

Angle-resolved specific heat measurements in a quantum spin-orbital liquid candidate CuVO_3

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The Kitaev model [1] is an exactly solvable model of quantum spin liquid and has been extensively studied both theoretically and experimentally. More recently, the Yao-Lee model, an extension of the Kitaev model, was proposed [2]. The Yao-Lee model is defined by a product of Heisenberg-type interactions in the spin sector and Kitaev-type interactions in the orbital sector. Remarkably, even in the presence of an external magnetic field, the flux operators remain conserved, allowing the model to remain exactly solvable [3]. Owing to the presence of orbital degrees of freedom in addition to spin degrees of freedom, the model hosts a quantum spin-orbital liquid ground state. Furthermore, the larger number of itinerant Majorana fermions compared with the Kitaev model is expected to give rise to a richer variety of topological phases, making the Yao-Lee model particularly intriguing.

In this context, CuVO_3 has recently been synthesized as a candidate material for realizing the Yao-Lee model [4]. In CuVO_3 , the CuO_6 octahedra possess trigonal structure, which suppresses the Jahn-Teller distortion and preserves the orbital degeneracy of the $\text{Cu}^{2+} e_g$ orbitals, thereby retaining orbital degrees of freedom. Previous specific-heat measurements on polycrystalline samples revealed no phase transition down to 2 K [4]. In this study, we performed specific heat measurements down to 0.5 K as well as angle-resolved specific heat measurements under magnetic fields. We discuss the low-temperature properties of CuVO_3 based on these experimental results.

[1] A. Kitaev, *Ann. Phys.* **321**, 2 (2006).

[2] H. Yao and D.-H. Lee, *Phys. Rev. Lett.* **107**, 087205 (2011).

[3] M. Akram, E. M. Nica, Y.-M. Li and O. Erten, *Phys. Rev. B.* **108**, 224427 (2023).

[4] K. Ochi, H. Yamamoto, T. Aoyama, K. Ishii, D. Matsumura, T. Tsuji, A. Suzuki and K. Ohgushi, preprint.