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Copper(II) and Cadmium(II) Complexes Based on N.N-Bis(3.5-dimethyl-2hydroxybenzyl)-N-(2-pyridylmethyl)amine Ligand: Syntheses, Structures, Magnetic, and Luminescent Properties

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Keywords: Aryl-oxide ligand; In situ metal/ligand reaction; Coordination complexes; Luminescence; Magnetic properties

Abstract. The reaction of the aryl-oxide ligand H_2L [$H_2L = N_1N_2$] bis(3,5-dimethyl-2-hydroxybenzyl)-N-(2-pyridylmethyl)amine] with CuSO₄·5H₂O, CuCl₂·2H₂O, CuBr₂, CdCl₂·2.5H₂O, and Cd(OAc)₂· 2H₂O, respectively, under hydrothermal conditions gave the complexes $[Cu(H_2L^1)_2]$ ·SO₄·3CH₃OH (1), $[Cu_2(H_2L^2)_2Cl_4]$ (2), $[Cu_2(H_2L^2)_2Br_4]$ (3), $[Cd_2(HL)_2Cl_2]$ (4), and $[Cd_2(L)_2(CH_3COOH)_2] \cdot H_2L$ (5), where H_2L^1 [$H_2L^1 = 2,4$ -dimethyl-6-((pyridin-2-ylmethylamino)methyl)phenol] and H_2L^2 [$H_2L^2 = 2$ -(2,4-dimethyl-6-((pyridin-2-ylmethylamino))

Introduction

The study of complexes with tetradentate amine-bis(phenolate) ligands is of unabated interest to inorganic chemists. The efforts of several research groups are driven by a number of considerations. These include the development of the structural models for mimicking the active site of galactose oxidase,^[1–3] the employment of the tetradentate amine-bis(phenolate) ligands in the synthesis of coordination complexes with interesting magnetic properties,^[4-8] and the application of metal ion/ tetradentate amine-bis(phenolate) systems as efficient catalysts for the polymerization of olefins and lactides.^[9-11] As a subclass of the tetradentate amine-bis(phenolate) ligands, N,Nbis(3,5-dimethyl-2-hydroxybenzyl)-N-(2-pyridylmethyl)amine (H₂L)^[12] is currently popular ligand because of several aspects. It is a tripodal ligand featuring a N₂O₂ donor site and forms mononuclear complexes with various transition metals, such as indium,^[13] rhodium,^[14] and titanium.^[15-16] Mean-

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methyl)phenoxy)-4,6-dimethylphenol] were derived from the solvothermal in situ metal/ligand reactions. These complexes were characterized by IR spectroscopy, elementary analysis, and X-ray diffraction. A low-temperature magnetic susceptibility measurement for the solid sample of 2 revealed antiferromagnetic interactions between two central copper(II) atoms. The emission property studies for complexes 4 and 5 indicated strong luminescence emission.

while, the phenol oxygen atom of the ligand can serve as a bridging atom [bis(µ-phenoxo) bridging motif], generating dinuclear iron^[17] and scandium^[15] complexes. There is only one polymeric 1D chain complex ([Cu(H₂L)(SO₄)]•CH₃OH) reported.[18]

However, all of the reported mononuclear and dinuclear complexes were synthesized by traditional coordination chemistry techniques, and the above-mentioned 1D chain complex^[18] can only be generated under the solvothermal conditions. We envisioned that a number of new polynuclear complexes with aesthetically pleasing structures and fascinating properties might be prepared under solvothermal conditions. With this consideration in mind, we performed the reactions between metal salts and H₂L ligand under solvothermal condi-



Scheme 1. The structures of the H_2L , H_2L^1 , and H_2L^2 ligands, and the reaction scheme for the H₂L ligand.

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Pages: 7

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tions. Our investigations led to five complexes of compositions $[Cu(H_2L^1)_2]\cdot SO_4 \cdot 3CH_3OH$ (1), $[Cu_2(H_2L^2)_2Cl_4]$ (2), $[Cu_2(H_2L^2)_2Br_4]$ (3), $[Cd_2(HL)_2Cl_2]$ (4), and $[Cd_2(L)_2(CH_3-COOH)_2]\cdot H_2L$ (5), where H_2L^1 $[H_2L^1 = 2,4$ -dimethyl-6-((pyr-idin-2-ylmethylamino)methyl)phenol] and H_2L^2 $[H_2L^2 = 2 \cdot (2,4$ -dimethyl-6-((pyridin-2-ylmethylamino)methyl)phenoxy)-4,6-dimethylphenol] were derived from solvothermal in situ metal/ligand reactions (Scheme 1). Herein, we report the syntheses, structures, and properties of these complexes.

Results and Discussion

Synthesis and IR Spectra

Complexes 1–5 were prepared under solvothermal conditions in methanol in sealed reaction vessels (Scheme 2).



Scheme 2. Syntheses of complexes 1-5.

Treatment of $CuSO_4 \cdot 5H_2O$ with two equiv. of the H_2L ligand led to $[Cu(H_2L^1)_2] \cdot SO_4 \cdot 3CH_3OH$ (1), where H_2L^1 was believed to be obtained by the in situ metal ligand reaction between $CuSO_4 \cdot 5H_2O$ and the H_2L ligand.^[2] Complex 1 was readily isolated as purple crystals with moderate yield.

The reactions of the H₂L ligand with one equiv. of CuCl₂·2H₂O and two equiv. of CuBr₂, respectively, generated $[Cu_2(H_2L^2)_2Cl_4]$ (2) and $[Cu_2(H_2L^2)_2Br_4]$ (3), in which the H₂L² ligand was assumed to be formed by the in situ metal/ ligand reaction of Cu^{II} and the H₂L ligand.^[2]

Treatment of the H_2L ligand with one equiv. of $CdCl_2 \cdot 2.5H_2O$ and $Cd(OAc)_2 \cdot 2H_2O$, respectively, gave $[Cd_2(HL)_2Cl_2]$ (4) and $[Cd_2L_2(CH_3COOH)_2] \cdot H_2L$ (5). They were both directly obtained as colorless crystals in moderate yields.

We have explored the preparation of 1-5 by "conventional" coordination chemistry. The synthetic investigation of the metal salts and the H₂L ligand in MeOH under atmospheric and ambient or reflux conditions resulted in solutions from which we failed to crystallize any product. It seems that solvo-thermal technique is a good method to prepare 1-5.

The presence of –OH groups in 1–5 is manifested by a broad IR band of medium intensity at $3421-3441 \text{ cm}^{-1}$. The strong intensity band in the $3135-3202 \text{ cm}^{-1}$ range, which was observed in 1–3 but was not found in 4–5, was assigned to the v(N–H) mode. The presence of the v(N–H) mode confirms the decomposition of the ligand H₂L in 1–3. The band in the range of 2912–2919 cm⁻¹ in 1–5 was ascribed to the v_{as}(C–H) vibration. Several bands, which are assigned as the stretching

vibrations of the aromatic rings and deformation vibrations of –OH groups in 1–5, appear in the 1612–1446 cm⁻¹ range. The out-plane deformation of the aromatic ring in 1–5 was found in the 788–659 cm⁻¹ range.

Structure Descriptions of Complexes 1-5

Partially labeled plots of complexes 1–5 are shown in Figure 1, Figure 2, Figure 3, and Figure 4. The crystallographic data of the complexes are listed in Table 1.



Figure 1. (a) Solid state structure of 1 showing the atom labeling scheme. Hydrogen atoms and solvent molecules are omitted for clarity. (b) Crystal packing diagram of complex 1. Hydrogen contacts are represented by dotted lines.



Figure 2. Solid state structure of **2** ($X = \text{Cl}^-$) and **3** ($X = \text{Br}^-$) showing the atom labeling scheme. Hydrogen atoms are omitted for clarity.







Figure 3. Solid state structure of **4** showing the atom labeling scheme. Hydrogen atoms are omitted for clarity.



Figure 4. Solid state structure of 5 showing the atom labeling scheme. Hydrogen atoms and one free ligand molecule are omitted for clarity.

Structure of $[Cu(H_2L^1)_2]$ ·SO₄·3CH₃OH (1)

X-ray crystallographic analysis reveals that **1** crystallizes in the triclinic $P\bar{1}$ space group. It consists of one Cu^{II} ion, two H₂L¹ ligands, which were assumed to be derived from the decomposition of the H₂L ligand, one SO₄²⁻ ion, and three solvate methanol molecules (Figure 1a). The central Cu^{II} atom displays a square planar arrangement and is coordinated by two pyridine nitrogen atoms (N1 and N1'), and two amine nitrogen atoms (N2 and N2') from two H₂L¹ ligands, with Cu–N bond lengths being 1.999(4) Å (N1, N1') and 2.050(4) Å (N2, N2'). The Cu–N bond lengths within **1** are slightly shorter than those in previously reported amine-containing Cu^{II} complexes [2.156(3)–2.1982(14) Å^[19–20] for Cu–N(amine) bonds, and 2.066(4)–2.119(4) Å^[21–22] for Cu–N(pyridyl) bonds].

Noticeable intermolecular N–H•••O contacts are presented from NH group of the H_2L^1 ligand (donor) to the oxygen atom

of SO_4^{2-} ion (acceptor). These hydrogen contacts connect the molecules to generate an infinite 1D chain structure (Figure 1b).

Structures of $[Cu_2(H_2L^2)_2Cl_4]$ (2) and $[Cu_2(H_2L^2)_2Br_4]$ (3)

Complex **2** has a centrosymmetrical dimeric structure. The two Cu^{II} ions are linked by a pair of chloride bridges and have a similar pentacoordinate environment. The arrangement around each central Cu^{II} atom is best described as a distorted square-pyramid ($\tau = 0.13$, the parameter τ is used to describe the geometry; τ is zero for an ideal square pyramid and one for an ideal trigonal bipyramid^[23]. The Cu^{II} ion is bound to one amine nitrogen atom, one pyridine nitrogen atom, a terminal Cl⁻ ion and two bridging Cl⁻ ions. The Cu–N distances [2.100(3) and 2.013(2) Å] are slightly shorter than those in previously reported complexes containing Cu–N bonds [2.156(3)–2.1982(14) Å^[19–20] for Cu–N(amine) bonds and 2.066(4)–2.119(4) Å^[21,22] for Cu–N(pyridyl) bonds]. The Cu–Cl distances are concurrent with the published values.^[24]

Complex 3 is isostructural with complex 2; therefore the structure of complex 3 is not described herein in detail.

Structure of $[Cd_2(HL)_2Cl_2]$ (4)

X-ray crystallographic analysis reveals that complex **4** is a dinuclear compound. It contains two Cd^{II} ions, two HL⁻ ligands and two Cl⁻ anions. The complex has a crystallographically-imposed C_2 symmetry. The result is that there is one crystallographically independent Cd^{II} site. The two cadmium atoms are bridged by two endogenous μ -phenoxo oxygen atoms, with the Cd···Cd distance being 3.4811(12) Å. Each cadmium atom was five-coordinate, with τ value being 0.167, indicating an arrangement closer to a regular square pyramid ($\tau = 0$) than to a regular trigonal bipyramid ($\tau = 1$).^[23] The basal plane contains one terminal Cl⁻ ion, one μ -phenoxo oxygen atom, one nitrogen atom of amine, and one nitrogen atom from pyridine ring. The oxygen atom from the other HL⁻ ligand (μ -phenoxo oxygen) occupies the apical position.

Structure of $[Cd_2L_2(CH_3COOH)_2] \cdot H_2L$ (5)

X-ray crystallographic analysis reveals that complex **5** is dinuclear and has a crystallographically-imposed C_2 symmetry, too. The complex is composed of two Cd^{II} ions, two L^{2–} ligands, two acetic acids, and one free H₂L ligand. The two Cd^{II} atoms are bridged by two phenoxo oxygen atoms from two L^{2–} ligands. Each central Cd^{II} atom is coordinated by two nitrogen atoms and one bridging phenoxo oxygen atom from one L^{2–} ligand, one bridging phenoxo oxygen atom from the other L^{2–} ligand, and one oxygen atom from one acetic acid molecule. The environment of the central metal could be described as a distorted octahedron. The Cd–O(μ -phenoxo) bond lengths are 2.231(2) and 2.374(2) Å, which are in the range of Cd–O bond lengths observed in other Cd^{II} complexes [2.213(3)–2.455(5) Å].^[25–26]

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A number of coordination complexes of transition metals supported by the tetradentate amine-bis(phenolate) ligands have been documented,^[1–11] but no coordination complex of Cd^{II} ion was reported. Complexes **4** and **5** are the first two coordination complexes based on the tetradentate amine-bis(phenolate) ligands.

Magnetic Property of 2

Magnetic property studies on polynuclear metal complexes are of continuing interest for coordination chemists. The dc magnetic property for **2** was measured in the temperature range of 2–300 K at the applied magnetic field of 1000 Oe (Figure 5). At 300 K, the $\chi_M T$ product value is measured to be 0.76 cm³·mol⁻¹·K, which is close to the theoretical value for the two isolated magnetic centers per formula unit (0.75 cm³·mol⁻¹·K). Upon cooling, the value is almost unchangeable (around 0.8 cm³·mol⁻¹·K) at the temperature range of 300–20 K, below which it decreases rapidly to a value of 0.16 at 2 K. This behavior indicates the antiferromagnetic interactions between the magnetic centers.



Figure 5. Temperature dependence of magnetic susceptibilities in the form of $\chi_M T$ vs. *T* for **2** at 1 kOe.

The Curie-Weiss fitting of the magnetic data (200–4 K) yields C = 0.83 cm³·mol⁻¹·K and $\theta = -0.70$ K (Figure 6), indicating the presence of very weak antiferromagnetic exchange coupling interactions between the central metal atoms.



Figure 6. Temperature dependence of magnetic susceptibilities in the form of $\chi_{\rm M}^{-1}$ vs. *T* for **2** at 1 kOe. The solid line corresponds to the best fit from 200 K to 4 K.

Luminescence Properties of 4 and 5

Pages: 7

Many previous studies have shown that coordination compounds including Cd^{II} and Zn^{II} ions, which have d¹⁰ arrangement exhibit luminescence properties.^[27–29] Thus we investigated the luminescent properties of the ligand H₂L and complexes **4** and **5** (Figure 7). In the solid state H₂L emits at a maximum 448 nm upon excitation around 360 nm. The spectra of compounds **4** and **5** show strong luminescence emission bands. Blue-shifted maxima at approximately 392 nm ($\lambda_{ex} =$ 305 nm) for **4** and red-shifted maxima at approximately 484 nm ($\lambda_{ex} =$ 335 nm) for **5** were observed.



Figure 7. Normalized emission spectra of H_2L , 4, and 5 in the solid state at room temperature.

Conclusions

Five complexes of compositions $[Cu(H_2L^1)_2] \cdot SO_4 \cdot 3CH_3OH$ (1), $[Cu_2(H_2L^2)_2Cl_4]$ (2), $[Cu_2(H_2L^2)_2Br_4]$ (3), $[Cd_2(HL)_2Cl_2]$ (4), and $[Cd_2(L)_2(CH_3COOH)_2] \cdot H_2L$ (5) were prepared and characterized, where the ligands H_2L^1 and H_2L^2 were generated via solvothermal in situ metal/ligand reactions. Magnetic property measurement indicates that there exist weak antiferromagnetic interactions between the magnetic centers in 2. The emission property studies reveal strong luminescence emission for complexes 4 and 5. Blue-shift maxima at approximately 392 nm ($\lambda_{ex} = 305$ nm) for 4 and red-shift maxima at approximately 484 nm ($\lambda_{ex} = 335$ nm) for 5 were observed. The indepth researches to produce polynuclear complexes, which may exhibit SMMs behavior, by adding other paramagnetic transition metals are under investigation in our lab. Our studies, already well advanced, will be reported soon.

Experimental Section

Materials and Instruments: All reagents used in the synthesis were of analytical grade. Elemental analyses for carbon, hydrogen, and nitrogen atoms were performed with a Carlo-Erba EA1110 CHNO-S microanalyzer. Infrared spectra (4000–400 cm⁻¹) were recorded by using KBr pellets with a Nicolet MagNa-IR500 FT-IR spectrometer.

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38:28

Pages: 7

Cu^{II} and Cd^{II} Complexes Based on *N*,*N*-Bis(3,5-dimethyl-2-hydroxybenzyl)-*N*-(2-pyridylmethyl)amine



Crystal determination was performed with a Bruker SMART APEX II CCD diffractometer equipped with graphite-mono-chromatized Mo- K_{α} radiation ($\lambda = 0.71073$ Å). Variable-temperature magnetic susceptibilities were measured with a Quantum Design MPMS-7 SQUID magnetometer. Diamagnetic corrections were made with Pascal's constants for all constituent atoms. The solid-state luminescence emission/excitation spectra were recorded on a FLS920 fluorescence spectrophotometer equipped with a continuous Xe-900 xenon lamp and a μ F900 microsecond flash lamp.

X-ray Crystallography: The single crystals were placed in a Bruker SMART APEX II CCD. The diffraction data were obtained by using graphite monochromated Mo- K_{α} radiation with an ω - 2θ scan technique at room temperature. The structure was solved by direct methods with SHELX-97. A full-matrix least-squares refinement on F^2 was carried out by using SHELXL-97. The collected crystal data for the five structures are shown in Table 1.

Crystallographic data (excluding structure factors) for the structures in this paper have been deposited with the Cambridge Crystallographic Data Centre, CCDC, 12 Union Road, Cambridge CB21EZ, UK. Copies of the data can be obtained free of charge on quoting the depository numbers CCDC-842644 (1), -821013 (2), -838312 (3), -838313 (4), and -805584 (5) (Fax: +44-1223-336-033; E-Mail: deposit@ccdc.cam.ac.uk, http://www.ccdc.cam.ac.uk).

[Cu(H₂L¹)₂]·SO₄·3CH₃OH (1): A mixture of CuSO₄·5H₂O (0.0125 g, 0.05 mmol), H₂L (0.0377 g, 0.1 mmol), and methanol (1.2 mL) was sealed in a 8 mL Pyrex-tube, which was heated at 70 °C for 3 days and cooled to room temperature at a rate of 5 K·h⁻¹. Purple crystals of 1 were collected in a yield of 36% (0.0133 g). Elemental analysis: C₃₃H₄₈CuN₄O₉S (740.4): calcd. C 53.53, H 6.53, N 7.57%; found: C 54.19, H 5.20, N 7.69%. **IR** (KBr, selected data): $\tilde{v} = 3441$ (m), 3135 (m), 1612 (s), 1498 (s), 1438 (m), 1256 (s), 1220 (m), 1161 (m), 1139 (m), 1049 (m), 859 (m), 768 (m), 618 (m) cm⁻¹.

 $[Cu_2(HL^2)_2Cl_4]$ (2): A mixture of CuCl₂·2H₂O (0.0085 g, 0.05 mmol), H₂L(0.0189 g, 0.05 mmol), and methanol (1.2 mL) was sealed in a

Table 1. Crystal data and structure refinements for 1-5.

8 mL Pyrex-tube, which was heated at 70 °C for 3 days and cooled to room temperature at a rate of 5 K·h⁻¹. Blue crystals of **2** were collected in a yield of 65% (0.0322 g). Elemental analysis: $C_{46}H_{52}Cl_4Cu_2N_4O_4$ (993.8): calcd. C 55.59, H 5.27, N 5.64%; found: C 55.27, H 5.205, N 5.745%. **IR** (KBr, selected data): $\tilde{\nu} = 3421$ (s), 3211 (s), 1607 (m), 1512 (s), 1301 (m), 1150 (m), 1138 (m), 1025 (s), 959 (m), 771 (m) cm⁻¹.

 $\label{eq:cu2} \begin{array}{l} [Cu_2(HL^2)_2Br_4] \ (3): \mbox{ A mixture of CuBr}_2 \ (0.0223 \ g, \ 0.1 \ mmol), \ H_2L \ (0.0189 \ g, \ 0.05 \ mmol), \ and \ methanol \ (1.2 \ mL) \ was \ sealed \ in \ a \ 8 \ mL \ Pyrex-tube, \ which \ was \ heated \ at \ 70 \ ^C \ for \ 3 \ days \ and \ cooled \ to \ room \ temperature \ at \ arate \ of \ 5 \ K \cdot h^{-1}. \ Green \ crystals \ of \ 3 \ were \ collected \ in \ a \ 9 \ model{eq:cu2} \ yield \ of \ 48 \ \% \ (0.014g). \ Elemental \ analysis: \ C_{23}H_{23}Br_2CuN_2O_2 \ (582.7): \ calcd. \ C \ 47.48, \ H \ 3.81, \ N \ 4.82 \ \%; \ found: \ C \ 47.60, \ H \ 4.25, \ N \ 4.70 \ \%. \ IR \ (KBr, \ selected \ data): \ \tilde{\nu} \ = \ 3438 \ (s), \ 3202 \ (s), \ 1607 \ (s), \ 1502 \ (s), \ 1300 \ (m), \ 1183 \ (m), \ 1151(m), \ 1138 \ (m), \ 1025 \ (s), \ 858 \ (m), \ 769 \ (m) \ cm^{-1}. \end{array}$

[Cd₂(HL)₂Cl₂] (4): A mixture of CdCl₂·2.5H₂O (0.0114 g, 0.05 mmol), H₂L (0.0189 g, 0.05 mmol), and methanol (1.2 mL) was sealed in a 8 mL Pyrex-tube, which was heated at 70 °C for 3 days and cooled to room temperature at a rate of 5 K·h⁻¹. Colorless crystals of 4 were collected in a yield of 30% (0.087 g). Elemental analysis: C₄₈H₅₀Cd₂Cl₂N₄O₄ (1042.7): calcd. C 55.29, H 4.83, N 5.37%; found: C 54.89, H 5.21, N 5.16%. **IR** (KBr, selected data): $\tilde{v} = 3393$ (s), 2912 (m), 1605 (s), 1488 (s), 1385 (m), 1296 (s), 1248 (s), 1198 (m), 1154 (s), 1071 (m), 863 (m), 788 (s), 762 (m), 480 (m) cm⁻¹.

 $[Cd_2(L)_2(CH_3COOH)_2]$ ·H₂L (5): A mixture of Cd(OAc)₂·2H₂O (0.0133 g, 0.05 mmol), H₂L (0.0189 g, 0.05 mmol), and methanol (1.2 mL) was sealed in a 8 mL Pyrex-tube, which was heated at 70 °C for 3 days and cooled to room temperature at a rate of 5 K·h⁻¹. Colorless crystals of **5** were collected in a yield of 38% (0.0342 g). Elemental analysis: C₅₂H₆₀Cd₂N₄O₈ (1798.5): calcd. C 57.20, H 5.35, N 5.13%; found: C 56.99, H 5.52, N 5.18%. **IR** (KBr, selected data): $\bar{v} = 3441$ (m), 2916 (m), 1603 (s), 1570 (m), 1486 (s), 1432 (m), 1255 (s), 1157 (m), 1005 (m), 856 (s), 788 (m), 755 (m), 660 (m) cm⁻¹.

| | 1 | 2 | 3 | 4 | 5 |
|---|--------------------------------|--------------------------------|---|---|---|
| Empirical formula | C33H48CuN4O9S | C46H52Cl4Cu2N4O4 | C ₂₃ H ₂₃ Br ₂ CuN ₂ O ₂ | C ₄₈ H ₅₀ Cd ₂ Cl ₂ N ₄ O ₄ | C ₁₀₀ H ₆₈ Cd ₂ N ₈ O ₁₂ |
| Formula weight | 740.35 | 993.80 | 582.78 | 1042.62 | 1798.44 |
| Temperature /K | 296(2) | 293(2) | 293(2) | 293(2) | 296(2) |
| Wavelength /Å | 0.71073 | 0.71073 | 0.71073 | 0.71073 | 0.71073 |
| Crystal system | triclinic | monoclinic | monoclinic | monoclinic | triclinic |
| Space group | ΡĪ | $P2_1/c$ | $P2_1/c$ | $P2_1/n$ | $P\bar{1}$ |
| a /Å | 8.4981(17) | 17.150(3) A | 18.043(4) | 8.6348(17) | 11.767(2) |
| b /Å | 11.403(2) | 8.2165(16) A | 8.3890(17) | 23.306(5) | 11.871(2) |
| c /Å | 18.144(4) | 17.882(4) A | 17.357(3) | 11.969(2) | 17.263(3) |
| a /° | 82.10(3) | 90 | 90 | 90 | 90.38(3) |
| β /° | 85.57(3) | 115.83(3) | 115.74(3) | 105.33(3) | 90.94(3) |
| γ /° | 88.29(3) | 90 | 90 | 90 | 110.63(3) |
| Volume /Å ³ | 1736.0(6) | 2268.0(8) | 2366.5(8) | 2323.0(8) | 2256.3(7) |
| Ζ | 2 | 2 | 4 | 2 | 1 |
| F(000) | 782 | 1028 | 1160 | 1056 | 916 |
| Crystal size /mm | $0.37 \times 0.28 \times 0.21$ | $0.41 \times 0.35 \times 0.28$ | $0.37 \times 0.29 \times 0.27$ | $0.31 \times 0.26 \times 0.20$ | $0.34 \times 0.28 \times 0.21$ |
| Theta range /° | 1.14 to28.37 | 1.32 to 25.00 | 2.51to 28.31 | 1.75 to 28.50 | 1.18 to 26.00 |
| Reflections col- | 30882 / 8618 | 17012 / 4000 | 21247/ 5882 | 21081 / 5836 | 34651 / 8876 |
| lected / unique | | | | | |
| GooF on F^2 | 1.062 | 1.162 | 0.995 | 1.164 | 1.085 |
| $R_1, wR_2 [I > 2\sigma(I)]$ | 0.0813, 0.2482 | 0.0349, 0.1050 | 0.0439, 0.1100 | 0.0808, 0.2349 | 0.0434, 0.1314 |
| R_1 , wR_2 (all data) | 0.1117,0.2656 | 0.0449, 0.1166 | 0.0863, 0.1278 | 0.1086, 0.2465 | 0.0629, 0.1511 |
| Largest residual peaks /e·Å ⁻³ | 2.034,-0.647 | 0.393,-0.682 | 0.694, -0.713 | 2.03, -0.787 | 0.580, -0.350 |

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Supporting Information (see footnote on the first page of this article): Selected bond lengths and angles of complexes 1-5.

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6

Cu^{II} and Cd^{II} Complexes Based on N,N-Bis(3,5-dimethyl-2-hydroxybenzyl)-N-(2-pyridylmethyl)amine



Copper(II) and Cadmium(II) Complexes Based on *N*,*N*-Bis(3,5-dimethyl-2-hydroxybenzyl)-*N*-(2-pyridylmethyl)amine Ligand: Syntheses, Structures, Magnetic, and Luminescent Properties



7