

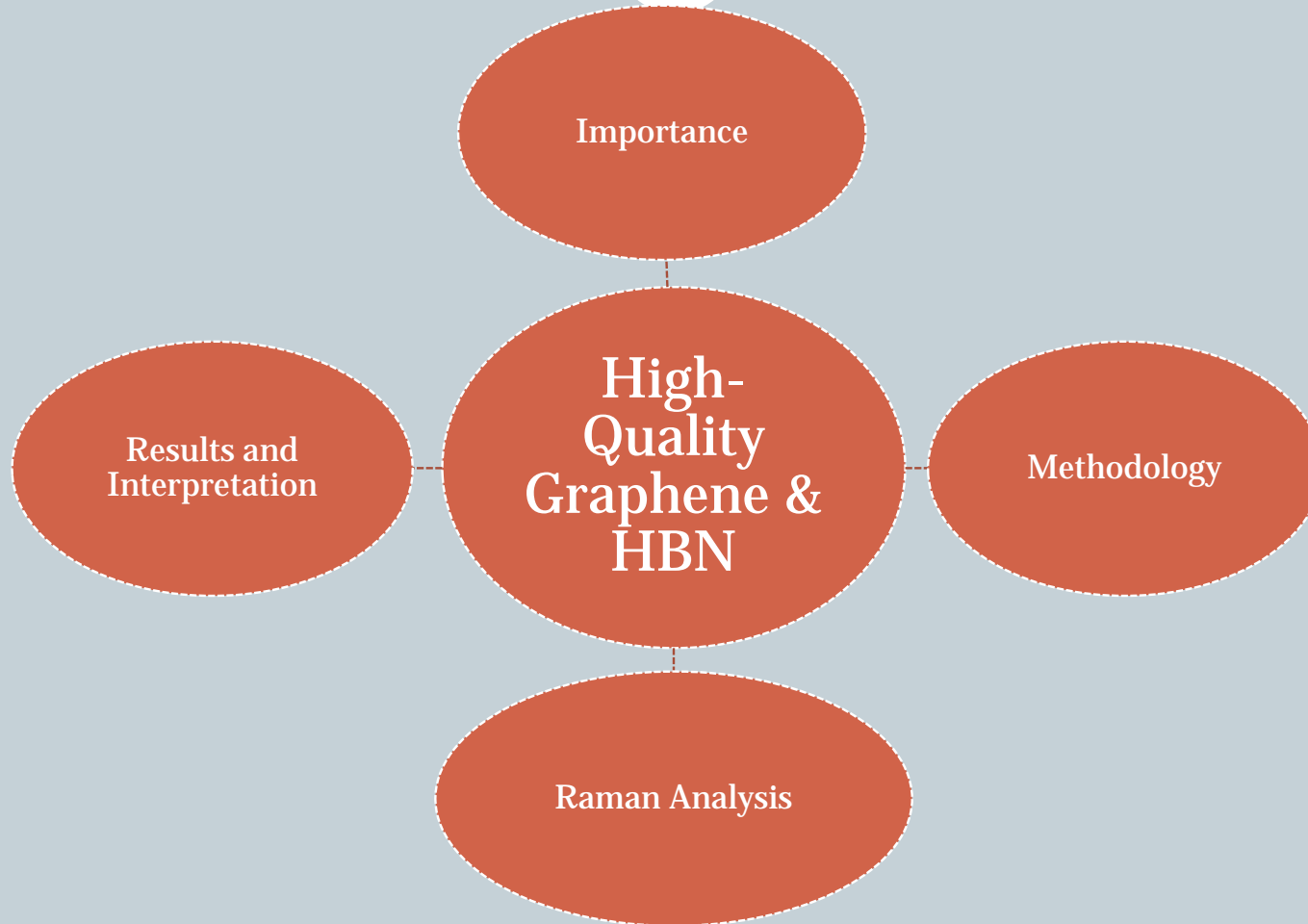
High-Quality Graphene and Hexagonal- Boron Nitride Transfers on SiO₂

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Overview

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Overview

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Importance

Results and
Interpretation

High-
Quality
Graphene &
HBN

Methodology

Raman Analysis

2D Materials

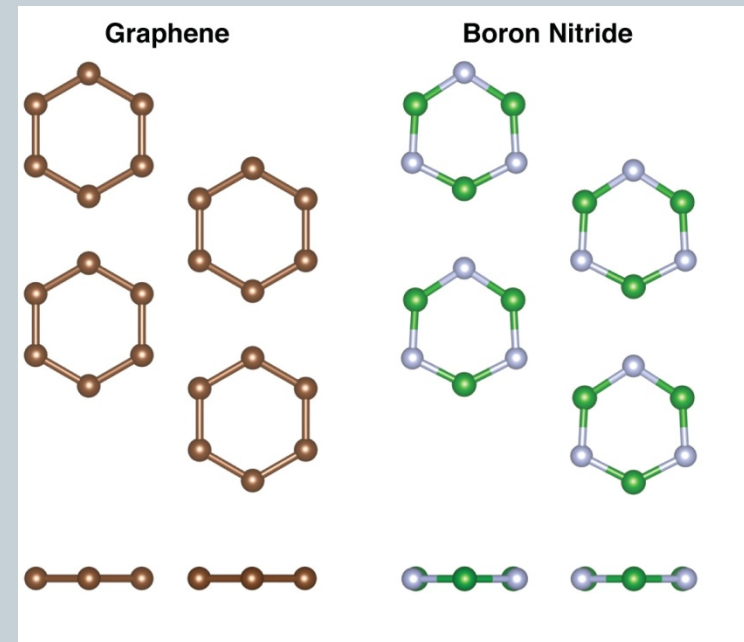
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- **Graphene**

- Zero overlap semimetal
- Durable
- Heat and electricity conductivity

- **Hexagonal-Boron Nitride**

- Similar properties to graphene



Future Application

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- **Biological engineering**
- **Optical Electronics**
- **Composite materials**
- **Super Capacitors/ Energy Storage**



Overview

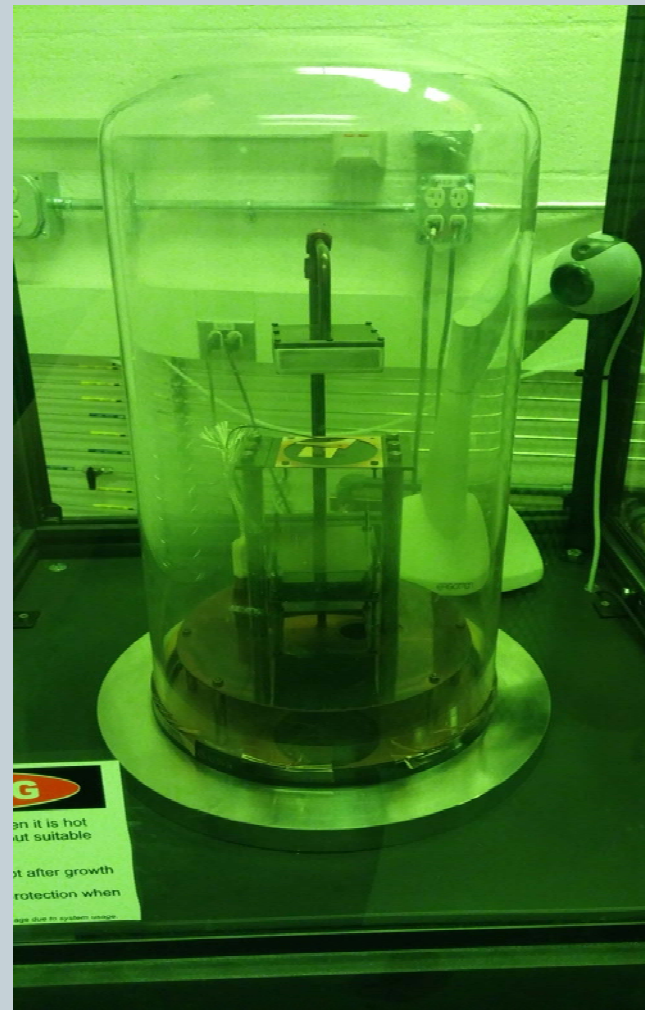
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Growth

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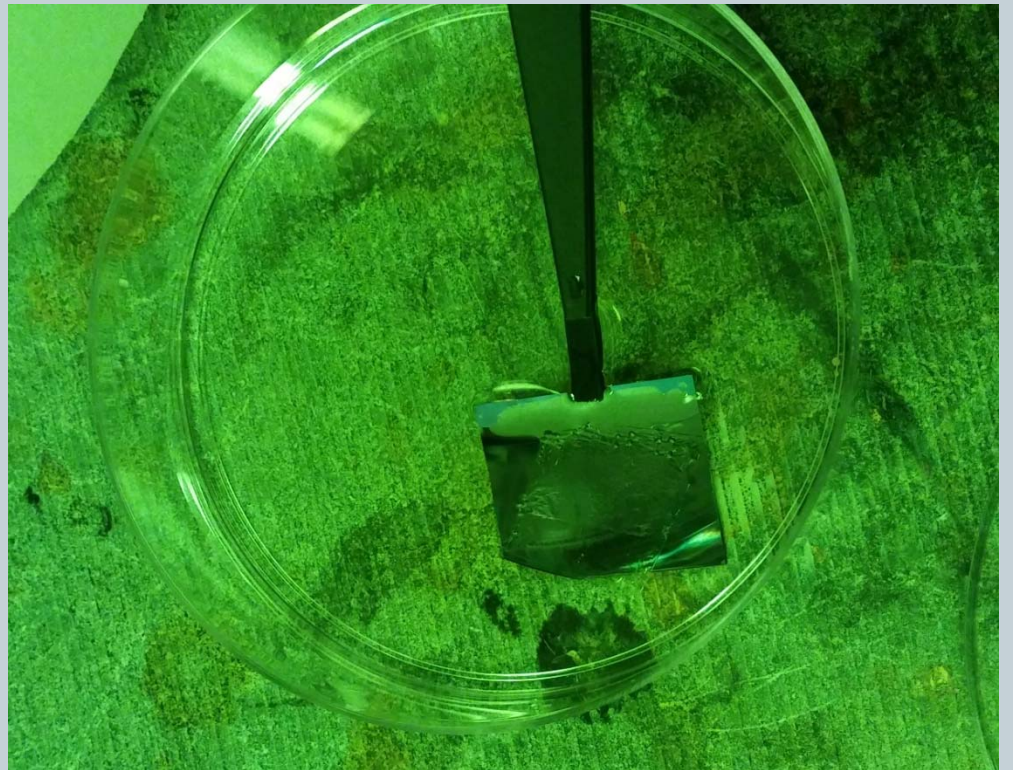
- Chemical Vapor Deposition (CVD)
- Copper catalyst
- Vertical growth with furnace
- Methane, hydrogen, argon gases



Transfer of Graphene

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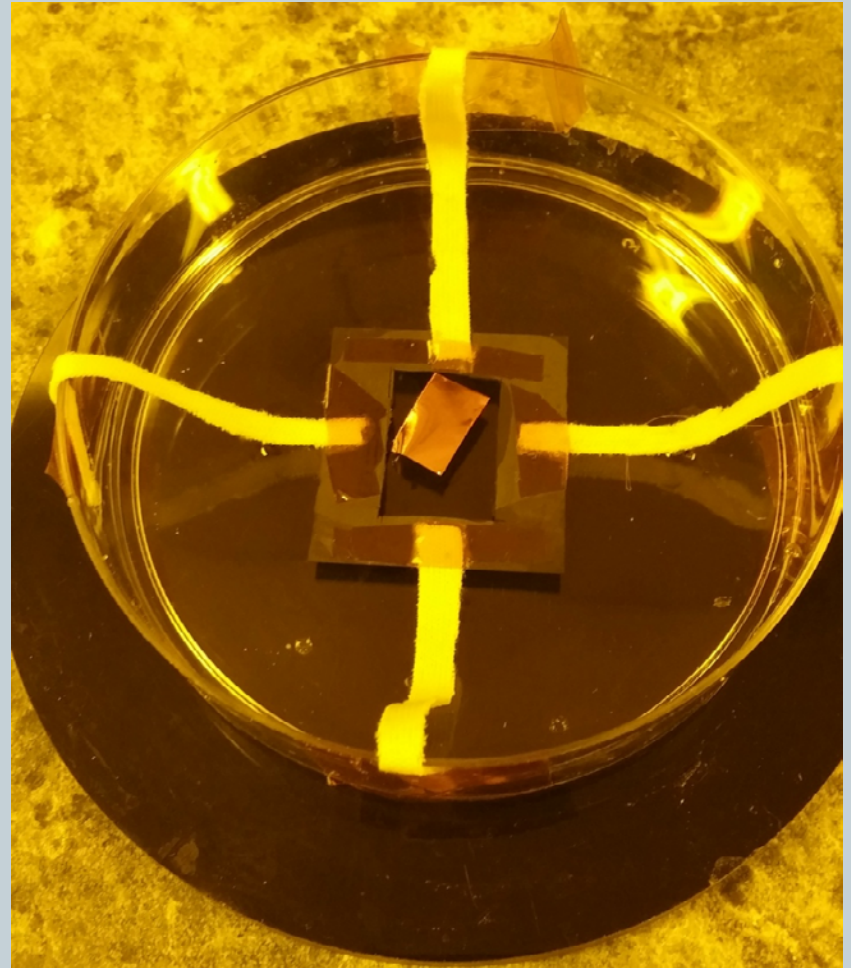
- PMMA spin coat
- Ammonium Persulfate (APS)
- Rinse
- Heat
- Acetone bath



Transfer of HBN

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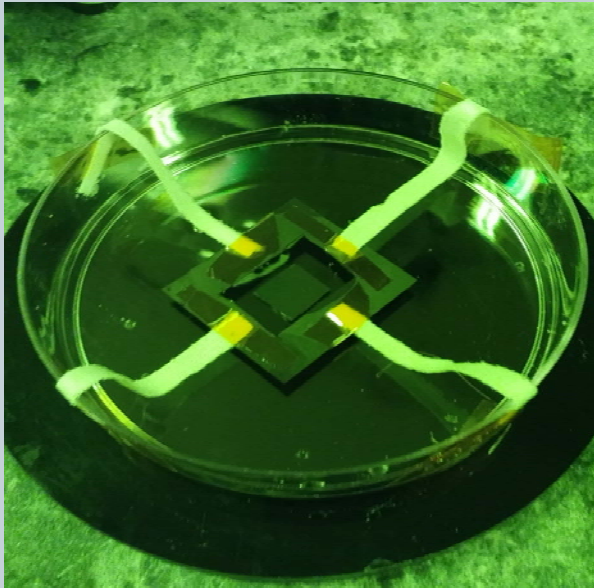
- Copper foil
- APS
- Corral
- Pumps



Polymer-Free Approach

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- Similar to H-BN
- Outflow: APS
- Inflow: DI H₂O and Isopropyl Alcohol



Overview

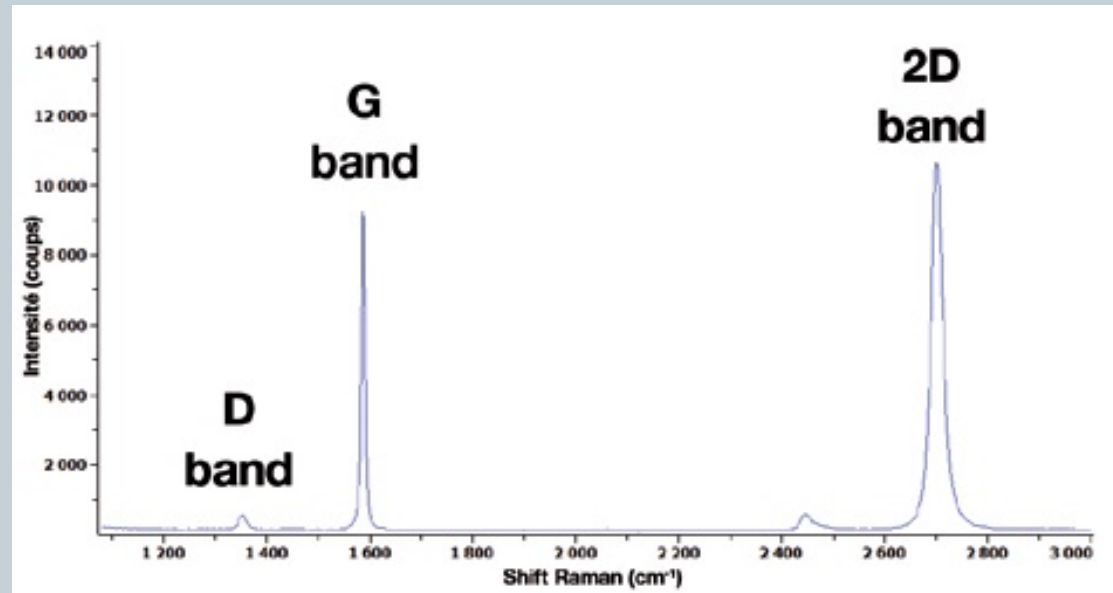
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Graphene Spectrum

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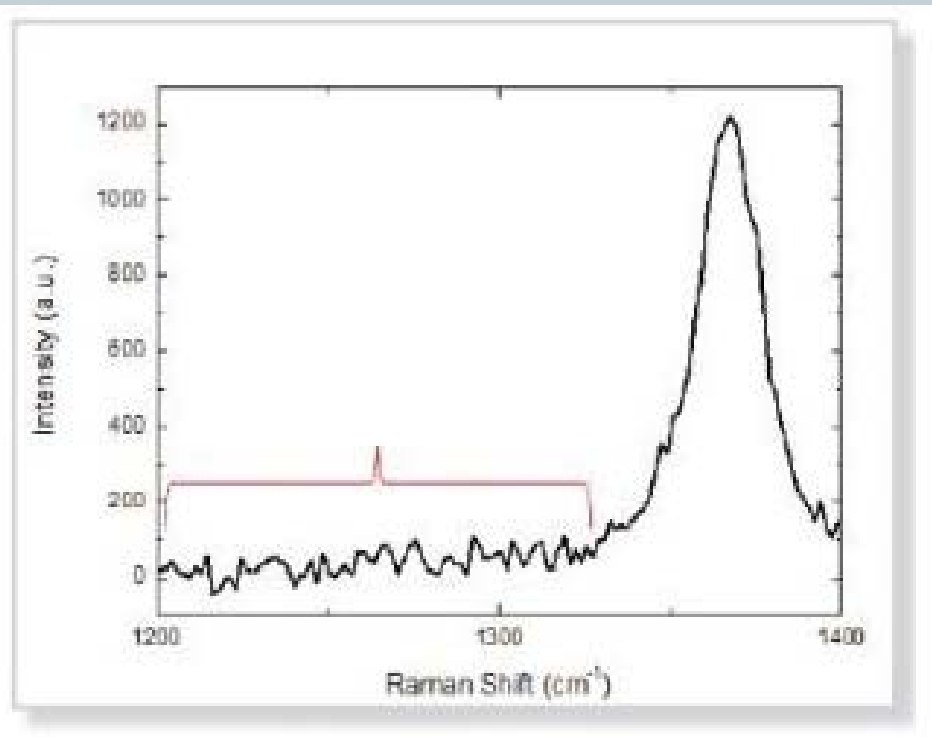
- D band
- G band
 - D/g
- 2D Band
 - 2D/G
- Ideal Spectrum



HBN spectrum

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- 1300-1400 range
- Weak readings
- Carbon contamination
- Ideal Spectrum



Overview

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Graphene Analysis



Grown at 830 °C [edge]



Grown at 840 °C [edge]

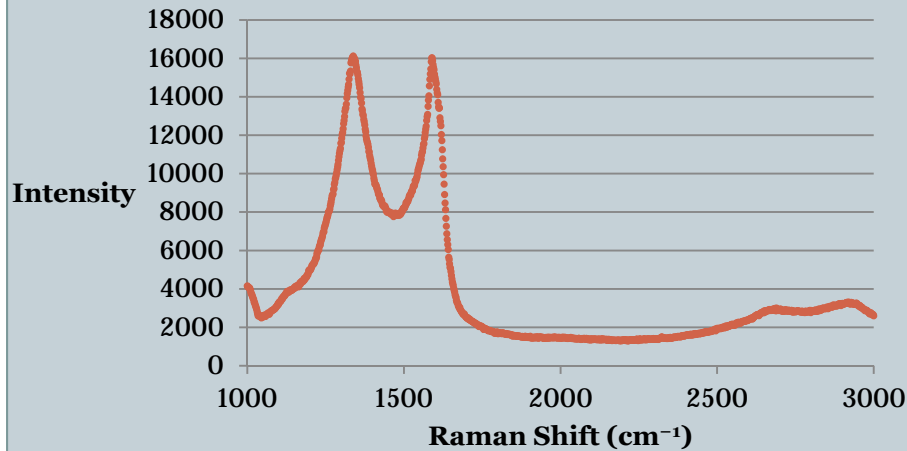


Grown at 850 °C [center]

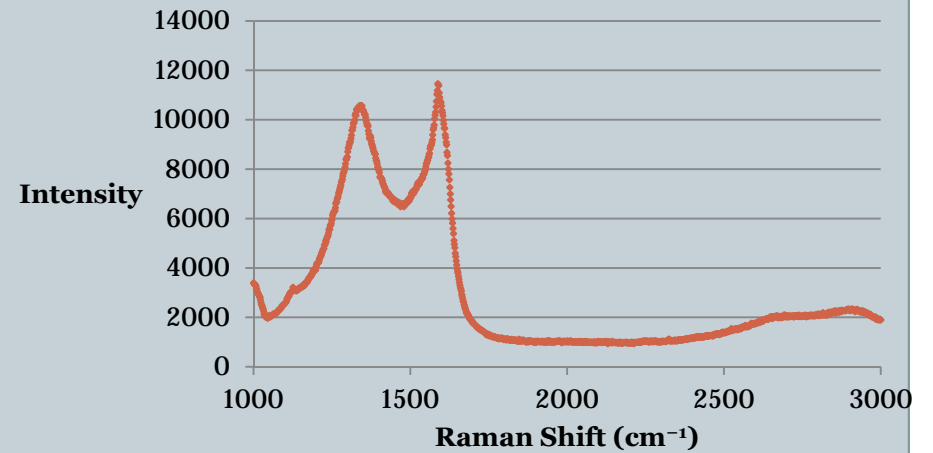
Graphene Analysis

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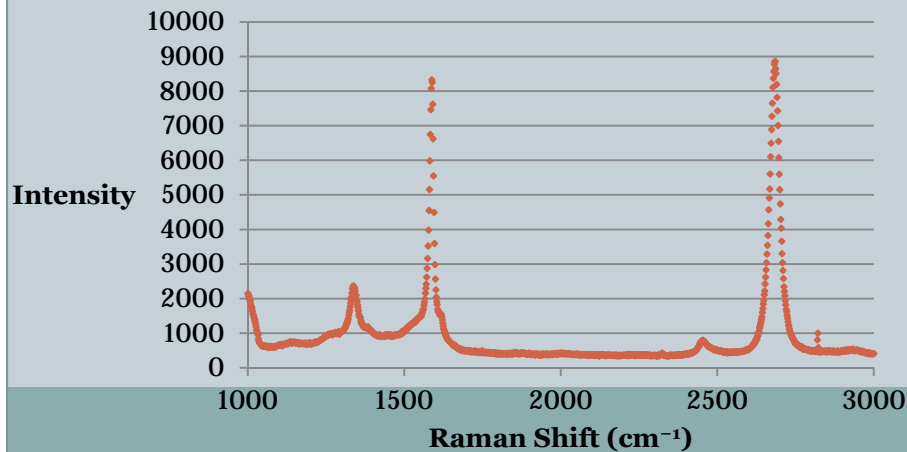
Graphene Center at 750 °C



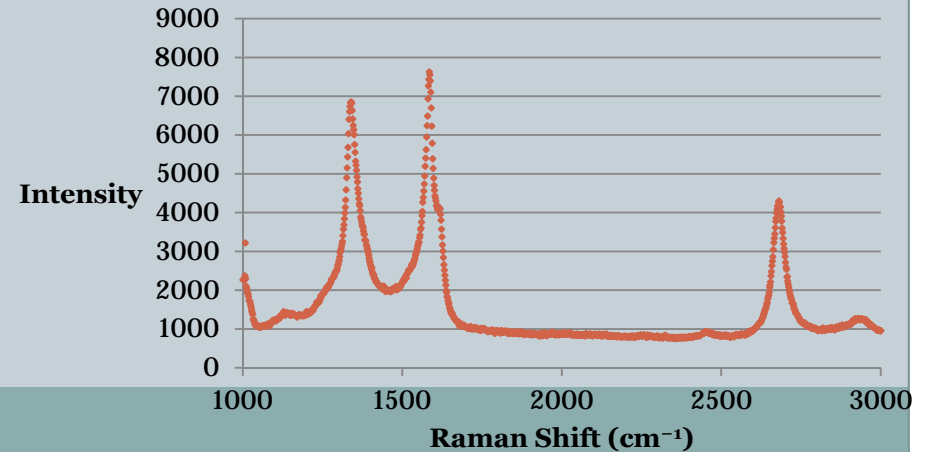
Graphene Edge at 750 °C



Graphene Center at 850 °C



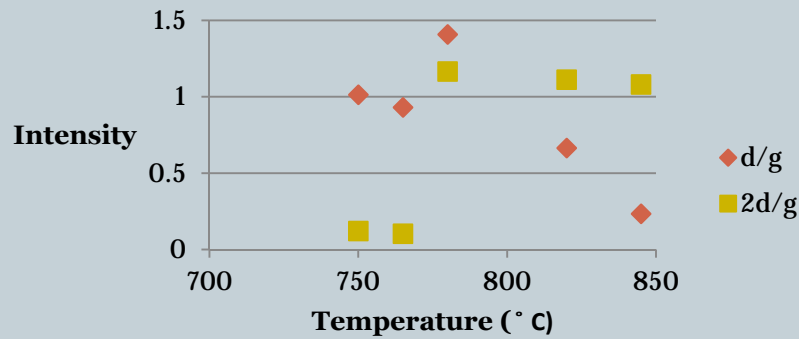
Graphene Edge at 850 °C



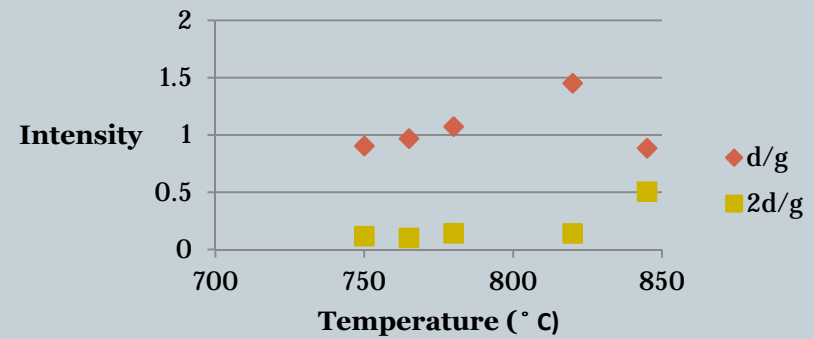
Graphene Analysis

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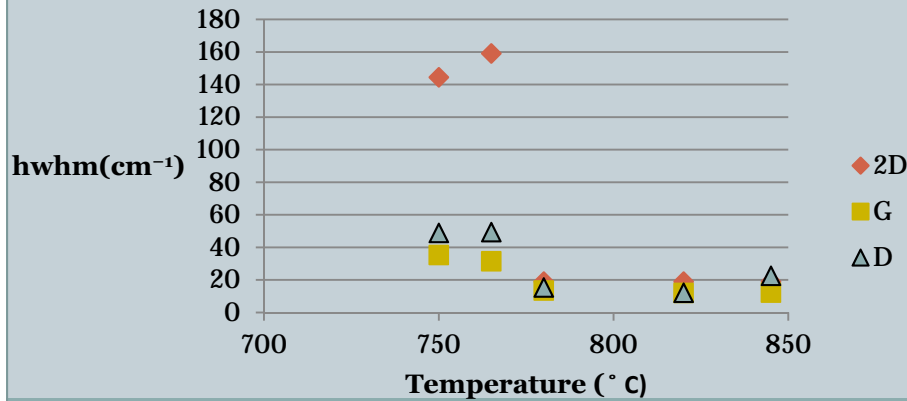
Intensity vs. Temperature (center)



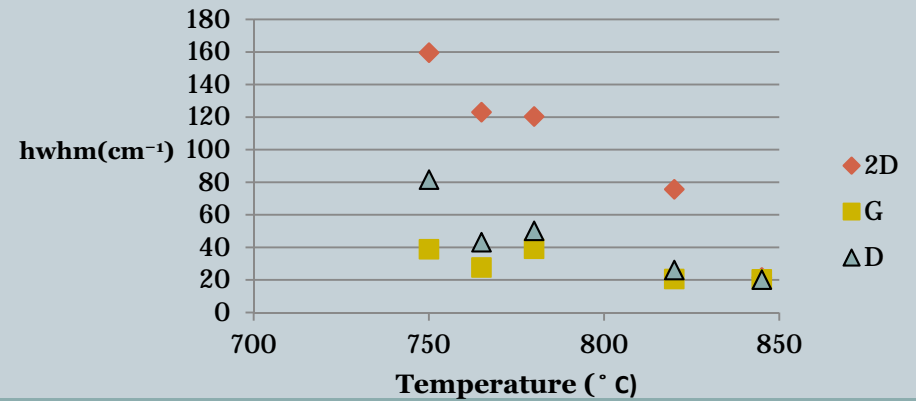
Intensity vs. Temperature (edge)



HWHM vs. Temperature (center)

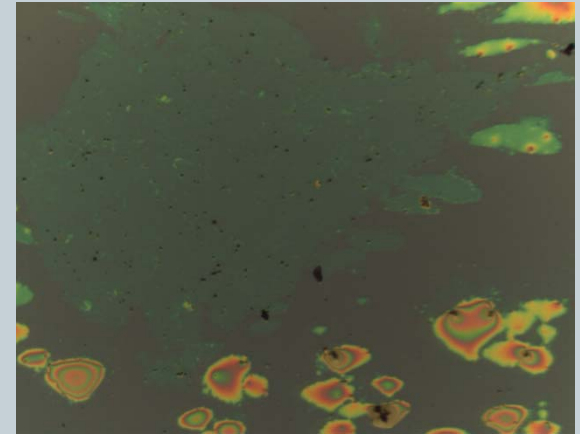
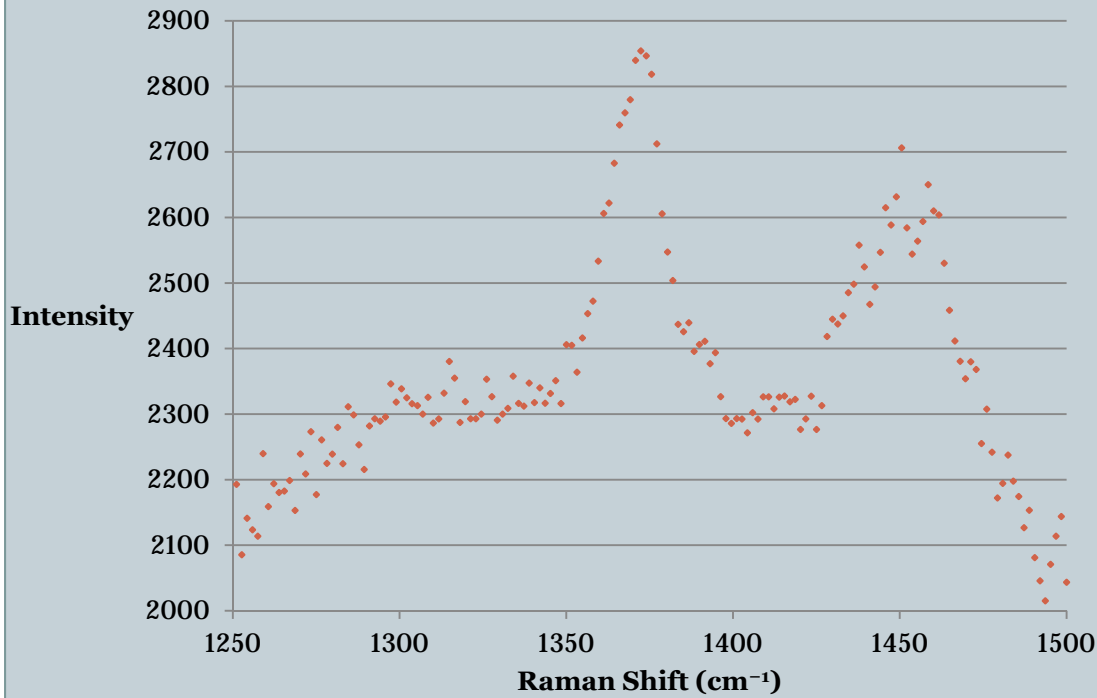


HWHM vs. Temperature (edge)



H-BN Analysis

H-BN Raman Spectrum (100x)



H-BN 10x

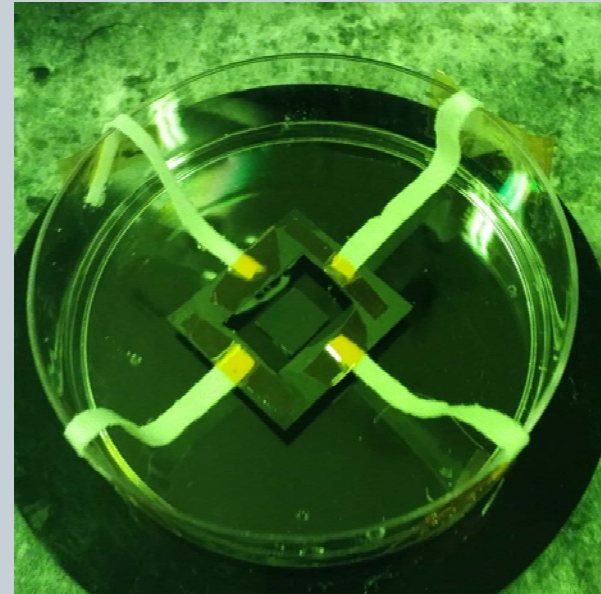


H-BN 100x

Towards Ideality

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- Corral adjustments
- Polymer-free transfer
- Particle prevention



Acknowledgments

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Thank you very much for listening!
Any questions or comments?