Magnetosensing Applications with Submicron Size Epitaxial Graphene Devices

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1. Introduction

- Semiconductor Hall effect devices have been successfully used for:
  - Industrial applications
  - Fundamental research
- Ideal for bead detection due to:
  - Use of DC magnetic field

2. Fabrication

- Graphene is epitaxially grown on 4H-SiC (0001) substrate
- Standard e-beam lithography to define:
  - Bonding pads and leads
  - Hall bars
- Oxygen plasma
- Used to etch graphene

3. Characterisation

- Hall coefficient determined by sweeping magnetic field.
- Noise level at finite bias current:
  - Johnson-Nyquist noise
- Noise level at zero bias current:
  - 2-terminal resistance

4. Conclusion

- We demonstrated epitaxial graphene magnetometers with:
  - Room temperature Hall coefficient approaching that of InSb devices
  - Order of magnitude better magnetic field sensitivity
  - Devices ≥ 1 μm are more sensitive than smaller devices due to higher resistance
  - Epitaxial graphene fabrication readily compatible with Si electronic processing

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6. References