

Yu Song

University of California, Berkeley
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Personal Information

Date of Birth: June 27, 1988
Gender: Male
Nationality: China

Research Experience

08/2017 – present: Postdoctoral Scholar, University of California, Berkeley
04/2017 – 07/2017: RCQM/Smalley-Curl Postdoctoral Fellow in Quantum Materials, Rice University
08/2013 – 03/2017: Research Assistant, Rice University
08/2011 – 08/2013: Research Assistant, University of Tennessee
08/2011 – present: Regular user of neutron scattering research facilities

Education

08/2013 – 03/2017: **PhD**, Rice University
Advisor: Pengcheng Dai

08/2010 – 08/2013: **PhD candidate**, University of Tennessee at Knoxville
Advisor: Pengcheng Dai

09/2006 – 07/2010: **Bachelor of Science**, Zhejiang University

Honors and Awards

2nd Place, 2009 Zhejiang Provincial Collegiate Programming Contest
National First Prize, 2008 China Undergraduate Mathematical Contest in Modeling

Research Interest

Using scattering techniques to probe the physics of quantum materials, such as unconventional superconductors and heavy-fermion metals.

Synthesis and characterization of novel materials.

Professional Skills

- **Neutron spectroscopy using triple-axes and time-of-flight chopper spectrometers**
For measuring magnetic excitations in materials in the energy range ~ 0.1 meV to ~ 1 eV
- **Spherical and longitudinal neutron polarimetry**

Sept. 06, 2017

Using polarized neutron to extract detailed polarization dependence of magnetic excitations in materials

- **Neutron single crystal and powder diffraction**
Determination of the crystal and magnetic structure of novel materials and structural and magnetic phase transitions
- **Materials synthesis using flux and Bridgeman methods**
- **Characterization of physical properties using transport, magnetization and X-ray diffraction methods**
- **Resonant Inelastic X-ray Scattering**
Studying electronic excitations (including spin fluctuations) in iron pnictides and cuprates using incident photons resonant at Fe and Cu L_3 edge

Invited Talks

Condensed Matter Physics seminar, University of California, Berkeley, Department of Physics

"Antiferromagnetic order and excitations in insulating $\text{NaFe}_{1-x}\text{Cu}_x\text{As}$ "

Nov. 8, 2016

Condensed Matter Physics seminar, Zhejiang University, Department of Physics

"Neutron Scattering in $\text{NaFe}_{1-x}(\text{Co}, \text{Ni}, \text{Cu})_x\text{As}$ "

Dec. 21, 2015

Heavy Fermion Forum, Zhejiang University Center for Correlated Matter

"Nature of the Neutron Resonance Mode in $\text{Ce}_{1-x}\text{Yb}_x\text{CoIn}_5$ "

Dec. 5, 2015

Workshop on Strongly Correlated Electron Materials, Rice Center for Quantum Materials

"Correlation Induced Insulating Behavior and Antiferromagnetic Order in $\text{NaFe}_{1-x}\text{Cu}_x\text{As}$ "

Nov. 20, 2015

Condensed Matter Physics Seminar, Triple-Axis Group, Helmholtz Zentrum Berlin

"Neutron Scattering in Iron-Based Superconductors"

Oct. 24, 2012

Book Chapters

High-Temperature Superconductors

Yu Song and Pengcheng Dai

Book Chapter in "Neutron Scattering-Magnetic and Quantum Phenomena" Edited by Felix Fernandez-Alonso and David L. Price, Volume 48 in *Experimental Methods in the Physical Sciences* (ISBN: 978-0-12-802049-4 ISSN: 1079-4042), pages 145-201 (2015).

Publications

36 peer-reviewed publications since 2011, **4** in *Nature Communications*, **1** in *Physical Review X*, **5** in *Physical Review Letters*, **1** in *npj Quantum Materials*, **1** in *Scientific Reports*, and **22** in *Physical Review B*

Two-Dimensional Massless Dirac Fermions in Antiferromagnetic $A\text{Fe}_2\text{As}_2$ ($A=\text{Ba}, \text{Sr}$)

Zhi-Guo Chen, Luyang Wang, **Yu Song**, Xingye Lu, Huiqian Luo, Chenglin Zhang, Pengcheng Dai, Zhiping Yin, Kristjan Haule, and Gabriel Kotliar
Phys. Rev. Lett. **119**, 096401 (2017)

Spin excitation anisotropy in the paramagnetic tetragonal phase of BaFe_2As_2

Yu Li, Weiyi Wang, **Yu Song**, Haoran Man, Xingye Lu, Frédéric Bourdarot, and Pengcheng Dai
Phys. Rev. B **96**, 020404(R) (2017)

Orbital selective neutron spin resonance in underdoped superconducting $\text{NaFe}_{0.985}\text{Co}_{0.015}\text{As}$

Weiyi Wang, J. T. Park, Rong Yu, Yu Li, **Yu Song**, Zongyuan Zhang, Alexandre Ivanov, Jiri Kulda, and Pengcheng Dai
Phys. Rev. B **95**, 094519 (2017)

Spin excitations and the Fermi surface of superconducting FeS

Haoran Man, Jiangang Guo, Rui Zhang, Rico U. Schönemann, Zhiping Yin, Mingxuan Fu, M. B. Stone, Qingzhen Huang, **Yu Song**, Weiyi Wang, David Singh, Felix Lochner, Tillman Hickel, Ilya Eremin, Leland Harriger, Jeffrey W. Lynn, Collin Broholm, Luis Balicas, Qimiao Si, and Pengcheng Dai
npj Quantum Materials **2**, 14 (2017)

Uniaxial pressure effect on the magnetic ordered moment and transition temperatures in $\text{BaFe}_{2-x}\text{T}_x\text{As}_2$ ($T=\text{Co}, \text{Ni}$)

David W. Tam, **Yu Song**, Haoran Man, Sky C. Cheung, Zhiping Yin, Xingye Lu, Weiyi Wang, Benjamin A. Frandsen, Lian Liu, Zizhou Gong, Takashi U. Ito, Yipeng Cai, Murray N. Wilson, Shengli Guo, Keisuke Koshiishi, Wei Tian, Bassam Hitti, Alexandre Ivanov, Yang Zhao, Jeffrey W. Lynn, Graeme M. Luke, Tom Berlijn, Thomas A. Maier, Yasutomo J. Uemura, and Pengcheng Dai
Phys. Rev. B **95**, 060505(R) (2017)

Strong ferromagnetic exchange interaction under ambient pressure in BaFe_2S_3

Meng Wang, S. J. Jin, Ming Yi, **Yu Song**, H. C. Jiang, W. L. Zhang, H. L. Sun, H. Q. Luo, A. D. Christianson, E. Bourret-Courchesne, D. H. Lee, Dao-Xin Yao, and R. J. Birgeneau
Phys. Rev. B **95**, 060502(R) (2017)

Phase diagram and neutron spin resonance of superconducting $\text{NaFe}_{1-x}\text{Cu}_x\text{As}$

Guotai Tan, **Yu Song**, Rui Zhang, Lifang Lin, Zhuang Xu, Long Tian, Songxue Chi, M. K. Graves-Brook, Shiliang Li, and Pengcheng Dai
Phys. Rev. B **95**, 054501 (2017)

Sept. 06, 2017

Lattice distortion and charge density wave in $\text{Na}_2\text{Ti}_2\text{Sb}_2\text{O}$ revealed by scanning tunnelling microscopy

M. Q. Ren, Y. J. Yan, J. Jiang, S. Y. Tan, J. Miao, C. Chen, Y. Song, C. L. Zhang, P. C. Dai, B. P. Xie, T. Zhang, and D. L. Feng

Philosophical Magazine **97**, 527-534 (2017)

Spin anisotropy due to spin-orbit coupling in optimally hole-doped $\text{Ba}_{0.67}\text{K}_{0.33}\text{Fe}_2\text{As}_2$

Yu Song, Haoran Man, Rui Zhang, Xingye Lu, Chenglin Zhang, Meng Wang, Guotai Tan, L. -P. Regnault, Yixi Su, Jian Kang, Rafael M. Fernandes, and Pengcheng Dai

Phys. Rev. B **94**, 214516 (2016)

A Mott insulator continuously connected to iron pnictide superconductors

Yu Song, Zahra Yamani, Chongde Cao, Yu Li, Chenglin Zhang, Justin Chen, Qingzhen Huang, Hui Wu, Jing Tao, Yimei Zhu, Wei Tian, Songxue Chi, Huibo Cao, Yao-Bo Huang, Marcus Dantz, Thorsten Schmitt, Rong Yu, Andriy H. Nevidomskyy, Emilia Morosan, Qimiao Si, Pengcheng Dai

Nature Communications **7**, 13879 (2016)

Robust upward dispersion of the neutron spin resonance in the heavy fermion superconductor $\text{Ce}_{1-x}\text{Yb}_x\text{CoIn}_5$

Yu Song, John Van Dyke, I. K. Lum, B. D. White, Sooyoung Jang, Duygu Yazici, L. Shu, A. Schneidewind, Petr Čermák, Y. Qiu, M. B. Maple, D. K. Morr and Pengcheng Dai

Nature Communications **7**, 12774 (2016)

$\text{NaFe}_{0.56}\text{Cu}_{0.44}\text{As}$: A Pnictide Insulating Phase Induced by On-Site Coulomb Interaction

C. E. Matt, N. Xu, Baiqing Lv, Junzhang Ma, F. Bisti, J. Park, T. Shang, Chongde Cao, Yu Song, Andriy H. Nevidomskyy, Pengcheng Dai, L. Patthey, N. C. Plumb, M. Radovic, J. Mesot, and M. Shi

Phys. Rev. Lett. **117**, 097001 (2016)

Spin waves and magnetic exchange interactions in the spin-ladder compound RbFe_2Se_3

Meng Wang, Ming Yi, Shangjian Jin, Hongchen Jiang, Yu Song, Huiqian Luo, A. D. Christianson, C. de la Cruz, E. Bourret-Courchesne, Dao-Xin Yao, D. H. Lee, and R. J. Birgeneau

Phys. Rev. B **94**, 041111(R) (2016)

Electron doping evolution of structural and antiferromagnetic phase transitions in $\text{NaFe}_{1-x}\text{Co}_x\text{As}$ iron pnictides

Guotai Tan, Yu Song, Chenglin Zhang, Lifang Lin, Zhuang Xu, Tingting Hou, Wei Tian, Huibo Cao, Shiliang Li, Shiping Feng, and Pengcheng Dai

Phys. Rev. B **94**, 014509 (2016)

Electron doping evolution of the magnetic excitations in $\text{NaFe}_{1-x}\text{Co}_x\text{As}$

Scott V. Carr, Chenglin Zhang, Yu Song, Guotai Tan, Yu Li, D. L. Abernathy, M. B. Stone, G. E. Granroth, T. G. Perring, and Pengcheng Dai

Phys. Rev. B **93**, 214506 (2016)

Electron doping evolution of the neutron spin resonance in $\text{NaFe}_{1-x}\text{Co}_x\text{As}$

Chenglin Zhang, Weicheng Lv, Guotai Tan, Yu Song, Scott V. Carr, Songxue Chi, M. Matsuda, A. D. Christianson, J. A. Fernandez-Baca, L. W. Harriger, and Pengcheng Dai

Phys. Rev. B **93**, 174522 (2016)

Sept. 06, 2017

Impact of uniaxial pressure on structural and magnetic phase transitions in electron-doped iron pnictides

Xingye Lu, Kuo-Feng Tseng, T. Keller, Wenliang Zhang, Ding Hu, Yu Song, Haoran Man, J. T. Park, Huiqian Luo, Shiliang Li, Andriy H. Nevidomskyy, and Pengcheng Dai
Phys. Rev. B **93**, 134519 (2016)

Energy dependence of the spin excitation anisotropy in uniaxial-strained $\text{BaFe}_{1.9}\text{Ni}_{0.1}\text{As}_2$

Yu Song, Xingye Lu, D. L. Abernathy, David W. Tam, J. L. Niedziela, Wei Tian, Huiqian Luo, Qimiao Si, and Pengcheng Dai
Phys. Rev. B **92**, 180504(R) (2015)

Photoemission study of the electronic structure and charge density waves of $\text{Na}_2\text{Ti}_2\text{Sb}_2\text{O}$

S. Y. Tan, J. Jiang, Z. R. Ye, X. H. Niu, Y. Song, C. L. Zhang, P. C. Dai, B. P. Xie, X. C. Lai, and D. L. Feng
Scientific Reports **5**, 9515 (2015)

Phase separation, competition, and volume-fraction control in $\text{NaFe}_{1-x}\text{Co}_x\text{As}$

Long Ma, J. Dai, P. S. Wang, X. R. Lu, Yu Song, Chenglin Zhang, G. T. Tan, Pengcheng Dai, D. Hu, S. L. Li, B. Normand, and Weiqiang Yu
Phys. Rev. B **90**, 144502 (2014)

Anisotropic neutron spin resonance in underdoped superconducting $\text{NaFe}_{1-x}\text{Co}_x\text{As}$

Chenglin Zhang, Yu Song, L.-P. Regnault, Yixi Su, M. Enderle, J. Kulda, Guotai Tan, Zachary C. Sims, Takeshi Egami, Qimiao Si, and Pengcheng Dai
Phys. Rev. B **90**, 140502(R) (2014)

Effect of Pnictogen Height on Spin Waves in Iron Pnictides

Chenglin Zhang, Leland W. Harriger, Zhiping Yin, Weicheng Lv, Miaoyin Wang, Guotai Tan, Yu Song, D. L. Abernathy, Wei Tian, Takeshi Egami, Kristjan Haule, Gabriel Kotliar, and Pengcheng Dai
Phys. Rev. Lett. **112**, 217202 (2014)

Doping dependence of spin excitations and its correlations with high-temperature superconductivity in iron pnictides

Meng Wang, Chenglin Zhang, Xingye Lu, Guotai Tan, Huiqian Luo, Yu Song, Miaoyin Wang, Xiaotian Zhang, E.A. Goremychkin, T.G. Perring, T.A. Maier, Zhiping Yin, Kristjan Haule, Gabriel Kotliar & Pengcheng Dai
Nature Communications **4**, 2874 (2013)

Measurement of a Double Neutron-Spin Resonance and an Anisotropic Energy Gap for Underdoped Superconducting $\text{NaFe}_{0.985}\text{Co}_{0.015}\text{As}$ Using Inelastic Neutron Scattering

Chenglin Zhang, Rong Yu, Yixi Su, Yu Song, Miaoyin Wang, Guotai Tan, Takeshi Egami, J. A. Fernandez-Baca, Enrico Faulhaber, Qimiao Si, and Pengcheng Dai
Phys. Rev. Lett. **111**, 207002 (2013)

Sept. 06, 2017

In-plane spin excitation anisotropy in the paramagnetic state of NaFeAs

Yu Song, Louis-Pierre Regnault, Chenglin Zhang, Guotai Tan, Scott V. Carr, Songxue Chi, A. D. Christianson, Tao Xiang, and Pengcheng Dai
Phys. Rev. B **88**, 134512 (2013)

Longitudinal and transverse Hall resistivities in NaFe_{1-x}Co_xAs single crystals with x=0.022 and 0.0205: weak pinning and anomalous electrical transport properties

L M Wang, Chih-Yi Wang, Un-Cheong Sou, H C Yang, L J Chang, Caleb Redding, Yu Song, Pengcheng Dai, and Chenglin Zhang
Journal of Physics: Condensed Matter **25**, 395702 (2013)

Simultaneous Optimization of Spin Fluctuations and Superconductivity under Pressure in an Iron-Based Superconductor

G. F. Ji, J. S. Zhang, Long Ma, P. Fan, P. S. Wang, J. Dai, G. T. Tan, Y. Song, C. L. Zhang, Pengcheng Dai, B. Normand, and Weiqiang Yu
Phys. Rev. Lett. **111**, 107004 (2013)

Distinguishing $s_{\pm}$ and s_{++} electron pairing symmetries by neutron spin resonance in superconducting NaFe_{0.935}Co_{0.045}As

Chenglin Zhang, H.-F. Li, Yu Song, Yixi Su, Guotai Tan, Tucker Netherton, Caleb Redding, Scott V. Carr, Oleg Sobolev, Astrid Schneidewind, Enrico Faulhaber, L. W. Harriger, Shiliang Li, Xingye Lu, Dao-Xin Yao, Tanmoy Das, A. V. Balatsky, Th. Brückel, J. W. Lynn, and Pengcheng Dai
Phys. Rev. B **88**, 064504 (2013)

Uniaxial pressure effect on structural and magnetic phase transitions in NaFeAs and its comparison with as-grown and annealed BaFe₂As₂

Yu Song, Scott V. Carr, Xingye Lu, Chenglin Zhang, Zachary C. Sims, N. F. Luttrell, Songxue Chi, Yang Zhao, Jeffrey W. Lynn, and Pengcheng Dai
Phys. Rev. B **87**, 184511 (2013)

Strong-coupling superconductivity in NaFe_{1-x}Co_xAs: Validity of Eliashberg theory

Guotai Tan, Ping Zheng, Xiancheng Wang, Yanchao Chen, Xiaotian Zhang, Jianlin Luo, Tucker Netherton, Yu Song, Pengcheng Dai, Chenglin Zhang, and Shiliang Li
Phys. Rev. B **87**, 144512 (2013)

Anisotropic but Nodeless Superconducting Gap in the Presence of Spin-Density Wave in Iron-Pnictide Superconductor NaFe_{1-x}Co_xAs

Q. Q. Ge, Z. R. Ye, M. Xu, Y. Zhang, J. Jiang, B. P. Xie, Y. Song, C. L. Zhang, Pengcheng Dai, and D. L. Feng
Phys. Rev. X **3**, 011020 (2013)

Sept. 06, 2017

Paramagnetic spin excitations in insulating $Rb_{0.8}Fe_{1.6}Se_2$

Miaoyin Wang, Xingye Lu, R. A. Ewings, Leland W. Harriger, Yu Song, Scott V. Carr, Chunhong Li, Rui Zhang, and Pengcheng Dai

Phys. Rev. B **87**, 064409 (2013)

Environmental stability and anisotropic resistivity of Co-doped $Na_{1-\delta}Fe_{1-x}Co_xAs$

N. Spyrisson, M. A. Tanatar, Kyuil Cho, Y. Song, Pengcheng Dai, Chenglin Zhang, and R. Prozorov

Phys. Rev. B **86**, 144528 (2012)

Doping-dependent anisotropic superconducting gap in $Na_{1-\delta}(Fe_{1-x}Co_x)As$ from London penetration depth

K. Cho, M. A. Tanatar, N. Spyrisson, H. Kim, Y. Song, Pengcheng Dai, C. L. Zhang, and R. Prozorov

Phys. Rev. B **86**, 020508(R) (2012)

Neutron scattering studies of spin excitations in superconducting $Rb_{0.82}Fe_{1.62}Se_2$

Miaoyin Wang, Chunhong Li, D. L. Abernathy, Yu Song, Scott V. Carr, Xingye Lu, Shiliang Li, Zahra Yamani, Jiangping Hu, Tao Xiang, and Pengcheng Dai

Phys. Rev. B **86**, 024502 (2012)

Spin waves and magnetic exchange interactions in insulating $Rb_{0.89}Fe_{1.58}Se_2$

Miaoyin Wang, Chen Fang, Dao-Xin Yao, GuoTai Tan, Leland W. Harriger, Yu Song, Tucker Netherton, Chenglin Zhang, Meng Wang, Matthew B. Stone, Wei Tian, Jiangping Hu & Pengcheng Dai

Nature Communications **2**, 580 (2011)