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Introduction

Molecular magnetic materials, in which discrete polynuclear clusters or coordination polymers (CPs) are self-assembled using paramagnetic metal ions and short bridging ligands, have received considerable attention over the past two decades. These materials not only offer opportunities to probe the fundamental magnetic phenomena such as long-range ordering, spin canting, metamagnetism, anisotropy, and relaxation dynamics, but also have promising applications in fields such as information storage and molecular electronics.1–5

To mediate the magnetic exchange between paramagnetic metal ions or induce bulk magnetic ordering, short bridging ligands such as halide, hydroxyl, cyanide, azide, formate, thiocyanide, oxalate, pyrazolate, etc., are generally preferred in the design and synthesis of molecular magnetic materials. Among these frequently employed ligands, the azide anion still remains a popular choice in the field of molecular magnetism. Owing to its diverse coordination modes (e.g., μ1,1−, μ1,3−, μ1,1,1−, μ1,1,3−, μ1,1,3−N3−, etc.) and its important role acting as an efficient magnetic coupler, the azide anion is a versatile ligand in bridging paramagnetic metal ions, which could generate various structures with interesting magnetic properties.6–9 The “versatility” of the bridging modes makes it difficult to precisely predict the bridging structure of the final assembly. However, for developing new molecular magnetic materials, it also gives opportunities to obtain serendipitous assemblies which would otherwise be impossible to design through a “bottom-up” approach. It has been found that minor varieties of the components within the metal-azido system may dramatically change the structures, and the magnetic behaviors of the metal-azido compounds could be strongly influenced by the composition and structure, such as the species of metal ions, the bridging modes of the azide ligand, and their bonding geometries. For example, the bonding geometry of CuII-azido compounds is strongly affected by the Jahn–Teller effect, and the magnetic interaction between the CuII ions bridged by the μ1,1-N3− ligand is ferromagnetic (FM) if the Cu–N–Cu angle is below the critical angle of 108° and antiferromagnetic (AF) above it.10

To date, besides the very few binary azides, most of the reported metal-azide compounds consist of those with a wide variety of coligands,10–27 whereas those with anionic metal-azide substructures in combination with charge-balanced cationic templates are somewhat rare.28–35 From the structural and magnetic points of view, the introduction of a cationic template rather than a coligand into the metal-azide system provides more coordination sites for the azide ligand, thus facilitating the azide-bridge magnetic exchange between paramagnetic metal ions. More importantly, the variation in the size or shape of the cationic templates could lead to diverse metal-azide structures, which may generate rich and varied magnetic properties. The small-size cationic templates were used to build three-dimensional (3D) perovskite-like CPs by us and others,36–40 among which the octahedrally coordinated metal ions are all bridged by the μ1,1-N3− ligand. On the other hand, when moderate- or large-size cationic templates are employed, compact one- (1D) or

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two-dimensional (2D) anionic metal-azide substructures can be obtained, among which the metal ions are often bridged by $\mu_{1,1}$ or $\mu_{1,1,1}$-$N_3$ modes. Considering that the moderate- or large-size cationic templates were less explored, in our current studies we select some diethyl or triethyl amines as moderate-size cationic templates, to seek for new metal-azide magnetic materials. Our research efforts yielded three new nickel(II) or copper(II) azido CPs, namely, $[\text{Ni}(N_3)_2(\text{Deeda})]$ (1), $[\text{DeaH}][\text{Cu}(N_3)_2]$ (2), and $[\text{TeaH}][\text{Cu}(N_3)_3]$ (3), where Deeda, $[\text{DeaH}]$, and $[\text{TeaH}]$ represent $N,N$-diethylthene-1,2-diamine, diethylammonium and triethyl-ammonium, respectively (see Scheme 1). Diversified magnetic behaviors can be observed for these new metal-azide CPs. Herein, we report their syntheses, structural characterization, and magnetic properties.

**Experimental**

**Materials and instrumentation**

All chemicals were obtained from commercial sources and used without further purification. Fourier transform infrared (FT-IR) spectra were recorded on a PerkinElmer Spectrum One FT-IR spectrometer using KBr pellets from 4000 to 400 cm$^{-1}$. Powder X-ray diffraction (PXRD) patterns (Cu-Kz) were collected on a Bruker Advance D8 $\beta$-2$\beta$ diffractometer. Variable-temperature magnetic susceptibility, zero-field ac magnetic susceptibility, and field dependence of magnetization were measured on a Quantum Design MPMS-XL5 (SQUID) magnetometer. Diamagnetic corrections were estimated from Pascal’s constants for all constituent atoms.

**Synthesis of complexes**

$[\text{Ni}(N_3)_2(\text{Deeda})]$ (1). NaN$_3$ (6.0 mmol) was dissolved in an aqueous solution of $[(\text{DeedaH})(\text{NO}_3)]$ (4.0 mmol, 10 mL), then Ni(NO$_3$)$_2$$\cdot$6H$_2$O (0.5 mmol) was added into the above solution under stirring, and the resultant turbid liquid was filtered to afford a dark brown solution, which was allowed to stand at room temperature. Four days later, green block-shaped crystals of 1 were deposited from the filtrates, in a ca. 81% yield based on Ni. The powder XRD for bulky crystals indicated that the experimental patterns match well with the simulated one (ESI $^\dagger$ Fig. S1a). IR data (KBr, cm$^{-1}$): 3398(m), 3325(s), 3262(m), 3157(m), 2970(m), 2938(m), 2114(s), 1977(m), 1592(m), 1447(m), 1394(m), 1302(m), 1215(m), 1109(m), 1060(m), 1024(m), 988(m), 902(m), 743(m), 672(m), 511(m). $[\text{DeaH}][\text{Cu}(N_3)_2]$ (2) and $[\text{TeaH}][\text{Cu}(N_3)_3]$ (3). NaN$_3$ (3.0 mmol) was dissolved in an aqueous solution of $[(\text{DeaH})(\text{NO}_3)]$ (2.0 mmol, 10 mL), then Cu(NO$_3$)$_2$$\cdot$3H$_2$O (0.25 mmol) was added into the above solution under stirring, and the resultant turbid liquid was filtered to afford a dark brown solution, which was allowed to stand at room temperature. Four days later, dark brown plate-shaped crystals of 2 were deposited from the filtrates, in a ca. 55% yield based on Cu. When a similar procedure was performed but with $[(\text{TeaH})(\text{NO}_3)]$ in place of $[(\text{DeaH})(\text{NO}_3)]$, dark brown plate-shaped crystals of 3 were obtained in a ca. 50% yield based on Cu. The powder XRD for bulky crystals indicated that their experimental patterns match well with the simulated ones (ESI $^\dagger$ Fig. S1b and c). IR data (KBr, cm$^{-1}$) for 2: 3444(m), 3218(m), 2991(m), 2931(m), 2092(s), 2060(s), 1571(m), 1451(m), 1385(m), 1340(m), 1280(s), 1051(m), 895(m), 779(m), 685(m); for 3: 3449(m), 3163(m), 2988(m), 2937(m), 2122(s), 2048(s), 1627(m), 1461(m), 1397(m), 1342(m), 1282(s), 1087(m), 888(m), 793(m), 681(m), 578(m).

**Caution!** Although our samples never exploded during handing, azide metal complexes are potentially explosive. Only a small amount of material should be prepared, and it should be handled with great caution.

**Single-crystal X-ray crystallography**

Data collections for 1–3 were performed on a Smart ApexII CCD diffractometer equipped with a graphite-monochromated Mo-K$\alpha$ radiation ($\lambda = 0.71073$ Å) source. Their intensity data were collected at 296 K. The data sets were corrected for Lorentz and polarization factors as well as for absorption by the SADABS program. The crystal structure was solved by the direct method and refined by full-matrix least-squares fitting on $F^2$ with the SHELXLT program package. All hydrogen atoms were generated geometrically. All non-hydrogen atoms were refined with anisotropic thermal parameters whereas all hydrogen atoms were refined isotropically. Crystallographic data and structural refinements of 1–3 are summarized in Table S1 (see the ESI $^\dagger$). Selected bond lengths are listed in Table S2 (see ESI $^\dagger$). More details about the crystallographic data have been deposited as the ESI $^\dagger$.

**Results and discussion**

**Synthesis**

Compounds 1–3 were obtained from the reactions of Ni(NO$_3$)$_2$ or Cu(NO$_3$)$_2$ with excess NaN$_3$ in the presence of excess diethyl/triethyl ammonium as the template. The excess of NaN$_3$ normally prevents the immediate precipitation of the mixture. On the other hand, the high concentration of the diethyl/triethyl ammonium promotes the role of the cation template.

**Structure of $[\text{Ni}(N_3)_2(\text{Deeda})]$ (1).** Compound 1 crystallizes in the monoclinic space group $P2_1/c$ and it exhibits a two-dimensional (2D) layered structure (Fig. 1). The asymmetric unit contains one Ni$^{2+}$ ion, two N$_3$$^-$$^-$ ligands, and one $N,N$-diethylthene-1,2-diamine (Deeda) ligand. The NiI ion is octahedrally coordinated by four N atoms from two pairs of symmetry-related N$_3$$^-$$^-$ anions and two N atoms of one bidentate chelating Deeda ligand. The Ni-N bond lengths range from 2.061(1) to 2.223(1) Å.
(Table S2, ESI†). The two unique N₃⁻ ligands both act as bidentate bridging ligands but show different coordination modes. The bridging mode of [N₁–N₂–N₃]⁻ is μ₁,1-N₁ (end-to-end, EE) whereas that of [N₄–N₅–N₆]⁻ is μ₁,1-N₁ (end-on, EO). Such two types of N₃⁻ ligands bridge the Ni²⁺ ions from two different directions, to build a compact layer, which can also be viewed as alternately arranged left- and right-handed helical N₃⁻ linkages via the formation of an elongated Cu₆ ring, as the repeat unit of the chain. The two adjacent rings are serially connected at their Cu₁ sites by double EO-azides along the chain. Within the Cu₆ ring, Cu₂ and Cu₃ are also linked by double EO-azides whereas the other Cu···Cu linkages are bridged by single EO-azide.

Overall, from a topological point of view, each Ni²⁺ center can be simplified as a three-connected node, while the bidentate bridging N₃⁻ ligands are defined as linkers; thus the topology of the layered framework of 1 can be described as a 2D 3-connected 6³ net. Within the layer, two types of hydrogen bonds, N₇–Hᵡ···N₃ and N₇–H₇B···N₁ [N···N distance: 3.179(2) and 3.251(2) Å; N···H···N angle: 155.1(1) and 146.8(1)°, respectively], are formed between the Deeda molecule and two azido anions. Finally, these 2D layers in 1 are assembled into a three-dimensional (3D) supramolecular structure via van der Waals forces (ESI†, Fig. S2). The shortest inter-layer Ni···Ni separation is 9.203(3) Å.

**Structure of (DeaH)[Cu₆(N₃)₇] (2).** Compound 2 crystallizes in the triclinic space group P1. The crystal structure features a 2D supramolecular layer made up of [[Cu₆(N₃)₇]⁺ anionic chains, with charge-balanced diethylammonium (DeaH)⁺ cations filling in the inter-layer region. The asymmetric unit contains three Cu²⁺ ions, seven N₃⁻ ligands, and one (DeaH)⁺ cation. The three Cu²⁺ ions all are four-coordinated with N atoms of four N₃⁻ ligands, and the coordination geometry around them each can be described as a square-planar (Fig. 2). The Cu–N bond lengths range from 1.972(2) to 2.042(2) Å (Table S2, ESI†). The seven crystallographically independent N₃⁻ ligands adopt two types of coordination modes. Five of them act as bidentate EO-azido ligands while the other two function as monodentate terminal ligands. These EO-azides bridge the Cu²⁺ ions to build a one-dimensional (1D) anion chain [[Cu₆(N₃)₇]⁺, n. In such a chain, the three unique Cu²⁺ ions (Cu₁, Cu₂, and Cu₃) are linked via EO-azides to form a linearly arranged Cu₆ motif, and such a Cu₁ motif further connects with a centrosymmetrically equivalent Cu₁ motif through a pair of EO-azides at both ends, resulting in the formation of an elongated Cu₆ ring as the repeat unit of the chain. The two adjacent rings are serially connected at their Cu₁ sites by double EO-azides along the chain. Within the Cu₆ ring, Cu₂ and Cu₃ are also linked by double EO-azides whereas the other Cu···Cu linkages are bridged by single EO-azide.

Although the coordination geometries of all Cu²⁺ ions in 2 are square planar, their axial positions, either one or two, in fact, are occupied by the N atoms of four N₃⁻ ligands, with the secondary, weak Cu···N bonds in the range of 2.548(3)–2.779(3) Å (Table S2, ESI† and Fig. 3, dashed bonds). If these longer Cu···N bonds are considered, some EO-azido anions are the μ₁,1,1-type, and the chains, which run along the b direction, form an anionic layer along the ab plane, through inter-chain μ₃,N₃ type and μ₁,1,1,1,N₉-azido anions. The shortest inter-chain Cu···Cu separation is 5.489(5) Å within the layer. The charge-balanced (DeaH)⁺ cations are located in between the anionic layers.
(ESI† Fig. S3). Pairs of hydrogen bonds, N22·H22A···N19 and N22·H22B···N21 [N···N distance: 2.890(3) and 3.005(4) Å; N·H···N angle: 152.5(1) and 131.0(2)°, respectively], are formed between the (DeaH)⁺ cations and two azido anions, which further stabilize the overall three-dimensional supramolecular structure. The shortest inter-layer Cu···Cu separation is 10.019(9) Å. It is worthy of note that the anionic chain and the supramolecular layer in 2 are similar to those in (dmenH₂)²⁺Cu₄(N₃)⁹⁺[N₃] (4) and (trimenH₂)²⁺Cu₄(N₃)⁹⁺[N₃] (5) [dmenH₂²⁺: N,N'-dimethylthelyenediammonium; trimenH₂²⁺: N,N,N'-trimethyl-thelyenediammonium], which are previously reported by S. Gao et al.²¹ However, these slight differences in geometric parameters result in very different magnetic properties (vide infra).

**Structure of (TeaH)²⁺[Cu₄(N₃)⁹⁺] (3).** Compound 3 crystallizes in the triclinic space group P1 but features a quite different structure to 2. The crystal structure features a complicated 2D layer made up of two types of anionic chains, with charge-balanced triethylammonium (TeaH)⁺ cations filling in the inter-layer region. The asymmetric unit contains three and two half Cu²⁺ ions, nine N₃⁻ ligands, and one (TeaH)⁺ cation. The half-occupied Cu1 and Cu2 ions locate at an inverse center while Cu3, Cu4, and Cu5 ions occupy a general position. The Cu1, Cu2, Cu3, and Cu5 ions are all four-coordinated with N atoms of four N₃⁻ ligands, and the coordination geometry around them each can be described as square-planar (Fig. 4). In contrast, Cu4 ions are five-coordinated with N atoms of five N₃⁻ ligands, showing a square-pyramid coordination geometry. The Cu–N bond lengths within the squares range from 1.977(2) to 2.027(2) Å, whereas that of the axial Cu–N bond is somewhat longer (2.332(2) Å). The nine crystallographically independent N₃⁻ ligands adopt two types of coordination modes. Eight of them act as bidentate EO-azido ligands while only one functions as a monodentate terminal ligand. These EO-azides bridge the Cu²⁺ ions to build an anion layer {[Cu₄(N₃)⁹⁺]}ₘ, which can be viewed as alternately arranged I- and II- chains interconnected via (N10–N11–N12⁻) ligands (Fig. 4). Chain I features a Cu5 ring, which is corner-sharing with two neighbouring Cu₂ rings at both Cu vertices. ChainII features a Cu5 ring similar to that in 2. However, the connection mode of the Cu5 rings in 3 is corner-sharing at one Cu vertex whereas that in 2 is serially connected between two Cu vertices. Within the layer, the shortest Cu···Cu linkage between chains I and II is 3.366(1) Å. The secondary, weak Cu···N bonds can also be observed in 3 (Table S2, ESI† and Fig. 5, dashed bonds).

It is noted that one type of hydrogen bond, N28·H28A···N6 [N···N distance: 3.194(3) Å; N·H···N angle: 145.9(2)°] is formed between the (TeaH)⁺ cation and the (N4–N5–N6⁻) anion, which further stabilizes the overall three-dimensional supramolecular structure. The shortest inter-layer Cu···Cu separation is 11.688(1) Å.

**Magnetic property studies for 1–3.**

Magnetic measurements were carried out on crystalline samples of complexes 1–3. The temperature dependence of $\chi_m T$ for 1 as a curve of $\chi_m T$ versus $T$ ($\chi_m$ is the molar magnetic susceptibility for one Ni²⁺ ion) in the range of 2–300 K, under an applied field of 1 kOe, is shown in Fig. 6a. The value of $\chi_m T$ at 300 K is 1.39 cm³ mol⁻¹ K, which is of the order expected for one Ni²⁺ ion ($g > 2.0$). The $\chi_m T$ value increases smoothly from room temperature until 50 K and then sharply reaches a maximum value of 2.83 cm³ mol⁻¹ K at 8 K upon cooling, which is attributed to the FM coupling between the neighbouring Ni²⁺ ions. Below 8 K, the $\chi_m T$ value drops to 0.42 cm³ mol⁻¹ K at 2 K, which is due to the zero-field splitting (ZFS) of Ni²⁺ ions and AF coupling between the Ni²⁺ ions bridged by EE azides. The field-dependent magnetization per one Ni²⁺ ion of 1 at 2 K tends to a value of 1.93 Nμ (close to the saturation value) at 7 T and
exhibits a pronounced sigmoid shape at low field. The latter implies metamagnetic behavior of 1 that a magnetic transition occurs from the AF interaction at a low field to a FM state at a high field (Fig. 6b), and the critical field defined as \( \frac{dM}{dH} \) at 2 K is 10 kOe. To investigate the nature of the metamagnetism of 1, the low temperature magnetic susceptibilities at different fields were measured. The \( \chi_m \) versus \( T \) plot (Fig. 6c) shows a cusp around 7.36 K when the applied fields are lower than 10 kOe. The cusp disappears at higher fields, and a plateau occurs at 15 kOe. The AF couplings mediated by the EE mode of \( \text{N}_3 \) could be overcome at external fields larger than 10 kOe, from which 1 turns into a FM state.

The \( \chi_m^T \) versus \( T \) plot (\( \chi_m \) is the molar magnetic susceptibility for three Cu\(^{2+} \) ions) at 1 kOe and the field-dependent magnetizations at 2 K of 2 are shown in Fig. 7a and b, respectively. At room temperature, the \( \chi_m^T \) value of 2 is 1.32 cm\(^3\) mol\(^{-1}\) K, which is slightly larger than the theoretical spin-only value (1.13 cm\(^3\) mol\(^{-1}\) K) for three magnetically isolated Cu\(^{2+} \) ions (\( S = 1/2 \), \( g = 2.0 \)). As the temperature decreases, the value of \( \chi_m^T \) increases gradually in the high temperature range with a value of 2.56 cm\(^3\) mol\(^{-1}\) K at 50 K. Upon further lowering the temperature to 5 K, \( \chi_m^T \) abruptly increases to a maximum value (42.83 cm\(^3\) mol\(^{-1}\) K). Below 5 K, \( \chi_m^T \) has a rapid and linear drop, to a minimum value of 20.95 cm\(^3\) mol\(^{-1}\) K at 2 K, indicating global AF at a very
low temperature. The values of the best-fit parameters ($\theta, C$) according to the Curie–Weiss law, from the magnetic data of $2$ in the temperature range of 100–300 K, are 42.64 K and 1.15 cm$^3$ mol$^{-1}$ K, respectively. These values indicate that the dominant feature of this magnetism is the FM interactions in the 1D chain. The field-dependent magnetizations at 2 K (Fig. 7b) clearly corroborate the FM coupling, and the $M/N_\beta$ value at 7 T is 3.13 N$\beta$, approaching the saturation value.

To characterize the low-temperature behaviors of $2$, the temperature dependencies of field-cooled (FC) and zero-field-cooled (ZFC) magnetization were performed under a field of 20 Oe upon warming from 2 K (Fig. 7c). The bifurcation point of FC–ZFC curves is at 4.8 K, indicating an irreversibility of magnetization in $2$. However, the maximum value of the ZFC curve is observed at 4.6 K, which may be the “blocking” temperature of the spin glass (SG). Strong in-phase $\chi'_m$ signals with peaks at around 5.6 K are shown in the ac measurements of $2$, which are nearly frequency-independent (ESI,† Fig. S5). On the other hand, weak out-of-phase $\chi'_m$ signals of $2$ are observed with sharp peaks, which are weakly frequency-dependent (Fig. 7d). The parameter $\phi = (\Delta f/\Delta T)/\Delta \log f$, where $f$ and $T$ are the frequency and the peak temperature of the $\chi'$ signals, respectively, is often used to judge the magnetic relaxation nature. The calculated $\phi$ value of $2$ was 0.05, falling within the normal value range for a SG state, whose $\phi$ value is in the order of 0.01. Thus, such a $\phi$ value suggests the SG behavior of $2$, which is slightly different from the similar structures reported by S. Gao et al. (4 and 5, see above). The maximum values of $\chi_mT$ in compounds 4 and 5 are much smaller than 3, which are attributed to the distinct Cu–N$\text{azido}$–Cu angles. The temperature dependence of $\chi_mT$ at 1 kOe for $3$ as a curve of $\chi_mT$ versus $T$ ($\chi_m$ is the molar magnetic susceptibility for four Cu$^{2+}$ ions) is shown in Fig. 8a. At 300 K, the $\chi_mT$ value is 1.56 cm$^3$ mol$^{-1}$ K, which is consistent with the expected value of 1.50 cm$^3$ mol$^{-1}$ K for four uncoupled Cu$^{2+}$ ions ($S = 1/2$, $g = 2.0$). As the temperature decreases, the value of $\chi_mT$ slowly increases up to 1.99 cm$^3$ mol$^{-1}$ K at 50 K. Upon further cooling to 3.0 K, $\chi_mT$ abruptly increases to a maximum value (8.27 cm$^3$ mol$^{-1}$ K), indicating strong FM coupling between the adjacent Cu$^{2+}$ ions. Below 3 K, $\chi_mT$ has a rapid drop, to a minimum value of 6.42 cm$^3$ mol$^{-1}$ K at 2 K. The Curie–Weiss fitting of the magnetic data over the temperature range of 110–300 K affords $\theta = 32.99$ K, exhibiting the existence of the FM interaction in $3$. The $M$ versus $H$ curve (at 2 K) of $3$ is shown in Fig. 8b. $M$ increases gradually at 0–5 T and reaches to about 1.84 N$\beta$ at 5 T, which is much lower than the saturation value (4 N$\beta$), indicative of the canted ferromagnetism. In addition, the $M$ versus $H$ plot of $3$ hardly shows hysteresis at 2 K (ESI,† Fig. S6a). The in-phase signals of $3$ are overlapped with obvious peaks, while the out-of-phase signals show no peaks, which is consistent with a canted ferromagnetism (ESI,† Fig. S6b). The canting angle of $3$ at 2 K is about 20.3°, estimated by the equation “$\sin(\gamma) = M_B/M_S$” ($M_S$ is obtained by extrapolating the high-field linear part of the magnetization curve at 2 K to zero field and $M_B = 4 N\beta$).

As is well known, the EE mode of azide often transfers AF coupling, while the nature of the interactions mediated by the EO mode between certain ions is dependent on the M–N$\text{azido}$–M angle. For $1$, there are both EE and EO modes and the exchange interaction conducted by EO-azide is expected to be always FM. Therefore, the azide with the EE mode plays a dominant role in the AF interaction between Ni$^{2+}$ ions at low fields, while the azide with the EO mode leads to the FM state for $1$ at high fields. Only the EO mode of the azide exists in complex $2$ considering that Cu–N with over a 2.5 Å distance is not a coordination bond and the Cu–N$\text{azido}$–Cu angles fall in the range of 89.79–113.19° and most of them are lower than 104°. According to the reported literature, the crossover angle from FM to AF interactions in Cu$^{2+}$ complexes is ~104° theoretically or ~108° experimentally, while FM coupling appears over the crossover angle of 98°. Thus, complex $2$ exhibits FM couplings between the adjacent Cu$^{2+}$ ions. Similar to $2$, the canted ferromagnetism in $3$ is induced through the Cu–N$\text{azido}$–Cu super exchange pathways with lower angles (94.19–102.96°).

**Conclusions**

In summary, three new Ni(u) and Cu(u) azido coordination polymers templated by diethyl or triethyl amines have been constructed and structurally characterized. All of them can exhibit 3D supramolecular structures considering the weak bonds. Magnetic investigations suggest that metamagnetic behavior, spin glass behavior and canted ferromagnetic behavior exist in 1–3,
respectively, due to the different coordination modes of azide and the related coordination bonds and angles. Further studies of template-directed 3d metal azido coordination polymers with a more interesting magnetic phenomenon are under way in our group.

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Notes and references