Charge-transfer phase transition in a two-dimensional cyanido-bridged Co-W assembly with isoquinoline ligands

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Molecular-based magnets have attracted attention from various fields such as chemistry, physics, and material science. Combinations between phase transitions and magnetic properties lead to development for magnetic switching materials. Cyanido-bridged assemblies are suitable for such materials because we can select metal ions to show spin crossover and charge transfer which provide phase transitions and change of spin states.[1] We have reported some cyanido-bridged Co-W assemblies showing photo-induced phase transitions as well as thermal phase transitions derived from a charge transfer between Co^{II}-W^{V} and Co^{III}-W^{IV} states.[2,3] Herein, we report a new cyanido-bridged Co-W assembly including isoquinoline as ligands, $[\{Co(isoquinoline)_4\}_2\{W(CN)_8\}_2]\cdot 4H_2O$ (**CoWIsoq**).

The purple single crystal was obtained by reacting a mixed solution of Ethanol/H_2O including $CoCl_2\cdot 6H_2O$ and isoquinoline with an aqueous solution containing $Cs_3[W(CN)_8]\cdot 2H_2O$ at room temperature using slow diffusion method. The crystal structure of **CoWIsoq** at 300 K has a two-dimensional cyanido-bridged Co-W layers and also the π-π interaction between layers because of ligands (Figure 1). The product of the molar magnetic susceptibility (χ_M) and temperature (T) vs. T plot of **CoWIsoq** shows the thermal phase transition derived from the charge transfer between Co^{II}-W^{V} (purple) and Co^{III}-W^{IV} (orange) states (Figure 2). In addition, the photo-induced phase transition was observed in the variable temperature UV-vis spectra and magnetic measurements with a 980 nm diode laser.

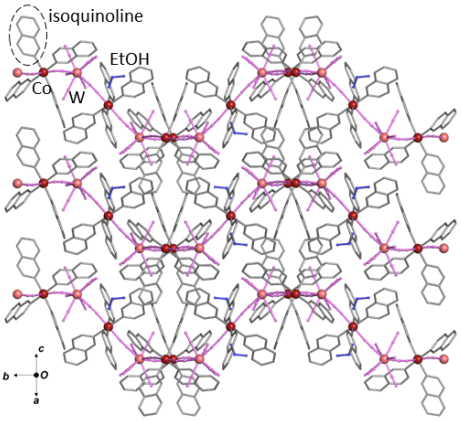

Fig.1 Crystal structure of **CoWIsoq** at 300 K viewed from (101) plane.

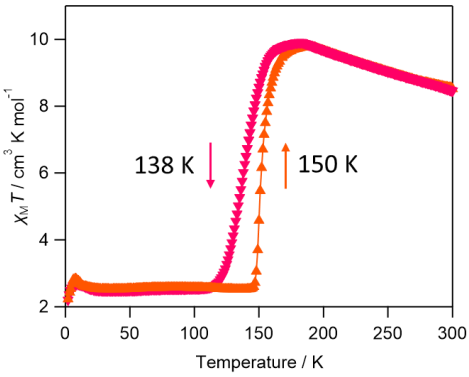

Fig. 2. $\chi_M T$-T plot of **CoWIsoq** under 5000 Oe.

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