# Abstract

Topological semimetals are new classes of quantum materials, which are characterized by surface states induced by the topology of the bulk band structure. We inspired from interesting phenomenon is shown by these materials on a bulk scale, i.e., high transport properties, quantum anomalies which may be further beneficial for many other applications.

Reason for choosing $RCrSb_3$ and SmSb is its a new class of magnetic material both for the study and for their possible use. The RX (R = Ce, Pr, Sm; X=Sb, Bi) family of materials display a very large magnetoresistance and non-trivial band topologies. In this thesis, I have used Flux method to grow single crystal and characterize with the help of EDX, XRD, and Laue diffraction.

The magnetization and transport measurements were taken from SQUID magnetometry and PPMS of Quantum design respectively. We have observed a very high valued anomalous hall effect in $RCrSb_3$ while a beautiful Subhnikov de Hass oscillations observed in SmSb. To achieve better understanding in term of band structure from oscillations in SmSb which are very helpful to resolve the electronic structure and orientation of the Fermi surfaces. The value of anomalous Hall conductivity is 1230 $\Omega^{-1}cm^{-1}$ for $LaCrSb_3$, 1590 $\Omega^{-1}cm^{-1}$ for $CeCrSb_3$, 2930 $\Omega^{-1}cm^{-1}$ for $NdCrSb_3$ respectively which is highest ever conductivity reported among any quasi 2D material. This high AHE arises from internal band structure as calculated from our analysis. To dig the root cause of this high AHE, we performed thermal hall which also shows anomalous behavior (high Seebeck coefficient ), Combined electrical, thermoelectric measurements reveal that this high value of the AHE and ANE may arise from the same cause which is large net Berry curvature. For a better understanding of the result, we are collaborated with the theory group and waiting for ARPES results to comment further.