Dominant Topological Surface State Transport in $HfTe_5$ brought about by Strain

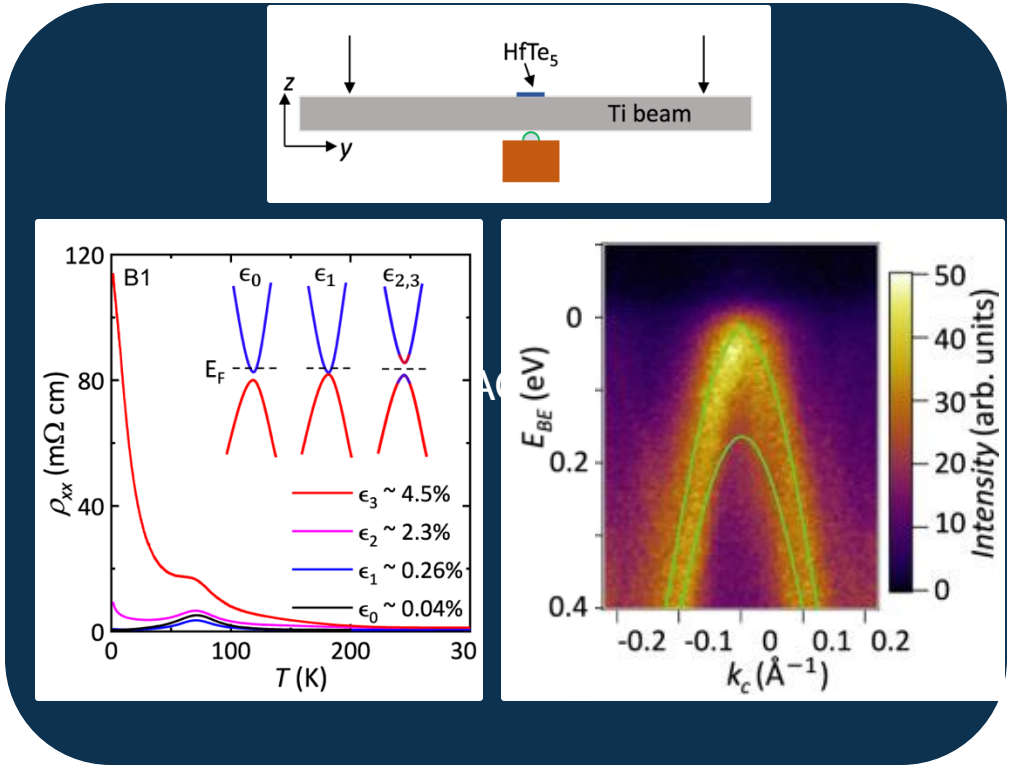

Figure 1. (a) Experimental configuration. (b) Temperature dependence of linear resistivity and cartoon bandstructure changes due to strain. (c) Angle resolved photoemission spectroscopy of the unstrained $HfTe_5$ compared with theory.

Reference: Liu, J.; Zhou, Y.; Rodriguez, S.; Delmont, M. A.; Welser, R. A.; Ho, T.; Sirica, N.; McClure, K.; Vilmercati, P.; Ziller, J. W.; Mannella, N.; Sanchez-Yamagishi, J. D.; Pettes, M. T.; Wu, R.; Jauregui, L. A. "Controllable Strain-Driven Topological Phase Transition and Dominant Surface-State Transport in HFTE5." *Nature Communications* 2024, 15 (1).

Work was performed, in part, at The Center for Integrated Nanotechnologies.

Scientific Achievement

An electronic topological phase transition successfully induced in $HfTe_5$ samples by subjecting them to significant strain, reaching ~4.5%.

Significance and Impact

This transformation shifted the material's properties from that of a weak topological insulator to that of a strong topological insulator. As a consequence of this transition, the topological surface states (TSS) emerged as the predominant pathway for electrical conduction.

Research Details

- Precisely modulated the bulk bandgap of $HfTe_5$, ranging from its closure (0eV) to approximately 100 meV.
- Performed linear and Hall resistivity measurements at 1.5 Kelvin under different mechanical bending strains.