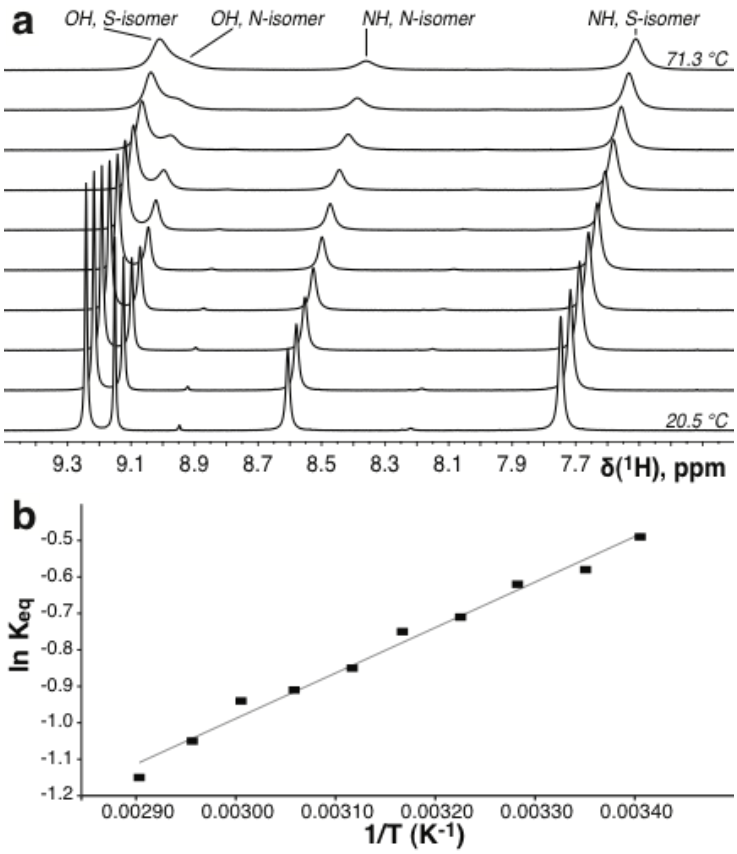

Figure S13. a) The NH and OH regions of the 600 MHz ^{1}H NMR spectrum of **3**, acquired at different temperatures in [D_6]DMSO: **3**-SCN isomer (9.25 ppm OH, 7.75 ppm NH at 20.5 °C); **3**-NCS-isomer (9.15 ppm OH, 8.61 ppm NH at 20.5 °C). Actual sample temperatures, calibrated with ethylene glycol, were 20.5, 25.3, 31.5, 36.9, 42.6, 47.7, 53.8, 59.6, 65.1, and 71.3 °C. The spectra shown are not shifted for display; increasing the temperature shifts the peaks upfield. b) Van't Hoff plot for the linkage isomerization of complex **3**: ΔG^{o} (1.42 kJmol^{-1}), ΔH^{o} (-15.7 kJmol^{-1}), and ΔS^{o} (-57.5 Jmol^{-1}K^{-1}) values were obtained for the isomerization process of complex **3**.

8. Cell culture conditions and *in vitro* cytotoxicity assay

A. Cell culture conditions. The MDA-MB-231-mCherry breast cancer cells were cultured in Dulbecco's modified Eagle's medium (DMEM) and supplemented with 5 % heat-inactivated fetal bovine serum (FBS), 50 units/ml penicillin, 50 µg/ml streptomycin, 2 mM *L*-glutamine, and 1µg/ml blasticidin S (Sigma). The A2780 and A2780^{CP} ovarian cancer cell lines and the multiple myeloma RPMI 8226 cell line were cultured in RPMI 1640 medium supplemented with 10 % FBS, 50 units/ml penicillin, 50 µg/ml streptomycin, 2 mM *L*-glutamine. The U-87 and HTC-116 cancer cell lines were cultured without antibiotics. Cells were grown at 37 ^{o}C in a humidified atmosphere of 5 % of CO_2.

B. *In vitro* cytotoxicity assay for MDA-MB-231mCherry, A270 and A2780^{CP} cancer cell lines. The cytotoxicities of **1**, cisplatin, and As_2O_3 were assessed by MTS assay using the CellTiter 96 Aqueous MTS (Promega). The 100 µL aliquots of cell suspension (1.0 x 10^5 cells/ml) were plated in 96-well tissue culture plates in the incubator overnight at 37 ^{o}C in a humidified atmosphere of 5 % of CO_2. The serial dilutions of **1**, cisplatin, and As_2O_3 in appropriate media were transferred to the cells. The MTS solution (20 µL) was added after 72 hours and the absorbance was measured at 495 nm 4 hours later. Sigmoidal dose response curves were plotted using the GraphPad Prism software. The IC_{50} values were obtained on at least three independent experiments. ***In vitro* cytotoxicity assay for U-87 and HTC-116 cancer cell line.** For the experiment, cells were cultured in RPMI 1640 medium with 5% FBS and 2mM L-glutamine. The drug was added in similar media supplemented with 50ug/mL gentamicin. HCT-116 and U-87 cancer cell were plated in 96 well plates. The cells were plated in four replicates. The densities of the cells were 5000 and 10000 per well in 90 µL for HTC-116 and U-87, respectively. 10 µL of the

final drug volume have added per well. The cells were treated with 100, 10, 1, 0.1 0.01, 0.001, 0.0001, 0.00001 and 0.000001 μM of complex **1**, cisplatin, and As_2O_3. After 48 hours post drug treatment all plates were allowed to equilibrate for 30 minutes at room temperature from incubator. Addition of 100 μL of Cell Titer Glow (Promega, Fitchburg, Wisconsin) reagent was added to the wells. The plates were shaken for 2 minutes and allowed to sit for activation prior to reading for 10 minutes. Plates were read on Biotek Synergy H1 (Biotek, Wenooski, Vermont) reader capable of luminescence detection.

Table S10

IC_{50} values in μM (± SD) of **1**, cisplatin, and arsenic trioxide in a panel of different human cancer cell lines

Cell line	Malignancy	Complex **1**	Cisplatin	As_2O_3
A2780	Ovarian cisplatin sensitive	20.3 ± 4.0	3.1 ± 1.1	17.1 ± 1.5
$A2780^{CP}$	Ovarian cisplatin resistant	21.4 ± 1.8	47.3 ± 2.1	21.6 ± 1.4
MDA-MB-231 (mCherry)	Triple negative breast cancer	9.5 ± 0.1	22.3 ± 2.8	11.9 ± 2.3
RPMI 8226	Multiple myeloma	4.5 ± 1.0	1.9 ± 0.1	7.1 ± 0.2
HTC-116	Colon	1.6±0.4	5.5±1.3	9.4±0.9
U-87	Glioblastoma	0.37±0.11	9.6±0.8	1.6±2.9

9. Dose response curves

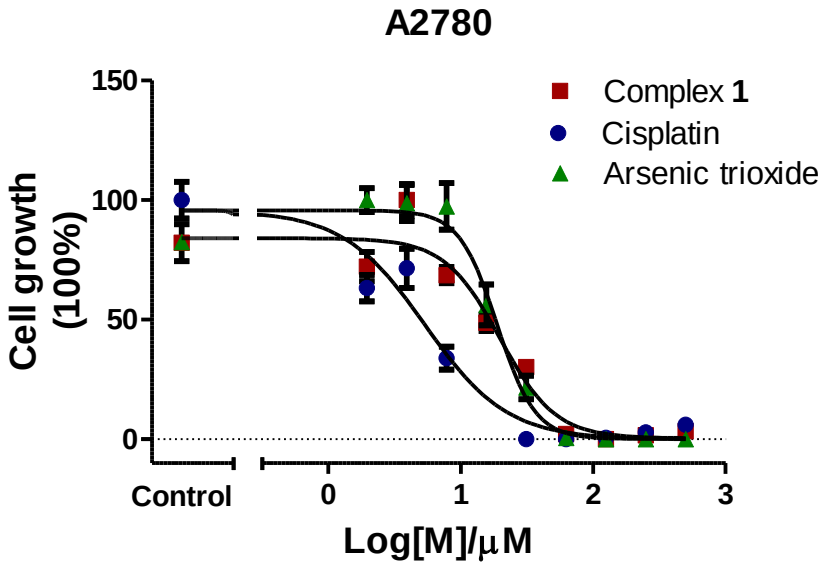

Figure S12. Dose response curves for ovarian cisplatin sensitive A2780 cell line treated with **1**, cisplatin, and As_2O_3.

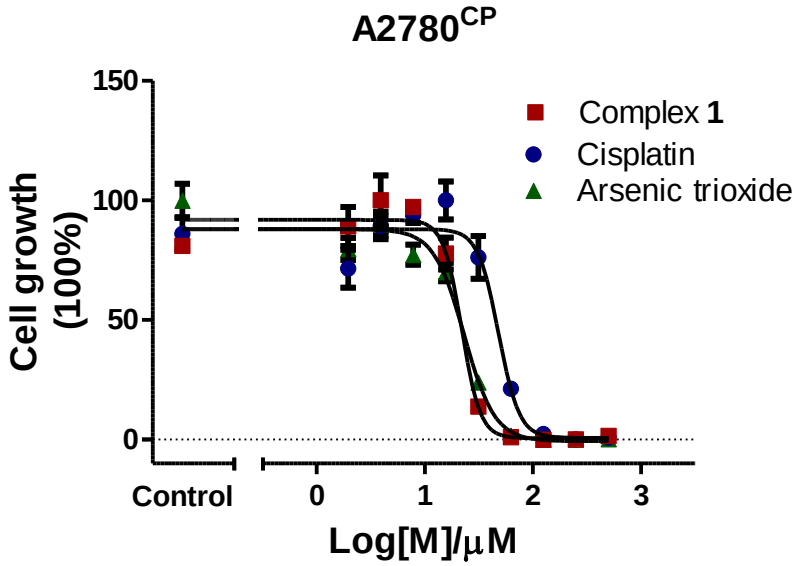

Figure S13. Dose response curves for ovarian cisplatin resistant $A2780^{CP}$ cell line treated with **1**, cisplatin, and As_2O_3.

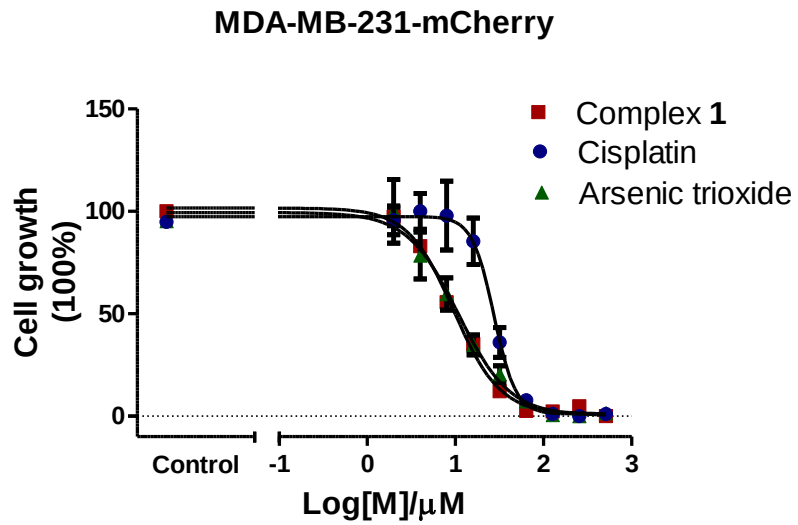

Figure S14. Dose response curves for triple negative breast MDA-MB-231 cell line treated with **1**, cisplatin, and As_2O_3.

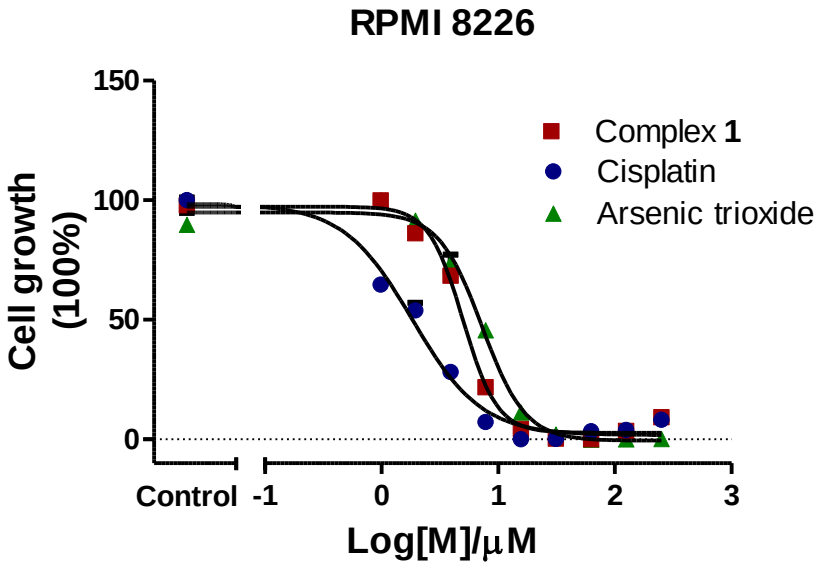

Figure S15. Dose response curves for multiple myeloma RPMI 8226 cell line treated with **1** , cisplatin, and As_2O_3.

10. References

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(S5) J. A.Ibers, W. C. Hamilton, *Acta Crystallogr*. **1964**, *17*, 781.