Magnetic Field Effect on Antifferomagnetic Insulating State of λ-$(BETS)_2FeCl_4$

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A quasi two dimensional organic conductor λ-$(BETS)_2FeCl_4$ exhibits a new type of phase transition from a paramagneticm metal (PM) to an antiferromagnetic insulator (AFI) at T_{MI} of 8.3 K under zero magnetic field.[1] In the earlier studies, it was concluded that the Fe 3d spin dominantly contributed to the formation of AF ordering. Recently, we clarify that the Fe 3d spin in this system maintains most of the degrees of freedom in the AFI phase. This 3d spin enables precise evaluation of the internal field induced by the π spin order. In this study, to get information about the influence of magnetic field on the AF order and the PM-AFI transition, we study the specific heat under the magnetic fields up to 7 T. At low magnetic field ($H \leq 4$ T), the observable Schottky specific heat in low temperature indicates very little change with increasing the applied field, whereas its magnetic susceptibility shows the strong anisotropy and spin flop transition at 1 T. The anomalous field dependence can be explained on the basis of the 3d spin paramagnetic model considering the Fe anisotropy. Furthermore, a relationship between the Fe anisotropy and the AF order will also be discussed.

[1]H. Kobayashi et al., J. Am. Chem. Soc. **118**, 368 (1996).