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RESEARCH INTERESTS

Synthesis and application of inorganic/organometallic complexes and main-group (mainly N-heterocyclic carbene) compounds, which 1) catalyze activation of small molecules (such as N₂, O₂, NO, CO₂, NH₃, and others) and inert bonds (carbon-fluorine or carbon-oxygen) in important molecules highly efficiently for better organic transformation, 2) allow facile access to highly reactive species for efficient functional materials. Synthesis and application of N-heterocyclic carbene based metal-organic frameworks.

EDUCATION

- 2004 – 2009 **Stanford University**, Stanford, CA, USA
Ph.D. *Inorganic and Organometallic Chemistry*
Advisor: Prof. Dmitry V. Yandulov
- 1999 – 2001 **POSTECH**, Pohang, Republic of Korea
M.S. *Inorganic Chemistry*
Advisor: Prof. Kimoon Kim
- 1995 – 1999 **POSTECH**, Pohang, Republic of Korea
B.S. *Inorganic Chemistry*
Advisor: Prof. Kimoon Kim

EXPERIENCE

- 2017 – current **POSTECH**, Department of Chemistry and Division of Advanced Materials Science
Associate Professor
- 2019 – 2020 **CALTECH**, Division of Chemistry and Chemical Engineering
Visiting Professor (Prof. Robert H. Grubbs)
- 2013 – 2018 **Institute for Basic Science (IBS)** Center for Self-assembly and Complexity (POSTECH Campus)
Research Fellow
- 2013 – 2017 **POSTECH**, Department of Chemistry, Assistant Professor
- 2009 – 2013 **Harvard University**, Department of Chemistry and Chemical Biology
MGH (Massachusetts General Hospital), Department of Radiology,
Postdoctoral Scholar (Advisor: Prof. Tobias Ritter)
- 2004 – 2009 **Stanford University**, Department of Chemistry
Teaching/Research Assistant
- 2004 **Soongsil University**, CAMDRC and Department of Chemistry
Researcher (Advisor: Prof. Jaheon Kim)
- 2001 **POSTECH**, Center for Smart Supramolecules (CSS)
Researcher (Advisor: Prof. Kimoon Kim)

AWARDS

- 2000 **POSTECH**, Center for Smart Supramolecules: Excellent Research Award
- 2015 TJ Park Science Fellowship
- 2015 IBS Excellent Researcher Award
- 2016 2016 Thieme Chemistry Journal Award
- 2018 KCS-Wiley Young Chemist Award, KCS, 2018
- 2018 Science and Technology Research Fund, Korea Toray Science Foundation, 2018
- 2019 Young Inorganic Chemist Award, KCS Inorganic Division, 2019

PUBLICATIONS

- (69) Highly stable 1,2-dicarbonyl radical cations derived from N-heterocyclic carbenes
J. Am. Chem. Soc. **2021**, *143*, 8527.
Y. Kim, J. E. Byeon, G. Y. Jeong, S. S. Kim, H. Song, E. Lee*
- (68) Programmable Synthesis of Silver Wheels
Inorg. Chem. **2021**, *60*, 6403.
H. Kwon, E. Pietrasiak, T. Ohhara, A. Nakao, B. Chae, C.-C. Hwang, D. Jung, I.-C. Hwang, Y. H. Ko, K. Kim, E. Lee*
- (67) Excited state Proton Transfer of Quinone Cyanine 9: Implications on the Origin of Super-Photoacidity
ChemPhotoChem **2021**, *5*, 245.
C. Lee, S. Chung, H. Song, Y. M. Rhee, E. Lee and T. Joo*
- (66) Indol-2-ylidene (IdY): Ambiphilic N-heterocyclic Carbene Derived from Indole
Chem. Eur. J. **2021**, *27*, 3849.
H. Kim, M. Kim, H. Song,* E. Lee*
- (65) Kinetic Resolution of α -Silyl-Substituted Allylboronate Esters via Chemo- and Stereoselective Allylboration of Aldehydes
Adv. Synth. Catal. **2021**, *363*, 2371.
J. Park, Y. Jung, J. Kim, E. Lee, S. Y. Lee, S. H. Cho*
- (64) Semi-aromatic polyester synthesis via alternating ring-opening copolymerization using a chromium complex based on a pentapyridine ligand
Inorg. Chem. Commun. **2020**, *122*, 105275.
H. K. Ryu, J. Cha, N. Yu, E. Lee,* K.-s. Son*
- (63) Dinitrogen activation by penta-pyridyl molybdenum complex
Dalton Trans. **2020**, *49*, 12945.
J. Cha, H. Kwon, H. Song, E. Lee*
- (62) Cobalt-Catalyzed Defluorosilylation of Aryl Fluorides via Grignard Reagent Formation
Org. Lett. **2020**, *22*, 7387.
S. Lim, H. Cho, J. Jeong, M. Jang, H. Kim, S. H. Cho, E. Lee*
- (61) Tunable Redox-Active Triazenyl-Carbene Platforms: A New Class of Anolytes for Non-Aqueous Organic Redox Flow Batteries
ACS Appl. Mater. Interfaces **2020**, *12*, 37338.
J. Back, G. Kwon, J. E. Byeon, H. Song, K. Kang,* E. Lee*
- (60) Concurrent Formation of N-H Imines and Carbonyl Compounds by Ruthenium-Catalyzed C-C Bond Cleavage of β -Hydroxy Azides
Org. Lett. **2020**, *22*, 4608.
J. M. Lee,[^] D. Y. Bae,[^] J. Y. Park, H. Y. Jo, E. Lee,* Y. H. Rhee,* J. Park*
- (59) Early transition metal complexes with triphenolamine ligands: Synthesis and applications
Coord. Chem. Rev. **2020**, *419*, 213402.
D. Y. Bae,[^] Y. Kim,[^] J. Cha, E. Lee*
- (58) Ring-opening copolymerization of cyclic epoxide and anhydride using a five-coordinate chromium complex with a sterically demanding amino triphenolate ligand
Polym. Chem. **2020**, *11*, 3756.
H. K. Ryu, D. Y. Bae, H. Lim, E. Lee,* K.-s. Son*
- (57) Activation of C-F, Si-F, and S-F Bonds by N-Heterocyclic Carbenes and Their Isoelectronic Analogues
Synlett **2020**, *31*, 1349.
E. Pietrasiak, E. Lee*
- (56) Facile Synthesis of α -Boryl-Substituted Allylboronate Esters Using Stable Bis[(pinacolato)boryl]methylzinc Reagents
Org. Lett. **2020**, *22*, 2476.
M. Shin, M. Kim, C. Hwang, H. Lee, H. Kwon, J. Park, E. Lee, S. H. Cho*
- (55) Superacid-mediated Functionalization of Hydroxylated Cucurbit[n]urils
J. Am. Chem. Soc. **2019**, *141*, 17503.
S. K. Ghosh, A. Dhamija, Y. H. Ko, J. An, M. Y. Hur, D. R. Boraste, J. Seo, E. Lee,* K. M. Park* and K. Kim*
- (54) Stereoselective three-component cascade synthesis of α -substituted 2,4-dienamide from gem-difluorochloro ethanes
Chem. Commun. **2019**, *55*, 14355.
S. Das, N. Ko, E. Lee, S. E. Kim and B. C. Lee*
- (53) Chemoselective Palladium-Catalyzed Suzuki-Miyaura Cross-Coupling of (Diborylmethyl)silanes with Alkenyl Bromides
Asian J. Org. Chem. **2019**, *8*, 1664.
J. Kim, E. Lee and S. H. Cho*
- (52) Tumor vasodilation by N-Heterocyclic carbene-based nitric oxide delivery triggered by high-intensity focused ultrasound

- and enhanced drug homing to tumor sites for anti-cancer therapy
Biomaterials **2019**, 217, 119297.
- (51) Y. Kang, J. Kim, J. Park, Y. M. Lee, G. Saravanakumar, K. M. Park, W. Choi, K. Kim,* E. Lee*, C. Kim* and W. J. Kim*
Oxygen atom transfer: A mild and efficient method for generating iminyl radicals
Chem. Commun. **2019**, 55, 7061.
Y. Kim, C. W. Bielawski and E. Lee*
- (50) Visible Light-mediated Metal-free Atom Transfer Radical Polymerization with N-trifluoromethylphenyl Phenoxazines
Eur. Polym. J. **2019**, 117, 347.
G. S. Park, J. Back, E. M. Choi, E. Lee* and K. Son*
- (49) Structural Control of Metal–Organic Framework Bearing N-Heterocyclic Imidazolium Cation and Generation of Highly Stable Porous Structure
Inorg. Chem. **2019**, 58, 6619.
H. Kim, H. Kim, K. Kim* and E. Lee*
- (48) First-row early transition metal complexes with a highly sterically demanding triisopropylphenyl amino triphenolate ligand: synthesis and applications
Dalton Trans. **2019**, 48, 9617.
D. Y. Bae, G. S. Park, N. Ko, K. Son* and E. Lee*
- (47) Fluxional motion in dinuclear copper(I) complex with a propeller-type ligand: metal hopping on both sides
Dalton Trans. **2018**, 47, 17206.
H. Kwon and E. Lee*
- (46) Cobalt-Catalyzed C–F Bond Borylation of Aryl Fluorides
Org. Lett. **2018**, 20, 7249.
S. Lim, D. Song, S. Jeon, Y. Kim, H. Kim, S. Lee, H. Cho, B. C. Lee,* S. E. Kim, K. Kim and E. Lee*
- (45) SuFEx in Metal-Organic Frameworks: a Versatile Postsynthetic Modification Tool
ACS Appl. Mater. Interfaces **2018**, 10, 33785.
S. Park, H. Song, N. Ko, C. Kim, K. Kim* and E. Lee*
- (44) Stable Organic Radicals Derived from N-Heterocyclic Carbenes
Chem. Eur. J. **2018**, 24, 19110.
Y. Kim and E. Lee*
- (43) Coordination preference of hexa(2-pyridyl)benzene with copper(II) directed by hydrogen bonding
CrystEngComm **2018**, 20, 5233.
H. Kwon and E. Lee*
- (42) Reduced Pyronin B as a Solution-Processable and Heating-Free n-Type Dopant for Soft Electronics
J. Mater. Chem. C. **2018**, 6, 6672.
E. K. Lee, Y. Kim, J. Back, E. Lee and J. H. Oh*
- (41) Static and dynamic coordination behaviours of copper(I) ions in hexa(2-pyridyl)benzene ligand systems
Dalton Trans. **2018**, 47, 8448.
H. Kwon and E. Lee*
- (40) Coumaraz-2-on-4-ylidene: Ambiphilic N-heterocyclic Carbenes with a Fine-Tunable Electronic Structure
Angew. Chem. Int. Ed. **2018**, 57, 8603.
H. Song,* H. Kim, E. Lee*
- (39) Separation of Acetylene from Carbon Dioxide and Ethylene by a Water Stable Microporous Metal-organic Framework with Aligned Imidazolium Groups inside the Channels
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J. Lee, C. Y. Chuah, J. Kim, Y. Kim, N. Ko, Y. Seo, K. Kim,* T. Bae,* E. Lee*
- (38) An air-stable N-heterocyclic carbene iminoxyl borate radical zwitterion
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Y. Kim, E. Lee*
- (37) Soft-template synthesis of mesoporous non-precious metal catalyst with Fe-Nx/C active sites for oxygen reduction reaction in fuel cells
Appl. Catal. B **2018**, 222, 191.
Y. Mun, M. J. Kim, S.-A. Park, E. Lee, Y. Yea, S. Lee, Y.-T. Kim, S. Kim, O.-H. Kim, Y.-H. Cho, Y.-E. Sung,* J. Lee.*
- (36) Oxime Ether Radical Cations Stabilized by N-Heterocyclic Carbene
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Y. Kim, K. Kim, E. Lee*
- (35) Triazenyl Radicals Stabilized by N-Heterocyclic Carbenes
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J. Back, J. Park, Y. Kim, H. Kang, Y. Kim, M. J. Park, K. Kim, E. Lee*
- (34) Synthetic control of coincidental formation of N-heterocyclic carbene copper(I) complex and imidazolium cations within

metal-organic frameworks

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H.-J. Lee, H. Kwon, J. Sim, D. Song, Y. Kim, J. Kim,* K. Kim,* E. Lee.*

- (33) On the Mechanism of Oxidative Cleavage of N-heterocyclic Carbene (NHC) Palladium Bond with Iodine
Eur. J. Inorg. Chem. **2017**, 2058.
E. Lee.*, D. Y. Bae, D. V. Yandulov
- (32) An N-heterocyclic Carbene TCNE Zwitterion: Experimental and Theoretical Study on its Formation and Reactivity
Eur. J. Org. Chem. **2017**, 1231.
H. Song, Y. Kim, J. Park, Y. H. Ko, K. Kim, E. Lee.*
- (31) A Highly Substitutable Palladium(II) Complex Stabilized by the Smallest Steric N-heterocyclic Carbene, IMe (IMe = 1,3-Dimethylimidazole-2-ylidene)
Bull. Korean Chem. Soc. **2016**, *37*, 1547.
E. Lee.*, D. Y. Bae, D. V. Yandulov
- (30) A Palladium(II) Peroxide Complex Supported by the Smallest Steric N-Heterocyclic Carbene, IMe (IMe = 1,3-Dimethylimidazole-2-ylidene), and Its Reactivity by Oxygen Atom Transfer
Eur. J. Inorg. Chem. **2016**, 4551.
E. Lee.*, D. Y. Bae, S. Park, A. G. Oliver, Y. Kim, D. V. Yandulov
- (29) Activation of C–F Bonds in Fluoroarenes by N-Heterocyclic Carbenes as an Effective Route to Abnormal NHC Complexes
Chem. Commun. **2016**, 52, 10922.
Y. Kim, E. Lee.*
- (28) Efficient Synthesis of Bulky N-Heterocyclic Carbene Ligands for Coinage Metal Complexes
J. Organomet. Chem. **2016**, *820*, 1.
Y. Kim, Y. Kim, M. Y. Hur, E. Lee.*
- (27) Activation of Small Molecules at N-Heterocyclic Carbene Centers
Synlett **2016**, *27*, 477.
H. Song, Y. Kim, J. Park, K. Kim, E. Lee.*
- (26) Hydrolytic Transformation of Microporous Metal–Organic Frameworks to Hierarchical Micro- and Mesoporous MOFs
Angew. Chem. Int. Ed. **2015**, *54*, 13273.
Y. Kim, T. Yang, G. Yoon, M. B. Ghasemian, J. Koo, E. Lee, S. J. Cho, K. Kim*
- (25) Porphyrin Boxes: Rationally Designed Porous Organic Cages
Angew. Chem. Int. Ed. **2015**, *54*, 13241.
S. Hong, M. R. Rohman, J. Jia, Y. Kim, D. Moon, Y. Kim, Y. H. Ko, E. Lee, K. Kim*
- (24) Designing Highly Active Metal-Free Oxygen Reduction Catalyst in Membrane Electrode Assemblies for Alkaline Fuel Cells: Effects of Pore Size and Doping-Site Position
Angew. Chem. Int. Ed. **2015**, *54*, 9230.
S. Lee, M. Choun, Y. Ye, J. Lee, Y. Mun, E. Kang, J. Hwang, Y.-H. Lee, C.-H. Shin, S.-H. Moon, S.-K. Kim, E. Lee, J. Lee*
- (23) N-Heterocyclic Carbene Nitric Oxide Radicals
J. Am. Chem. Soc. **2015**, *137*, 4642.
J. Park, H. Song, Y. Kim, B. Eun, Y. Kim, D. Y. Bae, S. Park, Y. M. Rhee, W. J. Kim, K. Kim, E. Lee.*

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- (22) Mechanism of electrophilic fluorination with Pd(IV): fluoride capture and subsequent oxidative fluoride transfer
Chem. Sci., **2014**, *5*, 169.
J. R. Brandt, E. Lee, G. B. Boursalian, T. Ritter.*
- (21) Application of Palladium-Mediated ¹⁸F-Fluorination to PET Radiotracer Development: Overcoming Hurdles to Translation
PLoS One **2013**, *8*, e59187.
A. Kamlet, C. Neumann, E. Lee, S. Carlin, C. Moseley, N. Stephenson, J. M. Hooker,* T. Ritter.*
- (20) Nickel-Mediated Oxidative Fluorination for PET with Aqueous [¹⁸F]Fluoride
J. Am. Chem. Soc. **2012**, *134*, 17456. *Highlight (C&EN 2012, 90 (43), 34.)* Synfacts 2013; 9(1): 0090
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- (19) Connecting Binuclear Pd(III) and Mononuclear Pd(IV) Chemistry by Pd–Pd Bond Cleavage
J. Am. Chem. Soc. **2012**, *134*, 12002.
D. C. Powers, E. Lee, A. Ariafard, M. S. Sanford, B. F. Yates,* A. J. Canty,* T. Ritter.*
- (18) Synthesis and Characterization of Pd(IMe)₂, and its Reactivity by C–S Oxidative Addition of DMSO
J. Organomet. Chem. **2011**, *696*, 4095.
E. Lee,* D. V. Yandulov.
- (17) Synthesis and Structure of Solution-Stable One-Dimensional Palladium Molecular Wires
Nature Chem., **2011**, *3*, 949.
M. G. Campbell, D. C. Powers, J. Raynaud, M. J. Graham, P. Xie, E. Lee, T. Ritter.*

- (16) A Fluoride-derived Electrophilic Late-Stage Fluorination Reagent for PET Imaging
Science **2011**, 334, 639. *Highlights (C&EN)* **2011**, 89 (45), 7. *Nat. Methods* **2012**, 9, 19. *Angew. Chem. Int. Ed.* **2012**, 51, 1106. *Nature Chem.* **2012**, 4, 152)
E. Lee,[‡] A. Kamlet,[‡] D. C. Powers, C. Neumann, G. B. Boursalian, T. Furuya, D. C. Choi, J. M. Hooker,* T. Ritter.*
- (15) Silver-Mediated Trifluoromethoxylation of Aryl Stannanes and Arylboronic Acids
J. Am. Chem. Soc. **2011**, 133, 13308.
C. Huang, T. Liang, S. Harada, E. Lee, T. Ritter.*
- (14) A Dinuclear Palladium Catalyst for α -Hydroxylation of Carbonyls with O₂
J. Am. Chem. Soc. **2011**, 133, 1760.
G. J. Chuang, W. Wang, E. Lee, T. Ritter.*
- (13) On the Isolation of Neat Allylic Fluorides
J. Fluor. Chem. **2009**, 130, 474.
E. Lee, D. V. Yandulov.*
- (12) Crystal structures of (2-substituted-5-N-tosyl)bicyclo[3.3.0]-5-azacyclooct-2-enone: a pseudo achiral crystal from enantiopure compound and a counter-example of Wallach's rule
Tetrahedron: Asymmetry **2009**, 20, 1736.
K. S. Jeong, D. E. Kim, E. Lee, Y. H. Jhon, H. Han, J. Kim, N. Jeong.*
- (11) A Three-dimensional MOF Assembled by Metal-organic Tapes Comprising of Copper(II) Tetranuclear Clusters and 5-Sulfoisophthalates
Bull. Kor. Chem. Soc. **2008**, 29, 2540.
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Angew. Chem. Int. Ed. **2006**, 45, 8134.
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S. -Y. Kim, I. -S. Jung, E. Lee, J. Kim, S. Sakamoto, K. Yamaguchi, K. Kim.
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Angew. Chem. Int. Ed. **2001**, 40, 1526.
H. -J. Kim, J. Heo, W. -S. Jeon, E. Lee, J. Kim, S. Sakamoto, K. Yamaguchi, K. Kim.*
- (3) A Two-Dimensional Polyrotaxane with Large Cavities and Channels: a Novel Approach to Metal-Organic Open-Frameworks Using Supramolecular Building Blocks
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E. Lee, J. Kim, J. Heo, D. Whang, K. Kim.*
- (2) A Three-Dimensional Polyrotaxane Network
Angew. Chem. Int. Ed. **2000**, 39, 2699.
E. Lee, J. Heo, K. Kim.*
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J. Kim, I.-S. Jung, S.-Y. Kim, E. Lee, J.-K. Kang, S. Sakamoto, K. Yamaguchi, K. Kim.*

Domestic Journals (Non SCI)

- (8) About naked fluoride
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E. Lee.*
- (7) Recent advance on the borylation of carbon-oxygen bonds in aromatic compounds
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S. Jeon, E. Lee.*
- (6) Development of fluorination methodology for carbon-fluorine bond formation: old electrophilic fluorinating reagents
J. Radiopharm. Mol. Probes. **2018**, *4*, 11 (English).
D. Y. Bae, E. Lee.*
- (5) Development of fluorination methodology for carbon-fluorine bond formation: nucleophilic fluorinating reagents in the mid-2000s
J. Radiopharm. Mol. Probes. **2017**, *3*, 129 (English).
D. Y. Bae, E. Lee.*
- (4) Transition metal-mediated/catalyzed fluorination methodology developed in the 2000s
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- (3) Theoretical Study on Electronic Properties of Deoxyfluorinating Sulfur-Based Reagents
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Transactions of the Korean Hydrogen and New Energy Society, **2004**, *15*, 105 (Korean).
E. Lee, Y. Oh, J. Kim,* J. Yoon, T.-B. Lee, S.-H. Choi, D. Kim, J. Lee, S. J. Cho

PATENT

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H. Song, S. Jeon, K. Kim, E. Lee, “N-Heterocyclic carbene metallocene compounds and application of the same” PLA0120120282-4

S. Park, H. Song, K. Kim, E. Lee, “Fluorosulfonyl Carboxylic Acid Compound and Uses Thereof” PLA0120120282-6

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