이종원 Jongwon Lee

전기전자공학과 / Electrical Engineering

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Curriculum Vitae

2019.09-Present, Ulsan National Institute of Science and Technology (UNIST), Ulsan, Korea
School of Electrical and Computer Engineering
Associate Professor
2015.09-2019.08, Ulsan National Institute of Science and Technology (UNIST), Ulsan, Korea
School of Electrical and Computer Engineering
Assistant Professor

Academic Credential

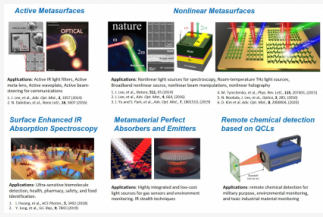
2012.01-2014.12, University of Texas at Austin, Austin, TX, U.S.A.
Ph.D. in Electrical and Computer Engineering (GPA: 4.0/4.0)
Dissertation title: "Nonlinear and wavelength-tunable plasmonic metasurfaces and devices"
Research advisor: Mikhail A. Belkin
2009.08-2011.12, University of Texas at Austin, Austin, TX, U.S.A.

M.S. in Electrical and Computer Engineering (GPA: 4.0/4.0)
Thesis title: "Broadly wavelength-tunable bandpass filters based on long-range surface plasmon-polaritons"
Research adv

Awards/Honors/Memberships

OSK rising star 30, (2020)
한국광학회 정회원
한국센서학회 정회원
한국물리학회 정회원
Optical Society of America (OSA) member

Nanostructured Photonic Devices Laboratory
나노구조광소자 연구실



Plasmonics forms a major part of the fascinating field of nanophotonics, which explores electromagnetic fields can be confined and interact with matters over dimensions on the order of or smaller than the wavelength. In recent years, technologies in this area have been explored extensively for variety of applications such as imaging systems, sensors, waveguides, light sources, metamaterials and metasurfaces, to name a few examples. Our research aims at studying plasmonics and developing plasmonic devices and metamaterials in mid-infrared (mid-IR) and terahertz (THz) portion of the electromagnetic spectrum (~1-150THz, or 2-300μm).

Mid-infrared and terahertz photonics, spectral range beginning at the current frequency limits of electronics and ending at the edge of the telecom range, encompass an astounding array of technologies and applications, including environmental monitoring, detection of chemical and biological agents for defense applications, non-contact materials characterization, non-invasive medical diagnostics, and food-safety and quality control applications. Beyond sensing, both the mid-IR and THz have applications in astronomy and have been suggested as potential frequency bands for wireless free-space communication. Although many practical applications are proposed in this spectral range, the relative paucity of IR and THz components calls for novel technologies, such as novel plasmonic, metamaterial, and metasurface phenomena. Our research goals are understanding of exotic optical responses from light-matter interaction of plasmonic phenomena and developing novel photonic devices based on the understandings.

관심분야	희망분야
Plasmonics, Metamaterials, Metasurfaces, Nonlinear Optics, Surface-enhanced Infrared Absorption Spectroscopy	THz photonics

Research Keywords and Topics

1. Surface-enhanced Infrared Absorption Spectroscopy
We are developing a novel class of plasmonic structures for Surface-enhanced infrared absorption (SEIRA) spectroscopy. Extremely high near-field enhancement and enhanced sensing area formed at various plasmonic metamaterial structures may provide a promising sensing platform for future applications of ultrasensitive biological and chemical sensing and detection.
2. Active metasurfaces
We are developing ultra-fast electrically-tunable plasmonic metasurfaces based on coupling of plasmonic resonances in metallic nanostructures with intersubband transitions in multiple-quantum-well (MQW) structures.
3. Nonlinear metasurfaces
We are developing highly-nonlinear metasurfaces based on coupling of electromagnetically-engineered plasmonic nanoresonators with quantum-engineered intersubband nonlinearities.

Research Publications

1. Jongwon Lee, Mykhailo Tymchenko, Christos Argyropoulos, Pai-Yen Chen, Feng Lu, Frederic Demmerle, Gerhard Boehm, Markus-Christian Amann, Andrea Alu*, and Mikhail A. Belkin*, "Giant nonlinear response from plasmonic metasurfaces coupled to intersubband transitions" Nature, 511, 65-69, (2014).
2. Inyong Hwang, Jaeyeon Yu, Jihye Lee, Jun-Hyuk Choi, Dae-Geun Choi, Sohee Jeon, Jongwon Lee*, and Joo-Yun Jung*, "Plasmon-enhanced infrared spectroscopy based on metamaterial absorbers with dielectric nanopedestals" ACS Photonics, 5, 3492-3498, (2018).
3. Daeik Kim, Hyeongju Chung, Jaeyeon Yu, Inyong Hwang, Seongjin Park, Frederic Demmerle, Gerhard Boehm, Markus-Christian Amann, Mikhail A. Belkin, Joo-Yun Jung, and Jongwon Lee*, "Spin-controlled nonlinear harmonic generations from plasmonic metasurfaces coupled to intersubband transitions" Advanced Optical Materials, 8, 2000004, (2020).

Patents

1. Jongwon Lee, Jaeyeon Yu and Seongjin Park, "Optical frequency modulation devices with broadband nonlinear optical responses" KR 10-2018-0067755, Ulsan National Institute of Science and Technology, June 12, (2018).
2. Jongwon Lee, Jaeyeon Yu and Seongjin Park, "Optical frequency modulation devices producing third-harmonic generation" KR 10-2018-0067723, Ulsan National Institute of Science and Technology, June 12, (2018).