Electrical Transport Measurements of Graphene on $CdPS_3$

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Background/Relevance

- Graphene is very thin, 2-Dimensional layer of graphite, organized in a hexagonal pattern on the atomic scale
- Graphene has great electrical, chemical, and thermal properties
- Graphene has very high electrical conductivity

Innovation

- Try to understand how electrical properties affect sensing parameters

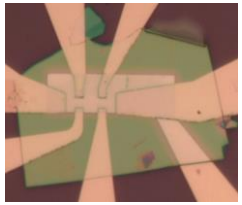
Approach

- Clean the chip, apply the resist (PMMA)
- Electron Beam Lithography (EBL) etches the design onto the chip
- Metal evaporation coat the design in gold
- Bond wires onto the wire contacts
- Flake transfer to put graphene onto the back gate
- Anneal the device and, if necessary, plasma etch as a final clean
- Finally, the device undergoes a Hall experiment at temperatures close to absolute zero in the cryostat

Key Results

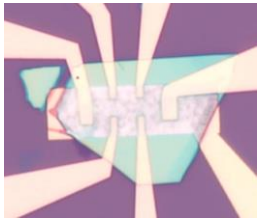
Hexagonal Boron Nitride (hBN)

- Carrier Density: n = $2.518*10^{12}$ cm^{-2}
- Electron Mobility: μ = 286 $\frac{cm^2}{Vs}$



Cadmium Phosphorus Sulfide ($CdPS_3$)

- Carrier Density: n = $1.774*10^{13}$ cm^{-2}
- Electron Mobility: μ = 164 $\frac{cm^2}{Vs}$



**discrepancy over mobility values due to inaccuracy of magnetic field value*

Conclusions

- No conclusive evidence to support either substrate being better than the other
- Boron nitride had a greater mobility
- Cadmium phosphorus sulfide had a higher carrier density
- Further testing must be done

Research funded by National Science Foundation REU Grant # EEC-1922719
REU Site: Tomorrow's Nanomanufacturing: Engineering with Science (TNEWS).