YUHANG CAI

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EDUCATION

Nanjing University **Nanjing, China**

Bachelor of Science in Physics *Sep.2014-Jun.2018*

- **The National Basic Discipline Elite Program**
- **GPA:** 4.553/5.0 (91.06/100); **GPA Ranking:** 6/201

University of Illinois Urbana-Champaign **Champaign, IL**

Student Intern *Jul.2017-Jan.2018*

Massachusetts Institute of Technology **Cambridge, MA**

Visiting Student *Aug.2018-Mar.2019*

RESEARCH EXPERIENCE

Research Laboratory of Electronics, Massachusetts Institute of Technology

Visiting Student, Advisor: Prof. Jeehwan Kim *Aug.2018-Mar.2019*

- **Topic: *2D layer based transfer and TEM sample preparation***
  - Deposited Ni or Cu to 2D materials such as graphene, TMDCs, exfoliated with thermal release tape.
  - Released the tape by heating the target substrates and etched metal films with $FeCl_3$.
  - TEM sample preparation: Transferred layered $MoSe_2$ to SiO_2 with the method above, then transferred to TEM grid by typical polymer-assisted wet transfer.

- **Topic: *Synthesis of 1L or 2L Graphene on GaN, AlN, Sapphire by Chemical Vapor Deposition and remote epitaxy***
  - Synthesized a full coverage 1L or 2L graphene on GaN, AlN, sapphire for remote epitaxy: grow GaN on graphene/GaN and graphene/AlN.
  - Characterized as-grown graphene and the grown GaN, InGaN by AFM, Raman spectroscopy, SEM and XRD.
  - Transferred graphene/Sapphire to various substrates by our special dry-transfer method above.

Micro and Nanotechnology Laboratory, University of Illinois Urbana-Champaign

- **Topic: *Synthesis of two-dimensional transition metal dichalcogenides for electronic and photonic devices***

Student Intern, Advisor: Prof. Wenjuan Zhu *Jul.2017-Jan.2018*

- Grew monolayer WSe_2, MoS_2 triangles (both 100 micros) and large domains of MoS_2, respectively, on SiO_2 substrates via chemical vapor deposition (CVD) and then optimized reaction conditions.
- Deposited monolayer MoS_2 and WSe_2 triangles on sapphire by CVD.
- Characterized as-grown films by AFM, raman spectroscopy and photoluminescence spectroscopy (PL)
- Utilized two-step CVD method to grow MoS_2 on the top surface of WSe_2, and processed the epitaxial growth of WSe_2 on the MoS_2 in the same method.
- Identified the lateral heterostructures of MoS_2/WSe_2 and $WSe_2/MoSe_2$ (Selenization of MoS_2).
- Synthesized monolayer MoS_2 (n-type) directly on p-doped Si substrates for esaki diodes.

- Studied electron transport and tunneling transport based on MoS_2/p-Si heterojuntions

National Laboratory of Solid State Microstructures, Nanjing University

➢ **Topic: *Quantum transport in two-dimensional layered topological insulators***

Independent Researcher, Advisor: Prof. Fengqi Song *Sep.2016-May.2017*

- Prepared $BiSbTeSe_2$ (BSTS) films by the Bridgman-Stockbarger method, and the films were mechanically exfoliated by a kind of special tape with weak adhesion
- Generated patterned electrodes through photolithographic process and gold plating technique (magnetron sputtering), and then characterized as-obtained products.
- Performed transport measurements in different magnetic fields and different temperatures
- Calculated the electron mobility, electron number density and phase coherence length, etc. by using the classical fitting method

JOURNALS

[1] **Yuhang Cai**, Kai Xu, and Wenjuan Zhu. Synthesis of Transition Metal Dichalcogenides and Their Heterostructures. Materials Research Express 5 (9), 095904. [URL]

[2] Kai Xu, **Yuhang Cai**, and Wenjuan Zhu. Esaki Diodes Based on Synthetic 2D/3D Heterojunctions. IEEE Transactions on Electron Devices. 65(10), 4155-4159 [URL]

[3] Jaron A. Kropp, **Yuhang Cai**, Zihan Yao, Wenjuan Zhu, and Theodosia Gougousi. Atomic Layer Deposition of Al_2O_3 and TiO_2 on MoS_2 Surfaces. Journal of Vacuum Science & Technology A 36, 06A101 (2018). [URL]

CONFERENCES & EXHIBITIONS

[1] **Yuhang Cai**, Kai Xu, and Wenjuan Zhu. Lateral $WSe_2/MoSe_2$ Heterostructures Grown by a Two-step CVD Method, 2018, APS March Meeting. [Abstract]

[2] Kai Xu, **Yuhang Cai**, Zijing Zhao, and Wenjuan Zhu. Esaki Diodes based on MoS_2/p-Si Heterostructures, 2018, APS March Meeting. [Abstract]

[3] Zihan Yao, Hojoon Ryu, Kai Xu, Jialun Liu, **Yuhang Cai**, Yueming Yan, and Wenjuan Zhu, Nanoscale Devices Based on Two-dimensional Materials and Ferroelectric Materials, 2018, ISCICT, invited talks.

HONORS & AWARDS

Outstanding Undergraduate Thesis (5%)	*Jun.2018*
First Prize, Elite Program Scholarship (2%)	*Nov.2017*
Second Prize, People's Scholarship	*Nov.2017*
Second Prize, Elite Program Scholarship	*Nov.2016*
Second Prize, People's Scholarship	*Nov.2016*
First Prize, Xing Quan Scholarship (2%)	*Nov.2015*
First Prize, Elite Program Scholarship (2%)	*Nov.2015*

PROFESSIONAL SKILLS

Computer Competencies: C language, Python, Matlab, Origin

Techniques and Instrumentation: Lithography, TEM sample preparation, TEM(in progress), SEM, AFM, XRD, Raman, PL， Transport Measurement, CVD， ALD， PVD, wet transfer, dry transfer.