MBE growth of Cd_3As_2 on GaAs(001) Substrates

<u>A.D. Rice</u>,[1+] **K. Alberi**[1]
[1] *National Renewable Energy Lab, Golden, CO, USA.*

The Dirac semimetal Cd_3As_2 has become a useful material in the scientific community, as it provides access to a variety of interesting phenomena ranging from topological superconductivity to massless Dirac fermions. It is also potentially useful for energy-related applications due to its high electron mobility and large phonon-phonon scattering. Both single crystal and thin film synthesis has been achieved, however thin film research to date has been confined to non-traditional substrates, such as mica [1], or zinc blende (111) orientations [2,3] due to the preferred (112) growth plane of Cd_3As_2. To aid integration of Cd_3As_2 into current technological applications, growth on a (001) substrate must be pursued.

Here, we explore the use of a II-Te/GaAs(001) platform to support Cd_3As_2. CdTe grown directly onto GaAs(001) results in a (111) orientation due to the large lattice mismatch (14.6%), as shown by X-ray diffraction (XRD). A high temperature anneal prior to CdTe growth, resulting in a Ga-rich surface reconstruction, further improves the interface and resulting film morphology. Atomic force microscopy reveals film roughness comparable to CdTe structures on GaAs(111). Growth of Cd_3As_2 on this platform is explored and compared to similar films on GaAs(111) substrates.

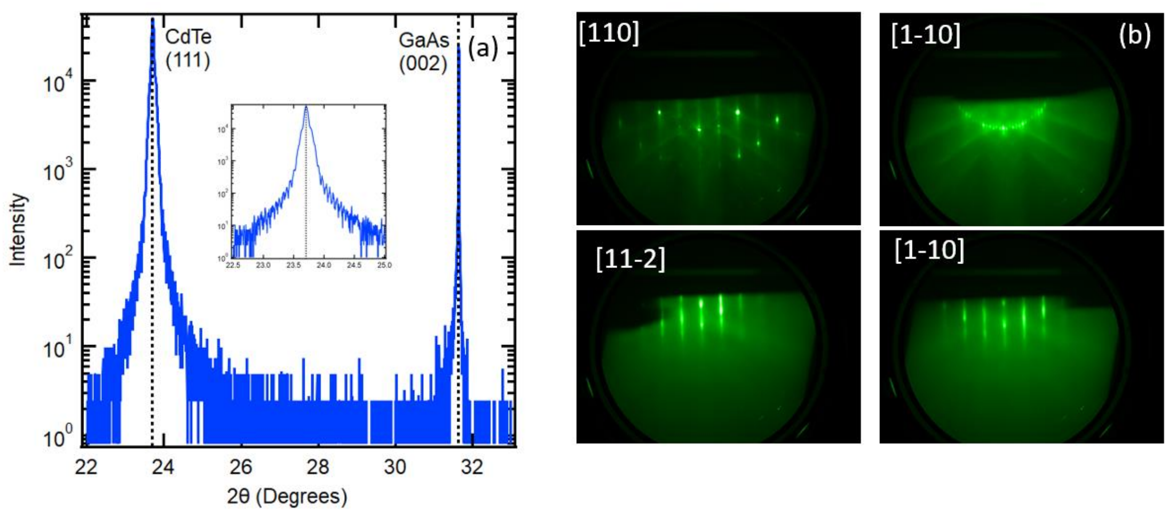

Fig. 1 (a) XRD of CdTe(111) grown on GaAs(001) (b) RHEED images of Ga-rich GaAs(001) and resulting growth of CdTe(111)

[1] P. Cheng *et al.,* New J. Phys. **18** 083003 (2016)
[2] T. Schumann *et al.,* APL Mater. **4**, 126110 (2016)
[3] M. Goyal *et al.* APL Mater. **6**, 026105 (2018)

+ Author for correspondence Anthony.Rice@nrel.gov