1A2a

Stabilization of Chiral Magnetic Structure by Chiral Crystal Structure

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Molecule-based magnets have been studied and developed past two decades, because we can control crystal structures. Then, we can control magnetic structures by crystal design and/or molecular design. Non-centrosymmetric crystal structures generate Dzyaloshinsky-Moriya (DM) interactions, which align nearest two spins perpendicular ($H = -\boldsymbol{DM} \cdot [S_1 x S_2]$, $\boldsymbol{DM} = (\Delta g/g)J$)[1]. DM interactions have strengths and directions, and then treated as vectors. Ferroic DM vectors stabilize chiral helical/conical spin structure, and antiferroic DM vectors stabilize spin canting. Ferroic DM vectors exist only in chiral crystal structure. Then, the chiral magnetic structures are highly expected by chiral crystal structure[2]. We have tried to synthesize chiral structural magnets using W^{5+} ions (anisotropic ions), because anisotropic magnetic ions generate strong DM interactions. We obtained chiral compounds $[Cu\{(R \text{ or } S)\text{-pn}\}H_2O]_4\ [Cu\{(R \text{ or } S)\text{-pn}\}]_2[W(CN)_8]_4 \bullet 2.5H_2O$ (**1S**, **1R**) and racemic compound $[Cu\{(rac)\text{-pn}\}H_2O]_4\ [Cu\{(rac)\text{-pn}\}]_2[W(CN)_8]_4 \bullet 2.5H_2O$ (**2Rac**)[3]. These compounds have almost same framework without chirality of ligands. All compounds are 2–D layer structure and magnetic interactions of intra layer are ferromagnetic and inter layers are antiferromagnetic. However, some differences are found. **2Rac** shows metamagnetic behavior without spin canting, but **1S** and **1R** show metamagnetic like behavior with spin canting. These differences (metamagnetic like behavior and spin canting) are clearly understood based on the presence or absence of the DM vectors.

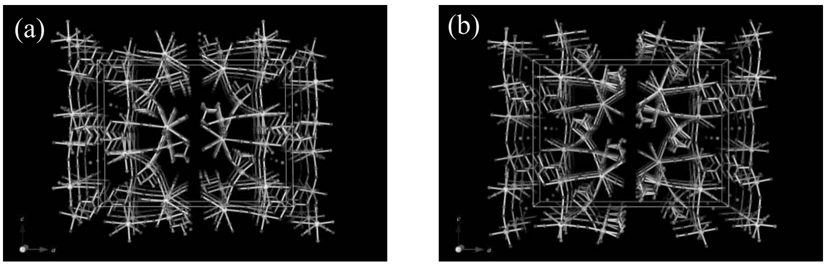

Fig.1 Crystal structures of (a) chiral compound, and (b) achiral compound.

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