

NOTE**A Novel Schiff Base Complex of Cobalt(II)
Self-assembled Synthesis and Magnetic Property**

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A new cobalt(II) complex with the molecular formula $[\text{CoL}]_4(\text{ClO}_4)_8(\text{H}_2\text{O})_8(\text{CH}_3\text{OH})_{0.5}$ {L = (6Z,15Z)-N1',N2'-bis[amino(pyridin-2-yl)methylene]oxalohydrazide} has been synthesized by self-assembly and characterized by elemental analysis, IR spectra and TG measurement. The study of magnetic properties indicates that there is a weak antiferromagnetic interactions between the Co(II) ions in molecule of the complex.

Key Words: Self-assembly, Schiff base, Cobalt(II) complex, Curie-Weiss law, Magnetic property.

Schiff-base transition metal complexes are active fields of material science¹⁻³. These Schiff-base ligands can provide the nitrogen or oxygen donors to the transition metals and can easily form thermodynamic stable complexes^{4,6}. They play a number of important roles in the design and construction of molecular magnetic material^{7,8}. A series of transition metal Schiff-base compounds have been synthesized and studied in our laboratory^{9,10}. Here we report a new Schiff-base cobalt(II) complex with the molecular formula $[\text{CoL}]_4(\text{ClO}_4)_8(\text{H}_2\text{O})_8(\text{CH}_3\text{OH})_{0.5}$ {L = (6Z,15Z)-N1',N2'-bis[amino(pyridin-2-yl)methylene]oxalohydrazide}, self-assembled synthesis and magnetic property.

All the reagents were of AR grade. Elemental analysis were performed on a Elementar Vario ELZ(III) analyzer. IR spectra were recorded on a Nexus-870 spectrophotometer. TG-DSC analyses were obtained with a STA449F3 thermoanalyzer. Magnetic data(5.0-300 K) were collected with Quantum Design MPMS XL5 Squid magnetometer.

Synthesis of the ligand: The ligand (6Z,15Z)-N1',N2'-bis[amino(pyridin-2-yl)-methylene]oxalohydrazide (L) was prepared according to the literature¹¹.

Synthesis of the complex: 1.45 g $\text{Co}(\text{ClO}_4)_2 \cdot 6\text{H}_2\text{O}$ was dissolved into a mixture of 10 mL H_2O and 5 mL methyl cyanide, then 0.33 g L in 5 mL methanol was added and stirred for 2 h. After filtered and standing at room temperature for 4 days, the red powder were obtained. IR spectrum (KBr, cm^{-1}): $\nu(\text{N-H, O-H})$ 3390, 3140; $\nu(\text{C=N})$ 1660, 1578, 1540; $\nu(\text{ClO}_4^-)$ 1090, 631. Elemental analysis: Calcd.

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(%) for $[\text{Co}(\text{C}_{14}\text{H}_{14}\text{N}_8\text{O}_2)]_4(\text{ClO}_4)_8(\text{H}_2\text{O})_8(\text{CH}_3\text{OH})_{0.5}$: C, 27.18; H, 2.99; N, 17.95; Found (%) C, 27.15; H, 3.06; N, 17.79. Thermogravimetry was done at 25 to 550 °C (5 °C, min^{-1}). TG-DSC data indicates that the number of the hydrated water molecules agree with that of elemental analysis. The magnetic susceptibility data on the complex were collected over the temperature range 5.0-300 K.

The self-assembly synthesis of the complex was achieved by the reaction of the ligand L with $\text{Co}(\text{ClO}_4)_2 \cdot 6\text{H}_2\text{O}$ and characterized by IR, elemental analyses and TG measurement. The result is consistent with the composition of $[\text{Co}(\text{C}_{14}\text{H}_{14}\text{N}_8\text{O}_2)]_4(\text{ClO}_4)_8(\text{H}_2\text{O})_8(\text{CH}_3\text{OH})_{0.5}$.

Magnetic properties: Fig. 1 is the plots of χ_m versus T and χ_m^{-1} versus T for the complex. With the temperature was decreased, the χ_m^{-1} value decrease gradually through out the temperature range 5.0 to 300 K. From 5.0 to 282.6 K, the magnetic data can be fitted well ($R = 0.99985$) to the Curie-Weiss law with $C = 7.125(23)$ $\text{cm}^3 \text{mol}^{-1} \text{K}$ and $\theta = -2.88(53)$ K, The small negative value of Weiss constant indicates that there is a weak antiferromagnetic exchange coupling between the Co(II) ions in molecule of the complex¹².

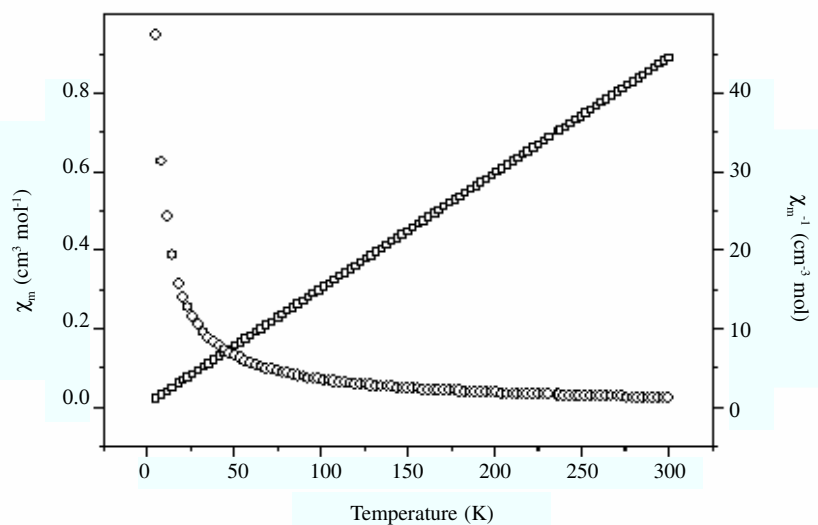


Fig. 1. χ_m -T and $1/\chi_m$ -T curves of the present cobalt(II) complex

In summary, a novel Schiff-base cobalt(II) complex was obtained at room temperature and characterized by elemental analysis, IR spectra and TG measurement. The magnetic properties show that there is a weak antiferromagnetic interactions between the Co(II) ions in molecule of the complex.

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