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Investigating heat transport within CdZnSe substrate on quality of Bolometric effect of a HgTe/HgCdTe heterostructure[1] MEHDI PAKMEHR, Shiraz University, University at Buffalo (SUNY), MOJTABA BANIASADI, ARDAVAN MOGHTADERI, Shiraz University, CHRISTOPH BRUENE, LAURENS W. MOLENKAMP, Wuerzburg University — HgTe/HgCdTe heterostructures have been investigated largely, due to its rich physics stem from spin orbit coupling (SOC), result in new class of materials (known as quantum materials) with novel properties like quantum phase transition. We probed the SOC effect combined with other mechanisms (e.g. strain, exchange many body, etc) on gapped Dirac type E(k) of 6.1 nm HgTe QW by a technique known as THz magneto-photoresponse spectroscopy [PRB 90, 235414, J. Ele. mat. 44, 3598]. The bolometric nature of the signals measured lead us to investigate heat diffusion mechanisms for our HgTe/HgCdTe heterostructure grown on CdZnSe [001] substrate at cryogenic temperature (1.4K). Thermal diffusion constant (κ) is 8 times larger for this material in comparison to other crystalline materials at low T. Modeling heat transport for our sample with Hall bar geometry confirms that CdZnSe sub. acts as a thermal heat sink when the chopped THz laser beam (40 mW @ ν =1.4 THz) hits our sample (in on cycle) and as a result cools down 2DEGs confined in QW region, in microsecond scale. This allows us to modulate the temperature of 2DEGs and probe the desired physics through lock-in technique. Heat transport studies of c-CdZnSe substrate at T<20K will be presented.

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