

1D2b

Threefold spiral structure constructed by 1-D chain self-assembled complexes

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Our laboratory has synthesized self-assembled complexes, $[trans\text{-Fe}(\text{NCX})_2(\text{bpa})_2]_n$ ($X = \text{S}, \text{Se}, \text{BH}_3$), by using bipyridine type bridging ligand, 1,2-bis(4-pyridyl)ethane (bpa). Self-assembled complexes show various types of structures (1-D chain, grid, interpenetrated structure) by enclathrating organic compounds as guests and selection of anion ligands [1]. In special case, threefold spiral structure constructed by 1-D chain self-assembled complexes was obtained [2]. In the present study, we investigated the condition to obtain the threefold spiral structure constructed by 1-D chain skeleton, $[trans\text{-M}(\text{NCS})_2(\text{bpa})_2 \cdot \text{biphenyl}]_n$ ($M = \text{Fe}, \text{Co}$) and discussed the mechanism to form spiral structure.

The synthesis of spiral complexes was carried out by diffusion method. Not too rapid diffusion rate is important for formation of spiral structure. In this structure, several 1-D chains gathered together to form 1-D chain sheet. The 1-D chain sheet was stacked spirally to form novel spiral assembly with threefold axis (Fig. 1).

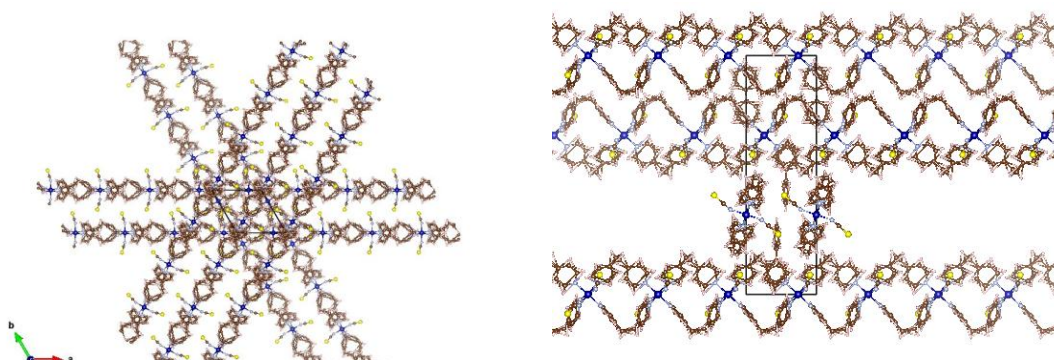


Figure 1. The projection of spiral complexes to ab plane (left) and b axis (right).

The use of biphenyl as guest is essential. Biphenyl shows an atropisomerism in the solid state. Biphenyl was stacked with threefold axis, and it was arranged between upper and lower 1-D chain sheets. The lower part of upper layer's biphenyl and the upper part of lower layer's biphenyl were parallel each other to form space (Fig. 2). The 1-D chain of $trans\text{-M}(\text{NCS})_2(\text{bpa})_2$ is fit in the space.

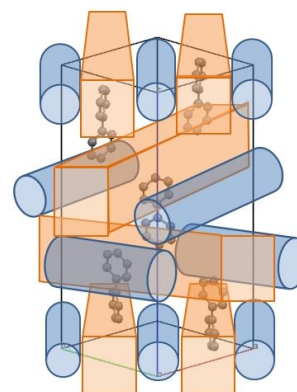


Figure 2.
Spiral structure
formation model.

Reference

- [1] S. Nakashima et al., *Hyperfine Interact.*, **188**, 107 (2009).
[2] S. Nakashima et al., *Polymers*, **4**, 880 (2012)