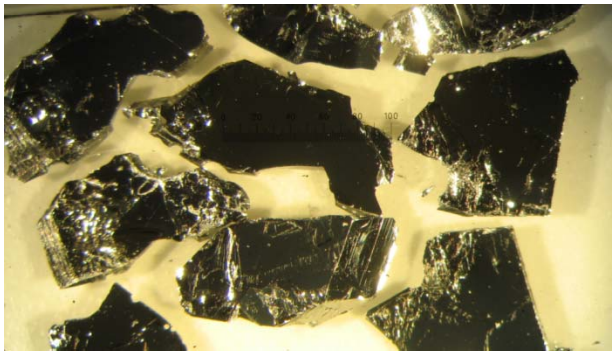
University of Maryland NSF-MRSEC Highlight

Synthesis and Characterization of Topological Insulator Materials

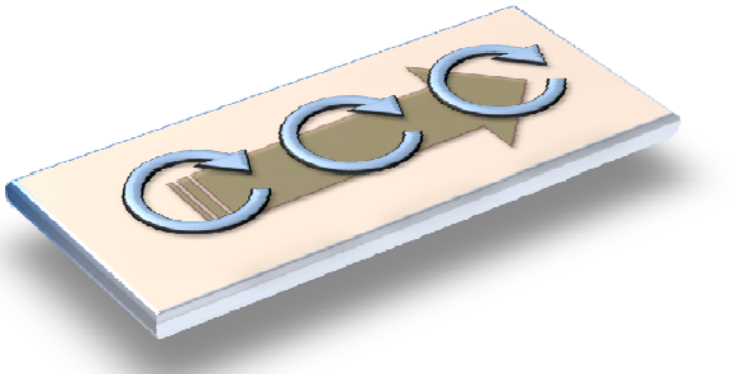
N. P. Butch, K. Kirshenbaum, P. Syers, A. B. Sushkov, G. S. Jenkins, H. D. Drew, J. Paglione

Exploration of a new class of “Dirac” materials that feature metallic surface states protected by time-reversal symmetry in a manner similar to graphene is of fundamental interest and relevance to future applications in spintronics and quantum computation. UMD-MRSEC researchers have progressed to achieving synthesis of high-quality crystals of Bi_2Se_3 with the highest electron mobility values and lowest carrier concentrations known to date.

Low temperature transport and optical transmission experiments have revealed a surprisingly strong scattering rate for surface conduction in this system, providing important information on the nature of the topological protection toted as the next frontier in exotic states of matter.



High-quality single crystals of Bi_2Se_3 grown via the Bridgeman technique.



Spin-polarized chiral surface states of a 3D topological insulator.

UMD MRSEC DMR0520471