Chemical vapor deposition growth of graphene

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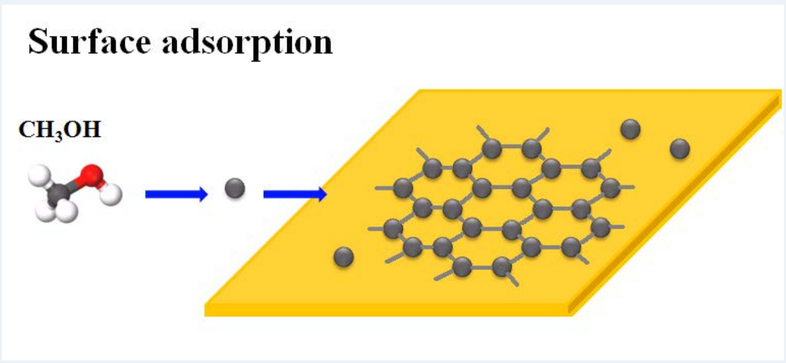
Chemical Vapor Deposition Growth of Graphene

Introduction

- The purpose of this project is to grow single layer graphene (SLG) on copper foil using different precursors (ethanol, methanol and etc).

Fig. 1. Schematic diagram of graphene growth mechanism on copper foil.

- Low solubility of carbon in copper .
- The precursors for graphene decomposes on the copper surface with minimal carbon diffusion onto the copper.



Experimental procedure

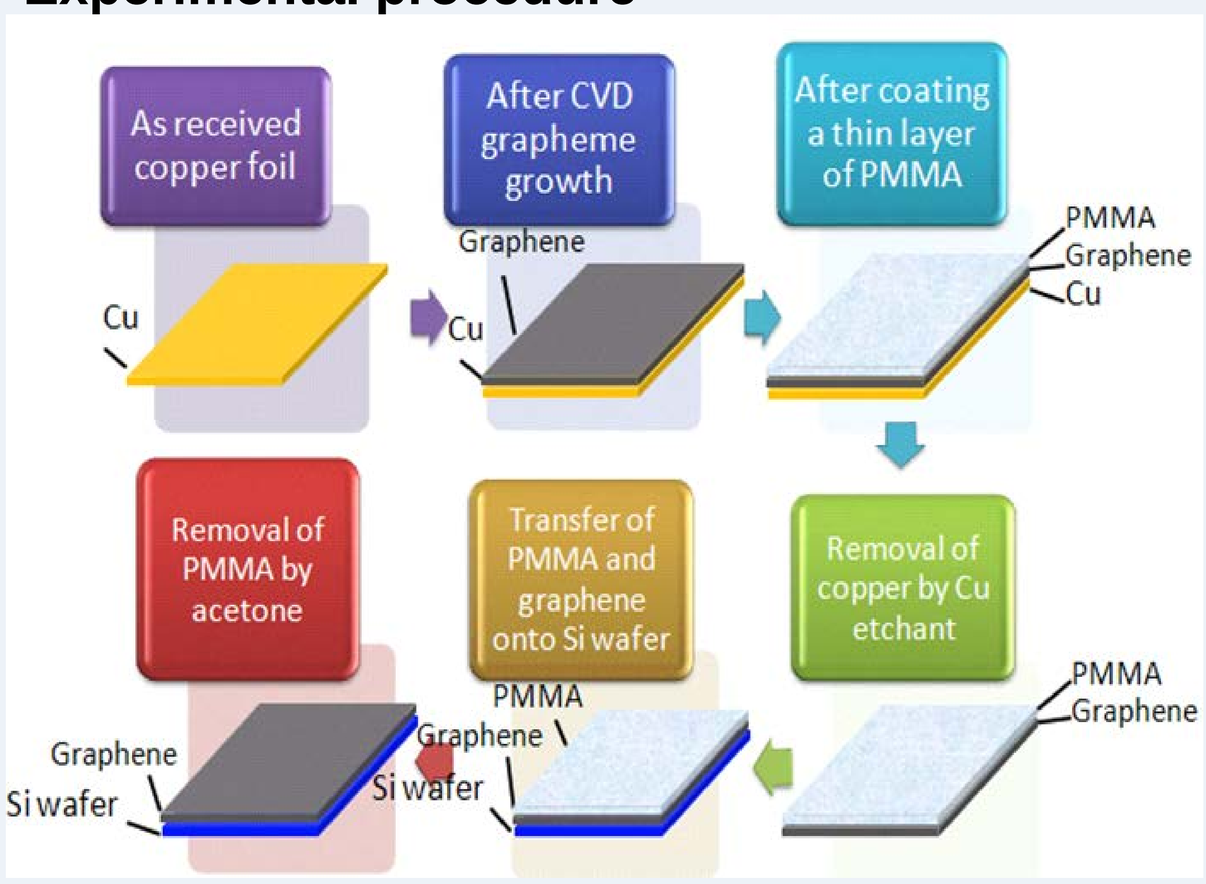


Figure 2. The route for large-scale graphene fabrication

- Large graphene films were grown by Chemical Vapor Deposition (CVD) method by adjusting temperature and the composition of gas mixture.
- The graphene films were transferred onto silicon wafer to be used for further characterization by Raman spectroscopy and Atomic Force Microscopy.
- Graphene based transistors were fabricated and electrical measurement was performed for calculation of on-off ratio and mobility.

Results and Discussion

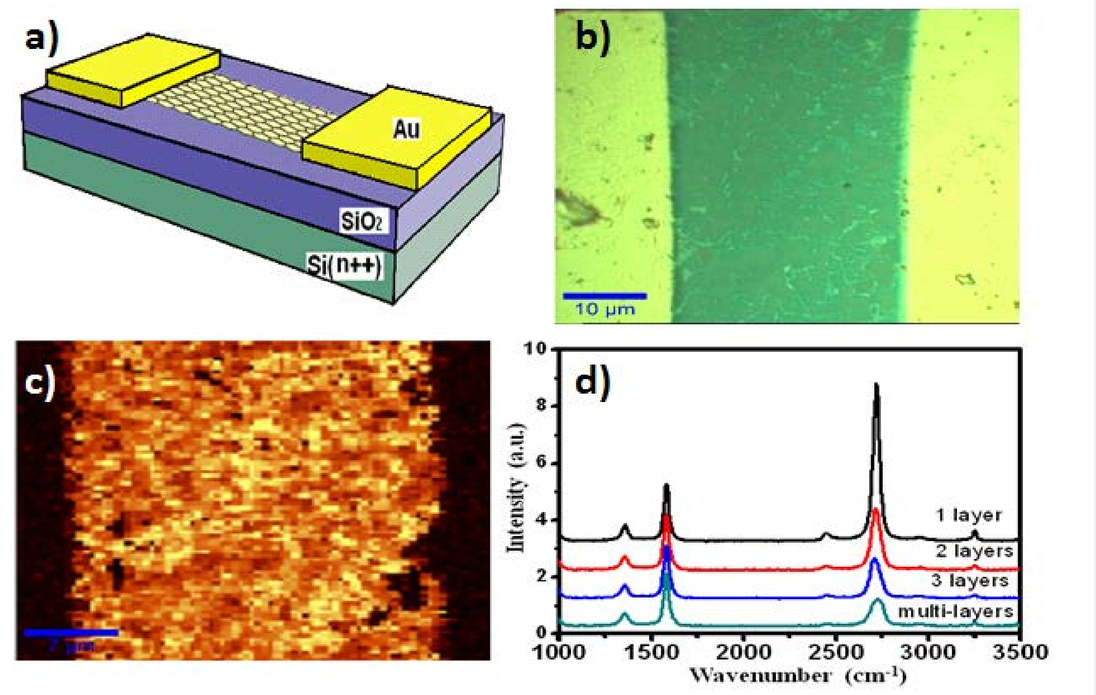


Figure 3. a) Schematic illustration of the graphene device. b) Optical microscopy image of the graphene films in channel. c) Raman map of the graphene in channel. d) Raman spectra of 1 (green), 2 (blue), and 3 (red) and multi- graphene layers from a CVD graphene film transferred onto silicon wafer.

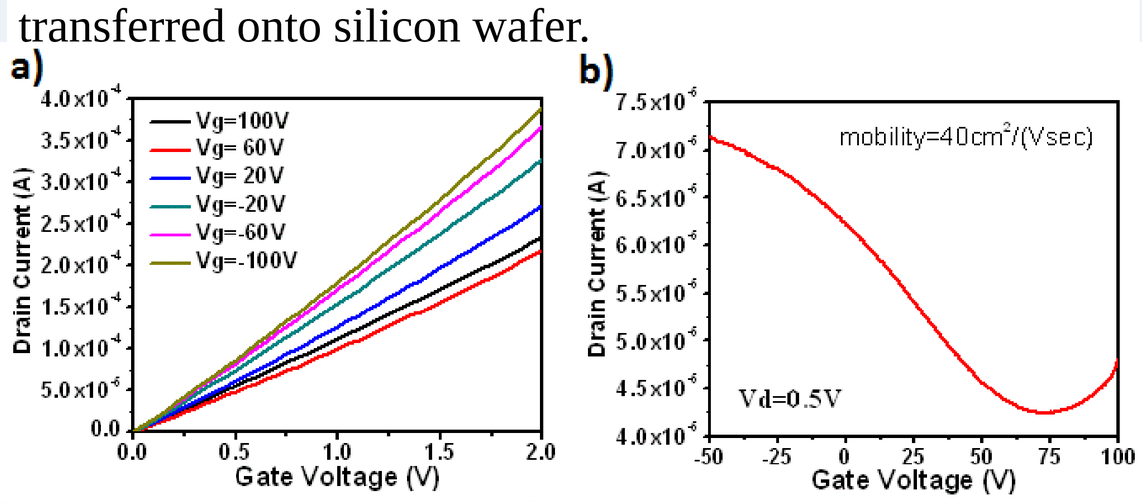


Figure 4. a) Vg-Id curve of graphene device shows gate dependence. b) Transfer characteristics for CVD growth graphene transistors . The calculated mobility is around 40cm^2/(V sec)

Conclusion

- Large, uniform graphene sheets can be grown on the copper foils by CVD method using ethanol as precursor, and these sheets are able to be transferred to other arbitrary substrates .
- The measurement of electrical properties indicates the resulting larger-area graphene film have high mobility, which is promising for further application such as production of graphene-based electronics.

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