

Myungchul Oh

Assistant Professor

Department of Semiconductor Engineering, POSTECH, Korea

E-mail : myungchul@postech.ac.kr

EDUCATION

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| Ph. D. Physics , Seoul National University, Korea | Feb. 2018 |
| M. S. Physics , Seoul National University, Korea | Feb. 2014 |
| B. S. Physics , Seoul National University, Korea (Summa cum laude) | Feb. 2012 |
| B. S. Electrical Communications Engineering* , Korea Advanced Institute of Science and Technology (KAIST), Korea | Feb. 2006 |

*Formerly, Information and Communications University (ICU), currently merged with KAIST

RESEARCH EXPERIENCE

Graduate Student, Seoul National University, Seoul, Korea Jun. 2012 – May. 2018

Department of Physics and Astronomy,

Advisor: Young Kuk

- *Multifunctional SPM Construction*

Designed and built length extension resonator and tuning fork based AFM/STM. Developed Micro-four-point probe(M4PP) mountable UHV variable temperature STM with growth chamber system for thin film superconductor transport experiment.

- *Observation of edge state at quasi-1D Se chain*

Grew quasi-1D structured Se thin film on Ge (111) and researched on the local electronic structure by scanning tunneling microscope. Also grew Se adatom structure on Au(111) surface and studied about the local electronic structure.

- *STM studies on Fe-based thin film superconductors*

Distinguished electronic features of quasiparticle density of state of 1UC FeSe/STO(100). Observed and examined dopant state induced STO substrate. Studied surface reconstruction of in-situ PLD grown BaFe₂As₂

Visiting Scientist, National Institute of Standards and Technology, Gaithersburg, MD

Center for Nanoscale Science and Technology

Oct. 2015 – Dec. 2015

Advisor: Joseph A. Stroscio

- *Cryo-preamp for ultra-low temperature STM/AFM*

Participated to the millikelvin STM/AFM construction project. To reconcile the dilution refrigerator and improve the SNR, designed and built cryo-preamplifier for STM/AFM module. Also designed and built STM/AFM module parts.

Postdoctoral Research Associate, Princeton University, NJ

Department of Physics

Jun. 2018 – May. 2023

Advisor: Ali Yazdani

- *Ultra low temperature Scanning Tunneling Microscope Construction*
Built dilution refrigerator based UHV STM which can cool down and run continuously at milli-kelvin temperature. It could measure the electronic structure of the sample with high energy resolution.
- *Magic Angle Twisted Bilayer Graphene*
Flat-bands in moiré superlattice structure of Magic angle twisted bilayer graphene(MATBG) host emergent quantum phenomena due to strong correlation between electrons. Fabricated and developed transfer method to achieve high-quality sample. Studied electronic structure with scanning tunneling microscope and studied about cascade electronic transition, Chern insulator and unconventional superconductivity.

PUBLICATIONS

Kevin P. Nuckolls*, Ryan L. Lee*, **Myungchul Oh***, Dillon Wong*, Tomohiro Soejima*, Jung Pyo Hong, Dumitru Călugăru, Jonah H. Arbeitman, B. Andrei Bernevig, Kenji Watanabe, Takashi Taniguchi, Nicolas Regnault, Michael P. Zaletel, and Ali Yazdani, “Quantum textures of the many-body wavefunctions in magic-angle graphene”, *Nature* (Accepted: April 28, 2023)

Dumitru Călugăru, Nicolas Regnault, **Myungchul Oh**, Kevin P. Nuckolls, Dillon Wong, Ryan L. Lee, Ali Yazdani, Oskar Vafek, and B. Andrei Bernevig, “Spectroscopy of Twisted Bilayer Graphene Correlated Insulators”, *Physical Review Letters* 129, 117602 (2022)

Myungchul Oh*, Kevin P. Nuckolls*, Dillon Wong*, Ryan L. Lee, Xiaomeng Liu, Kenji Watanabe, Takashi Taniguchi and Ali Yazdani, “Evidence for unconventional superconductivity in twisted bilayer graphene”, *Nature* 600, 240–245 (2021)

Kevin P. Nuckolls*, **Myungchul Oh***, Dillon Wong*, Biao Lian, Kenji Watanabe, Takashi Taniguchi, B. Andrei Bernevig and Ali Yazdani, “Strongly correlated Chern insulators in magic-angle twisted bilayer graphene”, *Nature* 588, 610–615 (2020)

Dillon Wong*, Kevin P. Nuckolls*, **Myungchul Oh***, Biao Lian*, Yonglong Xie, Sangjun Jeon, Kenji Watanabe, Takashi Taniguchi, B. Andrei Bernevig and Ali Yazdani, “Cascade of electronic transitions in magic-angle twisted bilayer graphene”, *Nature* 582, 198–202 (2020)

Dillon Wong*, Sangjun Jeon*, Kevin P. Nuckolls*, **Myungchul Oh***, Simon C. J. Kingsley, and Ali Yazdani, “A modular ultra-high vacuum millikelvin scanning tunneling microscope”, *Review of Scientific Instruments* 91, 023703 (2020)

Minjun Lee, **Myungchul Oh**, Hoyeon Jeon, Sunwouk Yi, Inhae Zoh, Chao Zhang, Jungseok Chae and Young Kuk, “Selective resolution of phonon modes in STM-IETS on clean and oxygen-adsorbed Cu(100) surfaces”, *Surface Science* 689, 121451 (2019)

Minjun Lee, Sungmo Kang, **Myungchul Oh**, Jungseok Chae, Jaejun Yu and Young Kuk, “Superstructures of Se adsorbates on Au(111): Scanning tunneling microscopy and spectroscopy study”, *Surface Science* 685, 19-23 (2019)

Sungmin Kim, Sunwouk Yi, **Myungchul Oh**, Bo Gyu Jang, Woohyun Nam, Yong-Chan Yoo, Minjun Lee, Hoyeon Jeon, Inhae Zoh, Hanho Lee, Chao Zhang, Kee Hoon Kim, Jungpil Seo, Ji Hoon Shim, Jungseok Chae and Young Kuk “Surface reconstruction and charge modulation in BaFe₂As₂ superconducting film”, *Journal of Physics: Condensed Matter* 30(31), 315001(2018)

Chao Zhang, Hoyeon Jeon, **Myungchul Oh**, Minjun Lee, Sungmin Kim, Sunwouk Yi, Hanho Lee, Inhae Zoh, Yongchan Yoo, and Young Kuk, “Note: Development of a wideband amplifier for cryogenic scanning tunneling microscopy.”, *Review of Scientific Instrument*, 88(6), 066109 (2017)

* *These authors contributed equally to the work.*

PRESENTATIONS

Poster, “Atomic-Resolution Frequency-Modulation Atomic Force Microscope using a Length-Extension Resonator”, International Conference on Nanoscience + Technology, Vail, CO, July 23, 2014

Speaker, “In-situ transport measurement in a variable temperature STM”, 20th International Vacuum Congress, Busan, Korea, August, 2016

Invited Speaker (Virtual), “Cascade of electronic transitions and strongly correlated topological phases in magic-angle twisted bilayer graphene”, Korea Physical Society Spring Meeting, Korea, April 23, 2021

Speaker, “Spectroscopic evidence for unconventional superconductivity in twisted bilayer graphene”, APS March Meeting, Chicago, IL, March 15, 2022

Condensed Matter Seminar, “Spectroscopic evidence for unconventional superconductivity in magic-angle twisted bilayer graphene”, University of California at Berkeley, Berkeley, CA, March 28, 2022

Seminar (Virtual), “Spectroscopic evidence for unconventional superconductivity in magic-angle twisted bilayer graphene”, National High Magnetic Field Laboratory, FL, April 8, 2022

Invited Speaker (Virtual), “Spectroscopic evidence for unconventional superconductivity in magic-angle twisted bilayer graphene”, The 20th International Symposium on the Physics of Semiconductors and Applications, Korea, July 21, 2022

Invited Speaker, “Spectroscopic evidence for unconventional superconductivity in magic-angle twisted bilayer graphene”, KAIX Future of Physics Workshop, KAIST, Daejeon, Korea, Dec 27, 2022