

Absence of Magnetic Order in Ising Honeycomb-Lattice $\text{Ba}_3\text{Co}_2\text{O}_6(\text{CO}_3)_{0.7}$

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$\text{Ba}_3\text{Co}_2\text{O}_6(\text{CO}_3)_{0.7}$ is a rare example of Ising spin chains on honeycomb lattice. We have found the quasi-one-dimensional electric conduction and its localization at low temperatures below 100 K. The magnetic susceptibility exhibits highly anisotropic Curie-Weiss behavior with the Weiss constant of 69 K for the magnetic field parallel to the chain and -104 K for perpendicular to the chain, which indicates the intrachain ferromagnetic interaction and the interchain antiferromagnetic one. The specific heat C and NMR measurements revealed no indication of magnetic order down to 2 K. Based on these experimental results, we discuss possibilities of weak localization, spin glass, and spin liquid states. The spin liquid state on the honeycomb lattice is supported by recent theoretical calculations considering the next-nearest neighbor interactions. A large C/T value at the lowest temperature suggests a gapless spin liquid state. The result is in contrast to the ferrimagnetic state induced by magnetic field in the Ising antiferromagnet $\text{Ca}_3\text{Co}_2\text{O}_6$ with spin $S = 2$.¹

¹Y. Shimizu, M. Horibe, H. Nanba, T. Takami, and M. Itoh, Phys. Rev. B **82**, 094430 (2010).