Zhongqiang Hu

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Education Background

- **Department of Electrical Engineering and Computer Science** **Sep. 2020 – Present**
  Massachusetts Institute of Technology (EECS, MIT)
  - Overall GPA: 5.0/5.0 Taken courses: 6.728 Quantum Mechanics, 6.730 Solid-State Physics
- **School of the Gifted Young** **Sep. 2016 – Jun. 2020**
  University of Science and Technology of China (SGY, USTC)
  - Bachelor of Science in Applied Physics with Honorary Degree (Jun. 2020)
  - Overall GPA: 4.08/4.3 (93.34/100) GPA Ranking: 1/203

Selected Honors and Awards

- **Analog Devices Fellowship, 2020 (Given to 1st-year Ph.D. students at EECS, MIT)**
- Excellent Graduation Thesis Award, 2020 (top 5%)
- **Yonghuai Guo Scholarship, 2020 (Given to students excelling both in morals and studies)**
- **Moruo Guo Scholarship, 2019 (top 1%, the highest honor for undergraduates at USTC)**
- Lixin Tang Scholarship, 2019 (top 1%, one of the most famous life-long scholarships in China)
- The Highest Scholarship in Jici Yan Elite Program, 2019, 2018 and 2017 (top 5%)
- **National Scholarship, 2017 (top 1%)**

Publications

- W. Bai, **Z. Q. Hu (co-first author)**, C. Xiao, J. Q. Guo, Z. Li, Y. M. Zou, X. G. Liu, J. Y. Zhao, W. Tong, W. S. Yan, Z. Qu, B. J. Ye, and Y. Xie. Parasitic ferromagnetism in few-layered transition-metal chalcogenophosphate. *J. Am. Chem. Soc.* **142**, 10849-10855 (2020)
- W. Bai, **Z. Q. Hu (co-first author)**, S. Wang, Y. Hua, Z. Sun, C. Xiao, and Y. Xie. Intrinsic negative magnetoresistance in van der Waals $FeNbTe_2$ single crystals. *Adv. Mater.* **31**, 1900246 (2019)

Research Experience

- Advisors: Prof. Yi Xie and Prof. Chong Xiao Jan. 2018 – Jun. 2020
  Hefei National Laboratory for Physical Sciences at the Microscale, USTC
  - **Parasitic ferromagnetism in few-layered transition-metal chalcogenophosphate**
    - Synthesized transition-metal chalcogenophosphate $Mn_2P_2S_6$ single crystals by chemical vapor transport and got few-layered samples by an ion-exchange exfoliation process
    - Discovered that parasitic ferromagnetism dominated the magnetic behaviors of few-layered $Mn_2P_2S_6$ while bulk counterparts were antiferromagnetic
    - Verified an electron redistribution by which part of the Mn 3d electrons migrated and redistributed on P atoms in few-layered $Mn_2P_2S_6$ due to the introduced Mn vacancies, which should account for the unexpected change of magnetic behaviors
  - **Intrinsic negative magnetoresistance in van der Waals $FeNbTe_2$ single crystals**
    - Synthesized van der Waals $FeNbTe_2$ single crystals by chemical vapor transport

- Discovered an unusual behavior of intrinsic negative magnetoresistance (nMR) which was not saturated up to 14T
- Interpreted the intrinsic nMR as the comprehensive effect of Anderson localization and a spin glass state, as evidenced by band structure characterization and magnetic measurement respectively

✧ **Optimizing thermoelectric performance of ternary selenide $PbCr_2Se_4$**

- Synthesized a series of doped ternary selenide $PbCr_2Se_4$ in a unique porous structure
- Measured Seeback coefficients, electrical conductivities, and thermal conductivities in order to analyze the effect of doping and achieve optimization

◆ Advisor: Prof. Roy Gordon — Jul. 2019 – Sep. 2019

Department of Chemistry and Chemical Biology, Harvard University

✧ **Construction of metal-dielectric photonic bandgaps by atomic layer deposition**

- Designed a new atomic layer deposition (ALD) system which was able to deposit Hf_3N_4 films and Cu_3N films alternately, and then characterized them by XPS, SEM and AFM
- Improved the film purity, uniformity, and surface continuity by optimizing experimental parameters such as precursor temperature, substrate temperature and vapor exposure
- Deposited Hf_3N_4-Cu_3N multilayers with precisely controlled thickness and then reduced Cu_3N to Cu by rapid thermal annealing in H_2 environment
- Measured the optical, mechanical, and electronic transport properties of Hf_3N_4-Cu multilayers (so-called metal-dielectric photonic bandgaps, or MDPBGs) in collaboration with Radiation Monitoring Devices Inc. in order to investigate the possibility of large-volume production and industrialization

◆ Advisor: Prof. Wenjie Liang — Jun. 2018 – Jul. 2018

Institute of Physics, Chinese Academy of Sciences

✧ **Quantum transport in nanostructures**

- Proposed a simplified theoretical model with double quantum dots both in series and in parallel in order to interpret an experimental electrical transport measurement

Research Interests

✧ Spintronic materials and devices with high-speed and low-dissipation

✧ Emergent properties and phenomena in novel low-dimensional quantum materials

✧ Fundamental research on strongly-correlated systems and novel quantum states

Research Skills

✧ Computing: C/C++, MATLAB, Python, MySQL, Materials Studio, Comsol

✧ Experimental Techniques: HRXRD/XRR, XPS/UPS/ISS, SEM/EDS, AFM, FTIR (trained at the Center for Nanoscale Systems, Harvard University); PPMS, MPMS, ESR, Raman

Teaching Experience

✧ A teaching assistant for a Solid-State Physics B course in Spring 2020 at USTC

✧ A teaching assistant for an Optics and Atomic Physics course in Fall 2019 at USTC

✧ A teaching assistant for an Atomic Physics course in Spring 2019 at USTC

✧ A teaching assistant for a Mechanics course in Fall 2018 at USTC