# Unveiling Exotic Quantum Phenomena in Ternary Metal Pnictide-Based Intermetallics: Probing Topological States through Quantum Oscillations

This study investigates transport and magnetic properties of rare-earth pnictides ($RETPn_2$). Measurements show anisotropic, linear, nonsaturating giant magnetoresistance up to 2500% at 2 K. Hall data reveal multiband transport with electrons and high-mobility holes (~85,000 $cm^2V^{-1}s^{-1}$), indicating nontrivial fermiology driven by nonsymmorphic symmetry in this quantum material.

Layered pnictides containing Bi/Sb square nets have attracted significant attention as a class of materials hosting relativistic fermions. In compounds like $AMnBi_2$ and $AMnSb_2$ (A = Ca, Sr, Ba, Eu), the interplay of magnetism and spin–orbit coupling can break time-reversal symmetry and generate Weyl states. $RAgBi_2$ and $RAgSb_2$ compounds, featuring antiferromagnetic ordering at low temperatures. Their tunable magnetic and electronic properties make them ideal systems for exploring Dirac fermions coupled with rare-earth magnetism. The in-plane resistivity ρ(T) of $REAgBi_2$ exhibits metallic behavior over the entire temperature range (300–2 K). A clear anomaly is observed near the Néel temperature ($T_n \approx 11$ K), where resistivity drops sharply due to the suppression of spin-disorder scattering associated with antiferromagnetic ordering. The low residual resistivity (~0.76 μΩ·cm) and high residual resistivity ratio (RRR ≈ 126) indicate excellent crystal quality. Magnetoresistance (MR) is large, anisotropic, and nonsaturating, reaching ~2500% for H ∥ c and ~1200% for H ∥ ab at 2 K. It shows an approximately linear dependence on magnetic field and decreases with increasing temperature. This behavior is consistent with Abrikosov quantum linear magnetoresistance, suggesting the presence of Dirac-like carriers. Hall resistivity measurements confirm multicarrier transport, with hole-dominated conduction at high fields and nonlinear behavior at low fields indicating contributions from both electrons and holes. Analysis reveals high hole mobility (~$10^4$–$10^5$ $cm^2V^{-1}s^{-1}$), supporting a semimetallic state with Dirac-like electronic behavior.

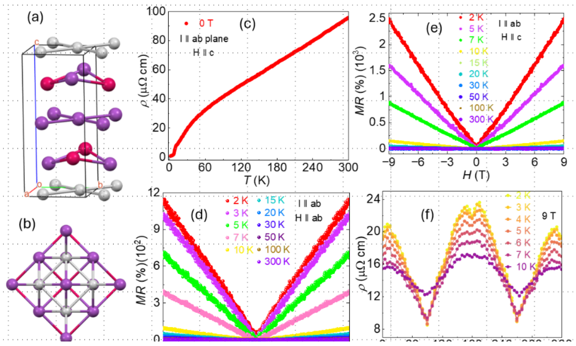


Fig. 1 (a) Layered tetragonal crystal structure of $REAgPn_3$ with square-net planes. (b) Top view of the square-net lattice. (c) Zero field In-plane resistivity ρ(T) from 2-300 K temperature. (d, e) Magnetoresistance for both H ∥ *ab* and H ∥ *c* field orientation. (f) Angular resistivity shows anisotropic magnetoresistance.

## References

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