

MYOUNG-HWAN KIM

Assistant Professor,

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PROFESSIONAL PREPARATION

2011 PhD in Physics, The State University of New York, Buffalo, NY

1999 MS in Physics, POSTECH, South Korea

1997 BS in Physics, Han Yang University, South Korea

APPOINTMENTS

2016 – now Assistant Professor, The University of Texas Rio Grande Valley, Brownsville, TX

2013 – 2015 Postdoc., Columbia University, New York, NY

2010 – 2013 Postdoc., University of Maryland, College Park, MD

HONORS/ AWARDS/ GRANTS

2018 Outstanding Young Researcher Award from AKPA.org for his study of modern materials (low dimensional, topological, and correlated system) with terahertz and infrared lasers.

2016 UTRGV, College of Science Research Enhancement Seed Grant. \$13,775 (PI).

2016 The University of Texas System Administration STARs Award. \$294,400 (PI).

2016 UTRGV, College of Science Start Up Funds. \$154,444 (PI).

RESEARCH INTERESTS

My main research interest is to search for a fundamental understanding of the near-field interaction between surface evanescent light and surface charge oscillations confined in gradient metasurfaces. The research focuses on three projects: Tailoring surface waves of light by reconfigurable optical and thermal metasurfaces, time-reversal symmetry-breaking metasurfaces, and metasurfaces imitating quantum many-body systems.

RESEARCH ACCOMPLISHMENTS

- Integration of metasurfaces into photonic circuits. (3 publications including 2 Nature journals)
- Graphene hot electron bolometer. (1 Nature journal and 1 Phys. Rev. Lett.)
- Mid-/far infrared Hall angles in topological insulators, graphene mono- and multilayers, itinerant ferromagnets, and superconductors. (8 publications including 1 Phys. Rev. Lett.)

TEACHING EXPERIENCE

- Taught calculus/non-calculus-based University Physics, Optics, and graduate-level Solid State Physics. Overall teaching evaluation: 90.3% taken from 200 students.
- Taught in various teaching environment including conventional lecture, online class, and ITV (Interactive Television) class between two campuses.
- Research training: 1 PhD, 3 MS, 4 undergraduates, and 3 high school students at UTRGV.
- Outreach program: UTRGV High Scholar program mentors and UTRGV Science Fair judges.
- Student mentoring: SPIE (The International Society for optics and photonics) Student Chapter advisor at UTRGV. 17 student members from Physics, Math, and Electrical Engineering.

JOURNAL PUBLICATIONS

Manuscript in preparation

1. S. R. Kachiraju, I. Nekrashevich, L. Chang, and **M.-H. Kim** (corresponding author), “Near-perfect absorption of light from localized surface phonon polaritons confined by metal-dielectric multilayer boundary,” *in preparation* (2018).

Peer-reviewed journals

2. C. Wang, Z. Li (equal contribution), **M.-H. Kim** (2nd author), X. Xiong, X.-F. Ren, G.-C. Guo, N. Yu, and M. Lončar, “Metasurface-assisted phase-matching-free second harmonic generation in lithium niobate waveguides,” *Nature Communication*, vol. 8, page 2098, (2017).
3. Z. Li, **M.-H. Kim**, C. Wang, Z. Han, S. Shrestha, A. C. Overvig, M. Lu, A. Stein, A. M. Agarwal, M. Lončar, and N. Yu, “Controlling propagation and coupling of waveguide modes using phase-gradient metasurfaces,” *Nature Nanotechnology*, vol. 12, pages 675 – 683, (2017).
4. S. Zhang, **M.-H. Kim** (equal contribution), F. Aieta, A. She, T. Mansuripur, I. Gabay, M. Khorasaninejad, D. Rousso, X. Wang, M. Troccoli, N. Yu, and F. Capasso, ‘High efficiency near diffraction-limited mid-infrared flat lenses based on metasurface reflectarrays,’ *Optics Express* vol. 24, No. 16, 18024 - 18034 (2016).
5. C. T. Ellis, A. V. Stier, **M.-H. Kim**, D. Xiao, J. G. Tischler, E. R. Glaser, R. L. Myeres-Ward, J. L. Tedesco, C. R. Eddy, Jr., D. K. Gaskill, and J. Cerne, “Magneto-optical fingerprints of distinct graphene multilayers using the giant infrared Kerr effect,” *Sci. Rep.* vol. 3, 3143 (2013).
6. **M.-H. Kim**, T. Tanaka, C. T. Ellis, A. Mukherjee, G. Acbas, I. Ohkubo, H. Christen, D. Mandrus, H. Kontani, and J. Cerne, “Infrared anomalous Hall effect in $\text{Ca}_x\text{Sr}_{1-x}\text{RuO}_3$ films,” *Phys. Rev. B* vol. 88, 155101 (2013).
7. **M.-H. Kim**, J. Yan, R. J. Suess, T. E. Murphy, M. S. Fuhrer, and H. D. Drew, “Photothermal response in dual-gated bilayer graphene,” *Phys. Rev. Lett.* vol. 110, 247402 (2013).
8. J. Yan, **M.-H. Kim**, J. A. Elle, A. B. Sushkov, G. S. Jenkins, H. M. Milchberg, M. S. Fuhrer, and H. D. Drew, “Dual-gated bilayer graphene hot electron bolometer,” *Nature Nanotechnology* vol. 7, 472 – 478 (2012).
9. G. S. Jenkins, A. B. Sushkov, D. C. Schmadel, **M.-H. Kim**, M. Brahlek, N. Bansal, S. Oh, and H. D. Drew, “Giant plateau in the terahertz Faraday angle in gated Bi_2Se_3 ,” *Phys. Rev. B* vol. 86, 235133 (2012).
10. **M.-H. Kim**, V. Kurz, G. Acbas, C. T. Ellis, and J. Cerne, “Measurement of the infrared complex Faraday angle in semiconductors and insulators,” *J. Opt. Soc. Am. B* vol. 28, No. 2, 199 – 207 (2011).
11. **M.-H. Kim**, G. Acbas, M.-H. Yang, M. Eginligil, P. Khalifah, I. Ohkubo, H. Christen, D. Mandrus, Z. Fang, and J. Cerne, “Infrared anomalous Hall effect in SrRuO_3 : Exploring evidence for crossover to intrinsic behavior,” *Phys. Rev. B* vol. 81, 235218 (2010).

12. G. Acbas, **M.-H. Kim**, M. Cukr, V. Novák, M. A. Scarpulla, O. D. Dubon, T. Jungwirth, J. Sinova, and J. Cerne, “Electronic Structure of Ferromagnetic Semiconductor $\text{Ga}_{1-x}\text{Mn}_x\text{As}$ Probed by Subgap Magneto-optical Spectroscopy,” *Phys. Rev. Lett.* vol. 103, 137201 (2009).
13. A. Zimmers, L. Shi, D. C. Schmadel, W. M. Fisher, R. L. Greene, H. D. Drew, M. Houseknecht, G. Acbas, **M.-H. Kim**, M.-H. Yang, J. Cerne, J. Lin, and A. Millis, “Infrared Hall effect in the electron-doped high- T_c cuprate $\text{Pr}_{2-x}\text{Ce}_x\text{CuO}_4$,” *Phys. Rev. B* vol. 76, 064515 (2007).
14. **M.-H. Kim**, G. Acbas, M.-H. Yang, I. Ohkubo, H. Christen, D. Mandrus, M. A. Scarpulla, O. D. Dubon, Z. Schlesinger, P. Khalifah, and J. Cerne, “Determination of the infrared complex magnetoconductivity tensor in itinerant ferromagnets from Faraday and Kerr measurements,” *Phys. Rev. B* vol. 75, 214416 (2007).
15. H. J. Lee, **M.-H. Kim**, S. H. Park, H. C. Kim, J. Y. Kim, and B. K. Cho, “Thermoelectric power study of $\text{Eu}_{1-x}\text{La}_x\text{B}_6$ ($x = 0, 0.1, 0.2$),” *Physica B* vol. 378 – 380, 626 – 627 (2006).
16. H. C. Kim, **M.-H. Kim**, M.-H. Jung, M.-S. Park, and S.-I. Lee, “Pressure effect on the infinite-layer superconductor $\text{Sr}_{0.9}\text{La}_{0.1}\text{CuO}_2$ studied by magnetization,” *Physica B* vol. 378 – 380, 886 – 887 (2006).
17. **M.-H. Kim**, S.-I. Lee, M.-S. Kim, and W. N. Kang, “An H - T diagram characterizing the activation barriers obtained from the magnetic relaxation of $\text{HgBa}_2\text{Ca}_2\text{Cu}_3\text{O}_{8+\delta}$ thin film,” *Supercond. Sci. Technol.* vol. 18, 835 – 838 (2005).

Theses

18. PhD Thesis, “Infrared Anomalous Hall Effect: Faraday and Kerr measurements in $\text{Ca}_x\text{Sr}_{1-x}\text{RuO}_3$.”
19. MS Thesis, “Magnetic Relaxation in $\text{HgBa}_2\text{Ca}_2\text{Cu}_3\text{O}_{8+\delta}$ thin film.”

Patent applications

20. N. Yu, **M.-H. Kim**, Z. Li, “Integrated Photonic Devices based on Waveguides Patterned with Optical Antenna Arrays,” *U.S. Patent Application* WO2015050602 A1 published April 9 (2015), filed April 24 (2014).
21. J. Yan, M. Fuhrer, **M.-H. Kim**, H.D. Drew, A.B. Sushkov, G.S. Jenkins, H.M. Milchberg, J.A. Elle, “Graphene Hot Electron Bolometer,” *U.S. Provisional Patent Application* 61/830365 filed June 3 (2013).

PRESENTATIONS

- 2018 Apr (PhD student presentation) “A control of localized surface phonon polariton resonances using hyperbolic material boundary,” College of Sciences Annual Conference 2018, UTRGV, Edinburg, TX.
- 2018 Apr (Invited, Colloquium) “Finding nano-blocks to control light,” Physics Colloquium, Texas Tech University, Lubbock, TX.
- 2018 Mar (Invited, Awardee presentation) “Mid-/far infrared anomalous Hall effect,” KPS-AKPA Symposium at APS March meeting 2018, Los Angeles, CA.

- 2017 Nov (Invited) “A control of localized surface phonon polariton resonances on silicon carbide nanostructures,” Southwestern Texas Asian Symposium 2017, Edinburg, TX.
- 2016 Aug (Invited, Chairing the physics session) “Surface Phonon Polaritons on Silicon Carbide at Soft Boundaries,” UKC 2016, Dallas, TX.
- 2016 Jun “Experimental Demonstration of Waveguide Mode Converters Based on Phase-Gradient Metasurfaces,” CLEO 2016, San Jose, CA.
- 2015 Sep (Invited, Colloquium) “Molding Light with Flat Optics,” Physics Dept., the Univ. of Texas Rio Grande Valley, Brownsville, TX.
- 2015 Sep (Invited, Seminar) “Molding Light with Flat Optics,” Naval Research Laboratory, Washington, DC.
- 2015 Mar (Invited, Seminar) “Molding Light with Flat Optics,” Physics Dept., The State University of New York at Buffalo, Buffalo, NY.
- 2015 Mar (Invited, Colloquium) “Molding Light with Flat Optics,” Physics Dept., Queens College of the City University of New York, Queens, NY.
- 2015 Feb (Invited, Colloquium) “Molding Light with Flat Optics,” Physics Dept., California State University Long Beach, Long Beach, CA.
- 2014 July “Controlling light propagation and mode coupling in optical waveguides using one-dimensional phased antenna arrays,” APS/URSI, Memphis, TN.
- 2013 Mar “Helicity-dependent photocurrent in a (110) GaAs quantum well stack,” APS Meeting, Baltimore, MD.
- 2013 Mar “Photovoltaic response time in dual-gated bilayer graphene,” APS Meeting, Baltimore, MD.
- 2012 Nov “Graphene photodetector,” UMD-NASA Joint Seminar, AKPA, College Park, MD.
- 2012 Feb “GHz response of bilayer graphene hot electron bolometer,” APS Meeting, Boston, MA.
- 2011 Mar “Photoconductive response study on a dual-gated bilayer graphene,” APS Meeting, Dallas, TX.
- 2010 Mar “The infrared complex magneto-optical conductivity tensor in $\text{Ca}_x\text{Sr}_{1-x}\text{RuO}_3$ films,” APS Meeting, Portland, OR.
- 2009 Mar “Mid-infrared Verdet coefficient studies in GaAs, BaF_2 , and LaSrGaO_4 , and ZnSe,” APS Meeting, Pittsburgh, PA.
- 2009 Mar “Applying the extended Drude model for the mid-infrared complex conductivity tensor of SrRuO_3 ,” APS Meeting, Pittsburgh, PA.
- 2008 Mar “Mid-infrared Hall conductivity in $\text{Ca}_x\text{Sr}_{1-x}\text{RuO}_3$ films,” APS Meeting, New Orleans, LA.
- 2007 Mar “Infrared longitudinal and Hall conductivity of SrRuO_3 and $\text{Ga}_{1-x}\text{Mn}_x\text{As}$ films obtained by magneto-polarization measurements,” APS Meeting, Denver, CO.

PROFESSIONAL SOCIETY MEMBERSHIP

American Physical Society

Optical Society of America

SPIE – The International Society for Optics and Photonics (Student Chapter Advisor)

Korean-American Scientists and Engineers Association

Association of Korean Physicists in America (Lifetime member)

REFERENCES

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5. **Dr. John Cerne**, Professor

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