Yefan Tian

EXPERIMENTAL CONDENSED MATTER AND MATERIALS PHYSICS

Laboratory of Atomic and Solid State Physics (LASSP) & Department of Physics, Cornell University
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(Updated date: July 13, 2021)

PROFESSIONAL EXPERIENCE

Postdoctoral Associate 2021 – Present
Cornell University, Ithaca, New York, USA
Specialized in experimental condensed matter and materials physics.

EDUCATION

Ph.D. and M.S. in Physics 2015 – 2021
Texas A&M University, College Station, Texas, USA
Specialized in experimental condensed matter and materials physics.

Trainee Certificate in D^{3}EM Program 2017 – 2019
Texas A&M University, College Station, Texas, USA
Developed interdisciplinary skills in materials science, informatics, and engineering design.

B.S. in Applied Physics 2011 – 2015
University of Science and Technology of China, Hefei, Anhui, China

RESEARCH INTERESTS

1. Low Temperature Physics
2. Topological Quantum Materials
3. Energy Materials
4. Machine Learning/Informatics

PROFESSIONAL SKILLS

1. Nuclear Magnetism Resonance Spectroscopy (NMR)
2. Density Functional Theory Calculation (DFT)
3. Chemical Vapor Transport (CVT)
4. Chemical Vapor Deposition (CVD)
5. Machine Learning/Informatics
6. Physical Properties Measurement System (PPMS)
7. Magnetic Properties Measurement System (MPMS)

RESEARCH EXPERIENCE

Postdoctoral Associate 2021 – Present

LASSP & Department of Physics, Cornell
Advisor: Prof. Jeevak Parpia
Project objective: Low temperature physics.

- ^{3}He superfluid
- Thermal transport

Graduate Research 2016 – 2020

Department of Physics and Astronomy, TAMU
Advisor: Prof. Joseph H. Ross, Jr.
Project objective: To discover and better understand the interesting physics of multiple material systems, including topological quantum materials (actively ongoing) and advanced thermoelectric materials, we have carried on various experimental measurements, such as NMR spectroscopy, magnetic measurements, transport measurements and other techniques including computational methods (such as DFT).

- Topological quantum materials
  - Topological nodal-line and nodal-loop semimetals ZrSi(Te, Se, S)
    - Lifshitz transitions and nodal-line network in Dirac semimetal ZrSiTe
  - Dirac semimetal $ZrTe_2$
    - Topological nodal line in $ZrTe_2$ demonstrated by nuclear magnetic resonance
  - Topological insulator/Dirac semimetal $ZrTe_5$
    - Dirac electron behavior and NMR evidence for topological band inversion in $ZrTe_5$
    - Gap-opening transition in Dirac semimetal $ZrTe_5$
  - Sc(Pd, Pt)Bi
- Advanced thermoelectric materials
  - Half-Heusler
    - Native defects and impurity band behavior in half-Heusler thermoelectric NbFeSb
    - Defect charging and resonant levels in half-Heusler $Nb_{1-x}Ti_xFeSb$
    - Half-Heusler thermoelectric materials: NMR studies
  - Skutterudite
    - Charge-carrier behavior in Ba-, Sr- and Yb-filled $CoSb_3$: NMR and transport studies
    - NMR study of doped skutterudites $Yb_xCo_4Sb_{12}$

D^{3}EM Trainee 2017 – 2019

Science and Engineering Interdisciplinary Program, TAMU
D^{3}EM Advisor: Prof. Raymundo Arróyave
Project objective: We utilized multiple machine learning and visualization techniques to design and optimize new soft magnetic materials based on the data mined from published open resources.

- Machine learning approach to FINEMET-type soft magnetic nanocrystalline materials design

Undergraduate Research 2013 – 2015

National Synchrotron Radiation Laboratory, USTC
Advisor: Prof. Li Song

- MoO_2 nanoparticles/3D graphene applications in lithium batteries
- CVD growth of graphene synthesized for supercapacitors

Hefei National Laboratory for Physical Sciences at the Microscale, USTC
Advisor: Prof. Tao Wu

- Electric transport of Rashba semiconductor BiTeCl

Physics Experiment Teaching Center, USTC
Advisor: Prof. Zengming Zhang

- Synthesis and luminescence properties of nanomaterial ($NaYbF_4$:Tm^{3+})@CaF_2

TEACHING EXPERIENCE

Graduate Teaching Assistant

Department of Physics and Astronomy, TAMU

- 2020 Fall: PHYS 207 (Electricity and Magnetism for Engineering and Science)
- 2020 Summer|2020 Spring|2019 Fall|2016 Fall|2016 Summer: PHYS 201 (College Physics I)
- 2016 Spring|2015 Fall: Physics Help Desk

Undergraduate Teaching Assistant

School of Physical Sciences, USTC

- 2014 Fall: Physics I (Classical Mechanics)

HONORS AND AWARDS

- Association of Former Students Distinguished Graduate Student Award for Excellence in Research (2021)
  Texas A&M Today
- Outstanding Undergraduate Scholarship (2014)
- Outstanding Undergraduate Scholarship (2013)
- USTC Optics Writing Competition Award (2013)
- Outstanding Undergraduate Scholarship (2012)

PUBLICATIONS

Submitted

17. **Yefan Tian**, John Reppy, and Jeevak Parpia, Explanation of anomalous inferred viscosity and normal density near the ^{3}He T_c in a torsion pendulum, J. Low Temp. Phys. (2021).
    Invited Special Issue

16. Nader Ghassemi, **Yefan Tian**, Xu Lu, Yanci Yan, Xiaoyuan Zhou, and Joseph H. Ross, Jr., Rattling and band-filling effects in substituted tetrahedrites: an NMR study, submitted to J. Phys. Chem. C (2021).

Peer-reviewed publications

15. **Yefan Tian**, Yanglin Zhu, Rui Li, Zhiqiang Mao, and Joseph H. Ross, Jr., NMR determination of van Hove singularity and Lifshitz transitions in nodal-line semimetal ZrSiTe, Phys. Rev. B **104**, L041105 (2021).
    Editors' Suggestion **Letter**

14. **Yefan Tian**, Nader Ghassemi, and Joseph H. Ross, Jr., Gap-opening transition in Dirac semimetal $ZrTe_5$, Phys. Rev. Lett. **126**, 236401 (2021).

13. Dmytro Lotnyk, Anna Eyal, Nikolay Zhelev, Abhilash Sebastian, **Yefan Tian**, Aldo Chavez, Eric Smith, John Saunders, Erich Mueller and Jeevak Parpia, Path-dependent supercooling of the ^{3}He superfluid A-B transition, Phys. Rev. Lett. **126**, 215301 (2021).
    Editors' Suggestion **Cornell Chronicle** **Mirage News**

12. **Yefan Tian**, Farit G. Vagizov, Nader Ghassemi, Wuyang Ren, Hangtian Zhu, Zhiming Wang, Zhifeng Ren, and Joseph H. Ross, Jr., Defect charging and resonant levels in half-Heusler $Nb_{1-x}Ti_xFeSb$, Mater. Today Phys. **16**, 100278 (2021).

11. **Yefan Tian**, Nader Ghassemi, and Joseph H. Ross, Jr., Topological nodal line in $ZrTe_2$ demonstrated by nuclear magnetic resonance, Phys. Rev. B **102**, 165149 (2020).

10. Naveen Kumar Chogondahalli Muniraju, Raju Baral, **Yefan Tian**, Rui Li, Narayan Poudel, Krzysztof Gofryk, Neven Barišić, Boris Kiefer, Joseph H. Ross, Jr., and Harikrishnan S. Nair, Magnetocaloric effect in a frustrated Gd-garnet with no long-range magnetic order, Inorg. Chem. **59**, 15144 (2020).

9. **Yefan Tian**, Nader Ghassemi, Wuyang Ren, Hangtian Zhu, Shan Li, Qian Zhang, Zhiming Wang, Zhifeng Ren, and Joseph H. Ross, Jr., Half-Heusler thermoelectric materials: NMR studies, J. Appl. Phys. **128**, 055106 (2020).

8. Yuhao Wang*, **Yefan Tian***, Tanner Kirk, Omar Laris, Joseph H. Ross, Jr., Ronald D. Noebe, Vladimir Keylin, and Raymundo Arróyave, Accelerated design of Fe-based soft magnetic materials using machine learning and stochastic optimization, Acta Mater. **194**, 144 (2020).
    ***Contributed Equally**

7. Nader Ghassemi, **Yefan Tian**, Xu Lu, Yanci Yan, Xiaoyuan Zhou, and Joseph H. Ross, Jr., Copper ion dynamics and phase segregation in Cu-rich tetrahedrite: an NMR study, J. Phys. Chem. C **124**, 3973 (2020).

6. **Yefan Tian**, Nader Ghassemi, and Joseph H. Ross, Jr., Dirac electron behavior and NMR evidence for topological band inversion in $ZrTe_5$, Phys. Rev. B **100**, 165149 (2019).

5. **Yefan Tian**, Ali A. Sirusi, Sedat Ballikaya, Nader Ghassemi, Ctirad Uher, and Joseph H. Ross, Jr., Charge-carrier behavior in Ba-, Sr- and Yb-filled $CoSb_3$: NMR and transport studies,

Phys. Rev. B **99**, 125109 (2019).

4. Nader Ghassemi, Xu Lu, **Yefan Tian**, Emily Conant, Yanci Yan, Xiaoyuan Zhou, and Joseph H. Ross, Jr., Structure change and rattling dynamics in $Cu_{12}Sb_4S_{13}$ tetrahedrite: an NMR study, ACS Appl. Mater. Interfaces **10**, 36010 (2018).
3. **Yefan Tian**, Hangtian Zhu, Wuyang Ren, Nader Ghassemi, Emily Conant, Zhiming Wang, Zhifeng Ren, and Joseph H. Ross, Jr., Native defects and impurity band behavior in half-Heusler thermoelectric NbFeSb, Phys. Chem. Chem. Phys. **20**, 21960 (2018).
2. Yu Zhou, Qin Liu, Daobin Liu, Hui Xie, Guixian Wu, Weifeng Huang, **Yefan Tian**, Qun He, Adnan Khalil, Yasir A. Haleem, Ting Xiang, Wangsheng Chu, Chongwen Zou, Li Song, Carbon-coated MoO_2 dispersed in three-dimensional graphene aerogel for lithium-ion battery, Electrochim. Acta **174**, 8 (2015).
1. Zhigang Wang, **Yefan Tian**, Tetraquark state candidates: Y(4140), Y(4274) and X(4350), Int. J. Mod. Phys. A **30**, 1550004 (2015).

CONFERENCES

8. **Yefan Tian**, Yanglin Zhu, Rui Li, Zhiqiang Mao, and Joseph H. Ross, Jr., NMR investigations of nodal-line semimetal ZrSiTe, APS March Meeting 2021, **Oral** Presentation, L51.00012 (2021, Virtual).
7. **Yefan Tian**, Nader Ghassemi, and Joseph H. Ross, Jr., NMR study of topological chalcogenide $ZrTe_5$, APS March Meeting 2021, **Oral** Presentation, R51.00010 (2021, Virtual).
6. **Yefan Tian**, Nader Ghassemi, and Joseph H. Ross, Jr., NMR investigation of topological quantum material $ZrTe_5$, APS March Meeting 2020, **Oral** Presentation, F60.00012 (2020, Denver, CO).
5. **Yefan Tian**, Rui Li, Farit Vagizov, Nader Ghassemi, Wuyang Ren, Hangtian Zhu, Zhifeng Ren and Joseph H. Ross, Jr., NMR and Mössbauer study of p-type half-Heusler thermoelectrics $Nb_{1-x}Ti_xFeSb$, APS March Meeting 2020, **Oral** Presentation, G27.00015 (2020, Denver, CO).
4. **Yefan Tian**, Yuhao Wang, Joseph H. Ross, Jr., Raymundo Arróyave, Accelerated design of Fe-based soft magnetic materials using machine learning and stochastic optimization, APS March Meeting 2019, **Poster** Presentation, T70.00267 (2019, Boston, MA).
3. **Yefan Tian**, Ali A. Sirusi, Sedat Ballikaya, Nader Ghassemi, Ctirad Uher, and Joseph H. Ross, Jr., NMR investigation of filled skutterudites $Ba_xYb_yCo_4Sb_{12}$ and $A_xCo_4Sb_{12}$ (A = Ba, Sr), APS March Meeting 2019, **Oral** Presentation, R47.00008 (2019, Boston, MA).
2. **Yefan Tian**, Hangtian Zhu, Wuyang Ren, Zhifeng Ren, Joseph H. Ross, Jr., NMR and magnetic study of half-Heusler semiconductor NbFeSb, APS March Meeting 2018, **Poster** Presentation, G60.00304 (2018, Los Angeles, CA).
1. **Yefan Tian**, Ali Sirusi, Joseph H. Ross, Jr., Sedat Ballikaya, Ctirad Uher, Yuqi Chen, Chihiro Sekine, NMR study of partially filled skutterudites $A_xCo_4Sb_{12}$ (A = Yb, Ba, Sr, Ca) and $Ba_xYb_yCo_4Sb_{12}$, APS March Meeting 2017, **Oral** Presentation, Y36.00002 (2017, New Orleans, LA).