

Development of thin film platforms for tunable topological materials

A.D. Rice¹

¹ *National Renewable Energy Laboratory, Golden, CO 80401, USA*

Cd_3As_2 is a prototypical Dirac semi-metal, a class of materials with gapless topologically protected electronic states. These materials could play a role in a large number of applications, including transistors, spintronics, photodetectors, and thermoelectrics. To be used in these technologies, however, significant progress needs to be made in developing routes to tune their properties as well as combining them with materials that are already technologically relevant. Here, a II-VI/III-V platform is first developed which allows for growth of Cd_3As_2 on GaAs(111) with high electron mobility. This platform is extended for both (110) and (001) film orientations, ultimately allowing for growth of heterostructures relevant for photodetectors. Analogous approaches also allow for integration of Cd_3As_2 with Si(001). Ways to alter the electronic properties of Cd_3As_2 will also be discussed. This work demonstrates routes toward developing quantum materials for a variety of applications and may be extended to a variety of other materials system.

⁺ Author for correspondence: Anthony.Rice@nrel.gov