

# VAPOR CHEMISORPTIONS, STRUCTURAL CHANGES, AND MAGNETIC PROPERTIES OF COPPER(II) COMPLEX

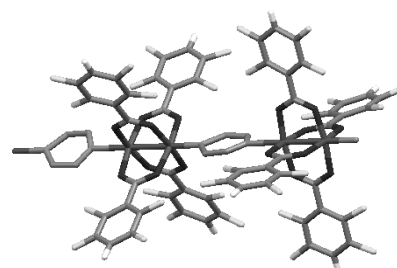
Kiyonori Takahashi,<sup>1</sup> Norihisa Hoshino,<sup>1,2</sup> and Tomoyuki Akutagawa,<sup>1,2</sup>

<sup>1</sup>Graduate School of Engineering, Tohoku University, Japan, <sup>2</sup>Institute of Multidisciplinary Research of Advanced Materials, Tohoku University, Japan.  
aaaaa@bbbb.cc.dd

Structural changes induced by the outer stimuli coupled with physical responses have been attracted much attentions to realize the new molecular-based functional materials. For instance, the ferroelectricity of (*m*-FAni<sup>+</sup>)(dibenzo[18]crown-6)[Ni(dmit)<sub>2</sub>] has been associated with the thermal rotations of *m*-fluoroanilinium (*m*-FAni<sup>+</sup>) within the crystal.<sup>[1]</sup> On the contrary, novel gas-adsorption properties of the one-dimensional Cu(II)-binuclear coordination polymers and their phase transition behaviours have been examined.<sup>[2,3]</sup> Herein, we report the crystal structures, gas adsorption-desorption properties, and magnetic properties of Cu(II)-binuclear coordination polymers of [Cu<sub>2</sub>(2,3-F<sub>2</sub>BA)<sub>4</sub>(pz)]<sub>∞</sub> (**1**) (2,3-F<sub>2</sub>BA and pz were 2,3-difluoro benzoate and pyrazine, respectively). We focused on the changes in crystal structures and magnetic properties after the molecular adsorptions.

The crystal structure of **1** was formed by the one-dimensional [Cu<sub>2</sub>(2,3-F<sub>2</sub>BA)<sub>4</sub>(pz)]<sub>∞</sub> polymer chain, where the binuclear Cu<sub>2</sub>(2,3-F<sub>2</sub>BA)<sub>4</sub>-units were bridged by the axial pz ligand (Fig. 1). One-dimensional channel structure was observed between the one-dimensional polymer chains, where the CH<sub>3</sub>CNs occupied the channel space as crystallized solvent.

The H<sub>2</sub>O adsorption isotherm at 298 K showed the stepwise adsorption-desorption process at relative pressure ( $P/P_0$ ) ~ 0.5 and ~0.7. At  $P/P_0$  ~ 1, and about three molar H<sub>2</sub>O were adsorbed into the channel of crystal **1**. After the H<sub>2</sub>O adsorption, the green-coloured crystals **1** were changed to the white-blue ones (**1a**), which changes were also observed under the existence of H<sub>2</sub>O vapour. The PXRD measurements showed the structural change after the H<sub>2</sub>O adsorption. The  $\chi_m T - T$  plots of crystal **1** showed the existence of strong antiferromagnetic coupling, whereas the ferromagnetic behaviour was observed in crystal **1a**. The chemisorption of **1** under H<sub>2</sub>O vapour induced the changes in the crystal structure and magnetic properties. Similar change induced by pyridine chemisorption will be also discussed in detail.



**Fig. 1** Crystal structure of **1**. 2,3-F<sub>2</sub>BA ligands showed the orientational disorder.

---

## References

- [1] T. Akutagawa, H. Koshinaka, D. Sato, S. Takeda, S. Noro, H. Takahashi, R. Kumai, Y. Tokura, T. Nakamura, *Nature Mat.*, **2009**, *8*, 342-347.
- [2] K. Takahashi, N. Hoshino, T. Takeda, S. Noro, T. Nakamura, S. Takeda, T. Akutagawa, *Dalton Trans.*, **2014**, *43*, 9081-8089.