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Propositions

Belonging to the PhD thesis

2D Materials and Interfaces in High-Carrier Density Regime

A Study on Optoelectronics and Superconductivity

Abdurrahman Ali El Yumin

1. 2D materials such as Graphene and Transition Metal Dichalcogenides group offer various promising application for future 2D nano-electronic devices (Chapter 1).
2. The electrical performance of 2D lateral p - n junction depends on the thickness of the 2D materials (Chapter 2).
3. Sharp and strong electroluminescence (EL) in the monolayer 2D p - n junction can be obtained using a combination of Electrical Double Layer Transistors (EDLTs) and 2D heterostructure configuration (Chapter 2 and 3).
4. The exciton species rate from the EL spectra strongly depends on induced carrier density ratio between the p - and n -type side of the p - n junction (Chapter 3).
5. The superconducting gap of field-induced few-layer MoS₂ superconductor can be characterized by using tunneling spectroscopy through normal-insulator-superconductor (N-I-S) junction (Chapter 4).
6. The magnitude of electron-phonon interaction in 2D MoS₂ superconductor depends on induced carrier density (Chapter 4).
7. Vacuum heterostructure fabrication offers a promising method to produce a 2D heterostructures with clean interfaces (Chapter 5).
8. People have different types of personalities but, like a p - n junction, if combined and form an equilibrium state, they can make something great.
9. Ph.D. life is like riding a roller coaster, besides highs and lows, except it has no clear end unless you make it clear by yourself.
10. Hard work and smart strategy are necessary to accomplish your mission, but sometimes it will never be finished without little bit of luck.