

Dr. Huibo Cao

Senior staff scientist

Instrument Scientist (2010-present)

HB-3A Single Crystal Neutron Diffractometer

<http://neutrons.ornl.gov/hb3a/>

High Flux Isotope Reactor

Neutron Scattering Division

Oak Ridge National Laboratory

P.O. Box 2008 MS-6393

Oak Ridge, TN 37831-6393, USA

Tel: 1-865-574-3011

Cell: 1-865-686-2608

Fax: 1-865-241-6770

E-mail: caoh@ornl.gov

Education and Training

- 2009-2010 Postdoctoral Research Fellow, Oak Ridge National Laboratory, hired through Oak Ridge Associated Universities, USA
- 2007-2009 Postdoctoral Research Fellow, Laboratoire Léon Brillouin, CEA-Saclay, France
- 2002-2007 Ph.D. in Condensed Matter Physics, Institute of Physics, CAS, Beijing, China
- Dissertation Title: Macroscopic quantum tunneling in the Fe-doped Mn_{12} -ac single molecular magnets
- 1998-2002 B.S. in Physics, Shanxi University, Taiyuan, China

Research and Professional Experience

2010-present Instrument Scientist at Oak Ridge National Laboratory (ORNL)

Currently I am a senior staff scientist at ORNL. My expertise is in neutron scattering study of complex magnetism and quantum materials, especially single crystal diffraction and polarized neutron diffraction. I perform both independent research and user support and instrumentation.

- **Research** I have an active group supported by ECA and have mentored 4 postdoc fellows and 4 students. My group is studying quantum materials by neutron scattering, especially polarized neutron diffraction. We are developing the polarized neutron diffraction under extreme sample environment conditions, particularly with high pressure, and the methods to parameterize the anisotropic magnetic interactions from the local magnetic susceptibilities. This is the substance of my DOE Early Career Award (ECA) proposal

awarded in 2018 “Local Site Magnetic Susceptibility for Quantum Materials by Polarized Neutron Diffraction”.

- **User support and Instrumentation** I have been in charge of a single crystal neutron diffraction beamline HB-3A at the High Flux Isotope Reactor (HFIR) at ORNL since 2010 and has led the efforts to modernize the four-circle single crystal neutron diffractometer (FCD) to the DEMAND (2D detector Extreme sample environment Magnetic Neutron Diffractometer), an ideal instrument for studying complex magnetism and quantum materials. I have rich experiences in planning and running neutron scattering under extreme sample environment conditions such as ultra-low temperature, high magnetic field, high pressure (the highest pressure reaches 7.4 GPa on one of hexaferrite system). I am also one of the Points of Contact for a next generation single crystal neutron diffractometer PIONEER at the Second Target Station.

Leading projects and proposals

I have led and written 3 LDRD proposals (Laboratory-wide), several NSD proposals (Directorate wide), and one DOE Early Career Award proposal. Here I list the awarded grant, large funding projects, and an ongoing proposal.

- DOE Early Career Research program proposal “Local Site Magnetic Susceptibility for Quantum Materials by Polarized Neutron Diffraction” was awarded. \$500 K per year for 5 years (09/01/2018-09/01/2023).
- Lead a capital project: Proposed and led the capital project on new technology large 2D detector upgrade. Phase I (\$1.18 million) was just successfully completed. The project will speed up the data collection, enable the capability of the polarized neutron diffraction in large 3D reciprocal space and the capability of the complex sample environments.
- HB-3A shutter replacement package. Developing a plan to replace the HB-3A shutter with a new design in conjunction with the HB-3 Triple-axis Spectrometer upgrade. The new shutter will increase the flux at the sample by 3 times, reduce the background, improve the beam profile. The supermirror bender will be considered as a great option for polarizing neutrons.
- One of Point-of-Contact for a next generation single crystal neutron diffractometer PIONEER at the Second Target Station (STS). <https://neutrons.ornl.gov/sts/poc>

Mentorship and manage experiences

I am the science lead of the detector upgrade and polarized neutron development projects. I have extensive experiences in working with diverse team members, various scientists, experts, and technicians from different groups, divisions, or universities for delivering neutron scattering science and techniques.

Mentored postdocs and students:

- Dr. Erxi Feng, Postdoctoral Fellow, formerly a PhD student graduated from the neutron scattering facility FRMII in Germany, joined the group in February 2019.
- Dr. Lei Ding, Postdoctoral Fellow, formerly a postdoctoral fellow from the time-of-flight neutron scattering facility ISIS in UK, joined the group in June 2019.
- Dr. Xiaojian Bai, Postdoctoral Fellow, formerly a PhD student graduated from Martin Mourigal's group in Georgia Institute of Technology, joined the group in February 2020. Dr. Bai will be 50% supported by the ECA grant.
- Madalynn Marshall, a graduate student from Louisiana State University and a DOE SCGSR award winner, joined the group in January 2019 for 9 months.
- Leah Zimmer from St. Norbert College, DOE SULI program student, 10 weeks starting from June 7, 2021.
- Courtney Baier, a HERE (Higher Education Research Experiences) student joined the group on July 15, 2019 for a year.
- Dr. Yan Wu, former Postdoctoral Fellow (2016-2019), graduated from Louisiana State University. She began neutron scattering research with me in July 2016. After three-year postdoctoral research, she became experienced in neutron scattering and high-pressure studies, recently joined our division as an instrument scientist at HB-2C WAND² and HB-3A DEMAND in 2019.
- Xin Gui, a visiting student from Weiwei Xie's group at Louisiana State University, worked with the group from September to November in 2018 on magnetic topological quantum materials.
- Emil Klahn, a visiting exchange student from Jacob Overgaard's group at Aarhus University in Denmark, is working here on single molecular magnets by polarized neutron diffraction from January until May in 2019.

Honors & Awards:

2019 "**Beam Line Scientist Award**" from SHUG for Excellence in Beam Line Science recognizes beam line scientists who have made significant scientific contributions in their area of research or instrumentation development and have participated in the growth and enrichment of the user community.

2018 **DOE Early Career Award** on "Local Site Magnetic Susceptibility for Quantum Materials by Polarized Neutron Diffraction".

Featured highlights

- 2020 **Huibo Cao**, Featured highlight "Realization of an Intrinsic Ferromagnetic Topological State in MnBi₈Te₁₃". <https://neutrons.ornl.gov/highlights/realization-intrinsic-ferromagnetic-topological-state%C2%A0-mnbi8te13> & **media** <https://www.ornl.gov/news/neutrons-ferromagnetic-topological-material>

- 2020 **Huibo Cao**, Featured highlight “Partial Antiferromagnetic Helical Order in Single Crystal $\text{Fe}_3\text{PO}_4\text{O}_3$ ”. <https://neutrons.ornl.gov/highlights/partial-antiferromagnetic-helical-order-single-crystal-fe3po4o3>
- 2019 **Huibo Cao**, Featured highlight **media** “Unveiling quantum materials with neutrons”. <https://www.ornl.gov/news/unveiling-quantum-materials-neutrons>
- 2019 **Huibo Cao**, Gabriele Sala, Feng Ye and Matt Stone, and the RICE University team Featured highlight research: “Physicists find first possible 3D quantum spin liquid”, <https://news.rice.edu/2019/07/15/physicists-find-first-possible-3d-quantum-spin-liquid-2/>
- 2018 **Huibo Cao** and Stuart Calder, Featured highlight research: “Neutrons Help Demystify Multiferroic Materials”, <https://neutrons.ornl.gov/content/neutrons-help-demystify-multiferroic-materials>
- 2018 Qiang Zhang, Alan Tennant, **Huibo Cao**, Featured highlight research: “Neutrons Reveal the Wild Weyl World of Semimetals”, <https://neutrons.ornl.gov/content/neutrons-reveal-wild-weyl-world-semimetals>
- 2013 **Huibo Cao**, Featured highlight research: “Neutron diffraction reveals semiconducting phase and contributes to new understanding of iron-based superconductors”
<https://neutrons.ornl.gov/news/Neutron%20diffraction%20reveals%20semiconducting%200phase%20and%20contributes%20to%20new%20understanding%20of%20iron-based%20superconductors>

Recent synergistic activities

1) Invited speaker (13 in total)

- Invited online colloquium speaker at the University of Tennessee - Knoxville, on “Quantum material characterization by neutrons”, April 6, 2021
- Invited online colloquium speaker at the University of Tennessee - Knoxville, on “Field-tunable toroidal moment in a chiral-lattice magnet”, March 1, 2021
- Invited speaker on “Local Site Magnetic Susceptibility on Quantum Materials by Polarized Neutron Diffraction” 2020 MRS Virtual Spring/Fall Meeting, Nov.29, 2020
- Invited online CM seminar speaker at the University of Tennessee - Knoxville, on “Multiferroic reentrance in a molecular magnet”, Nov.4, 2020
- Invited online CM Seminar speaker at Rutgers on “Unveiling quantum materials with neutrons”, Apr. 28, 2020

- Invited to speak on “Anisotropic Magnetism in Quantum Materials” to the Neutron Advisory Board, Sept.2, 2020
- Invited colloquium speaker on “Neutron scattering studies on quantum materials” at the University of Arkansas, Fayetteville, AR. Oct.4, 2019
- Invited to attend and present at the DOE BES PIs’ meeting (7/1-4,2019 Washington, DC)
- Invited speaker on “Complex spin orbital orders in vanadates” APS March meeting 2018, Los Angeles, CA, March 5-9, 2018
- Invited speaker on Polarized neutron diffraction for Quantum Materials at UT-Battelle Science and Technology Committee (10/ 25, 2018, Oak Ridge)
- Invited LaCNS Seminar Speaker “Giant spin-lattice coupling in a paraelectric antiferromagnet EuTiO_3 studied by neutron scattering” at Louisiana State University October 30, 2018.
- Invited to attend “Workshop on single-crystal neutron diffraction under pressure” at Ames Laboratory, May 30, 2018
- Invited to attend “2018 Quantum Materials Young Investigators Workshop” June 7-8, 2018

2) Tutorial speaker and workshop organizers

- 2010-2018, Taught experiments and lectures for “National School on Neutron and X-ray Scattering”, Oak Ridge National Laboratory/ Argonne National Laboratory.
- 2012-2020, “Magnetic structure determination workshop” , co-organizer and tutorial speaker
- Co-organizer and invited speaker for “Polarized Neutron Diffraction and Spectroscopy: Applications to Quantum Materials” workshop. ORNL, Oak Ridge, TN, USA. Sept. 17-19, 2019
- Co-organizer for “Symmetry and Superspace Approach to Modulated Crystal Structures” Workshop. Oak Ridge, TN, USA. Oct. 23-24, 2019
- Invited Lecturer “7th School on Representational Analysis and Magnetic Structures (RAMS)” University of Maryland, June 20-23, 2018.

- Invited speaker on Polarized Single-Crystal Diffraction, Polarized Neutron Capabilities at ORNL workshop, in conjunction with 2017 Joint Nanoscience and Neutron Scattering User Meeting, ORNL, Aug 3, 2017
- Invited speaker on the ACA workshop “Magnetic Structure Analysis by Unpolarized Neutron Diffraction Techniques” July 22, 2016, Denver, Colorado
- Invited speaker on “Magnetic Structure Determination from Neutron Diffraction Data Workshop”, May 23-26, 2016, Florida State University, Tallahassee, Florida.

3) Membership and journal/proposal reviewer

- Memberships, AAAS (American Association for the Advancement of Science) member, American Physical Society, Neutron Scattering Society of America, American Crystallographic Association. Nominated for APS fellow in 2021.
- Reviewer for Physical Review Letters, Physical Review B, Physical Review Materials, Physical Review X, Nature Communications, Journal of Physics, Applied Physics Letters, Journal of Applied Physics, Journal of Magnetism and Magnetic Materials, and Computational Materials Science.
- Reviewer for the neutron scattering proposals for NIST Center for Neutron Research
- Reviewer for the DOE funding proposals

Publications:

<https://scholar.google.com/citations?user=W661AQAAAAJ&hl=en>

Here are 40 selected publications

*****In Review 3 *****

1. **Lei Ding**, Xianghan Xu, Harald O. Jeschke, **Xiaojuan Bai**, **Erxi Feng**, Admasu Solomon Alemayehu, Jaewook Kim, Feiting Huang, Qiang Zhang, Xiabin Ding, Neil Harrison, Vivien Zapf, Daniel Khomskii, Igor I. Mazin, Sang-Wook Cheong, **Huibo Cao**, “Field-tunable toroidal moment in a chiral-lattice magnet”, *Nature Physics*, in review. [arXiv:2103.01360](https://arxiv.org/abs/2103.01360) (2021)
2. **Y. Wu**, **Lei Ding**, Na Su, N. Ma, K. Zhai, **Xiaojuan Bai**, B. C. Chakoumakos, Young Sun, Yongqiang Cheng, Jinguang Cheng, Wei Tian, **Huibo Cao**, “Reentrance of spin-driven ferroelectricity through rotational tunneling of ammonium”, *Physical Review Letter*, in review. [arXiv: 2101.02795](https://arxiv.org/abs/2101.02795) (2021)

3. **Xiaojian Bai**, Randy S. Fishman, Gabriele Sala, Daniel M. Pajerowski, V. Ovidiu Garlea, Tao Hong, Minseong Lee, Jaime A. Fernandez-Baca, **Huibo Cao**, Wei Tian, “Magnetic Excitations of the Hybrid Multiferroic $(\text{ND}_4)_2\text{FeCl}_5\text{D}_2\text{O}$ ”, *Physical Review B*, in review. arXiv:2008.06827 (2021)

*****In Press 2 *****

4. **Lei Ding**, Chaowei Hu, **Erxi Feng**, Chenyang Jiang, Iurii A. Kibalin, Arsen Gukasov, MiaoFang Chi, Ni Ni, and **Huibo Cao**, “Neutron diffraction study of magnetism in van der Waals layered $\text{MnBi}_{2n}\text{Te}_{3n+1}$ ”, *Journal of Physics D: Applied Physics* **54** 174003 (2021) **invited**
5. **Madalynn Marshall**, Ivo Pletikosić, Mohammad Yahyavi, Hung-Ju Tien, Tay-Rong Chang, **Huibo Cao**, Weiwei Xie, Magnetic and electronic structures of antiferromagnetic topological material candidate EuMg_2Bi_2 . *Journal of Applied Physics* **129** 035106 (2021) **invited**.
6. J.K. Clark, C. Pak, **H.B. Cao**, M. Shatruk, Helimagnetism in MnBi_2Se_4 Driven by Spin-Frustrating Interactions Between Antiferromagnetic Chains, *Crystals*, **11**, 242 (2021) **invited**.
7. Q. Du, L. Wu, **H.B. Cao**, C. Kang, C. Nelson, G. Pascut, T. Besara, T. Siegrist, K. Haule, G. Kotliar, I.A. Zaliznyak, Y. Zhu, C. Petrovic, Vacancy defect control of colossal thermopower in FeSb_2 , *npj Quantum Materials*, **6**, 13 (2021).
8. Z.L. Dun, M. Daum, R. Baral, H.E. Fischer, **H.B. Cao**, Y. Liu, M.B. Stone, J.A. Rodriguez-Rivera, E.S. Choi, Q. Huang, H.D. Zhou, M. Mourigal, B.A. Frandsen, Neutron scattering investigation of proposed Kosterlitz-Thouless transitions in the triangular-lattice Ising antiferromagnet TmMgGaO_4 , *Physical Review B*, **103**, 064424 (2021).
9. S.K. Karna, D. Tristant, J.K. Hebert, G. Cao, R. Chapai, W.A. Phelan, Q. Zhang, Y. Wu, C. Dhital, Y. Li, H.B. Cao, W. Tian, C. dela Cruz, A.A. Aczel, O. Zaharko, A. Khasanov, M.A. McGuire, A. Roy, W. Xie, D.A. Browne, I. Vekhter, V. Meunier, W.A. Shelton, "Helical magnetic order and Fermi surface nesting in noncentrosymmetric ScFeGe ", *Physical Review B*, **103**, 014443 (2021).

*****Published 35 *****

10. **L. Ding**, M. Lee, T. Hong, Z. L. Dun, R. Sinclair, S. X. Chi, H. K. Agrawal, E. S. Choi, B. C. Chakoumakos, H. D. Zhou, **H. B. Cao**, "Noncollinear magnetic structure and magnetoelectric coupling in buckled honeycomb $\text{Co}_4\text{Nb}_2\text{O}_9$: A single-crystal neutron diffraction study", *Physical Review B* **102**, 174443 (2020).
11. **Lei Ding**, Minseong Lee, Eun Sang Choi, Jing Zhang, Yan Wu, Ryan Sinclair, Bryan C. Chakoumakos, Yisheng Chai, Haidong Zhou, and **Huibo Cao**, “Large spin-driven dielectric response and magnetoelectric coupling in the buckled honeycomb $\text{Fe}_4\text{Nb}_2\text{O}_9$ ” *Phys. Rev. Materials* **4**, 084403 (2020)
12. **Lei Ding**, Chaowei Hu, Feng Ye, Erxi Feng, Ni Ni, **Huibo Cao**, “Crystal and magnetic structures of magnetic topological insulators MnBi_2Te_4 and MnBi_4Te_7 ”, *Physical Review B* **101**, 020412(R) (2020).
13. J. Xing, **E. Feng**, Y. Liu, E. Emmanouilidou, C. Hu, J. Liu, D. Graf, A.P. Ramirez, G. Chen, **H.B. Cao**, N. Ni, "Néel-type antiferromagnetic order and magnetic field–temperature phase diagram in the spin-1/2 rare-earth honeycomb compound YbCl_3 ", *Physical Review B*, **102**, 014427 (2020).
14. Jie Xing, **Huibo Cao**, Arpita Paul, Chaowei Hu, Hsin-Hua Wang, Yongkang Luo, Raj Chaklashiya, Stuart Brown, Turan Birol, and Ni Ni, “Anisotropic properties, charge ordering, and ferrimagnetic

structures in the strongly correlated β -V₂PO₅ single crystal”, *Physical Review Materials*, **4**, 094414 (2020).

15. Chaowei Hu, **Lei Ding**, Kyle N. Gordon, Barun Ghosh, Haoxiang Li, Shang-Wei Lian, A. Garrison Linn, Hung-Ju Tien, Cheng-Yi Huang, P. V. Sreenivasa Reddy, Bahadur Singh, Amit Agarwal, Arun Bansil, Su-Yang Xu, Hsin Lin, **Huibo Cao**, Tay-Rong Chang, Dan Dessau, Ni Ni, “Realization of an intrinsic ferromagnetic topological state in MnBi₈Te₁₃”, *Science Advances*, **6**, eaba4275 (2020).
16. Chaowei Hu, Xiaoqing Zhou, Pengfei Liu, Jinyu Liu, Peipei Hao, Eve Emmanouilidou, Hongyi Sun, Yuntian Liu, Harlan Brawer, Arthur P. Ramirez, **Huibo Cao**, Qihang Liu, Dan Dessau, Ni Ni, “A van der Waals antiferromagnetic topological insulator with weak interlayer magnetic coupling”, *Nature communications* **11**, 97 (2020)
17. Yan J.Q., Okamoto S., Wu Y., Zheng Q., Zhou H.D., **Cao H.B.**, McGuire M.A., "[Magnetic order in single crystals of Na₃Co₂SbO₆ with a honeycomb arrangement of 3d⁷ Co²⁺ ions](#)", *Physical Review Materials*, **3**, 074405 (2019).
18. **Gui, Xin**; Pletikoscic, Ivo; **Cao, Huibo**; Tien, Hung-Ju ; Xu, Xitong; Zhong, Ruidan; Wang, Guangqiang; Chang, Tay-Rong; Jia, Shuang; Valla, Tonica; Xie, Weiwei; Cava, Robert, A New Magnetic Topological Quantum Material Candidate by Design, *ACS Central Science*, **5**, 900-910 (2019).
19. **Huibo Cao**, Bryan C. Chakoumakos, Katie M. Andrews, Yan Wu, Richard A. Riedel, Jason Hodges, Wenduo Zhou, Ray Gregory, Bianca Haberl, Jamie Molaison, and Gary W. Lynn, ” DEMAND, a Dimensional Extreme Magnetic Neutron Diffractometer at the High Flux Isotope Reactor” *Crystals*, **9**(1), 5 (2019). <https://doi.org/10.3390/cryst9010005>
20. Y. Song, **H.B. Cao**, B.C. Chakoumakos, Y. Zhao, A. Wang, H. Lei, C. Petrovic, R.J. Birgeneau, "Intertwined Magnetic and Nematic Orders in Semiconducting KFe_{0.8}Ag_{1.2}Te₂", *Physical Review Letters*, **122**, 8, 087201 (2019).
21. P. Lampen-Kelley, S. Rachel, J. Reuther, J.-Q. Yan, A. Banerjee, C.A. Bridges, **H.B. Cao**, S.E. Nagler, and D. Mandrus, “Anisotropic susceptibilities in the honeycomb Kitaev system alpha-RuCl₃”, *Physical Review B*, **98**, 10043(R). (2018) <https://doi.org/10.1103/PhysRevB.98.100403>
22. Tian W., **Cao H.B.**, Clune A.J., Hughey K.D., Hong T., Yan J.Q., Agrawal H.K., Singleton J., Sales B.C., Fishman R.S., Musfeldt J.L., Fernandez-Baca J.A., "[Electronic phase separation and magnetic-field-induced phenomena in molecular multiferroic \(ND₄\)₂FeCl₅ ·D₂O](#)", *Physical Review B*, **98**, 5, 054407 (2018).
23. Y. Kamiya, L. Ge, T. Hong, Y. Qiu, D.L. Quintero-Castro, Z. Lu, **H.B. Cao**, M. Matsuda, E.S. Choi, C.D. Batista, M. Mourigal, H.D. Zhou, J. Ma, The nature of spin excitations in the one-third magnetization plateau phase of Ba₃CoSb₂O₉, *Nature Communications* **9**, 2666 (2018). <https://www.nature.com/articles/s41467-018-04914-1>
24. Lampen-Kelley, P., A. Banerjee, A.A. Aczel, **H.B. Cao**, J.-Q. Yan, S.E. Nagler, D. Mandrus, Destabilization of magnetic order in a dilute Kitaev spin liquid candidate. *Physical Review Letters*, **119**, 23, 237203 (2017).

25. Zhai, K., **Yan Wu**, Shipeng Shen, Wei Tian, **Huibo Cao**, Yisheng Chai, B. C. Chakoumakos, Dashan Shang, Liqin Yan, Fangwei Wang, Young Sun, Giant magnetoelectric effects achieved by tuning spin cone symmetry in Y-type hexaferrites. *Nature Communications* 8, 519 (2017)
26. Liu, J.Y., J. Hu, D. Graf, T. Zou, M. Zhu, Y. Shi, S. Che, S.M.A. Radmanesh, C.N. Lau, L. Spinu, **H.B. Cao**, X. Ke, Z.Q. Mao, Unusual interlayer quantum transport behavior caused by the zeroth Landau level in YbMnBi₂. *Nature Communications* 8, 646 (2017).
27. McGuire, M. A., V. O. Garlea, K. C. Santosh, V. R. Cooper, J.Q. Yan, **Huibo Cao**, B. C. Sales, Antiferromagnetism in the van der Waals layered spin-lozenge semiconductor CrTe₃. *Physical Review B* 95, 144421 (2017).
28. Berlijn, T., P. C. Snijders, O. Delaire, H.-D. Zhou, T. A. Maier, **Huibo Cao**, S.-X. Chi, M. Matsuda, Y. Wang, M. R. Koehler, P. R. C. Kent, H. H. Weitering, Itinerant antiferromagnetism in RuO₂. *Physical Review Letters*, 118, 077201 (2017).
29. W. Tian, **Huibo Cao**, Jincheng Wang, Feng Ye, M. Matsuda, J.-Q. Yan Yaohua Liu, V. O. Garlea, B. C. Chakoumakos, B. C. Sales, Randy S. Fishman, J. A. Fernandez-Baca, Spin-lattice coupling mediated multiferroicity in (ND₄)₂FeCl₃D₂O. *Physical Review B*, 94, 214405 (2016).
30. **Huibo Cao**, A. Banerjee, J.-Q. Yan, C. B. Bridges, M. D. Lumsden, D. G. Mandrus, B. C. Chakoumakos, S. E. Nagler, Low-temperature crystal and magnetic structure of α -RuCl₃. *Physical Review B* 93, 134423 (2016).
31. Ma, J., Y. Kamiya, Tao Hong, **Huibo Cao**, G. Ehlers, W. Tian, C. D. Batista, Z. L. Dun, H. D. Zhou, M. Matsuda, Static and dynamical properties of the spin-1/2 equilateral triangular-lattice antiferromagnet Ba₃CoSb₂O₉. *Physical Review Letters* 116, 087201 (2016).
32. **Huibo Cao**, Z.Y. Zhao, M. Lee, E.S. Choi, M.A. McGuire, B.C. Sales, H.D. Zhou, J.Q. Yan, D. Mandrus, "High pressure floating zone growth and structural properties of ferrimagnetic quantum paraelectric BaFe₁₂O₁₉", *APL Materials*, 3, 062512 (2015). **Invited submission**
33. McGuire, M.A., **Huibo Cao**, B.C. Chakoumakos, B.C. Sales, Symmetry-lowering lattice distortion at the spin-reorientation in MnBi single crystals. *Physical Review B* 90, 174425(2014)
34. **Huibo Cao**, B.C. Chakoumakos, X. Chen, J.-Q. Yan, M.A. McGuire, H. Yang, R. Custelcean, H.D. Zhou, D.J. Singh, D. Mandrus, "Origin of the phase transition in IrTe₂: Structural modulation and local bonding instability" *Physical Review B* 88, 115122 (2013).
35. **Huibo Cao**, C. Cantoni, A.F. May, M.A. McGuire, B.C. Chakoumakos, S.J. Pennycook, R. Custelcean, A.S. Sefat, B.C. Sales, "Evolution of the nuclear and magnetic structures of TlFe_{1.6}Se₂ with temperature" *Physical Review B* 85, 054515 (2012).
36. J. Zhao, **Huibo Cao**, E. Bourret-Courchesne, D.-H. Lee, R.J. Birgeneau "Neutron-Diffraction Measurements of an Antiferromagnetic Semiconducting Phase in the Vicinity of the High-Temperature Superconducting State of K_xFe_{2-y}Se₂" *Physical Review Letters* 109, 267003 (2012).
37. A.F. May, M.A. McGuire, **Huibo Cao**, I. Sergueev, C. Cantoni, B.C. Chakoumakos, D.S. Parker, B.C. Sales "Spin reorientation in TlFe_{1.6}Se₂ with complete vacancy ordering" *Physical Review Letters* 109, 077003 (2012).

38. F. Ye, S. Chi, **Huibo Cao**, B.C. Chakoumakos, J.A. Fernandez-Baca, R. Custelcean, T.F. Qi, O.B. Korneta, G. Cao, "Direct evidence of a zigzag spin-chain structure in the honeycomb lattice: A neutron and x-ray diffraction investigation of single-crystal Na_2IrO_3 " *Physical Review B*, 85 180403(R) (2012).
39. B.C. Chakoumakos, **Huibo Cao**, F. Ye, A.D. Stoica, M. Popovici, M. Sundaram, W. Zhou, J.S. Hicks, G.W. Lynn, R.A. Riedel, "Four-circle single-crystal neutron diffractometer at the High Flux Isotope Reactor" *Journal of Applied Crystallography* 44, 655 (2011).
40. B.C. Sales, M.A. McGuire, A.F. May, **Huibo Cao**, B.C. Chakoumakos, A.S. Sefat, "Unusual phase transitions and magnetoelastic coupling in $\text{TlFe}_{1.6}\text{Se}_2$ single crystals" *Physical Review B* 83, 224510 (2011).
41. **Huibo Cao**, A. Gukasov, I. Mirebeau, P. Bonville, C. Decorse, G. Dhahlenne, "Ising versus XY anisotropy in frustrated $\text{R}_2\text{Ti}_2\text{O}_7$ compounds as seen by polarized neutrons" *Physical Review Letters* 103, 056402 (2009).
42. **Huibo Cao**, A. Gukasov, I. Mirebeau, P. Bonville, "Anisotropic exchange in frustrated pyrochlore $\text{Yb}_2\text{Ti}_2\text{O}_7$ " *Journal of Physics: Condensed Matter* 21, 492202 (2009).
43. I. Mirebeau, I. Goncharenko, **Huibo Cao**, A. Forget, "Magnetic order in $\text{Tb}_2\text{Sn}_2\text{O}_7$ under high pressure: From ordered spin ice to spin liquid and antiferromagnetic order" *Physical Review B* 80, 220407(R) (2009).
44. **Huibo Cao**, A. Gukasov, I. Mirebeau, P. Bonville, G. Dhahlenne, "Field-Induced Spin-Ice-Like Orders in Spin Liquid $\text{Tb}_2\text{Ti}_2\text{O}_7$ " *Physical Review Letters* 101, 196402 (2008).