Antiferromagnetic Transitions in Botallackite-Structure $Cu_2(OH)_3Cl$ and $Cu_2(OH)_3Br$

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In recent years, we found unconventional magnetic transitions in a mineral compound clinoatacamite $Cu_2(OH)_3Cl$ and the coexistence of long-range antiferromagnetic order and spin fluctuation in clinoatacamite $Cu_2(OH)_3Cl$ [1]. It is the first example of the $S = 1/2$ (Cu^{2+}) Heisenberg quantum spin on a pyrochlore lattice and the mother compound for the "perfect kagome lattice" $ZnCu_3Cl_2(OH)_6$ exhibiting spin liquid behavior [2]. $Cu_2(OH)_3Cl$ has four polymorphous structures of atacamite, clinoatacamite, paratacamite and botallackite. Among them, botallackite is the only two-dimensional structure with the spins on a triangular lattice showing long-range antiferromagnetic transition below $T_N = 7.2$ K [3]. The present work further investigates the magnetic transitions in botallackite-structure $Cu_2(OH)_3Br$ and $Cu_2(OH)_3I$. We hope the obtained information should help us to understand the magnetic structure as well as the role of super exchange interaction and dimensionality in these triangular lattices.

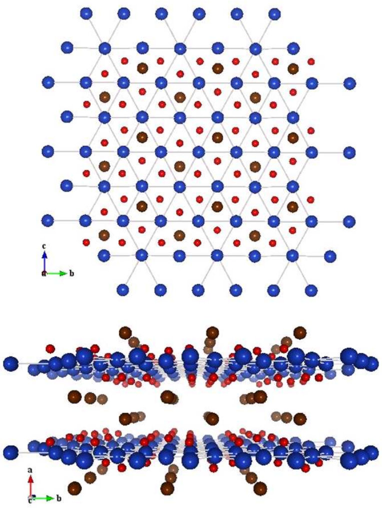

Fig.1 Crystal structure of botallackite.

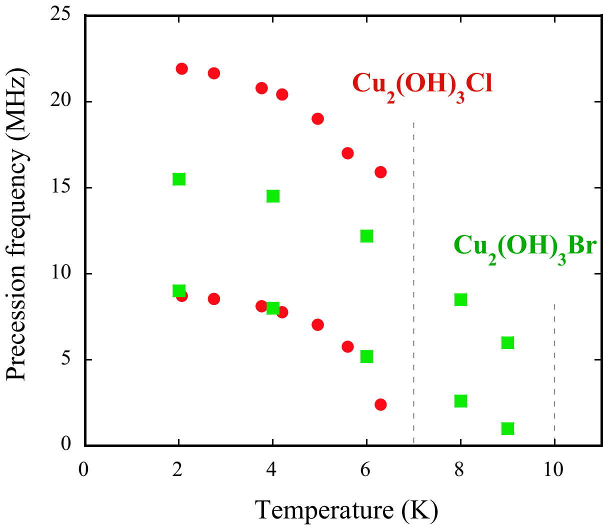

Fig.2: Muon precession frequencies for $Cu_2(OH)_3Cl$ and $Cu_2(OH)_3Br$.

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