Magnetic Excitation of the Low-dimensional Antiferromagnet $Cu_2(MoO_4)(SeO_3)$

P. Piyawongwatthana, K. Nawa, D. Okuyama, and T. J. Sato

IMRAM, Tohoku University

Low-dimensional spin chain systems have been attracting renewed interest in terms of a magnon or spinon-band splitting, which is found in α-$Cu_2V_2O_7$ [1] and Cs_2CuCl_4 [2]. A key parameter for the band splitting is an intrachain antisymmetric Dzyaloshinskii-Moriya (DM) interaction. To expand the variety of materials that can exhibit the band splitting, we have further searched for a possible low-dimensional antiferromagnet. $Cu_2(MoO_4)(SeO_3)$ is a candidate low-dimensional compound, which crystallizes in a monoclinic system (space group *P*21/*c*) with the unit cell parameters β = 104.675(12)°, a = 8.148(5) Å, b = 9.023(5) Å, and c = 8.392(5) Å [3]. The Cu^{2+} ions are connected via edges of CuO_5, forming armchair-like chains along the c-axis with three different bond lengths, 3.186 Å, 2.973 Å, and 3.149 Å with the possible DM interaction located between the shortest Cu-Cu bond.

We performed an inelastic neutron scattering on $Cu_2(MoO_4)(SeO_3)$ co-aligned single crystals to investigate the temperature dependence of its magnetic excitation. The thermal-neutron triple-axis spectrometer 4G-GPTAS installed at the JRR-3 was used for this experiment. The measurement at 4G-GPTAS was performed using neutron with fixed final energy 14.7 meV and horizontal collimations of 40’-80’-RC-30mm slit. A PG filter was placed after the sample toeliminate higher energy contamination. The scattering plane of the sample was set to be (*HHL*) plane. In this experiment, we focused on the magnetic excitation around $\boldsymbol{Q}$ = (1, 1, L). The data were collected at T = 2.55 K, 20K, 25 K, 50 K, and 100 K.

We investigated the temperature dependence of the magnetic excitation at $\boldsymbol{Q}$ = (1, 1, 0) at 4G-GPTAS spectrometer. Figure 1 shows the temperature dependence of the magnetic excitation at $\boldsymbol{Q}$ = (1, 1, 0). We found that the magnetic excitation still persists even at temperature well above T_N ~ 23 K suggesting that at high temperature, the magnetic excitation of this compound is resemble to 1D magnetism.

[1] G. Gitgeatpong, et al., Phys. Rev. Lett. 119, 047201 (2017)
[2] K. Yu. Povarov et al., Phys. Rev. Lett. 107, 037204 (2011)
[3] S. Y. Zhang, H. et al, Inorg. Chem., 48 (24), 11809–11820 (2009)

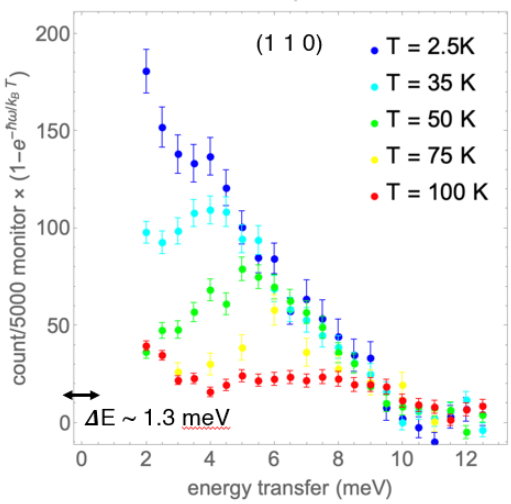

Fig. 1. The temperature dependence of the magnetic excitation at $\boldsymbol{Q}$ = (1, 1, 0). Blue, cyan, green, yellow, and red curves represent the constant-Q scan at T = 2.55 K, 20 K, 25 K, 50 K, and 100 K, respectively.