

Lei Fang

Center for Quantum Nanoscience, Institute for Basic Science (IBS) Seoul 03760, Republic of Korea

EDUCATION

- Ph. D. Physics,** The Ohio State University, March 2011, *Advisor: Dr. Ezekiel Johnston-Halperin*
Specialization: Physics, Condensed Matter Experiment
- Bachelor of Science,** University of Science and Technology of China, July 2004
Major: Physics

PROFESSIONAL EMPLOYMENT

Research Engineer, Seoul, Republic of Korea (Oct.2020- present)

Center for Quantum Nanoscience, Institute for Basic Science (IBS) at Ewha Womans University

- Design, construction and maintenance of 1 Kelvin, 3 axis magnet (6T, 4T, 1T) ESR-STM system “Charlie”
- Design and construction of optics integrated STM systems “Dave” and “Flux”
- Solve technical issue of home-built STM systems and scientific projects.

Technical Engineer, Seoul, Republic of Korea (April 2017-July 2019)

Center for Quantum Nanoscience, Institute for Basic Science (IBS) at Ewha Womans University

- Designing the He3 gas handling and vacuum pumping system for the new QNS science building.
- Solve technical issue of scientific projects.

Postdoctoral Fellow, College Park, MD (Jan. 2012 – Oct. 2014)

Department of Materials Science and Engineering, University of Maryland

Synthesis and characterization of exchange coupled rare-earth-free permanent magnet material MnBi_{1-x}Co_x/Fe. Realize energy product ((BH)_{max}) of 25MGOe at room temperature.

- Optimizing and Synthesis of rare-earth-free permanent magnetic material MnBi_{1-x}Co_x/Fe by DC/RF sputtering system.
- Synthesis and characterization of varieties of combinatorial thin film libraries in search of novel multifunctional materials
- Setting up and leading scanning magneto-optical Kerr measurements for magnetic materials (both longitudinal and transverse depending on easy axis of the material).

Postdoctoral Fellow, Columbus, OH (March 2011- Aug. 2011)

Department of Physics, The Ohio State University

Magneto-Optical Kerr effect measurement of AC susceptibility of complex oxide system

Graduate Research Assistant, Columbus, OH (June 2004- March 2011)
Department of Physics, The Ohio State University

Using Magneto-Optical Kerr effect, first time demonstrate the ferromagnetic property of the world first strong ferromagnetic ferroelectric (multiferroic) material $\text{EuTiO}_3/\text{DyScO}_3$, results publish in Nature

- Design, set up and perform the MOKE experiment in Helium 4 Spectromag system:

Demonstrate optical spin detection of electric spin injection from an organic based ferrimagnet $\text{V}[\text{TCNE}]_{x-2}$ to an inorganic semiconductor (GaAs/AlGaAs quantum well) hybrid heterostructure, laying the foundation for a new class of multifunctional hybrid spintronics structures.

- Design, set up and perform spin-LED (light emitting diode) measurements in organic/inorganic hybrid structures to optically detect electrical spin injection in a cryogenic system
- Design and fabrication on organic/inorganic hybrid devices

Study the polarization anisotropy of randomly oriented nanowire ensembles. Investigate control of the polarization anisotropy by dielectric matching of the nanowires with dielectric close materials.

- Design and perform polarization dependent photoluminescence measurement on nanowire ensembles (InP, ZnO nanowires) in Spectromag system
- Pulsed laser deposition of III-V, II-IV semiconductor nanowires

Cathodode luminescence measurements of ZnO nanowires and Si/HfO₂/Mo gate oxide heterostructures

Graduate Teaching Assistant, Columbus, OH (Sept. 2004- Dec. 2006)
Department of Physics, The Ohio State University

Teach general physics lab (Mechanics) to science and engineering majors.

Grade exams, quizzes, and homework.

PUBLICATIONS:

1. “Development of a Scanning Tunneling Microscope for Variable Temperature Electron Spin Resonance”
Jiyoon Hwang, Denis Krylov, Robertus J. G. Elbertse, Sangwon Yoon, Taehong Ahn, Jeongmin Oh, **Lei Fang**, Won-jun Jang, Franklin H. Cho, Andreas J. Heinrich, and Yujeong Bae, *Rev. Sci. Instrum.* 93, 093703 (2022)
2. “Large energy product enhancement in perpendicularly coupled MnBi/CoFe magnetic bilayers”
T. R. Gao, **L. Fang**, S. Fackler, S. Maruyama, X. H. Zhang, L. L. Wang, T. Rana, P. Manchanda, A. Kashyap, K. Janicka, A. L. Wysocki, A. T. N’Diaye, E. Arenholz, J. A. Borchers, B. J. Kirby, B. B. Maranville, K. W. Sun, M. J. Kramer, V. P. Antropov, D. D. Johnson, R. Skomski, J. Cui, and I. Takeuchi, *Phys. Rev. B.* 94, 060411(R) (2016) ;
3. “Comprehensive Control of Optical Polarization Anisotropy in Semiconducting Nanowires”
Lei Fang, Xianwei Zhao, Yi-Hsin Chiu, Dongkyun Ko, Kongara M. Reddy, Thomas R. Lemberger, Nitin Padture, Fengyuan Yang and E. Johnston-Halperin, *Appl. Phys. Lett.* 99, 141101(2011)
4. “Electrical spin injection from an organic-based ferrimagnet in a hybrid organic/inorganic heterostructure”
Lei Fang, K. D. Bozdag, Chia-Yi Chen, P. A. Truitt, A. J. Epstein and E. Johnston-Halperin, *Phys. Rev. Lett.* 106, 156602 (2011)
5. “A strong ferroelectric ferromagnet created by means of spin-lattice coupling”
June Hyuk Lee, **Lei Fang**, Eftihia Vlahos, Xianglin Ke *et al.* Nature, 466, 954-959 (2010)

6. “Process-dependent defects in Si/HfO₂/Mo gate oxide heterostructures”
Shawn Walsh, **Lei Fang**, J. K. Schaeffer, E. Weisbrod and L. J. Brillson, Appl. Phys. Lett. 90, 052901 (2007)
7. “Process-dependent electronic states at Mo/hafnium oxide/Si interface”
Shawn Walsh, **Lei Fang**, J. K. Schaeffer and L. J. Brillson, J. Vac. Sci. Technol., A. 25, 1261 (2007)

INVITED PRESENTATIONS:

1. *SPIE Optics and Photonics Conference*: San Diego, CA, USA. Aug. 2011,
Title: “Electrical spin injection from an organic-based magnet in a hybrid organic/inorganic heterostructure”

CONTRIBUTED PRESENTATIONS:

1. 58th MMM conference, Denver, USA. Nov. 2013
Title: “Exchange coupling study of MnBi/Fe-Co bilayers”
2. Gordon Research Conference: Magnetic nanostructure; Bates College, Lewiston, USA. Aug. 2010
Poster Title: “Electrical spin injection from an organic-based magnet in a hybrid organic/inorganic heterostructure”
3. 52nd Electronic Materials Conference; Notre Dame, USA. June 2010
Title: “The Magneto-Optic Kerr Effect (MOKE) as a Measure of Strain-Induced Ferromagnetism in EuTiO₃ grown by Molecular-Beam Epitaxy”
4. MRS Spring Meeting , San Francisco, USA. April 2010
Title: “Polarization dependent photoluminescence studies of InP Nanowires”
5. Annual meeting of the American physical society; Portland, USA. Mar 2010
Title: “Optical detection of electrical spin injection in a V[TCNE]_{x~2} based hybrid spin LED”
6. Annual meeting of the American physical society; Pittsburgh, USA. Mar 2009
Title: “Polarization dependent photoluminescence studies of InP Nanowires”
7. 48th Electronic Materials Conference; University Park, USA. June 2006
Title: “Spatially-dependent optical emission from ZnO nanotips on Al₂O₃ and Si.”

LANGUAGES:

- English: Fluent in reading, writing and speaking
- Chinese: Native language