

Artificial defects in epitaxial graphene on SiC investigated by scanning tunneling microscopy

Background & Motivation: Graphene consists of a single layer of carbon atoms arranged in hexagonal lattice and represents an excellent platform for two dimensional materials with huge potentials in electronics and quantum technology. Structural defects in graphene can be deliberately introduced in the honeycomb network. One important role of defects is to serve as nanoscale pathways for metal atoms to enter the interface between epitaxial graphene and SiC to form stable ultrathin metal layers with new exotic properties. In this project, we investigate artificial defects in graphene using low-temperature scanning tunneling microscopy. Atomic level structures and electronic properties of these defects will be identified which shed lights on the future nanoscale understanding of metal-defect interaction, which serves as founding background for metal intercalation.

Objective: Investigate artificial defects of graphene and defect-metal interaction using low temperature scanning tunneling microscopy.

Methodology: Graphene will be grown on a SiC substrate. The point defects on graphene will be generated by oxygen plasma or focus ion beam (FIB). We will use scanning tunneling microscopy operating at 5 K to investigate topography and electronic properties of defects. Metal adatoms will be deposited onto graphene with defects in situ in ultra-high vacuum and defect-metal interaction will be further investigated.

Expected Outcomes: Understanding the defect properties and defect-metal interaction will shed light on real-space metal intercalation pathway in forming 2D metal layers between graphene and SiC.

Student's Role and Responsibilities

- Learn scanning tunneling microscopy techniques
- Conduct experiments: characterization of defects on graphene; metal deposition on graphene sample and defect-metal interaction and data analysis

Skills & Requirements

- *Basic background in solid state physics and surface science or related fields*
- *Hands-on experimental skills*

Opportunities and Benefits

- *Working with highly skilled scientist; access surface science analytical tools with atomic resolutions and opportunity for continuing a PhD program at PDI*

Contact

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