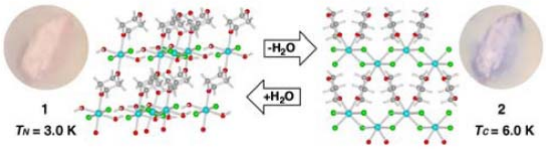
Crystal-to-crystal Transformation from Antiferromagnetic Chains into a Ferromagnetic Diamondoid Framewrok

Bin Zhang[1], Zhiming Duan[1], Yan Zhang[2], Daoben Zhu[1]
[1]*BNLMS, Organic Solid Laboratory, CMS & Institute of Chemistry, Chinese Academy of Science, Beijing, 100190, P. R. China*
[2] *Department of Physics, Peking University, Beijing, 100871, P. R. China*
Email: zhangbin@iccas.ac.cn

The application of crystal-to-crystal transformations involving the dimensionality changes of coordination polymers to generating dynamic magnetic systems is currently a challenging topic in the molecular crystal. It is usually difficult to obtain qualified transformed crystal. Two compounds belonging to ternary MCl_2-H_2O-1,4-dioxane system (M = Co) were obtained us, and a crystal-to-crystal transformation was observed between 1D chains of $CoCl_2$(1,4-dioxane)$(H_2O)_2$ (**1**) and diamondoid framework $CoCl_2$(1,4-dioxane) (**2**). Both of them can be synthesized by solvothermal method and hydration/dehydration methods. The crystal color, structure, cell parameter and magnetic properties of them are different. **1** consists of neutral chains of $CoCl_2$(1,4-dioxane)$(H_2O)_2$, **2** consists of $CoCo_4$ tetrahedra with zigzag $CoCl_2$ chain connected by 1,4-dioxane bridge in chair-conformation. Co is octahedral coordinated by two Cl^-, two O from 1,4-dioxane and two H_2O in **1** and four Cl^-, two O atoms from 1,4-dioxane in **2**. The transformation from 1 to **2** involves the changes in the connecting mode of Cl^-, i.s., Cl^- acts as μ-bridge in **2**, while the m-bridge is interrupted by H_2O molecule in **1**. The magnetic susceptibility measurement shows there are strong spin-orbit coupling in octahedral coordinated Co2+ ions. The ZFCM/FCM shows irreversibility below 3K of **1** and below 6K on **2**. 1 shows weak ferromagnetism and a weak frequency dependence was observed on AC measurement. 2 shows ferromagnetic behavior and saturation can be estimated above 100 kOe. The frequency dependence belongs to spin glass. The related work on SCM is in process.



*This work was supported by CMS-CX200809, NSFC No.20673120, 20873154, and MOST 2006CB601001, 2006CB932102 of China
[1] Z. M. Duan, Y. Zhang, B. Zhang, D. B. Zhu, J. Am. Chem. Soc., ASAP, April 29, 2009.