

# Wonhee Ko

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## Professional Experience

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<b>University of Tennessee, Knoxville</b> Assistant Professor, Department of Physics and Astronomy	2022.8 – present
<b>Oak Ridge National Laboratory</b> R&D Associate, Center for Nanophase Materials Sciences	2019.7 – 2022.7
<b>University of Tennessee, Knoxville / Oak Ridge National Laboratory</b> Postdoctoral Research Associate, PI: Dr. An-Ping Li Research Project: <i>Multiprobe STM study on quantum materials</i>	2017.1 – 2019.7
<b>Samsung Advanced Institute of Technology</b> Research Staff Member, Project Leader: Dr. Hwansoo Suh Research Project: <i>Development of mK-UHV-STM</i>	2012.7 – 2016.12

## Education

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<b>Stanford University</b> , Stanford, CA Ph.D., Applied Physics, Research Advisor: Prof. Hari C. Manoharan Dissertation Title: <i>"Quantum imaging of Dirac materials"</i>	2006.9 – 2012.6
<b>Keio University</b> , Yokohama, Japan Exchange Student, Research Advisor: Prof. Kohei Itoh Research project: <i>Silicon-based solid-state quantum computer</i>	2005.9 – 2006.2
<b>Seoul National University</b> , Seoul, South Korea B.S., Physics and Mathematics (Summa Cum Laude)	2002.3 – 2006.8

## Honors and Awards

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UT-Battelle Awards Night, Outstanding Scholarly Output Team Award	2021.12
Samsung Best Paper Awards, Silver Prize (Co-author)	2015
Stanford Graduate Fellowship in Science & Engineering	2008.9 – 2011.8
The Korean Foundation for Advanced Studies Scholarship	2006.9 – 2011.8
International Physics Olympiad, Bronze medal	2001.7

## Selected Publications ([Scopus, 1144+ citations, 38 papers, h-index: 15](#))

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- W. Ko**, J. L. Lado, and P. Maksymovych\*, "Non-contact Andreev reflection as a direct probe of superconductivity on the atomic scale," *Nano Lett.* **22** 4042 (2022)
- W. Ko**, Z. Gai, A. Puzetzy, L. Liang, T. Berlijn, J. Hachtel, K. Xiao, P. Ganesh, M. Yoon, and A.-P. Li\*, "Understanding Heterogeneities in Quantum Materials (review paper)," *Adv. Mater.* 2106909 (2022) <https://doi.org/10.1002/adma.202106909>
- W. Ko**, E. F. Dumitrescu, and P. Maksymovych\*, "Statistical detection of Josephson, Andreev, and single quasiparticle currents in scanning tunneling microscopy," *Phys. Rev. Res.* **3** 033248 (2021)

**W. Ko**, M. Kolmer, J. Yan, A. D. Pham, M. Fu, F. Lüpke, S. Okamoto, Z. Gai, P. Ganesh, and A.-P. Li\*, "Realizing gapped surface states in magnetic topological insulator  $\text{MnBi}_{2-x}\text{Sb}_x\text{Te}_4$ ," *Phys. Rev. B* **102** 115402 (2020)

**W. Ko**, G. D. Nguyen, H. Kim, J. S. Kim, X.-G. Zhang, and A.-P. Li\*, "Accessing the intrinsic spin transport in a topological insulator by controlling the crossover of bulk-to-surface conductance," *Phys. Rev. Lett.* **121** 176801 (2018)

H. W. Kim<sup>†</sup>, **W. Ko**<sup>†</sup>, J. Ku, I. Jeon, D. Kim, H. Kwon, Y. Oh, S. Ryu, Y. Kuk, S. W. Hwang, and H. Suh\*, "Nanoscale control of phonon excitation in graphene nanobubbles," *Nat. Commun.* **6** 7528 (2015)

K. K. Gomes<sup>†</sup>, W. Mar<sup>†</sup>, **W. Ko**<sup>†</sup>, F. Guinea, and H. C. Manoharan\*, "Designer Dirac fermions and topological phases in molecular graphene," *Nature* **483** 306 (2012)

<sup>†</sup> Contributed equally, \* Corresponding author

## Grants

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1. DOE Office of Science, BES, QIS and Research Infrastructure at the NSRCs, "Precision Atomic Assembly for Quantum Information Science," Co-PI (Lead PI: Art Baddorf), FY2022 – 2024
2. DOE Office of Science, BES Materials Science and Engineering Division, "Probing Coupled and Competing Polar Orders from the Atomistic to Mesoscopic Scales," Co-PI (Lead PI: Petro Maksymovych), FY2022

## Teaching Experience

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**Teaching Assistant**, Stanford University

- [Phys 172] Solid State Physics (2012 spring quarter): led section classes and office hours.
- [Phys 108] Advanced Physics Laboratory: Project (2012 winter quarter): supervised designing and performing experimental projects in cryogenic temperature.
- [Phys 105] Analog Electronics (2011 fall quarter): supervised laboratory classes and final project.

## Synergistic Activities and Outreach

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**Featured in APS TV 2022 video** highlighting the quantum information science research in Center for Nanophase Materials Sciences, ORNL, <https://youtu.be/15LHWAfgvZ8> (2022)

**Executive Committee Member** of Nanoscale Science and Technology Division (NSTD), AVS (Jan 2022 – present)

**Co-organizer**, Topical workshop in 2021 *Joint Nanoscience and Neutron Scattering User Meeting: "Quantum Materials Across Multiple Length Scales"*, ORNL (Aug 2021)

**Co-organizer**, Topical workshop in 2019 *CNMS User Meeting: "Understanding Electronic Behaviors in Quantum Materials"*, ORNL (Aug 2019)

**Peer-reviewed** journal articles for *Science Advances*, *Physical Review Letters*, *Physical Review B*, *Physical Review Applied*, *Scientific Reports*

## Skills

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**Technical**

Computer programming in MATLAB, Python, and LabVIEW; CAD with SolidWorks.

### Language

Native speaker of Korean; Fluent in English and Japanese.

## Full Publication List

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1. F. Lüpke<sup>†</sup>, M. Kolmer<sup>†</sup>, J. Yan, H. Chang, P. Vilmercati, H. Weitering, **W. Ko**<sup>\*</sup>, and A.-P. Li<sup>\*</sup>, "Anti-site defect-induced disorder in compensated topological magnet  $\text{MnBi}_{1.36}\text{Sb}_{0.64}\text{Te}_4$ ," (submitted)
2. M. Zohair, N. Moehring, P. Cheng, J. Eaves-Rathert, E. Brody, J. Warner, **W. Ko**, A.-P. Li, P. Kidambi, and C. Pint<sup>\*</sup>, "Nanoporous Graphene Modified Separators Enable Early Dendrite Detection for Safe Lithium and Magnesium Batteries," (submitted)
3. N. K. Moehring, P. Chaturvedi, P. Cheng, **W. Ko**, A.-P. Li, M. S. H. Boutilier, and P. R. Kidambi<sup>\*</sup>, "Kinetic Control of Angstrom-Scale Porosity in 2D Lattices for Direct Scalable Synthesis of Atomically Thin Proton Exchange Membranes," (submitted)
4. P. Cheng, F. Fornasiero, M. L. Jue, **W. Ko**, A.-P. Li, J. C. Idrobo, M. S. H. Boutilier, and P. R. Kidambi<sup>\*</sup>, "Differences in Water and Vapor Transport through Angstrom-scale Pores in Atomically Thin Membranes," (submitted)
5. M. S. Kavrik<sup>†\*</sup>, J. Hachtel<sup>†\*</sup>, **W. Ko**<sup>†\*</sup>, C. Qian, A. Abelson, E. B. Unlu, H. Kashyap, A.-P. Li, J.-C. Idrobo, and M. Law<sup>\*</sup>, "Emergence of Distinct Electronic States in Epitaxially-Fused PbSe Quantum Dot Superlattices," *ResearchSquare DOI:10.21203/rs.3.rs-841852/v1* (submitted)
6. Q. Zou, S. Huang, **W. Ko**, M. Fu, Y. Yang, K. Zhao, S. Crittenden, E. W. Plummer, R. Jin<sup>\*</sup>, and Z. Gai<sup>\*</sup>, "Exploration of two surfaces observed in Weyl semimetal  $\text{BaMnSb}_2$ ," (accepted to *npj Quantum Materials*)
7. **W. Ko**, J. L. Lado, and P. Maksymovych<sup>\*</sup>, "Non-contact Andreev reflection as a direct probe of superconductivity on the atomic scale," *Nano Lett.* **22** 4042 (2022)  
✓ [Highlighted in Aalto University News: <https://www.aalto.fi/en/news/an-atomic-scale-window-into-superconductivity-paves-the-way-for-new-quantum-materials>]
8. **W. Ko**, S. Hus, H. Kim, J. S. Kim, X.-G. Zhang, and A.-P. Li<sup>\*</sup>, "Resistivity of Surface Steps in Bulk-Insulating Topological Insulators," *Front. Mater.* **9** 887484 (2022)
9. **W. Ko**, Z. Gai, A. Puzdov, L. Liang, T. Berlijn, J. Hachtel, K. Xiao, P. Ganesh, M. Yoon, and A.-P. Li<sup>\*</sup>, "Understanding Heterogeneities in Quantum Materials (review paper)," *Adv. Mater.* 2106909 (2022) <https://doi.org/10.1002/adma.202106909>
10. S.-H. Kang<sup>†</sup>, S. Jeon<sup>\*</sup>, H.-J. Kim, **W. Ko**, S. Cho, S. H. Kang, S. W. Kim, H. Yang, H. W. Kim<sup>\*</sup>, and Y.-W. Son<sup>\*</sup>, "Coulomb interaction-driven reshaped Weyl fermionic dispersions in  $\text{MoTe}_2$ ," *Phys. Rev. B* **105** 045143 (2022)
11. F. Lüpke, A. D. Pham, Y.-F. Zhao, L.-J. Zhou, W. Lu, E. Briggs, J. Bernholc, M. Kolmer, J. Teeter, **W. Ko**, C.-Z. Chang, P. Ganesh<sup>\*</sup>, and A.-P. Li<sup>\*</sup>, "Local manifestations of thickness dependent topology and axion edge state in topological magnet  $\text{MnBi}_2\text{Te}_4$ ," *Phys. Rev. B* **105** 035423 (2022)
12. K. Wang, L. Zhang, G. D. Nguyen, X. Sang, C. Liu, Y. Yu, **W. Ko**, R. R. Unocic, A. A. Puzdov, C. M. Rouleau, D. B. Geohegan, G. Duscher, A.-P. Li, M. Yoon, and K. Xiao<sup>\*</sup>, "Selective Antisite Defect Formation in  $\text{WS}_2$  Monolayers via Reactive Growth on Dilute W-Au Alloy Substrates,"

*Adv. Mater.* **34** 2106674 (2022)

✓ [Selected as Frontispiece of *Advanced Materials* 3/2022:

<https://onlinelibrary.wiley.com/doi/10.1002/adma.202270024>]

13. **W. Ko**, E. F. Dumitrescu, and P. Maksymovych\*, "Statistical detection of Josephson, Andreev, and single quasiparticle currents in scanning tunneling microscopy," *Phys. Rev. Res.* **3** 033248 (2021)
14. J. Lapano, O. Dyck, A. Lupini, **W. Ko**, H. Li, H. Miao, H. N. Lee, A.-P. Li, M. Brahlek, S. Jesse, R. G. Moore\*, "Van der Waals Epitaxy Growth of Bi<sub>2</sub>Se<sub>3</sub> on a Freestanding Monolayer Graphene Membrane: Implications for Layered Materials and Heterostructures," *ACS Appl. Nano Mater.* **4** 7607 (2021)
15. H. W. Kim, I. Jeon, **W. Ko**\*, and S. H. Kim\*, "Unidirectional Growth of Graphene Nano-Islands from Carbon Cluster Seeds on Ge(110)," *App. Surf. Sci.* **536** 147722 (2021)
16. S. M. Hus, R. Ge, P.-A. Chen, M.-H. Chiang, G. Donnelly, **W. Ko**, F. Huang, L. Liang, A.-P. Li, and D. Akinwande\*, "Observation of single-defect memristor in an MoS<sub>2</sub> atomic sheet," *Nat. Nanotechnol.* **16** 58 (2021)  
✓ [Highlighted in ORNL News: <https://www.ornl.gov/research-highlight/observation-single-defect-memristor-mos2-atomic-sheet>]
17. **W. Ko**, M. Kolmer, J. Yan, A. D. Pham, M. Fu, F. Lüpke, S. Okamoto, Z. Gai, P. Ganesh, and A.-P. Li\*, "Realizing gapped surface states in magnetic topological insulator MnBi<sub>2-x</sub>Sb<sub>x</sub>Te<sub>4</sub>," *Phys. Rev. B* **102** 115402 (2020)
18. **W. Ko**<sup>†</sup>, H. W. Kim<sup>†</sup>, Y. Cho, J. Ku, H. Kwon, Y. Oh, J.-W. Jung, I. Jeon, H. Suh, Y. Kuk, and S. W. Hwang, "Magnetic states of atomic vacancies in graphite probed by scanning tunneling microscopy," *AIP Adv.* **10** 085325 (2020)
19. P. Cheng, M. M. Kelly, N. K. Moehring, **W. Ko**, A.-P. Li, J. C. Idrobo, M. S. H. Boutilier, and P. R. Kidambi\*, "Tailoring Sub-nanometer Pore Size Distributions in Atomically Thin Graphene Membranes for Desalination and Molecular Separations," *Nano Lett.* **20** 5951 (2020)
20. H. W. Kim<sup>†\*</sup>, S.-H. Kang<sup>†</sup>, H.-J. Kim<sup>†</sup>, K. Chae, S. Cho, **W. Ko**, S. Jeon, S. H. Kang, H. Yang, S. W. Kim, S. Park, S. Hwang, Y.-K. Kwon, and Y.-W. Son\*, "Symmetry dictated grain boundary state in a two-dimensional topological insulator," *Nano Lett.* **20** 5837 (2020)
21. M. Kolmer, A. K. Steiner, I. Izydorczyk, **W. Ko**, M. Engelund, M. Szymonski, A.-P. Li\*, and K. Amsharov\*, "Rational synthesis of atomically precise graphene nanoribbons directly on metal oxide surfaces," *Science* **369** 571 (2020)  
✓ [Highlighted in ORNL News: <https://www.ornl.gov/news/surface-synthesis-graphene-nanoribbons-could-advance-quantum-devices>, and Phys.org: <https://phys.org/news/2020-10-on-surface-synthesis-graphene-nanoribbons-advance.html>]
22. G. D. Nguyen, A. D. Oyedele, A. Haglund, **W. Ko**, L. Liang\*, A. A. Puretzy, D. Mandrus, K. Xiao, and A.-P. Li\*, "Atomically Precise PdSe<sub>2</sub> Pentagonal Nanoribbons," *ACS Nano* **14** 2 1951-1957 (2020)
23. N. Briggs, B. Bersch, Y. Wang, J. Jiang, R. Koch, N. Nayir, K. Wang, M. Kolmer, **W. Ko**, A. de la Fuente Duran, S. Subramanian, C. Dong, J. Shallenberger, M. Fu, Q. Zou, Y.-W. Chuang, Z. Gai, A.-P. Li, A. Bostwick, C. Jozwiak, C.-Z. Chang, E. Rotenberg, J. Zhu, A. van Duin, V. Crespi, and J. Robinson\*, "Atomically thin half-van der Waals metals enabled by confinement

- heteroepitaxy," *Nat. Mater.* **19** 637 (2020)
- ✓ [Highlighted in ORNL News: <https://www.ornl.gov/research-highlight/atomically-thin-half-van-der-waals-metals-enabled-confinement-heteroepitaxy>]
24. J. W. Kim, T.-S. Ju, S. Song, D. Lee, S. Y. Cho, S. D. Bu, **W. Ko**, A.-P. Li, J. Park\*, and S. Park\*, "Enhancing the Local Conductivity of Cu Films Using Temperature-Assisted Agglomerated Cu Nanostructures," *J. Phys. D: Appl. Phys.* **53** 09LT02 (2020)
25. **W. Ko**, C. Ma, G. D. Nguyen, M. Kolmer, and A.-P. Li\*, "Atomic-Scale Manipulation and In Situ Characterization with Scanning Tunneling Microscopy (review paper)," *Adv. Funct. Mater.* **29** 1903770 (2019)
26. A. L. Miettinen, M. S. Nevius, **W. Ko**, M. Kolmer, A.-P. Li, M. N. Nair, B. Kierren, L. Moreau, E. H. Conrad\*, and A. Tejada, "Edge States and Ballistic Transport in Zig-zag Graphene Ribbons: The Role of SiC Polytypes," *Phys. Rev. B* **100** 045425 (2019)
27. M. H. Lee, J. H. Yun, G. Kim, J. E. Lee, S.-D. Park, H. Reith, G. Schierning, K. Nielsch, **W. Ko**, A.-P. Li, and J.-S. Rhyee\*, "Synergetic Enhancement of Thermoelectric Performance by Selective Charge Anderson Localization-Delocalization Transition in n-Type Bi-Doped PbTe/Ag<sub>2</sub>Te Nanocomposite," *ACS Nano* **13** 3806 (2019)
28. H. W. Kim\*, **W. Ko**, W.-J. Joo, Y. Cho, Y. Oh, J. Ku, I. Jeon, S. Park, and S. W. Hwang\*, "Unraveling the Structural and Electronic Properties of Graphene/Ge(110)," *J. Phys. Chem. Lett.* **9** 7059 (2018)
29. **W. Ko**, G. D. Nguyen, H. Kim, J. S. Kim, X.-G. Zhang, and A.-P. Li\*, "Accessing the intrinsic spin transport in a topological insulator by controlling the crossover of bulk-to-surface conductance," *Phys. Rev. Lett.* **121** 176801 (2018)
- ✓ [Highlighted in DOE Office of Science: <https://www.energy.gov/science/bes/articles/channeling-electrons-ultrafast-spin-conductivity>, <https://www.eurekalert.org/features/doe/2020-02/drn1-cef020520.php>]
30. C.-S. Lee, K. W. Shin, H.-J. Song, H. Park, Y. Cho, D.-H. Im, H. Lee, J.-H. Lee, J. Y. Won, J. G. Chung, C. Kim, K.-E. Byun, E.-K. Lee, Y. Kim, **W. Ko**, H. J. Lim, S. Park\*, and H.-J. Shin\*, "Fabrication of metal/graphene hybrid interconnects by direct graphene growth and their integration properties," *Adv. Electron. Mater.* **4** 1700624 (2018)
31. **W. Ko**, S. M. Hus, X. Li, T. Berlijn, G. D. Nguyen, K. Xiao, and A.-P. Li\*, "Tip-induced local strain on MoS<sub>2</sub>/graphite detected by inelastic electron tunneling spectroscopy," *Phys. Rev. B* **97** 125401 (2018)
32. H. W. Kim<sup>†</sup>, **W. Ko**<sup>†</sup>, J. Ku, Y. Kim, S. Park, and S. W. Hwang, "Evolution of graphene growth on Pt(111): From carbon clusters to nanoislands," *J. Phys. Chem. C* **121** 25074 (2017)
33. H. Kwon<sup>†</sup>, K. Lee<sup>†</sup>, J. Heo, Y. Oh, H. Lee, S. Appalakondaiah, **W. Ko**, H. W. Kim, J.-W. Jung, H. Suh, H. Min, I. Jeon\*, E. Hwang\*, and S. W. Hwang, "Characterization of edge contact: Atomically resolved semiconductor-metal lateral boundary in MoS<sub>2</sub>," *Adv. Mater.* **29** 1702931 (2017)
34. H. W. Kim\*, J. Ku, **W. Ko**, Y. Cho, I. Jeon, and S. W. Hwang, "Quenching of the resonant states of single carbon vacancies in graphene/Pt(111)," *J. Phys. Chem. C* **121** 24641 (2017)
35. S. M. Hus, X.-G. Zhang, G. D. Nguyen, **W. Ko**, A. P. Baddorf, Y. P. Chen, and A.-P. Li\*, "Detection of the spin-chemical potential in topological insulators using spin-polarized four-probe STM," *Phys. Rev. Lett.* **119** 137202 (2017)

36. Y. Oh<sup>\*</sup>, Y. Cho, H. Kwon, J. Lee, I. Jeon, **W. Ko**, H. W. Kim, J. Ku, G. Kim, H. Suh<sup>\*</sup>, and S. W. Hwang, "Electronic structure and switching behavior of the metastable silicene domain boundary," *Appl. Phys. Lett.* **110** 263112 (2017)
37. S. Cho<sup>†</sup>, S. H. Kang<sup>†</sup>, H. S. Yu, H. W. Kim, **W. Ko**, S. W. Hwang, W. H. Han, D. H. Choe, Y. H. Jung, K. J. Chang, Y. H. Lee<sup>\*</sup>, H. Yang<sup>\*</sup>, and S. W. Kim<sup>\*</sup>, "Te vacancy-driven superconducting transition in orthorhombic molybdenum ditellurides," *2D Mater.* **4** 021030 (2017)
38. **W. Ko**<sup>\*</sup>, J. Park, I. Jeon, H. W. Kim, H. Kwon, Y. Oh, J. S. Kim, H. Suh<sup>\*</sup>, S. W. Hwang, and C. Chung, "Local potential fluctuation of topological surface states in Bi<sub>1.5</sub>Sb<sub>0.5</sub>Te<sub>1.7</sub>Se<sub>1.3</sub> observed by Landau level spectroscopy," *Appl. Phys. Lett.* **108** 083109 (2016)
39. H. W. Kim<sup>†</sup>, **W. Ko**<sup>†</sup>, J. Ku, I. Jeon, D. Kim, H. Kwon, Y. Oh, S. Ryu, Y. Kuk, S. W. Hwang, and H. Suh<sup>\*</sup>, "Nanoscale control of phonon excitation in graphene nanobubbles," *Nat. Commun.* **6** 7528 (2015)
40. H. W. Kim, J. Ku, **W. Ko**, I. Jeon, H. Kwon, S. Ryu, S.-J. Kahng, S.-H. Lee, S. W. Hwang, and H. Suh<sup>\*</sup>, "Strong interaction between graphene edge and metal revealed by scanning tunneling microscopy," *Carbon* **78** 190 (2014)
41. **W. Ko**, I. Jeon, H. W. Kim, H. Kwon, S.-J. Kahng, J. Park, J. S. Kim<sup>\*</sup>, S. W. Hwang, and H. Suh<sup>\*</sup>, "Atomic and electronic structure of an alloyed topological insulator, Bi<sub>1.5</sub>Sb<sub>0.5</sub>Te<sub>1.7</sub>Se<sub>1.3</sub>," *Sci. Rep.* **3** 2656 (2013)
42. K. K. Gomes<sup>†</sup>, W. Mar<sup>†</sup>, **W. Ko**<sup>†</sup>, F. Guinea and H. C. Manoharan<sup>\*</sup>, "Designer Dirac fermions and topological phases in molecular graphene," *Nature* **483** 306 (2012)
43. S. Lee, M. F. Toney, **W. Ko**, J. C. Randel, H. J. Jung, K. Munakata, J. Lu, T. H. Geballe, M. R. Beasley, R. Sinclair, H. C. Manoharan and A. Salleo<sup>\*</sup>, "Laser-synthesized epitaxial graphene," *ACS Nano* **4** 7524 (2010)
44. K. K. Gomes<sup>†</sup>, **W. Ko**<sup>†</sup>, W. Mar<sup>†</sup>, Y. Chen, Z. X. Shen and H. C. Manoharan<sup>\*</sup>, "Quantum imaging of topologically unpaired spin-polarized Dirac fermions," *arXiv:0909.0921*
45. C. R. Moon, B. K. Foster, L. S. Mattos, G. Zeltzer, **W. Ko** and H. C. Manoharan<sup>\*</sup>, "Quantum geometry and phase extraction in isospectral electronic nanostructures," *Science* **319** 782 (2008)
46. H. Hayashi, **W. Ko**, T. Itahashi, A. Sagara, K. M. Itoh<sup>\*</sup>, L. S. Vlasenko<sup>\*</sup> and M. P. Vlasenko, "Dynamic nuclear polarization of <sup>29</sup>Si nuclei in the isotope enriched n-type silicon," *Phys. Stat. Sol. (c)* **3** 4388 (2006)

<sup>†</sup> Contributed equally, <sup>\*</sup> Corresponding author

## Patents

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1. J. Ku, **W. Ko** and H. W. Kim, "Method of fabricating graphene structure having nanobubbles," US Patent 11,078,082 (2021)
2. **W. Ko**, H. W. Kim, J. Ku, D. Kim, S. Ryu, and S.-J. Jeon, "Conductor including nano-patterned substrate and method of manufacturing the conductor," US Patent 10,312,100 (2019)
3. **W. Ko** and I. Jeon, "Transporting apparatus and method for transporting using the same," US Patent 10,249,473 (2019)

## Invited Talks

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1. "Topological States Revealed by Scanning Tunneling Microscope", *2021 Joint Nanoscience and Neutron Scattering User Meeting: Topical Workshop on Quantum Materials across Multiple Length Scales*, ORNL, Oak Ridge, TN (Aug 2021)
2. "Probing Quasiparticles in Topological Quantum Materials by Advanced Scanning Tunneling Microscopy," *CMP Seminar Series, University of Tennessee, Knoxville, TN* (Feb 2021)
3. "Probing the Quantum States of Topological Materials by Advanced Scanning Tunneling Microscopy," *CNMS Seminar Series, Oak Ridge National Laboratory, Oak Ridge, TN* (May 2020)
4. "Detecting the Topologically Protected Spin Current with Four-Probe Scanning Tunneling Microscope," *POSTECH, Pohang, South Korea* (Oct 2019)
5. "Accessing the Intrinsic Surface Transport in a Topological Insulator with Multiprobe Scanning Tunneling Microscope", *2019 CNMS User Meeting: Topical Workshop on Understanding Electronic Behaviors in Quantum Materials, ORNL, Oak Ridge, TN* (Aug 2019)
6. "STM studies of topological materials: From building the materials atom-up to detecting the topologically protected spin current," *Oak Ridge National Laboratory, Oak Ridge, TN* (Feb 2019)
7. "Manipulating Atoms to Realize Artificial Materials and Topological States," *Princeton University, Princeton, NJ* (May 2016)
8. "Construction and characterization of topological materials with scanning tunneling microscopy," *Max Plank Institute for the Structure and Dynamics of the Matter, Hamburg, Germany* (May 2015)
9. "Molecular graphene: Designing Dirac fermions by atom manipulation," *KPS Spring Meeting, Daejeon, South Korea* (Apr 2014)
10. "Molecular graphene: Designing Dirac fermions by atom manipulation," *10<sup>th</sup> Workshop on Surface Nano-Science, POSTECH, Pohang, South Korea* (Feb 2014)