



NOTE

Synthesis and Magnetic Properties of $[\text{Ni}_3(\text{BTC})_2(\text{H}_2\text{O})_{12}]_n$ (BTC = 1,3,5-Benzenetricarboxylate)

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(Received: 18 May 2011;

Accepted: 30 July 2011)

AJC-10246

A self-assembled coordination polymer with the composition, $[\text{Ni}_3(\text{BTC})_2(\text{H}_2\text{O})_{12}]_n$ (BTC = 1,3,5-benzenetricarboxylate radical) has been synthesized and characterized by IR spectra and elemental analysis. The magnetic properties shows that there are weak antiferromagnetic interactions between the Ni(II) ions of in molecule of the coordination polymer.

Key Words: Nickel(II) complex, Coordination polymer, Self-assemble, Magnetic property.

The design, synthesis, structure and property study of coordination polymer materials is a rapid development research field which involves inorganic chemistry, synthetic chemical, crystals engineering, materials engineering and topology, *etc.*¹⁻⁴. In recent years, carboxylate ligands have been employed to the design and in syntheses of the magnetic coordination polymers⁵⁻⁸. Herein, we presented a metal-organic framework coordination polymer: $[\text{Ni}_3(\text{BTC})_2(\text{H}_2\text{O})_{12}]_n$ (BTC = 1,3,5-benzenetricarboxylate radical) and its synthesis, characterization and magnetic properties.

All the reagents were of AR grade and used without further purification. IR spectra were recorded on a Nexus-870 spectrophotometer. Elemental analysis were performed on a Elementar Vario ELZ(III) analyzer. Variable temperature magnetic data (5-296 K) were collected with Quantum Design MPMS XL5 Squid magnetometer.

Synthesis of the coordination polymer: The mixture of 50 mL of H₂O solution of 20 mmol NiSO₄ and 20 mmol thiocarbamide was added to 50 mL H₂O solution of 20 mmol sodium 1,3,5-benzenetricarboxylate (Na₃BTC), then refluxed for 1 h and standing at room temperature. The green powder solids was obtained separately. Yield 50%. IR spectrum (KBr, ν_{max} , cm⁻¹): 3442 (O-H); 1628, 1381 (-COO); 1533, 1447, 726 (-Ar). Elemental analysis (%): Calcd. (found); C, 26.81 (26.73), H, 3.75 (3.89).

The magnetic susceptibility data on the coordination polymer were collected over the temperature range 5-296 K at 0.1 T.

Magnetic properties: Fig. 1 shows the plots of χ_m versus T and χ_m^{-1} versus T for the coordination polymer. When the temperature was decreased from 296 to 34 K, the χ_m values increased gradually from 0.0109 to 0.085 cm³/mol. This indicates that the χ_m of $[\text{Ni}_3(\text{BTC})_2(\text{H}_2\text{O})_{12}]_n$ is accord with the Curie-Weiss law in wide temperature range. When the temperature was decreased from 34 to 5 K, the χ_m values increased rapidly from 0.085 to 0.43 cm³/mol. This shows that there are intramolecular weak antiferromagnetic coupling. From 5.0 to 296 K, the magnetic data can be fitted well ($r = 0.99975$) to the Curie-Weiss law with $C = 3.2398$ cm³/mol K and $\theta = -3.7590$ K, The small negative value of Weiss temperature also

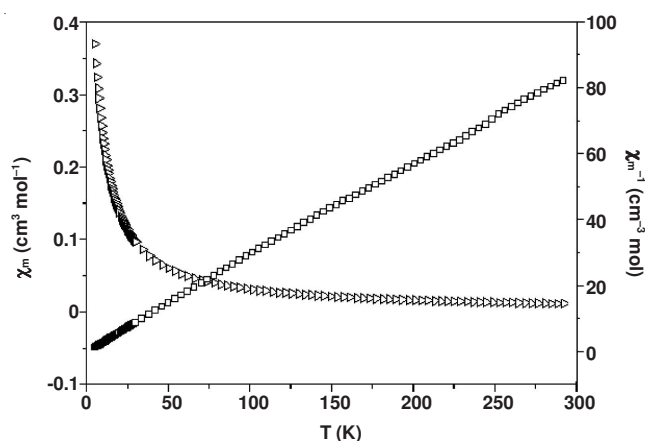


Fig. 1. $\chi_m \sim T$ and $1/\chi_m \sim T$ curves of the title compound

indicates that there is a weak antiferromagnetic exchange coupling between the Ni(II) ions of the coordination polymer⁹.

In summary, a metal-organic framework coordination polymer: $[\text{Ni}_3(\text{BTC})_2(\text{H}_2\text{O})_{12}]_n$ was obtained and characterized by IR spectra and elemental analysis. The magnetic measurement reveals that there is a weak antiferromagnetic interactions between the Ni(II) ions of $[\text{Ni}_3(\text{BTC})_2(\text{H}_2\text{O})_{12}]_n$.

ACKNOWLEDGEMENTS

This work is financially supported by Natural science Foundation of China (20871039). Follow-up support from the Nature Science Foundation of Anhui Universities (KJ2011Z299) and Key Disciplines Foundation of Hefei Normal University.

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