Heat Transport of Quasi-One-Dimensional Ising-Like Antiferromagnet $BaCo_2V_2O_8$ in the Longitudinal and Transverse Fields

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We study the very-low-temperature thermal conductivity κ of $BaCo_2V_2O_8$, a quasi-one-dimensional Ising-like antiferromagnetic spin chain material, to probe the magnetic phase transitions induced by transverse and longitudinal magnetic fields, respectively. κ shows nearly isotropic behavior for heat current along or vertical to the spin-chain direction, indicating the magnetic excitation scattering on phonons. In the longitudinal field, κ is always smaller than the zero-field conductivity, and there is a sharp decrease at ~ 4 T in $\kappa(H)$ isotherms, which is related to the quantum phase transition from Néel order to incommensurate state. This is coincide with the $H-T$ phase diagram.[1] Moreover, another dip below 4 T is found and is likely resulted from the spin-flop transition. The case in the transverse field is quite different, in which κ presents a deep minimum at ~ 10 T and this "diplike" feature becomes broader with increasing temperature. This result strongly suggests a newly found field-induced magnetic phase transition.

[1]S. Kimura *et al.*, Phys. Rev. Lett. **101**, 207201 (2008); H. Yamaguchi *et al.*, J. Phys. Soc. Jpn. **80**, 033701 (2011).