

Jieun Lee

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Current Position

Assistant Professor, Physics, **Ajou University**, Suwon, Korea

2016 - now

Education

Doctor of Philosophy, Physics, **University of Michigan**, Ann Arbor, MI, USA 2009-2014

Thesis "Spatial and temporal control of quantum dots for on-chip integration" Advisor: Vanessa Sih

Master of Science, Physics, **Postech**, Korea 2007-2009

Thesis "Soft X-ray spectroscopy and cluster calculations on manganese oxides" Advisor: Byung Il Min

Bachelor of Science, Physics, **Postech**, Korea 2003-2007

Magna Cum Laude

Research Interests

Spin/valley dependent physics: Spin and valley dependent photonics, electronics and optoelectronics in 2D semiconductors for novel spintronics and valleytronics devices.

2D heterostructures: Developing new heterostructures based on graphene and other 2D materials in terms of fabrication, unprecedented functionalities, and novel material properties.

Nanophotonics and integrated optoelectronics: Photonic and optoelectronic devices based on nanostructures and 2D materials and their application in integrated photonics and energy applications.

Research Experience

Postdoctoral associate, Physics, Penn State University, University Park, PA, USA

Mentors: Kin Fai Mak, Jie Shan 9/2014 – 8/2016

- **Spin/valley electron transport**
 - Investigated the valley Hall effect by the optical Kerr imaging technique.
 - Demonstrated the electrically tunable valley Hall conductivity in bilayer MoS₂.
- **2D semiconductor magnetoelectricity**
 - Developed the strain-engineered monolayer 2D materials with internal piezoelectricity.
 - Demonstrated the valley magnetization in strained MoS₂ induced by the electric field.
- **Spin/valley ferromagnetism**
 - Investigated magneto-optic effects in 2D materials.

Research assistant, Physics, University of Michigan, Ann Arbor, MI, USA

Advisor: Vanessa Sih 1/2010 – 8/2014

- **Integrated nanophotonics**
 - Designed and investigated the quantum dot – photonic crystal cavity coupled structures.
 - Demonstrated the nonlinear emission dynamics of InGaAs single quantum dot in a cavity.
 - Investigated the cavity-QED of dot-cavity coupled system with quantum optical simulation.

- **Wide bandgap spintronics**
 - Investigated the spin dynamics of wide bandgap materials for room temperature spintronics.
 - Demonstrated the anisotropic spin dephasing in ZnO by pump-probe experiment.
- **Demonstrated the spatial imaging** of site-controlled single quantum dots for quantum information.

Research assistant, Physics, Postech, Korea

Advisor: Byung Il Min 1/2008 – 6/2009

- Investigated the valence electronic structures of manganese oxides using synchrotron light source with X-ray absorption spectroscopy and cluster calculation.

Undergraduate research assistant, Physics, Postech, Korea

Advisor: Yoon-Ho Kim 3/2006 – 2/2007

- Investigated two-photon interferometry using Hong-Ou-Mandel set-up.

Teaching Experience

Student instructor, Physics, University of Michigan

- 'Undergraduate Mechanics Lab' Fall 2009 – Fall 2011
Hands-on lab course introducing non-science/non-engineering students to mechanics experiment.

Teaching assistant, Physics, Postech

- 'Mathematical methods for Physics' and 'Optics' Spring 2007, Fall 2007
Served as grader and discussion instructor for Intermediate physics courses.

Awards and Honors

- Finalist of ProQuest Dissertation Awards, University of Michigan 2014
- Undergraduate Scholarship, Postech 2003-2007

Services

- **Referee** for peer-reviewed journals: Nature Communications, Carbon and Physica E.
- **Lab research mentor** for 1 undergraduate student at Penn State University.
 - Seamus O'hara
- **Research mentor** for 2 undergraduates and 2 high school students at University of Michigan.
 - Deborah Tien, Garret Rodriguez, Elizabeth Langenburg, Angelica Davis

Peer-reviewed Publications

1. **Jieun Lee**, Kin Fai Mak, and Jie Shan, "Valley magnetoelectricity in strained monolayer MoS₂," submitted.
2. **Jieun Lee**, Kin Fai Mak, and Jie Shan, "Electrical control of the valley Hall effect in bilayer MoS₂ transistors," *Nature Nanotechnology* **11**, 421 (2016).
3. **Jieun Lee**, Aneesh Venugopal, and Vanessa Sih, "Anisotropic spin dynamics of impurity-bound electrons in ZnO," *Applied Physics Letters* **106**, 012403 (2015).

4. **Jieun Lee**, Timothy Saucer, Andrew Martin, Joanna Millunchick, and Vanessa Sih, "Time-resolved two-pulse excitation of quantum dots coupled to a photonic crystal cavity in the Purcell regime," *Physical Review Letters* **110**, 013602 (2013).
5. **J.-E. Lee**, T. W. Saucer, A. J. Martin, D. Tien, J. M. Millunchick, and V. Sih, "Ground state exciton emission of InAs quantum dots produced by focused-ion-beam directed nucleation," *Journal of Luminescence* **133**, 117 (2013).
6. **Jieun Lee**, Timothy Saucer, Andrew Martin, Deborah Tien, Joanna Millunchick, and Vanessa Sih, "Photoluminescence imaging of focused ion beam induced individual quantum dots," *Nano Letters* **11**, 1040 (2011).
7. **Jieun Lee**, Bongjae Kim, B. H. Kim, B. I. Min, S. Kolesnik, O. Chmaissem, J. Mais, B. Dabrowski, H. J. Shin, D. H. Kim, H. J. Lee, and J.-S. Kang, "Valence-state transition in $\text{SrMn}_{1-x}\text{Mo}_x\text{O}_3$ ($0 \leq x \leq 0.5$) investigated by soft x-ray absorption spectroscopy," *Physical Review B* **80**, 205112 (2009).
8. M. Kang, A. A. Al-Heji, **J.-E. Lee**, T. W. Saucer, S. Jeon, J. H. Wu, L. Zhao, A. L. Katzenstein, D. L. Sofferman, V. Sih, and R. S. Goldman, "Ga nanoparticle-enhanced photoluminescence of GaAs," *Applied Physics Letters* **103**, 101903 (2013).
9. T. W. Saucer, **J.-E. Lee**, A. J. Martin, D. Tien, J. M. Millunchick, and V. Sih, "Photoluminescence of patterned arrays of vertically stacked InAs/GaAs quantum dots," *Solid State Communications* **151**, 269 (2011).
10. J. H. Hwang, D. H. Kim, J.-S. Kang, S. Kolesnik, O. Chmaissem, J. Mais, B. Dabrowski, J. Baik, H. J. Shin, **Jieun Lee**, Bongjae Kim, B. I. Min, "Soft x-ray absorption spectroscopy study of Mo-rich $\text{SrMn}_{1-x}\text{Mo}_x\text{O}_3$ ($x \geq 0.5$)," *Physical Review B* **83**, 073103 (2011).
11. J. H. Hwang, D. H. Kim, S. M. Lee, J. S. Kang, S. Kolesnik, B. Dabrowski, B. G. Park, J. Y. Kim, J. Baik, H. J. Shin, **Jieun Lee**, B. I. Min, "Electronic structures of $\text{SrMn}_{1-x}\text{Mo}_x\text{O}_3$ ($0 \leq x \leq 0.75$) perovskite oxides investigated by XAS and PES," *Journal of Applied Physics* **109**, 07E130 (2011).
12. J.-S. Kang, S. M. Lee, D. H. Kim, S. Kolesnik, B. Dabrowski, B.-G. Park, J.-Y. Kim, **Jieun Lee**, Bongjae Kim, B. I. Min, "Temperature-dependent magnetic circular dichroism study of ferromagnetic double perovskite $\text{La}_2\text{MnNiO}_6$," *Journal of Applied Physics* **107**, 09D721 (2010).
13. D. H. Kim, H. J. Lee, B. Dabrowski, S. Kolesnik, **Jieun Lee**, Bongjae Kim, B. I. Min, J.-S. Kang, "Photoemission spectroscopy study of metal-insulator transition in $\text{SrMn}_{1-x}\text{Fe}_x\text{O}_3$," *Physical Review B* **81**, 073101 (2010).
14. D. H. Kim, S. M. Lee, S. Kolesnik, B. Dabrowski, B. G. Park, J. Y. Kim, **Jieun Lee**, B. I. Min, J. S. Kang, "Soft x-ray synchrotron radiation spectroscopy study of $\text{SrMn}_{1-x}\text{Ru}_x\text{O}_3$ perovskites ($0 \leq x \leq 1$)," *Journal of Applied Physics* **107**, 09E137 (2010).
15. J.-S. Kang, H. J. Lee, D. H. Kim, S. Kolesnik, B. Dabrowski, K. Świerczek, **Jieun Lee**, Bongjae Kim, B. I. Min, "Valence and spin states, and the metal-insulator transition in ferromagnetic $\text{La}_{2-x}\text{Sr}_x\text{MnNiO}_6$ ($x = 0, 0.2$)," *Physical Review B* **80**, 045115 (2009).
16. J.-S. Kang, G. Kim, H. J. Lee, S. Kolesnik, B. Dabrowski, Hangil Lee, J.-Y. Kim, **Jieun Lee**, Bongjae Kim, B. I. Min, "Investigation of valence states and electronic structure of ferromagnetic double-perovskite $\text{La}_2\text{MnNiO}_6$ by using synchrotron radiation," *Journal of Applied Physics* **105**, 07D721 (2009).
17. Bongjae Kim, **Jieun Lee**, Beom Hyun Kim, Hong Chul Choi, Kyoo Kim, J.-S. Kang, B. I. Min, "Electronic structures and magnetic properties of a ferromagnetic insulator: $\text{La}_2\text{MnNiO}_6$," *Journal of Applied Physics* **105**, 07E515 (2009).

Selected Conference Presentations and Seminars

1. **Jieun Lee**, "Optical imaging of the valley Hall effect in MoS₂ transistors," (**Invited Talk**) *APS March Meeting*, Baltimore, MD, Mar. 2016.
2. **Jieun Lee**, "Optical imaging of the valley Hall effect in MoS₂," *BK21 Seminar*, Postech, Jan. 2016.
3. **Jieun Lee**, "Electrical control of the valley Hall effect in bilayer MoS₂ transistors," *2D Seminar*, Penn State University, Oct. 2015.
4. **Jieun Lee**, "Temporal and spatial control of quantum dots for on-chip integration," *BK21 Seminar*, Postech, Sep. 2014.
5. **Jieun Lee**, "Temporal and spatial control of quantum dots for on-chip integration," *Physics Seminar*, Cornell University, Ithaca, NY, May 2014.
6. **Jieun Lee**, "Quantum dots coupled to a photonic cavity for quantum information processing," *PGSS Seminar*, University of Michigan, MI, Aug. 2013.
7. **Jieun Lee**, "Emission dynamics and spin dynamics of semiconductor quantum dots," *CPHOM Seminar*, University of Michigan, MI, Apr. 2013.
8. **Jieun Lee**, Timothy Saucer, Andrew Martin, Joanna Millunchick, and Vanessa Sih, "Nonlinear emission dynamics of quantum dots coupled to a photonic crystal cavity," *APS March Meeting*, Baltimore, MD, Mar. 2013.
9. **Jieun Lee**, Timothy Saucer, Andrew Martin, Deborah Tien, Joanna Millunchick, and Vanessa Sih, "Photoluminescence imaging of FIB-induced single quantum dots," *International Conference on Luminescence*, Ann Arbor, MI, July 2011.
10. **Jieun Lee**, Timothy Saucer, Andrew Martin, Deborah Tien, Joanna Millunchick, and Vanessa Sih, "Photoluminescence imaging of focused ion beam induced individual quantum dots," *APS March Meeting*, Austin, TX, Mar. 2011.