


# Unprecedented Hexanuclear Cobalt(II) Nonsymmetrical Salamo-Based Coordination Compound: Synthesis, Crystal Structure, and Photophysical Properties

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Received: 26 February 2018; Accepted: 20 March 2018; Published: 22 March 2018



**Abstract:** A novel hexanuclear Co(II) coordination compound with a nonsymmetrical Salamo-type bisoxime ligand  $H_4L$ , namely  $[Co_3(HL)(MeO)(MeOH)_2(OAc)_2]_2 \cdot 2MeOH$ , was prepared and characterized by elemental analyses, UV-vis, IR and fluorescence spectra, and X-ray single-crystal diffraction analysis. Each Co(II) is hexacoordinated, and possesses a distorted  $CoO_6$  or  $CoO_4N_2$  octahedrons. The Co(II) coordination compound possesses a self-assembled infinite 2D supramolecular structure with the help of the intermolecular C-H...O interactions. Meanwhile, the photophysical properties of the Co(II) coordination compound were studied.

**Keywords:** nonsymmetrical Salamo-type ligand; Co(II) coordination compound; crystal structure; synthesis; photophysical property

## 1. Introduction

Salen (*N,N'*-Disalicylideneethylenediamine) and its derivatives play an important role in inorganic chemistry [1–10], which are gained via the condensation reaction of diamines with salicylaldehyde or its analogues, and can coordinate to transition metal ions in a tetradentate chelating mode to form a neutral metal coordination compound [11–18]. Such coordination compounds have been extensively investigated as nonlinear optical materials [19], catalysts [20,21], strong activities with DNA, and so on [22–29]. In addition, some of these coordination compounds possess interesting magnetic properties [30–32]. Meanwhile, supramolecular chemistry has recognized Salen-type coordination compounds because of intermolecular hydrogen bonding interactions, C-H... $\pi$  and  $\pi$ ... $\pi$  stacking interactions consist in chelate rings and the associated aromatic rings [33–42]. In recent years, our focus switched to the syntheses, structures, and properties of metal coordination compounds with Salamo (2,2'-[Ethylenedioxybis(nitrilomethylidene)]diphenol) and its various derivatives derived from its constitutional units with different substituent groups [43–49]. The structural motifs of these coordination compound molecules may be affected by several factors, such as the performance of the ligands, the property of the central atoms, anion effects, solvent effects, and so on [50–59]. Transition metal Salamo-type coordination compounds have aroused widespread concerns for their photophysical properties [60–66]. Previous studies have been carried out on the mononuclear coordination compounds [67,68]. However, there are relatively few studies on multinuclear Salamo-type bisoxime coordination compounds. Though mono-, di-, and trinuclear Co(II) coordination compounds have been reported [69–71], the study of the synthesis and corresponding properties of multinuclear Co(II) coordination compounds are relatively few [72–74].

The purpose of the present work is the structural characterization of polynuclear Co(II) coordination compounds derived of nonsymmetrical Salamo-type bisoxime ligands. Here, the ligand  $H_4L$  and its corresponding hexanuclear Co(II) coordination compound ( $[Co_3(HL)(MeO)(MeOH)_2(OAc)_2]_2 \cdot 2MeOH$ ) was gained. In addition, the supramolecular buildings and photophysical behaviors of the Co(II) coordination compound are discussed.

## 2. Experimental

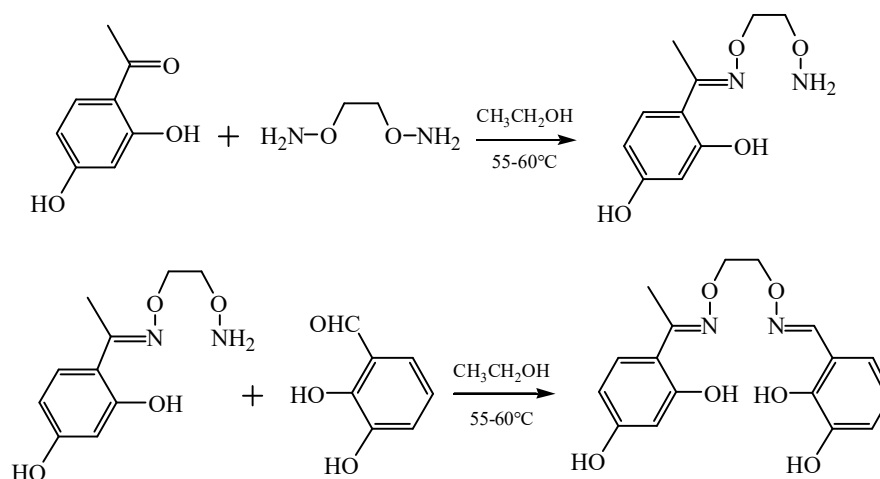
### 2.1. Materials and Physical Measurements

All chemicals were of analytical reagent grade. Elemental analyses for C, H, and N were gained using a GmbH VarioEL V3.00 automatic elemental analysis instrument (Berlin, Germany), elemental analysis for Co was detected by an IRIS ER/S-WP-1 ICP atomic emission spectrometer (Berlin, Germany). UV-vis and fluorescence spectra were measured on a Shimadzu UV-2550 spectrometer (Shimadzu, Japan) and F-7000 FL spectrometer (Hitachi, Tokyo, Japan), respectively. Infrared (IR) spectra were performed on a VERTEX-70 FT-IR spectrophotometer (Bruker, Billerica, MA, USA), with samples prepared as KBr ( $500\text{--}4000\text{ cm}^{-1}$ ).  $^1\text{H-NMR}$  spectra were carried out via German Bruker AVANCE DRX-400 spectroscopy (Bruker AVANCE, Billerica, MA, USA). Single-crystal X-ray structure determination was performed on a SuperNova Dual (Cu at zero) Eos four-circle diffractometer. Melting points were measured via a microscopic melting point apparatus (Beijing Taike Instrument Limited Company, Beijing, China).

### 2.2. Preparations and Characterizations

#### 2.2.1. Preparation and Characterization of $H_4L$

1,2-Bis(aminooxy)ethane was obtained by an early reported method [75–77]. Yield: 85.2%. Anal. Calcd for  $C_2H_8N_2O_2$  (%): C, 26.08; H, 8.76; N, 30.42. Found: C, 25.98; H, 8.90; N, 30.38. The synthetic route to  $H_4L$  is depicted in Scheme 1.



**Scheme 1.** Synthetic route to  $H_4L$ .

Monooxime compound was obtained by a modified method [32]. After purification by column chromatography, single condensation product of ethylene oxide single condensing 1,2-diamine-2,4-dihydroxyacetophenone was obtained. Reaction of ethylene oxide single condensing 1,2-diamine-2,4-dihydroxyacetophenone with 2,3-dihydroxybenzaldehyde provided one nonsymmetrical Salamo-type compound  $H_4L$ . Yield: 88.7%. Anal. Calcd. for  $C_{17}H_{18}N_2O_6$  (%): C, 58.89; H, 4.82; N, 8.17. Found: C, 59.23; H, 4.91; N, 8.01.  $^1\text{H-NMR}$  (400MHz,  $CDCl_3$ ):  $\delta$  = 2.28(s, 3H,  $-CH_3$ ), 4.45–4.53(m, 4H,  $-CH_2-CH_2-$ ), 5.12(s, 1H, O-H), 5.59(s, 1H, O-H), 6.42(m, 2H, Ar-H), 6.75(dd,

$J = 1.52, 1.28\text{Hz}$ , 1H, Ar-H), 6.85(t,  $J = 1.36, 1.20, 1.16\text{Hz}$ , 1H, Ar-H), 6.97(dd,  $J = 1.56, 1.68\text{Hz}$ , 1H, Ar-H), 7.28(d,  $J = 9.12\text{Hz}$ , 1H, Ar-H), 8.22(s, 1H, N=C-H), 9.91(s, 1H, O-H), 11.38(s, 1H, O-H) ppm.

## 2.2.2. Preparation and Characterization of the Co(II) Coordination Compound

A methanol solution (3 mL) of  $\text{Co}(\text{OAc})_2 \cdot 4\text{H}_2\text{O}$  (37.3 mg, 0.150 mmol) was added dropwise to a methanol solution (4 mL) of  $\text{H}_4\text{L}$  (17.3 mg, 0.050 mmol). The color of the mixed solution immediately turned to brown, and then continuing stirring for 2 h. The resultant solution was allowed to slowly evaporate at room temperature. Brown diamond single crystals suitable for X-ray diffraction studies were obtained after four weeks. Yield: 68.5%. Anal. Calcd. for  $\text{C}_{50}\text{H}_{72}\text{Co}_6\text{N}_4\text{O}_{28}$  (%): C, 39.23; H, 4.74; N, 3.66; Co, 26.10. Found: C, 39.62; H, 4.57; N, 3.38; Co, 25.78.

## 2.3. X-ray Structure Determination of the Co(II) Coordination Compound

X-ray diffraction data were collected on a SuperNova Dual (Cu at zero) Eos four-circle diffractometer via graphite monochromatized Mo- $K_\alpha$  radiation ( $\lambda = 0.71073 \text{ \AA}$ ) at 298(2) K. Unit cell parameters were determined by least squares analysis. The LP factor and semi-empirical absorption corrections were applied to the intensity data. The structure was solved by the direct method (SHELXS-97), and all hydrogen atoms were added theoretically. All non-hydrogen atoms were refined anisotropically using a full-matrix least-squares procedure on  $F^2$  with SHELXL-97. Anisotropic thermal parameters were assigned to all non-hydrogen atoms. The hydrogen atoms were generated geometrically. Some reflections with high intensities, which made the detector overflow, were automatically omitted by the diffractometer. So some reflections were missing. The crystallographic and structural refinement data for the Co(II) coordination compound are summed in Table 1. Supplementary crystallographic data for this paper have been deposited at the Cambridge Crystallographic Data Centre (1519431) and can be obtained free of charge via [www.ccdc.cam.ac.uk/conts/retrieving.html](http://www.ccdc.cam.ac.uk/conts/retrieving.html).

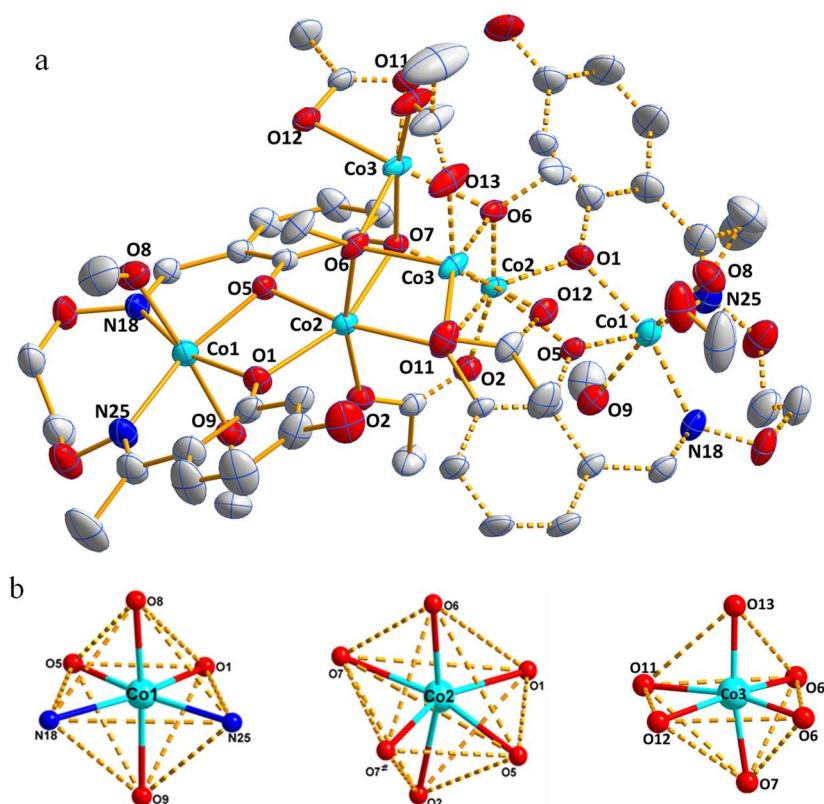
**Table 1.** Crystallographic and structural refinement data for the Co(II) coordination compound.

Molecular formula	$\text{C}_{50}\text{H}_{72}\text{Co}_6\text{N}_4\text{O}_{28}$
Molecular weight/ $\text{g}\cdot\text{mol}^{-1}$	1530.63
Color	Light-brown
Habit	Block-shaped
Crystal size (mm)	$0.21 \times 0.23 \times 0.31$
Crystal system	Monoclinic
Space group	$C2/c$
Unit cell dimension	
$a$ (Å)	17.9738(8)
$b$ (Å)	15.0717(8)
$c$ (Å)	24.5022(14)
$\alpha$ (°)	90
$\beta$ (°)	102.627(5)
$\gamma$ (°)	90
$V$ (Å <sup>3</sup> )	6477.0(6)
$Z$	4
$D_c$ (g·cm <sup>-3</sup> )	1.570
$\mu$ (mm <sup>-1</sup> )	1.585
$F(000)$	3144
$\theta$ range for data collection (°)	3.2–26.0
Index ranges	$-22 \leq h \leq 22, -18 \leq k \leq 18, -29 \leq l \leq 30$
Reflections collected	14,114
Completeness to $\theta = 25.00$ (%)	99.7
Data/restraints/parameters	6381/0/415
Final R indices ( $I > 2\sigma(I)$ )	$R_1 = 0.0504, wR_2 = 0.1227$
R indices (all data)	$R_1 = 0.0694, wR_2 = 0.1111$
Largest diff. peak and hole (e·Å <sup>-3</sup> )	0.51 and $-0.43$

### 3. Results and Discussion

#### 3.1. Description of the Crystal Structure

As depicted in Figure 1, the centrosymmetric neutral homomultinuclear Co(II) coordination compound has been revealed by single crystal X-ray diffraction (Table 2). It crystallizes in the monoclinic crystal system, space group  $C2/c$ , and consists of six Co(II) atoms, two  $(HL)^{3-}$  units, two  $\mu_2$ -acetato ions, two bidentate chelating acetate ions, two coordinated deprotonated methanol molecules, four coordinated methanol molecules, and two crystallizing methanol molecules. This 6:2 (Co(II) atom: Ligand) type of Co(II) coordination compound is unprecedented in the early reported Salamo-based Co(II) coordination compounds bearing the structures of 1:1 [44,58], 3:2 [44,47,74], 4:2 [15] and 8:4 [78]. (Figure 1) The whole coordination compound molecule is symmetrical and therefore only shows Co1, Co2, and Co3 coordination situation can explain the structure of the whole coordination compound. The terminal Co1 atom is located in the  $N_2O_2$  coordination sphere, the axial position is occupied by two oxygen atoms from two coordinated methanol molecules. The Co2 atom is surrounded by quadruple phenol oxygen atoms (O1, O5, O7 and O7<sup>#1</sup>) from two  $(HL)^{3-}$  moieties, one  $\mu_2$ -acetato oxygen atom (O2) and one deprotonated methanol oxygen atom (O6). Meanwhile, the Co3 atom coordinates with one phenol oxygen atom (O7) from one  $(HL)^{3-}$  moiety, one  $\mu_2$ -acetato oxygen atom (O13), two oxygen atoms (O6 and O6<sup>#1</sup>) of two coordinated deprotonated methanol molecules and two bidentate chelate acetato oxygen atoms (O11 and O12) which adopt a familiar Co–O–C–O–Co fashion. Each Co(II) atom bears a hexacoordinate sphere and possesses distorted  $CoO_6$  or  $CoO_4N_2$  octahedrons. The hydrogen atoms of two  $\mu_2$ -acetato ions (H10B, H10C, H10D and H10B<sup>#1</sup>, H10C<sup>#1</sup>, H10D<sup>#1</sup>; H22A, H22B, H22C and H22A<sup>#1</sup>, H22B<sup>#1</sup>, H22C<sup>#1</sup>) are disordered equally over two different positions, which were allowed for during refinement.



**Figure 1.** (a) Crystal structure and atom numberings of the Co(II) coordination compound; (b) Coordination polyhedrons for Co(II) atoms.

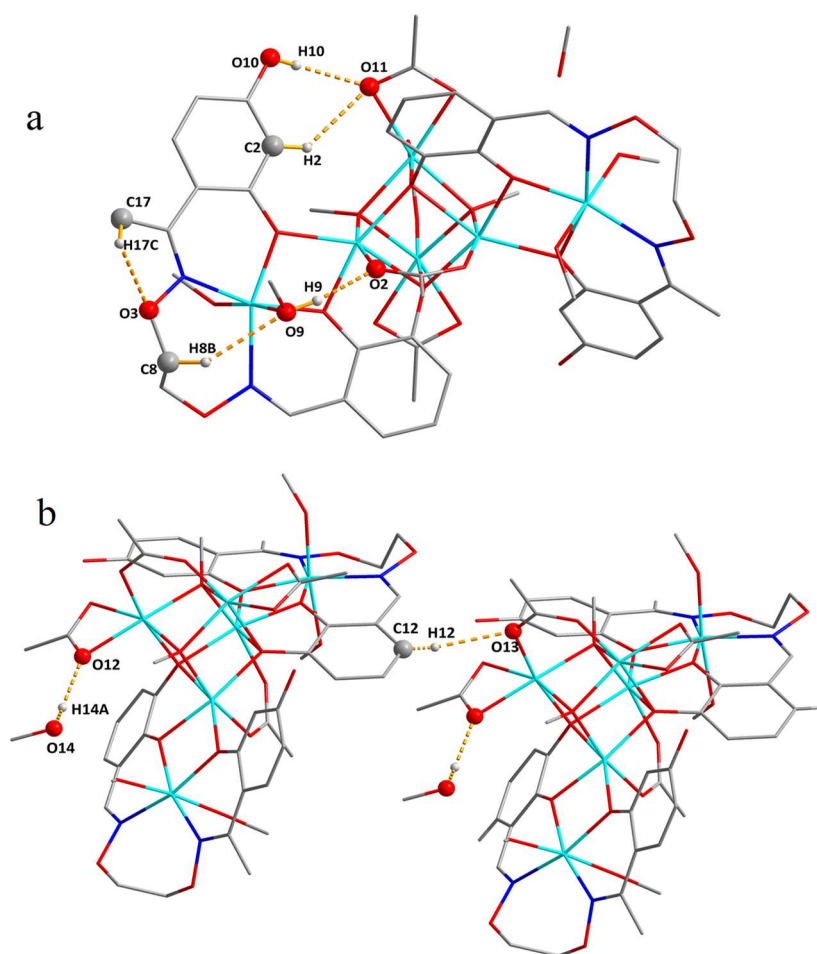
**Table 2.** Selected bond lengths (Å) and angles (°) for the Co(II) coordination compound.

Bond	Dist.	Bond	Dist.	Bond	Dist.
Co2–O1	2.117(3)	Co3–O6	2.061(2)	Co1–O1	2.019(3)
Co2–O2	2.141(3)	Co3–O6 <sup>#1</sup>	2.089(3)	Co1–O5	2.025(2)
Co2–O5	2.029(2)	Co3–O7	2.150(2)	Co1–O8	2.112(3)
Co2–O6	2.067(3)	Co3–O11	2.208(3)	Co1–O9	2.214(3)
Co2–O7	2.073(2)	Co3–O12	2.116(3)	Co1–N18	2.165(3)
Co2–O7 <sup>#1</sup>	2.209(2)	Co3–O13	2.041(3)	Co1–N25	2.113(4)
Co3–Co3 <sup>#1</sup>	2.9071(10)	Co3–C18	2.511(4)	Co3 <sup>#1</sup> –O6	2.089(3)
Co2 <sup>#1</sup> –O7	2.209(2)				
Bond	Angles	Bond	Angles	Bond	Angles
O1–Co2–O2	90.80(11)	O11–Co3–C18	30.08(12)	Co3–O6–Co2	101.80(10)
O1–Co2–O7 <sup>#1</sup>	153.79(9)	O12–Co3–Co3 <sup>#1</sup>	146.40(9)	Co3–O6–Co3 <sup>#1</sup>	88.94(11)
O2–Co2–O7 <sup>#1</sup>	88.85(10)	O13–Co3–O6	91.72(11)	C20–O6–Co2	121.2(3)
O5–Co2–O1	76.15(10)	O13–Co3–O6 <sup>#1</sup>	93.82(14)	C20–O6–Co3	122.4(2)
O5–Co2–O2	86.34(10)	O13–Co3–O7	170.00(10)	C20–O6–Co3 <sup>#1</sup>	115.2(3)
O5–Co2–O6	101.62(10)	O13–Co3–O11	92.80(13)	Co2–O7–Co2 <sup>#1</sup>	92.10(9)
O5–Co2–O7 <sup>#1</sup>	77.67(9)	O13–Co3–O12	98.46(11)	Co2–O7–Co3	98.68(9)
O5–Co2–O7	163.15(10)	O13–Co3–C18	97.74(13)	Co3–O7–Co2 <sup>#1</sup>	94.82(9)
O6–Co2–O1	102.51(11)	C18–Co3–Co3 <sup>#1</sup>	176.17(11)	C15–O7 <sup>#1</sup> –Co2 <sup>#1</sup>	105.67(19)
O6–Co2–O2	165.75(10)	O1–Co1–O5	78.47(10)	C15–O7–Co2 <sup>#1</sup>	133.1(2)
O6–Co2–O7	80.59(9)	O1–Co1–O8	98.60(14)	C15–O7–Co3 <sup>#1</sup>	121.9(2)
O6–Co2–O7 <sup>#1</sup>	81.45(10)	O1–Co1–O9	87.35(11)	Co1–O8–H8	111(4)
O7–Co2–O1	119.97(10)	O1–Co1–N18	161.07(12)	C24–O8–Co1	132.9(3)
O7–Co2–O2	88.43(10)	O1–Co1–N25	86.34(13)	Co1–O9–H9	98(4)
O7–Co2–O7 <sup>#1</sup>	86.23(9)	O5–Co1–O8	91.60(11)	C23–O9–Co1	122.5(3)
O6 <sup>#1</sup> –Co3–Co3 <sup>#1</sup>	45.14(7)	O5–Co1–O9	90.46(11)	C18–O11–Co3	88.4(3)
O6–Co3–Co3 <sup>#1</sup>	45.92(8)	O5–Co1–N18	83.09(11)	C18–O12–Co3	92.5(2)
O6–Co3–O6 <sup>#1</sup>	87.96(11)	O5–Co1–N25	164.65(13)	C10–O13–Co3	126.2(4)
O6–Co3–O7 <sup>#1</sup>	82.40(10)	O8–Co1–O9	173.99(13)	O4–N18–Co1	124.2(2)
O6–Co3–O7	78.93(9)	O8–Co1–N18	86.09(14)	C10–N18–Co1	127.3(3)
O6–Co3–O11 <sup>#1</sup>	161.75(10)	O8–Co1–N25	92.93(14)	O3–N25–Co1	120.9(3)
O6–Co3–O11	108.83(11)	N18–Co1–O9	88.55(13)	C7–N25–Co1	128.9(3)
O6–Co3–O12 <sup>#1</sup>	101.92(11)	N25–Co1–O9	86.53(14)	Co1–O5–Co2	103.33(11)
O6–Co3–O12	165.23(11)	N25–Co1–N18	111.85(14)	C16–O5–Co2	112.6(2)
O6–Co3–C18	137.80(13)	Co1–O1–Co2	100.48(11)	C16–O5–Co1	132.1(2)
O6–Co3 <sup>#1</sup> –C18	131.87(12)	C1–O1–Co2	128.5(3)	Co2–O6–Co3 <sup>#1</sup>	101.10(11)
O7–Co3–Co3 <sup>#1</sup>	90.21(6)	C1–O1–Co1	129.0(2)	O12–Co3–O7	91.39(10)
O7–Co3–O11	93.59(11)	C21–O2–Co2	128.6(3)	O12–Co3–O11	60.23(11)
O7–Co3–C18	91.63(12)	O12–Co3–O7	91.39(10)	O12–Co3–O11	60.23(11)
O11–Co3–Co3 <sup>#1</sup>	153.05(8)				

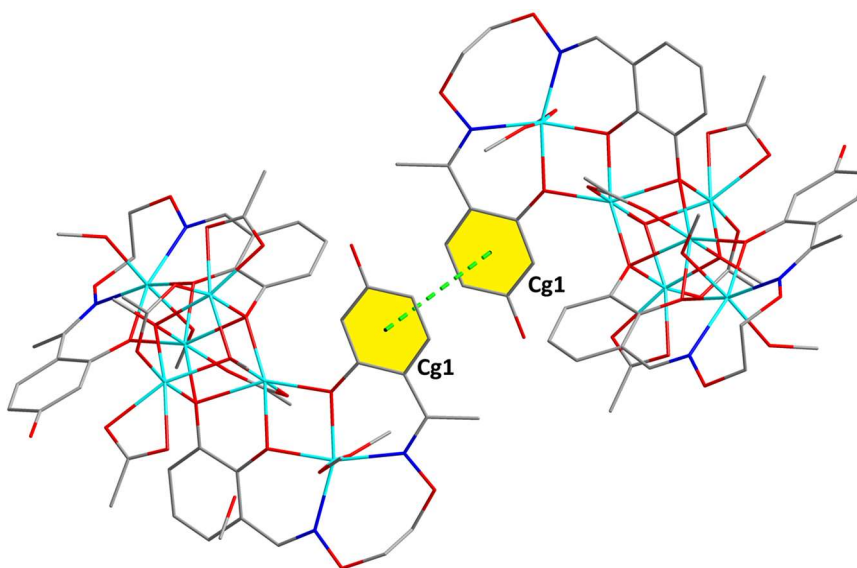
Symmetry transformations used to generate equivalent atoms: #1-*x*+1, -*y*+1, -*z*+1.

In the crystal structure of the Co(II) coordination compound, there are five significant intramolecular hydrogen bonds (O9–H9···O2, O10–H10···O11, C2–H2···O11, C17–H17C···O3 and C8–H8B···O9) and two intermolecular C12–H12···O13 and O14–H14A···O12 interactions (Figure 2). In addition, there is a pair of  $\pi\cdots\pi$  interactions Cg1···Cg1 (Cg1=C1–C2–C3–C4–C5–C6) (Figure 3) in the Co(II) coordination compound [79]. Meanwhile, the hydrogen bonds interactions existing in the Co(II) coordination compound are described in graph sets (Figure 4) [80]. Furthermore, the molecules are linked by intermolecular interactions form a 2D infinite planar (Figure 5). Putative hydrogen bonds for the Co(II) coordination compound are listed in Table 3.





**Figure 2.** View of the intramolecular (a) and intermolecular (b) interactions of the Co(II) coordination compound.



**Figure 3.**  $\pi \cdots \pi$  stacking interactions of the Co(II) coordination compound.

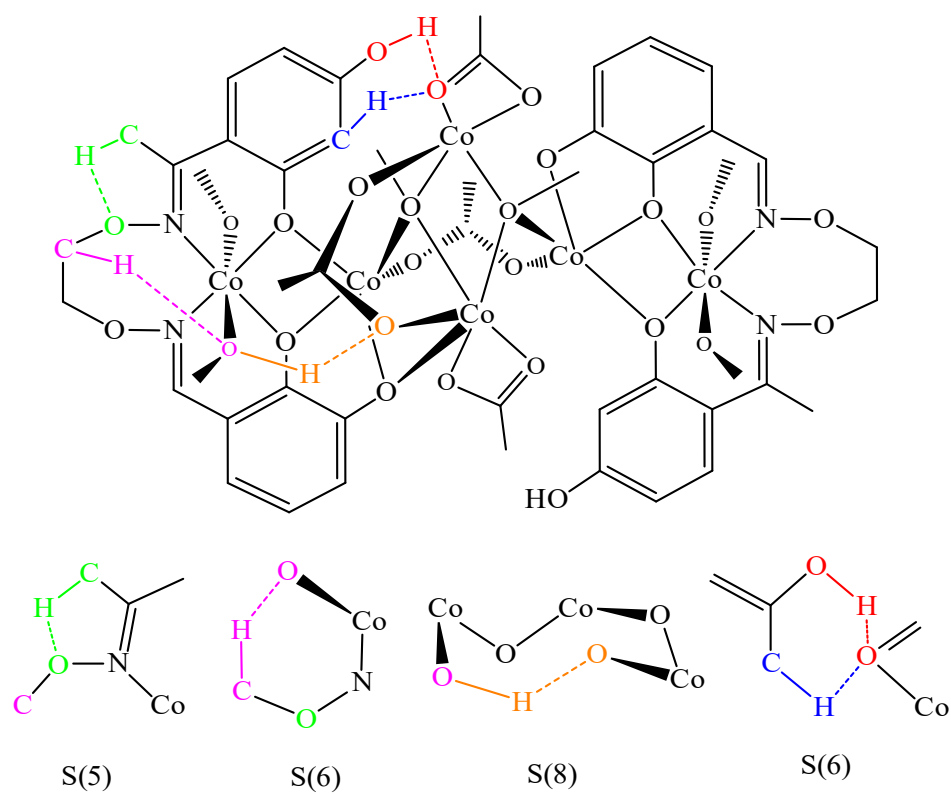


Figure 4. Graph set assignments for the Co(II) coordination compound.

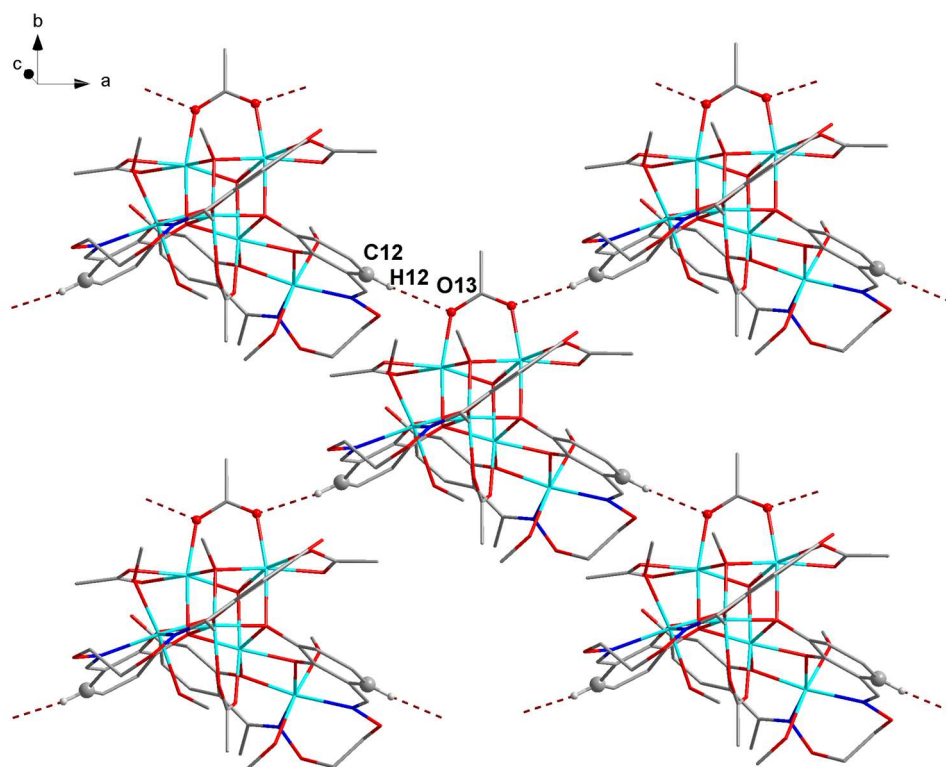


Figure 5. View of the 2D layered structure of the Co(II) coordination compound.

**Table 3.** Putative hydrogen bondings (Å), (°) in the Co(II) coordination compound.

D–H···A	d(D–H)	d(H···A)	d(D···A)	∠D–H···A	Symmetry Code
C12–H12···O13	0.93	2.35	3.275(5)	171	−1/2+x, −1/2+y, z
O9–H9···O2	0.85	1.77	2.616(4)	171	
O10–H10···O11	0.82	1.99	2.759(5)	157	
O14–H14A···O12	0.82	1.90	2.718(5)	175	
C2–H2···O11	0.93	2.46	3.191(5)	135	
C8–H8B···O9	0.97	2.45	3.291(6)	145	−x, y, 1/2 − z
C17–H17C···O3	0.96	2.19	2.543(8)	100	

### 3.2. IR Spectroscopy

IR spectra (Table 4) of H<sub>4</sub>L and its corresponding Co(II) coordination compound exhibit different bands in the region of 400–4000 cm<sup>−1</sup>. H<sub>4</sub>L shows a characteristic C=N stretching band at 1630 cm<sup>−1</sup>, while the C=N stretching band of the Co(II) coordination compound appears at 1592 cm<sup>−1</sup> [64]. For the ligand H<sub>4</sub>L, the Ar–O stretching band appears at 1260 cm<sup>−1</sup>, which is observed at 1255 cm<sup>−1</sup> for the Co(II) coordination compound. The characteristic C=N and Ar–O stretching frequencies are shifted to lower frequencies, exhibiting that the Co–N and Co–O bonds are formed [69,71]. The O–H stretching frequency of H<sub>4</sub>L appears at 3373 cm<sup>−1</sup>, whereas the Co(II) coordination compound shows a stretching band at 3421 cm<sup>−1</sup>, which is attributed to vibrations of the coordinated methanol molecules. For the Co(II) coordination compound, the  $\nu_{(\text{Co–O})}$  and  $\nu_{(\text{Co–N})}$  frequencies are observed at 463 and 519 cm<sup>−1</sup>, respectively [74,81].

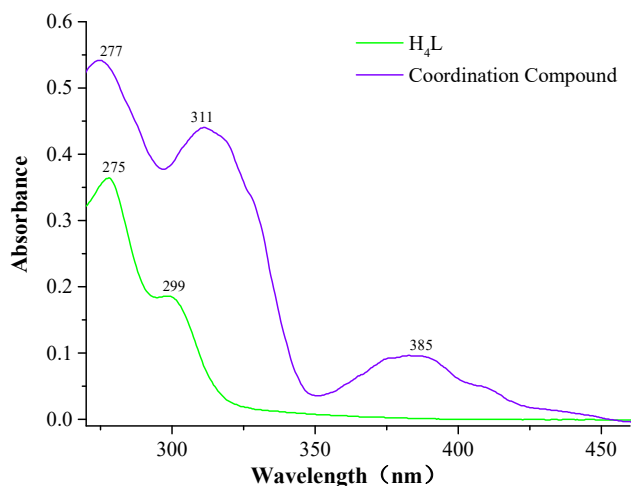
**Table 4.** Major IR bands for H<sub>4</sub>L and its Co(II) coordination compound (cm<sup>−1</sup>).

Compound	$\nu_{(\text{O–H})}$	$\nu_{(\text{C=N})}$	$\nu_{(\text{Ar–O})}$	$\nu_{(\text{Co–O})}$	$\nu_{(\text{Co–N})}$
H <sub>4</sub> L	3373	1630	1260	–	–
Co(II)	3421	1592	1255	463	519

### 3.3. UV–Vis Spectroscopy

The UV–vis spectra of H<sub>4</sub>L and its Co(II) coordination compound were measured in  $1 \times 10^{-6}$  mol·L<sup>−1</sup> CH<sub>2</sub>Cl<sub>2</sub> solution. It is noteworthy that the absorption peaks of the Co(II) coordination compound are evidently different from those of H<sub>4</sub>L (Figure 6). Electronic absorption spectrum of H<sub>4</sub>L composes of two relatively intense peaks centered at 275 and 299 nm, attributed to the intra-ligand  $\pi$ – $\pi^*$  transitions of the benzene rings and the C=N bonds, respectively. Compared with H<sub>4</sub>L, the absorption peaks of the Co(II) coordination compound appears at 277 and 311 nm, which are bathochromically shifted by ca. 2 and 12 nm, exhibiting the Co(II) ions have coordinated with H<sub>4</sub>L. The new peak of the Co(II) coordination compound appears at ca. 385 nm, attributed to L→M charge-transfer transition [82,83].

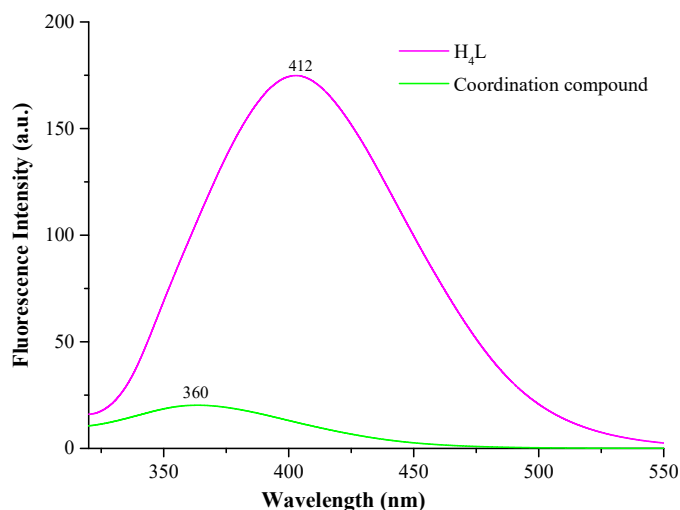




**Figure 6.** UV-vis spectra of H<sub>4</sub>L and its Co(II) coordination compound in CH<sub>2</sub>Cl<sub>2</sub> ( $1 \times 10^{-6}$ M).

### 3.4. Fluorescence Properties

The fluorescence properties of H<sub>4</sub>L and its corresponding Co(II) coordination compound were studied and are depicted in Figure 7. H<sub>4</sub>L displays strong emission peak at ca. 412 nm upon excitation at 271 nm, and it should be attributed to the intra-ligand  $\pi-\pi^*$  transition. The Co(II) coordination compound displays lower photoluminescence with maximum emission at ca. 360 nm. Compared with H<sub>4</sub>L, emission intensity of the Co(II) coordination compound evidently reduces, showing that the Co(II) ions possess a certain degree of fluorescence quenching, which makes the conjugated system larger, and also indicates it may be a purple device. The solid-state fluorescence spectra of the ligand H<sub>4</sub>L and its Co(II) coordination compound are depicted in Figure 8. Compared to liquid fluorescence spectroscopy, the ligand H<sub>4</sub>L and its corresponding Co(II) coordination compound have strong fluorescence in solid-state fluorescence spectroscopy.



**Figure 7.** Fluorescence spectra of H<sub>4</sub>L and its Co(II) coordination compound in dilute CH<sub>2</sub>Cl<sub>2</sub> solutions ( $c = 1 \times 10^{-6}$ M,  $\lambda_{\text{ex}} = 271$  nm).

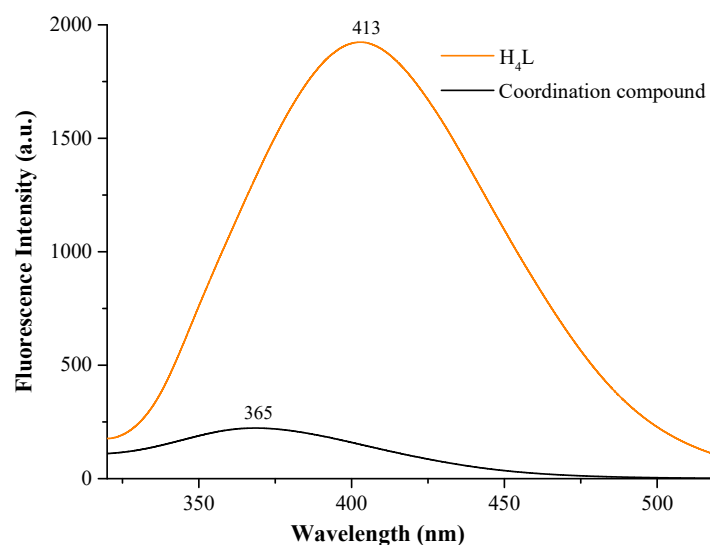


Figure 8. Fluorescence spectra of the ligand  $H_4L$  and its Co(II) coordination compound in the solid state.

#### 4. Conclusions

In summary, we have synthesized and characterized a nonsymmetrical Salamo-type  $N_2O_2$  ligand, and obtained an unprecedented hexanuclear Co(II) coordination compound,  $[Co_3(HL)(MeO)(MeOH)_2(OAc)_2] \cdot 2MeOH$ . X-ray crystal structure analysis of the Co(II) coordination compound revealed that each Co(II) is hexacoordinated, and possesses distorted  $CoO_6$  or  $CoO_4N_2$  octahedrons. The Co(II) coordination compound possesses a 2D layered structure through intermolecular C–H $\cdots$ O interactions. In addition, the fluorescence properties indicate that coordinated Co(II) ions resulted to the fluorescence quenching of  $H_4L$ .

**Acknowledgments:** This work was supported by the National Natural Science Foundation of China (21761018) and the Program for Excellent Team of Scientific Research in Lanzhou Jiaotong University (201706), which is gratefully acknowledged.

**Author Contributions:** Wen-Kui Dong and Fei Wang conceived and designed the experiments; Bo-Xian Jin performed the experiments; Ling-Zhi Liu analyzed the data; Wen-Kui Dong contributed reagents/materials/analysis tools; Zong-Li Ren wrote the paper.

**Conflicts of Interest:** The authors declare no competing financial interests.

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