Observation of slow relaxation of the magnetization and hysteresis loop in antiferromagnetic ordered phase of a 2D framework based on \( \text{Co}^{\text{II}} \) magnetic chains

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Crystallographic studies

Diffraction intensity data for single crystals of 1 were collected at 113 K on a Rigaku Saturn 007 CCD diffractometer. The instruments were equipped with graphitemonochromated Mo-\textit{K}_\alpha radiation (\( \lambda = 0.71073 \) Å). The structures were solved by the direct method and refined by the full-matrix least-squares method on \( F^2 \) with anisotropic thermal parameters for all non-hydrogen atoms.\cite{1,2} Hydrogen atoms were located geometrically and refined isotropically.

\cite{1} Sheldrick, G. M. *SHELXS 97, Program for the Solution of Crystal Structures*; University of Göttingen: Germany, 1997.

\cite{2} Sheldrick, G. M. *SHELXL 97, Program for the Refinement of Crystal Structures*; University of Göttingen: Germany, 1997.

Physical measurements

Analyses for C, H, and N were carried out on a Perkin-Elmer analyzer. TGA experiments were performed on a NETZSCH TG 209 instrument with a heating rate of 10 °C min\(^{-1}\). Variable-temperature magnetic susceptibilities were measured on a Quantum Design MPMS XL-7 SQUID magnetometer. Diamagnetic corrections were made with Pascal’s constants for all the constituent atoms. Heat-capacity data were measured on a Quantum Design PPMS-9 physical property measurement system. Both the magnetic data and heat-capacity data are corrected with the contribution of sample holder.
**Scheme S1.** Two coordination modes of the ipa$^{2-}$ anions: $\mu_2$-$\eta^1$:$\eta^1$ (left) and $\mu_2$-$\eta^2$:$\eta^1$ and $\mu_3$-$\eta^2$:$\eta^1$ (right)

**Scheme S2.** The pathway of magnetic interactions among the Co$^{II}$ ions.
Figure S1. The [Co$_5$] moiety built by vertex-sharing of the Co$^{II}$ trimers.

Figure S2. Perspective of the [Co$_5$]-based 1D chains linked by btx with 
cis-configuration viewed down the $a$ axis.
**Figure S3.** Edge-to-face π···π interactions of the layers viewed down the $a$ axis.

**Figure S4.** Plots of $\chi_M$ vs $T$ (left) and $\chi_MT$ vs $T$ (right) at an applied field of 0, 20, 40, 100, 1000 and 10000 Oe, respectively. The 0 Oe data were measured at 1 Hz frequency, 3 Oe oscillating field and zero external field.
Figure S5. Plots of $\chi_M^{-1}$ vs $T$ fitted by Curie-Weiss law in the temperature range of 50-300 K with the data obtained at 1000 Oe.

Figure S6. Magnetization curves at different temperature.
**Figure S7.** First field derivative of the magnetization as a function of the applied dc-field for 1 at different temperature. The plots were obtained from the data of Figure S6. Solid lines are guides for eyes.

**Figure S8.** \((T, H)\) phase diagram of 1. The plots were obtained from the maximum of susceptibility from Figure S7. Solid lines are guides for eyes.
Figure S9. The heat-capacity plots of $\mathbf{1}$ in the temperature range of 2-15 K.
**Figure S10.** Temperature dependence of the $\chi'$ (top) and $\chi''$ (bottom) components of the ac magnetic susceptibilities of I measured in an oscillating field of 3 Oe at various frequencies.
Figure S11. X-Ray powder diffraction patterns of 1.

Figure S12. TGA curve of 1. The sample was heated to 730 °C at the heating rate of 10 °C/min.