

My research focuses on experimental condensed matter physics, particularly on superconductivity and topological materials. I work on synthesizing high-quality single crystalline and polycrystalline samples using techniques such as solid-state reaction and flux growth methods. After synthesis, I study their physical properties through electrical transport, magnetization, and penetration depth measurements to understand how electrons behave inside these materials. A key goal of my research is to investigate the pairing symmetry of electrons in superconductors, which helps determine whether the superconductivity is conventional or has a topological nature. Topological superconductors are especially interesting because they may host exotic quantum states, such as Majorana modes, which are highly robust against disturbances. These properties make such materials promising candidates for fault-tolerant quantum computation, where stable quantum states can be used to build more reliable quantum bits (qubits). Thus, my work contributes to understanding novel superconducting materials and their potential applications in future quantum technologies.

In summary, the synthesis and characterization of high-quality single crystals of nodal-line semimetal SnTaS₂ is discussed in this paper. The sample is an intercalated transition metal dichalcogenide. The specimen was grown using the chemical vapor transport method. The residual resistive ratio comes out to be ~530 with no signatures of structural phase transition. The onset resistive critical temperature is found to be 2.9 ± 0.1 K. The upper critical field $H_{c2,c}$ fits very well with GL fit while $H_{c2,ab}$ shows upward behavior near T_c . Anisotropy factor is estimated to be 3.1. SnTaS₂ is an orbital limited weakly coupled Type-II superconductor. Magneto-transport measurements show a non-saturating MR of 320% at 5K up to ± 5 Tesla. We observe WAL effect at low fields which is the first ever experimental confirmation of WAL in SnTaS₂. In essence, SnTaS₂ provides a good platform for understanding the superconducting transition metal dichalcogenides with nodal-line fermions. A lot about the pairing symmetry in the superconducting state as well as the topological feature needs to be unraveled in this superconducting system.