Electronic Supplementary Information

For

Heterotrimetallic {LnOVPt} complexes with Antiferromagnetic Ln-V Coupling and Magnetic Memory

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Table of Contents:

	Title	Page
	Experimental Procedures	3-6
Figure S1	ORTEP of **1**	8
Figure S2	ORTEP of **2**	9
Figure S3	ORTEP of **2** inter-lantern contacts	10
Figure S4	Temperature dependent magnetic susceptibility of **1**	11
Figure S5	Temperature dependence of $1/\chi$ for **1**	12
Figure S6	Temperature dependence of χ at 10-50 kOe of **1**	13
Figure S7	Field dependence of magnetization of **1**	14
Figure S8	Temperature dependence of χ for **1**	15
Figure S9	Temperature dependent magnetic susceptibility of **1**	16
	Note on magnetic data interpretation for **1**	16
Figure S10	IR spectra of **1** and **2**	18
Figure S11	IR spectra of **1, 3Ce,** and **3Nd**	19
Figure S12	IR spectra of **2, 4Ce,** and **4Nd**	20
Figure S13	UV-vis spectra of **1-2**	21
Figure S14	UV-vis spectrum of **3Nd**	22
Figure S15	UV-vis spectrum of **4Nd**	23
Figure S16	UV-vis spectrum of **3Ce**	24
Figure S17	UV-vis spectrum of **4Ce**	25
Figure S18	M vs H magnetization curves of **3Ln-4Ln**	26
Figure S19	M vs B/T curves for **3Ln-4Ln**	27
Figure S20	AC susceptibility measurements for **3Ce** and **3Nd**	28
Figure S21	ORTEP of **4Ce**	29
Figure S22	ORTEP of **3Nd**	30
Figure S23	ORTEP of **4Nd**	31
Table S1	Select interatomic distances (Å) and angles (°) for **1-2**	32
Table S2	Summary of X-ray crystallographic collection parameters **1,2,3Ln-4Ln**	33
Table S3	All non-hydrogen bond distances (Å) of **1**	34
Table S4	All non-hydrogen bond angles (°) of **1**	35-36
Table S5	All non-hydrogen bond distances (Å) of **2**	37-38
Table S6	All non-hydrogen bond angles (°) of **2**	39-41
Table S7	All non-hydrogen bond distances (Å) of **3Ce**	42-45
Table S8	All non-hydrogen bond angles (°) of **3Ce**	46-51
Table S9	All non-hydrogen bond distances (Å) of **4Ce**	52-59
Table S10	All non-hydrogen bond angles (°) of **4Ce**	60-72
Table S11	All non-hydrogen bond distances (Å) of **3Nd**	73-75
Table S12	All non-hydrogen bond angles (°) of **3Nd**	76-80
Table S13	All non-hydrogen bond distances (Å) of **4Nd**	81-88
Table S14	All non-hydrogen bond angles (°) of **4Nd**	89-102

Experimental Details

Materials and Methods

The starting complexes $Ln(ODtbp)_3$ (Ln=Ce,[1] Nd[2]) were prepared by previously reported methods. Potassium tetrachloroplatinate (K_2PtCl_4) was prepared by the same method as previously published.[3] All moisture and air sensitive materials were manipulated in dinitrogen filled MBraun gloveboxes. All glassware was dried in a 160 °C oven overnight, cooled under vacuum and purged with nitrogen before use. Toluene, pentane, hexamethyldisiloxane, and hexane were collected from a Vac Atmospheres solvent purification system, degassed and stored over activated 4 Å molecular sieves under dinitrogen. Prior to collection the solvent was cycled over a drying column containing molecular sieves for 12 hours. Toluene-d_8 was degassed, stirred over potassium for 24 hours and distilled by trap to trap distillation under static vacuum prior to use. CD_2Cl_2 was degassed and stirred over CaH_2 for 24 hours and distilled by trap to trap distillation under static vacuum prior to use. All other reagents were obtained commercially and used without further purification. Elemental analyses were performed by Atlantic Microlab Inc. (Norcross, GA). UV-vis-NIR spectra were measured with a Shimadzu UV-3600 spectrometer. ^{1}H-NMR spectral measurements for Evans method[4, 5] susceptibility measurements were recorded on a Varian 500 MHz spectrometer (**1-2** at Boston University) and a Bruker 500 MHz spectrometer (**3Ln-4Ln** at University of Edinburgh). Solutions were prepared with CD_2Cl_2 doped with tetramethylsilane, and the change in ^{1}H chemical shift was measured for both the protio solvent and the CH_3 protons of the tetramethylsilane. IR spectra were collected with a Nicolet FT-IR with an ATR attachment inside a dinitrogen filled MBraun glovebox.

Synthetic Procedures

$[Pt(V{=}O)(SOCMe)_4]$ (**1**). A portion of $NaHCO_3$ (170.9 mg, 2.03 mmol) was dissolved in approximately 10 mL H_2O, and to that solution thioacetic acid (HSOCMe) (136.0 µL, 1.92 mmol) was added. These were allowed to react for 20 minutes until bubbles of CO_2 stopped forming. Separately, K_2PtCl_4 (202.4 mg, 0.482 mmol) was dissolved in minimum H_2O (2 mL) and added, yielding a light pink solution. This mixture was then allowed to react overnight, resulting in a

yellow solution. $VOSO_4$ (82.4 mg, 0.482 mmol) was dissolved in minimum H_2O (5 mL) and added to the Pt(II) solution, resulting in the immediate formation of a light green precipitate. The reaction was allowed to proceed for 4 h, and the precipitate was recovered by vacuum filtration, followed by extensive washing with H_2O and Et_2O. The precipitate was then dried *in vacuo* overnight, yielding a light green powder (152.8 mg, 56 %). Single crystals suitable for X-ray analysis were grown by layering a saturated solution in $CHCl_3$ with hexanes. Anal. Calcd. for $C_8H_{12}O_5PtS_5V$: C, 17.08; H, 2.15; N, 0.00. Found: C, 17.37; H, 2.21; N, 0.00. UV-vis-NIR (CH_2Cl_2) (λ_{max}, nm (ε_M, cm^{-1} M^{-1})): 269 (53,100), 616 (23), 731 (26). μ_{eff} (Evans method, CD_2Cl_2): 1.68. IR (cm^{-1}): 2886 w, 1547 m, 1483 m, 1423 m, 1358 m, 1349 m, 1341 m, 1279 w, 1241 w, 1145 s, 1012 m, 984 s, 961 s, 841 m, 717 s, 514 s.

$[Pt(V=O)(SOCPh)_4]$ (**2**). A portion of potassium thiobenzoate, KSOCPh (127.0 mg, 0.722 mmol) was dissolved in approximately 10 mL H_2O. Separately, a portion of K_2PtCl_4 (74.6 mg, 0.180 mmol) was dissolved in minimum H_2O (1 mL) and added. The resulting pink solution was allowed to react for 1 h, yielding a yellow color. A portion of $VOSO_4$ (29.6 mg, 0.180 mmol) was dissolved in minimum H_2O (2 mL) and added to the Pt(II) solution, resulting in the immediate formation of a light green precipitate. The reaction was allowed to proceed overnight and the solid was recovered by vacuum filtration. The product was washed extensively with H_2O and dried *in vacuo* overnight, yielding a green/yellow powder (106.8 mg, 73 %). Single crystals suitable for X-ray analysis were grown by layering a saturated solution in CH_2Cl_3 with hexanes. Anal. Calcd. for $C_{29}H_{22}O_5Cl_2PtS_4V$: C, 41.48; H, 2.49; N, 0.00. Found: C, 41.99, H, 2.60; N, 0.00. UV-vis-NIR (CH_2Cl_2) (λ_{max}, nm (ε_M, cm^{-1} M^{-1})): 256 (67,200), 302 (62,900), 620 (35), 726 (38). μ_{eff} (Evans method, CD_2Cl_2): 1.60. IR (cm^{-1}): 3057 w, 1594 w, 1583 w, 1510 s, 1487 s, 1440 m, 1307 m, 1215 s, 1173 s, 1075 w, 989 s, 955 s, 930 m, 846 w, 771 s, 722 s, 681 s, 643 s, 616 m, 582 s, 513 m.

$[Ce(ODtbp)_3\{PtVO(SOCMe)_4\}]$ (**3Ce**). In a N_2(g) filled glovebox, $Ce(ODtbp)_3$ (78.0 mg, 0.103 mmol) was dissolved in 2mL of toluene forming a yellow/green solution. $[PtVO(SOCMe)_4]$ (58.0 mg, 0.102 mmol) was then added as a solid. As the $[PtVO(SOCMe)_4]$ dissolves, there is a color change

to a dark red/brown, translucent solution. After stirring for 24 h at room temperature, the [PtVO(SOCMe)$_4$] has fully dissolved and the solution is a homogenous dark red/brown color with no precipitate formation. The reaction mixture is directly crystallized through slow diffusion of HMDSO into the toluene reaction mixture at room temperate to obtain analytically pure red crystals of the composition [Ce(ODtbp)$_3${PtVO(SOCMe)$_4$}] · tol · HMDSO. Recrystallized yield: 79.6%. Anal. Calc'd. for $C_{50}H_{75}CeO_8PtS_4V$: C, 45.55; H, 5.73; N, 0%. Found: C, 45.39; H, 5.85; N, 0%. UV–vis–NIR (C_7H_8) (λmax, nm (εM, $cm^{-1}M^{-1}$)): 304(30,900), 427(1930), 759 sh(59.6), 904 sh(27.3). IR (cm^{-1}): 2955(br) m, 1533 m, 1403 s, 1240 s, 1160 m, 1093 w, 1000 w, 912 s, 856 s, 818 m. Evans method (toluene-d_8): 2.2(1).

[Ce(ODtbp)$_3${PtVO(SOCPh)$_4$}] (**4Ce**). The same procedure as **3Ce** was performed, with Ce(ODtbp)$_3$ (96.5 mg, 0.128 mmol) and [PtVO(SOCPh)$_4$] (103.4 mg, 0.128 mmol). Red crystals of the composition [Ce(ODtbp)$_3${PtVO(SOCPh)$_4$}] · 1.5tol. Recrystallized yield: 73.5%. Anal. Calc'd. for $C_{70}H_{83}CeO_8PtS_4V$: C, 53.66; H, 5.34; N, 0%. Found: C, 53.34; H, 5.15; N, 0%. UV–vis–NIR (C_7H_8) (λmax, nm (εM, $cm^{-1}M^{-1}$)): 317(147,000), 429(1370), 460(1020). IR (cm^{-1}): 2955(br) m, 1502 m, 1405 s, 1233 s, 1175 s, 1096 w, 963 s, 911 s, 858 s, 818 m. Evans method (toluene-d_8): 1.9(9).

[Nd(ODtbp)$_3${PtVO(SOCMe)$_4$}] (**3Nd**). The same procedure as **3Ce** was performed with Nd(ODtbp)$_3$ (91.7 mg, 0.121 mmol) and [PtVO(SOCMe)$_4$] (68 mg, 0.121 mmol). Red crystals of the composition [Nd(ODtbp)$_3${PtVO(SOCMe)$_4$}]. Recrystallized yield: 84.5%. Anal. Calc'd. for $C_{50}H_{75}NdO_8PtS_4V$: C, 45.41; H, 5.72; N, 0%. Found: C, 45.28; H, 5.75; N, 0%. UV–vis–NIR (C_7H_8) (λmax, nm (εM, $cm^{-1}M^{-1}$)): 304(23,800), 402(1520), 426(1600), 580(300), 591(267). IR (cm^{-1}): 2954(br) m, 1532 m, 1403 s, 1240 s, 1159 s, 1098 w, 996 w, 912 s, 858 s, 818 m. Evans method (toluene-d_8): 3.1(4).

[Nd(ODtbp)$_3${PtVO(SOCPh)$_4$}] (**4Nd**). The same procedure as **3Ce** was performed with Nd(ODtbp)$_3$ (74.0 mg, 0.098 mmol) and [PtVO(SOCPh)$_4$] (79.1 mg, 0.098 mmol). Red crystals of

the composition $[Nd(ODtbp)_3\{PtVO(SOCPh)_4\}] \cdot 2$ tol. Recrystallized yield: 77.1%. Anal. Calc'd. for $C_{70}H_{83}NdO_8PtS_4V$: C, 53.52; H, 5.33; N, 0%. Found: C, 53.41; H, 5.47; N, 0%. UV–vis–NIR (C_7H_8) (λmax, nm (εM, $cm^{-1}M^{-1}$)): 317(122,000), 430(1250), 462(972), 581(210), 592(202). IR (cm^{-1}): 2954(br) m, 1595 w, 1500 m, 1403 s, 1219 s, 1175 s, 1098 w, 963 s, 909 s, 859 s, 818 m. Evans method (toluene-d_8): 2.8(9).

X-Ray Crystallography

X-ray collection parameters are collected in **Table S1**. Data collection, solution, and refinement were performed by Prof. Arnold Rheingold at the University of California-San Diego on **1, 2,** and **4Nd.** Suitable crystals of **1, 2,** and **4Nd** were selected and data were collected on a Bruker APEX-II CCD diffractometer. The crystals were kept at 100 K during data collection. Using Olex2,[6] the structures were solved with the XT[7] structure solution program using Direct Methods and refined with the XL[8] refinement package using Least Squares minimization. X-ray data refinement was performed by Dr. Jeffrey Bacon at Boston University on data collected and solved at the University of Edinburgh. Suitable crystals of **3Ln** and **4Ce** were selected and data were collected on a Xcalibur Eos single crystal x-ray diffractometer with Mo Kα radiation at 170(2) K. Structures **3Ln** and **4Ce** were solved using SHELXT and least squares refinement using SHELXL in Olex2.[7] Absorption corrections were applied using Crysalis PRO 1.171.38.42b (Rigaku Oxford Diffraction, 2015) or 1.171.37.34 (Agilent Technologies, 2014) software. Unless otherwise stated, all non-hydrogen atoms refined with anisotropic displacement parameters and hydrogen atoms were placed and refined using a riding model.

Magnetic Measurements

Magnetic susceptibility data for **1** were collected by Brooke N. Livesay using a Quantum Design MPMS XL SQUID magnetometer housed at Colorado State University, Fort Collins, Colorado. Finely ground samples were loaded into polyethylene bags, sealed on the benchtop, and then inserted into drinking straws. Ferromagnetic impurity checks were performed by sweeping the field (0 - 10 kOe) at 100 K: linearity in the plot (Figure S7, top) indicates lack of

significant ferromagnetic impurities. Static (dc) magnetic susceptibility data were collected at temperatures ranging from 2 K to 300 K at applied fields of 1 kOe and 10-50 kOe. Magnetization measurements were collected at 1.8 K while varying the applied field up to 50 kOe. The molar mass used for all data work up assumes two PtV=O lantern units. Data were corrected for the magnetization of the sample holder by subtracting the susceptibility of an empty container, and for diamagnetic contributions of the sample by using Pascal's constants.[9] Magnetic susceptibility data were interpreted by Brooke N. Livesay and Prof. Matthew P. Shores and fit to various models using PHI,[10] with the general spin Hamiltonian:

$$\hat{H} = -2JS_1 \cdot S_2.$$

Magnetic susceptibility measurements of complexes **3Ln**-**4Ln** were collected using a Quantum Design SQUID magnetometer at the University of Copenhagen. The air sensitive samples were obtained as sealed glass vials, opened and handled in an oxygen- and water-free glovebox. A small amount of ground powder (15-50 mg) was pressed inside a Teflon tape and inserted in drinking straws. The compounds were taken outside the glovebox under liquid nitrogen and immediately inserted in the He atmosphere of the instrument. The magnetic data were collected and corrected for any magnetic impurity by measuring a magnetization curve at room temperature. The diamagnetism of the Teflon tape and of the organic backbone was corrected by using Pascal's constants.

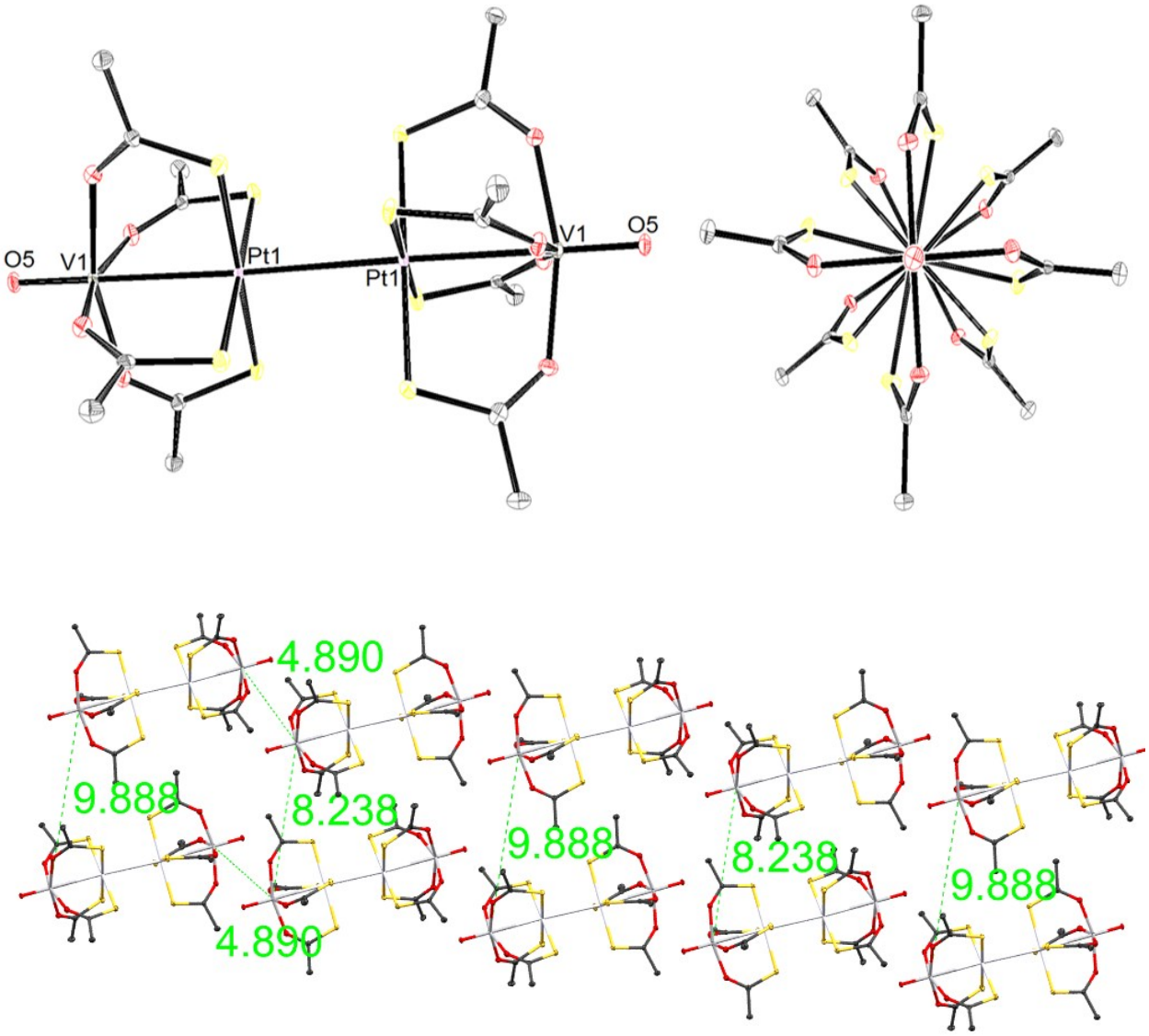


Figure S1: ORTEP of **1** (top left), staggered thiocarboxylate backbone as viewed along the M-M vector (top right). Ellipsoids shown at the 50% level and hydrogen atoms omitted for clarity. Packing diagram of **1** (bottom).

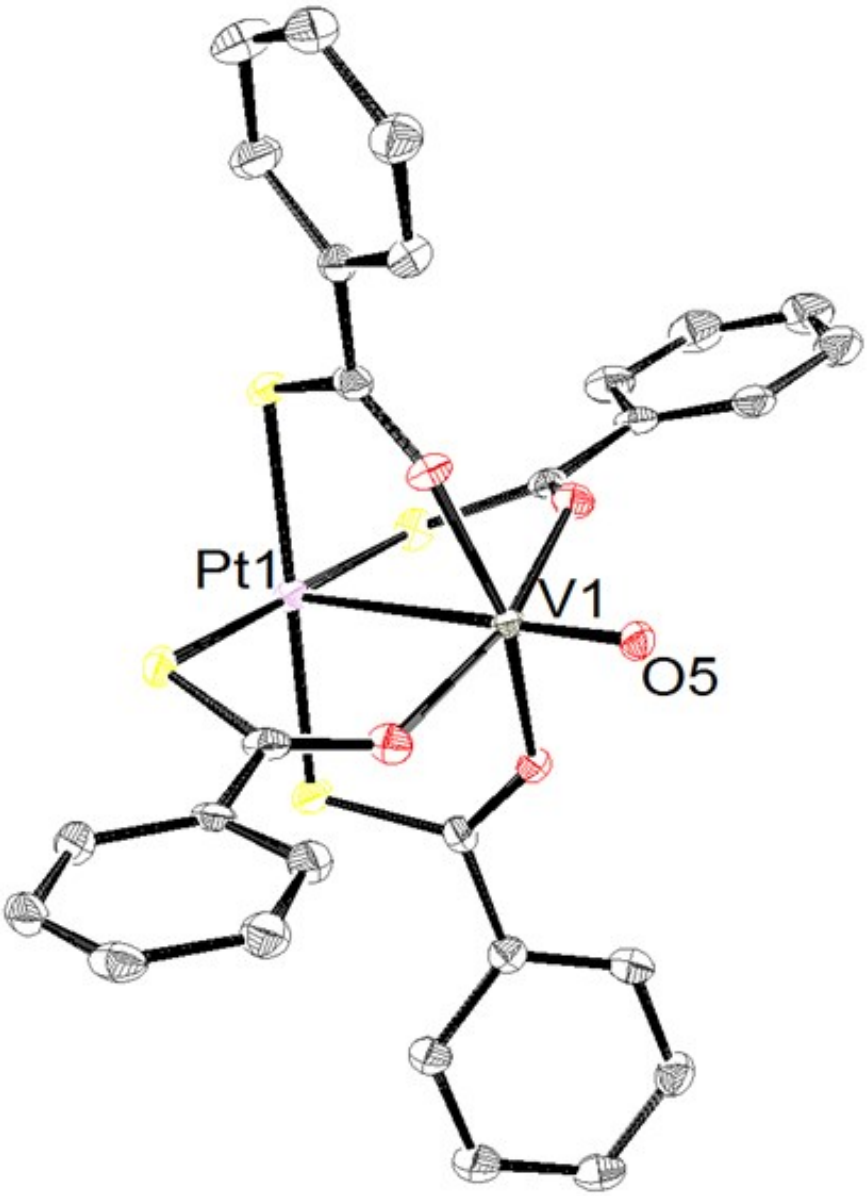


Figure S2: ORTEP of **2**. Hydrogen atoms and one equivalent of CH_2Cl_2 are omitted for clarity, and ellipsoids are drawn at the 50% level.

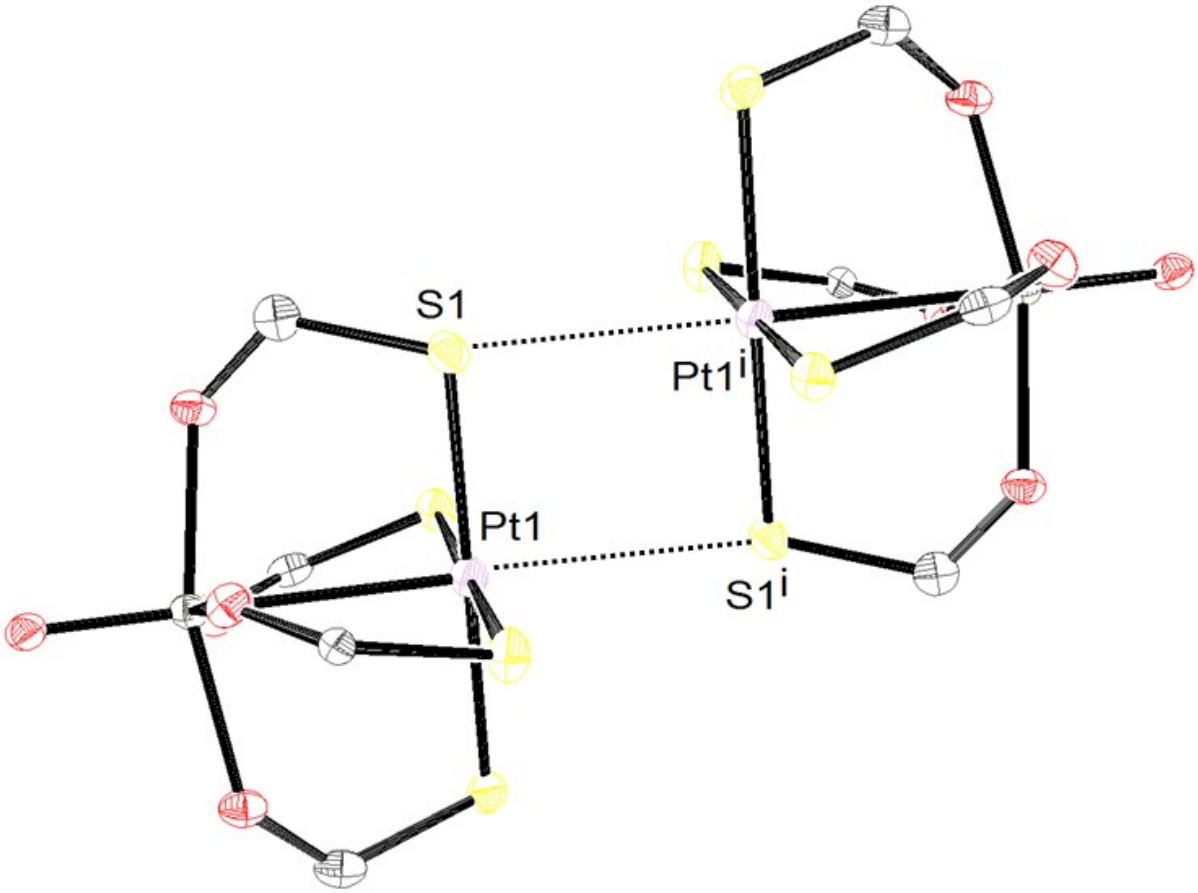
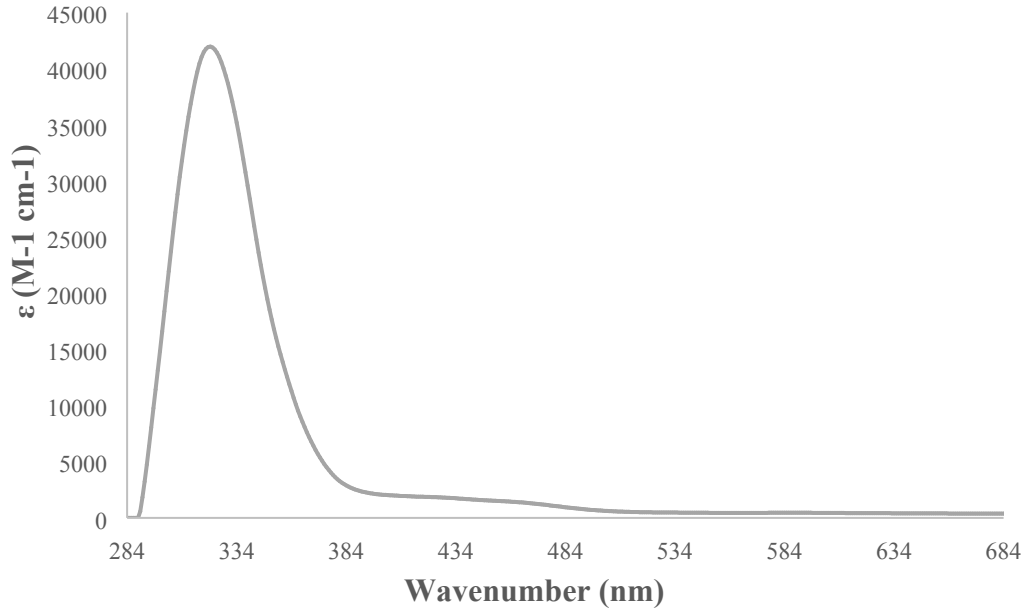


Figure S3: ORTEP displaying the inter-lantern contacts in **2**. Two equivalents of CH2Cl2 and the phenyl groups on the lanterns are omitted for clarity. The superscript i denotes atoms related by a C2 rotation.



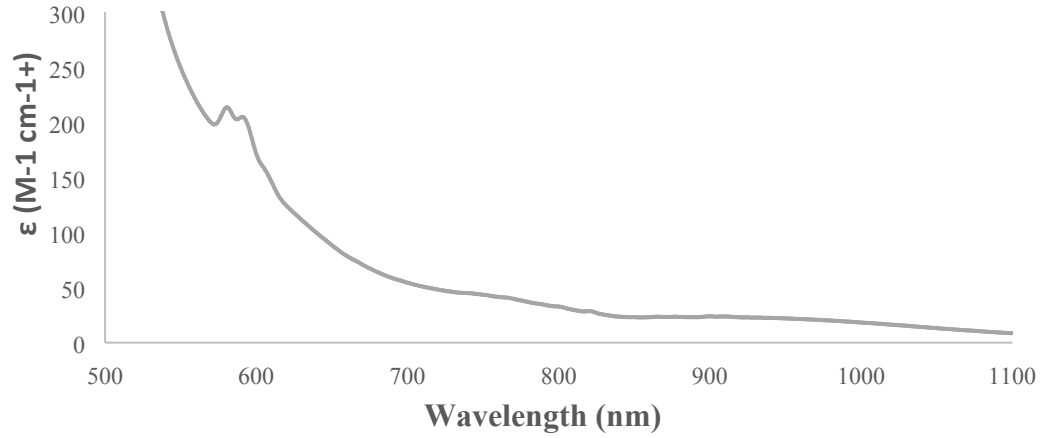


Figure S4: UV-vis spectrum of **4Nd**.

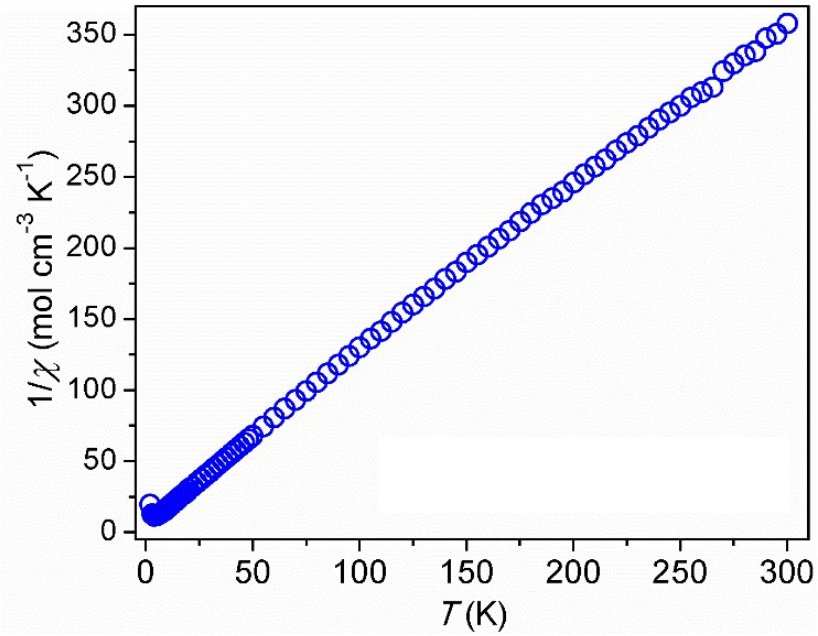


Figure S5: Temperature dependence of 1/ χ_{para} for **1**, collected at 1 kOe. Calculated Weiss constants (Θ) were determined using linear regression in several temperature ranges: -12.9 K (50-300 K), -17.1 K (100-300 K), -20.8 K (150-300 K), and -20.9 K (200-300 K).

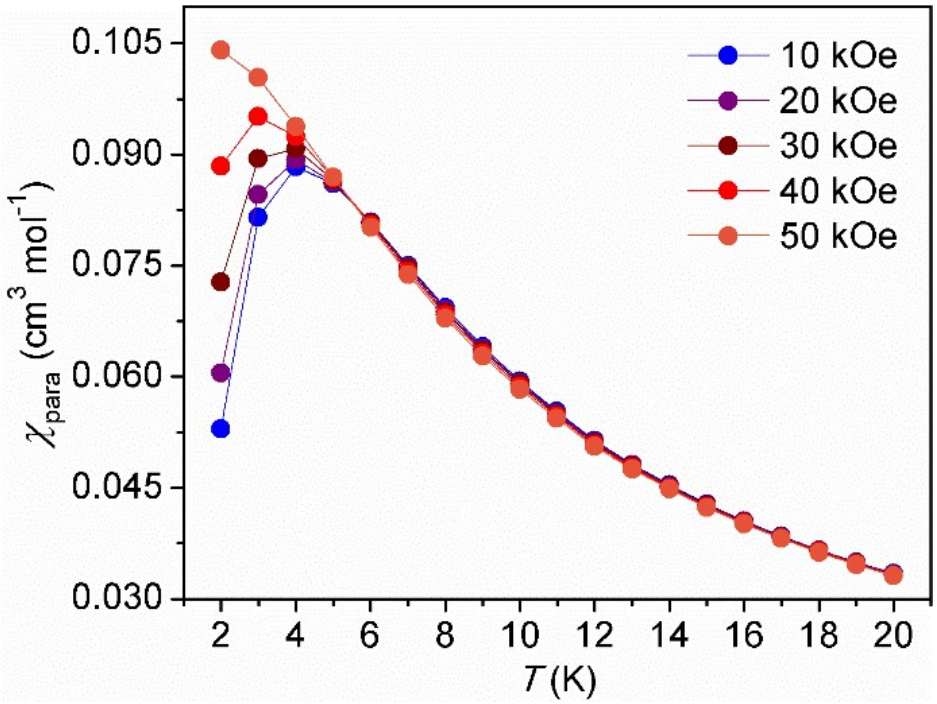


Figure S6: Low temperature dependence of molar magnetic susceptibility (χ_{para}) (2 - 20 K) of **1** collected at applied fields of 10 to 50 kOe. Lines are guides for the eye.

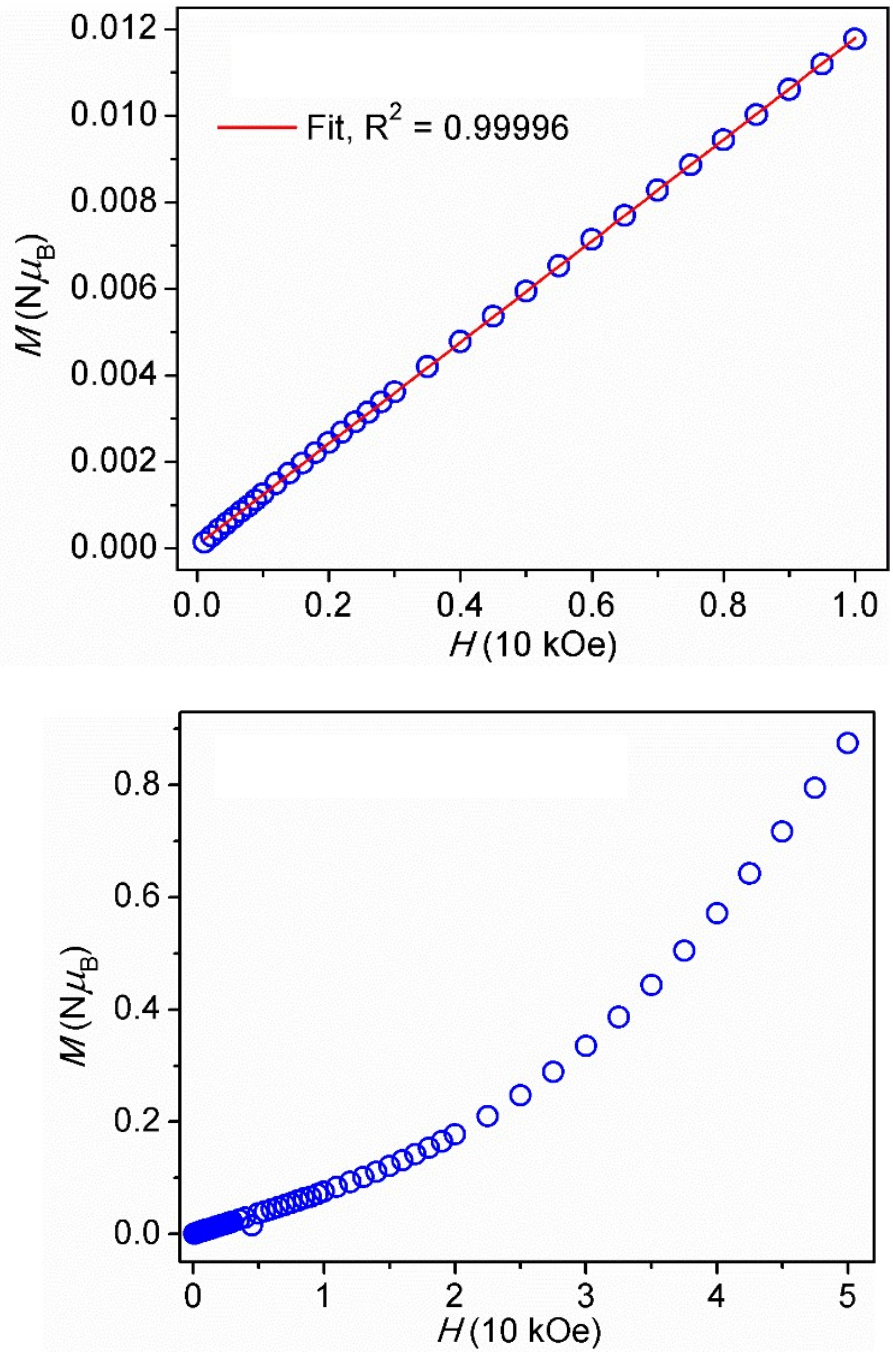


Figure S7: Top: Field dependence of magnetization at 100 K for **1**. Fit: y = 11.7×10^{-3}(x) + 7.67×10^{-5} (R^2 = 0.99996). Bottom: Field dependence of magnetization collected at 1.8 K for **1**.

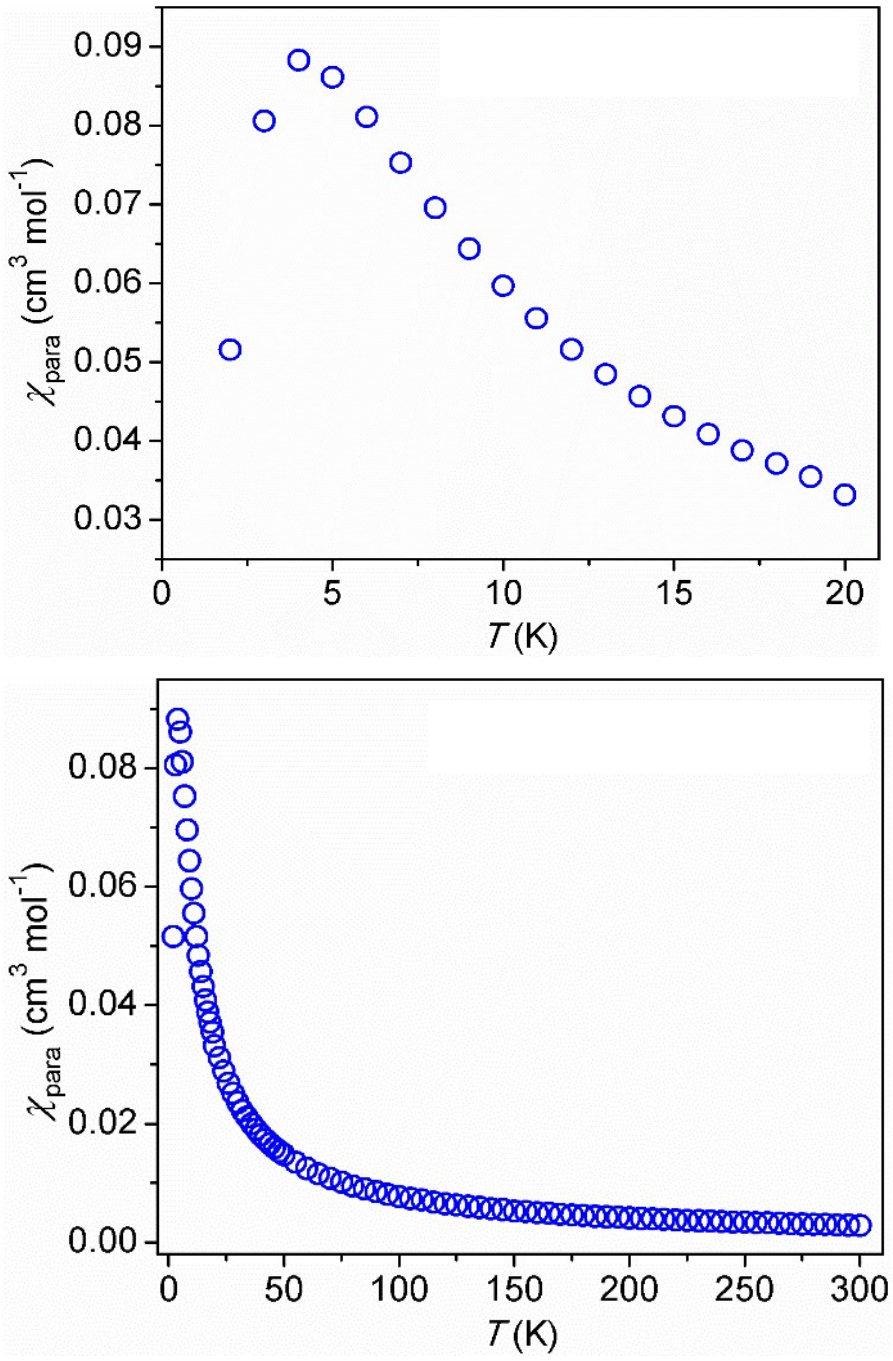


Figure S8: Temperature dependence of molar magnetic susceptibility (χ_{para}) for **1**, collected at 1 kOe.

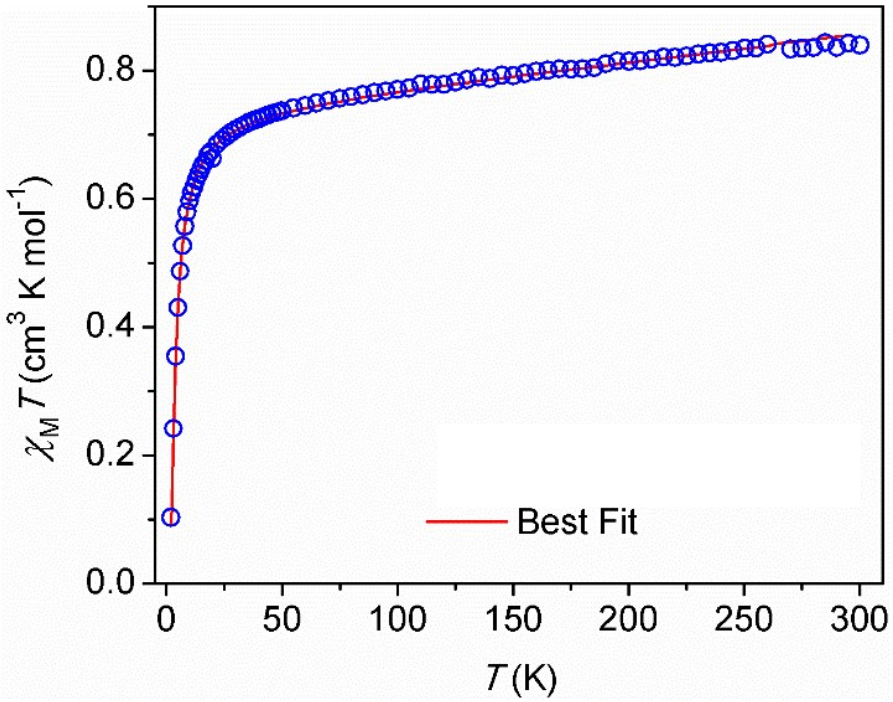


Figure S9: Temperature dependence on magnetic susceptibility – temperature product ($\chi_M T$) of **1** "dimer" collected at 1 kOe. The molar mass used assumes two PtV=O lantern units. The fit was calculated using PHI.

*A note on the magnetic data interpretation for **1**:*

The magnetic susceptibility data were fit to a model assuming exchange interactions between two S = ½ centers within the "dimer" lantern species. Magnetic susceptibility data were fit to various models using PHI, using the 2*J* formalism. The best fit gives an isotropic *g* = 1.98 and exchange coupling *J* = –2.35 cm-1, assuming TIP = 400 × 10^{-6} cm^3 mol^{-1}. The calculated *g* value agrees with other V(IV) compounds with similar coordination environments. The exchange coupling (*J*) suggests weak intramolecular antiferromagnetic coupling. The addition of a mean field approximation does not improve the fit, suggesting minimal additional intermolecular antiferromagnetic coupling. Related linear MPt···PtM complexes show antiferromagnetic coupling; however, a concern with this "dimer" interpretation is that there is not an obvious

orbital pathway by which intramolecular superexchange can operate: whether unpaired electrons are in local (V-based) d_{xy} or $d_{xz/yz}$ orbitals, the relative orientation of the vanadyl lanterns precludes orbital overlap that would lead to antiferromagnetic coupling. The fact that the compound crystallizes in a symmetry lower than tetragonal leaves some possibility for an orbital pathway for antiferromagnetic exchange coupling. More likely, any "dimer" behavior could be best rationalized by intermolecular coupling between V(IV) ions on adjacent complexes: the minimum such contact is less than 5 Å (Figure S1 bottom). We note that several next-nearest neighbor interactions are also possible and might compete.

Adding to (next-)nearest neighbor exchange coupling, the temperature dependence of susceptibility (χ_M) reveals an antiferromagnetic phase change, with a Néel temperature of 4 K (Figures S8). Curie-Weiss analysis of the temperature dependence of inverse susceptibility (Figure S5) gives a Weiss constant (Θ) ranging from -13 K to -21 K, depending on the chosen temperature range. That Θ is larger than the observed ordering temperature indicates competing interactions, as expected from the packing of complexes (Figure S1 bottom).

To further investigate these long-range interactions, we measured the temperature dependence of χ_{para} (2-20 K) at applied fields up to 50 kOe (Figure S6). Upon increasing the applied field, there is a shift in the Néel temperature to lower values. At 50 kOe, antiferromagnetic ordering occurs beyond the lowest temperature measured (2 K). The data are consistent with metamagnetic behavior where antiferromagnetic ordering is converted to paramagnetism via applied fields.

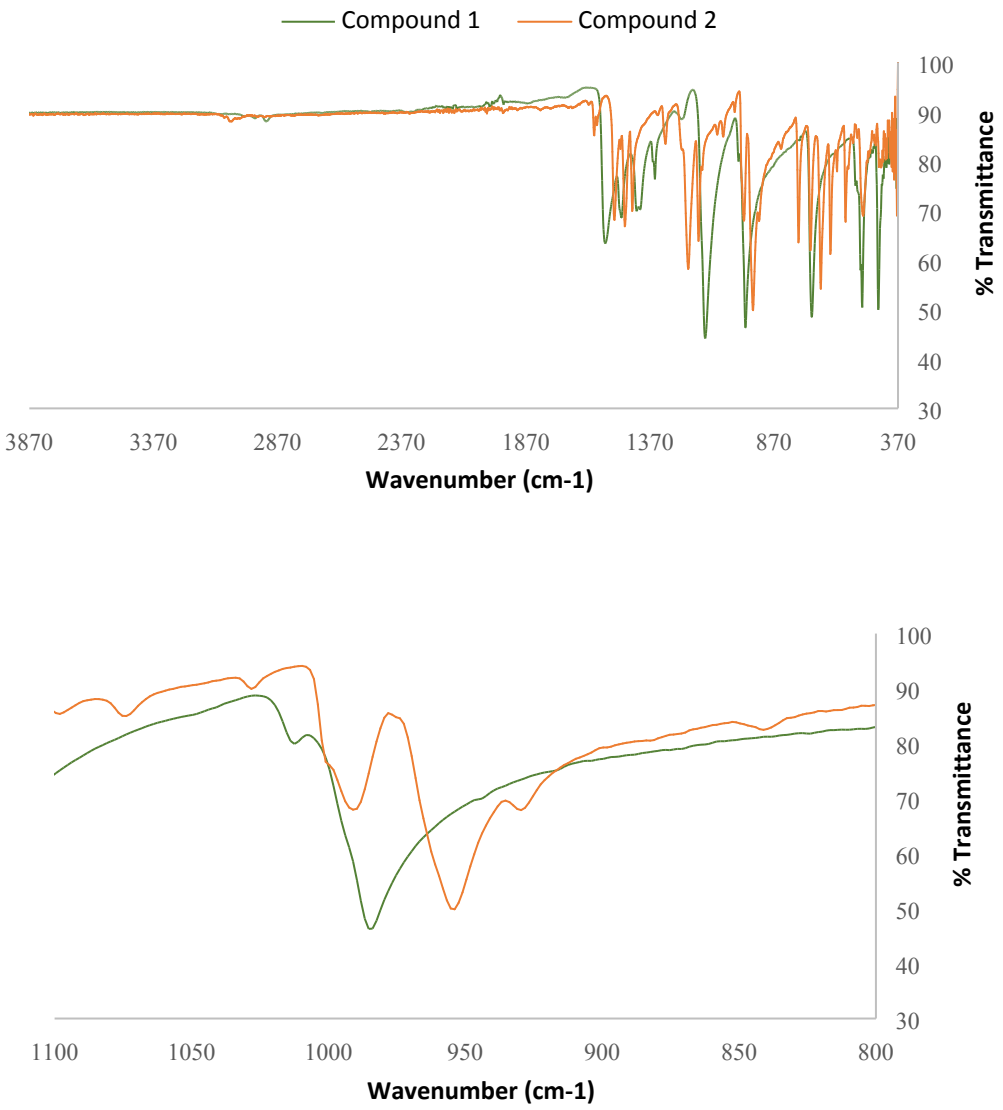


Figure S10: Top: IR spectra of **1** (green) and **2** (orange). Bottom: {V=O} stretch of **1** and **2**.

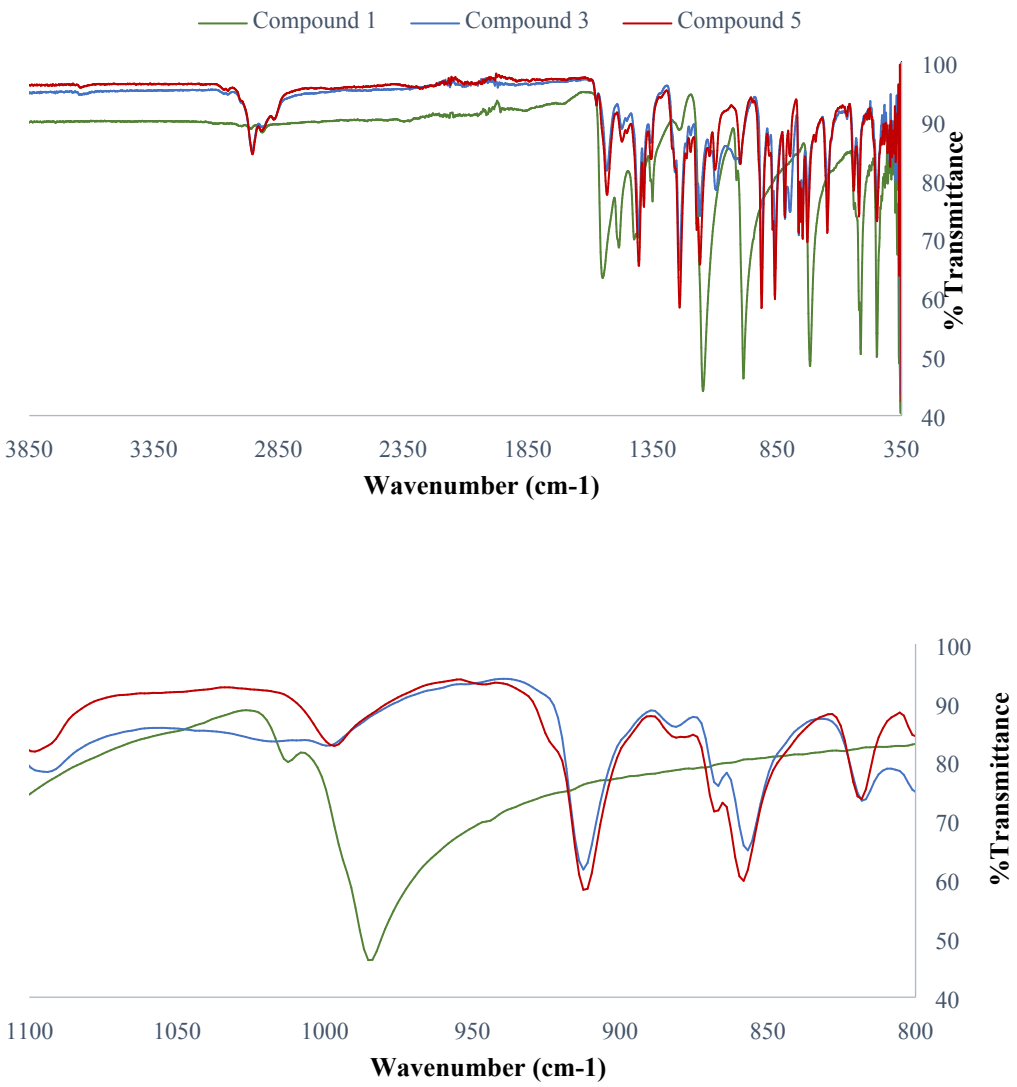


Figure S11: IR spectra comparison of **1** (green), **3Ce** (blue), and **3Nd** (red). Inset shows {V=O} stretching.

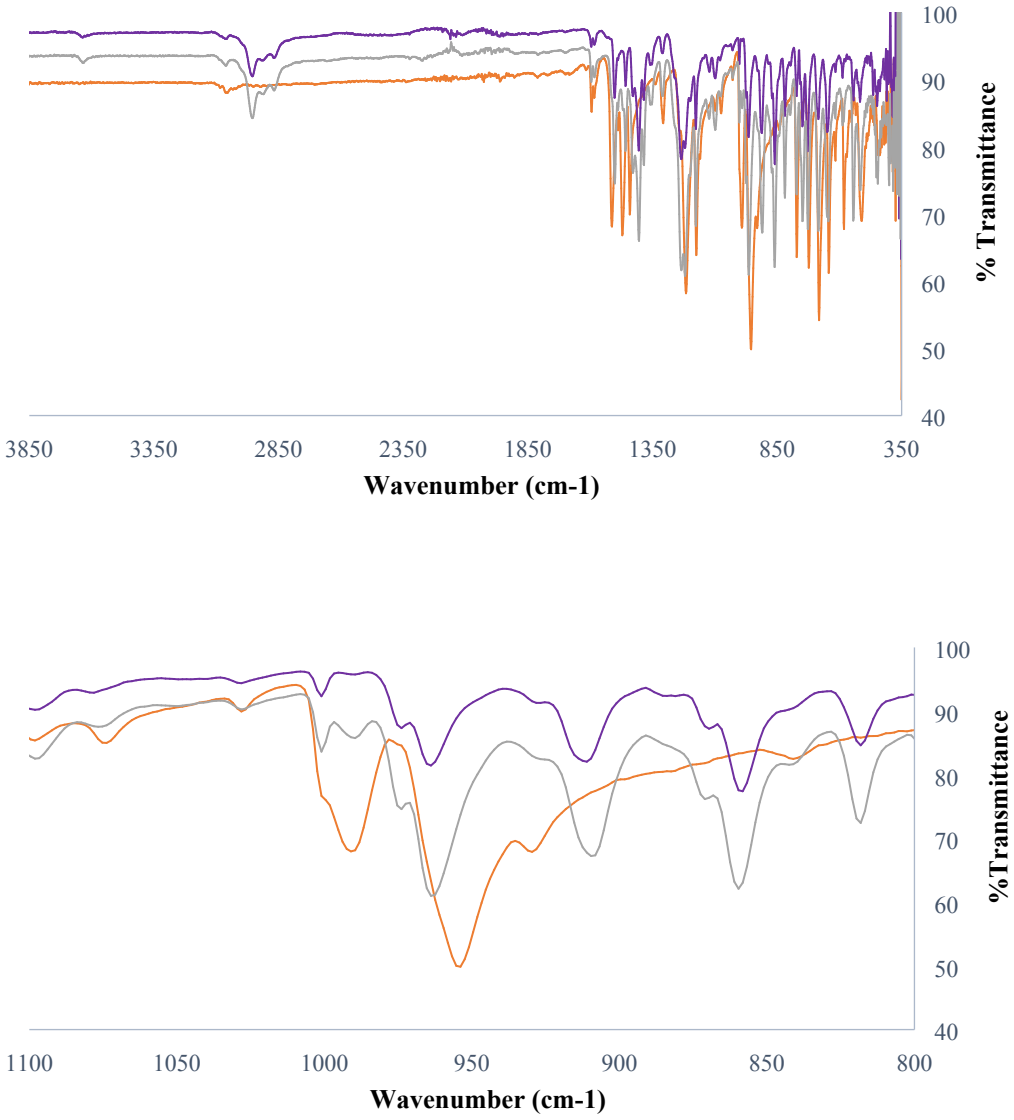


Figure S12: IR spectra comparison of **2** (orange), **4Ce** (purple), and **4Nd** (gray). Inset shows {V=O} stretching.

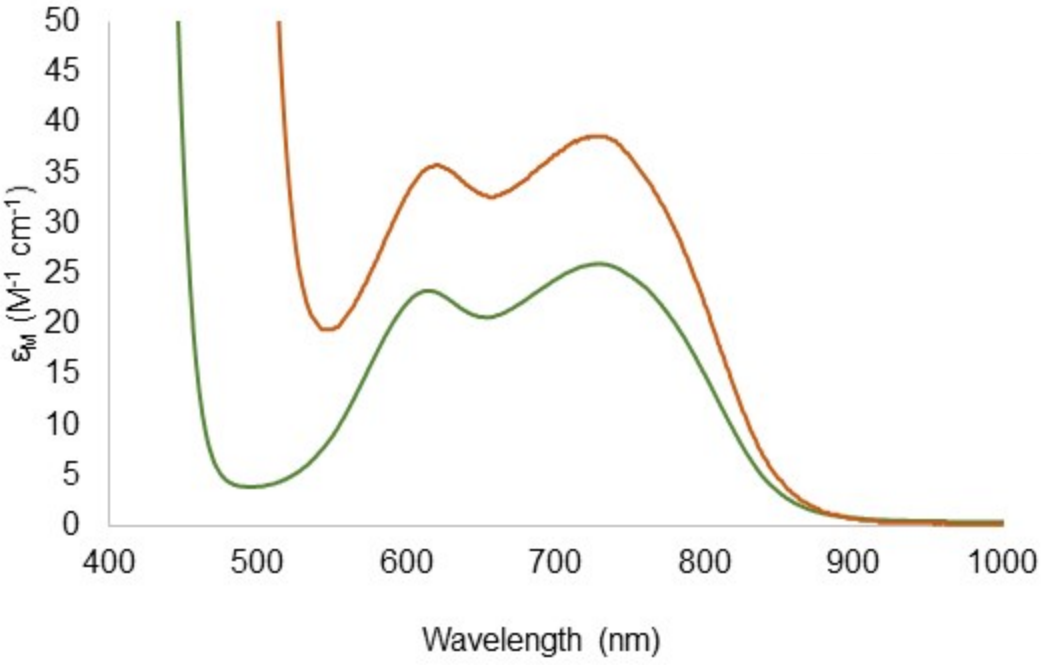


Figure S13: UV-vis spectra for the visible range of **1** (green) and **2** (orange) in $CHCl_3$.

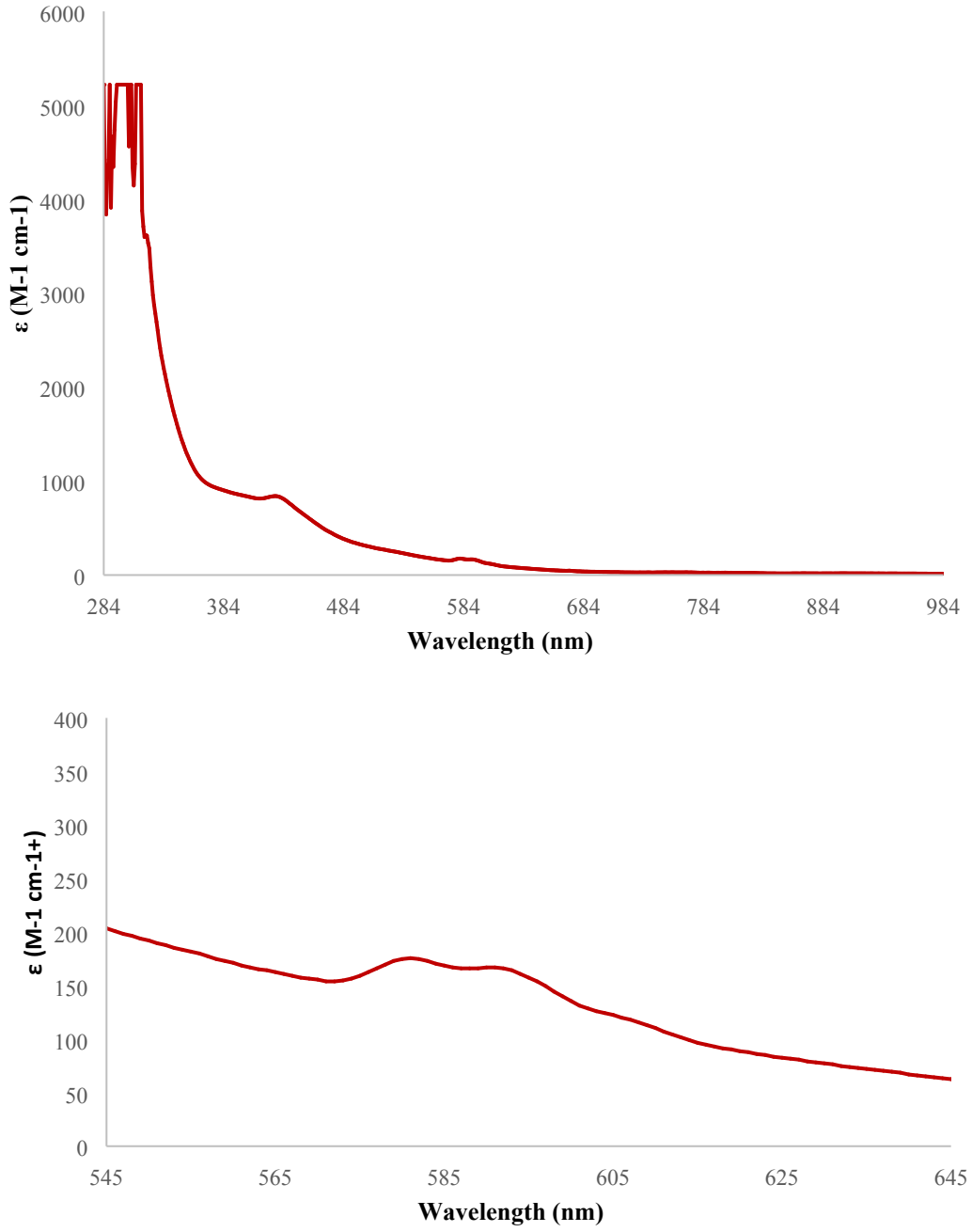
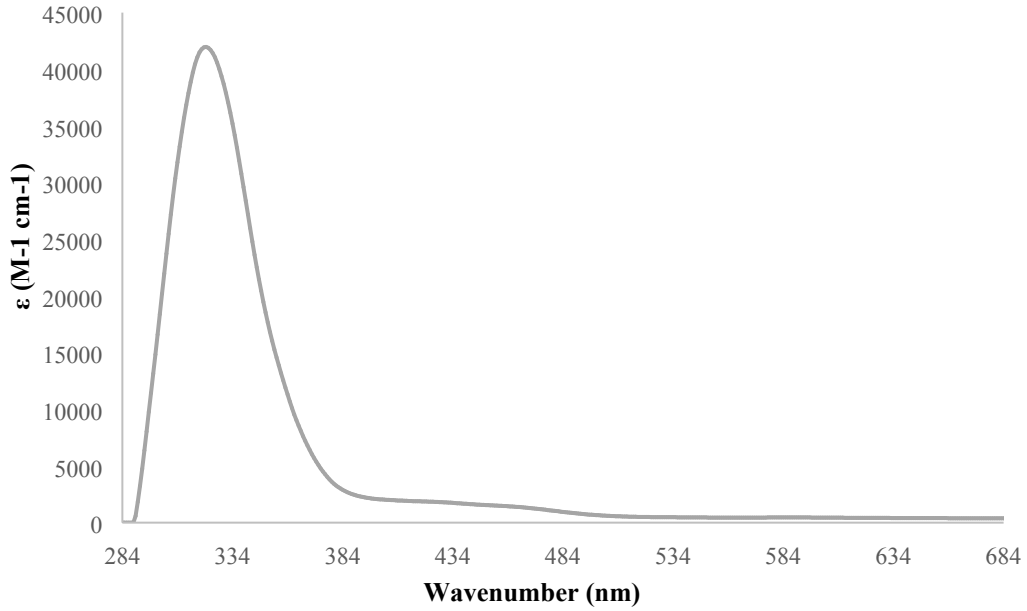


Figure S14: UV-vis spectrum of **3Nd** in toluene.



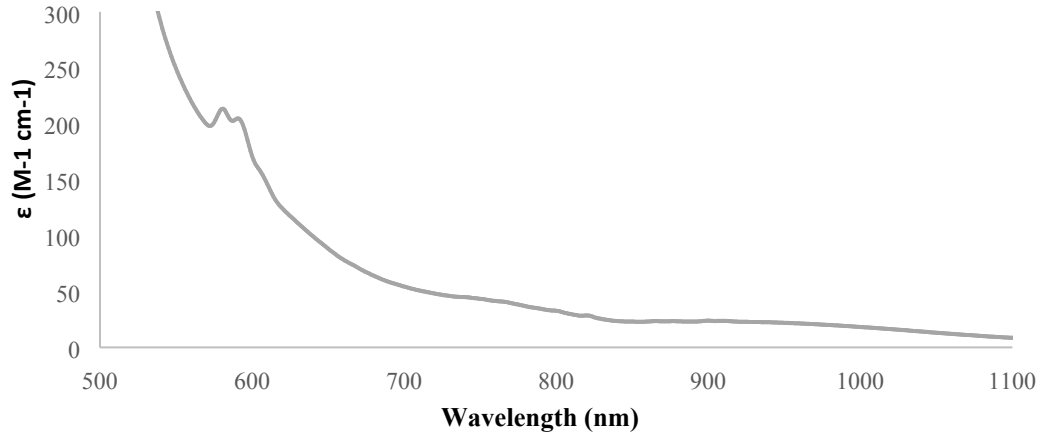


Figure S15: UV-vis spectrum of **4Nd** in toluene.

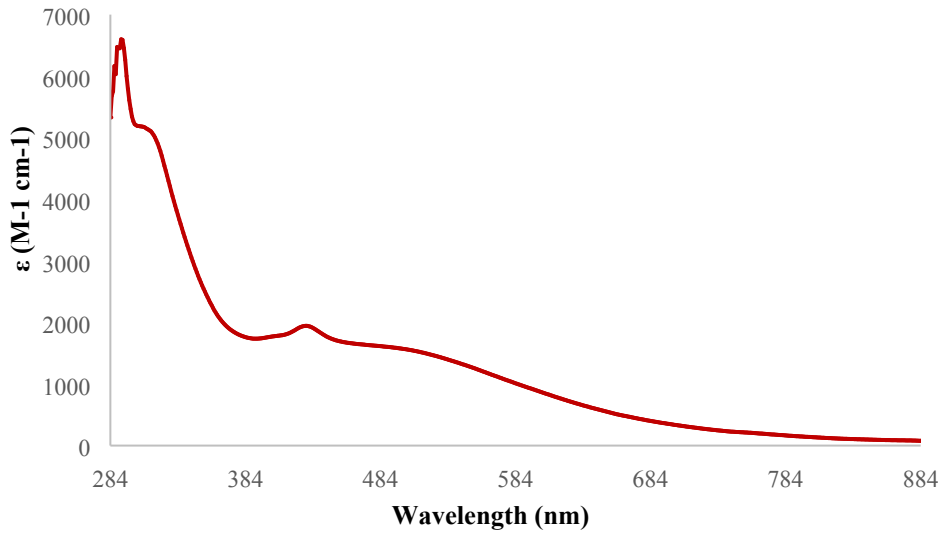


Figure S16: UV-vis spectrum of **3Ce** in toluene.

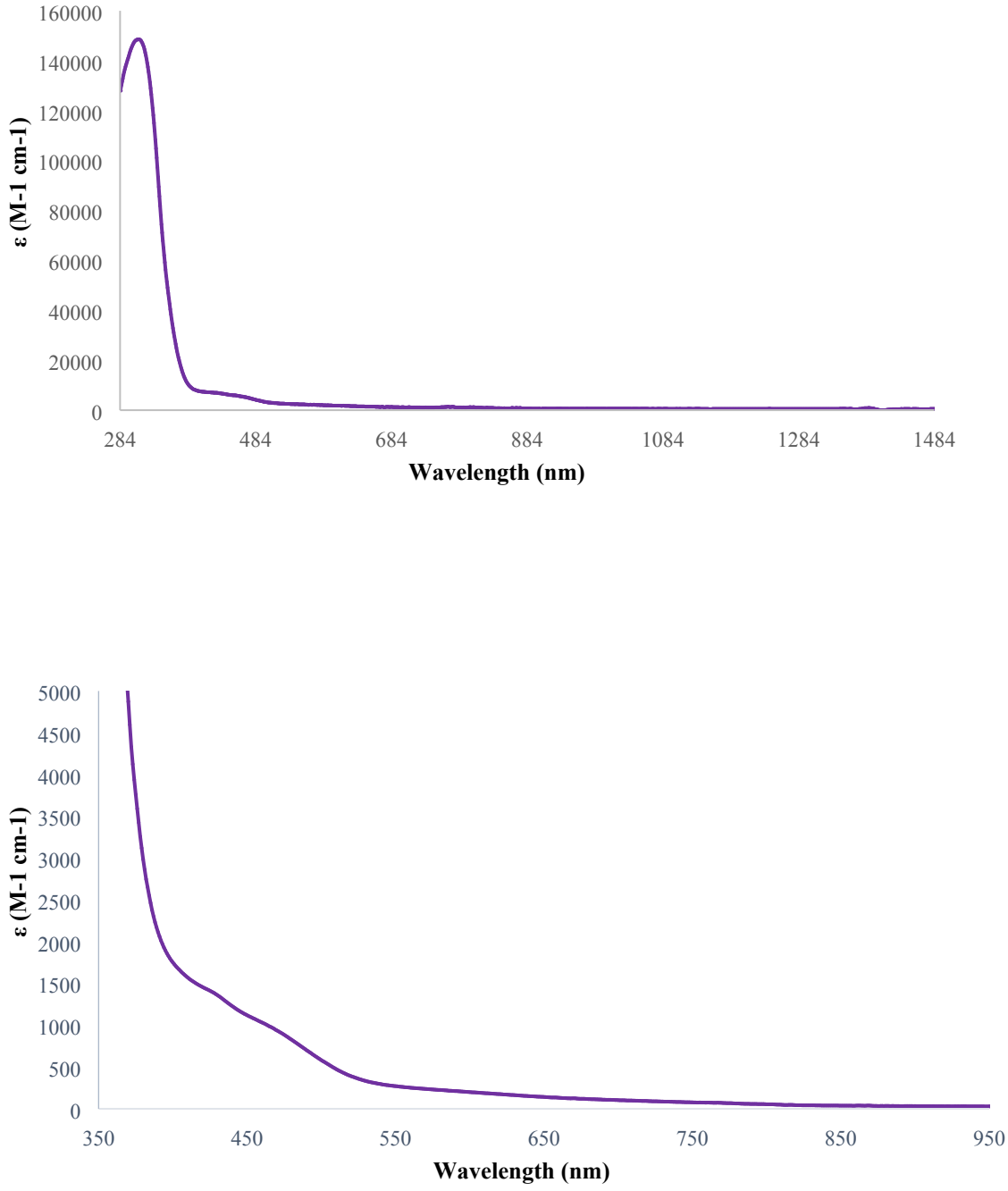


Figure S17: UV-vis spectrum of **4Ce** in toluene.

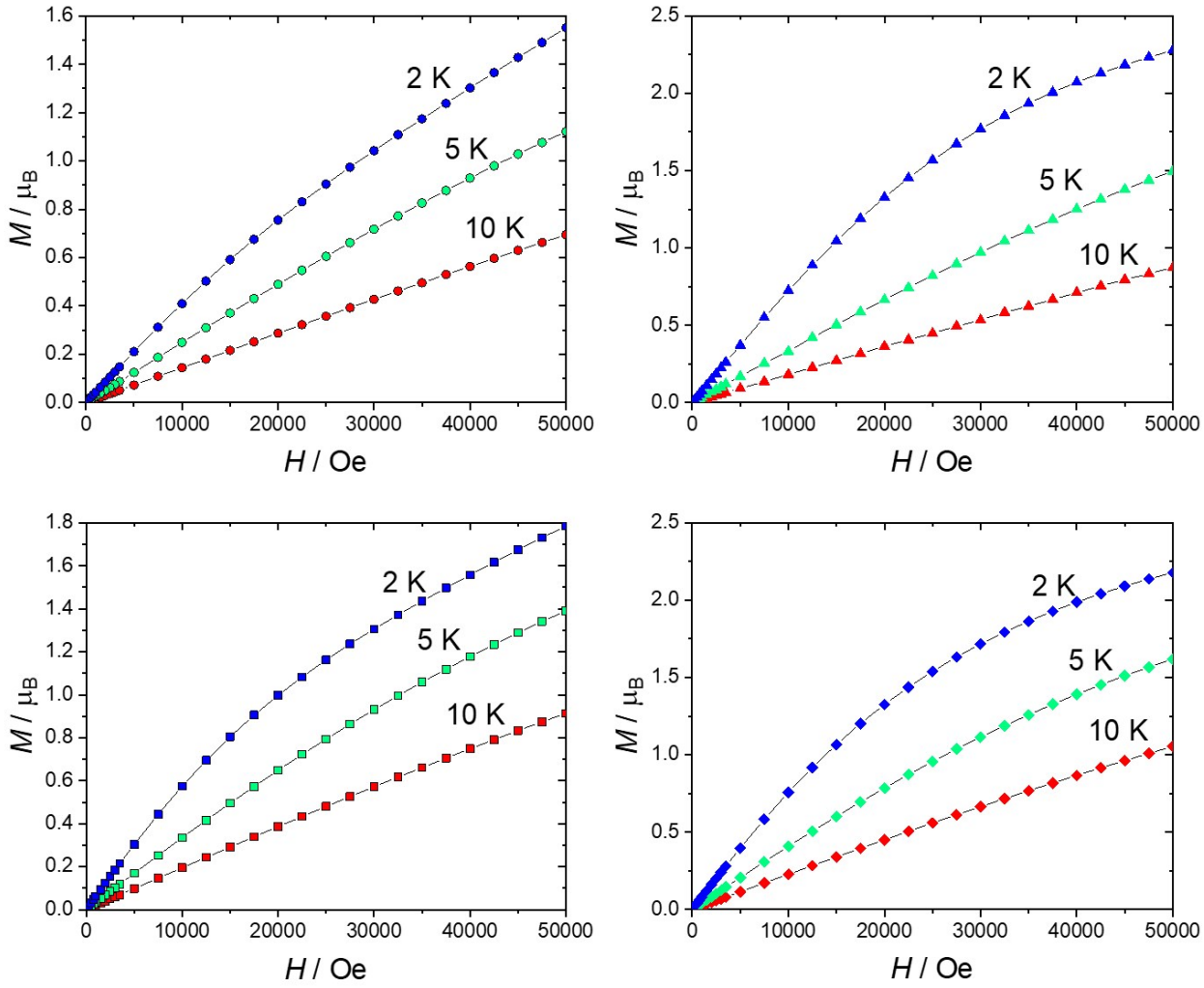


Figure S18: M vs H magnetization curves at T = 2K (blue), 5K (green), and 10K (red). Circles (**3Ce** – top left), triangles (**4Ce** – top right), squares (**3Nd** – bottom left), diamonds (**4Nd** – bottom right).

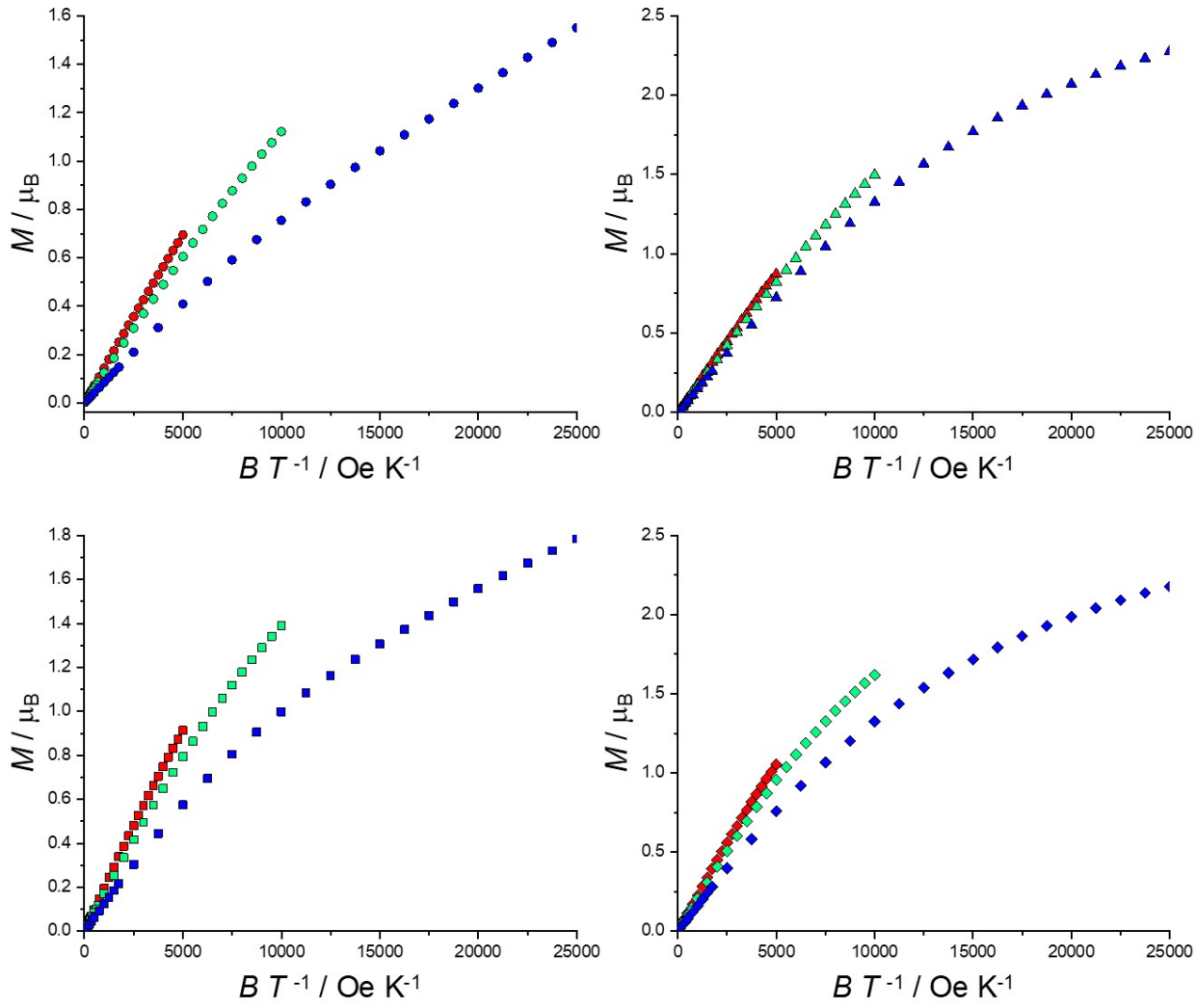


Figure S19: M vs B/T curves. at T = 2K (blue), 5K (green), and 10K (red). Circles (**3Ce** – top left), triangles (**4Ce** – top right), squares (**3Nd** – bottom left), diamonds (**4Nd** – bottom right).

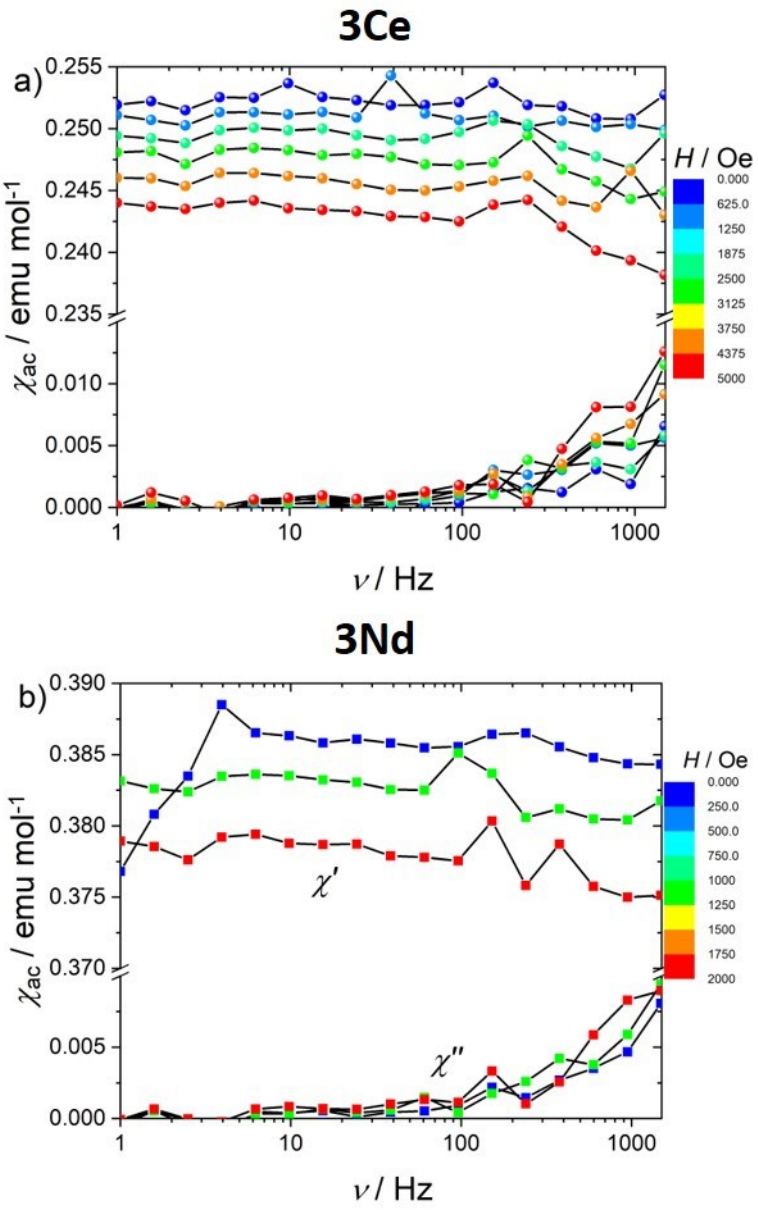


Figure S20: Alternating current (ac) susceptibility measurements at varying fields, T = 2K of **3Ce** (circles) and **3Nd** (squares).

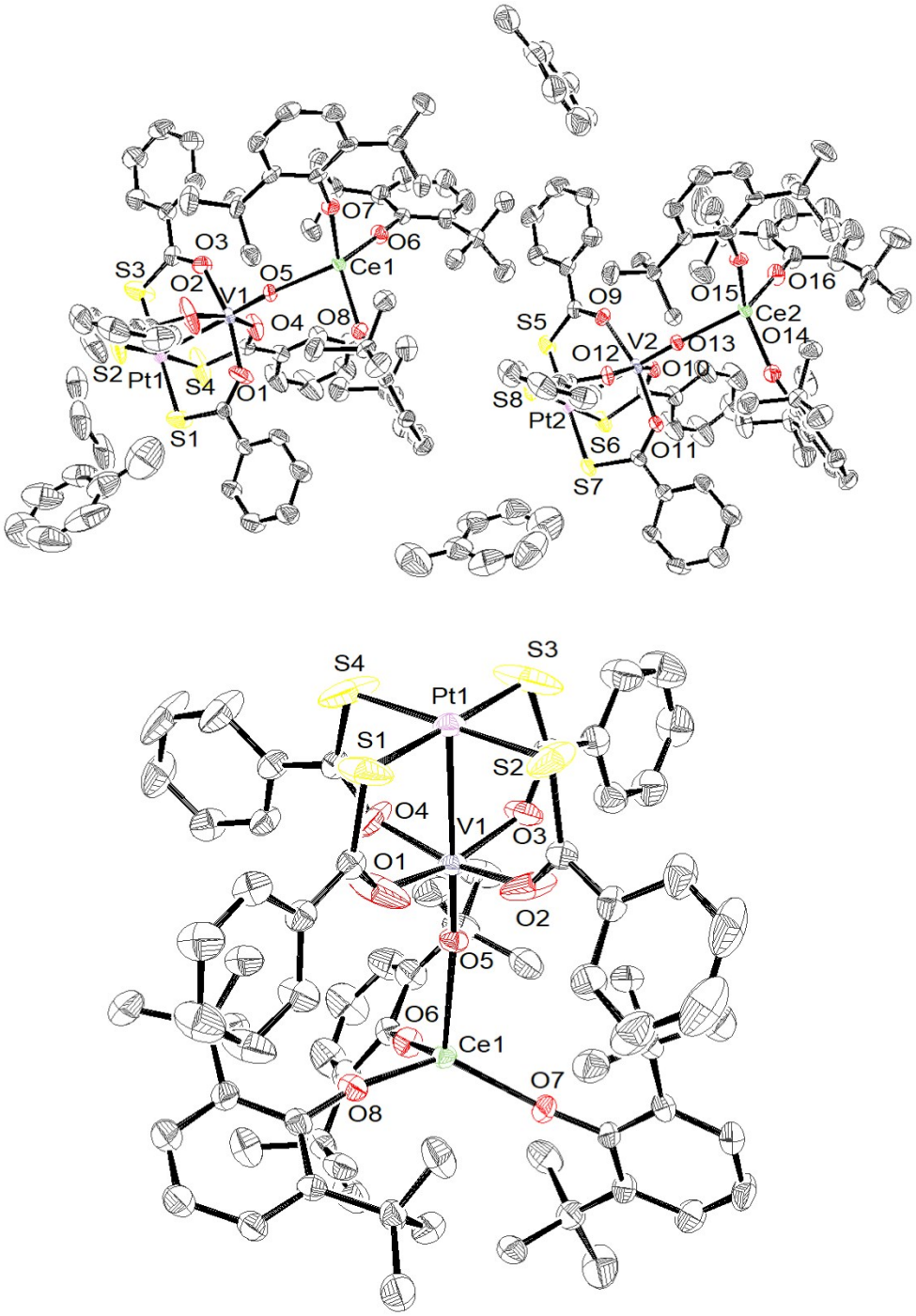


Figure S21: ORTEP of **4Ce**. Top: two independent molecules shown with lattice solvent, H atoms excluded for clarity, ellipsoids shown at the 50% level. Bottom: Molecule **4Cea** shown, H atoms and solvent molecules excluded for clarity, ellipsoids shown at the 50% level.

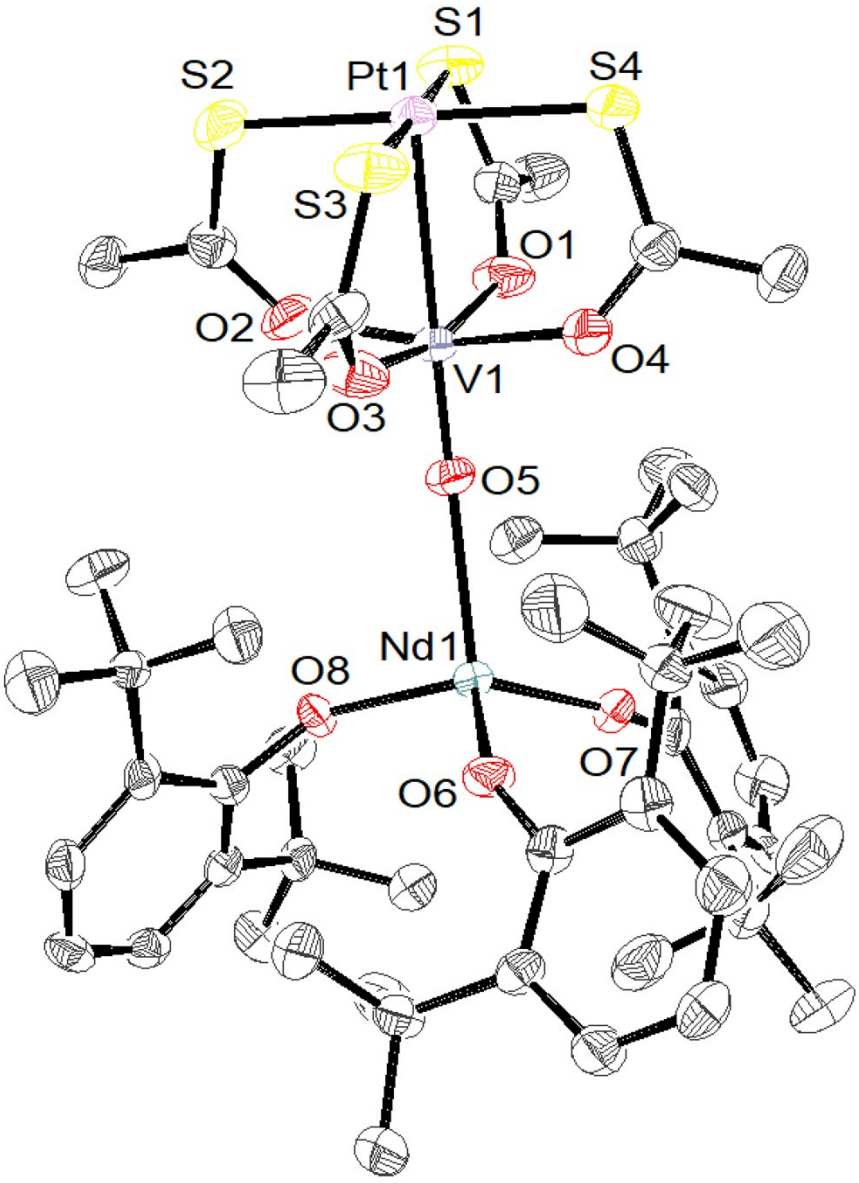


Figure S22: ORTEP of **3Nd**, H atoms excluded for clarity. Ellipsoids shown at the 50% level.

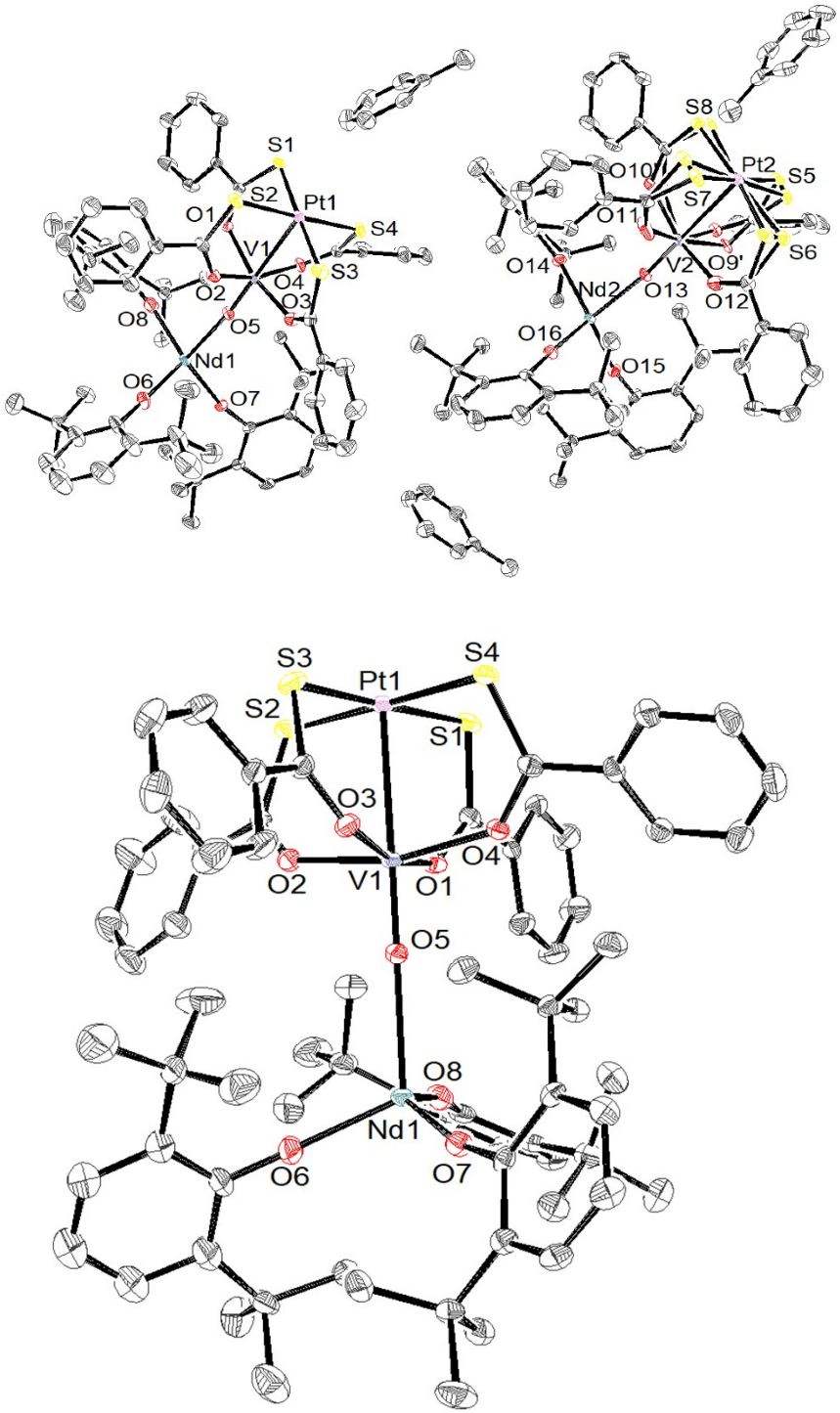


Figure S23: ORTEP of **4Nd**. Top: two independent molecules shown with lattice solvent, ellipsoids shown at the 50% level, hydrogen atoms excluded for clarity. Bottom: Molecule **4Nda** shown, hydrogen atoms and solvent molecules excluded for clarity, ellipsoids shown at the 50% level.

Table S1. Select interatomic distances (Å) and angles (°) for **1-2**

COMPOUND		**DISTANCE (Å)**		**ANGLE (°)**
1	Pt(1)-V(1)	2.8635(6)	V(1)-Pt(1)-S(1)	90.11(2)
	V(1)-O(1)	1.592(2)	V(1)-Pt(1)-Pt(1)	177.168(11)
	Pt(1)···Pt(1)	3.1747(4)	S(1)-Pt(1)-Pt(1)	90.30(2)
2	Pt(1)-V(1)	2.7823(10)	V(1)-Pt(1)-S(1)	89.31(4)
	V(1)-O(5)	1.581(4)	V(1)-Pt(1)-S(1)^{i}	176.24(3)
	Pt(1)···S(1)^{i}	3.1266(14)	V(1)-Pt(1)-Pt(1)^{i}	143.62(2)

Table S2. Summary of X-ray crystallographic data collection parameters for **1-4Nd**

Compound	*1*	*2·CH_2Cl_2*	*3Ce · 0.5HMDSO · toluene*	*4Ce · 2 toluene*	*3Nd*	*4Nd*
Formula	$C_8H_{12}O_5PtS_4V$	$C_{29}H_{22}O_5Cl_2PtS_4V$	$C_{60}H_{92}O_{8.5}SiPtS_4VCe$	$C_{84}H_{99}O_8PtS_4VCe$	$C_{50}H_{75}O_8PtS_4VNd$	$C_{80.5}H_{95}O_8PtS_4VNd$
Formula Weight	562.45	895.63	1490.36	1749.44	1319.25	1709.07
Crystal System	Monoclinic	Triclinic	Monoclinic	Triclinic	Orthorhombic	Triclinic
Space Group	*C2/c*	*P-1*	*P 2_1/n*	*P 1 bar*	*Pcba*	*P-1*
a, Å	27.225(2)	11.7092(11)	15.9088(2)	16.9219(3)	20.6526(5)	16.7686(12)
b, Å	8.3989(8)	11.7557(10)	23.5478(5)	22.5655(3)	21.3478(4)	22.4235(16)
c, Å	15.7502(15)	12.2506(11)	17.7553(2)	22.5881(3)	25.5068(6)	22.4927(17)
α, °	90	71.254(4)	90	81.4710(10)	90	81.3420(10)
β, °	122.160(3)	75.235(5)	93.8100(10)	83.2750(10)	90	72.858(2)
γ, °	90	88.198(4)	90	72.9520(10)	90	83.4340(10)
V, $Å^3$	3048.8(5)	1541.8(2)	6636.74	8130.33	11245.6	7967.7(10)
Z	8	2	4	4	8	4
ρ(calcd), g cm^{-3}	2.451	1.929	1.493	1.410	1.562	1.425
μ, mm^{-1}	10.336	15.359	3.108	2.533	3.750	2.664
Temp, K	100	100.0	293	293	293	100.0
R(F), %[a]	2.25	3.74	4.46	4.80	5.26	3.60
R(ωF²), %[b]	4.88	9.06	9.69	10.94	11.98	7.98

[a] $R = \sum||F_o| - |F_c||/\sum|F_o|$ [b] $R(\omega F^2) = \{\sum[\omega(F_o^2 - F_c^2)^2]\}/\{\sum[\omega(F_o^2)^2]\}^{1/2}$; $\omega = 1/[\sigma^2(F_o^2) + (aP)^2 + bP]$ with a and b given in CIF, $P = [2F_c^2 + \max(F_o,0)]/3$

Table S3: All non-hydrogen bond distances (Å) of **1**.

Atom 1	Atom 2	Distance
Pt(1)	Pt(1)#1	3.1747(4)
Pt(1)	V(1)	2.8635(6)
Pt(1)	S(1)	2.3249(9)
Pt(1)	S(3)	2.3236(8)
Pt(1)	S(2)	2.3190(8)
Pt(1)	S(4)	2.3239(8)
V(1)	O(3)	2.002(2)
V(1)	O(1)	1.992(2)
V(1)	O(2)	2.008(2)
V(1)	O(4)	2.003(2)
V(1)	O(5)	1.592(2)
S(1)	C(1)	1.700(4)
S(3)	C(5)	1.706(3)
S(2)	C(3)	1.701(3)
S(4)	C(7)	1.702(4)
O(3)	C(5)	1.253(4)
O(1)	C(1)	1.258(4)
O(2)	C(3)	1.257(4)
O(4)	C(7)	1.260(4)
C(1)	C(2)	1.499(5)
C(6)	C(5)	1.496(4)
C(4)	C(3)	1.500(4)
C(8)	C(7)	1.497(4)

Table S4: All non-hydrogen bond angles (°) of **1**.

Atom 1	Atom 2	Atom 3	Angle
V(1)	Pt(1)	Pt(1)#1	177.168(11)
S(1)	Pt(1)	Pt(1)#1	90.30(2)
S(1)	Pt(1)	V(1)	90.11(2)
S(3)	Pt(1)	Pt(1)#1	90.46(2)
S(3)	Pt(1)	V(1)	89.14(3)
S(3)	Pt(1)	S(1)	179.24(3)
S(3)	Pt(1)	S(4)	90.89(3)
S(2)	Pt(1)	Pt(1)#1	87.61(2)
S(2)	Pt(1)	V(1)	89.59(3)
S(2)	Pt(1)	S(1)	89.90(3)
S(2)	Pt(1)	S(3)	90.19(3)
S(2)	Pt(1)	S(4)	178.78(3)
S(4)	Pt(1)	Pt(1)#1	92.96(2)
S(4)	Pt(1)	V(1)	89.85(2)
S(4)	Pt(1)	S(1)	89.01(3)
O(3)	V(1)	Pt(1)	82.13(7)
O(3)	V(1)	O(2)	88.53(9)
O(3)	V(1)	O(4)	88.73(9)
O(1)	V(1)	Pt(1)	80.88(7)
O(1)	V(1)	O(3)	162.99(11)
O(1)	V(1)	O(2)	88.31(9)
O(1)	V(1)	O(4)	89.31(9)
O(2)	V(1)	Pt(1)	81.69(7)
O(4)	V(1)	Pt(1)	80.91(7)
O(4)	V(1)	O(2)	162.60(10)
O(5)	V(1)	Pt(1)	179.64(9)
O(5)	V(1)	O(3)	98.14(10)

O(5)	V(1)	O(1)	98.84(11)
O(5)	V(1)	O(2)	98.07(11)
O(5)	V(1)	O(4)	99.33(11)
C(1)	S(1)	Pt(1)	103.56(12)
C(5)	S(3)	Pt(1)	104.45(12)
C(3)	S(2)	Pt(1)	104.53(11)
C(7)	S(4)	Pt(1)	103.97(10)
C(5)	O(3)	V(1)	134.3(2)
C(1)	O(1)	V(1)	136.4(2)
C(3)	O(2)	V(1)	134.5(2)
C(7)	O(4)	V(1)	134.5(2)
O(1)	C(1)	S(1)	125.1(3)
O(1)	C(1)	C(2)	117.1(3)
C(2)	C(1)	S(1)	117.8(2)
O(4)	C(7)	S(4)	124.9(3)
O(4)	C(7)	C(8)	117.7(3)
C(8)	C(7)	S(4)	117.4(2)
O(3)	C(5)	S(3)	125.6(2)
O(3)	C(5)	C(6)	117.1(3)
C(6)	C(5)	S(3)	117.3(3)
O(2)	C(3)	S(2)	125.4(2)
O(2)	C(3)	C(4)	117.7(3)
C(4)	C(3)	S(2)	116.9(3)

Symmetry transformations used to generate equivalent atoms:

#1 -x+1,y,-z+3/2

Table S5: All non-hydrogen bond distances (Å) of **2**.

Atom 1	Atom 2	Distance
Pt(1)	V(1)	2.7823(10)
Pt(1)	S(3)	2.3247(14)
Pt(1)	S(1)	2.3203(14)
Pt(1)	S(1)#1	3.1266(14)
Pt(1)	S(2)	2.3228(13)
Pt(1)	S(4)	2.3220(13)
V(1)	O(4)	2.009(4)
V(1)	O(2)	2.019(4)
V(1)	O(3)	2.003(4)
V(1)	O(5)	1.581(4)
V(1)	O(1)	2.001(4)
S(3)	C(15)	1.710(6)
S(1)	C(1)	1.728(6)
S(2)	C(8)	1.722(6)
S(4)	C(22)	1.714(5)
Cl(2)	C(29)	1.751(9)
Cl(1)	C(29)	1.747(9)
O(4)	C(22)	1.259(7)
O(2)	C(8)	1.252(7)
O(3)	C(15)	1.266(7)
O(1)	C(1)	1.256(7)
C(23)	C(28)	1.386(8)
C(23)	C(24)	1.403(8)
C(23)	C(22)	1.484(8)
C(1)	C(2)	1.478(8)
C(16)	C(21)	1.398(8)
C(16)	C(17)	1.390(8)

C(16)	C(15)	1.485(8)
C(18)	C(17)	1.386(8)
C(18)	C(19)	1.376(9)
C(21)	C(20)	1.381(8)
C(28)	C(27)	1.383(8)
C(20)	C(19)	1.403(9)
C(9)	C(10)	1.386(8)
C(9)	C(14)	1.400(8)
C(9)	C(8)	1.489(7)
C(4)	C(3)	1.383(9)
C(4)	C(5)	1.362(10)
C(2)	C(7)	1.403(8)
C(2)	C(3)	1.393(9)
C(24)	C(25)	1.374(9)
C(26)	C(27)	1.380(9)
C(26)	C(25)	1.395(10)
C(11)	C(10)	1.395(8)
C(11)	C(12)	1.380(9)
C(13)	C(14)	1.394(9)
C(13)	C(12)	1.375(10)
C(7)	C(6)	1.398(9)
C(6)	C(5)	1.383(10)

Table S6: All non-hydrogen bond angles (°) of **2**.

Atom1	Atom2	Atom3	Angle
V(1)	Pt(1)	S(1)#1	176.24(3)
S(3)	Pt(1)	V(1)	90.24(4)
S(3)	Pt(1)	S(1)#1	88.82(4)
S(1)	Pt(1)	V(1)	89.31(4)
S(1)	Pt(1)	S(3)	179.51(5)
S(1)	Pt(1)	S(1)#1	91.61(4)
S(1)	Pt(1)	S(2)	90.49(5)
S(1)	Pt(1)	S(4)	90.03(5)
S(2)	Pt(1)	V(1)	89.86(4)
S(2)	Pt(1)	S(3)	89.31(5)
S(2)	Pt(1)	S(1)#1	86.49(4)
S(4)	Pt(1)	V(1)	90.67(4)
S(4)	Pt(1)	S(3)	90.18(5)
S(4)	Pt(1)	S(1)#1	92.97(4)
S(4)	Pt(1)	S(2)	179.26(5)
O(4)	V(1)	Pt(1)	81.49(11)
O(4)	V(1)	O(2)	163.29(16)
O(2)	V(1)	Pt(1)	81.89(11)
O(3)	V(1)	Pt(1)	81.43(12)
O(3)	V(1)	O(4)	87.87(16)
O(3)	V(1)	O(2)	87.94(16)
O(5)	V(1)	Pt(1)	179.79(16)
O(5)	V(1)	O(4)	98.52(18)
O(5)	V(1)	O(2)	98.09(18)
O(5)	V(1)	O(3)	98.36(18)
O(5)	V(1)	O(1)	98.19(18)
O(1)	V(1)	Pt(1)	82.01(11)

O(1)	V(1)	O(4)	90.92(16)
O(1)	V(1)	O(2)	88.50(16)
O(1)	V(1)	O(3)	163.39(17)
C(15)	S(3)	Pt(1)	103.0(2)
C(1)	S(1)	Pt(1)	103.7(2)
C(8)	S(2)	Pt(1)	103.02(19)
C(22)	S(4)	Pt(1)	102.79(19)
C(22)	O(4)	V(1)	132.6(4)
C(8)	O(2)	V(1)	133.8(4)
C(15)	O(3)	V(1)	133.2(4)
C(1)	O(1)	V(1)	133.6(4)
C(28)	C(23)	C(24)	119.4(5)
C(28)	C(23)	C(22)	119.0(5)
C(24)	C(23)	C(22)	121.5(5)
O(1)	C(1)	S(1)	122.5(4)
O(1)	C(1)	C(2)	118.3(5)
C(2)	C(1)	S(1)	119.1(4)
C(21)	C(16)	C(15)	117.5(5)
C(17)	C(16)	C(21)	120.1(5)
C(17)	C(16)	C(15)	122.4(5)
C(19)	C(18)	C(17)	121.7(6)
C(20)	C(21)	C(16)	120.2(6)
C(23)	C(28)	C(27)	119.7(5)
C(21)	C(20)	C(19)	119.8(6)
C(18)	C(17)	C(16)	118.9(6)
C(10)	C(9)	C(14)	119.6(5)
C(10)	C(9)	C(8)	118.5(5)
C(14)	C(9)	C(8)	121.9(5)
C(5)	C(4)	C(3)	120.1(7)

C(7)	C(2)	C(1)	122.5(6)
C(3)	C(2)	C(1)	117.7(5)
C(3)	C(2)	C(7)	119.8(5)
C(18)	C(19)	C(20)	119.2(5)
C(25)	C(24)	C(23)	120.2(6)
C(27)	C(26)	C(25)	119.2(6)
C(26)	C(27)	C(28)	121.1(6)
C(24)	C(25)	C(26)	120.3(6)
C(12)	C(11)	C(10)	120.4(6)
C(12)	C(13)	C(14)	120.0(6)
C(9)	C(10)	C(11)	119.7(6)
C(13)	C(14)	C(9)	120.0(6)
C(13)	C(12)	C(11)	120.4(6)
O(2)	C(8)	S(2)	123.6(4)
O(2)	C(8)	C(9)	117.5(5)
C(9)	C(8)	S(2)	118.9(4)
O(4)	C(22)	S(4)	124.2(4)
O(4)	C(22)	C(23)	117.4(5)
C(23)	C(22)	S(4)	118.3(4)
C(6)	C(7)	C(2)	118.9(6)
C(4)	C(3)	C(2)	120.2(6)
C(5)	C(6)	C(7)	119.9(6)
C(4)	C(5)	C(6)	121.1(6)
Cl(1)	C(29)	Cl(2)	113.0(5)
O(3)	C(15)	S(3)	123.6(4)
O(3)	C(15)	C(16)	117.3(5)
C(16)	C(15)	S(3)	119.1(4)

Symmetry transformations used to generate equivalent atoms:

#1 -x+1,-y+1,-z+1

Table S7: All non-hydrogen bond distances (Å) of **3Ce**.

Atom1	Atom2	Length
Pt1	V1	2.768(1)
Pt1	S1	2.296(2)
Pt1	S4	2.311(2)
Pt1	S3	2.296(3)
Pt1	S2	2.297(3)
Ce1	O7	2.220(4)
Ce1	O5	2.455(4)
Ce1	O8	2.205(4)
Ce1	O6	2.182(4)
V1	O5	1.630(3)
V1	O4	1.990(5)
V1	O1	1.972(4)
V1	O2	1.978(5)
V1	O3	2.001(4)
S1	C1	1.683(7)
S4	C7	1.689(7)
S3	C5	1.688(8)
S2	C3	1.675(8)
O7	C23	1.341(6)
O8	C37	1.359(7)
O4	C7	1.231(8)
O1	C1	1.240(7)
O2	C3	1.244(9)
O3	C5	1.232(9)
O6	C9	1.345(6)
C28	C23	1.424(9)
C28	C33	1.53(1)

C28	C27	1.391(8)
C23	C24	1.432(9)
C31	C29	1.53(1)
C7	C8	1.49(1)
C1	C2	1.490(9)
C26	C27	1.380(9)
C26	C25	1.366(9)
C42	C41	1.39(1)
C42	C37	1.423(9)
C42	C47	1.54(1)
C33	C36	1.47(1)
C33	C34	1.53(1)
C33	C35	1.53(1)
C41	C40	1.36(1)
C29	C24	1.524(9)
C29	C32	1.545(9)
C29	C30	1.55(1)
C24	C25	1.387(8)
C39	C38	1.39(1)
C39	C40	1.37(1)
C37	C38	1.42(1)
C38	C43	1.52(1)
C3	C4	1.51(1)
C5	C6	1.51(1)
C50	C47	1.55(1)
C47	C49	1.53(1)
C47	C48	1.55(1)
C18	C15	1.53(2)
C43	C45	1.53(1)

C43	C44	1.53(1)
C43	C46	1.53(1)
C14	C9	1.389(7)
C14	C13	1.391(7)
C14	C19	1.57(2)
C9	C10	1.39(1)
C10	C11	1.391(7)
C10	C15	1.54(1)
C11	C12	1.389(7)
C12	C13	1.39(1)
C21	C19	1.49(2)
C22	C19	1.56(1)
C19	C20	1.55(1)
C15	C16	1.48(2)
C15	C17	1.57(2)
C54	C55	1.39(1)
C54	C59	1.39(1)
C54	C60	1.45(1)
C55	C56	1.39(1)
C56	C57	1.39(1)
C57	C58	1.39(1)
C58	C59	1.39(1)
Si1	C51	1.71(2)
Si1	C52	1.96(5)
Si1	C53	1.77(3)
Si1	O9	1.62(2)
Si1	O9	1.95(3)
O9	Si1	1.95(3)
O9	O9	1.59(5)

Si1	C51	1.71(2)
Si1	C52	1.96(5)
Si1	C53	1.77(3)
Si1	O9	1.62(2)

Table S8: All non-hydrogen bond angles (°) of **3Ce**.

Atom1	Atom2	Atom3	Angle
V1	Pt1	S1	91.03(5)
V1	Pt1	S4	90.73(6)
V1	Pt1	S3	90.48(7)
V1	Pt1	S2	89.79(7)
S1	Pt1	S4	88.99(8)
S1	Pt1	S3	177.82(9)
S1	Pt1	S2	89.29(9)
S4	Pt1	S3	89.43(9)
S4	Pt1	S2	178.21(9)
S3	Pt1	S2	92.3(1)
O7	Ce1	O5	101.8(1)
O7	Ce1	O8	109.9(1)
O7	Ce1	O6	129.7(2)
O5	Ce1	O8	114.8(1)
O5	Ce1	O6	86.9(2)
O8	Ce1	O6	110.6(2)
Pt1	V1	O5	178.6(1)
Pt1	V1	O4	83.1(1)
Pt1	V1	O1	82.8(1)
Pt1	V1	O2	84.4(1)
Pt1	V1	O3	83.7(1)
O5	V1	O4	95.6(2)
O5	V1	O1	97.6(2)
O5	V1	O2	96.9(2)
O5	V1	O3	95.9(2)
O4	V1	O1	88.9(2)
O4	V1	O2	167.5(2)

O4	V1	O3	89.5(2)
O1	V1	O2	89.6(2)
O1	V1	O3	166.5(2)
O2	V1	O3	89.1(2)
Pt1	S1	C1	104.5(2)
Pt1	S4	C7	104.7(2)
Pt1	S3	C5	105.2(3)
Pt1	S2	C3	106.0(3)
Ce1	O7	C23	163.4(3)
Ce1	O5	V1	163.7(2)
Ce1	O8	C37	168.8(4)
V1	O4	C7	136.4(4)
V1	O1	C1	136.7(4)
V1	O2	C3	134.9(5)
V1	O3	C5	134.7(5)
Ce1	O6	C9	173.3(4)
C23	C28	C33	122.7(6)
C23	C28	C27	118.1(6)
C33	C28	C27	118.9(6)
O7	C23	C28	120.9(5)
O7	C23	C24	119.7(5)
C28	C23	C24	119.3(5)
S4	C7	O4	124.3(5)
S4	C7	C8	118.3(5)
O4	C7	C8	117.4(6)
S1	C1	O1	124.3(5)
S1	C1	C2	117.7(5)
O1	C1	C2	118.0(6)
C27	C26	C25	120.0(6)

C41	C42	C37	117.9(6)
C41	C42	C47	118.8(6)
C37	C42	C47	123.1(6)
C28	C33	C36	114.5(7)
C28	C33	C34	106.8(6)
C28	C33	C35	111.0(7)
C36	C33	C34	111.3(7)
C36	C33	C35	109.4(7)
C34	C33	C35	103.3(7)
C42	C41	C40	122.4(7)
C31	C29	C24	111.9(5)
C31	C29	C32	110.8(5)
C31	C29	C30	106.1(5)
C24	C29	C32	108.5(5)
C24	C29	C30	112.4(5)
C32	C29	C30	107.0(5)
C28	C27	C26	121.9(6)
C23	C24	C29	121.9(5)
C23	C24	C25	118.7(5)
C29	C24	C25	119.3(5)
C26	C25	C24	121.6(5)
C38	C39	C40	122.4(7)
O8	C37	C42	119.4(5)
O8	C37	C38	120.3(5)
C42	C37	C38	120.3(6)
C39	C38	C37	117.5(6)
C39	C38	C43	119.2(6)
C37	C38	C43	123.3(6)
S2	C3	O2	124.5(6)

S2	C3	C4	118.8(6)
O2	C3	C4	116.7(7)
S3	C5	O3	125.0(6)
S3	C5	C6	116.9(6)
O3	C5	C6	118.1(7)
C41	C40	C39	119.5(7)
C42	C47	C50	109.2(6)
C42	C47	C49	113.0(6)
C42	C47	C48	112.9(6)
C50	C47	C49	110.3(6)
C50	C47	C48	105.2(6)
C49	C47	C48	105.9(7)
C38	C43	C45	109.0(7)
C38	C43	C44	109.9(7)
C38	C43	C46	113.7(7)
C45	C43	C44	112.2(8)
C45	C43	C46	106.8(8)
C44	C43	C46	105.2(8)
C9	C14	C13	120.0(5)
C9	C14	C19	121.9(6)
C13	C14	C19	117.8(6)
O6	C9	C14	122.6(5)
O6	C9	C10	117.3(5)
C14	C9	C10	120.0(5)
C9	C10	C11	120.0(5)
C9	C10	C15	123.0(6)
C11	C10	C15	116.9(6)
C10	C11	C12	120.0(5)
C14	C19	C21	109.2(8)

C14	C19	C22	111.4(9)
C14	C19	C20	110.1(9)
C21	C19	C22	108.2(9)
C21	C19	C20	112.9(9)
C22	C19	C20	105.0(9)
C18	C15	C10	112.5(9)
C18	C15	C16	107(1)
C18	C15	C17	108(1)
C10	C15	C16	116(1)
C10	C15	C17	109(1)
C16	C15	C17	104(1)
C55	C54	C59	120.1(7)
C55	C54	C60	121.5(7)
C59	C54	C60	118.4(7)
C54	C55	C56	119.9(7)
C55	C56	C57	120.1(8)
C56	C57	C58	119.9(8)
C57	C58	C59	120.1(8)
C54	C59	C58	119.9(8)
C51	Si1	C52	94(1)
C51	Si1	C53	114(1)
C51	Si1	O9	127(1)
C51	Si1	O9	99(1)
C52	Si1	C53	125(2)
C52	Si1	O9	87(2)
C52	Si1	O9	136(2)
C53	Si1	O9	108(2)
C53	Si1	O9	87(1)
O9	Si1	O9	52(1)

Si1	O9	Si1	128(2)
Si1	O9	O9	75(2)
Si1	O9	O9	53(2)
O9	Si1	C51	99(1)
O9	Si1	C52	136(2)
O9	Si1	C53	87(1)
O9	Si1	O9	52(1)
C51	Si1	C52	94(1)
C51	Si1	C53	114(1)
C51	Si1	O9	127(1)
C52	Si1	C53	125(2)
C52	Si1	O9	87(2)
C53	Si1	O9	108(2)
Si1	O9	O9	53(2)
Si1	O9	Si1	128(2)
O9	O9	Si1	75(2)

Table S9: All non-hydrogen bond distances (Å) of **4Ce**.

Atom 1	Atom 2	Length
Pt2	V2	2.7653(9)
Pt2	S7	2.329(2)
Pt2	S8	2.322(1)
Pt2	S5	2.313(2)
Pt2	S6	2.326(1)
Ce2	O13	2.531(3)
Ce2	O15	2.218(3)
Ce2	O14	2.212(4)
Ce2	O16	2.173(4)
V2	O9	1.983(4)
V2	O13	1.616(3)
V2	O12	1.985(3)
V2	O11	1.982(4)
V2	O10	1.996(3)
S7	C85	1.699(5)
S8	C92	1.714(4)
S5	C71	1.705(4)
S6	C78	1.709(5)
O9	C71	1.268(6)
O12	C92	1.265(5)
O11	C85	1.266(6)
O15	C113	1.352(5)
O10	C78	1.255(5)
O14	C99	1.347(7)
O16	C127	1.304(8)
C85	C86	1.480(8)
C113	C118	1.416(6)

C113	C114	1.431(6)
C71	C72	1.474(8)
C92	C93	1.473(8)
C86	C87	1.391(7)
C86	C91	1.389(8)
C121	C119	1.531(8)
C118	C123	1.550(8)
C118	C117	1.387(7)
C99	C100	1.42(1)
C99	C104	1.436(7)
C72	C77	1.39(1)
C72	C73	1.382(8)
C87	H87	0.93
C87	C88	1.38(1)
C114	C119	1.541(6)
C114	C115	1.401(6)
C100	C101	1.396(8)
C100	C105	1.522(7)
C93	C94	1.406(8)
C93	C98	1.38(1)
C78	C79	1.498(8)
C79	C84	1.371(9)
C79	C80	1.395(9)
C127	C132	1.44(1)
C127	C128	1.41(1)
C122	C119	1.54(1)
C101	C102	1.382(8)
C108	C105	1.54(1)
C123	C126	1.536(9)

C123	C125	1.54(1)
C123	C124	1.536(9)
C105	C106	1.54(1)
C105	C107	1.545(9)
C94	C95	1.39(1)
C119	C120	1.540(8)
C91	C90	1.38(1)
C137	C140	1.53(1)
C137	C132	1.51(1)
C137	C139	1.514(9)
C137	C138	1.559(9)
C88	C89	1.378(9)
C98	C97	1.392(9)
C84	C83	1.390(9)
C77	C76	1.38(1)
C104	C109	1.54(1)
C104	C103	1.39(1)
C73	C74	1.38(1)
C132	C131	1.41(1)
C109	C112	1.502(9)
C109	C111	1.49(1)
C109	C110	1.575(9)
C96	C95	1.36(1)
C96	C97	1.38(1)
C89	H89	0.93
C89	C90	1.38(1)
C103	C102	1.37(1)
C75	C76	1.368(9)
C75	C74	1.37(1)

C128	C133	1.53(1)
C128	C129	1.40(1)
C133	C136	1.50(1)
C133	C134	1.56(1)
C133	C135	1.52(2)
C82	C81	1.38(1)
C80	C81	1.38(1)
C131	C130	1.40(1)
C129	C130	1.39(1)
Pt1	V1	2.7878(9)
Pt1	S1	2.306(2)
Pt1	S2	2.303(2)
Pt1	S4	2.307(2)
Pt1	S3	2.301(3)
Ce1	O8	2.216(4)
Ce1	O7	2.212(3)
Ce1	O6	2.171(4)
Ce1	O5	2.525(3)
V1	O5	1.628(3)
V1	O3	1.972(4)
V1	O4	1.964(4)
V1	O2	1.954(4)
V1	O1	1.961(6)
S1	C1	1.671(5)
S2	C8	1.676(5)
S4	C22	1.682(5)
S3	C15	1.670(5)
O8	C57	1.345(7)
O7	C43	1.347(5)

O6	C29	1.356(7)
O3	C15	1.256(6)
O4	C22	1.242(5)
O2	C8	1.243(6)
O1	C1	1.237(7)
C57	C58	1.426(8)
C57	C62	1.428(7)
C58	C59	1.393(8)
C58	C63	1.544(6)
C15	C16	1.470(9)
C43	C44	1.411(8)
C43	C48	1.438(8)
C29	C34	1.425(8)
C29	C30	1.43(1)
C8	C9	1.479(8)
C22	C23	1.485(6)
C1	C2	1.476(9)
C2	C7	1.399(9)
C2	C3	1.395(8)
C59	C60	1.388(7)
C63	C65	1.54(1)
C63	C64	1.54(1)
C63	C66	1.546(9)
C23	C28	1.388(6)
C23	C24	1.392(8)
C9	C10	1.380(8)
C9	C14	1.390(9)
C16	C21	1.391(9)
C16	C17	1.39(1)

C34	C39	1.55(1)
C34	C33	1.39(1)
C44	C49	1.554(9)
C44	C45	1.387(7)
C55	C53	1.53(1)
C48	C47	1.406(7)
C48	C53	1.530(9)
C62	C67	1.54(1)
C62	C61	1.41(1)
C52	C49	1.516(8)
C49	C51	1.54(1)
C49	C50	1.536(9)
C7	C6	1.37(1)
C28	C27	1.374(8)
C45	C46	1.385(9)
C60	C61	1.39(1)
C3	C4	1.38(1)
C37	C35	1.54(1)
C35	C30	1.524(9)
C35	C36	1.547(8)
C35	C38	1.53(1)
C10	C11	1.37(1)
C67	C68	1.53(1)
C67	C69	1.522(9)
C67	C70	1.552(8)
C47	C46	1.367(9)
C21	C20	1.38(1)
C39	C40	1.54(1)
C39	C41	1.542(8)

C39	C42	1.536(9)
C30	C31	1.39(1)
C33	C32	1.36(1)
C27	C26	1.362(8)
C53	C54	1.55(1)
C53	C56	1.548(9)
C6	C5	1.373(9)
C19	C20	1.37(1)
C19	C18	1.365(9)
C4	C5	1.38(1)
C14	C13	1.38(1)
C26	C25	1.37(1)
C12	C11	1.37(1)
C12	C13	1.38(1)
C17	C18	1.40(1)
C24	C25	1.38(1)
C32	C31	1.38(1)
C156	C155	1.36(1)
C156	C157	1.39(1)
C160	C155	1.38(1)
C160	C159	1.37(1)
C155	C161	1.49(1)
C158	C157	1.35(1)
C158	C159	1.41(1)
C142	C143	1.34(1)
C142	C141	1.40(1)
C143	C144	1.46(2)
C141	C146	1.37(2)
C141	C147	1.43(1)

C146	C145	1.38(2)
C144	C145	1.32(2)
C149	C148	1.41(2)
C149	C150	1.35(2)
C152	C153	1.32(2)
C152	C151	1.37(2)
C148	C153	1.33(2)
C148	C154	1.50(2)
C150	C151	1.44(2)
C163	C164	1.36(2)
C163	C162	1.39(2)
C164	C162	1.42(1)
C162	C165	1.23(3)
C162	C164	1.42(1)
C163	C164	1.36(2)
C163	C162	1.39(2)
C162	C165	1.23(3)

Table S10: All non-hydrogen bond angles (°) of **4Ce**.

Atom 1	Atom 2	Atom 3	Angle
V2	Pt2	S7	90.20(4)
V2	Pt2	S8	90.56(4)
V2	Pt2	S5	90.47(4)
V2	Pt2	S6	90.58(4)
S7	Pt2	S8	88.55(5)
S7	Pt2	S5	179.33(6)
S7	Pt2	S6	89.54(5)
S8	Pt2	S5	91.42(5)
S8	Pt2	S6	177.78(6)
S5	Pt2	S6	90.48(5)
O13	Ce2	O15	114.3(1)
O13	Ce2	O14	88.0(1)
O13	Ce2	O16	115.3(1)
O15	Ce2	O14	131.3(1)
O15	Ce2	O16	99.4(1)
O14	Ce2	O16	109.4(1)
Pt2	V2	O9	81.9(1)
Pt2	V2	O13	179.4(1)
Pt2	V2	O12	81.6(1)
Pt2	V2	O11	82.3(1)
Pt2	V2	O10	82.1(1)
O9	V2	O13	97.5(2)
O9	V2	O12	91.3(1)
O9	V2	O11	164.1(2)
O9	V2	O10	89.9(1)
O13	V2	O12	98.6(2)
O13	V2	O11	98.3(2)

O13	V2	O10	97.7(2)
O12	V2	O11	85.4(1)
O12	V2	O10	163.3(1)
O11	V2	O10	88.9(1)
Pt2	S7	C85	103.5(2)
Pt2	S8	C92	101.9(2)
Pt2	S5	C71	103.3(2)
Pt2	S6	C78	102.9(2)
V2	O9	C71	134.4(3)
Ce2	O13	V2	175.8(2)
V2	O12	C92	135.5(3)
V2	O11	C85	134.0(3)
Ce2	O15	C113	168.0(3)
V2	O10	C78	132.9(3)
Ce2	O14	C99	167.7(3)
Ce2	O16	C127	173.7(4)
S7	C85	O11	123.4(4)
S7	C85	C86	119.6(4)
O11	C85	C86	117.0(4)
O15	C113	C118	121.0(4)
O15	C113	C114	119.4(4)
C118	C113	C114	119.6(4)
S5	C71	O9	123.2(4)
S5	C71	C72	119.0(4)
O9	C71	C72	117.8(4)
S8	C92	O12	123.3(4)
S8	C92	C93	118.9(4)
O12	C92	C93	117.8(4)
C85	C86	C87	122.6(4)

C85	C86	C91	118.5(5)
C87	C86	C91	118.8(5)
C113	C118	C123	121.6(5)
C113	C118	C117	118.1(5)
C123	C118	C117	120.3(5)
O14	C99	C100	119.4(5)
O14	C99	C104	120.1(5)
C100	C99	C104	120.5(5)
C71	C72	C77	122.8(5)
C71	C72	C73	119.0(5)
C77	C72	C73	118.1(6)
C86	C87	C88	120.3(5)
C113	C114	C119	121.1(4)
C113	C114	C115	118.4(5)
C119	C114	C115	120.5(5)
C99	C100	C101	118.2(5)
C99	C100	C105	121.5(5)
C101	C100	C105	120.3(5)
C92	C93	C94	121.8(5)
C92	C93	C98	118.9(5)
C94	C93	C98	119.3(6)
S6	C78	O10	124.1(4)
S6	C78	C79	118.2(4)
O10	C78	C79	117.7(5)
C78	C79	C84	119.2(6)
C78	C79	C80	122.0(6)
C84	C79	C80	118.5(7)
O16	C127	C132	119.6(6)
O16	C127	C128	119.3(6)

C132	C127	C128	120.7(7)
C100	C101	C102	121.6(6)
C118	C123	C126	110.4(5)
C118	C123	C125	110.6(5)
C118	C123	C124	112.2(5)
C126	C123	C125	109.9(5)
C126	C123	C124	106.0(5)
C125	C123	C124	107.5(5)
C100	C105	C108	111.1(5)
C100	C105	C106	113.1(5)
C100	C105	C107	108.7(5)
C108	C105	C106	106.5(5)
C108	C105	C107	111.4(5)
C106	C105	C107	105.9(5)
C93	C94	C95	119.4(6)
C121	C119	C114	110.5(4)
C121	C119	C122	112.2(5)
C121	C119	C120	106.1(5)
C114	C119	C122	109.4(5)
C114	C119	C120	112.4(5)
C122	C119	C120	106.2(5)
C86	C91	C90	121.1(6)
C140	C137	C132	117.4(6)
C140	C137	C139	108.4(6)
C140	C137	C138	105.2(6)
C132	C137	C139	111.1(6)
C132	C137	C138	107.8(6)
C139	C137	C138	106.3(6)
C87	C88	C89	120.1(6)

C118	C117	C116	122.7(6)
C114	C115	C116	122.0(6)
C93	C98	C97	120.7(6)
C79	C84	C83	121.2(6)
C72	C77	C76	121.3(6)
C99	C104	C109	122.6(5)
C99	C104	C103	117.0(5)
C109	C104	C103	120.3(6)
C72	C73	C74	120.5(6)
C127	C132	C137	128.4(7)
C127	C132	C131	116.4(7)
C137	C132	C131	114.9(7)
C104	C109	C112	110.2(6)
C104	C109	C111	111.9(6)
C104	C109	C110	110.9(6)
C112	C109	C111	114.2(6)
C112	C109	C110	104.1(6)
C111	C109	C110	105.1(6)
C95	C96	C97	121.7(7)
C88	C89	C90	120.4(7)
C91	C90	C89	119.3(6)
C117	C116	C115	119.2(6)
C104	C103	C102	123.3(6)
C76	C75	C74	120.2(6)
C77	C76	C75	119.4(6)
C73	C74	C75	120.4(6)
C101	C102	C103	119.4(6)
C84	C83	C82	119.7(7)
C127	C128	C133	122.9(7)

C127	C128	C129	119.1(8)
C133	C128	C129	118.0(8)
C94	C95	C96	120.0(7)
C128	C133	C136	112.2(7)
C128	C133	C134	108.7(7)
C128	C133	C135	113.9(7)
C136	C133	C134	107.5(7)
C136	C133	C135	109.3(7)
C134	C133	C135	104.8(7)
C98	C97	C96	118.9(7)
C83	C82	C81	120.2(8)
C79	C80	C81	121.0(7)
C132	C131	C130	123.9(8)
C128	C129	C130	122.2(9)
C131	C130	C129	117.5(9)
C82	C81	C80	119.4(8)
V1	Pt1	S1	90.43(6)
V1	Pt1	S2	90.37(6)
V1	Pt1	S4	90.79(6)
V1	Pt1	S3	90.74(7)
S1	Pt1	S2	88.21(7)
S1	Pt1	S4	89.27(7)
S1	Pt1	S3	178.76(9)
S2	Pt1	S4	177.23(8)
S2	Pt1	S3	91.39(8)
S4	Pt1	S3	91.11(9)
O8	Ce1	O7	130.8(1)
O8	Ce1	O6	109.9(1)
O8	Ce1	O5	88.3(1)

O7	Ce1	O6	99.8(1)
O7	Ce1	O5	114.9(1)
O6	Ce1	O5	113.5(1)
Pt1	V1	O5	179.0(1)
Pt1	V1	O3	82.0(1)
Pt1	V1	O4	82.1(1)
Pt1	V1	O2	82.0(1)
Pt1	V1	O1	81.9(2)
O5	V1	O3	97.5(2)
O5	V1	O4	97.1(2)
O5	V1	O2	98.8(2)
O5	V1	O1	98.6(2)
O3	V1	O4	90.2(2)
O3	V1	O2	91.1(2)
O3	V1	O1	163.7(2)
O4	V1	O2	163.8(2)
O4	V1	O1	89.3(2)
O2	V1	O1	85.0(2)
Pt1	S1	C1	105.4(2)
Pt1	S2	C8	104.8(2)
Pt1	S4	C22	104.7(2)
Pt1	S3	C15	105.7(2)
Ce1	O8	C57	167.2(3)
Ce1	O7	C43	168.0(3)
Ce1	O6	C29	177.3(3)
Ce1	O5	V1	174.4(2)
V1	O3	C15	138.9(3)
V1	O4	C22	138.3(4)
V1	O2	C8	139.1(4)

V1	O1	C1	139.3(4)
O8	C57	C58	120.5(5)
O8	C57	C62	119.8(5)
C58	C57	C62	119.7(5)
C57	C58	C59	120.1(5)
C57	C58	C63	120.3(4)
C59	C58	C63	119.5(5)
S3	C15	O3	122.3(4)
S3	C15	C16	119.6(4)
O3	C15	C16	118.1(5)
O7	C43	C44	121.2(4)
O7	C43	C48	118.9(4)
C44	C43	C48	119.9(5)
O6	C29	C34	121.1(5)
O6	C29	C30	118.3(5)
C34	C29	C30	120.5(5)
S2	C8	O2	122.4(4)
S2	C8	C9	119.6(4)
O2	C8	C9	117.9(5)
S4	C22	O4	123.2(4)
S4	C22	C23	119.3(4)
O4	C22	C23	117.4(4)
S1	C1	O1	122.4(4)
S1	C1	C2	119.5(4)
O1	C1	C2	118.1(5)
C1	C2	C7	123.0(5)
C1	C2	C3	118.2(5)
C7	C2	C3	118.8(6)
C58	C59	C60	120.3(5)

C58	C63	C65	111.1(5)
C58	C63	C64	112.6(5)
C58	C63	C66	109.4(5)
C65	C63	C64	106.1(5)
C65	C63	C66	111.5(5)
C64	C63	C66	105.9(5)
C22	C23	C28	119.1(5)
C22	C23	C24	122.4(5)
C28	C23	C24	118.4(5)
C8	C9	C10	123.1(5)
C8	C9	C14	117.3(5)
C10	C9	C14	119.6(6)
C15	C16	C21	119.0(5)
C15	C16	C17	122.5(5)
C21	C16	C17	118.5(6)
C29	C34	C39	127.3(6)
C29	C34	C33	116.5(6)
C39	C34	C33	116.2(6)
C43	C44	C49	121.7(5)
C43	C44	C45	119.0(6)
C49	C44	C45	119.3(6)
C43	C48	C47	117.8(5)
C43	C48	C53	121.5(5)
C47	C48	C53	120.6(5)
C57	C62	C67	122.8(5)
C57	C62	C61	117.8(5)
C67	C62	C61	119.3(5)
C44	C49	C52	110.7(5)
C44	C49	C51	110.2(5)

C44	C49	C50	112.6(5)
C52	C49	C51	109.9(5)
C52	C49	C50	106.4(5)
C51	C49	C50	107.1(5)
C2	C7	C6	120.6(6)
C23	C28	C27	120.6(5)
C44	C45	C46	121.4(6)
C59	C60	C61	120.4(6)
C2	C3	C4	119.8(6)
C37	C35	C30	110.5(5)
C37	C35	C36	110.5(5)
C37	C35	C38	106.1(5)
C30	C35	C36	111.2(5)
C30	C35	C38	113.1(6)
C36	C35	C38	105.3(5)
C9	C10	C11	119.9(6)
C62	C67	C68	112.9(5)
C62	C67	C69	109.5(5)
C62	C67	C70	111.7(5)
C68	C67	C69	111.3(5)
C68	C67	C70	105.5(5)
C69	C67	C70	105.7(5)
C48	C47	C46	121.5(6)
C16	C21	C20	120.2(6)
C34	C39	C40	116.7(5)
C34	C39	C41	110.0(5)
C34	C39	C42	108.2(5)
C40	C39	C41	107.0(5)
C40	C39	C42	106.1(5)

C41	C39	C42	108.5(5)
C29	C30	C35	121.9(6)
C29	C30	C31	117.6(6)
C35	C30	C31	120.5(6)
C34	C33	C32	124.1(7)
C28	C27	C26	120.5(6)
C45	C46	C47	120.3(6)
C55	C53	C48	109.4(5)
C55	C53	C54	111.7(5)
C55	C53	C56	105.9(5)
C48	C53	C54	110.2(5)
C48	C53	C56	112.9(5)
C54	C53	C56	106.8(5)
C7	C6	C5	120.0(6)
C20	C19	C18	119.6(7)
C62	C61	C60	121.6(6)
C3	C4	C5	120.5(6)
C9	C14	C13	120.2(6)
C6	C5	C4	120.2(6)
C27	C26	C25	119.8(7)
C11	C12	C13	121.1(8)
C16	C17	C18	120.2(6)
C10	C11	C12	120.1(7)
C23	C24	C25	119.9(7)
C33	C32	C31	118.3(7)
C30	C31	C32	122.8(7)
C21	C20	C19	120.8(6)
C21	C20	H20	119.5
C19	C20	H20	119.7

C19	C18	C17	120.5(7)
C14	C13	C12	119.1(7)
C26	C25	C24	120.8(8)
C155	C156	C157	121.2(7)
C155	C160	C159	120.3(8)
C156	C155	C160	118.5(7)
C156	C155	C161	121.3(7)
C160	C155	C161	120.1(7)
C157	C158	C159	117.8(8)
C156	C157	C158	120.9(7)
C160	C159	C158	121.2(9)
C143	C142	C141	118.5(9)
C142	C143	C144	123(1)
C142	C141	C146	119.5(9)
C142	C141	C147	119.0(9)
C146	C141	C147	121.5(9)
C141	C146	C145	120(1)
C143	C144	C145	114(1)
C146	C145	C144	125(1)
C148	C149	C150	121(1)
C153	C152	C151	125(1)
C149	C148	C153	118(1)
C149	C148	C154	119(1)
C153	C148	C154	123(1)
C149	C150	C151	120(1)
C152	C153	C148	121(1)
C152	C151	C150	115(1)
C164	C163	C162	120(1)
C163	C164	C162	124.5(9)

C163	C162	C165	116(1)
C163	C162	C164	116(1)
C165	C162	C164	128(1)
C164	C163	C162	120(1)
C162	C164	C163	124.5(9)
C164	C162	C163	116(1)
C164	C162	C165	128(1)
C163	C162	C165	116(1)

Table S11: All non-hydrogen bond distances (Å) of **3Nd**.

Atom 1	Atom 2	Length
Pt1	V1	2.762(1)
Pt1	S4	2.319(2)
Pt1	S3	2.321(2)
Pt1	S1	2.319(2)
Pt1	S2	2.316(3)
Nd1	O8	2.170(4)
Nd1	O7	2.164(5)
Nd1	O6	2.175(5)
Nd1	O5	2.438(5)
V1	O5	1.625(5)
V1	O3	1.980(6)
V1	O4	1.983(7)
V1	O2	1.980(6)
V1	O1	1.989(6)
S4	C7	1.682(9)
S3	C5	1.683(9)
S1	C1	1.676(8)
S2	C3	1.682(9)
O8	C37	1.359(9)
O7	C23	1.364(9)
O6	C9	1.363(8)
O3	C5	1.26(1)
O4	C7	1.27(1)
O2	C3	1.26(1)
O1	C1	1.26(1)
C37	C38	1.43(1)
C37	C42	1.42(1)

C41	C42	1.38(1)
C41	C40	1.38(1)
C38	C39	1.39(1)
C38	C43	1.54(1)
C39	C40	1.37(1)
C42	C47	1.55(1)
C32	C29	1.54(1)
C7	C8	1.50(1)
C5	C6	1.49(1)
C44	C43	1.52(1)
C3	C4	1.50(1)
C23	C24	1.42(1)
C23	C28	1.42(1)
C43	C46	1.53(1)
C43	C45	1.52(1)
C9	C10	1.42(1)
C9	C14	1.41(1)
C15	C10	1.53(1)
C15	C18	1.52(1)
C15	C16	1.53(1)
C15	C17	1.52(2)
C10	C11	1.39(1)
C29	C24	1.54(1)
C29	C31	1.53(1)
C29	C30	1.55(1)
C33	C28	1.54(1)
C33	C34	1.54(1)
C33	C35	1.51(1)
C33	C36	1.54(1)

C24	C25	1.39(1)
C14	C19	1.56(1)
C14	C13	1.39(1)
C19	C22	1.52(1)
C19	C21	1.53(1)
C19	C20	1.56(1)
C47	C49	1.51(1)
C47	C48	1.53(1)
C47	C50	1.56(1)
C28	C27	1.42(1)
C12	C13	1.39(1)
C12	C11	1.39(1)
C1	C2	1.50(1)
C27	C26	1.34(1)
C25	C26	1.36(1)

Table S12: All non-hydrogen bond angles (°) of **3Nd**.

Atom 1	Atom 2	Atom 3	Angle
V1	Pt1	S4	90.15(7)
V1	Pt1	S3	90.40(7)
V1	Pt1	S1	90.04(7)
V1	Pt1	S2	89.30(7)
S4	Pt1	S3	92.00(9)
S4	Pt1	S1	88.95(9)
S4	Pt1	S2	178.17(9)
S3	Pt1	S1	178.95(9)
S3	Pt1	S2	89.74(9)
S1	Pt1	S2	89.31(9)
O8	Nd1	O7	113.9(2)
O8	Nd1	O6	110.2(2)
O8	Nd1	O5	97.1(2)
O7	Nd1	O6	109.8(2)
O7	Nd1	O5	106.9(2)
O6	Nd1	O5	118.6(2)
Pt1	V1	O5	176.7(2)
Pt1	V1	O3	82.6(2)
Pt1	V1	O4	83.1(2)
Pt1	V1	O2	83.9(2)
Pt1	V1	O1	83.3(2)
O5	V1	O3	95.4(3)
O5	V1	O4	94.5(3)
O5	V1	O2	98.6(3)
O5	V1	O1	98.8(3)
O3	V1	O4	91.8(3)
O3	V1	O2	89.3(2)

O3	V1	O1	165.8(3)
O4	V1	O2	166.7(3)
O4	V1	O1	88.2(3)
O2	V1	O1	87.6(2)
Pt1	S4	C7	104.4(3)
Pt1	S3	C5	103.1(3)
Pt1	S1	C1	103.9(3)
Pt1	S2	C3	104.4(3)
Nd1	O8	C37	143.2(4)
Nd1	O7	C23	161.7(5)
Nd1	O6	C9	151.4(5)
Nd1	O5	V1	164.8(3)
V1	O3	C5	134.7(6)
V1	O4	C7	132.5(6)
V1	O2	C3	132.9(5)
V1	O1	C1	132.9(6)
O8	C37	C38	119.1(6)
O8	C37	C42	119.9(6)
C38	C37	C42	121.0(7)
C42	C41	C40	123.1(7)
C37	C38	C39	116.8(7)
C37	C38	C43	121.9(6)
C39	C38	C43	121.2(7)
C38	C39	C40	122.4(7)
C37	C42	C41	116.5(7)
C37	C42	C47	120.8(7)
C41	C42	C47	122.7(7)
S4	C7	O4	124.0(7)
S4	C7	C8	119.1(7)

O4	C7	C8	116.9(8)
S3	C5	O3	124.9(6)
S3	C5	C6	118.1(6)
O3	C5	C6	117.0(7)
S2	C3	O2	124.9(6)
S2	C3	C4	116.2(6)
O2	C3	C4	118.9(7)
O7	C23	C24	119.7(7)
O7	C23	C28	119.3(7)
C24	C23	C28	121.0(7)
C38	C43	C44	114.7(6)
C38	C43	C46	108.0(6)
C38	C43	C45	112.0(6)
C44	C43	C46	108.4(7)
C44	C43	C45	105.9(7)
C46	C43	C45	107.5(7)
C41	C40	C39	119.0(7)
C41	C40	H40	120.6
C39	C40	H40	120.4
O6	C9	C10	118.4(7)
O6	C9	C14	120.5(7)
C10	C9	C14	121.1(7)
C10	C15	C18	112.9(8)
C10	C15	C16	112.0(8)
C10	C15	C17	110.6(8)
C18	C15	C16	105.3(8)
C18	C15	C17	106.0(9)
C16	C15	C17	109.8(9)
C9	C10	C15	122.3(7)

C9	C10	C11	117.3(8)
C15	C10	C11	120.4(8)
C32	C29	C24	109.7(7)
C32	C29	C31	112.4(7)
C32	C29	C30	106.5(7)
C24	C29	C31	110.6(7)
C24	C29	C30	111.2(7)
C31	C29	C30	106.3(7)
C28	C33	C34	111.8(8)
C28	C33	C35	112.9(8)
C28	C33	C36	108.8(8)
C34	C33	C35	106.8(8)
C34	C33	C36	106.1(8)
C35	C33	C36	110.1(8)
C23	C24	C29	121.1(7)
C23	C24	C25	117.7(7)
C29	C24	C25	121.1(7)
C9	C14	C19	121.8(7)
C9	C14	C13	117.9(7)
C19	C14	C13	120.1(7)
C14	C19	C22	113.6(7)
C14	C19	C21	109.7(7)
C14	C19	C20	111.1(7)
C22	C19	C21	109.4(7)
C22	C19	C20	105.9(7)
C21	C19	C20	106.9(7)
C42	C47	C49	111.8(7)
C42	C47	C48	109.9(7)
C42	C47	C50	110.0(7)

C49	C47	C48	111.8(7)
C49	C47	C50	107.7(7)
C48	C47	C50	105.5(7)
C23	C28	C33	122.4(7)
C23	C28	C27	114.2(7)
C33	C28	C27	123.3(8)
C13	C12	C11	119.2(9)
S1	C1	O1	125.5(6)
S1	C1	C2	118.2(6)
O1	C1	C2	116.3(7)
C14	C13	C12	121.6(8)
C10	C11	C12	121.8(9)
C28	C27	C26	125.3(9)
C24	C25	C26	122.4(8)
C27	C26	C25	118.4(9)

Table S13: All non-hydrogen bond distances (Å) of **4Nd.**

Atom 1	Atom 2	Distance
Pt(1)	V(1)	2.7605(5)
Pt(1)	S(1)	2.3245(9)
Pt(1)	S(3)	2.3131(10)
Pt(1)	S(4)	2.3222(9)
Pt(1)	S(2)	2.3184(9)
Pt(2)	V(2)	2.7861(6)
Pt(2)	S(6')	2.320(2)
Pt(2)	S(5')	2.275(2)
Pt(2)	S(6)	2.331(2)
Pt(2)	S(7')	2.372(2)
Pt(2)	S(5)	2.378(3)
Pt(2)	S(7)	2.258(3)
Pt(2)	S(8')	2.317(3)
Pt(2)	S(8)	2.311(4)
Nd(2)	O(16)	2.144(2)
Nd(2)	O(13)	2.477(2)
Nd(2)	O(14)	2.185(2)
Nd(2)	O(15)	2.183(2)
Nd(1)	O(6)	2.142(2)
Nd(1)	O(5)	2.470(2)
Nd(1)	O(8)	2.177(3)
Nd(1)	O(7)	2.185(2)
V(1)	O(1)	1.971(2)
V(1)	O(2)	1.987(2)
V(1)	O(5)	1.629(2)
V(1)	O(4)	1.984(2)
V(1)	O(3)	1.981(2)

V(2)	O(13)	1.630(2)
V(2)	O(11)	1.962(3)
V(2)	O(12)	1.962(3)
V(2)	O(9)	2.046(9)
V(2)	O(9')	1.920(8)
V(2)	O(10')	2.005(6)
V(2)	O(10)	1.969(7)
S(1)	C(1)	1.708(3)
S(3)	C(15)	1.704(3)
S(4)	C(22)	1.708(3)
S(2)	C(8)	1.709(3)
O(6)	C(29)	1.312(4)
O(16)	C(113)	1.347(4)
O(1)	C(1)	1.263(4)
O(2)	C(8)	1.260(4)
O(4)	C(22)	1.272(4)
O(8)	C(57)	1.353(4)
O(7)	C(43)	1.355(4)
O(14)	C(127)	1.349(4)
O(11)	C(92)	1.238(4)
O(15)	C(99)	1.346(4)
O(3)	C(15)	1.270(4)
C(118)	C(113)	1.418(5)
C(118)	C(123)	1.553(5)
C(118)	C(117)	1.401(5)
C(122)	C(119)	1.536(5)
C(44)	C(43)	1.422(4)
C(44)	C(45)	1.388(5)
C(44)	C(49)	1.538(4)

C(34)	C(29)	1.421(5)
C(34)	C(39)	1.517(6)
C(34)	C(33)	1.416(6)
C(113)	C(114)	1.428(5)
C(29)	C(30)	1.428(6)
C(7)	C(2)	1.398(5)
C(7)	C(6)	1.372(5)
C(75)	C(76)	1.375(6)
C(75)	C(74)	1.384(6)
O(12)	C(71)	1.256(4)
C(79)	C(78)	1.468(5)
C(79)	C(84)	1.398(5)
C(79)	C(80)	1.386(5)
C(48)	C(43)	1.430(4)
C(48)	C(47)	1.388(5)
C(48)	C(53)	1.548(5)
C(128)	C(129)	1.396(5)
C(128)	C(127)	1.426(5)
C(128)	C(133)	1.534(5)
C(129)	C(130)	1.384(5)
C(62)	C(61)	1.386(5)
C(62)	C(57)	1.422(5)
C(62)	C(67)	1.536(5)
C(39)	C(42)	1.541(5)
C(39)	C(40)	1.528(6)
C(39)	C(41)	1.559(6)
C(155)	C(160)	1.372(6)
C(155)	C(156)	1.384(6)
C(85)	C(86)	1.480(5)

C(85)	S(8')	1.708(4)
C(85)	S(8)	1.656(5)
C(85)	O(10')	1.271(6)
C(85)	O(10)	1.304(7)
C(92)	C(93)	1.483(5)
C(92)	S(7')	1.697(4)
C(92)	S(7)	1.715(4)
C(78)	S(5')	1.735(4)
C(78)	S(5)	1.656(4)
C(78)	O(9)	1.259(9)
C(78)	O(9')	1.292(8)
C(114)	C(119)	1.542(5)
C(114)	C(115)	1.384(5)
C(1)	C(2)	1.482(5)
C(17)	C(16)	1.386(5)
C(17)	C(18)	1.377(6)
C(130)	C(131)	1.377(5)
C(16)	C(21)	1.394(5)
C(16)	C(15)	1.479(5)
C(142)	C(141)	1.382(6)
C(142)	C(143)	1.399(7)
C(126)	C(123)	1.533(5)
C(93)	C(98)	1.391(5)
C(93)	C(94)	1.387(5)
C(138)	C(137)	1.536(5)
C(127)	C(132)	1.423(5)
C(9)	C(8)	1.491(5)
C(9)	C(14)	1.392(5)
C(9)	C(10)	1.399(5)

C(4)	C(3)	1.383(5)
C(4)	C(5)	1.388(5)
C(160)	C(159)	1.381(6)
C(160)	C(161)	1.505(6)
C(47)	C(46)	1.384(5)
C(133)	C(136)	1.534(5)
C(133)	C(134)	1.555(5)
C(102)	C(101)	1.383(5)
C(102)	C(103)	1.383(5)
C(53)	C(55)	1.539(5)
C(53)	C(56)	1.533(5)
C(53)	C(54)	1.539(5)
C(52)	C(49)	1.546(5)
C(88)	C(87)	1.379(5)
C(88)	C(89)	1.387(5)
C(101)	C(100)	1.393(5)
C(99)	C(100)	1.427(5)
C(99)	C(104)	1.432(5)
C(87)	C(86)	1.397(5)
C(3)	C(2)	1.395(5)
C(22)	C(23)	1.475(5)
C(100)	C(105)	1.536(5)
C(98)	C(97)	1.387(5)
C(86)	C(91)	1.388(5)
C(23)	C(28)	1.400(5)
C(23)	C(24)	1.389(5)
C(103)	C(104)	1.389(5)
C(131)	C(132)	1.401(5)
C(19)	C(18)	1.369(6)

C(19)	C(20)	1.379(6)
C(72)	C(73)	1.398(5)
C(72)	C(77)	1.394(5)
C(72)	C(71)	1.479(5)
C(28)	C(27)	1.385(5)
C(125)	C(123)	1.541(5)
C(76)	C(77)	1.374(6)
C(70)	C(67)	1.550(5)
C(159)	C(158)	1.386(6)
C(111)	C(109)	1.547(5)
C(123)	C(124)	1.543(5)
C(45)	C(46)	1.385(5)
C(14)	C(13)	1.389(5)
C(49)	C(50)	1.538(5)
C(49)	C(51)	1.531(5)
C(6)	C(5)	1.384(5)
C(119)	C(121)	1.543(5)
C(119)	C(120)	1.541(5)
C(61)	C(60)	1.384(5)
C(60)	C(59)	1.375(6)
C(141)	C(146)	1.385(6)
C(115)	C(116)	1.377(5)
C(112)	C(109)	1.529(5)
C(139)	C(137)	1.529(5)
C(57)	C(58)	1.426(5)
C(104)	C(109)	1.539(5)
C(67)	C(68)	1.534(5)
C(67)	C(69)	1.550(5)
C(35)	C(37)	1.507(6)

C(35)	C(38)	1.532(6)
C(35)	C(30)	1.535(6)
C(35)	C(36)	1.572(7)
C(145)	C(146)	1.384(6)
C(145)	C(144)	1.365(6)
C(132)	C(137)	1.542(5)
C(97)	C(96)	1.374(5)
C(20)	C(21)	1.381(5)
C(109)	C(110)	1.541(5)
C(27)	C(26)	1.386(6)
C(58)	C(59)	1.387(6)
C(58)	C(63)	1.541(6)
C(108)	C(105)	1.540(5)
C(24)	C(25)	1.384(5)
C(84)	C(83)	1.385(5)
C(65)	C(63)	1.513(5)
C(74)	C(73)	1.374(5)
C(105)	C(107)	1.532(5)
C(105)	C(106)	1.552(5)
C(140)	C(137)	1.538(5)
C(13)	C(12)	1.387(6)
C(157)	C(158)	1.390(6)
C(157)	C(156)	1.372(6)
C(96)	C(95)	1.374(6)
C(116)	C(117)	1.375(6)
C(63)	C(64)	1.493(6)
C(63)	C(66)	1.573(6)
C(83)	C(82)	1.381(7)
C(146)	C(147)	1.512(6)

C(26)	C(25)	1.375(6)
C(12)	C(11)	1.378(6)
C(82)	C(81)	1.375(7)
C(152)	C(153)	1.388(6)
C(152)	C(151)	1.378(6)
C(91)	C(90)	1.382(5)
C(150)	C(149)	1.371(7)
C(150)	C(151)	1.407(7)
C(10)	C(11)	1.394(6)
C(94)	C(95)	1.383(6)
C(154)	C(153)	1.497(6)
C(149)	C(148)	1.361(7)
C(90)	C(89)	1.387(5)
C(32)	C(33)	1.383(7)
C(32)	C(31)	1.381(6)
C(80)	C(81)	1.384(6)
C(31)	C(30)	1.402(6)
C(153)	C(148)	1.376(6)
C(71)	S(6')	1.711(4)
C(71)	S(6)	1.709(4)
C(144)	C(143)	1.375(7)

Table S14: All non-hydrogen bond angles (°) of **4Nd.**

Atom 1	Atom 2	Atom 3	Angle
S(1)	Pt(1)	V(1)	90.27(2)
S(3)	Pt(1)	V(1)	90.42(2)
S(3)	Pt(1)	S(1)	179.21(3)
S(3)	Pt(1)	S(4)	90.99(3)
S(3)	Pt(1)	S(2)	90.81(4)
S(4)	Pt(1)	V(1)	90.53(2)
S(4)	Pt(1)	S(1)	88.61(3)
S(2)	Pt(1)	V(1)	90.52(2)
S(2)	Pt(1)	S(1)	89.58(3)
S(2)	Pt(1)	S(4)	177.91(3)
S(6')	Pt(2)	V(2)	90.38(4)
S(6')	Pt(2)	S(7')	90.06(8)
S(5')	Pt(2)	V(2)	89.96(5)
S(5')	Pt(2)	S(6')	92.48(8)
S(5')	Pt(2)	S(7')	177.36(8)
S(5')	Pt(2)	S(8')	89.31(8)
S(6)	Pt(2)	V(2)	90.92(5)
S(6)	Pt(2)	S(5)	89.04(10)
S(7')	Pt(2)	V(2)	90.77(5)
S(5)	Pt(2)	V(2)	90.49(6)
S(7)	Pt(2)	V(2)	90.27(7)
S(7)	Pt(2)	S(6)	93.04(11)
S(7)	Pt(2)	S(5)	177.77(10)
S(7)	Pt(2)	S(8)	91.18(11)
S(8')	Pt(2)	V(2)	91.15(7)
S(8')	Pt(2)	S(6')	177.65(8)
S(8')	Pt(2)	S(7')	88.13(8)

S(8)	Pt(2)	V(2)	89.51(8)
S(8)	Pt(2)	S(6)	175.76(10)
S(8)	Pt(2)	S(5)	86.73(10)
O(16)	Nd(2)	O(13)	112.16(8)
O(16)	Nd(2)	O(14)	109.22(9)
O(16)	Nd(2)	O(15)	100.77(9)
O(14)	Nd(2)	O(13)	88.62(8)
O(15)	Nd(2)	O(13)	114.73(8)
O(15)	Nd(2)	O(14)	131.19(9)
O(6)	Nd(1)	O(5)	112.41(8)
O(6)	Nd(1)	O(8)	109.63(9)
O(6)	Nd(1)	O(7)	100.77(9)
O(8)	Nd(1)	O(5)	89.26(8)
O(8)	Nd(1)	O(7)	131.57(9)
O(7)	Nd(1)	O(5)	113.10(8)
O(1)	V(1)	Pt(1)	82.33(6)
O(1)	V(1)	O(2)	89.13(10)
O(1)	V(1)	O(4)	85.06(10)
O(1)	V(1)	O(3)	164.34(9)
O(2)	V(1)	Pt(1)	82.18(6)
O(5)	V(1)	Pt(1)	179.37(9)
O(5)	V(1)	O(1)	98.24(10)
O(5)	V(1)	O(2)	97.55(10)
O(5)	V(1)	O(4)	98.84(10)
O(5)	V(1)	O(3)	97.35(11)
O(4)	V(1)	Pt(1)	81.47(6)
O(4)	V(1)	O(2)	163.24(9)
O(3)	V(1)	Pt(1)	82.09(7)
O(3)	V(1)	O(2)	90.27(10)

O(3)	V(1)	O(4)	91.11(10)
O(13)	V(2)	Pt(2)	178.99(9)
O(13)	V(2)	O(11)	97.04(11)
O(13)	V(2)	O(12)	97.87(11)
O(13)	V(2)	O(9)	97.9(3)
O(13)	V(2)	O(9')	99.9(2)
O(13)	V(2)	O(10')	99.04(16)
O(13)	V(2)	O(10)	97.9(2)
O(11)	V(2)	Pt(2)	81.98(7)
O(11)	V(2)	O(12)	90.27(14)
O(11)	V(2)	O(9)	163.9(3)
O(11)	V(2)	O(10')	80.66(19)
O(11)	V(2)	O(10)	101.4(2)
O(12)	V(2)	Pt(2)	81.91(7)
O(12)	V(2)	O(9)	81.8(2)
O(12)	V(2)	O(10')	161.65(17)
O(12)	V(2)	O(10)	159.1(2)
O(9)	V(2)	Pt(2)	83.0(2)
O(9')	V(2)	Pt(2)	81.1(2)
O(9')	V(2)	O(11)	159.4(2)
O(9')	V(2)	O(12)	98.9(2)
O(9')	V(2)	O(10')	85.2(2)
O(10')	V(2)	Pt(2)	81.06(14)
O(10)	V(2)	Pt(2)	82.60(18)
O(10)	V(2)	O(9)	82.5(3)
C(1)	S(1)	Pt(1)	103.09(12)
C(15)	S(3)	Pt(1)	103.04(13)
C(22)	S(4)	Pt(1)	101.88(12)
C(8)	S(2)	Pt(1)	102.91(12)

C(29)	O(6)	Nd(1)	178.3(3)
C(113)	O(16)	Nd(2)	177.5(2)
C(1)	O(1)	V(1)	133.9(2)
C(8)	O(2)	V(1)	132.5(2)
V(2)	O(13)	Nd(2)	173.62(14)
V(1)	O(5)	Nd(1)	174.17(13)
C(22)	O(4)	V(1)	135.3(2)
C(57)	O(8)	Nd(1)	167.5(2)
C(43)	O(7)	Nd(1)	168.1(2)
C(127)	O(14)	Nd(2)	166.0(2)
C(92)	O(11)	V(2)	138.3(2)
C(99)	O(15)	Nd(2)	167.5(2)
C(15)	O(3)	V(1)	133.6(2)
C(113)	C(118)	C(123)	127.4(3)
C(117)	C(118)	C(113)	117.6(3)
C(117)	C(118)	C(123)	115.0(3)
C(43)	C(44)	C(49)	121.3(3)
C(45)	C(44)	C(43)	118.9(3)
C(45)	C(44)	C(49)	119.8(3)
C(29)	C(34)	C(39)	128.0(4)
C(33)	C(34)	C(29)	117.6(4)
C(33)	C(34)	C(39)	114.4(4)
O(16)	C(113)	C(118)	121.4(3)
O(16)	C(113)	C(114)	118.5(3)
C(118)	C(113)	C(114)	120.1(3)
O(6)	C(29)	C(34)	121.2(4)
O(6)	C(29)	C(30)	118.5(3)
C(34)	C(29)	C(30)	120.0(4)
C(6)	C(7)	C(2)	120.3(3)

C(76)	C(75)	C(74)	119.9(4)
C(71)	O(12)	V(2)	139.0(2)
C(84)	C(79)	C(78)	117.3(3)
C(80)	C(79)	C(78)	122.9(4)
C(80)	C(79)	C(84)	119.7(4)
C(43)	C(48)	C(53)	121.5(3)
C(47)	C(48)	C(43)	118.1(3)
C(47)	C(48)	C(53)	120.3(3)
C(129)	C(128)	C(127)	118.9(3)
C(129)	C(128)	C(133)	119.8(3)
C(127)	C(128)	C(133)	121.2(3)
C(130)	C(129)	C(128)	121.3(4)
C(61)	C(62)	C(57)	118.6(4)
C(61)	C(62)	C(67)	120.4(3)
C(57)	C(62)	C(67)	121.0(3)
C(34)	C(39)	C(42)	117.4(3)
C(34)	C(39)	C(40)	111.5(4)
C(34)	C(39)	C(41)	107.9(4)
C(42)	C(39)	C(41)	104.4(3)
C(40)	C(39)	C(42)	107.7(3)
C(40)	C(39)	C(41)	107.3(3)
C(160)	C(155)	C(156)	122.2(4)
C(86)	C(85)	S(8')	118.5(3)
C(86)	C(85)	S(8)	120.7(3)
O(10')	C(85)	C(86)	118.0(4)
O(10')	C(85)	S(8')	123.1(4)
O(10)	C(85)	C(86)	115.1(4)
O(10)	C(85)	S(8)	123.7(4)
O(11)	C(92)	C(93)	117.3(3)

O(11)	C(92)	S(7')	125.2(3)
O(11)	C(92)	S(7)	118.6(3)
C(93)	C(92)	S(7')	116.1(3)
C(93)	C(92)	S(7)	122.8(3)
O(7)	C(43)	C(44)	119.9(3)
O(7)	C(43)	C(48)	120.5(3)
C(44)	C(43)	C(48)	119.7(3)
C(79)	C(78)	S(5')	123.0(3)
C(79)	C(78)	S(5)	114.6(3)
O(9)	C(78)	C(79)	116.6(5)
O(9)	C(78)	S(5)	128.7(5)
O(9')	C(78)	C(79)	117.0(4)
O(9')	C(78)	S(5')	119.6(4)
C(113)	C(114)	C(119)	121.6(3)
C(115)	C(114)	C(113)	118.3(3)
C(115)	C(114)	C(119)	120.1(3)
O(1)	C(1)	S(1)	123.4(3)
O(1)	C(1)	C(2)	117.1(3)
C(2)	C(1)	S(1)	119.4(2)
C(18)	C(17)	C(16)	120.4(4)
C(131)	C(130)	C(129)	119.5(4)
C(17)	C(16)	C(21)	118.4(3)
C(17)	C(16)	C(15)	123.0(3)
C(21)	C(16)	C(15)	118.6(3)
C(141)	C(142)	C(143)	119.8(4)
C(98)	C(93)	C(92)	118.8(3)
C(94)	C(93)	C(92)	122.4(3)
C(94)	C(93)	C(98)	118.7(3)
O(14)	C(127)	C(128)	119.7(3)

O(14)	C(127)	C(132)	120.3(3)
C(132)	C(127)	C(128)	120.0(3)
C(14)	C(9)	C(8)	118.7(3)
C(14)	C(9)	C(10)	119.1(3)
C(10)	C(9)	C(8)	121.9(3)
C(3)	C(4)	C(5)	120.0(3)
C(155)	C(160)	C(159)	118.3(4)
C(155)	C(160)	C(161)	121.8(4)
C(159)	C(160)	C(161)	120.0(4)
C(46)	C(47)	C(48)	122.4(3)
C(128)	C(133)	C(135)	109.0(3)
C(128)	C(133)	C(134)	110.6(3)
C(135)	C(133)	C(134)	112.0(3)
C(136)	C(133)	C(128)	113.1(3)
C(136)	C(133)	C(135)	106.2(3)
C(136)	C(133)	C(134)	106.0(3)
C(101)	C(102)	C(103)	118.9(4)
C(55)	C(53)	C(48)	111.2(3)
C(55)	C(53)	C(54)	110.2(3)
C(56)	C(53)	C(48)	111.6(3)
C(56)	C(53)	C(55)	107.2(3)
C(56)	C(53)	C(54)	106.2(3)
C(54)	C(53)	C(48)	110.2(3)
C(87)	C(88)	C(89)	119.9(3)
C(102)	C(101)	C(100)	122.1(3)
O(15)	C(99)	C(100)	119.8(3)
O(15)	C(99)	C(104)	120.5(3)
C(100)	C(99)	C(104)	119.6(3)
C(88)	C(87)	C(86)	120.2(3)

O(2)	C(8)	S(2)	124.0(3)
O(2)	C(8)	C(9)	118.0(3)
C(9)	C(8)	S(2)	117.9(3)
C(4)	C(3)	C(2)	119.7(3)
O(4)	C(22)	S(4)	123.1(3)
O(4)	C(22)	C(23)	117.6(3)
C(23)	C(22)	S(4)	119.2(2)
C(101)	C(100)	C(99)	118.5(3)
C(101)	C(100)	C(105)	120.9(3)
C(99)	C(100)	C(105)	120.6(3)
C(97)	C(98)	C(93)	120.6(3)
C(87)	C(86)	C(85)	122.4(3)
C(91)	C(86)	C(85)	118.1(3)
C(91)	C(86)	C(87)	119.4(3)
C(28)	C(23)	C(22)	118.7(3)
C(24)	C(23)	C(22)	121.7(3)
C(24)	C(23)	C(28)	119.7(3)
C(102)	C(103)	C(104)	122.7(3)
C(130)	C(131)	C(132)	122.6(4)
C(18)	C(19)	C(20)	119.4(4)
C(73)	C(72)	C(71)	118.7(3)
C(77)	C(72)	C(73)	119.0(4)
C(77)	C(72)	C(71)	122.3(3)
C(27)	C(28)	C(23)	119.7(3)
C(77)	C(76)	C(75)	120.6(4)
C(160)	C(159)	C(158)	120.4(4)
C(126)	C(123)	C(118)	116.6(3)
C(126)	C(123)	C(125)	106.2(3)
C(126)	C(123)	C(124)	107.4(3)

C(125)	C(123)	C(118)	108.2(3)
C(125)	C(123)	C(124)	108.8(3)
C(124)	C(123)	C(118)	109.3(3)
C(46)	C(45)	C(44)	121.8(3)
C(7)	C(2)	C(1)	122.6(3)
C(3)	C(2)	C(7)	119.6(3)
C(3)	C(2)	C(1)	117.7(3)
C(13)	C(14)	C(9)	120.0(4)
C(44)	C(49)	C(52)	108.9(3)
C(44)	C(49)	C(50)	112.6(3)
C(50)	C(49)	C(52)	106.5(3)
C(51)	C(49)	C(44)	110.3(3)
C(51)	C(49)	C(52)	112.5(3)
C(51)	C(49)	C(50)	106.1(3)
C(7)	C(6)	C(5)	119.9(4)
C(122)	C(119)	C(114)	110.1(3)
C(122)	C(119)	C(121)	111.4(3)
C(122)	C(119)	C(120)	106.9(3)
C(114)	C(119)	C(121)	110.7(3)
C(120)	C(119)	C(114)	112.2(3)
C(120)	C(119)	C(121)	105.5(3)
C(60)	C(61)	C(62)	121.8(4)
C(59)	C(60)	C(61)	119.2(4)
C(142)	C(141)	C(146)	120.9(4)
C(116)	C(115)	C(114)	122.3(4)
O(8)	C(57)	C(62)	119.3(3)
O(8)	C(57)	C(58)	120.7(3)
C(62)	C(57)	C(58)	120.0(3)
C(99)	C(104)	C(109)	121.5(3)

C(103)	C(104)	C(99)	118.0(3)
C(103)	C(104)	C(109)	120.4(3)
C(19)	C(18)	C(17)	121.0(4)
C(62)	C(67)	C(70)	109.3(3)
C(62)	C(67)	C(69)	110.6(3)
C(68)	C(67)	C(62)	113.0(3)
C(68)	C(67)	C(70)	106.5(3)
C(68)	C(67)	C(69)	106.1(3)
C(69)	C(67)	C(70)	111.3(3)
C(37)	C(35)	C(38)	108.7(4)
C(37)	C(35)	C(30)	112.6(4)
C(37)	C(35)	C(36)	108.9(4)
C(38)	C(35)	C(30)	112.9(4)
C(38)	C(35)	C(36)	104.0(4)
C(30)	C(35)	C(36)	109.3(4)
C(144)	C(145)	C(146)	121.8(4)
C(47)	C(46)	C(45)	119.1(3)
C(127)	C(132)	C(137)	123.1(3)
C(131)	C(132)	C(127)	117.6(3)
C(131)	C(132)	C(137)	119.2(3)
C(96)	C(97)	C(98)	119.8(4)
C(19)	C(20)	C(21)	120.2(4)
C(112)	C(109)	C(111)	110.3(3)
C(112)	C(109)	C(104)	110.8(3)
C(112)	C(109)	C(110)	106.3(3)
C(104)	C(109)	C(111)	110.6(3)
C(104)	C(109)	C(110)	111.7(3)
C(110)	C(109)	C(111)	107.0(3)
C(28)	C(27)	C(26)	119.8(4)

C(57)	C(58)	C(63)	122.6(4)
C(59)	C(58)	C(57)	117.9(4)
C(59)	C(58)	C(63)	119.5(4)
C(60)	C(59)	C(58)	122.5(4)
C(25)	C(24)	C(23)	120.1(4)
C(83)	C(84)	C(79)	119.9(4)
C(73)	C(74)	C(75)	120.2(4)
C(100)	C(105)	C(108)	110.4(3)
C(100)	C(105)	C(106)	112.3(3)
C(108)	C(105)	C(106)	106.4(3)
C(107)	C(105)	C(100)	109.4(3)
C(107)	C(105)	C(108)	112.2(3)
C(107)	C(105)	C(106)	106.0(3)
C(20)	C(21)	C(16)	120.5(4)
C(12)	C(13)	C(14)	120.4(4)
C(156)	C(157)	C(158)	119.3(4)
C(95)	C(96)	C(97)	120.2(4)
C(159)	C(158)	C(157)	120.5(4)
C(74)	C(73)	C(72)	120.2(4)
C(117)	C(116)	C(115)	119.0(4)
C(58)	C(63)	C(66)	110.7(4)
C(65)	C(63)	C(58)	110.5(3)
C(65)	C(63)	C(66)	104.1(3)
C(64)	C(63)	C(58)	112.7(3)
C(64)	C(63)	C(65)	112.8(4)
C(64)	C(63)	C(66)	105.6(4)
C(116)	C(117)	C(118)	122.6(4)
C(76)	C(77)	C(72)	120.1(4)
O(3)	C(15)	S(3)	123.6(3)

O(3)	C(15)	C(16)	117.9(3)
C(16)	C(15)	S(3)	118.5(3)
C(82)	C(83)	C(84)	119.9(4)
C(141)	C(146)	C(147)	120.4(4)
C(145)	C(146)	C(141)	118.0(4)
C(145)	C(146)	C(147)	121.6(4)
C(25)	C(26)	C(27)	120.6(4)
C(6)	C(5)	C(4)	120.4(4)
C(11)	C(12)	C(13)	120.2(4)
C(157)	C(156)	C(155)	119.4(4)
C(81)	C(82)	C(83)	120.1(4)
C(138)	C(137)	C(132)	109.1(3)
C(138)	C(137)	C(140)	106.4(3)
C(139)	C(137)	C(138)	109.7(3)
C(139)	C(137)	C(132)	112.8(3)
C(139)	C(137)	C(140)	106.4(3)
C(140)	C(137)	C(132)	112.3(3)
C(151)	C(152)	C(153)	121.4(4)
C(90)	C(91)	C(86)	120.3(3)
C(149)	C(150)	C(151)	118.4(5)
C(11)	C(10)	C(9)	120.4(4)
C(95)	C(94)	C(93)	120.3(4)
C(26)	C(25)	C(24)	120.1(4)
C(148)	C(149)	C(150)	121.4(5)
C(91)	C(90)	C(89)	119.8(4)
C(31)	C(32)	C(33)	119.6(5)
C(32)	C(33)	C(34)	122.2(4)
C(81)	C(80)	C(79)	119.6(4)
C(32)	C(31)	C(30)	121.3(5)

C(29)	C(30)	C(35)	122.3(4)
C(31)	C(30)	C(29)	119.0(4)
C(31)	C(30)	C(35)	118.7(4)
C(152)	C(153)	C(154)	122.0(4)
C(148)	C(153)	C(152)	118.0(5)
C(148)	C(153)	C(154)	119.9(5)
C(152)	C(151)	C(150)	119.4(5)
O(12)	C(71)	C(72)	118.2(3)
O(12)	C(71)	S(6')	121.3(3)
O(12)	C(71)	S(6)	121.0(3)
C(72)	C(71)	S(6')	118.7(3)
C(72)	C(71)	S(6)	118.6(3)
C(12)	C(11)	C(10)	119.8(4)
C(149)	C(148)	C(153)	121.3(5)
C(145)	C(144)	C(143)	120.3(5)
C(96)	C(95)	C(94)	120.3(4)
C(88)	C(89)	C(90)	120.3(4)
C(82)	C(81)	C(80)	120.8(4)
C(144)	C(143)	C(142)	119.1(5)
C(71)	S(6')	Pt(2)	103.10(15)
C(78)	S(5')	Pt(2)	103.85(15)
C(71)	S(6)	Pt(2)	102.72(16)
C(92)	S(7')	Pt(2)	101.26(16)
C(78)	S(5)	Pt(2)	102.32(17)
C(92)	S(7)	Pt(2)	105.25(18)
C(78)	O(9)	V(2)	129.2(6)
C(78)	O(9')	V(2)	137.8(5)
C(85)	S(8')	Pt(2)	103.19(17)
C(85)	S(8)	Pt(2)	105.2(2)

C(85)	O(10')	V(2)	132.0(4)
C(85)	O(10)	V(2)	132.5(5)

1. H. A. Stecher, A. Sen and A. L. Rheingold, *Inorg. Chem.*, 1988, **27**, 1130-1132.
2. H. D. Amberger, H. Reddmann, C. Guttenberger, B. Unrecht, L. Zhang, C. Apostolidis, O. Walter and B. Kanellakopulos, *Z. Anorg. Allg. Chem.*, 2003, **629**, 1522-1534.
3. S. A. Beach and L. H. Doerrer, *Acc. Chem. Res.*, 2018, DOI: 10.1021/acs.accounts.7b00585.
4. D. F. Evans, *J. Chem. Soc.*, 1959, 2003-2005.
5. S. K. Sur, *J. Magn. Reson.*, 1989, **82**, 169-173.
6. O. V. Dolomanov, L. J. Bourhis, R. J. Gildea, J. A. K. Howard and H. Puschmann, *J. Appl. Crystallogr.*, 2009, **42**, 339-341.
7. G. M. Sheldrick, *Acta Crystallogr., Sect. A: Found. Adv.*, 2015, **71**, 3-8.
8. G. Sheldrick, *Acta Crystallographica Section A*, 2008, **64**, 112-122.
9. G. A. Bain and J. F. Berry, *J. Chem. Educ.*, 2008, **85**, 532-536.
10. N. F. Chilton, R. P. Anderson, L. D. Turner, A. Soncini and K. S. Murray, *J. Comput. Chem.*, 2013, **34**, 1164-1175.