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High magnetic field magnetization of a new triangular lattice antiferromagnet

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Introduction

In $CsV(MoO_4)_2$, the magnetic V^{3+} ions with octahedral oxygen-coordination form a geometrically frustrated triangular lattice [1]. So fare, there is no magnetic properties reported on it. Recently, we successfully grew single crystals of $CsV(MoO_4)_2$ by using flux method. The susceptibility shows a sharp drop around 24 K, representing a long range magnetic ordering.

To understand the physical properties of this new triangular lattice antiferromagnet (TLAF), we pursued high field magnetization measurements to answer two questions: (i) *what is the saturation field*, which will be very useful to calculate the exchange interaction of the system*?* (ii) *Will it exhibit spin state transition*, such as the up up down phase with 1/3-saturation moment as other TLAFs? Recently, we performed VSM measurements in Cell 8, Tallahassee, NHMFL, the results show that the magnetization reaches 0.38 MuB at 34 T, which is just 19% of the full moment of 2 MuB for V^{3+} ($3d^2$) ions. Apparently we need higher field to reach 1/3 value or full moment.

Experimental

The magnetization was measured with the inductive compensated coil technique in the pulsed field facility.

Results and Discussion

Figure 1 shows the measured magnetization with H // c-axis of the single crystal CsV(MoO4)2 at different temperatures up to 60 T. First, the obtained moment is around 0.65 MuB at 60 T, which is still significantly smaller than the full moment 2 MuB. Therefore, we fail to reach the saturation field. Second, for the 1.4 and 4.2 K data, it tends to show a flat regime around 50 ~ 60 T with 0.65 MuB, which is around 1/3 of the full moment. This could be the signature of 1/3 Ms. However due to the limitation of our experiment up to 60 T, we can not unambiguously confirm the existence of 1/3 Ms. In order to reach the saturation field and clearly demonstrate the 1/3 Ms feature, we need higher field measurements.

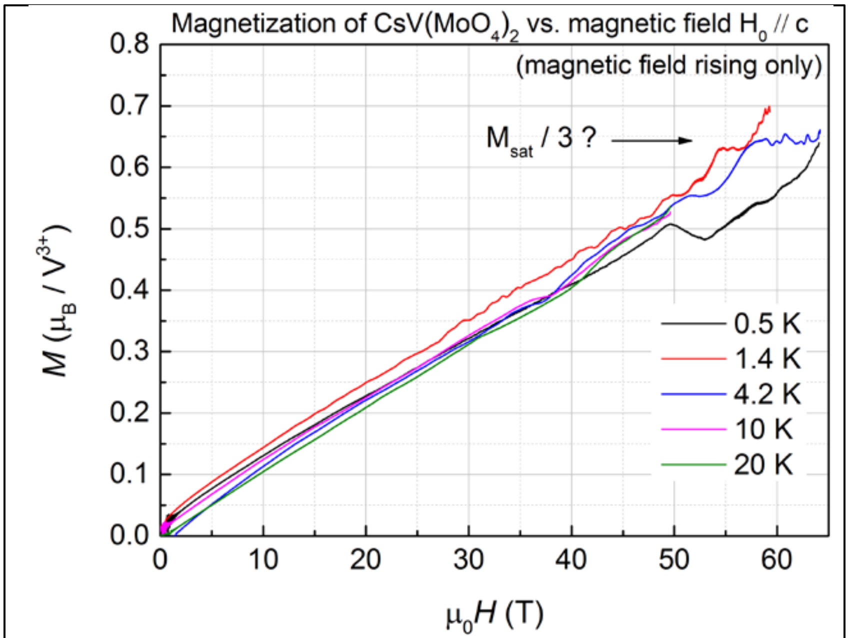

Figure 1 The magnetization measured at different temperatures for $CsV(MoO_4)_2$.

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References

[1] K. H. Lii, et al., J. Solid Sate Chemistry **80** 144 (1989).