Strained bulk HgTe as a 3-dimensional topological insulator

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Abstract

The prediction and discovery of topological insulators (TIs) generated a large interest in the physics community during the past years. This new state of mater is characterized by conducting Dirac type surface states while the bulk of the material remains insulating. These surface states have been observed so far in, e.g., Bi_2Te_3, Bi_2Se_3 and Sb_2Te_3. These materials do however exhibit large defect densities paired with low arrier mobilities. So far this prevented transport studies in the quantum Hall regime of 3D TIs. Recently, however, we succeeded in using strained bulk HgTe as 3D TI. This enabled us to measure the quantum Hall effect from the 3D TI surface state in transport experiments. The samples were fabricated by molecular beam epitaxy of HgTe layers on top of CdTe substrates. The strain induced by the lattice mismatch between HgTe and CdTe results in opening a gap in the HgTe band structure which makes the TI state observable.