Min Gyu Kim

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Education

Doctor of Philosophy, Condensed Matter Physics, Iowa State University, Ames, IA, Aug. 2012

Doctoral thesis: Structural and magnetic properties of transition metal substituted $BaFe_2As_2$ compounds studied by x-ray and neutron scattering.

Master of Science, Physics, The University of Seoul, Seoul, South Korea, Mar. 2006

Master thesis: Study of Transport and Dielectric of Resistive Memory States in NiO Thin Film.

Bachelor of Science, Physics, The University of Seoul, Seoul, South Korea, Mar. 2004

Professional appointment

Sep. 2016 – Current

Postdoctoral Associate | with Valery Kiryukhin | Rutgers University

Oct. 2012 – Aug. 2016

Postdoctoral Fellow | with Robert Birgeneau | Lawrence Berkeley National Lab.

Research interest

- Fractionalized spin excitations in quantum-computing candidate magnets.
- Quantum spin dynamics at/near quantum critical point.
- Visualization of antiferromagnetic domain formation in exotic materials.
- Static and dynamic properties of lattice, charge, and spin and their possible relation to exotic ground states.
- Experimental x-ray diffraction and x-ray resonant magnetic scattering.
- Experimental elastic and inelastic neutron scattering.

Publications

Please see the separate list of publications.

Awards

QuantEmX Scientist Exchange Award sponsored by Institute for Complex Adaptive Matter, 2018

The Zaffarano Prize for Graduate Student Research, Iowa State University, 2012

One awarded to recognize superior performance in publishable research among all Iowa State University graduate Students.

Graduate College Research Excellence Award, Iowa State University, 2012

Talks

Invited Talks

- "Structural and magnetic properties of transition metal substituted $BaFe_2As_2$ compounds studied by x-ray and neutron scattering", Physics department colloquium, The University of Seoul, Seoul, South Korea, September 2013.
- "Interplay between structure and antiferromagnetism in electron doped $BaFe_2As_2$", Jülich Center for Neutron Scattering Seminar, Forschungszentrum Jülich - Jülich Center for Neutron Scattering Institute, Jülich, Germany, June 2011.
- "Suppression of orthorhombic distortion in superconducting Co-doped $BaFe_2As_2$", Advanced Photon Source User Science Seminar, Argonne National Laboratory, IL, USA, October 2010.

Conference Talks

- "Ru L_2 edge X-ray resonant magnetic scattering from $Ba(Fe_{0.795}Ru_{0.205})_2As_2$ compound", American Physical Society's March Meeting, Baltimore, MD, USA, March 2013.
- "Nature of the phase transitions in the parent and lightly electron doped $BaFe_2As_2$ compounds", American Physical Society's March Meeting, Boston, MA, USA, February 2012.
- "Character of the structural/magnetic phase transitions in the parent and electron doped $BaFe_2As_2$ compounds", Resonant Elastic X-ray Scattering conference 2011, Aussois, France, June 2011.
- "Antiferromagnetic ordering in the absence of structural distortion in $Ba(Fe_{1-x}Mn_x)_2As_2$", American Physical Society's March Meeting, Dallas, TX, USA, March 2011.
- "Commensurate antiferromagnetic ordering in $Ba(Fe_{1-x}Co_x)_2As_2$ determined by x-ray resonant magnetic scattering at the Fe K edge", American Physical Society's March Meeting, Dallas, TX, USA, March 2011.
- "Low-temperature spin excitations in $Ba(Fe_{0.972}Cu_{0.028})_2As_2$ single crystals", American Physical Society's March Meeting, Portland, OR, USA, March 2010.

Teaching Experience

Lawrence Berkeley National Laboratory, Berkeley, CA

Mentoring a graduate student, Oct. 2012 – Aug. 2016

- Taught neutron scattering methods in large-scale facilities.
- Helped data analysis and preparation for publication.

Iowa State University, Ames, IA

Mentoring graduate students, May. 2009 – Sep. 2012

- Taught scattering methods using a laboratory x-ray diffraction and Laue camera as well as x-ray and neutron scattering at large-scale facilities.

Teaching Assistant, Aug. 2007 – May. 2009

- Held three 2-hour laboratory classes per one week for one semester in Introduction to Classical Physics I and for another semester in Introduction to Classical Physics II. The courses are intended for science and engineering students. Helped students' experiments and graded their lab reports.
- Held three 1-hour recitation classes per one week for one year in Introduction to Classical Physics I. Taught problem solving, explained concepts behind problems, and helped students' in-class group work. Developed a series of weekly quizzes. Graded homework and quizzes.
- Held 2-hour help-room hour per one week for one semester and 3-hour help-room per one week for another semester. Explained concepts behind equations and problems, and helped problem solving.

The University of Seoul, Seoul, South Korea

Teaching Assistant, Mar. 2004 – Dec. 2006

- Graded homework for undergraduate Classical Mechanics, Quantum Mechanics, Mathematical Physics II classes for physics major students.
- Graded the undergraduate Solid State Physics exams.
- Held 2-hour Modern Physics Lab. I, intended for physics major students, for one semester and 2-hour Physics & Experiment II classes, intended for science and engineering students for one semester. Helped students' experiments and graded their lab reports.

Research Experience

Rutgers University, Piscataway, NJ

Postdoctoral Associate with Valery Kiryukhin, Sep. 2016 – Current

- Investigation of possible magnetic transition under applied pressures in the hybrid improper ferroelectric $Ca_3Mn_2O_7$: Investigating the behaviors of octahedron rotations and magnetic structure in $Ca_3Mn_2O_7$ as a function of external pressure and temperature.
- Spin-Liquid-Like State in the Triangular Lattice Antiferromagnet $TbInO_3$: Studying the fractionalized spin excitations in the triangular-lattice using unpolarized and polarized inelastic neutron scattering. Observed broad gapless magnetic excitations that suggest spin liquid state in $TbInO_3$. In preparation for publication.
- Imaging antiferromagnetic antiphase domain boundaries using magnetic Bragg diffraction phase contrast: Direct visualization of antiferromagnetic domain walls using resonant soft x-ray scattering techniques that do not require mathematical reconstruction. Studied antiphase domains in antiferromagnetic $Fe_2Mo_3O_8$ and $NiMn_2TeO_6$.

Lawrence Berkeley National Laboratory, Berkeley, CA

Postdoctoral Fellow with Robert Birgeneau, Oct. 2012 – Aug. 2016

- Spin polarization of Ru in superconducting $Ba(Fe_{0.795}Ru_{0.205})_2As_2$: Investigating magnetism of the dopant element and a possible orbital ordering of Ru using x-ray resonant magnetic scattering.
- Spin fluctuations near the putative antiferromagnetic quantum critical point in $Ba(Fe_{1-x}Cu_x)_2As_2$ compounds: Studying a possible quantum critical behavior that is evident in the inelastic neutron scattering spectrum.
- Critical quasi-two-dimensional magnetic scattering in $Ba(Fe_{1-x}Co_x)_2As_2$ compounds: Investigating the dimensionality of the system and the behavior of the magnetic correlation length across the magnetic tricritical point in $Ba(Fe_{1-x}Co_x)_2As_2$. Synthesized and characterized a series of single crystals.

Iowa State University, Ames, IA

Research Assistant with Alan Goldman and Andreas Kreyssig, Jul. 2008 – Sep. 2012

- Actively involved in various projects including:
    - Structural and magnetic phase transitions in the Fe-based superconductors: Exploring the phase diagram of $Ba(Fe_{1-x}M_x)_2As_2$ (M = Co, Ru, and Mn) compounds using x-ray and neutron diffraction.
    - Character of phase transitions in the parent $BaFe_2As_2$ compounds: Identifying the true nature of phase transition and understanding the relation between structure and magnetism. First independent project.
    - Spin density wave ordering in $Ba(Fe_{1-x}M_x)_2As_2$ (M = Co and Cu) compounds: Focusing on commensurability of the spin density wave ordering.
    - Superconducting spin resonance in $Ba(Fe_{1-x}Ni_x)_2As_2$ compound: Revealing that the spin resonance disperse like magnon, which is consistent with $s^{\pm}$ gap symmetry. Independent project.
    - Crystallographic orientation of quasi-crystalline $Sc_{12}Zn_{88}$, antiferromagnetic ordering in a quasi-crystal approximant Cd_6Tb, and antiferromagnetic ordering in a Half-Heusler alloy, GdBiPt.
- Resulted in 27 publications: 9 first-author publications (2 in Physical Review Letter, 6 in Physical Review B, and 1 in the European Physical Journal Special Topics) and 5 second-author publications (2 in Physical Review Letter and 3 in Physical Review B).

The University of Seoul, Seoul, South Korea

Research Assistant with Eun Jip Choi, Mar. 2002 – Mar. 2006

- Transport and dielectric properties in NiO thin film, which was collaboration with the Samsung Advanced Institute of Technology, Samsung Electronics Co., Ltd. Led the project. Resulted in 1 first-author publication in the Japanese Journal of Applied Physics.
- Setting-up a low temperature experiment system including an optical cryostat and a far-IR detector Bolometer. Involved in the design of the apparatus and took charge of communicating with engineers. Tested and performed the first experiment on this system.
- Dielectric properties in Li- and Ti-doped NiO studied by infrared spectroscopy. Performed a part of the measurement. Resulted in 1 publication in Physical Review B.
- Doping dependence in the infrared spectrum of $(Eu_{1-x}Ca_x)B_6$ and $(Eu_{1-x}La_x)B_6$. Performed a part of the measurement.