Optical Characterization of Thermal Transport Across Graphene/h-BN Hetero-junction

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Motivation & Introduction

- Emergence of novel 2d hetero-structure devices
- Interesting transport phenomenon, rectification and negative differential resistance in graphene based devices
- The operating temperature and device performance affected by interfacial thermal conductance
- Experimental Measurements of interfacial heat transport across the junctions lacking

Experimental Setup

- The fabricated device is placed on a cryostat
- Joule heating of underlying graphene layer using applied current (P=I\textsuperscript{2}R)
- Raman spectra of Graphene (G band (1580 cm\textsuperscript{-1}), 2D band (2680 cm\textsuperscript{-1}) and h-BN (1370 cm\textsuperscript{-1}) downshifts with temperature
- Calibrate downshift as a function of Temperature
- Measure downshift of Raman spectra for every 0.25 mA increment of current
- Use the calibration graph to obtain the change in temperature as a function of Power applied

Results

- G\textsubscript{th} reported to be 7.41±0.43 MWm\textsuperscript{-2}K\textsuperscript{-1}
- Interface quality needs to be improved for higher Conductance
- Currently working on measurement of thermal transport across hetero-junction between graphene and various other 2d materials

Conclusion and Future Work

- \( G_{th} = \frac{Q}{\Delta T} \)

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References