RESONANT NERNST EFFECT IN THE FIELD-INDUCED SPIN DENSITY WAVE STATES OF $(TMTSF)_2ClO_4$

E.S. Choi, J.S. Brooks, Y.J. Jo (Florida State University, Physics/NHMFL); H. Kang, W. Kang (Ewha Womans University, Korea)

We reported the resonant-like enhanced Nernst effect of $(TMTSF)_2ClO_4$ in the metallic state [1], which showed similar behaviors observed in the metallic state of $(TMTSF)_2PF_6$ [2]. We extended our study to higher field where the field-induced spin density wave (FISDW) state is stabilized. We found that the resonant Nernst effect still persists in the FISDW state with enhanced magnitude.

The angular dependences of the Nernst effect at selected fields are presented in Fig. 1 (a), where in the inset, a summary of all data clearly show the equivalence of the resonant Nernst periods for both metallic and FISDW phases. The solid vertical lines in the main panel of Fig. 1 (a) correspond to the angles where the angular dependent magnetoresistance (ADMR) shows dips, and the dashed lines indicate the peak and dip positions for the resonant Nernst signal in the metallic phase. The resonant signal is evident for the second (*p/q*= 2) magic angle, and the positive peaks for the third (*p/q*= 3) magic angle is also observed. The up arrows indicate θ_{th} and the down arrows show the angle below which the Nernst signal is angle independent. The down arrows follow $H_\perp = H \cos\theta$, where $H_\perp$= 6.5 ~ 6.9 T. Additional structures due to the FISDW subphases also appear with the resonant behavior as shown in Fig. 1(b).

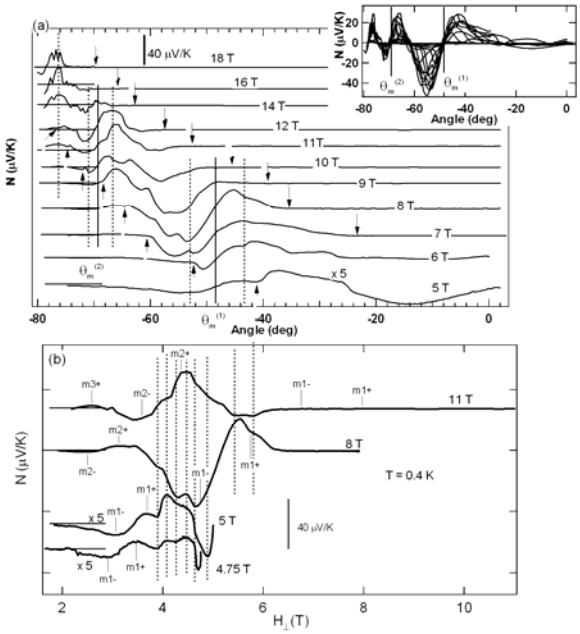

Fig. 1. (a) The angle dependence of the Nernst effect for representative fields, offset for clarity, between 5 and 18 T at 0.4 K. The solid lines indicate the magic angles ($\theta_m^{(1)}$ for *p/q* = 1 and $\theta_m^{(2)}$ for *p/q* = 2). The dotted lines indicate the angles where the Nernst signal shows a dip or peak in the metallic state. Up arrows: FISDW threshold angle θ_{th} where $H_\perp$ ~ 3.9 T; down arrows: critical angle above which the Nernst effect is angle independent for $H_\perp$ ~ 6.5 to 6.9 T. Inset: Nernst data for all fields between 5 and 18 T without offset. (b) The Nernst signal as a function of $H_\perp$ (=H cos θ) obtained from angle sweeps at fixed fields, offset for clarity. The dotted vertical lines indicate anomalies associated the FISDW transitions. The resonant Nernst signals are labeled as mn+(-) indicating peaks (dips) at p/q=n magic angles.

Our results suggest that the coherent-incoherent [2] picture at or near magic angle planes seems to be a robust description, based on both experimental and theoretical treatments. What remains to be settled is the nature of the excitations that are present in the 2D planes which cause the large Nernst signal.

Acknowledgements

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References

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