

Jongbum Kim

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SUMMARY

Dr. Jongbum Kim's research interest spans *Nanophotonics, Plasmonics, Optoelectronics, Optical Materials and Nanofabrications*. Primary goal of his research is to find the new way for the realization of nanophotonic devices from exploring the potential material platforms and novel physical phenomena in nano- and micro-scale optics and electronics for applications in on-chip optics, nanoscale light manipulation, energy harvesting and sensing.

EDUCATION

Doctor of Philosophy, Electrical and Computer Engineering Aug 2008 – Dec 2016
Purdue University, West Lafayette, IN, USA
Thesis: Plasmonic Devices Based on Transparent Conducting Oxides for Near Infrared Applications
Advisor: Alexandra Boltasseva

Bachelor of Science, Electrical and Computer Engineering Mar 2001 – Feb 2007
Korea University, Seoul, South Korea

PROFESSIONAL EXPERIENCE

Postdoctoral Associate, University of Maryland, College Park, MD, USA Jan 2017 – Current

- Lab. For Solar and Quantum Technology (PI: Jeremy N. Munday)
- Design, fabrication and analysis of thin film photodetector with metal oxides
- Materials engineering in metal nitrides to achieve epsilon near zero (ENZ) property
- Casimir force measurement between sphere and diverse shapes of nanostructure

Research Assistant, Purdue University, West Lafayette, IN, USA Dec 2016 – Jul 2010

- Photonics and Spectroscopy Lab. (PI: Alexandra Boltasseva)
- Development of metal oxides as alternative plasmonic materials with low losses and tunability
 - Pulsed Laser Deposition (PLD) system was used for the development
- Design, fabrication and analysis of plasmonic/nanophotonic devices with metal oxides and noble metals
 - Metal-insulator-metal resonator for mid infrared (MIR) bio sensor
 - NIR and MIR quarter waveplate metasurface
 - NIR optical modulator with Fabry-Pérot nano-cavities
 - Visible color filters with Fabry-Pérot nano-cavities embedded with metasurface
- Epsilon near zero (ENZ) of metal oxides for the advanced control of light
- Pump-Probe spectroscopy for understanding carrier dynamics in metal oxides
- Exploration of potential materials in the field of nanophotonics such as metal nitrides, 2D materials as well as phase changing materials

Research Intern, Samsung Advanced Institute of Technology, Suwon, Korea Jun 2013 – Jul 2013

- Development of energy harvesting devices with frictional electricity

Research Assistant, Korea University, Seoul, Korea

Mar 2007 – Apr 2008

- Semiconductor and Advanced Materials Lab. (PI: Byungmoo Moon)
- Development of epitaxial growth of ZnO thin films by pulsed laser deposition
- Study on crystallinity of n-type doped ZnO thin films

PUBICATION SUMMARY

16 referred journal articles, 20 conference presentations, 1 book chapter

Source	Total Citations	Highest Citation	Paper with Citation > 50	h-index	i10-index
Google Scholar	1105	496	5	12	12
ISI Web of Science	698	353	4	10	10

Source: Google Scholar Profile (Updated on November 10, 2018)

SERIAL JOURNAL ARTICLES

- 18 L. Krayner, **Jongbum Kim**, J. Garrett and J. Munday, "Near-perfect Absorption Throughout the Visible Using Ultra-Thin Metal Films on Index-Near-Zero Substrates" Submitted to *Optical Materials Express* (IF:2.566)
- 17 C. DeVault, V. A. Zenin, A. Pors, K. Chaudhuri, **Jongbum Kim**, A. Boltasseva, V. M. Shalaev and S. I. Bozhevolnyi, "Suppression of Near-Field Coupling in Plasmonic Antennas on Epsilon-Near-Zero Substrates" Accepted in *Optica* (IF: 7.53)
- 16 A. Shaltout*, **Jongbum Kim***, A. Boltasseva, V. M. Shalaev and A. V. Kildishev, "Optical Cavities with Embedded Metasurfaces: Ultrathin and Multicolor", *Nature Communications*, vol. 9, pp. 2673, 2018 (IF 12.35) *First two authors contributed equally
- 15 **Jongbum Kim**, E. G. Carnemolla, C. DeVault, A. Shaltout, D. Faccio, V. M. Shalaev, A. V. Kildishev, M. Ferrera and A. Boltasseva, "Dynamic Control of Nano-Cavities with Tunable Metal Oxides" *Nano Letters*, vol 18, no 2, pp 740-746, 2017 (IF: 12.08)
- 14 M. Clerici, N. Kinsey, C. DeVault, **Jongbum Kim**, E. G. Carnemolla, L. Caspani, A. Shaltout, D. Faccio, V. M. Shalaev, A. Boltasseva and M. Ferrera, "Controlling hybrid nonlinearities in transparent conducting oxides via two-colour excitation" *Nature Communications*, vol. 8, pp. 15892, 2017 (IF:12.35)
- 13 U. Guler, D. Zemlyanov, **Jongbum Kim**, Z. Wang, R. Chandrasekar, X. Meng, E. Stach, A. V. Kildishev, V. M. Shalaev and A. Boltasseva, "Plasmonic Titanium Nitride Nanostructures via Nitridation of Nanopatterned Titanium Dioxide" *Advanced Optical Materials*, vol. 5, no. 7, pp. 1600717, 2017 (IF:6.87)
- 12 Z. Zhang, F. Zuo, C. Wan, A. Dutta, **Jongbum Kim**, J. Rensberg, R. Nawrodt, H. H. Park, T. J. Larrabee, X. Guan, Y. Zhou, SM Prokes, C. Ronning, V. M. Shalaev, A. Boltasseva, M. A Kats and S. Ramanathan, "Evolution of Metallicity in Vanadium Dioxide by Creation of Oxygen Vacancies" *Physical Review Applied*, vol. 7, no. 3, pp. 034008, 2017 (IF: 4.78)

- 11 **Jongbum Kim**, S. Choudhary, C. DeVault, Y. Zhao, A. V. Kildishev, V. M. Shalaev, A. Alu and A. Boltasseva, "Controlling the Polarization state of Light with Plasmonic Metal Oxide Metasurfaces" *ACS Nano*, vol. 10, no. 10, pp. 9326–9333, 2016 (IF: 13.70)
- 10 A. Urbas, Z. Jacob, L. D. Negro, N. Engheta, A. D. Boardman, P. Egan, A. B. Khanikaev, V. Menon, M. Ferrera, N. Kinsey, C. DeVault, **Jongbum Kim**, V. Shalaev, A. Boltasseva, J. Valentine, et al., "Roadmap on Optical Metamaterials" *Journal of Optics*, vol.18, no. 9, 093005, 2016 (IF: 2.05)
- 9 A. M. Shaltout*, N. Kinsey*, **Jongbum Kim***, R. Chandrasekar*, J. C. Ndukaife*, A. Boltasseva, and V. M. Shalaev, "Development of Optical Metasurfaces: Emerging Concepts and New Materials" *Proceeding of the IEEE*, no.99, pp.1-18, 2016 (IF: 9.10) *First five authors contributed equally
- 8 L. Caspani, R. P. M. Kaipurath, M. Clerici, M. Ferrera, T. Roger, A. D. Falco, **Jongbum Kim**, N. Kinsey, V. M. Shalaev, A. Boltasseva, and D. Faccio, "Enhanced Nonlinear Refractive Index in Epsilon-Near-Zero Materials" *Physical Review Letters*, vol. 116, pp. 233901, 2016 (IF: 8.83)
- 7 **Jongbum Kim**, A. Dutta, G. V. Naik, A. V. Kildishev, A. Giles, F. J. Bezares, O. J. Glembocki, A. Mahmoud, H. Caglayan, J. D. Caldwell, A. Boltasseva, and N. Engheta, "The Role of Epsilon-Near-Zero Substrates in the Optical Response of Plasmonic Antennas" *Optica*, vol. 3, no. 3, pp. 339-346, 2016 (IF: 7.53)
- 6 **Jongbum Kim**, A. Dutta, B. Memarzadeh, A. V. Kildishev, H. Mosallaei, and A. Boltasseva, "Zinc Oxide Based Plasmonic Multilayer Resonator: Localized and Gap Surface Plasmon in the Infrared" *ACS Photonics*, vol. 3, no. 8, pp. 1224-1230, 2015 (IF: 6.88)
- 5 N. Kinsey, C. DeVault, **Jongbum Kim**, M. Ferrera, V. M. Shalaev, and A. Boltasseva, "Epsilon-Near-Zero Al-doped ZnO for Ultrafast Switching at Telecom Wavelengths" *Optica*, vol. 2, no. 7, pp. 616-622, 2015 (IF: 7.53)
- 4 W. Tianwu, M. Zalkovskij, K. Iwaszczuk, A. V. Lavrinenko, G. V. Naik, **Jongbum Kim**, A. Boltasseva, and P. U. Jepsen, "Ultrabroadband Terahertz Conductivity of Highly Doped ZnO and ITO" *Optical Materials Express*, vol. 5, no. 3, pp. 566-575, 2015 (IF: 2.56)
- 3 **Jongbum Kim**, G. V. Naik, A. V. Gavrilenko, K. Dondapati, V. I. Gavrilenko, S.M. Prokes, O. J. Glembocki, V. M. Shalaev, and A. Boltasseva, "Optical Properties of Gallium-Doped Zinc Oxide-A Low-Loss Plasmonic Material: First-Principles Theory and Experiment" *Physical Review X*, vol. 3, no. 4, pp. 041037, 2013 (Invited letter) (IF: 14.358)
- 2 **Jongbum Kim**, G. V. Naik, N. K. Emani, U. Guler, and A. Boltasseva, "Plasmonic Resonances in Nanostructured Transparent Conducting Oxide Films" *IEEE Selected Topics in Quantum Electronics*, vol.19, no. 3, pp.4601907, 2013 (Invited letter) (Cover letter) (IF: 3.367)
- 1 G. V. Naik, **Jongbum Kim**, and A. Boltasseva, "Oxides and Nitrides as Alternative Plasmonic Materials in the Optical Range" *Optical Materials Express*, vol. 1, no. 6, pp. 1090-1099, 2011 (Invited letter) (IF: 2.56)

BOOK CHAPTER

- 1 G. V. Naik, **Jongbum Kim**, N. Kinsey, A. Boltasseva, Alternative plasmonic materials, Chapter in "Modern Plasmonics" Eds: A. A. Maradudin, J. R. Sambles and W. L. Barnes, Elsevier, Sep. 2014

INTERNATIONAL CONFERENCES

- 20 M. Ferrera†, M. Clerici, N. Kinsey, C. DeVault, **Jongbum Kim**, E. Carnemolla, L. Caspani, A. Shaltout, D. Faccio, V. Shalaev, and A. Boltasseva, "Engineered Nonlinearities in Transparent Conducting Oxides", in *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA, USA, May 2017
- 19 DeVault†, V. Zenin, A. Pors, **Jongbum Kim**, K. Chaudhuri, S. Bozhevolnyi, V. Shalaev, and A. Boltasseva, "Plasmonic Antenna Resonance Pinning and Suppression of Near-Field Coupling from Epsilon-Near-Zero Substrate", in *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA, USA, May 2017
- 18 Alexandra Boltasseva†, Nathaniel Kinsey, Matteo Cleirci, Marcello Ferrera, **Jongbum Kim**, Clayton DeVault, Amr M. Shaltout, Daniele Faccio, Vladimir Shalaev, "Oxides in plasmonics and nanophotonics: materials and dynamic devices", Proc. SPIE 9920, Active Photonic Materials VIII, 99200J, Nov 2016
- 17 C. DeVault†, N. Kinsey, **Jongbum Kim**, A. Dutta, M. Ferrera, V. M. Shalaev, and A. Boltasseva, "Ultrafast Optical Tuning of Epsilon-Near-Zero Thin Films," in *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA, USA, Jun 2016
- 16 A. Shaltout*†, **Jongbum Kim***, A. Kildishev, A. Boltasseva, and V. M. Shalaev, "Implementation of Metasurface Based Nano-Cavities," in *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA, USA, Jun 2016 (* Co-leading authors)
- 15 **Jongbum Kim**, N. Kinsey, A. Dutta, M. Ferrera, C. DeVault, A. V. Kildishev, V. M. Shalaev and A. Boltasseva†, "Transparent conducting oxides as plasmonic component in near infrared", in *SPIE Nanoscience+ Engineering*, International Society for Optics and Photonics, San Diego, CA, USA, Oct 2015
- 14 N. Kinsey†, C. DeVault, **Jongbum Kim**, M. Ferrera, A. V. Kildishev, V. M. Shalaev and A. Boltasseva, "Ultrafast dynamics of Al-doped zinc oxide under optical excitation", in *SPIE Nanoscience+ Engineering*, International Society for Optics and Photonics, San Diego, CA, USA, Oct 2015
- 13 N. Kinsey, M. Ferrera, C. DeVault, **Jongbum Kim**, A. V. Kildishev, V. M. Shalaev and A. Boltasseva†, "Alternative materials lead to practical nanophotonic components", in *SPIE Nanoscience+ Engineering*, International Society for Optics and Photonics, San Diego, CA, USA, Oct 2015
- 12 N. Kinsey, M. Ferrera, C. DeVault, **Jongbum Kim**, A. Dutta, K. Chaudhuri, S. Choudhuri, V. M. Shalaev, and A. Boltasseva†, "Practical Platform for Nanophotonics with Refractory Plasmonic Metal Nitrides and Transparent Conducting Oxides", in *Frontiers in Optics Proceedings*, San Jose, CA, USA, Oct 2015
- 11 N. Kinsey, C. DeVault, **Jongbum Kim**, M. Ferrera, A. V. Kildishev, V. Shalaev, A. Boltasseva†, "Transient Response of Optically Excited Al-Doped Zinc Oxide," Conference Proceedings, Lasers and Electro-

Optics/Europe and the European Quantum Electronics Conference CLEO Europe, Munich, Germany, Jun 2015

- 10 **Jongbum Kim**†, A. Dutta, G. V. Naik, A. V. Kildishev, A. Boltasseva, A. Giles, F. J. Bezares, O. J. Glembocki, J. D. Caldwell, A. Mahmoud, H. Caglayan, and N. Engheta, "Gold Antenna on Epsilon-near-Zero Substrates: Effect on Radiation Pattern and Resonance Frequency" in *MRS Spring meeting 2015*, San Francisco, CA, USA, Apr 2015
- 9 N. Kinsey, C. DeVault, **Jongbum Kim**, I. Kitamura, M. Ferrera, U. Guler, L. Prokopeva, A. Kildishev, V. Shalaev, A. Boltasseva†, "Dynamic Properties of Highly Doped Zinc Oxide", NANOMETA 2015: 5th International Topical Meeting on Nanophotonics and Metamaterial Conference, paper MON3o-I-03, Seefeld (Tirol), Austria, Jan 2015
- 8 N. Kinsey, U. Guler, **Jongbum Kim**, G. V. Naik, V. M. Shalaev, and A. Boltasseva†, "Developing ceramic materials for practical plasmonics," in *SPIE Nanoscience+ Engineering*, International Society for Optics and Photonics, San Diego, CA, USA, Aug 2014
- 7 N. Kinsey, **Jongbum Kim**, L. Prokopeva, M. Ferrera, V. Babicheva, A. Dutta, S. Choudhury, A. Kildishev, V. Shalaev, and A. Boltasseva, "Practical Nanophotonics with Plasmonic Ceramics" 8th International Congress on Advanced Electromagnetic Materials in Microwaves and Optics (METAMATERIALS) 2014, Copenhagen, Aug, 2014
- 6 **Jongbum Kim**†, Y. Zhao, A. Dutta, S. M. Choudhury, A. Kildishev, A. Alu, and A. Boltasseva, "Nanostructured Transparent Conducting Oxide Films for Polarization Control with Plasmonic Metasurfaces", in *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA, USA, Jun 2014
- 5 **Jongbum Kim**†, B. Memarzadeh, A. Dutta, S. M. Choudhury, A. Kildishev, H. Mosallaei, and A. Boltasseva, "GZO/ZnO Multilayered nanodisk metasurface to engineer the plasma frequency", in *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA, USA, Jun 2014
- 4 **Jongbum Kim**†, Y. Zhao, G. V. Naik, N. K. Emani, U. Guler, A. Kildishev, A. Alu, and A. Boltasseva, "Nanostructured Transparent Conductive Oxide Films for Plasmonic Applications", in *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA, USA, Jun 2013
- 3 G. V. Naik, **Jongbum Kim**, U. Giler, N. K. Emani, P. R. West, N. Kinsey, J. S. Ndukaife and A. Boltasseva†, "Empowering plasmonics and metamaterials technology with new material platforms", in *Proceedings of V Intl. Conf. Frontiers of Nonlinear Physics*, Nizhny Novgorod, Russia, 2013
- 2 G. V. Naik, **Jongbum Kim**, N. K. Emani, P. R. West, A. Boltasseva, "Plasmonic metamaterials: Looking beyond gold and silver," 6th International Congress on Advanced Electromagnetic Materials in Microwaves and Optics: Metamaterials 2012, St. Petersburg, Russia, Sep, 2012
- 1 A. V. Gavrilenko†, K. Dondapati, V. I. Gavrilenko, **Jongbum Kim**, G. V. Naik, A. Boltasseva, "Optical functions of nano-crystalline ZnO containing voids and doped with Ga", in *SPIE Nanoscience+ Engineering*, International Society for Optics and Photonics, San Diego, CA, USA, Oct 2012

PROFESSIONAL ACTIVITIES

- Optical Society of America (OSA): Member (since 2011)
- Materials Research Society (MRS): Member (since 2013)
- Korean-American Scientists and Engineers Association (KSEA): Member (since 2018)
- Technical reviewer for Scientific Reports, Optics Letters, Optics Express, Optical Materials Express, Journal of Nanophotonics

TECHINICAL SKILLS

- **Thin Film Growth:** Pulsed Laser Deposition (PLD)*, Nitride Sputtering, Atomic Layer Deposition (ALD)
* Served as a technical manager of the PLD system at Birck Nanotechnology Center, Purdue University
- **Nanofabrication*:** Vistec/ Raith Ebeam Lithography, Panasonic Reactive Ion Etching (RIE), Focus Ion Beam (FIB)
* Hands-on cleanroom experiences over 10 years
- **Material Characterization:** X-ray Powder Diffraction (XRD), Veeco/ Ashylum Cypher Atomic Force Microscope (AFM), scanning electron microscope (SEM), Hall Effect MMR
- **Optical Characterization:** J.A. Woollam spectroscopic ellipsometer, Fianium supercontinuum laser, SpectraPhysics Spitfire femtosecond CPA system
- **Numerical Calculation:** COMSOL Multiphysics, Lumerical FDTD