Front. Phys. Vol. 17, No. 6 (2022)
https://journal.hep.com.cn/fop

Novel Semiconductor Device and Chip Laboratory

Location

School of Physics and Technology, Wuhan University, Wuhan 430072, China

Further Information: http://hejun.whu.edu.cn/

Overview

Established in 2019, the Novel Semiconductor Device and Chip Laboratory is committed to the controllable preparation and device applications of low dimensional semiconductors, aiming to realize the integrated applications of high-performance electronic and optoelectronic devices based on low dimensional materials through structure design, growth control and device optimization. The Novel Semiconductor Device and Chip Laboratory is in School of Physics and Technology of Wuhan University.

Key Contact

Professor Jun He

Director, Novel Semiconductor Device and Chip Laboratory

Telephone: 86-10-82545670

E-mail: He-jun@whu.edu.cn

Research Foci

• **Van der Waals Epitaxial Growth of Two-dimensional Materials:** Two-dimensional (2D) semiconductors are potential candidates for the next generation of high-density integrated circuits. Van der Waals (vdW) epitaxial growth of high-quality large-area 2D materials and heterostructures are essential for device integration. This group puts forward a general van der Waals epitaxy growth methodology for 2D semiconductors, resolving the problem of multi-physical mismatch in the traditional heteroepitaxy.

• **Advanced Multifunctional Devices Based on vdW Heterostructures:** Different 2D materials can be stacked freely to form vdW heterostructures for constructing artificial functional structures. This group develops electronic and optoelectronic devices with new structures and principles towards silicon based integrated circuits.

• **Optimization and Modulation of 2D Electronic Devices:** While studying 2D electronic devices, exploring the effects of various external conditions on device performance is essential for optimizing and regulating the performance of 2D electronic devices.

Recent Projects

• **Van der Waals Epitaxial Growth of Two-dimensional Materials:** Epitaxial growth and substitutional doping of both layered and non-layered 2D semiconductor single crystals have been realized. Based on the vdW epitaxy method, this group has successfully realized the large-area preparation of magnetic single crystals with 1 to 2 unit cell thickness, which are promising for constructing 2D room-temperature spintronic devices

• **Advanced Multifunctional Devices Based on vdW Heterostructures:** An asymmetric van der Waals heterogeneous structure design was proposed for high-performance and multifunctional 2D electronic device. Based on vdW ferroelectric semiconductors, the function of human-like vision system was realized. An infrared non-volatile memory was designed based on vdW heterostructure, which significantly improves the photoconductive gain and exhibits extremely high infrared light detection performance.

• **Optimization and Modulation of 2D Electronic Devices:** A general strategy was proposed to eliminate vdW gaps for advanced optoelectronic devices. Through the synergistic effect of S vacancies and isoelectronic Se atoms, a robust trap effect has been realized, and it can capture carriers and store them steadily for advanced multifunctional devices.