Anomalous Hall effect in Weyl semimetal

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Introduction

Weyl metals have exotic transport phenomena owing to chiral anomaly. One of these is negative longitudinal magneto resistance which have been reported several. Beyond the transport phenomena, we focus on measuring another interesting transportation under high magnetic field. For the object, we plan to measure anomalous Hall effect induced by pulsed magnetic field based on Ref [1] . When we apply pulsed magnetic field, the magnetic monopole in Weyl metal varies with time , which may induce new type of anomalous Hall effect. Based on the theoretical calculation, we focus on measuring the anomalous Hall effect in $Bi_{0.96}Sb_{0.04}$ using pulsed magnetic field.

Experimental

We used 65T pulsed magnet to measure longitudinal magneto resistance and Hall effect in Weyl metal $Bi_{0.96}Sb_{0.04}$. And we measured same conditions in $Bi_{0.90}Sb_{0.10}$ for comparing between Weyl metal and non-Weyl metal.

Results and Discussion

Fig.1 a is Hall effect of $Bi_{0.96}Sb_{0.04}$ at 4, 20, 50 and 100 K. At low magnetic field, the sign of 4 and 20 K is negative but that of 50 and 100 K is positive. We can exclude experimental artifacts because the values observed are saturated at 65 T which shows similar behavior as reported in other material. Near 10 T it has drastically changed and above 40 T its sign has changed and saturated at the specific value. Data of 4, 20, 50 K saturated at the same value but the trend of 100 K data shows that it may saturate at the value reached when we applied above 60 T. But $Bi_{0.90}Sb_{0.10}$ has no such strange behavior. It can be described by two-band model. Therefore, we focus on analyzing the effect by chiral-anomaly.

Conclusions

We measured longitudinal MR and Hall effect. Our object to measure anomalous Hall effect in pulsed field was not successful but we observed strange Hall effect in $Bi_{0.96}Sb_{0.04}$, which will be investigated by theoretical calculation.

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References

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